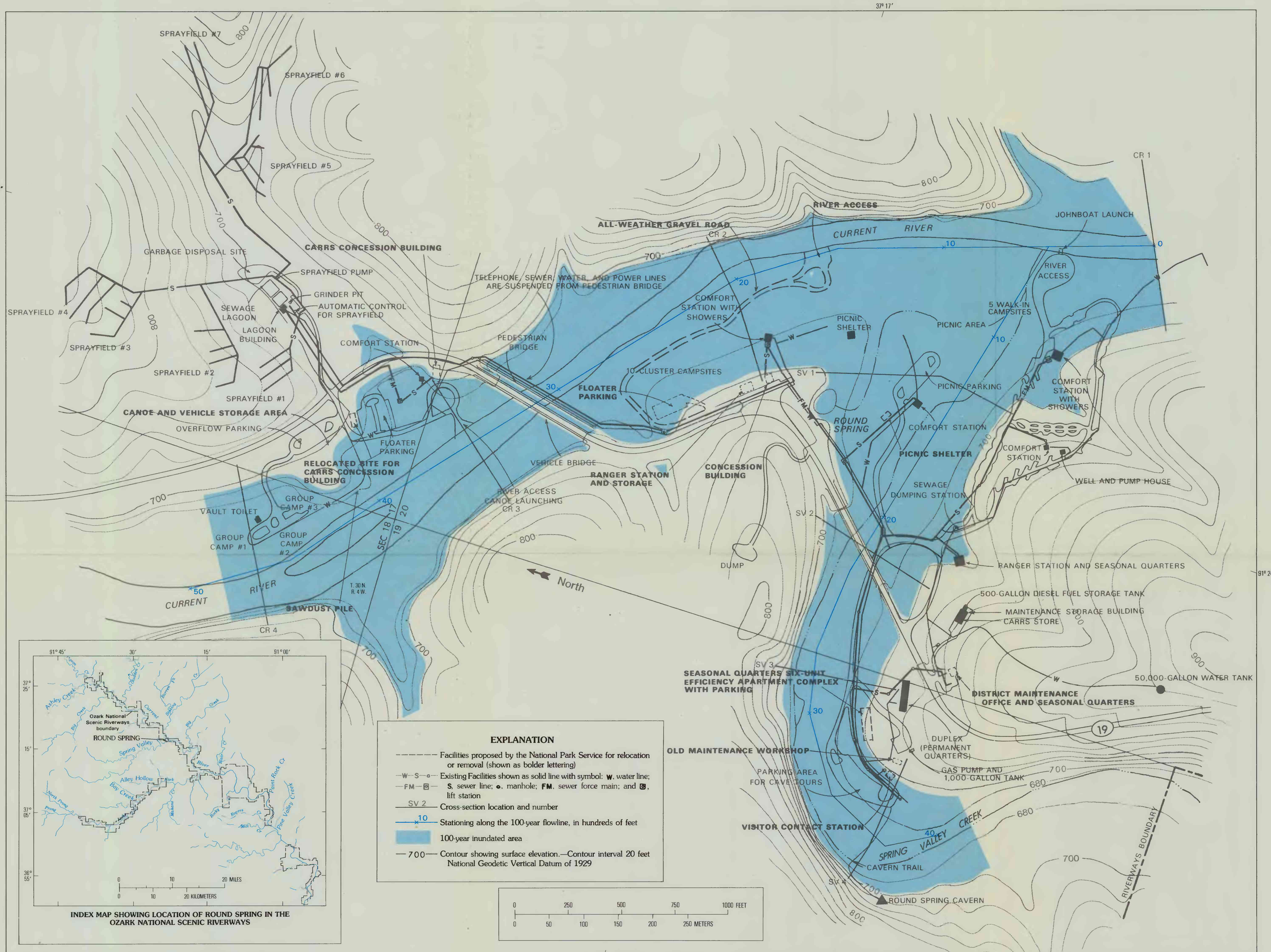

Figure 5. Location of existing and proposed Round Spring developments during 1981, valley cross sections, and delineation of the area inundated by the 100-year flood discharge.

