ECONOMIC ACTIVITY ASSOCIATED WITH **WILDLIFE OBSERVATION** ALONG THE TEXAS GULF COAST

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Introduction

This report focuses on estimating the economic activity[1] associated with wildlife observation[2] 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. The results show trip- and equipment-related spending of residents and non-residents on wildlife observation in each of these regions and the impact this spending had on the economy in terms of earnings, employment and sales output. Birding is assumed to be the main activity associated with wildlife observation in the regions of interest to this study.

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. 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) is also available for wildlife observation. However, no information exists on a regional basis for this type of activity, but information on this type of activity is collected by Metropolitan Statistical Area (MSA), the counties of which closely conform to counties surrounding bays and estuaries. In addition, some survey-based studies have been done on participation rates in, and expenditures on, wildlife observation associated with specific events and these studies have been utilized to extrapolate information which is not available on a state or regional basis. Estimates of hunting 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.

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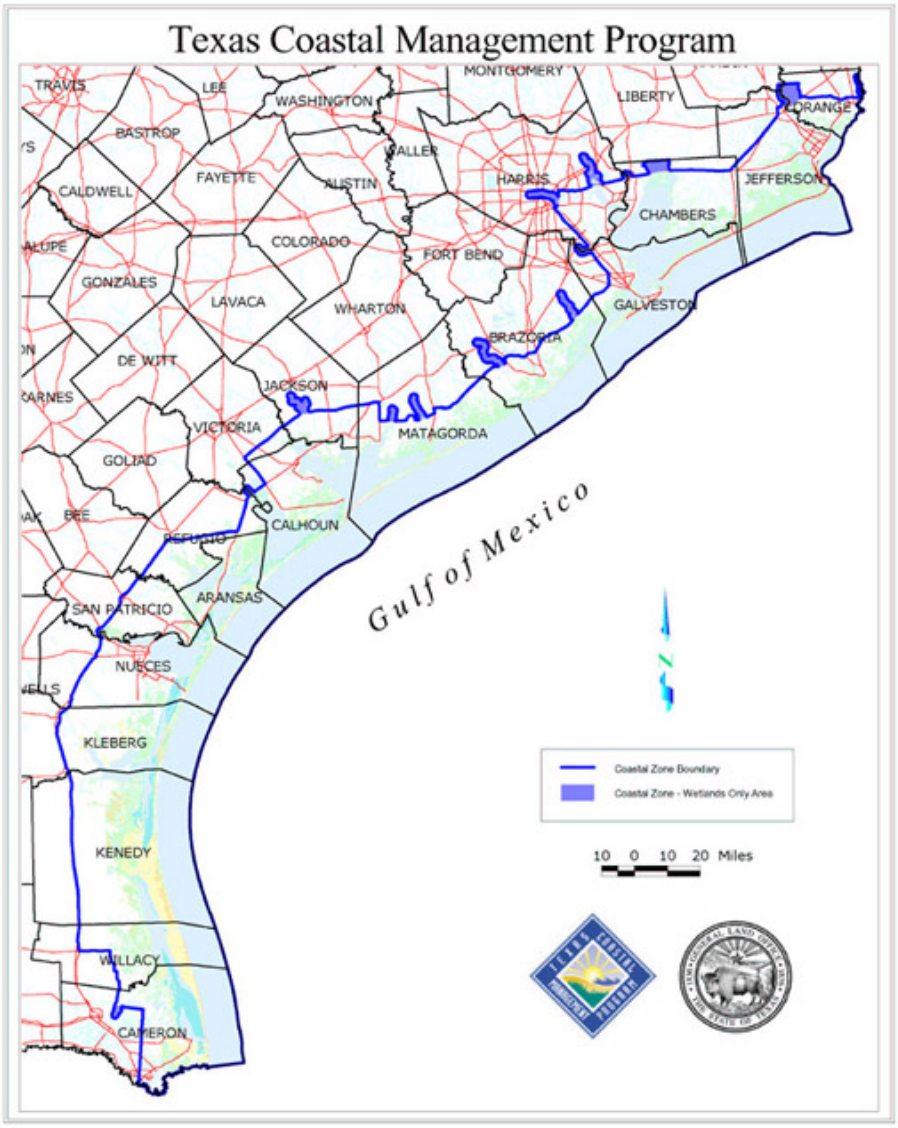
[1] In this study, economic activity refers to the direct stimuli generated by resident and non-resident expenditures. It is not uncommon to make a distinction between economic impact and economic activity. Southwick refers to economic activity as 'economic importance' Southwick, R. (2002). The Economic 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] Non-consumptive use of birds includes taking a trip to observe, photograph or feed birds of prey, waterfowl and shore birds and all other birds (e.g., songbirds). Non-consumptive use of waterfowl includes taking a trip to observe, photography or feed waterfowl and shore birds as defined in Southwick Associates.

