

The Economic Impacts of Recreational Fishing in the Lower Laguna Madre Bay System

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Executive Summary

The objective of this report was to estimate the economic impacts of marine recreational fishing in the Lower Laguna Madre Bay System. The estimates presented include only impacts associated with fishing trips and not spending on durable goods (fishing gear, rods, boats, etc.) related to fishing. The data used to estimate the economic impacts came from fishing effort estimates provided by the Texas Parks and Wildlife Department and a National Marine Fisheries Service study titled: “The Economic Contribution of Marine Angler Expenditures in the United States, 2011.” Major findings include:

- Total annual economic impacts of marine recreational fishing in the Lower Laguna Madre Bay System were estimated to be:
 - 479 jobs,
 - \$16.6 million in labor income,
 - \$26.0 million in value-added (contribution to Texas GDP), and
 - \$45.3 million in output (sales value of goods and services).
- Shore-based fishing trips accounted for roughly 62% of all angler-trips and the majority of economic impacts (~60%).
- While mean trip expenditures of for-hire trips were more than twice as large as private vessel and shore based expenditures, for-hire trips accounted for the smallest share of total economic impacts due to fewer trips (~3% of all trips).
- Resident anglers accounted for 95% of all angler-trips and almost all economic impacts (~93%).

Introduction

The Laguna Madre is a coastal bay that stretches approximately 130 miles from Corpus Christi to the Rio Grande Valley. The lagoon is the only hyper-saline coastal lagoon (higher salinity than seawater) in North America and one of only five in the world (Blankinship and Spiller 2016). The lagoon is actually two bodies of water separated by approximately 25 miles of mud and sand flats. The Lower Laguna Madre Bay System is approximately 60 miles long and stretches through portions of Kennedy, Willacy, and Cameron counties. The Lower Laguna Madre Bay System includes the Lower Laguna Madre and South Bay. The bay system is home to expansive seagrass beds that provide habitat for numerous fish species and make the lagoon popular with recreational anglers. Species commonly targeted by anglers include spotted seatrout, flounder, and red and black drum. In addition to these more common species, recreational fishers in the Lower Laguna Madre Bay System have opportunities to target species not often found in other Texas bay systems such as snook, gray snapper, Florida pompano, and barracuda (Blankinship and Spiller 2016).

The abundant fishing opportunities available in the Lower Laguna Madre Bay System make recreational fishing a favored pastime of both locals and visitors to the area. The Texas economy benefits from these fishing trips through angler spending on goods and services such as lodging, food, ice, bait, and fuel. In this paper, we estimate the annual economic impacts of Lower Laguna Madre Bay System recreational fishing on the Texas economy. Our analysis combines data from the Texas Parks and Wildlife Department (TPWD) on recreational fishing in the Lower Laguna Madre with Texas marine recreational angler spending estimates from a National Marine Fisheries Service (NMFS) report (Lovell, Steinback, and Hilger 2013) to calculate estimated economic impacts. The analysis presented covers three types of bay fishing: 1) for-hire fishing trips utilizing a guide or charter service, 2) fishing from a private vessel, and 3) and fishing from shore⁵.

Recreational Angler Effort Data

Data on fishing effort by bay system in the state of Texas are collected annually by the TPWD through their creel surveys. TPWD conducts creel surveys throughout the year at specified boat-access sites along the Texas coast from Port Arthur to Port Isabel. More than 1,000 surveys are scheduled annually on randomly selected weekdays and weekend days, with site survey frequency proportional to

⁵ Shore fishing includes fishing from fishing piers.

site fishing pressure, meaning more active sites are surveyed more frequently (Green 2016). While the major objective of the surveys is to determine how many fish are being caught, TPWD also uses the data gathered to estimate fishing effort (number of trips) in each bay system, including the Lower Laguna Madre Bay System. Table 1, shown below, provides TPWD estimates of recreational angler effort in the Lower Laguna Madre Bay System for anglers employing for-hire vessels (charter trips), fishing from private vessels, and shore anglers. The estimates are provided in “angler-trips,” which accounts for multiple anglers on a trip; for instance, if four anglers went fishing together, it would represent four angler-trips, not a single group fishing trip. The percentage of anglers from Texas is also included. The estimates for private vessel and for-hire effort is from the 2014-2015 fishing year, while the estimate for shore fishing effort is from the 2013-2014 fishing year⁶.

