

Fourth of July Creek

General Information

Fourth of July Creek is a tributary of the Salmon River approximately 14 miles south of Stanley, Idaho. The study reach is about a 520 ft length of stream about 2.9 miles east of Highway 75. The site is on land administered by the Forest Service at an elevation of about 7,300 ft above sea level. The drainage area is 17.1 mi² and the geology of the watershed is intrusive igneous and sedimentary.

In 1994 and 1995, personnel of Case Western Reserve University established a stream gage and measured sediment transport and streamflow at this site. Additional information collected at this site include a survey of the stream reach, pebble counts of the substrate surface and transport distance of painted rocks during high flows in 1995. Figures 1 and 2 show photographs of Fourth of July Creek looking upstream and downstream from the measurement location for stream discharge and sediment transport.



Figure 1. Fourth of July Creek looking upstream from the measurement site.

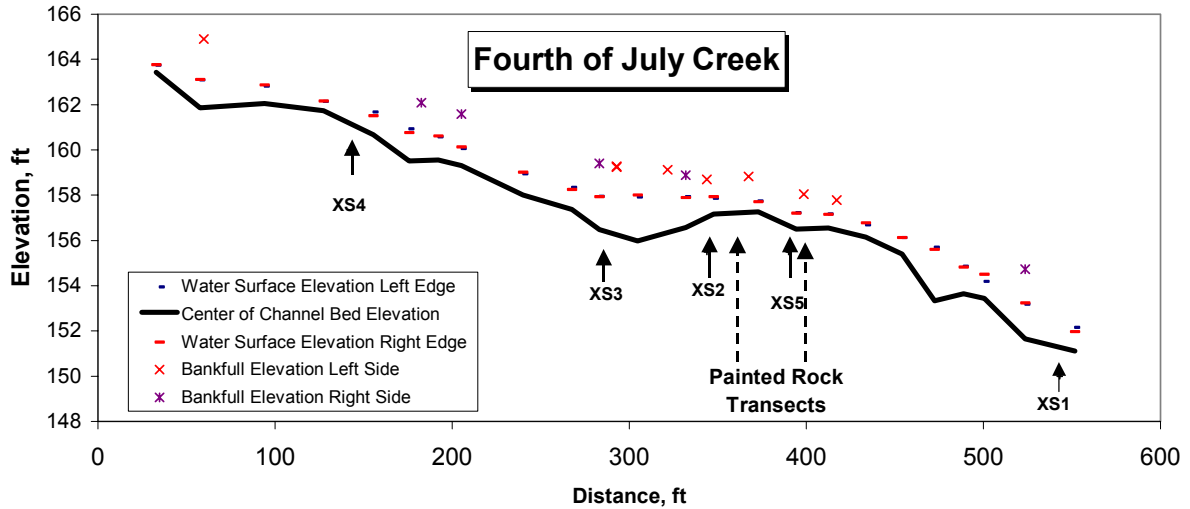


Figure 2. Fourth of July Creek looking downstream from the measurement site

Streamflow was recorded for water years 1994 and 1995 from the beginning of the spring snowmelt hydrograph until fall. Estimated average annual streamflow (Q_a) for the stream is $15.0 \text{ ft}^3/\text{s}$ and the estimated bankfull discharge (Q_b) is $137 \text{ ft}^3/\text{s}$. Stream discharge was recorded in 1994 from April 30 to October 21. Stream discharge was very low in 1994 and the largest daily mean discharge was only $36.7 \text{ ft}^3/\text{s}$. In 1995, stream discharge was recorded from April 21 to September 30 and the largest daily mean discharge recorded was $129 \text{ ft}^3/\text{s}$ on June 27. A portion of the flow is diverted upstream of the study reach. The diversion appears to be less than about $4 \text{ ft}^3/\text{s}$ and during 1994 occurred from July 7 to September 20 and in 1995 from August 25 to September 25.

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 0.0202 ft/ft. Cross-sections of the channel were surveyed at five locations. All but one of the discharge and sediment transport measurements were made at cross-section 2 (XS2) and the movement of painted rocks during the spring and early summer snowmelt flows in



1995 were measured at two transects about 16 and 52 ft downstream of XS2.

