An Economic Impact and Valuation Analysis of the Pensacola and Perdido Bays Estuary Program (PPBEP)

– Final Report

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PENSACOLA & PERDIDO BAYS ESTUARY PROGRAM

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Executive Summary

Three estuary programs have recently been created in the Panhandle region of Florida – based on the EPA's National Estuary Program model: the Pensacola & Perdido Bay (PPBEP; hosted by Escambia County[1]), the Choctawhatchee Bay (hosted by Okaloosa County) and the St. Andrews & St. Joe Bay[2] (hosted by FSU's Consensus Center at the Panama City Campus) Estuary Programs. In early 2022, the Florida State University Center for Economic Forecasting and Analysis (FSU CEFA) was contracted by the PPBEP to conduct an economic impact and valuation analysis of the PPBEP (and associated watershed). The following sections provide a summary of the study's economic impact and valuation analysis findings.

Direct Business Sales and Property Value Results

The sales and spending directly supported by the Pensacola and Perdido Bay Estuaries are significant. 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. 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. Bay-related businesses in Escambia County contribute the most to both sales and employment, with $3.9 billion in sales and 38 thousand employees.

In addition to business spending, the estuaries are estimated to contribute $2.7 billion to property values in the area and nearly $81 million to consumer spending. The team estimates that properties right on the bay are the most impactful. Out of the $2.7 billion that the estuaries contribute to property values, $2.2 billion comes from Bay Front properties. This translates to $67 million of the $81 million increase in consumer spending. Properties in Escambia County are again the most significant contributors to increased property values and consumer spending, with $1.6 billion in increased property values and $47 million in wealth induced spending.

Economic Impact Analysis Results

The PPBEP area is not only valuable as an ecological and environmental treasure, but also as an engine of economic activity. This report demonstrates the economic value the Perdido

[1] See: https://www.ppbep.org/
[2] See: https://pc.fsu.edu/estuaryprogram

and Pensacola estuaries bring to the surrounding areas. Businesses that are directly impacted by the estuaries contribute significantly to their local economies, and generate a total of $7.98 (or nearly $8) billion in direct sales. In addition to business sales, local property values are also impacted by the PPBEP area. The FSU CEFA team estimates that property values are increased by a total of $2.7 billion. The increase in property values attributed to proximity to the PPBEP area leads to an additional $80.7 million in direct consumer, or wealth-induced, spending. 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. In addition to monetary impacts, businesses tied to the estuaries also employ large numbers of workers. Direct employment supported by these businesses is 84,712 jobs. Businesses and consumer spending also contributed an additional 28,831 indirect and induced jobs. Total employment supported by businesses and consumer spending tied to the estuaries is 113,143.

Economic Valuation Analysis Results

Although flooding and sea level rise both involve excess water, statistical modeling yields maps that are quite different. The preceding Figures show each vulnerability's geographic footprint for Escambia County. Sea Level Rise is projected to occur near the coastline while flooding can present near the coast as well as inland in low-lying areas. Each of these vulnerabilities produce different economic risks for the estuaries. This report analyzes property values for both vulnerabilities.

Sea Level Rise presents a greater economic risk based upon market values of properties when compared to flooding. This scenario is likely explained because Sea Level Rise occurs closer to the coastline where there are numerous residential and properties. The Flood zone covers more land area but a generous portion is agricultural land use, which has a lower market value.

This vulnerability study shows the need for considering risks of all types to the estuary system. Vulnerabilities produce different economic threats depending upon the type of land use affected by the threat. Weather and climate risks should be expanded to include storm surge, extreme heat, and other threats so that scientists and planners can be informed of the similarities and differences that each vulnerability poses.

This report also investigates the link between water quality and economic activity using hedonic modeling of home prices. In particular, water quality affects the value of homes located near the estuaries, with poorer water quality being associated with decreased property values. This report investigates this link using three water quality measures. Chlorophyll was the measure most associated with price changes. If chlorophyll increases 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. Since chlorophyll is usually produced by algae in bodies of water, chlorophyll is used as a measure of water clarity. Therefore, the results are in line with other studies that show that water clarity – one of the most visible indicators of water quality – is associated with higher real estate values. Local authorities and policymakers have a strong incentive to increase water quality in the PPBEP area to generate increased economic activities.

The PPBEP watershed area will experience substantial population growth by the year 2040, with Escambia county expecting to grow by nine percent.[3] The increasing population, in addition to other factors such as sea level rise in the ensuing years, will continue to place substantial pressure on this area. The goal of this project will be to provide local planners and other stakeholders with information on the value of the PPBEP ecosystem, so that they may more accurately assess the costs and benefits related to future land-use decisions.

[3] See (using 2017 population estimates): https://www.fdot.gov/planning/demographic/

Literature Review

The following is a review of the literature concerning the modeling methodologies developed to capture the economic impact of estuaries on regional economies, the economic contribution of estuaries, and finally, use-value issues associated with estuaries and any potential changes in water quality. The literature review is divided into global, national, state, and local sections.

Global

Globally, various studies have been developed to fully capture the economic impact of estuaries on regional economies. A common methodology utilized in the literature is to integrate travel cost models. The travel cost method defines the higher costs that visitors are willing to pay for trip and equipment expenditures to participate in more frequent recreational trips. A global literature search was performed on studies using the travel cost method to value e.g., beach day trips. The purpose of these studies is to estimate the satisfaction a recreation user incurs from a day at the beach. Che Leh, et. al., (2018) contributed to the literature by addressing several issues and limitations regarding economic value assessments using the travel cost method. According to the authors, future studies should consider variations in the calculation of travel duration as they differ based on individuals' influences, perceptions and variations in transportation costs beyond general fuel and maintenance expenses.

A literature search also revealed studies on use value-issues associated with estuaries and any potential changes in water quality. Lankia et. al., (2019) applied a combined travel cost and contingent behavior model to examine the effects of changes in water quality on recreational benefits by focusing on swimming trips in Finland. Recreation inventory data were used to provide information on welfare changes at the national level. The authors found that the recreation value of a swimming trip for the current state of beaches was approximately 16 euros. A hypothetical decrease in water quality to a level at which the water visibility would be less than one meter decreased the value per trip to 9 euros. In contrast, a hypothetical increase of water quality to a level at which the water visibility would be over two meters increased the value per trip to 22 euros. In many cases increases in water quality will provide numerous economic and recreational benefits to regional economies. With that said, Ravenscroft and Church (2011) presented another view. The authors argued that the perceived recreational benefits associated with water quality improvements might be marginal, as people use complex heuristics to judge where and when they will pursue water-related recreation. Taking this into consideration, water quality may be one of the issues people consider when making the decision, but it is unlikely to be the major one.

National

An extensive search of national studies was conducted next. Chen (2013) applied a travel cost model to measure the monetary values of day trips to public Great Lakes beaches in Michigan. After collecting data through a two-stage survey of over 29,000 locals from 2011-2012, the author found that the value of access to a public beach for a day trip was estimated to be in the range of $32-$39 per person per trip, in 2011 dollars. Furthermore, Chen (2013) estimated that as beach trips increased to four days or more, the recreational value increased to approximately $53 per person per beach day, in 2011 dollars. Parsons et al (2013) applied a travel cost model to combine revealed and stated preferences on beach use in Delaware and assess the effects of changes in beach width on recreation. The authors estimated the value of Delaware beach visits at $81 per trip for those that stay overnight and $33 per trip for those that stay for a single day, in 2010 dollars. In addition, findings revealed that narrowing the beach by one-quarter of its current width would contribute to a welfare loss of approximately $5 per person per day.

A search of the national literature revealed other modeling methodologies that capture the full extent of the economic impact of estuaries on regional economies. Landry et al (2021) examined the relationship between residential property values and coastal beach width by applying a hedonic pricing model. Hedonic pricing is a model that identifies price factors based on internal characteristics of the good being sold, and external factors affecting it. The authors' findings suggest a positive correlation between improved beach width and quality and property values of homes and businesses, with proximity to the shore. Efimova (2019) applied a random utility model of beach use to measure per trip values, focusing on the effect of hypothetical closures of beaches on the East Coast of the United States. Random utility models aim to model individuals' choices among discrete sets of alternatives. The survey area included 275 ocean beaches stretching along the shoreline from Massachusetts to South Carolina. The author considered three different trip types, day trips, short overnight trips up to 4 nights long, and long overnight trips from 4 to 30 nights long. Findings in 2015 dollars revealed that the loss-to-trip ratios for individual beach closures range from $17.7 to $32.5, $88.8 to $149.1, and $324 to $1,865.9 for day, short and long overnight trips, respectively. Efimova (2019) highlighted the importance of considering longer trips in beach valuation, which has not been given enough attention in the existing literature.

There have been significant national studies that have examined the relationship between the health of bodies of water and economic impacts on regional economies. Wallace, et. al., (2017) estimated the economic contribution of Casco Bay in Maine, with an emphasis on the economic effects of changes to Bay health. The authors evaluated the likely effects of climate change on the Bay economy from a resource, tourism, and recreational perspective. The study concluded by emphasizing the need to establish frameworks for continued monitoring and tracking of the health of the Bay due to its significant economic and environmental

importance. Klemick, et. al., (2018) estimated the impact of a proposed water quality improvement policy on property values around the Chesapeake Bay using a hedonic pricing model. The authors collected 2015 property data from 14 counties bordering the Bay and estimated the effect of the proposed water clarity improvements on aggregate property values, in 2010 dollars. Kauffman (2018) assessed the broad economic benefits of improved water quality using the Delaware River as a case study. The author utilized use values of recreational activities, the travel cost method, stated preferences, and benefits transfer to estimate the effect of increasing the dissolved oxygen criteria from 3.5 mg/L to 5.0 mg/L. Findings revealed that the 1.5 mg/L water quality improvement could result in estimated direct use benefits from $371 million to $1.1 billion per year, in 2010 dollars. Other economic sectors benefiting from the proposed improved water quality included recreational boating, recreational fishing, non-use values, and property values.

State

A literature search of estuary-related studies in the State of Florida revealed a significant focus on the economic significance of Bays on regional economies. Stainback (2017) examined the economic value and impact of some of the ecosystem services provided by Florida Bay, located between the Everglades and the Keys. Following an input-output analysis using IMPLAN Software and data collection from public sources, the author estimated that the total value of ecosystem services from Florida Bay was over $15 billion, in 2016 dollars. Ecosystem services studied included recreation and commercial fishing, residential real estate, and carbon sequestration. The author concluded that values are very likely to be underestimated, as only the four ecosystem services were included due to a lack of available data. Hindsley & Morgan (2014) applied recreational use values, surveys, and hedonic price models to assess the economic value of Sarasota Bay. The study, surveying 27,801 homes with proximity to the Bay, defined as homes between 0 to 4,000 feet, estimated that the total capitalized value associated with proximity was $3.1 billion, in 2014 dollars. Additionally, based on the total number of trips taken by residents and visitors, it is estimated that the total value of Sarasota Bay estuarine-related recreation is approximately $487.4 million per year. Adams (2014) presented a similar report of the economic contribution of Biscayne Bay to the Miami-Dade economy, considering visitation data and recreational uses. The author concluded by addressing changes in the Bay's water quality and the resulting potential future impacts on economic activities.

The Balmoral Group (2020) quantified the linkages between decreased water quality because of harmful algal blooms and economic outcomes in the Gulf of Mexico to allow relevant stakeholders to assess restoration investments and management actions. The report primarily collected data and reported findings from the coastal "high hazard" area, which included the metro areas of Panama City, Tampa-St. Petersburg, Pensacola, Tallahassee-Thomasville, and Ft. Myers-Naples. The authors also collected data from all gulf-

coast counties in Florida. The data sampled included metrics representing tourism, housing sales, and fishing activities. According to the report, decreased water quality due to harmful algal blooms resulted in an estimated $460,218,158 loss in sales value due to reductions in property values across the five aforementioned metropolitan areas, in 2019 dollars.

Local

Following a global, national, and state-level search, a search of estuary-related studies in the market area of North Florida was conducted. Similar to those found in previous literature, various modeling methodologies are presented in the North Florida studies. Nguyen (2017) examined the recreational benefits of four spring sites located in North Central Florida using the travel cost method. The author estimated that the total economic value of outdoor recreation visiting the four springs, using 2016 attendance data, was $144,952,276, with an average trip valued at $177.49 per person per trip. Whitehead, et. al., (2018) took a different approach by applying the travel cost model to estimate the lost recreational value of visitors to Northwest Florida Beaches from canceled trips due to the Deepwater Horizon Oil Spill. Bi, et. al., (2019) used 2016-2017 interviews of recreational visitors at several sites along the Ocklawaha River to estimate visitors' willingness to pay for their recreational experiences, using 2019 dollars. The study found that the willingness to pay is $152.79 per person per year, above their actual trip expenditure, for those involved in fishing activities, and $69.98 per person per year, above their actual trip expenditure, for those engaged in the other types of recreational activities. Seidel, et. al., (2015) developed a hedonic price model to study the effect of proximity to the St. Johns River on residential property values in Duval County. The authors collected data from single-family residential property sale prices in Duval County from 2003 to 2015. The analysis revealed that being on the riverfront contributed to 46.2 percent of the sales price for the properties studied. Additionally, for every additional 33 feet of distance from the river, the study showed a reduction in property value of approximately $300 per acre.

Significant studies have been conducted in North Florida estimating estuaries' economic contribution and value. Harrington & Feng (2017) conducted an economic valuation and assessment analysis of the Pellicer watershed area, close to the Guana Tolomato Matanzas National Estuarine Research Reserve (GTM NERR), to provide relevant stakeholders with information on the value of the Pellicer estuarine ecosystem. The authors utilized four models from InVEST, a modeling software developed by Natural Capital Project, and statistics from the Florida Department of Revenue land-use parcels to conduct the economic and vulnerability analysis. The InVEST models were selected based on the GTM NERR researchers' priority, data availability, and the LU features. The analysis helped identify the ranking of priority conservation areas within the Pellicer watershed area. Stokes-Cawley, et. al., (2021) examined the economic contributions of four estuarine reserves, including the Guana Tolomato Matanzas (GTM) Reserve and the Apalachicola Reserve. Data was compiled

between 2019 and 2020 from available public surveys and coordination with reserve officials, while an IMPLAN model was developed to calculate contributions. The authors estimated that the GTM Reserve hosts 222,361 visitors annually, with a per-person per-day visitor expenditure of $30.62 in 2020 dollars. Overall, the GTM reserve generates a total estimated annual revenue of $57,627,000 for Duval, Flagler, and St. Johns counties. Additionally, the authors' findings revealed that the Apalachicola Reserve hosts approximately 476,077 to 563,271 visitors annually. The reserve generates an estimated revenue of $46,408,000 for Franklin County and supports a fishery that generates $14 million to $16 million annually.

Recent research has examined environmental issues facing North Florida estuaries, considering the correlation between changes in water quality and the economic contribution of estuaries. Research from University of West Florida (2022) reveals that two professors from the University of West Florida and the University of Florida recently received a grant award to collect, analyze, and model data relating to water quality trends, land cover trends, and activities upstream from North Florida estuaries. The project launched in early 2020 and supports local programs such as the Pensacola and Perdido Bays Estuary Program and the Choctawhatchee Bay Estuary Program. Mederos (2021) discussed a similar project examining the role of shellfish in improving water quality in the Guana Tolomato Matanzas estuary located in St Johns County. A researcher from the University of Florida Institute of Food and Agricultural Sciences will assess and collect data on water quality and shellfish health, identify how changes in land use have increased pollution, and examine how shellfish can improve the water quality, which would, in turn, benefit the local economy.

An Overview of the Economy near the PPBEP Area

There are four counties that directly border the estuaries – Escambia, Okaloosa, and Santa Rosa Counties in Florida, and Baldwin County in Alabama. This section characterizes the economy of this area using data from the American Community Survey (ACS) collected from IPUMS USA.[4] ACS data reveals that the economy of the PPBEP Area is largely similar to the United States as a whole, with some notable exceptions. In addition to characterizing the current economy of the region, ACS data allows the team to examine how the economy in the region has changed between years 2005 and 2020.[5]

The American Community Survey (ACS) Data

The ACS is an annual survey administered throughout the U.S. that collects data from individuals and households on a wide range of topics including employment data. In

[4] Steven Ruggles, Sarah Flood, Ronald Goeken, Megan Schouweiler and Matthew Sobek. IPUMS USA: Version 12.0 [dataset]. Minneapolis, MN: IPUMS, 2022. https://doi.org/10.18128/D010.V12.0

[5] While ACS data has been collected since 2000, information about participants' counties of residence is not available before 2005. ACS data after 2020 has not yet been released.

particular, the survey asks respondents to report the industry of their employer or most recent employer, if a respondent has been unemployed for less than five weeks. IPUMS USA later categorizes the responses into North American Industrial Classification System (NAICS) -coded industries and industry categories. The team used responses about an individual's employment to construct estimates of total employment in each NAICS category.[6]

Industries in the PPBEP Area

Figure 1 shows the NAICS industry categories in the PPBEP Area by the percentage of the workforce in each industry in 2020. In addition, the Figure compares the percentage of the workforce in each industry in the PPBEP Area to the percentage of the workforce in each industry in Alabama, Florida, and the United States. Figure 1 reveals some differences between the PPBEP Area and the broader economy, the most visible of which is the relatively large percentage of the workforce in the estuary area that is active duty military. In addition, the region has greater employment in accommodation and food services than the U.S., Alabama, or Florida, in line with the theory that proximity to water boosts tourism-related industries. Next, the region is much less invested in manufacturing than Alabama or the US, though it does have greater manufacturing employment than Florida. Finally, the region has fewer workers in agriculture, forestry, and hunting than the U.S., Alabama, or Florida.

Figures 2 and 3 show how the makeup of the economy in the PPBEP Area has changed since 2005. Figure 2 shows the growth in workers for industries for which growth has been positive. Figure 3 shows the change in workers for industries for which growth has been negative. There has been an increase in workers for most industries in the area, with the largest increase occurring in Health Care and Social Assistance. The most notable decrease in workers in the PPBEP Area has been in the Information industry.

[6] Note that NAICS codes do not always directly correspond to SIC codes used later in the analysis. Therefore there are some differences in industry categorization between this section and the rest of the report.

