Navarre, 2004. (Florida Memory)

E
APPENDIX

THE POTENTIAL ECONOMIC CONSEQUENCES OF FLOODING ON FLORIDA'S HISTORIC COMMUNITIES

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INTRODUCTION

State hazard plans demonstrate different levels of commitment in the manner in which they link historic resources and their preservation to mitigation plans. Compared to other hazards, like wildfires and tornadoes, planners have access to much more information on the degree to which historic resources are exposed to floods. With this in mind, the National Park Service's (NPS's) Certified Local Governments (CLG) program and the National Trust for Historic Preservation's Main Street program promote community resilience. Moreover, the State of Florida is a national leader in disaster planning and, in addition, has a particularly strong CLG program.

Interestingly, about a quarter of the properties on Florida's National Register (NR) sit within the 100-year flood plain and may therefore be vulnerable to flooding. Listings of historic properties (national, state, and local) associated with businesses tend to be buildings or districts of buildings. Most important to the aims of this study, districts associated with businesses typically include the downtown areas, often the focus of tourism and small-scale, retail-oriented economic development efforts. This high number of historic commercial sites in floodplains is a cause for concern by local landowners and local governments that we explore more thoroughly as "Main Street Program" economic impacts to the state.

There is a consensus in the empirical literature that local historic districts generate price premia for properties within their boundaries.[1] The magnitude of the premia naturally varies with the restrictiveness and degree of enforcement of local ordinances.[2] If historic buildings within a historic district are compromised—for example, through premature demolition following a flood event—both the property owner and community lose a key asset. History, cultural heritage, and architectural value are lost, never to be recovered. Old places matter! [3]

But more than just property price premia, historic resources bestow numerous other benefits to communities. They contribute to economic development through building preservation, heritage tourism, and business activity on main streets and along commercial corridors.[4] Indeed, historic preservation is a natural policy for urban revitalization, particularly in aging central-city neighborhoods. Its historic aspect has near universal appeal a characteristic that new construction in declining neighborhoods lacks. They also provide a sense of place by helping to further educate local citizens of their area's heritage.[5]

In 2015, of the 454 National Register listings in Florida's floodplains, nearly half (49.8%) was located in CLG communities.[6] This suggest that a substantial number of communities that pride themselves on their historic character are at risk of losing historic resources if they do not properly prepare themselves to deal with floods. A somewhat more- optimistic view is that many historic resources at risk from flooding are in communities that are experienced in protecting historic sites from development pressures; thus, they likely also have the capacity to enable mitigation measures that can enhance the resilience of properties to floods.

It is with the above in mind that the State of Florida decided, as part of a larger study on local disaster risk assessment, to address the economic impact of flooding events on its historic communities. A core part of any such effort must include an assessment of the economy that is at risk. Given the above, this portion of the report examines the magnitude of heritage tourism's economic contribution of to the State of Florida. It reviews the contribution for the year 2019, the last year prior to the COVID-19 pandemic. This is followed by the economic contribution of investments made through Florida's Main Street Program, including long-term retail jobs that the program attributes to those investments. These two components, Florida's heritage tourism and its Main Street program are two tangible and readily measured aspects of the state's historic preservation efforts. Indeed, the total economic contribution of heritage tourism is ultimately the best single economic measure of federal, state, and local efforts in this regard.

Note, given the focus of this report is on the flooding's effect on businesses, it does not cover property values. This is because there few commercial and mixed-use properties in many of the sample of communities covered in this report; moreover, they sell far less frequently than do residential properties. Thus, statistically viable measurement of changes (pre- to post-flood) in the values of commercial, industrial, and mixed-use properties would be rather difficult, give the large span of time covered herein.

Prior reports on the economics of historic preservation activities in the State of Florida also roughly estimated the amount of annual rehabilitation construction in historic districts. Data on the value of permits issued by place as reported by the U.S. Census were key to these analyses. Unfortunately, the latest readily data on permits for residential alterations and remodeling are from 1994. Those for the value of alterations to commercial and industrial structures have been unavailable for even a longer period. Moreover, the prior analyses asked communities the state to remit the value of alterations and remodeling permits issued to properties for a sample of communities. Ultimately, due to the lack of viable basic data on permit values, this effort was not undertaken for the present study.

Nonetheless, following this broad, statewide perspective, the report homes in on the impact of floods for a selected set of 16 historic Florida communities. The communities are dispersed geographically across the state and vary substantially in size, from Everglades City to Daytona Beach. Moreover, some, like St. Augustine, flood frequently; others, like Hyde Park and LaBelle, had few, if any, flood events during the study timeframe. To examine the economic impact of floods on these communities, we examine several measures. One is analyzed at the community level—Airbnb rentals. These data are uniquely available to and, hence, analyzed by a study team in the Economic Impact Analysis Program of the Food and Resource Economics Department at the University of Florida in Gainesville. The other measures—gross sales, taxable sales, sales tax revenues, and tourism jobs—are county-level analyses.

INTRODUCTION ENDNOTES

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SUMMARY OF FINDINGS

HERITAGE TOURISM

Table S1 displays the direct expenditures by all heritage travelers, relative to the total spending for all Florida travel. Total Florida traveler spending in 2019 was about $52.5 billion. Of that, nearly $3.0 billion (about 5.6 percent) is attributed to heritage tourism.

TABLE S1. FLORIDA TRAVELER SPENDING, 2019

	TOTAL TRAVELER SPENDING (MILLIONS)	TOTAL HERITAGE TRAVEL SPENDING (MILLIONS)	HERITAGE TRAVEL SPENDING (%)
Day Trip	$2,116	$57	2.7%
Overnight	$50,371	$2,901	5.8%
Day and Overnight	$52,487	$2,958	5.6%

Source: TravelTrak Survey and Visit Florida data as analyzed by Rutgers Economic Service (R/ECONtm).

Compared to non-heritage travelers, heritage travelers were more likely to be under 55 years of age, ethnic or racial minorities, and more educated. They were slightly more likely to be Floridians as opposed to tourists from outside of the state and to have earn more household income. Heritage travelers generally spent in patterns like other tourists in Florida but spent a bit less on lodging and dining, despite slightly longer stays.

The R/ECON™ I–O Model for the State of Florida was applied to the spending in Table S1 translated the nearly $3 billion in direct spending by Florida heritage travelers into total economic benefits shown in Table S2 below. It contributes over 51 thousand jobs, nearly $1.9 billion in household income, and over $3 billion in net wealth (GDP) to the state. It adds even more when the whole nation's economy is counted.

TABLE S2. TOTAL ECONOMIC IMPACTS OF FLORIDA

	FLORIDA	OUTSIDE FLORIDA	TOTAL (U.S.)
Jobs*	51,440	15,004	66,444
Income ($000)	$1,914,336	$905,554	$2,819,889
GDP ($000)	$3,041,305	$1,443,334	$4,484,638

Source: TravelTrak Survey and Visit Florida data as analyzed by Rutgers Economic Service (R/ECONtm).

**Note: Person-year, full-time or full-time equivalent*

FLORIDA'S MAIN STREET PROGRAM (FMSP)

The FMSP started just five years after the National Main Street Program in communities like DeLand in 1985 and Fort Pierce in 1988. Since then, it has provided technical assistance to more than 80 Florida communities. At the present, the FMSP encompasses 39 accredited communities and 8 apprentice communities.

Since its inception, the FMSP has enabled total private investment of $1.6 billion and total of public investment of $2.9 billion—a cumulative total investment of $4.5 billion (see Table S3). Moreover, it has also enabled 7,575 new businesses and 27,479 jobs.

TABLE S3: CUMULATIVE STATISTICS FROM THE FLORIDA MAIN STREET PROGRAM THROUGH MARCH 2022 (MILLION $, NOMINAL)

COMPONENT	1985-2022
Net Businesses	7,575
Net Gain in Jobs Created	27,479
Private Investment	$1,617
Public Investment	$2,881
Total Investment	$4,499

Source: Florida Division of Historical Resources, 2022.

Table S4 summarizes the effects of the annual average Florida Main Street investments for the state of Florida. On average, it annually program creates about 1,888 jobs (71 percent of the total jobs generated nationally), $90.4 million in labor income (65 percent of the income generated nationally), and $144 million in wealth (65 percent of the wealth added to national GDP). Such economic leakage is typical for construction activity in states like Florida that do not produce much construction material (cf., California, Michigan, and Texas).

TABLE S4. TOTAL ECONOMIC IMPACTS OF FLORIDA MAIN STREET PROGRAM, AVERAGE ANNUAL INVESTMENT, 2017-2021

	FLORIDA	OUTSIDE FLORIDA	TOTAL (U.S.)
Jobs	1,888	781	2,669
Income ($000)	$90,377	$48,552	$138,929
GDP ($000)	$144,835	$78,389	$223,224

Source: Florida Division of Historical Resources as analyzed by Rutgers Economic Service (R/ECON[tm]).

THE ECONOMIC IMPACTS OF FLOODING IN FLORIDA'S HISTORICAL COMMUNITIES

Historically speaking, Florida cities mostly located along its coasts, although some also were founded on the state's inland coastal plain. All of them are exposed to risks from floods and other natural hazards. For detailed analyses, 16 communities were identified (see Table S5) with some sensitivity to geographic and demographic diversity, as well as their exposure to flooding.

TABLE S5. THE COUNTIES AND SHARE OF AREA AT RISK OF FLOODING FOR THE 16 SELECTED HISTORIC COMMUNITIES

COMMUNITY	COUNTY	AREA AT RISK
Apalachicola	Franklin	60.1%
Cedar Key	Levy	95.3%
Daytona Beach	Volusia	51.2%
Everglades City	Collier	99.8%
Fernandina Beach	Nassau	38.1%
Fort Myers	Lee	41.1%
Hyde Park	Hillsborough	18.6%
Key West	Monroe	90.7%
LaBelle	Hendry	11.4%
Lake Worth	Palm Beach	25.4%
Leesburg	Lake	37.7%
Port St. Joe	Gulf	52.4%
St. Augustine	St. Johns	76.9%
St. Pete Beach	Pinellas	99.9%
Stuart	Martin	6.4%
Venice	Sarasota	32.7%

There is a paucity of publicly available data at the community level. This made it difficult to estimate economic impacts of flooding on the 16 selected communities. Because of this only an analysis of Airbnb rental data could be performed at this level of geography. Other related data on retail sales and jobs were also analyzed, but at the county level.

AIRBNBS

While flooding negatively affected Airbnb rentals in Florida's historic communities, the effects were tough to gauge. This is because, until recently, many of the smaller communities had few rental properties. On average the 16 communities lose on the order of 7% of their Airbnb reservation days during the month of a flood. Findings suggests that larger historic communities were more heavily affected. Despite the loss of reservation days, however, losses in Airbnb revenues were not as evident, at least among smaller communities.

SALES ACTIVITY

Business activity in Florida is subject to sales and use tax. Monthly data on gross sales, taxable sales, and sales tax collections by county are available from the Florida Department of Revenue. A series of these data for 2015 through 2021 was analyzed controlling for flood events. During the month of floods, we observe an average drop of 3.6 percent for gross sales, 3.7 percent for taxable sales, and 3.4 percent for sales tax revenues within the counties of the 16 communities. For the month following a flood event two of the measures fall further—taxable sales drop of 1.4 percent more and sales tax revenues drop 2.0 percent more. Gross sales do not; perhaps because exempt organizations in the 16 counties pick up their spending during recovery efforts. Within three months of a flood event, sales tend to fully recover.

TOURISM-RELATED JOBS

Tourism-related job losses from flood events are smaller and more temporary than those for sales. Such jobs tend to fall half as far during the month of the event (1.5 percent versus around 3.5 percent). Moreover, no effects tend to appear after that month with a full recovery in three months. Job losses, no matter how temporary, are experienced more heavily in Leisure and hospitality activities than in retail activities (an average drop of 1.9 percent versus 0.9 percent).

CHAPTER ONE:

PROFILE AND ECONOMIC IMPACTS OF FLORIDA HERITAGE TOURISM

INTRODUCTION

The travel and tourism industry is a major economic driver for the United States. It supports millions of jobs, bolstering local economies and enhancing community amenities. Prior to the COVID-19 pandemic, the travel and tourism industry experienced ten years of continuous growth and accounted for a large share of the gross domestic product (GDP).[7] In 2019, this industry accounted for 2.9 percent of the GDP,[8] generating $2.6 trillion (directly and indirectly) and supporting 16.7 million jobs.[9]

Florida is a national leader in travel and tourism and ranks as the second most-visited state by international travelers.[10] In 2019, Florida received 131.1 million domestic and international visitors,[11] which marked the tenth consecutive year of record-high visitation.[12] While the state's pristine beaches and world-renowned theme parks make it a highly popular tourist destination, Florida receives millions of travelers who are interested in the state's historic sites: defined here as heritage travelers.

Nationwide, heritage travel is a crucial component of the travel and tourism industry; every year, millions of domestic and international tourists participate in cultural activities and visit historic places, structures, and landscapes across the country.[13] The role that historic sites play in promoting leisure travel has been carefully documented in the past: A study by Mandala Research (2013, p. 1), for instance, shows that most domestic leisure visitors (76 percent) opt to engage in "cultural and/or heritage activities while traveling."[14]

Heritage tourism offers significant economic benefits at the local level, while making historic preservation efforts more viable. In addition, strong heritage tourism efforts help improve the quality of life of residents and assist in fostering the "sense of place" that lends communities their unique identity. Ultimately, heritage tourism encourages localities to protect their resources and heritage, share it with visitors, and reap the economic benefits through tourist spending.

Florida captures a considerable share of U.S. heritage travel, as it is home to hundreds of historic attractions, including historical homes, museums, monuments, parks, and villages. A 2017 Visit Florida study found that 11 percent of domestic leisure visitors who traveled to Florida visited a historic site.[15] Considering the popularity of Florida's historical sites, this chapter analyzes the economic impacts of heritage tourism in the state.

The analysis incorporates visitor volume and travel spending estimates for 2019 from two data sources (TravelTrak Survey and Visit Florida) and is divided into three sections: (1) visitor volume and visitor profile, (2) visitor expenditures, and (3) the economic impacts of Florida heritage travel.

HERITAGE VISITOR VOLUME AND VISITOR PROFILE

To assess the magnitude/volume of heritage tourism in Florida, the Rutgers Economic Advisory Service (R/ECON) at Rutgers University analyzed travel information from two sources: Visit Florida and the TravelTrak survey. The former, Florida's official tourism marketing organization, provided information on visitor count and traveler profile– note that the data gleaned from this source did not focus on heritage tourism per se, but was necessary for generating visitor volume and spending estimates. The later, TravelTrak, is a nationwide monthly survey of business and leisure travelers. While this survey focuses on all domestic travelers, not solely heritage travelers, it contained information that was able to be extracted and extrapolated to provide useful data for this heritage tourism analysis.

The TravelTrak survey asked travelers to indicate their trip activities. Subsequently, it asked respondents if the primary or secondary reason for going on the trip was linked to their participation in any of the selected activities. In the current analysis, we identified "heritage travelers" as any Florida business and leisure traveler who cited visiting "a historic site/ church," "an old home/mansion", and/or "Native Americans ruins/rock art" as their primary or secondary reason for their trip to the state.

It is important to note that the approach taken to identify and label heritage travelers likely underestimates the full incidence of heritage tourism in Florida. Aside from the three activities listed above, there are several other forms of participating in heritage tourism that are not specified in the survey— e.g., historical museums, heritage festivals and special events, and military sites. Furthermore, our estimates exclude international heritage travelers, as well as domestic travelers who participated in heritage activities but whose primary and secondary reasons for traveling to Florida were not those activities.

All Florida domestic travelers not identified as heritage travelers (as defined above) are referred to as "non-heritage travelers." In sum, the current analysis focuses on three traveler groups: All travelers (encompassing heritage and non-heritage tourists), heritage travelers only, and non-heritage travelers only. To provide a greater level of detail, each traveler group is broken down into three sub-groups: daytrip visitors, overnight visitors, and all visitors (day and overnight).

In 2019, Florida received a total of 117.2 million domestic visitors. This same year, heritage travel accounted for 5.9 percent of all Florida travel— this translates to roughly 7.0 million heritage visitors (see Table 1.1). Heritage day-trips represented 3.8 percent of all day trips to Florida, while heritage overnight trips amounted to 6.4 percent of all overnight trips. Note that these figures are expressed in terms of person-trips, which is defined a one person on a trip that is 50 miles or more, one-way, away from their residence. Table 1.2 presents visitor volume figures as a function of person-days, meaning that it considers length of stay.

Heritage travel amounted to 6.1 percent of the 553.3 million person-days spent on Florida travel in 2019.

TABLE 1.1. HERITAGE TRAVEL MAGNITUDE (PERSON-TRIPS) IN FLORIDA, 2019

TRAVEL TYPE	ALL DOMESTIC TRAVEL (MILLIONS)	DOMESTIC HERITAGE TRAVEL (MILLIONS)	DOMESTIC HERITAGE TRAVEL (%)
Day Trip (person-trips)	20.3	0.8	3.8%
Overnight (person-trips)	96.9	6.2	6.4%
Total person-trips of travel	117.2	7.0	5.9%

Source: TravelTrak Survey and Visit Florida data as analyzed by Rutgers Economic Service (R/ECON[tm]).

TABLE 1.2. HERITAGE TRAVEL MAGNITUDE (PERSON-DAYS) IN FLORIDA, 2019

TRAVEL TYPE	ALL DOMESTIC TRAVEL (MILLIONS)	DOMESTIC HERITAGE TRAVEL (MILLIONS)	DOMESTIC HERITAGE TRAVEL (%)
Day Trip (person-trips)	20.3	0.8	3.8%
Overnight (person-trips)	533.0	33.2	6.2%
Total person-trips of travel	533.3	34.0	6.1%

Source: TravelTrak Survey and Visit Florida data as analyzed by Rutgers Economic Service (R/ECON[tm]).

To understand the profile of Florida's heritage traveler population, Table 1.3 presents a side-by-side comparison of demographic data and trip characteristics of Florida's heritage and non-heritage travelers; for informational purposes, Table 1.3 also displays the demographic and trip characteristics of all domestic travelers who visited Florida in 2019.

Compared to non-heritage travelers, heritage travelers were more likely to be under 55 years of age and more likely to be members of an ethnic or racial minority. The proportion of married individuals was similar across all groups. Another main difference between the heritage and non-heritage traveler groups pertained to education level and employment status: Heritage travelers tended to have completed more years of formal education, as evidenced by an above-average share of travelers who obtained a post-graduate degree (24.9 percent of heritage travelers versus 19.4 percent of non-heritage travelers). Also, compared to non-heritage travelers, heritage travelers were less likely to be retired (11.2 percent of heritage travelers versus 20.5 percent of non-heritage travelers).

TABLE 1.3. FLORIDA TRAVELER PROFILE, 2019

		All Travelers	Heritage Travelers	Non-heritage Travelers
Age				
	55 years and over	32.4%	25.4%	32.8%
Race				
	White	85.7%	77.8%	86.2%
Marital Status				
	Married	65.8%	64.4%	65.8%
Education Level				
	Bachelor's degree	33.0%	33.0%	33.1%
	Post graduate degree	19.7%	24.9%	19.4%
Employment Status				
	Full-time	52.8%	65.3%	52.0%
	Retired	20.0%	11.2%	20.5%
Household Income				
	$60,000 and above	65.9%	66.9%	65.9%
Origin State				
	Florida	40.1%	47.0%	39.6%
Visit Type				
	Day visit	17.3%	11.1%	17.7%
	Overnight visit	82.7%	88.9%	82.3%
Days spent in Florida				
	Average trip duration (days)	4.68	4.87	4.67
Accommodation Type *				
	Hotel/B&B	66.0%	97.2%	63.9%
	Shared Economy Property (e.g., AirBnB)	7.4%	19.4%	6.6%
	Private home	26.6%	26.3%	26.7%
Spending**				
	Average per day expenditure (per person)	$85.54	$75.25	$86.14

Source: TravelTrak Survey data as analyzed by Rutgers Economic Advisory Service (R/ECON™).

*Notes: *Stayed at least one night*

***Includes day and overnight travelers, and excludes spending on transportation to/from FL).*

The results displayed on Table 1.3 also suggest that a greater proportion of heritage travelers than non-heritage travelers earned incomes of or above $60,000 (66.9 percent of heritage travelers versus 65.9 percent of non-heritage travelers). Furthermore, heritage travelers were more likely to be Florida residents than non-heritage travelers.

In terms of differences in trip characteristics, the results on Table 1.3 suggest that a greater proportion of heritage visitors than non-heritage visitors opted to stay overnight (88.9 percent of heritage travelers versus 82.3 percent of non-heritage travelers). Moreover, the average trip duration of heritage travelers is slightly longer than the duration of non-heritage travelers (4.87 days versus 4.67 days). The vast majority of heritage travelers spent at least one night of their trip in a hotel or B&B (97.2 percent), compared to only 63.9 percent of non-heritage travelers. While favoring traditional lodging options (i.e., hotel and B&B), heritage travelers tended to spend less per day on average than their non-heritage counterparts ($75.25 versus $86.14).

VISITOR EXPENDITURE ANALYSIS

To further evaluate spending patterns of heritage travelers, Tables 1.4 through 1.11 break down the per-person, per-day expenditures by top spending categories: Lodging, transportation, dining, groceries, entertainment, amenities, retail/gifts, and casinos.

TABLE 1.4. AVERAGE PER-PERSON, PER-DAY EXPENDITURES: LODGING - FLORIDA TRAVELERS, 2019

	All Travelers	Heritage Travelers	Non-heritage Travelers
Day trip	N/A	N/A	N/A
Overnight	$29.96	$17.51	$30.85
Day & Overnight	$24.78	$15.56	$25.39

TABLE 1.5. AVERAGE PER PERSON, PER DAY EXPENDITURES: TRANSPORTATION (DURING TRIP)- FLORIDA TRAVELERS, 2019

	All Travelers	Heritage Travelers	Non-heritage Travelers
Day trip	$21.35	$15.17	$21.49
Overnight	$8.12	$10.14	$7.93
Day & Overnight	$10.41	$10.69	$10.33

TABLE 1.6. AVERAGE PER PERSON, PER DAY EXPENDITURES: DINING (FOOD/BEVERAGES)- FLORIDA TRAVELERS, 2019

	All Travelers	Heritage Travelers	Non-heritage Travelers
Day trip	$19.20	$14.73	$19.36
Overnight	$16.77	$13.47	$17.03
Day & Overnight	$17.19	$13.61	$17.44

TABLE 1.7. AVERAGE PER PERSON, PER DAY EXPENDITURES: GROCERIES- FLORIDA TRAVELERS, 2019

	All Travelers	Heritage Travelers	Non-heritage Travelers
Day trip	$7.93	$6.18	$7.98
Overnight	$4.05	$4.82	$3.98
Day & Overnight	$4.72	$4.97	$4.69

TABLE 1.8. AVERAGE PER PERSON, PER DAY EXPENDITURES: ENTERTAINMENT (EXCLUDING CASINOS)- FLORIDA TRAVELERS, 2019

	All Travelers	Heritage Travelers	Non-heritage Travelers
Day trip	$13.05	$10.07	$13.16
Overnight	$12.96	$12.49	$13.06
Day & Overnight	$12.98	$12.22	$13.08

TABLE 1.9. AVERAGE PER PERSON, PER DAY EXPENDITURES: AMENITIES (E.G., SPAS, GYMS, GOLF)- FLORIDA TRAVELERS, 2019

	All Travelers	Heritage Travelers	Non-heritage Travelers
Day trip	$3.57	$0.94	$3.69
Overnight	$2.18	$4.15	$2.01
Day & Overnight	$2.42	$3.80	$2.31

TABLE 1.10. AVERAGE PER-PERSON, PER DAY EXPENDITURES: RETAIL/GIFTS- FLORIDA TRAVELERS, 2019

	All Travelers	Heritage Travelers	Non-heritage Travelers
Day trip	$13.68	$9.98	$13.84
Overnight	$7.68	$7.50	$7.65
Day & Overnight	$8.72	$7.78	$8.75

TABLE 1.11. AVERAGE PER PERSON, PER DAY EXPENDITURES: CASINOS/GAMING- FLORIDA TRAVELERS, 2019

	All Travelers	Heritage Travelers	Non-heritage Travelers
Day trip	$5.07	$1.08	$5.26
Overnight	$1.41	$3.73	$1.22
Day & Overnight	$2.05	$3.43	$1.93

Source: TravelTrak Survey data as analyzed by Rutgers Economic Advisory Service (R/ECON™).

The results presented in Tables 1.4 through 1.11 indicate that day and overnight heritage travelers spent more than non-heritage travels, per-day, in the following areas: transportation (during trip), groceries, amenities, and casinos; none of these differences in spending, however, are remarkable. At the same time, a lower lodging outlay is particularly pronounced from heritage overnight travelers ($17.51) versus the same outlay by their non-heritage counterparts ($30.85); thus, despite staying at hotels and B&Bs at greater proportions, heritage travelers spent notably less than non-heritage travelers in accommodation. This could, in part, be due to the average party size of heritage tourist compared to other tourist in Florida (an average of 3.09 versus 2.85 people per travel party), which spreads lodging costs across a broader swath when examined per capita. It also undoubtedly arises also because lodging costs tend to be higher in many of Florida's prime visitation centers, e.g., Orlando, greater Tampa Bay, and other places with beachfront property that are not so historical. Of course, less-expensive online lodging venues, like Airbnb and VRBO that are new options for out-of-state visitors to smaller communities could also be playing a role. Another remarkable spending difference pertains to dining (food and beverages), as heritage travelers spent almost 25 percent less in this category than non-heritage visitors ($13.61 versus $17.44). Spending in all other categories was similar for both groups, only reflecting differences amounting to less than 2 dollars. Considering the spending patterns by category examined above, we find that lodging and dining spending explain the daily expenditure differences presented in Table 1.3 ($75.25 for heritage travelers versus $86.14 for non-heritage travelers).

Overall, non-heritage visitors tend to outspend heritage visitors regardless of the type of trip (i.e., day or overnight). As shown in the table below, Table 1.12, the difference in spending between heritage and non-heritage groups is notably higher for day-trippers than overnight visitors: day trip heritage travelers spent an average of $64.63, compared to $90.21 averaged by non-heritage visitors. It is also worth noting that heritage overnight visitors outspent heritage day-trippers by about $12 per day on average ($76.62 overnight visitors vs. $64.34 day-trippers). The opposite phenomenon is observed for non-heritage travelers, meaning that day-trippers spent more than overnight non-heritage travelers.

TABLE 1.12. AVERAGE PER-PERSON PER-DAY TRAVELER SPENDING, FLORIDA, 2019

	ALL TRAVELERS	HERITAGE TRAVELERS	NON-HERITAGE TRAVELERS
Day trip	$89.33	$64.34	$90.21
Overnight	$84.75	$76.62	$85.26
Day & Overnight	$85.54	$75.25	$86.14

Source: TravelTrak Survey data as analyzed by Rutgers Economic Advisory Service (R/ECON™).

