

Collier County Vulnerability Assessment

Public Meeting

January 8, 2025





Agenda

Agenda

- ı. Introductions
- 2. **Project Overview**
- **3. Draft Report Overview**
- 4. Vulnerability Assessment Results
- 5. Next Steps



Introductions





Introductions

Role/Department/Agency

William Lang, FPEM, CFM, ANFI, Community Development Christopher Mason, Community Planning and Resiliency Howard Critchfield, Community Planning and Resiliency



Consultant Team

David Stroud, CFM
Abby Moore, AICP, CFM
Ranger Ruffins



Project Overview



Project Overview

Resilient Florida Program

- 2021 Senate Bill 1954 was signed: Statewide Flooding and Sea Level Rise Resilience
 - Established the Resilient Florida Grant Program within the Department of Environmental Protection (DEP)
 - Requires DEP to complete statewide flood vulnerability and sea level rise data assessments
- The program creates a coordinated approach to building coastal and inland resilience
 - Seeks to protect inland waterways, coastlines, and shores
 - Prepares communities for the impacts of sea level rise, intensified storms and flooding





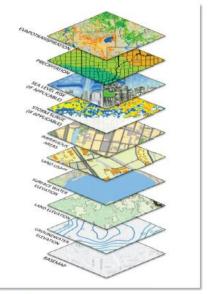
Project Overview

Scope

- Get organized and form the Steering Committee
 - Local Mitigation Strategy (LMS) Working Group/Committee
- Acquire background data on assets and flood hazard scenarios
- Conduct an exposure analysis
- Conduct a sensitivity analysis
- Draft a Vulnerability Assessment report
- Present the final draft report to the public
- Finalize Vulnerability Assessment report

Must meet statute S. 380.093, F.S. requirements and DEP standardized scope

Standardized Vulnerability Assessment: Scope of Work Guidance



Example Input Data Schematic for Flood Simulation Models (Esri, 2020; FDEP, 2017; HPRCC, 2022; Jean-Paul Rodrigue, 2015; NOAA, 2022; NOAA, 2018; USGS 2021; USGS, 2018)

Acknowledgements

This document was created by the Florida Department of Environmental Protection's (Department) Resilient Florida Program, within the Office of Resilience and Coastal Protection (ORCP) in partnership with the resilience team from Taylor Engineering, Inc. to act as a resource for local community efforts when assessing vulnerability through the Resilient Florida Program's planning grants. This document is up to date as of May 2022.

Standardized Vulnerability Assessment: Scope of Work Guidance May 2022



Vulnerability Assessment Report Overview

Section 1. Introduction

Section 2. Asset Inventory

Section 3. Hazard Identification

Section 4. Vulnerability Assessment

Appendix A: Asset Inventory

Appendix B: Exposure Analysis

Appendix B-1: Exposure Maps





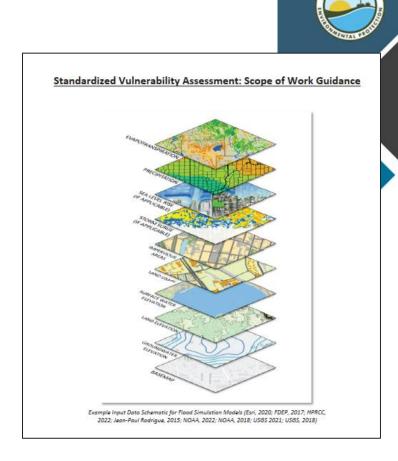
Section 1 Introduction

Background

Project Objectives

Scope

Data Collection



Florida Statewide Resilience Dataset

May 2023

Statewide Critical Assets: Final Report on Dataset



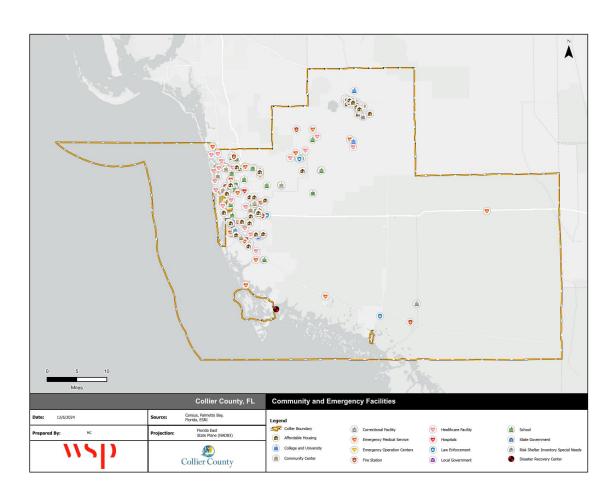
Section 2 Asset Inventory

Overview

- DEP Resilience Statewide Asset Inventory
- Local Asset Inventory (Unincorporated County)
- Regional Asset Inventory (Incorporated Areas)
- Broken down by 4 asset classes

