



APALACHEE REGIONAL PLANNING COUNCIL (ARPC)

A TRUE REGIONAL APPROACH LESSONS LEARNED: 9 COUNTY VULNERABILITY ASSESMENT

FSBPA CONFERENCE

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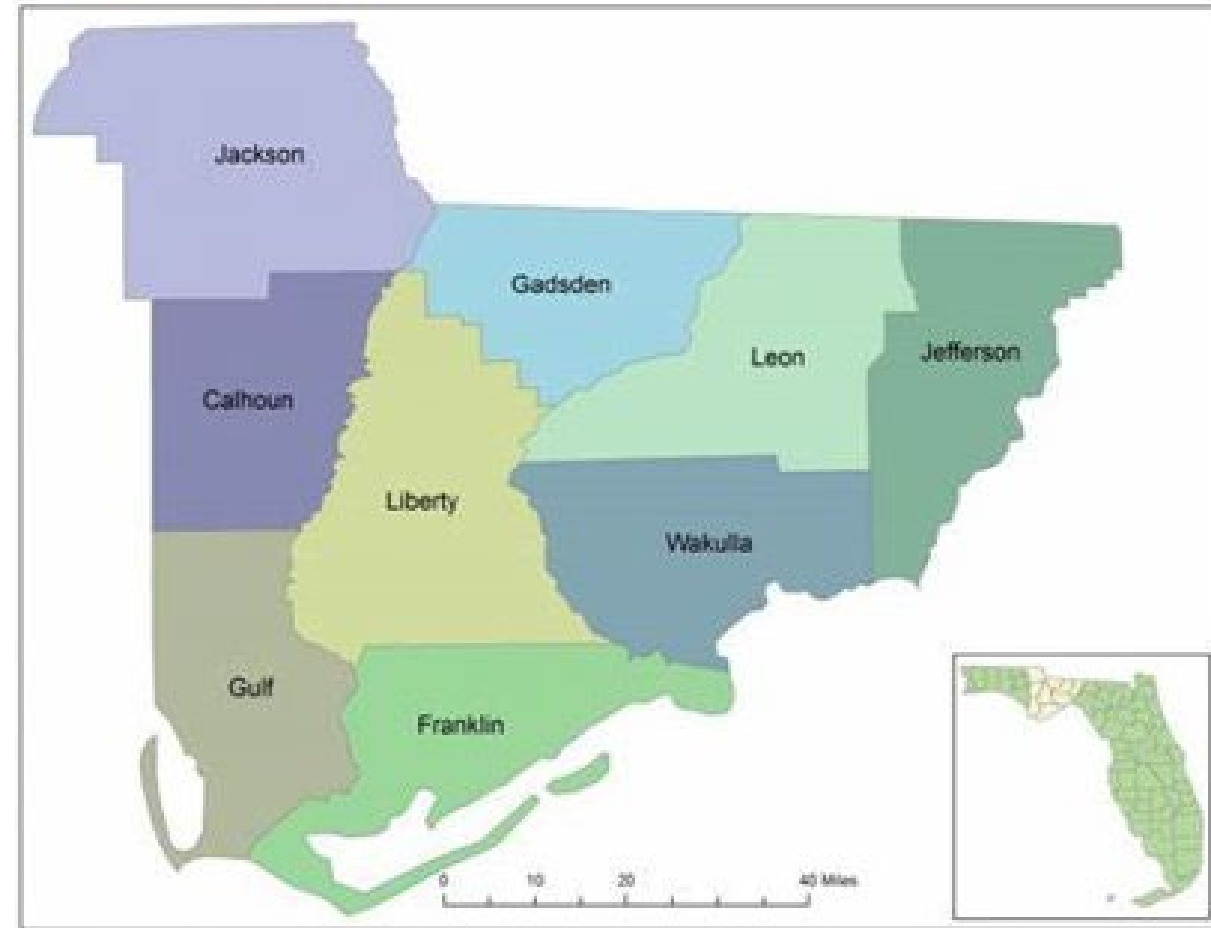
FEBRUARY 2, 2023

CUMMINS | CEDERBERG
Coastal & Marine Engineering



INTRODUCTION

- The Apalachee Regional Planning Council (ARPC) is one of 10 regional planning councils in Florida established pursuant to State Statutes in the 1970's.
- The core function: to provide technical assistance to its member local governments. This includes 9 counties and 28 municipalities located throughout the Florida Panhandle.
- The ARPC worked in collaboration with Leon County to apply for a Regional Resiliency Entity grant from Resilient Florida Program in 2021.
- The objective of this project was to conduct a regional vulnerability assessment of the 9-county region and evaluate the vulnerabilities of critical and regionally significant assets to the hazards of tidal flooding, storm surge, precipitation, sea level rise, and compound flooding.



FAST FACTS

- Timing is everything!
 - Project executed March 31; Due June 30
 - HB 7053 “Glitch Bill”
 - FDEP’s VA Guidance May 2022
- One of largest vulnerability assessments to be conducted in state and among first to follow 2021 statutory requirements
- More than 17,000 infrastructure assets evaluated across 9 counties and 28 municipalities
- Vulnerability assessment covered 10.8% of Florida’s total land area
- Final report – 350 pages, 90+ GIS maps, 90+ tables, and 36 individual critical asset case studies
- Local governments across region now have comprehensive resources for informing future decision-making; including final report and interactive GIS geodatabase

Apalachee Regional Vulnerability Assessment

*An Evaluation of Current and Future Flood
Risks Across the Nine-County Region*



Prepared by:
Halff Associates, Inc.
Cummins Cederberg

Prepared for:
Apalachee Regional Planning Council (ARPC)

Funded by:
Florida Department of
Environmental Protection (FDEP)

SCOPE OF WORK

- \$253,000 State Awarded Resilience Grant
- 9 Counties – 4 coastal, 5 inland
- Intent: To provide basis for multi-phased resilience planning and implementation; and position counties for subsequent funding opportunities
- Task 1 – Critical Asset / Climate Hazard Data Inventory
- Task 2 – Critical Facilities Analysis
- Task 3 – Draft Vulnerability Assessment
- Task 4 – Final Vulnerability Assessment



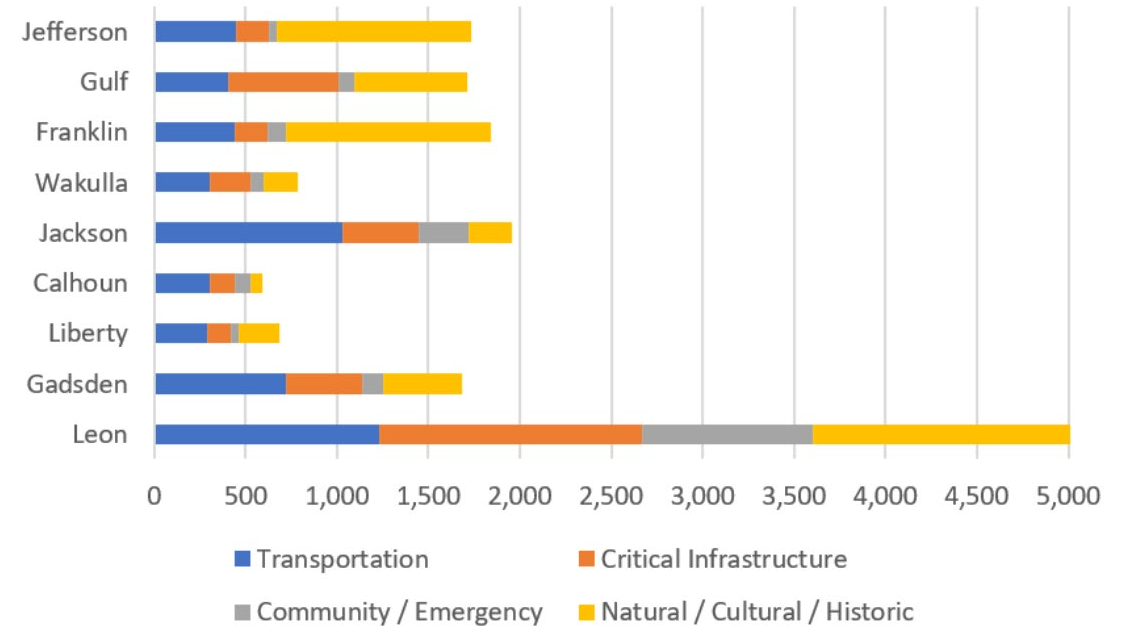
CRITICAL ASSET REQUIREMENTS

- Section 380.093 (F.S.) requires vulnerability assessments to evaluate the exposure and sensitivity of critical assets, including:
 - i. Transportation assets and evacuation routes**, including airports, bridges, bus terminals, ports, major roadways, marinas, rail facilities, and railroad bridges.
 - ii. Critical infrastructure**, including wastewater treatment facilities and lift stations, stormwater treatment facilities and pump stations, drinking water facilities, water utility conveyance systems, electric production and supply facilities, solid and hazardous waste facilities, military installations, communications facilities, and disaster debris management sites.
 - iii. Critical community and emergency facilities**, including schools, colleges, universities, community centers, correctional facilities, disaster recovery centers, emergency medical service facilities, emergency operation centers, fire stations, health care facilities, hospitals, law enforcement facilities, local government facilities, logistical staging areas, affordable public housing, risk shelter inventory, and state government facilities.
 - iv. Natural, cultural, and historical resources**, including conservation lands, parks, shorelines, surface waters, wetlands, and historical and cultural assets.

