

Dollar Creek

General Information

Dollar Creek, located in the Boise National Forest, is a tributary of the South Fork of the Salmon River. The study reach is about a 515 ft length of stream at the Geological Survey (USGS) discontinued gage 13310520 (Dollar Creek near Warm Lake near Cascade, Idaho). The site is about 1,000 ft upstream of the confluence with the South Fork Salmon River at an elevation of about 4,900 ft. The drainage area is 16.5 mi² and the predominant geology of the watershed is intrusive igneous.

Sediment transport measurements were made by USFS personnel during the spring snowmelt flows in 1990 through 1994. Additional information collected at this site by Case Western Reserve University personnel include a survey of the stream reach, and pebble counts of the surface material in 1994. In 2000, Forest Service personnel collected additional information to characterize surface and subsurface channel material. Figures 1 and 2 show photographs of the site looking upstream and downstream from the USGS gaging station. The gaging station is on the left bank on the upstream side of the bridge.



Figure 1. Dollar Creek looking upstream from the USGS gaging station.



Figure 2. Dollar Creek looking downstream from the USGS gaging station.

Streamflow was recorded for water years 1990 through 1994. The range of daily mean discharge for this period is 4.2 ft³/s to 318 ft³/s. Average annual streamflow (Q_a) for the period of record is 24.2 ft³/s. Estimated long-term average annual streamflow for the stream is 34.9 ft³/s and the estimated bankfull discharge (Q_b) is 227 ft³/s. During the five year period of record, daily mean discharge exceeded bankfull flow in just one water year, 1993, for about 16 days. The maximum instantaneous peak discharge of 429 ft³/s occurred on May 20, 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 0.0146 ft/ft. Cross-sections of the channel were surveyed at four locations. Sediment transport measurements were made at or near cross-section 2 (XS2).

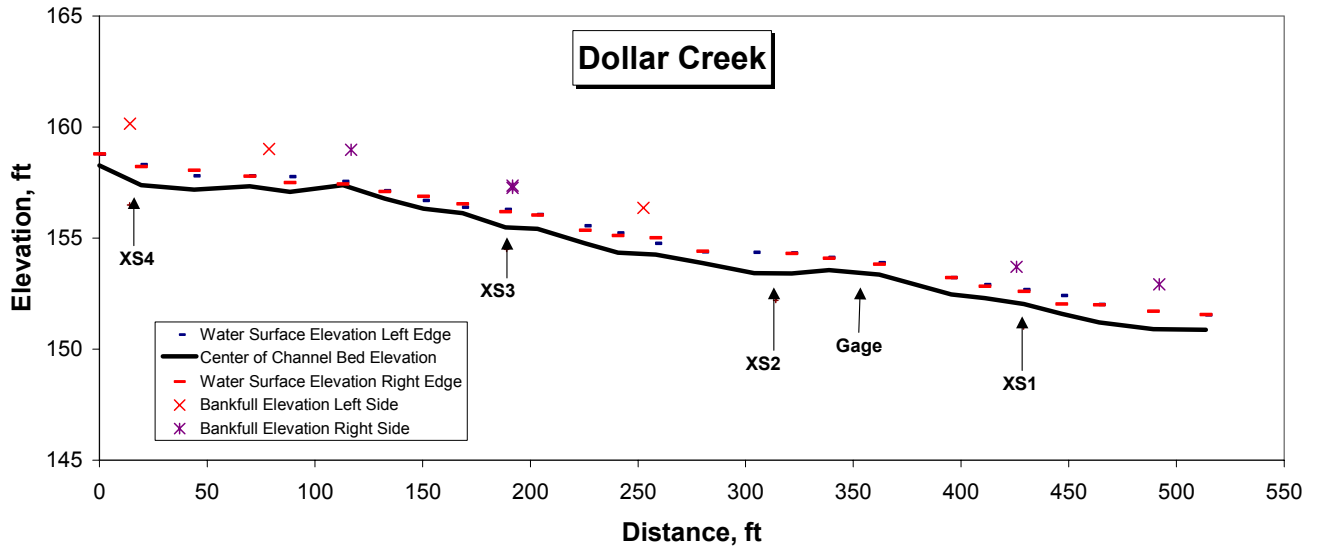


Figure 3. Longitudinal profile of the study reach in Dollar Creek.

