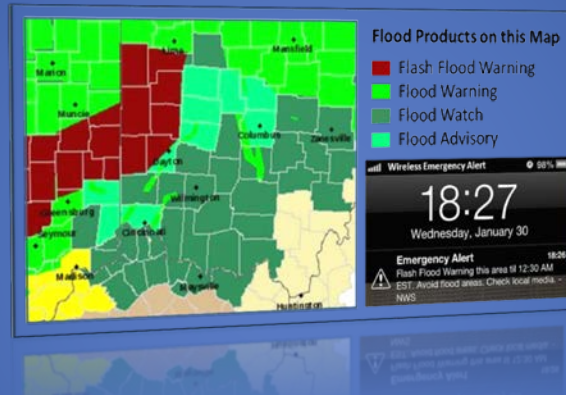


# Thinking Ahead: Understanding Flood Risks In the Future

## *NOAA's Strategy to Help Communities*



**Dr. Holly A. Bamford**

Acting Assistant Secretary for Conservation and Management  
*National Oceanic and Atmospheric Administration*

*Resilient America Roundtable Flood Insurance Meeting*  
*July 9, 2015*



# Managing risk: What is impacted?

## Communities



## Businesses



## Economies





National Oceanic and Atmospheric Administration's  
**National Weather Service**

Site Map      News      Organization

Local forecast by "City, St"      Go

RSS Feeds      Warnings      Current      By State/Country...      UV Alerts      Observations      Radar      Satellite      Snow Cover      Surface      Weather...      Observed Precip      Forecasts      Local      Graphical      Aviation      Marine      Hurricanes      Severe Weather      Fire Weather      Text Messages      By State      By Message Type      National      Forecast Models      Numerical      Models      Statistical      Models...      MOS Prod      GFS-LAMP Prod      Climate      Past Weather      Predictions      Weather Safety      Weather Radio

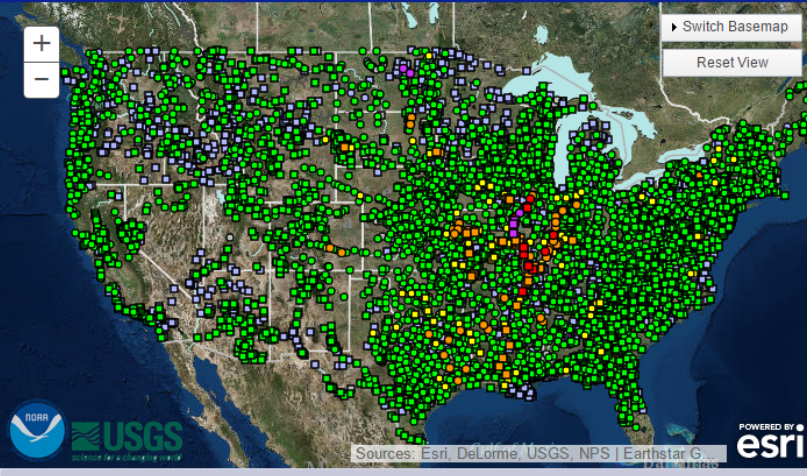
National Observations

Warnings & Forecasts      Graphical Forecasts      National Maps      Radar      Water      Air Quality      Satellite      Climate

River Observations      River Forecasts      Experimental Long-Range River Flood Risk      Precipitation      River Download      Other Information

Auto Refresh is OFF      Print this map      Permalink      BOOK-MARK      f      t      e      .

All Locations



Switch Basemap      Reset View

Click on the map or select one of the data views below:

United States      NWS Weather Forecast Offices      NWS River Forecast Centers      Water Resources Regions

☐ Probability and Hydrograph Available      ☐ Hydrograph Available

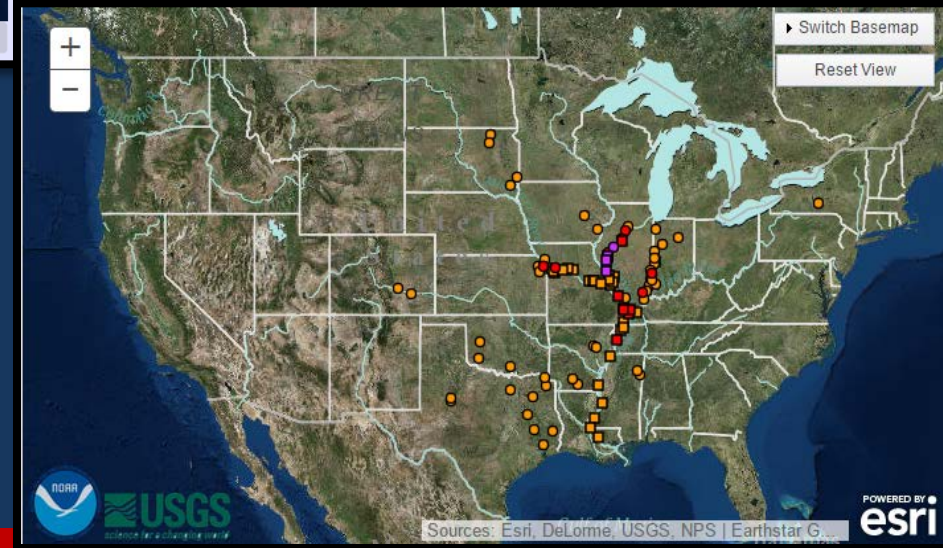
7301 total gauges  
[Show all locations in flood \(91\)](#)

- 7 Gauges: Major Flooding
- 12 Gauges: Moderate Flooding
- 72 Gauges: Minor Flooding
- 101 Gauges: Near Flood Stage
- 4892 Gauges: No Flooding
- 1948 Flood Category Not Defined
- 2 At or Below Low Water Threshold
- 248 Gauges: Observations Are Not Current
- 19 Gauges: Out of Service

USGS      POWERED BY esri      Sources: Esri, DeLorme, USGS, NPS | Earthstar G...

