Salmon River near Obsidian, ID

General Information

The study reach is about a 670 ft length of river near the discontinued Geological Survey (USGS) gage 13292500 (Salmon River near Obsidian, ID) in the Sawtooth National Forest. The site is on land administered by the Forest Service at an elevation of about 6,950 ft. The drainage area upstream of this location is 93.9 mi^2 and the geology of the watershed is predominantly sedimentary, intrusive igneous and glacial deposits.

Sediment transport measurements were made by Utah State University personnel during the spring snowmelt flows of 1999 near the old gaging station (Figure 1). Additional measurements at this site include pebble counts of the surface substrate and core samples of the subsurface substrate material.

Figure 1. Salmon River near discontinued USGS gaging station.

Streamflow records are available for this gage for water years 1941 to 1953. Average annual streamflow (Q_a) for the period of record is 75.6 ft^3/s and the 1.5-year return interval discharge is estimated at 448 ft^3/s. The highest flow recorded during the period of record was 721 ft^3/s on May 29, 1952.

Cross-Section

Figure 2 shows the cross-section at the cableway, 30 ft upstream from the discontinued gage. The average gradient for the study reach is 0.0066 ft/ft. All sediment transport measurements were made at the cableway.

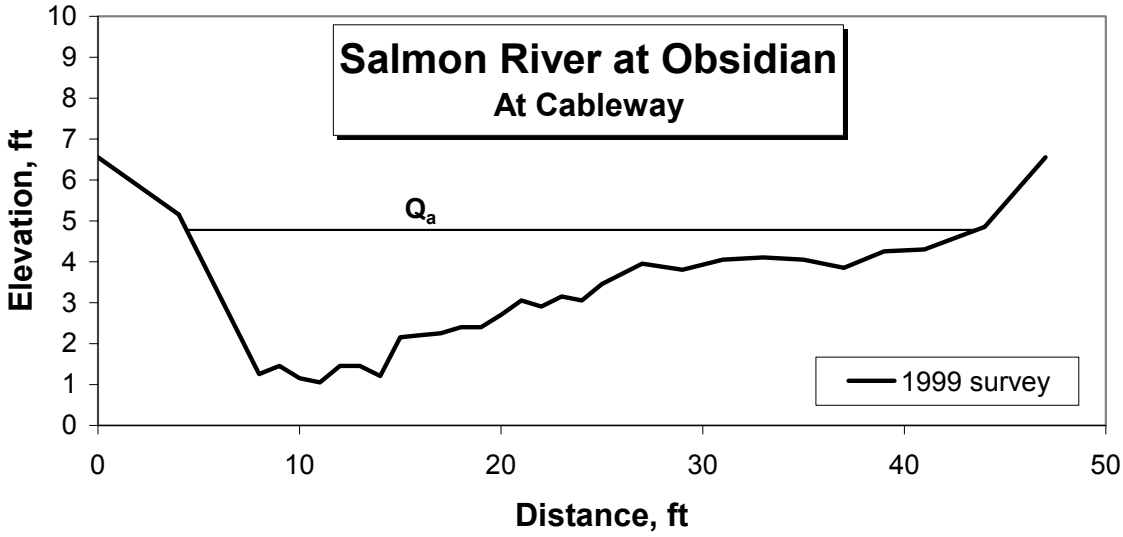

Figure 2. Cross-section of the Salmon River near Obsidian, Idaho.

Channel Geometry

The station geometry relationships for the cross-section at the cableway are shown in Figure 3. All discharge note information for 1999 were used to develop the power relationships with discharge. Over the range of discharges when sediment transport was measured (264 to 739 ft^3/s) estimated stream width, estimated average depth and estimated average velocity varied from 39.3 to 46.4 ft, 2.25 to 3.05 ft, and 3.0 to 5.2 ft/s, respectively. The average reach slope is 0.0066 ft/ft.

