

Enhancing Community Resiliency to Climate Hazards: What can Hudson Valley communities do now to adapt?

Kristin Marcell
Hudson River Estuary Program/Cornell WRI



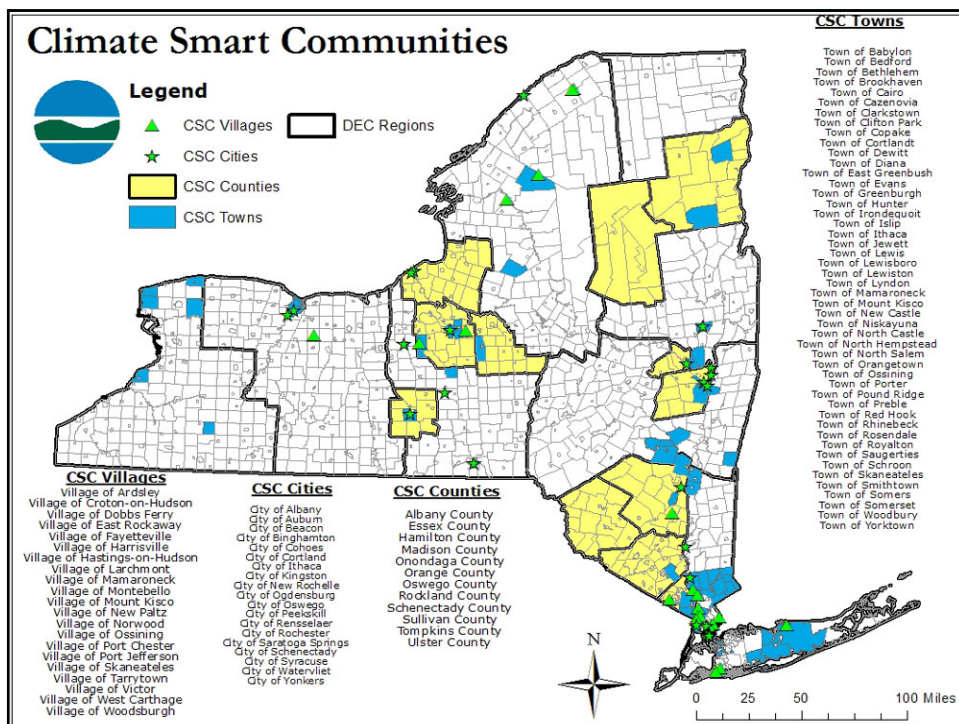
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Hudson River Estuary Program works on:

1. Clean Water
2. Fish & Wildlife Habitats
3. Recreation & Access
4. Climate Change
5. Scenery





Climate hazards relevant to Hudson Valley communities

- Sea level rise
- Intense downpours
- Extreme storms
- Extreme heat
- Short term drought



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Climate Change in the Hudson Valley

- Sea Level Rise: up ~4 feet by the 2080s
- Avg. Temps: up 4-9 degrees F by 2080s, more extreme heat
- More rain in winter, less in summer
- More big rain storms > 1" more often (74% increase in Northeast from 1958 -2010)
- Since 60's the "100 year storm" rainfall amount up (5.5" to >7") & return period down (now 66 year storm)

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Sea Level Rise Projections

Lower Hudson Valley & Long Island	2020s	2050s	2080s
Sea Level Rise ¹	2 - 5 in	7 - 12 in	12 - 23 in
Sea Level Rise ² Rapid Ice Melt	5 - 10 in	19 - 29 in	41 - 55 in
Mid-Hudson Valley & Capitol Region	2020s	2050s	2080s
Sea Level Rise ¹	1 - 4 in	5 - 9 in	8 - 18 in
Sea Level Rise ² Rapid Ice Melt	4 - 9 in	17 - 26 in	37 - 50 in

¹ Shown is the central range (middle 67%) of values from model-based probabilities (16 models x 3 scenarios) rounded to the nearest inch.

² The rapid ice melt scenario is based on acceleration of recent rates of ice melt in the Greenland and West Antarctic Ice sheets and paleoclimate studies.

Note: Baseline is average sea level from 1971-2000.