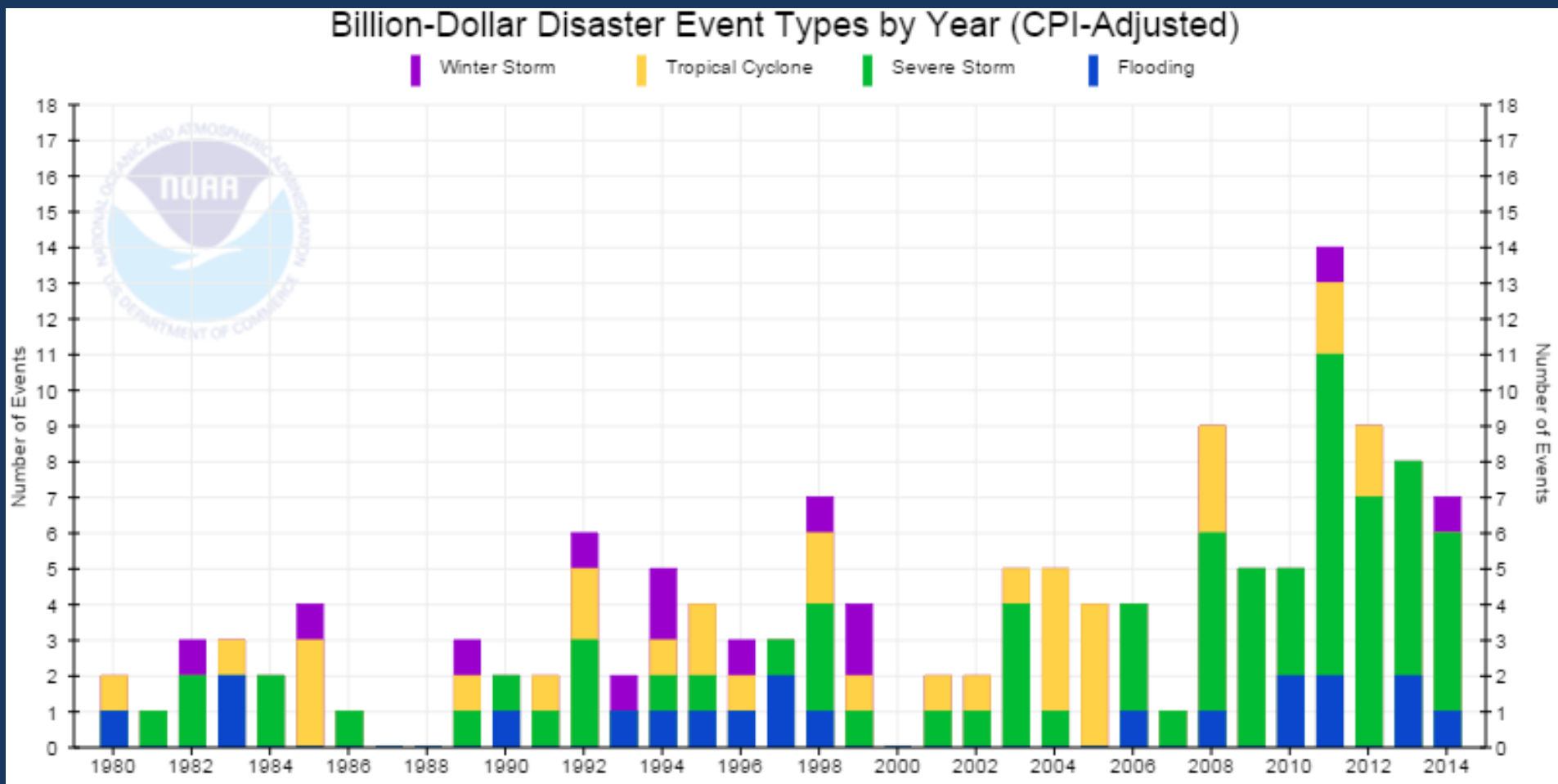
# Water-level Observations

## Water-level Forecasts



*Who is at risk and why?*

# Billion Dollar Disasters: Fact of Life



Source: NOAA/NCDC

# Billion Dollar Disasters: Fact of Life

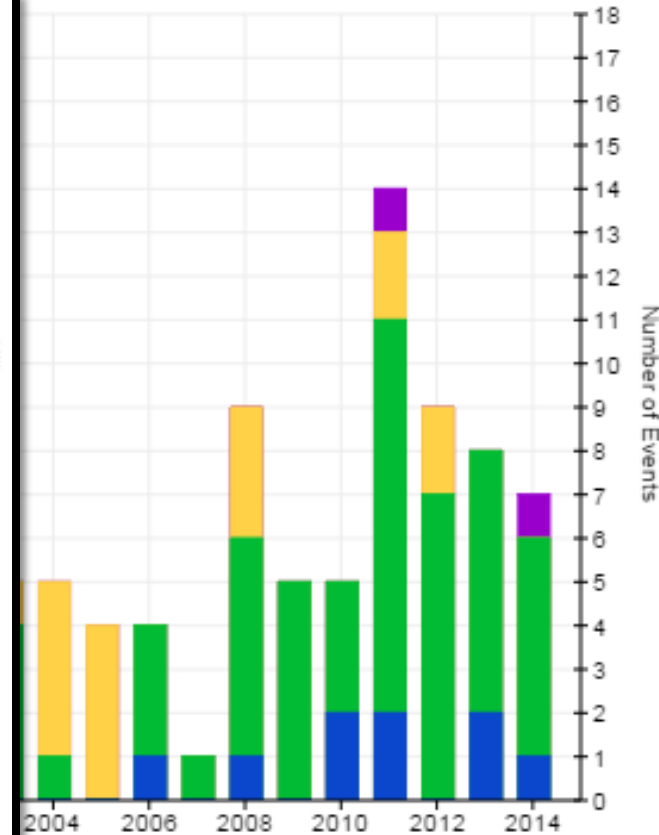
Billion-Dollar Disaster Event Types by Year (CPI-Adjusted)

Winter Storm Tropical Cyclone Severe Storm Flooding

U.S. 2014 Billion-Dollar Weather and Climate Disasters



This map denotes the approximate location for each of the eight billion-dollar weather and climate disasters that impacted the United States during 2014.

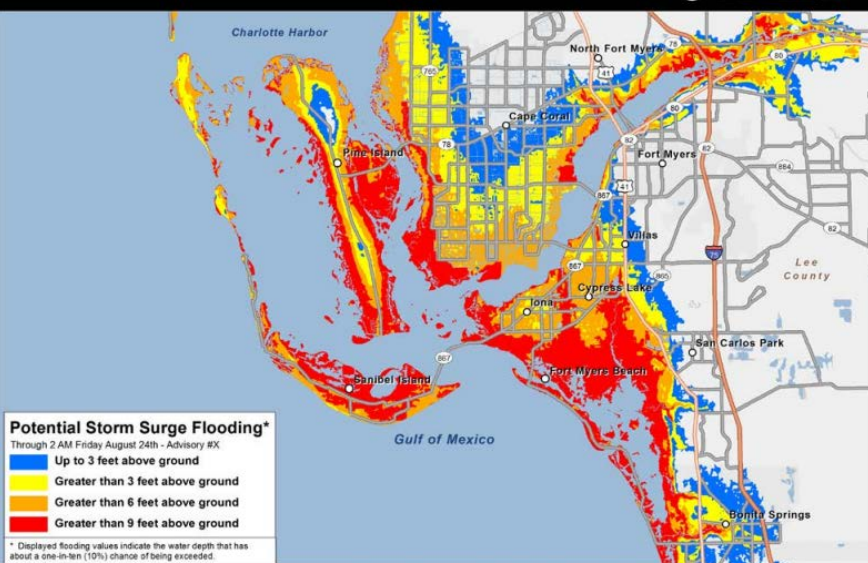


Source: NOAA/NCDC



# Coastal Inundation/Storm Surge

Hurricane X



National Hurricane Center  
Storm Surge Unit



*What are we at risk to?*



# Nuisance Flooding

## UCN Unitarian Church of Norfolk

Moving forward and growing

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 Search

### Meeting Times

- 09:00 Adult discussion
- 09:30 Teen RE
- 10:30 Worship
- 10:30 Youth RE
- 11:30 Coffee Hour

### This Week

- > Sunday RE
- > Sunday's discussion
- > Sunday's service
- > Pastoral Care
- > From the President's Desk
- > Upcoming Events

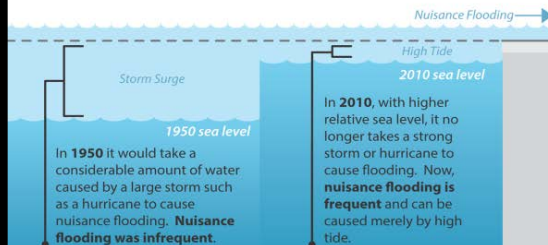
### Visiting UCN

- > Info and Directions
- > Office Hours
- > Visiting RE classes
- > Yarmouth Tide Predictions



### The tides, they are a changing...

Flood Level	No. of Floods (days/year)	
	(1956-60)	(2006-10)
Nuisance (~ 1')	3	35
Moderate (~ 2')	0	3