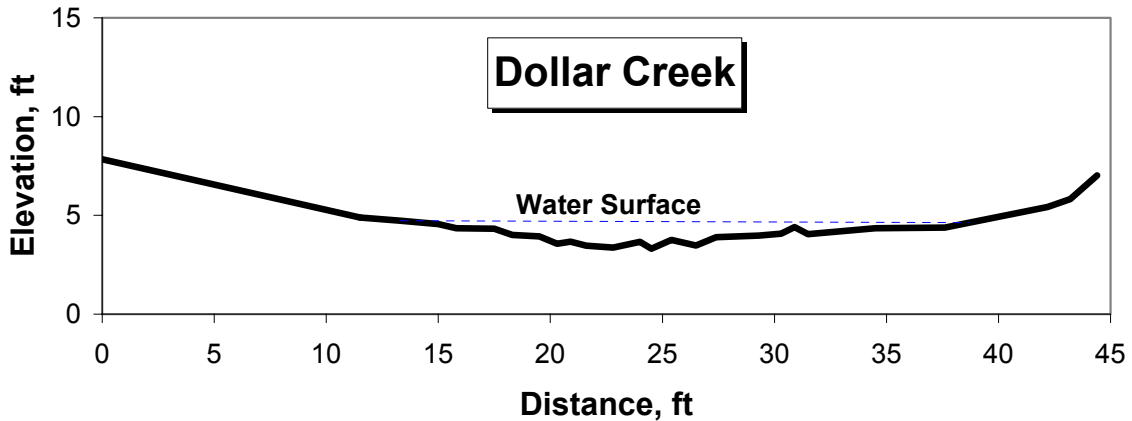


Figure 4. Cross-section of Dollar Creek at the sediment transport measurement site.

Channel Geometry

Figure 4 shows the cross-section at the sediment transport measurement site, cross-section 2 and the water surface at the time of the survey, April 14, 1994. The station geometry relationships are shown in Figure 5. All discharge note information for 1990 through 1994 with known locations and no ice effects were used to develop the power relationships with discharge. Over the range of discharges when sediment transport was measured (14 to 225 ft³/s) estimated stream width, estimated average depth and estimated average velocity varied from 20.5 to 33.9 ft, 0.62 to 1.34 ft, and 1.1 to 4.9 ft/s, respectively. The average reach slope is 0.0146 ft/ft.

