

**CONTRACT CLOSE-OUT CHECKLIST**  
(To Be Prepared by the Contracts & Lease Coordinator)

**DATE:** June 27, 2023

**TO:** Finance Department

**SUBJECT:** Contract No. C23-3292-TDD

**MANAGING DEPARTMENT:** TDD

**CONTRACTOR'S NAME:** Crane Associates, INC.

**PROJECT TITLE:** Choctawhatchee Bay Estuary, Economic Impact Analysis

The attached has met the final payment contract requirement in subject contract.

	<b>Yes</b>	<b>No</b>
1. <u>Final Invoice</u>	<b>X</b>	

	<b>Yes</b>	<b>No</b>	<b>N/A</b>
2. <u>Close-Out Documents</u>			
a. <u>Signed Release of Lien</u>			<b>X</b>
b. <u>Proof of Completion Advertisement</u>			<b>X</b>
c. <u>Certificate of Insurance</u>			<b>X</b>
d. <u>Consent of Surety to Final Payment</u>			<b>X</b>
e. <u>Proof of Performance/Payment Bond</u>			<b>X</b>
<u>Continuation 12 Months Following</u>			
<u>Final Payment</u>			
f. <u>Grants approval/signature</u>			<b>X</b>

3. Remarks

Vendor # 2023007

Invoice # OK03 Invoice Amount: \$11,760.00

**Faye Douglas** Digitally signed by Faye Douglas  
Date: 2023.06.27 10:18:07 -05'00'

OMB DIRECTOR

DATE

Invoice OK03 was paid on 7/13/23 with voucher # V2306663 for \$11,760.00. ARH

C23-3292-TDD  
 Ven. 20230077  
 712030-534900

## INVOICE

**FROM**

Supplier Crane Associates, Inc  
 21 Ivy Lane, Suite 202  
 Burlington VT 05408



**TO**

Jennifer Adams, Director  
 Tourism Development Department  
 1540 Miracle Strip Parkway SE  
 Ft Walton Beach, FL 32548

**Invoice #** OK03  
**Invoice Date** 5/26/2023  
**Due Date** 6/25/2023

**RE**

Contract Name Choctawhatchee Bay Estuary Economic Impact Analysis  
 Contract Number C23-3292-TDD  
 Supplier Tax ID 20-8393046  
 Supplier UEI number TCVDCJKTZ311

**Invoice Total** **\$ 11,760.00**

Task	Description	Quantity	Unit Fixed Fee	Total
4	Economic Profile of 4-county region (delivered in Chapter 5 of Final Report)	1	\$ 3,000.00	\$ 3,000.00
5	Deliverables from Task 5 (all interviews and meetings assembled and incorporated as appropriate into final report.)	1	\$ 4,200.00	\$ 4,200.00
7	Draft Report	1	\$ 3,600.00	\$ 3,600.00
8	Final Report	1	\$ 960.00	\$ 960.00
<b>Subtotal</b>				<b>\$ 11,760.00</b>

Taxes 0

Expenses All expenses for site visits and travel are included 0

**Total** **\$ 11,760.00**

**Terms and Conditions**

Payable in full within 30 days of invoice date  
 by ETF to Key Bank account 454520025957  
 Routing : 211672531

**Michael Norberg** Digitally signed by Michael Norberg  
 Date: 2023.06.19 10:46:08 -05'00'

Total contract value \$ 24,998.00

Amount paid to date (invoices OK1 and OK 2) \$ 13,238.00

Total remaining balance \$ 11,760.00

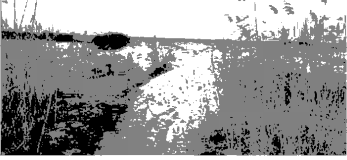
All final deliverables and supporting documents are available in the project Dropbox folder at  
<https://www.dropbox.com/scl/fo/1mydz5f98bnpa7lcy865j/h?dl=0&rlkey=7uuwpsk5teol09915h3tno55y>  
 Contact me at michael@craneassociates.us if you have any problems accessing the files.

**It was a pleasure working for you!**

File Home Insert Design Layout References Mailings Review View Zotero Help ACROBAT Tell me what you want to do

Clipboard Font Paragraph Styles

Arial -12 A Aa B I U abc X X<sup>2</sup> Normal Body Text List Para... No Spacing Heading 1 Heading 2 Heading 3 Heading 4 Title Subtitle Subtle Em... Editing



**ECONOMIC VALUE OF  
CHOCTAWHATCHEE BAY**  
May 9<sup>th</sup> 2023



**CHOCTAWHATCHEE BAY  
Estuary Program**



Under award OCE-19-036-0001 from the RESTORE Council

RESTORE COUNCIL

**ACKNOWLEDGMENTS**

This report was prepared for the Choctawhatchee Bay Estuary Program and Okaloosa County under award OCE19-036-0001 from the RESTORE Council. The statements, findings, conclusions, and recommendations are those of the authors and do not necessarily reflect the views of the RESTORE Council.

The Choctawhatchee Bay Estuary Program was established in 2017 by a local County Council, including Bayview, Okaloosa, Walton, and Washington Counties in Florida. Currently, the program is supported and administered by Okaloosa County and is funded through a variety of sources including The Nature Conservancy, RESTORE, An Restoracion Council administered by the Florida Gulf Consortium and the Department of Treasury under the Restoration and Ecosystem Sustainability, Tourist Opportunities, and Revived Ecosystems of the Gulf Coast States Act of 2012 (RESTORE Act).

The author would like to thank...

**EXECUTIVE SUMMARY**

Choctawhatchee Bay is many things to many people. Its beauty as a source of inspiration, its water as the life that flows back together. It is home to Tom's favorite fishing hole and Troy's crab traps. It is where Buddy sees his dreams, and where the General finds his peace. The Bay is a source of income for Santa Rosa Chapter, Luther's Produce stands and another 137 businesses and their 24,000 full-time working employees. The Bay is a highway for some, a playground for others, and the best fishing place for many.

Choctawhatchee Bay Estuary Program (CBEP) was established to protect the Bay. It was formed by a 2017 regional agreement between the County governments of Bay, Okaloosa, Walton and Washington with the goals of improving Choctawhatchee Bay's water quality, restore and conserve estuarine and ecosystems, enhance community resiliency, and revitalize the coastal economy. The Program is guided by a mission to promote a Comprehensive Conservation Management Plan, currently underway, and by completing the economic study.

The CBEP issued a public Request for Qualifications for an economic consulting firm to "define and quantify the economic and ecosystem service values of the Choctawhatchee Bay." Okaloosa County contracted with Crane Associates Inc, an environmental economics consulting firm with offices in Detroit, Florida and Stuttgart, Germany, to complete this study. Funding for this study came from the RESTORE Act Gulf Coast Restoration Council through the Gulf Consortium.

**Table of Contents**

Acknowledgements	5
Executive Summary	6
Chapter 1 Methodology	11
Characteristics of a Natural Capital	14
Four Economic Goods and Services	15
Economic Analysis Using Input-Output Program	16
Marine Wildlife Habitat	17
Defining the Output Economy	18
A Natural Capital Input-Output Program	19
Defining the Coastal Economy	20
Chapter 2 Measuring the Output Economy of Choctawhatchee Bay	22
Baseline Data	22
Marine Ecosystem Services (MSES)	23
Marine Wildlife Habitat (MWH)	23
Wildlife	23
Coastal Fish	23
Shellfish	23
Offshore Marine	23
Offshore Marine Fisheries	23
Florida Department of Fish and Wildlife Conservation Fisheries	24
Marine Wildlife Habitat Services	24
Primary Data	24
Secondary Data	24
The Input-Output and Input-Output Methods	25
Chapter 3 Economic Analysis	27
Marine Wildlife Habitat	41
Coastal Fish	41
Shellfish	41
Offshore Marine	41
Offshore Marine Fisheries	41
Florida Department of Fish and Wildlife Conservation Fisheries	41
Marine Wildlife Habitat Services	41
Summary	58

22

Regional Input-Output Modeling	60
Economic Linkages of Choctawhatchee Bay	61
Jobs and Wages	62
Ecosystems and Coastal Services	63
Chapter 4 Additional Benefit Streams	74
Carbon Sequestration	74
Property Taxes	76
Ecosystem Resilience	86
Ecosystem Benefits of Water Quality Improvements	86
Chapter 5 Conclusions	87
Conclusions	87

87

**Bay means many things to many people. It also means that it contributes many different goods and services. It produces ecosystem goods such as food, estuarine products, and coastal fisheries that improve both quality of life and primary values. The Bay also provides environmental regulatory services, for fishing, boating, anchoring, carbon, housing, habitat and other benefits. All of these products and services are benefits to humans, and a Bay of products measured and measured in our economy. A limited number of economic values, those confined to marketable transactions are measured, but are not the only values that are important to humans. The importance of environmental ecosystem, or industry goods, or in advancing technologies to reach the natural capital of non-market resources, the study was limited to three market of land and a narrow subset of work that presented their inclusion.**

The Choctawhatchee Bay Estuary Program follows guidance from the EPA's National Estuary Program, which focuses a network of 28 different programs nationwide. The CBEP is within a national network of estuary programs, the researchers focused on applying natural resource methodology to value the economic contribution made by Choctawhatchee Bay. The National Oceanic and Atmospheric Administration (NOAA), Office of Coastal Management has established the Economic National Oceanic Data (ENOD) database. NOAA, in coordination with several government agencies, non-profit organizations, higher education institutions, and the National Oceanic and Atmospheric Administration (NOAA), have worked for decades to create and maintain a comprehensive database and studies that measure the value of the

Building a coast, level within economy as a cost-reduced beyond the standard established for the coast. The data collected included several national databases such as the Bureau of Economic Analysis, Bureau of Labor Statistics, and US Census. It also included many data sources at the national and state government levels including business surveys, environmental permitting and monitoring databases, and local water and coastal planning. The research benefited greatly from partnerships with local, state, and federal agencies. The study included a team of economists, ecologists, and other experts. The study also included a team of economists, ecologists, and other experts. The study also included a team of economists, ecologists, and other experts. The study also included a team of economists, ecologists, and other experts.

**It is a goal for the Bay to be a place of 200 jobs in the fishing sector and 200 jobs in the tourism sector. The authors hope to 200 more jobs over the 10-year period.**

## Michael Norberg

---

**From:** Melinda Gates <GatMelinda@co.walton.fl.us>  
**Sent:** Thursday, June 15, 2023 4:26 PM  
**To:** Michael Norberg  
**Cc:** Jane Evans; Greg Stewart; Alex Fogg; Sabina Pennington  
**Subject:** RE: Final Report. Economic Value of Choctawhatchee Bay

All requested items have been made. I approve the final invoice, unless anyone sees something different.

Thank you,  
-Melinda

Melinda Gates  
Environmental Coordinator  
Walton County Board of County Commissioners  
Public Works Department  
Environmental Section  
117 Montgomery Circle  
Defuniak Springs, FL 32435  
Phone: (850)892-8108  
Fax: (850)892-8094

**HOW DID WE DO?** In order to assist us in providing the highest level of Customer Service, please take the time to complete our short survey. [Walton County Customer Satisfaction Survey](#)



Under Florida law, Florida Statute 119.011, chapter 2006-32, e-mail addresses are public records. If you do not want your e-mail address released in response to a public records request, do not send electronic mail to this entity. Instead, contact this office by phone or in writing

**From:** Michael Norberg <mnorberg@myokaloosa.com>  
**Sent:** Thursday, June 15, 2023 1:10 PM  
**To:** Melinda Gates <GatMelinda@co.walton.fl.us>  
**Cc:** Jane Evans <jevans@myokaloosa.com>; Greg Stewart <gstewart@myokaloosa.com>; Alex Fogg <afogg@myokaloosa.com>; Sabina Pennington <spennington@myokaloosa.com>  
**Subject:** RE: Final Report. Economic Value of Choctawhatchee Bay

**CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.**

Good afternoon, all –

Michael Crane has made the modifications requested by the Gulf Consortium (attached v2 report). If there are no objections by NLT 12:00pm on Monday then I will get the final invoice paperwork submitted for payment.

Thanks

---

**Mike Norberg**

Coastal Resource Coordinator  
(850) 609-5395

*Please note: Due to Florida's very broad public records laws, most written communications to or from county employees regarding county business are public records, available to the public and media upon request. Therefore, this written e-mail communication, including your e-mail address, may be subject to public disclosure.*

**From:** Melinda Gates <GatMelinda@co.walton.fl.us>  
**Sent:** Wednesday, June 14, 2023 8:05 AM  
**To:** Michael Crane <michael@craneassociates.us>  
**Cc:** Michael Norberg <mnorberg@myokaloosa.com>; Jane Evans <jevans@myokaloosa.com>  
**Subject:** FW: Final Report. Economic Value of Choctawhatchee Bay  
**Importance:** High

Good Morning Michael,

We received the comments from the Gulf Consortium below. Would you be able to add the logo and below disclaimer to the report. Mike will get the invoice finalized for payment.

Also, do you have some time that I can call you and discuss an infographic? I just want to make sure I am pulling out the right/best information to summarize the report.

Thank you,  
-Melinda

Melinda Gates  
Environmental Coordinator  
Walton County Board of County Commissioners  
Public Works Department  
Environmental Section  
117 Montgomery Circle  
Defuniak Springs, FL 32435  
Phone: (850)892-8108  
Fax: (850)892-8094

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**From:** Jane Evans <[jevans@myokaloosa.com](mailto:jevans@myokaloosa.com)>  
**Sent:** Tuesday, June 13, 2023 4:11 PM  
**To:** Michael Norberg <[mnorberg@myokaloosa.com](mailto:mnorberg@myokaloosa.com)>; Melinda Gates <[GatMelinda@co.walton.fl.us](mailto:GatMelinda@co.walton.fl.us)>  
**Subject:** FW: Final Report. Economic Value of Choctawhatchee Bay  
**Importance:** High

Good afternoon,

Below is The Gulf Consortium comment and suggestion is listed below. Also attached is the logo.

Jane

**From:** Daniel Dourte <[DDourte@balmoralgroup.us](mailto:DDourte@balmoralgroup.us)>  
**Sent:** Tuesday, June 13, 2023 3:21 PM  
**To:** Jane Evans <[jevans@myokaloosa.com](mailto:jevans@myokaloosa.com)>  
**Subject:** RE: Final Report. Economic Value of Choctawhatchee Bay

Hi Jane,  
We have reviewed this (not for technical merit, but for completion).

This looks complete and in align with the award scope.

The attribution to RESTORE Council funding is sufficient. While not a requirement, if you could add the Gulf Consortium logo and adjust the attribution sentence that would be nice.

Maybe something like:

“This report was prepared for the Choctawhatchee Bay Estuary Program and Okaloosa County under Gulf Consortium award GNTSP20FL0090 from the RESTORE Council. The statements, findings, conclusions, and recommendations are those of the author and do not necessarily reflect the views of the RESTORE Council.”

I’ve attached a Gulf Consortium logo.

Let me know if you have any questions. Sorry for the delay!

Sincerely,  
Dan

Daniel Dourte, Ph.D.



**The Balmoral Group**  
165 Lincoln Avenue | Winter Park, FL 32789  
Phone: 407-629-2185 x 113  
Visit our [website](#) for more information!

**From:** Jane Evans <[jevans@myokaloosa.com](mailto:jevans@myokaloosa.com)>  
**Sent:** Friday, June 2, 2023 2:03 PM  
**To:** Daniel Dourte <[DDourte@balmoralgroup.us](mailto:DDourte@balmoralgroup.us)>  
**Subject:** RE: Final Report. Economic Value of Choctawhatchee Bay

Good afternoon,

Just following up with this. Do you have a turnaround time? Not rushing – we are waiting to make final payment until we get the all clear from The Gulf Consortium.

Thank you,  
Jane

**From:** Jane Evans  
**Sent:** Friday, May 26, 2023 1:11 PM  
**To:** 'Daniel Dourte' <[DDourte@balmoralgroup.us](mailto:DDourte@balmoralgroup.us)>  
**Cc:** Greg Stewart <[gstewart@myokaloosa.com](mailto:gstewart@myokaloosa.com)>; 'Amy Bainbridge' <[ABainbridge@balmoralgroup.us](mailto:ABainbridge@balmoralgroup.us)>; 'Richard Bernier' <[RBernier@balmoralgroup.us](mailto:RBernier@balmoralgroup.us)>  
**Subject:** FW: Final Report. Economic Value of Choctawhatchee Bay  
**Importance:** High

Dan,

Attached is the Economic Analysis Report for your review. Specifically, the required language and logos (what about the Gulf Consortium?).

Jane

**From:** Michael Crane <[michael@craneassociates.us](mailto:michael@craneassociates.us)>  
**Sent:** Friday, May 26, 2023 10:00 AM  
**To:** [gatmelinda@co.walton.fl.us](mailto:gatmelinda@co.walton.fl.us); Alex Fogg <[afogg@myokaloosa.com](mailto:afogg@myokaloosa.com)>; Michael Norberg <[mnorberg@myokaloosa.com](mailto:mnorberg@myokaloosa.com)>; Jane Evans <[jevans@myokaloosa.com](mailto:jevans@myokaloosa.com)>; Stewart, Greg <[gstewart@ngn-tally.com](mailto:gstewart@ngn-tally.com)>; Sabina Pennington <[spennington@myokaloosa.com](mailto:spennington@myokaloosa.com)>  
**Subject:** Final Report. Economic Value of Choctawhatchee Bay

Dear Melinda, Alex, et al,

I am pleased to send you the final report on the Economic Value of Choctawhatchee Bay. You will see substantial changes from the last version. I trust that you will find this report to meet all the final deliverable requirements in the contract. I know that you needed to close out this contract before the 30<sup>th</sup> so I believe we met that hurdle. However, I am available anytime to make modifications if you see some editing errors, and I am happy to do that any time after the 30<sup>th</sup> if needed. I will send a final invoice in a separate email that covers the remaining balance.

A special shout out to Mike Norberg for the extra time he spent with me on the details of the commercial fishing sector, and for all of his editorials, it really helped.

For writing, punctuation, and grammar rules, I used the U.S. Government Printing Office (GPO) Styles Manual. While it differs slightly from Chicago or MLA (and some of your previous edits), I believe that considering the client, and the funding agency, that this is the correct source. The manual is attached, some notable differences are the use of hyphenations, capitalization and abbreviations. Also I selected to write out numbers below 20 (not 10).

I believe the report is presentable as is. However, I do recommend further graphic design work. There are inevitable formatting glitches that happen when importing PPT graphics into MS word, or when saving to a .pdf, or when the file is opened on another computer with different versions of the same software. I also recommend that you create a separate Executive Summary for public distribution. Of course, this is all the decision of the CBEP. However, as I stated previously, I am more than happy to assist, contribute, and cooperate where needed on these subsequent improvements. The MS word version of this report will be uploaded to the project Dropbox folder where it will remain indefinitely unless you request it to be removed. I will also upload all supporting files.

I also confirm that I am available to present this report to the Board, and/or anyone else via teleconference at almost anytime at no cost. I have July 12<sup>th</sup> reserved.

I truly enjoyed working for Okaloosa and Walton Counties and I hope this is not the last time.

Sincerely,

**Michael D. Crane AICP**

Crane Associates Inc

21 Ivy Lane Suite 202

Burlington Vermont 05408

[www.craneassociates.us](http://www.craneassociates.us)

[michael@craneassociates.us](mailto:michael@craneassociates.us)

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and pursuant to the terms of this Agreement and shall report to the County accordingly. Contractor agrees to immediately inform the County via telephone and in writing of any problems that could cause damage to the County. Contractor will require its employees to perform their work in a manner befitting the type and scope of work to be performed.

**3. Term and Renewal.** The term of this Agreement shall begin when all parties have signed and continue until April 30, 2023, subject to the County’s ability to terminate in accordance with Section 7 of this Agreement. The terms of Section 20 entitled “Indemnification and Waiver of Liability” shall survive termination of this Agreement.

**4. Revenue/Compensation.** The Contractor agrees to provide the Services to the County, including materials and labor, in a total amount of twenty four thousand, nine hundred ninety-eight Dollars (\$ 24,998.00). Payments will be made based on the following schedule:

Completion of Task 1-3: \$5,198.00	= \$24,998 upon full contract completion
Completion of Task 4-6: \$15,240.00	
Completion of Task 7-8: \$4,500.00	

- a. Contractor shall submit an invoice to the County upon completion of project. The invoice shall indicate that all services have been completed for that invoice period. In addition, Contractor agrees to provide the County with any additional documentation requested to process the invoices.
- b. **Payment Schedule.** Invoices received from the Contractor pursuant to this Agreement will be reviewed by the initiating County Department. Payment will be disbursed as set forth above. If services have been rendered in conformity with the Agreement, the invoice will be sent to the Finance Department for payment. Invoices must reference the contract number assigned by the County after execution of this Agreement. Invoices will be paid in accordance with the State of Florida Local Government Prompt Payment Act.
- c. **Availability of Funds.** The County’s performance and obligation to pay under this Agreement is contingent upon annual appropriation for its purpose by the County Commission and the State of Florida’s Legislature.

Contractor shall make no other charges to the County for supplies, labor, taxes, licenses, permits, overhead or any other expenses or costs unless any such expenses or cost is incurred by Contractor with the prior written approval of the County. If the County disputes any charges on the invoices, it may make payment of the uncontested amounts and withhold payment on the contested amounts until they are resolved by agreement with the Contractor. Contractor shall not pledge the County’s credit or make it a guarantor of payment or surety for any contract, debt, obligation, judgment, lien, or any form of indebtedness. The Contractor further warrants and represents that it has no obligation or indebtedness that would impair its ability to fulfill the terms of this Agreement.

