

## Eggers Creek

### **General Information**

Eggers Creek is a small stream on the Boise National Forest that flows into Silver Creek, a tributary the Middle Fork Payette River (Figure 1). Eggers Creek is the undisturbed “control” watershed for a Forest Service paired watershed study evaluating the effects of forest management activities on streamflow and sediment production. The watershed was instrumented in 1964 with a Parshall flume and water level recorder to continuously measure streamflow near the outlet of the watershed. A sediment basin, just upstream of the gaging station, was constructed and used for annual volumetric measurement of sediment deposition. The study reach is a 140 ft length of stream at the Forest Service gaging station. The site is on land administered by the Forest Service at an elevation of about 4,750 ft. The drainage area is 0.497 mi<sup>2</sup> and the geology of the watershed is intrusive igneous.



Figures 1. Eggers Creek upstream of the gaging station.

Sediment transport measurements were made by Forest Service personnel during the spring snowmelt flows in 1975, 1976 and 1978 through 1984 at a location a short distance upstream of the sediment basin. Additional information collected by Case Western Reserve University personnel at this site in 1994 and 1995 includes a survey of the stream reach and pebble counts of the substrate surface material.

Streamflow has been recorded for water years 1965 through 1996. Average annual streamflow ( $Q_a$ ) for the 32 year period of record is 0.592 ft<sup>3</sup>/s (16.2 in) and the bankfull discharge ( $Q_b$ ) is estimated to be 1.69 ft<sup>3</sup>/s. The highest flow recorded was 10.027 ft<sup>3</sup>/s on May 4, 1971.

## Channel Profile and Cross-Section

Figure 3 shows the longitudinal profile for the channel bed in the center of the channel, the water surface elevation at the channel center at the time of the survey and bankfull flow elevations (floodplains). The average gradient for the study reach is 0.0747 ft/ft. Cross-sections of the channel were surveyed at two locations by Case Western Reserve University personnel. This reach is just downstream of the location where sediment transport was measured. The 43 ft reach just upstream of the sediment transport site has an average gradient of 0.0718 ft/ft. Five cross-sections were surveyed in this upstream reach by USFS personnel in 1975 through 1984.

