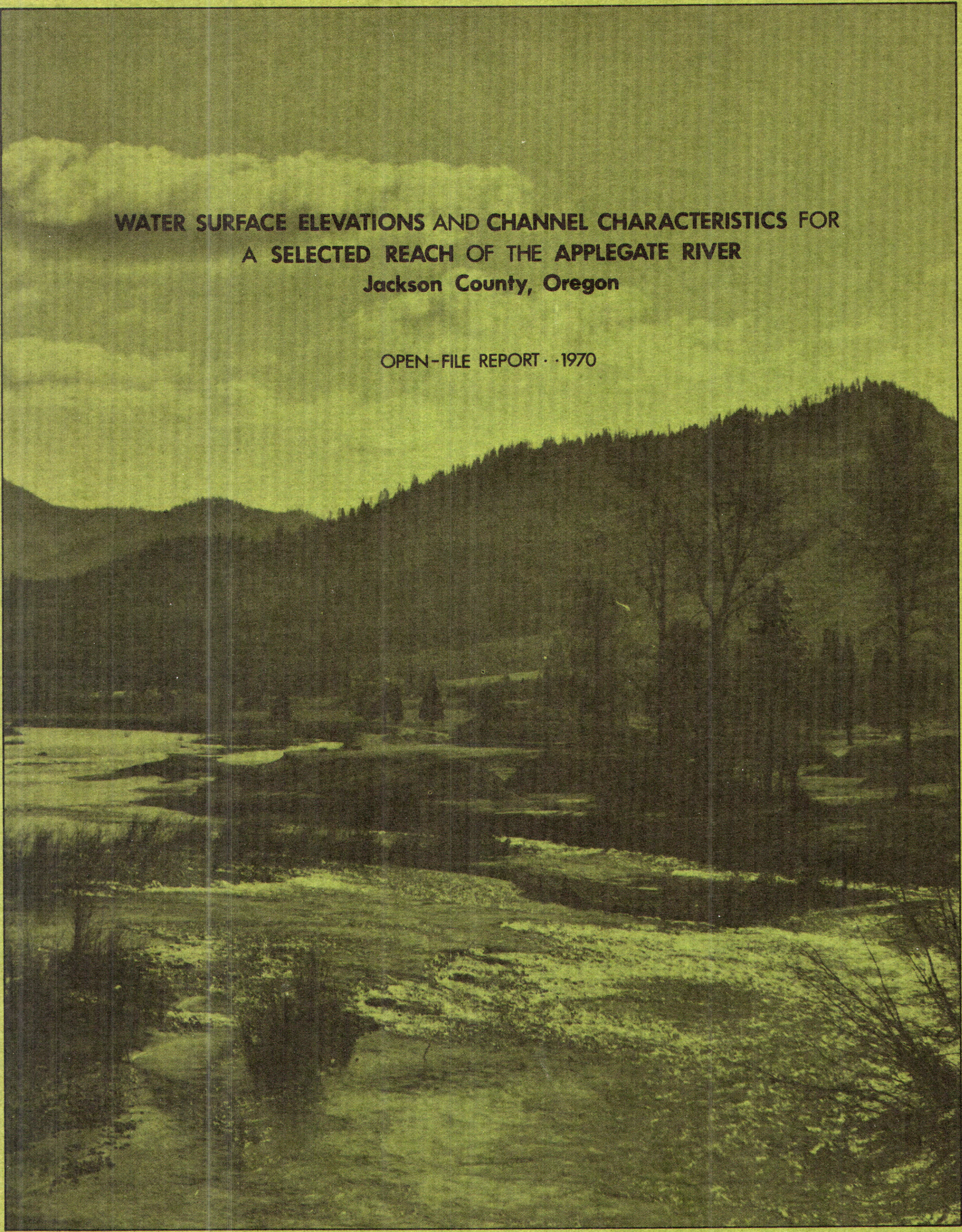
WATER SURFACE ELEVATIONS AND CHANNEL CHARACTERISTICS FOR A SELECTED REACH OF THE APPLEGATE RIVER

Jackson County, Oregon

OPEN-FILE REPORT · ·1970



UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
Water Resources Division

WATER-SURFACE ELEVATIONS AND CHANNEL CHARACTERISTICS FOR A SELECTED REACH OF THE APPLEGATE RIVER, JACKSON COUNTY, OREGON

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By D. D. Harris and C. W. Alexander

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Prepared in cooperation with Jackson County
and the Oregon State Water Resources Board

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Portland, Oregon
1970

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INTRODUCTION

In land-use planning for the Applegate River and its flood plain, consideration should be given to (1) preservation of the recreational attributes of the area, (2) allowance for optimum development of the flood plain's natural resources, and (3) protection of the rights of private landowners. Major factors that influence evaluation of the above considerations are the elevations and characteristics of floods. Heretofore, such flood data for the Applegate River have been inadequate to evaluate the flood potential or to use as a basis for delineating reasonable land-use zones. Therefore, at the request of Jackson County, this study was made to provide flood elevations, water-surface profiles, and channel characteristics (geometry and slope) for a reach of the Applegate River from the Jackson-Josephine County line upstream to the Applegate damsite (fig. 1). A similar study was previously made for reaches of adjacent Rogue River and Elk Creek (Harris, 1970).

Profiles were defined for a 26-mile reach of the Applegate River for (1) the December 1964 flood, (2) the 20-year flood, (3) the 10-year flood, (4) the flood of December 1964 after adjusting for storage in the proposed Applegate Reservoir, (5) a low flow considered to be the minimum operational flow from the proposed Applegate Reservoir, and (6) the thalweg, the lowest part of the channel bottom.

The December 1964 flood discharges, adjusted for proposed storage, were based on data provided by the Corps of Engineers (1965) but were modified slightly to account for revised peak-discharge figures for the two existing gaging stations in the reach. Because the figures were modified, the data should be considered only as an approximation of the adjusted flow.

For the purpose of this study, a minimum operational flow of 100 cfs (cubic feet per second) at the damsite (Copper gaging station) was used. According to the Corps of Engineers (1967, p. 30), this flow represents the lowest minimum release proposed from the Applegate Reservoir to ensure an adequate water supply for native fish. The Corps also

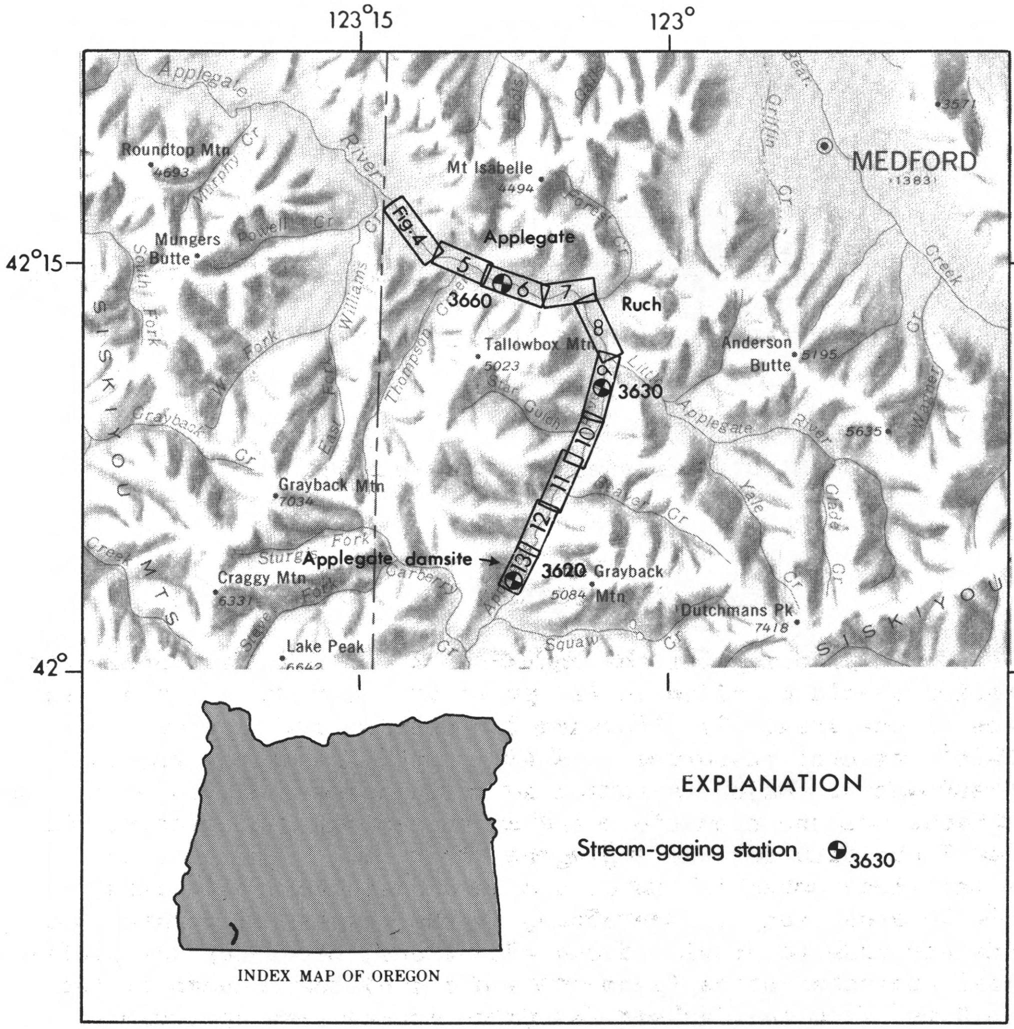

Figure 1.--Location of the study area.

indicates that a flow of 100 cfs from the proposed reservoir, except during a flood, will produce a flow of 200 cfs at the Applegate gaging station, 20 miles downstream from the reservoir. Discharges were interpolated between the gaging stations, and extrapolated downstream from the Applegate gaging station on the basis of drainage area.

The step-backwater method was used to define high-water profiles; photogrammetric maps and water-depth soundings made during periods of low flow were used to define the low-water and thalweg profiles. The theory of the step-backwater method, described in Geological Survey Water-Supply Paper 1869-A (Bailey and Ray, 1966) and in many textbooks on hydraulics, involves the use of hydraulic equations expressed as functions of channel geometry, roughness, and slope.

This report is not intended to show areas inundated by the selected floods. Such information can be determined, however, by using the flood elevations provided in this report in conjunction with the contoured photogrammetric work maps. An interim report of the Corps of Engineers for Jackson County (1965) shows areas inundated by the December 1964 flood on the Applegate River from the Jackson-Josephine County line upstream to river mile 33.

Elevations computed for the 2-, 25-, and 50-year floods downstream from cross section 117 at about river mile 42.8 are not included in this report, but are available for inspection in the Oregon District Office of the U.S. Geological Survey.

This study was made in cooperation with Jackson County and the Oregon State Water Resources Board, under the general supervision of Stanley F. Kapustka, district chief of the Water Resources Division of the U.S. Geological Survey in Oregon.

DESCRIPTION OF THE STUDY REACH

The study reach extends 26 miles between the Jackson-Josephine County line where the low-water elevation is about 1,160 ft above msl (mean sea level) and Applegate damsite where the low-water elevation is about 1,740 ft above msl (fig. 1).

From the Jackson-Josephine County line upstream to the bridge at Applegate, a distance of about 5 miles, the Applegate River meanders on a wide flat flood plain that at places is 3,000 feet across. At Applegate, the flood plain narrows, and the channel is contained in a rock gap. Channel slope through this subreach averages about 17 feet per mile.

In the 6 miles from the narrow gap at Applegate upstream to the vicinity of Ruch, the flood plain widens to a maximum of 2,000 feet. Average slope through this subreach is about 24 feet per mile.

From Ruch upstream to McKee Bridge, about 8.5 miles, the channel progressively narrows and steepens. Much of the lower part of this subreach was inundated during the December 1964 flood, but only a few isolated pastures were inundated in the upper part of the subreach. The subreach contains one notably narrow stretch where abrupt changes in river alinement are created by local geologic structures. Through this part of the reach, average slope is about 23 feet per mile.

The upper 6.5 miles of the reach upstream from McKee Bridge is generally narrow and well confined. This subreach contains many rapids and has a notably steep gradient with an average channel slope of about 28 feet per mile.

FLOODS IN THE APPLEGATE RIVER VALLEY

Highest flows in the Applegate River usually occur between November and May. Annual peak flows for the gaging station near Copper are shown in table 1. On the Applegate River, the highest peak of record occurred in December 1964, as it did throughout most of Oregon. During this flood, much farmland in the lower part of the reach was inundated, and much of the valley upstream from the Little Applegate River was isolated because of flooding and road washouts (fig. 2). Based on historic information for nearby streams, higher peaks than that of December 1964 possibly occurred in 1861 and 1890; however, no historic data are available for the Applegate River to verify this assumption.

Figure 3 shows flood-frequency curves for the two existing gaging stations, near Copper and near Applegate, and also an estimated frequency curve for an old gaging station near Ruch (fig. 1). The estimated frequency curve is based on data collected at the site prior to 1954 and is adjusted to include estimated peak discharges for the recent floods of 1955 and 1964.

Flood discharges used to develop the flood profiles for this study are listed in table 2. The 10- and 20-year floods are floods that will be exceeded on the average of once every 10 and 20 years, respectively.

Figure 2.--Road washout on the upper Applegate River during December 1964 flood. Photograph courtesy of Medford Mail Tribune.

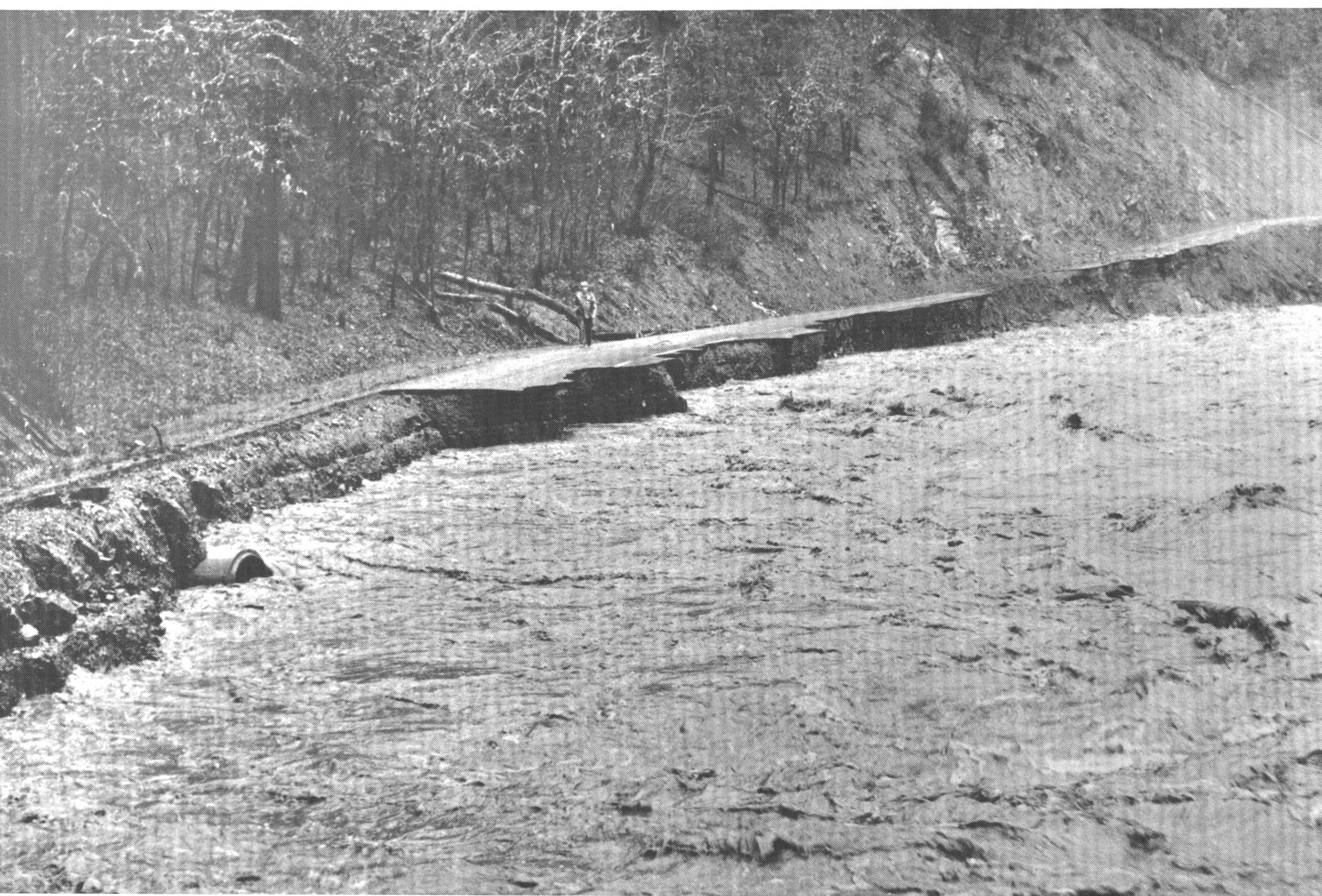

Table 1.--Annual peaks for Applegate River at Copper, Oreg.

Water year	Date	Elevation (in feet above msl)	Discharge (in cfs)
1939	Mar. 22, 1939	1,763.94	1,330
1940	Feb. 28, 1940	1,771.50	7,410
1941	Dec. 20, 1940	1,768.92	5,090
1942	Dec. 2, 1941	1,771.32	6,900
1943	Dec. 31, 1942	1,772.51	7,980
1944	May 5, 1944	1,763.64	909
1945	Feb. 8, 1945	1,769.48	5,330
1946	Dec. 28, 1945	1,776.36	12,000
1947	Nov. 18, 1946	1,766.48	2,820
1948	Jan. 6, 1948	1,777.50	13,400
1949	Feb. 22, 1949	1,766.92	3,260
1950	Mar. 17, 1950	1,767.44	3,670
1951	Oct. 29, 1950	1,776.16	11,800
1952	Feb. 1, 1952	1,770.71	6,660
1953	Jan. 18, 1953	1,779.14	15,300
1954	Nov. 23, 1953	1,771.69	7,550
1955	Dec. 31, 1954	1,764.06	1,180
1956	Dec. 21, 1955	1,783.13	20,300
1957	Feb. 26, 1957	1,774.51	11,100
1958	Jan. 29, 1958	1,775.25	11,900
1959	Jan. 12, 1959	1,774.23	10,700
1960	Feb. 8, 1960	1,758.35	4,920
1961	Feb. 10, 1961	1,770.56	7,000
1962	Dec. 20, 1961	1,765.66	2,510
1963	Dec. 2, 1962	1,775.78	12,500
1964	Nov. 8, 1963	1,766.71	3,440
1965	Dec. 22, 1964	1,785.66	29,000
1966	Jan. 6, 1966	1,771.48	8,130
1967	Jan. 28, 1967	1,772.64	9,480
1968	Feb. 23, 1968	1,771.50	8,220
1969	Jan. 13, 1969	1,766.23	3,240

Table 2.--Discharges used in developing the flood profiles

Gaging station 1/	Discharge, in cubic feet per second			
	December 1964 flood	December 1964 flood (adjusted)	20-year flood	10-year flood
Applegate River near Copper (143620)	29,000	2/14,000	19,900	16,800
Applegate River near Ruch 3/ (143630)	2/40,000	2/25,000	2/26,000	2/20,000
Applegate River near Applegate (143660)	45,700	2/32,000	34,800	27,700

1/ Number following station name is gaging station number.
2/ Estimated.
3/ Gaging station discontinued September 1953.

