COASTAL RESILIENCE PARTNERSHIP

SOUTHEAST PALM BEACH COUNTY

November 1, 2020

# City of Lake Worth Beach

## Update on the Southern Palm Beach County Climate Change Vulnerability Assessment

# Presentation Agenda

1. Coastal Resilience Partnership
2. Climate Change Vulnerability Assessment
3. Preliminary Flood Threat Results
    - Tidal Flooding
    - Storm Surge
    - Rainfall Induced Flooding
4. October 2020 Flooding
5. Regional Comparisons

# Coastal Resiliency Partnership (CRP) Timeline

| 2017 | 2018 | Early 2019 | Late 2019 | Early 2020 | Today | Spring 2021 |
|---|---|---|---|---|---|---|
| Began meeting to discuss common climate threats and needs | PBC opened Office of Resilience, CRP decided to pursue joint CCVA | Inventoried GIS data, developed CCVA scope, Drafted ILA | Revised and executed ILA, prepared RFP | Hired consultants, conducted 3 workshops, completed Steps 1-2 of CCVA | CCVA Step 3: Vulnerability Assessment |  |

Florida Department of Environmental Protection

Florida Department of Environmental Protection

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Engineers...Working Wonders With Water®

Emmett Environmental Law & Policy Clinic
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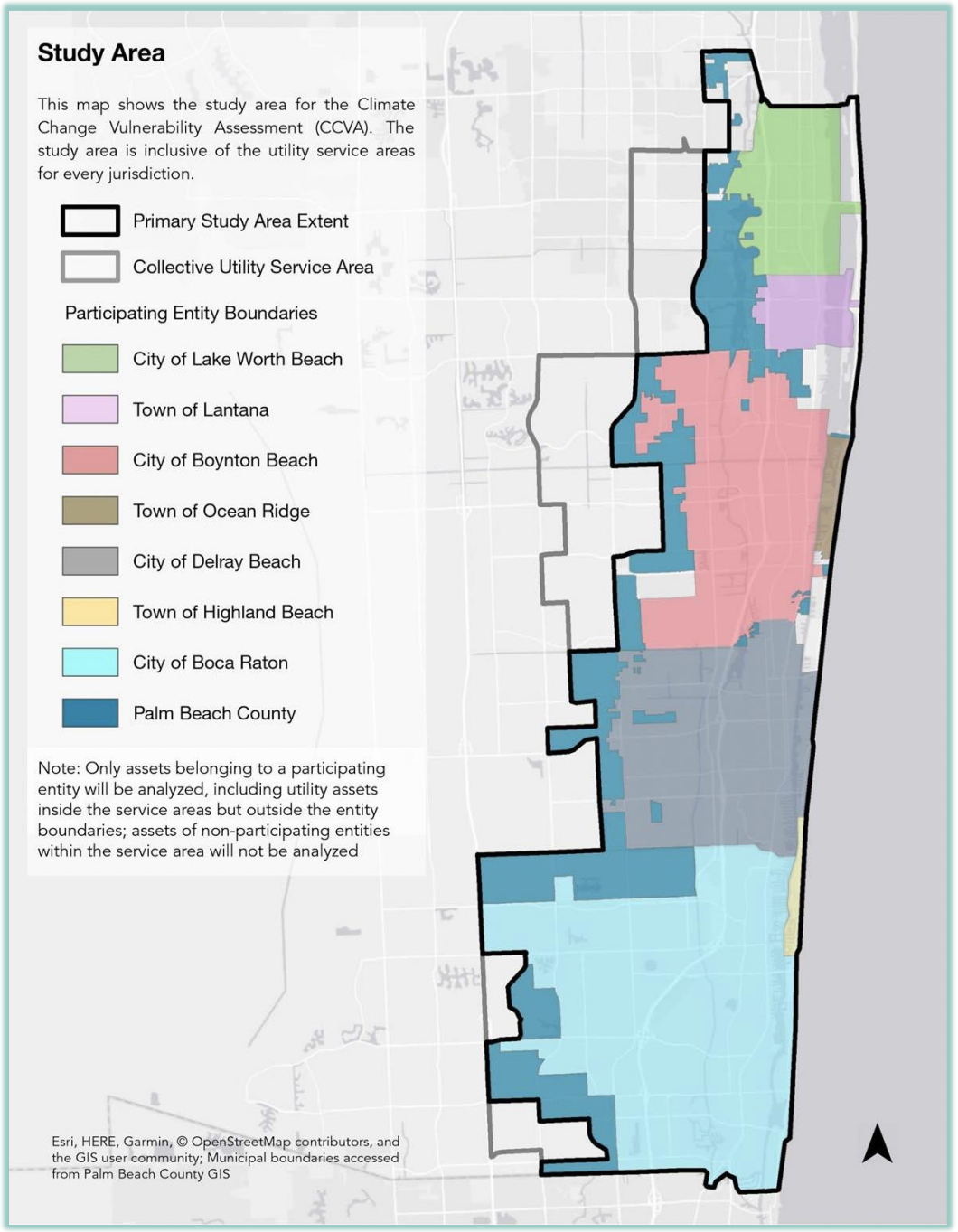
WATER RESOURCES

# STUDY AREA

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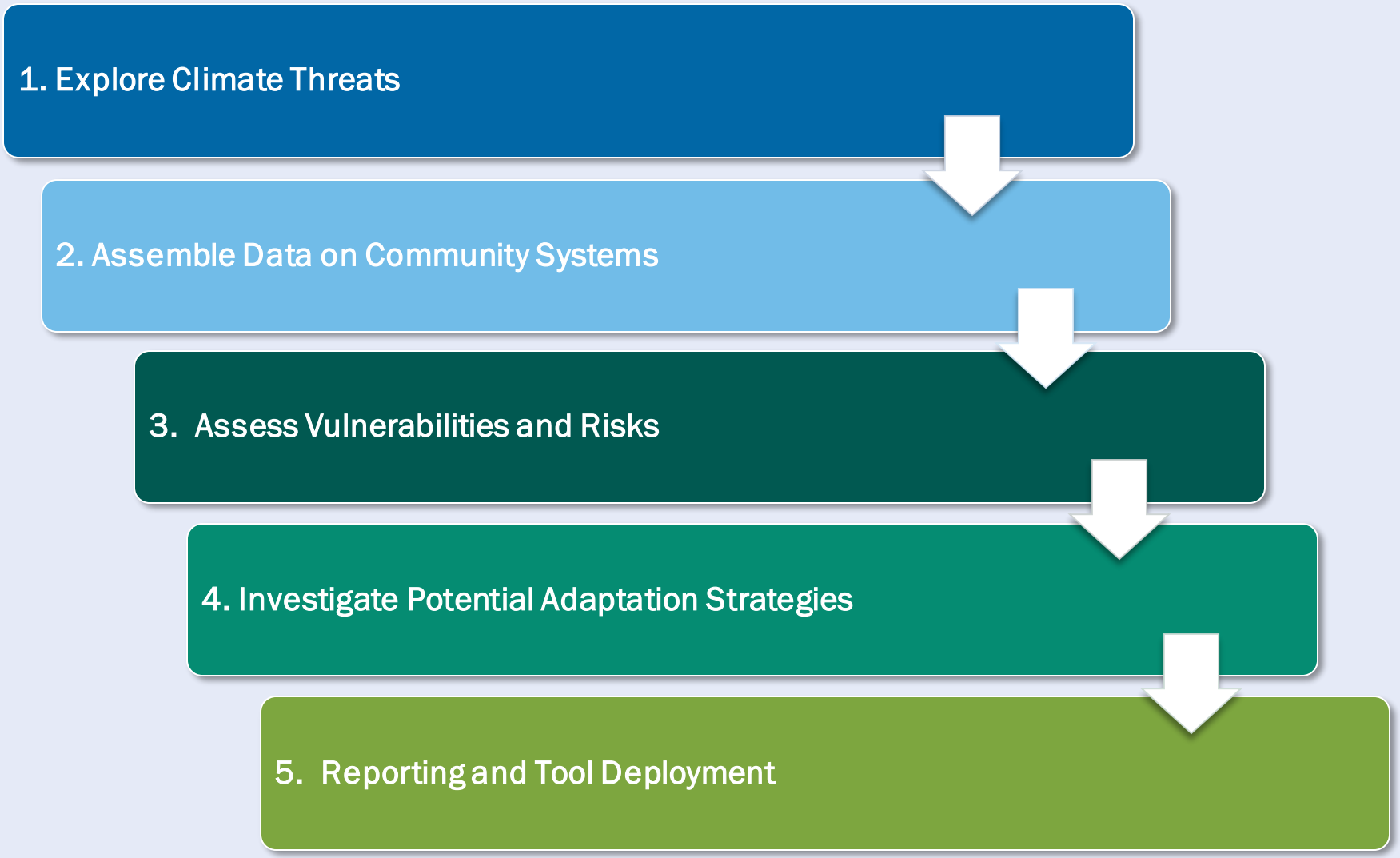
# Climate Change Vulnerability Assessment: The Process

