

# Retrofits for Resiliency

**Nicholas Muzia, P.E.**

Infrastructure Maintenance Manager  
Stormwater Engineer  
Martin County Public Works Department



**Richard Neal**

Southeast Regional Manager  
WAPRO Inc

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- B.S. Ocean Engineering from Florida Atlantic University 2009
- Manage stormwater and roadway infrastructure for Martin County
- Not a big fan of tidal flooding

## Why is it Important?

Resilient Florida Grant Program

Section 380.093 F.S.

Statewide Flooding and Sea Level Rise  
Resilience

SB 1954 Effective May 2021

HB 7053 Effective July 2022

Damages Infrastructure &

looks bad on the news

## Where can I get information on projections?

### The Intergovernmental Panel on Climate Change (IPCC)

- ▶ United Nations Program
- ▶ Provides Governments with scientific information to develop climate policies
- ▶ regular assessment based on Temperature

### National Oceanic and Atmospheric Administration (NOAA)

- ▶ US Government Agency Collaboration
- ▶ Mapping tools and detailed reports
- ▶ regular assessment more local driven

### Local Climate & Resiliency Compacts

- ▶ Regional Approach and preparedness

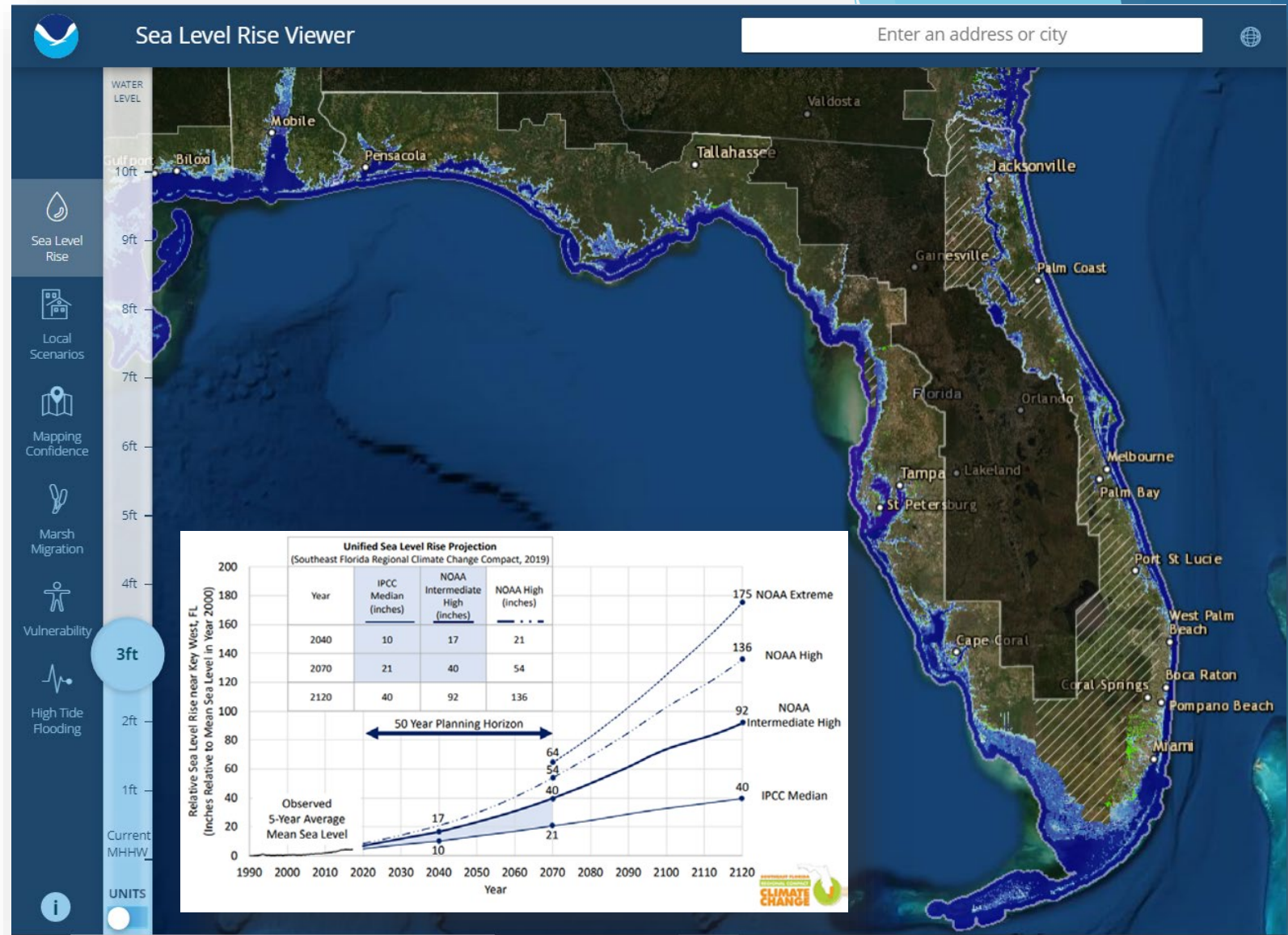