Table 1.13 displays the direct expenditures by all heritage travelers, relative to the total spending for all Florida travel. Using the TravelTrak survey data, we estimate that total Florida traveler spending in 2019 amounted to approximately $52,487 million. At the same time, the sum total of all outlays by heritage travelers amounted to $2,958 million. Note that direct expenditures for all groups includes 50 percent of the amount spent in transportation to/from the travel destination.

It is important to highlight that while heritage travelers represented 5.9 percent of all Florida visitors (see Table 1.1), their spending accounted for 5.6 percent of all travel expenditures. This small discrepancy results from the aforementioned lower-than-average daily spending by heritage travelers.

TABLE 1.13. FLORIDA TRAVELER SPENDING*, 2019

	TOTAL TRAVELER SPENDING (MILLIONS)	TOTAL HERITAGE TRAVEL SPENDING (MILLIONS)	HERITAGE TRAVEL SPENDING (%)
Day trip	$2,116	$57	2.7%
Overnight	$50,371	$2,901	5.8%
Day & Overnight	$52,487	$2,958	5.6%

Source: TravelTrak Survey and Visit Florida data as analyzed by Rutgers Economic Advisory Service (R/ECON™).

*Note: *Includes 50% of spending on transportation to/from FL destination*

Having estimated the total expenditures by heritage travelers in 2019 ($2,958 million), Table 1.14 displays the distribution of heritage travel spending across categories. Noticeably, lodging ($582 million) accounted for 19.7 percent of direct heritage travel spending, and food/beverage/dining ($448 million) accounted for 15.5 percent. Other areas capturing high spending shares include entertainment (14.3 percent), transportation to/from travel destination (12.2 percent), and transportation costs during trip (11.8 percent).

TABLE 1. 14. DISTRIBUTION OF HERITAGE TRAVEL SPENDING, FLORIDA, 2019

	AMOUNT ($ MILLIONS)			SHARE (%)		
Spending category	Day & Overnight	Day trip	Overnight	Day & Overnight	Day trip	Overnight
Lodging	$582.0	$0.0	$582.0	19.7%	0.0%	20.1%
Transportation (during trip)	$348.7	$11.7	$337.0	11.8%	20.5%	11.6%
Food/Beverage/ Dining	$459.1	$11.4	$447.7	15.5%	19.9%	15.4%
Groceries	$165.1	$4.8	$160.4	5.6%	8.3%	5.5%
Entertainment (excluding casinos)	$423.0	$7.8	$415.2	14.3%	13.6%	14.3%
Amenities	$138.9	$0.7	$138.1	4.7%	1.3%	4.8%
Retail/gifts	$257.2	$7.7	$249.5	8.7%	13.5%	8.6%
Casinos/Gaming	$124.6	$0.8	$123.8	4.2%	1.5%	4.3%
Transportation* (to/from destination)	$361.4	$7.5	$353.9	12.2%	13.2%	12.2%
Other	$98.2	$4.8	$93.4	3.3%	8.4%	3.2%
Total	$2,958	$57	$2,901	100%	100%	100%

Source: TravelTrak Survey and Visit Florida data as analyzed by Rutgers Economic Service (R/ECON™).

*Note: *Only accounts for 50% of spending on transportation to/from a Florida destination*

R/ECON™ INPUT-OUTPUT MODEL

We use the R/ECON™ Input-Output (I-O) Model developed at the Bloustein School to measure the economic and fiscal impacts of infrastructure investments, business operations, and other economic events. The highly detailed model comprises 409 industries and measures the effect of changes in expenditures on economic activity across a specified economy. In this report we examine the impact of expenditures in the State of Florida on labor, materials, professional services, and other inputs that support heritage tourism and Main Street investments. The tourism spending and Main Street investments are termed the direct economic effect. But they both are enhanced by the income of workers and the improved revenue for businesses. This spending generates a first round of the subsequent indirect effects, as those workers and businesses, in turn, spend those dollars on other things—consumer goods, business investment expenditures, which, in turn, become income for other workers and businesses. This income gets further spent, and so on. When separated from other indirect effects, the indirect expenditures of households are termed induced effects.

We also report the economic impacts to the nation as well as to Florida. The differences between the national and state impacts arise because Florida's industries are unable to supply all goods and services demanded by the activities that emanate within the state. For example, wheat use to produce bread in Florida likely comes from Kansas, North Dakota, or Texas. Cheese could come from Wisconsin, while wine likely derives from California, Washington State, or New York. Hardwoods for construction likely come from Tennessee, Kentucky, North Carolina, Virginia, or Pennsylvania. Meanwhile, specialized financial and legal services as well as real estate development is often provided by firms from as far away as New York City, Los Angeles, or Chicago. Moreover, even those industries in which Florida has a substantial presence typically compete with out-of-state firms. Citrus fruits are also produced in Texas and California, for example. These goods and specialized services themselves have supply chains that extend far and wide across the United States and beyond. This is the sort of activity that activities in Florida generate nationwide.

The R/ECON™ I-O model estimates the indirect (or multiplier) effects of the economic activity that occurs following the initial set of expenditures (the direct effects), both of which the model translates into jobs, labor income, and gross domestic product. The model also estimates the tax revenues (federal, state, and local) generated by the combined direct and indirect economic activity caused by the initial spending. These various measures are described below. A detailed description of input-output modeling with a focus on R/ECON I-O is provided in Appendix A.

JOBS OR EMPLOYMENT

A job-year is equivalent to one job lasting one year. Contrary to this abstract concept, the direct and indirect employment effects generated by the expenditures tend to occur as the funded are spent and last about as long as a project or operation is active. Jobs are generated across a wide range of sectors, starting from the initial direct expenditures supporting jobs and business revenues in the construction, engineering, management, manufacturing, and wholesale sectors, and then the "ripples" of the initial disturbance spread over the broader economy, generating indirect employment in other industries such as retail, transportation, services, etc.

VALUE ADDED OR GROSS DOMESTIC PRODUCT (GDP)

This is the total wealth added to the economy through all of the newly produced final goods and services. It can be broken down into three main components, including labor compensation, taxes, and profits, dividends, rents and interest (property-type income). It is measured and reported annually for each state by the U.S. Bureau of Economic Analysis.[16]

INCOME OR COMPENSATION

Labor compensation represents the total wages, salaries, and wage supplements (i.e., employer contributions to government and private pension funds) paid for jobs generated in the State of Florida.

STATE TAXES AND FEES

State taxes generated by heritage tourism or Main Street investments include the sales tax, state business taxes, various excise taxes, and other state levies and fees. There is no personal income tax in Florida.

LOCAL TAXES AND FEES

The estimated local tax revenues mainly represent property tax revenues that accrue, over time, as a result of heritage tourism or Main Street investments that enables the remodeling of existing structures or the purchase and construction of new buildings afforded by the personal and business incomes generated both directly and indirectly via the spending.

ECONOMIC IMPACTS OF FLORIDA HERITAGE TRAVEL

The following section applies the R/ECON™ I–O Model to translate the direct spending by Florida heritage travelers ($2,958 million) into total economic benefits that encompass direct, indirect, and induced effects. (Full details on the R/ECON™ I–O economic model are found at Appendix A). Tables 1.15 and 1.16 display a summary of the results.

TABLE 1.15. TOTAL ECONOMIC IMPACTS OF FLORIDA HERITAGE TOURISM SPENDING, 2019

	FLORIDA	OUTSIDE FLORIDA	TOTAL (U.S.)
Jobs*	51,440	15,004	66,444
Income ($000)	$1,914,336	$905,554	$2,819,889
GDP ($000)	$3,041,305	$1,443,334	$4,484,638

Source: TravelTrak Survey and Visit Florida data as analyzed by Rutgers Economic Advisory Service (R/ECON™).

*Note: *Person-year, full-time or full-time equivalent.*

TABLE 1.16. TOTAL TAX CONTRIBUTION OF FLORIDA HERITAGE TOURISM SPENDING, 2019

	FLORIDA	OUTSIDE FLORIDA	TOTAL (U.S.)
Total Taxes ($000)	$516,561	$216,204	$732,765
Federal ($000)	$104,525	$30,038	$134,564
State ($000)	$122,752	$86,983	$209,736
Local ($000)	$289,283	$99,182	$388,466

Source: TravelTrak Survey and Visit Florida data as analyzed by Rutgers Economic Advisory Service (R/ECON™).

NATIONWIDE IMPACTS

The results displayed in Table 1. 15 indicate that the $2,958 million spent by heritage travelers in Florida generated 66,444 jobs nationwide, as well as $2,819.9 million in income and $4,484.6 million in GDP. Appendix Table B.1 (see end of chapter) presents the details of the national economic impacts, showing that indirect and induced effects contributed 32,804 out of the 66,444 total jobs; indirect and induced effects also added $1,804 million to total income, and $2,950 million to total GDP. In terms of tax contribution, Table 1.16 shows that the $2,958 million in direct spending from heritage travel in Florida generated a total of $732.8

million in taxes (federal, state, and local) from business and households.

A finer breakdown of national economic impacts by industry (see Appendix Table B.1, Section I) indicates that out of the total 66,444 jobs generated nationwide by Florida heritage tourism, more than a quarter (28.1 percent) are in the "arts, entertainment, recreation, and hospitality" industries (18,661 jobs). Other industries in which a high number of jobs were generates include: "transportation and warehousing" (13,546 jobs), "retail trade" (7,097 jobs), and "professional and business services" (6,670 jobs).

Of the total $2,819.9 million in labor income generated from heritage travel spending, the "arts, entertainment, recreation, and hospitality" industries contributed the greatest portion ($647.7 million), followed by "professional and business services" ($431.3 million). The average income per job amounts to $42,440; however, average income figures differ drastically by industry. For instance, the average contribution per job in the "arts, entertainment, recreation, and hospitality" industries ($34,711) and "retail trade" ($33,948) are comparatively below the average. These two industries are characterized for paying low wages and are composed of high proportions of part-time jobs.

Due to the tourism industry's reliance in retail trade and hospitality services, the national average labor income per direct job is substantially lower than for indirect and induced jobs (see Appendix Table B.1, Section II). Specifically, induced and indirectly created jobs that paid on average $53,087 and $58,119, respectively. At the same time, jobs created directly paid on average $30,210. Thus, this dichotomy suggests that low-paying jobs indirectly create high-paying jobs. As mentioned above, some of the pay gap between direct and indirect/induced jobs is due to the part-time nature of the direct jobs created in the retail trade and the accommodation/food service industries.

STATE-LEVEL IMPACTS

The results displayed in Table 1.15 indicate that the total economic impacts of heritage tourism at the state level include 51,440 jobs, $1,914.3 million in income, and $3,041.3 million in state GDP. In addition, Table 1.16 shows that the $2,958 million in direct spending from heritage travel in Florida generated a total of $412.0 million in state and local taxes ($122.7 and $289.3 million, respectively), for an aggregate 69 percent of the total $589.2 million in state and local taxes generated nationally.

Appendix Table B.2 presents the total in-state economic effects of heritage tourism spending in greater detail. This shows that Florida retained 98 percent of the total (i.e., nationwide) direct jobs created in support of heritage tourism (32,803 out of 33,640 direct jobs). At the same time, Florida retained a lower proportion of the total indirect and induced heritage tourism employment impacts: approximately 76 percent of indirect jobs (9,405 out of 12,351 indirect jobs) and only 45 percent of induced jobs (9,232 out of 20,453 induced jobs). Recall that indirect and induced effects are those multiplier effects estimated via the R/ECON I-O model for the State of Florida, with induced effects being the share that derives from the spending of labor income paid to households by firms receiving the indirect effects.

The analysis of in-state economic impacts by industry (see Appendix Table B.2, Section I) reflects concentrations and patterns analogous to those noted at the national level. Of the 51,440 total state-level jobs derived from heritage tourism, most are to be found in the "arts, entertainment, recreation, and hospitality" industries (16,982 jobs), followed by the "transportation and warehousing" industries (12,550 jobs). Also, as observed at the national level, the jobs generated directly from heritage travel spending paid relatively low wages: these jobs paid on average $29,931. In comparison, in-state induced and indirectly created jobs paid on average $47,327 and $52,694, respectively.

CHAPTER ONE ENDNOTES

7 U.S. Travel Association (2022). "U.S. Travel Answer Sheet". Retrieved from: https://www.ustravel.org/sites/default/files/2022-04/research_2022_national_ei_data_eim.pdf

8 U.S. Bureau of Economic Analysis (2022). "U.S. Travel and Tourism Satellite Account for 1999–2020". Retrieved from: https://apps.bea.gov/scb/2022/02-february/pdf/0222-travel-tourism-satellite-account.pdf

9 Though the impact of the COVID-19 pandemic on tourism exceeds the scope of the current analysis, it is important to highlight that the travel and tourism sector's contribution to the national economy contracted at record rates in 2020 (see footnote 8).

10 ShareAmerica (2019). "Top 3 U.S. States International Tourists Visit". Retrieved from: https://share.america.gov/top-3-u-s-states-international-tourists-visit/

11 Visit Florida (2022). "Florida Visitor Estimates". Retrieved from: https://www.visitflorida.org/resources/research/

12 See footnote 10.

13 Advisory Council on Historic Preservation (2022). "Heritage Tourism". Retrieved from: https://www.achp.gov/heritage_tourism

14 Mandala Research, LLC (2013). "The 2013 Cultural & Heritage Traveler Study". Retrieved from: https://mandalaresearch.com/downloads/2013-cultural-heritage-traveler-report/

15 Visit Florida (2019). "Profile of Domestic Leisure Visitors to Florida, 2017". Retrieved from: https://www.visitflorida.org/media/67569/profile-of-domestic-leisure-visitors_2017-complete-section.pdf

16 The broadly defined services sector includes professional and business services (e.g., engineering, architecture, accounting, legal services, etc.), education and health services, leisure and hospitality services, the information sector, and other service industries.

APPENDIX A: INPUT-OUTPUT ANALYSIS AND THE R/ECON™ MODEL

This appendix discusses the history and application of input-output analysis and details the input-output model, called the R/ECON™ I-O model, developed by Rutgers University. This model offers significant advantages in detailing the total economic effects of an activity (such as historic rehabilitation and heritage tourism), including multiplier effects.

ESTIMATING MULTIPLIERS

The fundamental issue determining the size of the multiplier effect is the "openness" of regional economies. Regions that are more "open" are those that import their required inputs from other regions. Imports can be thought of as substitutes for local production. Thus, the more a region depends on imported goods and services instead of its own production, the more economic activity leaks away from the local economy. Businessmen noted this phenomenon and formed local chambers of commerce with the explicit goal of stopping such leakage by instituting a "buy local" policy among their membership. In addition, during the 1970s, as an import invasion was under way, businessmen and union leaders announced a "buy American" policy in the hope of regaining ground lost to international economic competition. Therefore, one of the main goals of regional economic multiplier research has been to discover better ways to estimate the leakage of purchases out of a region or, relatedly, to determine the region's level of self-sufficiency.

The earliest attempts to systematize the procedure for estimating multiplier effects used the economic base model, still in use in many econometric models today. This approach assumes that all economic activities in a region can be divided into two categories: "basic" activities that produce exclusively for export, and region-serving or "local" activities that produce strictly for internal regional consumption. Since this approach is simpler but similar to the approach used by regional input-output analysis, let us explain briefly how multiplier effects are estimated using the economic base approach.

If we let x be export employment, l be local employment, and t be total employment, then

$$t = x + l$$

For simplification, we create the ratio a as

$$a = l/t$$

so that

$$l = at$$

then substituting into the first equation, we obtain

$$t = x + at$$

By bringing all of the terms with t to one side of the equation, we get

$$t - at = x \text{ or } t\,(1-a) = x$$

Solving for t, we get

$$t = x/(1-a)$$

Thus, if we know the amount of export-oriented employment, x, and the ratio of local to total employment, a, we can readily calculate total employment by applying the economic base multiplier, 1/(1-a), which is embedded in the above formula. Thus, if 40 percent of all regional employment is used to produce exports, the regional multiplier would be 2.5. The assumption behind this multiplier is that all remaining regional employment is required to support the export employment. Thus, the 2.5 can be decomposed into two parts the direct effect of the exports, which is always 1.0, and the indirect and induced effects, which is the remainder—in this case 1.5. Hence, the multiplier can be read as telling us that for each export-oriented job another 1.5 jobs are needed to support it.

This notion of the multiplier has been extended so that x is understood to represent an economic change demanded by an organization or institution outside of an economy—so-called final demand. Such changes can be those effected by government, households, or even by an outside firm. Changes in the economy can therefore be calculated by a minor alteration in the multiplier formula:

$$\Delta t = \Delta x/(1-a)$$

The high level of industry aggregation and the rigidity of the economic assumptions that permit the application of the economic base multiplier have caused this approach to be subject to extensive criticism. Most of the discussion has focused on the estimation of the parameter a. Estimating this parameter requires that one be able to distinguish those parts of the economy that produce for local consumption from those that do not. Indeed, virtually all industries, even services, sell to customers both inside and outside the region. As a result, regional economists devised an approach by which to measure the degree to which each industry is involved in the nonbase activities of the region, better known as the industry's regional purchase coefficient (r). Thus, they expanded the above formulations by calculating for each i industry

$$l_i = r_i d_i$$

and

$$x_i = t_i - r\, i d_i$$

given that di is the total regional demand for industry i's product. Given the above formulae and data on regional demands by industry, one can calculate an accurate traditional aggregate economic base parameter by the following:

$$a = l/t = Sl_i/St_i$$

Although accurate, this approach only facilitates the calculation of an aggregate multiplier for the entire region. That is, we cannot determine from this approach what the effects are on the various sectors of an economy. This is despite the fact that one must painstakingly calculate the regional demand as well as the degree to which each industry is involved in non-base activity in the region.

As a result, a different approach to multiplier estimation that takes advantage of detailed demand and trade data was developed. This approach is called input-output analysis.

REGIONAL INPUT-OUTPUT ANALYSIS: A BRIEF HISTORY

The basic framework for input-output analysis originated nearly 250 years ago when François Quesenay published Tableau Economique in 1758. Quesenay's "tableau" graphically and numerically portrayed the relationships between sales and purchases of the various industries of an economy. More than a century later, his description was adapted by Leon Walras, who advanced input-output modeling by providing a concise theoretical formulation of an economic system (including consumer purchases and the economic representation of "technology").

It was not until the twentieth century, however, that economists advanced and tested Walras's work. Wassily Leontief greatly simplified Walras's theoretical formu¬lation by applying the Nobel prize–winning assumptions that both technology and trading patterns were fixed over time. These two assumptions meant that the pattern of flows among industries in an area could be considered stable. These assumptions permitted Walras's formulation to use data from a single time period, which generated a great reduction in data requirements.

Although Leontief won the Nobel Prize in 1973, he first used his approach in 1936 when he developed a model of the 1919 and 1929 U.S. economies to estimate the effects of the end of World War I on national employment. Recognition of his work in terms of its wider acceptance and use meant development of a standardized procedure for compiling the requisite data (today's national economic census of industries) and enhanced capability for calculations (i.e., the computer).

The federal government immediately recognized the importance of Leontief's development and has been publishing input-output tables of the U.S. economy since 1939. The most recently published tables are those for 2007. Other nations followed suit. Indeed, the United Nations maintains a bank of tables from most member nations with a uniform accounting scheme.

FRAMEWORK

Input-output modeling focuses on the interrelationships of sales and purchases among sectors of the economy. Input-output is best understood through its most basic form, the interindustry transactions table or matrix. In this table (see table C-1 for an example), the column industries are consuming sectors (or markets) and the row industries are producing sectors. The content of a matrix cell is the value of shipments that the row industry delivers to the column industry. Conversely, it is the value of shipments that the column industry receives from the row industry. Hence, the interindustry transactions table is a detailed accounting of the disposition of the value of shipments in an economy. Indeed, the detailed accounting of the interindustry transactions at the national level is performed not so much to facilitate calculation of national economic impacts as it is to back out an estimate of the nation's gross domestic product.

TABLE A.1: INTERINDUSTRY TRANSACTIONS MATRIX (VALUES)

	AGRICULTURE	MANUFACT-URING	SERVICE	OTHER	FINAL DEMAND	TOTAL OUTPUT
Agriculture	10	65	10	5	10	$100
Manufacturing	40	25	35	75	25	$200
Services	15	5	5	5	90	$120
Other	15	10	50	50	100	$225
Value Added	20	95	20	90		
Total Input	100	200	120	225		

For example, in Table A.1, agriculture, as a producing industry sector, is depicted as selling $65 million of goods to manufacturing. Conversely, the table depicts that the manufacturing industry purchased $65 million of agricultural production. The sum across columns of the interindustry transaction matrix is called the intermediate outputs vector. The sum across rows is called the intermediate inputs vector.

A single final demand column is also included in Table A.1. Final demand, which is outside the square interindustry matrix, includes imports, exports, government purchases, changes in inventory, private investment, and sometimes household purchases.

The value-added row, which is also outside the square interindustry matrix, includes wages and salaries, profit-type income, interest, dividends, rents, royalties, capital consumption allowances, and taxes. It is called value added because it is the difference between the total value of the industry's production and the value of the goods and nonlabor services that it requires to produce. Thus, it is the value that an industry adds to the goods and services it uses as inputs in order to produce output.

The value-added row measures each industry's contribution to wealth accumulation. In a national model, therefore, its sum is better known as the gross domestic product (GDP). At the state level, this is known as the gross state product—a series produced by the U.S. Bureau of Economic Analysis and published in the Regional Economic Information System. Below the state level, it is known simply as the regional equivalent of the GDP—the gross regional product.

Input-output economic impact modelers now tend to include the household industry within the square interindustry matrix. In this case, the "consuming industry" is the household itself. Its spending is extracted from the final demand column and is appended as a separate column in the interindustry matrix. To maintain a balance, the income of households must be appended as a row. The main income of households is labor income, which is extracted from the value-added row. Modelers tend not to include other sources of household income in the household industry's row. This is not because such income is not attributed to households but rather because much of this other income derives from sources outside of the economy that is being modeled.

The next step in producing input-output multipliers is to calculate the direct requirements matrix, which is also called the technology matrix. The calculations are based entirely on data from Table A.1. As shown in Table A.2, the values of the cells in the direct requirements matrix are derived by dividing each cell in a column of Table A.1, the interindustry transactions matrix, by its column total. For example, the cell for manufacturing's purchases from agriculture is 65/200 = .33. Each cell in a column of the direct requirements matrix shows how many cents of each producing industry's goods and/or services are required to produce one dollar of the consuming industry's production and are called technical coefficients. The use of the terms "technology" and "technical" derive from the fact that a column of this matrix represents a recipe for a unit of an industry's production. It, therefore, shows the needs of each industry's production process or "technology."

TABLE A.2: DIRECT REQUIREMENTS MATRIX

	Agriculture	Manufacturing	Services	Other
Agriculture	.10	.33	.08	.02
Manufacturing	.40	.13	.29	.33
Services	.15	.03	.04	.02
Other	.15	.05	.42	.22

Next in the process of producing input-output multipliers, the Leontief Inverse is calculated. To explain what the Leontief Inverse is, let us temporarily turn to equations. Now, from Table A.1 we know that the sum across both the columns of the square interindustry transactions matrix (Z) and the final demand vector (y) is equal to vector of production by industry (x). That is,

$$\mathbf{x = Zi + y}$$

where i is a summation vector of ones. Now, we calculate the direct requirements matrix (A) by dividing the interindustry transactions matrix by the production vector or

$$\mathbf{A = ZX\text{-}1}$$

where X-1 is a square matrix with inverse of each element in the vector x on the diagonal and the rest of the elements equal to zero. Rearranging the above equation yields

$$\mathbf{Z = AX}$$

where X is a square matrix with the elements of the vector x on the diagonal and zeros elsewhere. Thus,

$$\mathbf{x = (AX)i + y}$$

or, alternatively,

$$x = Ax + y$$

solving this equation for x yields

x =	(I-A)-1	y
Total =	Total *	Final
Output	Requirements	Demand

The Leontief Inverse is the matrix (I-A)-1. It portrays the relationships between final demand and production. This set of relationships is exactly what is needed to identify the economic impacts of an event external to an economy.

Because it does translate the direct economic effects of an event into the total economic effects on the modeled economy, the Leontief Inverse is also called the total requirements matrix. The total requirements matrix resulting from the direct requirements matrix in the example is shown in Table A.3.

TABLE A.3: TOTAL REQUIREMENTS MATRIX

	AGRICULTURE	MANUFACTURING	SERVICES	OTHER
Agriculture	1.5	.6	.4	.3
Manufacturing	1.0	1.6	.9	.7
Services	.3	.1	1.2	.1
Other	.5	.3	.8	1.4
Industry Multipliers	.33	2.6	3.3	2.5

In the direct or technical requirements matrix in Table A.2, the technical coefficient for the manufacturing sector's purchase from the agricultural sector was .33, indicating the 33 cents of agricultural products must be directly purchased to produce a dollar's worth of manufacturing products. The same "cell" in Table A.3 has a value of .6. This indicates that for every dollar's worth of product that manufacturing ships out of the economy (i.e., to the government or for export), agriculture will end up increasing its production by 60 cents. The sum of each column in the total requirements matrix is the output multiplier for that industry.

MULTIPLIERS

A *multiplier* is defined as the system of economic transactions that follow a disturbance in an economy. Any economic disturbance affects an economy in the same way as does a drop of water in a still pond. It creates a large primary "ripple" by causing a direct change in the purchasing patterns of affected firms and institutions. The suppliers of the affected firms and institutions must change their purchasing patterns to meet the demands placed upon them by the firms originally affected by the economic disturbance, thereby creating a smaller secondary "ripple." In turn, those who meet the needs of the suppliers must change their purchasing patterns to meet the demands placed upon them by the suppliers of the original firms, and so on; thus, a number of subsequent "ripples" are created in the economy.

The multiplier effect has three components—direct, indirect, and induced effects. Because of the pond analogy, it is also sometimes referred to as the ripple effect.

- A direct effect (the initial drop causing the ripple effects) is the change in purchases due to a change in economic activity.
- An indirect effect is the change in the purchases of suppliers to those economic activities directly experiencing change.
- An induced effect is the change in consumer spending that is generated by changes in labor income within the region as a result of the direct and indirect effects of the economic activity. Including households as a column and row in the interindustry matrix allows this effect to be captured.

Extending the Leontief Inverse to pertain not only to relationships between total production and final demand of the economy but also to changes in each permits its multipliers to be applied to many types of economic impacts. Indeed, in impact analysis the Leontief Inverse lends itself to the drop-in-a-pond analogy discussed earlier. This is because the Leontief Inverse multiplied by a change in final demand can be estimated by a power series. That is,

$$\mathbf{(I\text{-}A)\text{-}1\,\Delta y = \Delta y + A\,\Delta y + A(A\,\Delta y) + A(A(A\,\Delta y)) + A(A(A(A\,\Delta y))) + \ldots}$$

Assuming that Δy—the change in final demand—is the "drop in the pond," then succeeding terms are the ripples. Each "ripple" term is calculated as the previous "pond disturbance" multiplied by the direct requirements matrix. Thus, since each element in the direct requirements matrix is less than one, each ripple term is smaller than its predecessor. Indeed, it has been shown that after calculating about seven of these ripple terms that the power series approximation of impacts very closely estimates those produced by the Leontief Inverse directly.

