FLOW DURATION

Records of flood stages at Elk River, Minn., and at the mouth of Rum River in Anoka were utilized to develop elevation hydrographs for the 100-year flood. For the 100-year flood condition, the duration of flooding to be expected above any given elevation at Elk River and Anoka can be estimated from the hydrographs shown in figures 6 and 7, respectively.

WATER-SURFACE PROFILES

Water-surface profiles of the 100- and 500-year floods were derived by standard step-backwater methods using a digital computer model. The model expresses in mathematical terms the geometry of the river valley and the roughness coefficients (retardance factors) that control the slope of the water-surface profile. The geometry of the valley was defined by cross-section data obtained at 83 locations in the 21-mile study reach. These data describe natural valley sections, bridges, encroachments, and all significant hydraulic factors required to define the water-surface profile.

Cross-section data for overbank areas were acquired by photogrammetric methods from aerial photography taken in 1972 and 1973. Where changes had occurred since the date of photography, field surveys were made to define valley conditions existing in the spring of 1973. Underwater parts of the cross sections were obtained from soundings made by field survey crews.

High-water elevations of the 1965 flood were obtained from many sources. However, these elevations were based on different datums, so field surveys were made to adjust all elevations to a common datum (NGVD).

The digital computer model was calibrated on the basis of documented data for the 1965 flood. After calibration, the model was altered in the vicinity of Elk River, Minn., to reflect present (1979) conditions which are significantly different owing to the levee construction following the 1965 flood and the emergency dike built in anticipation of the flood in April 1969 and not removed.

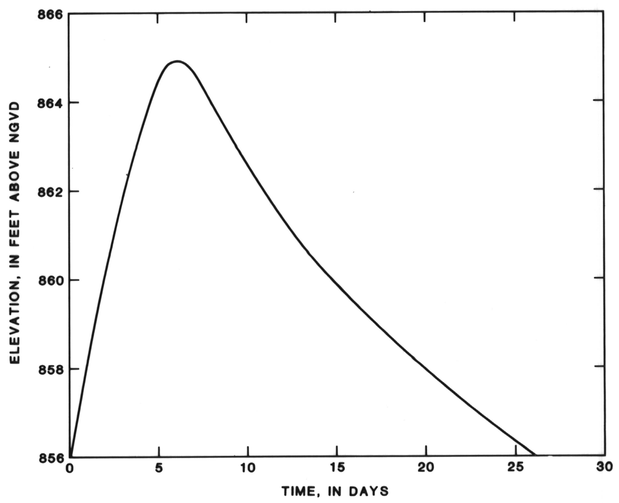

Figure 6.--Estimated 100-year elevation hydrograph for Mississippi River at Elk River, Minn.

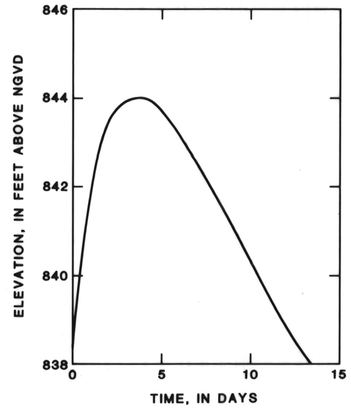

Figure 7.--Estimated 100-year elevation hydrograph for Mississippi River at Anoka, Minn.

The elevation-discharge relation at Coon Rapids Dam was developed to provide starting elevations for the profile analysis using data obtained by Northern States Power Company during the 1965 flood. By substituting the 100- and 500-year peak discharges into the model and using the appropriate starting elevations at the dam, water-surface profiles for the 100- and 500-year frequency floods were computed (fig. 8). Profiles shown on plates 2 and 7 for the Rum and Elk Rivers were computed similarly by starting at the mouths of those streams with elevations from the Mississippi River profiles. The computed water-surface profiles were then used to delineate areas subject to flooding.

FLOOD-PLAIN AREAS

Approximate areas inundated by the 100-year (regional) and 500-year floods along the Mississippi River and near the mouths of the Rum and Elk Rivers, are shown on plates 1-8. Delineations extending up tributary streams are limited to downstream areas where flooding from the Mississippi River is the dominant factor.

FLOOD-PROTECTION ELEVATIONS

The water-surface profile reflecting the increase in elevation due to State authorized encroachments is designated as the floodway profile. Adding 1 foot to the elevations of the floodway profile establishes the flood-protection elevation. As designated by State standards, the flood-protection elevation is the level to which authorized developments on the flood plain are to be protected against flood damage. Proposed floodways through the study reach have been designated by local officials. Water-surface profiles for those floodways were developed and the corresponding flood-protection elevations are shown in figure 8 and plates 1-8.

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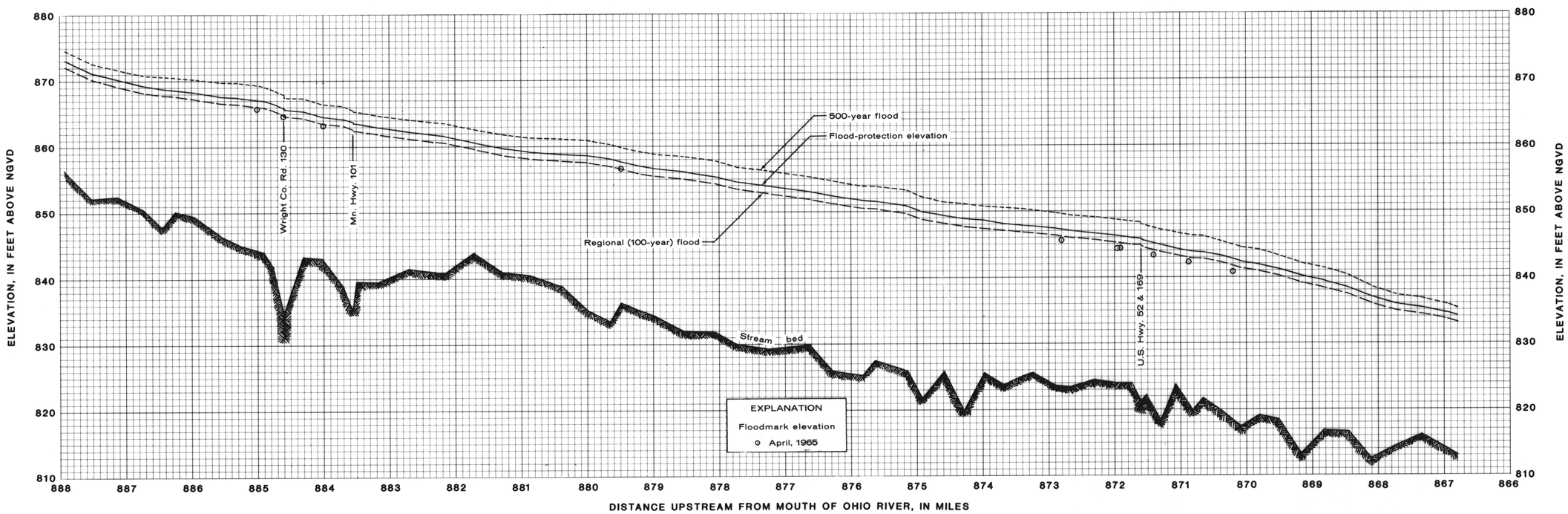

Figure 8.--Water surface profiles of Mississippi River, mile 866.8 to 888.0

FLOOD-PLAIN AREAS OF THE MISSISSIPPI RIVER, MILE 866.8 to MILE 888.0

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