

South Fork Salmon River

General Information

The study reach is about a 2,000 ft length of river at the Geological Survey (USGS) gage 13310700 (South Fork Salmon River near Krassel Ranger Station, Idaho) in the Payette National Forest. The stream gaging station is approximately 1.4 miles downstream from the Krassel Ranger Station. The site is on land administered by the Forest Service at an elevation of about 3,750 ft. The drainage area upstream of this location is 329.3 mi² 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 1985, 1986, 1994, 1995. Two additional measurements were made during the high spring discharges of 1997. Additional measurements at this site include a survey of the stream reach and pebble counts of the surface substrate. Figures 1 and 2 show photographs of the site looking downstream and upstream from the USGS gaging station. The cableway is approximately 50 ft upstream of the gaging station.



Figure 1. South Fork Salmon River looking downstream from the USGS gaging station.



Figure 2. South Fork Salmon River looking upstream from the USGS gaging station.

Streamflow has been recorded from October 1966 to September 1982, April 1985 to September 1986, and February 1986 to present. Average annual streamflow (Q_a) for the period of record is $556 \text{ ft}^3/\text{s}$ (22.9 in) and bankfull discharge (Q_b) is estimated at $2,500 \text{ ft}^3/\text{s}$. The highest flow recorded was $6,740 \text{ ft}^3/\text{s}$ on June 17, 1974.

In a different channel reach, about 1.5 miles upstream from the USGS gage, measurements were made of the transport distance of painted rocks during the high snowmelt flows in 1995 and samples of floodplain material were collected in 1997.

Cross-Section

Figure 3 shows the cross-section at the USGS cableway. The average gradient for the study reach is 0.0025 ft/ft. All sediment transport measurements were made at the cableway cross-section.

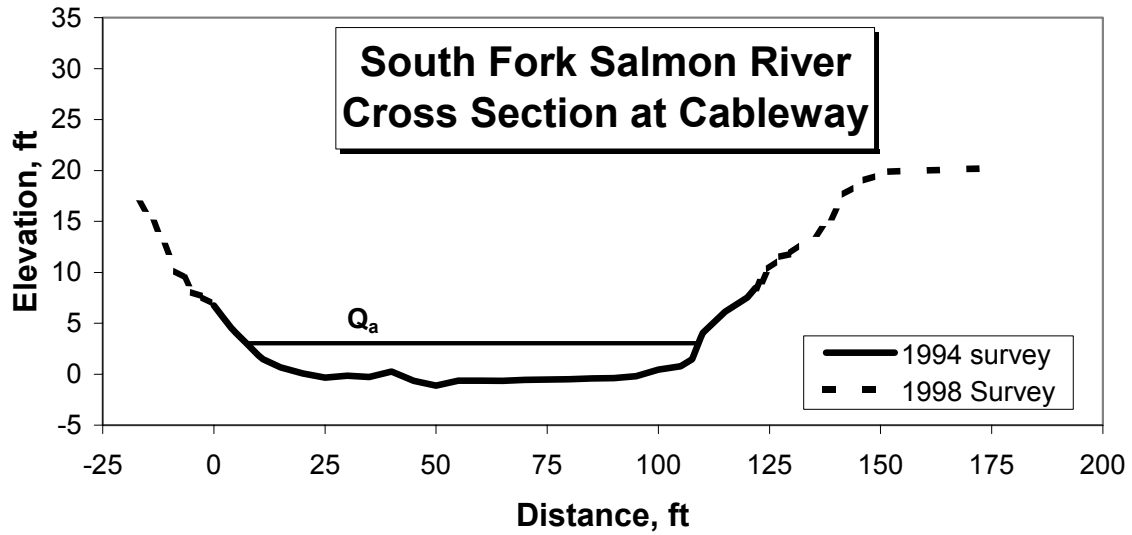


Figure 3. Cross-section of the South Fork Salmon River at the USGS cableway.