Assets

- Critical Community & Emergency Facilities
- Critical Infrastructure
- Transportation & Evacuation Routes
- · Natural, Cultural, & Historical



Includes maps and asset count summary for each asset group



Critical Assets

Asset Classes and Types required by the Resilient Florida Program (where applicable)

Asset Class	Asset Type
Transportation & Evacuation Routes	airports, bridges, bus terminals, ports, major roadways, marinas, rail facilities, and railroad bridges
Critical Infrastructure	wastewater treatment facilities and lift stations, stormwater treatment facilities and pump stations, drinking water facilities, solid and hazardous waste facilities, military installations, communications facilities, and disaster debris management sites
Critical Community & Emergency Facilities	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
Natural, Cultural, and Historical Resource	conservation lands, parks, shorelines, surface waters, wetlands, and historical and cultural assets



Critical Assets

Asset Inventory Process

Summary of Asset Inventory

Asset Class	Count
Critical Community & Emergency Facilities	260
Critical Infrastructure	24,338 (over 19,000 are manholes; 3,000 are stormwater ponds)
Transportation Assets	11,094 (over 10,000 are road segments)
Natural, Cultural, and Historical Resource	37,395 (over 27,000 are wetlands; over 6,000 are surface water flowlines)

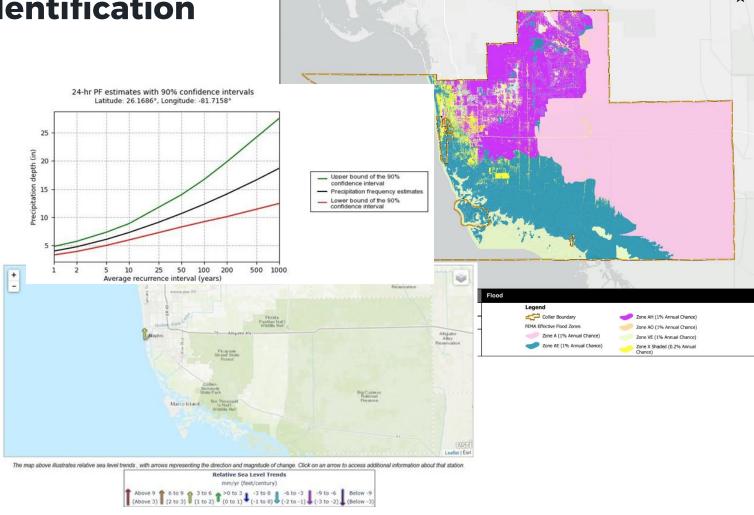
Section 3 Hazard Identification

Overview

Climate Change

Sea Level Rise

- High Tide Flooding
 Rainfall-Induced Flooding
 Storm Surge Flooding
 Compound Flooding
 - Stormwater Flooding



Overview of each hazard including a review of past occurrences, influences of climate change, and general impacts to the Collier County region

Section 4 Vulnerability Assessment

Overview

- Flood Scenarios (21)
 - Based on the identified hazards and time horizons
- Three planning horizons (present, 2040, 2070)

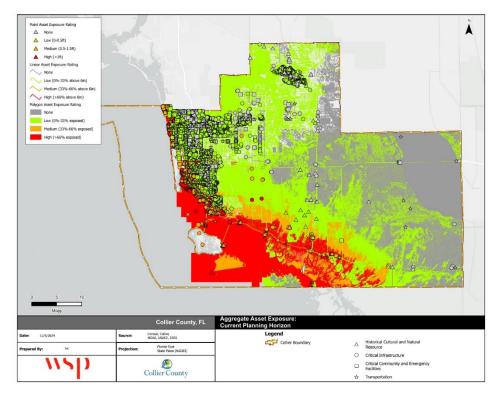
Presents the assessed flood scenarios across the three planning horizons. Includes maps detailing the various hazard extents

Exposure Analysis

Sensitivity Analysis

Risk Analysis

Each analysis subsection includes a brief overview, description of the methodology, and a results section with maps and/or tables