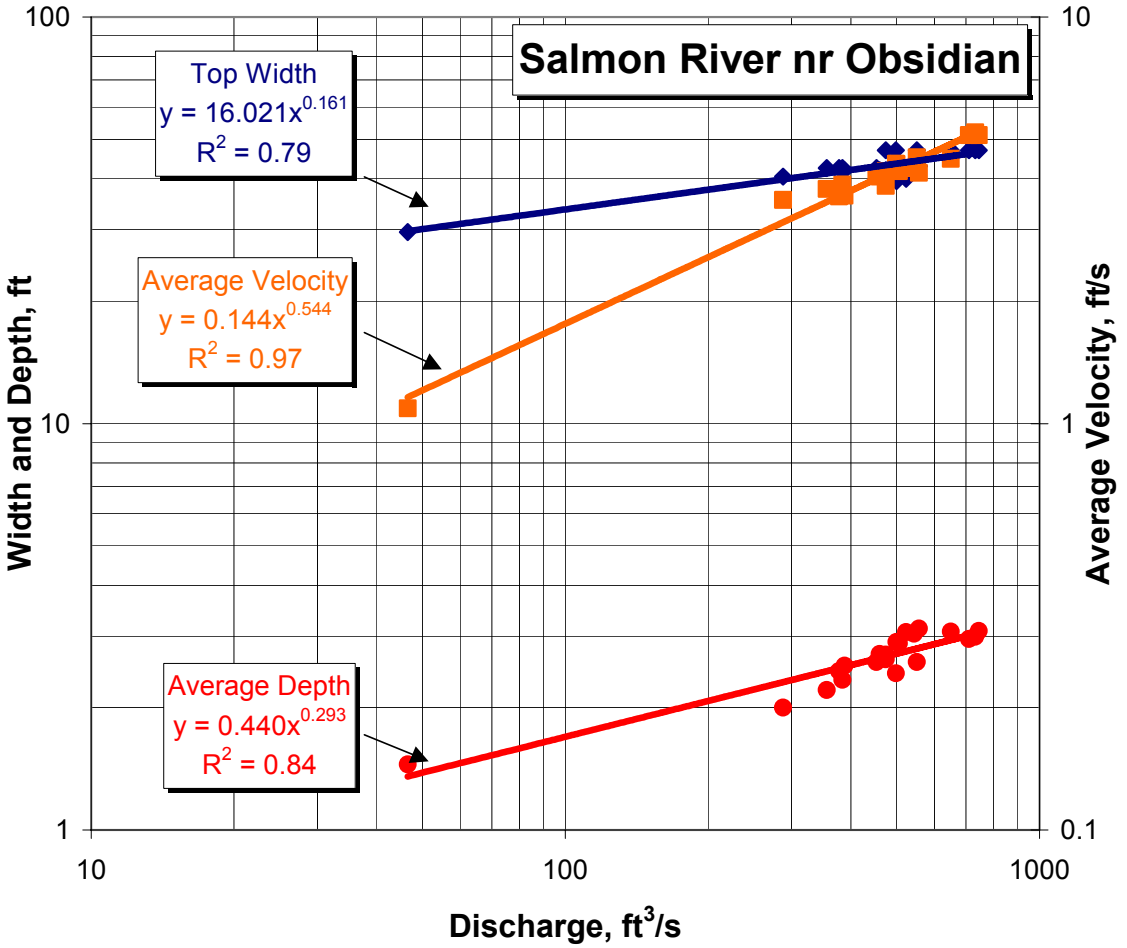

Figure 3. Width, average depth, and average velocity versus stream discharge at the cableway cross-section on the Salmon River near Obsidian.

Channel Material

Surface pebble counts were made at three cross-sections and three cores of surface and subsurface material were collected, one at each cross-section, in July 2000. The D_{50} and D_{90} for the combined pebble counts in the reach were 61 mm and 148 mm, respectively (Figure 4). About 6% of the surface material was sand (2 mm) size or smaller. The D_{50} and D_{90} for the combined surface and combined subsurface cores were 64 mm and 127 mm and 26 mm and 97 mm, respectively.