Channel Geometry

The station geometry relationships for the cross-section at the cableway are shown in Figure 4. Information for 1985 through 1997 within the range of discharges for the sediment transport measurements were used to develop the power relationships with discharge (solid symbols). Over the range of discharges when sediment transport was measured (137 to 5,260 ft³/s) estimated stream width, estimated average depth and estimated average velocity varied from 94.9 to 116.7 ft, 1.80 to 7.57 ft, and 0.8 to 6.0 ft/s, respectively. The average reach slope is 0.0025 ft/ft.

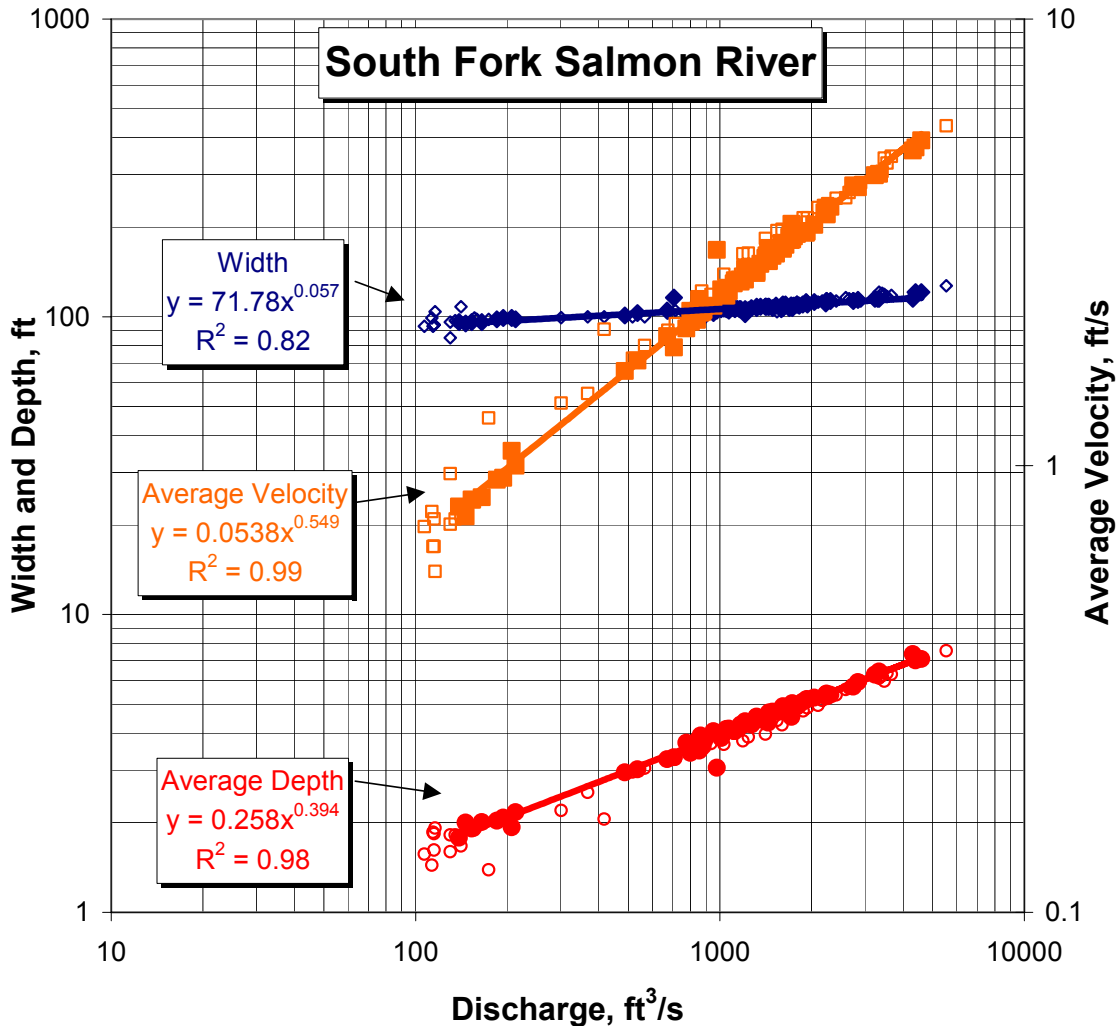


Figure 4. Width, average depth, and average velocity versus stream discharge at the cableway cross-section on the South Fork Salmon River. (Solid symbols represent data used to develop the power relationships; open symbols were not used because they were either outside the range of discharges when sediment transport was measured or not made during a year of sediment transport sampling.)

Channel Material

Surface pebble counts were made at the cableway cross-section in October 1994 and again in April and September 1999. No subsurface core samples were collected at this site. The average D_{50} and D_{90} for the surface material in the reach in 1994 are 38 mm and 113 mm, respectively (Figure 5). In 1994, about 33% of the surface material is sand (2 mm) size or smaller. A large storm around Jan. 1, 1997 brought large quantities of new material into the channel and this is reflected in the much finer material composing the channel surface in 1999. In April 1999 about 56% of the surface material was sand size or smaller. The D_{50} of the floodplain samples ranged from 0.11 and 0.24 mm. Floodplain samples were collected at a secondary study reach about 1.5 miles upstream of the USGS gage.

