ECONOMIC ACTIVITY ASSOCIATED WITH **RECREATIONAL FISHING** ALONG THE TEXAS GULF COAST

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Contracted through the

River Systems Institute

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For the National Wildlife Federation

February 2005

Introduction

This report focuses on estimating the economic activity[1] associated with recreational fishing in Sabine Lake/Sabine-Neches Estuary, Galveston Bay/Trinity-San Jacinto Estuary, Matagorda Bay/Lavaca-Colorado Estuary, San Antonio Bay/Guadalupe Estuary, Aransas Bay/Mission-Aransas Estuary, Corpus Christi Bay/Nueces Estuary, Baffin Bay/Upper Laguna Madre Estuary, and South Bay/Lower Laguna Madre Estuary. Each bay/estuary area will define a separate geographic region of study comprised of one or more counties. Recreational fishing, therefore, refers to bay (saltwater) fishing only. The results show trip- and equipment-related spending of residents and non-residents on recreational fishing in each of these regions and the impact this spending had on the economy in terms of earnings, employment and sales output.

Estimates of the direct impacts associated with visitor spending were produced using IMPLAN, an input-output of the Texas economy developed by the Minnesota IMPLAN Group. Regional stamp data was obtained from the Texas Parks and Wildlife Department (TPWD)[2] and general state information from the 2001 National Survey of Fishing, Hunting, and Wildlife Associated Recreation (U.S. Department of the Interior March 2003) and a study done by Southwick Associates (Southwick 2003). Estimates of recreational fishing economic activity are provided in terms of direct expenditure, sales output, income, and employment. These estimates are reported by category of expenditure.

Indirect and Induced (Secondary) impacts are generated from the direct impacts calculated by IMPLAN. Indirect impacts represent expenditures made and allocated to the sectors in which purchases made from suppliers. Induced impacts represent spending by employees who earn income within these industries.

Section A provides a brief overview of the study area and geography of the bay system. Section B briefly describes recreational fishing in the study area. Section C summarizes the direct impact of recreational fishing in each of the Bay areas. Section D will provide estimates of economic activity of each region of study - regional direct and indirect employment, as well as direct and indirect income generated by recreational fishing. Appendix A contains definitions of words and terms used in this study. Appendix B provides details of data collection, methods used to calculate expenditures, adjustments made to the data, assumptions and discusses limitations of the model. Appendix C explains the model used to estimate economic activity.

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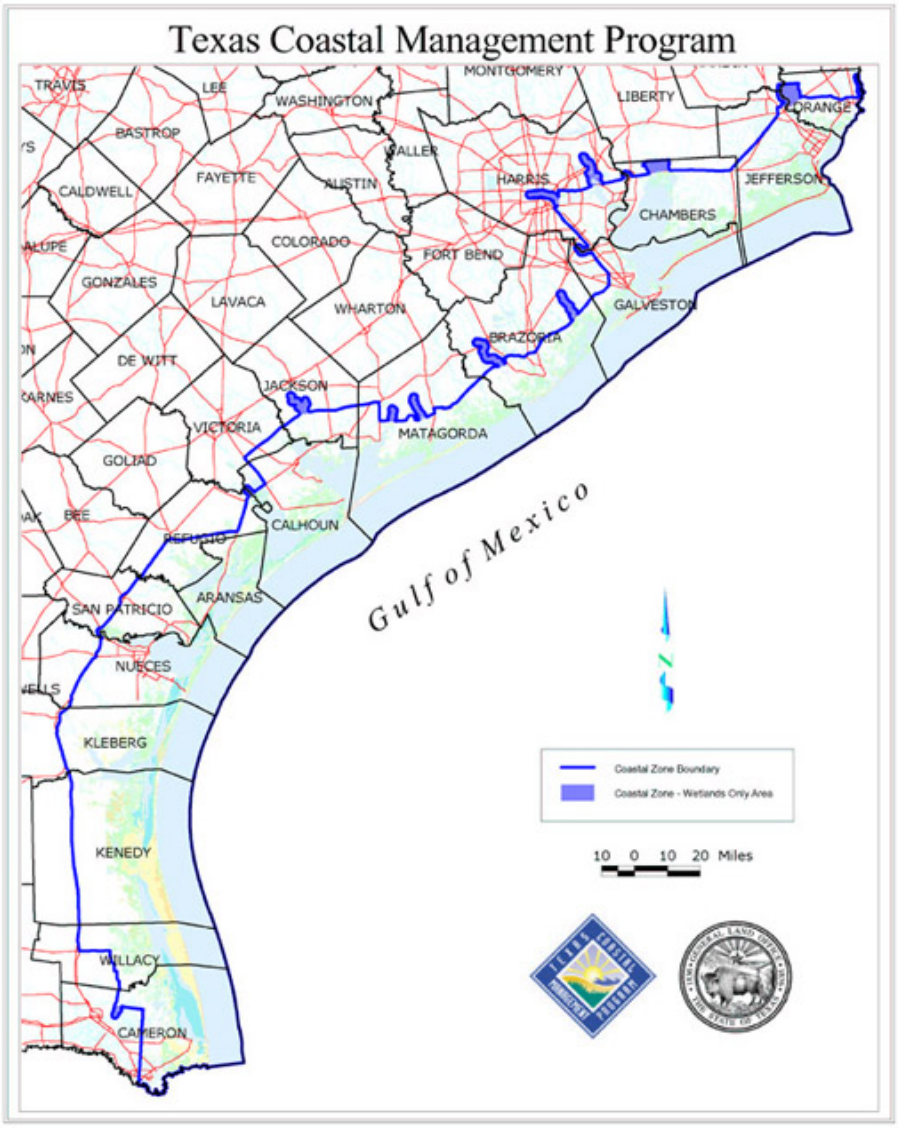
[1] In this study, economic activity refers to the direct stimuli generated by resident and non-resident expenditures. It is not uncommon to make a distinction between economic impact and economic activity. Southwick refers to economic activity as 'economic importance' Southwick, R. (2002). The Economic Effects of Sportfishing Closures in Marine Protected Areas: The Channel Islands Example - A Report Prepared for the American Sportfishing Association United Anglers of Southern California. Fernandina Beach, Florida, Southwick Associates, Inc.**:** 1-18.

[2] Page Campbell: personal communication and data obtained through electronic media.

A. Study Area and Geography of the Bay System[3]

Figure 1: Counties of the Study Area



[3] **See http://www.glo.state.tx.us/coastal/cmpdoc/jpegs/guidance-czb-sm.jpg for maps of Texas coastal zones.**

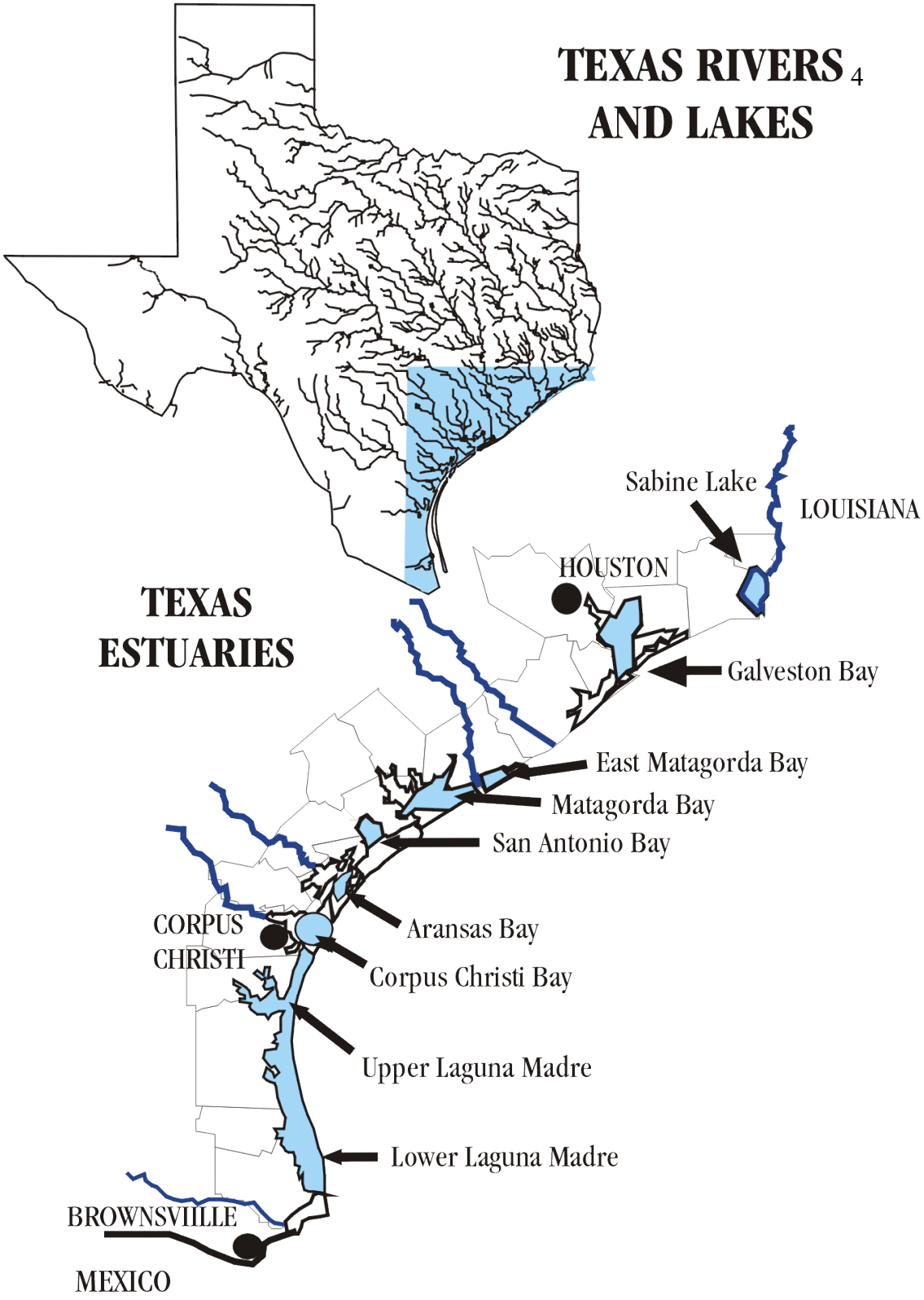


Figure 2: Bay Areas Comprising the Study Area

Table 1: Texas Bays, Estuaries and County Breakdown of Study Area	
Bay/Estuary	Counties
South Bay/Lower Laguna Madre Estuary	
	+ ½ Kenedy (Port Mansfield Area)
	Cameron
	(Hidalgo)
	Willacy
Baffin Bay/Upper Laguna Madre Estuary	
(Jim Wells)	Kenedy (- ½ Kenedy Baffin Area)
	Kleberg
Corpus Christi Bay/Nueces Estuary	
	Nueces
	San Patricio
	Aransas (½ Aransas)
Aransas Bay/Mission-Aransas Estuary	
	(2/3 Refugio)
	Aransas
	San Patricio
San Antonio Bay/Guadalupe Estuary	
(Goliad)	(1/3 Refugio)
	Calhoun
	(½ Aransas)
	(Victoria)
Matagorda Bay/Lavaca-Colorado Estuary	
(Wharton)	(Jackson)
	Matagorda
	Calhoun
	Victoria
Galveston Bay and the Trinity-San Jacinto Estuary	
(Fort Bend)	Galveston
	Brazoria
	Harris
	(Liberty)
	Chambers
Sabine Lake and the Sabine-Neches Estuary	
	Orange
	Jefferson

