Johnson Creek

General Information

The study reach is about a 1,555 ft length of river at the Geological Survey (USGS) gage 13313000 (Johnson Creek at Yellowpine, Idaho) in the Boise National Forest (Figures 1 and 2). The stream gaging station is approximately 700 ft upstream from the confluence with the East Fork of the South Fork Salmon River. The site is on land administered by the Forest Service at an elevation of about 4,656 ft. The drainage area upstream of this location is 216.4 mi^2 and the geology of the watershed is predominantly intrusive igneous.

Sediment transport measurements were made by USGS personnel predominantly during the spring snowmelt flows of 1994 and 1995. Additional measurements were also made on May 18, 1997 during unusually high streamflows. Additional information collected at the site include a survey of the stream reach and pebble counts of the surface substrate. The cableway is approximately 405 ft upstream of the gage.

Figure 1. Johnson Creek looking downstream from the USGS gage.

Figure 2. Johnson Creek looking upstream from the USGS gage.

Streamflow has been recorded since August 1928, although prior to July 19, 1977 the station was 385 ft upstream of the present location. Average annual streamflow (Q_a) for the period of record is 347 ft^3/s (19.8 in) and bankfull discharge (Q_b) is estimated at 1,400 ft^3/s. The highest flow recorded was 6,230 ft^3/s on June 17, 1974.

Cross-Section

Figure 3 shows the cross-section at the USGS cableway. The average gradient for the study reach is 0.0040 ft/ft. All but one of the sediment transport measurements were made at the cableway cross-section.

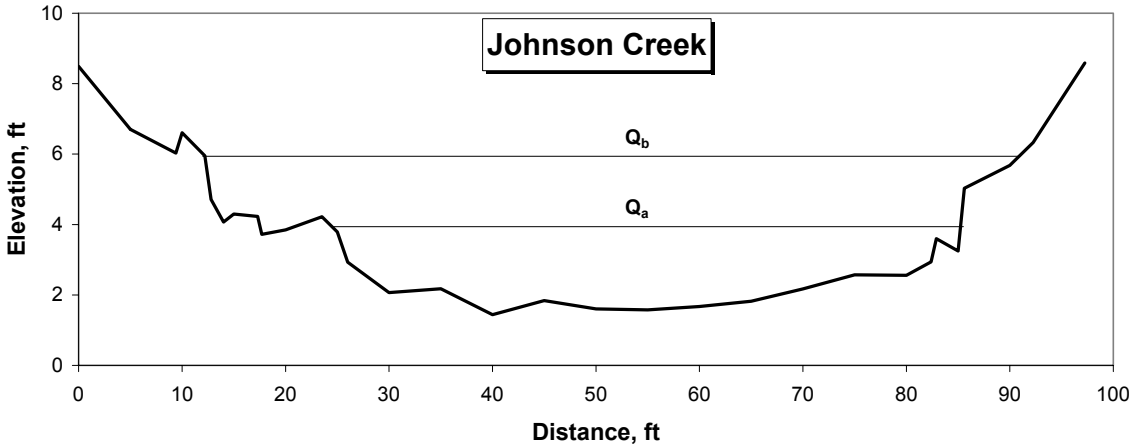

Figure 3. Cross-section of Johnson Creek at the USGS cableway.

Channel Geometry

The station geometry relationships for the cross-section at the cableway and the gage location are shown in Figure 4. Information for 1994 through 1995 were used to develop the power relationships with discharge. Over the range of discharges when sediment transport was measured (224 to 2,870 ft^3/s), estimated stream width, estimated average depth and estimated average velocity varied from 59.1 to 88.0 ft, 1.59 to 4.42 ft, and 2.4 to 7.4 ft/s, respectively. The average reach slope is 0.0040 ft/ft.