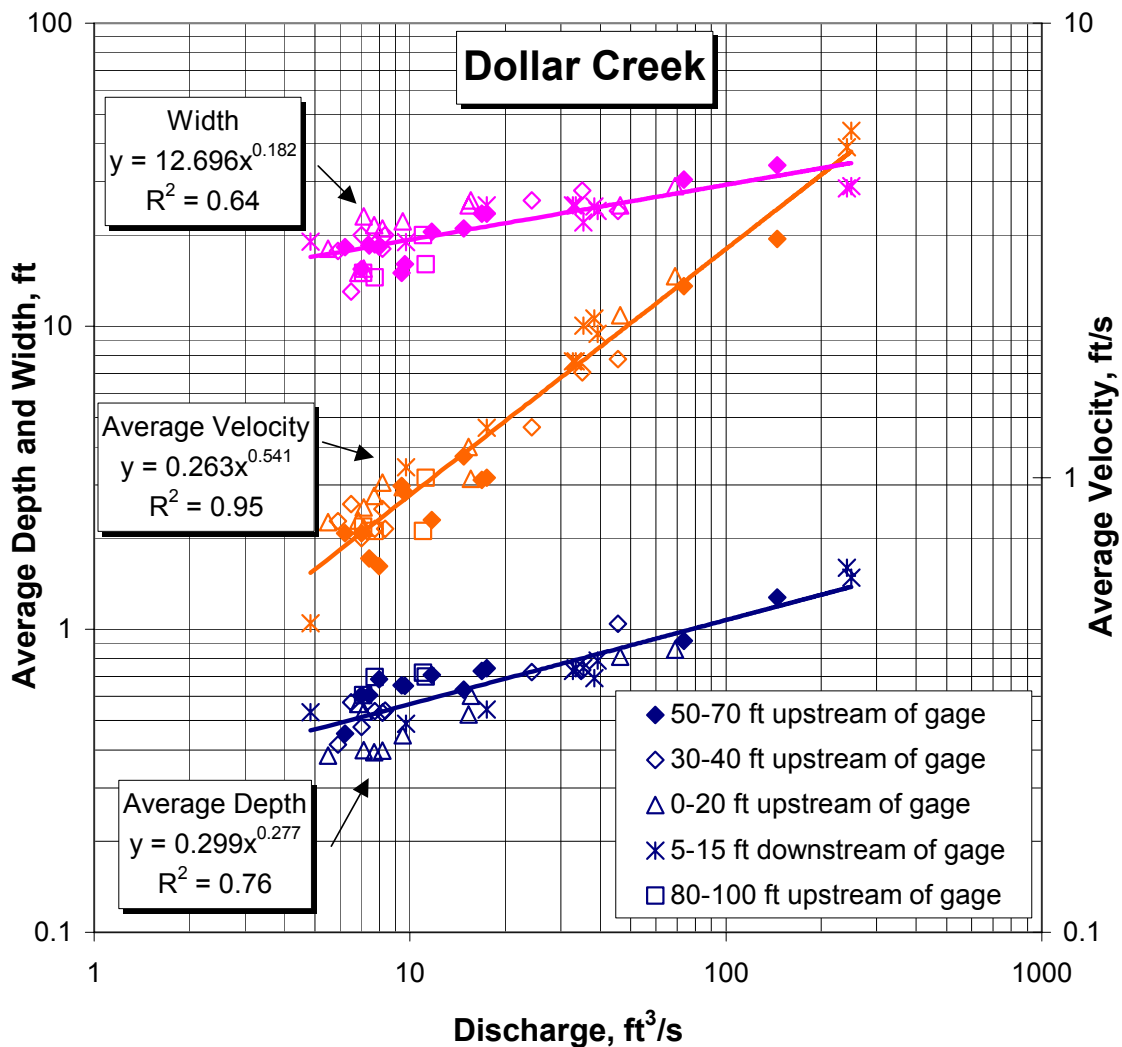


Figure 5. Width, average depth, and average velocity versus stream discharge at Dollar Creek.

Channel Material

A surface pebble count was made at the sediment transport measurement cross-section (XS2) in July 1994 and at three cross-sections in the reach in July 2000. The D_{50} and D_{90} for the sediment transport cross-section (1994) were 77 mm and 174 mm, respectively (Figure 6). The D_{50} and D_{90} for the combined pebble counts in 2000 were 87 mm and 224 mm, respectively, and about 11% of the surface material was sand size or smaller. In July of 2000 three core samples were also collected for determination of the surface and subsurface particle size distribution. The D_{50} and D_{90} for the combined surface cores were 100 mm and 164 mm, respectively. The D_{50} and D_{90} for the combined subsurface cores were 22 mm and 94 mm, respectively.

