UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

WATER RESOURCES DIVISION

SEDIMENT INVESTIGATIONS OF THE PLATTE RIVER NEAR OVERTON, NEBRASKA

January 1950 to September 1953

FOR ADMINISTRATIVE USE ONLY
SUBJECT TO REVISION

Prepared as part of a program of the Department of the Interior for development of the Missouri River basin

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SEDIMENT INVESTIGATIONS OF THE PLATTE RIVER NEAR OVERTON, NEBRASKA

INTRODUCTION

This report contains results of sediment-transport investigations on the Platte River near Overton, Nebr., from January 1950 to September 1953. The basic data of suspended-sediment studies, results of bed-material analyses, and determinations of water-surface slopes from staff readings are given.

The data indicate that a reliable determination of suspended sediment, hence total load, is difficult. Because of the nature of the river at the station and the limited scope of the investigations, the suspended-sediment data may not be representative.

The Platte River is characterized by a wide braided channel, a small hydraulic radius, low banks, and a wide flood plain. (See figs. 1 and 2.) The river bed is composed of coarse to fine sands.

Near Overton, natural flow of the river is controlled or modified by diversions, storage reservoirs, power development, return flow from irrigation, and withdrawals of ground water. A temporary jetty was extended into the river below the bridge during the summer of 1952 as part of commercial

sand-pumping operations. Beavers carry on active construction in the narrows and shallows, particularly upstream from the sampling section.

Daily fluctuations in water discharge at the gaging station at the bridge are caused by regulation of the flow, mainly from the generation of power by release of water from a reservoir. The water discharge at the station begins increasing about 9:30 a.m., reaches a crest about 2:00 p.m., and then immediately recedes. Weekly water-discharge measurements of alternate high and low stages indicate a daily variation from 200 to more than 1,000 cfs. During spring, summer, and fall, increases in water discharge are also caused by thunderstorm activity in the area.

FIELD STUDIES

Sediment Discharge Measurements

A total of 156 sediment discharge measurements were made at or near the gaging station from January 1950 to September 1953. Samples were normally collected with a DH-48 hand sampler. Sediment discharge measurements were usually made at 2-week intervals during periods of high water discharge and less frequently during low water discharge. The water and sediment discharges of each sediment discharge measurement and the particle-size distribution for many of the measurements are shown in table 1.

Samples were collected generally at 20 verticals during high stages and at 10 verticals during low stages. The sampling verticals were spaced in the stream width, which varied from about 300 to 820 feet, either by measurements or by distribution curves of water discharge. Use of the distribution curves probably resulted in small errors in the mean concentration because of the shifting channel.

The maximum measured sediment discharge was 5,870 tons per day for a water discharge of 5,970 cfs, and the minimum was 5.4 tons per day for a water discharge of 166 cfs. A relation of suspended-sediment discharge to water discharge is shown in figure 3. The plot illustrates the wide variation of suspended-sediment load or concentration for a given water discharge.

A relation of instantaneous water discharge to suspended sediment finer than 62 microns is shown in figure 4. Considerable variation in the percentage of the sediment for a given discharge is indicated. However, the figure illustrates a probable trend of about 86 percent finer than 62 microns at a water discharge of 150 cfs to about 20 percent finer at a water discharge of 6,000 cfs.

Point-Integrated Samples

Point-integrated samples were collected at nine verticals in the cross section with a P-46 sampler. The number of

points in the vertical at which samples were collected ranged from 3 to 5 in depths of water from 1.1 to 5.3 feet. Water velocities at each point were determined by current meter, and depth-integrated samples at each vertical were collected with a DH-48 sampler. (See table 2.) Most of the plotted data outline typical velocity and concentration curves (figs. 5 and 6). However, as might be expected, some data do not plot near an assumed curve; for example, the concentration observations at the 1.60 and 3.10 depths for station 842 on March 28, 1952.

Periodic Samples From Selected Verticals

On September 24 and 25, 1952, and April 29 and 30, 1953, suspended-sediment samples were collected simultaneously at stations 45 and 845 about every 2 hours for a period of 30 hours. Stream-bed elevation at the time of collection of each sample was measured by reference to a datum on the bridge railing. Water discharge ranged from 179 to 714 cfs during September 24 to 25, 1952, and from 674 to 1,730 cfs during April 29 to 30, 1953. Sediment samples for the latter period were analyzed also for particle size. Data from the sampling are summarized in table 3 and shown graphically on figures 7 and 8. The graphs illustrate the change in water discharge, concentration, and stream-bed elevation during the period. Figure 8 shows the possibility of

obtaining erratic concentration data. For example, the concentration was 15 ppm at 9:50 a.m. and 4,140 ppm at 12:00 m. for a relatively low water discharge of 277 cfs.

Bed-Material Samples

Surface samples of bed material were collected on August 14 and September 25, 1952, and on April 16 and September 24, 1953. Five to eight points in the cross section were sampled on each of the days. Also, samples were collected at 5 selected verticals to depths of 0.2 to 3.0 feet from the bed surface. Particle-size gradation for each sample was determined by sieve analysis, and the results are tabulated in table 4. A comparison of bed-material and suspended-sediment sizes is given in figure 9. The median size of the bed material was 0.73 millimeter, and the median size of the suspended material was 0.15 millimeter.

Slope Determination

On May 15, 1952, 4 staff gages were installed on the left bank in a reach of about 2,100 feet and were referred to gage datum. Forty-two observations of slope, usually immediately before or after a sediment discharge measurement, were made during the period from May 15, 1952, to September 24, 1953. The time of the observation, the water

discharge, and the slope in feet per mile are given in table 5. This table shows that the slope tends to increase with water discharge; thus, the meandering of the flow in the wide channel is decreased.

Total-Load Computations

Computations of total load were made for a range of water discharge from 242 to 4,170 cfs. The results of the computations are shown by figure 10 and table 6. For each determination of total load the cross section was divided into two parts, and a total-load computation was made for each part. The subdivision was necessary because of distinct differences in depth and velocity across the section. For example, on May 15, 1952, a width of 65 feet carried about one-third of the total discharge in a total width of about 700 feet. Depth or velocity or both were used as guides to choose the points of division. A velocity of 1.5 feet per second seems to be about the middle of a transitional zone where movement of bed material of sand size becomes appreciable. For low flows, such as on July 9, 1953, a velocity of 1.5 feet per second was used as a point of division. For normal flows, a depth of 2.5 to 3.0 feet was used as a division point.

For a constant velocity and roughness the unmeasured load varies with the depth. In shallow streams the load passing through the 0.3 foot of depth below the nozzle of

the sampler is a large percentage of the total load. As the depth increases, the load in the unsampled zone becomes less and less, percentagewise. A plot of unmeasured load (computed total load minus measured load) versus water discharge indicates that unmeasured load increases with water discharge on a slope of about one. If the relation between unmeasured load and water discharge for any one stream is constant, total load can be estimated from measured load with a reasonable degree of accuracy. Of course, the relation of unmeasured load to water discharge must first be defined for the range of water discharge.

C. D. Albert

H. P. Guy

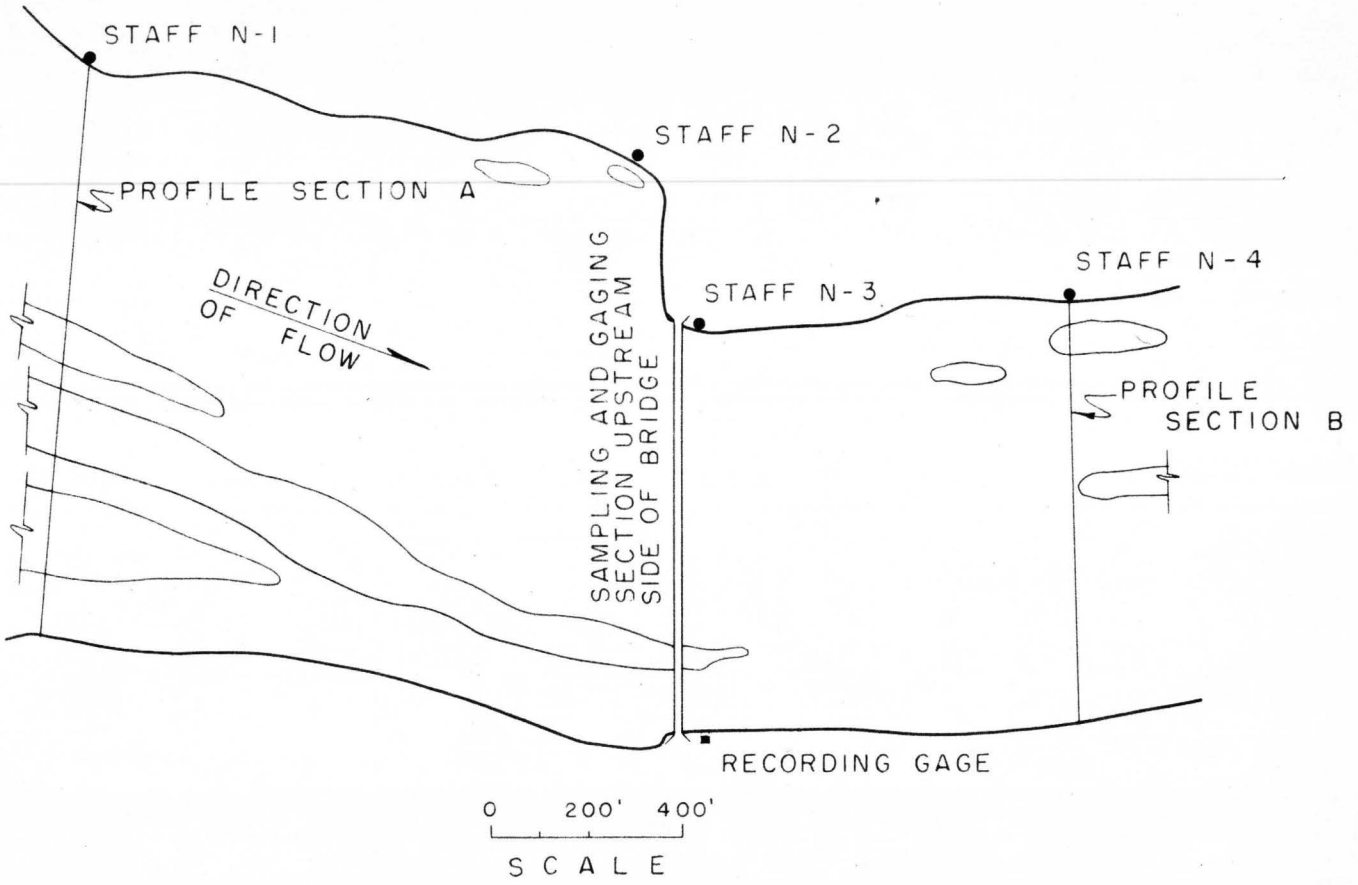

Figure 1.-- Sketch map showing location of sampling section and profile sections A and B, Platte River near Overton, Nebr.

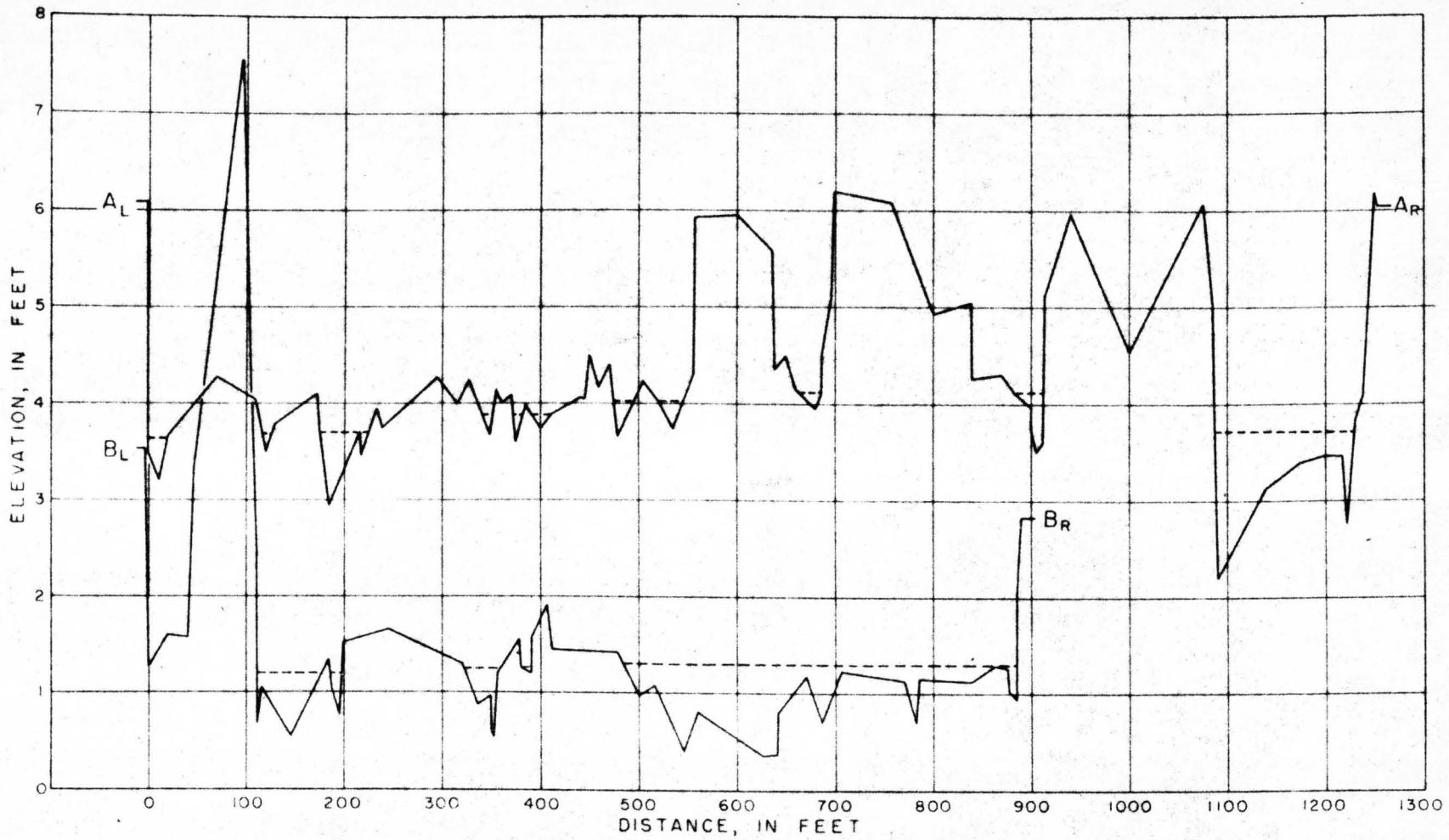

Figure 2.--Profile of sections A and B across the channel from staff gages N-1 and N-4, Platte River near Overton, Nebr.

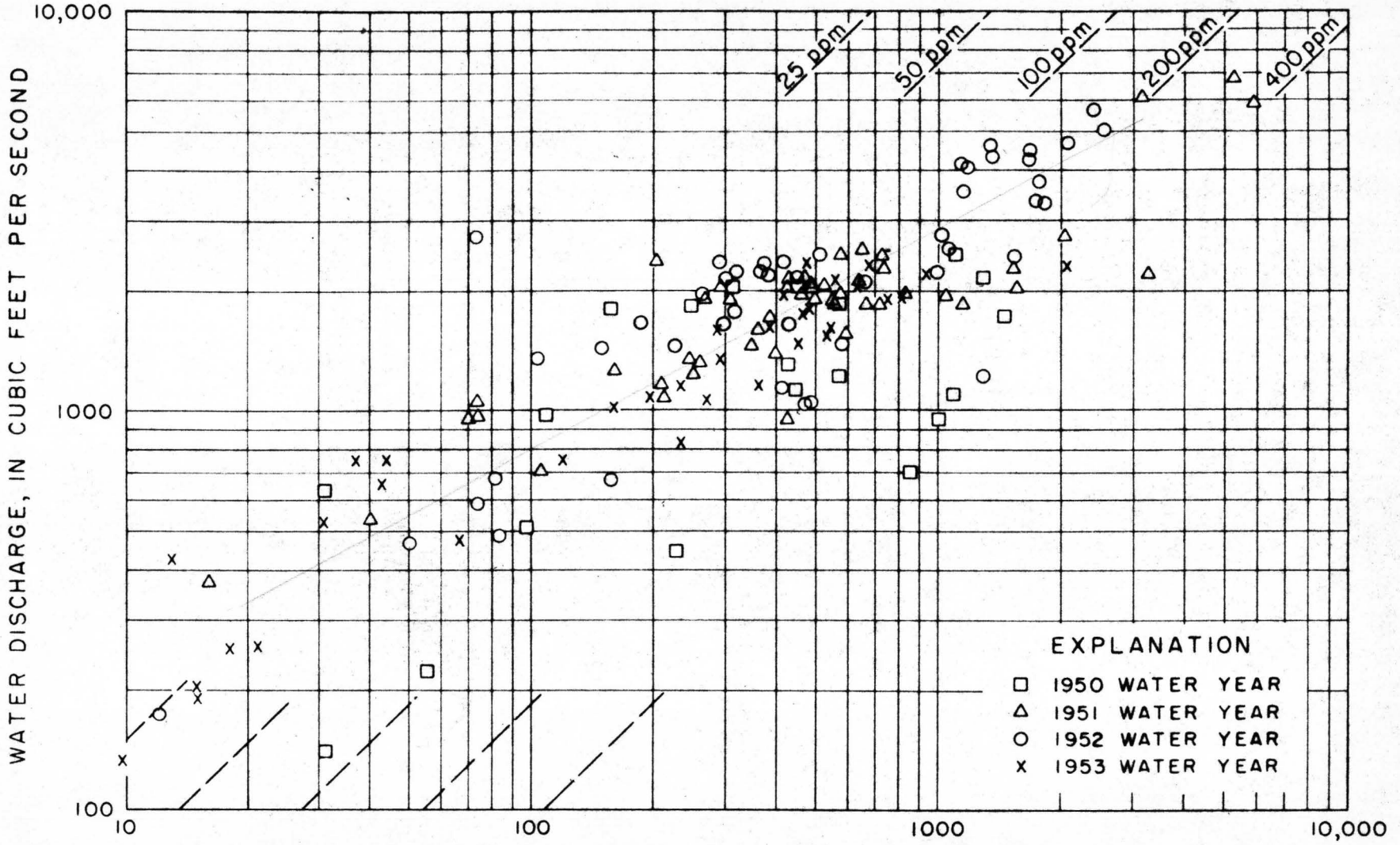

Figure 3.--Relation of suspended-sediment discharge to water discharge, Platte River near Overton, Nebr., January 19, 1950, to September 30, 1953.

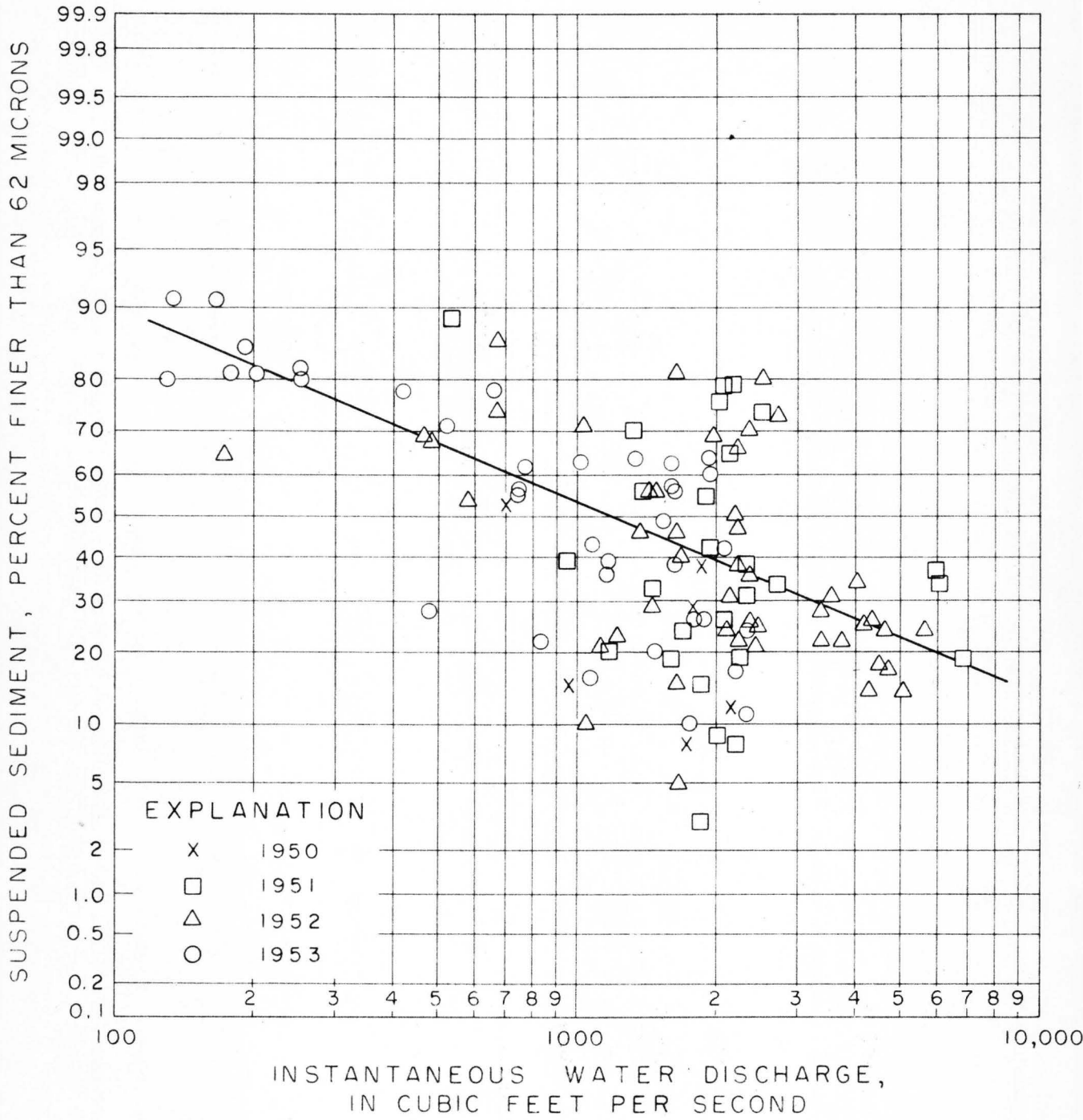

Figure 4 .--Relation of instantaneous water discharge to suspended sediment finer than 62 microns, Platte River near Overton, Nebr.

