Lolo Creek

General Information

Lolo Creek is a tributary to the Middle Fork Clearwater River near Greer, Idaho. The study reach is about a 1,100 ft length of stream near the western boundary of the Clearwater National Forest. The site is on land administered by the Forest Service at an elevation of about 3,040 ft. The drainage area is 41.0 mi^2 and the geology of the watershed is predominantly intrusive igneous.

The site is associated with an existing Forest Service gaging station. Streamflow records are available from water year 1986 to water year 1999 and sediment transport measurements are available from water year 1982 to water year 1997. Additional information collected at the site includes a survey of the stream reach, pebble counts of the substrate surface, and core samples of the substrate subsurface material. Figures 1 and 2 show photographs of the study reach. There is a bridge at the gage site from which are made most discharge and sediment transport measurements during high flows.

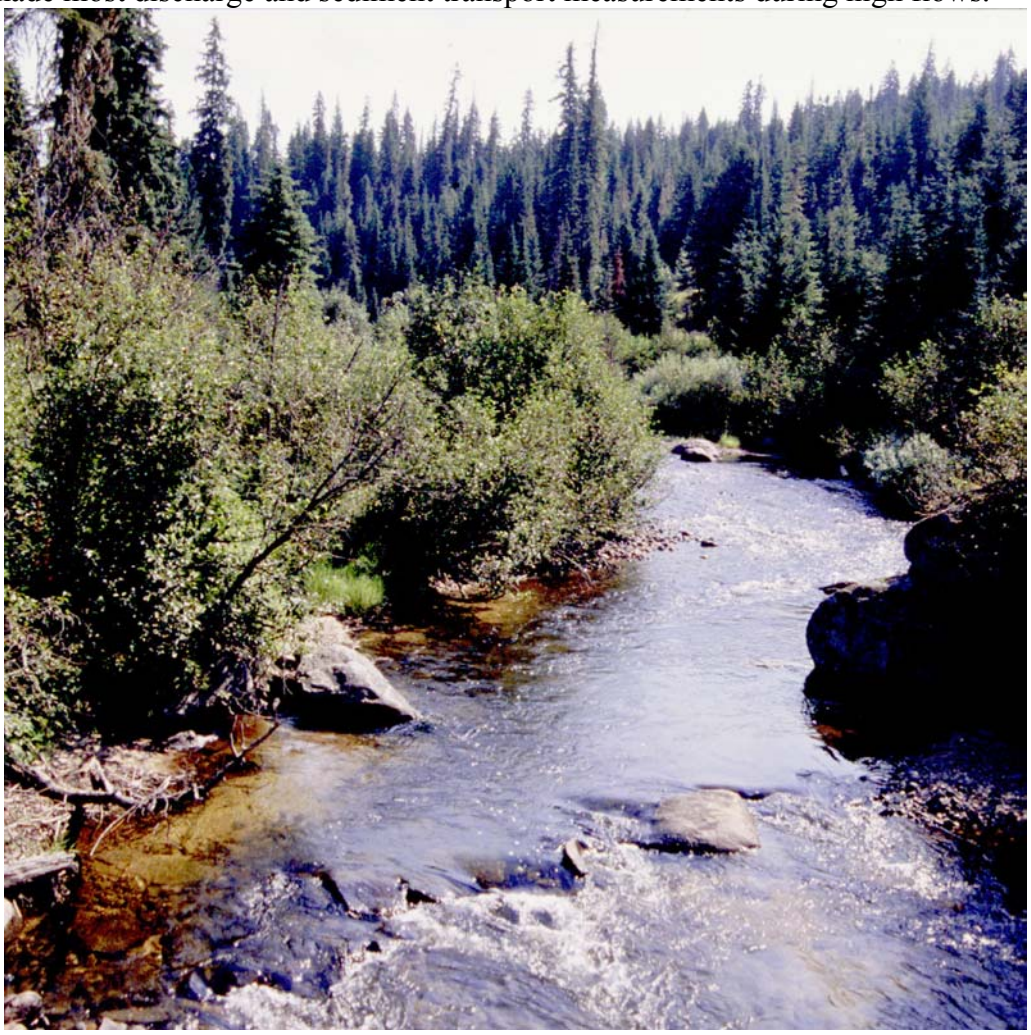

Figure 1. Lolo Creek looking upstream from the measurement site.