Figure 3. Longitudinal profile of the study reach in Fourth of July Creek.

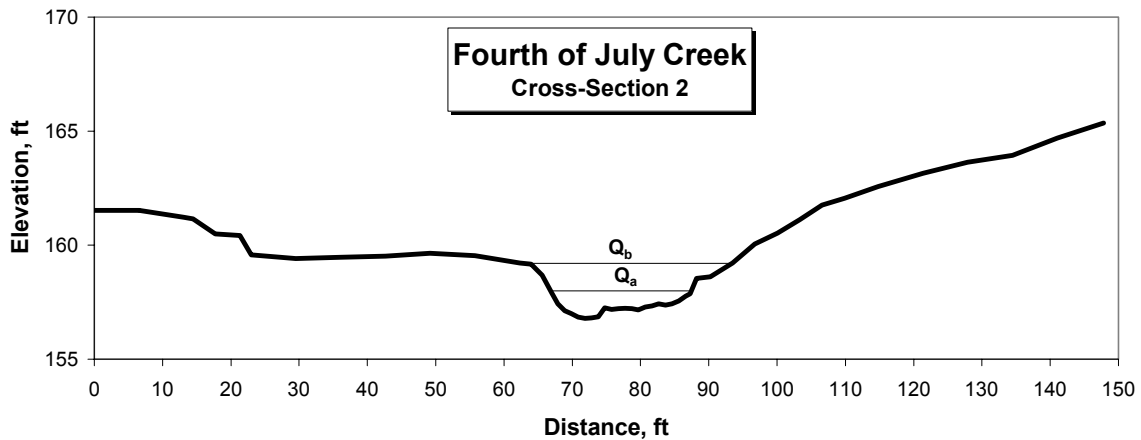


Figure 4. Cross-section of Fourth of July Creek at the sediment transport measurement site.

Figure 4 shows the cross-section at the sediment transport measurement site, cross-section 2. The channel geometry relationships for this cross-section are shown in Figure 5. All data collected in 1994 and 1995 were used to develop the power relationships with discharge, with the exception of the June 12, 1994 measurement made at a location about 33 ft upstream of cross-section 2. Over the range of discharges when sediment transport was measured (5.46 to 137 ft³/s), estimated stream width, estimated average depth and estimated average velocity varied from 17.5 to 26.8 ft, 0.5 to 1.5 ft, and 0.6 to 3.4 ft/s, respectively. The average reach slope is 0.0202 ft/ft.