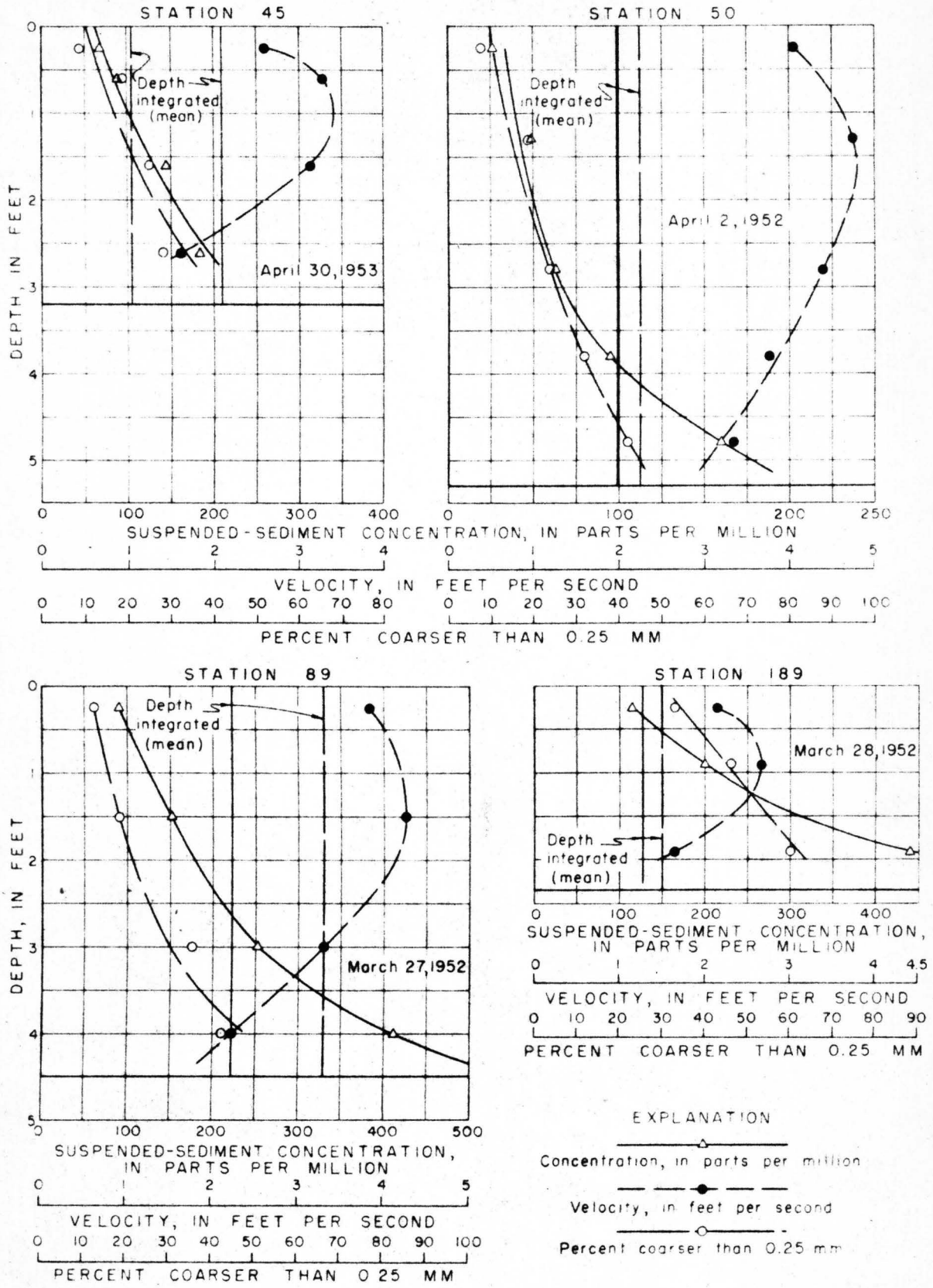

Figure 5. -- Distribution of velocity and suspended sediment at stations 45, 50, 89, and 189, Platte River near Overton Nebr.

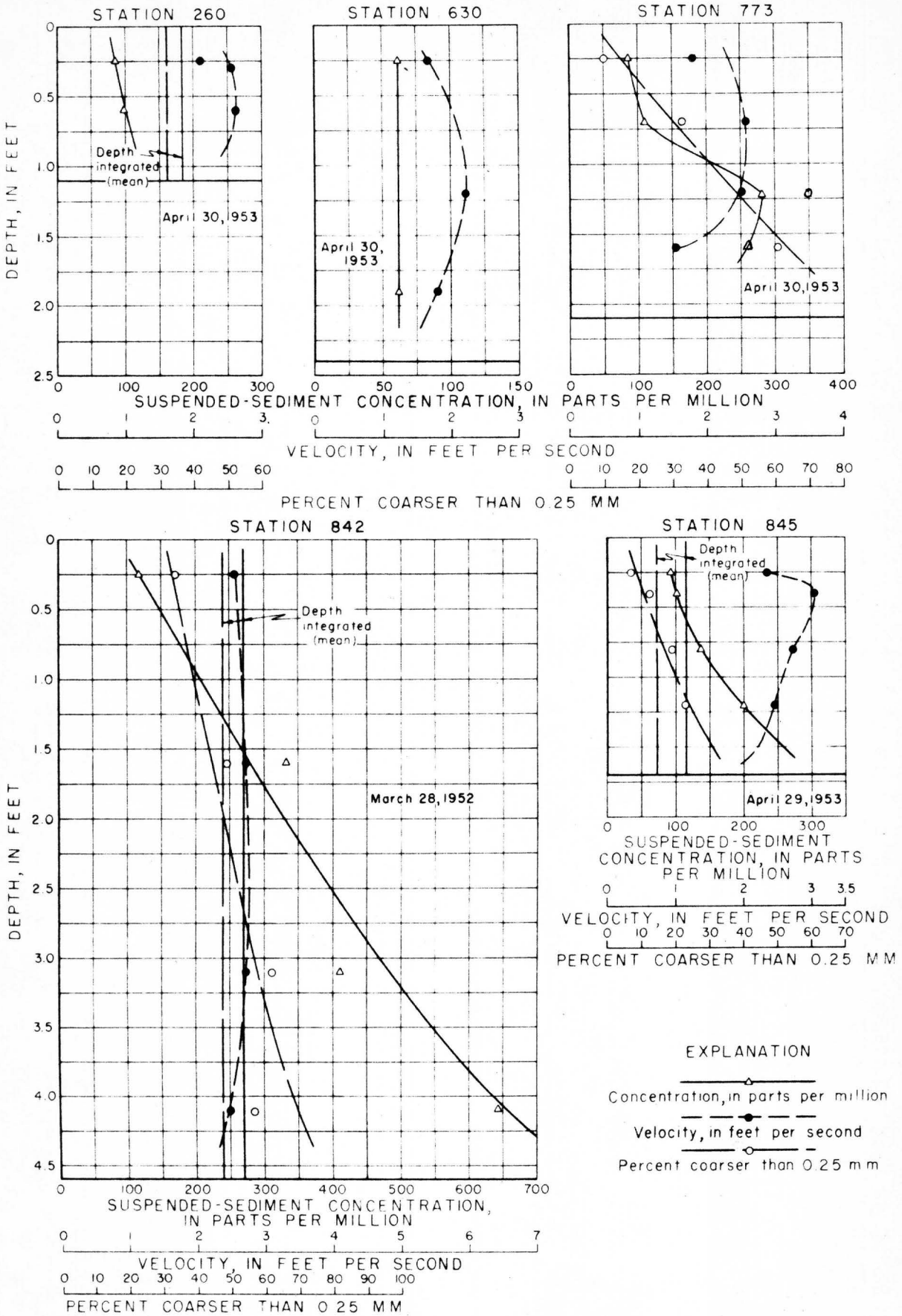

Figure 6.-- Distribution of velocity and suspended sediment at stations 260, 630, 773, 842, and 845, Platte River near Overton, Nebr.

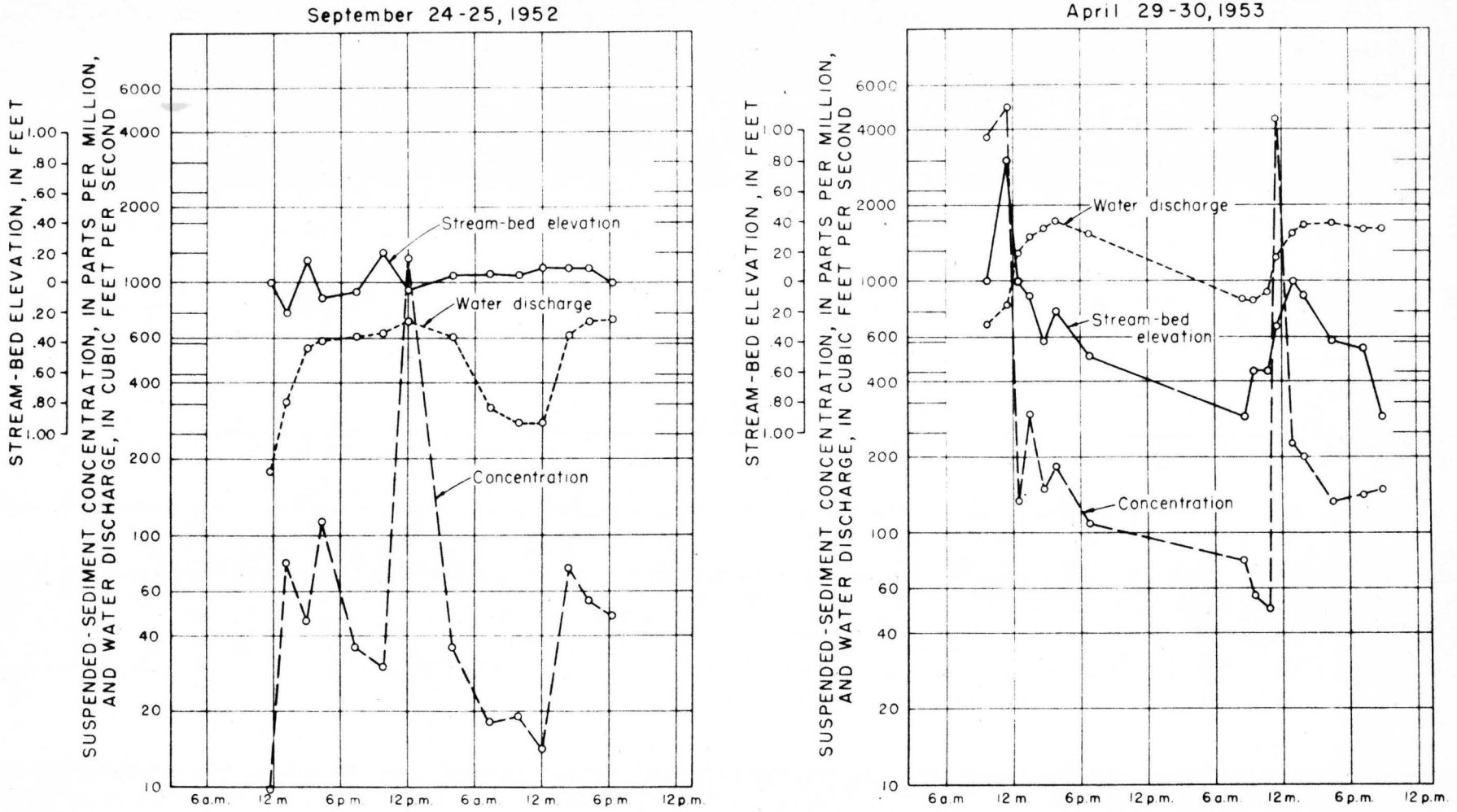

Figure 7.-- Observations of water discharge, suspended-sediment concentration, and stream-bed elevation at station 45, Platte River near Overton, Nebr.

