Johns Creek

General Information

Johns Creek is a tributary to the South Fork Clearwater River. Its headwaters drain a portion of the Gospel Hump Wilderness in north central Idaho. The study reach is about a 1,200 ft length of river ending at the confluence with the South Fork Clearwater River. The site is on land administered by the Nez Perce National Forest at an elevation of about 2,410 ft. The drainage area upstream of this location is 113 mi^2 and the geology of the watershed is intrusive igneous and metamorphic.

This site is associated with an existing Forest Service gaging station. Streamflow records and sediment transport measurements are available from water year 1986 to 1995. Additional information collected at the site include a survey of the stream reach, pebble counts of the surface material, and core samples of the subsurface material. Figures 1 and 2 show photographs of looking upstream and downstream from the gaging station.

Figure 1. Johns Creek looking downstream from the gaging station.

Figure 2. Johns Creek looking upstream from the gaging station.

Streamflow records are available for water years 1986 through 1995. Estimated average annual streamflow (Q_a) is about 158 ft^3/s and bankfull discharge (Q_b) is estimated at 1,730 ft^3/s. During the period of record, daily mean discharges ranged from 15.5 ft^3/s to 2,919 ft^3/s. The highest instantaneous discharge recorded was 4,090 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 0.0207 ft/ft. Cross-sections of the channel were surveyed at three locations. The gage and cableway are located at cross-section 1 (XS1).

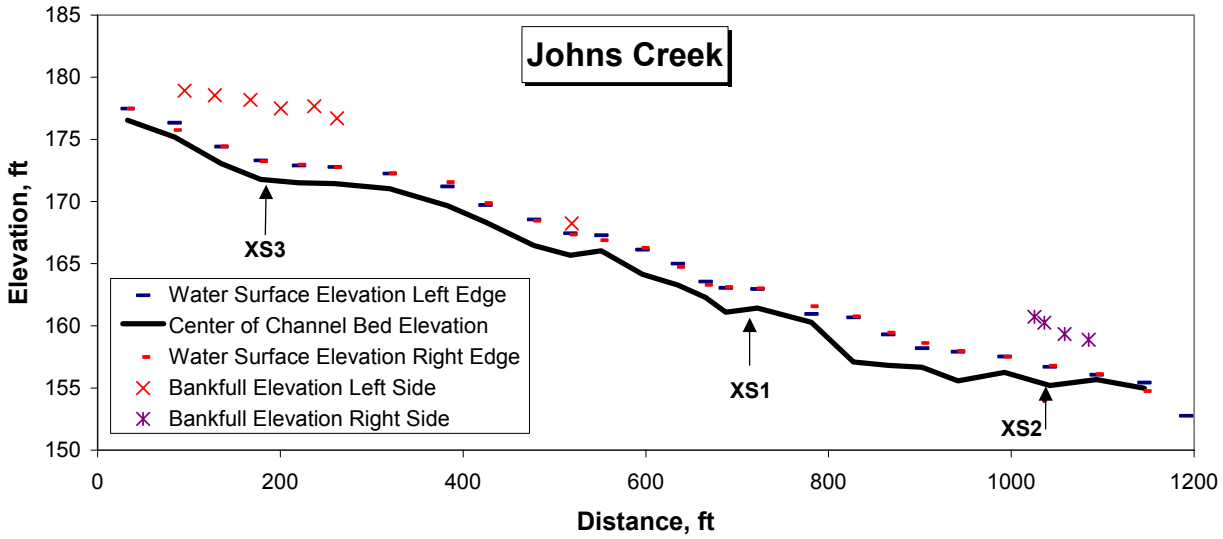

Figure 3. Longitudinal profile of the study reach in Johns Creek.