Figure 2. Lolo Creek looking upstream..

Streamflow was recorded for water years 1986 through 1999. Estimated average annual streamflow (Q_a) for the stream is 93.1 ft^3/s and the estimated bankfull discharge (Q_b) is 415 ft^3/s. Recorded daily mean stream discharge for this period ranged from 6.77 ft^3/s to 904 ft^3/s. The largest instantaneous discharge was 1,020 ft^3/s on May 15, 1997.

Channel Profile and Cross-Section

Figure 3 shows the longitudinal profile for the channel bed in the center of the channel, the water surface elevations along each bank at the time of the survey and bankfull flow elevations (floodplains). The average gradient for the study reach is 0.0097 ft/ft. Cross-sections of the channel were surveyed at six locations. The gage is located at cross-section 3 (XS3). Most sediment transport measurements were made at cross-section 3, which is under the bridge.

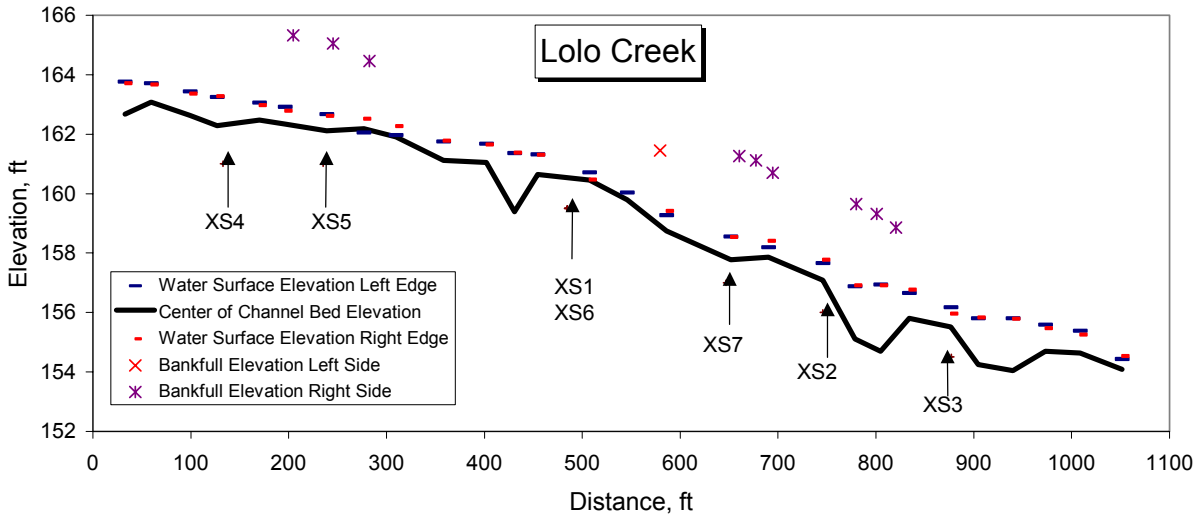

Figure 3. Longitudinal profile of the study reach in Lolo Creek.