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Coastal Flooding

- New York state alone has almost \$2 trillion in insured property in coastal counties.
- More than 60% of NYS population lives in coastal counties – primarily in waterfront communities.



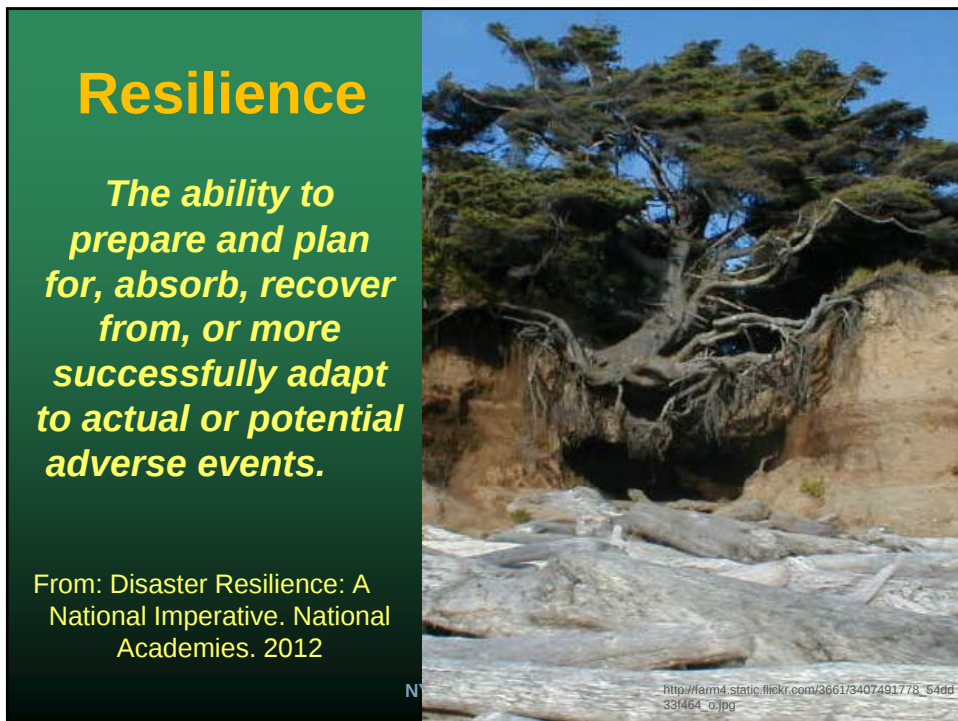
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Climate change affects communities

- Waterfronts
- Water supply
- Infrastructure
- Critical facilities/services
- Public health
- Transportation





Resiliency enhanced by:

- Long term thinking
- Collaboration
- Diversity
- Decentralized efforts
- Flexibility
- Redundancy



<http://signsofpolitics.blogspot.com/2009/03/around-and-about-resilience.html>

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**What does a flood-resilient
Cold Spring waterfront
mean to you?**



Damaged boats at a Hudson River marina, Wednesday, October 31, 2012.



What is the long term vision for the waterfront?

What is the lifespan of infrastructure?

What assets do we want to conserve?

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What is realistic?

- The future is uncertain. Can't remove all risk, difficulty or distress.
- Do we plan for current or future conditions?
- What storm? 100 year? 500 year? 10,000 year (like the Dutch)

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Armoring: For good reason



Oil terminals



Infrastructure



Cultural landmarks

Conservation



Consider armoring carefully



Protection like this?

Or like this?



10 Steps to better shore zones

- Preserve physical diversity
- Resist tidiness
- Don't squeeze the zone
- Prevent pollution
- Reduce wave damage
- Tread lightly
- Don't make dead ends
- Don't make it so hard
- Give shores room to move
- Be careful about building



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Esopus Meadows Preserve after several storms



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Demo Site Network



Scenic Hudson
Foundry Dock
Park

- Web resource
- Lists sites Hudson ecologically enhanced sites
- Includes case study, design docs, photos, contacts
- Currently: 3 finalized case studies, 5 being drafted