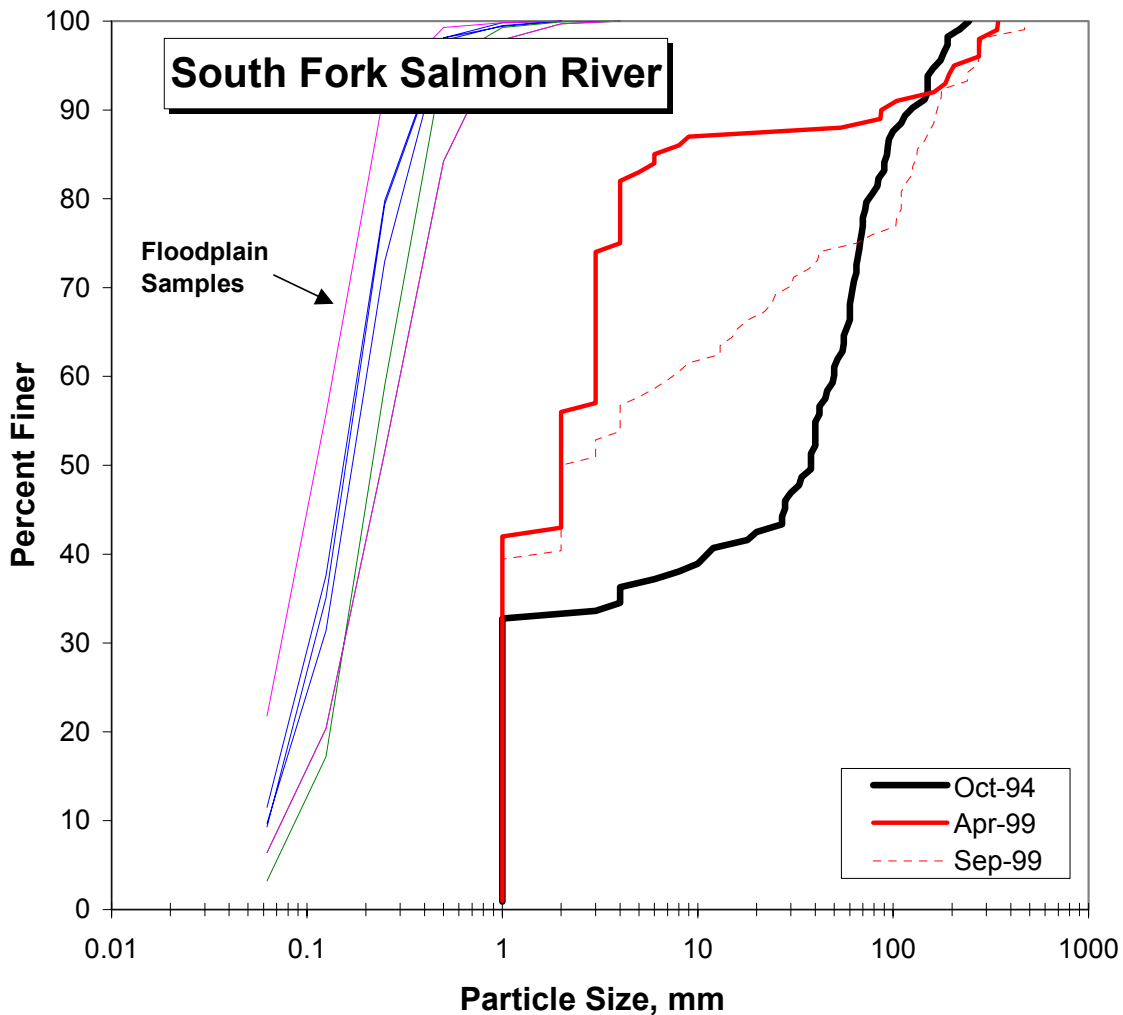


Figure 5. Particle size distribution for surface material in the South Fork Salmon River reach.

Sediment Transport

The bedload and suspended load measurements in water years 1985 through 1995 and in 1997 from the cableway. The sediment transport data includes 130 measurements of bedload transport and 92 measurements of suspended sediment. Sediment transport measurements spanned a range of stream discharges from 137 ft³/s (0.25Q_a; 0.05Q_b) to 5,260 ft³/s (9.46Q_a; 2.10Q_b). Bedload transport ranged from 0.02 to 1,040 t/d and suspended transport ranged from 0.58 to 1,600 t/d. Over the range of measured discharges, suspended transport accounts for the majority of the material in transport with over an order of magnitude greater suspended transport at the lower range of sampled discharges to approximately equal amounts at the highest discharge (Figure 6).

