

Polk County Vulnerability Assessment Additional Flood Modeling Project

CHNEP Work Assignment for the CFRPC

Charlotte County Purchase Order Number: 25000387

Memorandum

From: Adrian F. Santiago Tate, CEO, HighTide Intelligence

To: Central Florida Regional Planning Council and Coastal & Heartland National Estuary Partnership

Subject: Task 4 – Public Presentations

Date: June 16, 2026

1. Purpose

This memorandum documents the Task 4 deliverables.

2. Deliverables

- A. Meeting agenda(s) to include location, date, time of meetings
- B. Meeting sign-in sheets with attendee names, affiliation (i.e. local stakeholder, resident, steering committee member, local government staff)
- C. A copy of the presentation(s) and any materials created in preparation of or for distribution at the meeting (i.e. social media posts, public announcements, graphics), as applicable;
- D. A copy of the files or weblink of the videos or audio recordings from the meeting, if applicable; and
- E. Summary reports including attendee input and meeting outcomes.

3. Public Presentations

The Polk County Stormwater Technical Advisory Committee (STAC) meeting was held on November 4, 2025 and June 2, 2026 at 6:00pm. The meetings were scheduled to provide an update on the status of the Vulnerability Assessment, to provide details on the technical process, gather feedback from the technical advisory committee, gain direction for next steps, and then report back final results and to make recommendations to the Board of County Commissioners.

Deliverables for Public Meeting #1 - November 4, 2025

- a. STAC Meeting Agenda - attached
- b. Meeting Sign-In - attached
- c. Presentations - attached

- d. Link to audio – not available
- e. Meeting Minutes - attached

Deliverables for Public Meeting #2 - June 2, 2026

- a. STAC Meeting Agenda - attached
- b. Meeting Sign-In - attached
- c. Presentations - attached
- d. Link to audio - not available
- e. Meeting Minutes - attached
- f. Summary - Detailed minutes in progress
 - i. Central Florida Regional Planning Council presented the Polk County Vulnerability Assessment (VA)
 - 1. Resilient Florida Grant Awarded 22-23
 - 2. Outline of VA Process
 - a. Acquire background Data
 - b. Critical/Regionally Significant Assets Data
 - c. Flood Scenario Related Data and Model Validation
 - d. Updating Exposure and Sensitivity based on new FDEP data
 - 3. Discussed Maps and Tables provided in the VA
 - ii. Coastal Heartland National Estuary Partnership
 - 1. Discussed their role in providing funding.
 - iii. HighTide presented the Sites Selected and the updated 3D representation of the Flood Models
 - iv. Next Steps
 - 1. Adaptation Plan - 2027
 - 2. Implementation

The second public meeting discussed the full Polk VA Adoption- with 200 and 500 yr. modeling and visuals included. The STAC moved to approve the Vulnerability Assessment and to proceed with the next steps.

4. Funding Acknowledgement

This project was funded by the Coastal & Heartland National Estuary Partnership (CHNEP) through Bipartisan Infrastructure Law (BIL) funding provided by the U.S. Environmental Protection Agency. HighTide thanks CHNEP, CFRPC, Polk County, and Halff Associates for their partnership and contributions throughout this work. The modeling and analysis presented herein will be formally integrated into Polk County's Comprehensive Vulnerability Assessment and used to inform long-term resilience planning across the County.



**POLK COUNTY
STORMWATER TECHNICAL ADVISORY COMMITTEE (STAC)
STAC Meeting**

**Location: Room 407, Fourth Floor; County Administration Building; 330 W. Church Street,
Bartow 33830**

Thursday November 4th, 2025, at 6:00 P.M.

AGENDA

Welcome & Introductions (*This meeting is being recorded*) - Chairman

Roll Call

Review and Approval of previous STAC Meeting Minutes

- June 19th, 2025, Meeting Minutes ***STAC Action Item***
- Approval of Central Florida Regional Planning Council Vulnerability Assessment. ***STAC Action Item***
- Approval of Florida Atlantic University's Watershed Master Planning Initiative. ***STAC Action Item***

Public Comment

Presentations

- *Central Florida Regional Planning Council, (Curtis Knowles) & Coastal Heartland National Estuary Partnership, (Jennifer Hecker). Vulnerability Assessment Presentation.*
- *High tide, (Adrian Santiago Tate), Extreme Rainfall Flood Modeling.*
- *Florida Atlantic University, (Fred Bloetscher) Watershed Master Planning Initiative.*

General Discussions

Next Meeting

Adjourn

STORMWATER TECHNICAL ADVISORY COMMITTEE MEETING SIGN-IN SHEET



November 4th, 2025
6:00 PM

Neil Combee Administration Building
Room 407
330 Church Street, Bartow

Member Name	Signature	Phone	E-Mail
✓ David C. Carter, P.E.	<i>David Carter</i>		
Kriss Kaye, P.E.		Not Here	
✓ Ed Murawski	<i>Ed Murawski</i>		
✓ Jeff Spence	<i>Jeff Spence</i>		
Robert Kollinger P. E		Not Here	

STAFF:

William D. Beasley			
John Bohde			
Tabitha Biehl	<i>Tabitha Biehl</i>		
Breezi Hicks			
Ryan Ellis	<i>Ryan Ellis</i>		
Shayla Bradford	<i>Shayla Bradford</i>		
Craig Johnson	<i>Craig Johnson</i>		
Blake Tew	<i>C. Blake Tew</i>		
Brooke Moherek			

GUESTS:

Curtis Knowles	<i>Curtis Knowles</i>	863 221 8780	cknowles@cfapc.org
Clinton Howerton	<i>Clinton Howerton</i>	863 534 6087	clintonhowertonjr@polkfla.gov
STEVE McQuaig	<i>Steve McQuaig</i>	863 534 6765	stevenmcquaig@polkfla.gov
Amee Bailey	<i>Amee Bailey</i>	863-206-3139	abailey@gpsamee.com
Adrian Santiago Tate	<i>Adrian Santiago Tate</i>	540-200-8101	adrian@highside.ai

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STORMWATER TECHNICAL ADVISORY COMMITTEE (STAC)

CONDENSED MINUTES

Thursday November 04, 2025

The Polk County Stormwater Technical Advisory Committee (STAC) meeting convened at 6:07 p.m., Thursday November 04, 2025, in Room 407, fourth floor of the County Administration Building, 330 W. Church Street, Bartow, FL 33830

Welcome & Roll Call

Craig Johnson took an official roll call of present STAC members

Members Participating: Dave Carter, Ed Murawski, and Jeff Spence (a quorum is present)

Members Absent: Bob Kollinger and Kriss Kaye

Staff Present: Tabitha Biehl, Shayla Bradford, Craig Johnson, Ryan Ellis, Blake Tew

Guests: Gator Howerton, Steve McQuiag, Curtis Knowles, Ameer Bailey, Adrian Santiago Tate, Fred Bloetscher, Jennifer Hecker and Yan Yong

Review and Approval of STAC Meeting Minutes *STAC Action Item*

Motion to approve meeting minutes (6-12-25) by Ed Murawski and seconded by Jeff Spence, Jeff clarified that a slight amendment needed to be made. All in favor, Motion carried.

Public Comment

No comments from the public.

Discussion/Presentation

- Approval of STAC meeting minutes from June 19th, 2025, meeting
- Central Florida Regional Planning Council Vulnerability Assessment–
Staff Presents - STAC Action Item*
Hightide
- Atlantic University's Watershed Master Planning Initiative- *STAC Action Item*

Overview

Two major presentations were delivered to the STAC committee:

1. **Polk County Vulnerability Assessment** – led by CFRPC with CHNEP support.

STORMWATER TECHNICAL ADVISORY COMMITTEE (STAC)

2. Watershed Master Plan – developed by FAU.

Both efforts aim to understand flood risk, extreme rainfall impacts, and long-term resilience planning for Polk County.

Vulnerability Assessment (CFRPC + CHNEP) Curtis Knowles & Jennifer Hecker

Funding & Purpose

- Funded by **\$500,000 from the State of Florida** under **Florida Statute 380.093(4)(b)**.
- Required statewide to help counties prepare for **extreme weather and future flood risk**.
- CHNEP contributed additional funding for **3D visualizations** to improve public communication.

Coverage

- Assessment includes **all Polk County municipalities**, except Bartow which conducted its own assessment (data shared both ways).
- Focus areas: **transportation, public safety, utilities, environmental resources, housing, and community assets**.

Modeling Approach & Limitations

Data Inputs

- **2018 LiDAR, Digital Elevation Models, NOAA rainfall atlas**, building footprints, FEMA FIRMs, NRCS soils, and critical asset inventories.

Flood Scenarios Modeled

- **100-year (24-hr)**
- **200-year (24-hr)**
- **500-year (24-hr)**
- Future rainfall projections for **2040 and 2070**, with rainfall expected to increase **~1.2%** based on long-term NOAA trends.

Key Limitations

- **No groundwater modeling** (due to lack of consistent countywide data).

STORMWATER TECHNICAL ADVISORY COMMITTEE (STAC)

- **Stormwater infrastructure not fully represented** (culverts, pipes, etc.).
- **No storm surge modeling** (Polk is inland).
- Water **depths not shown** to avoid misinterpretation by the public.

Purpose of the Tool

- Designed as a **planning tool**, not an engineering model.
- Helps compare locations, visualize ponding, and identify vulnerable assets.

Findings & Sensitivity Analysis

Critical Assets

- Assets analyzed as **points, lines, and polygons** (roads, hospitals, utilities, parks, etc.).
- Percent of each asset inundated was calculated for each scenario.

Socioeconomic Sensitivity

- 21 factors included, such as:
 - Unemployment, age distribution, income levels, race, education
- Purpose: identify communities with **lower capacity to recover** from flooding.

Municipal Data Sharing Issues

- Some cities declined to share utility data due to **security concerns**.
- This may affect their ability to receive **Resilient Florida funding**, since projects must be **named in the plan** to qualify.

Visualizations & Real-World Comparisons

3D Flood Imagery

- CHNEP funded realistic 3D renderings to show:
 - Bartow wastewater treatment plant, US-92 flooding, Electric substations, Other critical sites
- These visuals were compared to **actual flood photos** from Hurricanes Ian, Irma, and Milton, showing strong alignment with model predictions.

Key Observations

STORMWATER TECHNICAL ADVISORY COMMITTEE (STAC)

- **Bartow** is highly vulnerable due to its position in the **Peace River watershed**.
- US-92 was underwater for **two days** during Hurricane Milton, affecting hospital access.
- Railroad embankments act as **barriers**, worsening ponding.

Adaptation Chapter (High tide & Halff Associates) Adrian Santiago Tate

Modeling

- Uses **HEC-RAS**, the same tool used by the U.S. Army Corps of Engineers.
- Captures major culverts but not full stormwater systems.
- Highlights that “100-year” terminology is misleading because such events occur more frequently now.

Asset Selection

- 12,450 assets assessed countywide.
- Bartow repeatedly appears as a hotspot due to watershed convergence.

Purpose

- Provide **site-specific examples** to communicate risk to the public and decision-makers.
- Not intended to restrict development, but to **inform smarter planning**.

Watershed Master Plan (FAU) Fredd Bloetscher

Funding & Scope

- Funded by the **Florida Division of Emergency Management**.
- FAU developed **three watershed models** (HUC-12 boundaries).

Modeling Approach

- Includes **groundwater modeling**, unlike the CFRPC model.
- Uses **Cascade 2001** and SFWMD methods (3-day, 25-year storm).
- Evaluates soils, hydrologic storage, and socio-economic vulnerability.

Findings

- Polk benefits from being inland (no tidal or sea-level-rise influence).
- Some bridges and roadways were identified as flood-prone.

STORMWATER TECHNICAL ADVISORY COMMITTEE (STAC)

- Topography in Polk allows more consistent flow compared to South Florida.
- Identified potential **green and gray infrastructure** solutions.

Data Access

- All FAU data is available on the **FAU data portal**.

STAC recommendations

- Ed Murawski made a motion to recommend further development of the tools shown and possible implementation of them in the future.
- Motion passed (Murawski) to continue developing and implementing the tools.

Staff Presents - STAC Action Item*

- Approval of STAC meeting of June 19th ,2025
- Approval of Central Florida Regional Planning Council Vulnerability assessment – Action Item*
- Approval of Florida Atlantic University’s watershed Master Planning Initiative-

Action Item*

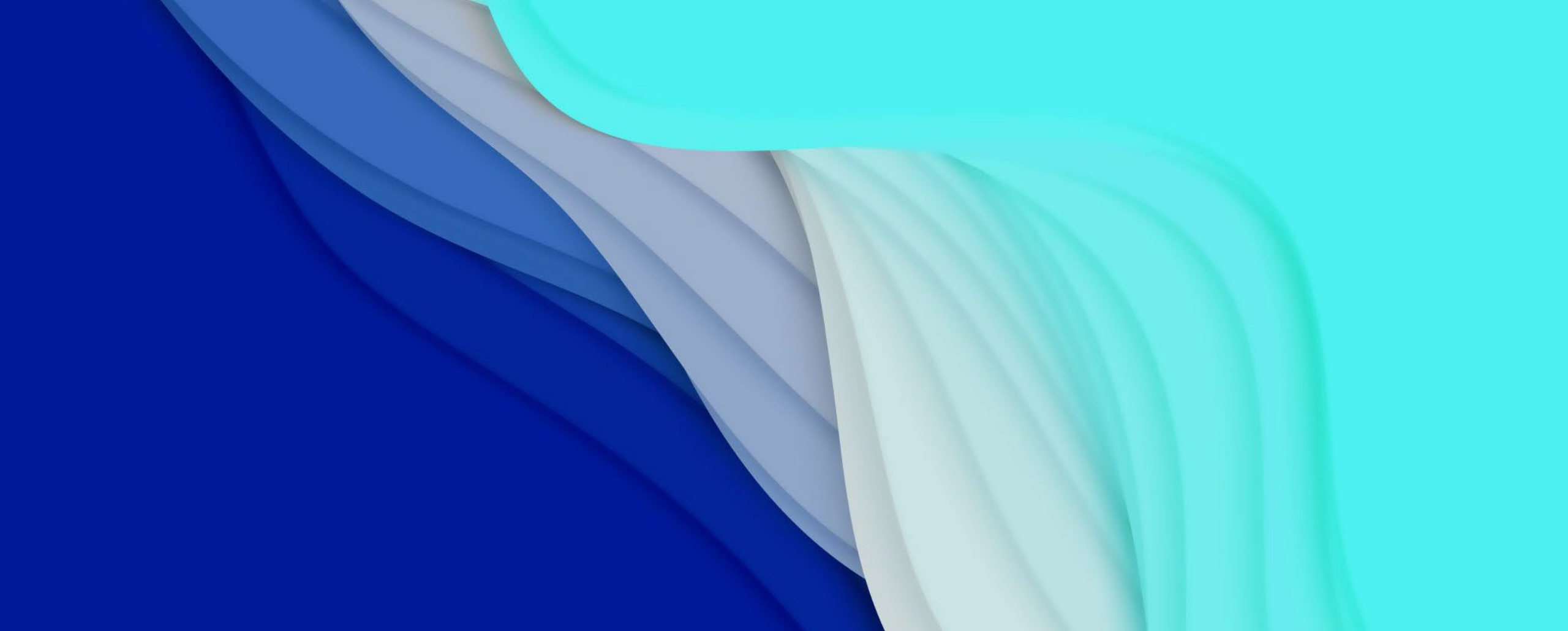
Next Steps

- County is building a centralized **Arclly GIS -based portal** to host all vulnerability and watershed data.
- STAC members expressed strong interest in using the tools for planning and engineering.

Fred asked if anyone had any questions and stated the STAC committee will be supplied with reports of the information. Dave asked if there was a place to view this data? Fred answered with the data was accessible on the FAU data portal. Tabitha also stated the County is working on compiling the data in a central website built upon the Arkly GIS system. Curtis stated that the benefit is that we have a lot of modelling done and with the new application in development we can zoom to a location and further categorize and understand the data. Dave said that would be very beneficial

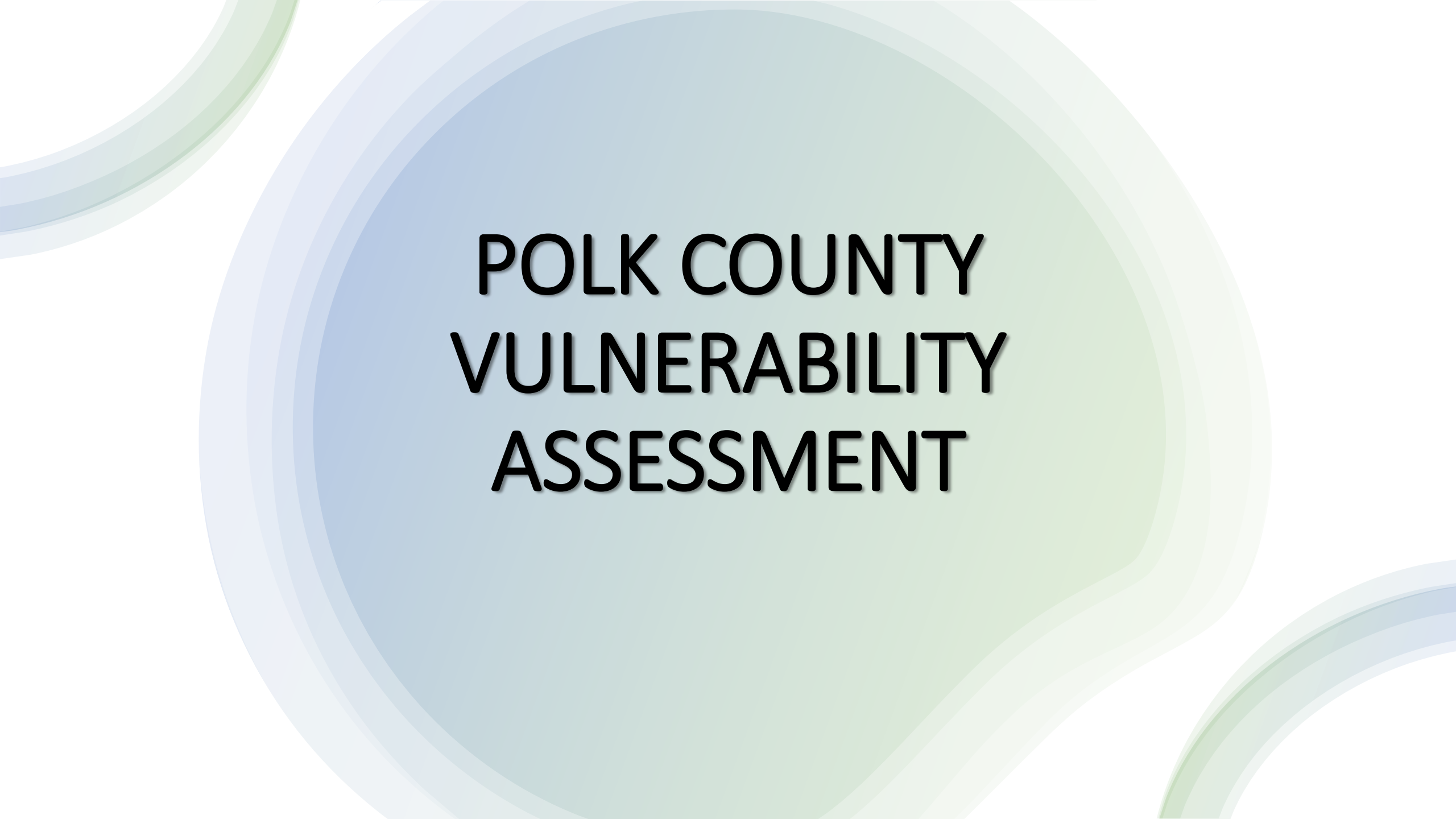
STORMWATER TECHNICAL ADVISORY COMMITTEE (STAC)

Ed Murawski made a motion to further develop the tools shown and implement them in the future



Polk County Stormwater Technical Advisory Committee Meeting

November 4, 2025



POLK COUNTY VULNERABILITY ASSESSMENT



May 12, 2021 – Governor Ron DeSantis
signed Senate Bill 1954 into law



- **Ensures** a coordinated approach to Florida's coastal and inland resilience
- **Enhances** our efforts to protect our inland waterways, coastlines and shores, which serve as invaluable natural defenses against sea level rise
- **Will yield** the largest investment in Florida's history to prepare communities for the impacts of sea level rise, intensified storms and flooding



RESILIENT FLORIDA GRANT PROGRAM (F.S. 380.093)



RESILIENT FLORIDA FRAMEWORK

PLANNING GRANTS

To assist local governments with Vulnerability Assessments, Peril of Flood Comprehensive Plan Amendments

STATEWIDE FLOODING AND SEA LEVEL RISE RESILIENCE PLAN

To assist local governments and eligible entities in implementing projects that address flooding and sea level rise

STATEWIDE DATA SET AND ASSESSMENT

Collection of local vulnerability assessments and data to assist in creating a Statewide Flooding and Sea Level Rise Assessment

REGIONAL RESILIENCE ENTITIES

Technical Support, develop project applications for members and multijurisdictional collaboration

FLORIDA FLOOD HUB

Scientific research, expert working groups, flooding and sea level rise modeling methodology, recommendations, training and education



RESILIENT FLORIDA

**FY22-23 Planning Grant
Award**

**“Polk County (16 cities &
coordinating with Bartow)
Vulnerability Assessment”**

End Date March 2026

STAKEHOLDER COMMITTEE

Public safety

Transportation

Utilities

Building &
Housing

Community &
Economic
Development

Education

Environment

Planning

Parks, Recreation
& Cultural
Resources

Human & Social
Services

Local Elected
Officials

Community
Leaders or
Champions

Researchers &
Scientists

State and Federal
Governments,
NGO's

Vulnerability Assessment Tasks



ACQUIRE
BACKGROUND
DATA



EXPOSURE
ANALYSIS
*ANALYZE WATER
DEPTH*



SENSITIVITY
ANALYSIS
*EVALUATE FLOODING
IMPACTS ON CRITICAL
ASSETS*



FINAL
VULNERABILITY
ASSESSMENT
REPORT, MAPS,
AND TABLES

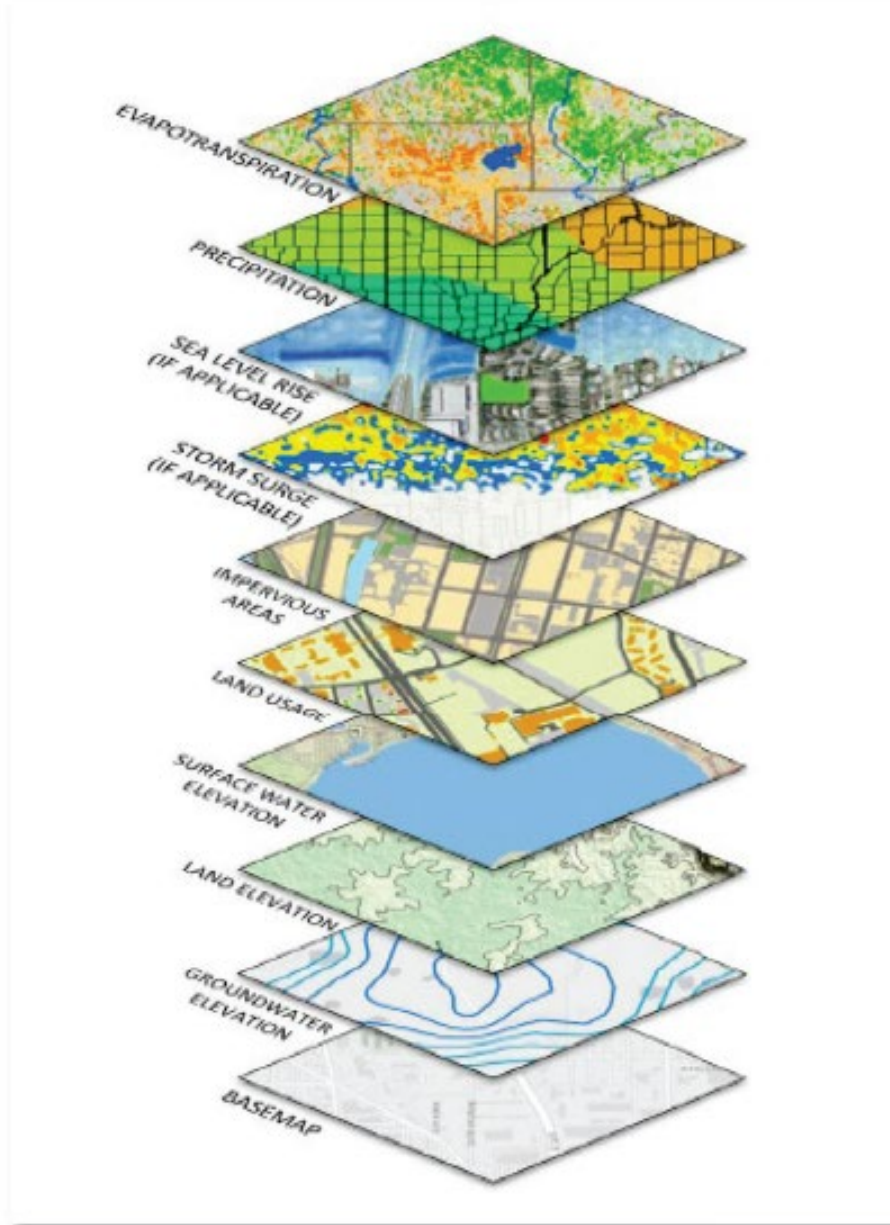
ACQUIRE BACKGROUND DATA

THREE MAJOR CATEGORIES

Critical / Regionally Significant Assets

Topographic Data

Flood Scenario-Related Data



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)