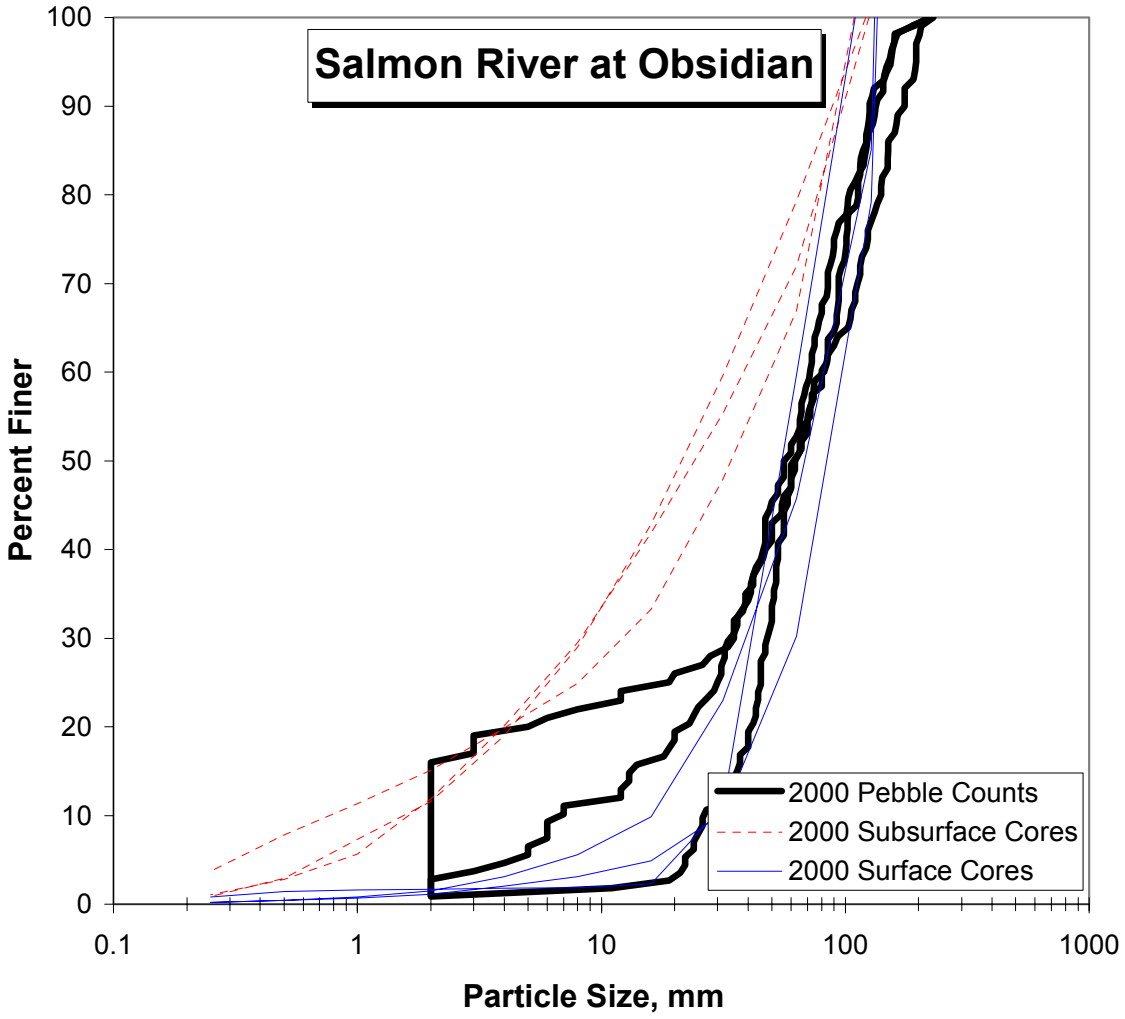

Figure 4. Particle size distribution for surface and subsurface material samples in the Salmon River near Obsidian.

Sediment Transport

The bedload and suspended load measurements in water years 1999 were all made from the cableway. The sediment transport data include 51 measurements of bedload transport and 23 measurements of suspended sediment. Sediment transport measurements spanned a range of stream discharges from 264 ft^3/s ($3.26Q_a$) to739 ft^3/s ($9.11Q_a$). Bedload transport ranged from 0.764 to 128 t/d and suspended transport ranged from 9.33 to 210 t/d. Suspended transport accounts for the majority of the material in transport with approximately an order of magnitude greater suspended transport at the lower range of measured discharges and about a two to three fold difference at the higher range of measured discharges (Figure 5).

