Squaw Creek

General Information

Squaw Creek is a tributary of the Salmon River near Clayton, ID. The study reach is a 800 ft length of stream located about 3.0 miles upstream from the confluence with the Salmon River at the site of an existing Geological Survey (USGS) gaging station, Squaw Creek below Bruno Creek near Clayton, ID (13297355). The elevation of the reach is about 5,710 ft. The drainage area is 71.6 mi^2 and the geology of the watershed is predominantly sedimentary and mixed volcanics.

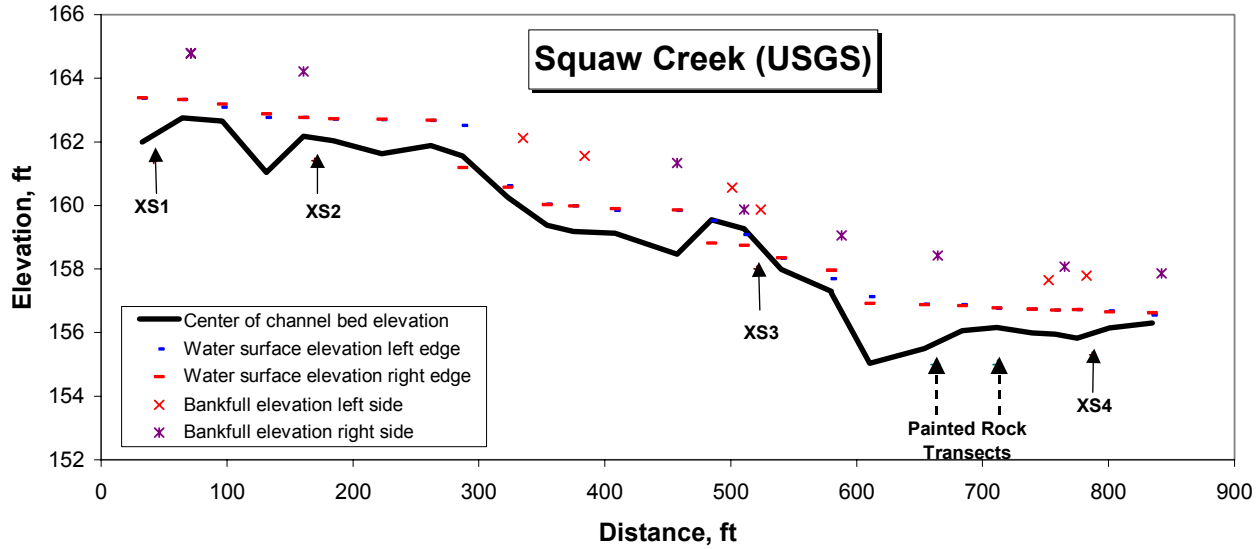
In 1994 and 1995, personnel of Case Western Reserve University measured sediment transport and streamflow at this site. Additional information collected at the site included a survey of the stream reach, pebble counts of the substrate surface in 1994, core samples of the surface and subsurface substrate in 2000 and transport distance of painted rocks during high flows in water year 1995. Figure 1 shows a photograph of Squaw Creek looking downstream.

Figure 1. Downstream view of Squaw Creek on May 22, 1995.

Streamflow records for this site are available from the USGS since October 1972. Estimated average annual streamflow (Q_a) for the stream is 34.3 ft^3/s and the estimated bankfull discharge (Q_b) is 181 ft^3/s. Stream discharge in 1994 was very low and the largest mean daily discharge was only 52 ft^3/s. In 1995 the largest mean daily discharge was 278 ft^3/s on June 3, well above bankfull discharge.

Channel Profile and Cross-Section

Figure 2 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 study reach is downstream of the bridge. The USGS gaging station is about 30 ft downstream of this bridge The average gradient for the study reach is 0.0100 ft/ft. Cross-sections of the channel were surveyed at four locations. In 1994, sediment transport and discharge were measured at cross-section 4 at 12 of the 15 sampling dates and the other three just downstream of the bridge near cross-section 1. In 1995, sediment transport and discharge were measured on thirty days. On the first 18 sampling days, measurements were made about 65 ft upstream of cross-section 4. On the remaining 12 sampling days, measurements were made at site about 100 ft downstream of cross-section 4, at a site that was wadeable during higher discharges. The movement of painted rocks during the spring and early summer snowmelt flows



in 1995 were measured at two transects about 75 ft and 125 ft upstream of XS4.

