Blackmare Creek

General Information

Blackmare Creek, located in the Payette National Forest, is a tributary of the South Fork of the Salmon River. The study reach is about a 450 ft length of stream at the now discontinued US Geological Survey gaging station (13310565 Blackmare Creek near Poverty Flat near Cascade, ID), near the confluence with the South Fork Salmon River. The elevation at the study reach is about 4,180 ft above sea level. The drainage area is 17.8 mi^2 and the geology of the watershed is predominantly intrusive igneous.

Sediment transport measurements were made by Forest Service 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 substrate surface 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. A cableway, to facilitate measurements during high discharges, is located about 60 ft downstream of the gage house.

Figure 1. Blackmare Creek looking upstream from the gaging station.

Figure 2. Blackmare Creek looking downstream from the gaging station.

Streamflow records are available from the USGS for water years 1990 through 1994. The range of daily mean discharge for this period is 5.6 ft^3/s to 249 ft^3/s. Average annual streamflow (Q_a) for the period of record is 25.9 ft^3/s. Estimated long-term average annual streamflow for the stream is 39.2 ft^3/s and the estimated bankfull discharge (Q_b) is 167 ft^3/s. During the five year period of record, daily mean discharge exceeded bankfull flow in just one water year, 1993, for about 21 days. The maximum instantaneous peak discharge for the period of record was 271 ft^3/s 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 0.0299 ft/ft. Cross-sections of the channel were surveyed at three locations by Case Western Reserve University personnel and at a fourth location about 50 ft upstream of the gage (not shown) by Forest Service personnel. Discharge measurements were made within 90 feet of the gage.

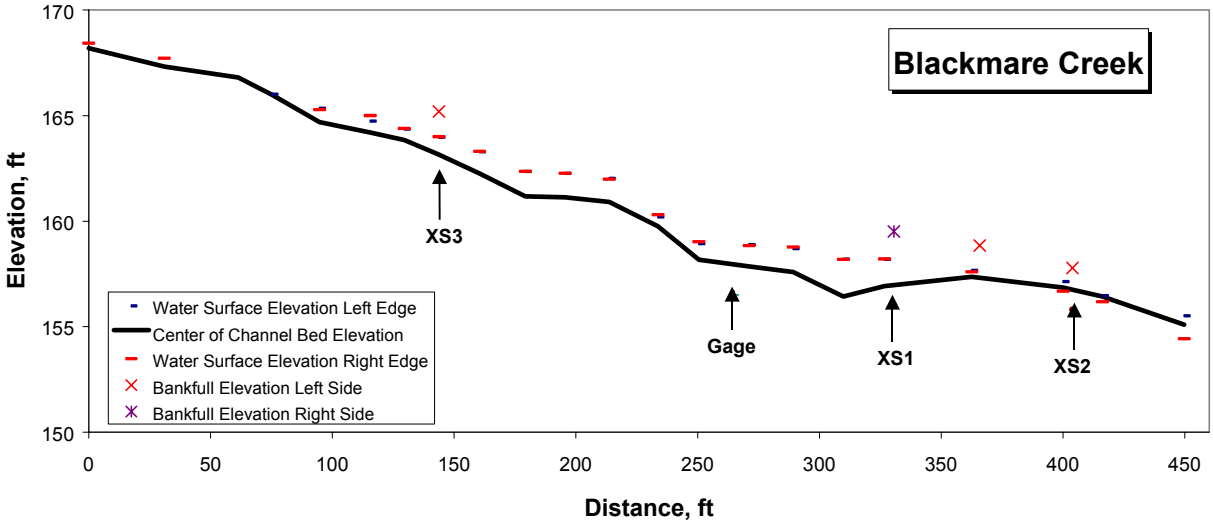

Figure 3. Longitudinal profile of the study reach in Blackmare Creek.

