Little Slate Creek

General Information

Little Slate Creek flows into the Salmon River at the Slate Creek Range Station, about nine miles downstream of Lucile, Idaho. The study reach is about a 860 ft length of stream on Little Slate Creek about 11 miles upstream from the Salmon River. The site is on land administered by the Nez Perce Forest Service at an elevation of about 3,500 ft. The drainage area upstream of this location is 62.6 mi^2 and the geology of the watershed is predominantly intrusive igneous.

This site is associated with an existing Forest Service gaging station. Streamflow records and sediment transport measurements are available from water year 1986 to 1999. The stage recorder at this site is operated seasonally, typically from early spring until late fall. Sediment transport measurements predominantly occurred during the high flows of snowmelt runoff. Additional measurements included a survey of the stream reach, pebble counts of the substrate surface and core samples of the substrate subsurface material. Figure 1 shows a photograph of looking downstream from the gaging station. There is a cableway several feet downstream of the gaging station to facilitate discharge and sediment transport measurements during high flows.

Figure 1. Little Slate Creek looking downstream from the gaging station.

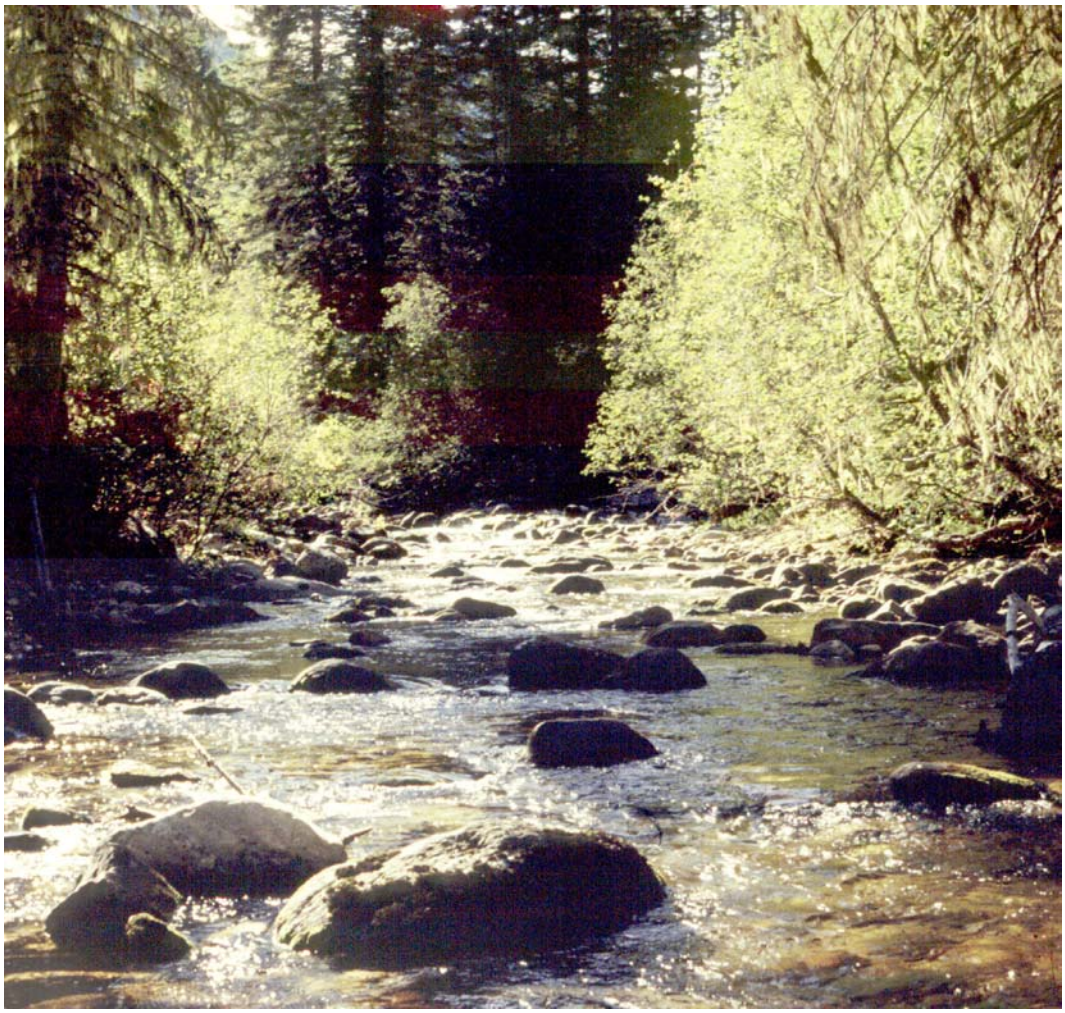

Figure 2. Little Slate Creek looking upstream.

Streamflow was recorded for water years 1986 through 1999 from the beginning of the spring snowmelt hydrograph until fall. Estimated average annual streamflow (Q_a) for the stream is 109 ft^3/s and the estimated bankfull discharge (Q_b) is 430 ft^3/s. Over the period of record, daily mean discharge has ranged from 12.5 ft^3/s to 868 ft^3/s. The largest instantaneous discharge was 1,366 ft^3/s on June 7, 1993.

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 0.0268 ft/ft. Cross-sections of the channel were surveyed at four locations. Discharge and sediment transport measurements were made at cross-section 1 (XS1).

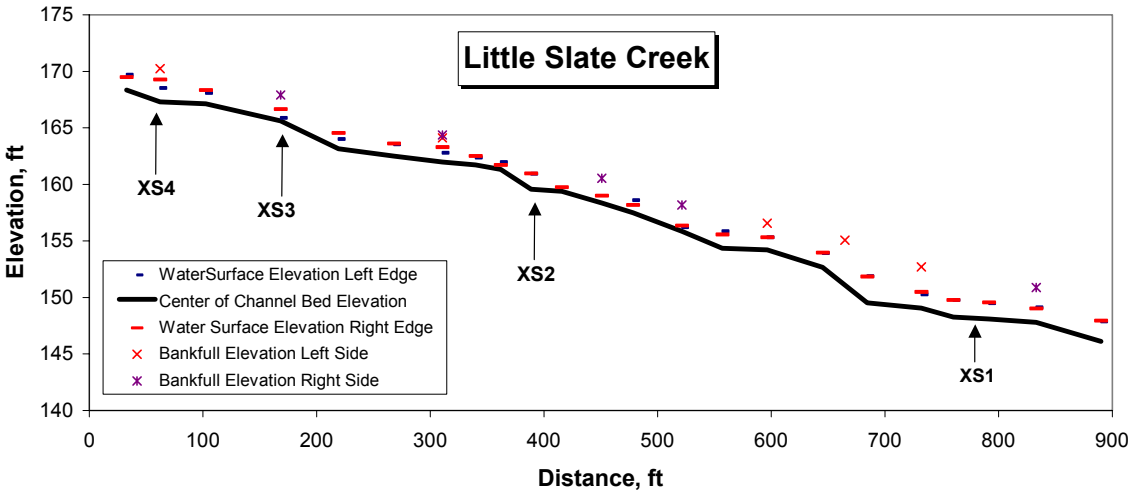

Figure 3. Longitudinal profile of the study reach in Little Slate Creek.

