

# Climate Vulnerability Training

Climate Smart Communities Program

April 19, 2013



**VHB** *Engineering, Surveying and Landscape Architecture, P.C.*  
An Independent Contractor to NYSERDA

# Agenda

- \* **Welcome and Roundtable Introductions**
- \* **Understanding Adaptation and Vulnerability**
- \* **The Vulnerability Assessment Process**
  - \* Assessing Exposure and Sensitivity
  - \* Understanding Adaptive Capacity
  - \* Identifying Key Vulnerabilities
  - \* A Look at the Capital Region
- \* **Moving from Vulnerability Identification to Action**
- \* **Resources to Support Action**
- \* **Closing and Next Steps**

# Roundtable Introductions

- \* Your Name, Title, Organization
- \* What your favorite thing is about living in your hometown
- \* What you hope to learn in today's training



**ADAPTATION**



**PUBLIC HEALTH**



**WATER RESOURCES**



**COASTAL ZONES**

**ECONOMICS**

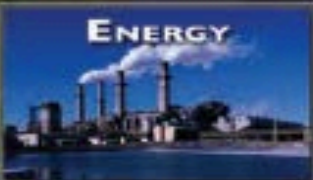


**ECOSYSTEMS**



**AGRICULTURE**

**VULNERABILITY**



**ENERGY**



**TELE-COMMUNICATIONS**



**TRANSPORTATION**

**EQUITY**

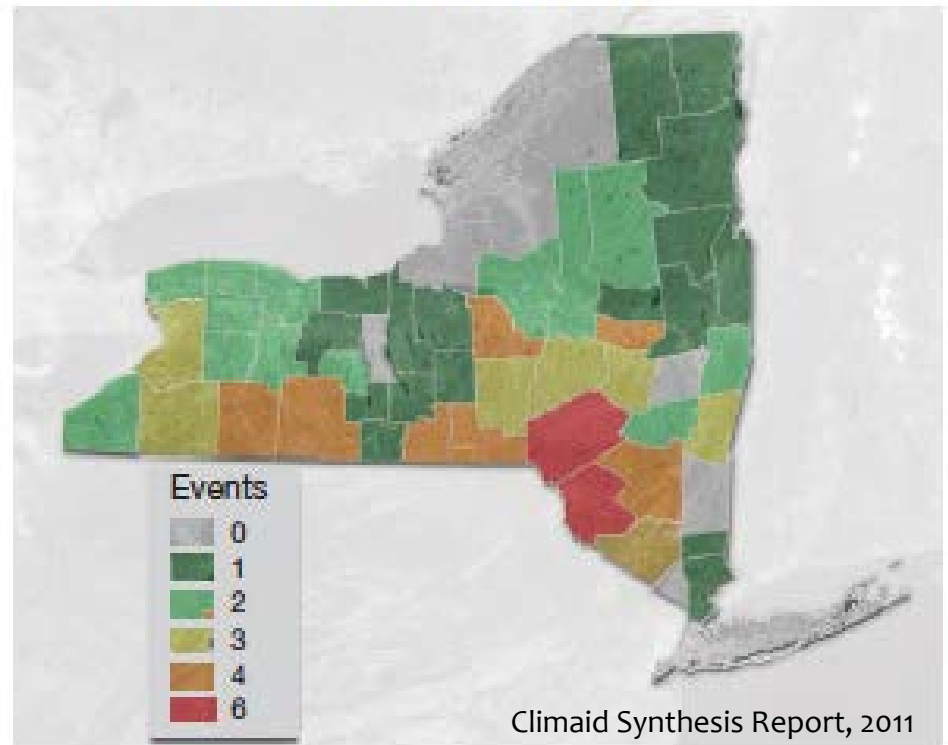
**CLIMATE**



**CLIMAD**

# Observed Changes

Flood Events per County, 1994–2006

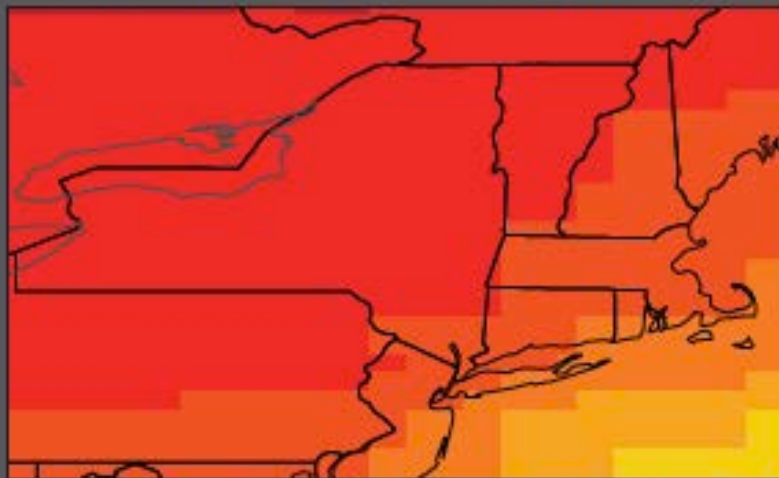


Number of FEMA-declared flood disasters in New York State counties. (FEMA)

- \* Annual average temperatures in New York State have risen about 2.4°F since 1970, with winter warming exceeding 4.4°F.
- \* Sea level along New York's coastline has risen about one foot since 1900.
- \* Since 1900, there has been no discernible trend in annual average precipitation for the state as a whole.
- \* Intense precipitation events (heavy downpours) have increased in recent decades.

