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Project:
Geomorphology and Native Fish Habitats in the Upper Colorado River Basin

Lead Investigator: John Pitlick
Sponsor: US Fish and Wildlife Service and Bureau of Reclamation

Since 1993 we have worked with biologists from the US Fish and Wildlife Service to determine how fish habitats in the upper Colorado River are affected by fluvial processes. Our goal in this work is to assess conditions under which habitats used by native endangered fishes are formed and maintained. We rely on historical information, as well as measurements from field studies, to develop hydrodynamic models of flow and sediment transport, and then use these results to formulate recommendations for flows that perform important geomorphic functions.

Our study area spans a 250-km segment of the Colorado River from Parachute, CO, to Moab, UT. Within this segment we have made detailed measurements of channel geometry, channel gradient, and bed material in order to establish relations between discharge and sediment load. The results shown below indicate that discharges capable of mobilizing the bed material of the Colorado River are consistent throughout the study area (Fig. 1). The top panel shows that at bankfull flow, the shear stress acting on the channel bed (t*) averages about 1.5 times the critical shear stress for bed load transport; the bottom panel shows that the threshold discharge required to initiate bed load transport occurs at about ½ of the bankfull discharge. The consistency in these trends provides some assurance to water managers and biologists that releases from upper basin reservoirs will achieve the desired geomorphic effects on a widespread basis.

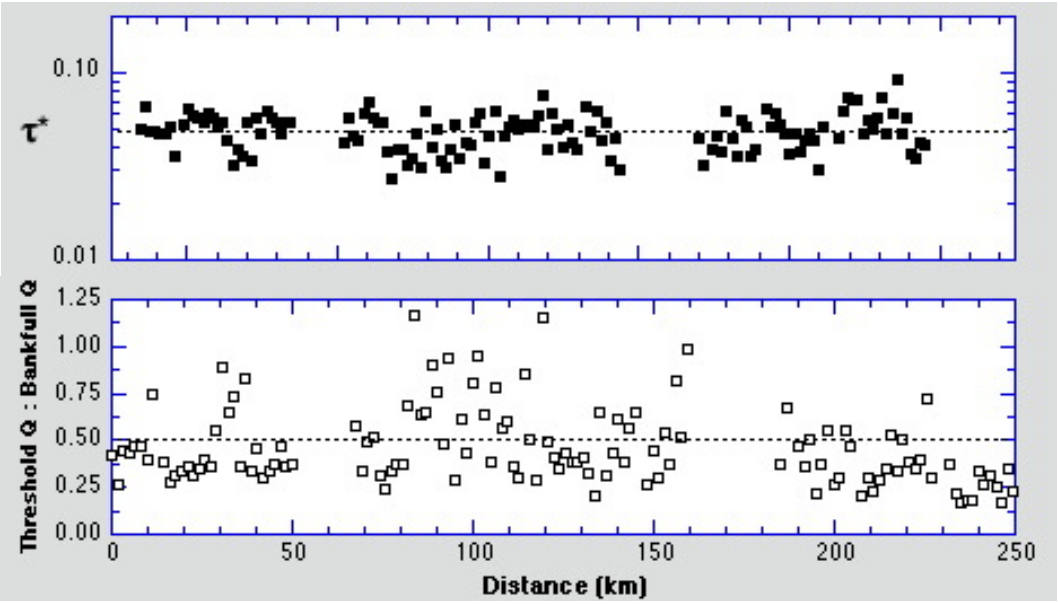

Figure 1. Downstream trends in bankfull Shields stress, t*, and the ratio of the threshold discharge for bed load transport to the bankfull discharge (from *Pitlick et al.*, 1999).

Additional information on the Upper Colorado River Endangered Fish Recovery Program can be found at the USFWS web site, http://www.fws.gov/coloradoriverrecovery/.

Publications Related to this Work:

1. Pitlick, J., 2007, Channel monitoring to evaluate geomorphic change on the main stem of the Colorado River, Final Report, Project Number 85A, *U.S. Fish and Wildlife Service Upper Colorado River Endangered Fish Recovery Program*, Denver, CO, 71 pp.
2. Pitlick, J. and R. Cress, 2002, Longitudinal trends in the channel characteristics of a large gravel-bed river, *Water Resources Research*, v. 38(10), 1216, doi: 10.1029/2001WR000898
3. Osmundson, D.B., R.J. Ryel, V.L. Lamarra, and J. Pitlick, 2002, Flow-sediment-biota relations: Implications for river regulation effects on native fish abundance, *Ecological Applications*, v. 12, p. 1719–1739.
4. Van Steeter, M.M. and J. Pitlick, 1998, Geomorphology and Endangered Fish Habitats of the Upper Colorado River 1. Historic Changes in Streamflow, Sediment Load and Channel Morphology, *Water Resources Research*, v. 34, p. 287-302.
5. Pitlick, J. and M.M. Van Steeter, 1998, Geomorphology and Endangered Fish Habitats of the Upper Colorado River 2: Linking Sediment Transport to Habitat Maintenance, *Water Resources Research*, v. 34, p. 303-316.