In impacts analysis practice, $\mathbf{\Delta y}$ is a single column of expenditures with the same number of elements as there are rows or columns in the direct or technical requirements matrix. This set of elements is called an impact vector. This term is used because it is the vector of numbers that is used to estimate the economic impacts of the investment.

There are two types of changes in investments, and consequently economic impacts, generally associated with projects—one-time impacts and recurring impacts. One-time impacts are impacts that are attributable to an expenditure that occurs once over a limited period of time. For example, the impacts resulting from the construction of a project are one-time impacts. Recurring impacts are impacts that continue permanently as a result of new or expanded ongoing expenditures. The ongoing operation of a new train station, for example, generates recurring impacts to the economy. Examples of changes in economic activity are investments in the preservation of old homes, tourist expenditures, or the expenditures required to run a historical site.

Such activities are considered changes in final demand and can be either positive or negative. When the activity is not made in an industry, it is generally not well represented by the input-output model. Nonetheless, the activity can be represented by a special set of elements that are similar to a column of the transactions matrix. This set of elements is called an economic disturbance or impact vector. The latter term is used because it is the vector of numbers that is used to estimate the impacts. In this study, the impact vector is estimated by multiplying one or more economic translators by a dollar figure that represents an investment in one or more projects. The term translator is derived from the fact that such a vector translates a dollar amount of an activity into its constituent purchases by industry.

One example of an industry multiplier is shown in Table A.4. In this example, the activity is the preservation of a historic home. The direct impact component consists of purchases made specifically for the construction project from the producing industries. The indirect impact component consists of expenditures made by producing industries to support the purchases made for this project. Finally, the induced impact component focuses on the expenditures made by workers involved in the activity on-site and in the supplying industries.

TABLE A.4: COMPONENTS OF THE MULTIPLIER FOR THE HISTORIC REHABILITATION OF A SINGLE-FAMILY RESIDENCE

<table>
<tr><th>DIRECT IMPACT</th><th>INDIRECT IMPACT</th><th>INDUCED IMPACT</th></tr>
<tr><td>Excavation/ Construction Labor</td><td>Production Labor</td><td rowspan="6">Expenditures by wage earners on-site and in the supplying industries for food, clothing, durable goods, entertainment</td></tr>
<tr><td>Concrete</td><td>Steel Fabrication</td></tr>
<tr><td>Wood</td><td>Concrete Mixing</td></tr>
<tr><td>Bricks</td><td>Factory and Office Expenses</td></tr>
<tr><td>Equipment</td><td>Equipment Components</td></tr>
<tr><td>Finance and Insurance</td><td></td></tr>
</table>

REGIONAL INPUT-OUTPUT ANALYSIS

Because of data limitations, regional input-output analysis has some considerations beyond those for the nation. The main considerations concern the depiction of regional technology and the adjustment of the technology to account for interregional trade by industry.

In the regional setting, local technology matrices are not readily available. An accurate region-specific technology matrix requires a survey of a representative sample of organizations for each industry to be depicted in the model. Such surveys are extremely expensive.[17] Because of the expense, regional analysts have tended to use national technology as a surrogate for regional technology. This substitution does not affect the accuracy of the model if local industry technology does not vary widely from the nation's average.[18]

Even when local technology varies widely from the nation's average for one or more industries, model accuracy may not be affected much. This is because interregional trade may mitigate the error that would be induced by the technology. That is, in estimating economic impacts via a regional input-output model, national technology must be regionalized by a vector of regional purchase coefficients,[19] $\boldsymbol{\rho}$, in the following manner:

$$(\mathbf{I}\text{-}\hat{\boldsymbol{\rho}}\mathbf{A})^{-1}\ \hat{\boldsymbol{\rho}}\times\Delta\mathbf{y}$$

or

$$\hat{\boldsymbol{\rho}}\times\Delta\mathbf{y} + \hat{\boldsymbol{\rho}}\mathbf{A}\ (\hat{\boldsymbol{\rho}}\times\Delta\mathbf{y}) + \hat{\boldsymbol{\rho}}\mathbf{A}\ (\ \hat{\boldsymbol{\rho}}\mathbf{A}\ (\hat{\boldsymbol{\rho}}\mathbf{A}\times\Delta\mathbf{y})) + \hat{\boldsymbol{\rho}}\mathbf{A}\ (\ \hat{\boldsymbol{\rho}}\mathbf{A}\ (\hat{\boldsymbol{\rho}}\times\Delta\mathbf{y}))) + \ldots$$

where the vector-matrix product $\boldsymbol{\rho}\mathbf{A}$ is an estimate of the region's direct requirements matrix. Thus, if national technology coefficients—which vary widely from their local equivalents—are multiplied by small RPCs, the error transferred to the direct requirements matrices will be relatively small. Indeed, since most manufacturing industries have small RPCs and since technology differences tend to arise due to substitution in the use of manufactured goods, technology differences have generally been found to be minor source error in economic impact measurement. Instead, RPCs and their measurement error due to industry aggregation have been the focus of research on regional input-output model accuracy.

RSRC EQUATION

The equation currently used by RSRC in estimating RPCs is reported in Treyz and Stevens (1985). In this paper, the authors show that they estimated the RPC from the 1977 CTS data by estimating the demands for an industry's production of goods or services that are fulfilled by local suppliers (*LS*) as

$$LS = D^{e^{(-1/x)}}$$

and where for a given industry

$$\mathbf{x} = \mathbf{k}\ \mathbf{Z}_1^{\mathbf{a1}}\mathbf{Z}_2^{\mathbf{a2}}\ \Sigma_j\ \mathbf{Z}_j^{aj}$$ and $\mathbf{D}$ is its total local demand.

Since for a given industry $\mathbf{RPC} = LS/D$ then

$$\ln\{-1/[\ln\ (\ln LS/\ \ln D)]\} = \ln\ \mathrm{k} + \mathrm{a}_1\ \ln Z_1 + \mathrm{a}_2\ \ln Z_2 + \Sigma_j\ \mathrm{a}_j \ln Z\mathbf{j}$$

which was the equation that was estimated for each industry.

This odd nonlinear form not only yielded high correlations between the estimated and actual values of the RPCs, it also assured that the RPC value ranges strictly between 0 and 1. The results of the empirical implementation of this equation are shown in Treyz and Stevens (1985, table 1). The table shows that total local industry demand ($\mathbf{Z}_1$), the supply/demand ratio ($\mathbf{Z}_2$), the weight/value ratio of the good ($\mathbf{Z}_3$), the region's size in square miles ($\mathbf{Z}_4$), and the region's average establishment size in terms of employees for the industry compared to the nation's ($\mathbf{Z}_5$)

are the variables that influence the value of the RPC across all regions and industries. The latter of these maintain the least leverage on RPC values.

Because the CTS data are at the state level only, it is important for the purposes of this study that the local industry demand, the supply/demand ratio, and the region's size in square miles are included in the equation. They allow the equation to extrapolate the estimation of RPCs for areas smaller than states. It should also be noted here that the CTS data only cover manufactured goods. Thus, although calculated effectively making them equal to unity via the above equation, RPC estimates for services drop on the weight/value ratios. A very high weight/value ratio like this forces the industry to meet this demand through local production. Hence, it is no surprise that a region's RPC for this sector is often very high (0.89). Similarly, hotels and motels tend to be used by visitors from outside the area. Thus, a weight/value ratio on the order of that for industry production would be expected. Hence, an RPC for this sector is often about 0.25.

The accuracy of CUPR's estimating approach is exemplified best by this last example. Ordinary location quotient approaches would show hotel and motel services serving local residents. Similarly, IMPLAN RPCs are built from data that combine this industry with eating and drinking establishments (among others). The results of such aggregation process is an RPC that represents neither industry (a value of about 0.50) but which is applied to both. In the end, not only is the CUPR's RPC-estimating approach the soundest, but it is also widely acknowledged by researchers in the field as being state of the art.

ADVANTAGES AND LIMITATIONS OF INPUT-OUTPUT ANALYSIS

Input-output modeling is one of the most accepted means for estimating economic impacts. This is because it provides a concise and accurate means for articulating the interrelationships among industries. The models can be quite detailed. For example, the current U.S. model currently has more than 500 industries representing many six-digit North American Industrial Classification System (NAICS) codes. The R/ECON™ model used in this study has 383 sectors. Further, the industry detail of input-output models provides not only a consistent and systematic approach but also more accurately assesses multiplier effects of changes in economic activity. Research has shown that results from more aggregated economic models can have as much as 50 percent error inherent in them. Such large errors are generally attributed to poor estimation of regional trade flows resulting from the aggregation process.

Input-output models also can be set up to capture the flows among economic regions. For example, the model used in this study can calculate impacts for a county, as well as a metropolitan area or a state economy.

The limitations of input-output modeling should also be recognized. The approach makes several key assumptions. First, the input-output model approach assumes that there are no economies of scale to production in an industry; that is, the proportion of inputs used in an industry's production process does not change regardless of the level of production. This assumption will not work if the technology matrix depicts an economy of a recessional economy (e.g., 1982) and the analyst is attempting to model activity in a peak economic year (e.g., 1989). In a recession year, the labor-to-output ratio tends to be excessive because firms are generally reluctant to lay off workers when they believe an economic turnaround is about to occur.

A less-restrictive assumption of the input-output approach is that technology is not permitted to change over time. It is less restrictive because the technology matrix in the United States is updated frequently and, in general, production technology does not radically change over short periods.

Finally, the technical coefficients used in most regional models assume that production processes are spatially invariant and are well represented by the nation's average technology. In a region as large and diverse as Florida, this assumption is likely to hold true.

CHAPTER ONE ENDNOTES

17 The most recent statewide survey-based model was developed for the State of Kansas in 1986 and cost on the order of $60,000 (in 1990 dollars). The development of this model, however, leaned heavily on work done in 1965 for the same state. In addition, the model was aggregated to the 35-sector level, making it inappropriate for many possible applications since the industries in the model do not represent the very detailed sectors that are generally analyzed.

18 Only recently have researchers studied the validity of this assumption. They have found that large urban areas may have technology in some manufacturing industries that differs in a statistically significant way from the national average. As will be discussed in a subsequent paragraph, such differences may be unimportant after accounting for trade patterns.

19 A regional purchase coefficient (RPC) for an industry is the proportion of the region's demand for a good or service that is fulfilled by local production. Thus, each industry's RPC varies between zero (0) and one (1), with one implying that all local demand is fulfilled by local suppliers. As a general rule, agriculture, mining, and manufacturing industries tend to have low RPCs, and both service and construction industries tend to have high RPCs.

APPENDIX B.1. NATIONAL ECONOMIC AND TAX IMPACTS OF 2019 FLORIDA HERITAGE TOURISM

UNITED STATES				
	OUTPUT ($1,000)	EMPLOYMENT (JOBS)	EARNINGS ($1,000)	GDP ($1,000)
I. Total Effects (Direct + Indirect/Induced)				
1. Agriculture, Forestry, Fishing, and Hunting	230,245.2	1,691	68,498.9	94,330.7
2. Mining	53,526.6	87	14,673.2	28,552.3
3. Utilities	163,707.6	181	34,976.4	114,771.0
4. Construction	75,182.2	530	24,218.4	34,046.0
5. Manufacturing	822,950.2	2,385	158,121.0	296,441.3
6. Wholesale Trade	366,182.4	1,343	104,527.4	223,485.4
7. Retail Trade	683,926.5	7,097	240,920.1	397,085.3
8. Transportation and Warehousing	950,486.7	13,546	334,192.7	438,958.0
9. Information	312,123.8	574	74,825.3	171,958.7
10. Finance, Insurance, Real Estate, Rental, and Leasing	1,273,207.2	4,794	243,310.2	672,184.6
11. Professional and Business Services	868,163.7	6,670	431,318.6	518,802.9
12. Educational Services, Health Care, and Social Assistance	457,298.0	4,402	247,174.1	282,066.6
13. Arts, Entertainment, Recreation, and Hospitality	1,858,691.1	18,661	647,746.2	1,021,940.1
14. Other Services (including Government)	2,011,002.5	4,484	197,086.9	190,015.6
Total Effects	**10,126,693.8**	**66,444**	**2,819,889.5**	**4,484,638.4**
II. Distribution of Effects and Multipliers				
1. Direct Effects	2,958,064.2	33,640	1,016,277.6	1,534,312.3
2. Indirect Effects	2,205,798.1	12,351	717,839.3	1,124,887.0
3. Induced Effects	4,962,831.5	20,453	1,085,772.6	1,825,439.1
4. Total Effects	**10,126,693.8**	**66,444**	**2,819,889.5**	**4,484,638.4**
5. *Multipliers (=4/1)*	*3.423*	*1.975*	*2.775*	*2.923*
III. Composition of GDP				
1. Compensation				2,505,721.1
2. Taxes				396,142.6
a. Local				88,430.6
b. State				148,701.3
c. Federal				159,010.7
3. Profits, Dividends, Rents, and Other				1,582,774.7
4. Total GDP (=1+2+3)				**4,484,638.4**

UNITED STATES				
	OUTPUT ($1,000)	EMPLOYMENT (JOBS)	EARNINGS ($1,000)	GDP ($1,000)
IV. Tax Accounts				
1. Labor Income		2,505,721.1	2,678,895.0	
2. Taxes		396,142.6	336,622.5	732,765.1
a. Local		159,010.7	229,455.1	388,465.8
b. State		148,701.3	61,034.4	209,735.7
c. Federal		159,010.7	229,455.1	388,465.8
Effects per Million Dollars of Initial Expenditure (in Dollars)				
Employment/Jobs				22.5
Earnings				$953,288.8
State Taxes				$70,903.0
Local Taxes				$45,490.4
GDP				$1,516,072.0
Initial Expenditure (in Dollars)				**$2,958,064,188**

APPENDIX B.2. IN-STATE ECONOMIC AND TAX IMPACTS OF 2019 FLORIDA HERITAGE TOURISM

UNITED STATES				
	OUTPUT ($1,000)	EMPLOYMENT (JOBS)	EARNINGS ($1,000)	GDP ($1,000)
i. Total Effects (Direct + Indirect/Induced)				
1. Agriculture, Forestry, Fishing, and Hunting	112,217.7	938	40,240.2	51,066.4
2. Mining	844.3	7	153.1	675.2
3. Utilities	71,366.9	84	16,247.8	61,081.7
4. Construction	41,134.4	308	12,960.5	19,327.4
5. Manufacturing	210,030.1	895	47,332.2	80,860.1
6. Wholesale Trade	224,403.6	898	67,073.9	139,374.8
7. Retail Trade	547,889.8	5,784	190,582.0	315,974.4
8. Transportation and Warehousing	814,201.2	12,550	275,184.3	369,226.3
9. Information	141,449.5	302	33,825.3	76,256.8
10. Finance, Insurance, Real Estate, Rental, and Leasing	839,318.9	3,183	142,127.6	436,206.6
11. Professional and Business Services	533,198.9	4,387	260,770.1	310,092.3
12. Educational Services, Health Care, and Social Assistance	223,889.5	2,172	119,984.4	136,712.7
13. Arts, Entertainment, Recreation, and Hospitality	1,719,435.7	16,982	593,293.3	940,768.4
14. Other Services (including Government)	159,154.2	2,948	114,560.8	103,681.8
Total Effects	**5,638,534.5**	**51,440**	**1,914,335.7**	**3,041,304.8**
II. Distribution of Effects and Multipliers				
1. Direct Effects	2,869,051.4	32,803	981,804.4	1,496,734.2
2. Indirect Effects	1,429,185.6	9,405	495,602.9	750,452.6
3. Induced Effects	1,340,297.4	9,232	436,927.9	794,118.0
4. Total Effects	**5,638,534.5**	**51,440**	**1,914,335.7**	**3,041,304.8**
5. *Multipliers (=4/1)*	*1.965*	*1.568*	*1.950*	*2.032*
III. Composition of GDP				
1. Compensation				1,731,987.3
2. Taxes				301,316.6
a. Local				65,980.0
b. State				111,802.1
c. Federal				123,534.5
3. Profits, Dividends, Rents, and Other				1,008,000.9
4. Total GDP (=1+2+3)				**3,041,304.8**

UNITED STATES				
	OUTPUT ($1,000)	EMPLOYMENT (JOBS)	EARNINGS ($1,000)	GDP ($1,000)
IV. Tax Accounts				
1. Labor Income		1,731,987.3	1,701,143.6	
2. Taxes		301,316.6	215,244.3	516,560.9
a. Local		65,980.0	38,545.2	104,525.2
b. State		111,802.1	10,950.1	122,752.2
c. Federal		123,534.5	165,748.9	289,283.5
Effects per Million Dollars of Initial Expenditure (in Dollars)				
Employment/Jobs				17.4
Earnings				$647,158.3
State Taxes				$41,497.5
Local Taxes				$35,335.7
GDP				$1,028,140.2
Initial Expenditure (in Dollars)				**$2,958,064,188**

CHAPTER TWO:

PROFILE AND ECONOMIC IMPACTS OF FLORIDA MAIN STREET PROGRAM

INTRODUCTION

For several decades, the downtowns of many urban and rural centers in the U.S. thrived; people worked, shopped, ate, and played in them. But transportation changes enabled ready access to less-expensive land, which led to the slow decay of some communities. Their workplaces, shops, diners and bistros, and entertainment venues were superseded by industrial parks, suburban malls and big box stores, franchise restaurants, twelve-screen movie theatres, and the like. To counter this trend, in 1980 the National Trust for Historic Preservation established the "National Trust Main Street Center." This program was designed to revitalize decayed downtowns with the hope of retaining their historic character. Since 1980, the program has launched more than 2,000 Main Street local affiliations over 43 U.S. states. This endeavor to revitalize downtown communities is a major thrust of federal historic preservation efforts. Fortunately, many Florida communities have opted to participate.

The following chapter overviews Florida's Main Street Program and presents its contribution to the state's economy. It begins with a description of the program by highlighting some of its participating communities and the program's cumulative investment and impacts (since its beginnings in 1985 until 2021). The chapter concludes by entering the recent annual average Florida Main Street Program investments in the R/ECON™ I-O Model. This procedure yields the direct and multiplier economic impacts of the Main Street program activity in Florida.

THE FLORIDA MAIN STREET PROGRAM: BACKGROUND

In 1980, the National Trust for Historic Preservation created the National Trust Main Street Center (NMSC) to revitalize declining downtowns and restore economic activity to these centers via a "preservation-based strategy." The NMSC takes a community-driven, comprehensive approach to downtown revitalization by providing participating communities with professional training, networking, technical assistance, and national resources and support.

The Florida Main Street Program (FMSP) started in 1985, just five years after the creation of the NMSC. FMSP is currently administered by the State of Florida's Division of Historical Resources. The program implements the NMSC's Four-Point Approach®, which corresponds to the NMSC-envisioned four forces of real estate value (i.e., social, political, physical, and economic). The following list summarizes the FMSP's four-point approach:

1. **Organization:** Public- and private-sector collaboration to assign responsibilities and form consensus and cooperation among key community members with a vested interest in downtown areas. Build leadership and strong organizational capacity.
2. **Promotion:** Advertise the downtown area through promotional retail activity, special events, and individually tailored marketing campaigns. Promote buy-local experiences.
3. **Design:** Enhance the physical appearance of the downtown area by creating an inviting atmosphere, while paying special attention to the maintenance of historic structures to protect and promote the character of the district. Foster accessible, people-centered public places.
4. **Economic vitality:** Enhance the competitiveness of existing businesses, bring in new businesses, and build a diverse economic base.

The FMSP started in communities like DeLand (1985) and Fort Pierce (1988). Since then, the program has designated and provided technical assistance to more than 80 Florida communities. At the time of this study (2022), the FMSP encompassed 39 accredited communities and 8 apprentice communities (i.e., sites within their first three years in the program). Below we highlight some of FMSP's 2022 accredited communities:

APALACHICOLA

Since its establishment in 2011, Apalachicola's Main Street program has been recognized twice as the "Florida Main Street Program of the Month" for its capacity to generate economic opportunities while promoting heritage tourism. In addition, in 2017, the program received the "Florida Main Street Merit Award" for its outstanding public-private partnerships. Apalachicola's Main Street program offers events and activities year-round, and its largest single-day event (Independence Eve Celebration) attracts approximately 8,000 visitors per year.[20]

LEESBURG

Leesburg became a Main Street community in 1994; this was a concerted effort by the City of Leesburg, the Downtown Merchants Association, and the Leesburg Chamber of Commerce to revitalize and promote its downtown. To bolster the economic landscape of its downtown area, in 1996, the City of Leesburg designated the downtown district as a Community Redevelopment Area (CRA).[21]

Since its establishment in 1994, the Leesburg Main Street program has generated 355 jobs[22] and 121 businesses[23] (as of March 2022). Most recently, the program has been promoting sports tourism and trails, while still hosting major events year-round (e.g., Christmas Parade, Mardi Gras, Bikefest, Fish Fry). In March 2022, the program received the "Florida Main Street Program of the Month" recognition.[24]

STUART

Established in 1987 as one of Florida's initial Main Street Programs, this initiative continues to flourish. Over the course of its 35-year duration, the Stuart Main Street program has received multiple recognitions, including awards for its outstanding public-private partnerships.

The Stuart Main Street Program has successfully revitalized and expanded its downtown business area; for instance, in 2011, the program revamped the Colorado Avenue Business District by increasing its walkability and bringing in new businesses. After four years of completing this project, occupancy levels increased from 70 percent to 95 percent.[25]

PROGRAM INVESTMENT AND ECONOMIC IMPACTS

Since the Florida Main Street Program began in 1985, it has generated a total private investment of $1.6 billion and a total of public investment of $2.9 billion—a cumulative total investment of $4.5 billion (see Table 2.1). These are in nominal terms, not constant dollars. Moreover, the initiative has also resulted in 7,575 new businesses and 27,479 jobs. [26, 27]

TABLE 2.1: CUMULATIVE INVESTMENT AND IMPACTS OF THE FLORIDA MAIN STREET PROGRAM, START IN 1985- MARCH 2022 (MILLION $, NOMINACL)

COMPONENT	1985-2022*
Net Businesses	7,575
Net Gain in Jobs Created (full-time and part-time)	27,479
Private Investment	$1,617
Public Investment	$2,881
Total Investment	$4,499

**Since the Program's establishment in 1985 to March 2022*

Source: Florida Division of Historical Resources

TABLE 2.2: RECENT ANNUAL INVESTMENT AND IMPACTS OF THE FLORIDA MAIN STREET PROGRAM, 2017-2021 (MILLION 2021$)

COMPONENT	2017	2018	2019	2020	2021	2017-2021 AVERAGE
New Construction Projects	43	55	61	167	209	107
New Rehabilitation Projects	421	522	307	689	1,006	589
Public Infrastructure Projects	14	20	43	49	38	33
New Businesses	470	469	183	349	371	368
Net Gain in Jobs Created (full-time)	461	893	1,113*	1,432*	1,897*	1,292*
Net Gain in Jobs Created (part-time)	107	557	-	-	-	-
Volunteer Hours	45,329	46,331	37,573	52,017	62,003	48,651
Private Investment	$19.3	$54.8	$129.5	$53.7	$114.3	$78.6
Public Investment	$96.0	$128.0	$0.04	$63.9	$0.4	$63.9
Total Investment	**$115.3**	**$182.8**	**$129.6**	**$117.5**	**$114.7**	**$142.5**

**Full-time and part-time employment combined*

<Investment amounts adjusted for inflation to 2021-dollar value.

Source: Florida Division of Historical Resources, 2022, as analyzed by Rutgers Economic Service (R/ECONtm).

As shown in Table 2.2, the average annual investment for the 2017-2021 period of all Main Street Programs in Florida amounted to $142.5 million; this economic activity included the construction of an average of 107 new projects, the rehabilitation of 589 buildings, and the completion of 33 public infrastructure projects. In addition, the initiative in the last five years has resulted in an average net gain of 1,292 jobs and 368 new businesses.

DIRECT, INDIRECT, AND INDUCED ECONOMIC IMPACTS

The following section applies the R/ECON™ I–O Model to translate the above FMSP annual average investment of $142.5 million into total economic benefits that encompass direct, indirect, and induced effects. (Full details on the R/ECON™ I–O economic model are found at Appendix A). Tables 2.3 and 2.4 display a summary of the results and Appendices 2.1 and 2.2 (at the conclusion of the chapter) present the results greater in detail. Note that the 2017-2021 period was picked to account for pandemic spending: due to annual fluctuations in capital spending, especially in the context of the COVID-19 pandemic, we selected the last five years to generate an annual average spending amount[28,]

TABLE 2.3. TOTAL ECONOMIC IMPACTS OF FLORIDA MAIN STREET PROGRAM, AVERAGE ANNUAL INVESTMENT, 2017-2021)

	FLORIDA	OUTSIDE FLORIDA	TOTAL (U.S.)
Jobs*	1,888	781	2,669
Income ($000)	$90,377	$48,552	$138,929
GDP ($000)	$144,835	$78,389	$223,224

Source: Florida Division of Historical Resources as analyzed by Rutgers Economic Service (R/ECONtm).

Note: Person-year, full-time or full-time equivalent.

TABLE 2.4. TOTAL TAX CONTRIBUTION OF FLORIDA MAIN STREET PROGRAM, AVERAGE ANNUAL INVESTMENT, 2017-2021

	FLORIDA	OUTSIDE FLORIDA	TOTAL (U.S.)
Total Taxes ($000)	$18,235	$12,127	$30,362
Federal ($000)	$11,134	$5,760	$16,894
State ($000)	$3,513	$4,626	$8,139
Local ($000)	$3,588	$1,741	$5,329

Source: Florida Division of Historical Resources as analyzed by Rutgers Economic Service (R/ECONtm).

NATIONWIDE IMPACTS

The results displayed in Table 2.3 indicate that the FMSP annual average investment of $142.5 million generated a total economic impact of 2,669 jobs nationwide, as well as $138.9 million in income and $223.2 million in GDP. As specified in Appendix Table C.1 (see end of chapter), the national induced and indirect effects of Main Street investment included the creation of 1,601 jobs, and generated $91.0 million in income and $152.2 million more in GDP.

The detailed industry section in Appendix Table C.1 indicates that the largest number of new employment fostered by Main Street investment was, not surprisingly, the construction sector (1,086 out of 2,669 jobs). Moreover, in terms of job creation, the second and third most-affected industries were professional and business services (266 jobs) and retail trade (239 jobs). Due to variations in earnings by industry, we found slightly different impacts in the contribution of labor income: Of the total $138.9 million in labor income generated by the average annual program investment, the construction sector contributed the greatest portion ($48.8 million), followed by professional and business services ($17.6 million) and the manufacturing sector ($13.1 million).

In terms of tax contribution, Table 2.4 shows that, nationally, the Florida Main Street Program annual average investment of $142.5 million generated $30.4 million in local, state, and federal tax revenue. Specifically, the federal government gained $16.9 million from the total tax revenue.

STATE-LEVEL IMPACTS

Table 2.3 also summarizes the effects of the annual average Florida Main Street investments for the state of Florida. In sum, the program creates 1,888 jobs (71 percent of the total jobs generated nationally), $90.4 million in labor income (65 percent of the income generated nationally), and $144 million in wealth (65 percent of the wealth added to national GDP). As displayed in Appendix Table C.2, Florida retains all of the 1,068 jobs created directly by state-based Main Street investments. But close to 50 percent of the indirect and induced jobs of Florida Main Street activity leaked out of the state. This finding is to be expected, since Florida is just one state out of the entire the national economy and not a state that produces a lot of construction material (cf., California, Michigan, and Texas).