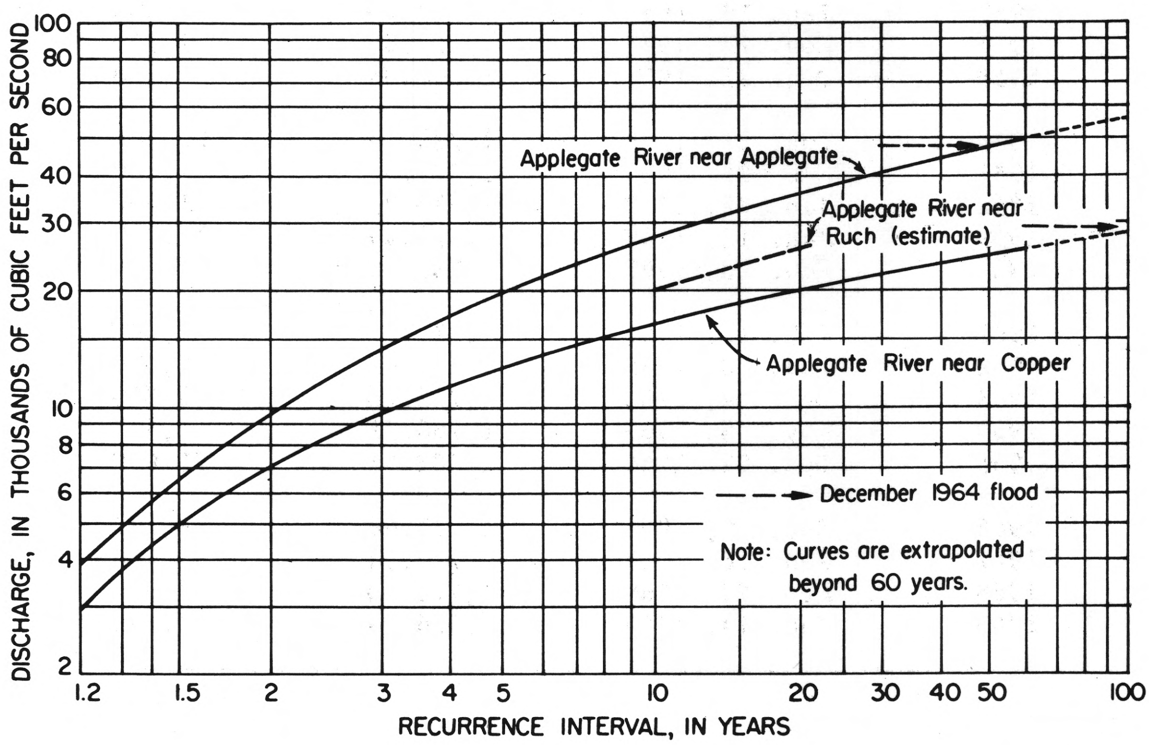

Figure 3.--Flood-frequency curves for gaging stations in the study area.

STUDY METHODS

Photogrammetric Mapping

Channel-geometry data required for the step-backwater analysis were obtained by a commercial photogrammetry firm. They produced photogrammetric work maps (scale, 1 inch = 200 ft) from aerial photographs, with horizontal and vertical map control established to third-order accuracy at primary picture ground-control points. The maps show planimetric features, tree and vegetation lines, stream boundaries, and 5-foot ground contours. Ground elevations were determined every 100 feet and at topographic breaks at flood-plain cross sections, oriented perpendicular to the direction of flow and positioned at locations preselected in the field. Where adjacent cross sections overlapped at sharp bends in the channel, the alinements of some photogrammetric cross sections were altered slightly. Water-surface elevations are shown for each cross section at the time of aerial photography. Accuracy of cross-section elevations was to be within ±1 foot for 90 percent of the elevation points where the ground surface was visible in the aerial photographs.

Copies of the photogrammetric work maps, not intended for publication, are available for inspection in the Oregon District office of the U.S. Geological Survey.

Collection of Field Data

Cross-section locations were selected and water-depth soundings were made prior to photogrammetric mapping. The sounded elevations were later combined with the photogrammetric ground elevations to complete each entire channel cross section. On the average, cross sections were spaced about every 1,000 feet, usually at principal breaks in the channel gradient. For use in computing backwater at bridge constrictions, cross sections were positioned at the downstream side and about one channel width upstream from each existing bridge. Bridge dimensions were measured by field survey.

Spot checks, made with an engineering level, indicate that the photogrammetric elevations are within the accuracy requirement indicated under "Photogrammetric mapping."

Roughness Coefficients

Channel roughness coefficients required in the hydraulic computations were selected in the field for subreaches adjacent to each cross section. Roughness is influenced by the size and gradation of bed material, cross-section irregularities, vegetation growth, and channel alinement. Stereo photographs of the channel were taken to aid in office review of the coefficients.

To support the choice of roughness coefficients, streambed material was sampled at two points in the reach. Results of the gradation analyses of the material (table 3) provide general information on gravel deposits in the channel. Because the samples were collected from the bed surface where the material is subject to erosion, they probably contain less fine material than would samples excavated from deep holes.

The material sampled is well graded and has a maximum intermediate diameter of about 6 inches, although large boulders were observed at many points in the channel. The gradation analyses help to support the choice of roughness coefficients of 0.032 to 0.045 used in the step-backwater analysis for the downstream part of the main channel. The upstream part of the reach has an irregular alinement and contains many bedrock outcroppings. Roughness values as high as 0.060 were selected for some segments of the main channel in the upper part of the reach.

Table 3.--Gradation analyses of streambed samples

Sieve no.	--	--	--	--	--	--	5	10	18	35	60	120	200
Size (in.)	6.0	4.0	2.0	1.0	0.62	0.31	0.16	0.079	0.039	0.020	0.0098	0.0049	0.0029
	PERCENTAGE FINER												
Sampling point 1	100	73	50	27	15	10	8.1	6.2	5.4	4.1	1.8	0.7	0.4
2	100	69	42	28	17	10	6.4	3.5	2.5	2.1	1.2	.7	.4

NOTE: Sample point 1 is 300 feet upstream from the bridge at Applegate (fig. 5). Maximum size observed but not sampled was about 12 inches.

Sample point 2 is just downstream from the Cameron Bridge (fig. 9). Maximum size observed but not sampled was about 16 inches.

Step-Backwater Analysis

Because repeated trial-and-error calculations are required to determine water-surface-profile elevations using the step-backwater technique, a digital computer was used. The profiles are developed by beginning at a downstream cross section with a known or computed stage-discharge relation and then progressively computing profile elevations upstream from cross section to cross section. A stage-discharge relation was developed for the Applegate River at the Jackson-Josephine County line by using slope-conveyance computations in combination with a documented stage and an estimated discharge for the December 1964 flood.

RESULTS OF THE STUDY

The computed profiles are shown in figures 4 to 13 and can be related to adjacent maps for locations of cross sections. The stream boundaries shown on the maps in figures 4 to 13 are for a low flow existing at the time of aerial photography, October 4, 1969.

Profile elevations for the selected flows and for the thalweg are listed in table 4. Distances, in feet, shown in the profiles and in table 4, were scaled from the photogrammetric work maps and checked for general consistency against the river mile index for the Rogue River (Columbia Basin Inter-Agency Committee, 1967). Downstream from mileage marker "33," river mileages shown on the maps (figs. 4-13) are the same as those used in the Corps of Engineers' interim report (1967) and are based on the 1923 U.S. Geological Survey river-profile survey. Upstream from this marker, river mileages are based on the river mile index for the Rogue River (Columbia Basin Inter-Agency Committee, 1967).

Plots of the cross sections (figs. 14 to 30) are included in this report primarily to show the general shape of the channel and the approximate bank-full stage at which water will spill over the main channel bank and onto the flood plain.

Downstream from McKee Bridge (fig. 11), the computed elevations for the December 1964 flood were generally in good agreement with documented elevations, although documented elevations were usually higher on the outside and lower on the inside of a bend. The theory underlying the basic step-backwater technique assumes that the water surface is level across a section. Actually, moving water tends to pile up on the outside and drop on the inside of a bend. Also, water that has overtopped a bank may become separated from the main channel and move through a low area adjacent to but at a higher elevation than the main channel. Therefore, areas can be flooded that are at a higher elevation than the flood level in the main channel. For example, some water that apparently overtopped the bank just upstream from river mile 24 (fig. 5) moved along a ditch and inundated land at a higher elevation than the water surface of the river. This condition is difficult to simulate for a step-backwater analysis, and, because channel conditions and flow patterns are continually changing, the same distribution of flow may not always occur for each flood of similar magnitude.

Upstream from McKee Bridge, the channel slope steepens. As a result of the steep slope, supercritical velocities (a condition in which velocity of flow exceeds the travel rate of a flood wave) occur at several points in this part of the reach. Because water-surface elevations cannot be computed accurately by the step-backwater method through a reach that alternately changes from subcritical to supercritical flow, profiles were estimated from high-water marks for sections 117 to 123 and 128 to 131.

Table 4.--Profile elevations for the Applegate River

Station			Elevations, in feet above msl					
Report reference	Photo-grammetric map reference	Distance up-stream from county line (feet)	December 1964 flood	December 1964 flood (adjusted)	20-year flood	10-year flood	Minimum operational flow (estimated)	Thalweg
Jackson-Josephine County line								
1	0+00	0	1,168.5	1,167.0	1,167.5	1,166.7	1,157.5	1,152.0
2	11+20	1,120	1,170.4	1,169.0	1,169.5	1,168.6	1,159.5	1,157.0
3	1/ 24+50	2,450	1,175.8	1,174.6	1,175.0	1,174.2	1,165.5	1,163.6
4	2/	4,920	1,185.9	1,184.4	1,184.8	1,183.9	1,177.5	1,172.0
5	1/ 52+90	5,290	1,186.6	1,185.1	1,185.5	1,184.6	1,178.5	1,173.4
6	1/ 64+30	6,430	1,189.7	1,188.4	1,188.8	1,188.0	1,179.5	1,175.0
7	1/ 75+40	7,540	1,194.0	1,192.8	1,193.2	1,192.4	1,182.5	1,180.6
8	1/ 87+50	8,750	1,199.0	1,197.7	1,198.1	1,197.2	1,186.5	1,184.0
9	107+80	10,780	1,206.3	1,204.6	1,205.1	1,204.1	1,193.5	1,187.5
10	120+80	12,080	1,211.7	1,210.7	1,211.1	1,210.3	1,199.5	1,196.4
11	140+10	14,010	1,217.1	1,215.6	1,216.0	1,215.0	1,204.5	1,200.5
12	153+20	15,320	1,221.2	1,219.8	1,220.2	1,219.3	1,207.5	1,204.0
Ferris Gulch	--	15,400	--	--	--	--	--	--
13	160+80	16,080	1,225.6	1,224.6	1,224.9	1,224.1	1,212.5	1,210.3
14	179+20	17,920	1,229.9	1,228.4	1,228.9	1,227.9	1,222.5	1,220.0
15	191+30	19,130	1,236.2	1,234.6	1,235.1	1,234.1	1,223.5	1,222.0
16	208+50	20,850	1,243.1	1,241.6	1,242.1	1,241.0	1,229.5	1,224.6
17	220+50	22,050	1,248.6	1,247.2	1,247.8	1,246.7	1,234.5	1,233.0
18	244+20	24,420	1,253.5	1,251.3	1,252.0	1,250.5	1,235.5	1,232.5
19	254+90	25,490	1,257.1	1,254.3	1,255.2	1,253.3	1,241.5	1,239.0
20	257+10	25,710	1,257.1	1,254.3	1,255.2	1,253.3	1,244.5	1,243.5
21	--	26,350	1,259.8	1,257.1	1,257.9	1,256.2	1,244.5	1,238.0
22	--	26,350	1,259.8	1,257.1	1,257.9	1,256.2	1,244.5	1,238.0
Applegate Bridge	--	26,360	--	--	--	--	--	--
23	265+45	26,545	1,260.0	1,257.4	1,258.2	1,256.7	1,244.5	1,238.0
Thompson Creek	--	26,800	--	--	--	--	--	--
24	277+30	27,730	1,271.7	1,267.6	1,268.6	1,266.2	1,248.5	1,246.3
25	292+70	29,270	1,274.6	1,270.5	1,271.6	1,269.2	1,251.5	1,247.5
26	303+80	30,380	1,277.4	1,273.5	1,274.5	1,272.2	1,257.5	1,254.0
Humbug Creek	--	30,380	--	--	--	--	--	--
27	314+90	31,490	1,283.0	1,278.8	1,279.8	1,277.4	1,263.5	1,259.0
28	327+70	32,770	1,285.7	1,282.2	1,283.0	1,281.0	1,266.5	1,261.0
29	338+55	33,855	1,289.5	1,286.6	1,287.2	1,285.5	1,272.5	1,270.3
30	348+90	34,890	1,294.9	1,292.0	1,292.7	1,290.9	1,275.5	1,270.0
Gaging station No. 3660	--	35,860	--	--	--	--	--	--
31	361+40	36,140	1,303.4	1,300.5	1,301.1	1,299.5	1,286.5	1,283.5

See footnotes at end of table.

Table 4.--Profile elevations for the Applegate River--Continued

Station			Elevations, in feet above msl					
Report reference	Photo-grammetric map reference	Distance upstream from county line (feet)	December 1964 flood	December 1964 flood (adjusted)	20-year flood	10-year flood	Minimum operational flow (estimated)	Thalweg
32	374+90	37,490	1,308.5	1,305.7	1,306.3	1,304.6	1,287.5	1,279.0
33	390+10	39,010	1,313.8	1,311.0	1,311.6	1,309.9	1,296.5	1,293.5
34	404+10	40,410	1,321.1	1,319.3	1,319.7	1,318.6	1,306.5	1,304.0
Keeler Creek	--	40,620	--	--	--	--	--	--
35	414+90	41,490	1,327.7	1,324.9	1,325.5	1,324.0	1,312.5	1,308.5
36	426+90	42,690	1,330.6	1,328.1	1,328.6	1,327.2	1,312.7	1,309.0
37	--	43,900	1,336.6	1,333.5	1,334.2	1,332.3	1,316.5	1,310.0
38	--	43,900	1,336.6	1,333.5	1,334.2	1,333.5	1,316.5	1,310.0
39	439+88	43,988	1,336.8	1,333.6	1,334.3	1,332.5	1,316.6	1,311.5
40	453+50	45,350	1,341.5	1,339.0	1,339.6	1,338.1	1,325.5	1,317.0
41	466+30	46,630	1,348.8	1,347.1	1,347.5	1,346.4	1,334.5	1,330.0
42	466+30	46,630	1,348.8	1,347.1	1,347.5	1,346.4	1,334.5	1,330.0
43	2/	46,700	1,352.0	1,350.1	1,351.4	1,348.8	1,335.0	1,330.3
44	484+30	48,430	1,358.0	1,356.4	1,356.8	1,356.0	1,347.5	1,342.0
Long Gulch	--	49,900	--	--	--	--	--	--
45	500+50	50,050	1,367.0	1,364.1	1,364.7	1,363.5	1,351.5	1,349.0
46	514+30	51,430	1,373.0	1,370.1	1,370.5	1,369.0	1,356.3	1,352.3
47	514+30	51,430	1,373.0	1,370.1	1,370.5	1,369.0	1,356.3	1,352.3
48	2/	51,490	1,373.5	1,370.9	1,371.3	1,370.0	1,356.6	1,352.5
49	522+10	52,210	1,375.6	1,373.5	1,373.9	1,372.8	1,360.0	1,355.0
50	534+50	53,450	1,380.8	1,378.9	1,379.4	1,378.0	1,366.5	1,361.5
51	554+00	55,400	1,388.6	1,387.4	1,387.6	1,387.0	1,377.2	1,372.3
52	554+00	55,400	1,388.6	1,387.4	1,387.6	1,387.0	1,377.2	1,372.3
53	2/	55,490	1,390.4	1,388.5	1,389.0	1,387.9	1,377.5	1,372.5
54	564+90	56,490	1,393.6	1,392.3	1,392.6	1,391.7	1,378.5	1,373.3
55	575+40	57,540	1,397.0	1,395.8	1,396.0	1,395.3	1,385.5	1,383.0
56	581+40	58,140	1,398.7	1,397.2	1,397.6	1,396.7	1,388.0	1,386.3
57	597+00	59,700	1,405.8	1,404.4	1,404.8	1,403.8	1,394.5	1,392.3
Forest Creek	--	60,680	--	--	--	--	--	--
58	608+00	60,800	1,410.4	1,408.6	1,409.0	1,408.0	1,400.5	1,398.5
59	623+40	62,340	1,418.0	1,415.0	1,415.7	1,414.2	1,401.5	1,399.5
60	2/	63,600	1,421.0	1,418.1	1,418.8	1,417.2	1,404.5	1,401.0
61	2/	63,600	1,421.0	1,418.1	1,418.8	1,417.2	1,404.5	1,401.0
Cantrell Bridge	--	63,600	--	--	--	--	--	--
62	1/638+88	63,888	1,424.8	1,420.3	1,421.2	1,419.0	1,406.4	1,401.8
63	644+40	64,440	1,425.2	1,421.2	1,422.0	1,420.1	1,406.6	1,403.0
64	663+40	66,340	1,431.4	1,428.9	1,429.5	1,428.1	1,418.5	1,417.0
Spencer Gulch	--	67,680	--	--	--	--	--	--
65	676+80	67,680	1,435.0	1,432.5	1,433.0	1,432.0	1,420.5	1,415.5
66	676+80	67,680	1,435.0	1,432.5	1,433.0	1,432.0	1,420.5	1,415.5
67	678+60	67,860	1,435.5	1,433.5	1,433.9	1,432.7	1,421.4	1,419.7
68	689+20	68,920	1,442.2	1,438.4	1,439.3	1,437.3	1,421.8	1,418.5
69	699+70	69,970	1,443.8	1,440.3	1,441.0	1,439.3	1,427.5	1,424.3

See footnotes at end of table.

