EXPLANATION

- Area flooded
- Area flooded in 1951 only
- Boundary of 1951 and 1957 floods (1951 1957)
- Boundary of 1951 flood only (1951)
- Boundary of 1957 flood only (1957)
- Boundary of 1963 flood (1963)
- Big Blue River drainage divide
- Tributary drainage divide
- River miles measured along stream channel (232)
- Inundated areas defined for different floods, upstream and downstream (1957 — 1963)

APPROXIMATE MEAN DECLINATION, 1967

SCALE 1:24 000

CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL

QUADRANGLE LOCATION

FLOODS IN SEWARD QUADRANGLE, SOUTHEASTERN NEBRASKA

Aerial view of Big Blue River at Seward during flood of 1949. Photo by Hughes Brothers, Seward.

This report describes floods on the Big Blue River and its tributaries near Seward. Valuable flood-plain areas have been inundated six times during the 20-year period, 1946-65. The maps and graphs in the report present an analysis of the available data on the depth, extent, and frequency of inundation during the major floods of record. These data are important factors to be considered in planning for the economic development of the flood plain and management of the land that is subject to flooding.

Description.— The Seward quadrangle is in north-central Seward County, Nebraska, and, except for two areas aggregating 2.59 square miles along the east boundary, it is wholly within the drainage basin of the Big Blue River (fig. 1). Seward, the county seat, population of 4,208 (1960), is located within the quadrangle. Largest tributaries entering the Big Blue River in the quadrangle are Lincoln Creek, just west of Seward, and Plum Creek, which flows along the eastern edge of Seward. The drainage area of the Big Blue River above the south line of the quadrangle is about 1,244 square miles, with only 53.83 square miles of this area within the quadrangle itself.

FIGURE 1.—*Big Blue River basin in southeastern Nebraska showing location of Seward quadrangle.*

Extent of inundation.— The maximum extent of inundation during the 20-year period is shown by the blue area on the Seward quadrangle. The flooded area north of the south limits of the city of Seward was most extensive in 1963, whereas the flooded area immediately south of Seward was greatest in 1957 and 1951. The flood crest below Seward was only 0.8 foot lower in 1963 than in 1957 and 1951; the flooded area therefore was so nearly the same that the difference could not be shown on the map. Also indicated on the map is the extent to which Seward was inundated in 1951 before construction of a levee (completed in 1953) to protect the Hughes Brothers industrial plant, the city park, and nearby residential property.

Flood limits delineated on the map are not necessarily indicative of the highest floods that have occurred to date or the highest floods that may occur in the future. Inundated areas shown reflect channel and valley conditions at the time of the indicated flood with no adjustments made for manmade changes which, with time, have altered the runoff characteristics of the stream. The inundation pattern of future floods no doubt will be affected by cultural changes.

Flood-producing storms.—— The principal cause of the 1963 flood was heavy precipitation on a relatively small area north of the Seward quadrangle. Much of the rain fell on the upper part of the Plum Creek drainage basin and resulted in the highest recorded flood stage along the full length of Plum Creek within the Seward quadrangle. Heavy precipitation also occurred on tributary basins drained by streams that join the Big Blue River 8 to 25 miles upstream from Seward and resulted in the highest flood stage above Seward during a 20-year period of record. The extent of inundation below Seward was not quite as great in 1963 as in 1957 and 1951 for the following reasons: Lincoln Creek contributed negligibly to the 1963 flooding and its valley provided temporary storage for a considerable amount of backwater from the flood on the Big Blue River; the crest of the flood on Plum Creek passed Seward in advance of the crest of the flood on the Big Blue River.

The crest stages at the gaging station for the 1957 and 1951 floods were almost identical. However, the inundated area in 1951 included the part of Seward that was protected from flooding in 1957 by the levee that had been constructed in 1953. The floods in both these years were the result of widespread precipitation over the basin upstream from Seward.

The center of the 2-day storm that caused flooding in 1957 was about 18 miles northwest of Seward. The crest in 1957 is the highest recorded since establishment of the gaging station in October 1953.

Flood heights.— The height of a flood is stated in terms of gage height or stage, which is the elevation of the water surface above the datum of the gage. Elevations shown on the topographic map are in feet above mean sea level. Gage heights for crest stages can be converted to elevations above mean sea level by adding the gage height to the datum of the gage. The datum of gages and the drainage areas at key locations are shown in the following table.

Station location	Datum of gage above mean sea level (feet)	Drainage area (square miles)
Lincoln Creek near Seward (2¼ miles west of Seward)[1]	1,429.27	446
Big Blue River at Seward (bridge on U.S. Highway 34 at southwest edge of Seward)	1,421.49	1,099
Plum Creek at mouth (south of Seward)	No gage	90

[1] Beyond limit of Seward quadrangle

Figure 2 shows floods having crest stages higher than 1,439 feet at the bridge on U.S. Highway 34 southwest of Seward. For those years in which more than one flood occurred only the highest is shown.

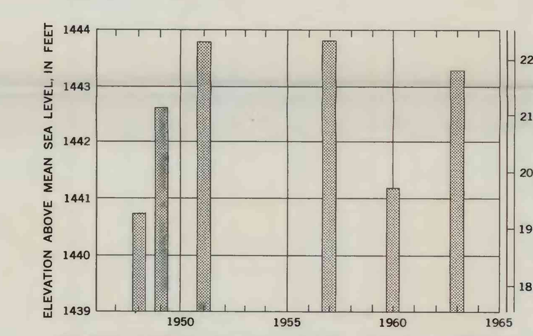

FIGURE 2.—*Flood crests at gaging station Big Blue River at Seward during period 1946-65.*

Flood frequencies.—— The relation between discharge and frequency of recurrence is shown in figure 3 and the general relation between stage and frequency of recurrence is shown in figure 4. The relation between stage and frequency is dependent on the relation of stage to discharge, which is affected by changes in the physical condition of the stream channel. The stage-frequency curve in figure 4 is based on channel conditions existing in 1965. Longer records and future changes in channel conditions may define somewhat different flood-frequency curves.

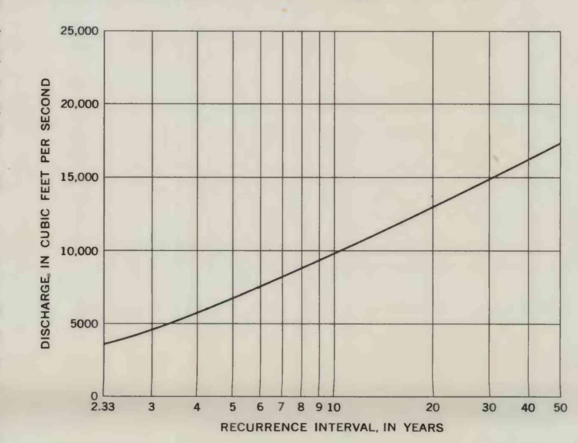

FIGURE 3.—*Frequency of flood discharges on Big Blue River at Seward.*

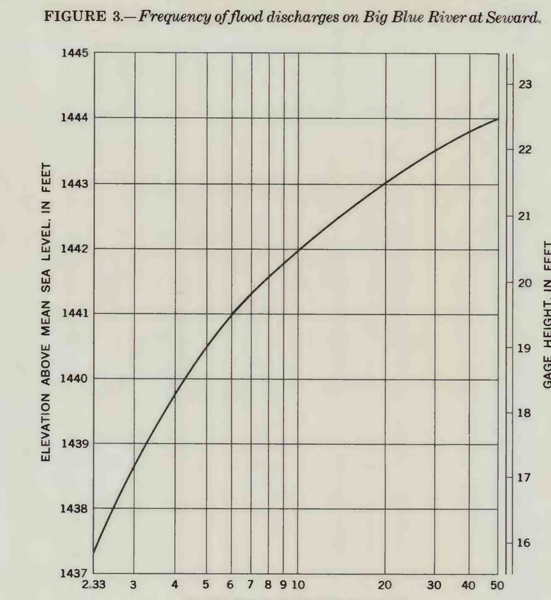

FIGURE 4.—*Frequency of flood stages on Big Blue River at Seward.*

Flood frequencies may be stated also in terms of their probabilities of occurrence—that is, as the reciprocal of their recurrence intervals. For example, a flood having a 25-year recurrence interval has a 4-percent chance of being equaled or exceeded in any given year, or a flood having a 50-year recurrence interval has a 2-percent chance of being equaled or exceeded in any given year. The 50-year flood is often used as the design flood for structures near streams. Such a flood is about 0.2 foot higher, at the gaging station, than the flood of 1957, the highest during the period of known floods, 1946-65.

Satisfactory interpretation of flood-frequency data cannot be made with records of short duration from a single gaging station. Experience has shown that a sample of information from past flood events at a group of homogeneous sites with long records can be used more reliably to estimate future expectancy than that of a single short-term record such as has been obtained for the Big Blue River at Seward. The actual grouping of floods during the short period of record at Seward does not represent the distribution of flood events that might be expected over a long period of time.

Flood-frequency data herein are from a report in preparation for the lower Missouri River basin which includes the Big Blue River. The discharge-frequency curve (fig. 3) has been plotted from these data for the gaging-station site at Seward. The discharge for the 50-year flood is 17,500 cfs (cubic feet per second) or 2,200 cfs more than has been experienced since 1946.