Section A provides a brief overview of the study area and geography of the bay system. Section B briefly describes wildlife observation in the study area. Section C summarizes the direct impact of observation 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 wildlife observation. 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.

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.

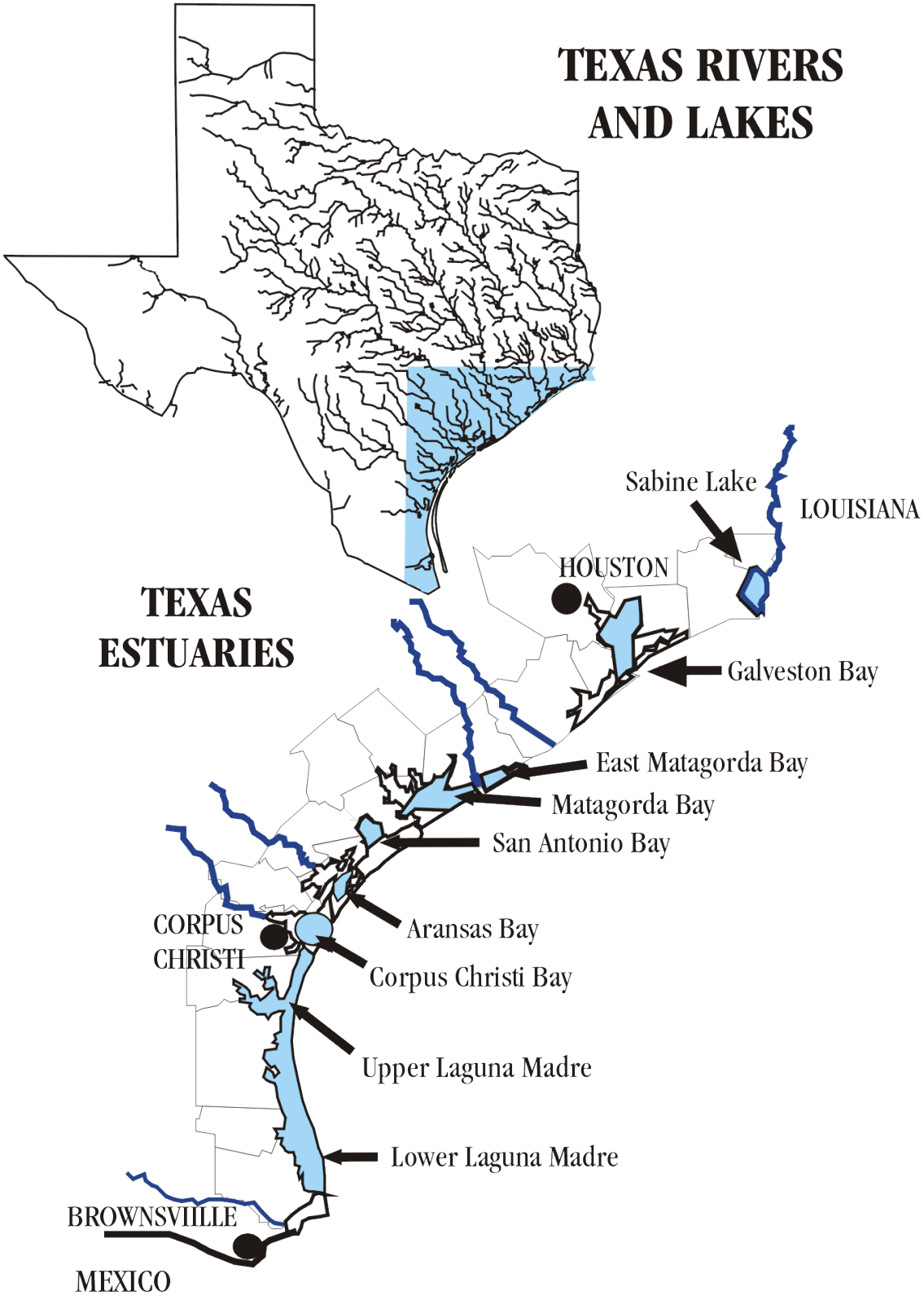


Figure 2: Bay Areas Comprising the Study Area

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:

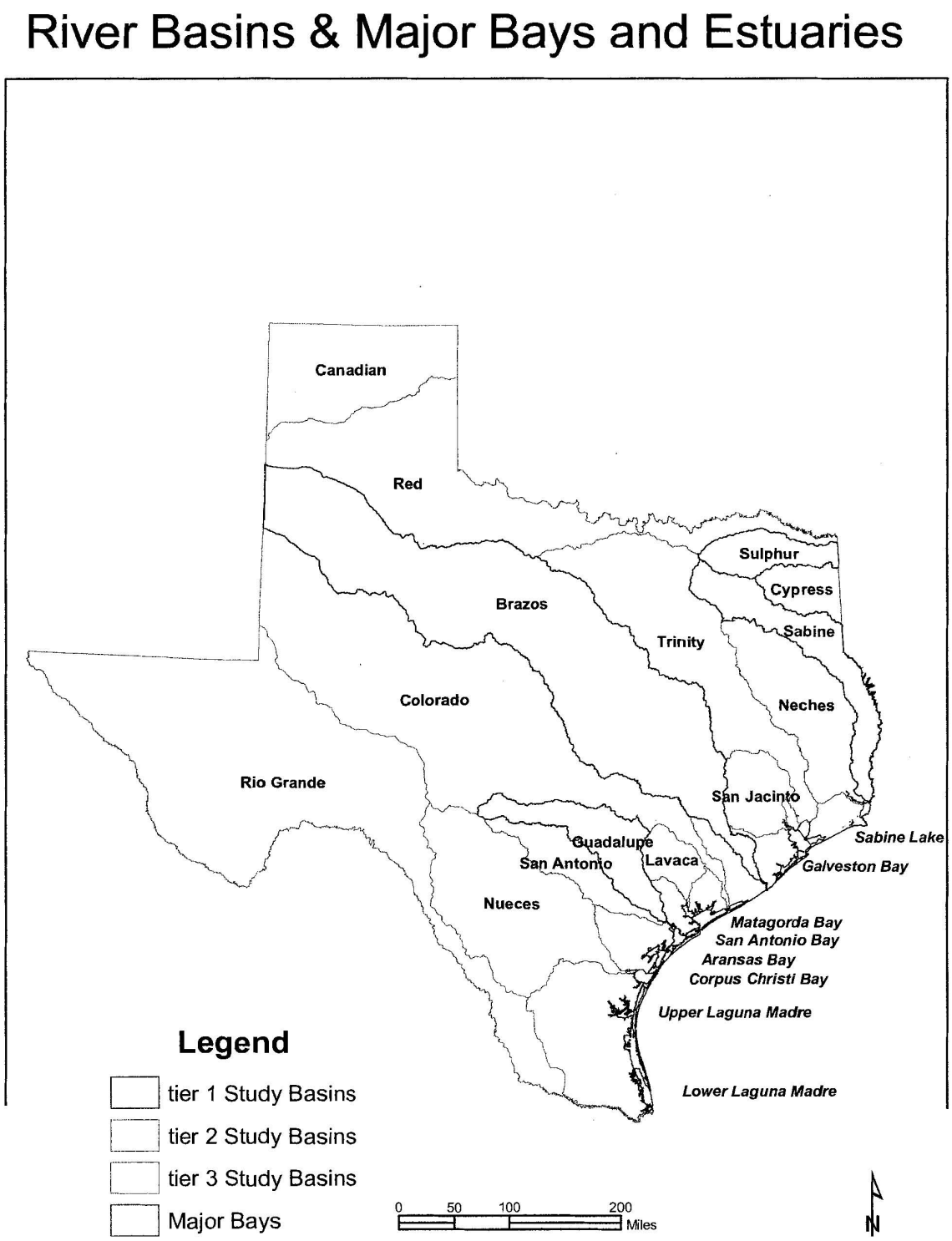

River Basins & Major Bays and Estuaries
Canadian
Red
Brazos
Colorado
Rio Grande
Nueces
Sulphur
Cypress
Sabine
Trinity
Neches
San Jacinto
Guadalupe
San Antonio
Lavaca
Sabine Lake
Galveston Bay
Matagorda Bay
San Antonio Bay
Aransas Bay
Corpus Christi Bay
Upper Laguna Madre
Lower Laguna Madre
Legend
tier 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 wildlife observation takes 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 Wildlife Observation in Texas[4]

Gulf coast estuaries and bays, fed by freshwater inflows, contain coastal wetlands which constitute the perfect marine environment for a wide variety of birds along the Texas Gulf coast. In this way, estuaries provide a benefit indirectly through the habitats which support these bird species and where people can enjoy them. Anahuac National Wildlife Refuge, High Island, King Ranch and Bolivar Flats are all considered to be premier spots for bird watching in this area[5]. Galveston Island State Park and Brazos Bend State Park are both places where many species of birds can be observed. Bird watching is an activity that can be enjoyed from the comfort of one's own backyard or the activity described in this report can refer to casual and active enthusiasts who travel to see specific species of birds in natural or wild environments.