### Deliverables Breakdown

Deliverables	Hours by Personnel				Total Hours	Rate	Total
	Crane	Carr	Chase	Cooper			
<b>Deliverable from Task 1:</b> Creation of Project Advisory Committee	3.32	0		0	3.32	120	\$ 398
<b>Deliverable from Task 2:</b> Inception Report	10		0	0	10	120	\$ 1,200
<b>Deliverable for Task 3:</b> Literature Review of Ecosystem Valuation Methods	25	0	0	5	30	120	\$ 3,600
<b>Deliverables from Task 4:</b> Project Status Report describing the Economic Profile of the 4-County study region.	5	10	5	5	25	120	\$ 3,000
<b>Deliverables from Task 5:</b>	15	10		10	35	120	\$ 4,200
1. Meetings with stakeholders/potential beneficiaries	9	0	0	0	9	120	\$ 1,080
2. Multiple site visits and area tours to relevant locations	20	0	0	0	20	120	\$ 2,400
3. One day-long workshop with Technical Advisory Committee and stakeholders to build the FECS framework for Choctawhatchee Bay ecosystem.	8				8	120	\$ 960
<b>Deliverables from Task 6:</b>					0	120	\$ -
1) REDYN Input-Output model fully calibrated to the 4-county region		5	5	5	15	120	\$ 1,800
2) Economic Contribution Analysis and Model outputs		5	5	5	15	120	\$ 1,800
<b>Deliverable from Task 7:</b> Draft Report	30				30	120	\$ 3,600
<b>Deliverable from Task 8:</b> Final report in full color, professionally formatted, and delivered in MS Word and .pdf formats. The report will be delivered electronically.	8				8	120	\$ 960
					0	120	\$ -
					0	120	\$ -
<b>SUBTOTAL</b>	133.32	30	15	30	208.32	120	\$ 24,998
Expenses - inclusive						0	
<b>Total</b>							<b>\$ 24,998</b>
<b>Budget Notes</b>							
Task 2: involves one (1) 2-hour meeting							
Task 4: includes up to 9 hours of meeting time in any combination of in-person, one-on-one meetings or focus groups. To be determined with the client.							

Total	24,998
Inv. OK01	(5,198)
Inv. OK02	(8,040)
<hr/>	
Contract Bal	11,760



---

# ECONOMIC VALUE OF CHOCTAWHATCHEE BAY

MAY 25<sup>TH</sup> 2023



## CHOCTAWHATCHEE BAY Estuary Program



This report was prepared for the Choctawhatchee Bay Estuary Program and Okaloosa County under Gulf Consortium award GNTSP20FL0090 from the RESTORE Council. The statements, findings, conclusions, and recommendations are those of the author and do not necessarily reflect the views of the RESTORE Council.

## Table of Contents

Table of Tables and Figures	5
Table of Abbreviations	6
Acknowledgements	7
<b>Chapter 1 Executive Summary</b>	<b>8</b>
<b>Chapter 2 Introduction</b>	<b>13</b>
Choctawhatchee Bay is Natural Capital	13
Final Ecosystem Goods and Services	14
<b>Chapter 3 Methodological Approach</b>	<b>18</b>
Economics: National Ocean Watch (ENOW) Program	18
Marine Satellite Accounts	18
Defining an Ocean Economy	19
Is Choctawhatchee Bay Within the Ocean Economy?	19
Defining the Coastal Economy	20
Data Used to Measure the Ocean economy of Choctawhatchee Bay	22
Secondary Data:	22
Marine Economy Satellite Accounts (MESA)	22
National Oceanic and Atmospheric Administration (NOAA): Economic: National Ocean Watch Database (ENOW)	22
United States Quarterly Census of Employment and Wages	23
United States Bureau of Economic Analysis	23
United States Census Bureau	23
Department of Environmental Protection	23
Florida Department of Fish and Wildlife Conservation Databases	23
Municipal and County Business Licenses	23
Primary Data	24
Personal Interviews	24
Final Ecosystem Goods and Services (FEGS) Workshop	24
<b>Chapter 4 Literature Review</b>	<b>26</b>
<b>Chapter 5 Economic Profile of the Four-County Region</b>	<b>39</b>
Holmes County Employment Profile	41
Employment Profile of Okaloosa County	42
Employment Profile of Walton County	43
Employment Profile of Washington County	44
<b>Chapter 6 The Economy of Choctawhatchee Bay</b>	<b>45</b>
Ocean Economy Industry Analysis	46
Marine Construction	46
Living Resources	47
Offshore Mineral Extraction	50
Ship and Boat Building	51

Tourism and Recreation	52
Marine Transportation	55
<b>Summary</b>	<b>57</b>
<b>Regional Input-Output Modeling</b>	<b>59</b>
<b>Economic Contributions of Choctawhatchee Bay</b>	<b>61</b>
Jobs and Wages	62
Output	68
Ocean Economy vs Coastal Economy	69
<b>Chapter 7 Additional Benefit Streams</b>	<b>74</b>
Carbon Sequestration	74
Property Values	76
Ecosystem Restoration	80
Economic Benefits of Water Quality Improvements	80
<b>Chapter 8 Conclusions</b>	<b>82</b>
Citations:	83

**TABLE OF TABLES AND FIGURES**

Table 1:1: Economic Contribution of Choctawhatchee Bay \_\_\_\_\_ 10  
 Table 2:1 FECS Framework \_\_\_\_\_ 15  
 Table 4:1 Economic Value Streams from Sarasota Bay \_\_\_\_\_ 28  
 Table 4:2 Property values in proximity to Florida Bay \_\_\_\_\_ 28  
 Table 5:1 Key Economic Variables of 4-county Region \_\_\_\_\_ 40  
 Table 5:2 Employment and Wages by County \_\_\_\_\_ 40  
 Table 5:3 Holmes County Employment Profile \_\_\_\_\_ 41  
 Table 5:4 Employment Profile of Okaloosa County \_\_\_\_\_ 42  
 Table 5:5 Employment Profile of Walton County \_\_\_\_\_ 43  
 Table 5:6 Employment profile of Washington County \_\_\_\_\_ 44  
 Table 6:1 Living Resources \_\_\_\_\_ 48  
 Table 6:2 commercial fish harvest activity \_\_\_\_\_ 48  
 Table 6:3 Tourism and Recreation Industry by Employees and Businesses \_\_\_\_\_ 53  
 Table 6:4 Marine Transportation Industry Group \_\_\_\_\_ 56  
 Table 6:5 Jobs and Wages Supported by the Choctawhatchee Bay \_\_\_\_\_ 62  
 Table 6:6 Direct and Indirect Jobs by County \_\_\_\_\_ 63  
 Table 6:7 Wages from Direct and Indirect Jobs by County \_\_\_\_\_ 63  
 Table 6:8 Economic Contribution of Choctawhatchee Bay \_\_\_\_\_ 64  
 Table 6:9 Total Wages (Direct and Indirect) by region \_\_\_\_\_ 64  
 Table 6:10 Direct and Indirect Jobs in each Ocean Economy Industry \_\_\_\_\_ 65  
 Table 6:11 Average Annual Wages Paid Per Employee by Job Type, 2021. Okaloosa and Walton Counties \_\_\_\_\_ 67  
 Table 6:12 Direct and Indirect Output from Choctawhatchee Bay \_\_\_\_\_ 68  
 Table 6:13 Total Economy vs Ocean Economy \_\_\_\_\_ 70  
 Table 6:14 2-County Ocean economy Percent of Total Industries \_\_\_\_\_ 71  
 Table 6:15 Walton County Properties by Type \_\_\_\_\_ 72  
 Table 6:16: Okaloosa County Properties by Type \_\_\_\_\_ 72

Figure 1-1 Ocean economy is primarily comprised of restaurants, accommodations and boat rentals. \_\_\_\_\_ 11  
 Figure 2-1 Total Ecosystem Value \_\_\_\_\_ 17  
 Figure 6-1 Ocean Economy Jobs by Industry Group \_\_\_\_\_ 57  
 Figure 6-2 Annual Wages by Ocean Economy Industry Group \_\_\_\_\_ 58  
 Figure 6-3 Direct, Indirect and Indirect Impacts \_\_\_\_\_ 61  
 Figure 6-4 Composition of Tourism and Recreation Industry Group \_\_\_\_\_ 66  
 Figure 6-5 Composition of the Tourism and Recreation Group \_\_\_\_\_ 66  
 Figure 7-1: Millennium Ecosystem Assessment Components of Value \_\_\_\_\_ 79

**TABLE OF ABBREVIATIONS**

BEA	Bureau of Economic Analysis
BLS	Bureau of Labor Statistics
CBEP	Choctawhatchee Bay Estuary Program
CEPP	Central Everglades Planning Project
CERP	Comprehensive Everglades Restoration Plan
DEP	Department of Environmental Protection
EIN	Employer Identification Number
ENOW	Economics: National Ocean Watch Program
EPA	Environmental Protection Agency
FWC	Florida Department of Fish and Wildlife Conservation
FECS	Final Ecosystem Goods and Services
GDP	Gross Domestic Product
HAB	Harmful Algal Blooms
MA	Millennium Ecosystem Assessment
MESA	Marine Economy Satellite Account
MRFSS	Marine Recreational Fisheries Statistics Survey
NAICS	North American Industrial Classification System
NEPA	National Environmental Policy Act
NERRS	National Estuarine Research Reserve System
NOAA	National Oceanic and Atmospheric Administration
NOEP	National Ocean Economics Program
NTU	Nephelometric Turbidity Units
PPBEP	Pensacola and Perdido Bays Estuary Program
PUD	Photo-user-days
QCEW	Quarterly Census of Employment and Wages
SCC	Social Cost of Carbon
SOC	Soil Organic Carbon
SPL	Saltwater Products License
TCM	Travel cost model

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**Chapter 1 EXECUTIVE SUMMARY**

Choctawhatchee Bay is many things to many people. Its beauty is a source of inspiration. Its water is the draw that brings families back together. The Bay serves a critical role in our national security and an equally important role in our sense of place. It is a source of income for 1,580 businesses and their 24,000 hard-working employees. The Bay is a highway for some, a playground for others, and a place of peace for many.

Choctawhatchee Bay Estuary Program (CBEP) was established to protect the Bay and watershed. It was formed by a 2017 Interlocal Agreement between the county governments of Holmes, Okaloosa, Walton and Washington with the goals of improving Choctawhatchee Bay's water quality, restoring and conserving critical habitats and ecosystems throughout the Bay and watershed, enhancing community resiliency and revitalizing the coastal economy<sup>1</sup>. The Program is fulfilling parts of its mission by developing a Comprehensive Conservation Management Plan, currently underway, and by completing this economic study. The CBEP issued a public Request for Qualifications for an economic consulting firm to "define and quantify the economic and ecosystem service values of the Choctawhatchee Bay<sup>2</sup>." Okaloosa County contracted with Crane Associates Inc, an environmental economics consulting firm with offices in Deland, Florida and Burlington, Vermont, to complete this study. Funding for this study came from the RESTORE Act Gulf Coast Restoration Council through the Gulf Consortium.

This study is an economic contribution analysis that determines the value that the waterbody of Choctawhatchee Bay provides to the local economy. The local economy is defined as the four counties of Holmes, Okaloosa, Walton and Washington. If the Bay means many things to many people, it then also means that it contributes many different



goods and services. It produces provisional goods such as food, minerals, and materials. It provides human enrichment services such as recreation, artistic inspiration, and beautiful aesthetics that improve both quality of life and property values. The Bay also provides environmental regulatory services by filtering water, absorbing carbon, hosting habitats and cycling nutrients. All of these products and services are benefits to humans, and a few of them are monetized and measured in our economy. A limited number of economic values, those confined to marketable transactions, are measured in this study. All the other values that are enjoyed by humans but not exchanged in the marketplace (non-market values) are not evaluated here. The profession of environmental economics is making great strides in advancing techniques to measure the economic values of non-market resources so that they can play a role in Benefit Cost Analysis. The CBEP could be well served to focus future work on valuing these resources.

The Choctawhatchee Bay Estuary Program follows guidance from the EPA's National Estuary Program, which includes a network of 28 estuary programs nationwide. Since the CBEP follows the national network of estuary programs framework, the researchers focused on applying a nationally recognized methodology to value the economic contribution made by Choctawhatchee Bay. The National Oceanic and Atmospheric Administration's (NOAA), Office of Coastal Management has established the Economic National Ocean Watch (ENOW) database. NOAA, in coordination with several government agencies, non-profits organizations, higher education institutions, and the National Ocean Economics Program (NOEP) have worked for decades to create and implement methodologies, databases, and studies that measure the value of the nation's marine resources. This work created the definitions of "ocean economy" and the "coastal economy." The ocean economy is defined as an economy that is active in any of the 21 specific North American Industry Classification System (NAICS)<sup>1</sup> industries within one or more of the 400 counties that are located on the shores of U.S. oceans or inland seas (or the Great Lakes). The U.S. Department of Commerce, Bureau of Economic Analysis uses this definition to create a Marine Economy Satellite Account (MESA) to measure the ocean economy of the United States. Choctawhatchee Bay lies within the geographic definition of the ocean economy and therefore the economic activity of these 21 NAICS industries that occur within Okaloosa and Walton Counties is recorded in the national Marine Economy Satellite Account. A coastal economy is defined as all economic activity that takes place in the coastal watershed zone regardless of its link to the ocean. In this study, the coastal economy is the entire economy of Okaloosa and Walton Counties because these counties are entirely within a coastal watershed zone as defined by NOAA. The study then compares the ocean economy to the coastal economy to provide us with a picture of the size of the ocean economy in relative terms to the whole economy. In taking this approach, the results of this research study emerge from the same framework of nationally recognized ocean economy terminology, definitions, and databases. County-level data is not provided through MESA, so this study effectively created a 2-county ocean economy account using the same data and methodology as the Department of Commerce uses

<sup>1</sup> The North American Industry Classification System is a classification of business establishments by type of economic activity.

for the nation. This allows the economic values of Choctawhatchee Bay to be compared to other estuaries or regions in the country.

Building a county-level ocean economy account required going beyond the standard databases established for the nation. The data collected included several national databases such as the Bureau of Economic Analysis, Bureau of Labor Statistics, and U.S. Census. It also included many data sources at the municipal and state government levels including business licenses, environmental permitting and monitoring databases, and boat owners and captain's licenses. This research benefitted greatly from personal interviews with those who live and work around the Bay. They included museum directors, educators, retired business owners, food and beverage business owners, religious leaders, representatives of the Muskogee/Creek nation, and a wide range of recreationists on-site, including kite surfers, SCUBA divers, recreational anglers, birders, hikers, Crab Island visitors, and beach goers.

In total, the Bay supports 28,236 jobs in the 4-county region and generates \$817million in household wages annually. This amounts to 25% more jobs than the military.

The ocean economy of Choctawhatchee Bay is responsible for supporting 24,029 direct jobs and generating \$470 million in take-home wages in the 2-county region. A direct job is employment that is directly dependent on the Bay. Indirect jobs are created when Bay-dependent businesses generate demand for products and services that are needed to operate their business. Local suppliers hire labor and pay wages to meet that demand. Just the portion of labor and wages that are responsible for supporting the Bay-dependent demand is allocated to indirect impacts. Induced impacts are when indirect wages are spent in the local economy. The REDYN Computable General Equilibrium Input-Output model is used to measure the indirect and induced impacts of the Bay. The Bay produces an additional 4,000 indirect jobs and generates another \$326 million in take-home wages. While the direct jobs and wages are located only in Okaloosa and Walton Counties, the indirect and induced effects are distributed across the 4-county local economy. In total, the Bay supports 28,236 jobs in the 4-county region and generates \$817million in wages. Any demand for goods and services not met by the 4-county economy is met by other suppliers outside of the local economy. The Bay is responsible for supporting an additional 7,574 jobs and \$554 million in wages in Florida but outside the 4-county local economy.

Table 1-1: Economic Contribution of Choctawhatchee Bay

Economic Effects	Geography	Jobs	Wages (\$M)
Direct	Okaloosa	16,507	\$374
Direct	Walton	7,522	\$96
Total Direct	Choctawhatchee Bay Ocean economy	24,029	\$470
Indirect	Holmes and Washington	218	\$18
Total Direct and Indirect	Holmes, Okaloosa, Walton, Washington	28,236	\$817
Indirect	Florida (outside of 4-county region)	7,574	\$554
Total Jobs and Wages Supported by the Bay		35,810	\$1,371

Ninety-seven percent of all jobs created by the Bay are in the Tourism and Recreation Industry Group. This group includes the following 8 NAICS industries: Scenic Tours and Sightseeing Transportation on Water including Charter Fishing; Recreational Boat Rentals; Maritime Museums; Amusement and Theme Parks; Marinas; Other Amusement and Recreation Activities; All Accommodations; and Food Services and Drinking Places. The majority of the 24,029 jobs (73%, or 17,034 jobs) are held by restaurant workers. Another 15% of workers are employed in the overnight accommodations industry and 6% in the boat rental businesses.

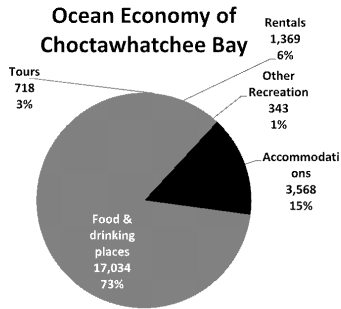


Figure 1-1 Ocean economy is primarily comprised of restaurants, accommodations and boat rentals.

To put the ocean economy into relative terms, while the Choctawhatchee Bay produces 24,029 direct jobs, the coastal economy (or total economy) of the 2-county region produces 194,108 jobs. This means that the ocean economy is 14% of the total 2-county coastal economy. There are 19,327 people employed by the U.S. military in the 2-county region. This amounts to 10% of the total employed population. In other words, the ocean economy of Choctawhatchee Bay produces 25% more jobs than the military in the 2-county region.

This study quantifies a small percentage of the total economy of Choctawhatchee Bay. Many of the important benefits of a healthy Bay are not evaluated here. Environmental economists have created tools to measure some of these values and a growing body of

literature has demonstrated their capability in calculating these economic contributions in other study areas. Some of these values include:

**Carbon Absorption:** The value of Bay's ability to absorb carbon emissions can be roughly estimated at \$1 billion based on comparable studies in Florida but it is not calculated here.

**Bayfront property** in the 2-county region has a total assessed value of \$2.3 billion. The Bay can be credited for generating a certain percentage of that value. An accurate method to calculate the values is time consuming and highly technical. Therefore, as of this writing these values are unknown.

**Restoration work.** An extensive amount of environmental restoration work has taken place on the Bay for many years. This work results in improved water quality, marine habitats and ecosystem functions. The work also produces jobs, wages and value-added output to society. The value of the Bay's water quality, and the value of the restoration work that produces improved water quality, can both be measured using commonly accepted economic principles but have not been completed yet.

The CBEP now has the baseline data and information upon which to build more detailed analyses. This report's findings, and the economic input-output model used in this research, are valuable tools for policy makers to use when weighing the benefits and costs of capital investments, policy applications and management decisions that may affect the Bay.







**Social Capital:** All the human resources within a society. The knowledge, innovation, skills, labor and the networks that humans create are social capital.

**Physical Capital:** All of society's human-made infrastructure, buildings, cultural and recreational resources. Physical capital is the result of combining social and natural capital to make assets for our wellbeing.

The economy of Choctawhatchee Bay includes all three forms of capital; however, this study focuses on the valuation of the natural capital of Choctawhatchee Bay. The approach used in identifying natural capital is to study interactions between humans and the Bay's ecosystems. A natural capital perspective can be a useful way to put the value of ecosystems on par with other socioeconomic values within a policy-making rubric. Through a natural capital approach, we can structure classifications of ecosystem components into a suite of environmental benefit streams of different goods and services, all of which flow to form the final ecosystem goods and services valuation.



## Chapter 2 INTRODUCTION

### CHOCTAWHATCHEE BAY IS NATURAL CAPITAL

All members of our society benefit from collectively shared public capital. Publicly held capital includes a wider array of assets than private capital. Private capital are assets owned by a household or business that accounts for the household's total wealth including cash, property, and equipment that can be sold. Public capital is assets shared by all of society. It is also a measure of wealth - society's wealth. Public capital is generally categorized into three major groups:

**Natural Capital:** All natural resources unmodified or manipulated by humans including fresh water, marine water, all biota, air, sunlight, soils, and minerals. An important consideration of natural capital is the interaction of these resources forming ecosystems. The sun provides energy to plants that filter water and provide habitat for microorganisms, and insects, that form a food chain for shellfish and fish, which are then consumed by humans for food and sport. It is the system, and not the individual components, that provide products and services to humans. Natural capital is defined as the products and services that the ecosystem provides.

### FINAL ECOSYSTEM GOODS AND SERVICES

Final Ecosystem Goods and Services (FEGS) is a user-centric framework that identifies and categorizes ecosystem products and services that are directly used, enjoyed, or appreciated by people. The theory, methodological approach, and practical applications of FEGS are well documented. A FEGS framework is used as a guide in this study to measure the economic values of Choctawhatchee Bay. Figure 1-1 shows an example of the FEGS framework. On the far-left column in blue are the final goods and services that are used by humans. These goods and services must grow out of the natural ecosystem which produces them. The second column in green is the ecosystem which supports the production of the goods or service in question. In order for the ecosystem to function correctly it is dependent on various, and often numerous and complicated, intermediate processes. The third brown colored column includes one example of an intermediate process on which the ecosystem relies. The beneficiary shown on the right column is the person or group of people who benefit from the final ecosystem good or service. They are also dependent, often unbeknownst to them, on the intermediate processes and the ecosystems for them to enjoy the benefits of the final good or service.