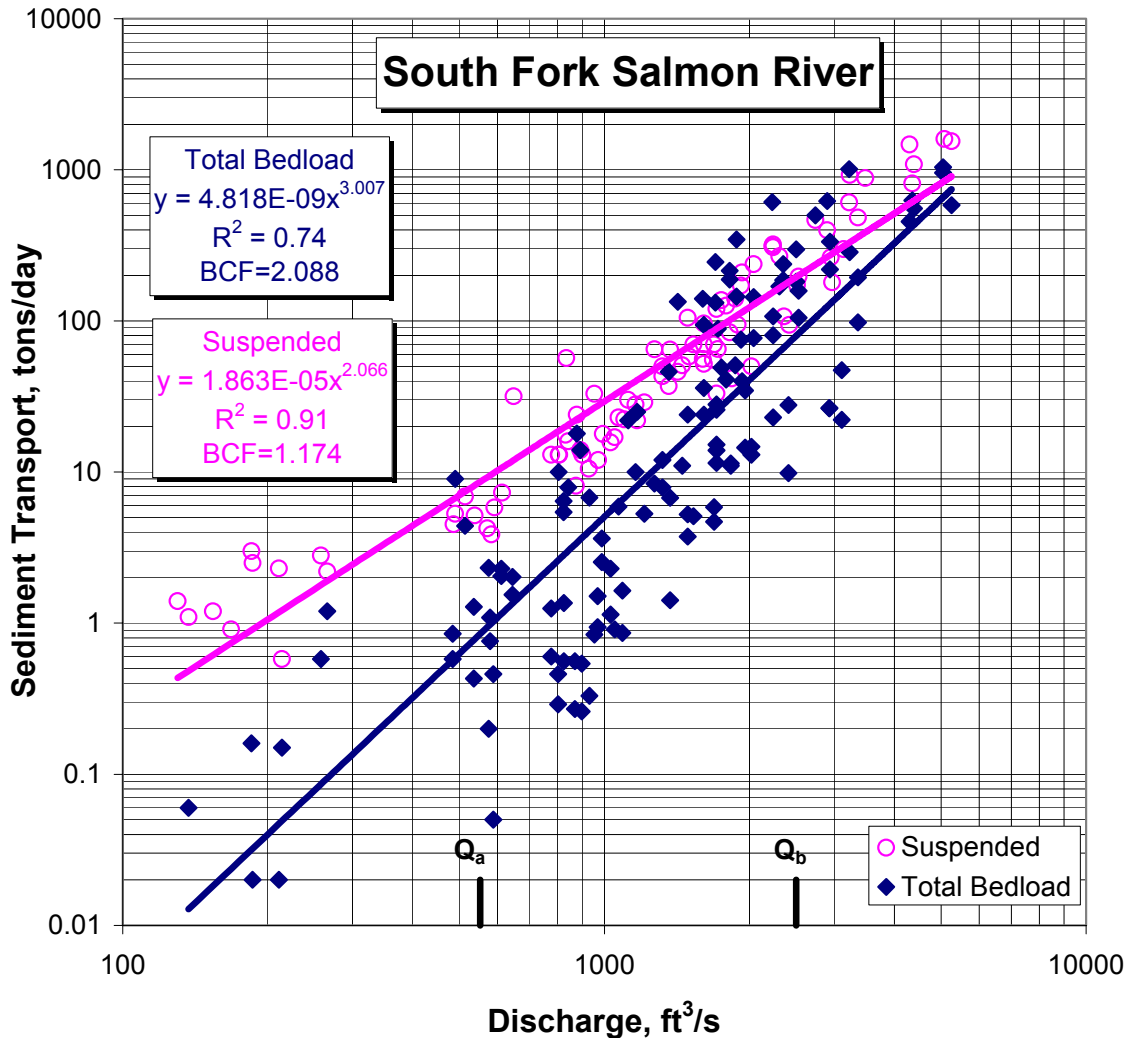


Figure 6. Bedload and suspended load transport rate versus discharge.

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 two bedload samples contained material larger than 32 mm diameter and these were at discharges of 1,710 ft³/s and 5,260 ft³/s.