Figure 2. Longitudinal profile of the Squaw Creek study reach.

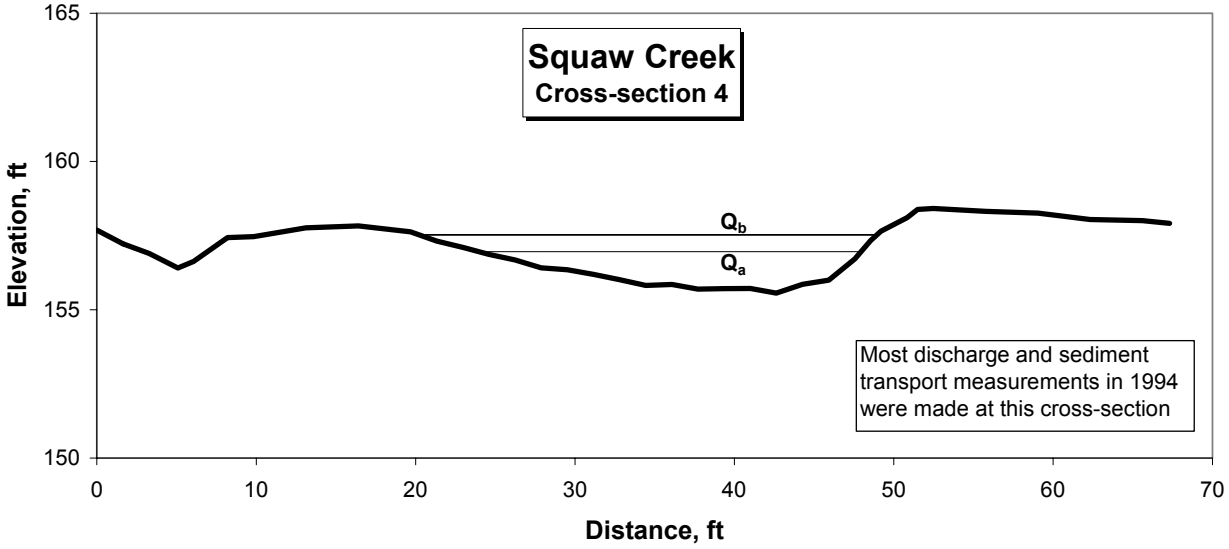
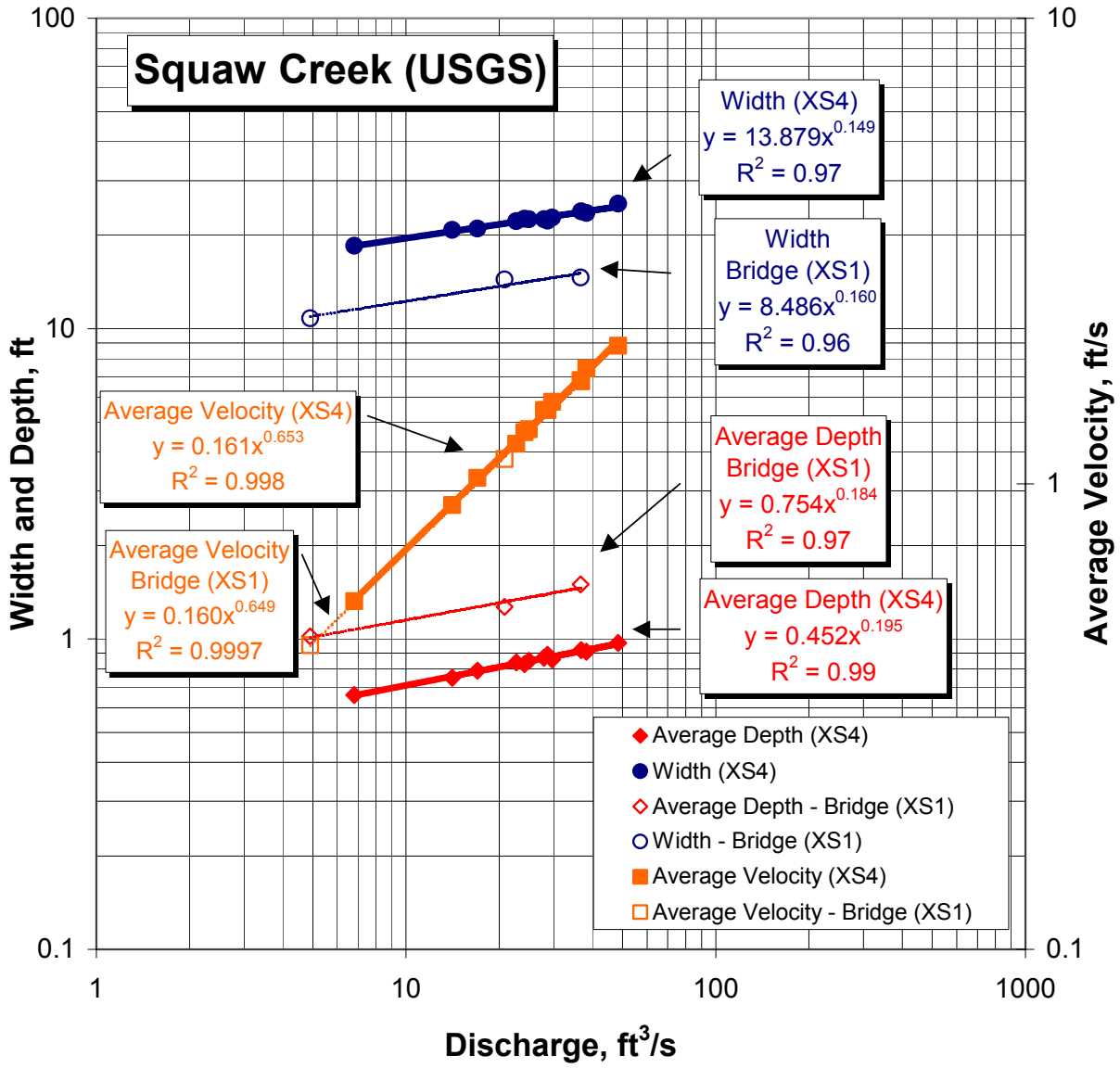