This study endeavored to implement the intent of the FEGS methodology by collecting feedback from those residents who earn a living from the Bay. Feedback, opinions, data and information from people whose livelihood depends on the Bay were collected through several methods. The most frequently used method was through personal interviews by the author over the first 3 months of 2023. The FEGS framework was also implemented through a one-day workshop that was held to collect opinions from those

who are working in each of the major ocean economy industry groups. The workshop served multiple purposes, including:

1. Connecting the attributes of ecosystems that people use or enjoy to specific interests.
2. Identifying how the attributes people use to achieve those interests will differ across ecosystem types.
3. Identifying important intermediate ecosystem processes that are not usually recognized but without them would result in loss of benefits.
4. Identifying the number, type, and resolution of FECS metrics that need to be measured.
5. Using a FECS survey questionnaire to identify common interests and prioritize the attributes of nature that are valued across beneficiary groups in the most collaborative and transparent way possible.

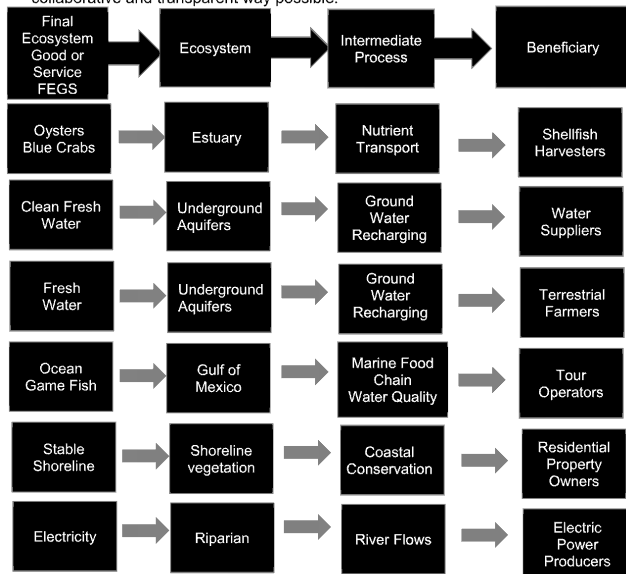


Table 2-1 FECS Framework

The results from this workshop documented a FECS-based estuarine/terrestrial relationship that:

1. Identified the ecosystem goods and services of Choctawhatchee Bay that are directly enjoyed, consumed or used by the beneficiaries.
2. Identified the beneficiaries who are benefiting from which ecosystem services.
3. Identified the intermediate natural processes that support the ecosystem services enjoyed by the end user.

This study is limited to measuring the market-based economic values of Choctawhatchee Bay. The FECS framework is valuable in identifying those market-based resources. The reader should remember that there are many additional values not being measured in this study. Environmental economics is built on, (and reinforces) a concept of Total Ecosystem Value (TEV). TEV is a classification hierarchy of all the values that can be derived from natural capital, or environmental resources. The Total Ecosystem Value of the Choctawhatchee Bay includes a wide range of goods and services that are categorized into the following five classes of value (Figure 2-1).

1. **Market Values:** the provision of goods and services that are typically bought and sold in the market. These include food, minerals, recreation services, chemicals, genetic resources, and ornamental goods. These are market-based goods and services that are measured by the exchange of money and recorded by the U.S. Department of Commerce, and other local governments. This study is limited to measuring market-based goods and services of Choctawhatchee Bay.
2. **Regulatory Services:** The Bay also provides us with regulatory services. The Bay regulates air temperature and carbon emissions. It is host to an ecosystem of natural processes that filter water, regulate flooding and remove waste. These services are not measured in this study.
3. **Human Enrichment:** The Bay is valuable to us in the way it enriches our quality of life. It provides artistic inspiration to writers, poets, painters, and sculptors. Its natural beauty improves our aesthetic surroundings, some of which is measured in increased property values. The Bay provides free recreation that is not measured by the exchange of money. The Bay forms a



connection between our families by serving as the common denominator of our cultural bond, social history, and heritage. These values are not measured in this study.

4. Biological Support Services: The Bay is valuable in providing critical biological services such as producing oxygen, cycling nutrients, and creating habitat that produces sea grass and protects bait fish among many other services. These services are not measured in this study.
5. Non-Use Value: People may value the intrinsic quality of the resource and would promote its protection even if they never saw or experienced the Bay (existence value). Others may be willing to fund the protection of the Bay to preserve the option of using it in the future (option value) or to ensure that future generations enjoy the Bay in the same quality as it is today (bequest value). These values are not measured in this study.

This study is limited to measuring only the market values of ecosystem goods and services in Choctawhatchee Bay as measured by a framework established by National Oceanic and Atmospheric Administration's NOAA Office of Coastal Management and the U.S. Bureau of Economic Analysis National Marine Satellite Account (MESA).

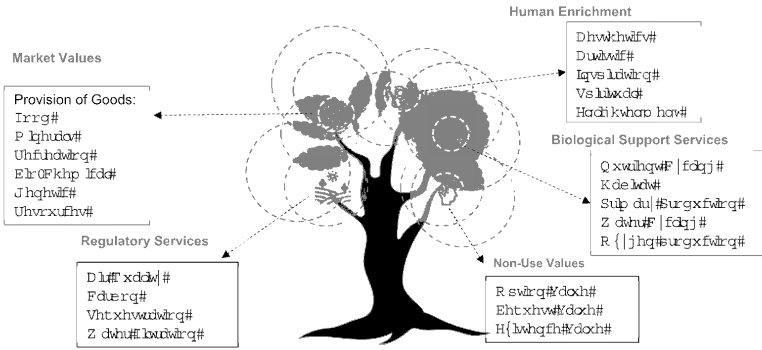


Figure 2-1 Total Ecosystem Value (TEV)

### Chapter 3 METHODOLOGICAL APPROACH

#### ECONOMICS: NATIONAL OCEAN WATCH (ENOW) PROGRAM

ENOW is a program under the National Oceanic and Atmospheric Administration's (NOAA) Office of Coastal Management to monitor economic activity associated with the nation's oceans and coastal regions in a consistent manner<sup>vi</sup>. ENOW provides data for about 400 counties, 30 coastal states, eight regions, and the nation. The basic geographic footprint for ENOW's county-level data is a suite of "Coastal Shoreline Counties" determined by using the Federal Emergency Management Agency's definition<sup>vii</sup>. The benefits of following the ENOW data framework in this study is that it allows for cross comparisons to other similar studies in the country. It also uses consistent and defensible economic data from U.S. Marine Satellite Accounts.

#### Marine Satellite Accounts

A MESA is a subset combination NAICS codes for the specific purpose of analyzing the productivity of the marine environment. Without a satellite account, measuring the economic activity of the marine environment would not be possible using standardized data from the U.S. Department of Commerce and Department of Treasury. The problem is that marine-related economic activities are embedded within non-marine data. For example, under the existing NAICS code structure "aquaculture activities" are embedded within all of farming industry codes; commercial ocean fishing is embedded within all forestry and fishing; and offshore oil drilling is embedded within all oil and gas extractions no matter where it occurs. Creating a U.S. Marine Satellite Account reconfigures the standard NAICS structure, then filters out ocean-related economic activities, and rebuilds them into ocean-related industries. The resulting industry group makes up a measurable and comparable "ocean economy" within a certain geography.

#### What is a Satellite Account

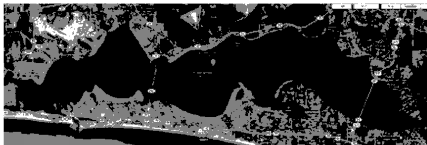
Satellite accounts are established and maintained by the US Department of Commerce to identify and present specific elements of the U.S. economy that are not readily visible in the current North American Industry Classification System (NAICS) code structure. NAICS is a system used to analyze the nation's economy by separating all economic activity into discernable sectors and industries. NAICS Sectors are high level classifications while NAICS industries are more detailed business activities. NAICS is a standard coding structure used by federal statistical agencies to classify business establishments. The output of each private sector business in the United States falls within at least one of the 1012 NAICS industry codes. A satellite account is a unique combination of NAICS industries that is assembled to focus on a specific industry within the US economy.

### DEFINING AN OCEAN ECONOMY

The Department of Commerce, Bureau of Economic Analysis, created the Marine Economy Satellite Account by following the same underlying methodology used to create many other Bureau of Economic Analysis (BEA) satellite accounts. First, the geographic scope of the account was determined. Second, a conceptual definition of ocean-related production was developed. Third, the conceptual definition of ocean economy was used by BEA and NOAA to identify the goods and services germane to measuring marine-related economic activity<sup>viii</sup>. In practice, the MESA uses unique estimation methods that statistically isolate marine-related spending and production from non-marine production within the same business establishment. A variety of private and public data sources are used to identify marine-related spending and production to develop the MESA estimates. The MESA economic activity is gathered from a specific geographic scope to create the ocean economy that will be referred to in this report.

### Is Choctawhatchee Bay Within the Ocean Economy?

Included in the geographical scope of the ocean economy are all U.S. oceans and marginal seas, the Atlantic, Pacific, and Arctic Oceans within the Exclusive Economic Zone (approximately 200 nautical miles off the U.S. coast) as well as marginal seas such as the Gulf of Mexico, Chesapeake Bay, Puget Sound, Long Island Sound, San Francisco Bay, and others. Also included is the U.S. shoreline directly along these bodies of water. Lastly, portions of inland waters are included where there is significant marine activity. Choctawhatchee Bay is an inland waterway and is considered within the geographic scope of the ocean economy and therefore all economic activity that is dependent on the Bay in Okaloosa and Walton Counties is being measured by the Bureau of Economic Analysis, within their Marine Satellite Accounts.<sup>ix</sup>



Three categories of production are measured in the accounts:

The first category relates to production from the waters that are geographically in scope, such as water freight transportation, offshore oil and gas extraction, and commercial fishing. The second category includes any production that, by necessity, takes place near the ocean such as coastal recreation and beach house rentals. The third category includes commodities purchased primarily for use on the ocean, no matter where production takes place, for example, ship and boat building, or marine navigation equipment. Other production in this category may be for a variety of uses, such as foul-weather gear and diesel fuel, but only ocean-specific uses tied to the geographically relevant region are considered in scope for the ocean economy. BEA statistically removes non-ocean-related production through a wide range of methods unique to each activity.

The production activities are then grouped into the following six ocean industries that make up the entire ocean economy account:

Major activity groupings for the ocean economy account include the following:

- Living resources, marine
- Construction, coastal and marine
- Transportation and warehousing, marine
- Minerals, offshore
- Ship and boat building, nonrecreational
- Tourism and recreation, coastal and offshore



### DEFINING THE COASTAL ECONOMY

A coastal economy is different from an ocean economy. According to ENOW definitions, the coastal economy includes all economic activity that takes place in the coastal watershed zone regardless of its link to the ocean<sup>x</sup>. In practical terms for this study, it includes all economic activity in Okaloosa and Walton Counties. Comparing a coastal economy to the ocean economy will provide us with economic dependency and industrial linkages between the two. For example, the sand and gravel sales and distribution that occurs in Port Washington is dependent on marine transportation, an ocean economy sector. However, the sand and gravel are inputs to construction that may occur anywhere in the 2-county region, a coastal economic activity. Washington and Holmes Counties are not coastal economies within the ENOW definitions; however, they are included in this study as beneficiaries of indirect and induced spending that the Bay generates. The results of this study will measure the economic contribution that the Bay makes to these counties. In its broadest definition, a coastal economy is designed to measure the type and quantity of economic activity in coastal areas. Coastal areas

are not only attractive to people and businesses because of their direct economic contributions associated with the ocean, but also for reasons unrelated to the water, including cultural history, family ties, past economic activity, and quality of life. The correct method to measure Choctawhatchee Bay's contribution to the local economy is to measure the ocean economy.



#### **DATA USED TO MEASURE THE OCEAN ECONOMY OF CHOCTAWHATCHEE BAY**

The process to measure the market-based economic value of the Choctawhatchee Bay ocean economy involved a wide range of data collection exercises. Some of these exercises included collecting and analyzing existing databases (secondary data) while other data used in this study are primary data from collection activities never previously performed. The data collected include the following:

##### **SECONDARY DATA:**

###### **Marine Economy Satellite Accounts (MESA)**

As explained above the U.S. Department of Commerce, Bureau of Economic Analysis is the central source for ocean economy data. The MESA was produced in partnership with the National Oceanic and Atmospheric Administration. These data are available at <https://www.bea.gov/news/2022/marine-economy-satellite-account-2014-2020#:~:text=The%20Marine%20Economy%20Satellite%20Account,%24610.3%20billion%2C%20of%20current%20dollar>

While MESA data is helpful, it is limited to national level data. It is valuable in measuring value-added production and gross output. Most important, it provides the overarching guide on how to measure the ocean economy of this study area.

###### **National Oceanic and Atmospheric Administration (NOAA): Economic: National Ocean Watch Database (ENOW)**

ENOW data provide county-level statistics necessary for this analysis and is available at this site: <https://coast.noaa.gov/digitalcoast/data/enow.html>

Economics: National Ocean Watch (ENOW) provides county-level data on the following six economic sectors that define the ocean economy:

- Living Resources
- Marine Construction
- Marine Transportation
- Offshore Mineral Resources
- Ship and Boat Building
- Tourism and Recreation.

ENOW's annual time-series data are produced by the NOAA Office for Coastal Management for about 400 coastal counties, 30 coastal states, eight regions, and the nation from 2005 and onward using data from the Bureau of Labor Statistics and the Bureau of Economic Analysis. ENOW provides data for four economic indicators:

- business establishments (ENOW counts individual places of business; a single firm may have multiple places of business)
- employment (the number of people employed by business establishments, including part-time and seasonal workers; this figure does not include the number of self-employed workers)
- annual wages (wages paid to employees)
- gross domestic product, or GDP (the value of goods and services that are produced; in ENOW, this is based on the state estimates of GDP that are produced by the Bureau of Economic Analysis, called Gross State Product, or GSP)

Economic activity for a business establishment is included in ENOW when the establishment is either:

\* associated with an industry whose definition explicitly ties the activity to the ocean, or is\* located in an industry which is partially related to the ocean and is located in a shore-adjacent zip code.

Unfortunately, the latest data set available from the ENOW web site was for 2019. Considering that the COVID-19 pandemic disrupted the economy in significant way, all attempts were made to update these data manually by researching each ocean economy sector and industry from the original data source at Bureau of Labor Statistics (BLS), Quarterly Census of Employment and Wages (QCEW) and the U.S. Bureau of Economic Analysis (BEA).

#### United States Quarterly Census of Employment and Wages

QCEW data from the U.S. Bureau of Labor Statistics (BLS), was used to verify ENOW data. The latest available QCEW dataset, at the county-level, is for 2021. Data for 2022 will be released after the conclusion of this research. These data provided the number of business establishments in each industry. These data are available at [www.bls.gov](http://www.bls.gov)

#### United States Bureau of Economic Analysis

U.S. Bureau of Economic Analysis (BEA) provided county-level data on number of total full-time and part-time employment by industry; employment by place of work; compensation of employees by industry and place of work; and Gross Domestic Product (GDP in current dollars) by county. BEA does not report establishments; and BLS does not report proprietors and partners; nor military personnel—only civilian government. BLS does report establishments for federal government—civilian and military—just not employment for the latter. These data are available at [www.bea.gov](http://www.bea.gov)

#### United States Census Bureau

The U.S. Census Bureau provided county business patterns data on the number of establishments by industry. These data were used to triangulate or verify other collected data. The U.S. Census Bureau also provided a wide range of data on demographics, labor force, employment rates; employment by residence per industry; median household income; households by income group, payroll by NAICS code; and employment by occupation type.

#### Department of Environmental Protection

The Florida Department of Environmental Protection (DEP) provided data on submerged land leases.

#### Florida Department of Fish and Wildlife Conservation Databases

Florida FWC provided data on quantity and value of fish landings; and fishing permit data.

#### Municipal and County Business Licenses

City of Fort Walton Beach, Okaloosa County, and Walton County provided data on relevant businesses operating in their jurisdiction, in particular, charter fishing companies and boat livery rental companies. These data were used to make adjustments on the number local businesses establishments. In all cases, the adjustments were moved upward from Department of Commerce data.

## PRIMARY DATA

### Personal Interviews

Personal interviews were irreplaceable in discovering local businesses that were operating in the 2-county ocean economy. There were twenty recorded formal interviews with business owners in the ocean economy, resource managers, local leaders, and a military representative. Summaries of these interviews are provided in the appendix. In addition, numerous informal interviews were conducted with a wide range of businesses and citizens throughout the 4-county region. They included museum directors, educators, retired business owners, food and beverage business owners, religious leaders, representatives of the Muskogee/Creek nation; a wide range of recreationists on-site, including kite surfers, SCUBA divers, leisure fishing, birders, hikers, Crab Island visitors, and beach goers. Whether or not their business was related to the ocean economy, all interviews provided valuable information on the local economy and culture.

### Final Ecosystem Goods and Services (FEGS) Workshop

A workshop was held on March 6<sup>th</sup> with 26 key stakeholders in attendance. The purposes of the workshop were to:

- Identify all the economic activities on the Choctawhatchee Bay
- Identify who benefits economically from the Bay
- Identify any micro-industries that may not appear in economic data
- Identify what natural processes of the Bay are supporting the economic activities
- Determine the economic dependencies on these natural processes.

To meet these objectives, the participants were guided through a series of questions. The format of the meeting was an open discussion where all members provided feedback and answers and shared information. Each participant also had a paper survey and they provided written answers to each of the same questions. The survey questions were:

**Question 1:** What is your occupation? Or Livelihood? Please state your occupation:



**Question 2:** What product(s) or service(s) do you sell?  
 Please list the main products and/or services that make up the majority of your income:  
**Question 3a:** Where is this product or service produced?  
 Please select the one answer where most of your product or service is produced:

1. Directly on the water or shoreline of the Bay
2. Directly on the water or shoreline of the Gulf
3. In Okaloosa County
4. In Walton County

**Question 3b:** Where is this product or service sold?  
 Please select the one answer where most of your product or service is sold:

1. Directly on the water or shoreline of the Bay or Gulf
2. In Okaloosa and/or Walton County
3. In the Florida Panhandle
4. In Florida
5. Outside of Florida (including Tourists)

**Question 4:** Does your income depend on the Choctawhatchee Bay water quality staying in a good quality condition?  
 Please select one answer that is most applicable:

1. My business income is highly dependent on high quality water of the Choctawhatchee Bay.
2. My business income is slightly dependent on high quality water Choctawhatchee Bay.
3. My business income is not dependent on high quality water Choctawhatchee Bay.

**Question 5:** How much would the following environmental impacts reduce your income? Please select one percentage reduction on each line:

My income could be reduced by	100%- 75%	74%- 50%	49% - 25%	24% - 1%	0%
If the water in the Bay became too polluted to enjoy					
If the water clarity decreased significantly					
If the amount of freshwater increased significantly					
If the amount of salt water increased significantly					
If there was a significant loss of seagrass					

Contact Name: \_\_\_\_\_  
 Business Name: \_\_\_\_\_  
 Number of Employees (including self): \_\_\_\_\_  
 Circle one: 1; 2-4; 5-7; 8-10; 11-15; 16-20; 20-50; >50  
 Gross Business Revenue per Year: Circle one: <\$100,000; \$100,001- \$250,000; \$250,001 - \$500,000; \$500,001 - \$1,000,000; <\$1,000,000

## Chapter 4 LITERATURE REVIEW

Approximately 72 past studies relevant to this project were reviewed. A selection of nineteen studies that are primarily from Florida, and which most closely relate to this study are described below.

### Hackney, C 2015. St. Johns River Economic Study. St. Johns River Water Management District

A workshop was held to determine if an ecosystem service approach was appropriate for the St. Johns River (SJR). Eleven economic priorities were set by in-state and out-of-state workshop participants using both an ecosystem service approach as well as other traditional economic analyses. Seven of the eleven priorities were funded with an appropriation from the Florida Legislature. Funded priorities included 1) a conceptual model connecting natural functions with economic values, 2) the value of the SJR wetlands in flood prevention, 3) the value of wetlands in the removal of phosphorus and nitrogen from water in the river, 4) the increase in value of real estate along or near the SJR in four counties, 5) value of surface water to consumers along the river, 6) the economic impact of recreation by Florida residents to the Florida Economy and 7) the potential for ecotourism on the river. Many significant economic values of the river remain to be determined.

To develop an economic valuation of the wetlands as related to flood abatement and flood insurance rates required the integration of hydrologic and hydrodynamics models. The economic value of total flood prevention is \$3 billion dollars with an average decrease in residential property value of \$15,156 from being in a flood zone.

The economic value of this watershed-wide nutrient removal was determined using the cost (per pound) of N and P removal by wastewater treatment plants and the cost (per pound) of N and P bought and sold in nutrient trading programs in the SJR watershed, Florida and nearby states. Assuming a very conservative N/P removal cost of \$1 per pound, the economic value for nutrient removal by SJR wetlands still exceeds 400 million dollars/year for N and 5.3 million dollars/year for P.