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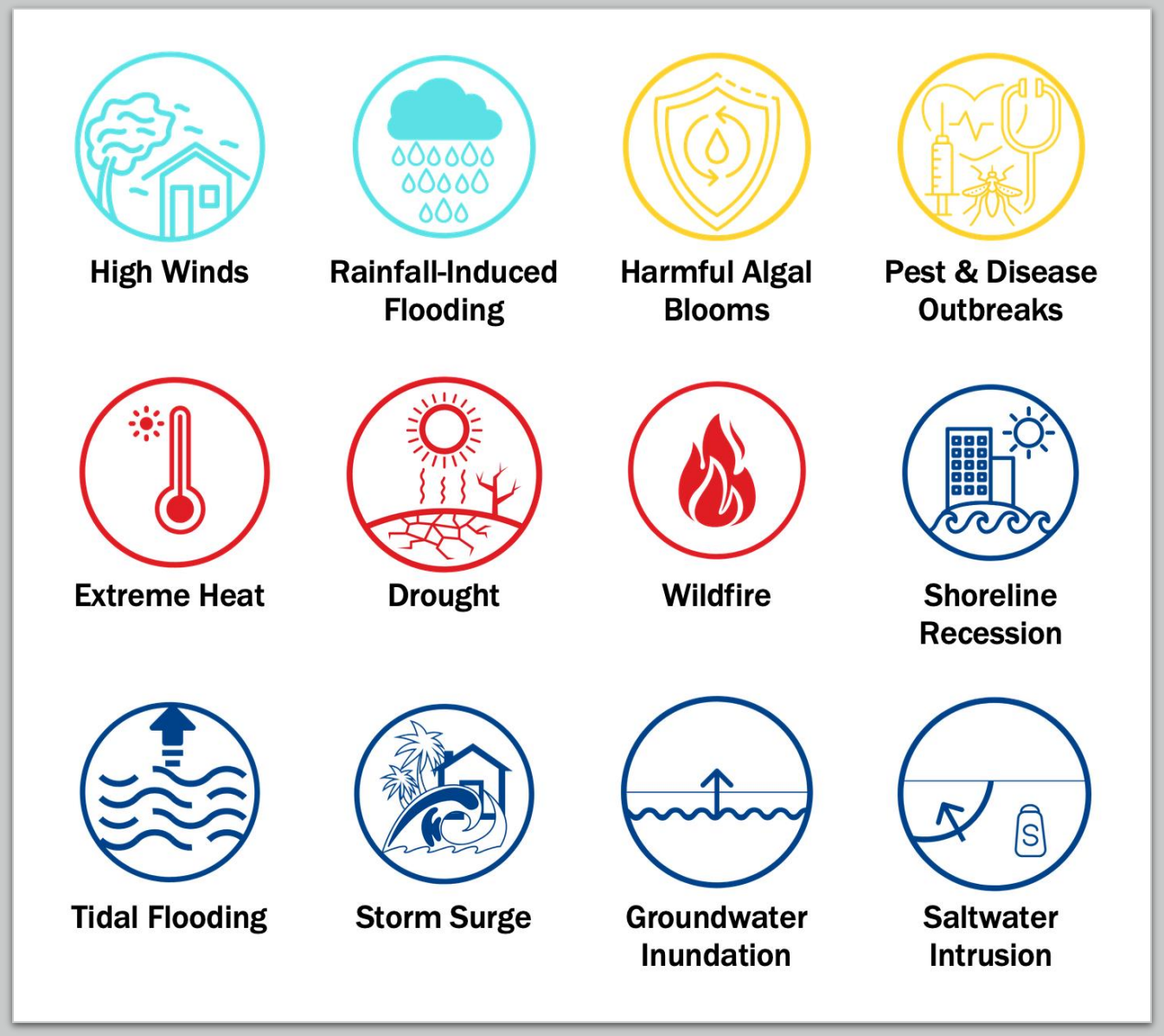
# Top Dozen Threats

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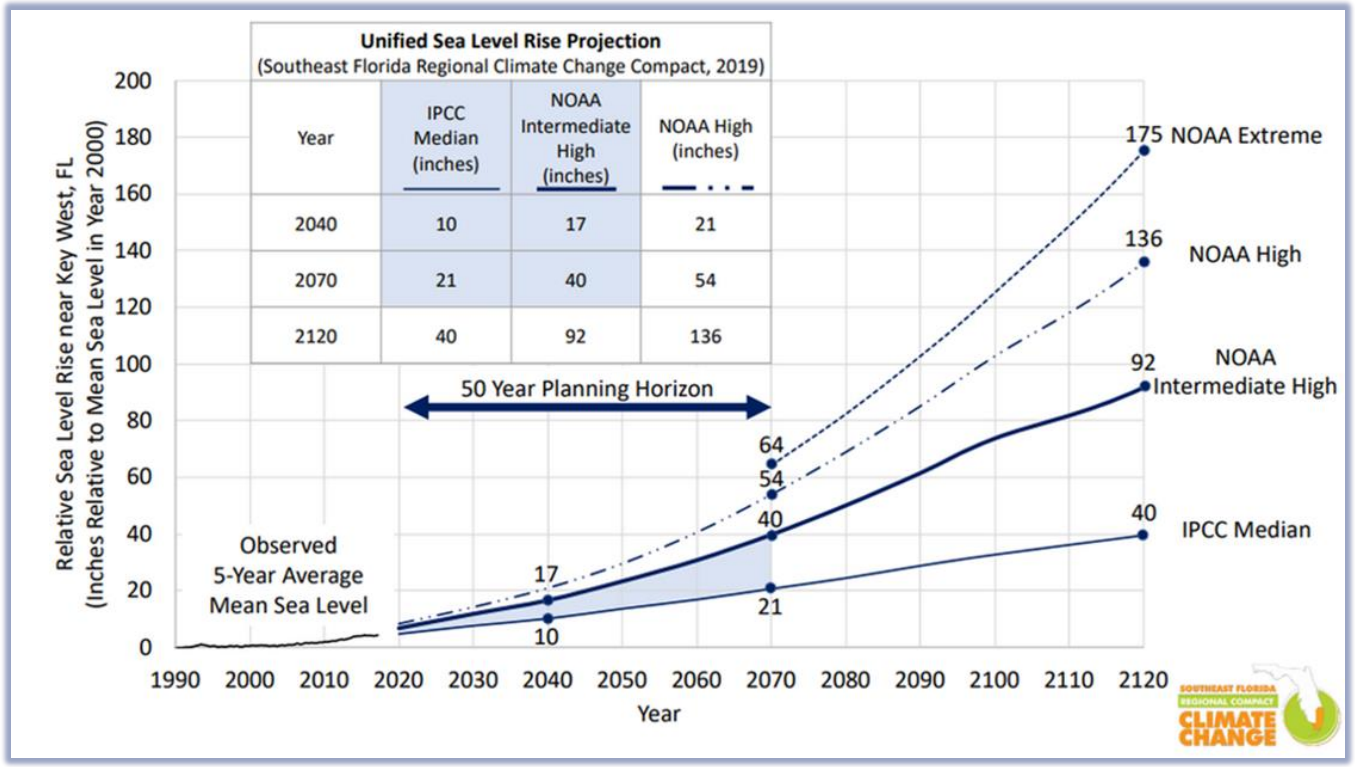
# Sea Level Rise is a Threat Multiplier

It is not a threat on its own.

- **Storm Surge:** SLR is a component that increases risk
- **Tidal Flooding:** SLR will increase frequency and severity until a threshold of persistent inundation could be reached
- **Groundwater/Saltwater Intrusion:** SLR is the primary cause of these threats
- **Rainfall-Induced Flooding:** SLR interacts as a compounding event in coastal areas
- **Shoreline Recession:** SLR accelerates the movement of shoreline

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# Tidal Flooding*

**exacerbated by sea level rise*

**Technical Lead:** Steve Peene, PhD

Indicates above normal high tide events, unrelated to a storm, where water levels flow over the tops of sea walls and onto streets or force water into stormwater outfalls.