	2070 Conditions										
Asset	2070 SLR - Low	2070 SLR - High	SS/5yr/2070 SLR - Low	SS/5yr/2070 SLR - High	SS/100yr/2070 SLR - Low	SS/100yr/2070 SLR - High	SS/1,000yr/2070 SLR - Low	SS/1,000yr/2070 SLR - High			
Whistler's Creen			-	-	-	1997		10			
Windsong Club	10.40		-	7227	-	100					
Bear Creek - Naples	1,0460	(10)		0000		1991	0.71				
Belvedere Apartments					1781	2.00		70			
Laurel Ridge	1.55	**		1990		0.50	11.14				
Summer Lakes						100	144	0.7			
Summer Lakes II	1070	170		377.3	-	125		(=)			
Allegro at Hacienda Lakes			-			7.23	7.48	55			
Cadenza at Hacienda Lakes	10.000	100		1870.0							
Collier Housing Alternatives	726	127	2	322	0.81		3.73				
Coodlette Arms	- 100	140	-	1.09	3.88	534					
Harmony on Santa Barbara	7427	1207	2			700	-	0.2			
Ospreys Landing	-	-		-		2.91	374	5.8			
Villas Of Capri	1740	un j		1227		7447		1.2			
Whistler's Cove			- 1	144	0.94	/3:00	3.54	5.6			
Wild Pines of Naples II	10 TEX			0.48	3.401		674				
Independence Place Shadowlawn	2.40	-	- 4	0.99	476						
Colleges and Universities											
Ave Maria University		-		-	-	((e))		166			
Florida International University Chrp Outreach Center	10.000	550	75	97/6		1001		5500			
Florida Southwestren(State College - Collier Campus	10750	100	75	978		0.08	0.43	2.4			
University Of Florida - Institute Of Food & Agri Sciences	1570	588	5	978	-	183		1/50			
Adult & Workforce Education School	10.550			675.0	-			1,000			
Keiser University Naples	1,20		-	0.84	7.491	5.35	8.58	8.6			
Jersey College	1,0465					0.000					
Lorenzo Walker Technical College	120		-	0.07	2.90)	5.05	(),618.	8.79			
Community Centers											
Veterans Community Park Community Center	12.002		-	1423	2.50	4.55	3.82	978			
Colden Gate Community Center	0.00	-		34.0		()		1.1			
Immokalee Community Center		200	-	10000	-	10000	-	11.00			
Colden Cate Aquatics Complex	-			100				1.6			
Colden Cate Library		-	-	100		2007	-				
County of Collier - Immokalee Branch Library											
NAPI ES BRANCH OF HARRY CHAPIN	-	-				0.66					



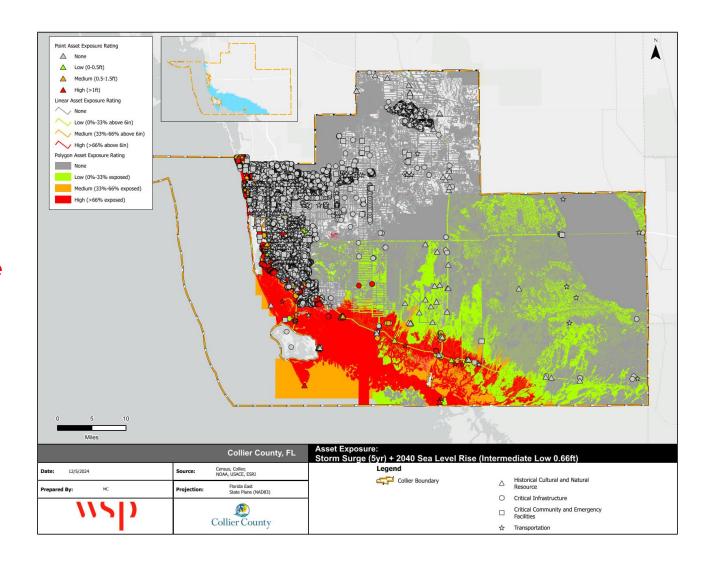
Appendix A & B

Appendix A - Asset Inventory

Tables with all assessed assets categorized by the four asset classes and asset types

Appendix B - Exposure Maps

Exposure analysis maps displaying the flood hazard extent and all of the assets categorized by exposure rating. One map for each of the 21 flood scenarios