The statewide distribution of impacts across industries parallels that observed for the entire nation: Florida naturally benefits from nearly all of the construction effort. More specifically, in terms of job contributions, state impacts by industry (see detailed industry section in Appendix Table C.2) reflect patterns of prior nationwide impact analyses: of the 1,888 jobs derived statewide via the investment of the Main Street Program, 1,076 jobs (57 percent) are in the construction industry, followed by 156 jobs (8 percent) in retail trade and 143 jobs (8 percent) in professional and business services. Furthermore, of the $90.4 million labor income derived statewide, $48.3 million in labor income (53 percent) is in the construction industry, $8.6 million (9 percent) is in professional and business services, and $5.1 million (6 percent) is in retail trade. Of the $144.8 million wealth derived statewide, $71.5 million (49 percent) is in construction, $16.4 million (11 percent) is in finance/insurance/real estate/rental/leasing, and $10.3 million (7 percent) is in retail trade.

In terms of tax contribution, Table 2.4 shows that, statewide, the annual average Florida Main Street Investments generated $18.2 million in local, state, and federal tax revenue. Specifically, the local and state governments gained $3.6 and $3.5 million, respectively, from the total tax revenue.

CHAPTER TWO ENDNOTES

20 Information about the Apalachicola Main Street Program can be found at: https://www.downtownapalachicola.com/

21 Information about the Leesburg Main Street Program can be found at: https://www.leesburgpartnership.com/

22 Net, full-time and part-time

23 Niceville News (March 2022). Leesburg Partnership named Florida Main Street Program of the Month. Niceville.com retrieved from: https://niceville.com/leesburg-partnership-named-florida-main-street-program-of-the-month/

24 Ibid

25 Information about the Stuart Main Street Program can be found at: https://www.stuartmainstreet.org/

26 This figure includes full-time and part-time employment.

27 Florida Division of Historical Resources (2022). Program Resources. Retrieved from: https://dos.myflorida.com/historical/preservation/florida-main-street/program-resources/

28 Interestingly 2015 and 2016 were more anomalous spending-wise for FMSP than were 2020 and 2021.

APPENDIX TABLE C.1. NATIONAL ECONOMIC AND TAX IMPACTS OF THE AVERAGE ANNUAL INVESTMENT IN FLORIDA'S MAIN STREET PROGRAM, 2017-2021

	OUTPUT ($1,000)	EMPLOYMENT (JOBS)	EARNINGS ($1,000)	GDP ($1,000)
i. Total Effects (Direct + Indirect/Induced)				
1. Agriculture, Forestry, Fishing, and Hunting	2,963.0	24	981.9	1,206.8
2. Mining	4,945.3	10	1,224.7	2,995.2
3. Utilities	6,042.4	7	1,276.8	4,044.0
4. Construction	145,202.4	1,086	48,809.3	72,193.0
5. Manufacturing	62,105.9	173	13,050.8	24,502.9
6. Wholesale Trade	20,011.4	65	5,505.6	12,347.9
7. Retail Trade	25,449.2	239	9,583.1	15,757.8
8. Transportation and Warehousing	13,041.7	102	5,170.4	6,508.7
9. Information	12,332.8	23	2,794.8	6,770.6
10. Finance, Insurance, Real Estate, Rental, and Leasing	50,911.6	171	9,384.0	28,620.9
11. Professional and Business Services	34,612.7	266	17,612.0	20,881.7
12. Educational Services, Health Care, and Social Assistance	21,906.6	211	11,889.1	13,465.3
13. Arts, Entertainment, Recreation, and Hospitality	11,848.7	146	4,423.0	6,545.9
14. Other Services (including Government)	92,741.6	147	7,223.2	7,423.6
Total Effects	**504,115.3**	**2,669**	**138,928.5**	**223,224.4**
II. Distribution of Effects and Multipliers				
1. Direct Effects	142,511.0	1,068	47,935.6	70,992.1
2. Indirect Effects	123,363.8	611	38,348.9	63,883.1
3. Induced Effects	238,240.5	990	52,644.0	88,349.2
4. Total Effects	**504,115.3**	**2,669**	**138,929**	**223,244.4**
5. *Multipliers (=4/1)*	*3.537*	*2.500*	*2.898*	*3.144*
III. Composition of GDP				
1. Compensation				117,113.8
2. Taxes				13,777.8
a. Local				3,056.2
b. State				5,132.4
c. Federal				5,589.2
3. Profits, Dividends, Rents, and Other				92,332.7
4. Total GDP (=1+2+3)				**223,224.4**

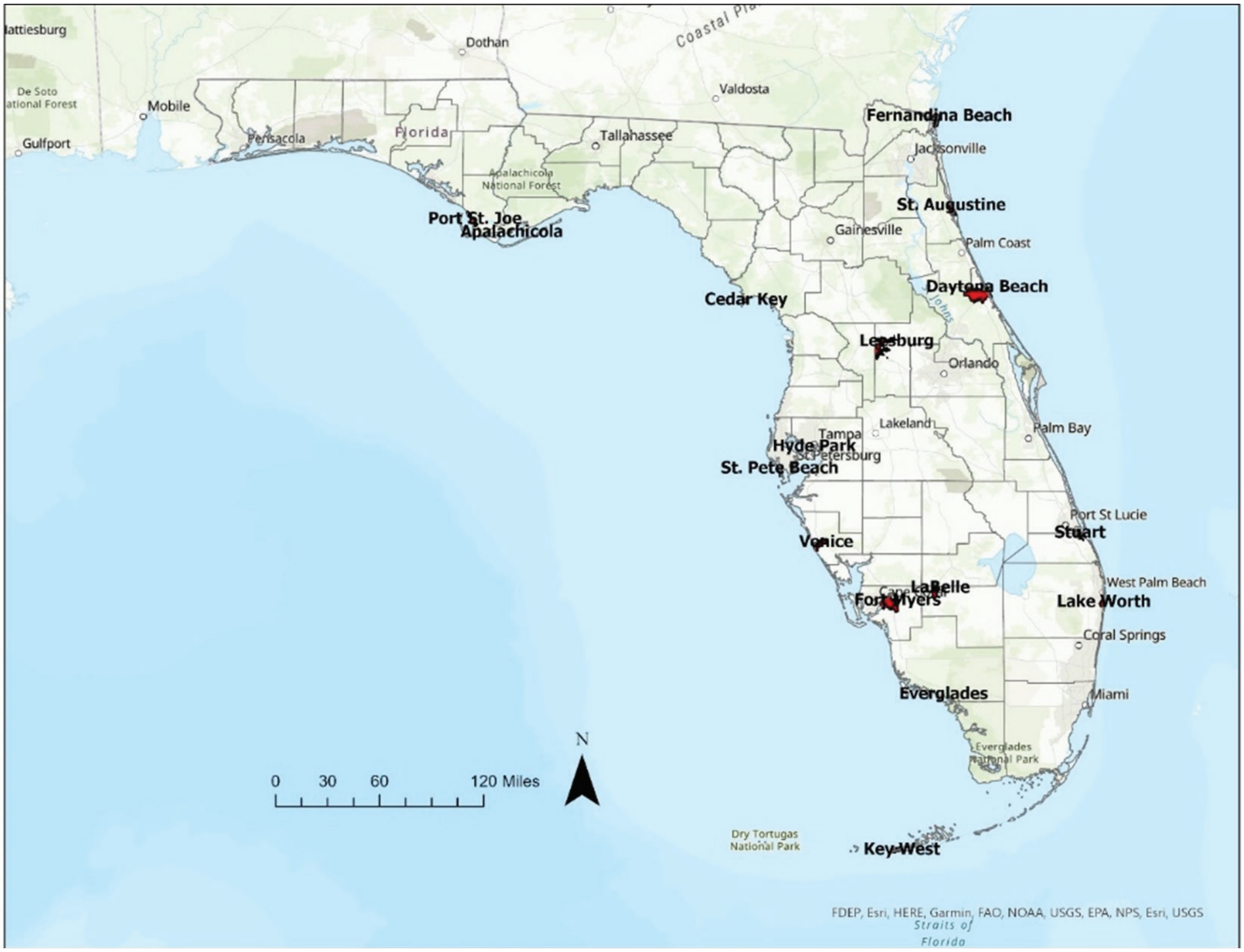
	OUTPUT ($1,000)	EMPLOYMENT (JOBS)	EARNINGS ($1,000)	GDP ($1,000)
		Business	Household	Total
IV. Tax Accounts				
1. Labor Income		117,113.8	131,982.1	----------
2. Taxes		13,777.8	16,584.5	30,362.3
a. Local		3,056.2	2,272.9	5,329.1
b. State		5,132.4	3,007.0	8,139.4
c. Federal		5,589.2	11,304.7	16,893.8
Effects per Million Dollars of Initial Expenditure (in Dollars)				
Employment/Jobs				18.7
Earnings				$974,862.2
State Taxes				$57,114.1
Local Taxes				$37,394.2
GDP				$1,566,366.0
Initial Expenditure (in Dollars)				**$142,510,987.7**

APPENDIX TABLE C.2. IN-STATE ECONOMIC AND TAX IMPACTS OF THE AVERAGE ANNUAL INVESTMENT IN FLORIDA'S MAIN STREET PROGRAM, 2017-2021

	OUTPUT ($1,000)	EMPLOYMENT (JOBS)	EARNINGS ($1,000)	GDP ($1,000)
I. Total Effects (Direct + Indirect/Induced)				
1. Agriculture, Forestry, Fishing, and Hunting	604.6	7	301.2	310.1
2. Mining	1,046.2	3	188.1	870.1
3. Utilities	1,919.7	2	441.2	1,646.6
4. Construction	143,553.7	1,076	48,263.7	71,480.4
5. Manufacturing	20,824.3	74	5,144.4	9,221.1
6. Wholesale Trade	10,918.4	37	3,095.0	6,932.0
7. Retail Trade	16,581.6	156	6,253.8	10,348.1
8. Transportation and Warehousing	5,800.0	52	2,237.7	2,835.1
9. Information	4,816.0	10	1,022.1	2,573.9
10. Finance, Insurance, Real Estate, Rental, and Leasing	28,656.0	91	4,277.7	16,400.1
11. Professional and Business Services	17,012.5	143	8,573.3	9,929.8
12. Educational Services, Health Care, and Social Assistance	10,402.1	101	5,571.4	6,320.8
13. Arts, Entertainment, Recreation, and Hospitality	5,261.8	66	1,851.4	2,740.2
14. Other Services (including Government)	5,183.9	71	3,156.1	3,226.0
Total Effects	**272,579.8**	**1,888**	**90,377.0**	**144,834.5**
II. Distribution of Effects and Multipliers				
1. Direct Effects	142,511.0	1,068	47,935.6	70,992.1
2. Indirect Effects	66,792.6	384	21,813.7	36,351.6
3. Induced Effects	63,276.3	436	20,627.6	37,490.8
4. Total Effects	**272,579.8**	**1,888**	**90,377.0**	**144,834.5**
5. *Multipliers (=4/1)*	*1.913*	*1.768*	*1.885*	*2.040*
III. Composition of GDP				
1. Compensation				75,231.8
2. Taxes				8,073.0
a. Local				1,768.2
b. State				2,996.1
c. Federal				3,308.7
3. Profits, Dividends, Rents, and Other				61,529.6
4. Total GDP (=1+2+3)				**144,834.5**

	OUTPUT ($1,000)	EMPLOYMENT (JOBS)	EARNINGS ($1,000)	GDP ($1,000)
		Business	Household	Total
IV. Tax Accounts				
1. Labor Income		75,231.8	80,312.0	---------
2. Taxes		8,073.0	10,161.8	18,234.9
a. Local		1,768.2	1,819.7	3,587.9
b. State		2,996.1	517.0	3,513.1
c. Federal		3,308.7	7,825.1	11,133.8
Effects per Million Dollars of Initial Expenditure (in Dollars)				
Employment/Jobs				13.2
Earnings				$634,175.5
State Taxes				$24,651.5
Local Taxes				$25,176.4
GDP				$1,016,303.9
Initial Expenditure (in Dollars)				**$142,510,988**

FIGURE 3.1. SELECTED HISTORICAL COMMUNITIES IN FLORIDA AT HIGH RISK OF FLOODING



CHAPTER THREE:

PROFILE AND ECONOMIC IMPACTS OF FLORIDA MAIN STREET PROGRAM

FLOOD HAZARD ZONES IN FLORIDA'S HISTORIC COMMUNITIES

Historic cities in Florida are in coastal and inland areas, both of which risk exposure to floods and other natural hazards. The Federal Emergency Management Agency (FEMA) has identified and ranked flood zones across the United States by level of flood risk. These geographical areas are depicted on a community's Flood Insurance Rate Map (FIRM) and each zone reflects the severity or type of flooding in the area. Table 3.1 shows the definition of distinct FEMA flood hazard zones and their flooding risk level.

TABLE 3.1: RISK AREAS BY FEMA FLOOD HAZARD ZONES

RISK AREA	DESIGNATION		DESCRIPTION
Moderate-to-low Risk Area		**X1**	Area of minimal flood hazard, the area outside the 0.2% annual chance (or 500-year) flood and protected by levee from 1% annual chance (or 100-year) flood.
		X2	Area of moderate flood hazard, the area between the limits of the base flood and 500-year flood.
High Risk Area	Area of 1% annual chance of flooding and a 26% chance of flooding over the life of a 30 year mortgage.	**AE**	A base floodplain where base flood elevations are provided.
		AH	Chance of shallow flooding, usually in the form of a pond, with an average depth ranging from 1 to 3 feet.
		AO	River or s.tream flood hazard areas with 1% or greater chance of shallow flooding each year, usually in the form of sheet flow, with an average depth ranging from 1 to 3 feet
		A	No floodplain analysis is provided.
High-Risk Coastal Area		**VE**	Coastal areas with a 1% or greater chance of flooding and an additional hazard associated with storm waves. These areas have a 26% chance of flooding over the life of a 30-year mortgage.

The study team focused on 16 historical communities in Florida (listed in Figure 3.1) to evaluate the economic impacts of historical floods on

FIGURE 3.2. ST. PETE BEACH FLOODING AREAS

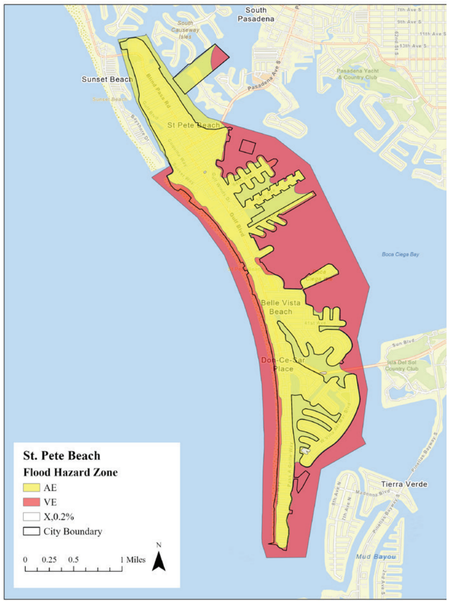


FIGURE 3.3. EVERGLADES CITY FLOODING AREAS

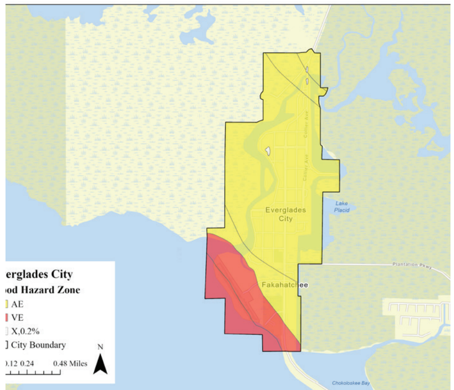


FIGURE 3.4. STUART FLOOD FLOODING AREAS

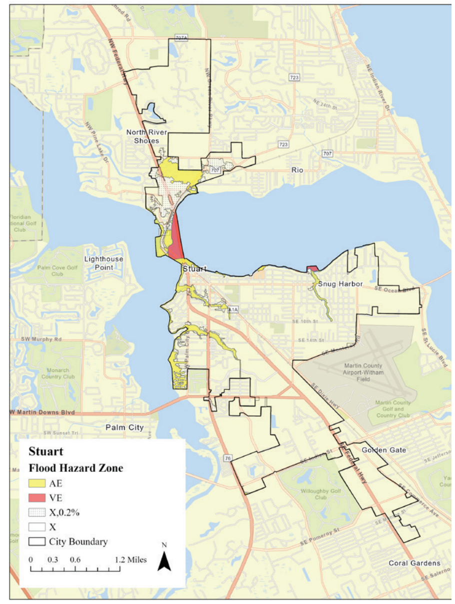


Table 3.2 lists the area size of different flood hazard zones by community. Zones X1 and X2 are moderate-to-low risk areas, while all other zones are high-risk areas. Note that each community has a different risk and magnitude (in terms of area) of exposure to flooding. This suggests that the economic activity, including tourism, of each community is affected differently by flood events.

TABLE 3.2: THE AREA (SQ MILE) OF FLOOD HAZARD ZONES BY COMMUNITY

COMMUNITY	MODERATE-TO-LOW RISK AREA		HIGH RISK AREA					TOTAL	% OF HIGH-RISK AREAS
	Xi	X2	A	AE	AH	AO	VE		
Apalachicola	0.27	0.78	0.00	0.57	0.06	0.00	0.94	2.63	60.1%
Cedar Key	0.03	0.07	0.00	0.35	0.00	0.00	1.70	2.15	95.3%
Daytona Beach	1.77	31.71	20.68	9.25	4.67	0.00	0.48	68.55	51.2%
Everglades City	0.00	0.00	0.00	0.96	0.00	0.00	0.24	1.20	99.8%
Fernandina Beach	1.07	6.44	0.00	3.45	0.00	0.02	1.16	12.15	38.1%
Fort Myers	1.00	27.97	0.01	8.28	3.58	0.00	8.38	49.22	41.1%
Hyde Park	0.07	0.95	0.00	0.17	0.00	0.00	0.07	1.25	18.6%
Key West	0.43	0.22	0.00	5.01	0.00	0.01	1.36	7.03	90.7%
LaBelle	0.97	11.95	0.51	1.00	0.14	0.00	0.00	14.58	11.4%
Lake Worth	0.23	4.85	0.00	1.56	0.00	0.00	0.18	6.81	25.4%
Leesburg	0.04	24.88	7.10	7.97	0.00	0.00	0.00	39.99	37.7%
Port St. Joe	0.98	4.17	1.37	3.05	0.00	0.00	1.26	10.84	52.4%
St. Augustine	1.78	1.18	0.00	7.05	0.00	0.00	2.78	12.78	76.9%
St. Pete Beach	0.00	0.00	0.00	2.63	0.00	0.00	2.12	4.75	99.9%
Stuart	0.29	5.97	0.00	0.34	0.00	0.00	0.09	6.69	6.4%
Venice	0.92	10.76	0.42	4.44	0.00	0.00	0.82	17.36	32.7%

Assessing flood impacts can use various approaches. For decades, a large body of research has concentrated on the impact of flooding on engineering and macroeconomic indicators, such as property damage and gross domestic product.[29] These studies tended to find negative short-term effects on direct economic growth, while impacts on long-term indirect economic costs varied.[30] In addressing some limitations of this body of work (i.e., narrow scope, lack of counterfactual analyses, overreliance on national-level data), more-recent microeconomic studies on the costs of flooding have focused on direct and indirect socio-economic impacts, including health and environmental effects,[31] household welfare[32] and inequities in flood-risk exposure.[33] For instance, they find a correlation between flooding events and reduced consumption at the household level, in part due to negative impacts on income.[34]

To date, few studies explore the effects of flooding on tourism. Closely linked to the present study, Chen et al. (2021) model the impact of the

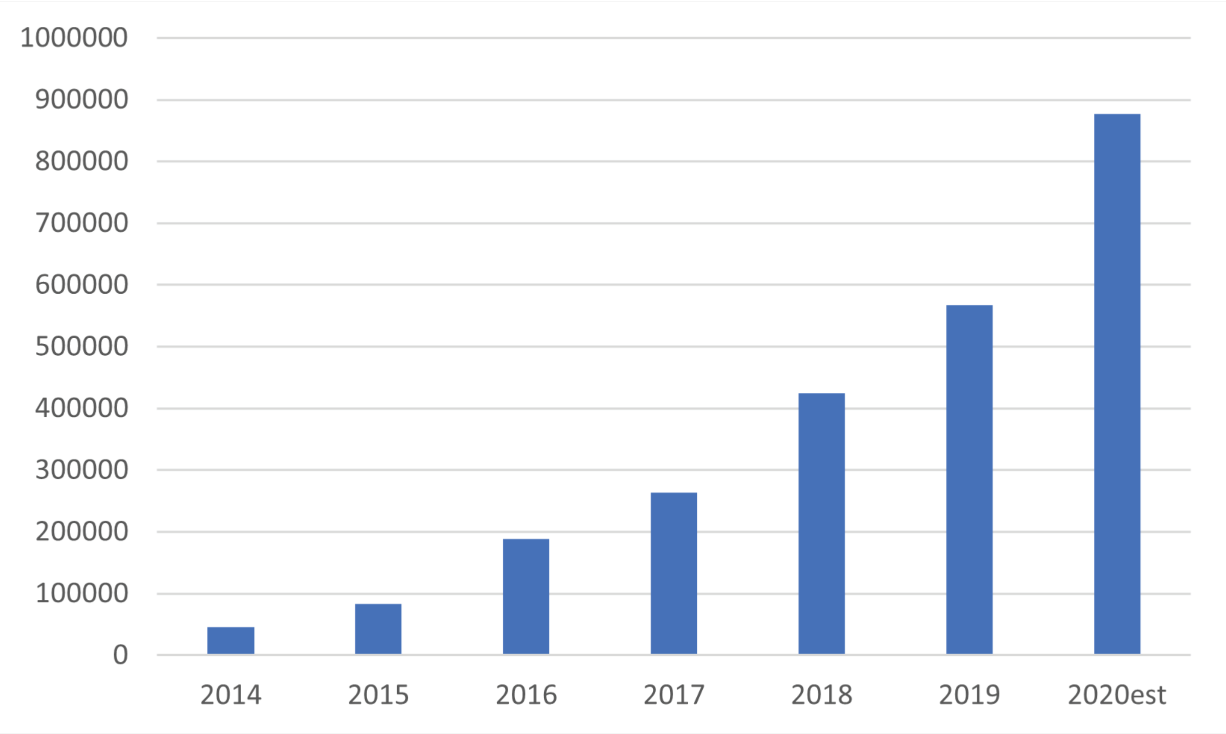
2017 Hurricane Irma on Collier County, Florida. Using Airbnb data, they find that the average direct loss for a typical Airbnb property located in the county's coastal zone was about $30,000, while the daily indirect loss of Airbnb income in that coastal zone was about $18,000.[35] In a similar vein, a study on the impact of high-tide flooding on heritage tourism in Annapolis, Maryland, (Hino et al., 2019) obtain a robust correlation between high-tide flooding and fewer visits to that city's historic downtown, translating to a loss of revenue in ranging from $86,000 to $172,000 in 2017 due to flood events.[36]

Considering earlier studies on the economic effects of flooding on tourist communities, this chapter examines the degree to which short- and long-term economic activity in historic communities is affected by flooding. It specifically focuses on activities linked to tourism (i.e., accommodation, sales revenue, sales taxes, and related employment). The first part of this chapter examines of the impact of flood events on shared accommodations (Airbnb activity). That is followed by an analysis of the magnitude of flood-caused changes in Florida Sales and Use Tax revenues at the county level— for those counties in which the 16 selected communities sit. The same procedure is repeated to examine the effects of flooding on employment.

PART 1: AIRBNB INDUSTRY IN FLORIDA

Tourism supports a significant portion of economic activity in Florida. In 2019, Florida was the destination of choice for 131 million domestic tourists and 14.5 million international tourists. According to the 2019 Contribution of Travel and Tourism to the Florida Economy report,[39] tourism spending amounted to approximately $99 billion, which generated a total economic contribution of $96.5 billion on sales and supported more than 1.6 million jobs in the state. Between 2014 and 2019, the number of nights spent by tourists in Florida increased by 48%, mostly due to the significant growth in the number of domestic visitors. A flourishing Airbnb market has partly supported this positive trend in tourism activity in Florida. In 2018 alone, the annual increase in Airbnb capacity corresponded to more than 400 thousand bedroom-equivalents. Figure 3.5 summarizes the increase in Airbnb accommodations between 2014 and 2020.

FIGURE 3.5. NEW AIRBNB RENTALS BY YEAR AND CURRENTLY ACTIVE UNITS (BEDROOM EQUIVALENTS) IN FLORIDA, 2014-2020



Source: AirDNA

Figure 3.5 highlights the linear increase in Airbnb supply during this timeframe. This increase is not exclusive to Florida, and some researchers suggest a possible oversupply in the Airbnb market.[37,38] This additional accommodation supply, however, is critical to increase the state's capacity for tourism and has directly impacted the 16 communities of focus— Table 3.3 highlights the increase in Airbnb supply by community between 2015 and 2021.

Table 3.3 shows that Daytona Beach, Key West, and St. Pete Beach are among the top three communities in terms of number of Airbnb rentals from 2015-2021. In contrast, LaBelle, Leesburg, and Everglades City host very few Airbnb units. Still, most communities experienced a remarkable increase in the number of Airbnb rentals from 2017 to 2021. For instance, Airbnb rentals in Cedar Keys, Daytona Beach, Everglades City, and St. Pete Beach increased by over 500% from 2015 to 2021. The trends depicted on Table 3.3 also indicate that growth in Airbnb rentals decelerated since the COVID-19 pandemic outbreak, compared to growth rates observed from 2015 to 2019. Given the recentness and rapid maturity of this genre of lodging, a deceleration of growth is to be expected. Furthermore, this form of shared accommodation shows significant variations in terms of average cost and size across communities. For example, in January 2021, the average daily price (ADR) of Airbnb rentals by community ranged from $557 in Key West to $95 in Leesburg.

TABLE 3.3. AIRBNB RENTALS PER COMMUNITY, 2015-2021

COMMUNITY	JAN-15	JAN-17	JAN-19	JAN-21
Apalachicola	6	26	80	115
Cedar Key	2	12	117	185
Daytona Beach	94	628	2,749	3,954
Everglades City	4	11	60	85
Fernandina Beach	17	186	834	1,076
Fort Myers	29	140	764	755
Hyde Park	11	98	165	197
Key West	92	526	2,642	3,080
LaBelle	0	0	0	3
Lake Worth	42	216	595	736
Leesburg	1	10	17	39
Port Saint Joe	2	63	163	248
Saint Augustine	73	248	868	1,484
St Pete Beach	75	379	1,597	2,359
Stuart	11	39	170	218
Venice	24	100	508	575

Source: AirDNA

Airbnb revenue per community is a function of the number of available rentals and the average price paid by visitors. Airbnb revenues largely depends on tourism, which undoubtedly differs across the 16 communities of focus. For example, the Airbnb activity in LaBelle, Leesburg and Everglades City represented less than $1 million in 2021. In contrast, the Airbnb activity in Daytona Beach, Key West, St. Pete Beach, and St. Augustine represented more than $40 million in revenues for local hosts in each. It is important to keep in mind that lodging only represents a small share of the money spent by visitors: According to Visit Florida (2021), an average tourist in Florida spends 30% of their money in Lodging leaving the other 70% to be spent in local shops, restaurants, transportation, and entertainment.

