Bruneau River

General Information

The headwaters of the Bruneau River are in northeast Nevada on the Humbolt National Forest. The river flows northward into Idaho and eventually confluences with the Snake River. The study area includes two river reaches and is associated with U.S. Geological Survey gaging station (13161500), which is located about 0.5 mi. upstream from Rowland, Nevada. The site is at an elevation of about 4,500 ft. The drainage area upstream of the gage is 382 mi^2 and the geology of the watershed is mixed with the dominant material being sedimentary and volcanic extrusive.

Streamflow records are available from June 1, 1913 to September 30, 1918 and October 1, 1966 to present (Water Year 2012). Sediment transport measurements are available for water years 1998, 1999, 2000 and 2002. Additional information collected includes a 1998 survey of a stream reach and pebble counts of the surface bed material in 1998 and 2000. Figures 1 and 2 show photographs of the reach surveyed in 1998.

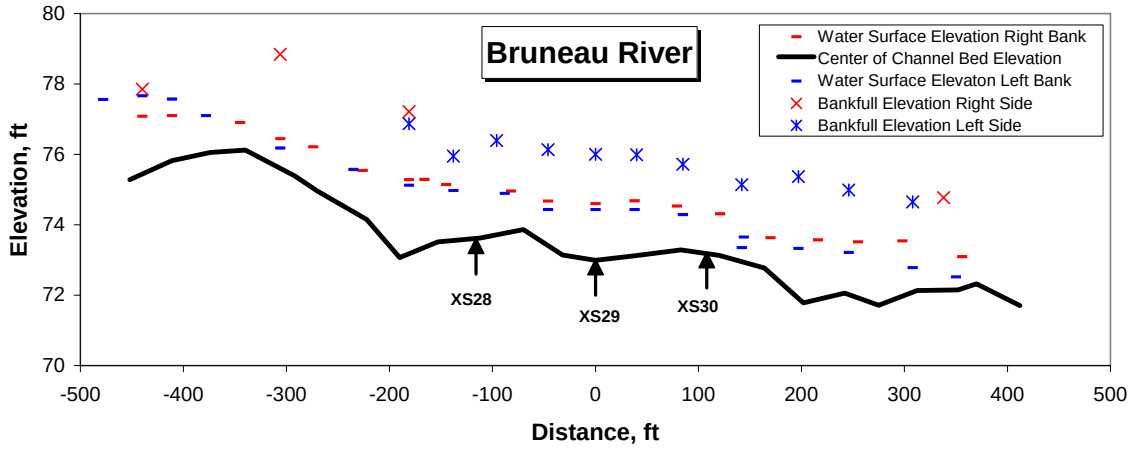
Figure 1. Bruneau River looking upstream from the downstream end of the surveyed reach.

Figure 2. Bruneau River looking downstream from the upstream end of the surveyed reach.

Streamflow records are available for 52 complete water years. The average annual streamflow (Q_a) for the period of record is 110 ft^3/s (3.8 in). During the period of record, daily mean discharges ranged from 1.7 ft^3/s to 2,070 ft^3/s. The highest instantaneous discharge recorded was 2,140 ft^3/s on May 14, 1984.

Channel Profile and Cross-Section

The surveyed river segment is about 890 ft. long, beginning about 1.4 miles upstream from the USGS gage. 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 0.0054 ft/ft. Cross-sections of the channel were surveyed at three locations. Figure 4 shows the channel cross-section (XS29) near the middle of the surveyed reach.



