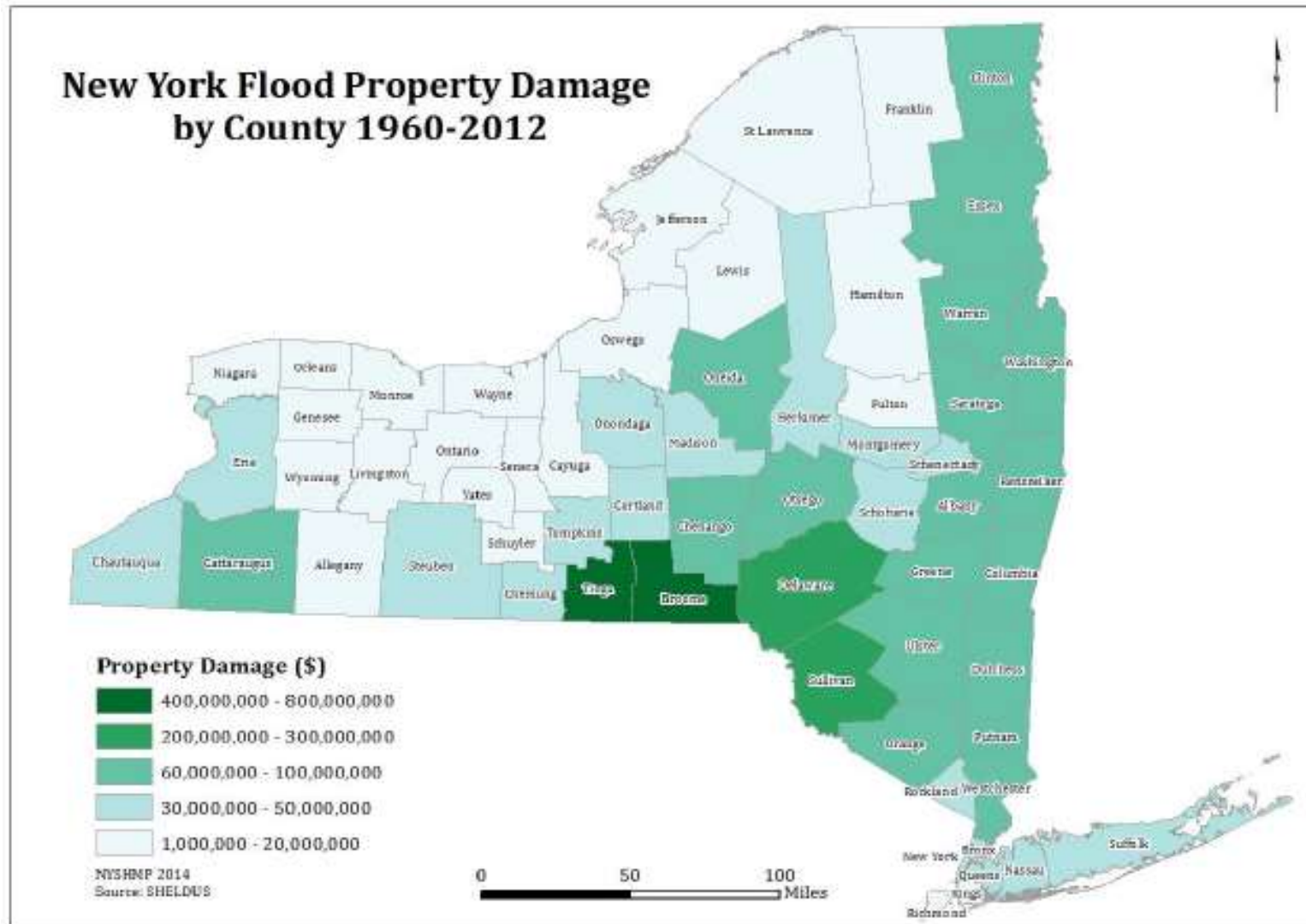


# Community Risk and Resiliency Act

*Mainstreaming consideration  
of climate change*



# Flood Risk in New York



## NYS Insured Losses

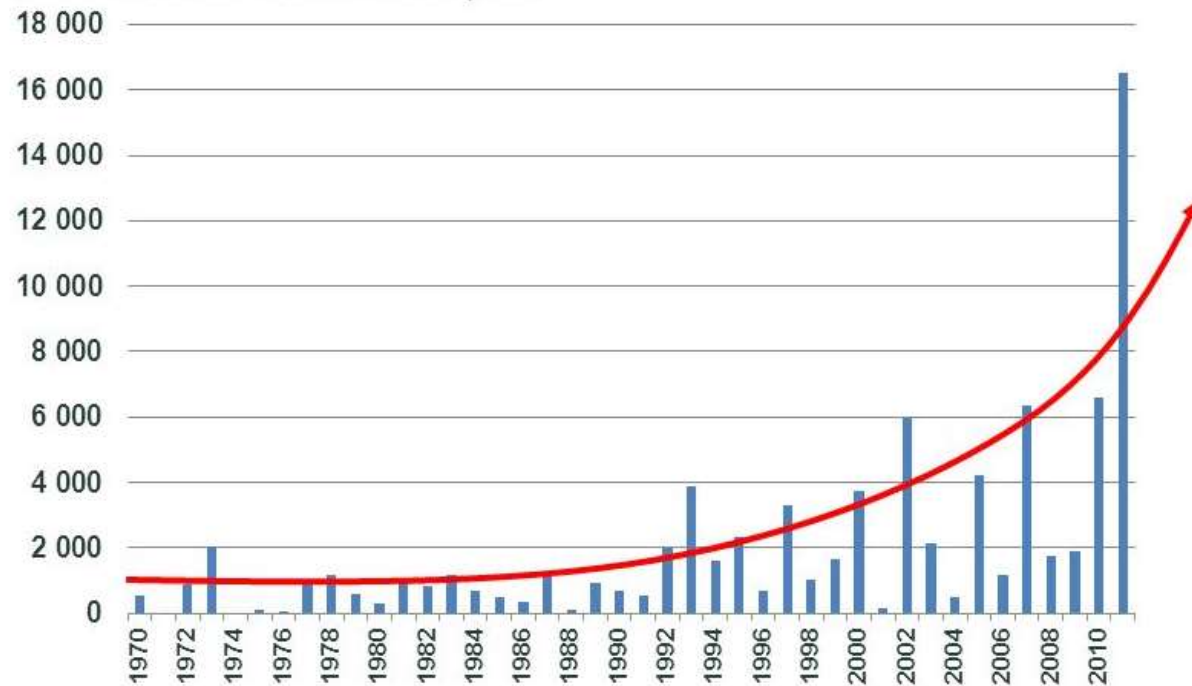
Decade	Losses (millions)
1950s	\$44
1960s	\$37
1970s	\$866
1980s	\$152
1990s	\$757
2000s	\$762
2010s	\$11,547