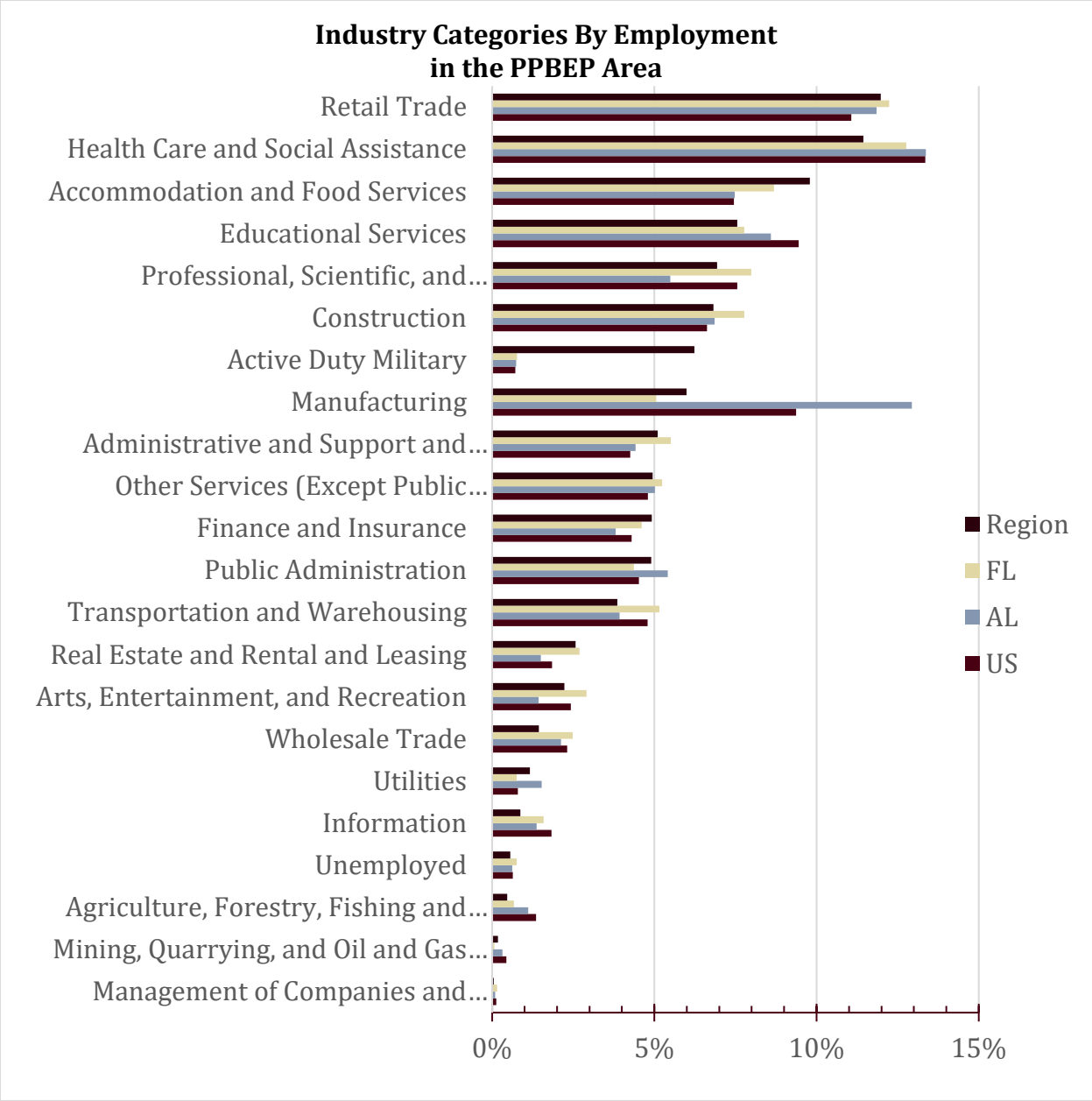


Figure 1. Industry Categories by Employment in the PPBEP Area

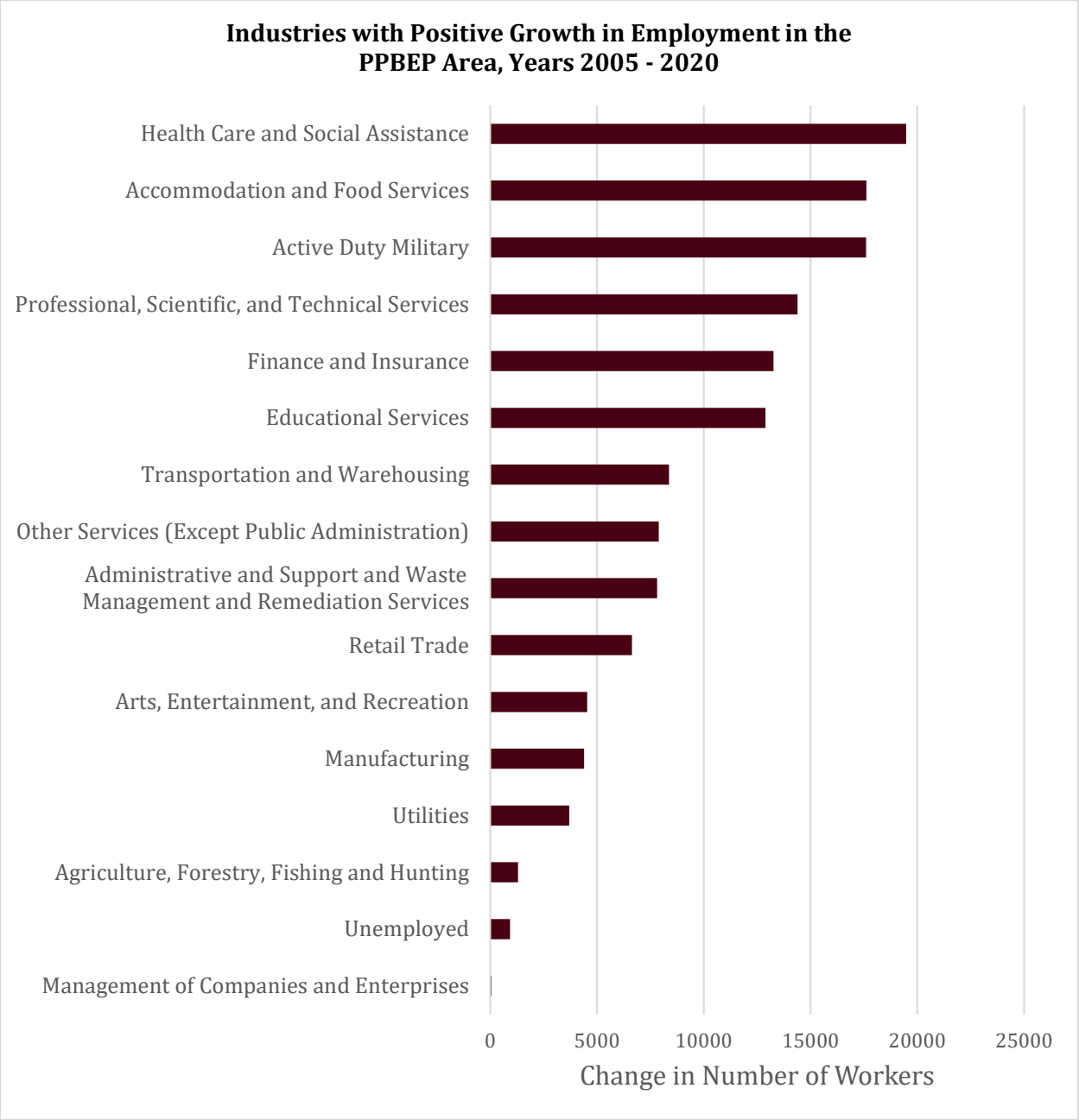


Figure 2. Industries with Positive Growth in Employment in the PPBEP Area, Years 2005 – 2020

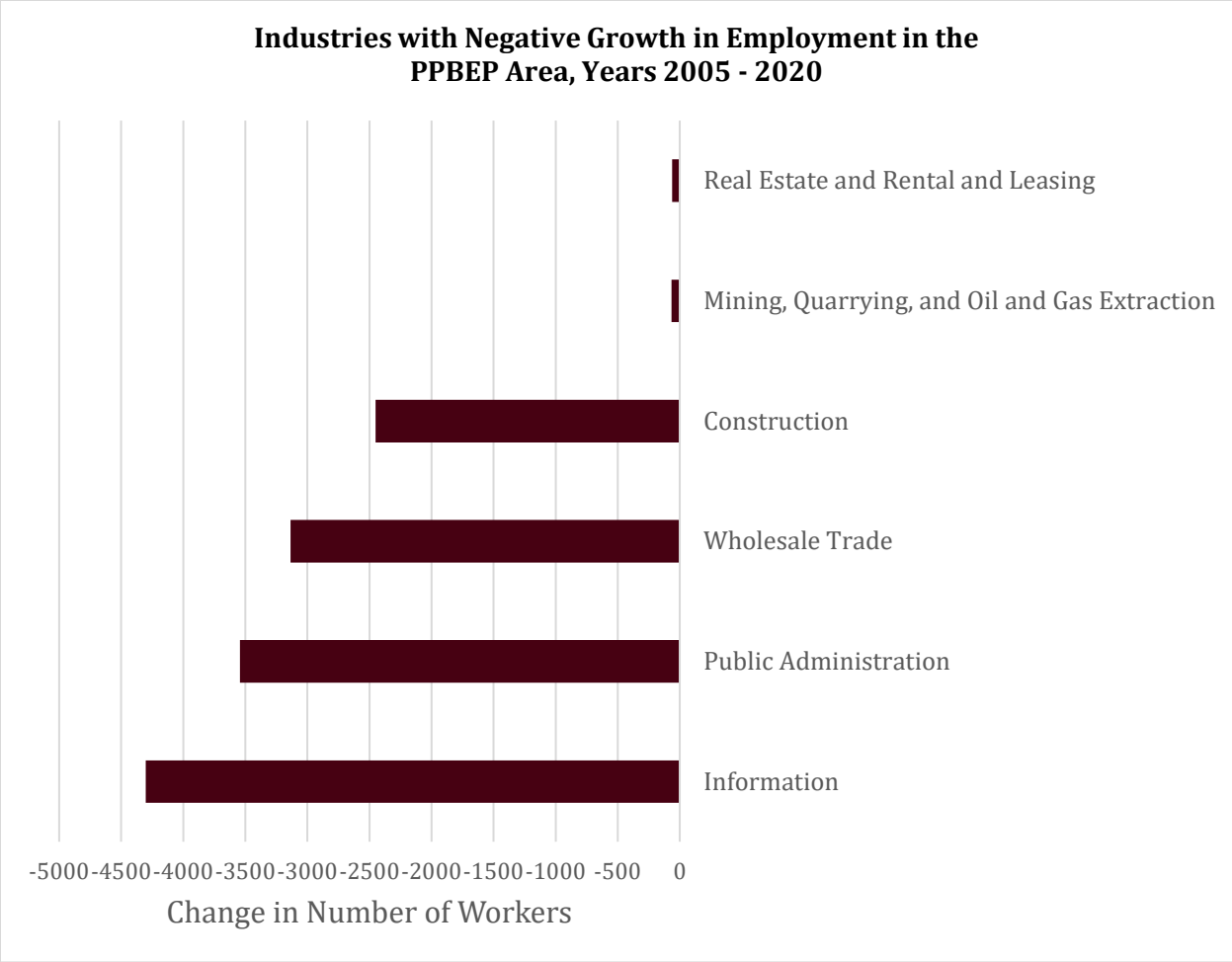


Figure 3. Negative Growth in Industries in the PPBEP Area, Years 2005 – 2020

Detailed Examination of Employment Trends by Industry Type

To better characterize the ways in which the industrial makeup of the four-county region has changed over time, this section provides a detailed breakdown of the employment trends for the following industry categories: Goods producing industries, service industries, and government.

Goods producing Industries

A goods producing industry is one with physical outputs that are either sold to final consumers and businesses or used as inputs in manufacturing and wholesale. Using NAICS codes, the four goods producing sectors are construction; manufacturing; agriculture, forestry, fishing, and hunting; and mining, quarrying, and oil and gas extraction. Figure 4 shows employment in goods producing sectors for each year since 2005.

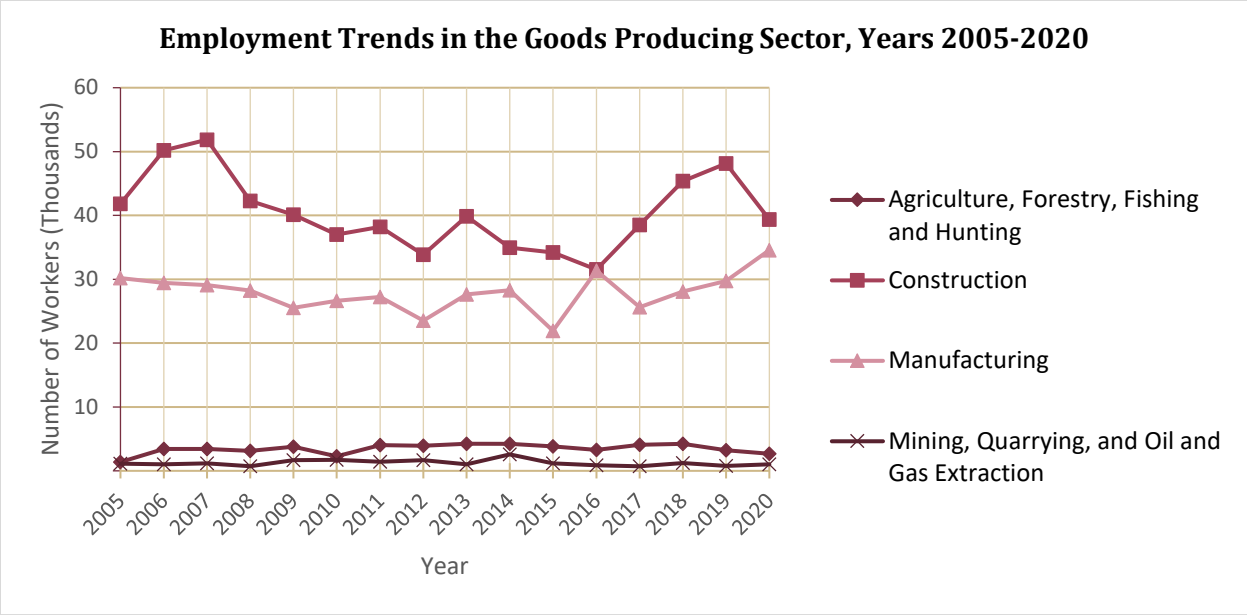


Figure 4: Employment Trends in the Goods Producing Sector, Years 2005-2020

Figure 4 shows that construction has been the primary goods producing sector since at least 2005, followed by manufacturing. Food and forestry products and mineral and rock extraction are distant third and fourth employers.

Table 1 shows how the makeup of the goods producing employment has changed since 2005 by two measures. The first two columns list the percentage of the goods producing workforce engaged in each goods producing sector in 2005 and 2020. Agriculture, forestry, fishing, and hunting and manufacturing both make up a larger portion of the goods producing sector in 2020 than they did in 2005, while construction and mining, quarrying, oil and gas extraction make up smaller proportions of the goods producing workforce in 2020 than they did in 2005.

Columns 3-5 of Table 1 show annualized growth in the goods producing sectors for five-year periods from 2005 to 2020. The table reveals that agriculture, forestry, and fishing and mining, quarrying, and oil and gas extraction are both volatile industries, with growth exceeding 13% in some periods. In addition, manufacturing grew considerably (11.52%) from 2015 to 2020.

Table 1: Growth in Goods Producing Employment, Years 2005 - 2020

Growth in Goods Producing Employment, 2005-2020					
Industry	**Percent of Goods Producing Workforce 2005**	**Percent of Goods Producing Workforce 2020**	**Growth 2005 - 2010**	**Growth 2010 - 2015**	**Growth 2015 - 2020**
Agriculture, Forestry, Fishing and Hunting	1.85%	3.46%	66.69%	66.26%	-29.75%
Construction	56.15%	50.69%	-11.47%	-7.67%	15.16%
Manufacturing	40.52%	44.52%	-11.80%	-17.59%	57.62%
Mining, Quarrying and Oil and Gas Extraction	1.48%	1.33%	55.90%	-32.65%	-10.54%

Table 2 shows manufacturing employment for each county in years 2005, 2010, and 2020. From this table, it is clear that growth in manufacturing has occurred exclusively in Baldwin County, Alabama. In contrast, employment in manufacturing has decreased since 2005 in primarily all the counties in Florida.

Table 2: Manufacturing Employment by County, Years 2005-2020

Manufacturing Employment by County, Years 2005-2020					
Year	**Baldwin**	**Escambia**	**Okaloosa**	**Santa Rosa**	**Total**
2005	8,719	11,038	4,263	6,153	30,173
2010	8,068	8,141	5,548	4,855	26,612
2020	14,004	9,895	5,298	5,373	34,570

Service Industries

Unlike the goods producing industries, service industries do not provide tangible goods, instead performing tasks for other businesses or consumers. There are 15 NAICS industry categories considered service industries. For readability, service industry sectors are split into two categories in Figures 5 and 6. Figure 5 shows the total number of workers in service industry sectors for each year from years 2005 to 2020 in the four-county region for the top seven industries as of 2020. Figure 6 shows the same Figure but for the bottom eight employers as of 2020.

Figure 5 shows that Retail Trade has been the dominant service industry since at least 2005, except for a brief spike in Health Care and Social Assistance in 2011. Figure 6 shows that this area has almost no activity in Management of Companies and Enterprises, with total

employment being zero for most years from years 2005-2020. The next smallest category is Utilities, except for a concurrent spike in Utilities and drop in Information in 2020. Figures 5 and 6 also show that there has been considerable growth in most service industry categories, which is analyzed further in Table 3.