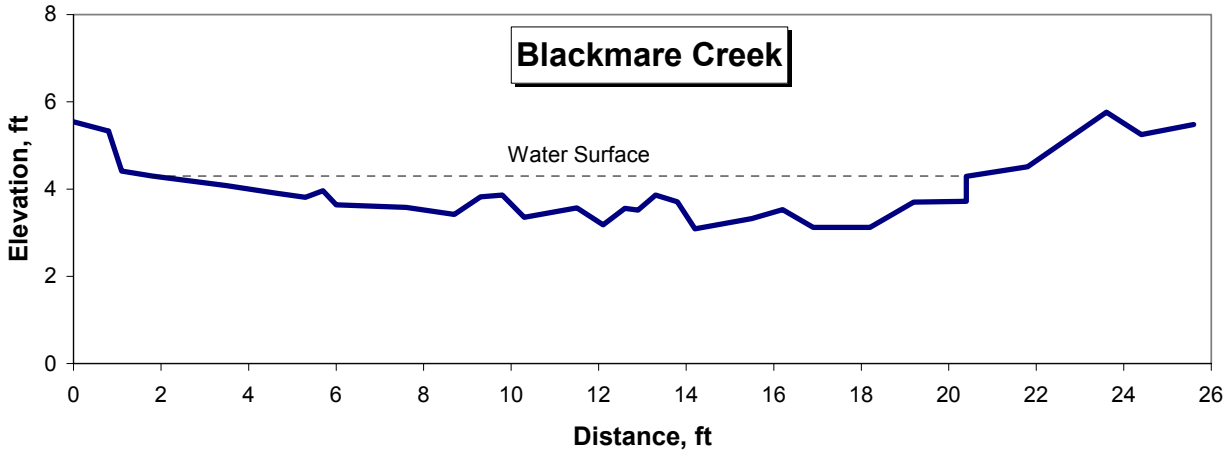

Figure 4. Cross-section of Blackmare Creek at the 1993 and 1994 sediment transport measurement site, about 50 ft upstream of the gage. (Also shown is the water surface at the time of the survey, April 11, 1994.)

Channel Geometry

Figure 4 shows the cross-section at the 1993 and 1994 sediment transport measurement site. The channel geometry relationships for the cross-section at the gage are shown in Figure 5. Also shown, as open symbols, are data collected within 10 ft of the cableway, about 60 ft downstream of the gage. Over the range of discharges when sediment transport was measured (12.0 to 166 ft^3/s) estimated stream width, estimated average depth and estimated average velocity vary from 12.2 to 22.4 ft, 0.69 to 1.82 ft, and 1.4 to 4.1 ft/s, respectively, at the gage. The average reach gradient is 0.0299 ft/ft.