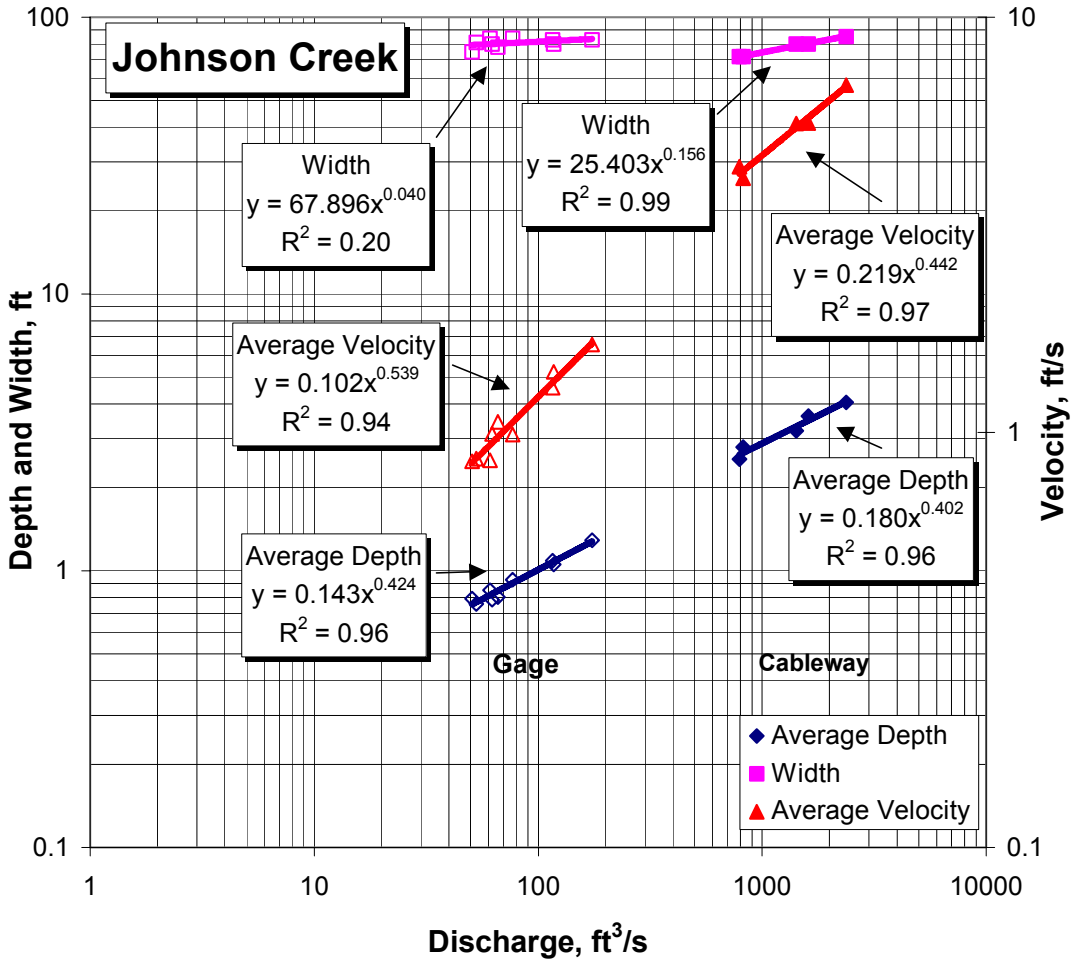

Figure 4. Width, average depth and average velocity versus stream discharge at the cableway and gage cross-sections on Johnson Creek.

Channel Material

Surface pebble counts were made at the cableway cross-section in October 1994. The average D_{50} and D_{90} for the surface material are190 mm and 430 mm, respectively (Figure 5). The smallest particle measured in the pebble count was 6 mm diameter.