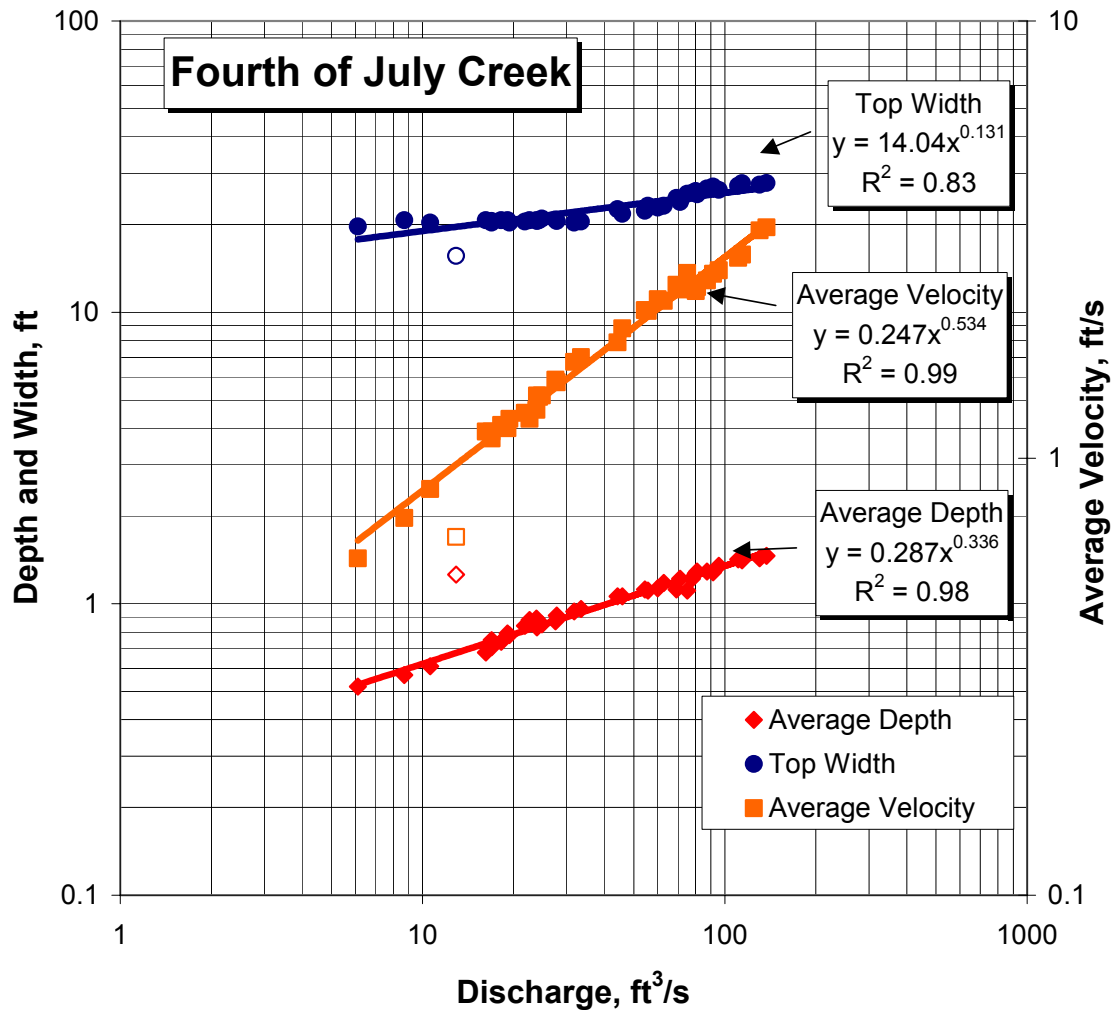


Figure 5. Width, average depth, and average velocity versus stream discharge at the predominant measurement site. (Open symbols are for a 6/12/94 measurement at site 33 ft upstream of cross-section 2).

Channel Material

Surface pebble counts were made within 15 ft of cross-section 2 on June 17, 1994. No subsurface cores were collected at this site. The average D_{50} and D_{90} for the surface material in the reach were 51 mm and 137 mm, respectively (Figure 6).