Table 4.--Profile elevations for the Applegate River--Continued

Station			Elevations, in feet above msl					
Report reference	Photo-grammetric map reference	Distance upstream from county line (feet)	December 1964 flood	December 1964 flood (adjusted)	20-year flood	10-year flood	Minimum operational flow (estimated)	Thalweg
70	711+10	71,110	1,449.9	1,447.3	1,447.9	1,446.6	1,430.5	1,425.5
71	721+90	72,190	1,455.7	1,452.3	1,453.1	1,451.4	1,440.5	1,437.0
72	732+90	73,290	1,461.7	1,458.7	1,459.4	1,457.7	1,445.5	1,442.0
Little Applegate River	--	73,890	--	--	--	--	--	--
73	742+70	74,270	1,465.7	1,462.6	1,463.3	1,461.5	1,448.5	1,445.5
74	742+70	74,270	1,465.7	1,462.6	1,463.3	1,461.5	1,448.5	1,445.5
75	745+30	74,530	1,466.2	1,462.8	1,463.5	1,461.8	1,449.5	1,447.0
76	748+40	74,840	1,467.7	1,464.5	1,465.0	1,463.3	1,450.5	1,447.5
77	762+00	76,200	1,470.6	1,467.5	1,467.9	1,466.3	1,453.5	1,450.5
78	2/	77,280	1,474.3	1,471.6	1,471.8	1,470.5	1,461.5	1,459.0
79	782+20	78,220	1,478.1	1,475.7	1,475.9	1,474.4	1,463.5	1,461.0
80	793+80	79,380	1,485.5	1,481.9	1,482.2	1,480.3	1,468.5	1,467.0
81	808+80	80,880	1,490.2	1,486.8	1,487.1	1,484.9	1,469.5	1,465.5
82	818+40	81,840	1,495.1	1,491.2	1,491.5	1,489.0	1,477.5	1,475.0
83	818+40	81,840	1,495.1	1,491.2	1,491.5	1,489.0	1,477.5	1,475.0
Cameron Bridge	--	81,840	--	--	--	--	--	--
84	820+50	82,050	1,496.2	1,492.4	1,492.7	1,490.6	1,478.5	1,476.5
Mill Gulch	--	82,060	--	--	--	--	--	--
85	827+50	82,750	1,500.0	1,495.8	1,496.0	1,494.5	1,481.5	1,476.5
86	840+90	84,090	1,504.2	1,500.9	1,501.1	1,499.6	1,489.5	1,487.5
87	850+50	85,050	1,507.8	1,505.2	1,505.5	1,504.2	1,495.5	1,493.5
88	863+00	86,300	1,516.7	1,513.0	1,513.3	1,511.6	1,499.5	1,498.0
89	878+70	87,870	1,520.5	1,516.8	1,517.1	1,515.3	1,501.5	1,499.3
90	890+30	89,030	1,526.0	1,521.7	1,522.0	1,519.7	1,505.5	1,503.3
91	901+30	90,130	1,530.0	1,525.2	1,525.6	1,523.2	1,507.5	1,505.5
92	921+90	92,190	1,538.7	1,534.2	1,534.5	1,532.3	1,518.5	1,515.5
Star Gulch	--	92,200	--	--	--	--	--	--
93	929+70	92,970	1,545.7	1,540.3	1,540.7	1,538.0	1,519.5	1,517.0
Star Ranger Station	--	93,300	--	--	--	--	--	--
Boaz Gulch	--	93,400	--	--	--	--	--	--
94	940+90	94,090	1,548.5	1,542.6	1,543.4	1,540.7	1,525.5	1,523.5
95	952+10	95,210	1,551.2	1,545.4	1,546.4	1,544.0	1,528.5	1,525.0
96	952+10	96,130	1,552.8	1,547.5	1,548.4	1,546.3	1,531.5	1,527.5
97	973+70	97,370	1,556.9	1,551.6	1,552.6	1,550.5	1,534.5	1,533.0
98	985+70	98,570	1,561.7	1,556.1	1,557.2	1,555.0	1,537.5	1,533.0
99	1000+50	100,050	1,573.6	1,568.6	1,569.6	1,567.7	1,551.5	1,548.0
100	1011+30	101,130	1,587.5	1,581.7	1,582.8	1,580.6	1,561.5	1,559.0
101	1022+30	102,230	1,595.9	1,590.6	1,591.8	1,589.4	1,574.5	1,573.0
102	2/	103,910	1,600.7	1,596.1	1,597.1	1,595.2	1,581.0	1,578.0
103	2/	103,910	1,600.7	1,596.1	1,597.1	1,595.2	1,581.0	1,578.0
McKee Bridge	--	103,970	--	--	--	--	--	--

See footnotes at end of table.

Table 4.--Profile elevations for the Applegate River--Continued

Station			Elevations, in feet above msl					
Report reference	Photo-grammetric map reference	Distance upstream from county line (feet)	December 1964 flood	December 1964 flood (adjusted)	20-year flood	10-year flood	Minimum operational flow (estimated)	Thalweg
104	1040+30	104,030	1,602.8	1,597.6	1,598.7	1,596.6	1,581.5	1,578.2
105	1055+50	105,550	1,609.1	1,604.5	1,605.4	1,603.6	1,594.5	1,591.3
106	1055+50	105,550	1,609.1	1,604.5	1,605.4	1,603.6	1,594.5	1,591.3
Highway Bridge	--	105,590	--	--	--	--	--	--
107 (Dam)	1056+90	105,690	1,611.5	1,607.0	1,607.7	1,605.7	1,597.0	1,596.0
108	1062+30	106,230	1,619.1	1,614.3	1,615.3	1,613.4	1,601.5	1,599.5
Beaver Creek	--	107,900	--	--	--	--	--	--
109	1079+90	107,990	1,625.3	1,621.2	1,622.2	1,620.8	1,609.5	1,607.5
110	1102+50	110,250	1,633.0	1,629.3	1,630.5	1,629.5	1,622.5	1,614.5
111	1119+10	111,910	1,643.6	1,640.7	1,641.6	1,640.7	1,631.5	1,629.5
112	2/	113,010	1,652.3	1,648.3	1,649.6	1,648.4	1,638.5	1,636.0
113	1148+80	114,830	1,657.0	1,654.2	1,655.1	1,654.3	1,646.5	1,644.5
Palmer Creek	--	114,900	--	--	--	--	--	--
Rock Gulch	--	115,600	--	--	--	--	--	--
114	1/ 1164+90	116,490	1,668.8	1,662.7	1,664.9	1,663.3	1,648.5	1,643.0
115	1178+90	117,890	1,671.2	1,665.6	1,667.8	1,666.6	1,655.5	1,654.0
116	1191+50	119,150	1,675.8	1,670.5	1,672.8	1,671.6	1,659.5	1,657.5
117	1205+50	120,550	1,683.8	1,679.5	1,681.5	1,680.5	1,666.5	1,664.5
118	1220+10	122,010	1,690.7	1,685.0	1,687.6	1,686.3	1,668.5	1,666.2
Kinney Creek	--	122,400	--	--	--	--	--	--
119	1234+10	123,410	1,697.0	1,692.0	1,694.0	1,693.0	1,677.5	1,675.2
Mule Creek	--	124,680	--	--	--	--	--	--
120	1251+10	125,110	1,705.4	1,700.0	1,702.4	1,701.1	1,684.5	1,682.5
121	1270+10	127,010	1,723.2	1,714.0	1,718.0	1,716.0	1,691.5	1,689.2
122	1283+70	128,370	1,734.0	1,726.0	1,729.6	1,727.8	1,705.5	1,703.2
123	1297+30	129,730	1,742.0	1,736.0	1,739.0	1,737.4	1,718.5	1,716.0
124	1310+90	131,090	1,750.0	1,744.5	1,746.9	1,745.8	1,730.5	1,726.5
125	1322+50	132,250	1,754.4	1,749.3	1,751.6	1,750.5	1,739.5	1,737.2
126	1334+90	133,490	1,759.0	1,753.7	1,756.1	1,754.9	1,741.5	1,739.8
Brushy Gulch	--	134,850						
127	1350+50	135,050	1,765.1	1,759.0	1,761.7	1,760.3	1,745.5	1,743.5
128	2/	136,000	1,770.0	1,762.9	1,766.0	1,764.2	1,751.5	1,750.0
129	1365+90	136,590	1,774.0	1,767.0	1,770.0	1,768.0	1,755.5	1,754.0
130	1374+90	137,490	1,782.0	1,775.0	1,778.0	1,776.0	1,760.5	1,758.5
131 Gaging station No. 3620	1375+70	137,570	1,785.0	1,776.0	1,780.0	1,778.0	1,760.6	1,757.0

1/ Alinement of photogrammetric cross section has been altered.

2/ Not included on photogrammetric map.

The profiles show that a flood equivalent to that of December 1964, adjusted for storage in the proposed Applegate Reservoir, would fall between a 10- and 20-year flood downstream from Beaver Creek at river mile 40.6 and would fall below a 10-year flood upstream from Beaver Creek.

USE OF THE RESULTS

The computed profiles can be used to estimate elevations of the 10- and 20-year floods, the December 1964 flood, and the low flow for any location in the study reach. Elevations of the adjusted December 1964 flood can be approximated.

In using the results of the study, allowances should be made (1) for pileup of water at the outside of bends or near the mouths of tributary streams and (2) for backwater in areas vulnerable to catching debris. Under these conditions, water-surface elevations will probably be higher than those shown on the profiles (figs. 4-13) or those listed in table 4. At the outside of a sharp bend, water could pile up as high as 3 or 4 feet above the flood elevations shown in table 4. It should also be recognized that in areas isolated from and above the water surface of the main stream, flooding can occur as the result of water becoming separated from the main channel or of water running off side-hills. Elevation of this "superelevated" water should not be confused with the elevation of the main channel profiles shown in this report.

Because the Applegate River channel alinement has shifted in the past due to flooding and will no doubt continue to shift, future flood elevations could differ from those shown in figures 4-13 and table 4. Development of the flood plain, which would measurably change existing channel roughness or the shape of the channel, could also change future flood elevations.

SUMMARY

Flood and low-water elevations for a selected reach of the Applegate River from the Jackson-Josephine County line to the Applegate damsite are presented in tables and graphical profiles. The data show that elevations for a discharge on the Applegate River equivalent to that of the flood in December 1964, but reduced by storage in the proposed Applegate Reservoir, would fall between 10- and 20-year flood elevations downstream from Beaver Creek (river mile 40.6). Upstream from Beaver Creek, the adjusted December 1964 flood would be lower than a 10-year flood. The computed water-surface profiles are generally in good agreement with the documented flood elevations downstream from cross section 117. Upstream from cross section 117, most of the flood profiles were estimated on the basis of high-water marks.

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Harris, D. D., 1970, Water-surface elevations and channel characteristics for selected reaches of the Rogue River and Elk Creek, Jackson and Josephine Counties, Oregon: U.S. Geol. Survey open-file rept., 61 p.

U.S. Army Corps of Engineers, 1965, Flood plain information, Jackson County, Oregon, interim report: 33 p.

________1967, Applegate Reservoir, Applegate, Oregon: Hydrology and Meteorology Design Memo. no. 2.

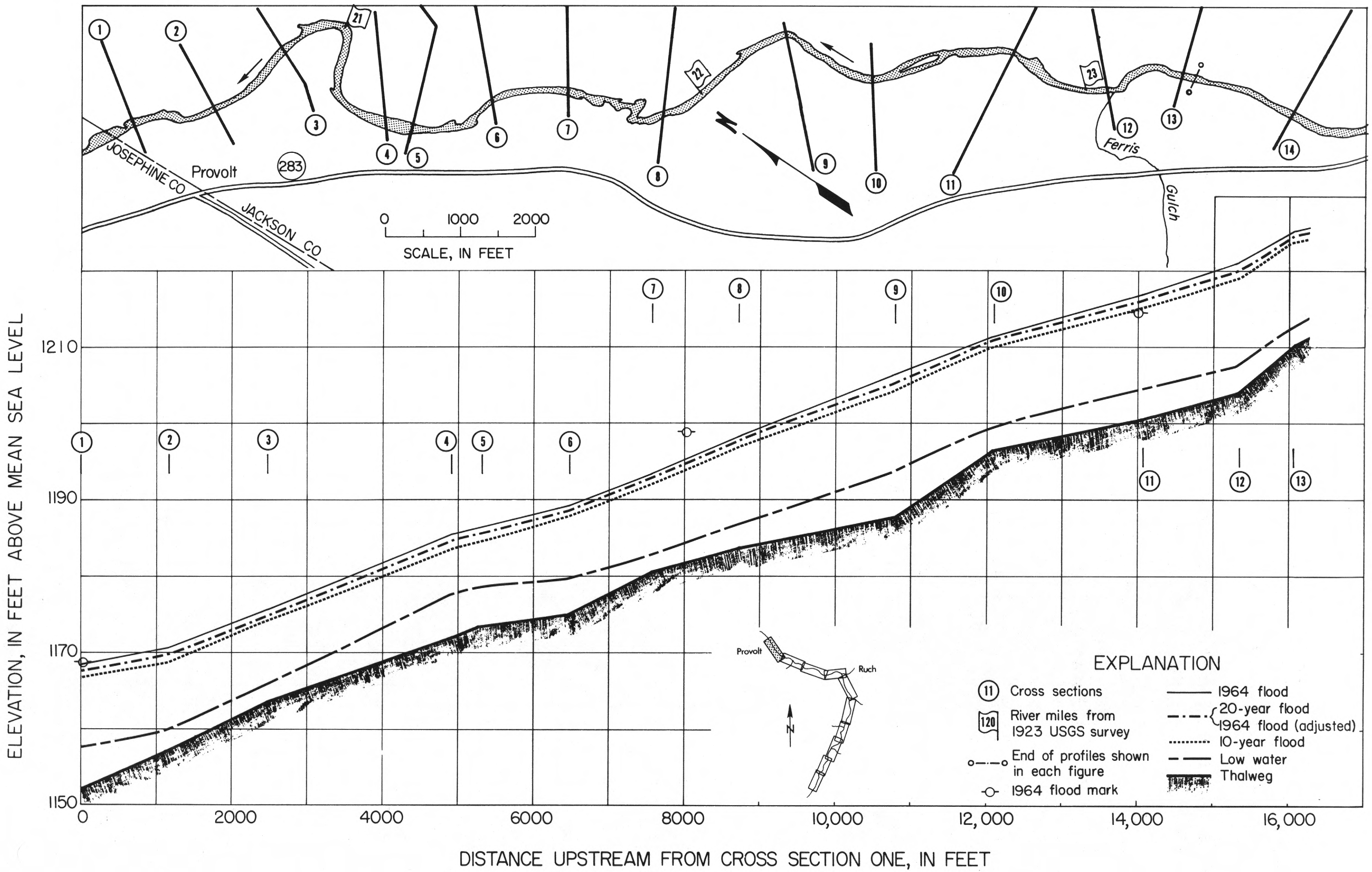

FIGURE 4.--Profiles of Applegate River.

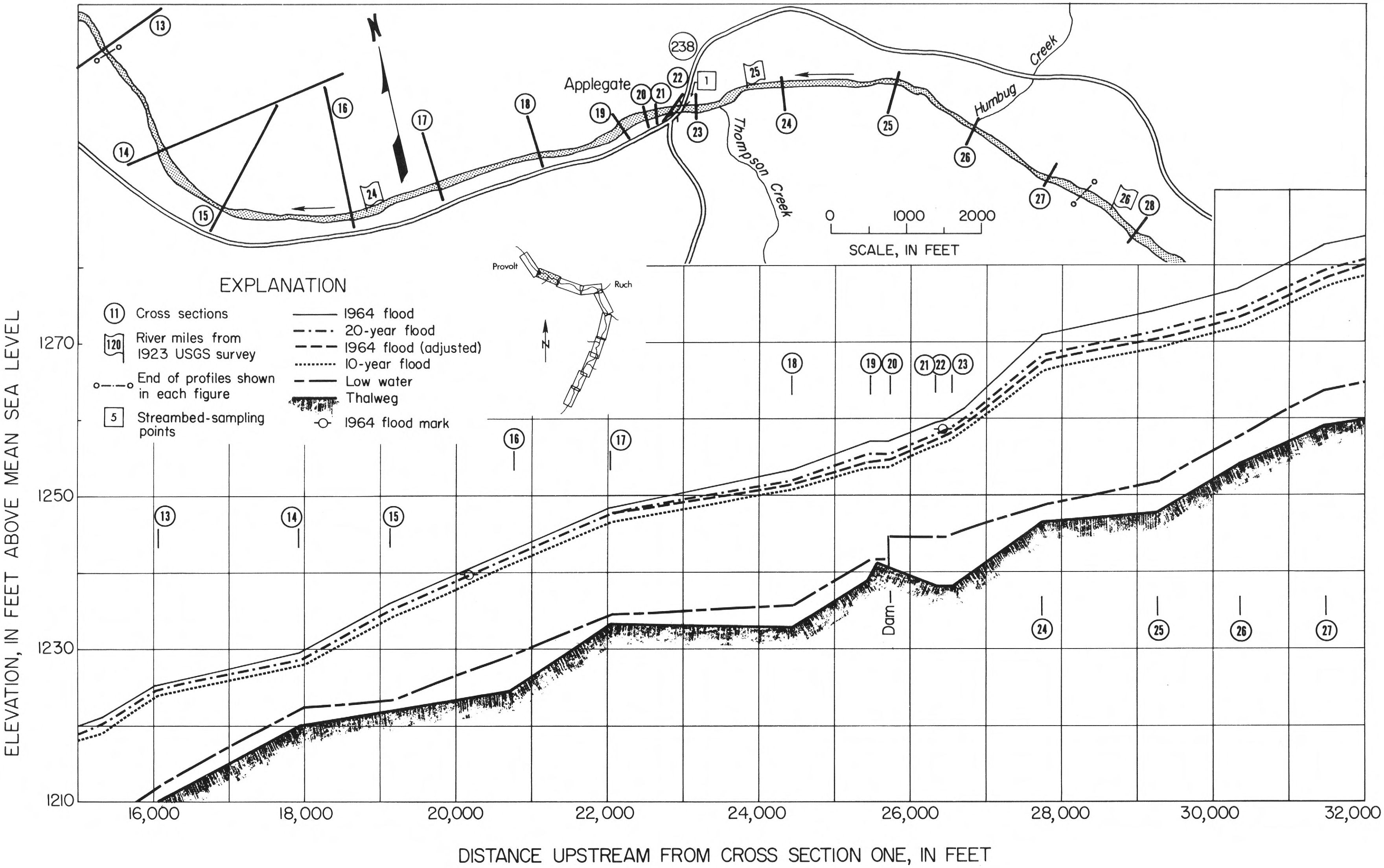

FIGURE 5.--Profiles of Applegate River.

