Flood Hazard Assessment Tools for Transportation

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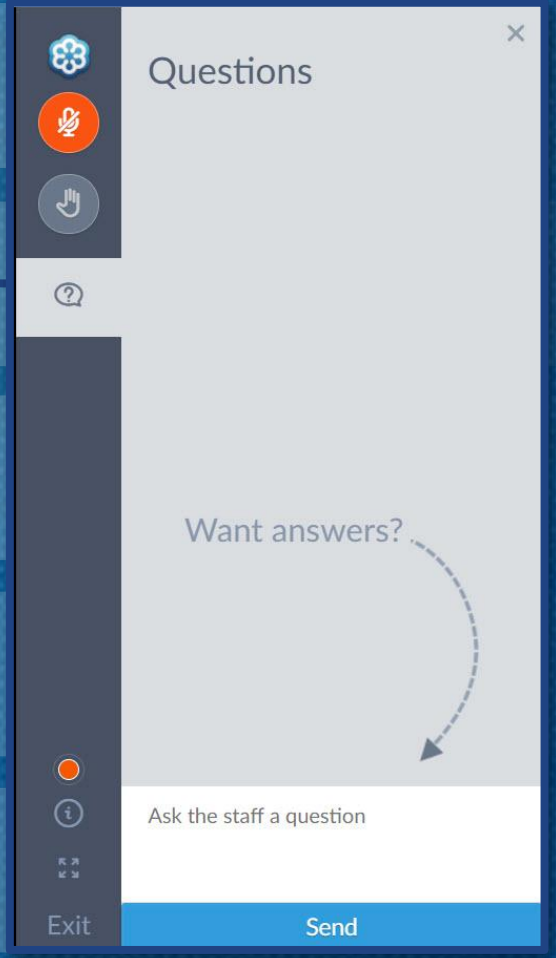
December 9, 2025

Attendee Participation Panel

- Attendees are automatically muted throughout the webinar
- Click the ? to open the panel box and submit a question to the panelists
- Questions will be answered by panelists either verbally or in the question box
- Webinar is being recorded and will be available with other materials on the FDOT website
- Please complete the evaluation survey that will be sent via email at the conclusion of this webinar



AICP Certification Maintenance (CM) Credits

- AICP members can earn 1.5 CM credits for this activity
  - Course number: 9321645
  - Course name: Flood Hazard Assessment Tools for Transportation Online Webinar
  - More information can be found at www.planning.org/cm

Purpose of Today's Webinar

Learn about updates to two hazard assessment tools for transportation:

- Sea Level Scenario Sketch Planning Tool (Sketch Planning Tool)
- Area of Interest (AOI) Tool Resilience Report (Resilience Report)

Today's Agenda

- Background & Purpose
- Sketch Planning Tool: Background & Data
- Sketch Planning Tool: Demo
- Resilience Report: Background & Data
- Resilience Report: Demo
- Q&A

University of Florida GeoPlan Center

- Geospatial research and teaching center in the School of Landscape Architecture & Planning
- We support land use, transportation, and environmental planning in Florida with our geospatial expertise.
- We build data and tools to inform planning decisions.

Background & Purpose

Transportation System Disruptions

Heat - Increased Temperatures

- Damage to roads and runways (cracking, buckling, rutting), rails (buckling); health risks to outdoor workers and public/active transportation

Coastal Flooding

- Flooding of facilities from more frequent high-tide flooding, rising seas, more intense tropical storms

Heavy Precipitation & Inland Flooding

- Risk of washout and bridge scour from increased runoff, erosion, riverine flooding

Wildfire

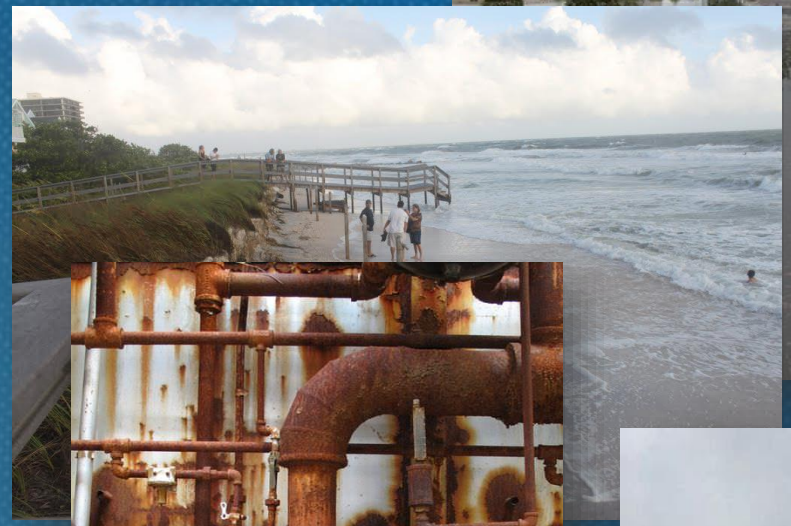
- Road closures; reduced visibility (safety); increased chance of runoff; system disruption and re-routing

Disruptions – cause direct and indirect economic and social impacts

Images: Union of Concerned Scientists, NOAA, Fox35 News, FDEM)

Coastal Flooding Impacts

- Increased high tide flooding
- Reduced stormwater drainage
- Higher storm surges
- Increased erosion
- Saltwater intrusion
- Reduction in groundwater storage
- Loss of coastal habitats and natural protection



Images: NOAA & Renee Collini, Miss State Univ.

Coastal Flooding Impacts to Transportation

Short-to-mid term

Episodic flooding increasing

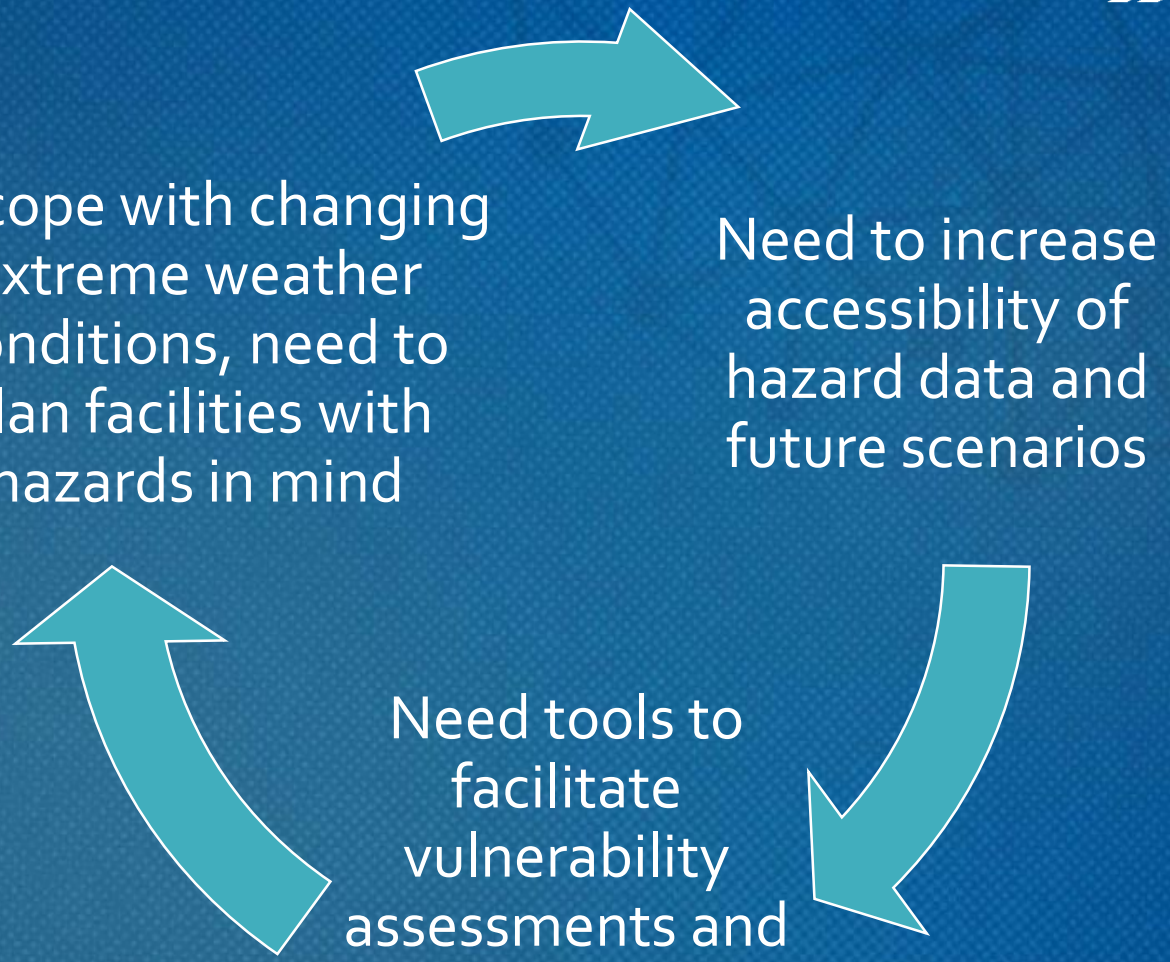
- Facilities: flooded, damaged, inaccessible
- Increased maintenance and repair costs
- Safety issues
- Mobility impacts
- Economic & social disruptions
- Reduction of tax base and services

