Climate Smart Communities Webinar

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No audio signal will be transmitted over the Internet
Climate Smart Communities Webinar
February 12, 2015

NYSDOT Flooding Vulnerability Assessment and NYSDEC Fine-Scale Culvert Assessment Project

This webinar will begin shortly. Please be considerate of your fellow attendees:

• Please mute your phone to reduce background noise
• If you need to take an incoming call, please hang up this line first, and then pick up the incoming call
• Please do not put your phone on hold at any time.
• To ask a question, please type your question or comment in the chat box feature.
Welcome

Kim Farrow
Environmental Program Specialist
Office of Climate Change
New York State
Department of Environmental Conservation
Climate Smart Communities Webinar

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Climate Smart Communities Webinar

Website Address

http://www.dec.ny.gov/energy/50845.html
Climate Smart Community Webinars
Schedule: http://www.dec.ny.gov/energy/86246.html

- March 12, 10:30 a.m. Mobilizing Regional Climate Action.
- April 9, 10:30 a.m. Reducing Community Transportation Emissions.

Events

Beginning the Certification Process

1. Review certification materials
2. Designate a project coordinator
3. Get organized
4. Gather publicly available information
5. Request materials from local government staff

More Extreme Precipitation Events and Flooding

More summer downpours
More extreme snow/ice events

Observed trends in 1-day very heavy precipitation (1958 to 2010).
Too much water when we don’t want it, too little when we do

- Less frequent summer rainfall may affect water supply
- Reduced flows on larger rivers
- Flooding may increase water pollution
- Damage to transportation infrastructure
- Changes in accretion & scour
- Landslides
NYSDOT
Statewide Flooding Vulnerability Assessment

Elisabeth Lennon
NYSDOT Statewide Policy & Performance

February 2015
NYS Multi-Modal System
Diverse, Complex and Vital

7,632 State Bridges
9,800 Local Bridges

4,137 Rail Route Miles

40,000 State Lane Miles
200,000 Local Lane Miles

> 44 Million Enplanements

130 billion vehicle miles annually
NYSDOT Mission

• To ensure our customers - those who live, work and travel in New York State -- have a safe, efficient, balanced and environmentally sound transportation system.

  ** Addressing changing climate and extreme weather impacts on transportation infrastructure and mobility is critical.
FHWA Approved Costs of Events

Declared Events

- April-May 2011 flooding
- Hurricane Irene
- Tropical Storm Lee
- Hurricane Sandy
- June-July 2013 Severe Storms and Flooding

Size of dots indicates dollar amount of FHWA approved costs:
- $0 - $500,000
- $500,000 - $1,000,000
- $1,000,000 - $2,000,000
- $2,000,000 - $3,000,000
- More than $3,000,000
Higher frequency and intensity of extreme weather in NYS

There has been a 71% increase in the number of 2-inch rainfall events occurring over a 48-hour period since the 1950s.
Climate Change Initiatives

Statewide:
- NYS Sea Level Rise Task Force (2008)
- NYSERDA’s ClimAID Project
- NYS Climate Action Council (2009)
- NYS Climate Smart Communities (ongoing)
- NYS 2100 Commission (2013)
- NY Rising (ongoing)
- 2014: Community Risk and Resilience Act
- NYS Climate Change Clearing House (Future)
- Ongoing Research

NYS Interagency Adaptation Work Group (ad hoc)

Local/Regional Examples:
- New York City’s PlaNYC
- Hudson Valley Climate Action Network
- Kingston Waterfront Flooding Taskforce
Executive Management Support

• NYSDOT hosted “Climate Change and Extreme Weather Workshop”
  ▫ Executives and Practitioners
  ▫ Climate Scientists, Planners and Engineers
  ▫ Held Oct 24, 2012

• NYSDOT Commissioner chairs national committee (AASHTO): “Resilient and Sustainable Transportation Systems Technical Assistance Program and Steering Committee”
NYSDOT CC Vulnerability Assessments

1) NY-NJ-CT Post Sandy Study - FHWA

2) NYSDOT/TNC Lake Champlain Watershed - FHWA Pilot

3) Statewide Flooding Vulnerability Assessment (state system only)
Virtual Framework for Vulnerability Assessment

This section of FHWA’s Climate Change Adaptation website provides resources, tools, and guidance to help local and regional transportation agencies implement the Federal Highway Administration’s (FHWA’s) Climate Change and Extreme Weather Vulnerability Assessment Framework, a guide to assessing the vulnerability of transportation assets to climate change and extreme weather events.