Exposure Annex

Exposure Annex

Separate document with the full exposure results. Provides exposure results for each of the individual asset. One section for each planning horizon and tables organized based on asset geometry (point, line, polygon)

COLLIER COUNTY, FLORIDA

VULNERABILITY ASSESSMENT

EXPOSURE ANNEX

Asset		0.0000000000000000000000000000000000000			
	1% Flood	High Tide	SS/5yr	SS/100yr	SS/1,000yr
Critical Infrastructure					
Electric Transmission Lines					
Carnestown - Immokalee No. 4 100-161-AC; Overhead	45%	6%	7%	13%	T T
Andytown - Orange River 500-AC; Overhead	40%	096	0%	0%	
Ave Maria South - Immokalee No. 4100-161-AC; Overhead	65%	0%	0%	096	(
Everglades City - Carnestown Not Available-Overhead	300%	35%	96%	100%	100
Capri - Rattlesnake 100-161-AC; Overhead	53%	0%	3%	48%	7
Marco - Belle Meade 100-161-AC; Overhead	19090	37%	94%	300%	
Belle Meade - Tap153226 100-161-AC, Overhead	979	15%	52%	92796	
Belle Meade - Capri 100-161-AC; Overhead	10,000	0%	77% 8	100%	
Weber - Orangetree 220-287-AC; Overhead	24%	096	0%	0%	
Tap141798 - Orangetree 220-287-AC; Overhead	55%	0%	0%	0%	
Colden Gate - Weber 220-287-AC, Overhead	20%	096	0%	0%	
Immokalee No. 4 - Tap172423 100-161-AC, Overhead	55%	0%	0%	096	
Tap154083 - Tap172423 100-161-AC; Overhead	24%	0%	0%	0%	
Unknown172422 - Tap172423 100-161-AC; Overhead	0%	0%	0%	096	
Vanderbilt - Collier 220-287-AC; Overhead	42%	0%	0%	0%	- 4
Tap141796 - Livingston 220-287-AC; Overhead	34%	0%	0%	096	
Tap141852 - Terry 100-161-AC; Overhead	496	0%	0%	0%	
Tap141853 - Collier 100-161-AC; Overhead	34%	096	0%	0%	
Riser141851 - Bonita Springs 100-161-AC; Overhead	40%	196	2%	3196	- 3
Collier - Corkscrew 220-287- AC, Overhead	30%	096	0%	0%	
Vanderbilt - Terry 220-287- AC; Overhead	12%	0%	0%	0%	
Colden Gate - Rattlesnake 100-161-AC, Overhead	32%	096	096	0%	
Collier - Golden Gate 100-161-AC; Overhead	1496	096	0%	196	- 13
Collier - Colden Gate 100-161-AC; Overhead	3196	096	0%	0%	
Pine Ridge - Solana 100-161-AC; Overhead	12%	0%	0%	0%	- 5
Riser141850 - Tap141853 100-161-AC, Overhead	20%	096	0%	0%	ŧ
Collier - Livingston 220-287-AC; Overhead	39%	0%	0%	096	
Collier - Tap153226 100-161-AC; Overhead	65%	196	196	29%	
Collier - Alligator 100-161-AC; Overhead	18396	196	196	39%	
Collier - Naples 100-161-AC; Overhead	21%	0%	0%	0%	
Solana - Tap152015 100-161-AC, Overhead	3%	0%	0%	2%	
Collier - Tap152015 100-161-AC; Overhead	30%	0%	0%	0%	- 3
Riser141850 - Riser141851 100-161-AC; Underground	32%	0%	0%	0%	- 1
Alligator - Tap153226 100-161-AC: Overhead	50%	0%	0%	0%	76









Hazard Identification

Rainfall-Induced Flooding

- 1%-annual-chance flood (100yr flood depth)
- · Data:
 - FFMA FIRM data

High Tide

- Mean higher high water (MHHW)
 - High tide flooding at 1.74ft above MHHW
- · Data:
 - NOAA High Tide Flooding Data

Storm Surge

- 5yr, 100yr, 1,000yr
- · Data:
 - Data: South Atlantic Coastal Study (SACS), USACE

Sea Level Rise

- Intermediate low and intermediate high
- · Data:
 - 2017 NOAA intermediate-low and intermediate-high projections
 - NOTE: Required to use 2017 data based on State requirements. Use of 2022 data required larger grant scope changes
 - 2017 and 2022 projections are very similar