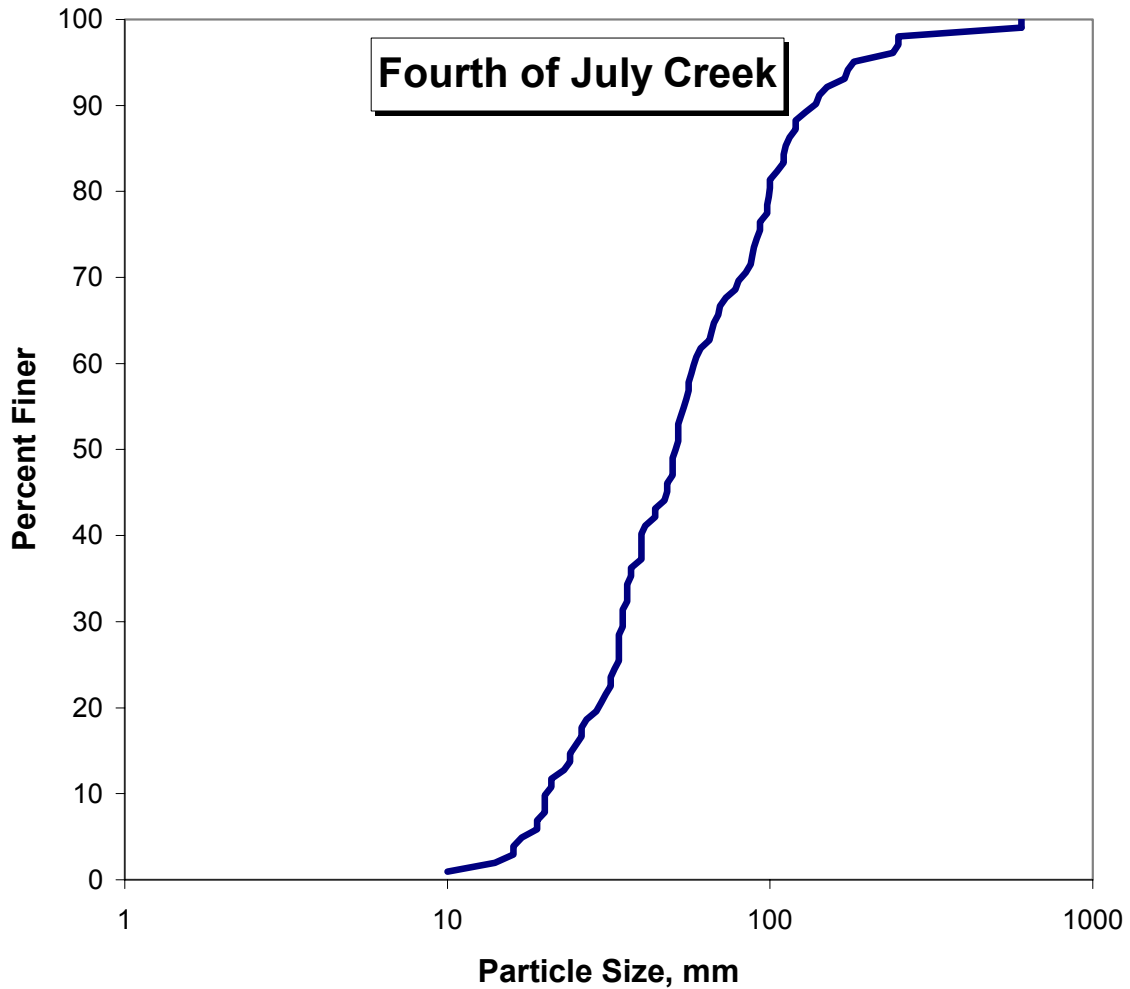


Figure 6. Particle size distribution for surface material samples in Fourth of July Creek.

Sediment Transport

The sediment transport data include 78 measurements of bedload transport and 25 measurements of suspended sediment transport. Sediment transport measurements spanned a range of stream discharges from 5.46 ft³/s (0.36Q_a; 0.04Q_b) to 137 ft³/s (9.13Q_a; 1.00Q_b). Bedload transport ranged from 0.00034 to 10.4 t/d and suspended transport ranged from 0.0952 to 71.7 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 at the lowest discharges and about three times as much at the highest discharges during which sediment transport was measured (Figure 7).