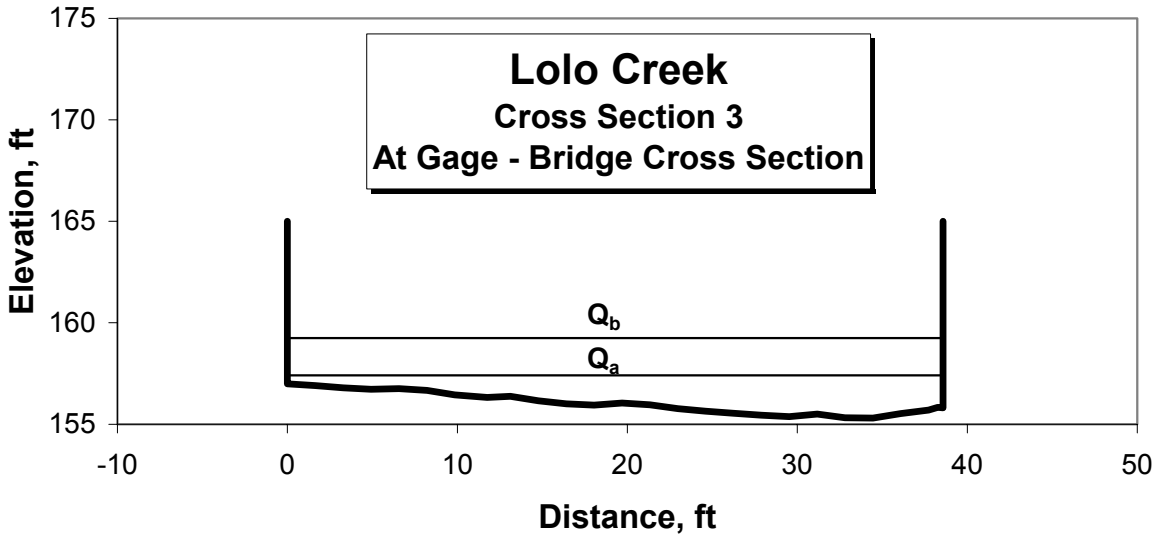

Figure 4. Cross-section 3 of Lolo Creek at the gage.

Channel Geometry

Figure 4 shows the cross-section at the gage (cross-section 3). The channel geometry relationships for this cross-section are shown in Figure 5. All data collected in 1986 through 1997 were used to develop the displayed power relationships with discharge. Over the range of discharges when sediment transport was measured (26.8 to 809 ft^3/s) estimated stream width, estimated average depth and estimated average velocity varied from 30.9 to 42.7 ft, 0.68 to 4.71 ft, and 1.3 to 4.0 ft/s, respectively. The average reach gradient is 0.0097 ft/ft.