CRITICAL ASSET INVENTORY

- Comprehensive critical asset GIS inventory
- Coordination with local counties and municipalities
- Statewide GIS inventory of critical assets was established because of lack of GIS data at local level
- More than 50 public datasets utilized to build inventory
 - Florida Department of Transportation (FDOT)
 - Florida Department of Emergency Management (FDEM)
 - Florida Geographic Data Library (FGDL)
 - U.S. Department of Housing and Urban Development (US HUD)
 - Florida Natural Areas Inventory (FNAI)
 - Florida Department of State (FDOS)
 - Florida Fish and Wildlife Conservation Commission (FWC)
 - Florida Department of Environmental Protection (FDEP)
 - Northwest Florida Water Management District (NWFWMD)
- Data Gaps vs. Excessive data
- Once inventory was built, data was clipped and separated by jurisdiction

Critical Asset Category Distributions by County



Category	Number of Critical Assets by County									Totals
	Leon	Gadsden	Liberty	Calhoun	Jackson	Wakulla	Franklin	Gulf	Jefferson	
1	1,234	723	286	306	1,032	307	438	406	449	5,181
2	1,434	412	131	133	412	220	181	600	176	3,699
3	935	118	45	87	272	69	103	87	42	1,758
4	2,562	434	221	64	239	189	1,117	616	1,065	6,507
Total	6,165	1,687	683	590	1,955	785	1,839	1,709	1,732	17,145

Figure 4

Transportation Asset Sub-Category Distributions by County

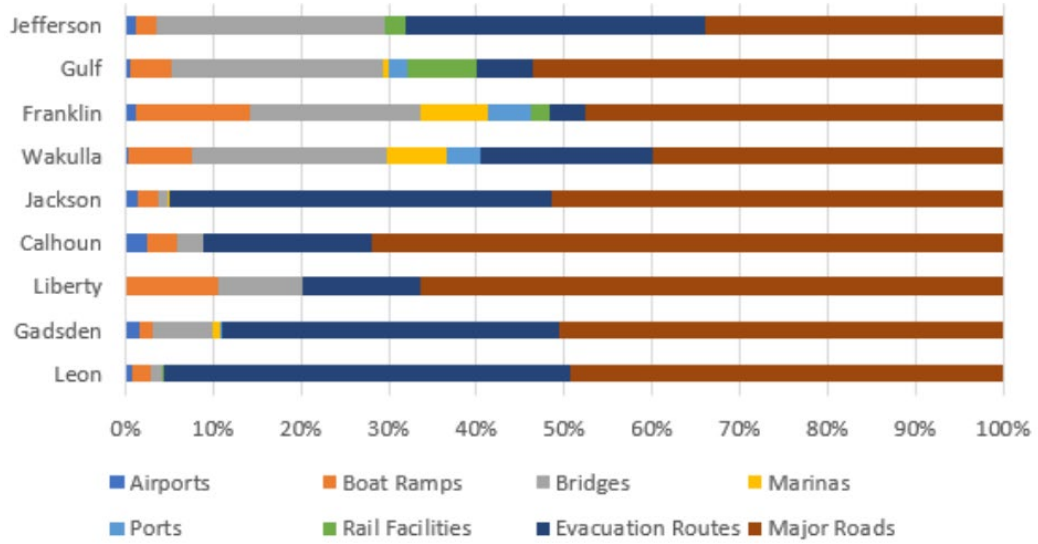


Figure 5

Critical Infrastructure Asset Sub-Category Distributions by County

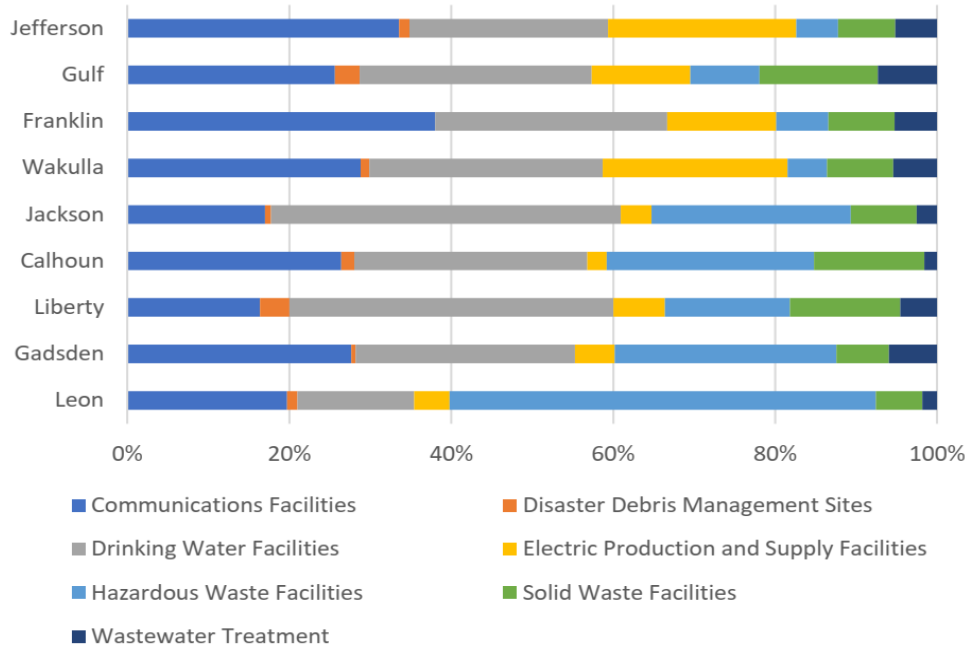


Figure 6

Community/Emergency Asset Sub-Category Distributions by County

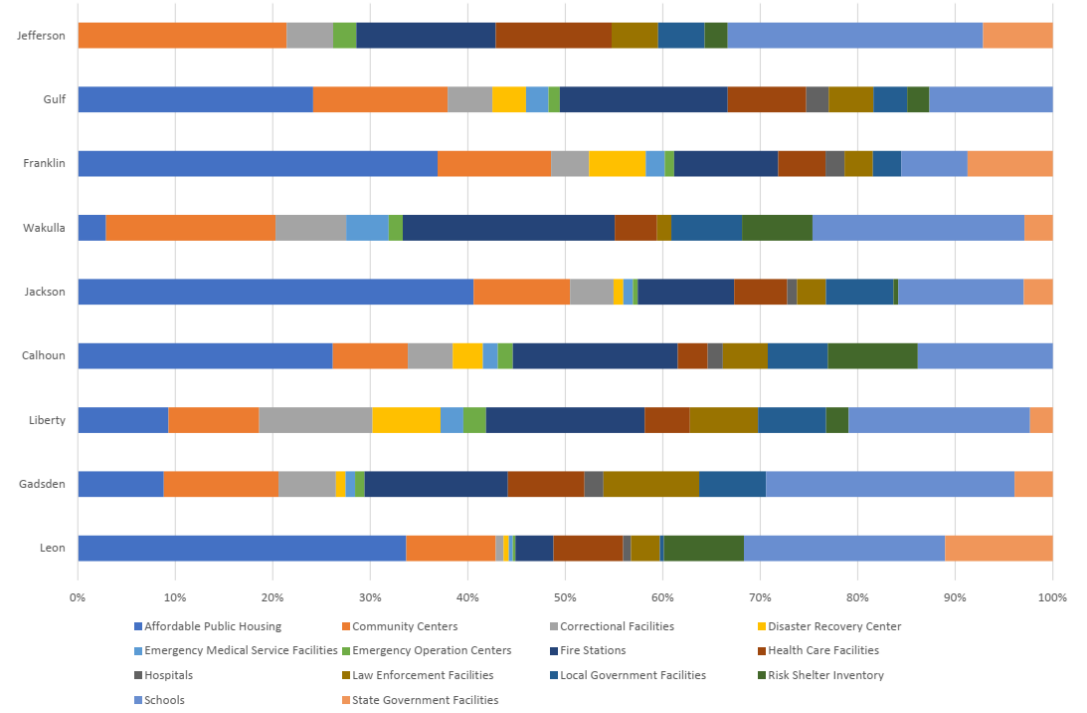
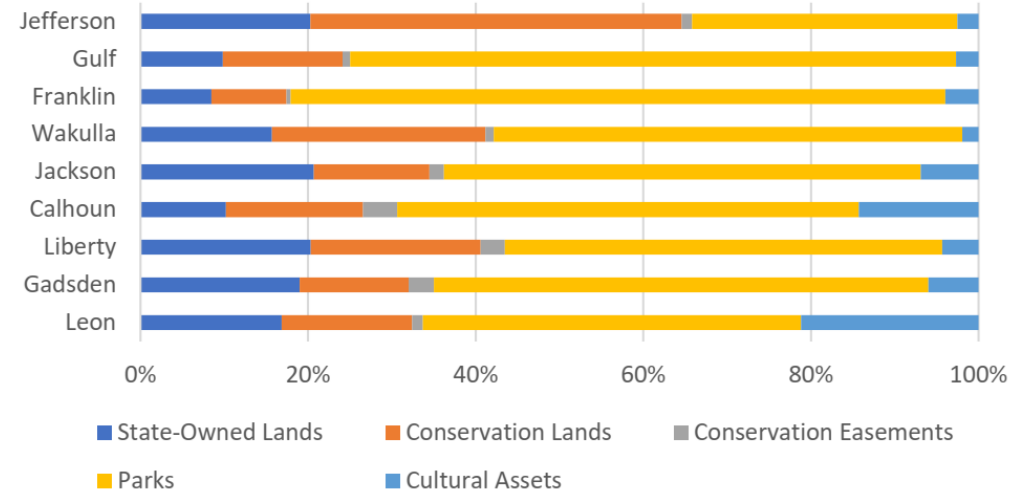


Figure 7

Natural/Cultural Asset Sub-Category Distributions by County



FLORIDA STATUTORY REQUIREMENTS

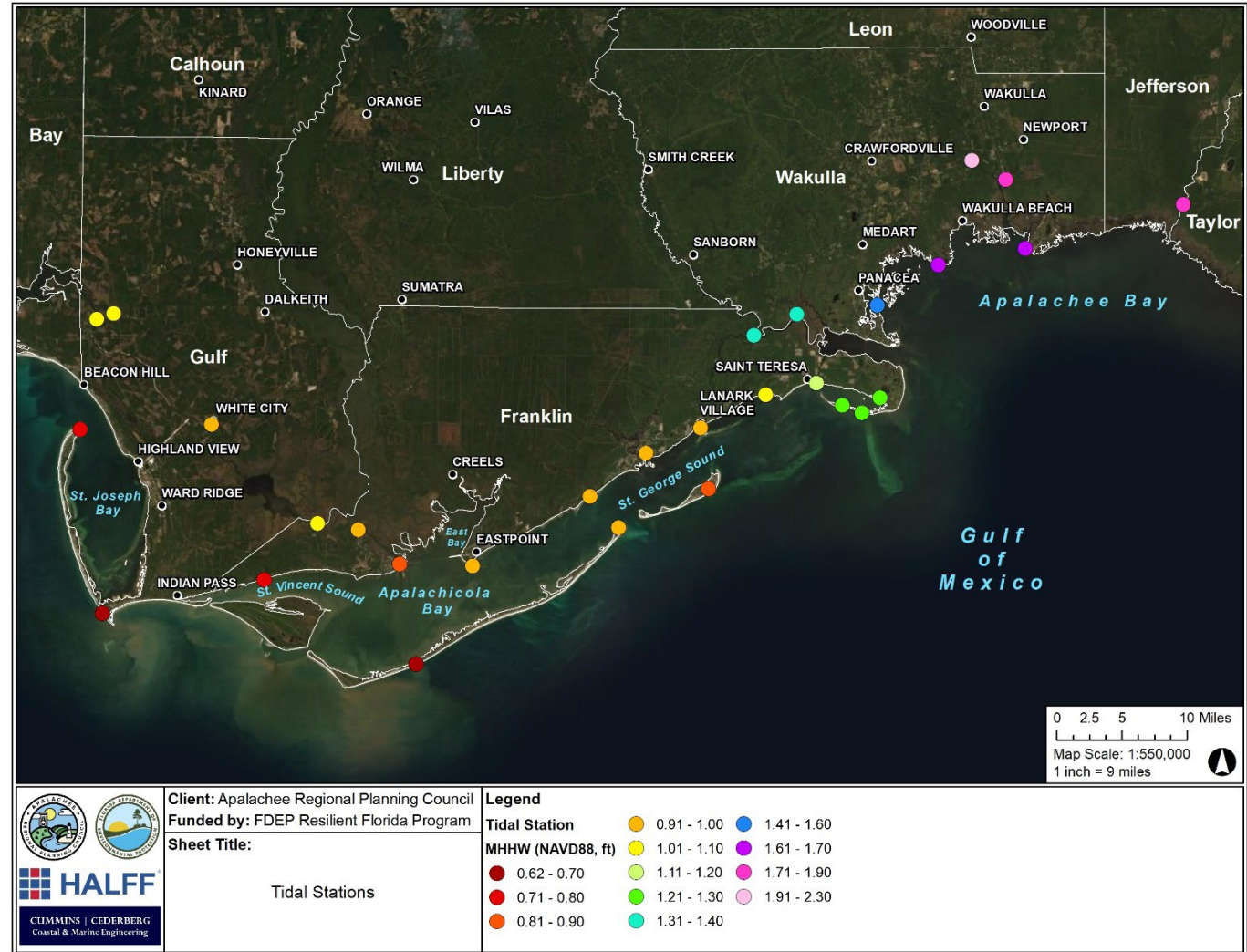
- Section 380.093 (F.S.) requires vulnerability assessments to evaluate:
 - i. Tidal flooding**, including future high tide flooding, which must use thresholds published and provided by the department. To the extent practicable, the analysis should also geographically display the number of tidal flood days expected for each scenario and planning horizon.
 - ii. Current and future storm surge flooding** using publicly available NOAA or FEMA storm surge data. The initial storm surge event used must equal or exceed the current 100-year flood event. Higher frequency storm events may be analyzed to understand the exposure of a critical asset.
 - iii. To the extent practicable, rainfall-induced flooding** using spatiotemporal analysis or existing hydrologic and hydraulic modeling results. Future boundary conditions should be modified to consider sea level rise and high tide conditions.
 - iv. To the extent practicable, compound flooding** or the combination of tidal, storm surge, and rainfall-induced flooding.

