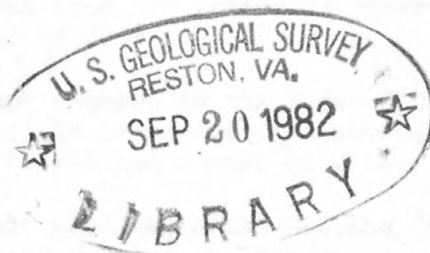


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UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY



GRAPHIC AND TABULAR SUMMARIES OF CHANGES
IN STREAM-CHANNEL CROSS SECTIONS BETWEEN 1976 AND 1978
FOR REDWOOD CREEK AND SELECTED TRIBUTARIES, HUMBOLDT COUNTY,
AND MILL CREEK, DEL NORTE COUNTY, CALIFORNIA



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OPEN-FILE REPORT 79-1637

This report is preliminary and has not been
edited or reviewed for conformity with
Geological Survey standards and nomencla-
ture.

Menlo Park, California
1979

U.S. Geological Survey

[Reports-Open file series]

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FOR REDWOOD CREEK AND SELECTED TRIBUTARIES, HUMBOLDT COUNTY,
AND MILL CREEK, DEL NORTE COUNTY, CALIFORNIA

By K. Michael Nolan

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*Menlo Park, California
November 1979*

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ABSTRACT

Forty-eight surveyed stream-channel cross sections were established along Redwood Creek, Humboldt County, California between 1973 and 1974. Eighty-three cross sections were established at selected sites along tributaries to Redwood Creek between 1974 and 1976. Eleven surveyed stream channel cross sections were established in the Mill Creek drainage basin, Del Norte County, California in the summer of 1974. All cross-sections have been resurveyed at least annually since they were established. All work was done in cooperation with the National Park Service.

Data tabulated in this report summarize changes at cross sections since release of previous reports. Data from the Redwood Creek cross sections are tabulated for the following periods: initiation of observation to summer 1978, summer 1975 to summer 1976, and summer 1977 to summer 1978. Data from the Redwood Creek tributary cross sections are tabulated for various periods between 1974 and 1978. Data from the Mill Creek cross sections are presented for the period of summer of 1975 to summer 1978. Thirteen figures are included to aid in understanding the tabulated data.

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FOR REDWOOD CREEK AND SELECTED TRIBUTARIES, HUMBOLDT COUNTY,
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by

K. Michael Nolan

This report consists of graphs and tables summarizing recent changes at 48 monumented stream-channel cross sections along Redwood Creek, at 83 similar sections along selected tributaries to Redwood Creek, and at 11 cross sections in the Mill Creek drainage basin.

All locations of cross sections are shown on planimetric maps of the drainage basins (figs. 1 and 12). The locations of sections along Redwood Creek are also shown on a longitudinal profile (fig. 2). Vertically exaggerated, repeated stream-channel cross-section profiles of 13 sections are presented in Figures 3, 4, 11 and 13 to provide examples of the changes summarized in Tables 2 through 6. Explanation of data in Tables 1 through 6 is presented in Figure 5.

Surveyed stream-channel cross sections along Redwood Creek and its larger tributaries and in the Mill Creek basin are monumented with 4.0-ft (1.2-m) lengths of 3/8-inch (9.5-mm) steel bar or by reference marks on concrete bridge abutments. Steel monuments were driven 3.0 to 3.5 ft (0.9 to 1.1 m) into the ground and referenced to at least two other triangulation points (Emmett, 1974). Triangulation was by tape and compass. Relative altitudes were established by leveling. Three stream-channel cross sections along Redwood Creek are located at cableways of stream-gaging

stations of the U.S. Geological Survey, and auxiliary data on stream-channel geometry are obtained from cross sections made while measuring stream discharge. Cross sections along smaller tributaries were determined by using a surveying rod, or a tape and plumb bob, to measure the vertical distance between the stream channel surface and a taut horizontal line attached to fixed end points. Photographs and information on bedforms, grain size of streambed material, and specific erosional and depositional features were obtained while surveying, to assist in the interpretation of any observed cross-sectional changes.

Two stream-channel cross sections reported here were installed along lower Redwood Creek at the start of the 1973 water year by the National Park Service; 40 additional cross sections along Redwood Creek were established early in the 1974 water year; and the remaining six Redwood Creek cross sections and the 11 cross sections in the Mill Creek drainage basin were established late in the 1974 water year or early in the 1975 water year by the U.S. Geological Survey. Tributary cross sections in the Redwood Creek basin were established at various times between September 1974 and December 1976 by the U.S. Geological Survey.

Data on initial changes in stream-channel cross sections along Redwood Creek and its tributaries were published by Nolan and others (1976) and data on initial changes in stream-channel cross sections in the Mill Creek basin were published by Iwatsubo and others (1976). Janda (1978) and Nolan and Janda (1979) interpreted some of the published data. Data reported here summarize changes in stream-channel configurations that have occurred since the release of earlier reports.