Table 1. Lower Laguna Madre Bay System Recreational Fishing Effort by Angler Type

<u>Angler Type</u>	<u>Angler-Trips</u>	<u>% Texan</u>
For-Hire	8,629	84.9%
Private Vessel	89,198	97.7%
Shore	160,875	93.8%

Recreational Angler Spending Data

Data on recreational angler spending were gathered from a NMFS report titled “The Economic Contribution of Marine Angler Expenditures in the United States, 2011.” This report used survey results to estimate marine recreational fishing expenditures for each coastal state. The report defined marine recreational fishing as: “... fishing for finfish in the open ocean or any body of water that is marine or brackish for sport or pleasure.” The surveys collected data on angler-trip expenditures related to their most recent marine recreational fishing trip. The data gathered were used to calculate the economic impacts of marine recreational fishing at the state and national level (Lovell, Steinback, and Hilger 2013). The analysis presented in this paper adjusts the trip expenditure estimates to account for changing prices (fuel) and general inflation and calculates current estimates of the economic impacts associated with marine recreational fishing in Texas.

⁶ TPWD creel survey data are annualized for a fishing year spanning from May 15th to May 14th. TPWD collects shore angler effort data less frequently, and the 2013-2014 creel year represents the most recent estimate of shore angler effort.

Texas survey data were collected through a mail survey of fishers with valid Texas fishing licenses that allowed marine recreational fishing in 2011⁷. Surveys were conducted monthly throughout the year to capture seasonality in trip expenditures. The survey response rate was 17.6%; 1,025 of the 5,820 mail surveys sent out were at least partially completed⁸ (Lovell, Steinback, and Hilger 2013). The survey asked respondents questions about their expenditures related to their most recent marine fishing trip and spending on marine fishing-related durable goods (tackle, clothing, boats, license fees, etc.) during the previous year⁹. Respondents were asked to report what they personally spent on themselves and others and to not include any money that was spent on them by others; the question was asked in this manner in an attempt to calculate per-angler expenditures and not per-angling-party expenditures. For multi-day trips that included other activities (sightseeing, beach-going, etc.), fishers were asked to estimate expenses related to the entire trip and not just the days spent fishing. Although all spending on multi-day trips was included in survey responses, reported mean trip expenditures were for an angler-trip, which was defined as a single day of fishing for a single angler (Lovell, Steinback, and Hilger 2013). Mean angler-trip expenditures from the report are presented in Table 2 by angler effort type (for-hire, private vessel, and shore) and residency status. The next section outlines the calculation of angler-trip economic impact estimates.

Angler-Trip Economic Impact Estimates

The first step in calculating the angler-trip economic impact estimates was to update the 2011 spending estimates to account for inflation and price changes. Spending estimates were updated to 2015 values. Fuel costs were adjusted to account for the decrease in fuel costs that occurred between 2011 and 2015¹⁰. All other expense categories were adjusted for inflation using the United States Bureau of Labor Statistics CPI figures¹¹. After accounting for inflation and lower fuel costs, mean angler-trip costs fell an

⁷ Some Texas fishing licenses are restricted to freshwater fishing only; these were excluded from the sample frame. The license holders that were included in the sample frame were: resident fishing and hunting combination, resident all-water, resident marine, non-resident all-water, and non-resident marine.

⁸ Some responses did not have all questions answered.

⁹ The analysis presented in this paper focuses on fishing trip expenditures and their impacts; durable goods expenditures are not included in the analysis.

¹⁰ The United States Energy Information Administration website was used to estimate changes in fuel costs. Per the website, the average fuel cost was \$3.37/gallon in 2011 and \$2.17/gallon in 2015. Mean angler-trip fuel expenditures were divided by the 2011 value and then multiplied by the 2015 value.

¹¹ Estimated inflation was 5.5% between 2011 and 2015.

average of 5% across the different angling types (for-hire, private boat, and shore) and angler types (resident and non-resident).

The second step in estimating the angler-trip economic impacts was to use IMPLAN, an input-output analysis software package, to determine how spending on recreational fishing impacted the Texas state economy (IMPLAN Group LLC. 2015). Each type of trip expenditure (fuel, lodging, food, etc.) is included in an IMPLAN sector that matches the type of business activity it represents and the economic impacts associated with spending in each sector are calculated. Once the appropriate IMPLAN sectors were identified, the IMPLAN model was run to estimate the associated impacts. Four different economic impact measures were calculated: employment, labor income, value-added, and output. Employment measures the number of jobs created by the marine recreational fishing expenditures. Labor income measures the wages paid to those employed due to marine recreational fishing in the Lower Laguna Madre Bay System. Value-added measures the increase in Texas GDP due to the spending of recreational fishers, and output measures the total value of goods and services purchased because of Lower Laguna Madre Bay System recreational fishing. Labor income is a component of value-added, which is a share of output; thus, these figures cannot be summed. The economic impacts estimated in this report are state-level impacts. Respondents to the NMFS survey were asked to report their trip expenditures incurred in the State of Texas; as such, we are unable to determine what percentage of spending occurred in the Lower Laguna Madre Bay System area. Because we are unable to determine where in Texas expenditures were incurred, estimating city or county level impacts was not feasible. The IMPLAN sectors associated with each expense category are presented in Table 3¹².