CLIMATE HAZARDS

Climate Hazard Data

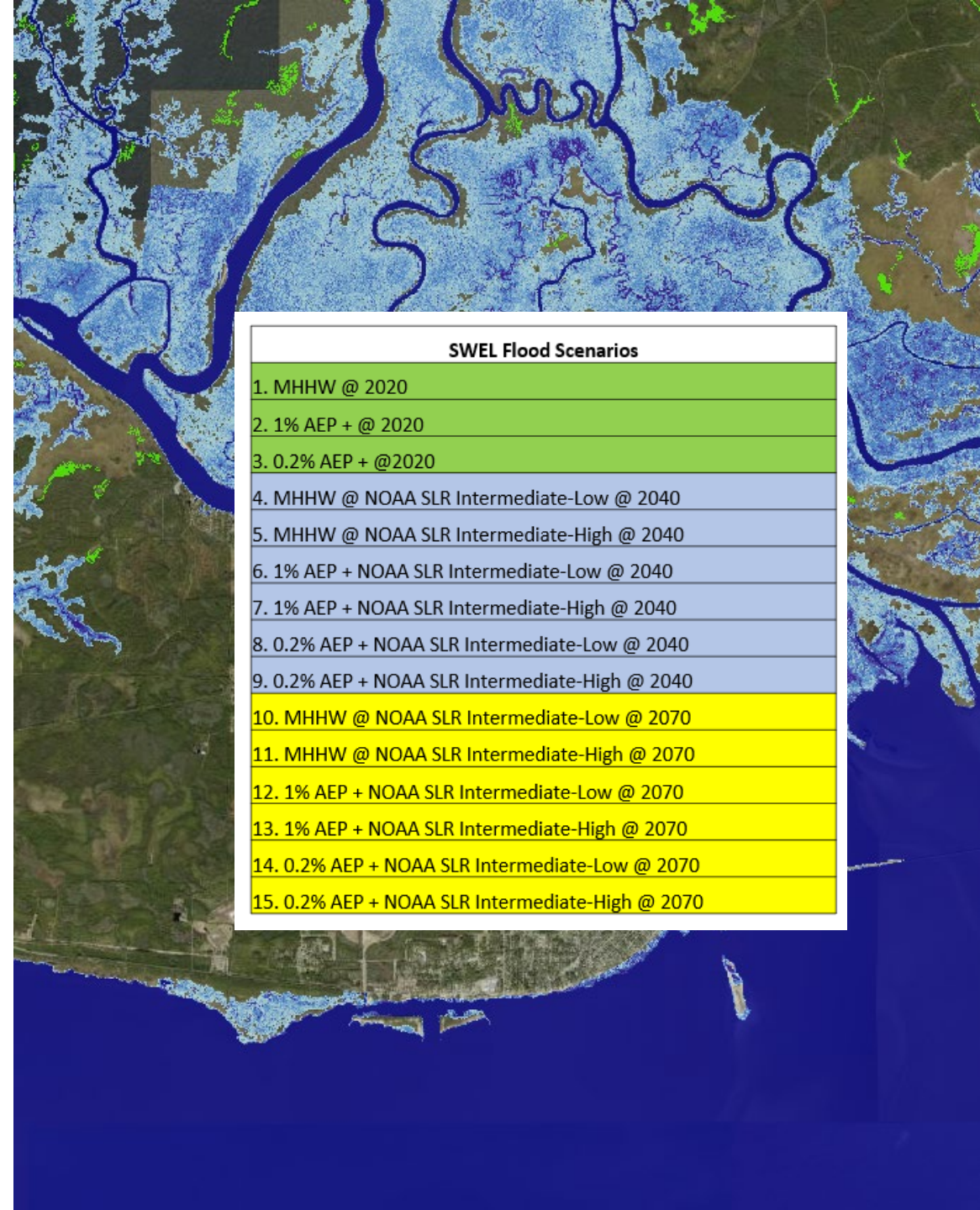
- DEM from NFWFMD with 2M resolution
- Storm surge evaluated using FEMA North FL Coastal Risk Assessment FIS conducted in 2020
 - ACIRC + SWAN + WAFIS
 - Spatially varied SWL raster files
 - 1% and 0.2% AEP
- Tidal data – 29 stations
- Index Correction = 3mm/yr (GRSLR, 2022)

County	NOAA Published MHHW, YEAR 1992 [ft, NAVD88]	Adjusted MHHW, YEAR 2020 [ft, NAVD88]
Jefferson	1.90	2.17
Wakulla	2.29	2.56
Franklin	1.31	1.58
Franklin, Barrier Island	0.98	1.25
Gulf	1.07	1.34
Gulf, Barrier Island	0.78	1.05



STORM SURGE

- Climate hazard data for tidal flooding, storm surge, sea level rise, precipitation, and compound flooding was mapped and visualized in GIS.
- GIS data for critical and regionally significant assets were then overlaid with climate hazard data so that the team could analyze and determine which assets were vulnerable to different climate conditions and scenarios.
- Analyzing the intersections of the hazard and critical assets data, the results were then visualized through mapping and tabulated to summarize which assets were identified as vulnerable.
- Compound flooding and precipitation were evaluated at regional scale.
- 15 flood scenarios evaluated for coastal counties in addition to existing Special Flood Hazard Area (SFHA) analysis.
- Inland counties only included SFHA analysis.

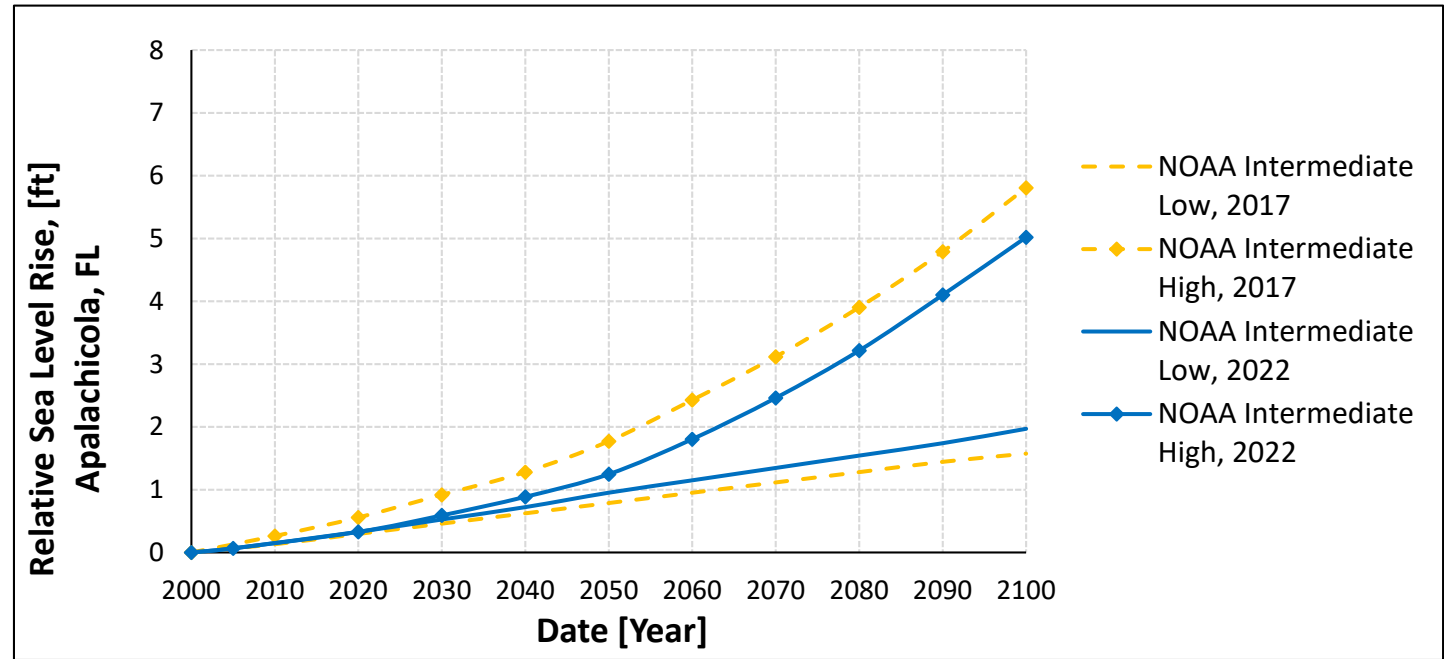


SEA LEVEL RISE PROJECTIONS

Applied weighted distance between three NOAA stations:

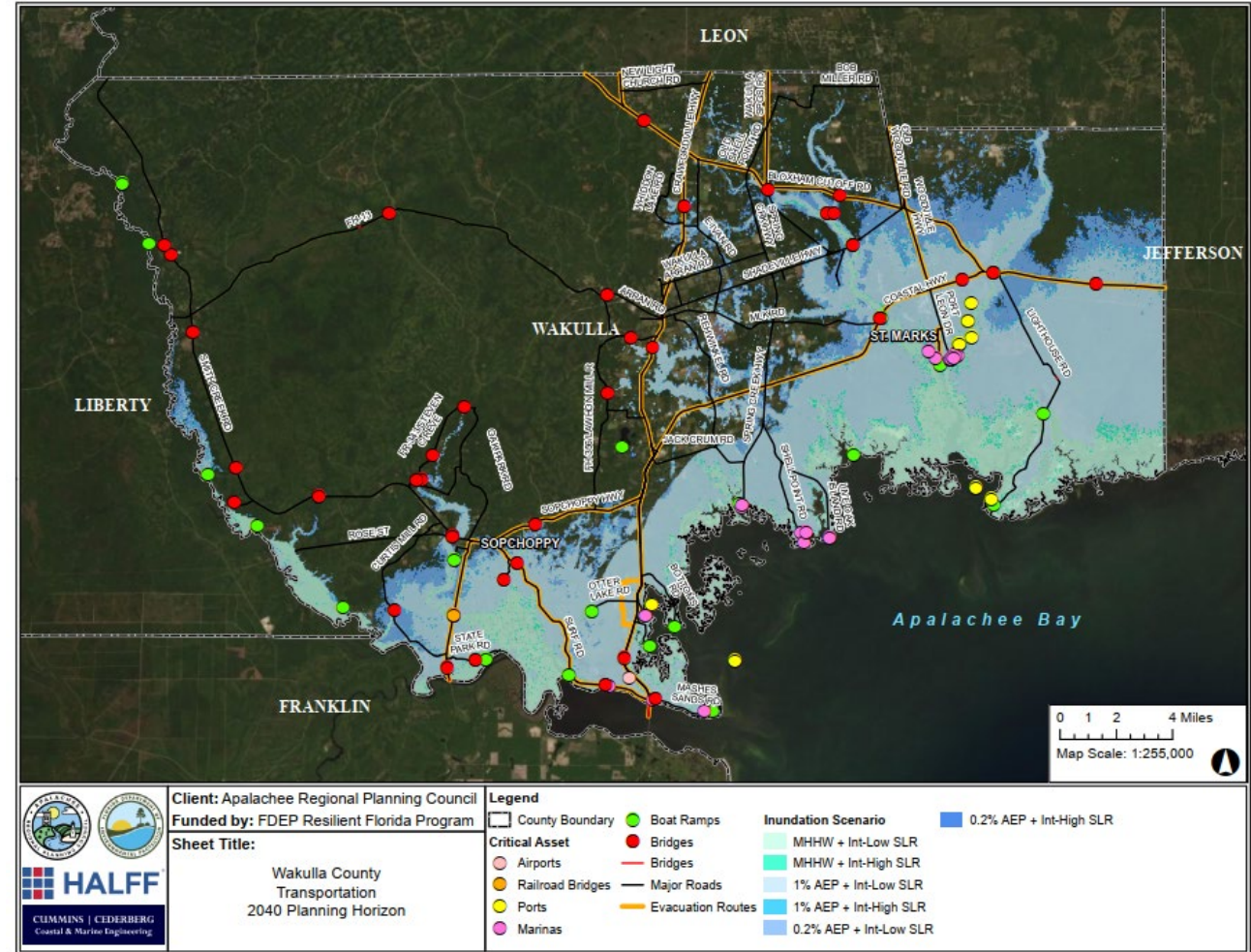
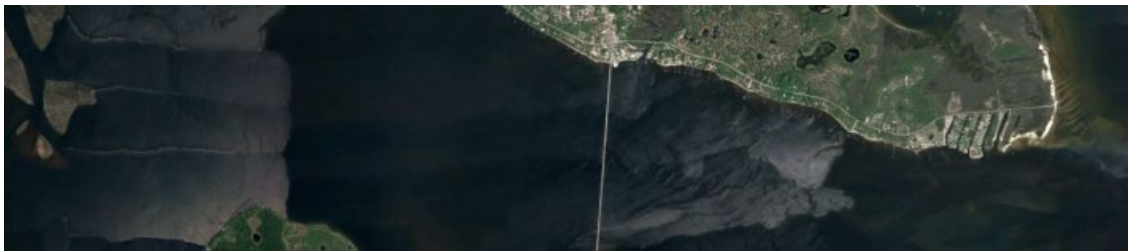
- NOAA Station 8729108 – Panama City, FL
- NOAA Station 8728690 – Apalachicola, FL
- NOAA Station 8727520 – Cedar Key, FL
- Updated Tidal Epoch from Year 2000 to 2020
 - Applied adjustment factor ~0.3FT
- Used NOAA 2017 Projections
- 4 SLR Scenarios, in accordance with F.S. 380.093
- Compared 2017 and 2022 projections

Projection	2020 [ft]	2030 [ft]	2040 [ft]	2050 [ft]	2060 [ft]	2070 [ft]	2080 [ft]	2090 [ft]	2100 [ft]
NOAA Intermediate-Low	0.00	0.16	0.32	0.50	0.68	0.84	0.99	1.16	1.29
NOAA Intermediate-High	0.00	0.36	0.73	1.24	1.88	2.58	3.36	4.26	5.26



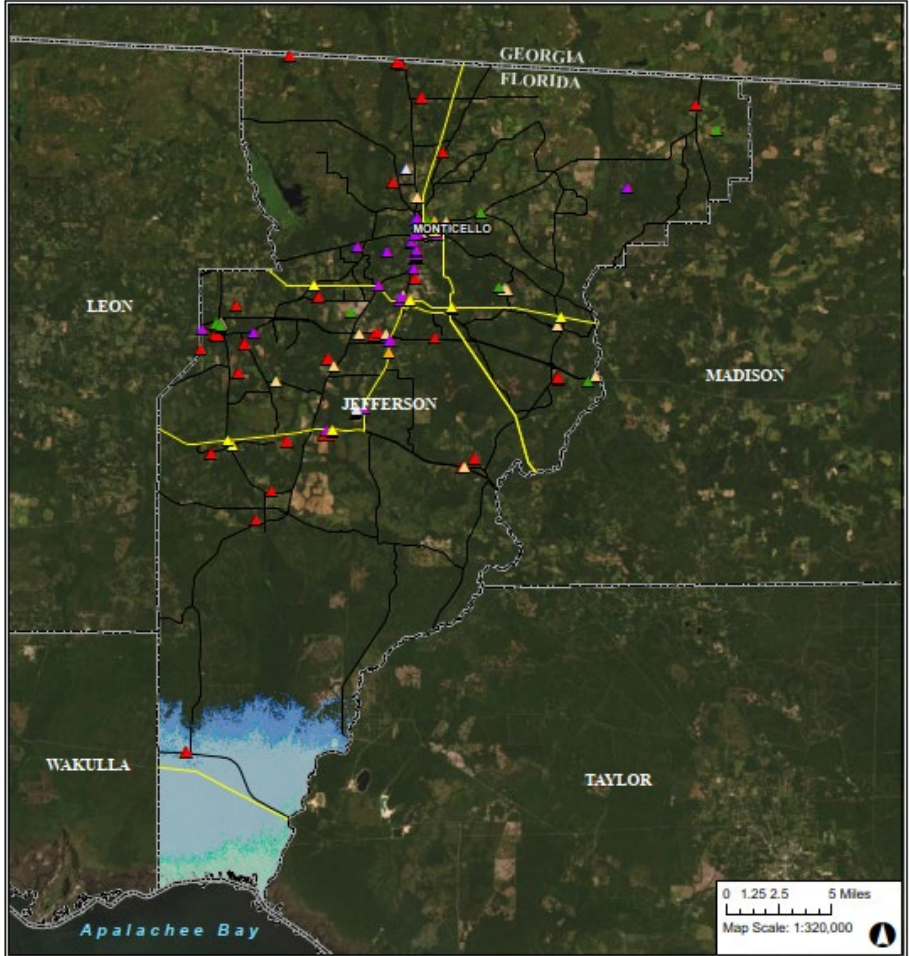
EXAMPLE 1: TRANSPORTATION

	Count of Crit_Asset	Count of 2020 MHHW	Count of 2020 1%	Count of 2020 0.2%	Count of 2040 IL MHHW	Count of 2040 IH MHHW	Count of 2040 IL 1%	Count of 2040 IH 1%	Count of 2040 IL 0.2%	Count of 2040 IH 0.2%
Transportation	307	89	160	187	92	98	162	163	193	193
Airports	1	-	1	1	-	-	1	1	1	1
Boat Ramps	22	14	17	17	15	15	17	17	17	17
Bridges	68	23	44	45	24	27	44	44	45	45
Evacuation Routes	60	8	20	30	8	9	20	21	30	30
Major Roads	122	15	48	64	16	17	50	50	70	70
Marinas	21	20	21	21	20	21	21	21	21	21
Ports	12	8	8	8	8	8	8	8	8	8
Railroad Bridges	1	1	1	1	1	1	1	1	1	1



EXAMPLE 2: CRITICAL INFRASTRUCTURE

	Count of Crit. Asset	Count of 2020 MHHW	Count of 2020 1%	Count of 2020 0.2%	Count of 2040 IL MHHW	Count of 2040 IH MHHW	Count of 2040 IL 1%	Count of 2040 IH 1%	Count of 2040 IL 0.2%	Count of 2040 IH 0.2%
Critical Infrastructure	155	1	3	3	1	1	3	3	3	3
Communications Facilities	52	-	2	2	-	-	2	2	2	2
Disaster Debris Management Sites	2	-	-	-	-	-	-	-	-	-
Drinking Water Facilities	38	-	-	-	-	-	-	-	-	-
Electric Production and Supply Facilities	36	1	1	1	1	1	1	1	1	1
Hazardous Waste Facilities	8	-	-	-	-	-	-	-	-	-
Solid Waste Facilities	11	-	-	-	-	-	-	-	-	-
Wastewater Treatment Facilities	8	-	-	-	-	-	-	-	-	-



Client: Apalachee Regional Planning Council
 Funded by: FDEP Resilient Florida Program