Compound Flooding

- Sea level rise: intermediate low and intermediate high
- Storm surge: 5yr, 100yr, 1,000yr

Assessed Flood Hazard Scenarios

Current Conditions

- 1%-annual-chance flood
- High Tide
- Storm Surge
 - 5yr, 100yr, and 1,000yr

Future Conditions (2040 & 2070)

- Sea Level Rise (SLR)*
 - Intermediate Low
 - Intermediate High
- Storm Surge & Sea Level Rise*
 - Storm Surge, 5yr, SLR Low
 - Storm Surge, 5yr, SLR High
 - Storm Surge, 100yr, SLR Low
 - Storm Surge, 100yr, SLR High
 - Storm Surge, 1,000yr, SLR Low
 - Storm Surge, 1,000yr, SLR High

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Components of the Vulnerability Assessment

Exposure: The depth of water caused by flooding

Flood depth (ft) at each asset

Sensitivity: Impact of flooding on assets

Number of assets impacted

Risk: Severity of flood on each asset type

Percentage of impacted assets by asset type

Exposure				
Low	≤½ ft			
Medium	½ ft – 1½ ft			
High	>1½ ft			

Note: Analysis for point features

Risk Assessment					
None	0%				
Low	≤25%				
Medium	25 - 50%				
High	50 - 75%				
Extreme	>75%				

Evaluated for each asset and each flood scenario



Exposure - Current Conditions

Depth of flooding for each assessed scenario

Example: Affordable Housing

		Current Conditions									
Asset Name	1%-Annual Chance	High Tide	SS/5yr	SS/100yr	SS/1,000yr						
Whistler's Green											
Windsong Club											
Bear Creek - Naples											
Belvedere Apartments	0.25			0.53	3.87						
Laurel Ridge											
Summer Lakes											
Summer Lakes II											
Allegro at Hacienda Lakes	1.21										
Cadenza at Hacienda Lakes	1.02										
Collier Housing Alternatives					2.48						
Goodlette Arms	2.71			2.63	5.86						
Harmony on Santa Barbara											
Ospreys Landing	0.41				2.49						
Villas Of Capri											
Whistler's Cove					2.29						
Wild Pines of Naples II	1.29			2.15	5.49						



Exposure - 2070 Conditions

Depth of flooding for each assessed scenario

Example: Affordable Housing

	2070 Conditions										
Asset Name	2070 SLR - Low	2070 SLR – High	SS/5yr/2070 SLR - Low	SS/5yr/2070 SLR - High	SS/100yr/2070 SLR - Low	SS/100yr/2070 SLR - High	SS/1,000yr/2070 SLR - Low	SS/1,000yr/2070 SLR - High			
Whistler's Green								1.75			
Windsong Club								2.02			
Bear Creek - Naples							0.71	2.77			
Belvedere Apartments					1.78	3.84	5.12	7.18			
Laurel Ridge						0.50	1.14	3.20			
Summer Lakes								0.79			
Summer Lakes II											
Allegro at Hacienda Lakes						2.23	2.48	4.54			
Cadenza at Hacienda Lakes						1.94	2.19	4.25			
Collier Housing Alternatives					0.81	2.87	3.73	5.79			
Goodlette Arms				1.09	3.88	5.94	7.11	9.17			
Harmony on Santa Barbara								0.22			
Ospreys Landing						2.91	3.74	5.80			
Villas Of Capri								1.28			
Whistler's Cove					0.94	3.00	3.54	5.60			
Wild Pines of Naples II				0.48	3.40	5.46	6.74	8.80			

Aggregate Exposure Maps

Aggregate exposure maps help us visualize where highly exposed assets are located in the County