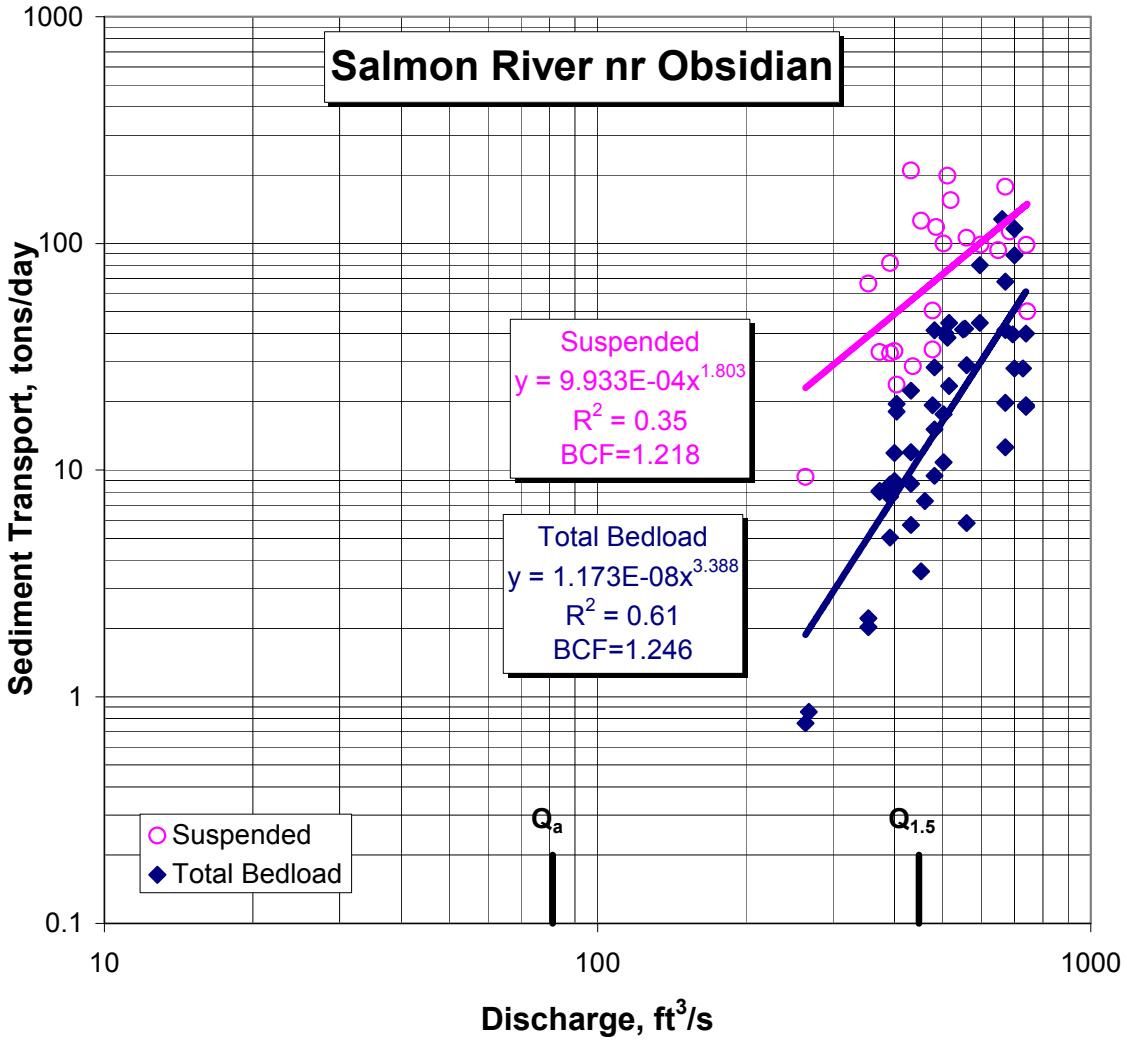

Figure 5. Bedload and suspended load transport rate versus discharge.

The bedload transport rates by size class (Figure 6) shows that the larger rates are associated with material 0.5 to 2 mm diameter. Twenty-two of the bedload samples contained material larger than 32 mm diameter and these were at discharges of 392 ft^3/s and larger.