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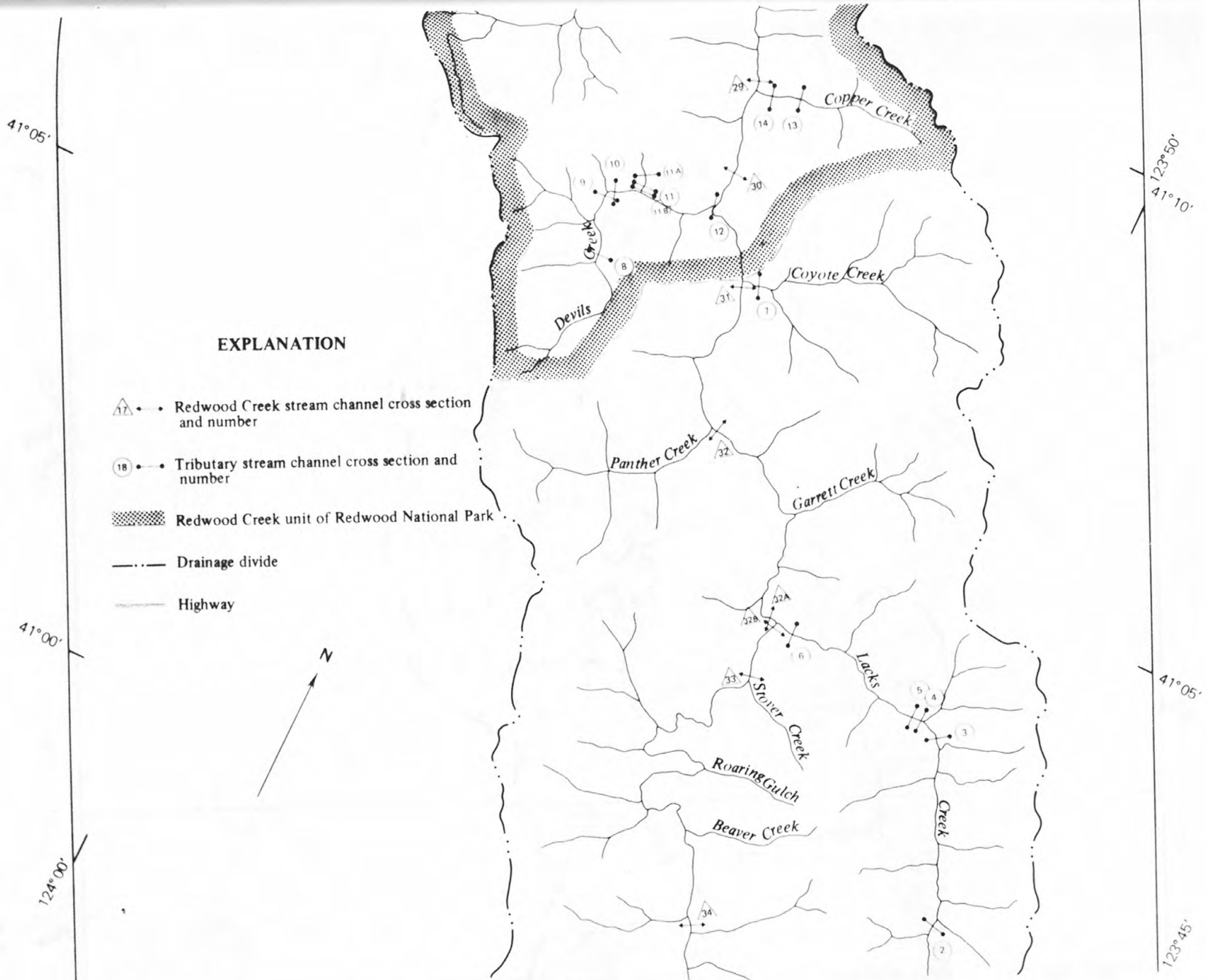
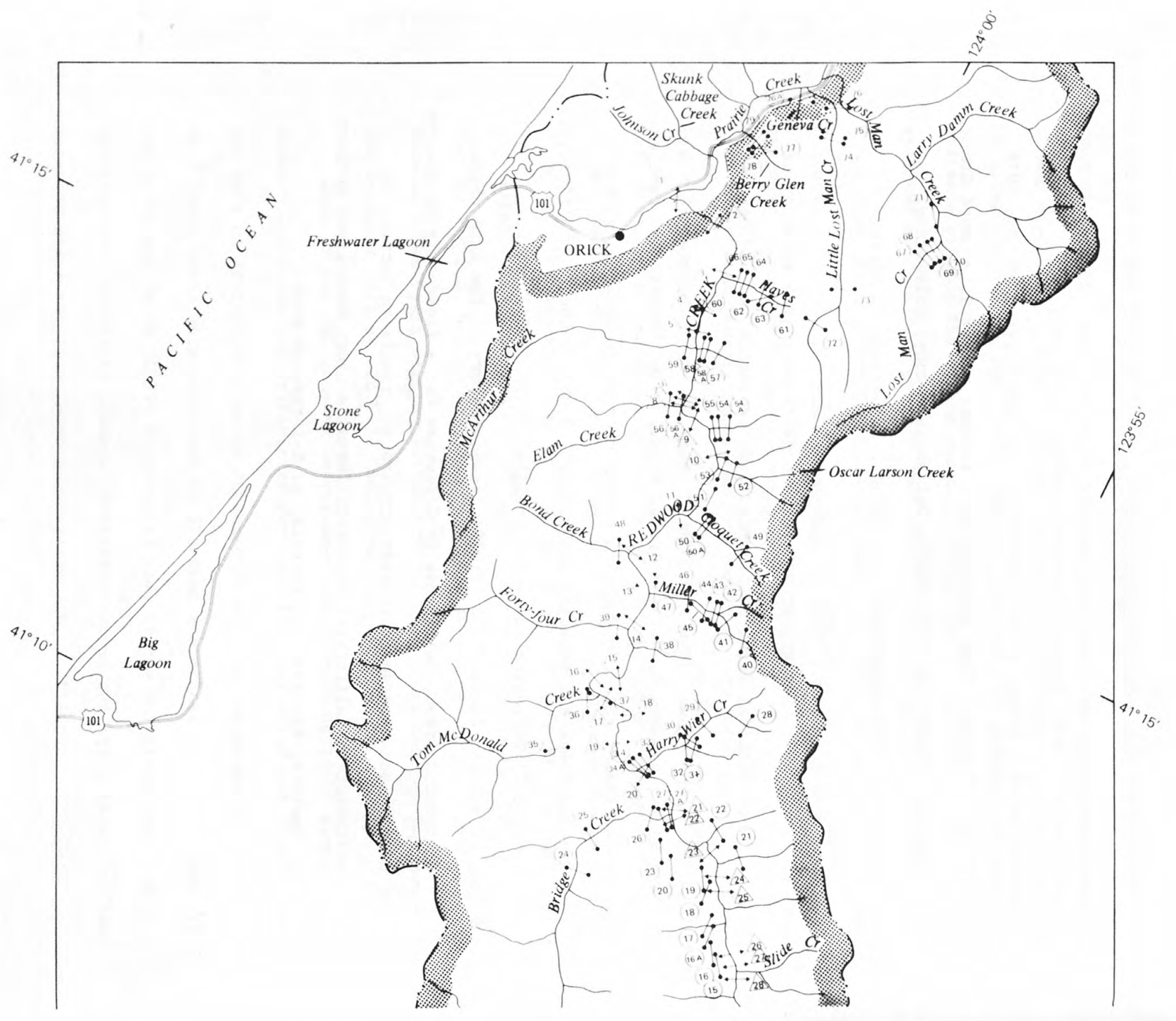