Analysis Type: Spatial

Climate Stressors:

- Sea level rise

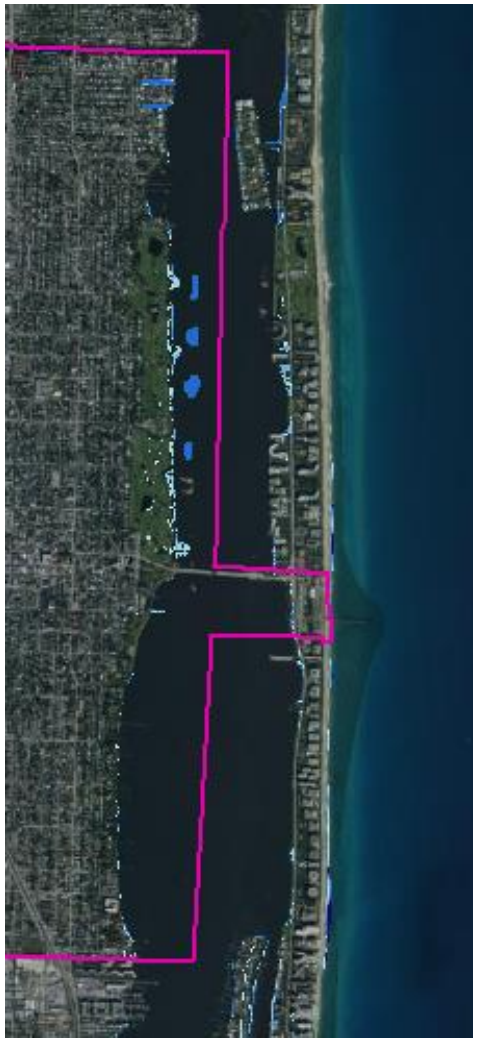
Non-Climate Stressors:

- Aging infrastructure
- Level of Service (LOS) requirements

Data Sources:

- SWMP
- Measured and Predicted Tides within Study Area
- Sea Level Rise Projections
- Digital Elevation Model (DEM)
- NOAA Studies and Reports

2020



2040

2070

Analysis by ATM, Inc., S. Peene & N. Pisarello

# Storm Surge*

**exacerbated by sea level rise*

**Technical Lead:** Steve Peene, PhD

Coastal flooding caused by an abnormal rise in tide from a storm (e.g. hurricane) over and above the usual, astronomical tide.

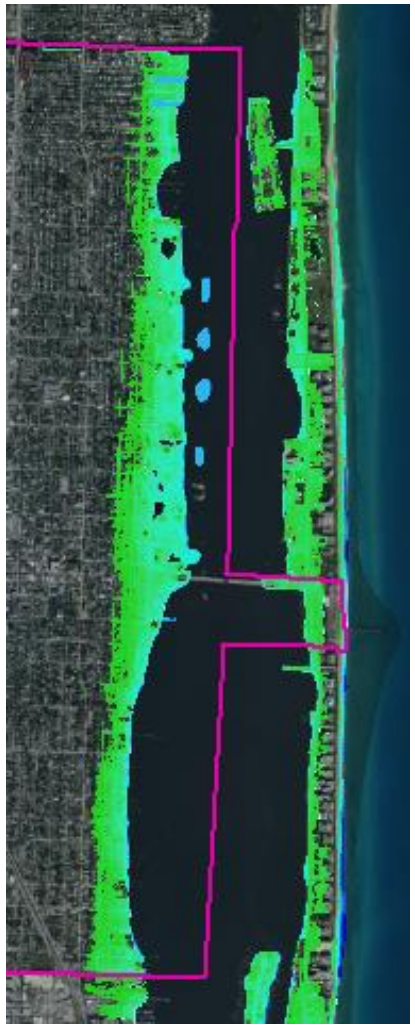
Analysis Type: Spatial

Climate Stressors:
- Sea level rise
- More frequent, stronger storms

Non-Climate Stressors:
- Aging infrastructure
- Density of development in coastal risk areas
- Level of Service (LOS) requirements

Data Sources:
- South Florida Flood Insurance Study Reports
- FEMA Base Maps; Flood Zones with (BFE)
- Still Water Elevations (SWEL)
- ADCIRC Wave Projections
- WHAFIS Model Information
- Sea Level Rise (SLR) Projections
- 2016 Digital Elevation Model (DEM)

2020



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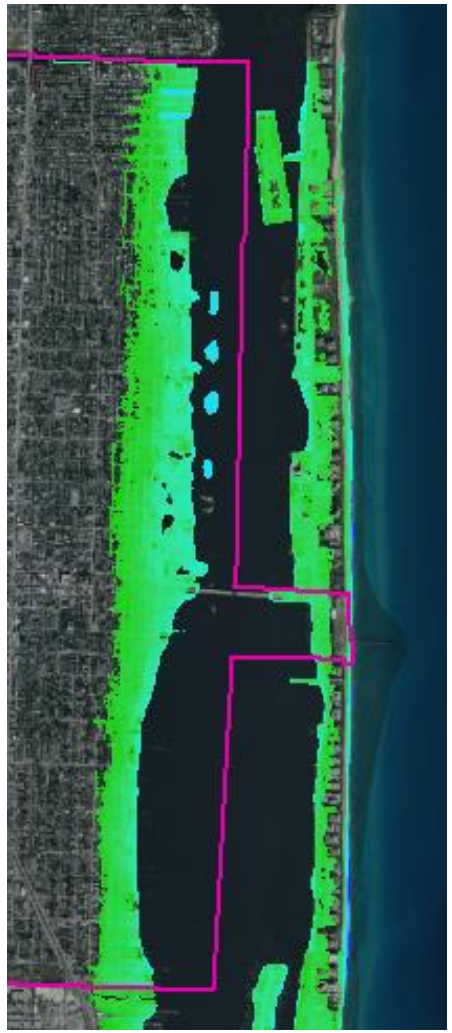

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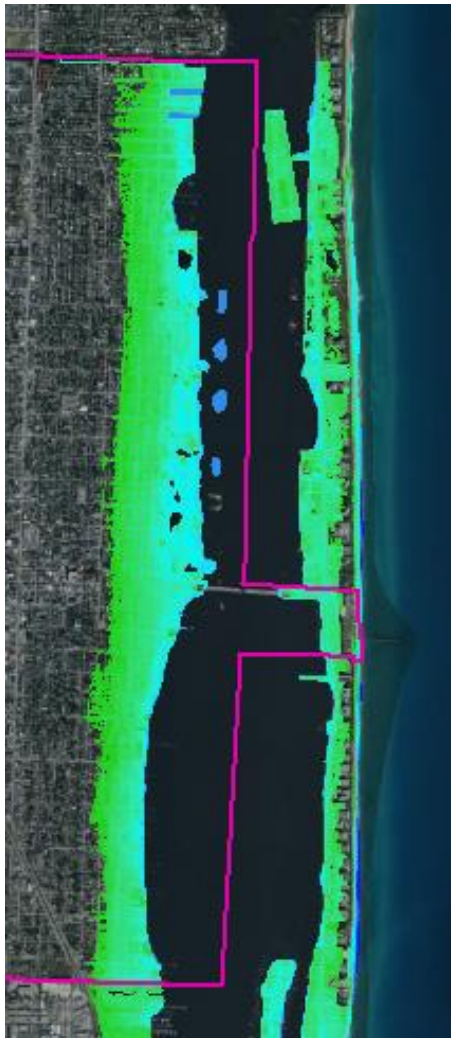
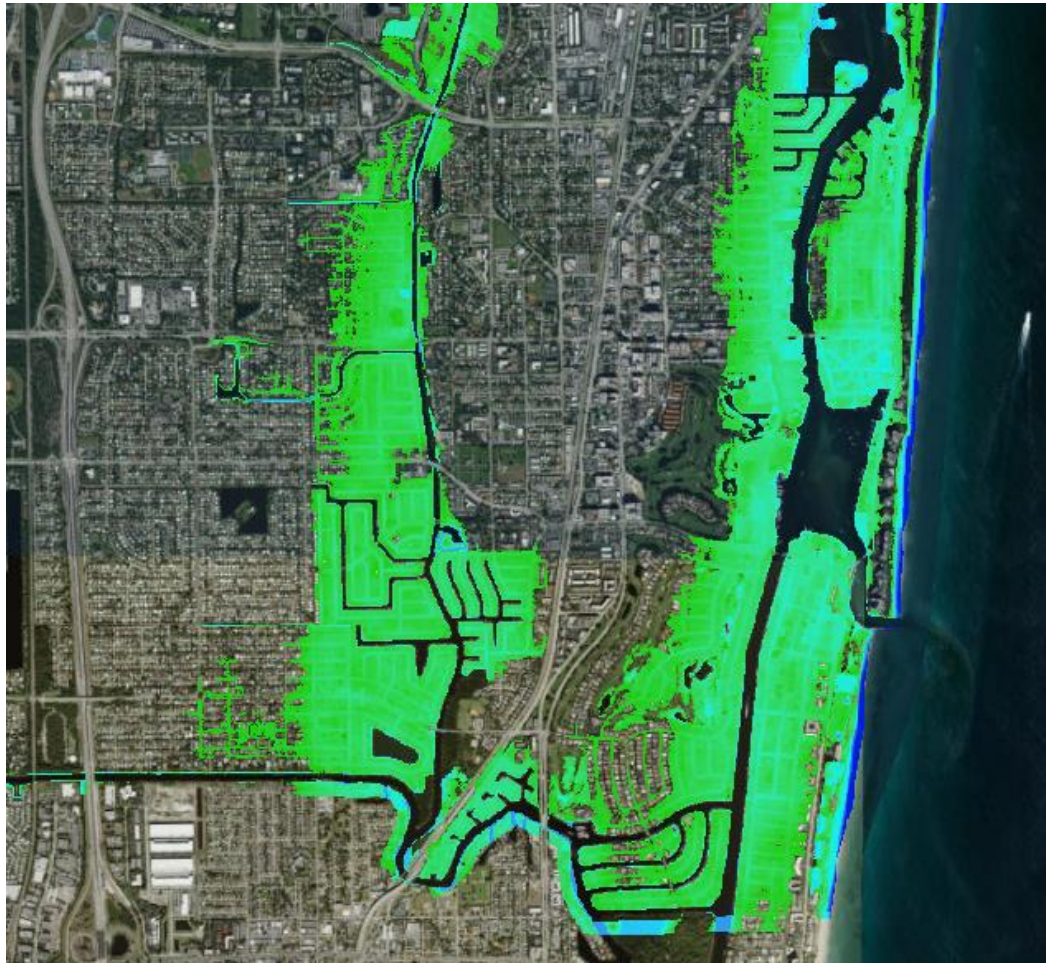


Analysis by ATM, Inc., S. Peene & N. Pisarello

# Tidal Flooding and Surge Flooding is a Regional Issue

## Other Communities in the CRP Project Area Face Similar Challenges



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# Rainfall Induced Flooding

Flooding due to the accumulation of rainwater on normally dry land.