Mid-to-long term

Episodic + Permanent flooding

- Permanent inundation in some areas
- Changes in where people live and work
- Need to increase transportation systems resilience to maintain reliability and safety

Increasing Resilience of Transportation Systems with Access to Data and Tools



Supporting Resilience Goals

These tools:

- FDOT's Resiliency Policy 000-525-053
- Support identification of current and future hazards that may impact the safety and efficiency of Florida's transportation system
- Support identification of transportation assets that may need hardening or fortification
- Facilitate hazard vulnerability assessments to inform decision making

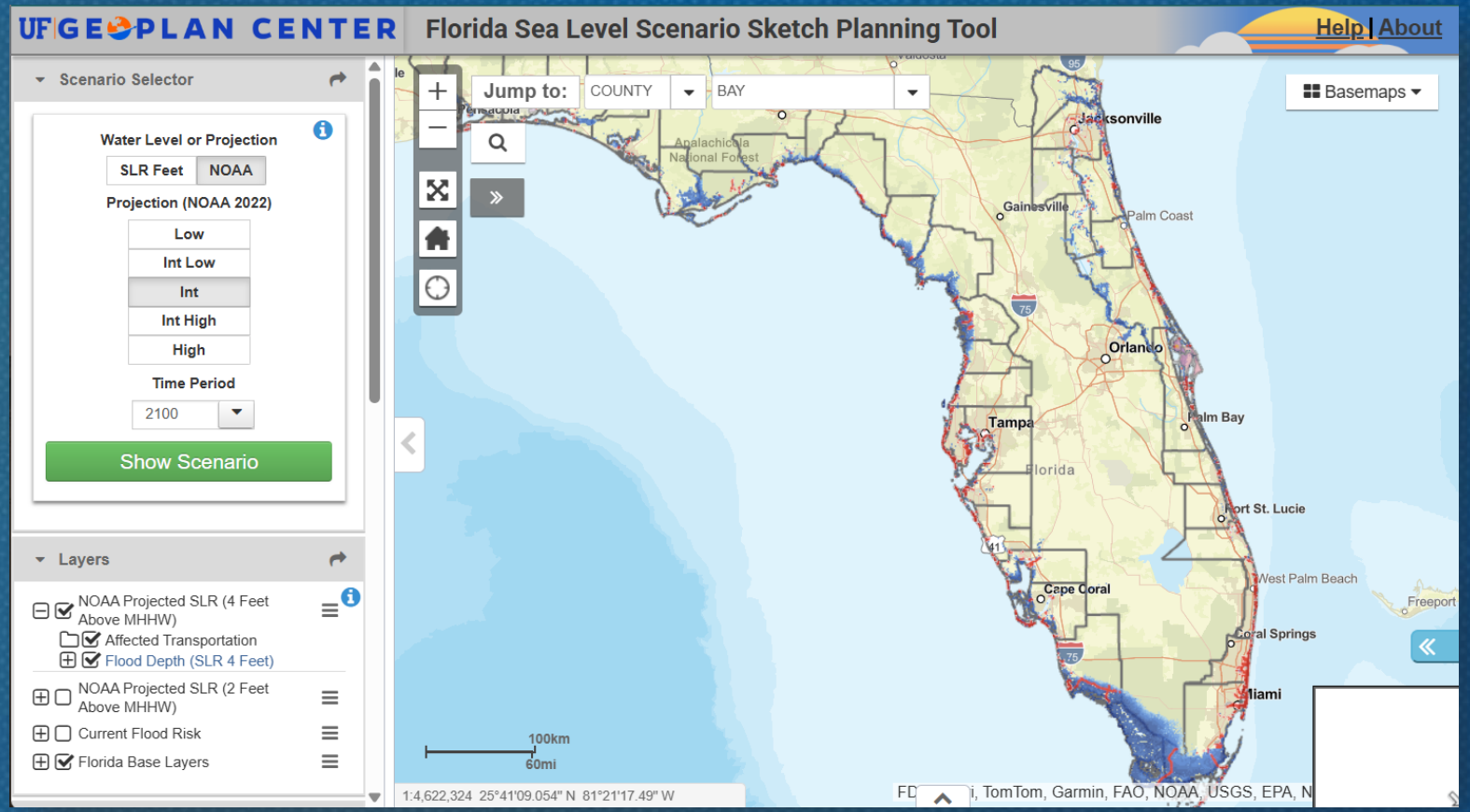
Tools and Hazards

Sketch Planning Tool	• Current Flooding • Future Flooding (SLR)
Resilience Report	• Current & Future Flooding • Non-Flood Hazards (heat, wildfire, sinkholes, other)

Sketch Planning Tool Background & Data

Sketch Planning Tool

- Planning-level tool to evaluate impacts of current and future flooding (sea level rise) on transportation in Florida
- View and compare SLR scenarios
- Segment and asset-level analysis of current and future flood exposure
- GIS data downloads
- Launched in 2013, updated in 2017, 2020, 2022, 2025



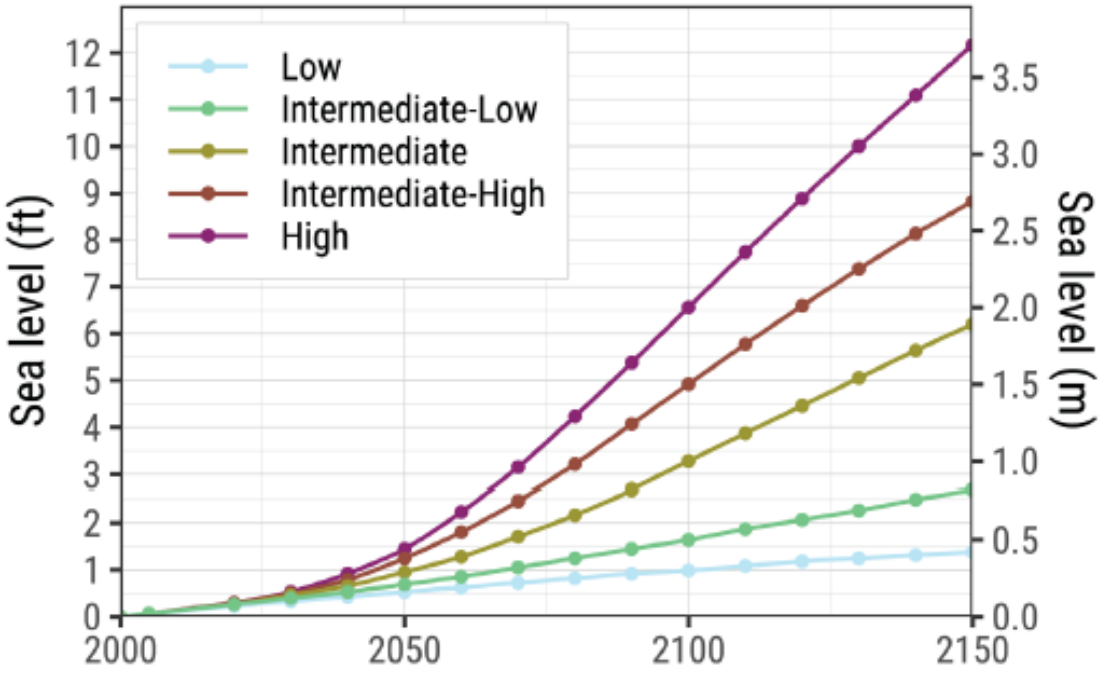
Public map viewer & GIS data sls.geoplan.ufl.edu

Sketch Planning Tool: What's New?