Figure 1. Location of stream-channel cross sections in the Redwood Creek drainage basin. (continued on following pages)

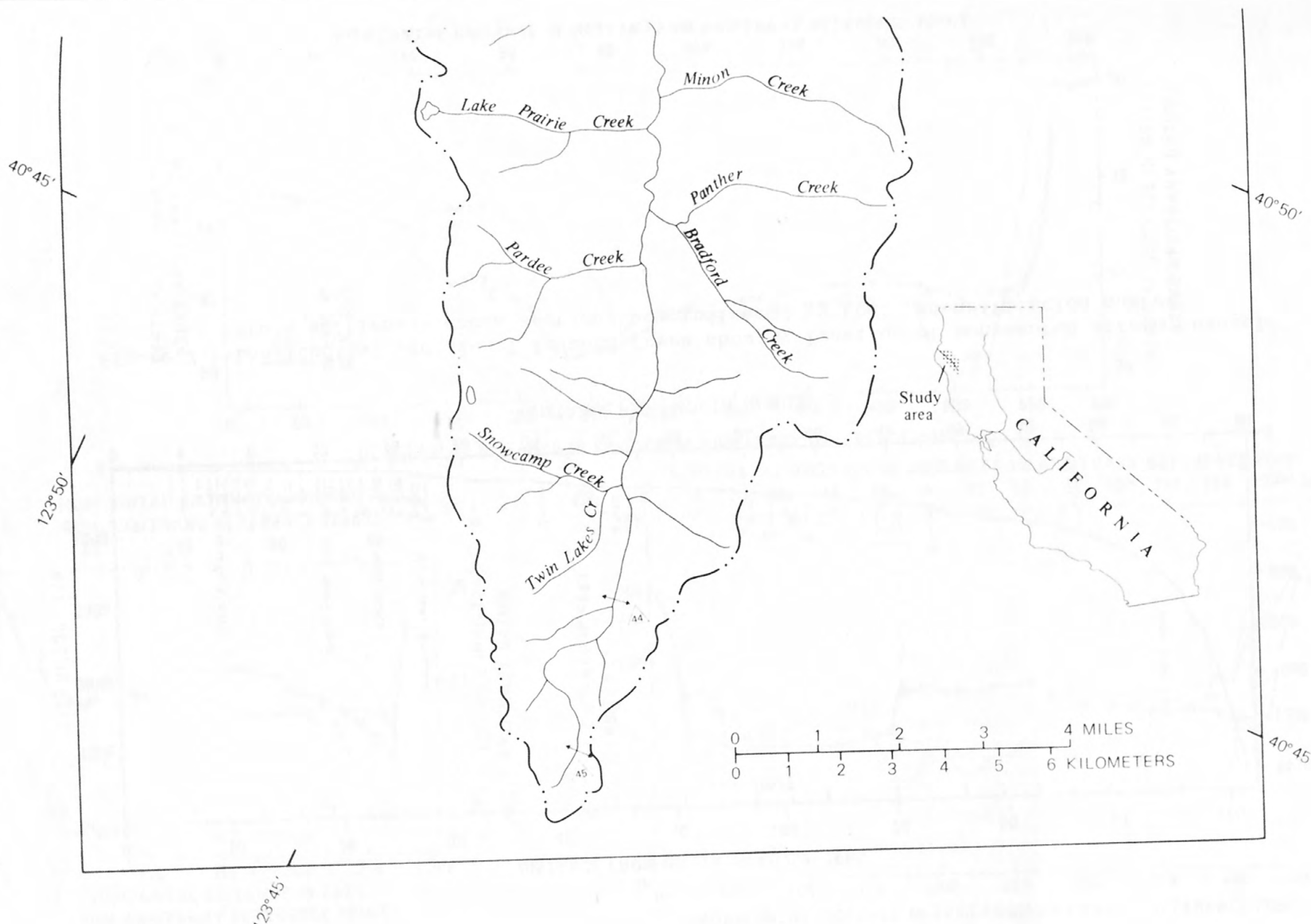


Figure 1. Location of stream-channel cross sections in the Redwood Creek drainage basin. (Cont'd.)

