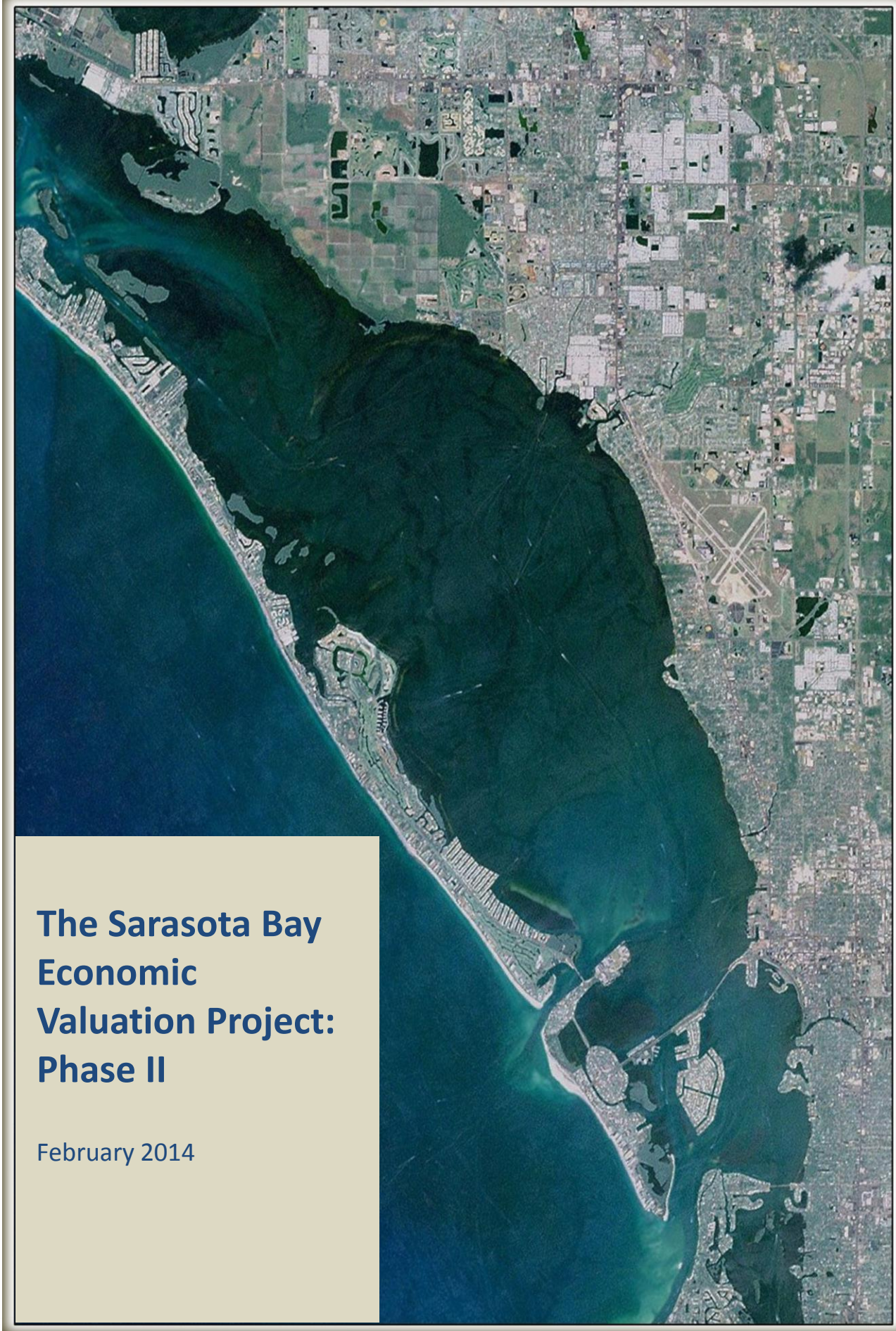


The Sarasota Bay Economic Valuation Project: Phase II

February 2014

Contributors

Principal Investigator

Paul R. Hindsley, PhD
Assistant Professor of Environmental Studies
Eckerd College
4200 54th Avenue South
St Petersburg, FL 33704

Cooperating Principal Investigator

O. Ashton Morgan, PhD
Associate Professor of Economics
Appalachian State University
Department of Economics
3094 Raley Hall
Howard Street
Boone, NC 28607

Special thanks to Beth Forys for GIS contributions and Joelle Godwin for technical writing. We would also like to thank the following research assistants: Lindsey Appleby, Kevin Boyd, Matt Hardy, Katherine Herklotz, Ryan Jarrett, Andrew Kerbs, and Matt McLean.

TABLE OF CONTENTS

1. Executive Summary

1.1 Project Overview

The purpose of this study is to provide economic values for environmental resources of the Sarasota Bay Estuary and its adjacent barrier islands. Phase I of this study is comprised of two key components: a benefit transfer application to evaluate direct and indirect use values associated with coastal recreation, and a hedonic property price model application to evaluate the direct and indirect use values associated with coastal residential real estate. Phase II of this study is comprised of three additional components: 1) an economic impact study to evaluate the economic contribution of Sarasota Bay on the local two-county economy, 2) estimates for the number of recreation trips for calculating the value of recreation use values, and 3) a discrete choice experiment to evaluate the value of management-relevant environmental resources in the Sarasota Bay Estuary. The study area for this project is the Sarasota Bay Estuary, which encompasses an expansive lagoon system from Anna Maria Sound to the area just north of Venice Inlet as well as adjacent marine resources. This project measures economic values associated with Sarasota and Manatee County residents, residents of adjacent counties, and visitors to this region.

1.1.2 Environmental Goods and Services: Connecting Sarasota Bay to Human Well-being

The Sarasota Bay provides local residents and visitors with access to a wide variety of natural resources. These resources play a key role in explaining the popularity of the Sarasota Bay region. As population pressure grows, it is important we work to better understand society's connection to these resources in order to better meet the needs of the public. The Millennium Ecosystem

Assessment (2003) provides one such framework for assessing the complex connections between human societies and ecosystems.

The Millennium Ecosystem Assessment framework begins by accounting for the structure and function of ecosystems. The ecosystem structure and function represent the components of ecosystems and those components' natural processes. The Millennium Ecosystem Assessment connects the structure and function of ecosystem to human beings through ecosystem goods and services. It is ecosystem goods and services which contribute to human well-being. As ecosystems decline (increase), the services those ecosystems provide decline (increase), and human well-being diminishes (increases).

The Millennium Ecosystem Assessment has developed categories for ecosystem goods and services. The classifications are as follows:

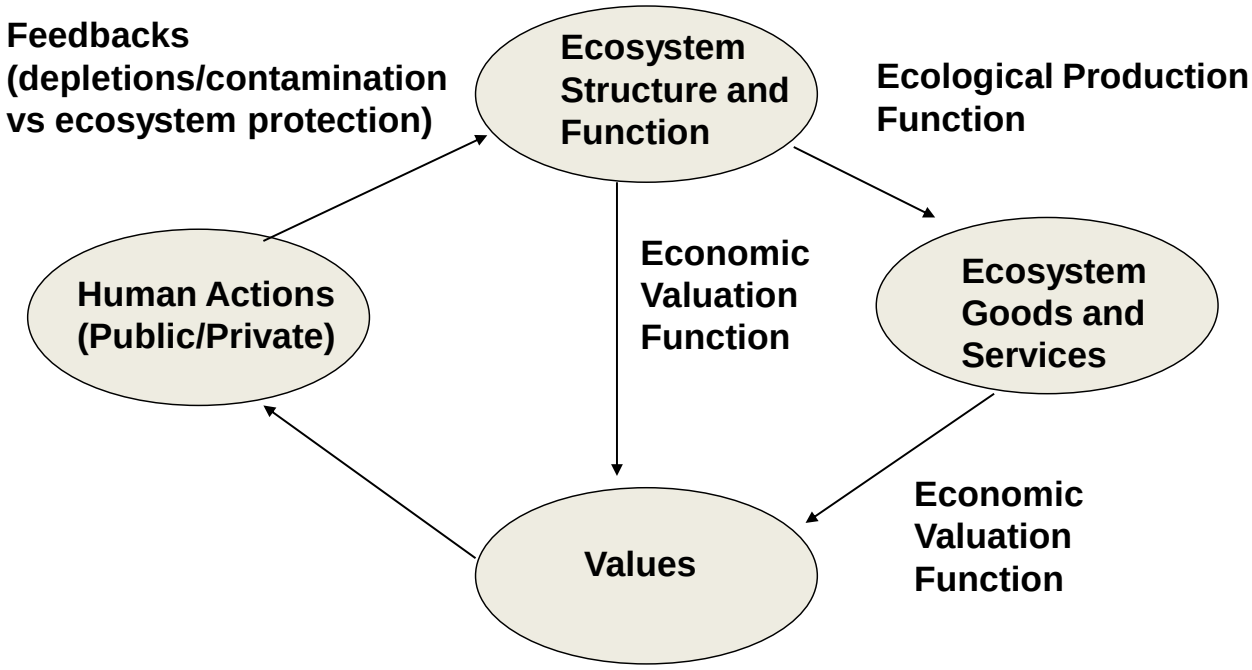
- **Provisioning Goods and Services:** These tend to be tangible goods and services provided by ecosystems. Examples include food, water, energy resources, and fuel wood.
- **Regulating Goods and Services:** This represents goods and services resulting from the regulation of ecosystem processes. Examples include climate regulation and natural hazard regulation.
- **Cultural Goods and Services:** These goods and services represent non-material benefits provided to society by ecosystems. Examples include spiritual, recreational, and aesthetic benefits.
- **Supporting Goods and Services:** These represent services necessary for the production of other ecosystem services. Examples include nutrient cycling, soil formation, and primary productivity.

People derive value from ecosystem goods and services and those values influence their future actions. We can view the interactions of people and ecosystems as a feedback loop. Figure 1, seen below, gives a heuristic model of the relationship between ecosystems, human value, and human actions. In this model, the structure and function of ecosystems can be translated into ecosystem goods and services through an ecological production function. People value these ecosystem services by either direct or indirect use.

Economists estimate the human value associated with these direct and indirect values by modeling their revealed (actual) and/or stated (anticipated) behavior.

People also value ecosystems because they exist and/or because they want themselves, their neighbors, and their descendants to have the option to use the resource at some future time. This represents non-use values, which can be measured using contingent valuation (a type of stated behavior method). These anthropocentric values (use and non-use) then influence the choices individuals make (private or public). Private and public actions finish the feedback loop by influencing the ecosystem structure and function.

Figure 1.1: Components of Ecosystem Valuation (Heal et al. 2005)



As an example, a mangrove habitat has specific structure and function associated with the relevant biotic (mangrove types, animal species, etc.) and abiotic (soil composition, water salinity, etc.) factors. This structure and function then translates into ecosystem services which individuals use directly or indirectly. People can use mangroves directly when they use the mangroves natural features to mitigate the risk associated with storm surge. They can use the mangroves indirectly when the mangroves contribute to biodiversity in an estuary. Increased biodiversity improves aesthetics and recreation. In addition

to direct and indirect use values, people also value ecosystems because they wish them to exist, even if they do not plan on using them (non-use value).

In Phase I of this study, we provided estimates of marginal value for recreational users and property owners in the Sarasota Bay Estuary region. The estimates provided in this project will contribute to an effort to evaluate the total economic value of the area. Economic Value represents ways in which a resource improves the economic well-being of individuals or society. Think of this value as the benefit individuals or society receives once costs have been accounted for. These costs could represent the costs for individuals or society to produce, provide, or protect the resource. The total economic value of a resource is divided into several components:

- **Direct Use Value:** Goods and Services Consumed by Individuals
  - **Marketed Goods and Services:** Fish (market), timber
  - **Non-marketed Goods and Services:** Recreation, aesthetics, education
- **Indirect Use Value:**
  - **Non-marketed Benefits Derived from Ecosystem Goods & Services**: Storm surge protection, climate regulation, water purification
- **Non-Use Value**
  - **Option Value:** Value associated with the option for future use
  - **Bequest Value:** Value associated with knowing the resource will be passed on to descendants
  - **Philanthropic Value:** Value associated with knowing the resource will be available to other people in the present
  - **Existence Value:** Value associated with knowing the resource exists

This project will work toward allowing policy makers to evaluate the existing natural capital and its associated services the area (total economic value) as well as the impact of changes in natural capital and ecosystem services (marginal value). As an analogy, the total economic value gives us a snapshot of the resources we have and how society values those resources. The marginal value gives us a snapshot of how the well-being of society changes when there is an incremental change in the resource. The marginal value provides the greatest

evaluation tool for policy because it allows policymakers to evaluate the trade-offs associated with different alternatives.

1.2 Benefit Transfer Model (Phase I Results)

In the Phase I benefit transfer study, we evaluate several distinct use values for a variety of potential recreation types in the region. The Sarasota Bay is comprised of numerous smaller bays and embayments with diverse biotic and abiotic characteristics. As a result, residents and visitors to these counties visit the Sarasota Bay Estuary and its adjacent resources to enjoy a wide variety of recreational opportunities. The value individuals derive directly from using the Bay's resources for recreational opportunities represents one type of economic value (use value). The problem faced by researchers is how to capture this value. While coastal and marine recreational opportunities provide significant value to residents and visitors, recreation itself is not traded in an explicit market. To overcome the problem, economists have developed a variety of methodologies to estimate the value of recreation for individuals based on their actual (observed) and anticipated (stated) behavior. In this study, we utilize the expansive economic literature on recreation use value to estimate individual's average willingness-to-pay for coastal and marine recreation trips using a methodology called meta-regression benefit transfer.

We estimate a benefit transfer meta-regression model with the goal of obtaining individuals' average willingness-to-pay for recreational trips with 95% confidence intervals. Our model enables us provide 76 estimates combining 19 activity types with trip purpose and trip duration. Table 1.1 lists all 76 average WTP estimates with 95% confidence intervals. Figures 1.2a – 1.2d gives graphical representations of these estimates.

Table 1.1: Estimated Mean Willingness-to-Pay for Recreation Trips by Activity Type (2011 Dollars)[a]

	Day Trip		Multi-Day Trip	
	Single Purpose	Multi-Purpose	Single Purpose	Multi-Purpose
Beach	$23.89 ($21.28, $26.49)	$18.76 ($16.07, $21.44)	$28.05 ($25.40, $30.69)	$22.03 ($19.30, $24.75)
Big Game Hunting	$57.79 ($55.35, $60.22)	$45.38 ($42.84, $47.91)	$67.83 ($65.34, $70.31)	$53.27 ($50.68, $55.85)
Biking	$68.96 ($66.38, $71.53)	$54.16 ($51.52, $56.79)	$80.95 ($78.31, $83.58)	$63.57 ($60.87, $66.26)
Camping	$24.72 ($22.24, $27.19)	$19.41 ($16.83, $21.98)	$29.02 ($26.50, $31.53)	$22.79 ($20.17, $25.40)
Env. Education	$21.19 ($18.37, $24.00)	$16.64 ($13.77, $19.50)	$24.87 ($22.00, $27.73)	$19.53 ($16.61, $22.44)
Freshwater Fishing	$37.47 ($35.04, $39.89)	$29.43 ($26.89, $31.96)	$43.99 ($41.50, $46.47)	$34.54 ($31.95, $37.12)
Motor boating	$37.42 ($34.86, $39.97)	$29.39 ($26.74, $32.03)	$43.93 ($41.31, $46.54)	$34.5 ($31.80, $37.19)
Running/Hiking	$54.42 ($51.96, $56.87)	$42.73 ($40.18, $45.27)	$63.87 ($61.35, $66.38)	$50.16 ($47.56, $52.75)
Kayaking/Canoeing	$44.9 ($42.29, $47.50)	$35.26 ($32.57, $37.94)	$52.7 ($50.05, $55.34)	$41.39 ($38.66, $44.11)
Off-Road Vehicle	$27.35 ($24.80, $29.89)	$21.48 ($18.84, $24.11)	$32.1 ($29.54, $34.65)	$25.21 ($22.56, $27.85)
Picnicking	$29.46 ($27.00, $31.91)	$23.14 ($20.59, $25.68)	$34.58 ($32.07, $37.08)	$27.16 ($24.56, $29.75)
Saltwater Fishing	$65.74 ($63.25, $68.22)	$51.63 ($49.02, $54.23)	$77.16 ($74.61, $79.70)	$60.6 ($57.94, $63.25)
Scuba Diving	$243.37 ($240.24, $246.49)	$191.13 ($187.86, $194.39)	$285.67 ($282.51, $288.82)	$224.34 ($221.04, $227.63)
Sightseeing	$51.25 ($48.74, $53.75)	$40.25 ($37.65, $42.84)	$60.16 ($57.60, $62.71)	$47.24 ($44.59, $49.88)
Small Game Hunting	$31.84 ($29.34, $34.33)	$25 ($22.40, $27.59)	$37.37 ($34.82, $39.91)	$29.35 ($26.71, $31.98)
Snorkeling	$104.18 ($100.34, $108.01)	$81.81 ($77.95, $85.66)	$122.28 ($118.38, $126.17)	$96.03 ($92.12, $99.93)
Swimming	$35.55 ($33.03, $38.06)	$27.92 ($25.32, $30.51)	$41.73 ($39.17, $44.28)	$32.77 ($30.12, $35.41)
Waterfowl Hunting	$40.80 ($38.39, $43.20)	$32.05 ($29.52, $34.57)	$47.9 ($45.43, $50.36)	$37.62 ($35.04, $40.19)
Wildlife Viewing	$35.47 ($33.03, $37.90)	$27.86 ($25.32, $30.39)	$41.64 ($39.14, $44.13)	$32.7 ($30.11, $35.28)

[a] **95% Confidence intervals in Parentheses**

Figure 1.2a: Mean Willingness-to-Pay for Recreation Trips with 95% Confidence Intervals

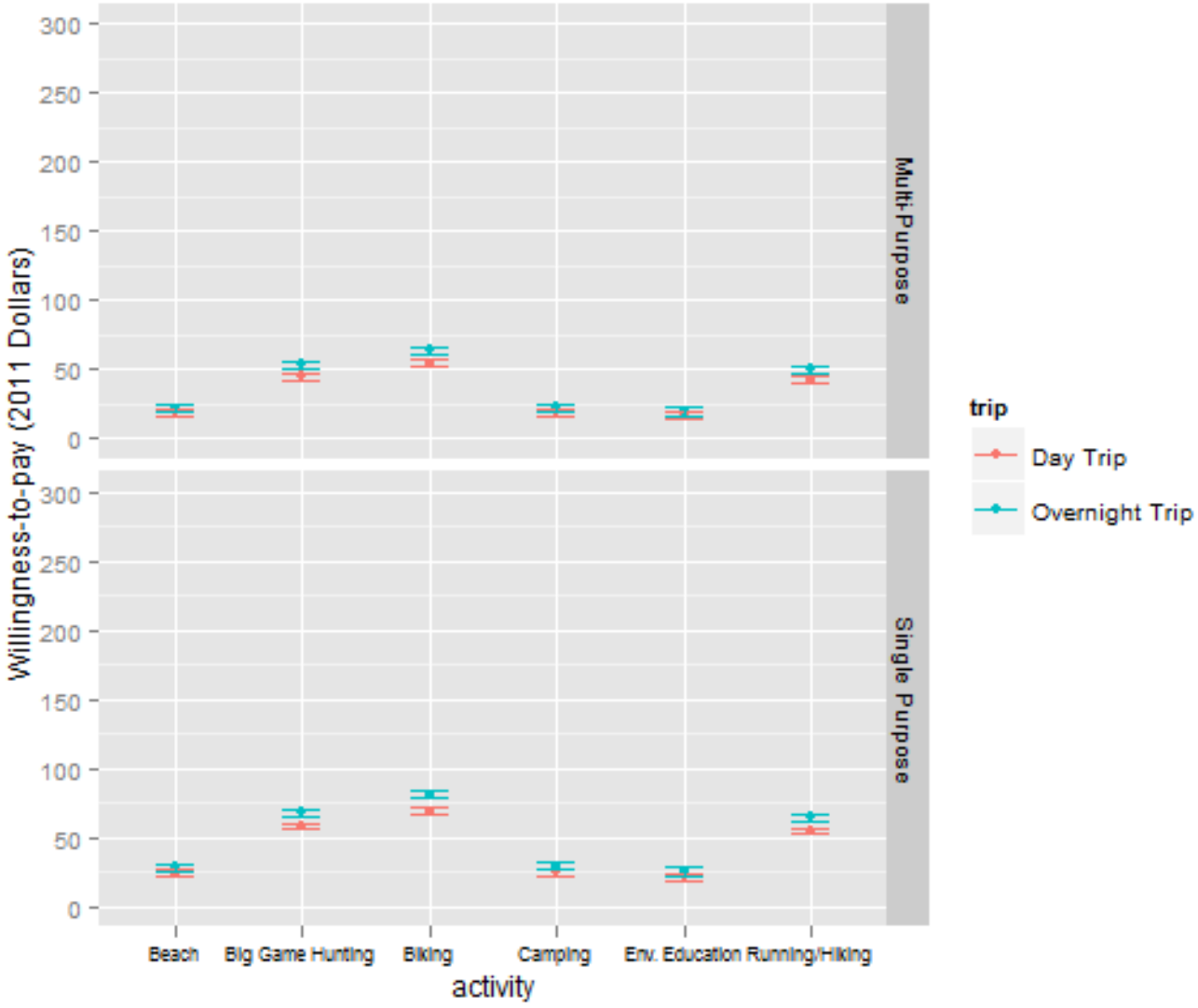


Figure 1.2b: Mean Willingness-to-Pay for Recreation Trips with 95% Confidence Intervals

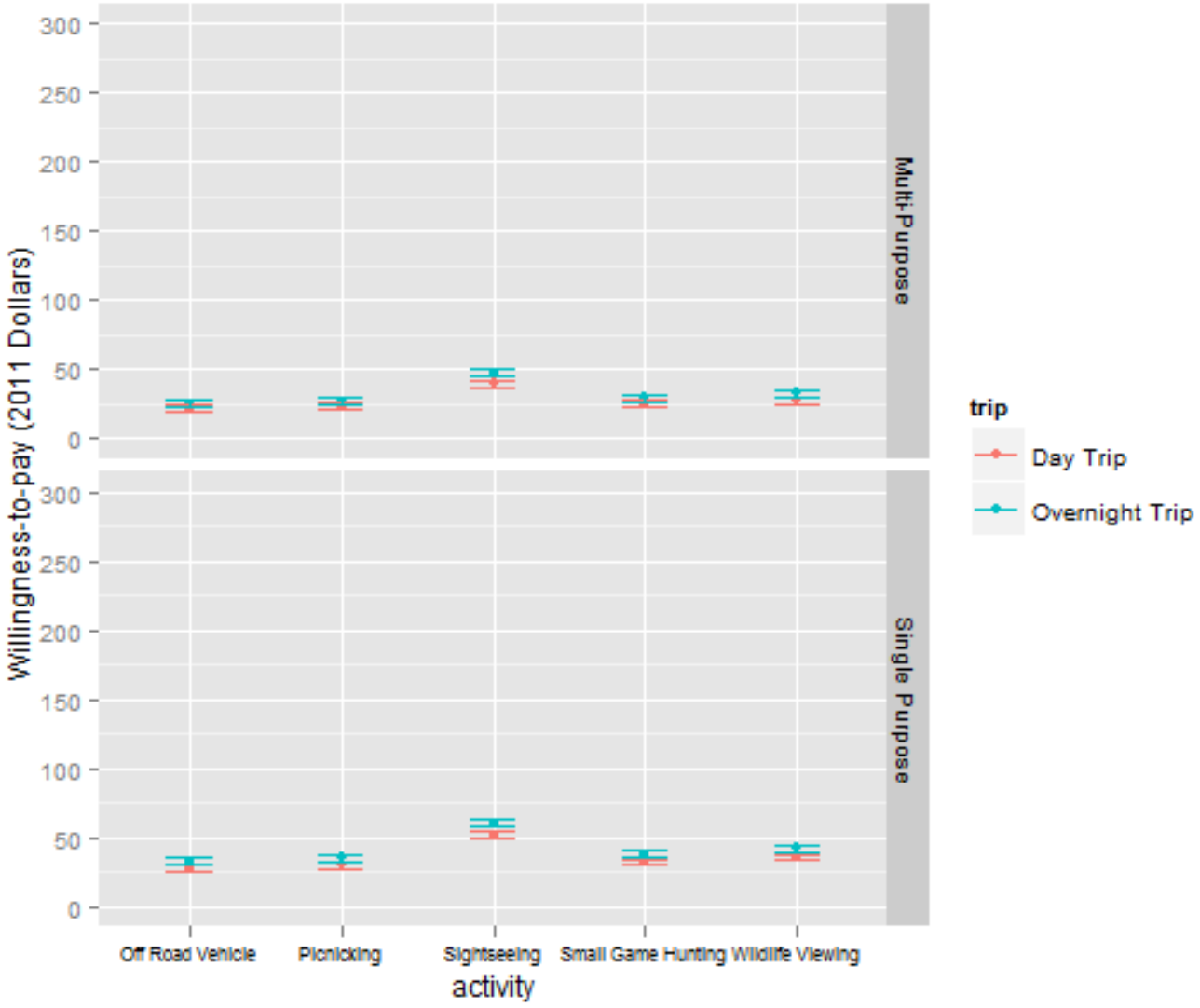


Figure 1.2c: Mean Willingness-to-Pay for Recreation Trips with 95% Confidence Intervals

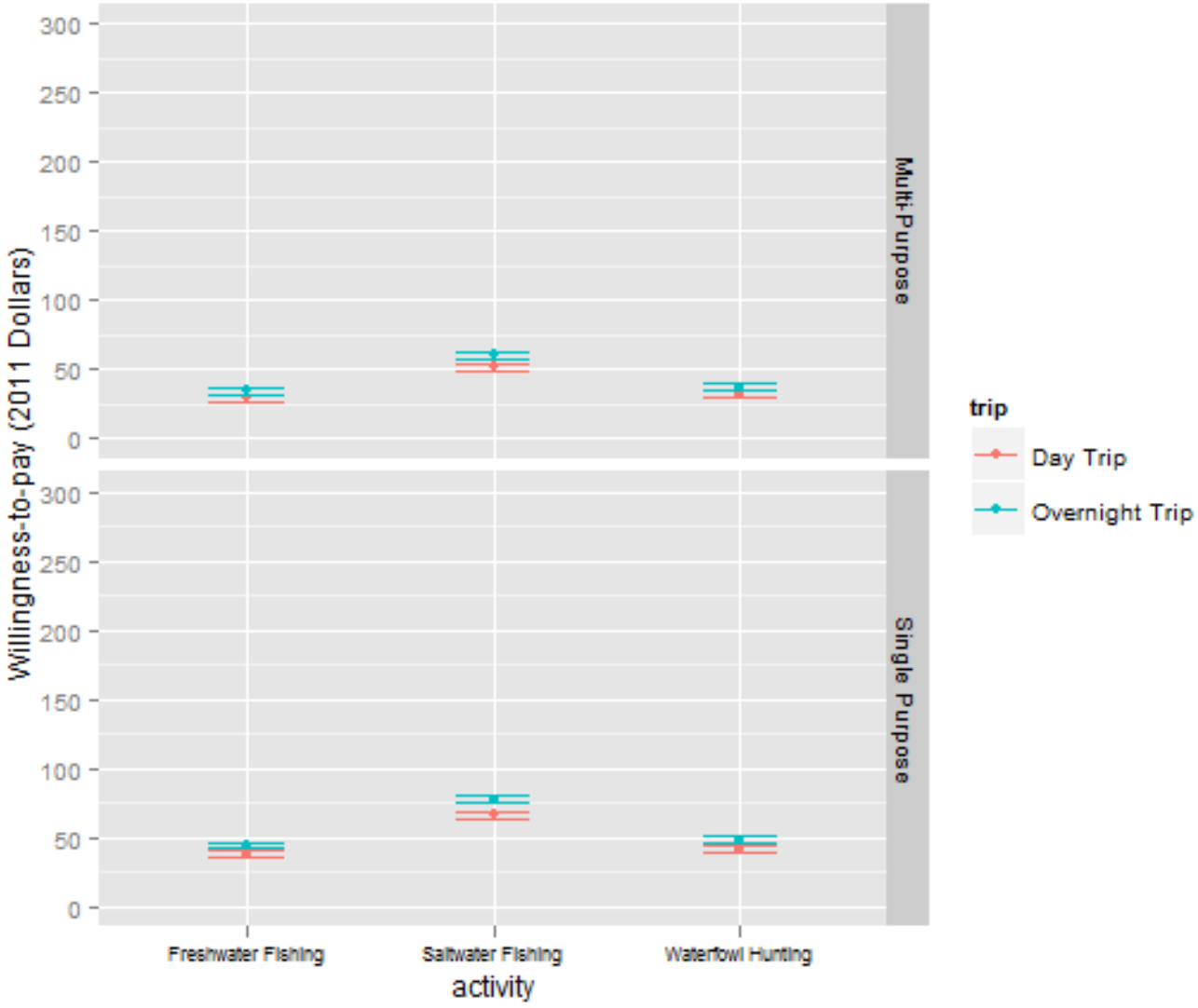
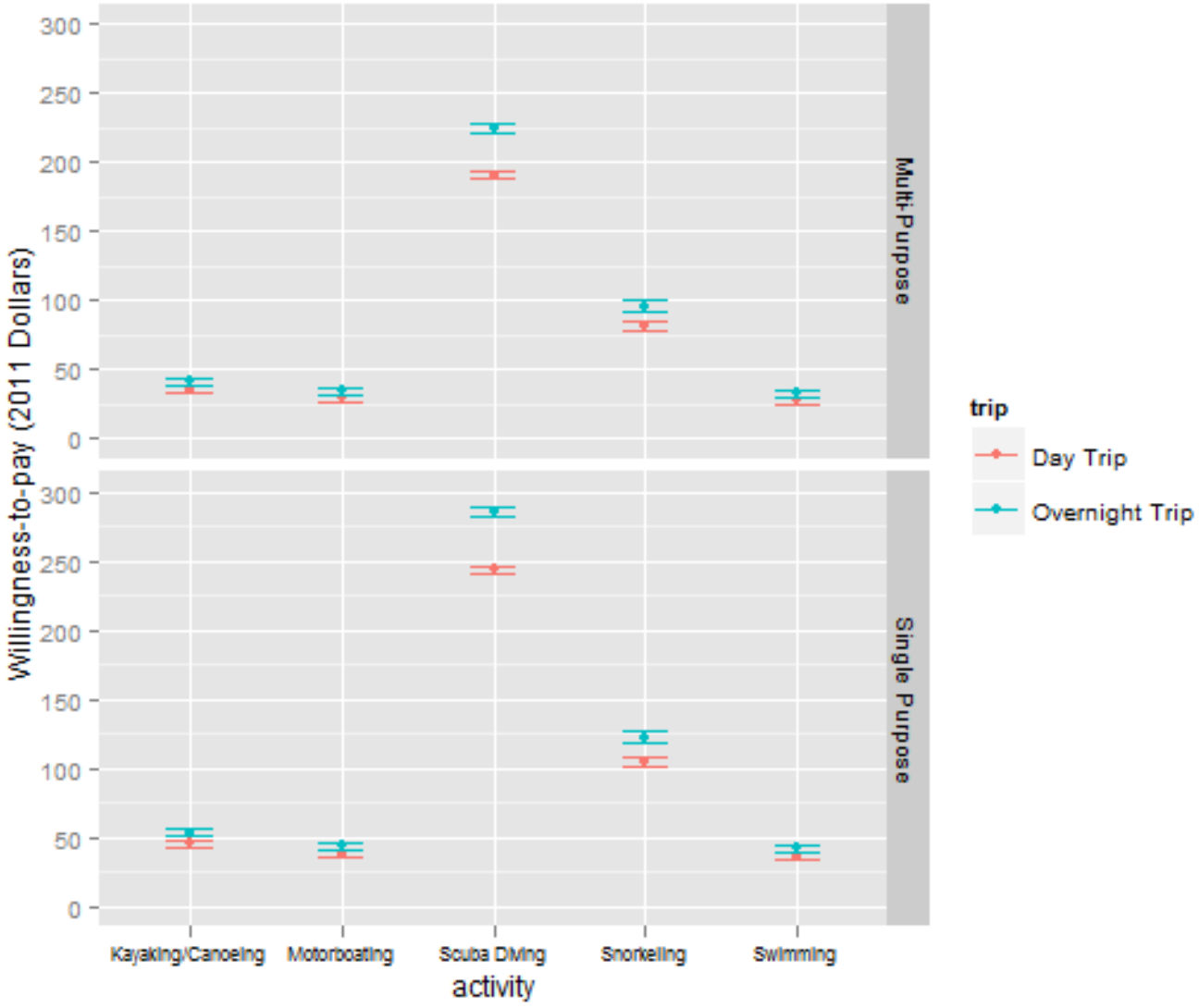


Figure 1.2d: Mean Willingness-to-Pay for Recreation Trips with 95% Confidence Intervals



These average individual values of willingness-to-pay will be combined with future survey results to estimate the recreation use value component of the total economic value of the Sarasota Bay Estuary.

1.3 Hedonic Property Model (Phase I Results)

The Phase I hedonic property study estimates the effect proximity of Sarasota Bay confers on nearby homeowners' property values. Given the empirical evidence that being located near resources, such as bays, oceans, rivers etc., increases property values, we expect that proximity to Sarasota Bay, for general access and leisure purposes, will have a similar positive value effect. The unique dataset used in the analysis includes detailed information on real estate market sales and housing characteristics, as well as locational and environmental attributes for over 11,000 properties across Sarasota and Manatee counties. An important detail in the data is that we identify the location of each property at a very fine geographic resolution, enabling its proximity to local amenities to be analyzed. Regression analysis is conducted to determine how a home's value is impacted by its proximity to Sarasota Bay, and to quantify the value placed on that proximity.