For each impact measure, three different effect types were estimated: direct, indirect, and induced. Direct effects are directly attributable to marine recreational fishing and include spending on goods and services by recreational anglers. Indirect effects are due to changes in inter-industry purchases as businesses used by recreational fishers purchase more goods and services from other businesses; an example of an indirect effect would be increased recreational fishing leading bait shops to buy more bait from commercial bait fishers. Induced effects include increased purchases of goods and services by those employed due to marine recreational fishing (bait fish retailers, charter guides, etc.).

¹² An examination of Table 3 will highlight differences between the IMPLAN sectors we used in our calculations of economic impacts and those used in the NMFS study. For a few of the expense categories, we felt different IMPLAN sectors better fit the expense than the sectors selected by the NMFS researchers.

Table 2. Mean Angler-Trip Expenditures by Fishing Type (from Lovell, Steinback, and Hilger 2013)

	For-Hire		Private Boat		Shore	
	Resident	Non-Resident	Resident	Non-Resident	Resident	Non-Resident
Auto Fuel	\$54.94	\$85.63	\$46.04	\$36.93	\$44.52	\$47.26
Auto Rental	\$0.00	\$22.57	\$0.00	\$14.27	\$0.04	\$3.16
Bait	\$4.26	\$2.55	\$13.60	\$10.20	\$12.33	\$10.35
Boat Fuel	\$0.00	\$0.00	\$32.99	\$16.11	\$0.00	\$0.00
Boat Rental	\$6.72	\$5.89	\$1.98	\$0.66	\$0.00	\$0.00
Charter Fees	\$205.77	\$152.20	\$0.00	\$0.00	\$0.00	\$0.00
Crew Tips	\$13.86	\$19.65	\$0.00	\$0.00	\$0.00	\$0.00
Fish Processing	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.09
Food from Grocery Stores	\$34.16	\$27.89	\$32.74	\$15.64	\$33.16	\$32.21
Food from Restaurants	\$37.31	\$30.41	\$23.84	\$28.68	\$24.39	\$24.82
Gifts/Souvenirs	\$8.13	\$24.83	\$1.70	\$8.94	\$3.04	\$10.24
Ice	\$5.45	\$2.42	\$4.19	\$3.17	\$2.87	\$3.50
Lodging	\$38.56	\$67.44	\$22.35	\$21.35	\$33.84	\$48.66
Parking & Site Access	\$0.58	\$4.64	\$1.68	\$1.59	\$2.33	\$2.60
Public Transportation	\$0.00	\$13.55	\$0.00	\$21.37	\$0.02	\$3.56
Tournament Fees	\$0.00	\$0.11	\$1.74	\$2.71	\$0.00	\$0.00
Total	<u>\$409.74</u>	<u>\$459.78</u>	<u>\$182.85</u>	<u>\$181.62</u>	<u>\$156.54</u>	<u>\$186.45</u>

Table 3. IMPLAN Sectors

Expense Category:	IMPLAN Sectors	IMPLAN Sector Descriptions
Auto Fuel	402	Retail - Gasoline Stores
Auto Rental	442	Automotive Equipment Rental & Leasing
Bait	404	Retail - Sporting Goods
Boat Fuel	402	Retail - Gasoline Stores
Boat Rental	443	General and Consumer Goods Rental
Charter Fees	414	Scenic and Sightseeing Transportation
Crew Tips	414	Scenic and Sightseeing Transportation
Fish Processing	93	Seafood Product Preparation & Packaging
Food from Grocery Stores	400	Retail - Food & Beverage Stores
Food from Restaurants	501	Full Service Restaurants
Gifts & Souvenirs	406	Retail - Miscellaneous
Ice	402	Retail - Gasoline Stores
Lodging - Hotels & Motels	499	Hotels & Motels
Lodging - Other Accommodations	500	Other Accommodation
Parking & Site Access	512	Other Personal Services - Parking
Public Transportation	408	Air Transportation