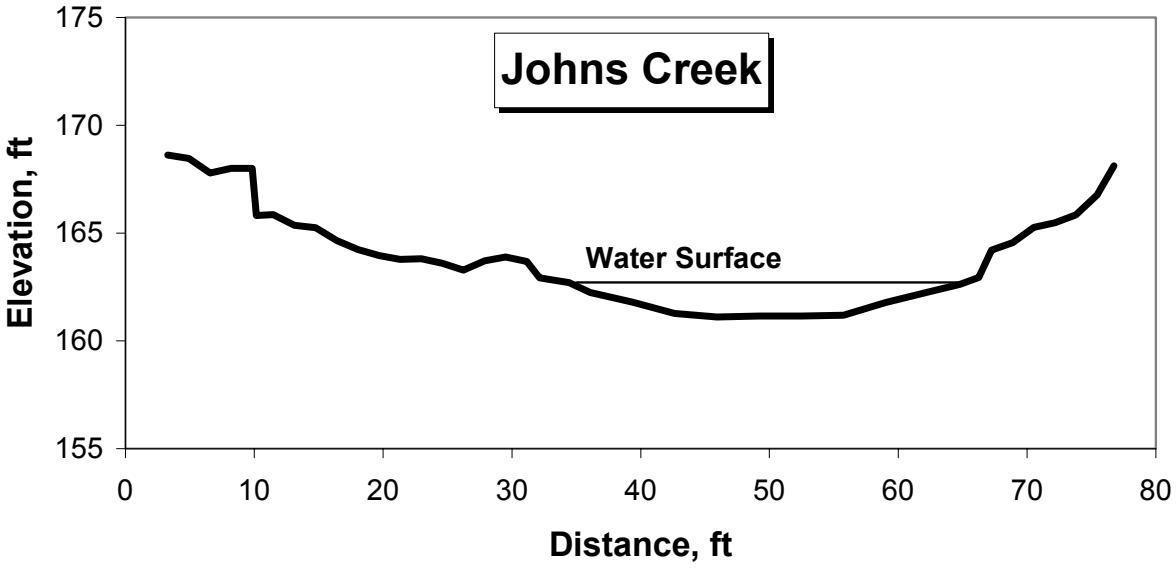

Figure 4. Cross-section 1 of the Johns Creek.

Channel Geometry

Figure 4 shows the cross-section at the gage (cross-section 1) and the water surface at the time of the survey. The channel geometry relationships for this cross-section are shown in Figure 5. During high discharges, measurements are taken from a cableway at this cross-section. 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 (21.1 to 1,210 ft^3/s) estimated stream width, estimated average depth and estimated average velocity ranged from 28.8 to 56.4 ft, 0.86 to 3.22 ft, and 0.9 to 6.7 ft/s, respectively. The average reach gradient is 0.0207 ft/ft.

