

# Thompson Creek

## General Information

Thompson Creek is a tributary of the Salmon River near Clayton, ID. The study reach is a 420 ft length of stream located upstream of the confluence with Pat Hughes Creek about 2.7 miles upstream of the existing USGS gaging station (13297330, Thompson Creek near Clayton, ID). The elevation of the study reach is about 5,700 ft. The drainage area above the USGS gage is 29.5 mi<sup>2</sup> and above the study reach is 21.8 mi<sup>2</sup>. The geology of the watershed is predominantly 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 the site include a survey of the stream reach, pebble counts of the substrate surface in 1994, core samples of surface and subsurface substrate in 2000 and transport distance of painted rocks during high flows in 1995. Figure 1 shows a photograph of Thompson Creek looking downstream.



Figure 1. Downstream view of Thompson Creek.

Streamflow records are also available for the downstream USGS station since water year 1972. Discharge at the study reach is estimated as 95.7% of the discharge of the USGS station. Estimated average annual streamflow for the stream is at the study reach is 15.8 ft<sup>3</sup>/s and the estimated bankfull discharge is 87.6 ft<sup>3</sup>/s. Stream discharge in 1994 was very low and the largest mean daily discharge and instantaneous peak discharge were only 31.6 ft<sup>3</sup>/s and 34.0 ft<sup>3</sup>/s, respectively. In 1995 the largest mean daily discharge and instantaneous peak discharge were 120 ft<sup>3</sup>/s and 135 ft<sup>3</sup>/s, respectively, on June 4, well above bankfull discharge.

### 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 0.0153 ft/ft. Cross-sections of the channel were surveyed at four locations. Discharge and sediment transport measurements were made at cross-section 1 (XS1) and the movement of painted rocks during the spring and early summer snowmelt flows in 1995 were measured at two transects about 13 and 28 ft downstream of XS1.

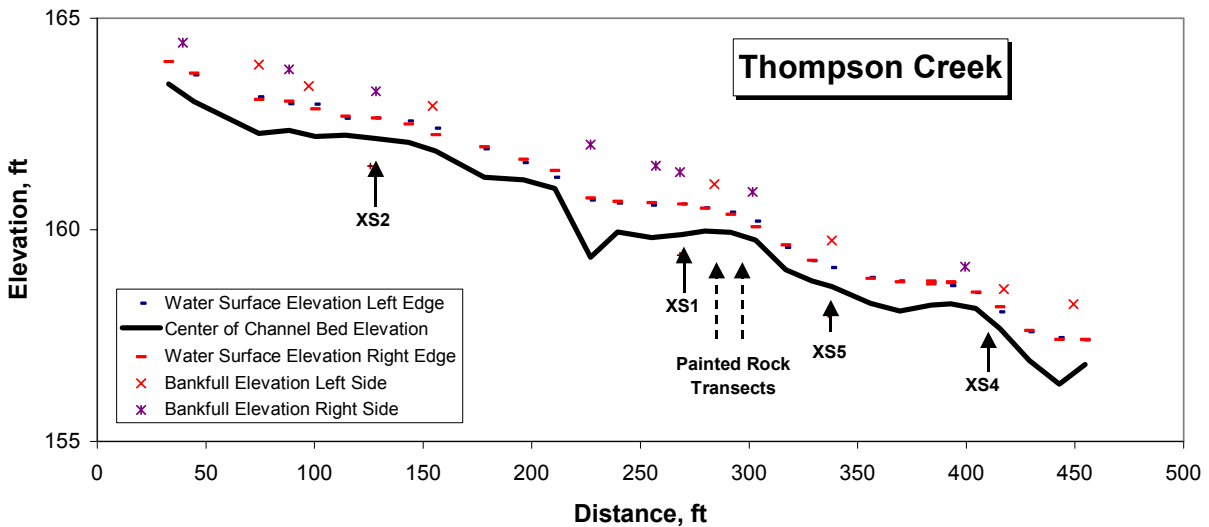


Figure 2. Longitudinal profile of the study reach in Thompson Creek.