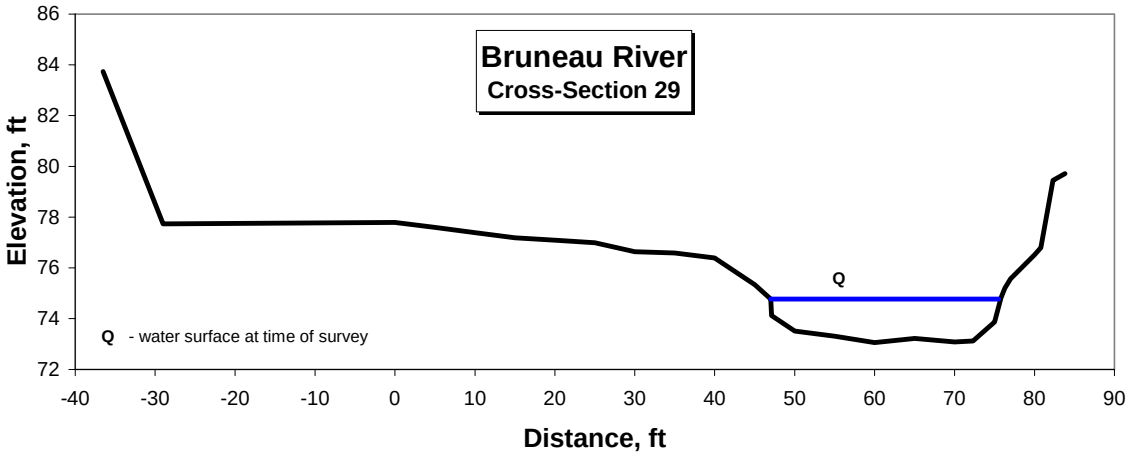


Figure 3. Longitudinal profile of the surveyed reach on the Bruneau River.
Figure 4. Cross-section 29 of the Bruneau River.

Channel Geometry

The station geometry relationships shown in Figure 5 are for the bridge site located about 3 miles upstream of the USGS gage. Most of the sediment transport measurements were made at this site. Information from stream discharge measurements for 1998 through 2002, that spanned the range of discharges during which sediment transport was measured, were used to develop the power relationships. Over the range of discharges when sediment transport was measured (169 to 744 ft^3/s), estimated stream width, estimated average depth and estimated average velocity vary from 39.3 to 50.1 ft, 2.17 to 3.37, and 1.99 to 4.44 ft/s, respectively.