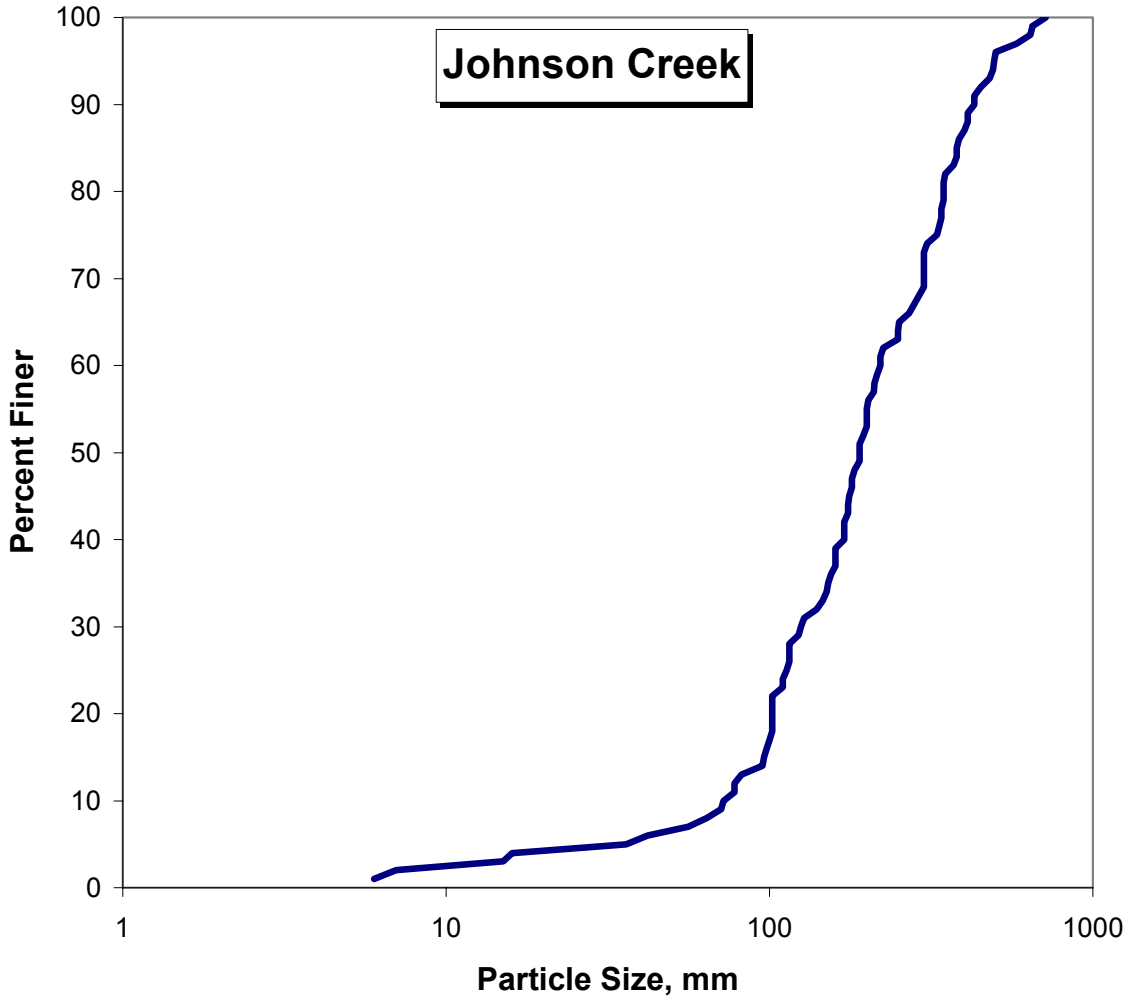

Figure 5. Particle size distribution for the surface material in Johnson Creek.

Sediment Transport

The bedload and suspended load measurements in water years 1994, 1995 and 1997 were all made from the cableway, except for one wading sample taken on April 19, 1994. The sediment transport data include 72 measurements of bedload transport and 36 measurements of suspended sediment. Sediment transport measurements spanned a range of stream discharges from 224 ft^3/s ($0.65Q_a$; $0.16Q_b$) to 3,450 ft^3/s ($9.94Q_a$; $2.46Q_b$). Bedload transport ranged from 0.02 to 38.5 t/d and suspended transport ranged from 1.92 to 331.5 t/d. Over the range of measured discharges, suspended transport accounts for the majority of the material in transport with typically over an order of magnitude greater suspended transport (Figure 6).