## Tools

### ➤ NOAA Sea Level Rise Viewer

- Simple to Use
- Plot Maps
- Communication Tool

<https://coast.noaa.gov/slr>



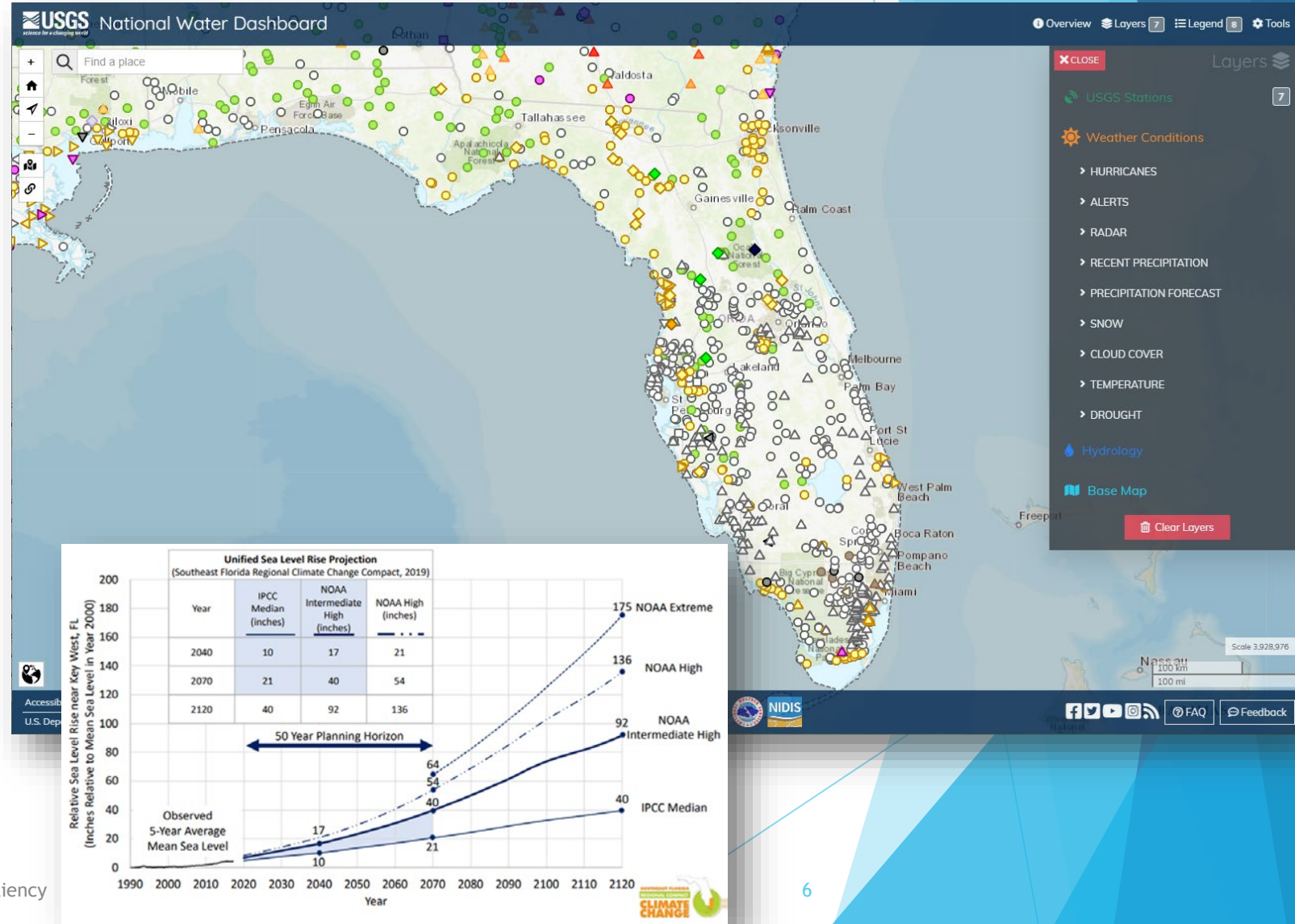
# Tools

## ➤ USGS Water Data Dashboard

- Lots of Data!
- What you are looking for
- Engineering sources

<https://dashboard.waterdata.usgs.gov>

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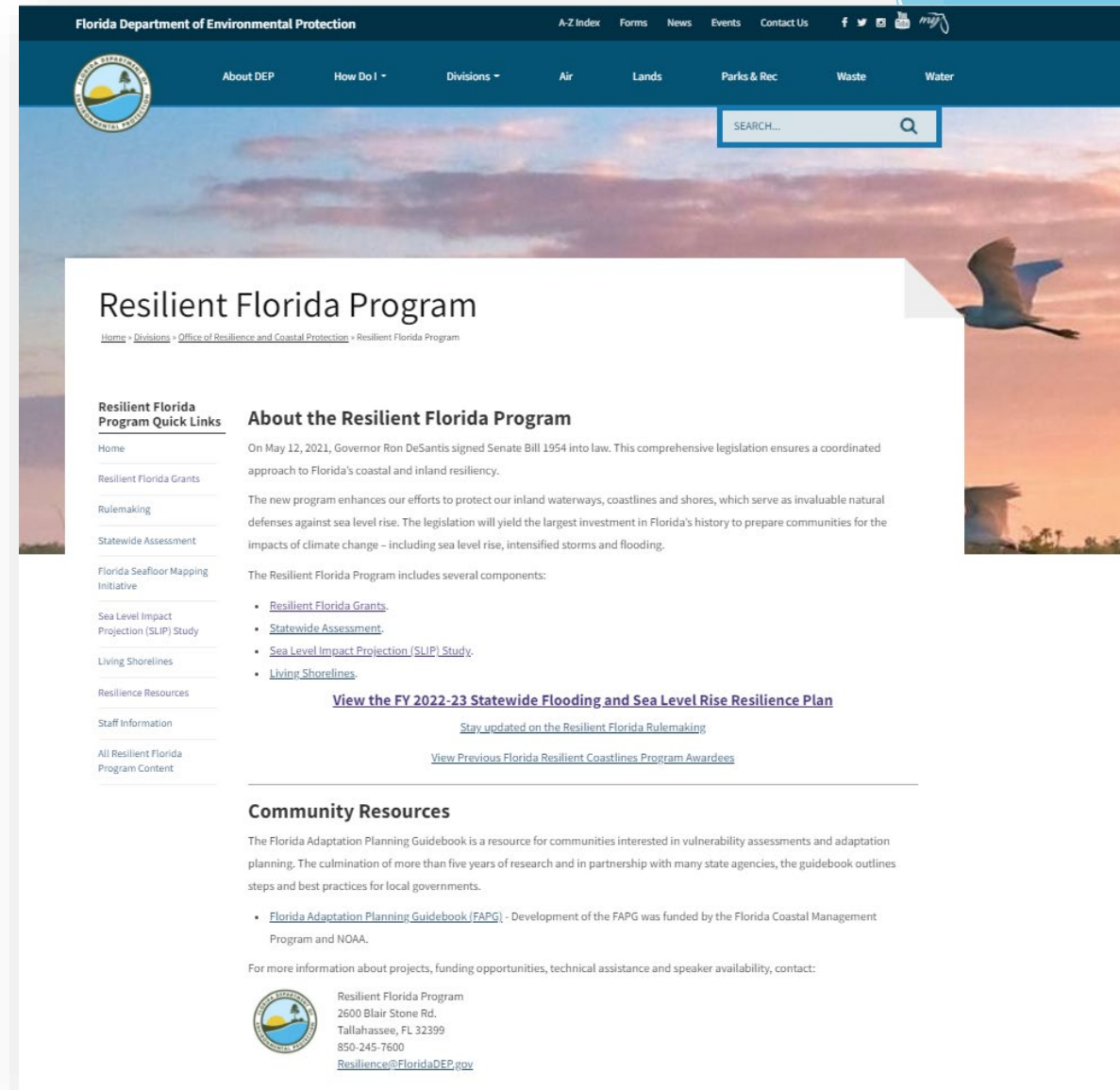


# Tools

## ➤ Resilient Florida website

- Must see resource for resiliency (FL)
- Information links
- Grant Funding Opportunities

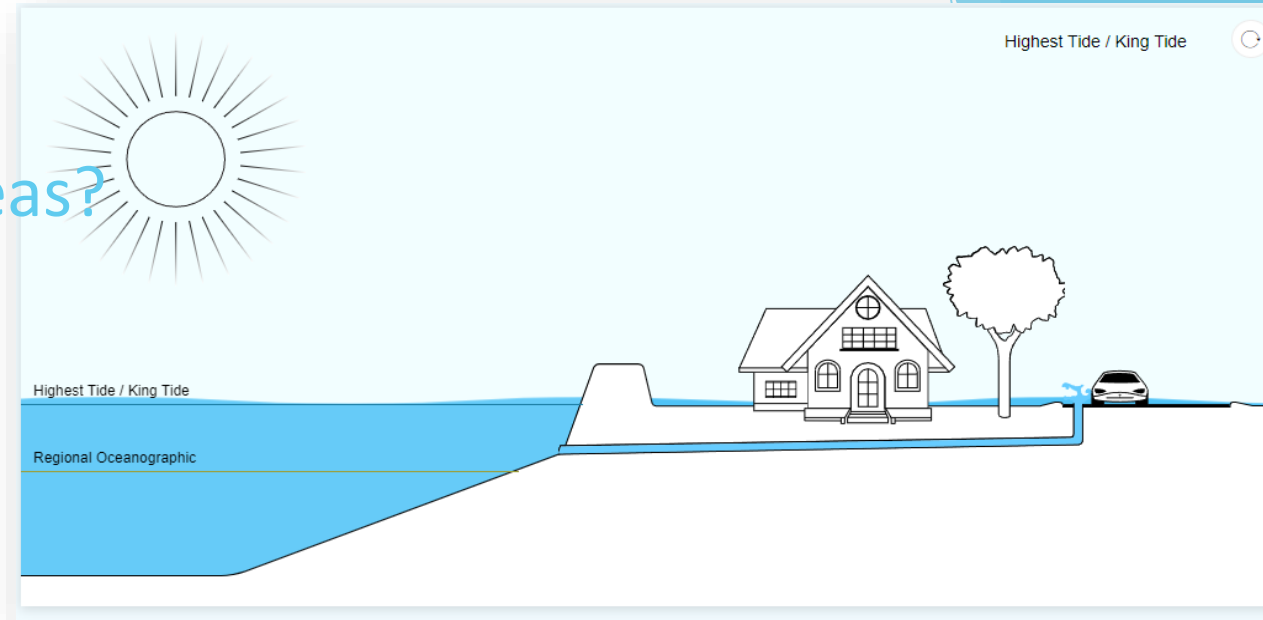
<https://floridadep.gov/ResilientFlorida>