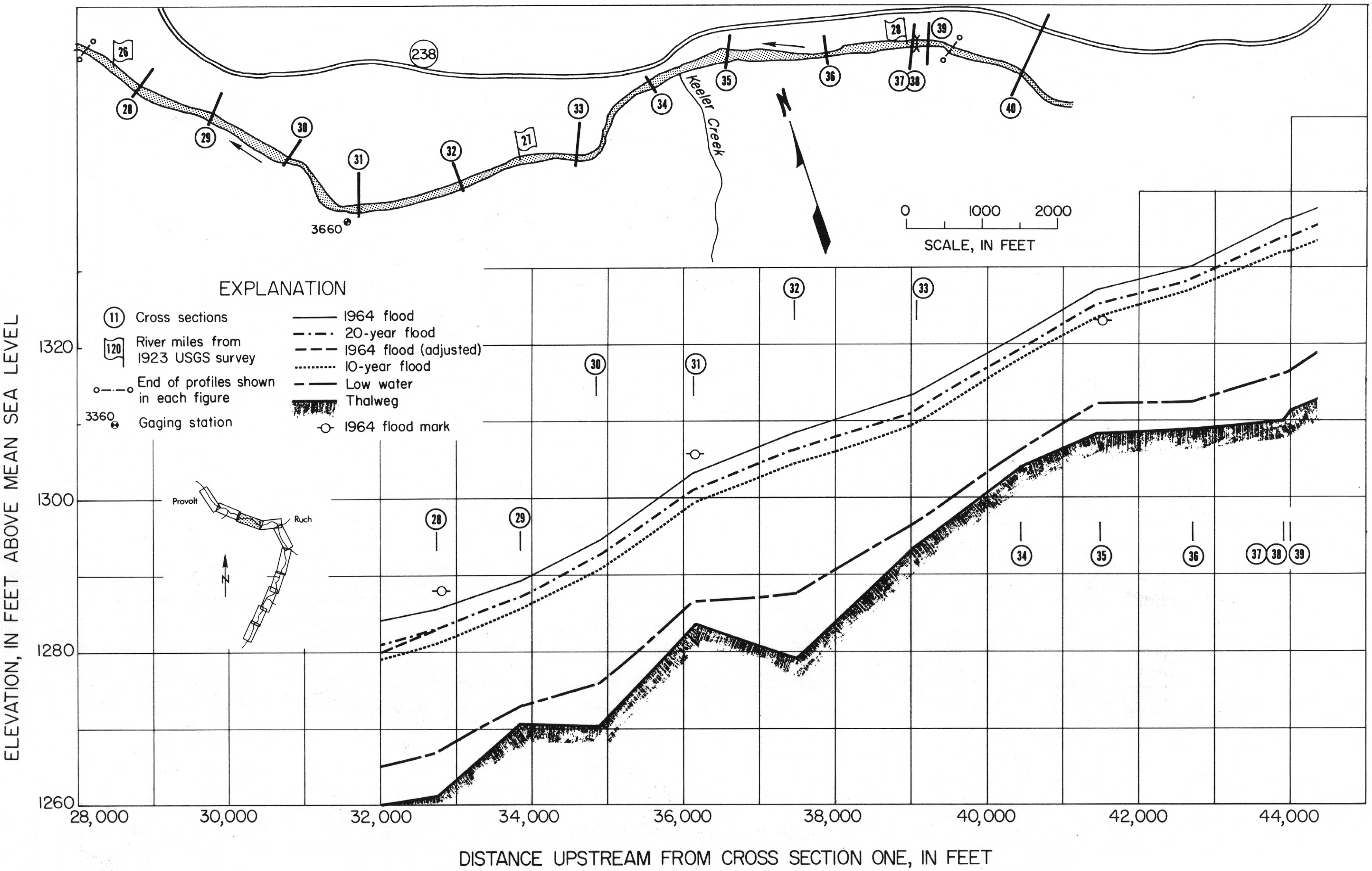

FIGURE 6.--Profiles of Applegate River.

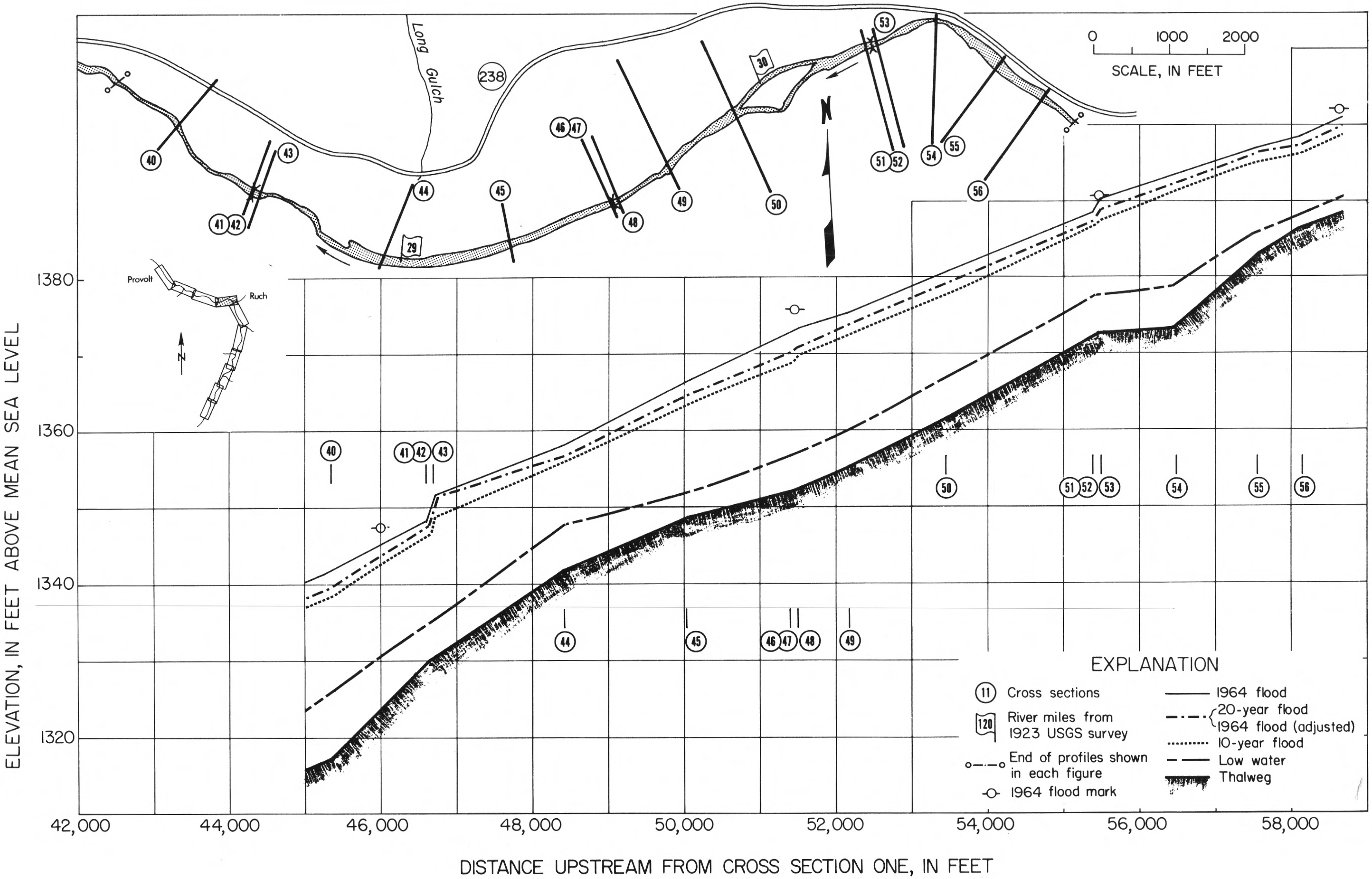

FIGURE 7.--Profiles of Applegate River.

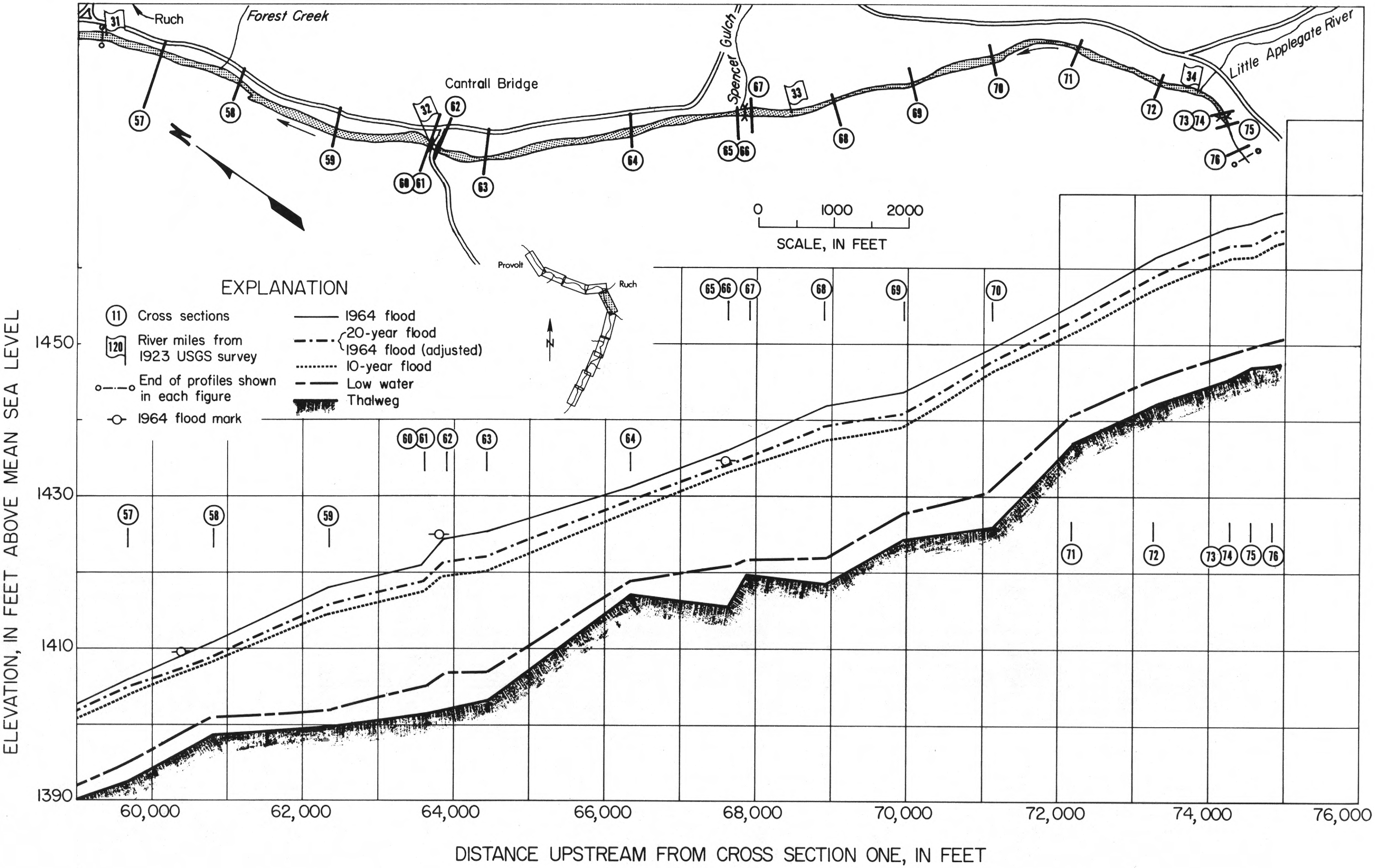

FIGURE 8.--Profiles of Applegate River.

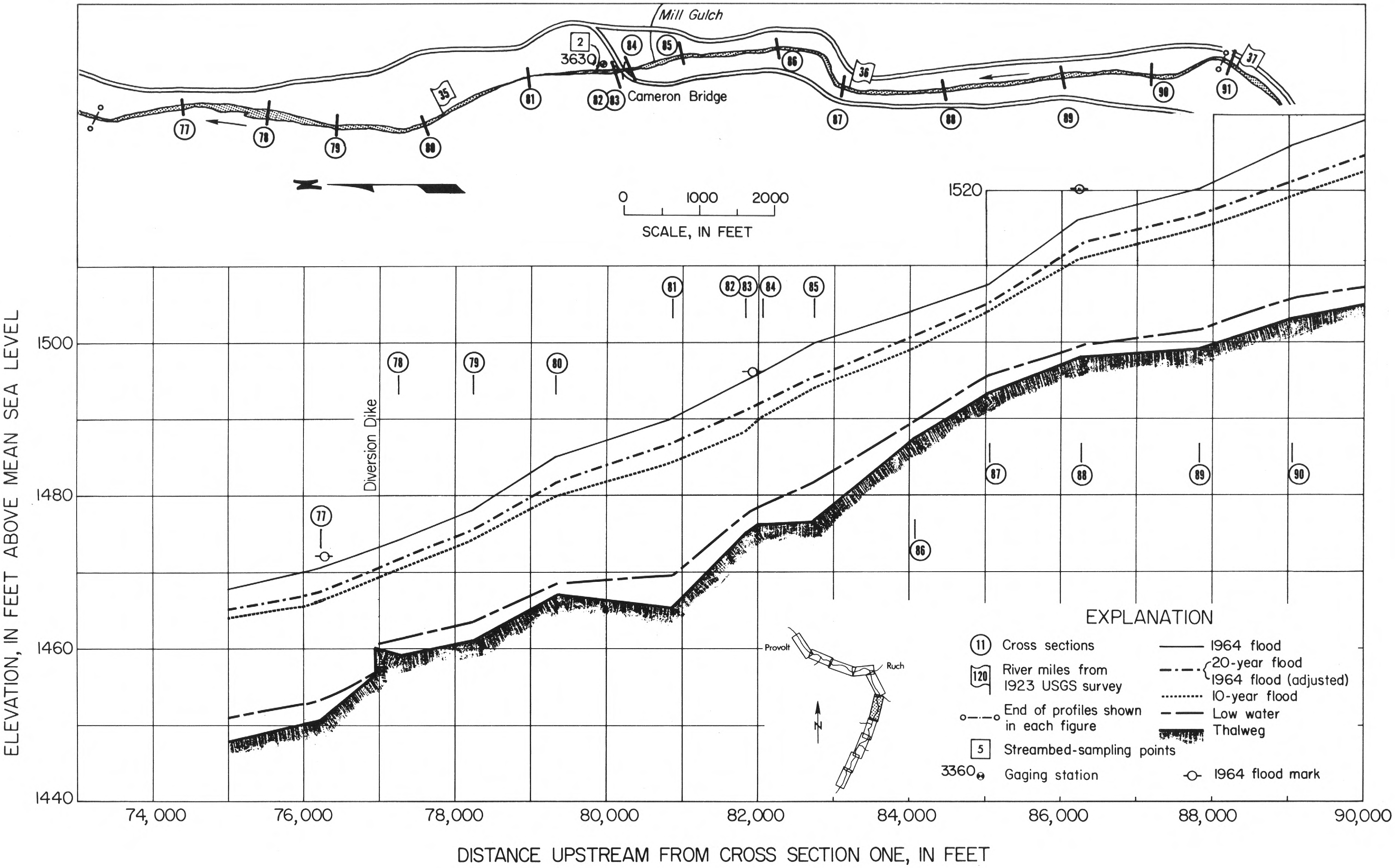

FIGURE 9.--Profiles of Applegate River.

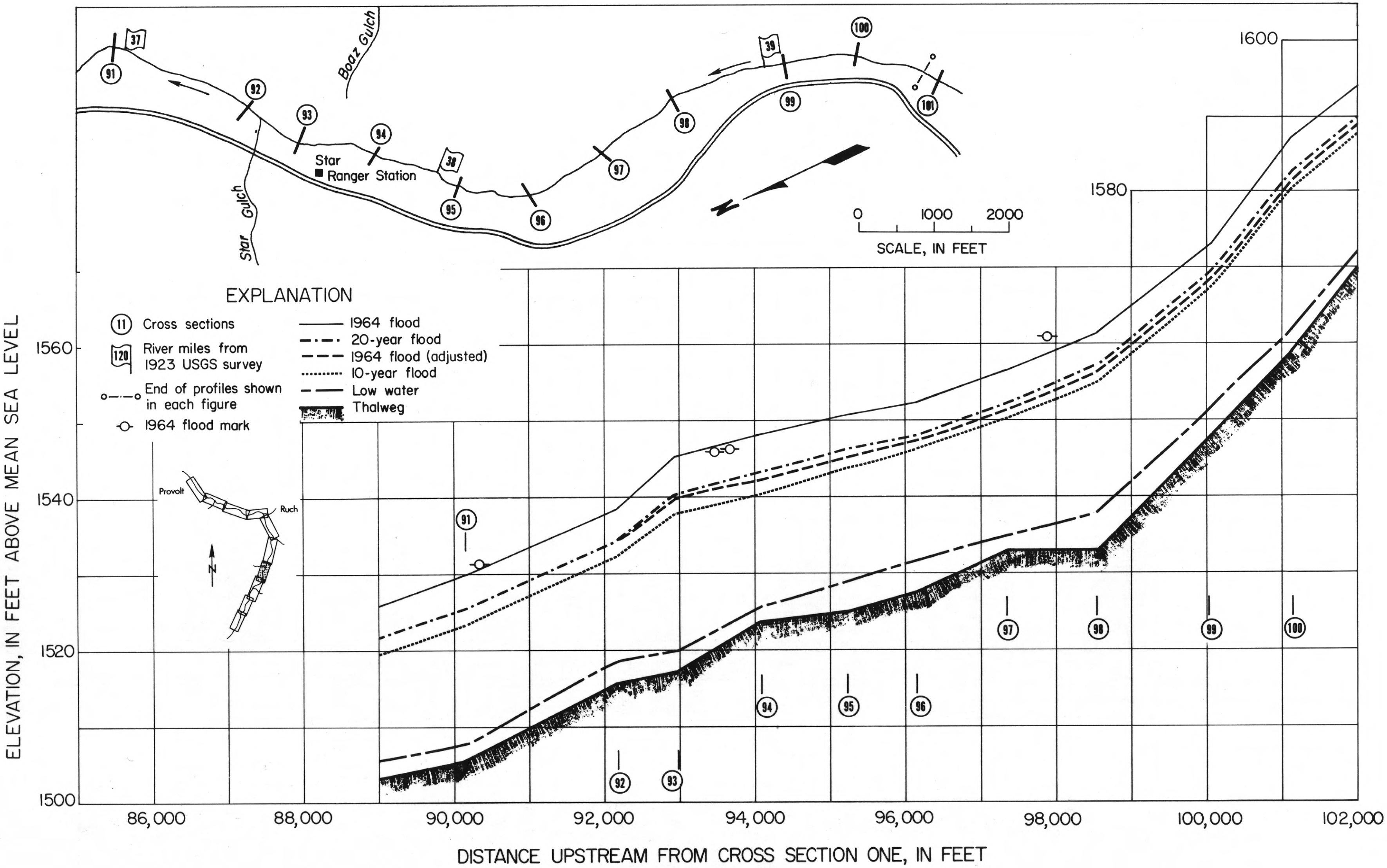

FIGURE 10.--Profiles of Applegate River.

