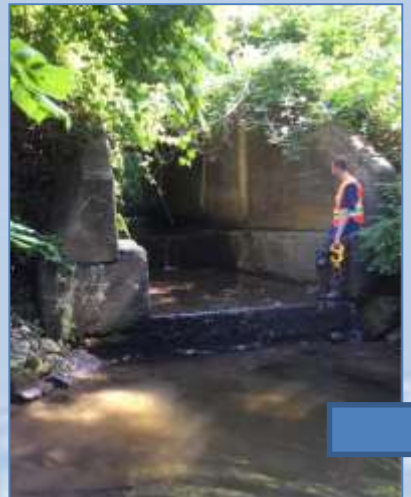
Planning for Flood-Resilient and Fish-Friendly Road-Stream Crossings

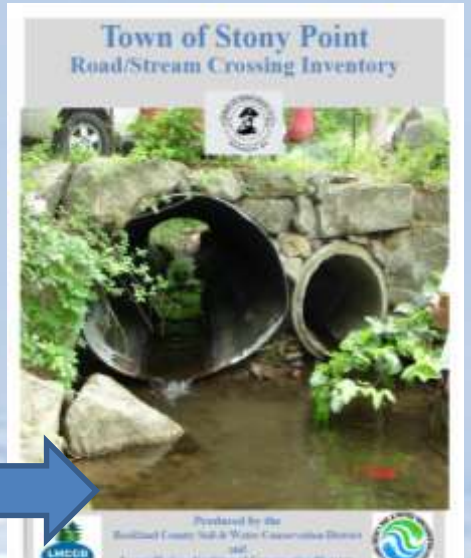
Regional Assessment

Megan Lung

From Assessment to Action

Nicole Laible

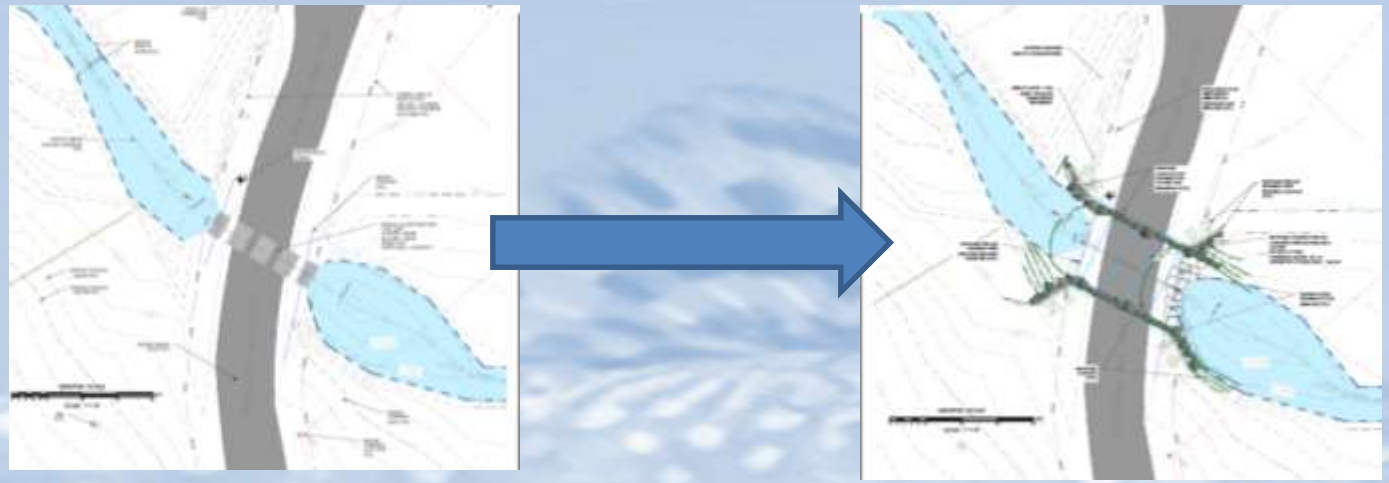




Implementation

Paul Woodworth

Princeton Hydro



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Re-Connecting Our Streams

Aquatic Connectivity and the Effect of Dams and Culverts

SENY Stormwater Conference
October 18th 2017

NEIWPCC
New England Interstate Water Pollution Control Commission

Cornell University

New York State
Water Resources Institute
Cornell University

HUDSON RIVER ESTUARY PROGRAM

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***

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AQUATIC CONNECTIVITY

Streams are highways

Dams and poorly installed culverts act as road blocks

Connected streams are stronger

Flood resilient structures overlap with fully passable structures

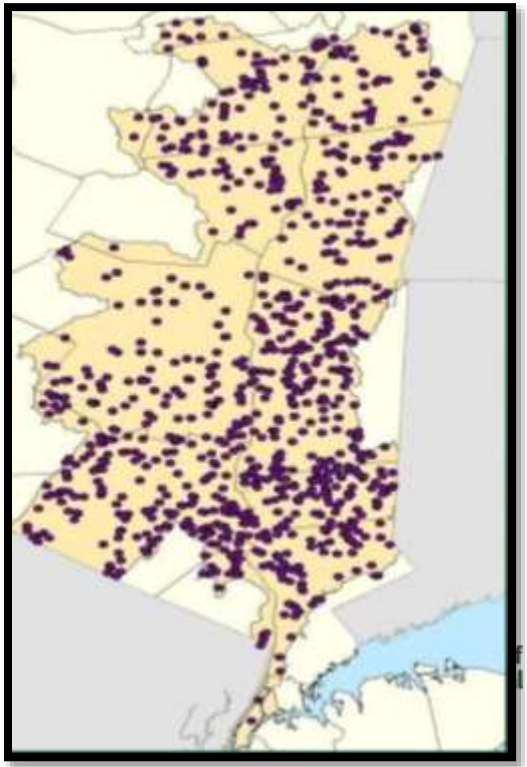
Hudson River Watershed

1900

Over 1800 in the watershed

Average age of regulated dam in NY is 69

2000



Hollowville Creek

Connected Streams

Crossings Impact

- Habitat
- Aquatic communities
- Sediment and debris
- Water quality
- Hydrology
- Maintenance/Replacement costs
- Liability
- Road condition

Where Our Project Comes In

No central database of road-stream crossings

Similar studies in other watersheds found 66% of crossings were barriers (Janushowski-Hartley et al. 2013, Gillespie et al 2014 Fisheries Magazine, USFS 2013)

Barrier mitigation is expensive

Crossings Have to Accommodate Storm Events

Cost of a culvert failing

- Maintenance Cost
- Replacement
- Repairing the road
- Disruption of emergency services
- Disruption of travel
- Effect on residents

Better culvert design can increase upfront costs by 50-100% (TNC 2013) but an emergency replacement is more expensive than a planned one.