An econometric model was used to estimate the economic value of properties in the lower SJR. Riverfront properties in the four counties studied increased in value \$944 million due solely to river frontage. Tributary frontage properties increased \$117 million over properties that lack frontage but were otherwise similar in property characteristics. The increased value attributable to the river carried to surrounding neighborhoods as well, with an \$837 million value for proximity to the river. Waterfront properties with the highest water clarity enjoyed an increased value premium of close to 24% for river frontage, while properties with the lowest clarity saw this premium reduced to only 6% of sales price. If all riverfront properties were adjacent to the highest water quality, i.e. six feet clarity, the hypothetical improvement in economic value attributable to the water quality improvement alone would total \$346.1 million.

A "benefit transfer" approach to valuing the annual surface and groundwater use in the watershed was conducted. Overall the annual value of surface water used in the SJR Basin (in 2010 dollars) was about \$70,000,000, while the value of groundwater used was greater than \$420,000,000.

The economic value of recreation along the freshwater portion of the St. Johns River, the current level of ecotourism activities, and the potential for future ecotourism activities in St. Johns River Basin (SJRB) area were evaluated through (a) telephone survey of the general public (i.e. a random sample of residents from northeast, north-central, and central Florida), and (b) online survey of potential frequent visitors (i.e., a random sample of Florida freshwater fishing license holders and those belonging to organizations that use the river, e.g., Florida Professional Paddlesports Association). Survey responses were used to estimate a travel cost model (TCM) to determine the economic value of recreation along the freshwater portion of the St. Johns River. The value of the freshwater portion of the SJR to each household in Florida was calculated to be between \$80.56 and \$97.67 annually.

#### Hindsley, P, Morgan Ashton, 2014. Sarasota Bay Economic Valuation Project. The Millennium Ecosystem 2

The researchers used Millennium Ecosystem Assessment framework to structure this study. The assessment was established in 2003 to organize and analyze the complex connections between human societies and ecosystems. It begins by accounting for the structure and function of the ecosystem in question. The Millennium Ecosystem Assessment is a human-centric approach that "connects the structure and function of ecosystem to human beings through ecosystem goods and services" to determine which components of the ecosystem shall be valued (Similar to a FEGS framework). The study performed four calculations: 1) economic value of recreation to residents using a meta-regression benefits transfer approach 2) the value of coastal residential real estate in proximity to the water using a hedonic property price model; 3) the economic impacts of visitor's recreation on economy of Sarasota and Manatee Counties (tourism) using an general equilibrium input-output model; 4) economic values using a Discrete Choice Model to calculate welfare benefits (or consumer surplus) from environmental resources in Sarasota Bay.

Based on the total number of properties influenced by proximity to the Bay across the two-county region, 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. 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).

The researchers estimated recreation values for residents through 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 provided 76 estimates combining nineteen activity types with trip purpose and trip duration.

The results showed the value of recreation trips for residents of Sarasota and Manatee Counties was between \$115, 621,769 and \$271,358,895 with a mean value of \$185,358,225. The value of recreation day trips for visitors of counties adjacent to Sarasota and Manatee Counties was 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 was 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 was 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 was between \$81,678,485 and \$134,384,448 with a mean value of \$106,867,724. A summation of 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 per year (95% Confidence Interval: \$321.4 million - \$689.9 million). These estimates are considered conservative since they do not include the value of windsurfing, kite sailing, paddle boarding, and sailing.

The authors estimated the region's 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. Results indicate that the regional value of Sarasota Bay estuarine resources is \$57.9 billion (95% Confidence: \$36.6 billion - \$79.0 billion) and to households in Manatee and Sarasota Counties as \$11.8 billion.

Table 4-1: Economic Value Streams from Sarasota Bay

Resource	Value
Combined value of recreation to residents and visitors	\$487.4 million per year
Total capitalized property value of proximity to water	\$3.1 billion
Sarasota Bay estuarine resources	\$57.9 billion to region \$11.8 billion Sarasota and Manatee Co.

Table 4-2: Property values in proximity to Florida Bay

Distance To Water	Marginal Value (mean)	Total Capitalized Value (mean)
Waterfront	\$504,838	\$233,674,360
100-1000 feet	\$100,161	\$416,697,181
1000-2000feet	\$55,322	\$238,937,999
2000-3000 feet	\$40,819	\$244,941,781
3000-4000 feet	\$28,894	\$ 47,371,518



**The Florida Everglades Foundation.** Dr. Andrew Stainback at the Greater Everglades Ecosystem Restoration conference in Coral Springs presented findings on four economic value streams including: recreational fishing; commercial fishing; residential property values; and carbon sequestration. The marginal values were: recreational fishing had an economic impact of \$438 million per year and provided \$73million in federal, state and local tax revenues and supported 4,112 jobs. Commercial fishing added another \$3million in economic impacts and supported 245 jobs. Carbon sequestration values were estimated at \$4.5 billion.

**L. Richardson et al. 2014. Assessing the value of the Central Everglades Planning Project (CEPP) in Everglades restoration: An ecosystem service approach. Ecological Economics 107 (2014) 366–377**

This study identifies a full range of ecosystem services that could be affected by a restoration project in the central Everglades and monetizes the economic value of a subset of these services using existing data. Findings suggest that the project will potentially increase many ecosystem services that have considerable economic value to society. The ecosystem services monetized within the scope of this study are a subset of the difference between the future with the CEPP and the future without CEPP, and they totaled ~ \$1.8 billion at a 2.5% discount rate. The subset values included: Carbon Sequestration (\$905M); Commercial Fishing (\$897K); Recreational fishing (\$45M); avoided lost recreational day (\$321K); Water quality (\$348K) and water supply (\$442M). Findings suggest that the use of ecosystem services in project planning and communications may require acknowledgement of the difficulty of monetizing important services and the limitations associated with using only existing data and models. Results of this study highlight the need for additional valuation efforts in this region, focused on those services that are likely to be impacted by restoration activities but were notably challenging to value in this assessment due to shortages of data.

**Felder, T 2009. The Economic Impact of Recreational Fishing in the Everglades Region. Everglades Foundation.**

The data used in this study were derived from two sources. The first source was a survey of Florida anglers fishing in the Everglades region. An internet survey was constructed and anglers throughout the south Florida region were directed to the Bonefish and Tarpon Trust website to complete the survey.

The second source of information used in this project was data from the 2006 National Survey of Fishing, Hunting and Wildlife Associated Recreation conducted by the U.S. Fish and Wildlife Service (2007). This survey, conducted every five years, collected data on freshwater and saltwater fishing in Florida, including the number of anglers, days fishing, and expenditures. Although the number of angler days fishing freshwater was slightly higher than for saltwater, the average daily expenditure for saltwater fishing was two and one-half times greater. Saltwater fishing expenditures were estimated to be \$516.9 million with a total output of \$883.6 million. Recreational angling in the Everglades region generated personal income of \$378.9 million from retail sales and an estimated 12,391 full-time equivalent jobs. The economic effects were based on retail sales only. These estimates were considered conservative for several reasons: first the study was included due to the limitations of the survey data. Non-resident anglers were responsible for 3.5 million fishing days in Florida and their spending is usually greater than residents; second, no non-residents were included due to the limitations of the survey data. Non-resident anglers were responsible for 3.5 million fishing days in Florida and their spending is usually greater than residents; third, the estimated number of fishing days were underestimated compared to the Marine Recreational Fisheries Statistics Survey (MRFSS).



**The Impact of Water Quality on Florida's Home Values. Florida Realtors. 2015**

The Florida Realtors Association, under contract with the Everglades Foundation, examined the impact of water quality and clarity on the sale prices of homes in Martin and Lee counties over a four-year period, from 2010 through 2013. Their finding were that ongoing problems of polluted water in the Caloosahatchee and St. Lucie rivers and estuaries were resulting in a negative impact on home values. Pollution was defined by four units of measure: micrograms per liter ( $\mu\text{g/L}$ ) of chlorophyll; milligrams per liter ( $\text{mg/L}$ ) of dissolved oxygen; Nephelometric Turbidity Units (NTUs); and Secchi disk depth for clarity. Researchers produced for each home sale record the average value of each metric's measurements over both the full month and full year leading up to the sale's contract date. The results of the one-month models and one-year models were statistically significant for all water quality metrics except for dissolved oxygen, which was not significant in either the Lee or Martin County models.

Three types of water quality measures for Lee County were found to have positive (negative) impacts on home values when water quality increases (decreases). The robust statistical significance of these results strongly supports the notion that water quality plays a role in the determination of nearby home prices. Statistically significant

results were found for two completely separate counties, another strong indicator that the water quality does indeed affect home prices in the hypothesized manner. Result also indicate that while the algal blooms and water discharge events have caused distress to home prices, for the most part, individual events have not affected homebuyers' opinions of homes. The stronger results were in the one-year averages which indicate that homebuyers take into account the quality of water over the long term when making their offers. In other words, a one-time event may not have a detrimental effect, but multiple negative pollution readings will produce long term downward pressure on home prices. Water clarity, as measured through Secchi disk readings, was superior to chlorophyll a, turbidity, and dissolved oxygen in terms of capturing homebuyers' and sellers' perceptions of water quality.

A one-foot increase in Secchi disk depth is associated with an estimated 2.48 percent increase in the sale price of a home on the waterfront of the Caloosahatchee Estuary. But the inverse also works: if there is a one-foot decrease in Secchi disk depth, then there is an estimated 2.48 percent decrease in sale price. The study results show that a one-foot increase in average Secchi disk depth throughout the Caloosahatchee Estuary raises Lee County's aggregate property value by an estimated \$541 million. Other things equal, researchers found that a one-foot increase in average Secchi disk depth throughout the St. Lucie Estuary, Loxahatchee Estuary, and the portion of the Indian River Lagoon north of the St. Lucie Inlet raises Martin County's aggregate property value by an estimated \$428 million. Conversely, changes in the water quality of the St. Lucie Estuary, Loxahatchee Estuary, and the portion of the Indian River Lagoon north of the St. Lucie Inlet—as measured by changes to one-year average Secchi disk depth at each monitoring point—resulted in an estimated \$488 million reduction in Martin County's aggregate property value between May 1, 2013 and September 1, 2013.

**Harrington, J et al. 2022. Economic Impact and Valuation Analysis of the Pensacola and Perdido Bays Estuary Program. By the Florida State University Center for Economic Forecasting and Analysis for the Pensacola and Perdido Bays Estuary Program.**

The researchers reported using a similar methodology as used by Harper et al. 2006 (also referred to as the Hass Report) that calculated the economic contribution of Choctawhatchee Bay. The methodology of this report can be summarized in three steps:

- 1) "Identify businesses related to the PPBEP area and calculate the direct economic activity by industrial sector (SIC)." (These businesses are identified by distance; all businesses within ½ mile of the estuary are included the study.)"
- 2) "Identify properties whose values are likely influenced by proximity to the PPBEP Area. Calculate the additional wealth contributed by the PPBEP Area and the additional consumer spending generated by this wealth."
- 3) "Use the results of (1) and (2) to calculate indirect and induced economic impacts using economic impact modeling software (REMI)."

This study did not attempt to estimate how proximity to the PPBEP area affects property values. The report states that "Doing so would require statistical modeling that can

separate the effects of various other determinants of price such as lot size, house size, proximity to amenities other than the estuaries, etc. Instead, the team applied estimates from the economics literature to the just values calculated in this report to determine how much property values are affected by proximity to the estuaries." The results of five studies are used to determine the "price premium" that results from proximity to the water (Major et al 2003; Bensen et al 1997; Michael et al 2003; Miller et al 2019; Cohen et al 2015; citations for these studies are not provided). Property value premiums were estimated as 45% for Bay front, 10% for Bay view, 3% for partial Bay view, and 0% for all other properties.

Based on this methodology, the researchers stated that the Bay was responsible for a \$2.6 billion property value premium that involved 77,046 residential units. Total consumer spending attributed to increases in property values is more than \$80 million. In addition to direct impacts, businesses and consumer spending also generated a total of \$14.6 billion in indirect and induced impacts, for a total of \$22.6 billion in economic impacts.

Businesses within ½ mile of the watershed had nearly \$8 billion in sales in 2020 and supported more than 84 thousand workers. A significant portion of Bay-related businesses are engaged in the service industry, with \$3.2 billion in sales and 40 thousand employees. This method did not distinguish between Bay-dependent business and Bay-related businesses and therefore was unable to measure the value of the waterbody itself. Small businesses contribute the most to both employment and sales, with 50.1% of employees working at firms with less than ten employees, and 42.5% of sales occurring at firms with less than ten employees. The model examined three water quality measures and found that chlorophyll was the metric most associated with price changes. If chlorophyll increased 1% faster per year, home prices are expected to decrease 0.06% faster. Applied to the change in median home prices in 2020, if the change in chlorophyll from 2020 to 2021 had been 1% greater, median home prices would have increased by \$1,410 less.

**Harper et. al. 2006. Economic Analysis of the Contribution of Choctawhatchee Bay to Okaloosa and Walton Counties (Hass Report). The Hass Center for Business Research. The University of West Florida.**

This study is the only economic research of its kind on Choctawhatchee Bay. It determined the economic contribution of the Bay to the two-county region of Okaloosa and Walton Counties and is what this current research project is seeking to update. The Hass Report identifies the "Bay economy" as those businesses or other entities whose activities are directly related to the Bay itself. These entities consist of: Firms whose products are directly related to water use, such as marinas, Bay-side hotels and restaurants, water related recreation services, and transportation-intensive companies. However, in collecting the data, the analysts did not distinguish businesses by type of business. Instead, they included all businesses that were located within one-half mile from the Bay and made the assumption that "For purposes of this analysis, a business located within this zone is by definition, Bay-related." This approach required the assumption that all economic activity within ½ mile of Bay was dependent on the

water and therefore can be used as a proxy to measure the value of the Bay. There were a total of 2,998 primary Bay-related businesses employing 22,804 employees in the Bay area.

Second, and properties whose value depends on water related amenities and access. The researchers selected residential properties within ½ half mile of the Bay and made the following assumption: "Bay-related residential properties will differ from similar properties in other areas due to their proximity to water. Specifically, the aesthetic benefits of living adjacent to the Bay are capitalized into the values of the Bay-related properties. One would expect a property adjacent to the Bay to yield a higher market value than an identical property in another, less aesthetically pleasing location." Price premiums for proximity to the Bay were not made from these data because it would require "further economic analysis accounting for structural and neighborhood characteristics. To undertake specific research of this nature for Choctawhatchee Bay is beyond the scope of this project. Instead, we use findings from the economics literature on the impacts on house prices from proximity to amenities such as the ocean or a Bay, and then applying these results to our data." Based on previous studies from around the country, the authors assign a price premium of 60% for Bayfront properties, 10% and 5% for Bayview and partial view properties, and 0% for all others. The study cites three previous research studies on which to determine the price premium. Major et al (2003) estimates a price premium of 15% for Bay front property and 156% for ocean front property at Stone Harbor, NJ; Benson et al. 1997 uses a price premium of 147% for ocean front property at Point Roberts in Washington State but does not report Bay front price premium; the third study is Michael et al. 2003 reports a Bay front price premium of 40% to 60% on Chesapeake Bay. Without further explanation, the authors selected 60% as the price premium to be used in Choctawhatchee Bay. The aggregate price premiums resulted in \$635 million in capitalized value. In addition, a wealth effect of 3% induced spending results in an additional \$19 million of spending in the local economy that would not otherwise have occurred but for the increases in property values. The study uses the REMI input-output model to determine the economic contribution that the Bay makes toward the regional economy. The results show that the Bay supports 36,030 jobs, generate 2.3 billion in personal income and \$2.4 billion in value-added the Gross Regional Product. The report attempts to place a value on the non-market recreational benefits from improvements to water quality. The authors provided findings from previous research but concluded that price premiums for proximity to the Bay cannot be made with these data without further economic analysis accounting for structural and neighborhood characteristics. "To undertake specific research of this nature for Choctawhatchee Bay is beyond the scope of this project. Instead, we use findings from the economics literature on the impacts on house prices from proximity to amenities such as the ocean or a Bay, and then applying these results to our data."

The study also attempted to determine economic value of non-market recreation values resulting from water quality. The authors provide selected studies from elsewhere to inform the reader of the potential values derived from good water quality. However, it concludes that "quantifying the increase in use value involves surveys and econometric techniques beyond the scope of this report; however, based on the economic theory

and literature presented, and the thousands of non-local visitors and local recreators that use the Bay, the increase in use value from improvements in water quality will be highly significant."

**Efimova, E 2019. A RANDOM UTILITY MODEL OF BEACH USE ON THE EAST COAST OF THE UNITED STATES: PER-TRIP VALUES AND HYPOTHETICAL BEACH CLOSURES.** A dissertation submitted to the University of Delaware. Random utility maximization models of beach recreation were created using survey data from 275 beaches between Massachusetts and South Carolina. Estimated welfare losses for hypothetical beach closures were generated from econometric RUM modeling. The loss-to-trip ratios for individual beach closures range from \$17.7 to \$32.5, \$88.8 to \$149.1 and \$324 to \$1865.9 for day, short and long overnight trips, respectively. The aggregate welfare losses for beach closures range from \$4.9 million to \$70.5 million, \$9.8 million to \$159.7 million and \$11 million to \$2.3 billion for day, short and long overnight trips, respectively.

**Bi, X. Tatiana Borisova, and Alan W. Hodges. 2019. Economic Value of Visitation to Free-Flowing and Impounded Portions of the Ocklawaha River in Florida: Implications for Management of River Flow. The Review of Regional Studies 49(2)244-267.**

This study assesses the trade-off of dam removal by estimating the economic benefits and regional economic contribution of recreation at the reservoir versus the upstream free-flowing river. River-based recreation on free-flowing rivers generates greater benefits and contributions than the reservoir. The trade-off between restoring the river ecosystem and loss in economic value for reservoir-related recreation can potentially be mitigated. The economic contributions to the local economy associated with recreational activities and visitor spending along free-flowing and impounded sections of the Ocklawaha River a regional economic model was constructed using the IMPLAN model. On average, the total trip expenditure per visitor-group per day was about \$253. The average trip expenditures by local visitors at reservoir sites were \$97.86 per visitor-group per day, while the expenditures by non-local visitors at reservoir sites were \$64.92. In contrast, local visitors at river sites spent just \$26.67, which is much less than local reservoir visitors. However, non-local visitors at the river sites spent \$92.80, which is similar to the spending level of local reservoir visitors. The total economic benefits or total annual consumer surplus from visitor groups at the reservoir sites were \$2.23 million while river sites produced \$3.97 million in consumer surplus. The results indicate the preference for nature-based recreation over human-made interventions.

**Borisova, T, et al (no date) Economic Contributions and Ecosystem Services of Springs in the Lower Suwannee and Santa Fe River Basins of North-Central Florida. University of Florida Extension (IFAS).**

An analysis of the economic contributions of springs-based recreational spending was carried out using a regional economic model of the nine-county study area constructed with the IMPLAN software. This study examines the monetary economic contributions and consumer surplus of recreational use and ecosystem services provided by fifteen key springs sites to the local economy of a nine-county area in north-central Florida.

Total recreational use at all springs sites (and related Santa Fe River activities) was estimated to average slightly over one million visitor-days annually during the 2008–2013 period. Attendance averaged over 100,000 visitor-days annually at several of these springs. In addition, the total number of diving visitor-days was estimated at around 57,000 annually. The estimated share of non-local visitors to the springs from outside the nine-county study area was typically about 70 percent for most of the sites studied. Total annual visitor spending attributed to springs recreation was estimated at \$83.8 million, including \$45.2 million by non-local visitors. The estimated total economic contributions of recreational spending (due to direct spending, supply chain activity and income re-spending) included employment of 1,160 full-time and part-time jobs, labor income of \$30.42 million annually, value-added of \$52.58 million annually, and industry output (revenue) of \$94 million annually. The value-added contribution is comparable to GDP. Tax revenue impacts to local/state governments totaled \$6.56 million, and impacts to the federal government were \$6.57 million. The largest tax impact for local/state governments were property taxes (\$4.13 million) and sales taxes (\$1.58 million). In addition, the total consumer surplus for the fifteen spring sites in the study area was estimated at \$9.44 million annually. The estimates of the direct economic contribution and consumer surplus focus on the value of recreational activities only. In addition to recreation, springs sites and related hydrologic systems provide a variety of ecosystem services, including provisioning (spring water bottling plant), supporting (e.g., hydrologic and nutrient cycling), regulating (e.g., flood control), and cultural (inspiration, art, cultural heritage, scientific knowledge, environmental education, existence value for endangered species, etc.).

**Botta, R. et al 2021. Short-term economic impacts of ecological restoration in estuarine and coastal environments: a case study of Lone Cabbage Reef.**

**Restoration Ecology.** This paper demonstrated how input-output analysis can be used as a method to quantify the short-term economic impacts of ecological restoration projects. Using the Lone Cabbage Reef restoration project in Florida as a case study and the economic modeling software IMPLAN, researchers found that the implementation phase of the project supported 44 full-time and part-time jobs earning \$1.01 million in labor income and generated \$5.08 million in total industry output, including \$3.02 million in total value-added within the regional economy. These findings support the notion that short-term economic impacts are an important component when evaluating ecological restoration projects and can provide stakeholders with immediate and tangible, albeit short-term results.

**Lake Clarity Makes a Difference in Maine, Non-Pint Source News. May 2005**

Researchers from the Maine DEP and the University of Maine recently published data showing that lake clarity can significantly affect the property values of lakeside homes. Ray Bouchard and Kevin Boyle investigated property values around 36 Maine lakes and found that properties on a lake with a clarity one meter greater than another similar lake have higher property values in the range of 2.6 percent (\$2,563) to 6.5 percent (\$9,271), depending on the market. Likewise, a one meter decrease in clarity causes property values to decrease anywhere in the range of 3.1 percent (\$3,084) to 8.5 percent (\$12,050). Like previous studies, researchers compared properties based on location

variables such as distance to nearest substantial town, type of road surface (gravel versus paved), density of other properties and cottages, property's lakefront footage, and lake surface area. Researchers also considered the structural variables that impact property value, including age and floor area of the unit, type of water supply and wastewater system, and presence of improvements (additions). Of all variables considered, lake surface area seems to have a large effect on the range of property values as it may affect individual perceptions of acceptable water quality.