CRITICAL / REGIONALLY SIGNIFICANT ASSETS DATA



- Transportation Assets and Evacuation Routes
- Critical Infrastructure
- Critical Community and Emergency facilities
- Natural, Cultural, and Historical Resources

Digital Elevation Model (DEM) Data

2018 FL LiDAR DEM



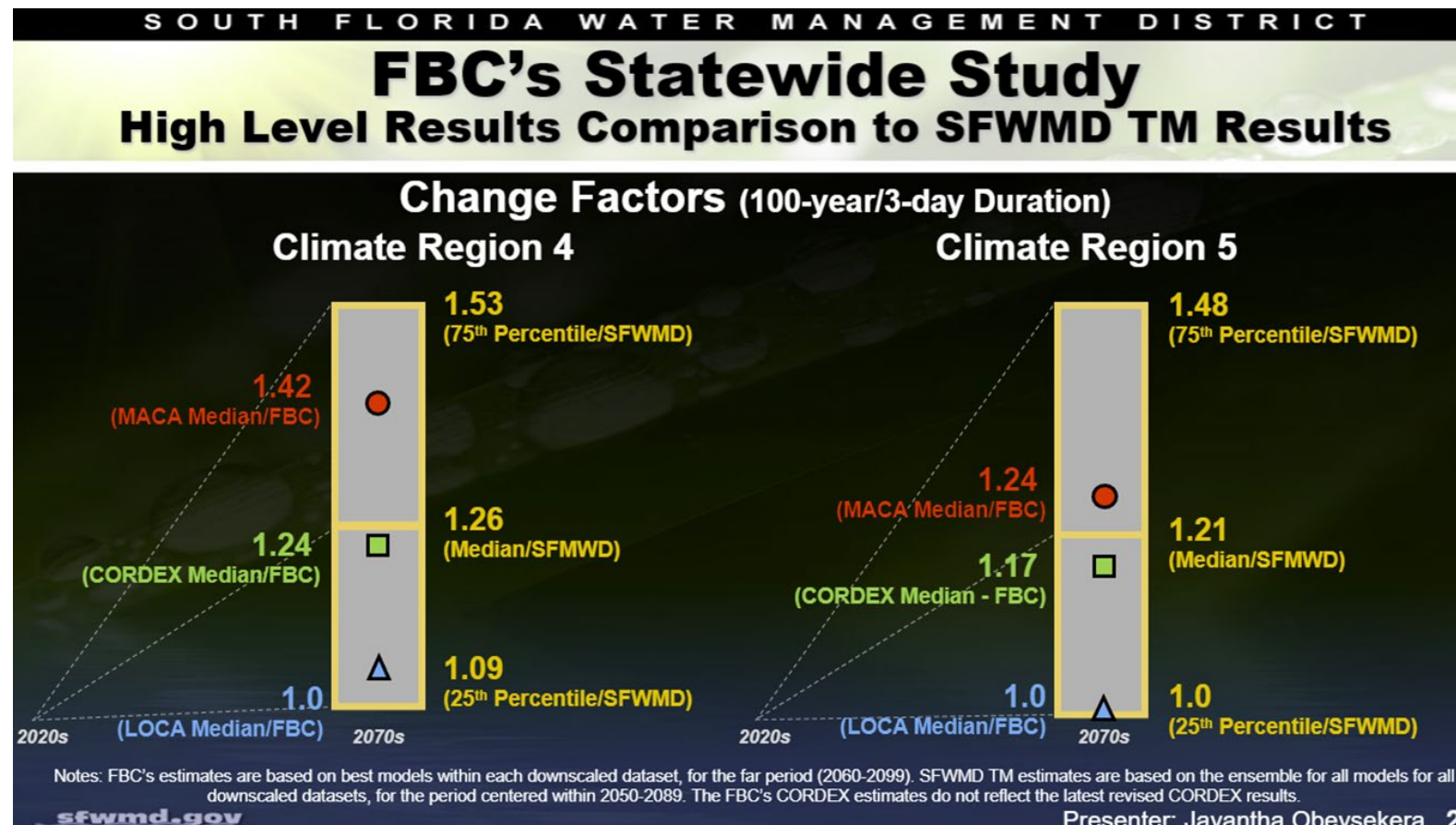


Flood Scenario Related Data

- Precipitation Data
 - ✓ NOAA Atlas 14 Rainfall Depths
- ~~Groundwater Level Data~~
- Storm Surge (no impact)
- ~~River Channel Cross-Section~~
- ✓ Land Use Data
- ~~Evapotranspiration Data~~
- ✓ FEMA FIRMs
- ✓ Soil Data
- ✓ Building Outlines

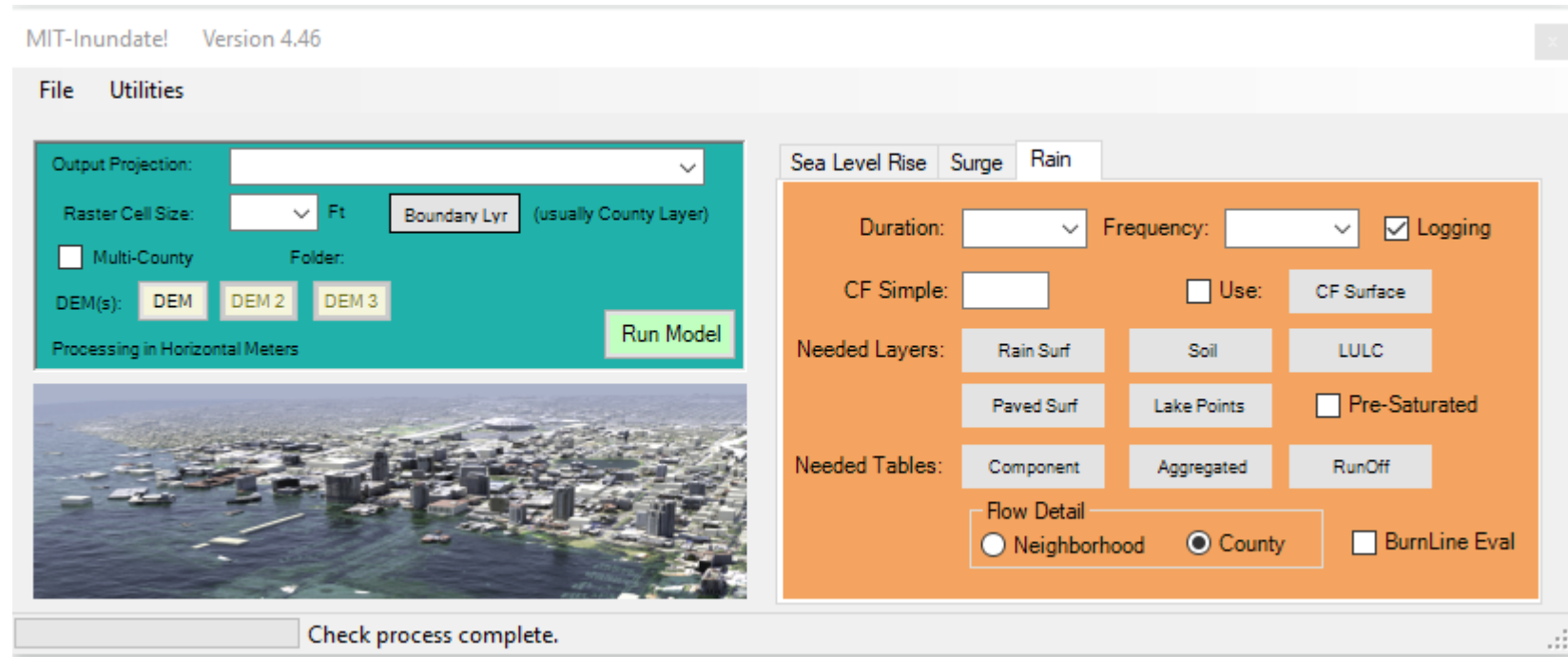
RAINFALL METHODOLOGY

- Used change factors from the FIU Florida Building Commission Study
- CORDEX data is available statewide
- CORDEX is the Median Range of the data



FLOOD MODELING PROCESS: INUNDATE! TOOL

- Planning and Spatial Analysis framework for identification and delineation of areas potentially exposed to the impacts of extreme rainfall, at scales relevant for statewide, regional, and local agencies.
- Not A framework for site-level design, engineering, and construction



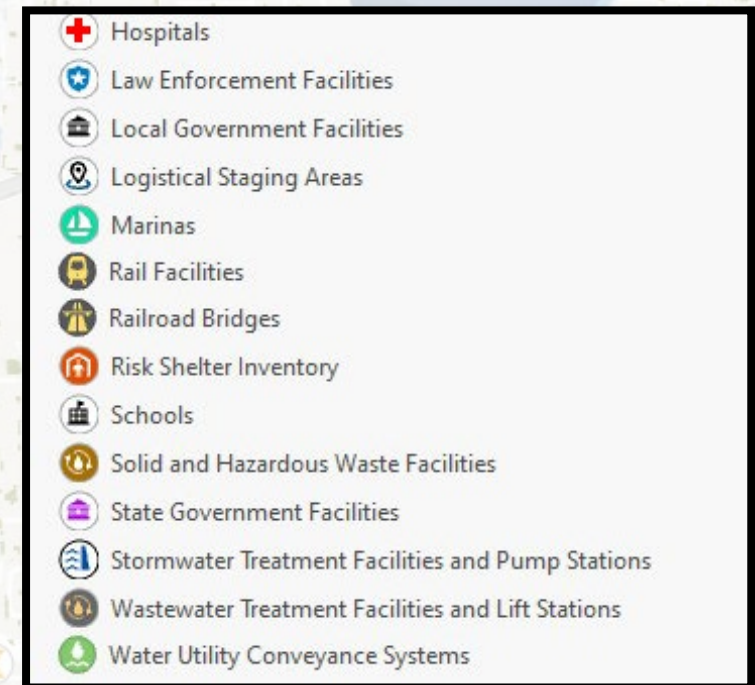
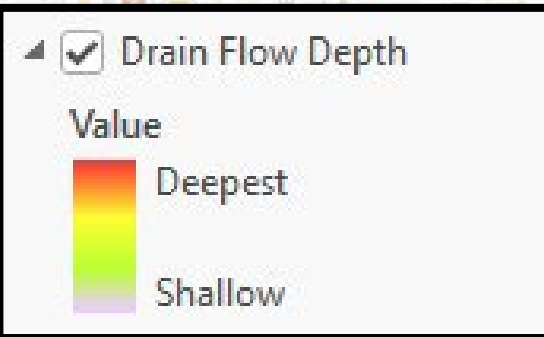
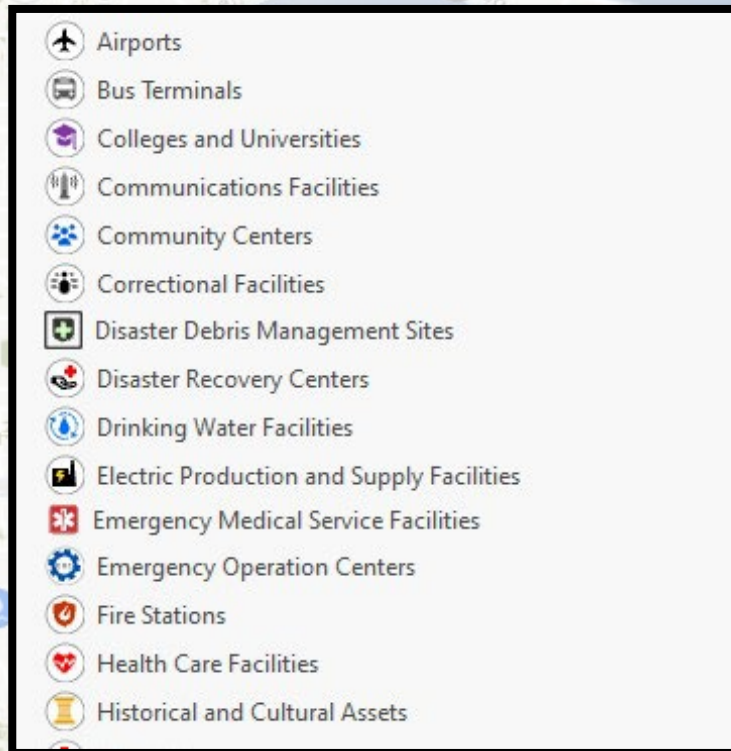
- This tool combines 2 types of hydrologic modeling:
- Flow model used to produce the inundation in the associated watershed catchments.
 - Ponding, which is based solely on water gathering and filling depressions with no flow involved.

Flood Scenario Data 2040 and 2070

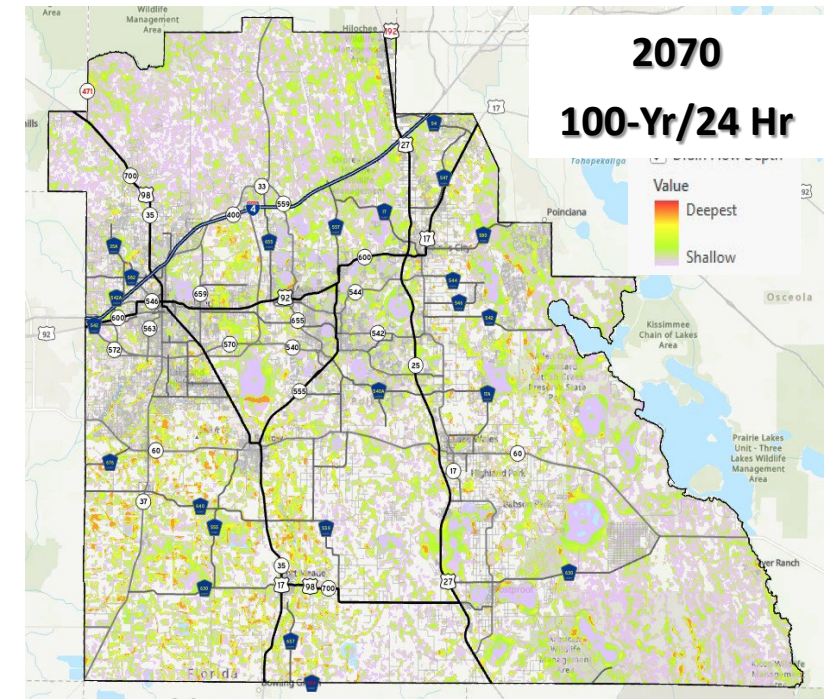
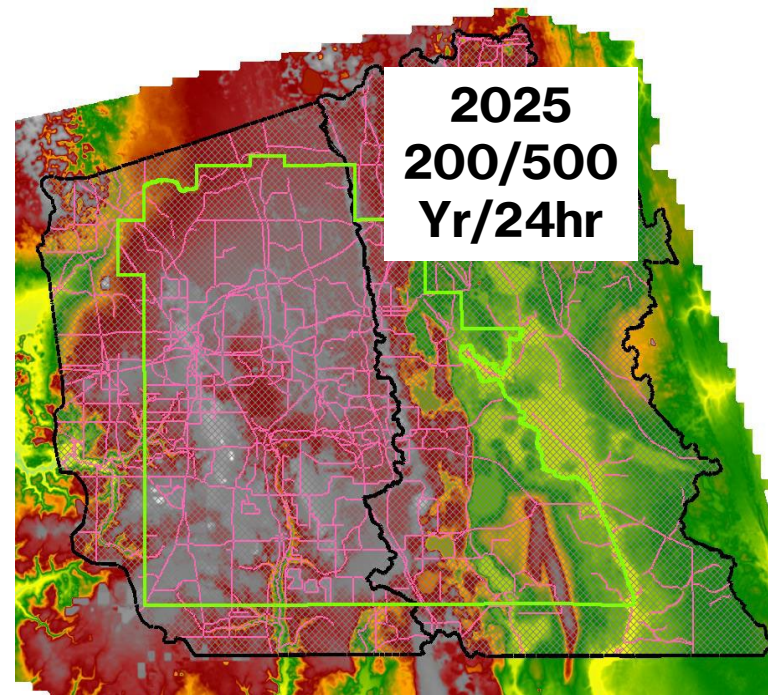
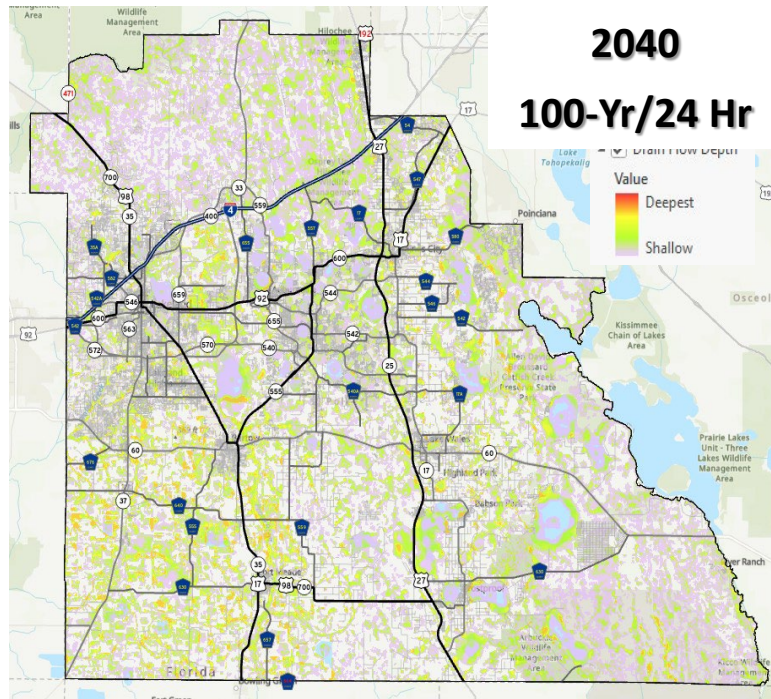
100-Yr/24-Hr

200-Yr/24-Hr

500-Yr/24-Hr



Inundation



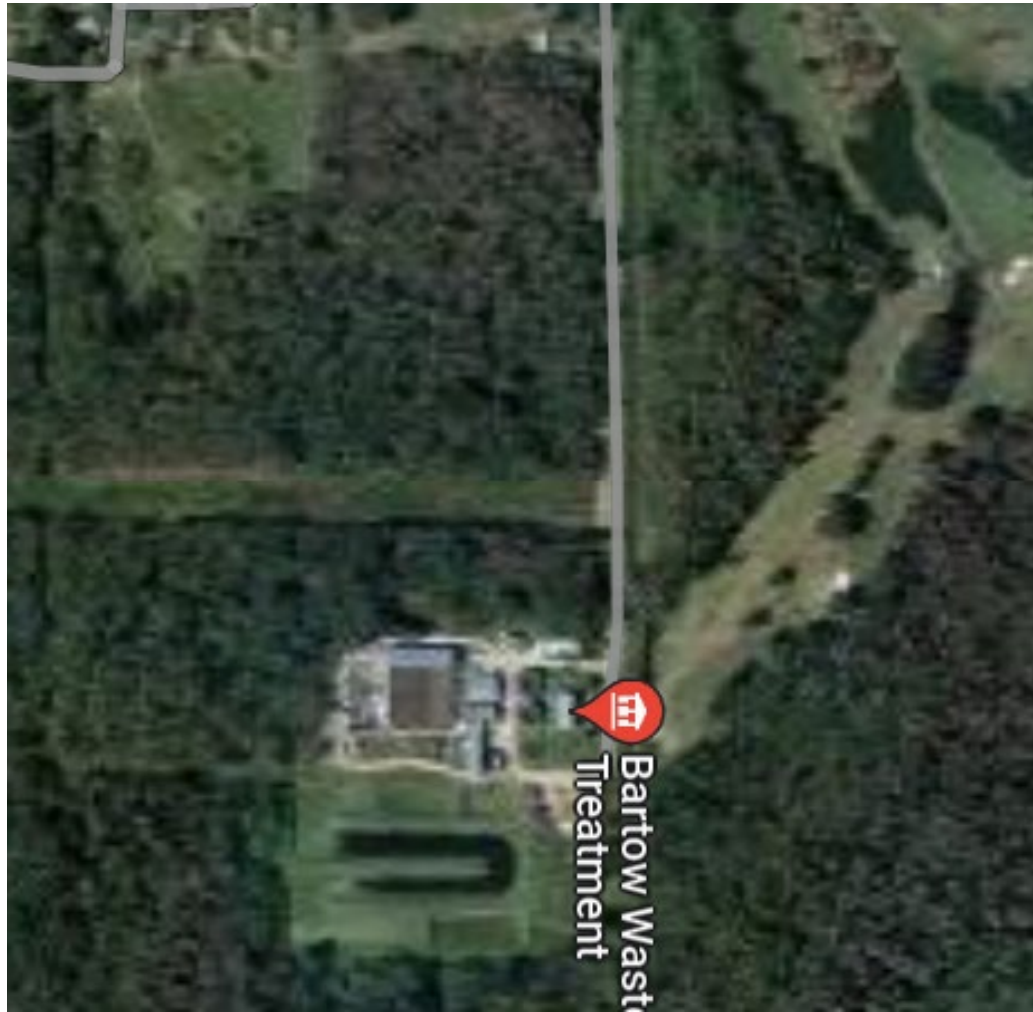
EXPOSURE ANALYSIS



**Example: Wauchula Wastewater Treatment Plant
2017 Google Earth**



**Example: Wauchula Wastewater Treatment Plant
Image Credit: Fox 35 - Sept. 29, 2022 (Hurricane Ian)**



Before



After

Bartow WWTP - POST HURRICANE IAN

Exposure Analysis

- Identification of depth of water caused by various flooding
- 2040 Projected Year and 2070 Projected year
- Includes data such as critical assets owned or maintained by the municipality/county
- Uses the most recent Digital Elevation Model data

Table 4 Example of a Deliverable Illustrating Flood Depths at Each Flood Scenario for Chosen Assets from FDEP Grant #R1927, City of St. Pete Beach
(Kimley Horn & Associates, 2020)

Exposure Level	City Lift Stations	City Buildings	City Roadways
	Flood Levels		
High	Exceeds station electrical controls	Exceeds Finished Floor Elevation	Greater than 6-inches above centerline of roadway
Medium	Less than 8-inches below station electrical controls	6-inches or less from Finished Floor Elevation	Up to 6-inches above centerline of roadway
Low	Above wet well top slab elevation	6-inches to 12-inches from Finished Floor Elevation	Above the shoulder of the roadway

