

Salmon River below Yankee Fork

General Information

The study reach is near the Geological Survey (USGS) gage 13296500 (Salmon River below Yankee Fork near Clayton, ID) in the Salmon - Challis National Forest. The site is about 0.25 miles downstream of the remains of the sunbeam dam and about 0.125 miles downstream of the mouth of the Yankee Fork Salmon River. The site is on land administered by the Forest Service at an elevation of about 5,900 ft. The drainage area upstream of this location is 811.1 mi² and the geology of the watershed consists predominantly of mixed volcanics, igneous intrusions and glacial deposits.

Sediment transport measurements were made by US Geological Survey personnel during the spring snowmelt flows of 1999 and 2000. Additional measurements at this site include a survey of the stream reach, pebble counts of the surface material and core samples of the surface and subsurface material.

Streamflow records are available for this gage for water years 1922 to 1991 and 2001. Average annual streamflow (Q_a) for the period of record is 983 ft³/s and the 1.5 year return interval discharge is estimated at 4,170 ft³/s. The highest flow recorded was 10,500 ft³/s on June 17, 1974.

Cross-Section

Figure 1 shows the cross-section at the USGS cableway, 50 ft upstream from the gage. The average gradient for the study reach is 0.0034 ft/ft. All sediment transport measurements were made at the cableway.

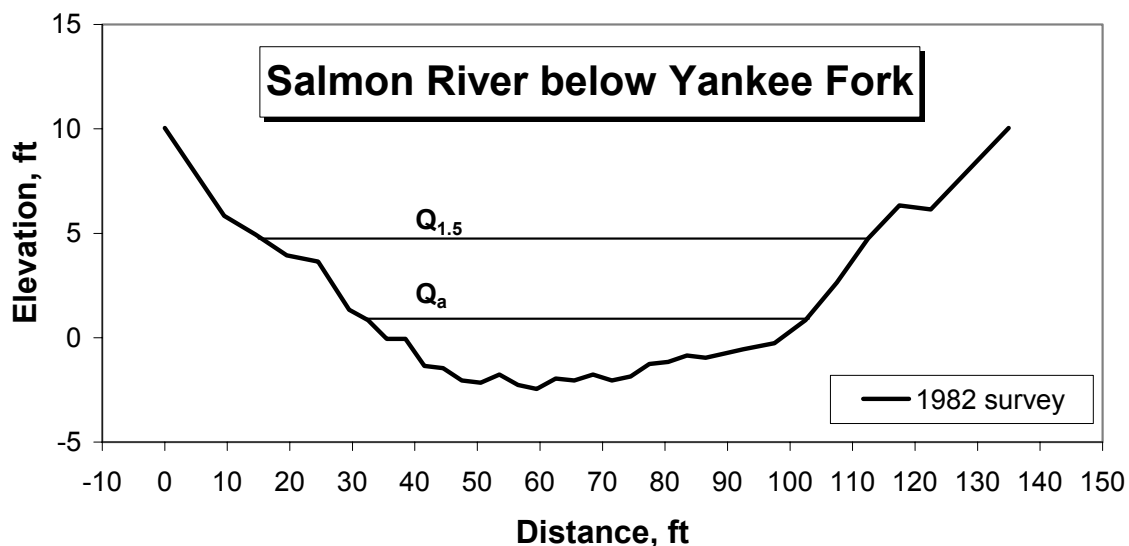


Figure 3. Cross-section of the Salmon River below Yankee Fork.

Channel Geometry

The station geometry relationships for the cross-section at the cableway are shown in Figure 2. All discharge note information for 1938 through 1990 for cableway measurements without ice effects were used to develop the power relationships with discharge. Over the range of discharges when sediment transport was measured (1,360 to 5,070 ft³/s) estimated stream width, estimated average depth and estimated average velocity varied from 98.4 to 123.1 ft, 4.08 to 6.39 ft, and 3.4 to 6.4.1 ft/s, respectively. The average reach slope is 0.0034 ft/ft.