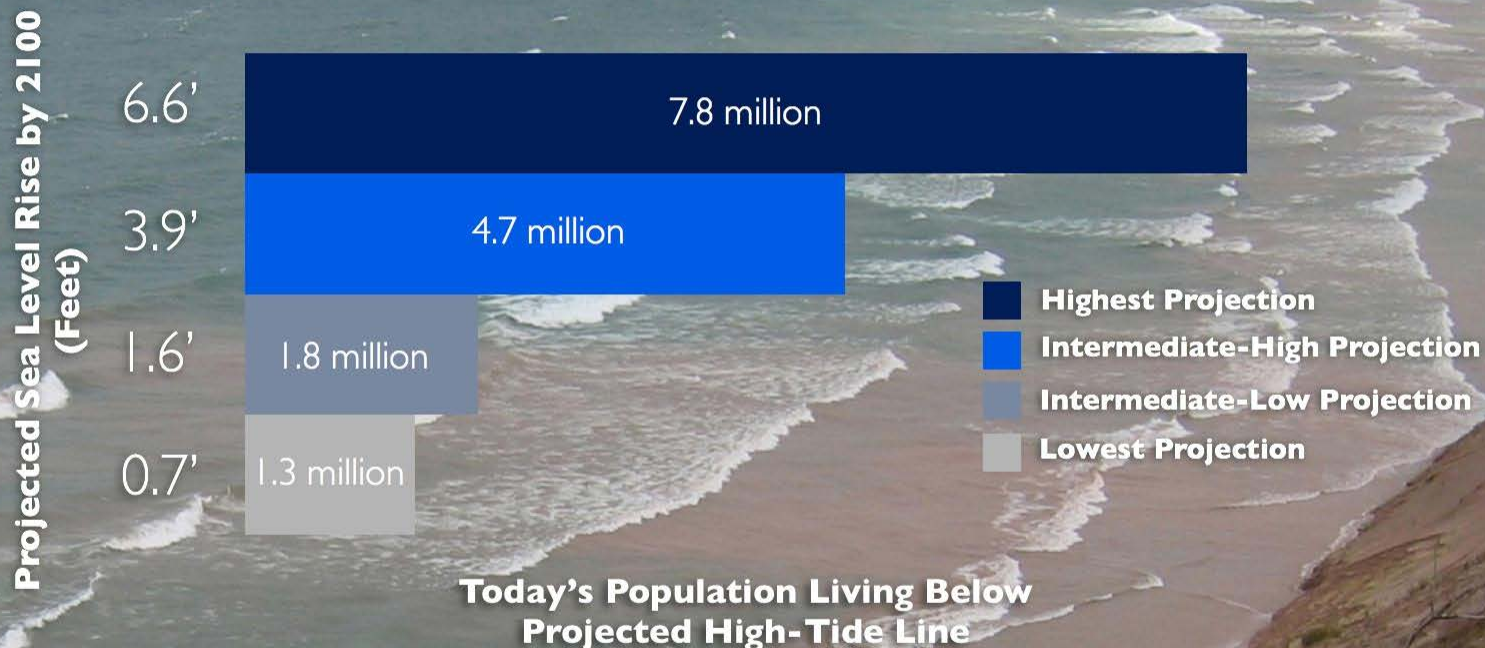
### How is local elevation important to nuisance flooding?

The relationship between local elevation and the high tide line determines the rate of nuisance flooding. If they are close to the same in elevation, flooding is frequent. If they are not close, flooding is infrequent.



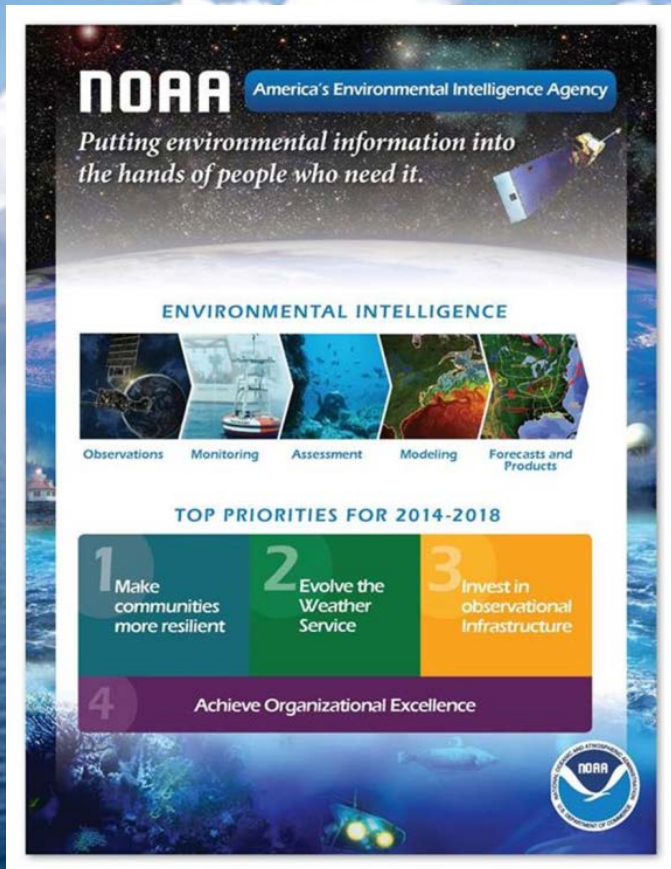


# Sea Level Rise & Population Impact





# How can NOAA help communities become more resilient



# Coastal Planning Tools for the Future

## Flood Exposure Snapshot

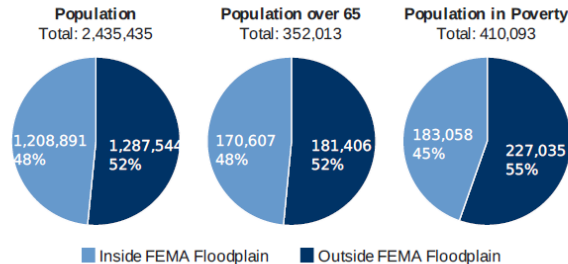
### Miami-Dade County, Florida

COASTAL COUNTY SNAPSHOTS

**People + Floodplains = Not Good**  
**High-Risk Populations + Floodplains = Even Worse**

The more homes and people located in a floodplain, the greater the potential for harm from flooding. Impacts are likely to be even greater when additional risk factors (age, income, capabilities) are involved, since people at greatest flood risk may have difficulty evacuating or taking action to reduce potential damage.

