

I. Project Title: Hydrophone Study of White River Bedload Transport

II. Bureau of Reclamation Agreement Number(s): N/A

III. Principal Investigator(s):

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IV. Abstract:

The White River is a major tributary to the Upper Green River, and important to the conservation and recovery of native fishes in the Upper Colorado River Basin. A management plan for the White River is under development, with a programmatic biological opinion to be issued on that plan. White River flow recommendations, still under development, will be crucial for evaluating that Plan. Annual high flow recommendations will be an important component, as these are crucial to the maintenance of the complex river channel morphologies that create a diversity of habitats important to fish, including riffle habitat relatively free of surficial and interstitial fine sediments. Draft recommendations for spring peak flows were developed for the Recovery Program based on geomorphic analyses by Schmidt and Orchard (2002). However, those recommendations have not, to date, been formally adopted by the Program.

This project attempts to provide additional insight into the dynamics of coarse sediment transport in the White River to further inform the Program's understanding of the flows necessary to maintain healthy channel habitats. This effort was designed to identify if and where bedload sediment transport would occur along the White River within two study reaches and at selected discharges during the 2017 spring runoff season. A mobile hydrophone was used to make audio measurements for evaluating the dynamics of coarse bedload sediment transport. The detection of sound generated by cobble- and gravel-sized particles moving along the riverbed via hydrophones can serve as a surrogate technology to identify discharges at which bedload sediment transport is initiated.

V. Study Schedule:

Field work was scheduled for the 2017 spring runoff period, and was conducted on the White River in May and June. The audio data currently are being processed and analyzed

using methods developed previously by Marineau *et al.* (2012) and with a novel noise interferometry technique by Justin Ball, CIRES post-doctoral researcher. Preliminary results from processing and interpreting the audio and other field data are expected to be available in early 2018 for the Annual Researchers Meeting. An additional year of field data collection will occur in May and June of 2018, with final results available by late 2018.

VI. Relationship to RIPRAP:

Green River Action Plan: White River

I.B.2 Identify flows.

I.D.1 Review scientific basis, dependent on development of flow recommendations by FWS.

VII. Accomplishment of FY 2017 Tasks and Deliverables, and Initial Findings:

In May and June 2017, Dr. Minear and assistants conducted three longitudinal hydrophone surveys, each of approximately 16 to 28 miles of the White River, to continue developing techniques for bedload sediment transport detection. Unfortunately, peak flow in the White River this year was of much lower magnitude than had been anticipated in February when the field effort was planned. Nevertheless, sampling of the lower White River (Bonanza Bridge to Enron) was performed at around 800 cfs and 1,400 cfs, and of the upper White River below Kenny Reservoir at around 1,850 cfs.

While there was almost no detectable bedload movement at these flows, a substantial amount of channel survey work was completed in sufficient detail to create a 1-D model of the 38-mile reach. This, together with the measured velocity and depth data and available grain size data, is expected to help the Program better understand the conditions in the White River under which bedload becomes mobilized.

VIII. Additional noteworthy observations: N/A

IX. Recommendations: Consider continuing the Recovery Program's support for hydrophone research and development efforts, to the extent hydrophone techniques offer promise as a cost-effective tool for understanding bedload sediment mobilization in the rivers of the upper Colorado Basin.

X. Project Status:

2017 field work is complete. Field data are currently being processed and evaluated at CIRES with the assistance of a post-doctoral student. Some initial results are likely to be presented at the annual Researchers Conference in January 2018.

XI. FY 2017 Budget Status

A. Funds provided: \$10,045

B. Funds expended: \$10,045
C. Difference: \$ 0

XII. Status of Data Submission (Where applicable):

The field data collected in 2017 are still being processed and evaluated. Eventually, the results of this study will be prepared as a peer-reviewed journal article for submission to a relevant geomorphology journal or as a conference paper. The results also may be presented at a national science conference, such as the American Geophysical Union Fall Meeting in San Francisco. In addition, we anticipate one or more presentations of the results to the Upper Colorado River Basin Recovery Program, including the annual Researchers Conference in late January 2018.

XIII. Signed:



Toby Minear 11/21/2016
Principal Investigator Date

References

Marineau, M.D., Gendaszek, A.S., Magirl, C.S., Czuba, C.R., and Czuba, J.S., (2012). Surrogate bedload monitoring using hydrophones in the gravel-bedded Cedar River, Washington. In Proceedings of the ASCE Hydraulic Measurements and Methods conference, Snowbird, Utah, USA, August 13-15, 2012.

Schmidt, J.C., and K.L. Orchard (2002). Flow Recommendations for the White River, Utah-Colorado: Geomorphic analysis in support of a channel maintenance flow recommendation for the White River near Watson, Utah – DRAFT. Report prepared for Upper Colorado River Basin Recovery Implementation Program, Project No. 5D. 135pp.