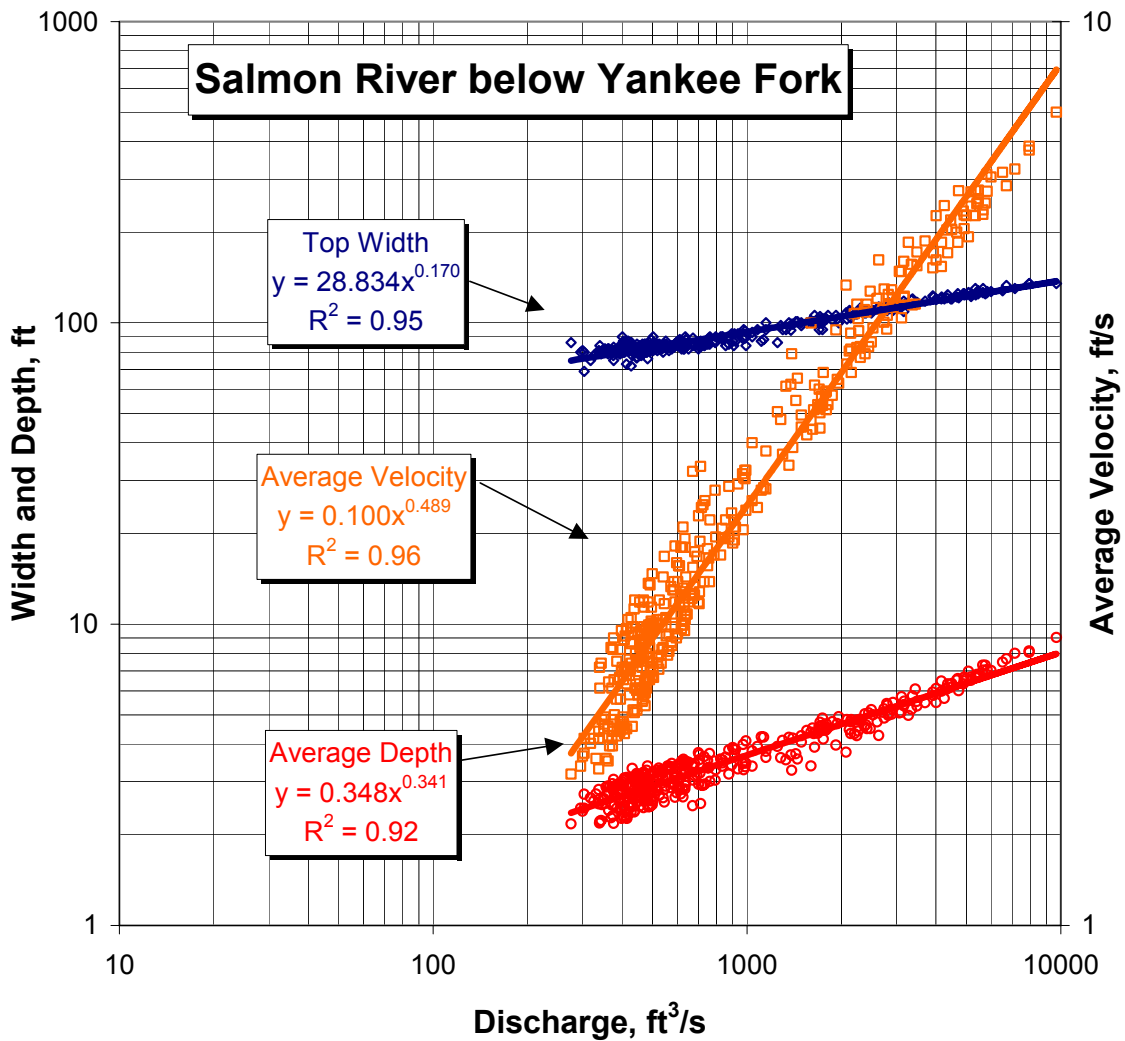


Figure 2. Width, average depth, and average velocity versus stream discharge at the cableway cross-section on the Salmon River below Yankee Fork.

Channel Material

Surface pebble counts were made at three cross-sections and three cores of surface and subsurface material were collected, one at each cross-section, in July 2000. The D_{50} and D_{90} for the combined pebble counts were 104 mm and 396 mm, respectively (Figure 3). About 6% of the surface material was sand (2 mm) size or smaller. The D_{50} and D_{90} for the combined surface cores were 138 mm and 182 mm, respectively. The average D_{50} and D_{90} for the subsurface material are 25 mm and 133 mm, respectively.