Expenditures on wildlife associated recreation generally reflect those of participants 16 years and older. In 2001, 2.3 million state residents and nonresidents, 16 years and older observed birds around the home and on trips; 89% or 2 million observed birds around the home and 38% (851,000) took trips away from home. They spent their money on trip-related expenditures such as food and lodging and equipment such as binoculars, tents, backpacking equipment, campers and trucks. Miscellaneous other things such as and land leasing and ownership were also purchased.

Estimates of hunting participation on the local or regional level is made difficult by the lack of published data. The Office of the Governor Economic Development and Tourism does collect information does report data by Metropolitan Statistical Area (MSA) on bird/wildlife observation/eco-tourism and this information is used in this report. Birders are considered to be nature tourists and are appreciated for their minimum impact on the environment.

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[4] Wildlife Observation can be broadly defined, but refers mainly, but not exclusively, to bird watching, or birding in the regions of interest in this study. It is a non-consumptive activity during which observing, feeding, or photographing birds and/or other wildlife.

[5] The information in this section is obtained from the Office of the Governor Economic Development and Tourism's 'Tourism Tip Sheet: Birding",
http://www.travel.state.tx.us/documents/birding_01127402705634712718.pdf

C. Initial Spending

Spending on wildlife observation is measured by the spending by nature tourists, 16 years or older, for such things as transport, lodging, food, miscellaneous and other expenses, and those expenditures made out-of-state. Wildlife observers are classified in this study into casual and active locals and non-locals and out-of-state participants.

1. Expenditures For Each Bay Area

Total expenditures in each Bay area was estimated using category expenditure data from studies by Cole and Scott (Cole and Scott 1999), Eubanks, Kerlinger and Payne (Eubanks, Kerlinger et al. 1993) and Eubanks, Stoll and Ditton (Eubanks, Stoll et al. 2004). Participation data was provided in Scott and Thigpen (Scott and Thigpen 2003) and Cole and Scott (Cole and Scott 1999). Methodology used to adapt these figures to spending at the bay/estuary regional level is explained in Appendix B. The following is a summary of expenditures in the Bay region of Texas adjusted for inflation[6].

1. San Antonio and Matagorda Bays[7]

Residents		Active	Casual
		5	**6**
	Food	384	192.2493506
	Misc/Other	306	153.0713766

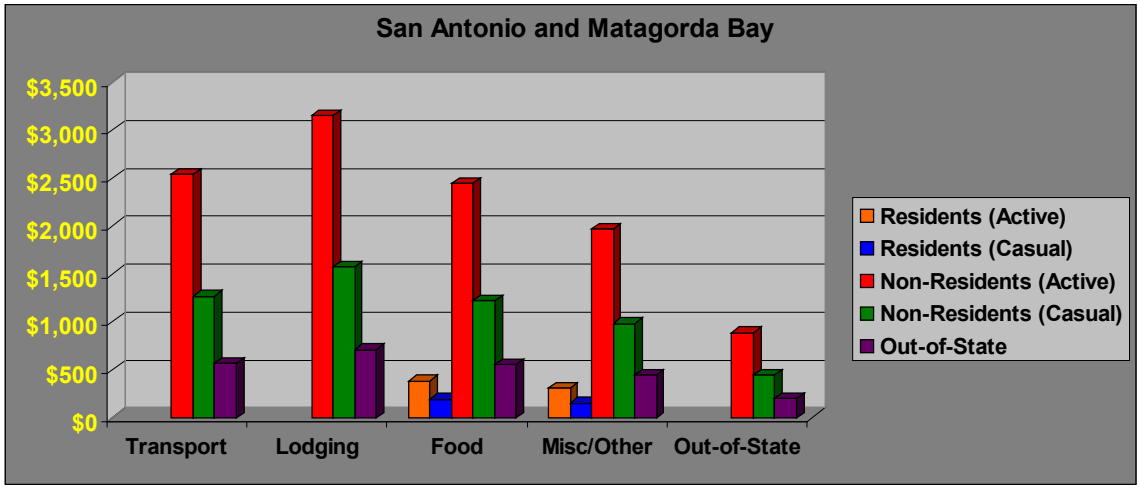
Texas Non-Residents		Active	Casual
	Transport	2536	1268.072727
	Lodging	3155	1577.267532
	Food	2441	1220.322078
	Misc/Other	1965	982.5038961
	Out-of-State	887	443.7194805

[6] 2001 adjusted to 2003 dollars.