Analysis Type:
- Spatial

Climate Stressors:
- Changes in spatial and temporal variability of rainfall

Non-Climate Stressors:
- Increases in impervious surfaces
- Aging infrastructure
- Development & floodplain alteration
- Maintenance challenges related to stormwater infrastructure

Data Sources:
- Stormwater master plans
- H&H/stormwater Models
- FEMA Maps/"Riverine" Floodplain Mapping
- Problem area reports
- Inundation mapping

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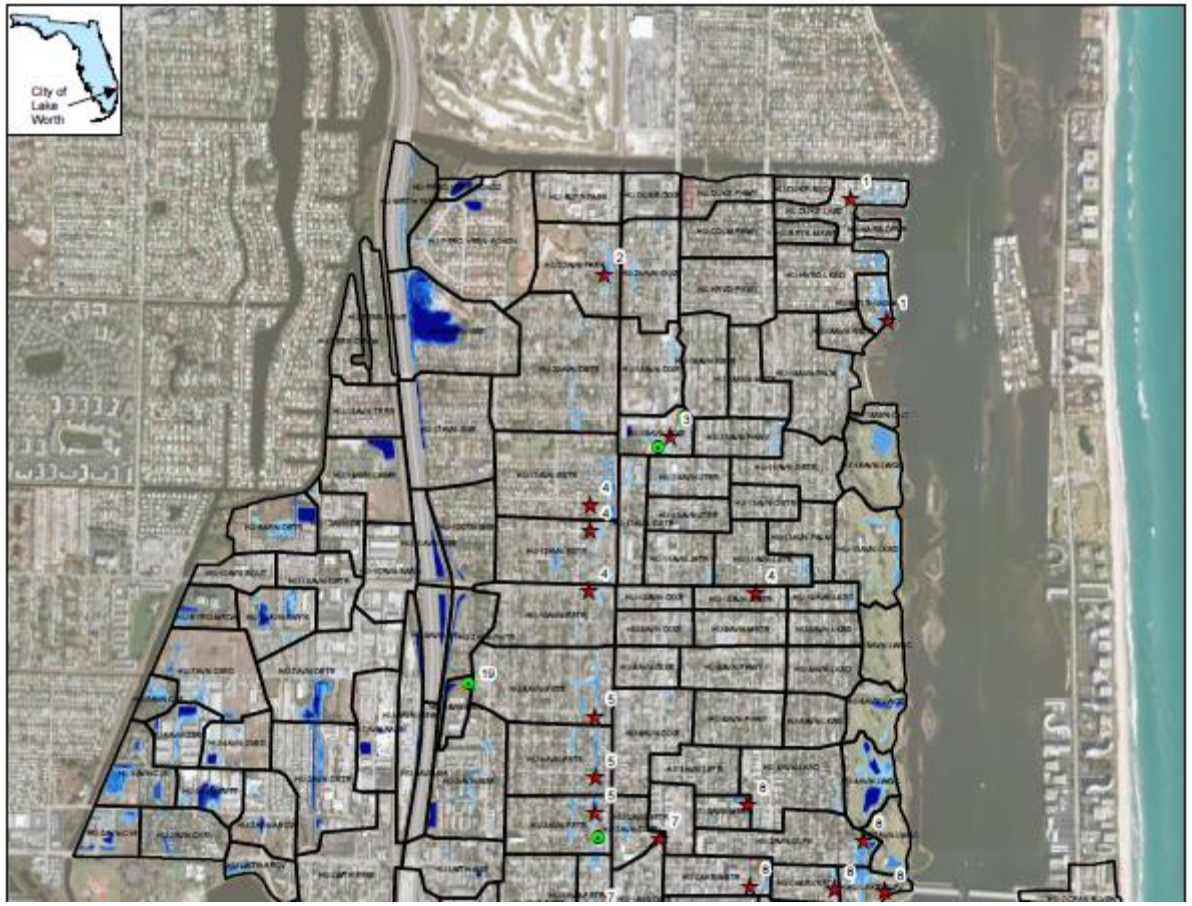
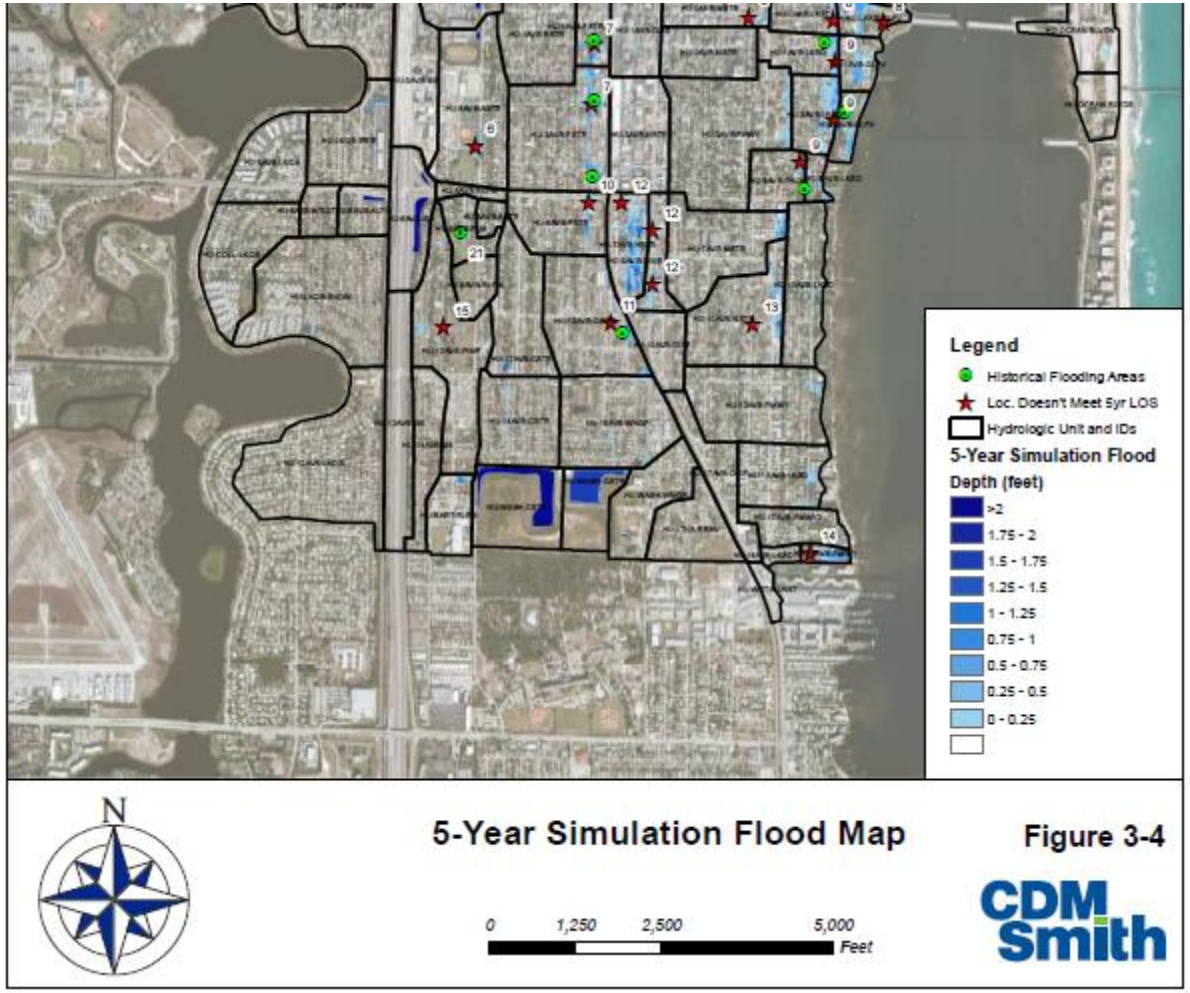
# CRP Regional Modeling - Not High Resolution Locally