# Increasing Temperatures

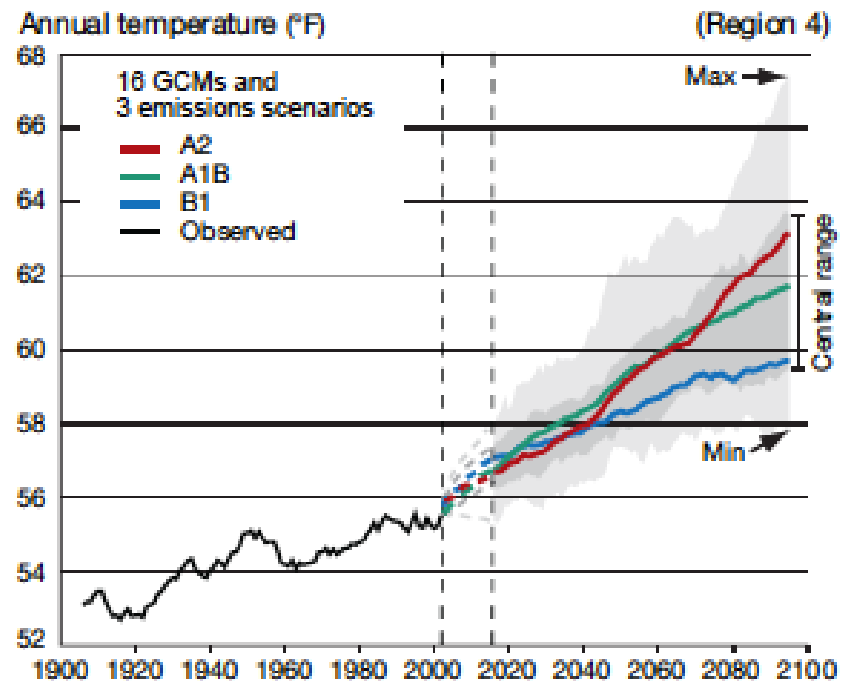
Projected Annual Temperature Change, 2080s (°F)



4°F 4.5 5 5.5 6 6.5 7 7.5

Average annual temperatures are projected to increase by 4.0 to 9.0°F by the 2080s, with the lower end of this range projected under lower greenhouse gas emissions scenarios and the higher end under higher emissions scenarios. A mid-range emissions scenario, A1B, was used for the maps above, yielding temperature increases of about 7°F for most of the state. The A1B trajectory is associated with relatively rapid increases in emissions for the first half of this century, followed by a gradual decrease in emissions after 2050.

