VERMONT
AGENCY OF TRANSPORTATION

FACT SHEET

2017 Research Symposium & STIC Annual Meeting

Using Remote Data Collection to Identify Bridges and Culverts Susceptible to Blockage During Flooding Events

RESEARCH PROJECT TITLE

Using Remote Data Collection to Identify Bridges and Culverts Susceptible to Blockage During Flooding Events

STUDY TIMELINE

October 2014 – October 2016

PRINCIPAL INVESTIGATOR

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VTRANS CONTACT(S)

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MORE INFORMATION

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

Full report is no. 16-003 at http://www.uvm.edu/trc/research-reports/

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?

Flooding occurs (1) when rain falls over a prolonged period of time, (2) when intense rain falls over a short period of time, or (3) when an ice or debris jam reduces the capacity of a crossing structure and causes a river or stream to overflow onto the surrounding area. The focus of this project is on the third type of flooding, specifically due to debris jams at crossing structures – culverts and bridges. Debris jams can also cause riverbank erosion, impede migration of aquatic creatures and adversely impact wildlife habitats. These types of flooding events contribute to the damage that was observed during both Tropical Storm Irene and the heavy rainfall in the spring and summer of 2013. A new approach is needed to mapping potential debris blockages - one that can produce actionable information in a timely manner at a reasonable cost.

Methodology or What was done?

The objectives of this project were to pilot-test the use of an unmanned aerial vehicle (UAV) to gather imagery of streambeds upstream of crossing structures, and to develop a process of rapidly transmitting data to stakeholders. A system was pilot-tested and a process was developed for automating detection of these potential obstructions and outputting a data table containing an extracted thumbnail image of each identified obstruction.

Conclusion or What are the next steps?

Two significant challenges were encountered during this project, in the post-processing of imagery and data transmission to stakeholders. Automation of the feature-extraction process in GIS was initially thought to be imperative to getting actionable results as quickly as possible. However, due to the extremely high resolution of the raw images and the need to check the results of the automated process, it became clear that the fastest method of getting actionable results was to visually scan the images for large woody debris (LWD) piles, which are relatively easy to discern in the streambed and on the stream banks. In addition, transmission of data from the field to critical stakeholders was originally not thought to be a critical aspect of the project. However, the file sizes that are typical of the high-resolution orthophotos that would be obtained from a UAV flight normally preclude their transmission with anything but a hosted file transfer service or by delivering the data on a portable storage device. As interactions with stakeholders progressed, it became clear that it would be beneficial for the team to transmit actionable information on the location and extent of LWD piles as rapidly as possible in the field. The team developed a procedure for extracting a small thumbnail image of each LWD pile and its relevant data, reducing the file sizes to make them transmittable as an attachment to an email or text message.

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

This type of deployment can be a significant benefit to both ANR and VTrans in the future. Making a UAV flight a standard part of the implementation of corrective action at problematic stream/road crossings can focus the mitigation efforts to significantly reduce resources and time needed to address the problem. Focusing these mitigations efforts will make the corrective measures more effective, and allow more problematic crossings to be fixed before the damage is done.