- National Oceanic and Atmospheric Administration (NOAA) 2022 SLR Scenarios
- NOAA Inundation layers: ½ foot and full foot (0.5 – 10ft)
- Updated Transportation Layers & Analyses:
  - RCI Roads, Local Roads, Rails, Airports, Ports (Sea & Space), Freight Terminals
- Flooded & full road segments

NOAA 2022: SLR Scenarios

- Federal Task Force (Sweet at al., 2022) and key input for NCA5
- Updated scenarios, five scenarios of SLR through 2150
- Reflects greater certainty and narrower range of SLR through 2050



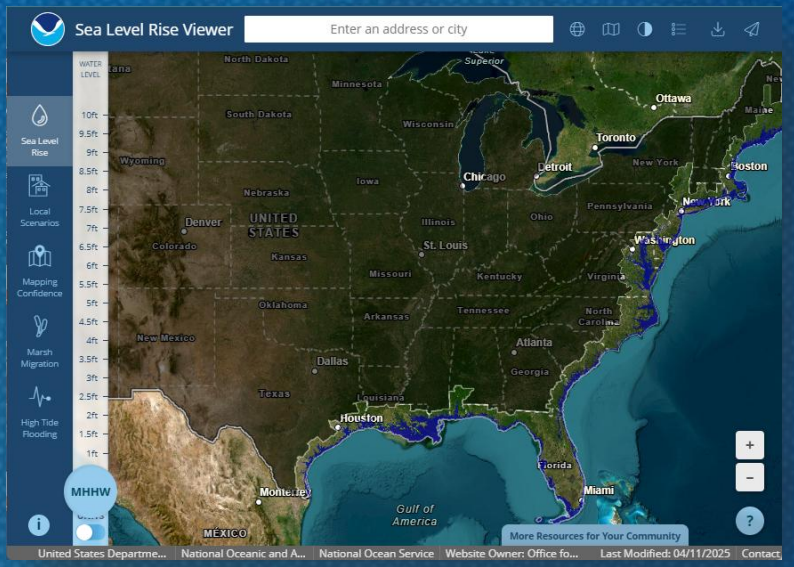
	Year		
Scenario	**2050**	**2100**	**2150**
Low	0.5	1.0	1.4
Intermediate-Low	0.7	1.6	2.7
Intermediate	1.0	3.3	6.2
Intermediate-High	1.2	4.9	8.8
High	1.4	6.6	12.2

Units in feet relative to year 2000

Image: NOAA Application Guide (Collini et al., 2022)

NOAA Inundation Depth Layers

- Produced by NOAA's Office of Coastal Management
- GIS layers of inundation depth by ½ foot increments
  - 0.5 ft – 10 ft SLR above mean higher high water (MHHW)
- Distributed in 11 regions across Florida
- GeoPlan data processing:



Converted depth values (floating point meters to integer inches)

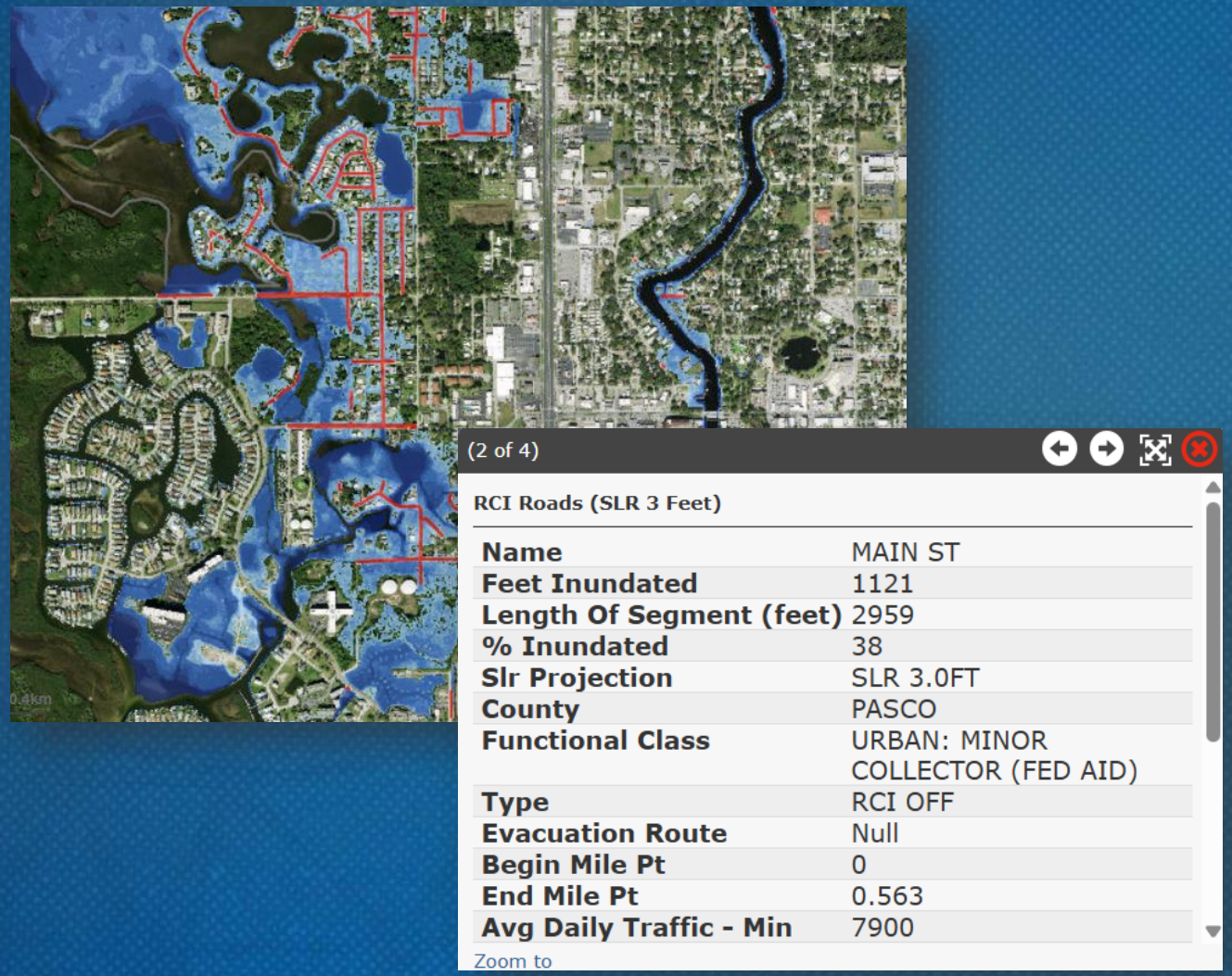
Projected data to EPSG 3087 Albers

Created statewide mosaic/layer from 11 regions

Reclassified raster depth values into categories for map viewer

Converted to vector for transportation overlay analysis

Updated Transportation Exposure Analysis



Transportation assets analyzed:

- Roadways (RCI and Tiger)
- Airports, rails, seaports, spaceports, freight terminals
- SIS designations

Segment and asset-level exposure analysis:

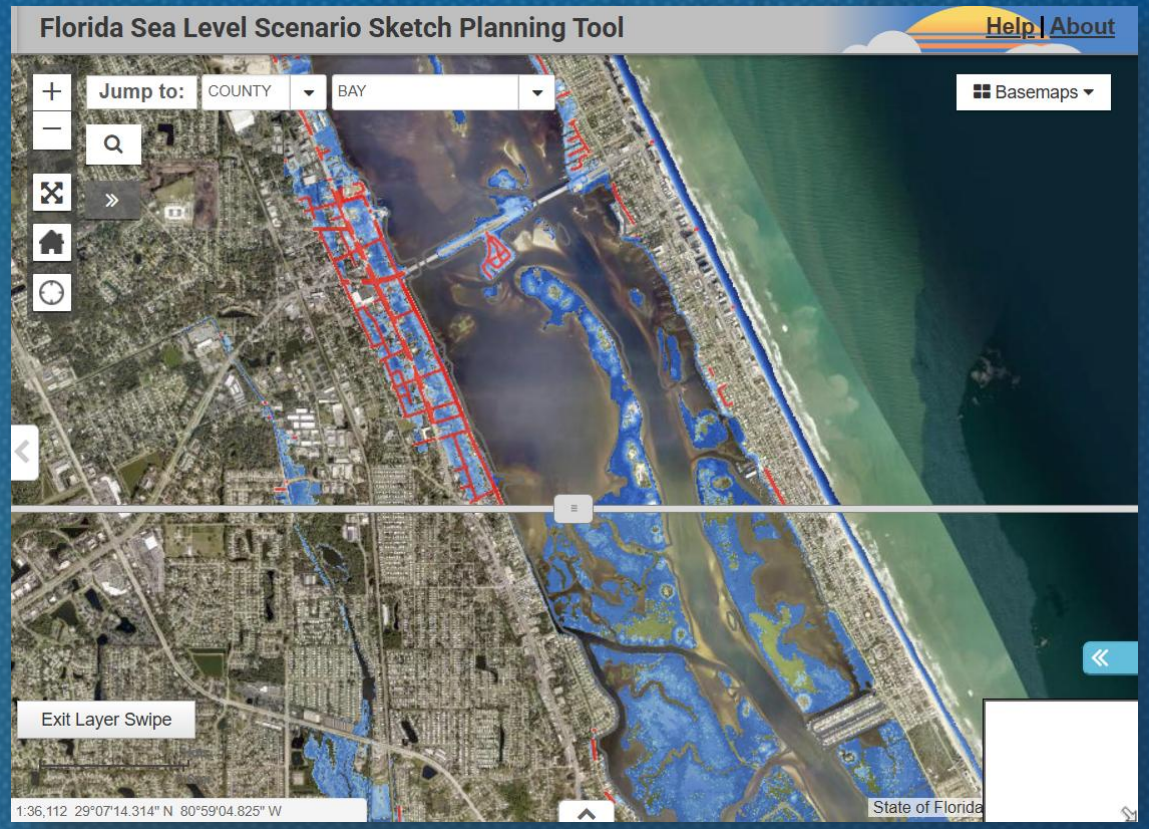
- Future flood risk: NOAA SLR scenarios
- Current flood risk: 100-year & 500-year floodplains, storm surge zones