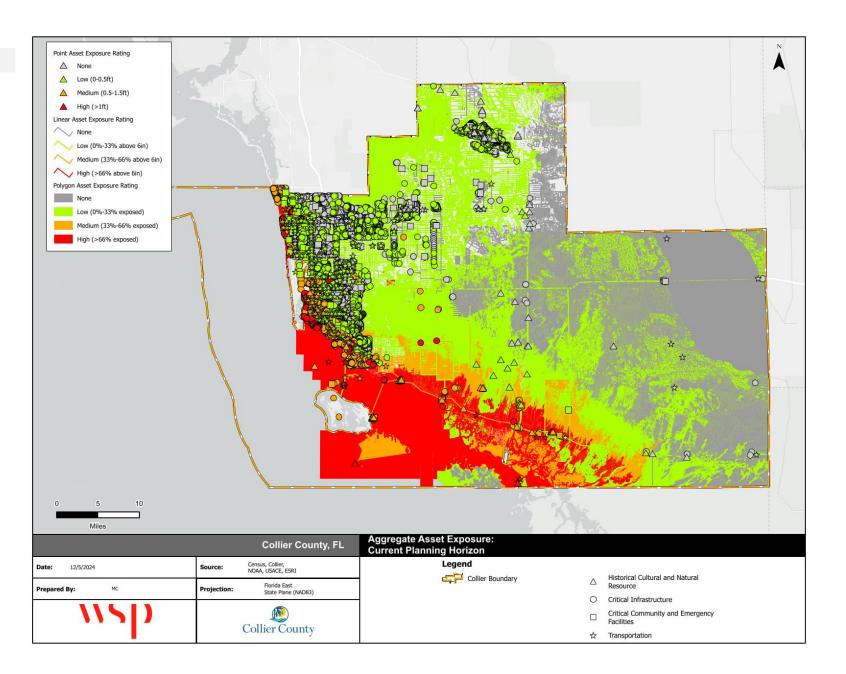
- Based on exposure ratings for each asset and each flood scenario
 - O points if the asset is not exposed
 - 1 point for low exposure rating
 - 2 points for medium exposure rating
 - 3 points for high exposure rating

Aggregate Exposure Rating

Aggregate Exposure Rating					
None 0 points					
Low	8 points or less				
Medium	8 – 12 points				
High	12 or more points				

