Remote Sensing Analysis of a Flood Season’s Impact on Pleasant Creek, Capitol Reef National Park, Utah

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Objectives
- Establishing base data for future flow and sediment transport analysis on Pleasant Creek in Capitol Reef National Park (CRNP)
- Using high-resolution RTK GPS and imagery with Structure from Motion (SfM) to create digital elevation surfaces for use in geomorphic change detection analysis.

Study Site
Capitol Reef National Park lies in south-central Utah. Little research has been done in this area, particularly with respect to the river morphology as well as sediment distribution and transport on the perennial rivers flowing in the National Park. Pleasant Creek flows through the Park adjacent to Utah Valley University’s Capitol Reef Field Station. We surveyed channel morphology at three locations along a reach of Pleasant Creek where the substrate composed of mixed gravel to sand overlying the Triassic Moenkopi Formation.

Geomorphic Change Detection

Site | 2013 | 2014 | GCD
--- | --- | --- | ---
A | | | 
B | | | 
C | | | 

Results (2013-2014)
Using a standard rtkGPS error threshold of 0.06m at 95% confidence (most conservative), eliminates ~27% of the analysis area. The total net volumetric difference is ~22 ± 15m³ (erosion) and the average net vertical difference is ~0.23 ± 0.15m. Over the reach there was 16% more volumetric change due to erosion than deposition. Data from all three sites highlight the geomorphic change between summer of 2013 and spring 2014.

In June 2014, we collected over 3000 RTK GPS data points of the entire study area. When we returned in September to collect high resolution imagery using a Dji quadcopter, the creek had experienced a massive flash flood, completely altering it. We are now creating elevation surfaces from both data sets to perform GCD and point cloud comparisons of the channel to calculate a sediment budget for the flash flood. This is an ongoing project. Each season we will conduct repeat surveys of the area to provide long-term change data on the creek and to investigate impacts of seasonal flash flooding. An important additional component will be to use gaging stations along the nearby Fremont River as a proxy for the hydrologic record of Pleasant Creek which is currently engaged.

Future Work
New 2014 RTK GPS data (pre-flood)
New 2014 point cloud SFM data (post-flood)

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