Sheet Title: Jefferson County Critical Infrastructure 2040 Planning Horizon

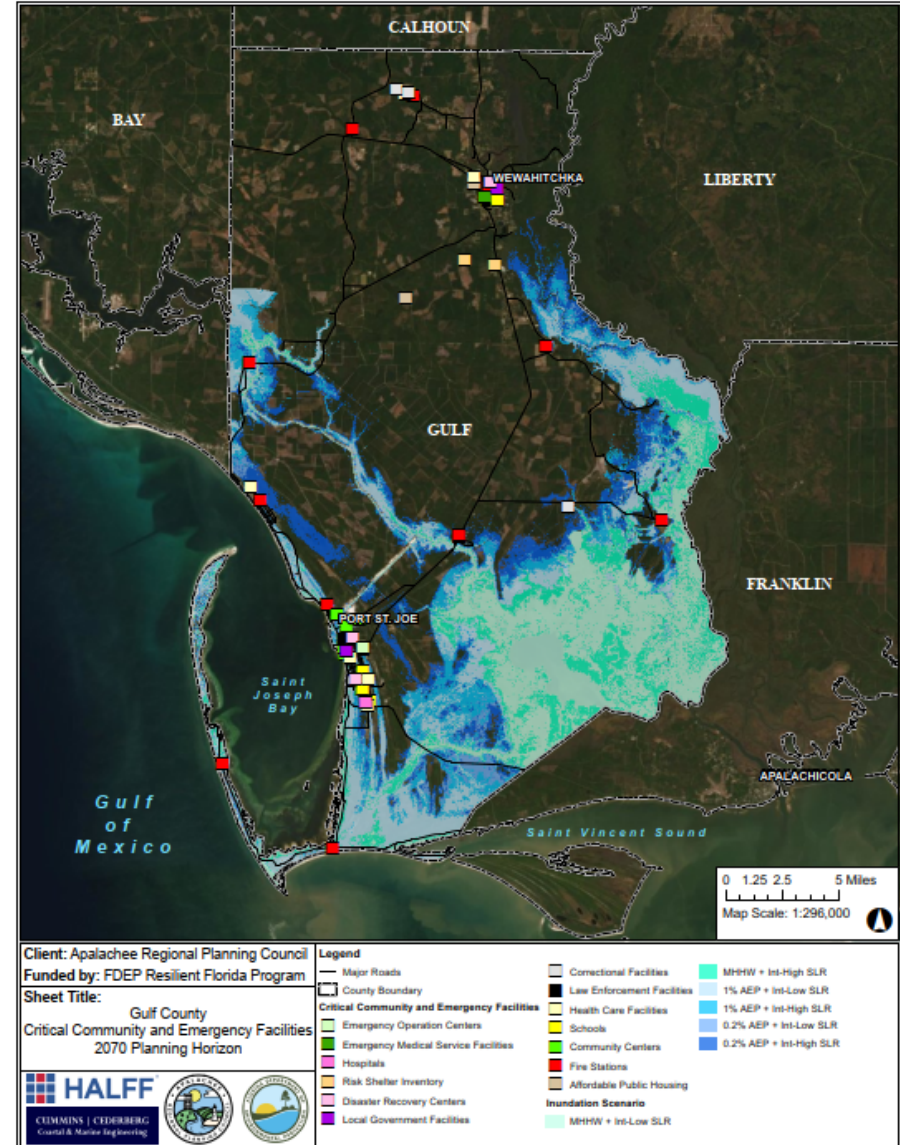
Legend

- Major Roads
- County Boundary
- State Boundary
- Critical Infrastructure
 - Disaster Debris Management Sites
 - Wastewater Treatment Facilities
 - Solid Waste Facilities
 - Electric Production and Supply Facilities
 - Hazardous Waste Facilities
 - Drinking Water Facilities
- Communications Facilities
- Electric Production and Supply Facilities
- Inundation Scenario
 - MHHW + Int-Low SLR
 - MHHW + Int-High SLR
 - 1% AEP + Int-Low SLR
 - 1% AEP + Int-High SLR
 - 0.2% AEP + Int-Low SLR
 - 0.2% AEP + Int-High SLR

Map Scale: 1:320,000

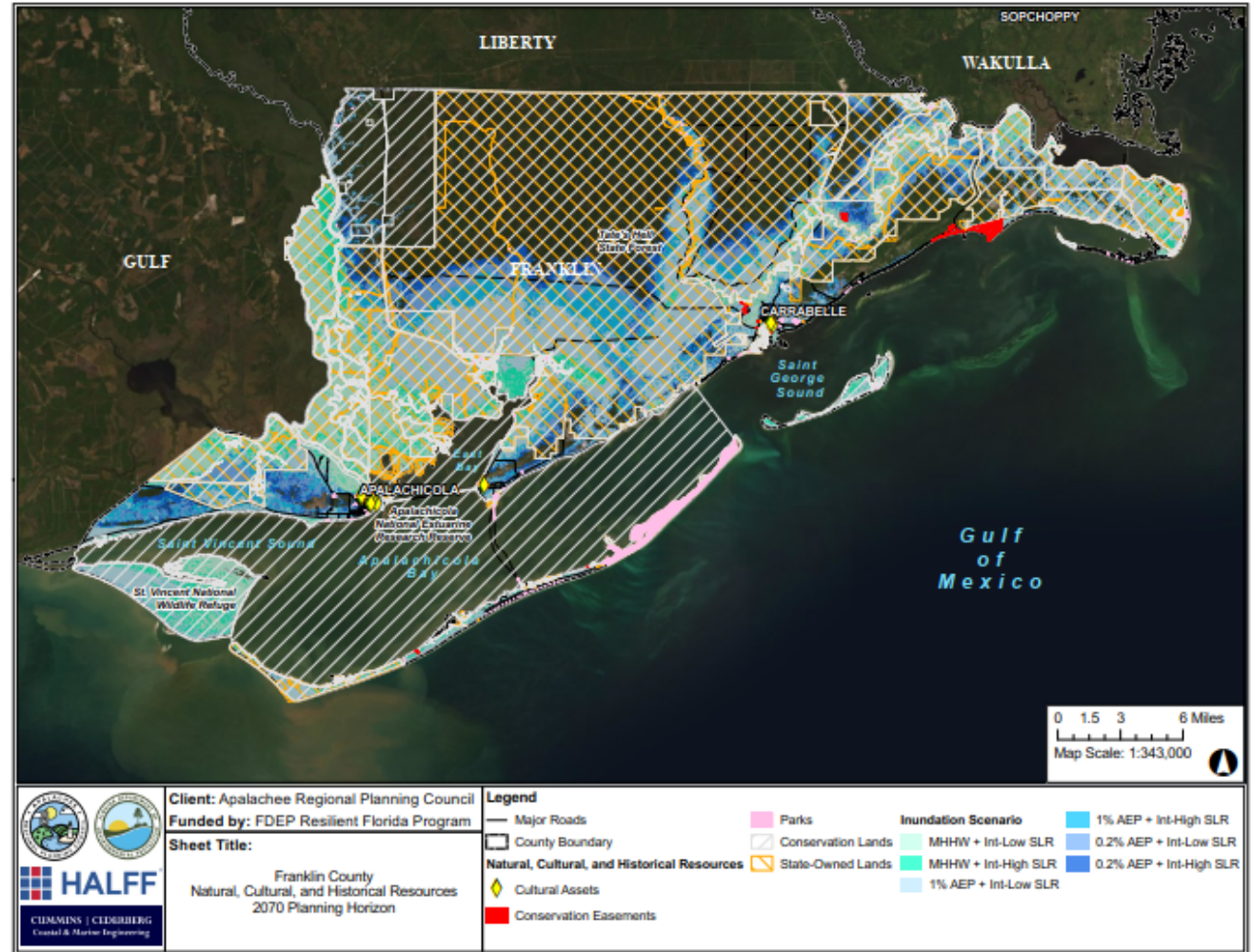
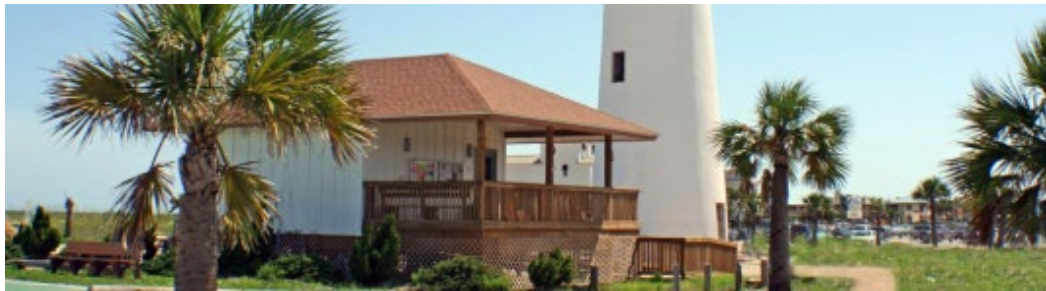
EXAMPLE 3: COMMUNITY/EMERGENCY

	Count of 2070 IL MHHW	Count of 2070 IH MHHW	Count of 2070 IL 1%	Count of 2070 IH 1%	Count of 2070 IL 0.2%	Count of 2070 IH 0.2%
Critical Community and Emergency Facilities	2	7	21	29	30	34
Community Centers	1	1	2	3	3	4
Correctional Facilities	-	-	1	2	2	2
Disaster Recovery Centers	-	-	-	1	1	2
Emergency Medical Service Facilities	-	-	1	1	1	1
Emergency Operation Centers	-	-	1	1	1	1
Fire Stations	1	1	4	7	7	8
Health Care Facilities	-	-	1	3	3	3
Hospitals	-	2	2	2	2	2
Law Enforcement Facilities	-	-	2	2	3	3
Local Government Facilities	-	-	2	2	2	2
Schools	-	3	5	5	5	6

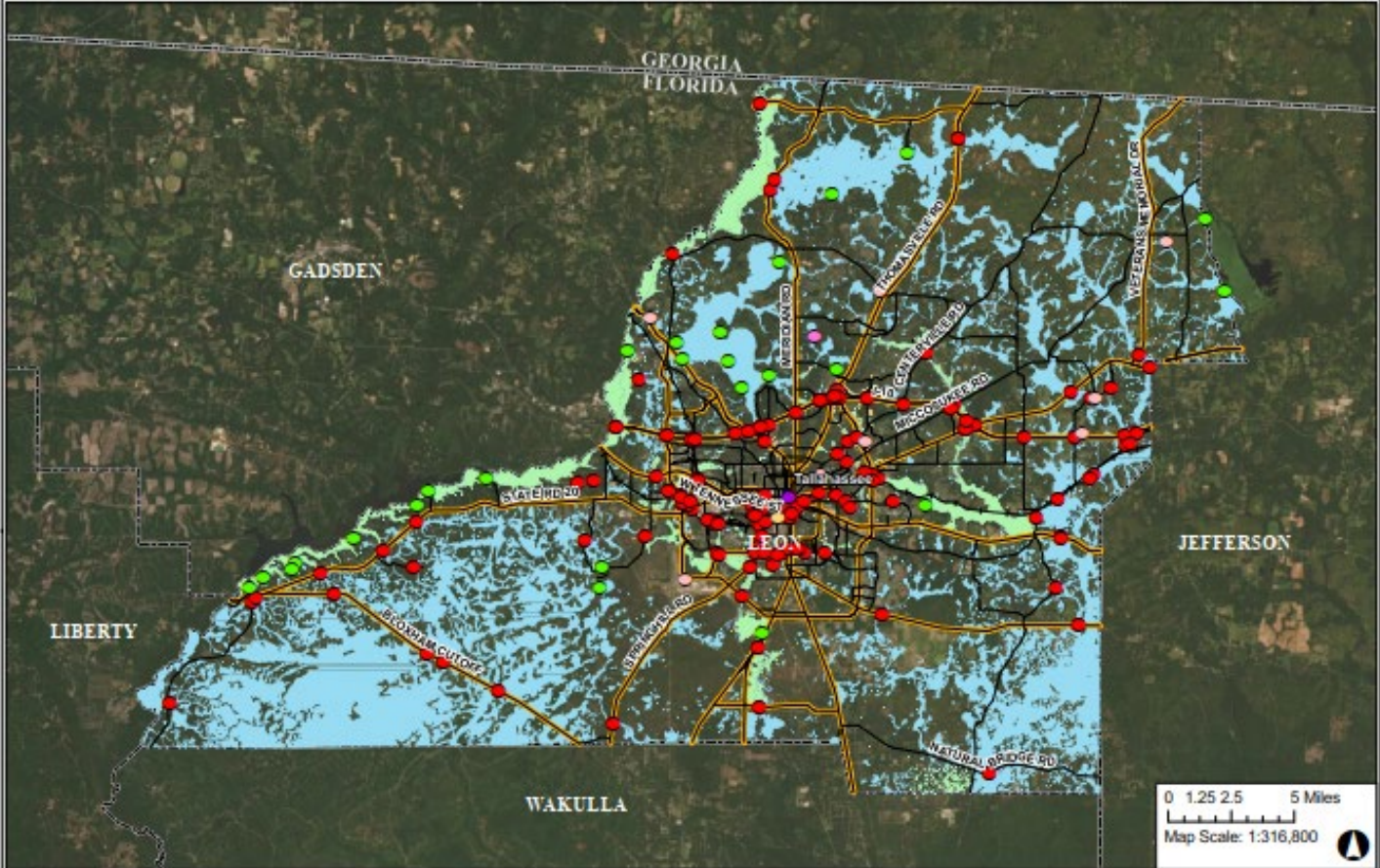


EXAMPLE 4: NATURAL, CULTURAL & HISTORIC

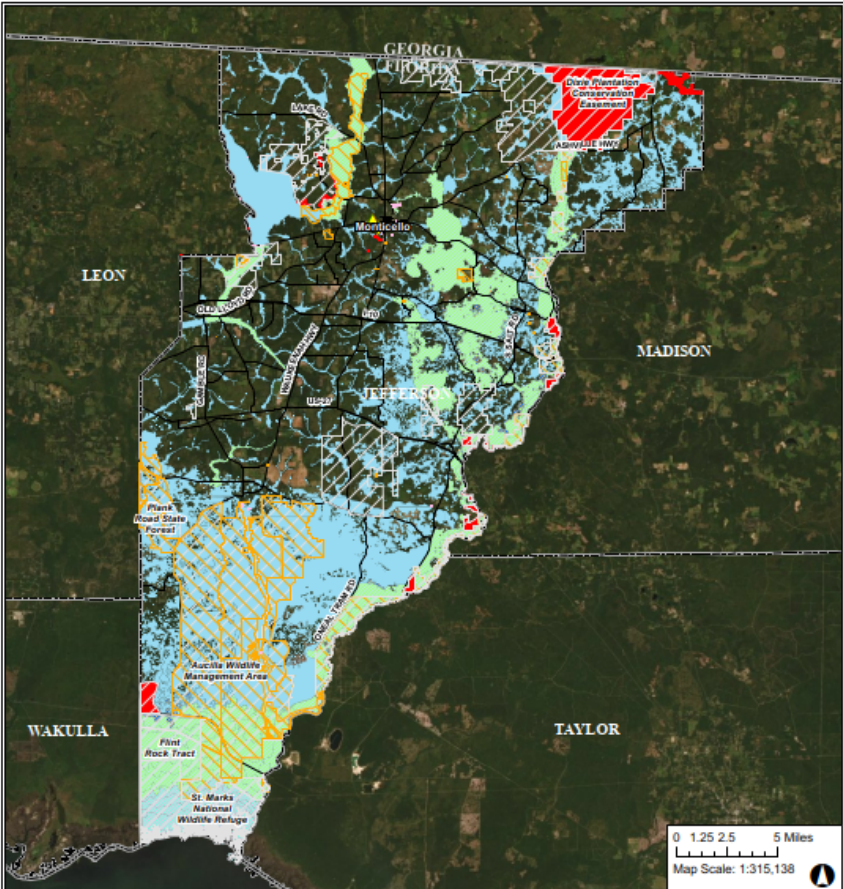
	Count of Crit. Asset	Count of 2020 MHHW	Count of 2020 1%	Count of 2020 0.2%	Count of 2040 IL MHHW	Count of 2040 IH MHHW	Count of 2040 IL 1%	Count of 2040 IH 1%	Count of 2040 IL 0.2%	Count of 2040 IH 0.2%
Natural, Cultural, and Historical Resources	201	90	175	185	98	103	176	178	187	188
Conservation Easements	1	1	1	1	1	1	1	1	1	1
Conservation Lands	18	16	17	18	16	16	17	17	18	18
Cultural Assets	8	2	4	6	2	2	5	5	7	7
Parks	157	59	137	143	67	70	137	138	144	145
State-Owned Lands	17	12	16	17	12	14	16	17	17	17



SPECIAL FLOOD HAZARD AREAS

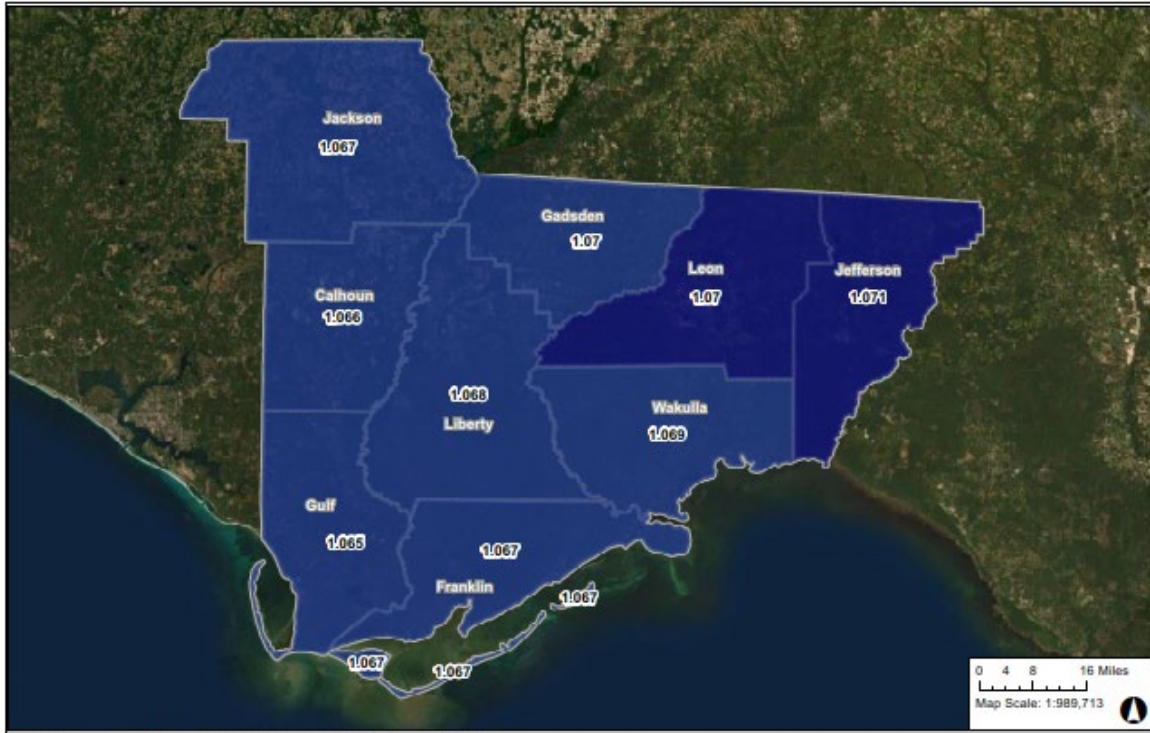


	<p>Client: Apalachee Regional Planning Council Funded by: FDEP Resilient Florida Program Sheet Title:</p>	<p>Legend</p> <ul style="list-style-type: none"> State Boundaries County Boundaries Transportation Airports Boat Ramps Bridges Bus Terminals Marinas Rail Facilities Bridges Evacuation Routes Major Roads Railways 	<p>FEMA Special Flood Hazard Areas</p> <ul style="list-style-type: none"> 1% AEP - Zone A 1% AEP - Zone AE 0.2% AEP - Zone X
	<p>Leon County Transportation FEMA Special Flood Hazard Areas</p>		



	<p>Client: Apalachee Regional Planning Council Funded by: FDEP Resilient Florida Program Sheet Title:</p>	<p>Legend</p> <ul style="list-style-type: none"> State Boundaries County Boundaries Major Roads Natural, Cultural, and Historical Resources Cultural Assets Conservation Easements Conservation Lands Parks State-Owned Lands FEMA Special Flood Hazard Areas 1% AEP - Zone A 1% AEP - Zone AE 1% AEP - Zone VE 0.2% AEP - Zone X
	<p>Jefferson County Natural, Culture, and Historical Resources FEMA Special Flood Hazard Areas</p>	

