

City of Satellite Beach (FL) Vulnerability to Rising Seas: Assessment and Management Implications

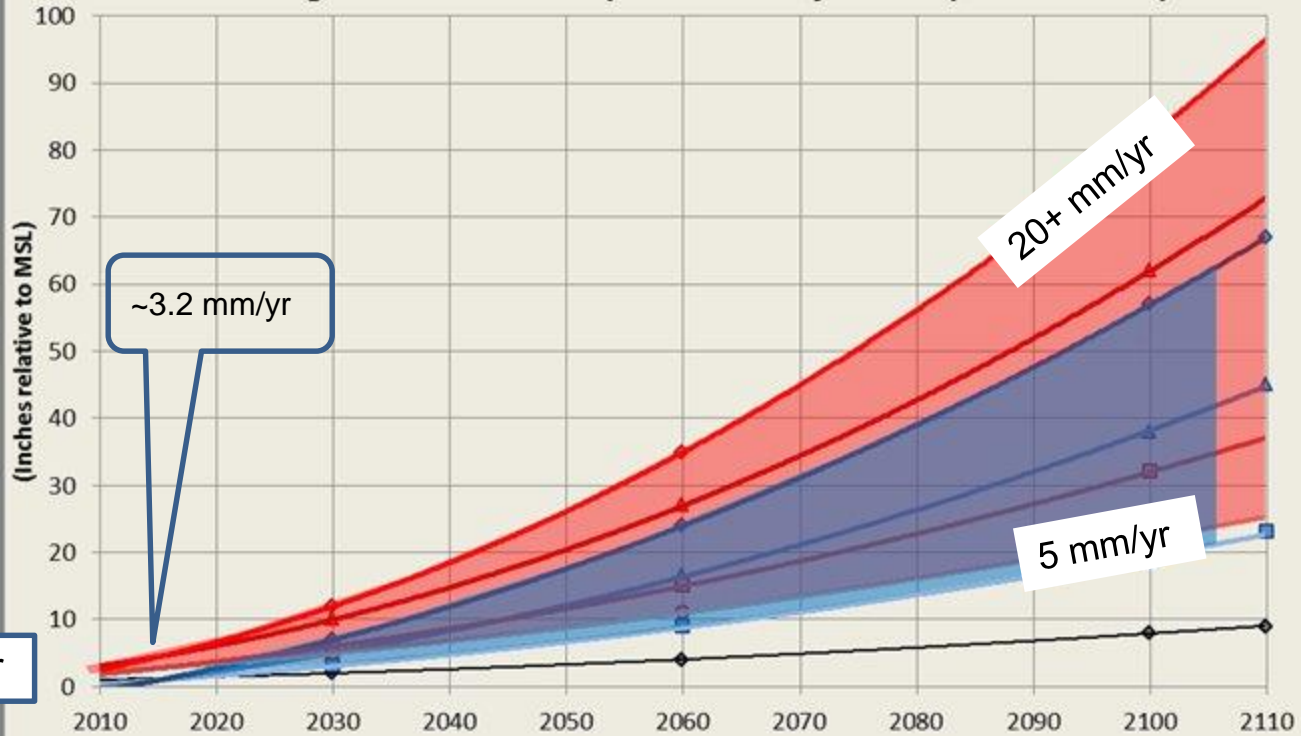
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Western edge of the City of Satellite Beach is only a few feet above water

SE FL Regional Climate Compact - SLR Projections (2011 vs 2015)



<1 mm/yr

~3.2 mm/yr

20+ mm/yr

5 mm/yr

- ◆ Historic
- ◆ 2011 Low
- ▲ 2011 Medium
- ◆ 2011 High
- 2015 NOAA Low
- 2015 IPCC Median
- ▲ 2015 USACE High
- ◆ 2015 NOAA High
- Historic Trendline
- 2011 Low Trendline
- 2011 Medium Trendline
- 2011 High Trendline
- 2015 Low Trendline
- 2015 Medium Trendline
- 2015 USACE High Trend
- 2015 NOAA High Trend