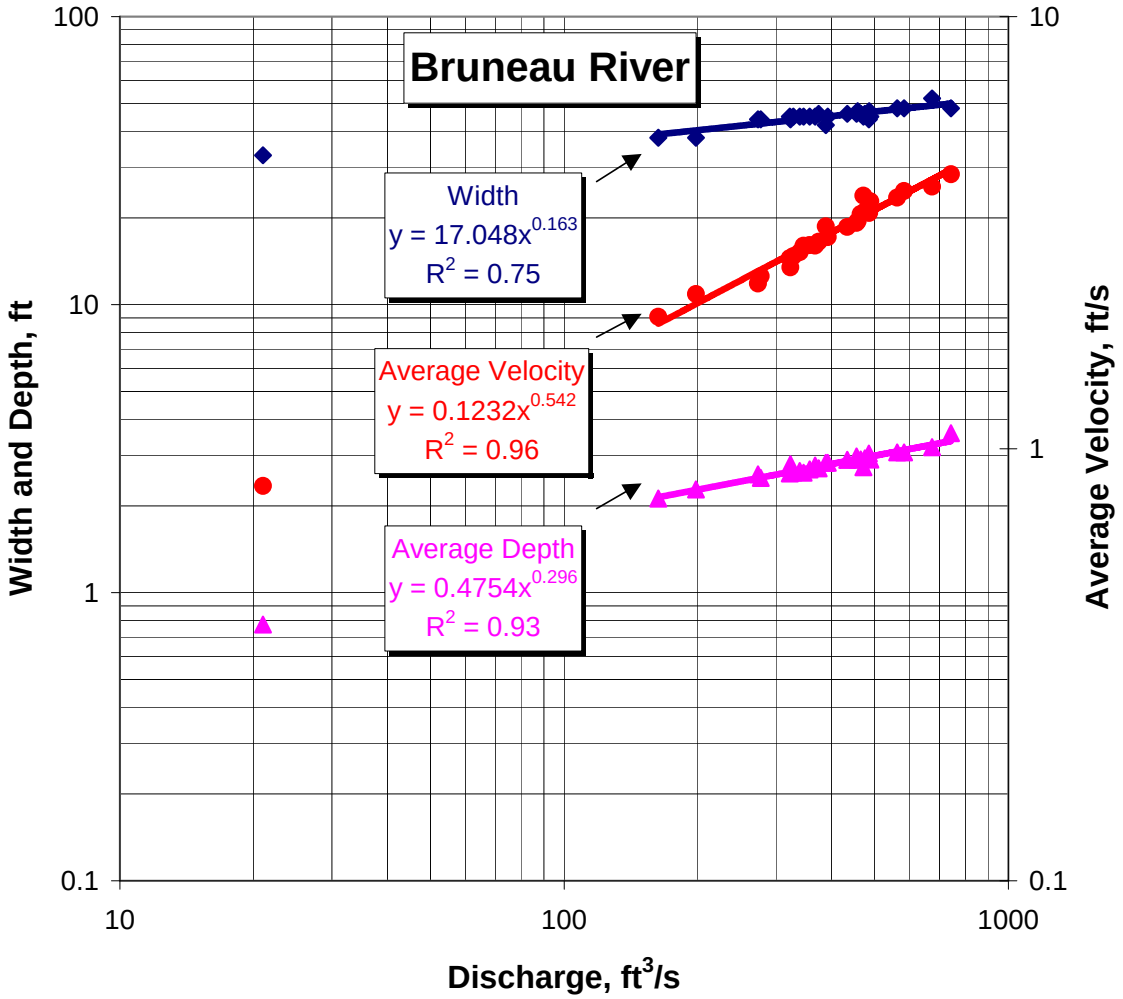


Figure 5. Width, average depth, and average velocity versus stream discharge at the bridge site on the Bruneau River, about 3 miles upstream of the USGS gaging station.

Channel Material

A surface pebble count was made near cross-section 29 of the surveyed reach in October 1998. Additional surface pebble counts were made in October 2000 along three transects in a 455 ft. reach of the river. This reach begins at the tributary junction, just upstream from the bridge used for most sediment transport measurements. The average D_{50} and D_{90} for the surface material were 41 mm and 175 mm, respectively in 1998 and 27 mm and 134 mm, in 2000 (Figure 6). About 33% (2000) of the surface material was sand (2 mm) size or smaller.