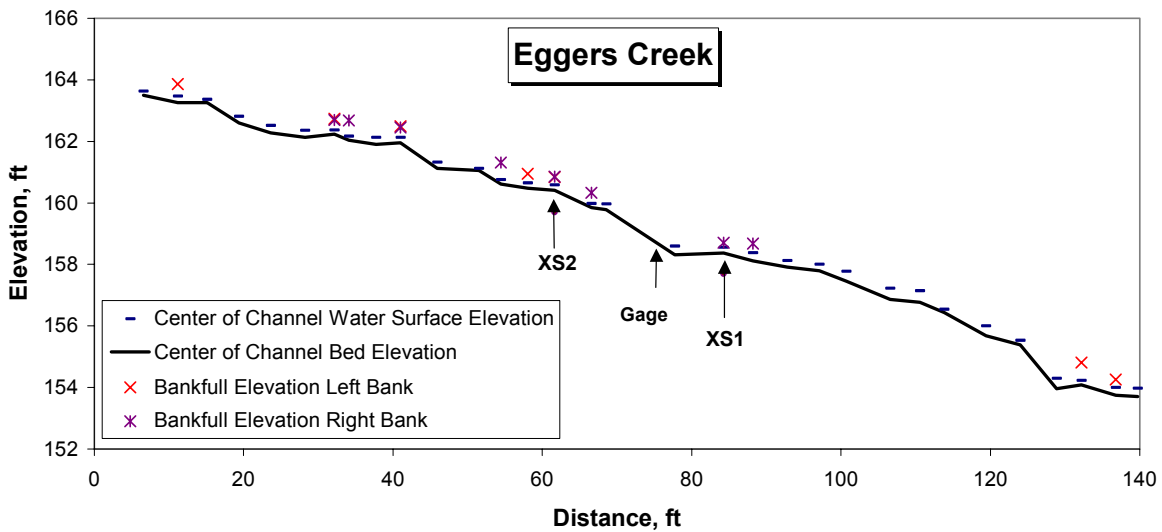


Figure 3. Longitudinal profile of the CWRU study reach in Eggers Creek

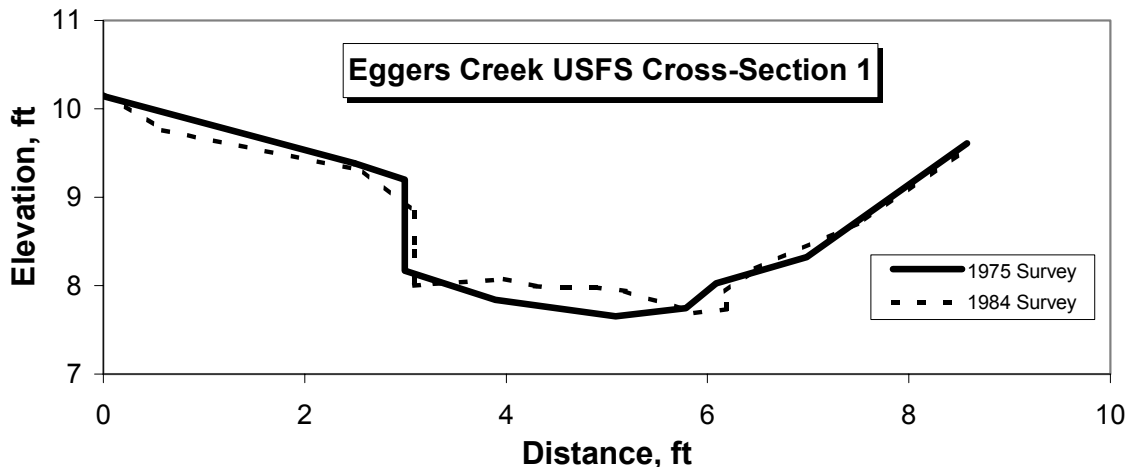


Figure 4. USFS cross-section 1 of Eggers Creek, just upstream of the sediment transport measurement location.

## Channel Geometry

Figure 4 shows the cross-section just upstream of the measurement cross-section for USFS surveys in 1975 and 1984. The station geometry relationships for the sediment transport measurement location are shown in Figure 5. This was a fairly rectangular stable channel and channel width was assumed to be constant across the range of flows associated with the sediment transport measurements. Sediment transport and discharge measurements made in 1979 and later years were at a cross-section 2 ft upstream of the original cross-section. Information for 1975 through 1984 for the two measurement cross-sections were used to develop the power relationships with discharge. Over the range of discharges when sediment transport was measured (0.426 to 8.75 ft<sup>3</sup>/s) estimated average depth and estimated average velocity at the original cross-section varied from 0.28 to 1.19 ft and 0.66 to 3.21 ft/s, respectively. The average reach slope is 0.0718 ft/ft.