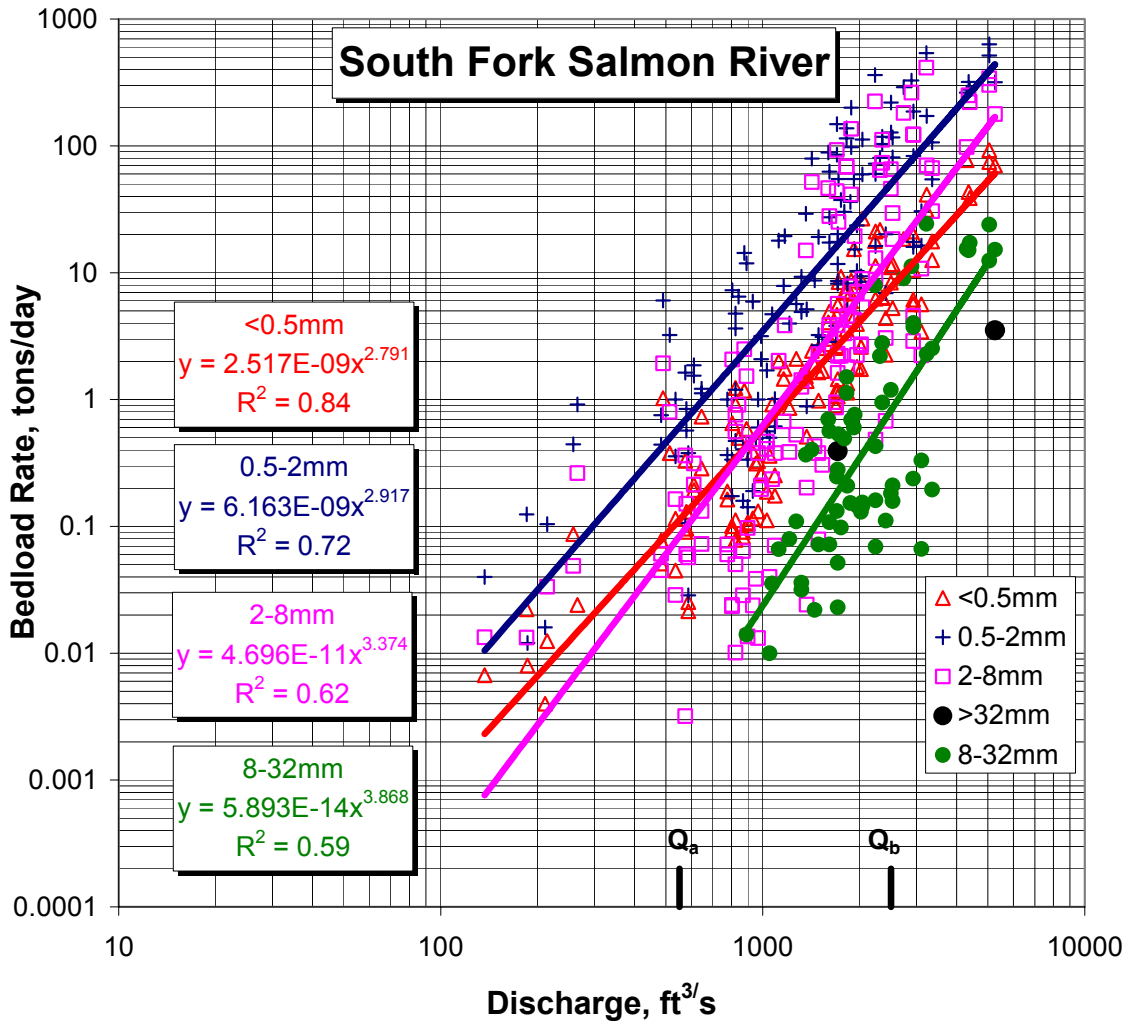


Figure 7. Bedload transport rate versus discharge for selected size classes.

The largest particle in the bedload sample generally increased with discharge (Figure 8). The largest particle measured in a bedload sample was 27 mm at a discharge of 5,050 ft³/s. Although the largest particle size increased with discharge, the D₅₀ for all but two samples was in the sand size, 0.5 to 2 mm. The largest median diameter of a bedload sample was only 2.29 mm.