## 2012 Stormwater Master Plan (CDM-Smith) – 5 year Design Storm

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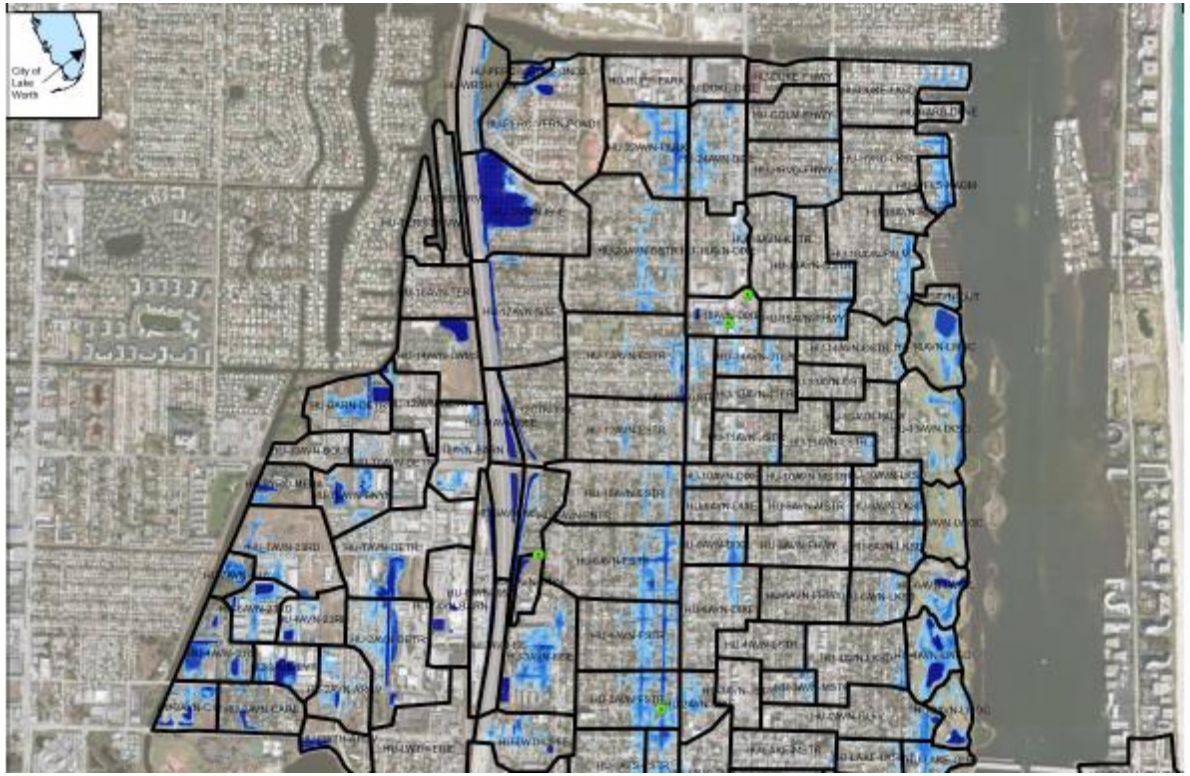
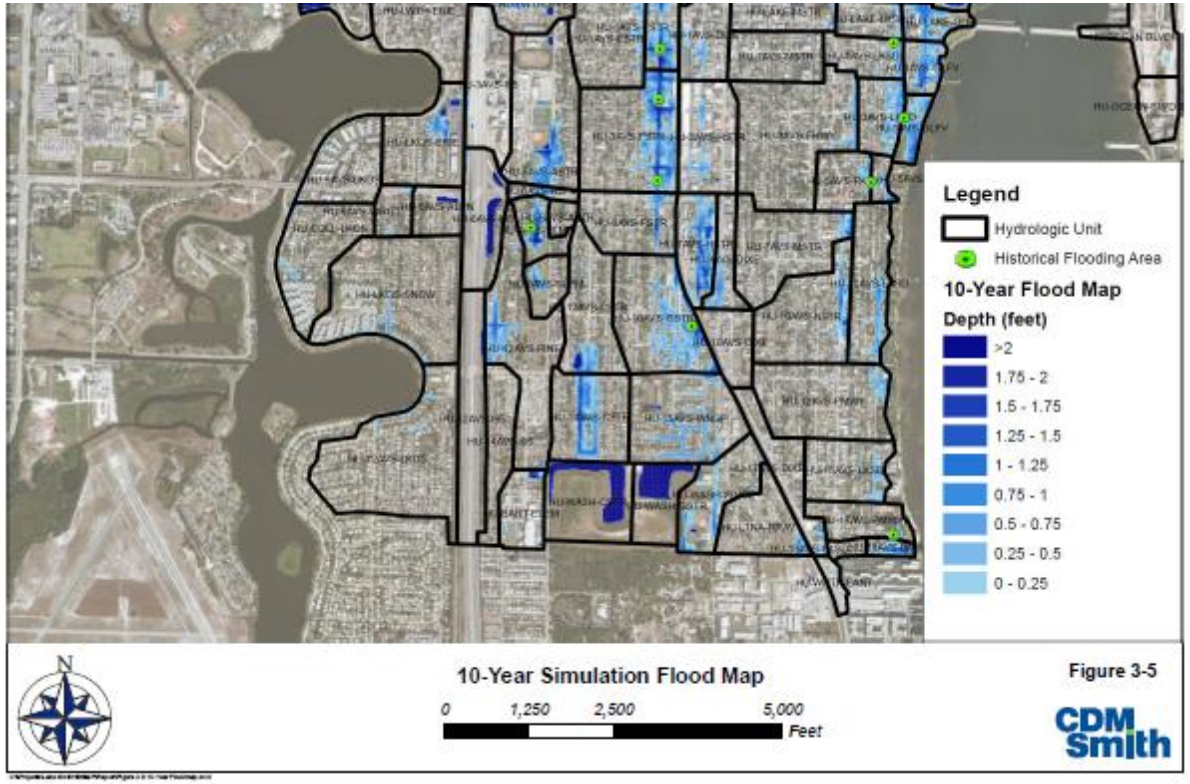
# CRP Regional Modeling - Not High Resolution Locally

2012 Stormwater Master Plan (CDM-Smith) – 10 year Design Storm

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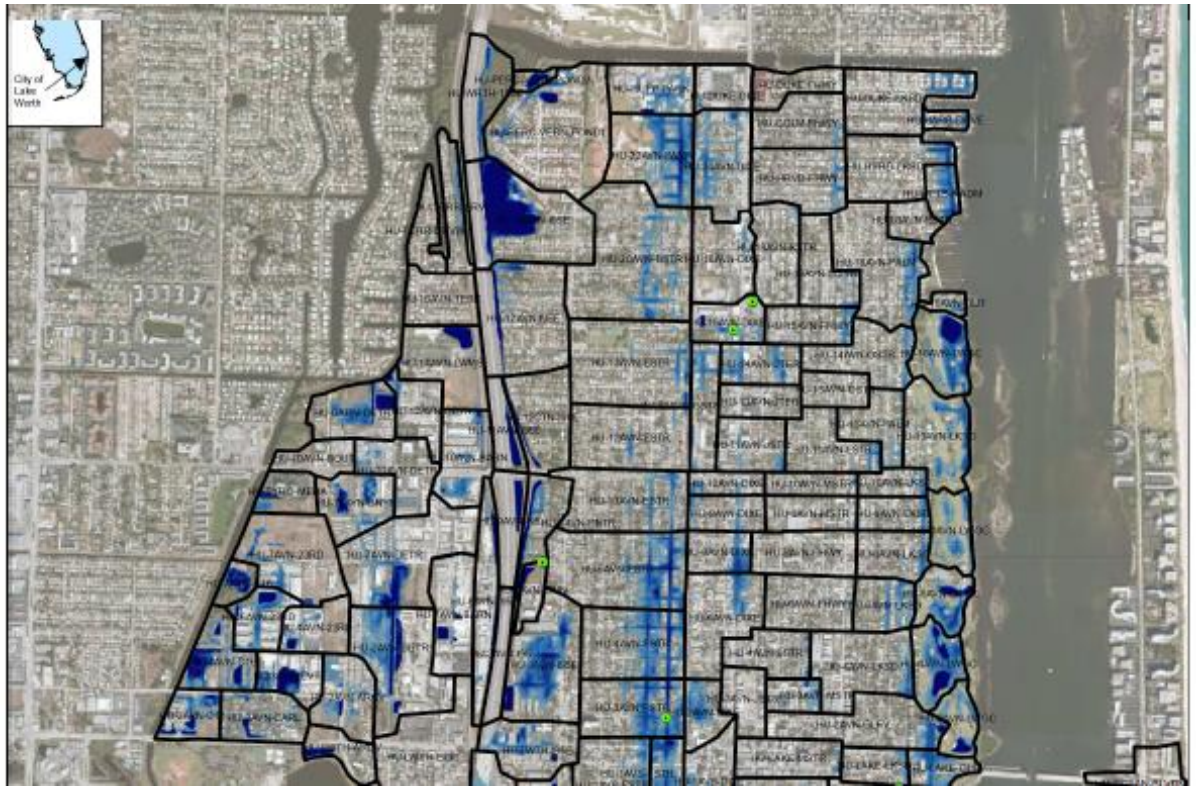


