



Modeling Flood Mitigation Alternatives in Margaretville, New York

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Abstract

Managing New York City's water supply requires collaboration between the city of New York and the upstate communities within the New York City (NYC) "Watershed." The 1997 Memorandum of Agreement (MOA) set aside aid for the upstate watershed towns to live under strict policies. One use of these funds was the creation of the Catskill Watershed Corporation (CWC), located in Margaretville, New York in the Catskill Mountains. In the wake of flooding in 2011 from Hurricane Irene, towns in this region have hired engineering firms to model flood mitigation alternatives that may soon be funded by CWC. In Margaretville, modeled alternatives have called for removal or relocation of several key businesses. As an intern with CWC in the summer of 2015, I modeled flood mitigation alternatives with little impact on Margaretville's business district. Reactions of local leaders to the model results reveal the benefits of modeling as a tool to collaborate with communities. However, some individuals viewed the model results as complete truth, despite local environmental agencies who stress that modeling is incomplete without input from community members who personally faced flooding.

Introduction

- NYC's water supply is comprised of two upstate "watersheds":
 - Catskill/Delaware (or West of Hudson (WOH))
 - Croton
- Eminent domain was used to flood communities into reservoirs as late as the 1960s
- After decades of animosity, the 1997 Memorandum of Agreement (MOA) set aside aid for upstate communities to live under strict filtration avoidance policy
- The MOA created the Catskill Watershed Corporation (CWC) to fund waste water, storm water, economic development, and recently flood mitigation projects in the WOH watershed
- 2011 flooding from Hurricane Irene devastated communities in the WOH
- Local committees have hired engineers to complete Local Flood Analyses (LFAs) and model flood mitigation alternatives
- In the Summer of 2015, I worked as an intern with CWC and modeled several mitigation alternatives in Margaretville, NY



