Valley Creek

General Information

Valley Creek is a tributary of the Salmon River at Stanley, Idaho. The study reach is a 1,500 ft length of stream at the Geological Survey (USGS) gage 13295000 (Valley Creek at Stanley, Idaho) in the Sawtooth National Forest. The site is just upstream of the confluence with the Salmon River at an elevation of about 6,222 ft. The drainage area is 148.9 mi^2 and the geology of the watershed is predominantly intrusive igneous and valley deposits associated with glaciation.

In 1994 and 1995 personnel of Case Western Reserve University and personnel of the US Geological Survey (USGS) both independently measured sediment transport at this site. USGS personnel also measured sediment transport on two dates during the high flows in 1997. Additional information collected at this site include a survey of the stream reach, pebble counts of the substrate surface and core samples of the substrate subsurface material. Figures 1 and 2 show photographs of looking upstream and downstream from a foot bridge about 300 ft upstream of the USGS gage.

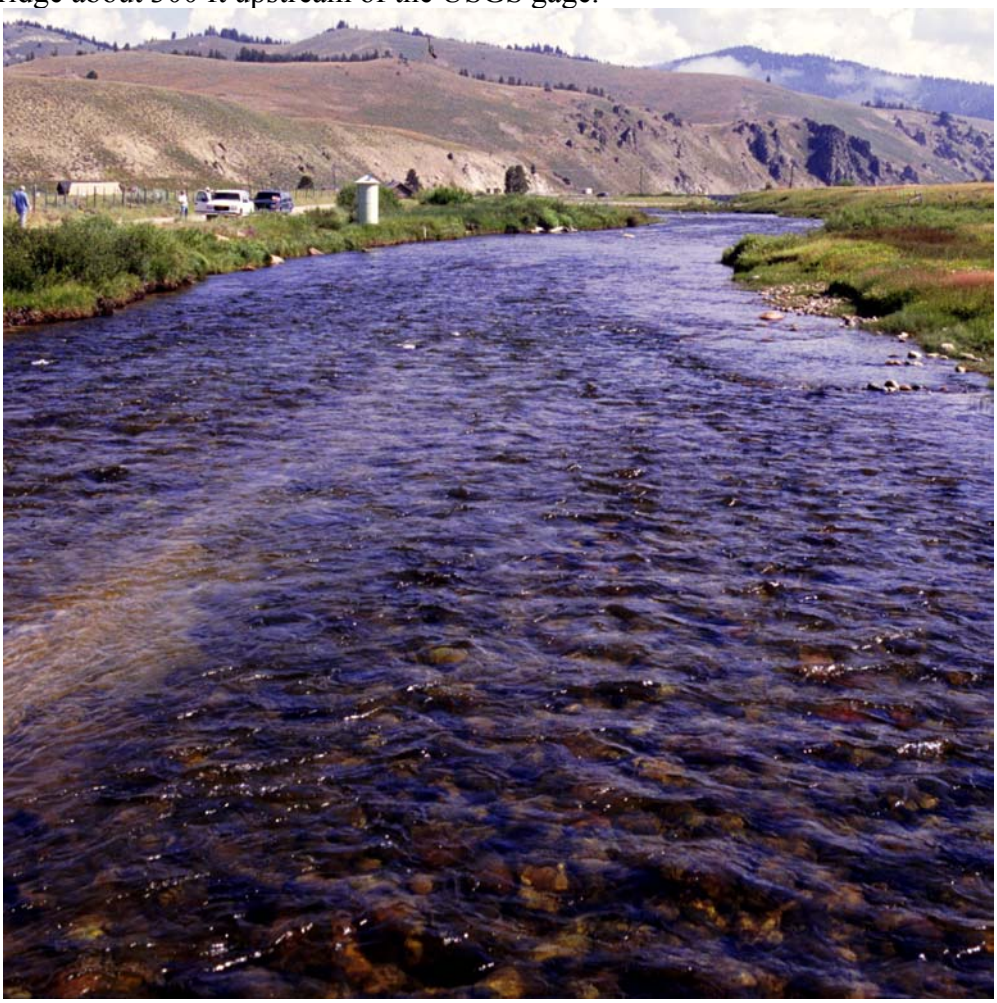

Figure 1. Valley Creek looking downstream from the foot bridge.

Figure 2. Valley Creek looking upstream from the foot bridge.

Daily mean discharge records are available for May 1911 to October 1913, May 1921 to December 1971, April 1972 to September 1972 and October 1992 to present. Estimated average annual discharge (Q_a) for the stream is 205 ft^3/s and the estimated bankfull discharge (Q_b) is 850 ft^3/s. The range of daily mean discharge for the period of record is 34 ft^3/s to 1,900 ft^3/s. The largest discharge recorded was 2,000 ft^3/s on May 24, 1956.