Tamarac

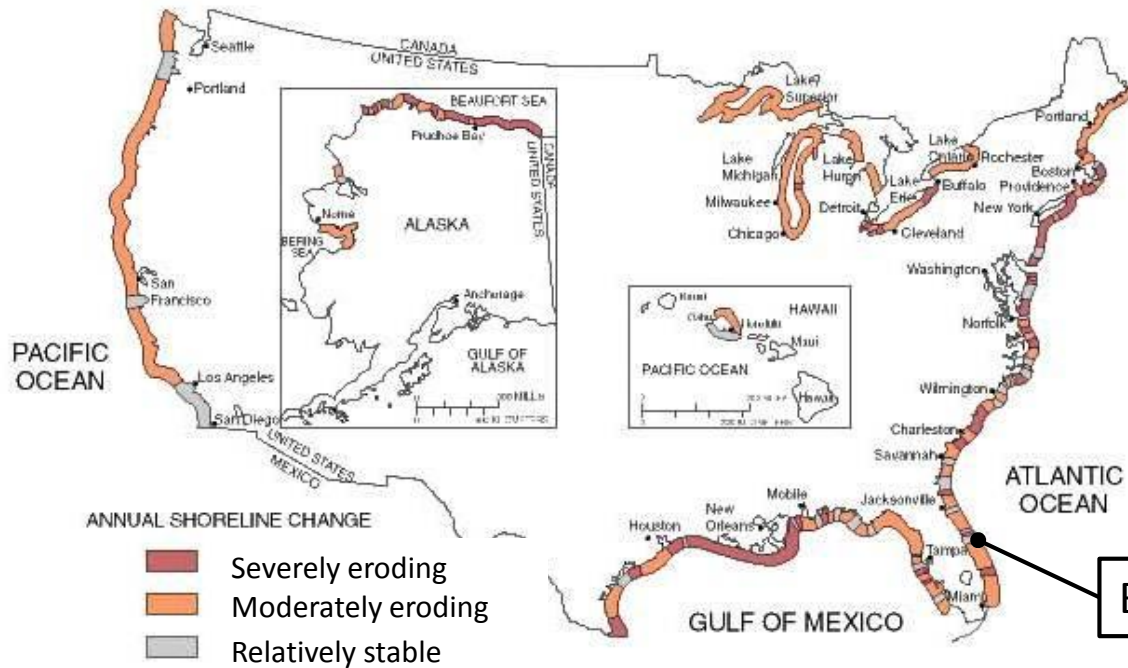


Miami Beach



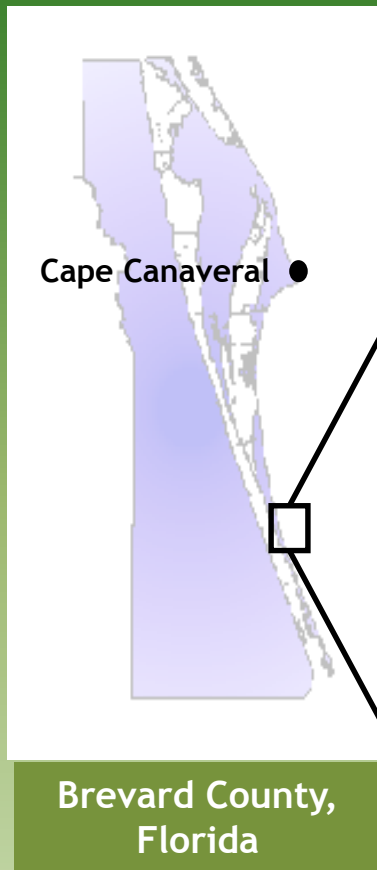
Ft. Lauderdale

Nuisance *flooding* in South Florida during September 2015 'supermoon' event



All 30 coastal states have experienced moderate to severe *erosion* during the last century.