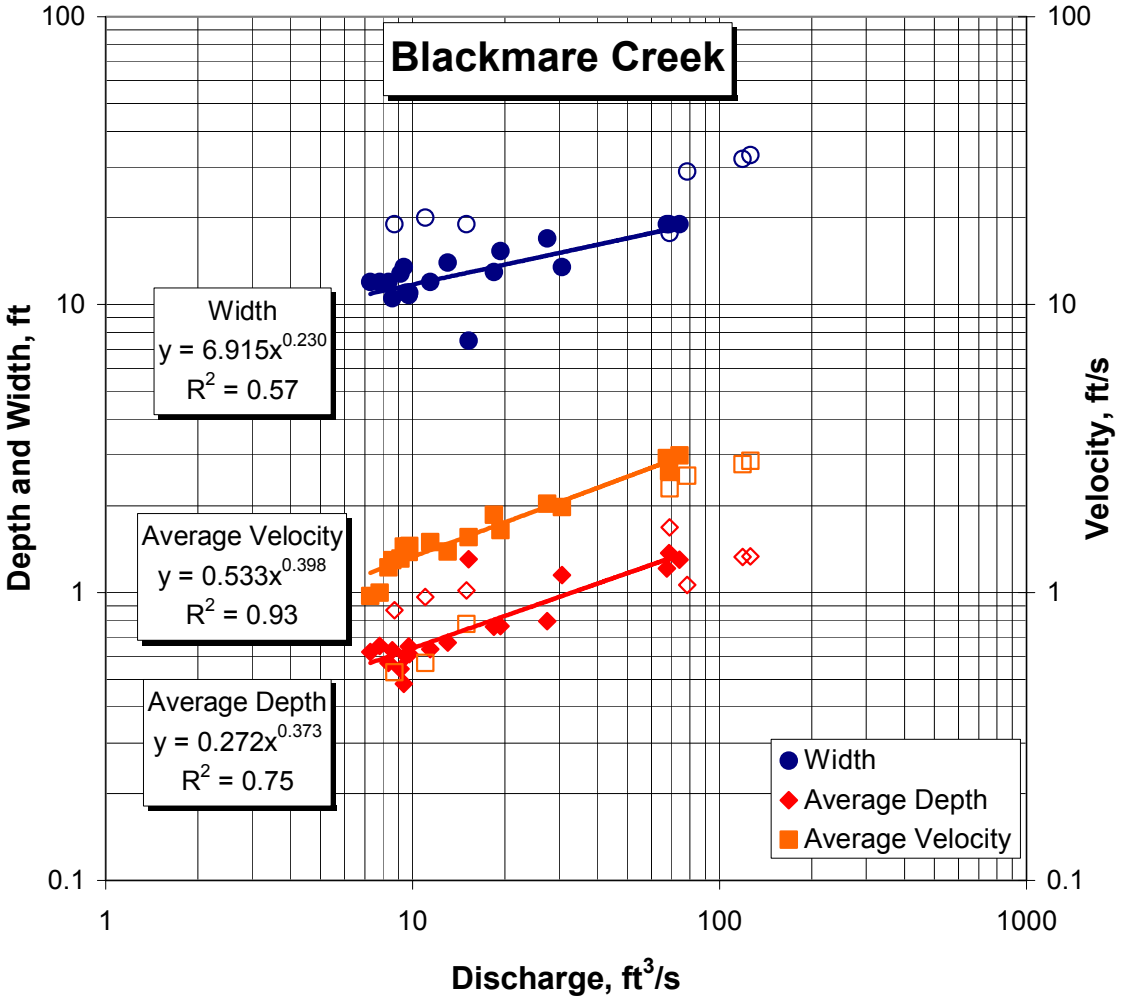

Figure 5. Width, average depth and average velocity versus stream discharge at the gage on Blackmare Creek. (Open symbols are for data collected within 10 ft of the cableway, about 60 ft downstream of the gage.)

Channel Material

Surface pebble counts were made at cross-section 2 in July 1994 and at three cross-sections in the reach in 2000. The D_{50} and D_{90} for the pebble counts in 1994 were 95 mm and 252 mm, respectively (Figure 6). The D_{50} and D_{90} for the three combined pebble counts in 2000 were 103 mm and 315 mm, respectively, and about 12% of the particles were sand size or smaller. In July 2000, core samples of surface and subsurface material were collected at three locations within the study reach. The D_{50} and D_{90} for the combined surface core samples collected in 2000 were 149 mm and 210 mm, respectively, and were 21 mm and 128 mm, respectively, for the combined subsurface material.

