

Marsh Creek

General Information

Marsh Creek is a tributary of the Middle Fork of the Salmon River. The study reach is about 1,110 ft in length and is just below the confluence of Cape Horn Creek and Marsh Creek, both upstream and downstream of the Forest Service bridge (Figure 1). The reach is on land administered by the Forest Service at an elevation of about 6,490 ft above sea level. The drainage area is 79.5 mi² and the geology of the watershed is predominantly intrusive igneous.

In 1994 and 1995, personnel of Case Western Reserve University measured sediment transport and streamflow at this site. Additional measurements included a survey of the stream reach and pebble counts of the surface material.



Figure 1. Marsh Creek looking downstream from the bridge.

Streamflow was recorded in water years 1994 and 1995 beginning in late April and into the late summer or fall. Estimated average annual streamflow (Q_a) is $134 \text{ ft}^3/\text{s}$ and the estimated bankfull discharge (Q_b) is $734 \text{ ft}^3/\text{s}$. Stream discharge was very low in 1994 and the maximum daily mean discharge was $324 \text{ ft}^3/\text{s}$. In 1995 the largest daily mean discharge recorded was $892 \text{ ft}^3/\text{s}$ on June 5.

Channel Profile and Cross-Section

Figure 2 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 0.0060 ft/ft . Cross-sections of the channel were surveyed at five locations. Discharge and sediment transport measurements were made at cross-section 2 (XS2), the upstream side of the bridge, in 1994 and for some measurement dates in 1995. In 1995, measurements were also made at three other locations: about 64 ft upstream of the bridge, 112 ft upstream of the bridge at cross-section 1 and 492 ft downstream of the.

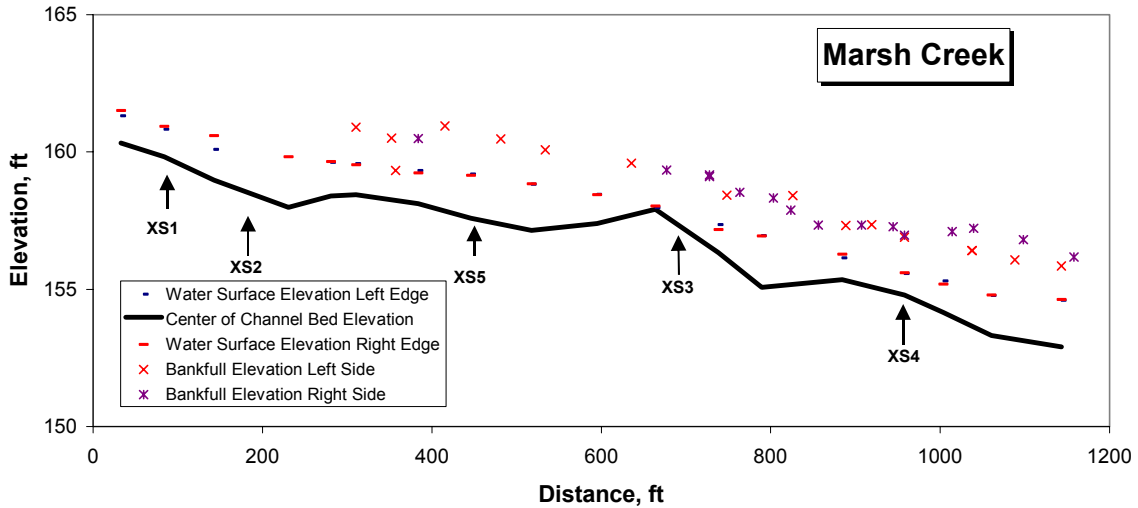


Figure 2. Longitudinal profile of the study reach in Marsh Creek.

