Lafayette College

Department of Civil and Environmental Engineering

CE 321: Environmental Engineering and Science Fall 2019

Homework #2

Due: Wednesday, 9/11/19

1. A watershed has an area of 25 square miles. A rain event of 0.25 inch falls on the watershed. One-third of the rain infiltrates into the ground, and the rest becomes runoff.
   1. What is the total volume of rain? (report your answer in acre-ft)
   2. What is the total volume of runoff? (report your answer in acre-ft)
   3. If some of the vegetation in the watershed is removed and replaced with a housing development, would the runoff increase or decrease? Explain your answer?
2. Find a maximum reservoir storage requirement (MG/mi2) if a uniform draft of 726,000 gpd/mi2 from a specific stream is to be maintained (MG = Million Gallons, gpd = gallons per day). Perform both a graphical and tabular analysis. *Explain any differences in your final storage requirement between the two methods*. The following record of average monthly runoff values is given:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Mo\* | A | M | J | J | A | S | O | N | D | J | F | M | A | M | J |
| RO\*\* | 97 | 136 | 59 | 14 | 6 | 5 | 3 | 7 | 19 | 13 | 74 | 96 | 37 | 63 | 49 |

\*Mo = Month, \*\*RO = Runoff (MG/mi2/mo)

1. A 4,000-km2 watershed receives 102 cm of precipitation in one year. The average flow of the river draining the watershed is 43.2 m3/s. Infiltration is estimated to be 5.5x10-7 cm/s and evapo-transpiration is estimated to be 40 cm/y. Determine the change in storage in the watershed over one year. (report your answer as m3) The ratio of runoff (in cm) to precipitation is termed the runoff coefficient. Computer the runoff coefficient for this watershed.
2. Lake Kickapoo, TX, is approximately 12 km in length by 2.5 km in width. The inflow for the month of April is 3.26 m3/s and the outflow is 2.93 m3/s. The total monthly precipitation is 15.2 cm and the evaporation is 10.2 cm. The seepage is estimated to be 2.5 cm. Estimate the change in storage during the month of April. (Answer 1.61 X 106 m3)
3. Sketch and label all parts of the hydrological cycle. Provide a detailed explanation of the overall cycle and at least 3 parts 🡺in addition to the terms mentioned in Problem 6.
4. Define evaporation, transpiration, runoff and baseflow.
5. Sketch and explain the hydrograph, label all parts.