In terms of flood risk, the exposure of Airbnb sites to flooding depends on the orographic characteristics of the hosting community, as well as the exact location of the site. Given an area like Everglades City or St. Pete Beach, where 99.9% of the land is classified as high-risk flood areas, it is expected that nearly all Airbnb activity is in high-risk areas. However, in other communities with somewhat equal terrain distributions across low, moderate, and high-risk areas, the location can depend on other factors like insurance policies, urban growth, zoning restrictions, or even the easiness of obtaining construction permits. Table 3.4 shows the distribution of Airbnb revenue in the various flood hazard zones in each historical community.

TABLE 3.4. DISTRIBUTION OF AIRBNB REVENUE BY FLOODING RISK AREA, FLORIDA COMMUNITIES, 2021

COMMUNITY	MODERATE-TO-LOW RISK AREA		HIGH RISK AREA			HIGH RISK COASTAL AREA
	X1	X2	AE	AH	AO	VE
Apalachicola	22%	17%	52%	0%	0%	10%
Cedar Key	1%	5%	44%	0%	0%	49%
Daytona Beach	0%	81%	1%	0%	0%	18%
Everglades City	0%	0%	91%	0%	0%	9%
Fernandina Beach	7%	61%	7%	0%	2%	22%
Fort Myers	3%	60%	33%	1%	0%	2%
Hyde Park	4%	93%	3%	0%	0%	0%
Key West	21%	25%	48%	0%	0%	6%
LaBelle	0%	100%	0%	0%	0%	0%
Lake Worth	10%	70%	20%	0%	0%	1%
Leesburg	%	84%	16%	0%	0%	0%
Port St. Joe	19%	6%	72%	0%	0%	3%
St. Augustine	22%	5%	71%	0%	0%	2%
St. Pete Beach	0%	0%	92%	0%	0%	8%
Stuart	6%	82%	9%	0%	0%	4%
Venice	6%	55%	36%	0%	0%	3%

The results displayed on Table 3.4 illustrate the various degrees of flooding exposure for Airbnb units across communities. In LaBelle and Hyde Park, for example, more than 95% of Airbnb revenues originated from moderate-to-low risk areas. At the same time, in seven of the sixteen municipalities, more than 50% of revenues were collected from Airbnb units in high-risk areas. As expected, in St. Pete Beach and Everglades City, all (100%) Airbnb activity was located in High-Risk Areas. Other places that show a significant concentration of Airbnb activity in High-Risk flooding areas are Cedar Key, Port Saint Joe, and Saint Augustine (each with more than 70% of the Airbnb activity located in High-Risk Areas). Table 3.5 displays the Airbnb unit concentration by flooding risk area for each community of focus, while also indicating the average daily rate in each.

TABLE 3.5. AIRBNB CONCENTRATION AND PRICE BY FLOODING RISK AREA, FLORIDA COMMUNITIES, 2021

COMMUNITY	% AREA HIGH-RISK	% OF REVENUE IN HIGH-RISK	AVERAGE PRICE IN HIGH-RISK AREA	AVERAGE PRICE IN LOW-MODERATE RISK AREA
Apalachicola	60%	62%	$219.90	$200.40
Cedar Key	95%	93%	$183.40	$197.00
Daytona Beach	51%	19%	$213.80	$234.00
Everglades City	100%	100%	$146.60	--
Fernandina Beach	38%	31%	$323.90	$309.00
Fort Myers	41%	36%	$196.10	$158.80
Hyde Park	19%	3%	$250.10	$240.70
Key West	91%	54%	$627.30	$575.50
LaBelle	11%	0%	--	$89.00
Lake Worth	25%	21%	$311.20	$200.00
Leesburg	38%	16%	$266.90	$138.80
Port St. Joe	52%	75%	$297.40	$272.60
St. Augustine	77%	73%	$248.10	$229.10
St. Pete Beach	100%	100%	$313.90	--
Stuart	6%	13%	$169.80	$233.20
Venice	33%	39%	$174.10	$203.30

The results displayed in Table 3.5 suggest that in a number of communities, Airbnb rentals tend to be disproportionally located in low- to moderate-risk areas. This seems particularly true in the case of Daytona Beach, where high-risk flooding zones comprise more than 50% of the community but only 19% of the Airbnb units sit within those zones. The same holds true for Hyde Park and Key West.

Table 3.5 also shows that in most communities (9 out of the 16), Airbnb prices (average daily rates) were higher in high-risk areas than in moderate-to-low risk areas. In Leesburg and Lake Worth, for instance, the average daily rates in high-risk areas were more than 50% higher than those located in less risky areas. These differences in price could be explained by several factors. For one, ocean front properties tend to be in high-risk areas and generally boast higher-than-average prices. Moreover, Airbnb average daily rates (ADR) could be directly affected by the risks of flooding in the rental unit's neighborhood. For example, local authorities often establish ordinances for residences and businesses located in flood zones. Such ordinances might require added precautionary infrastructure to the property, which would be passed on to any renter in the form of a higher ADR. Such property improvements also might be made due to demands of insurance companies and also results in higher ADRs.

AIRBNB ACTIVITY AND FLOODING EVENTS

An important aspect to consider when studying Airbnb markets is consumer response to natural disasters, i.e., tourists' perceptions of places in the wake of events. Flooding, and the damage associated with it, can decrease the attractiveness of a place, often causing visitors to reconsider visitation. For this reason, we collected information on all significant flood events for the 16 Florida historical communities from 2015 to 2021. We gleaned data from multiple sources, including NOAA Storm Events Database,[40] FEMA declared flood disasters,[41] FEMA historical floods at state and county,[42] and USGS historical flood events.[43] The NOAA Storm Events Database is, perhaps, the most comprehensive record of weather and climate events in the U.S: it contains records on the occurrence of storms and other significant weather phenomena that have sufficient intensity to cause loss of life, injuries, significant property damage, and/or disruption to commerce. It also includes data on other significant meteorological events, such as record maximum or minimum temperatures or precipitation that occurs in connection to another event. For each event, the database lists the event type, start and end date/time, state and county, latitude/longitude (if available), a brief description of the event, and other supplemental information. We extracted any event characterized as a "flood", "coastal flood", or "flash flood." In addition, we also gathered information on some non-flood events that might have caused a modicum of flooding in the 16 communities; these were mostly labelled tropical storms, surge storms, or, simply, heavy rainfall.

We ultimately identified 90 flood events across the communities over the study period. While we anticipate that this list is not exhaustive and that there were other undocumented flood-type events in the communities, we assume these events to be "minor," i.e., not significantly impactful on visitation. The number of events in each community is shown in Figure 3.6. The number of events for different types in each year is shown in Figure 3.7. In addition, a detailed description of each event is listed in Appendix D.

The results presented in Figure 3.6 indicate that St. Augustine experienced the most flood events (21). All other communities suffered less than ten events. Based on the storm and Airbnb data gleaned, our subsequent statistical analyses exclude two of the 16 communities of focus: LaBelle and Hyde Park— LaBelle had no Airbnb rentals at the time of its lone event, and Hyde Park had no flood event from 2015 through 2021.

FIGURE 3.6. NUMBER OF FLOOD EVENTS BY HISTORIC FLORIDA COMMUNITY, 2015-2021

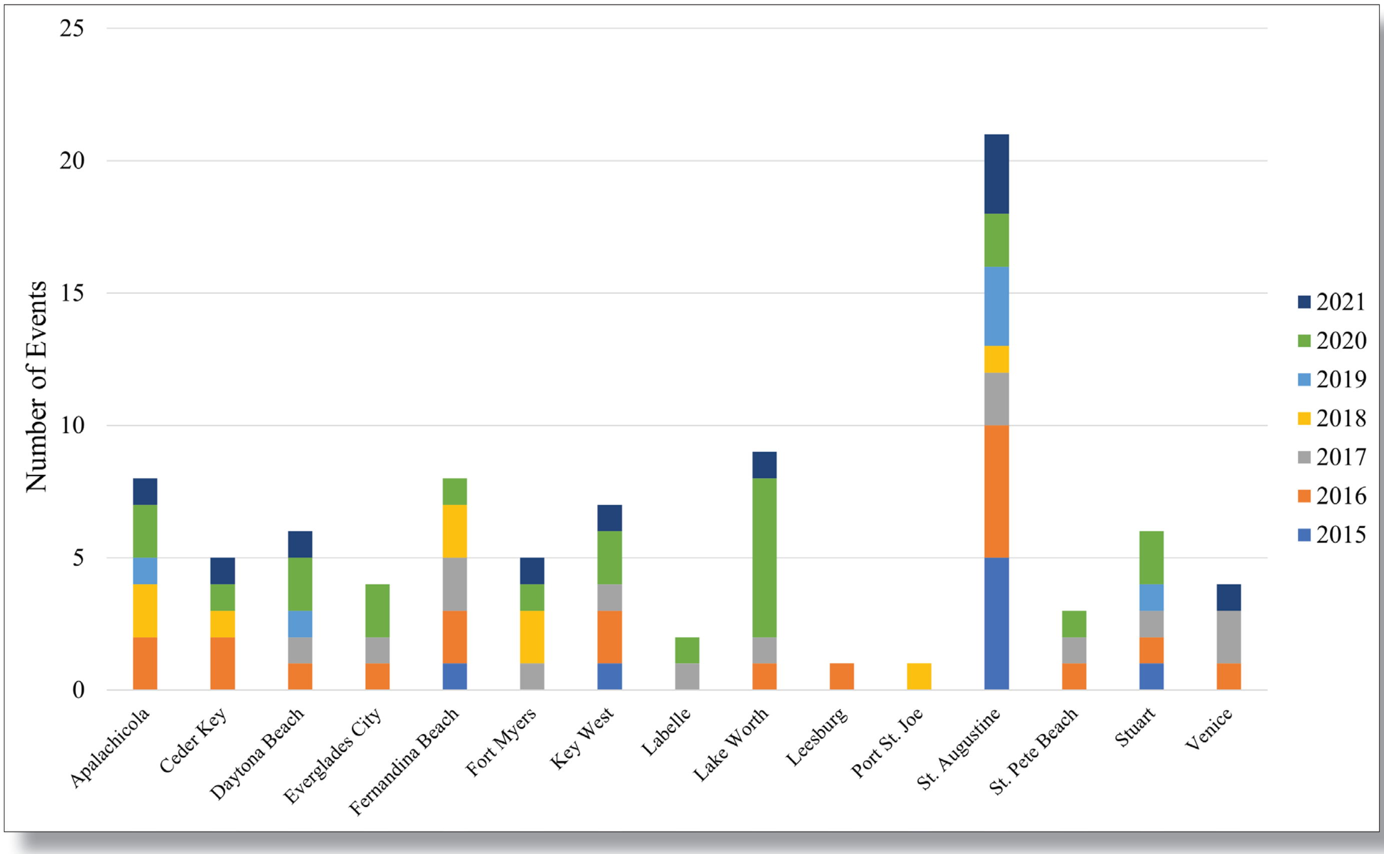
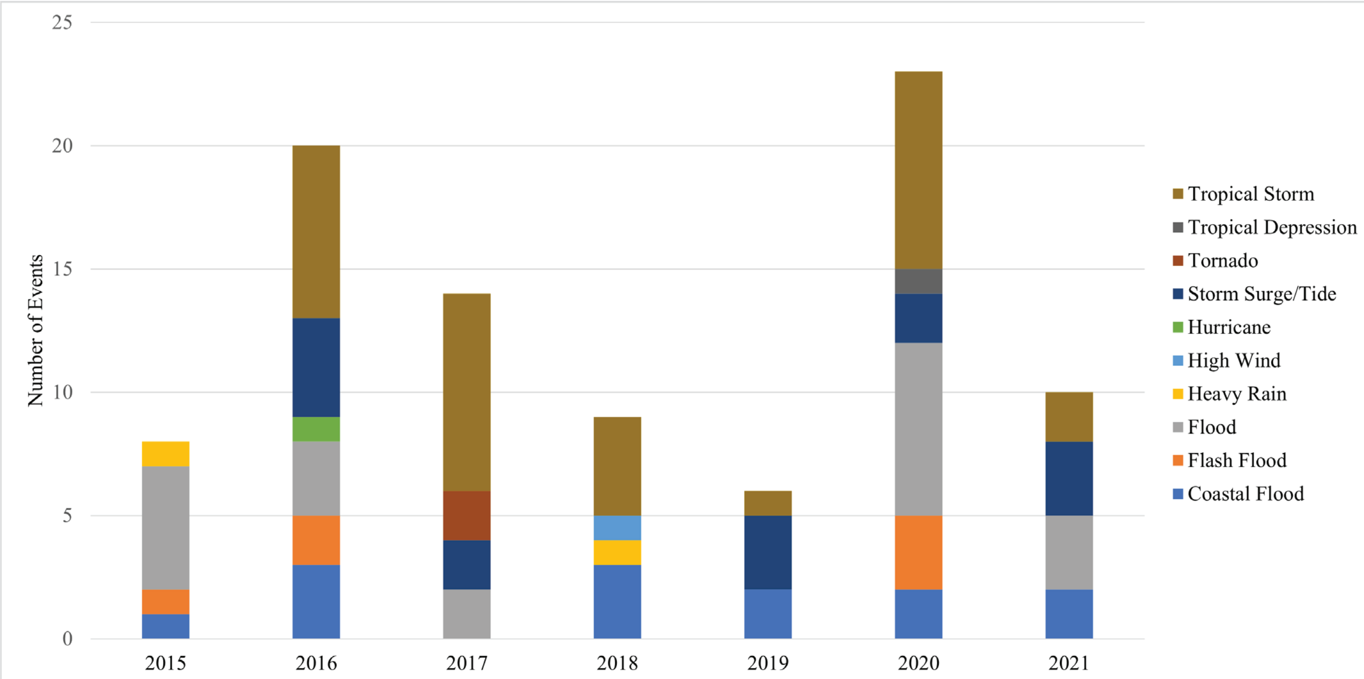


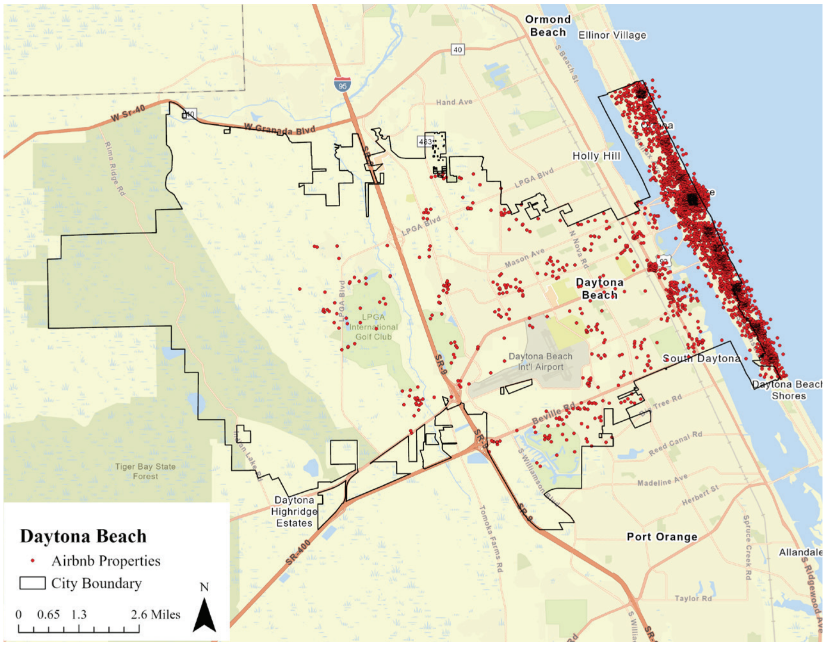
FIGURE 3.7. NUMBER OF EVENTS BY TYPE IN SELECTED HISTORIC FLORIDA COMMUNITIES, 2015-2021



3.6. The number of events for different types in each year is shown in Figure 3.7. In addition, a detailed description of each event is listed in Appendix D.

The results presented in Figure 3.6 indicate that St. Augustine experienced the most flood events (21). All other communities suffered less than ten events. Based on the storm and Airbnb data gleaned, our subsequent statistical analyses exclude two of the 16 communities of focus: LaBelle and Hyde Park— LaBelle had no Airbnb rentals at the time of its lone event, and Hyde Park had no flood event from 2015 through 2021.

FIGURE 3.8. AIRBNB PROPERTIES IN DAYTONA BEACH, 2015-2021



We had few variables at our disposal to analyze the monthly total revenues or reservation days for Airbnb rental units at a community level. Only the number of available units in a community (# available units), the ADR, and the share of available units in the community's high-risk zones (% in high risk). Such model under-specification required the use of binary variables to control for basic characteristics associated with respect both to a given community over time and to a specific year across all communities. That is, we controlled for "two-way fixed-effects" (space and time). Thus, the model took the following functional form:

$$y_{it} = \sum_{j=1}^{N} \alpha_j d_{it}^{j} + x'_{it}\beta + u_{it}\,, \quad u_{it} \sim iid\,(0, \sigma_u^2)$$

In this case, the parameter d corresponds to a binary variable for each community $\mathbf{i}$ and for each month $\mathbf{t}$, and if $i = j, d_{it}^{j} = 1$, and $\mathbf{0}$ in all other cases.

In addition, we tested for the duration of the effects of flood events on Airbnb outcomes (revenues and reservation days) for four spans of time. First, we tested for effects within the month of the event (*event*). The extent to which Airbnb rentals are affected by an event within the same month as an event can be observed can depend heavily upon exactly when the event takes place within that month. Clearly, if the event occurs on the last day of a month its effects should be smaller than if it occurs at the start of the month, there was any effect felt in the month after the event (*event1*), if there was any effect felt in the three months after the event (*event3*) and if there was any effect felt in the six months after the event (*event6*). The model was tested with distinct dependent variables to confirm for effects both in prices (ADR), quantities (*reservation days*) or *Total revenues*. All the simulations that included the flood events as explaining the level of prices revealed to be not statistically significant and therefore are not shown. Some control variables were included as: the share of Airbnb located in high-risk areas, average price (*ADR*), and the number of available rentals in the market (*# available units*). Table 3.7 shows the results for the models with LSDV estimators and the impacts in reservation days.

TABLE 3.7. THE IMPACTS OF FLOOD EVENTS IN AIRBNB RESERVATION DAYS AND REVENUES TABLE 3.4. DISTRIBUTION OF AIRBNB REVENUE BY FLOODING RISK AREA, FLORIDA COMMUNITIES, 2021

DEPENDANT VARIABLE	MODEL 1 *Reservation Days*	MODEL 2 *Reservation Days*	MODEL 3 *Reservation Days*	MODEL 4 *Total Revenues*	MODEL 5 *Total Revenues*	MODEL 6 *Total Revenues*
Constant	-2220*** (-4.23)	2280*** (-4.36)	-2919*** (-4.20)	-1.2e+06*** (-5.91)	-1.2e+06*** (-5.98)	-1.2e+06*** (-5.86)
% in high risk	-15.8** (-2.32)	-15.3** (-2.24)	-15.3** (-2.25)	-1.3e+04*** (-4.94)	-1.3e+04*** (-4.89)	-1.3e+04*** (-4.90)
ADR	18.6*** (10.09)	18.8*** (10.18)	19.2*** (10.43)	1.4e+04*** (19.29)	1.4e+04*** (19.36)	1.4e+04*** (19.54)
# available units	0.38*** (25.67)	0.38*** (25.57)	0.38*** (25.88)	1.1e+01*** (19.51)	1.1+01*** (19.50)	1.1+01*** (19.68)
event	-981** (-3.09)			-2.1e+05* (-1.73)		
event1		-748** (-2.36)			-2.0e+05* (-1.66)	
event3			-932* (-4.32)			-2.6e+05*** (-3.09)
F-test (p-value)	220 (0.0000)	219 (0.0000)	222 (0.0000)	185 (0.0000)	185 (0.0000)	186 (0.0000)
n	1,138	1,138	1,138	1,138	1,138	1,138
R^2	.814	.813	.816	.787	.787	.789

According to the results presented in Table 3.7, the presence of a flooding event has a statistically significant effect on both Reservation Days and Revenues in the Airbnb market of the 14 historical communities included in the econometric analysis. The coefficients estimated in Models 1 and 4 show that the 14 communities experienced an average reservation decline of 981 unit-nights and an average decrease in Airbnb revenues of $210,000 in the month of the flood event. The number of unit-nights lost is substantial since, over the period of study, the average number of reservation days per month across all 16 communities was 3,538. Thus, a typical community lost about a 16.7% of its reservation-days during the month of a flood. The order of magnitude of the revenue losses was similar since average monthly revenues across the period for all 16 communities was about $971,000; so, a loss of $210,000 suggests a typical loss of 21.6% of Airbnb revenues during the month of a flood.

Alternatively, according to Model 2 and 5, the communities experienced a reservation decline of 764 unit-nights and $200,000 in the Airbnb revenues in the month after the flooding. Finally, the econometric modelling also identifies effects beyond the short-term. It suggests that reservations declined across the 14 communities by an average of 932 unit-nights and $260,000 in Airbnb revenues during each of the three months following a flood event. Numbers across these models should not be accumulated; The three statistical exercises are separate. The coefficients for the control variables show how much the other values contributed for the results in terms of reservation days and revenues per community and per month.

A few issues potentially arise in the above analysis. One is that outcomes of larger communities, like Daytona Beach, affect the statistical outcomes more heavily than do those for smaller communities, like Cedar Key and Everglades City. This is simply because these communities have greater volumes of revenues and reservation days. Further, as suggested earlier, it also is possible that the ADR and supply of units fall in the immediate wake of a flood. Thus, coefficients of these variables might well vary with the event variables, and the analysis undertaken does not take this into account; that is, any event-caused variation in those two variables is absorbed by their coefficients.

To avoid such statistical endogeneity, forced the analysis to abandon ADR and # of available units as control variables. This meant that we had even fewer relevant variables at our disposal to analyze Airbnb rental units. So, we took a strict time-series approach, using as a primary predicting variable the lag of the dependent variable. That is, to estimate this month's Airbnb reservations, we used last month's reservation count as a primary predictor and then used the flood event variables—event, event1, event3, and event6—to identify the impact of the flood event. Note that we still include the panel controls that adjust for monthly seasonal changes that affect all communities equally as well as any distinct community differences that are stable over time. A generalized formulation of the approach is displayed below.

$$y_{it} = y_{i,t-1} + \sum_{j=1}^{N} \alpha_j d_{it}^{j} + u_{it}\,, \;\; u_{it} \sim iid\,(0, \sigma_u^2)$$

We used the natural log of the dependent variable and its lag. While this approach cures some issues affiliated with community size, it also enables ready estimates of the change induced by the flood events. This is because log-log regression analyses yield coefficients that are elasticities. This will be elaborated upon during interpretation of the findings.

TABLE 3.8. THE IMPACTS OF FLOOD EVENTS IN AIRBNB RESERVATION DAYS AND REVENUES IN LOG-LOG FORM

DEPENDENT *Independent*	MODEL 7 LN(ADR)	MODEL 8 LN(RESERVATION DAYS)	MODEL 9 LN(REVENUE)
Constant	2.232** (17.94)	0.8337** (10.86)	2.557** (14.01)
Lag of dependent	0.5186** (28.15)	0.7523** (39.97)	0.6744** (31.90)
event	0.04503 (0.22)	-0.07302* (-1.82)	-0.03169 (-0.46)
event1	-0.01679 (-0.31)	0.05954 (1.22)	-0.03897 (-0.46)
event3	0.03860 (1.03)	-0.00284 (-0.09)	0.02505 (0.43)
F-test **(p-value)**	107 (0.0000)	1,730 (0.0000)	886 (0.0000)
n	1,138	1,138	1,138
R^2	.684	.973	.947

Model 7 in Table 3.8 checks whether the ADR falls immediately after a flood. The lack of statistical significance (no asterisks on the coefficients) in the event variables suggests that there is no systematic trend in the ADR that can be attributed to flooding. However, the somewhat weak R2 for a time-series analysis (.684) and the positive sign of the coefficient for event (granted, it is not statistically significant) in that model hint at some irregularities in the Airbnb ADR over time.

Model 8 in Table 3.8 pertains to reservation days and has a rather robust R2, which means it has reasonable predictive power for a time series analysis. Besides the Constant and the lag of reservation days, the coefficients of which we can essentially ignore since they are controls, only event is identified as being statistically different from zero. It has the expect negative sign as well; that is, it signifies that something apparently related to the flooding event reduced the number of reservation days. The -0.7302 value of the coefficient suggest that on average in the month of a flooding event the number of Airbnb reservation days available in a month decreased by about 7.3% across the 16 communities. While not statistically significant, the size of the coefficient for event1 is nearly the size of that for event, which suggests that the count of reservation days nearly rebounds the month following the flood event. Given the coefficient's size, its lack of statistical significance is a bit puzzling, however. It points to substantial variation in the timing of the post-flood rebound. That for event3, while negative and not statistically significant, is extremely small, suggesting that the number of reservation days does not change much after the month following a flood.

The lack of statistically significant results in the event variables for Airbnb revenues in Table 3.8 (model 9) is surprising. Particularly so, given that we obtained some solid results for reservation days as well as for the parallel models of revenues in Table 3.7. Referring to models 7 and 8, it may be that an inconsistent, modest rise in the ADR counteracts the drop in the share of reservation days in the immediate wake of a flood. The fact that we obtained expected results in Table 3.7 suggests that this rise in ADR is more evident in smaller historic communities.

In summary, flooding negatively affects Airbnb rentals in Florida's historic communities. The effects are tough to peg, however. On average the communities lose on the order of 7% of their Airbnb reservation days during the month of a flood. Larger historic communities may well be affected more heavily. Despite the loss of reservation days, Airbnb revenues losses were not as evident, at least among smaller communities. It is not entirely clear why this might be the case. Some statistical evidence suggests Airbnb rental rates rise slightly in the wake of floods. Rather than a true rise in the average rate, it may instead be that some units with lower daily rates are temporarily removed from the market. This would both explain the apparent nonsystematic post-flood rise the ADR as well a "nondetectable" fall in the Airbnb revenues in smaller communities.

PART 2: FLORIDA COUNTY-LEVEL GROSS SALES, TAXABLE SALES, AND SALES TAX COLLECTIONS

Business activity in Florida is subject to sales and use tax. According to the Florida Department of Revenue's Business Owner's Guide for Sales and Use Tax, business activity subject to sales in use taxes in Florida, includes, but is not limited to:

- selling, leasing, licensing, or renting tangible personal property (i.e., electronics, furniture, motor vehicles, certain food and meals, and other goods);
- leasing, licensing, or renting real property;
- leasing, licensing, or renting living, sleeping or housekeeping accommodations;
- selling detective or burglar protection service, nonresidential cleaning service, or nonresidential pest control service;
- selling admissions to any place of amusement, sport, or recreation; and
- operating amusement machines.