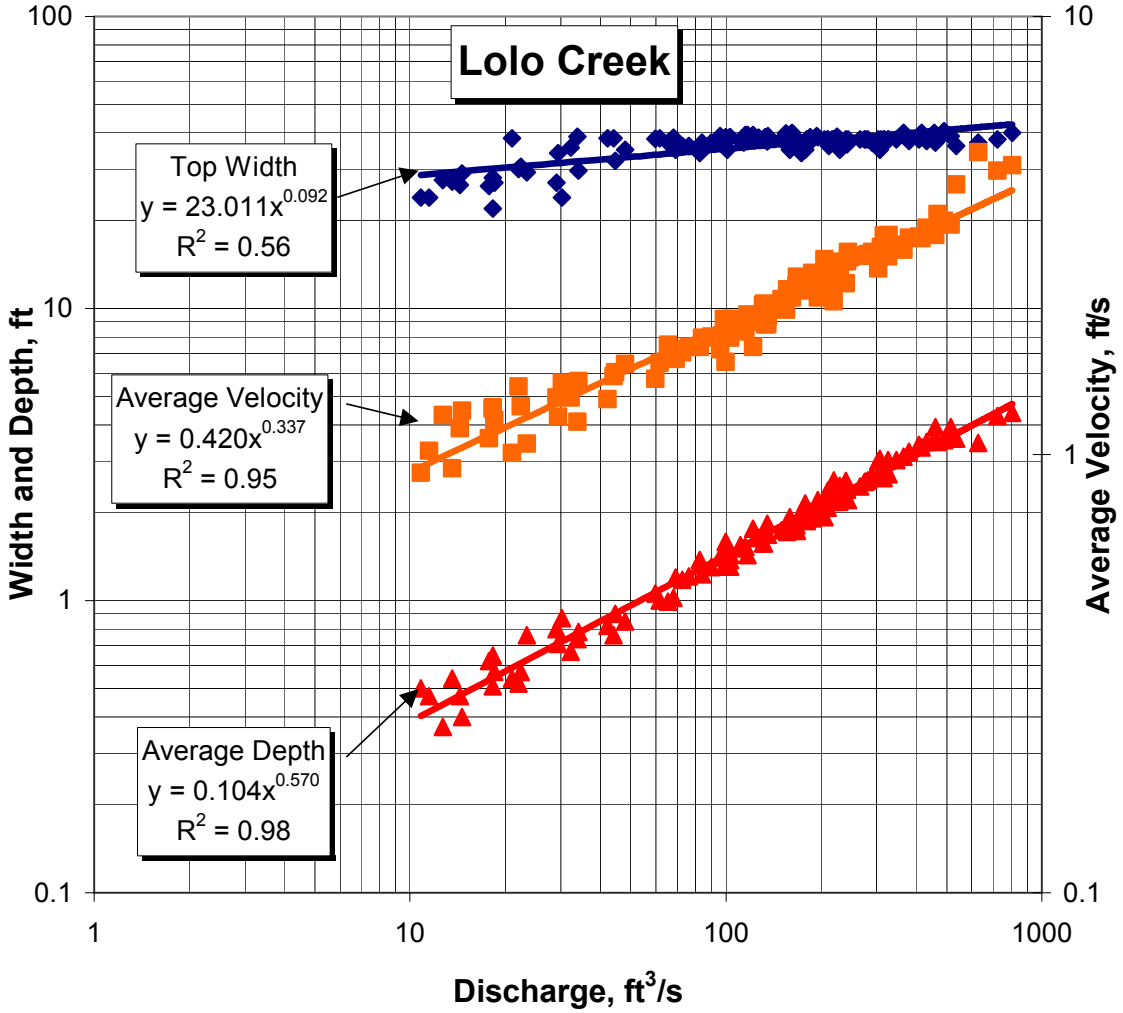

Figure 5. Width, average depth, and average velocity versus stream discharge at the gage cross section on Lolo Creek.

Channel Material

Surface pebble counts were made by CWRU personnel in October 1994 near cross-section 2 and in July 1995 near ?????. Surface pebble counts were made by USFS personnel along three transects in August 1995 and a core of subsurface material was collected, one per transect. The average D_{50} and D_{90} for the surface material (USFS 1995) were 68 mm and 172 mm, respectively (Figure 5). The average D_{50} and D_{90} for the subsurface material (USFS 1995) were 20 mm and 93 mm, respectively. Floodplain samples were collected at two locations in November of 1997. The D_{50} for the floodplain samples ranged from 0.14 to 0.43 mm.