The section’s structure follows that of the framework as shown in the graphic below. Click on any area of the graphic to go to the corresponding module on the Virtual Framework site. Each module includes an overview, summary of key steps, an introductory video, and links to case studies, tools, and other resources. Several of the modules include tools developed by FHWA to help transportation agencies implement their assessments.
NYSDOT Statewide Flooding Vulnerability Assessment

- Based on WashDOT’s 2011 FHWA Pilot
- Obtain & share knowledge from Regional staff
- Communicate vulnerabilities
Diverse Team

Tools:
- Maps
- Climate Science

Communicate Findings

Team QA/QC
- Build Statewide GIS Data Layer

Populate Spreadsheets

Meetings with Regions

Regional Reviews
Diverse Team

Tools:
- Maps
- Climate Science

Meetings with Regions

Communicate Findings

Team QA/QC
Build Statewide GIS Data Layer

Populate Spreadsheets

Planning
Hydraulic Engineering
Design Services
GIS
Environmental

STEPS OF ASSESSMENT

Planning
Hydraulic Engineering
Design Services
GIS
Environmental
Diverse Team

Tools: Maps

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Populate Spreadsheets

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Communicate Findings
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Tools:
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Meetings with Regions

- Vulnerable Bridges
- Vulnerable Culverts
- Vulnerable Roads
- Interstate
- Federal Touring Routes
- State Touring Routes
- Local Roads
  - Bridges (State and Local)
  - Large Culverts
  - NYSDOT Residencies
  - Parking Area
  - Passenger Rail Stations
- Hospital
- Public Schools
- Nursing Homes
- Shelters
- Libraries
- Fire Stations
- Police Stations
- Railroad
- Hydrography
- 100 Year Flood Risk
- 500 Year Flood Risk
Understand Trends & Projections

Example: Gage Record of annual peak flows from a 2.94 sq mi watershed in Southern Wayne County.

Walton, Delaware County
Photo: Town of Walton

Newburgh, Orange County
Diverse Team

Tools:
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- Climate Science

Meetings with Regions

Regional Reviews

Populate Spreadsheets

Team QA/QC

Build Statewide GIS Data Layer

Communicate Findings
Diverse Team

Tools:
Maps
Climate Science

Meetings with Regions

Regional Teams & Reviews

Regional Teams:
Maintenance Staff:
Regional, Residencies,
Bridge Maintenance
Hydraulic Engineers
Design & Structures
Environmental

Populate Spreadsheets

Team QA/QC
Build Statewide GIS Data Layer

Communicate Findings
Future Trends

Recent Experiences

Maps

Regional Reviews

Expected effects of Climate Change

What keeps you up at night?

Prioritize
Diverse Team

Tools:
- Maps
- Climate Science

Meetings with Regions
Regional Reviews
Communicate Findings

Team QA/QC
Build Statewide GIS Data Layer
Populate Spreadsheets
<table>
<thead>
<tr>
<th>ID</th>
<th>Impact /Cause</th>
<th>Location Info</th>
<th>Criticality Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Stream alongside highway with historic flooding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Stream alongside highway with historic flooding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Debris Log clogging: cross culvert causing overtopping</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Stream alongside highway with one of slope erosion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Stream alongside highway with one of slope erosion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Road bridge on highway</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Drainage ditch across state highway with historic flooding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Glacial till clogging: cross (Drift debris)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Stream alongside highway with one of slope erosion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Stream alongside highway with one of slope erosion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Egress underpass through culvert in East Aurora</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Catsarague Creek/Clear Creek Flood Plain in Catsarague Territory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Egress underpass through culvert in Catsarague Territory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Egress underpass through culvert in Catsarague Territory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Egress underpass through culvert in Catsarague Territory</td>
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<td>16</td>
<td>Egress underpass through culvert in Catsarague Territory</td>
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<tr>
<td>17</td>
<td>Egress underpass through culvert in Catsarague Territory</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Spreadsheet Example*
1. Location/Impacts/Causes
   - Present or Future Vulnerability
     - State highways and bridges
     - Regional knowledge
     - Note: FEMA mapping
       - not necessarily indicative of vulnerability
       - not available throughout state