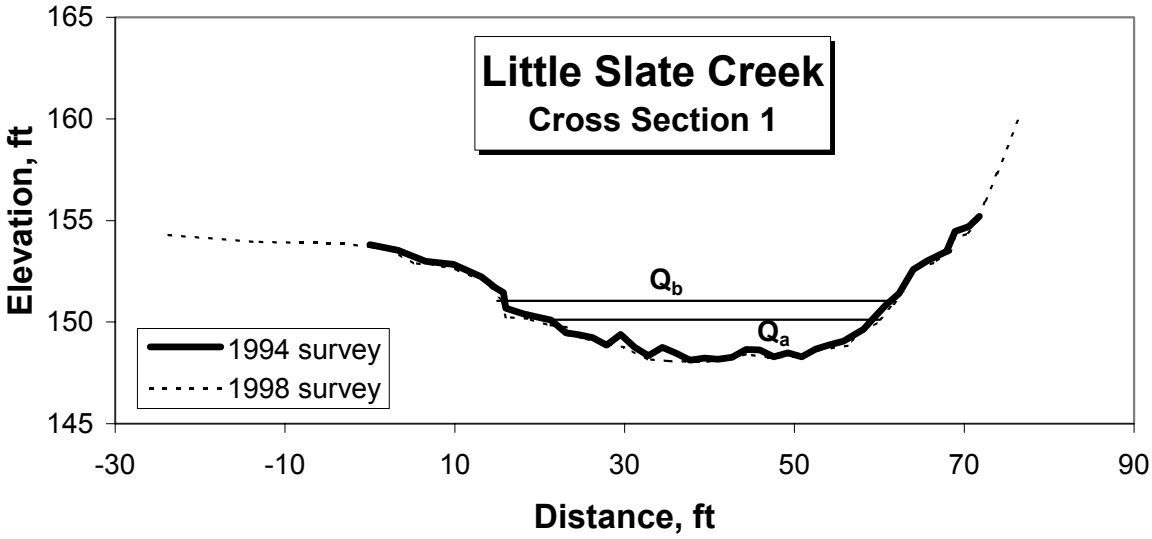

Figure 4. Cross-section of Little Slate Creek at the sediment transport measurement site.

Channel Geometry

Figure 4 shows the cross-section at the sediment transport measurement site, cross-section 1. 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 (18.7 to 647 ft^3/s) estimated stream width, estimated average depth and estimated average velocity varied from 32.6 to 49.0 ft, 0.82 to 2.45 ft, and 0.7 to 5.4 ft/s, respectively. The average reach gradient is 0.0268 ft/ft.