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 0.0040 ft/ft. Cross-sections of the channel were surveyed at seven location locations. Figure 3 shows the locations of the five cross-sections surveyed by CWRU personnel and the three cross-sections surveyed by USFS personnel (underlined). Cross-section 4 (not underlined) is the upstream side of the foot bridge and cross-section 2 (cross-section 5 underlined) is at the USGS gage.

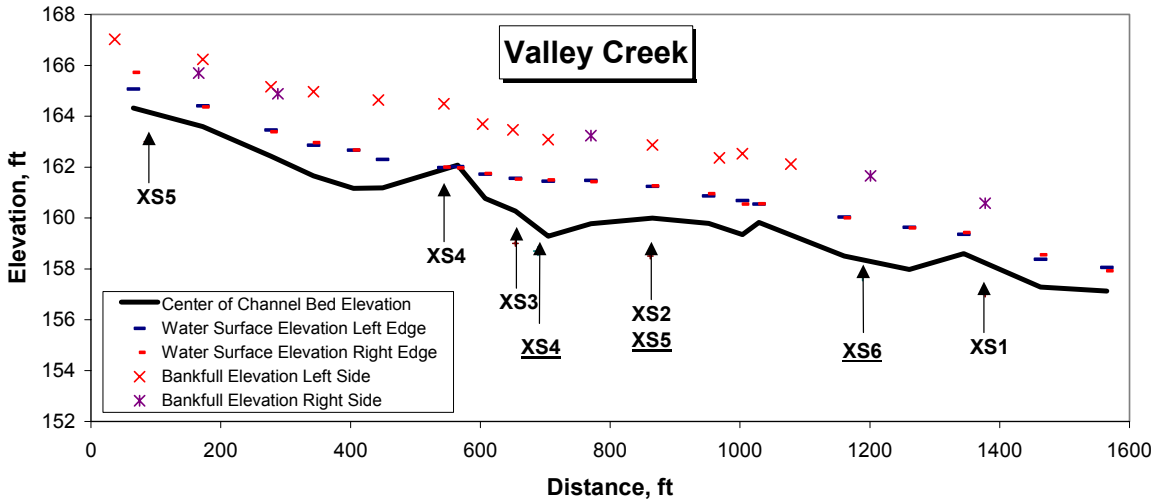

Figure 3. Longitudinal profile of the study reach in Valley Creek.

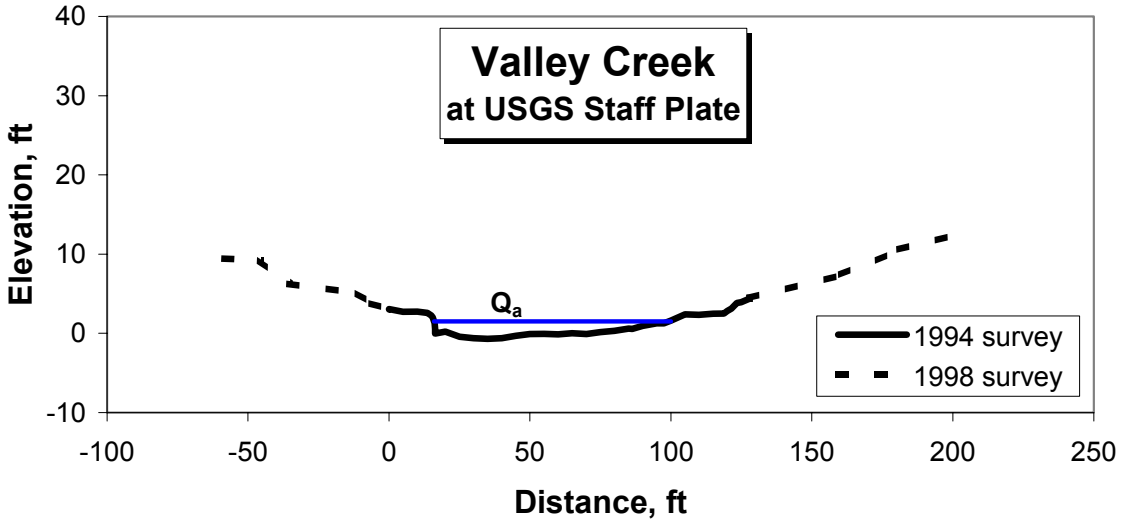

Figure 4. Cross-section of Valley Creek at the USGS staff plate.