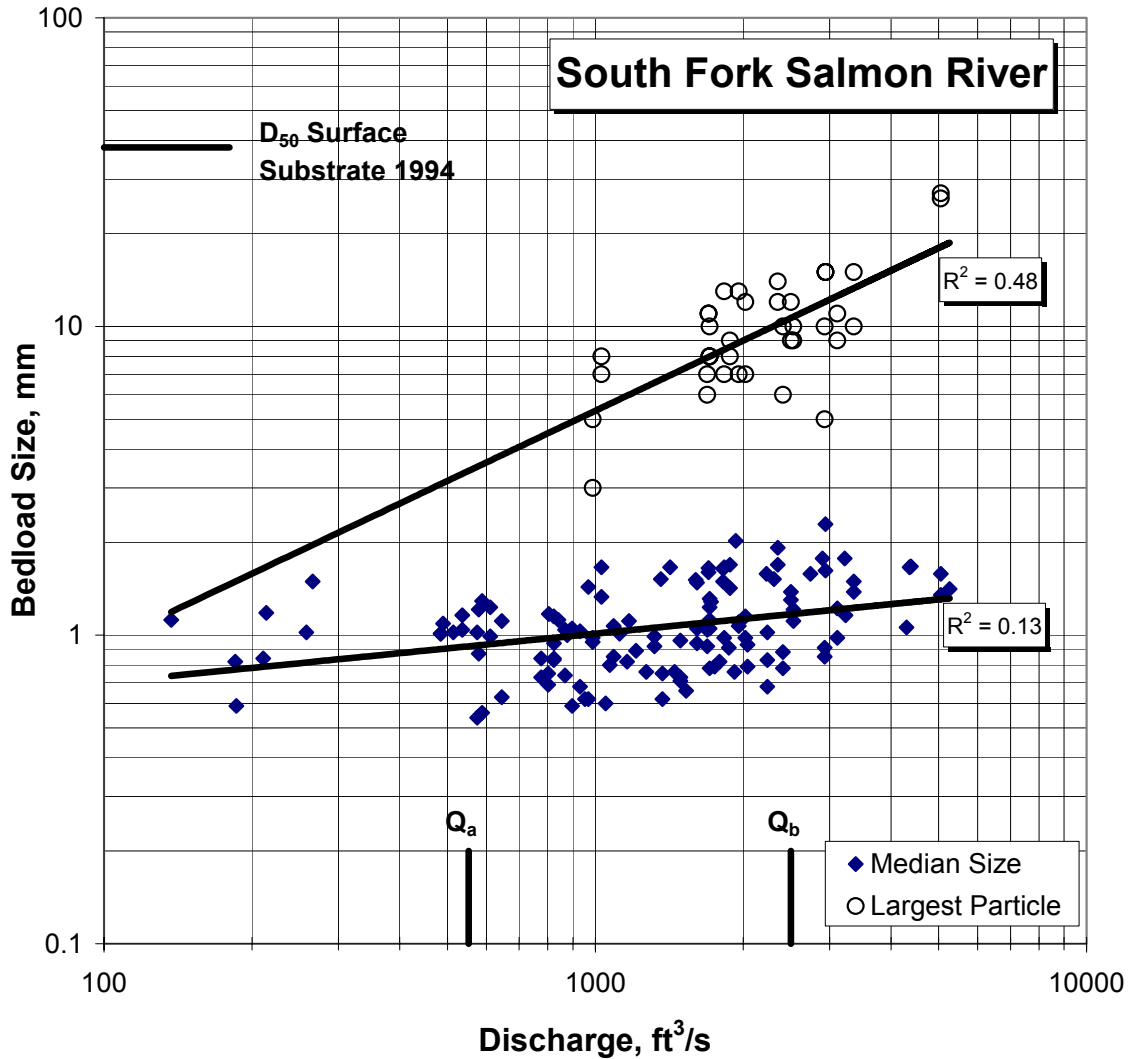


Figure 8. Largest particle in the bedload sample and median size of the sample versus stream discharge for the South Fork Salmon River.

Painted Rock Transport

A total of forty painted rocks were placed across two transects (twenty per transect) on April 26, 1995 at a secondary study reach about 1.5 miles upstream of the USGS gage. The average reach gradient at this site is 0.0008. Daily mean discharge on the day of rock placement was 760 ft³/s. The size of the rocks ranged from 43 to 120 mm diameter (b-axis) which represents the D₅₇ up to the D₉₀ of the surface particle size distribution for the reach. Transport of the rocks as of July 17, 1995 are shown in Figures 9 and 10.