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Culvert Prioritization

Field work identifies culverts

Assess culvert passability

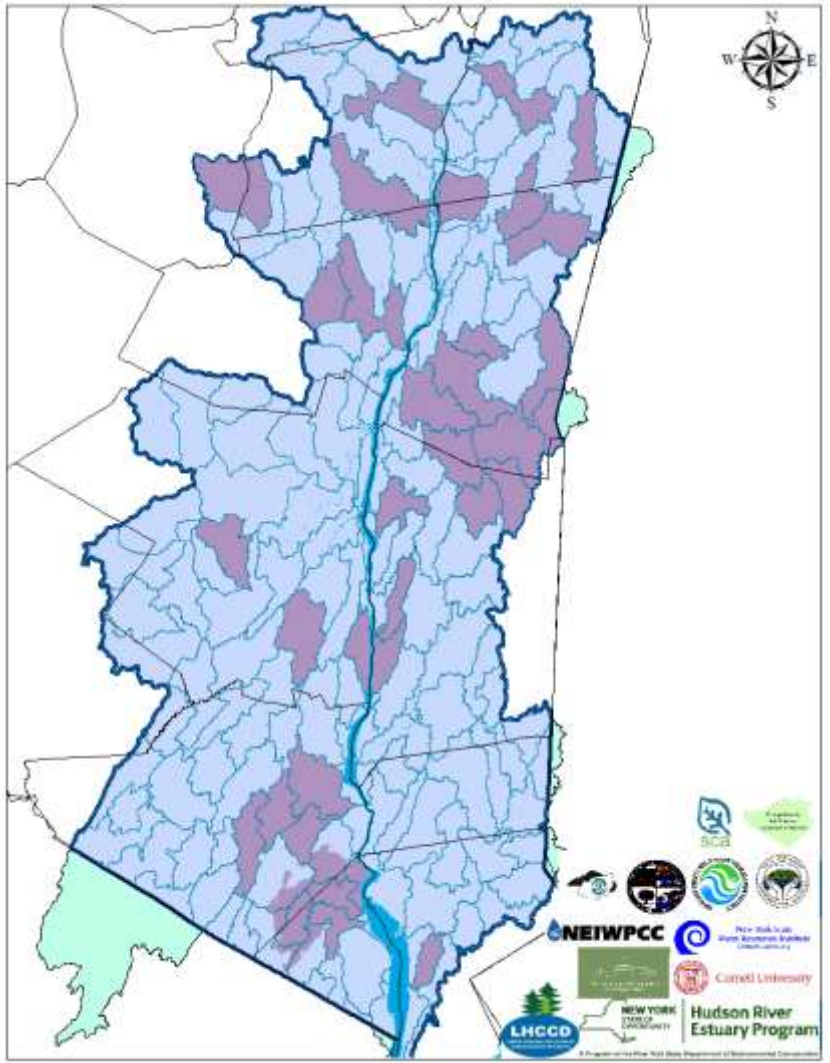
- North Atlantic Aquatic Connectivity Collaborative

