# LOWER CLEAR CREEK FLOODPLAIN REHABILITATION PROJECT: GEOMORPHIC MONITORING OF PHASE 3A

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**Abstract:** Three years of geomorphic monitoring of Phase 3A of the *Lower Clear Creek Floodway Rehabilitation Project* evaluated the effectiveness of reconstructing 0.5 miles of stream channel historically impacted by gravel mining, gold dredging and flow regulation. Sequential surveying, stream gaging, scour monitors, bulk sampling, suspended sediment and bedload sampling, photography and bed-mobility experiments were employed to evaluate floodplain function and in-channel geomorphic processes.

Large winter storm flows in December 2002 resulted in significant initial changes to the cross section, topographic and longitudinal geometry of the re-constructed channel. Point bars, mid-channel bars, new pools and transverse riffles began to develop. Riffle matrix particles initially mobilized at well below the design bankfull discharge of 3,000 cfs, but as the channel adjusted, the threshold of bed mobility increased to an average of 2,800 cfs. Gravel-injected banks eroded and some pools deepened. Further channel adjustment followed a rare sustained spill event in April 2003. Water years 2004 and 2005, with lower peak discharges, had a relatively smaller effect.

The design channel failed to flow over bank at flows above 3,000 cfs at the upstream end of the reach, thus contributing greater erosive energy to transport introduced gravels. However, at 6 of 8 cross sections, the channel functioned as designed, flowing over the banks above 3,000 cfs, resulting in fine sediment deposition on the floodplain. Increased roughness associated with floodplain plantings enhanced deposition of material (< 0.1 mm) in the desired size class.

Sediment transport curves for bedload and suspended load (generated from medium to high flow samples collected with a 6 inch Helley-Smith sampler deployed from a cataraft on a cableway) were applied to continuous discharge records to compute annual loads. Water Year 2003 produced 7,360 tons of bedload while Water Year 2004 produced 2,500 tons, illustrating the hydrologic differences in two consecutive years. Similarly, suspended sediment yield was computed using the relationships between suspended sediment concentration and discharge and/or turbidity: Water Year 2003 yielded 35,300 tons of suspended sediment compared to 8,460 tons in Water Year 2004.

The hydraulic design for Phase 3A may require modification to improve floodplain function and gravel injections may be required to provide desired geomorphic attributes.