The screenshot shows the Florida Department of Environmental Protection (DEP) website. The header includes the DEP logo, navigation links (About DEP, How Do I, Divisions, Air, Lands, Parks & Rec, Waste, Water), and a search bar. The main content area is titled "Resilient Florida Program" and features a sidebar with "Resilient Florida Program Quick Links" (Home, Resilient Florida Grants, Rulemaking, Statewide Assessment, Florida Seafloor Mapping Initiative, Sea Level Impact Projection (SLIP) Study, Living Shorelines, Resilience Resources, Staff Information, All Resilient Florida Program Content). The main text includes "About the Resilient Florida Program" with a date (May 12, 2021) and a description of the program's goals. It lists several components: Resilient Florida Grants, Statewide Assessment, Sea Level Impact Projection (SLIP) Study, and Living Shorelines. There are also links to "View the FY 2022-23 Statewide Flooding and Sea Level Rise Resilience Plan", "Stay updated on the Resilient Florida Rulemaking", and "View Previous Florida Resilient Coastlines Program Awardees". A "Community Resources" section mentions the Florida Adaptation Planning Guidebook (FAPG). Contact information for the Resilient Florida Program is provided at the bottom, including the address (2600 Blair Stone Rd., Tallahassee, FL 32399), phone number (850-245-7600), and email (Resilience@FloridaDEP.gov).



# How does SLR affect Stormwater Treatment Areas?



- Flooding
- Increased Salinity
- Decreases storage volume
- Increases tail water condition



## Know the indicators

- ▶ Conductivity in Water
- ▶ Determine the Salinity

### Wetland Typically

< 1000 micromhos/cm

or

0-1 part per thousand  
(PPT)





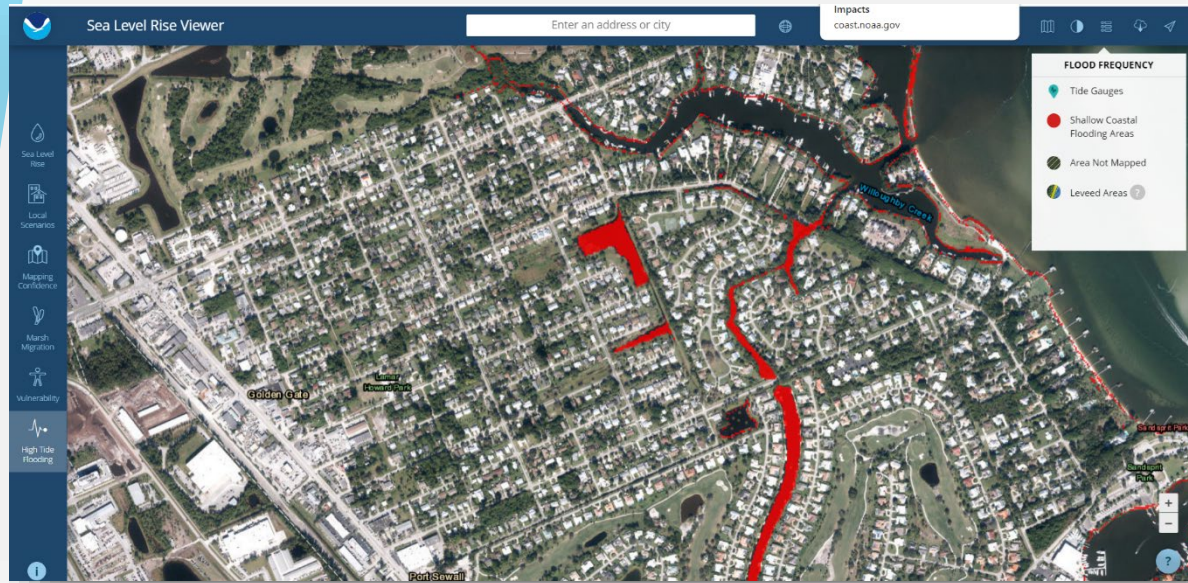
## Know the indicators

- ▶ Is the water going backwards?
- ▶ It is not always obvious... Go check.