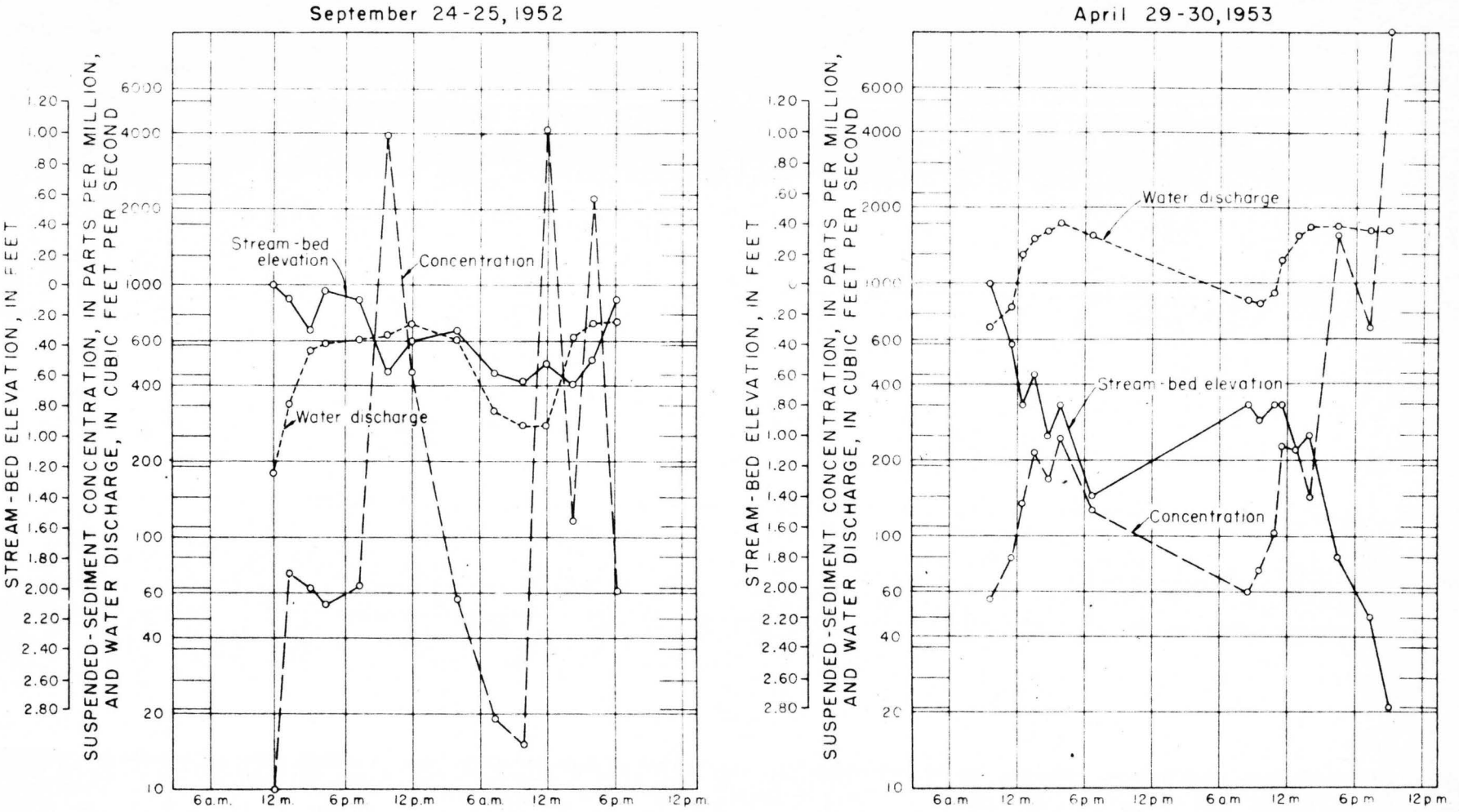

Figure 8.-- Observations of water discharge, suspended-sediment concentration, and stream-bed elevation at station 845, Platte River near Overton, Nebr.

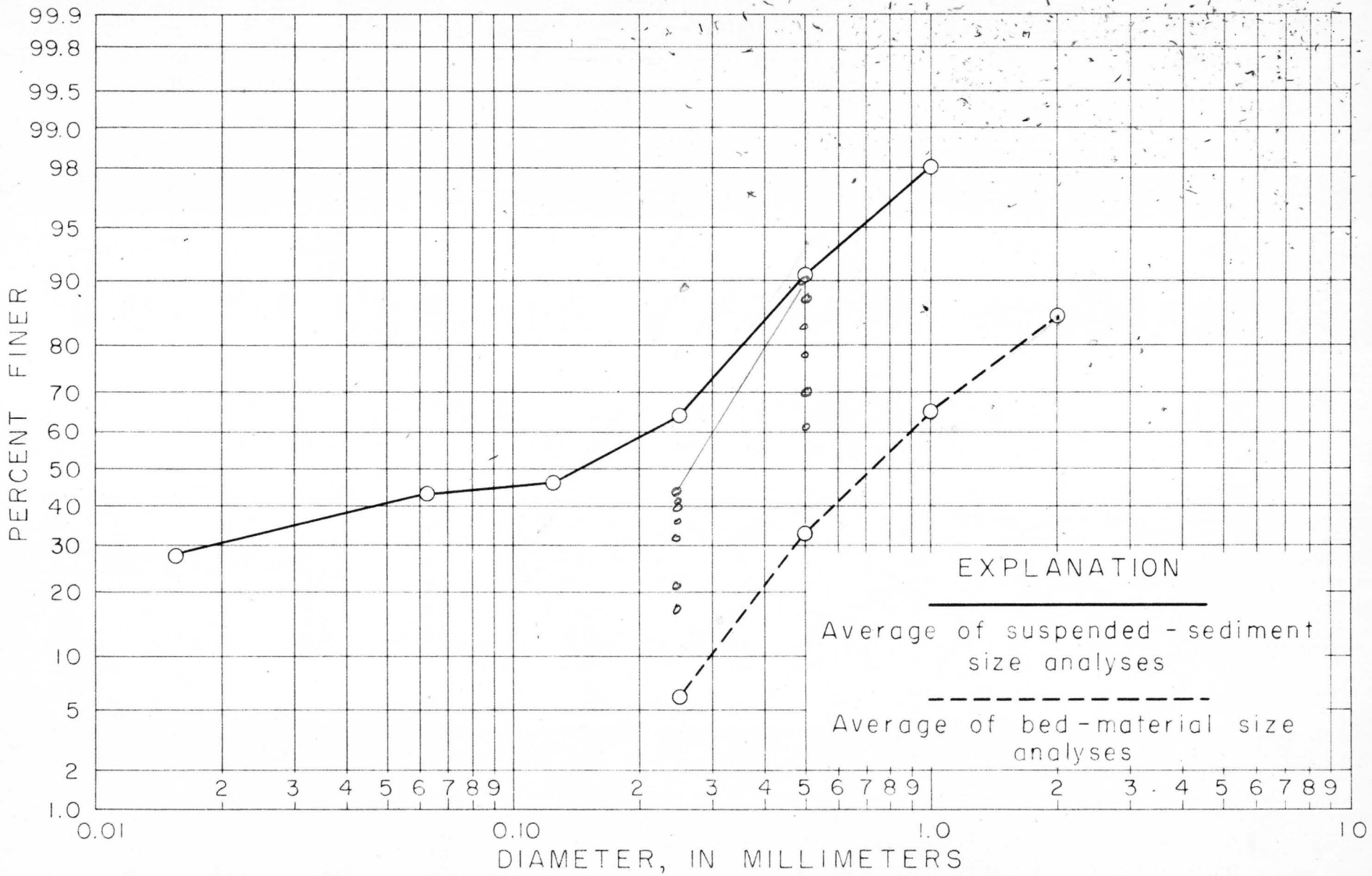

Figure 9 .--Comparison of bed-material and suspended-sediment size analyses, Platte River near Overton, Nebr.