Figure 3. Cross-section of Squaw Creek at a sediment transport measurement site

Channel Geometry

Figure 3 shows the cross-section at which most sediment transport measurements were made in water year 1994 (XS4). The station geometry relationships for this cross-section and other measurement sites are shown in Figures 4 and 5. At cross-section 4, for the range of discharges when sediment transport was measured (4.93 to 48.4 ft^3/s) in 1994, the estimated stream width, estimated average depth and estimated average velocity varied from 17.6 to 24.7



ft, 0.62 to 0.96 ft, and 0.46 to 2.03 ft/s, respectively. The average reach slope is 0.0100 ft/ft.

Figure 4. Width, average depth, and velocity versus stream discharge at the 1994 measurement cross-sections..

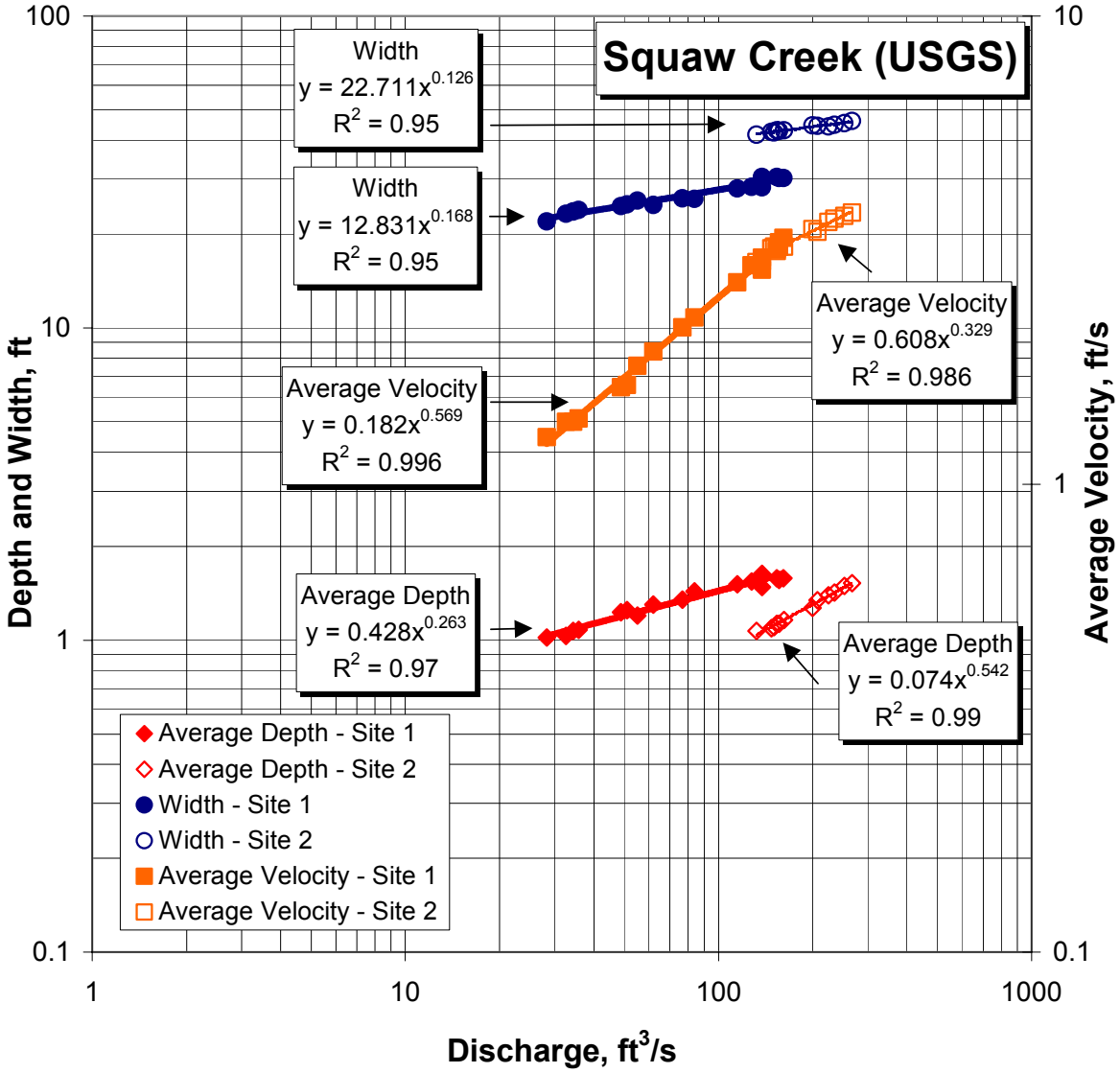


Figure 5. Width, average depth, and velocity versus stream discharge at the 1995 measurement cross-sections.

Channel Material

A pebble count was made at one cross-section in June 1994 and at three cross-sections in July 2000. The D_{50} and D_{90} for the 1994 pebble count were 43 mm and 82 mm, respectively (Figure 6). The D_{50} and D_{90} for the 2000 combined pebble counts were 46 mm and 116 mm, respectively, and about 9% of the material was sand size or smaller. In July 2000, three core samples were also collected in the reach. The D_{50} and D_{90} for the surface and subsurface cores were 83 mm and 151 mm and 29 mm and 124 mm, respectively.