Results from two statistical models indicate that, on average, being in close proximity to Sarasota Bay increases the value of properties in Sarasota and Manatee counties, holding other factors constant. Based on these findings, we report two economic impact measures. First, we report the estimated marginal value of proximity to the Bay. This represents the mean additional increase in property value attributable to being more proximate to the Bay as opposed to being farther away, all else being equal. In this model we measure the value of proximity to the Gulf of Mexico and the Sarasota Bay Estuary by using categorical distance bands in 1,000 foot increments. In each case, we use the following eight distance bands: 1) homes less than 1,000 feet from Sarasota Bay, 2) homes between 1,000 and 2,000 feet from Sarasota Bay, 3) homes between 2,000 and 3,000 feet from Sarasota Bay, 4) homes between 3,000 and 4,000 feet from

Sarasota Bay, 5) homes less than 1,000 feet from the Gulf of Mexico, 6) homes between 1,000 and 2,000 feet from the Gulf of Mexico, 7) homes between 2,000 and 3,000 feet from the Gulf of Mexico, and 8) homes between 3,000 and 4,000 feet from the Gulf of Mexico. Marginal willingness-to-pay estimates for these proximity measures are summarized in Table 1.2. Figures 1.3a and 1.3b give graphical representations.

Table 1.2. Marginal Willingness-to-Pay Estimates for Proximity to Sarasota Bay and the Gulf of Mexico

	Distance to Bay			
	1,000 Feet	2,000 Feet	3,000 Feet	4,000 Feet
Upper Bound	$113,122	$66,906	$52,402	$37,709
Mean	$90,235	$49,840	$36,774	$26,031
Lower Bound	$67,348	$32,773	$21,145	$14,353
	Distance to Gulf			
	1,000 Feet	2,000 Feet	3,000 Feet	4,000 Feet
Upper Bound	$205,717	$105,952	$53,314	$35,696
Mean	$148,841	$65,823	$24,354	$9,579
Lower Bound	$91,966	$25,694	-$4,605	-$16,537

Figure 1.3a. Distribution of MWTP for Distance Bands to the Sarasota Bay Estuary

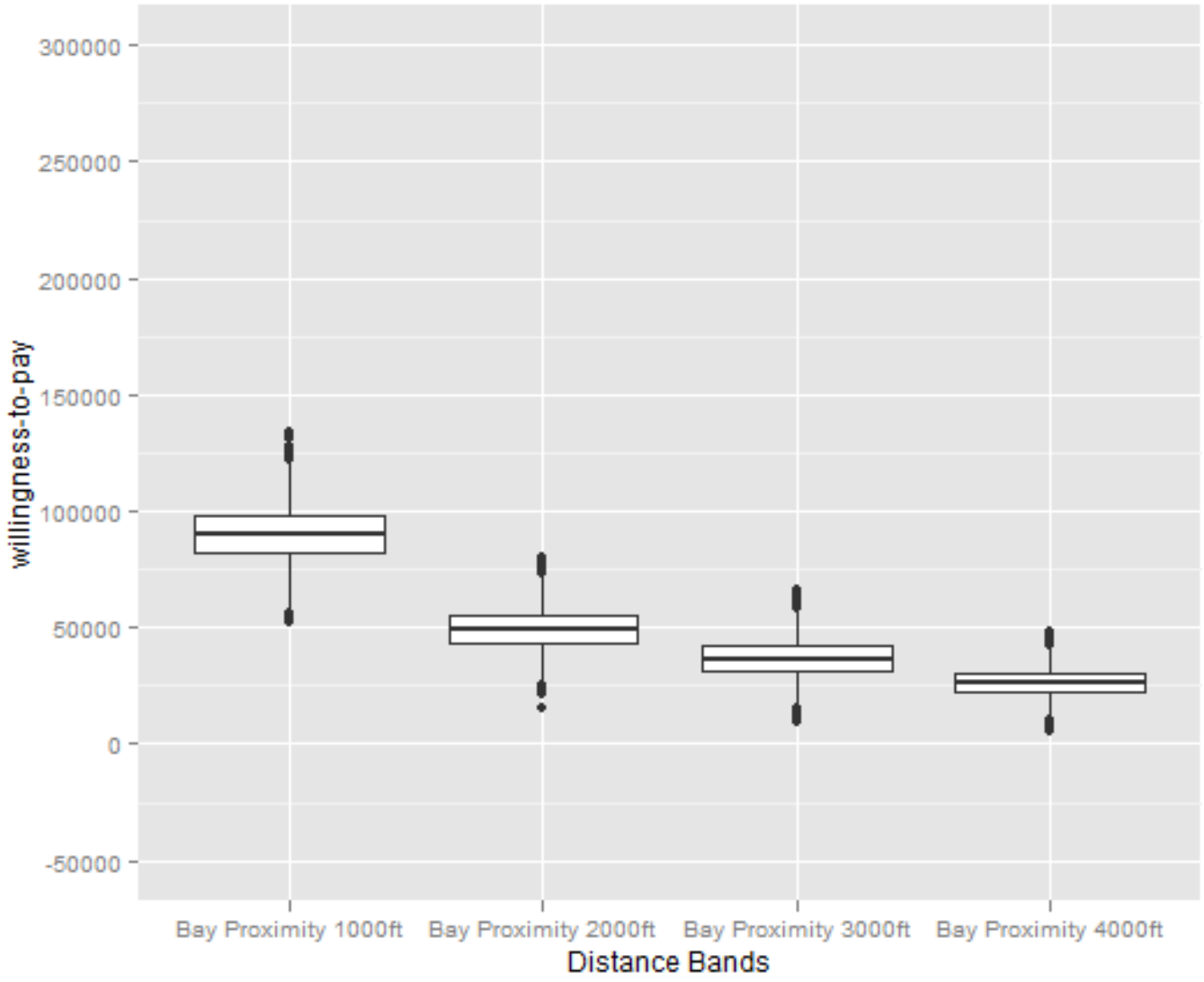
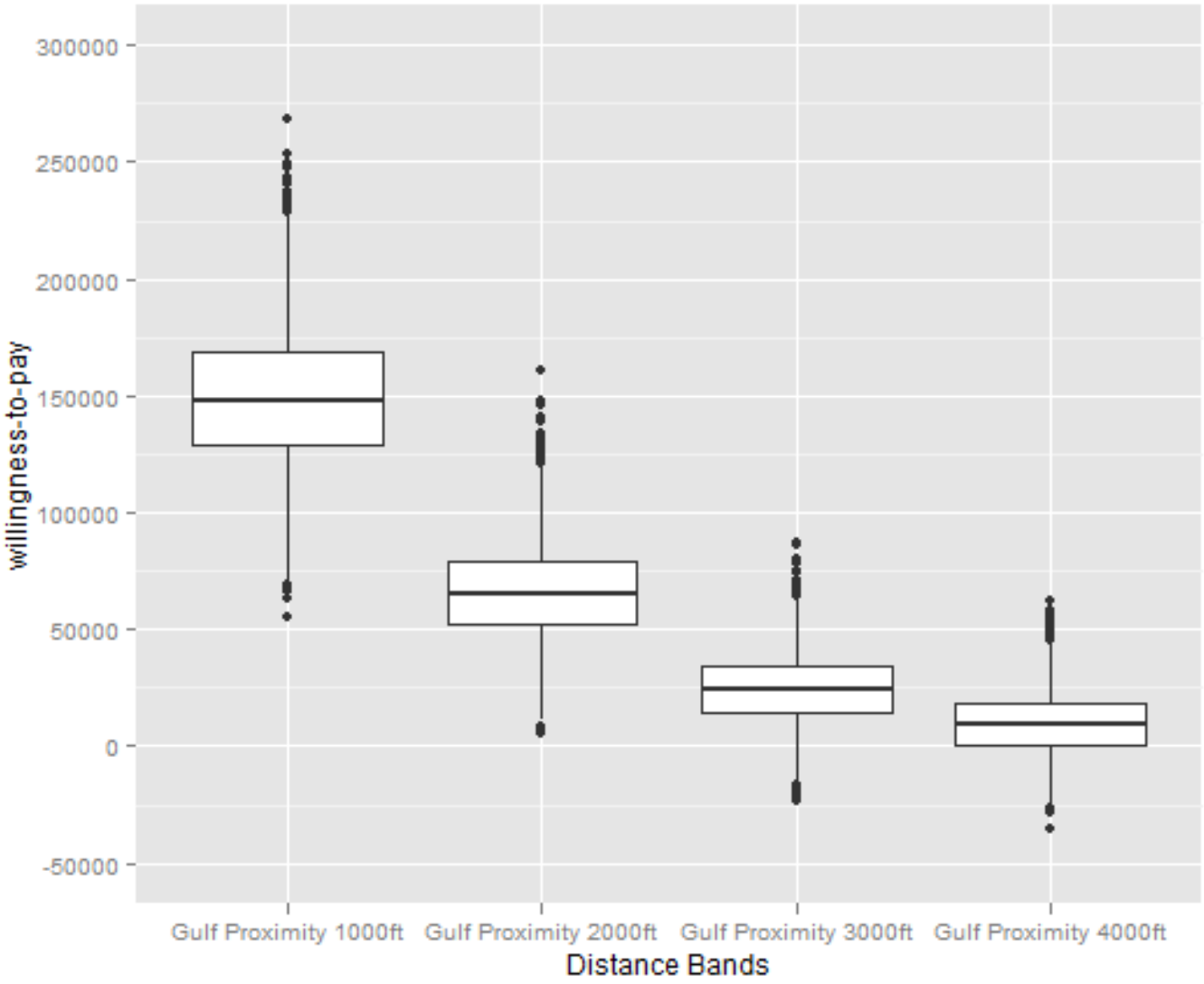


Figure 1.3b. Distribution of MWTP for Distance Bands to the Gulf of Mexico

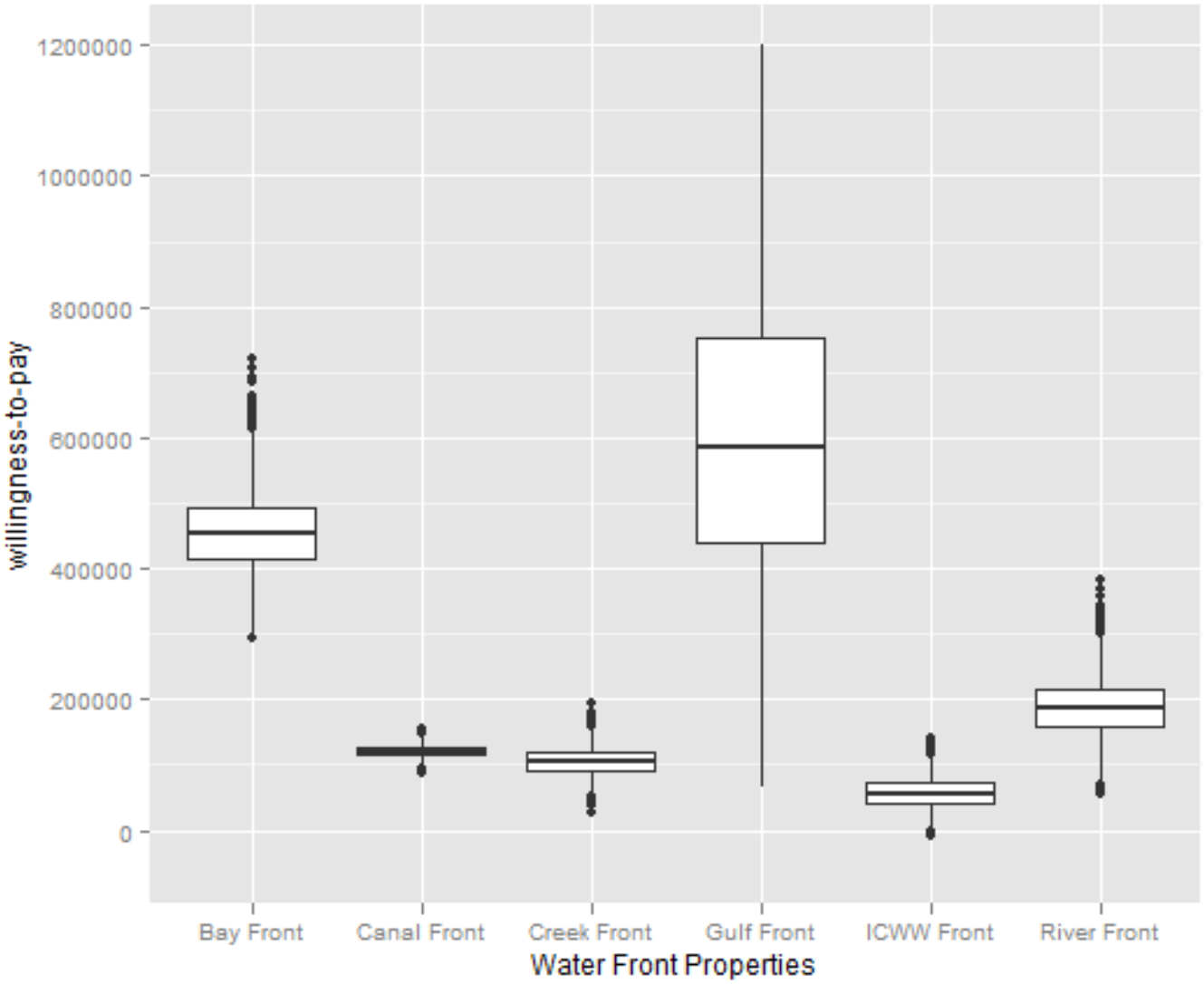


We also account for adjacency to the Gulf of Mexico, Sarasota Bay, and other water bodies in an effort to account for homes that are water front properties. Based on the marginal analysis from our model, the mean willingness to pay for a property less than 1,000 feet from Sarasota Bay is $90,235. The mean willingness to pay for a property less than 1,000 feet from the Gulf of Mexico is $148,841. Marginal willingness-to-pay estimates for these adjacency measures are summarized in Table 1.3. Figure 1.4 gives graphical representations of these estimates.

Table 1.3. Marginal Willingness-to-Pay Estimates for Frontage

	Resource Frontage					
	Bay	Canal	Creek	Gulf	ICWW	River
Upper Bound	$570,701	$140,180	$144,649	$1,087,781	$100,511	$270,808
Mean	$454,809	$121,249	$104,348	$595,141	$57,049	$186,368
Lower Bound	$338,917	$102,318	$64,046	$102,502	$13,588	$101,929

Figure 1.4. Distribution of MWTP for Resource Frontage



The second measure converts impacts into a total “capitalized value” that aggregates the marginal values over properties whose prices are influenced by proximity to the Bay. Based on the total number of properties influenced by proximity to the Bay across the two-county region, the total capitalized value associated with proximity to the Sarasota Bay and its tributaries is $3.1 billion. With regard to the Gulf of Mexico, the total capitalized value is $500 million. The total capitalized value for the two counties is $3.6 billion.

An important factor to note is that “capitalized value” does not represent the value of what is lost, absent the Bay. Instead, it provides an estimate of the increased property tax base that local communities enjoy as a result of the presence of the Bay and its provision of aesthetic, leisure, and recreational amenities to nearby homeowners. As such, it is important to understand that this value constitutes one component of the overall benefit Sarasota Bay provides to local communities.

1.4 Economic Impact Study Results

Tourism to Sarasota Bay plays a critical role in the economic makeup and growth of Manatee and Sarasota counties as well as the quality of life of its residents. Tourists, attracted to the area to enjoy the many amenities provided by the Bay translates into a flow of Bay-related spending that drives local employment, sales, and personal income. Despite the significance of Bay-related visitor spending, the magnitude of the Bay's contribution to the local economy has not been examined. This component of the study fills the gap by measuring the economic contribution of Sarasota Bay-related spending on the local two-county economy. These dollar value estimates are calculated by tracing visitor spending as it flows through the supply chain of the regional economy.

The most recent annual visitor trip counts were provided by the Manatee and Sarasota Visitor Bureaus. A break down of trip counts, by trip type is provided in Table 1.4. In 2012, there were a total of 4,680,800 visitors in Sarasota County and 2,796,500 visitors in Manatee County, giving a total annual visitor count of 7,477,300.

Table 1.4. Visitor-Trip Counts, by Type and by County, 2012

Trip Type	Sarasota	Manatee	Total
Day Trips	3,054,200	1,454,080	4,508,280
Overnight Trips	879,300	978,900	1,858,200
Staying with Friends/relatives	747,300	363,520	1,110,820
Total	4,680,800	2,796,500	7,477,300

Visitor spending estimates were derived from both onsite and online survey instruments. Aggregating all spending by category across all visitor types provides an estimate for the total Bay-related visitor spending.

Table 1.5. Total Visitor Spending by Expenditure Category

Spending Category	Mean Spending per Visitor	Sarasota	Manatee	Total
Accommodation	$394.3	$201,962,714	$221,311,750	$423,274,464
Gas	$87.1	$61,237,037	$48,828,161	$110,065,198
Other Trans	$50.9	$23,379,718	$19,736,816	$43,116,534
Groceries	$164.6	$74,446,625	$65,065,367	$139,511,992
Restaurants	$172.1	$139,967,654	$102,944,048	$242,911,702
Boats	$8.3	$2,314,483	$1,115,469	$3,429,952
Rec. Equipment	$7.0	$5,127,846	$4,019,591	$9,147,436
Fishing Gear	$7.5	$3,772,692	$3,140,985	$6,913,677
Licenses	$15.4	$4,412,742	$3,444,193	$7,856,936
Entertainment	$86.1	$13,945,046	$10,845,340	$24,790,386
Shopping	$46.2	$58,811,380	$51,310,229	$110,121,608
Gifts	$13.7	$10,329,512	$8,961,577	$19,291,090
Other	$5.6	$7,698,364	$6,592,865	$14,291,230
Total	$1,070.7	$607,405,814	$547,316,392	$1,154,722,206

Total annual Bay-related spending is approximately $1.15 billion. These represent the direct flows that form inputs into the region-specific input-output model. The total (direct plus indirect plus induced) economic impacts of Bay-related expenditures are described in Table 1.6.

Table 1.6. Total Economic Impacts of Bay-related Expenditures

Category	Direct	Indirect	Induced	Total
Employment	14,639	3,169	3,660	21,468
Income ($Millions)	$472.8	$123.1	$135.0	$730.9
Output ($Millions)	$1,154.7	$363.7	$422.8	$1,941.2

The annual economic impact generated by Bay-related visitor spending includes the creation of approximately 21,000 jobs and $731 million in earnings. These estimates infer that Bay-related spending accounts for about 1 in every 17 jobs in the two-county region. Bay-related activity creates an impact on the regional economy valued at $1.94 billion. This represents about 4 percent of the region's gross regional product. Finally, the additional activity generates approximately $184 million in additional tax revenues.

It is important to note that the present study, as other economic impact studies, only reports the level of the gross impacts of financial (spending) flows and ignores many of the wider economic benefits that arise from tourism-based expenditures. The contribution of the tourism industry to Manatee and Sarasota County's economic activity goes beyond the economic impacts of visitor spending and secondary trickle down effects. The same quality of life amenities that attract visitors also attract permanent residents, either in a direct sense, as they choose to retire or relocate to the region to enjoy those amenities, or indirectly, as they are attracted by the economic opportunity associated with a growing population. This in turn generates further spending that occurs due to additional household wealth that can be attributed to factors such as the price appreciation of local real estate above and beyond the rate experienced by the nation as a whole. These values are not estimated during this study.

1.5 Recreation Use Values

In this study, we combine results from the benefit transfer study with estimates of recreation behavior in Sarasota Bay. First, we utilize four data sources to estimate recreation trips to the Sarasota Bay Estuary. We estimate 9,205,155 day trips and 2,969,020 multi-day trips to the bay for a total of 12,174,175 trips. Table 1.7 details these estimates.

Table 1.7: Day and Multi-day Recreation Trips to the Sarasota Bay Estuary by Residents and Visitors

Trip Type	User Groups	Lower Bound	Total	Upper Bound
Day Trips	**All Users**	8,146,458	9,205,155	10,258,004
	Sarasota & Manatee Counties	3,638,178	4,696,875	5,749,724
	Adjacent Counties	2,265,657	2,731,138	3,182,370
	Non-Adjacent County Visitors	2,242,623*	1,777,142	1,325,910*
Multi-Day Trips	**All Users**	2,969,020	2,969,020	2,969,020
	Adjacent Counties	422,733	574,727	729,095
	Non-Adjacent County Visitors	2,546,287*	2,394,293	2,239,925*
All Trips	**All Users**	11,115,478	12,174,175	13,227,024

* Estimates for Non-Adjacent County Visitors calculated using data from the Manatee and Sarasota Visitor Bureaus

Next, we combine trip estimates and reported activity types with the Phase I meta-regression results to generate economic value of recreation trips to the Sarasota Bay Estuary by residents and visitors. Table 1.8 details these results. We find the aggregated economic value of recreation trips to be $487 million. We would like to remind the reader that this estimate does not include the value of several types of

recreation, for example sailing. A full accounting of recreation types would lead to larger estimates. Further research is necessary to calculate estimate for missing values.

Table 1.8: Aggregated Economic Value Estimates (Day and Multi-Day Trips)

User Groups	Lower Bound Estimate	Mean Estimate	Upper Bound Estimate
Manatee and Sarasota County Day Trips	$115,621,769.30	$185,358,225.90	$271,358,895.33
Adjacent County Visitor Day Trips	$70,628,847.49	$106,406,763.22	$149,442,808.42
Adjacent County Visitor Multi-Day Trips	$14,304,640.39	$24,337,736.81	$37,090,997.88
Non-Adjacent County Visitor Day Trips	$39,139,481.28	$64,381,305.93	$97,587,675.16
Non-Adjacent County Visitor Multi-Day Trips	$81,687,485.25	$106,867,724.21	$134,384,448.40
Totals	$321,382,223.70	$487,351,756.08	$689,864,825.19

1.6 Discrete Choice Experiment Study Results

The main purpose of this chapter is to evaluate household preferences for the key environmental resources within the Sarasota Bay Estuary. These resources capture bundles of local public goods under the purview of the Sarasota Bay Estuary Program. We estimate individuals' willingness-to-pay for wetlands, oyster beds, sea grass beds, artificial reefs, and ecological parks with estuarine access. Because these resources are not traded in explicit markets, we employ a discrete choice experiment (DCE) to assess households' preferences for these resources.

We use an Error Components Logistic Regression to estimate the discrete choice model. We utilize two different model specifications. In the first specification, we focus on all households in the region, as defined by Manatee County, Sarasota County, and those counties adjacent to Manatee and Sarasota Counties. Next, we specify a model that separates those who use the Sarasota Bay Estuary and those who do not. Table 1.9 provides the Marginal Willingness-to-pay for these resources. The marginal willingness-to-pay tells use the value of an incremental increase in a resource. For example, households would be willing-to-pay $2.48 for an additional acre of wetland.

Table 1.9 Marginal Willingness-to-pay for Sarasota Bay Estuarine Resources.

	Regional Mean MWTP	Regional Mean MWTP for Users	Regional Mean MWTP for Non-users
Wetland Restoration	$2.48 ($1.82, $3.14)	$3.66 ($2.35, $4.98)	$1.42 ($0.80,$2.05)
Oyster Restoration	$5.93 ($2.54, $9.32)	$13.55 ($6.68,$20.42)	
Sea Grass Restoration	$0.36 ($0.20, $0.51)	$0.60 ($0.32,$0.88)	
Artificial Reef	$0.34 ($0.17, $0.51)	$0.70 ($0.35, $1.04)	
Ecological Park	$9.87 ($6.04, $13.70)	$17.62 ($9.89 ,$25.35)	

Next, we calculate the regional economic value of Sarasota Bay Resources as well as the economic value of these resources to residents of Manatee and Sarasota Counties. Table 1.10 provides the regional economic value of Sarasota Bay Estuarine resources for all households, with 95% confidence intervals. Table 1.11 provides the economic value of Sarasota Bay Estuarine resources for all Manatee and Sarasota county households, with 95% confidence intervals. Our estimates indicate the regional value of Sarasota Bay resources and access at $58 billion and the value to Sarasota and Manatee County households at $11.8 billion.

Table 1.10 Regional Economic Value of Sarasota Bay Resources for Users and Non-Users (With 95% Confidence Intervals)

Attribute	Quantity	WTP (Lower Bound)	WTP (Mean)	WTP (Upper Bound)
Wetland Restoration (Acres)	9,596 Acres	$25,803,198,170	$35,160,401,902	$44,517,605,634
Oyster Restoration (Acres)	1,596 Acres	$5,989,333,746	$13,982,972,093	$21,976,610,440
Increase in Seagrass Area (Acres)	12,641 Acres	$3,735,281,505	$6,723,506,710	$9,524,967,839
Artificial Reef Enhancement (# of Reef Domes)	3,000 Reef Domes	$753,497,970	$1,506,995,940	$2,260,493,910
Ecological Park with Access (#)	38 Parks	$339,103,635	$554,131,272	$769,158,908
Totals		$36,620,415,027	$57,928,007,916	$79,048,836,730

Table 1.11 Economic Value of Sarasota Bay Resources for Manatee and Sarasota County Resource Users and Non-Users (With 95% Confidence Intervals)

Attribute	Quantity	WTP (Lower Bound)	WTP (Mean)	WTP (Upper Bound)
Wetland Restoration (Acres)	9,596 Acres	$5,258,173,109	$7,164,983,138	$9,071,793,167
Oyster Restoration (Acres)	1,596 Acres	$1,220,505,824	$2,849,448,637	$4,478,391,449
Increase in Seagrass Area (Acres)	12,641 Acres	$761,175,287	$1,370,115,516	$1,940,996,981
Artificial Reef Enhancement (# of Reef Domes)	3,000 Reef Domes	$153,547,740	$307,095,480	$460,643,220
Ecological Park with Access (#)	38 Parks	$69,102,504	$112,920,814	$156,739,124
Totals		$7,462,504,465	$11,804,563,585	$16,108,563,942

2. General Survey Design

2.1 Introduction

The Sarasota Economic Valuation Survey was designed to collect information related to Sarasota Bay Estuary residents' and visitors' 1) attitudes, awareness, and perceptions of existing natural resources and the management of those resources; 2) recreation behavior; 3) expenditures associated with recreational behavior; 4) preferences for additional management efforts in the Sarasota Bay Estuary; and 5) basic demographic information for the survey respondents. A copy of the survey instrument is provided in Appendix 1.

The survey design and implementation process included four primary steps.

1. Initial Survey Instrument Design: Dr. Paul Hindsley and Dr. Ash Morgan designed the initial survey instrument with input from Sarasota Bay Estuary Program staff and two external reviewers (Dr. Craig Landry and Dr. John Whitehead).
2. Focus Groups: Four focus groups were conducted to test the survey instrument.
3. Pilot Study: The initial survey design was implemented in the field using onsite, face-to-face interviews.
4. Full Survey Implementation: Results from the pilot study informed minor changes to the choice experiment. The survey was then fully implemented.

In full survey implementation, Sarasota Bay Estuary residents', visitors', and regional non-users' preferences were captured using two survey modes, an onsite, face-to-face survey and an internet panel of regional resource users and non-users.

2.2 Onsite Survey

The onsite survey captures the information related to resource users' preferences and behavior. In general, onsite surveys have the benefit of giving researchers the ability to capture a variety of user types that may otherwise be difficult to capture. For example, Manatee and Sarasota Counties are popular destinations for international travelers. It would be incredibly expensive to conduct a mail, telephone or internet survey that captures a representative sample of national and international resource users. Onsite surveys allow researchers to capture a probability sample of trips rather than a probability sample of users, thus capturing those otherwise difficult to reach users.

In this case, the onsite survey utilizes a multi-stage survey design. The onsite survey elicited information from resource users at 46 different sites. The 46 sites where chosen in an effort to provide a spatial representative characterization of the Sarasota Bay Estuary. The sites represent popular cultural, historical, and natural heritage sites and were chosen in an attempt to capture individuals participating in a variety of activities. Many of the sites were chosen from the Gulf Coast Heritage Trail or in consultation with Sarasota Estuary Program staff.[1]

The 46 sites were divided into 8 clusters based on spatial proximity. These clusters enabled the research group to randomly select groups of sites for sampling, while minimizing data collection costs. Research assistants would randomly select a cluster and then collect surveys at specific sites within that cluster. At each individual site, research assistants sampled individuals by combining a random and systematic sample selection process. The sampling sites are represented in table 2.1. Figure 2.1 shows a map of the sampling sites.

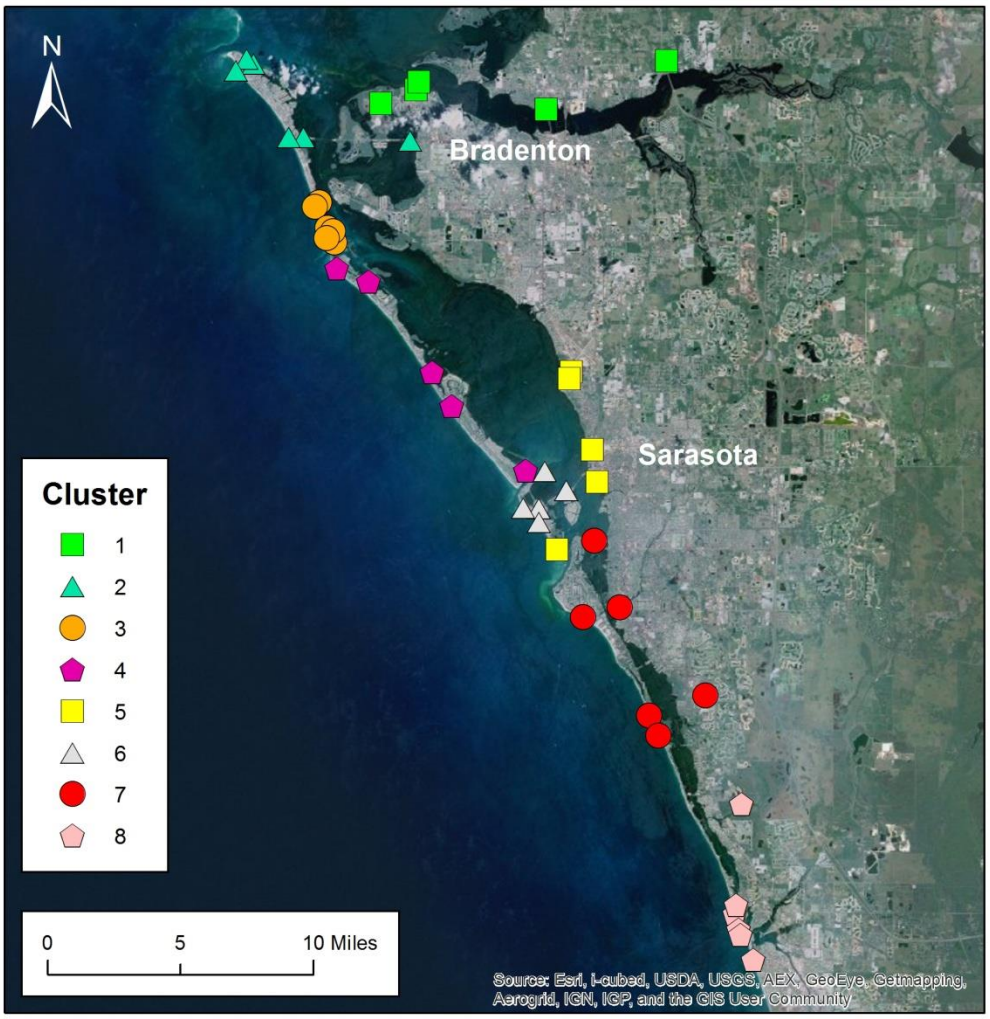
[1] A map of the Gulf Coast Heritage Trail can be found at the Sarasota Bay Estuary Program's website < http://sarasotabay.org/eco-tourism/gulf-coast-heritage-trail-map/>.

Table 2.1 Intercept Sites and Clusters in Sarasota and Manatee Counties

Sites	Cluster
Ellenton Premium Outlets	1
Green Bridge Fishing Pier	1
Desoto National Memorial	1
Riverview Pointe Preserve	1
Robinson Preserve	1
Palma Sola Causeway Park	2
Kingfish Boat Ramp	2
Anna Maria City Pier	2
Anna Maria Bay Front Park	2
Anna Maria Gulf Beaches	2
Manatee County Public Beach	2
Historic Bridge Street Area	3
Beaches near Historic Bridge Street Area	3
Coquina Bayside North Boat Ramp	3
Coquina Gulfside Beach Park	3
Coquina Bayside Park	3
Coquina Bayside South Boat Ramp	3
Beach Access Northshore Ave	4
Joan M Durante Park	4
Bayfront Park & Beach	4
Overlook Park	4
New College of Florida	5
John & Mable Ringling Museum of Art	5
Centennial Park &Bayfront BayWalk	5
Island Park	5
South Lido Beach Park	5

Sites	Cluster
Bird Key Park	6
Armand's Circle	6
Mote Marine Lab	6
Sarasota Bay Walk	6
Ken Thompson Park	6
City Island	6
North Lido Beach Park	6
Lido Beach Park	6
Bay Island Park	7
Siesta Public Beach	7
Turtle Park	7
Palmer Point Park	7
Potter Park	7
Phillippi Estates	7
South Jetty Park /Venice Beach	8
Boat Ramp near Nokomis Beach	8
Nokomis Beach	8
North Jetty Park	8
Oscar Scherer State Park	8
Venice Public Beach Access	8

Figure 2.1 Intercept Sites and Clusters in Sarasota and Manatee Counties



A total of 562 surveys were collected over the 46 sites. The response rate of the visitor survey is the percent of qualifying visitors who agreed to complete the survey. The response rate over all of the survey sites was 41 percent. These completed surveys are sufficient to make meaningful inferences to the population of visitors in the region. Table 2.2 shows the number of observations collected within each cluster of sites over the sampling area.