Note that most of the items listed are related to retail sales and personal services, the hospitality industry (i.e., accommodation and food services), or the leisure industry (i.e., arts, entertainment, and recreation). But not all do. Except for those on accommodations, local residents are more apt to pay sales taxes than are visitors. That is, sales tax revenues are a less focused measure of tourism spending than are Airbnb rentals. Moreover, they are readily available in Florida only at the geography of counties, not by community.

SALES ACTIVITY AND FLOODS IN FLORIDA: BACKGROUND

Flooding should still dampen both retail sales and receipts of eating and drinking establishments and, hence, cause sales tax revenues to dip. Further, we recognize that all 16 historic communities selected are far smaller than the county in which they are located. The flooding events, however, are certainly not just focused on the 16 communities and undoubtedly cut a broader geographic swath. In this regard, observing change in sales taxes even at the county level should yield a reasonable sense of the loss of tourism business activity for communities in those counties.

The counties for each of the 16 communities are displayed in Table 3.9. Note that no two communities are in the same county. This enables the analysis of sales tax collections to parallel that for the Airbnb information in the previous section of this report.

TABLE 3.9. THE COUNTIES FOR THE 16 SELECTED HISTORIC COMMUNITIES

COMMUNITY	COUNTY
Apalachicola	Franklin
Cedar Key	Levy
Daytona Beach	Volusia
Everglades City	Collier
Fernandina Beach	Nassau
Fort Myers	Lee
Hyde Park	Hillsborough
Key West	Monroe
LaBelle	Hendry
Lake Worth	Palm Beach
Leesburg	Lake
Port St. Joe	Gulf
St. Augustine	St. Johns
St. Pete Beach	Pinellas
Stuart	Martin
Venice	Sarasota

Study team members downloaded and collated data from the Florida Department of Revenue website.[44] We centered on monthly data from January 2017 to December 2021 for gross sales, taxable sales, and sales tax collections. Naturally, sales taxes only apply to taxable sales, and gross sales are the sum of taxable and exempt sales, where exempt sales are sales (or rentals) to tax-exempt establishments. We then included the same flooding event binary variables applied to the Airbnb case: event, event1, event3, and event6.

SALES ACTIVITY AND FLOODS IN FLORIDA: A STATISTICAL ANALYSIS

Table 3.10 shows the statistical results. First, note that the R2, a statistic that indicates a model's explanatory power, is strictly above .99 and, thus, is extraordinarily strong across all models. The core results are those pertaining to the event variables; the other two—the constant and the lag of the dependent variable—are controls.

In all three measures (i.e., the dependent variables) shown in Table 3.10, it is clear that volumes dropped during the month of a flood event, as denoted by the independent variable event. A drop of 3.622% is identified for gross sales, for taxable sales it is 3.681%, and for sales tax revenues 3.434%. Note, however, that for gross sales our confidence is lower about its negative effect than it is for the other two measures; that is, we are less certain that the elasticity (or coefficient) identified for gross sales in the Table 3.10 is statistically different from zero. The fact that it is in line with those for taxable sales and sales tax revenues makes it more acceptable, however.

TABLE 3.10. THE IMPACT OF FLOODING ON MONTHLY GROSS SALES, TAXABLE SALES, AND SALES TAX COLLECTIONS, 2015-2021

	DEPENDENT		
INDEPENDENT	LN(GROSS SALES)	LN(TAXABLE SALES)	LN(SALES TAX REVENUES)
Constant	13.5102** (20.86)	6.9777** (13.75)	5.2433** (12.66)
Lag of dependent	0.3389** (10.70)	0.9941** (25.09)	0.6897** (28.15)
event	-0.03622* (-1.44)	-0.03681** (-2.00)	-0.03434** (-2.02)
event1	-0.03409 (-0.33)	-0.05112** (-2.30)	-0.05775** (-2.80)
event3	0.02273 (0.28)	0.004806 (0.27)	0.01236 (0.74)
event6	0.006365 (0.62)	0.02581* (1.96)	0.02608** (2.13)
F-test	24.18	130.28	164.43
(p-value)	(0.0000)	(0.0000)	(0.0000)
n	1,138	1,138	1,138
R^2	.684	.973	.947

The elasticities for event1 (i.e., the month following the event) are a bit more interesting. They fall a bit more (their absolute values are larger) and remain statistically different from zero for taxable sales (from -3.7% to -5.1%) and sales tax revenues (from

-3.4% to -5.4%) but remain at about the same level as for event and are not at all statistically different from zero for gross sales. It is not clear why gross sales do not follow taxable sales. But a rationale is that exempt organizations in some of the 16 counties spend more during recovery efforts.

Elasticities for event3 and event6 are positive. Further, in the case of event6 for taxable sales and sales tax revenues they are also statistically different from zero. The main take away from this finding is that all three measures of sales tend to recover within six months.

PART 3: FLORIDA COUNTY-LEVEL TOURISM EMPLOYMENT

DATA DESCRIPTION: THE QUARTERLY CENSUS OF EMPLOYMENT AND WAGES

As part of the analysis, we also thought it would be useful to examine how the job count responds to flooding. The best monthly publicly available data on jobs can be secured from the Quarterly Census of Employment and Wages (QCEW) program. The QCEW produces employment and wages by industry down to the geography of a county. The program's data are a census of all employers covered by state Unemployment Insurance laws. It also includes federal workers covered by the Unemployment Compensation for Federal Employees program. It does not cover the self-employed (a.k.a., business proprietors), however. The QCEW job count covers about 98 percent of all jobs nationwide.

This reports focus, as mentioned previously, is on tourism, particularly that associated with historic communities. This section centers on tourism-related jobs. Recall, the QCEW does not include proprietors and their income. This is somewhat problematic because many tourism-affiliated businesses are run by sole proprietors, for example Airbnb's and private campsites, hot-dog and ice-cream stands, boutiques, convenience stores, laundromats, and tattoo parlors. But it is also highly unlikely that an owner of a business will not employ themselves during hard economic times, like in the wake of a flooding event. In this vein, there is likely to be very little bias in any elasticities calculated using QCEW data. Still, in interpreting results, we should keep in mind that the data pertain to employees only, and do not include business owners.

TOURISM JOBS: JOBS ARE PEOPLE AND SHOULD REACT TO FLOODS ACCORDINGLY

Compared to sales, we expect jobs to be less elastic (vary less) to flooding. This is because jobs and wages are "relatively sticky" in economics parlance. That is, they are not as responsive to economic conditions. In part, this is because managers believe cutting jobs or wages hurts employees' morale.[45] If managers act otherwise, it becomes far tougher for them to secure the cooperation of employees and to convince them to internalize the managers' business longer-run objectives.

We define tourism jobs as those in the Leisure and hospitality sector (entertainment, sports, accommodations and eating and drinking establishments) and in the Retail sector. The latter includes most stores and dealers but does not include personal care services and repair services. Of the two categories, Note, many activities in the Leisure and hospitality sector are also demanded by nearby Florida residents. Still such activities generally align better with tourism activities undertaken by nonlocal families than are retail sector activities. In this vein, we should expect jobs in the leisure and hospitality sector to be more elastic to flooding than jobs in retail industries.

IMPACTS OF FLOODING ON TOURISM JOBS: A TIME-SERIES ANALYSIS

Table 3.11 displays the results of the impact analysis of tourism jobs at the county level for the 16 selected communities. As expected, the elasticities for these jobs are smaller and more shortly lived than are impacts on sales for the same counties. That is, the elasticities are less than half of those for sales (-1.5% versus around -3.5%), and any deleterious effects appear not to be experienced after the month in which flooding takes place. Jobs also seem to recover more quickly after a flood than do sales. Moreover, the job losses, no matter how temporary, are experienced more heavily in Leisure and hospitality activities than in Retail activities (an elasticity of -1.9% versus -0.9%).

TABLE 3.11. THE IMPACT OF FLOODING ON TOURISM JOBS, 2015–2021

INDEPENDENT	DEPENDENT		
	MODEL 10 LN(TOURISM JOBS)	MODEL 11 LN(LEISURE AND HOSPITALITY JOBS)	MODEL 12 LN(RETAIL JOBS)
Constant	3.6262** (13.86)	3.5786** (14.32)	2.3033** (11.02)
Lag of dependent	0.6422** (24.89)	0.6221** (23.61)	0.7546** (33.91)
event	-0.01507** (-2.00)	-0.01941** (-1.65)	-0.009469** (-2.43)
event1	0.0009699 (0.11)	-0.000628 (-0.04)	0.004761 (1.00)
event3	0.0015477 (0.21)	-0.007681 (-0.67)	0.01234*** (3.25)
event6	0. 009869* (1.82)	0.01905** (2.26)	-0.001614 (-0.58)
F-test	130.09	117.09	240.19
(p-value)	(0.0000)	(0.0000)	(0.0000)
n	896	896	896
R^2	.9983	.9959	.9996

CHAPTER THREE ENDNOTES

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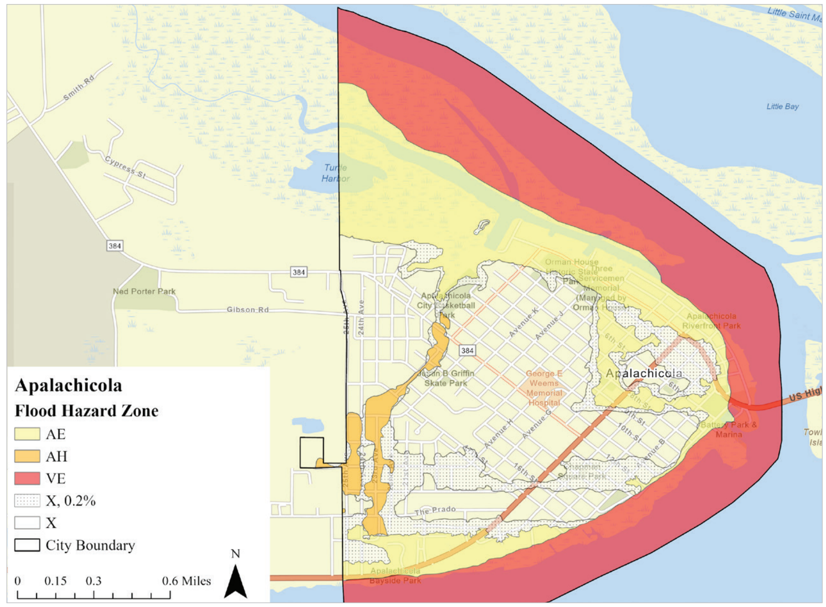
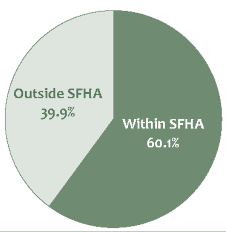
APPENDIX D. FLOOD EVENTS FOR SELECTED FLORIDA COMMUNITIES, 2015-2021



Apalachicola
Historic Properties



APALACHICOLA: FLOOD EVENTS 2015-2021				
YEAR	**MONTH**	**TYPE OF EVENT**	**CAUSE OF FLOOD**	**EVENT NARRATIVE**
2016	June	Storm Surge/Tide	Storm Surge/Tide	Tropical Storm Colin made landfall across the southeast big bend during the overnight hours of June 6-7. In Franklin County, a voluntary evacuation was in place along the coast. Coastal flooding affected areas from Apalachicola to Alligator Point. Homes had water in backyards on the Gulf side of US-98 from Carrabelle Beach to St Teresa Beach. The St Teresa Beach and boat ramp flooded. Alligator Point Road was flooded with debris washed inland. Gulfshore Drive was flooded and closed on the east end of Alligator Point.
2016	September	Storm Surge/Tide	Storm Surge/Tide	Hurricane Hermine impacted the Florida big bend in early September with significant storm surge along the coast and strong winds inland which downed numerous trees and power lines, resulting in extended power outages in Tallahassee. The inundation values (height above mean higher high water) of Apalachicola were estimated as 3.04 ft. Surge flooding was reported in Apalachicola, Carrabelle Beach, and Alligator Point. Approximately 27 homes or businesses were destroyed, 43 suffered major damage, 102 suffered minor damage, and 100 others were affected.

APALACHICOLA: FLOOD EVENTS 2015-2021				
YEAR	**MONTH**	**TYPE OF EVENT**	**CAUSE OF FLOOD**	**EVENT NARRATIVE**
2018	October	Tropical Storm	Heavy Rain	Hurricane Michael
2018	May	Tropical Storm	Storm Surge/Tide	Subtropical Storm Alberto affected portions of the Florida panhandle and southeast Alabama on May 28th. In Franklin County, Alligator Point Road was overwashed during the peak storm surge. In Eastpoint, flooding affected the east end of the causeway to Apalachicola, Buck Street, the beach near Reed Court, and water was up to the rock at 10th Street and Highway 98. In Apalachicola, the marina and Water Street flooded. The beaches were also underwater at the east end of the St. George Island Plantation.
2019	October	Storm Surge/Tide	Storm Surge/Tide	A maximum water level of 3.33 ft above Mean Higher High Water was recorded at the Apalachicola tide gauge. Storm surge flooding occurred in the Eastpoint area as well as along Water Street in Apalachicola where a boat came loose in the marina. Alligator Point Road was washed out with water reported to be 4 feet deep. Tom Sawyer Road on Saint George Island was closed due to surge.
2020	August	Flash Flood	Heavy Rain	Several roads were flooded in Apalachicola, including Highway 98 between 8th and 9th Street, 16th and 17th Street, in front of Ace Hardware, and along other side streets.
2020	September	Flash Flood	Heavy Rain	The public reported via social media that Avenue F along with adjacent yards were underwater in Apalachicola.
2021	August	Storm Surge/Tide	Storm Surge/Tide	The tide gauge APCF1 measured a max inundation of 3.37 ft MHHW at 4:18 pm EDT.

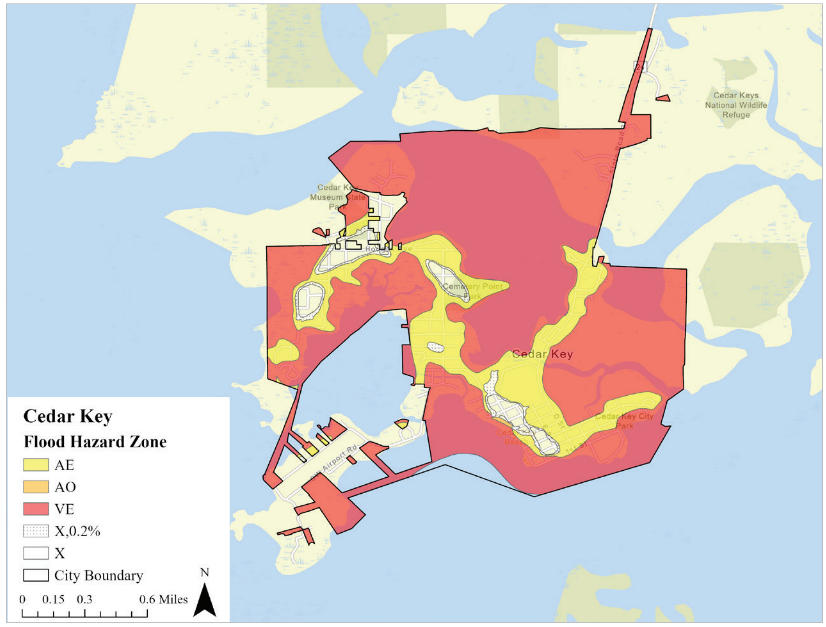
Sources:

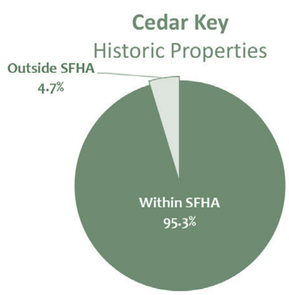
NOAA. (2022). Storm Events Database. National Centers for Environmental Information (NCEI). https://www.ncdc.noaa.gov/stormevents/details.jsp

Federal Emergency Management Agency (FEMA). (2022). Historical flood risk and costs. https://www.fema.gov/data-visualization/historical-flood-risk-and-costs

Federal Emergency Management Agency (FEMA). (2022). Disaster declarations for states and counties. https://www.fema.gov/data-visualization/disaster-declarations-states-and-counties

The United States Geological Survey (USGS). 2022. Flood Event Viewer: https://stn.wim.usgs.gov/fev/





CEDAR KEY: FLOOD EVENTS 2015-2021				
YEAR	**MONTH**	**TYPE OF EVENT**	**CAUSE OF FLOOD**	**EVENT NARRATIVE**
2016	September	Storm Surge/Tide	Storm Surge/Tide	In Levy County, storm surge generally ranged from 6 to 8 feet above normal high tide. At Cedar Key, the peak surge was 7.5 feet late in the evening of the 1st. When added to the normal astronomical tide cycle, the storm tide was 7.64 feet NAVD88. Surge was 5 to 8 feet MSL (4.7 to 7.5 feet NAVD88) from 2000 EST on the 1st through 0430 EST on the 2nd. The storm tide flooded over 40 homes and businesses located in the west end of Yankeetown. Levy County Emergency Management tabulated the damage at $2,105,883, with 51 structures sustaining minor damage, 68 with major damage, and 1 destroyed.
2016	June	Storm Surge/Tide	Storm Surge/Tide	The tide gauge at Cedar Key measured a peak tide of 7.43 feet MLLW on the afternoon of the 6th. Subtracting the predicted astronomical tide, the calculated highest storm surge was 4.37 feet on the evening of the 6th. Levy County emergency management reported that the surge caused flooding to 7 homes and 5 business in Cedar Key. In total, around $13,000 in property damage was reported by Levy County Emergency Management.

CEDAR KEY: FLOOD EVENTS 2015-2021				
YEAR	**MONTH**	**TYPE OF EVENT**	**CAUSE OF FLOOD**	**EVENT NARRATIVE**
2018	October	Tropical Storm	Heavy Rain	Hurricane Michael
2020	November	Tropical Storm	Heavy Rain	In Levy County the highest wind reported from Hurricane Eta was a gust of 50 mph at a meso-net site on Cedar Key. Rainfall was below 5 inches across the area with no significant damage being reported. The maximum storm surge was 2.10 ft MHHW in Cedar Key.
2021	July	Storm Surge/Tide	Storm Surge/Tide	Site CKYF1 Cedar Key reported a maximum water level of 2.68 ft MHHW.

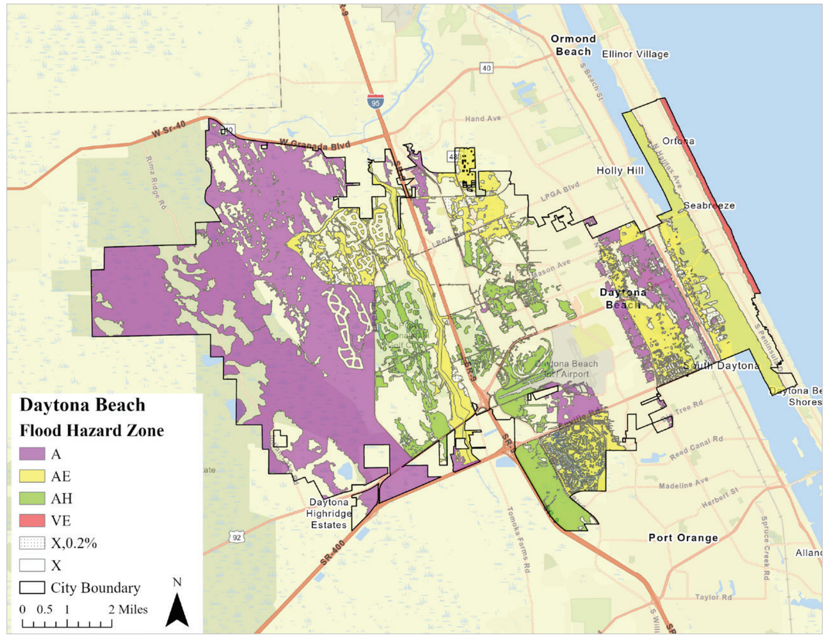
Sources:

NOAA. (2022). Storm Events Database. National Centers for Environmental Information (NCEI). https://www.ncdc.noaa.gov/stormevents/details.jsp

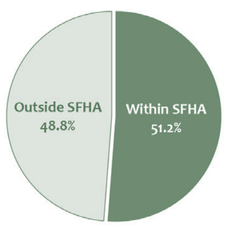
Federal Emergency Management Agency (FEMA). (2022). Historical flood risk and costs. https://www.fema.gov/data-visualization/historical-flood-risk-and-costs

Federal Emergency Management Agency (FEMA). (2022). Disaster declarations for states and counties. https://www.fema.gov/data-visualization/disaster-declarations-states-and-counties

The United States Geological Survey (USGS). 2022. Flood Event Viewer: https://stn.wim.usgs.gov/fev/



Daytona Beach
Historic Properties



DAYTONA BEACH: FLOOD EVENTS 2015-2021				
YEAR	**MONTH**	**TYPE OF EVENT**	**CAUSE OF FLOOD**	**EVENT NARRATIVE**
2016	October	Hurricane	Heavy Rain	Hurricane Matthew. A storm surge of 3-6 feet affected the beaches from near the Indian River/St. Lucie County line northward to the Volusia/Flagler County line, along with moderate to major beach erosion, with the highest surge (5-6 feet) and most significant erosion occurring north of Daytona Beach. Farther south, a surge of 2-3 feet occurred, along with minor to moderate beach erosion. Rainfall totals reached 7-9 inches across parts of Seminole and Volusia Counties, where widespread flooding of streets and low-lying areas occurred. Elsewhere, rainfall totals were generally 2-6 inches, with isolated, minor flooding of poor drainage areas and standing water on roadways.
2017	September	Storm Surge/Tide	Storm Surge/Tide	As Hurricane Irma moved northward over west-central Florida, the Volusia County beaches experienced moderate to major erosion and wave run-up due to an estimated 3-4-foot storm surge. Similar water level rises occurred within the Indian River Lagoon, which combined with wave action to produce areas of moderate to major damage to docks and boathouses, primarily along the western shores of the rivers.

DAYTONA BEACH: FLOOD EVENTS 2015-2021				
YEAR	**MONTH**	**TYPE OF EVENT**	**CAUSE OF FLOOD**	**EVENT NARRATIVE**
2019	September	Storm Surge/Tide	Storm Surge/Tide	As Hurricane Dorian moved northwest parallel to the east central Florida coast, the Volusia County beaches experienced varying degrees of beach erosion, with moderate to major beach erosion in some areas. The strong onshore winds and large swells over three high tide cycles contributed to an estimated 2-3 feet AGL of storm surge. Similar water level rises around 2 feet above normal levels occurred within the Halifax and Indian River Lagoon system, where shore-side flooding occurred in some locations. Preliminary damage estimates, primarily due to beach erosion, were $469,514, mainly impacting Ormond Beach, Port Orange, and Daytona Beach Shores.
2020	September	Coastal Flood	High tide	Minor to locally moderate coastal flooding occurred near the times of high tide. The greatest impacts were reported along portions of Daytona Beach, New Smyrna Beach and Bethune Beach. Dunes, jetties and seawalls were overwashed, with water over several beachfront roads, requiring closures. Beach erosion was primarily minor to moderate, with flattening of the beach profile and dune recession ranging from none to moderate.
2020	October	Tropical Storm	Heavy Rain	Distant Hurricane Epsilon produced rough surf and strong rip currents along the east-central Florida coastline.
2021	November	Flood	Heavy Rain	A very slow-moving front produced persistent heavy rains across portion of Volusia County. The 24-hour rain totals were 6-10 inches, however most of the rain fell in less than 12-hours, impacting Daytona Beach and Port Orange. As much as 5-6 inches accumulated between 1500 and 1800 LST. Numerous roadways were flooded, with as much as 1-2 feet of standing water in some localized areas, resulting in road closures.

Sources:

NOAA. (2022). Storm Events Database. National Centers for Environmental Information (NCEI). https://www.ncdc.noaa.gov/stormevents/details.jsp

Federal Emergency Management Agency (FEMA). (2022). Historical flood risk and costs. https://www.fema.gov/data-visualization/historical-flood-risk-and-costs

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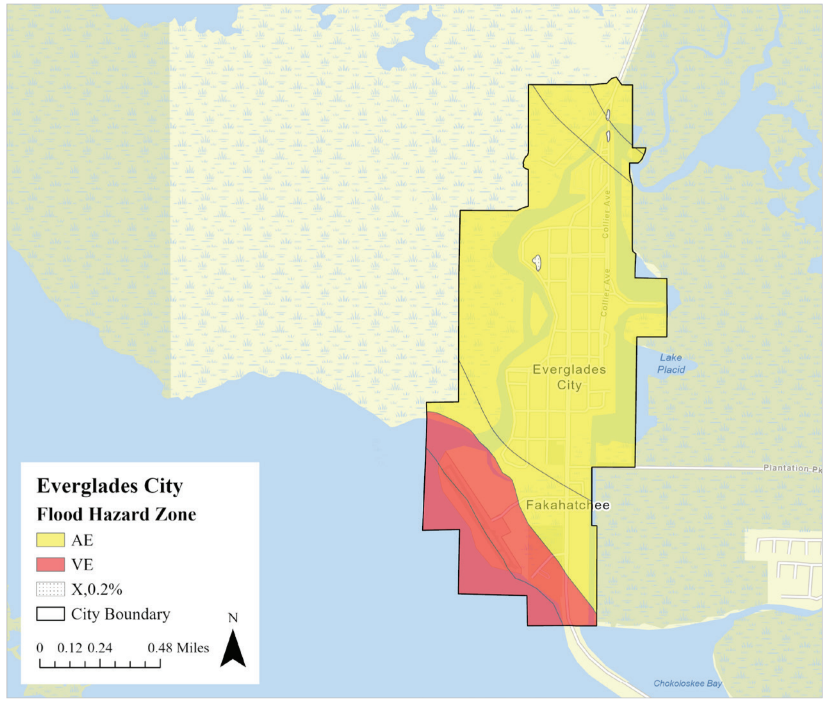
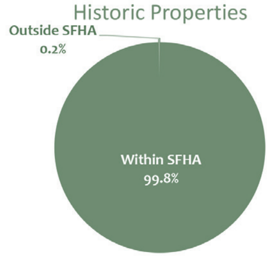


Everglades City
Historic Properties



EVERGLADES CITY: FLOOD EVENTS 2015-2021				
YEAR	**MONTH**	**TYPE OF EVENT**	**CAUSE OF FLOOD**	**EVENT NARRATIVE**
2016	August	Coastal Flood	High tide	Reports of water covering low lying roadways and docks in the areas around Goodland and Everglades City with the morning high tide. This included State Road 92/San Marco Road near the bridge over Goodland Bay. Everglades City Airpark along Chokoloskee Bay was also shut down due to high water affecting the runway.
2017	September	Tropical Storm	Heavy Rain	Hurricane Irma

EVERGLADES CITY: FLOOD EVENTS 2015-2021				
YEAR	**MONTH**	**TYPE OF EVENT**	**CAUSE OF FLOOD**	**EVENT NARRATIVE**
2020	September	Flood	Heavy Rain	A tropical tropospheric trough (TUTT) moving northwest across the area along with a surface trough across the Florida peninsula allowed for scattered showers and storms to develop across the Atlantic waters and Biscayne Bay. Deep moisture and plenty of instability resided across the region as well, with PW's close to 2.5 inches. The overall flow regime was light and a little more southeasterly to southerly. Therefore, another day of increased diurnal coverage of showers and thunderstorms on top of already saturated soils with slow storm motion and high rainfall rates led to flooding across portions of Miami-Dade and Collier counties.
2020	November	Storm Surge/Tide	Storm Surge/Tide	A peak water level of 2.29 feet above mean higher high water was observed at Naples Pier at 11:06 AM EST on November 11th, with a peak surge of 3.39 feet above the predicted astronomical tide. Inundation was generally between 1-2 feet. Main impacts from storm surge was flooding along intracoastal waterways, with water overtopping sea walls and over docks along much of the Collier County coastline.

