**Watershed Area, Discharge and Response to Storm Events**

In this exercise, you will retrieve data from a USGS website about a local watershed, and use these data to test the following hypotheses:

a. in southern New England watersheds, watershed area correlates with average annual discharge

b. watershed area correlates with the maximum discharge following a high-precipitation event

c. watershed area correlates with the time lag between a precipitation event and maximum discharge

Open the website “USGS Current Water Data for the Nation” (<http://waterdata.usgs.gov/nwis/rt>). On the left side of the page, you will see a map of the United States with many color-coded dots. Each dot represents a gaged river monitored by the USGS. Blue and teal dots represent higher-than-average streamflow for today’s date compared with a long-term average; red and orange dots represent lower-than-average streamflow.

1. For the entire southern New England region, is streamflow currently higher or lower than average for this date?

2. What recent weather phenomena might help to explain this observation?

Select a New England state either by clicking on that state on the map, or by selecting the state by name in the scroll-down menu “Geographic Area” on the upper-right of the web page. This will open a new page zoomed in to show USGS monitored rivers for the state you have selected.

With your mouse, hover over any dot for a monitored river. An information box will appear that provides the following information:

the 8-digit station ID #: flow in cubic feet per second (cfs), stage in feet, year-month-date time, streamflow percentile (compared to long-term average for this date), and a name/brief description of the river station.

Click on a station’s dot to open up a new page with information and data for that station. You may select any station you choose within the states of Connecticut, Massachusetts, New Hampshire, Rhode Island or Vermont: if you choose NH or VT, please select stations in the southern portions of those states.

When you select a station, a new page will open with information about the location of the station, watershed area, period of record, and other remarks about the gage and data for this station.

3. What is the name and 8-digit station ID for your station?

4. What is the drainage area for your station? Drainage area is the area of the watershed upstream of your station. Be sure to convert this area from square miles (mi2) to square kilometers (km2), showing your work.

If you scroll further down the page, you will see a table of available data for your station. Commonly this is discharge and gage height. These are the real-time data about recent streamflow for your station. You can choose to display these data as a graph or on a table. For now, select to display the parameter “discharge” in the output format “Graph w/ stats”.

5. What is the current (most recent instantaneous value) for discharge at your station? Be sure to convert this discharge from cfs to m3/s, showing your work.

6. What is the median daily discharge for today’s date at this station? Be sure to convert this discharge from cfs to m3/s, showing your work. Is today’s discharge greater than or less than the median discharge for this date?

Scroll down past the graph to the table labeled “Daily Discharge, cubic feet per second – statistics” and click on the hyperlinked work “more” following the years of record. This will open a new page showing daily statistics for your station. Scroll down the page to find a table with the median daily discharge for every day of the year for your station.

7. In what month is the median daily discharge highest for your station?

8. In what month is the median daily discharge lowest for your station?

9. Find the date with the highest median daily discharge, and the date with lowest median daily discharge. Record these data here

 highest: date \_\_\_\_\_\_\_\_\_\_\_\_\_\_ discharge \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 lowest: date \_\_\_\_\_\_\_\_\_\_\_\_\_\_ discharge \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

10. How much greater (in %) is the highest discharge compared to the lowest? Be sure to show all of your work.

Scroll up the page to find the drop-down menu “Available data for this site”, and switch from “Time Series: Daily Statistics” to “Time Series: Annual Statistics”. This will open a new page on which you can select which data parameters to display. Select “Discharge, cubic feet per second”, scroll down to confirm that the output format is “table of annual mean” and click “submit”. This will display a table of the annual mean daily discharge for your station for each year of record.

11. What is the annual mean daily discharge for the most recent year of data for your station? Be sure to convert this discharge from cfs to m3/s, showing your work.

12. The value you provided in Question #11 is in cubic meters per second. Use this value to calculate the average annual discharge for your station (hint: multiply by the number of seconds in a year to get annual discharge). What is the annual discharge for your station?

[INSTRUCTOR: you can stop the exercise here, or if there has been a recent heavy rainfall event, continue with the following questions]

Click your browser’s back button three times until you return to the page showing station location and area information and the graphs of discharge and other parameters for the past several days. If you cannot find this page, you can return to the page showing the state map of stations and re-select your station.

Change the display options for the graphs to show data for the past 30 days.

13. What is the maximum discharge recorded at your station over the past 30 days? (It may help to change the display output from graph to table, to better show this information).

14. What was the date and time of this maximum discharge?

15. What was the lowest discharge recorded at your station immediately before this high discharge event? (do not look for the absolute lowest discharge, but rather the lowest discharge between the high discharge you identified in question #13 and a preceding high point. In other words, look for the “valley” between two “hills”).

16. What was the date and time of this minimum discharge?

17. How much time, in hours, was there between this minimum discharge and the maximum discharge that followed it?

18. Examine the location data for your station carefully. Are there any remarks to indicate that your station monitors a river whose flow is regulated or diverted to other watersheds?