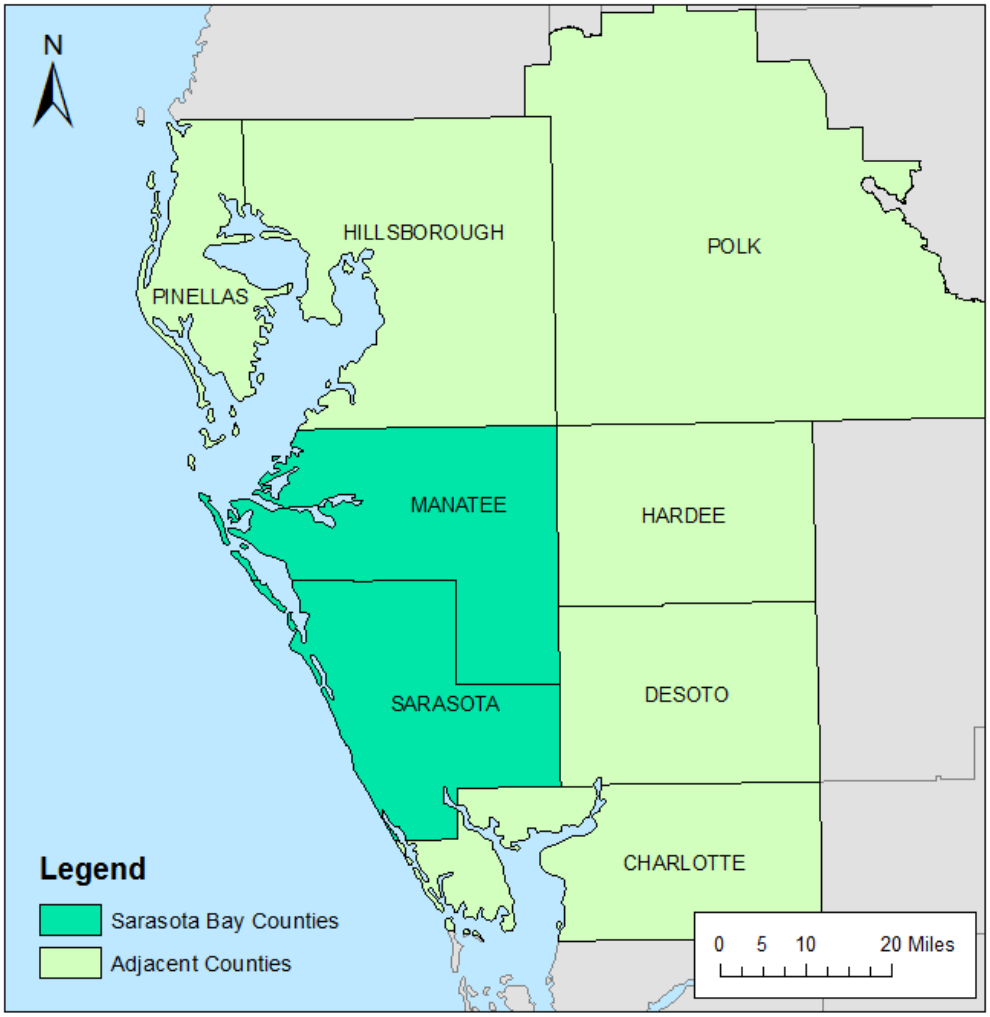
Table 2.2 Observations Collected in Each Sampling Cluster

Cluster	Number of Observations
Cluster 1	51
Cluster 2	125
Cluster 3	51
Cluster 4	50
Cluster 5	65
Cluster 6	93
Cluster 7	71
Cluster 8	71

2.3 Internet Panel Survey Implementation

The internet panel survey captures the information related to regional resource users' and non-users' preferences and behavior. A major benefit of the internet panel comes from the ability to capture individuals who do not use the Sarasota Bay Estuary. We call these non-users. The internet panel survey utilizes a survey design with two strata of 1) residents of Manatee and Sarasota Counties; and 2) residents of those counties adjacent to Manatee and Sarasota Counties (Pinellas, Hillsborough, Polk, Hardee, Desoto, and Charlotte). Figure 2.2 shows a map of the survey region.

Figure 2.2 Spatial Representation for Internet Panel Strata



The online version of the survey was developed in collaboration with an online survey software group, Online Survey Solutions, Inc (OSS).[2] The online survey was tested between May 1st and May 20th, 2013. The sample was then drawn from a panel of online respondents maintained by OSS and the survey was administered between May 30th and June 2nd 2013.

A total of 906 surveys were collected over the two strata. OSS utilizes a quota sampling procedure. In this procedure, they send the survey to individuals in the specified region. In all, 1831 individuals clicked the link and 906 completed the survey, a rate of 49%. Once 906 observations were collected, the survey was no longer accessible to potential respondents. Of the 906 respondents, 416 observations came from residents of Manatee and Sarasota Counties and 490 from adjacent counties. As a result, residents of Manatee and Sarasota Counties were oversampled.

2.4 Demographic Characteristics

In this section, we present the general demographic characteristics of our data collected in the onsite and internet panel surveys. Table 2.3 provides general demographic characteristics for these two samples as well as a subsample of all residents of Manatee and Sarasota Counties. In general, the online and internet panel surveys are both older and wealthier than the general population. These samples also over-represent the white population. In our economic analyses, we utilize survey weights to address potential sampling biases.

[2] Online Survey Solution, Inc. < http://www.onlinesurveysolution.com/> is a division of M/A/R/C Research, an Omnicom Group Company.

Table 2.3 Descriptive Statistics for Samples

Variable	Onsite Sample	Internet Panel	SB Residents
Sarasota and Manatee County Residents	41%	46%	100%
Adjacent Counties	17%	54%	0%
Other Visitors (Including International)	42%	0%	0%
Gender: Female	53%	58%	55%
Gender: Male	47%	42%	45%
Education: Some High School	20%	23%	20%
Education: High School Graduate	17%	16%	17%
Education: Some College	20%	23%	21%
Education: 2 Year Degree or Technical School	7%	12%	10%
Education: College Graduate	38%	34%	37%
Education: Professional or Doctoral Degree	18%	13%	14%
Ethnicity: Hispanic or Latino	4%	7%	3%
Income: Less than $10,000	4%	4%	3%
Income: $10,000 to $14,999	3%	5%	3%
Income: $15,000 to $24,999	3%	10%	6%
Income: $25,000 to $34,999	6%	9%	11%
Income: $35,000 to $49,999	11%	14%	14%
Income: $50,000 to $74,999	17%	24%	24%
Income: $75,000 to $99,999	20%	15%	18%
Income: $100,000 to $149,999	21%	11%	14%
Income: $150,000 to $199,999	7%	5%	4%
Income: $200,000 or more	8%	3%	3%
Unemployed	1%	8%	4%
Full Time Student	5%	4%	3%
Age: Under 30	31%	29%	26%
Age: 30 to 49	33%	31%	33%
Age: 50 to 64	21%	27%	32%
Age: Over 65	15%	12%	9%

2.5 Respondent Attitudinal Questions

The onsite and internet panel surveys began with several questions meant to gauge knowledge of and attitudes towards resources in the natural environment. The first series of questions attempt to gauge the role of government in the provision of public goods and services. These questions are asked on an ordinal scale (Not Important, Somewhat Unimportant, No Opinion, Important, Very Important). The survey asks respondents to rate the importance of public policies emphasizing 1) Health Care; 2) Air and Water Pollution; 3) Education; 4) Roads and Highways; 5) Economic Growth and Jobs; 6) Species at Risk; 7) Reduction of Taxes; and 8) Parks and Reserves. Among these classifications, respondents felt that economic growth/jobs, education, and health care were the most important roles of government. Among environmental topics, they rated the reduction of air and water pollution the most important role of government. They rated tax reduction and species at risk as the least important topics. Figure 2.3 and Table 2.4 present the results for the Internet panel sample. Figure 2.4 and Table 2.5 present the results for the Manatee and Sarasota County Subsample.

Figure 2.3 Internet Panel Responses to Question A1.

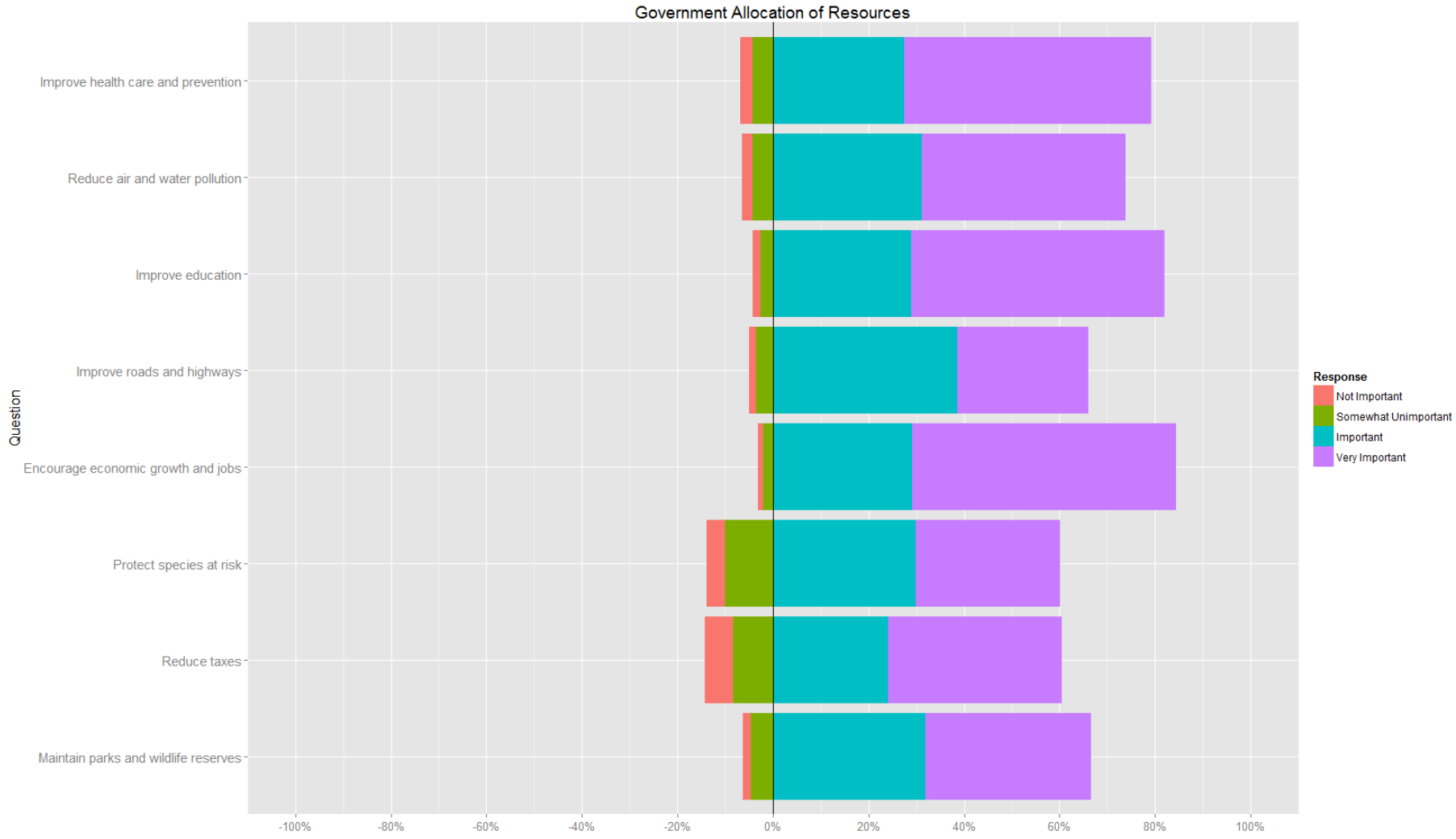


Table 2.4 Internet Panel Responses to Question A1.

Category	Not Important	Somewhat Unimportant	No Opinion	Important	Very Important
Improve health care and prevention	0.03	0.04	0.14	0.27	0.52
Reduce air and water pollution	0.02	0.04	0.20	0.31	0.43
Improve education	0.02	0.03	0.14	0.29	0.53
Improve roads and highways	0.02	0.04	0.29	0.39	0.28
Encourage economic growth and jobs	0.01	0.02	0.12	0.29	0.55
Protect species at risk	0.04	0.10	0.26	0.30	0.30
Reduce taxes	0.06	0.08	0.25	0.24	0.36
Maintain parks and wildlife reserves	0.02	0.05	0.27	0.32	0.35

Figure 2.4 Sarasota & Manatee County Resident Subsample Response to Question A1.

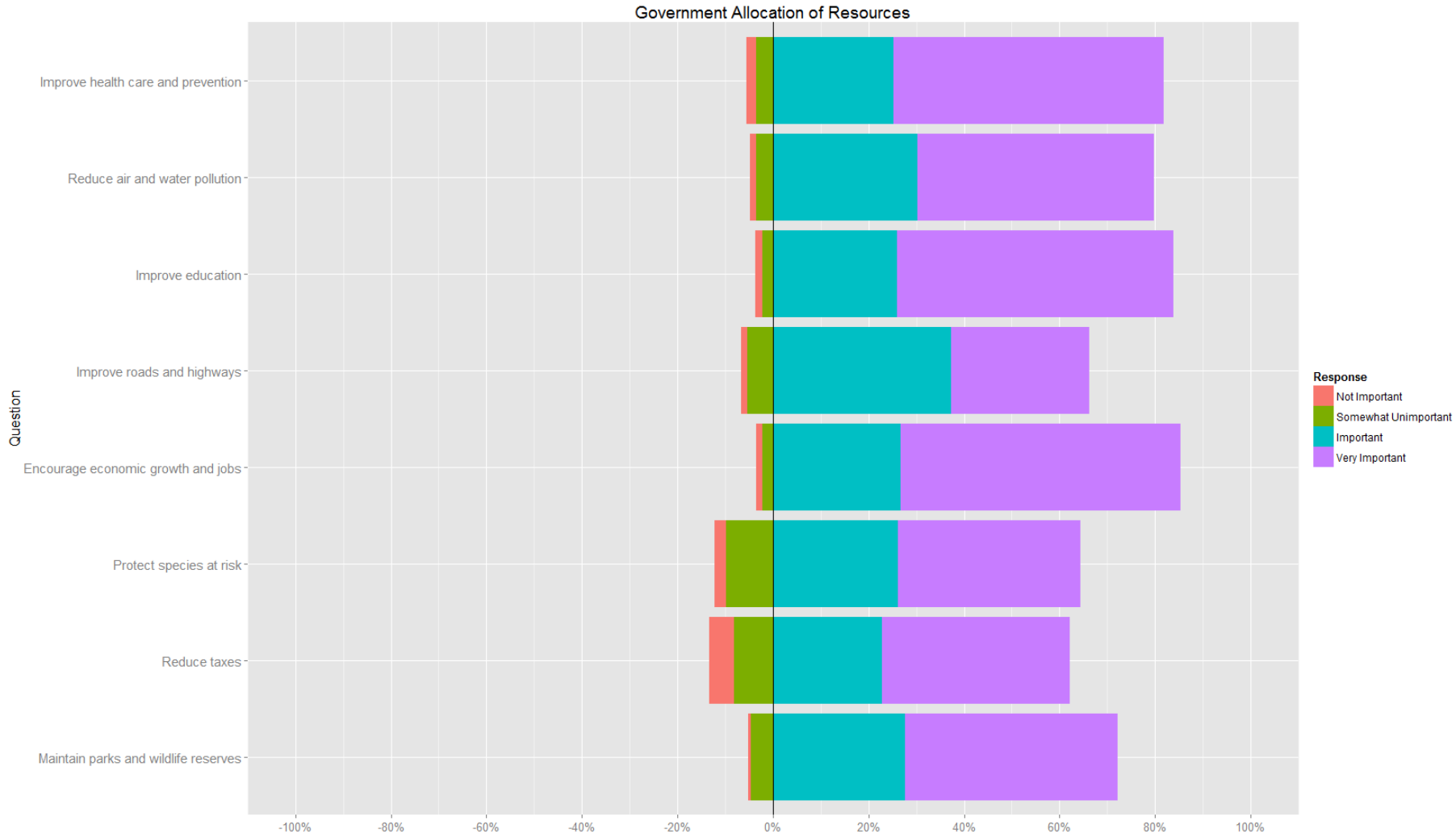


Table 2.5 Sarasota & Manatee County Resident Subsample to Question A1.

Category	Not Important	Somewhat Unimportant	No Opinion	Important	Very Important
Improve health care and prevention	0.02	0.04	0.13	0.25	0.57
Reduce air and water pollution	0.01	0.04	0.15	0.30	0.49
Improve education	0.01	0.02	0.12	0.26	0.58
Improve roads and highways	0.01	0.05	0.27	0.37	0.29
Encourage economic growth and jobs	0.01	0.02	0.11	0.27	0.59
Protect species at risk	0.02	0.10	0.23	0.26	0.38
Reduce taxes	0.05	0.08	0.24	0.23	0.39
Maintain parks and wildlife reserves	0.01	0.05	0.23	0.28	0.45

Next, the onsite and internet panel surveys ask respondents how they would rate the overall quality of the Sarasota Bay Estuary and how that compares to environmental quality 10 years earlier. Environmental quality was rated on an ordinal scale (Poor, Fair, Good, Very Good, Excellent/Pristine). Among regional respondents, 40 percent felt the overall quality of the Sarasota Bay Estuary was Very Good or Excellent. Among Manatee and Sarasota County Residents, 58 percent felt the overall quality of the Sarasota Bay Estuary was Very Good or Excellent. Table 2.6 gives the results for this question and figures 2.5a & 2.5b give graphical depictions.

A 10 year comparison of environmental quality was also rated on an ordinal scale (Much Worse, Worse, Same, Better, Much Better). Among regional respondents, 36 percent felt the overall quality of the Sarasota Bay Estuary was Better or Much Better over 10 years earlier. Forty-eight percent felt that they could not make a comparison. Among Manatee and Sarasota County Residents, 28 percent felt the overall quality of the Sarasota Bay Estuary was Better or Much Better over 10 years earlier. Forty-three percent felt that they could not make a comparison. Table 2.7 gives the results for this question and figures 2.6a & 2.6b give graphical depictions.

Table 2.6 Overall Environmental Quality of Sarasota Bay Estuary

	Poor	Fair	Good	Very Good	Excellent/Pristine	I don't know
Internet Panel	0.00	0.04	0.24	0.35	0.05	0.32
SB Residents	0.01	0.04	0.23	0.46	0.12	0.14

Table 2.7 10 Year Comparison of Overall Environmental Quality of Sarasota Bay Estuary

	Much Worse	Worse	Same	Better	Much Better	I Don't Know
Internet Panel	0.01	0.03	0.13	0.20	0.16	0.48
SB Residents	0.01	0.07	0.21	0.17	0.11	0.43

Figure 2.5a Overall Environmental Quality of Sarasota Bay Estuary (Internet Panel)

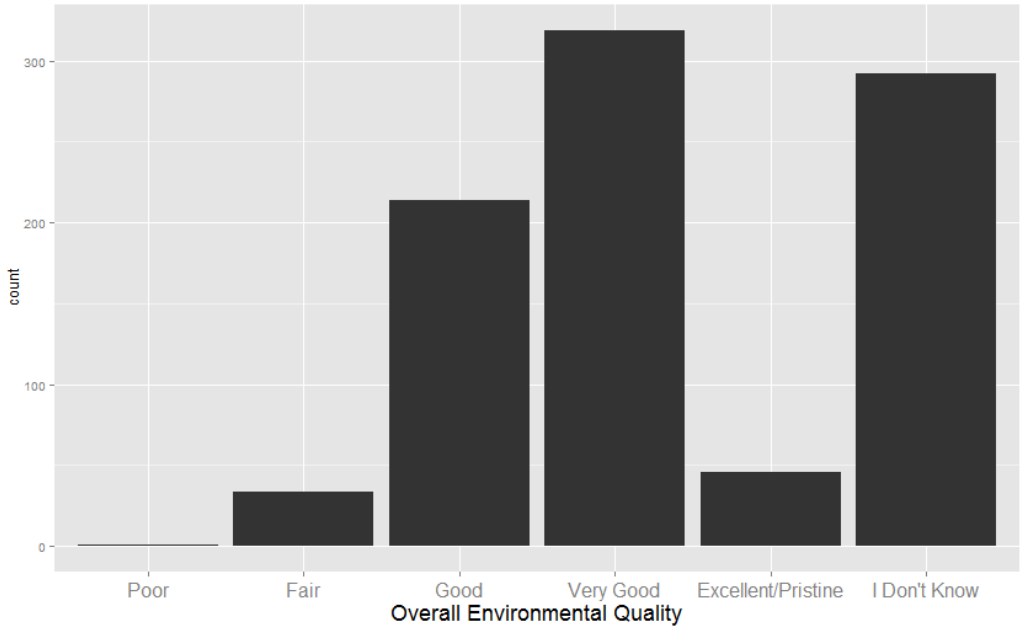


Figure 2.5b Overall Environmental Quality of Sarasota Bay Estuary (Sarasota and Manatee County Subsample)

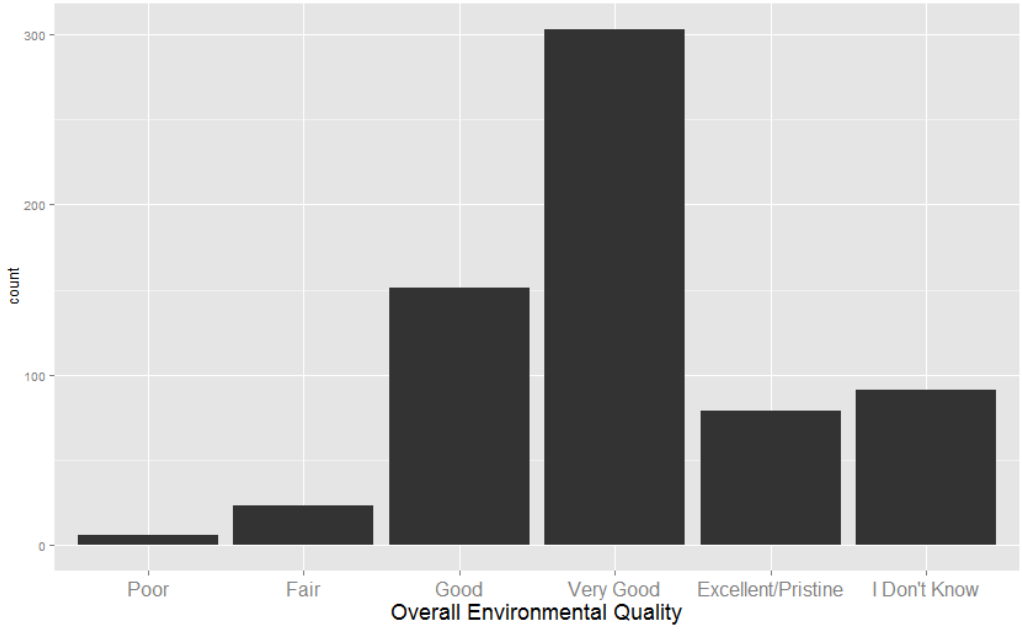


Figure 2.6a 10 Year Comparison of Overall Environmental Quality of Sarasota Bay Estuary (Internet Panel)

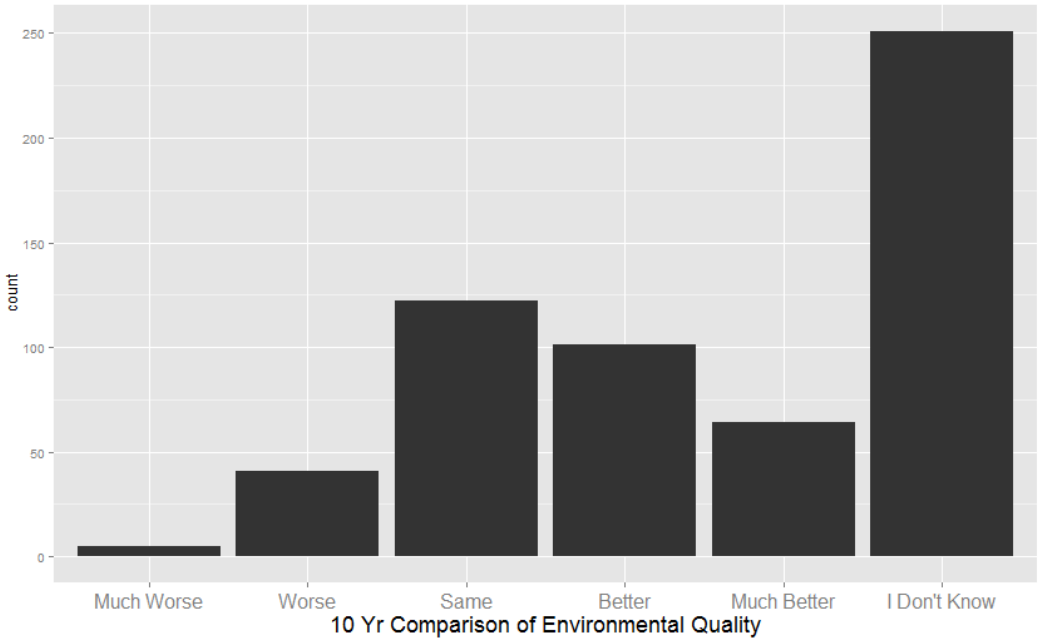
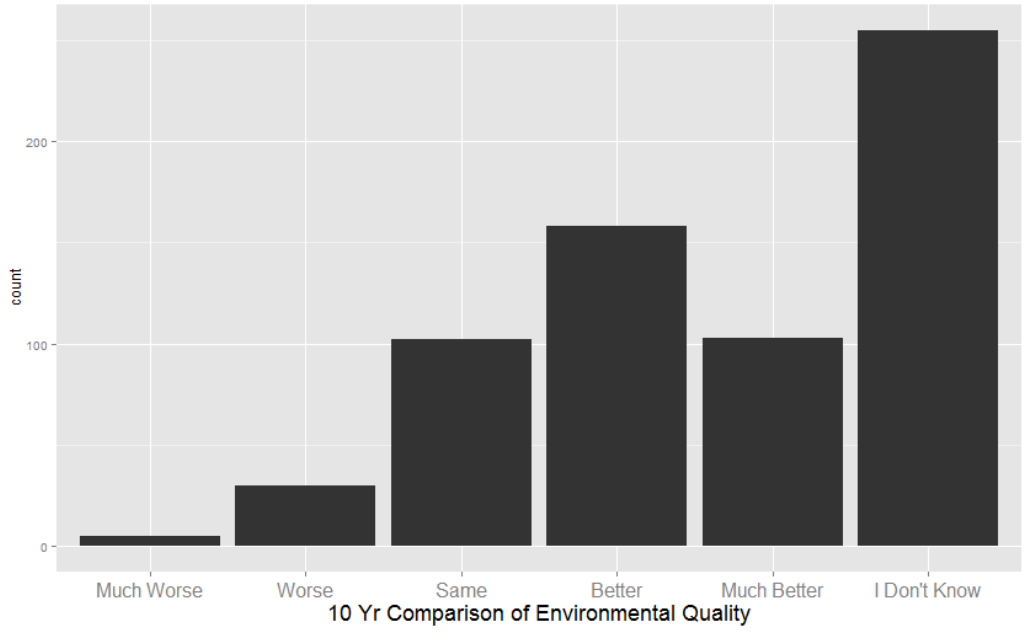


Figure 2.6b 10 Year Comparison of Overall Environmental Quality of Sarasota Bay Estuary (Sarasota and Manatee County Subsample)

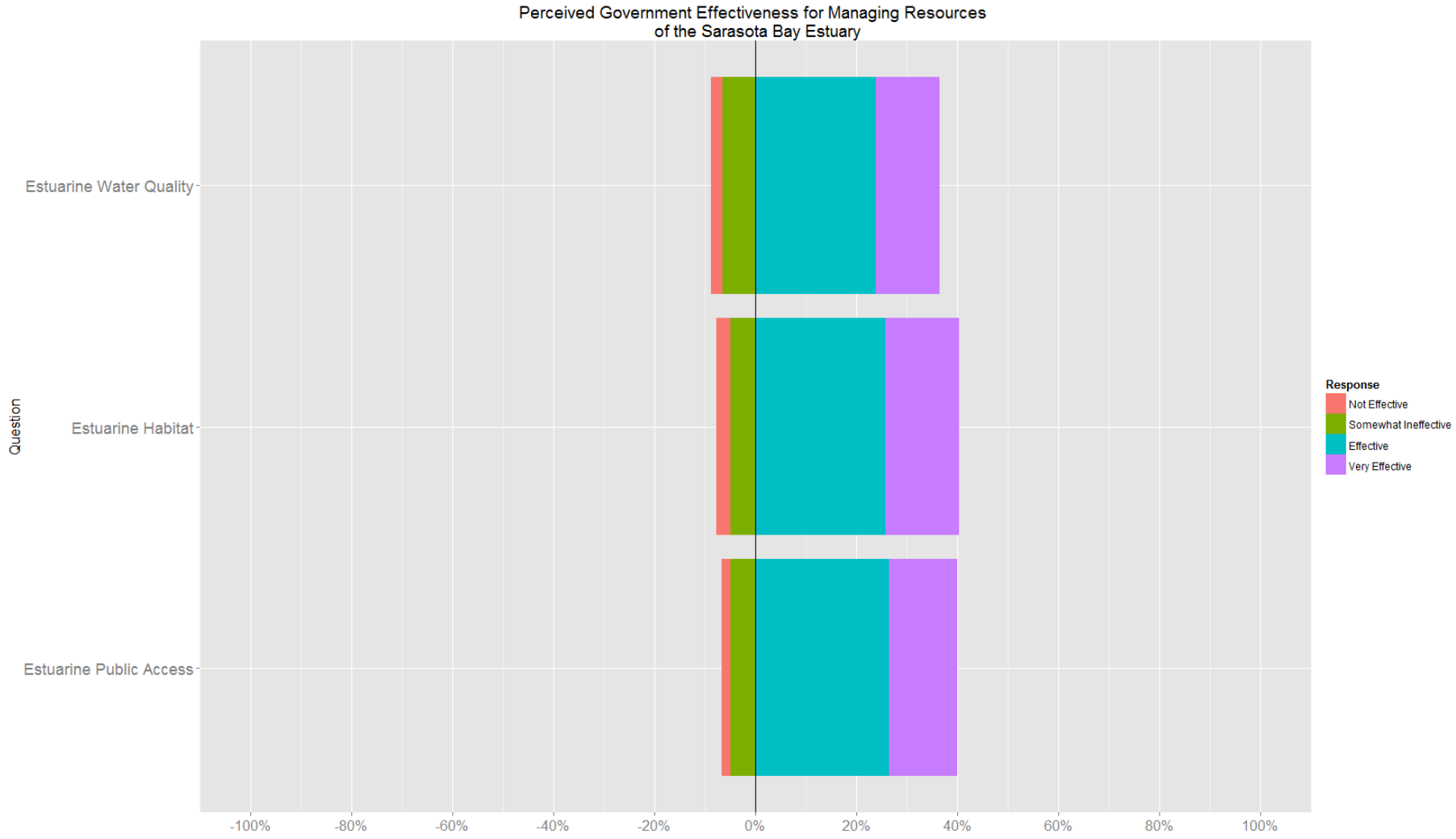


Last, the onsite and internet panel surveys ask respondents how they would rate the effectiveness of local and state governments in protecting and enhancing Sarasota Bay Estuarine 1) water quality, 2) habitats, and 3) public access. Local and state government efficacy was rated on an ordinal scale (Not Effective, Somewhat Ineffective, No Opinion, Effective, Very Effective). Among regional respondents (Internet Panel), 36 percent felt that state and local government was effective or very effective managing water quality; 41 percent felt that state and local government was effective or very effective managing coastal habitats; and 39 percent felt state and local government was effective or very effective at managing ecological parks with access to the estuary. Table 2.8 gives the results for this question and figures 2.7 gives a graphical depiction.

Table 2.8 Effectiveness of State and Local Government at Management of Sarasota Bay Estuarine Resources (Internet Panel)

Category	Not Effective	Somewhat Ineffective	No Opinion	Effective	Very Effective	I don't know
Water Quality	0.02	0.07	0.21	0.24	0.12	0.34
Coastal Habitats	0.03	0.05	0.19	0.26	0.15	0.33
Ecological Parks with Access to Estuary	0.02	0.05	0.18	0.26	0.13	0.36

Figure 2.7 Effectiveness of State and Local Government at Management of Sarasota Bay Estuarine Resources (Internet Panel)

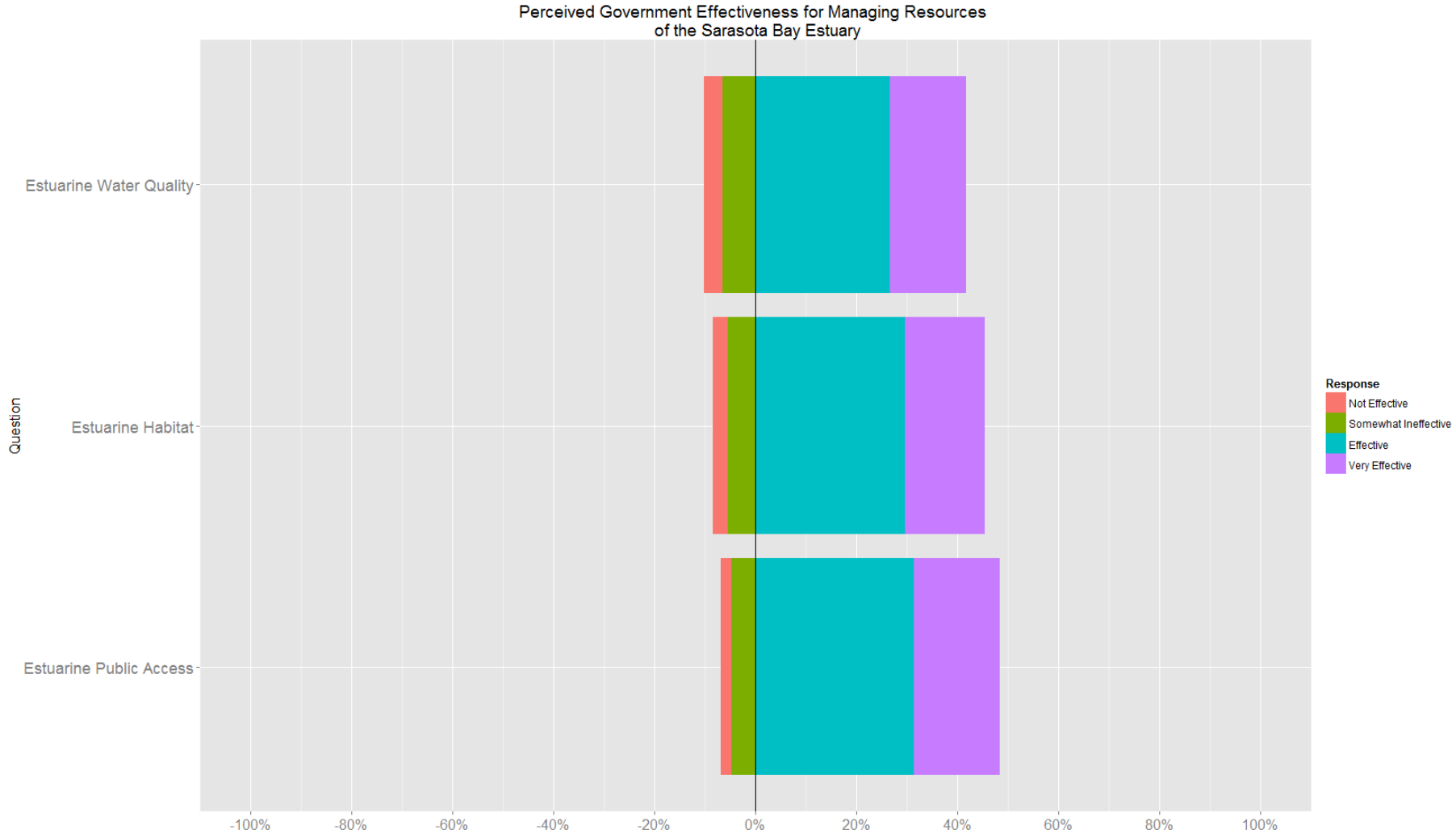


Among Sarasota and Manatee county respondents, 42 percent felt that state and local government was effective or very effective managing water quality; 46 percent felt that state and local government was effective or very effective managing coastal habitats; and 48 percent felt state and local government was effective or very effective at managing ecological parks with access to the estuary. Table 2.9 gives the results for this question and figures 2.8 gives a graphical depiction.