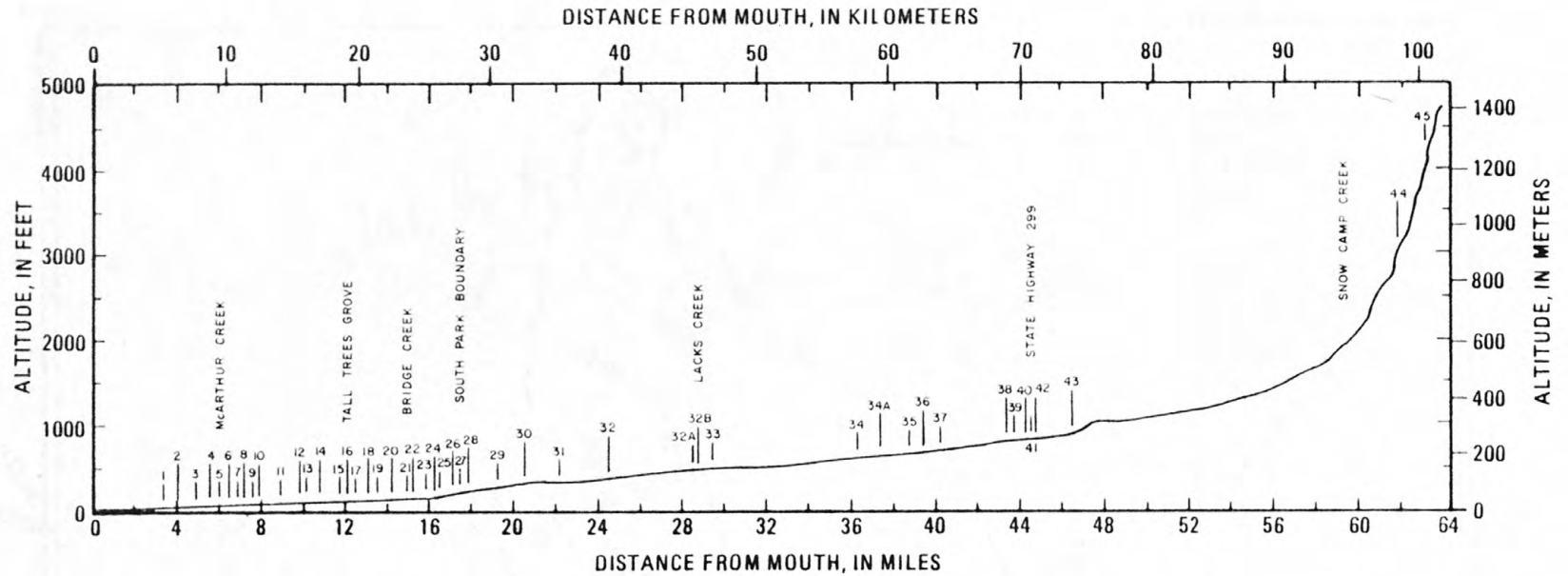


Figure 2.--Longitudinal profile of Redwood Creek showing location of monumented stream channel cross sections. Cross sections