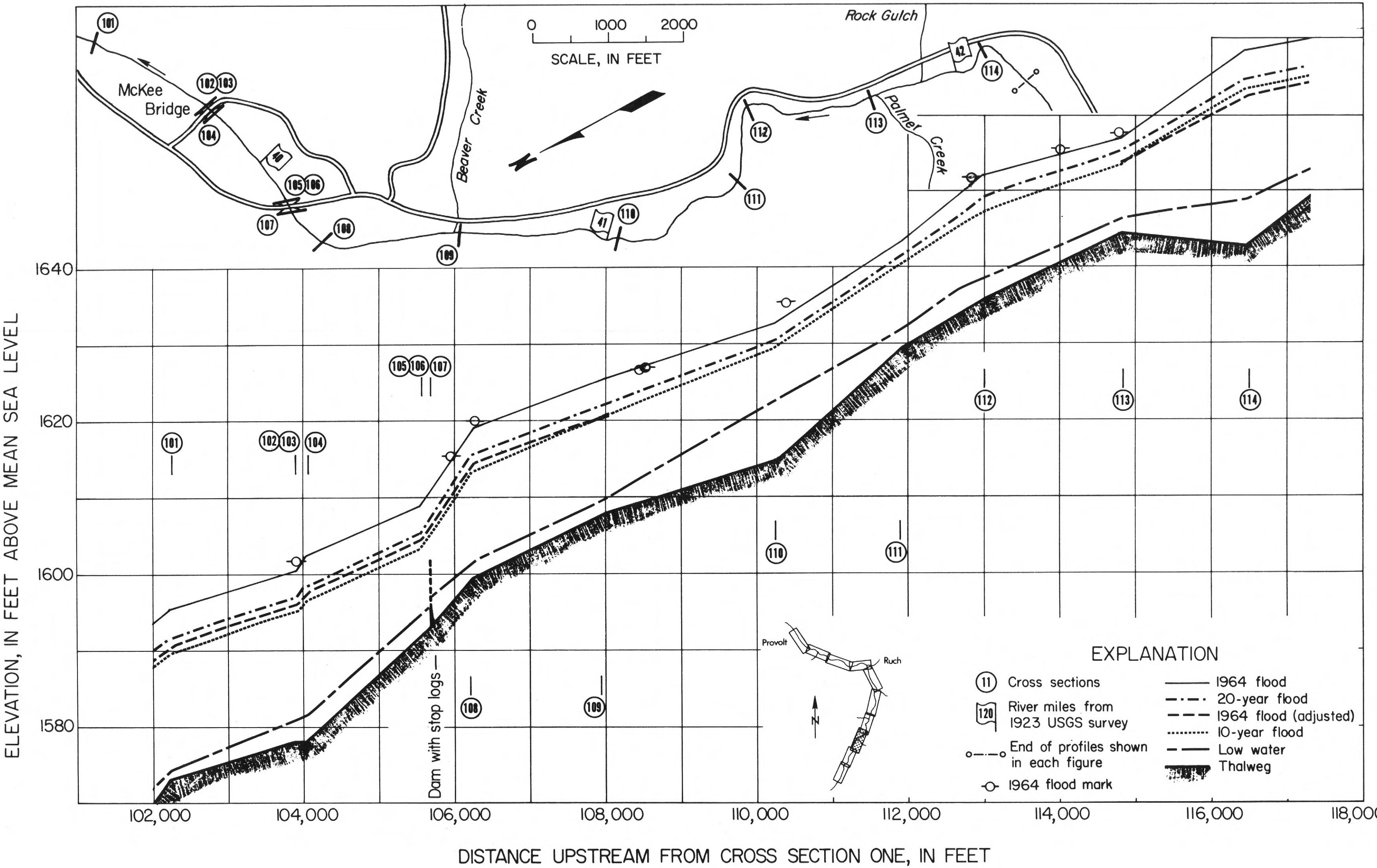

FIGURE 11.--Profiles of Applegate River.

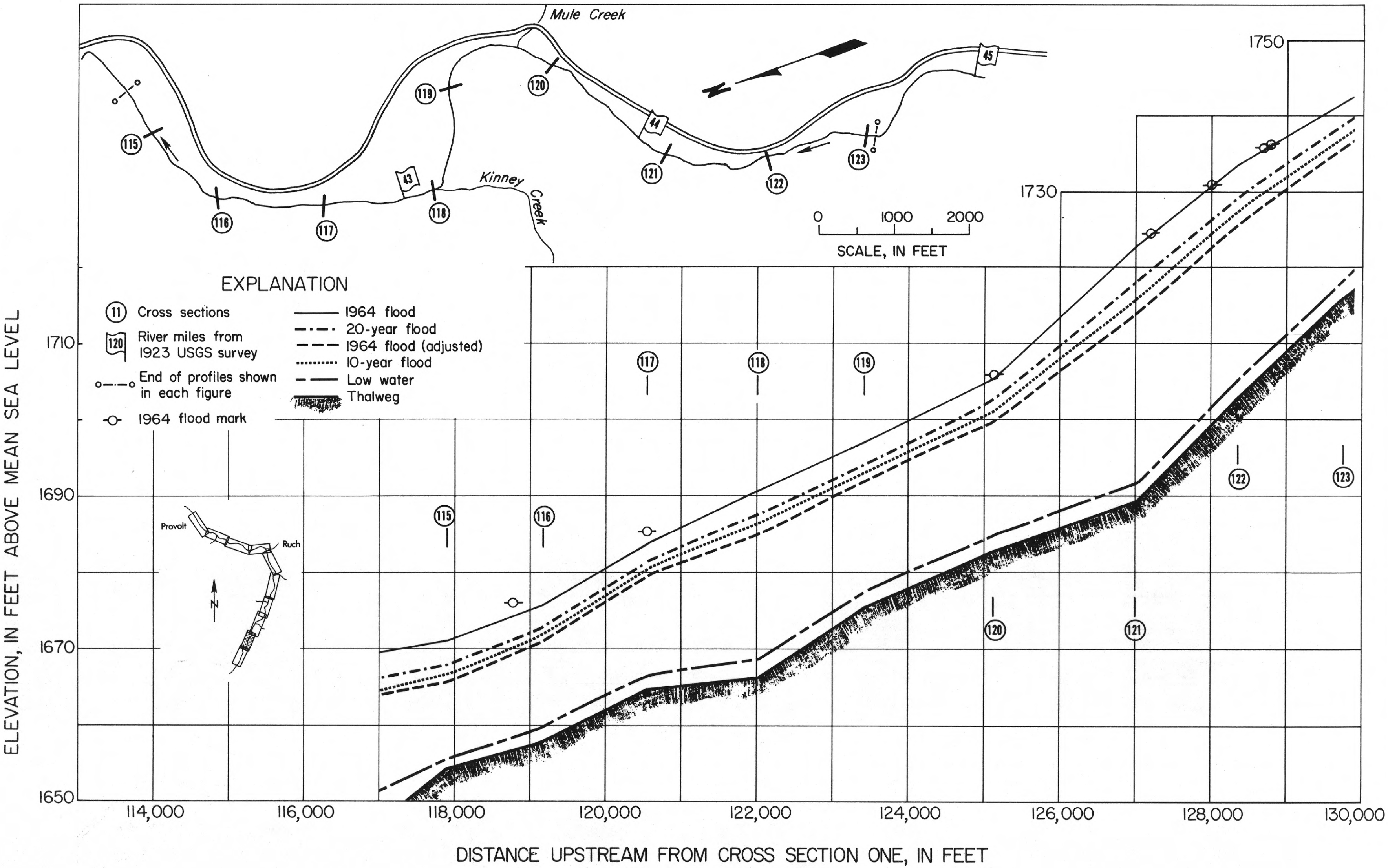

FIGURE 12.--Profiles of Applegate River.

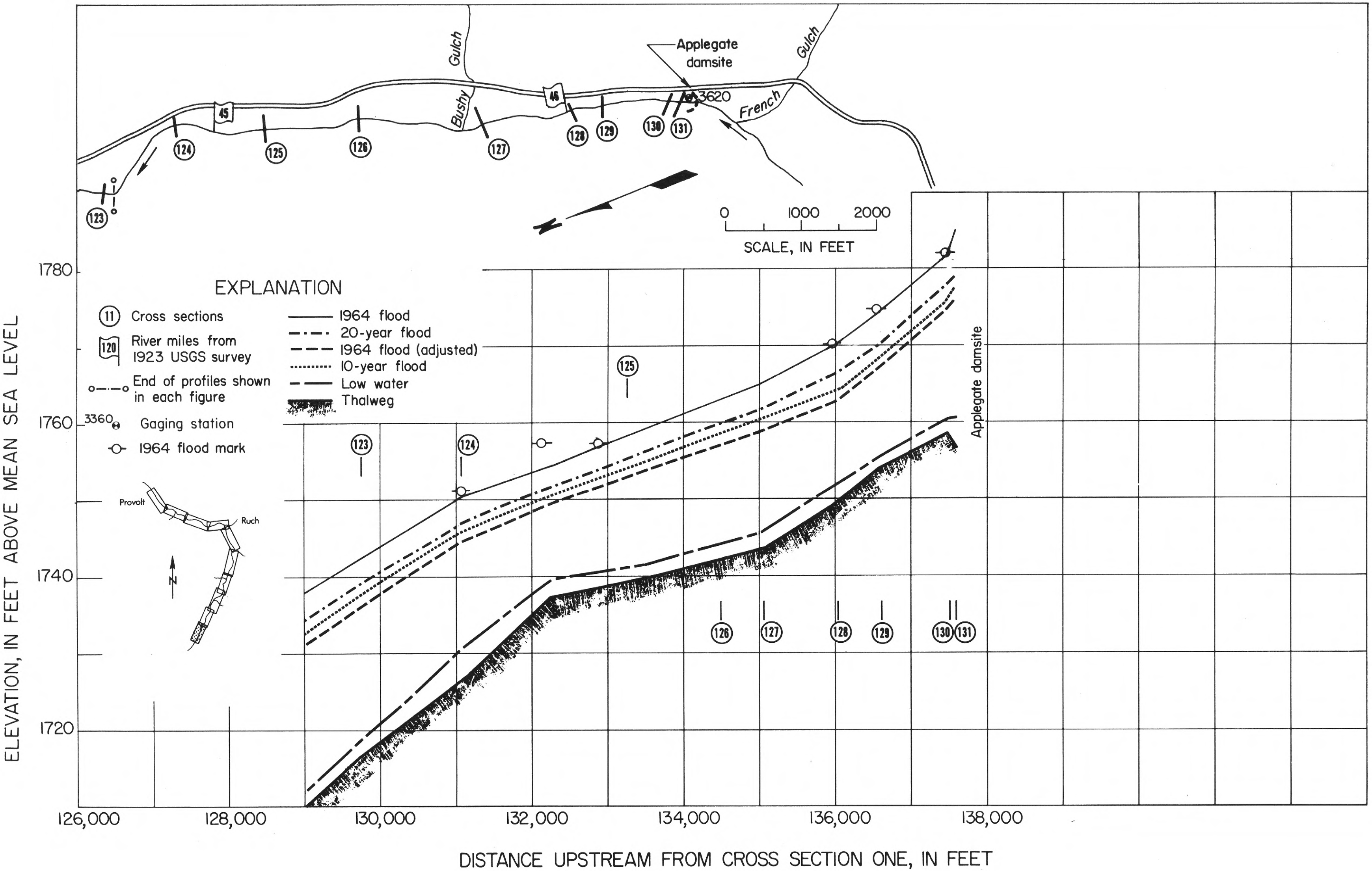

FIGURE 13.--Profiles of Applegate River.

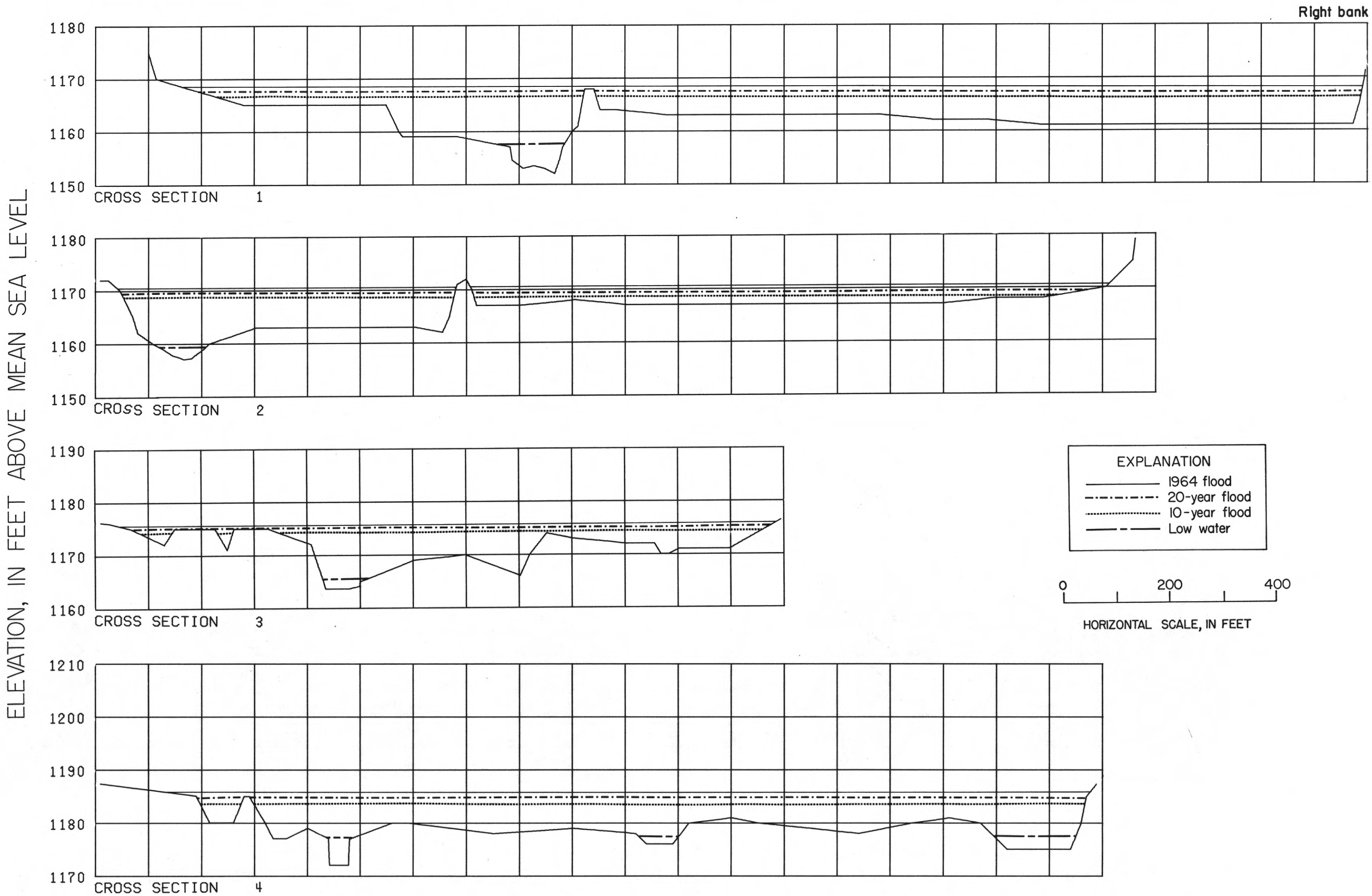

FIGURE 14.--Applegate River cross sections 1-4.

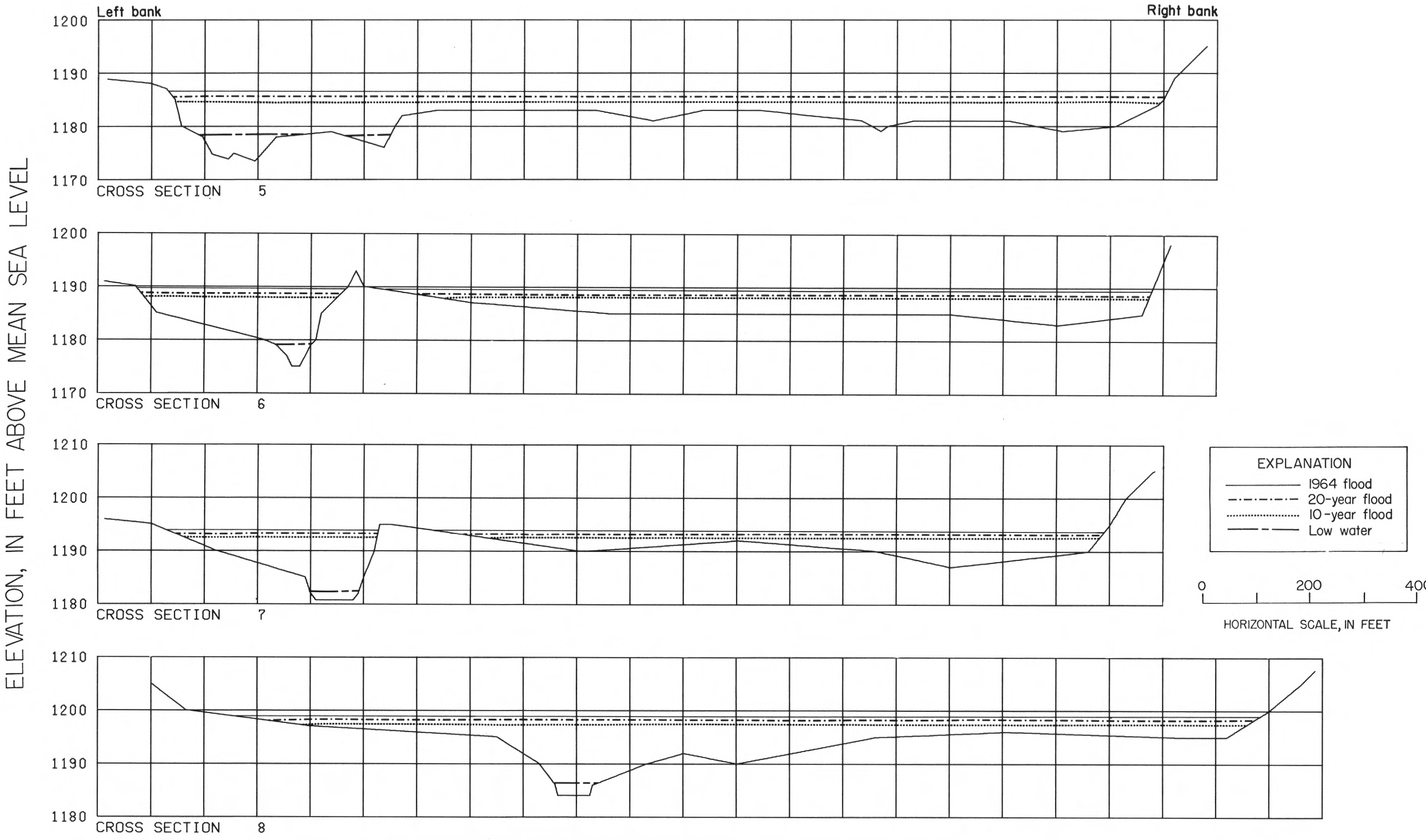

FIGURE 15.--Applegate River cross sections 5-8.