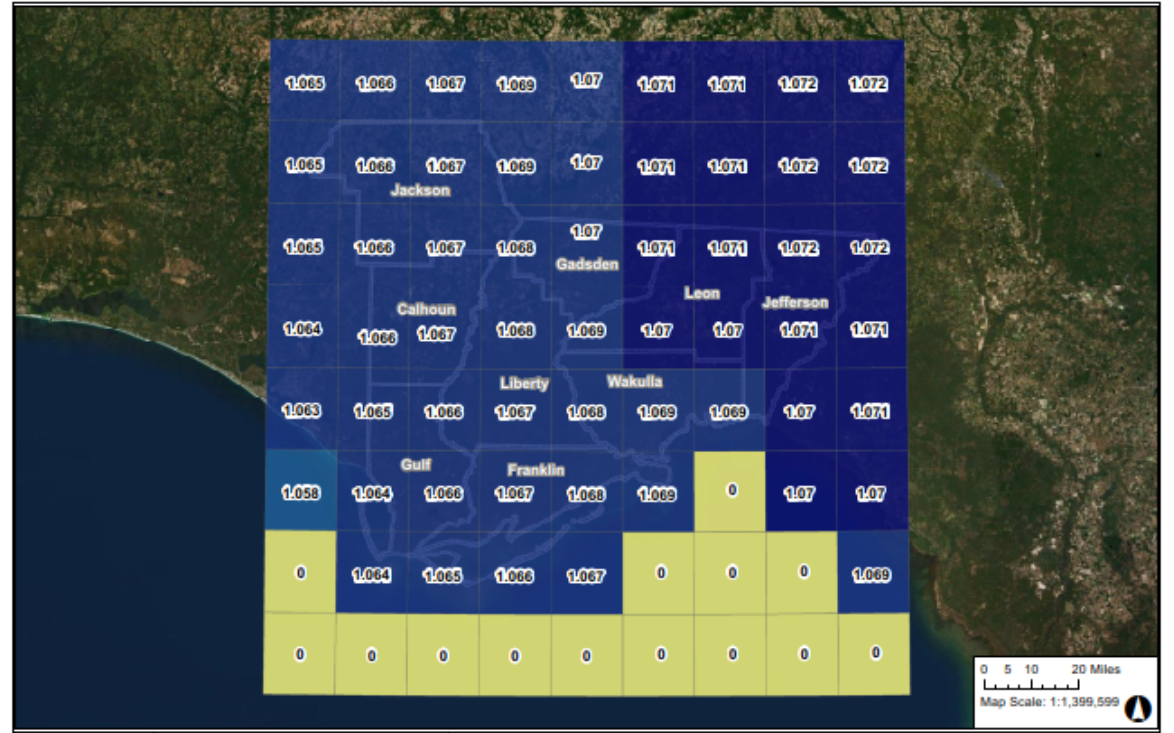
FUTURE PRECIPITATION




Client: Apalachee Regional Planning Council
Funded by: FDEP Resilient Florida Program
Sheet Title: Annual Precipitation Change Factors 2070 Planning Horizon SSP245

Legend	
	County Boundary
	1.00 - 1.01
	1.04 - 1.05
	0.00
	0.01 - 1.00
	1.01 - 1.02
	1.05 - 1.06
	1.02 - 1.03
	1.06 - 1.07
	1.03 - 1.04
	1.07 - 1.08


 Map Scale: 1:989,713

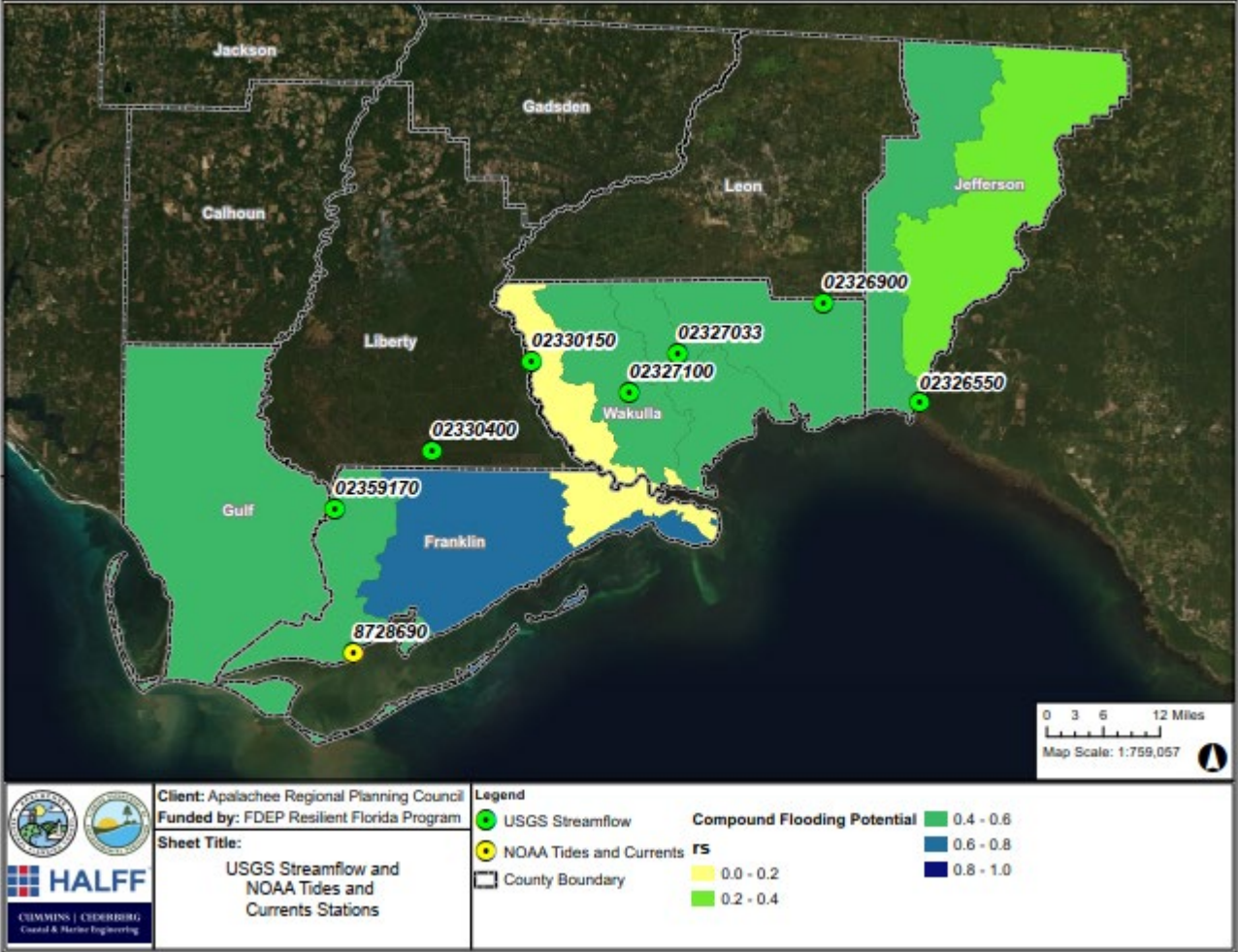



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	County Boundary
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	1.01 - 1.02
	1.05 - 1.06
	1.02 - 1.03
	1.06 - 1.07
	1.03 - 1.04
	1.07 - 1.08


 Map Scale: 1:1,399,599

COMPOUND FLOODING



FACILITY ADAPTATION

- Identify current and future conditions of critical assets at site-specific scale
 - 4 assets per county (1 per category) with 36 critical assets evaluated at site scale in total
 - Ground regional analysis conclusions within the context and conditions of individual communities
 - Identify adaptation strategies and grant funding/finance opportunities
-
- Multi-disciplinary exercise which involved civil, transportation, and public works engineers
 - Limited to desktop exercise because of budget and timeline constraints (i.e., not enough time or budget to physically inspect the site locations)



EXAMPLE 1: TRANSPORTATION



1. Transportation: U.S. 98

General Information

Facility Name: US 98 from the Ochlockonee Bay to Panacea, Florida

Category: Transportation

Address: US 98 (a.k.a. State Road 30) from the north end of the 5,855 foot long bridge over Ochlockonee Bay to the southern end of the town of Panacea in Wakulla County, Florida.

Utility/Purpose: US 98 (SR 30) provides vehicular access to the 500 +/- homes, businesses and property owners. US 98 (SR 30) is designated a Hurricane Evacuation Route by the Florida Department of Transportation.

Description: US 98 (SR 30) is a two-lane asphalt paved roadway approximately 3.15 miles long running from the Ochlockonee Bay Bridge to the intersection with Chattahoochee Street at the southern limits of the town of Panacea, Florida. The US 98 (SR30) roadway consists of two - 12 foot wide lanes with 4 foot shoulders and a 10 to 12 foot wide asphalt paved multi-use trail along the west side of the roadway. This multi-use trail is constructed at grade for most of the 3.15 mile corridor length but there are several sections of the trail built on elevated bridge structures. The posted speed is 55mph but is reduced to 45mph at the south end of the corridor near the Ochlockonee Bay Bridge and at the north end of the 3.15 mile corridor near the town of Panacea. There is a 40 foot long concrete bridge carrying US 98 (SR 30) over Evans Creek and an additional three concrete culverts under US 98 (SR 30) within the 3.15 miles. The Evans Creek Bridge is located at milepost 0.84 and the culverts at mileposts 1.62, 1.90 and 3.12, with these mileposts measured from the Ochlockonee Bay Bridge north to Panacea. There are several intersecting roads and drives along the 3.15 mile corridor, most are located near the southern terminus of the corridor at Ochlockonee Bay. There is an estimated 500 private residences and several businesses along US 98 (SR 30) and these intersecting roads and drives.



Existing Conditions

Year Built: Estimated US 98 (SR 30) road constructed in 1933 (based on the road construction at this time between Apalachicola and Pensacola).

Base Flood Elevation (BFE): 17.00 ft to 20.00 ft NAVD88 along the 3.15 mile corridor from the south end of Panacea to the Ochlockonee Bay.

At the southern end of the corridor at the Ochlockonee Bay Bridge, the elevation is 27 ft.

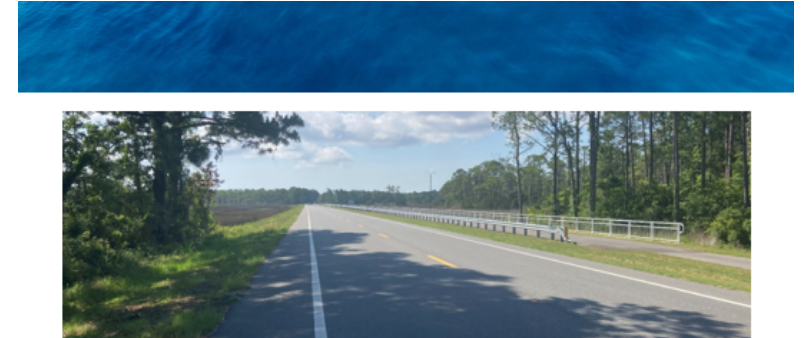
US 98 (SR 30) roadway elevation drops 7 ft near the Evan Creek culvert and increases back to around elevation 20 where it stays before decreasing to around elevation 14 near the north end of the 3.15 mile corridor near the town of Panacea.

Elevation of Structures: The concrete culvert elevations and bridge at Evans Creek are as noted: at Milepost 0.84 has a roadway elevation of 7 ft, at Milepost 1.62 has a roadway elevation of 14 ft, at Milepost 1.90 has a roadway elevation of 17 ft and at Milepost 3.12 has a roadway elevation of 14 ft.

Critical Component Elevations: Low points along US 98 (SR 30) are located around the Evans Creek area with elevations at 7 ft.

Storm/Flood Resistance: None. However, the bridge and three concrete culverts under US 98 (SR 30) provide equalization of water bodies at low points along the roadway corridor. Recently constructed multi-use trail has several segments on elevated bridge structures to protect the trail from high water events.

