21st Annual
Southeast New York Stormwater Conference

Session I - Tuesday, November 16th - 9 AM-12:30 PM

Rapid Flood Risk Modeling at Culverts and Application to Replacement Project Prioritization

9:00 — **Welcome and Housekeeping**
Mike Jastremski/Lower Hudson Coalition

9:05— **Promoting Flood Resiliency Through Assessment and Modeling in the Lower Hudson Valley**
Ben Houston, PE/GroundPoint Engineering
Jesenia Laureano/NYS DEC

10:05— **Applying the University of Connecticut's CREST 3.0 Hydrologic Model to Culvert Project Prioritization in the Housatonic River Watershed**
Xinyi Shen, Ph.D/University of Connecticut Civil and Environmental Engineering Department
Lindsay Larson/Housatonic Valley Association

11:05 — **Modeling Hydraulic Capacity and Aquatic Organism Passage in New England Culverts**
Erin Rodgers, Ph.D/Trout Unlimited

12:05 — **Additional questions/discussion**

12:30 — **Adjourn**

Session I Continuing Education Credit

We anticipate Session I being approved for 3 CECs for Certified Floodplain Managers (Association of State Floodplain Managers) . Session I is approved for 2 PDHs for Professional Engineers (Practicing Institute for Engineers) and 3 PDHs for Registered Landscape Architects have been approved (Landscape Architecture Continuing Education System). Attendance Certificates for self-certification are available upon request.

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Session I Program

Promoting Flood Resiliency Through Assessment and Modeling in the Lower Hudson Valley

Ben Houston, PE/GroundPoint Engineering
Jesenia Laureano/NYS DEC

This presentation will discuss how the Hudson River Estuary Program Program's Culvert Prioritization Project supports municipal-level road-stream crossing assessments. The project has led directly to increased aquatic connectivity in Hudson River tributary streams and has helped communities adapt priority road crossings to be more flood and climate change resilient.

The Project leverages culvert assessment protocols from the North Atlantic Aquatic Connectivity Collaborative (NAACC) and supports an annual field assessment effort with a growing list of partners, including municipalities, non-profits, soil and water conservation districts, and cooperative extension offices.

The Estuary Program has augmented its support for annual NAACC based culvert field assessments with ongoing application and improvement to the Cornell Culvert Model. The results of the Model provide meaningful prioritization data to communities when evaluating road-stream crossings across an entire municipality.

This session will provide an orientation to the NAACC field protocols, along with an orientation to the Cornell Culvert Model. A discussion of how this particular model functions compared to other models will help audience members better understand both the limitations and advantages of various options available, and some of the cost/benefit issues that may go into field data collection and subsequent modeling decisions.

We will present two case studies from the Town of Copake in Columbia County and the Town of Esopus in Ulster County. The Town of Copake partnered with Trout Unlimited to create a road-stream crossing municipal management plan which led to the design and replacement of priority structures that have helped restore stream connectivity and increased climate resiliency within the Town while replacing infrastructure in poor condition. Similarly, the Town of Esopus represents an ongoing partnership with the HREP that is in the process of replacing two undersized "barrier" culverts that inhibit aquatic connectivity and healthy stream function. Finally, we will discuss how communities can get involved in aquatic barrier removal and culvert redesign as part of their overall strategy for improving infrastructure and increasing community resiliency to storm impacts and climate change.

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Session I Program

Promoting Flood Resiliency Through Assessment and Modeling in the Lower Hudson Valley

Meet the Speakers

Ben Houston, PE/GroundPoint Engineering

Ben Houston has over 25 years of experience with mapping technologies ranging from military applications to environmental conservation and public works. A licensed Professional Engineer in New York, Ben has a broad background in public health engineering, utilities infrastructure, and storm water management. He has worked as both an engineer and a GIS analyst at for-profit and non-profit consulting companies, and with various local government agencies including County Departments of Planning, Public Works, and Public Health.
A former Army Officer, Ben spent 12 years as a Topographic Engineer, Public Health Engineer, and Special Operations Team Leader before returning to the private sector. He is a graduate of the US Army Combined Arms Services Staff School, the Defense Mapping School, and the JFK Special Warfare Center and School and completed a tour in Afghanistan in 2002. His focus the past 15 years has been using airborne LiDAR data for topographic mapping and raster-based terrain analysis, and more recently began working with drones as tools for surveying and mapping. Ben is a former adjunct professor of GIS at the Bard Center for Environmental Policy and was elected to the NYS GIS Association Board of Directors in 2017. A certified Project Management Professional and a certified GIS Professional, Ben has a BS in Geological Engineering from the Colorado School of Mines, and an MS in Hydrogeology from NC State University.

Jesenia Laureano/NYS DEC

Jesenia Laureano is a Watershed Specialist for the New York State Department of Environmental Conservation (DEC), based out of Region 3 in New Paltz, NY. Her main focus is road-stream crossing assessment using the North Atlantic Aquatic Connectivity Collaborative (NAACC) protocol, and managing NAACC assessment data- including map creation. She also assists the Trees for Tribs program run by DEC. A Stony Brook 2020 alumna, she received her Bachelor of Science in Coastal Environmental Science. She is passionate about improving our waterways and making them resilient to climate change. She is also improving the accessibility of all the resources she creates, making them available to all people but especially people of color.

