

Quarterly Progress Report:

Project Number and Title: 4.4 Bridge-Stream Network Assessments to Identify Sensitive Structural, Hydraulic, and Landscape Parameters for Planning Flood Mitigation

Research Area: Thrust 4 Connectivity for Enhanced Asset and Performance Management

PI: Mandar Dewoolkar, University of Vermont

Co-PI(s): Donna Rizzo and Arne Bomblies, University of Vermont

Reporting Period: 07.01.2020 to 09.30.2020

Submission Date: 09.30.2020

Overview: (Please answer each question individually)

Provide **BRIEF** overview and summary of activities performed during the reporting period. This summary should be written in lay terms for a general audience to understand. This should not be an extensive write up of findings (those are to be included in the final report), but a **high-level overview of the activities conducted during the last three months no more than 3 bullet points no more than 1 sentence each**

- The Black Creek was selected as the third study site location and a two-dimensional (2D) hydraulic model was built using the computer program HEC-RAS. The model was also calibrated.
- Sensitivity analyses were started in all three models (Otter Creek, Mad River, and Black Creek study sites) to examine how localized perturbations to bridge, road, culvert and stream landscape features affect velocity and stream power up and downstream in the river network.

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Provide context as to how these activities are helping achieve the overarching goal(s) of the project...

- Selecting the Black Creek as the third study site completes the necessary amount of river corridors to capture low, medium, and high gradients.
- All necessary 2D HEC-RAS models have been built and calibrated allowing various simulations for the sensitivity analyses.
- Starting sensitivity analyses helps in identifying structural, hydrogeological and landscape features of importance to the bridge-stream networks to identify similar sensitivities across all three study sites.

Complete the following tables to document the work toward each task and budget (add rows/remove rows as needed, make sure you complete the Overall Project progress row and include all tasks even if they have ended or have not been started)...

| Table 1: Task Progress | | | |
|---|-------------------|-----------------|-------------------|
| Task Number | Start Date | End Date | % Complete |
| Task 1: Data Collection | 07/01/2018 | 09/30/2019 | 100% |
| Task 2: Sensitivity Analysis | 06/01/2019 | 03/31/2020 | 45% |
| Task 3: Probabilistic Network Model Development | 01/01/2020 | 06/30/2020 | 0% |
| Task 4: Transferability | 03/01/2020 | 06/30/2020 | 0% |
| Overall Project: | 07/01/2018 | 05/01/2021 | 60% |

| Table 2: Budget Progress | |
|---------------------------------|--|
|---------------------------------|--|

| Project Budget | Spend – Project to Date | % Project to Date* |
|----------------|-------------------------|--------------------|
| \$374,716 | \$256,578 | 68.5% |

**Include the date the budget is current to.*

Describe any opportunities for training/professional development that have been provided...

Describe any activities involving the dissemination of research results (be sure to include outputs, outcomes, and the ways in which the outcomes/outputs have had an impact during the reporting period. Please use the tables below for any Publications and Presentations in addition to the description of any other technology transfer efforts that took place during the reporting period.)... Use the tables below to complete information about conferences, workshops, publications, etc. List all other outputs, outcomes, and impacts after the tables (i.e. patent applications, technologies, techniques, licenses issued, and/or website addresses used to disseminate research findings).

| Table 3: Presentations at Conferences, Workshops, Seminars, and Other Events | | | | |
|---|--|----------------------------------|----------|------------|
| Title | Event | Type | Location | Date(s) |
| Bridge-Stream network Assessments to Identify Sensitive Structural and Hydraulic Parameters for Planning Flood Mitigation | Vermont Agency of Transportation Virtual Research and Innovation Symposium | Live Poster Presentation | Online | 09/09/2020 |
| Bridge-Stream Network Assessments to Identify Sensitive Structural and Hydraulic Parameters for Planning Flood Mitigation | TIDC Annual Conference | Recorded PowerPoint Presentation | Online | 08/12/2020 |

| Table 4: Publications and Submitted Papers and Reports | | | | |
|--|-------|----------|------|--------|
| Type | Title | Citation | Date | Status |
| No new publications. | | | | |
| | | | | |

