Coupling updated flow duration curves from downscaled climate change predictions with sediment transport relations to estimate future transport regimes in the Yampa Biver basin.

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Abstract. Since the inception of global circulation models and the subsequent downscaling of future predictions of global temperature and precipitation regimes, numerous hydrological applications of these predictions have followed. The questions asked are often pragmatic: How will climate change affect water yields or impact flood recurrence intervals? An additional practical question that has received relatively little attention thus far is how will climate change impact sediment yield and channel morphology? This question is inevitably more complex because sediment yield and channel morphology are, in part, a function not only of precipitation and runoff regimes, but also of vegetation cover, local topography, soil properties, and valley type. In Colorado, downscaled climate predictions and hydrologic modeling indicate future reductions in snowpack and/or precipitation, yielding a shift towards earlier spring flows in conjunction with an overall decrease in water yield (Ray et al. 2008). Increased variability in precipitation could mean many things for Colorado including more intense convective precipitation as well as more severe droughts. Increased rainfall variability could yield more frequent transporting events of transport limited coarse sediment; however, decreased overall runoff may reduce the yield of supply limited sediments. This study utilizes runoff predictions from spatially downscaled surface water projections generated by the U.S. Bureau of Reclamation's West-Wide Climate Risk Assessments (USBR 2011) to compare contemporary and updated flow duration curves (FDC) at a USGS gage along the mainstem of the Yampa River. These FDCs are then coupled with sediment transport relations for bed material and wash loads to estimate changes in the magnitude and frequency of at-a-station sediment transport by particle size. Implications for how sediment supply and transport regimes will vary throughout a river network are discussed.

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