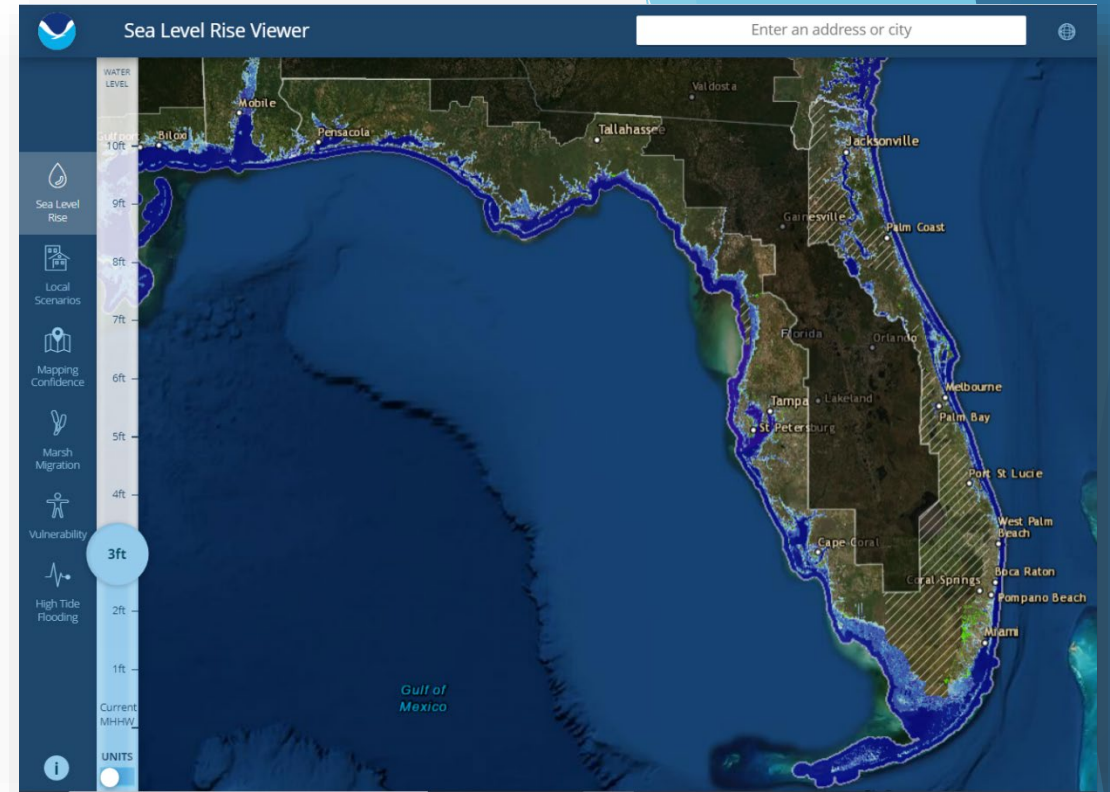


# Know the indicators

- ▶ Elevation Rules!
- ▶ Utilize the tools
- ▶ Utilize Control elevations & Record Drawings



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NOAA Sea Level Rise Viewer  
<https://coast.noaa.gov/slr>

USGS Water Data Dashboard  
<https://dashboard.waterdata.usgs.gov>



# Planning

Resilient Florida Grant Program  
Section 380.093(1)(a) F.S.

## Vulnerability Analysis & Mapping

- Looking at USGS or NOAA water elevation gauges in your area
- Utilize Asset elevations



# Now we have problems... Need Solutions

What tools are available?



- Modelling and Retrofitting processes
- Control Structures & Weirs
- Elevating Structures
- Nature Based Solutions
- Check Valves