[7] San Antonio Bay: Calhoun, Matagorda, Victoria, Goliad, Refugio Counties. Matagorda Bay: Jackson, Matagorda, Victoria, Wharton Counties

Out-of-State

Transport	570.6408623
Lodging	709.7793662
Food	549.1398857
Misc/Other	442.1292779
Out-of-State	199.6872312



2. Corpus Christi and Aransas Bays[8]

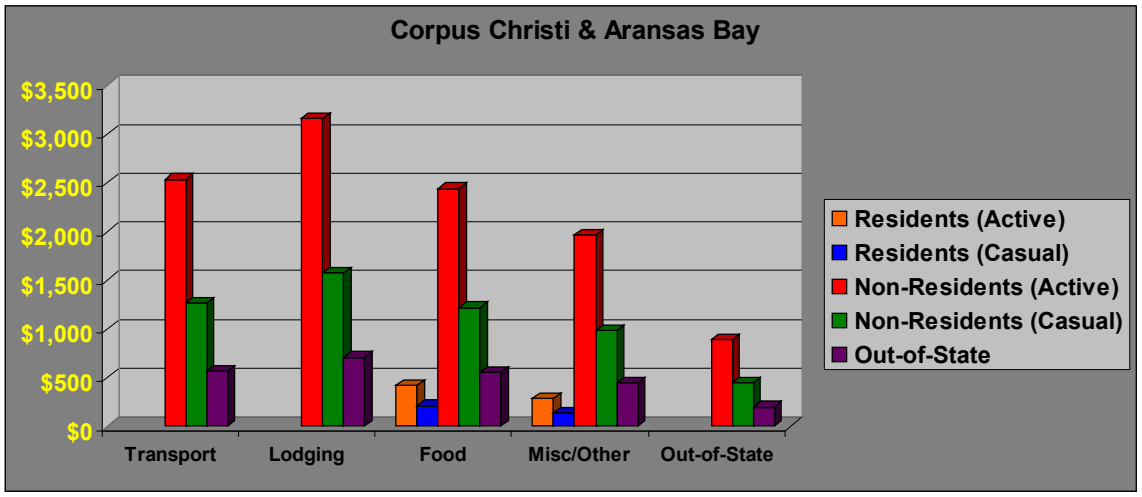
Table 4:

		Active	Casual
Residents			
	Food	423	211.4742857
	Misc/Other	287	143.6641745
Texas Non-Residents			
	Transport	2536	1268.072727
	Lodging	3155	1577.267532
	Food	2441	1220.322078
	Misc/Other	1965	982.5038961
	Out-of-State	887	443.7194805

[8] Corpus Christi Bay: Nueces, San Patricio Counties. Aransas Bay: Aransas, Bee, Jim Wells, Refugio Counties

Out-of-State

Transport	570.6409
Lodging	709.7794
Food	549.1399
Misc/Other	442.1293
Out-of-State	199.6872



3. Baffin Bay/South Bay[9]

Residents

Food	324	162.1743325
Misc/Other	422	210.8513728

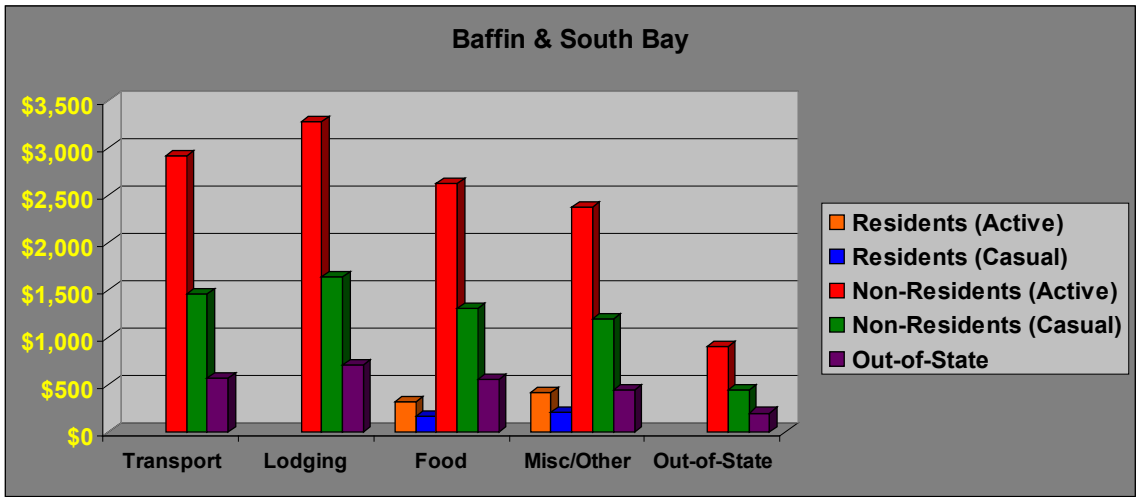
Texas Non-Residents

Transport	2912	1456.145455
Lodging	3274	1636.862338
Food	2621	1310.4
Misc/Other	2376	1187.844156

[9] Baffin Bay: Kenedy, Kleberg Counties. South Bay: Brooks, Cameron, Hidalgo Counties.