City of Satellite Beach, Florida



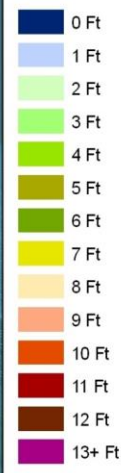
Width of photo is 2.5 km or 1.5 miles

Highway A1A

Atlantic Ocean

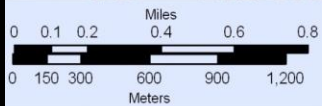
Grand Canal

Elevation

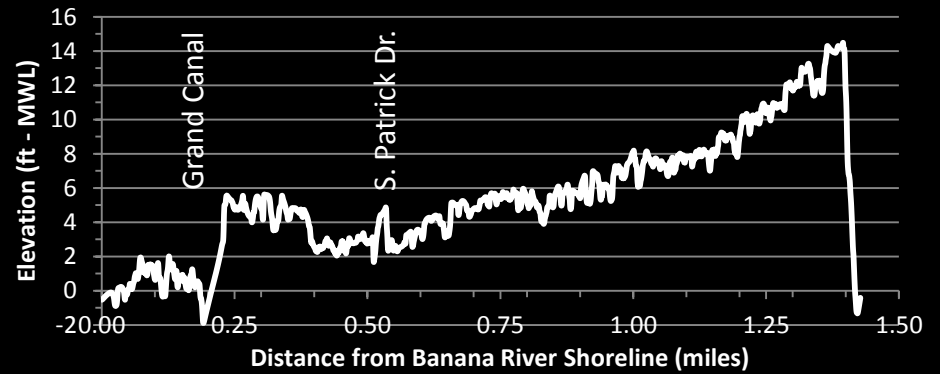


Banana River

South Patrick Dr



Topographic Profile from Banana River to Atlantic Ocean



Barrier Island Elevation (Topography)

City limit



Miles 0 0.1 0.2 0.4

5% of the City is flooded by a 2 ft rise in sea level.

Atlantic Ocean



City limit



Miles 0 0.1 0.2 0.4

25% of the City is flooded by a 4 ft rise in sea level.

Atlantic Ocean



City limit



Miles 0 0.1 0.2 0.4

50% of the City is flooded by a 6 ft rise in sea level.

Atlantic Ocean



How Should Coastal Municipalities Like the City of Satellite Beach Respond to Sea Level Rise?

- There are four adaptation options to address sea level rise:
 - (1) Do Nothing
 - (2) Protect and Defend
 - (3) Accommodate
 - (4) Strategic Withdrawal
- Selecting an option(s) will be based upon some sort of cost-benefit analysis comparing:
 - Threatened asset value
 - Cost of protecting asset
- But realistically, how will decisions like these be made by small coastal municipalities when many have no full time planner on staff?



Based upon our vulnerability analysis, the City of Satellite Beach recommended simple but important changes to their Comprehensive Plan. These changes would provide a *legal* basis for subsequent adaptation action activities.

2010 changes proposed to the City's Comprehensive Plan

Future Land Use

- Policy 1.1.2 - The City shall continue to monitor zoning regulations ~~pertaining to land east of the Coastal Construction Control Line (CCCL)~~ and enact regulations to achieve a balance ~~of~~ among economic feasibility, potential adverse environmental conditions, and ~~limitation of development in the Coastal High Hazard Area (CHHA)~~ sustainability consistent with the character of the City.
- Policy 1.2.9a - Post-disaster redevelopment shall be governed by all applicable codes, city charter provisions and standards, in regards to setbacks, off-street parking, and landscaping; and shall decrease future public and private vulnerability to future storms ~~by complying with applicable state and county construction regulations~~ and sea level rise.



In March 2013, after nearly three years of debate and revision, the City of Satellite Beach approved amendments to the Coastal Management/Conservation element of their Comprehensive Plan.

The focal point of these changes was the establishment of *Adaptation Action Areas (AAAs)*.

AAAs are a state policy tool that allows local governments to plan for sea level rise, designate vulnerable areas, prioritize adaption strategies, and establish policies for the funding of 'at risk' infrastructure and facilities.

What's happened since the 2013 Comp Plan amendments to include AAAs?

In 2014, FDEP awarded a Coastal Partnership Community Resiliency Grant to the East Central Florida Regional Planning Council that was completed in 2015.