are indicated by their identification number.

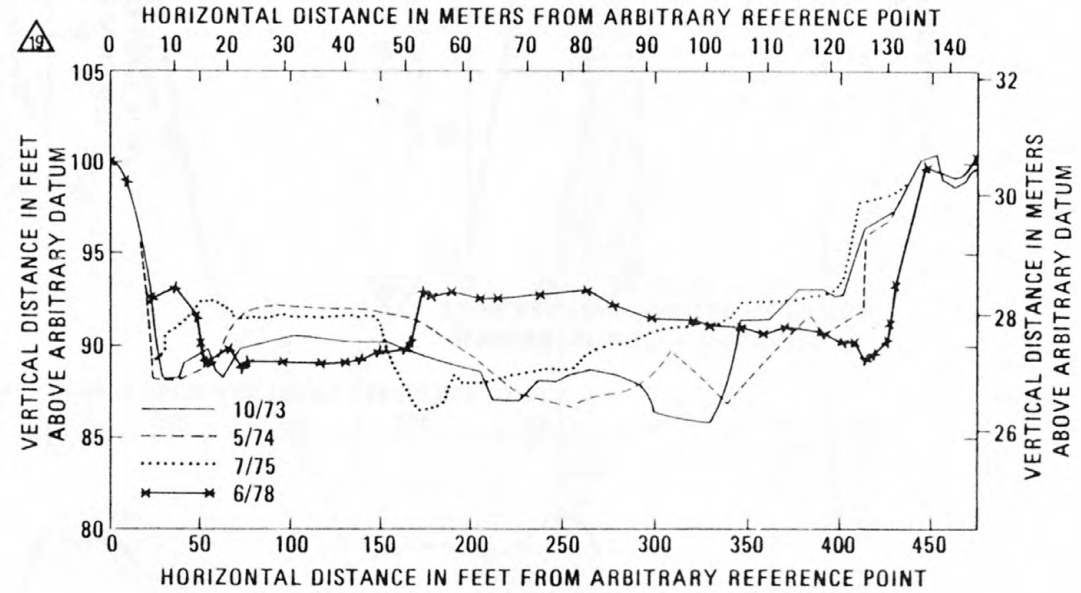
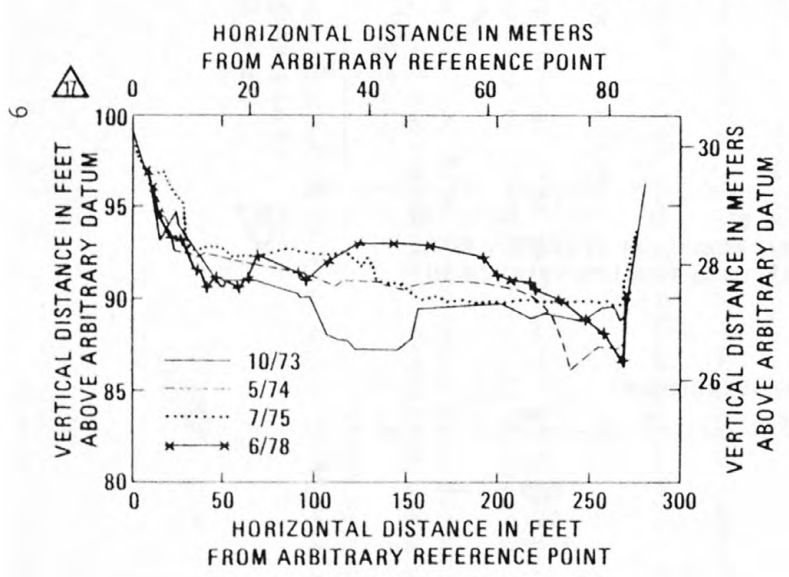
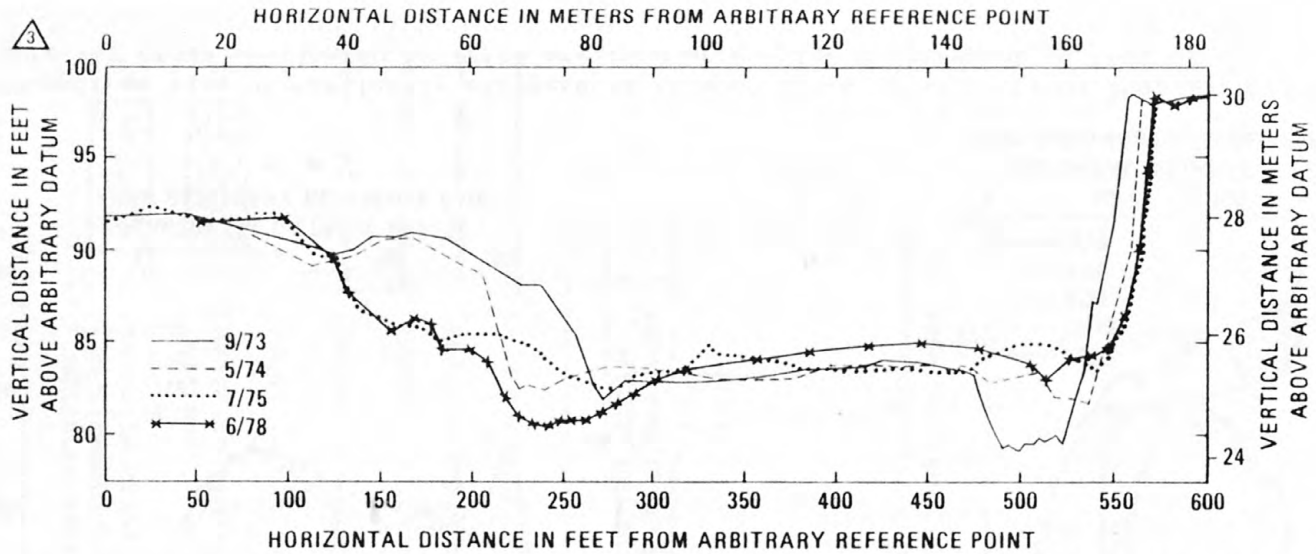