Based on 2010 U.S. Census records and 2006-2010 American Community Survey 5-year Summary File data.

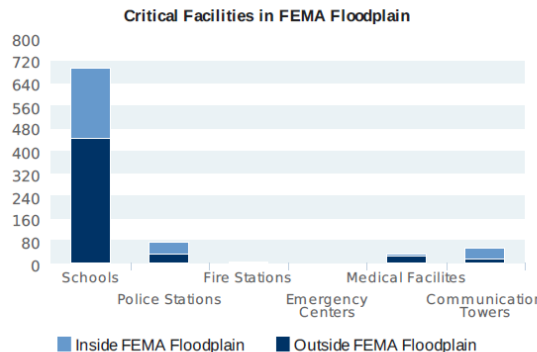


**Community Infrastructure + Floodplains = Bad News**

40% of critical facilities and 46% of road miles (4429 miles) in Miami-Dade County, Florida, are within the floodplain.

Hospitals. Roads. Schools. Shelters. These facilities play a central role in disaster response and recovery. Understanding which facilities are exposed, and the degree of that exposure, can help reduce or eliminate service interruptions and costly redevelopment. Incorporating this information into development planning helps communities get back on their feet faster.

Based on Critical Facilities from FEMA HAZUS.

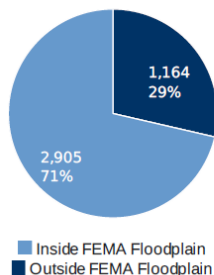


**Increasing Development in Floodplains = More People in Harm's Way**  
**Loss of Natural Buffers = Less Protection**

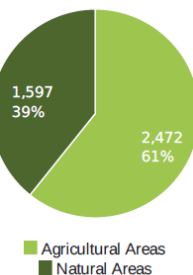
A county with more natural areas (wetlands, forests, etc.) and less development within floodplains typically has lower exposure to flooding. A county that monitors land cover changes within the floodplain will detect important trends that indicate whether flood exposure is increasing or decreasing. Armed with this information, local leaders can take steps to improve their safety and resilience.

Based on NOAA Land Cover Data.

Amount of Land Converted to Development 2001-2006 (acres)  
Total: 4,069



Type of Land Converted to Development 2001-2006 (acres)  
Total: 4,069



## Local Community Snapshots

- **People**
  - Who they are
  - Where they live
- **Places**
  - Floodplain
  - Natural vs. Agriculture
- **Coastal dependent economy**
- **Comparison across local communities**
- **Downloads can serve as handout/ educational tool**

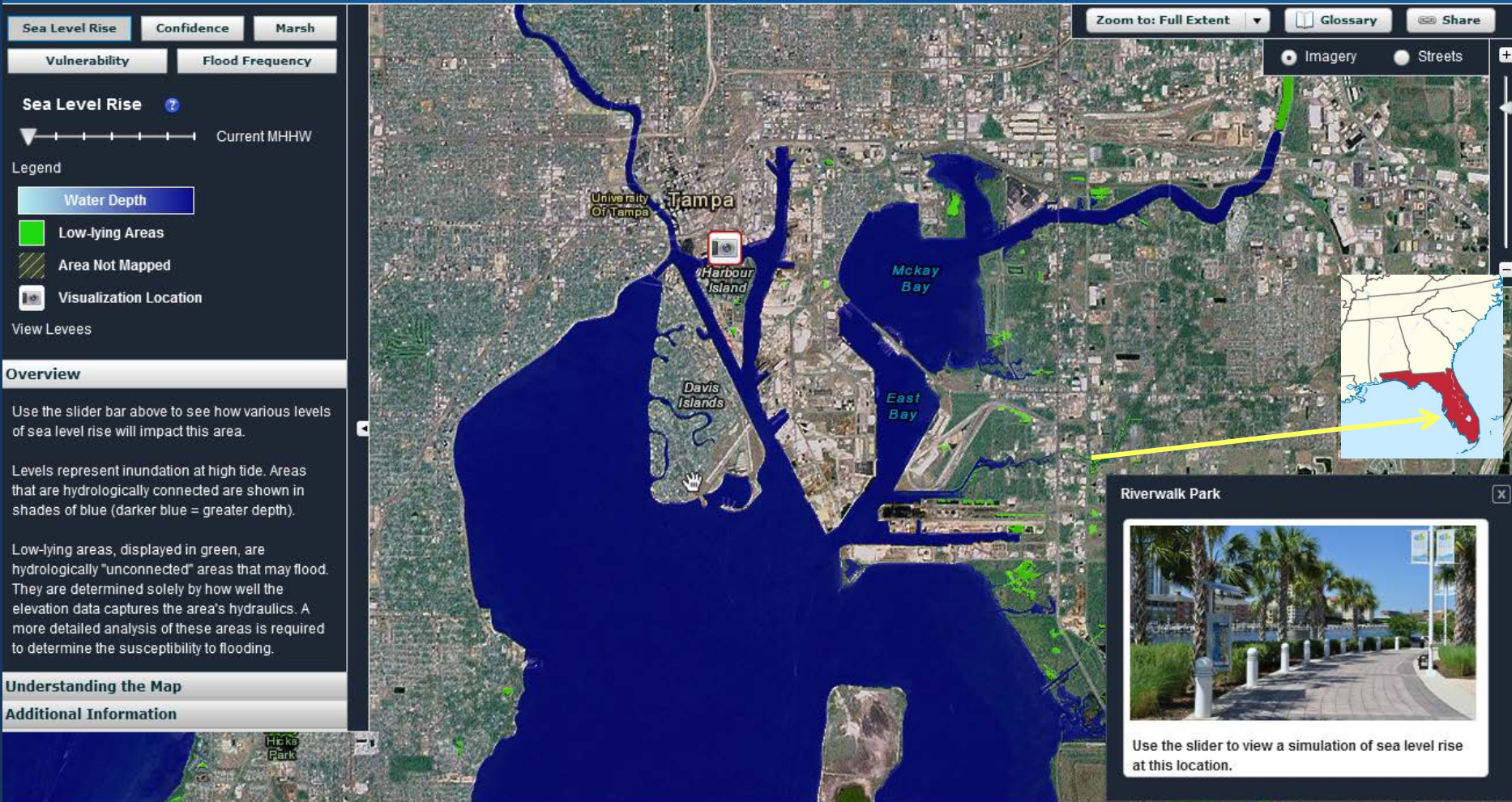
<http://coast.noaa.gov/digitalcoast/tools/snapshots>