Observed and Projected Annual Temperature Change



# Increasing Heat



# Worsening Air Quality





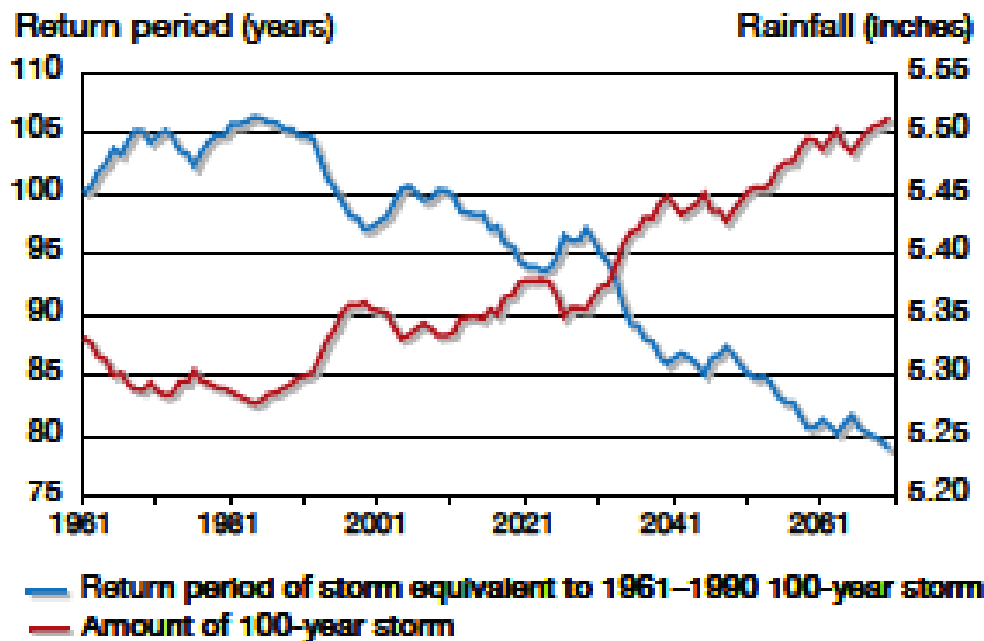
# Stress on Energy Infrastructure



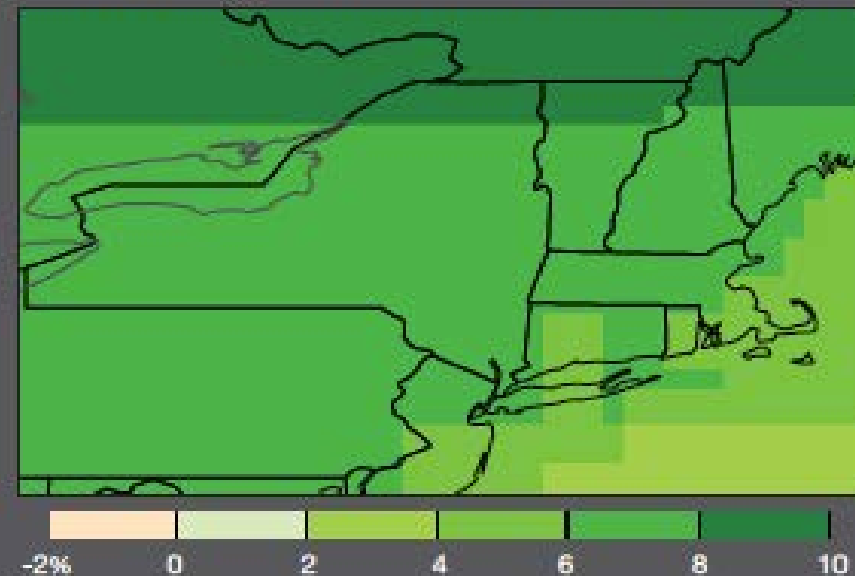
Image from [news.nationalgeographic.com](https://news.nationalgeographic.com)

# Changing Precipitation Patterns

## Projected Rainfall and Frequency of Extreme Storms

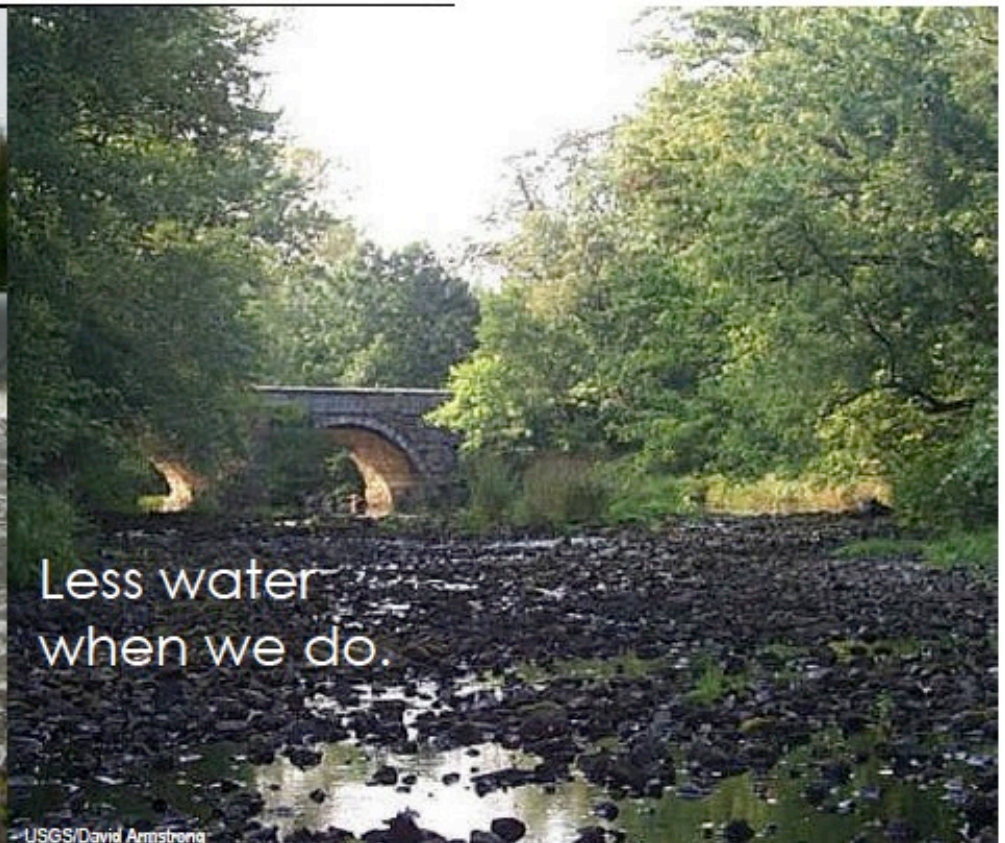


## Projected Annual Precipitation Change, 2080s (%)



Precipitation across New York State may increase by approximately 5 to 15 percent by the 2080s, with the greatest increases in the northern parts of the state. Much of this additional precipitation may occur during the winter months as rain, while late summer and early fall precipitation could decline slightly. Both maps show the average across 16 global climate models.