Figure 3.--Downstream view of vertically exaggerated Redwood Creek cross sections 3, 17, and 19.

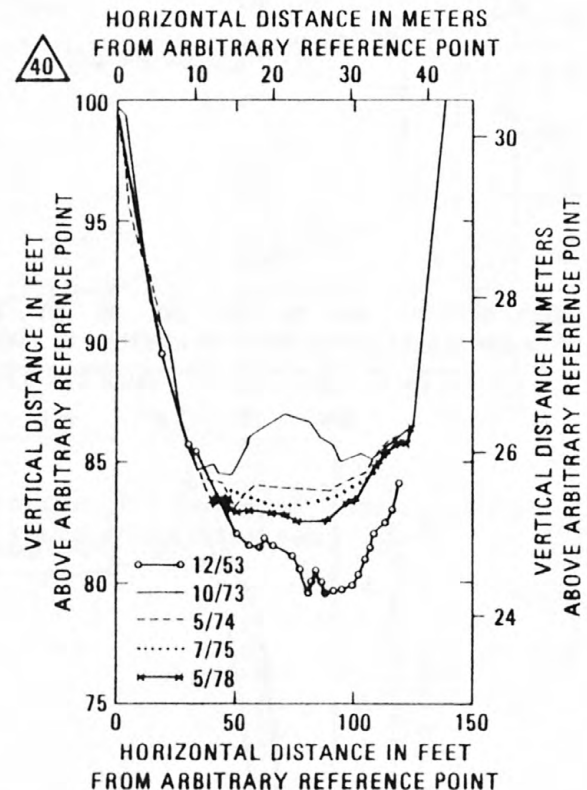
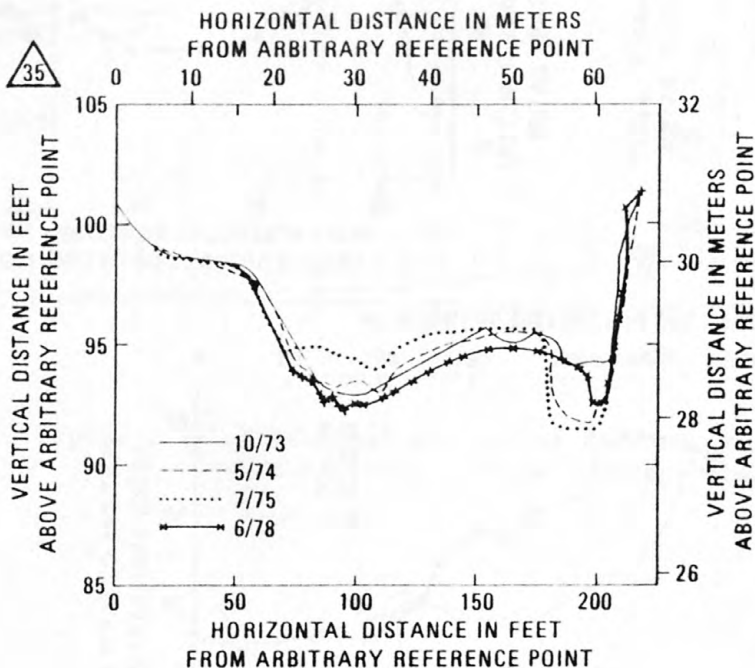
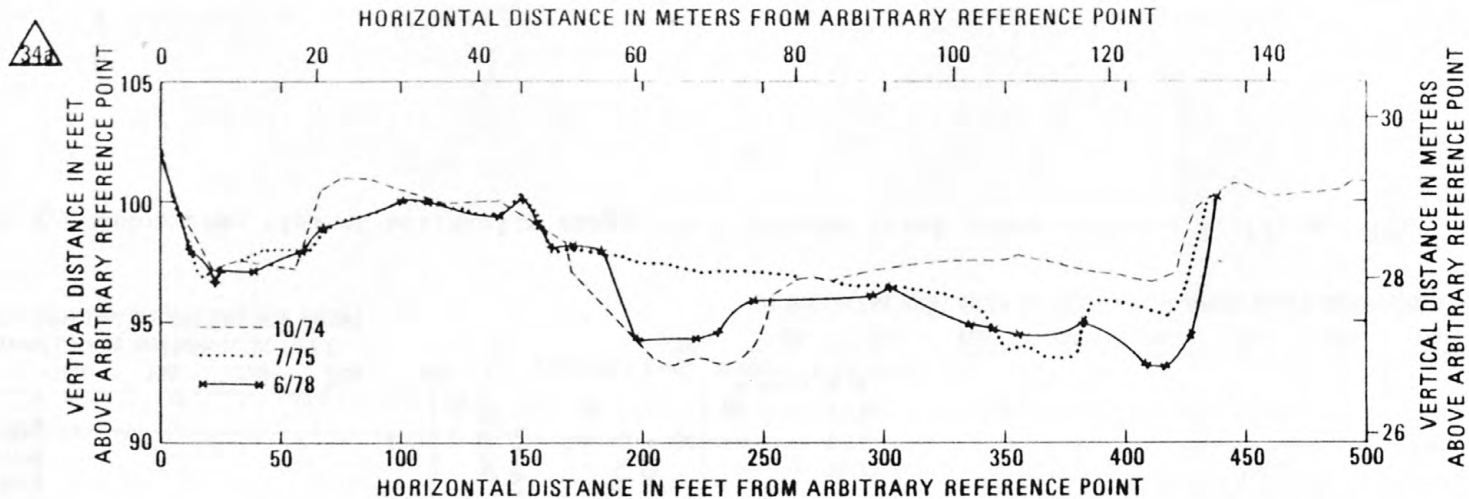
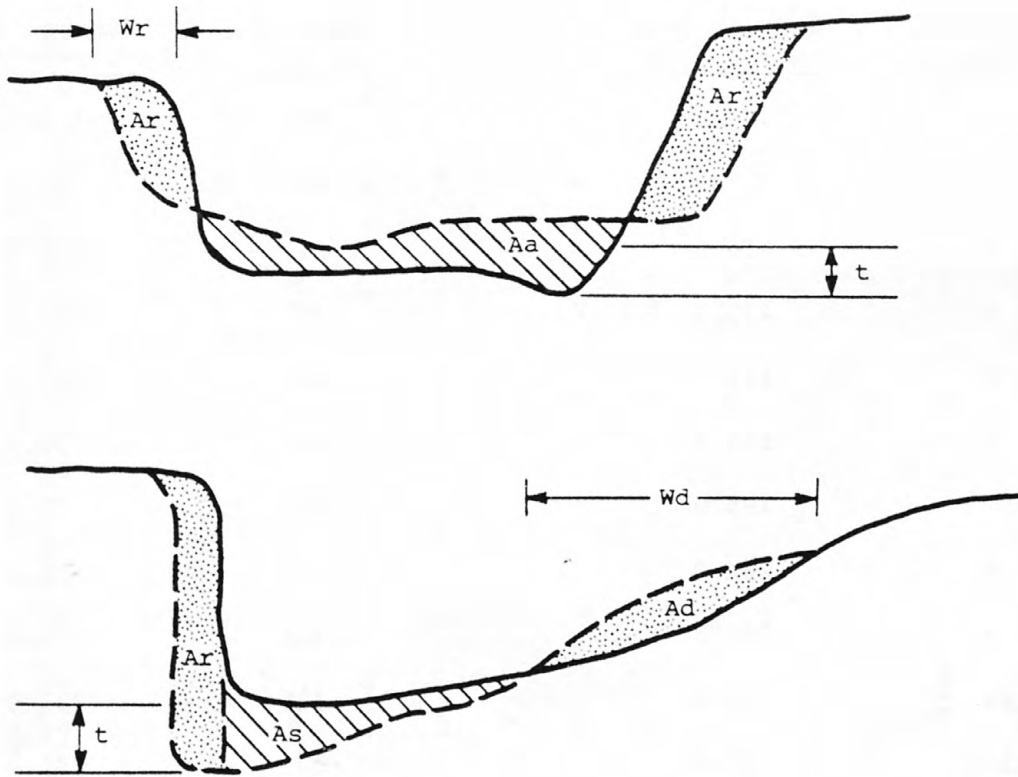


Figure 4.--Downstream view of vertically exaggerated Redwood Creek cross sections 34a, 35, and 40. Data for cross section 40 on 12/53 are from streamflow measurement on that date.





