Bankfull stage is the water depth at which a stream completely fills its channel (to the top of the banks) and begins to

overflow onto its floodplain. Many researchers feel that bankfull flows are the critical flows in determining character

and geometry of the stream channel. Others have argued (perhaps less convincingly) that due to their relatively high

magnitude and frequency, bankfull flows may be responsible for accomplishing the largest amount of geomorphic

work (bank erosion, sediment transport, etc.). The size of the bankfull channel of a river is important because it

scales the balance of reach-scale erosion and deposition with the longer-term flow regime and sediment flux. Rivers

will tend to adjust towards an equilibrium condition, wherein the scale of the channel topography and the size of bed

sediments are able to convey recurrent bankfull-level floods.

What data would we need to collect in the field to determine the bankfull discharge of a river using the Manning

equation?

How could we determine the Manning roughness coefficient for modern stream flow? What data would we need to

collect to do this?

From an environmental standpoint, why are some streams more sensitive to environmental impact than others? If

you worked for a consulting firm and were asked by a client to evaluate the impact of real estate development on a

local drainage basin, what would you look for? How would you design your study?

Describe how urbanization (constructing cities with buildings, parking lots, etc.) affects the frequency of large

flooding events.

Explain in your own words, how a stream transport and deposits sediments. Make sure that you include all

appropriate equations and terms.

State Darcy’s law and explain the core sample method. (Hint: A drawing may be a useful way to present the

variables used in Darcy’s law.)

In this exercise you will analyze discharge data from the U.S. Geologic Service (USGS). Data for all USGS gages in

the state of New York can be found at: https://waterwatch.usgs.gov/?m=real&r=ny

Select a gage station by clicking on the circle and then the name of the station (in blue).

From the “Available data for this site” window on the main page for the Missoula gage, go to “Field measurements.”

Download “field measurements” to a tab separated file, open in Excel. These are data collected over the years at this

gaging station by USGS personnel. These data provide a nice record of channel changes at this site over time.

Spend some time looking at the data and understanding what each column represents. All of the analyses below

should be done in metric, so you’ll need to create some new columns with the appropriate unit conversions.

Plot inside gage height versus Q, first for the data set as a whole, then for the most recent rating set (9). What you’ve

plotted here is a stage-discharge rating curve, which describes the relationship between flow depth (stage) and

discharge, for a specific cross-section. The discharges used to develop rating curves are developed from field

measurements of crosssectional flow area and velocity (Q=UA); then, once a rating curve has been established at a

site, discharge can be determined based on measurements of depth only. So when you see daily/hourly USGS

discharge data, these data are based on continuous automated measurements of depth (stage). Changes in crosssectional morphology produce changes in stage-discharge relationships, which is why stable reaches are desirable

as gage locations.

Your rating curve probably isn’t a straight line. Would you expect it to be linear or not? Explain your reasoning.

Plot channel width vs time. Is any trend in channel width (i.e., narrowing or widening) evident? Is this plot an

accurate way of assessing changes in width? How would you explain the obvious outliers?

Calculate the width-depth ratio for each measurement. Plot Q vs w:h. What can you infer about cross-section shape

and confinement from this curve?