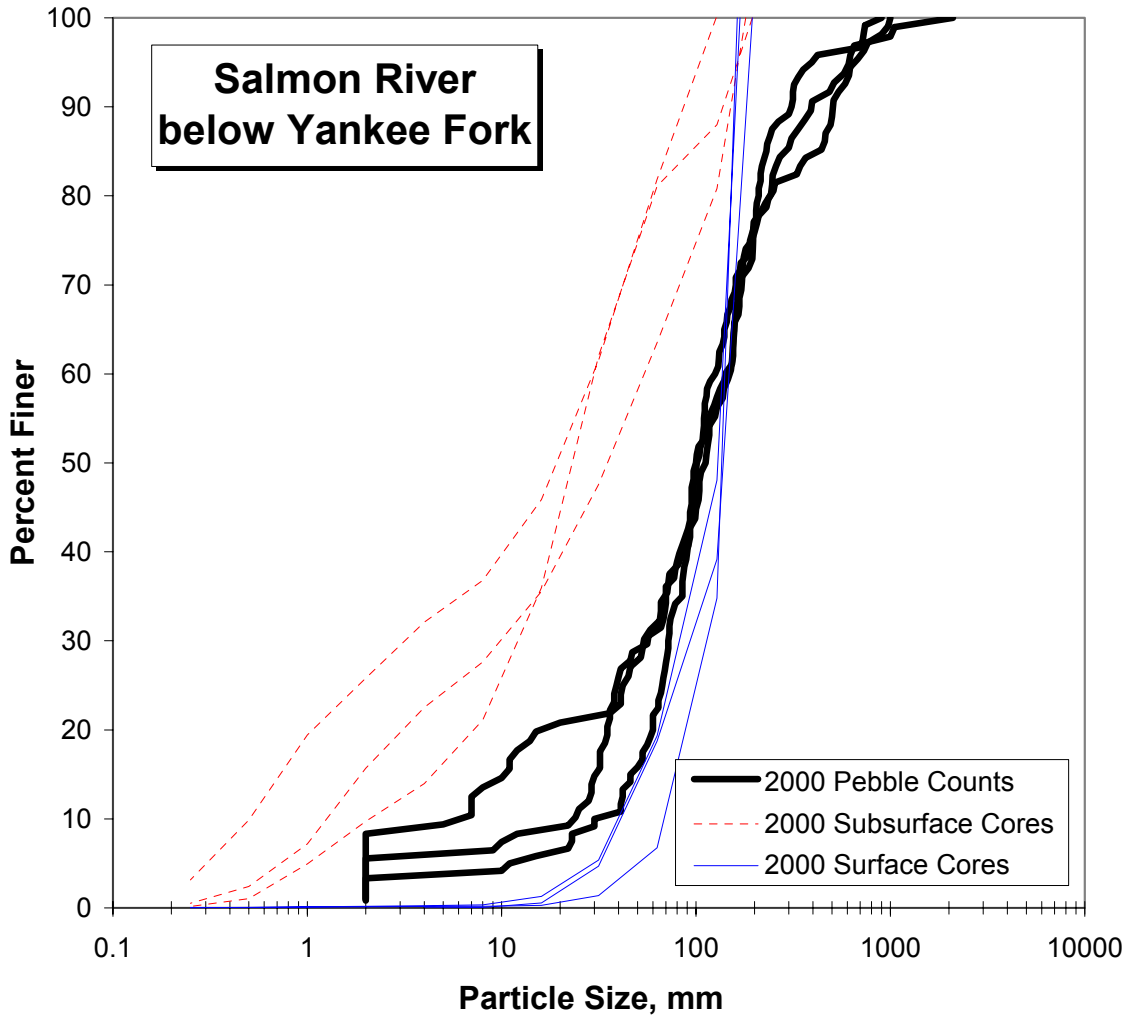


Figure 3. Particle size distribution for surface and subsurface material samples for the Salmon River below Yankee Fork.

Sediment Transport

The bedload and suspended load measurements in water years 1999 and 2000 were all made from the cableway. The sediment transport data includes 60 measurements of bedload transport and 30 measurements of suspended sediment. Sediment transport measurements spanned a range of stream discharges from 1,360 ft³/s (1.37Q_a) to 5,070 ft³/s (5.12Q_a). Bedload transport ranged from 0.111 to 328 t/d and suspended transport ranged from 17.0 to 4,730 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 (Figure 4).

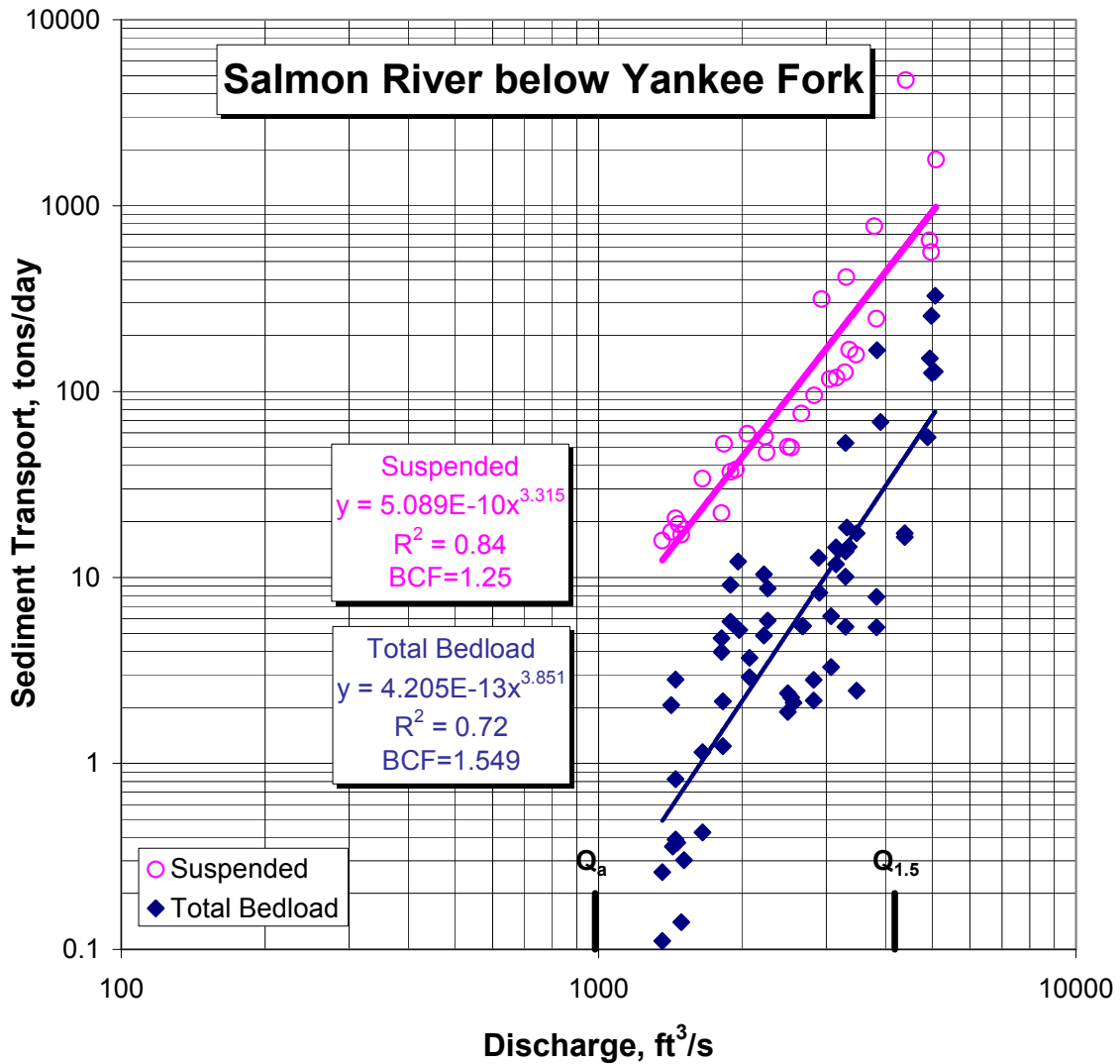


Figure 4. Bedload and suspended load transport rate versus discharge.

The bedload transport rates by size class (Figure 5) show that at discharges up to about 0.8 of the 1.5 year recurrence discharge the largest rates are associated with material 0.5- 2 mm diameter. At higher discharges, the larger transport rates are associated with 8-32 mm and > 32 mm material. Ten of the bedload samples contained material larger than 32 mm diameter and these were at discharges of 2,890 ft³/s and larger.