Channel Geometry

Figure 4 shows the cross-section at the USGS gage at Valley Creek. The channel geometry relationships for this cross-section are shown in Figure 5. All data collected from Sept. 1992 through Jan. 1998 were used to develop the displayed power relationships with discharge. Sediment transport was measured during discharges ranging from 139 to 1,420 ft^3/s. Wading measurements of sediment transport within 150 ft of this cross-section were at discharges ranging from 166 to 680 ft^3/s. For this range of discharges, the estimated stream width, estimated average depth and estimated average velocity varied from 72.0 to 79.6 ft, 1.32 to 2.35 ft, and 1.8 to 3.6 ft/s, respectively. The average reach gradient is 0.0040 ft/ft.

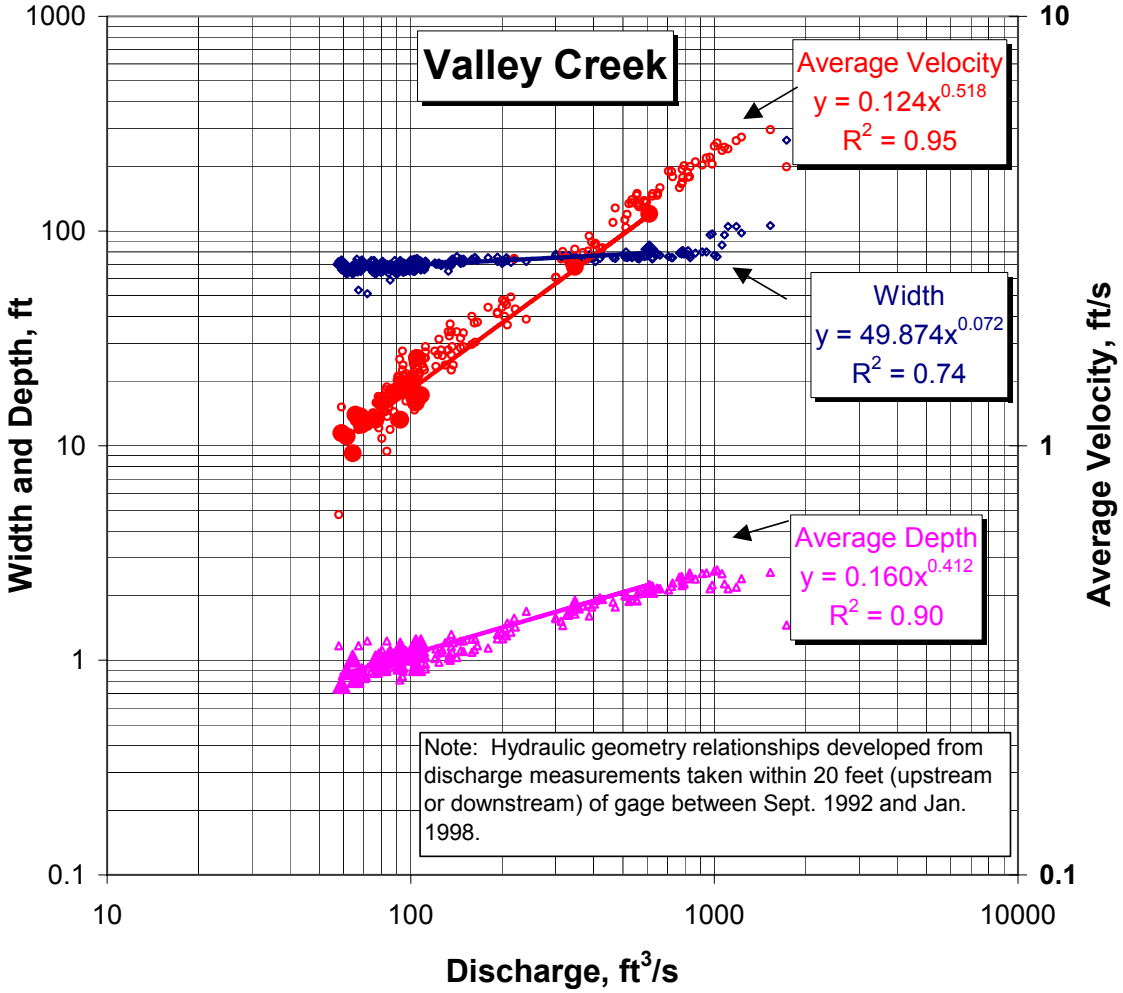

Figure 5. Width, average depth, and average velocity versus stream discharge at the cross-section at the USGS gage on Valley Creek. (Open symbols represent data collected prior to Sept. 1992 and were not used to develop the power relationships.)