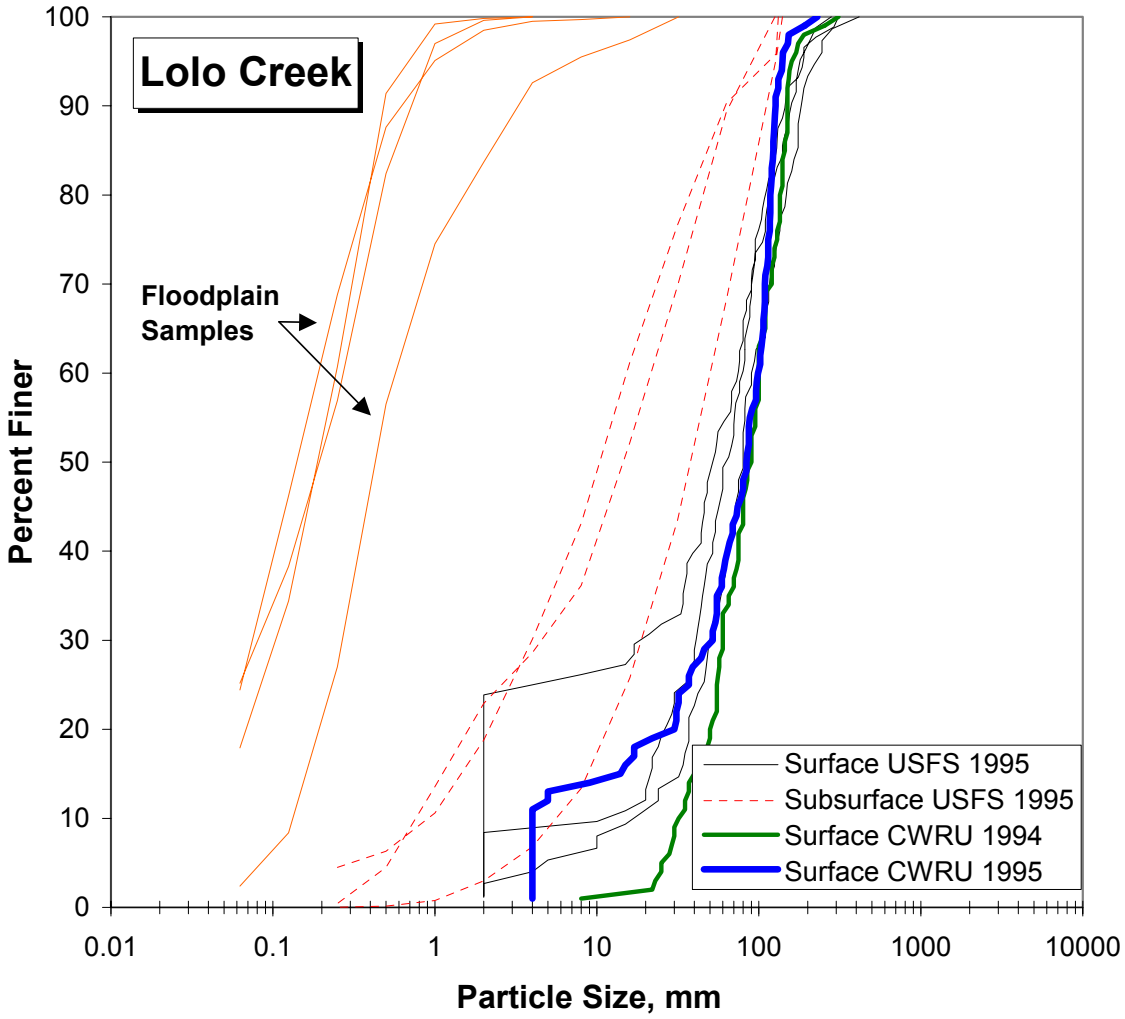

Figure 5. Particle size distribution for surface and subsurface material and floodplain samples in Lolo Creek.

Sediment Transport

Sediment transport measurements made in 1982, 1983, 1986, 1988 to 1990, 1992 to 1995 and 1997 include 112 measurements of bedload transport and 136 measurements of suspended sediment transport. Sediment transport measurements spanned a range of stream discharges from 26.8 ft^3/s ($0.29Q_a$; $0.06Q_b$) to 809 ft^3/s ($8.69Q_a$; $1.95Q_b$). Bedload transport ranged from 0.0110 to 14.1 t/d and suspended transport ranged from 0.03 to 58.4 t/d. Over the range of measured discharges, suspended transport accounts for the majority of the material in transport with about an order of magnitude greater suspended transport than bedload transport (Figure 6).

