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Oregon State University
Corvallis, Oregon 97331-4304
(503) 737-4022

Peak Flow Prediction for Small Forested Watersheds Along the Southern Oregon and Northern California Coast

C.W. Andrus, H.A. Froehlich, and M.R. Pyles
Forest Engineering Department, Oregon State University, Corvallis, OR 97331

The magnitude of peak flows from small forested watersheds in the Pacific Northwest is controlled largely by regional weather patterns. Harris (1979) and Campbell et al. (1982), in their attempts to derive equations for predicting peak flows in western Oregon, isolated four regions, each representing a distinct climatic regime. They then used various topographic and rainfall parameters to develop regression equations for estimating peak flows for return intervals of 10 through 100 years (Harris also considered 2- and 5-year return intervals).

We are currently updating the predictive equations developed by Campbell et al. for the coast region, which they define as a strip of land varying in width from 20-50 miles along the entire Oregon coast. In the process we have isolated a sub-region in the south end that has peak flows much greater than elsewhere in the coast region. Peak flows derived from actual flow records for eight streams in the sub region average twice the magnitude of peak flows estimated with Campbell's equations. And, peak flows corresponding to a 25-year return interval averaged twice as large for the eight streams in the sub-region than they did for gauged streams elsewhere in the coast region. Therefore, we recommend avoiding Campbell's equations for estimating peak flows in this sub-region and we propose the alternate method described here.

The boundaries of the sub-region are not accurately known due to the scarcity of gauging sites. However, we suggest that the northern boundary is about halfway between Bandon and Port Orford and that the southern boundary is at least 30 miles south of the Oregon-California border. The sub-region extends at least 20 and perhaps 30 miles inland from the coast (Fig. 1). The boundaries may correspond to an area of high annual precipitation identified in a map prepared by Froehlich et al. (1982).

Because the records from the eight gauged streams in the sub-region are of short duration (Table 1) peak flows on the gauged streams must be estimated by extrapolation, even for common design return intervals (such as 25 years). This shortcoming must be overlooked since alternate means of estimating peak flows for culvert design purposes require even greater extrapolation. The estimated peak flows for a range of return intervals are illustrated in Figure 2.

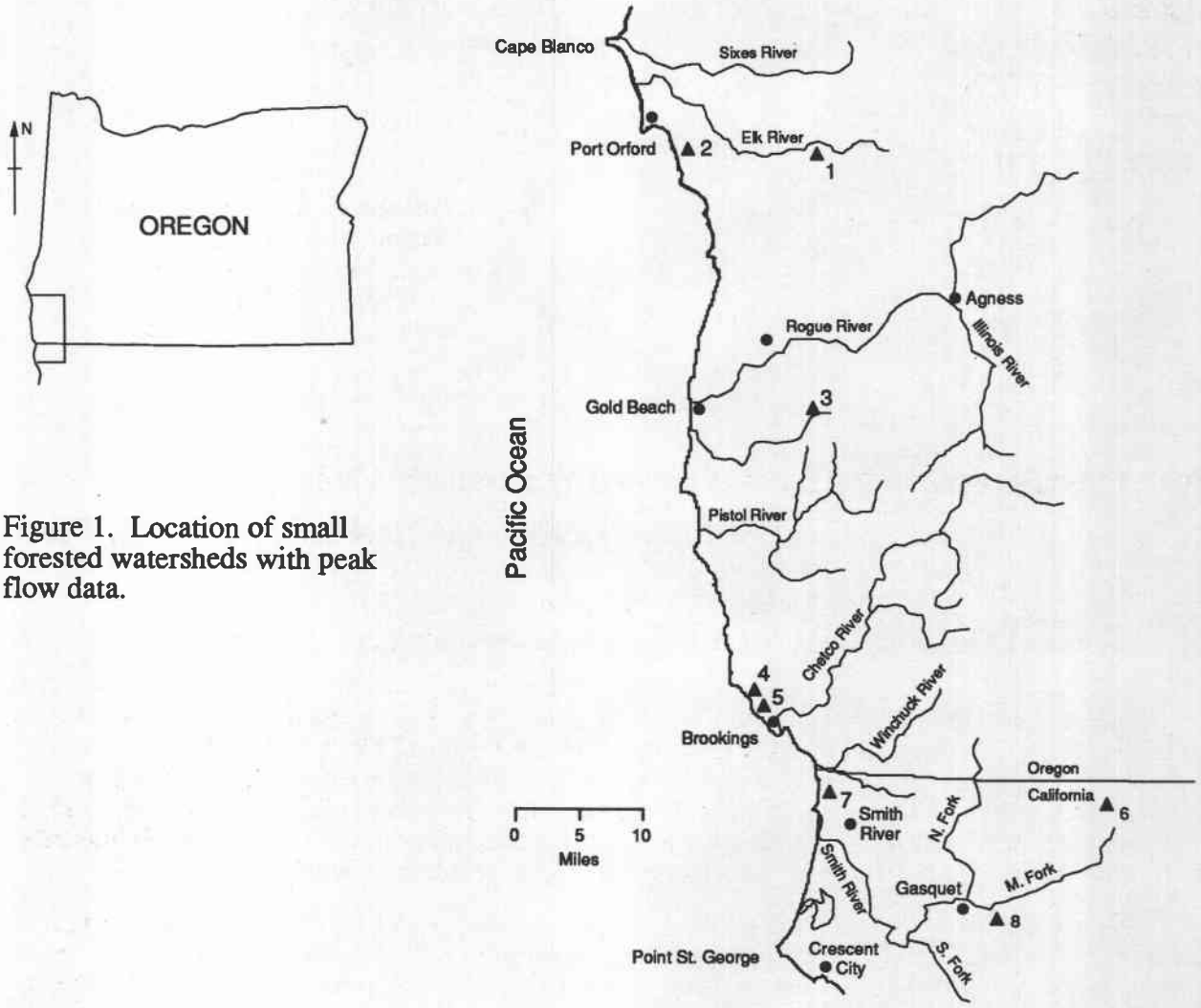

Figure 1. Location of small forested watersheds with peak flow data.

Expected peak flows for streams in the sub-region range from 270 to 630 cubic feet per second per square mile (csm) for a 25-year return interval (Table 1). Although there appear to be weak correlations between some topographic and climatic characteristics and the peak flows from the gauged watersheds, none were found to be statistically significant at the 0.05 level. Therefore, when estimating peak flows for ungauged streams in this sub-region, we recommend using a mean value for the nearest stations and adjusting it up or down depending on the proximity of the stream to the gauged streams.

References

Campbell, A.J., R.C. Sidle, and H.A. Froehlich. 1982. Prediction of peak flows for culvert design on small watersheds in Oregon. WRRI-74. Water Resources Research Institute, Oregon State University, Corvallis, OR. 96 p.

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Table 1. Watershed characteristics and expected peak flows for gauged streams in the Coast sub-region.

Site	Stream	Drainage Area (mi^2)	Average Elevation (ft)	Years of Record	25-year Return Interval Flow[a] (csm)
1	Milbury	0.80	1600	12	500
2	Dry Run	0.86	700	27	270
3	Hunter	0.98	2800	13	570
4	Harris	1.05	600	14	540
5	Ransom	0.74	400	24	480
6	M. Fork Smith River Trib.	0.29	2600	12	360
7	Lopez	0.92	1500	12	530
8	Darlingtonia	0.70	1200	11	630

[a] Expected probability, Log-Pearson Type III analysis.

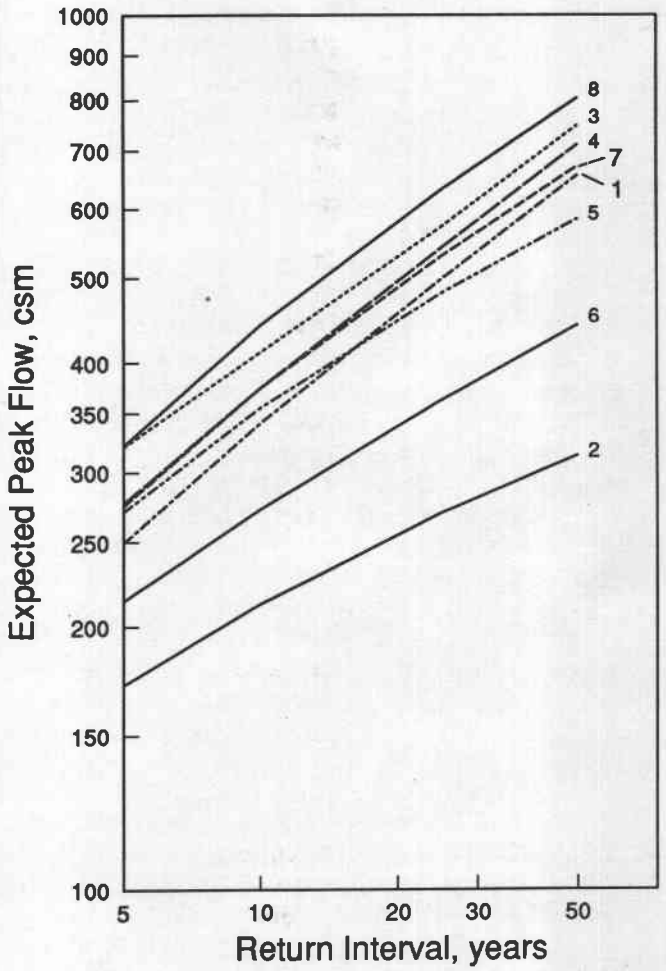

Figure 2. Flood-frequency curves for eight gauged streams in the south coast sub-region.

WATER RESOURCES RESEARCH INSTITUTE
OREGON STATE UNIVERSITY
STRAND AGRICULTURE HALL 210
CORVALLIS, OREGON 97331-2208