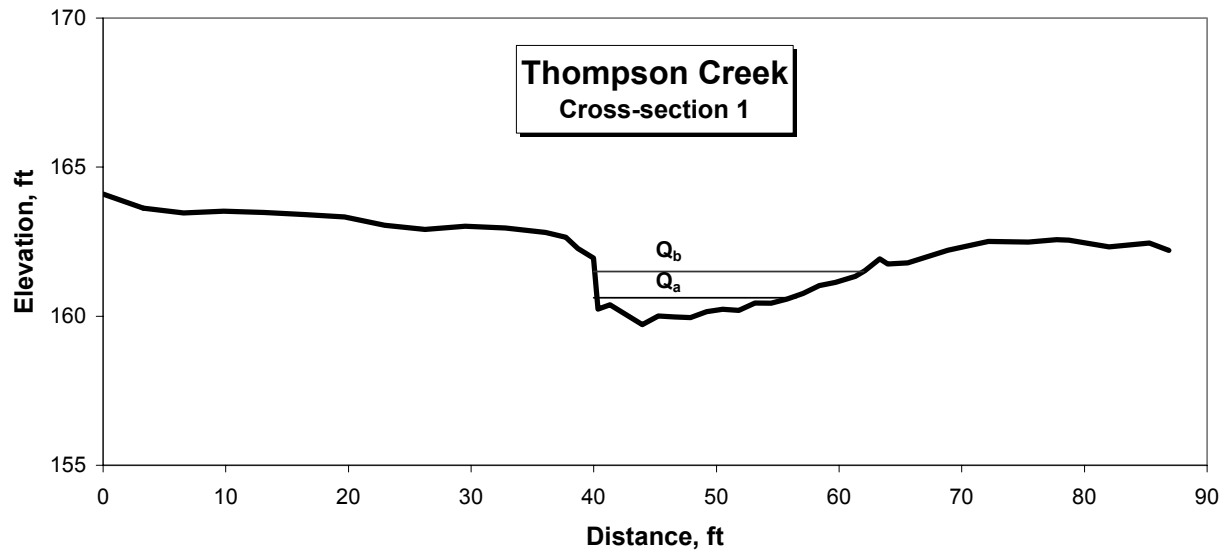


Figure 3. Cross-section of Thompson Creek at the sediment transport measurement site.

## Channel Geometry

Figure 3 shows the cross-section at the sediment transport measurement site, cross-section 1. The channel geometry relationships for this cross-section are shown in Figure 4. All data collected in 1994 and 1995 were used to develop the displayed power relationships with discharge. Over the range of discharges when sediment transport was measured (8.15 to 124 ft<sup>3</sup>/s) estimated stream width, estimated average depth and estimated average velocity varied from 14.2 to 22.1 ft, 0.51 to 1.22 ft, and 1.1 to 4.6 ft/s, respectively. The average reach slope is 0.0153 ft/ft.

