Physical Geology

Chemung River Flood Recurrence Intervals

NAME

Period

NOTE: You may use this MSWord file to do this exercise. Make sure you save it with the name *yourlastname*chemungriver.doc to your space on the network (or to your hard drive if you're working on your own machine). Where appropriate, text boxes are available for you to record your answers. To avoid closing this document, ***right click*** the hyperlinks and select "Open in a new window". Save frequently!

INTRODUCTION:

Go to The USGS site "Effects of August 1995 and July 1997 Storms in the City of Charlotte and Mecklenburg County, North Carolina" (http://water.usgs.gov/pubs/FS/FS-036-98/) and read the introduction to the article.

Continue reading at "RAINFALL IN THE CITY OF CHARLOTTE AND MECKLENBURG COUNTY DURING THE STORMS OF AUGUST 26-28, 1995, AND JULY 22-24, 1997" (http://water.usgs.gov/pubs/FS/FS-036-98/text/rainfall.html). When you've finished that section, find the link to the "What is a recurrence interval" on the left side of the page. Read for understanding, and answer the following questions:

1. What are the odds of 2.07 inches of rain falling in Mecklenburg during a 1 hour period in any particular year?

2. How often would an observer in Mecklenburg expect to experience a 5.88 inch rainfall in a 24 hour period?

3. What is the rainfall recurrence interval of a 5.71in. rainfall occurring in a 12 hour period?

4. How do rainfall recurrence intervals differ from discharge (flood) recurrence intervals?

5. Is a rain storm that produces 1 inch of rainfall in 1/2 an hour a relatively rare event in Mecklenburg? Explain/defend your answer.

Open the Excel spreadsheet entitled chemungriver.xls (http://www.bedford.k12.ny.us/flhs/science/stevek/rivers/chemungriver.xls) and save it with the name *yourlastname*chemungriver.xls to your space on the network (or to your hard drive if you're working on your own machine). Then follow the instructions at the top of the spreadsheet to determine the rank and recurrence interval of each of the flood events listed in the data table. As you work through the process, keep in mind and answer the following questions:

1. How many years of records (n)are recorded here? (Remember, n is equal to the total number of years encompassed by the records presented here)

The formula I wrote is: = ??? and I copied it by:

2. How did you use the spreadsheet's various functions to determine and label the rank (m)?

3. Specifically, what formula did you write to calculate the first recurrence interval and how did you copy it to the remaining recurrence interval spaces on the table?

Construct a scatter chart of the discharge recurrence intervals (on a logarithmic x-axis) and the corresponding discharges (y-axis). Make sure your graph has a title, that the axes are labeled, and that if you choose to "show series" that you've named the series. Finally, make your chart attractive - fonts and dimensions proportioned nicely. Use Excel's line drawing tool or print the graph and use a pen and ruler to draw a straight, best fit line through the data points on the graph (do NOT use the "trendline" function). Cut, paste, and format your chart into this document below:

Then answer the following questions:

1. According to YOUR graph, what is the approximate discharge of a "50 year storm" in the Chemung River basin?

2. About how many times greater is the discharge of a 100 year flood than that of a 50 year flood on the Chemung River? (show your work here!)

3. Go to this USGS site for current data on Cross River in Pound Ridge Reservation (http://waterdata.usgs.gov/nwis/uv/?site_no=01374890&PARAmeter_cd=00065,00060,00062,72020).

A. What is the current discharge at that gauging station? How has the discharge changed over the last few days? What might explain those changes?

B. Note the similarity of the shape of the discharge curve and the shape of the 'gauge height' (water level) curve. Write a brief statement that explains that similarity.

C. At the top of the page, select "Surface Water: Peak streamflow" from the *Available data for this site* drop down menu. From the graph, determine the year and discharge of the highest flow rate on the graph.

D. Select "Table" in the "Output Format" box and determine the exact date of the maximum discharge. Use that date and a word that might describe the condition of Cross River on that day to search the internet for the specific event that caused the high discharge. What event was that high discharge related to?

E. What event(s) might have caused the 'outliers' (those data points WAY off the best fit line) on the Chemung River chart you created?

E. In recent years, many of the dams that were built in the late 1800's as part of NYC's Croton Reservoir system were rebuilt. Originally they had been built to "100 year storm" specifications, but the dams were repaired to 500 year storm specs, and include "fuse plug" outlets that may fail if a 500 year storm strikes the area. Fuse plugs are essentially weak spots in the dam that will fail first and allow a more controlled release than a catastrophic failure of the entire dam would. This reconstruction took considerably longer and cost significantly more than it would have to simply inspect and repair the dams to the 100 year storm specifications. Consider the changes in area land use patterns, changes that may or may not be occurring in regional climate, and the political/economic climate of the area and write a brief essay either defending or criticizing the expenditure of the extra resources to upgrade the dams.