**Kauffman, G. J. 2018. Economic benefits of improved water quality in the Delaware River (USA) Resources Applications. 2019;1–14**

The objectives of this research were to estimate the economic benefits of pollution reduction strategies that would raise dissolved oxygen (DO) levels from the current standard of 3.5 mg/L to a future year-round fishable criterion of 5.0 mg/L in the Delaware River. The improved water quality would boost tourism, fishing/hunting, recreation, real estate, and water supply. Dissolved oxygen is the metric used to determine a "fishable" water quality standard and an essential indicator of the ecological health of the estuary system. Initial economic analysis by the Federal Water Pollution Administration in 1966 concluded the multimillion-dollar pollution abatement program would generate \$350 million in annual benefits by improving dissolved oxygen levels to fishable standards in the Delaware River. Although water quality in the Delaware has improved substantially, scientists have called for raising the 1960s dissolved oxygen criteria from 3.5 mg/L to 5.0 mg/L to ensure year-round propagation of anadromous American Shad and Atlantic Sturgeon. This higher level would also mitigate atmospheric warming, increased water temperatures, and sea water incursion, all of which lead to reductions in dissolved oxygen saturation in the river. Economic valuation of this water quality improvement shows direct use benefits in the Delaware River to range from \$371 million to \$1.1 billion per year. Other economic sectors benefiting from improved water quality include recreational boating (\$46–\$334 million), recreational fishing (\$129–\$202 million), agriculture (\$8–\$188 million), non-use value (\$76–\$115 million), viewing/boating/fishing (\$55–\$68 million), bird watching (\$15–\$33 million), property value (\$13–27 million), water supply (\$12–\$24 million), commercial fishing (up to \$17 million), and navigation (\$7–\$16 million).

**Stokes-Cawley, O.; Stroud, H.; Lyons, D.; Wiley, P.; Goodhue, C. Economic Contribution Analysis of National Estuarine Research Reserves. Water 2021, 13, 1596. <https://doi.org/10.3390/w13111596>**

Stokes et. al. determined the value of the National Reserve System. Protected coastal environments within the National Estuarine Research Reserve System (NERRS) add jobs and revenue to the local communities. The reserve system provides educational and recreational opportunities, supports restoration projects and contributes to useful research and costal management. Reserves contribute to the regional economy by attracting visitors, funding research operations, and collaborating with partners who spend additional money on separate studies. Institutions such as NERRS provide economic contributions that extend beyond their operations. Spending by reserves and their partners ripples throughout the economy. This study performed an economic contribution analysis at four pilot sites using IMPLAN input-output modeling. The results

showed that spending from visitors and research studies was between \$27 million and \$44 million annually.

**Feng, S et al 2017. An Economic Valuation and Assessment Analysis of the Pellicer Watershed. Florida State University.**

The InVEST, model was used to conduct an economic valuation and assessment analysis study of the Pellicer watershed area and its tributaries. The study team examined the land use classifications by various categories of the Pellicer watershed area, by county, parcel number, acreage, just-value (JV), and the LU features of Flagler County and St. Johns County, in order to recommend suitable ecosystem valuation data for the InVEST model. The study team examined four models using InVEST: Habitat Quality, Fisheries, Unobstructed Views: Scenic Quality Provision and Visitation: Recreation and Tourism. The Habitat Quality model estimates the extent of habitat and vegetation types across a landscape, and their state of degradation. The Fisheries model within InVEST produced estimates of the harvest volume and economic value for the "commercial landings of white shrimp" and showed the impact of changes in habitat on the production of wild fish in the Pellicer watershed area. The Unobstructed Views: Scenic Quality Provision model determined the locations from which new nearshore or offshore features can be seen, by analyzing two human use features, aquaculture and boat ramp(s), as example, and by generating viewshed maps that can be used to further identify the visual footprint of new offshore development. The Visitation: Recreation and Tourism Model quantified the value of the natural environments and predicted the spread of person-days of recreation by using photo-user-days (PUD) as proxies for tourism. The Vulnerability and Economic Analysis were conducted based on the inputs and results of the InVEST models and economic statistics of the DOR LU parcels. The results of the vulnerability and economic valuation assessment show that the LU classifications "001: Single Family", "004: Condominiums", and "000: Vacant Residential – with/without extra features" in the Residential category have the highest JVs and most vulnerable to the invasive species Brazilian Peppertree and Cogongrass. The study draws no conclusions on how to use this information.

**J. Walter Milon, Alan W. Hodges, Arbindra Rimal, Clyde F. Kiker, and Frank Casey 1999. PUBLIC PREFERENCES AND ECONOMIC VALUES FOR RESTORATION OF THE EVERGLADES/SOUTH FLORIDA ECOSYSTEM. Economics Report 99-1 University of Florida.**

This report describes the application of a multi-attribute utility survey of nearly 500 south and central Florida residents to evaluate tradeoffs between natural and social system dimensions of restoration. Hydrological and wildlife attributes were used to represent alternative states of the ecosystem along with possible effects on municipal water supplies, farmland, and annual household taxes. Statistical results show that respondents indicated strong preferences for Everglades restoration, but the responses varied depending on how the alternative states of the ecosystem were represented. Also, these preferences were tempered by concern for the consequences of restoration decisions on municipal water users and farmland acreage. Willingness to pay measures derived from the sample indicate a maximum annual benefit from "full restoration" of approximately \$60 - \$70 per household per year over a ten year period. Extrapolating

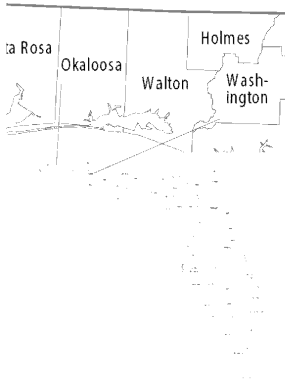
these results to the Florida population yields annual benefits of \$342.2 - \$406.5 million or \$3.42 - \$4.07 billion over a ten year period. These benefits, however, decline rapidly and turn negative if restoration imposes high costs in the form of water supply restrictions, losses in farmland acreage, and annual household taxes

**Mather Economics. Measuring the Economic Benefits of Comprehensive Everglades Restoration Plan (CERP). For Everglades Foundation (no date).** Mather Economics conducted extensive literature review, expert interviews, and site visits to collect the relevant data and establish valid assumptions on which economic models could be built. Drawing on the collected data, including environmental, river discharge, housing prices, employment, and tourism expenditure data, Mather Economics estimated the economic impact of the environmental improvements projected under CERP implementation. Each estimate is based on economic and analytical models that are supported by the latest science and most relevant data. The analysis suggests that restoration of the Everglades, as described in CERP, will have economic benefits estimated approximately \$46.5 billion in net present value terms. The range of this estimate can be as high as \$123.9 billion. Assuming an \$11 billion cost of restoration, the benefit: cost ratio is 4.04 for full CERP implementation.

**The Balmoral Group, 2020. Economic Impacts of Water Quality Issues in the Gulf of Mexico. Winter Park, FL. Gulf of Mexico Alliance.**

The research objectives of this project focused on quantifying the linkages between economic outcomes and Gulf of Mexico coastal health, specifically Harmful Algal Blooms (HABs). Results from the project were intended to enable resource managers and their state and federal partners to quantify the economic implications for HABs and their avoidance and assess restoration investments and/or management actions. The tools developed in this project estimated impacts measured in revenues, employment, wages and property values. The critical linkage between social media metrics and economic impacts was identified. However, the linkage between scientific data (HAB cell counts) and economic effects, which was weak or non-existent. This is potentially the first work to link economic impacts relating to Harmful Algal Blooms to social media activity. The economic impacts of HABs were estimated in terms of revenues, employment, wages and property values. Specifically, the research found losses of nearly \$1 billion and tax revenue declines of \$178 million across the 23 Gulf Coast counties in Florida were statistically attributable to the 2017-2019 Red Tide event in Florida. The value of 152 marine mammals stranded by the HAB event was estimated at \$198 million using published willingness to pay values. While the HABs themselves cause physical effects that cannot be ignored or downplayed, this research found that frequently the economic outcomes were unrelated to actual HABs, but highly correlated to social media.

## Chapter 5 ECONOMIC PROFILE OF THE FOUR-COUNTY REGION



The purpose of this study is to determine the economic contribution that Choctawhatchee Bay gives to the four counties of Okaloosa, Walton, Holmes, and Washington. These four counties comprise the entire study area of this research. Only Okaloosa and Walton Counties have waterfront on the Choctawhatchee Bay, therefore these are the only two counties included in NOAA's definition of the ocean economy. However, Holmes and Washington Counties are beneficiaries of the indirect and induced economic effects from the ocean economy activities that occur in Okaloosa and Walton Counties. These include additional jobs, local demand spending and wages earned. In addition, Holmes and Washington Counties are entirely in the watershed of the Bay and through them the Choctawhatchee River flows on its way from Alabama to the Estuary and Gulf of Mexico. Each county has its strengths and weaknesses and forms its own

unique position in the regional economy. This chapter summarizes the economy of the region and the economic composition of each county and serves as baseline information for the input-output model and economic contribution analysis.

The four-county region covers 3427 square miles (including water). Walton is the largest with 1240sqmi, followed by Okaloosa with 1082sqmi, Washington with 616sqmi and Holmes with 489sqmi. Both Okaloosa and Walton extend from the Alabama border to the Gulf of Mexico.

Okaloosa County is the most economically significant within the region with the largest labor force at 97,068 people and the most employed population at 93,326 and the greatest number of jobs and employers. Walton County ranks a distant second with a third as many jobs at 32,955. Walton County appears slightly wealthier than Okaloosa with the highest per capita income at \$38,777 versus \$36,762 in Okaloosa County and the highest median household income at \$68,111 versus Okaloosa with a median of \$67,390. Washington and Holmes Counties have the highest unemployment rates (3.1% and 4.1% respectively) and lowest median household incomes at \$41,800. Seventeen percent of Washington County families are living below the poverty line, versus 7% in Okaloosa.

Table 5:1 Key Economic Variables of 4-county Region

	2021	Holmes	Okaloosa	Walton	Washington
Population <sup>1</sup>	19,622	209,230	73,456	24,906	
Civilian Labor Force <sup>1</sup>	7,729	97,068	34,550	9,190	
Annual Ave. Unemployment (2021) <sup>2</sup>	4.1%	2.2%	2.4%	3.1%	
Current Unemployment Rate (Feb'23) <sup>2</sup>	2.90%	2.3%	2.5%	2.8%	
Private Business Establishments <sup>3</sup>	354	7019	3393	458	
Median HH Income <sup>1</sup>	\$41,809	\$67,390	\$68,111	\$41,806	
Households <sup>1</sup>	6,995	81,785	30,182	8,853	

Sources:  
 1. U.S. Census American Community Survey  
 2. Federal Reserve Bank of St Louis: <https://fred.stlouisfed.org/series/FLWASH3URN>  
 3. U.S. Department of Commerce, Bureau of Economic Analysis, QCEW

Table 5:2 Employment and Wages by County

2021	Total Private Employers <sup>1</sup>	Private Employment <sup>2</sup>	Total Employment (Private and Gov't) <sup>2</sup>	Wages <sup>2</sup>
Holmes	354	5016	6377	\$99,760,000
Okaloosa	7,019	108,500	145,195	\$5,112,477,000
Walton	3,393	46,287	49,967	\$1,697,733,000
Washington	458	7173	9002	\$204,395,000

1: U.S. BLS, QCEW;  
 2: U.S. Bureau of Economic Analysis (BEA);

Tables 5.3 through 5.6 provide details on the amount and type of employment in each county.

Table 5-3 Holmes County Employment Profile

Holmes County Employment Profile					
Description	2017	2018	2019	2020	2021
<b>Employment By Place Of Work</b>					
Total employment (number of jobs)	6,246	6,122	6,267	6,297	6,377
<b>By Type</b>					
Wage and salary employment	3,745	3,667	3,794	3,724	3,760
Proprietors employment	2,501	2,455	2,473	2,573	2,617
Farm proprietors employment	739	738	737	738	738
Nonfarm proprietors employment 2/	1,762	1,717	1,736	1,835	1,879
<b>By Industry</b>					
Farm employment	756	762	758	760	756
Nonfarm employment	5,490	5,360	5,509	5,537	5,621
Private nonfarm employment	4,053	3,933	4,026	4,132	4,260
Forestry, fishing, and related activities	(D)	(D)	(D)	(D)	(D)
Mining, quarrying, and oil and gas extraction	(D)	(D)	(D)	(D)	19
Utilities	(D)	(D)	(D)	(D)	(D)
Construction	570	546	663	790	811
Manufacturing	132	129	126	139(D)	
Wholesale trade	(D)	(D)	(D)	63	58
Retail trade	562	562	546	550	577
Transportation and warehousing	144	129	134(D)	(D)	
Information	(D)	(D)	(D)	(D)	(D)
Finance and insurance	147	150	145	162	152
Real estate and rental and leasing	179	147	148	167	172
Professional, scientific, and technical services	134	130(D)		147	153
Management of companies and enterprises	(D)	(D)	(D)	(D)	(D)
Administrative and support and waste management and remediation services	(D)	(D)	436(D)	(D)	
Educational services	(D)	(D)	(D)	(D)	41
Health care and social assistance	(D)	(D)	(D)	(D)	537
Arts, entertainment, and recreation	(D)		61	47(D)	(D)
Accommodation and food services	(D)		318	275(D)	(D)
Other services (except government and government enterprises)	495	493	489	487	494
Government and government enterprises	1,437	1,427	1,483	1,405	1,361
Federal civilian	62	63	66	67	68
Military	36	35	78	36	35
State and local	1,339	1,329	1,339	1,302	1,258
State government	472	470	470	461	408
Local government	867	859	869	841	850

(D)= data not disclosed due to confidentiality

Table 5-4 Employment Profile of Okaloosa County

Employment Profile of Okaloosa County					
Description	2017	2018	2019	2020	2021
<b>Employment by Place of Work</b>					
Total employment (number of jobs)	131,642	135,352	137,946	139,816	145,195
<b>By Type</b>					
Wage and salary employment	104,252	106,891	109,944	108,448	112,917
Proprietors employment	27,390	28,461	28,002	31,368	32,278
Farm proprietors employment	425	425	424	425	425
Nonfarm proprietors employment 2/	26,965	28,036	27,578	30,943	31,853
<b>By Industry</b>					
Farm employment	446	445	443	447	443
Nonfarm employment	131,196	134,907	137,503	139,369	144,752
Private nonfarm employment	97,980	100,915	101,955	103,096	108,057
Forestry, fishing, and related activities	301	319(D)		345	343
Mining, quarrying, and oil and gas extraction	300	212(D)		217	216
Utilities	266	250	189	199	204
Construction	6,855	7,253	7,053	7,322	7,478
Manufacturing	3,311	2,828	3,131	3,305	3,256
Wholesale trade	1,519	1,627	1,615	1,494	1,625
Retail trade	14,787	14,828	14,438	14,168	14,652
Transportation and warehousing	2,406	2,528	3,136	3,756	4,119
Information	1,265	1,392	1,377	1,382	1,375
Finance and insurance	4,891	5,064	4,605	5,118	5,359
Real estate and rental and leasing	7,419	7,766	7,536	8,340	8,553
Professional, scientific, and technical services	10,303	11,053	12,348	13,527	14,336
Management of companies and enterprises	565	590	598	627	704
Administrative and support and waste management and remediation services	8,033	8,772	8,489	7,557	8,374
Educational services	1,175	1,100	1,248	1,162	1,153
Health care and social assistance	10,181	10,216	10,583	10,586	10,743
Arts, entertainment, and recreation	2,650	2,818	2,633	2,577	2,725
Accommodation and food services	14,393	14,698	14,712	13,469	14,805
Other services (except government and government enterprises)	7,360	7,601	7,809	7,945	8,037
Government and government enterprises	33,216	33,992	35,548	36,273	36,695
Federal civilian	8,677	8,766	8,961	9,300	9,428
Military	16,227	16,960	18,240	18,880	19,188
State and local	8,312	8,266	8,347	8,093	8,079
State government	1,755	1,693	1,748	1,666	1,677
Local government	6,557	6,573	6,599	6,427	6,402

Table 3-5: Employment Profile of Walton County

Employment Profile of Walton County					
Description	2017	2018	2019	2020	2021
<b>Employment by Place of Work</b>					
Total employment (number of jobs)	42,000	43,881	45,111	47,043	49,967
<b>By Type</b>					
Wage and salary employment	27,142	27,850	29,208	29,029	31,472
Proprietors employment	14,858	16,031	15,903	18,014	18,495
Farm proprietors employment	596	596	594	595	595
Nonfarm proprietors employment 2/	14,262	15,435	15,309	17,419	17,900
<b>By Industry</b>					
Farm employment	606	606	607	616	611
Nonfarm employment	41,394	43,275	44,504	46,427	49,356
Private nonfarm employment	37,954	39,776	40,886	42,758	45,676
Forestry, fishing, and related activities	(D)	(D)	(D)	186	184
Mining, quarrying, and oil and gas extraction	(D)	(D)	(D)	198	174
Utilities	306	307	309	318	326
Construction	3,702	3,917	4,061	4,562	4,941
Manufacturing	544	537	535	602	625
Wholesale trade	564	621	646	655	679
Retail trade	5,609	5,720	5,823	5,670	6,135
Transportation and warehousing	598	754	896	1,091	1,197
Information	297	295	310	346	409
Finance and insurance	1,642	1,923	1,752	2,260	2,414
Real estate and rental and leasing	4,996	5,367	5,328	6,085	6,490
Professional, scientific, and technical services	2,415	2,611	2,739	2,960	3,258
Management of companies and enterprises	225	264	262	293	303
Administrative and support and waste management and remediation services	2,889	3,077	3,306	3,457	3,747
Educational services	360	450	492	455	494
Health care and social assistance	2,828	2,707	2,849	2,829	2,862
Arts, entertainment, and recreation	810	847	888	973	994
Accommodation and food services	7,038	7,087	7,429	7,001	7,580
Other services (except government and government enterprises)	2,751	2,929	2,906	2,817	2,864
Government and government enterprises	3,440	3,499	3,618	3,669	3,680
Federal civilian	149	147	157	181	168
Military	119	121	127	133	139
State and local	3,172	3,231	3,334	3,355	3,373
State government	554	546	528	489	469
Local government	2,618	2,685	2,806	2,866	2,904

Table 3-6: Employment profile of Washington County

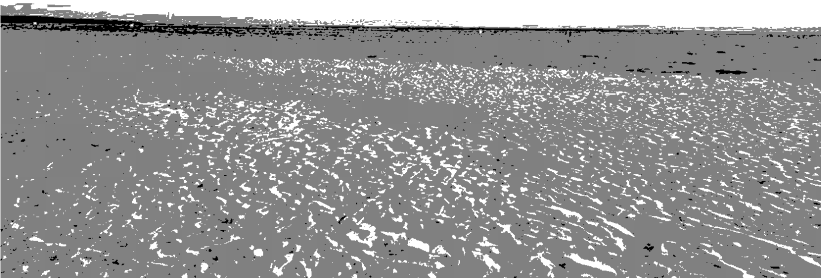
Employment Profile of Washington County					
Description	2017	2018	2019	2020	2021
<b>Employment by Place of Work</b>					
Total employment (number of jobs)	8,816	9,012	9,229	9,112	9,002
<b>By Type</b>					
Wage and salary employment	6,287	6,387	6,557	6,350	6,175
Proprietors employment	2,529	2,625	2,672	2,762	2,827
Farm proprietors employment	393	392	392	392	392
Nonfarm proprietors employment 2/	2,136	2,233	2,280	2,370	2,435
<b>By Industry</b>					
Farm employment	419	418	417	420	416
Nonfarm employment	8,397	8,594	8,812	8,692	8,586
Private nonfarm employment	6,423	6,623	6,857	6,830	6,757
Forestry, fishing, and related activities	(D)	(D)	(D)	(D)	138
Mining, quarrying, and oil and gas extraction	(D)	(D)	(D)	(D)	23
Utilities	(D)	(D)	(D)	(D)	(D)
Construction	663	655	737	799	829
Manufacturing	329	327	300	270	269
Wholesale trade	205	189(D)	(D)	(D)	(D)
Retail trade	995	972	983	941	978
Transportation and warehousing	(D)	(D)	(D)	(D)	(D)
Information	40	47	41	39	20
Finance and insurance	246	284	274	279	301
Real estate and rental and leasing	224	248	226	251	268
Professional, scientific, and technical services	431	443(D)	(D)	(D)	435
Management of companies and enterprises	(D)	(D)	(D)	(D)	(D)
Administrative and support and waste management and remediation services	(D)	(D)	773	772(D)	(D)
Educational services	(D)	54(D)	(D)	(D)	(D)
Health care and social assistance	(D)	991(D)	(D)	(D)	(D)
Arts, entertainment, and recreation	(D)	(D)	(D)	(D)	(D)
Accommodation and food services	(D)	(D)	(D)	(D)	(D)
Other services (except government and government enterprises)	584	610	603	608	599
Government and government enterprises	1,974	1,971	1,955	1,862	1,829
Federal civilian	34	34	34	40	33
Military	62	66	65	48	43
State and local	1,878	1,871	1,856	1,774	1,753
State government	957	961	936	887	860
Local government	921	910	920	887	893



## Chapter 6 THE ECONOMY OF CHOCTAWHATCHEE BAY

The economy of Choctawhatchee Bay is measured through the six ocean economy industry groups, as described in chapter three. Evaluating the Choctawhatchee Bay economy through NOAA's methodology ensures consistency with, and comparability to, other regions of the country. It also ensures that the value of the Choctawhatchee Bay economy, in terms of GDP, employment productivity, and wages is a true percentage of the National MESA as calculated by the Department of Commerce, Bureau of Economic Analysis.