2011 flooding in Margaretville, NY

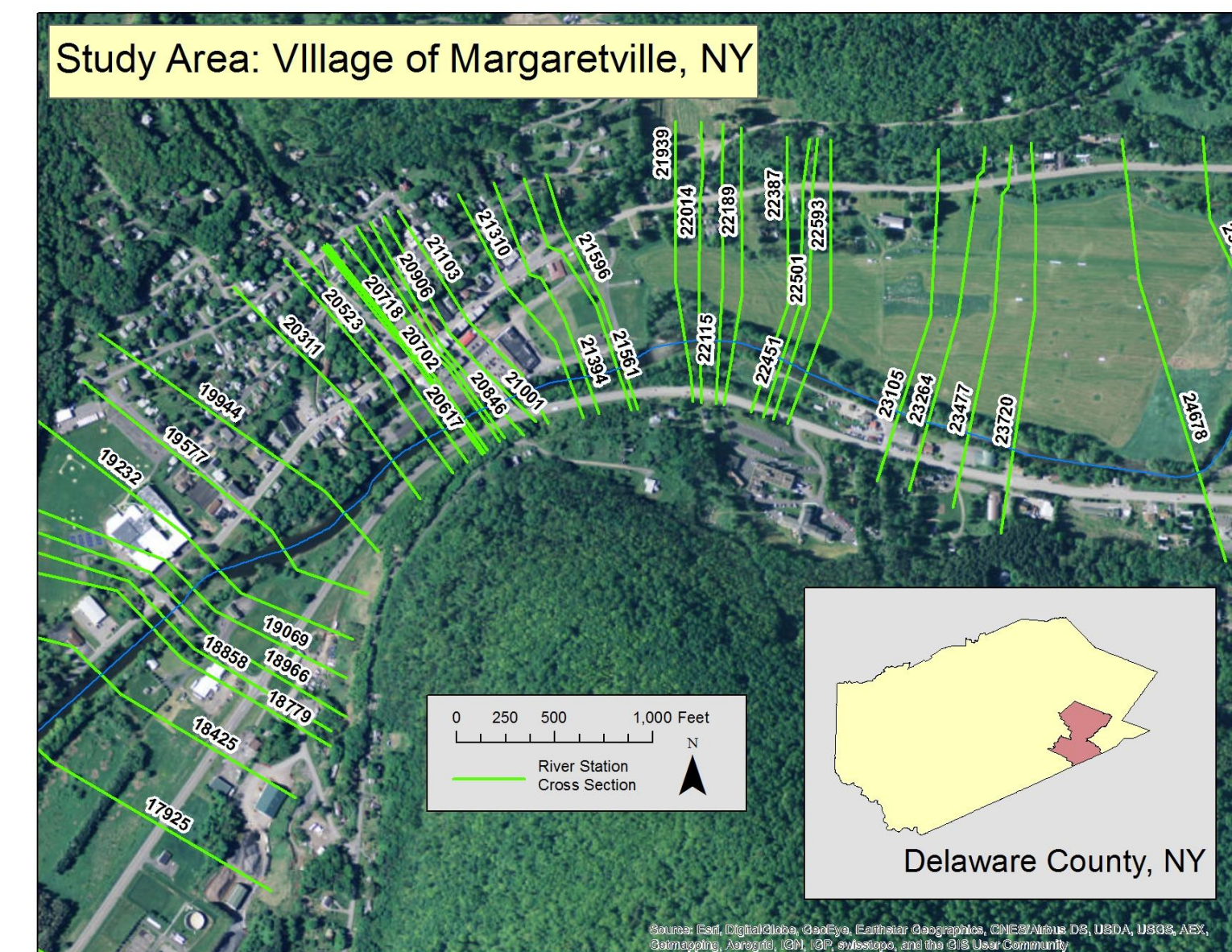


Margaretville, NY

- 500-person village and home to CWC office
- Located on the East Branch Delaware River floodplain and an alluvial fan
- Historic flood event in 2011
- Chosen for New York Rising Communities Reconstruction Program with flood modeling done by an engineering firm

Study Problems

- Previous focus of flood mitigation alternatives on removal/relocation of local businesses is an issue for some local leaders
- Goal: Flood reduction with minimal impact on business
- Models are received well by local leaders, but overreliance on their results is a concern



Cross Section	With Lower Floodplain (Edited Benches)
18858	0
18966 - Downstream Fair St.	0
19069 - Upstream Fair St.	-0.24
19232 - Lowered Floodplain	0.84
19577 - Lowered Floodplain	1.92
19944 - Lowered Floodplain	-10.8
20311 - Lowered Floodplain	-9.36
20523 - Lowered Floodplain	-10.56
20617 - Lowered Floodplain	-13.08
20702 - Lowered Floodplain	-18.84
20718 - Lowered Floodplain	-21.72
20739 - Lowered Floodplain	-21
20817 - Lowered Floodplain	-23.52
20846 - Lowered Floodplain	-22.44
20906 - Lowered Floodplain	-25.8
21001 - Upstream Bridge St.	-12.96
21103 - Fresh Town	-12.72
21310	-9.72
21394	-9.48
21561	-9
21596	-8.88
21939	-7.92
22014	-7.8
22115	-7.2
22189	-7.08
22387	-6.72
22451	-6.6
22501	-6.36
22593	-6.24
23105	-4.44
23264	-3.84
23477	-3.84
23720	-3
24678	-0.84
25492	-0.24
26150	0