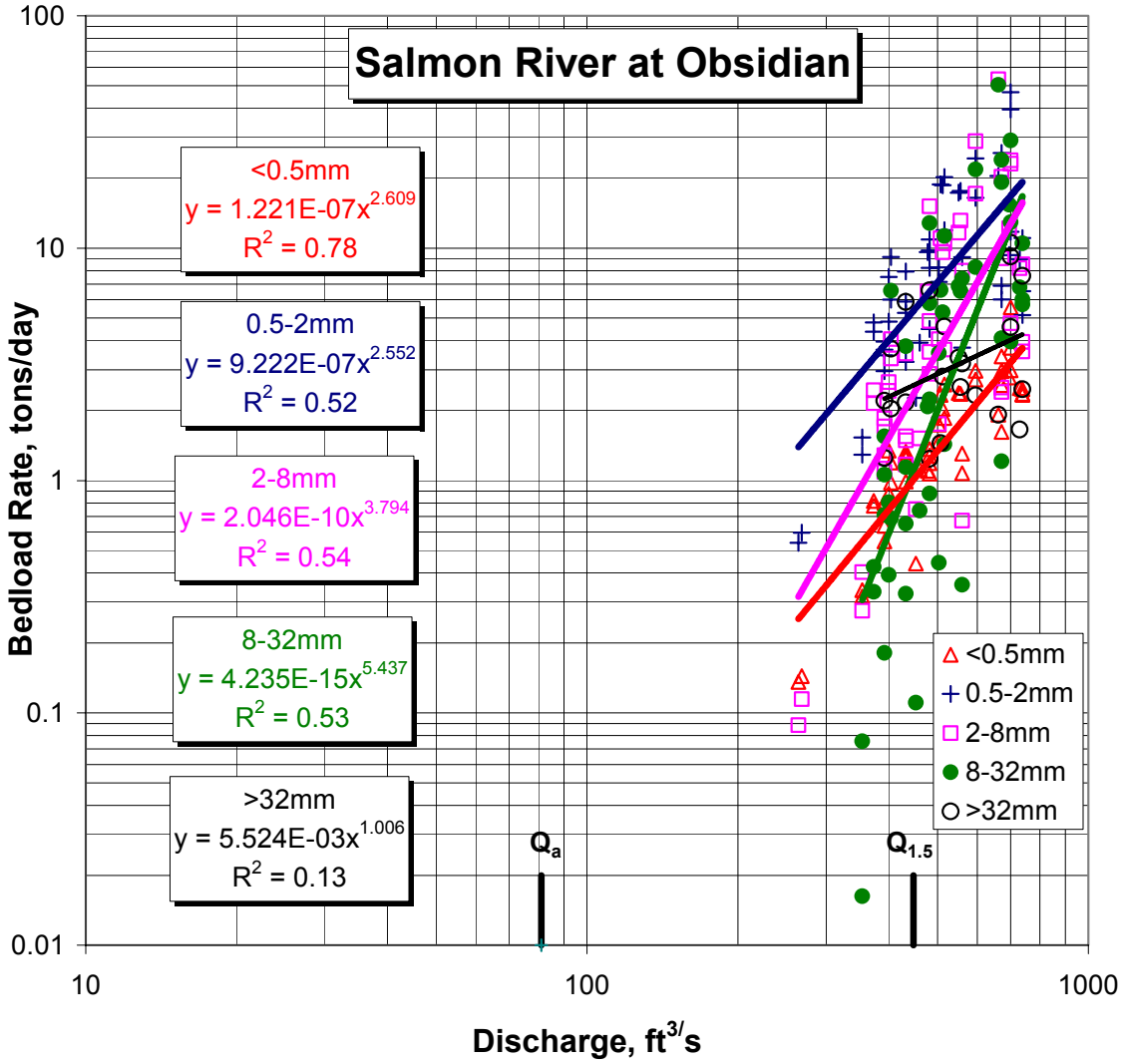

Figure 6. Bedload transport rate versus discharge for selected size classes.

The size of the largest particle in the bedload sample increased with discharge (Figure 7). The largest particle measured in a bedload sample was 72 mm at a discharge of 512 ft^3/s. There is also a trend of increasing median size of the bedload sample with increasing discharge. The D_{50} for about 38% of the bedload samples was in the sand size, 0.5 to 2.0 mm. The largest median diameter of a bedload sample was 10.73 mm at a discharge of 671 ft^3/s. The information on the largest particle in the bedload sample suggests that discharges near the 1.5 year return period discharge are capable of moving the median diameter particles on the channel surface.