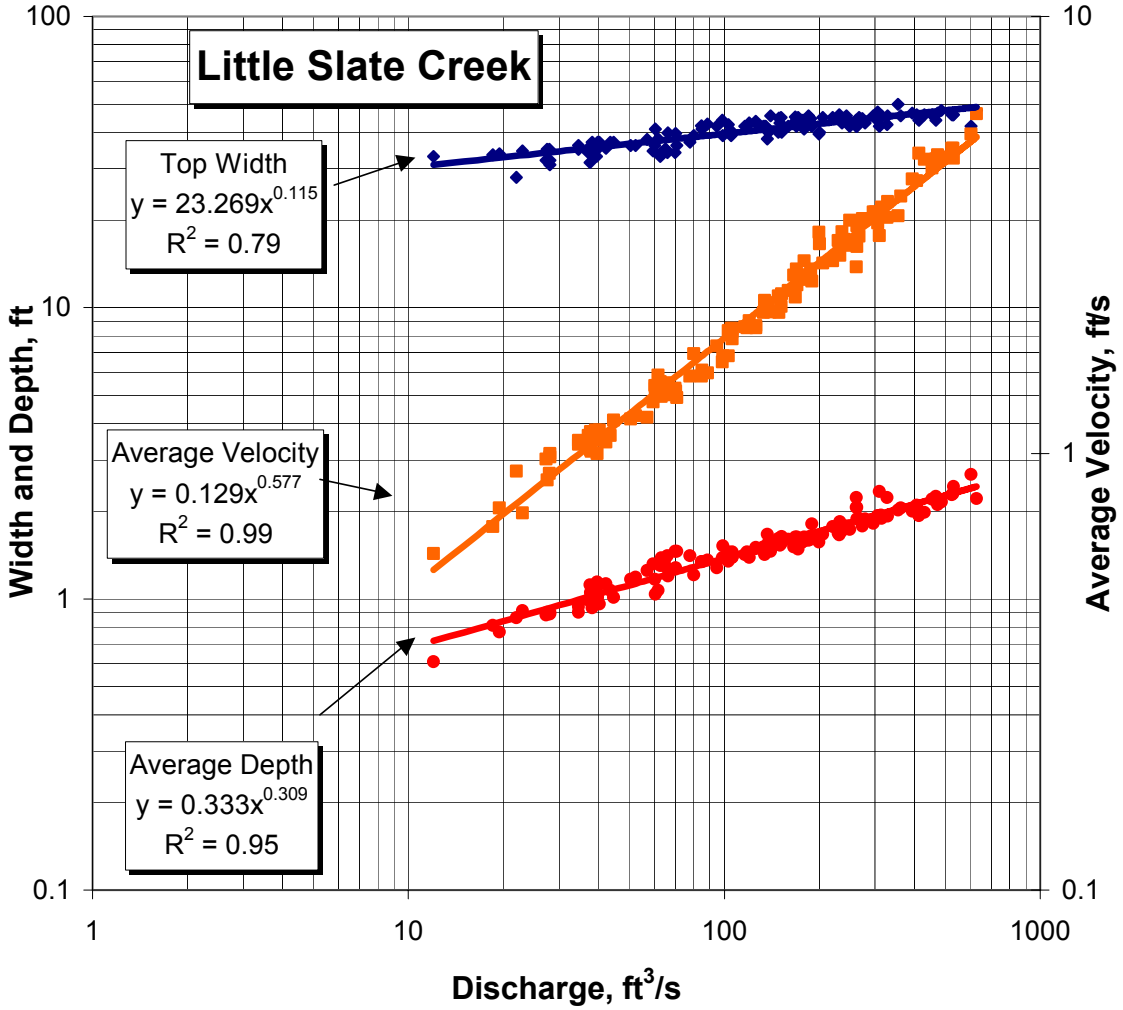

Figure 5. Width, average depth, and velocity versus stream discharge at the measurement cross section on Little Slate Creek.

Channel Material

A surface pebble count was made at cross-section 1 in October 1994. In October 1995 surface pebble counts were made at four cross-sections and four cores of subsurface material were collected. The average D_{50} and D_{90} for the surface material in 1994 were 207 mm and 450 mm, respectively (Figure 6). The average D_{50} and D_{90} for the surface material in the reach in 1995 were 102 mm and 355 mm, respectively. The average D_{50} and D_{90} for the subsurface material in 1995 were 24 mm and 169 mm, respectively. About 11% of the surface material in 1995 was sand (2 mm) size or smaller. The D_{50} for floodplain surface material (the three distributions on the left) at three locations ranged from 0.17 to 0.29 mm. The other two much coarser floodplain material distributions are for subsurface material at two of the sample locations.