Table 2.9 Effectiveness of State and Local Government at Management of Sarasota Bay Estuarine Resources (Internet Panel)

Category	Not Effective	Somewhat Ineffective	No Opinion	Effective	Very Effective	I don't know
Water Quality	0.04	0.06	0.22	0.27	0.15	0.26
Coastal Habitats	0.03	0.05	0.20	0.30	0.16	0.26
Ecological Parks with Access to Estuary	0.02	0.05	0.18	0.31	0.17	0.27

Figure 2.8 Effectiveness of State and Local Government at Management of Sarasota Bay Estuarine Resources (Manatee and Sarasota County Subsample)



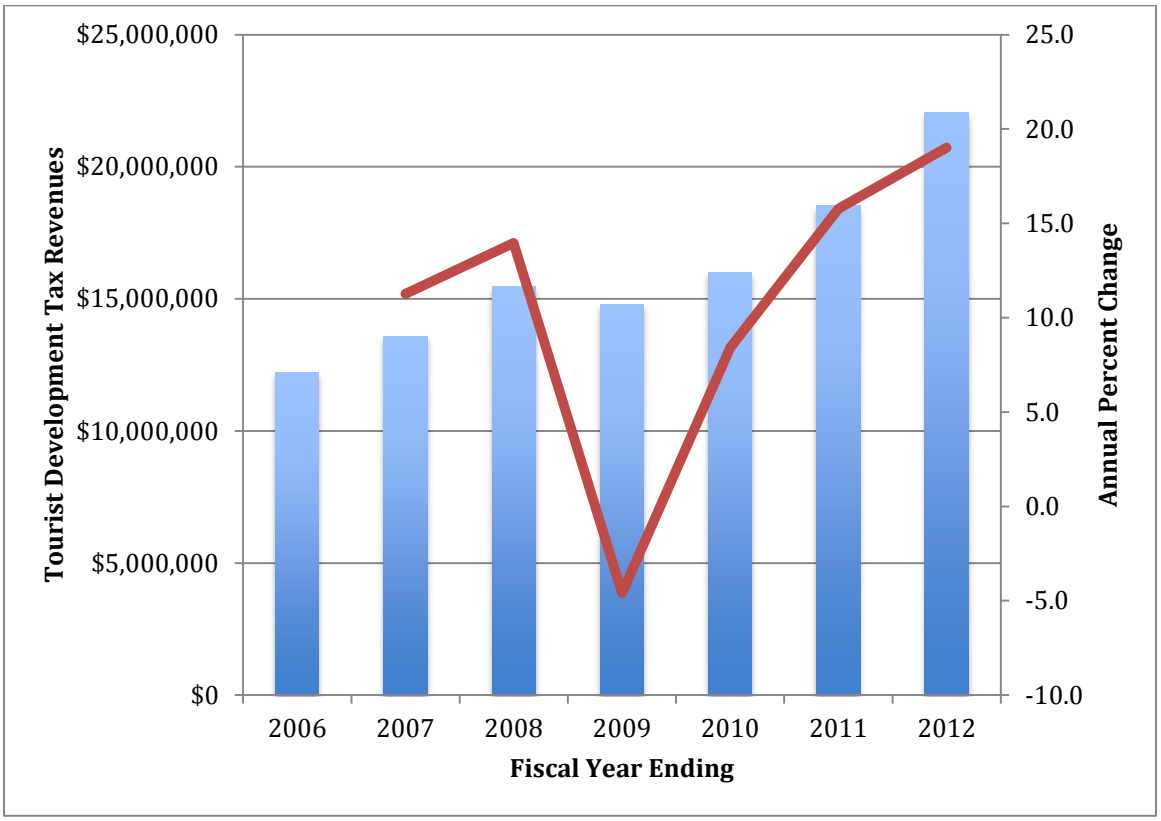
3. Measuring the Economic Impact of Visitors to the Sarasota Bay Region

3.1 Introduction

Like many of the coastal counties of Florida, tourism is an important driver of economic growth in Sarasota and Manatee counties. Across both counties, approximately 20 percent of the total workforce is employed in the retail trade and accommodation services sectors. Sarasota Bay provides a suite of recreational amenities, such as fishing, boating, wildlife viewing, and Bay-side dining, that attracts millions of visitors each year to the two-county area. Bay-related visitor spending in the two-county region directly contributes to local area economic output, personal income, and local employment. In turn, personal income attributed to the tourism sector indirectly contributes toward further spending and regional output that help sustain the economy's growth. The importance of tourism in the region is also heightened due to the structure of a tax system (and in particular the tourist development tax) that allows local government to switch at least some of the burden of funding public services off permanent residents and onto the visitor population. As such, local efforts to influence the growth and character of the tourism sector may be more important than local efforts in any of the other primary income drivers, such as health care. This is because decisions taken locally (regarding e.g., branding, promotion, attractions) can heavily influence the behaviors and spending patterns of customers and potential customers, while the majority of health care spending is driven by decisions or circumstances beyond the control of local policy makers.

Figure 1 shows the trend in combined tourist development tax revenues (also known as a "tourist tax") for Sarasota and Manatee counties. There is a definite overall upward trend in tourist tax revenues over this period despite a brief decrease in collections in 2009 as the effects of the last recession trickled into the tourism sector.

Figure 1. Tourist Development Tax Collections – 2006 – 2012.



Source: Sarasota and Manatee County Tax Collectors

The Sarasota Bay Estuary Program has commissioned this economic impact study in order to document the contribution of the tourism industry on the local economy. The primary focus of the study is on capturing the importance to the local economy of visitor spending, and this contribution is presented in the traditional economic impact "multiplier analysis" framework. This framework first measures the amount of direct Bay-related spending by visitors. Bay-related spending is defined as all expenditures by non-Manatee and Sarasota Bay residents that travel to the two-county region for activities on or adjacent to Sarasota Bay, such as fishing, swimming, jogging, or dining at a Bay restaurant.

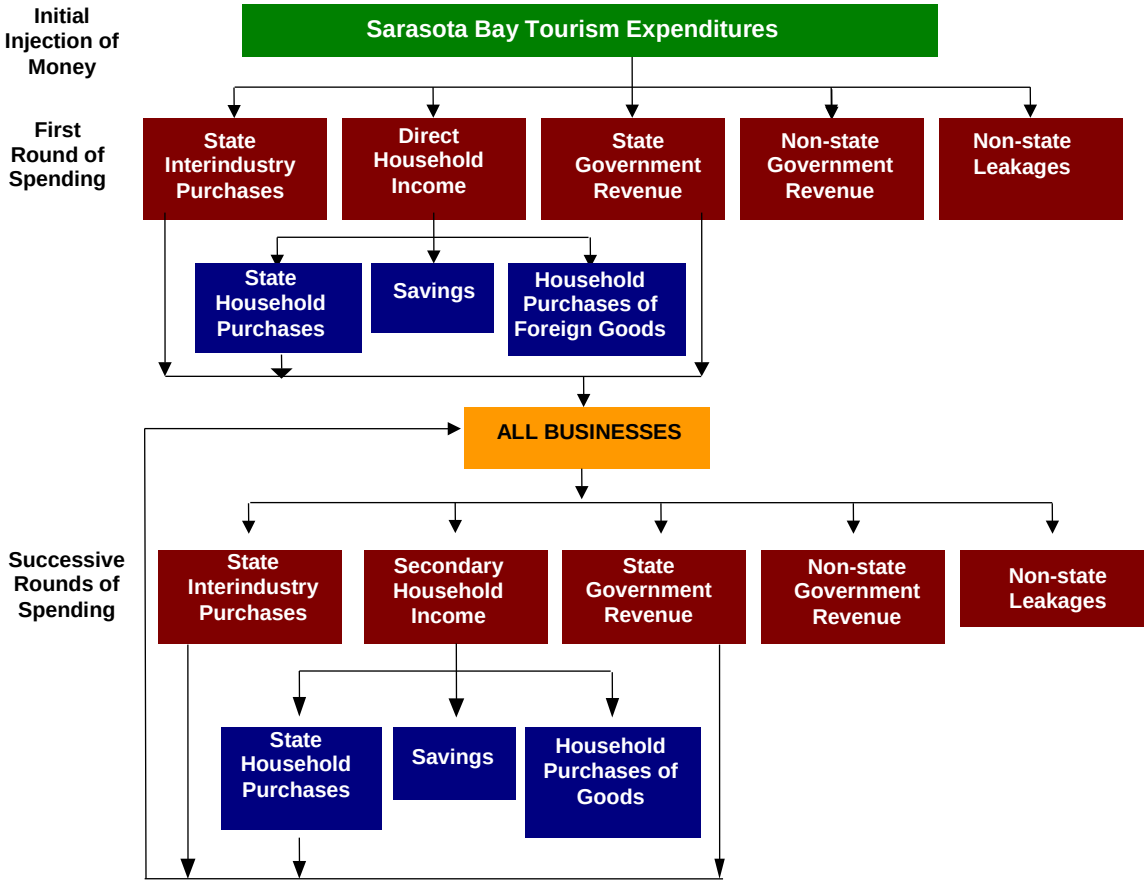
The multiplier component then accounts for indirect impacts (due to purchases by tourism businesses from other local businesses in the tourism supply chain)

and induced impacts (due to household income paid by businesses in the tourism supply chain) that are caused by the direct spending flow. Overall, the total economic contribution of Sarasota Bay on the two-county economy is estimated.

3.2 Methodology

This study estimates the economic impacts arising from visitor spending in the two-county regional economy of Sarasota and Manatee. To conduct these analyses, we construct a 20-sector regional input-output model. The 20-sector model was constructed to provide estimates at a two-digit North American Industry Classification System (NAICS) level of aggregation. NAICS is the standard used by Federal statistical agencies in classifying business establishments when analyzing statistical economic data. The essential element of the input-output model is that it captures all of the economic linkages in the regional economy and by so doing is able to compute the final effects of an injection of a dollar to the regional economy. The process works by means of a "multiplier" which aggregates the effects of the dollar circulating through the various sectors that comprise the regional economy. The total impact is the net effect of spending, considering that some leakage of spending will occur to domestic and international trade. These funds do not remain in the local economy and do not contribute to indirect or induced spending.

Figure 2. The Multiplier Process



The multiplier process is a key component of the input-output model and provides conceptual insights into the relationship between direct and indirect effects. Figure 2 is a graphical representation of the multiplier process that results from the total direct expenditures in the regional economy arising from Bay-related visitor expenditures in the region. These expenditures are disbursed in five different ways. The three local (regional-level) recipients of the disbursement will continue to spend this money in the same five ways over successive rounds of spending. Money that flows to non-local governments and other non-local leakages (intermediate purchases from non-regional suppliers, and non-regional employees) have no further impact in the regional economy. The initial expenditures associated with the Bay have a ripple effect through the

economy as successive rounds of spending magnify its impact. This is the principle of the multiplier.

The two-county economic model is based on the database generated by the Minnesota IMPLAN Group (MIG). IMPLAN is an input-output database that uses financial flow data generated from businesses' accounting data, and spending patterns for households of particular income levels, to describe the economic linkages that exist within an economy. These models begin with U.S. government-generated county level data on business purchases and receipts in order to model the inputs that are used from across the many sectors of the economy in the production of particular goods and services. These data incorporate adjustments using regional purchase coefficients accounting for leakages from the local economy. The IMPLAN database is available at the county and state level. To construct a state level database we aggregate across Sarasota and Manatee counties that make up the region being studied.

The IMPLAN databases report industry level transactions for 440 sectors comprising the structure of the state economy. As such, the level of geographic and commodity detail in IMPLAN can vary from production of printing ink, to storage batteries, to banking services in a geographic area as small as the county or as large as the national economy. It is typically useful to aggregate these data into a smaller number of sectors. However, any aggregation scheme will, of course, sacrifice some of the information that would be available in the detailed data. To circumvent this problem, we enter the model inputs at the 440-sector level but then aggregate results to the 20-sector model. As such, the results of the impact analysis are much more accessible and can be evaluated more readily. The aggregation design and baseline output contributions for this study are reported in Table 1. The input-output model used for the impact analysis is made up of 20 economic sectors that describe the entire economy of the region. These 20 sectors were derived from 440 sectors using the IMPLAN aggregation utility. The IMPLAN database covers the most recent year of data

available - 2012. Table 1 presents baseline levels of output, in millions of dollars, and employment for each of the 20 sectors in the model across the two-county region.

Table 1. Baseline Economic Conditions

NAICS 2-Digit Sector	Output ($Millions)	Employment
Ag, Forestry, Fish & Hunting	468.1	5,895
Mining	90.4	376
Utilities	535.8	764
Construction	2,539.1	24,550
Manufacturing	4,963.6	13,784
Wholesale Trade	1,486.0	9,098
Retail trade	2,954.8	43,785
Transportation & Warehousing	734.5	9,020
Information	1,636.8	5,418
Finance & insurance	3,848.7	20,677
Real estate & rental	6,882.1	24,214
Professional, scientific, & tech svcs	3,150.1	27,906
Management of companies	701.1	4,129
Administrative & waste services	1,635.7	30,412
Educational svcs	355.0	6,868
Health & social services	4,288.5	48,777
Arts, entertainment, & rec	611.8	9,554
Accommodation & food services	1,731.2	27,611
Other services	1,451.6	22,731
Government & non NAICs	2,346.9	27,572
Total	42,411.8	363,142

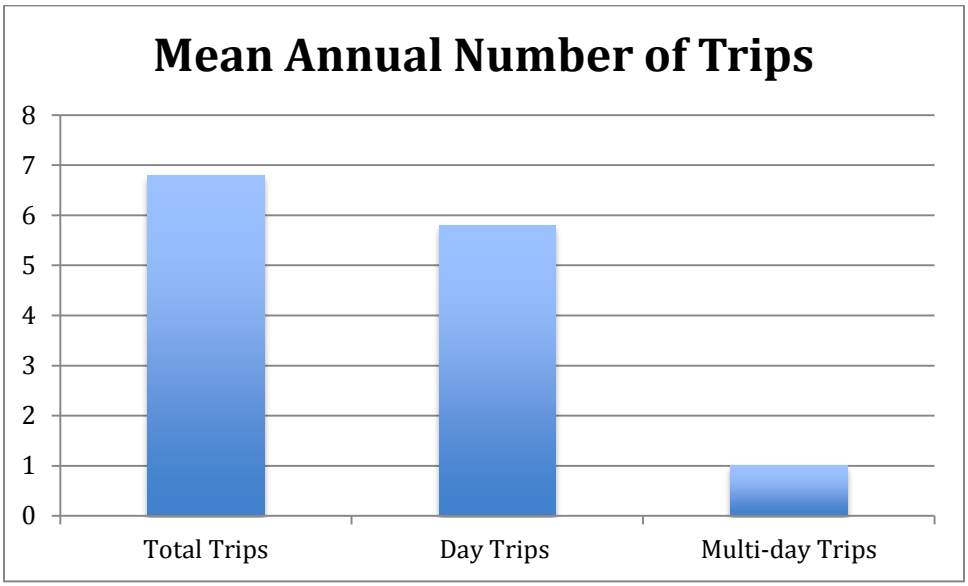
In terms of economic output, the largest economic sectors in the region are real estate and rentals, manufacturing, and health services. In terms of employment, health services and retail trade account for approximately 13 percent and 12 percent of the regional workforce, respectively, with employment accommodation and food services also accounting for 8 percent of the total workforce.

3.3 Survey Design and Data Description

Visitor spending data for use in the model were derived from both onsite and online survey instruments, as described in Section 2 of the report. As part of the overall survey process, questions were developed to elicit visitor spending on all Bay-related activities. From the intercept survey, 355 completed responses were used, plus 272 completed responses from the online survey, with all residents removed from the dataset. In total, this generates 627 usable responses for the input-output model. Overall, this provides a healthy dataset of visitor spending behavior to draw upon and make inferences to the population of visitors to the two-county area. Spending flows by residents of the Sarasota and Manatee counties are not included as Bay-related expenditure flows that contribute to economic output as they represent a transfer of funds between local competing entities with a net-zero gain in economic contribution. That is, absent Bay-related spending, local residents would otherwise frequent other local attractions that would receive the spending flows. So, Bay-related spending merely shifts expenditures from one component of the local economy to another.

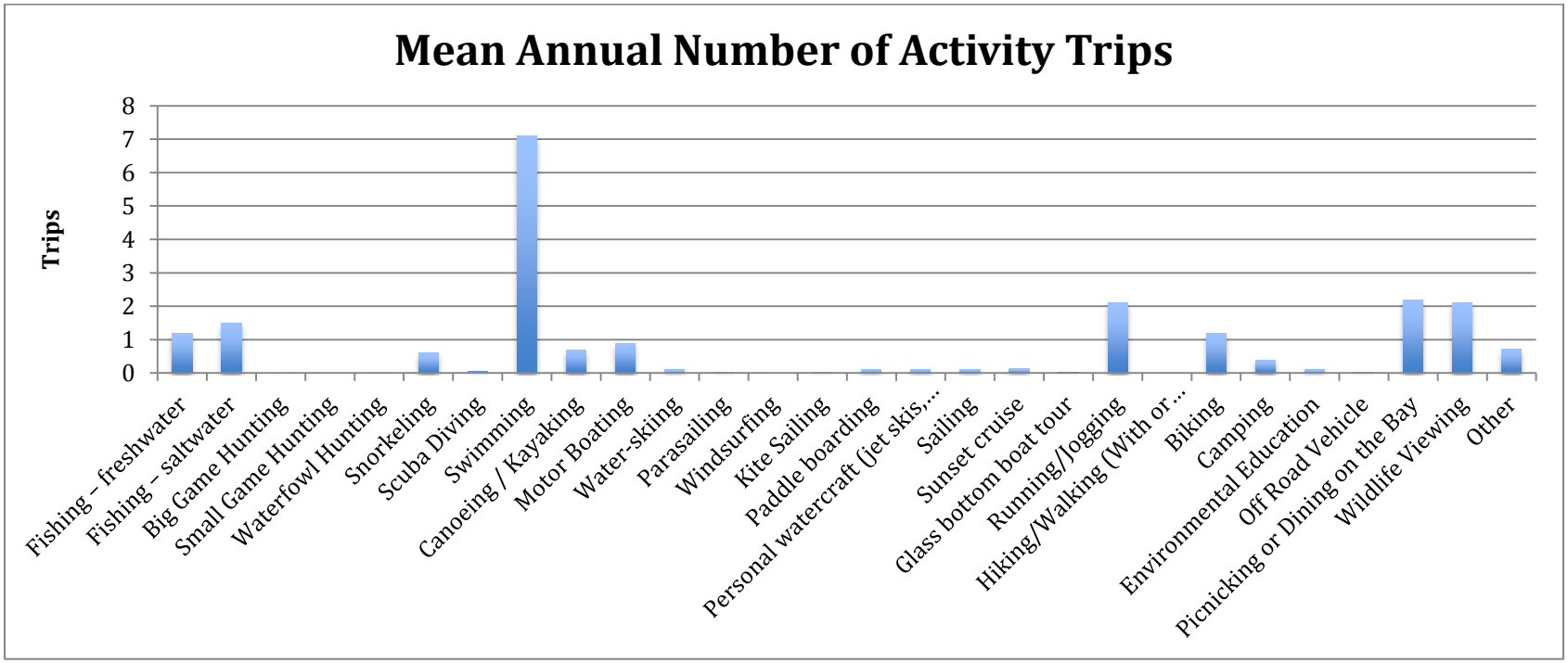
By survey design, respondents are first asked how many trips they had taken to Sarasota Bay over the previous 12 months.

Figure 3. Trip Counts



On average, visitors took 7 trips to Sarasota Bay over the past year. Six of those were day trips while one, on average, was an overnight trip. Respondents were then asked to indicate how many trips they took to the Bay over the past 12 months for a specific activity. Respondents could indicate multiple activities per trip such that if a respondent took a day trip to partake in swimming and biking, then both activities could be selected for the one trip. Responses provide a sense of the popularity of different activities that the Bay offers visitors. Figure 3 shows that the most popular visitor activities are swimming, fishing, running or jogging, picnicking or dining at the Bay, and wildlife viewing. Swimming and fishing-related trips comprised approximately 33% and 13% of Bay-related visitor activities per trip.

Figure 3. Trip Activities



3.4 Visitor Expenditures to Sarasota Bay

A critical component of the survey instrument is to collect spending data from visitors, by expenditure category. These spending flows provide inputs into the input-output model. We asked all respondents to document their spending behavior, by category. While visitors typically take multiple day trips to the Bay and on average one multi-day trip each year, asking respondents to specify spending for all trips over the past 12 months creates recall problems. Instead, to aid response accuracy, respondents are asked to document their spending behavior only for the last trip.

Figure 4 details the percent contribution of visitor spending to each expenditure category. This breakdown represents average spending across trip type.

Figure 4. Trip Expenditures

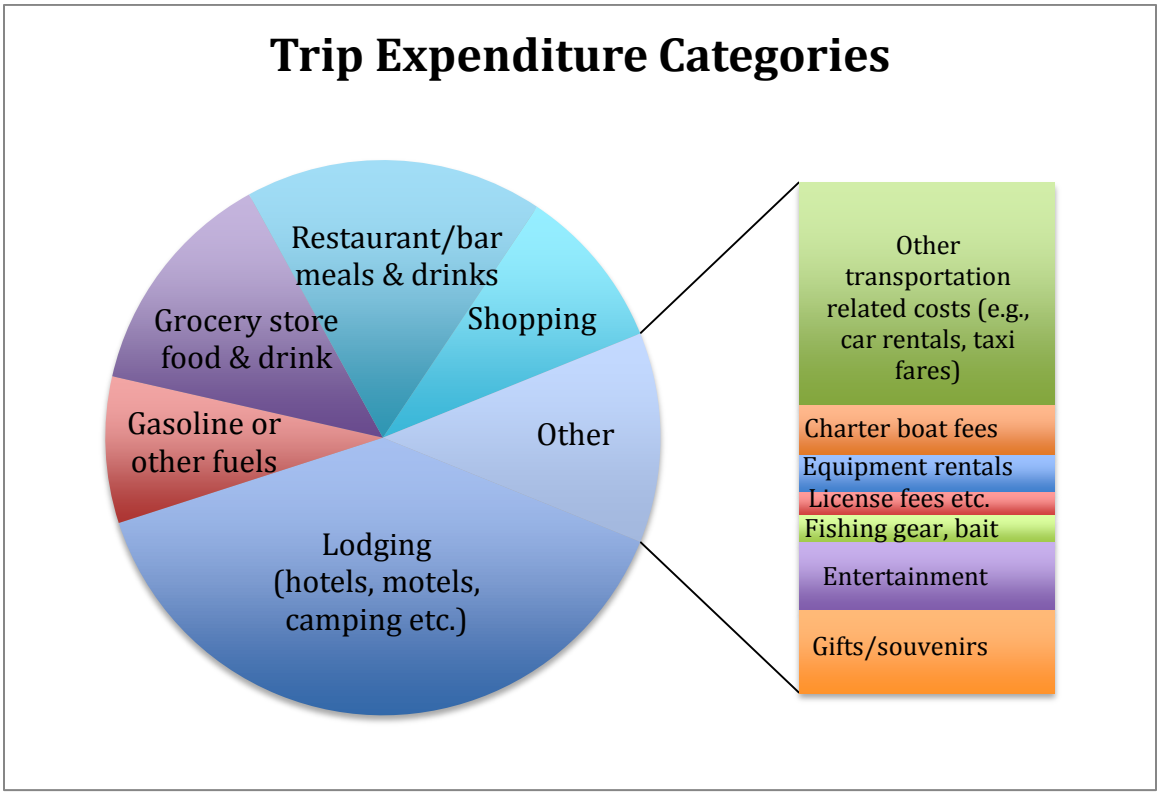
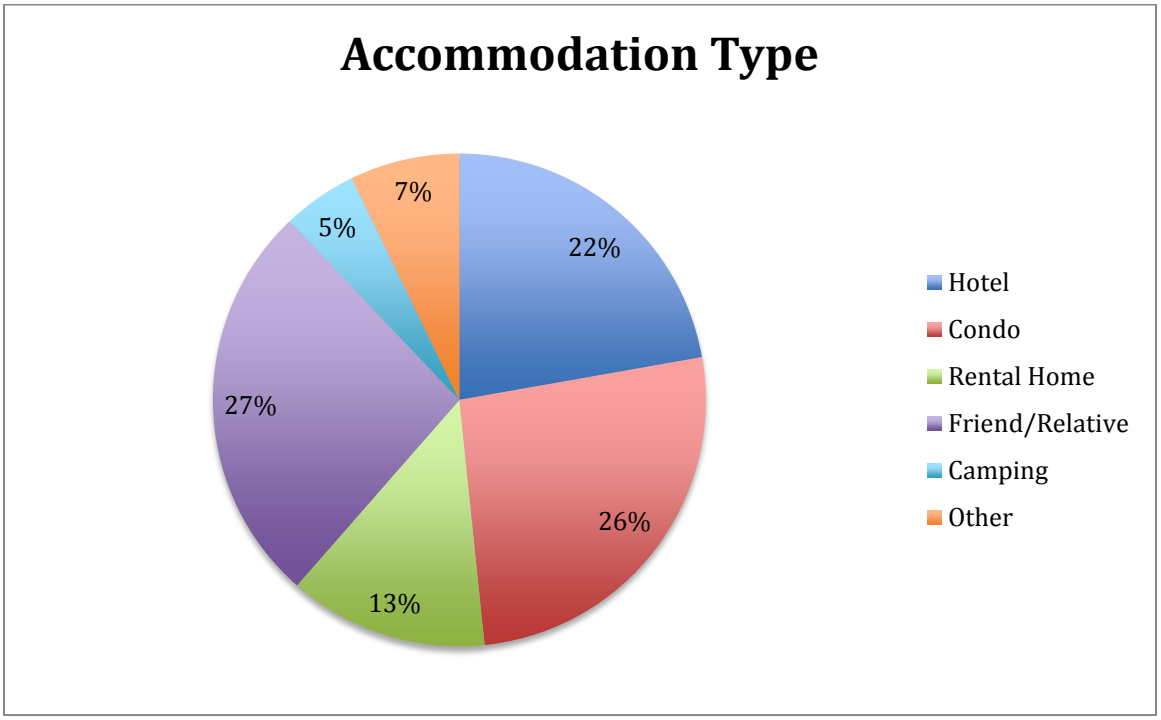


Figure 4 shows that, for the average trip, lodging expenditures comprise the largest component of visitor spending with approximately 39 percent of total trip spending. The other main trip expenditure categories (and percent contributions) are restaurant/bar meals and drinks (17 percent), grocery and convenience store food and drink (13 percent), shopping (10 percent), and gasoline (9 percent).

To provide further insight into the largest expenditure category, for overnight visitors, details of the type of accommodation they stayed in on their last visit was also asked.

Figure 5. Accommodation Type



Almost half of Sarasota Bay visitors either stay in a hotel or motel or rent a condo during their overnight stay, while a further 13 percent rent a home. Over one-quarter of visitors stay overnight stay with a friend or relative.

The next step is to disaggregate visitor spending by trip type and apply average spending levels to visitor counts. Visitor counts for 2012 were provided by the Sarasota and Manatee Visitor Bureaus, respectively. These counts are estimated based on tourist development tax figures and intercept surveys. Visitor trip counts are also broken out by trip type; namely, day trips, overnight trips involving at least a one-night stay, and trips in which the visitor stays with a friend or relative.

Table 2. Visitor-Trip Counts, by Type and by County, 2012

Trip Type	Sarasota	Manatee	Total
Day Trips	3,054,200	1,454,080	4,508,280
Overnight Trips	879,300	978,900	1,858,200
Staying with Friends/relatives	747,300	363,520	1,110,820
Total	4,680,800	2,796,500	7,477,300

In 2012, there were a total of 4,680,800 visitors in Sarasota County and 2,796,500 visitors in Manatee County, giving a total annual visitor count of 7,477,300. Breaking visitor counts out by trip type reveals that the majority of trips are day trips (60 percent) with 25 percent constituting overnight trips. Also worthy of note from an economic impact perspective is that over 35 percent of all trips are overnight trips in Manatee County, compared to about 19 percent in Sarasota.

Visitor-trip counts are then adjusted to account for users and non-users. That is, of the total number of annual visitors to both counties, some visitors are attracted by a specific Bay-related activity or activities (users) while others visit the area for another non-Bay-related purpose (non-users). To estimate the number of users, two methods were considered. First, a breakdown of collected local tourist development tax by municipality was provided by the Visitor Bureaus. From this, we are able to identify a geographical distribution of tax collections. We assumed that tourist development tax collections in municipalities directly adjacent to the Bay constituted a Bay-related trip while all other tax collections were non-Bay-related. From this analysis, approximately 60 percent of all tourist development tax collections are collected in municipalities adjacent to the Bay. A second approach was to examine those that identified themselves as users and non-users through the panel survey. After weighting the sample to account for the stratification process, again approximately 60 percent of sampled visitors identified themselves as users. While two separate methods are used to derive an equivalent approximation of the percentage of users, this is likely an over-estimate of the Bay users as due to the geographical proximity of the Bay to the beaches, it is difficult to disentangle Bay from beach visitors. That is, it is likely that some visitors travel to the region to go to the area's beaches are being picked up in our estimate of Bay users. Overall, due to the difficulty in identifying Bay users from beach users, our 60 percent Bay user estimate likely provides an upper bound for the user-adjusted estimate.

Applying user-adjusted visitor counts, by type, to average spending levels provides an estimate of total visitor spending, by expenditure category. Tables 3 to 6 break out average visitor and total spending across the relevant expenditure classifications across the three trip types.

Table 3. Day-Trip Visitor Spending by Expenditure Category

Spending Category	Mean Spending per Visitor	Sarasota	Manatee	Total
Accommodation	$0.0	$0	$0	$0
Gas	$9.6	$17,663,920	$8,409,650	$26,073,570
Other Trans	$0.2	$298,246	$141,992	$440,238
Groceries	$3.9	$7,075,393	$3,368,537	$10,443,930
Restaurants	$29.8	$54,580,501	$25,985,337	$80,565,838
Boats	$0.5	$1,004,401	$478,187	$1,482,589
Rec. Equipment	$0.8	$1,393,863	$663,607	$2,057,470
Fishing Gear	$0.2	$402,785	$191,763	$594,548
Licenses	$0.7	$1,319,763	$628,328	$1,948,091
Entertainment	$0.9	$1,585,007	$754,609	$2,339,616
Shopping	$4.1	$7,602,703	$3,619,586	$11,222,289
Gifts	$1.0	$1,908,363	$908,556	$2,816,919
Other	$0.3	$630,313	$300,087	$930,400
Total	$52.1	$95,465,258	$45,450,240	$140,915,498

Day trippers spend, on average, about $52 per trip. The largest component of day-trip visitor spending is at Bay-side restaurants. Almost $30 is spent per day-trip visitor, giving a total restaurant expenditure of about 57 percent of all day-trip spending. In aggregate, based on 2012 visitation counts, $141 million was spent at the Bay from this group.

Table 4. Overnight-Trip Visitor Spending by Expenditure Category

Spending Category	Mean Spending per Visitor	Sarasota	Manatee	Total
Accommodation	$372.1	$196,334,899	$218,574,130	$414,909,029
Gas	$58.1	$30,666,508	$34,140,162	$64,806,669
Other Trans	$25.3	$13,348,121	$14,860,088	$28,208,208
Groceries	$87.5	$46,144,222	$51,371,067	$97,515,289
Restaurants	$107.1	$56,510,928	$62,912,029	$119,422,957
Boats	$11.9			
Rec. Equipment	$4.7	$2,456,192	$2,734,409	$5,190,601
Fishing Gear	$4.0	$2,089,809	$2,326,526	$4,416,336
Licenses	$4.0	$2,091,966	$2,328,928	$4,420,894
Entertainment	$12.3	$6,506,189	$7,243,158	$13,749,347
Shopping	$68.9	$36,342,481	$40,459,063	$76,801,544
Gifts	$12.0	$6,312,103	$7,027,087	$13,339,190
Other	$8.6	$4,553,987	$5,069,825	$9,623,812
Total	$776.4	$403,357,404	$449,046,472	$852,403,876

Table 4 shows that, as expected, overnight visitors constitute the highest spending cohort, with an average of $776 spent per trip. Approximately 44 percent of spending from overnight trippers is on accommodation with an additional 23 percent on food and beverages (this includes spending at grocery stores and bars and restaurants). Across both counties, approximately $852 million was spent by overnight visitors in 2012.

Table 5. Friend/Relative-Trip Visitor Spending by Expenditure Category

Spending Category	Mean Spending per Visitor	Sarasota	Manatee	Total
Accommodation	$12.6	$5,627,815	$2,737,620	$8,365,435
Gas	$28.8	$12,906,609	$6,278,349	$19,184,959
Other Trans	$21.7	$9,733,352	$4,734,736	$14,468,088
Groceries	$47.3	$21,227,010	$10,325,763	$31,552,774
Restaurants	$64.4	$28,876,226	$14,046,682	$42,922,908
Boats	$2.9	$1,310,081	$637,282	$1,947,363
Rec. Equipment	$2.8	$1,277,791	$621,574	$1,899,365
Fishing Gear	$2.9	$1,280,097	$622,696	$1,902,794
Licenses	$2.2	$1,001,013	$486,937	$1,487,950
Entertainment	$13.1	$5,853,850	$2,847,573	$8,701,423
Shopping	$33.2	$14,866,196	$7,231,580	$22,097,775
Gifts	$4.7	$2,109,047	$1,025,934	$3,134,981
Other	$5.6	$2,514,065	$1,222,953	$3,737,018
Total	242.2	$108,583,151	$52,819,680	$161,402,832

Visitors staying with a friend or relatives spend, on average, $242 per trip. Spending at grocery stores and bars and restaurants constitutes approximately 47 percent.[1] Spending from this group totals $161 million.