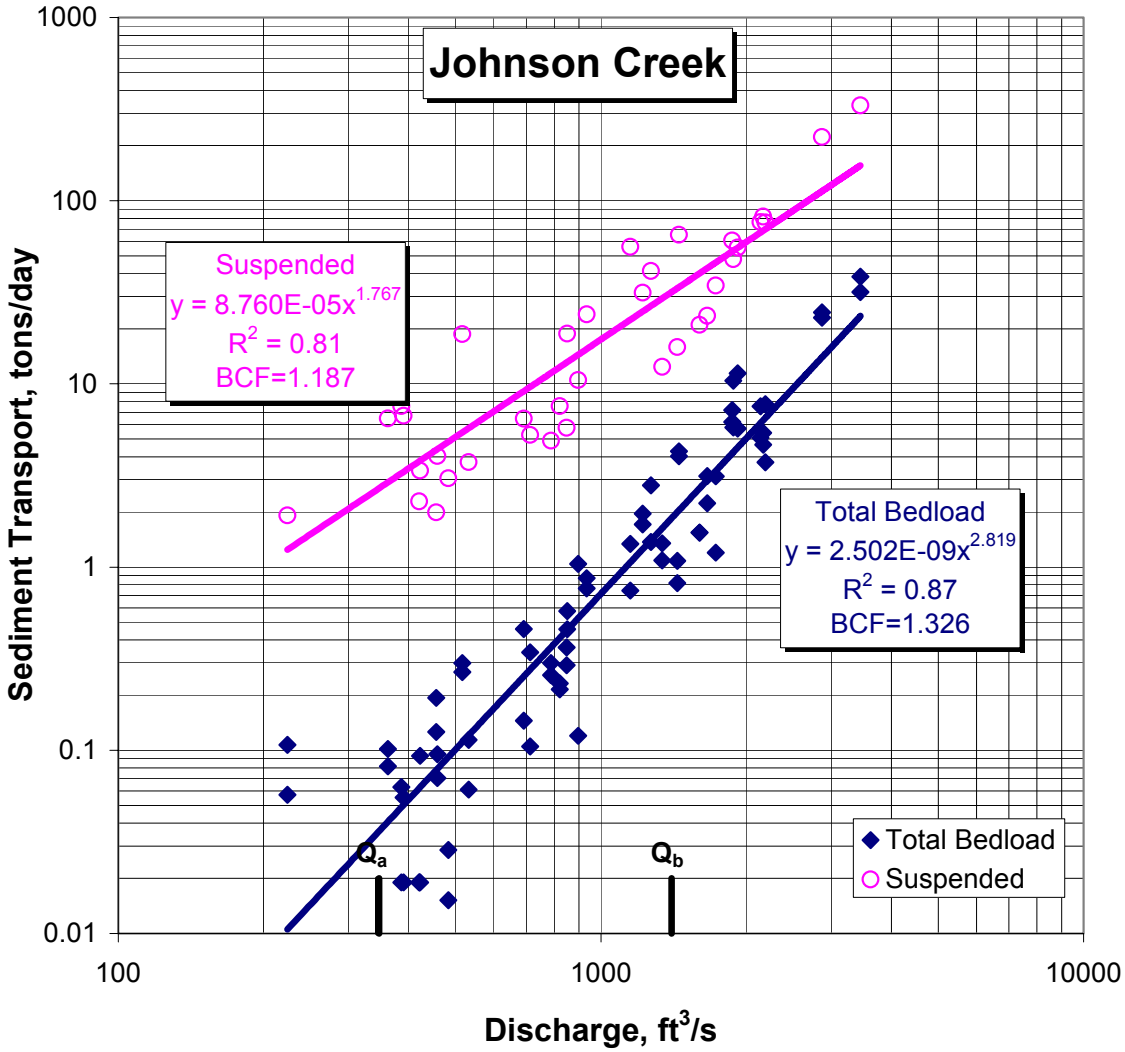

Figure 6. Bedload and suspended load transport rate versus discharge.

The bedload transport rates by size class (Figure 7) shows that the larger rates are associated with material 0.5 to 2 mm diameter. Only three bedload samples contained material larger than 32 mm diameter and these were at discharges of 1,920 ft^3/s and larger.