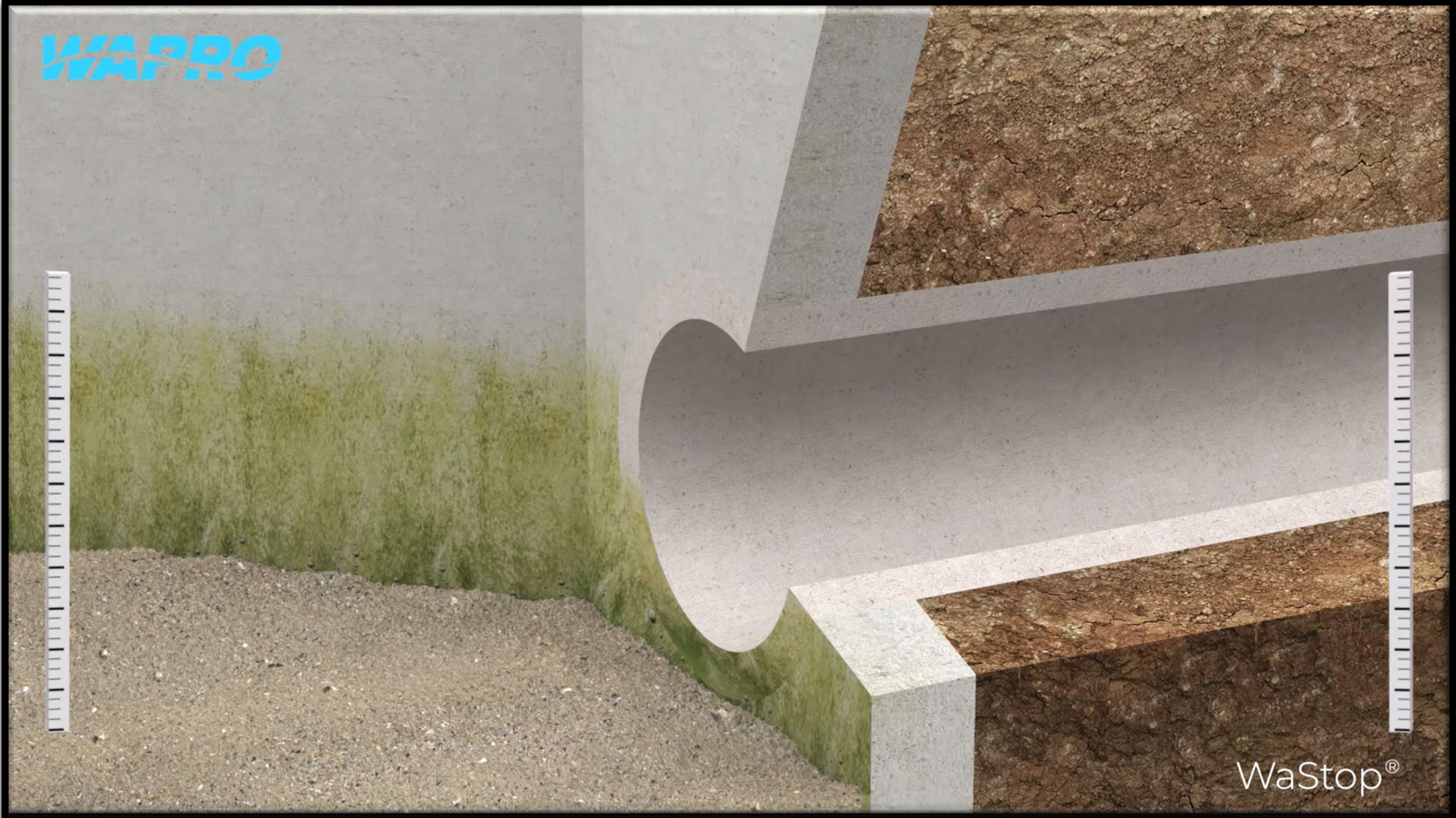
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South East Regional Manager  
WAPRO Inc

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# Field Conditions that Require a Backflow Prevention Valve

How does the inline stormwater check valve function?





# Wapro Provides Field Service and Design Assistance



- Initial meeting to discuss the project application
- Valve placement
- Pipe size and material
- Headwall mounting
- Mounting tabs or flanged connection







## Meet With Design Engineer to Determine the Following

- Location and hydraulics
- What is the host pipe material
- What are the flow requirements
- Physical limitations in mounting
- Who will install
- Manatee guard required on seawall

## Final Review



- Application Reviewed and Completed
- Budget Estimate Accepted
- Drawings and Flow Chart Approved
- Specifications Finalized



# Retrofits for Resiliency

## Key Components for success

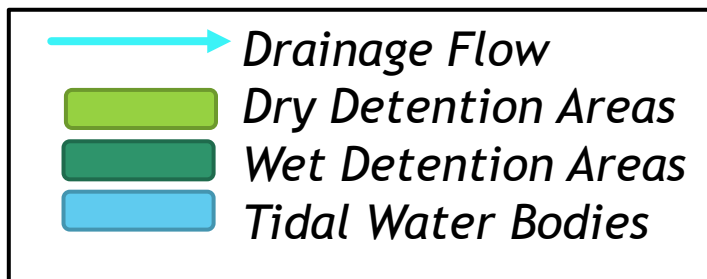
- Often multi-disciplinary
- Communicate sunny day flooding
- Cost benefit for lost flood control storage
- Environmental improvements within your resiliency retrofit project





# Golden Gate Resilient Outfall Project

- 6.8 Acres of wet ponds @ 0.5 Control EL
- 3 areas all hydraulically connected
- Plant Die offs and pour water quality
- Monitored salinity up to 8 ppt



*\*All Elevations NAVD 88*

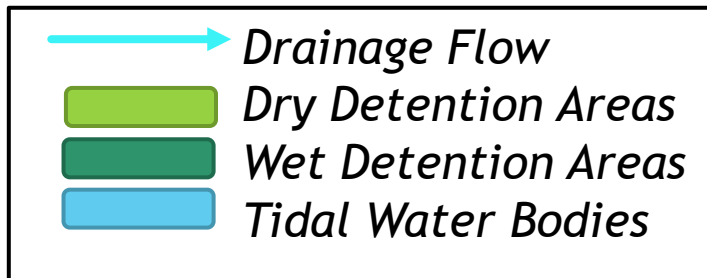
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# Golden Gate Resilient Outfall Project