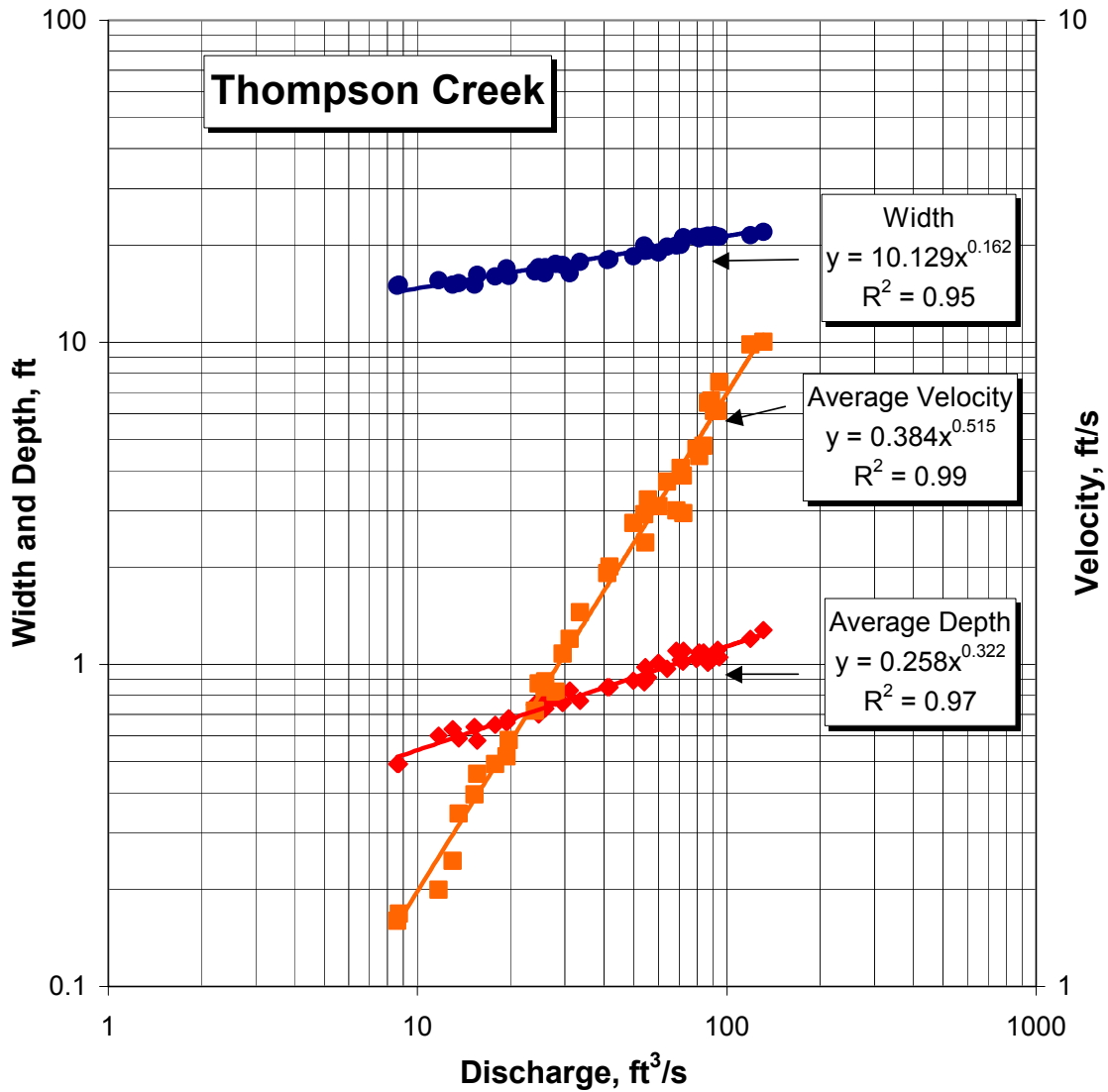


Figure 4. Width, average depth, and average velocity versus stream discharge at the sediment transport measurement cross-section.

## Channel Material

Pebble counts were made near cross-section 1 in June 1994 and at four cross-sections in July 2000. The  $D_{50}$  and  $D_{90}$  for the pebble counts in 1994 were 66 mm and 130 mm, respectively (Figure 5). The  $D_{50}$  and  $D_{90}$  for the combined 2000 pebble counts were 59 mm and 140 mm, respectively, and about 5% of the surface was sand size and smaller material. In July 2000, three core samples were also collected in the reach. The  $D_{50}$  and  $D_{90}$  for the combined surface and combined subsurface cores were 135 mm and 228 mm and 43 mm and 164 mm, respectively.

