ESTIMATING PRECIPITATION MISSING DATA

(CWR 3540-WRE: Example for method in section 2.6.1 of textbook)

(Source: R. H. McCuen, Hydrologic Analysis and Design, Pearson, 2005)

A number of methods have been proposed for estimating missing rainfall data. The station-average method is the simplest method. The normal-ratio and quadrant methods provide a weighted mean, with the former method basing the weights on the mean annual rainfall at each gage and the latter method having weights that depend on the distance between the gages where recorded data are available and the point where a value is required. The isohyetal method is the fourth alternative.

4.3.1 Station-Average Method. The station-average method for estimating missing data uses n gages from a region to estimate the missing point rainfall, $\hat{P}$, at another gage:

$$\hat{P} = \frac{1}{n}\sum_{i=1}^{n} P_i. \tag{4.8}$$

In the preceding equation, P_i is the catch at gage i. Equation 4.8 is conceptually simple, but may not be accurate when the total annual catch at any of the n regional gages differs from the annual catch at the point of interest by more than 10%. Equation 4.8 gives equal weight to the catches at each of the regional gages. The value $1/n$ is the weight given to the catch at each gage used to estimate the missing catch.

Example 4.4

As an example, consider the following data:

Gage	Annual P (in.)	Storm-Event P (in.)
A	42	2.6
B	41	3.1
C	39	2.3
X	41	?

The storm-event catch at gage X is missing. Ten percent of the annual catch at gage X is 4.1 in., and the average annual catch at each of the three regional gages is within ± 4.1 in.; therefore, the station-average method can be used. The estimated catch at the gage with the missing storm-event total is

$$\hat{P} = \frac{1}{3}(2.6 + 3.1 + 2.3) = 2.67 \text{ in.} \tag{4.9}$$

Using this method requires knowledge of the average annual catch, even though this information is not used in computing the estimate, $\hat{P}$.