<table>
<thead>
<tr>
<th>Description of Impact/Vulnerability &amp; Cause</th>
<th>Is Vulnerability an Issue Now and/or in Future?</th>
<th>Location</th>
<th>Impact of Long Term Closure</th>
<th>Factors Affecting Severity of Closure Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present</td>
<td>Future</td>
<td>Start Ref Marker</td>
<td>End Ref Marker</td>
<td>BIN (if applicable)</td>
</tr>
<tr>
<td>Stream alongside highway with historical flooding</td>
<td>Yes</td>
<td>No</td>
<td>62 5302973</td>
<td>62 5302978</td>
</tr>
<tr>
<td>Stream alongside highway with historical flooding</td>
<td>Yes</td>
<td>No</td>
<td>62 5303080</td>
<td>62 5303082</td>
</tr>
<tr>
<td>Debris load-clogging, ooze-outlet causing overtopping</td>
<td>Yes</td>
<td>No</td>
<td>62 5303091</td>
<td>62 5303092</td>
</tr>
<tr>
<td>Stream alongside Highway with toe of slope erosion</td>
<td>Yes</td>
<td>No</td>
<td>240 5301605</td>
<td>240 5301602</td>
</tr>
<tr>
<td>Stream alongside Highway with toe of slope erosion near high volume roadway</td>
<td>Yes</td>
<td>No</td>
<td>70 53029032</td>
<td>70 53029033</td>
</tr>
</tbody>
</table>
Determine Criticality

**Low**
- Short Detours Available
- Not on a Significant Access Route to Essential Services

**Medium**
- Detours will affect some people
- Access to Emergency Services Not Affected

**High**
- No or Long Detours
- Evacuation Route
- Significant Access to Hospital, Schools, Employment

Populate Spreadsheets
Team: QA/QC
Build Statewide GIS Data Layer

Diverse Team

Communicate Findings

Tools:
Maps
Climate Science

Meetings with Regions

Regional Reviews

Populate Spreadsheets
Communicate Findings

- Team QA/QC
  - Build Statewide GIS Data Layer
- Populate Spreadsheets

Diverse Team

Tools:
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- Climate Science

Meetings with Regions

Regional Reviews
Information for improved decision-making
Diverse Team

Tools:
- Maps
- Climate Science

Annual Updates

Communicate Findings

Team QA/QC
- Build Statewide GIS Data Layer

Populate Spreadsheets

Meetings with Regions

Regional Reviews
NYSDOT Flooding Vulnerability Data Dissemination Policy

- Share Data
  - Spreadsheet and/or GIS Files
  - Not NYSDOT GIS Application (CAMCI)
  - Conditions
- State and Local Agencies
  - Consultants/contractors
- Publish analyses from data but not original data
NYSDOT Commitment

○ Build resilience into DOT organizational structure

○ Inform asset management/investment decisions

○ Promote and support a robust resilient and efficient transportation network.
GETTING TO RESILIENCE