Aggregating all spending by category across all visitor types provides total Bay-related visitor spending.

[1] Some visitors that identified themselves as staying with friends or relatives also indicated accommodation expenditures.

Table 6. Total Visitor Spending by Expenditure Category

Spending Category	Mean Spending per Visitor	Sarasota	Manatee	Total
Accommodation	$394.3	$201,962,714	$221,311,750	$423,274,464
Gas	$87.1	$61,237,037	$48,828,161	$110,065,198
Other Trans	$50.9	$23,379,718	$19,736,816	$43,116,534
Groceries	$164.6	$74,446,625	$65,065,367	$139,511,992
Restaurants	$172.1	$139,967,654	$102,944,048	$242,911,702
Boats	$8.3	$2,314,483	$1,115,469	$3,429,952
Rec. Equipment	$7.0	$5,127,846	$4,019,591	$9,147,436
Fishing Gear	$7.5	$3,772,692	$3,140,985	$6,913,677
Licenses	$15.4	$4,412,742	$3,444,193	$7,856,936
Entertainment	$86.1	$13,945,046	$10,845,340	$24,790,386
Shopping	$46.2	$58,811,380	$51,310,229	$110,121,608
Gifts	$13.7	$10,329,512	$8,961,577	$19,291,090
Other	$5.6	$7,698,364	$6,592,865	$14,291,230
Total	$1,070.7	$607,405,814	$547,316,392	$1,154,722,206

Across the three trip types, total Bay-related spending by visitors is $1.15billion. These spending categories are then transferred into direct effects in the input-output model as one of the 440 IMPLAN sectors. This provides a high level of precision for the multiplier analysis.

3.5 Total (Direct plus Secondary) Impacts in Aggregate and by Sector

The aggregate economic impacts attributable to Sarasota Bay are reported in Table 7 below. Economic impacts can be measured in different ways. Considering that Bay-related spending creates local jobs, a job count is an appropriate way to measure impact. It is also an intuitive concept and provides a broad measure of economic opportunities created for workers. However, it is worth noting that not all jobs are equal. Differences in industry structure between regions and differences in pay for similar jobs due to other factors (e.g., quality of life) may mean that jobs in one region are different from jobs in another region. Also, the number of jobs alone does not indicate whether the quality of employment opportunities has changed. Relying on job numbers alone would overlook the implications of creating low paying jobs at the expense of relatively higher paid employment.

Bay-related spending also creates labor income. Changes in labor income include changes in employee compensation and proprietor income resulting from changes in final demand. Employee compensation constitutes wage and salary payments as well as benefits including health and life insurance, retirement payments, and any other noncash compensation. Essentially, it includes all income paid to workers by employers. Proprietary income consists of payments received by self-employed individuals as income, e.g., includes income received by private business owners, doctors, lawyers, and so forth. Any income a person receives for payment of self-employed work is counted. Personal income, however, excludes net business income (profit) and therefore is an underestimate of the true income impact to the region.

Perhaps the most widely accepted measure of economic impact is the change in total industry output. The change in output attributable to Bay-related expenditures represents the change in the annual value of production, by industry. Essentially, the change in output can be thought of as the increase in the value of sales plus or minus inventory. We also include tax revenue

contributions, which constitute the sum of additional exise taxes, property taxes, fees, licenses, and sales taxes collected due to Bay-related expenditures.

In the modeling process, direct Bay-related expenditures are entered into the input-output model as a vector of changes to the Manatee-Sarasota aggregate demand. The input-output data represents 2012 economic conditions, which is the most recent year for which Florida IMPLAN economic data are available.

As described in Figure 2, these expenditures then create secondary rounds of spending that ripple through the economy. The input-output model then estimates the total economic impacts of these spending flows on the local economy. Table 7 details the total economic impacts of Bay-related spending on the two-county economy in terms of part-time and full-time jobs.

Table 7. Total Economic Impacts of Bay-related Expenditures

Category	Direct	Indirect	Induced	Total
Employment	14,639	3,169	3,660	21,468
Income ($Millions)	$472.8	$123.1	$135.0	$730.9
Output ($Millions)	$1,154.7	$363.7	$422.8	$1,941.2

From direct Bay-related expenditures of $1.15 billion across the two-county region, t**he total—direct plus indirect and induced—impacts are estimated to be $1.94 billion** (see Figure 5). This represents about 4 percent of the region's gross regional product. Bay-related expenditures directly and indirectly generate a total of **21,468 fulltime equivalent positions**. Thus, spending by visitors on Bay-related activities accounts for about 6 percent of the jobs in the two-county region, which implies that one in every 17 jobs in the region exists

because of these expenditures. Further, Bay activity adds an additional **$730.9 million in labor earnings** (wages and salaries) to the region. The additional economic activity associated with the Bay also yields **$183.6 million in additional tax revenue.**

The 20-sector model also enables impacts to be broken out by NAICS sector. Table 8 provides impact estimates for output, employment, and labor income, by sector.

Table 8. Total Economic Impacts, by Sector

Sector	Output ($Millions)	Employment	Income ($Millions)
Agriculture	$0.9	11	$0.4
Mining	$0.9	4	$0.0
Utilities	$22.5	29	$3.4
Construction	$18.8	201	$8.9
Manufacturing	$7.7	34	$1.7
Wholesale Trade	$22.3	135	$8.5
Retail Trade	$694.9	11,060	$332.3
Transportation	$20.1	248	$5.1
Information	$60.1	238	$14.9
Finance and Ins.	$90.1	446	$19.5
Real Estate	$208.1	1,079	$25.0
Professional Serv.	$78.5	663	$36.9
Mgt. of Companies	$25.1	139	$11.1
Admin Services	$56.4	999	$26.9
Education	$7.0	132	$3.8
Health	$69.0	735	$37.0
Arts and Ent.	$42.2	553	$18.3
Accommodation	$465.9	4,163	$149.3
Other Serv.	$30.1	454	$16.2
Govt	$20.6	146	$11.7

As expected from visitor spending flows, the accommodation and retail trade sectors accrue the largest impacts from Bay-related visitor spending. Combined, approximately 71 percent of all jobs created and 60 percent of local output generated by visitor spending flows are attributable to these two sectors.

3.6 Conclusion

The purpose of this section of the report is to measure the total economic contribution of visitor spending at Sarasota Bay on the two-county regional economy. Spending data gathered from intercept and online surveys of visitors and visitation rates were used to develop direct Bay-related spending levels. As direct spending constitutes the initial injection of money into the local economy, an input-output model is then developed to estimate the subsequent secondary impacts as these dollars circulate through local businesses and are, in turn, spent locally again. The aggregate economic impact is then calculated as direct plus secondary effects and is identified as regional output, income, and employment attributable to the presence of the Bay. Results indicate that approximately 4 percent of the region's output or 6 percent of employment can be attributable to the Bay.

Due to the difficulty in disentangling economic activity of visitors to one of the area's beaches, as opposed to the Bay itself, it should be noted that this potentially constitutes an upper bound estimate.

4. Measuring the Economic Value of Recreation to the Sarasota Bay Estuary

4.1 Introduction

In this section, we estimate the economic value associated with Sarasota Bay Estuary recreation by resident and visitors. We develop these estimates by combining results from the Phase I benefit transfer study, survey estimates, and external data sources.

Residents and visitors to Sarasota and Manatee Counties visit the Sarasota Bay Estuary and its adjacent resources to enjoy a wide variety of recreational opportunities. The value individuals derive directly from using the Bay's resources for recreational opportunities represents one type of economic value, which is classified as a direct use value. The problem faced by researchers is how to capture this value. While coastal and marine recreational opportunities provide significant value to residents and visitors, recreation itself is not traded in an explicit market. To overcome the problem, economists have developed a variety of methodologies to estimate the value of recreation for individuals based on their actual (observed) and anticipated (stated) behavior.

Benefit transfer is a method to evaluate natural resources when primary research is not practical due to budget constraints, time limitations, or unidentifiable resource impacts (Rosenberger and Loomis 2001). In our application, project budget constraints limit our ability to adequately estimate the wide variety of recreational services provided by the Sarasota Bay estuary and adjacent resources. Our benefit transfer study will target a wide variety of recreational activities such as saltwater angling, boating, and wildlife viewing.

In general, the term benefit transfer refers to methods that collect existing information and utilize it in a new context. In natural resource and environmental economics, benefit transfer studies may utilize existing results from the economic

literature to estimate non-marketed values (Smith 1992). These methods allow analysts to transfer values from study sites (previous economic studies) to a project site (Sarasota Bay and adjacent regions) through time and/or space.

In practice, analysts utilize two different types of benefit transfer: value transfers and function transfers. Value transfers represent a more simplistic methodology, where single values or arithmetic means of multiple values are obtained from study sites that are similar to the policy site. These point estimates can then be transferred to the policy site. While the strength of this methodology is its simplicity, it does not allow analysts to control for differences in studies, recreational users, or sites of interest. The function transfer uses an equation to transfer calibrated value estimates from the study site(s) to the policy site(s). The functional approach includes both preference function approaches using single study sites as well as meta-analytic approaches using multiple study sites. The empirical literature suggests that function approaches outperform simple value transfers (Kirchhoff et al 1997; Rosenberger and Stanley 2006). In this study, we combine the results of the Phase I meta-analysis regression (function transfer) with trip estimates to the Sarasota Bay Estuary to calculate the value of coastal recreation.

4.2 Revisiting the Meta-Analytic Benefit Transfer Methodology

4.2.1 Theory

In Phase I of this project, we developed a theoretical framework for coastal recreational users in the Sarasota Bay region which captured their preferences for recreation as well as the constraints they may face. This involved the development of a utility theoretic model which estimates Sarasota Bay recreational users' willingness-to-pay for non-marketed commodities and services. We use the general theoretical model outlined by Bergstrom and Taylor (2006), where recreational users will utilize an underlying conditional indirect utility function

$$V = V_{i,j}(P, M_i, Q1_j, Q2_j, S, Z_i, I_i) \quad (1)$$

where the indirect utility for individual *i* is a function of the price of relevant market goods (P), household income for individual *i* (M_i), the quantity of the nonmarket good or service at site *j* ($Q1_j$), the quality of the good or service at site *j* ($Q2_j$), a measure of substitutes for the quantity of goods and services available (S), household characteristics of individual *i* (Z_i), and the information available to the household (I_i).[1] This conditional indirect utility function (1) can then be utilized to construct a general bid function for willingness-to-pay (WTP) for relevant non-marketed goods and services:

$$WTP = f(P, M_i, Q1_j, Q2_j, S, Z_i, I_i, \tilde{\beta}_{ij}) \quad (2)$$

where WTP for recreation is estimated from study sites and transferred to policy sites using the individual and study characteristics described in (1) as well as econometric parameter estimates ($\tilde{\beta}_{ij}$).

These WTP estimates represent the willingness-to-pay for each additional trip, otherwise known as marginal willingness-to-pay estimates. IF we develop estimates of the total number of recreation trips to the Sarasota Bay Estuary, these estimates can be combined with the marginal willingness-to-pay estimates to determine the value of coastal recreation in the Sarasota Bay Estuary.

4.2.2 Data and Conceptual Approach

In Phase I, we then followed the five steps recommended in the EPA's (2000) "Guidelines for Preparing Economic Analyses":

1) Describe the Policy Case;
2) Identify existing, relevant studies;
3) Review studies for quality and applicability;
    - Basic commodities must be equivalent
    - Baseline and extent of change should be similar

[1] Bergstrom and Taylor describe three general approaches for empirically representing the underlying utility functions: the strong structural utility theoretic (SSUT) approach, the weak structural utility theoretic (WSUT) approach, and the non-structural utility theoretic (NSUT) approach. Our application utilizes WSUT via a preference function transfer.

- Affected populations should be similar

4) Transfer benefit estimates; and
5) Address uncertainty.

For our policy case, we focused on estimating individual's willingness-to-pay (per person per activity day) for coastal and marine recreational trips in the counties of Sarasota and Manatee located on the west coast of Florida. We utilized the Recreation Use Values Database for North America (Rosenberger 2011), an extensive, publically available database, which contains 2,703 economic estimates from 352 different studies between 1958 and 2006. This database includes use values for numerous recreation activities throughout North America. We added 106 value estimates from 19 additional documents.

After identifying relevant economic value estimates we developed inclusion criteria for our benefit transfer study, specifically 1) Commodity consistency, 2) welfare change measure consistency, 3) study location, 4) activity type, and 5) sufficiency of information. Phase I of this project gives detail for each criteria. The Phase I metadata included 2052 observations (economic value estimates) collected from 263 studies between 1964 and 2011.

4.3 Results

4.3.1 Benefit Transfer Results

Previous studies on meta-analysis benefit transfer provided insight into those specific attribute types that should influence the value surface for coastal/marine recreation trips (Nelson and Kennedy 2009; Johnston and Rosenberger 2010). Based on these previous studies, the Phase I model included a variety of attribute types including surveyed attributes of the recreation populations, the recreation type, the geographic location of the recreation activity, and the methodology of the original study. Table 1 gives estimated WTP values by activity as calculated using the meta-regression model.

Table 1: Estimated Mean Willingness-to-Pay for Recreation Trips by Activity Type (2011 Dollars)[a]

	Day Trip		Multi-Day Trip	
	Single Purpose	Multi-Purpose	Single Purpose	Multi-Purpose
Beach	$23.89 ($21.28, $26.49)	$18.76 ($16.07, $21.44)	$28.05 ($25.40, $30.69)	$22.03 ($19.30, $24.75)
Big Game Hunting	$57.79 ($55.35, $60.22)	$45.38 ($42.84, $47.91)	$67.83 ($65.34, $70.31)	$53.27 ($50.68, $55.85)
Biking	$68.96 ($66.38, $71.53)	$54.16 ($51.52, $56.79)	$80.95 ($78.31, $83.58)	$63.57 ($60.87, $66.26)
Camping	$24.72 ($22.24, $27.19)	$19.41 ($16.83, $21.98)	$29.02 ($26.50, $31.53)	$22.79 ($20.17, $25.40)
Env. Education	$21.19 ($18.37, $24.00)	$16.64 ($13.77, $19.50)	$24.87 ($22.00, $27.73)	$19.53 ($16.61, $22.44)
Freshwater Fishing	$37.47 ($35.04, $39.89)	$29.43 ($26.89, $31.96)	$43.99 ($41.50, $46.47)	$34.54 ($31.95, $37.12)
Motorboating	$37.42 ($34.86, $39.97)	$29.39 ($26.74, $32.03)	$43.93 ($41.31, $46.54)	$34.5 ($31.80, $37.19)
Running/Hiking	$54.42 ($51.96, $56.87)	$42.73 ($40.18, $45.27)	$63.87 ($61.35, $66.38)	$50.16 ($47.56, $52.75)
Kayaking/Canoeing	$44.9 ($42.29, $47.50)	$35.26 ($32.57, $37.94)	$52.7 ($50.05, $55.34)	$41.39 ($38.66, $44.11)
Off Road Vehicle	$27.35 ($24.80, $29.89)	$21.48 ($18.84, $24.11)	$32.1 ($29.54, $34.65)	$25.21 ($22.56, $27.85)
Picnicking	$29.46 ($27.00, $31.91)	$23.14 ($20.59, $25.68)	$34.58 ($32.07, $37.08)	$27.16 ($24.56, $29.75)
Saltwater Fishing	$65.74 ($63.25, $68.22)	$51.63 ($49.02, $54.23)	$77.16 ($74.61, $79.70)	$60.6 ($57.94, $63.25)
Scuba Diving	$243.37 ($240.24, $246.49)	$191.13 ($187.86, $194.39)	$285.67 ($282.51, $288.82)	$224.34 ($221.04, $227.63)
Sightseeing	$51.25 ($48.74, $53.75)	$40.25 ($37.65, $42.84)	$60.16 ($57.60, $62.71)	$47.24 ($44.59, $49.88)
Small Game Hunting	$31.84 ($29.34, $34.33)	$25 ($22.40, $27.59)	$37.37 ($34.82, $39.91)	$29.35 ($26.71, $31.98)
Snorkeling	$104.18 ($100.34, $108.01)	$81.81 ($77.95, $85.66)	$122.28 ($118.38, $126.17)	$96.03 ($92.12, $99.93)
Swimming	$35.55 ($33.03, $38.06)	$27.92 ($25.32, $30.51)	$41.73 ($39.17, $44.28)	$32.77 ($30.12, $35.41)
Waterfowl Hunting	$40.80 ($38.39, $43.20)	$32.05 ($29.52, $34.57)	$47.9 ($45.43, $50.36)	$37.62 ($35.04, $40.19)
Wildlife Viewing	$35.47 ($33.03, $37.90)	$27.86 ($25.32, $30.39)	$41.64 ($39.14, $44.13)	$32.7 ($30.11, $35.28)

[a] **95% Confidence intervals in Parentheses**

4.3.2 Survey Results

After estimating the meta-regression model, we needed estimates into the population of recreation users in the Sarasota Bay Estuary. For our purposes, we divide this population into three groups, 1) residents of Sarasota and Manatee Counties, 2) visitors from the counties adjacent to Sarasota and Manatee Counties (Charlotte, Desoto, Hardee, Hillsborough, Pinellas, and Polk), and 3) visitors from all areas beyond Hillsborough Counties. In this application, we utilize data from the internet panel survey, the onsite survey, the Census Bureau's American Community Survey, and visitor estimates from the Sarasota and Manatee County Visitor Boards.

We develop our Manatee and Sarasota County resident estimates using the internet panel survey and 2012 population estimates for individuals 18 years of age and older from the American Community Survey. In this sample, certain groups are over-represented. On average, our sample is older and wealthier than the general population. To account for potential sampling biases, we utilize post-stratification weights which are estimated using a raking procedure. These weights are generated using the American Community Survey. On average, residents of Manatee and Sarasota Counties took 8.03 day trips to the Sarasota Bay estuary over a 12 month period. We are 95% confident that the average resident of Sarasota and Manatee counties takes between 6.22 and 9.83 recreational trips to the Sarasota Bay Estuary. According 2012 estimates from the American Community Survey, Manatee and Sarasota counties have 584,916 individuals 18 years of age and older. This means that Manatee and Sarasota county residents made 4,696,875 day trips to the Sarasota Bay Estuary (95% CI: 3,638,178 – 5,749,724). Table 2 provides trip estimates for all user groups.

Next, we generated trip estimates for all visitors to the Sarasota Bay Estuary divided into two groups, 1) residents of counties adjacent to Manatee and Sarasota counties and 2) those outside adjacent counties. We begin by utilizing visitor estimates developed by the Sarasota and Manatee County Visitors

Bureaus. We chose to utilize these estimates because of the difficulty of developing estimates for all visitors using our two sampling routines. The Sarasota and Manatee County Visitor Bureaus develop trip counts using tourist development tax figures and intercept surveys. They find 4,508,280 day trips and 2,969,020 multi-day trips made by visitors to the Sarasota Bay Estuary. Using the Visitor Bureaus' data as a starting point, we then use the internet panel and onsite surveys to estimate visitation for our two groups of visitors.

We develop our estimates for visitation by people from adjacent counties by using the internet panel survey and 2012 population estimates for individuals 18 years of age and older from the American Community Survey. Much like the Manatee and Sarasota county samples, we need to account for over- and under-represented groups. We utilize post-stratification weights which are estimated using a raking procedure. These weights are generated using the American Community Survey. On average, visitors from adjacent counties took 1.15 day trips and 0.24 multi-day trips to the Sarasota Bay Estuary over a 12 month period. We are 95% confident that the average visitor from adjacent counties takes between 0.95 and 1.34 day trips and between 0.18 and 0.31 multi-day trips to the Sarasota Bay Estuary. According 2012 estimates from the American Community Survey, counties adjacent to Manatee and Sarasota counties have 2,374,903 individuals 18 years of age and older. This means that visitors from adjacent counties made 2,731,138 day trips to the Sarasota Bay Estuary (95% CI: 2,265,657 – 3,182,370). Visitors from adjacent counties made 574,727 multi-day trips to the Sarasota Bay Estuary (95% CI: 422,733 – 729,095).

Due to the difficulty of developing population estimates for all other visitors from our survey data, we combine our estimates for visitors from counties adjacent to Manatee and Sarasota counties with the Visitor Bureau estimates to develop trip estimates for all other visitors. These visitors include domestic and international visitors making recreation trips to the Sarasota Bay Estuary. These visitors

made 1,777,142 day trips to the Sarasota Bay Estuary (Sensitivity Range[2]: 1,325,910 – 2,242,623). These visitors made 2,394,293 multi-day trips to the Sarasota Bay Estuary (Sensitivity Range: 2,239,925 – 2,546,287).

Table 2: Day and Multi-day Recreation Trips to the Sarasota Bay Estuary by Residents and Visitors

Trip Type	User Groups	Lower Bound	Total	Upper Bound
Day Trips	**All Users**	8,146,458	9,205,155	10,258,004
	Sarasota & Manatee Counties	3,638,178	4,696,875	5,749,724
	Adjacent Counties	2,265,657	2,731,138	3,182,370
	Non-Adjacent County Visitors	2,242,623*	1,777,142	1,325,910*
Multi-Day Trips	**All Users**	2,969,020	2,969,020	2,969,020
	Adjacent Counties	422,733	574,727	729,095
	Non-Adjacent County Visitors	2,546,287*	2,394,293	2,239,925*
All Trips	**All Users**	11,115,478	12,174,175	13,227,024

* Estimates for Non-Adjacent County Visitors calculated using data from the Manatee and Sarasota Visitor Bureaus

Next we used the internet panel and onsite samples to calculate the proportion of recreation trips by activity type. Respondents provided estimates of the number of trips taken by activity type. We utilize their responses to determine the proportion of trips by type. The internet panel survey captures responses on activity type for 1) residents of Sarasota and Manatee counties and 2) residents

[2] We call this a sensitivity range because it is calculated as the difference between the Visitors Bureau estimates for all visitors and the estimates from the survey of adjacent counties.

from counties adjacent to Sarasota and Manatee counties. The onsite sample provides responses from other visitors.

Among residents of Sarasota and Manatee counties, the most common activities reported were swimming, wildlife viewing, walking, picnicking, and saltwater fishing. Among all visitors, the most common activities were swimming, walking, picnicking, saltwater fishing, and wildlife viewing. These activities were most common for both day and multi-day visitors.

Interestingly, no-one responded that they participate in hunting in the Manatee and Sarasota county sample. A larger sample may be needed to pick up these types of users because a very small proportion of visitors reported participating in hunting activities. Other than hunting, the least reported activities among residents were paddle boarding, windsurfing, parasailing, and driving off road vehicles. Among visitors, the least reported activities were small game hunting, waterfowl hunting, riding off road vehicles, and glass bottom boat tours. In a comparison of residents and visitors, visitors reported taking a higher proportion of trips swimming, picnicking, camping, freshwater fishing, and paddle boarding. Residents reported taking a higher proportion of trips wildlife viewing, running, biking, and motor boating. Table 3 provides the proportion of trips by activity for all users. Figures 1-5 give graphical depictions for each user type. Tables 4 – 8 provides estimates of the total number of trips by activity type. Again, it should be noted that this likely underrepresents the number of trips among activity types such as hunting (Sarasota and Manatee county residents).

Table 3: Proportion of Trips by Activity for All Users.

Activity Type	Manatee and Sarasota County Day Trips*	Adjacent County Visitor Day Trips*	Adjacent County Visitor Multi-Day Trips*	Non-Adjacent County Visitor Day Trips	Non-Adjacent County Visitor Multi-Day Trips
Freshwater Fishing	0.010	0.043	0.041	0.019	0.007
Saltwater Fishing	0.091	0.095	0.079	0.079	0.075
Big Game Hunting	0.000	0.007	0.006	0.000	0.000
Small Game Hunting	0.000	0.002	0.001	0.000	0.000
Waterfowl Hunting	0.000	0.002	0.001	0.000	0.000
Snorkeling	0.027	0.029	0.027	0.031	0.023
Scuba Diving	0.003	0.005	0.004	0.000	0.001
Swimming	0.196	0.184	0.191	0.420	0.373
Kayaking	0.038	0.046	0.034	0.029	0.016
Motor Boating	0.049	0.048	0.044	0.028	0.013
Water Skiing	0.005	0.011	0.020	0.000	0.002
Parasailing	0.001	0.007	0.009	0.003	0.001
Windsurfing	0.001	0.006	0.016	0.000	0.000
Kite Sailing	0.002	0.006	0.004	0.000	0.001
Paddle boarding	0.001	0.009	0.020	0.017	0.003
Personal Water Craft	0.008	0.021	0.028	0.000	0.003
Sailing	0.018	0.012	0.021	0.002	0.001
Sunset Cruise	0.018	0.018	0.017	0.003	0.006
Glass Bottom Boat	0.005	0.003	0.003	0.000	0.000
Running	0.064	0.067	0.091	0.000	0.000
Walking	0.128	0.119	0.101	0.131	0.193
Biking	0.050	0.040	0.048	0.010	0.025
Camping	0.008	0.018	0.021	0.054	0.014
Environmental Education	0.013	0.014	0.013	0.000	0.010
Off Road Vehicles	0.001	0.001	0.000	0.000	0.003
Picnicking	0.100	0.100	0.092	0.150	0.138
Wildlife Viewing	0.162	0.086	0.067	0.022	0.091

* Weighted using American Community Survey

Figure 1: Proportion of Trips by Activity for Day Users (Sarasota and Manatee County Residents)

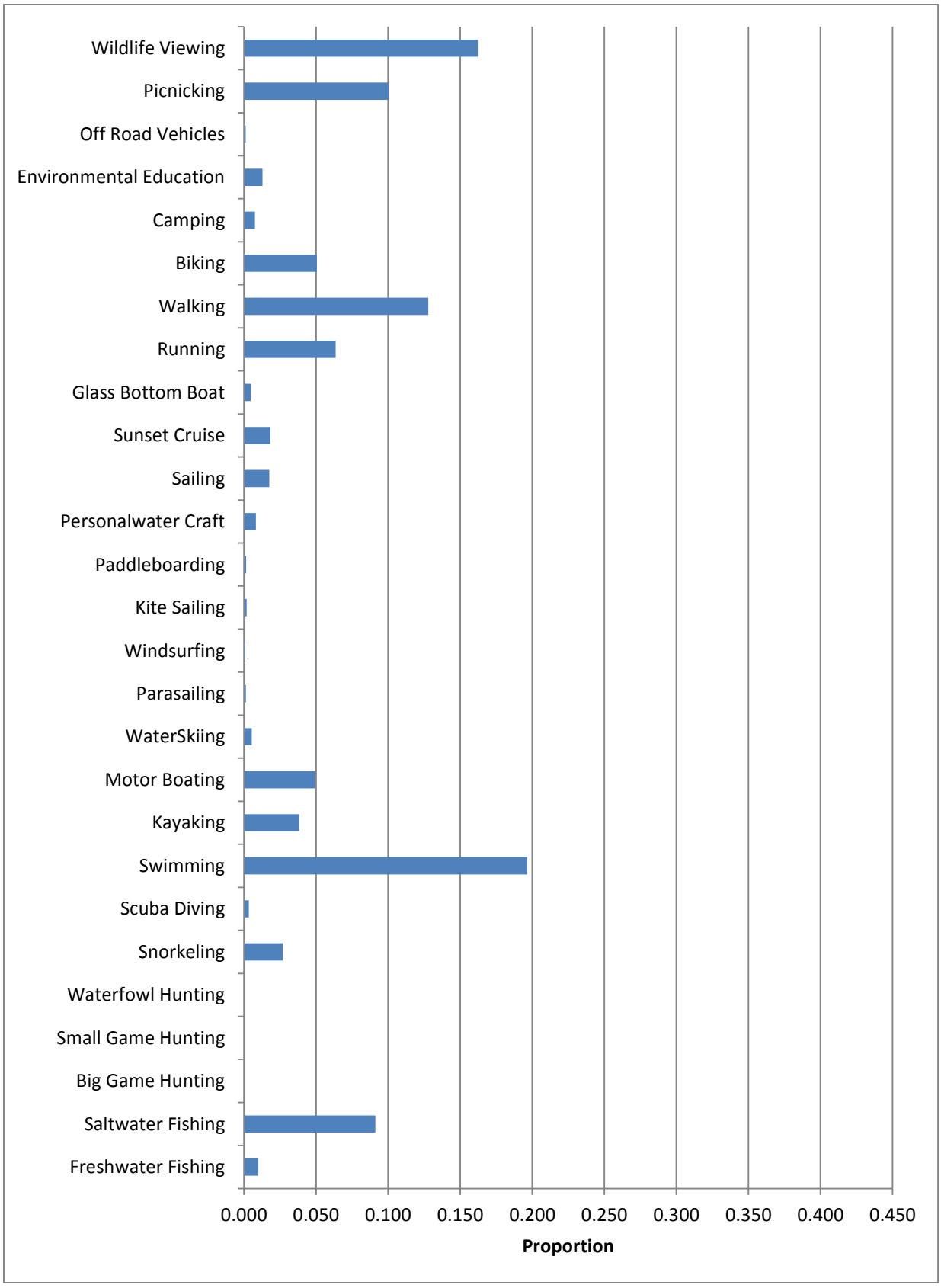


Figure 2: Proportion of Trips by Activity for Day Users (Adjacent County Visitors: Charlotte, Desoto, Hardee, Hillsborough, Pinellas, and Polk County Residents)

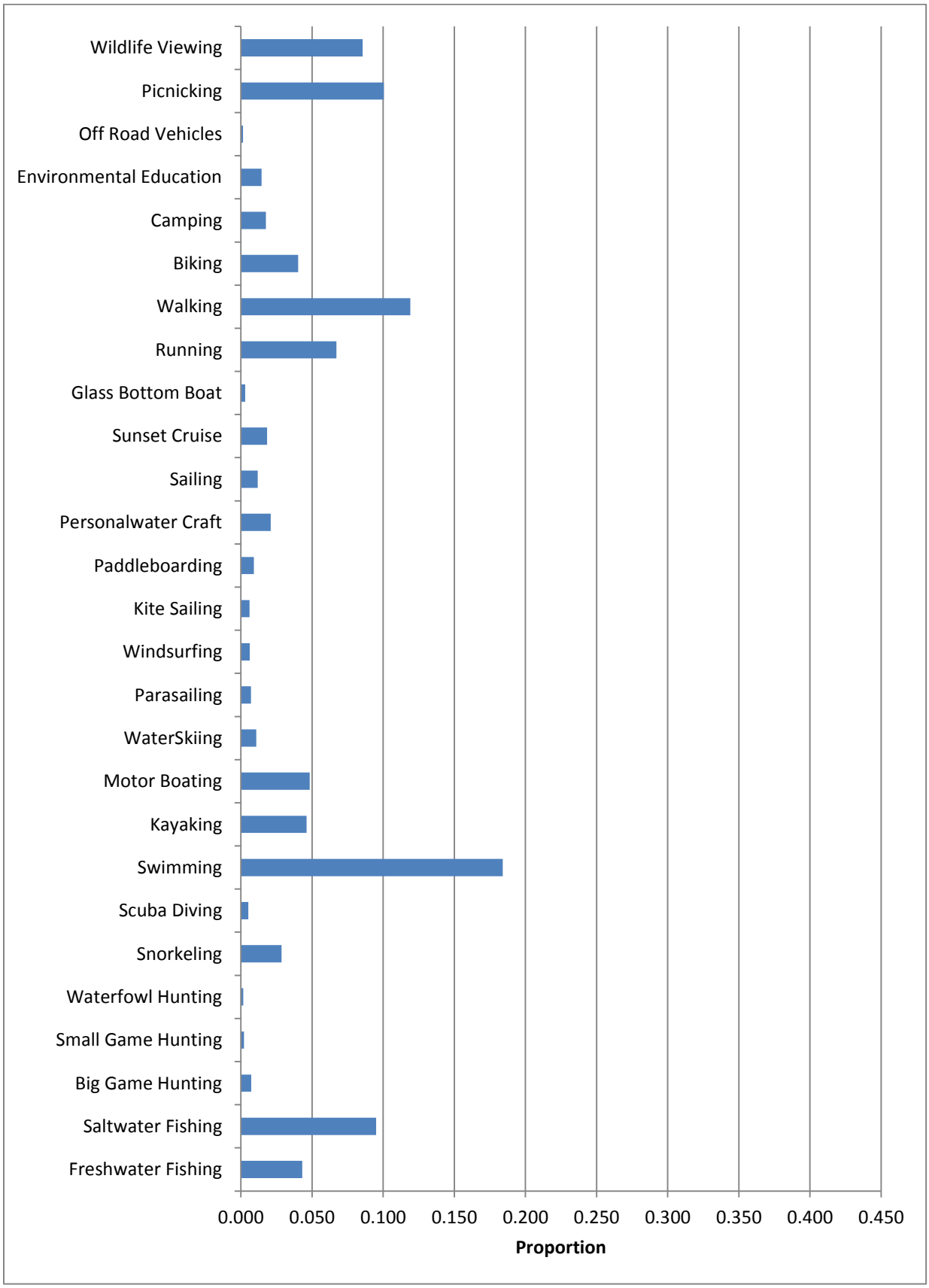


Figure 3: Proportion of Trips by Activity for Mult-Day Users (Adjacent County Visitors: Charlotte, Desoto, Hardee, Hillsborough, Pinellas, and Polk County Residents)