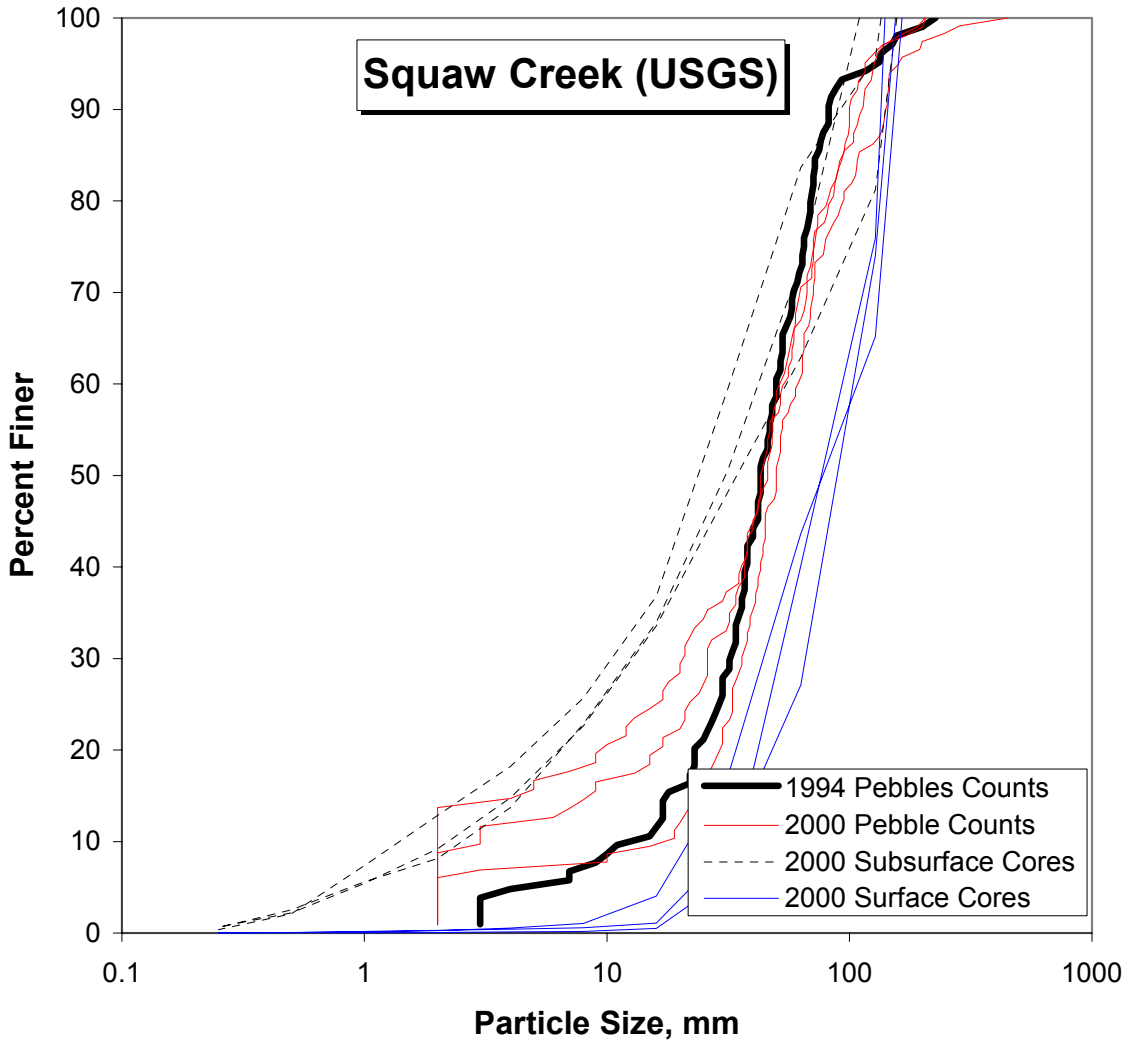


Figure 6. Particle size distribution for surface and subsurface material samples in Squaw Creek.

Sediment Transport

Sediment transport measurements made in 1994 and 1995 include 92 measurements of bedload transport and 32 measurements of suspended sediment transport. Sediment transport measurements spanned a range of stream discharges from 4.93 ft^3/s ($0.15Q_a$; $0.03Q_b$) to 267 ft^3/s ($8.37Q_a$; $1.48Q_b$). Bedload transport ranged from 0.0002 to 27.2 tons/day and suspended transport ranged from 0.12 to 107 tons/day. 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 four times as much at the highest discharges during which sediment transport was measured (Figure 7).