Bridges and overpasses – not analyzed due to limitations of inundation models

Sketch Planning Tool Uses

- High level vulnerability assessments - get "big picture" of inundated areas
- Compare scenarios over time and determine broad tipping points for impacts
- Start planning for long-term impacts
- Narrow focus to asset level and do high level asset screening using risk-based approach

Not Intended for: engineering assessments, stormwater or drainage design, property assessment, or permitting



Choosing scenarios for planning

How likely are these scenarios?

- Likelihood of exceeding a global SLR scenario based on warming trajectories
- Can use probabilities to narrow scenarios to use

FL Flood Hub best estimates

NOAA Application Guide (Collini et al., 2022)

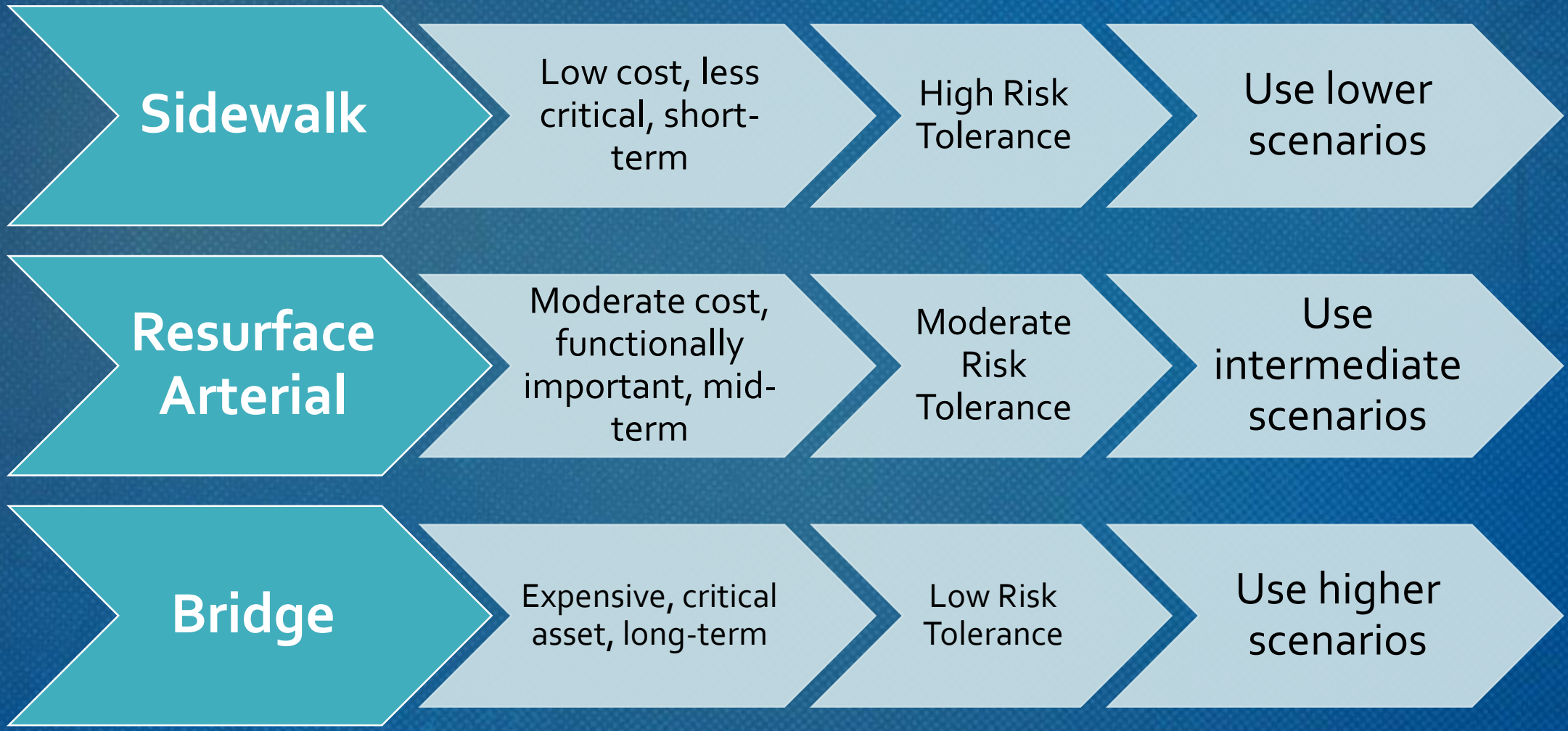
Increase in Average Global Air Temperature in 2100	Likelihood of Exceeding a SLR Scenario				
	Low	Intermediate-Low	Intermediate	Intermediate-High	High
2.7°F (1.5°C)	92%	37%	<1%	<1%	<1%
5.4°F (3.0°C)	>99%	82%	5%	<1%	<1%
9.0°F (5.0°C)	>99%	>99%	23%	2%	<1%

What is Your Flood Risk Tolerance?

	High Tolerance	Moderate Tolerance	Low Tolerance
DESCRIPTION	Willing to accept **high** level of flood risk	Willing to accept **moderate** level of flood risk	Only willing to accept **low** or minimal level of flood risk
PROJECT CONSIDERATIONS	Low cost or value to community	Moderate cost or value to community	High cost or value to community
	Easy to modify	Somewhat modifiable	Difficult to modify
	Not critical to public or little impacts	Moderately important to public or moderate impacts	Critical function to the public
	Lifespan: Short term	Lifespan: moderate	Lifespan: Long-term

Adapted from:
NH Coastal Flood Risk Science and Technical Advisory Panel (2020). *New Hampshire Coastal Flood Risk Summary, Part II: Guidance for Using Scientific Projections*. Report published by the University of New Hampshire, Durham, NH. https://scholars.unh.edu/ersc/211/

Flood Risk Tolerance Examples



Sketch Planning Tool: Demo

Resilience Report Background & Data

Background: Environmental Screening Tool (EST)

Web application to facilitate ETDM.

Screening process for potential impacts to environmental and human resources from proposed transportation projects.