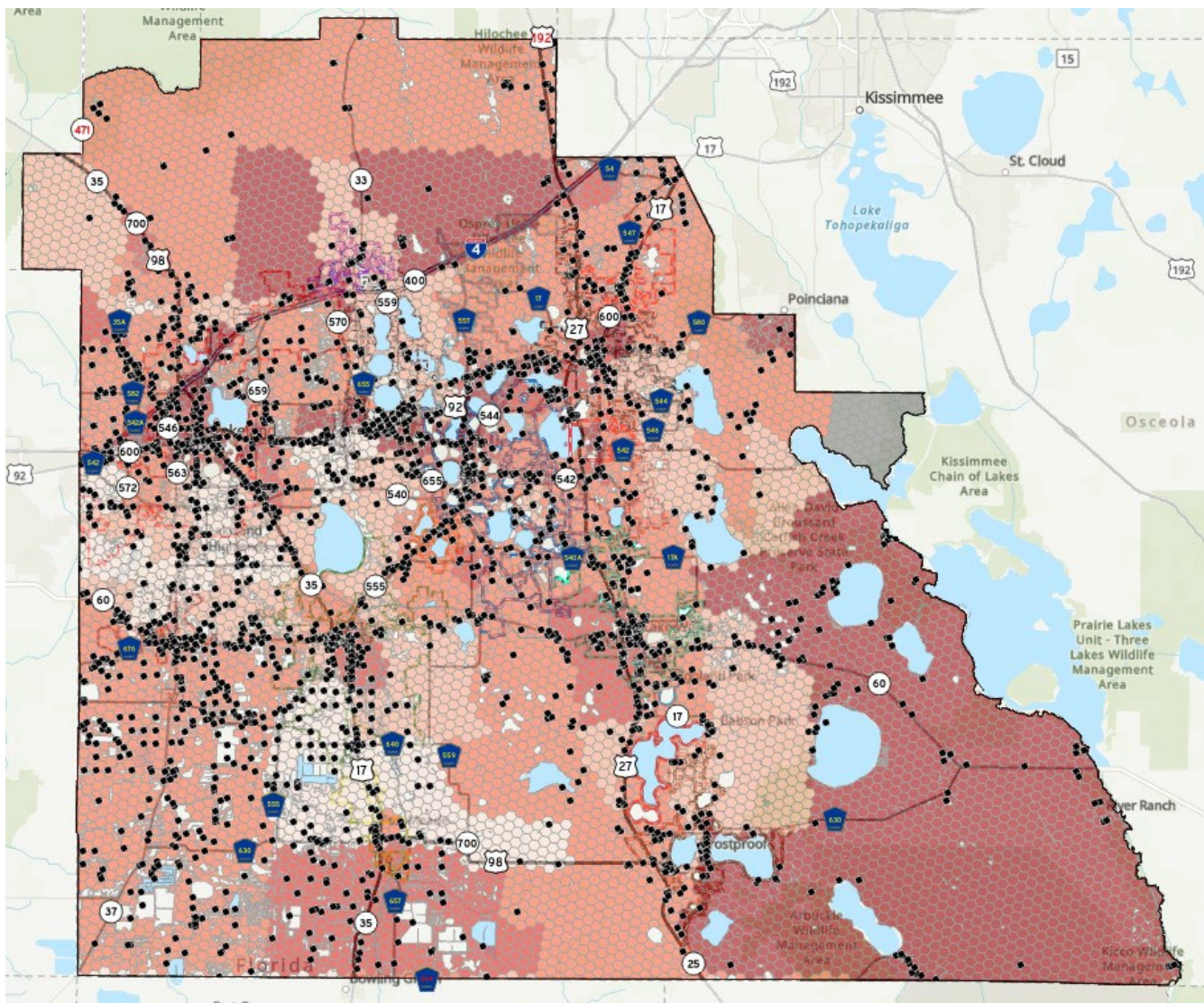
City Buildings		Finished Floor Elevation (ft)	Flood Level Elevations (ft)								
Building Description	Address		100 Year/24 Hour	25 Year/24 Hour	2050 SLR (Intermediate)	2050 SLR (Intermediate) + 25 Year/24 Hour	2050 SLR (Extreme)	2050 SLR (Extreme) + 100 Year/24 Hour	Category 1 Hurricane	King Tide	King Tide 2050 SLR (Intermediate)
St. Pete Beach Public Library	375 73rd Ave	7.65	-	-	-	-	-	-	8.011	-	-
Don Vista Center	3300 Gulf Blvd.	5.57	-	-	-	-	-	-	8.015	-	-
Fire Department	1950 Pass A Grille	4.98	-	-	-	-	-	3.996	8.041	-	4.39
Fire Department Bay	1950 Pass A Grille	4.40	-	-	-	-	-	3.996	8.041	-	4.39
Community Center	1500 Pass A Grille	3.84	3.278	3.278	-	3.278	2.95	3.996	8.05	3.39	4.39
Paradise Grill	900 Gulf Way	7.74	2.261	2.042	-	-	2.95	3.99	8.02	-	-
Bathroom	9300 Blind Pass	4.70	3.608	3.607	-	3.61	-	4.005	8.023	-	4.39



SENSITIVITY ANALYSIS

Social Vulnerability Index Input Variables		
Variable	Description	Pillar
1	Percent Civilian Unemployment	Employment Structure
2	Percent Employment in Extractive Industries	Employment Structure
3	Percent Employment in Service Industry	Employment Structure
4	Percent Female Participation in Labor Force	Employment Structure
5	Percent Renters	Housing
6	Percent Mobile Homes	Housing
7	Percent Unoccupied Housing Units	Housing
8	Percent Population under 5 years or 65 and over*	Population structure
9	Percent of Children Living in 2-parent families	Population structure
10	Median Age	Population structure
11	Percent Female*	Population structure
12	Percent Female Headed Households*	Population structure
13	People per Unit	Population structure
14	Percent Asian*	Race/Ethnicity
15	Percent Black*	Race/Ethnicity
16	Percent Hispanic*	Race/Ethnicity
17	Percent Native American*	Race/Ethnicity
18	Percent Poverty	Socioeconomic Status
19	Percent Households Earning over \$200,000 annually	Socioeconomic Status
20	Per Capita Income	Socioeconomic Status
21	Percent with Less than 12th Grade Education	Socioeconomic Status
22	Median Housing Value	Socioeconomic Status
23	Median Gross Rent	Socioeconomic Status
24	Percent of households spending more than 40% of their income on rent or mortgage	Socioeconomic Status
25	Percent Households Receiving Social Security Benefits*	Special Needs
26	Percent Speaking English as a Second Language with Limited English Proficiency	Special Needs
27	Nursing Home Residents Per Capita	Special Needs
28	Percent of population without health insurance	Special Needs
29	Percent of Housing Units with No Car	Special Needs

Social Vulnerability (SOVI)



Critical Asset Category Ranking Criteria

Critical Asset Ranking (Parcels)

Group	Score	Asset Parcels
Low	1	< 25%
	3	25 to 37%
Medium	5	> 37 to 50%
	7	> 50 to 65%
High	10	> 65%

Critical Asset Ranking (Points)

Group	Score	Asset Points
Low	1	< 3"
	2	> 3" - 8.4"
Medium	3	> 8.4" - 14"
	4	> 14" - 18"
High	5	> 18"

Critical Asset Ranking (Lines)

Group	Score	Transportation
Low	1	< 3"
	3	3" - 4"
Medium	5	> 4" - 5"
	7	> 5" - 6"
High	10	> 6"

Two Different Methods – Analyzing Sensitivity on Assets

Zonal Statistics

- footprint of an asset was defined, and the minimum elevation came from the DEM
- finished structures were assumed slab-on-grade, and the finished floor elevation was the minimum DEM elevation plus one foot

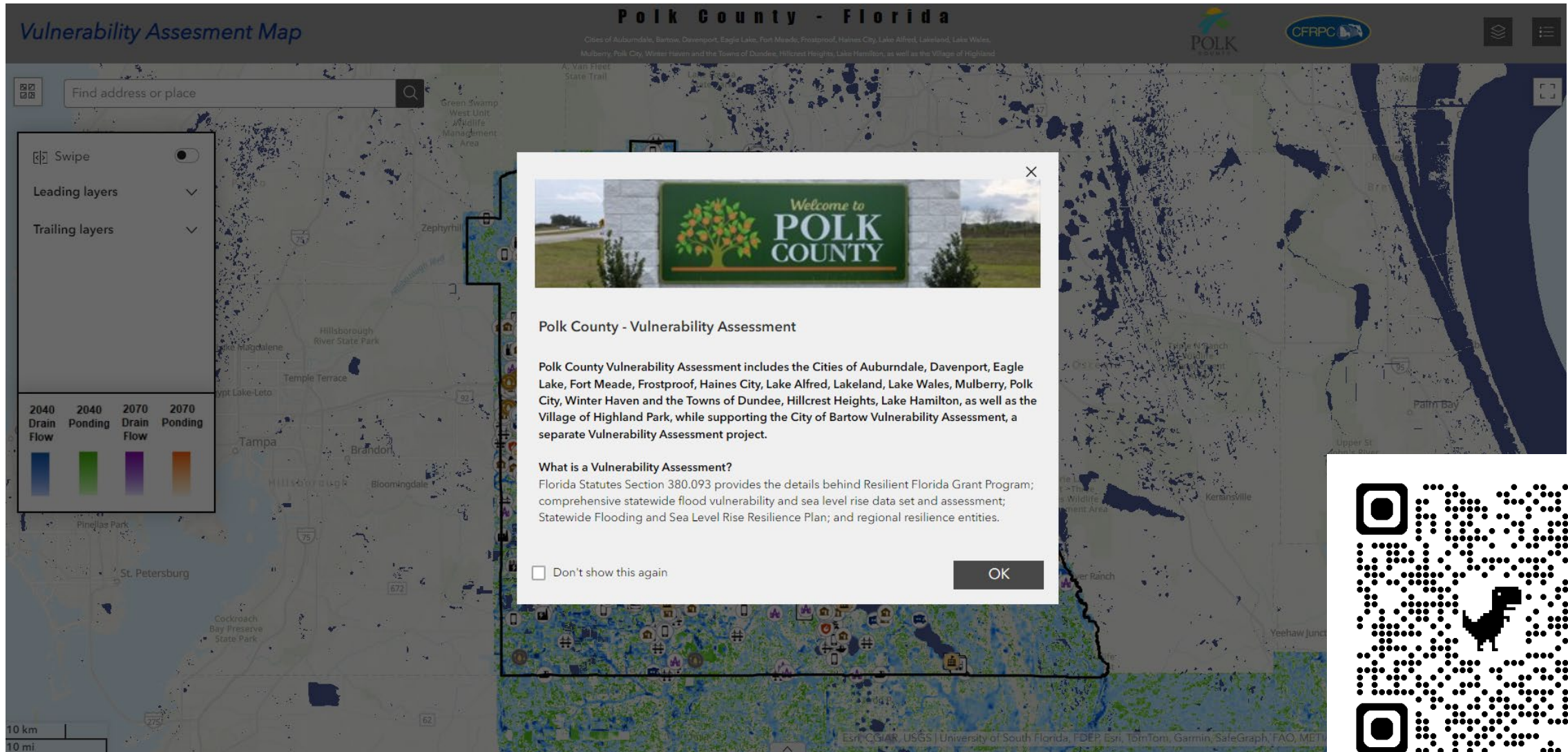
Percent Inundation by Area

- total area and the total flooded area of an asset are compared to determine the amount of flooding impacting the asset.
- results are reported as percentage by area

Critical Facilities Asset Type	POLK	SOURCE	LOCATION TYPE	CRITICAL ELEVATION (POINT)	INUNDATION % (PARCEL)	Critical Elevation
Airports		FDEP / COUNTY / CITY	POINT / PARCEL	Zonal Statistics	Percent Inundation	Helipad - Z Value
Bus Terminals		-	-	-	-	
Colleges and Universities		FDEP / COUNTY / CITY	POINT / PARCEL	Zonal Statistics	Percent Inundation	Communication Towers - Z Value
Communications Facilities		FDEP	POINT	Z Value	-	
Community Centers		FDEP / COUNTY / CITY	POINT	Zonal Statistics	-	
Correctional Facilities		FDEP / COUNTY / CITY	POINT / PARCEL	Zonal Statistics	Percent Inundation	
Disaster Debris Management Sites		FDEP / COUNTY / CITY	POINT / PARCEL	Z Value	Percent Inundation	
Disaster Recovery Centers		FDEP / COUNTY / CITY	POINT / PARCEL	Zonal Statistics	Percent Inundation	
Drinking Water Facilities		FDEP / COUNTY / CITY	POINT	Zonal Statistics	-	Water Wells - Z Value
Electric Production and Supply Facilities		FDEP	POINT / PARCEL	Zonal Statistics	Percent Inundation	Substations - Z Value
Emergency Medical Service Facilities		FDEP / COUNTY / CITY	POINT	Zonal Statistics	-	
Emergency Operation Centers		FDEP / COUNTY / CITY	POINT	Zonal Statistics	-	
Fire Stations		FDEP / COUNTY / CITY	POINT	Zonal Statistics	-	
Health Care Facilities		FDEP / COUNTY / CITY	POINT	Zonal Statistics	-	
Historical and Cultural Assets		FDEP	POINT	Zonal Statistics	-	
Hospitals		FDEP / COUNTY / CITY	POINT / PARCEL	Zonal Statistics	Percent Inundation	
Law Enforcement Facilities		FDEP / COUNTY / CITY	POINT	Zonal Statistics	-	
Local Government Facilities		FDEP / COUNTY / CITY	POINT	Zonal Statistics	-	
Logistical Staging Areas		-	-	-	-	
Marinas		-	-	-	-	
Rail Facilities		FDEP / COUNTY / CITY	POINT	Z Value	-	
Railroad Bridges		FDEP / COUNTY / CITY	POINT	Z Value	-	
Risk Shelter Inventory		FDEP / COUNTY / CITY	POINT / PARCEL	Zonal Statistics	Percent Inundation	
Schools		FDEP / COUNTY / CITY	POINT / PARCEL	Zonal Statistics	Percent Inundation	
Solid and Hazardous Waste Facilities		FDEP / COUNTY / CITY	POINT / PARCEL	Zonal Statistics	Percent Inundation	
State Government Facilities		FDEP / COUNTY / CITY	POINT	Zonal Statistics	-	
Stormwater Treatment Facilities and Pump Stations		FDEP / COUNTY / CITY	POINT / PARCEL	Zonal Statistics	Percent Inundation	Drainage Assets and Dams - Z Value
Wastewater Treatment Facilities and Lift Stations		FDEP / COUNTY / CITY	POINT / PARCEL	Zonal Statistics	Percent Inundation	
Water Utility Conveyance Systems	- -	FDEP	POINT	Zonal Statistics	-	Water Tanks - Z Value

Polk County Vulnerability Assessment Map

<https://experience.arcgis.com/experience/a6e99ed8857e469494f0c13ff2cab3a3/>



What happens after the Assessment?

Adaptation Plan – 2026

- Identify strategies, solutions, and policies to address vulnerabilities
- Explore implementation options and develop project ideas

Implementation

- Identify grant funding opportunities and prepare applications
- Develop project designs, procure labor, and turn dirt

500 Year Modeling Project

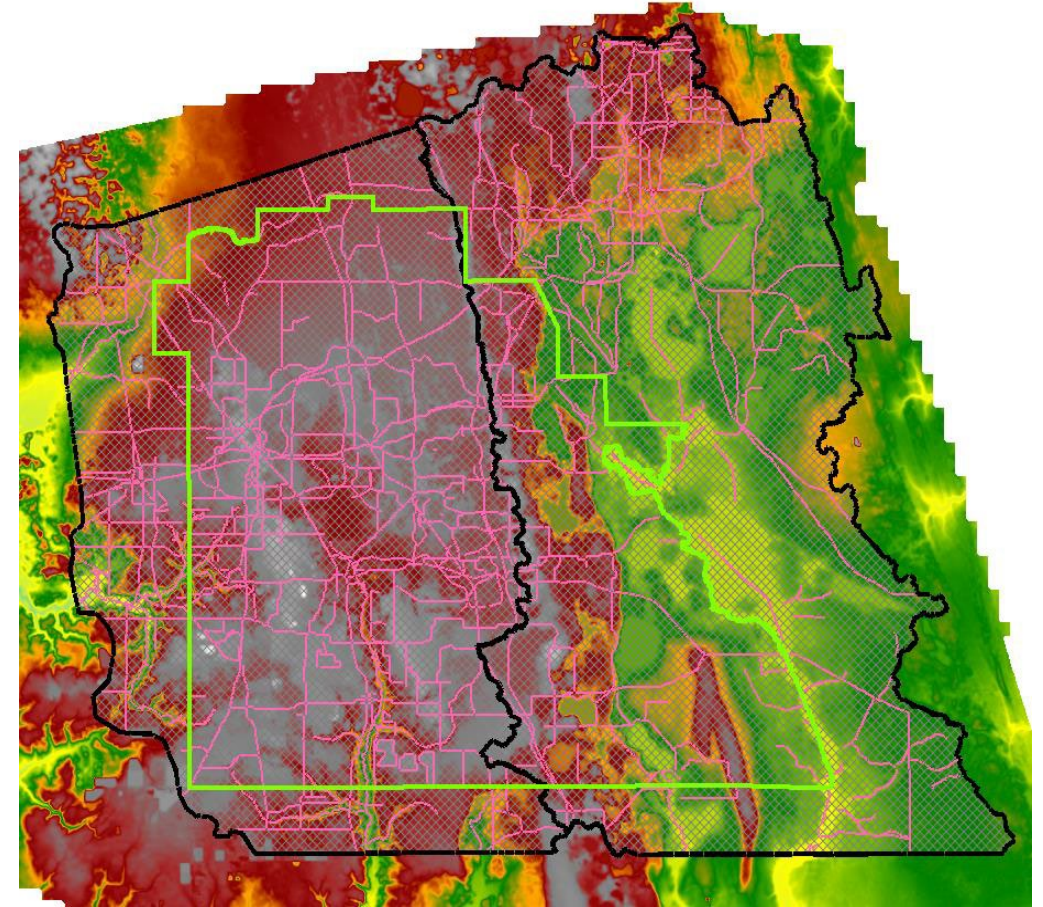
- Exposure
- 3-D Renderings of Critical Assets

Polk County Additional Flood Modeling Project

**Funder - Coastal & Heartland National
Estuary Partnership (CHNEP)**

Contractor - HighTide Intelligence

- **Subcontractor Halff Associates, Inc**



WHO WE ARE

Coastal & Heartland National Estuary Partnership

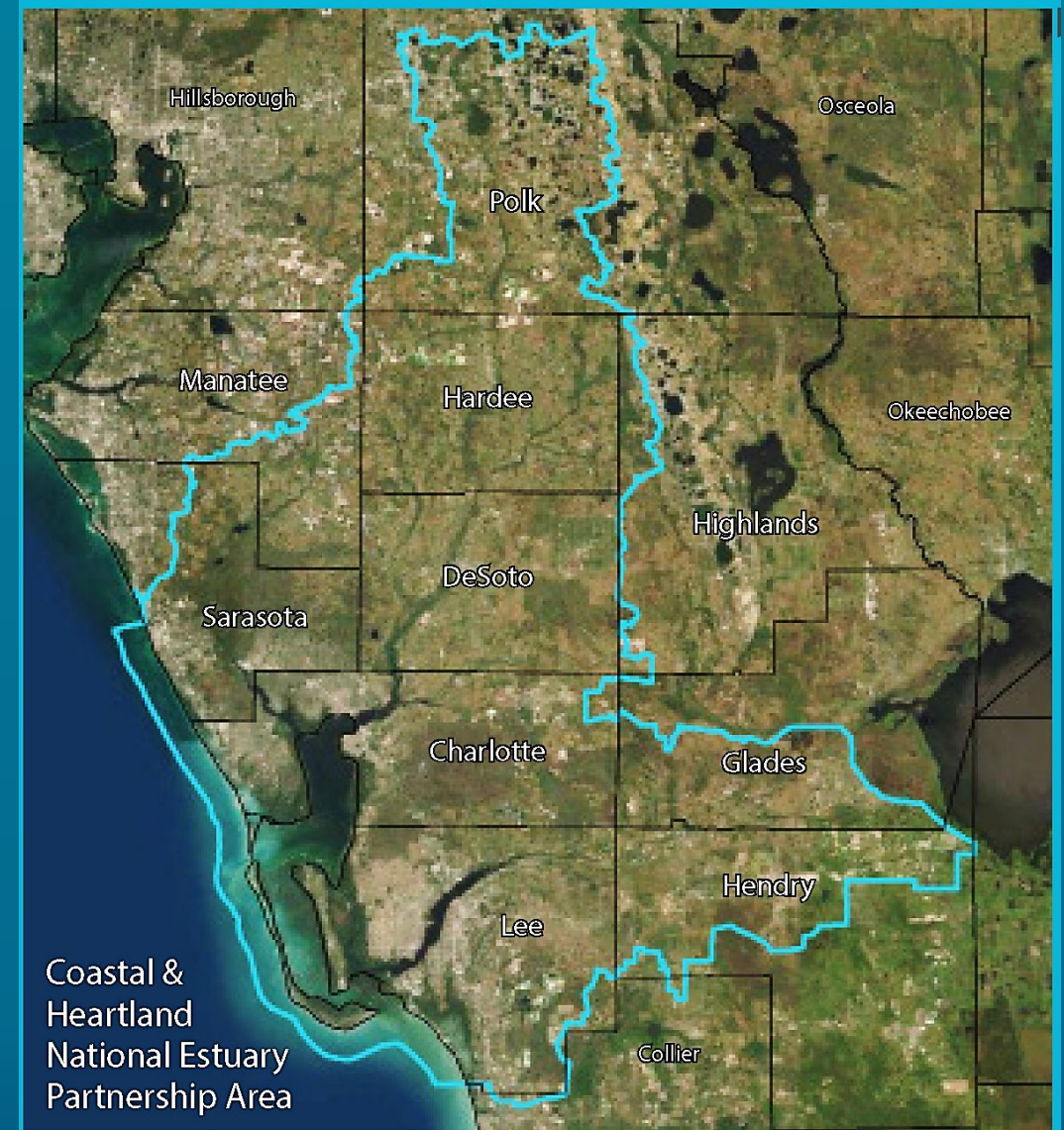
- Formed in 1995 and one of only 28 Congressionally designated “estuaries of national significance” in the United States.
- Receive special funding and support from US EPA under the Clean Water Act to protect and restore water resources in the CHNEP area.



Uniting Central and Southwest Florida to Protect Water and Wildlife

WHERE WE WORK

- CHNEP area encompasses 5,416 sq. miles (3,146,280 acres)
- Estuaries include Lemon Bay, Dona & Roberts Bay, Charlotte Harbor, Pine Island Sound, Caloosahatchee, San Carlos Bay and Estero Bay
- Rivers including Myakka, Peace, Caloosahatchee, and Estero
- Inland and coastal Communities incl. 10 counties and 25+ cities!



Uniting Central and Southwest Florida to Protect Water and Wildlife

THE POWER OF PARTNERSHIP

- CHNEP is:
 - Public-private partnership
 - Consensus-based
 - Non-regulatory
 - Science-based
 - Citizen-supported
- CHNEP, because of private contributions, volunteers and donated in-kind services has been able to provide more than 19 dollars of restoration for every dollar it receives of federal governmental funding!



Uniting Central and Southwest Florida to Protect Water and Wildlife

HOW WE FIT INTO THIS PROJECT

- CHNEP is:
 - Funding for this project \$\$\$
 - Providing project management support in:
 - participating in project meetings and reviewing deliverables to provide technical comment
 - disseminating project information to policymakers, general public, and other audiences
- CHNEP is also planning to help with the implementation of County's Vulnerability Assessment and Adaptation Action Area Plans long-term!*





Polk County Comprehensive Vulnerability Assessment

November 4, 2025



In partnership with the Central Florida Regional
Planning Council and the Coastal & Heartland National
Estuary Partnership

Table of Contents

1	Introduction
2	Flood Modeling
3	VA Process
4	Results: by Site
5	Conclusions

HighTide is on a **mission**.



Adrian Santiago Tate
CEO & Cofounder



Noah Dewar, PhD
CTO & Cofounder



Iuliia Marchenko
Marketing Specialist



Romina Argüello Zuazo
Business Development Lead

Our **mission** is to accelerate flood adaptation with data-driven technology.

Historic Rainfall Events

2017 Hurricane Irma: 6 inches, up to 17.6 inches (Davenport)

2022 Hurricane Ian: 10 inches, up to 16.9 inches (Lake Wales)

2024 Hurricane Milton: 12 inches

Sequential storms Debby, Helene, Milton: 20 inches above



[The Ledger, 2017.](#)

Why This Study?

