VERMONT
AGENCY OF TRANSPORTATION

FACT SHEET

2019 Research Showcase & STIC Annual Meeting

Leveraging High-Resolution LiDAR and Stream Geomorphic Assessment Datasets to Expand Regional Hydraulic Geometry Curves for Vermont

PROJECT TITLE
Leveraging High-Resolution LiDAR and Stream Geomorphic Assessment Datasets to Expand Regional Hydraulic Geometry Curves for Vermont: A Blueprint for New England States

STUDY TIMELINE
June 2019 – May 2020

INVESTIGATORS
Kristen L. Underwood, UVM, PI
Donna M. Rizzo, UVM, co-PI
Arne Bomblies, UVM, co-PI

VTRANS CONTACTS
Nick Wark, Hydraulics Manager
Cassidy Cote, Hydraulics Engineer

Funding provided by the Transportation Infrastructure Durability Center at the University of Maine by a grant from the U.S. DOT's UTC program.

This fact sheet was prepared for the 2019 VTrans Research Showcase & STIC Annual Meeting held at the Dill Building in Berlin, VT, on September 11, 2019 from 8:30 am– 1:00 pm.

Fact sheets can be found for additional projects featured at the 2019 Symposium at http://vtrans.vermont.gov/planning/research/2019showcase

Additional information about the VTrans Research Program can be found at http://vtrans.vermont.gov/planning/research

Additional information about the VTrans STIC Program can be found at http://vtrans.vermont.gov/boards-councils/stic

Additional information on this project can be found at http://www.tidc-utc.org

Introduction

Regional hydraulic geometry curves (RHGCs) for Vermont are being updated through development of additional observations and use of newly-available high-resolution lidar and stream geomorphic assessment data to improve the prediction ability and reduce estimation uncertainty using RHGCs.

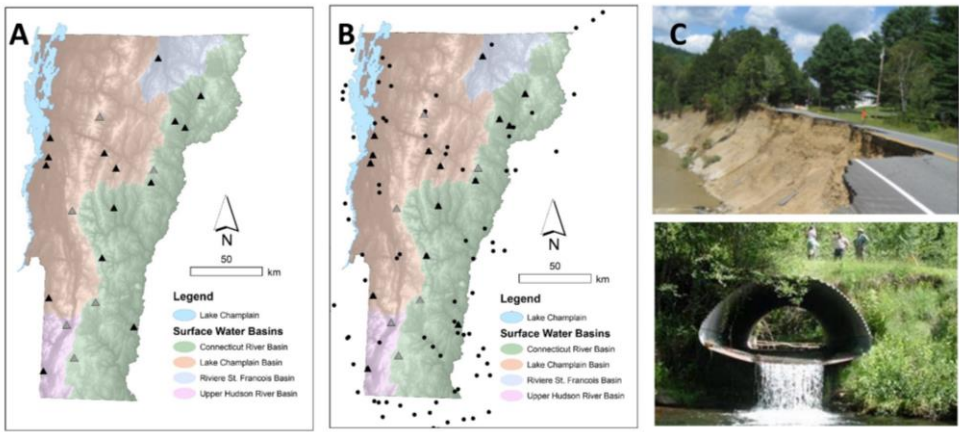

Figure 1: To complement the (A) n=21 stations in Vermont upon which original regional hydraulic geometry curves were based, (B) up to 70 new observation sites will be evaluated to generate improved curves to support (C) flood recovery efforts along road embankments to restore river cross sections of sufficient width to convey bankfull flows, as well as improve sizing of crossing structures.

Actions Taken

We have identified additional observation sites and a list of predictor variables, additional to drainage area, that may relate to the bankfull channel width, depth, cross-sectional area, and discharge – including, but not limited to main-channel slope, elevation, mean annual precipitation, mean annual runoff, mean annual snowfall, percent carbonate bedrock, percent basin storage (lakes, ponds, wetlands), and percent land cover.

Next Steps

Applying advanced statistical techniques (e.g., clustering, penalized logistic regression, multiple linear regression, Bayesian inference), we will develop and explore additional predictor variables that may better refine regression estimates. Observation sites may be stratified by biogeophysical region, hydrologic landscape region, EPA Level III Ecoregion, or reach-based geomorphic stream type.

Potential Impacts and VTrans Benefits

Updated curves will support sizing of stream crossing structures as well as embankment design for roads and rails that share narrow valleys with rivers. Geomorphically-compatible structures will have greater resilience to extreme flood events and will support aquatic organism passage objectives.