Channel Material

Surface pebble counts were made at three cross-sections (XS4, XS5, and XS6) by USFS personnel and at one cross-section (XS1) by CWRU personnel in 1994. Surface pebble counts were also made at four cross-sections and four cores of subsurface material were collected, one at each cross-section, in 1995. The D_{50} and D_{90} for the combined pebble counts (1995) in the reach were 40 mm and 132 mm, respectively (Figure 6). About 16% of the surface material was sand (2 mm) size or smaller in the 1995 sampling. The D_{50} and D_{90} for the combined subsurface cores (1995) were 21 mm and 81 mm, respectively. The D_{50} for the surface of the floodplain material ranged between 0.16 and 0.22 mm.

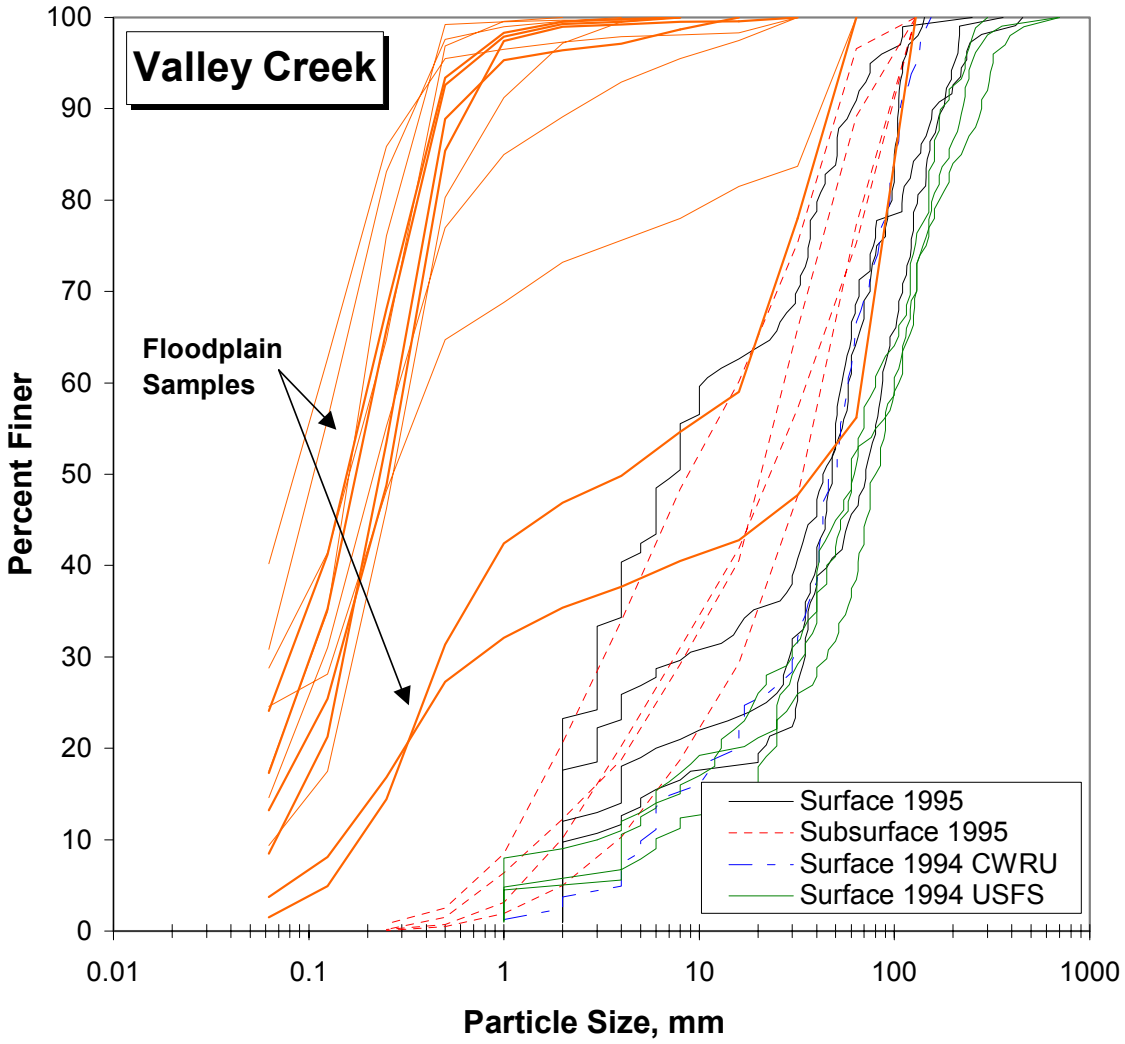

Figure 6. Particle size distribution for surface and subsurface substrate samples in the Valley Creek reach.

Sediment Transport

The bedload and suspended load measurements in water years 1994 through 1997 were all made at various locations within the reach. All measurements by Case Western Reserve University personnel were at the foot-bridge, about 300 ft upstream of the gage. USGS personnel made measurements near the gage at discharges less than about 700 ft^3/s. At higher flows they made measurements 500 ft and 1,000 ft downstream of the gage and at highest discharges they made measurements from the highway bridge about 1,000 ft downstream of the gage. The sediment transport data includes 116 measurements of bedload transport and 71 measurements of suspended sediment. Sediment transport measurements spanned a range of stream discharges from 139 ft^3/s ($0.68Q_a$; $0.16Q_b$) to 1,420 ft^3/s ($6.96Q_a$; $1.67Q_b$). Bedload transport ranged from 0.0077 to 89.8 t/d and suspended transport ranged from 1.08 to 223 t/d. At discharges less than about 500 ft^3/s suspended transport accounts for the majority of the material in transport and at higher discharges bedload accounts for the majority of material in transport (Figure 7).

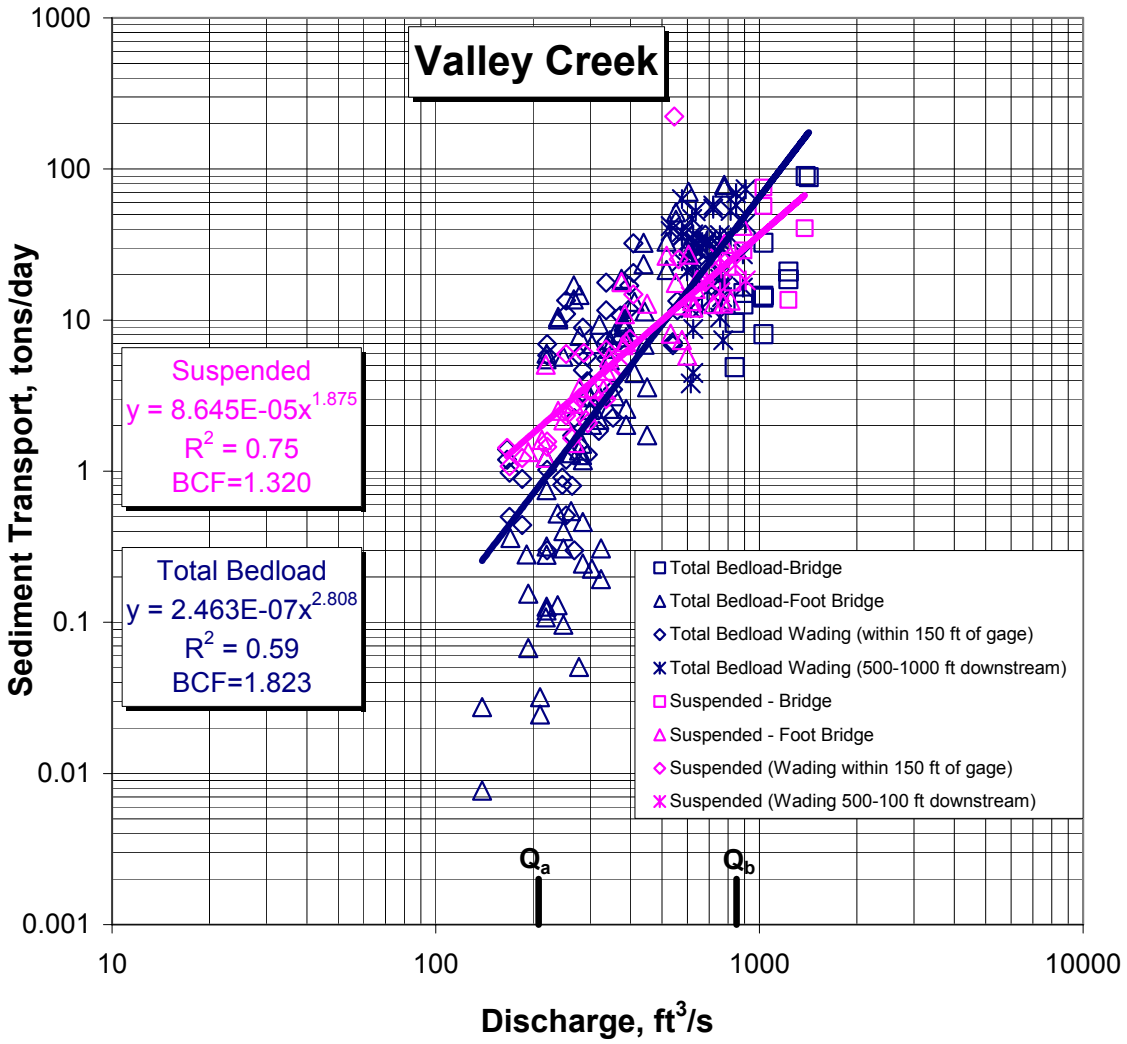

Figure 7. Bedload and suspended load transport rate versus discharge.