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Applying the University of Connecticut's CREST 3.0 Hydrologic Model to Culvert Project Prioritization in the Housatonic River Watershed

Xinyi Shen, Ph.D/University of Connecticut Civil and Environmental Engineering Department
Lindsay Larson/Housatonic Valley Association

HVA has been working to assess bridges and culverts in the Housatonic watershed since 2009. Our assessments focused initially on understanding which structures are barriers to fish and wildlife movement. As we shared our results with watershed communities, it became clear that we needed to address other local priorities in order to build support for moving from barrier identification to action. Specifically, our approach was missing the following key elements:

1. Assessment of flood risk as well as barrier status, and identification of structures where there is overlap between these management issues;
2. A framework that communicates the results of our assessments to highway managers and decision-makers, while gathering existing research and local knowledge related to flood risk and maintenance need at road-stream crossing structures;
3. Creation of new tools for securing financing for replacement projects.

HVA developed the Town-Scale Road-Stream Crossing Management Plan (RSCMP) approach to address these needs. In 2015, we began a pilot project to develop RSCMPs in seven towns in Northwest Connecticut. HVA established a partnership with the University of Connecticut's Civil and Environmental Engineering Department (UConn) to add a Risk-of-Failure analysis to our road-stream crossing assessment, which is now an integral component of the community-based replacement project prioritization that is a part of each RSCMP process. As of 2021, UConn and HVA have worked together on 23 RSCMPs across the Housatonic watershed in Connecticut, New York and Massachusetts, with four more scheduled to begin development in 2022. This presentation will describe the specifics of UConn's Coupled Routing and Excess Storage (CREST) v3.0 hydrologic model, and how it is applied to culvert Risk of Failure analysis. We will also discuss the results of UConn's analysis over 23 towns, how those results line up with local knowledge of flood risk, and how we've worked with communities to use those results to set priorities for replacement.

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Applying the University of Connecticut's CREST 3.0 Hydrologic Model to Culvert Project Prioritization in the Housatonic River Watershed

Meet the Speakers

Xinyi Shen, Ph.D/University of Connecticut Civil and Environmental Engineering Department

Dr. Shen is an Assistant Research Professor with the Department of Civil & Environment Engineering at the University of Connecticut. He has published 47 peer-reviewed journal articles first or corresponding authoring 17 of them mostly in tier-one journals in Remote Sensing, Hydrology, Environment Sciences, and Meteorology, and 3 book chapters. He is an associate editor of the Journal of Hydrology, hosted three special issues for Remote Sensing and Water, and served as a peer reviewer for more than 20 scientific journals. He is also an external reviewer for NASA and NSF/ECR proposals in earth sciences, and NSF of the Czech Republic. As the PI, he has been awarded $1.52M grants. His research interest includes the socioeconomic impact of flood disasters, emphasizing on infrastructure, houses, and croplands and the climate impact on biodiversity. His research methodology is a combination of mechanistic and AI modeling. He developed distributed hydrological models, Coupled Routing and Excess STorage (CREST v2.1, v3.0), the CONUS NRT satellite-based inundation mapping system-the Radar Produced Inundation Diary (RAPID), a comprehensive flood event database (FEDB) from the USGS hydrological stations in CONUS, a global distributed geomorphological database (GDBC), a machine learning-based flood insurance property claim prediction model-iClaim, a flood triggered cropland damage prediction model by Convolutional Neural Network (CNN), and a deep learning-based saguaro decadal population product.

Lindsay Larson/Housatonic Valley Association

Lindsay has been with Housatonic Valley Association since January 2018 and is a part of the Watershed Conservation Team. Her primary projects include creating safe, equitable, sustainable and welcoming river recreation access, road-stream crossing assessment and replacement planning, and community-based watershed management planning. Prior to joining HVA, she worked in a variety of natural resource management positions with universities, state agencies, and consulting firms. Lindsay has several years of experience managing, interpreting, and visualizing GIS data, and is skilled in both map creation and geospatial analysis. She is trained in field data collection techniques for stream corridor assessments and road-stream crossing assessments, including detailed surveys to support culvert replacement design development. Lindsay has a B.S. in Wildlife Ecology from the University of Maine and a Master's Degree in Natural Resources & the Environment with a focus on Human Dimensions in Natural Resource Management from the University of Connecticut.

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Session I Program

Modeling Hydraulic Capacity and Aquatic Organism Passage in New England Culverts

Erin Rodgers, Ph.D./Trout Unlimited

In this presentation, we'll begin by reviewing the problem with undersized road-stream crossings, the field protocols used for collecting assessment data, and the metrics used to determine a structure's vulnerability or chance of failure. This two-part model used by Trout Unlimited, and developed in partnership with University of New Hampshire and NH Department of Environmental Services, uses a watershed-scale analysis using different storm return intervals as well as a long-range planning climate change multiplier to assess failure risk under current and future conditions. This model is particularly well-suited to analyzing a large number of culverts across a watershed or landscape.

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Modeling Hydraulic Capacity and Aquatic Organism Passage in New England Culverts

Meet the Speaker:

Erin Rodgers, Ph.D./Trout Unlimited

Erin is a Project Coordinator with Trout Unlimited. Erin began working with TU part time while she was finishing her doctoral work, then joined as a full time Project Coordinator in 2015. Since then she has worked on culvert replacements, dam removals, bank stabilizations, and in-stream habitat restoration in coldwater fisheries from Maine to Massachusetts. While most of her work focuses on applied restoration, she is increasing project monitoring to look more closely at how increasing large woody material can help improve not just trout habitat, but also sediment transport, water quality, floodplain connectivity, and groundwater hydrology.