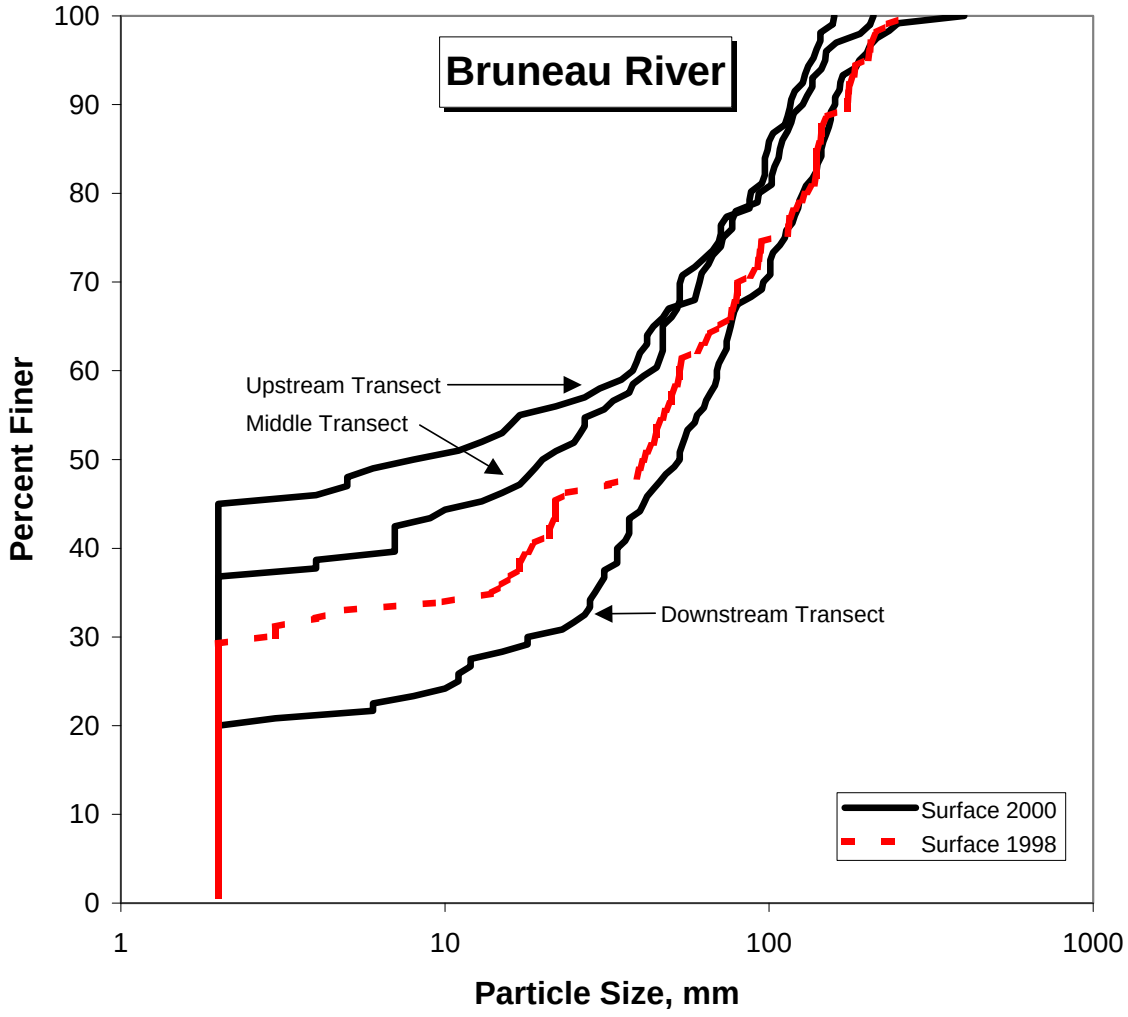


Figure 6. Particle size distribution for surface material collected in the Bruneau River.

Sediment Transport

Sediment transport measurements were made in 1998, 1999, 2000 and 2002. The sediment transport data include 66 measurements of bedload transport and 31 measurements of suspended sediment. Sediment transport measurements spanned a range of stream discharges from 169 ft^3/s ($1.56Q_a$) to 744 ft^3/s ($6.89Q_a$). Bedload transport ranged from 2.76 to 91.6 t/d and suspended sediment transport ranged from 5.73 to 412 t/d. Over the range of measured discharges, suspended transport accounts for the majority of the material in transport. At the lowest measured discharges predicted suspended transport is about 2.1 times that of bedload and at the highest measured discharge about 8.3 times (Figure 7).