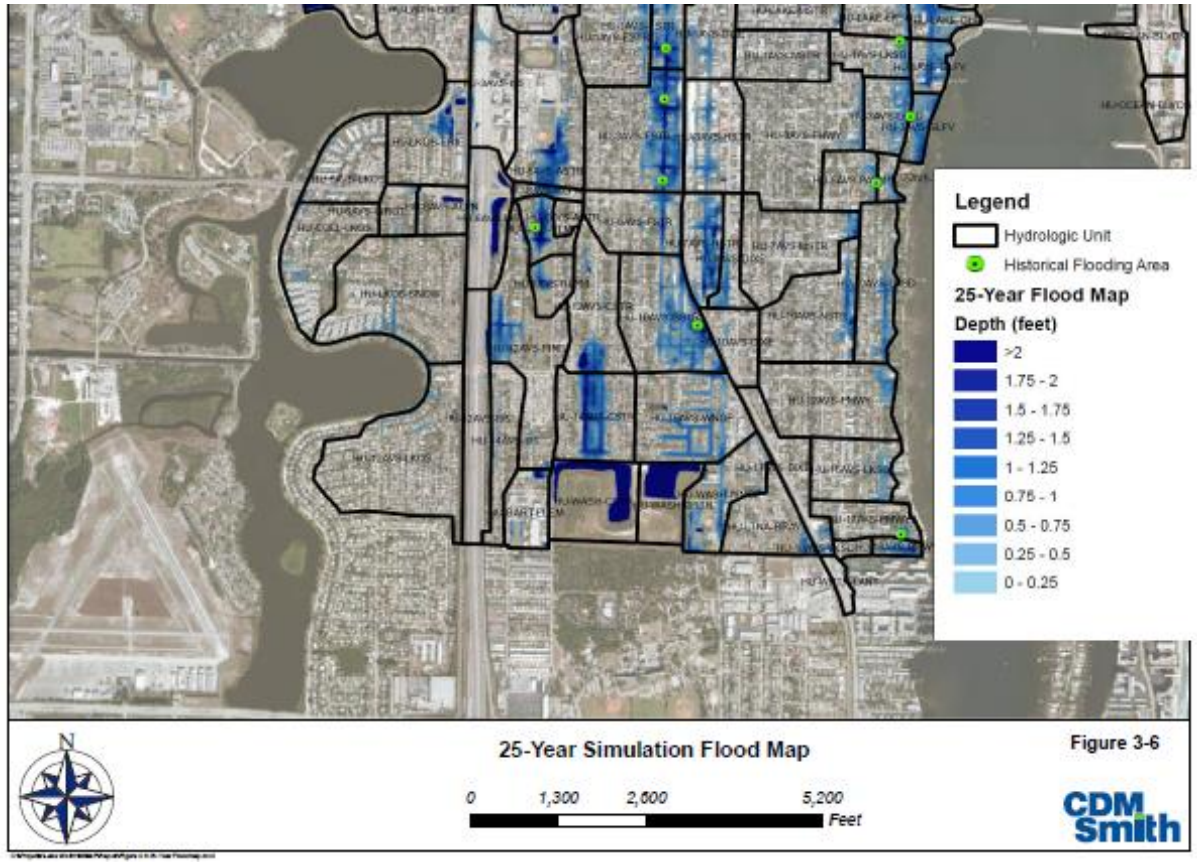


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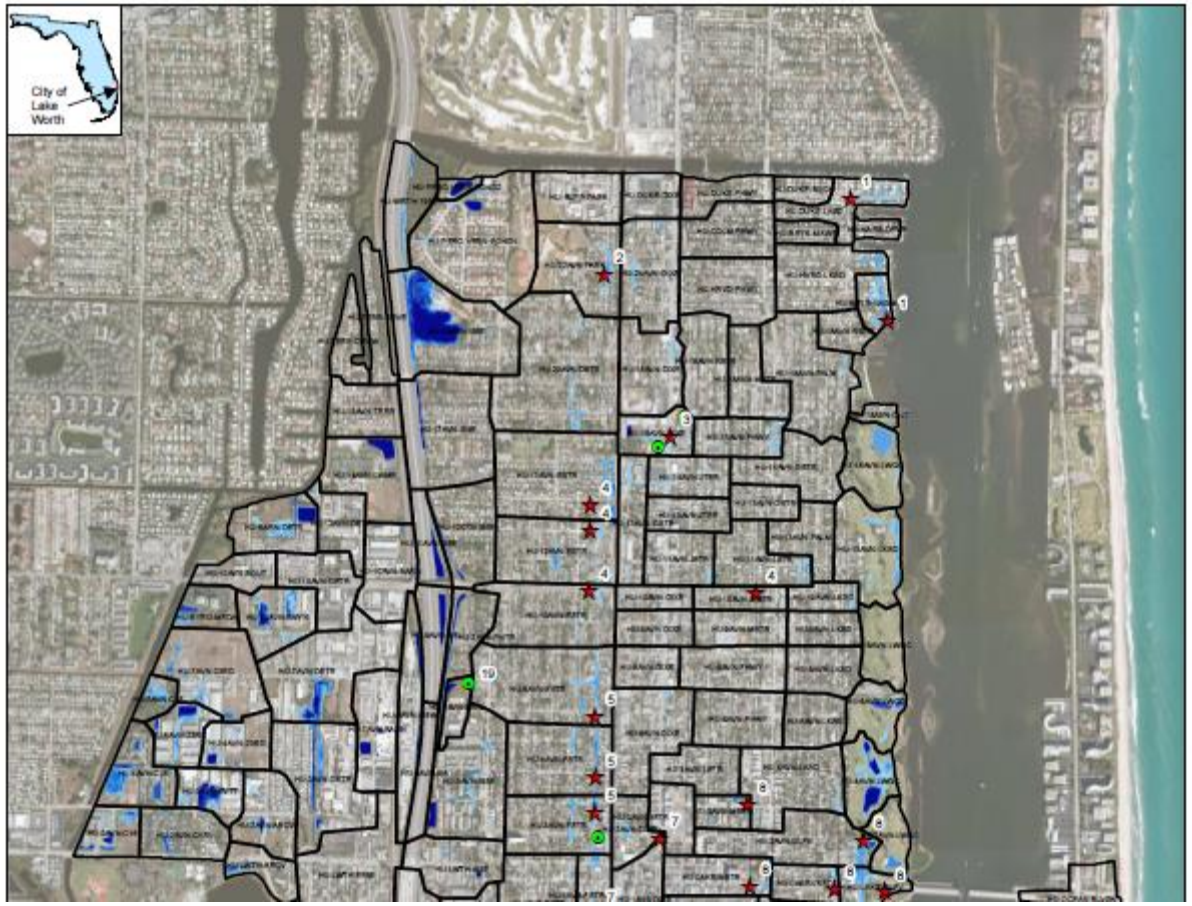