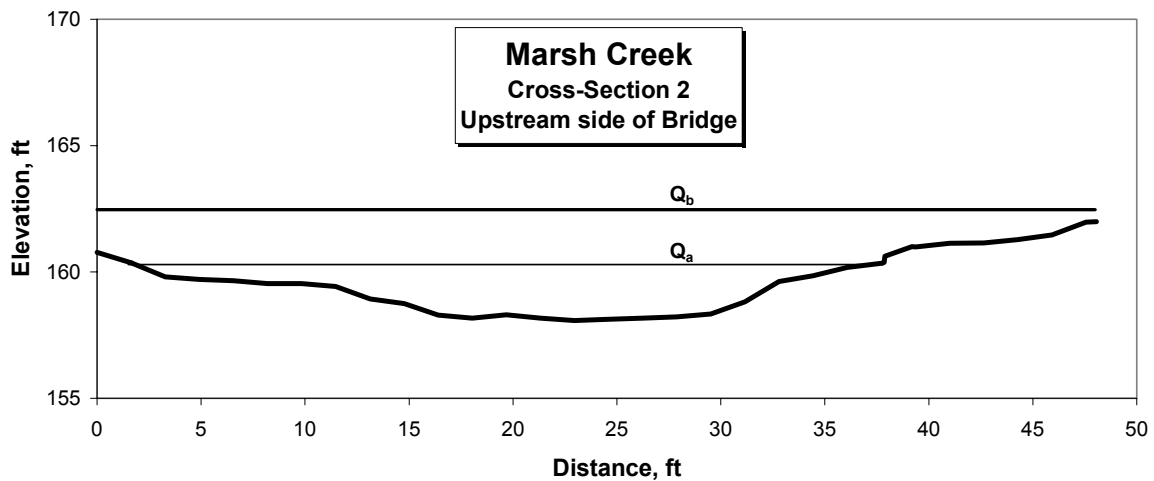


Figure 3. Cross-section 2 of Marsh Creek at the bridge.

Channel Geometry

Figure 3 shows the cross-section at the 1994 sediment transport measurement site on the upstream of the bridge (cross-section 2). The station geometry relationships for this cross-section and for the other sediment transport measurement cross-sections are shown in Figures 4 and 5. Over the range of discharges when sediment transport was measured (30.0 to 796 ft³/s) estimated stream width, estimated average depth and estimated average velocity varied from 29.2 to 47.5 ft, 0.84 to 2.81 ft, and 1.2 to 6.0 ft/s, respectively, at cross-section 2. The average reach slope is 0.0060 ft/ft.