Model current and future stream flow

- NYS Water Resource Institute

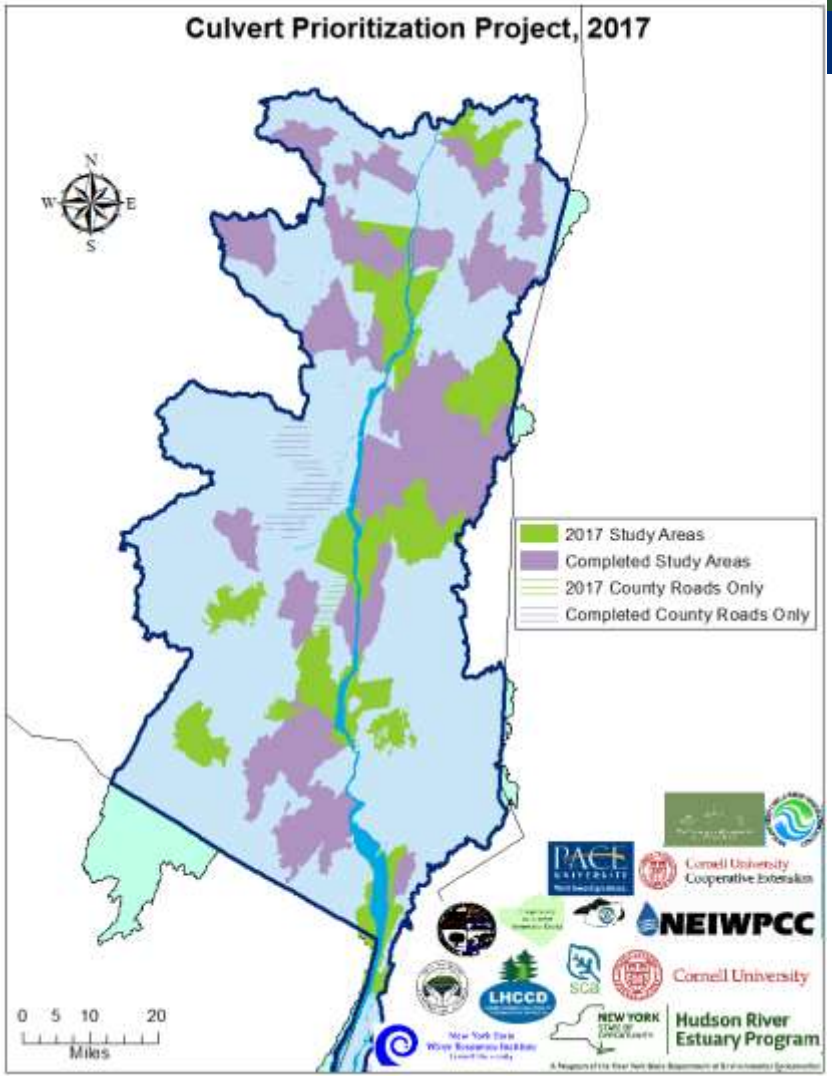
Prioritize culverts

Work with municipalities to fund replacement of top priorities




Rt. 9, Stuyvesant


Ancram



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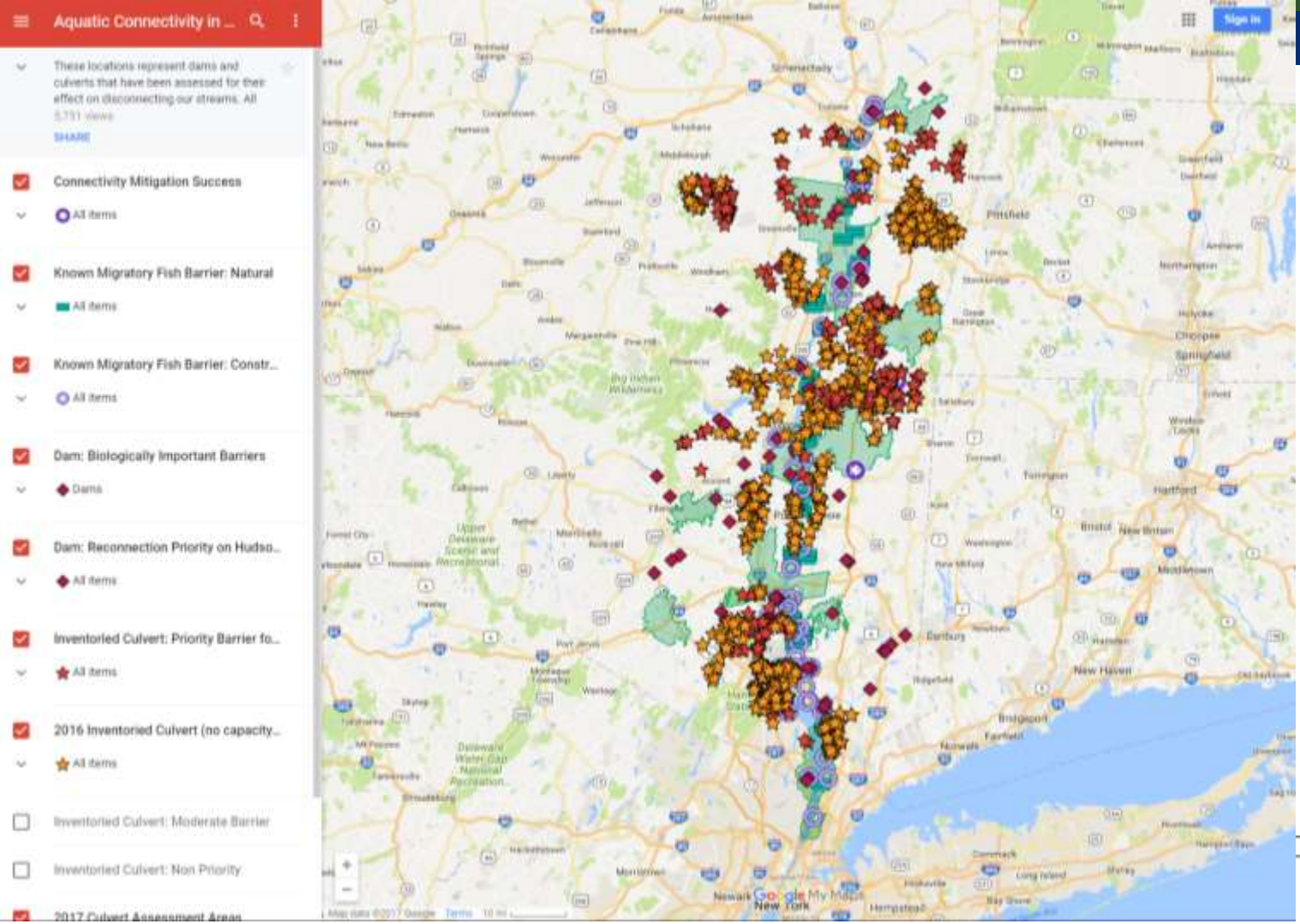

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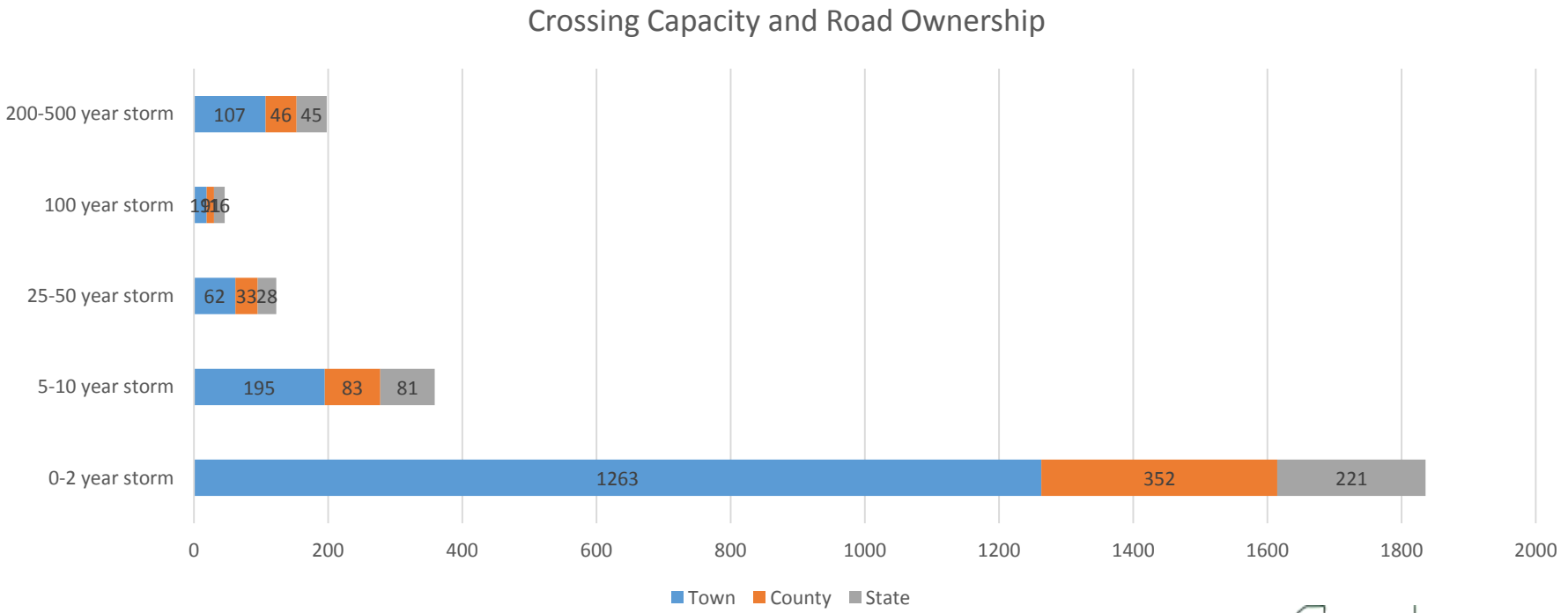
Many Undersized Barriers are on Town Roads