To measure the Choctawhatchee Bay economy, we investigate and report on the level of activity in each of the six ocean economy industry groups in Okaloosa and Walton Counties.



### OCEAN ECONOMY INDUSTRY ANALYSIS

#### Marine Construction

Industry Group: Marine Construction  
 Number of NAICS Industries: 1  
 Name of NAICS Industry  
 • Other Heavy Construction  
 Number of Jobs Produced: 84  
 Number of Businesses in Industry Group: 13  
 Annual Wages Paid: \$4.9 million

Marine Construction refers to the construction of docks, piers, seawalls and construction projects involving water resources such as dredging, waterfront parks, and dam construction. It falls under NAICS code 237990 and category of "other heavy construction." Based on data from the Bureau of Labor Statistics there are thirteen registered business establishments that identify themselves in this category. There are eight in Okaloosa County and five in

Walton County. Other construction companies may occasionally perform water related construction activities but may not be within this category because a majority of the annual revenue is from other types of construction. When calculating the size of the ocean economy in Choctawhatchee Bay it is important to remove all non-marine-related activities to ensure a conservative estimate and avoid any double counting of economic activity.

The marine construction sector in the study area produces 84 jobs and pays 4.9 million in wages annually. This is a small fraction of the 10,880 total construction jobs indicating limited demand, specialty skills required, and barriers to entry.

**Living Resources**

Ocean Economy Industry Group: Living Resources  
 Number of NAICS Industries: 3  
 Name of NAICS Industries:  
 o Fishing (fin and shellfish)  
 o Fish and Seafood Merchant Wholesalers  
 o Fish and Seafood Markets  
 Number of Jobs Produced: 98  
 Number of Businesses in Industry Group: 27  
 Annual Wages Paid: \$4.3 million



Living Resources is an ocean economy activity that includes three NAICS industries: fishing for finfish or shellfish; seafood wholesalers; and fish and seafood markets. Counting the number of local businesses in the fishing industry is complicated by the process of monitoring and regulations over fish harvesting and the multiple agencies who collect and distribute these data. On one hand, the Department of Commerce recognizes nine fish harvesting businesses, seven wholesalers, and eleven retail fish markets in the two counties (table 6.1). These eighteen businesses are self-reported to the Department of Commerce, Bureau of Labor Statistics (BLS) under a specific NAICS code that represents their primary business activity. On the other hand, when a commercial harvester lands their catch, the Florida Fish and Wildlife Conservation Commission records the quantity and value of fish landings through the states' mandatory Marine Fisheries Trip Ticket Program. These trip ticket data show that 114 unique permit holders sold commercially harvested fish in 2022 and therefore were beneficiaries of the ocean economy (table 6.2). The amount each individual permit holder sold is not available. The large difference between the eighteen businesses in the living resources industry and the 114 permit holders was investigated to try to determine the actual size of this industry in terms of employees and businesses. The data are inconclusive.

A permit holder can acquire a Saltwater Products License (SPL permit) with little barrier to entry. They are not expensive. The SPL holder is not required to harvest fish. There are no additional requirements such as residency, insurance, knowledge or skill level. The permits are not mutually exclusive to other industries; in other words, an SPL holder can also be employed and economically active in any other industry. SPL holders can be crew on boats who are assisting vessel owners in fish harvesting. Conversely, a crew member on a boat doesn't need an SPL to help a boat owner harvest fish under a valid vessel SPL, yet on another day, that same person can be the boat owner who is harvesting and selling fish under their own SPL. An SPL holder can also be a wholesaler who harvested fish and sold to himself. An SPL holder may be a sole proprietor who relies on fishing activity to provide some, or all, of his household income. If a sole proprietor pays into the national Unemployment Insurance program, then they would likely have an Employer Identification Number (EIN) number and their business is counted in these data. If the SPL holder is a sole proprietor but reporting his/her income through a Social Security Number, then they are not included as a "business establishment" in the BLS data. If the SPL holder was earning a majority of income through fishing, then it would be financially beneficial for that person to register the business and operate through an EIN to write off business expenses. At the end of the day, counting SPLs to estimate the number of businesses harvesting fish commercially would result in a gross overestimation of the number of businesses in commercial fishing. Yet, the number of

Table 6.1: Living Resources

	Okaloosa		Walton	
	Businesses	Employees	Businesses	Employees
Fishing (Fin and Shell)	6	18	3	3
Fish and Seafood Merchant Wholesalers	5	10	2	2
Fish & Seafood Markets	7	42	4	23
<b>Total</b>	<b>18</b>	<b>70</b>	<b>9</b>	<b>28</b>



Table 6.2: commercial fish harvest activity

Year	County	Pounds	Trips	Value	SPL holders
2022	Okaloosa	876,820	897	\$ 3,135,985	105
2021	Okaloosa	842,859	1,077	\$ 3,000,469	120
2020	Okaloosa	854,989	1,147	\$ 2,771,617	99
2019	Okaloosa	1,061,373	1,318	\$ 3,266,871	122
2022	Walton	28,169	139	\$ 73,727	9
2021	Walton	43,847	138	\$ 120,570	8
2020	Walton	19,143	49	\$ 31,984	8
2019	Walton	53,488	103	\$ 97,488	12

Source: Florida Fish and Wildlife Research Institute,

SPL holders equals, at least, the number of individuals who benefit from the ocean economy (114 in 2022).

On the other hand, the nine commercial fishing companies is likely a small underestimation of the actual total in the study area. Any company with an employee earning W-2 wages would be included in the nine estimated here. So, the missing companies are sole proprietors reporting income through personal social security numbers. These establishments are likely small scale and do not have large capital assets. Any business that owns an expensive boat and other large capital assets would be advised to establish a Limited Liability Corporation (LLC) and work through a company with an EIN. Reviewing the average size of the harvest can help reveal a little more insight.

In 2022, 904,989 pounds of fish with a value of \$3.1 million were landed in Okaloosa and Walton Counties from a total of 1,036 fishing trips. This amounts to an average harvest of 873 pounds of fish, which is likely too much for a sole proprietor with a small boat to handle in a single trip. Most commercial fishers that can handle harvests this large need larger boats. In which case, most would have insurance, protect themselves through a Limited Liability Corporation (LLC), have an EIN, and hire labor. In other words, these companies are already identified in the BLS data. Sole proprietors are small companies with small boats and likely do not harvest large quantities of fish per year. A majority of the economic value of the fish harvested is from the nine registered businesses. The exact percentage of the total \$3.7 million in product value that these companies harvest is unknown due to confidentiality requirements of the Trip Ticket Program.



#### Offshore Mineral Extraction

The State of Florida has a moratorium on offshore oil and gas drilling. There are no mining activities in this sub-industry in the study area. However, the title of this industry group "Offshore Mineral Extraction" is a misnomer. This industry group includes NAICS code 212321 "Construction Sand and Gravel Mining" however the definition of this industry is:

*"This U.S. industry comprises establishments primarily engaged in one or more of the following: (1) operating commercial grade (i.e., construction) sand and gravel pits; (2) dredging for commercial grade sand and gravel; and (3) washing, screening, or otherwise preparing commercial grade sand and gravel"*

The definition includes storage and processing of the material. In Walton County there are three sand and gravel businesses and there is one in Okaloosa County. All four operations are sand and gravel depots that receive shipments of material from out of the area by barge, possibly process them, and resell them to local construction companies. These companies should be included in the ocean economy and the economic impact model. The sand and gravel businesses pay over \$2.9 million in wages annually. So long as Okaloosa and Walton Counties remain two of the fastest growing counties in Florida then the demand for these materials will continue to grow. It is important to not exclude them simply because of the term "mining" especially when these businesses are dependent on the Bay to receive these goods. These jobs and establishments are not included in the Marine Transportation Industry Group because it represents only transportation activities and support services. In addition to the sand and gravel businesses, there are two businesses in the Geophysical Mapping Services industry that employ fifteen people and pay \$865,500 in annual wages.

Ocean economy Industry Group:  
Offshore Mineral Extraction  
Number of NAICS Industries: 3  
Name of NAICS Industries:  

- o Oil and Gas Extraction
- o Sand, Gravel, and Refractory Minerals Mining
- o Geophysical Exploration and Mapping Services

 Number of Jobs Produced: 53  
 Number of Businesses in Industry Group: 6  
 Annual Wages Paid: \$3.7 million



### Ship and Boat Building

Ocean economy Industry Group: Ship and Boat Building  
 Number of NAICS Industries: 1  
 Name of NAICS Industries:  
 ○ Ship and Boat Building  
 Number of Jobs Produced: 12  
 Number of Businesses in Industry Group: 1  
 Annual Wages Paid: \$.5 million

The last ship and boat building company on Choctawhatchee Bay recently closed its doors. An interview with the last boat builder from the region provided in-depth details of the industry past and present. Buddy Gentry, owner of G&S boat building of Freeport was interviewed at his home on March 4<sup>th</sup>. G&S started in 1973. They built 32' to 72' yachts each costing several million dollars. The production rate

was approximately one yacht per year. He hired between nine and eighteen employees earning an average of \$20/hr. All of his customers were obtained by word of mouth and the company held a strong reputation for high quality boats. He hired many subcontractors in the region including aluminum welders, upholsterers, and finish carpenters. About 80% of his customers were not residents of Florida and therefore imported dollars to the region. When he closed his business, no other companies filled the void. Freeport shipbuilding group closed several years ago and converted their business to boat storage. The Bureau of Labor Statistics reports undisclosed data indicating at least one company in the region. This is likely old data and will be removed soon. Luxury yacht building is still in high demand nationwide, and the Choctawhatchee Bay is an excellent location for the business. When Mr. Gentry was asked why no other builders took his place, he commented on how difficult and complicated it was to run the business. This industry presents an excellent economic development opportunity for the region and it should be nurtured.



### Tourism and Recreation

Ocean Economy Industry Group: Tourism and Recreation  
 Number of NAICS Industries: 8  
 Name of NAICS Industries:  
 ○ Scenic and Sightseeing  
 Transportation, Water Transport  
 ○ Recreational Goods Rental  
 ○ Maritime Museums  
 ○ Amusement and Theme Parks  
 ○ Marinas  
 ○ Other Amusement and Recreation Activities  
 ○ Accommodations  
 ○ Food Services and Drinking Places  
 Number of Jobs Produced: 23382  
 Number of Businesses in Industry Group: 1504  
 Annual Wages Paid: \$734 million

The Tourism and Recreation Industry Group accounts for 97% of the entire ocean economy in the Choctawhatchee Bay region. It is also the most complicated to analyze due to the numerous sub-industries and the way the businesses operate. An extensive amount of time was spent interviewing companies, creating locally derived databases, and researching local business licenses and permits to determine the extent of the business activity in the region.

Interviews were held with at least one representative of each of the eight industry groups. The eight industries are:  
 1. Scenic and Sightseeing, Water Transportation which includes dolphin tours, sunset cruises as well as recreational, or charter, fishing guide services.

2. Recreational Rentals which include all the boat and jet ski liveries and beach rental operations.
3. Maritime Museums.
4. Amusement Parks and theme parks such as Gulfarium Marine Adventure Park.
5. Marinas.
6. All Accommodations including hotels/motels, camping, and RV parks.
7. Food Services and Drinking Places.
8. Other amusement or recreational activities.

There were large differences between the data that BLS used to report the number of establishments and the number that was found through local research. The differences were largely the result of how business establishments operated. Similar to commercial fish harvesters, tourism recreation businesses are operated seasonally and generate part-time income, and therefore are reported under social security numbers. For example, QCEW data for Walton County reported a total of 213 establishments while locally conducted primary research found 402 establishments. In Okaloosa County, QCEW data reported 586 establishments while local primary research found 1102 (table 6.3). The corrected data is what is being used to calculate economic impacts.

Table 6.3 Tourism and Recreation Industry by Employees and Businesses

	Okaloosa		Walton		Total	
	Businesses	Employees	Businesses	Employees	Businesses	Employees
<i>Scenic &amp; Sightseeing Transport, Water</i>	209	621	37	97	246	718
<i>Recreational Goods Rental--boating</i>	133	1,196	27	173	160	1,369
<i>Maritime Museums</i>	3	30	0	0	3	30
<i>Amusement &amp; Theme Parks</i>	11	120	0	0	11	120
<i>Marinas</i>	19	200	0	0	19	200
<i>Other Amusement &amp; Recreation Activities</i>	35	321	3	22	38	343
<i>Accommodation--Hotel, RV, Camps</i>	79	1,625	52	1,943	131	3,568
<i>Food Services &amp; Drinking Places</i>	613	11,973	283	5,061	896	17,034
<b>Total</b>	<b>1,102</b>	<b>16,086</b>	<b>402</b>	<b>7,296</b>	<b>1504</b>	<b>23,382</b>

Boat rental and livery businesses are in a period of rapid transition. The demand for rental is largely driven by the demand to visit Crab Island. Marketed as a "5-acre swimming pool" Crab Island is an expansive waist-deep sand bar in warm, calm, turquoise waters where tourists flock for a day of sun and fun. A boat is required to access this area. The demand for this activity has grown so large and fast that the City of Destin put a moratorium on boat rentals and it is becoming a challenge to manage crowds and ensure public safety. The traffic to Crab Island is becoming dense that a management plan is needed soon. Interviews with Okaloosa County and City of Fort Walton Beach code enforcement and planning officials revealed that this business is mostly unregulated. There is little or no regulations that would prevent any private boat owner from renting his boat. With the strong demand to visit Crab Island and the moratorium in Destin, new small companies are starting to form and locate in neighboring Fort Walton Beach and Niceville. A tax records search in the City of Fort Walton Beach found 44 registered boat rental companies in the City. According to an interview with the owner of Luther's Pontoon Rentals and President of the Water Sports Owners Coalition, the City of Destin has a limit of sixteen livery boat rental companies. The two cities have combined have a total of 60 companies. The remaining 100 were found through various primary research data collection efforts. Permit data from Walton and Okaloosa Counties, combined with charter fishing cooperative data, was used to estimate charter fishing guides.





**Marine Transportation**

Ocean Economy Industry Group: Marine Transportation  
 Number of NAICS Industries: 5  
 Name of NAICS Industries:  
 o Navigational Measuring Instruments Manufacturing  
 o Petroleum Bulk Stations and Terminals  
 o Deep Sea, Coastal Water Transportation  
 o Other Support Activities for Water Transportation  
 o Warehousing and Storage  
 Number of Jobs Produced: 400  
 Number of Businesses in Industry Group: 28  
 Annual Wages Paid: \$33 million

The Marine Transportation Industry Group not only includes the barge traffic that is a common sight on Choctawhatchee Bay but also the destination for those barges including the fuel terminals and warehouses. There are only two water transportation companies operating in the study area and both are located in Okaloosa County. This industry group also includes navigational equipment manufacturing. There are nine companies in the 2-county study area that contribute to this industry, six in Okaloosa and three in Walton County. This is the second largest industry group in the ocean economy of Choctawhatchee Bay producing \$33 million in wages. Interviews with the U.S. Coast Guard and barge captains revealed the strategic importance of the marine transportation industry in the Choctawhatchee Bay economy. The northwest Florida region is not serviced by the Colonial Pipeline that moves 3 million barrels of refined petroleum products between Texas and New York daily. Instead, the Choctawhatchee Bay region is

dependent on barge services to deliver fuel including gasoline, diesel, jet fuel, heating oil and other petroleum products.

Eglin and Hurlburt Field receive aviation fuel and gasoline approximately every 10 days via barges from New Orleans/Baton Rouge area. The Citgo Terminal in Niceville receives two tank barges of various grades of petroleum products approximately every 10 days from Pascagoula. The Murphy Oil terminal in Freeport receives two tank barges of various grades of petroleum products approximately every week also from Pascagoula. The sand and gravel depots in Port Washington and Boggy Bayou benefit from weekly barge deliveries from Mobile. In addition to receiving local deliveries, the Choctawhatchee Bay is a critical link in the Intercoastal Waterway that facilitates marine transportation nationwide. This means the shipping channels are maintained, which supports additional jobs. Four companies with a total of 31 employees provide various support services to the marine transportation industry.



Table 6-4 Marine Transportation Industry Group

	Establishments	Employees
<i>Navigational measuring instruments manufacturing</i>	9	247
<i>Petroleum bulk stations and terminals</i>	4	18
<i>Deep sea, coastal water transportation</i>	2	54
<i>Support Activities for water transportation</i>	4	31
<i>Warehousing &amp; storage</i>	9	50

**SUMMARY**

The ocean economy of Choctawhatchee Bay is comprised of six industry groups with a total of 21 individual NAICS industries. Some industry groups include only one industry within it, while other industry groups have several unique industries. The Tourism and Recreation Industry Group is the largest with eight sub-industries. Tourism and Recreation is clearly the dominant industry of Choctawhatchee Bay's ocean economy. It produces 97% of all jobs and generates \$743 million in wages. The Marine Transportation Industry Group ranks second in generating wages at \$33 million.

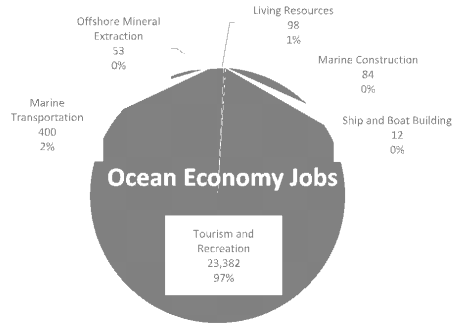
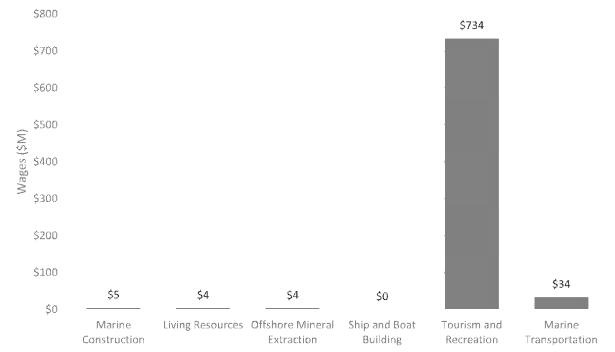


Figure 6-1 Ocean Economy Jobs by Industry Group

In total, the Choctawhatchee Bay waterbody is responsible for supporting 1579 businesses who employ a total of 24,029 people and who bring home \$781 million in wages.

Figure 6-2 Annual Wages by Ocean Economy Industry Group



### REGIONAL INPUT-OUTPUT MODELING

To understand the Choctawhatchee Bay economy, one must identify and quantify the economic relationships that transact between each of the different ocean economy sectors. For example, commercial fish harvesters have relationships with many other economic sectors of the Bay's economy. They sell their fish to wholesalers and buy from a wide range of sectors including fuel, provisions, tools and equipment, insurance, and other essential support services (direct impacts). Each of those sectors are benefiting from the fish harvest and in-turn generate demand for inputs to operate their businesses (indirect impacts). In addition, all of the affected businesses buy labor who bring home wages and generate demand for household goods and services (induced impacts) (Fig 6.3). All of these transactions are supported by the Choctawhatchee Bay, much the same way that any larger employer (a manufacturing plant, the military, or a university) is responsible for producing jobs. The interrelationship between economic sectors is measured by a Computable General Equilibrium Model, or "input-output" model for short. Input-Output (I-O) models are built as statistical packages to measure the effects of changes to an economy. In this case, we can use an I-O model to measure the economic effects that spending caused by the Choctawhatchee Bay has on the 4-county economy. Each of the businesses that rely on the Bay for its revenue purchase supplies, capital equipment, services, and labor to operate. We calibrate the model to recognize Choctawhatchee Bay-related spending as inputs. The model knows how this spending is distributed across all sectors of the 4-county economy. The outputs represent what is produced by this spending and is measured by the number of jobs that the Bay supports, the amount of household wages that is paid to these job holders, and the value of the products produced by the labor as measured in GDP.