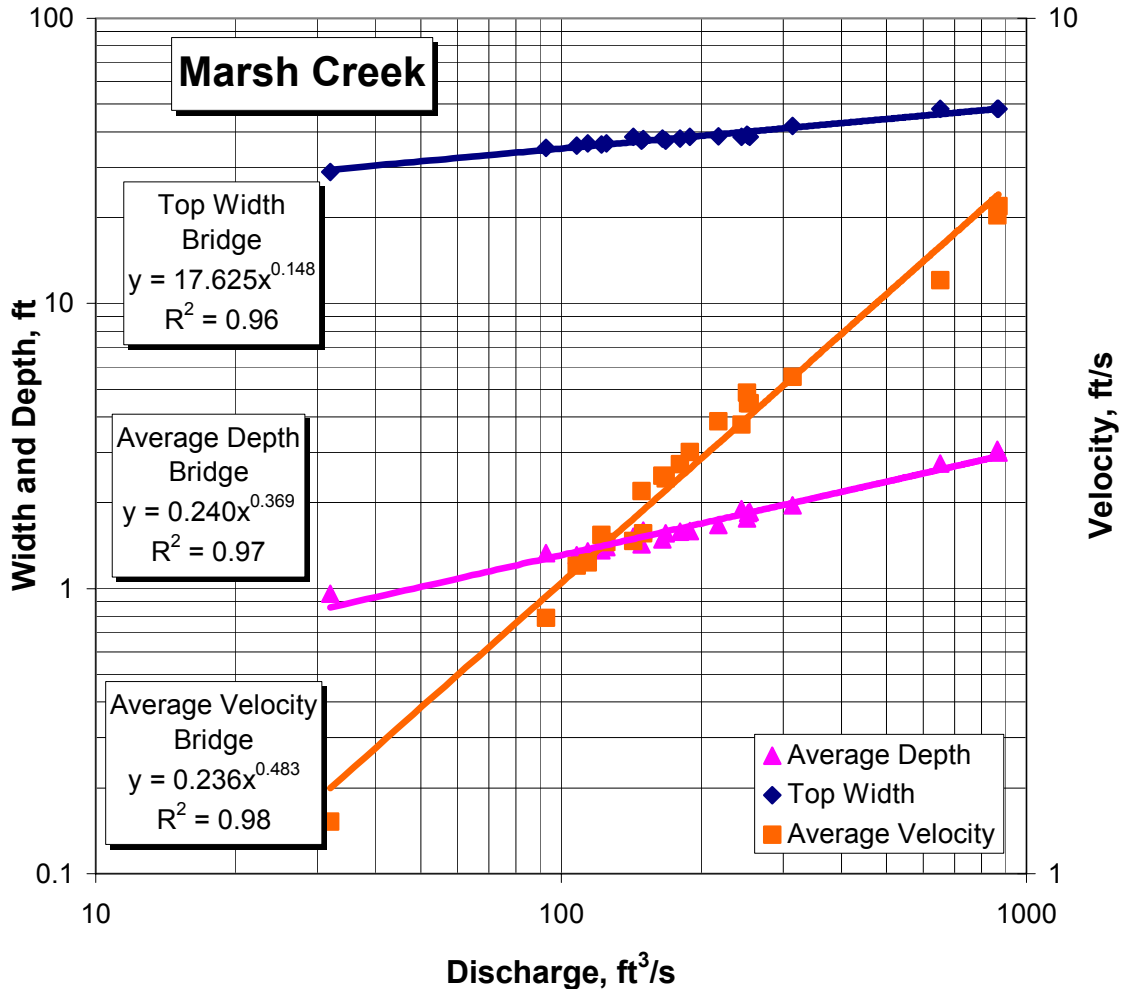


Figure 4. Width, average depth, and average velocity versus stream discharge at cross-section 2 on Marsh Creek.