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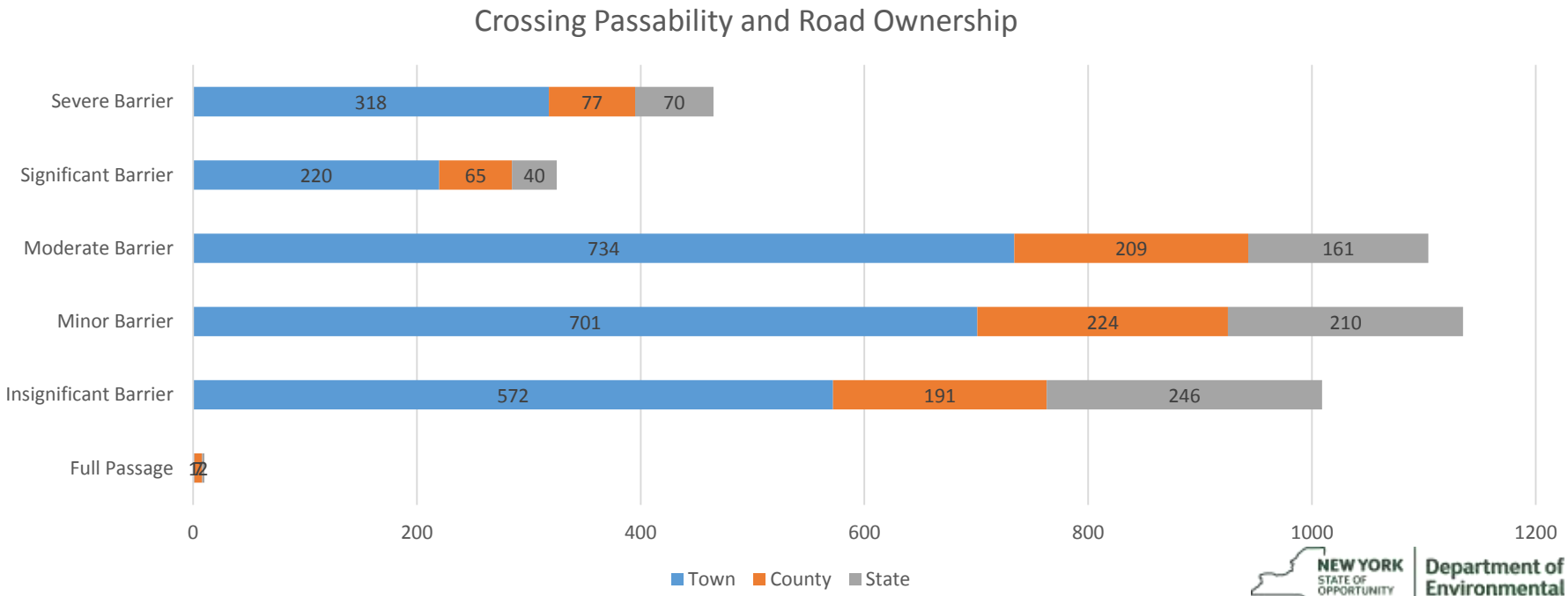
Many Town Crossings are Barriers



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Hudson River Estuary Program Grants

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Conservation

Aquatic barriers "…sit unneeded, unused, undermaintained—a growing ecological and fiscal liability" National Forest System Legacy Roads and Trails program 2013

USFS Legacy Roads and Trails program 2013

USFS Legacy Roads and Trails
program 2013

From assessments to local action: Town-scale road-stream crossing management planning

PRESENTATION BY:

NICOLE LAIBLE
ROCKLAND COUNTY SOIL & WATER CONSERVATION DISTRICT

SENY STORMWATER CONFERENCE & TRADE SHOW
OCTOBER 18, 2017

Outline

- RC SWCD Mission and Projects
- Stony Point Project Overview
- Project Partners & Collaborations
- Data Collection
- Inventory Document
- Collaborative Prioritization
- Summary (Timeline of process)
- Contact Information

Rockland County Soil & Water Conservation District

Mission Statement:
The RC SWCD was established in 1965 and is responsible for developing Soil and Water Conservation District programs to protect and conserve soil, water, prime and unique farmland, wildlife, energy and other renewable resources to meet the needs of the local land user on non-federal lands. The Board of Directors represent the County's five towns. They are appointed by the County Executive and confirmed by the County Legislature.

Board Members:
Jim Dean, Chair
Larry Brissing
Tony Sharan
George Wargo, Jr.
Frank DiZenzo


Youths learn about road-stream crossings at National Hunting and Fishing Day.


Enviroscape lesson taught to youths at Orangetown Highway Open House.