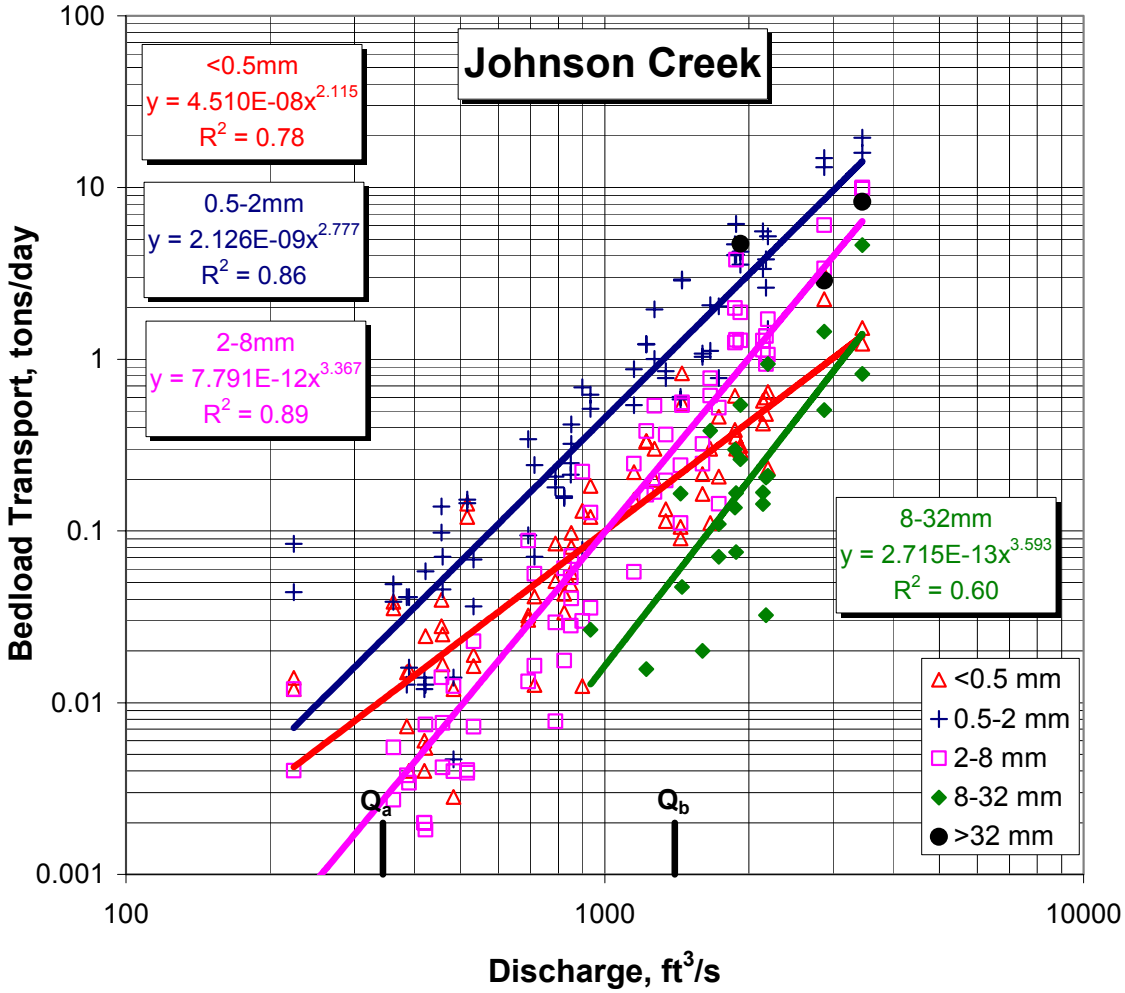

Figure 7. Bedload transport rate versus discharge for selected size classes.

The largest particle in the bedload sample generally increased with discharge (Figure 8). The largest particle measured in a bedload sample was 55 mm at a discharge of 1,920 ft^3/s. The D_{50} for most samples was in the sand size, 0.5 to 2 mm. Only four samples had median diameters larger than 2 mm. The largest median diameter of a bedload sample was 4.59 mm.