ASSESSMENTS

DESIGN STANDARDS

EXTREME WEATHER

EMERGENCY RESPONSE OPERATIONS

CLIMATE CHANGE PROJECTIONS FOR NY

GUIDANCE

LIFE CYCLE DESIGN

FLOODPLAIN MAPPING

STATE POLICIES

Critical Infrastructure

COSTS $$

Uncertainties

CLIMATE CHANGE DENIERS

TIGHT BUDGETS

FUTURE IDF CURVES

RISK TOLERANCE
We Can’t Do It Alone

Universities/Climate Scientists

@NYSDOS

ASCE

AMERICAN SOCIETY
OF CIVIL ENGINEERS

NYSERDA


AASHTO

THE VOICE OF TRANSPORTATION

TRB

TRANSPORTATION
RESEARCH BOARD
OF THE NATIONAL ACADEMIES

NEW YORK STATE DEPARTMENT OF TRANSPORTATION

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

FEDERAL HIGHWAY ADMINISTRATION

U.S. DEPARTMENT OF TRANSPORTATION

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL PROTECTION

NYS

NEW YORK STATE

DOE

DEPARTMENT OF ENERGY

NOAA

U.S. NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

US ARMY CORPS OF ENGINEERS
Community Assessments Critical

- Diverse Landscape
- Climate
- Population

• Drained by > 70,000 miles of streams
• 10 major river systems
• >>% of population lives in coastal areas
Thank you.

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Culvert Assessments in the Hudson River Estuary Watershed

Climate Smart Communities webinar
Thursday, February 12th, 2015
Core Mission
® Ensure *clean water*
® Protect and restore fish, wildlife, and their *habitats*
® Provide water recreation and river *access*
® Adapt to *climate change*
® Conserve world-famous *scenery*
Streams are highways

Dams and poorly installed culverts act as road blocks

Connected streams are stronger
Connected Streams

Barriers Impact:

- Habitat
- Aquatic communities
- Sediment and debris
- Water quality
- Hydrology
- Maintenance/Replacement costs
- Liability
- Dam failure
- Recreation value
- Property value
Connected Streams

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- Recreation value
- Property value
Economics of barrier mitigation

Number of barriers

- 64% not fully passable, Great Lakes basin (Janushowski-Hartley et al. 2013)
- Over 60% not fully passable, Green Mountain National Forest (USFS 2013)
- 1 million culverts statewide (NYSDOT)
- 5700 dams in NYS Dam Inventory, on average 69 years old (Vedachalem and Riha, 2013)

Cost of Mitigation

- Ecologically-based designs increase cost by 80%, and 300% for small culverts (as cited in draft TNC NYSDOT culvert prioritization project report)
- $77,582 median cost for dam removal (n=225, Biohabitats, 2010)
Biologically Important Aquatic Barriers

- The Nature Conservancy and Hudson River Estuary Program
- Prioritized barriers
  - watershed condition
  - river network
  - Natural Heritage Program Important Areas
- Field-verified
Culvert Prioritization project

- Field work identifies culverts
- Assess passability of culvert
- Model current and future stream flow
- Prioritize culverts
- Work with municipalities to fund replacement of top priorities
Culvert Prioritization project
Culvert Prioritization project
Culvert Prioritization project
With 2013 rainfall/runoff
Many culverts are undersized
Culverts are largely on town roads

Figure 2. Distribution of return period of culvert peak flow capacity (submerged outlet), displayed by road ownership and watershed.
Improving Watershed Resiliency

• Plan for climate adaptation
• Integrate water resource protection into municipal plans
• Move infrastructure out of floodplains
• Create partnerships, work intermunicipally and with watershed groups
Improving Watershed Resiliency

- Replace undersized road crossings
- Remove dams where feasible
- Manage runoff with green infrastructure
- Build demonstration sites
- Protect forests, wetlands, floodplains
- Restore vegetation along streams
® Funding opportunities

® Resources

° American Rivers
° Cornell Cooperative Extension Hudson River Resiliency webpage
° Land trusts and non-profits
° NYSDEC Hudson River Estuary Program webpage

® Other Estuary Program projects

Lake Creek
Roeliff Jansen Kill
Aquatic barriers “...sit unneeded, unused, undermaintained—a growing ecological and fiscal liability” National Forest System Legacy Roads and Trails program 2013
Andrew Meyer
Andrew.meyer@dec.ny.gov

Hudson River Estuary Program
New York State Department of Environmental Conservation
in cooperation with
Cornell University
NYS Water Resources Institute
Climate Smart Communities Webinar

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