# Changing Water Availability



# Flooding



Image from [breakingnews.com](http://breakingnews.com)

# Drought



Image from [money.cnn.com](http://money.cnn.com)

# Agricultural Impacts



Image from [uscusa.org](http://uscusa.org)

# Changes in Intensity and Frequency of Storms



Image from [severe-wxpbworks.com](http://severe-wxpbworks.com)

# Ice Storms



Missy Stults



# Sea Level Rise

## Projected Sea Level Rise for New York State (inches)

Modeled Sea Level Rise	2020s	2050s	2080s
GCM-based	+1 to +5	+5 to +12	+8 to +23
Rapid ice melt scenario	+4 to +10	+17 to +29	+37 to +55



Coastal and  
Riverine Flooding

# Economic Impacts



Image from [oh.water.usgs.gov](http://oh.water.usgs.gov)



Image from [mymidwestliving.com](http://mymidwestliving.com)



Image from [voyageaire.com](http://voyageaire.com)



Image from [wxrt.cbslocal.com](http://wxrt.cbslocal.com)

# Ecosystem Shifts



# Changing Disease Vectors

Bats



Mosquitoes



Ticks



Lice



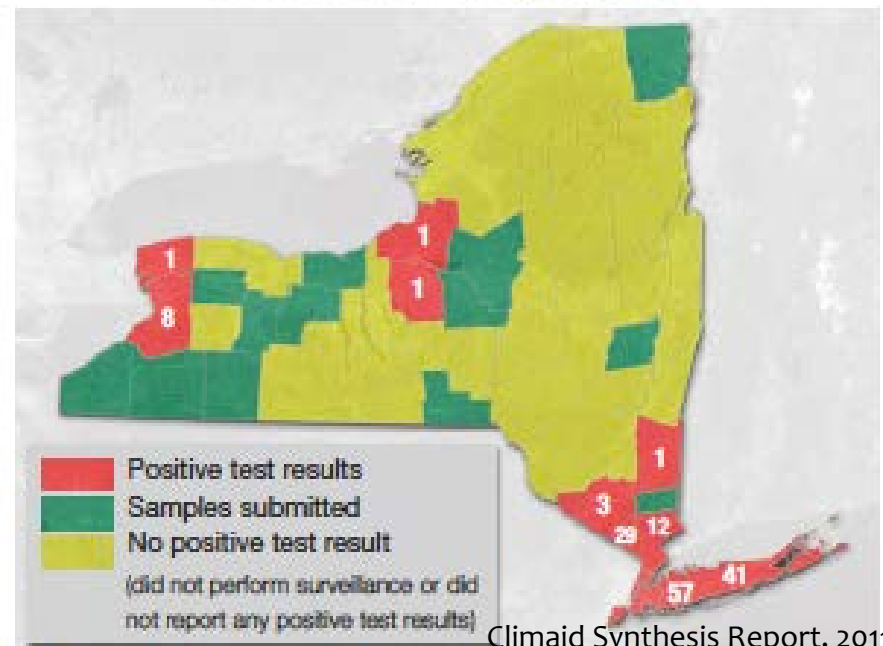
Fleas



Rodents



West Nile Virus in Mosquitoes, 2008

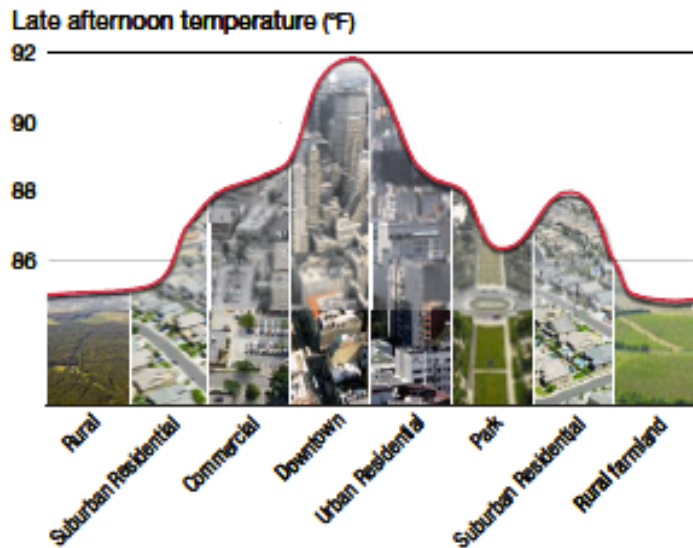


Climaid Synthesis Report, 2011

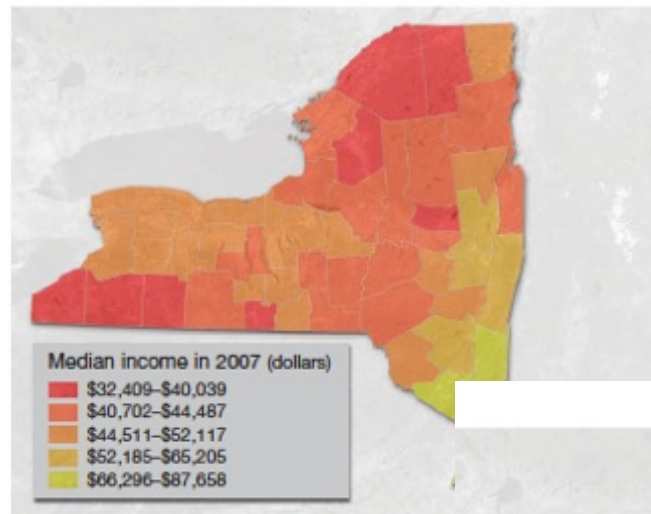
While West Nile virus infections in humans and birds have only been reported in a limited part of the state, the prevalence of West Nile virus in mosquitoes is more widespread throughout the state.