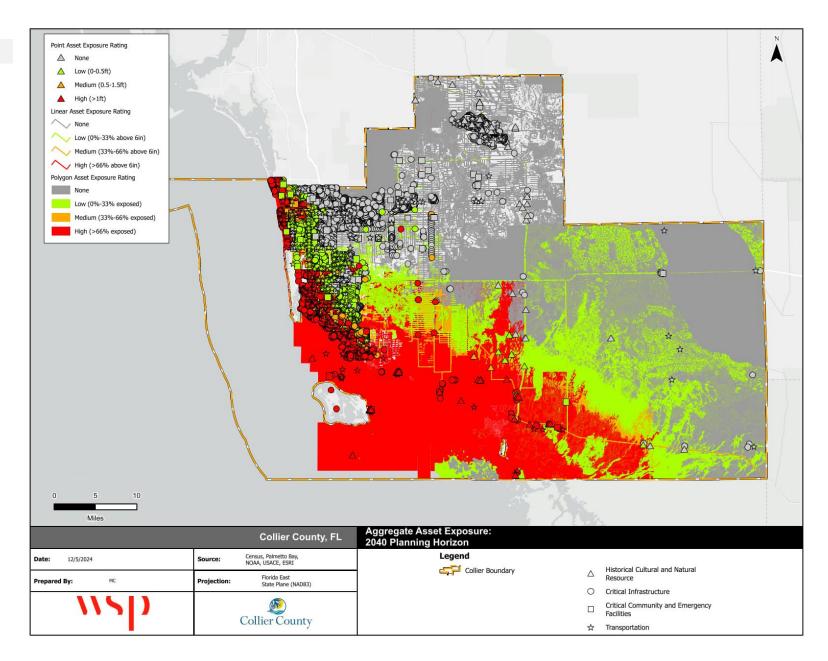


Current Conditions



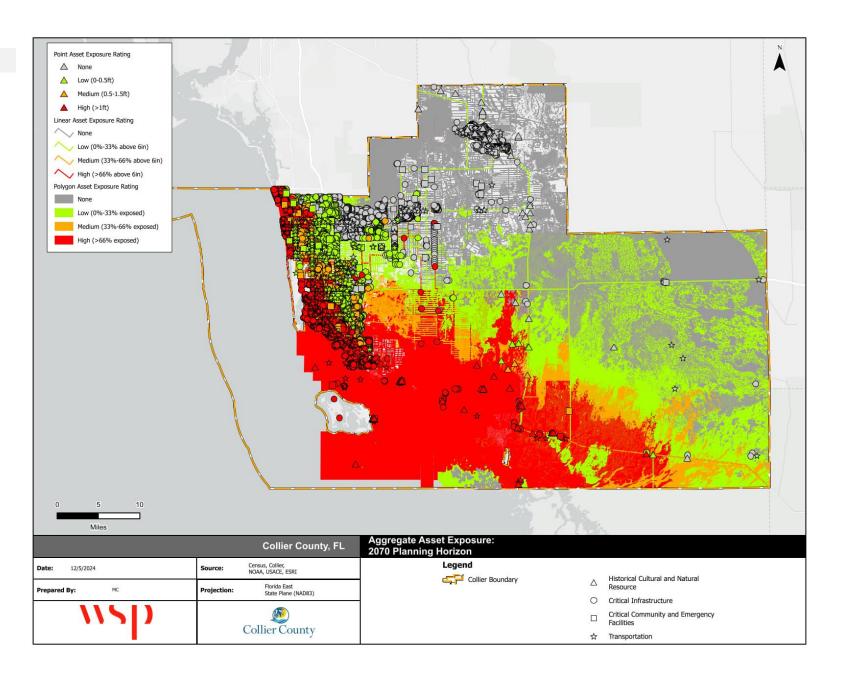


2040 Conditions





2070 Conditions



Sensitivity - Current Conditions

Severity of flooding - number of assets impacted by each flood scenario

Example: Critical Community and Emergency Facilities

		Current Conditions						
Asset Type	Total Asset Count	1%-Annual Chance	High Tide	SS/5yr	SS/100yr	SS/1,000yr		
Affordable Housing	46	11	0	0	4	7		
Colleges and Universities	8	2	0	0	2	2		
Community Centers	12	1	0	0	1	3		
Correctional Facilities	4	3	0	0	2	3		
Disaster Recovery Centers	3	2	0	0	1	1		
Emergency Medical Facilities	31	5	0	0	6	12		
Emergency Operation Centers	1	0	0	0	0	0		
Fire Stations	26	6	0	0	8	13		
Healthcare Facilities	47	5	0	0	6	28		
Hospitals	5	0	0	0	1	3		
Law Enforcement Facilities	8	2	0	0	2	3		
Local Facilities	1	1	0	0	1	1		
Risk Shelters - Special Needs	1	0	0	0	0	0		
Schools	66	13	0	0	12	19		
State Facilities	1	0	0	0	0	0		



Sensitivity - 2070 Conditions

Severity of flooding - number of assets impacted by each flood scenario

Example: Critical Community and Emergency Facilities

		2070 Conditions								
Asset Type	Total Asset Count	2070 SLR - Low	2070 SLR - High	SS/5yr/2070 SLR - Low	SS/5yr/2070 SLR - High	SS/100yr/2070 SLR - Low	SS/100yr/2070 SLR - High	SS/1,000yr/2070 SLR - Low	SS/1,000yr/2070 SLR - High	
Affordable Housing	46	0	0	0	3	6	10	13	21	
Colleges and Universities	8	0	0	0	2	2	3	3	3	
Community Centers	12	0	0	0	0	2	3	5	9	
Correctional Facilities	4	0	0	0	2	3	3	3	3	
Disaster Recovery Centers	3	0	0	0	1	1	1	1	1	
Emergency Medical Facilities	31	0	0	1	3	8	12	13	18	
Emergency Operation Centers	1	0	0	0	0	0	0	0	0	
Fire Stations	26	0	1	2	4	9	13	14	15	
Healthcare Facilities	47	0	0	0	1	20	28	37	42	
Hospitals	5	0	0	0	0	2	3	3	4	
Law Enforcement Facilities	8	0	0	0	1	2	2	3	4	
Local Facilities	1	0	0	0	1	1	1	1	1	
Risk Shelters - Special Needs	1	0	0	0	0	0	0	0	0	
Schools	66	0	0	0	10	17	26	28	38	
State Facilities	1	0	0	0	3	6	10	13	21	

Risk - Current Conditions

Level of risk is based on the percentage of assets impacted for each asset type Example: Critical Community and Emergency Facilities