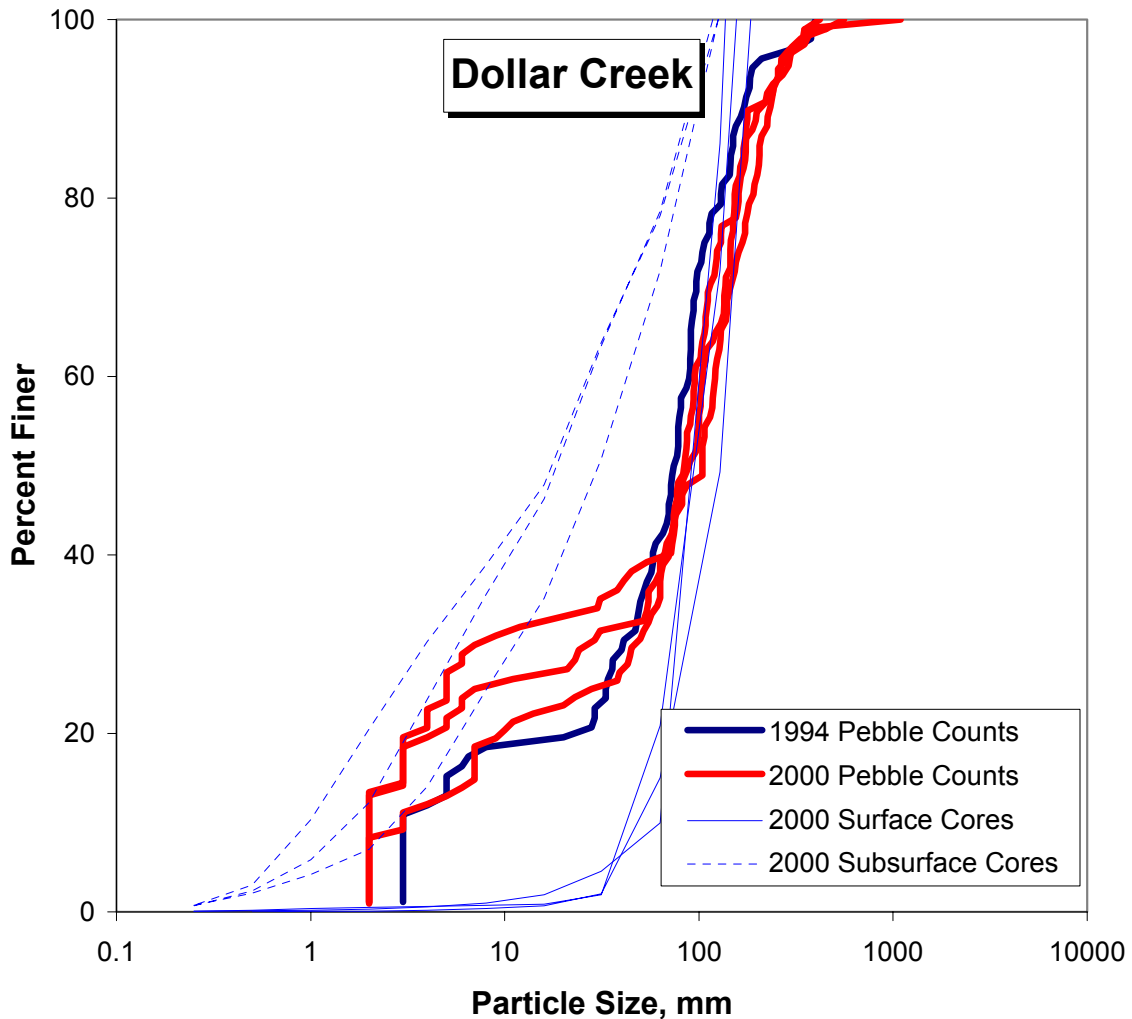


Figure 6. Particle size distributions for surface and subsurface material samples in the Dollar Creek.

Sediment Transport

The sediment transport data include 85 measurements of bedload transport and 76 measurements of suspended sediment transport. Sediment transport measurements spanned a range of stream discharges from 14 ft³/s (0.40Q_a; 0.06Q_b) to 239 ft³/s (6.85Q_a; 1.05Q_b). Bedload transport ranged from 0.00309 to 9.23 t/d and suspended transport ranged from 0.142 to 66.2 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 at the lowest discharges and about twice as much at the highest discharges during which sediment transport was measured (Figure 7).