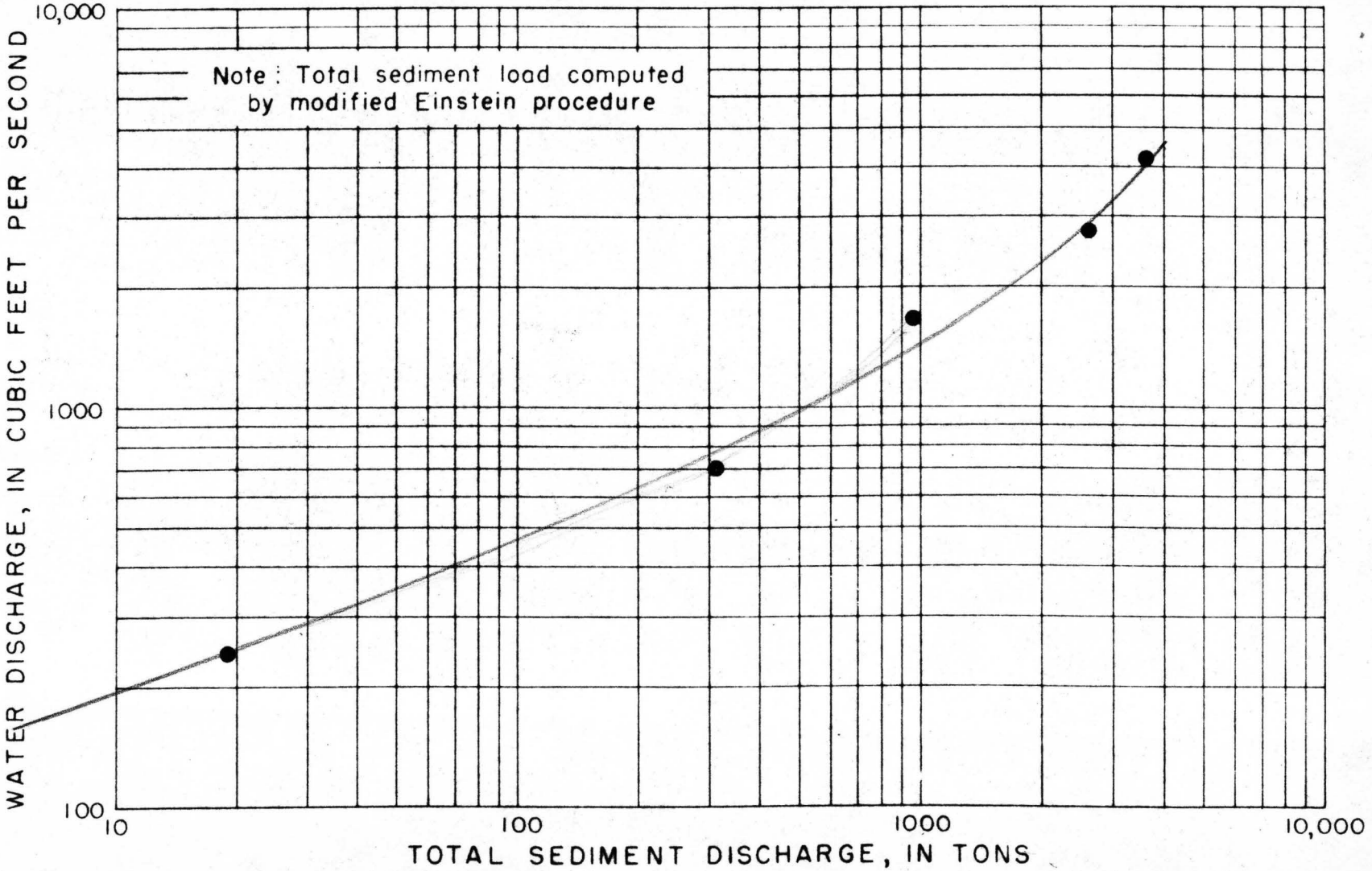

Figure 10 .-- Computed sediment discharge plotted against water discharge.

Table 1.--Discharge and particle-size analyses of suspended sediment, Platte River near Overton, Nebr.

/Methods of analysis: B, bottom-withdrawal tube; W, in distilled water; S, sieve; C, chemically dispersed; M, mechanically dispersed; P, pipette/

Date		Time	Water discharge (cfs)	Suspended sediment: Concentration (ppm)	Suspended sediment: Discharge (tons per day)	Suspended sediment: Percent finer than indicated size in millimeters: 0.004	0.016	0.062	0.125	0.250	0.500	1.00	Water temperature (°F)	Methods of analysis
1950														
Jan.	19	4:15 p.m.	1,820	52	256	-----	-----	-----	-----	-----	-----	----	33	--------
	20	11:35 a.m.	1,120	147	444	-----	-----	-----	-----	-----	-----	----	33	--------
Feb.	1	6:30 p.m.	a 1,800	32	156	14	22	29	32	36	40	90	33	BW
	3	5:30 p.m.	2,020	57	311	-----	-----	-----	-----	-----	-----	----	33	--------
Mar.	1	6:25 p.m.	a 2,160	222	1,290	3	6	11	14	20	-----	----	40	BW
	2	10:40 a.m.	2,020	82	450	-----	-----	-----	-----	-----	-----	----	41	--------
	27	9:25 a.m.	1,220	173	570	-----	-----	-----	-----	-----	-----	----	-------	--------
Apr.	5	5:45 p.m.	2,480	268	1,790	-----	-----	-----	-----	-----	-----	----	-------	--------
	6	10:30 a.m.	a 1,720	313	1,450	2	5	8	10	15	-----	----	41	BW
May	3	5:35 p.m.	a 1,300	121	425	-----	-----	-----	-----	-----	-----	----	54	--------
	4	10:20 a.m.	634	18	31	-----	-----	-----	-----	-----	-----	----	47	--------
	21	6:00 p.m.	1,110	356	1,070	60	72	82	90	91	92	95	65	BWCM
	25	5:20 p.m.	a 958	388	1,000	-----	-----	15	16	30	58	83	53	S
June	15	6:45 p.m.	a 701	447	846	-----	-----	53	57	71	87	100	88	S
July	6	11:55 a.m.	a 140	81	31	-----	-----	-----	-----	-----	-----	----	75	--------
	21	10:30 a.m.	446	210	253	-----	-----	-----	-----	-----	-----	----	73	--------
Aug.	9	5:40 p.m.	a 222	92	55	-----	-----	-----	-----	-----	-----	----	89	--------
	31	12:10 p.m.	a 512	70	97	-----	-----	-----	-----	-----	-----	----	76	--------
Sept.	27	6:15 p.m.	a 1,850	114	569	23	30	38	46	75	-----	----	65	BWCM
	28	11:05 a.m.	977	41	108	-----	-----	-----	-----	-----	-----	----	59	--------

a Water discharge measurement made this day.

Table 1.--Discharge and particle-size analyses of suspended sediment, Platte River near Overton, Nebr.--Continued

/Methods of analysis: B, bottom-withdrawal tube; W, in distilled water; S, sieve; C, chemically dispersed; M, mechanically dispersed; P, pipette/

Date	Time	Water discharge (cfs)	Concentration (ppm)	Discharge (tons per day)	Percent finer than indicated size in millimeters							Water temperature (°F)	Methods of analysis
					0.004	0.016	0.062	0.125	0.250	0.500	1.00		
1950													
Oct. 11	4:40 p.m.	1,260	47	160	-----	-----	-----	-----	-----	-----	----	62	--------
19	6:30 p.m.	a 2,010	287	1,560	-----	-----	8	11	22	51	78	-------	S
20	10:15 a.m.	1,050	26	74	-----	-----	-----	-----	-----	-----	----	56	--------
30	4:15 p.m.	1,700	84	386	-----	-----	24	29	52	73	87	58	S
31	11:00 a.m.	a 958	27	70	-----	-----	-----	-----	-----	-----	----	54	--------
Nov. 13	5:50 p.m.	a 1,900	52	267	-----	-----	-----	-----	-----	-----	----	43	--------
14	10:20 a.m.	977	28	74	-----	-----	-----	-----	-----	-----	----	40	--------
27	12:35 p.m.	a 2,200	547	3,250	-----	-----	8	11	26	78	96	37	S
Dec. 4	3:30 p.m.	a 2,090	86	485	-----	-----	26	31	64	97	----	34	S
5	12:50 p.m.	b 1,560	142	598	-----	-----	-----	-----	-----	-----	----	-------	--------
11	4:45 p.m.	b 1,990	107	575	-----	-----	-----	-----	-----	-----	----	-------	--------
12	10:40 a.m.	b 2,260	120	732	-----	-----	-----	-----	-----	-----	----	-------	--------
18	4:50 p.m.	a 1,900	107	549	-----	-----	-----	-----	-----	-----	----	35	--------
19	10:15 a.m.	701	55	104	-----	-----	-----	-----	-----	-----	----	33	--------
1951													
Jan. 3	3:55 p.m.	a 1,980	154	823	-----	-----	-----	-----	-----	-----	----	33	--------
4	11:50 a.m.	1,090	72	212	-----	-----	-----	-----	-----	-----	----	32	--------
15	3:35 p.m.	a 1,850	128	639	-----	-----	15	-----	-----	-----	----	-------	S
15	3:35 p.m.	a 1,850	144	719	-----	-----	-----	-----	-----	-----	----	-------	--------
16	11:00 a.m.	1,170	66	208	-----	-----	20	-----	-----	-----	----	-------	S

a Water discharge measurement made this day.
b Mean daily discharge.

Table 1.--Discharge and particle-size analyses of suspended sediment, Platte River near Overton, Nebr.--Continued

[Methods of analysis: B, bottom-withdrawal tube; W, in distilled water; S, sieve; C, chemically dispersed; M, mechanically dispersed; P, pipette]

Date		Time	Water discharge (cfs)	Suspended sediment: Concentration (ppm)	Suspended sediment: Discharge (tons per day)	Suspended sediment: Percent finer than indicated size in millimeters: 0.004	0.016	0.062	0.125	0.250	0.500	1.00	Water temperature (°F)	Methods of analysis
1951														
Jan.	29	4:00 p.m.	2,330	32	201	-----	-----	31	-----	-----	-----	----	32	S
	30	12:00 m.	b 1,850	231	1,150	-----	-----	3	-----	-----	-----	----	32	S
Feb.	19	5:15 p.m.	a 2,470	109	727	-----	-----	-----	-----	-----	-----	----	44	-----
	20	9:55 a.m.	1,220	76	250	-----	-----	-----	-----	-----	-----	----	-----	-----
Mar.	5	5:00 p.m.	a 2,460	87	578	-----	-----	-----	-----	-----	-----	----	-----	-----
	6	10:10 a.m.	1,340	68	246	-----	-----	-----	-----	-----	-----	----	33	-----
	19	3:45 p.m.	a 2,120	111	635	-----	-----	-----	-----	-----	-----	----	39	-----
	20	10:45 a.m.	1,460	88	347	-----	-----	33	-----	66	86	----	33	S
Apr.	2	3:40 p.m.	a 2,040	53	292	-----	-----	-----	-----	-----	-----	----	46	-----
	3	11:45 a.m.	1,600	83	358	-----	-----	19	-----	-----	-----	----	48	S
	16	3:30 p.m.	a 1,960	87	460	-----	-----	-----	-----	-----	-----	----	49	-----
	17	12:40 p.m.	1,850	110	549	-----	-----	-----	-----	-----	-----	----	48	-----
May	1	6:50 p.m.	2,140	110	636	-----	-----	65	-----	-----	-----	----	57	S
	17	6:05 p.m.	a 5,970	364	5,870	-----	-----	37	-----	-----	-----	----	73	S
	18	9:00 a.m.	6,020	194	3,150	-----	-----	34	-----	-----	-----	----	64	S
	18	1:20 p.m.	6,870	282	5,230	-----	-----	19	-----	-----	-----	----	64	S
	24	7:50 p.m.	a 2,720	276	2,030	-----	-----	34	-----	-----	-----	----	75	S
	25	12:20 p.m.	2,510	95	644	-----	-----	74	-----	-----	-----	----	74	S
June	7	6:05 p.m.	a 1,390	106	398	-----	-----	56	-----	-----	-----	----	69	S
	21	3:25 p.m.	a 2,060	94	523	-----	-----	79	-----	-----	-----	----	-----	S

a Water discharge measurement made this day.
b Mean daily discharge.