Calculation and Presentation of Economic Impacts

Angler-trip economic impacts were calculated for all three angling types (for-hire, private vessel, and shore) for both resident and non-resident anglers. Total economic impacts from recreational fishing in the Lower Laguna Madre Bay System were calculated as the product of TPWD estimates of angler-trips, and the estimated economic impacts per angler-trip. The economic impacts from for-hire, private vessel, and shore anglers are presented in Tables 4, 5, and 6, respectively. Economic impacts associated with shore-based fishing were approximately double the size of those associated with private vessel fishing and roughly four times the size of impacts associated with for-hire fishing. The higher impacts from shore fishing were due to the large number of shore-based recreational fishing trips taken (62% of all trips). Total impacts across all three angler types (for-hire, private vessel, and shore) are presented in Table 7. The impacts associated with resident anglers were significantly higher than the those associated with non-resident trips. While non-resident fisher trips generally led to greater angler-trip expenditures and economic impacts, the larger volume of residential trips (95% of all trips) outweighed the per-trip effects.

Table 4. Economic Impacts of Lower Laguna Madre Bay System For-Hire Recreational Fishing

For-Hire Resident				
Impact Type	Employment	Labor Income	Value Added	Output
Direct Effect	24.70	\$961,433	\$1,207,178	\$2,489,528
Indirect Effect	8.62	\$476,787	\$748,493	\$1,316,642
Induced Effect	8.99	\$417,943	\$728,254	\$1,278,096
<u>Total Effect</u>	<u>42.30</u>	<u>\$1,856,163</u>	<u>\$2,683,925</u>	<u>\$5,084,266</u>
For-Hire Non-Resident				
Impact Type	Employment	Labor Income	Value Added	Output
Direct Effect	4.65	\$175,645	\$243,253	\$470,166
Indirect Effect	1.50	\$82,717	\$132,657	\$235,134
Induced Effect	1.62	\$75,110	\$130,879	\$229,693
<u>Total Effect</u>	<u>7.76</u>	<u>\$333,472</u>	<u>\$506,789</u>	<u>\$934,994</u>
For-Hire Total				
Impact Type	Employment	Labor Income	Value Added	Output
Direct Effect	29.34	\$1,137,078	\$1,450,431	\$2,959,694
Indirect Effect	10.12	\$559,504	\$881,150	\$1,551,776
Induced Effect	10.61	\$493,053	\$859,133	\$1,507,789
<u>Total Effect</u>	<u>50.07</u>	<u>\$2,189,635</u>	<u>\$3,190,714</u>	<u>\$6,019,259</u>

Table 5. Economic Impacts of Lower Laguna Madre Bay System Private Vessel Recreational Fishing

Private Vessel Resident				
Impact Type	Employment	Labor Income	Value Added	Output
Direct Effect	98.91	\$2,730,353	\$3,923,644	\$6,537,068
Indirect Effect	16.90	\$874,572	\$1,547,816	\$2,780,371
Induced Effect	22.65	\$1,053,615	\$1,836,221	\$3,222,478
<u>Total Effect</u>	<u>138.47</u>	<u>\$4,658,541</u>	<u>\$7,307,682</u>	<u>\$12,539,916</u>
Private Vessel Non-Resident				
Impact Type	Employment	Labor Income	Value Added	Output
Direct Effect	2.62	\$80,527	\$127,395	\$222,173
Indirect Effect	0.52	\$29,199	\$52,394	\$96,933
Induced Effect	0.69	\$32,055	\$55,864	\$98,038
<u>Total Effect</u>	<u>3.83</u>	<u>\$141,781</u>	<u>\$235,652</u>	<u>\$417,144</u>
Private Vessel Total				
Impact Type	Employment	Labor Income	Value Added	Output
Direct Effect	101.52	\$2,810,880	\$4,051,039	\$6,759,241
Indirect Effect	17.43	\$903,772	\$1,600,210	\$2,877,303
Induced Effect	23.34	\$1,085,670	\$1,892,085	\$3,320,516
<u>Total Effect</u>	<u>142.30</u>	<u>\$4,800,322</u>	<u>\$7,543,334</u>	<u>\$12,957,060</u>

Table 6. Economic Impacts of Lower Laguna Madre Bay System Shore-Based Recreational Fishing