EST integrates:

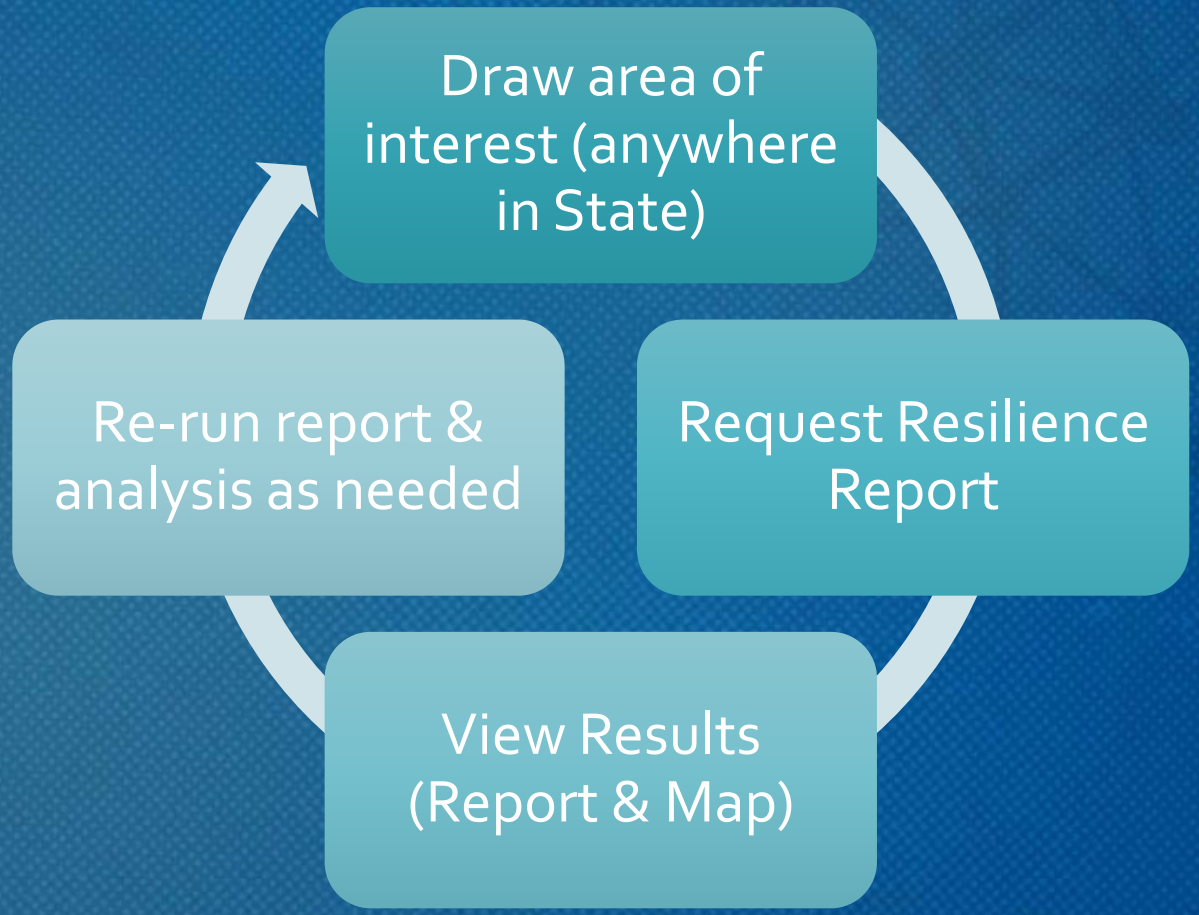
- Database of transportation projects and information
- 500+ environmental, cultural, community resource GIS layers
- Automated screening/ analyses of layers

Area of Interest (AOI) Tool: allows a user to define and analyze an area anywhere in Florida to learn about people, places, natural resources

Images: FDOT

AOI Tool Resilience Report

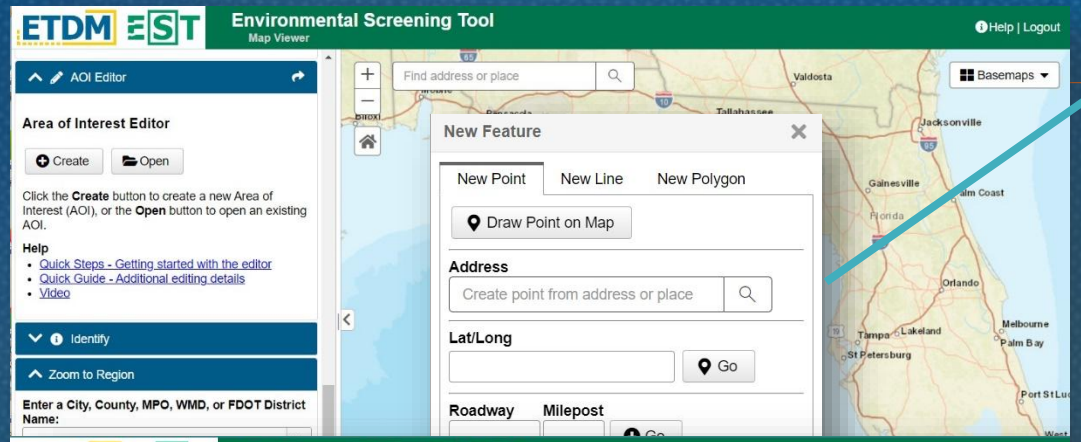
- Screening tool to evaluate potential impacts from multiple hazards.
- Summarizes and displays analyses of flood exposure for a user-specified area of interest.
- Integrated into the EST – Area of Interest tool
- Flexible infrastructure – *supports additional data layers as they become available*
- Originally released in 2023