Table 1.--Discharge and particle-size analyses of suspended sediment, Platte River near Overton, Nebr.--Continued

[Methods of analysis: B, bottom-withdrawal tube; W, in distilled water; S, sieve; C, chemically dispersed, M, mechanically dispersed; P, pipette]

Date	Time	Water discharge (cfs)	Suspended sediment: Concentration (ppm)	Suspended sediment: Discharge (tons per day)	Suspended sediment: Percent finer than indicated size in millimeters: 0.004	0.016	0.062	0.125	0.250	0.500	1.00	Water temperature (°F)	Methods of analysis
1951													
July 5	3:10 p.m.	a 1,940	200	1,050	-----	-----	42	-----	-----	-----	----	-------	S
6	10:20 a.m.	1,320	73	260	-----	-----	70	-----	-----	-----	----	64	S
19	3:10 p.m.	a 2,160	81	472	-----	-----	79	-----	-----	-----	----	85	S
Aug. 2	4:00 p.m.	a 952	165	424	-----	-----	39	-----	-----	-----	----	-------	S
3	9:10 a.m.	536	28	40	-----	-----	89	-----	-----	-----	----	70	S
17	10:00 a.m.	373	16	16	-----	-----	-----	-----	-----	-----	----	71	--------
30	4:40 p.m.	a 2,020	90	491	-----	-----	76	-----	-----	-----	----	79	S
Sept. 11	5:50 p.m.	2,260	248	1,510	-----	-----	19	-----	-----	-----	----	--------	S
12	8:20 a.m.	1,900	60	308	-----	-----	-----	-----	-----	-----	----	63	--------
27	3:25 p.m.	a 2,030	77	422	-----	-----	-----	-----	-----	-----	----	62	--------
28	12:35 p.m.	1,900	97	498	-----	-----	55	-----	-----	-----	----	50	S
Oct. 4	11:10 a.m.	1,650	66	294	-----	-----	46	52	70	96	100	63	S
11	3:45 p.m.	a 2,200	64	380	-----	-----	50	57	77	98	100	69	S
12	10:20 a.m.	1,680	70	318	-----	-----	40	45	65	95	100	59	S
24	5:15 p.m.	a 2,230	53	319	-----	-----	47	54	78	98	100	55	S
Nov. 8	5:10 p.m.	a 2,480	76	509	-----	-----	25	32	62	95	100	46	S
9	2:00 p.m.	2,370	65	416	-----	-----	26	33	69	96	100	47	S
21	10:40 a.m.	a 2,140	52	300	-----	-----	31	38	75	98	100	38	S
21	3:20 p.m.	2,380	45	289	-----	-----	36	44	78	98	100	42	S
Dec. 5	9:35 a.m.	a 1,650	66	294	-----	-----	16	21	64	97	100	35	S

a Water discharge measurement made this day.

Table 1.--Discharge and particle-size analyses of suspended sediment, Platte River near Overton, Nebr.--Continued

[Methods of analysis: B, bottom-withdrawal tube; W, in distilled water; S, sieve; C, chemically dispersed; M, mechanically dispersed; P, pipette]

Date	Time	Water discharge (cfs)	Suspended sediment: Concentration (ppm)	Suspended sediment: Discharge (tons per day)	Suspended sediment: Percent finer than indicated size in millimeters: 0.004	0.016	0.062	0.125	0.250	0.500	1.00	Water temperature (°F)	Methods of analysis
1951													
Dec. 5	2:25 p.m.	2,230	61	367	-----	-----	22	28	64	98	100	39	S
28	2:00 p.m.	b 1,040	172	483	-----	-----	10	11	16	55	90	-------	S
29	11:15 a.m.	b 1,130	137	418	-----	-----	21	22	28	54	91	-------	S
1952													
Jan. 11	11:00 a.m.	a 2,100	116	658	-----	-----	24	26	39	78	95	-------	S
11	4:15 p.m.	b 2,210	72	430	-----	-----	38	41	64	96	100	-------	S
31	3:15 p.m.	a 3,350	188	1,700	-----	-----	28	37	69	98	100	-------	S
Feb. 1	9:05 a.m.	b 3,380	206	1,880	-----	-----	22	28	61	97	100	32	S
14	11:00 a.m.	3,550	120	1,150	-----	-----	31	38	68	98	100	-------	S
14	4:45 p.m.	a 4,050	107	1,170	-----	-----	34	42	70	98	100	-------	S
21	3:50 p.m.	a 4,340	115	1,350	-----	-----	26	35	72	98	100	-------	S
Mar. 5	5:30 p.m.	a 4,700	165	2,090	-----	-----	17	22	56	90	96	33	S
6	10:50 a.m.	4,270	145	1,670	-----	-----	14	15	26	90	99	33	S
19	7:15 p.m.	a 3,770	173	1,760	-----	-----	22	28	50	88	96	-------	S
20	11:00 a.m.	4,510	137	1,670	-----	-----	18	26	56	91	100	44	S
20	2:10 p.m.	4,610	107	1,330	-----	-----	24	32	58	90	99	44	S
27	1:10 p.m.	5,670	156	2,390	-----	-----	24	31	63	94	99	45	S
28	9:20 a.m.	a 5,030	186	2,530	-----	-----	14	19	52	90	98	41	S
Apr. 2	1:40 p.m.	a 4,170	101	1,140	-----	-----	25	31	63	93	100	53	S

a Water discharge measurement made this day.
b Mean daily discharge.

Table 1.--Discharge and particle-size analyses of suspended sediment, Platte River near Overton, Nebr.--Continued

[Method of analysis: B, bottom-withdrawal tube; W, in distilled water; S, sieve; C, chemically dispersed; M, mechanically dispersed; P, pipette]

Date	Time	Water discharge (cfs)	Suspended sediment: Concentration (ppm)	Suspended sediment: Discharge (tons per day)	Suspended sediment: Percent finer than indicated size in millimeters: 0.004	0.016	0.062	0.125	0.250	0.500	1.00	Water temperature (°F)	Methods of analysis
1952													
Apr. 16	9:20 a.m.	1,460	57	225	-----	-----	29	32	54	92	100	47	S
16	3:10 p.m.	a 2,720	10	73	-----	-----	34	38	59	92	98	50	S
29	1:45 p.m.	2,430	232	1,520	-----	-----	21	22	29	68	92	63	S
May 2	5:10 p.m.	2,370	58	371	-----	-----	70	74	87	99	100	66	S
14	5:00 p.m.	1,980	49	262	-----	-----	69	72	83	98	100	71	S
15	8:15 a.m.	1,370	28	104	-----	-----	46	50	68	95	100	60	S
15	11:45 a.m.	1,440	38	148	-----	-----	56	58	75	98	100	72	S
15	4:10 p.m.	a 1,680	41	186	-----	1	5	15	51	90	100	67	SPWCM
28	9:30 a.m.	2,230	164	988	33	44	66	69	78	96	100	63	SPWCM
28	1:35 p.m.	a 2,540	155	1,060	35	42	80	84	89	97	100	72	SPWCM
June 12	4:00 p.m.	a 2,760	136	1,010	32	48	73	75	86	98	100	84	SPWCM
13	9:25 a.m.	1,650	96	428	56	69	81	83	90	99	100	-------	SPWCM
26	3:30 p.m.	1,480	145	579	-----	-----	56	60	73	96	99	70	S
July 16	3:35 p.m.	1,220	393	1,290	12	16	23	25	31	63	91	-------	SBWCM
17	9:30 a.m.	a 468	40	50	-----	-----	69	80	84	100	-----	-------	S
31	9:40 a.m.	a 173	25	12	-----	-----	65	-----	-----	-----	----	70	S
Aug. 13	3:10 p.m.	1,030	171	476	-----	-----	71	72	80	94	100	85	S
14	11:25 a.m.	a 674	87	158	-----	-----	86	89	93	100	----	79	S
28	6:35 p.m.	489	63	83	-----	-----	68	71	84	97	100	75	S
Sept. 24	4:00 p.m.	584	47	74	-----	-----	54	56	70	100	----	-------	S

a Water discharge measurement made this day.

Table 1.--Discharge and particle-size analyses of suspended sediment, Platte River near Overton, Nebr.--Continued

[Methods of analysis: B, bottom-withdrawal tube; W, in distilled water; S, sieve; C, chemically dispersed; M, mechanically dispersed; P, pipette]

Date	Time	Water discharge (cfs)	Suspended sediment: Concentration (ppm)	Suspended sediment: Discharge (tons per day)	Suspended sediment: Percent finer than indicated size in millimeters: 0.004	0.016	0.062	0.125	0.250	0.500	1.00	Water temperature (°F)	Methods of analysis
1952													
Sept. 25	6:10 p.m.	683	44	81	-----	-----	74	77	87	100	----	71	S
Oct. 9	4:35 p.m.	a 1,020	58	160	-----	-----	63	-----	-----	98	----	87	S
10	10:20 a.m.	424	11	13	-----	-----	78	-----	-----	100	----	52	S
Nov. 6	2:40 p.m.	a 1,600	66	285	-----	-----	57	63	85	98	----	-------	S
6	5:00 p.m.	a 1,620	88	385	-----	-----	38	-----	-----	86	----	47	S
7	9:40 a.m.	478	52	67	-----	-----	28	-----	-----	98	----	-------	S
7	12:05 p.m.	1,170	115	363	-----	-----	36	-----	-----	93	----	-------	S
Dec. 3	4:30 p.m.	b 1,880	149	756	-----	-----	26	-----	-----	77	----	-------	S
4	10:50 a.m.	b 1,070	94	272	-----	-----	16	-----	-----	81	----	33	S
1953													
Jan. 21	4:35 p.m.	a 2,330	76	478	-----	-----	24	-----	-----	69	----	33	S
22	10:00 a.m.	b 1,760	98	466	-----	-----	10	-----	-----	96	----	32	S
Feb. 4	3:30 p.m.	a 2,120	97	555	-----	-----	-----	36	-----	92	----	55	S
5	9:40 a.m.	1,090	67	197	-----	-----	43	-----	-----	94	----	-------	S
18	3:50 p.m.	a 2,310	108	674	-----	-----	38	-----	-----	92	----	-------	S
Mar. 4	10:20 a.m.	a 1,480	113	452	-----	-----	20	-----	-----	83	----	-------	S
4	4:00 p.m.	a 2,310	330	2,060	-----	-----	11	-----	-----	68	----	39	S
17	4:10 p.m.	a 2,200	155	921	-----	-----	17	-----	-----	54	----	-------	S
18	10:25 a.m.	1,800	99	481	-----	-----	26	-----	-----	94	----	50	S
Apr. 1	4:00 p.m.	a 2,090	112	632	-----	-----	42	-----	-----	93	----	54	S

a Water discharge measurement made this day.
b Mean daily discharge.