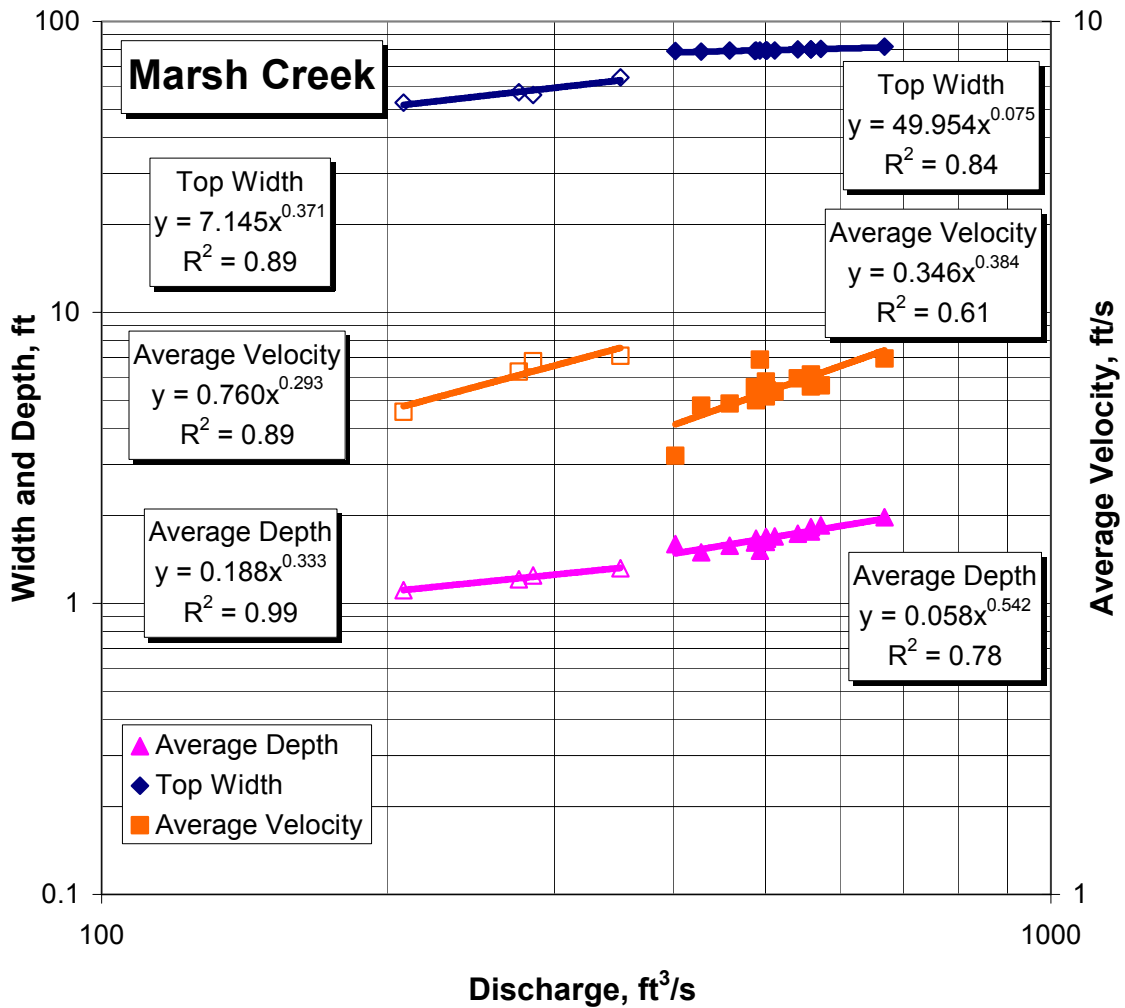


Figure 5. Width, average depth, and average velocity versus stream discharge on Marsh Creek. (Data plotted to the left is from the site 112 ft upstream from the bridge and data plotted on the right is from the site 492 ft downstream from the bridge.)

Channel Material

Surface pebble counts were made near cross-section 2 in July 1994. No subsurface cores were collected at this site. The average D_{50} and D_{90} for the surface material in the reach were 56 mm and 162 mm, respectively (Figure 6).

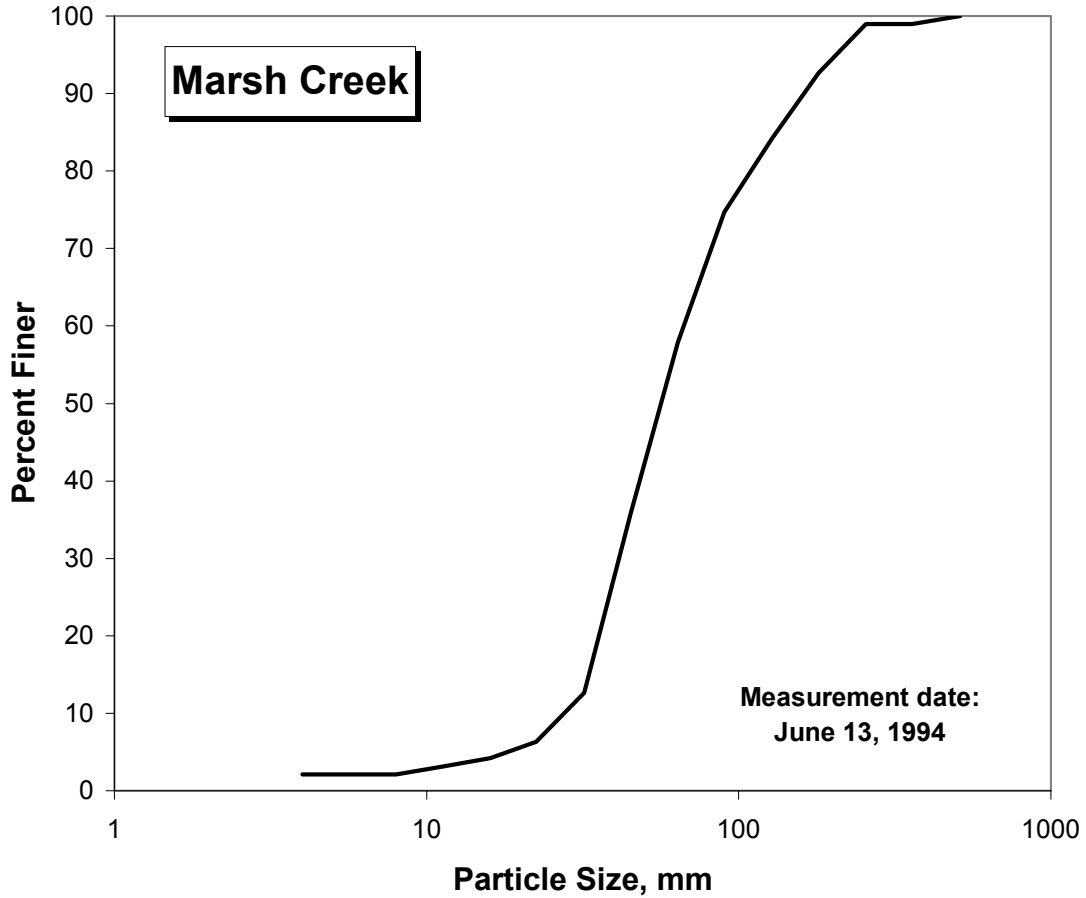


Figure 6. Particle size distribution for surface material in Marsh Creek.

Sediment Transport

Sediment transport measurements made in 1994 and 1995 include 98 measurements of bedload transport and 27 measurements of suspended sediment transport. Sediment transport measurements spanned a range of stream discharges from 30.0 ft³/s (0.22Q_a; 0.04Q_b) to 796 ft³/s (5.94Q_a; 1.08Q_b). Bedload transport ranged from 0.00227 to 38.9 t/d and suspended transport ranged from 0.371 to 29.7 t/d. The relationships between sediment transport and discharge varied by sampling site and are shown in Figure 7 for the cross-section 2 sampling location. Over the range of measured discharges, it appears that suspended transport and bedload transport account for about equal amounts of transport.