Extreme rainfall and flooding are increasing in frequency

A warmer atmosphere holds more moisture, resulting in heavier rainfall

Sequential storms saturated soils result in higher flood depths

Flood Modeling Overview

- H&H HEC-RAS model developed by Halff Associates
- “Rain-on-mesh” simulates runoff and surface water interaction
- **Scenarios:**
 - 200-year, 24-hour event (0.5% Annual Chance)
 - 200-year, 24-hour event (0.5% Annual Chance) with saturated ground conditions
 - 500-year, 24-hour event (0.2% Annual Chance)
 - 500-year, 24-hour event (0.2% Annual Chance) with saturated ground conditions

Flood Model Rainfall Amounts

Return Period (years)	AEP	Total Rainfall (in)	Rainfall w/ ARF (in)
100	1%	10.5	9.98
200	0.5%	12.3	11.69
500	0.2%	14.8	14.06

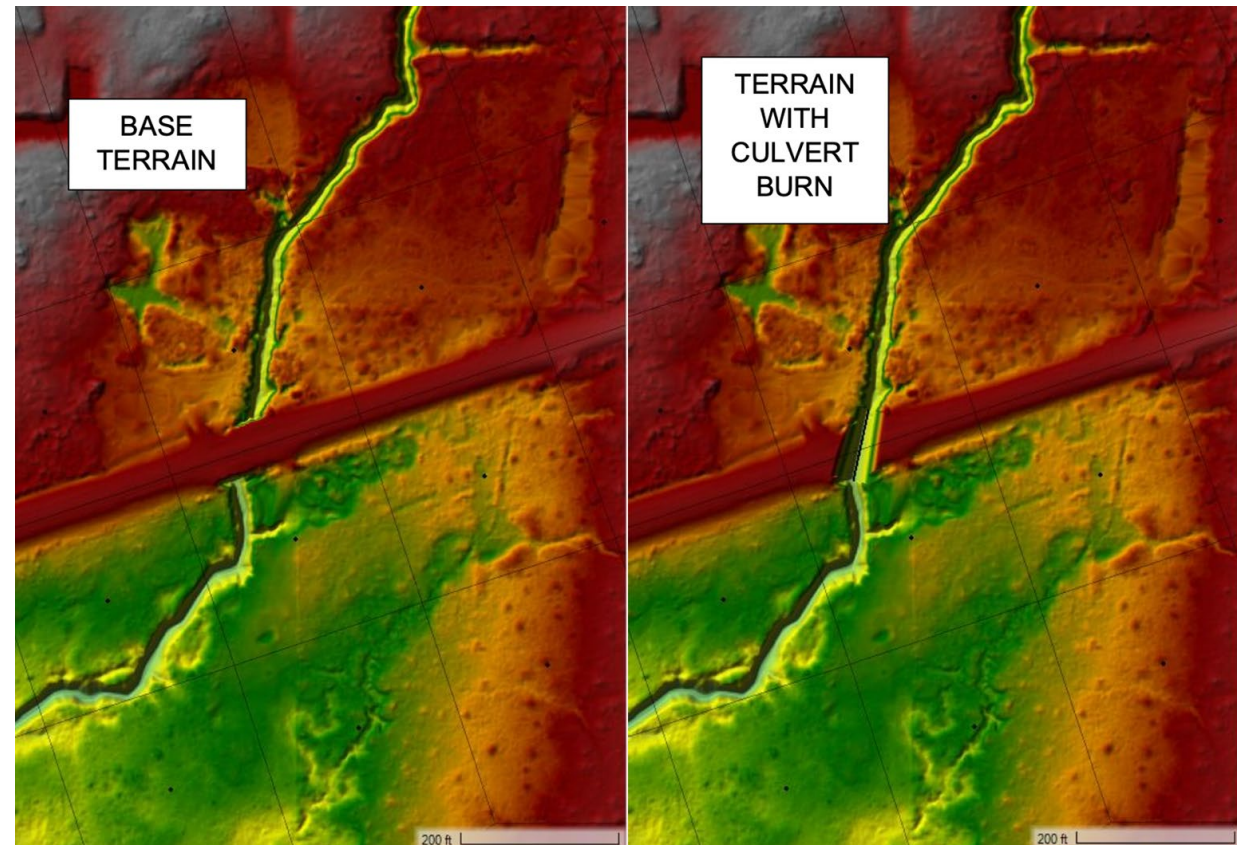
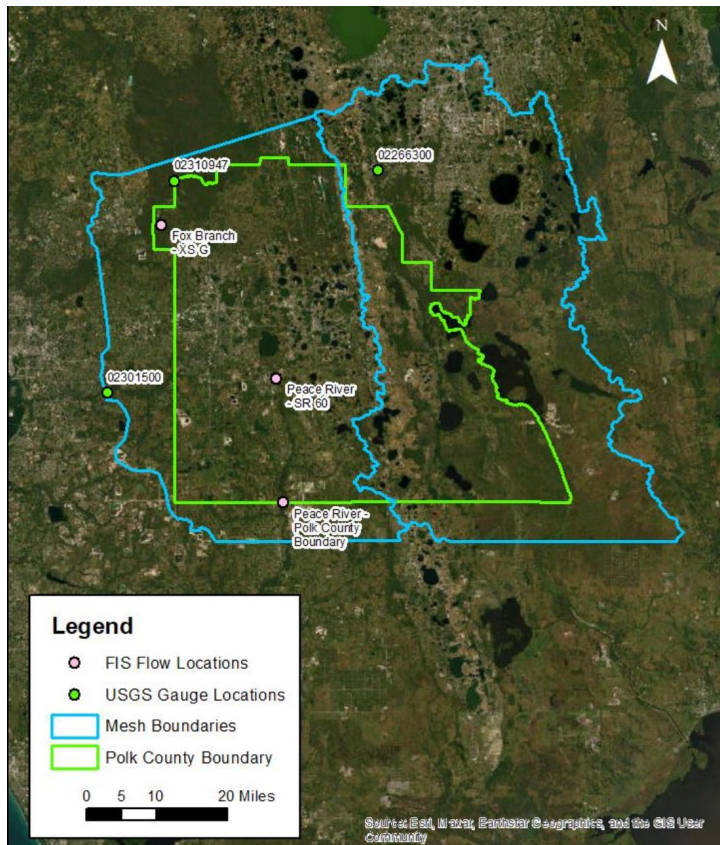
The table lists both the return period and its equivalent Annual Exceedance Probability (AEP) from NOAA Atlas 14 24-Hour Precipitation Data.

The Areal Reduction Factor (ARF) adjusts the total rainfall depth to represent the average rainfall expected across a larger watershed area rather than at a single point.

Flood Model **Validation**

- Validation through observed flood behavior
- Compare the 100-year flood event with modeled event
- Compared to USGS NWIS and FEMA Flood Insurance Study (2016)
- Adjustments included manual clean-up of breaklines
- Addition of burn lines and terrain corrections

Flood Model Validation



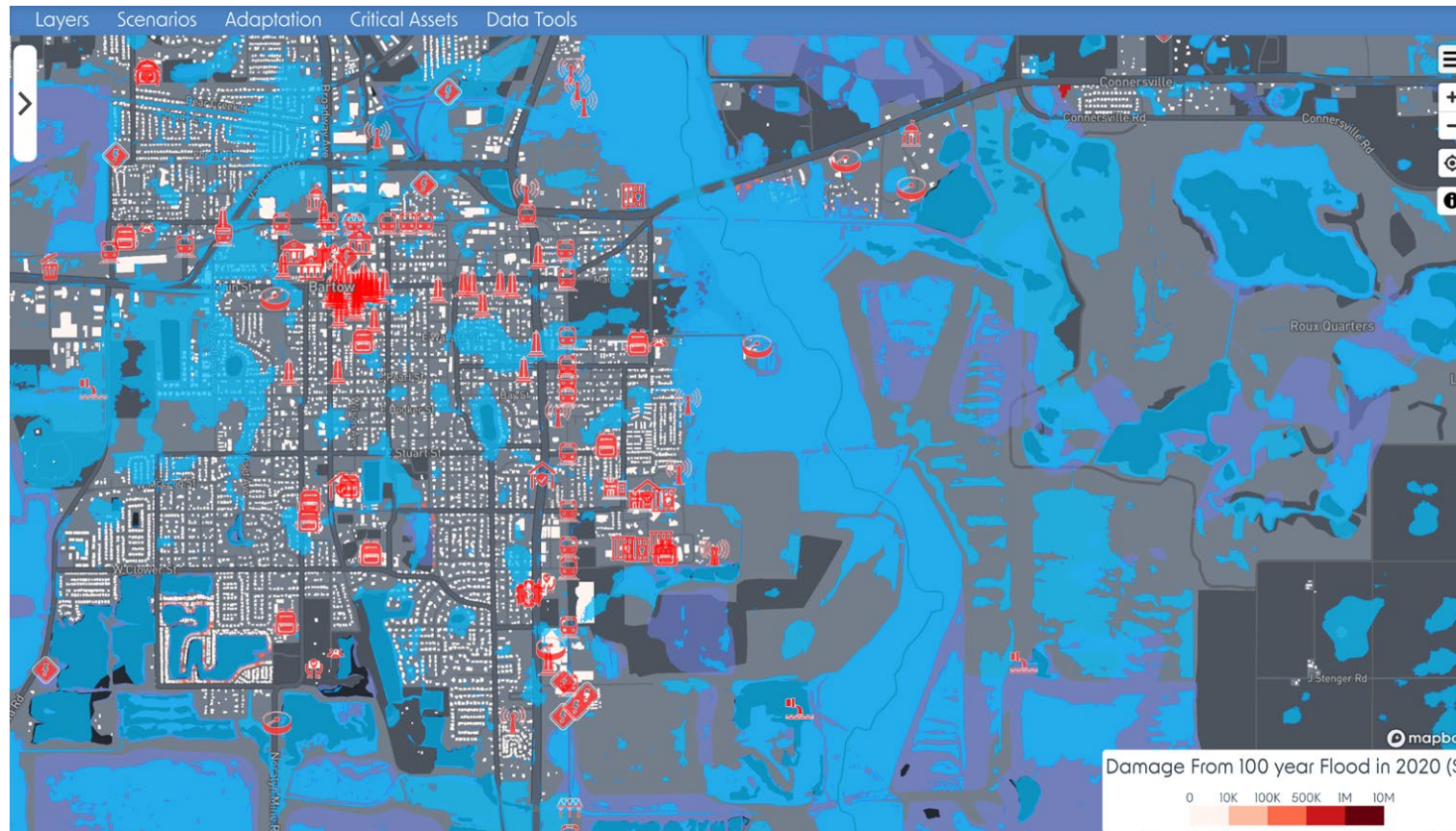
Critical Assets

- FL DEP Statewide Resilience Dataset (2023)
- **Categories:**
 - Critical Community and Emergency Facilities (CCEH)
 - Infrastructure
 - Natural, Cultural, and Historical Resource (NCH)
 - Transportation
- **12,450 total countywide assets**

Exposure Analysis Overview

- Flood depth grids overlaid with asset locations
- Flood depth calculated for each asset under each scenario
- Provides baseline exposure for adaptation planning
- Reports number and percentage of assets in each class and type that are exposed to flooding

Exposure Analysis Overview



Exposure Summary by Class

Asset Class Summary			
Asset Class	Total Assets	Number of assets in 2025 exposed to a 200-year precipitation event (%)	Number of assets in 2025 exposed to a 200-year precipitation event with Saturated Ground Conditions (%)
Critical Community and Emergency Facilities	762	20 (2.6%)	25 (3.3%)
Critical Infrastructure	4,485	551 (12.3%)	578 (12.9%)
Natural, Cultural, and Historical Resource	6,594	382 (5.8%)	413 (6.3%)
Transportation and Evacuation Routes	609	134 (22.0%)	141 (23.2%)
Total	12,450	1,087 (8.7%)	1,157 (9.3%)

Exposure Summary by Class

Asset Class Summary			
Asset Class	Total Assets	Number of assets in 2025 exposed to a 500-year precipitation event (%)	Number of assets in 2025 exposed to a 500-year precipitation event with Saturated Ground Conditions (%)
Critical Community and Emergency Facilities	762	26 (3.4%)	32 (4.2%)
Critical Infrastructure	4,485	618 (13.8%)	660 (14.7%)
Natural, Cultural, and Historical Resource	6,594	436 (6.6%)	463 (7.0%)
Transportation and Evacuation Routes	609	148 (24.3%)	159 (26.1%)
Total	12,450	1,228 (9.9%)	1,314 (10.1%)

Site Selection Approach

- Combined model data + stakeholder input
- **Criteria:**
 - Exposure to flooding
 - Asset priority class
 - Relevance and impact
 - Geographic representation

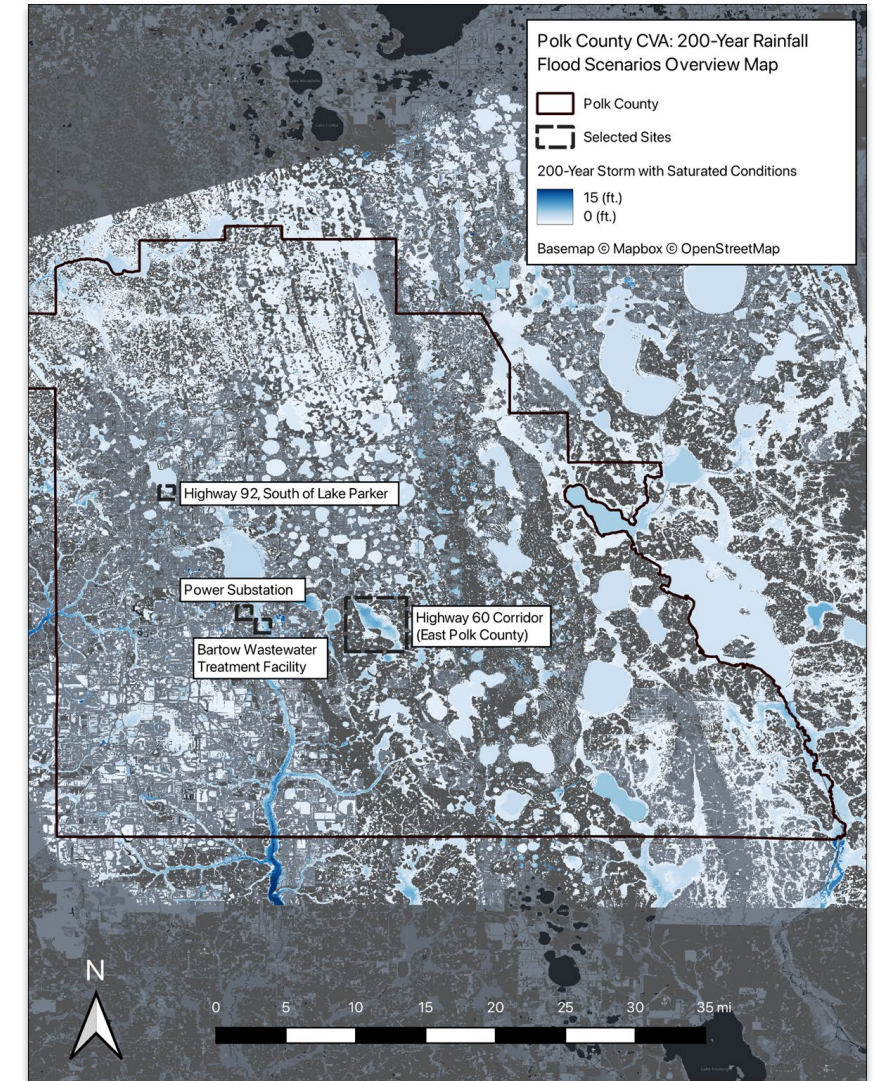
Site Selection Results

Bartow Wastewater Treatment Facility

Power Substation (North Bartow)

Highway 92 (South of Lake Parker, Lakeland)

Highway 60 Corridor (East Polk County)



Overview map showing location of selected sites in Polk County. HighTide, 2025.

Visualization Approach

- Visualized using open-source software, Blender:
 - Imported DEM terrain
 - Added building and structure footprints
 - Overlapped with flood rasters
 - Added lighting and realistic water rendering
 - Python scripts automated scene generation

Site 1: Bartow Wastewater Treatment Facility

Site 1: Bartow Wastewater Treatment Facility

Site 1: Bartow Wastewater Treatment Facility

Site 2: Power Substation

Site 2: Power Substation



Site 2: Power Substation



Sites 3: Highway 92



Sites 3: Highway 92

Sites 3: Highway 92

Sites 4: Highway 60

Sites 4: Highway 60

Sites 4: Highway 60

Comparative Summary:

200-Year vs. 500-Year Scenarios

- The 500-year rainfall event produces significantly **deeper and more widespread** flooding than the 200-year event
- Saturated soil conditions **amplify flood depths by 15–40%** across all sites
- **Impacts shift** from surface and parking areas to building-level flooding under the 500-year conditions

Conclusion

- Extreme rainfall events are **increasing in frequency and intensity** across Polk County
- Saturated soil conditions **increase flood depths and duration**
- Critical infrastructure and transportation routes **show exposure under both 200- and 500-year events**
- Visualizations offer **a powerful communication tool** for public engagement and policy making
- Model results provide **a scientific foundation** for prioritizing resilience investments, including drainage improvements and asset hardening



Thank you!

For further inquiries and information

Adrian Santiago Tate

CEO & Cofounder

HighTide Intelligence

adrian@hightide.ai





OPEN DISCUSSION

PROJECT TEAM CONTACT INFORMATION

Central Florida Regional Planning Council

Curtis Knowles, FPEM

Emergency Management and Community Projects Director

Central Florida Regional Planning Council

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Mobile: 863.221.8280

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POLK COUNTY

Ryan Ellis

Water Resources Project Manager

Polk County Parks and Natural Resources Division

Office: 863-534-7377 ext. 250

Mobile: 863-344-2984

Email: RyanEllis@polk-county.net



**POLK COUNTY
STORMWATER TECHNICAL ADVISORY COMMITTEE (STAC)
STAC Meeting**

**Location: Room 407, Fourth Floor; County Administration Building; 330 W. Church Street,
Bartow 33830**

Tuesday June 2nd, 2026, at 6:00 P.M.

AGENDA

Welcome & Introductions (*This meeting is being recorded*) - Chairman

Roll Call

Review and Approval of previous STAC Meeting Minutes

- November 4, 2025, Meeting Minutes. ***STAC Action Item***

Public Comment

Presentations

- DRAFT Vulnerability Assessment presentation by the Central Florida Regional Planning Council, (Curtis Knowles), Coastal Heartland National Estuary Partnership, (Jennifer Hecker), and High Tide, (Adrian Santiago Tate) ***STAC Action Item***
- Discussion of Water Quality and Corridor Adaptation Plan
- Proposed Community Investment Program (CIP) Projects – Staff Presents ***STAC Action Item***

General Discussions

Next Meeting

Adjourn

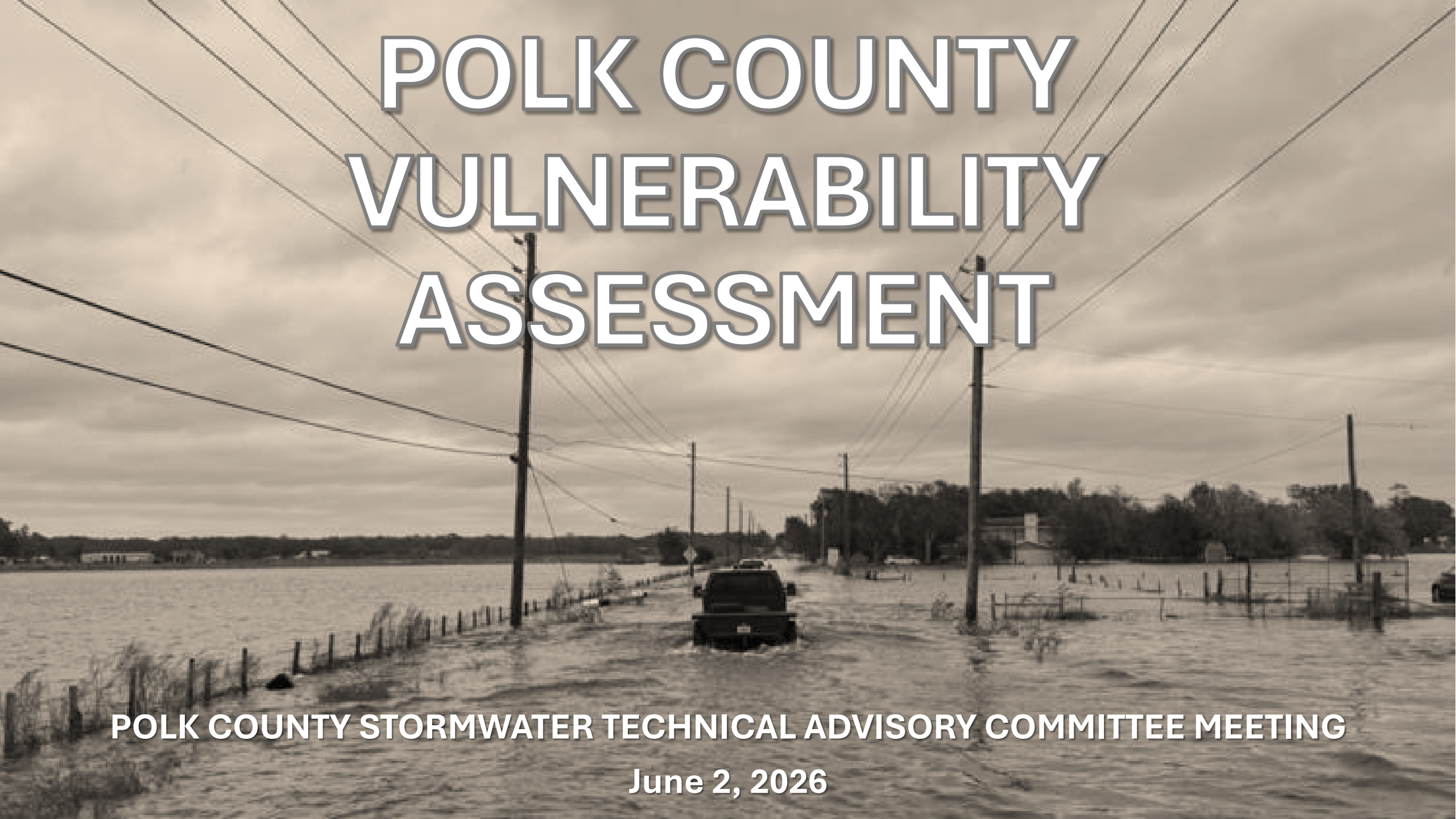
STORMWATER TECHNICAL ADVISORY COMMITTEE MEETING SIGN-IN SHEET



June 2, 2026
6:00 PM

Neil Combee Administration Building
Room 407
330 Church Street, Bartow

Member Name	Signature	Phone	E-Mail
David C. Carter, P.E.			
Kriss Kaye, P.E.			
Ed Murawski			
Jeff Spence			
Robert Kollinger P.E.			
STAFF:			
William D. Beasley			
John Bohde			
Tabitha Biehl			
Dane Norman		863-534-5822	danenorman@polkfl.gov
Ryan Ellis		863-534	Ryan Ellis @ Polk FL gov
Shayla Bradford		863-534-7377	shaylabradford@polkfl.gov
Chad Allison		863-534-7869	chadallison@polkfl.gov
Blake Tew			
Greg Knothe		863-244-7324	gregory.knothe@polkfl.gov
GUESTS:			
Curtis Knabe		863-534-7130 x124	cknab@cfrc.org
Amée Bailey		352-477-2633	amee@hightide.ai
STEVE McQUAIG		863-534-6769	steve.mcquaig@polkfl.gov
Clinton Howerton Jr		534 6087	clintonhowertonjr@polkfl.gov
Adrian Santiago			



POLK COUNTY VULNERABILITY ASSESSMENT

POLK COUNTY STORMWATER TECHNICAL ADVISORY COMMITTEE MEETING

June 2, 2026



May 12, 2021 – Governor Ron DeSantis
signed Senate Bill 1954 into law



- **Ensures** a coordinated approach to Florida's coastal and inland resilience
- **Enhances** our efforts to protect our inland waterways, coastlines and shores, which serve as invaluable natural defenses against sea level rise
- **Will yield** the largest investment in Florida's history to prepare communities for the impacts of sea level rise, intensified storms and flooding



RESILIENT FLORIDA GRANT PROGRAM (F.S. 380.093)



RESILIENT FLORIDA FRAMEWORK

PLANNING GRANTS

To assist local governments with Vulnerability Assessments, Peril of Flood Comprehensive Plan Amendments

STATEWIDE FLOODING AND SEA LEVEL RISE RESILIENCE PLAN

To assist local governments and eligible entities in implementing projects that address flooding and sea level rise

STATEWIDE DATA SET AND ASSESSMENT

Collection of local vulnerability assessments and data to assist in creating a Statewide Flooding and Sea Level Rise Assessment