Table 1.--Discharge and particle-size analyses of suspended sediment, Platte River near Overton, Nebr.--Continued

[Methods of analysis: B, bottom-withdrawal tube; W, in distilled water; S, sieve; C, chemically dispersed; M, mechanically dispersed; P, pipette]

Date	Time	Water discharge (cfs)	Suspended sediment: Concentration (ppm)	Suspended sediment: Discharge (tons per day)	Suspended sediment: Percent finer than indicated size in millimeters: 0.004	0.016	0.062	0.125	0.250	0.500	1.00	Water temperature (°F)	Methods of analysis
1953													
Apr. 2	10:00 a.m.	755	18	37	-----	-----	57	-----	-----	96	----	51	S
15	4:25 p.m.	a 1,930	154	802	-----	-----	64	-----	-----	94	----	51	S
16	10:05 a.m.	755	59	120	-----	-----	56	-----	-----	99	----	-------	S
28	4:45 p.m.	1,530	129	533	-----	-----	49	51	63	84	94	-------	S
29	5:45 p.m.	1,600	82	354	-----	-----	63	66	80	98	100	-------	S
30	10:10 a.m.	a 838	104	235	-----	-----	22	23	35	85	100	-------	S
30	7:20 p.m.	a 1,620	124	542	-----	-----	56	58	73	96	100	-------	S
May 14	3:15 p.m.	a 1,960	77	407	-----	-----	60	-----	-----	92	----	62	S
15	9:50 a.m.	772	21	44	-----	-----	62	-----	-----	99	----	51	S
28	3:20 p.m.	a 1,340	81	293	-----	-----	64	-----	-----	99	----	80	S
29	9:30 a.m.	660	24	43	-----	-----	78	-----	-----	99	----	69	S
June 11	3:50 p.m.	a 1,170	74	234	-----	-----	39	-----	-----	74	----	87	S
12	8:05 a.m.	524	22	31	-----	-----	71	-----	-----	99	----	72	S
24	2:30 p.m.	a 166	12	5.4	-----	-----	91	-----	-----	99	----	89	S
25	7:30 a.m.	179	16	7.7	-----	-----	81	-----	-----	99	----	-------	S
July 9	3:30 p.m.	a 253	27	18	-----	-----	82	84	92	100	----	75	S
10	8:40 a.m.	253	31	21	-----	-----	80	83	90	98	----	-------	S
Aug. 20	3:50 p.m.	a 135	26	9.5	-----	-----	91	92	96	100	----	-------	S
21	9:30 a.m.	130	28	9.8	-----	-----	80	85	93	100	----	69	S
Sept. 24	9:15 a.m.	a 203	28	15	-----	-----	81	84	92	100	----	-------	S
24	3:10 p.m.	a 191	30	15	-----	-----	85	86	87	92	100	76	S

a Water discharge measurement made this day.

Table 2.--Particle-size analyses of point- and depth-integrated samples, Platte River near Overton, Nebr.

[Method of analysis: Sieve]

Date	Time	Sampling station	Water discharge (cfs)	Total depth (feet)	Depth below surface (feet)	Velocity (fps)	Suspended sediment					
							Concentration (ppm)	Percent finer than given size in millimeters				
								0.062	0.125	0.250	0.500	1.00
1952												
Mar. 27	3:30 p.m.	89	5,670	4.50	(a)	--------	222	18	22	34	55	86
					0.25	3.84	90	58	70	88	96	100
					1.50	4.25	152	38	44	82	99	100
					3.00	3.30	252	22	30	65	96	100
					4.00	2.23	411	12	18	58	95	100
28	10:00 a.m.	189	5,030	2.40	(a)	--------	177	20	26	60	95	100
					.25	2.15	118	24	32	67	97	100
					.90	2.66	200	11	16	54	96	100
					1.90	1.65	437	7	10	40	93	100
28	1:50 p.m.	842	5,310	4.60	(a)	--------	270	9	13	48	95	100
					.25	2.55	118	22	29	66	97	100
					1.60	2.76	333	12	16	51	96	100
					3.10	2.74	412	1	5	38	86	----
					4.10	2.50	642	7	9	43	94	100
Apr. 2	2:00 p.m.	50	4,170	5.30	(a)	--------	99	21	25	45	69	91
					.25	4.06	27	81	88	92	-----	----
					1.30	4.76	48	55	61	81	-----	----
					2.80	4.40	63	34	41	76	-----	----
					3.80	3.76	95	23	30	68	96	----
					4.80	3.35	160	6	23	58	89	95

a Depth-integrated sample.

Table 2.--Particle-size analyses of point- and depth-integrated samples, Platte River near Overton, Nebr.--Continued

[Method of analysis: Sieve]

Date	Time	Sampling station	Water discharge (cfs)	Total depth (feet)	Depth below surface (feet)	Velocity (fps)	Suspended sediment: Concentration (ppm)	Suspended sediment: Percent finer than given size in millimeters: 0.062	0.125	0.250	0.500	1.00
1953												
Apr. 29	4:30 p.m.	845	1,680	1.70	(a)	--------	116	40	54	71	94	100
					0.25	2.35	93	59	73	86	100	----
					.40	3.03	102	47	61	75	96	100
					.80	2.71	137	34	46	62	90	98
					1.20	2.45	200	33	39	54	93	100
30	3:30 p.m.	773	1,730	2.10	.25	1.79	86	57	76	90	100	----
					.70	2.56	111	41	54	67	97	100
					1.20	2.52	283	16	20	30	78	93
					1.60	1.55	258	21	25	39	96	100
30	4:00 p.m.	45	1,700	3.10	(a)	--------	110	41	45	79	100	----
					.25	2.63	67	32	55	91	100	----
					.60	3.28	89	32	48	81	100	----
					1.60	3.14	145	20	35	75	98	100
					2.60	1.63	184	14	30	72	99	100
30	4:50 p.m.	260	1,680	1.10	(a)	--------	182	35	40	68	89	97
					.25	2.11	85	84	90	100	-----	----
					.30	2.56	-------	-----	-----	-----	-----	----
					.60	2.63	98	72	80	99	100	----
30	5:15 p.m.	630	1,680	2.40	(a)	--------	62	94	100	-----	-----	----
					.25	1.68	62	100	-----	-----	-----	----
					1.20	2.21	-------	-----	-----	-----	-----	----
					1.90	1.90	63	93	100	-----	-----	----

a Depth-integrated sample.

Table 3.--Observations of water discharge, suspended sediment, and stream-bed elevation, Platte River near Overton, Nebr.

/Method of analysis: Sieve/

Date	Time	Water discharge (cfs)	Stream-bed elevation (feet)	Suspended sediment						
				Concentration (ppm)	Percent finer than given size, in millimeters					
					0.062	0.125	0.250	0.500	1.00	2.00
			Station 45							
1952										
Sept. 24	11:40 a.m.	179	0.00	7	-----	-----	-----	-----	----	----
24	1:05 p.m.	337	-.20	78	-----	-----	-----	-----	----	----
24	3:00 p.m.	548	+.15	46	-----	-----	-----	-----	----	----
24	4:20 p.m.	584	-.10	113	-----	-----	-----	-----	----	----
24	7:20 p.m.	608	-.06	36	-----	-----	-----	-----	----	----
24	9:45 p.m.	634	+.20	30	-----	-----	-----	-----	----	----
24	12:00 p.m.	701	-.05	1,250	-----	-----	-----	-----	----	----
25	4:00 a.m.	608	+.05	36	-----	-----	-----	-----	----	----
25	7:20 a.m.	318	+.06	18	-----	-----	-----	-----	----	----
25	9:50 a.m.	277	+.05	19	-----	-----	-----	-----	----	----
25	12:00 m.	277	+.10	14	-----	-----	-----	-----	----	----
25	2:20 p.m.	620	+.10	74	-----	-----	-----	-----	----	----
25	4:10 p.m.	701	+.10	55	-----	-----	-----	-----	----	----
25	6:15 p.m.	714	.00	48	-----	-----	-----	-----	----	----
1953										
Apr. 29	9:40 a.m.	674	.00	3,750	0	1	1	20	72	96
29	11:30 a.m.	804	+.80	4,960	-----	0	5	53	98	100
29	12:30 p.m.	1,300	.00	133	27	41	66	96	100	----
29	1:30 p.m.	1,500	-.10	297	12	16	33	86	100	----
29	2:45 p.m.	1,620	-.40	150	25	33	59	96	100	----

Table 3.--Observations of water discharge, suspended sediment, and stream-bed elevation, Platte River near Overton, Nebr.--Continued

[Method of analysis: Sieve]

Date	Time	Water discharge (cfs)	Stream-bed elevation (feet)	Suspended sediment						
				Concentration (ppm)	Percent finer than given size, in millimeters					
					0.062	0.125	0.250	0.500	1.00	2.00
Station 45--Continued										
1953										
Apr. 29	3:45 p.m.	1,730	-0.20	184	24	31	58	94	98	100
29	6:45 p.m.	1,550	-.50	109	30	36	60	91	100	----
30	8:30 a.m.	854	-.90	78	30	39	74	95	100	----
30	9:30 a.m.	838	-.60	56	17	23	66	97	100	----
30	10:45 a.m.	904	-.60	50	38	45	80	100	----	----
30	11:30 a.m.	1,240	-.30	4,410	1	1	4	32	75	97
30	1:00 p.m.	1,550	.00	227	24	31	61	95	100	----
30	2:00 p.m.	1,680	-.10	200	30	34	68	95	100	----
30	4:30 p.m.	1,700	-.40	132	44	50	80	99	100	----
30	7:20 p.m.	1,620	-.45	142	34	42	66	96	100	----
30	9:00 p.m.	1,620	-.90	149	35	39	69	96	100	----
Station 845										
1952										
Sept. 24	11:40 a.m.	179	0.00	10	-----	-----	-----	-----	----	----
24	1:05 p.m.	337	-.10	72	-----	-----	-----	-----	----	----
24	3:00 p.m.	548	-.30	63	-----	-----	-----	-----	----	----
24	4:20 p.m.	584	-.04	54	-----	-----	-----	-----	----	----
24	7:20 p.m.	608	-.10	64	-----	-----	-----	-----	----	----

Table 3.--Observations of water discharge, suspended sediment, and stream-bed elevation, Platte River near Overton, Nebr.--Continued

[Method of analysis: Sieve]

Date	Time	Water discharge (cfs)	Stream-bed elevation (feet)	Suspended sediment						
				Concentration (ppm)	Percent finer than given size, in millimeters					
					0.062	0.125	0.250	0.500	1.00	2.00
Station 845--Continued										
1952										
Sept. 24	9:45 p.m.	634	-0.58	3,950	-----	-----	-----	-----	----	----
24	12:00 p.m.	701	-.37	450	-----	-----	-----	-----	----	----
25	4:00 a.m.	608	-.30	57	-----	-----	-----	-----	----	----
25	7:20 a.m.	318	-.58	19	-----	-----	-----	-----	----	----
25	9:50 a.m.	277	-.64	15	-----	-----	-----	-----	----	----
25	12:00 m.	277	-.52	4,140	-----	-----	-----	-----	----	----
25	2:20 p.m.	620	-.66	116	-----	-----	-----	-----	----	----
25	4:10 p.m.	701	-.50	2,200	-----	-----	-----	-----	----	----
25	6:15 p.m.	714	-.10	61	-----	-----	-----	-----	----	----
1953										
Apr. 29	9:40 a.m.	674	.00	56	42	48	66	88	100	----
29	11:30 a.m.	804	-.40	82	35	47	64	95	100	----
29	12:30 p.m.	1,300	-.80	136	34	43	61	96	100	----
29	1:30 p.m.	1,500	-.60	214	20	26	40	88	100	----
29	2:45 p.m.	1,620	-1.00	169	28	35	51	93	100	----
29	3:45 p.m.	1,730	-.80	245	22	27	39	85	96	100
29	6:45 p.m.	1,550	-1.40	127	34	42	66	96	100	----
30	8:30 a.m.	854	-.80	60	51	60	71	100	----	----
30	9:30 a.m.	838	-.90	73	31	43	60	97	100	----
30	10:45 a.m.	904	-.80	103	38	43	60	96	100	----

Table 3.--Observations of water discharge, suspended sediment, and stream-bed elevation, Platte River near Overton, Nebr.--Continued

[Method of analysis: Sieve]

Date	Time	Water discharge (cfs)	Stream-bed elevation (feet)	Suspended sediment						
				Concentration (ppm)	Percent finer than given size, in millimeters					
					0.062	0.125	0.250	0.500	1.00	2.00
Station 845--Continued										
1953										
Apr. 30	11:30 a.m.	1,240	-0.80	228	23	28	39	82	96	100
30	1:00 p.m.	1,550	-1.10	220	24	29	41	85	100	----
30	2:00 p.m.	1,680	-1.00	143	46	53	68	93	100	----
30	4:30 p.m.	1,700	-1.80	1,550	4	4	6	25	74	98
30	7:20 p.m.	1,620	-2.20	663	8	9	13	37	82	100
30	9:00 p.m.	1,620	-2.80	12,100	-----	0	2	32	86	100

Table 4.--Particle-size gradation of bed material, Platte River near Overton, Nebr.