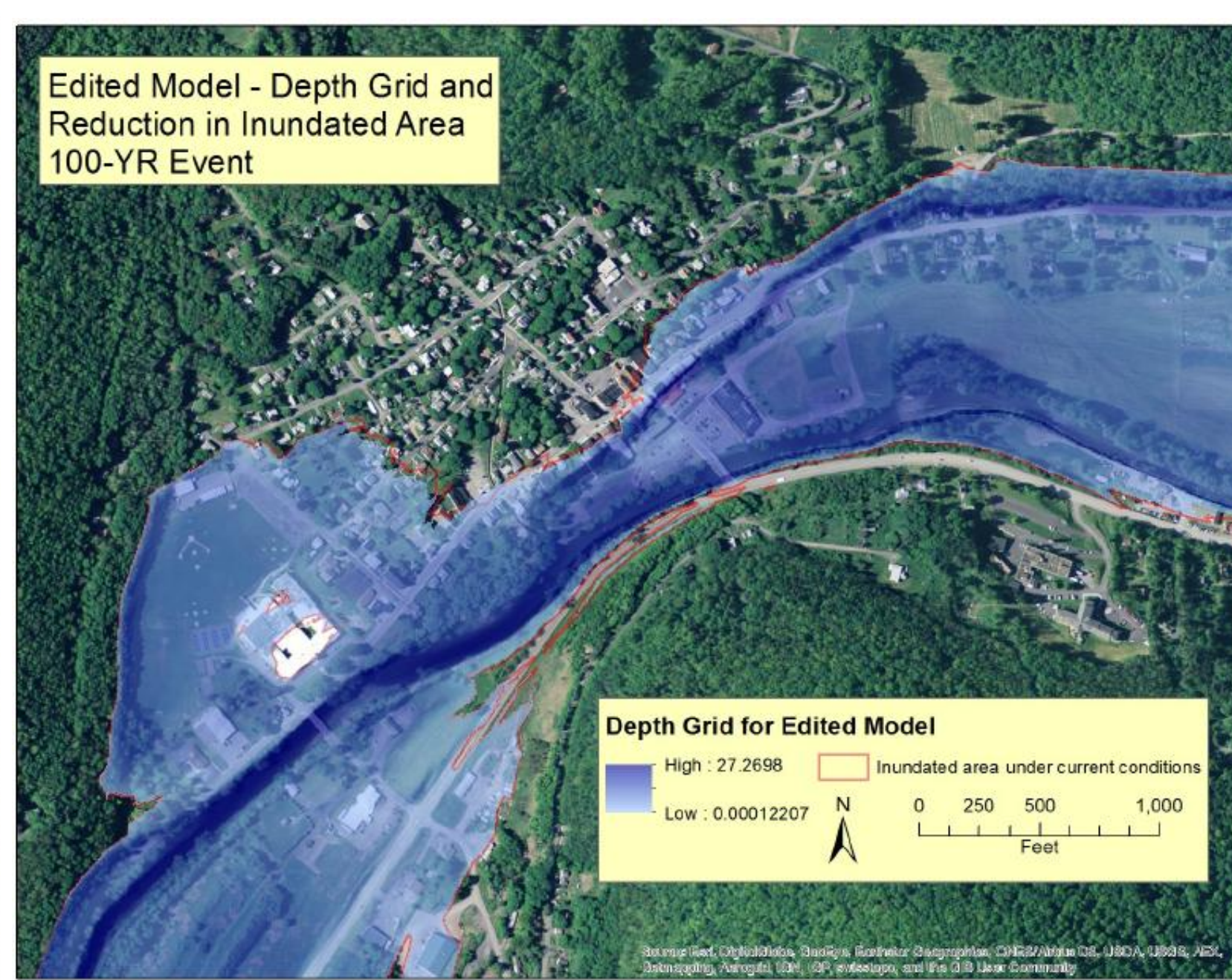
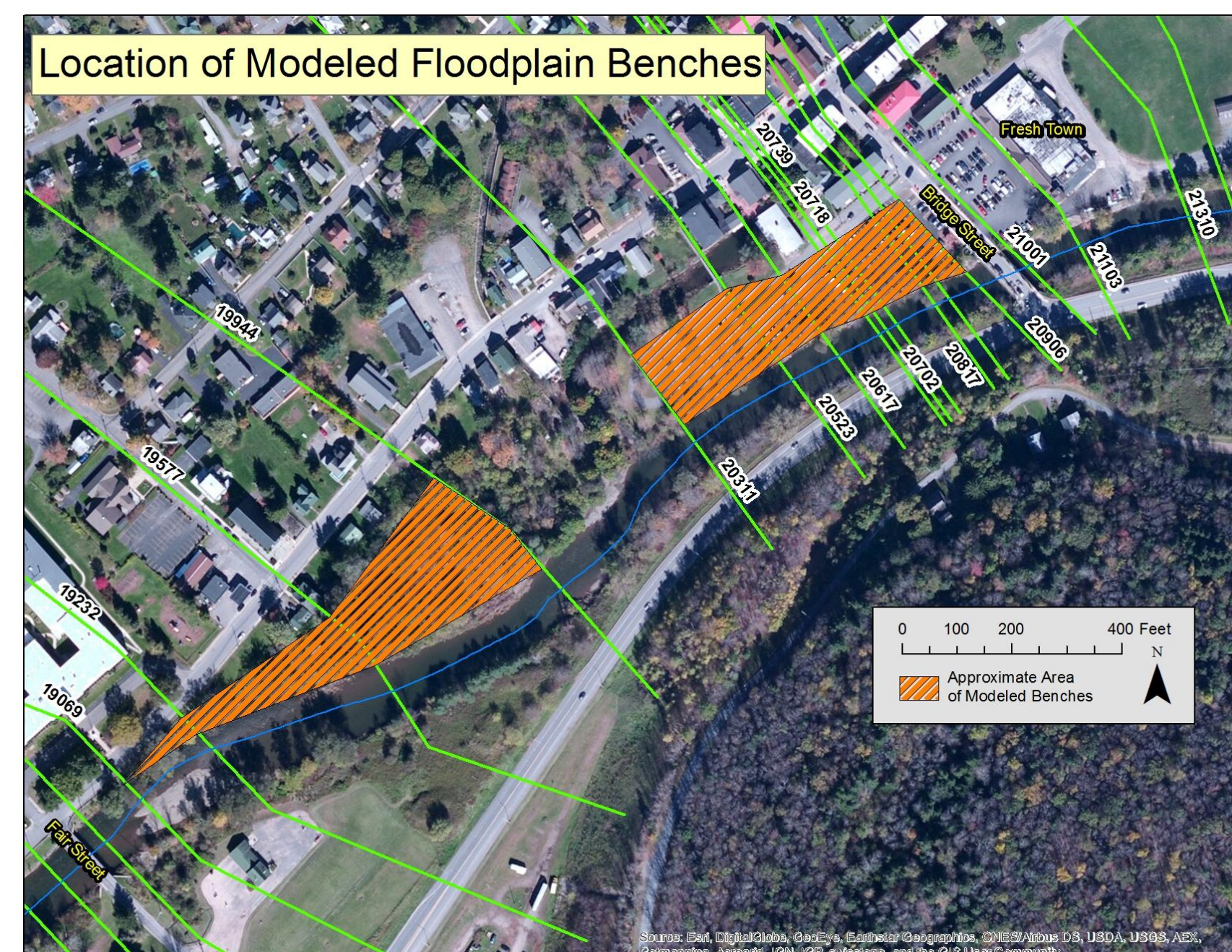
Change in Water Surface Elevation