- Land-surface profile at time of initial survey
 - - - - - Land-surface profile at time of resurvey
 ← Wr → Change in width associated with bank recession (erosion)
 ← Wd → Change in width associated with deposition (lateral accretion)
 ↑ t ↓ Change in altitude of thalweg
 Change in cross-sectional area associated with changing streambed altitude. Aa indicates aggradation. As indicates scour
 Change in cross-sectional area associated with erosion or deposition on streambanks. Ar indicates bank recession (erosion). Ad indicates bank deposition

Figure 5.--Explanation of cross sectional changes shown in Tables 1 - 6 and Figures 6 - 10.

Table 1.--Bank to bank width of Redwood Creek stream channel at cross sections as of the summer of 1978. These values were used to calculate cross-sectional area changes per foot of stream channel in figures 7 and 10.

<u>Section Number</u>	<u>Bank to Bank Width (ft)</u>	<u>Section Number</u>	<u>Bank to Bank Width (ft)</u>
1	435.0	25	148.0
2	427.9	26	150.0
3	416.0	27	212.0
4	473.0	28	294.0
5	355.0	29	215.0
6	366.0	30	120.0
7	195.0	31	82.0
8	287.0	32	113.0
9	364.0	32a	234.0
10	313.0	32b	321.0
11	219.0	33	135.0
12	245.0	34	221.0
13	230.0	34a	417.0
14	193.0	35	153.0
15	192.0	36	134.0
16	278.0	37	140.0
17	241.0	38	106.0
18	224.0	39	99.0
19	405.0	40	100.0
20	187.0	41	91.0
21	224.0	42	103.0
22	190.0	43	276.0
23	226.0	44	47.0
24	--	45	38.0

Table 2.-- Net changes in the Redwood Creek stream channel at cross sections from initiation of observation to the summer of 1978.

Cross Section Number	Interval of Measurements	Change in Altitude of Thalweg (Ft) Aggradation Scour		CHANGE IN CROSS-SECTIONAL AREA										Net Change in Area(ft ²)
				Associated With Changing Stream Bed Altitude		At Left Bank				At Right Bank				
				Aggradation	Scour	CHANGE IN WIDTH		CHANGE IN AREA		CHANGE IN WIDTH		CHANGE IN AREA		
						Deposition	Recession	Deposition	Recession	Deposition	Recession	Deposition	Recession	
(Aa) (ft ²)	(As) (ft ²)	(Wd) (ft)	(Wr) (ft)	(Ad) (ft ²)	(Ar) (ft ²)	(Wd) (ft)	(Wr) (ft)	(Ad) (ft ²)	(Ar) (ft ²)					
1	10/73 - 7/7/78	0	1.83	0	450.7	0	7.0	0	57.6	0	0	7.2	0	+501.1
2	10/73 - 6/23/75	1.69	0	351.7	0	0	0	0	0	0	153.0	0	1,245	+893.3
3	9/26/73 - 6/23/78	1.34	0	0	395.1	7.0	0	9.6	0	0	8.0	0	77.0	+462.5
4	10/73 - 7/5/78	0	0.22	156.2	0	Slide				0	0	0	4.0	-152.2
5	10/73 - 6/29/78	0	0.63	0	101.3	0	7.0	0	34.3	0.0	0.0	1.6	0	+134.0
6	10/73 - 6/27/78	1.5	0	635.7	0	0	0	0	0	0	0	0	23.1	-612.6
7	9/9/73 - 6/27/78	0.4	0	238.7	0	0	0	0	0	0	42.0	0	140.4	- 98.3
8	9/9/73 - 6/27/78	2.17	0	0.0	0.0	3.0	0	55.9	0	0	26.0	0	212.0	+156.1
9	9/9/73 - 9/27/78	0	1.41	0	52.1	0	12.0	0	57.8	0	2.0	0	46.3	+156.2
10	10/73 - 6/26/78	0	0.48	86.1	0	0	0	6.7	0	0	0	3.9	0	- 96.7
11	10/20/73 - 6/26/78	1.23	0	51.2	0	0	0		0.0	0	8.0	0	28.4	- 22.8
12	10/20/73 - 6/21/78	0.7	0	187.6	0	0	Slide			0	1.0	0	1.1	-186.5
13	10/3/73 - 6/21/78	1.01	0	224.1	0	0	3.0	0	18.1	Monument changed				-206.0

Table 2.-- Net changes in the Redwood Creek stream channel at cross sections from initiation of observation to the summer of 1978.

Cross Section Number	Interval of Measurements	Change in Altitude of Thalweg (Ft) Aggradation Scour		CHANGE IN CROSS-SECTIONAL AREA										Net Change in Area(ft ²)
				Associated With Changing Stream Bed Altitude		At Left Bank				At Right Bank				
				Aggradation (Aa) (ft ²)	Scour (As)(ft ²)	CHANGE IN WIDTH		CHANGE IN AREA		CHANGE IN WIDTH		CHANGE IN AREA		
						Deposition (Wd)(ft)	Recession (Wr)(ft)	Deposition (Ad)(ft ²)	Recession (Ar)(ft ²)	Deposition (Wd)(ft)	Recession (Wr)(ft)	Deposition (Ad)(ft ²)	Recession (Ar)(ft ²)	
14	10/3/73 - 6/21/78	1.33	0	333.4	0	Monument changed				0	2.0	0	4.9	-328.5
15	10/73 - 6/20/78	0.19	0	170.6	0	3.0	0	30.4	0	0	4.0	0	11.6	-189.4
16	10/20/73 - 6/20/78	1.13	0	144.0	0	Slide				0	6.0	0	18.0	-126.0
17	10/4/73 - 6/18/78	0	0.82	369.1	0	0	0	4.1	0	0	0	0	9.2	-364.0
18	10/5/73 - 6/16/78	3.27	0	306.5	0	0	0	32.8	0	0	0	0	0	-339.3
19	10/73 - 6/15/78	3.07	0	728.8	0	0	0	6.5	0	0	24.0	0	84.6	-650.7
20	10/73 - 6/15/78	1.05	0	241.0	0	0	0	0	6.0	0	0	0	0	-235.0
21	10/19/73 - 8/09/78	1.67	0	471.7	0	0	1.0	0	2.2	0	0.0	0	8.7	-460.8
22	10/73 - 6/12/78	0.50	0	203.3	0	1.0	0	1.0	0	0	3.0	0	7.2	-197.1
23	10/73 - 6/12/78	1.59	0	266.7	0	0	0	0	17.4	0	0	0	1.8	-247.5
24						Monument lost								
25	10/73 - 6/12/78	0	1.35	45.1	0	0	0	12.8	0	2.0	0	2.2	0	- 60.1
26	10/73 - 6/9/78	1.80	0	0	79.8	0	5.0	0	12.3	2.0	0	33.8	0	+ 58.3