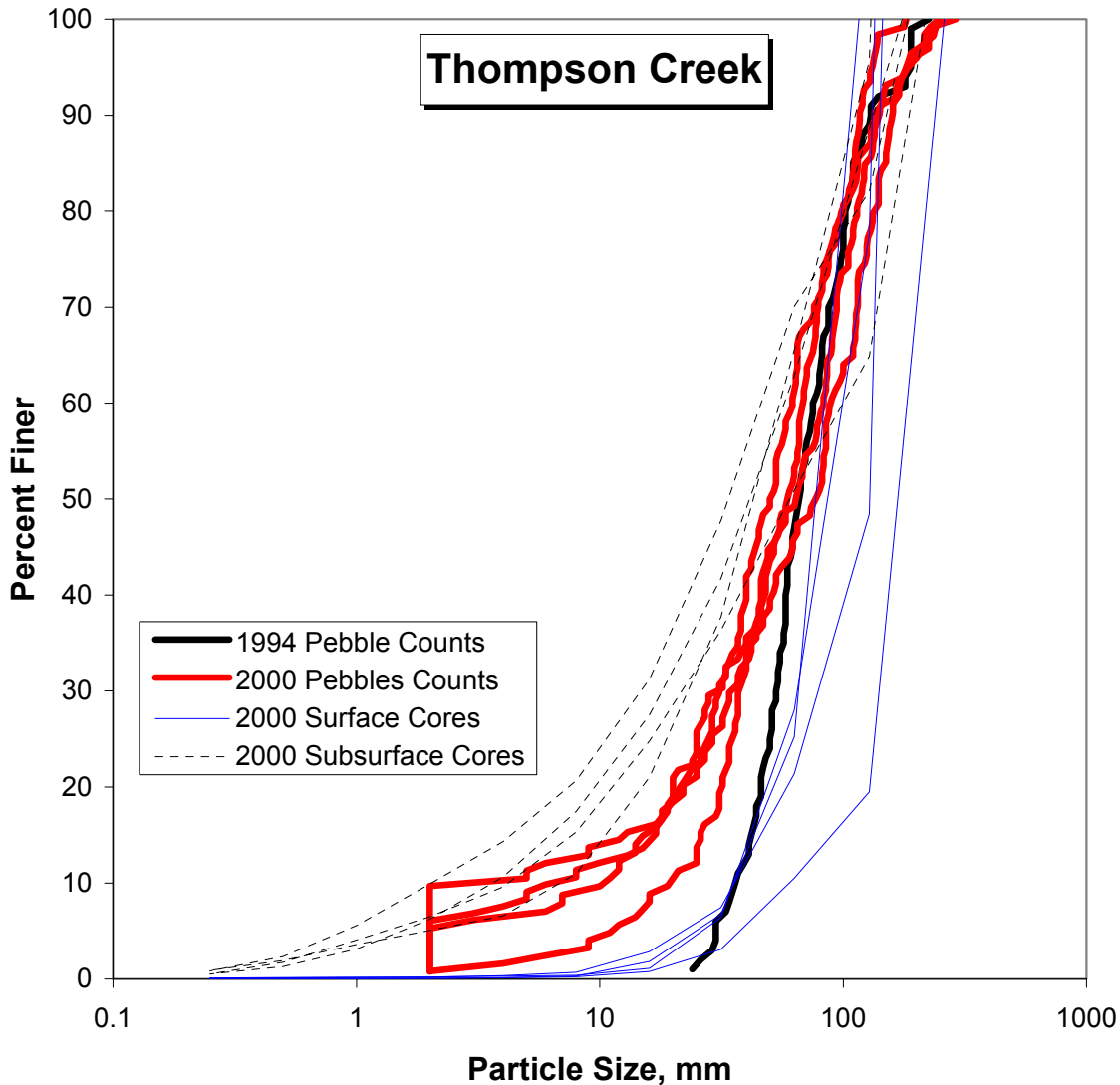


Figure 5. Particle size distribution for surface and subsurface material samples in Thompson Creek.

## Sediment Transport

The sediment transport data include 84 measurements of bedload transport and 24 measurements of suspended sediment transport. Sediment transport measurements spanned a range of stream discharges from 8.15 ft<sup>3</sup>/s (0.52Q<sub>a</sub>; 0.09Q<sub>b</sub>) to 124 ft<sup>3</sup>/s (7.85Q<sub>a</sub>; 1.42Q<sub>b</sub>). Bedload transport ranged from 0.000627 to 22.0 tons/day and suspended transport ranged from 0.154 to 63.7 tons/day. 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 6).