Sources:

NOAA. (2022). Storm Events Database. National Centers for Environmental Information (NCEI). https://www.ncdc.noaa.gov/stormevents/details.jsp

Federal Emergency Management Agency (FEMA). (2022). Historical flood risk and costs. https://www.fema.gov/data-visualization/historical-flood-risk-and-costs

Federal Emergency Management Agency (FEMA). (2022). Disaster declarations for states and counties. https://www.fema.gov/data-visualization/disaster-declarations-states-and-counties

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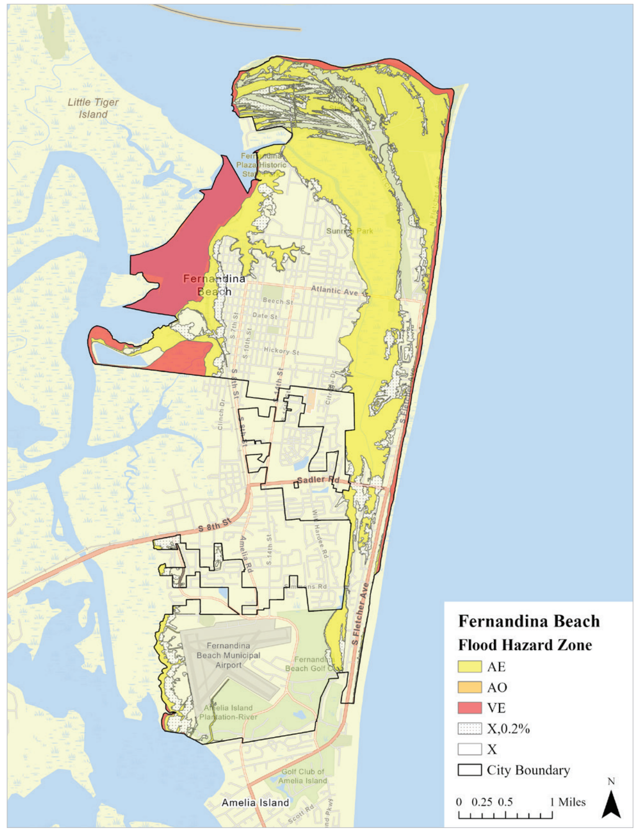
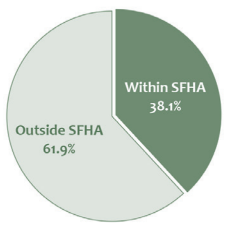


Fernandina Beach
Historic Properties



FERNANDINA BEACH: FLOOD EVENTS 2015-2021				
YEAR	**MONTH**	**TYPE OF EVENT**	**CAUSE OF FLOOD**	**EVENT NARRATIVE**
2015	October	Coastal Flood	High tide	The tide gage at Fernandina Beach measured at water level of 5.18 ft above NAVD88 datum. Minor coastal flooding typically begins at 4.8 ft.
2016	November	Coastal Flood	High tide	On Nov. 13th at 0736 am, the Fernandina NOS tide gauge measured 5.22 ft NAVD88 datum or 2.48 ft MHHW datum. This was about 1.2 ft above predicted astronomical tide and was the peak during the perigee event. These levels equated to minor coastal flooding at this site. ||On Nov. 14th at 0824 am, the Fernandina NOS tide gauge station measured 4.86 ft NAVD88 datum or 2.12 ft MHHW datum which was about 0.5 ft above predicated astronomical tide levels. This was minor coastal flooding for this location.

FERNANDINA BEACH: FLOOD EVENTS 2015-2021				
YEAR	**MONTH**	**TYPE OF EVENT**	**CAUSE OF FLOOD**	**EVENT NARRATIVE**
2016	October	Flash Flood	Heavy Rain	Extensive flooding of Fletcher Avenue occurred, especially near the 600 block section which extended southward to the 1500 block section of Fletcher Avenue and Southward to Ocean Drive. These areas are just east of Egan's Creek. Water level observations indicated a potential seiche flooding trialing the storm surge that likely flooded Egan's Creek as Hurricane Matthew started to track farther North of the local area. As winds shifted to the NNW, surge water was pushed back across the Edgan's Creek Drainage which funneled southward and caused flooding.
2017	September	Tropical Storm	Heavy Rain	Hurricane Irma. Storm total rainfall included 9.86 inches about half a mile north of Fernandina Beach, 9.93 inches 6.3 miles S of Fernandina Beach, and 12.70 inches in Fernandina Beach.
2017	September	Tornado	Heavy Rain	Hurricane Irma
2018	November	Coastal Flood	High tide	Water level peaked at 2.37 ft above MHHW at the Fernandina Beach C-man station.
2018	July	Heavy Rain	Heavy Rain	A total of 3.62 was measured since 5 pm.
2020	November	Tropical Storm	Heavy Rain	Tropical Storm Eta offshore of the SW FL Gulf Coast tracked NE through the day, crossing NE FL while gradually weakening through the day. Strong, gusty winds and locally heavy rainfall impacted NE FL as bands of heavy showers moved onshore. The storm moved offshore of the NE FL coast in the afternoon, with improving local conditions over night. Elevated tides combined with persistent, strong onshore flow caused isolated minor flooding within the St. Johns River basin during times of high tide. Water levels were generally near or just below 1.5 feet MHHW datum at high tides. At 9:36 am on 11/12, the NOS Station at Fernandina Beach measured a peak wind of 22 mph (150 deg) with a peak gust of 38 mph. The highest water level was measured days before peak winds on 11/09 at 3:42 pm of 1.08 ft MHHW datum at the same NOS station (still below action stage for this site).

Sources:

NOAA. (2022). Storm Events Database. National Centers for Environmental Information (NCEI). https://www.ncdc.noaa.gov/stormevents/details.jsp

Federal Emergency Management Agency (FEMA). (2022). Historical flood risk and costs. https://www.fema.gov/data-visualization/historical-flood-risk-and-costs

Federal Emergency Management Agency (FEMA). (2022). Disaster declarations for states and counties. https://www.fema.gov/data-visualization/disaster-declarations-states-and-counties

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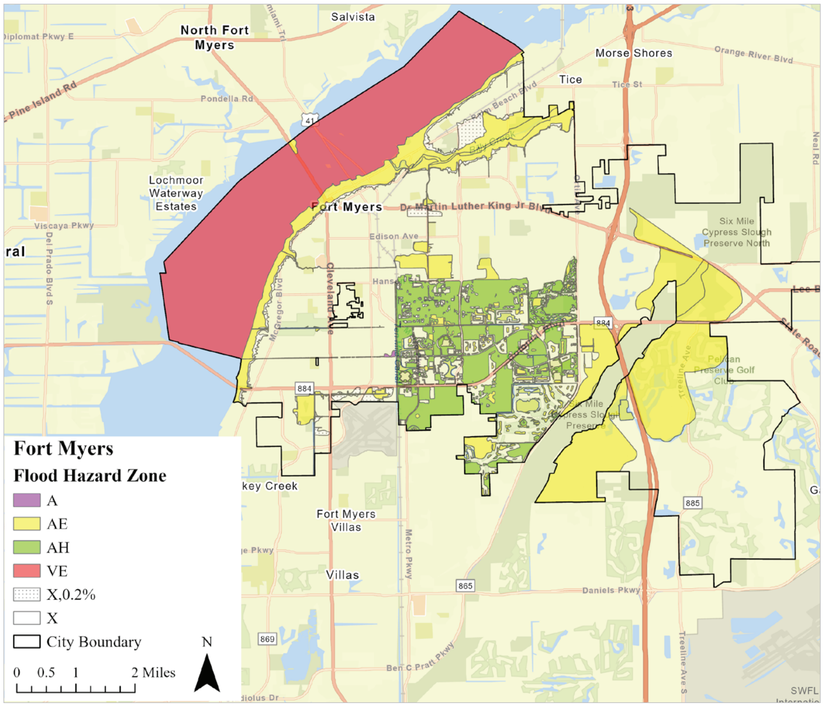
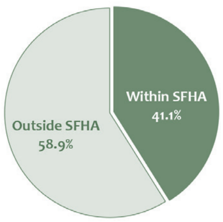


Fort Myers
Historic Properties



FORT MYERS: FLOOD EVENTS 2015-2021				
YEAR	**MONTH**	**TYPE OF EVENT**	**CAUSE OF FLOOD**	**EVENT NARRATIVE**
2017	September	Tropical Storm	Heavy Rain	Hurricane Irma. The maximum storm surge was 3.88 feet in Fort Myers at midnight EST on the 11th. Subtracting the astronomical tide of 0.04 feet, the maximum storm tide was calculated from the tide gauge as 3.28 feet MHHW 1436EST on the 11th.
2018	October	Coastal Flood	High tide	NBC2 in Fort Myers reported water covering County Road 92A between Marco Island and Goodland.
2018	December	High Wind	High wind	The ASOS at Fort Myers Page Field (KFMY) recorded a 51 knot gradient wind gust.
2020	November	Tropical Storm	Heavy Rain	In Lee County the highest wind reported from Hurricane Eta was a gust of 52 mph at the ASOS at Southwest Florida International Airport. Rainfall was generally below 5 inches, with the highest rain total being 4.77 at the Southwest Florida International Airport. Saltwater flooding was observed on south exposed beaches and nearby homes. The National Weather Service estimates about $100,000 in damages in the county. The maximum storm surge was 2.74 ft MHHW in Fort Myers.

FORT MYERS: FLOOD EVENTS 2015-2021				
YEAR	**MONTH**	**TYPE OF EVENT**	**CAUSE OF FLOOD**	**EVENT NARRATIVE**
2021	July	Storm Surge/Tide	Storm Surge/Tide	NOS site FMRF1 Fort Myers reported a maximum water level of 1.47 ft MHHW.

Sources:

NOAA. (2022). Storm Events Database. National Centers for Environmental Information (NCEI). https://www.ncdc.noaa.gov/stormevents/details.jsp

Federal Emergency Management Agency (FEMA). (2022). Historical flood risk and costs. https://www.fema.gov/data-visualization/historical-flood-risk-and-costs

Federal Emergency Management Agency (FEMA). (2022). Disaster declarations for states and counties. https://www.fema.gov/data-visualization/disaster-declarations-states-and-counties

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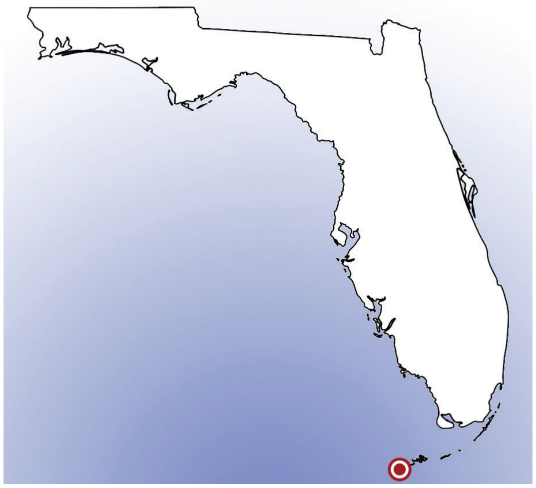

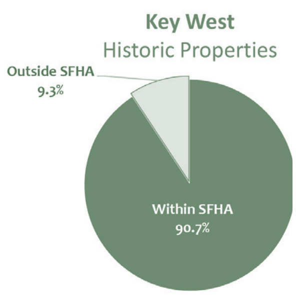

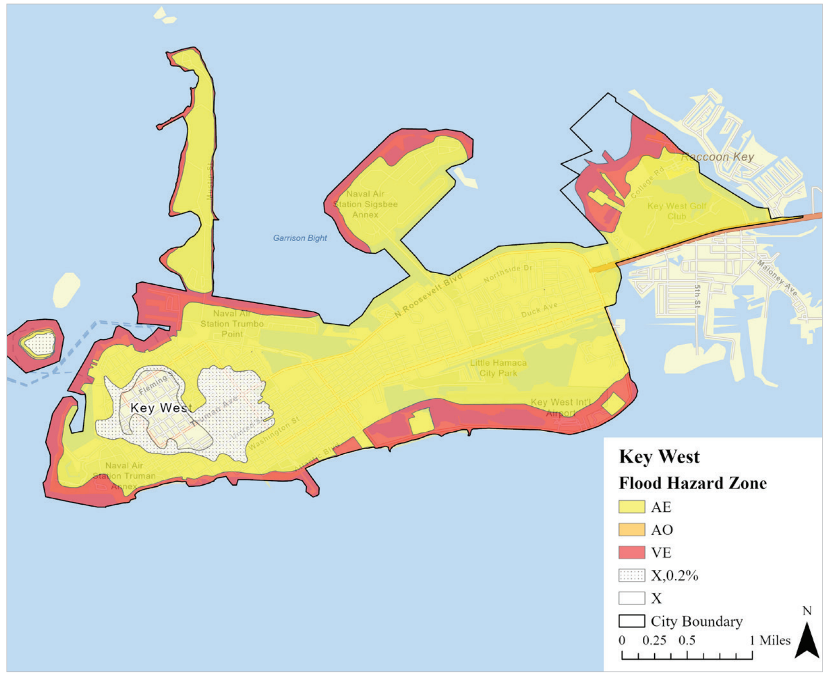

KEY WEST: FLOOD EVENTS 2015-2021				
YEAR	**MONTH**	**TYPE OF EVENT**	**CAUSE OF FLOOD**	**EVENT NARRATIVE**
2015	August	Flood	Heavy Rain	Several reports were received of widespread street flooding in the New Town section of northeast Key West. Rainfall of 4.73 inches in 90 minutes was measured by a NWS employee at a residence, with a daily rainfall record of 3.14 inches measured at the Key West International Airport, just south of the area of significant street flooding.
2016	October	Coastal Flood	High tide	Minor street flooding was reported in multiple areas of Key West, including Flagler Avenue between 12th Street and Venetian Drive, Grinnell and James Streets, along Front Street between Duval and Simonton Streets, Reynolds Street at Atlantic Boulevard, Rose and Ashby Streets, and along Jose Marti Drive near Truman Avenue.
2016	September	Tropical Storm	Heavy Rain	Hurricane Hermine formed in the Florida Straits south of Key West on August 28th. Heavy rainfall over West-Central and Southwest Florida began on August 31 and continued through September 2, with as much as 20 inches of rain falling in some locations.

KEY WEST: FLOOD EVENTS 2015-2021				
YEAR	**MONTH**	**TYPE OF EVENT**	**CAUSE OF FLOOD**	**EVENT NARRATIVE**
2017	September	Tropical Storm	Hurricane Irma	Hurricane Irma
2020	November	Tropical Storm	Heavy Rain	As Tropical Storm Eta moved to the north northeast well to the west of the Lower Florida Keys, sustained winds of 25 to 30 mph with frequent gusts of 40 to 45 mph occurred. Peak gusts of 44 mph were measured at Key West High School, and 43 mph at Cudjoe Key. Minor power outages affecting less than 100 customers occurred in Key West.
2020	September	Flood	Heavy Rain	Key West Police Department reported numerous streets impassable due to flooding with stalled vehicles, including the Triangle (U.S. 1 and Roosevelt Boulevards), South Roosevelt and New Town neighborhoods along Northside Drive through Flagler Boulevard, and near Flagler and 5th Street. Flooding later expanded to include the Bertha Street and Atlantic Boulevard neighborhoods, flooding a resident to a depth of 6 inches on Atlantic Drive.
2021	July	Tropical Storm	Heavy Rain	Tropical Storm Elsa moved north-northwest from western Cuba, through the western Straits of Florida, and passed between the Marquesas Keys and Dry Tortugas into the southeast Gulf of Mexico. Numerous rain bands moved northwest and north through the Lower and Middle Florida Keys, with strong tropical-storm-force wind gusts measured near Key West from the evening of July 5th through the afternoon of July 6th. Maximum winds over the Florida Keys of Monroe County were recorded at 52 mph with gusts to 70 mph at Key West. Wind impacts were confined to damage to trees and utility lines, mostly in Key West proper. No storm surge was recorded in the Florida Keys, however the onshore southerly winds raised water levels just below 1.0 foot above normal at Key West closer to low astronomical tide. Moderate ocean-side beach erosion occurred at Key West along with overwash from heavy wave action. Storm total rainfall up to near 7.5 inches resulted in brief but significant street flooding in Key West midday on July 6th.

Sources:

NOAA. (2022). Storm Events Database. National Centers for Environmental Information (NCEI). https://www.ncdc.noaa.gov/stormevents/details.jsp

Federal Emergency Management Agency (FEMA). (2022). Historical flood risk and costs. https://www.fema.gov/data-visualization/historical-flood-risk-and-costs

Federal Emergency Management Agency (FEMA). (2022). Disaster declarations for states and counties. https://www.fema.gov/data-visualization/disaster-declarations-states-and-counties

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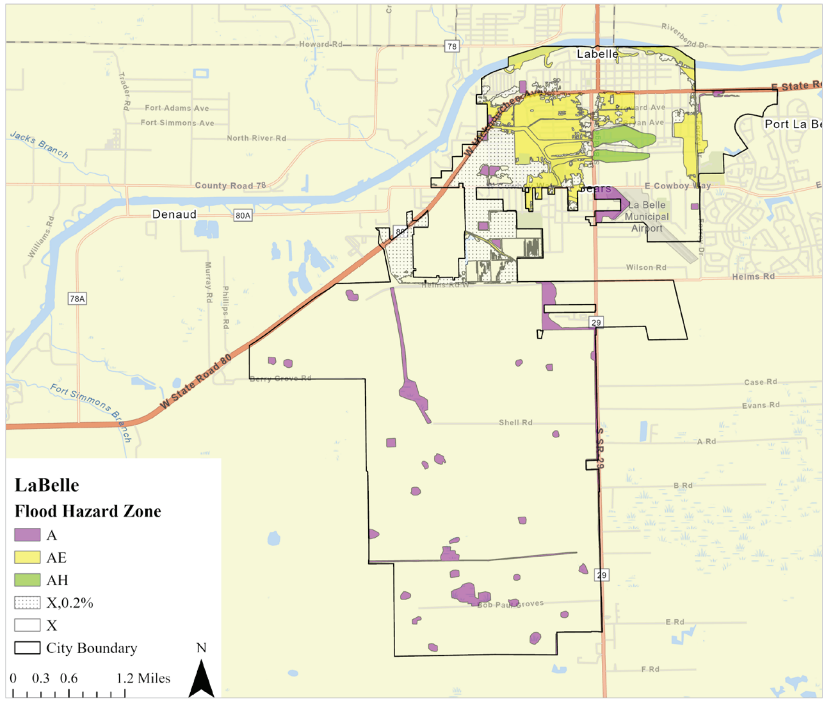
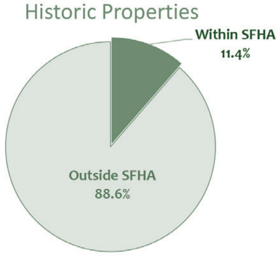


LaBelle
Historic Properties



LABELLE: FLOOD EVENTS 2015-2021				
YEAR	**MONTH**	**TYPE OF EVENT**	**CAUSE OF FLOOD**	**EVENT NARRATIVE**
2017	September	Tropical Storm	Heavy Rain	Hurricane Irma
2020	September	Flood	Heavy Rain	Law enforcement reported street flooding near the intersection of Bridge Street and Oklahoma Avenue due to heavy rainfall from thunderstorms. A frontal boundary is draped over the Atlantic waters off the eastern seaboard of the United States and across central Florida and into the Gulf of Mexico. Aloft, high pressure retreats into the central Gulf and western Caribbean with a mid-level trough amplifying across the peninsula. Additionally, a meso-low has developed along the frontal boundary off the Space Coast before pushing over the Lake Okeechobee region and into the Atlantic waters. This setup combined with increasing amounts of available moisture |created areas of more vigorous convection that produced torrential rainfall that eventually lead to flooding across areas of Palm Beach and Hendry counties.

Sources:

NOAA. (2022). Storm Events Database. National Centers for Environmental Information (NCEI). https://www.ncdc.noaa.gov/stormevents/details.jsp

Federal Emergency Management Agency (FEMA). (2022). Historical flood risk and costs. https://www.fema.gov/data-visualization/historical-flood-risk-and-costs

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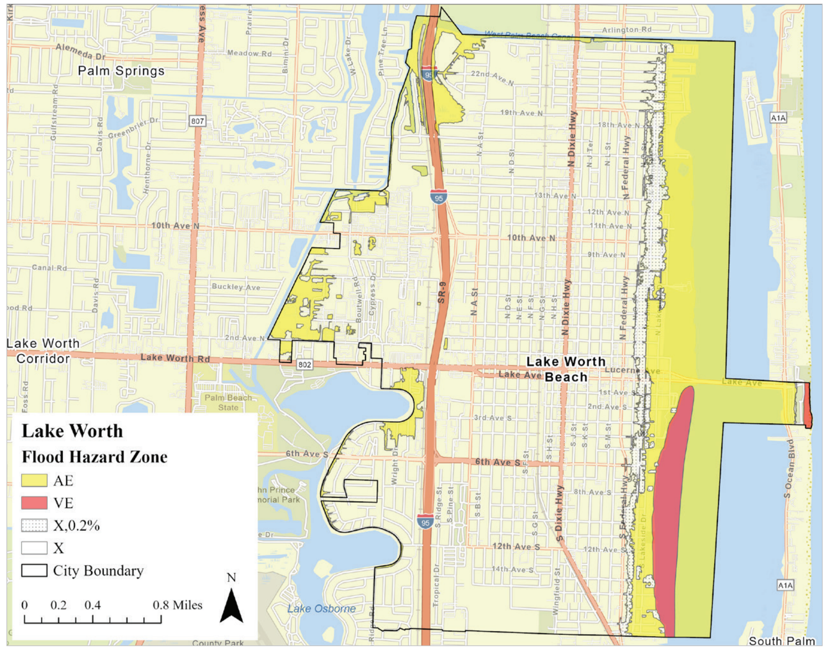
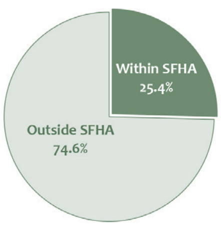


Lake Worth
Historic Properties



LAKE WORTH: FLOOD EVENTS 2015-2021				
YEAR	**MONTH**	**TYPE OF EVENT**	**CAUSE OF FLOOD**	**EVENT NARRATIVE**
2016	October	Tropical Storm	Heavy Rain	The following inundation values (height above mean higher high water) were measured along the coast: Lake Worth Pier: 1.49 feet and Virginia Key: 1.083 feet.
2017	September	Storm Surge/Tide	Storm Surge/Tide	Maximum storm tide in Palm Beach County was in the 2-3 ft range, with a measured maximum storm tide of 1.97 feet above Mean Higher High Water (MHHW) at Lake Worth Pier. Little significant inundation was noted.
2020	August	Tropical Storm	Heavy Rain	Hurricane Isaias. A peak storm surge of 1.11 feet was observed at Lake Worth Pier, 1.06 feet at Virginia Key, and 0.99 feet at Port Everglades. Along the Atlantic coast, minor to moderate beach erosion was observed in usually vulnerable locations, most notably at the beaches of Palm Beach and Broward counties. A total of 165 people voluntarily evacuated in Palm Beach County.

LAKE WORTH: FLOOD EVENTS 2015-2021				
YEAR	**MONTH**	**TYPE OF EVENT**	**CAUSE OF FLOOD**	**EVENT NARRATIVE**
2020	November	Tropical Storm	Heavy Rain	Hurricane Eta. The effects from Tropical Storm Eta were generally minor for wind and more significant for rainfall/flooding for South Florida. Rainfall flooding impacts were significant across South Florida, with around 4 to almost 21 inches across portions of Broward County, around 4 to almost 14 inches across portions of Miami-Dade County, and around 4 to almost 7 inches across portions of Collier and Palm Beach County. A peak storm surge of 3.39 feet was observed at Naples Pier, 2.26 feet at Virginia Key, and 1.95 feet at Port Everglades.
2020	June	Flood	Heavy Rain	Snap map video of street flooding occurring near the intersection of US highway 1 and 13th avenue North in Lake Worth. Water had pooled to a depth of a few inches on street.
2020	October	Flood	Heavy Rain	City of Lake Worth Beach reported 3 homes with visible water marks on garage doors, however no major structural impacts were noted.
2020	October	Flood	Heavy Rain	WPTV photojournalist reported several inches of water on US1 near Crestwood Blvd in Lake Worth.
2020	August	Tropical Depression	Heavy Rain	A peak storm surge of 1.11 feet was observed at Lake Worth Pier
2021	November	Coastal Flood	High tide	Broadcast media reported via social media and television of minor salt water flooding along the eastern side of the intracoastal water way along South Lake Trail in Palm Beach, Flagler Drive (just north of the Flagler Memorial Bridge), and in the parking lot of a condominium along North Flagler Drive. Standing water less than 1 foot on sidewalks and parking lots. ||Tide levels at nearby Lake Worth Pier peaked at 2.1 feet MHHW or 5.1 feet MLLW.