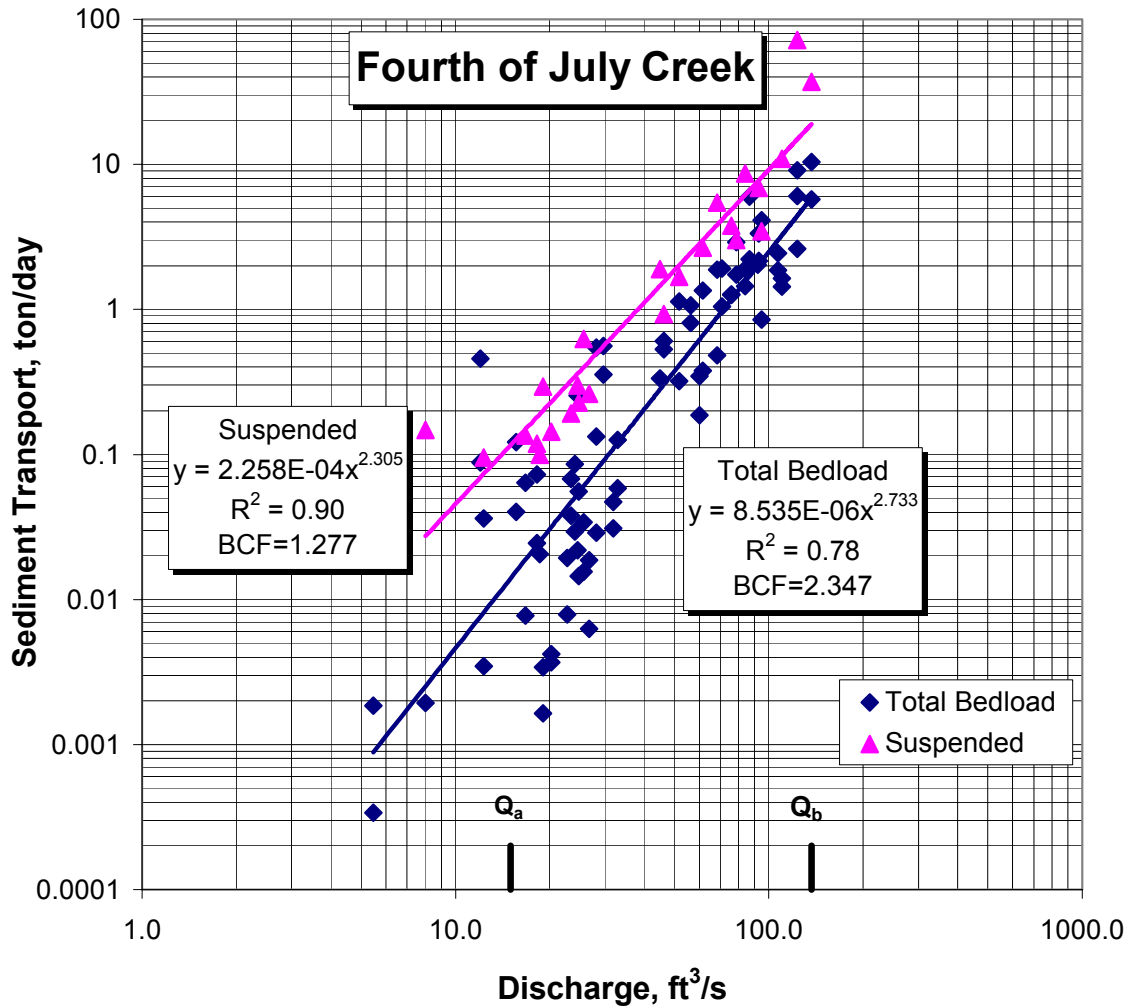


Figure 7. Bedload and suspended load transport rate versus discharge.

The bedload transport rates by size class (Figure 8) shows that the larger rates are associated with material in the 0.5 to 2mm diameter size class. No curve fitting was done for sediment >22.6mm diameter since only eight of the samples contained this size class of material. All discharges transporting material >22.6mm exceeded 68.3 ft³/s.