# Multiple Stressors

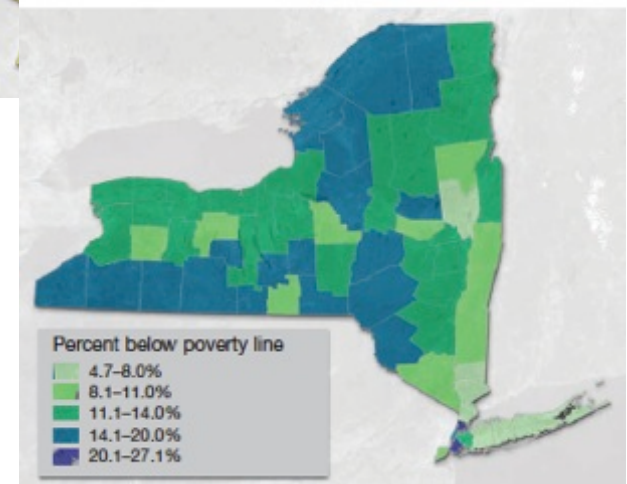
## Urban Heat Island Effect



Income Disparities



Poverty Rates



# But What Can We Do?

- \* We can plan, act, be proactive



- \* Or we can wait



# Emergency Preparedness



**Emergency Preparedness** – Any action associated with the **short-term** response to and recovery from a disaster event

# Hazard Mitigation



**Hazard Mitigation** – Any action taken to reduce or eliminate the long-term risk to human life and property from natural hazards

(Stafford Act)



# Addressing Climate Change

- \* **Climate Adaptation** – Any measure or action that reduces the negative impacts of climate change or increases new opportunities.
- \* **Climate Mitigation** – Any measure or action taken to reduce greenhouse gas emissions.



# Preparing for Climate Requires All



# Vision of Resilience

**Resilience:** The ability of systems to absorb disturbances while retaining the same basic structure and ways of functioning, or to evolve to a new state of operation



# Understanding Vulnerability

- \* The degree to which a system is susceptible to (sensitive), and unable to cope with (adaptive capacity), adverse effects of climate change (including climate variability and extremes)
- \* Three core elements:
  - \* Exposure;
  - \* Sensitivity; and
  - \* Adaptive capacity



# Questions?



# Why is a Vulnerability Assessment Important?

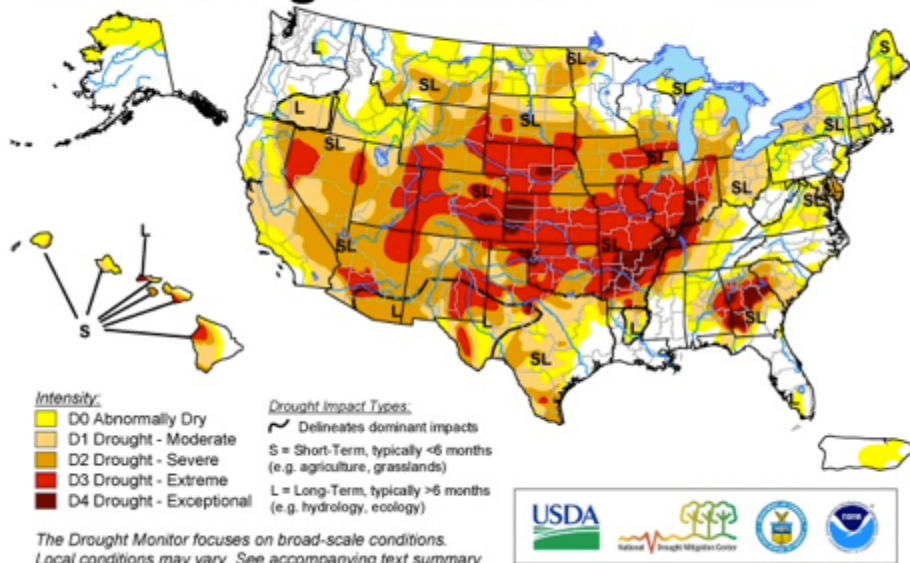
- \* Provides insight into the areas of your community that need attention
- \* Helps prioritize actions
- \* Provides opportunity for multi-jurisdictional collaboration
- \* Structure for tracking progress



# Exposure

## U.S. Drought Monitor

July 31, 2012  
Valid 7 a.m. EDT



<http://droughtmonitor.unl.edu/>

Released Thursday, August 2, 2012  
Author: Mark Svoboda, National Drought Mitigation Center

- \* Exposure is a determination of whether the system as a whole or its parts will experience a specific changing climate condition.
- \* It is often an inventory of the “assets”—people, property, systems, and functions—that could be lost, injured, or damaged due to an impact of climate change.

# Sensitivity



Laura DeGaetano, Albany County Senior Natural Resource Planner

- \* The degree to which a built, natural, or human system is directly or indirectly affected by changes in climate conditions or specific climate change impacts. If a system is likely to be affected as a result of climate change, it should be considered sensitive to climate change



# Adaptive Capacity

- \* The ability of a system to adjust to climate change, to moderate potential damages, to take advantage of opportunities, or to cope with consequences.