Out-of-State

Transport	549.2418	570.6409
Lodging	683.1626	709.7794
Food	528.5471	549.1399
Misc/Other	425.5494	442.1293
Out-of-State	192.199	199.6872



4. Sabine Lake[10]

Residents

	Active	Casual
	5	**6**
Food	269	134.5745455
Misc/Other	178	89.16779221

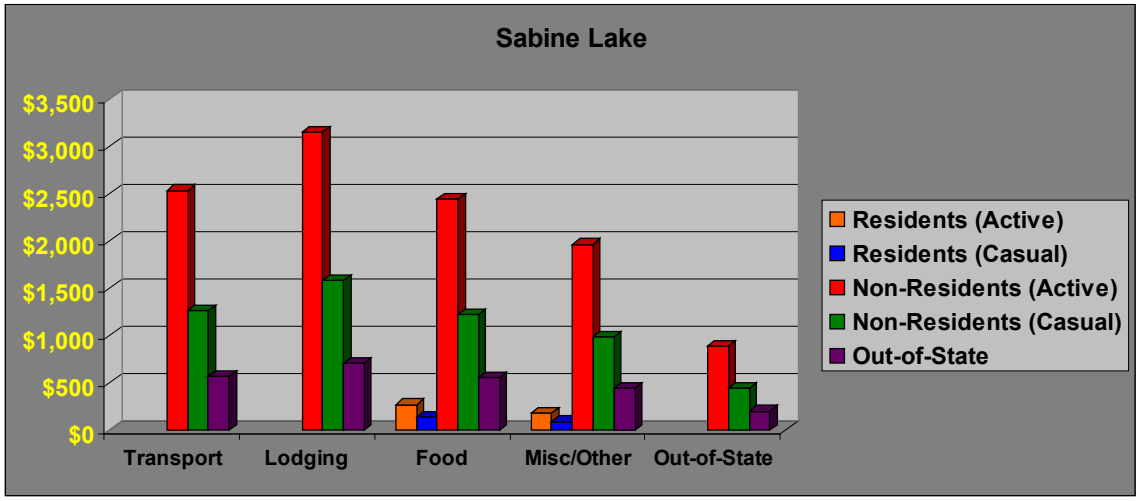
[10] Sabine Lake: Hardin, Jefferson, Orange Counties

Texas Non-Residents

Transport	2536	1268.072727
Lodging	3155	1577.267532
Food	2441	1220.322078
Misc/Other	1965	982.5038961
Out-of-State	887	443.7194805

Out-of-State

Transport	549.2418	570.9633
Lodging	683.1626	710.1804
Food	528.5471	549.4501
Misc/Other	425.5494	442.3791
Out-of-State	192.199	199.8



C. Estimates of Economic Activity

1. Impact Categories

Impact Category	Description
Sales Output	• Measured in dollars • Sales or output as the dollar volume of a good or service sold as a result of the direct, indirect, and induced effect of an extra dollar of spending in the region. • Final demand = sales to final consumers or participants in wildlife observation

	• Intermediate sales = sales to other industrial sectors
Income	• Measured in dollars • The amount of personal income (wages, salary income, proprietor's income, rents and profits stimulated in wildlife observation-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 wildlife observation-related sectors, as a result of the direct, indirect, and induced effect of an extra dollar of spending in the region. Includes 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 2,011,933 wildlife observers participated in wildlife observation in bay/estuary regions along the Texas Gulf Coast, which is not an unreasonable estimate given the estimate obtained from the USFWS and U.S. Census 2001 Report (U.S. Department of the Interior March 2003). Transport, Food, Lodging, and Miscellaneous Other (souvenirs, fees and equipment (Eubanks, Stoll et al. 2004)) expenditures were almost equally weighted.
- Expenditures made by local wildlife observationists generate direct, indirect, and induced results of economic activity. The sum of these is the total economic activity resulting from wildlife participant expenditure. Total economic activity from local hunter expenditures adjusted to 2003 dollars in Gulf Coast bays is estimated at $3,530,769.
- Expenditures made by non-local wildlife observationists generate direct, indirect, and induced results of economic activity. The sum of these is the total economic activity resulting from wildlife participant expenditure. Total economic activity from non-local wildlife participant expenditures adjusted to 2003 dollars in Gulf Coast bays is estimated at $1,477,775.