Participants and Collaborators:

Use the table below to list all individuals who have worked on the project.

| Table 5: Active Principal Investigators, faculty, administrators, and Management Team Members | | | |
|---|--------------------------|-------------------------------------|-------------------------|
| Individual Name | Email Address | Department | Role in Research |
| Mandar Dewoolkar | Mandar.Dewoolkar@uvm.edu | Civil and Environmental Engineering | Primary Investigator |
| Donna Rizzo | Donna.Rizzo@uvm.edu | Civil and Environmental Engineering | Co-Primary Investigator |

| | | | |
|---------------|-----------------------|-------------------------------------|-------------------------|
| Arne Bomblies | Arne.Bomblies@uvm.edu | Civil and Environmental Engineering | Co-Primary Investigator |
|---------------|-----------------------|-------------------------------------|-------------------------|

Use the table below to list all students who have participated in the project during the reporting. (This includes all paid, unpaid, intern, independent study, or any other student that participated in this project.)

| Table 6: Student Participants during the reporting period | | | | |
|--|----------------------|--------------|---------------------------|-----------------------------|
| Student Name | Email Address | Class | Major | Role in research |
| Rachel Seigel | | Master's | Environmental Engineering | Graduate Research Assistant |
| | | | | |
| | | | | |

Use the table below to list any students who worked on this project and graduated during this reporting period.

| Table 7: Student Graduates | | | |
|-----------------------------------|-------------------------|---------------|------------------------|
| Student Name | Role in Research | Degree | Graduation Date |
| | | | |
| | | | |

Use the table below to list organizations have been involved as partners on this project and their contribution to the project.

| Table 8: Research Project Collaborators during the reporting period | | | | | | |
|--|-----------------|------------------------------------|------------------------|-------------------|-------------------------------|----------------------------|
| Organization | Location | Contribution to the Project | | | | |
| | | Financial Support | In-Kind Support | Facilities | Collaborative Research | Personnel Exchanges |
| | | | | | | |

List all other outputs, outcomes, and impacts here (i.e. patent applications, technologies, techniques, licenses issued, and/or website addresses used to disseminate research findings). Please be sure to provide detailed information about each item as with the tables above.

Have other collaborators or contacts been involved? If so, who and how? (This would include collaborations with others within the lead or partner universities; especially interdepartmental or interdisciplinary collaborations.)

| Table 9: Other Collaborators | | | |
|-------------------------------------|--|--|---|
| Collaborator Name and Title | Contact Information | Organization and Department | Contribution to Research |
| Jaron Borg | Vermont Department of Environmental Conservation, 1 National Life Drive, Main 2, Montpelier, VT 05620-3522 | River Management Engineer, Watershed Management Division, Rivers Program | VT-DEC's representative on the technical advisory committee |

Who is the Technical Champion for this project?

Name: Cassidy Cote (Cassidy has left VTrans and we are in the process of finding a replacement from VTrans)
Title: Hydraulics and Structures Engineer
Organization: Vermont Agency of Transportation
Location (City & State): Montpelier, Vermont
Email Address: Cassidy.Cote@vermont.gov

Changes:

Due to COVID-19 field work has been impacted. A 2D HEC-RAS model was previously made for a section of the Black Creek, this model has been chosen for the final river reach to capture low, medium and high gradients in the project. By using this model field work has been reduced and the rest of the project could proceed.

Planned Activities:

In the next few months, the 2D HEC-RAS models for the Mad River, Otter Creek and Black Creek will run different scenarios to represent a variety of changes in bridge and dam structures along the river. Sensitivity analyses will continue for the three river reaches to identify at risk structures.