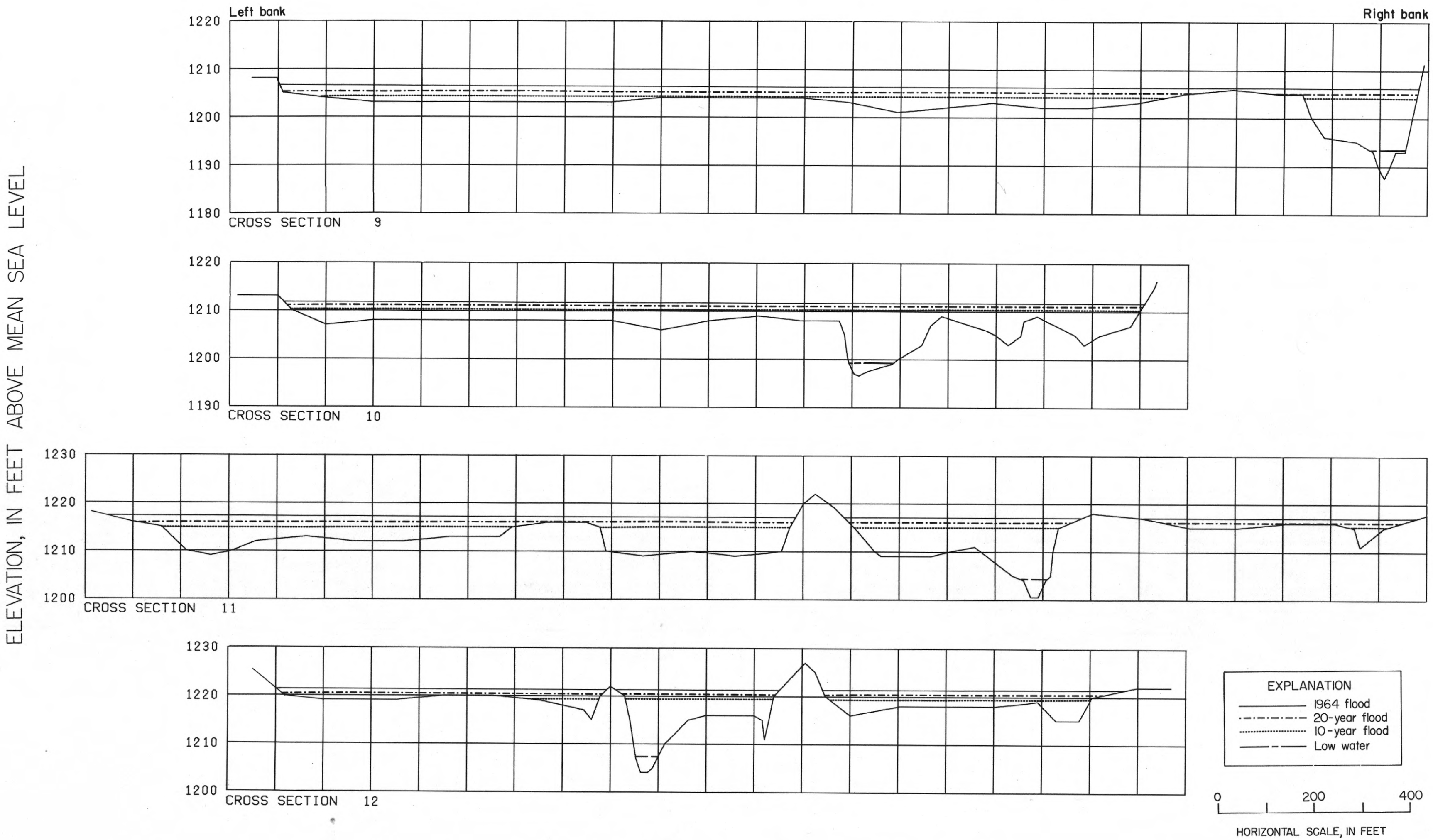

FIGURE 16.--Applegate River cross sections 9-12.

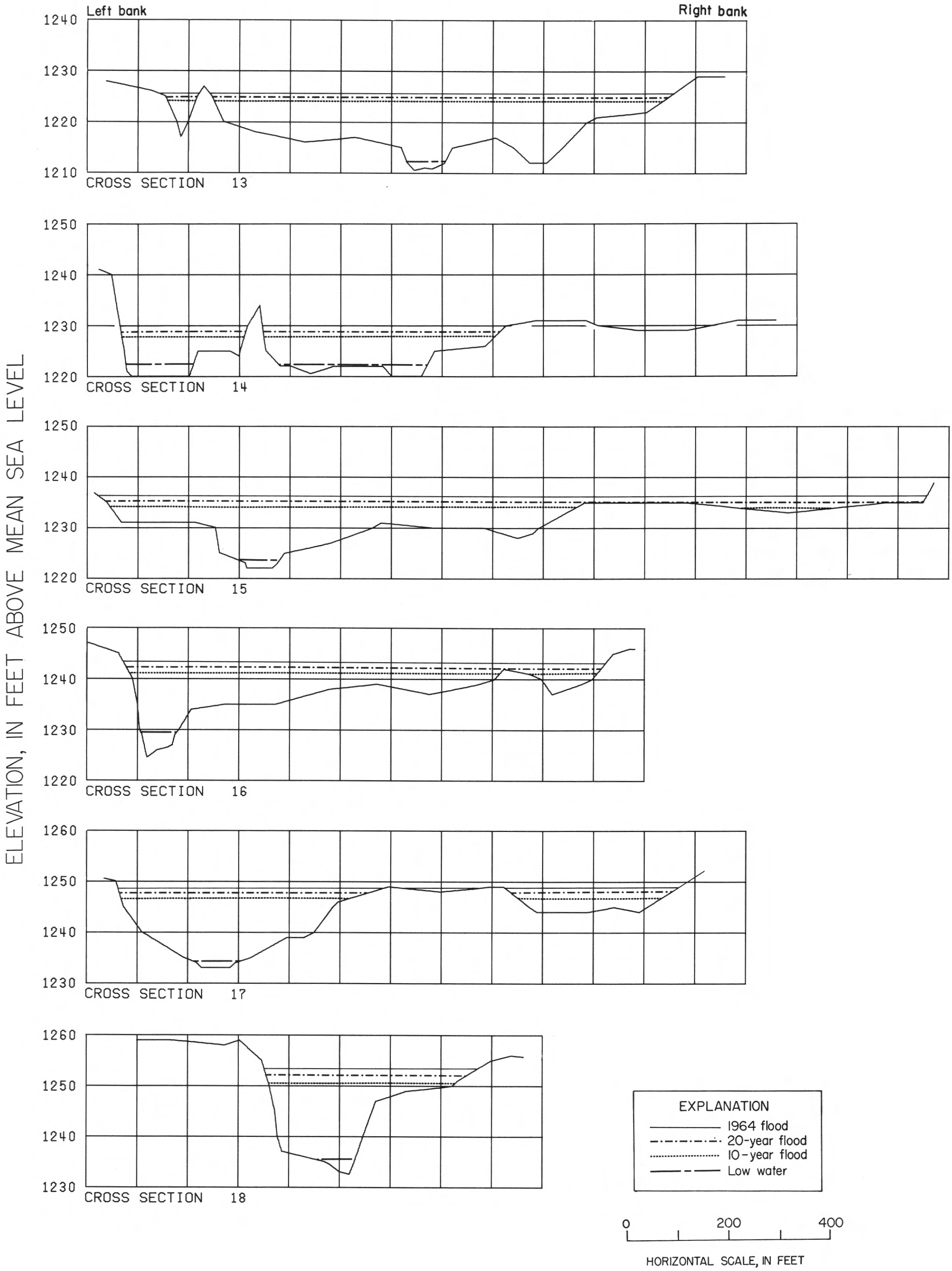

FIGURE 17.--Applegate River cross sections 13-18.

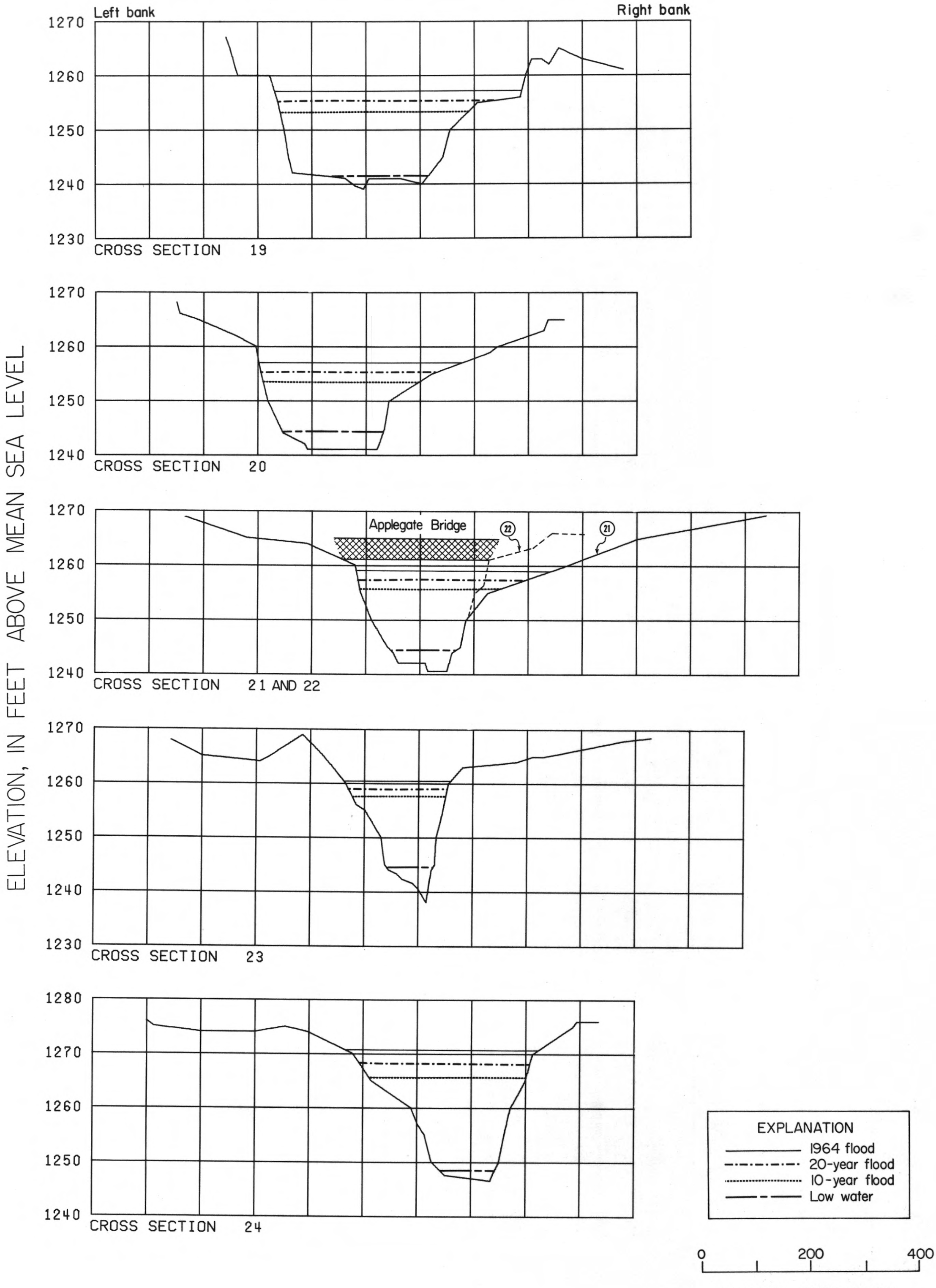

FIGURE 18.--Applegate River cross sections 19-24.

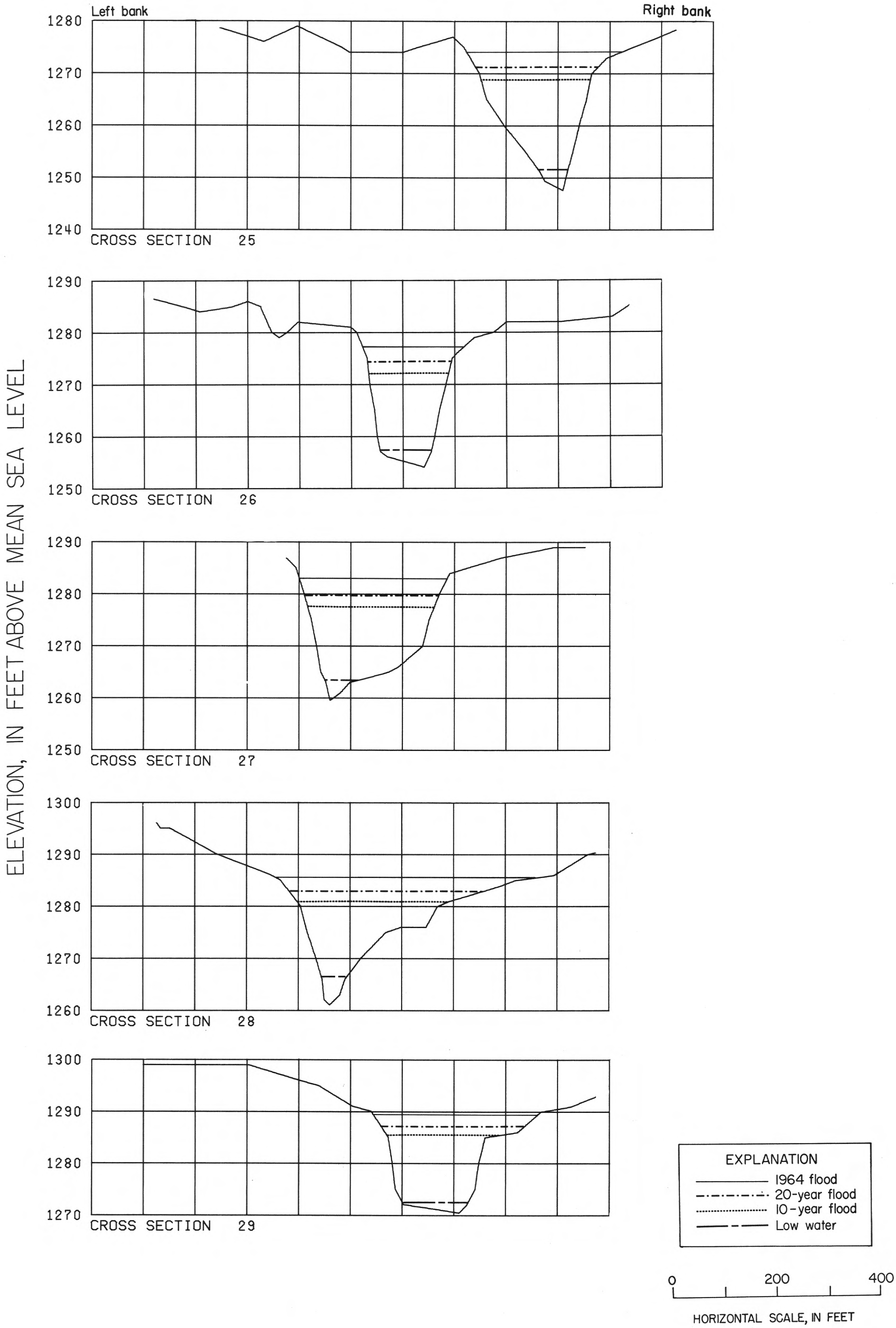

FIGURE 19.--Applegate River cross sections 25-29.

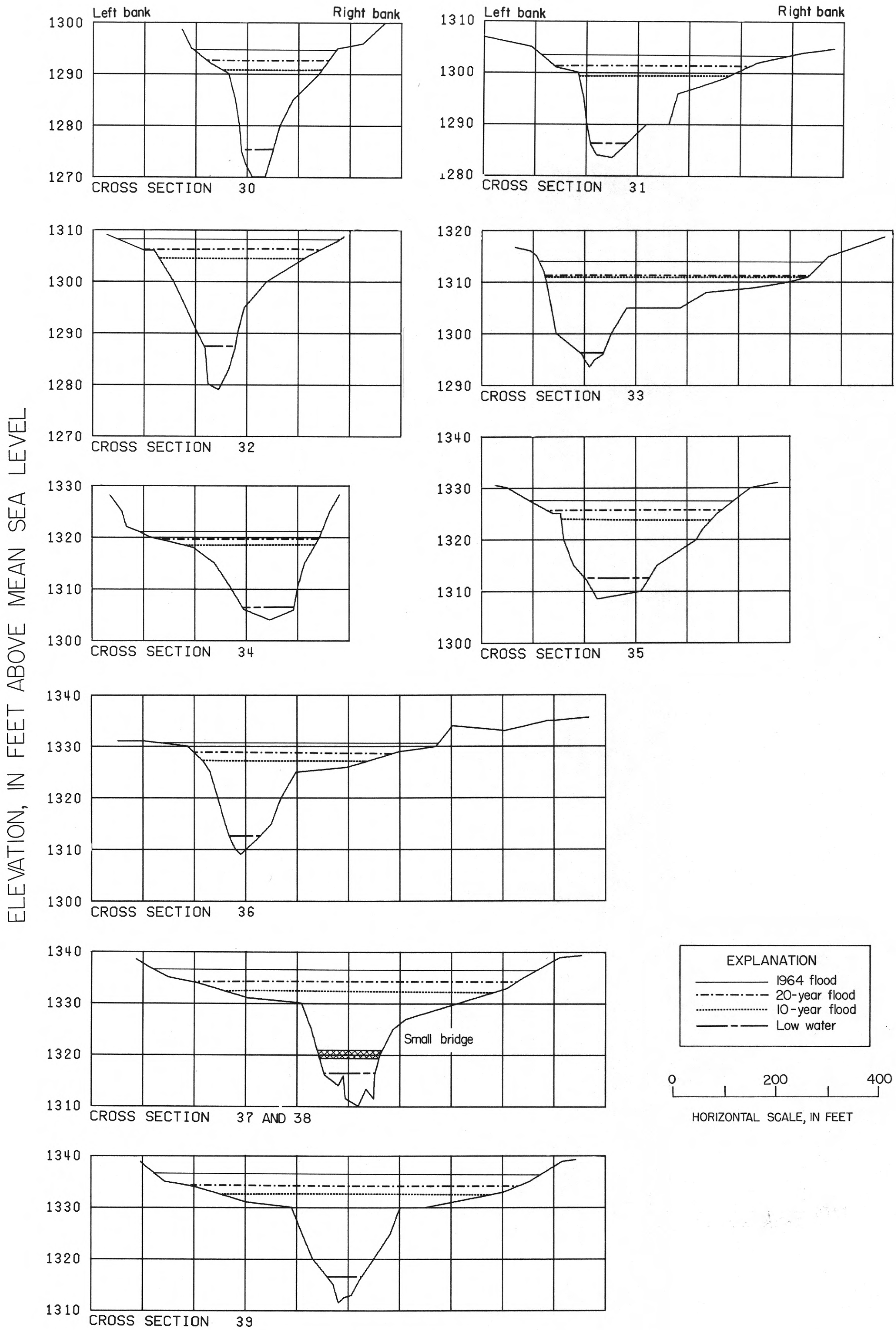

FIGURE 20.--Applegate River cross sections 30-39.