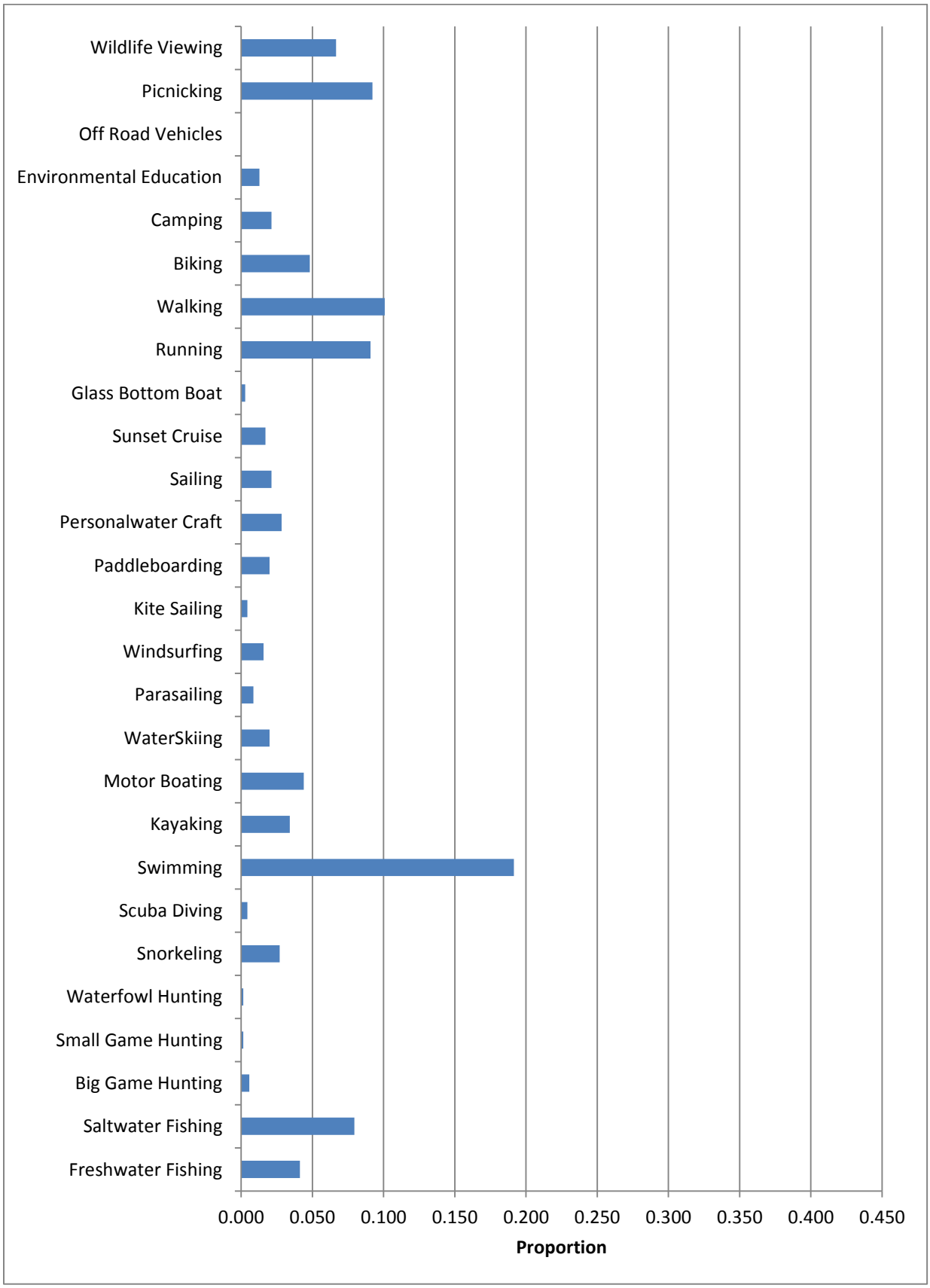


Figure 4: Proportion of Trips by Activity for Day Users (All Visitors Except of Adjacent County Visitors)

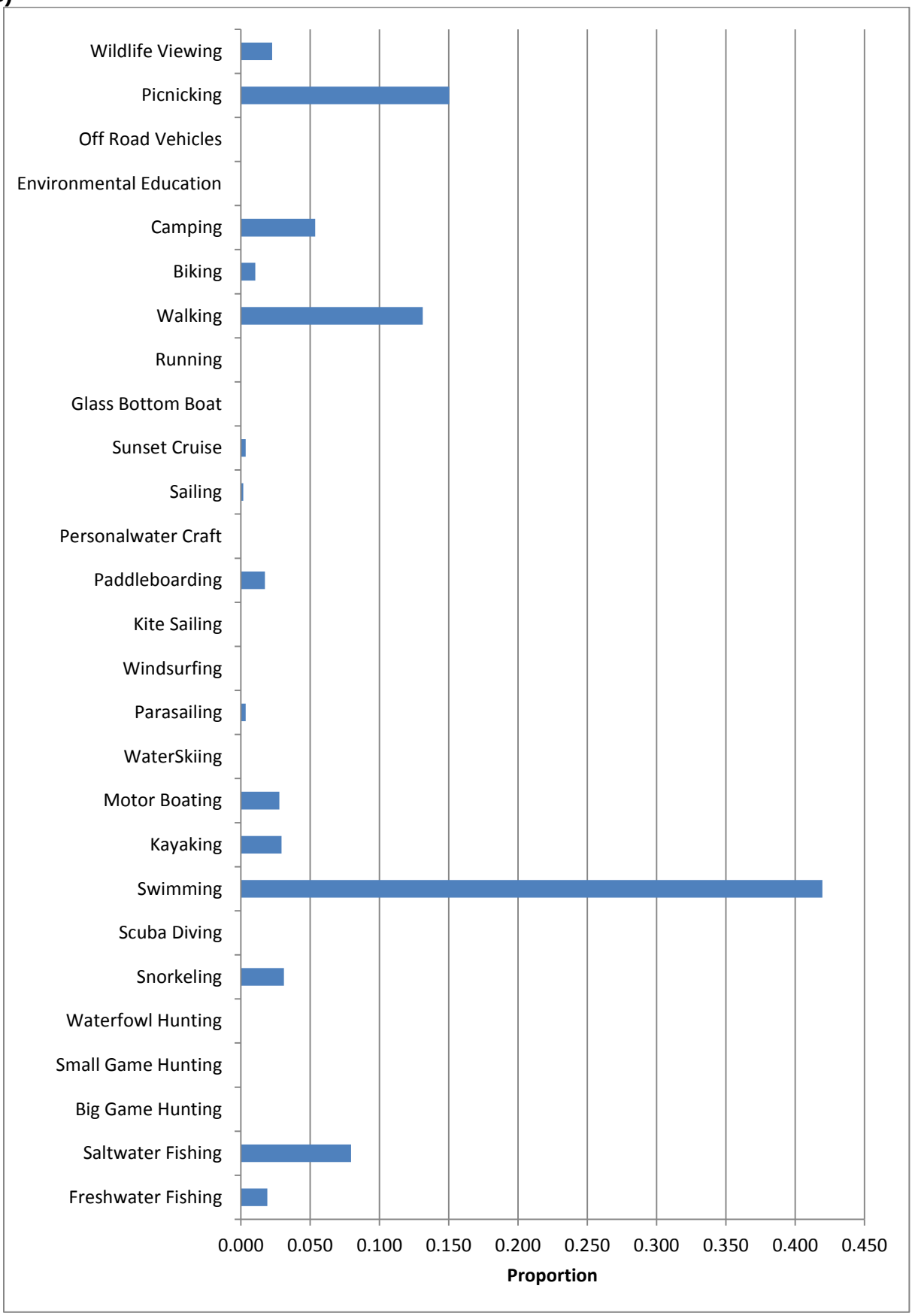


Figure 5: Proportion of Trips by Activity for Multi-Day Users (All Visitors Except of Adjacent County Visitors)

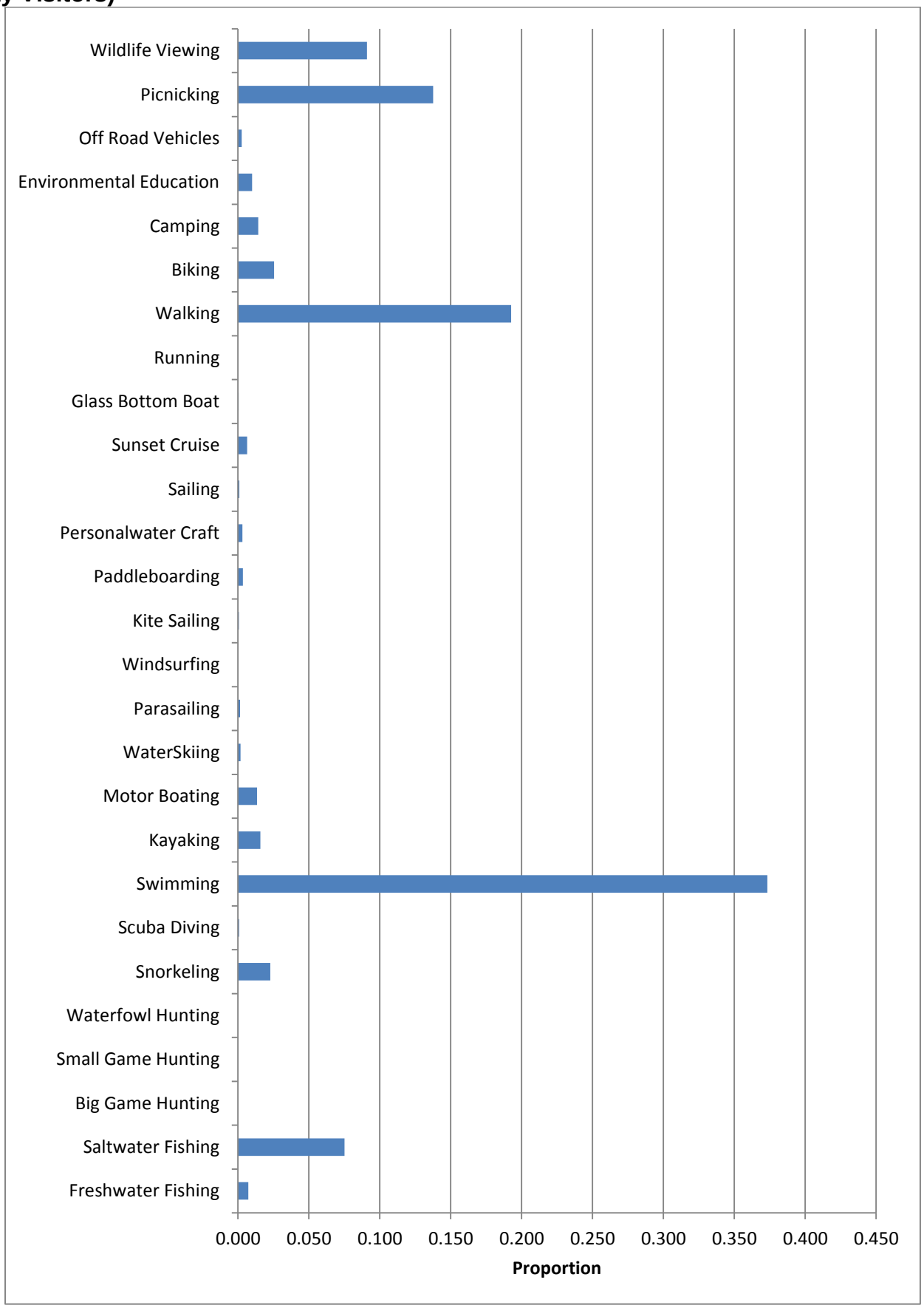


Table 4: Manatee and Sarasota County Trip Count Estimates by Activity

Activity Type	Manatee and Sarasota County Day Trip Proportions	Trip Counts Lower Bound	Trip Counts Mean	Trip Counts Upper Bound
Freshwater Fishing	0.010	35839	46268	56640
Saltwater Fishing	0.091	331368	427795	523690
Big Game Hunting	0.000	0	0	0
Small Game Hunting	0.000	0	0	0
Waterfowl Hunting	0.000	0	0	0
Snorkeling	0.027	97836	126306	154618
Scuba Diving	0.003	12369	15968	19547
Swimming	0.196	714210	922043	1128727
Kayaking	0.038	139343	179892	220216
Motor Boating	0.049	179602	231865	283840
Water Skiing	0.005	19271	24879	30455
Parasailing	0.001	4701	6069	7429
Windsurfing	0.001	3038	3922	4801
Kite Sailing	0.002	6770	8740	10699
Paddle boarding	0.001	5323	6872	8412
Personal Water Craft	0.008	30024	38761	47450
Sailing	0.018	63779	82338	100795
Sunset Cruise	0.018	65987	85189	104285
Glass Bottom Boat	0.005	17223	22235	27220
Running	0.064	231299	298606	365541
Walking	0.128	465314	600719	735376
Biking	0.050	183630	237066	290206
Camping	0.008	27582	35609	43591
Environmental Education	0.013	46446	59962	73403
Off Road Vehicles	0.001	3939	5086	6226
Picnicking	0.100	364895	471079	576675
Wildlife Viewing	0.162	588389	759608	929882
Totals	1.000	3638178	4696875	5749724

Table 5: Adjacent County Visitor Trip Count Estimates by Activity (Day Trips)

Activity Type	Adjacent County Visitor Day Trips	Trip Counts Lower Bound	Trip Counts Mean	Trip Counts Upper Bound
Freshwater Fishing	0.043	97457	117480	136890
Saltwater Fishing	0.095	215377	259627	302522
Big Game Hunting	0.007	16372	19736	22996
Small Game Hunting	0.002	4958	5976	6964
Waterfowl Hunting	0.002	3685	4442	5176
Snorkeling	0.029	64735	78035	90927
Scuba Diving	0.005	11761	14177	16519
Swimming	0.183	415554	500930	583692
Kayaking	0.046	104664	126167	147013
Motor Boating	0.048	109523	132025	153838
Water Skiing	0.011	24565	29612	34504
Parasailing	0.007	15817	19066	22216
Windsurfing	0.006	14166	17077	19898
Kite Sailing	0.006	13597	16390	19098
Paddle boarding	0.009	20716	24972	29097
Personal Water Craft	0.021	47460	57211	66663
Sailing	0.012	26699	32184	37502
Sunset Cruise	0.018	41720	50292	58601
Glass Bottom Boat	0.003	6832	8235	9596
Running	0.067	151986	183212	213481
Walking	0.119	269682	325088	378798
Biking	0.040	91168	109899	128056
Camping	0.018	39782	47955	55878
Environmental Education	0.014	32778	39512	46040
Off Road Vehicles	0.001	3275	3948	4600
Picnicking	0.100	227452	274182	319482
Wildlife Viewing	0.086	193878	233710	272323
Totals	1.000	2265657	2731138	3182370

Table 6: Adjacent County Visitor Trip Count Estimates by Activity (Multi--Day Trips)

Activity Type	Adjacent County Visitor Multi-Day Trips	Trip Counts Lower Bound	Trip Counts Mean	Trip Counts Upper Bound
Freshwater Fishing	0.041	17389	23641	29991
Saltwater Fishing	0.079	33579	45652	57914
Big Game Hunting	0.006	2398	3261	4137
Small Game Hunting	0.001	600	815	1034
Waterfowl Hunting	0.001	600	815	1034
Snorkeling	0.027	11393	15489	19649
Scuba Diving	0.004	1799	2446	3103
Swimming	0.191	80949	110054	139614
Kayaking	0.034	14391	19565	24820
Motor Boating	0.044	18588	25272	32060
Water Skiing	0.020	8395	11413	14478
Parasailing	0.009	3598	4891	6205
Windsurfing	0.016	6596	8967	11376
Kite Sailing	0.004	1799	2446	3103
Paddle boarding	0.020	8395	11413	14478
Personal Water Craft	0.028	11992	16304	20684
Sailing	0.021	8994	12228	15513
Sunset Cruise	0.017	7195	9783	12410
Glass Bottom Boat	0.003	1199	1630	2068
Running	0.091	38376	52174	66187
Walking	0.101	42573	57880	73427
Biking	0.048	20387	27717	35162
Camping	0.021	8994	12228	15513
Environmental Education	0.013	5397	7337	9308
Off Road Vehicles	0.000	0	0	0
Picnicking	0.092	38975	52989	67222
Wildlife Viewing	0.067	28182	38315	48606
Totals	1.000	422733	574727	729095

Table 7: Non-Adjacent County Visitor Trip Count Estimates by Activity (Day Trips)

Activity Type	Non-Adjacent County Visitor Day Trips	Trip Counts Lower Bound	Trip Counts Mean	Trip Counts Upper Bound
Freshwater Fishing	0.019	25190	33763	42606
Saltwater Fishing	0.079	105340	141189	178170
Big Game Hunting	0.000	0	0	0
Small Game Hunting	0.000	0	0	0
Waterfowl Hunting	0.000	0	0	0
Snorkeling	0.031	41220	55248	69719
Scuba Diving	0.000	0	0	0
Swimming	0.419	555674	744781	939859
Kayaking	0.029	38930	52179	65846
Motor Boating	0.028	36640	49109	61972
Water Skiing	0.000	0	0	0
Parasailing	0.003	4580	6139	7747
Windsurfing	0.000	0	0	0
Kite Sailing	0.000	0	0	0
Paddle boarding	0.017	22900	30693	38733
Personal Water Craft	0.000	0	0	0
Sailing	0.002	2290	3069	3873
Sunset Cruise	0.003	4580	6139	7747
Glass Bottom Boat	0.000	0	0	0
Running	0.000	0	0	0
Walking	0.131	174040	233269	294368
Biking	0.010	13740	18416	23240
Camping	0.054	70990	95149	120071
Environmental Education	0.000	0	0	0
Off Road Vehicles	0.000	0	0	0
Picnicking	0.151	200026	268098	338320
Wildlife Viewing	0.022	29770	39901	50352
Totals	1.000	1325910	1777142	2242623

Table 8: Non-Adjacent County Visitor Trip Count Estimates by Activity (Multi-Day Trips)

Activity Type	Non-Adjacent County Visitor Multi-Day Trips	Trip Counts Lower Bound	Trip Counts Mean	Trip Counts Upper Bound
Freshwater Fishing	0.007	16148	17261	18357
Saltwater Fishing	0.075	168152	179741	191151
Big Game Hunting	0.000	0	0	0
Small Game Hunting	0.000	0	0	0
Waterfowl Hunting	0.000	0	0	0
Snorkeling	0.023	50902	54410	57864
Scuba Diving	0.001	1755	1876	1995
Swimming	0.373	836199	893827	950569
Kayaking	0.016	35456	37899	40305
Motor Boating	0.013	30190	32271	34319
Water Skiing	0.002	3862	4128	4390
Parasailing	0.001	3159	3377	3592
Windsurfing	0.000	0	0	0
Kite Sailing	0.001	1404	1501	1596
Paddle boarding	0.003	7723	8255	8779
Personal Water Craft	0.003	7021	7505	7981
Sailing	0.001	2106	2251	2394
Sunset Cruise	0.006	14393	15385	16362
Glass Bottom Boat	0.000	1053	1126	1197
Running	0.000	0	0	0
Walking	0.193	431439	461173	490449
Biking	0.025	56870	60789	64648
Camping	0.014	31945	34147	36315
Environmental Education	0.010	22116	23640	25141
Off Road Vehicles	0.003	5968	6379	6784
Picnicking	0.138	308221	329463	350378
Wildlife Viewing	0.091	203835	217882	231714
Totals	1.000	2239919	2394288	2546281

4.4 Economic Estimates

The final task involves developing estimates of economic value using our estimates of marginal willingness-to-pay, depicted in table 1, and total trip counts by user types, depicted in tables 4 – 8. We should note that our meta-regression estimates generated from the economic literature are somewhat incomplete because we were unable to find studies providing valuation estimates for water skiing, parasailing, windsurfing, kite surfing, paddle boarding, personal water craft, sailing , sunset cruises, and glass bottom boat tours. Another limitation of our approach is our inability to determine what proportion of trips are single purpose trips and what proportion of trips are multi-purpose trips. As a result, we utilize a sensitivity analysis to give a range of estimates. In some cases, we were able to utilize multi-purpose valuations from other categories to substitute for missing values. For example, we substitute the multipurpose value for motor boating for water skiing, parasailing, personal water craft, and glass bottom boat tours.

Tables 9 and 10 provide the economic value of recreation trips by activity and user type. Table 11 provides the aggregated values of recreation trips by user type. We find that the value of recreation trips for residents of Sarasota and Manatee counties is between $115, 621,769 and $271,358,895 with a mean value of $185,358,225. We find that the value of recreation day trips for visitors of counties adjacent to Sarasota and Manatee counties to be between $70, 628,847 and $149,442,808 with a mean value of $106,406,763. The value of multi-day recreation trips for visitors of counties adjacent to Sarasota and Manatee counties is between $14,304,640 and $37,090,997 with a mean value of $24,337,736. The value of day recreation trips for all other visitors to Sarasota and Manatee counties is between $39, 139,481 and $97,587,675 with a mean value of $64,381,305. The value of multi-day recreation trips for all other visitors to Sarasota and Manatee counties is between $81, 678,485 and $134,384,448 with a mean value of $106,867,724. A summation the economic

values from each user group leads to a total range of values between $321,382,223 and $689,864,825 with a mean value of $487,351,756. These estimates should be considered somewhat conservative since they do not include the value of windsurfing, kite sailing, paddle boarding, and sailing. There appears to be future opportunity for researchers to develop estimates for these other activity types.

Table 9: Economic Value Estimates by Activity (Multi-Day Trips)

Activity Type	Manatee and Sarasota County Day Trips			Adjacent County Visitor Day Trips			Adjacent County Visitor Multi-Day Trips		
	Lower Bound Estimate	Mean Estimate	Upper Bound Estimate	Lower Bound Estimate	Mean Estimate	Upper Bound Estimate	Lower Bound Estimate	Mean Estimate	Upper Bound Estimate
Freshwater Fishing	$963,719.35	$1,546,882.76	$2,259,367.46	$2,620,626.59	$3,922,479.63	$5,460,530.05	$555,578.71	$929,472.65	$1,393,688.69
Saltwater Fishing	$16,243,675.80	$25,093,325.70	$35,726,113.69	$10,557,794.48	$15,208,831.57	$20,638,020.31	$1,945,553.89	$3,148,691.04	$4,615,741.38
Big Game Hunting	$0.00	$0.00	$0.00	$701,375.54	$1,016,225.38	$1,384,835.95	$121,555.21	$197,706.23	$290,852.26
Small Game Hunting	$0.00	$0.00	$0.00	$111,052.12	$169,529.57	$239,061.18	$16,015.91	$27,230.36	$41,274.11
Waterfowl Hunting	$0.00	$0.00	$0.00	$108,786.40	$161,514.52	$223,613.71	$21,010.76	$34,903.95	$52,081.29
Snorkeling	$7,626,309.15	$11,738,830.21	$16,700,339.79	$5,046,079.19	$7,242,912.06	$9,821,059.27	$1,049,504.58	$1,692,988.21	$2,479,161.87
Scuba Diving	$2,323,571.50	$3,467,338.96	$4,818,191.79	$2,209,331.66	$3,074,325.94	$4,071,761.44	$397,620.61	$624,502.51	$896,073.54
Swimming	$18,083,799.90	$29,245,809.86	$42,959,362.71	$10,521,830.66	$15,867,700.83	$22,215,332.32	$2,438,178.50	$4,104,791.44	$6,182,106.97
Kayaking	$4,538,417.19	$7,206,477.36	$10,460,280.28	$3,408,910.91	$5,047,577.54	$6,983,094.62	$556,352.26	$921,645.39	$1,373,553.35
Motor Boating	$4,802,546.41	$7,741,463.71	$11,345,074.98	$2,928,658.25	$4,402,191.64	$6,148,906.16	$591,106.32	$992,309.02	$1,492,049.51
Water Skiing	$0.00	$365,397.71	$975,485.25	$0.00	$434,337.00	$1,105,163.03	$0.00	$197,126.51	$538,454.84
Parasailing	$0.00	$89,130.97	$237,948.81	$0.00	$279,658.45	$711,586.12	$0.00	$84,482.80	$230,766.39
Windsurfing	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Kite Sailing	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Paddle boarding	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Personal Water Craft	$0.00	$569,290.76	$1,519,809.04	$0.00	$839,155.56	$2,135,216.87	$0.00	$281,609.31	$769,221.24
Sailing	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Sunset Cruise	$0.00	$1,251,192.24	$3,340,249.65	$0.00	$737,669.59	$1,876,987.59	$0.00	$168,965.60	$461,532.79
Glass Bottom Boat	$0.00	$326,576.61	$871,846.37	$0.00	$120,791.13	$307,350.94	$0.00	$28,160.91	$76,922.05
Running	$9,293,582.09	$14,497,762.80	$20,788,324.61	$6,106,798.35	$8,883,419.40	$12,140,688.02	$1,825,150.65	$2,978,610.82	$4,393,518.83
Walking	$18,696,329.91	$29,165,821.51	$41,820,836.32	$10,835,802.71	$15,762,593.51	$21,542,237.45	$2,024,775.30	$3,304,394.41	$4,874,057.06
Biking	$9,460,613.08	$14,586,909.84	$20,758,439.69	$4,696,998.19	$6,753,254.97	$9,159,867.41	$1,240,963.49	$2,005,519.00	$2,938,843.39
Camping	$464,212.56	$785,264.32	$1,185,236.55	$669,527.56	$1,056,127.07	$1,519,322.52	$181,415.30	$317,167.65	$489,114.30
Environmental Education	$639,563.09	$1,133,506.55	$1,761,666.71	$451,352.75	$745,942.71	$1,104,968.31	$89,637.33	$163,079.81	$258,099.71
Off Road Vehicles	$74,219.01	$124,101.33	$186,090.07	$61,698.45	$96,202.05	$137,491.46	$0.00	$0.00	$0.00
Picnicking	$7,513,195.85	$12,382,656.97	$18,401,711.70	$4,683,231.99	$7,197,530.93	$10,194,655.46	$957,234.82	$1,637,845.80	$2,492,574.94
Wildlife Viewing	$14,898,014.40	$24,040,485.72	$35,242,519.85	$4,908,991.67	$7,386,792.16	$10,321,058.22	$848,565.47	$1,426,006.05	$2,144,998.05
Totals	$115,621,769.30	$185,358,225.90	$271,358,895.33	$70,628,847.49	$106,406,763.22	$149,442,808.42	$14,304,640.39	$24,337,736.81	$37,090,997.88

Table 10: Economic Value Estimates by Activity (Multi-Day Trips)

Activity Type	Non-Adjacent County Visitor Day Trips			Non-Adjacent County Visitor Multi-Day Trips		
	Lower Bound Estimate	Mean Estimate	Upper Bound Estimate	Lower Bound Estimate	Mean Estimate	Upper Bound Estimate
Freshwater Fishing	$677,359.09	$1,118,769.91	$1,699,551.54	$515,936.82	$677,477.26	$853,045.69
Saltwater Fishing	$5,163,766.72	$8,227,662.73	$12,154,781.76	$9,742,755.55	$12,375,870.82	$15,234,759.42
Big Game Hunting	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Small Game Hunting	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Waterfowl Hunting	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Snorkeling	$3,213,098.95	$5,102,264.21	$7,530,331.41	$4,689,103.01	$5,936,993.14	$7,300,723.68
Scuba Diving	$0.00	$0.00	$0.00	$387,979.50	$478,278.94	$576,287.41
Swimming	$14,069,676.96	$23,403,427.19	$35,771,022.28	$25,186,309.58	$33,281,072.52	$42,091,184.34
Kayaking	$1,267,950.08	$2,073,118.63	$3,127,664.42	$1,370,727.39	$1,782,264.97	$2,230,500.68
Motor Boating	$979,753.59	$1,624,700.34	$2,477,032.76	$960,049.07	$1,264,975.01	$1,597,227.04
WaterSkiing	$0.00	$0.00	$0.00	$0.00	$71,171.77	$163,252.72
Parasailing	$0.00	$81,162.94	$227,670.73	$0.00	$58,231.54	$133,570.62
Windsurfing	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Kite Sailing	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Paddleboarding	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Personalwater Craft	$0.00	$0.00	$0.00	$0.00	$129,403.30	$296,823.33
Sailing	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Sunset Cruise	$0.00	$81,162.94	$227,670.73	$0.00	$265,276.72	$608,487.72
Glass Bottom Boat	$0.00	$0.00	$0.00	$0.00	$19,410.47	$44,523.44
Running	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Walking	$6,992,927.09	$11,244,929.05	$16,740,731.82	$20,519,255.09	$26,283,537.32	$32,555,993.78
Biking	$707,884.79	$1,125,884.01	$1,662,329.43	$3,461,673.65	$4,390,976.12	$5,403,300.88
Camping	$1,194,761.68	$2,073,324.70	$3,264,739.40	$644,340.09	$884,173.10	$1,145,004.49
Environmental Education	$0.00	$0.00	$0.00	$367,348.32	$524,561.62	$697,159.67
Off Road Vehicles	$0.00	$0.00	$0.00	$134,634.39	$182,712.03	$235,068.33
Picnicking	$4,118,525.93	$6,973,681.42	$10,795,789.43	$7,569,909.55	$10,166,053.51	$12,992,000.16
Wildlife Viewing	$753,776.39	$1,251,217.85	$1,908,359.46	$6,137,463.23	$8,095,284.05	$10,225,534.99
Totals	$39,139,481.28	$64,381,305.93	$97,587,675.16	$81,687,485.25	$106,867,724.21	$134,384,448.40

Table 11: Aggregated Economic Value Estimates (Day and Multi-Day Trips)

User Groups	Lower Bound Estimate	Mean Estimate	Upper Bound Estimate
Manatee and Sarasota County Day Trips	$115,621,769.30	$185,358,225.90	$271,358,895.33
Adjacent County Visitor Day Trips	$70,628,847.49	$106,406,763.22	$149,442,808.42
Adjacent County Visitor Multi-Day Trips	$14,304,640.39	$24,337,736.81	$37,090,997.88
Non-Adjacent County Visitor Day Trips	$39,139,481.28	$64,381,305.93	$97,587,675.16
Non-Adjacent County Visitor Multi-Day Trips	$81,687,485.25	$106,867,724.21	$134,384,448.40
Totals	$321,382,223.70	$487,351,756.08	$689,864,825.19

5. Measuring the Economic Value of Sarasota Bay Estuarine Resources

5.1 Introduction

The main purpose of this chapter is to evaluate household preferences for the key environmental resources within the Sarasota Bay Estuary. These resources capture bundles of local public goods under the purview of the Sarasota Bay Estuary Program. The primary management goals[1] of the Sarasota Bay Estuarine program are to:

1. Improve water transparency.
2. Reduce the quantity and improve the quality of stormwater runoff to the Bay.
3. Restore lost seagrasses and shoreline habitats, and eliminate further losses.
4. Establish an appropriate management structure for Sarasota Bay and its resources.
5. Provide increased levels of managed access to Sarasota Bay and its resources.
6. Restore and sustain fish and other living resources in Sarasota Bay.
7. Improve beach, inlet and channel management.

In this chapter, we estimate individuals' willingness-to-pay for a specific bundle of local public goods. These resources under management, specifically wetlands, oyster beds, sea grass beds, artificial reefs, and ecological parks with estuarine access, are not traded in explicit markets, so we employ a discrete choice experiment (DCE) to assess households' preferences for these resources. Estimates of willingness-to-pay can be used to inform the management of Sarasota Bay Estuarine resources.

[1] The management goals for the Sarasota Bay Estuary Program can be found at their website < http://sarasotabay.org/about-sbep/management-goals/>.

5.2 Background on Discrete Choice Experiments

Discrete choice experiments, first introduced by Louviere and Hensher (1982) and Louviere and Woodworth (1983), have become a commonly applied stated preference methodology for the valuation of environmental resources. In general, stated preference methods utilize surveys to elicit individuals' preferences for goods and/or services within a hypothetical context rather than real markets. These methods have numerous benefits, such as the ability to gain estimates for environmental goods and services not traded within explicit markets as well as determining the behavioral implications of conditions different than those observed.

Discrete choice experiments elicit respondents' preferences by asking them to make a specific (discrete) choice between two or more alternatives within a set of potential choices, called a choice set. Researchers utilize an experimental design to establish measurable differences in the attributes of respondents' choice sets. Respondents are often asked to make multiple choices, which give researchers more precision as they generate estimates of the impact of those individual attributes on respondent's choices.

The economic foundation of discrete choice experiments can be traced to microeconomic models of consumer behavior and Lancaster's (1966) theory of demand. Consumers are assumed to be utility maximizers, meaning they make those choices that give them the greatest satisfaction given existing constraints (budgetary, physical, or mental). Lancaster (1966) developed a theory that connects utility maximizing behavior to the constituent components of individual choices. This means that individuals' choices reveal their preferences for the characteristics of goods and services. For the discrete choice experiment, respondents choose a bundle of goods and/or services, thus revealing their preferences for the characteristics of those goods and/or services.

Following microeconomic theory, Random Utility Theory provides the behavioral foundation for empirical models estimating respondents' preferences

for the attributes of these discrete choices (McFadden 1974). According to Random Utility Theory,

$$U_{ij} = V_{ij} + \varepsilon_{ij}, \quad (1)$$

where U_{ij} is the utility, or satisfaction, individual *i* receives from alternative *j*, *i* = 1, …, *I*, *j* = 1, …, *J*, $V_{ij} = \beta' x_{ij}$ is the systematic, observable portion of utility, β is a vector of unknown parameters, x_{ij} is a vector of variables specific to the choice, and ε is the random error. Given the observed and unobserved elements of utility, we consider the probability of individual *i* choosing alternative *j* as

$$\pi_{ij} = Pr\left(V_{ij} + \varepsilon_{ij} > V_{ik} + \varepsilon_{ik}; \forall k \in J\right). \quad (2)$$

The Random Utility Model links the deterministic model of choice behavior with a statistical model of choice behavior. It requires an econometric model which specifies the observed components of utility and distributional assumptions associated with the unobserved components of utility.

Hanemann (1984) provides a framework for estimating welfare estimates using discrete choice experiments. Respondents' willingness-to-pay (WTP) for changes in attributes can be calculated as

$$WTP_{\Delta X} = -\frac{1}{\beta_{Cost}}\left[ln\left(\sum \exp(\beta X_{ij}^{0})\right) - ln\left(\sum \exp(\beta X_{ij}^{1})\right)\right]. \quad (3)$$

where Δx is a change in an individual attribute. In addition to the estimation of WTP for a change in an individual attribute, the marginal willingness-to-pay for a given attribute can be estimated using

$$MWTP_X = -\frac{\beta_X}{\beta_{Cost}}. \quad (4)$$

In both cases, uncertainty in the point estimates can be addressed through the use of confidence intervals., which provide a range of possible values for the WTP estimate. The Delta Method and the Krinsky-Robb method are the two most common approaches to developing confidence intervals.