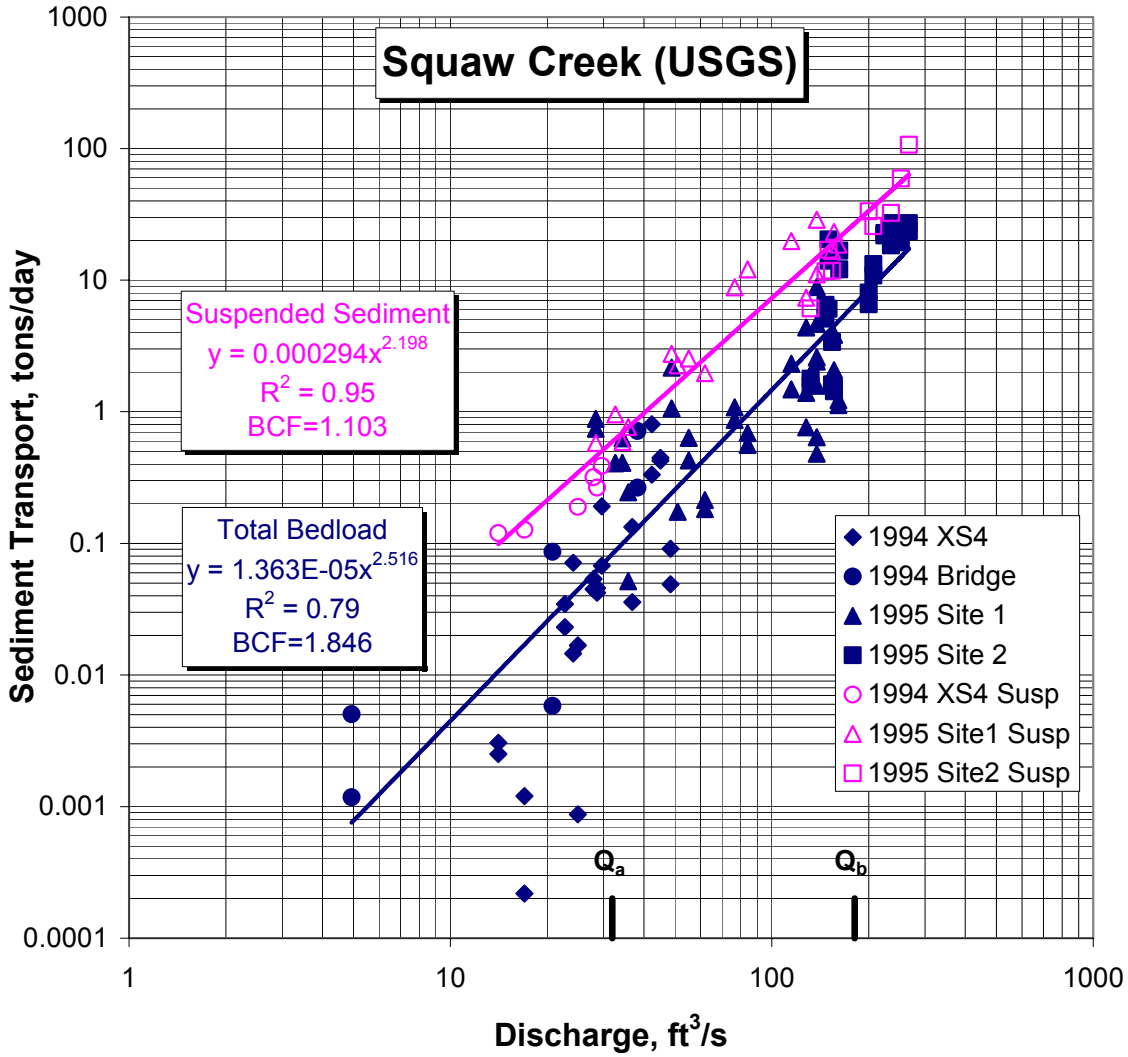


Figure 7. Bedload and suspended load transport rate versus discharge.

The bedload transport rates by size class (Figure 8) shows that the larger rates are associated with material in the 0.5 to 2 mm diameter size class. No relationship is shown for particles >32 mm diameter since only five of the samples contained this size class of material. All discharges transporting material >32 mm exceeded 138 ft^3/s.

