DATASHEET: What Shapes a River

Definitions:

Bankful Depth

A measurement from the deepest part of the river channel, the thalweg, to the top of the bank. This is often delineated by a change in slope, a fining of bed material (to floodplain material), the beginning of woody plant establishment, and coincides with the height of point bars.

Stream Power

As streams become deeper and flow faster, they have more power to transport gravels and cobbles.

Channel-forming Flow

This represents a level of river flow (discharge) that is powerful enough to transport bed material and shape the channel.

D50

The median particle size - half the particles on the stream bed are larger and half are smaller than this size. You can also define a D84, a particle larger than 86% of the particles, or a D16, a particle larger than 16% of the particles.

Entrainment

The process whereby materials in a stream bed are entrained into the flow of the river.

Equation of Entrainment

An equation used to predict the grain size of materials in a stream bed from factors such as slope and bankful depth.

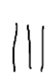
Dynamic Equilibrium

This refers to a balance point, where sediment input equals sediment output, and where the shape of a river stays the same, as the erosion of the outer curve of a meander bend is balanced by deposition in the inner curve of a meander bend.

Directions Part A Field Data:

Count and measure 100 stream bed particles as directed by your instructor. Enter count and cumulative count below. So if you measure a 18 mm particle, you would add one count to the 22mm bin, as it is larger than 16 mm but smaller than 22 mm. Add count values from left to right to get cumulative # of pebbles larger than the size indicated.

Cross hatching can be a quick way to keep track of counts. For example here is a count of five

 and a count of three. 

Next you will graph the count and cumulative count for each size category as shown in the figure. In this example, the D50 is 11 mm.

Table 1: Example Pebble Count Data and Cumulative Count Calculation

<table>
<tr><th>Size mm</th><th><2</th><th>4</th><th>6</th><th>8</th><th>11</th><th>16</th><th>22</th><th>32</th><th>45</th><th></th><th>64</th><th>90</th><th>128</th><th>180</th><th>256</th></tr>
<tr><td>Count</td><td>3</td><td>2</td><td>7</td><td>12</td><td>21</td><td>28</td><td>16</td><td>5</td><td>3</td><td></td><td>2</td><td>1</td><td></td><td></td><td></td></tr>
<tr><td>Cumulat-ive Count:</td><td></td><td>5</td><td>12</td><td>24</td><td>45</td><td>73</td><td>89</td><td>94</td><td>97</td><td></td><td>99</td><td>100</td><td></td><td></td><td></td></tr>
<tr><td>Example Count</td><td>|||</td><td></td><td></td><td></td><td></td><td></td><td>~~||||~~ ~~||||~~ ~~||||~~ |</td><td>~~||||~~</td><td>|||</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
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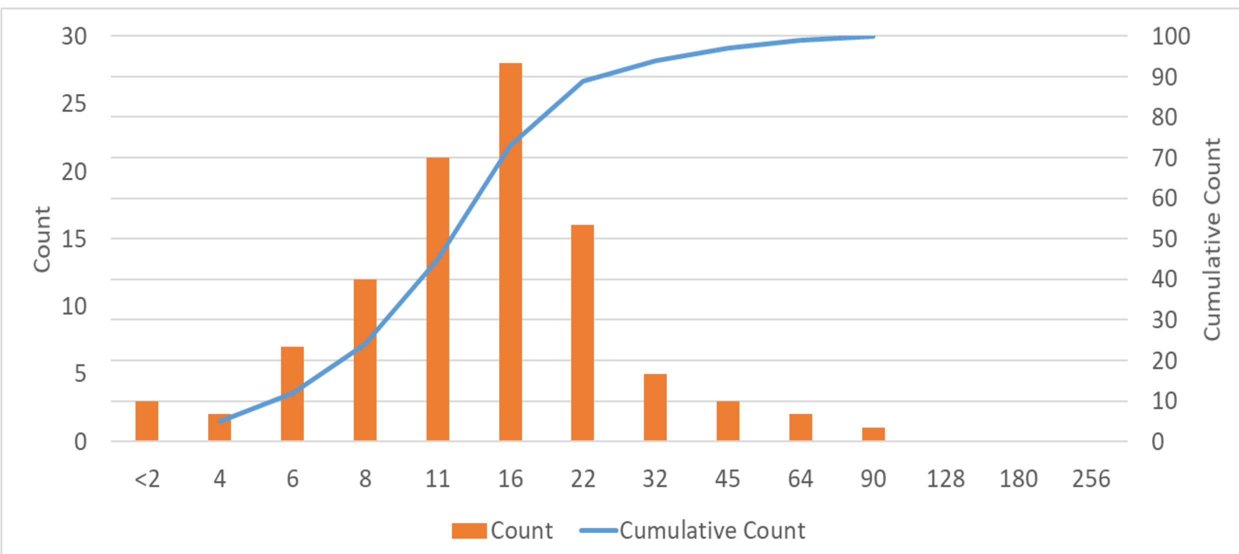

Figure 1: Example Graph of Pebble Count Frequency and Cumulative Count

Field Data Sheet

(fill in the count and cumulative count below, then create the graph like the example above)

100														
90														
80														
70														
60														
50														
40														
30														
20														
10														
Size mm	<2	4	6	8	11	16	22	32	45	64	90	128	180	256
Count														
Cumulative Count:														

Directions: Part B Theoretical Approach

Use the clinometer to measure the slope of the stream bed. It is best to measure the elevation from the top of one riffle crest to the top of the next riffle crest. Identify the bankful depth and then measure it with the measuring stick. You can measure the depth of water at the deepest point in the channel, and then measure from the height of water at the edge of the river (assuming it is the same) to the bankful elevation, and add these numbers together. Then enter these numbers into the data sheet and calculate the D50 as shown in the example in the data sheet.

Datasheet

Group Name	
Group Members	
S = Slope (decimal) *Example (0.02)*	S=
D =Bankful Depth (meters) *Example (0.5 m)*	D=
Equation of Entrainment: D50 (cm) = 1000 D S *Example* *D50 = 1000 * 0.5m * 0.02 = 10 cm*	D50 =

S is measured with the clinometer. Be sure to measure a percentage not degrees. It will be printed on the clinometer. D is the bankful depth that you have determined in the field.

Questions

1. List the D16 D50 and D84 for this data. What was the most common particle size?
2. Did the equation of entrainment correctly predict the D50? How close was it? What factors might have influenced this result? Does the D50 reflect bankful flow at this location?
3. Describe how geology, vegetation, humans and flood events have affected the shape of the river at this site.
4. Discuss how changes to variables listed in 3, might affect the river shape, and associated habitats.