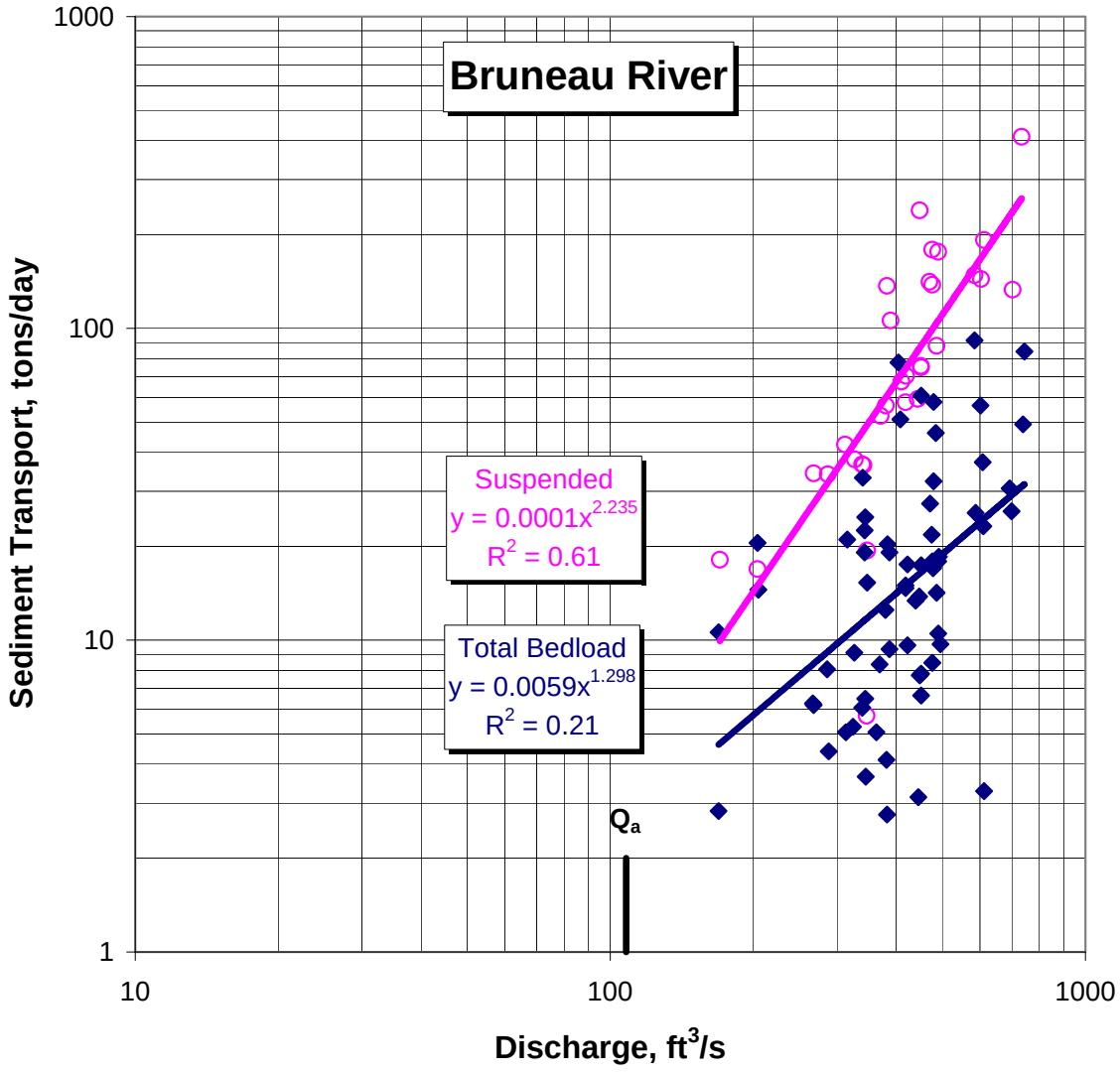


Figure 7. Bedload and suspended load transport rate versus discharge. (Bias correction factors for bedload and suspended load transport are 1.327 and 1.134, respectively.

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. Only 12 samples contained material >32 mm diameter and associated discharges were greater than 363 ft^3/s.