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# Increasing Flood Damage Nationally

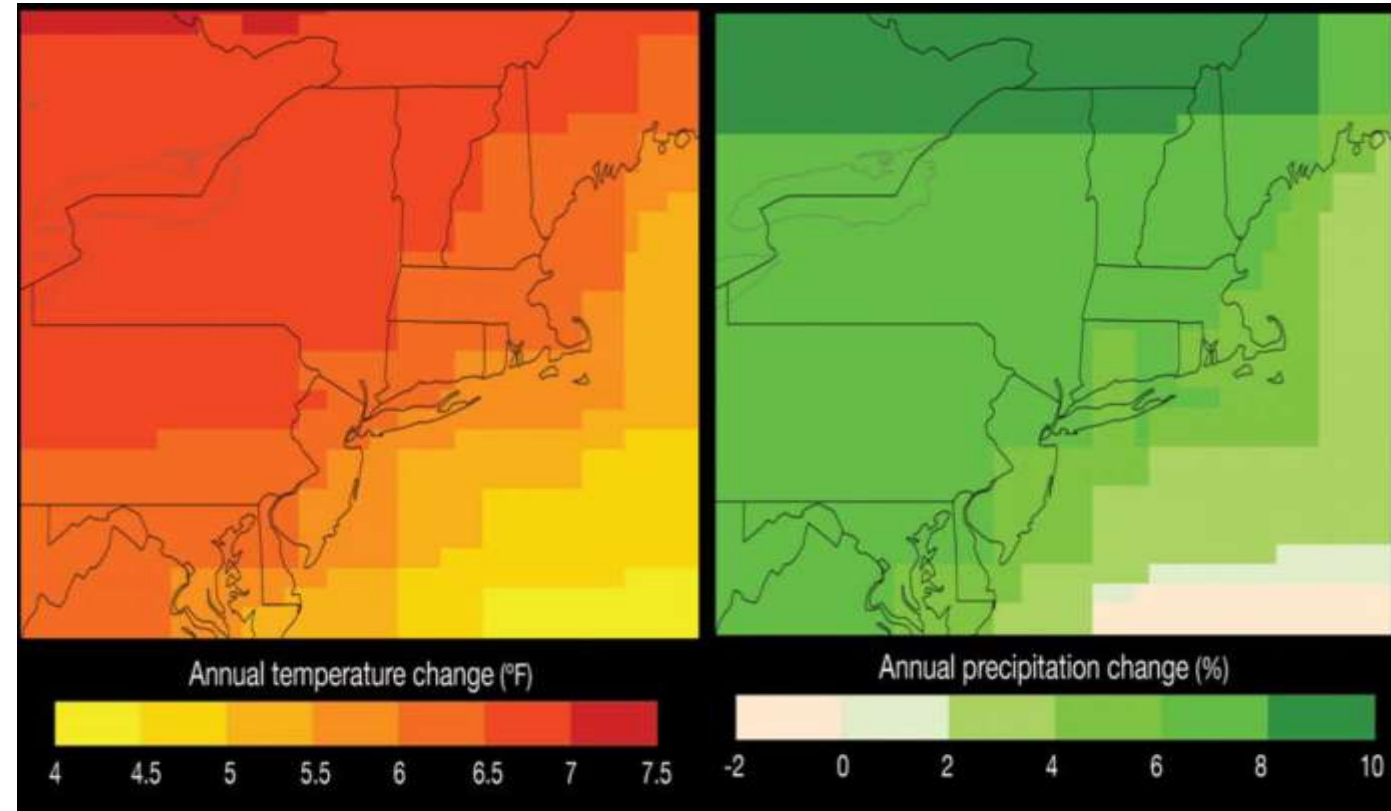
insured loss in m USD at 2011 price



- National flood damage costs are increasing
  - Function of changing precipitation, floodplain development, real estate values
  - Ca. 33% losses in X zone
- Riverine SFHAs 45% broader and deeper by 2100, 55% for coastal SFHAs
- NFIP premiums 10 to 70% higher

# New York's Future Climate

- Hotter
- Wetter
- More extreme precipitation
- Flooding
- Sea-level rise
- Stronger coastal storms