# Decision Support Tools: Sea Level Viewer

## Sea Level Rise and Coastal Flooding Impacts

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

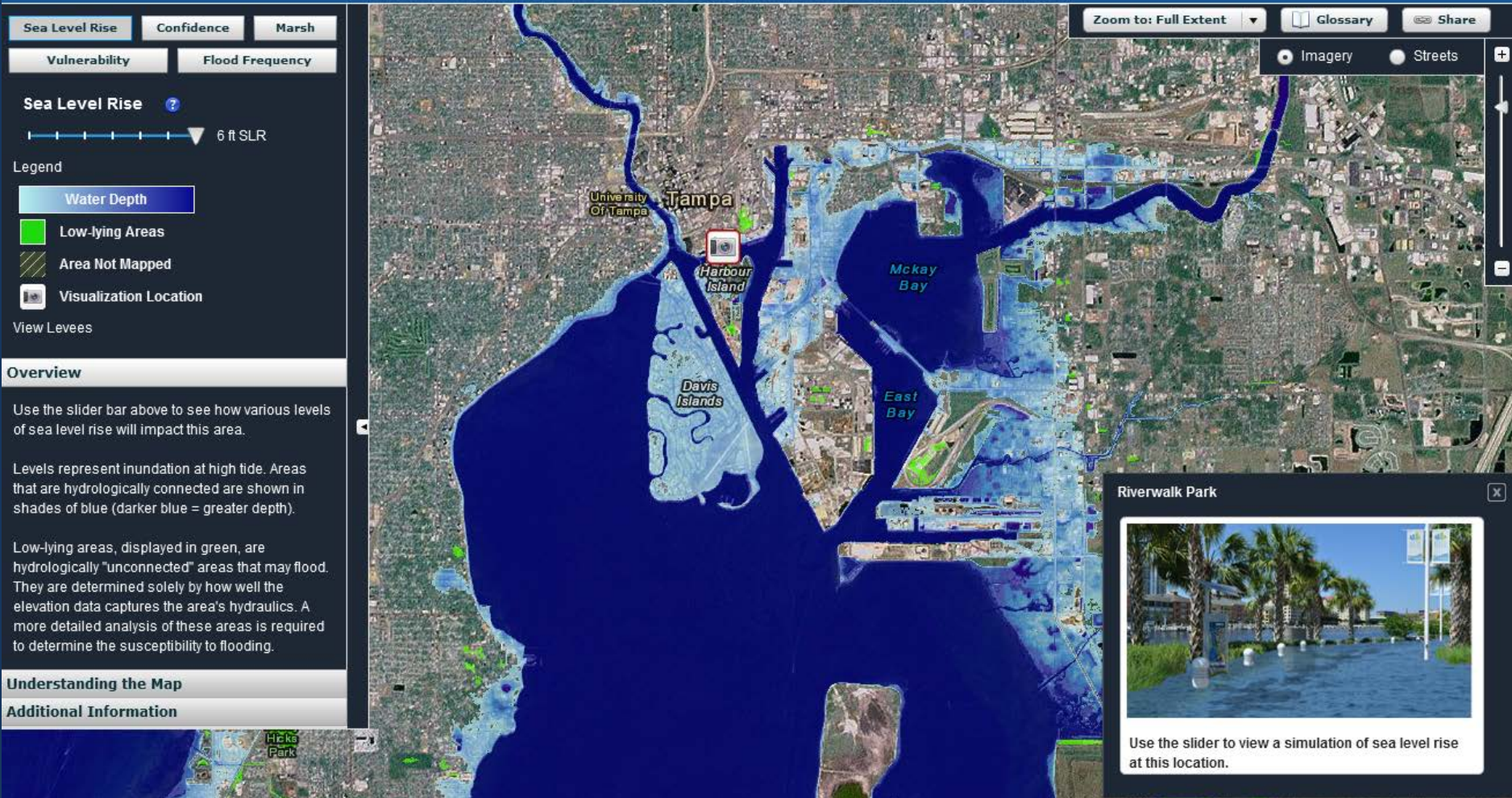




# Decision Support Tools: Sea Level Viewer

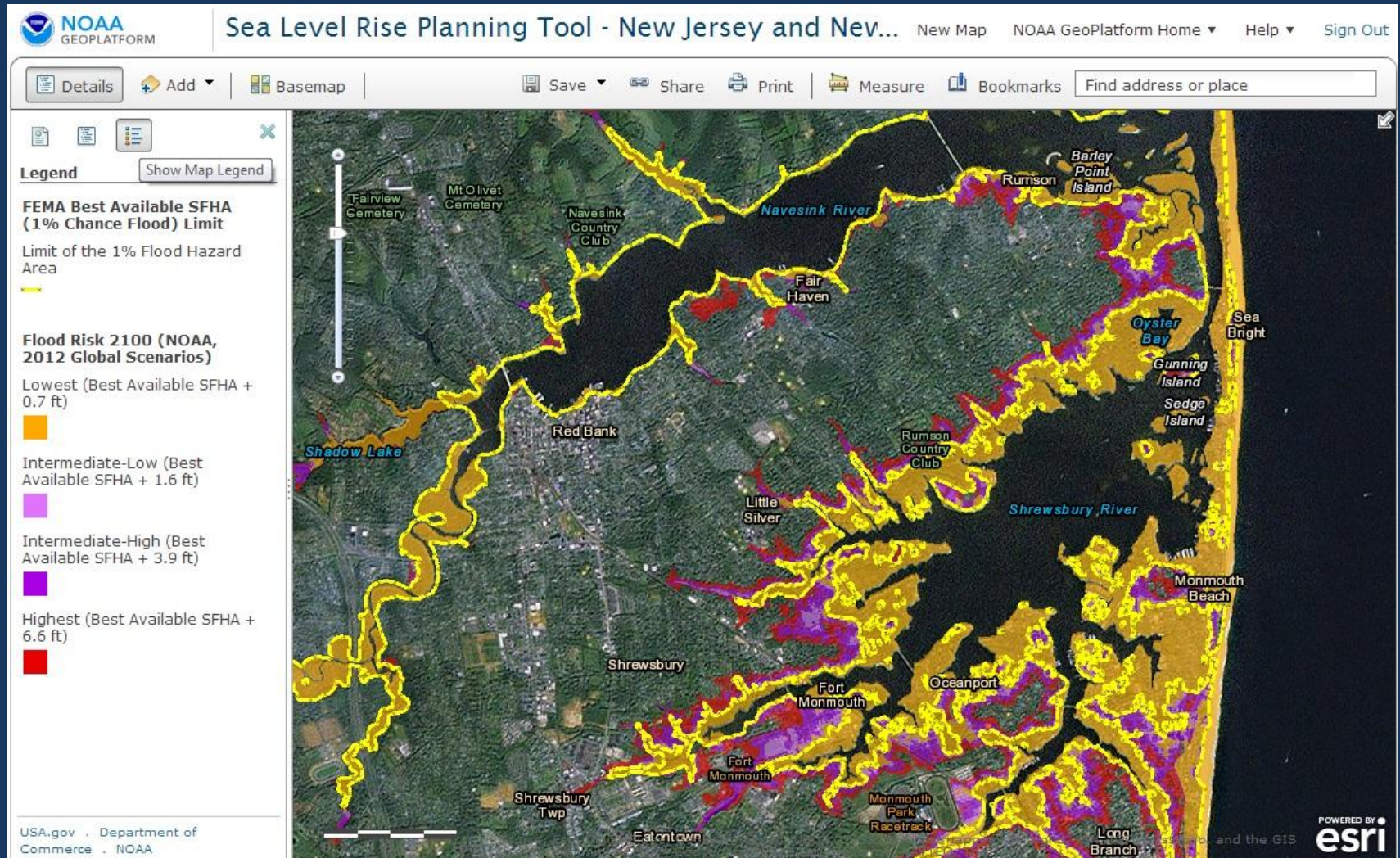
## Sea Level Rise and Coastal Flooding Impacts

