COLORADO RIVER RECOVERY PROGRAM
FY 2019 ANNUAL PROJECT REPORT

RECOVERY PROGRAM
PROJECT NUMBER: 85f

I. Project Title: Green River Suspended Sediment Monitoring

II. Bureau of Reclamation Agreement Number(s): R17PG0047

Project/Grant Period:
Start date (Mo/Day/Yr): 10/1/2016
End date: (Mo/Day/Yr): 9/30/2021
Reporting period end date: 9/30/2021
Is this the final report? Yes _____ No _X__

III. Principal Investigator:

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IV. Abstract:

The purpose of this project is to collect and analyze suspended-sediment data to help the Program better understand geomorphic processes that form and maintain habitats important to Colorado pikeminnow and razorback suckers in the Green River, including connected backwaters, side channels, and flooded bottomlands. The Recovery Program is interested in: (1) quantifying changes in sediment storage in the Jensen-Ouray segment of the Green River as a function of the magnitude and timing of inputs of sediment and water; and (2) quantifying the streamflows required to export the sediment delivered to this segment to maintain/improve habitat. For this purpose, this project collects high-temporal-resolution suspended-sediment data using multi-frequency acoustics, calibrated pump samples, and conventional EWI measurements near the USGS gages on the Green River near Jensen and at Ouray, UT, and uses these data to construct mass-balance silt-and-clay and sand budgets.

V. Study Schedule:

Collection of sediment-transport data for this project began at both Green River sites in FY 2017. These sites will continue to be visited by field staff multiple times each year through FY 2021 for equipment maintenance, collection of suspended-sediment samples for the calibration and verification of acoustical sediment-transport data, and for tracking bedform migration to estimate the bedload component of total sediment transport. In addition, ~33 historical cross sections will be resurveyed in October 2020 to document long-term topographic changes in the Jensen to Ouray segment.

VI. Relationship to RIPRAP:

General Recovery Program Support Action Plan I. Provide and Protect Instream Flows

VII. Accomplishment of FY 2019 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

During FY 2019, 15-minute, two-frequency acoustical suspended-sediment measurements were made at the Green River above Jensen, UT, station (located just downstream from the Split Mountain Campground in Dinosaur National Monument) and the Green River above Ouray, UT, station (located at the fish observation deck in the Ouray National Wildlife Refuge). These stations are located upstream from the USGS gages near Jensen, UT (#09261000) and at Ouray, UT (#09272400), respectively. In addition to the acoustical measurements, 57 calibrated-pump suspended-sediment samples were collected at the above Jensen station and 110 calibrated-pump suspended-sediment samples were collected at the above Ouray station, and 4 EWI measurements (measurements made using depth-integrating samplers deployed across the entire cross section) were made at the above Jensen station and 5 EWI measurements were made at the above Ouray station. Most of pump and EWI physical suspended-sediment samples have been processed through the GCMRC sediment laboratory for concentration and grain size; the remainder will be processed through the laboratory before the end of December 2019.

Both sites were visited multiple times FY 2019 for operation and maintenance purposes, including visits to collect suspended-sediment samples used for calibration and verification of the acoustic sampler data. The above Jensen station was visited 4 times and the above Ouray station was visited 5 times. EWI and bed-sediment measurements were made during each of these visits. Each of these stations was visited again, with additional EWI and bed-sediment measurements made during October 2019 (with funds carried over from FY 2019). During FY 2019, we finalized the relations used to estimate sand bedload at the Ouray station on the basis of the suspended-sand load and discharge. These relations were developed from paired EWI and bedform-tracking measurements made during 6 site visits in FY 2017-2018 and have been programmed into our website.

Results indicate that, during FY 2019, between 610 and 370,000 metric tons of silt and clay were **eroded** from the segment of the Green River between the above Jensen and above Ouray stations, whereas between 84,000 and 360,000 metric tons of sand were **deposited** in this segment of the Green River. The ranges in these numbers reflect the propagated uncertainty in measurements of silt and clay loads and sand loads at these two stations. All measurements and user-interactive sediment budgets for FY 2019 are available at our website at either: https://www.gcmrc.gov/discharge_qw_sediment/ or https://cida.usgs.gov/gcmrc/discharge_qw_sediment/. Sediment budgets for the segment of the Green River between the above Jensen and above Ouray stations can be constructed on demand by clicking on "Uintah Basin."

VIII. Additional noteworthy observations:

So far during our study, we have collected data during three years with very different hydrographs and three very different sediment responses. Of the three years, the annual flood during FY 2019 had the largest peak discharge (21,000 ft^3/s) whereas the annual flood during FY 2017 had a lower peak discharge (18,000 ft^3/s) and much longer duration. The flood during FY 2018 was negligible (<13,000 ft^3/s). Although silt and clay were eroded from the Jensen-Ouray segment during all three years, the very different flood hydrographs led to very different sand responses in this segment between the three years. The only year of the three where we observed net sand erosion, and therefore a likely increase in aquatic habitat, was 2017, the year with the longest-duration flood. Net sand deposition actually occurred in the Jensen-Ouray segment during the year with the largest flood, 2019. Negligible change in sand mass occurred in this segment during the year without a major flood, 2018. These findings, where a flood of longer duration may be more effective at eroding sand from a river segment, and therefore increasing channel complexity and habitat, than a flood with a larger peak discharge, are consistent with the results from our work on the Colorado and Green rivers in Canyonlands (submitted in October 2019 to the Journal of Geophysical Research).

IX. Recommendations:

We recommend that our study be continued for a sufficient number of years so that we can collect data during enough years with differing hydrologic and sediment conditions to test our hypothesis that longer-duration floods are more effective at eroding sand from the Jensen-Ouray segment than are floods of shorter duration with larger peaks. In addition, we recommend that the cross sections that we are resurveying in October 2020 (last surveyed in the 1980s-1990s and now being surveyed for the first time during our study) be resurveyed again before the termination of our study, and that our study continue long enough to make this resurvey meaningful for comparing against our flux-based sediment budgets (i.e., this second survey occurs some number of years after 2020).

X. Project Status:

Ongoing

XI. FY 2019 Budget Status

A. Funds Provided: $40,255
B. Funds Expended: $37,910
C. Difference: $2,345 (all but $623 of this carried over amount was used to cover field work in October 2019)
D. Percent of the FY 2019 work completed, and projected costs to complete: 100%
E. Recovery Program funds spent for publication charges: Zero

XII. Status of Data Submission:

All data have been posted to our website, where data can be plotted and downloaded, and mass-balance sediment budgets can be constructed and viewed. This website can be accessed at: https://www.gcmrc.gov/discharge_qw_sediment/ or https://cida.usgs.gov/gcmrc/discharge_qw_sediment/.

XIII. Signed: David J. Topping
Principal Investigator Date: November 14, 2019