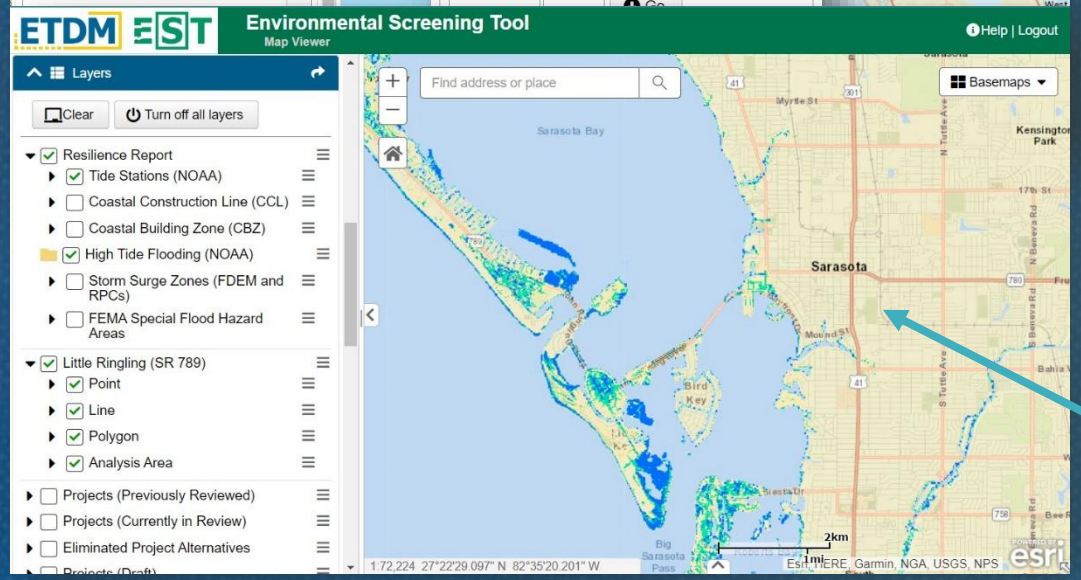


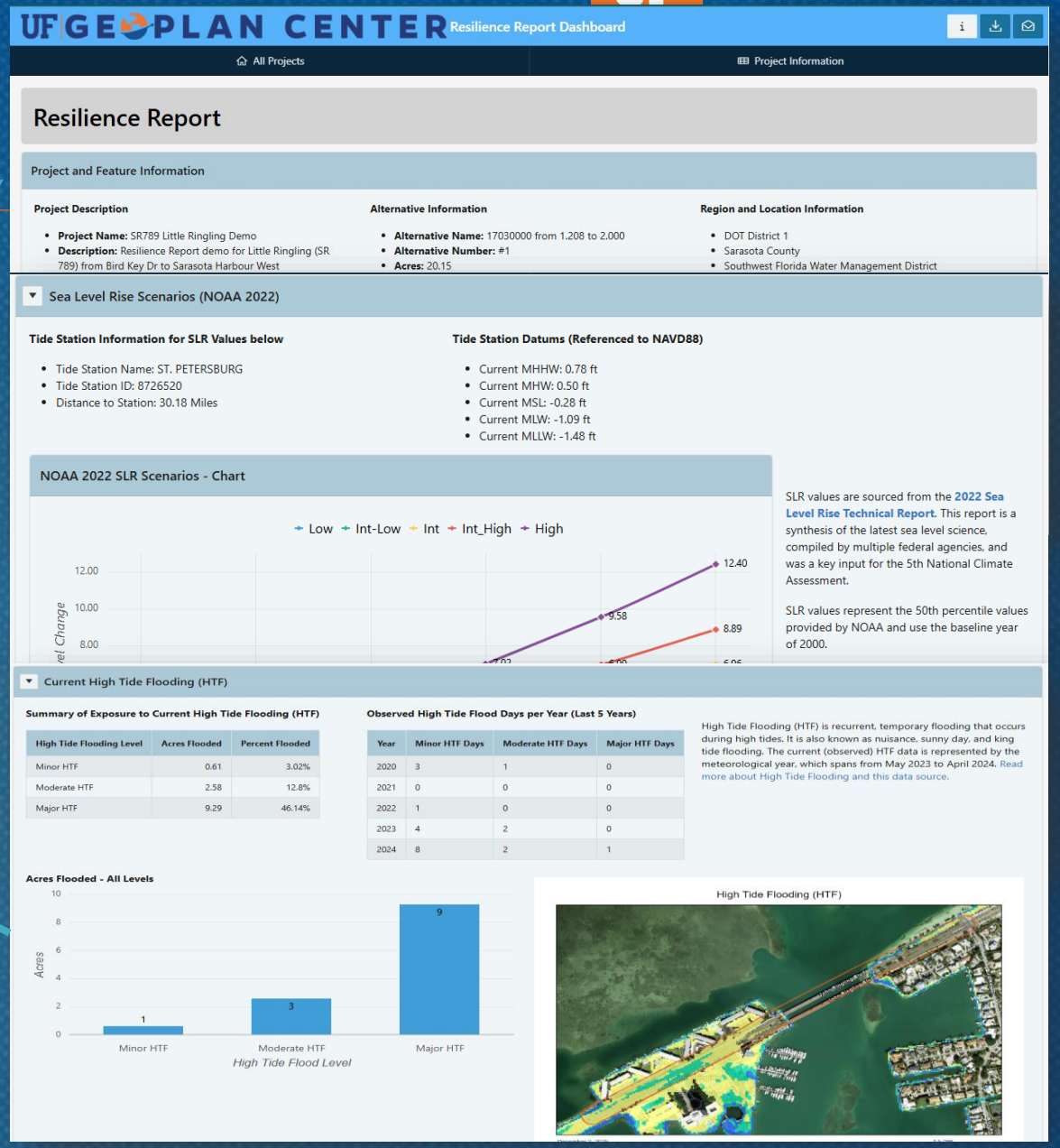
What's New?

- Brief summary table of hazards
- Additional NOAA 2022 inundation depth layers – ½ foot increments and 8 – 10 ft
- SLR Projections out to 2150
- High Tide Flooding Days – 3 years of observed days of flooding
- *Coming soon!* Resilience Report will be available for ETDM projects as well as Area of Interest (AOI) features

AOI Tool Workflow







Hazard Data

Coastal and Inland Flooding

- NOAA 2022 SLR scenarios; SLIP study areas
- High Tide Flooding – Extent and Days of Flooding
- Storm Surge (SLOSH)
- FEMA Floodplains 1% & 0.2%

Statewide (Non-flooding)

- Extreme Heat – Projected Days over 95 degrees F
- Wildfire Ignition Risk
- Severe Thunderstorm Risk (Lightning and Strong Winds)
- Sinkhole Risk

Flooding Data

Areas at Risk Due to Sea Level Rise (SLR)

Identifies areas in need of a **Sea-Level Impact Projection (SLIP) Study.**

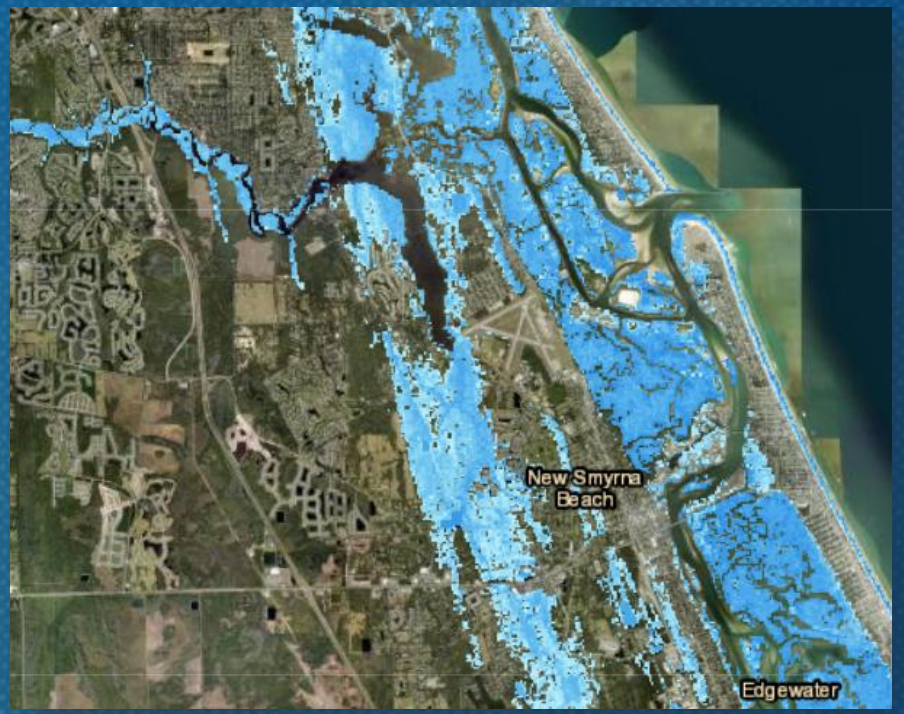
Section 380.0937, *Florida Statutes*, requires state agencies, municipalities, counties, special districts, authorities, or other corporate bodies of the state, which commission or manage a construction project within the area at risk due to SLR using state funds, to conduct a SLIP study.

2023: Updated SLIP requirements for state-financed construction projects within these areas that begin after July 1, 2024. Expands the Coastal Building Zone of Florida to Areas at Risk Due to SLR.

https://floridadep.gov/rcp/resilient-florida-program/content/resilient-florida-program-slip

Sea Level Rise Inundation Layers

- Layers represent the extent and depth of potential permanent flooding due to future sea levels
- Layers available in 0.5-foot increments of SLR above MHHW (high tide)
- Report includes 1-10ft SLR
- Inundation layers use the most current LiDAR elevation data in Florida



Data Source: NOAA Coastal Services Center

High Tide Flooding

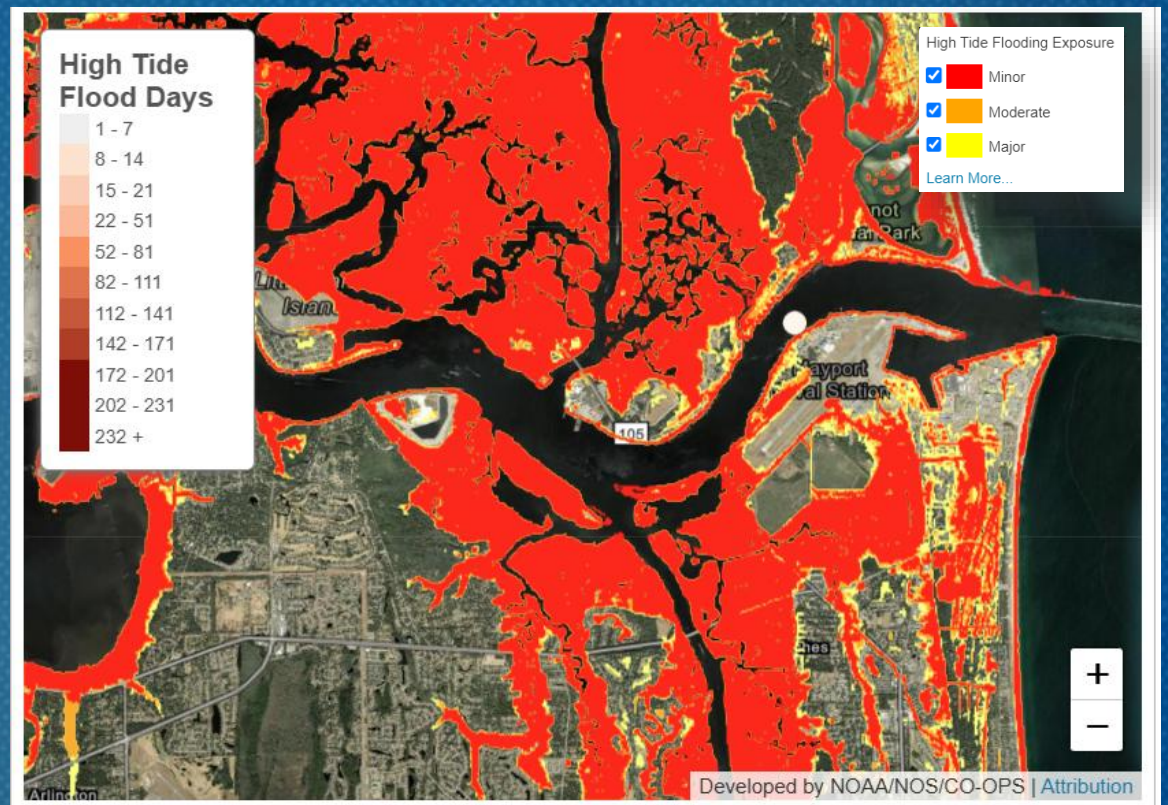
- Recurrent flooding that occurs during high tides
- Also known as: *nuisance, sunny day, king tides*
- **Occurs more frequently, as much as double** in some U.S. coastal communities compared to 20 years ago, due to rising sea levels, land subsidence, and loss of natural barriers
- Frequency of HTF may increase depending on future sea levels and mitigation activities

https://tidesandcurrents.noaa.gov/HighTideFlooding_AnnualOutlook.html

Extent of High Tide Flooding (NOAA)