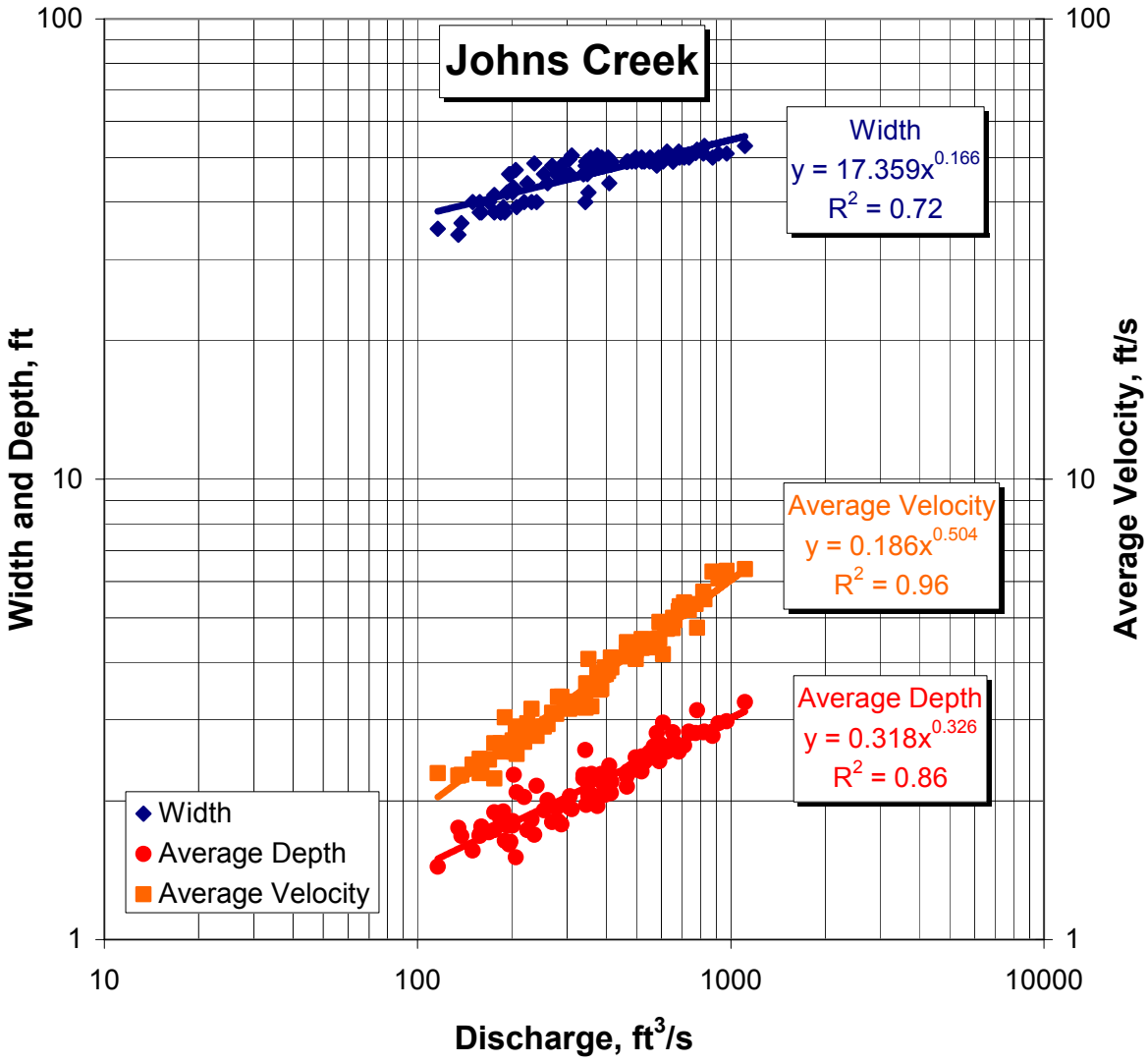

Figure 5. Width, average depth, and average velocity versus stream discharge at cross-section 1 on Johns Creek.

Channel Material

Surface pebble counts were made at the cableway cross-section in 1994 and at three transects in September 1995. Three cores of subsurface material were collected in October 1995. The average D_{50} and D_{90} for the surface material (1995) were 207 mm and 1,008 mm, respectively (Figure 5). The average D_{50} and D_{90} for the subsurface material were 35 mm and 305 mm, respectively. About 8% of the surface material was sand (2 mm) size or smaller. About 2.5% of the pebble count points fell on bedrock and these points were not used in calculating or plotting the particle size distributions.