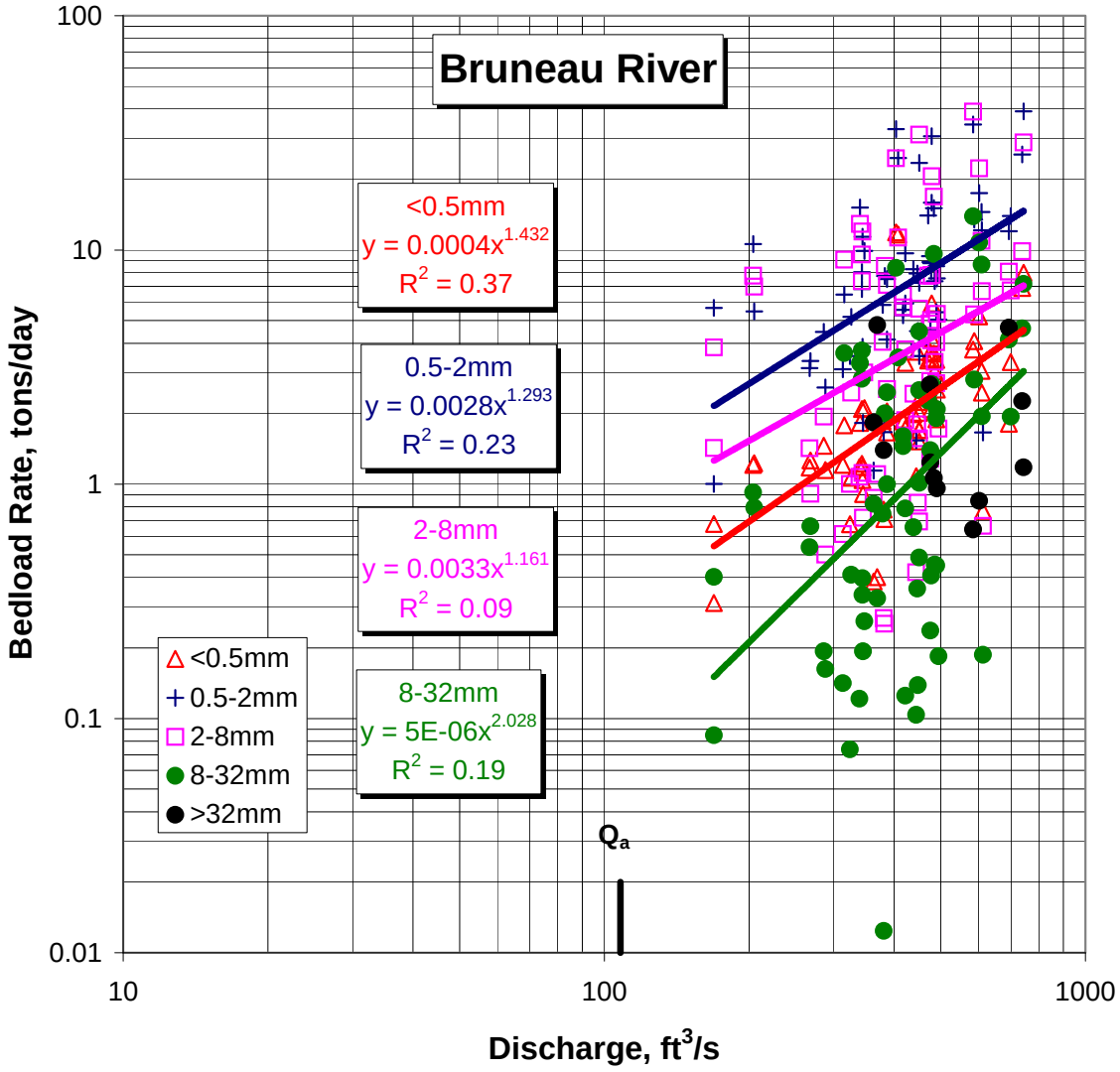


Figure 8. Bedload transport rate versus discharge for selected size classes.

The largest size class in the bedload sample increased with discharge (Figure 9). The largest size class in 12 of the bedload samples was 32-64 mm. This size material was collected at discharges at or above 363 ft^3/s. The D_{50} for the bedload samples did not show an increase in size with increasing discharge. The D_{50} for the majority of the samples was <2 mm. The largest D_{50} was 34.9 mm associated with a sampling discharge of 369 ft^3/s. The largest size class in the bedload sample was often within the range of the median size of the surface material, suggesting that the larger sampled discharges are capable of moving the median diameter particles on the channel surface.