Methodology

- FEMA hydraulic data were applied to Army Corps of Engineers Hydraulic Engineering Center River Analysis Software (HEC-RAS)
- Elevations were edited to simulate "floodplain benches" or areas of excavation where fill, etc. has been added to the floodplain
- Floodplain benches could not require removal or relocation of businesses or other structures in the village
- Results were mapped using ESRI ArcGIS and Army Corps of Engineers HEC-GeoRAS extension to create depth grids and inundated areas

Model Results

- Combination of two floodplain benches had greatest reduction
- Total inundated area reduced
- Results were presented to the CWC Board of Directors, comprised of local leaders and environmental agency representatives



The Role of Models

Benefits

- Models have been useful to help locals visualize the impacts of various mitigation alternatives
- Improves partnership with communities when all mitigation suggestions are modeled

Potential Issues

- Models are only representations of reality, but are taken as total and complete truth
- Minimizes the knowledge and direct experiences of locals
 - Local scientists and environmental agencies are pushing for more input from community members



Flooding & damage near CVS/Fresh Town building, 2011

Sources

- ArcGIS, 10.2, Esri, Redlands, CA.
- Catskill Watershed Corporation. 2013. *Mission*. <http://www.cwconline.org/mission.html> (last accessed September 23, 2015).
- Delaware County Stream Management Program Project Advisory Committee Meeting. June 11, 2015. Delaware County Soil and Water Conservation District, Walton, NY.
- Federal Emergency Management Agency. 2013. *EBDR_08272013* (data prepared for HEC-RAS).
- HEC-GeoRAS, 10.2, U.S. Army Corps of Engineers, Washington, DC.
- HEC-RAS, 4.1.0, U.S. Army Corps of Engineers, Washington, DC.