Round Spring

DELINEATION OF FLOODING WITHIN THE OZARK NATIONAL SCENIC RIVERWAYS IN SOUTHEASTERN MISSOURI—ROUND SPRING AND POWDER MILL

By
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1990

ROUND SPRING

The Ozark National Scenic Riverways recreational development at Round Spring (fig. 5) is one of the three original Missouri State Parks. The frequently accessed points along the upper Current River, the shallow depths, and narrow winding course has made the Round Spring development a popular canoeing area for one-day recreational activities.

The two major visitor attractions are Round Spring and Round Spring Cavern. The Round Spring facilities built around these two attractions include numerous single-family, cluster, walk-in, and group campsites.

The potential exists for flash flooding at most of these facilities from either Spring Valley Creek or the Current River. A detailed flood analysis at Round Spring, in conjunction with the study-area hydrologic analysis (sheet 1) will assist the National Park Service in evaluating all flood-hazard areas associated with any existing or proposed developments.

FLOOD ANALYSIS

The Current River drainage area upstream from Spring Valley Creek is 570 mi^2 (square mile) with an additional 143 mi^2 of area drained by Spring Valley Creek. The 100- and 500-year flood discharges are 36,000 ft^3/s (cubic feet per second) and 48,000 ft^3/s for Spring Valley Creek; and 74,000 ft^3/s and 99,000 ft^3/s for the Current River (figs. 2-3, sheet 1). Four Spring Valley Creek (SV1–SV4) and four Current River (CR1–CR4) field-surveyed valley-cross sections were located at intervals that are as uniform in channel geometry and valley roughness as practical. All sections are referred to a zero station measured from the most downstream Current River field surveyed valley cross-section number CR1 (fig. 5). These data were used in the step-backwater method (Shearman, 1976) to calculate the 100- and 500-year water-surface profiles for Spring Valley Creek and the Current River, as shown in figures 6 and 7. The Highway 19 bridges do not affect the 100- and 500-year flood profiles as determined from February and November 1985 high-water profiles; therefore, no bridge sections were used in the analysis. Elevations obtained from the 100-year water-surface profiles in figure 6 were used to delineate the inundated areas along Spring Valley Creek and the Current River shown in figure 5.

The average basin lag time for flood-peak discharges within the Round Spring development would be 10.5 hours on Spring Valley Creek (143 mi^2) and 21 hours on the Current River (570 mi^2; fig. 4, sheet 1).

Most Round Spring major-use facilities are located partly in or near potential flood areas (fig. 5); therefore, a duration-of-flooding analysis is important in the establishment of a Round Spring flood-plain management plan (flood-warning system). One facility on Spring Valley Creek (picnic area) and two facilities (cluster campsites and group campsites) along the Current River were selected for duration-of-flooding analysis based upon visitor use and safety (D.G. Stubblefield, National Park Service, oral commun., 1986). The three duration analyses were made using the HEC-1 model (U.S. Army Corps of Engineers, 1982) that transforms excess basin rainfall using duration-frequency data developed by the National Weather Service (Hershfield, 1961) into elevation hydrographs. An elevation-duration curve can be developed for each of the three facilities using these elevation hydrographs. The cumulative rainfall-duration relations (figs. 8–10) give the duration, in hours, that the flood-elevation hydrographs at each facility equal or exceed the ground elevation at which local flooding occurs. The average duration of flooding can be estimated by using cumulative rainfall, in inches, and figures 8 to 10.

EXAMPLE

During periods of excessive rainfall within the Ozark National Scenic Riverways, a possible flood-alert situation may develop. The following is an example of potential flooding within the Round Spring development:

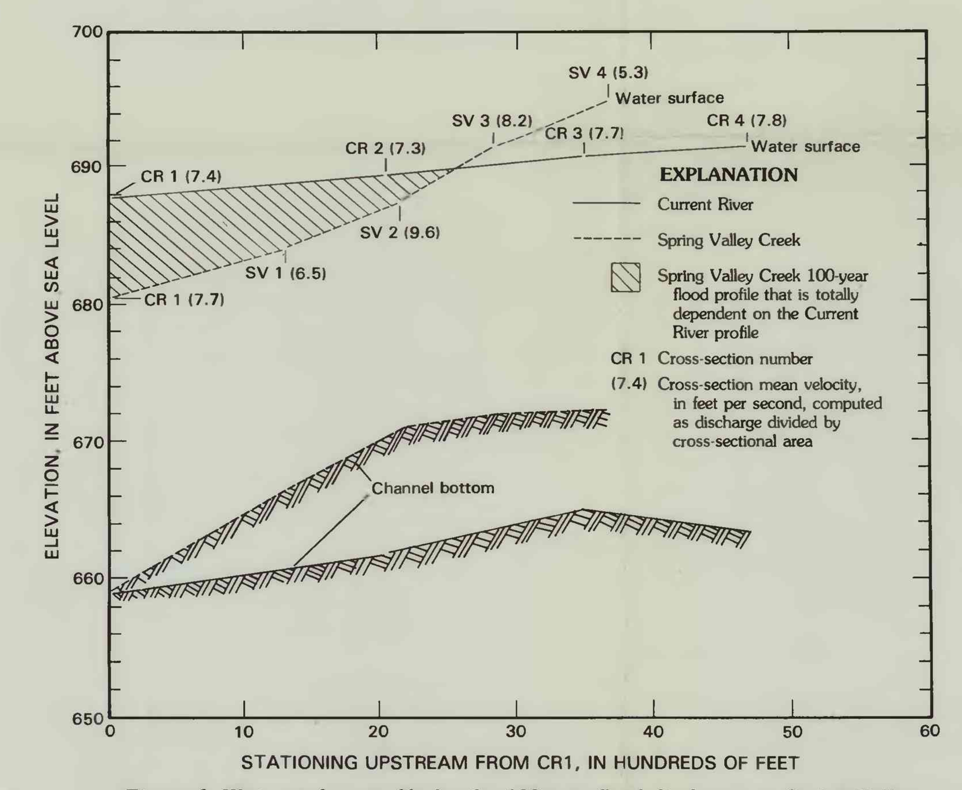


Figure 6. Water-surface profile for the 100-year flood discharge on Spring Valley Creek and the Current River.

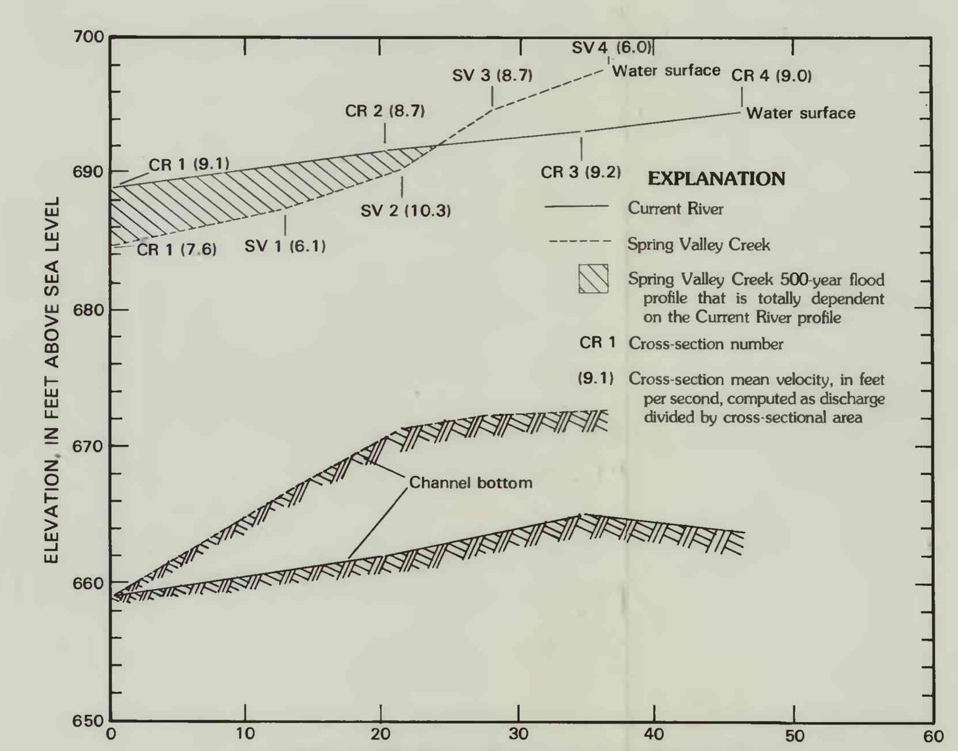


Figure 7. Water-surface profile for the 500-year flood discharge on Spring Valley Creek and the Current River.