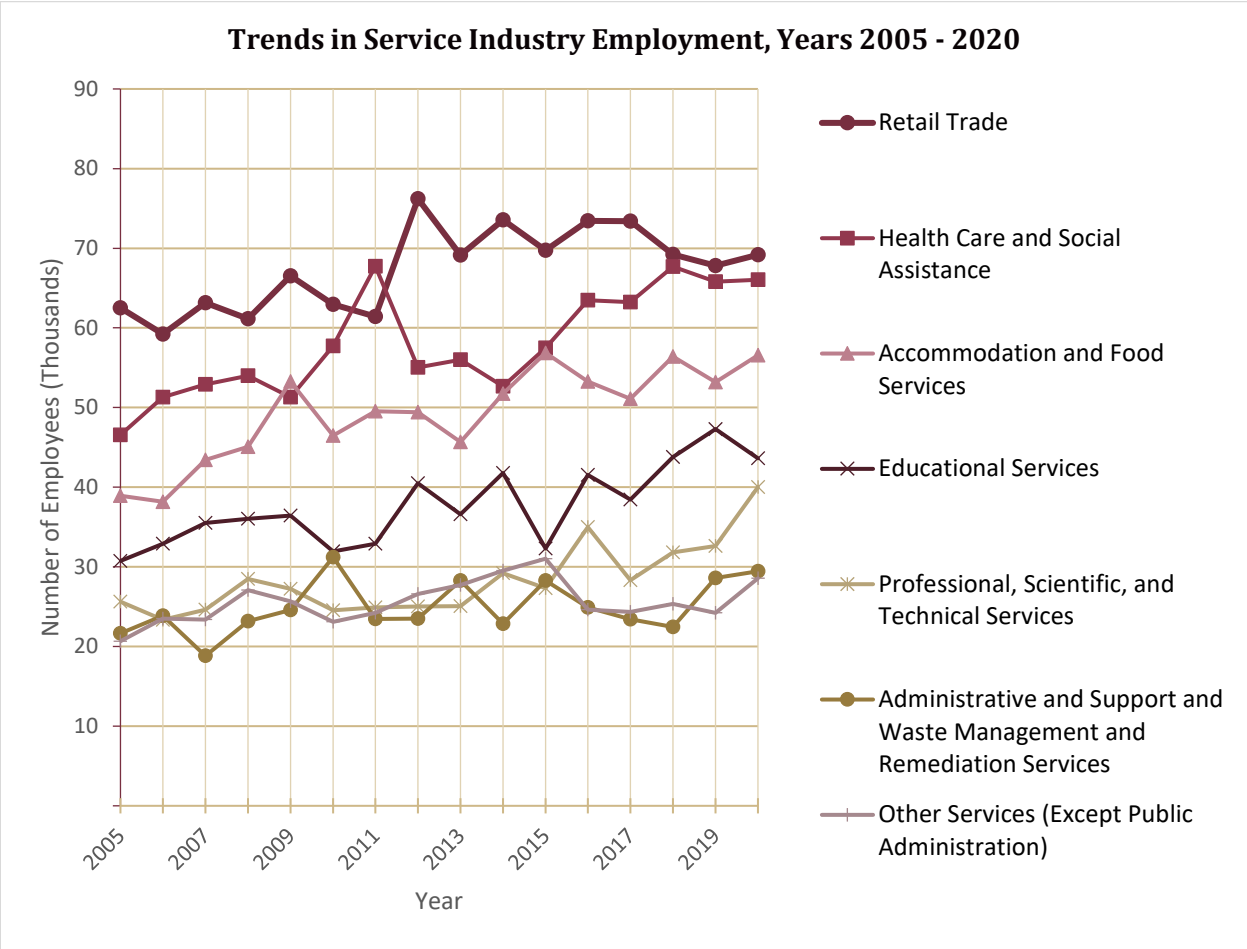


Figure 5: Trends in Service Industry Employment, Years 2005-2020

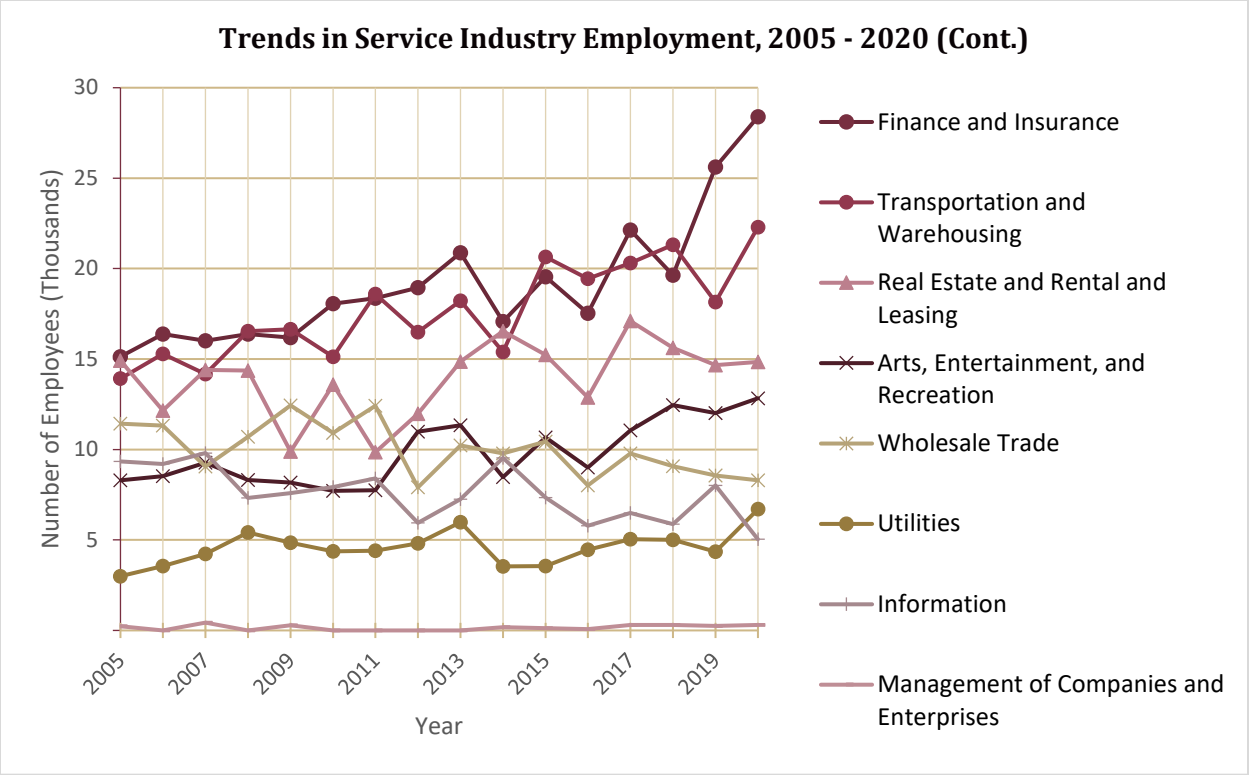


Figure 6: Trends in Service Industry Employment, Years 2005-2020 (Cont.)

Table 3 analyzes changes in the makeup of the service industries. The first two columns show the percentage of the service industry workforce in each category. Columns 3-5 show annualized growth in each sector for five-year periods between 2005 and 2020. There have been some significant changes in the makeup of the workforce engaged in service industries since 2005. Retail Trade, and Health Care and Social Assistance have both lost shares in the service sector, with most other industries gain shares. This indicates that there has been some diversification in service industries since 2005. Despite losing shares in the service sector, Retail Trade and Health Care and Social Assistance saw significant periods of growth due to the overall growth in the services sector since 2005.

Table 3: Growth in Service Industry Employment, Years 2005-2020

Growth in Service Industries Employment, 2005-2020					
Industry	**Percent of Service Industry Workforce 2005**	**Percent of Service Industry Workforce 2020**	**Growth 2005 - 2010**	**Growth 2010 - 2015**	**Growth 2015 - 2020**
Retail Trade	19.36%	16.01%	0.14%	2.16%	-0.17%
Health Care and Social Assistance	14.42%	15.28%	4.80%	-0.08%	2.98%
Accommodation and Food Services	12.06%	13.09%	3.88%	4.46%	-0.11%
Educational Services	9.52%	10.10%	0.79%	0.22%	7.01%
Professional, Scientific, and Technical Services	7.93%	9.26%	-0.84%	2.27%	9.29%
Administrative and Support and Waste Management and Remediation Services	6.70%	6.82%	8.86%	-1.88%	0.83%
Other Services (Except Public Administration)	6.40%	6.61%	2.34%	6.87%	-1.59%
Finance and Insurance	4.69%	6.57%	3.86%	1.66%	9.04%
Transportation and Warehousing	4.31%	5.16%	1.73%	7.31%	1.59%
Real Estate and Rental and Leasing	4.62%	3.44%	-1.78%	2.44%	-0.51%
Arts, Entertainment, and Recreation	2.57%	2.97%	-1.39%	7.64%	4.07%
Wholesale Trade	3.54%	1.92%	-0.90%	-0.86%	-4.12%
Utilities	0.93%	1.55%	9.16%	-3.76%	17.75%
Information	2.89%	1.17%	-3.02%	-1.49%	-6.27%
Management of Companies and Enterprises	0.07%	0.07%	-20.00%	N/A	23.70%

Government

The final sector that the team analyzed is the government sector, comprised of the industry categories Public Administration and Active Duty Military. Figure 7 shows the number of people employed in these two categories for each year from 2005 to 2020. This figure shows that both categories represent a significant part of the economy in the four-county area. For most of this period, Public Administration had more workers than Active Duty Military, with a recent spike in Active Duty Military making it the dominant government category in 2020.

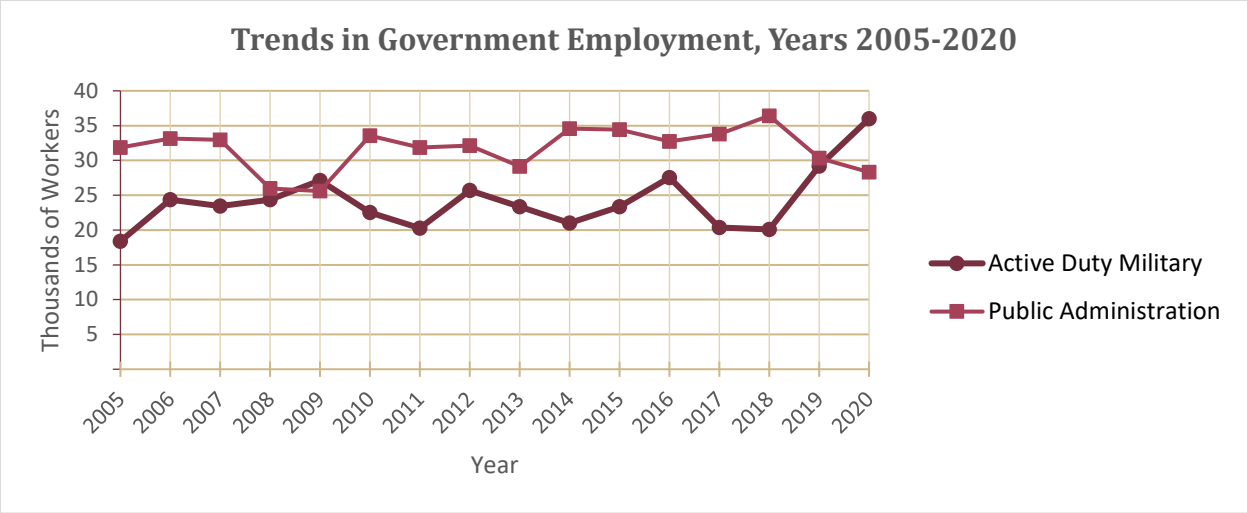


Figure 7: Trends in Government Employment, Years 2005-2020

Similar to the other industry sectors, Table 4 shows trends in the government sector in two ways. Columns 1 and 2 report the share of the government sector workforce employed in each industry. Columns 3 – 5 report the annualized growth in each industry for five year periods from 2005-2010. Similar to Figure 7, Table 4 shows that there has been significant growth in Active Duty military from 2015-2020 (10.82%). Coupled with the decline in employment in Public Administration from 2015-2020, this led to Active Duty Military taking over as the larger government sector.

Table 4: Growth in Government Employment, Years 2005-2020

Growth in Government Employment, 2005-2020					
Industry	**Percent of Government Workforce 2005**	**Percent of Government Workforce 2020**	**Growth 2005 – 2010**	**Growth 2010 – 2015**	**Growth 2015 – 2020**
Public Administration	63.41%	44.04%	1.05%	0.53%	-3.55%
Active Duty Military	36.59%	55.96%	4.52%	0.72%	10.82%

Tourism

Estuaries provide an area with increased tourism opportunities through recreational fishing, boating, swimming, and other activities. This section provides historical background for tourism using several sources of data. First is employment data from the ACS. Second is estimated bed tax data from the Florida Department of Revenue (FDOR). Using NAICS codes, Figure 8 depicts the employment in tourism-related industries for Years 2005, 2010, 2015, and 2020.

Figure 8 shows that tourism-related industries in the area are dominated by "Eating and Drinking Establishments" which includes all restaurants and bars. Table 5 breaks down changes in the makeup of the tourism industry similar to previous sections, where columns 1 and 2 report the share of the tourism workforce for each tourism-related industry in 2005 and 2010. Columns 3 – 5 report annualized growth for five-year periods between 2005 and 2015 for each industry.

Table 5 shows that employment in Eating and Drinking Establishments has experienced growth since 2005 but has nevertheless declined slightly in its share of the total tourism workforce. In contrast, travel accommodations has risen to become the second largest employer in the tourism industry, taking the place of Other amusement, gambling, and recreation industries. Clothing and accessory stores have also gained in their share of tourism employment, though growth in this industry has declined since 2010.

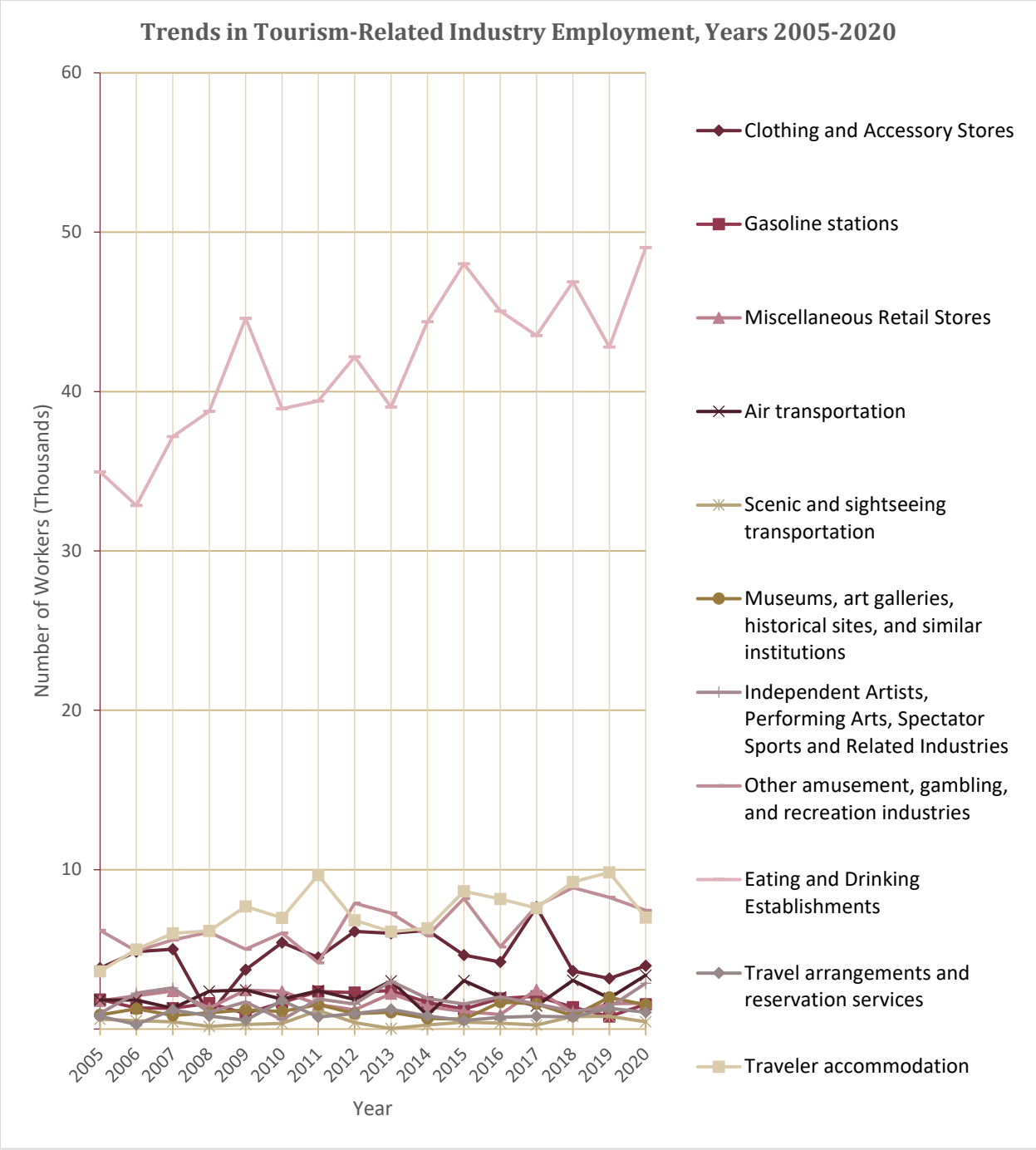


Figure 8: Trends in Tourism-Related Employment, Years 2005-2020

Table 5: Growth in Tourism-Related Employment, Years 2005-2020

Growth in Tourism Employment, Years 2005 - 2020					
Industry	**Percent of Tourism Workforce 2005**	**Percent of Tourism Workforce 2020**	**Growth 2005 - 2010**	**Growth 2010 - 2015**	**Growth 2015 - 2020**
Clothing and Accessory Stores	6.67%	8.08%	8.34%	-2.89%	-2.85%
Gasoline stations	3.23%	2.49%	-1.96%	-5.06%	4.92%
Miscellaneous Retail Stores	3.09%	3.54%	6.76%	-10.71%	9.32%
Air transportation	3.19%	2.80%	0.52%	12.33%	2.27%
Scenic and sightseeing transportation	1.08%	0.52%	-8.73%	4.69%	0.60%
Museums, art galleries, historical sites, and similar institutions	1.54%	1.65%	4.95%	-8.84%	29.32%
Independent Artists, Performing Arts, Spectator Sports and Related Industries	1.73%	0.86%	-8.30%	34.54%	16.40%
Other amusement, gambling, and recreation industries	10.80%	8.99%	-0.51%	7.14%	-1.81%
Eating and Drinking Establishments	60.95%	58.02%	2.28%	4.67%	0.42%
Travel arrangements and reservation services	1.39%	2.66%	24.86%	-13.98%	19.33%
Travel accommodation	6.33%	10.39%	18.43%	4.78%	-3.81%

A second measure of an area's tourism come from estimated bed taxes from the FDOR.[7] In addition to a 2% base tax collected by the State of Florida, counties in Florida are authorized to apply an additional sales tax on short-term rentals like hotels and condominiums, colloquially known as bed taxes. The maximum rate a county can charge depends on the facilities in the county the tax is intended to support, but under normal circumstances the maximum a county can charge is 5% (2% minimum plus up to an additional 3%). The current

[7] Data on bed taxes for Baldwin County, AL could not be located prior to publication.

rates for the three counties in Florida are 5% for Escambia, 5% for Okaloosa,[8] and 5% for Santa Rosa.[9] Figure 9 shows the total bed taxes collected in Escambia, Okaloosa, and Santa Rosa Counties, in 2020 dollars.

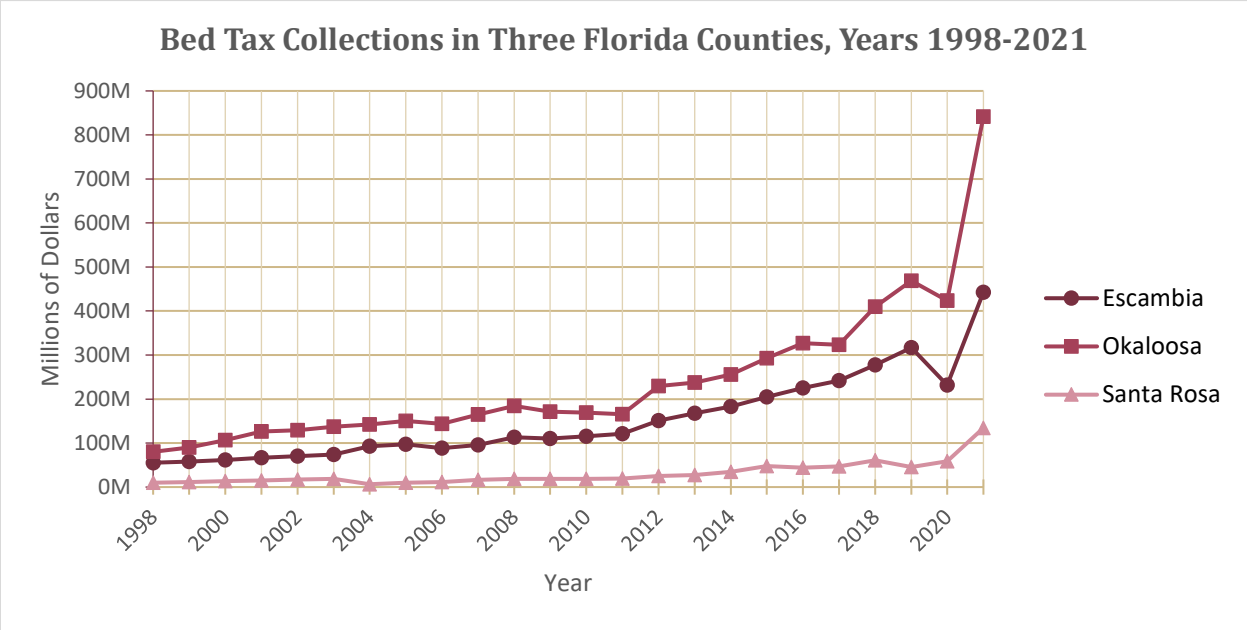


Figure 9: Bed Tax Collections in Escambia, Okaloosa, and Santa Rosa Counties, Years 1998-2021

As Figure 9 shows, Okaloosa County leads the three counties in collections, with Santa Rosa collecting the least amount of bed taxes. The chart also shows a large spike in collections in 2021 following the dip in collections in 2020 caused by the COVID-19 pandemic. The spike is consistent across Florida and is also consistent with pent-up demand for travel that built up during the pandemic.[10] Ignoring the anomalous years of 2020 and 2021, all three counties have seen growth in bed taxes since 1998. Table 6 shows growth rates in bed taxes for five-year increments from years 1999-2019, in 2020 dollars. Note that Table 6 excludes 2020 and 2021 to avoid obscuring the underlying trends in bed taxes. The Table shows that bed taxes have grown significantly for all three Florida counties, as well as for the region as a whole. Growth has been especially strong in the region since 2010 at 10% for 2010-2014 and 12% for 2015-2019. However, Santa Rosa experienced its strongest growth in the period from years 2005-2009.

[8] Except for facilities in a special "Expansion District," which are 4%.
[9] Local Option Transient Rental Tax Rates (Tourist Development Tax Rates). Florida Department of Revenue. https://floridarevenue.com/Forms_library/current/dr15tdt.pdf
[10] See, for example https://www.newsherald.com/story/news/local/2021/09/20/panama-city-beach-florida-sees-spike-tourism-tax-revenue-2021/8368421002/

Table 6: Average Growth in Bed Tax Collections in Escambia, Okaloosa, and Santa Rosa Counties

Average Growth in Bed Tax Collections in Three Florida Counties				
	Time Period (Years)			
County	1999-2004	2005-2009	2010-2014	2015-2019
Escambia	9.20%	3.91%	10.98%	11.59%
Okaloosa	10.20%	4.23%	9.30%	13.21%
Santa Rosa	0.51%	25.45%	13.94%	8.30%
Region	8.88%	4.85%	10.15%	12.07%

Methodology and Data

Methodology

The economic methodology used in this report follows that of Harper, Morgan, and Morgan (2006), hereafter referred to as the "Haas Report". To calculate the economic impact of the PPBEP Area, the FSU CEFA team uses two sources of economic value: business activity associated with the PPBEP Area and properties that benefit from the proximity to the PPBEP Area. Businesses directly benefit from the estuaries through access to transportation, tourism service opportunities and natural resources. In addition, businesses benefit indirectly from individuals coming to the area because of the estuary. The estuaries attract individuals, both as tourists and permanent residents, who then generate economic activity by patronizing the businesses near the estuaries.

In addition to economic activity generated directly through businesses, economic activity is also stimulated by the desirability of, or demand for, the estuaries themselves. The recreational and economic activities provided by the estuaries increase the desirability of nearby residential properties, increasing their value. Since residential property is a large portion of many families' wealth, when property values increase, average wealth levels increase as well. When families' wealth increases, they are more inclined to spend money; this is known as a wealth effect on consumer spending. Economic literature indicates that 3% of an increase in household wealth will be used on consumer spending (Guerrieri, Lorenzoni, and Vavra; 2018) This increase in consumer spending based on higher property values has a multiplicative impact on the local economy in the same way that business sales do.

Finally, this report considers multipliers on economic activity. When a consumer spends money at a particular business, that business uses this income to pay vendors, employees,

and owners, who, in turn, use this income to pay their own vendors, patronize other businesses, and make investments. Thus, a single dollar spent at a business propagates through the economy, generating much more than a single dollar's worth of economic activity. When calculating overall economic impacts, the team uses three categories:

1) Direct effects are direct expenditures at businesses.
2) Indirect effects are expenditures by businesses generated by indirect effects. Specifically, paying vendors and employee salaries out of income from sales.
3) Induced effects are expenditures at businesses that employees make after being paid.

Keeping these three components in mind, the methodology of this report can be summarized as:

1) Identify businesses related to the PPBEP area and calculate the direct economic activity by industrial sector (SIC).
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 project improves on the methodology of the Haas Report by using more detailed GIS data on watershed boundaries. This allows the team to better identify businesses and properties that rely on the estuaries based on their proximity. In addition, this study uses more recent literature on the property value premium from proximity to water and the wealth effect on consumer spending. This literature confirms that the Haas Report's original estimates for these numbers are sound.

Data

The data used in this report come from several sources. The team used GIS data from the PPBEP to identify the boundaries of the estuary.[11] To find businesses related to the PPBEP area, the team used NETS 2020[12], a database of businesses identified by Dun & Bradstreet and which are surveyed annually. Using the addresses of businesses in NETS 2020, the team identified businesses that are within one-half mile of the estuaries and considers these

[11] The GIS data was provided as Shapefiles (SHP) by Haley Gancel, of PPBEP, on June 17, 2022.
[12] NETS 2020 Florida is a business database of over 7.5 million businesses, from years 1990 to 2020. The NETS database is owned and managed by Don Walls. The SIC codes also provide up to 8 digits resolution (level of detailed business description) for business types.

businesses to be directly related to the PPBEP area. The team then aggregated sales data from NETS 2020 (year 2020) for these businesses by county and by SIC industrial sector.

To find properties that are likely impacted by the PPBEP area, the team used parcel and just value data from the Florida Department of Revenue (FDOR), and from Baldwin County, AL. Keeping consistent with the previous Haas reports' methodology, the team split properties into four tiers depending on distance from the estuaries.

1) Zero – 250 feet (Bayfront)
2) 250 – 600 feet (Bayview)
3) 600 feet – ¼ miles (Partial Bayview)
4) ¼ miles – ½ miles (No Bayview)

The FSU CEFA team then identified average and total just values of properties for different distances to the estuaries.

This study does not attempt to estimate how proximity to the PPBEP area affects property values. 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. Table 7 reports findings from several papers.

Table 7. Empirical Estimates of Property Price Premiums from Proximity to PPBEP Area

Empirical Estimates of Property Price Premiums from Proximity to PPBEP area		
Study	**Proximity**	**Price Premium**
Major et al. (2003)	Ocean Front	156%
	Bay Front	15%
	Beach Block	46%
	2nd Block	10.50%
Bensen et al. (1997)	Ocean Front	147%
	Ocean View	32%
	Partial Ocean View	10%
Michael et al. (2003)	Bay Front	from 40% to 63%
	100m	3% to 18% less per 100 m distance
Miller et al. (2019)	Ocean Front	45%
Cohen et al. (2015)	Various	2.7% decline for each 1% increase in distance

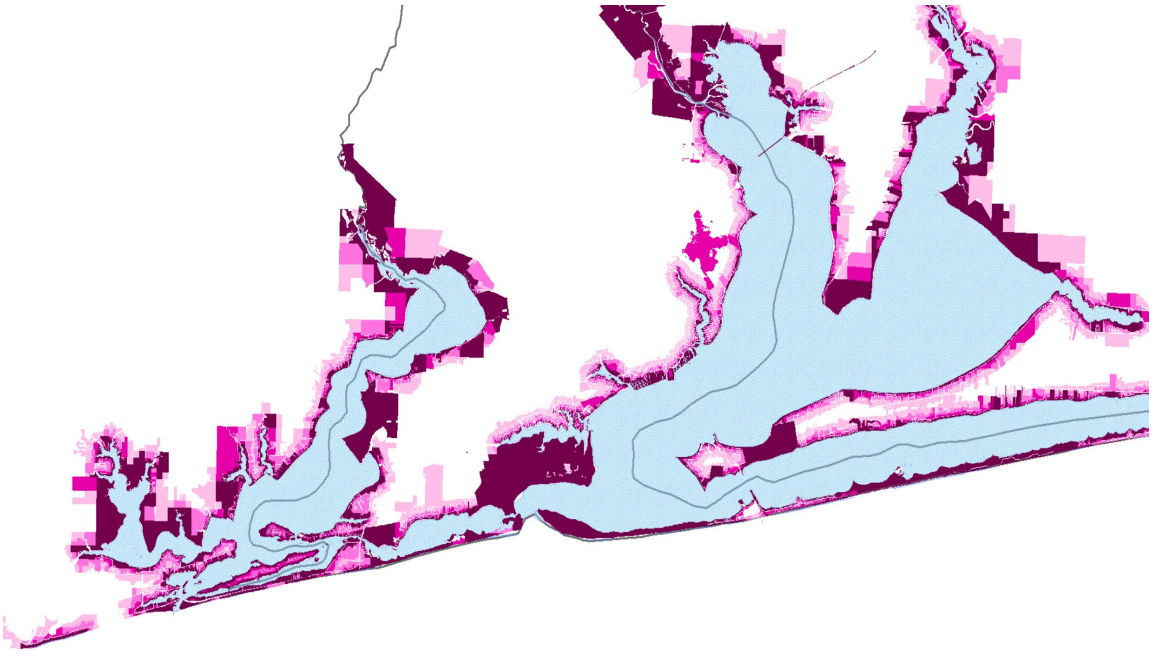
Following the methodology outlined in the Haas report, the team determined that the results during Hurricane Michael et. al., are a conservative benchmark and set the proportion of the price of a home determined by proximity to the estuaries to 45% for bay front, 10% for bay view, 3% for partial bay view, and 0% for all other properties. Finally, the team uses the economics literature again to determine an appropriate estimate of the wealth effect on consumer spending of 3% (Guerrieri, Lorenzoni, and Vavra; 2018).

Data Cleaning and Preparation

To prepare the NETS 2020 data for analysis, the team extracted businesses for each county in the PPBEP area (Baldwin, AL, and Escambia, Okaloosa, and Santa Rosa, FL). Each business has an associated address, and latitude. Each business also has an associated longitude that must be multiplied by -1 to conform to GIS mapping standards. The businesses were then converted to a GIS shape file using the provided latitudes and longitudes. Next, the shape file delineating the estuary boundaries was used to select businesses within ½ mile of the watershed. Next, the team deleted all businesses that were not in operation in 2020 to limit the sample to a single year.[13] Finally, total sales and total employees for the identified businesses are aggregated to produce totals by SIC code and by county. See Appendix A (Tables A-1 and A-2) to view the data sources, and GIS data pre-processes used in the economic analyses.

To prepare data to analyze the effect of proximity to the PPBEP area, the team joined parcel GIS data with just value data provided by FDOR and Baldwin County. Next, the team created a new variable "bayview" with values "front," "view," "partial," "none," and "x." The team then aggregated each category to produce total parcel numbers, total values, and average just values for each category and each county. Figure 10 shows a map of the properties categorized by distance from the PPBEP area.

[13] The team also joined the file with parcel data from FDOR and Baldwin County so that business property values could be analyzed. In addition, the team kept a separate file that contains all businesses in operation from years 1990 – 2020 for historical analysis. However, no analysis of these additional files was conducted for this report.



* The darkest color indicates a waterfront view and the lightest color represents no view. Properties farther than 1/2 mile are not shown.

Figure 10. Properties Categorized by Distance from the PPBEP Area

Results of Businesses and Property Values in the PPBEP Area

Businesses

Table 8 show the total number of businesses, number of employees, and aggregated sales for each SIC code for all businesses within ½ mile of the estuaries. The Table shows that businesses within ½ mile of the estuary contribute significantly to the local economy, employing more than 84,000 people and generating nearly $8 billion in sales.

Table 8: Businesses by SIC Code within ½ Mile of the PPBEP Area

Summary of Businesses within 1/2 Mile of the PPBEP Area			
Sector (by SIC)	**Number of Businesses**	**Number of Employees**	**Total Sales**
Agriculture, Forestry, and Fishing	348	955	$42,118,131
Mining	13	53	$11,121,196
Construction	1,492	4,594	$547,325,600
Manufacturing	327	2,528	$541,926,269
Transportation, Communications, Electric, Gas, and Sanitary Services	593	2,831	$390,851,878
Wholesale Trade	376	1,810	$407,218,815
Retail Trade	2,045	17,125	$1,638,585,349
Finance, Insurance, and Real Estate	1,822	6,655	$1,114,908,410
Services	10,290	40,634	$3,254,706,236
Public Administration	127	7,527	$26,936,543
Totals	**17,433**	**84,712**	**$7,975,698,428**

By far the largest industry sector in the PPBEP area is the service(s) sector with 10,290 businesses, 40,634 employees, and more than $3.254 billion in sales[14]. The smallest sector in the estuary area is mining with only 13 businesses, 53 employees, and $11 million in sales. In addition to examining businesses as a whole, The team broke down businesses into large (50 or more employees), medium (between 10 and 49 employees) and small (less than 10 employees) to show the distribution of businesses and their total sales compared over these categories. The results of this breakdown are in Tables 9 and 10 and Figure 11.

Figure 11 shows that most businesses have less than 10 employees and that only 1% of businesses have more than 50 employees. Even though large businesses are the minority numerically, they produce 33.54% of sales and account for 26.18% of employees. Another notable feature is that small businesses account for 50.95% of employees but only 42.54%

[14] All total sales are in NETS data year dollars ($2020).

of sales, indicating that small businesses in the area support larger numbers of employees on fewer dollars of revenue. This can be explained by small businesses either paying their employees less than larger businesses or by small businesses dividing the revenues more equally between owners and employees. Determining which is the case is beyond the scope of this analysis. Please see Appendix B for breakouts by respective counties.

Table 9: Large, Medium and Small Businesses within 1/2 Mile of the PPBEP Area

Large, Medium, and Small Businesses within 1/2 Mile of the PPBEP Area				
	Sector (by SIC)	**Number of Businesses**	**Number of Employees**	**Total Sales**
Less than 10 Employees (Small)	Agriculture, Forestry, and Fishing	340	826	$33,355,080
	Mining	12	40	$7,667,226
	Construction	1,441	3,495	$361,734,520
	Manufacturing	273	945	$106,020,013
	Transportation, Communications, Electric, Gas, and Sanitary Services	571	1,684	$147,780,417
	Wholesale Trade	352	1,106	$183,748,821
	Retail Trade	1,443	4,978	$478,858,435
	Finance, Insurance, and Real Estate	1,760	5,041	$580,628,191
	Services	9,813	24,902	$1,491,710,946
	Public Administration	40	146	$1,113,606
	Totals	**16,045**	**43,163**	**$3,392,617,256**
10 - 49 Employees (Medium)	Agriculture, Forestry, and Fishing	8	129	$8,763,051
	Mining	1	13	$3,453,970
	Construction	47	695	$134,079,523
	Manufacturing	47	763	$100,700,264
	Transportation, Communications, Electric, Gas, and Sanitary Services	18	354	$34,171,181
	Wholesale Trade	21	384	$105,319,667
	Retail Trade	569	8,563	$618,312,137
	Finance, Insurance, and Real Estate	54	1,073	$455,531,001
	Services	407	6,522	$431,917,064
	Public Administration	41	879	$15,412,375
	Totals	**1,213**	**19,375**	**$1,907,660,233**

Table 10. Large, Medium and Small Businesses within 1/2 Mile of the PPBEP Area, Cont.

Large, Medium, and Small Businesses within 1/2 Mile of the PPBEP Area (Cont.)				
50 or more Employees (Large)	Agriculture, Forestry, and Fishing	-	-	$0
	Mining	-	-	$0
	Construction	4	404	$51,511,557
	Manufacturing	7	820	$335,205,992
	Transportation, Communications, Electric, Gas, and Sanitary Services	4	793	$208,900,280
	Wholesale Trade	3	320	$118,150,327
	Retail Trade	33	3,584	$541,414,777
	Finance, Insurance, and Real Estate	8	541	$78,749,218
	Services	70	9,210	$1,331,078,226
	Public Administration	46	6,502	$10,410,562
	Totals	**175**	**22,174**	**$2,675,420,939**

Table 11 shows how businesses, employees, and sales are distributed between the four counties by industry group. Table 11 shows that Escambia County generates the most economic activity, with nearly $4 billion in sales and over 38 thousand workers. This should not be surprising since the largest city in the area, Pensacola, is located in Escambia County. In contrast, Baldwin County, Alabama is the least productive county with only $1.1 billion in sales and 11 thousand employees.

Figure 12 breaks down the total sales in each county by SIC category. Figure 12 shows that industries are not equally distributed between each county. Services make up the majority of sales in each county but range from 32% of sales in Baldwin County to nearly 47% of sales in Escambia County. Proportionate with the large share of services in Escambia County, Retail Trade and Finance, Insurance, and Real Estate are lower in Escambia than in other counties. This may indicate that Escambia County has a greater portion of the tourist economy than other parts of the estuary area. This is consistent with the tourist destinations of Pensacola Beach and Perdido Key being located in Escambia County.

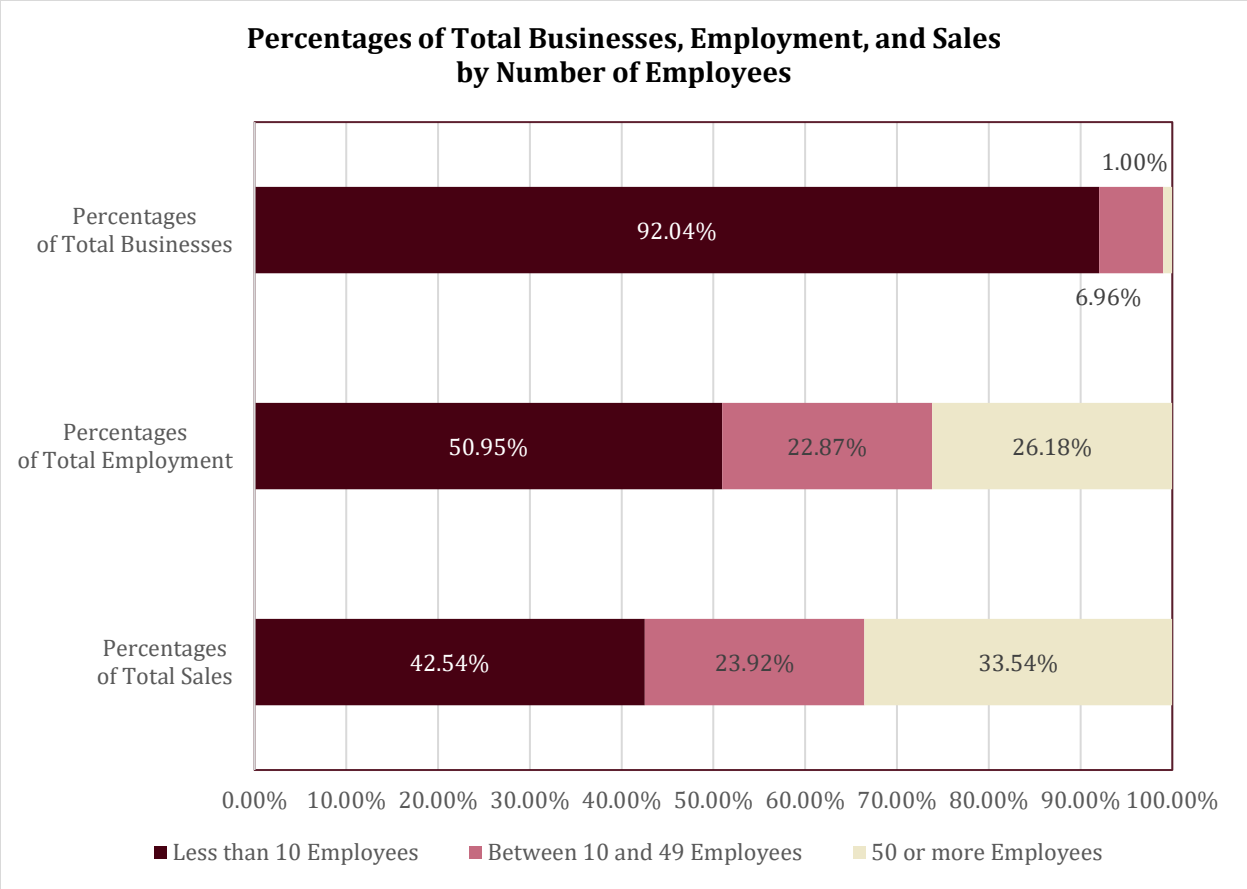


Figure 11. Percentages of Total Businesses, Employment, and Sales by Number of Employees

Table 11. Total Businesses, Employees, and Sales by County for Businesses within 1/2 Mile of the PPBEP Area

Total Businesses, Employees, and Sales by County for Businesses within 1/2 Mile of the PPBEP Area			
County	**Total Businesses**	**Total Employees**	**Total Sales**
Baldwin	2,094	11,492	$1,160,791,687
Escambia	7,218	38,450	$3,935,163,916
Okaloosa	3,118	17,253	$1,478,201,569
Santa Rosa	5,003	17,517	$1,401,541,256
Totals	**17,433**	**84,712**	**$7,975,698,428**

