

## 2017 Research Symposium

## Prediction and mitigation of scour and scour damage to Vermont bridges

## & STIC Annual Meeting

### RESEARCH PROJECT TITLE

Project 731 *Prediction and mitigation of scour and scour damage to Vermont bridges*

### STUDYTIMELINE

9/2012 – 6/2016

### PRINCIPAL INVESTIGATOR

Mandar Dewoolkar, UVM, PI  
Ian Anderson  
Donna Rizzo  
Dryver Huston  
Jeff Frolik

### VTRANS CONTACT(S)

Dr. Emily Parkany, P.E.

### MORE INFORMATION

*Research will add link to the final report and other materials on VTrans website*

This fact sheet was prepared for the 2017 VTrans Research Symposium & STIC Annual Meeting held on **September 28, 2017** at National Life in Montpelier, VT. 8:00 am– 12:00 pm.

Fact sheets can be found for additional projects featured at the 2017 Symposium at <http://vtrans.vermont.gov/planning/research/2017symposium>

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>

### Introduction or What was the Problem?

Over 300 Vermont bridges were damaged in the 2011 Tropical Storm Irene and many experienced significant scour. Successfully mitigating bridge scour in future flooding events depends on our ability to reliably estimate scour potential, design safe and economical foundation elements accounting for scour potential, design effective scour prevention and countermeasures, and design reliable and economically feasible monitoring systems, which served as the motivation for this study.

### Methodology or What was done?

The research sought to identify features that could be included in inspections and into a scour rating system that are capable of assessing network-level scour vulnerability of bridges more holistically. Watershed assessments were conducted to add stream metrics to the available data.

Work was also done to develop a scour sensor for use in erodible soils, using both optical and acceleration sensors.

### Conclusion or What are the next steps?

Stream geomorphic and watershed assessment calculations, particularly stream power, were found to be significant in relation to bridge scour damage from Tropical Storm Irene. With the inclusion of these variables, and the bridge inspection records, new relationships could be identified and related to bridge damage.

Metrics are under review that could be used to aid in bridge scour vulnerability, and used to make informed decisions about the risk of flood related bridge damage.

Proof of concept sensors for both optical detection and accelerometers were successfully tested.

### What are potential impacts? What is the benefit to VTrans?

Mapping done using the resulting metrics can be used to predict vulnerable locations in future extreme events. Stream geomorphic parameters and watershed assessments variables provide additional information to be used when conducting bridge scour evaluation. Updated risk assessments can be conducted to determine the exposure to high stream stress locations, and predict effects of large flooding events on bridges.

Optical and accelerometer sensors are both promising methods for detecting scour in erodible soils.