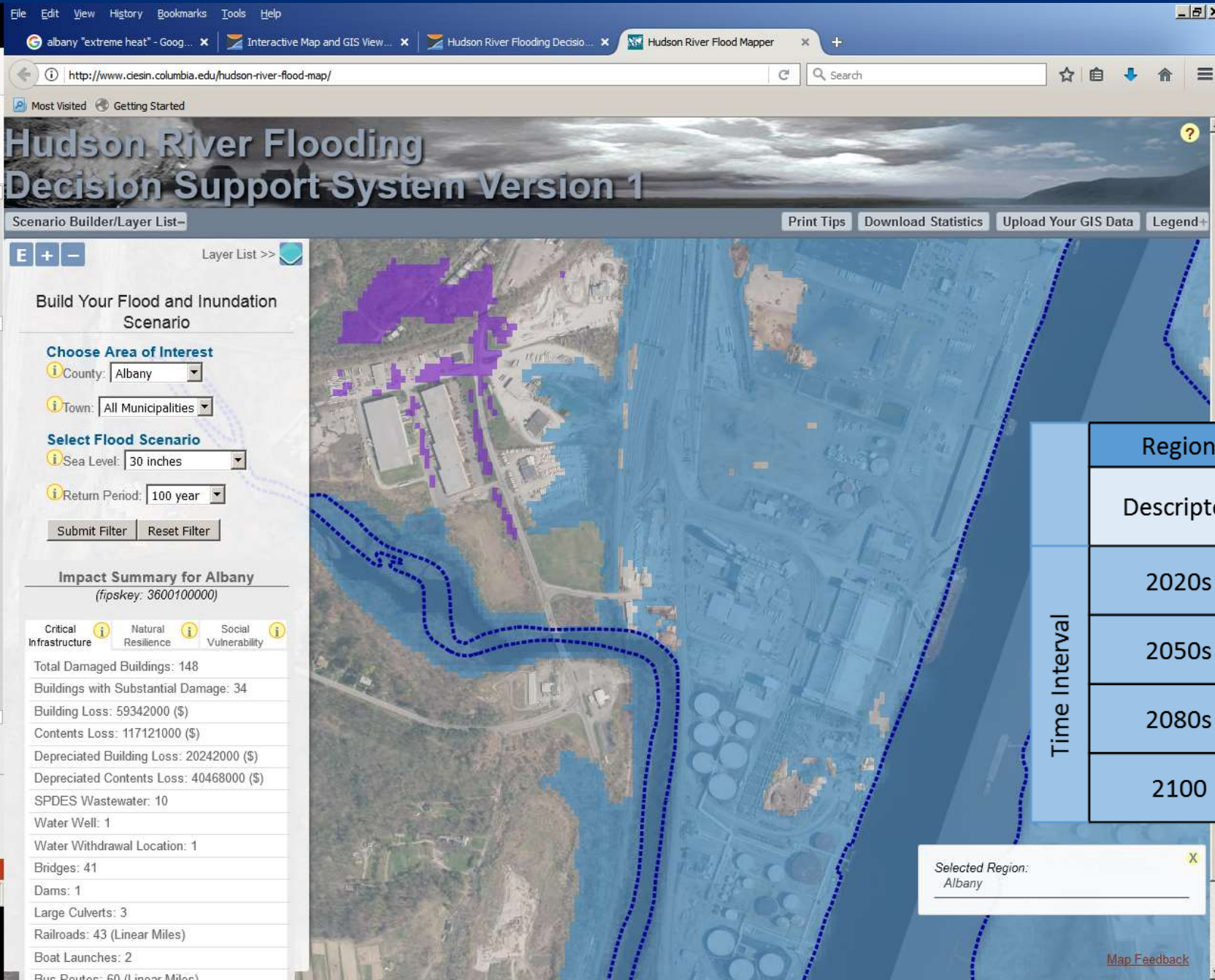
# Too Much Water When We Don't Want it, Too Little When We Do

## Projected Annual Precipitation:

- 3-12% increase by 2050s
- 4-15% increase by 2080s
- Up to 26% increase by 2100



- Reduced summer rainfall may affect supply
- Reduced flows on larger rivers
- Flooding potential to increase water pollution
- Changes in accretion and scour
- Landslides



- Loss of populated areas
- Loss of tidal ecosystems
- Threats to infrastructure
- Salt-water intrusion

Projected sea-level rise (inches)

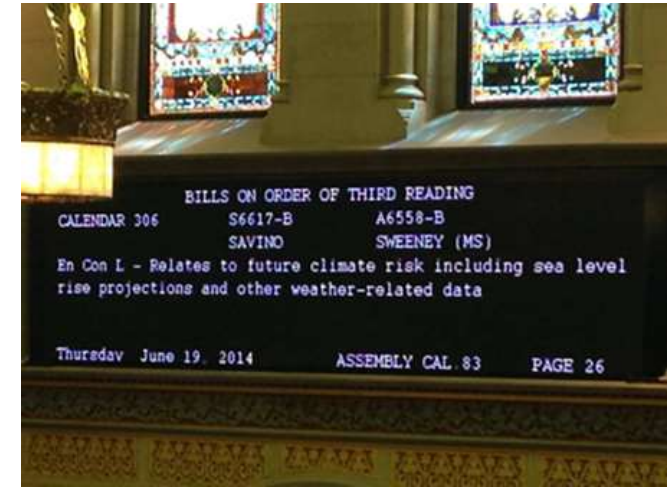
	Region	New York City/Lower Hudson				
	Descriptor	Low	Low-medium	Medium	High-medium	High
Time Interval	2020s	2	4	6	8	10
	2050s	8	11	16	21	30
	2080s	13	18	29	39	58
	2100	15	22	36	50	75



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# Community Risk & Resiliency Act

- Requires sea-level rise projections (DEC)
- Requires applicants demonstrate consideration of sea-level rise, storm surge & flooding in specified permits & funding programs, & guidance on implementation (DEC, DOS)
- Adds mitigation of sea-level rise, storm surge & flooding to Smart Growth Public Infrastructure Policy Act criteria (DEC, DOS)
- Requires guidance on use of natural resiliency measures to reduce risk (DEC, DOS)
- Requires model local laws to enhance resiliency (DOS, DEC)



<http://www.dec.ny.gov/energy/102559.html>



# Regulatory Programs Covered by CRRA

## DEC Permits

- Oil and natural gas wells
- Major projects:
  - Protection of waters
  - Freshwater wetlands
  - Tidal wetlands
  - Coastal erosion hazard areas
  - Mined land reclamation
  - Sewerage service
  - Liquefied natural gas and liquefied petroleum gas facilities