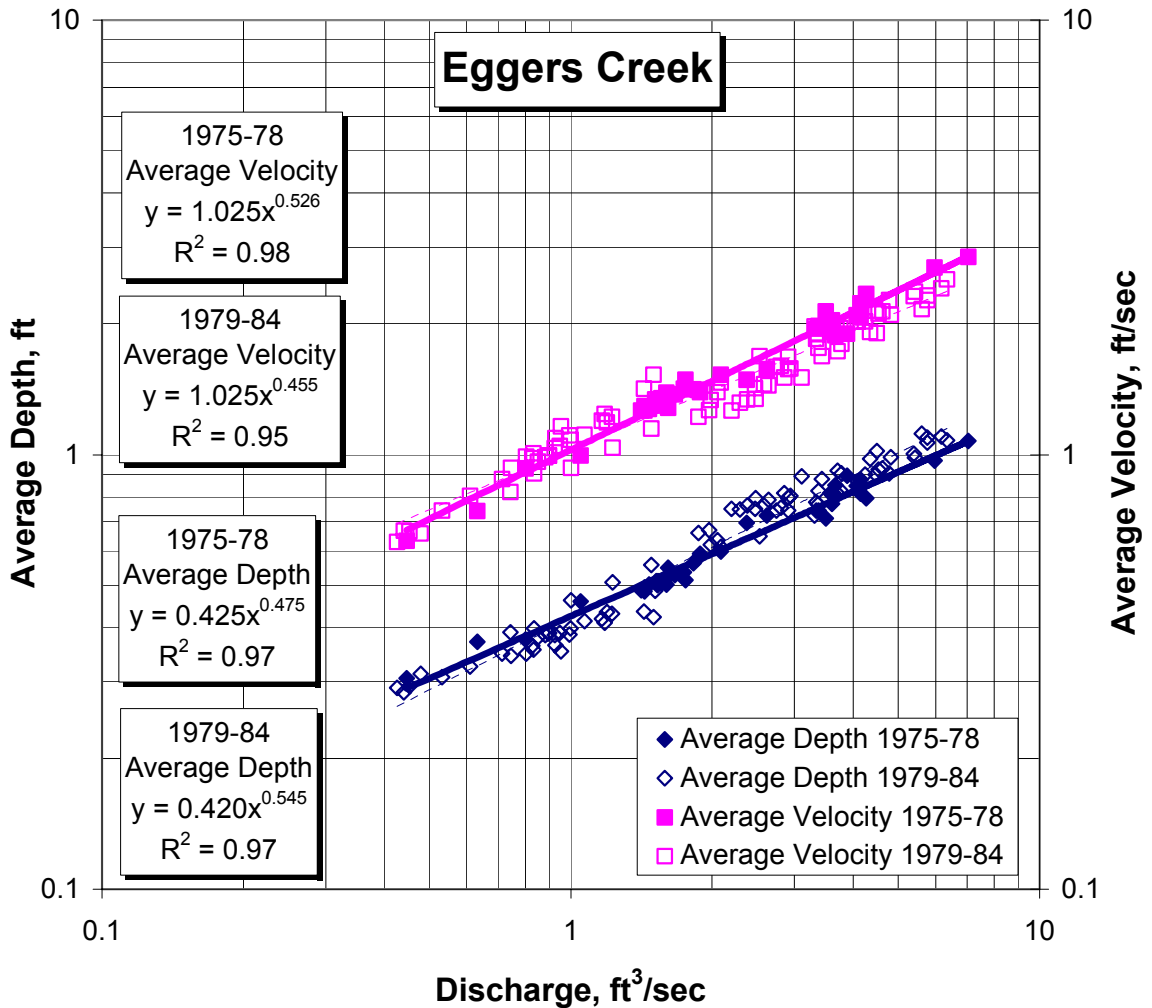


Figure 4. Average depth and velocity versus stream discharge for Eggers Creek.

## Channel Material

Surface material was classified by type of material and size class annually at the five Forest Service cross-sections just upstream of the sediment transport measurement site. The average  $D_{50}$  and  $D_{90}$  for the surface material are 22.8 mm and 164 mm, respectively (Figure 5). About 20% of the surface material is sand (2 mm) size or smaller and about 5-6% of the channel was vegetation or imbedded debris. Also shown in the particle size distribution for surface material measured by Case Western Reserve University personnel in 1994, at cross-section 1 (Figure 3) just below the stream gage. Material is much finer than the upstream locations and this difference is probably the result of annual cleaning of deposited sediments from the debris basin upstream of the gage.

