Volfe Watershed Rainfall/Runoff in Southern California

Sandra Jimenez
Water Resources Institute
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Acknowledgements

Abstract

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Acknowledgements
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Water is a limiting commodity in arid regions worldwide, including Southern California. If more water supplies could be developed locally, less would be needed via expensive water delivery systems. However supplies are variable annually with unpredictable rainfall. If rainfall/runoff relationships were better understood, perhaps variable supplies could be better estimated. My internship through the Water Resources Institute (WRI) at California State University San Bernardino that placed me with Pacific Southwest Research Station allowed me participate in this research and to help make past and present water stream flow charts reading from the Volfe Watershed/Runoff accessible to future researchers.

Introduction
Volfe Watershed/Runoff is located in The San Dimas Experimental Forest. The San Dimas Experimental Forest is one of the oldest natural hydraulics in the nation. It was originally established as an outdoor hydrologic laboratory to document and quantify the water cycle in semi-arid steep lands. It was established to determine the value of chaparral and associated forests for watershed protection and to provide a basis for management to obtain the maximum beneficial yield of water.
The San Dimas Experiment Forest is located in the San Gabriel Mountains about 45 km northeast of Los Angeles (see map).

Volfe Watershed has the following characteristics (see figure 1):
- Size – 300 hectares
- Elevation – 600 to 1200 meters
- Geology – igneous and metamorphic rocks
- Climate – Mediterranean (cool moist winters and hot dry summers)
- Soils – coarse-textured sandy loams
- Vegetation – mixed chaparral with riparian trees

Rainfall and streamflow have been measured since the 1930s.

**Methods**
Stream flow was calculated by manually reading historical stream charts (see picture).
Rainfall was available from previous work.
Annual rainfall volume was calculated for Volfe watershed and compared with annual stream flow volumes to get a ratio (runoff/rainfall).
Graphs were generated comparing the runoff ratios to the annual rainfall.

Results
- Spikes in the hydrograph correspond to individual rainstorms (see graph 1).
- Runoff is only a small percentage (<10) of rainfall in Volfe watershed
- Plotting the runoff ratio against the same year’s rainfall shows no pattern (see graph 2).
- Plotting the runoff ratio against the previous year’s rainfall shows a better pattern (see graph 3).

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Figure 1
Volfe Watershed Rainfall/Runoff

Graph 2

$R^2 = 0.0165$

Annual Rainfall (mm)
Volfe Watershed Rainfall/Runoff

Graph 3

$R^2 = 0.331$

Previous Year Annual Rainfall (mm)

Runoff Ratio (percent)
Conclusions

- Rainfall is the source of streamflow in Volfe watershed, but only a small percentage generates runoff.
- Streamflow volume corresponds to individual rainstorms.
- However, the total annual runoff ratio is more closely related to the previous year’s rainfall.
- Ultimately, the watershed is important because it provides people with drinking water, water for recreation, irrigation as well as industrial activities.
- The watershed also provides food and water to plants and animals.

During my internship with the Forest Service-Pacific Southwest Research Station, I was able to learn so much about their experimental forests. I learned about the importance of preserving the land for recreational use, water accessibility, food and other industrial needs. I also learned that many species of birds, mammals, and critters depend on the forest land to survive and strive. I believe that as an intern and for future interns, it’s important to get involved as much as possible at work. It is extremely helpful to get involved with activities such as field work, ask questions, be curious, get involved, ask how you could be helpful, ask to learn as much as possible about the agency you are working for and what it represents in order to be able to understand the importance of what you are doing and learning in order to be able to be a successful intern and benefit from the opportunity of being involved and being able to give back through the work and effort we as interns provide. I am forever grateful for this opportunity and the experience that the Water Resources Institute made possible through this internship.
References