District staff complete PEERS assessments.


Grandview ES take field trip to Cropsey Farm.

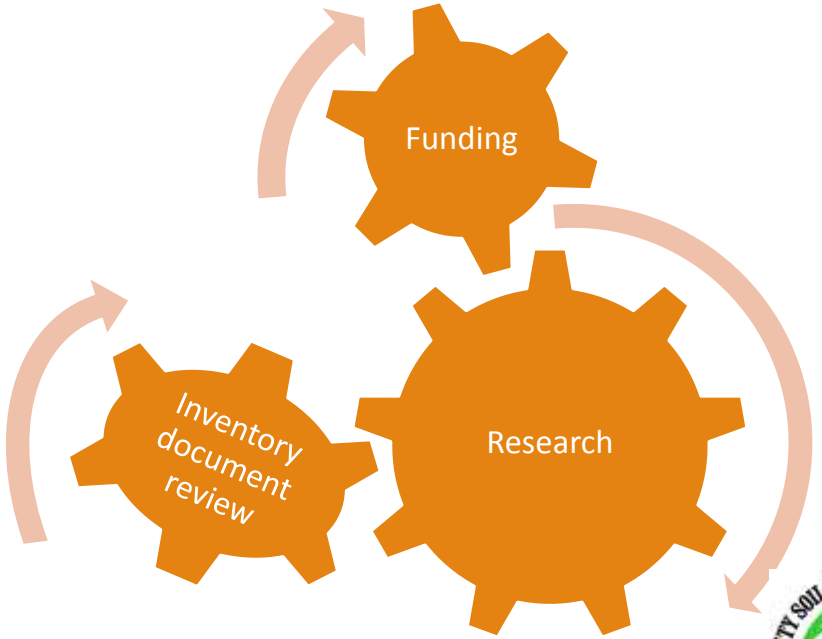
Stony Point

Image by RC SWCD

Image by RC SWCD

Sherwood Farms crossing. Image by: Mike Jastremski

Project Partners & Collaborations



Data Collection

1. Assessments

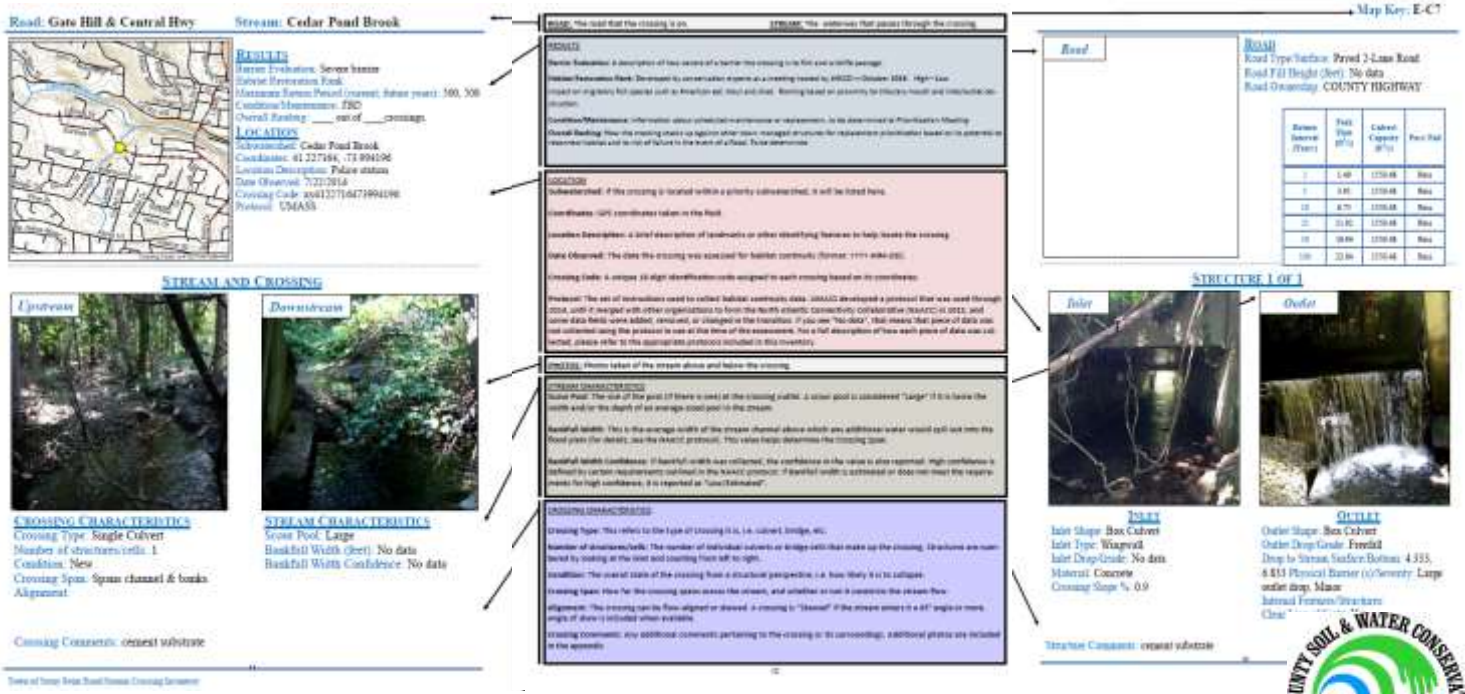
2. NAACC Uploads and Approvals

3. Cornell Data

ROCKLAND COUNTY SOIL & WATER CONSERVATION DISTRICT

Inventory Document

Inventory Document



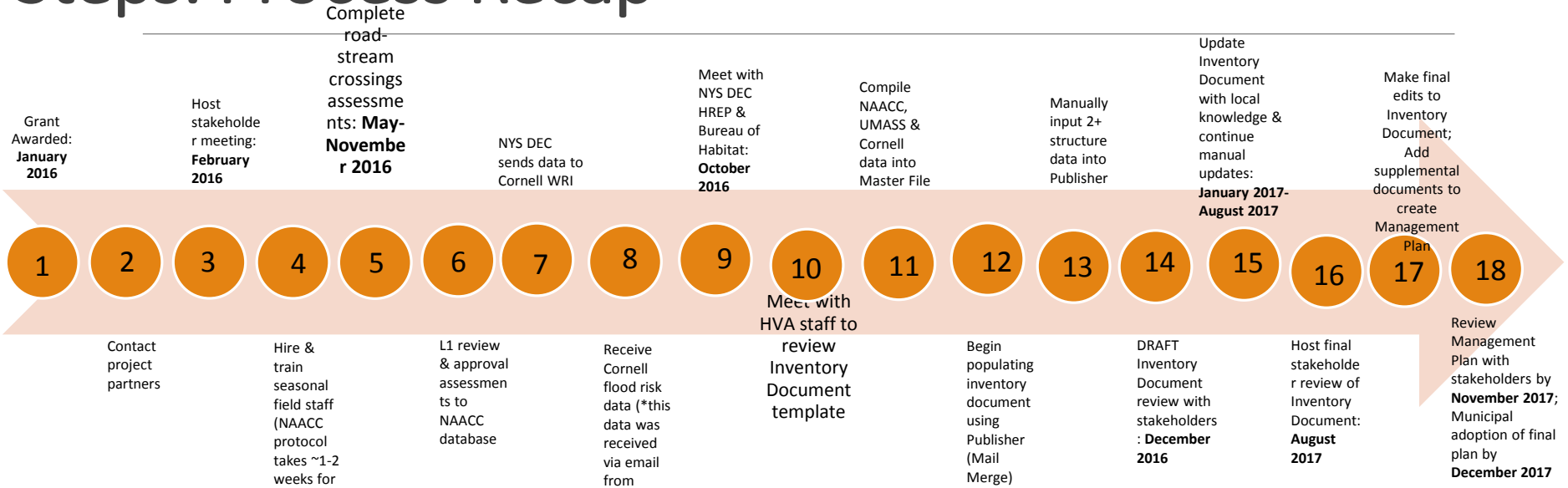
Prioritization

Key take-aways

- 4 stakeholder meetings held to date
- Top 10 ranking system
- Conservation, flood risk and proximity to Hudson River
- Overlaps with funding opportunities
- Working document ensures ability for municipal updates into the future

Photo caption: August 2017 final inventory document stakeholder meeting.

Steps: Process Recap



Road-Stream Crossing Management Plan

1. **Comprehensive bridge and culvert inventory**
2. **Prioritization results**
3. **Conceptual design/implementation strategy for a demonstration replacement project (Paul will talk more about that)**
4. **Supporting information:**
   - Executive summary including recommendations
   - Planning process description
   - Common management issues