Figure 3:

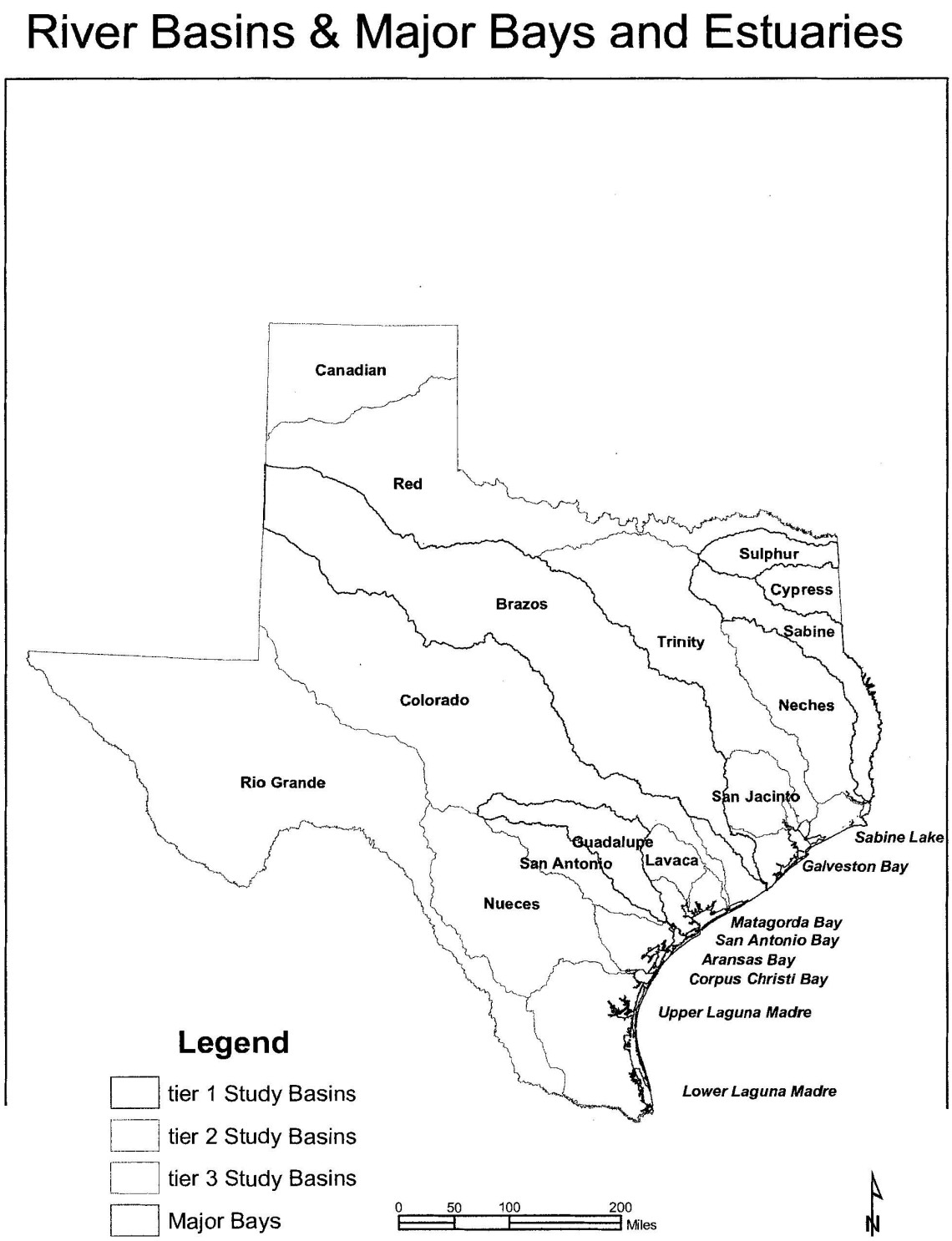

River Basins & Major Bays and Estuaries
Canadian
Red
Sulphur
Cypress
Brazos
Sabine
Trinity
Colorado
Neches
Rio Grande
San Jacinto
Sabine Lake
Guadalupe
San Antonio
Lavaca
Galveston Bay
Nueces
Matagorda Bay
San Antonio Bay
Aransas Bay
Corpus Christi Bay
Upper Laguna Madre
Lower Laguna Madre
Legend
tier 1 Study Basins
tier 2 Study Basins
tier 3 Study Basins
Major Bays
0 50 100 200
Miles
N

Figure 1 shows the study area by county where recreational fishing activities take place. Study area will be defined in this study as the area where both the activity and the economic activity takes place. Figure 2 shows the location of each bay. Table 1 shows the counties which are the primary beneficiaries of the sales, employment, and income from activities in the bays and estuaries fed by freshwater inflows. Bay regions may overlap more than one county boundary to define the economic region of interest to this study.

B. About Recreational Fishing in Texas[4]

Gulf coast estuaries and bays, fed by freshwater inflows, contain coastal wetlands which are home to 95% of the recreational and commercially important fish species found in the Gulf of Mexico.' (Cook 2002) 11 out of 15 of Texas major rivers have historically provided freshwater to the coast, but this is increasingly being threatened by demands for freshwater by agricultural, industrial and municipal interests. Healthy estuaries and bays, and the activities they support, depend on healthy freshwater sources. This has not escaped the notice of the public print media (Thompkins 2004) which reports that one in 24 Texas residents fished at least once somewhere in the coastal waters of Texas. At the same time, 30% of the sources of freshwater are considered unsafe for recreational use and 10% of these same sources are considered polluted and unable to support aquatic life.

Expenditures on recreational fishing generally reflect those of participants 16 years and older. In 2001, 2.4 million state residents and nonresidents, 16 years and older fished in Texas. State and non-State participants in saltwater fishing numbered approximately 860,000 statewide and 36% of anglers, took almost 5000 trips collectively, over 7500 days, for an average trip length of 9 days in 2001.

Estimates of recreational participation on the local or regional level is made more difficult by the lack of published data. Over 450,000 stamps were issued to participants in recreational saltwater fishing by the end of Summer 2003. Counties surrounding Galveston Bay and Corpus Christi Bay were the sources of the largest number of stamp licensees, with approximately[5] 47% and 21% of licenses issued. South Bay, Aransas Bay and Matagorda Bay had smaller (less than 10%), but appreciable recreational fishing activity. It is important to note that estuaries along the Texas Gulf coast vary by size, population, and economic viability, as noted in a Jones and Tanyeri-Abur study (Jones and Tanyeri-Abur 2001). Saltwater anglers engage in fishing through the use of charter boats, private boats, or by means of shore fishing.

[4] 2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, Texas
[5] Note: Some counties are included in more than one estuary.

C. Initial Spending

Spending on recreational fishing activity is measured by the spending by saltwater recreational participants, 16 years or older, for such things as food, drinks, ice, lodging, transportation, boat fuel, charter and guide fees, bait and tackle, and other miscellaneous expenditures. These expenditures become revenues from sales to final demand.

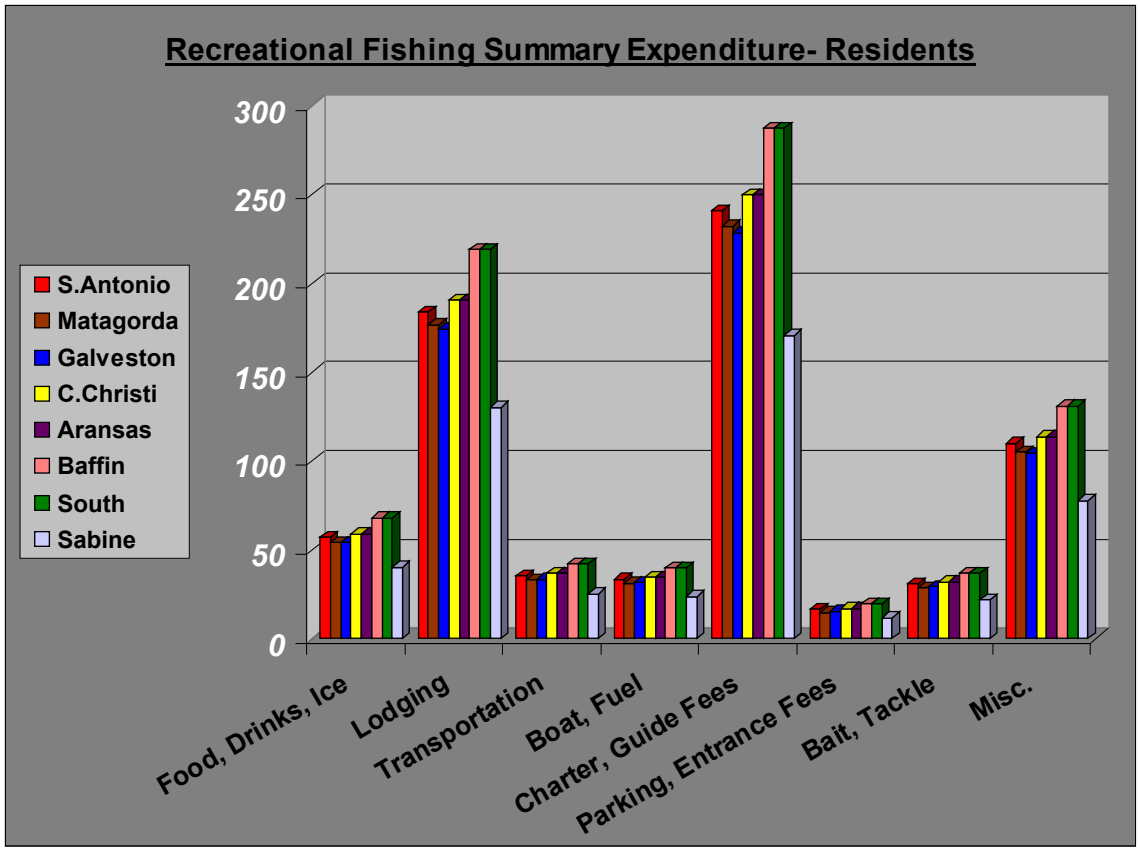
1. Summary of Expenditures

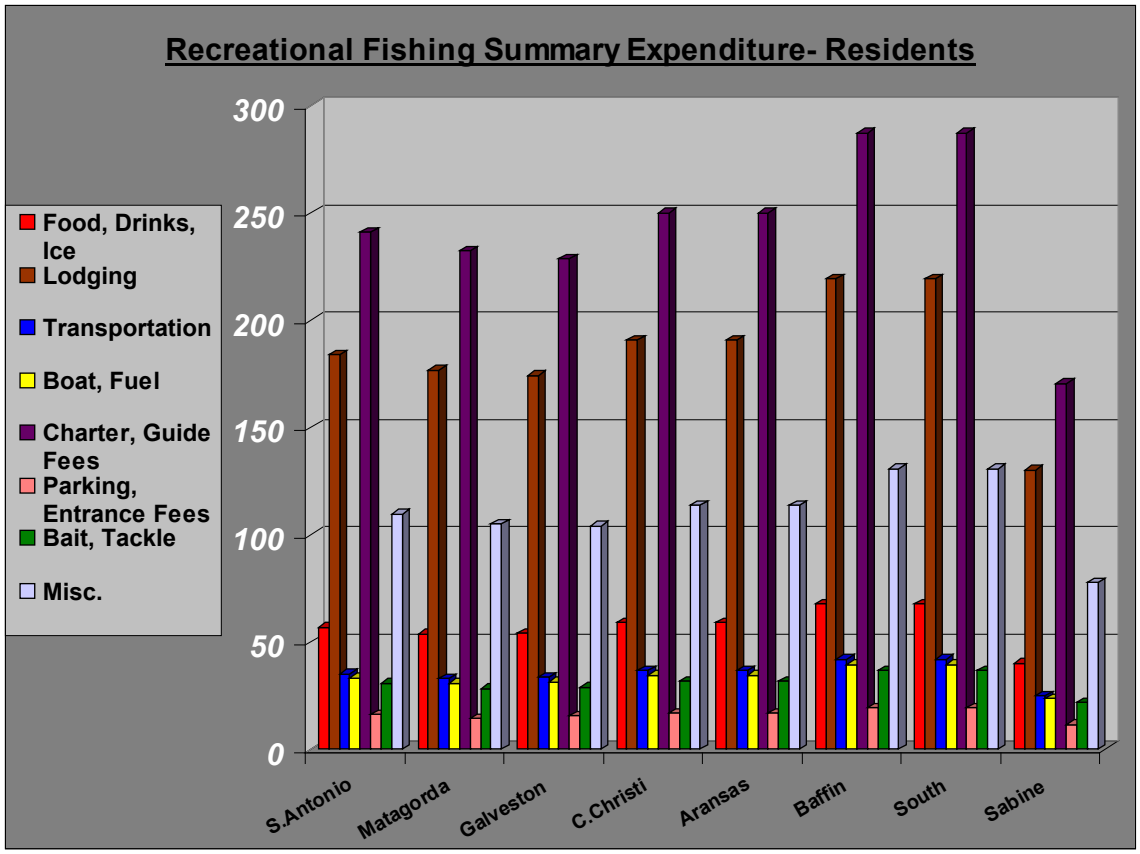
Total expenditures in each Bay area was estimated using category expenditure data from studies by Ditton (Ditton and Hunt 1996), Anderson (Anderson and Ditton 2004) and Jones and Tanyeri-Abur (Jones and Tanyeri-Abur 2001), with reference made to the 2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation and the Southwick Report. This data was used to estimate trip and equipment expenditures. The following is a summary of expenditures in the Bay region of Texas adjusted for inflation[6].

Table 2: Summary of Resident and Non-Resident Category Expenditures – by Bay ($)

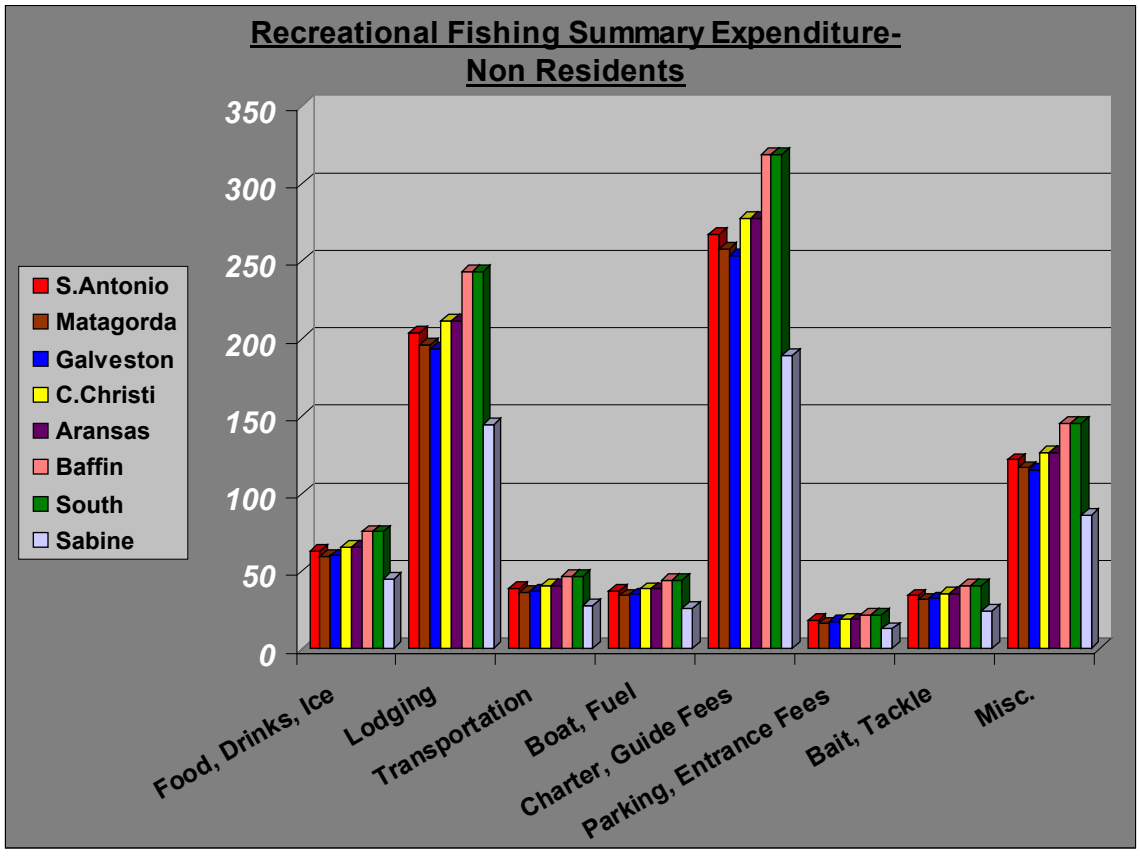
Bay: Resident	Food, Drinks, Ice	Lodging	Transport	Boat Fuel	Charter/ Guide Fees	Parking/ Entrance Fees	Bait, Tackle	Misc.
S.Antonio	56.84	183.73	35.24	33.23	240.92	16.26	30.64	109.66
Matagorda	53.77	176.80	32.82	30.87	232.26	14.41	28.36	104.99
Galveston[7]	53.95	174.38	33.44	31.54	228.65	15.43	29.08	104.08
C. Christi	58.98	190.64	36.56	34.48	249.97	16.87	31.79	113.78
Aransas	58.98	190.64	36.56	34.48	249.97	16.87	31.79	113.78
Baffin	67.80	219.14	42.03	39.63	287.35	19.39	36.54	130.80
South	67.8	219.14	42.03	39.63	287.35	19.39	36.54	130.80
Sabine	40.23	130.06	24.94	23.52	170.54	11.51	21.69	77.63

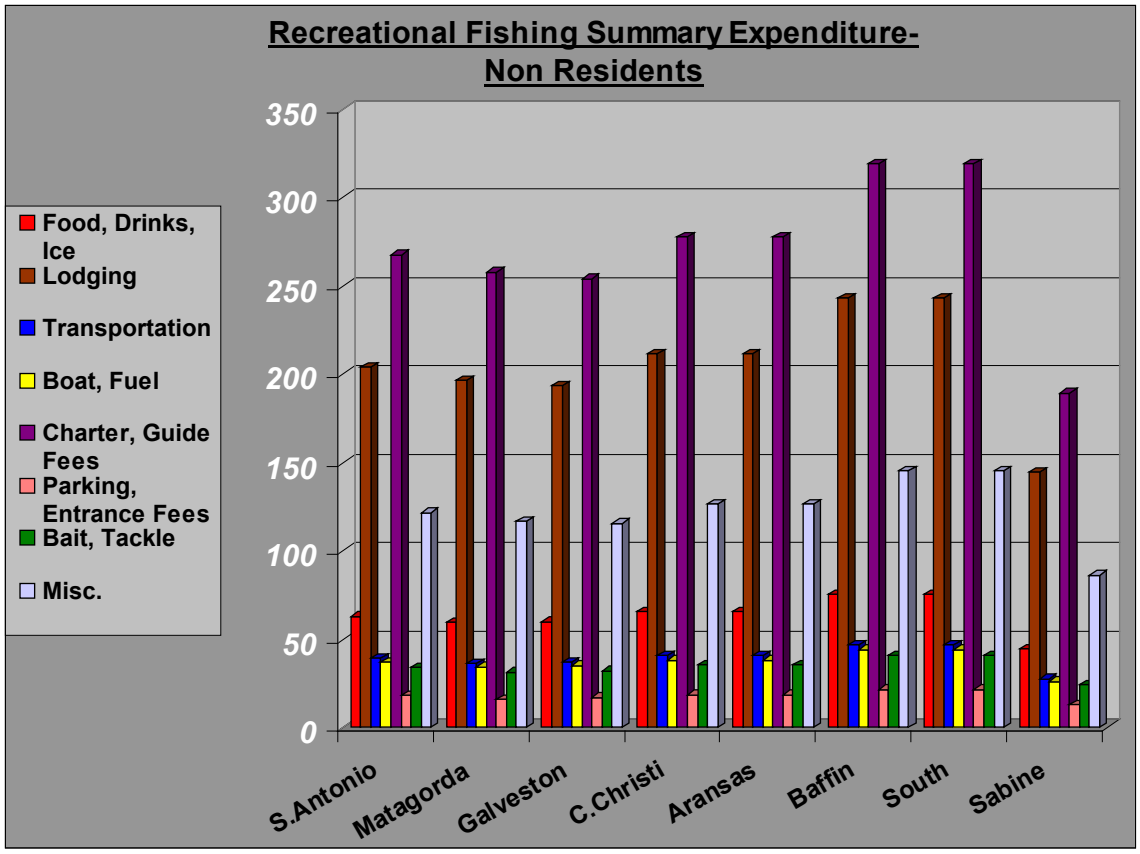
[6] 2001 adjusted to 2003 dollars.
[7] Average Houston, Galveston, and Brazoria counties


Recreational Fishing Summary Expenditure- Residents
300
250
200
150
100
50
0
S.Antonio
Matagorda
Galveston
C.Christi
Aransas
Baffin
South
Sabine
Food, Drinks, Ice
Lodging
Transportation
Boat, Fuel
Charter, Guide Fees
Parking, Entrance Fees
Bait, Tackle
Misc.


Recreational Fishing Summary Expenditure- Residents
300
250
200
150
100
50
0
Food, Drinks, Ice
Lodging
Transportation
Boat, Fuel
Charter, Guide Fees
Parking, Entrance Fees
Bait, Tackle
Misc.
S.Antonio
Matagorda
Galveston
C.Christi
Aransas
Baffin
South
Sabine

Bay: N/Resident	Food, Drinks, Ice	Lodging	Transport	Boat Fuel	Charter/ Guide Fees	Parking/ Entrance Fees	Bait, Tackle	Misc.
S. Antonio	63.09	203.94	39.11	36.89	267.42	18.05	34.00	121.72
Matagorda	59.68	196.25	36.43	34.26	257.81	16.00	31.48	116.54
Galveston	59.88	193.56	37.12	35.00	253.80	17.13	32.28	115.53
C. Christi	65.47	211.60	40.58	38.27	277.47	18.73	35.29	126.30
Aransas	65.47	211.60	40.58	38.27	277.47	18.73	35.29	126.30
Baffin	75.25	243.25	46.65	43.99	318.96	21.53	40.56	145.18
South Bay	75.25	243.25	46.65	43.99	318.96	21.53	40.56	145.18
Sabine	44.66	144.37	27.69	26.11	189.30	12.78	24.07	86.17

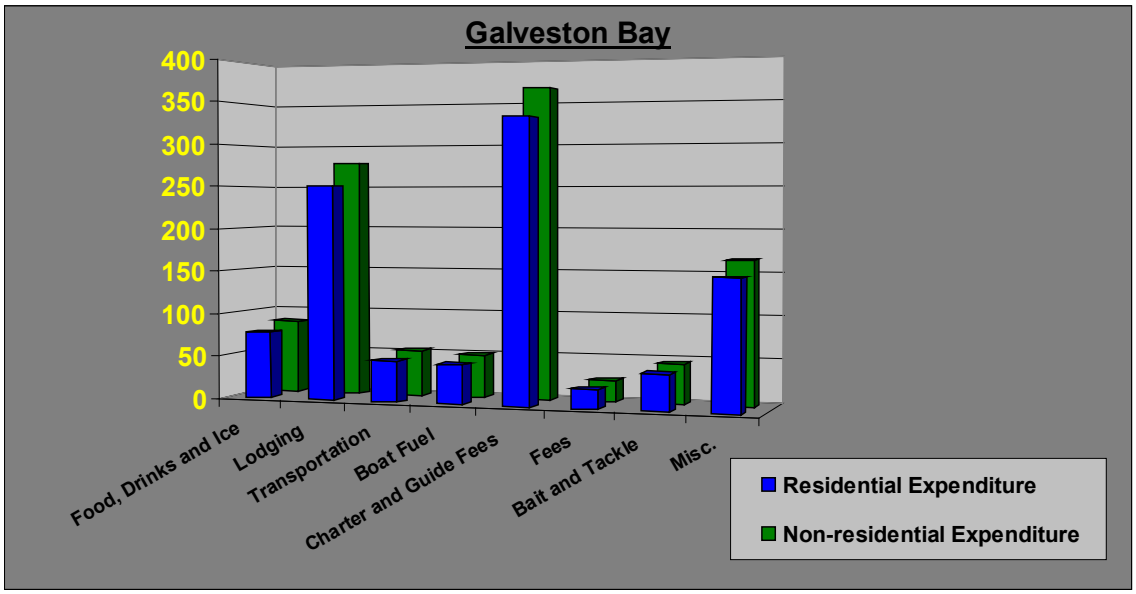



Recreational Fishing Summary Expenditure-
Non Residents
350
300
250
200
150
100
50
0
Food, Drinks, Ice
Lodging
Transportation
Boat, Fuel
Charter, Guide Fees
Parking, Entrance Fees
Bait, Tackle
Misc.
S.Antonio
Matagorda
Galveston
C.Christi
Aransas
Baffin
South
Sabine

2. Expenditures For Each Bay Area

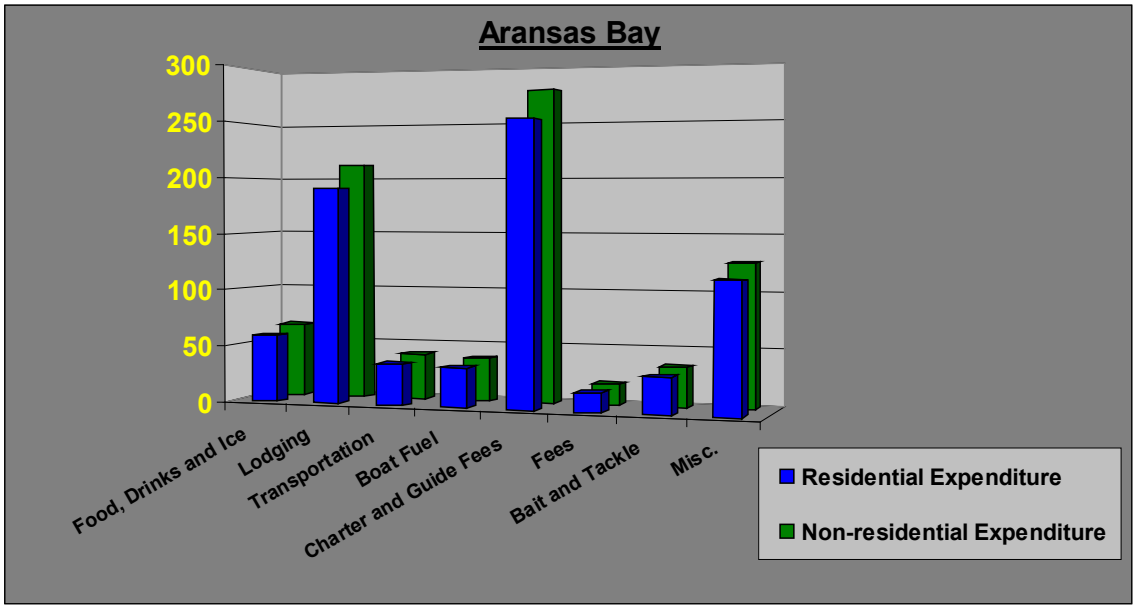
I. Trinity-San Jacinto Estuary and the Galveston Bay System

Galveston Bay		
Category	**Residential Expenditure**	**Non-residential Expenditure**
Food, Drinks and Ice	77.5125	86.038875
Lodging	250.5438	278.103618
Transportation	48.0519	53.337609
Boat Fuel	45.3141	50.298651
Charter and Guide Fees	328.5243	364.661973
Fees	22.1715	24.610365
Bait and Tackle	41.7807	46.376577
Misc.	149.5377	165.986847



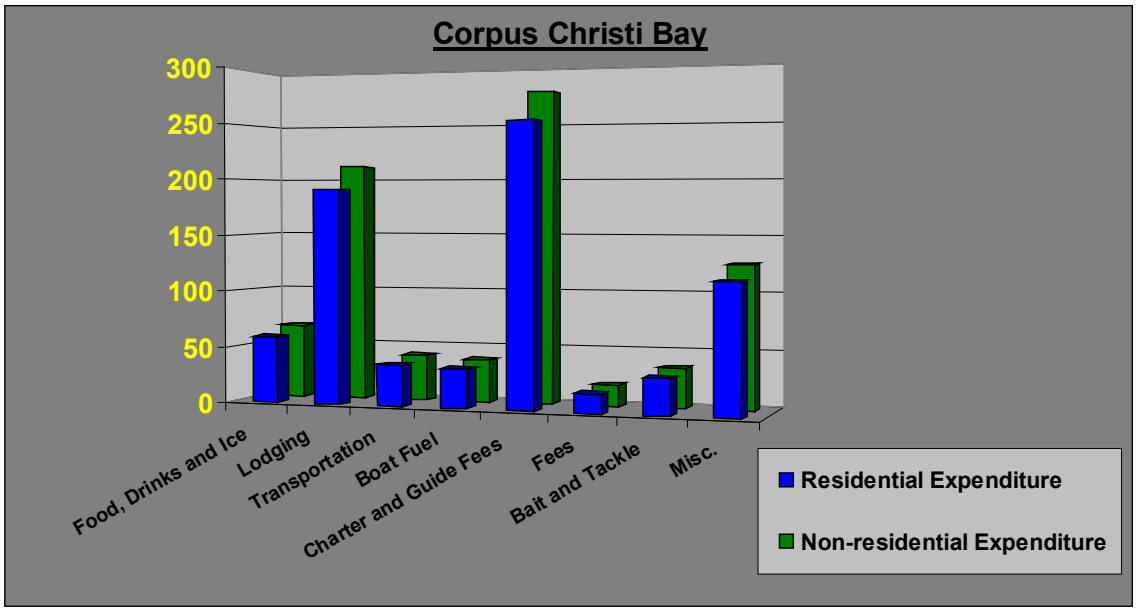
II. Mission-Aransas Estuary and the Aransas Bay System

Aransas Bay		
Category	**Residential Expenditure**	**Non-residential Expenditure**
Food, Drinks and Ice	58.9784	65.466024
Lodging	190.6359936	211.6059529
Transportation	36.5621568	40.58399405
Boat Fuel	34.4789952	38.27168467
Charter and Guide Fees	249.9704896	277.4672435
Fees	16.870048	18.72575328
Bait and Tackle	31.7904704	35.28742214
Misc.	113.7815744	126.2975476



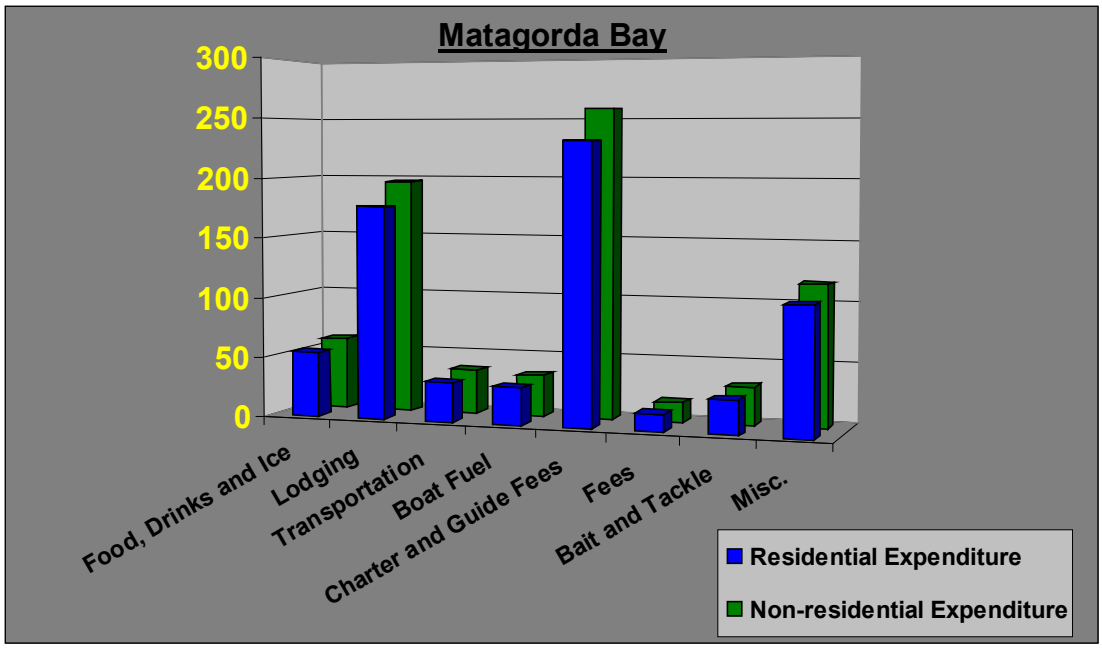
III. Nueces Estuary and the Corpus Christi Bay System

Corpus Christi Bay		
Category	**Residential Expenditure**	**Non-residential Expenditure**
Food, Drinks and Ice	58.9784	65.466024
Lodging	190.6359936	211.6059529
Transportation	36.5621568	40.58399405
Boat Fuel	34.4789952	38.27168467
Charter and Guide Fees	249.9704896	277.4672435
Fees	16.870048	18.72575328
Bait and Tackle	31.7904704	35.28742214
Misc.	113.7815744	126.2975476



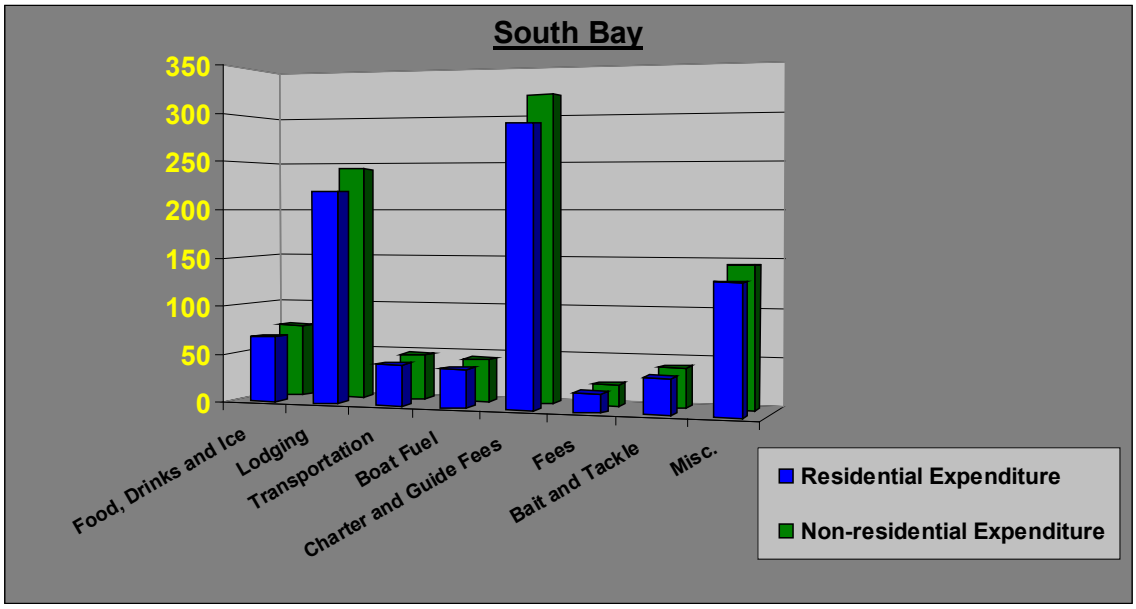
IV. Lavaca-Colorado Estuary and the Matagorda Bay System

Matagorda Bay		
Category	**Residential Expenditure**	**Non-residential Expenditure**
Food, Drinks and Ice	53.768	59.68248
Lodging	176.8	196.248
Transportation	32.8224	36.432864
Boat Fuel	30.8672	34.262592
Charter and Guide Fees	232.2632	257.812152
Fees	14.4144	15.999984
Bait and Tackle	28.3608	31.480488
Misc.	104.988	116.53668



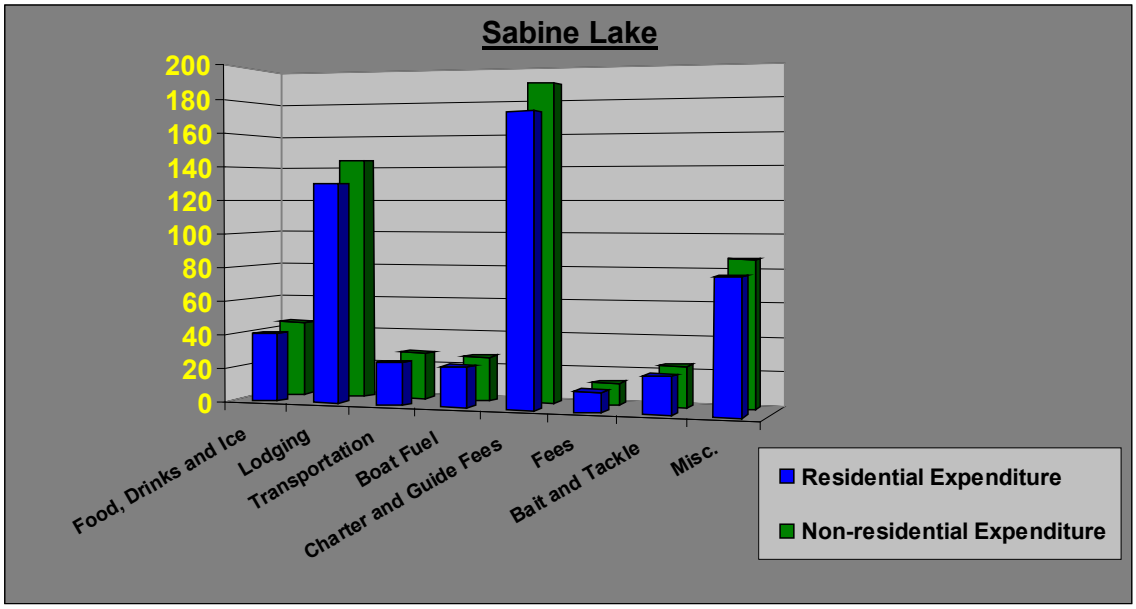
V. Upper and Lower Laguna Madre Estuary and the Baffin Bay/South Bay Systems

South Bay		
Category	**Residential Expenditure**	**Non-residential Expenditure**
Food, Drinks and Ice	67.7976	75.255336
Lodging	219.1423104	243.2479645
Transportation	42.0293952	46.65262867
Boat Fuel	39.6347328	43.99455341
Charter and Guide Fees	287.3492544	318.9576724
Fees	19.392672	21.52586592
Bait and Tackle	36.5441856	40.56404602
Misc.	130.7956416	145.1831622



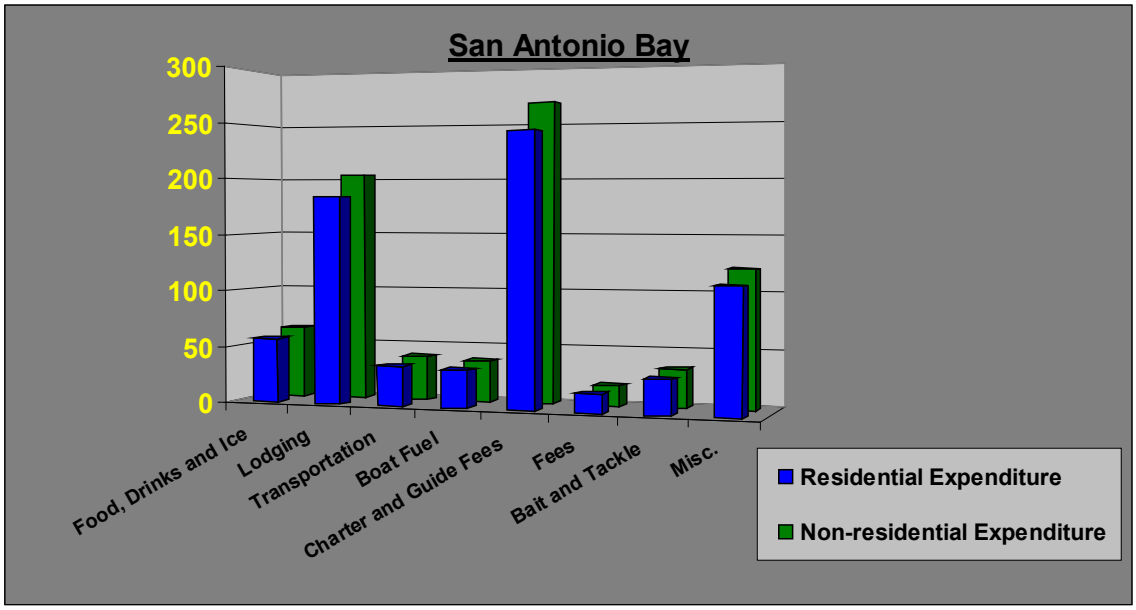
VI. Sabine-Neches Estuary and the Sabine Lake System

Sabine Lake		
Category	**Residential Expenditure**	**Non-residential Expenditure**
Food, Drinks and Ice	40.2376	44.663736
Lodging	130.0600704	144.3666781
Transportation	24.9442752	27.68814547
Boat Fuel	23.5230528	26.11058861
Charter and Guide Fees	170.5406144	189.300082
Fees	11.509472	12.77551392
Bait and Tackle	21.6888256	24.07459642
Misc.	77.6266816	86.16561658



VII. Guadalupe Estuary and the San Antonio Bay System

San Antonio Bay		
Category	**Residential Expenditure**	**Non-residential Expenditure**
Food, Drinks and Ice	56.836	63.08796
Lodging	183.73212	203.9426532
Transportation	35.23806	39.1142466
Boat Fuel	33.23034	36.8856774
Charter and Guide Fees	240.91782	267.4187802
Fees	16.2591	18.047601
Bait and Tackle	30.63918	34.0094898
Misc.	109.66098	121.7236878



C. Estimates of Economic Activity

1. Impact Categories

Impact Category	Description
Sales Output	• Measured in dollars • The amount of total regional business sales revenue stimulated from goods sold in recreational fishing related sectors, as a result of the direct, indirect, and induced effect of an extra dollar of spending on recreational fishing activity in the region.
Income	• Measured in dollars • The amount of personal income stimulated in recreational fishing related sectors, as a result of the direct, indirect, and induced effect of an extra dollar of spending in the region.
Employment	• Measured by number of jobs • The number of jobs (not full-time equivalent) created in recreational fishing related sectors, as a result of the direct, indirect, and induced effect of an extra dollar of spending in the region. Includes wages, salaries and proprietors, full- and part-time positions.

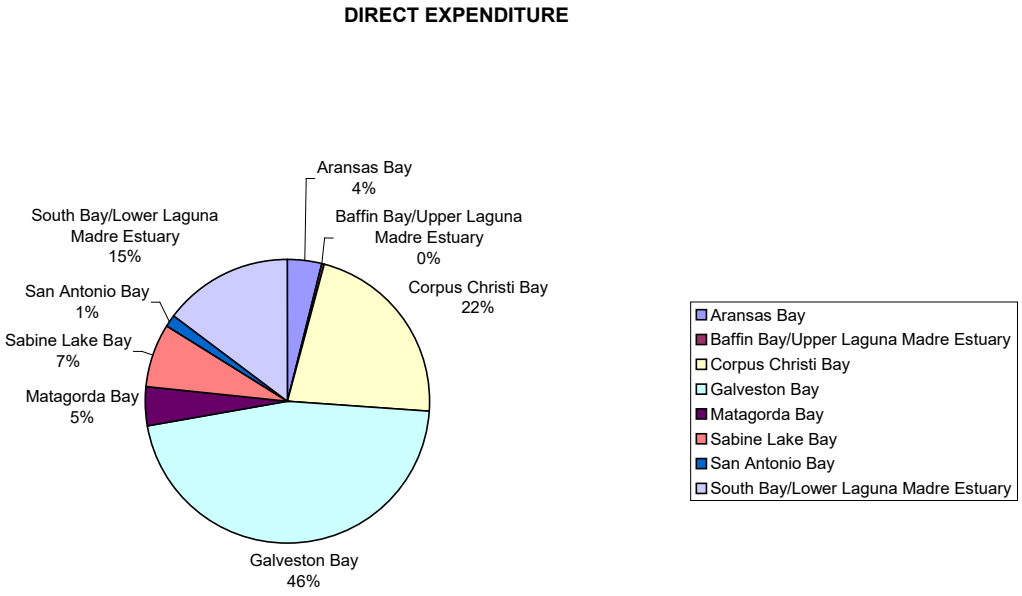
2. Direct and Indirect Impacts of Recreational Fishing Expenditures in Bays and Estuaries of the Gulf Coast: A Summary

- A total of approximately 348,366 saltwater anglers participated in recreational fishing in bay/estuary regions along the Texas Gulf Coast. The largest trip related expenditure category was Lodging. The highest equipment expenditure category was boat related expenditures such as Charter/Guide Fees.
- Expenditures made by local anglers generate direct, indirect, and induced results of economic activity. The sum of these is the total

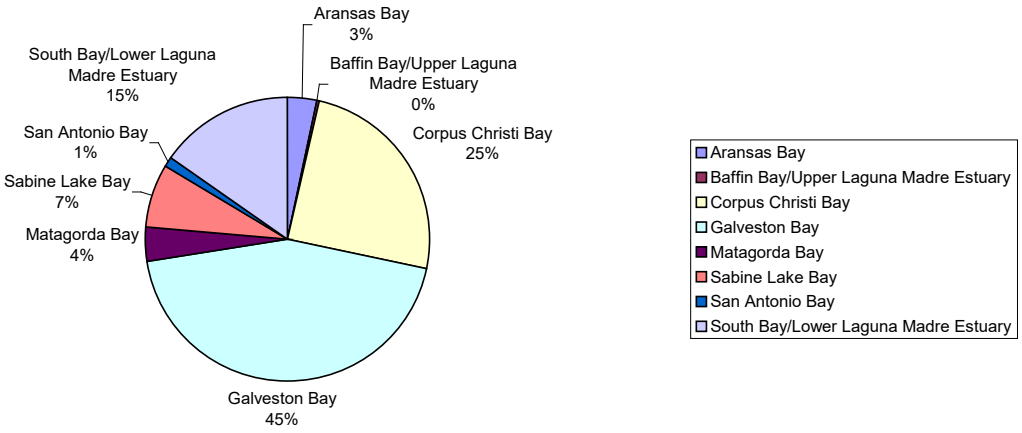
economic activity resulting from angler expenditure. Total economic activity from local angler expenditures adjusted to 2003 dollars in Gulf Coast bays is estimated at $183,668,284.

- Expenditures made by non-local anglers generate direct, indirect, and induced results of economic activity. The sum of these is the total economic activity resulting from angler expenditure. Total economic activity from non-local angler expenditures adjusted to 2003 dollars in Gulf Coast bays is estimated at $65,123,200.
- Sales Output Total retail sales generated from expenditures adjusted to 2003 dollars from local anglers is estimated at $284,248,069.
- Sales Output Total retail sales generated from expenditures adjusted to 2003 dollars from non-local anglers is estimated at $81,644,648
- Income Total household earnings generated from expenditures adjusted to 2003 dollars from local anglers is estimated at $157,221,639.
- Income Total household earnings generated from expenditures adjusted to 2003 dollars from non-local anglers is estimated at $157,221,639.
- Employment Recreational fishing by local participants supported 4,863.9 full-time and part-time jobs in the Gulf Coast region of Texas. These are jobs that are directly associated with recreational fishing in addition to jobs in industries that indirectly support these activities.
- Employment Recreational fishing by non-local participants supported 1725.4 full-time and part-time jobs in the Gulf Coast region of Texas. These are jobs that are directly associated with recreational fishing in addition to jobs in industries that indirectly support these activities.

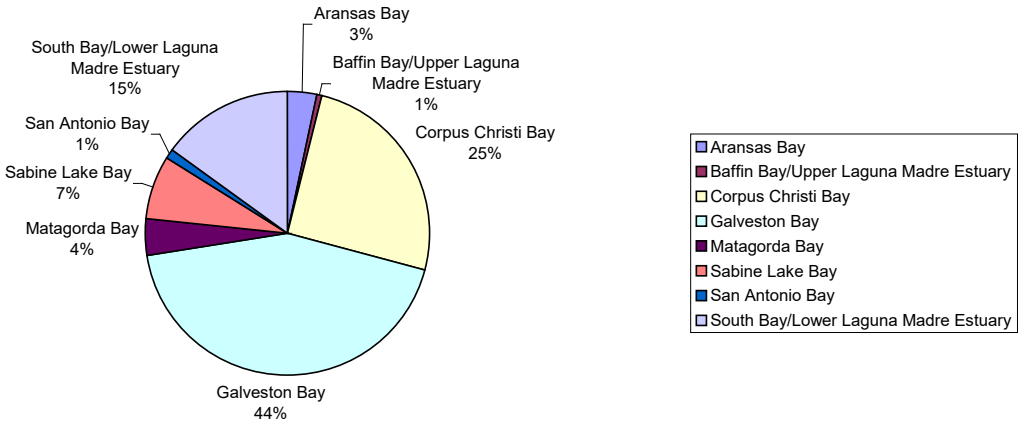
Figure 10: Economic Activity of Recreational Fishing as a Result of Local Spending - Bay Proportion of Total

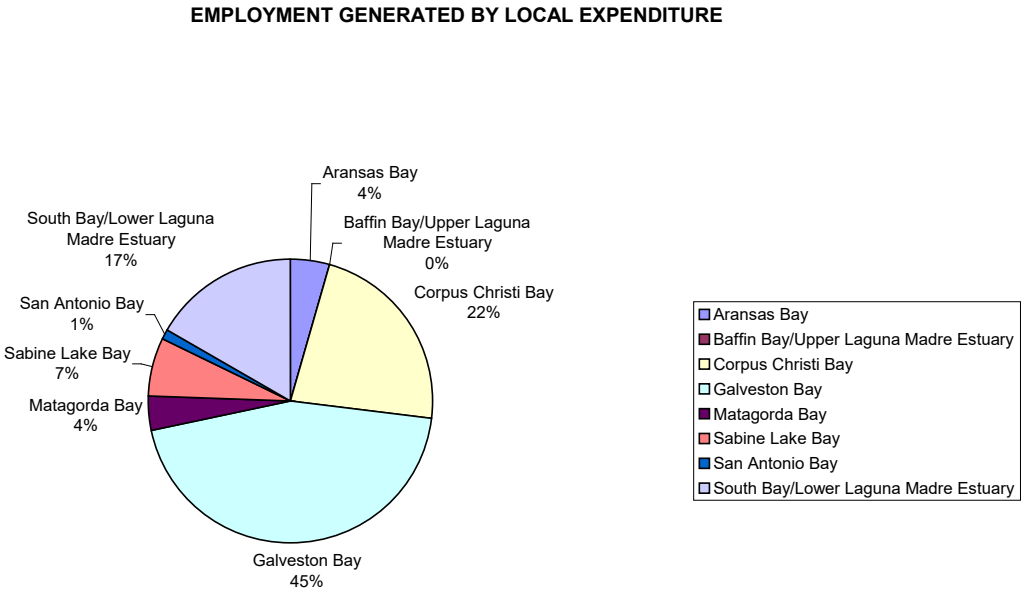


SALES OUTPUT GENERATED BY LOCAL EXPENDITURE



INCOME GENERATED BY LOCAL EXPENDITURE



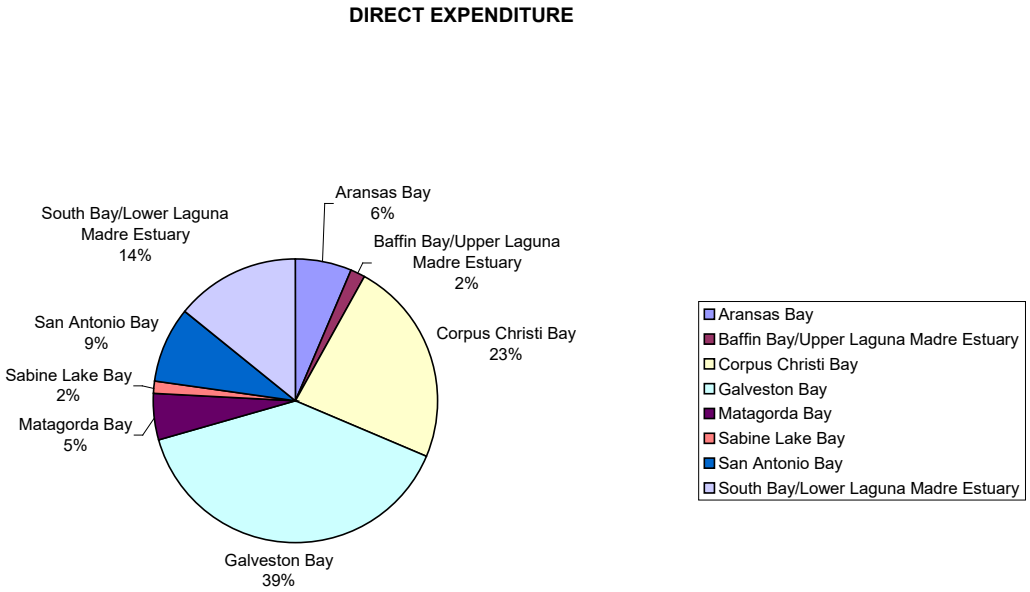


Economic Impact of Recreational Fishermen Expenditure

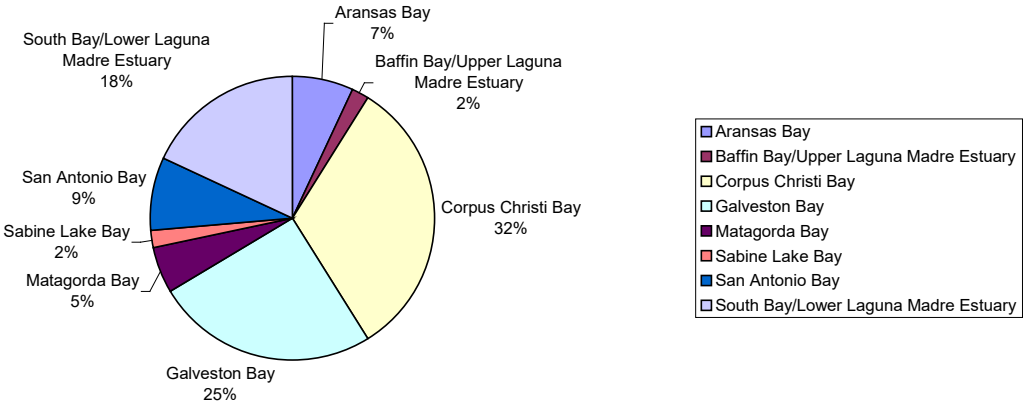
BAY	LOCAL DIRECT EXPENDITURE	SALES OUTPUT	INCOME	EMPLOYMENT
Aransas Bay	$7,036,520	$9,736,826	$5,093,984	211.3
Baffin Bay	$364,803	$497,039	$957,436	9.5
Corpus Christi Bay	$40,736,592	$70,334,487	$40,012,081	1,089.0
Galveston Bay	$84,440,088	$125,626,990	$68,102,560	2,171.0
Matagorda Bay	$8,457,650	$11,012,353	$6,425,589	192.5
Sabine Lake Bay	$13,030,000	$20,387,540	$11,417,549	328.2
San Antonio Bay	$2,334,276	$2,876,712	$1,575,771	56.9
South Bay	$27,268,355	$43,776,122	$23,636,670	805.6
	$183,668,284	**$284,248,069**	**$157,221,639**	**4,863.9**