## DEC Facility-siting Regulations

- Hazardous waste transportation, storage and distribution facility siting
- Petroleum bulk storage (including conformity with the uniform fire prevention and building code)
- Hazardous substance bulk storage





## Funding Programs Covered by CRRA

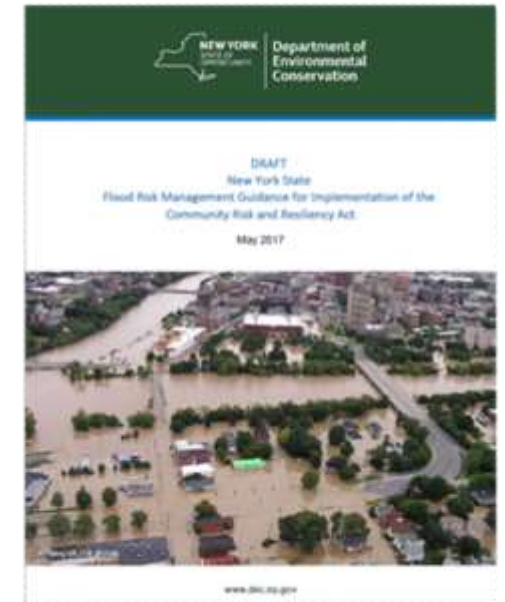
- Water Pollution Control Revolving Fund (EFC)
- Drinking Water Revolving Fund (DOH, EFC)
- Local waterfront revitalization (DOS)
- Open space acquisition (DEC, OPRHP)
- Agricultural and farmland protection (DAM)
- Landfill closure assistance (DEC)
- Coastal rehabilitation project assistance (DEC)
- Open space project operation and maintenance agreements (OPRHP)

Initialism	Agency
EFC	Environmental Facilities Corp
DOH	Department of Health
DOS	Department of State
OPRHP	Office of Parks, Recreation and Historic Preservation
DAM	Department of Agriculture and Markets



# State Flood Risk Management Guidance

- Non-binding technical guidance to agencies
- Specific guidelines by structure type, tidal/nontidal
- Available for incorporation into
  - CRRA topical guidance & CRRA program-specific guidance, regulations, etc.
  - Programs not covered by CRRA
  - DEC's model local law for flood damage prevention, optional additional language



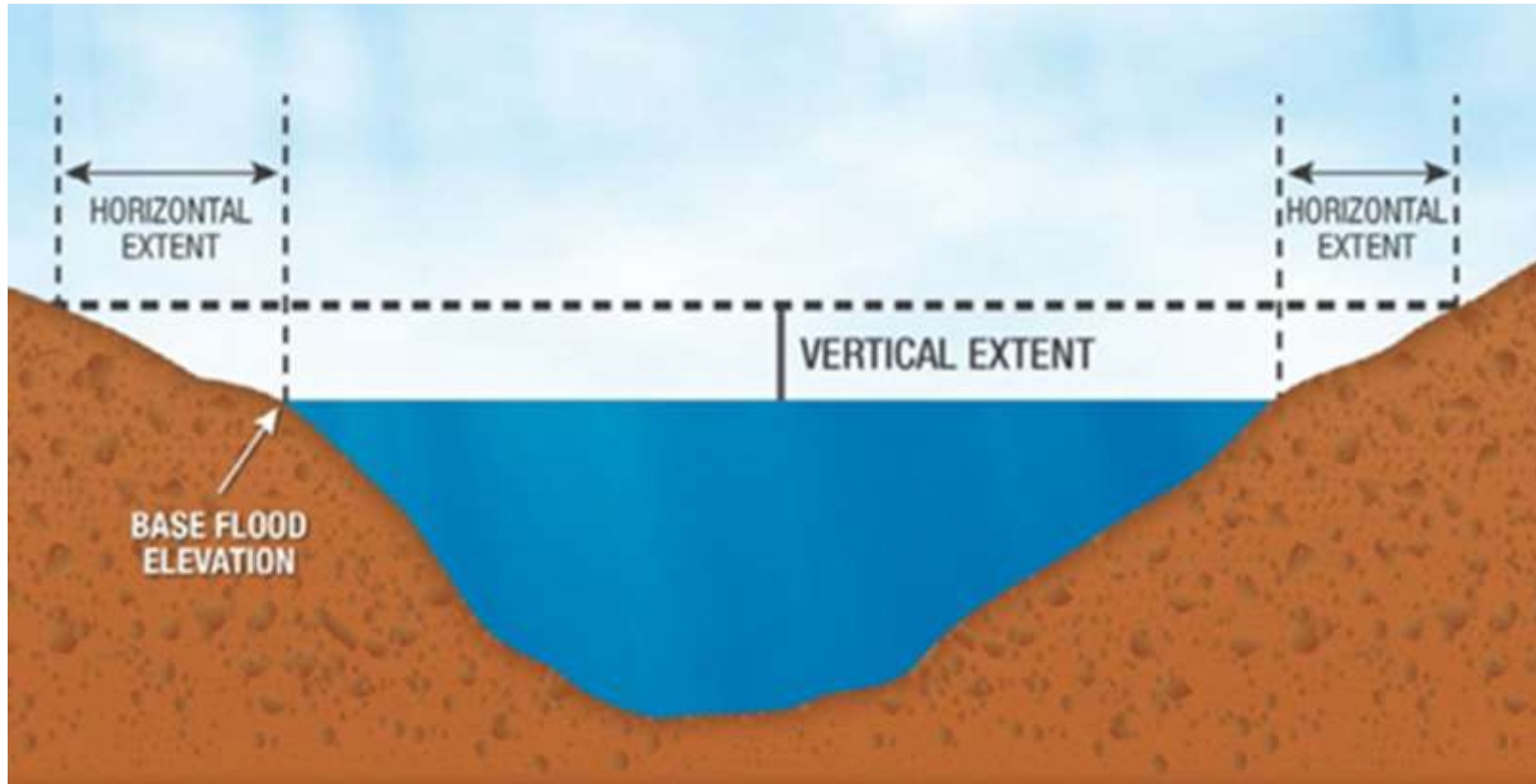
## General Flood-risk Management Guidelines (highest of)