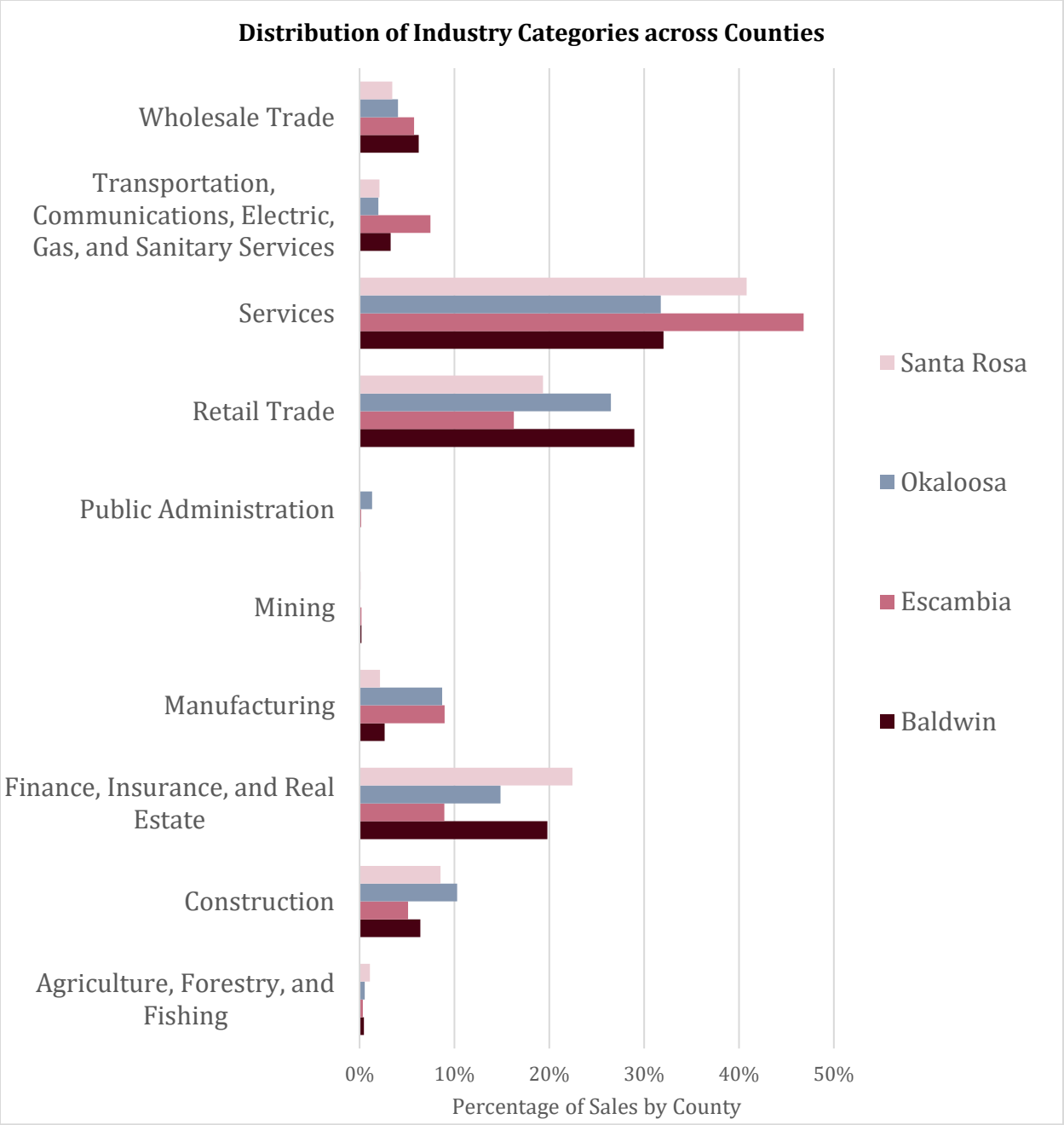


Figure 12. Distribution of Industry Categories Across Counties

Property Values

Table 12 reports the market values of residential properties within ½ mile of the PPBEP area. This table shows that these properties are not distributed evenly between the four counties. Escambia County has the largest number of properties within ½ mile of the estuaries at 34,049 units, while Baldwin County has the fewest with only 7,431. However, these units are worth a substantial amount, ranging from a total of $761 million in Baldwin County to $8.4 billion in Escambia County. In addition, the decline in average values between bay front and

bay view properties is largely consistent with the theory that properties receive a premium from proximity to the estuaries. However, properties more distant from the estuaries are less consistent with this finding. For example, partial bay view properties are on average less expensive than no bay view properties in Baldwin County. This indicates the importance of adding in additional property amenities to make precise statistical conclusions based on these property values. For example, properties more distant from the estuaries may increase in average acreage or average square footage. In addition, properties far from the estuaries in Escambia County may be closer to downtown in Panama City. Determining the influence of the estuaries independent of these factors is beyond the scope of this analysis. Instead, as discussed in the methodology section, the team assumes that a percentage of housing values is determined by proximity to the estuaries depending on which distance category a property is in. Please see Appendix C for breakouts of property market values by respective property types.

Table 12: Market Value of Properties by Proximity to the PPBEP Area

Market Value of Properties by Proximity in the PPBEP Area				
County	**Proximity to Bay**	**Number of Units**	**Average Market Value**	**Total Market Value**
Baldwin	Bay Front	348	$268,125	$84,390,600
	Bay View	1,473	$132,169	$201,309,700
	Partial Bay View	2,546	$104,982	$261,613,700
	No Bay View	3,064	$127,484	$213,681,800
	Total	**7,431**	**$158,190**	**$760,995,800**
Escambia	Bay Front	8,898	$335,951	$2,961,036,883
	Bay View	6,672	$193,925	$1,719,931,170
	Partial Bay View	8,543	$173,445	$1,816,735,139
	No Bay View	9,936	$203,899	$1,913,945,955
		34,049	**$226,805**	**$8,411,649,147**
Okaloosa	Bay Front	1,672	$368,823	$431,243,456
	Bay View	1,547	$334,068	$399,039,854
	Partial Bay View	2,186	$212,079	$399,975,003
	No Bay View	3,357	$388,076	$683,548,510
	Total	**8,762**	**$325,762**	**$1,913,806,823**
Santa Rosa	Bay Front	3,834	$311,772	$1,521,467,128
	Bay View	3,666	$148,473	$794,688,288
	Partial Bay View	7,722	$506,972	$1,861,342,637
	No Bay View	11,582	$142,092	$2,091,870,125
	Total	**26,804**	**$277,327**	**$6,269,368,178**
Grand Total		**77,046**	**$247,021**	**$17,355,819,948**

Table 13 reports the total increase in property values attributed to the estuaries according to the percentages discussed in the methodology section. In addition this table reports the increase in consumer spending attributed to increased property values. Table 13 shows that total consumer spending attributed to increases in property values is more than $80 million. Baldwin County had the smallest increase in property value associated with the estuaries at less than $66 million, which translates to an increase in consumer spending of $1.98 million. In contrast, Escambia had the largest increase in property value associated with the estuaries at more than $1.5 billion, which translates to an increase in consumer spending of more than $46.7 million.

Table 13. Increase in Property Values and Consumer Spending from Proximity to the PPBEP Area

Total Increase in Property Values and Consumer Spending by Proximity to the PPBEP Area				
County	**Proximity**	**Number of Units**	**Increase in Property Values**	**Wealth Induced Spending**
Baldwin	Bay Front	348	$37,975,770	$1,139,273
	Bay View	1,473	$20,130,970	$603,929
	Partial Bay View	2,546	$7,848,411	$235,452
	No Bay View	3,064	$0	$0
	Total	**7,431**	**$65,955,151**	**$1,978,655**
Escambia	Bay Front	8,898	$1,332,466,597	$39,973,998
	Bay View	6,672	$171,993,117	$5,159,794
	Partial Bay View	8,543	$54,502,054	$1,635,062
	No Bay View	9,936	$0	$0
	Total	**34,049**	**$1,558,961,769**	**$46,768,853**
Okaloosa	Bay Front	1,672	$194,059,555	$5,821,787
	Bay View	1,547	$39,903,985	$1,197,120
	Partial Bay View	2,186	$11,999,250	$359,978
	No Bay View	3,357	$0	$0
	Total	**8,762**	**$245,962,791**	**$7,378,884**
Santa Rosa	Bay Front	3,834	$684,660,208	$20,539,806
	Bay View	3,666	$79,468,829	$2,384,065
	Partial Bay View	7,722	$55,840,279	$1,675,208
	No Bay View	11,582	$0	$0
	Total	**26,804**	**$819,969,316**	**$24,599,079**
Total	Bay Front	14,752	$2,249,162,130	$67,474,864
	Bay View	13,358	$311,496,901	$9,344,907
	Partial Bay View	20,997	$130,189,994	$3,905,700
	No Bay View	27,939	$0	$0
	Grand Total	**77,046**	**$2,690,849,026**	**$80,725,471**

Table 13 also shows that bay front properties contribute the most to increases in property values. This is true even in Baldwin County where there are only 348 bay front properties. This is due in part to a higher proportion of property values being explained by proximity to the estuaries (45% as opposed to 10% and 3%, respectively), but it is also due to higher average property values for bay front properties as reported in Table 12.

Economic Impact Analysis

REMI (2020 data) is a widely used dynamic integrated input output (I/O) and econometric model. The REMI model is based on neoclassical theory and was founded in 1980. The model's structure incorporates inter-industry transactions and endogenous final demand feedbacks. The basic assumption of REMI is that the model is based on theoretical structural restrictions rather than individual econometric estimates based on single time-series observations for each region. It has much in common with the computable general equilibrium (CGE) models. REMI is used extensively to measure proposed legislative and other program and policy economic impacts across the private and public sectors of the state by the Florida Joint Legislative Management Committee, Division of Economic and Demographic Research, the Florida Department of Employment Opportunity and other state and local government agencies. In addition, it is the chosen tool to measure these impacts by a number of universities and private research groups that evaluate economic impacts across the state and nation. REMI shares two underlying assumptions with mainstream economic theory: households maximize their utility and producers maximize their profits. It includes hundreds of equations that describe cause-and-effect relationships in the economy, extending beyond an I/O model. The REMI used for this analysis (version 3.0) was developed specifically for the state of Florida and includes 160 sectors.[15] REMI's principal advantage is that it is a dynamic I/O econometric model and can be used to forecast both direct and indirect economic effects over multiple-year timeframes. REMI uses three sources of employment, wage and salary data: the Bureau of Economic Analysis (BEA) employment, wage and personal income series, ES 202 establishment employment and wage and salary data, and county business patterns (CBPs) data published by the Bureau of the Census. The industries are based on the North American Industrial Classification System (NAICS).

The PPBEP's economic impact forecast time horizon is to the year 2040.[16] The following expected annual economic impact results for the PPBEP area are presented in Figure 13, and include: output, income (in current dollars), and numbers of expected jobs.

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[15] It should be noted that the three counties in Florida (Escambia, Okaloosa and St. Rosa) were analyzed using REMI (for state of Florida). To purchase and add just one county to our state model, Baldwin county Alabama, was cost-prohibitive at this time. The research team estimated the total economic impacts for Baldwin county but taking a proportion of Baldwin county's proportion of business sales and consumer spending, and applying that to the REMI output, employment and income results.

[16] Based on personal communication with the PPBEP.

The economic impact presented below is based on the data by county shown in Tables 8 and 13.[17]

- Employment increases to 116,683 jobs in year 2023. After the first four years where the market demonstrates a slight over-employment strategy, it begins to decrease the number of jobs annually, until year 2034, where it begins to climb incrementally annually, reaching 126,138 in year 2040.
- Annual Output increases to $22.6 billion for the 2nd year of operation in year 2022, and continues to rise to $46.3 billion in year 2040.
- Personal Income increases by $7.3 billion in year 2022 and gradually increases to $20.8 billion in year 2040.

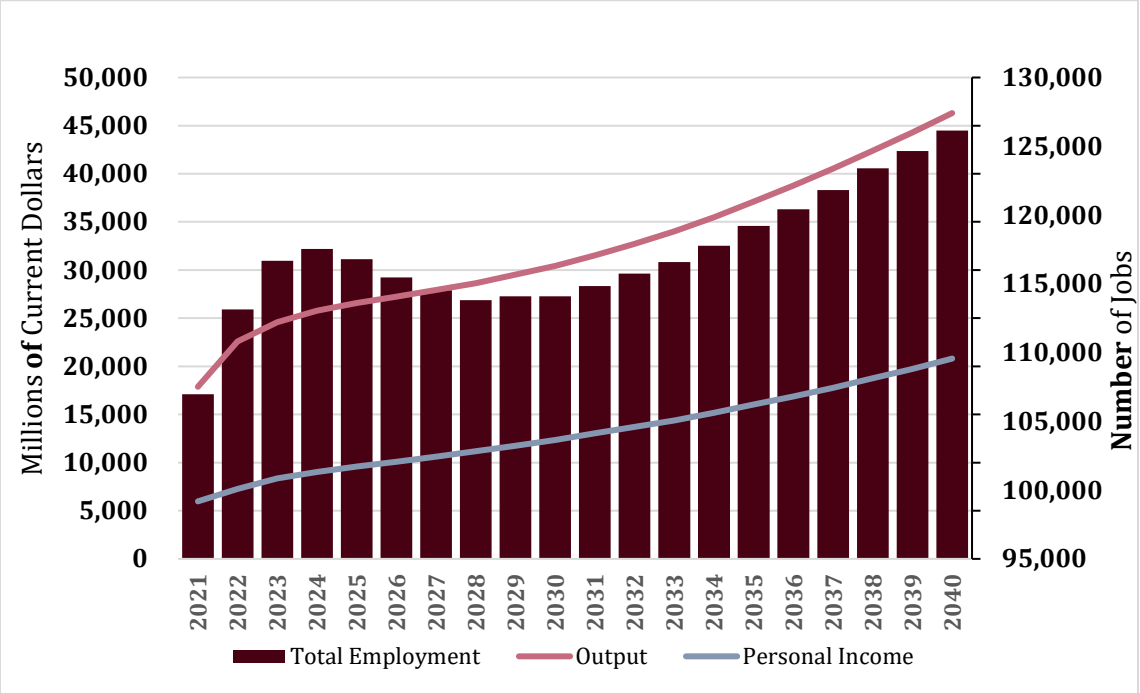

Figure 13. Projected PPBEP Area Economic Impacts Including Output, Income and Jobs to Year 4040

[17] The data includes all business type sales and wealth induced spending in current dollars in the PPBEP area. An assumption of two percent annually was made relating to the expected growth rate over time. The growth rate of two percent was based on economic assumptions related to growth rates based on the current credit underwriting standards.

Economic Valuation

Vulnerability Analyses – Flooding and Sea Level Rise

Flooding and Sea Level Rise can impact the estuaries environmentally and economically. Runoff, which can include fertilizer and sewage, threatens water quality, increases risk of algae overgrowth, and poses risks to fish and the livelihoods of fishermen. Flooding and sea level rise can contribute to lower property values. Sea level rise exacerbates nuisance flooding, saltwater intrusion, increased storm surge, and threats to critical infrastructure. Sea level rise that results in complete inundation can result in properties becoming unusable.

Study Area

This report focuses on limited economic impacts of flooding and sea level rise for Escambia County, Florida. Escambia County was selected because the Florida Division of Emergency Management (FDEM) is developing statewide flood predictor maps, and at the time of this writing, has completed a limited number of counties including Escambia. Although sea level rise data is readily available for many areas, this vulnerability section is limited to Escambia County in order to facilitate a side-by-side comparison between the two water-related vulnerabilities.

Figures 14 and 15 show Flood and Sea Level Rise for Escambia County and the differences in geographic areas that each occupies. Flooding occurs more inland in low-lying areas and has a larger geographic footprint. Sea Level Rise is located near the coast over a smaller geographic area. The analyses to follow will show different economic impacts based upon the land use types affected by each type of threat.

*Red lines are the PPBEP Estuary ½ mile buffer zone; the medium blue polygons are the 100-Year Flood boundary.

Figure 14. Map of the 100-Year Flood for Escambia and Santa Rosa Counties

*Red lines are the PPBEP estuary ½ mile buffer zone; the medium blue polygons are the 2-foot sea level rise boundary.

Figure 15. Map of 2-foot Sea Level Rise for Escambia and Santa Rosa Counties

Data and Methods

The Florida Division of Emergency Management (FDEM) updates the 100-year flood predications every five years in accordance with the 2023 Statewide Hazard Mitigation Plan (SHMP). Under Section 322 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act) enacted under the Disaster Mitigation Act of 2000 (DMA2K), the State of Florida is required to have a Federal Emergency Management Agency (FEMA)-approved hazard mitigation plan. To address flooding, the Florida Division of Emergency Management (FDEM) is developing the 2023 Statewide Hazard Mitigation Plan (SHMP), which is conducted every five years. The FDEM is preparing 100- and 500-year flood maps for all Florida counties. At the time of this writing, several counties have been completed, including Escambia, which is used for this study.

The flood analysis uses Hazus, a risk modeling methodology designed by the Federal Emergency Management Agency (FEMA) to provide information for mitigation, recovery, preparedness, and response to natural disasters. The Hazus Flood model uses a dasymetric approach to include population and building stock to more accurately reflect the landscape.

Sea level rise predictions offer support to communities to assess potential changes in tides and to adapt to sea level rise. The National Oceanic and Atmospheric Administration (NOAA) is dedicated to understanding and predicting changes in climate and weather.

The FSU Research Team is using the latest data from the FDEM and NOAA agencies for flooding and sea level rise. As these two datasets are considered authoritative, the team is incorporating them directly into this project. We use GIS methods to visualize and analyze market value and land use types in relation to these two datasets.

Flooding

Flooding is defined as the flow of water onto land that is normally dry. Floods are dangerous and kill more people in the United States each year than tornadoes, hurricanes, or lightning. This report uses the “100-year flood” measurement for estuary analysis. The term “100-year flood” as described by a television or radio spokesperson can mistakenly convey that a storm of this nature would happen every 100 years. However, hydrologists describe the term using a combination of magnitude and duration, and it is possible for a “100-year flood” to occur more frequently than every 100 years. The flood level is computed using past data and changes to topology, whether man-made or natural. It is important to regularly obtain new flood data for disaster preparedness and planning purposes.

This project shows a sample of Escambia County for the 100-year flood as an example of how the flood zone data can be used. Readers are encouraged to make use of this body of work for flood analysis in their communities.

Figures 16 and 17 show the 100-year Flood Zone overlaying the various land use types. In northern Escambia County, much of the underlying land use is agricultural, followed by miscellaneous, and governmental lands, and less land area categorized as residential, commercial, industrial, and institutional.