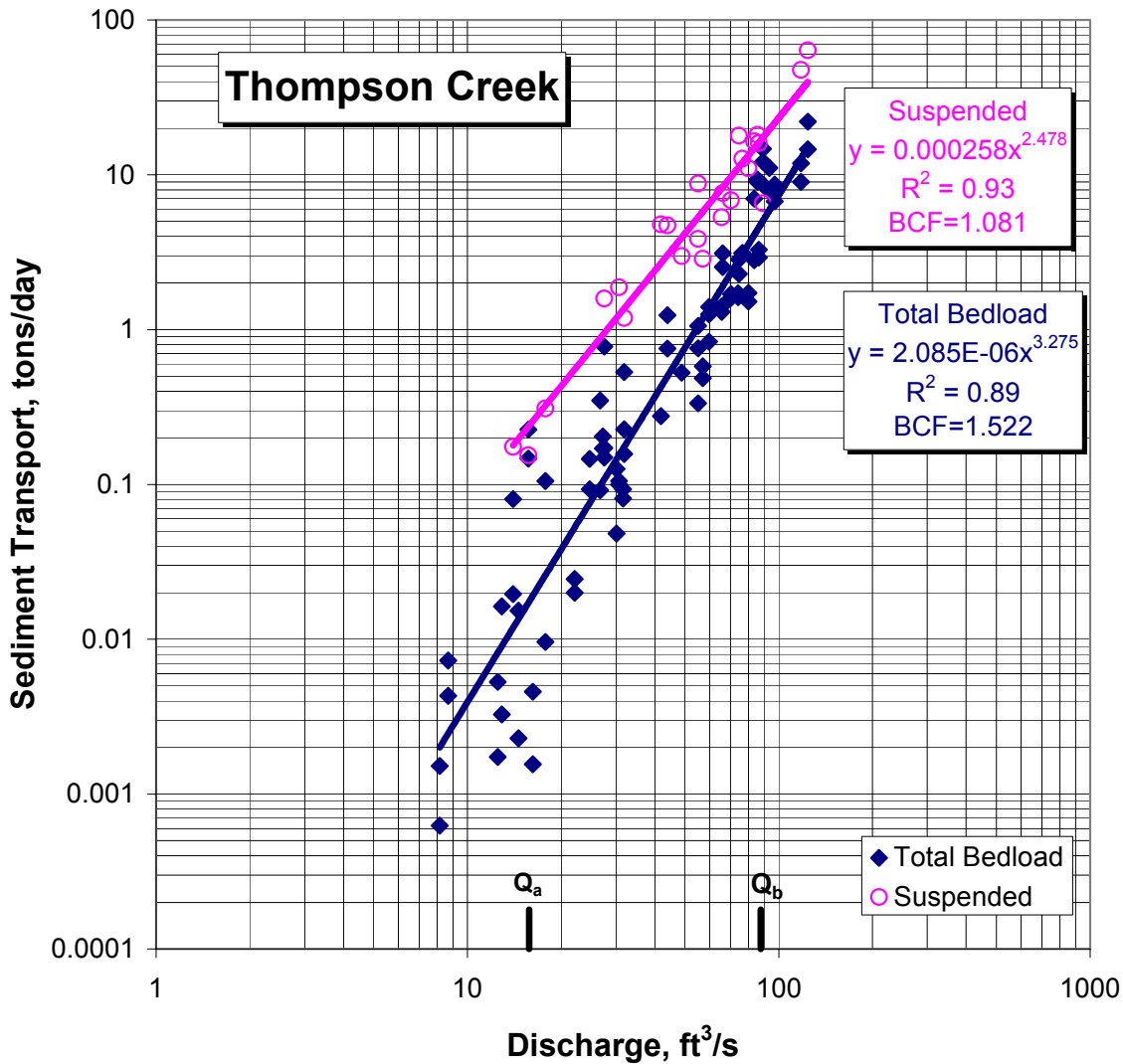


Figure 6. Bedload and suspended load transport rate versus discharge.

The bedload transport rates by size class (Figure 7) shows that the larger rates are associated with material in the 0.5 to 2mm diameter size class. No curve fitting was done for sediment >32mm diameter since only one of the samples contained this size class of material.