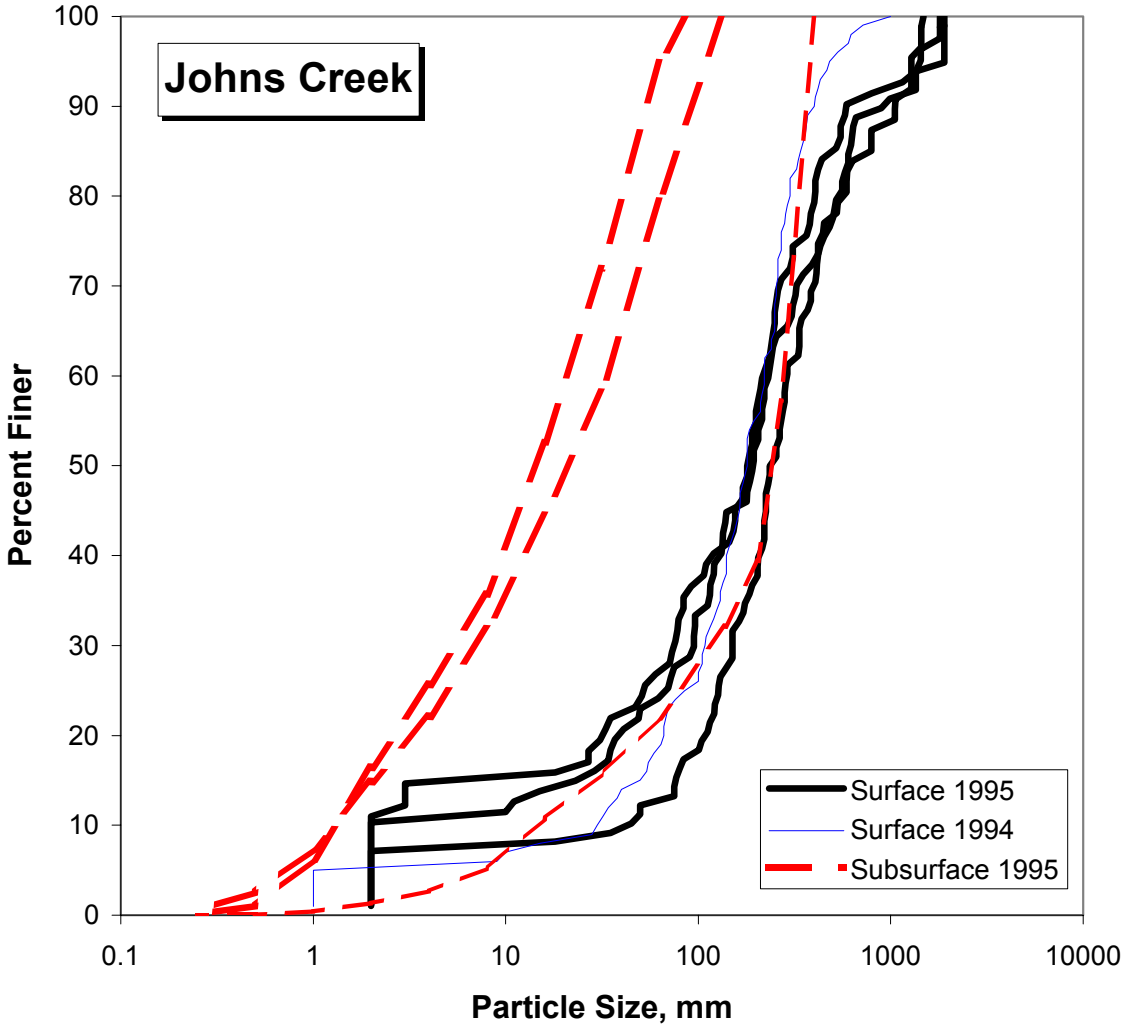

Figure 5. Particle size distribution for surface and subsurface material samples in Johns Creek.

Sediment Transport

Sediment transport measurements were made in 1986 through 1995 and include 115 measurements of bedload transport and 46 measurements of suspended sediment. Sediment transport measurements spanned a range of stream discharges from 21.1 ft^3/s ($0.13Q_a$; $0.01Q_b$) to 1,210 ft^3/s ($7.66Q_a$; $0.70Q_b$). Bedload transport ranged from 0.0007 to 23.5 t/d and suspended sediment transport ranged from 0.109 to 2,213 t/d. Over the range of measured discharges, suspended sediment accounts for the majority of the sediment transport with rates exceeding bedload transport by over an order of magnitude (Figure 6).