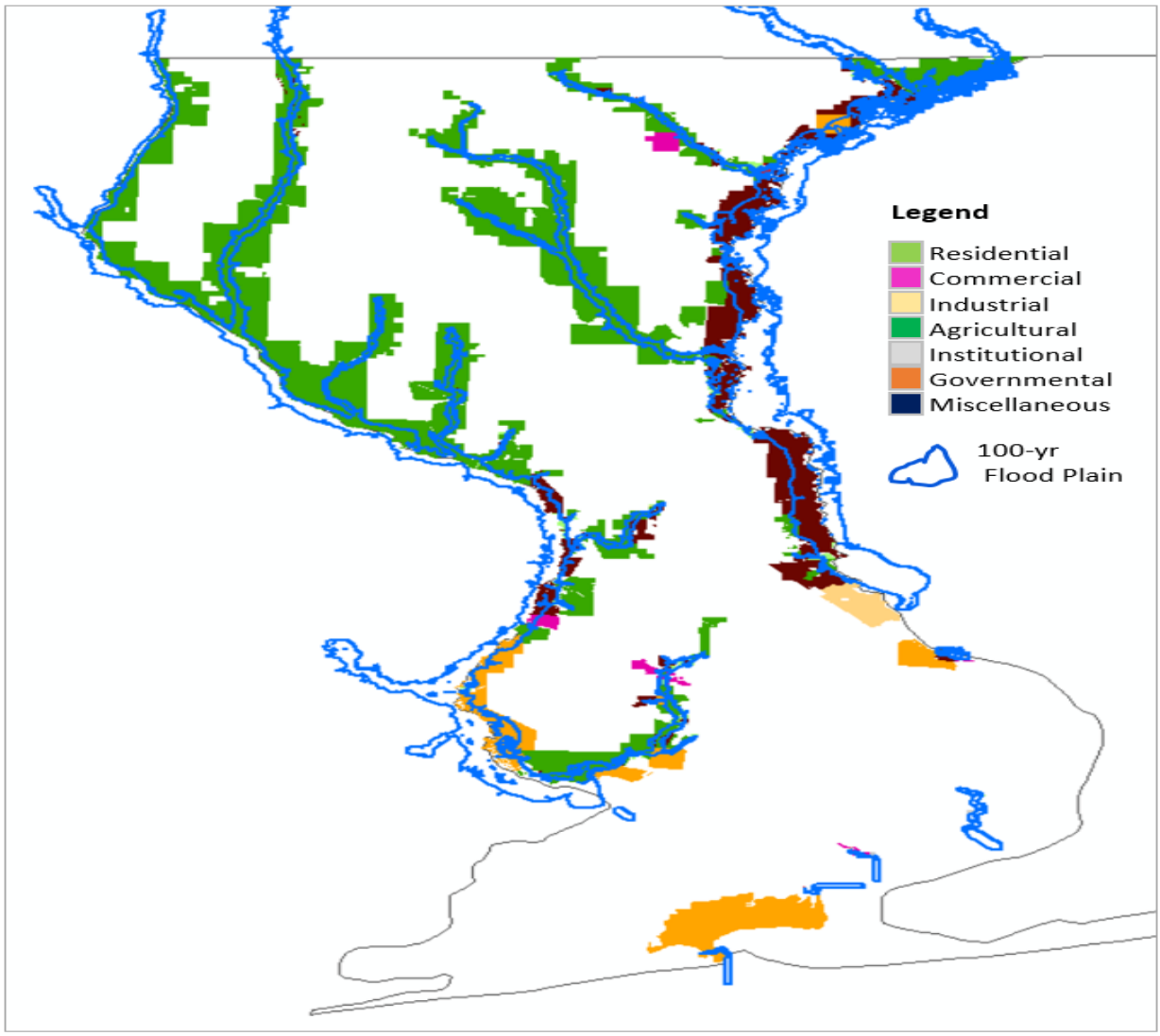

Figure 16. The PPBEP Area (Escambia County) 100-Year Flood Zone and Property Parcels by Land Use Type

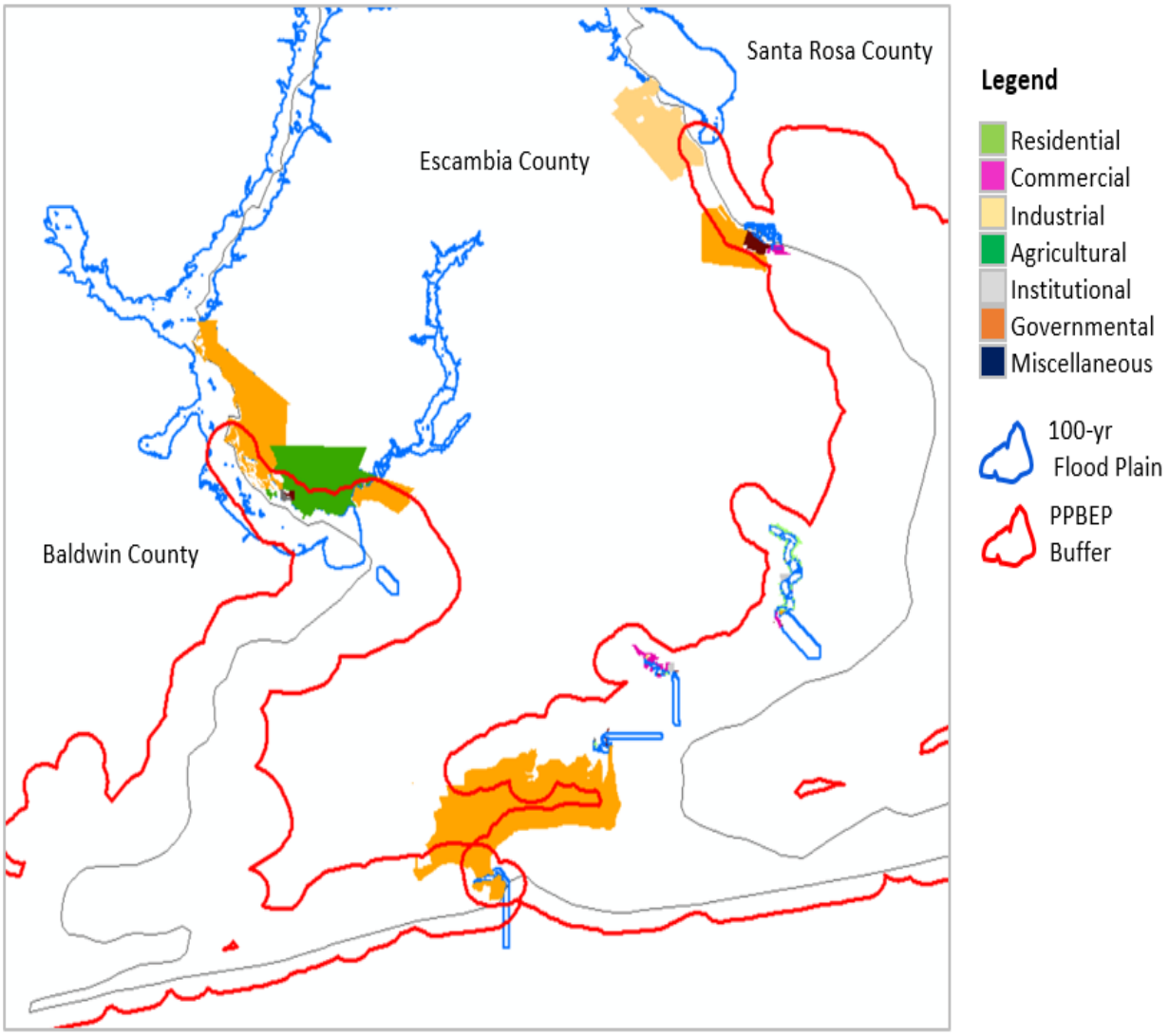

Figure 17. Lower Portion of Escambia County Showing the 100-Year Flood Zone, the PPBEP ½ Mile Estuary Buffer, and Property Parcels by Land Use Type

The tables to follow outline the market values of the land parcels within the Flood zone. Table 14 shows an overview of all land parcels within Escambia County by land use category. Table 15 provides a close-up of the land parcels that lie within the Flood zone and the PPBEP ½ mile buffer. In both cases, the governmental land use category has the highest market value, and the miscellaneous category trends toward a lower market value in spite of having a larger portion of land area. Table 16 breaks down the residential land use type into various housing type (i.e. single family, condo, etc.) by waterfront view, based upon our earlier analysis as shown in Appendix C.

Table 14. Market Values for PPBEP (Escambia County) Land Parcels Located Within the 100-Year Flood Zone

Market Values for PPBEP (Escambia) within 100-year Flood Zone		
Land Use Category	**Number of Parcels**	**Total Market Value**
Residential	856	$251,105,793
Commercial	30	$346,978,057
Industrial	6	$17,008,027
Agricultural	299	$112,716,829
Institutional	4	$9,920,827
Government	32	$1,255,352,659
Miscellaneous	161	$27,537,447
Totals	**1,388**	**$2,020,619,639**

Table 15. Market Values for Escambia County Land Parcels Located Within the 100-Year Flood Zone and the PPBEP ½ Mile Buffer

Market Values for PPBEP (Escambia) within 100-year Flood Zone and PPBEP ½ Mile Buffer		
Land Use Category	**Number of Parcels**	**Total Market Value**
Residential	350	$174,295,063
Commercial	17	$14,960,540
Industrial	2	$16,786,520
Agricultural	6	$4,086,840
Institutional	2	$9,292,132
Government	12	$1,234,450,988
Miscellaneous	11	$83,262
Total	**400**	**$1,453,955,345**

Table 16. Market Values Within PPBEP (Escambia County) and the 100-year Flood Zone Categorized by Type of Waterfront View

Market Values within PPBEP (Escambia) and 100-year Flood Zone				
Proximity to Bay	**Housing Category**	**Number of Units**	**Average Market Value**	**Total Market Value**
Bay Front	Vacant	47	$124,450	$5,849,158
	Family Home	140	$969,866	$135,781,231
	Mobile Home	0	n/a	$0
	Townhouse	10	$1,663,121	$16,631,206
	Condo	0	n/a	0
	Totals	**197**	**$803,358**	**$158,261,595**
Bay View	Vacant	0	n/a	0
	Family Home	0	n/a	0
	Mobile Home	0	n/a	0
	Townhouse	0	n/a	0
	Condo	0	n/a	0
	Totals	**0**	**n/a**	**0**
Partial View	Vacant	4	$12,341	$49,363
	Family Home	6	$410,506	$2,463,037
	Mobile Home	0	n/a	0
	Townhouse	0	n/a	0
	Condo	16	$190,438	$3,047,006
	Totals	**26**	**$213,823**	**$5,559,406**
No View	Vacant	0	n/a	0
	Family Home	0	n/a	0
	Mobile Home	0	n/a	0
	Townhouse	0	n/a	0
	Condo	0	n/a	0
	Totals	**0**	**n/a**	**0**
Totals		**223**	**$734,623**	**$163,821,001**

Sea Level Rise

Sea level rise is a global concern as almost 30 percent of the world's population lives in coastal areas. Sea level rise contributes to nuisance flooding, erosion, and storm hazards. Infrastructure such as roads, bridges, sewage treatment plants, landfills, and more are threatened. This report uses 2-foot sea level rise estimates as the probability is increasingly likely to occur between years 2020 and 2100.

Figures 18 and 19 show the 2-foot Sea Level Rise Zone overlaying the various land use types. In the more northern part of Escambia County, much of the underlying land use is miscellaneous, governmental, and industrial, and less land area categorized as residential, commercial, and institutional. The lower portion of the county has more land in the governmental and agricultural categories.

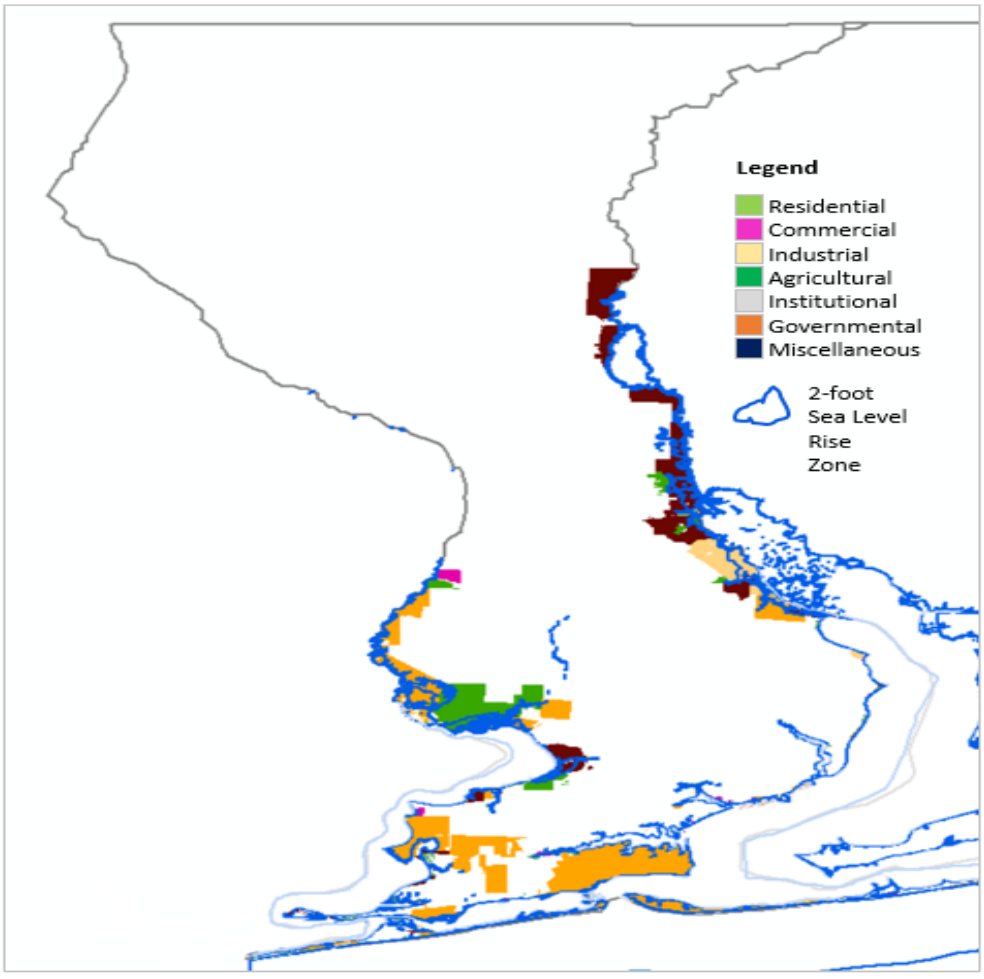

Figure 18. The PPBEP Area (Escambia County) 2-Foot Sea Level Rise Zone and Property Parcels by Land Use Type

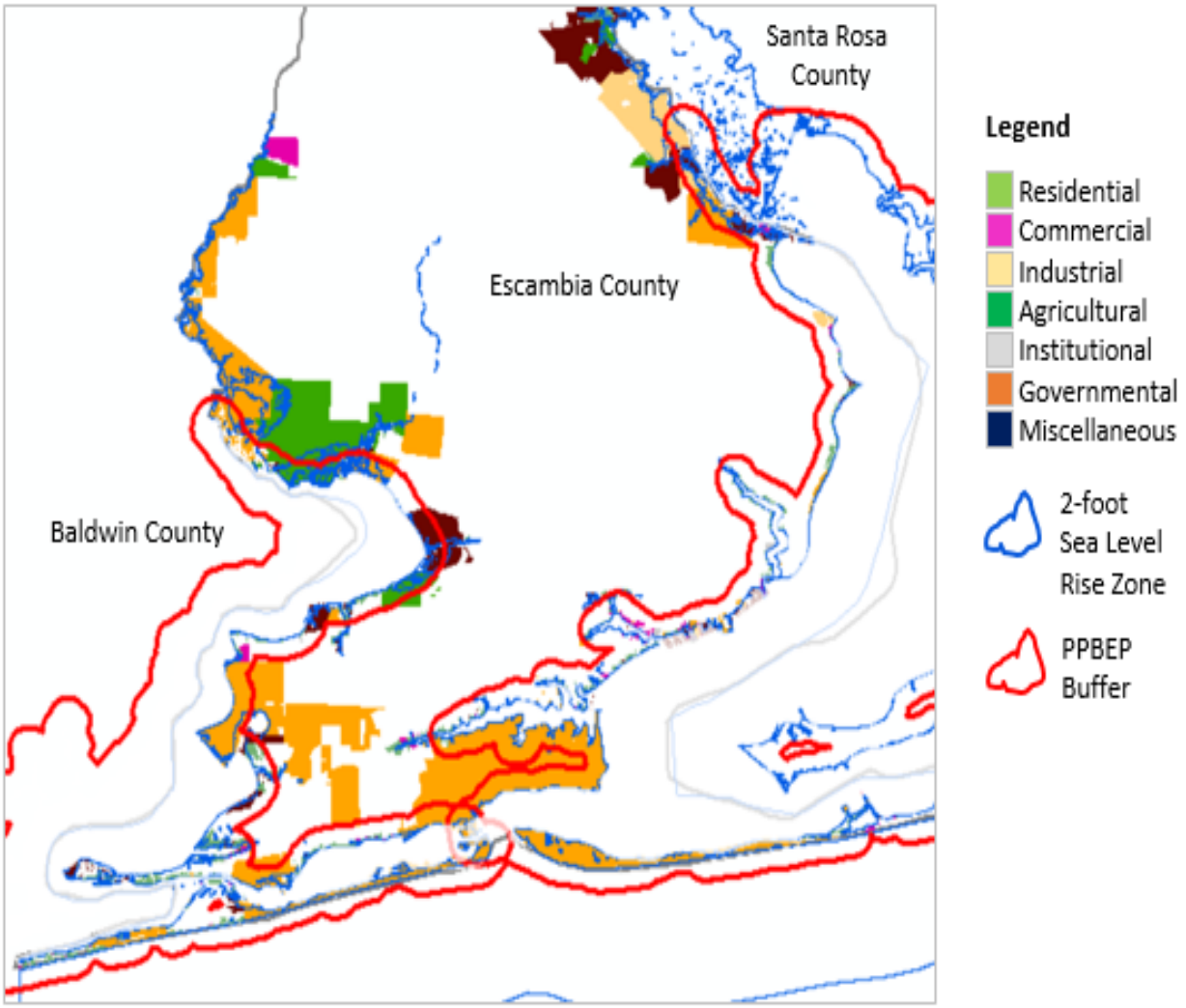

Figure 19. Lower Portion of Escambia County Showing the 2-Foot Sea Level Rise Zone, the PPBEP ½ Mile Estuary Buffer, and Property Parcels by Land Use Type

The tables to follow outline the market values of the land parcels within the Sea Level Rise zone. Table 17 outlines land parcels for the county by land use category. Table 18 provides a close-up of the land parcels that lie within the Sea Level Rise zone and the PPBEP ½ mile buffer. In both cases, the governmental and residential land use categories have the highest market value, and the miscellaneous category trends toward a lower market value in spite of having a larger portion of land area. Table 19 breaks down the residential land use type into various housing type (i.e. single family, condo, etc.) by waterfront view, based upon analysis similar to Appendix C.

Table 17. Market Values for the PPBEP Area (Escambia County) Land Parcels Located Within the 2-foot Sea Level Rise Zone

Market Values for the PPBEP Area (Escambia County) Within the 2-foot Sea Level Rise Zone		
Land Use Category	**Number of Parcels**	**Total Market Value**
Residential	6,913	$2,132,893,755
Commercial	141	$94,079,766
Industrial	9	$54,095,747
Agricultural	25	$11,977,768
Institutional	7	$15,265,564
Government	92	$3,260,992,104
Miscellaneous	230	$60,939,909
Totals	**7,417**	**$5,630,244,613**

Table 18. Market Values for Escambia County Land Parcels Located Within the 2-foot Sea Level Rise Zone and the PPBEP ½ Mile Buffer

Market Values for the PPBEP Area (Escambia County) Within 2-foot Sea Level Rise Zone and PPBEP ½ Mile Buffer		
Land Use Category	**Number of Parcels**	**Total Market Value**
Residential	5,056	$1,244,187,373
Commercial	117	$36,087,535
Industrial	3	$926,632
Agricultural	10	$5,476,447
Institutional	3	$4,545,617
Government	42	$1,290,212,607
Miscellaneous	61	$41,060,898
Total	**5,292**	**$2,622,497,109**

Table 19. Market Values Within the PPBEP Area (Escambia County) and the 2-Foot Sea Level Rise Zone Categorized by Type of Waterfront View

Market Values within the PPBEP Area Buffer (Escambia County) and 2-foot Sea Level Rise Zone				
Proximity to Bay	**Housing Category**	**Number of Units**	**Average Market Value**	**Total Market Value**
Bay Front	Vacant	662	$156,052	$103,306,633
	Family Home	1,389	$586,105	$814,100,038
	Mobile Home	14	$127,079	$1,779,103
	Townhouse	74	$823,727	$60,955,811
	Condo	3,010	$266,238	$801,375,548
	Totals	**5,149**	**$345,993**	**$1,781,517,133**
Bay View	Vacant	109	$105,825	$11,534,909
	Family Home	280	$452,871	$126,803,780
	Mobile Home	15	$76,598	$1,148,977
	Townhouse	6	$503,079	$3,018,472
	Condo	211	$276,831	$58,411,333
	Totals	**621**	**$323,539**	**$200,917,471**
Partial View	Vacant	121	$110,306	$13,346,987
	Family Home	161	$490,882	$79,032,016
	Mobile Home	9	$61,998	$557,978
	Townhouse	6	$525,776	$3,154,653
	Condo	305	$230,980	$70,448,873
	Totals	**602**	**$276,645**	**$166,540,507**
No View	Vacant	30	$65,698	$1,970,950
	Family Home	106	$230,789	$24,463,679
	Mobile Home	0	n/a	0
	Townhouse	8	$188,735	$1,509,880
	Condo	0	n/a	0
	Totals	**144**	**$194,059**	**$27,944,509**
Totals		**6,516**	**$334,088**	**$2,176,919,620**

Economic Valuation Analysis of Changes in Water Quality

This section examines changes in water quality and how they relate to the economic valuation of the estuaries. The quality of the water in estuaries is linked to its desirability as a tourist destination. Given tourism is one of the primary industries in the PPBEP areas, changes in the water quality may have an impact on the economic value of the estuaries. This section examines that link through the valuation of real estate properties that are near the estuaries.