5.3 Description of the Data

A description of the survey methodology is discussed in Chapter 2 and a copy of the survey can be found in Appendix 1. In this study, we utilize the entire internet sample and a subset of the onsite sample in order to generate a regional sample of both users and non-users. The sampling region accounts for Sarasota and Manatee Counties as well as adjacent counties (Pinellas, Hillsborough, Polk, Hardee, Desoto, and Charlotte). The sample combines two survey modes, an onsite sampling process and an internet panel. The onsite sampling process captures individuals 18 years of age or older using a combination of simple random sampling and systematic sampling. This sample can be described as a probability sample of trips. The internet panel was recruited using random digit dialing or address-based sampling methods. This sample represents a probability sample of individuals in the region that are 18 years of age or older. It is a stratified sample with strata defined by 1) Manatee and Sarasota counties, and 2) counties adjacent to Manatee and Sarasota counties.

A survey weight is utilized to account for bias from non-response and non-coverage by comparing the demographic distributions of the sample to that of data from the U.S. Census Bureau's American Community Survey (ACS). This survey weight was calculated using the anesrake package in the R statistical software package. This weight compares respondent demographics to the regional benchmark demographics from the ACS, specifically age, education, ethnicity, gender, and race. The weights also account for oversampling of Sarasota and Manatee County residents as well as over-sampling of resource users in the onsite sample. The weight is calculated using raking, which is also called sampling balancing or raking ratio balancing estimation (Kalton 1983). Raking uses an iterative process to fit a weight based on population estimates. A process is then used to trim extreme weights and the resulting weights are

scaled to the sum of the total sample size. Table 5.1 shows the unweighted and weighted proportions for the sample.

Table 5.1: Proportions for Demographic Characteristics

	Sample Proportions (No Weight)	Sample Proportions (Weighted)
Gender: Male	0.43	0.49
Gender: Female	0.57	0.51
Education: Some High School	0.01	0.02
Education: High School	0.17	0.17
Education: Technical School	0.11	0.12
Education: Some College	0.23	0.26
Education: College	0.34	0.31
Education: Graduate/Professional	0.14	0.13
Ethnicity: Hispanic	0.07	0.16
Ethnicity: Non-Hispanic	0.93	0.84
Race: White	0.93	0.84
Race: Other	0.03	0.04
Race: African American	0.03	0.11
Age: 20 to 34	0.16	0.23
Age: 35 to 54	0.33	0.35
Age: 55 to 64	0.22	0.17
Age: Over 65	0.29	0.25
Income: Less than $10,000	0.08	0.09
Income: $10,000 to $14,999	0.04	0.05
Income: $15,000 to $24,999	0.08	0.10
Income: $25,000 to $34,999	0.09	0.09
Income: $35,000 to $49,999	0.14	0.14
Income: $50,000 to $74,999	0.22	0.21
Income: $75,000 to $99,999	0.16	0.14
Income: $100,000 to $149,999	0.13	0.12
Income: $150,000 to $199,999	0.04	0.04
Income: $200,000 or more	0.03	0.02
Sarasota & Manatee County Residents	0.53	0.20
Adjacent County Residents	0.47	0.80
Resource User	0.74	0.58
Non-Resource User	0.26	0.42
Survey: Onsite	0.25	0.15
Survey: Panel	0.75	0.85
Observations	1207	1207

5.4 *Choice Script and Experimental Design*

Our choice experiment investigates natural resource management options using six primary attributes: 1) wetland restoration, 2) oyster bed restoration, 3) increased sea grass coverage, 4) enhanced artificial reefs, 5) ecological parks with estuarine access, and 6) a funding mechanism in the form of a one-time increase in tax payments. The management alternatives were chosen after consultation with Sarasota Bay Estuary staff. The survey script for the discrete choice experiment begins with the following language:

> We would now like to ask you about four plans for the management of environmental resources in the Sarasota Bay Estuary. The plans differ in the types of improvements made to the environmental resources of Sarasota Bay and the cost to taxpayers. The next series of questions asks you to compare the current situation in the Sarasota Bay Estuary with different scenarios about what could happen each year for the next 5 years if additional management efforts are implemented.

As indicated in table 5.2, each program attribute has a status quo condition as well as five alternative levels.

Table 5.2: Current Conditions and Management Attributes for Discrete Choice Experiment

Attributes	Current Conditions	Management Improvements (Change per year for 5 years)				
Wetland Restoration (Acres)	9,596 Acres	0	6	12	18	24
Oyster Restoration (Acres)	1,596 Acres	0	0.5	1	2	4
Increase in Seagrass Area (Acres)	12,641 Acres	0	20	40	60	80
Artificial Reef Enhancement (# of Reef Domes)	3,000 Reef Domes	0	20	40	60	80
Ecological Park with Access (#)	38 Parks	0	1	2	3	4
One-Time Cost ($)	$0	$5	$15	$50	$100	$350

The initial level of each program attribute is described as the status quo condition, which represents an estimate of current resources in the Sarasota Bay Estuary. Within each choice set, respondents were given a choice between current conditions and two management alternatives with improved environmental conditions. Before the series of management choices, respondents were given descriptions of each management alternative.

In each choice alternative, respondents were given one level from five potential levels of wetland restoration. The *status quo* option maintains the

current level of coastal wetlands, which was estimated at 9,596 acres. The two *alternative* management options would create and restore wetlands for five years at either 1) 0 acres per year, 2) 6 acres per year for a total of 30 acres, 3) 12 acres/year for a total of 60 acres, 4) 18 acres/year for a total of 90 acres, and 5) 24 acres/year for a total of 120 acres. The discrete choice experiment script gave the following description for the wetland restoration alternative:

> Wetlands, such as mangroves and marshes, provide habitat for plants and animals, provide feeding and nursery habitat for adult and juvenile fish, absorb wave energy, reduce coastal erosion, and improve water quality by trapping sediment and nutrients. This management characteristic represents the total number of acres of wetlands restored by Sarasota Bay Estuary Program and its partners in each year.

The choice sets include an option for five levels of restoration of Sarasota Bay oyster beds. The *status quo* option was to maintain the current level of coastal oyster beds, which was estimated at 1,596 acres. The two *alternative* management options would create and restore oyster beds over a five-year period at either 1) 0 acres per year, 2) 0.5 acres per year for 2.5 acres, 3) 1 acres/year for a total of 5 acres, 4) 2 acres/year for a total of 10 acres, and 5) 4 acres/year for a total of 20 acres. The discrete choice experiment script gave the following description for the oyster bed restoration alternative:

> Oyster beds provide habitat for many fish and invertebrates. Oysters also directly improve water quality by filtering water. This management characteristic represents the total number of acres of oyster beds restored by Sarasota Bay Estuary Program and its partners.

The choice sets include an option for five levels of new growth of Sarasota Bay seagrass beds resulting from projects influencing water quality and clarity. The *status quo* option maintains the current level of coastal seagrass beds, which was estimated at 12,641 acres. The two *alternative* management options would improve water quality conditions so that seagrass beds would change over

a five-year period at either 1) 0 acres per year, 2) 20 acres per year for a total of 100 acres, 3) 40 acres/year for a total of 200 acres, 4) 60 acres/year for a total of 300 acres, and 5) 80 acres/year for a total of 400 acres. The discrete choice experiment script gave the following description for the seagrass alternative:

> Seagrasses are grass-like flowering plants that are completely submerged in Sarasota Bay waters. Seagrasses are highly productive habitat for numerous marine species including marine mammals, fin fish, and shell fish. Seagrasses can help trap sediment and improve water clarity. Seagrasses also depend on clean, clear water so it can flower and reproduce. This management characteristic represents the total area of new growth for seagrasses, in acres, as a result of actions taken by the Sarasota Bay Estuary Program and its partners to improve water quality and clarity.

The choice sets include alternatives with five potential levels of enhanced artificial reefs. This study focuses on artificial reef domes. The *status quo* option was to maintain the current number of artificial reef domes in Sarasota Bay, which was estimated at 3,000 reef domes. The two *alternative* management options would enhance the number of artificial reef domes over a five-year period at either 1) 0 reef domes per year, 2) 20 reef domes per year for a total of 100 enhanced reef domes, 3) 40 reef domes /year for a total of 200 enhanced reef domes, 4) 60 reef domes /year for a total of 300 enhanced reef domes, and 5) 80 reef domes /year for a total of 400 enhanced reef domes. The discrete choice experiment script gave the following description for the artificial reef alternative:

> Artificial reefs provide aquatic habitat within the Sarasota Bay Estuary. Most of these artificial reefs are made up of “reef balls,” which are submerged cement domes of various widths with perforations for the passage of fish. This management characteristic represents the total number of existing reef balls that are replaced or enhanced by Sarasota Bay Estuary Program and its partners.

The choice sets include an option for five levels for the creation of ecological parks with estuarine access. The *status quo* option was to maintain

the current number of ecological parks with estuarine access, which was estimated at 38 ecological parks. The two *alternative* management options would create new ecological parks with public access over a five-year period at either 1) 0 additional parks, 2) 1 park/year for a total of 5 parks, 3) 2 parks/year for a total of 10 parks, 4) 3 parks /year for a total of 15 parks, and 5) 4 parks/year for a total of 20 parks. The discrete choice experiment script gave the following description for the ecological parks with access alternative:

> Sarasota Bay Estuary Program often develops ecological parks in conjunction with its restoration projects. This management characteristic represents the total number of ecological parks that are developed with amenities such as boardwalks, trails, and boat access.

For each explanation of an alternative, respondents were asked how important that alternatives was to them.

The payment vehicle was a compulsory, one-time increase in local, state, and federal tax payments for *all* households. The *status quo* was provided at zero additional cost, while the tax payment associated with the two *alternatives* varied at $5, $15, $50, $100, or $350 per household. The discrete choice experiment script gave the following description for the tax paid by households:

> The Sarasota Bay Estuary Program is a collaboration between local governments, the state of Florida, and the United States government. These management activities will be funded by a one-time increase in local, state, and federal taxes. To simplify this scenario, we have combined the tax increases into one estimate.

5.5 Experimental Design

In applying DCE, the researcher designs the choice sets that are shown to subjects. This means they must determine which levels of attributes must be combined in a single alternative and how alternatives must be combined to define each choice set. As such, the design of profiles influences the efficiency of statistical estimates. With our proposed attributes and levels, a full factorial design has 18,750 alternative profiles ($5^5 \times 6 = 18{,}750$). As it would be highly infeasible to implement a full factorial design, several methods exist to choose a fraction, or subset, of the full array of possible choice profiles. These methods are called fractional factorial designs. For our application, we begin with an orthogonal fractional factorial design, which means the design emphasizes attribute balance. The design does not make any assumptions about the preferences of respondents. Because the orthogonal fractional factorial design has too many choices for each individual, we also utilize a five block design, meaning the design is not balanced within each block, but it is balanced across blocks. Within each block, individuals face four choice sets. In a given choice set, they must choose between a status quo option and two management options.

Our design leads to 20 unique choice scenarios, divided between 5 blocks. This means that each individual is randomly assigned to 1 of the 5 blocks and then faces four choices between the status quo and two management options. The optimal designs were determined using the Ngene software package. For our application, we begin with an orthogonal fractional factorial design. Following this initial design, we conducted focus groups to test the wording of the survey, followed by pilot study with data collected onsite in Sarasota and Manatee Counties.

Following the pilot study, we calculated parameter estimates for use as fixed priors in an efficient discrete choice experiment design. The efficient design

attempts to lead to parameter estimates that minimize standard errors.[2] We use the D-error measure for the multinomial-logit model to determine our efficient design. Our model 's D-error efficiency measure was 0.000487. Table 5.3 depicts an example of a choice faced by respondents.

Table 5.3: An Example of a Choice Scenario Faced By Respondents

Please compare the management alternatives below to our best estimate of the current conditions in the Sarasota Bay Estuary. Vote for the alternative you would most prefer for the Sarasota Bay Estuary.

Attributes	Current Conditions	Management Efforts (Per Year & Over 5 Years)	
		Management Alternative 1	Management Alternative 2
Wetland Restoration (in Acres)	9, 596 Acres	6 Acres/yr or 30 Acres	18 Acres/yr or 90 Acres
Oyster Bed Restoration (in Acres)	1,596 Acres	4 Acres/yr or 20 Acres	0 Acres
Increase in Seagrass Acreage	12,641 Acres	0 Acres	80 Acres/yr or 400 Acres
Artificial Reef Enhancement	3000 Reef Domes	20 Reef Domes/yr or 100 Reef Domes	60 Reef Domes/yr or 300 Reef Domes
Ecological Parks with Estuary Access	38 Ecological Parks	4 Parks/yr or 20 Parks	0 Parks
One Time Cost from Increased Taxes	$0	$15	$50
Choice	⬭	⬭	⬭

[2] The Ngene software develops an efficient design by determining the optimal asymptotic variance-covariance matrix using the experimental components and prior information about parameter estimates, as determined from the pilot study.

5.6 Econometric Model

Our empirical model utilizes an Error Components Logit (ECL) model in order to estimate the choice probabilities in equation 2. The ECL model can capture unobserved characteristics of utility that are correlated over alternatives (Train 2003). In this model, the utility function is specified as

$$U_{ij} = V_{ij} + \eta_{ij} + \varepsilon_{ij}, \quad (5)$$

where U_{ij} is the utility individual *i* receives for alternative *j*, V_{ij} is the observed portion of utility, η_{ij} is a normally distributed random term with zero mean that captures unobserved components of utility that are correlated over alternatives, and ε_{ij} is an error component assumed to be distributed IID extreme value. For a given value of the error component, η_{ij}, the conditional probability of choice *j* is

$$\pi_{ij}(\beta_i|\eta_{ij}) = \frac{\exp(V_{ij}+\eta_{ij})}{\sum_k \exp(V_{ik}+\eta_{ik})}. \quad (6)$$

In this study, we utilize two specifications. The first specification focuses on estimating parameters for all user types and the second specification separates resource users from non-users. Each specification includes an error component for the status quo alternative in an effort to address status quo bias (Rabin 1998). Under status quo bias, respondents are more likely to choose current conditions as opposed to proposed alternatives. Kahneman, Knetsch, and Thaler (1991) partially attribute this to loss aversion (which reflects individuals' tendencies to strongly prefer avoiding losses more than they crave equivalent gains).

Scarpa, Ferrini, and Willis (2005) find that the Error Components logit models outperform the conditional logit and nested logit model when addressing status quo conditions. This model helps capture unobserved differences in how respondents view observed conditions (status quo) and proposed conditions (alternatives). As such, we also include an error component for the status quo and the combined management conditions. We also include error components

for each individual management condition in order to capture any potential ordering effects (Day et al 2012).

Each model is specified to account for the attributes of the choice experiment, wetland restoration, oyster restoration, sea grass restoration, artificial reef enhancement, and ecological parks with estuary access. Both models also account for the one-time tax associated with each management alternative. The first specification does not differentiate between preferences of different user types. The second specification captures users' and non-users' preferences for management alternatives.

5.7 Results: Model Estimation

Table 5.5 provides the estimated coefficients, standard errors, and p values for the error components logit model capturing preferences of the regional population. This model is weighted using the American Community Survey (ACS). The model also accounts for non-attendance and respondent uncertainty. Non-attendance can be accounted for within a choice scenario when respondents explicitly identify attributes that they ignore when making choices (Scarpa, Gilbride, Campbell, and Hensher 2009). The artificial reef enhancement was reported as the most commonly ignored attribute, followed by oyster restoration. Table 5.4 provides a count of ignored attributes.

Respondent uncertainty for choice scenarios can also lead to increased biases in responses. In dichotomous choice contingent valuation, previous research indicated that uncertainty can lead to upward bias in willingness-to-pay estimates (Loomis and Ekstrand 1998; Ready, Navrud, and Dubourg 2001). In choice experiments, both Norwood (2005) and Ready et al (2010) found a similar connection between uncertainty and upward bias in estimates. As a result, we utilize a follow-up likert-based question to guage respondent certainty for choice tasks. This likert-based question gauges certainty on a scale between 1 (uncertain) and 7 (very certain). Following each choice, respondents identified

their level of certainty for that task. We then use respondent levels of choice certainty to calibrate uncertain responses to the status quo. Studies have shown certainty calibration methods help reduce hypothetical biases in both dichotomous choice contingent valuation (Bloomquist et al 2009) and discrete choice experiments (Ready et al 2010).

Table 5.4: A Count of Ignored Attributes (Attribute Non-Attendance)

Variable	Count
Wetland Restoration	80
Oyster Restoration	145
Sea Grass Restoration	97
Artificial Reef	147
Ecological Park	107

As we would expect, the tax variable is negative and highly significant, meaning respondents are sensitive to increases in taxes. We also include a alternative specific constant for the Management Alternative 1 option so we account for ordering affects within a given choice set (Day et al 2012). The sign on this coefficient is positive and statistically significant indicating a propensity for respondents to choose the first management over the second. Each of the management characteristics lead to positive, statistically significant coefficients for the average respondent. This means that the average respondent gains positive utility from increased levels of each of these management alternatives. The standard deviations for the error component are simulated using 500 Halton draws (Train 2009). We use error components on the Status Quo option and a term capturing both Management Alternatives 1 & 2. We find statistically significant results for both error components.

Table 5.5: Error Components Logit Model Results (All Households)

Variable	Coefficient	Standard Error	Pvalue
Management 1 ASC	0.144	0.0433	0.0009
Wetland Restoration	0.006	0.0006	0.0000
Oyster Restoration	0.014	0.0036	0.0002
Sea Grass Restoration	0.001	0.0002	0.0000
Artificial Reef	0.001	0.0002	0.0000
Ecological Park	0.023	0.0036	0.0000
Tax	-0.002	0.0002	0.0000
Standard Deviations			
Error Component (Status Quo)	3.131	1.6832	0.0629
Error Component (Management Alternatives 1 & 2)	3.547	1.3445	0.0083
Observations	1207		
Choices	4255		
Log Likelihood	-3989.417		
McFadden Rsquared	0.248		

Table 5.6 provides the estimated coefficients, standard errors, and p values for the error components logit model representing users and non-users in the regional population. This model also accounts for attribute non-attendance and response uncertainty.

As we found in the previous specification, the tax variables for users and non-users are negative and highly significant. Each of the management characteristics lead to positive, statistically significant coefficients for the average user. This means that the average resource user gains positive utility from increased levels of each of these management alternatives. For the average non-resource user, we only find statistically significant results for wetland restoration. The standard deviations for the error component are simulated using 500 Halton draws (Train 2009). We use error components on the Status Quo option and a combination of both Management Alternatives 1 & 2. We find statistically significant results for the error component for the combined management alternatives.

Table 5.6: Error Components Logit Model Results (Users & Non-users)

Variable	Coefficient	Standard Error	Pvalue
Management 1 ASC	0.139	0.0434	0.0014
Wetland Restoration (Users)	0.007	0.0008	0.0000
Oyster Restoration (Users)	0.026	0.0049	0.0000
Sea Grass Restoration (Users)	0.001	0.0003	0.0000
Artificial Reef (Users)	0.001	0.0003	0.0000
Ecological Park (Users)	0.033	0.0048	0.0000
Tax (Users)	-0.002	0.0003	0.0000
Wetland Restoration (Non-Users)	0.004	0.0009	0.0000
Oyster Restoration (Non-Users)	-0.002	0.0052	0.7134
Sea Grass Restoration (Non-Users)	0.0003	0.0003	0.2362
Artificial Reef (Non-Users)	0.0007	0.0002	0.7426
Ecological Park (Non-Users)	0.007	0.0049	0.1461
Tax (Non-Users)	-0.003	0.0003	0.0000
Standard Deviations			
Error Component (Status Quo)	1.777	1.4926	0.2339
Error Component (Management Alternatives 1 & 2)	4.008	0.7828	0.0000
Observations	1207		
Choices	4828		
Log Likelihood	-3976.70		
McFadden Rsquared	0.25		

5.8 Results: Welfare Estimation

Table 5.7 provides marginal willingness-to-pay (MWTP) estimates for the management alternatives in two models. This table also includes 95% confidence intervals for these alternatives. Standard errors for the MWTP estimates are calculated using the Delta method. Our results suggest that, on the margin, the highest valued resources among respondents are ecological parks with estuarine access followed by oyster restoration. Similarly, the lowest valued resources, on the margin, are enhanced artificial reefs and restored seagrass beds. There are likely multiple reasons for these differences. On one hand, individuals may feel one resource has more importance in the coastal environment. On the other hand, scarcity of a resource may drive a perceived need for restoration.

Our results indicate that the average household's marginal willingness-to-pay for an additional acre of wetland restoration at $2.48. Among resource users, the average household's marginal willingness-to-pay for an additional acre of wetland restoration is $3.66 and the average non-user household's marginal willingness-to-pay for an additional acre of wetland restoration is $1.42.

Our results indicate that the average household's marginal willingness-to-pay for an additional acre of oyster restoration is $5.93. For households of resource users, the average marginal willingness-to-pay for an additional acre of oyster restoration is $13.55. Among non-users, we do not know if the average household's marginal willingness-to-pay for an additional acre of oyster restoration is statistically different than $0.

Our next management characteristic focused on improving environmental conditions, resulting in increased sea grass area. Our results indicate that the average household's marginal willingness-to-pay for an additional acre of seagrass is $0.36. Households with resource users have an average marginal willingness-to-pay for an additional acre of seagrass at $0.60. Non-resource

using households' average marginal willingness-to-pay is not statistically different than $0.

Our final two attributes included enhanced reef balls and the creation of ecological parks with estuarine access. For artificial reef enhancement, we estimate that the average household will pay $0.34 for an additional enhanced reef ball. Resource users will pay $0.70 for an additional enhanced reef ball. For ecological parks with estuarine access, on average, households are willing-to-pay $9.87 for an additional park. Users are willing-to-pay $17.62 for an additional park. Table 5.7 depicts willingness-to-pay measures for each management characteristic.

Table 5.7 Marginal Willingness-to-pay for Sarasota Bay Estuarine Resources.

	Regional Mean MWTP	Regional Mean MWTP for Users	Regional Mean MWTP for Non-users
Wetland Restoration	$2.48 ($1.82, $3.14)	$3.66 ($2.35, $4.98)	$1.42 ($0.80,$2.05)
Oyster Restoration	$5.93 ($2.54, $9.32)	$13.55 ($6.68,$20.42)	
Sea Grass Restoration	$0.36 ($0.20, $0.51)	$0.60 ($0.32,$0.88)	
Artificial Reef	$0.34 ($0.17, $0.51)	$0.70 ($0.35, $1.04)	
Ecological Park	$9.87 ($6.04, $13.70)	$17.62 ($9.89 ,$25.35)	

5.9 Estimating Aggregate Welfare Measures

Our final task involves estimating aggregate welfare measures for the region. Table 5.8 provides regional household population estimates using the 2012 American Community Survey. The regional marginal willingness-to-pay for a resource can be calculated by multiplying the average marginal willingness-to-pay for a resource by the total number of households in the region of interest. These estimates for regional marginal willingness-to-pay can be found in table 5.9. The total value for a resource can then be calculated by multiplying the

regional marginal willingness-to-pay by the total quantity of that resource. The total value estimates can be found in table 5.10. The total regional economic value for this resource is roughly $57.9 billion with a 95% confidence interval between 36.6 billion and $79 billion. The total regional economic value for resource users is $39.billion with a 95% confidence interval between $15.9 billion and $56.5 billion. Table 5.11 provides the 95% confidence intervals for the total economic value of these resources for all regional households.

The total value for this resource can also be calculated for Manatee and Sarasota counties. These results can be found in table 5.12. The total economic value of this resource for Manatee and Sarasota counties is $11.8 billion with a 95% confidence interval between $7.5 billion and $16.1 billion. The total economic value of this resource for resource users in Manatee and Sarasota counties is $8.1 billion with a 95% confidence interval between $3.3 billion and $11.5 billion. Table 5.13 provides the 95% confidence intervals for the total economic value of these resources for Manatee and Sarasota county households. We provide a more detailed discussion of these estimates in the final chapter of this report.

Table 5.8 Regional Household Estimates Calculated from the American Community Survey 3-Year Estimates

	Households	User Households	Non-User Households
Charlotte County	70,035	28,014	42,021
Desoto County	10,595	4,238	6,357
Hardee County	7,687	3,075	4,612
Hillsborough County	467,397	186,959	280,438
Manatee County	131,255	52,502	78,753
Pinellas County	399,785	159,914	239,871
Polk County	220,874	88,350	132,524
Sarasota County	169,819	67,928	101,891
Total	1,477,447	590,979	886,468

Table 5.9a Regional Marginal Willingness-to-pay for All Households

	Wetland Restoration			Oyster Restoration			Seagrass Restoration		
	Regional	Regional Users	Regional Non-Users	Regional	Regional Users	Regional Non-Users	Regional	Regional Users	Regional Non-Users
Charlotte County	$173,697	$102,531	$59,670	$415,308	$379,590	--	$25,213	$16,808	--
Desoto County	$26,276	$15,511	$9,027	$62,828	$57,425	--	$3,814	$2,543	--
Hardee County	$19,064	$11,255	$6,549	$45,584	$41,666	--	$2,767	$1,845	--
Hillsborough County	$1,159,145	$684,270	$398,222	$2,771,664	$2,533,294	--	$168,263	$112,175	--
Manatee County	$325,512	$192,157	$111,829	$778,342	$711,402	--	$47,252	$31,501	--
Pinellas County	$991,467	$585,285	$340,617	$2,370,725	$2,166,835	--	$143,923	$95,948	--
Polk County	$547,768	$323,361	$188,184	$1,309,783	$1,197,143	--	$79,515	$53,010	--
Sarasota County	$421,151	$248,616	$144,685	$1,007,727	$920,424	--	$61,135	$40,757	--
Total	$3,664,069	$2,553,028	$1,258,783	$8,761,261	$5,295,170	--	$531,881	$644,167	--

Table 5.9b Regional Marginal Willingness-to-pay for All Households

	Artificial Reef Enhancement			Ecological Parks with Access		
	Regional	Regional Users	Regional Non-Users	Regional	Regional Users	Regional Non-Users
Charlotte County	$23,812	$19,610	--	$691,246	$493,607	--
Desoto County	$3,602	$2,967	--	$104,573	$74,674	--
Hardee County	$2,614	$2,153	--	$75,871	$54,182	--
Hillsborough County	$158,915	$130,871	--	$4,613,208	$3,294,218	--
Manatee County	$44,627	$36,751	--	$1,295,487	$925,085	--
Pinellas County	$135,927	$111,940	--	$3,945,878	$2,817,685	--
Polk County	$75,097	$61,845	--	$2,180,026	$1,556,727	--
Sarasota County	$57,738	$47,550	--	$1,676,114	$1,196,891	--
Total	$502,332	$413,686	--	$14,582,402	$10,413,068	--

Table 5.10 Regional Economic Value of Sarasota Bay Resources

Attribute	Quantity	WTP (All)	WTP (Users)	WTP (Non-Users)
Wetland Restoration (Acres)	9,596 Acres	$35,160,401,902	$20,756,021,333	$12,079,283,011
Oyster Restoration (Acres)	1,596 Acres	$13,982,972,093	$12,780,415,284	
Increase in Seagrass Area (Acres)	12,641 Acres	$6,723,506,710	$4,482,346,908	
Artificial Reef Enhancement (# of Reef Domes)	3,000 Reef Domes	$1,506,995,940	$1,241,058,000	
Ecological Park with Access (#)	38 Parks	$554,131,272	$395,696,569	
Totals		$57,928,007,916	$39,655,538,093	$12,079,283,011

Table 5.11 Regional Economic Value of Sarasota Bay Resources for Users and Non-Users (With 95% Confidence Intervals)

Attribute	Quantity	WTP (Lower Bound)	WTP (Mean)	WTP (Upper Bound)
Wetland Restoration (Acres)	9,596 Acres	$25,803,198,170	$35,160,401,902	$44,517,605,634
Oyster Restoration (Acres)	1,596 Acres	$5,989,333,746	$13,982,972,093	$21,976,610,440
Increase in Seagrass Area (Acres)	12,641 Acres	$3,735,281,505	$6,723,506,710	$9,524,967,839
Artificial Reef Enhancement (# of Reef Domes)	3,000 Reef Domes	$753,497,970	$1,506,995,940	$2,260,493,910
Ecological Park with Access (#)	38 Parks	$339,103,635	$554,131,272	$769,158,908
Totals		$36,620,415,027	$57,928,007,916	$79,048,836,730

Table 5.12 Economic Value of Sarasota Bay Resources for Sarasota and Manatee Counties

Attribute	Quantity	WTP (All)	WTP (Users)	WTP (Non-Users)
Wetland Restoration (Acres)	9,596 Acres	$7,164,983,138	$4,229,665,385	$2,461,512,950
Oyster Restoration (Acres)	1,596 Acres	$2,849,448,637	$2,604,395,094	
Increase in Seagrass Area (Acres)	12,641 Acres	$1,370,115,516	$913,413,378	
Artificial Reef Enhancement (# of Reef Domes)	3,000 Reef Domes	$307,095,480	$252,903,000	
Ecological Park with Access (#)	38 Parks	$112,920,814	$80,635,111	
Totals		$11,804,563,585	$8,081,011,967	$2,461,512,950

Table 5.13 Economic Value of Sarasota Bay Resources for Manatee and Sarasota County Resource Users and Non-Users (With 95% Confidence Intervals)

Attribute	Quantity	WTP (Lower Bound)	WTP (Mean)	WTP (Upper Bound)
Wetland Restoration (Acres)	9,596 Acres	$5,258,173,109	$7,164,983,138	$9,071,793,167
Oyster Restoration (Acres)	1,596 Acres	$1,220,505,824	$2,849,448,637	$4,478,391,449
Increase in Seagrass Area (Acres)	12,641 Acres	$761,175,287	$1,370,115,516	$1,940,996,981
Artificial Reef Enhancement (# of Reef Domes)	3,000 Reef Domes	$153,547,740	$307,095,480	$460,643,220
Ecological Park with Access (#)	38 Parks	$69,102,504	$112,920,814	$156,739,124
Totals		$7,462,504,465	$11,804,563,585	$16,108,563,942

6. Deciphering Economic Measures: The Value of Sarasota Bay Estuary

6.1 Introduction

A large proportion of the World's population lives on or near the coast. Some research suggests that coastal population densities are almost three times inland population densities (Kay and Alder 2005). The spatial distribution of human development can be closely connected to the human demand for coastal ecosystem derived goods and services (Millennium Ecosystem Assessment 2005). As populations have risen, so has the demand for these resources. This increased demand puts pressure on these resources, leading to resource scarcity and degradation. In the face of these challenges, it becomes increasingly important to develop strategies to balance resource conservation with resource use.

Effective management of coastal and marine resources works best through an integrated approach. This means gaining an understanding of both the coastal resource and the people who rely on it. The Millennium Ecosystem Assessment (2003) gives us a good starting point. The MEA framework begins by describing ecosystems by the abiotic and biotic components of those systems (its structure) and the processes that occur as a result of the interaction between those components (its function). For example, a seagrass ecosystem has numerous structural components, such as flora, fauna, water, and sediment. These biotic and abiotic factors interact with one another to create the functional components of this ecosystem, such as nursery grounds for juvenile fish.

The MEA framework then expands this model of the natural environment to include human benefits from ecosystems, called ecosystem services, as well as the constituents to human well-being. An effective management system should

make some effort to understand how changes in the natural environment translate into changes in human well-being.

This integrated approach to managing coastal resources involves numerous types of expertise, including the expertise of managers, policy makers, natural scientists, and social scientists. This integrated approach requires not only an understanding of the natural environment, but also some understanding of how the natural environment benefits society. Economics provides one method for measuring the link between ecosystem services and human well being. Economic methods provide managers and policy makers with a tool for understanding how society values scarce coastal resources. This understanding of value can help managers make more informed decisions.

The Sarasota Bay Economic Valuation study measures the economic impact and value of the Sarasota Bay Estuary on a variety of resource users, including property owners, recreational users, and regional residents. This study develops several types of economic measures to better guide future management. This final chapter puts these economic measures into context, in an effort to help future decision making.

6.2 The Sarasota Bay Estuary and Human Use of Its Resources

The study area for this project is the Sarasota Bay Estuary, which encompasses an expansive lagoon system from Anna Maria Sound to the area just north of Venice Inlet as well as adjacent marine resources. Figure 1 provides a map of this study area. In this study, we primarily focus on individuals who reside and visit this region.

The population within the region surrounding the Sarasota Bay Estuary has experienced significant growth over the past 80 years. This growth has increased population pressures on existing resources. Using Census data, we

find that between 1930 and 2010, the population of Manatee and Sarasota Counties has grown from 34,942 to 702,271. This is a change of 1910 percent over an 80 year period. If we also include all adjacent counties (Charlotte, DeSoto, Hardee, Hillsborough, Pinellas, and Polk) in those estimates, the regional population has grown from 345,007 to 3,672,705, a change of 965 percent. Figure 2 shows a graph of population growth in all the relevant counties.