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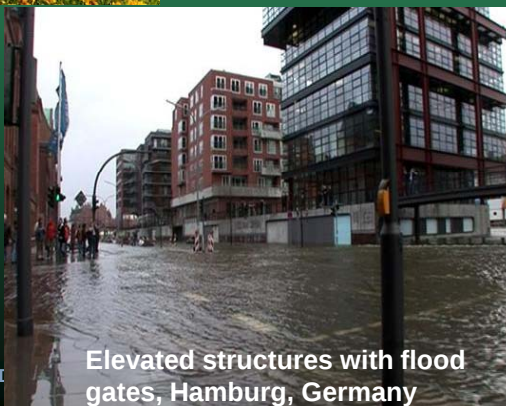
Village of Tarrytown ,
www.scenichudson.org



Can we design
a waterfront to
flood safely?

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Elevated structures with flood
gates, Hamburg, Germany



Use Green Infrastructure

2013 State of the State:

“rebuild the harbor area’s natural defenses, including preserving and building natural areas ... as well as reinforced man-made protections such as berms and seawalls that mimic nature...”



Wave attenuation,
Brooklyn Bridge Park

Use “Green” Infrastructure

Town of Bethlehem Rain Garden

- Treats runoff through infiltration prior to entering storm drain
- Cost Share:
 - Plants (\$850) - Albany SWCD
 - Design - Cornell COOP Ext.
 - Excavation/mulch – Town
 - Maintenance - Town



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Green Infrastructure Examples in the Hudson Valley

<http://www.dec.ny.gov/lands/58930.html>

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Outdoor Activities

Animals, Plants, Aquatic Life

Chemical & Pollution Control

Energy and Climate

Lands and Waters

Oceans & Estuaries

Hudson River Estuary Program

Green Infrastructure Examples for Stormwater Management in the Hudson Valley

Vassar College Rain Garden

Education

Permits and Licenses

Public Involvement and News

Regulations and Enforcement

Publications, Forms, Maps

About DEC

Vassar College Rain Garden

Description

This rain garden is an example of green infrastructure in an institutional setting. The runoff from the maintenance building is directed to the rain garden where is infiltrated into the ground.

Site Location

- **Site Address:** Hooker Ave. Poughkeepsie, NY 12601
- **Town:** Poughkeepsie
- **County:** Dutchess
- **Land Use of Site:** College Campus
- **Can Site be visited?:** Check with College
- **Location on Site:** North of first building on the right after entering the athletic complex from Hooker Avenue

Practice Information Details

- **Intent of Design:** Treat parking lot runoff through infiltration and biological uptake.
- **Stormwater Management Capacity:** 152 Cubic Feet

Page Applies To:



Related Links:

Better Site Design Program for the Hudson River Estuary

NYSDEC Construction Stormwater Toolbox

NYSDEC Stormwater Public Review Documents

Offsite Links:

Low Impact Development Center



Should
some
structures
be moved
out of
harm's
way?

Kingston waterfront low tide



Simulation: 4' sea level rise, strategic relocation



Allow Room for Rivers

- Town of Pleasant Valley
 - Floodplain Protection: Zoning code limits uses in 100 yr floodplain to those minimally affected by high water (housing and bldgs sited elsewhere).
 - No net loss of groundwater infiltration for a 10 year storm in most zoning districts.
 - <http://pleasantvalley-ny.gov/>

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In the long term in many areas parks may be better uses of the shore than buildings.



Other Local actions

- Risk assessment
- Consider changes to building codes
- Conserve our sponges – upland wetlands!
- Incorporate climate hazards into emergency planning
- Work with neighbors
- Talk across departments