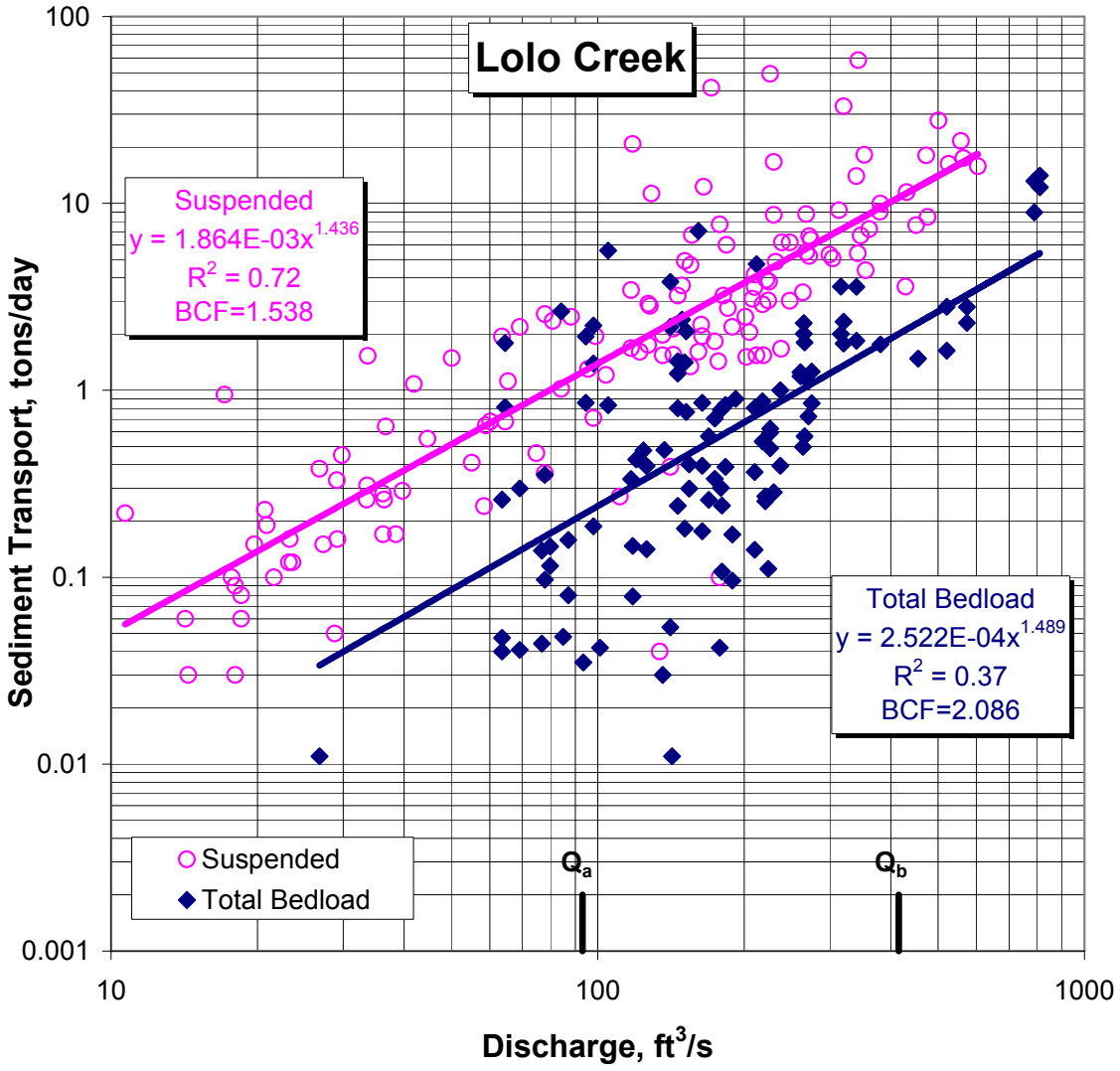

Figure 6. Bedload and suspended load transport rate versus discharge.

The bedload transport rates by size class (Figure 7) shows that the larger rates are generally associated with material in the 0.5 to 2mm diameter size class. Only five of the samples contained particles greater than 32 mm.