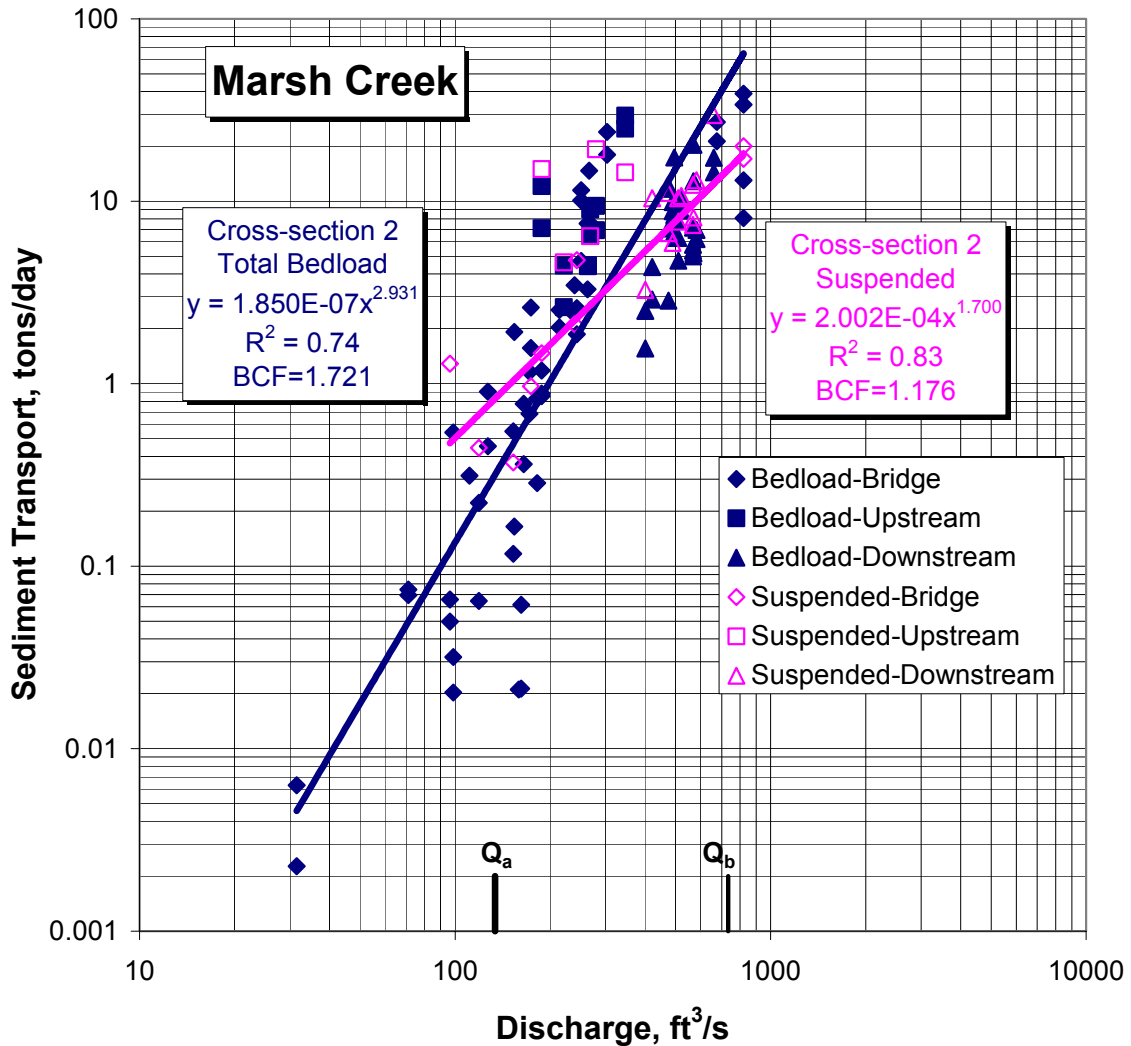


Figure 7. Bedload and suspended load transport versus discharge.

The bedload transport rates by size class (Figure 8) shows that the larger rates are associated with material in the 0.5 to 2mm size class followed by material in the 2 to 8mm diameter size class. No relationship is shown for sediment >32mm diameter since only four of the samples contained this size class of material. All discharges transporting material >32mm exceeded 300 ft³/s.