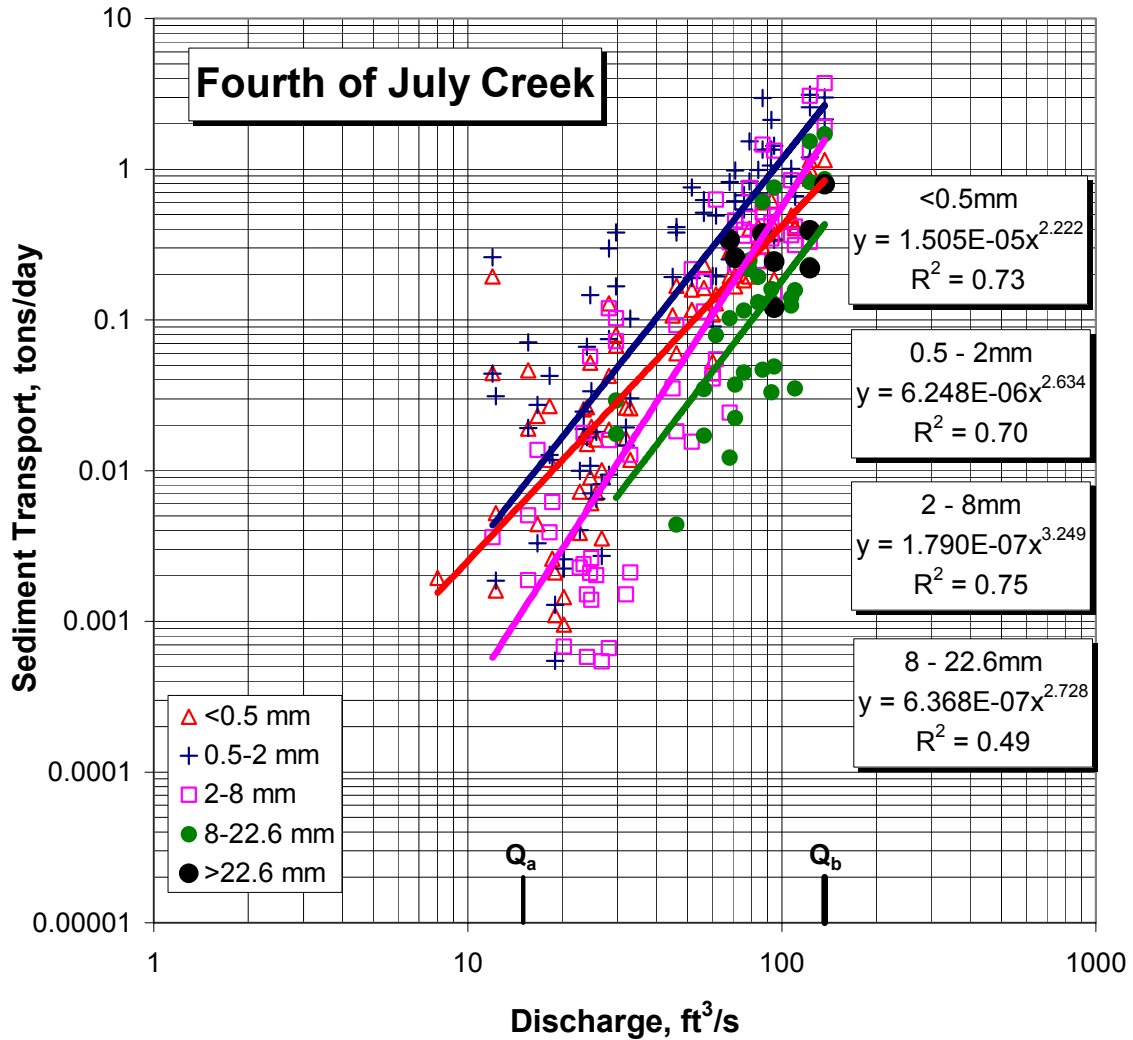


Figure 8. Bedload transport rate versus discharge for selected size classes.

The size of the largest particle in the bedload sample increased with discharge (Figure 9). The largest particle measured in a bedload sample was 40 mm at a discharge of 130 ft³/s. There is also a trend of increasing median size of the bedload sample with increasing discharge. The D₅₀ for most of the bedload samples was in the sand size, 0.5 to 2.0 mm, with only four samples exceeding 2 mm. The largest median diameter of a bedload sample was 3.1 mm. The information on the largest particle in the bedload sample and observations of painted rock movement suggest that discharges at or slightly above the bankfull discharge are capable of moving the median diameter particles on the channel surface.