REGIONAL RESILIENCE ENTITIES

Technical Support, develop project applications for members and multijurisdictional collaboration

FLORIDA FLOOD HUB

Scientific research, expert working groups, flooding and sea level rise modeling methodology, recommendations, training and education



RESILIENT FLORIDA

**FY22-23 Planning Grant
Award**

**“Polk County (16 cities &
coordinating with Bartow)
Vulnerability Assessment”**

STAKEHOLDER COMMITTEE

Public safety

Transportation

Utilities

**Building &
Housing**

**Community &
Economic
Development**

Education

Environment

Planning

**Parks, Recreation
& Cultural
Resources**

**Human & Social
Services**

**Local Elected
Officials**

**Community
Leaders or
Champions**

**Researchers &
Scientists**

**State and Federal
Governments,
NGO's**

VULNERABILITY ASSESSMENT TASKS



**ACQUIRE BACKGROUND
DATA**



EXPOSURE ANALYSIS
ANALYZE WATER DEPTH



SENSITIVITY ANALYSIS
*EVALUATE FLOODING
IMPACTS ON CRITICAL
ASSETS*



**FINAL VULNERABILITY
ASSESSMENT REPORT,
MAPS, AND TABLES**

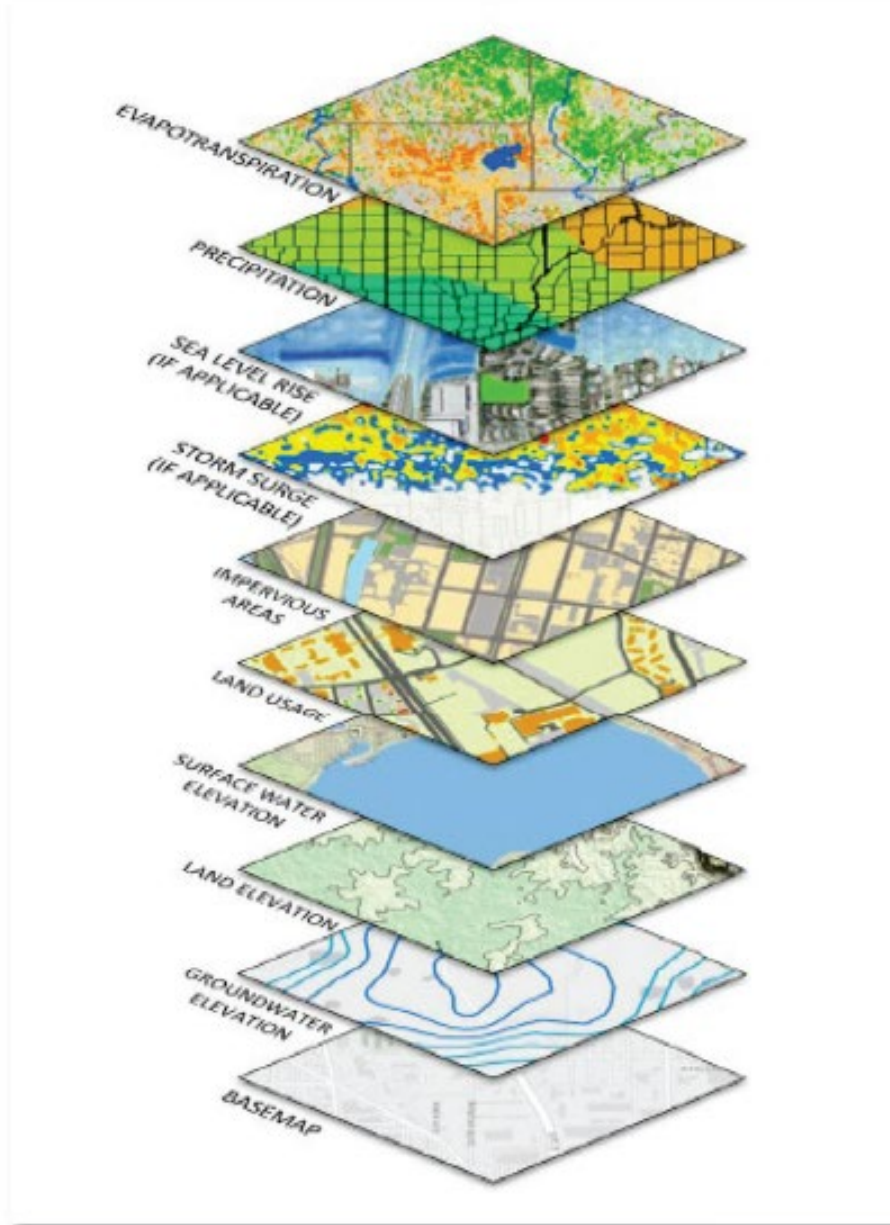
ACQUIRE BACKGROUND DATA

THREE MAJOR CATEGORIES

Critical / Regionally Significant Assets

Topographic Data

Flood Scenario-Related Data



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)

CRITICAL / REGIONALLY SIGNIFICANT ASSETS DATA

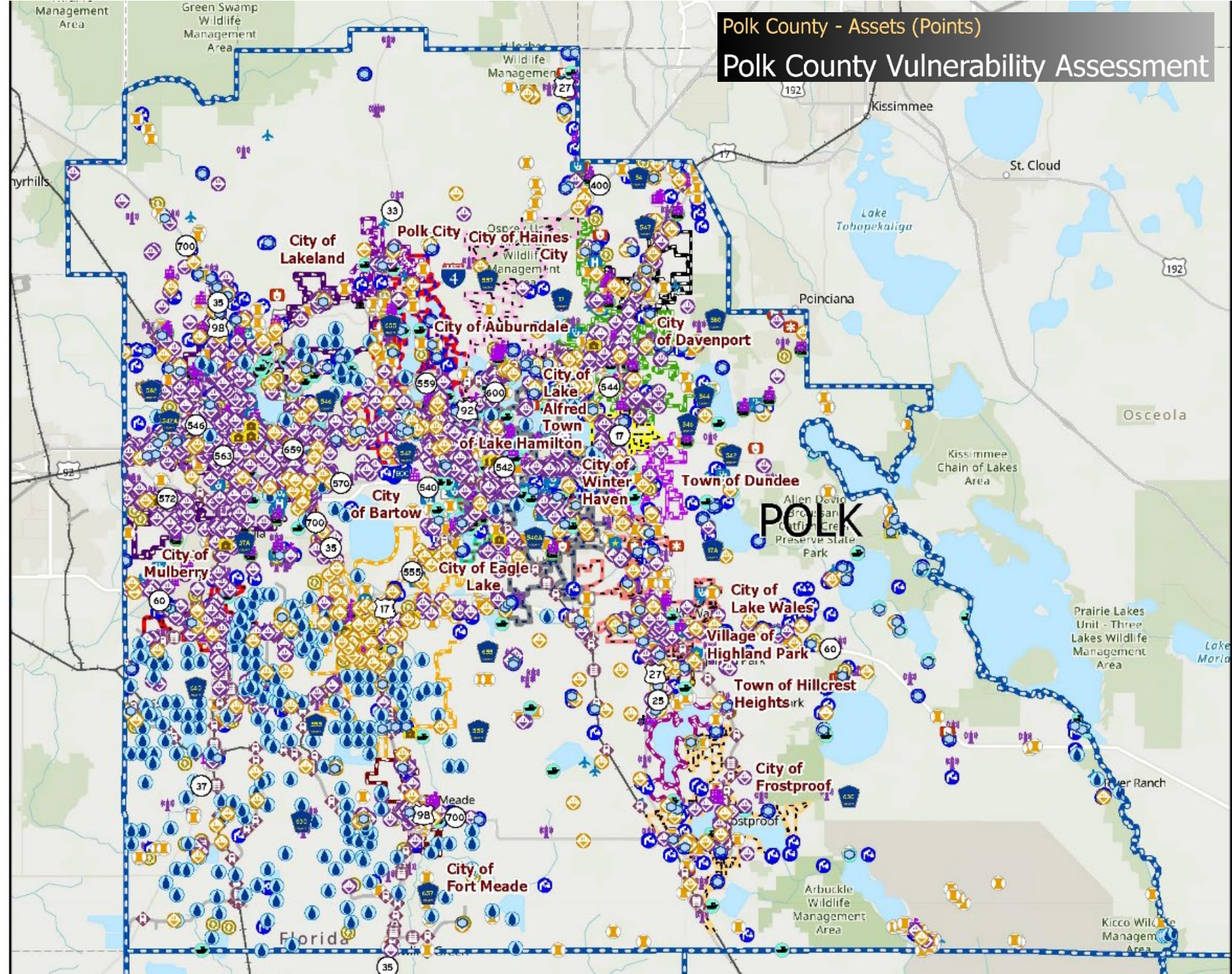
~12,500 countywide assets

Points, Polylines, Polyline Transportation, Polygons

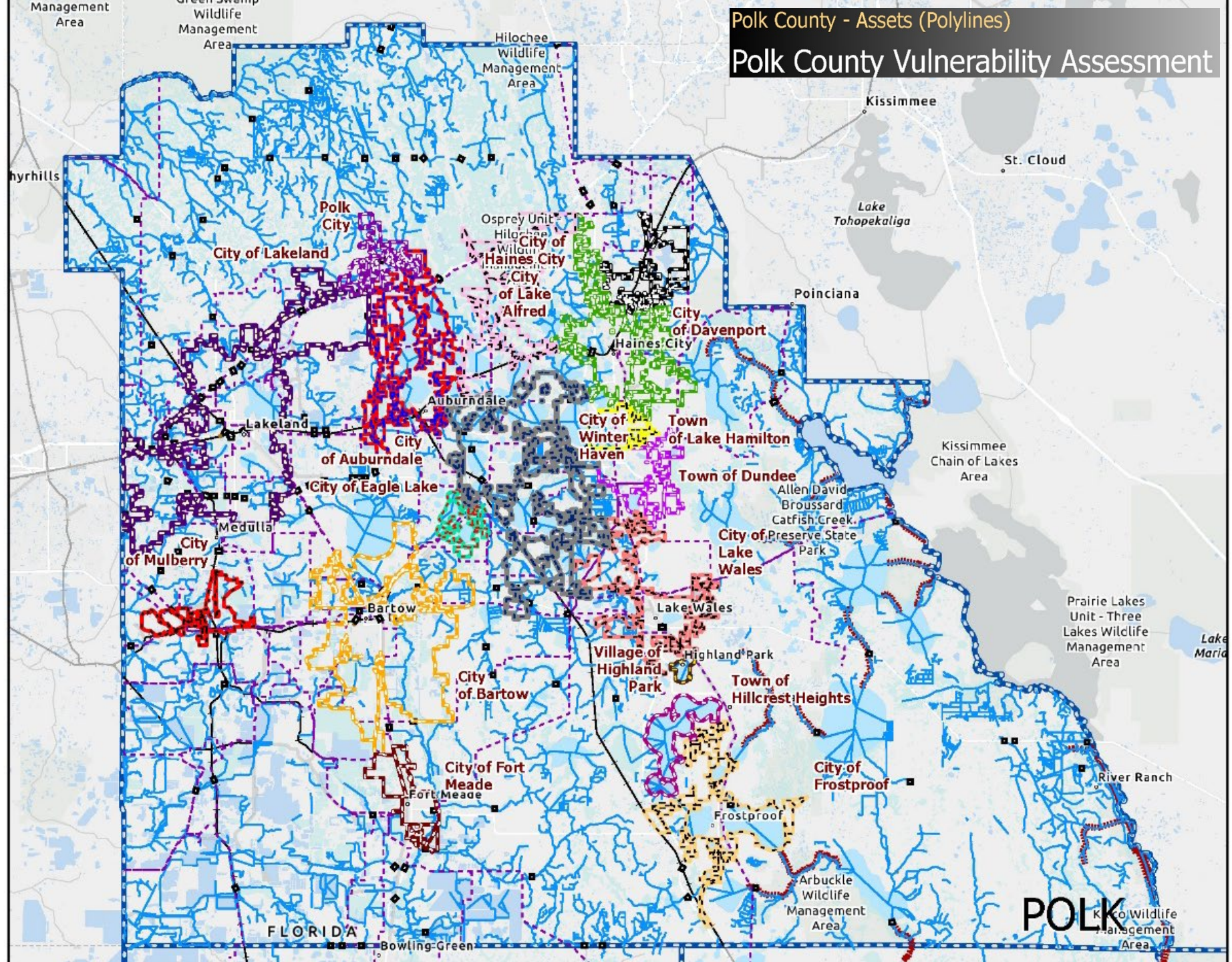
1. Transportation Assets and Evacuation Routes
2. Critical Infrastructure
3. Critical Community and Emergency facilities
4. Natural, Cultural, and Historical Resources



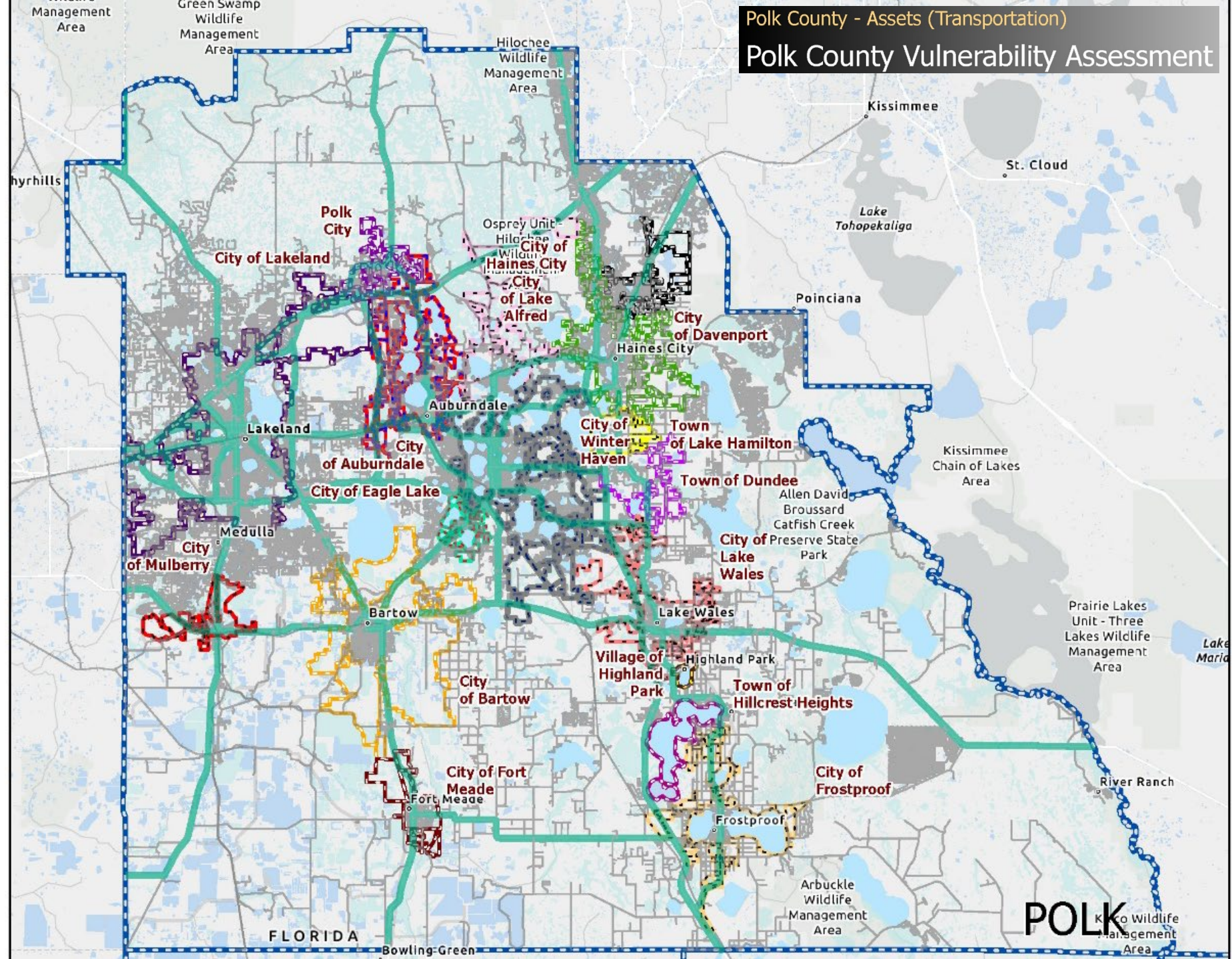
Polk County Vulnerability Assessment

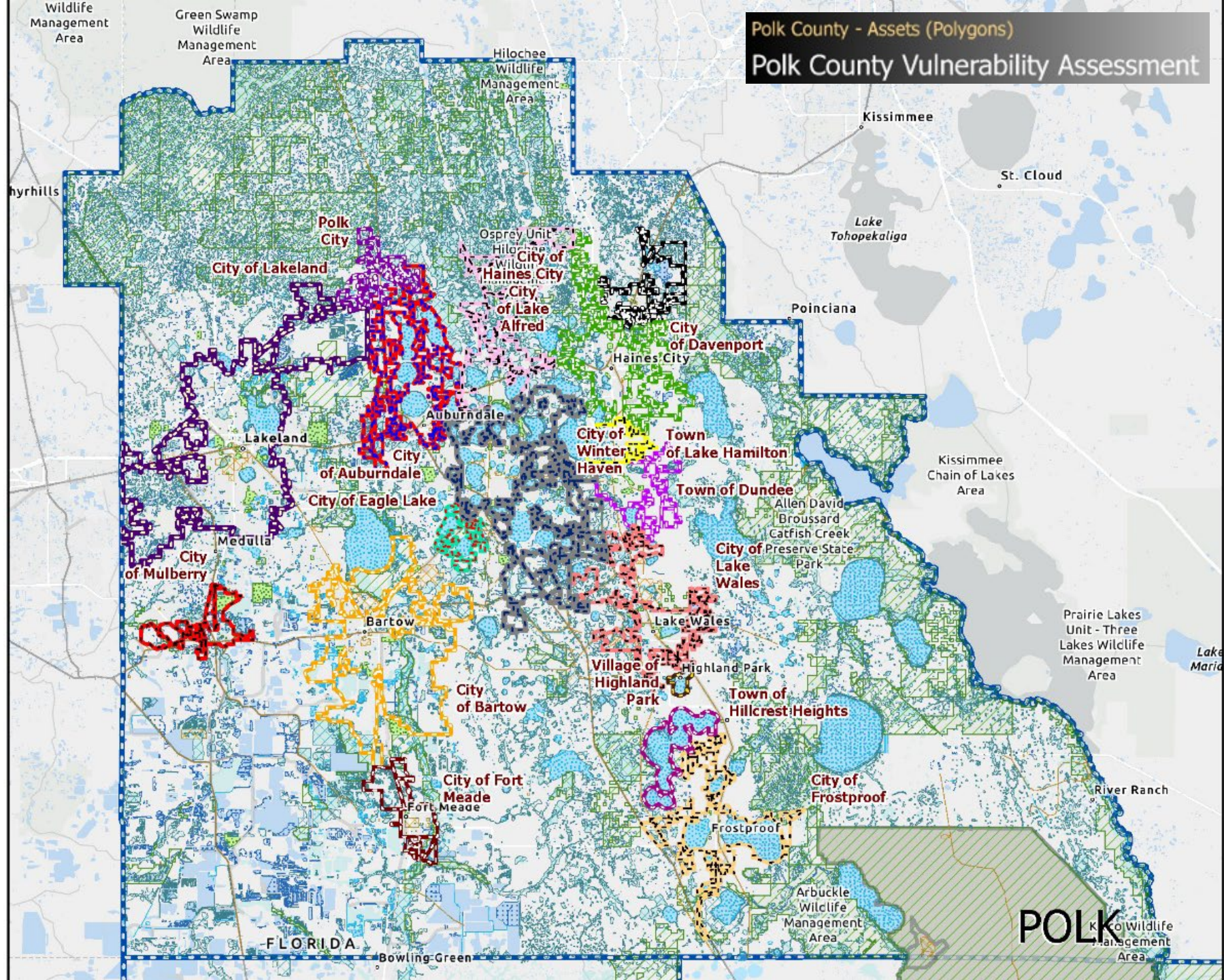


Polk County Vulnerability Assessment



Polk County - Assets (Transportation)
Polk County Vulnerability Assessment





Digital Elevation Model (DEM) Data

**2018
Florida
LiDAR DEM**



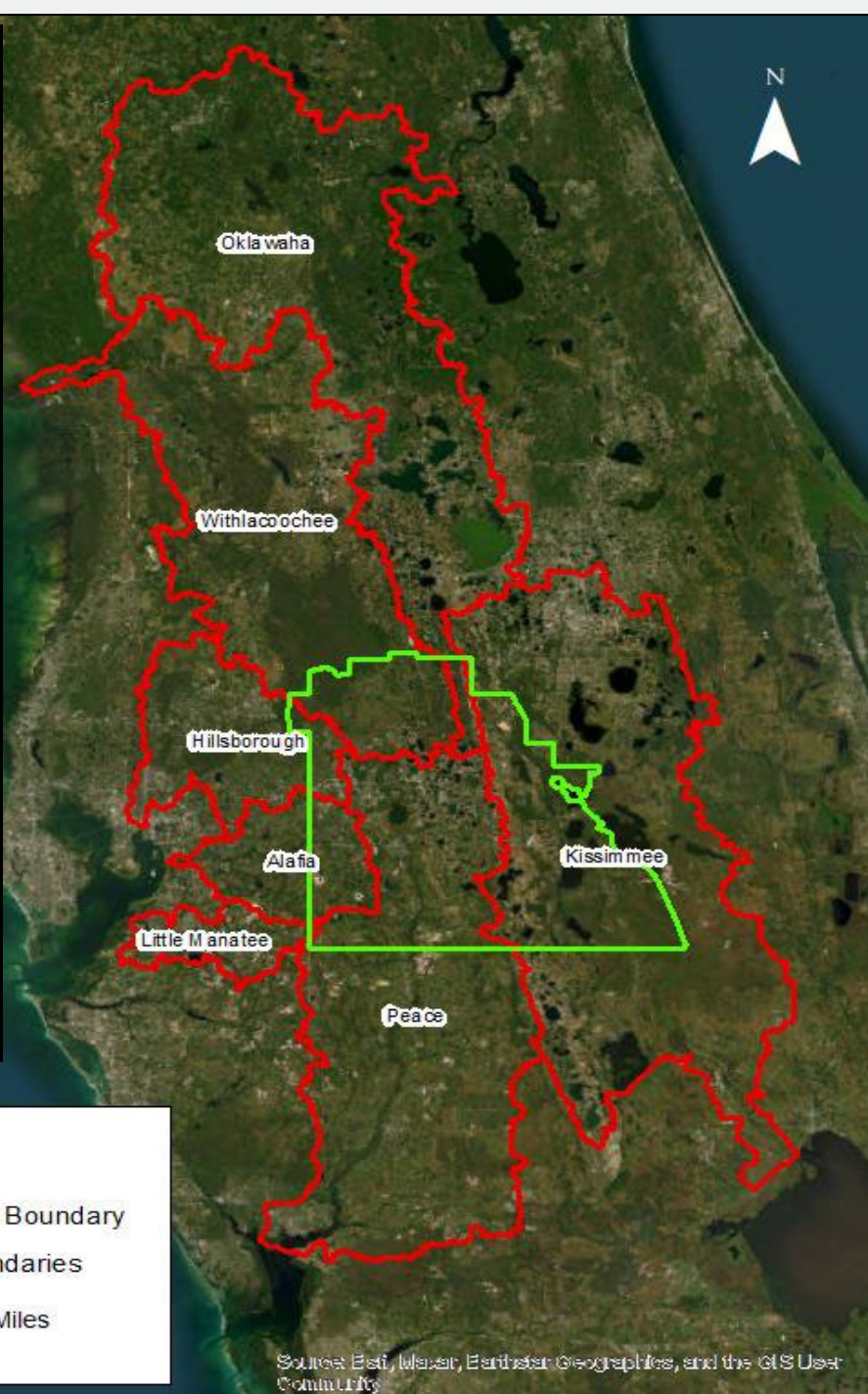


Flood Scenario Related Data

- Precipitation Data
 - NOAA Atlas 14 Rainfall Depths
- Storm Surge (no impact)
- Land Use Data
- FEMA FIRMs
- Soil Data
- Building Outlines