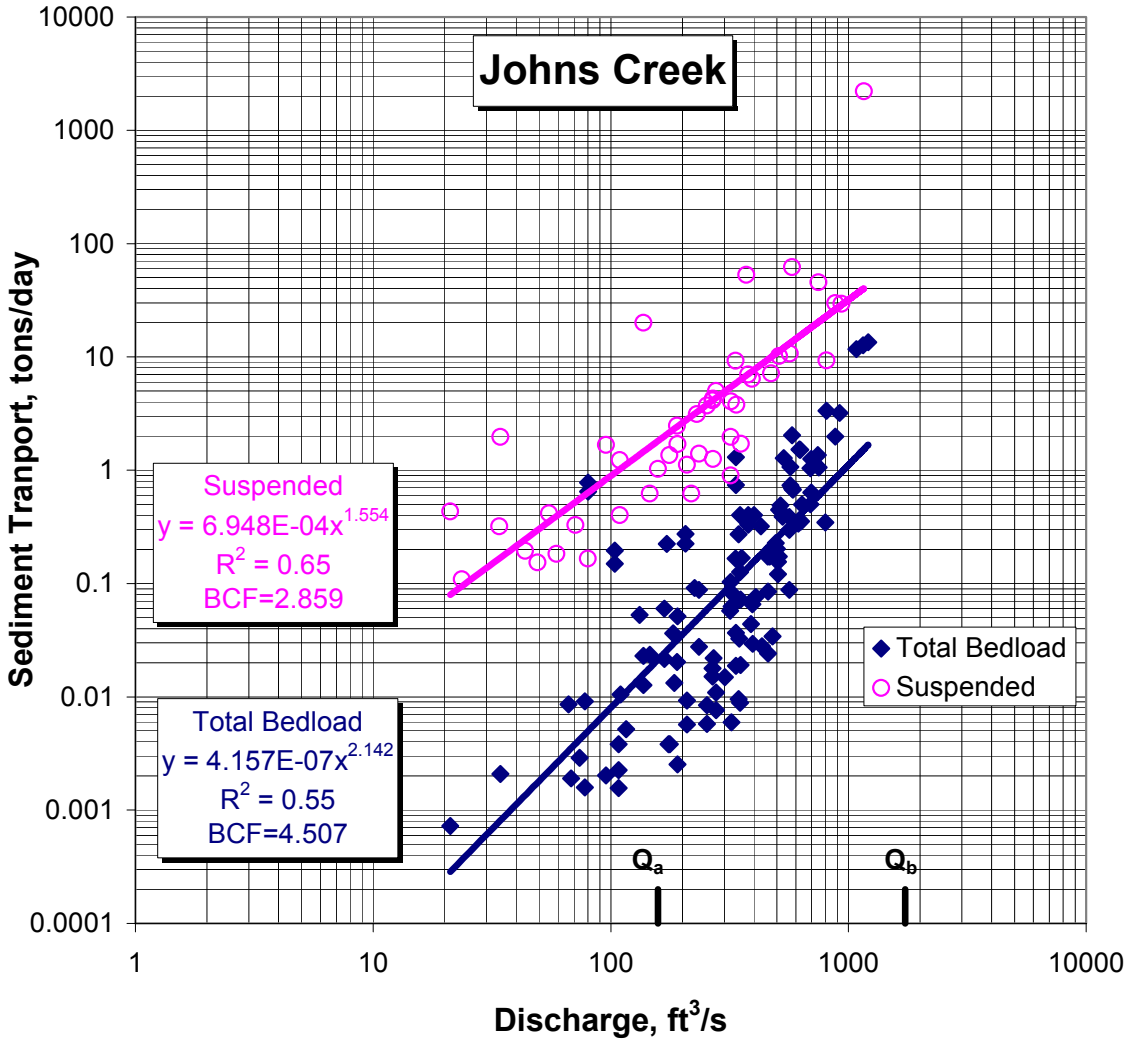

Figure 6. Bedload and suspended load transport rate versus discharge.

The bedload transport rates by size class (Figure 7) shows that the larger rates are associated with material in the 0.5 to 2mm diameter size class. No power curve is shown for the 8-32mm size class since the relationship had an r^2 of only 0.03. Only one sample had material >32mm diameter and this was for a sample collected at a discharge of 621 ft^3/s.