- Sales Output Total retail sales generated from expenditures adjusted to 2003 dollars from local wildlife observationists is estimated at $5,175,733.
- Sales Output Total retail sales generated from expenditures adjusted to 2003 dollars from non-local wildlife observationists is estimated at $2,087,688.
- Income Total household earnings generated from expenditures adjusted to 2003 dollars from local wildlife participants is estimated at $2,950,250.
- Income Total household earnings generated from expenditures adjusted to 2003 dollars from non-local wildlife observationists is estimated at $1,184,291.
- Employment Hunting by local participants supported 114.1 full-time and part-time jobs in the Gulf Coast region of Texas. These are jobs that are directly associated with wildlife participation in addition to jobs in industries that indirectly support these activities.
- Employment Hunting by non-local participants supported 47.7 full-time and part-time jobs in the Gulf Coast region of Texas. These are jobs that are directly associated with wildlife observation in addition to jobs in industries that indirectly support these activities.

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

Table 10:

Economic Impact of Bird Hunting Expenditure

BAY	LOCAL DIRECT EXPENDITURE	OUTPUT	INCOME	EMPLOYMENT
Aransas Bay	$33,429	$46,062	$25,991	1.2
Baffin Bay	$37,869	$51,559	$28,661	1.3
Corpus Christi Bay	$120,344	$206,449	$120,554	3.8
Galveston Bay	$2,453,001	$3,592,195	$2,046,133	79.9
Matagorda Bay	$328,091	$423,960	$239,344	10.3
Sabine Lake Bay	$486,976	$752,523	$432,194	15.2
San Antonio Bay	$30,184	$37,388	$20,657	0.9
South Bay	$40,875	$65,597	$36,716	1.5
	$3,530,769	**$5,175,733**	**$2,950,250**	**114.1**

Table 11:

	NON-LOCAL			
	DIRECT EXPENDITURE	OUTPUT	INCOME	EMPLOYMENT
Aransas Bay	$32,260	$44,451	$25,083	1.1
Baffin Bay	$0	$0	$0	0.0
Corpus Christi Bay	$108,116	$185,470	$108,305	3.4
Galveston Bay	$724,926	$1,062,335	$603,912	23.7
Matagorda Bay	$545,807	$705,592	$397,125	17.3
Sabine Lake Bay	$0	$0	$0	0.0
San Antonio Bay	$46,836	$58,014	$32,053	1.4
South Bay	$19,831	$31,825	$17,813	0.7
	$1,477,775	**$2,087,688**	**$1,184,291**	**47.7**

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

Table 12:

Economic Impact of Bird Hunting Expenditure

BAY	LOCAL			
	DIRECT EXPENDITURE	OUTPUT	INCOME	EMPLOYMENT
Aransas Bay	$33,429	$46,062	$25,991	1.2
Baffin Bay	$37,869	$51,559	$28,661	1.3
Corpus Christi Bay	$120,344	$206,449	$120,554	3.8
Galveston Bay	$2,453,001	$3,592,195	$2,046,133	79.9
Matagorda Bay	$328,091	$423,960	$239,344	10.3
Sabine Lake Bay	$486,976	$752,523	$432,194	15.2
San Antonio Bay	$30,184	$37,388	$20,657	0.9
South Bay	$40,875	$65,597	$36,716	1.5
	$3,530,769	**$5,175,733**	**$2,950,250**	**114.1**
	NON-LOCAL			
	DIRECT EXPENDITURE	OUTPUT	INCOME	EMPLOYMENT
Aransas Bay	$32,260	$44,451	$25,083	1.1
Baffin Bay	$0	$0	$0	0.0
Corpus Christi Bay	$108,116	$185,470	$108,305	3.4
Galveston Bay	$724,926	$1,062,335	$603,912	23.7
Matagorda Bay	$545,807	$705,592	$397,125	17.3
Sabine Lake Bay	$0	$0	$0	0.0
San Antonio Bay	$46,836	$58,014	$32,053	1.4
South Bay	$19,831	$31,825	$17,813	0.7
	$1,477,775	**$2,087,688**	**$1,184,291**	**47.7**
	TOTAL			
	DIRECT EXPENDITURE	OUTPUT	INCOME	EMPLOYMENT
Aransas Bay	$65,689	$90,513	$51,074	2.3
Baffin Bay	$37,869	$51,559	$28,661	1.3
Corpus Christi Bay	$228,460	$391,919	$228,859	7.2
Galveston Bay	$3,177,927	$4,654,530	$2,650,045	103.6
Matagorda Bay	$873,898	$1,129,552	$636,469	27.6
Sabine Lake Bay	$486,976	$752,523	$432,194	15.2
San Antonio Bay	$77,020	$95,402	$52,710	2.4
South Bay	$60,705	$97,422	$54,529	2.2
	$5,008,544	**$7,263,421**	**$4,134,541**	**161.8**