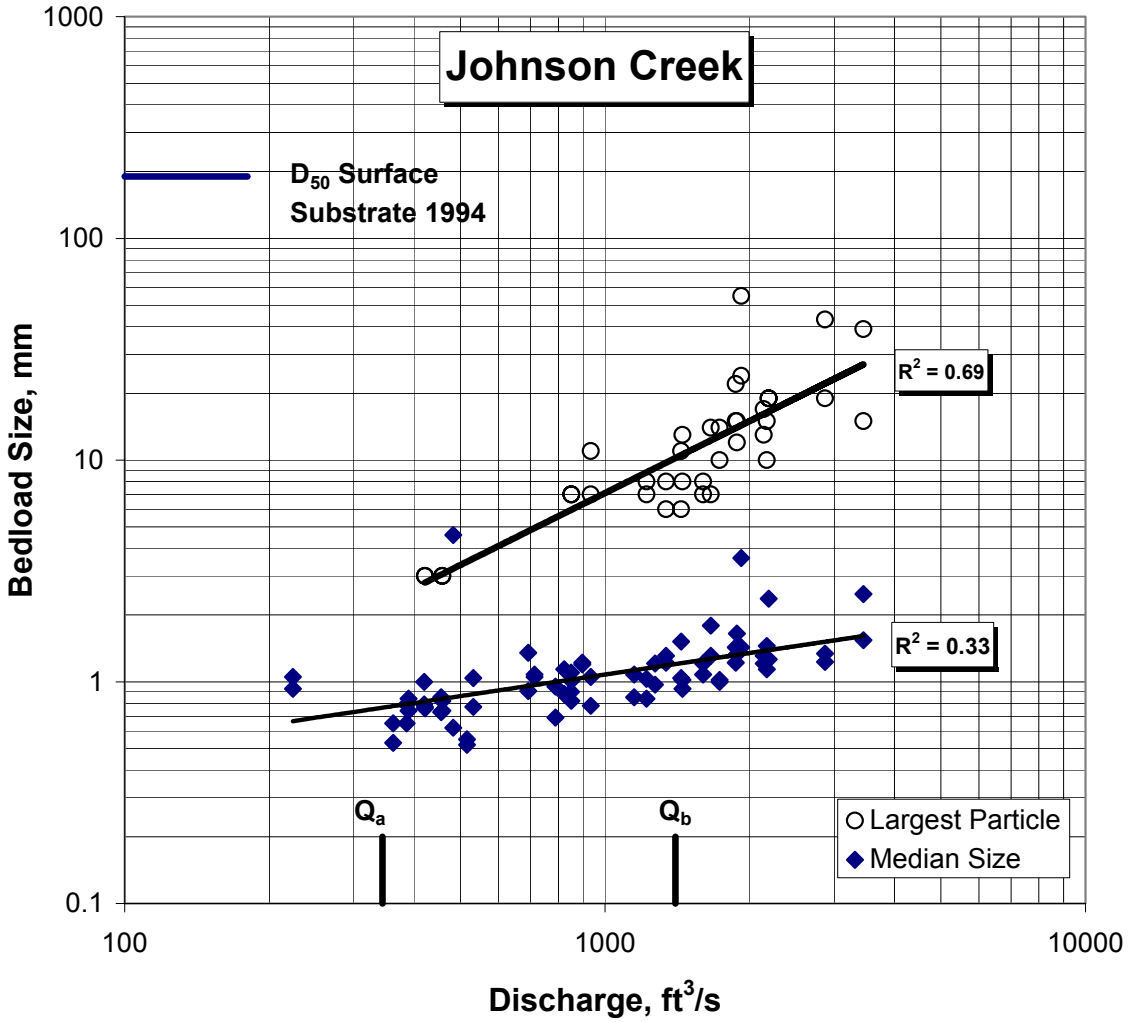

Figure 8. Largest particle in the bedload sample and median size of the sample versus stream discharge for Johnson Creek.