Description of hypothetical storm

Rainfall began throughout the Current River and Spring Valley Creek basins on the evening of day 1 about 2100 hours (9 p.m.). The morning of day 2, it had stopped raining by 0700 hours (7 a.m.), with a total accumulated rainfall of 4.5 in. It was noted by National Park Service personnel that the more intense rainfall had occurred around 0200 hours (2 a.m.) of day 2.

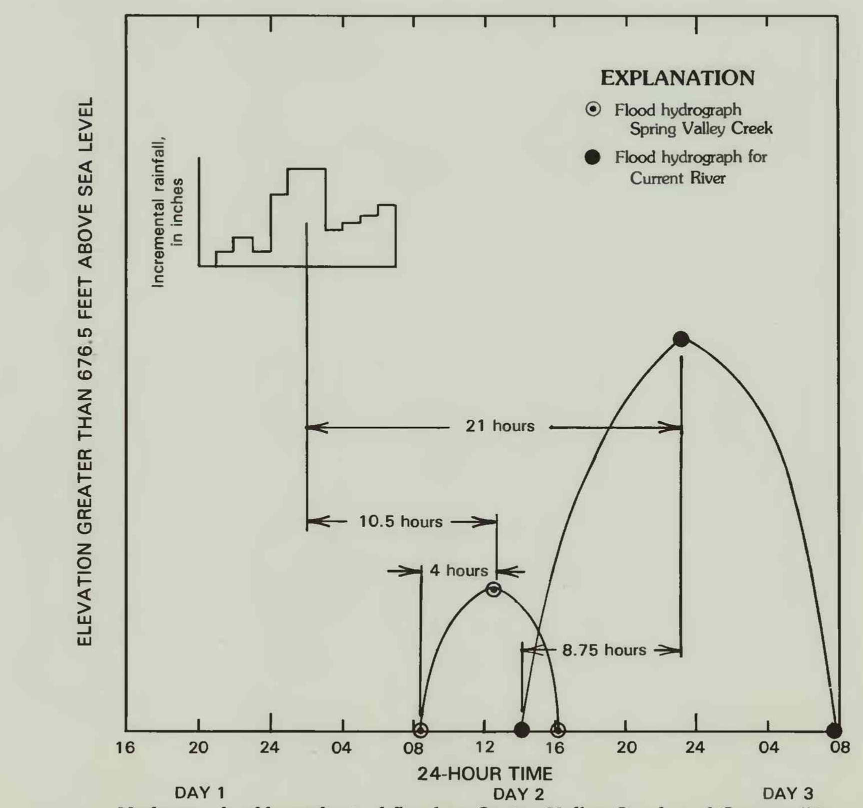
Problem

Assuming this hypothetical rainfall condition, what would be the average potential flooding expected from Spring Valley Creek and the Current River at the cluster campsites near Round Spring?

Solution

The Spring Valley Creek drainage area (143 mi^2) has an average basin lag time of 10.5 hours, whereas the Current River drainage area (570 mi^2) average basin lag time is 21 hours (fig. 4, sheet 1). By using 0200 hours (2 a.m.) of day 2 as the assumed center of mass of effective rainfall, the expected peak-flood elevation and discharge would occur on day 2 at 1230 hours (12:30 p.m.) on Spring Valley Creek and 2300 hours (11 p.m.) on the Current River. From figure 9, the average duration of flooding above 676.5 ft (elevation at which flood damage may occur for Spring Valley Creek is 8 hours and the Current River is 17.5 hours.

From these data, the flood-elevation hydrographs can be estimated for the hypothetical 4.5 in. cumulative rainfall as shown below.



Hydrograph of hypothetical flood on Spring Valley Creek and Current River near Round Spring.

Results

The average potential for flooding at the cluster campsites would be from 0830 hours (8:30 a.m.) of day 2 until 0745 hours (7:45 a.m.) of day 3.