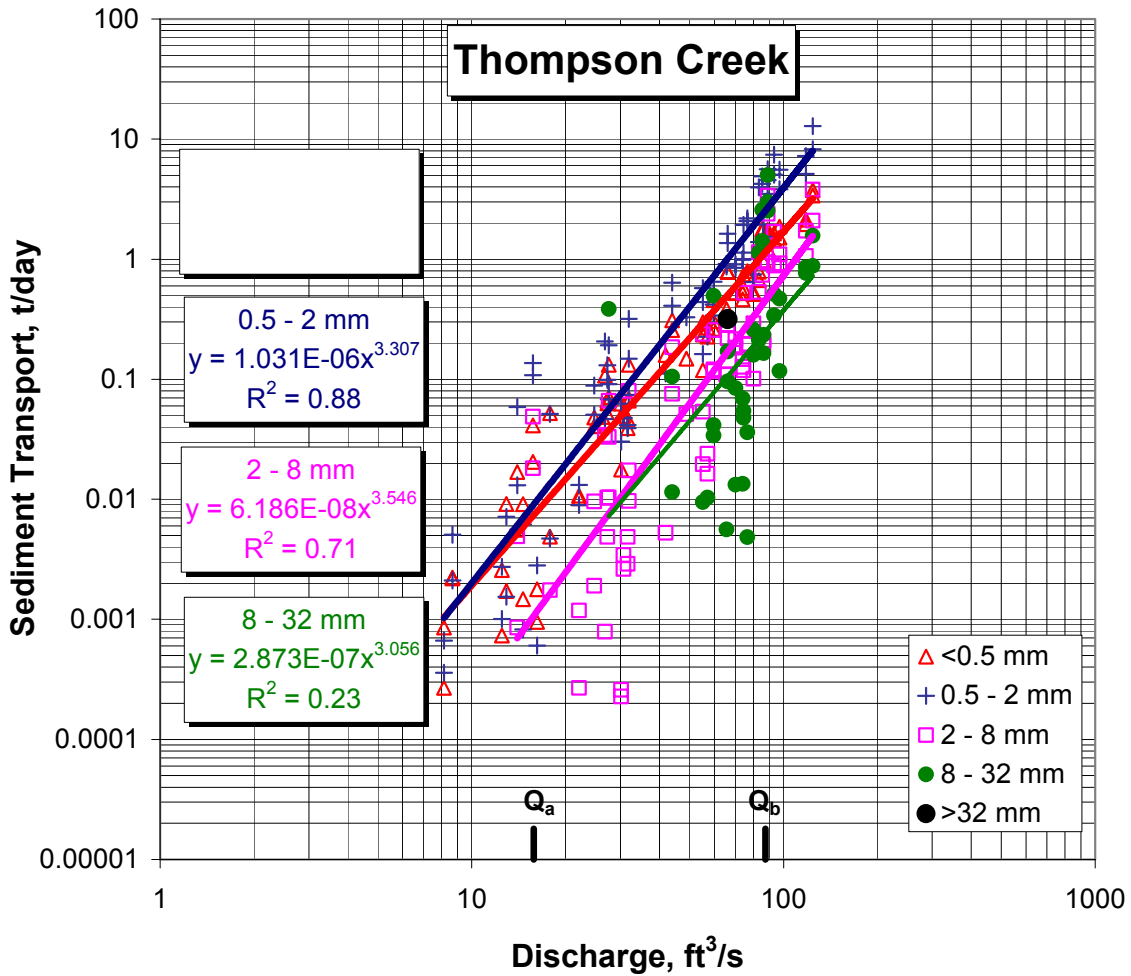


Figure 7. Bedload transport rate versus discharge for selected size classes.



The size of the largest particle in the bedload sample increased with discharge (Figure 8). The largest particle measured in a bedload sample was 68.5 mm at discharges of 85.4 and 89.0 ft<sup>3</sup>/s. At discharges near or greater than bankfull discharge (87.6 ft<sup>3</sup>/s), the largest particle often exceeded 30 mm. There is a tendency for increasing median size of the bedload sample with increasing discharge. The D<sub>50</sub> for most of the bedload samples was in the sand size, 0.5 to 2.0 mm. The largest median diameter of a bedload sample was 7.1 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.