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION





# Decision Support Tools: Sea Level Rise Planning Tool



FEMA



United States  
Global Change  
Research Program

# Decision Support Tools: Interactive Flood Information Map

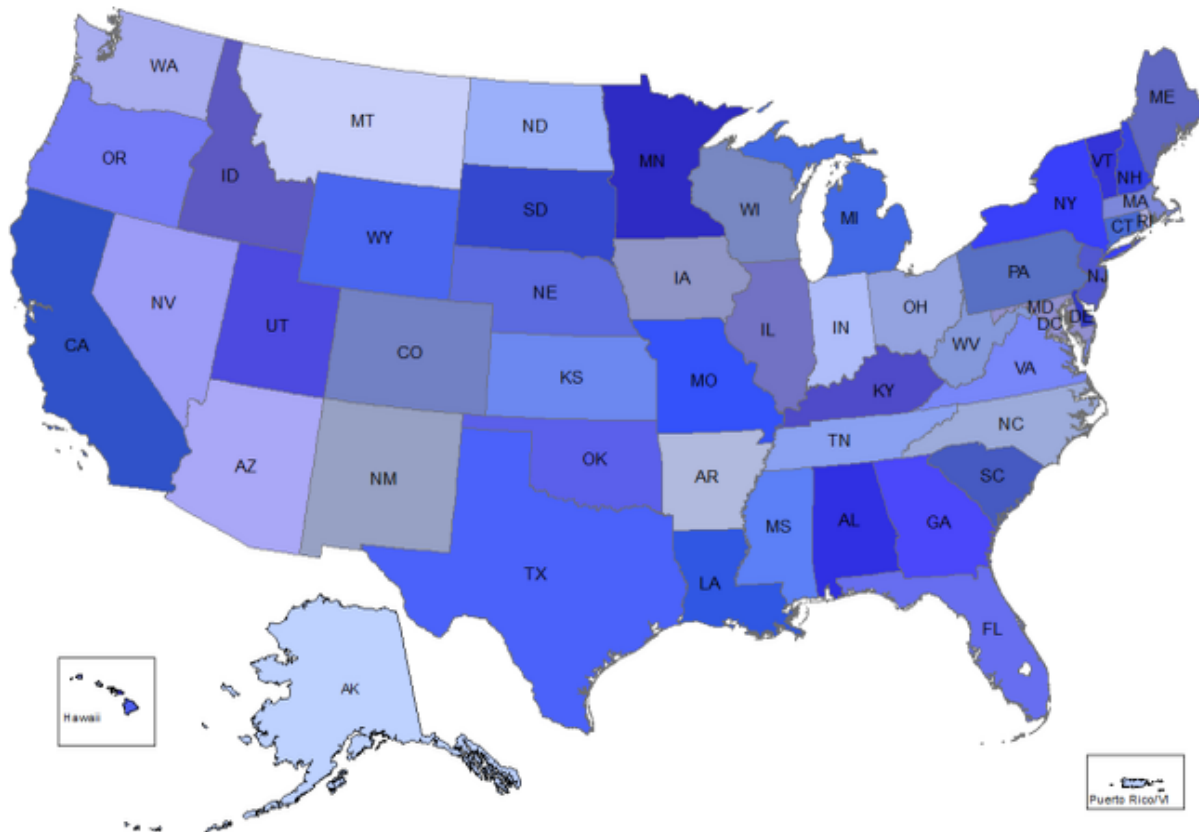


**NATIONAL WEATHER SERVICE**  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION



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## Interactive Flood Information Map



### Flooding Resources

[Flood Safety](#)

[Turn Around Don't Drown](#)

[State Flood Information](#)

[Flood Hazards](#)

[NWS Flood Related Products](#)



[Forecasts and Observations](#)

[Education and Outreach Materials](#)

[Partner Agencies](#)





# Decision Support Tools: Interactive Flood Information Map



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#### Flooding in Washington, D.C.

On this page you learn what types of flooding are typical in the Washington, D.C., and how do you protect yourself, your family and your home. You will also find out more about significant D.C., floods. Finally, you'll find links to NWS offices that provide forecast and safety information for D.C. as well as links to our partners who play a significant role in keeping you safe.



##### Flooding Resources

- [Flood Safety](#)
- [Turn Around Don't Drown](#)
- [State Flood Information](#)
- [Flood Hazards](#)
- [NWS Flood Related Products](#)
- [Forecasts and Observations](#)
- [Education and Outreach Materials](#)
- [Partner Agencies](#)


##### Significant Washington, D.C., Floods

- [Great Flood of 1889, May 30–June 2](#)
- [Great Potomac Flood of 1936, March 17–19](#)
- [Record Flood of 1942, October 14–17](#)
- [Hurricane Agnes, June 22–24, 1972](#)
- [Federal Triangle Flash Flood, June 25–26, 2006](#)

##### Flood Hazard Information

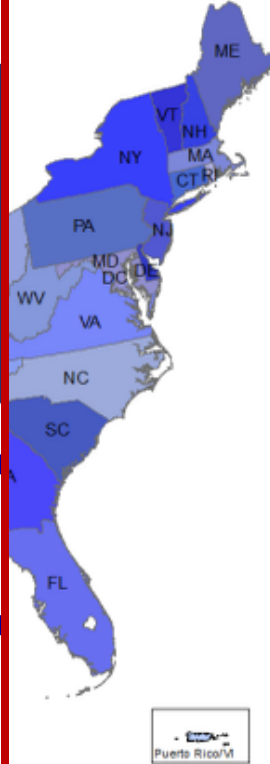
- [Flash Flooding](#)
- [River Flooding](#)
- [Tropical Systems and Coastal Flooding](#)
- [Ice/Debris Jams](#)
- [Snowmelt](#)
- [Dam Breaks/Levee Failure](#)

Protect Life and Property      NWS Forecast Offices and River Forecast Center (RFC) Covering D.C.



#### Flooding Resources

- [Flood Safety](#)
- [Turn Around Don't Drown](#)
- [State Flood Information](#)
- [Flood Hazards](#)
- [NWS Flood Related Products](#)
- [Forecasts and Observations](#)
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- [Partner Agencies](#)



# Initial Operating Capacity: May 26, 2015

A catalyst to transform NOAA's water prediction program



**VISION:** Scientific excellence and innovation driving water prediction to support decisions for a water resilient nation.

## **BENEFITS:**

- State-of –the science model for global to street level prediction
- Operations Center to establish common operating picture within NOAA and among water agencies; decision support for floods to drought
- Proving ground to accelerate research to operations
- Data integration and service backup for entire water program



# NOAA's Big Data Project

**Research and development** effort with major cloud providers to develop market ecosystems for NOAA environmental data.

- Each of the five collaborators anchors a “data alliance”
- Each alliance organizes companies and other organizations to drive demand for NOAA data
- Collaborators work with NOAA to address challenges of staging NOAA data on the cloud
- NOAA provides data and alliances develop market-based business models to sustain the effort at no net cost to government



# Incorporation of Natural & Built Infrastructure





# Dow Chemical: Wetlands vs. Wastewater Treatment Plant



## Natural Capital Case Study

Change is Here: Time to Act is Now