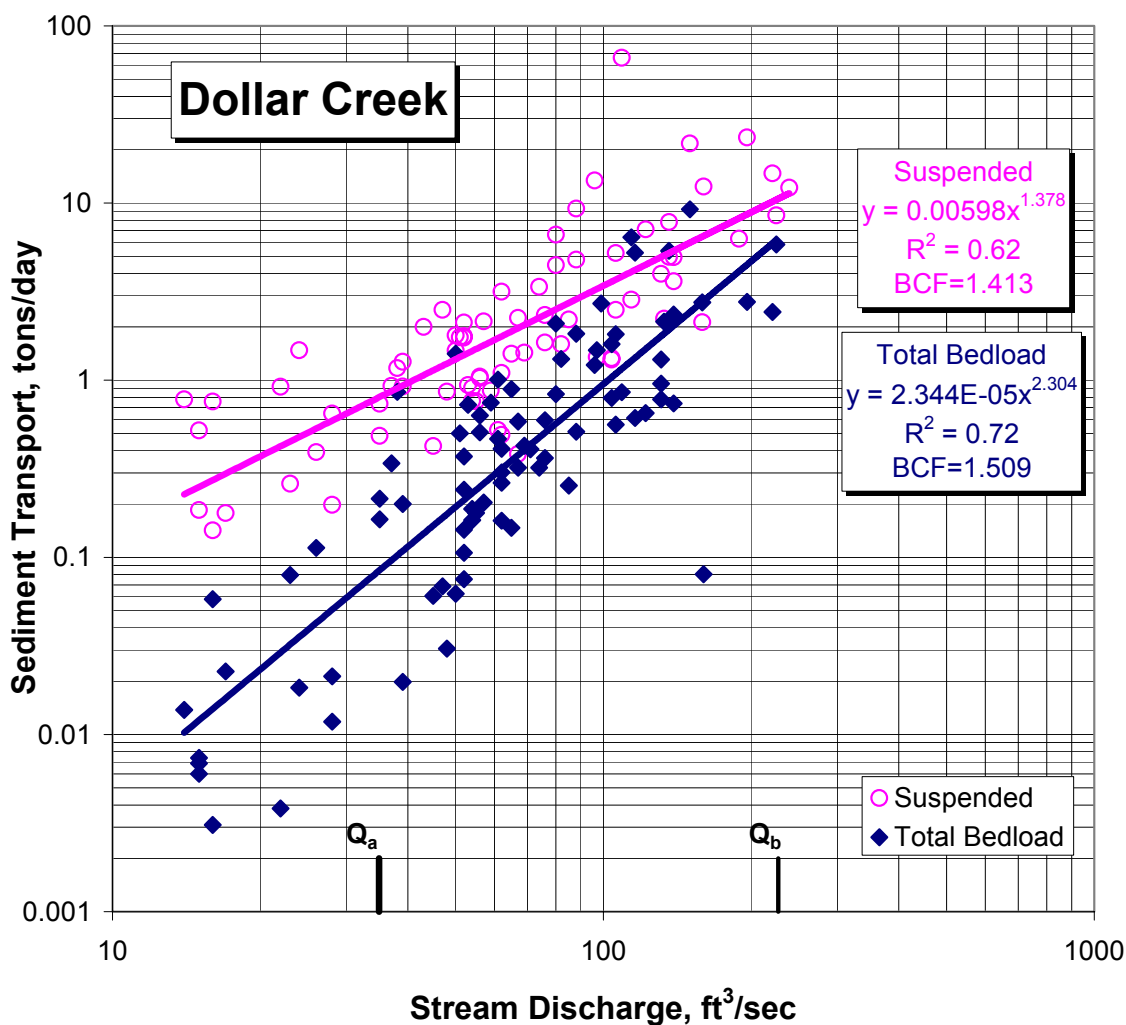


Figure 7. Bedload and suspended load transport rate versus discharge.

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 particles larger than 32 mm diameter.