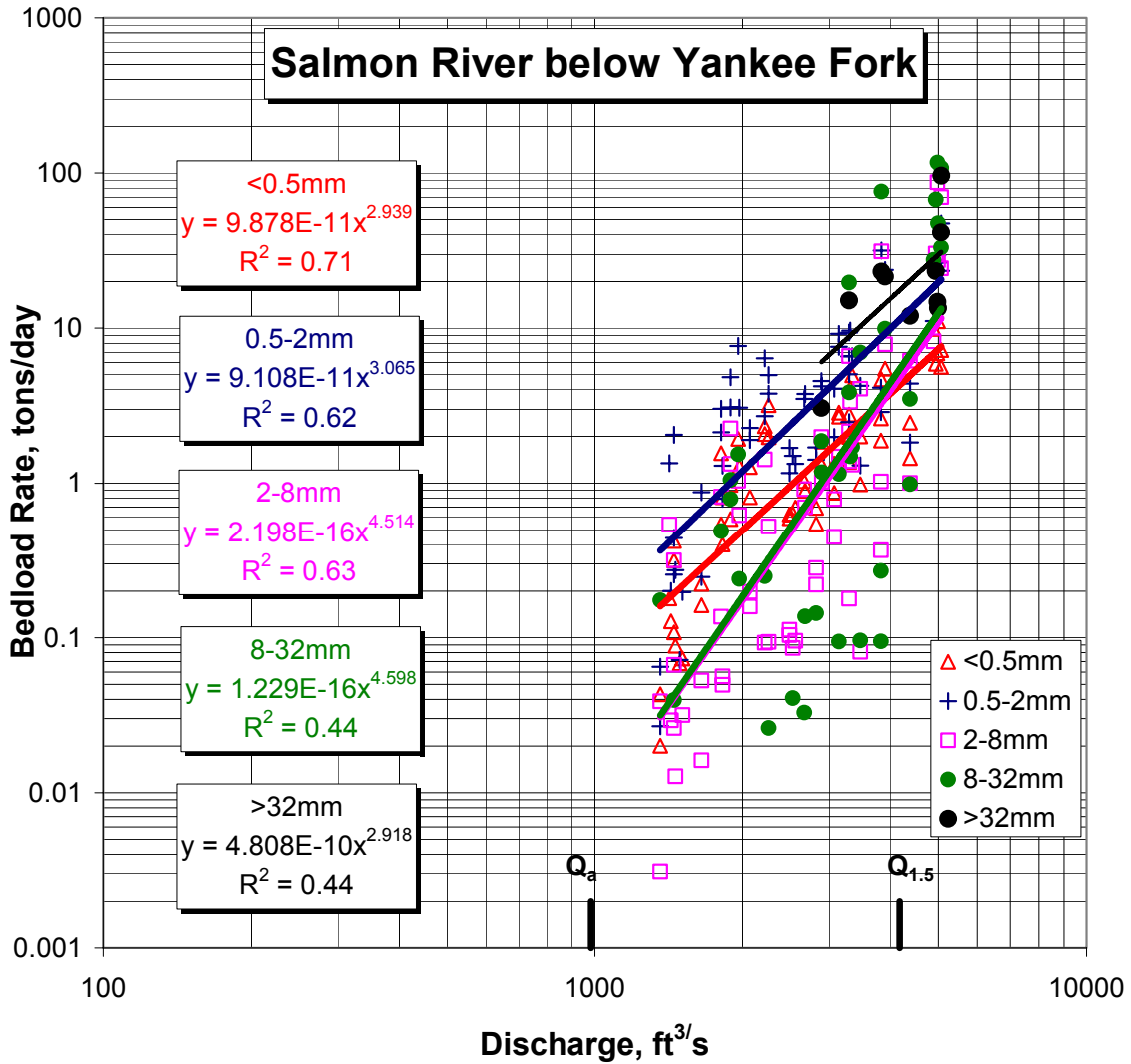


Figure 5. Bedload transport rate versus discharge for selected size classes.