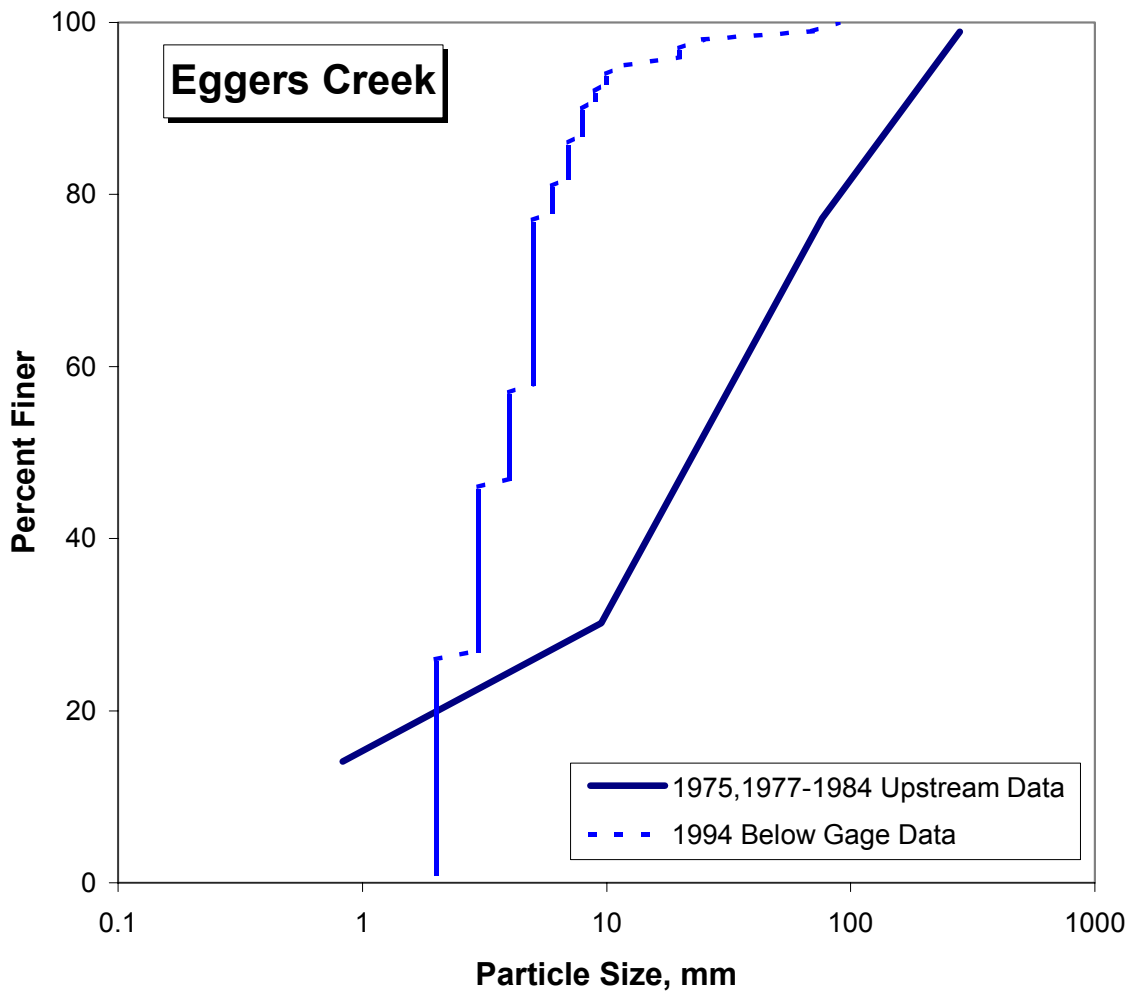


Figure 5. Particle size distribution for surface material in Eggers Creek.

## Sediment Transport

The bedload and suspended load transport measurements were made in water years 1975, 1976 and 1978 through 1984. Discharges associated with sediment transport rates were measured at the same cross-section using a pygmy current meter. The data includes 137 measurements of bedload transport and 130 measurements of suspended sediment. Sediment transport measurements spanned a range of stream discharges from 0.426 ft<sup>3</sup>/s (0.72Q<sub>a</sub>; 0.25Q<sub>b</sub>) to 8.75 ft<sup>3</sup>/s (14.78Q<sub>a</sub>; 5.18Q<sub>b</sub>). Bedload transport ranged from 0.004 to 1.73 t/d and suspended transport ranged from 0.00 to 2.23 t/d. There is a tendency for bedload transport to account for slightly over half of the total sediment transport, especially at the lower discharges. At higher discharges the proportion of bedload and suspended load transport are about equal (Figure 6).

