CEE 166A/266A
WATERSHEDS AND WETLANDS

Autumn 2014-15

Exercise No. 1: Watershed Delineation and Characterization

Due at the beginning of class, 30 September 2014

Goals: The goals of this exercise are straightforward: 1) practice at working with topographic maps to delineate watershed boundaries, and 2) practice at quantifying different physiographic characteristics of watersheds relevant to hydrologic understanding.

Collaboration: You are welcome to discuss this exercise *ad nauseum* with other classmates, with friends, with your parents, or with anyone from whom you think you might learn. However, it is essential that you develop your own delineation experience and that you actually make the measurements requested, since you may be asked to do any or all of these tasks on exams or professionally. Therefore, I expect you to submit your map sheet with a delineation for which you take responsibility (see below), and that you prepare your own report based on your own observations for the other measurements requested.

Submission: Please prepare a hard-copy document to accompany your map sheet. It should describe your methods and present your results for each of the exercises described below. You may *also* submit a digital document, e.g., MS Word or Excel, but that is not required. Please include your name and a page number on each sheet. If you prepare an electronic document, you may submit it via CourseWork, either using your Drop Box or using the Assignment page. Please include your family name in the file name of any file you upload via CourseWork. Please hand in your map sheet by leaving it in your assigned map file drawer. Hand in any non-electronic supporting documentation at the end of our classroom discussion of the exercise.

Discussion: On your submission please show enough work and provide enough discussion so that the TAs and I may understand how you have made the decisions you needed to make for the exercise. This will allow us to provide you with cogent feedback focused on your understanding and learning. Simply providing a quantitative result is inadequate. Assumptions should be clearly identified. If you choose to use tools such as spreadsheets or MATLAB, be sure to show clearly all formulae and other relationships mathematically, i.e., don't make us decipher your spreadsheet or code.

1) **(To be completed at or before 6:00 pm, Friday, 26 Sep)** For one of the locations described in the table below, delineate the watershed divide on the U.S. Geological Survey 7.5 Minute Topographic Quadrangle sheet provided. In each of the map drawers in the left stack of drawers in Y2E2 164, the Fresh Water Project Studio, you will find either one (thin upper drawers)or two (thicker lower drawers) pairs of map sheets, i.e., Hatchet Mountain Pass and McKinley Mountain. You will be working with a partner (of your own choosing). **You should arrange partners before leaving class on Tuesday.** You and your partner should take one pair of map sheets, each then choosing one of the map sheets for your initial delineation. Write your names on the label on the drawer and use that drawer to store your quad sheets and to submit them. Be sure also to write your name on the front of your map sheet.

In preparing your delineation please make sure that the divide is easily observed on the sheet. It is important that the line showing the divide not be too thick, especially in regions where elevation contours are closely spaced, but it needs to be visible. Pencil or pen is fine; choose a color that is easily seen. I recommend that you not fold your map sheet.

USGS Quadrangle	Location (Catchment)
Hatchet Mountain Pass, CA	North Fork Montgomery Creek, at the 3200 ft elevation contour crossing
McKinley Mountain, CA	Little Humbug Creek, immediately above its confluence with the Klamath River in Section 13 (on the Eagles Nest Golf Course)

2) Exchange quad sheets with your partner, who will have delineated the other watershed. (This is the reason for the Friday deadline for part 1). Begin by checking your partner's delineation. Make any corrections you think are necessary. You are welcome to discuss your review of the delineation with your partner. Somewhere on the front of the quad sheet add: "Delineation checked by *Your Name*". Submit your quad sheet by placing it your team's map drawer.

3) Using your new quad sheet and watershed, i.e., the one you checked, determine the catchment area (in both km^2 and mi^2). Include a quantitative estimate of the uncertainty in your area determination.

A Tamaya Technics Planix 5 digital planimeter is available in Y2E2 164 for your use in measuring area. It is stored in the rightmost full-height cabinet. Access will be explained in class. A manual is included which explains its operation. This instrument is delicate and very expensive. Please treat it with great care. Please keep the battery as charged as possible by plugging the unit into an outlet whenever feasible. Please keep the planimeter locked up except when in use.

4) Construct and plot a vertical profile of the main channel of your watershed to the divide. (The blue lines indicating channels end upstream somewhat arbitrarily. Therefore, it is common practice to extend the blue-line channel to the divide by following the valley occupied by the blue line. In other words, to trace the route of a drop of water starting at the divide and ending up in the blue-line channel.) Be sure to indicate your main channel and its extension to the divide on your quad sheet. A couple of instruments that you might find helpful for measuring linear distance on maps are available in the same rightmost cabinet in Y2E2 164. Please use a minimum of 5 points along the channel to construct your profile.

5) Determine the main-channel slope (in dimensionless form). Plot that slope on the vertical profile plot you construct for the previous question in such a way that your main-channel (overall) slope can be compared to the local slopes along the channel profile.

6) Label each link of the stream channel network of the watershed with its Strahler order. Determine the magnitude of the network and the bifurcation ratio(s).

7) In what 8-digit (Cataloging Unit) HUC is your watershed located? Hint: http://water.usgs.gov/wsc/map_index.html