The bedload transport rates by size class (Figure 8) shows that the larger rates are associated with material 0.5 to 2 mm diameter and 2 to 8 mm diameter. Only seven bedload samples contained material larger than 32 mm diameter and these were at discharges of 614 ft^3/s and larger.

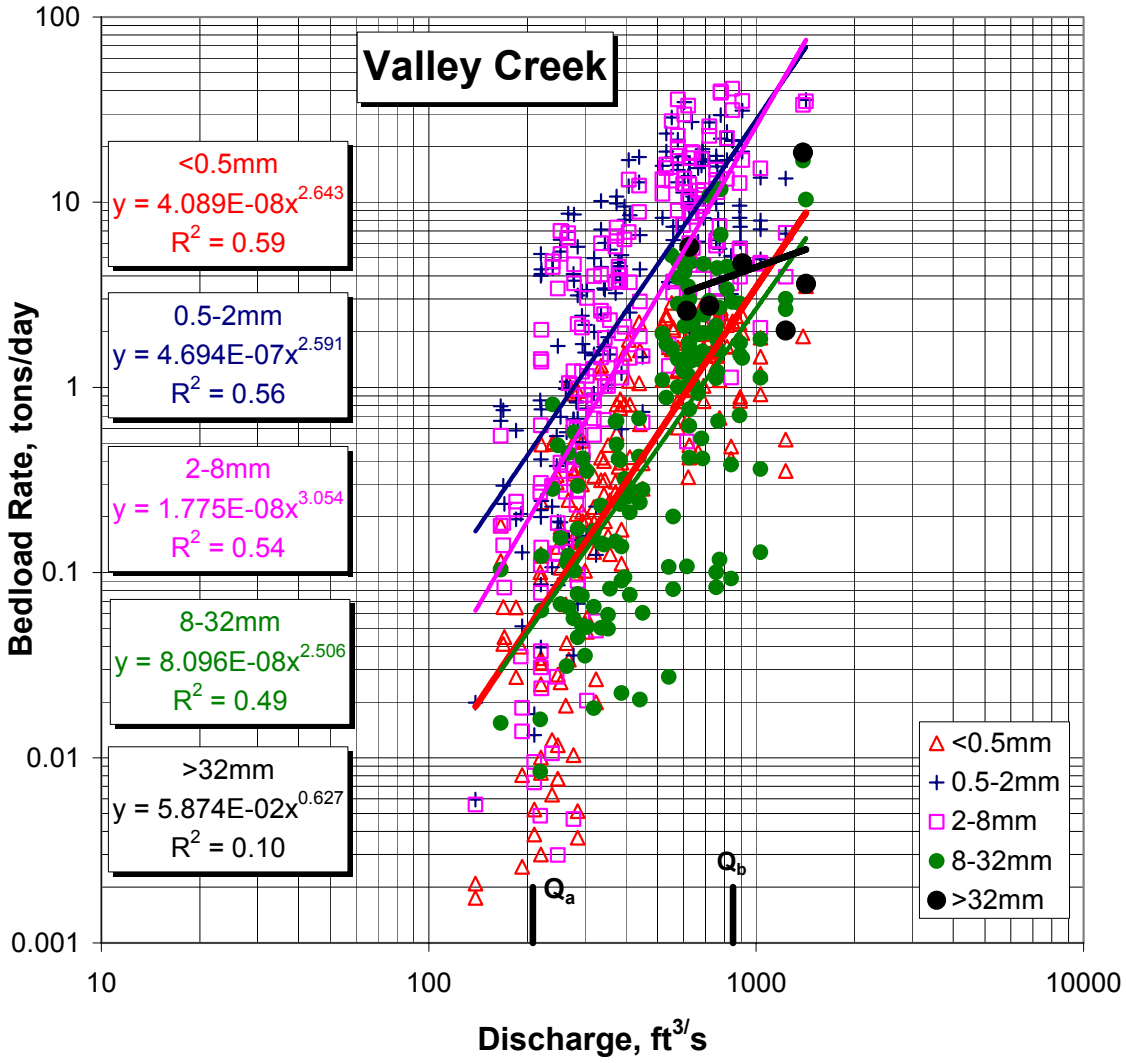

Figure 8. Bedload transport rate versus discharge for selected size classes

The largest particle in the bedload sample generally increased with discharge (Figure 9). The largest particle measured in a bedload sample was 141 mm at a discharge of 1,390 ft^3/s. There is also a weak trend of increasing median size of the bedload sample with increasing discharge. The largest median size of a bedload sample was 18.5 mm. The relationship between discharge and the largest particle in the bedload sample and the observations of painted rock movement suggest that discharges near bankfull discharge are capable of moving the median diameter particles on the channel surface.