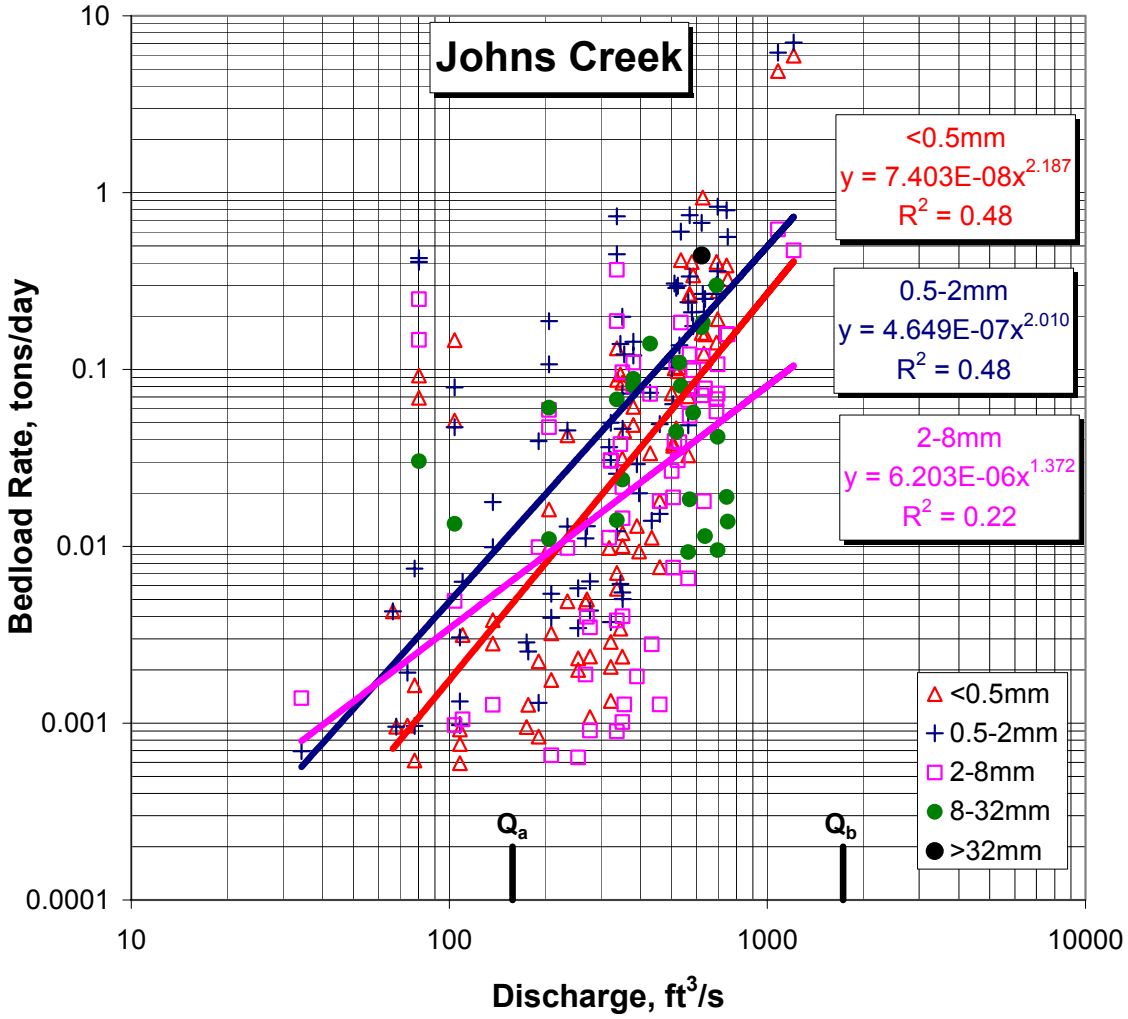

Figure 7. Bedload transport rate versus discharge for selected size classes.

The size of the largest particle in the bedload sample generally increased with discharge, although there is much scatter at lower discharges (Figure 8). The largest particle measured in the bedload sample was 22 mm at a discharge of 692 ft^3/s. There is no obvious relationship between discharge and the median diameter of the bedload samples. The D_{50} for most samples was <2 mm. The information on the largest particle in the bedload sample and observations of the sizes of particles on a downstream bar moved during 1995 high discharges, suggest that discharges near bankfull discharge are capable of moving the median diameter particles on the channel surface.