   - Resources and how to access them
5. **Plan is then adopted as Annex to Natural Hazard Mitigation Plan**

Re-Designing Road Crossings Using **Stream Simulation**

Paul Woodworth
Fluvial Geomorphologist
Princeton Hydro
Email@PrincetonHydro.com

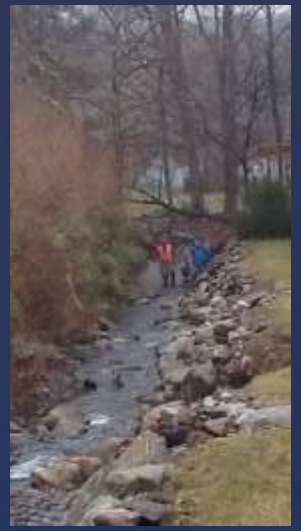
Princeton Hydro

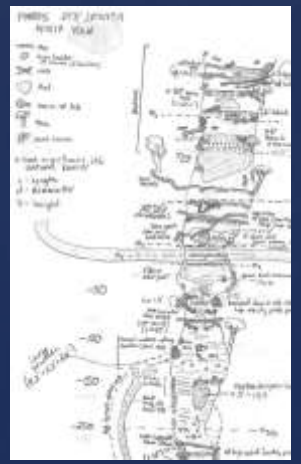
Stream Simulation Design

- Aims to recreate the natural stream through the road-crossing structure
  - Provides Aquatic Organism Passage (AOP) up and down
  - Not hydraulic-centered design
  - USFS Manual - *Stream Simulation: An Ecological Approach to Providing Passage for Aquatic Organisms at Road/Stream Crossings*
- Results in **Flood Resilient Infrastructure**
  - increased hydraulic capacity, minimized debris clogging, reduced over-topping failure, less maintenance, longer structure life

Stream Simulation Design Process

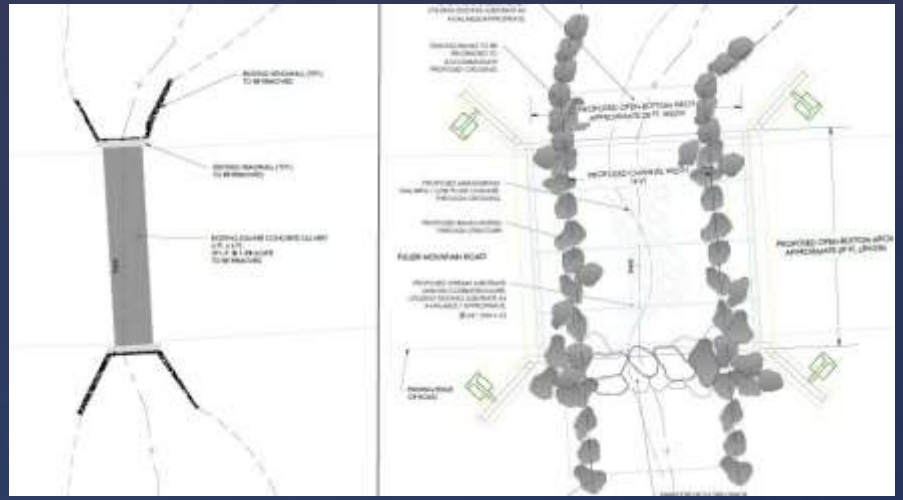
- Detailed stream survey & field measurements
  - Cross-section, profile, alignment of natural channel
  - Substrates
  - Channel morphology
- Hydrology
  - Cornell or USGS StreamStats
- Hydraulics (HY-8, HEC-RAS)
  - Flood Conveyance (50-,100-,500-yr)
  - AOP; Sediment Stability/Mobility
- Structure Selection
  - Size, Type, Material, Position
  - Road, utility impacts