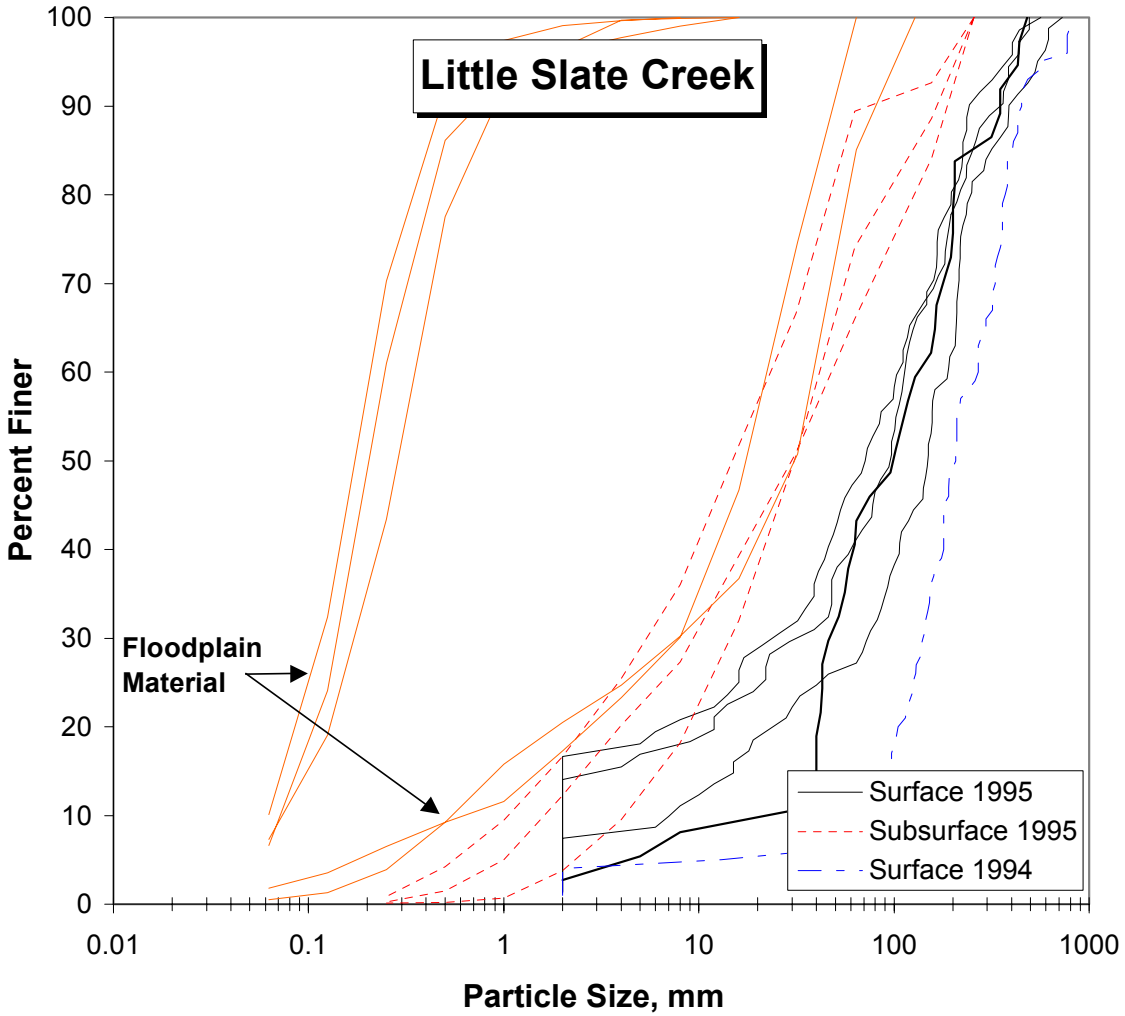

Figure 6. Particle size distribution for surface and subsurface material and floodplain material samples collected in Little Slate Creek.

Sediment Transport

The bedload and suspended load measurements in water years 1986 through 1999 were all made in the vicinity of the cableway. The sediment transport data include 157 measurements of bedload transport and 80 measurements of suspended sediment. Sediment transport measurements spanned a range of stream discharges from 18.7 ft^3/s ($0.17Q_a$; $0.04Q_b$) to 647 ft^3/s ($5.94Q_a$; $1.50Q_b$). Bedload transport ranged from 0.0 to 10.3 t/d and suspended transport ranged from 0.04 to 126 t/d. Over the range of measured discharges, suspended transport accounts for the majority of the material in transport with approximately an order of magnitude greater suspended transport (Figure 7).