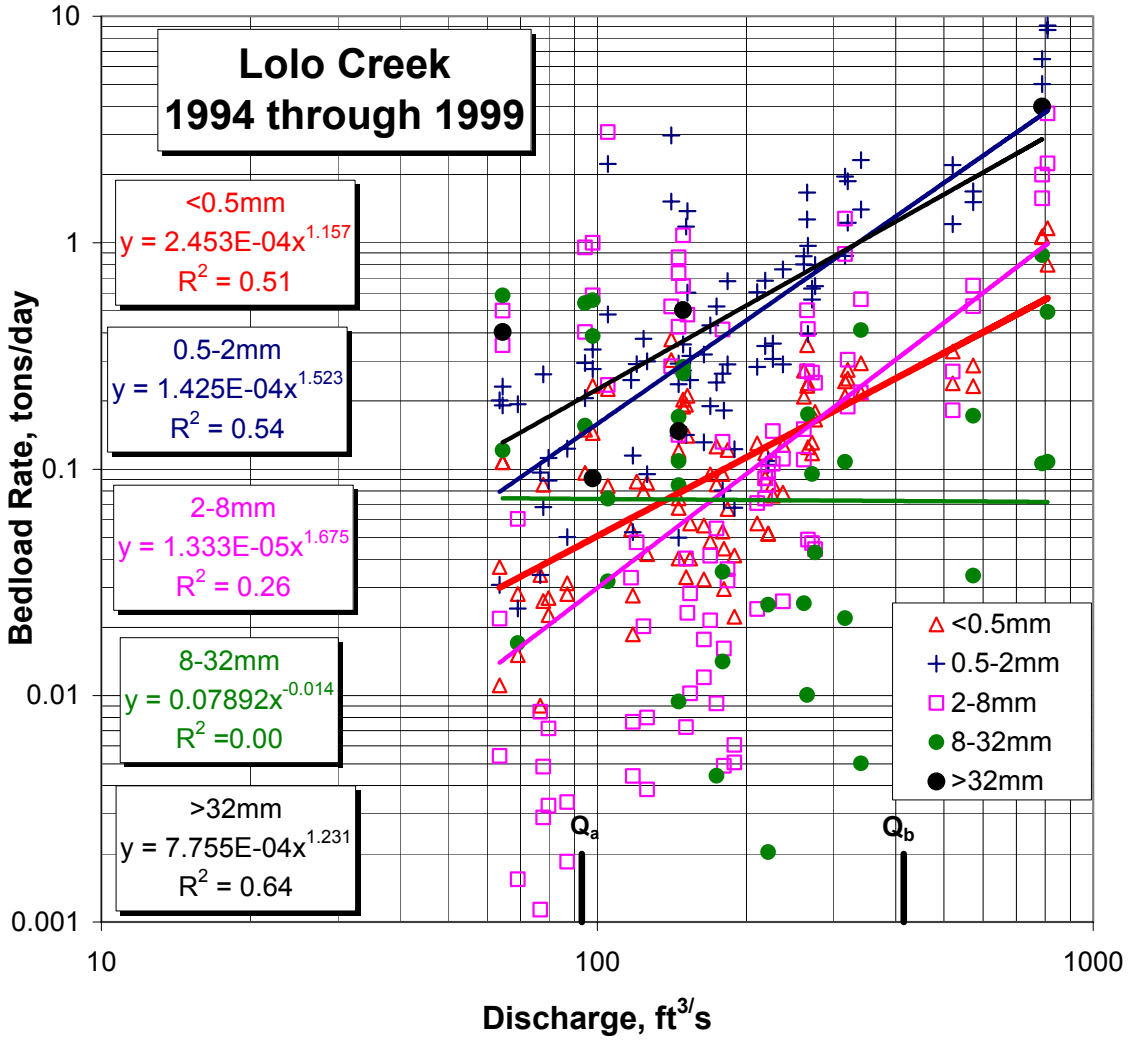

Figure 7. Bedload transport rate versus discharge for selected size classes.

The size of the largest particle in the bedload sample increased with discharge (Figure 8). The largest particle measured in a bedload sample was 55 mm at a discharge of 789 ft^3/s. At discharges greater than bankfull (193 ft^3/s) the largest particle usually exceeded about 15 mm. There is no noticeable trend between median size of the bedload sample and discharge. The D_{50} for most of the bedload samples was in the sand size, 0.5 to 2.0 mm. The largest median diameter of a bedload sample was 10.23 mm. The information on the largest particle in the bedload sample and observations of recently moved large rocks in 1997 and associated instantaneous peak discharges for that snowmelt period suggest that the median diameter particles on the channel surface begin to move at discharges slightly near bankfull discharge.