Effect of institution on adaptive capacity	Score	Aggregated scores for dimensions and adaptive capacity as a whole
Positive effect	2	1.01 to 2.00
Slightly positive effect	1	0.01 to 1.00
Neutral or no effect	0	0
Slightly negative effect	-1	-0.01 to -1.00
Negative effect	-2	-1.01 to -2.00

# Assessing Exposure and Sensitivity

## Exercise

# Assessing Exposure and Sensitivity

## Discussion

# Assessing Adaptive Capacity

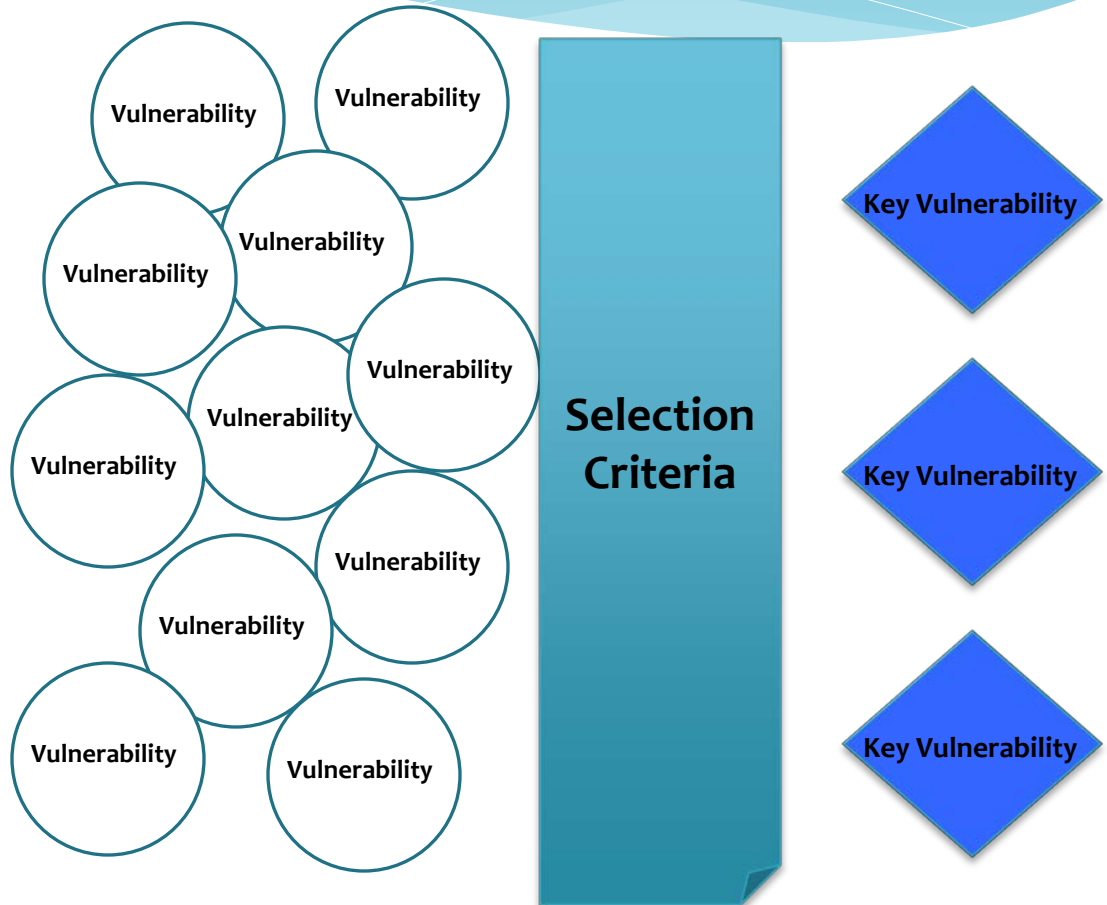
## Exercise

# Assessing Adaptive Capacity

## Discussion

# Identifying Key Vulnerabilities

- \* Decision criteria can help determine which vulnerabilities to initially prioritize
- \* Criteria derived from the Intergovernmental Panel on Climate Change
- \* Qualitative and Quantitative



# Key Vulnerability Selection Criteria

- \* Magnitude of Impact
- \* Timing of Impact
- \* Persistence and Reversibility of Impact
- \* Likelihood of Impact
- \* Potential for Adaptation Actions
- \* Importance of Vulnerable Populations
- \* Distributional Aspects of Impacts and Vulnerabilities

# Assessing Vulnerability in the Capital Region: A Case Study

**Insights from Doug Melnick and  
team**



# Assessing Vulnerability in the Capital Region: A Case Study

- \* Designed to coordinate with the city's Comprehensive Plan
- \* Begins with Hazards profile – observed and current impacts; projected future
  - \* Historical documents
  - \* FEMA maps
  - \* GIS
  - \* FEMA HAZUS-MH modeling software

# Assessing Vulnerability in the Capital Region: A Case Study

- \* Used material from ClimAID, Northeast Climate Impacts Assessment, and the NYC Panel on Climate Change
- \* Developed series of 2030 floodplain scenarios using USGS DEM data in conjunction with GIS
  - \* 9 inches of rise on the Hudson
- \* Selected: society, infrastructure, and natural resources as systems for analysis
  - \* Public health; transportation; critical facilities; energy, water, and sewer; air quality; natural habitat; and urban forests

# Assessing Vulnerability in the Capital Region: A Case Study

- \* Conducted qualitative risk assessment
- \* Prioritized areas of vulnerability
- \* Starting to identify strategies to build resilience to identified vulnerabilities
- \* Created a Community Advisory Committee on Sustainability