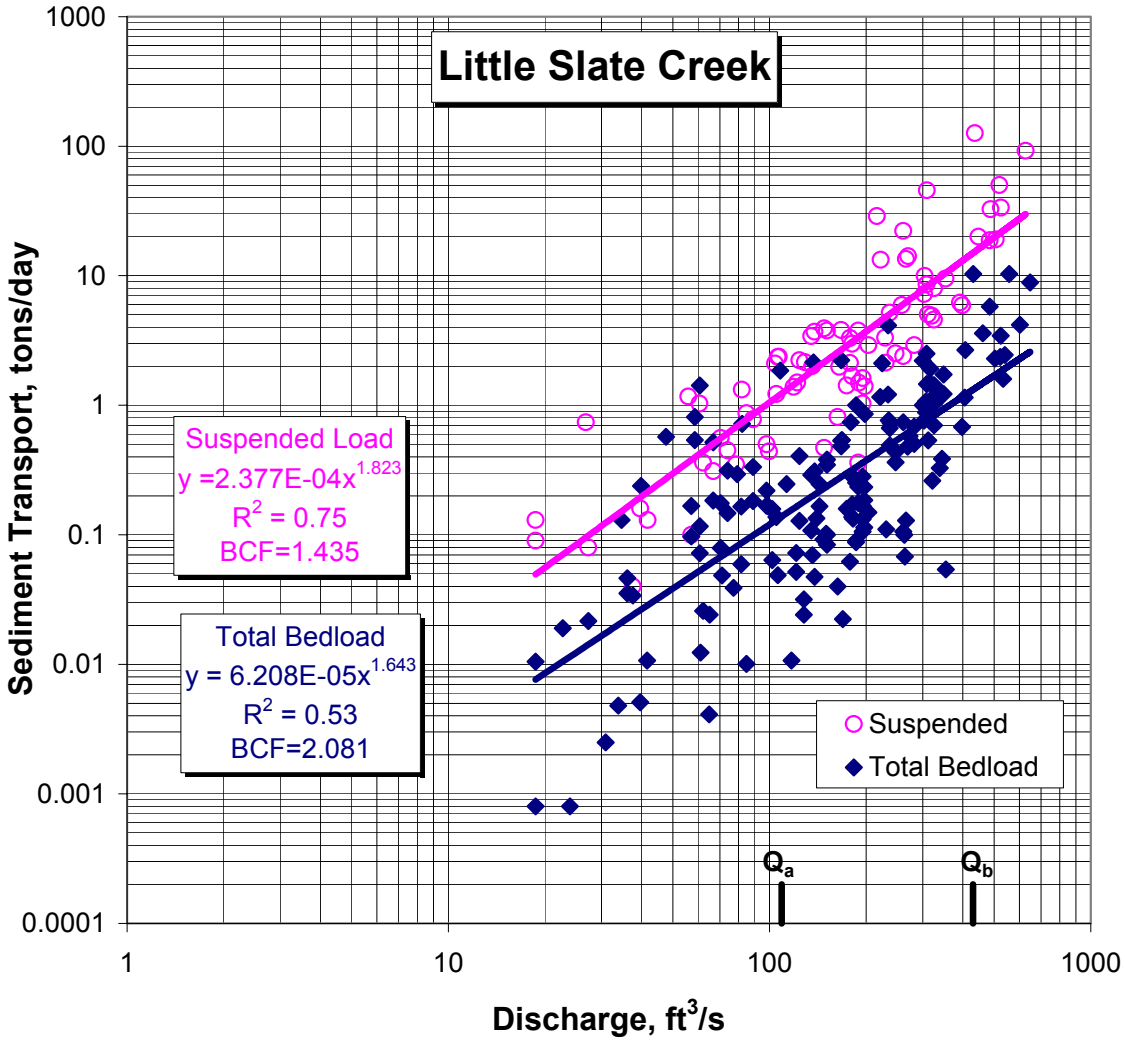

Figure 7. Bedload and suspended load transport rate versus discharge.

The bedload transport rates by size class (Figure 8) shows that the larger rates are associated with material in the 0.5 to 2mm diameter size class. None of the bedload samples contained material larger than 32mm.