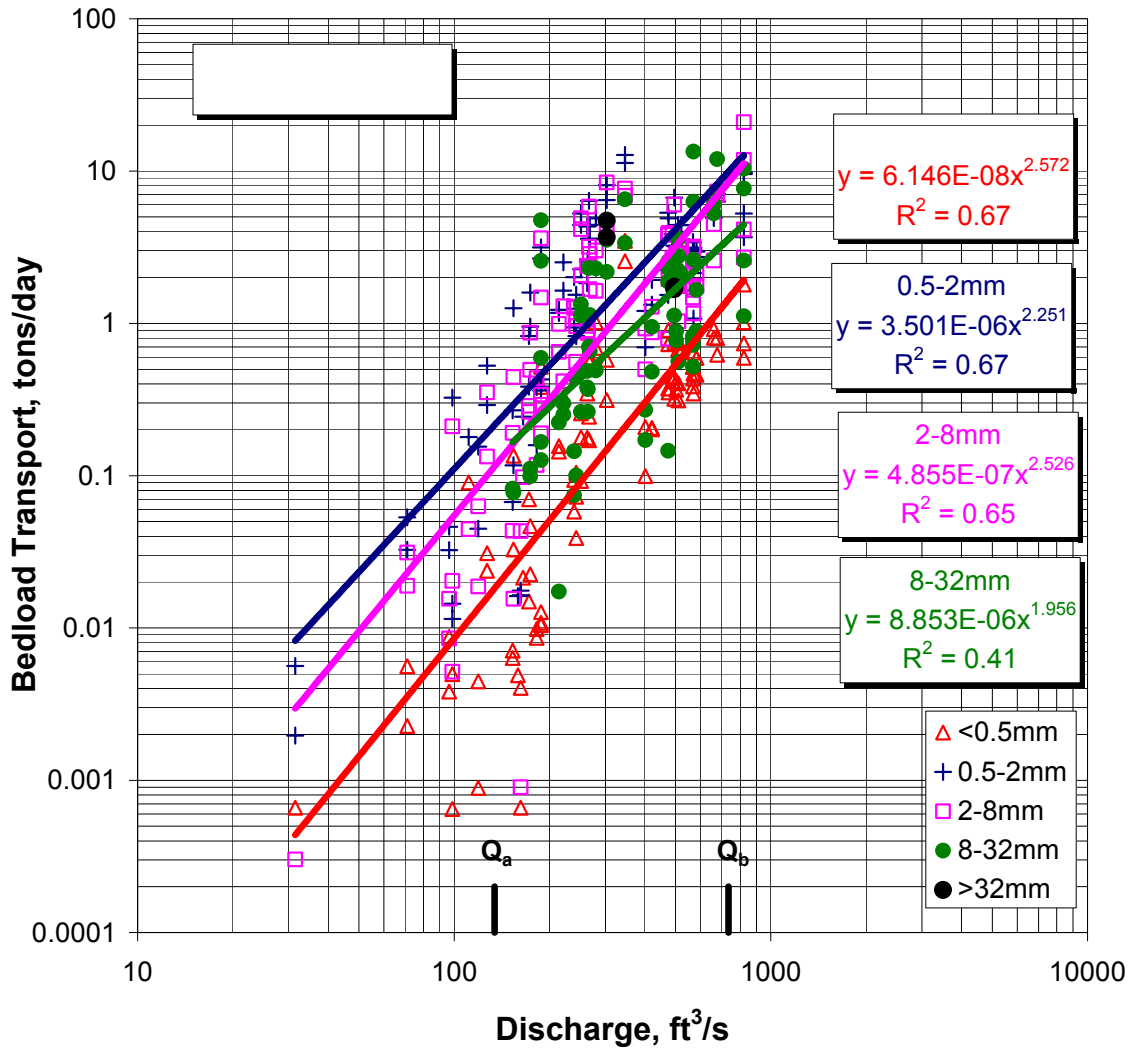


Figure 8. Bedload transport rate versus discharge for selected size classes

The size of the largest particle in the bedload sample increased with discharge (Figure 9). The largest particle measured in a bedload sample was 66 mm at a discharge of 662 ft³/s. The largest particle in the bedload sample exceeded the median diameter of the surface substrate (56mm) on four occasions during discharges ranging from 314 to 652 ft³/s, well below bankfull discharge. This information suggests that discharges at or slightly below the bankfull discharge are capable of moving the median diameter particles on the channel surface. 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. The largest median diameter of a bedload sample was 23.36mm at a discharge of 562 ft³/s. During discharges greater than 400 ft³/s, the median diameter exceeded 4mm in 5 samples.

