A Conversation on our Changing Climate and Its Impacts on River and Coastal Flooding

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Religious Experience:

Record floods in my hometown of West Warwick – March 2010

Record flooding on the Pawtuxet River, West Warwick, RI – 10 am March 31st, 2010. Photo: D. Vallee/NWS
Our conversation will cover:

- An overview of our changing climate
- Rainfall/Temperature trends & the impacts on river flooding
- Sea Level Rise and ramifications on coastal flood potential
- The challenges before us
- A look at a few best practices to stem the tide of flooding
- Some new tools to help us
The latest Science:
A warming planet and shrinking Arctic Sea ice

This graph shows the average area covered by sea ice during September each year. Minimum sea ice extent has decreased 12% per decade since 1979. Reference: Fourth National Climate Assessment [https://nca2018.globalchange.gov/chapter/1/#fig-1-2](https://nca2018.globalchange.gov/chapter/1/#fig-1-2)

Is there a common theme to recent floods?

Several:

- Slow moving weather systems – a blocked up atmosphere
  - Related to loss of artic ice cover
  - Multiple events in close succession or one big slow moving storm
- Results in saturated antecedent conditions before the “main event”
- Each fed by a “tropical connection”
  - Plumes of deep moisture
  - High moisture values are reaching our latitude more frequently
A Look at Rhode Island Annual Precipitation Trends

Coldest year in past 40 years – still warmer than the old average of the 1930s

Of top 10 warmest years – just one occurred prior to 1970!

http://www.ncdc.noaa.gov/cag
A Look at Rhode Island Annual Precipitation Trends

2018: 3rd wettest year!
2018: Record days >1” rain!

http://www.ncdc.noaa.gov/cag
Record Flash Flooding from 5-7 inches of rain. Westport, CT September 25th, 2018. Photo: Westport Fire Department

St-Jean-sur-Richelieu, Quebec, Canada, 5/6/11 Photo: AP//Canadian Press, R. Remoirz

Warwick Mall overtaken by the Pawtuxet River - Warwick, RI at 1030 am Wednesday 3/31/10. Photo: RI ANG

Record flooding in Dolgeville, NY on West Canada Creek, November 1st, 2019. Source: D. McGee, Office of the Governor
Moving to the coast: Sea Level Rise

*Increasing high tide flood events*
Providence Rate of Rise
0.74 feet in 100 years

http://tidesandcurrents.noaa.gov/sltrends/index.shtml

High Tide Flooding

Historical Yearly Inundation Events

Providence, RI Tide Gauge #8454000
Flooding begins at 1.84 ft MHHW (0.56m)

Relative Sea Level Trends
mm/yr (feet/century)

NOAA/NOS/Center for Operational Oceanographic Products and Services

Building a Weather-Ready Nation //11
Annual Mean Relative Sea Level since 1960
with various regional emissions scenarios

https://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?plot=scenario&id=8454000
Sandy’s Setup:
Long Duration Southeast Fetch
*Damaging Waves, Multiple Tide Cycles & a 4-5 ft Storm Surge*

Swells built on 2 days of southeast winds were driven right into the south coast of RI
- Impacted Multiple Tide Cycles – worst of which was Monday night
- 15-30 foot seas resulted in relentless pounding surf which first weakened then obliterated the 6-10 foot dunes along parts of the coast
- Storm surge of 4-5 feet atop a “middle-of-the-road” astronomical tide produce a total water level (storm tide) of 9.6 feet; One foot shy of Hurricane Bob in ’91
- What she lacked in intensity she made up for in duration!
Vulnerability in Portsmouth
Practices that are working to mitigate losses due to heavy rains, flooding, and storm surge

- Natural valley storage
- Building for the new normal
- Setbacks & Elevating critical systems
- Bioswales & Porous Pavement
- Elevate & Evacuate!

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Protecting Lives and Property for 150 Years
https://uri.maps.arcgis.com/home/webmap/viewer.html?useExisting=1
http://www.beachsamp.org/stormtools/stormtools-map-gallery/
http://sealevel.climatecentral.org/
http://www.riema.ri.gov//resources/citizens/prepare/evacuation.php
Developing Real-time Flood Inundation Mapping

Where is the event? When will it occur? How likely is it?
For More Information, Click on the links below:

http://www.beachsamp.org/stormtools/stormtools-map-gallery/
http://sealevel.climatecentral.org/
http://www.riema.ri.gov/resources/citizens/prepare/evacuation.php
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