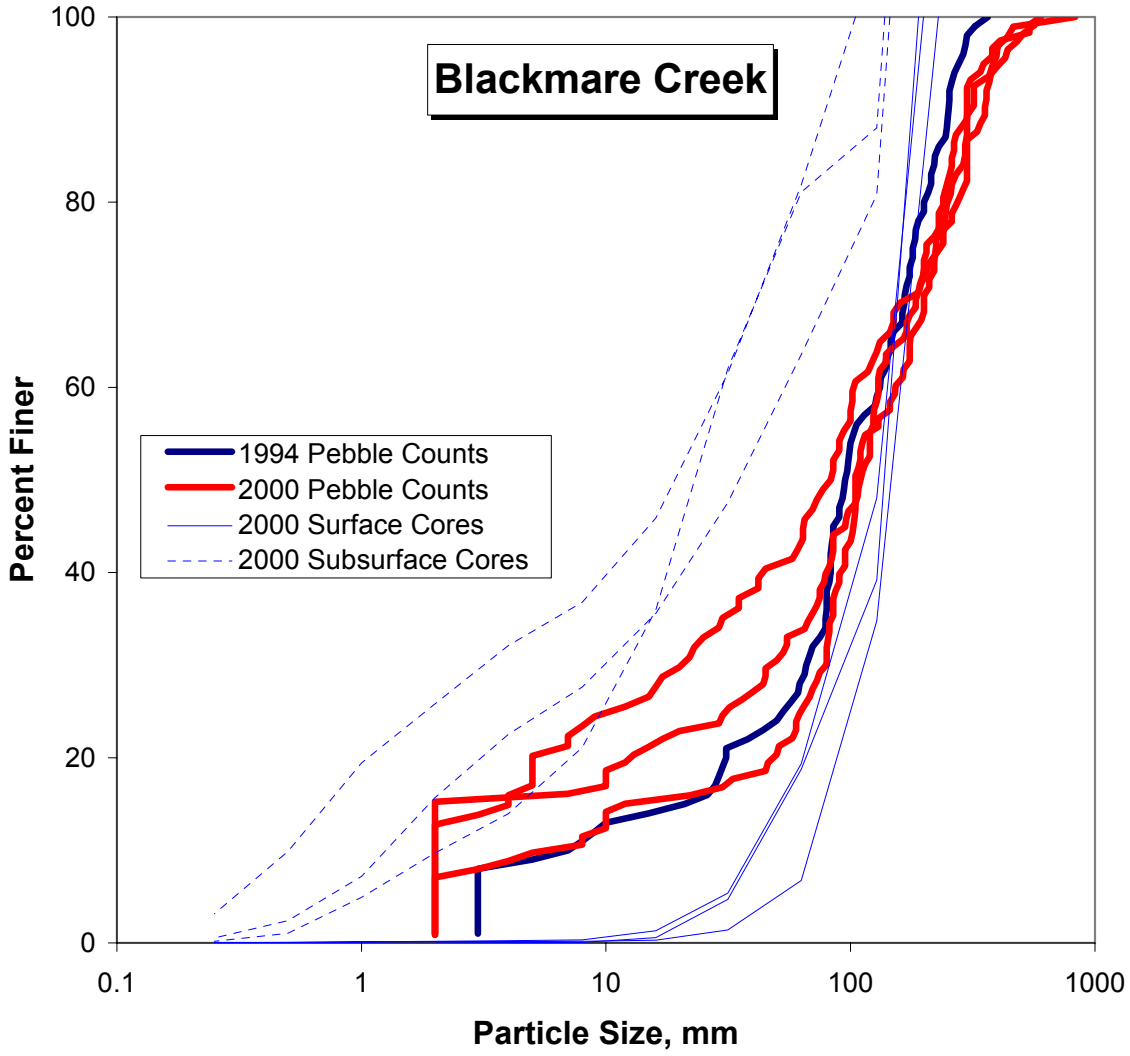

Figure 6. Particle size distribution for surface and subsurface material samples in Blackmare Creek.

Sediment Transport

The sediment transport data include 88 measurements of bedload transport and 83 measurements of suspended sediment transport. In 1993 and 1994, transport measurements were made about 50 ft upstream of the gage. In earlier years, measurements were made about 15 to 20 ft downstream of the gage. Sediment transport measurements spanned a range of stream discharges from 12 ft^3/s ($0.31Q_a$; $0.07Q_b$) to 166 ft^3/s ($4.23Q_a$; $0.99Q_b$). Bedload transport ranged from 0.00334 to 5.66 t/d and suspended transport ranged from 0.0 to 36.9 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).