WATERSHEDS -

Oklawaha,
Withlacoochee,
Hillsborough,
Alafia,
Little Manatee,
Peace



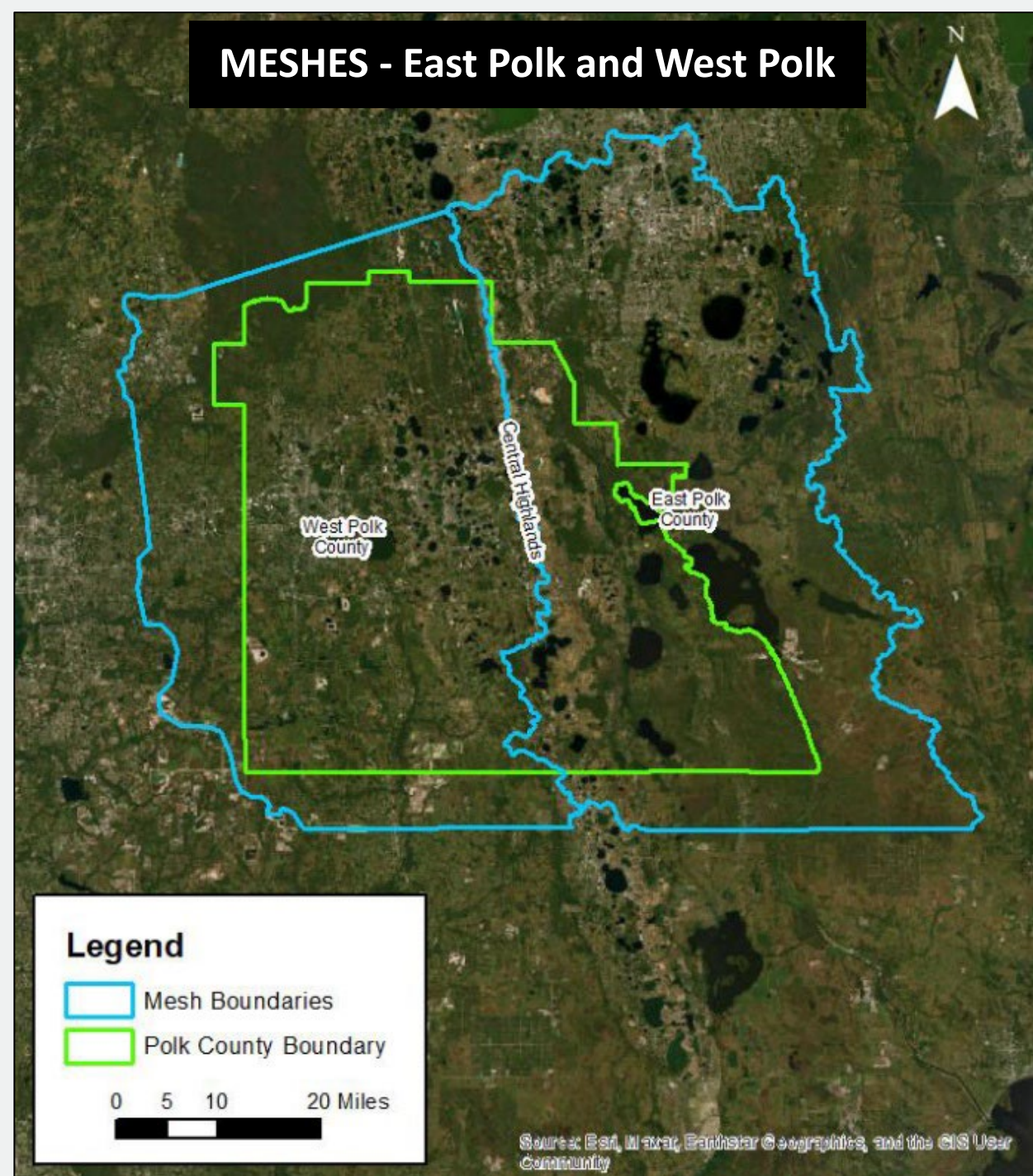
Legend

- Polk County Boundary
- HUC-8 Boundaries

0 5 10 20 Miles

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

MESHES - East Polk and West Polk



Legend

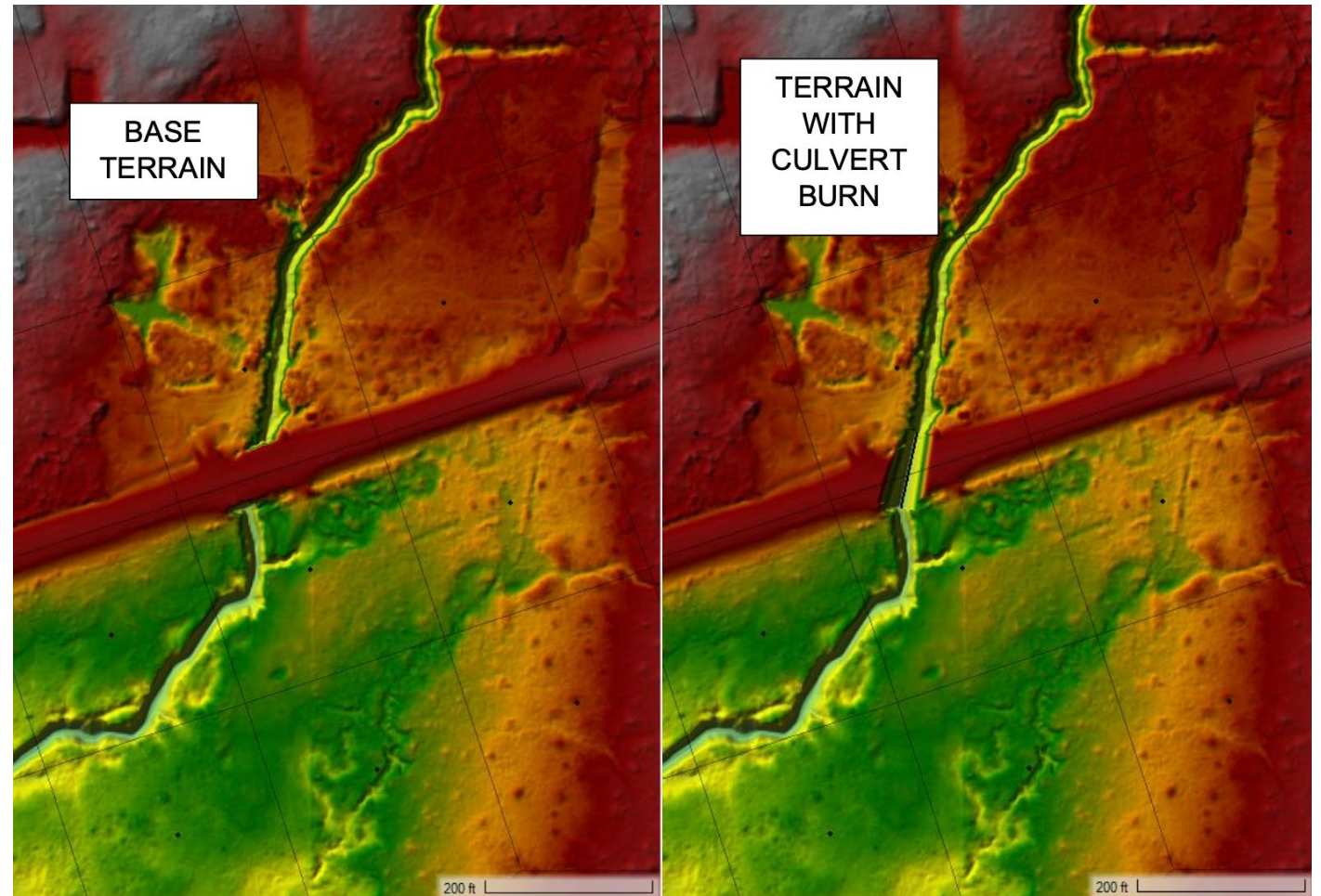
- Mesh Boundaries
- Polk County Boundary

0 5 10 20 Miles

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

MODEL VALIDATION

- Validation through observed flood behavior
- Compare the 100-year flood event with modeled event
- Compared to USGS NWIS and FEMA Flood Insurance Study (2016)
- Adjustments included manual clean-up of breaklines
- Addition of burn lines and terrain corrections

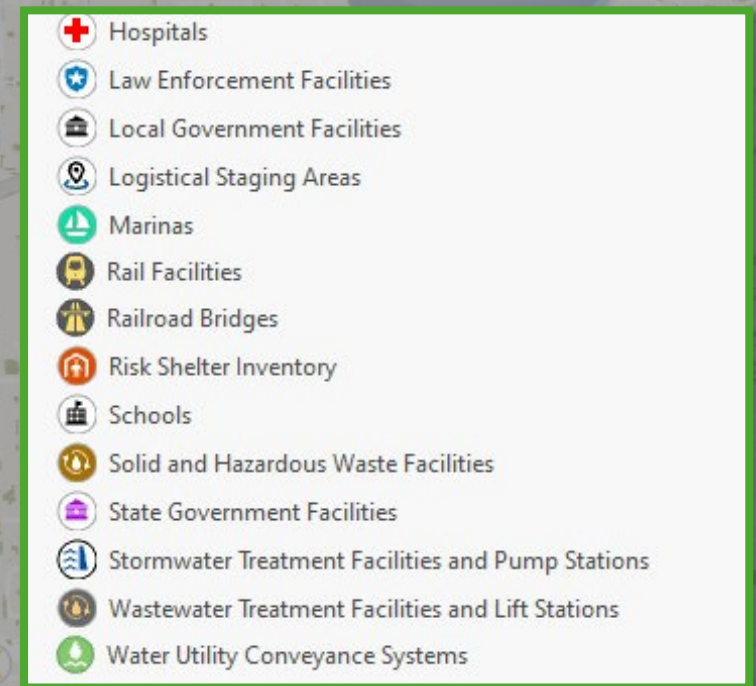
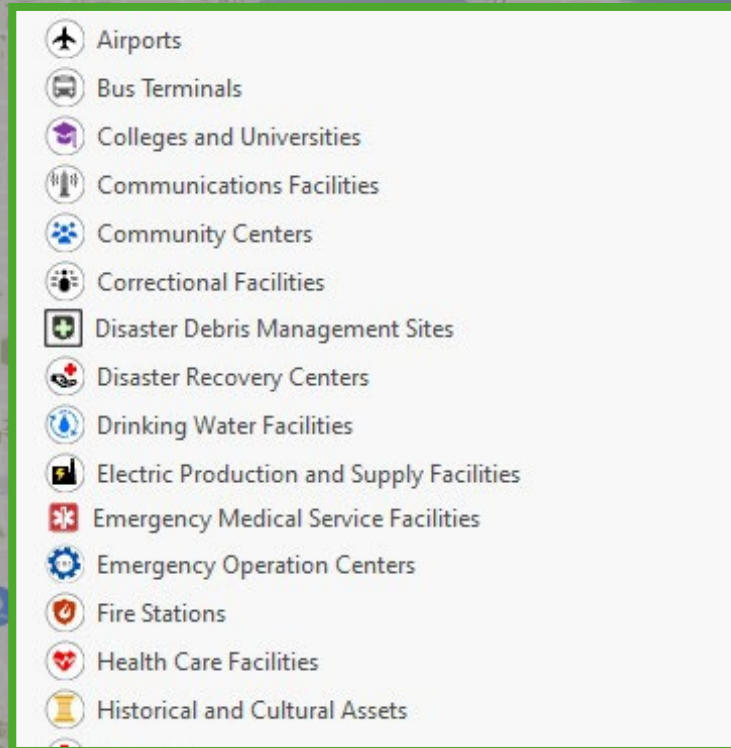


Flood Scenario Data 2040 and 2070

100-Yr/24-Hr

200-Yr/24-Hr

500-Yr/24-Hr



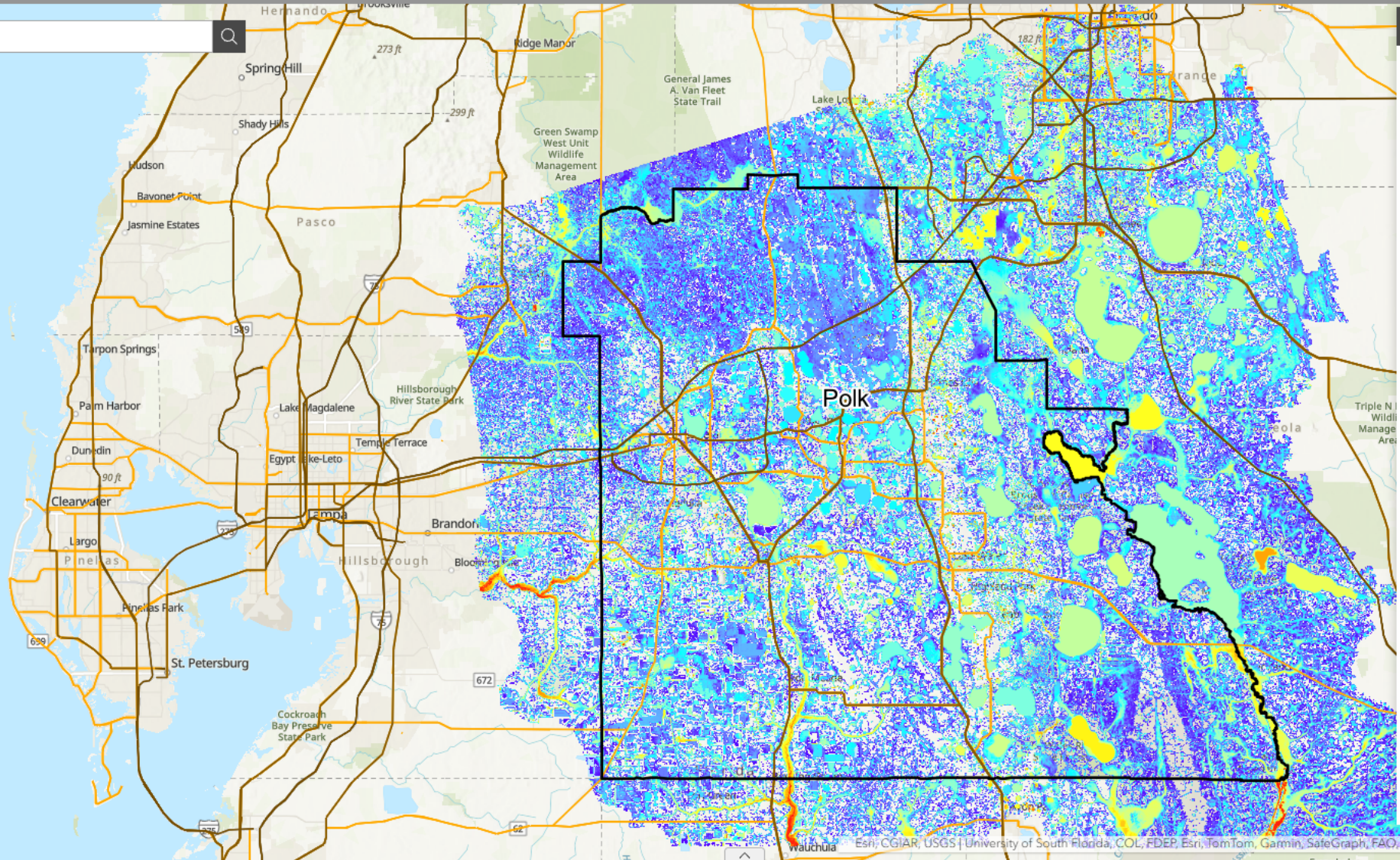
Vulnerability Assessment Map

Polk County - Florida

Cities of Auburndale, Bartow, Davenport, Eagle Lake, Fort Meade, Frostproof, Haines City, Lake Alfred, Lakeland, Lake Wales, Mulberry, Polk City, Winter Haven and the Towns of Dundee, Hillcrest Heights, Lake Hamilton, as well as the Village of Highland



Find address or place



Map Layers

☒ Polk County

...

☐ City Limits

...

☒ Reference Layers

...

☒ Regional Assets

...

☒ Rainfall Rasters

...

☐ 100 YR - Current

...

☐ 100YR - 2040

...

☒ 100YR - 2070

...

☐ 200 YR - Current

...

☐ 200YR - 2040

...

☐ 200YR - 2070

...

☐ 500 YR - Current

...

☐ 500YR - 2040

...

☐ 500YR - 2070

...

☐ USA Flood Hazard

...

10 km
10 mi

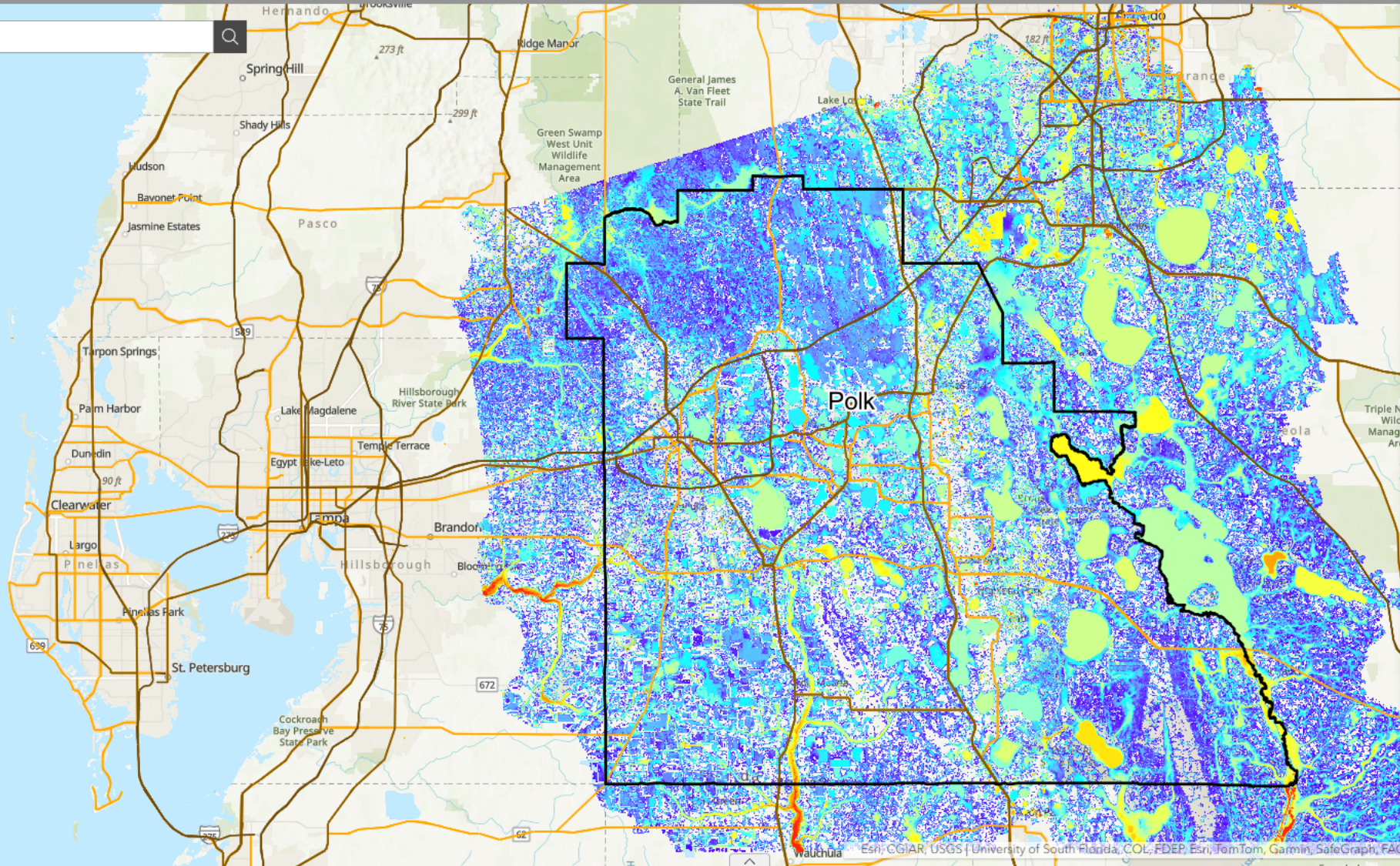
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Find address or place



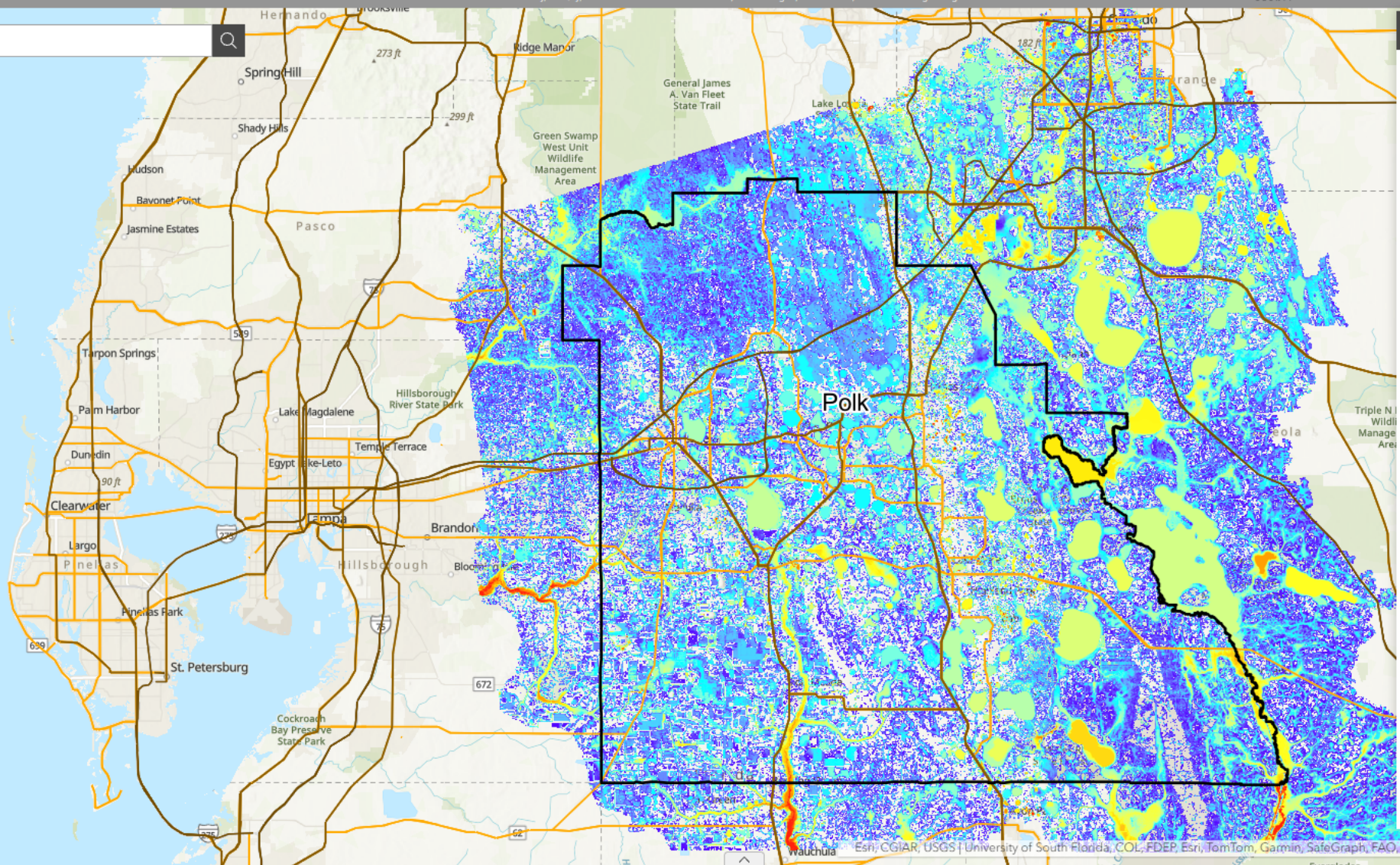
Map Layers

- ☒ Polk County
- ☐ City Limits
- ☒ Reference Layers
- ☒ Regional Assets
- ☒ Rainfall Rasters
 - ☐ 100 YR - Current
 - ☐ 100YR - 2040
 - ☐ 100YR - 2070
 - ☐ 200 YR - Current
 - ☐ 200YR - 2040
 - ☒ 200YR - 2070
 - ☐ 500 YR - Current
 - ☐ 500YR - 2040
 - ☐ 500YR - 2070
- ☐ USA Flood Hazard

Vulnerability Assessment Map

Polk County - Florida

Cities of Auburndale, Bartow, Davenport, Eagle Lake, Fort Meade, Frostproof, Haines City, Lake Alfred, Lakeland, Lake Wales, Mulberry, Polk City, Winter Haven and the Towns of Dundee, Hillcrest Heights, Lake Hamilton, as well as the Village of Highland



Map Layers

☒ Polk County

...