Estimating the Link Between Water Quality and Economic Value

To test the theoretical link between water quality and economic value, this section uses data from the National Water Quality Monitoring Council (NWQM)[18] and FDOR. The NWQM keeps a database of water characteristic measurements obtained by various local, state, and federal authorities, as well as volunteer organizations. The FDOR data used in this analysis is parcel-level data on just value and geographic location. Using these two data sources, the team employs hedonic modeling to evaluate the impact of water quality on home prices.

Hedonic modeling is an econometric technique for estimating the price of a good that is composed of many features, each of which can contribute to the value of the product. For example, home prices vary depending on various factors, including lot size, square footage, number of bedrooms, number of bathrooms, location, general market conditions, and many others. A hedonic model is a linear regression model that uses the various attributes of properties as independent variables and the prices of properties as the dependent variable. The coefficients on the independent variables in this model can be interpreted as the marginal contribution of each factor to the price of the house. For example, a simple model could be

$$\widehat{price} = \beta_0 + \beta_1 sqft$$

Where *price* is the price of a home, and *sqft* is the area of the home in square feet. β_1 in this case would measure the marginal contribution of an additional square foot to the estimated price of a home (Macpherson & Zietz, 2005).

Parcel Value Data

The research team uses percent change in parcel just values as the dependent variable for the analysis in this section. To best depict how just values change over time, the team needed data at the highest frequency available for the longest period possible. FDOR has annual just

[18] https://www.waterqualitydata.us/

value data for the three Florida counties in the PPBEP area spanning from 2007 to 2021,[19] though it is only available through a public information request. Data for Baldwin County, AL parcels could not be located, therefore, Baldwin County is excluded from this analysis. After acquiring this data, each year was filtered to only include the parcels within ½ mile of the PPBEP area. Additionally, the parcels were filtered to include only residential properties. Finally, each year/county is distributed as a separate table, which were merged together for analysis. Figure 20 displays a map of the land parcels used in the hedonic modeling.

*Parcels are in garnet. Estuaries are in light blue. Florida borders and shorelines are in gold.

Figure 20. Land Valuation Parcels Included in the Hedonic Model

Water Quality Data

The NWQM stores water quality data in several tables that can be queried for characteristics, geolocation, sample date and time, and other measures. The research team first narrowed the sampling locations to a box defined by latitude and longitude surrounding the PPBEP area. Next, the research team selected several of water quality measures, including toxins, organic matter, and microbiological contaminants. Using GIS data to define the boundaries of the Pensacola and Perdido Bays, the research team then narrowed the sampling locations down to only those within the PPBEP area's boundaries. Figure 21 shows the location of the monitoring sites. Note that not all monitoring sites were used in each year due to data limitations.

[19] 2022 data became available in October and as this analysis was being conducted, and therefore is not included.

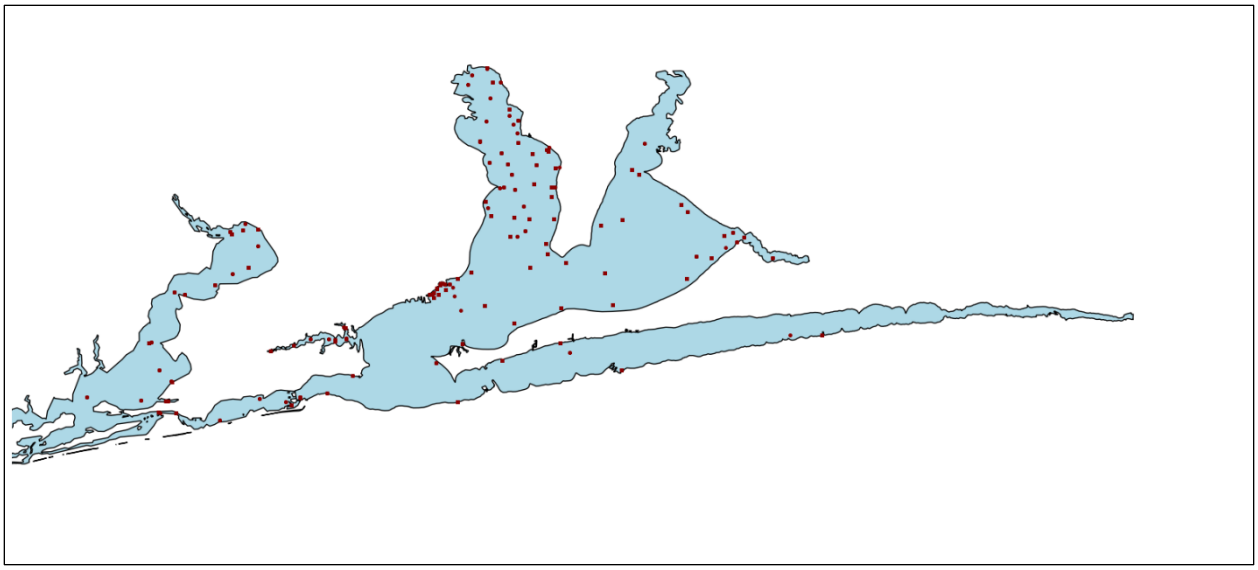

Figure 21. Monitoring Sites Data Used in the Hedonic Model

Next, the research team averaged each measure of water quality by year and by PPBEP area Bay. After examining the averaged data, the team determined that very few water quality measures were taken frequently enough to be useful in the analysis. Therefore, the team narrowed the measures down to only three criteria: chlorophyll A corrected for pheophytin (measured in micrograms per liter), enterococcus (measured in colony forming units per 100ml), and fecal coliform (measured in colony forming units per 100ml).

Chlorophyll A is used as a measure of the volume of phytoplankton (algae) in a body of water (Boyer et al 2009). Some chlorophyll is normal, as all healthy bodies of water support photosynthetic plankton that form the basis of the food chain. However, higher proportions of algae can be indicators of excess agricultural runoff in the form of nitrates, phosphates, and other nutrients. Excess nutrients can cause algal blooms that use up dissolved oxygen and block light from reaching seagrasses and other plants on which species depend. This can cause die-offs of plant and animal life that in the more extreme cases lead to complete ecosystem collapse. In addition, chlorophyll is among the most visible indicators of water quality as excess algae reduce visibility, making water bodies less visually appealing. For this reason, an increase in chlorophyll should be associated with a decline in housing prices. Enterococcus and fecal coliforms are types of bacteria that commonly come from the fecal matter of terrestrial animals. Enterococcus is of particular concern because it can directly cause several diseases, including urinary tract infections, meningitis, and wound infections. Fecal coliforms may also cause diseases, for example, some strains of *Escherichia coli*, but it is less common. Some enterococcus and fecal coliforms are present in nearly all bodies of water, but excessive amounts may indicate excess agricultural runoff from livestock or poor water sanitation practices (Krishinhi, Tchounwou, & Farah, 2013). Therefore, an increase in enterococcus and fecal coliforms should be associated with a decline in house prices.

Methodology for the Economic Valuation Analysis Using Hedonic Modeling

The research team uses a percent first-difference(s), linear regression design as the hedonic model in this analysis. The primary reason for choosing this methodology is that each parcel in this data contains individual characteristics that do not change over time that determine its price (individual-level fixed effects).[20] One way to ensure that these characteristics do not affect the analysis is to take the first difference. For example, a parcel being located in an urban area is correlated with property values and may also be correlated with water quality, assuming water quality is worse in urban areas. Since location does not change over time for parcels, taking the first difference removes the influence of this variable on the regression equation.

First differences are converted into percent differences because the different indicators of water quality are measured in different units (colony forming units for fecal coliforms and enterococcus, and micrograms per liter for chlorophyll). Converting each measure into percent differences allows comparison between the three measures without complications arising from differing units. Finally, differences in just values are converted to percent differences because prices tend to change in steady growth rates expressed in percentages, as opposed to linearly. A general formula for the regression estimation is:

$$\Delta \widehat{JustValue}_{\iota,t} = \beta_0 + \beta_1 \Delta Ch_t + \beta_2 \Delta F_t + \beta_3 \Delta E_t + \Delta X_t \delta$$

where $\Delta \widehat{JustValue}_{\iota,t}$ is the estimated percent change in just value for property *i* in year *t*, ΔCh_t is the percent change in average chlorophyll, ΔF_t is the percent change in average fecal coliforms, ΔE_t is the percent change in enterococcus, and ΔX_t is a vector of time-varying factors thought to influence property values. The factors include the percent change in the median selling price of homes in the United States and the percent change in the population of the Pensacola metropolitan statistical area.[21] One disadvantage of using a percent first difference design is that it complicates the interpretation of the results. The coefficients β_j for j = 1,2,3 can be interpreted as differences in the percent changes in just values associated with a 1% difference in the change in each measure of water quality, holding the change in all other factors constant. For example, if the percent difference in chlorophyll increases by 1%, the percent difference in parcel values is expected to change by β_1.

Given each estuary is fed by a separate watershed, the team chose to perform regression analyses separately for properties near each estuary, using the average water quality measures from the nearest estuary in each regression. In addition, the team performed a

[20] For more information on the first-difference regression design, see Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data*. MIT press.
[21] Retrieved from FRED: https://fred.stlouisfed.org/

primary regression, which combines the two estuaries, using average water quality measures from the nearest estuary to each parcel. The formulas for the two separate regressions are the same as the formula above, while the formula for the combined regression is:

$$\Delta \widehat{JustValue}_{i,t} = \beta_0 + \beta_1 \Delta Ch_{i,t} + \beta_2 \Delta F_{i,t} + \beta_3 \Delta E_{i,t} + \Delta X_t \delta$$

The inclusion of additional *i* subscripts indicates that the water quality measures are different for different parcels, depending on which estuary is closer.

Results of the Economic Valuation Analysis Using Hedonic Modeling

Table 20 presents the results of the three hedonic models. All three models indicate that the effect of water quality measures is both statistically and economically significant. For example, the combined model predicts that an increase of 1% in the change in chlorophyll in the nearest estuary leads to a 0.06% change in the increase in just values. For example, the average increase in parcel prices in 2021 was 6.0%, while chlorophyll levels increased, on average, 7%. The model predicts that if chlorophyll levels had increased by 8% instead of 7%, parcel values would have increased by 5.4% instead of 6%. For further clarification, the average parcel price in 2020 was $232,219 while the average parcel price in 2021 was $246,169. If average chlorophyll levels had increased by 8% instead of 7% between 2020 and 2021, the model predicts the average just values would have been $244,759, a difference of $1,410. While a difference of $1,410 may seem small, considering there were 63,049 parcels in the combined data in 2020, the cumulative impact on wealth of water quality could be significant. Applying this estimate across all 2020 parcels, if chlorophyll levels had increased by 8% instead of 7% between 2020 and 2021, the model predicts a total difference in wealth of $88,900,506 for the region. Thus, the local governments in the PPBEP study area have a significant motivation to improve water quality in the area. In the combined model, enterococcus and fecal coliforms have a smaller impact on prices than chlorophyll. For a 1% change in the percent difference in enterococcus, the percent difference in just values is expected to decrease by 0.002%. For a 1% change in the percent difference in fecal coliform, the percent difference in just values is expected to decrease by 0.0009%.

Limitations and Considerations

Examining the results in Table 20 reveal some inconsistencies that should be noted. For example, while changes in quality measures are negatively associated with changes in just value in the combined regression, the models that are split by estuary are not consistent with the main results. For example, in the Pensacola regression an increase in the percent difference in enterococcus is associated with an increase in the change in just values.

Table 20. Results of the Economic Valuation Using Hedonic Modeling

Coefficient	Combined Results	Pensacola Bay Only	Perdido Bay Only
Intercept	0.20%***	0.35%***	0.31%***
	(0.6)	(0.01)	(0.023)
ΔChlorophyll	-0.06%***	-0.10%***	0.07%***
	(0.0002)	(0.004)	(0.004)
ΔEnterococcus	-0.002%***	0.03%***	0.13%***
	(0.00007)	(0.002)	(0.012)
ΔFecal Coliform	-0.0009%***	-0.003%***	0.07%***
	(0.004)	(0.000)	(0.003)
ΔMean Selling Price	0.2580%***	-0.13%***	-1.24%***
	(0.031)	(0.044)	(0.133)
ΔPens. Population	-12.74%***	-17.99%***	-19.59%***
	(0.441)	(0.716)	(1.418)
Number of observations	377,722	307,200	70,510
R^2	0.005	0.008	0.016

In the Perdido Bay regression all three of the coefficients are positive. This likely means that there is significant omitted variable bias in the results for the Perdido Bay regression. This is further evidenced by the higher standard errors for the control variables (e.g., mean selling price, Pensacola population) in the Perdido Bay model.

The difference between the three models indicate that the Perdido Bay area is somewhat different than the Pensacola Bay area, and there are likely unobserved factors determining parcel values that are correlated with water quality measures. For example, the Perdido Bay area is more rural than the Pensacola Bay area. Therefore, it is possible that less tourism

activity occurs in Perdido Bay. Instead, the drivers of poorer water quality (agricultural activity, urbanization, etc.) positively influence just values and negatively influence water quality. Some of the influence of urbanization is captured by the Pensacola population variable, but presumably this is less important in the Perdido Bay area which is not located next to the city of Pensacola.

Economic Valuation Using Hedonic Modeling Conclusions

While the results of the hedonic modeling analysis are mixed, if the combined Bays analysis is taken as viable, then water quality is important to the economic impact of the estuaries. This is in line with other studies with similar conclusions. Additionally, the impact is most prominent for chlorophyll. In the combined model, if chlorophyll increases 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. This is in line with other studies that show that water clarity – one of the most visible indicators of water quality – is associated with higher real estate values. Local authorities and policymakers have a strong incentive to increase water quality in the bay area in order to increase economic activity.

Conclusions

Direct Business Sales and Property Value Results

The sales and spending directly supported by the Pensacola and Perdido Bay Estuaries are significant. 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. 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. Bay-related businesses in Escambia County contribute the most to both sales and employment, with $3.9 billion in sales and 38 thousand employees.

In addition to business spending, the estuaries are estimated to contribute $2.7 billion to property values in the area and nearly $81 million to consumer spending. The team estimates that properties right on the bay are the most impactful. Out of the $2.7 billion that the estuaries contribute to property values, $2.2 billion comes from Bay Front properties. This translates to $67 million of the $81 million increase in consumer spending. Properties in Escambia County are again the most significant contributors to increased property values and consumer spending, with $1.6 billion in increased property values and $47 million in wealth induced spending.

Economic Impact Analysis Results

The PPBEP area is not only valuable as an ecological and environmental treasure, but also as an engine of economic activity. This report demonstrates the economic value the Perdido and Pensacola estuaries bring to the surrounding areas. Businesses that are directly impacted by the estuaries contribute significantly to their local economies, and generate a total of $7.98 (or nearly $8) billion in direct sales. In addition to business sales, local property values are also impacted by the PPBEP area. The FSU CEFA team estimates that property values are increased by a total of $2.7 billion. The increase in property values attributed to proximity to the PPBEP area leads to an additional $80.7 million in direct consumer, or wealth-induced, spending. 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. In addition to monetary impacts, businesses tied to the estuaries also employ large numbers of workers. Direct employment supported by these businesses is 84,712 jobs. Businesses and consumer spending also contributed an additional 28,831

indirect and induced jobs. Total employment supported by businesses and consumer spending tied to the estuaries is 113,143.

Economic Valuation Analysis Results

Although flooding and sea level rise both involve excess water, statistical modeling yields maps that are quite different. The preceding Figures show each vulnerability's geographic footprint for Escambia County. Sea Level Rise is projected to occur near the coastline while flooding can present near the coast as well as inland in low-lying areas. Each of these vulnerabilities produce different economic risks for the estuaries. This report analyzes property values for both vulnerabilities.

Sea Level Rise presents a greater economic risk based upon market values of properties when compared to flooding. This scenario is likely explained because Sea Level Rise occurs closer to the coastline where there are numerous residential and properties. The Flood zone covers more land area but a generous portion is agricultural land use, which has a lower market value.

This vulnerability study shows the need for considering risks of all types to the estuary system. Vulnerabilities produce different economic threats depending upon the type of land use affected by the threat. Weather and climate risks should be expanded to include storm surge, extreme heat, and other threats so that scientists and planners can be informed of the similarities and differences that each vulnerability poses.

Hedonic price modeling of the PPBEP area reveals that water quality is an important component of the economic valuation of the estuaries. In particular, water quality affects the value of homes located near the estuaries, with poorer water quality being associated with decreased property values. This is in line with other studies with similar conclusions. The main model examined three water quality measures and found that chlorophyll was the measure most associated with price changes. If chlorophyll increases 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. Since chlorophyll is usually produced by algae in bodies of water, chlorophyll is used as a measure of water clarity. Therefore, the results are in line with other studies that show that water clarity – one of the most visible indicators of water quality – is associated with higher real estate values. Local authorities and policymakers have a strong incentive to increase water quality in the PPBEP area to generate increased economic activities.

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Appendix A. Data Sources and GIS Data Pre-Processes Steps for Analysis

Table A-1. Data Sources Used for this Project

Data Sources Used for this Project			
Source	**Type of Data**	**Purpose for this Project**	**Format**
PPBEP	PPBEP boundaries	Define estuary boundary	GIS shapefile
NETS 2020	Business data	Analyze business sales and employment over time and by SIC classification	CSV file
Florida Department of Revenue (FDOR)	Property appraiser data for Escambia, Santa Rosa, and Okaloosa Counties	Analyze just values for property parcels and land use categories	GIS shapefile
Baldwin County, Alabama GIS Department	Property appraiser data for Baldwin County	Analyze just values for property parcels and land use categories	GIS shapefile
National Oceanic and Atmospheric Administration (NOAA)	2-foot Sea Level Rise predictions	Define areas affected by sea level rise modeling	GIS shapefile
Florida Department of Emergency Management (FDEM)	100-year Flood Zone predictions	Define areas affected by flood modeling	GIS shapefile

Table A-2. GIS Data Pre-Processes Used to Prepare Data for Analysis

GIS Data Pre-Processing Steps		
Data	**Processing Step**	**Result**
PPBEP boundary	Used GIS to create a ½ mile buffer around the estuary boundary	GIS shapefile (polygon format)
NETS 2020	Used GIS to convert CSV data into a GIS shapefile	GIS shapefile of businesses (point format)
Property appraiser data (both from FDOR and Baldwin County)	1. Joined NETS 2020 GIS point data to the property appraiser polygon data 2. Added and calculated a new field "bayview" to indicated distance from bay	GIS shapefile of property parcels and businesses (polygon format)
NOAA Sea Level Rise data	n/a	Original GIS shapefile format (polygon format)
FDEM Flood data	n/a	Original GIS shapefile format (polygon format)

Appendix B. Detailed Results of Businesses in the PPBEP Area

Summary of Businesses within 1/2 mile of the PPBEP Area, Escambia County				
Small Businesses (less than 10 employees)				
Sector (by SIC)	**Number of Businesses**	**Number of Employees**	**Total Sales**	**Total Just Value of Properties**
Agriculture, Forestry, and Fishing	130	281	$10,106,143	$6,607,636
Mining	2	14	$3,805,904	$0
Construction	489	1169	$121,776,038	$6,011,567
Manufacturing	97	370	$35,908,329	$1,716,985
Transportation, Communications, Electric, Gas, and Sanitary Services	231	706	$72,417,431	$7,504,269
Wholesale Trade	162	495	$82,847,258	$2,350,769
Retail Trade	514	1714	$145,066,617	$7,985,001
Finance, Insurance, and Real Estate	758	2146	$215,651,803	$26,667,047
Services	4253	10780	$634,737,127	$232,240,962
Public Administration	19	61	$1,019,147	$1
Totals	**6,655**	**17,736**	**$1,323,335,797**	**$291,084,237**
Medium Businesses (between 10 and 49 employees)				
Sector (by SIC)	**Number of Businesses**	**Number of Employees**	**Total Sales**	**Total Just Value of Properties**
Agriculture, Forestry, and Fishing	3	48	$3,320,300	$0
Mining	1	13	$3,453,970	$0
Construction	15	191	$56,101,627	$412,741
Manufacturing	26	443	$55,354,580	$1
Transportation, Communications, Electric, Gas, and Sanitary Services	7	138	$12,988,371	$0
Wholesale Trade	8	139	$25,528,520	$0
Retail Trade	227	3,280	$278,553,305	$5,655,794
Finance, Insurance, and Real Estate	11	217	$104,710,082	$0
Services	152	2,535	$158,691,635	$5,215,223
Public Administration	22	470	$6,142,375	$1
Totals	472	7,474	$704,844,765	$11,283,760

Summary of Businesses within 1/2 mile of the PPBEP Area, Escambia County (Cont.)				
Large Businesses (50 or more employees)				
Sector (by SIC)	**Number of Businesses**	**Number of Employees**	**Total Sales**	**Total Just Value of Properties**
Agriculture, Forestry, and Fishing	0	0	$0	$0
Mining	0	0	$0	$0
Construction	2	185	$23,495,910	$0
Manufacturing	5	520	$261,335,992	$0
Transportation, Communications, Electric, Gas, and Sanitary Services	4	793	$208,900,280	$0
Wholesale Trade	3	320	$118,150,327	$0
Retail Trade	9	1,140	$216,088,861	$0
Finance, Insurance, and Real Estate	3	202	$30,878,056	$0
Services	30	5,079	$1,048,133,928	$0
Public Administration	35	5,001	$0	$0
Totals	**91**	**13,240**	**$1,906,983,354**	**$0**
All Businesses				
Sector (by SIC)	**Number of Businesses**	**Number of Employees**	**Total Sales**	**Total Just Value of Properties**
Agriculture, Forestry, and Fishing	133	329	$13,426,443	$6,607,636
Mining	3	27	$7,259,874	$0
Construction	506	1,545	$201,373,575	$6,424,308
Manufacturing	128	1,333	$352,598,901	$1,716,986
Transportation, Communications, Electric, Gas, and Sanitary Services	242	1,637	$294,306,082	$7,504,269
Wholesale Trade	173	954	$226,526,105	$2,350,769
Retail Trade	750	6,134	$639,708,783	$13,640,795
Finance, Insurance, and Real Estate	772	2,565	$351,239,941	$26,667,047
Services	4,435	18,394	$1,841,562,690	$237,456,185
Public Administration	76	5,532	$7,161,522	$2
Totals	**7,218**	**38,450**	**$3,935,163,916**	**$302,367,997**

Summary of Businesses within 1/2 mile of the PPBEP Area, Santa Rosa County				
Small Businesses (less than 10 employees)				
Sector (by SIC)	**Number of Businesses**	**Number of Employees**	**Total Sales**	**Total Just Value of Properties**
Agriculture, Forestry, and Fishing	124	316	$14,389,531	$7,343,611
Mining	5	14	$1,637,242	$1,089,793
Construction	455	1077	$100,281,008	$40,549,803
Manufacturing	94	283	$21,855,851	$10,231,119
Transportation, Communications, Electric, Gas, and Sanitary Services	150	385	$26,260,656	$17,609,031
Wholesale Trade	91	253	$46,454,270	$5,111,251
Retail Trade	412	1407	$129,359,749	$97,001,439
Finance, Insurance, and Real Estate	479	1344	$198,517,035	$50,806,115
Services	2922	7432	$416,502,109	$724,765,123
Public Administration	5	22	$94,459	$1,198,923
Totals	**4,737**	**12,533**	**$955,351,910**	**$955,706,208**
Medium Businesses (between 10 and 49 employees)				
Sector (by SIC)	**Number of Businesses**	**Number of Employees**	**Total Sales**	**Total Just Value of Properties**
Agriculture, Forestry, and Fishing	2	29	$1,054,419	$0
Mining	0	0	$0	$0
Construction	11	184	$11,124,510	$541,506
Manufacturing	6	74	$8,239,905	$0
Transportation, Communications, Electric, Gas, and Sanitary Services	2	43	$2,890,368	$1,198,923
Wholesale Trade	2	35	$1,910,660	$388,481
Retail Trade	120	1,746	$91,972,616	$23,384,227
Finance, Insurance, and Real Estate	12	195	$115,986,930	$577,349
Services	88	1,311	$79,597,483	$7,767,207
Public Administration	5	103	$0	$49,646,991
Totals	**248**	**3,720**	**$312,776,891**	**$83,504,684**

Summary of Businesses within 1/2 mile of the PPBEP Area, Santa Rosa County (Cont.)				
Large Businesses (50 or more employees)				
Sector (by SIC)	**Number of Businesses**	**Number of Employees**	**Total Sales**	**Total Just Value of Properties**
Agriculture, Forestry, and Fishing	0	0	$0	$0
Mining	0	0	$0	$0
Construction	1	70	$8,056,650	$0
Manufacturing	0	0	$0	$0
Transportation, Communications, Electric, Gas, and Sanitary Services	0	0	$0	$0
Wholesale Trade	0	0	$0	$0
Retail Trade	4	343	$49,526,087	$100
Finance, Insurance, and Real Estate	0	0	$0	$0
Services	11	737	$75,829,718	$3,354,560
Public Administration	2	114	$0	$1,657,668
Totals	**18**	**1,264**	**$133,412,455**	**$5,012,328**
All Businesses				
Sector (by SIC)	**Number of Businesses**	**Number of Employees**	**Total Sales**	**Total Just Value of Properties**
Agriculture, Forestry, and Fishing	126	345	$15,443,950	$7,343,611
Mining	5	14	$1,637,242	$1,089,793
Construction	467	1,331	$119,462,168	$41,091,309
Manufacturing	100	357	$30,095,756	$10,231,119
Transportation, Communications, Electric, Gas, and Sanitary Services	152	428	$29,151,024	$18,807,954
Wholesale Trade	93	288	$48,364,930	$5,499,732
Retail Trade	536	3,496	$270,858,452	$120,385,766
Finance, Insurance, and Real Estate	491	1,539	$314,503,965	$51,383,464
Services	3,021	9,480	$571,929,310	$735,886,890
Public Administration	12	239	$94,459	$52,503,582
Totals	**5,003**	**17,517**	**$1,401,541,256**	**$1,044,223,220**

Summary of Businesses within 1/2 mile of the PPBEP Area, Okaloosa County				
Small Businesses (less than 10 employees)				
Sector (by SIC)	**Number of Businesses**	**Number of Employees**	**Total Sales**	**Total Just Value of Properties**
Agriculture, Forestry, and Fishing	47	136	$5,500,264	$9,884,609
Mining	0	0	$0	$0
Construction	343	818	$81,810,838	$72,026,499
Manufacturing	52	184	$18,879,491	$9,223,907
Transportation, Communications, Electric, Gas, and Sanitary Services	93	262	$20,519,192	$28,369,426
Wholesale Trade	50	173	$22,505,302	$15,734,049
Retail Trade	290	1023	$118,110,829	$58,526,382
Finance, Insurance, and Real Estate	249	742	$86,048,835	$100,086,907
Services	1664	4314	$266,584,187	$623,569,796
Public Administration	9	41	$0	$20,764,851
Totals	**2,797**	**7,693**	**$619,958,938**	**$938,186,426**
Medium Businesses (between 10 and 49 employees)				
Sector (by SIC)	**Number of Businesses**	**Number of Employees**	**Total Sales**	**Total Just Value of Properties**
Agriculture, Forestry, and Fishing	2	37	$2,592,037	$0
Mining	0	0	$0	$0
Construction	12	203	$50,250,335	$1,811,178
Manufacturing	13	222	$35,823,621	$1,323,225
Transportation, Communications, Electric, Gas, and Sanitary Services	5	106	$8,905,737	$4,797,546
Wholesale Trade	7	135	$37,538,238	$276,404
Retail Trade	106	1,708	$132,096,707	$45,611,679
Finance, Insurance, and Real Estate	16	304	$91,051,758	$22,775,548
Services	109	1,830	$124,592,360	$96,923,291
Public Administration	9	189	$9,270,000	$70,155,008
Totals	**279**	**4,734**	**$492,120,793**	**$243,673,879**

Summary of Businesses within 1/2 mile of the PPBEP Area, Okaloosa County (Cont.)				
Large Businesses (50 or more employees)				
Sector (by SIC)	**Number of Businesses**	**Number of Employees**	**Total Sales**	**Total Just Value of Properties**
Agriculture, Forestry, and Fishing	0	0	$0	$0
Mining	0	0	$0	$0
Construction	1	149	$19,958,997	$0
Manufacturing	2	300	$73,870,000	$1,227,359
Transportation, Communications, Electric, Gas, and Sanitary Services	0	0	$0	$0
Wholesale Trade	0	0	$0	$0
Retail Trade	10	815	$141,521,407	$10,557,812
Finance, Insurance, and Real Estate	3	229	$42,349,153	$0
Services	20	2,126	$78,011,719	$7,648,155
Public Administration	6	1,207	$10,410,562	$53,843,615
Totals	**42**	**4,826**	**$366,121,838**	**$73,276,941**
All Businesses				
Sector (by SIC)	**Number of Businesses**	**Number of Employees**	**Total Sales**	**Total Just Value of Properties**
Agriculture, Forestry, and Fishing	49	173	$8,092,301	$9,884,609
Mining	0	0	$0	$0
Construction	356	1,170	$152,020,170	$73,837,677
Manufacturing	67	706	$128,573,112	$11,774,491
Transportation, Communications, Electric, Gas, and Sanitary Services	98	368	$29,424,929	$33,166,972
Wholesale Trade	57	308	$60,043,540	$16,010,453
Retail Trade	406	3,546	$391,728,943	$114,695,873
Finance, Insurance, and Real Estate	268	1,275	$219,449,746	$122,862,455
Services	1,793	8,270	$469,188,266	$728,141,242
Public Administration	24	1,437	$19,680,562	$144,763,474
Totals	**3,118**	**17,253**	**$1,478,201,569**	**$1,255,137,246**

Summary of Businesses within 1/2 mile of the PPBEP Area, Baldwin County				
Small Businesses (less than 10 employees)				
Sector (by SIC)	**Number of Businesses**	**Number of Employees**	**Total Sales**	**Total Just Value of Properties**
Agriculture, Forestry, and Fishing	39	93	$3,359,142	$2,351,400
Mining	5	12	$2,224,080	$2,700
Construction	154	431	$57,866,636	$12,470,700
Manufacturing	30	108	$29,376,342	$2,018,700
Transportation, Communications, Electric, Gas, and Sanitary Services	97	331	$28,583,138	$9,200,000
Wholesale Trade	49	185	$31,941,991	$5,170,500
Retail Trade	227	834	$86,321,240	$26,689,600
Finance, Insurance, and Real Estate	274	809	$80,410,518	$41,824,500
Services	974	2376	$173,887,523	$88,263,200
Public Administration	7	22	$0	$108,800
Totals	**1,856**	**5,201**	**$493,970,611**	**$188,100,100**
Medium Businesses (between 10 and 49 employees)				
Sector (by SIC)	**Number of Businesses**	**Number of Employees**	**Total Sales**	**Total Just Value of Properties**
Agriculture, Forestry, and Fishing	1	15	$1,796,295	$50,000
Mining	0	0	$0	$0
Construction	9	117	$16,603,051	$502,100
Manufacturing	2	24	$1,282,158	$0
Transportation, Communications, Electric, Gas, and Sanitary Services	4	67	$9,386,705	$0
Wholesale Trade	4	75	$40,342,249	$1,600
Retail Trade	116	1,829	$115,689,509	$21,251,800
Finance, Insurance, and Real Estate	15	357	$143,782,231	$2,846,600
Services	58	846	$69,035,586	$6,340,900
Public Administration	5	117	$0	$108,800
Totals	**214**	**3,447**	**$397,917,784**	**$31,101,800**

Summary of Businesses within 1/2 mile of the PPBEP Area, Baldwin County (Cont.)				
Large Businesses (50 or more employees)				
Sector (by SIC)	**Number of Businesses**	**Number of Employees**	**Total Sales**	**Total Just Value of Properties**
Agriculture, Forestry, and Fishing	0	0	$0	$0
Mining	0	0	$0	$0
Construction	0	0	$0	$0
Manufacturing	0	0	$0	$0
Transportation, Communications, Electric, Gas, and Sanitary Services	0	0	$0	$0
Wholesale Trade	0	0	$0	$0
Retail Trade	10	1,286	$134,278,422	$600
Finance, Insurance, and Real Estate	2	110	$5,522,009	$0
Services	9	1,268	$129,102,861	$109,200
Public Administration	3	180	$0	$0
Totals	**24**	**2,844**	**$268,903,292**	**$109,800**
All Businesses				
Sector (by SIC)	**Number of Businesses**	**Number of Employees**	**Total Sales**	**Total Just Value of Properties**
Agriculture, Forestry, and Fishing	40	108	$5,155,437	$2,401,400
Mining	5	12	$2,224,080	$2,700
Construction	163	548	$74,469,687	$12,972,800
Manufacturing	32	132	$30,658,500	$2,018,700
Transportation, Communications, Electric, Gas, and Sanitary Services	101	398	$37,969,843	$9,200,000
Wholesale Trade	53	260	$72,284,240	$5,172,100
Retail Trade	353	3,949	$336,289,171	$47,942,000
Finance, Insurance, and Real Estate	291	1,276	$229,714,758	$44,671,100
Services	1,041	4,490	$372,025,970	$94,713,300
Public Administration	15	319	$0	$217,600
Totals	**2,094**	**11,492**	**$1,160,791,687**	**$219,311,700**

Summary of Businesses within 1/2 mile of the PPBEP Area, All Counties				
Small Businesses (less than 10 employees)				
Sector (by SIC)	**Number of Businesses**	**Number of Employees**	**Total Sales**	**Total Just Value of Properties**
Agriculture, Forestry, and Fishing	340	826	$33,355,080	$26,187,256
Mining	12	40	$7,667,226	$1,092,493
Construction	1441	3495	$361,734,520	$131,058,569
Manufacturing	273	945	$106,020,013	$23,190,711
Transportation, Communications, Electric, Gas, and Sanitary Services	571	1684	$147,780,417	$62,682,726
Wholesale Trade	352	1106	$183,748,821	$28,366,569
Retail Trade	1443	4978	$478,858,435	$190,202,422
Finance, Insurance, and Real Estate	1760	5041	$580,628,191	$219,384,569
Services	9813	24902	$1,491,710,946	$1,668,839,081
Public Administration	40	146	$1,113,606	$22,072,575
Totals	**16,045**	**43,163**	**$3,392,617,256**	**$2,373,076,971**
Medium Businesses (between 10 and 49 employees)				
Sector (by SIC)	**Number of Businesses**	**Number of Employees**	**Total Sales**	**Total Just Value of Properties**
Agriculture, Forestry, and Fishing	8	129	$8,763,051	$50,000
Mining	1	13	$3,453,970	$0
Construction	47	695	$134,079,523	$3,267,525
Manufacturing	47	763	$100,700,264	$1,323,226
Transportation, Communications, Electric, Gas, and Sanitary Services	18	354	$34,171,181	$5,996,469
Wholesale Trade	21	384	$105,319,667	$666,485
Retail Trade	569	8,563	$618,312,137	$95,903,500
Finance, Insurance, and Real Estate	54	1,073	$455,531,001	$26,199,497
Services	407	6,522	$431,917,064	$116,246,621
Public Administration	41	879	$15,412,375	$119,910,800
Totals	**1,213**	**19,375**	**$5,765,774,023**	**$369,564,123**

Summary of Businesses within 1/2 mile of the PPBEP Area, All Counties (Continued)				
Large Businesses (50 or more employees)				
Sector (by SIC)	**Number of Businesses**	**Number of Employees**	**Total Sales**	**Total Just Value of Properties**
Agriculture, Forestry, and Fishing	0	0	$0	$0
Mining	0	0	$0	$0
Construction	4	404	$51,511,557	$0
Manufacturing	7	820	$335,205,992	$1,227,359
Transportation, Communications, Electric, Gas, and Sanitary Services	4	793	$208,900,280	$0
Wholesale Trade	3	320	$118,150,327	$0
Retail Trade	33	3,584	$541,414,777	$10,558,512
Finance, Insurance, and Real Estate	8	541	$78,749,218	$0
Services	70	9,210	$1,331,078,226	$11,111,915
Public Administration	46	6,502	$10,410,562	$55,501,283
Totals	**175**	**22,174**	**$2,675,420,939**	**$78,399,069**
All Businesses				
Sector (by SIC)	**Number of Businesses**	**Number of Employees**	**Total Sales**	**Total Just Value of Properties**
Agriculture, Forestry, and Fishing	348	955	$42,118,131	$26,237,256
Mining	13	53	$11,121,196	$1,092,493
Construction	1,492	4,594	$547,325,600	$134,326,094
Manufacturing	327	2,528	$541,926,269	$25,741,296
Transportation, Communications, Electric, Gas, and Sanitary Services	593	2,831	$390,851,878	$68,679,195
Wholesale Trade	376	1,810	$407,218,815	$29,033,054
Retail Trade	2,045	17,125	$1,638,585,349	$296,664,434
Finance, Insurance, and Real Estate	1,822	6,655	$1,114,908,410	$245,584,066
Services	10,290	40,634	$3,254,706,236	$1,796,197,617
Public Administration	127	7,527	$26,936,543	$197,484,658
Totals	**17,433**	**84,712**	**$7,975,698,428**	**$2,821,040,163**

Appendix C. Results of Market Values of Properties by Residence Type in PPBEP Area

Market Value of Properties by Residence Type in PPBEP Area				
Proximity to Bay	**Housing Category**	**Number of Units**	**Average Market Value**	**Total Market Value**
Bay Front	Vacant	2,388	$242,755	$361,824,155
	Family Home	5,493	$443,647	$2,816,703,794
	Mobile Home	60	$196,463	$10,045,342
	Townhouse	156	$546,962	$104,314,106
	Condo	6,655	$176,012	$1,705,250,670
Bay Front Total		**14,752**	**$321,168**	**$4,998,138,067**
Bay View	Vacant	2,208	$106,266	$140,813,633
	Family Home	7,358	$253,378	$2,030,071,026
	Mobile Home	183	$76,897	$12,038,415
	Townhouse	202	$388,456	$80,284,289
	Condo	3,407	$185,797	$851,761,649
Bay View Total		**13,358**	**$202,159**	**$3,114,969,012**
Partial Bay View	Vacant	2,958	$95,527	$140,823,321
	Family Home	14,297	$198,759	$3,129,168,113
	Mobile Home	635	$67,204	$40,422,312
	Townhouse	365	$663,653	$136,955,786
	Condo	2,742	$221,703	$892,296,947
Partial Bay View Total		**20,997**	**$249,369**	**$4,339,666,479**
No Bay View	Vacant	3,701	$67,951	$117,979,290
	Family Home	21,527	$170,622	$4,211,651,951
	Mobile Home	1,267	$52,723	$71,269,585
	Townhouse	527	$511,994	$253,897,601
	Condo	917	$273,650	$248,247,963
No Bay View Total		**27,939**	**$215,388**	**$4,903,046,390**
Grand Total		**77,046**	**$247,021**	**$17,355,819,948**