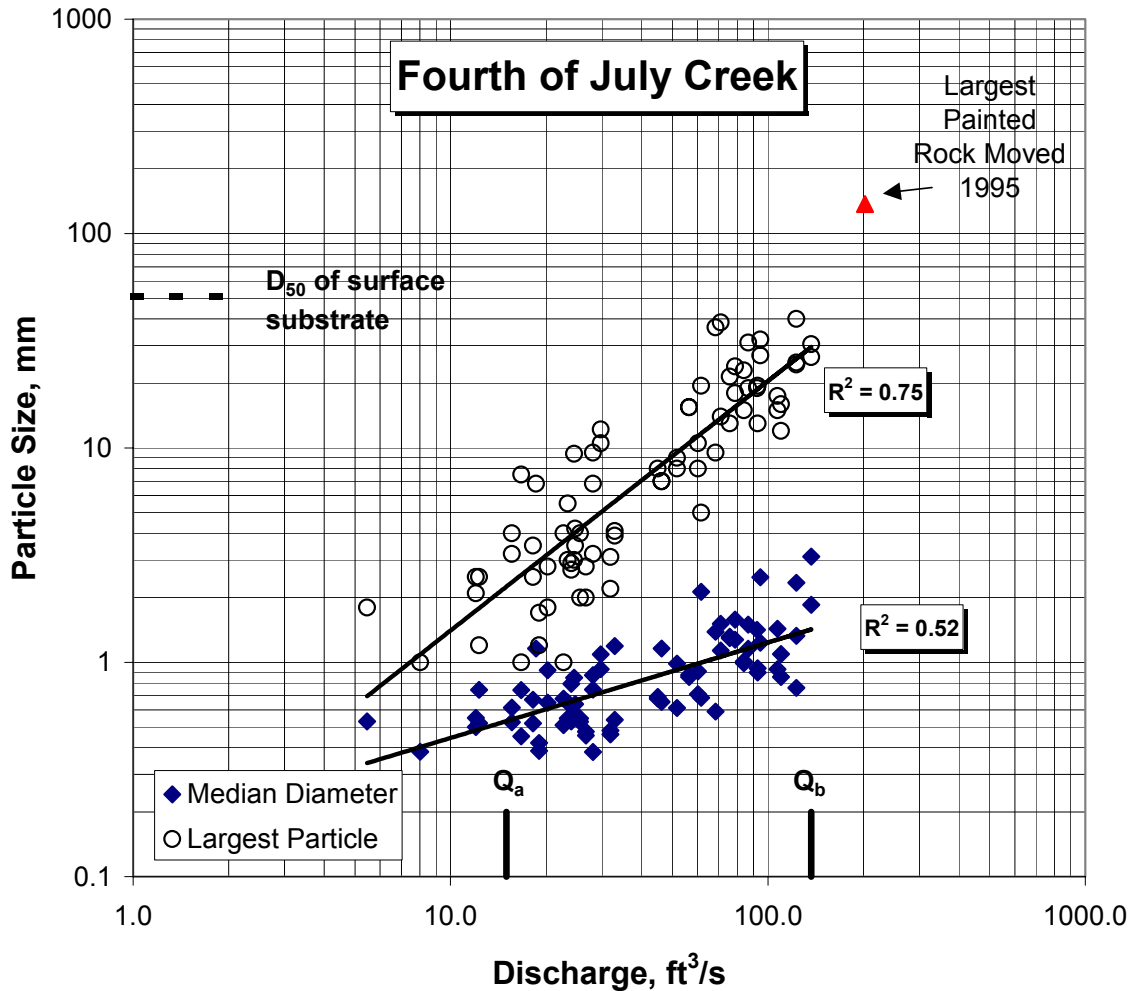


Figure 9. Median size of the bedload sample and the largest particle size versus stream discharge for Fourth of July Creek.

Painted Rock Transport

A total of forty painted rocks were placed across two transects (twenty per transect) on May 29, 1995. Daily mean discharge on the day of rock placement was 26.7 ft³/s. The size of the rocks ranged from 32 to 137 mm diameter (b-axis) which represent the D₂₄ up to the D₉₀ of the surface particle size distribution measured at cross-section 2. Transport of the rocks as of July 5, 1995 are shown in Figures 10 and 11.

