Title: **The Last Glacial History of the East River Valley, Colorado: Implications for Watershed Function**

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Project Abstract: The geomorphic history of watersheds can influence watershed function by altering topography, subsurface flow paths and hence the timescale of mineral-water interactions. Erosion can also remove the critical zone, thereby re-setting the template for chemical weathering. In mountain landscapes, like the East River watershed near Crested Butte, Colorado, the extent, timing, and intensity of past glaciations can have long lasting impacts on watershed processes. However, relatively few investigations of ancient glaciations have occurred in the East River watershed and none have used modern cosmogenic exposure dating techniques. Here we present, >20 new *in situ*-produced ^{10}Be exposure dates for glacial landforms in the East River and Washington Gulch valleys. The exposure dates provide limits on the timing and extent of the most recent glaciation, which is globally known as the Last Glacial Maximum (LGM) and locally termed the Pinedale glaciation, and the rates of deglaciation. We also use ice-flow modeling to constrain the parts of the watershed that were ice-covered and ice-free during the LGM. The distribution of moraines and ice modeling results indicate glaciers from the East River crossed the drainage divide and flowed into Washington Gulch. The summit of Snodgrass Mountain extended above the maximum elevation of glaciation, and hence may have a much thicker and well-developed weathering zone than adjacent areas that were incised by glacial erosion. The ^{10}Be ages, currently undergoing analysis at Lawrence Livermore National Lab, will constrain the timing of glaciation and ice retreat, and hence provide a spatially averaged view of the time at which bedrock in the watershed was first exposed to weathering. In addition to constraining the time weathering initiated in different parts of the watershed, establishing the timing of glacial moraine deposition is a key part of our overall project, as dating the moraines and sampling soils will allow us to calibrate the deposition rate of meteoric ^{10}Be within the watershed. Calibration of the delivery rate to soils is required to use meteoric ^{10}Be to infer erosion rates in non-quartz-bearing lithologies, and we intend to apply this technique to the portions of the watershed with Mancos Shale bedrock.