Historical Damage: Hurricanes traveling through the Gulf of Mexico are the major cause of significant damage along US 98 (SR 30). Since 1950 there have been seven major hurricanes (Category 3 and above) that have hit along the Florida panhandle and impacted portions of the 3.15 mile corridor. Hurricane induced rise in the Ochlockonee Bay water levels have caused moderate to severe damage to the lower elevations of the US 98 (SR 30) asphalt riding surface, shoulders, cross drains, roadway subbase and embankments along with debris accumulation.



Consequence Analysis

Financial Impacts: There are residential properties and numerous businesses along the 3.15 miles of US 98 (SR 30) corridor between the Ochlockonee Bay to the south, and the town of Panacea to the north. Several restaurants, convenience stores, marinas, fishing charter operations and miscellaneous services type businesses will be financially impacted by closing of US 98 (SR 30) due to water elevation rise in Ochlockonee Bay from storm events. No significant financial impacts to residential homes along the corridor due to road damages other than added fuel costs to detour around closed sections of US 98 (SR 30). FDOT is the owner of US 98 (SR 30) and is responsible for repairs/reconstruction costs.

Period of Closure: Depending on the rise in water elevations caused by the severity of a storm event, closure of the roadway can be estimated at between three and five days. After this period, a temporary road can be constructed, if necessary, to carry one lane of traffic while one lane of the original roadway is reconstructed. US 98 is a designated Hurricane Evacuation Route and therefore would receive high priority for repair/reconstruction following a storm event.

Cost of Repair/Closure: FDOT's current cost per mile models for new construction of an undivided 2 lane rural road is \$2,547,000 per mile. In addition, the replacement cost of a 12 foot wide multi-use trail is \$344,800 per mile. If the entire 3.15 miles of US 98 (SR 30) needs reconstruction the cost would be \$9,109,200.

Adaptation Recommendations

Prepare a post disaster redevelopment plan for US 98 (SR 30) to include raising selected roadway elevations particularly along current low point segments of the road, armoring roadway side slopes at areas close to the Ochlockonee Bay inlets (such as Evans Creek), placing additional concrete culvert cross drains under the roadway (at low points) for equalization/stabilization of water levels to both sides of US 98 (SR 30).

EXAMPLE 2: INFRASTRUCTURE



2. Infrastructure: Eastpoint Water & Sewer Treatment Plant

General Information

Facility Name: Eastpoint Water and Sewer Treatment Plant

Category: Infrastructure

Address: 40 Island Dr, Eastpoint, FL 32328 (Office)

Two wells on Twin Lakes Rd (well #3 is primary, well #4 is secondary)

117 Gilbert Street (Sewer Treatment Plant)

Utility/Purpose: Water and Wastewater Treatment

Description: The treatment plant serves approximately 1,100 customers providing residential, commercial and industrial service. The Eastpoint Water and Sewer District operates and maintains two wells for potable water, a distribution system and a 350,000 gallon per day sewer plant. According to the Eastpoint Sewer & Water District website, "The Eastpoint Water & Sewer District is an Independent Special Taxing District created by the Florida Legislature, Laws of Florida, Acts of 1967 Chapter 67-1399, and is governed by a five member volunteer board of commissioners appointed by the Governor for four year terms. The purpose of the District is to provide affordable, quality water and sewer service to the unincorporated area of Franklin County, FL known as Eastpoint."

Existing Conditions

Year Built: System is approximately 40 years old.

Elevation of Structures: Water Plant on Twin Lakes Rd, 17 ft elevation; Sewer Treatment Plant, between 20-25 ft elevation.

Historical Damage: The plant itself has not received historical damage but the water lines running along U.S. 98 experience breaks when the road washes out.



Consequence Analysis

Financial/Community Impacts: If the water wells or sewer treatment plant were to be inundated or damaged because of a storm event, there would be tremendous financial and community impacts because of the number of customers the plant provides services to. Beyond financial impacts associated with loss of function and costs for repair, service disruptions would result in serious impacts to the local community. Inundation of the sewer treatment plant would more than likely cause environmental damage from the release of untreated or partially treated sewage.

Period of Closure: When U.S. 98 washes out and the water lines break it can take several days to make repairs or longer depending on the road repairs.

Cost of Repair/Closure: The grant submitted to build a new plant was initially submitted at \$3.5M, the estimate has now risen to between \$3.5M and up to \$5M due to construction cost increases. It is estimated the cost to replace one of the wells would be in the range \$3.5 - \$5M.

Adaption Recommendations

The County has applied for a state grant to build a new wastewater treatment plant. The new plant will be built adjacent to the existing and the existing plant would continue in service until the new plant is ready to go online. The existing plant uses a sequential batch reduction system heavily reliant on pumps and electricity. The new plant will employ a gravity feed system, solar panels and batteries reducing the electricity needs by 35%. This will also allow backup generators to keep the plant operational.

A related area of need are the water lines that run along Highway 98. As highway 98 is prone to erosion and washing out these conditions often break water lines that run along the right of way. There are no valves available to shut off the water to these lines requiring a full plant shut down until repairs are made. This results in a disruption of service to customers and requires a boil water notice. The installation of shut off valves would greatly help but the County has no budget available.

Info obtained from phone interview with Billy Fuentes, Administrator.

EXAMPLE 3: EMERGENCY



3. Emergency: St. Marks Fire Rescue Station

General Information

Facility Name: St. Marks Fire Rescue Station

Category: Community/Emergency Facility

Address: 32 Shell Island Road, St. Marks, Florida 32355

Utility/Purpose: Volunteer Fire Station

Description: The Saint Marks Volunteer Fire Department, located in St. Marks, FL, provides fire protection and emergency response services to the St. Marks community. The Fire Department's mission is to prevent the loss of life and property. In addition to responding to fires, the Saint Marks Volunteer Fire Department also responds to medical emergencies, motor vehicle accidents, rescue calls, and incidents involving hazardous materials.

Existing Conditions

Year Built: Between 1999 and 2004 (from Google Earth historic imagery)

Base Flood Elevation: 19 ft NAVD88

Elevation of Structures: +/- 11 ft (Structure) (Google Earth)

Storm/Flood Resistance: Storm and flood resistance of the station house is poor due to its low elevation. The entire community of St. Marks, located at the confluence of the St. Marks and Wakulla Rivers, is inundated during storm surge events. When flood events are predicted, the entire community is evacuated.

Historical Damage: While it could not be verified if the St. Marks Fire Rescue Station has been historically damaged, what is known is that St. Marks has experienced a number of flood and inundation events in the past. Hurricane Dennis, for example, bypassed the town of St. Marks' however, the storm surge reached over 10 ft with little prior warning to the residents.



Consequence Analysis

Financial/Community Impacts: Fire stations serve a critical and essential function for local communities on an everyday basis. During a storm event, it is of vital importance that fire trucks and emergency personnel are able to effectively exit and enter fire stations. If the fire station were to be inundated during a storm event, impacts would be costly and consequential because of the probability for injury or loss of life to fire fighters, and citizens seeking emergency assistance.

Period of Closure: Depending on the magnitude of a flood event, period of closure for a fire station could span the duration of the event to weeks or months following the event. In the case of a worst-case-scenario flood event, or permanent inundation from sea level rise, fire stations could also be closed indefinitely depending on damage incurred.

Cost of Repair/Closure: The total cost to repair or rebuild a fire station following impacts will vary based on area, size, and material/construction costs.

Adaptation Recommendations

Because of the effects of flooding and long-range sea level rise, many local governments across Florida have taken proactive measures to integrate engineering solutions to protect fire stations from damage. In some communities, capital improvement programming decisions have been made to entirely relocate fire stations to higher ground and less vulnerable locations. Local officials should evaluate historical damages incurred to fire stations across the community, evaluate future vulnerabilities, and determine if steps must be taken to either protect or relocate these assets.

Through Capital Improvements Programing, local governments should examine all proposed projects utilizing a resilience lens. Within the context of fire stations, decisions should be informed by current and future vulnerabilities and priorities across fire rescue service areas.

EXAMPLE 4: NATURAL



4. Natural: Angus Gholson Nature Park

General Information

Facility Name: Angus Gholson Nature Park

Category: Natural/Cultural/Historic

Address: Park Street, Chattahoochee, Florida 32456

Utility/Purpose: Provides eco-tourism and social and recreational benefits.

Description: Named after amateur botanist Angus Gholson, this 130-acre park combines with Chattahoochee's River Landing Park to provide three nature trails: the Angus Gholson Nature Trail of 0.4-miles length; the 1.5-mile Muscogee Trail; and the 1.0-mile Fitness Trail. Angus Gholson Nature Park serves as the trailhead for the Angus Gholson Nature Trail. When originally developed, the park's purpose was to preserve the unique flora and fauna of the area that includes both rare and endangered plants. In addition, the unique, rugged ravines and floodplain forests within the park are unique to this part of Florida and are preserved within the park's boundaries.

Ecologically, this park winds through bluffs and ravines typical of this area on the east bank of the Apalachicola River. Many threatened and endangered plant species such as endangered Torreya trees and Ashe's magnolias. Rare plants that grow only in the deep ravines on the east back of the Apalachicola include Florida Flame Azaleas, Baldwin's milkvine, and wild white indigo among others.

Existing Conditions

Year Built: 2012

Base Flood Elevation (BFE): 78 ft NAVD88

Historical Damage: Portions of park are still closed due to damage from Hurricane Michael in 2018. The removal of portions of the tree canopy from the storm event is allowing sun to reach areas of the park similar to a prescribed burn. The revised light conditions is providing a new habitat for the re-emergent plants.



Consequence Analysis

Financial Impacts: Because the Angus Gholson Nature Park is primarily comprised of natural vegetation and conserved lands, there are limited financial costs associated with impacts caused by flooding and other climate-related hazards. Despite this, however, there would be financial costs associated with making repairs necessary to fix wooden boardwalks that are found throughout the park.

Period of Closure: To complete repairs to the infrastructure within the park, approximately one year will be required for vertical elements and one to two years for vegetation reestablishment. Because of other priorities in the local community following a disaster, it is also likely that repairs to the park and its facilities would be delayed.

Cost of Repair/Closure: \$158,575 (2008 Cost)

Adaptation Recommendations

In the existing condition of the park, the broader community, especially nearby homes, receive a considerable amount of value from the flood mitigation benefits that the park produces. Moving into the future, local officials should recognize the value that this conservation area provides to the community and ensure that this natural space is protected and preserved for decades to come.

PROJECT TAKEAWAYS

- Goal: Establish a unified baseline foundation for informing future infrastructure priorities, grant funding applications, and regional planning objectives
- Delays in securing grant agreement with FDEP and Leon County until March 2022.
- Fiscal demands imposed by Florida Legislature on this category of funding = project was mandated to be finished by June 2022.
- Project timeline consolidated to 3 months
- Asset data QA/QC of 17,000 assets is a heavy lift
- Overlapping task demands, a lack of time, and considerable scope of work resulted in challenges that needed to be overcome on a weekly basis.
- Gap in GIS records maintained by area local governments.





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