Flood profiles and depth of flooding.—— Profiles of the water surface, based primarily on elevations of high-water marks resulting from the floods of June 1951, 1957, and 1963, are shown in figures 5-7. Where floodmarks could not be identified, the profiles were defined on the basis of flood crests determined from photographs, reports of local residents, and field surveys. River miles used for these profiles correspond to those shown along the streams on the flood map.

Depth of flooding at any site can be estimated by subtracting the ground elevation from the flood profile shown in figures 5-7 for the same river-mileage location. Approximate ground elevation can be determined by interpolation between contours on the map.

Breaks in the slope of a low-water profile may be related to similar breaks in the slope of the streambed. Breaks in flood profiles tend to be more pronounced where natural or manmade constrictions retard runoff or where tributary inflow is especially great. Straightening stream channels, construction of levees and dams, and other alterations of natural conditions that affect streamflow commonly cause changes in stream profiles. The profiles in figures 5-7 are defined by a limited number of points and, therefore, the indicated breaks in slope cannot be correlated definitely with their causes.

Acknowledgments.— Information supplied by the Kansas City District of the U.S. Corps of Engineers, the Chicago, Burlington & Quincy Railroad, the Nebraska Department of Roads, and Hughes Brothers of Seward, Nebraska, is hereby acknowledged.