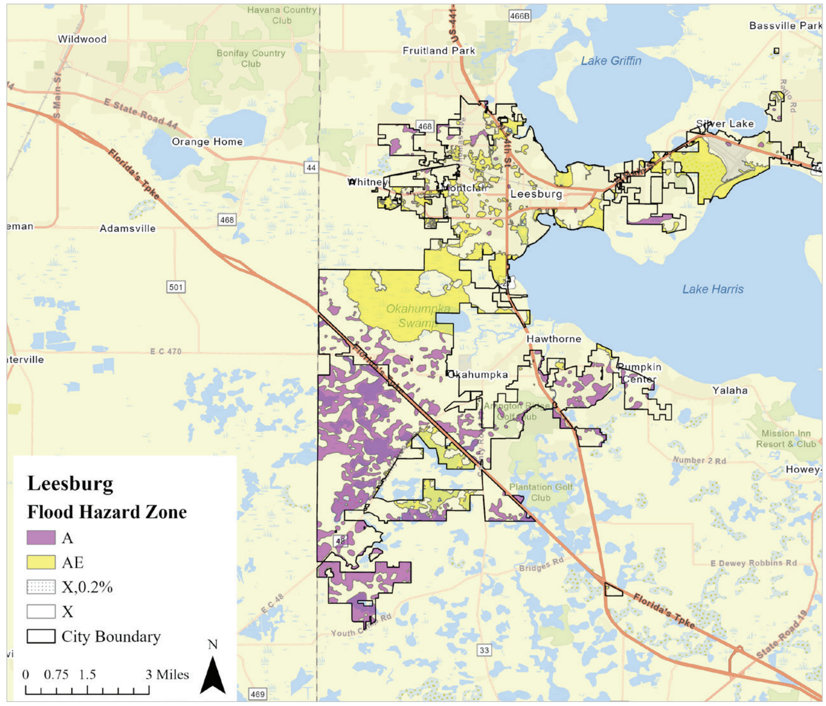
Sources:

NOAA. (2022). Storm Events Database. National Centers for Environmental Information (NCEI). https://www.ncdc.noaa.gov/stormevents/details.jsp

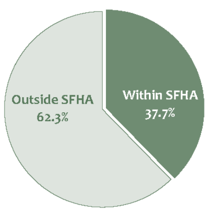
Federal Emergency Management Agency (FEMA). (2022). Historical flood risk and costs. https://www.fema.gov/data-visualization/historical-flood-risk-and-costs

Federal Emergency Management Agency (FEMA). (2022). Disaster declarations for states and counties. https://www.fema.gov/data-visualization/disaster-declarations-states-and-counties

The United States Geological Survey (USGS). 2022. Flood Event Viewer: https://stn.wim.usgs.gov/fev/



Leesburg
Historic Properties



LEESBURG: FLOOD EVENTS 2015-2021				
YEAR	**MONTH**	**TYPE OF EVENT**	**CAUSE OF FLOOD**	**EVENT NARRATIVE**
2016	October	Flood	Heavy Rain	Rainbands associated with Hurricane Matthew produced a swath of heavy rain of between 3.5 and 4.5 inches from Clermont to Mount Plymouth, resulting in areas of minor urban, roadway and lowland flooding. The St. Johns River near Astor peaked just below moderate flood stage. A total of 10 residents evacuated to shelters within the county due to the potential for river flooding.

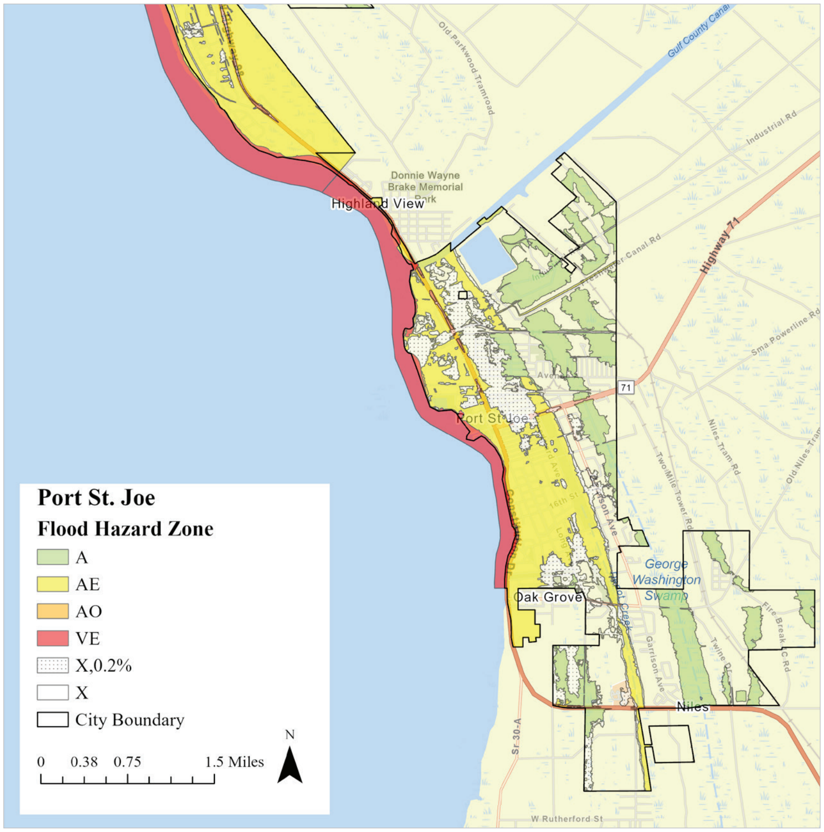
Sources:

NOAA. (2022). Storm Events Database. National Centers for Environmental Information (NCEI). https://www.ncdc.noaa.gov/stormevents/details.jsp

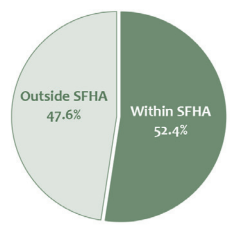
Federal Emergency Management Agency (FEMA). (2022). Historical flood risk and costs. https://www.fema.gov/data-visualization/historical-flood-risk-and-costs

Federal Emergency Management Agency (FEMA). (2022). Disaster declarations for states and counties. https://www.fema.gov/data-visualization/disaster-declarations-states-and-counties

The United States Geological Survey (USGS). 2022. Flood Event Viewer: https://stn.wim.usgs.gov/fev/



Port St. Joe
Historic Properties



PORT ST. JOE: FLOOD EVENTS 2015-2021				
YEAR	**MONTH**	**TYPE OF EVENT**	**CAUSE OF FLOOD**	**EVENT NARRATIVE**
2018	October	Tropical Storm	Heavy Rain	Hurricane Michael

Sources:

NOAA. (2022). Storm Events Database. National Centers for Environmental Information (NCEI). https://www.ncdc.noaa.gov/stormevents/details.jsp

Federal Emergency Management Agency (FEMA). (2022). Historical flood risk and costs. https://www.fema.gov/data-visualization/historical-flood-risk-and-costs

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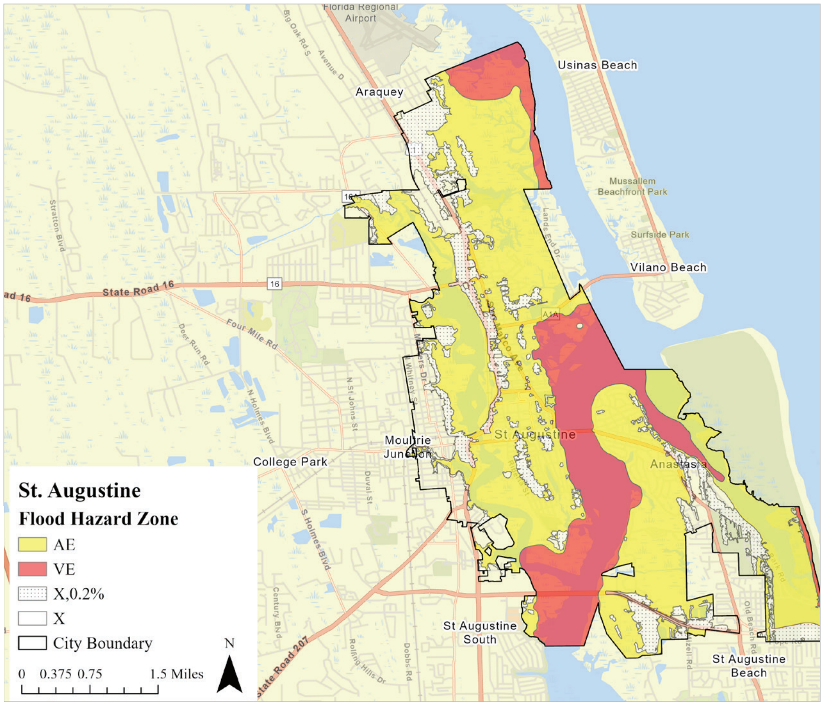
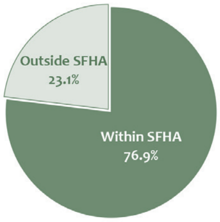


St. Augustine
Historic Properties



ST. AUGUSTINE: FLOOD EVENTS 2015-2021				
YEAR	**MONTH**	**TYPE OF EVENT**	**CAUSE OF FLOOD**	**EVENT NARRATIVE**
2015	July	Flood	Heavy Rain	Roads were flooded and several cars stranded due to flood waters in historic St. Augustine. Flood waters were up to the doors of many structures.
2015	August	Flood	Heavy Rain	Several cars were stranded along St. George Street due to road flooding.
2015	August	Flood	Heavy Rain	Moderate flooding was reported near the intersection of Orange Street and Cordova Street. Minor flooding was reported on Malaga Street.
2015	September	Flood	Heavy Rain	The combination of elevated water levels and recent heavy rainfall cause street flooding along the waterfront of historic St. Augustine.
2015	September	Heavy Rain	Heavy Rain	Street flooding was reported in downtown St. Augustine.

ST. AUGUSTINE: FLOOD EVENTS 2015-2021				
YEAR	**MONTH**	**TYPE OF EVENT**	**CAUSE OF FLOOD**	**EVENT NARRATIVE**
2016	September	Tropical Storm	Heavy Rain	At 1:40 pm on 9/13, a meso-net site at Vilano Beach measured a wind gust to 41 mph. Wind gusts of 41 mph were measured at the same site at 6 pm, and 46 mph was measured at 6:35 pm. At 7:16 pm the AWOS station at the St. Augustine Airport measured a wind gust to 45 mph and at 7:45 pm the meso-net site at Vilano Beach measured at wind gust to 47 mph sustained at 45 mph. ||The peak wind at at St. Augustine Airport was 45 mph on 9/13 at 7:09 pm. The WeatherFlow mesonet sensor at Crescent Beach/ Summerhouse measured a wind gust to 46 mph on 9/13 at 6 pm. The WeatherFlow sensor at Lewis measured a gust to 38 mph on 9/13 at 6:04 pm. The C-man station measured a peak wind of 46 mph on 9/13 at 6:55 pm. ||Storm total rainfall included 3.37 inches 1 mile WNW of St. Augustine Beach . ||Storm surge values included 1.13 ft (1.38 ft tide) at Racy Point on the St. Johns River.
2016	September	Flood	Heavy Rain	King Street was flooded near Flagler College which required a detour. There was about 4 to 6 inches of standing water in the street near the Bridge of Lions.
2016	October	Flash Flood	Heavy Rain	Multiple roads were closed in St. Augustine including West San Carlos, Valencia Street and parts of King Street. Most streets were opened by 1115 am later that morning. One home on Viscaya Blvd and two homes on Shore Blvd had minor flooding inside. The cost of damage was unknown.
2016	October	Tropical Storm	Heavy Rain	Hurricane Matthew
2016	June	Tropical Storm	Heavy Rain	Average rainfall ranged from 4 to 7 inches. The main impacts included flooded roads, especially east of Interstate 95. Two sink holes were reported, one at Colee Cover Branch Road and the second at Old Dixie and Venetian. A culvert washed out at Dan Manual Road. At 10:23 pm on June 6th, the St. Augustine airport AWOS measured at wind gust to 41 mph. At 11:31 pm, the C-man SAUF1 in St. Augustine measured a wind gust of 45 kt. Ground truth storm total rainfall included 6.93 inches about 2 miles NNW of Bakersville, 5.74 inches 1 mile W of St. Augustine Shores, 4.88 inches about 5 WSW of Durbin, and 4.71 inches at the St Augustine Airport.
2017	June	Flood	Heavy Rain	Cars were stalled in flood waters in downtown St. Augustine. Cost of damage was unknown, but it was estimated for the event to be included in Storm Data.

ST. AUGUSTINE: FLOOD EVENTS 2015-2021				
YEAR	**MONTH**	**TYPE OF EVENT**	**CAUSE OF FLOOD**	**EVENT NARRATIVE**
2017	September	Tornado	Heavy Rain	This tornado passed the northern side of Castillo de San Marcos and uprooted 2 trees before strengthening to EF1 and moving toward Huguenot Cemetery. Multiple trees were uprooted and snapped in the cemetery. The tornado continued moving west in the vicinity of Orange Street before dissipating just before reaching Highway 1. This tornado likely began as a waterspout offshore.
2018	November	Coastal Flood	High tide	A1A flooded along the Matanzas River in historic St. Augustine. The nearest tide gage along the Tolomoto River measured water level 3.67 ft MHHW as of 8:54 am, reaching moderate flooding thresholds. Thus far, this level tied the 9th highest historic crest for the site, previously set on 11/14/2012.
2019	November	Coastal Flood	High tide	The public reported minor inundation at the intersection of State Road 16 and Lewis Speedway along the San Sebastian River during high tide.
2019	November	Coastal Flood	High tide	Minor tidal flooding was reported along portions of King Street in downtown St. Augustine near the San Sebastian Inlet.
2019	September	Tropical Storm	Heavy Rain	At 155 pm on 9/4,, a storm surge value of 3.16 ft MHHW datum was measured at the temporarily deployed USGS Tidal Gauge along the Tolomoto River near St. Augustine. Coastal flooding for this location begins around 1.6 ft MHHW. At 3 pm, the water level reached 2.52 ft MHHW on the Tolomoto River north of St. Augustine airport via a DEP Tide Gauge. Coast flooding occurs around 1.2 ft MHHW at this location. This was the highest sea level rise since 3.61 ft MHHW during Hurricane Irma in 2017. There were some homes flooded in the Davis Shores neighborhood near St. Augustine. A new cut in the beach was formed near Summerhaven. There was overwash and beach erosion observed in Vilano Beach.
2020	November	Tropical Storm	Heavy Rain	Tropical Storm Eta offshore of the SW FL Gulf Coast tracked NE through the day, crossing NE FL while gradually weakening through the day. Strong, gusty winds and locally heavy rainfall impacted NE FL as bands of heavy showers moved onshore. The storm moved offshore of the NE FL coast in the afternoon, with improving local conditions over night. Elevated tides combined with persistent, strong onshore flow caused isolated minor flooding within the St. Johns River basin during times of high tide. Water levels were generally near or just below 1.5 feet MHHW datum at high tides.

ST. AUGUSTINE: FLOOD EVENTS 2015-2021				
YEAR	**MONTH**	**TYPE OF EVENT**	**CAUSE OF FLOOD**	**EVENT NARRATIVE**
2020	September	Flood	Heavy Rain	At 16:25, a trained storm spotter reported heavy rain caused street flooding up to 1 ft deep in some areas in the vicinity of St. Augustine. Roads impacted by flood water included State Road 312, State Road 207 and US Route 1. Cars were stalled in flood water. At 17:30, Emergency Management reported roads were closed in St. Augustine due to flood water. Road closures included San Sebastian Bridge and King Street from Ponce de Leon Blvd to past Whitney Street.
2021	November	Coastal Flood	High tide	Historic downtown St. Augustine and Anastasia Island had coastal flooding impacts.
2021	July	Flood	Heavy Rain	The road was flooded along Cordova Street about 2 ft deep near the Mojo Restaurant.
2021	September	Flood	Heavy Rain	A broadcast media partner shared a social media video of about 6 inches of flood water over Cordova Street near Valencia Street in historic St. Augustine.

Sources:

NOAA. (2022). Storm Events Database. National Centers for Environmental Information (NCEI). https://www.ncdc.noaa.gov/stormevents/details.jsp

Federal Emergency Management Agency (FEMA). (2022). Historical flood risk and costs. https://www.fema.gov/data-visualization/historical-flood-risk-and-costs

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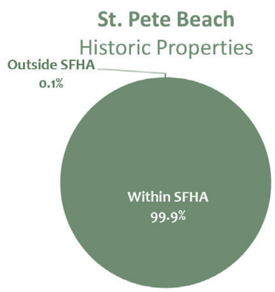
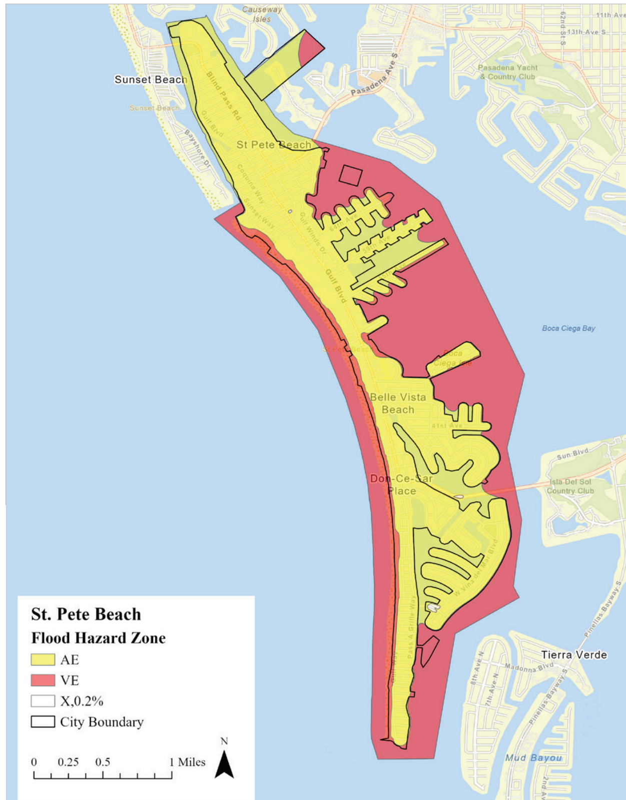
The United States Geological Survey (USGS). 2022. Flood Event Viewer: https://stn.wim.usgs.gov/fev/





ST. PETE BEACH: FLOOD EVENTS 2015-2021				
YEAR	**MONTH**	**TYPE OF EVENT**	**CAUSE OF FLOOD**	**EVENT NARRATIVE**
2016	August	Flood	Heavy Rain	Excessive rainfall from a deeply moist environment ahead of Hurricane Hermine led to numerous reports of street flooding in southern and central Pinellas County. Cars were reported to be stalled in high water at 54th Avenue and Interstate 275, and additional flooding was reported in Saint Petersburg, Gulfport, and Indian Rocks Beach.
2017	September	Tropical Storm	Heavy Rain	Hurricane Irma
2020	November	Storm Surge/Tide	Storm Surge/Tide	Public social media posts show flooding in St. Pete Beach. Water over roadways and boat docks.

Sources:

NOAA. (2022). Storm Events Database. National Centers for Environmental Information (NCEI). https://www.ncdc.noaa.gov/stormevents/details.jsp

Federal Emergency Management Agency (FEMA). (2022). Historical flood risk and costs. https://www.fema.gov/data-visualization/historical-flood-risk-and-costs

Federal Emergency Management Agency (FEMA). (2022). Disaster declarations for states and counties. https://www.fema.gov/data-visualization/disaster-declarations-states-and-counties

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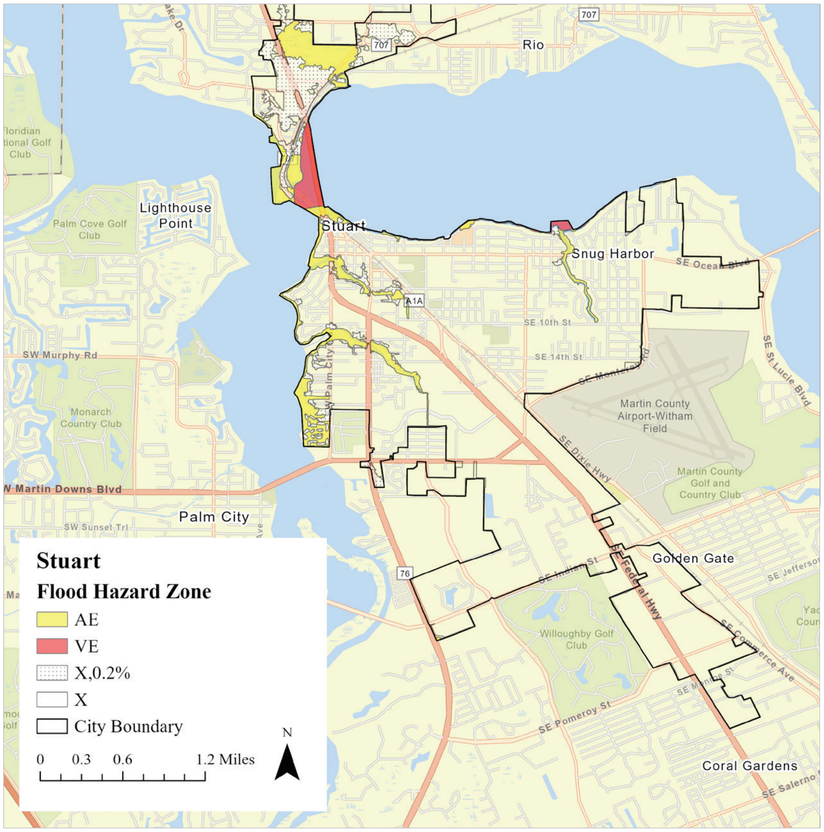

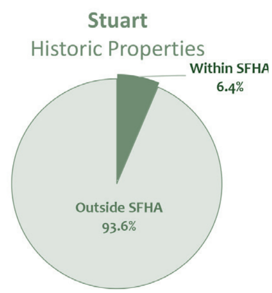

STUART: FLOOD EVENTS 2015-2021				
YEAR	**MONTH**	**TYPE OF EVENT**	**CAUSE OF FLOOD**	**EVENT NARRATIVE**
2015	February	Flash Flood	Heavy Rain	A combination of CoCoRAaS, ham radio and public reports indicated 5 to 11 inches of rain fell across northeastern Martin County, with most of the rain falling in a 6-hour or less period. The highest totals occurred within the southwestern portion of Stuart and in Palm City. ||Flooding closed many roadways, stranding over 100 vehicles. Drainage canals and creeks overflowed.
2016	October	Tropical Storm	Heavy Rain	Hurricane Matthew
2017	September	Tropical Storm	Heavy Rain	Hurricane Irma

STUART: FLOOD EVENTS 2015-2021				
YEAR	**MONTH**	**TYPE OF EVENT**	**CAUSE OF FLOOD**	**EVENT NARRATIVE**
2019	September	Storm Surge/Tide	Storm Surge/Tide	As Hurricane Dorian moved northwest parallel to the east central Florida coast, the Martin County beaches experienced varying degrees of beach erosion, with moderate to major beach erosion in some areas, due to an estimated 2 foot AGL storm surge. The strong onshore winds and large swells over two high tide cycles contributed to the surge. Similar water level rises occurred within the Indian River Lagoon system where shoreside flooding occurred in some locations, including at Sandspirit Park and along the east side of the Saint Lucie River in Stuart.
2020	September	Coastal Flood	High tide	Minor to moderate coastal flooding occurred near the times of high tide. The greatest impacts occurred as excess sea water entered St. Lucie Inlet and raised water levels within the St. Lucie River. Water inundated many roadways and properties adjacent to and near the river, primarily within Palm City, Stuart, Sewall's Point and Port Salerno. High water levels within the Indian River caused roadway flooding in Jensen Beach, as well as roadway flooding and water intrusion into a few homes in Hobe Sound. Sea water also entered Jupiter Inlet and raised water levels within the Indian River and Loxahatchee River, causing roadway flooding in far south Jupiter Island and in Tequesta. Beach erosion was primarily minor to locally moderate.
2020	October	Flash Flood	Heavy Rain	Training bands of heavy showers redeveloped across coastal areas of Martin County during the morning of October 2 and persisted into the early afternoon. Rain totals of 5 to 8 inches fell across the same area impacted by 6 to 10 inches only a day earlier. Many of the same areas which experienced flash flooding were again inundated with rapidly rising water, exceeding 3 feet in some areas. High water resulted in the closing of dozens of roadways. Flood waters approached many homes and intruded into several homes resulting in damage. Drainage canals and creeks overflowed and high water from the Savannas Preserve flowed into surrounding areas. The flood waters were very slow to recede.

Sources:

NOAA. (2022). Storm Events Database. National Centers for Environmental Information (NCEI). https://www.ncdc.noaa.gov/stormevents/details.jsp

Federal Emergency Management Agency (FEMA). (2022). Historical flood risk and costs. https://www.fema.gov/data-visualization/historical-flood-risk-and-costs

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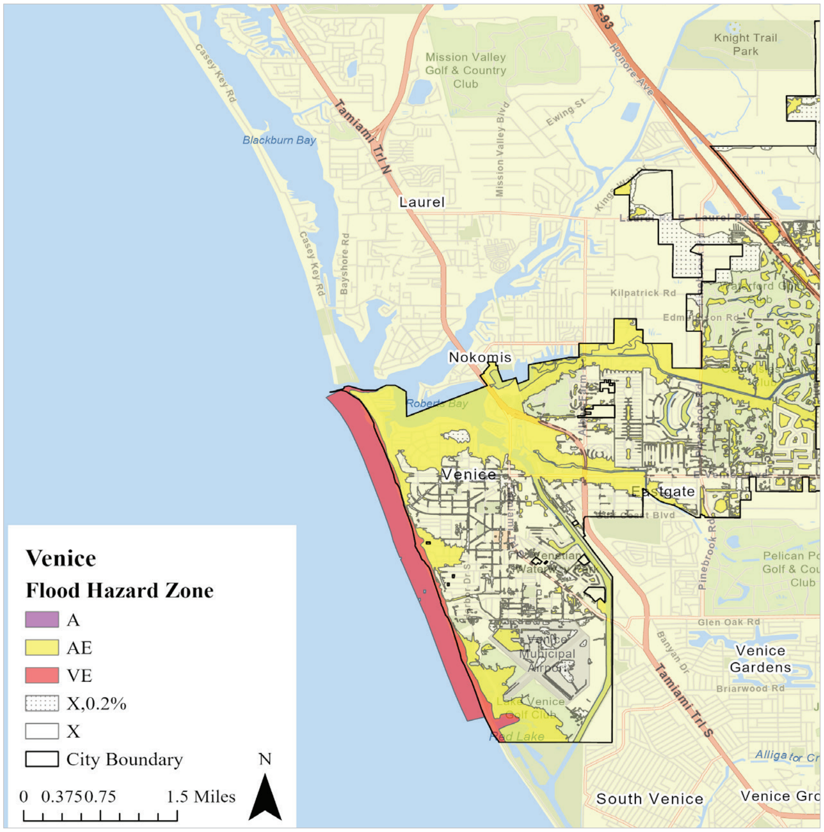
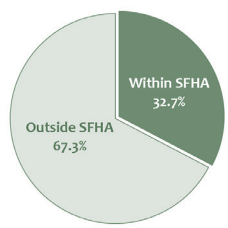


Venice
Historic Properties



VENICE: FLOOD EVENTS 2015-2021				
YEAR	**MONTH**	**TYPE OF EVENT**	**CAUSE OF FLOOD**	**EVENT NARRATIVE**
2016	September	Tropical Storm	Heavy Rain	Hurricane Hermine
2017	September	Tropical Storm	Heavy Rain	Hurricane Irma
2017	August	Flood	Heavy Rain	Heavy rain started to fall over Sarasota County on the 26th and continued through the 28th, with as much as 16 inches of rainfall. The highest rain totals were reported along the coast, with 14.74 inches falling in 3 days at the Sarasota/Bradenton Airport in Manatee County. This led to numerous reports of streets flooding across the area, mainly on the 26th through early morning on the 27th.
2021	July	Tropical Storm	Heavy Rain	Hurricane Elsa

Sources:

NOAA. (2022). Storm Events Database. National Centers for Environmental Information (NCEI). https://www.ncdc.noaa.gov/stormevents/details.jsp

Federal Emergency Management Agency (FEMA). (2022). Historical flood risk and costs. https://www.fema.gov/data-visualization/historical-flood-risk-and-costs

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