Three HTF levels, using standard thresholds above the daily high tide:

- Minor: tides exceed approximately 0.55m (1.8ft). Low threat of property damage
- Moderate: tides exceed 0.85m (2.8ft)
- Major: tides exceed 1.2m (3.9ft)

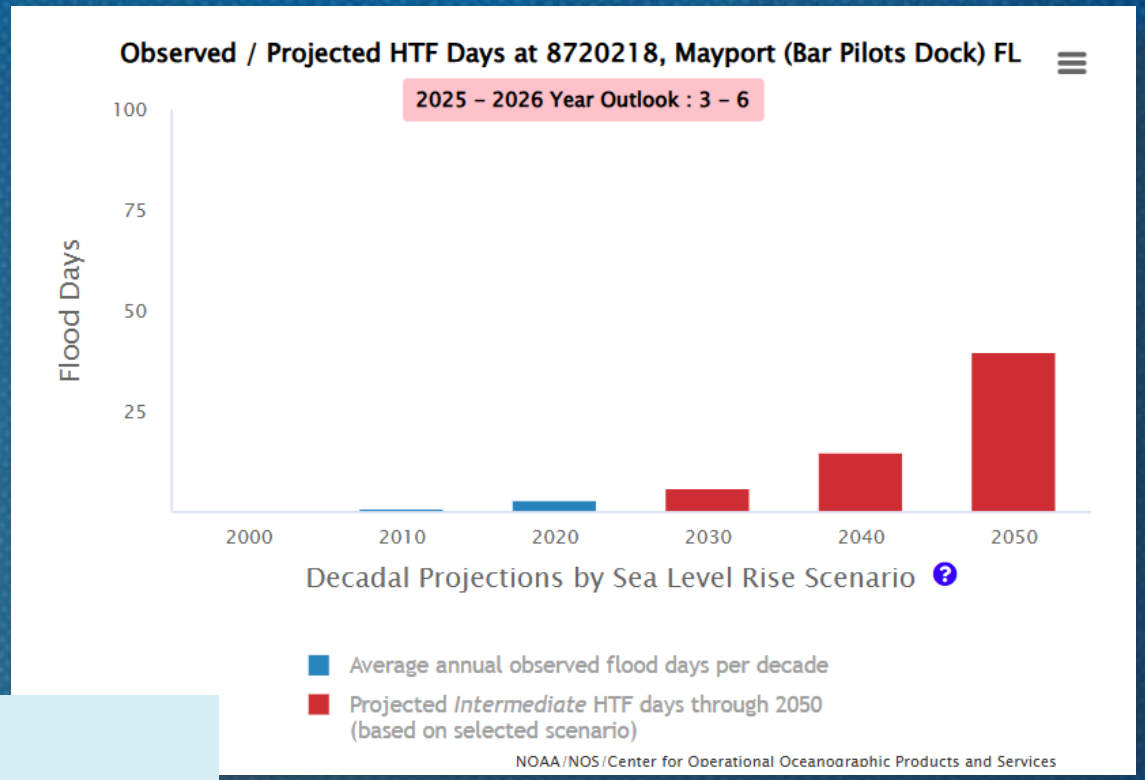


A map showing the number of high tide flooding days at National Water Level Observation Network stations observed or projected for the selected year. Flooding thresholds are supplied by NOAA's Office for Coastal Management.

https://tidesandcurrents.noaa.gov/high-tide-flooding/annual-outlook.html

Projected Days of High Tide Flooding (NOAA)

- Frequency of HTF may increase depending on future sea levels
- NOAA produces projected annual days of minor HTF by decade and SLR scenario.



National estimates of minor HTF:

- May 2025 – April 2026: median of 4 - 9 flood days/year
- About 5 more flood days per year, compared to 2000
- In 2050: projected median of 55 - 85 flood days/year

Using the High Tide Flooding Data

Two parts to this data:

1. Spatial Extent of HTF
   - Minor, moderate, major – determined by elevation threshold

2. Projected Days of Flooding Annually
   - For each decade (to 2100), projected days of HTF under 2022 SLR Scenarios
   - Currently only available for minor HTF

Where?

Where will this temporary flooding occur?

How Often?

Average # of days per year

FEMA Flood Hazard Areas

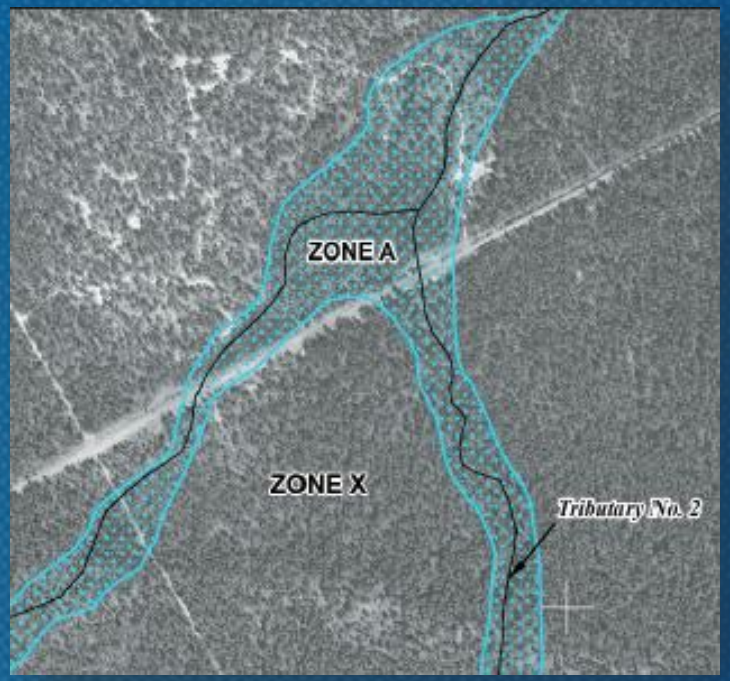
Special Flood Hazard Areas (SFHA)

- Areas inundated by the **1% annual chance flood event.** Also known as: "base flood" or "100-year flood"
- Over a 30-year period, 26% chance of occurring

Moderate flood hazard areas:

- Areas between base flood and **0.2% annual chance flood event**
- Also known as "500-year flood"