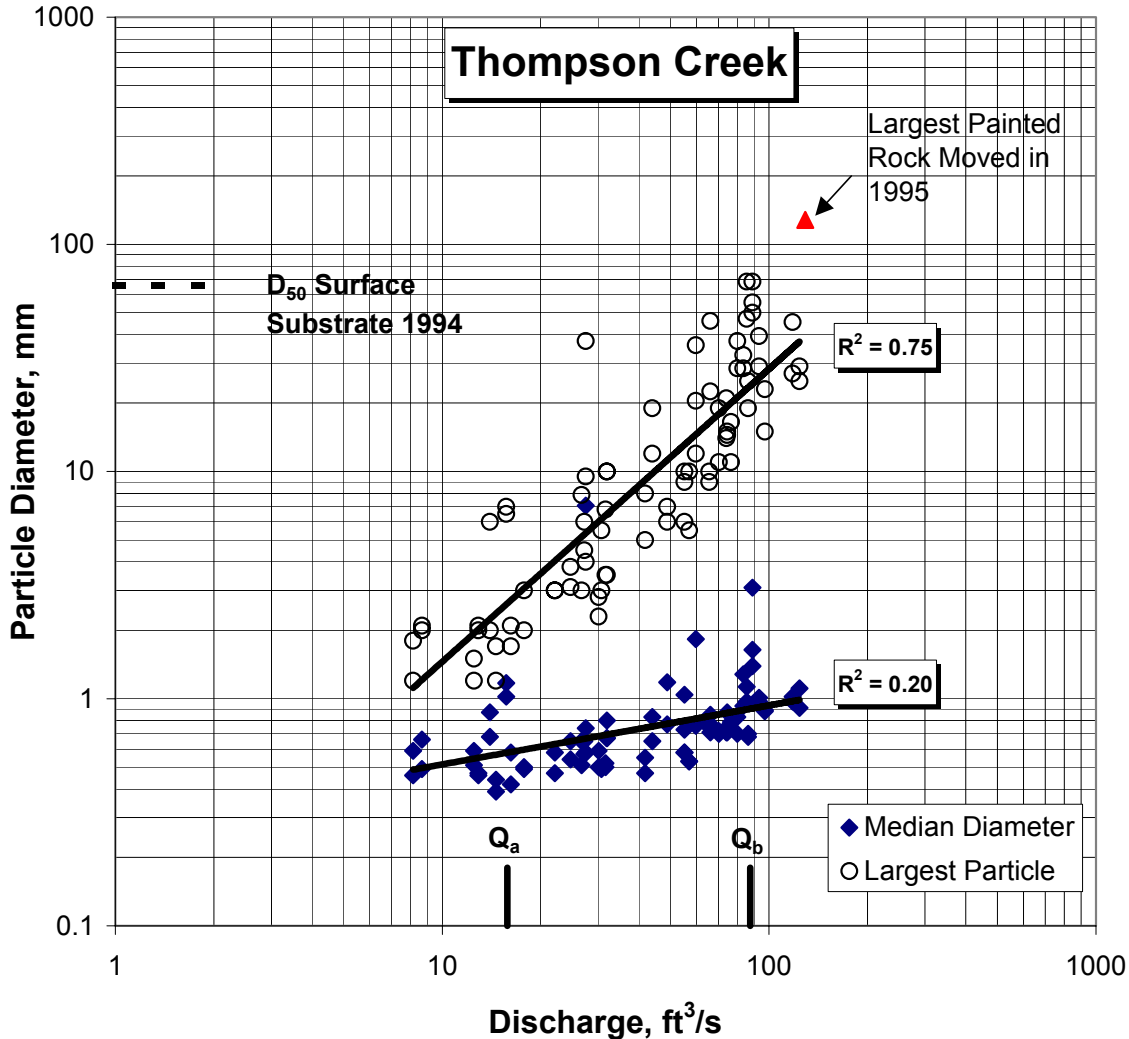


Figure 8. Median size of the bedload sample and the largest particle size versus stream discharge for Thompson Creek.



## Painted Rock Transport

A total of forty painted rocks were placed across two transects (twenty per transect) on April 25, 1995. Daily mean discharge on the day of rock placement was  $18.2 \text{ ft}^3/\text{s}$ . The size of the rocks ranged from 41 to 131 mm diameter (b-axis) which represents the  $D_{14}$  up to the  $D_{91}$  of the surface particle size distribution measured at cross-section 1. Transport of the rocks as of July 31, 1995 are shown in Figures 9 and 10.