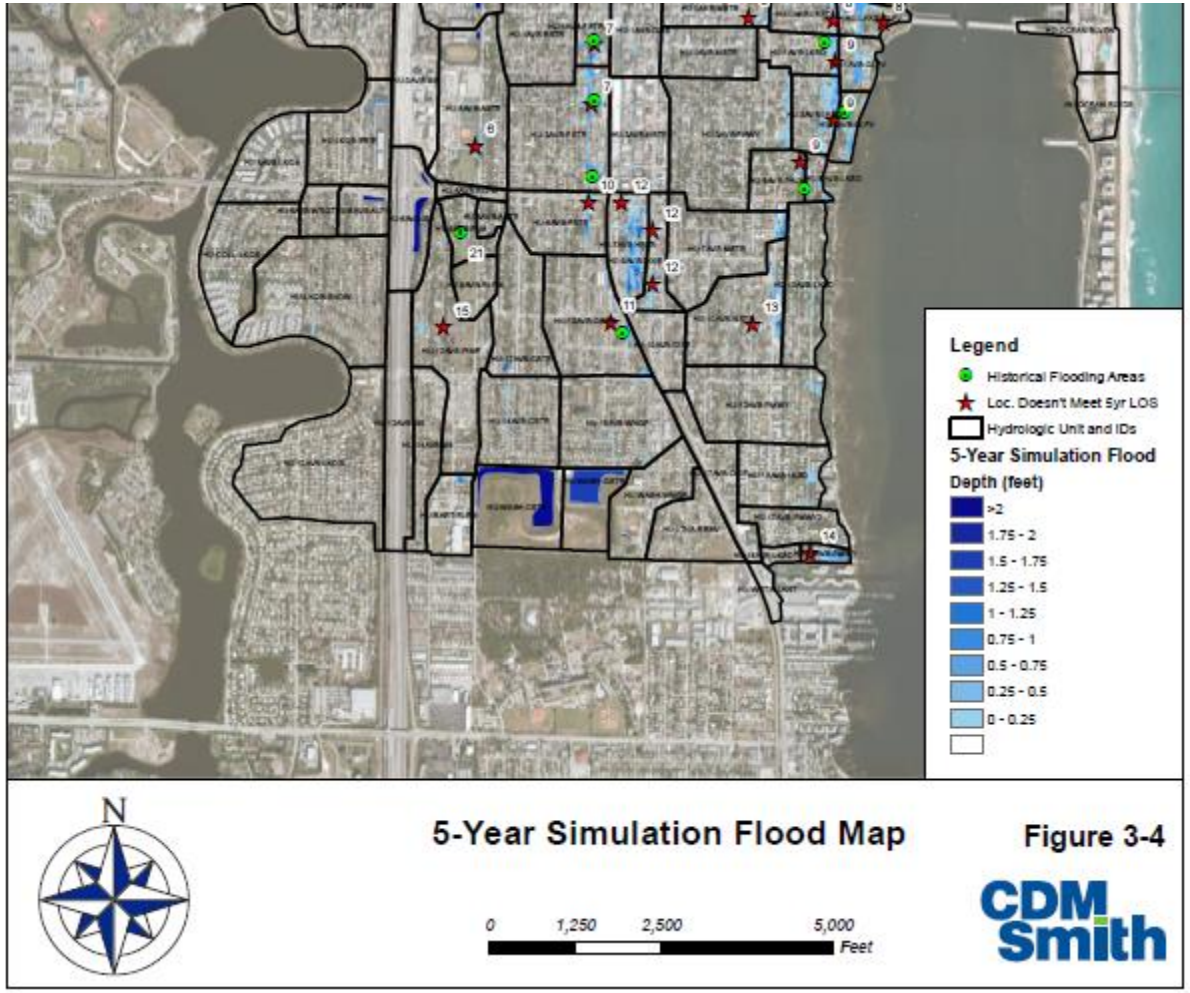


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# Recent Flooding (October 24-25) was a Regional Issue

Simo Volanen stands in knee-deep water after heavy rain flooded the Sea Pines neighborhood in Lantana on Monday. Residents are urged to call the Town of Lantana to report damage. GREG LOVETT/PALM BEACH POST

## Lantana neighborhood that flooded could get aid

**Kimberly Miller**
Palm Beach Post
USA TODAY NETWORK

Palm Beach County officials are hoping there may be some emergency money available to help a Lantana neighborhood that found itself underwater after a weeklong deluge.

A rain gauge near the Sea Pines community east of Interstate 95 and north of Hypoluxo Road measured 9.86 inches in the week that ended Sunday, as tropical moisture was pushed into South Florida by the system that became Hurricane Zeta.

Palm Beach County Emergency Management Director Bill Johnson said the community might be eligible for disaster money and urged residents to call the Town of Lantana to report damage at 561-540-5775.

The rain gauge at Palm Beach International Airport measured 6.5 inches in the week that ended Sunday. The gauge about a mile northeast of the Sea Pines community is monitored by the Southeast Regional Climate Center.

Johnson said the Boynton Lakes community in Boynton Beach also may be eligible and that he is collecting damage information from both municipalities.

"I would encourage anyone to notify their flood insurance folks also," Johnson said. "Some of those people in Sea Pines are stranded. Their home may be fine, but their truck or car is sitting in their driveway and they would have to wade through water to get out of the area."

The county sent pumps into Sea Pines to remove the water. Lantana Town Manager Deborah Manzo said more than 1 million gallons of water was pumped out of the community overnight Sunday.

Johnson said it didn't appear that there was a problem with clogged drains, which had been cleared the week before.

"I was told it wasn't because there was junk sitting in the drainage system," he said. "I think it's just a matter of complete saturation."

In a statement to WPTV-Channel 5, Manzo said the town and county's drainage systems were functioning properly.

The National Weather Service in Miami had predicted a rainy week after a low pressure system stalled south of Cuba. The system became Hurricane Zeta on Monday and is forecast to reach the Gulf Coast between western Louisiana and the west end of Florida's Panhandle mid-week.

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*@Kmillerweather*

NEWS

## Days of heavy rain flood Boynton Beach neighborhood

October 23, 2020 at 7:10 PM EDT - Updated October 23 at 7

After several days of rain in Palm Beach Co

There was sunshine after the rain Friday at flooding along Southwest Fourth Avenue.

## Flooded Fort Lauderdale hit with 30% of annual rainfall in just one week

Several areas in Broward under water

**FORT LAUDERDALE, Fla.** – Streets are looking more like lakes in many areas of Broward County, making it hard for people to get into and out of their homes.

To give some perspective, officials with the City of Fort Lauderdale say 30% of the annual rainfall they were expecting in 2020 came down within the past week.

BROWARD COUNTY

## Stormy Weekend Leaves Many Parts of Broward County Flooded

Published October 25, 2020 • Updated on October 26, 2020 at 5:27 am


6's Laura Rodriguez shows us how some residents plan on drying out with the watch going until Monday night.

er a wet 48 hours, nearly all of Broward County is dealing with flooding, leaving many in the a to deal with the stormy aftermath.

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# Assets – What will we analyze?

| Asset Type | Primary Asset Categories | Asset Category Description |
|---|---|---|
| Critical Facilities | Public Safety | Emergency services including police and fire |
| | Food, Water, Shelter | Food distribution centers, SNAP retailers, shelters |
| | Health and Medical | Hospitals, clinics, extended care facilities, pharmacies |
| | Energy and Communications | Electrical utilities, substations, radio/cell tower properties |
| | Government Facilities | Schools (public and private), City/County buildings, and any other government-owned property (federal, state, municipal) |
| Water Infrastructure | Stormwater | Stormwater lines, BMPs, structures |
| | Wastewater | Wastewater lines, treatment plants, structures, lift stations |
| | Potable Water Supply | Water supply, lines, structures, treatment plants |
| Economic | Annual Sales Volume | Annual sales for businesses |
| | Jobs/Employees | Number of employees for business locations |
| Natural Resources | Beaches & Coastal Areas | Beaches or natural coastal property |
| | Natural Areas and Parks | Parks, greenways, waterbodies |
| People | Population/Social Vulnerability | Socioeconomics with a focus on sensitive or socially vulnerable populations, seasonal populations |
| Property | Commercial & Industrial Property | Retail, offices, industrial or manufacturing, |
| | Cultural Property | Religious or cultural property, landmarks, historical properties |
| | Residential Property | Any multi or single residence, group homes, public housing, apartments and condos |
| Transportation & Mobility | Roads & Transportation Systems | All major and minor roads, transportation facilities |

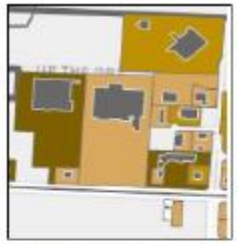
# CCVA – Next Steps

<u>Investigate Potential Mitigation Strategies</u>:

- Infrastructure Recommendations
- Policy Recommendations

<u>Reporting and Tool Development</u>:

- AccelAdapt

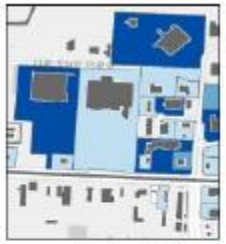


**Potential Impact**

High (dark tan): business structure exposed
Med: storage structure exposed
Low (light tan): only land inundated

**Adaptive Capacity**

Low (dark green): exposed structure built before BFE requirement
Med: exposed structure at BFE
High (light green): exposed structure built 1-2ft above BFE

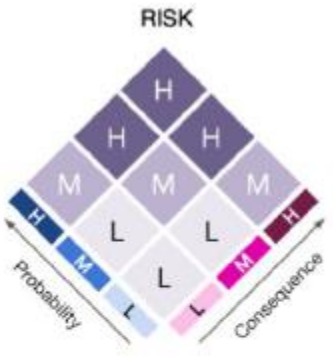


**Probability**

High (dark blue): in 10-yr inundation extent
Med: In 100-yr inundation extent
Low (light blue): in 500-yr inundation extent

**Consequence**

High (dark purple): exposed structure > median value
Med: exposed structure < median value
Low (light purple): no exposed structure