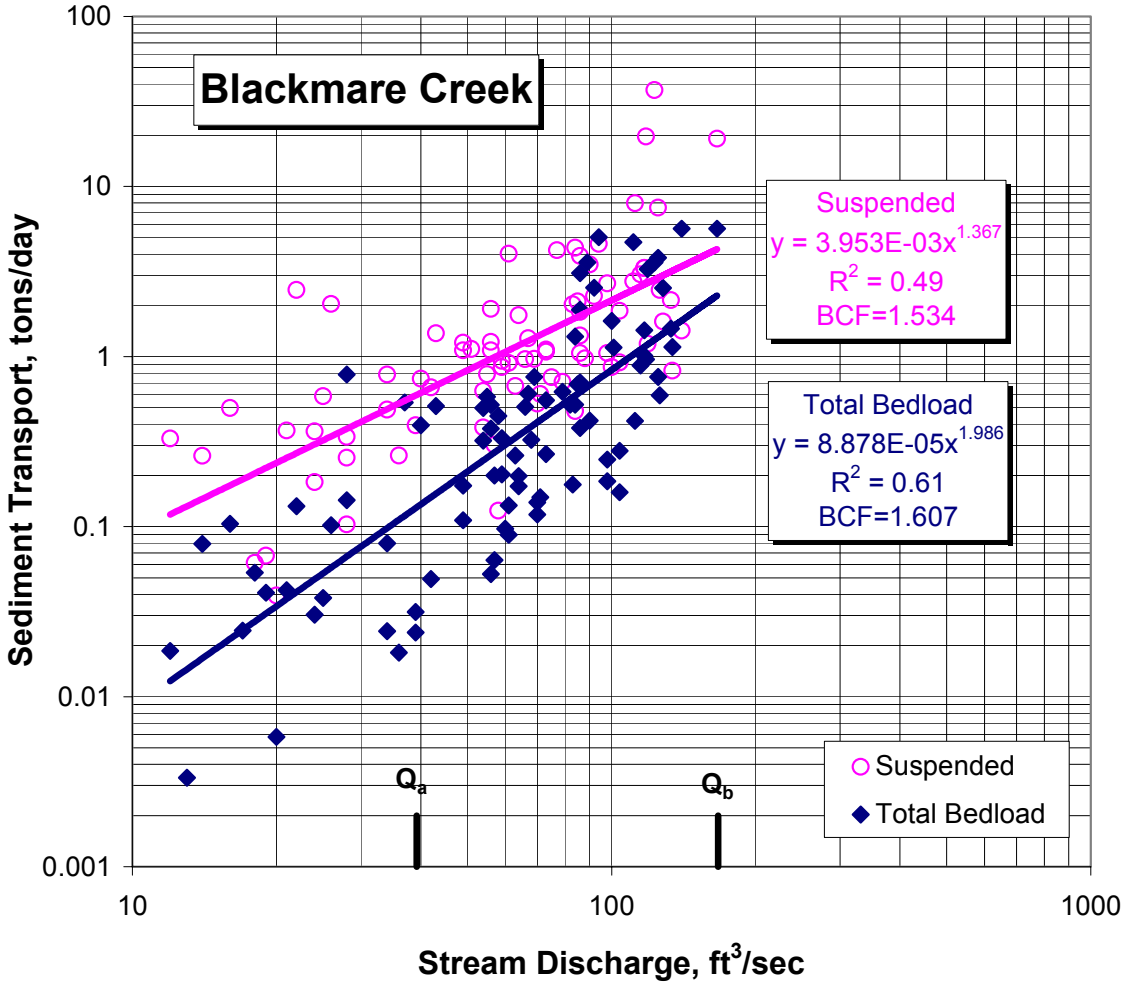

Figure 7. Bedload and suspended load transport rate versus discharge.

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. No relationship is shown for particles greater than 32 mm diameter, since only one sample contain material in this size class. The sample that contain this size class of material was collected at a discharge of 84 ft^3/s.