There are several commonly used I-O models that are purchased as packages. The operator must calibrate the packaged model to the regional geography and local spending to answer the researcher's specific questions. REDYN, IMPLAN, and RIMS are commonly used I-O models that are publicly available for purchase. REDYN is far superior to the other models and therefore was chosen for this project. The REDYN model allows industry-specific inputs for 2,171 industry sectors, including: 1,053 private-sector industries, 28 government and functional industries, and 996 private-sector aggregate industries. By comparison RIMS provides multipliers for only 372 detailed

and 64 aggregate industry sectors. IMPLAN allows inputs for 546 industry sectors. REDYN distributes local spending to all 3,143 counties in the U.S., while all other I-O models do not. Instead, they estimate indirect and induced spending with Regional Purchasing Coefficients that are too simplistic to measure the interrelationships of spending patterns between sectors. REDYN is the only dynamic model that calculates all transactions in all regions that are implied by the spending in Choctawhatchee Bay. Transactions are allowed to cycle through the U.S. economy, becoming progressively smaller with each cycle, until all sectors achieve cycle-over-cycle equilibrium. REDYN is the only model that uses the all-modes transportation network database, produced by Oak Ridge National Laboratories, to identify impedance of goods and services from each region to all other regions via road, rail, water, air, pipeline, and proxy modalities. This multi-modal transportation network data enables REDYN to capture and estimate unique trade relationships between each U.S. county and every other U.S. county simultaneously. By leveraging transportation margin data specific to the production and distribution of each commodity in the model, REDYN captures commodity-specific efficiency subtleties in each region-to-region network segment, and by extension the transportation network as a whole. As a result, REDYN's internally estimated region-to-region trade for every commodity very closely replicates the region-to-region trade that actually occurs in the real world, as verified by regional commodity flow survey data and supply chain analysis of individual enterprises. IMPLAN and RIMS use rough estimates of commodity flows and the results may grossly underestimate or overestimate the actual impacts. The REDYN model does not attempt to produce, nor does it use, any multipliers for any economic concept. Economic Impact multipliers are often used by IMPLAN and other models to create a shortcut to estimating economic impacts. However, it is important to understand that multipliers are a *product* of an economic model, not a *feature*. The number of multipliers that each model uses is directly proportional to the number of shortcuts it is using. REDYN has no multipliers because it doesn't make assumptions through multiplier coefficients to reach conclusions on economic impacts. Rather, as mentioned, it thoroughly cycles all spending through all sectors of the economy until it reaches equilibrium.



**ECONOMIC CONTRIBUTIONS OF CHOCTAWHATCHEE BAY**

The correct term for this study is an “economic contribution” analysis. Economic contribution analyses will differ from economic impact analyses by the level of displacement. If a development project, or government policy, is implemented that will have both positive and negative economic impacts, like when jobs will be gained *and* lost, then an economic impact analysis is conducted to measure these positive and negative effects. This study is measuring the baseline economic value of Choctawhatchee Bay. Therefore, there is no loss (economic displacement) to anyone. The study measures the existing value of the Bay in its present state today. Hence, the correct terminology for this study is an economic contributions analysis. If one would like to measure the economic effects of physical development, or changes in policy, that would potentially impact the Bay, then an economic impact analysis should be used. This economic contribution analysis will form the baseline for any subsequent economic impact analysis. For the purposes of this report, the terms impacts, effects, and contributions are used synonymously.

Okaloosa and Walton Counties are the only counties that benefit from the direct economic impact of the ocean economy of Choctawhatchee Bay. The indirect and induced impacts are received by all four counties of the study area.

The economic effects are measured in employment demand (jobs created by the Bay), value of all products and services produced (also referred to as “output” or gross domestic product) and wages (the amount of take-home income earned by the job holders).

**Jobs and Wages**

*Table 6.5 Jobs and Wages Supported by the Choctawhatchee Bay*

<i>Economic Effects</i>	<i>Geography</i>	<b>Jobs</b>	<b>Wages (\$M)</b>
<i>Direct</i>	Okaloosa	16,507	\$374
<i>Direct</i>	Walton	7,522	\$96
<i>Total Direct</i>	Choctawhatchee Bay Ocean economy	24,029	\$470
<i>Indirect</i>	Holmes and Washington	218	\$18
<i>Total Direct and Indirect</i>	Holmes, Okaloosa, Walton, Washington	28,236	\$817
<i>Indirect</i>	Florida (outside of 4-county region)	7,574	\$554
<i>Total Jobs and Wages Supported by the Bay</i>		35,810	\$1,371

Tables 6.5, 6.6 and 6.7 are the outputs from the I-O model and summarize the economic contribution that Choctawhatchee Bay makes to the local and regional economy. The Choctawhatchee Bay ocean economy supports a total of 24,029 jobs, 16,507 in Okaloosa and 7,522 in Walton and it generates \$470 million in household wages annually. Holmes and Washington Counties are beneficiaries of 218 indirect jobs and 18 million in wages created by the Bay. Okaloosa and Walton Counties also benefit from 3,989 indirect jobs and \$326million in indirect wages. In total, the Bay supports 28,236 jobs in the 4-county region and generates \$817 million in household wages.

**Economic Recirculation of the Ocean Economy**

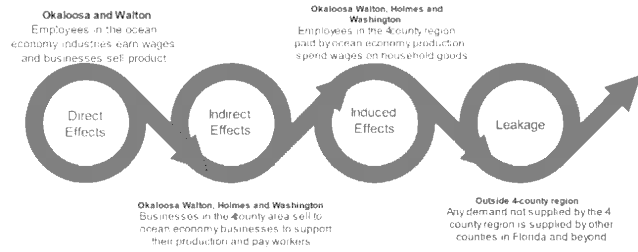


Figure 6.3 Direct, Indirect and Induced Effects

Table 6-6 Direct and Indirect Jobs by County

**Summary of Jobs by County**

County	Direct	Indirect	Total
Holmes	0	129	129
Okaloosa	16,507	3,460	19,967
Walton	7,522	529	8,051
Washington	0	89	89
<b>Total</b>	<b>24,029</b>	<b>4,207</b>	<b>28,236</b>

Table 6-7 Wages from Direct and Indirect Jobs by County

**Summary of Household Wages by County (in Millions \$2021)**

County	Direct	Indirect	Total
Holmes	\$0.00	\$13.55	\$13.55
Okaloosa	\$374.62	\$201.36	\$575.98
Walton	\$96.26	\$126.22	\$222.47
Washington	\$0.00	\$5.30	\$5.30
<b>Total</b>	<b>\$470.88</b>	<b>\$346.43</b>	<b>\$817.31</b>

The Bay also supports jobs and wages outside of the 4-county region because all demand for goods and services cannot be met by businesses within the region. Tables 6.8 and 6.9 show the additional jobs and wages that the rest of Florida enjoys.

The Choctawhatchee Bay ocean economy supports a total of 24,029 jobs, 16,507 in Okaloosa and 7,522 in Walton and it generates \$470 million in household wages annually. Holmes and Washington Counties are beneficiaries of 218 indirect jobs and 18 million in wages created by the Bay. Okaloosa and Walton Counties also benefit from 3,989 indirect jobs and \$326 million in indirect wages. In total, the Bay supports 28,236 jobs in the 4-county region and generates \$817 million in household wages.



Table 6-8 Economic Contribution of Choctawhatchee Bay

**Choctawhatchee Bay Ocean Economy (Okaloosa + Walton Counties)**

	2021
<b>Direct Economic Effects</b>	
Total Jobs	24,029
Output (\$ Millions)	\$1,882.93
Labor Income (\$ Millions)	\$781.73
Household Wages (\$ Millions)	\$470.88
<b>Indirect Economic Effects--4-County Choctawhatchee Bay</b>	
Total Jobs	4,207
Output (\$ Millions)	\$518.68
Labor Income (\$ Millions)	\$224.46
Household Wages (\$ Millions)	\$346.43
<b>Total Economic Effects--4-County Choctawhatchee Bay</b>	
Total Jobs	28,236
Output (\$ Millions)	\$2,401.61
Labor Income (\$ Millions)	\$1,006.20
Household Wages (\$ Millions)	\$817.31
<b>Total Economic Effects--State of Florida</b>	
Total Jobs	35,810
Output (\$ Millions)	\$3,644.32
Labor Income (\$ Millions)	\$1,546.25
Household Wages (\$ Millions)	\$1,371.88

Notes: All dollar values are presented in millions of 2021 dollars.

Table 6-9 Total Wages (Direct and Indirect) by region

Region	Wages
Holmes	\$13,549,269
Okaloosa	\$575,983,551
Walton	\$222,472,102
Washington	\$5,302,257
Rest of Florida	\$554,571,836
<b>Ocean economy (Okaloosa + Walton Co)</b>	<b>\$798,455,653</b>
<b>Total 4-county Choctawhatchee Bay Region</b>	<b>\$817,307,179</b>
<b>Total Florida</b>	<b>\$1,371,879,015</b>

The jobs and wages that occur outside the study area are sometimes referred to as "economic leakage" because it is not captured by the regional market. Every economic region will experience leakage because the U.S. economy benefits greatly from "specialization and trade" facilitated by transportation networks and concentrations of

specialized skills and resources in other areas of the country. The Bay supports 7,574 indirect jobs<sup>2</sup> and \$554 million in indirect wages from outside the 4-county region but within Florida. There are additional economic effects outside of Florida but are not measured in this study. Including Florida, the Choctawhatchee Bay supports a total of \$1.3 billion in wages and 35,810 jobs.

Table 6:10 Direct and Indirect Jobs in each Ocean Economy Industry

Jobs by Type: Ocean Economy of Okaloosa + Walton Counties		2021
<b>Ocean economy--Marine Construction</b>		
Direct Jobs		84
Indirect Jobs		26
Total Jobs		110
<b>Ocean economy--Living Resources</b>		
Direct Jobs		98
Indirect Jobs		25
Total Jobs		123
<b>Ocean economy--Mineral Extraction</b>		
Direct Jobs		53
Indirect Jobs		31
Total Jobs		84
<b>Ocean economy--Ship &amp; Boat Building</b>		
Direct Jobs		12
Indirect Jobs		4
Total Jobs		16
<b>Ocean economy--Tourism and Recreation</b>		
Direct Jobs		23,382
Indirect Jobs		3,820
Total Jobs		27,202
<b>Ocean economy--Marine Transportation</b>		
Direct Jobs		400
Indirect Jobs		301
Total Jobs		701

<sup>2</sup> 35,810 - 8,236 = 7,574 jobs.

As shown previously, 97% of the jobs and wages are within the Tourism and Recreation Industry Group (table 6:10). This group produces 23,382 direct jobs and generates an additional 3,820 indirect jobs. The second largest group is marine transportation with 702 direct and indirect jobs. All other industry groups are comparatively insignificant with each producing less than 125 jobs.

Tourism and Recreation Industry Group includes the following 8 NAICS industries: Scenic and Sightseeing Transportation on Water including Charter Fishing; Recreational Boat Rentals; Maritime Museums; Amusement and Theme Parks; Marinas; Other Amusement and Recreation Activities; All Accommodations; and Food Services and Drinking Places. The majority of the 24,029 jobs created by the ocean economy are held by restaurant workers. Restaurant workers hold 73%, or 17,034 jobs, of the entire ocean economy. Another 15% of workers are employed in the overnight accommodations industry and 6% in the boat rental businesses.

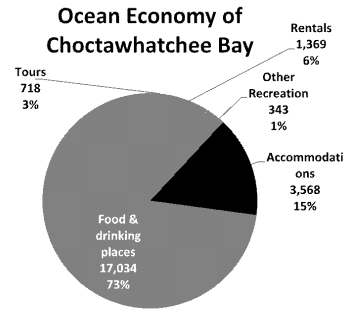


Figure 6-4 Composition of Tourism and Recreation Industry Group



The majority of the 24,029 jobs created by the ocean economy are held by restaurant workers. Restaurant workers hold 73%, or 17,034 jobs, of the entire ocean economy. Another 15% of workers are employed in the overnight accommodations industry and 6% in the boat rental businesses.

Table 6:11 Average Annual Wages Paid Per Employee by Job Type, 2021, Okaloosa and Walton Counties

Ocean Economy Industry Group	Ave Ages/Job
Other Heavy & Civil Engineering Construction	\$39,947.14
<i>Living Resources</i>	
Fishing (Fin and Shell)	\$26,226.87
Fish and Seafood Merchant Wholesalers	\$25,545.65
Fish & Seafood Markets	\$31,141.52
Offshore Mineral Extraction	
Sand Gravel and Refractory Minerals Mining	\$51,643.09
Geophysical Exploration and Mapping Services	\$39,306.24
WA-Ship Bldg	\$14,169.32
<i>Tourism and Recreation</i>	
Scenic & Sightseeing Transport, Water, Inc. Rec Fishing	\$48,969.32
Recreational Goods Rental--boating	\$23,407.14
Maritime Museums	\$25,040.53
Amusement & Theme Parks	\$24,924.20
Marinas	\$27,162.35
Other Amusement & Recreation Activities	\$10,748.80
Accommodation--Hotel, RV, Camps	\$10,558.87
Food Services & Drinking Places	\$ 8,917.22
Marine Transportation	
Navigational Measuring Instruments Manufacturing	\$64,439.41
Petroleum Bulk Stations and Terminals	\$49,297.02
Deep Sea, Coastal Water Transportation	\$51,316.10
Other Support Activities for Water Transportation	\$36,029.58
Warehousing & Storage	\$13,665.22
<b>Average</b>	<b>\$31,122.78</b>
Median Household Income in Okaloosa County	<b>\$67,390</b>

Source: U.S. Bureau of Labor Statistics and U.S. Census

Not all jobs are created equal, however. The average wage of all ocean economy jobs in Choctawhatchee Bay is \$31,122. Most of the Marine Transportation jobs pay well above the average wage. Sand and gravel storage also pays well. Within the Tourism and Recreation Industry Group, only charter fishing and other sightseeing tours pay above average. The remaining job holders in this group are earning below average pay. This is likely a reflection of the seasonality of these jobs and not the daily or weekly take-home pay.

## Output

Output is another metric that is used to measure the size of an economy. Output is the value of all goods and services produced and is measured by the transaction price. Choctawhatchee Bay is responsible for either supporting the supply of, or generating demand for, various goods and services. Table 6.12 shows output as a measure of the size the ocean economy for Choctawhatchee Bay.

Table 6:12 Direct and Indirect Output from Choctawhatchee Bay

### Summary of Output by County (in Millions \$2021)

County	Direct	Indirect	Total
Holmes	\$0.00	\$12.42	\$12.42
Okaloosa	\$1,221.62	\$416.98	\$1,638.60
Walton	\$661.32	\$80.38	\$741.70
Washington	\$0.00	\$8.89	\$8.89
<b>Total</b>	<b>\$1,882.93</b>	<b>\$518.68</b>	<b>\$2,401.61</b>

The value of all goods and services produced from direct jobs in the Bay is \$1.8 billion. Only Okaloosa and Walton Counties generate direct output. The output from Okaloosa County is twice as large as Walton. Another \$500 million of output is produced by the indirect jobs in the 4-county region. This results in a total output value of \$2.4 billion in products and services per year.

**Ocean Economy vs Coastal Economy**

It is important to put the ocean economy into relative terms with the total economy of the 2-county study region. As explained in Chapter 2, the total economy of Okaloosa and Walton Counties is also referred to as the “coastal economy” and is defined by NOAA’s Economics: National Ocean Watch Program (ENOW) and the BEA. Comparing the ocean economy to the coastal economy will allow one to observe the relative effects that the 21 industries of the ocean economy have on the total coastal economy of the study area.

Table 6.13 compares job counts between ocean economy and total economy in all industries within the 2-county region. There are 194,108 total jobs in the 2-county coastal economy, 144,752 in Okaloosa and 49,356 in Walton County. There are 36,695 government jobs in Okaloosa County and 3,680 government jobs in Walton County. Of those government jobs, Okaloosa has 19,188 military personnel under Department of Defense payroll, while Walton has 193. In total, there are 19,327 people employed by the U.S. military in the 2-county region. This amounts to 10% of the total employed population. The ocean economy produces 24,029 direct jobs in the 2-county region and 97% of these are in the tourism business (as shown above). In other words, Choctawhatchee Bay produces more jobs than the military in the 2-county region. Tourism jobs are approximately 14% of all jobs in the 2-county economy (actually 13.7%).



Table 6.13 Total Economy vs Ocean Economy

Coastal Industry Sector	Total Economy		Ocean Economy		
	Okaloosa Jobs	Walton Jobs	Ocean Industry	Okaloosa Jobs	Walton Jobs
Forestry, fishing, and related activities	343	184	Other Heavy & Civil Engineering	49	35
Mining, quarrying, and oil and gas extraction	216	174	Construction	18	3
Utilities	204	326	Fishing (Fin and Shell)	10	2
Construction	7,478	4,941	Fish & Seafood Wholesalers	42	23
Manufacturing	3,256	625	Sand gravel and refractory minerals mining	5	33
Wholesale trade	1,625	679	Geophysical Exploration and Mapping Services	8	7
Retail trade	14,652	6,135	Ship and boat building	0	12
Transportation and warehousing	4,119	1,197	Scenic & sightseeing Transport, Water, inc. rec fishing	621	97
Information	1,375	409	Recreational Goods rental--boating	1,196	173
Finance and insurance	5,359	2,414	Maritime museums	30	0
Real estate and rental and leasing	8,553	6,490	Amusement & Theme Parks	120	0
Professional, scientific, tech services	14,336	3,258	Marinas	200	0
Management of companies and enterprises	704	303	Other Amusement & Recreation Activities	321	22
Administrative and support and waste management and remediation services	8,374	3,747	Accommodation--Hotel, RV, camps	1,625	1,943
Educational services	1,153	494	Food services & drinking places	11,973	5,061
Health care and social assistance	10,743	2,862	Navigational measuring instruments manufacturing	165	82
Arts, entertainment, and recreation	2,725	994	Petroleum bulk stations and terminals	14	4
Accommodation and food services	14,805	7,580	Deep sea, coastal water transportation	54	0
Other services (except government and government enterprises)	8,037	2,864	Other Support Activities for water transportation	16	15
Government and gov't enterprises	36,695	3,680	Warehousing & storage	40	10
Federal civilian	9,428	168	<b>total</b>	<b>16,507</b>	<b>7,522</b>
Military	19,188	139	<b>Total 2-County Ocean economy</b>	<b>24,029</b>	
State and local	8,079	3,373	<b>% of total economy</b>	<b>14%</b>	
State government	1,677	469			
Local government	6,402	2,904			
<b>total</b>	<b>144,752</b>	<b>49,356</b>			
<b>Total 2-county Coastal Economy</b>	<b>194,108</b>				
<b>Total Net Jobs (Less Ocean jobs)</b>	<b>170,079</b>				

Source: U.S. Bureau of Economic Analysis

Table 6:14 2-County Ocean Economy Percent of Total Industries

Ocean Economy Industry Group	NAICS Industry	Est.	Jobs	Wages	GDP
Marine Construction	Other Heavy & Civil Engineering Construction	13	84	\$ 4,958,000	\$ 7,377,976
	Total	27	98	\$ 4,303,319	\$ 7,772,744
Living Resources	Fishing (Fin and Shell)	9	21	\$ 856,000	\$ 1,200,561
	Seafood wholesalers	7	12	\$ 430,000	\$ 961,538
	Fish & Seafood Markets	11	65	\$ 3,017,319	\$ 5,610,645
	Total	6	53	\$ 3,782,400	\$ 10,847,466
Offshore Mineral Extraction	Oil & Gas Extraction	-	-	\$ -	\$ -
	Sand gravel and refractory minerals mining	4	38	\$ 2,916,900	\$ 9,626,733
	Geophysical Exploration and Mapping Services	2	15	\$ 865,500	\$ 1,220,733
	Ship and boat building	1	12	\$ 499,200	\$ 924,444
	Total	1,504	23,382	\$ 734,377,718	\$ 1,468,895,128
Ship and Boat Building	Scenic & sightseeing Transport, Water, inc. rec fishing	246	718	\$ 32,166,550	\$ 56,631,250
	Recreational Goods rental--boating	160	1,369	\$ 52,779,114	\$ 338,327,655
	Maritime museums	3	30	\$ 1,258,800	\$ 2,666,949
	Amusement & Theme Parks	11	120	\$ 3,297,000	\$ 5,072,308
	Marinas	19	200	\$ 9,141,000	\$ 14,063,077
	Other Amusement & Recreation Activities	38	343	\$ 10,824,254	\$ 16,652,698
	Accommodation--Hotel, RV, camps	131	3,568	\$ 139,171,000	\$ 289,336,798
	Food services & drinking places	896	17,034	\$ 485,740,000	\$ 746,144,393
	Total	28	400	\$ 33,804,645	\$ 56,670,715
	Marine Transportation	Navigation measuring instruments manufacturing	9	247	\$ 23,870,685
Petroleum bulk stations and terminats		4	18	\$ 1,302,500	\$ 3,101,190
Deep sea, coastal water transportation		2	54	\$ 4,590,000	\$ 8,080,986
Support Activities for water transportation		4	31	\$ 2,035,460	\$ 3,583,556
Warehousing & storage		9	50	\$ 2,006,000	\$ 2,120,507
Total		1,579	24,029	\$ 781,725,282	\$ 1,552,488,474
All Ocean Economy (Direct)		10,412	194,108	\$ 6,810,210,000	\$ 13,649,104,000
Total, All Private Industries		15%	14%	11%	11%

In measuring jobs, there is one sector that is not included in the ocean economy data that perhaps justifies a modification to the definition of ocean economy for this study. The real estate rental and leasing sector in the total economy includes property managers of vacation rentals. NOAA's National Ocean Economic Program ENOW data excludes this sector because it includes many jobs that are irrelevant to the ocean economy. This sector includes the jobs held by property managers in the business of vacation condominium rentals, but it also includes all other rentals of property, rental of equipment such as construction tools, rental of motor vehicles, and rental of intellectual property rights. Because this sector is co-mingled between ocean and non-ocean economic activity, NOAA decided to exclude it altogether. In this research, one may want to include an estimated percentage that may be attributable to vacation rentals because this activity is so prevalent in the study area. To do this, we assume an average ratio of ten units to one employee and apply that to the number of estimated vacation rental units. An estimated number of vacation rentals was calculated by assuming that the total number of waterfront condominiums in each county was a vacation rental. Most of these units are for rent while a small percentage are not. Conversely, townhomes were not included even though a small percentage of single family townhomes are vacation rentals. This is a reasonable estimation given the limitations of this research project. In Okaloosa County, there are 432 waterfront condominiums, which is assumed to produce 43 vacation property rental jobs. In Walton County, we assume that the 2,358 SFR/Resort parcels represent properties that are rented for vacation on the water and therefore 235 jobs are assigned to property rentals. This results in a total of 278 jobs in the property rental industry in the 2-county

Table 6:16 Okaloosa County Properties by Type

Okaloosa County		
Bay Waterfront Unit Type	# of Units	% of total
SINGLE FAM	537	48%
CONDOMINIUM	432	38%
VACANT	62	5%
RES COMMON	15	1%
VACANT/RES	13	1%
SFR/TOWNHOME	8	1%
Other	61	5%
Total Bay Waterfront Units	1128	100%

Source: Okaloosa County Property Assessor Office

Table 6:15 Walton County Properties by Type

Walton County		
Property Type	Count	Percentage
SFR	27685	39%
VAC RES	18723	27%
SFR/MH	3114	4%
SFR RESORT	2358	3%
SFR WATER	1889	3%
MH-SFR LOT	1709	2%
AC NON-AG	1648	2%
COMMERCIAL	1336	2%
TIMBER 1A	1263	2%
MKT.VAL.AG <40	873	1%
GULF FRONT	871	1%
SFR BAY	742	1%
HARDWD HI	661	1%
SFR LAKE	571	1%
SFR RURAL	503	1%
RURAL HOME	483	1%
SFR CANAL	280	0%
TIMBER 2	275	0%
MULTI-FAM	264	0%
COUNTY	243	0%
GULF VIEW	237	0%
all Other	4519	6%
Total Parcels	70247	100%

Source: Walton County Property Assessor Office

ocean economy. Including 278 more jobs to the base of 24,092 results in 24,370 ocean economy jobs, which results in 14.3% of the total jobs in the county. If 50% of all rental jobs were added to the ocean economy (a probable overestimation) it would boost the total percentage of ocean economy jobs from 14% to 19%.