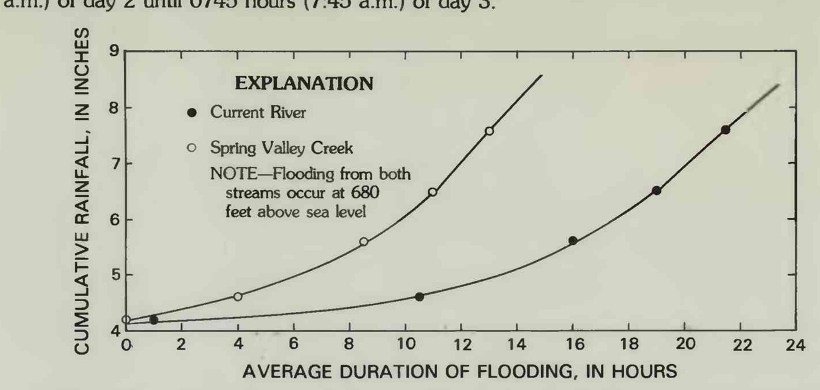


Figure 8. Relation between duration of flooding at the picnic area and cumulative rainfall throughout Spring Valley Creek and Current River Basins.

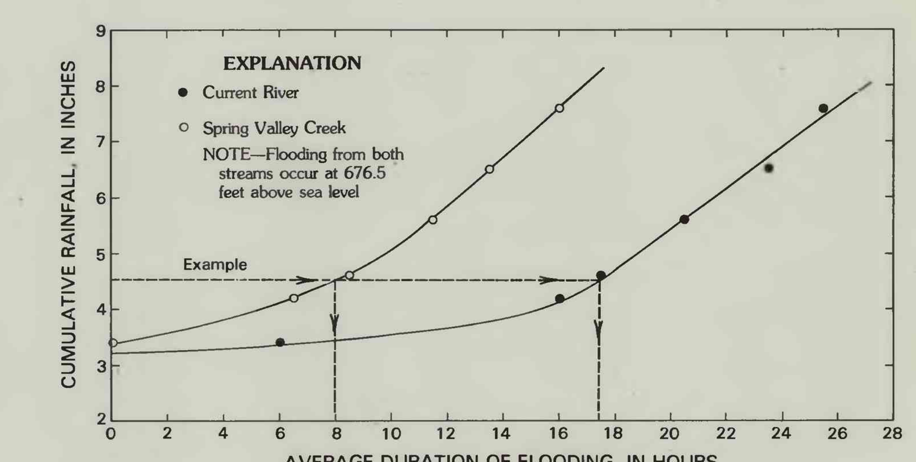


Figure 9. Relation between duration of flooding at the cluster campsites and cumulative rainfall throughout Spring Valley Creek and Current River basins.

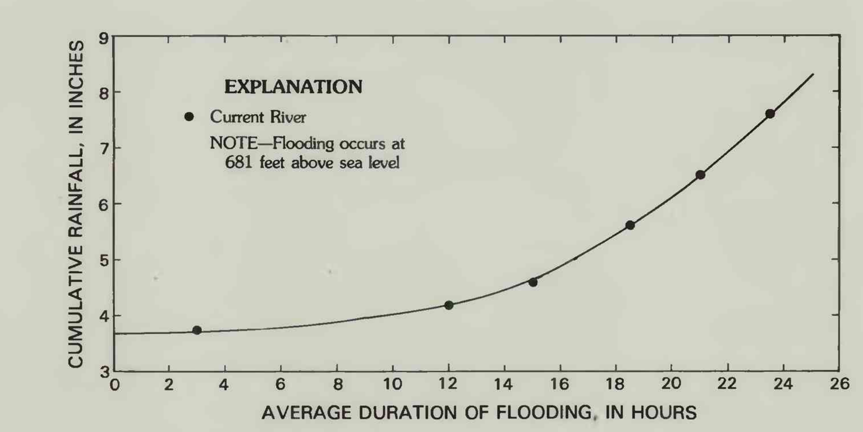


Figure 10. Relation between duration of flooding at the group campsites and cumulative rainfall throughout the Current River Basin.