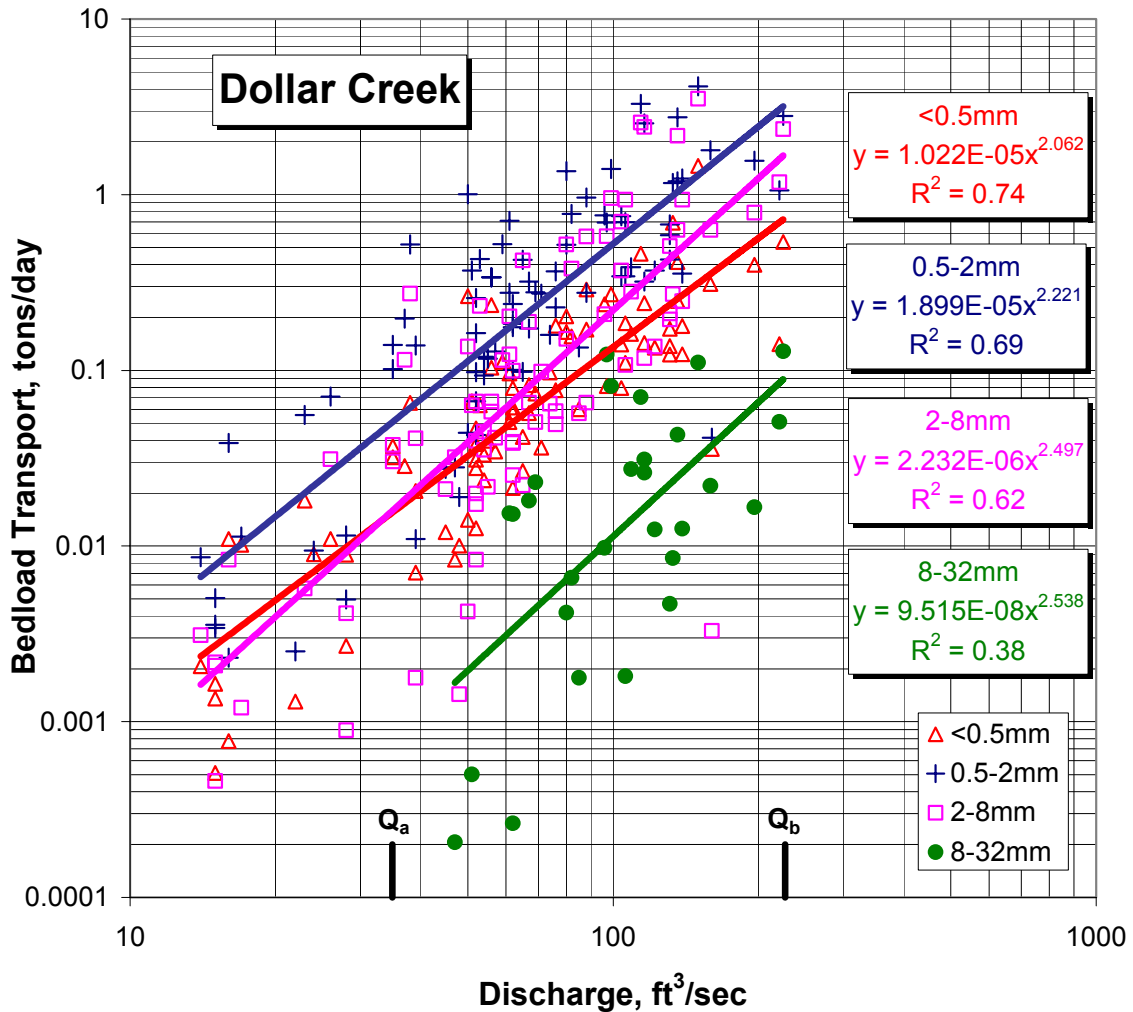


Figure 8. Bedload transport rate versus discharge for selected size classes.

Measurements of the largest particle in the bedload sample were not made for this site. However, size class data indicates that 8.2% of the bedload samples had particles in the 16-32 mm class and 31.8% had particles in the 8-16 mm class. There is a weak trend of increasing median diameter (D_{50}) of the bedload samples with discharge. The D_{50} for all of the samples was in the sand size, ranging from 0.5 to 2.0 mm (Figure 9).