- 2018 modelled increased storage with check valve bleeder to 0.5
- Estimated 11.5 Acre feet of storage lost to storm surge from Hurricane Dorian in 2019
- Installed South outfall check valve in 2020



*\*All Elevations NAVD 88*

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# Golden Gate Resilient Outfall Project

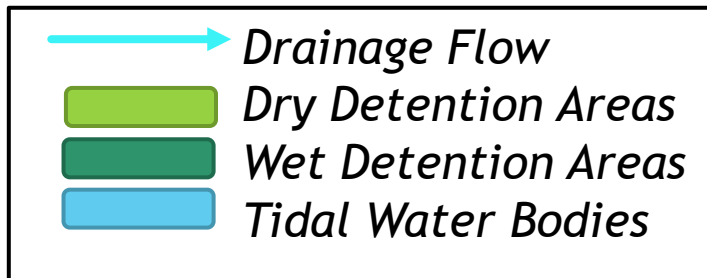
- 48 inch diameter Check Valve
- Headwall Installation & Channel enhancement





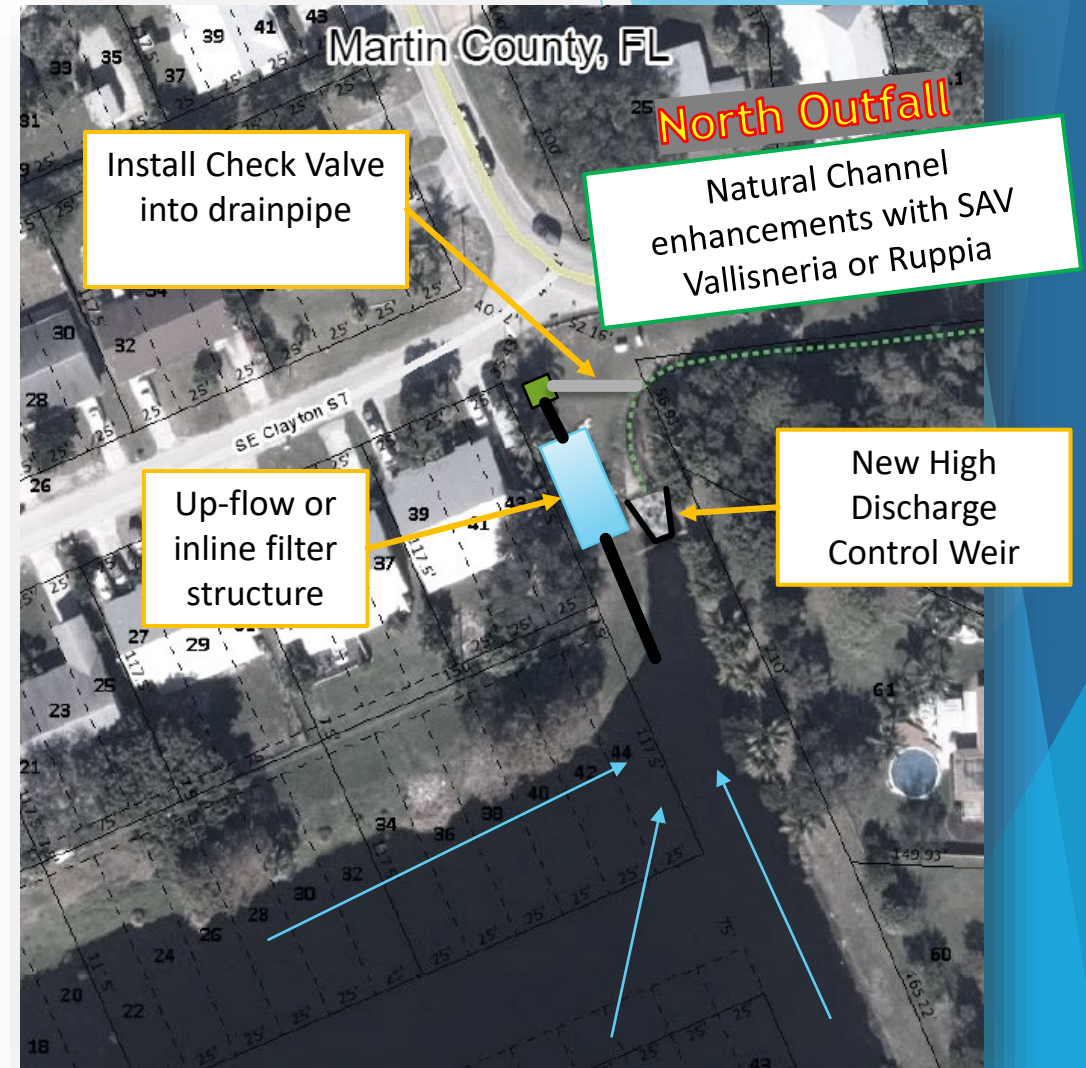
# Golden Gate Resilient Outfall Project

- North Outfall part of the Statewide Flooding and Sea Level Rise Resilience Plan
- Project goals include
  - Flood prevention
  - Water quality
  - Habitat restoration
  - Nature based solutions