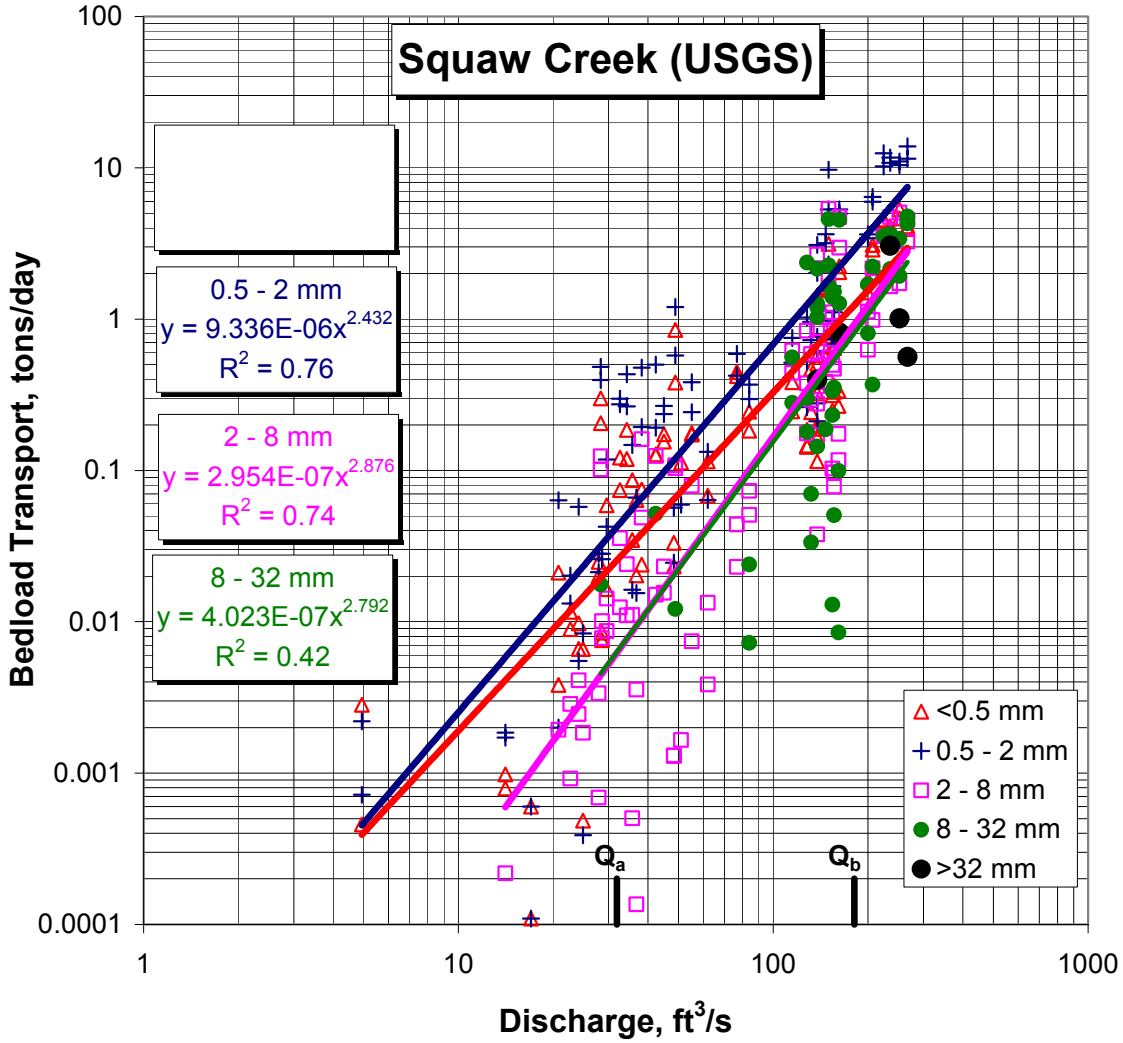


Figure 8. Bedload transport rate versus discharge for selected size classes.

The size of the largest particle in the bedload sample increased with discharge (Figure 9). The largest particle measured in a bedload sample was 66.5 mm at a discharge of 267 ft^3/s. At discharges greater than bankfull discharge (181 ft^3/s) the largest particle typically exceeded 30 mm and often was larger than the median diameter of the surface material. There is a weak tendency for increasing median size of the bedload sample with increasing 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 10.3 mm. The information on the largest particle in the bedload sample and observations of painted rock movement suggest that discharges near or slightly below the bankfull discharge are capable of moving the median diameter particles on the channel surface.