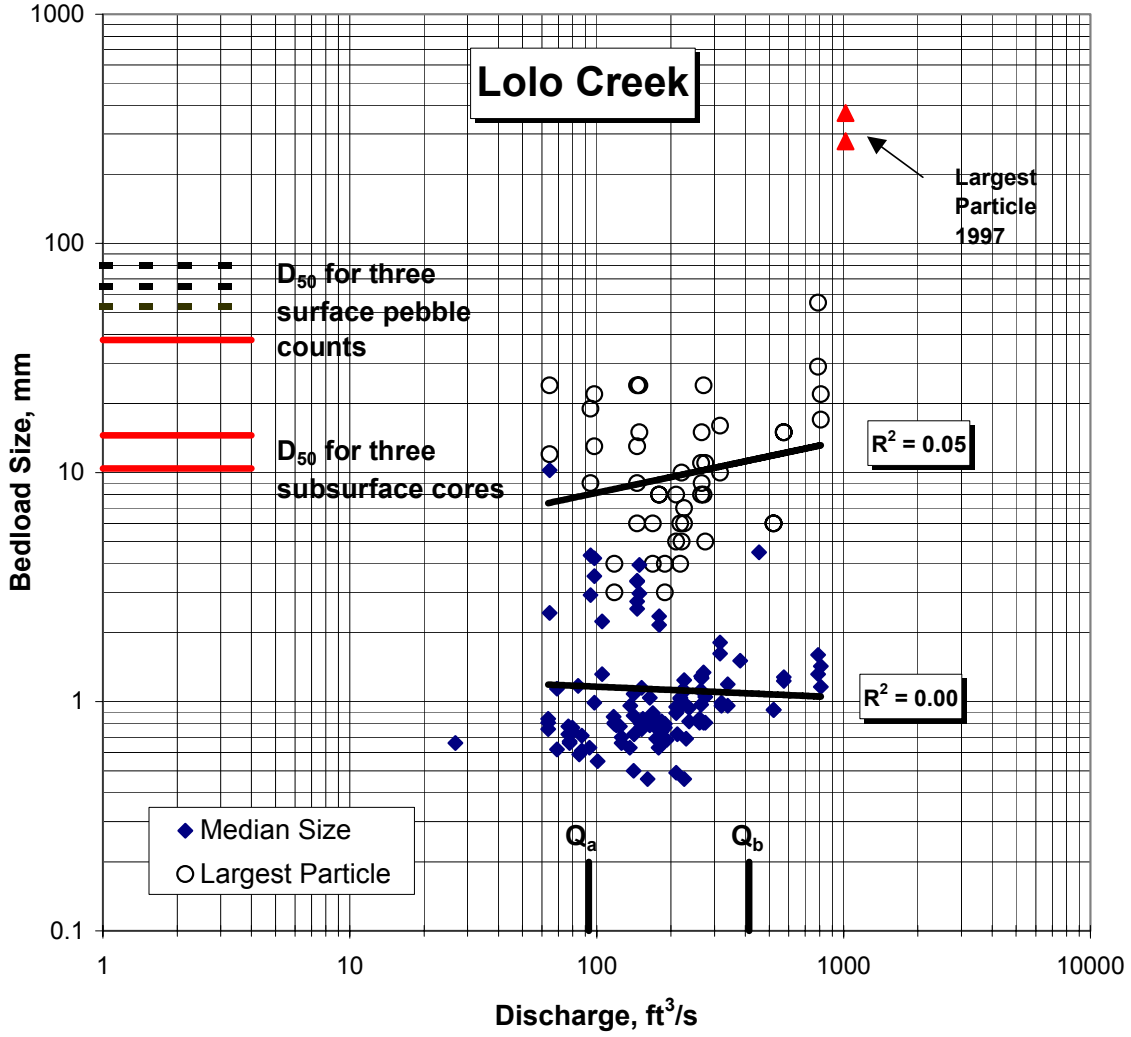

Figure 8. Median size of the bedload sample and the largest particle size versus stream discharge for Lolo Creek. (Substrate information displayed were collected by USFS personnel in 1995).