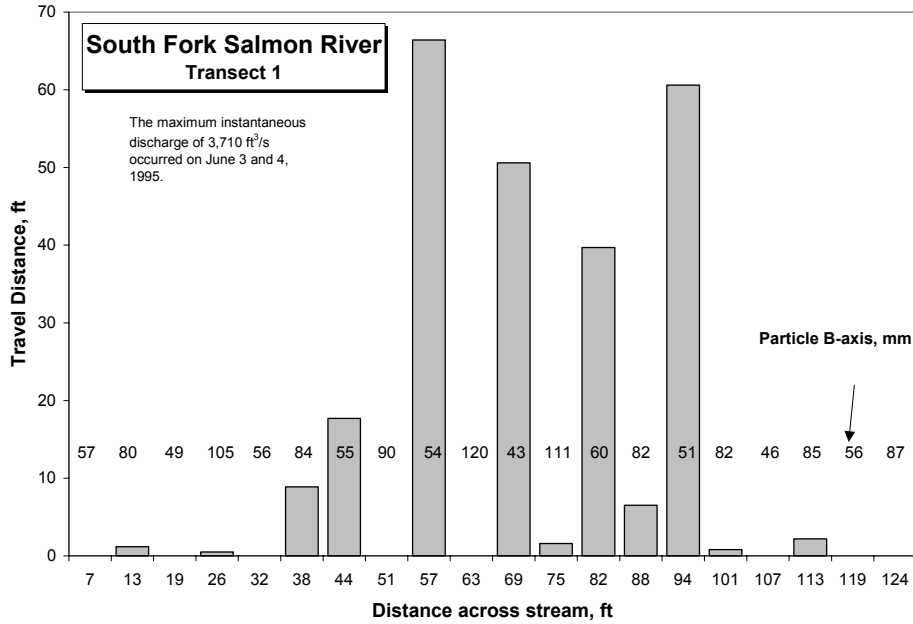


Figure 9. Transport distance of painted rocks at transect 1.

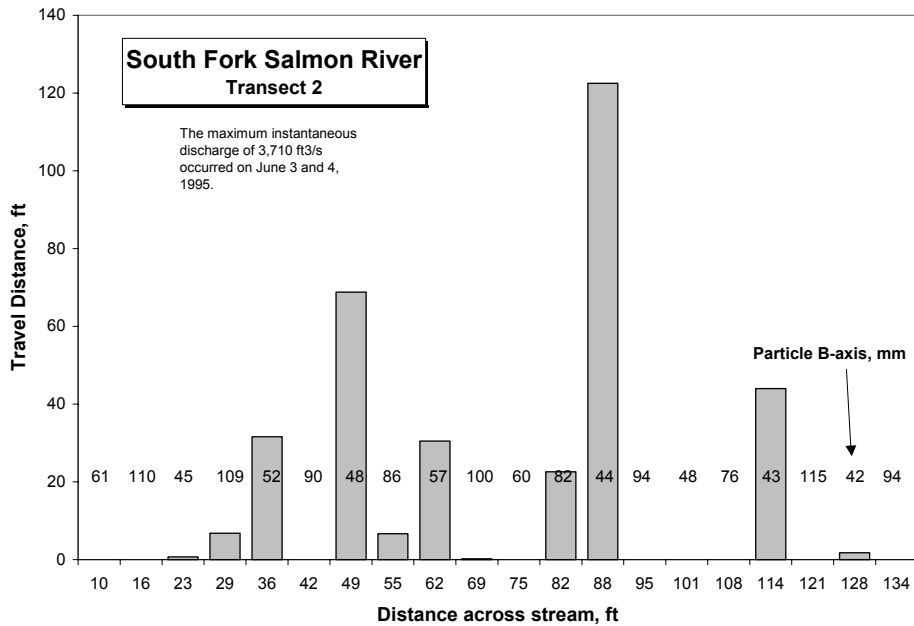


Figure 10 Transport distance of painted rocks at transect 2.

Thirty-four of the forty rocks were found. Of those found, fifteen had not moved. The maximum transport distance was 122.5 ft for a 44 mm diameter rock and the average was transport distance was 17.42 ft. The largest daily mean discharge during this period was 3,510 ft³/s on June 5, 1995 and the largest instantaneous discharge was 3,710 ft³/s on June 4 and June 5, 1995.