Appendix A – Terms and Definitions

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

Economic Activity - the economic stimuli as a result of resident and non-resident expenditures. The direct effect in hunting refers to the money spent by hunters. This term is especially useful even when the data does not identify the percentage of hunters comprised by non-residents[11].

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.[12]

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 hunters.

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

Input-Output Model[13] – 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 shotguns, scopes.

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[11] 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.

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

[13] 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

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

Multiplier – Estimates the impact that every dollar of hunting expenditure has on the economy. A multiplier of 1.50 indicates that for every dollar of expenditure in hunting, $1.50 worth of products and services is generated in the regional economy. They measure the size of the indirect effects in a given region, as a ratio of the total change in economic activity in the region relative to the total change. IMPLAN multipliers are used, which do not estimate the duration of the impact.[14]

Multipliers may be expressed as ratios of sales, income or employment, or as ratios of total income or employment changes relative to direct sales. They can vary across regions because they depend on the degree of interdependency between sectors in a region's economy.

Type I multipliers do not include induced effects, while Type II and Type III multipliers do.

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

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[15].

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[14] 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.

[15] 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 wildlife observation is available, expenditure data is not available for the regions of interest to this study. Categories of expenditure were obtained from studies done by Shifflet and Associates, conducted for the Texas Department of Economic Development (Shifflet Associates Ltd. and Development 2001), Cole and Scott (Cole and Scott 1999), Eubanks, Kerlinger and Payne (Eubanks, Kerlinger et al. 1993) and Eubanks, Stoll and Ditton (Eubanks, Stoll et al. 2004). Proportion of eact expenditure category to total spending was given by the Eubanks, Kerlinger, et al. study. Participation data was provided in Scott and Thigpen (Scott and Thigpen 2003) and Cole and Scott (Cole and Scott 1999). Gulf average expenditures were obtained from the High Island Study. Regional differences in expenditure categories were accounted for by using the Texas Department of Economic Development indices for bird/wildlife observation/eco-tourism. 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. Non-local daily expenditure was given by using the local to non-local and foreign visitor breakdown reported in the High Island study. Casual and Non-Casual expenditure differences were obtained by using the difference in the number of days and the number of trips taken by casual and non-casual visitors. An adjustment for inflation (2003) was made to each expenditure category.

Other Input Data

Number of Local and Non-local Wildlife Participants

The studies mentioned above were used to estimate the number of wildlife observation participants. In all regions except Galveston and South and Baffin Bays, the Office of Economic Development numbers given for the volume of visitors to each MSA was obtained. For each MSA, except Galveston and South and Baffin Bays, this number was then multiplied by the percentage of wildlife observationists in that region. which the same source reported. This number was then broken down into locals, non-locals and out-of-state participants by assuming that the proportion would be the same as given in the High Island study. An individual study was done on High Island which is in the Houston/Galveston region, so these numbers were used in that region. Similarly, an individual study was done with survey data from the Baffin/South Bay region, and this data was used instead of the Texas Office of Economic Development data.

Assumptions and Limitations

Local and Non-local

Licenses issued to adjacent (contiguous to a coastal county) and non-coastal counties were assumed to indicate non-local activity.

Trip Length

1 day = 1 trip for the local resident.

1 trip = 7 days for active non-resident participants

1 trip = 1.24 – 1.93 days for casual non-resident participants

Average number of days spent hunting per year

12 days for the Casual Participant and 90 days for the Active/Committed Participant.

Average Number of Trips per year

An assumption of 6 trips for Casual Participants and 12 trips for more Active/Committed Participants 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 hunting 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[16]

IMPLAN© was used to analyze the economic activity from hunting 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[17], under the direction of Dr. John Crompton[18]. Jamie-Rae Lee[19] 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 hunting 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 the hunting, is greater than the actual amount of direct expenditure.

The total amount of spending by hunting participants 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 the hunters. 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 hunters 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 hunters is payments (personal income) to employees who reside in the area, in the form of salaries and wages.

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[16] 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.

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