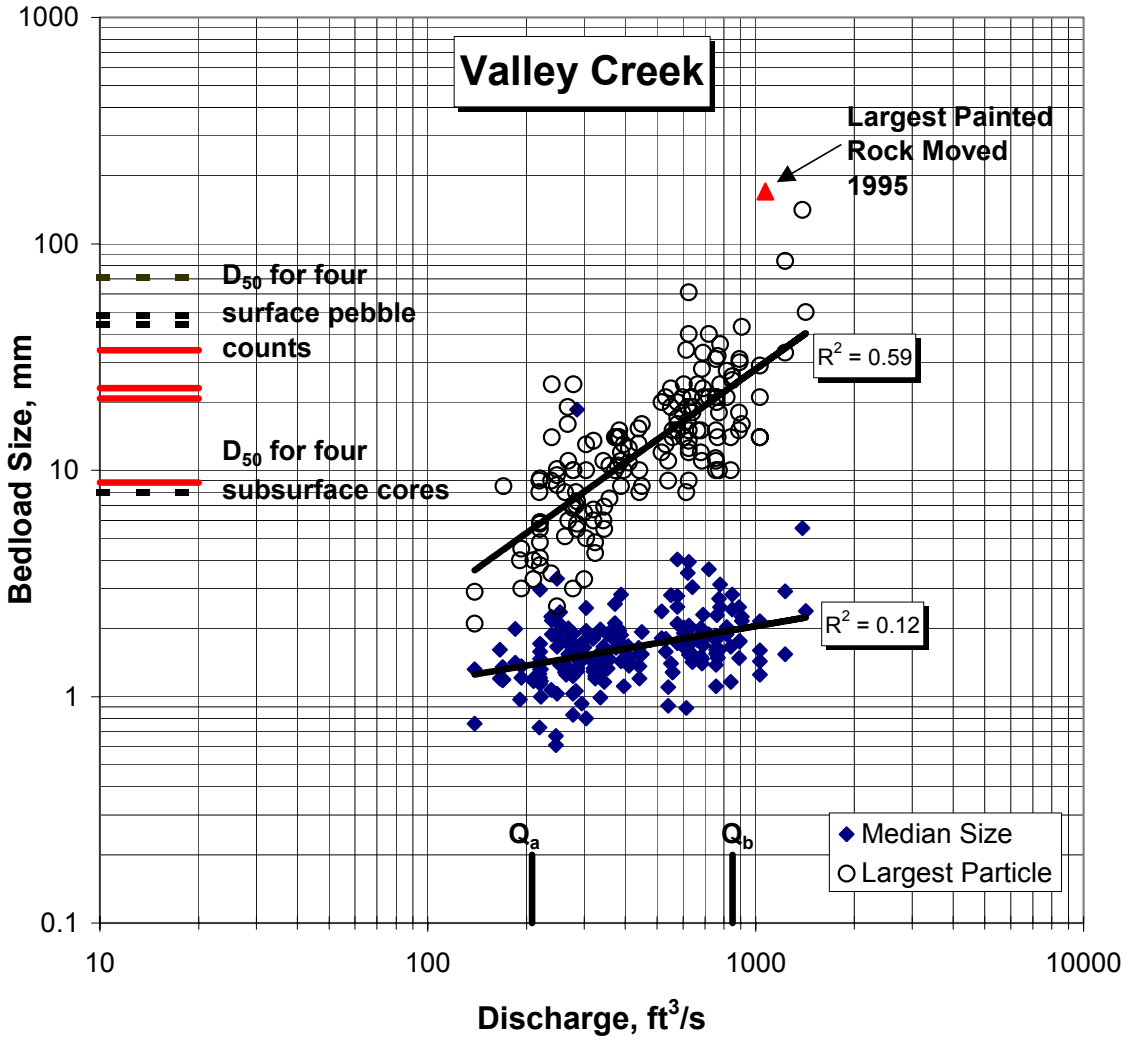

Figure 9. Largest particle in the bedload sample and median size of the sample versus stream discharge for Valley Creek.