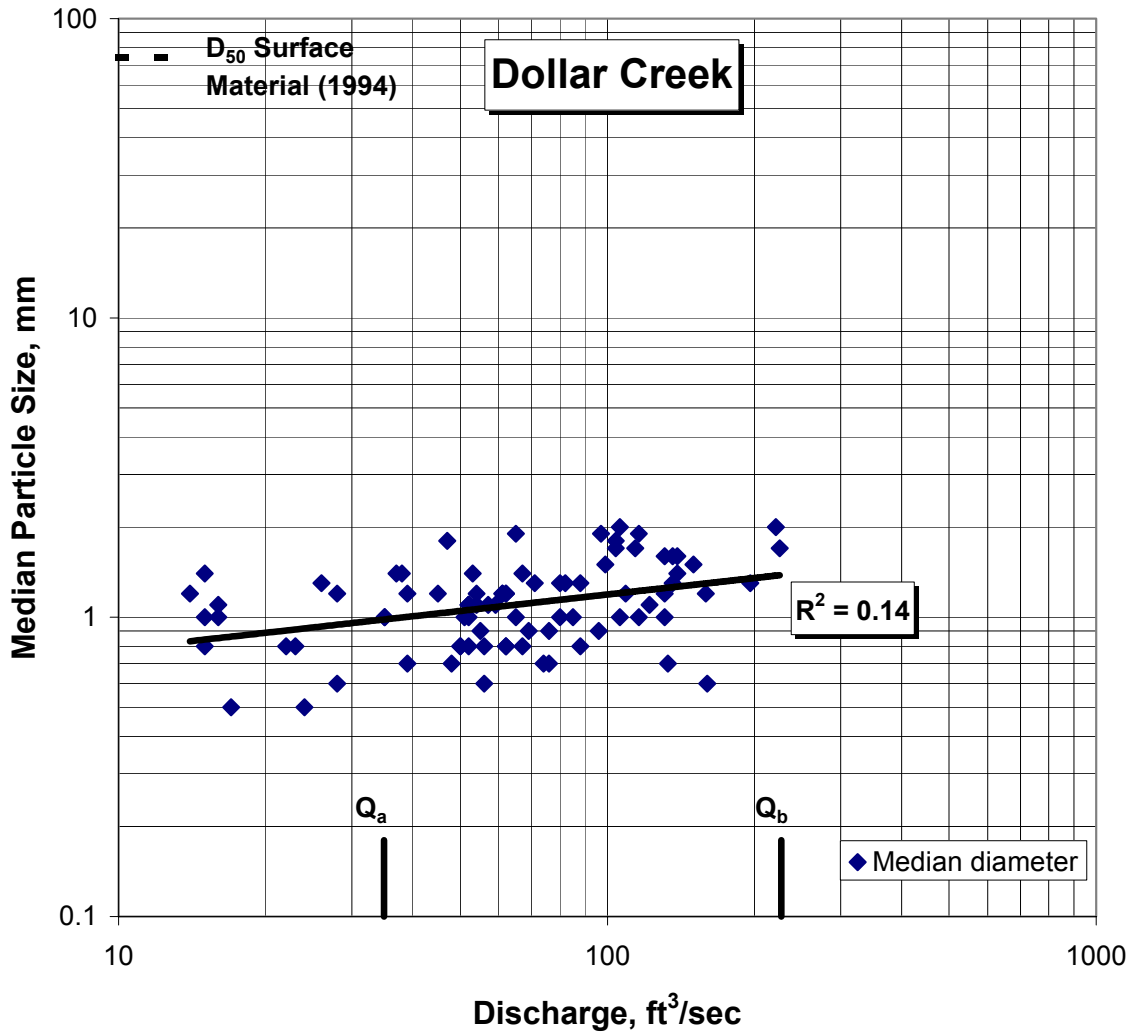


Figure 9. Median size of the bedload sample versus stream discharge for the Dollar Creek site.