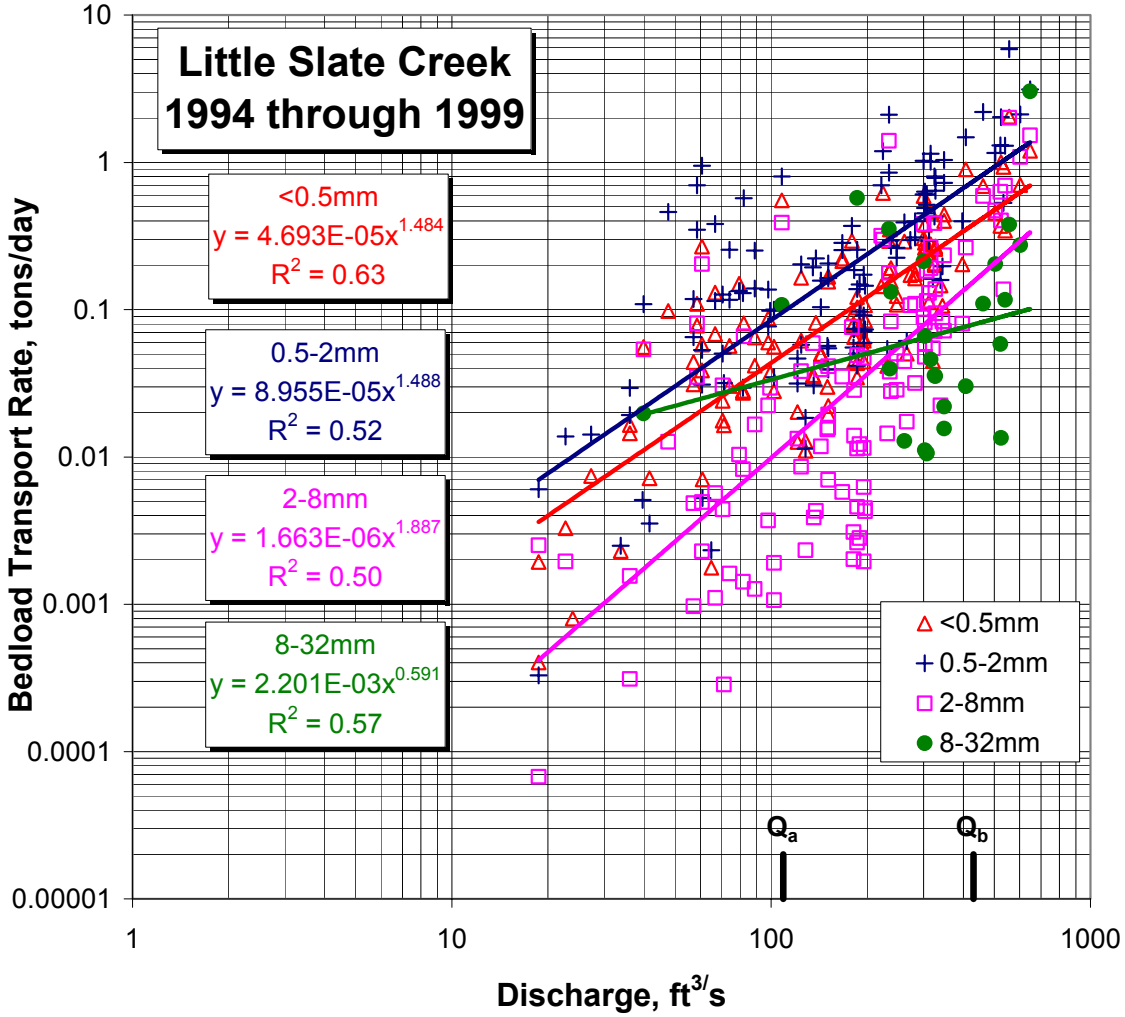

Figure 8. Bedload transport rate versus discharge for selected size classes.

There was a weak trend of increasing size of the largest particle in the bedload sample with increasing discharge (Figure 9). The largest particle measured in a bedload sample was 30 mm at a discharge of 647 ft^3/s. The size of the largest particles recently moved by snowmelt discharges in 1997, suggests that discharges near bankfull are capable of moving the median size particles on the channel surface. At discharges less than average annual discharge (Q_a) the median diameter of the bedload sample was always less than 2mm. At discharges greater than the average annual discharge, the median size of the bedload sample is often greater than sand size (2 mm). The largest median diameter size measured for a bedload sample was 17.5 mm.