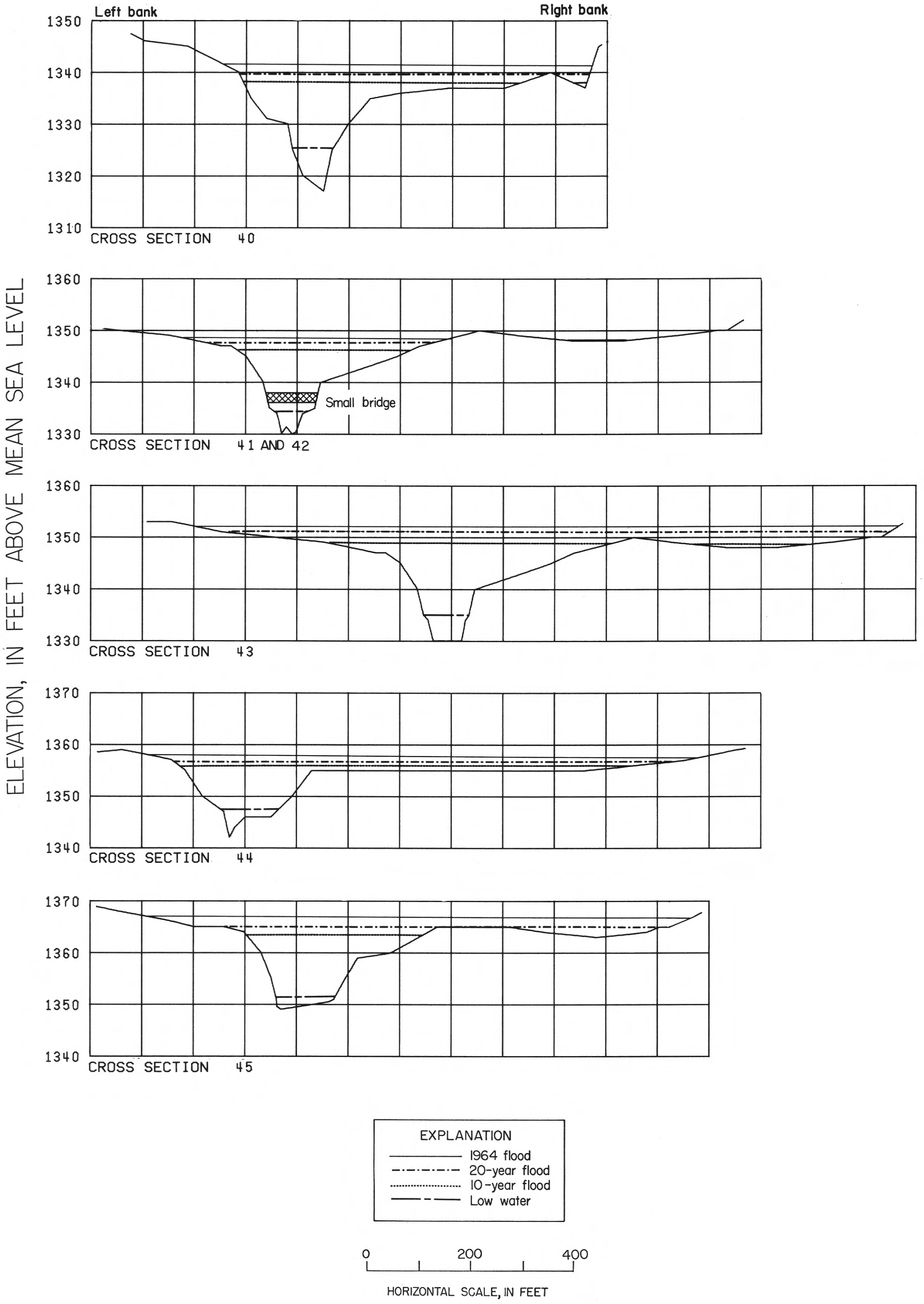

FIGURE 21.--Applegate River cross sections 40-45

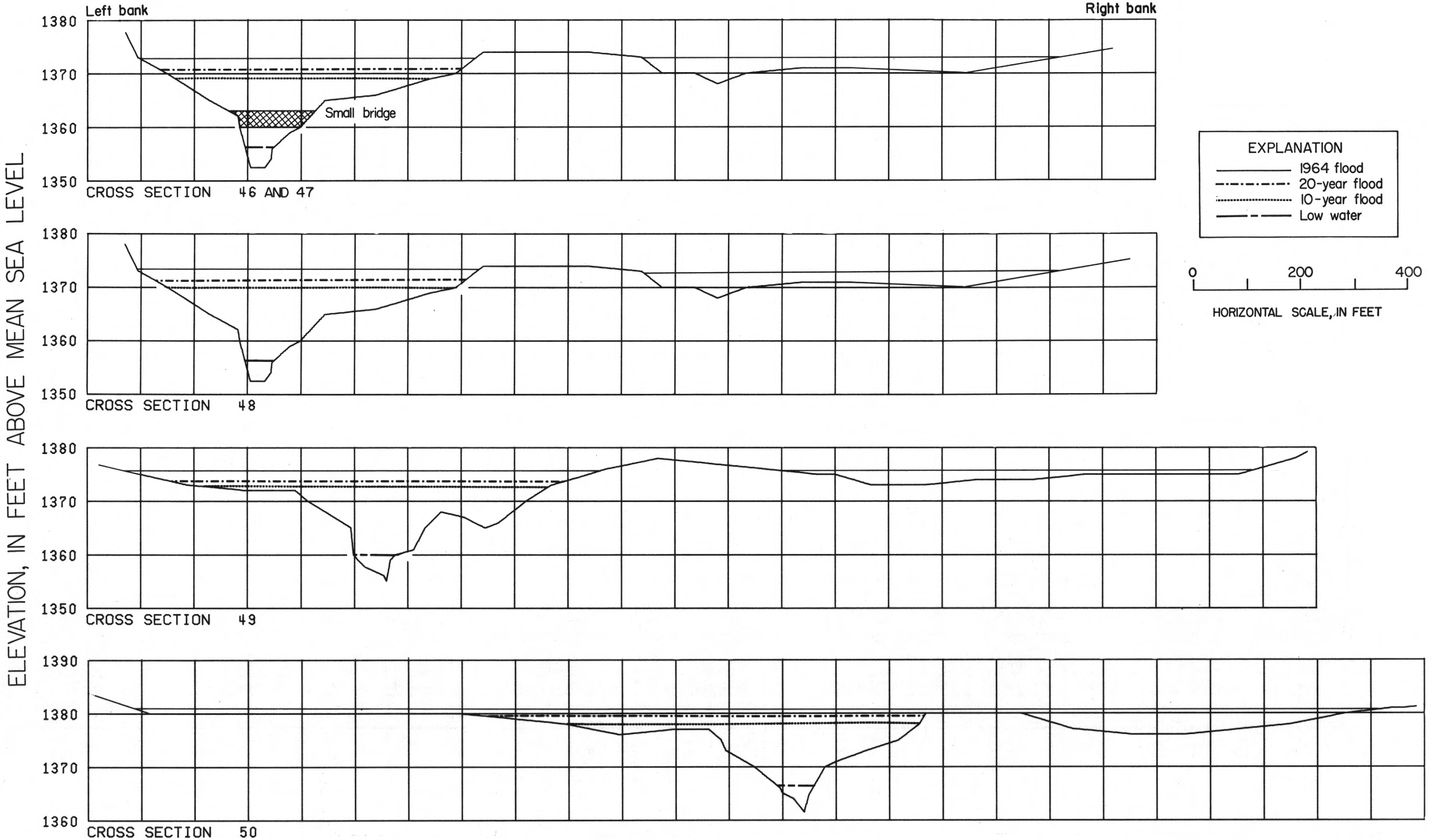

FIGURE 22.--Applegate River cross sections 46-50.

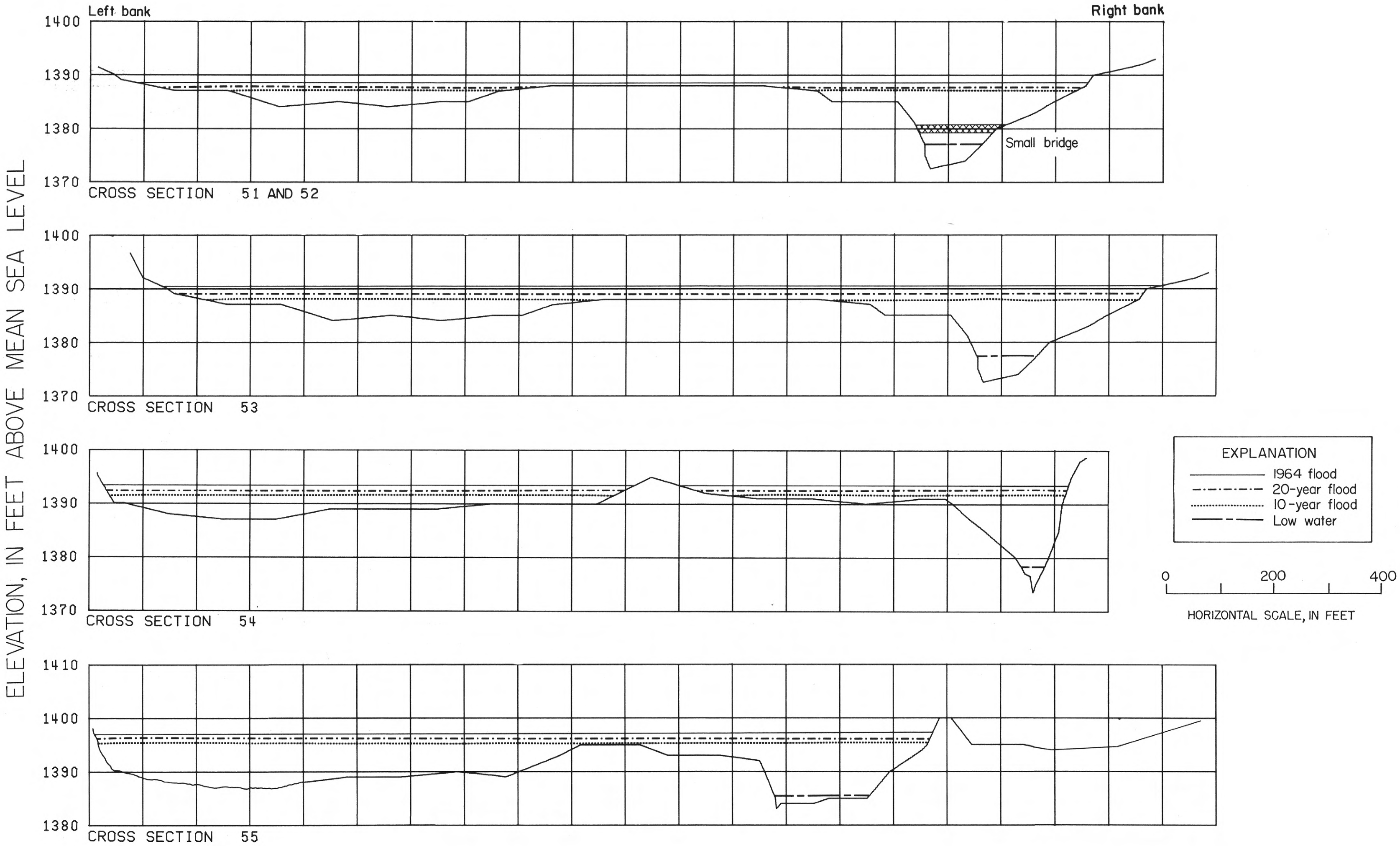

FIGURE 23--Applegate River cross sections 51-55.

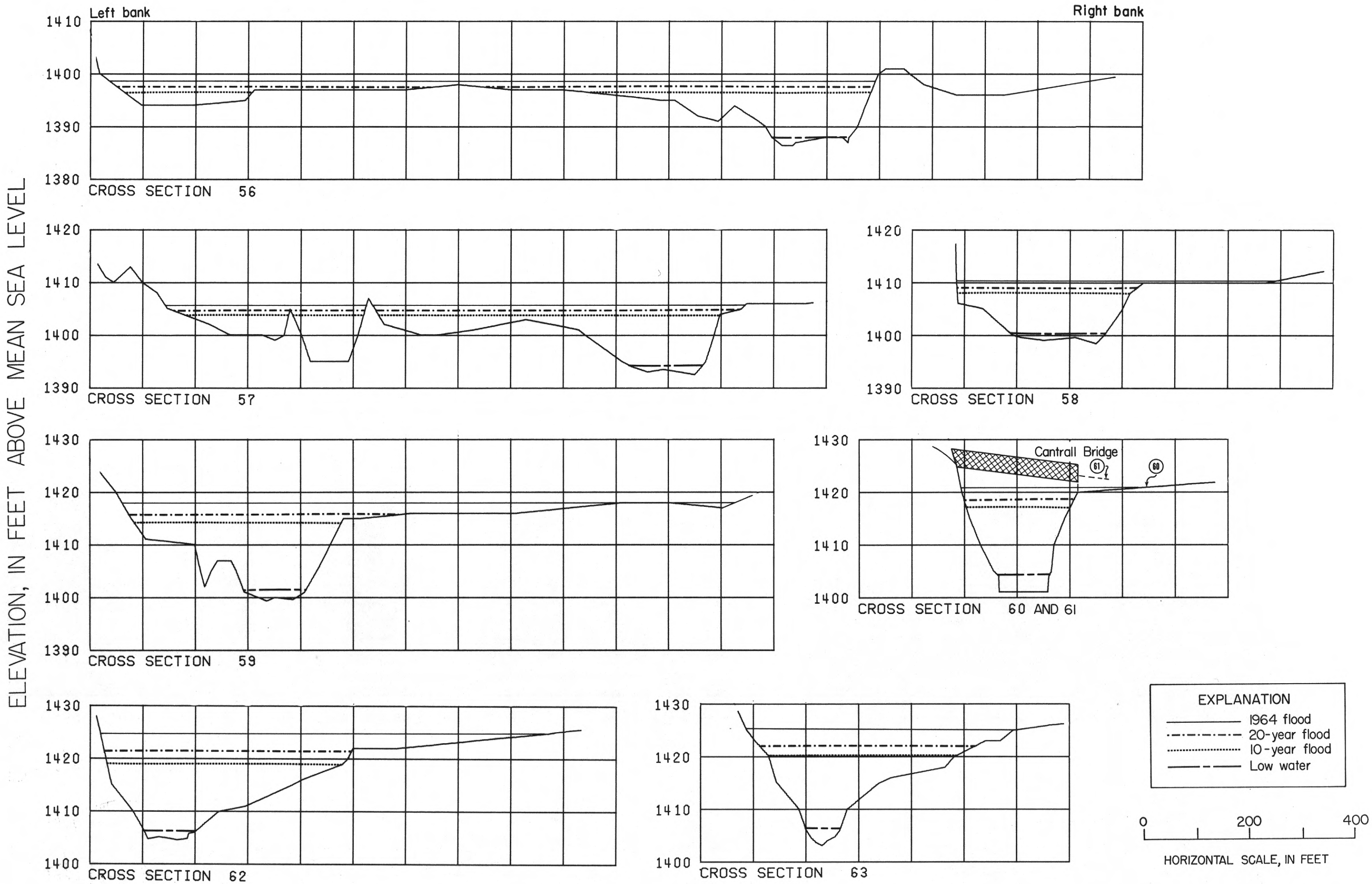

FIGURE 24.--Applegate River cross sections 56-63

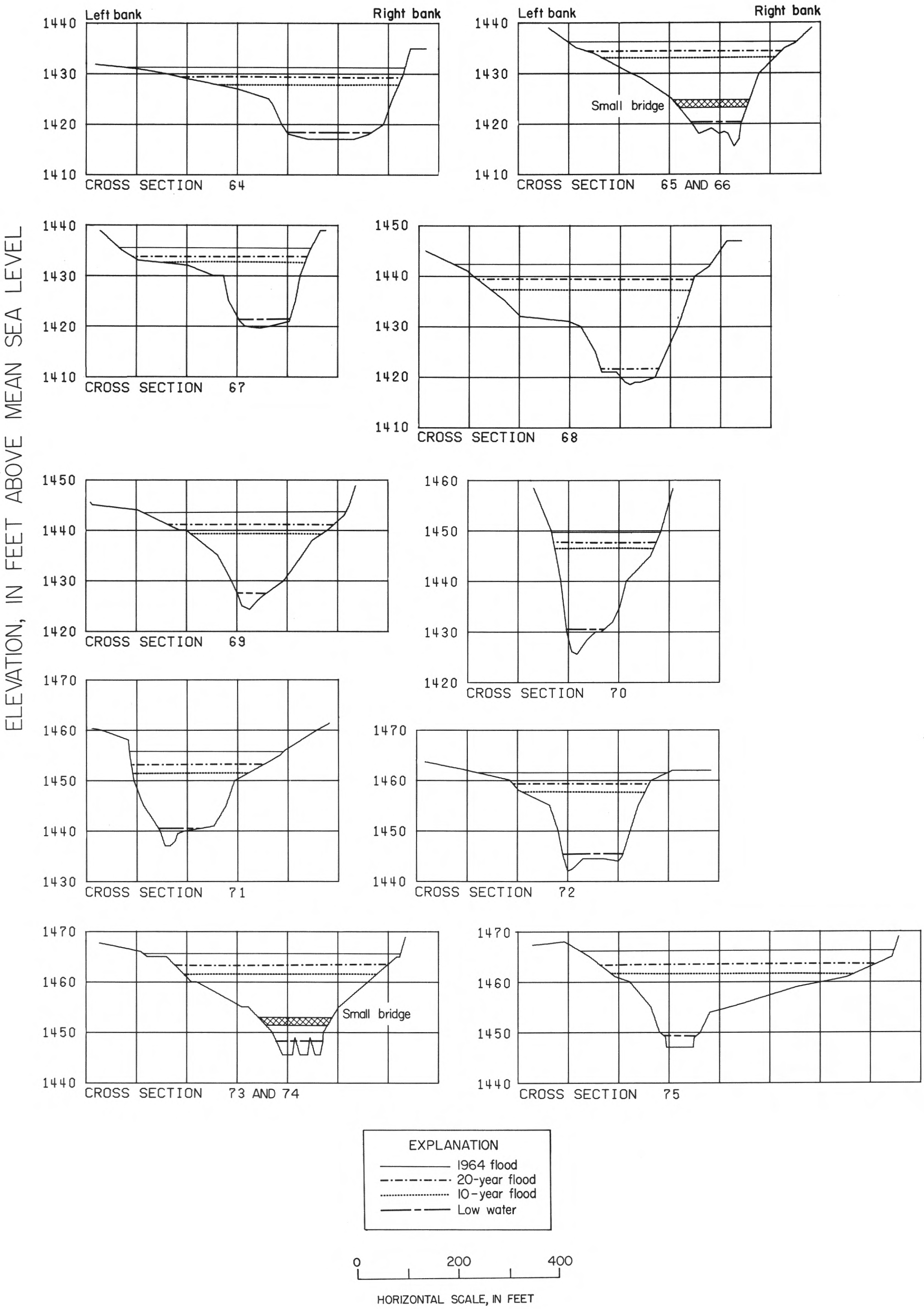

FIGURE 25.--Applegate River cross sections 64-75.