# Golden Gate Resilient Outfall Project

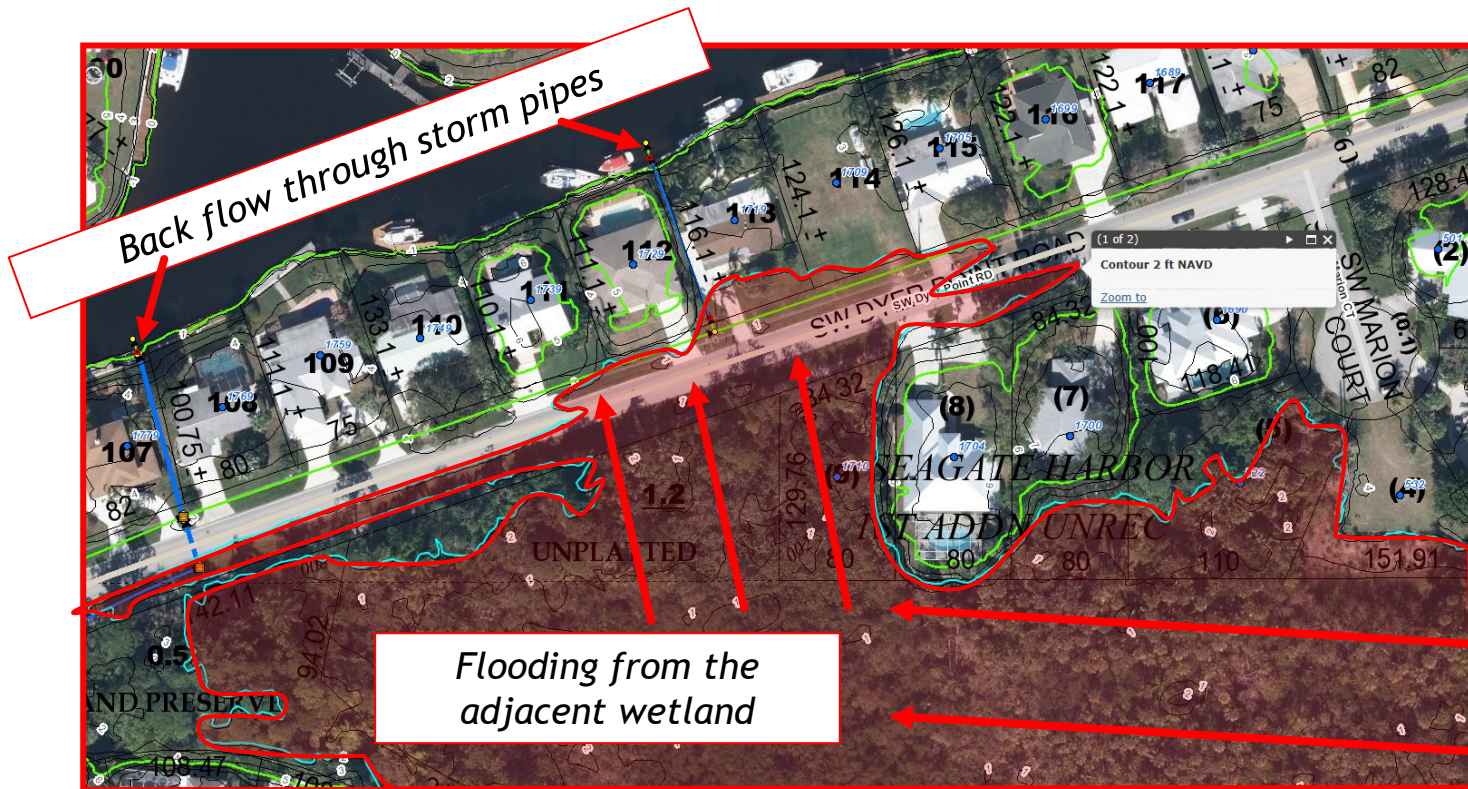
- North Outfall part of the Statewide Flooding and Sea Level Rise Resilience Plan
- Components:
  - ✓ **High discharge weir design**
  - ✓ **Increased storage and filtration**
  - ✓ **Protection against salinity impacts**
  - ✓ **Nature based solutions SAV planting downstream to Indian River Lagoon**





# Dyer Point Road Resiliency Project

- Multi-phase project
- Utilized Check (3) Check Valves
- Road Elevation 0.5
- Elevated sidewalk on south side





## Dyer Point Road Resiliency Project

- Initially installed the check valves & elevated sidewalk to 1.5

But the road still flooded...

- Then elevated sidewalk to 3.0 and added Type F Curb



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## Recap

How are stormwater facilities impacted?

Where to look for less obvious impacts?

What tools are available to help Stormwater managers?

Why should you be thinking about resiliency for your next retrofit?

Any Questions?