	NON-LOCAL DIRECT EXPENDITURE	OUTPUT	INCOME	EMPLOYMENT
Aransas Bay	$4,105,117	$5,680,461	$2,971,929	123.3
Baffin Bay	$1,221,763	$1,664,639	$957,436	31.8
Corpus Christi Bay	$15,177,370	$26,204,563	$14,907,559	405.7
Galveston Bay	$25,519,070	$20,582,023	$20,582,023	656.1
Matagorda Bay	$3,310,173	$4,310,042	$2,514,886	75.3
Sabine Lake Bay	$1,008,425	$1,577,854	$883,615	25.4
San Antonio Bay	$5,642,384	$6,953,537	$3,809,069	137.6
South Bay	$9,138,900	$14,671,529	$7,921,750	270.0
	$65,123,200	**$81,644,648**	**$54,548,267**	**1725.4**

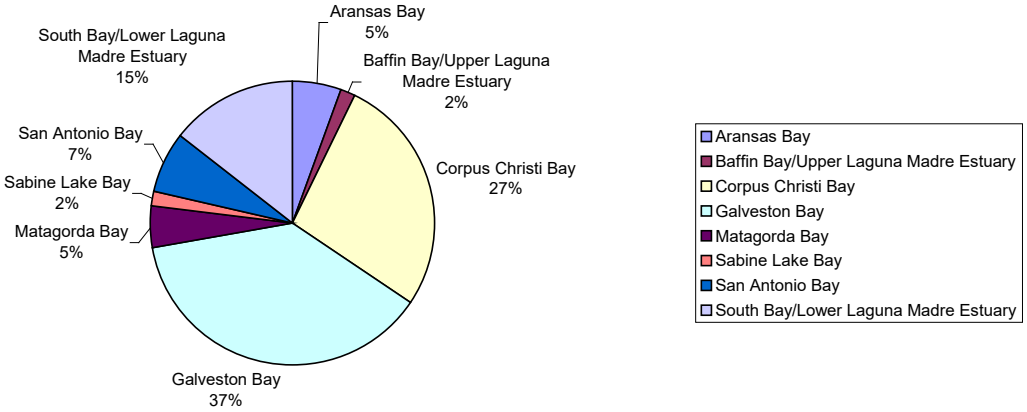
Figure 10: Economic Activity of Recreational Fishing as a Result of Non-Local Spending - Bay Proportion of Total



SALES OUTPUT GENERATED BY NON-LOCAL EXPENDITURE



INCOME GENERATED BY NON-LOCAL SPENDING



EMPLOYMENT GENERATED BY NON-LOCAL SPENDING

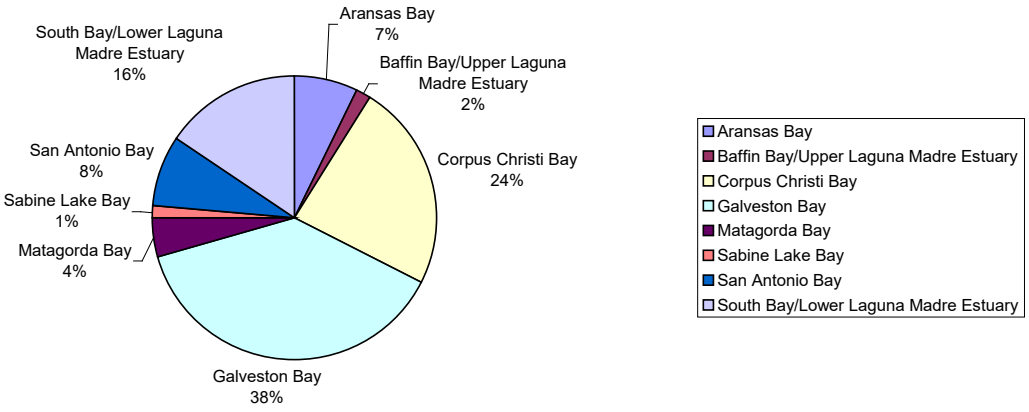
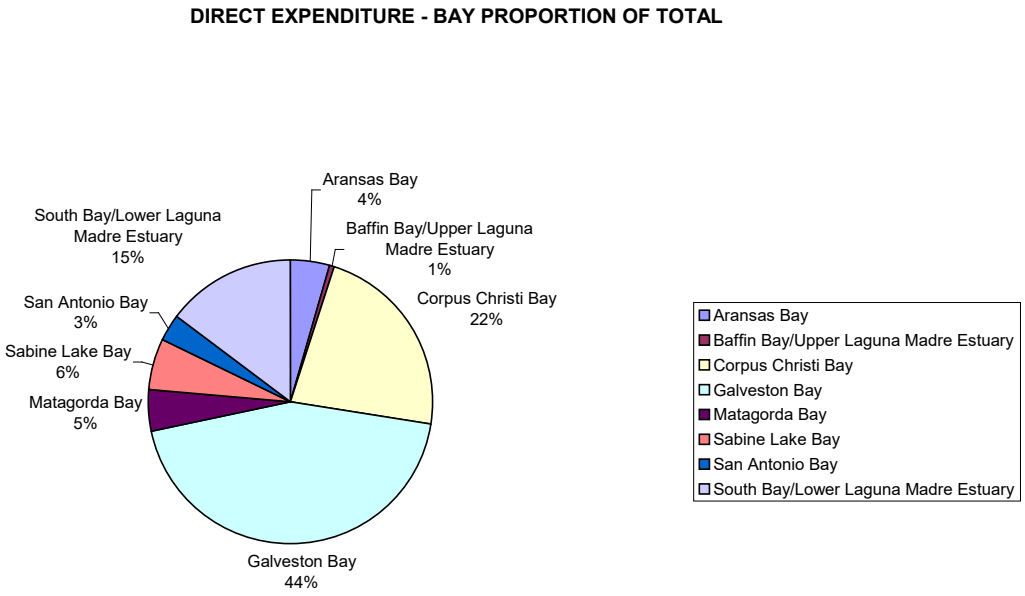
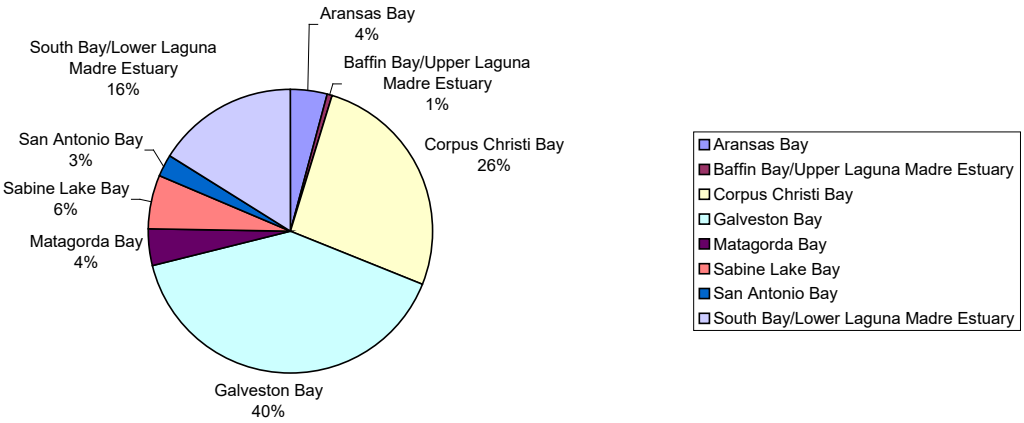


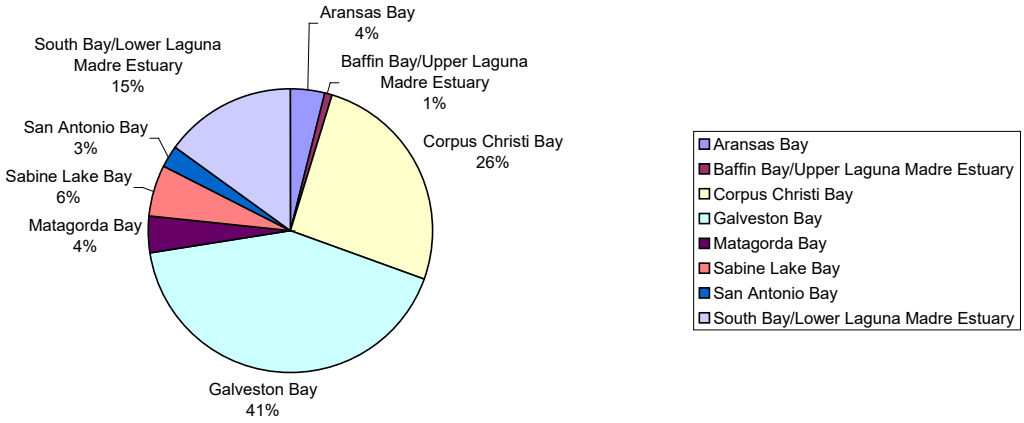
Figure 10: Economic Activity of Hunting – Local and Non-Local Spending as Bay Proportions of Total



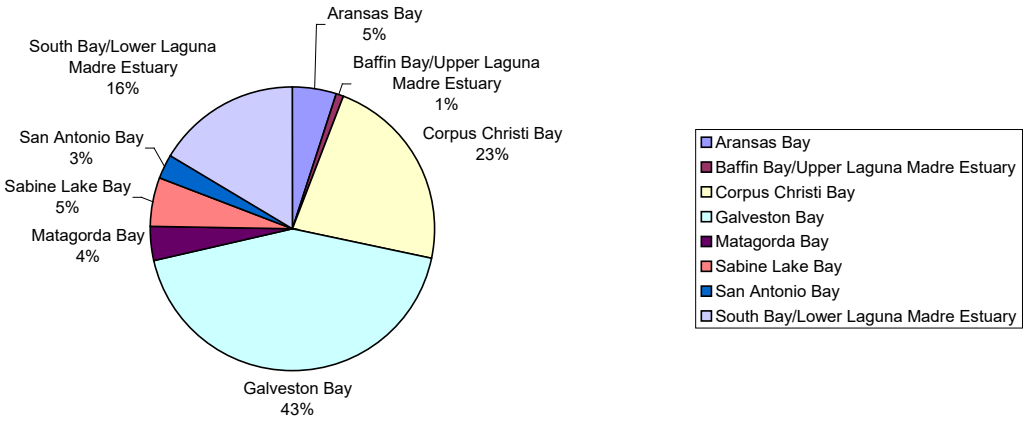
SALES OUTPUT - BAY PROPORTION OF TOTAL



INCOME - BAY PROPORTION OF TOTAL



EMPLOYMENT - BAY PROPORTION OF TOTAL



Economic Impact of Recreational Fishermen Expenditure

BAY	LOCAL DIR. EXPENDITURE	SALES OUTPUT	INCOME	EMPLOYMENT
Aransas Bay	$7,036,520	$9,736,826	$5,093,984	211.3
Baffin Bay	$364,803	$497,039	$957,436	9.5
Corpus Christi Bay	$40,736,592	$70,334,487	$40,012,081	1,089.0
Galveston Bay	$84,440,088	$125,626,990	$68,102,560	2,171.0
Matagorda Bay	$8,457,650	$11,012,353	$6,425,589	192.5
Sabine Lake Bay	$13,030,000	$20,387,540	$11,417,549	328.2
San Antonio Bay	$2,334,276	$2,876,712	$1,575,771	56.9
South Bay	$27,268,355	$43,776,122	$23,636,670	805.6
	$183,668,284	**$284,248,069**	**$157,221,639**	**4,863.9**