Painted Rock Transport

A total of forty painted rocks were placed across two transects (twenty per transect) on April 12, 1995. Daily mean discharge on the day of rock placement was 219 ft^3/s. The size of the rocks ranged from 69 to 190 mm diameter (b-axis) at transect 1, which represents the D_{69} up to the D_{96} of the average surface particle size distribution measured in the reach in 1995. The size of the rocks ranged from72 to 206 mm diameter (b-axis) at transect 2, which represents the D_{71} up to the D_{97} of the average surface particle size distribution measured in the reach in 1995. Transport of the rocks as of August 11, 1995 are shown in Figures 10 and 11.

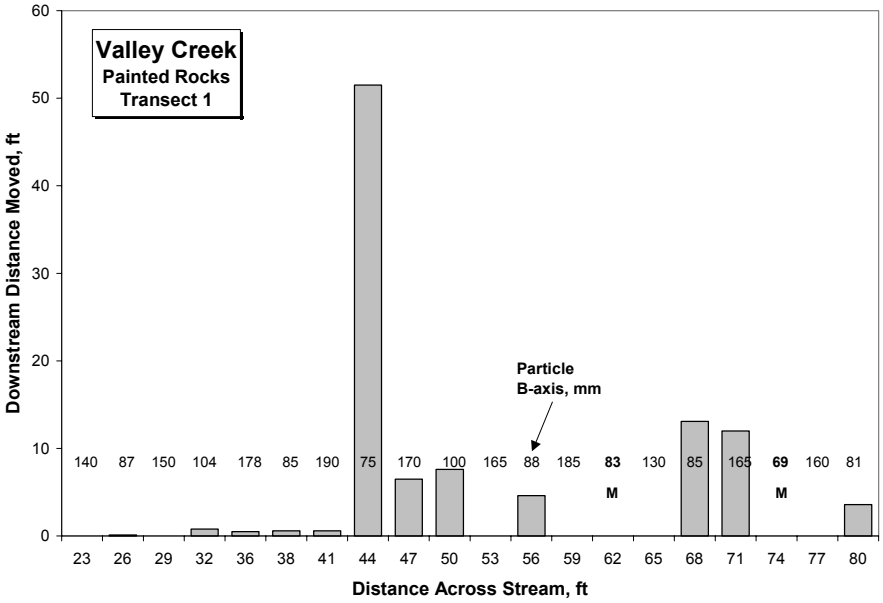

Figure 10. Transport distance of painted rocks at transect 1.

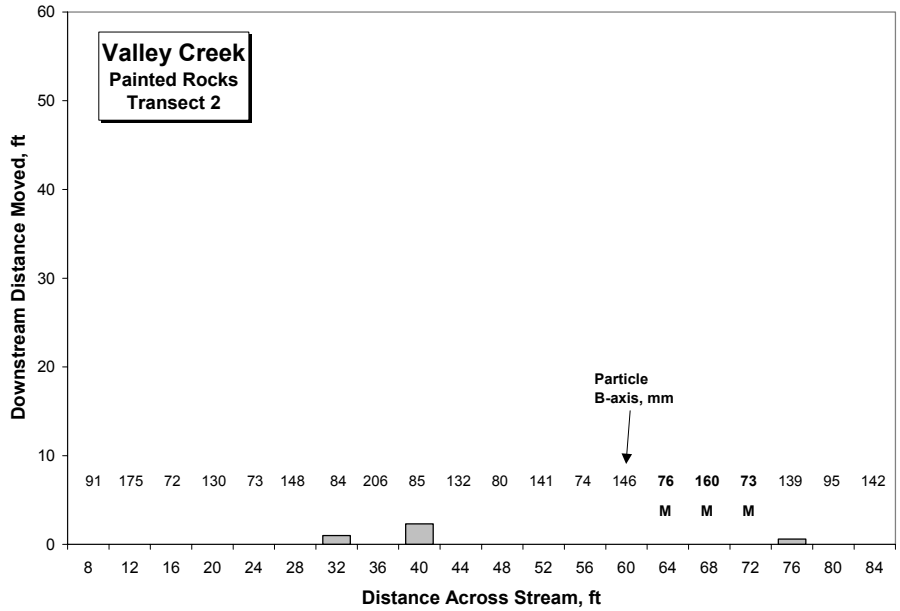

Figure 11. Transport distance of painted rocks at transect 2.

Thirty five of the forty rocks were found. Of those found, eight had moved more than 1 ft. Most of the movement occurred for rocks in transect 1. The maximum transport distance was 51.5 ft for a 75mm diameter rock and the average was transport distance was 3.0 ft. The largest daily mean discharge during this period was 1,020 ft^3/s on June 6, 1995 and the largest instantaneous discharge was 1,070 ft^3/s on the same date.