
Name Part: A B C D Sum %

Student ID:.....

Date:..... Due: Jan. 28. 2015

Lab 1 Geog 323 winter 2015

The discharge of most large streams in the U.S. is measured at permanent gauging stations established by the US Geological Survey (USGS) and various local agencies. At these permanent stations, the **relationship between discharge and water level** (called **stage**) is known from past measurements at many different discharges. Thus the gauges actually record stream stage, which is converted to discharge by a rating curve. **A rating curve** is a graph that relates stage to discharge. This relationship is not usually linear, but it often appears linear when scales of both gauge height and discharge are made **logarithmic**. Thus rating curves are usually plotted on log-log paper. With a rating curve one can estimate the discharge of a stream by reading gauge height and using the rating curve to convert it to discharge.

A statement of the probability of floods greater than certain limits (or their average frequency of occurrence) is the basis for much planning that concerns river channels and valley floors. Such information is required for engineering design, planning, flood-insurance plans and land use zoning. It is also important in understanding the development of landforms. In geomorphology large floods are responsible for catastrophic processes, but generally the amount of work done (*i.e.*, erosion) in extreme floods is exceeded by the amount accomplished by more frequent floods. The geomorphologist therefore needs to know the **magnitude (size)** and the **frequency (how often they occur)** of a complete spectrum of floods. The frequency of hydrological events can be discussed in terms of either:

Probability (P): sometimes called exceedance probability, is the chance an event will equal, or exceed, some given discharge value.. **Recurrence Interval (RI):** sometimes called the return period, is the average interval in years between events equaling or exceeding a given magnitude. The magnitude of an extreme event is **inversely related to its frequency,** *i.e.*, very severe events occur less frequently than more moderate ones. The objective of frequency analysis is to relate the magnitude of extreme events to their frequency of occurrence **through probability distributions**. The techniques you will use in this lab concerning frequencies of events are appropriate not only to flood events. They can also be used to assess the probability/return period of **intense rainstorms**, **drought**, **snowfall**, **high winds**, *etc.*

Part A: Graphing

1. Construct a **rating curve** using the data for Winter Creek (table 1) using double log paper. As is common in the US, these discharge measurements are in **cubic feet per second** (cfs). We are using for this Lab m^3 min^{-1}. By convention **discharge is plotted on the x-axis, depth on the y-axis**. Always label every axis in all your graphs!
2. Draw a **best-fit line** through the points

Part B: Analysing the data

1. Use the rating curve (*i.e.*, your best fit line, which is the relationship between depth and discharge) to estimate the discharge at the gauge heights listed in the table 2.

Observation Number	Date	Time	Gauge Ht (m)	Discharge (m^3 min^{-1})
128	7/12/2008	1420	79.2482	234.4635
131	10/13/2008	1355	66.7512	161.9157
134	1/10/2009	1430	100.2347	499.7676
137	4/4/2009	805	202.0040	1780.2121
140	7/6/2009	1300	22.9318	10.1692
143	10/4/2009	945	45.7823	47.7139
146	1/3/2010	1315	34.5505	35.9820
149	3/27/2010	1110	90.1090	450.9450
152	7/3/2010	1440	111.6746	701.1141
155	10/3/2010	805	57.6072	102.1105
157	12/11/2010	1500	53.9496	82.5719
158	7/2/2011	1205	644.9143	5200.0733

Tab. 1: Summary of Discharge Measurement Data for Winter Creek, U.S. Department of Interior

Gauge Height (m)	Discharge (m^3 min^{-1})
60	
250	
500	

Tab. 2: