ERE445/645
Hydrologic Modeling
HW# 1
Due Thursday February 4, 2016, submitted on Blackboard by the beginning of class.

Average daily streamflow records are employed in a variety of applications. Daily streamflow data are used to obtain streamflow statistics such as the 100-year flood and the 7-day 10-year low flow. Daily streamflow sequences are also commonly employed to calibrate watershed models, investigate reservoir yield and reliability, explore potential impacts of land use and/or climatic change on a watershed, and aid in water quantity and water quality simulations. In this assignment you are asked to read in a sequence of daily streamflows and calculate the annual average streamflow.

The first step is to obtain daily streamflow data for our study site: the West Branch Delaware River at Hale Eddy, NY. The Delaware River is an important watershed that serves users in New York City, NY and Philadelphia, PA, and drainage an area of 36,570 km^2 (14,119 mi^2) before discharging into the Delaware Bay and the Atlantic Ocean. At the location of the Hale Eddy gauge, the drainage area is 1541 km^2 (595 mi^2).

For this assignment, we will use a 20-year record of daily streamflow at the site for the water years from 1941 to 1960. A water year begins on October 1st of the previous year and continues to September 30th of the water year. Thus you will need to obtain streamflow from October 1st, 1940 to September 30th, 1960. While you can obtain this data from many sources, I suggest you use the USGS's National Water Information System (NWIS) data retrieval system. To do this:

1) Go to the USGS's NWIS Site: waterdata.usgs.gov/nwis
2) Click the link for "Surface Water", and then "Daily Data".
3) Under "Site Identifier" click the box for "Site Name" and then "Submit" (or hit enter)
4) Put in the site name, "West Branch", and then "Submit". You will see that there are 88 USGS stream gauges with the word "West Branch" in their name.
5) Scroll down and click on the site number: 01426500.
6) In the box for "Available data for this site" make sure "Time-Series: Daily Data" is selected.
7) Scroll down and in the box with "Available Data" select the box for "Discharge", Output Format "Tab Separated", and beginning and end data given above, and click on "Go".

You will be presented with all of the data on your screen. You will now need to be a little creative to create a file with the discharges. Ideally you would remove the header (leaving only the dates and the discharges). The data you collect is recorded in cubic feet per second (cfs). In this file, each daily streamflow measurement is represent by a line of data, including the USGS gauge number, the date of the measurement, and whether the streamflow was estimated or not. How you manage this file is up to you.

In this assignment, you are to write a script in R to calculate the following:

1) The average daily streamflow across the 20 year period.

2) The average daily streamflow for each of the 20 water years.

This data should be exported to an output file (such as a table).

You are to submit in Blackboard the following items as a single zipped file with your last name as the title of your zip file (i.e. Kroll_HW1.zip):

1) Your input file
2) A script of your R code
3) Your output file

You can submit these files by attaching them under the assignments tab in Blackboard. Results should be given in units of cfs. You should follow the instructions for writing a script in the Introduction to R file, including the proper header and a description of all variables used in your script. As you write your code, consider adding flexibility whenever possible. For instance, if you were to read in 50 years of streamflow data instead of 20, could your program handle this?