- The vertical flood elevation and corresponding horizontal floodplain that result from adding two feet (three feet for critical facilities) of freeboard to the base flood elevation and extending this level to its intersection with the ground.
- The vertical flood elevation and corresponding horizontal floodplain associated with the 0.2-percent annual chance flood.
- The vertical flood elevation and corresponding horizontal floodplain determined by a climate-informed science approach in which adequate, actionable science is available.





# BFE + Freeboard, Horizontally Extended



The elevation & horizontal flood hazard area resulting from adding an additional 2 ft. to the base flood elevation (BFE + 3 ft. for critical facilities), and extending this elevation to its intersection with the ground

# 0.2% Annual Chance Flood



The vertical flood elevation and corresponding horizontal floodplain associated with the 0.2-percent annual chance flood (shown in pink here).

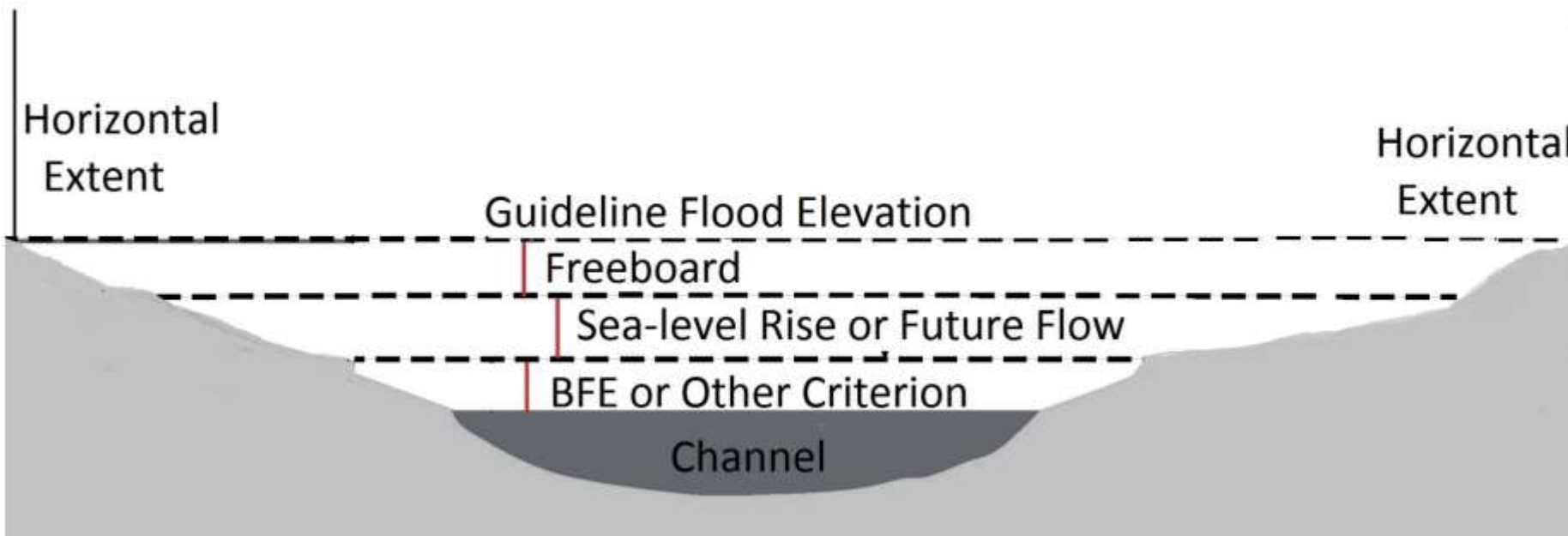
# Climate-informed Science Flood-risk Management Guideline