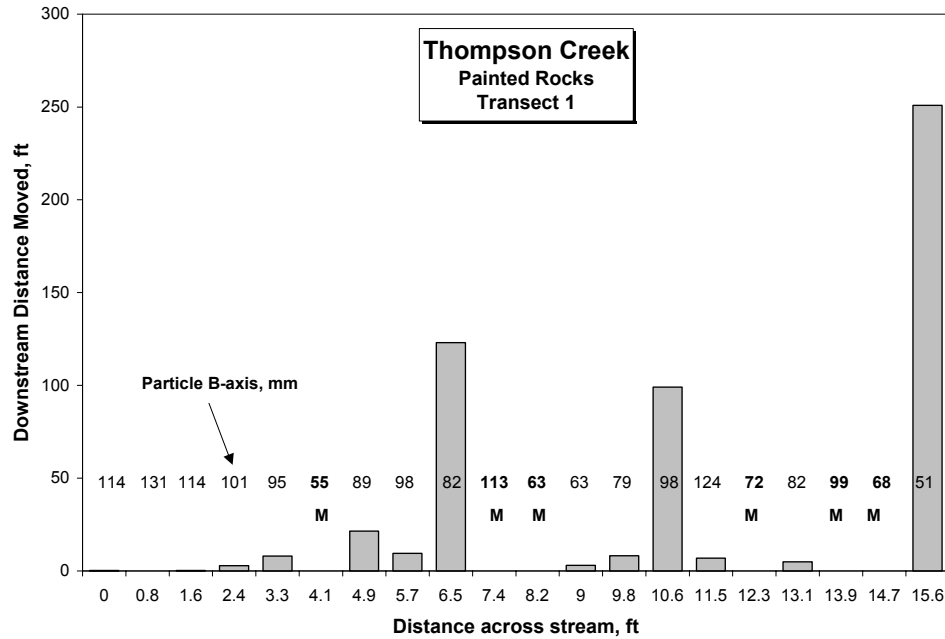


Figure 9. Transport distance of painted rocks at transect 1.

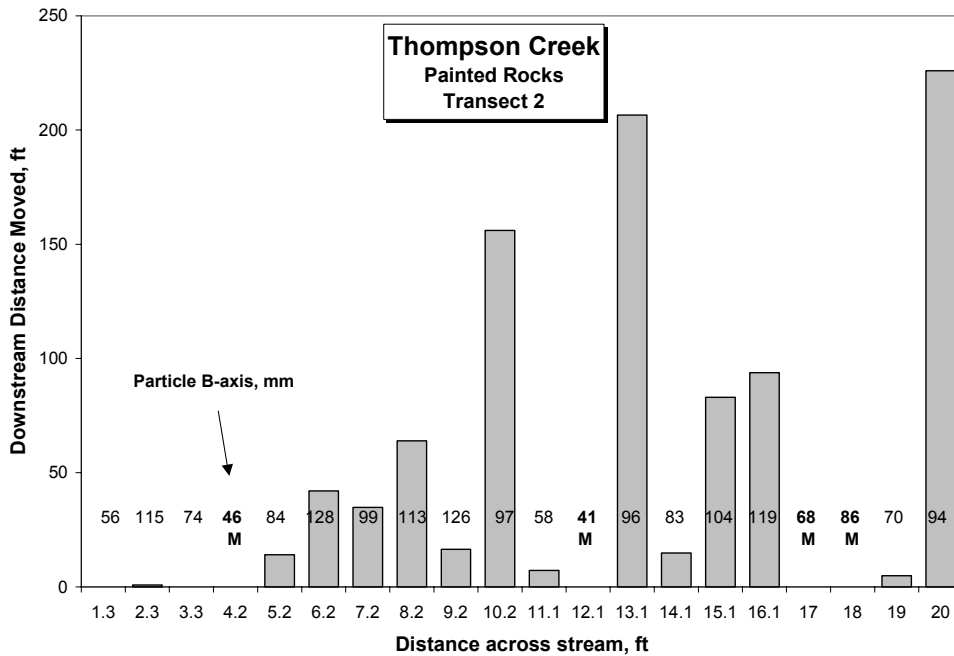


Figure 10. Transport distance of painted rocks at transect 2.

Thirty of the forty rocks were found. Of those found, only three had not moved. The maximum transport distance was 250.9 ft for a 51 mm diameter rock and the average was transport distance was 50.1 ft. The largest daily mean discharge during the period when painted rock movement was studied was 119.6 ft<sup>3</sup>/s on June 4, 1995 and the largest instantaneous discharge was 129 ft<sup>3</sup>/s.