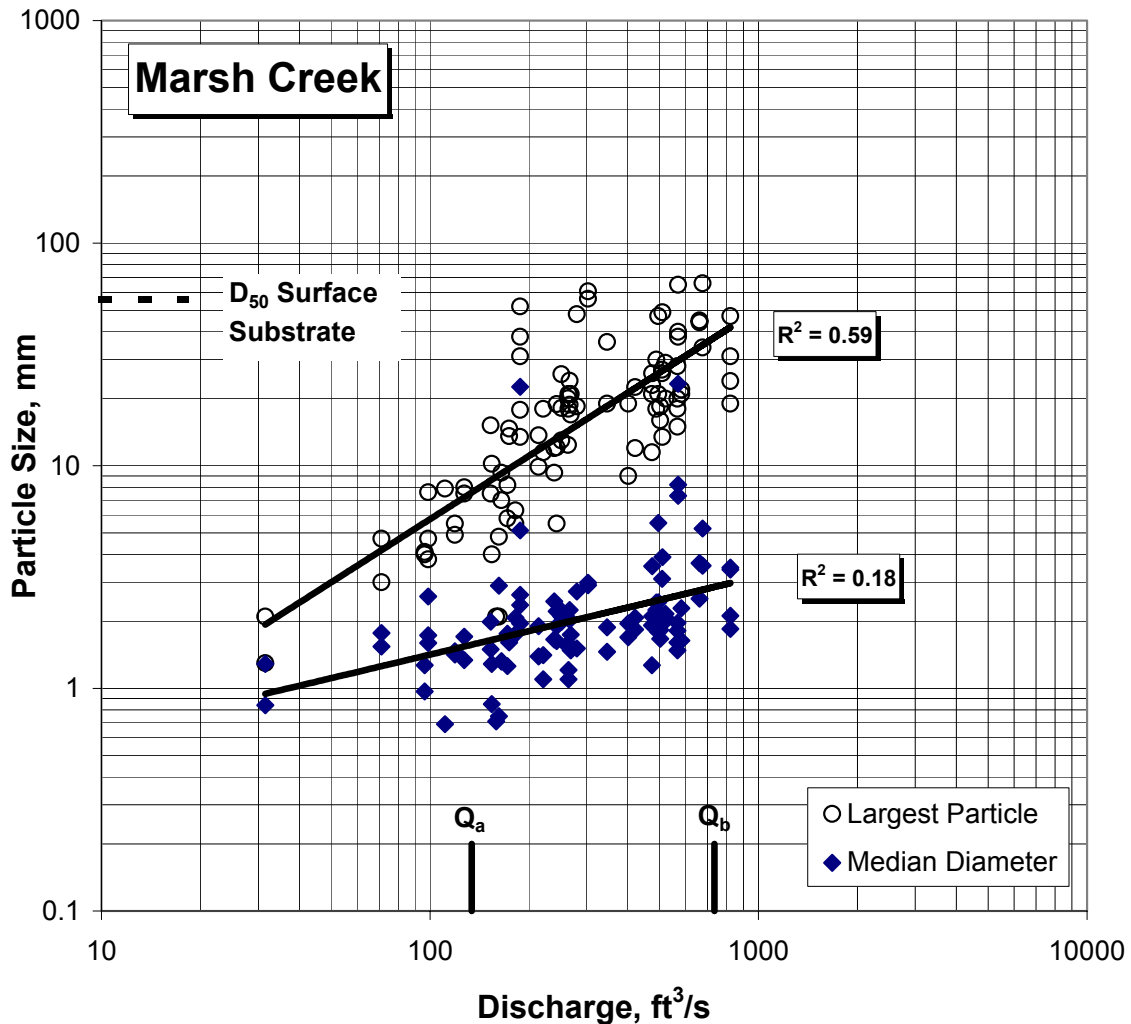


Figure 9. Median size of the bedload sample and the largest particle size versus stream discharge for Marsh Creek.