Figure 1 Map of Sarasota Bay Estuary Watershed

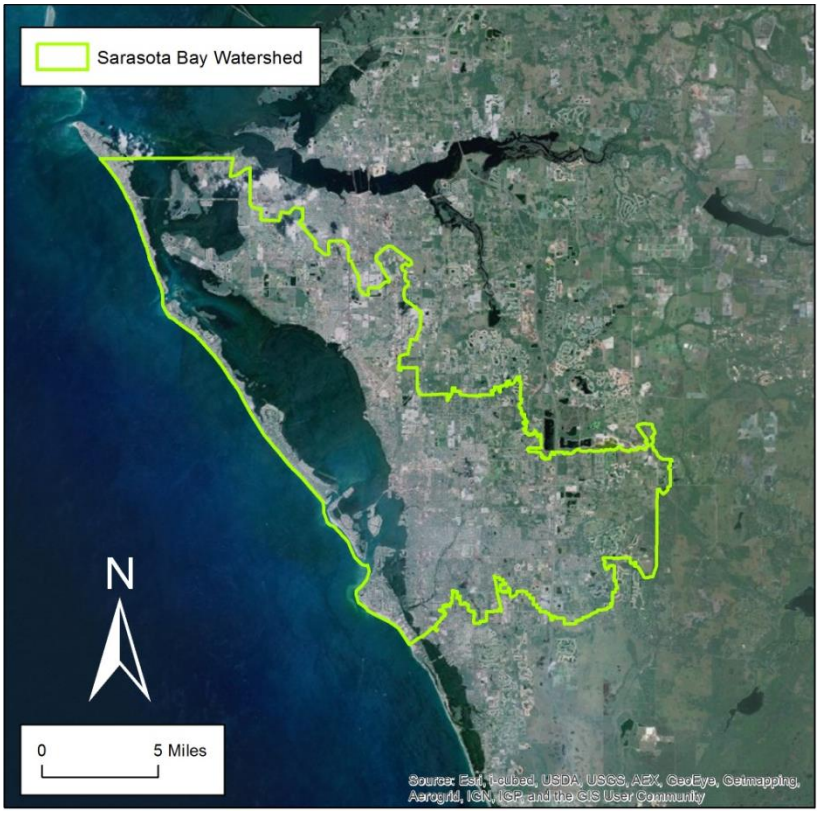
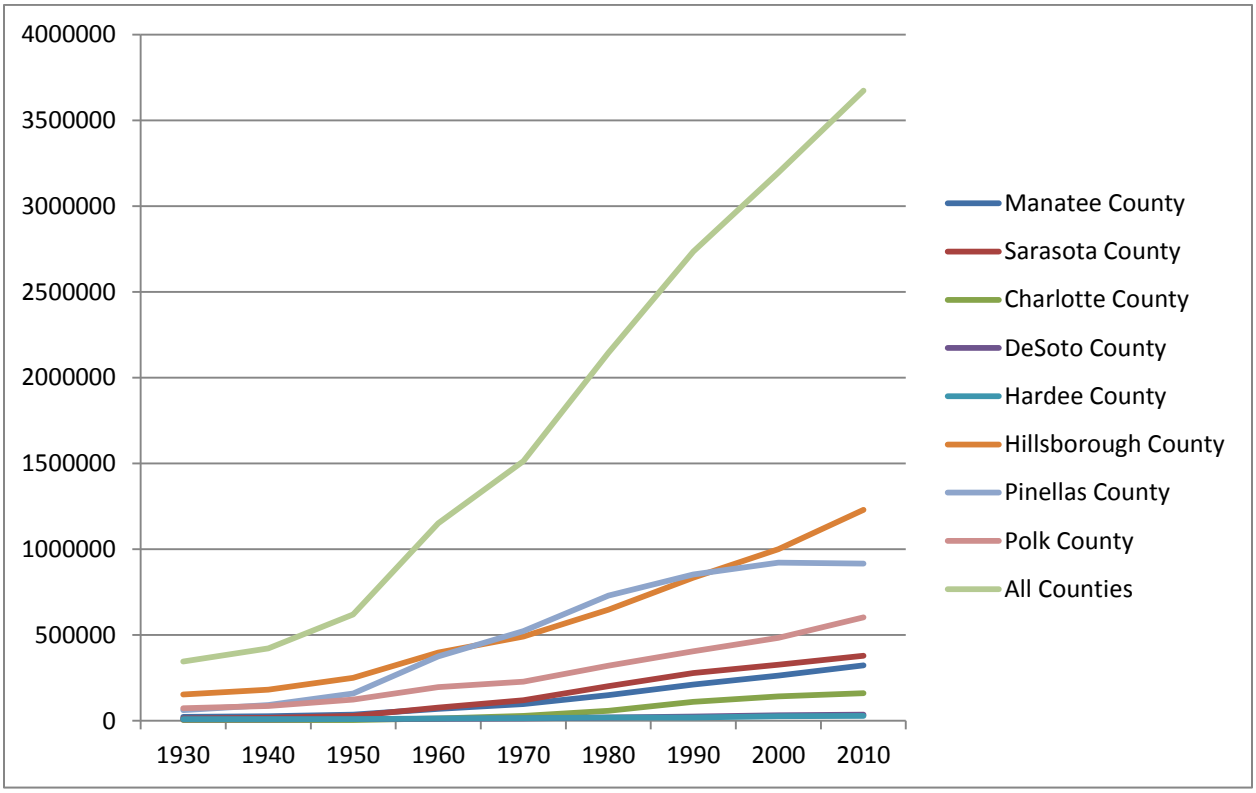


Figure 2 Population Changes in Manatee County, Sarasota County, and Adjacent Counties over Time (1930-2010)



In addition to a growth in people residing in the region, Manatee and Sarasota Counties have become a popular destination for domestic and international visitors. In Chapter 4, we combine primary survey data with data from the Census Bureau and the Manatee and Sarasota Visitors' Bureaus to estimate the number of recreation trips to the Sarasota Bay Estuary. Of the 7.9 million visitor

trips to the region, we estimate that residents of adjacent counties make roughly 2.7 million day trips and over ½ a million multi-day trips for Sarasota Bay Estuarine-related recreational activities. Among other visitors, we estimate they take just under 1.8 million day trips and almost 2.4 million multi-day trips.[1]

6.3 Economic Value and the Economic Impact (or Economic Activity)

As we have discussed several times, the Sarasota Bay provides local residents and visitors with access to a wide variety of goods and services. Economists would say that residents and visitors value Sarasota Bay Estuarine goods and services when those goods and services improve their economic well-being. These goods and services may improve economic well-being in a variety of ways. For example, individuals can directly use a resource (use values), they can indirectly use a resource (indirect use values), and they may even place a value on the resource if they never use it (non-use value). The combination of these three types of values represents the total economic value of a resource. For example, if a person goes fishing in the Sarasota Bay Estuary, they value the resource because they use it directly. They also may indirectly benefit from the ecosystem processes that filter nutrients, allowing fish to thrive or allowing the Bay to be an excellent place to swim. Last, some people may benefit from knowing the Bay is clean and well functioning without needing to utilize the resource.

As we discussed in Chapter 1, the Millennium Ecosystem Assessment developed four categories of ecosystem goods and services. The classifications are as follows:

- **Provisioning Goods and Services:** These tend to be tangible goods and services provided by ecosystems. Examples include food, water, energy resources, and fuel wood.

[1] The second classification of visitors represents individuals from counties outside those adjacent to Manatee and Sarasota county, individuals from other states, and international visitors.

- **Regulating Goods and Services:** This represents goods and services resulting from the regulation of ecosystem processes. Examples include climate regulation and natural hazard regulation.
- **Cultural Goods and Services:** These goods and services represent non-material benefits provided to society by ecosystems. Examples include spiritual, recreational, and aesthetic benefits.
- **Supporting Goods and Services:** These represent services necessary for the production of other ecosystem services. Examples include nutrient cycling, soil formation, and primary productivity.

People derive value from ecosystem goods and services and those values influence their future actions.

In this study, we calculate several different types of economic values: 1) economic value for recreation trips to the Sarasota Bay Estuary, 2) economic value for living in close proximity to the Sarasota Bay Estuary, and 3) the economic value of key Sarasota Bay Estuarine resources. We also estimate the economic impact of visitor-based recreation.

It is important to discern the difference between economic value and economic impact. Economic impact represents the economic activity associated with a resource, but it is not the same as economic value. Economic impact analyses tell us some of the economic consequences of out-of-area visitors travelling to the region to enjoy the Bay's amenities. The assumption is that the associated spending would not occur in the region absent the Bay. Visitor expenditures kick-start a chain reaction of spending flows throughout the local economy. A region-specific input-output model traces the flow of visitor spending through the local economy to estimate the total economic impact of in the form of additional local revenue, jobs, and taxes. Economic valuation studies tell us the additional benefits people get for the direct or indirect use of resources or activities above what they pay. This is actually an estimate of the value added from the use of a resource, a term economists call consumer surplus. Because economic impact and economic value are not the same, it is not appropriate to add them together to develop aggregate estimates. In fact, we must also be careful in how we add

together economic valuation estimate. Different types of economic valuation studies may actually account for similar ecosystem services. Adding them together may in fact lead to double counting of value estimates. On the other hand, it is very difficult to develop economic estimates of many of the more intangible ecosystem services. As a result, many economic studies of environmental resources actually undervalue the resources (Barbier 2009).

The Role of Coastal Housing

In Phase I of our study, we estimated a hedonic property price model to determine the influence of proximity to the Sarasota Bay Estuary and its tributaries on single-family resident home prices in Manatee and Sarasota Counties. In this case, proximity to the Sarasota Bay Estuary may provide positive value in the form of aesthetic and recreation amenities. The quality of the environment may also influence property values, since certain types of environmental amenities may mitigate risks from natural hazards.

Information from the Florida Department of Revenue indicated that there are 145,870 single family homes in Sarasota and Manatee Counties with homestead exemptions and GIS analysis shows that 27,801 homes have at least one proximity measure as a home attribute.[2] Some homes actually had multiple proximity measures influencing home value. Based on the total number of properties influenced by proximity to the Bay across the two-county region, the total capitalized value associated with proximity to the Sarasota Bay and its tributaries is $3.1 billion (95% Confidence Interval: $2.3 billion - $4.0 billion).

[2] We found that 3220 single family homes had Gulf of Mexico proximity measures, 27,143 homes had proximity measures from the Sarasota Bay and its tributaries, and 27,801 properties had Gulf of Mexico and/or Sarasota Bay Estuary proximity measures.

The Role of Coastal Recreation

In Chapter 4, we estimate the economic value associated with Sarasota Bay Estuary recreation by resident and visitors. We develop these estimates by combining results from the Phase I benefit transfer study, survey estimates, and external data sources. Our estimates are based on 23 different types of activities. Unfortunately, several estimates were not well represented in the literature (sailing, paddle boarding, kite sailing) and were not included in estimates. Based on the total number of trips taken by residents and visitors, the total value associated Sarasota Bay Estuarine related recreation is $487.4 million per year (95% Confidence Interval: $321.4 million - $689.9 million).

The Role of Coastal Estuarine Resources

In Chapter 5, we estimate regional household's willingness-to-pay for Sarasota Bay Estuarine resources, specifically wetlands, oyster beds, sea grass beds, artificial reefs, and ecological parks with estuarine access. These resources are not traded in explicit markets, so we employ a discrete choice experiment (DCE) to assess households' preferences for these resources. When the DCE assesses respondents' preferences for the resource of Sarasota Bay, it can capture direct use, indirect use, and non-use values for the resources. We cannot, however, differentiate how each type of value influences the total. There is likely significant heterogeneity of preferences among regional households. Our results indicate that the regional value of Sarasota Bay Estuarine resources is $57.9 billion (95% Confidence: $36.6 billion - $79.0 billion). We also estimate that the value of Sarasota Bay Estuarine resources to households in Manatee and Sarasota Counties as $11.8 billion (95% Confidence: $7.5 billion - $16.1 billion).

The regional values provided by the discrete choice experiment represent a best estimate for the value of the Sarasota Bay Estuarine resources. This economic valuation methodology picks up the largest variety of use and non-use values. To put these estimate in perspective, the combined GDP of the North Port-Bradenton-Sarasota MSA and the Tampa-St Petersburg-Clearwater MSA for 2012 is $144.4 billion (BEA). The GDP is a yearly measure, but these resources represent a stock providing a wide array of ecosystem goods and services to the region.

7.1 Bibliography

Barbier, E. B. (2009). Ecosystem service trade-offs. *Ecosystem-based management for the oceans*, 129-144.

Bergstrom, J.C., and L.O. Taylor. 2006. Using meta-analysis for benefits transfer: theory and practice. *Ecological Economics* 60: 351-360.

Blomquist, G. C., Blumenschein, K., & Johannesson, M. (2009). Eliciting willingness to pay without bias using follow-up certainty statements: comparisons between probably/definitely and a 10-point certainty scale. *Environmental and Resource Economics*, *43*(4), 473-502.

Day, B., Bateman, I. J., Carson, R. T., Dupont, D., Louviere, J. J., Morimoto, S., and Wang, P. (2012). Ordering effects and choice set awareness in repeat-response stated preference studies. *Journal of environmental economics and management*, *63*(1), 73-91.

EPA. 2000. *Guidelines for preparing economic analyses*. EPA 240-R-00-003.. Washington, DC, US Environmental Protection Agency.

Hanemann, W. M. (1984). Welfare evaluations in contingent valuation experiments with discrete responses. *American journal of agricultural economics*, *66*(3), 332-341.

Heal, G.M., E.B. Barbier, K.J. Boyle, A.P. Covich, S.P.Gloss, C.H. Hershner, J.P. Hoehn, C.M. Pringle, S. Polasky, K. Segerson, K. Schrader-Frechette. 2005. Valuing Ecosystem Services: Toward Better Environmental Decision-Making. The National Academies Press, Washington, DC.

Johnston, R. J., & Rosenberger, R. S. (2010). Methods, trends and controversies in contemporary benefit transfer. *Journal of Economic Surveys*, *24*(3), 479-510.

Kahneman, D., Knetsch, J. L., & Thaler, R. H. (1991). Anomalies: The endowment effect, loss aversion, and status quo bias. *The journal of economic perspectives*, *5*(1), 193-206.

Kalton, G. (1983). *Compensating for missing survey data*. Survey Research Center, Institute for Social Research, the University of Michigan.

Kay, R., & Alder, J. (2005). Coastal Planning and Management, Taylor and Francis. *New York*

Kirchhoff, S., B.G. Colby, and J.T. La France. 1997. Evaluating the performance of benefit transfer: an empirical inquiry. *Journal of Environmental Economics and Management* 59(3): 329-347.

Krinsky, I. and A. Robb. 1986. Estimating the Statistical Properties of Elasticities. *Review of Economics and Statistics* 68: 715-719.

Lancaster, K. J. (1966). A new approach to consumer theory. *The journal of political economy*, *74*(2), 132-157.

Loomis, J., & Ekstrand, E. (1998). Alternative approaches for incorporating respondent uncertainty when estimating willingness to pay: the case of the Mexican spotted owl. *Ecological Economics*, *27*(1), 29-41.

Louviere, J. J., & Hensher, D. A. 1982. Design and analysis of simulated choice or allocation experiments in travel choice modeling. *Transportation research record*, (890).

Louviere, J. J., & Woodworth, G. (1983). Design and analysis of simulated consumer choice or allocation experiments: an approach based on aggregate data. *Journal of marketing research*, 350-367.

McFadden, D. (1974). The measurement of urban travel demand. *Journal of public economics*, *3*(4), 303-328.

Millennium Ecosystem Assessment, 2003. Ecosystems and Human Well-Being: A Framework for Assessment. Island Press, Washington, DC.

Nelson, J.P. and P.E. Kennedy. 2009. The use (and abuse) of meta-analysis in environmental and resource economics: an assessment. *Environmental and Resource Economics* 42: 345-377.

Rabin, M. (1998). Psychology and economics. *Journal of economic literature*, *36*(1), 11-46.

Ready, R. C., Champ, P. A., & Lawton, J. L. (2010). Using respondent uncertainty to mitigate hypothetical bias in a stated choice experiment. *Land Economics*, *86*(2), 363-381.

Rosenberger, R.S. and J.B. Loomis. 2000. Using meta-analysis for benefit transfer: in-sample convergent validity tests of an outdoor recreation database. Water Resources Research 36(4): 1097-1107.

Rosenberger, R.S. and J.B. Loomis. 2001. Benefit Transfer of Outdoor Recreation Use Values: A Technical Document Supporting the Forest Service Strategic Plan (2000 Revisions). *General Technical Report RMRS-GTR-72*. Fort Collins, CO: US Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Rosenberger, R. S., and Stanley, T. D. 2006. Measurement, generalization, and publication: Sources of error in benefit transfers and their management. *Ecological Economics*, *60*(2), 372-378.

Scarpa, R., Ferrini, S., & Willis, K. (2005). Performance of error component models for status-quo effects in choice experiments. In *Applications of simulation methods in environmental and resource economics* (pp. 247-273). Springer Netherlands.

Scarpa R., Gilbride T., Campbell D. and Hensher D. (2009a) "Modelling attribute non-attendance in choice experiments for rural landscape valuation" European Review of Agricultural Economics, 36 (2), 151-174.

Train, K. (2009). Discrete choice methods with simulation. Cambridge university press.

U. S. Census Bureau. 1930-2010. *American FactFinder fact sheet: Charlotte County, DeSoto County, Hardee County, Hillsborough County, Manatee County, Pinellas County, Polk County, Sarasota F.L.* Retrieved January 20, 2014

Appendix 1: General Survey Implemented Onsite and via Internet Panel

Sarasota Bay Estuary Economic Survey

What do you think?

SARASOTA BAY ESTUARY PROGRAM
Restoring Our Bays

Sponsored by

The Sarasota Bay Estuarine Program

B1H: If you have any questions regarding the survey, please contact Paul Hindsley Email: hindslpr@eckerd.edu

Study Summary:

The purpose of this study is to understand the public's preferences for the management of environmental resources in the Sarasota Bay Estuary and its adjacent barrier islands. The study area for this project is the Sarasota Bay Estuary, which encompasses an expansive lagoon system from Anna Maria Sound to the area just north of Venice Inlet as well as adjacent marine resources.

This study is funded by the Sarasota Bay Estuary Program (SBEP). SBEP is a program dedicated to restoring and protecting Sarasota Bay. SBEP is one of our nation's 28 national estuary programs. The program strives to improve water quality, increase habitat and enhance the area's natural resources for the use and enjoyment by the public.

This study measures economic impacts and values associated with Sarasota and Manatee County residents as well as visitors to this region. The results of this study will be used to assess the importance of environmental and natural resource management as it relates to the Sarasota Bay Estuary.

Privacy Statement:

Your participation is voluntary, but it is extremely important. Researchers from Eckerd College and Appalachian State University are conducting this study for the Sarasota Bay Estuary Program. Uses of the information include evaluation of Sarasota Bay management activities and the value of the Sarasota Bay Estuary and its adjacent resources. The results of this survey will provide guidance as to how residents of and visitors to Sarasota Bay value the natural environment. This survey does not ask for any information that identifies you personally. General results from this survey will be available on the Sarasota Bay Estuary Program website. The interview should take an average time of 15 to 20 minutes.

Section A

A1. In today's difficult economic environment, government must choose how to best allocate its resources. Please identify the importance of the following categories using the following scale:

Category	Not Important				Very Important
Improve health care and prevention	1	2	3	4	5
Reduce air and water pollution	1	2	3	4	5
Improve education	1	2	3	4	5
Improve roads and highways	1	2	3	4	5
Encourage economic growth and jobs	1	2	3	4	5
Protect species at risk	1	2	3	4	5
Reduce taxes	1	2	3	4	5
Maintain parks and wildlife reserves	1	2	3	4	5

A2. How would you rate the overall quality of the Sarasota Bay Estuary?

Category	Poor	Fair	Good	Very Good	Excellent/Pristine	I don't know
Rating	1	2	3	4	5	6

A3. On a scale between 1 (Much Worse) and 5 (Much Better), how would you compare the overall quality of the Sarasota Bay Estuary today as compared to 10 years ago?

Category	Much Worse				Much Better	I don't know
Rating	1	2	3	4	5	6

A4. On a scale between 1 (Not Effective) and 5 (Very Effective), how effective do you think local and state governments have been in protecting and enhancing the following Sarasota Bay Estuary characteristics?

Category	Not Effective				Very Effective	I don't know
Water Quality	1	2	3	4	5	6
Coastal Habitats	1	2	3	4	5	6
Ecological Parks with Access to Estuary	1	2	3	4	5	6

Section B: Your Recreation Trips in the Sarasota Bay Estuary

We would now like to ask you questions regarding the trips you have taken to Sarasota Bay. First, we'd like to ask you about trips you have taken **over the past 12 months.**

B1) How many trips did you take to Sarasota Bay **over the past 12 months**?

_____ trips.

B2) Of these trips, how many were day-trips and how many were multi-day trips where you spent the night in Manatee or Sarasota County?

_____ day-trips. _____ multi-day trips.

B3) On these trips **over the past 12 months**, how many total days did you spend at Sarasota Bay? *Count partial days as full days.*

B4) Thinking about the trips taken **over the past 12 months**, on the table below, in the column marked "Trips over the Past 12 Months", please indicate how many trips you took for each listed activity? For example, if you took one trip to the Bay **over the past 12 months** to go windsurfing and kayaking, then put a "1" next to those activities.

General Activity	Activity	Trips Over the Past 12 Months
Fishing & Hunting	Fishing – freshwater	
Fishing & Hunting	Fishing – saltwater	
Fishing & Hunting	Big Game Hunting	
Fishing & Hunting	Small Game Hunting	
Fishing & Hunting	Waterfowl Hunting	
Water Based Activities	Snorkeling	
Water Based Activities	Scuba Diving	
Water Based Activities	Swimming	
Water Based Activities	Canoeing / Kayaking	
Water Based Activities	Motor Boating	
Water Based Activities	Water-skiing	

Water Based Activities	Parasailing	
Water Based Activities	Windsurfing	
Water Based Activities	Kite Sailing	
Water Based Activities	Paddle boarding	
Water Based Activities	Personal watercraft (jet skis, etc.)	
Water Based Activities	Sailing	
Water Based Activities	Sunset cruise	
Water Based Activities	Glass bottom boat tour	
Land Based Activities	Running/Jogging	
Land Based Activities	Hiking/Walking (With or Without Pets)	
Land Based Activities	Biking	
Land Based Activities	Camping	
Land Based Activities	Environmental Education	
Land Based Activities	Off Road Vehicle	
Land Based Activities	Picnicking or Dining on the Bay	
Land or Water Based Activities	Wildlife Viewing	
Land or Water Based Activities	Other (Please Describe)	

If "other", please indicate the activity _____

B5) How many trips do you expect to take over the next 12 months?

_____ trips.

Now we would like to ask you specifically about your **most recent** trip to Sarasota Bay.

B6) During what month and year did your **most recent** Sarasota Bay trip begin?

B7) How many total days did you spend at Sarasota Bay on your **most recent** trip?

B8) On your **most recent** trip to Sarasota Bay, what type of accommodation did you stay in? *Please check*

- ○ Not applicable, it was a day-trip
- ○ Hotel/Motel/Bed and Breakfast
- ○ Condo
- ○ Rental Home/Apartment
- ○ With Friend/Relative
- ○ Campground/RV Park
- ○ Other (please specify)

B9) **If Question B7 is (b: Hotel/Motel/Bed and Breakfast), ask:** How many guest rooms did you and your party rent on this trip? _____ # of rooms.

B10) On your **most recent** trip to Sarasota Bay, on the table below, please indicate the Bay-related activities that you participated in? *(check as many as applicable)*

General Activity	Activity	Most Recent Trip
Fishing & Hunting	Fishing – freshwater	
Fishing & Hunting	Fishing – saltwater	
Fishing & Hunting	Big Game Hunting	
Fishing & Hunting	Small Game Hunting	
Fishing & Hunting	Waterfowl Hunting	
Water Based Activities	Snorkeling	
Water Based Activities	Scuba Diving	
Water Based Activities	Swimming	
Water Based Activities	Canoeing / Kayaking	
Water Based Activities	Motor Boating	
Water Based Activities	Water-skiing	
Water Based Activities	Parasailing	
Water Based Activities	Windsurfing	
Water Based Activities	Kite Sailing	
Water Based Activities	Paddle boarding	

Water Based Activities	Personal watercraft (jet skis, etc.)	
Water Based Activities	Sailing	
Water Based Activities	Sunset cruise	
Water Based Activities	Glass bottom boat tour	
Land Based Activities	Running/Jogging	
Land Based Activities	Hiking/Walking (With or Without Pets)	
Land Based Activities	Biking	
Land Based Activities	Camping	
Land Based Activities	Environmental Education	
Land Based Activities	Off Road Vehicle	
Land Based Activities	Picnicking or Dining on the Bay	
Land or Water Based Activities	Wildlife Viewing	
Land or Water Based Activities	Other (Please Describe)	

If “other”, please indicate the activity _____

B11) On your **most recent** trip, please indicate in the table below, how much money you and your party spent while at Sarasota Bay:

Category	**Most Recent Trip Expenditure ($)**
Lodging (hotels, motels, camping etc.)	
Gasoline or other fuels	
Other transportation related costs (e.g., car rentals, taxi fares)	
Grocery or convenience store food & drink	
Restaurant/bar meals & drinks	
Charter boat fees	
Recreational equipment rentals or purchases (e.g., boat, jet skis, paddle boards)	
Fishing gear, bait	
Payments to public agencies (licenses, entrance fees, etc.)	
Entertainment	
Shopping	
Gifts/souvenirs	
Other (please specify)	

B12) How many people were covered by these expenditures (including you)? _____ people.

B13) Of these people, how many were under the age of 18? _____ under 18 years.

Section C: Your Management Preferences in the Sarasota Bay Estuary

We would now like to ask you about four plans for the management of environmental resources in the Sarasota Bay Estuary. The plans differ in the types of improvements made to the environmental resources of Sarasota Bay and the cost to taxpayers.

The next series of questions asks you to compare the **current situation** in the Sarasota Bay Estuary with different scenarios about what **could happen each year** for the **next 5 years** if additional management efforts are implemented.

These management scenarios will **vary** in terms of the following **six** characteristics:

1. **Wetlands restored (in acres)**: Wetlands, such as mangroves and marshes, provide habitat for plants and animals, provide feeding and nursery habitat for adult and juvenile fish, absorb wave energy, reduce coastal erosion, and improve water quality by trapping sediment and nutrients. This management characteristic represents the total number of acres of wetlands restored by Sarasota Bay Estuary Program and its partners in each year over a 5 year period;

How important is wetland restoration to you?

Not Important				Very Important	I don't know
1	2	3	4	5	6

2. **Oyster beds restored (in acres)**: Oyster beds provide habitat for many fish and invertebrates. Oysters also directly improve water quality by filtering water. This management characteristic represents the total number of acres of oyster beds restored by Sarasota Bay Estuary Program and its partners;

How important is oyster bed restoration to you?

Not Important				Very Important	I don't know
1	2	3	4	5	6

3. **Expansion of Seagrasses as a result of improved water clarity and quality (in acres)**: Seagrasses are grass-like flowering plants that are completely submerged in Sarasota Bay waters Seagrasses are highly productive habitat for numerous marine species including marine mammals, fin fish, and shell fish. Seagrasses can help trap sediment and improve water clarity. Seagrasses also depend on clean, clear water so it can flower and reproduce. This management characteristic represents the total area of new growth for sea grasses, in acres, as a result of actions taken by the Sarasota Bay Estuary Program and its partners to improve water quality and clarity;

How important is seagrass coverage and improved water quality to you?

Not Important				Very Important	I don't know
1	2	3	4	5	6

4. **Artificial Reef Enhancement**: Artificial reefs provide aquatic habitat within the Sarasota Bay Estuary. Most of these artificial reefs are made up of "reef balls," which are submerged cement domes of various widths with perforations for the passage of fish. This management characteristic represents the total number of existing reef balls that are replaced or enhanced by Sarasota Bay Estuary Program and its partners;

How important are artificial reefs to you?

Not Important				Very Important	I don't know
1	2	3	4	5	6

5. **Ecological Parks with Estuary Access**: Sarasota Bay Estuary Program often develops ecological parks in conjunction with its restoration projects. This management characteristic represents the total number of ecological **parks that are developed wi**th amenities such as boardwalks, trails, and boat access;

How important are ecological parks with access to the estuary to you?

Not Important				Very Important	I don't know
1	2	3	4	5	6

6. The costs necessary to fund the management activities: The Sarasota Bay Estuary Program is a collaboration between local governments, the state of Florida, and the United States government. These management activities will be funded by a one time increase in local, state, and federal taxes. To simplify this scenario, we have combined the tax increases into one estimate.

We are asking you to state whether you feel that the program, and your payment of higher taxes, should be undertaken.

After critically analyzing the differences between the current situation and the proposed actions, you will be asked to **"vote"** by choosing one action over the other.

It is very important that you "vote" as if this were a real vote. You need to imagine that you actually have to dig into your household budget and pay the additional costs.

Please compare the management alternatives below to our best estimate of the current conditions in the Sarasota Bay Estuary. Vote for the alternative you would most prefer for the Sarasota Bay Estuary.

Attributes	Current Conditions	Management Efforts (Per Year & Over 5 Years)	
		Management Alternative 1	Management Alternative 2
Wetland Restoration (in Acres)	9, 596 Acres	6 Acres/yr or 30 Acres	18 Acres/yr or 90 Acres
Oyster Bed Restoration (in Acres)	1,596 Acres	4 Acres/yr or 20 Acres	0 Acres
Increase in Seagrass Acreage	12,641 Acres	0 Acres	80 Acres/yr or 400 Acres
Artificial Reef Enhancement	3000 Reef Domes	20 Reef Domes/yr or 100 Reef Domes	60 Reef Domes/yr or 300 Reef Domes
Ecological Parks with Estuary Access	38 Ecological Parks	4 Parks/yr or 20 Parks	0 Parks
One Time Cost from Increased Taxes	$0	$15	$50
Choice	⬭	⬭	⬭

Given the management plan you identified is the one that you would vote for, on the following scale, how certain are you that you would vote this way?

Very Unsure						Very Sure
1	2	3	4	5	6	7

Next, consider a new collection of management alternatives. Please compare the management alternatives below to our best estimate of the current conditions in the Sarasota Bay Estuary. Vote for the alternative you would most prefer for the Sarasota Bay Estuary.

Attributes	Current Conditions	Management Efforts (Per Year & Over 5 Years)	
		Management Alternative 1	Management Alternative 2
Wetland Restoration (in Acres)	9, 596 Acres	18 Acres/yr or 90 Acres	6 Acres/yr or 30 Acres
Oyster Bed Restoration (in Acres)	1,596 Acres	0 Acres	4 Acres/yr or 20 Acres
Increase in Seagrass Acreage	12,641 Acres	40 Acres/yr or 200 Acres	40 Acres/yr or 200 Acres
Artificial Reef Enhancement	3000 Reef Domes	80 Reef Domes/yr or 400 Reef Domes	0 Reef Domes
Ecological Parks with Estuary Access	38 Ecological Parks	1 Parks/yr or 5 Parks	3 Parks/yr or 15 Parks
One Time Cost from Increased Taxes	$0	$50	$100
Choice	⬭	⬭	⬭

Given the management plan you identified is your preferred choice, on the following scale, how certain are you that you would make this choice?

Very Unsure						Very Sure
1	2	3	4	5	6	7

Next, consider a new collection of management alternatives. Please compare the management alternatives below to our best estimate of the current conditions in the Sarasota Bay Estuary. Vote for the alternative you would most prefer for the Sarasota Bay Estuary.

Attributes	Current Conditions	Management Efforts (Per Year & Over 5 Years)	
		Management Alternative 1	Management Alternative 2
Wetland Restoration (in Acres)	9, 596 Acres	18 Acres/yr or 90 Acres	6 Acres/yr or 30 Acres
Oyster Bed Restoration (in Acres)	1,596 Acres	0.5 Acres/yr or 2.5 Acres	2 Acres/yr or 10 Acres
Increase in Seagrass Acreage	12,641 Acres	80 Acres/yr or 400 Acres	0 Acres
Artificial Reef Enhancement	3000 Reef Domes	0 Reef Domes	80 Reef Domes/yr or 400 Reef Domes
Ecological Parks with Estuary Access	38 Ecological Parks	3 Parks/yr or 15 Parks	1 Parks/yr or 5 Parks
One Time Cost from Increased Taxes	$0	$15	$100
Choice	⬭	⬭	⬭

Given the management plan you identified is your preferred choice, on the following scale, how certain are you that you would make this choice?

Very Unsure						Very Sure
1	2	3	4	5	6	7

Last, consider a final collection of Sarasota Bay Estuary management alternatives. Please compare the management alternatives below to our best estimate of the current conditions in the Sarasota Bay Estuary. Vote for the alternative you would most prefer for the Sarasota Bay Estuary.

Attributes	Current Conditions	Management Efforts (Per Year & Over 5 Years)	
		Management Alternative 1	Management Alternative 2
Wetland Restoration (in Acres)	9, 596 Acres	0 Acres	24 Acres/yr or 120 Acres
Oyster Bed Restoration (in Acres)	1,596 Acres	2 Acres/yr or 10 Acres	0.5 Acres/yr or 2.5 Acres
Increase in Seagrass Acreage	12,641 Acres	80 Acres/yr or 400 Acres	0 Acres
Artificial Reef Enhancement	3000 Reef Domes	60 Reef Domes/yr or 300 Reef Domes	20 Reef Domes/yr or 100 Reef Domes
Ecological Parks with Estuary Access	38 Ecological Parks	0 Parks	4 Parks/yr or 20 Parks
One Time Cost from Increased Taxes	$0	$100	$15
Choice	⬭	⬭	⬭

Given the management plan you identified is your preferred choice, on the following scale, how certain are you that you would make this choice?

Very Unsure						Very Sure
1	2	3	4	5	6	7

Do you think the results of this survey will really be used by policy makers?

Very Unlikely						Very Likely
1	2	3	4	5	6	7

B1H: If you have any questions regarding the survey, please contact Paul Hindsley Email: hindslpr@eckerd.edu

Please indicate if any of the following attributes did not influence the choices you made in the last four scenarios.

- ○ Wetland Restoration
- ○ Oyster Restoration
- ○ Seagrass Expansion
- ○ Artificial Reef Enhancement
- ○ Ecological Park Access
- ○ Tax

Please rank the importance of the attributes in making the choices you made in the scenarios (1 most important, 6 least important).

- Wetland Restoration _____
- Oyster Restoration _____
- Seagrass Expansion _____
- Artificial Reef Enhancement _____
- Ecological Park Access _____
- Tax _____

Section D: About You and Your Household

D1. Are you....?

Male	
Female	

D2. What is your...?

Town, State & Zip Code (Primary Residence): _____

Town, State & Zip Code (Secondary Residence): _____

D3. What is the highest level of education you have completed?

- ○ Some high school
- ○ High school graduate
- ○ 2-year degree or technical school
- ○ Some college
- ○ College graduate
- ○ Professional or doctoral degree

D4. What best describes your employment status? Please check all that apply.

- ○ Employed full-time
- ○ Employed part-time
- ○ Full time homemaker
- ○ Retired
- ○ Student (part-time)
- ○ Student (full-time)
- ○ Unemployed
- ○ Other (specify) _____

D5. What year were you born?

Year _____

D6. What is your ethnic background?

- ○ Hispanic or Latino
- ○ Not Hispanic or Latino

D7. What is your race? Please check all that apply

- ○ White
- ○ Black/African American
- ○ Native Hawaiian or Pacific Islander
- ○ American Indian or Alaskan Native
- ○ Asian

D8. Counting all adults and children (including yourself), how many people are living in your household?

People _____

D9. Which of the following categories best describes your household's total annual income before taxes in 2012?

- ○ Less than $10,000
- ○ $10,000 to $14,999
- ○ $15,000 to $24,999
- ○ $25,000 to $34,999
- ○ $35,000 to $49,999
- ○ $50,000 to $74,999
- ○ $75,000 to $99,999
- ○ $100,000 to $149,999
- ○ $150,000 to $199,999
- ○ $200,000 or more

Thank You for Participating!

B1H: If you have any questions regarding the survey, please contact Paul Hindsley Email: hindslpr@eckerd.edu