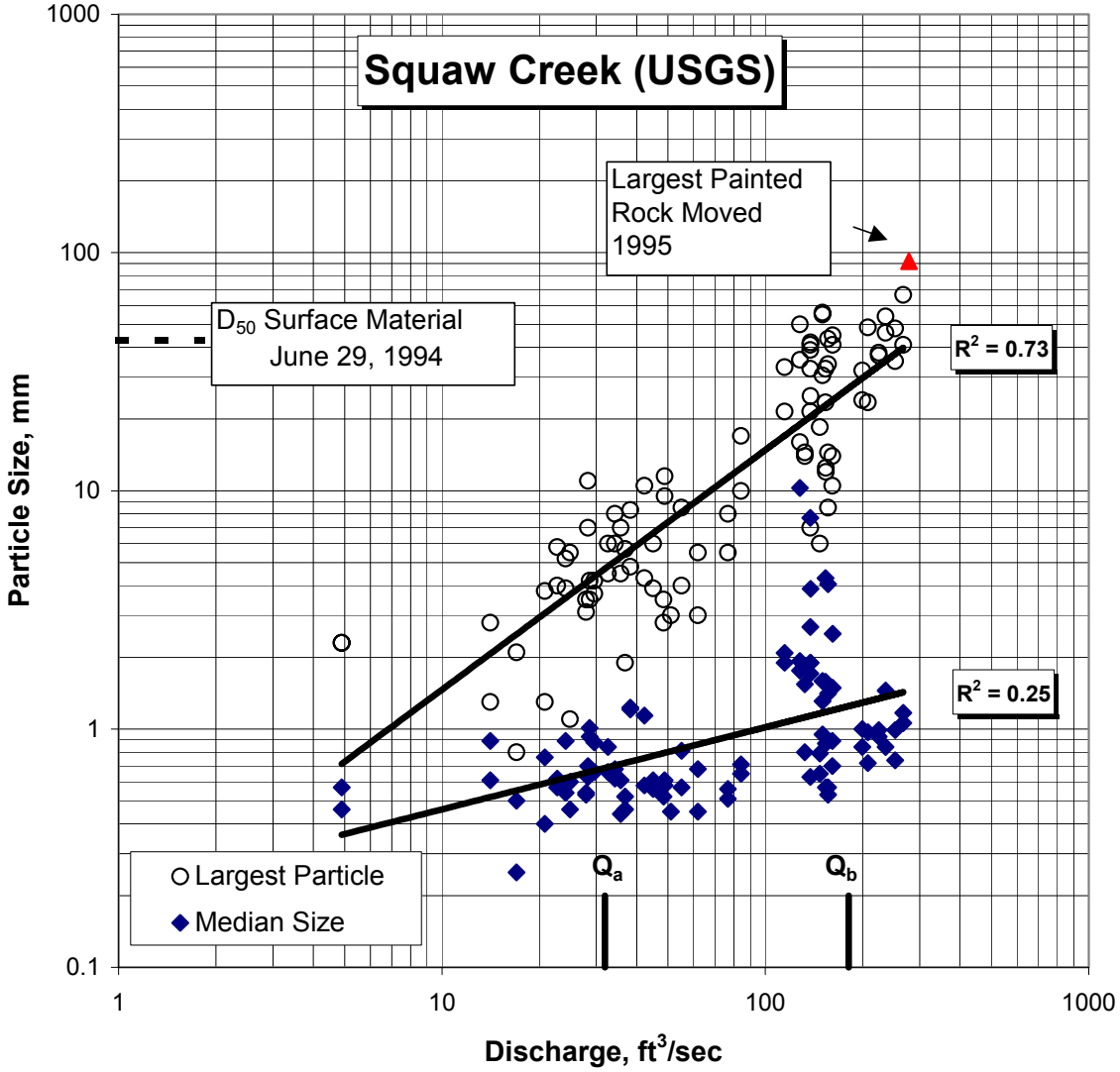


Figure 9. Median size of the bedload sample and the largest particle size versus stream discharge for Squaw Creek.

Painted Rock Transport

A total of forty painted rocks were placed across two transects (twenty per transect) on April 25, 1995 (Figure 2). Daily mean discharge on the day of rock placement was 32 ft^3/s. The size of the rocks ranged from 30 to 100 mm diameter (b-axis) which represents the D_{28} up to the D_{94} of the surface particle size distribution. The final transport distances of the rocks were measured on July 29, 1995.

Only eight of the forty rocks were found. Of those found, seven had not moved or only moved 0.2 ft. One rock had moved 1 ft and another rock was found 194 ft downstream of transect 2, but could not be identified as to its original transect or location. The largest daily mean discharge during this period of study of painted rocks was 278 ft^3/s on June 3, 1995.