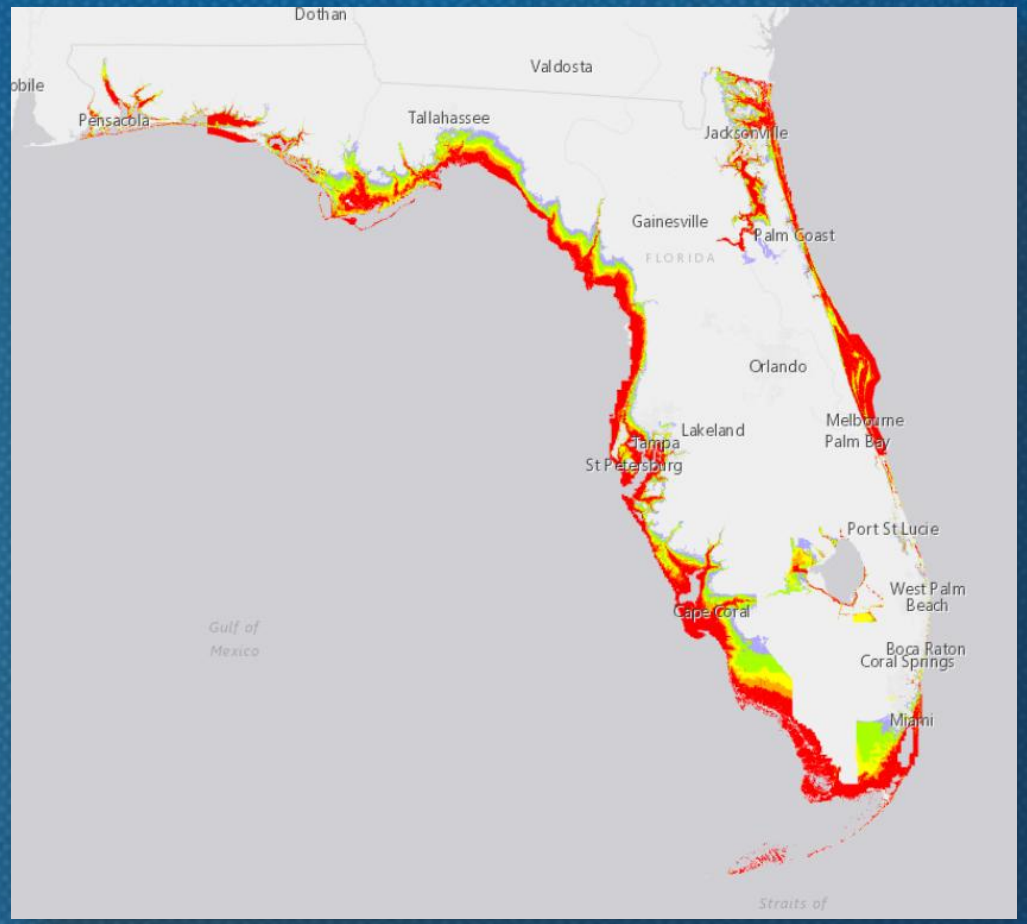
Represents *current* flood hazard areas, based on historical data; does not include future precipitation or SLR



Source: FEMA National Flood Hazard Layer - Digital Flood Insurance Rate Map

Storm Surge Zones

- Developed by Florida's Regional Planning Councils - part of Florida Statewide Regional Evacuation Update Study (August 2021)
- Derived from National Hurricane Center SLOSH
- Provides worst case snapshot of surge for each hurricane category (1-5) under perfect storm conditions
- Represents current surge, does not include future SLR



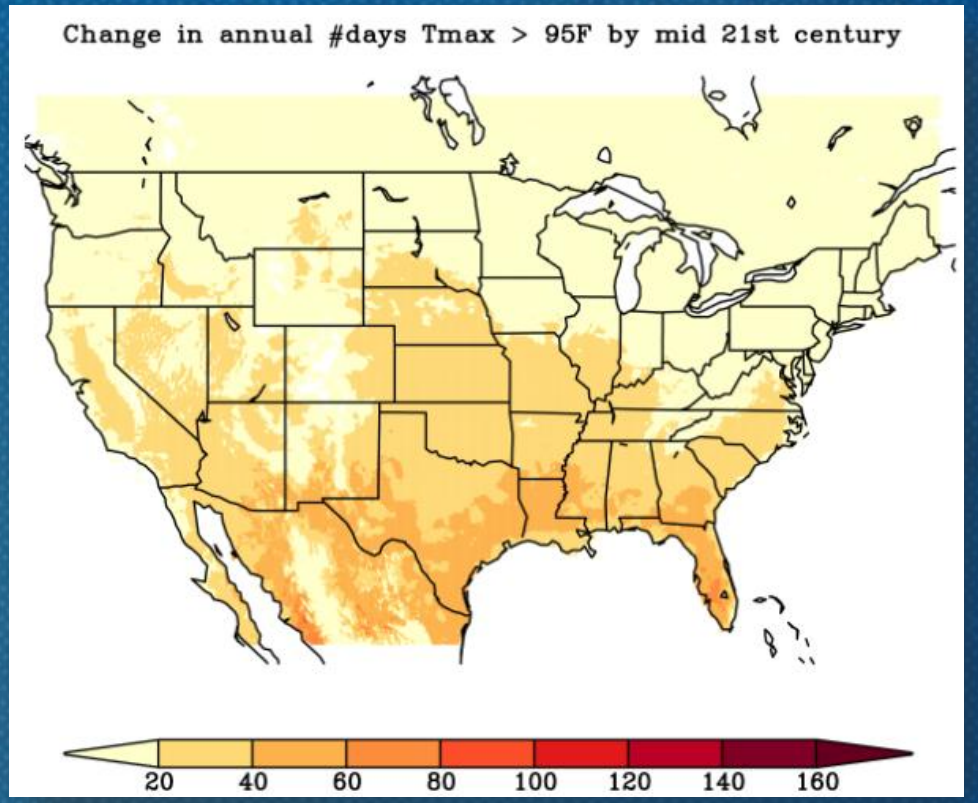
Statewide (Non-Flood) Hazards

Extreme Heat: Projected Change in Annual Days over 95°F

Early century (2016 - 2045):
Lower Emissions simulated change for 2016–2045, compared to 1976–2005

Mid-Century (2036 - 2065):
Lower emissions simulated change for 2036–2065, compared to 1976–2005

Lower Emissions scenario under Representative Concentration Pathway (RCP) 4.5



Data Source: Localized Constructed Analogs (LOCA) data set. Univ of California San Diego - Scripps Institute

Wildfire Risk: Ignition Density

- Wildfire - unplanned fire in a natural area, caused by natural sources (lightning) or human activity
- Part of the natural cycle of Florida's fire-adapted ecosystems (FDEM)
- Wildfire Ignition Density: Likelihood of a wildfire igniting in an area, based on available fuel and other factors (e.g. lightning)
- Represents current wildfire risk, does not account for future conditions
- Transportation impacts: impaired visibility from smoke (safety, mobility), evacuation needs

Data Source: Southern Group of State Foresters (SGSF)

Sinkhole Risk

- Naturally occurring geologic features in Florida (porous karst geology), can form suddenly
- Periods of severe drought followed by extreme rainfall can destabilize ground conditions and increase formation potential
- Transportation infrastructure - at risk of collapse or damage from sinkholes, leading to disruptions, delays, and repairs
- Data source: Florida Geological Survey. Favorable geology for sinkhole formation
- Represents current risk, does not account for future conditions

Data Source: Florida Geological Survey; Image: Florida Museum (Univ of Florida)

Severe Thunderstorms

Severe thunderstorms can be life-threatening and cause impacts to the transportation system:

- Flash floods, downed trees, power outages, and blocked roadways
- Mobility disruptions and safety concerns

Lightning and strong winds - proxy for severe thunderstorms.

- **Lightning:** Visible spark of electricity in the atmosphere between clouds, the air, and/or the ground often produced by a thunderstorm (FEMA)
- **Strong Winds:** damaging winds, often originating from thunderstorms, exceeding 58 mph (FEMA)
- Data source: FEMA National Risk Index

Images: NOAA National Severe Storms Lab

Resilience Report Demo

Using the Report

Usage since launch (April 2023)

- > 470 Resilience Reports requested for variety of projects (PD&E, culverts, multi-use trails, utility corridors, wildlife crossings)
- Organizations: FDOT Central Office; All 7 DOT districts; Turnpike; 5 MPOs/ TPOs

Applications

- Project level screening – gathering data for corridor/ feasibility studies, PD&E studies
- Evaluate full range of potential impacts (low to high scenarios)
- Long-range Transportation Plan (LRTP) screening
- Initial screening & support for SLIP Study

Requesting Access to AOI Tool & Resilience Report

EST & ETDM contacts: https://etdmpub.fla-etat.org/est/pub/help/EstContacts.do

FDOT staff or consultants with FDOT IT accounts:

- Districts: request via District ETDM Coordinator
- Central Office: request via Statewide ETDM Coordinator or contact ETDM Help Desk

After approval, submit AARF selecting the EST – AOI Only application

MPO & FDOT consultants without FDOT IT accounts:

1. Request: MPO or FDOT Project Manager
2. PM request via ETDM Coordinator
3. ETDM Coordinator - email authorization to ETDM Help Desk

MPO staff

- Request via MPO ETDM Coordinator (if vacant, contact District ETDM Coordinator)
- ETDM Coordinator - email authorization to ETDM Help Desk

Summary

Sketch Planning Tool

- Current & Future Flooding
- Public access

Resilience Report

- Flooding (current & future) and Non-Flood Hazards
- Reports for user-drawn corridors or areas
- EST login required
- Data updated as available via EST

Thank you!

https://www.geoplan.ufl.edu
https://sls.geoplan.ufl.edu