[Samples collected at the bridge or gaging section. Method of analysis: sieve]

Date	Sampling station	Sample depth (feet)	Bed material: Percent finer than indicated size in millimeters						
			0.125	0.250	0.500	1.000	2.000	4.000	8.000
1952 Aug. 14	35	Surface	0	4	39	77	95	-----	-----
	160	---do---	0	5	35	71	90	-----	-----
	224	---do---	0	6	32	64	83	-----	-----
	400	---do---	1	18	53	83	96	-----	-----
	578	---do---	1	10	44	77	93	-----	-----
	645	---do---	1	7	43	78	94	-----	-----
Section average			0	8	41	75	92	-----	-----
1952 Sept. 25	35	Surface	0	3	26	57	81	-----	-----
	160	---do---	0	5	23	46	66	-----	-----
	224	---do---	0	5	29	54	73	-----	-----
	400	---do---	0	5	26	57	83	-----	-----
	585	---do---	0	5	27	55	78	-----	-----
	645	---do---	0	5	27	58	82	-----	-----
	800	---do---	0	4	19	40	64	-----	-----
Section average			0	5	25	52	75	-----	-----

Table 4.--Particle-size gradation of bed material, Platte River near Overton, Nebr.--Continued

[Samples collected at the bridge or gaging section. Method of analysis: sieve]

Date	Sampling station	Sample depth (feet)	Bed material: Percent finer than indicated size in millimeters						
			0.125	0.250	0.500	1.000	2.000	4.000	8.000
1953									
Apr. 16	60	Surface-	0	5	32	67	91	98	100
	300	---do---	0	11	33	50	64	79	92
	470	---do---	0	8	42	81	97	100	-----
	770	---do---	0	1	27	69	84	96	100
	850	---do---	0	1	14	53	85	97	100
Section average----------			0	5	30	64	84	94	98
1953									
Apr. 29	845	0.2	0	1	12	42	80	98	100
	845	1.0	0	1	14	40	71	94	100
	845	2.0	0	4	27	60	81	92	99
	845	3.0	0	5	27	56	79	96	100
				3	20	49			
30	45	.2	0	3	20	58	90	100	-----
	45	2.0	0	2	15	46	79	95	99
	45	3.0	0	1	17	48	78	95	100
	773	1.0	0	3	38	79	95	99	100
	773	2.0	0	8	32	52	67	82	94
	630	1.0	0	6	22	48	71	88	95
	630	2.0	0	8	25	49	68	87	98
	320	1.0	0	9	38	68	87	96	99
	320	2.0	0	3	24	57	79	94	98

Table 4.--Particle-size gradation of bed material, Platte River near Overton, Nebr.--Continued

[Samples collected at the bridge or gaging section. Method of analysis: sieve]

Date	Sampling station	Sample depth (feet)	Bed material: Percent finer than indicated size in millimeters						
			0.125	0.250	0.500	1.000	2.000	4.000	8.000
1953									
Sept. 24	865	Surface-	0	2	30	69	92	99	100
	845	---do---	0	3	24	59	86	98	100
	800	---do---	0	8	35	59	79	92	100
	760	---do---	1	17	74	97	99	100	-----
	520	---do---	0	9	46	77	91	100	-----
	340	---do---	0	6	30	57	79	93	98
	130	---do---	0	7	38	68	93	100	-----
	40	---do---	0	1	12	54	87	98	100
Section average----------			0	7	36	68	88	98	100
Mean of four sections------			0	6	33	65	85	-----	-----

Table 5.--Periodic observations of water discharge and water-surface slope, Platte River near Overton, Nebr.

Date	Time	Water discharge (cfs)	Gage height (feet)					Fall from N-1 to N-4 (feet)	Slope (ft per mile)	
			Recorder	Staff N-1	Staff N-2	Staff N-3	Staff N-4			
1952									.00119	
May 15	4:20 p.m.	1,580	2.89	4.66	3.34	2.98	2.18	2.48	5280 / 9.960	.00188
28	9:15 a.m.	2,120	2.98	4.71	3.57	3.10	2.31	2.40	9.2	.0017
28	1:50 p.m.	2,510	3.15	4.97	3.80	3.29	2.51	2.46	9.9	.00188
June 12	3:10 p.m.	2,770	3.23	5.09	3.87	3.40	2.58	2.51	10.0	.00189
12	4:10 p.m.	2,770	3.24	5.10	3.89	3.43	2.59	2.51	10.0	"
13	10:05 a.m.	1,650	2.85	4.68	3.45	3.02	2.16	2.52	10.0	"
26	3:30 p.m.	1,480	2.83	4.58	3.39	2.98	2.13	2.46	9.8	.00186
July 17	10:00 a.m.	455	2.38	3.85	-----	2.32	1.59	2.26	8.9	.00169
17	4:20 p.m.	958	2.84	4.48	3.42	3.02	2.10	2.38	9.5	
Aug. 28	5:40 p.m.	457	2.58	3.90	2.77	2.51	1.70	2.20	8.8	.00167
Sept. 24	2:30 p.m.	584	2.57	4.02	2.81	2.44	1.55	2.47	9.8	
25	9:20 a.m.	284	2.26	3.74	2.52	2.19	1.27	2.47	9.8	
Oct. 9	3:40 p.m.	1,020	2.69	4.38	3.15	2.80	1.85	2.53	10.1	
10	10:15 a.m.	424	2.29	3.78	2.68	2.26	1.32	2.46	9.8	
Nov. 6	4:15 p.m.	1,600	3.00	4.80	3.56	3.19	2.05	2.75	10.9	
7	10:30 a.m.	548	2.42	3.96	2.50	2.38	1.44	2.52	10.0	
1953										
Feb. 4	2:25 p.m.	2,090	3.16	4.89	3.69	3.20	2.15	2.74	10.9	
18	2:55 p.m.	2,010	3.12	5.00	3.73	3.25	2.19	2.81	11.2	.00212
Mar. 4	3:10 p.m.	2,230	3.22	5.10	3.80	3.38	2.37	2.73	10.9	
17	3:15 p.m.	2,170	3.22	5.03	3.80	3.34	2.46	2.57	10.2	
18	9:50 a.m.	1,700	3.05	4.76	3.56	2.96	2.18	2.58	10.2	

Table 5.--Periodic observations of water discharge and water-surface slope, Platte River near Overton, Nebr.--Continued

Date	Time	Water discharge (cfs)	Gage height (feet)					Fall from N-1 to N-4 (feet)	Slope (ft per mile)	
			Recorder	Staff N-1	Staff N-2	Staff N-3	Staff N-4			
1953										
Apr. 1	3:15 p.m.	2,030	3.17	4.94	3.81	3.31	2.28	2.66	10.6	
2	9:10 a.m.	634	2.47	3.82	2.84	2.57	1.75	2.07	8.2	.00155
15	3:30 p.m.	1,830	3.11	4.92	3.64	3.24	2.22	2.70	10.7	
16	9:15 a.m.	647	2.53	4.22	2.92	2.63	1.66	2.56	10.2	
28	5:15 p.m.	1,500	2.95	4.80	3.59	3.08	2.05	2.75	10.9	
29	3:00 p.m.	1,680	3.03	4.90	3.67	3.21	2.11	2.79	11.1	.00210
30	9:15 a.m.	838	2.60	4.07	-----	2.56	1.42	2.65	10.5	
30	2:25 p.m.	1,730	3.02	4.84	3.61	3.16	2.02	2.82	10.2	
May 14	2:45 p.m.	1,960	2.98	4.92	3.69	3.20	2.17	2.75	10.9	
15	9:10 a.m.	788	2.47	4.07	2.97	2.61	1.71	2.36	9.4	
28	2:50 p.m.	1,220	2.76	4.59	3.44	2.99	2.00	2.59	10.3	
29	9:05 a.m.	674	2.46	4.02	3.01	2.62	1.83	2.19	8.7	
June 11	3:20 p.m.	1,090	2.74	4.38	3.19	2.77	1.81	2.57	10.2	
12	7:40 a.m.	536	2.39	3.93	2.92	2.47	1.58	2.35	9.4	
24	4:00 p.m.	172	2.10	3.64	-----	2.09	-----	----------	----------	
25	5:00 p.m.	166	2.10	3.64	-----	2.10	-----	----------	----------	
July 9	4:00 p.m.	245	2.23	3.75	-----	-----	1.38	2.37	9.4	
10	8:00 a.m.	245	2.22	3.77	-----	2.27	1.41	2.36	9.4	
Aug. 20	3:30 p.m.	140	2.16	3.62	-----	2.12	-----	----------	----------	
21	10:10 a.m.	130	2.15	3.62	-----	2.12	-----	----------	----------	
Sept. 24	9:40 a.m.	203	2.27	3.74	-----	2.45	-----	----------	----------	

Table 6.--Comparison of total sediment discharge computed by the modified Einstein procedure with measured sediment discharge, Platte River near Overton, Nebr.

Date	Type of sediment discharge	Sediment discharge, in tons per day								Percentage of measured sediment discharge	% of total sed. disch.
		Less than 0.062	0.062 to 0.125 mm	0.125 to 0.25 mm	0.25 to 0.50 mm	0.50 to 1.00 mm	1.00 to 2.00 mm	2.00 to 8.00 mm	Total		
1952											
Apr. 2	Computed	287	77	492	905	890	859	115	3,625	319	31%
	Measured	284	68	364	341	80	-------	-------	1,137	----------	
May 15	Computed	9	21	102	246	299	266	17	960	519	19%
	Measured	9	19	67	72	18	-------	-------	185	----------	
June 12	Computed	745	24	176	459	604	568	66	2,642	262	38%
	Measured	735	20	111	121	20	-------	-------	1,007	----------	
Sept. 25	Computed	64	3	15	58	87	82	4	314	378	26%
	Measured	61	3	8	11	-------	-------	-------	83	----------	
1953											
July 9	Computed	15	.4	1.8	2.0	-------	-------	-------	19	106	94%
	Measured	15	.4	1.4	1.4	-------	-------	-------	18	----------	

use (5) = 42%
use (4) = 28%