## Tidal Areas

- Apply specified Part 490 projection

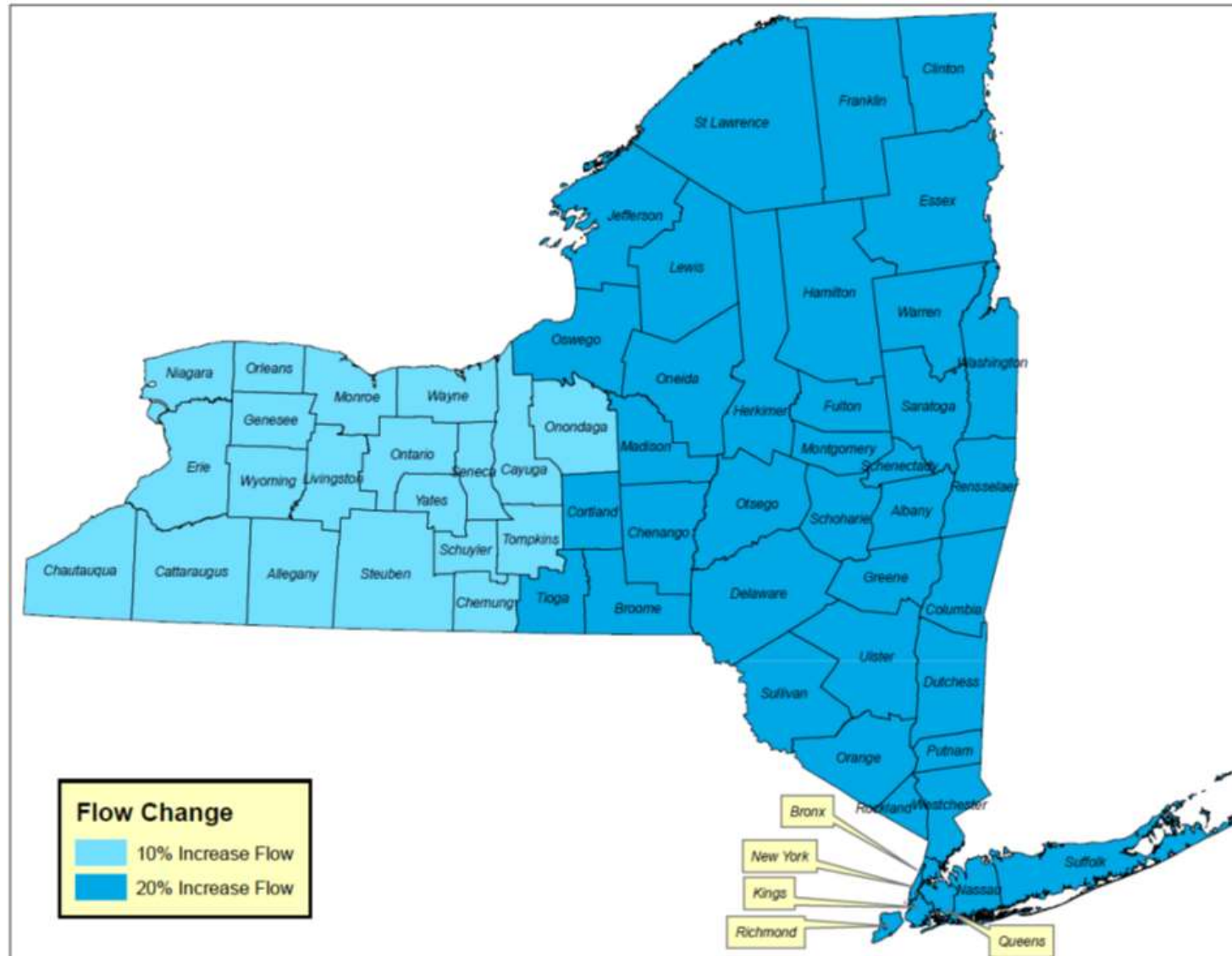
## Nontidal areas

- Apply regional design-flow multipliers





# Design Flow Multipliers



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# Buildings

	Nontidal	Tidal
One- and two-family residential, and small nonresidential structures	<ul style="list-style-type: none"> <li>• BFE + 2 feet, horizontally extended</li> <li>• 0.2-percent annual chance flood (<math>Q_{500}</math>).</li> </ul>	<ul style="list-style-type: none"> <li>• BFE + medium SLR+ 2 feet, horizontally extended</li> <li>• 0.2-percent annual chance flood (<math>Q_{500}</math>)</li> </ul>
Multi-family and large non-residential structures	<ul style="list-style-type: none"> <li>• BFE + 2 feet, horizontally extended</li> <li>• 0.2-percent annual chance flood (<math>Q_{500}</math>).</li> <li>• current one-percent annual chance peak flow (<math>Q_{100}</math>) X DFM, + 2 feet, horizontally extended</li> </ul>	<ul style="list-style-type: none"> <li>• BFE + medium SLR+ 2 feet, horizontally extended</li> <li>• 0.2-percent annual chance flood (<math>Q_{500}</math>)</li> </ul>

# Additional CRRA Guidance

- Smart Growth Public Infrastructure Project Assessment Guidance
- Natural Resiliency Measures Guidance
- Model Local Laws

The 11<sup>th</sup> smart-growth criterion:

*“To mitigate future physical climate risk due to sea-level rise, and/or storm surges and/or flooding, based on available data predicting the likelihood of future extreme weather events, including hazard risk analysis data, if applicable”*



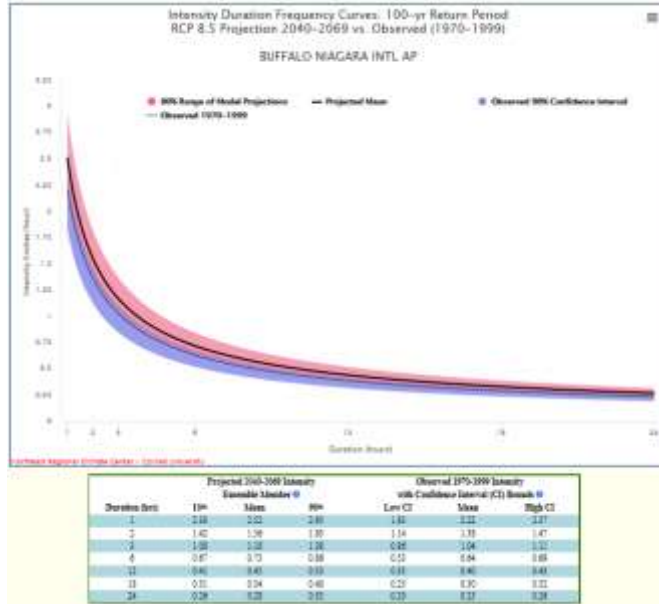


# Associated Guidance

- Observed and Projected Climate Change in New York (complete)
- Coastal Consistency Review Guidance
- Calculation of Flood Risk Management Guideline Elevations
- ECL Article 15 Bridges and Culverts Guidance