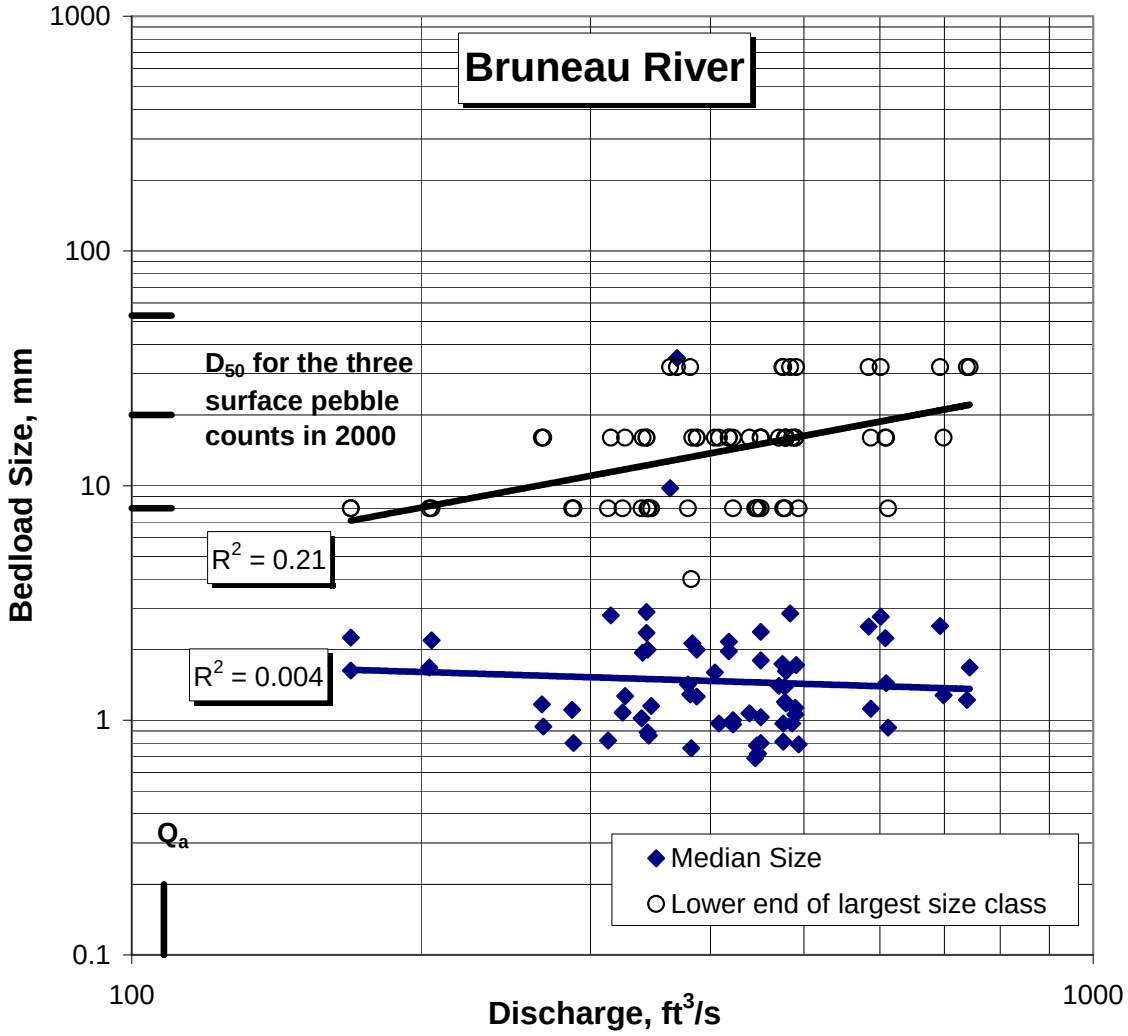


Figure 9. Lower end of the largest size class in the bedload sample and median size of the sample versus stream discharge for the Bruneau River.