		Current Conditions							
Asset Type	Total Asset Count	1%-Annual Chance	High Tide	SS/5yr	SS/100yr	SS/1,000yr			
Affordable Housing	46	24%	0%	0%	9%	15%			
Colleges and Universities	8	25%	0%	0%	25%	25%			
Community Centers	12	8%	0%	0%	8%	25%			
Correctional Facilities	4	75%	0%	0%	50%	75%			
Disaster Recovery Centers	3	67%	0%	0%	33%	33%			
Emergency Medical Facilities	31	16%	0%	0%	19%	39%			
Emergency Operation Centers	1	0%	0%	0%	0%	0%			
Fire Stations	26	23%	0%	0%	31%	50%			
Healthcare Facilities	47	11%	0%	0%	13%	60%			
Hospitals	5	0%	0%	0%	20%	60%			
Law Enforcement Facilities	8	25%	0%	0%	25%	38%			
Local Facilities	1	100%	0%	0%	100%	100%			
Risk Shelters - Special Needs	1	0%	0%	0%	0%	0%			
Schools	66	20%	0%	0%	18%	29%			
State Facilities	1	0%	0%	0%	0%	0%			



Risk - 2040 Conditions

Level of risk is based on the percentage of assets impacted for each asset type Example: Critical Community and Emergency Facilities

Asset Type		2040 Conditions								
	Total Asset Count	2040 SLR - Low	2040 SLR - High	SS/5yr/2040 SLR - Low	SS/5yr/2040 SLR - High	SS/100yr/204 0 SLR - Low	SS/100yr/204 0 SLR - High	-	SS/1,000yr/20 40 SLR - High	
Affordable Housing	46	0%	0%	0%	0%	13%	13%	22%	28%	
Colleges and Universities	8	0%	0%	0%	0%	25%	25%	25%	38%	
Community Centers	12	0%	0%	0%	0%	17%	17%	42%	50%	
Correctional Facilities	4	0%	0%	0%	0%	50%	75%	75%	75%	
Disaster Recovery Centers	3	0%	0%	0%	0%	33%	33%	33%	33%	
Emergency Medical Facilities	31	0%	0%	0%	3%	26%	26%	42%	45%	
Emergency Operation Centers	1	0%	0%	0%	0%	0%	0%	0%	0%	
Fire Stations	26	0%	0%	0%	8%	35%	35%	54%	54%	
Healthcare Facilities	47	0%	0%	0%	0%	30%	47%	66%	79%	
Hospitals	5	0%	0%	0%	0%	40%	40%	60%	60%	
Law Enforcement Facilities	8	0%	0%	0%	0%	25%	25%	38%	38%	
Local Facilities	1	0%	0%	0%	0%	100%	100%	100%	100%	
Risk Shelters - Special Needs	1	0%	0%	0%	0%	0%	0%	0%	0%	
Schools	66	0%	0%	0%	0%	23%	26%	39%	44%	
State Facilities	1	0%	0%	0%	0%	0%	0%	0%	0%	



Risk - 2070 Conditions

Level of risk is based on the percentage of assets impacted for each asset type Example: Critical Community and Emergency Facilities

Asset Type	Total Asset Count	2070 Conditions								
		2070 SLR - Low	2070 SLR - High	SS/5yr/2070 SLR - Low	SS/5yr/2070 SLR - High	SS/100yr/207 0 SLR - Low	SS/100yr/207 0 SLR - High	_	SS/1,000yr/20 70 SLR - High	
Affordable Housing	46	0%	0%	0%	7%	13%	22%	28%	46%	
Colleges and Universities	8	0%	0%	0%	25%	25%	38%	38%	38%	
Community Centers	12	0%	0%	0%	0%	17%	25%	42%	75%	
Correctional Facilities	4	0%	0%	0%	50%	75%	75%	75%	75%	
Disaster Recovery Centers	3	0%	0%	0%	33%	33%	33%	33%	33%	
Emergency Medical Facilities	31	0%	0%	3%	10%	26%	39%	42%	58%	
Emergency Operation Centers	1	0%	0%	0%	0%	0%	0%	0%	0%	
Fire Stations	26	0%	4%	8%	15%	35%	50%	54%	58%	
Healthcare Facilities	47	0%	0%	0%	2%	43%	60%	79%	89%	
Hospitals	5	0%	0%	0%	0%	40%	60%	60%	80%	
Law Enforcement Facilities	8	0%	0%	0%	13%	25%	25%	38%	50%	
Local Facilities	1	0%	0%	0%	100%	100%	100%	100%	100%	
Risk Shelters - Special Needs	1	0%	0%	0%	0%	0%	0%	0%	0%	
Schools	66	0%	0%	0%	15%	26%	39%	42%	58%	
State Facilities	1	0%	0%	0%	0%	0%	0%	0%	0%	



Next Steps

Next Steps

- Finalize report
 - Include additional comments from the VA Steering Committee (1/17/25)



Questions?



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