

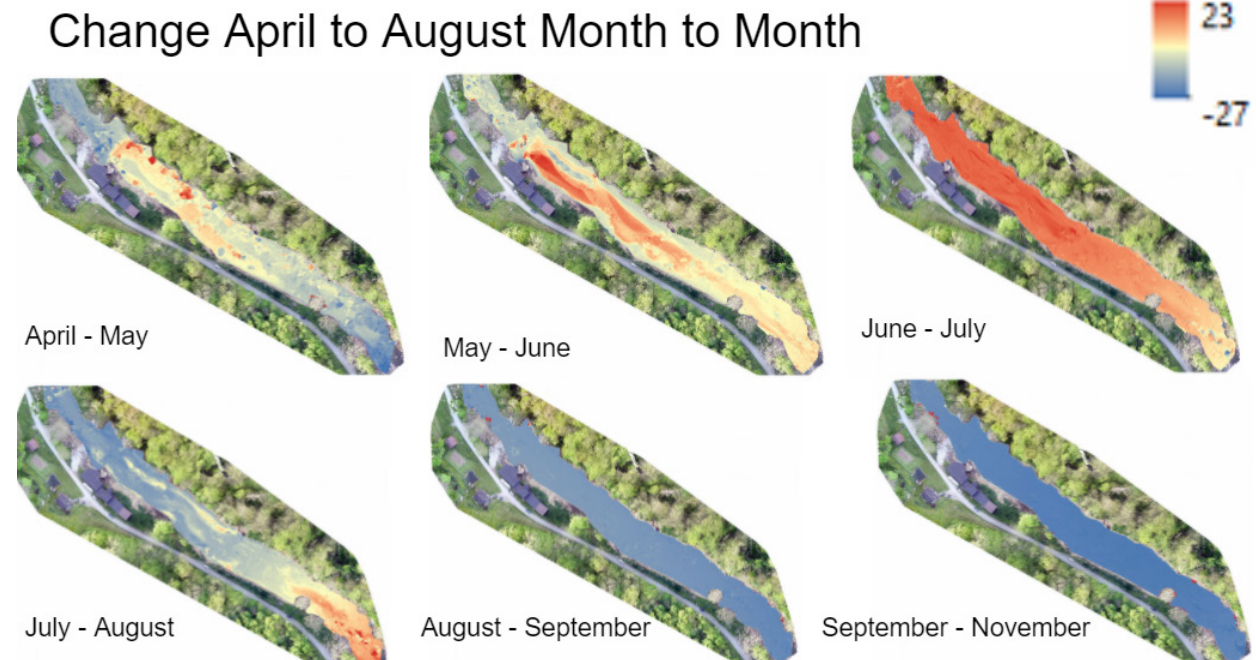
UAV-based Bathymetric Mapping and Soil Erosion Monitoring using LiDAR for the Removal of Ward's Mill Dam

Dr. OK-Youn Yu, Dr. Song Shu, Chris Schoonover

Department of Sustainability Technology and the Built Environment, Department of Geography and Planning
Appalachian State University

Background

- Ward's Mill Dam was removed on May 14 – 16, 2021
- UAV-based SfM has been used to monitor the sediment transportation and soil erosion on the banks



Background

- The bathymetric changes (the scouring of sediment) in the riverbed, however, is still unknown to us, mainly due to the technological limitations of UAV-based SfM
- UAV-based SfM is incapable of capturing the information of riverbeds under water

Objectives

- Evaluate the applicability of incorporating UAV-based technology (including SfM and LiDAR) in dam removal efforts
- Monitor soil erosion and bathymetric changes in the Watauga River due to the removal of Ward's Mill Dam

Specific Goals

- Refine the set of standard procedures developed by this research team for collecting UAV-based remote sensing data (e.g., surface elevation and bathymetric maps)
- Evaluate the accuracy of UAV-based remote sensing data by comparing with the in-situ survey data produced by total stations
- Assess the bathymetric changes along the river channel and the soil erosion on the up- and down-stream banks after dam removal through monitoring the elevation, shoreline, and water depth changes
- Investigate the applicability of UAV-based LiDAR for the bathymetry of waterbodies with different levels of water clarity
 - ✓ Ward's Mill Dam
 - ✓ Price Lake on Blue Ridge Parkway (high level of water clarity)
 - ✓ Rhodhiss Lake near Huffman Brige (low level of water clarity)

Deliverables

- Optimal methodologies for UAV-based data collection in various monitoring/inspection projects for underwater structures or adjacent scour
- A series of data products for NCDOT/public use, including UAV-based imagery, DEMs, and bathymetric maps. In particular, a series of soil erosion/bathymetric maps will provide useful information for NCDOT to develop **project-specific planning/monitoring/inspection guidelines** for underwater structures.

Proposed Project Schedule

Tasks	Year 1	Year 2				Year 3		
	4 th	1 st	2 nd	3 rd	4 th	1 st	2 nd	3 rd
1. Refine the current standard procedures								
2. Collect UAV data								
3. Generate orthophotos, DEMs, and bathymetric maps								
4. Evaluate the data accuracy								
5. Combine the two datasets								
6. Identify dam removal impacts								
7. Evaluate the applicability of UAV-based bathymetry LiDAR								
8. Draft manuscripts for outcomes								