# Moving from Vulnerability Identification to Action

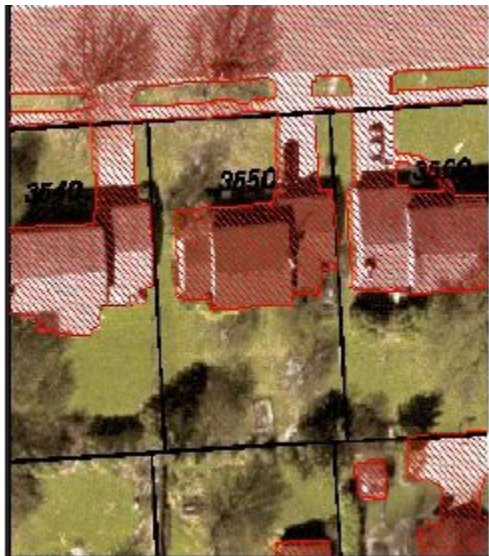


# Addressing Existing Stressors: Flooding Response



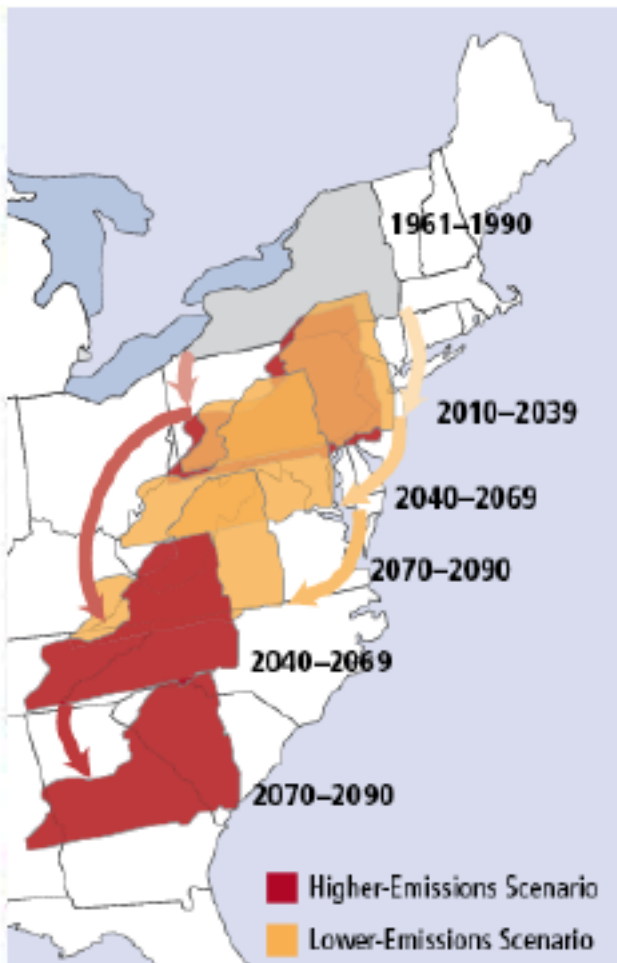
## Addressing Existing Stressors

- \* Thunder Bay, ON: Developing city-wide Urban Design Guidelines that incorporate green infrastructure and 'complete street' model
- \* Developing greenways along the tributaries of the Huron River to improve water quality and reduce flooding
- \* Stormwater utility developing in Ann Arbor, MI; already updated rate structure based on amount of impervious surface
- \* Increasing culvert sizes in Keene, NH



# Heat

## Upstate New York



- \* Cincinnati Health Department has special outreach to high-risk population (those taking medication and with mental illness)
- \* Urban heat island mitigation in Chicago via cool roofs and neighborhood efforts
- \* NYC has created a reverse 911 program
- \* Minneapolis officials conduct door-to-door wellness checks during events – working on a plan for pets.

# Other Stressors

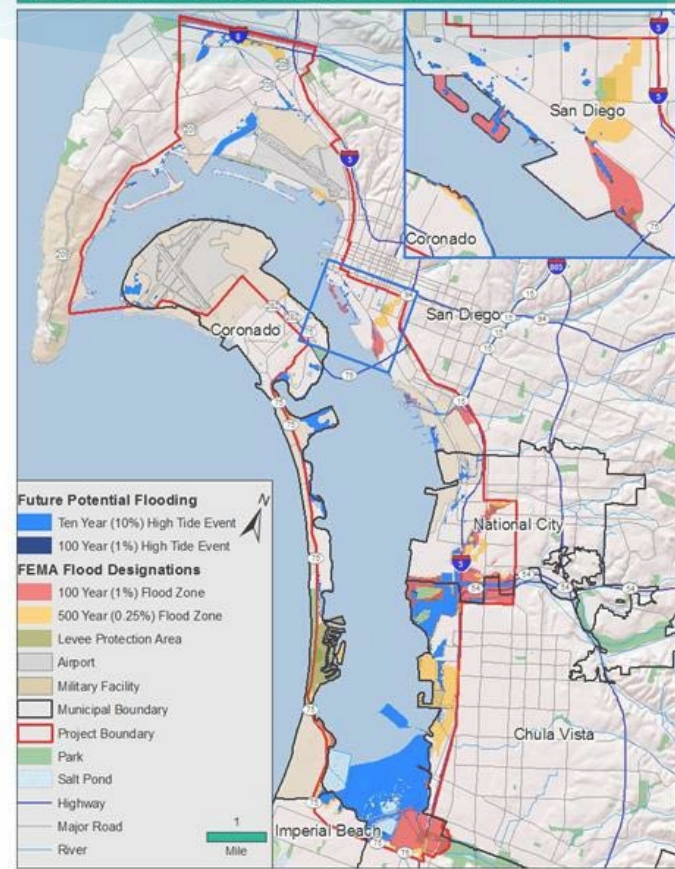
- ✓ Dayton, OH Canopy reduces run-off 7%
- ✓ Promoting landscape alternatives such as the use of native plants and drought resistant grasses, planting shade trees, and rain water collection systems to divert water from the sewer system in Bedford, NY
- ✓ Green roof on city hall in Dayton, OH
- ✓ Dubuque, IA is building new wastewater treatment facility to hold water and prevent sewer overflows; created a green alley program to install permeable pavers in alleys