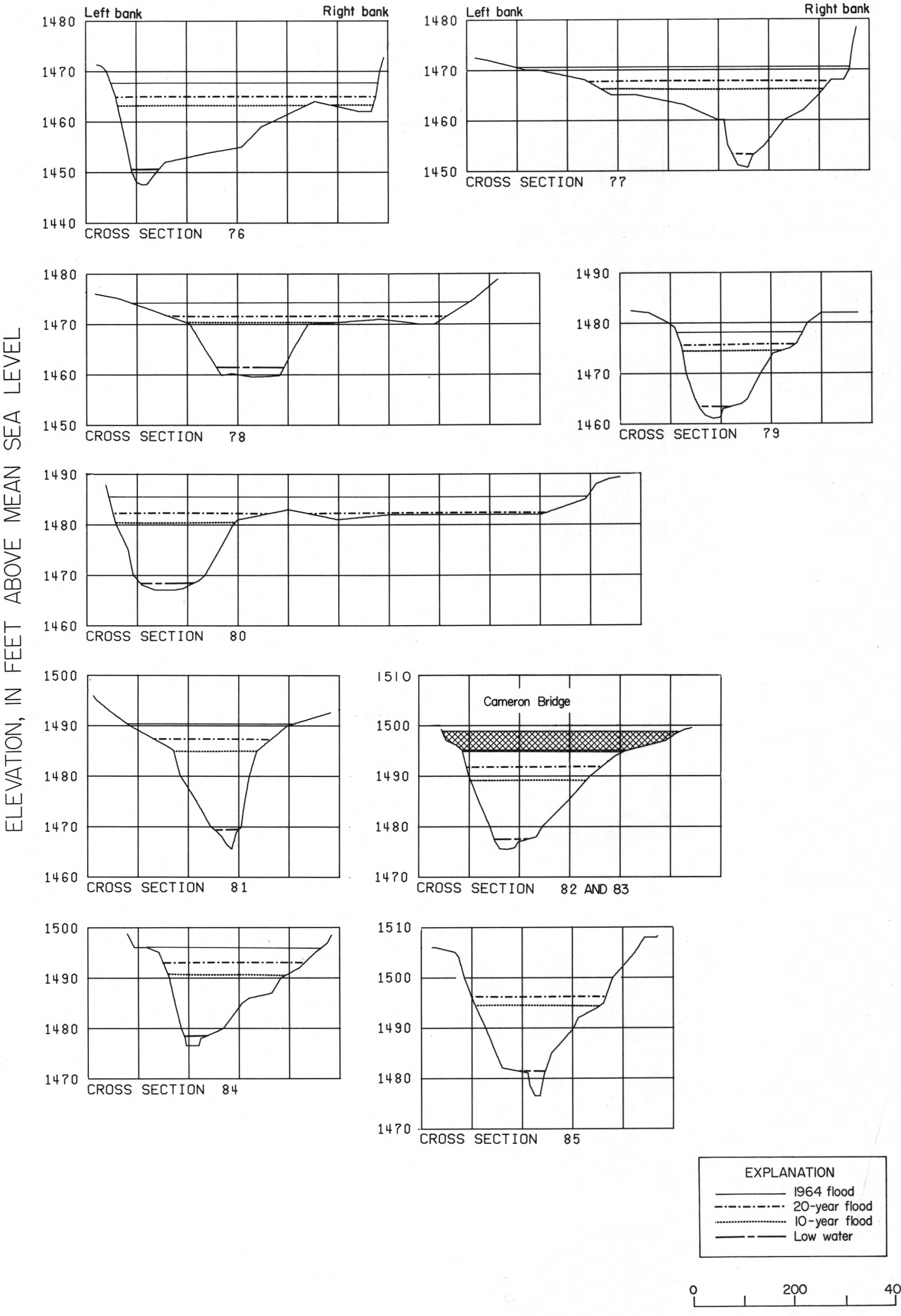

FIGURE 26.--Applegate River cross sections 76-85.

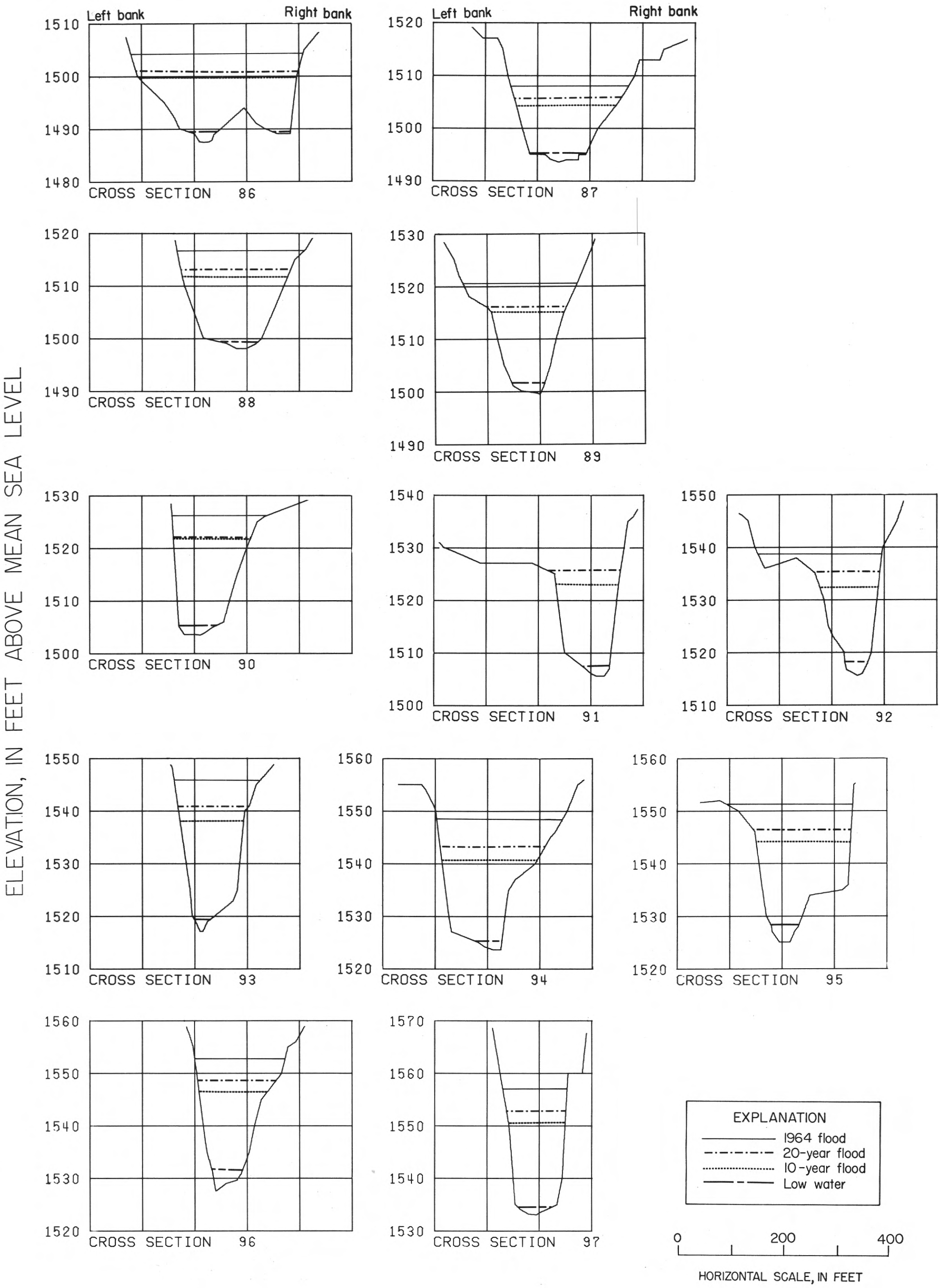

FIGURE 27.--Applegate River cross sections 86-97.

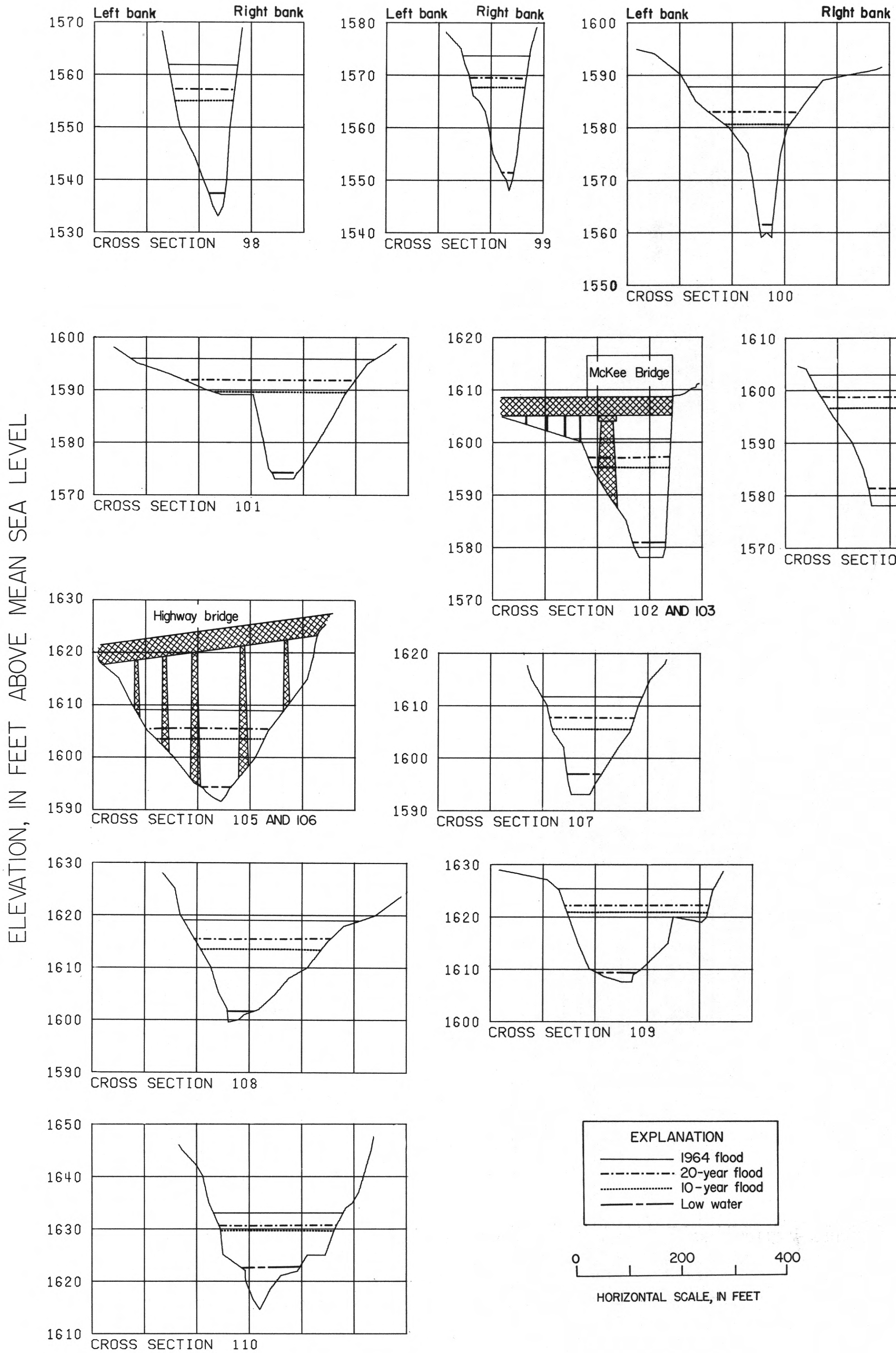

FIGURE 28.--Applegate River cross sections 98-110.

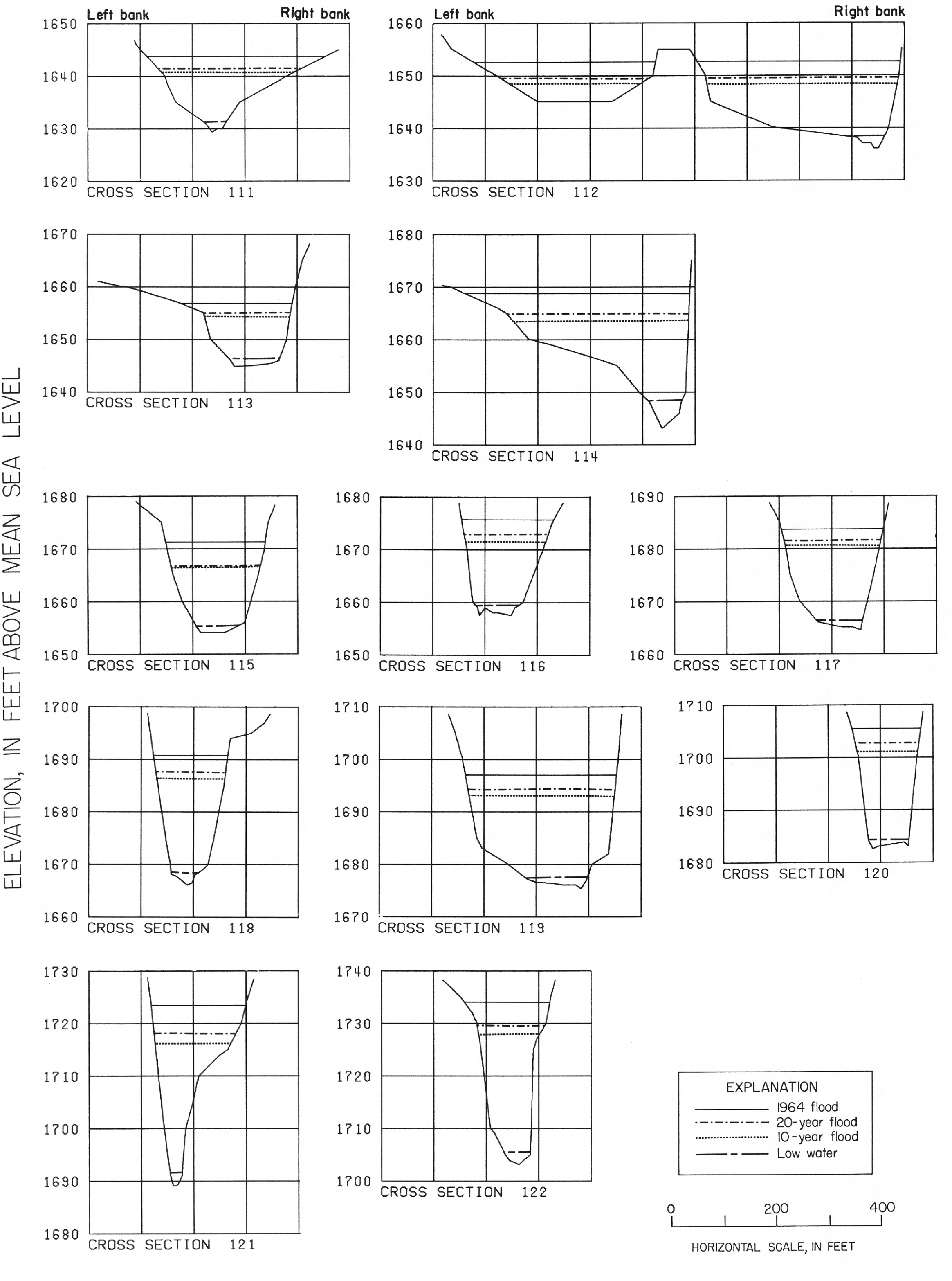

FIGURE 29--Applegate River cross sections 111-122.

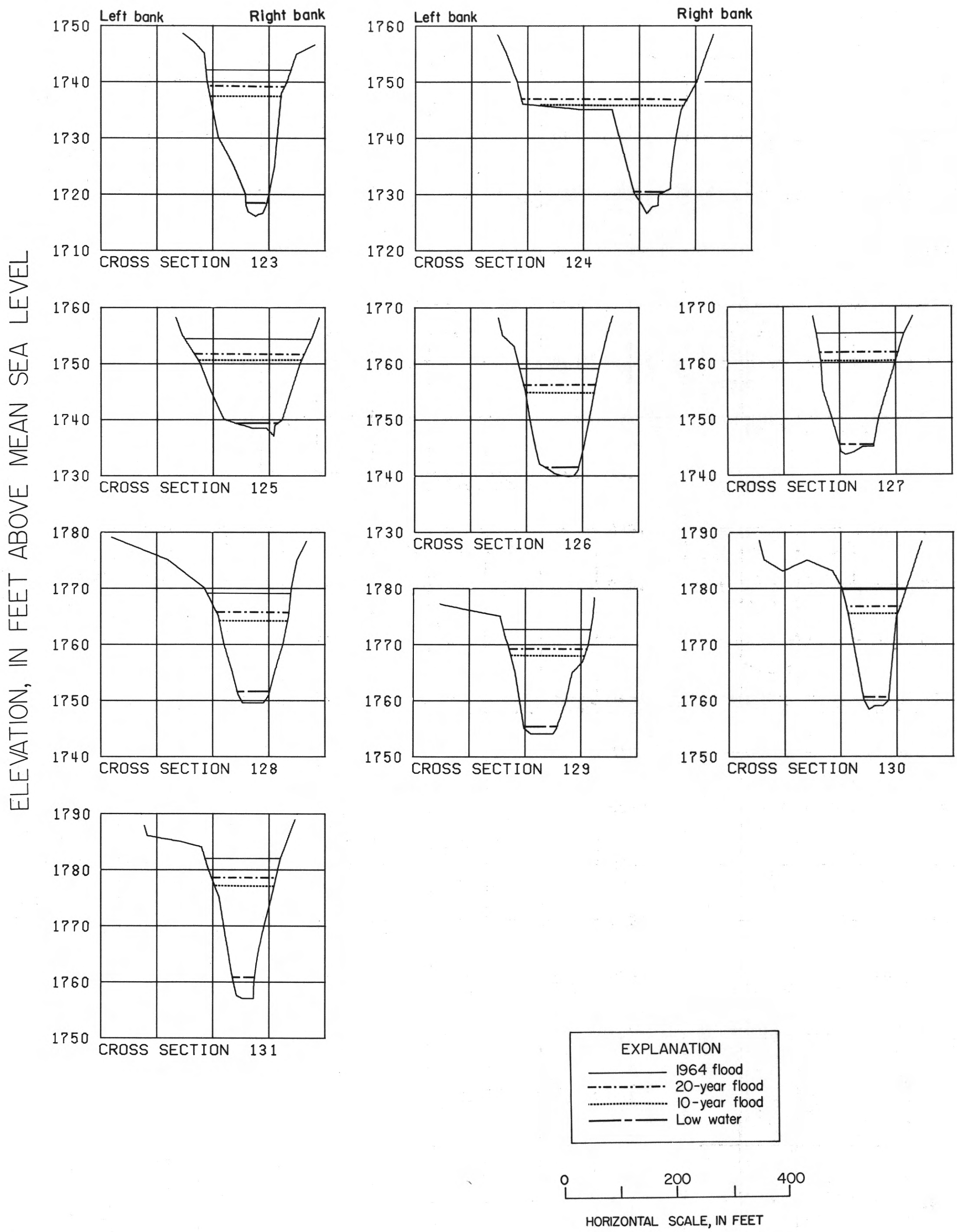

FIGURE 30--Applegate River cross sections 123-131.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION
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