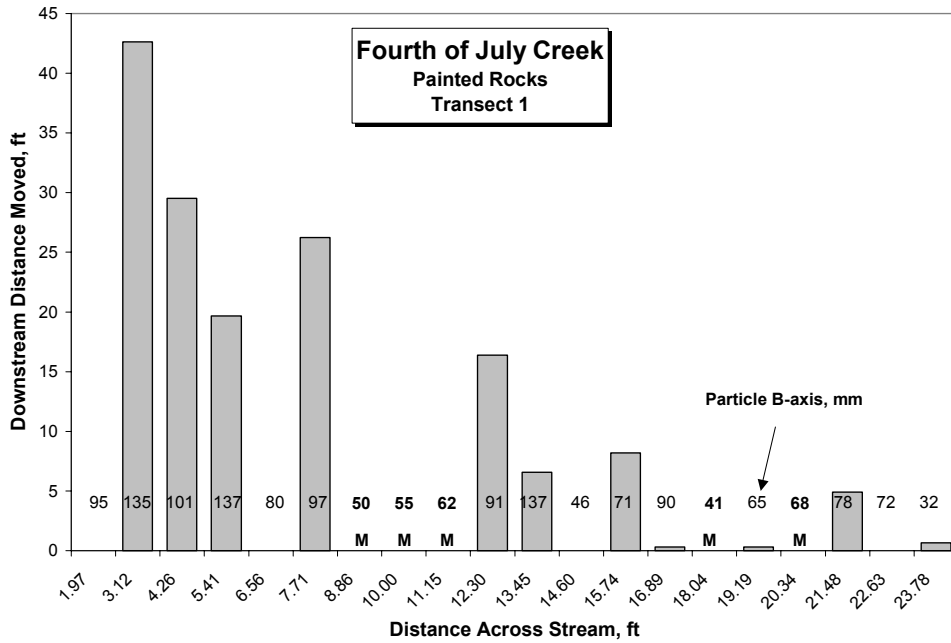


Figure 10. Transport distance of painted rocks at transect 1.

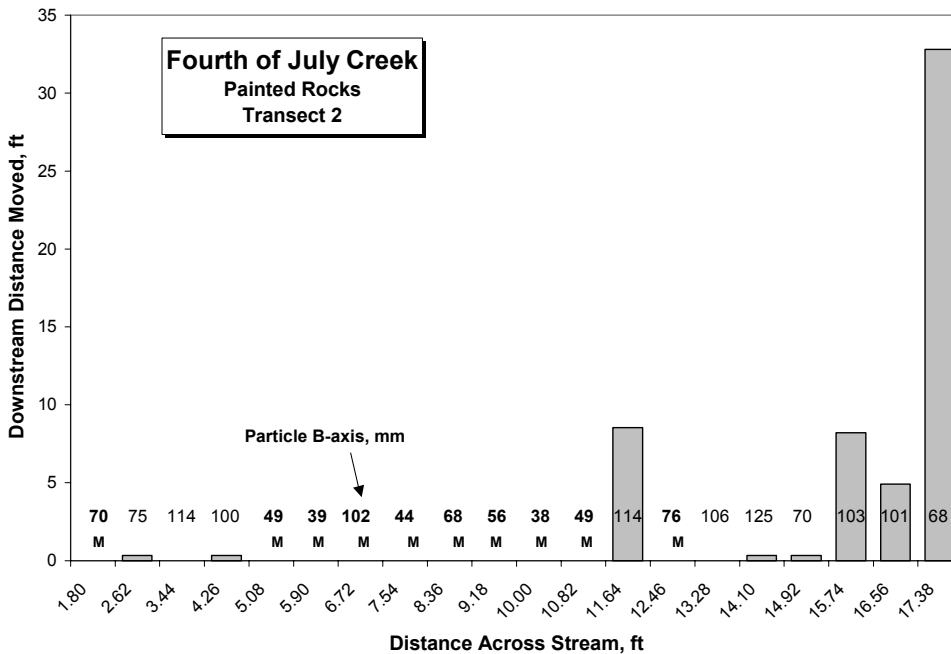


Figure 11 Transport distance of painted rocks at transect 2.

Twenty two of the forty rocks were found. Of those found, only three had not moved. The maximum transport distance was 42.6 ft for a 135mm diameter rock and the average transport distance was 9.6 ft. The largest daily mean discharge during this period was 129 ft³/s on June 27, 1995 and the largest instantaneous discharge was 202 ft³/s.