The D_{50} for the bedload samples ranged from 0.49 to 38.87 mm. At discharges less than the 1.5-year discharge, the median diameter is usually sand size. At discharges larger than the 1.5-year discharge, the median diameter exceeds sand size. The largest median diameter was associated with a discharge of 4,380 ft^3/s .

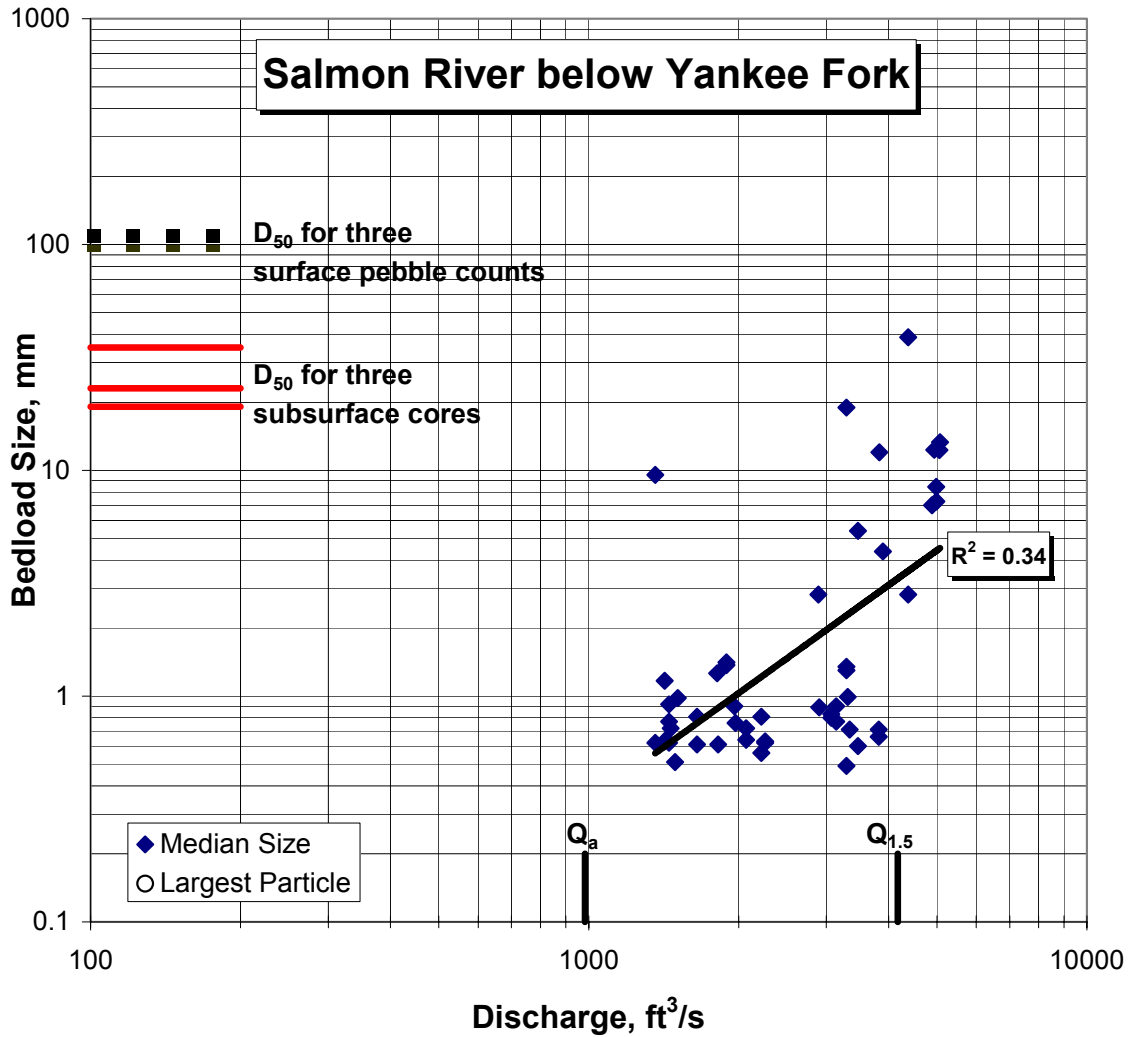


Figure 8. Median size of the bedload sample versus stream discharge for the Salmon River below Yankee Fork.