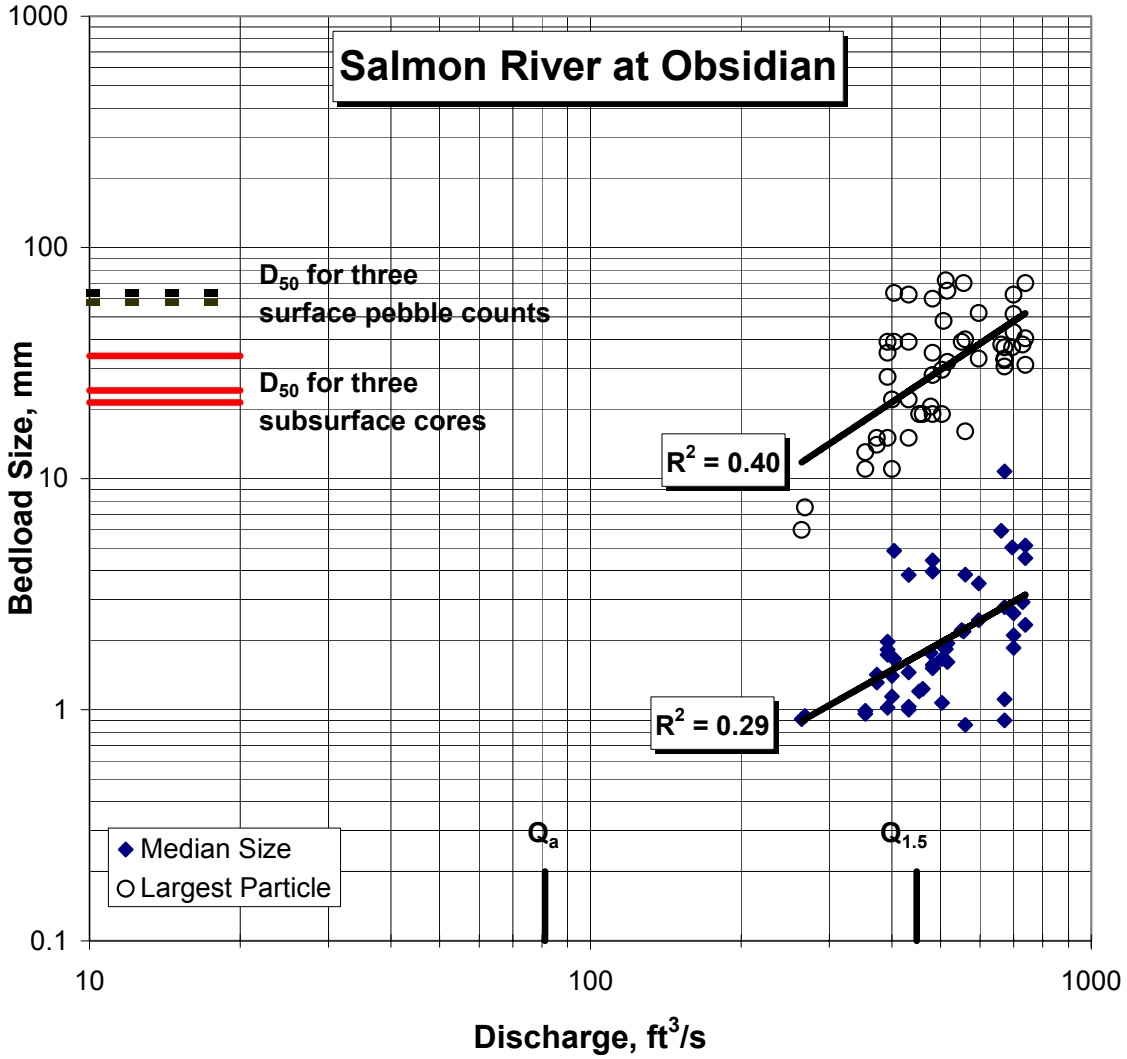

Figure 7. Median size of the bedload sample and the largest particle size versus stream discharge for the Salmon River at Obsidian.