Shore Angler Resident				
Impact Type	Employment	Labor Income	Value Added	Output
Direct Effect	188.52	\$5,112,623	\$7,541,873	\$12,670,475
Indirect Effect	33.32	\$1,723,258	\$3,009,281	\$5,436,940
Induced Effect	42.99	\$1,999,432	\$3,484,653	\$6,115,366
<u>Total Effect</u>	<u>264.83</u>	<u>\$8,835,313</u>	<u>\$14,035,806</u>	<u>\$24,222,781</u>
Shore Angler Non-Resident				
Impact Type	Employment	Labor Income	Value Added	Output
Direct Effect	15.42	\$431,783	\$658,367	\$1,104,266
Indirect Effect	2.87	\$150,061	\$261,111	\$473,465
Induced Effect	3.66	\$170,099	\$296,447	\$520,249
<u>Total Effect</u>	<u>21.95</u>	<u>\$751,942</u>	<u>\$1,215,925</u>	<u>\$2,097,979</u>
Shore Angler Total				
Impact Type	Employment	Labor Income	Value Added	Output
Direct Effect	203.94	\$5,544,406	\$8,200,240	\$13,774,741
Indirect Effect	36.19	\$1,873,319	\$3,270,392	\$5,910,405
Induced Effect	46.65	\$2,169,530	\$3,781,099	\$6,635,614
<u>Total Effect</u>	<u>286.77</u>	<u>\$9,587,255</u>	<u>\$15,251,731</u>	<u>\$26,320,760</u>

Table 7 Economic Impacts of Lower Laguna Madre Bay System Recreational Fishing (All)

Resident				
Impact Type	Employment	Labor Income	Value Added	Output
Direct Effect	312.13	\$8,804,409	\$12,672,695	\$21,697,071
Indirect Effect	58.84	\$3,074,618	\$5,305,591	\$9,533,953
Induced Effect	74.63	\$3,470,990	\$6,049,128	\$10,615,940
<u>Total Effect</u>	<u>445.60</u>	<u>\$15,350,017</u>	<u>\$24,027,414</u>	<u>\$41,846,963</u>
Non-Resident				
Impact Type	Employment	Labor Income	Value Added	Output
Direct Effect	22.68	\$687,955	\$1,029,015	\$1,796,605
Indirect Effect	4.90	\$261,977	\$446,162	\$805,532
Induced Effect	5.96	\$277,263	\$483,189	\$847,980
<u>Total Effect</u>	<u>33.54</u>	<u>\$1,227,195</u>	<u>\$1,958,366</u>	<u>\$3,450,117</u>
Total				
Impact Type	Employment	Labor Income	Value Added	Output
Direct Effect	334.81	\$9,492,364	\$13,701,710	\$23,493,676
Indirect Effect	63.73	\$3,336,595	\$5,751,753	\$10,339,484
Induced Effect	80.59	\$3,748,253	\$6,532,317	\$11,463,920
<u>Total Effect</u>	<u>479.14</u>	<u>\$16,577,212</u>	<u>\$25,985,779</u>	<u>\$45,297,080</u>

Concluding Remarks

Marine recreational fishing in the State of Texas is not only a popular recreational activity but also a valuable part of the Texas economy. Our analysis indicates that Lower Laguna Madre Bay System recreational fishing trips generate 479 jobs and \$16.6 million in labor income in Texas annually. Trip spending by Lower Laguna Madre Bay System recreational fishers is also responsible for \$45.3 million of economic activity and contributes \$26 million to the Texas economy each year. Although per trip spending by anglers employing for-hire vessels was much higher than trip level spending by shore and private-vessel anglers, shore and private-vessel angler impacts were higher due to greater effort levels (more trips). Similarly, although non-resident anglers spent more money per trip on average; economic impacts from resident fishing trips were much larger than non-resident impacts because 95% of the trips were by residents.

The results of this analysis are presented with some caveats regarding the data from the NMFS survey. The first issue is that the data were not specific to the Lower Laguna Madre Bay System; the survey gathered data on Texas marine recreational fishing regardless of where the fishing occurred. It is possible that Gulf of Mexico anglers spend more on fishing trips, on average, than bay anglers, which would lead to overstated economic impacts. Such a problem would be exacerbated if Gulf anglers were more willing to respond to the survey. Similar problems could arise if spending on fishing trips varied significantly by coastal region or bay system. The second issue concerns the possibility of response bias. Anglers were asked to report only what they personally spent on themselves or others and not to include expenses paid on their behalf by others (Lovell, Steinback, and Hilger 2013). If anglers that funded trips were more likely to respond to the survey than those being funded, the spending estimates at the angler-trip level would be skewed upwards, which would lead to overstated impacts. The NMFS survey did not look specifically at this form of response bias; the authors evaluated other possible forms of response bias and found no issues. While the issues noted could impact the findings of this analysis, we have no evidence that any of these issues exist (regional spending differences, bay vs. Gulf differences, non-response bias among non-paying anglers) and believe the results presented provide an appropriate estimate of the annual economic impacts of recreational fishing in the Lower Laguna Madre Bay System.

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