BAY	NON-LOCAL DIR. EXPENDITURE	OUTPUT	INCOME	EMPLOYMENT
Aransas Bay	$4,105,117	$5,680,461	$2,971,929	123.3
Baffin Bay	$1,221,763	$1,664,639	$957,436	31.8
Corpus Christi Bay	$15,177,370	$26,204,563	$14,907,559	405.7
Galveston Bay	$25,519,070	$20,582,023	$20,582,023	656.1
Matagorda Bay	$3,310,173	$4,310,042	$2,514,886	75.3
Sabine Lake Bay	$1,008,425	$1,577,854	$883,615	25.4
San Antonio Bay	$5,642,384	$6,953,537	$3,809,069	137.6
South Bay	$9,138,900	$14,671,529	$7,921,750	270.0
	$65,123,200	**$81,644,648**	**$54,548,267**	**1725.4**

BAY	TOTAL DIR. EXPENDITURE	OUTPUT	INCOME	EMPLOYMENT
Aransas Bay	$11,141,637	$15,417,286	$8,065,914	334.6
Baffin Bay	$1,586,566	$2,161,678	$1,914,872	41.4
Corpus Christi Bay	$55,913,962	$96,539,050	$54,919,640	1,494.7
Galveston Bay	$109,959,158	$146,209,013	$88,684,582	2,827.2
Matagorda Bay	$11,767,824	$15,322,395	$8,940,475	267.8
Sabine Lake Bay	$14,038,425	$21,965,394	$12,301,164	353.6
San Antonio Bay	$7,976,660	$9,830,250	$5,384,840	194.6
South Bay	$36,407,255	$58,447,651	$31,558,421	1,075.6
	$248,791,485	**$365,892,717**	**$211,769,906**	**6,589.3**

Appendix A – Terms and Definitions

Direct Effect or Direct Impact – the money actually spent in local regional economy. In recreational fishing, this refers to money spent by anglers.

Economic Activity - the economic stimuli as a result of resident and non-resident expenditures. The direct effect in recreational fishing, sometimes referred to as sportfishing, refers to the money spent by anglers. This term is especially useful even when the data does not identify the percentage of anglers comprised by non-residents[8].

Freshwater inflows – water that is less saline than marine water, and generally refers to water which flows downstream from inland sources. This water enters into the bay and mixes with the more saline seawater, creating an estuary area that is less salty than the ocean.[9]

IMPLAN – a micro-computer-based input-output (I-O) modeling system. With IMPLAN, one can estimate 528 sector I-O models for any region consisting of one or more counties. IMPLAN includes procedures for generating multipliers and estimating impacts by applying final demand changes to the model. **Indirect Effect** – impacts which originate in the businesses that supply inputs to businesses which are the recipients of the dollars spent by anglers.

Induced Effect – results from the wages paid to employees in recreation fishing-related businesses who then spend their earnings on goods and services.

Input-Output Model[10] – An input-output model is a representation of the flows of economic activity between sectors within a region. The model captures what each business or sector must purchase from every other sector in order to produce a dollar's worth of goods or services. Using such a model, flows of economic activity associated with any change in spending are calculated. Multipliers maybe derived from an input-output model. Estimates of sales output, employment and income due to economic spending in a particular category are obtained by multiplying total expenditures by output, income and employment multipliers.

Trip-related expenditures – expenditures such as food, lodging and fuel.

Equipment-related expenditures – expenditures such as fishing tackle and boats.

Local participants – commonly refers to participants who traveled less than one mile from home for the purpose of recreational fishing.

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[8] See Steinbeck, Steinbeck, S. R. (1999). " Regional Economic Impact Assessments of Recreational Fisheries: An Application of the IMPLAN Modeling System to Marine Party and Charter Boat Fishing in Maine." North American Journal of Fisheries Management **19**: 724-736.

[9] http://www.texaswatermatters.org

[10] Definitions of Input-output model, IMPLAN, and Sector are adapted from Daniel J. Stynes, Economic Impacts of Tourism, s.v. "Glossary of Economic Impact Terms", http://www.msu.edu/course/prr/840/econimpact/pdf/ecimpvol1.pdf

Multiplier – Estimates the impact that every dollar of recreational fishing expenditure has on the economy. A multiplier of 1.50 indicates that for every dollar of expenditure in recreational fishing, $1.50 worth of products and services is generated in the regional economy. IMPLAN multipliers are used, which do not estimate the duration of the impact.[11]

Non-local participants – commonly refers to participants who traveled one mile or more from home for the purpose of recreational fishing.

Sector – is a grouping of industries that produce similar products or services.

Total Effect – the sum of the direct effect, the indirect effect, and the induced effect. Economic impact is usually described in terms of employment (jobs), sales, income, and value added. For instance, direct income is the earnings of labor and owners in recreational fishing activity. Indirect income is the earnings of labor and owners in firms supplying those directly involved in recreational fishing. Induced earnings, are the earnings of labor and owners that occur when those earning direct and indirect income spend their income.

Trips – measured in terms of the number of days from the time left from home until the return to the home.

Wetlands – lands where saturation with water is the dominant factor determining the nature of soil development and the types of plant, animal, and marine life communities living in the soil and on its surface[12].

[11] Definitions of direct, indirect, induced, total effects and multipliers are adopted from Ransom, M. M. (2001). Economic Impact of Salmon Fishing. Davis, CA, USDA Natural Resources Conservation Service.

[12] Adapted from California Wetlands Information System, s.v. "Defining Wetlands," http://ceres.ca.gov/wetlands/introduction/defining_wetlands.html

Appendix B – Details of Data Collection, Estimation Methods, Assumptions, and Limitations

Method of Data Collection and Estimation Methods

Expenditure Data

Although state expenditure data on recreational fishing is available, expenditure data is not available for the regions of interest to this study. Categories of expenditure were obtained from Bohnsack and Ditton (Bohnsack and Ditton 1999) and slightly modified. A 1995 study by Jones and Tanyeri-Abur provided a Gulf Coast average expenditure. An index was calculated to determine how a specific bay compared to the Gulf Coast average for different expenditure categories. The index was calculated by dividing the Bay average trip expenditure by the Gulf average expenditure. For instance, an index greater than one indicated that the regional expenditure was above the Gulf Coast average. This index was then multiplied by the Gulf Coast average for each expenditure category, to determine the Bay's categories of expenditure. An adjustment for inflation (2003) was made to the result. Non-local angler expenditures annually, and daily were, on average, 11% higher than local angler expenditure based on the Southwick study (Southwick 2003). This percentage was used and applied to resident expenditures to calculate non-local expenditures.

Other Input Data

Number of Local and Non-local Anglers

Stamp data by county was used to obtain the number of anglers. The number of stamps issued to residents of coastal counties was used as the number of local anglers for that county. The number of stamps issued to residents of adjacent and non-coastal county residents was used as the number of non-local anglers. Total number of anglers per Bay was determined by adding the stamp data for the counties surrounding each Bay area.

Assumptions[13] and Limitations

Local and Non-local

Stamp data was categorized as coastal, adjacent and non-coastal. Sportfishing licenses issued to coastal counties surrounding a Bay were assumed to indicate local activity. Stamp licenses issued to adjacent (contiguous to a coastal county) and non-coastal counties were assumed to indicate non-local activity.

Trip Length

1.25 days, although the Ditton study uses one (1) day = 1 trip

Average number of days fished per boat per year

7.5 days based on statewide figures (U.S. Department of the Interior March 2003), Bohnsack, and Southwick studies, this is a reasonable approximation.

Average Number of Trips per year

[13] Based on Wade Griffin survey or log data. All assumptions based on this data are my responsibility.

Studies suggest 5 – 8 trips. An assumption of 6 trips is used in this study.

Estimates

All estimates are adjusted for inflation and are based on the most current information which was available at the beginning of this study. The estimates of direct impact and secondary impacts reported here represent regional impacts. County level direct and indirect impacts have been aggregated and averaged to determine regional impacts, but regional estimates should be used and compared with caution, since bay/estuary regions can overlap several counties. Finally, estimates of recreational fishing impacts in each region may differ from those obtained from different models, methodologies and data sources. However, the input data contained herein compares with approaches taken in other studies.

Appendix C – The IMPLAN Model[14]

IMPLAN© was used to analyze the economic activity from recreational fishing expenditures in the bay/estuaries of the Texas Gulf Coast. The economic data used in the analysis, as well as the model, was purchased for and used by Sang-Kwon Lee[15], under the direction of Dr. John Crompton[16]. Jamie-Rae Lee[17] provided research assistance. IMPLAN and the database of relevant county social/economic accounts represent the regional economy in terms of transactions between households and industry sectors.

The data input to the IMPLAN model are the estimates of direct recreational fishing expenditures made by participants in hunting along the Texas Gulf Coast. Direct expenditure estimates are based on extrapolations from various studies, reports and data sources (see text for relevant bibliography references).

The IMPLAN model uses multipliers which are reported elsewhere in this report. Multipliers are estimates of how a dollar of spending multiplies itself throughout the regional economy. As a consequence of this, the total effect of the economic activity at the regional level, resulting from recreational fishing, is greater than the actual amount of direct expenditure.

The total amount of spending by anglers is the first round of spending and represents direct expenditure. This direct spending stimulates economic activity as these dollars are paid to those who supply inputs to businesses which directly sell to anglers. These suppliers then spend the money they receive as income to pay for labor (salaries, wages and benefits). The indirect effect, then, of the initial spending of anglers are purchases from other local industries. These are payments of the recipient businesses to other private sector businesses in the same locality to restock inventories, provide for future sales, maintenance and other services, such as insurance. The induced effect of the initial spending of anglers is payments (personal income) to employees who reside in the area, in the form of salaries and wages.

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[14] The description of IMPLAN in this section draws heavily from Thompson, M. and E. Wagenhals (2002). Economic Impact of Nature Tourism and Cultural Activities in Worcester County, Maryland. College Park, Maryland, University of Maryland.

[15] Ph.D student, Department of Recreation, Parks, and Tourism Sciences, Texas A&M University

[16] Distinguished Professor, Department of Recreation, Parks, and Tourism Sciences, Texas A&M University

[17] Ph.D student, Department of Recreation, Parks, and Tourism Sciences, Texas A&M University.

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