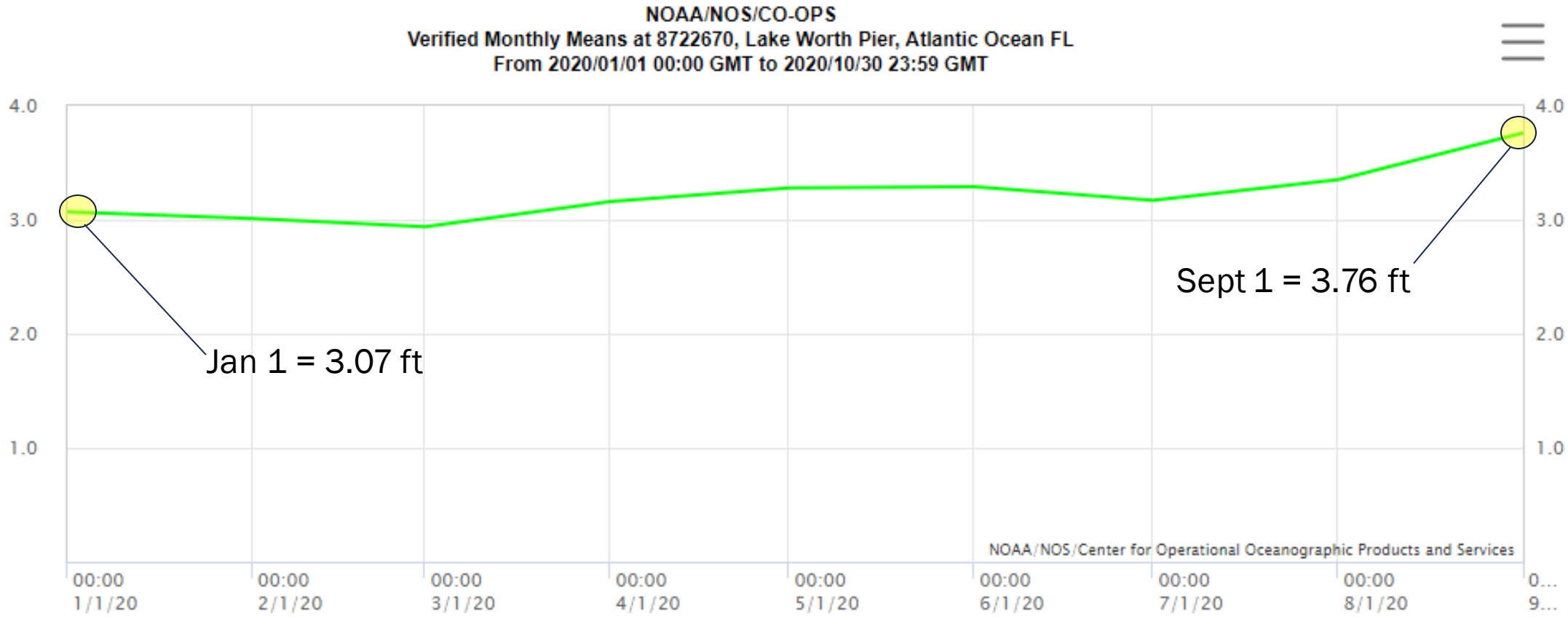

**Vulnerability**

**Risk Scoping**

## October 2020 Flooding

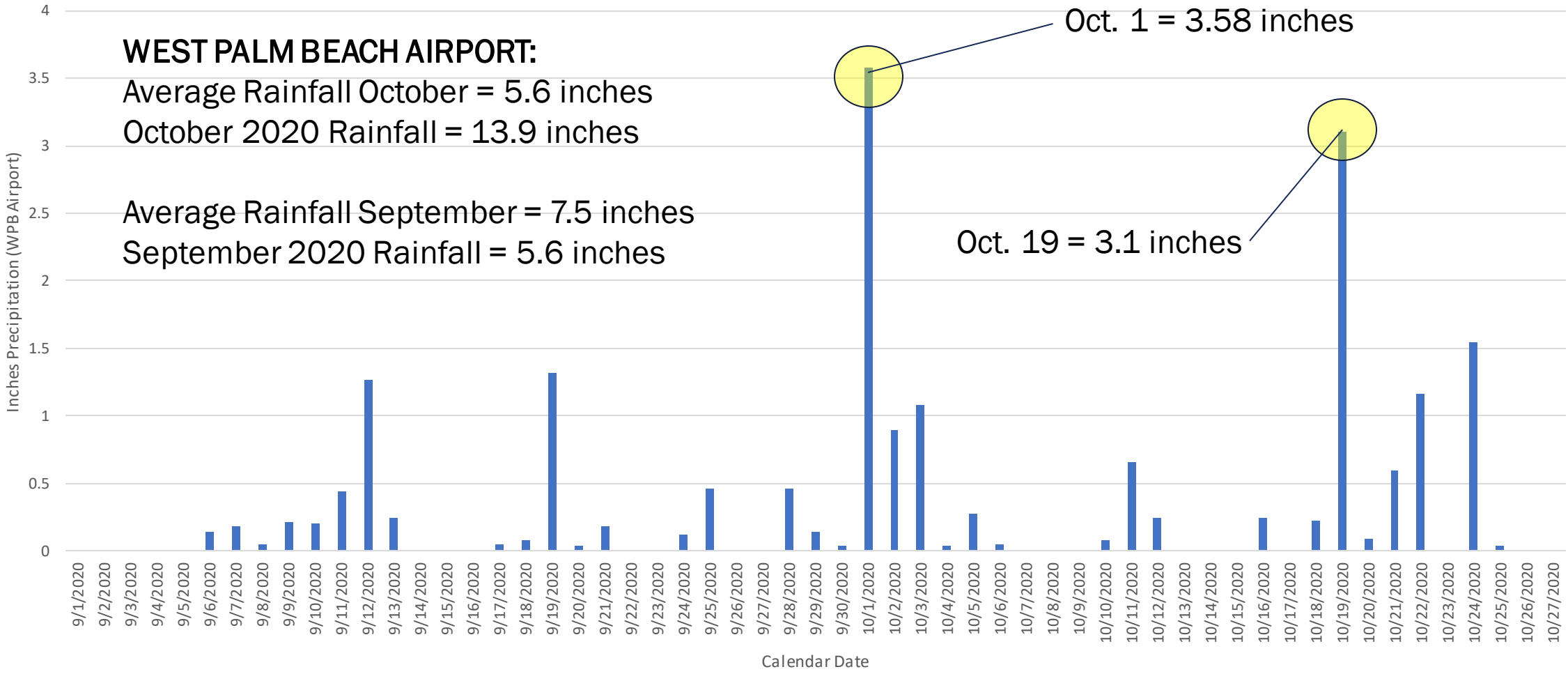
1. Tidal Conditions
2. Antecedent Conditions
3. Weekend Rainfall

# NOAA Tide Gage Data
# Lake Worth Pier

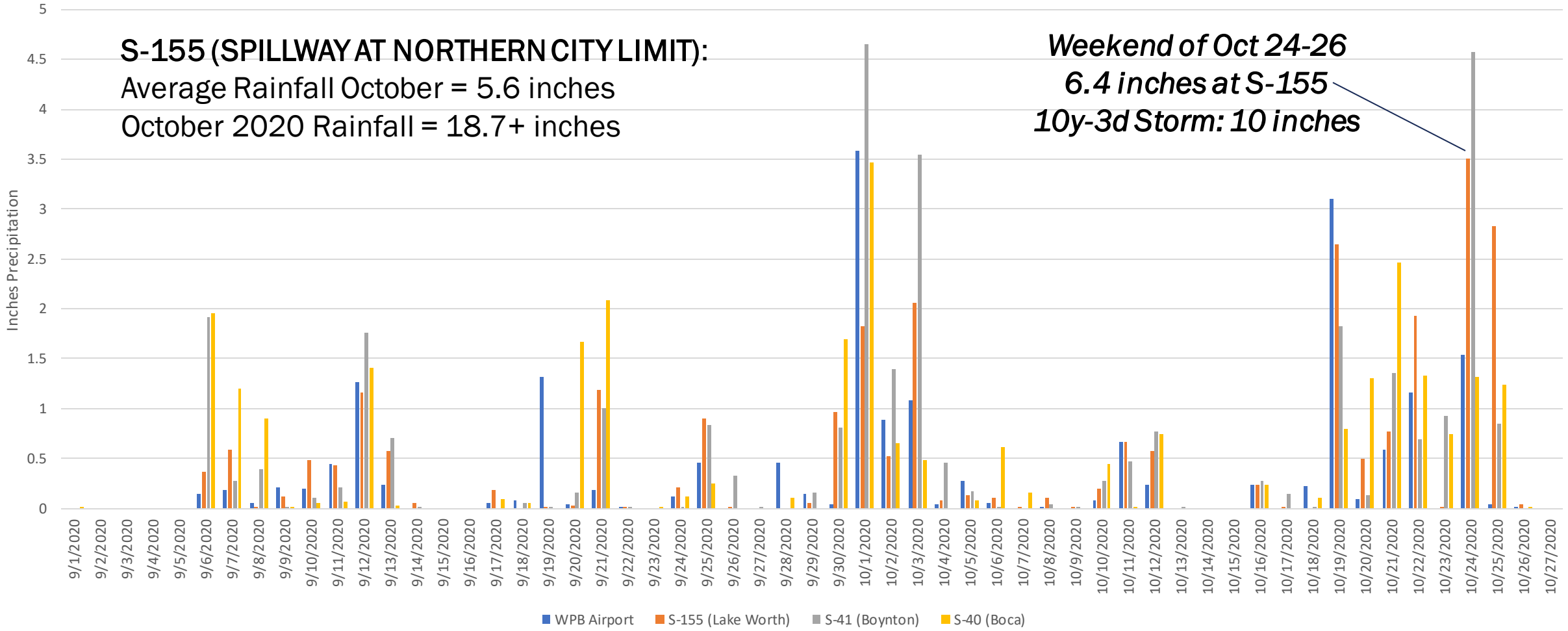



Seasonal increases in tides diminish the capacity to discharge runoff by gravity

# Antecedent Conditions Daily Precipitation September-October 2020



# Daily Precipitation at S-155 / S-40 / S-41 September-October 2020



# Higher Tides + Higher Rainfall = Flooding in Low Lying Areas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# QUESTIONS