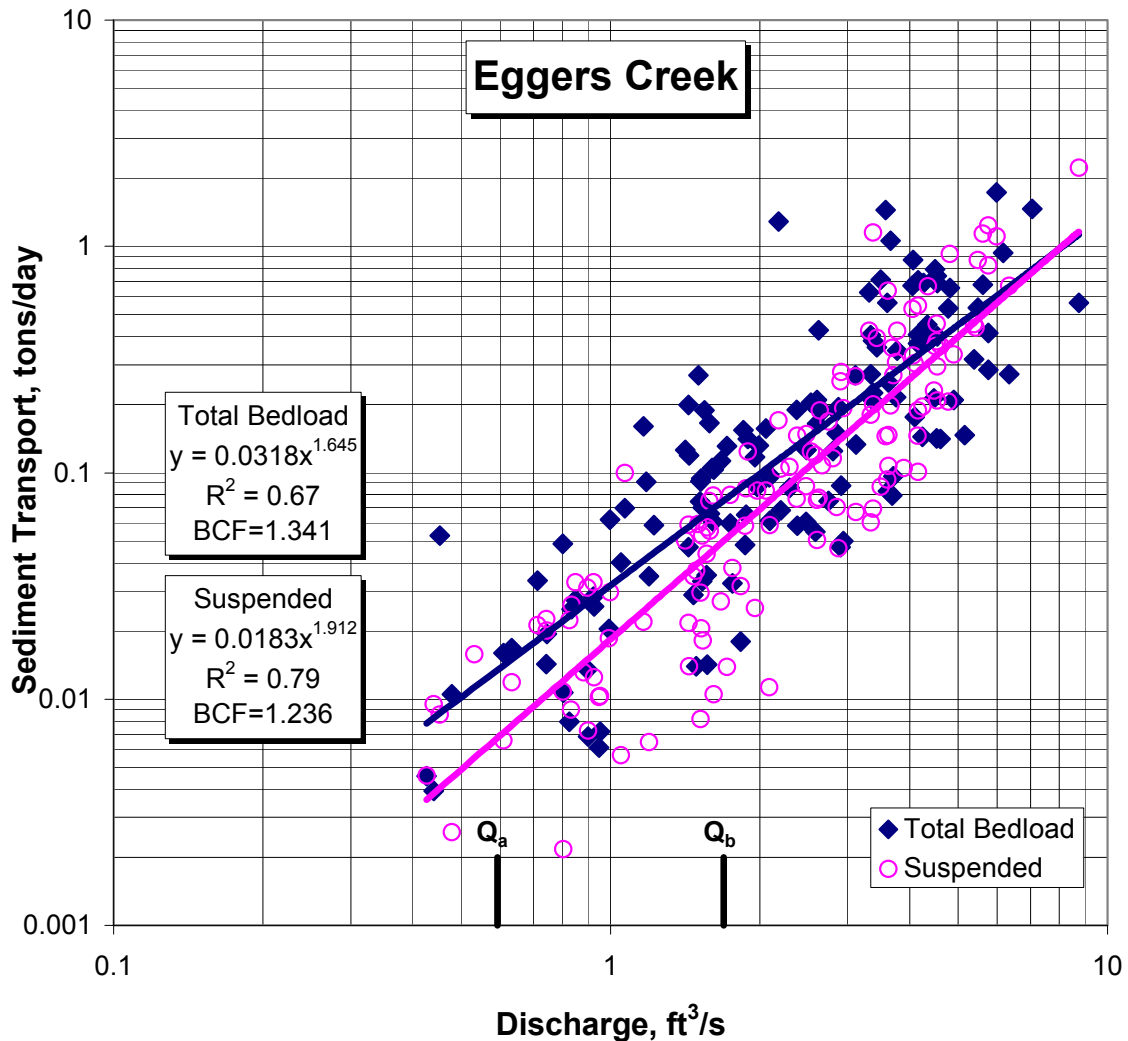


Figure 6. Bedload and suspended load transport rate versus discharge.