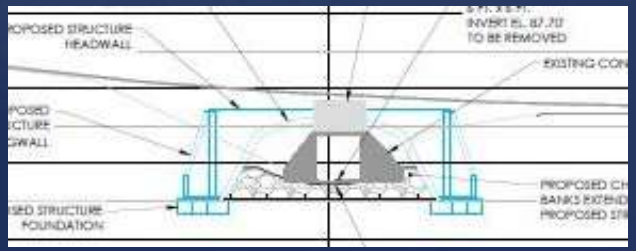


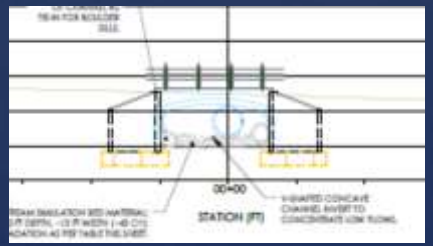


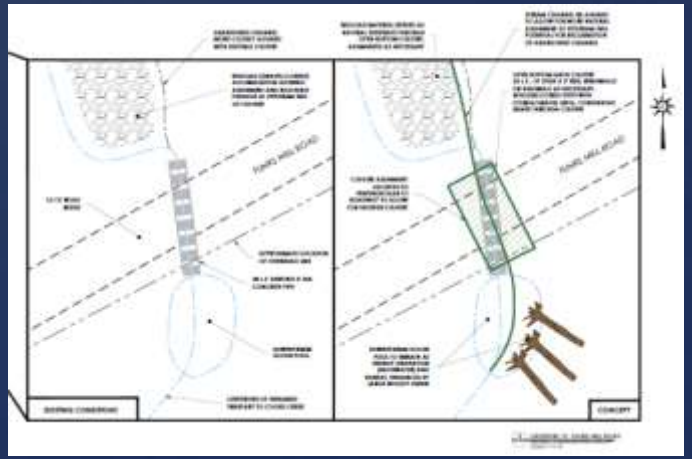
Stream Simulation Design Elements

- Accommodates natural channel width (+20%)
  - Continuous stream banks
- Improves channel alignment
- Provides wiggle room
- Minimizes skew



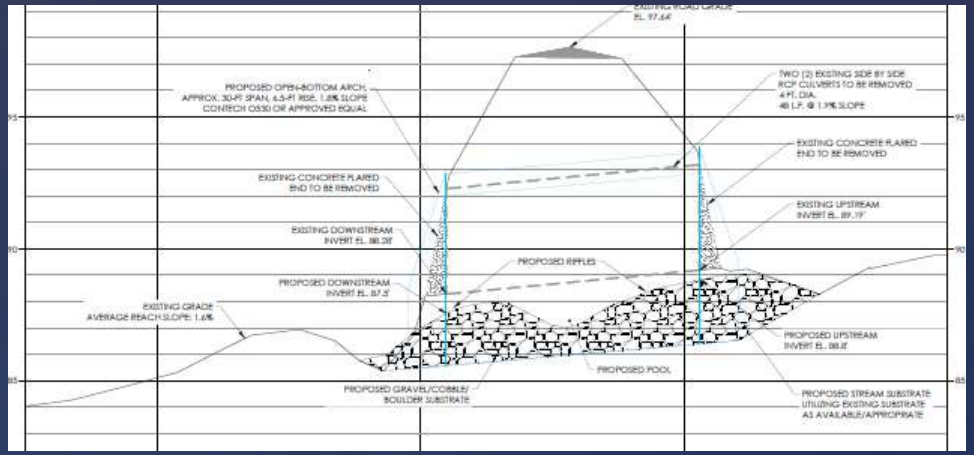


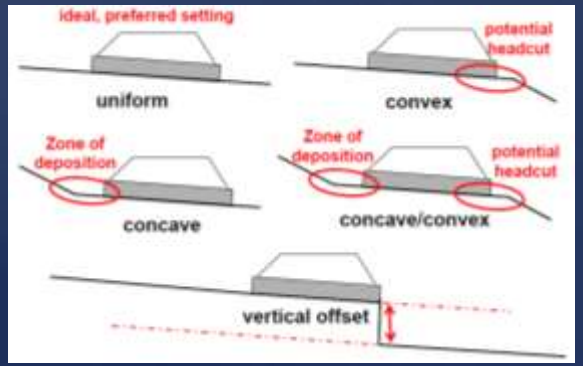


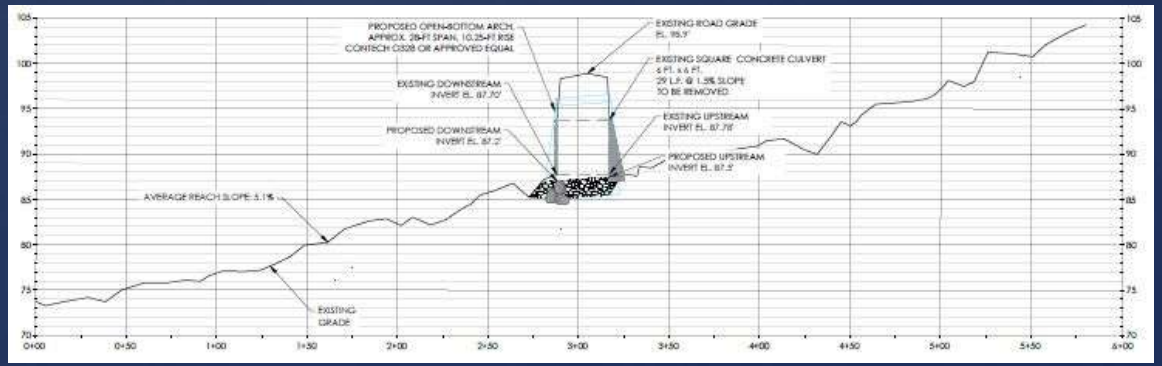


Stream Simulation Design Elements

- Considers stream slope
  - Longitudinal profile
- Addresses vertical stability
- Mimics natural profile
  - Bedforms