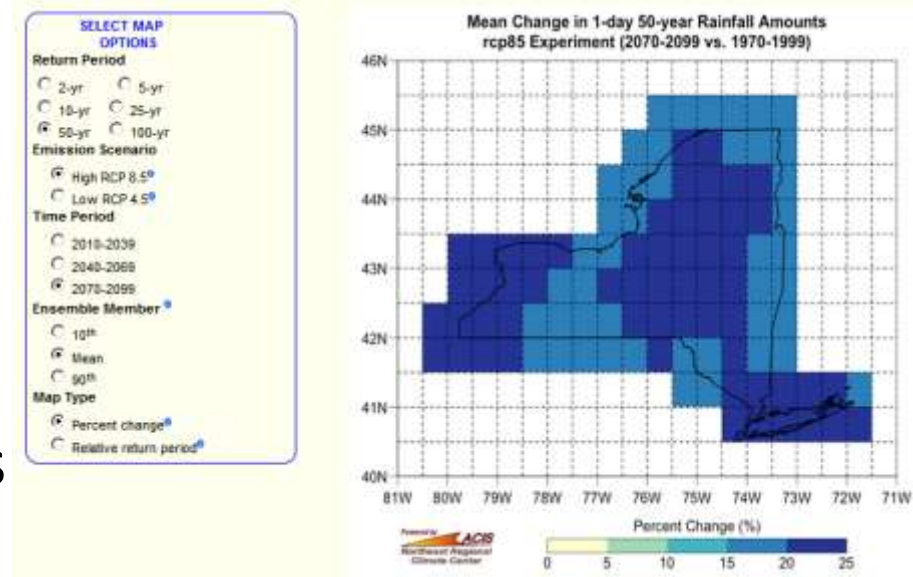


# Resources: Future Extreme Precipitation

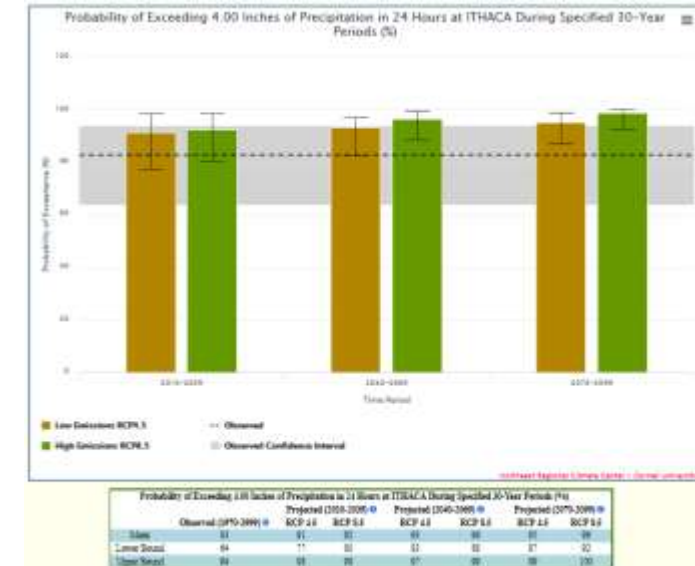


Station-specific IDF Graphs

## Statewide Projected Change Maps



## Exceedance Probabilities

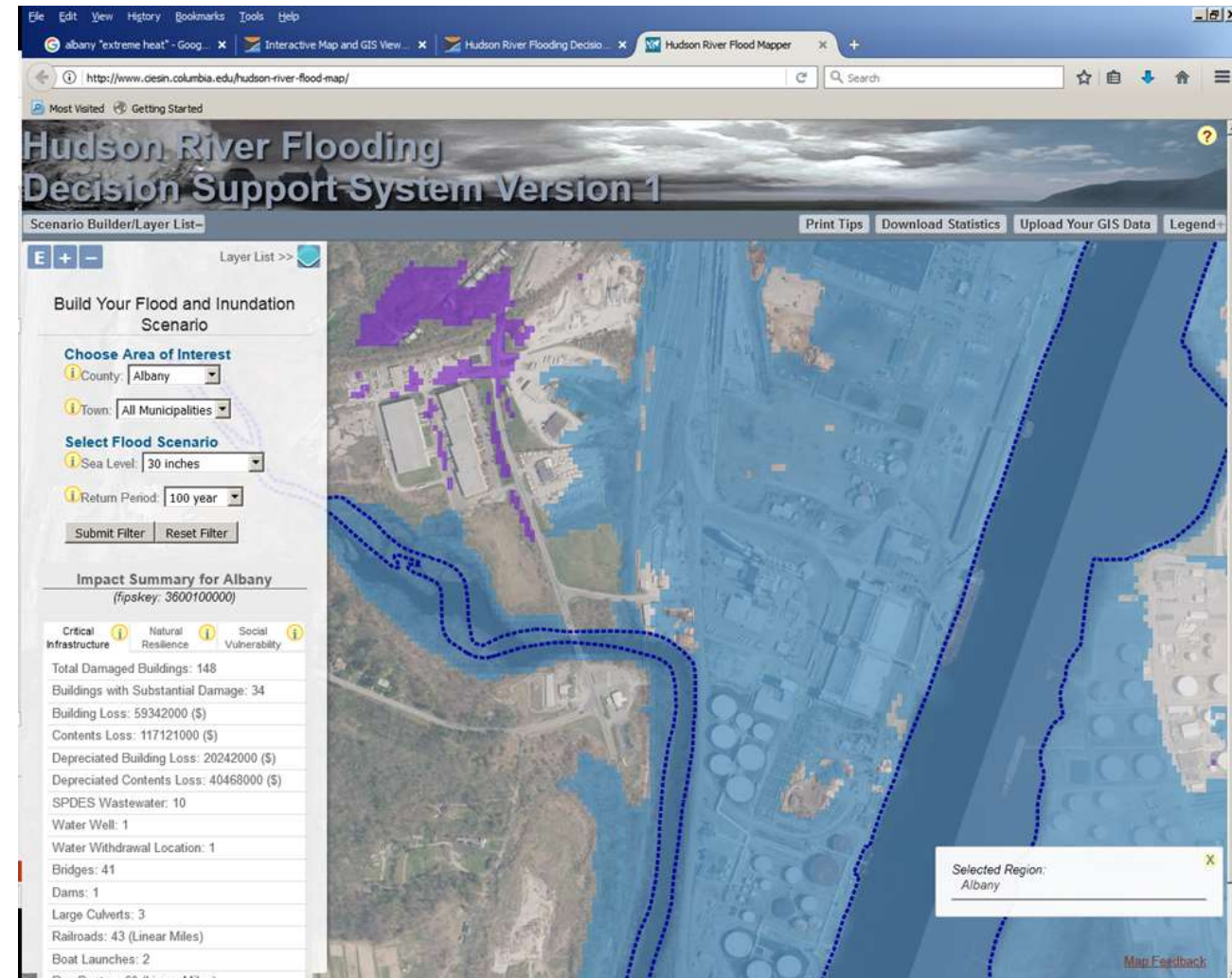


<http://ny-idf-projections.nrcc.cornell.edu/>

# Resources: Hudson River Flooding Decision Support System

- Available for ten Hudson Valley counties
- Statewide system in progress
- Accessible directly or through NYCCSC

<http://www.ciesin.columbia.edu/hudson-river-flood-map/>

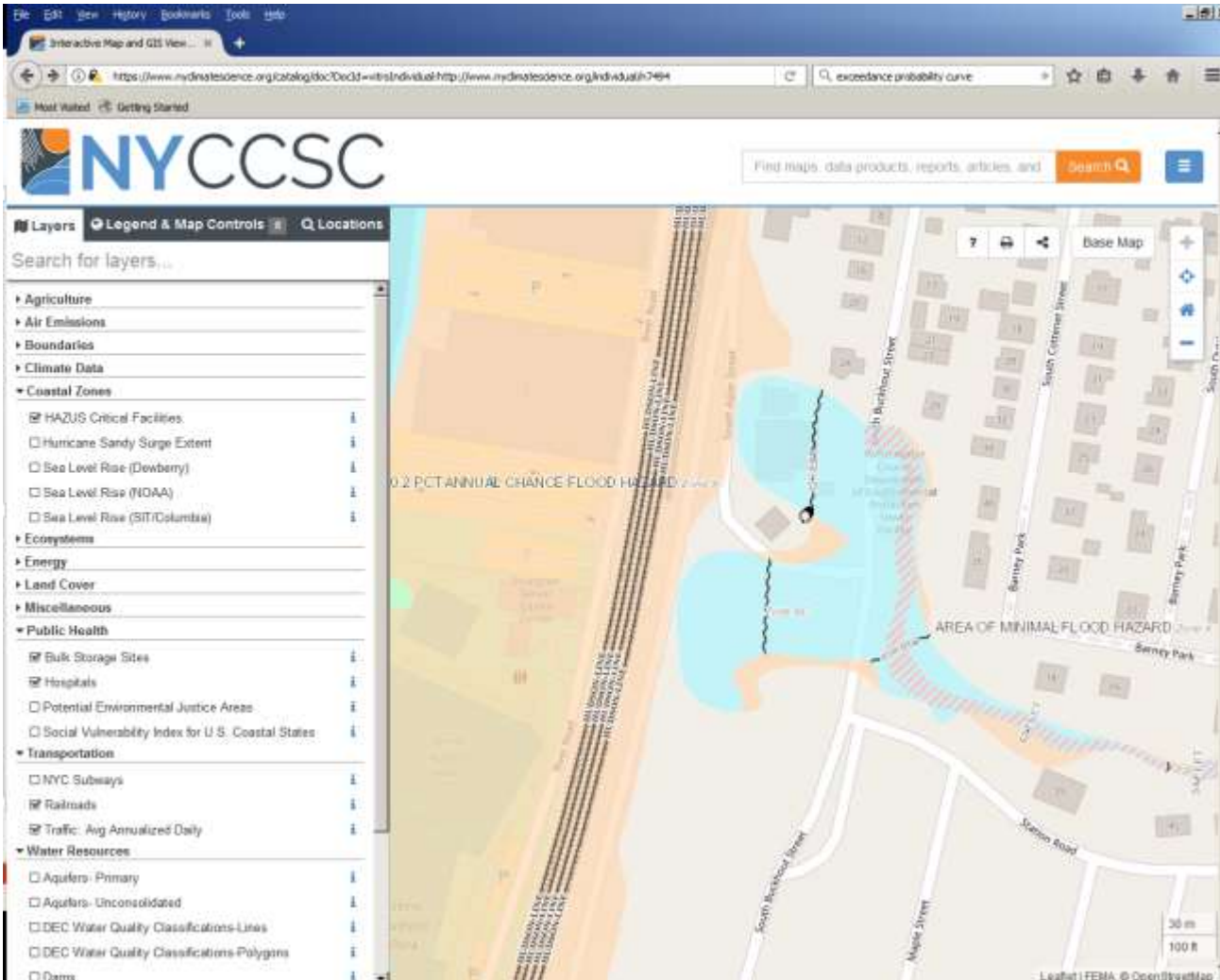




# Resources: NY Climate Change Science Clearinghouse

Maps, data and documents to support decision making

<https://www.nyclimatescience.org/>



# Thank You

Mark Lowery

Climate Policy Analyst

625 Broadway

Albany NY 12233-1030

Mark.Lowery@dec.ny.gov

## Connect with us:

- DEC: [www.dec.ny.gov](http://www.dec.ny.gov)
- Community Risk and Resiliency Act: [www.dec.ny.gov/energy/102559.html](http://www.dec.ny.gov/energy/102559.html)
- Climate Smart Communities: [www.dec.ny.gov/energy/76483.html](http://www.dec.ny.gov/energy/76483.html)
- Facebook: [www.facebook.com/NYSDEC](http://www.facebook.com/NYSDEC)
- Twitter: [twitter.com/NYSDEC](https://twitter.com/NYSDEC)
- Flickr: [www.flickr.com/photos/nysdec](http://www.flickr.com/photos/nysdec)

