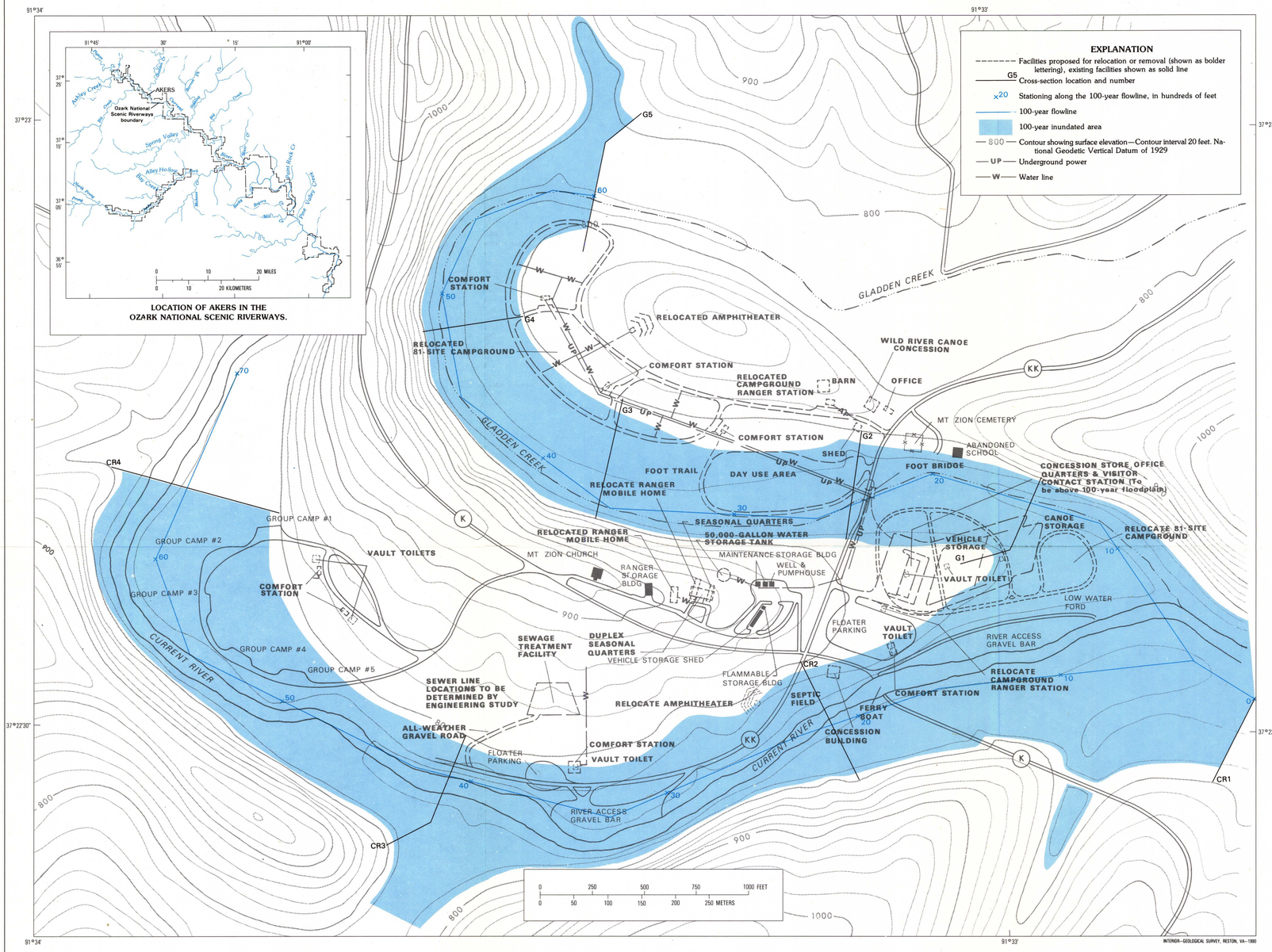

Figure 5. Location of existing and proposed Akers developments during 1981, valley cross sections, and delineation of the 100-year inundated area (modified from National Park Service, 1981).

Akers

DELINEATION OF FLOODING WITHIN THE OZARK NATIONAL SCENIC RIVERWAYS IN SOUTHEASTERN MISSOURI—AKERS AND ALLEY SPRING

By
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1990

AKERS

The Ozark National Scenic Riverways recreational development at Akers is located near the mouth of Gladden Creek (fig. 5). Akers is a major canoe-access point and camping area. On weekends or holiday, during peak visitor season it is not uncommon for 1,000 canoes to be put in at the two Current River access points provided within the development (fig. 5).

Most single-family and group campgrounds, river accesses, and visitor facilities are located on low-elevation terraces and are subject to flooding from Gladden Creek or the Current River, or both. To alleviate some of these problems, the National Park Service has proposed the relocation and removal of selected facilities (fig. 5)

A detailed flood analysis at Akers, in conjunction with the study-area hydrologic analysis given on sheet 1, will assist in evaluating all flood-hazard areas associated with existing and proposed developments.

FLOOD ANALYSIS

The Current River drainage area upstream from Gladden Creek is 293 mi² and the drainage area for Gladden Creek is 85.7 mi². The 100- and 500-year flood discharges are 28,000 ft³/s and 39,000 ft³/s for Gladden Creek; and are 52,000 ft³/s and 68,000 ft³/s for the Current River (figs. 2 and 3, sheet 1). Five Gladden Creek (G1–G5) and four Current River (CR1–CR4) field-surveyed valley cross sections were located at intervals that are as uniform in channel geometry and valley cross section roughness as practical (fig. 5). These data were used in the step-backwater method (Davidian, 1984) to calculate the 100- and 500-year water-surface profiles for Gladden Creek and the Current River, as shown in figures 6 and 7. Elevations obtained from the 100-year water-surface profile shown in figure 6 were used to delineate the flooded areas on Gladden Creek and the Current River shown on figure 5.

The average basin lag for flood-peak discharges within the Akers development would be 8 hours on Gladden Creek (85.7 mi²) and 14 hours on the Current River (293 mi²). See figure 4, sheet 1.

Most major-use facilities at Akers are partly located in the areas of inundation. For this reason, a duration-of-flooding analysis is important in the establishment of an Akers flood-plain management plan (flood-warning system). Two facilities (single-family and group campgrounds) along the Current River and on along Gladden Creek (Highway KK) were selected for duration-of-flooding analysis based on visitor use and safety (M. E. Hunter, National Park Service, oral commun., 1985). The duration analyses were made by 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 determined for each of the three facilities on the basis of 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. An average duration of flooding can be estimated for each of these facilities 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 could exist. The following is an example of potential flooding within the Akers development:

Description of hypothetical storm

Rainfall began throughout the Current River and Gladden Creek basins upstream from the development at Akers on the evening of day 1 at 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.

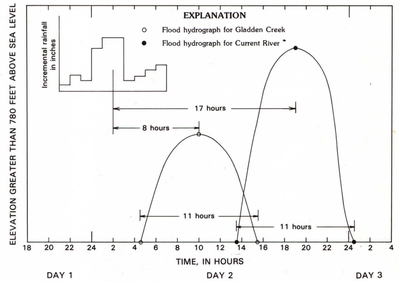
Problem

Assuming this hypothetical rainfall condition, what would be the average potential flooding expected from Gladden Creek and the Current River at County Highway KK within the Akers development?

Solution

The Gladden Creek drainage area is 85.7 mi² and has an average basin lag time of 8 hours, whereas the Current River drainage area is 378.7 mi² (including Gladden Creek) with an average basin lag time of 17 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 1000 hours (10 a.m.) on Gladden Creek and 1900 hours (7 p.m.) on the Current River. From figure 8, the average duration of flooding above 780 ft (elevation at which flood damage may occur) at County Highway KK for both Gladden Creek and Current River is 11 hours.

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



Results

The average potential for flooding at County Highway KK over Gladden Creek would be from day 2 at 0430 hours (4:30 a.m.) until day 3 at 0030 hours (12:30 a.m.).

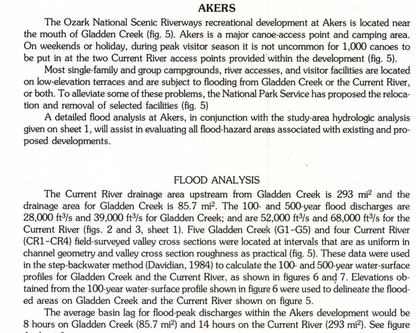


Figure 6. Water-surface profile for the 100-year flood discharge on Gladden Creek and the Current River.

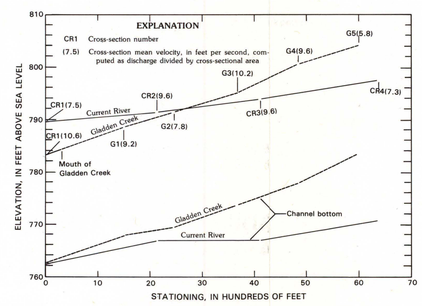


Figure 7. Water-surface profile for the 500-year flood discharge on Gladden Creek and the Current River.

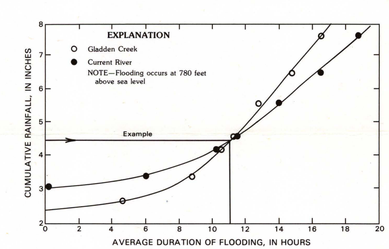


Figure 8. Relation between duration of flooding at County Highway KK and cumulative rainfall throughout Gladden Creek and Current River basins.

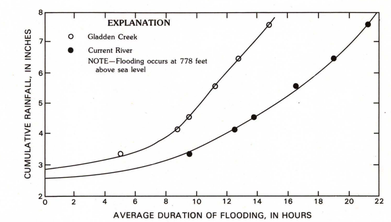


Figure 9. Relation between duration of flooding at the existing single-family campgrounds and cumulative rainfall throughout Gladden Creek and Current River basins.

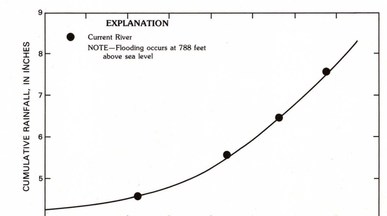


Figure 10. Relation between duration of flooding at the group campgrounds and cumulative rainfall throughout the Current River basin.