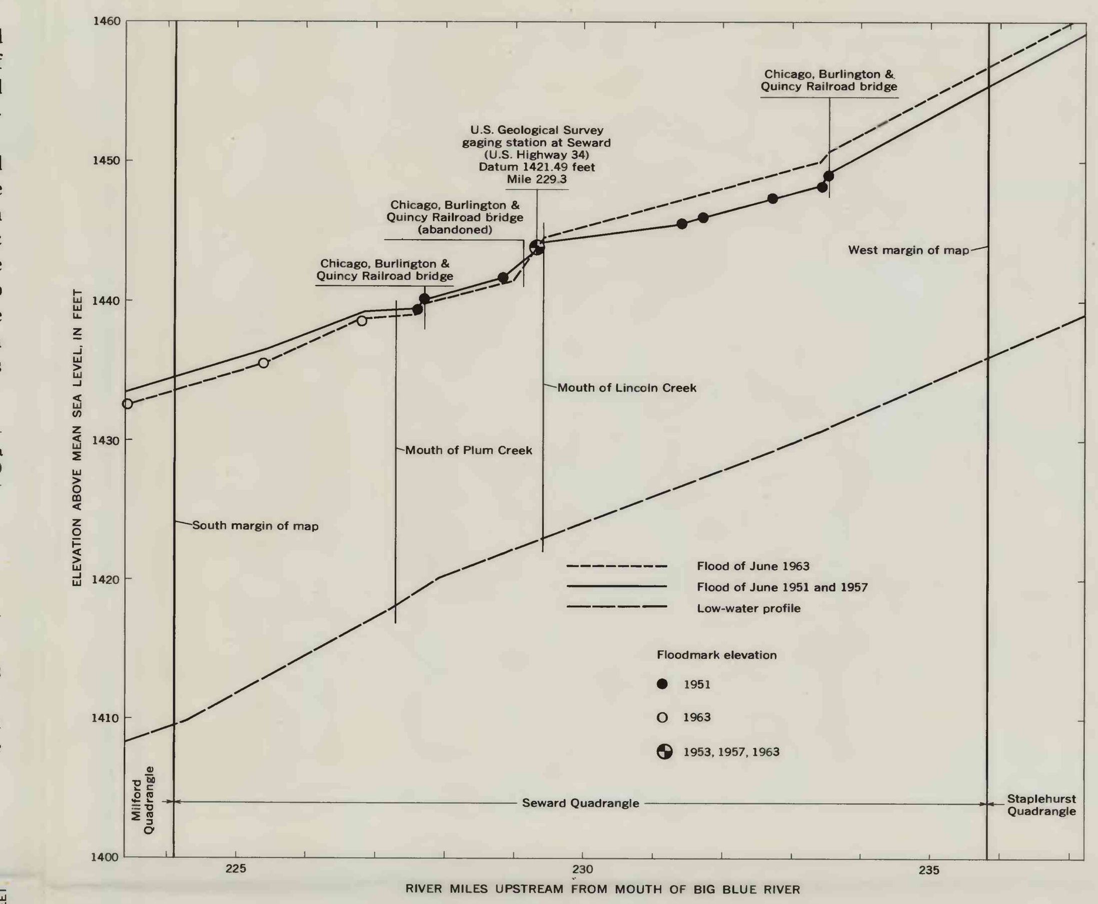

FIGURE 5.—*Flood and low-water profiles of the Big Blue River.*

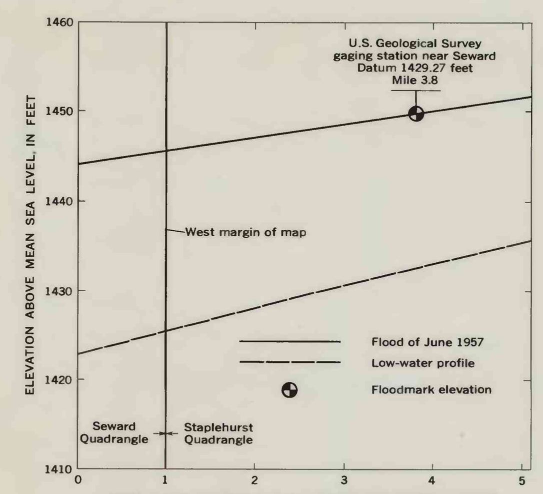

FIGURE 6.—*Flood and low-water profiles of Lincoln Creek.*

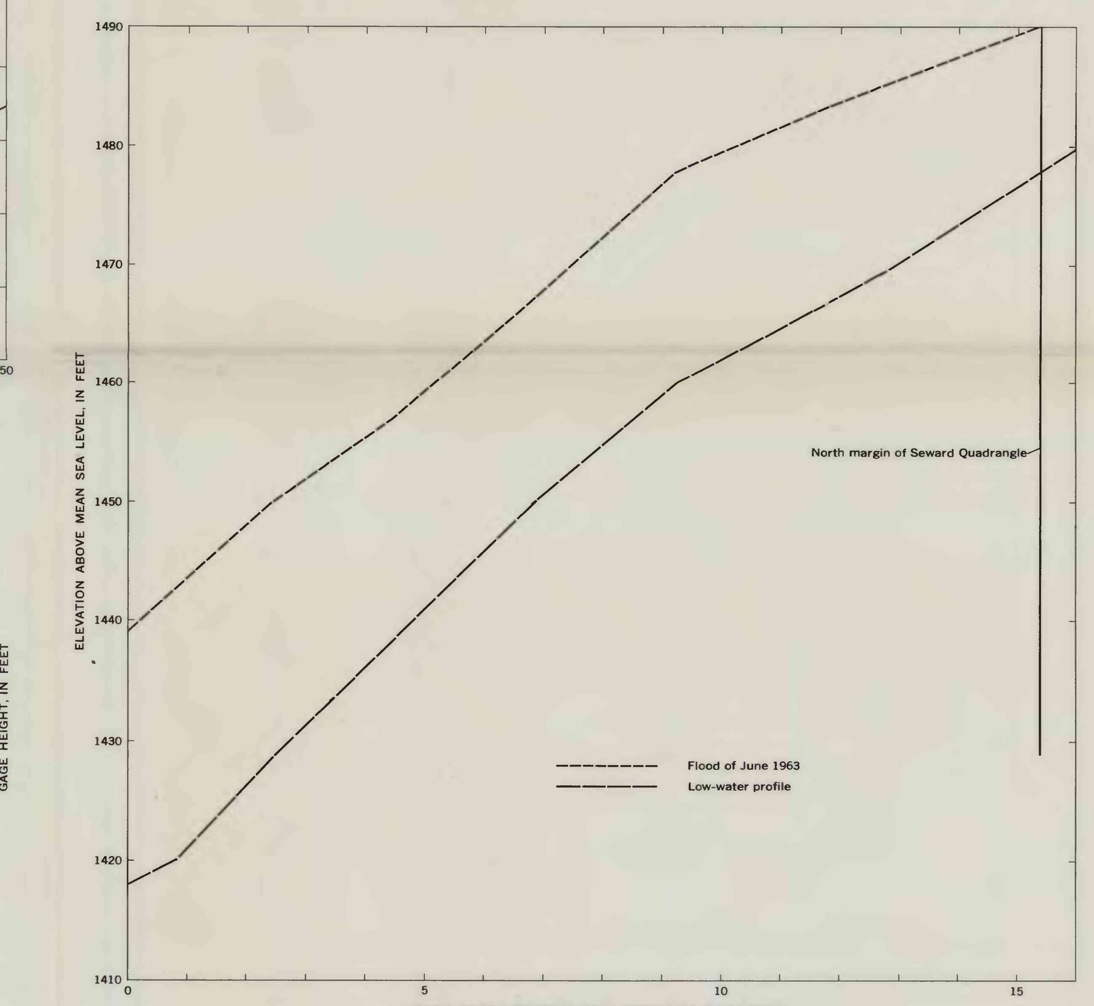

FIGURE 7.—*Flood and low-water profiles of Plum Creek.*

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