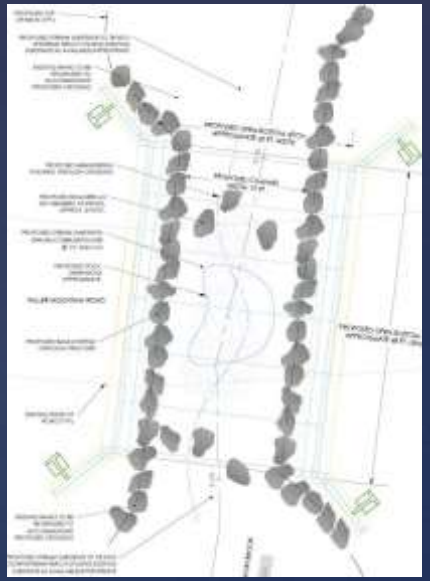


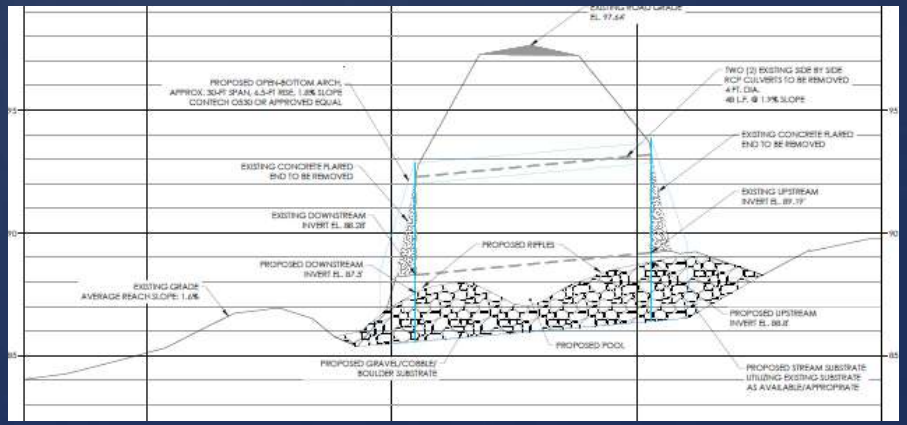


Stream Simulation Design Elements

Stream Bed Substrate & Bedforms

- Gravel Riffles
- Boulders Steps
- Isolated Boulders
- Pools



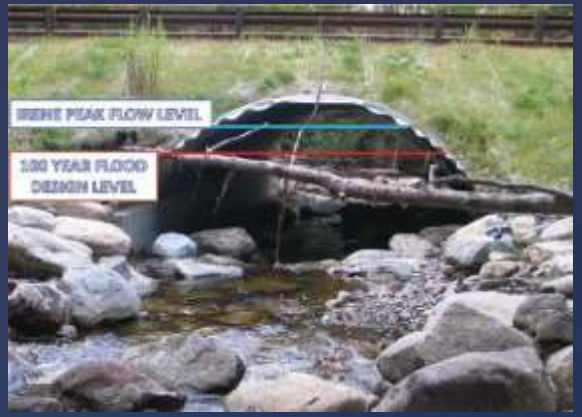


Stream Simulation
Habitat Benefits

- Restores passage (AOP)
  - Movement and Migration
  - Resident Fish, Migratory Fish, Aquatic Invertebrates (insects, molluscs, crustaceans), Reptiles/Amphibians, Mammals
  - Reconnects isolated populations
  - Restores access to habitats for critical life stages
    - Spawning
    - Rearing
    - Feeding
    - Thermal refuge
- Restores natural transport of sediment and organic material

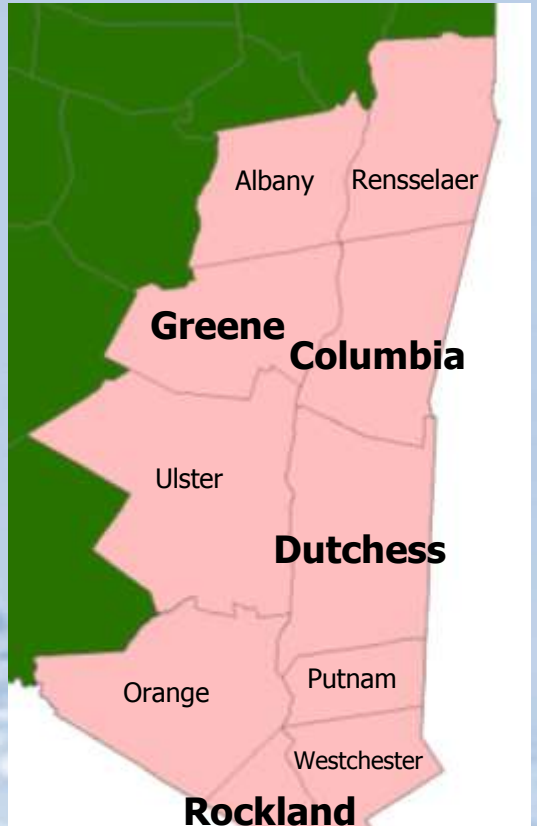
Stream Simulation
Flood Resiliency

- Increased hydraulic capacity
- Minimized debris clogging
- Reduced over-topping failure
- Less maintenance
- Longer structure life
- Reduced flood damage



Current status and next steps

- Stony Point Management Plan complete by 12/31/2017
- Actively seeking funding for replacement of identified priorities
- Expanding project into six more towns in 2018
- Interested for 2019?



Partner contact info

Megan Lung
Hudson River Estuary Program
21 South Putt Corners Road
New Paltz, NY 12561
Megan.Lung@dec.ny.gov

Michael S. Jastremski, CFM
Coordinator
Lower Hudson Coalition of
Conservation Districts
E:MJ.LHCCD@gmail.com
T: 860-672-6678

Nicole Laible
District Manager
Rockland County Soil & Water
Conservation District
Email: laiblen@co.Rockland.ny.us
Phone: 845-364-2669

Paul Woodworth
Fluvial Geomorphologist
Princeton Hydro
pwoodworth@@PrincetonHydro.com