☐ City Limits

...

☒ Reference Layers

...

☒ Regional Assets

...

☒ Rainfall Rasters

...

☐ 100 YR - Current

...

☐ 100YR - 2040

...

☐ 100YR - 2070

...

☐ 200 YR - Current

...

☐ 200YR - 2040

...

☐ 200YR - 2070

...

☐ 500 YR - Current

...

☐ 500YR - 2040

...

☒ 500YR - 2070

...

☐ USA Flood Hazard

...

10 km
10 mi

EXPOSURE ANALYSIS



**Example: Wauchula Wastewater Treatment Plant
2017 Google Earth**



**Example: Wauchula Wastewater Treatment Plant
Image Credit: Fox 35 - Sept. 29, 2022 (Hurricane Ian)**

Exposure Analysis



Identification of depth of water at each flood scenario



Current Year, 2040 and
2070 Projected
Scenarios

100-Year Storm Event
200-Year Storm Event
500-Year Storm Event



Includes data such as critical assets owned
or maintained by the municipality/county



Uses the most recent Digital Elevation Model
data

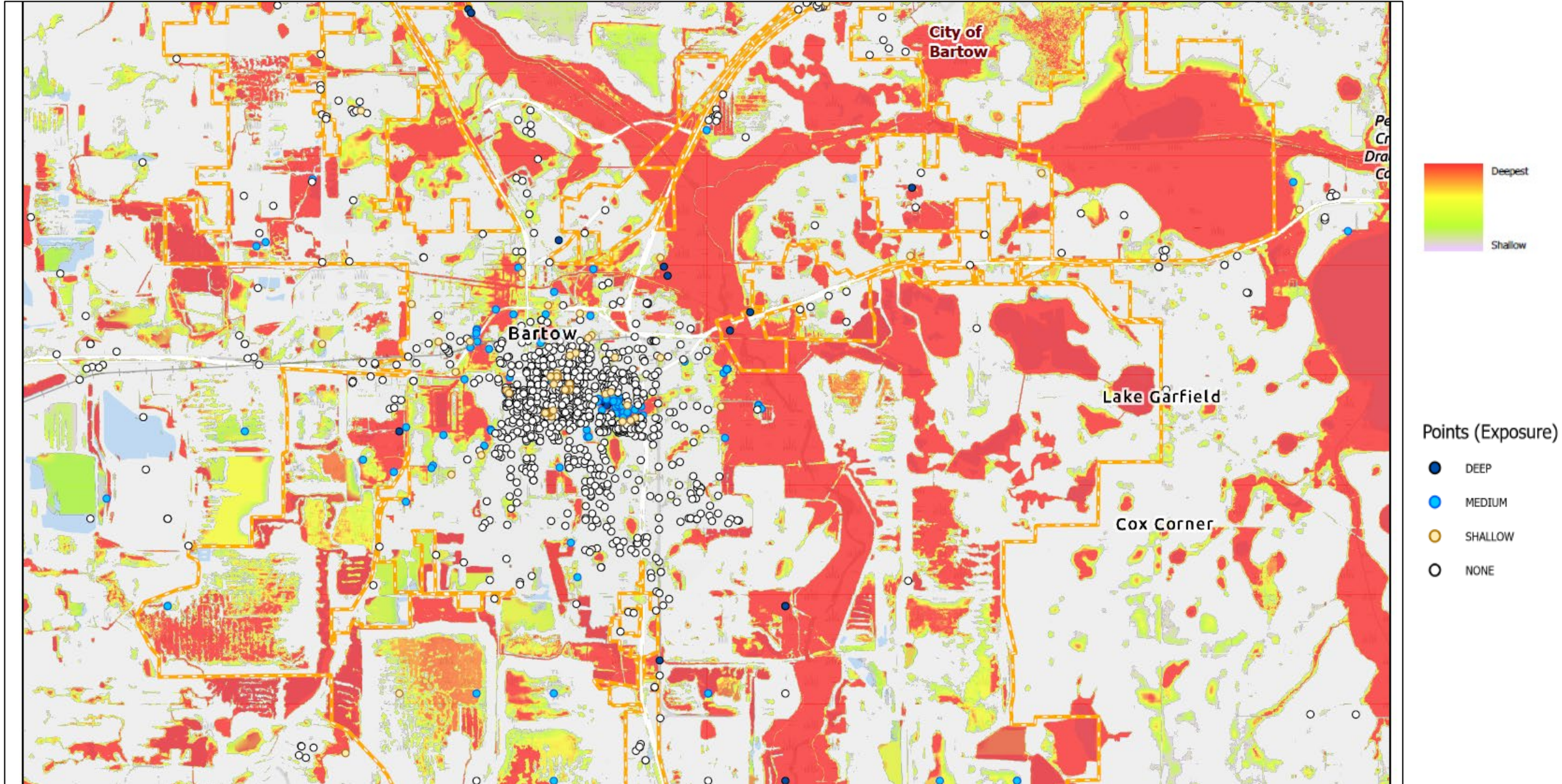
Exposure Count by Asset Type

Class Summary of Critical Assets Exposed to a Current Day (2025) 100-year Event									
Asset Class	Total Point Assets	Point Assets Exposed	Percent Point Assets Exposed (%)	Total Line Assets	Line Assets Exposed	Percent Line Assets Exposed (%)	Total Polygon Assets	Polygon Assets Exposed	Percent Polygon Assets Exposed (%)
Critical Community and Emergency Facilities	764	20	2.6	0	0	N/A	0	0	N/A
Critical Infrastructure	4,619	535	11.6	262	196	74.8	6,657	6,122	92
Natural, Cultural, and Historical Resource	6,594	336	5.1	11,786	11,178	94.8	28,033	27,040	96.5
Transportation and Evacuation Routes	609	130	21.3	99,584	10,638	10.7	0	0	N/A

Exposure Table Example – Bartow/Davenport Point Assets

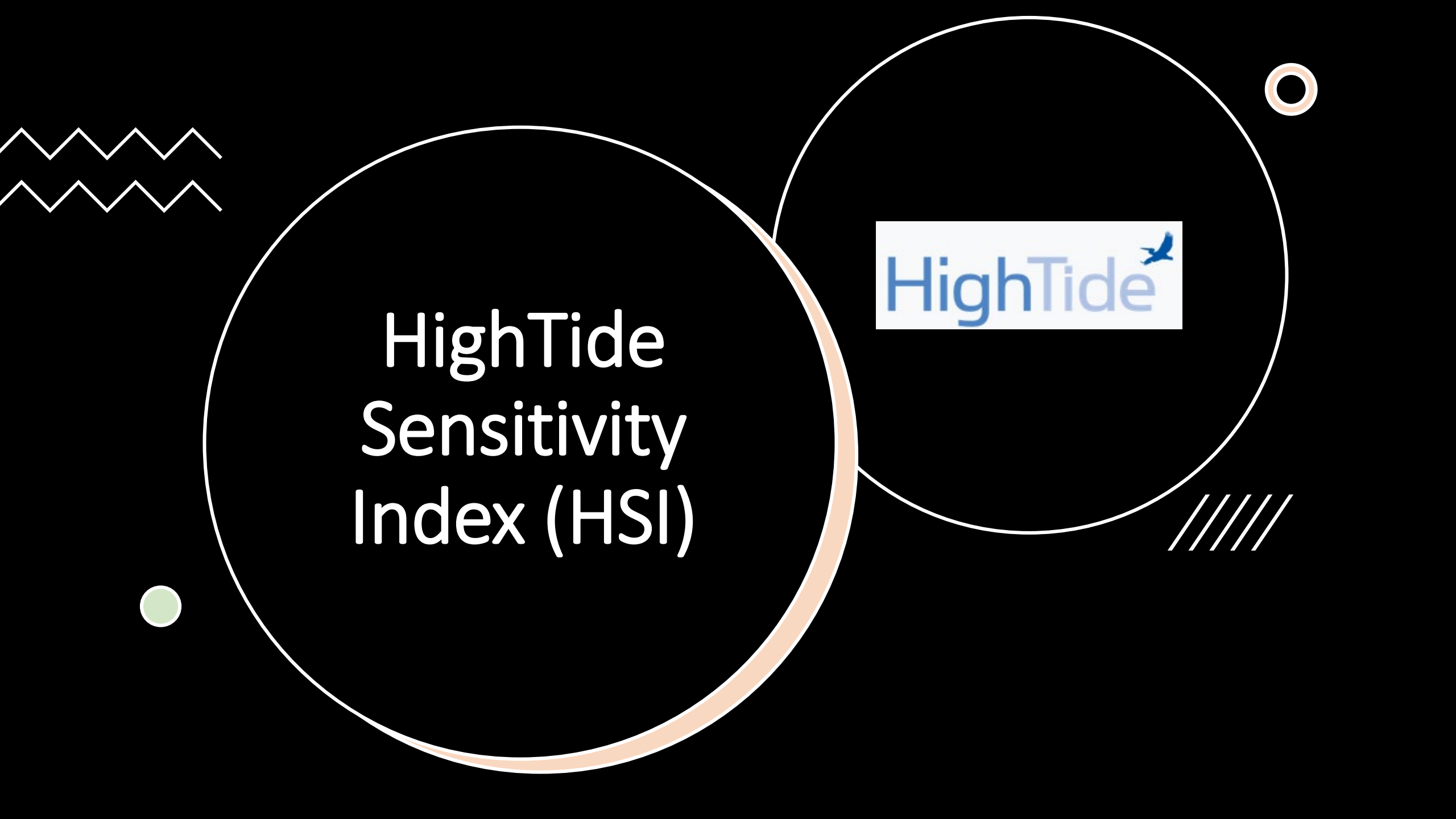
Countywide Detailed Point Asset Table														
Asset Municipality	Asset Group	Asset Type	CFRPC ID	Asset Name	Asset Relevancy	100 Year 2025	100 Year 2040	100 Year 2070	200 Year 2025	200 Year 2040	200 Year 2070	500 Year 2025	500 Year 2040	500 Year 2070
BARTOW	Transportation and Evacuation Routes	Rail Facilities	CFRPC_PT:019456	(blank)	Regionally Significant	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BARTOW	Transportation and Evacuation Routes	Rail Facilities	CFRPC_PT:019457	(blank)	Regionally Significant	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BARTOW	Transportation and Evacuation Routes	Rail Facilities	CFRPC_PT:019458	(blank)	Regionally Significant	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BARTOW	Transportation and Evacuation Routes	Railroad Bridges	CFRPC_PT:019530	NONE	Regionally Significant	3.58	3.84	4.13	4.30	4.74	4.88	5.14	5.48	5.66
BARTOW	Transportation and Evacuation Routes	Railroad Bridges	CFRPC_PT:019551	N WILSON AVE	Regionally Significant	13.23	13.27	13.30	13.33	13.39	13.65	13.88	14.14	14.31
DAVENPORT	Critical Community and Emergency Facilities	Community Centers	CFRPC_PT:019641	Davenport Community Center	Regionally Significant	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DAVENPORT	Critical Community and Emergency Facilities	Fire Stations	CFRPC_PT:000380	DAVENPORT FD	Regionally Significant	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DAVENPORT	Critical Community and Emergency Facilities	Health Care Facilities	CFRPC_PT:020203	CROSSROADS, THE	Locally Significant	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DAVENPORT	Critical Community and Emergency Facilities	Law Enforcement Facilities	CFRPC_PT:000695	POLK COUNTY SHERIFF DAVENPORT SUBSTATION	Regionally Significant	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DAVENPORT	Critical Community and Emergency Facilities	Law Enforcement Facilities	CFRPC_PT:020251	DAVENPORT POLICE DEPT. HEADQUARTERS	Regionally Significant	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DAVENPORT	Critical Community and Emergency Facilities	Local Government Facilities	CFRPC_PT:000726	DAVENPORT CITY HALL	Regionally Significant	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DAVENPORT	Critical Community and Emergency Facilities	Risk Shelter Inventory	CFRPC_PT:000800	Ridge Community HS	Regionally Significant	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DAVENPORT	Critical Community and Emergency Facilities	Risk Shelter Inventory	CFRPC_PT:000885	Horizons ES	Regionally Significant	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DAVENPORT	Critical Community and Emergency Facilities	Schools	CFRPC_PT:001072	HORIZONS ELEMENTARY SCHOOL	Regionally Significant	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DAVENPORT	Critical Community and Emergency Facilities	Schools	CFRPC_PT:001154	NAVIGATOR ACADEMY OF LEADERSHIP DAVENPORT	Regionally Significant	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DAVENPORT	Critical Infrastructure	Communications Facilities	CFRPC_PT:001219	Davenport Post Office	Regionally Significant	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DAVENPORT	Critical Infrastructure	Communications Facilities	CFRPC_PT:001499	CROWN CASTLE GT COMPANY LLC	Regionally Significant	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DAVENPORT	Critical Infrastructure	Communications Facilities	CFRPC_PT:001606	T-MOBILE SOUTH LLC	Regionally Significant	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DAVENPORT	Critical Infrastructure	Drinking Water Facilities	CFRPC_PT:001920	DAVENPORT, CITY OF	Regionally Significant	1.59	1.74	1.84	1.93	2.07	2.14	2.24	2.36	2.41
DAVENPORT	Critical Infrastructure	Drinking Water Facilities	CFRPC_PT:001921	DAVENPORT, CITY OF	Regionally Significant	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DAVENPORT	Critical Infrastructure	Drinking Water Facilities	CFRPC_PT:002318	DAVENPORT, CITY OF	Regionally Significant	1.59	1.74	1.84	1.93	2.07	2.14	2.24	2.36	2.41

Example: 500-Year 2070 Scenario – Points Exposure





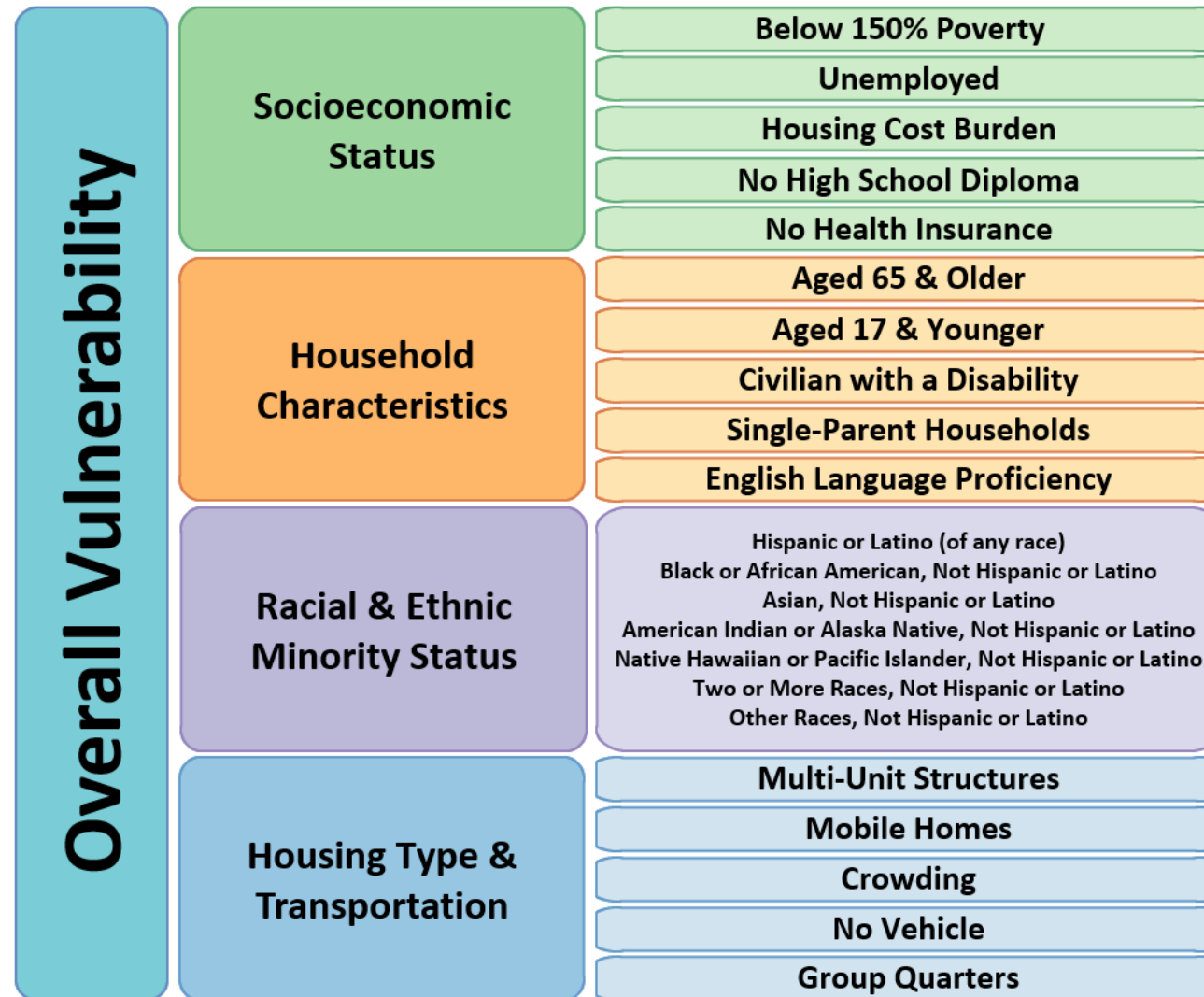
SENSITIVITY ANALYSIS



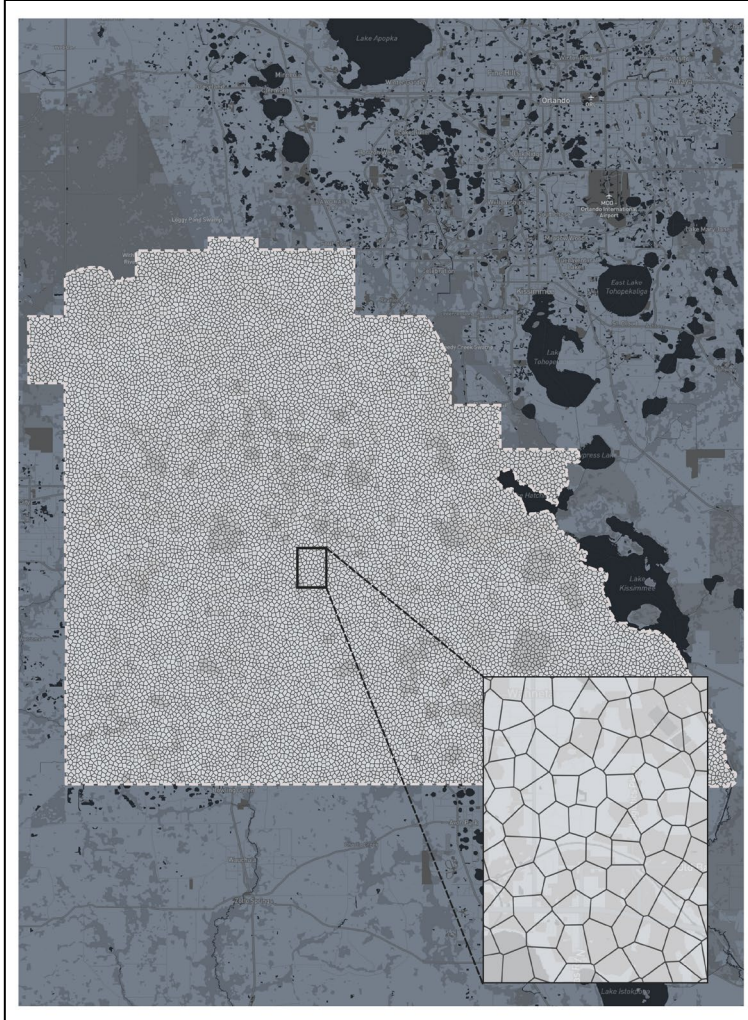
HighTide Sensitivity Index (HSI)



Centers for Disease Control and Prevention and Agency for Toxic Substances and Disease Registry Social Vulnerability (SVI)



PHYSICAL VULNERABILITY



Environment around a Critical Asset

- Determine the percentage of the area that is inundated the depth of inundation under each scenario.

Voronoi Polygons

- roughly equal area
- mitigating the inaccuracies associated with political boundaries

Critical Assets near the boundaries of Voronoi

- polygons used the inverse distance weighted average of the percent area inundated of the two closest Voronoi polygons
- ensures no sudden changes in physical vulnerability were introduced at polygon boundaries
- *calculated from the polygon centroids*

DIRECT VULNERABILITY

FEMA Flood Zone Designations				
Undetermined Risk	Low Risk	Moderate Risk	High Risk	Coastal High Risk
Increasing Risk 				
Zone D	Zones C and X (unshaded)	Zones B and X (shaded)	Zones A, AE, A1-30, AH, AO, A99	Zones V, VE, V1-30
	Non-Special Flood Hazard Area (NSFHA)		Special Flood Hazard Area (SFHA)	

This component quantifies the flood risk directly impacting each critical asset

Two variables are considered:

- the modeled depth of flooding at the asset location
- the base flood elevation (BFE) within FEMA special flood hazard zones
- where BFE data is unavailable, FEMA guidance for shallow flooding analysis is applied

CRITICAL ASSET DATA ANALYSIS

Point Assets

- Data is gathered at each point location

Segmentation of Line Assets

- Subdivided using the Voronoi Polygons
- Each line includes eleven evenly spaced sample points (with the starting and ending point)
- Gathered data at each point

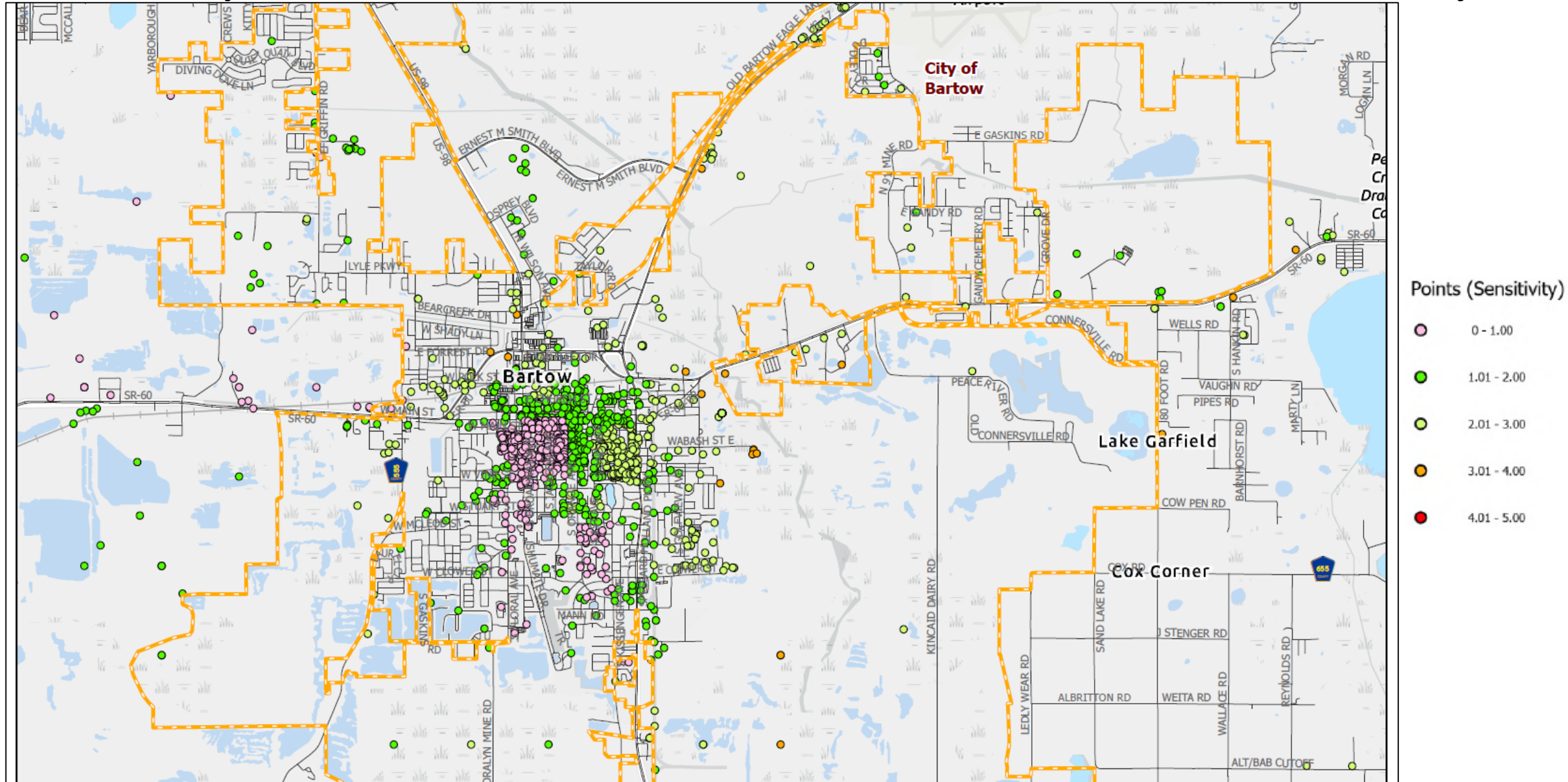
Partitioning of Polygon Assets

- Subdivided using the Voronoi Polygons
- Average flood depth is calculated over each segment
- Minimum and Maximum levels assigned to each segment
- Maximum level is used for prioritization