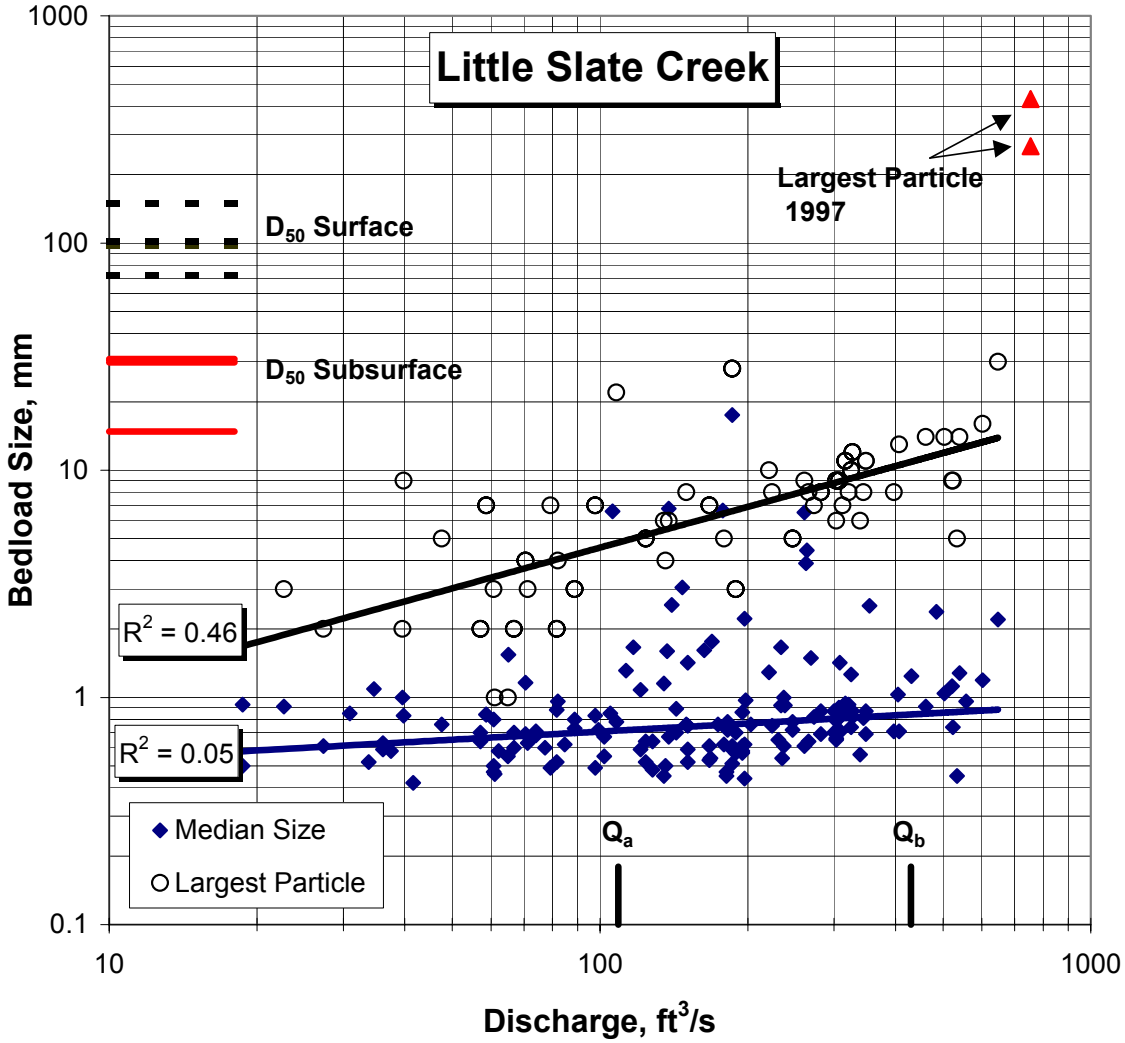

Figure 9. Largest particle in the bedload sample and median size of the sample versus stream discharge for Little Slate Creek.