Project Goals

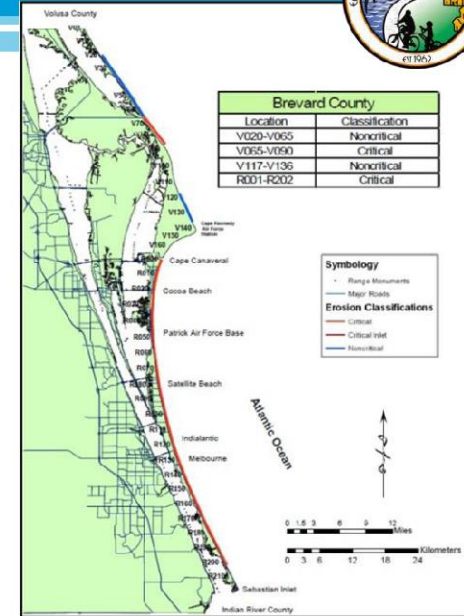
1. Identify *criteria* for the *selection* of vulnerable lands that could be included in an Adaption Action Area (AAA)
2. Recommend AAA policies that could be adapted by the City
3. Engage the public to help set priorities to increase reliance



Vulnerability Assessment

Asset damage or loss from:

- Coastal Erosion
- Storm Surge
- Flooding (FEMA)
- Sea Level Rise



Source: Critical Erosion Report; FDDEP
<http://www.dep.state.fl.us/beaches/publications/pdf/CriticalErosionReport.pdf>



DEP Coastal Partnership Community Resiliency Grant

Goal #1: Identify *criteria* for the *selection* of vulnerable lands that could be included in an Adaption Action Area (AAA)

What criteria should be used to simulate vulnerability to slr?

ECFRPC used USCOE projections at years 2040, 2070, 2100

We used +1 to +6 foot rise with no time frame implied

Other sea level rise projections include:

International: IPCC

National: FEMA, NOAA, National Climate Assessment

Local: SE Florida Regional Climate Compact

Should there be standard criteria for simulating vulnerability to sea level rise?

DEP Coastal Partnership Community Resiliency Grant

Goal #1: Identify *criteria* for the *selection* of vulnerable lands that could be included in an Adaption Action Area (AAA)

What criteria should be used to select a vertical datum?

ECFRPC adjusted NAVD 88 to MHHW of the Atlantic Ocean for the Atlantic coast and MAHW of the Banana River for the lagoon coast

We used MWL of Banana River for the entire study area

Should there be a standard method for selecting an adjusted vertical datum?

DEP Coastal Partnership Community Resiliency Grant

Goal #3. Engage the public to help set priorities increase reliance

Resident priorities:

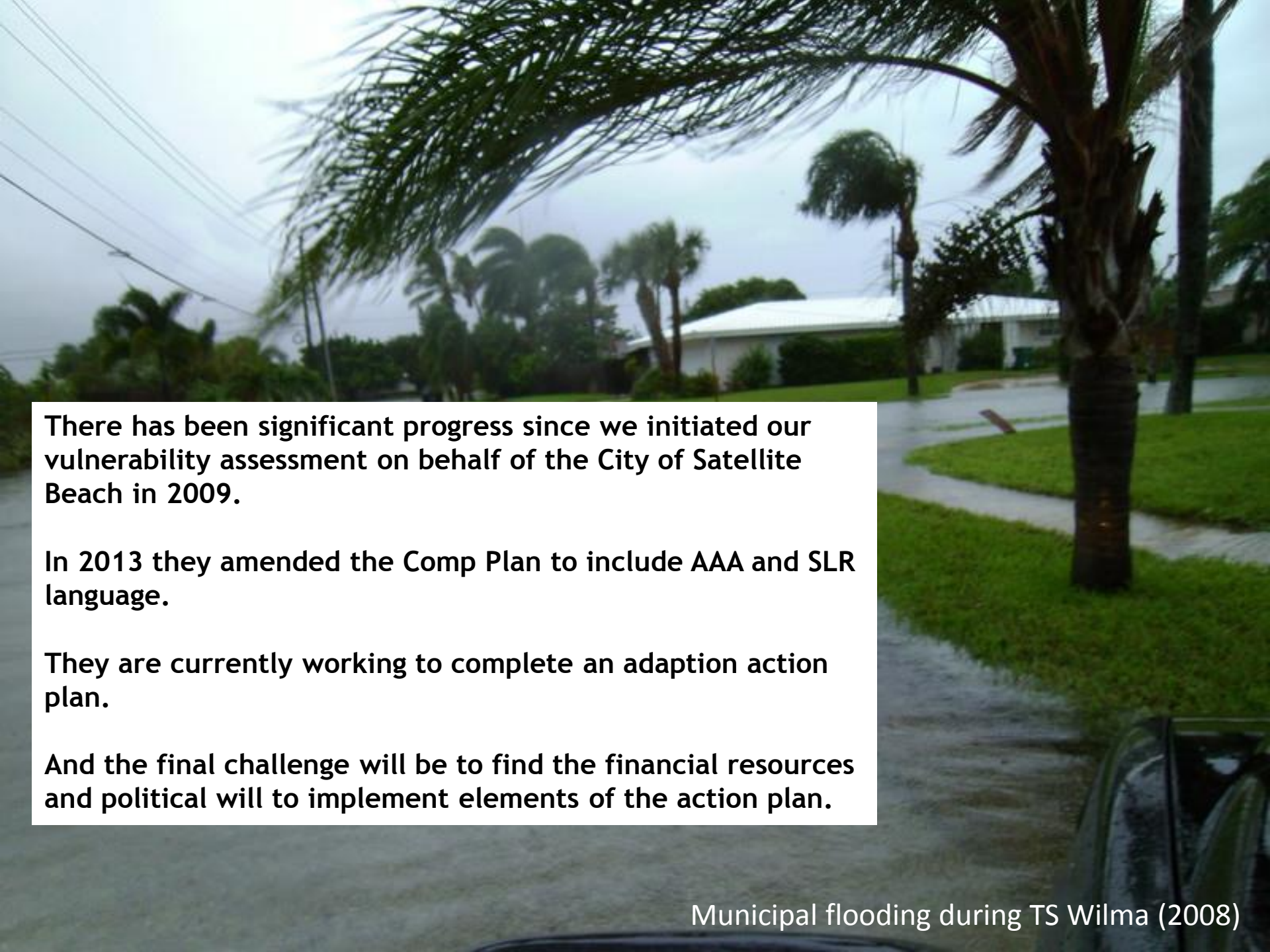
1. Loss of Power/Utilities during storms
2. Coastal Erosion
3. Storm Surge
4. Flooding
5. Sea Level Rise
6. Do Nothing

What's Next?

1. GIS exercise to refine infrastructure details (Stetson Univ. 2016)
 - Delineate building footprints and first floor elevations to facilitate more accurate flood damage assessments
 - Update stormwater conveyance layers to facilitate planning and capital improvements to drainage infrastructure

2. Cost-Benefit Analysis of Adaption Actions using GIS platform (in development)

Asset	Strategy	Business as usual	Coastal erosion	Rainstorm flooding	Tidal flooding	Storm surge
Buildings	Renovate	X		X	X	X
	Rebuild	X	X	X	X	X
	Harden	pilings	pilings	waterproof	waterproof	waterproof
	Protect	armor	armor	berm	berm	berm
	Elevate	X		X	X	X
	Relocate		TDR	TDR	TDR	TDR
	Remove		easement	easement	easement	easement
	Abandon	X	X	X	X	X
Roads	Renovate	resurface				
	Rebuild	X	X			
	Harden			new base	new base	new base
	Elevate				X	X
	Abandon		X	X	X	X
Electric substation	Elevate				X	X
	Relocate				X	X
Sanitary sewer	Renovate	slipline				
	Rebuild		X		X	X
	Harden		X		X	X
	Abandon		X		X	X
Stormwater system	Renovate	X		X	X	X
	Rebuild	slipline				
	Harden	X	X	enlarge	X	X
	Abandon		X		X	X*



There has been significant progress since we initiated our vulnerability assessment on behalf of the City of Satellite Beach in 2009.

In 2013 they amended the Comp Plan to include AAA and SLR language.

They are currently working to complete an adaption action plan.

And the final challenge will be to find the financial resources and political will to implement elements of the action plan.

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Thank you

City of Satellite Beach, Florida, September 2014 after intense 2-yr rainfall event