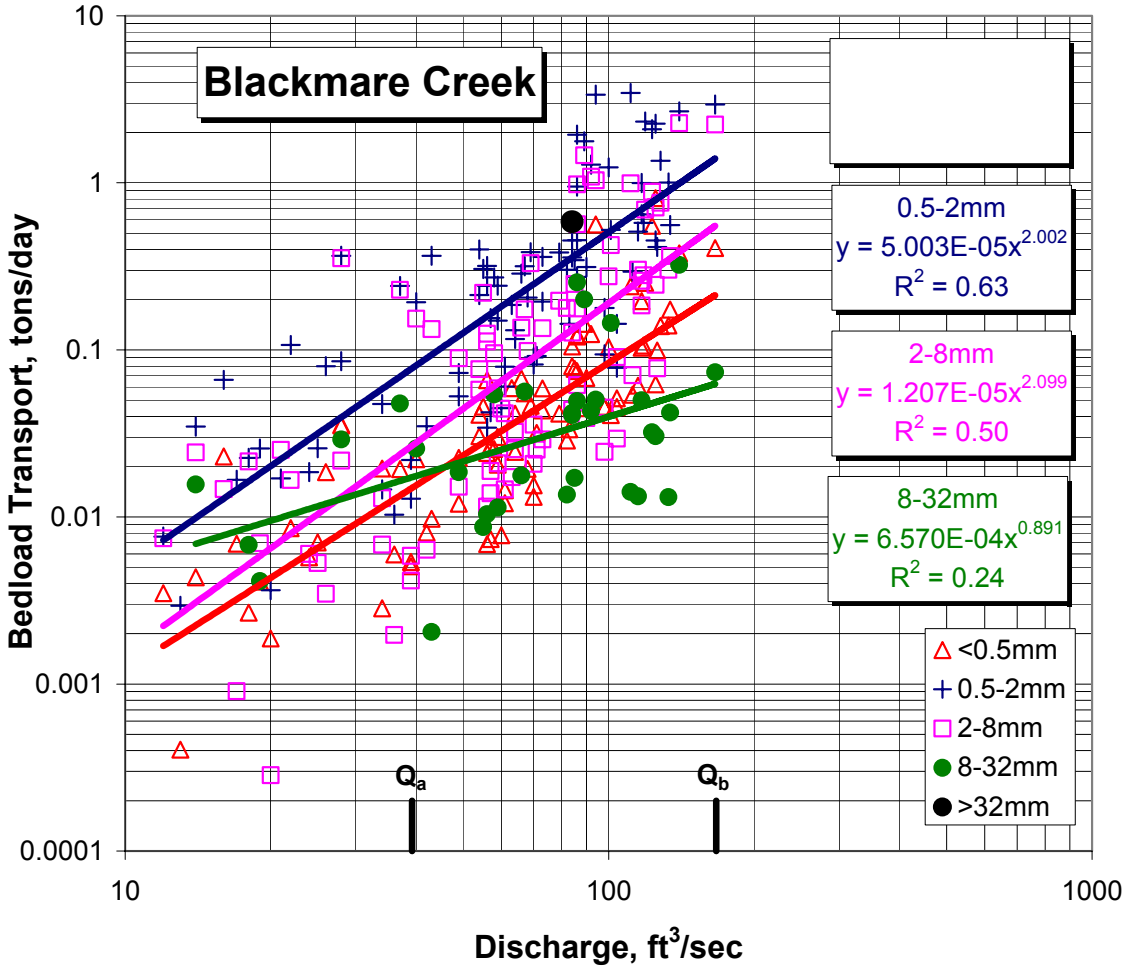

Figure 8. Bedload transport rate versus discharge for selected size classes.

Measurements of the largest particle in the bedload samples were not made for this site. However, size class data indicates that 1.1%, 4.5% and 37.5% of the bedload samples had particles in the 32-64 mm, 16-32 mm, and 8-16 mm size class, respectively. The median diameter (D_{50}) of the bedload sample was not significantly related discharge and for 94% of the bedload samples was in the sand size, 0.5 to 2.0 mm (Figure 9). The largest median diameter of the bedload samples was 4.0 mm associated with a discharge of 84 ft^3/s.