Sensitivity Table Example – Haines City/Highland Park/Hillcrest Heights Point Assets

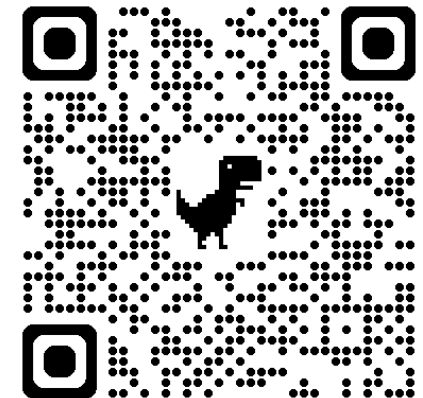
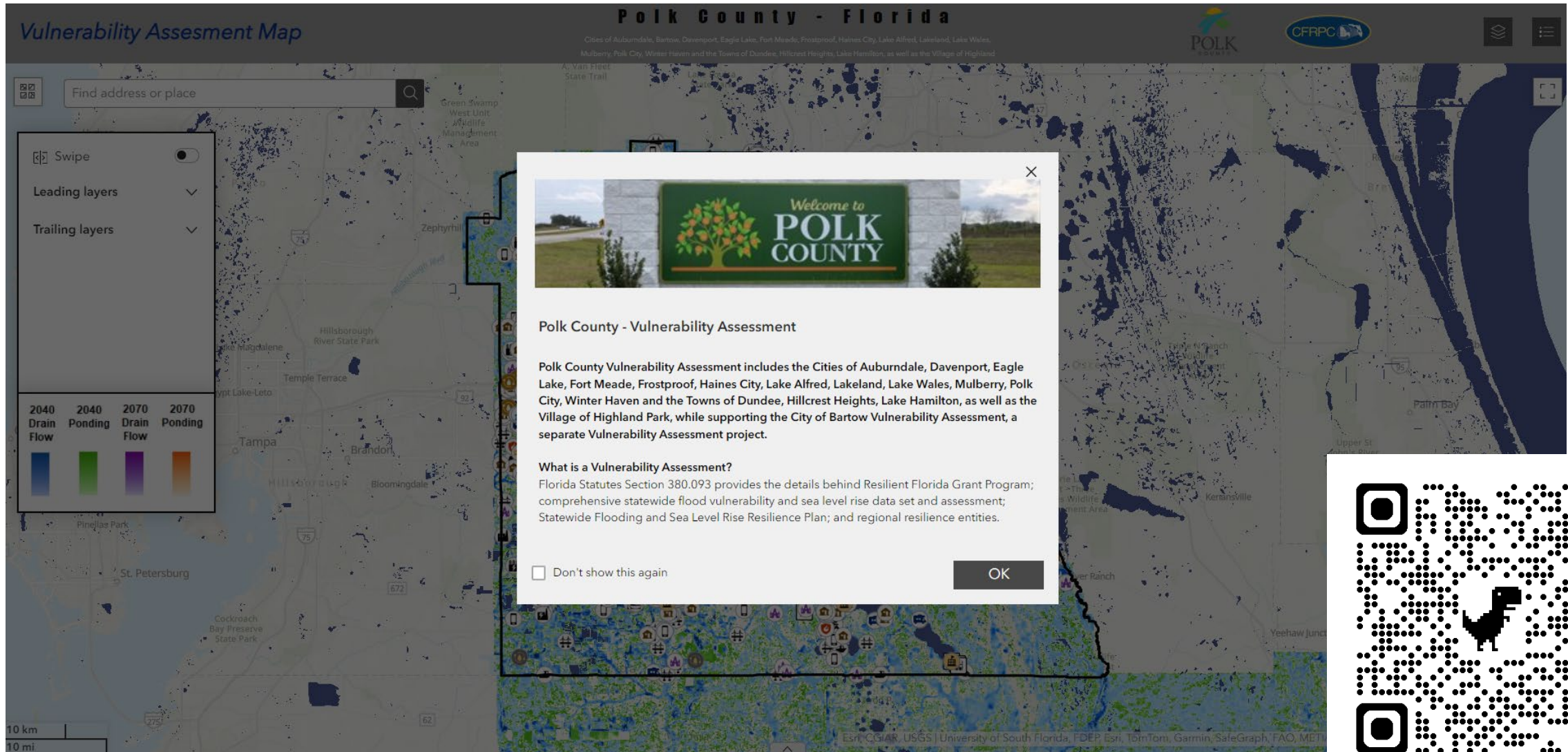
Countywide Sensitivity Scores - Point Assets																									
Asset Municipality	Asset Group	Asset Type	CFRPC ID	Asset Name	Asset Relevancy	Final Risk Rating	Final Risk Rating Class	100 Year 2025		100 Year 2040		100 Year 2070		200 Year 2025		200 Year 2040		200 Year 2070		500 Year 2025		500 Year 2040		500 Year 2070	
								Sensitivity Score	Inundation Percentage	Sensitivity Score	Inundation Percentage	Sensitivity Score	Inundation Percentage	Sensitivity Score	Inundation Percentage	Sensitivity Score	Inundation Percentage	Sensitivity Score 2	Inundation Percentage	Sensitivity Score 3	Inundation Percentage	Sensitivity Score	Inundation Percentage	Sensitivity Score	Inundation Percentage
HAINES CITY	Natural, Cultural, and Historical Resources	Historical and Cultural Assets	CFRPC_PT:025357	602 N 8TH STREET	Locally Significant	0.05	Very Low Risk	1.21	1.22	1.22	1.24	1.22	1.27	1.2	1.28	1.2	1.31	1.2	1.33	1.19	1.37	1.19	1.43	1.19	1.46
HAINES CITY	Natural, Cultural, and Historical Resources	Historical and Cultural Assets	CFRPC_PT:025358	600 N 8TH STREET	Locally Significant	0.05	Very Low Risk	1.21	1.22	1.22	1.24	1.22	1.27	1.2	1.28	1.2	1.31	1.2	1.33	1.19	1.37	1.19	1.43	1.19	1.46
HAINES CITY	Critical Community and Emergency	Fire Stations	CFRPC_PT:000416	DAVENPORT FIRE STATION 2	Regionally Significant	0	Very Low Risk	1.18	7.71	1.17	7.81	1.17	7.86	1.16	7.9	1.16	8.05	1.16	8.13	1.16	8.23	1.16	8.4	1.16	8.51
HIGHLAND PARK	Critical Infrastructure	Drinking Water Facilities	CFRPC_PT:001901	LA CASA CONDOMINIUM	Regionally Significant	5	Very High Risk	2.15	20.94	2.16	20.97	2.16	21.01	2.18	21.05	2.19	21.22	2.2	21.36	2.19	21.61	2.26	22.11	2.27	22.36
HIGHLAND PARK	Critical Infrastructure	Drinking Water Facilities	CFRPC_PT:001902	LA CASA CONDOMINIUM	Regionally Significant	5	Very High Risk	2.15	20.94	2.16	20.97	2.16	21.01	2.18	21.05	2.19	21.22	2.2	21.36	2.19	21.61	2.26	22.11	2.27	22.36
HIGHLAND PARK	Natural, Cultural, and Historical Resources	Historical and Cultural Assets	CFRPC_PT:014754	CASA DE JOSEFINA	Regionally Significant	5	Very High Risk	2.15	20.94	2.16	20.97	2.16	21.01	2.18	21.05	2.19	21.22	2.2	21.36	2.19	21.61	2.26	22.11	2.27	22.36
HIGHLAND PARK	Critical Infrastructure	Drinking Water Facilities	CFRPC_PT:001952	HIGHLAND PARK	Regionally Significant	1.19	Low Risk	2.02	12.76	2.02	13.04	2.03	13.27	2.02	13.45	2.02	13.79	2.02	14	2.01	14.25	2.02	14.59	2.02	14.82
HIGHLAND PARK	Critical Infrastructure	Solid and Hazardous Waste Facilities	CFRPC_PT:031166	LEKARICA	Locally Significant	1.19	Low Risk	2.02	12.76	2.02	13.04	2.03	13.27	2.02	13.45	2.02	13.79	2.02	14	2.01	14.25	2.02	14.59	2.02	14.82
HIGHLAND PARK	Critical Infrastructure	Drinking Water Facilities	CFRPC_PT:001951	HIGHLAND PARK	Regionally Significant	0	Very Low Risk	1.98	7.23	1.99	7.36	1.99	7.43	1.96	7.51	1.96	7.67	1.97	7.8	1.95	7.95	1.96	8.31	1.96	8.58
HILLCREST HEIGHTS	Critical Infrastructure	Drinking Water Facilities	CFRPC_PT:002731	BOB'S LANDING MOBILE HOME PARK	Regionally Significant	5	Very High Risk	1.67	18.54	1.68	18.8	1.69	18.99	1.68	19.13	1.69	19.38	1.7	19.56	1.69	19.79	1.7	20.18	1.7	20.41

Example: 500-Year 2070 Scenario – Points Sensitivity



Polk County Vulnerability Assessment Map

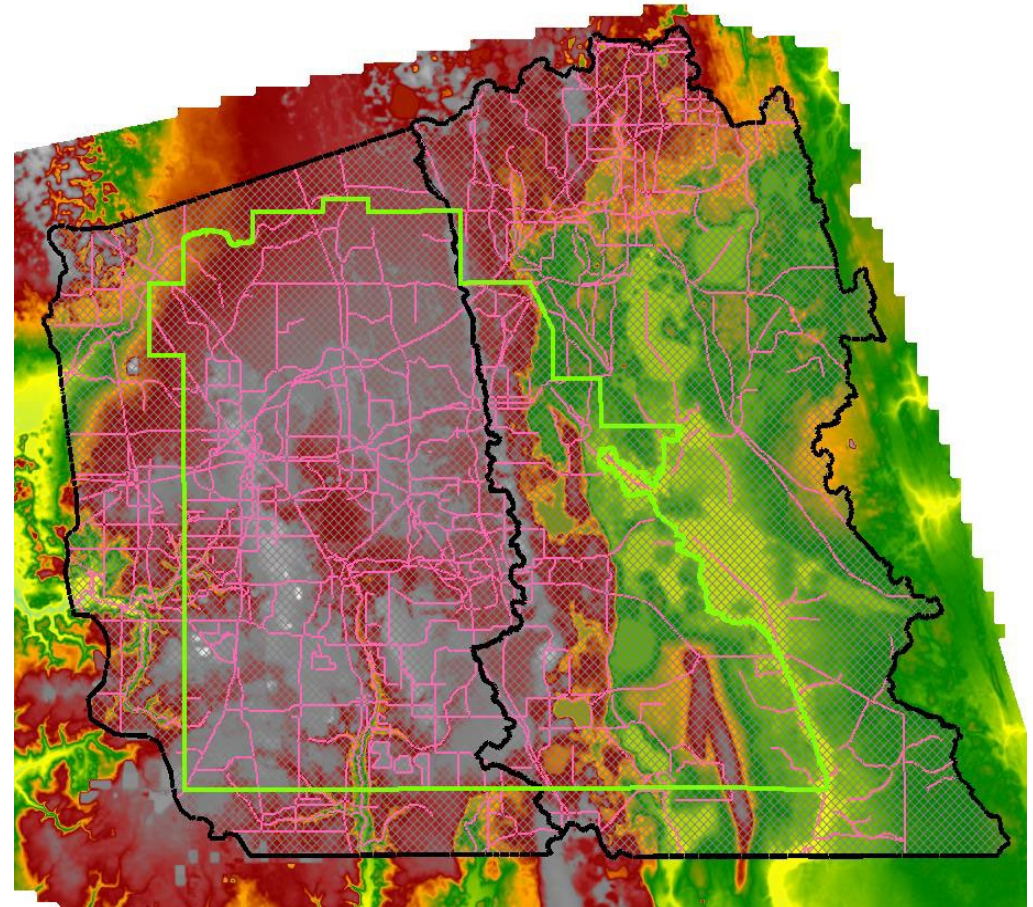
<https://experience.arcgis.com/experience/a6e99ed8857e469494f0c13ff2cab3a3/>



Polk County Additional Flood Modeling Project

**Funder - Coastal & Heartland
National Estuary Partnership
(CHNEP)**

Contractor - HighTide Intelligence
• Subcontractor Halff Associates, Inc



WHO WE ARE

Coastal & Heartland National Estuary Partnership

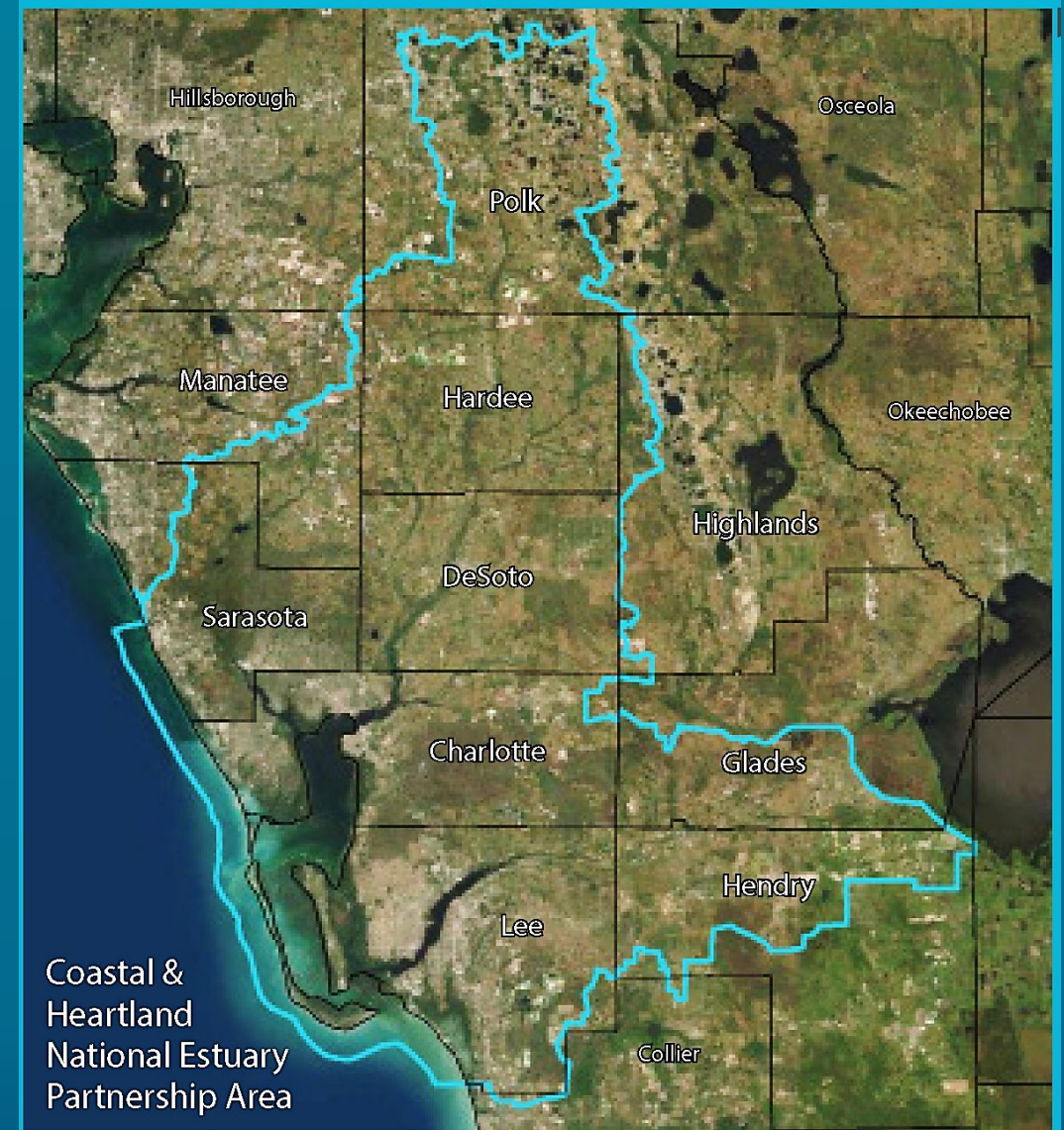
- Formed in 1995 and one of only 28 Congressionally designated “estuaries of national significance” in the United States.
- Receive special funding and support from US EPA under the Clean Water Act to protect and restore water resources in the CHNEP area.



Uniting Central and Southwest Florida to Protect Water and Wildlife

WHERE WE WORK

- CHNEP area encompasses 5,416 sq. miles (3,146,280 acres)
- Estuaries include Lemon Bay, Dona & Roberts Bay, Charlotte Harbor, Pine Island Sound, Caloosahatchee, San Carlos Bay and Estero Bay
- Rivers including Myakka, Peace, Caloosahatchee, and Estero
- Inland and coastal Communities incl. 10 counties and 25+ cities!



Uniting Central and Southwest Florida to Protect Water and Wildlife

THE POWER OF PARTNERSHIP

- **CHNEP is:**
 - **Public-private partnership**
 - **Consensus-based**
 - **Non-regulatory**
 - **Science-based**
 - **Citizen-supported**
- **CHNEP, because of private contributions, volunteers and donated in-kind services has been able to provide more than 19 dollars of restoration for every dollar it receives of federal governmental funding!**



Uniting Central and Southwest Florida to Protect Water and Wildlife

HOW WE FIT INTO THIS PROJECT

- CHNEP is:
 - Funding for this project \$\$\$
 - Providing project management support in:
 - participating in project meetings and reviewing deliverables to provide technical comment
 - disseminating project information to policymakers, general public, and other audiences

CHNEP is also planning to help with the implementation of County's Vulnerability Assessment and Adaptation Action Area Plans long-term!





Polk County Comprehensive Vulnerability Assessment

November 4, 2025



In partnership with the Central Florida Regional
Planning Council and the Coastal & Heartland National
Estuary Partnership

Table of Contents

1	Introduction
2	Flood Modeling
3	VA Process
4	Results: by Site
5	Conclusions

HighTide is on a **mission**.



Adrian Santiago Tate
CEO & Co-founder



Noah Dewar, PhD
CTO & Co-founder



Iuliia Marchenko
Marketing Specialist



Romina Argüello Zuazo
Business Development Lead

Our **mission** is to accelerate flood adaptation with data-driven technology.

Site Selection Approach

- Combined model data + stakeholder input
- **Criteria:**
 - Exposure to flooding
 - Asset priority class
 - Relevance and impact
 - Geographic representation

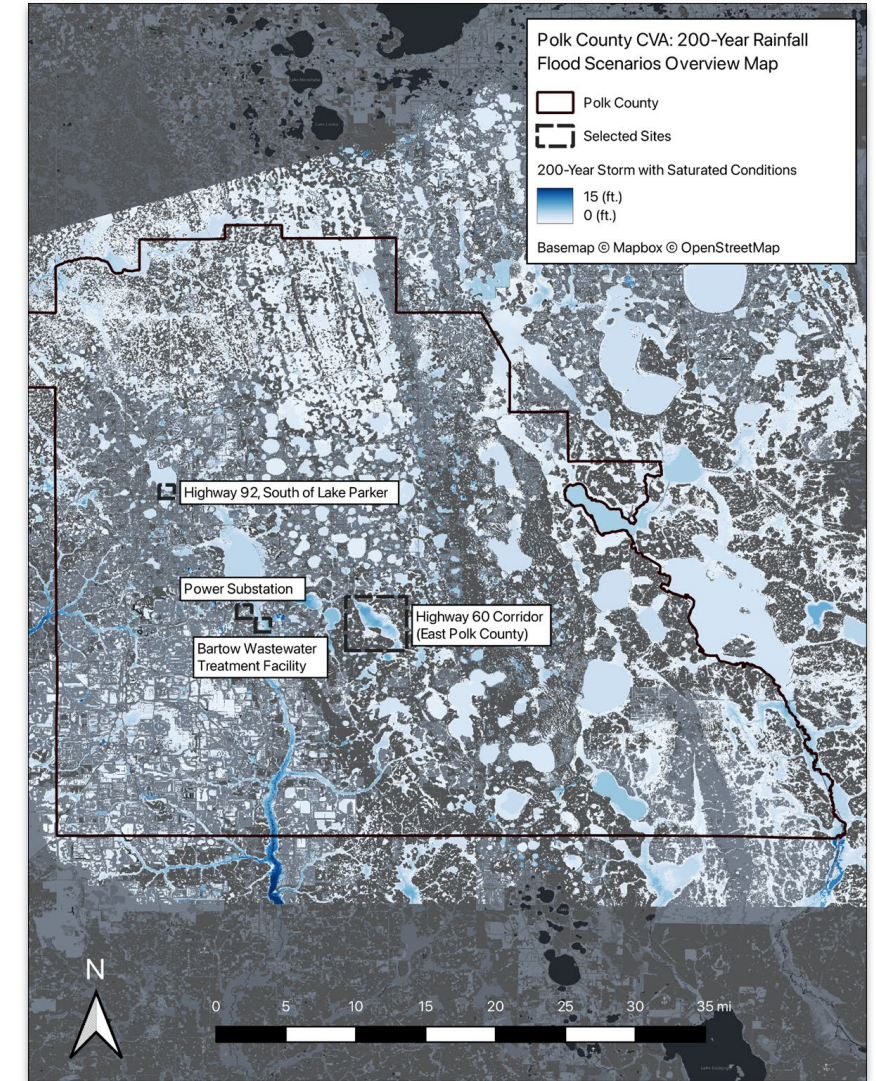
Site Selection Results

Bartow Wastewater Treatment Facility

Power Substation (North Bartow)

Highway 92 (South of Lake Parker, Lakeland)

Highway 60 Corridor (East Polk County)



Overview map showing location of selected sites in Polk County. HighTide, 2025.

Visualization Approach

- Visualized using open-source software, Blender:
 - Imported DEM terrain
 - Added building and structure footprints
 - Overlapped with flood rasters
 - Added lighting and realistic water rendering
 - Python scripts automated scene generation

Site 1: Bartow Wastewater Treatment Facility

Site 1: Bartow Wastewater Treatment Facility

Site 1: Bartow Wastewater Treatment Facility

Site 2: Power Substation

Site 2: Power Substation



Site 2: Power Substation



Sites 3: Highway 92



Sites 3: Highway 92

Sites 3: Highway 92

Sites 4: Highway 60

Sites 4: Highway 60

Sites 4: Highway 60

Comparative Summary:

200-Year vs. 500-Year Scenarios

- The 500-year rainfall event produces significantly **deeper and more widespread** flooding than the 200-year event
- Saturated soil conditions **amplify flood depths by 15–40%** across all sites
- **Impacts shift** from surface and parking areas to building-level flooding under the 500-year conditions

Conclusion

- Extreme rainfall events are **increasing in frequency and intensity** across Polk County
- Saturated soil conditions **increase flood depths and duration**
- Critical infrastructure and transportation routes **show exposure under both 200- and 500-year events**
- Visualizations offer **a powerful communication tool** for public engagement and policy making
- Model results provide **a scientific foundation** for prioritizing resilience investments, including drainage improvements and asset hardening



Thank you!

For further inquiries and information

Adrian Santiago Tate

CEO & Cofounder

HighTide Intelligence

adrian@hightide.ai



What happens after the Assessment?

Adaptation Plan – 2027

- Identify strategies, solutions, and policies to address vulnerabilities
- Explore implementation options and develop project ideas

Implementation

- Identify grant funding opportunities and prepare applications
- Develop project designs, procure labor, and turn dirt



OPEN DISCUSSION

PROJECT TEAM CONTACT INFORMATION

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