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Project:
Sediment Transport Variability and Benthic Organisms in a Mountain Stream

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Research Interest:
Fluvial geomorphology
Sediment transport its relationship with stream ecology
Physical disturbance regimes for different geomorphic settings
Sediment transport intensity and frequency variations within a watershed

Since 2003 we have been working in the Williams Fork River basin to investigate the responses of benthic organisms to channel bed disturbances caused by sediment transport. In particular we are interested in (1) the spatial variability of bedload transport at the reach scale; (2) the relationship between substrate disturbance and the rate of recovery of benthic algae and (3) the variations of bedload transport frequency and intensity at the watershed scale.

Detailed studies regarding (1) and (2) have been conducted in 3 reaches located in close proximity to USGS gauging stations. Data from another 28 sites distributed throughout the watershed have been added to address (3) (Fig 1). In order to establish the spatial variability of sediment transport at the reach scale, detailed surveys of channel geometry in conjunction with measurements of water surface elevations and flow have been used to model the spatial distribution of boundary shear stress and velocity for flows ranging from 20%-100% of the bankfull flow for all 3 sites (Figure 2 presents an example for Site 1).

We find that at bankfull flow more than 50% of the channel bed is likely to be in motion at the 3 study sites. In addition we find that the frequency of sediment-transport events appears to increase downstream, while the intensity of the transport decreases.The trade-off between frequency and intensity suggests that the channel geometry, slope and bed-surface grain size of different segments of the channel are adjusted to carry similar loads from the drainage area above. The implications for the benthic community are still under study based on periodic sampling of benthic algae taken during the growing seasons of 2004 and 2005, macroinvertebrates sampling, water chemistry, light, and temperature.

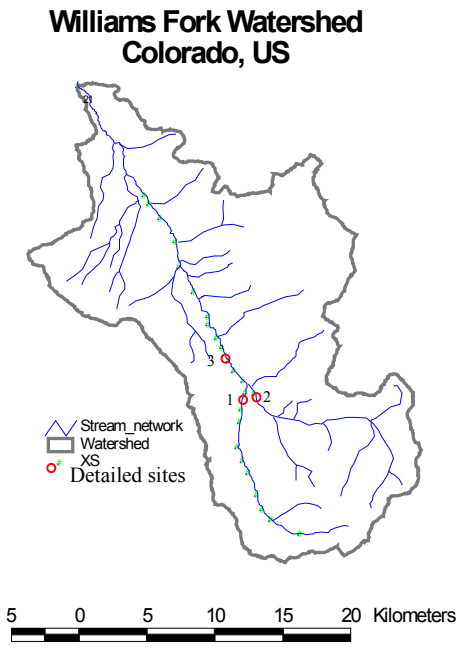

Figure 1: Williams Fork watershed.

Site 1

Site 2

Site 3

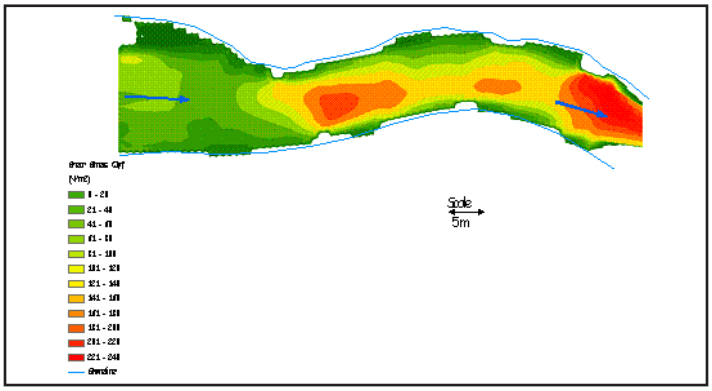

Figure 2: Map of shear Stress at bankfull discharge on Site 1

Publications Related to this Work:

1. Segura, C and Pitlick, J. Relation between shear stress, grain size distributions and bed load transport in a a mountain stream and its potential relationship to disturbance of the biological community. American Geophysical Union, Fall Meeting, San Francisco, CA, Dec 9-12/2006.

2. Segura, C, Pitlick, J, McCutchan, J and Lewis, W. 2005. Effects of channel bed disturbance on algal biomass in a mountain stream. American Geophysical Union, Fall Meeting, San