# Regional Collaboration

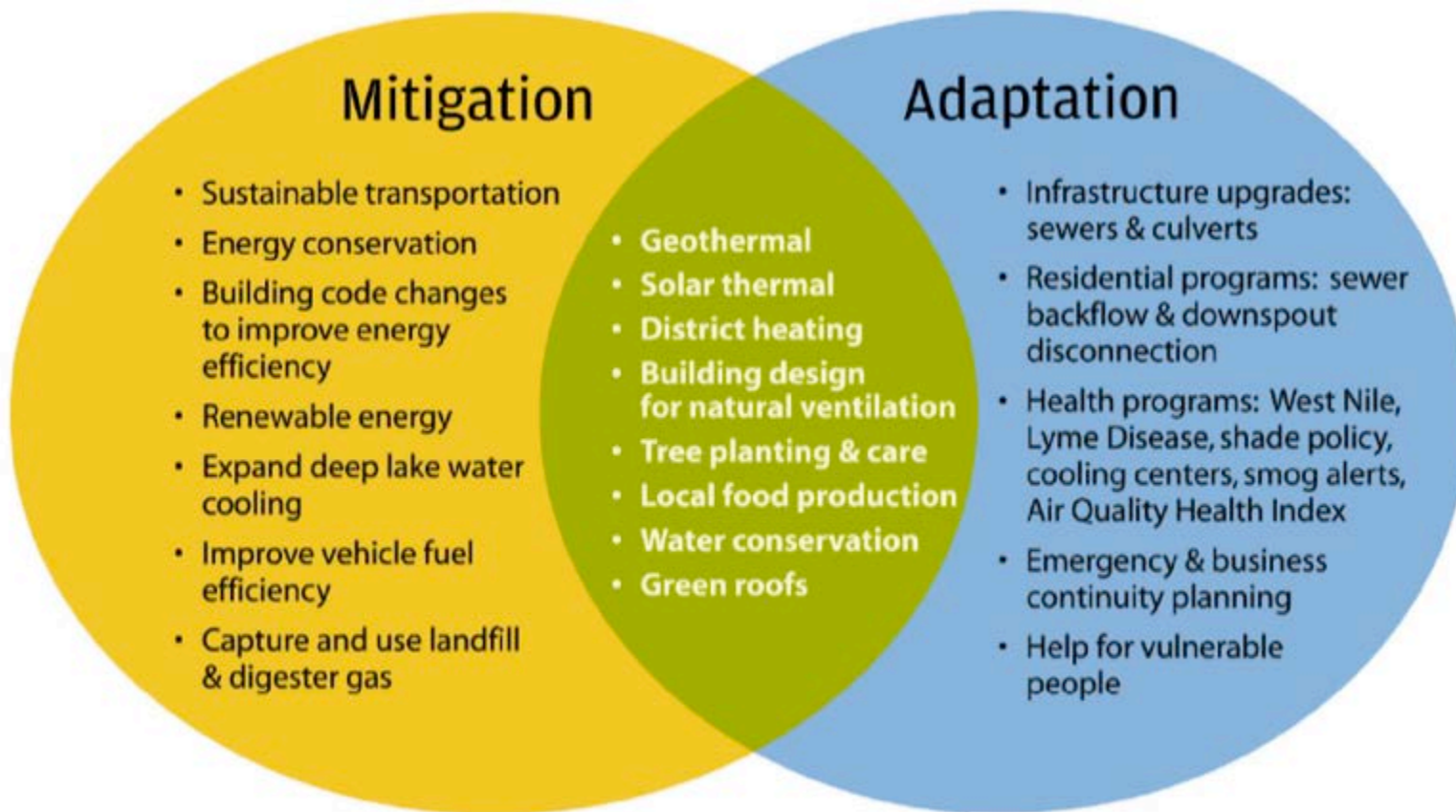


Figure 3.4 Half Meter of Sea Level Rise - Potential Future Flooding





# Toronto's Win-Win Identification



# **Additional Resources to Support Local Climate Action**

**Mark Lowery, NYSDEC**

# Closing and Next Steps

- \* Questions
- \* Lunch
- \* Clean Communities Coalition
- \* Roundtable Discussion

# Thank You!



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