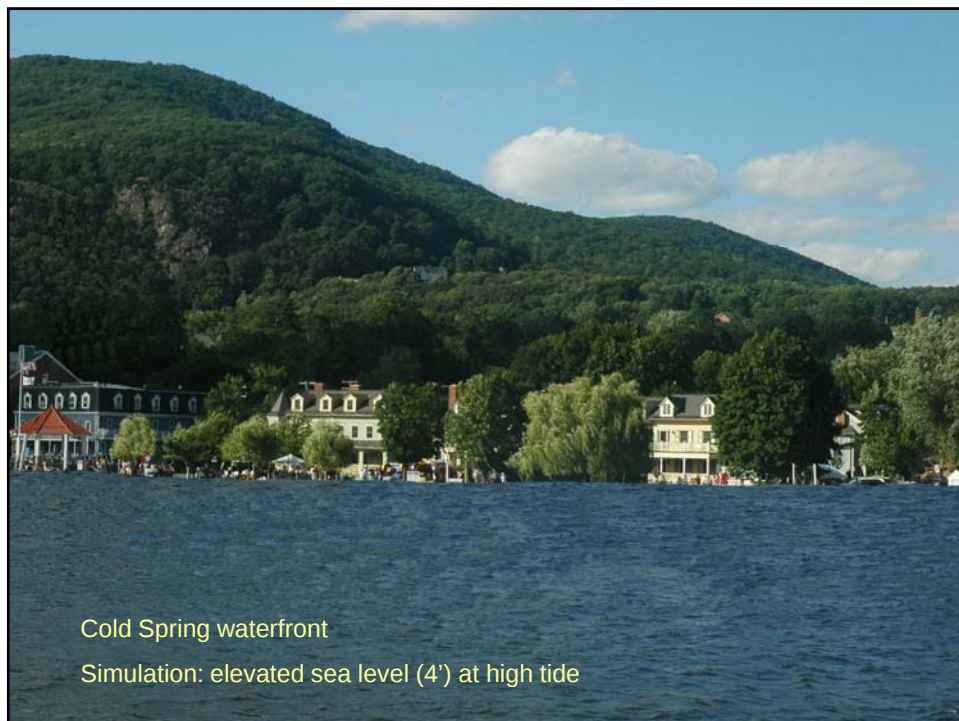
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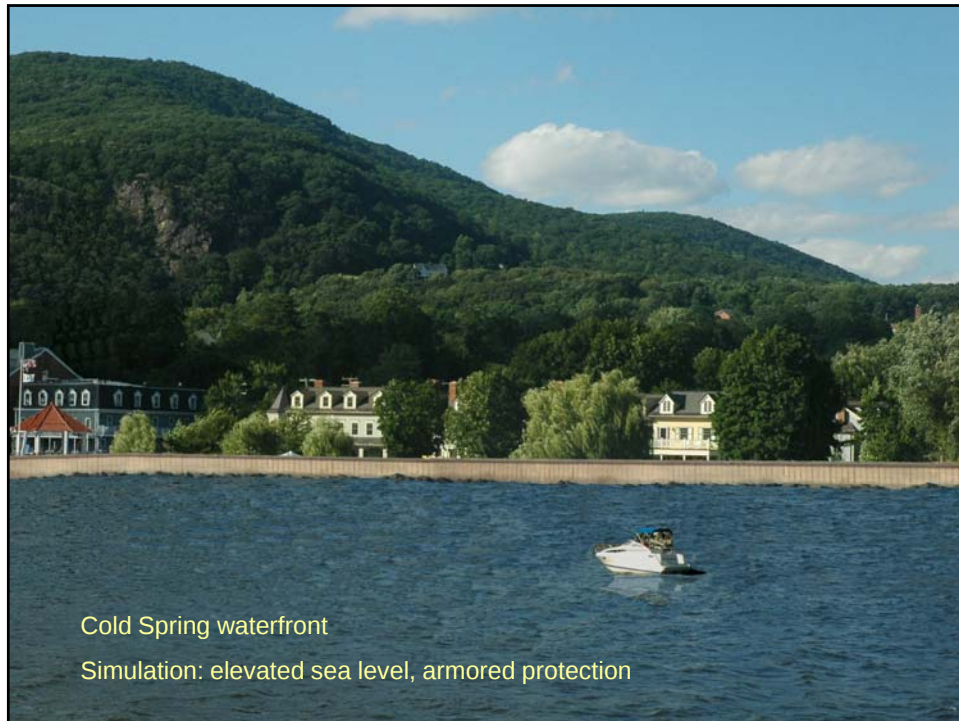


Simulations

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Questions?

Kristin Marcell
Hudson River Estuary Program
Phone: (845) 256-3017
Email: kamarcel@gw.dec.state.ny.us

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