CEE3430 Engineering Hydrology

Homework 5. Introduction to Surface Water Hydrology and Precipitation

Date: 2/12/14
Due: 2/21/14

Objectives.

- To be able to quantify watershed attributes
- To be able to describe the role of atmospheric and ocean circulation in hydrology and the formation of precipitation
- To be able to quantify the variability of precipitation, calculate area average precipitation and determine design storm amounts
- To be able to calculate evaporation from an open water surface

Streamstats is a USGS web service that helps with watershed delineation and calculation of watershed attributed for hydrologic analysis. Use Streamstats to complete problems 1 and 2. The Utah Streamstats website is http://water.usgs.gov/osw/streamstats/utah.html.

[Some hints on using Streamstats.

- Turn the popup blocker off
- If blank screen, select ESRI_Imagery_World_2D for navigation
- Zoom in close to see streams as pixels
- Click exactly on stream with watershed delineation from a point
- Click Basin Characteristics and Compute parameters to obtain desired basin parameters
- Use Alt PrtScn to capture screen into copy buffer. Paste in to Paint to crop and edit for hand in.]

1. In Streamstats zoom in on the Logan River and determine attributes of the watershed upstream of First Dam. Report/hand in the following:

   a) A computer screen shot picture that depicts the Logan River Watershed as you delineated it using Streamstats.

   b) The mean annual precipitation in inches from Streamstats

   c) A graph that shows the mean precipitation each month from Streamstats. This graph should be similar to the normal monthly distribution graphs in Mays Fig 7.2.6.

   d) Refer to Homework 1. Use the USGS NWIS website http://waterdata.usgs.gov/ to determine the mean annual runoff expressed as a depth (yearly discharge volume/area) for the Logan River Above State Dam (gage USGS 10109000)

e) Given precipitation from (b) and streamflow from (d) calculate the residual term ($G+E+T+\Delta S$) in equation 7.1.4 for the Logan River Watershed. Indicate which of these quantities you think dominates the residual.

2. Repeat problem 1 for another location of your choosing (where data is available).

3. Mays 7.2.1 but for Logan Utah. Use http://hdsc.nws.noaa.gov/hdsc/pfds

4. Mays 7.2.3 but for Logan Utah. Use http://hdsc.nws.noaa.gov/hdsc/pfds

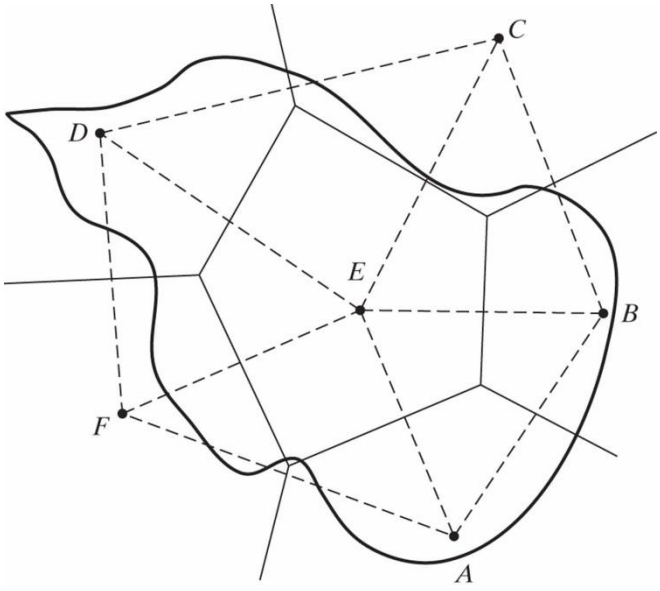
5. Mays 7.2.10. The table in the text should read

Interval of isohyets (cm)	0-2	2-4	4-6	6-8	8-10	10-12	12-14
Enclosed area (ha x 1000)	5.3	4.4	3.2	2.6	2.3	1.9	1.4

6. A watershed of 544 ac with six rainfall gages can be divided into Thiessen polygons with the data listed in the accompanying table. Using the total storm rainfall depths listed; find the average rainfall over the watershed.

Gage	Rainfall (in.)	Area (ac)
A	2.20	101
B	3.22	83
C	0.71	21
D	0.88	111
E	2.49	191
F	6.72	37

(From Bedient et al., 2008)



7. Mays 7.2.14

8. Mays 7.3.6.

9. Repeat Mays 7.3.6 but assume the wind speed is halved and calculate the evaporation by each method. Compare your results to the solution of 7.3.6 and explain the differences. Comment on the implications of your results as they pertain to how wind speed influences evaporation.

10. Mays 7.3.7