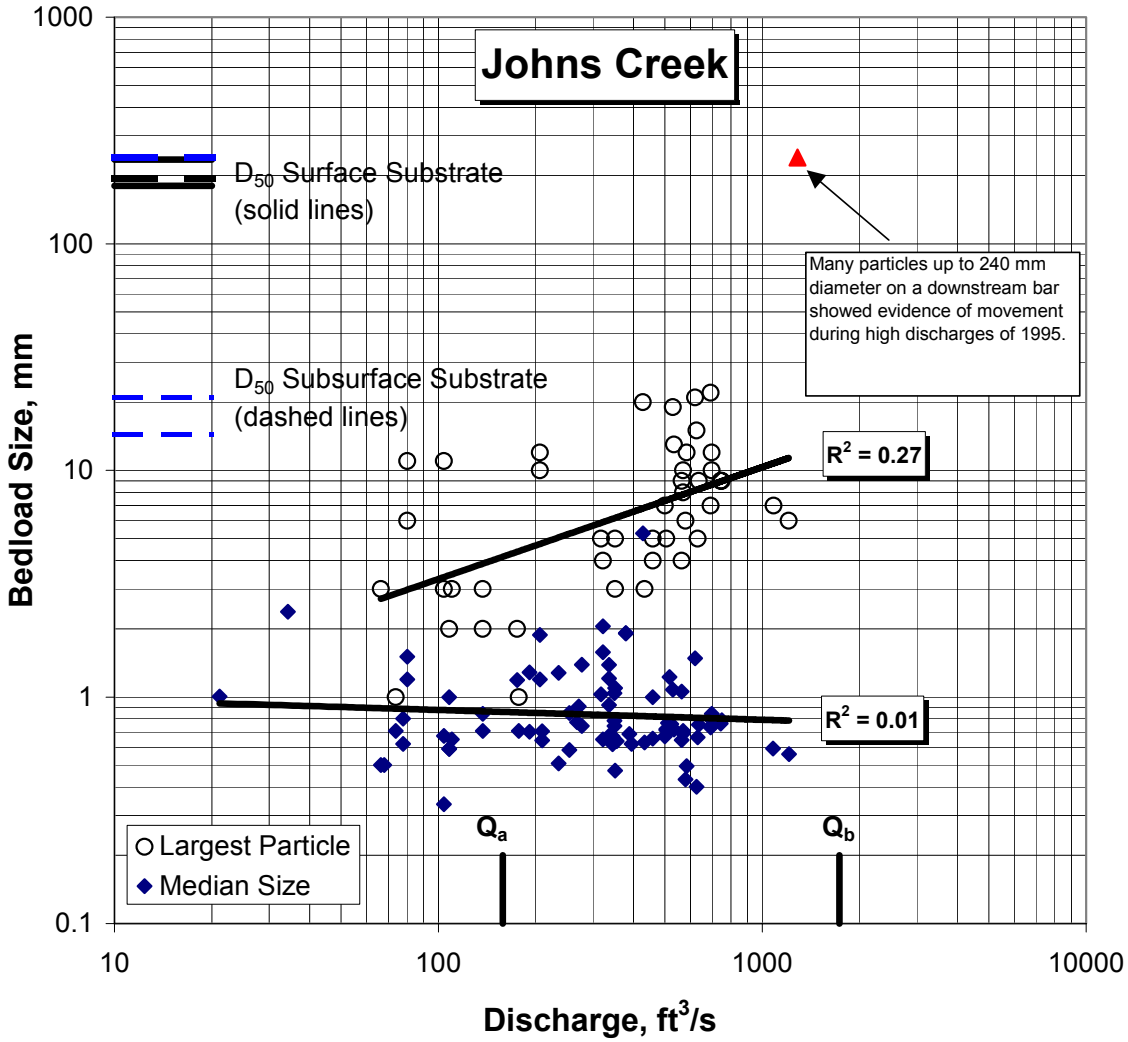

Figure 8. Largest particle in the bedload sample and median size of the sample versus stream discharge for Johns Creek.