Other metrics can be used to put the ocean economy into relative terms with the total coastal economy. Total business establishments, wages, and GDP are three other comparable measurements. These are shown in table 6.14. The ocean economy produces 11% of the total wages in the 2-county region. Since it produces 14% of the jobs but 11% of the wages this indicates that the sector pays slightly below average wages (also shown in table 6.11). Tourism also produces 11% of the total GDP for the region and 15% of the business establishments.

## Chapter 7 ADDITIONAL BENEFIT STREAMS

The Choctawhatchee Bay supports numerous other benefit streams that may be valued in monetary terms with enough time and resources. Valuation procedures for these other benefit streams are highly technical, time consuming, and at times controversial. The scope and budget limitations of this study do not permit further analysis into these benefit streams, but a brief discussion on four notable benefit streams is merited.

### **CARBON SEQUESTRATION**

Blue Carbon is referred to as the carbon that is stored in coastal and marine ecosystems. Conserving blue carbon through improved management of marshes, mangroves, and seagrasses can result in protection of vulnerable stocks of sequestered atmospheric carbon dioxide (CO<sub>2</sub>), now held in biomass and soils, and ongoing sequestration capacity. Particular focus is on wetlands, which occupy less than 2% of the ocean surface, but represent almost 50% of the ocean's transfer of carbon to burial in sediment sinks.<sup>xi</sup> Wetlands are remarkably efficient and effective in sequestering carbon. How these wetlands are managed will determine both the fate of carbon stocks that have accumulated over hundreds to thousands of years, as well as the gradual, ongoing process of future carbon sequestration from the atmosphere. Coastal ecosystems and salt marshes can store up to ten times more carbon than temperate forests<sup>xii</sup>. There are over 450 million tons of carbon dioxide released each year from stores of carbon in coastal wetland soils as human development impacts drive wetland loss<sup>xiii</sup>. A 2016 study in Tampa Bay found that coastal habitats in Tampa Bay are expected to remove between 73,415,000 and 74,317,000 tons of CO<sub>2</sub> from the atmosphere by 2100, the equivalent of removing approximately 15.5 million fossil-fueled vehicles from the roads<sup>xiv</sup>. The study also showed that wetland restoration projects increase carbon sequestration services.



The economic value of retaining existing carbon in the soils undisturbed and absorbing future emission (carbon sequestration) is determined by multiplying the quantity of carbon sequestered by the Social Cost of Carbon (SCC). The SCC estimates the damage caused by the effects of climate change over the life cycle of one metric ton of CO<sub>2</sub> emitted into the earth's atmosphere.

The SCC is currently used by local, state, and federal governments to inform billions of dollars of policy and investment decisions in the United States and abroad. In the federal government's initial implementation of the SCC, government agencies and departments each developed and applied their own estimates. The Office of Management and Budget convened an Interagency Working Group on the Social Cost of Carbon (IWG) to develop a harmonized set of estimates to be applied consistently across the federal government. The group consolidated multiple models drawn from academic literature and ran them over a range of standardized input scenarios in order to arrive at the federal government's estimates of the SCC. Today the SCC is \$51, but in November 2022, the EPA proposed a nearly fourfold increase to \$190. (The EPA is weighing public comments on that proposal.) When calculating the SCC, climate scientists and economists create models to predict what will happen to a range of indicators when new carbon dioxide is put into the atmosphere. Among these indicators are health outcomes, agricultural production, and property values. An extra ton of carbon emissions shortens lifespans, hurts crops, and causes sea levels to rise, decreasing property values. An SCC of \$51 means that economists and climate scientists expect the total damage from one additional ton of carbon emissions to equal \$51.

The Choctawhatchee Bay provides carbon sequestration services. The soil and vegetation in and around the Bay absorb carbon and have a measurable economic value that can be used in Benefit Cost Analysis for various policy decisions. Any environmental policy decision, water management action, or development project that creates "dry down" events that effectively reduces wet soil accretion, or sequestration rates, due to soil oxidation, will result in the release of previously stored Soil Organic Carbon in the form of CO<sub>2</sub> into the atmosphere, thereby contributing to societal damages from climate change.<sup>xv</sup> When Choctawhatchee Bay is managed to maintain existing carbon stocks and continue to absorb future emissions, then it provides an economic benefit to society that can be quantified by the Social Cost of Carbon. To determine the economic value that the Bay provides society in terms of carbon sequestration, one must first determine the amount of carbon stored in the Bay's soil and vegetation. An extensive series of soil and vegetation tests would be conducted over a 12-month period for soil density, volume, and inundation which would result in the Soil Organic Carbon (SOC) content of the Bay. SOC is then multiplied by 3.67 to convert to metric tons of carbon and then valued by using the SCC. Using this method, Richardson et.al determined the value of the Florida Bay to be over \$900 million<sup>xvi</sup>. The value of carbon sequestration in Tampa Bay is \$3.7 billion (using an SCC of \$51). Tampa Bay is 400 square miles in size. Choctawhatchee Bay is 130 square miles large or roughly 1/3 of the size of Tampa Bay. If Choctawhatchee Bay had the same level of

SOC stored in its soil and vegetation as Tampa Bay, and all other factors were similar except size, then one might estimate that the value of carbon sequestration services in Choctawhatchee Bay at approximately \$1.2 billion.

### PROPERTY VALUES



How might the waterbody of Choctawhatchee Bay increase property values is a popular question among researchers and policy makers in this region. Common opinion states that a house on the waterfront will cost more than an identical house across the street on a non-waterfront lot and therefore the waterbody of Choctawhatchee Bay contributes to higher property values. The logic is straightforward and is gaining popularity among practitioners. For example, a guidebook published by the Nature Conservancy that advises communities on how to incorporate ecosystem service values in coastal restoration projects recommends including increases in property values in a list of ten classes of metrics of restoration projects<sup>xvii</sup>. Examples cited in that report include a research paper demonstrating that beach width is positively correlated with reductions in probability of damages contributing to higher property values<sup>xviii</sup>. A second example cited that increases in sea level negatively affects property values. Both examples use avoided costs of environmentally related damages as a proxy to determine the benefits of protecting shorelines through various interventions. The results, however, show the benefits of environmental management, not the value of the water.

Several studies in Florida have attempted to determine the economic contribution that proximity to a waterbody has on private property values. Harper et. al. 2006 estimates the aggregate price premium of waterfront property on Choctawhatchee Bay is \$635 million<sup>xix</sup>. To determine this, the authors made two substantial assumptions: first, 60% of



the total value of a waterfront parcel was due to it being on the water; second, the entire 60% premium can serve as a proxy to represent the value of aesthetics. As explained in further detail in the literature review above, the price premium was determined by reviewing three previous studies nationwide. They then selected one of them that had a premium range of 40% to 60% and without explanation determined that 60% is the price premium for Choctawhatchee Bay. A 2022 study to determine economic values of the Pensacola and Perdido Bays<sup>xx</sup> used a nearly identical methodology as Harper et.al 2006 but selected a price premium of 45% for Bay front property and estimated that the Bay was responsible for a \$2.6 billion property value premium that involved 77,046 residential units.

Neither of these two studies demonstrate any correlation (statistically significant or otherwise) of waterfront property values to the water. It is merely assumed that the waterbody itself is the one and only factor that drives consumers to spend 60% more on waterfront property. There are numerous other possible factors that can increase demand, and hence value, of waterfront property that have no association with the water but are not considered in these studies. Some examples include:

**Social status:** the property owner of a waterfront property may believe that his or her social standing would be improved with a waterfront property.

**Better public services:** perhaps some waterfront properties are in neighborhoods with better school systems, more frequent police patrols or better privately funded security; they may be safer for kids to play in.

**Urban Design:** the streetscape of waterfront neighborhoods may be preferable even if the waterbody is not visible. They may have better sidewalks designs, street trees, or have better access to public parks.

**Non-Water Amenities:** Waterfront properties may have better access to non-water related amenities such as golf courses, theaters, and shopping and entertainment districts.

None of these factors were considered in either study.

Hindsley et al 2014, followed a Millennium Ecosystem Assessment approach that employed a more sophisticated analysis using hedonic modeling. Hedonic models will use regression analysis to isolate the value of the water from other selected factors that determine a property's value. The other factors in hedonic models typically include architectural features, amenities, size, and location. While this study was thorough in what it considered, it did not attempt to incorporate any of the non-architectural features listed above. To the author's knowledge, there are no hedonic models used in real estate valuations that do. The use of hedonic modeling in comparing the values between marketable real estate properties is an excellent tool. However, when hedonic modeling is used to calculate the value of non-market resources (like aesthetics or access to water) by isolating the value of individual marketable amenities (square footage, number of bedrooms, swimming pools etc.), then at some point a leap of faith must be taken to assume that the non-market factor is the only remaining feature of the property that creates value. This is a very weak assumption.

During the primary data collection process, the author interviewed real estate agents to gauge their opinion on the price premium of waterfront property on Choctawhatchee

Bay. The responses were as diverse as the waterfront parcels. Certain locations will demand higher premiums while waterfront property in other locations will actually be a liability due to flooding. The agents also cited social status and access to non-water amenities as a frequent reason why people buy on the waterfront. To determine an accurate price premium that can be assigned to the value of Choctawhatchee Bay, a highly complex series of statistical analyses using primary survey data collected from the purchasers of the property would have to be conducted.

Despite the common popularity among some interest groups to use property values as a proxy to resource value, many policy makers and researchers do not attempt to incorporate increases in property values as a metric for the value of a waterbody. In fact, research by Presnall et. al. shows that the U.S. Forest Service, in evaluating environmental impacts through the National Environmental Policy Act (NEPA) process, considers the value of 27 different factors including: tourism and recreational benefits, natural processes such as carbon sequestration, erosion control and nutrient cycling, water quality improvements, habitat protection, timber and agricultural values. Improvements in property values is not one of them<sup>xi</sup>. The debate on which benefit streams are valued in a Total Ecosystem Valuation framework has been held for decades. The Millennium Ecosystem Assessment (MA) approach suggests that, "to make ethical and informed policy, planning and management decisions, the full range of ecosystems and ecosystem services should be assessed<sup>xiii</sup>". The MA then details 24 ecosystem services derived from ten Reporting Categories (biome groups), providing an assessment of the full range of ecosystems and services for the whole planet. Property values are not listed in this method. Robert Costanza, one of the most cited environmental economists in the world, advocates the MA approach, stating "the full range of ecosystem services must be considered to prevent creating dysfunctional incentives and to maximize net benefits to society<sup>xviii</sup>". Maynard et. al. used the Millennium Ecosystem Assessment approach to determine the ecosystem values of the entire South Queensland Australia region<sup>xv</sup>. This comprehensive framework identifies four main components of an ecosystem service assessment:

1. Ecosystem Reporting Categories (ERCs) — 32 groups of ecosystems, each ecosystem within a group having similarities in climatic conditions, geophysical condition, dominant use by humans, surface cover, species composition and resource management systems and institutions.
2. Ecosystem Functions— 19 biological, geochemical and physical processes and components that take place or occur within an ecosystem.
3. Ecosystem Services — 28 goods and services provided by natural (and semi-natural) ecosystems that benefit, sustain, and support the wellbeing of people.
4. Constituents of Wellbeing (COWB)— 15 aspects of human wellbeing that are improved through the use of ecosystem services or the knowledge that these services exist.

The complete list is shown in Figure 7.1. Property values are notably absent from this valuation process.

**Table 1**  
The ten key components of the SEQ Ecosystem Services Framework, adapted from Maynard et al., 2010.

Ecosystem reporting categories	Ecosystem functions	Ecosystem services	Contributors of wellbeing
<b>Deep ocean</b>			
Open water – pelagic	Gas regulator	Food products	Beaching
Open water – benthic	Climate regulator	Waters consumption	Drinking
Coral reefs	Decarbonyl regulator	Building & Fine products	Nutrient
Seagrass	Water regulator	Fuel	Shelter
Rocky shores	Water intake	Genetic resources	Physical health
Beaches	Nitrogen regulator	Biobacterials, medicines & pharmaceuticals	Mental health
Dunes	Waste treatment & assimilation	Ornamental resources	Secure & continuous supply of services
Coastal zone wetlands	Pollination	Transport infrastructure	Security of health
Freshwater wetlands	Biological control	Ornamental resources	Security of pension
Lacustrine wetlands	Barriers effect of vegetation	Water quality	Community & social cohesion
Riverine wetlands	Supporting habitats	Arable land	Secure access to services
Rainforest	Soil formation	Bullfighting, aquatic extremes	Family cohesion
Sclerophyll forests	Food	Pollination	Security of property
Native plantations	Raw materials	Reduce pests & diseases	Social & economic freedom
Exotic plantations	Water supply	Productive soils	Self actualisation
Regrowth	Genetic resources	Soil amelioration	
Native & improved grasslands	Poison of shade & shelter	Genetic diversity	
Shrublands & Woodlands	Pharmaceutical resources	Knowledge systems	
Miscottan Island	Landscape opportunity	Specialist & religious values	
Blue Heron Island		Knowledge systems	
S. Middlemore & Bay Islands		Inspiration	
Montana		Aesthetic values	
Sugar cane		Effect on social interactions	
Maize (corn) – small crops		Sense of place	
Miscellaneous – tree crops		Local landscapes	
Other aridated crops		Recreational opportunities	
Dams		Therapeutic landscapes	
Hard surfaces			
Parks & gardens			
Residential gardens			

Figure 7-1: Millennium Ecosystem Assessment Components of Value

The reader is welcome to apply the simple methodologies employed in the Harper et. al. report Choctawhatchee Bay and Harrington et. al. report for and Perdido Bay to get a rough estimate on the value of the Choctawhatchee Bay water through a property valuation approach. To do this, one simply multiplies the price premium by the property value. In Okaloosa County there are 1128 waterfront parcels on the Bay with a total assessed value of \$1.4 billion. For Walton County, the parcel data that was received does not segregate Bay front parcels from gulf front parcels. For these purposes we can use the 742 single family residential Bay front properties. The total assessed value of these parcels is \$922 million. In total the Bay has approximately \$2.3 billion in real estate property values on its waterfront. At this stage the reader can assign any price premium they wish to apply. For reasons explained above this research study will not.

**ECOSYSTEM RESTORATION**

Ecosystem restoration work is underway in the Bay. This work produces improvements in water quality and habitat. It also generates direct and indirect jobs and wages. The Choctawhatchee Basin Alliance was established in 1996 to “promote swimmable, fishable waterways through monitoring, education, restoration, and research.” With their employees and subcontractors, they create living shorelines, manage stormwater, regenerate seagrass, and remove invasive species. This work creates jobs, wages and GDP in a wide range of industries. Other restoration work may be underway including the artificial reefs being installed and any mandated mitigation or wetlands offset work. The REDYN I-O model used in this study can be used to estimate the additional benefits that restoration efforts in Choctawhatchee Bay. Under the NOAA-NOEP methodology, restoration jobs are not included in the ocean economy and therefore excluded from this study. To include these impacts would require research to inventory historical and forecasted restoration projects, the jobs created by sector and estimated wages.



Photo Credit:  
Choctawhatchee Basin Alliance, Sean Murphy

**ECONOMIC BENEFITS OF WATER QUALITY IMPROVEMENTS**

Water quality improvements can be measured using a wide variety of metrics including dissolved oxygen (DO), water clarity, or concentrations of pollutants such as phosphates, chlorophyll and nitrates. There are numerous valuation techniques that are used to determine the economic value of water quality improvements. Some of these methods are described in the literature review section of this report. The Florida Realtors Association conducted a statistically robust four-year study using primary data

to calculate the economic impact of clean vs polluted water in two unconnected and unrelated estuaries in two different counties. The results were statistically significant in both counties and showed that a 1-foot improvement in water clarity resulted in an increase of \$428 million in Martin County property values. Conversely, a 1-foot reduction in clarity resulted in a \$488 million loss in property value. A similar study could be conducted in Choctawhatchee Bay. Increases of dissolved oxygen up to swimmable and fishable standards in the Delaware River resulted in direct use benefits from \$3.7 million to \$1.1 billion in economic benefits from ten separate benefit streams. The economic benefits of water quality improvements were not completed in this study. However, this study did start the process by completing the baseline information and built the economic impact model needed to complete this research.



## Chapter 8 CONCLUSIONS

This study employed a standardized and nationally recognized methodology to determine the size of the ocean economy in Choctawhatchee Bay. An ocean economy is defined by the National Oceanic and Atmospheric Administration's (NOAA), National Ocean Economics Program (NOEP) as an economy that is active in any of 21 specific NAICS industries within one or more of the 400 counties that are located on the shores of U.S. oceans or inland seas (or the Great Lakes). The U.S. Department of Commerce, Bureau of Economic Analysis uses this definition to create a MESA to measure the ocean economy of the United States. Choctawhatchee Bay lies within the geographic definition of the ocean economy and therefore the economic activity of these 21 NAICS industries that transpire within Okaloosa and Walton Counties is recorded in the national Marine Economy Satellite Account. Since the MESA does not provide data at the county-level, this study essentially creates for Choctawhatchee Bay a 2-county account using the same data and methodology as the Department of Commerce does for the nation. In this way, the Choctawhatchee Bay can be compared to other estuaries or regions in the country (if similar methodologies were used). Although cross comparisons were not part of this study, the NOEP web site contains a library of past studies and an extensive database.<sup>3</sup>

Conducting this methodology at the county-level required collecting similar data but through a variety of means. Department of Commerce data for Okaloosa and Walton Counties was calibrated and corrected through primary data collection methods, including interviews with local business owners, municipal records searches, and site visits. The data show there are a total of 194,108 jobs in Okaloosa and Walton Counties combined. The Choctawhatchee Bay ocean economy produces 24,029 direct jobs and 97% of them are in recreation and tourism. The Bay produces between 14% to 19% of all jobs in the region depending on how property management jobs are counted. Compared to the military with 19,327 jobs, this means that Choctawhatchee Bay produces nearly 20% more jobs than the military in the same two counties. The Okaloosa half of the ocean economy produces twice as many jobs as Walton. The ocean economy generates \$781 million in wages that are brought home to these job holders or 11% of the total \$6.8 billion in total wages. Holmes and Washington Counties also benefit from the Bay as recipients of indirect jobs and wages. There are an additional 4207 indirect jobs spread throughout the 4-county region and another \$346 million in wages. The Bay also supports 7,574 indirect jobs and \$554 million in indirect wages from outside the 4-county region but within Florida.

<sup>3</sup> at [www.oceaneconomics.org](http://www.oceaneconomics.org).

**CITATIONS:**

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<sup>2</sup> ITQ-TDD 02-23 October 3<sup>rd</sup> 2022. Okaloosa County Purchasing Department

<sup>3</sup> Economics, National Ocean Watch Program. Coast. NOAA Office of Coastal Management. [www.noaa.gov](http://www.noaa.gov)

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<sup>5</sup> T. G. O'Higgins et al. (eds.), 2020. Ecosystem-Based Management, Ecosystem Services and Aquatic Biodiversity. Springer Open, Switzerland

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<sup>7</sup> Counties List: Economics, National Ocean Watch Program. Coast. NOAA Office of Coastal Management. [www.noaa.gov](http://www.noaa.gov)

<sup>8</sup> Nichols, William. et al. 2020. Defining and Measuring the U.S. Ocean economy. US Bureau of Economic Analysis.

<sup>9</sup> An Email from William Nichols, Manager of the Marine Satellite Account within the Bureau of Economic Analysis, confirms the inclusion of Choctawhatchee Bay, 03/06/2023

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<sup>14</sup> Tampa Bay Blue Carbon Assessment. Restore America's Estuaries. May 2016.

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<sup>16</sup> Tampa Bay Blue Carbon Assessment. Restore America's Estuaries. May 2016.

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