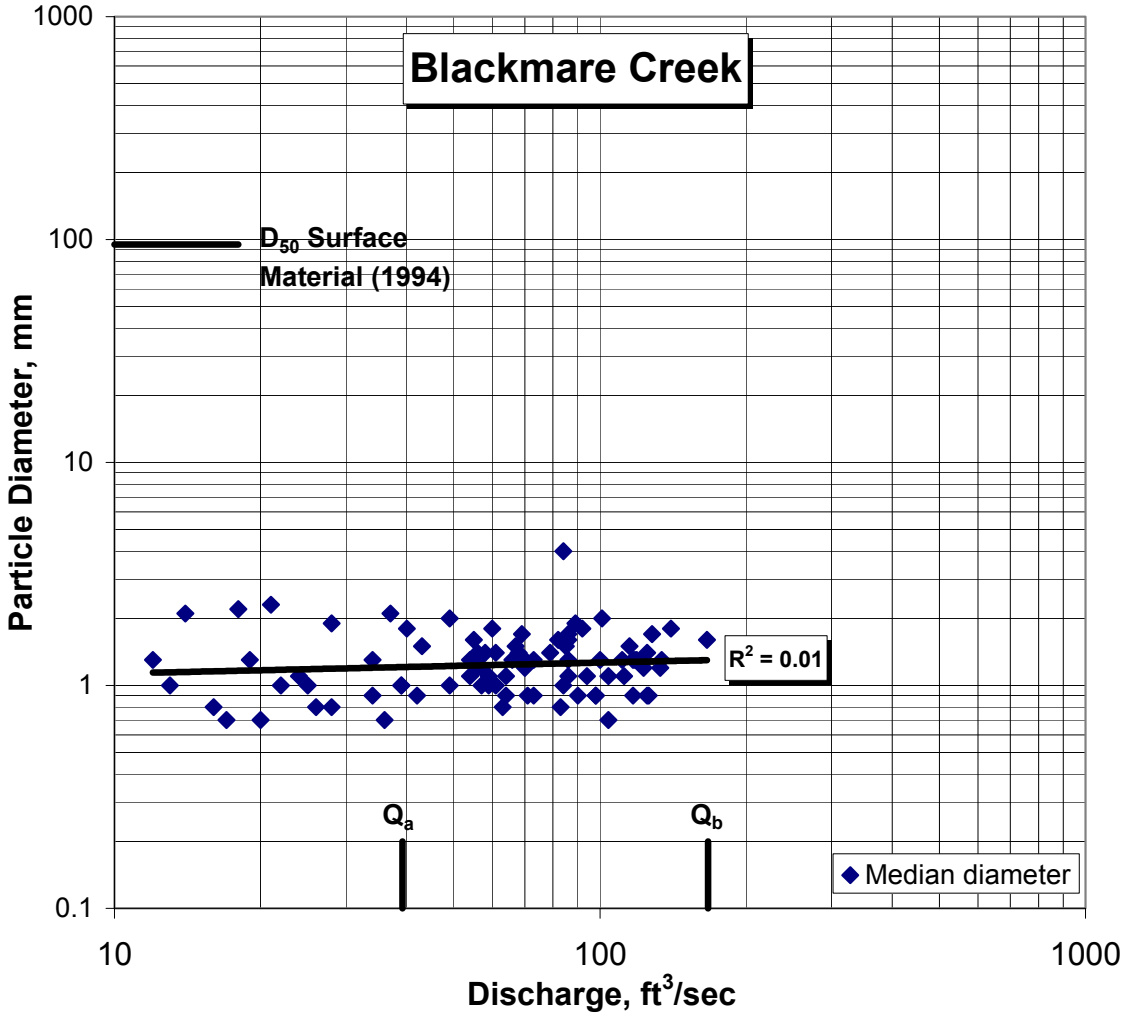

Figure 9. Median size of the bedload sample versus stream discharge for the Blackmare Creek site.