Table 2.-- Net changes in the Redwood Creek stream channel at cross sections from initiation of observation to the summer of 1978.

Cross Section Number	Interval of Measurements	Change in Altitude of Thalweg (Ft) Aggradation Scour		CHANGE IN CROSS-SECTIONAL AREA										Net Change in Area (ft ²)
				Associated With Changing Stream Bed Altitude		At Left Bank				At Right Bank				
				Aggradation (Aa) (ft ²)	Scour (As) (ft ²)	CHANGE IN WIDTH		CHANGE IN AREA		CHANGE IN WIDTH		CHANGE IN AREA		
						Deposition (Wd) (ft)	Recession (Wr) (ft)	Deposition (Ad) (ft ²)	Recession (Ar) (ft ²)	Deposition (Wd) (ft)	Recession (Wr) (ft)	Deposition (Ad) (ft ²)	Recession (Ar) (ft ²)	
27	10/73 - 6/9/78	0.62	0	217.6	0	0	10.0	0	56.2	14.0	0	149.0	0	-310.4
28	10/73 - 6/9/78	0	0.99	0	245.8	3.0	0	2.9	0	0	4.0	0	14.5	+257.4
29	10/6/73 - 6/6/78	0	1.96	0	141.2	0	7.0	0	132.6	5.0	0	22.3	0	+251.5
30	10/73 - 6/6/78	0	1.46	7.7	0	0	0	0	0	0	17.0	0	71.3	+ 63.6
31	10/73 - 6/6/78	0	0.83	0	36.0	0	4.0	0	2.4	0	3.0	0	5.8	+ 44.2
32	10/73 - 6/6/78	0	1.26	0	107.0	0	4.0	0	14.5	0	3.0	0	7.2	+128.7
32a	12/11/74 - 6/2/78	0	1.12	0	146.1	0.0	0.0	19.5	0	0	9.0	0	5.8	+132.4
32b	10/3/74 - 6/2/78	1.48	0	22.6	0	1.5	0	59.6	0	0	10.0	0	54.2	- 28.0
33	10/15/73 - 6/2/78	0	1.90	0	141.0	0.0	0.0	1.30	0	0	2.0	0	29.7	+169.4
34	10/73 - 6/1/78	0	0.77	0	95.2	0	6.0	0	53.0	0	2.0	0	6.6	+154.8
34a	10/4/74 - 6/1/78	0	0.06	0	396.5	0	2.0	0	5.0	0	6.0	0	26.9	+428.4
35	10/73 - 6/1/78	0	0.79	0	120.0	0	3.0	0	2.1	0	4.0	0	17.1	+139.2
36	10/73 - 5/25/78	0	1.85	0	299.8									+299.8

Table 2.-- Net changes in the Redwood Creek stream channel at cross sections from initiation of observation to the summer of 1978.

Cross Section Number	Interval of Measurements	Change in Altitude of Thalweg (Ft) Aggradation Scour		CHANGE IN CROSS-SECTIONAL AREA										Net Change in Area (ft ²)
				Associated With Changing Stream Bed Altitude		At Left Bank				At Right Bank				
				Aggradation	Scour	CHANGE IN WIDTH		CHANGE IN AREA		CHANGE IN WIDTH		CHANGE IN AREA		
						Deposition	Recession	Deposition	Recession	Deposition	Recession	Deposition	Recession	
(Aa) (ft ²)	(As) (ft ²)	(Wd) (ft)	(Wr) (ft)	(Ad) (ft ²)	(Ar) (ft ²)	(Wd) (ft)	(Wr) (ft)	(Ad) (ft ²)	(Ar) (ft ²)					
37	10/73 - 5/25/78	0	3.50	0	229.9	0	0	0	0	0	2.0	0	7.2	+237.1
38	10/7/73 - 5/30/78	0	2.61	0	122.0	Bridge site								+122.0
39	10/73 - 5/30/78	0	0.73	0	82.6	0	0	0	8.6	0	0	0	0	+ 91.2
40	10/17/73 - 5/30/78	0	1.94	0	208.2	0	2.0	0	4.7	0	0	15.4	0	+197.5
41	10/17/73 - 5/24/78	0	3.15	0	206.0	0	4.0	0	15.4	0	0	0	0	+221.4
42	10/17/73 - 7/10/78	0	0.80	0	183.3	2.0	0	15.7	0	0	1.0	0	28.7	+196.3
43	10/8/74 - 6/9/78	0	0.47	0	5.5	0	0	0	0	0	2.0	11.6	0	- 6.1
44	10/02/74 - 8/03/78	0	1.15	0	9.3	0	2.0	0	14.8	1.0	0	5.8	0	+ 18.3
45	10/02/74 - 8/03/78	0.78	0	5.0	0	1.0	0	0	7.9	0	0	9.5	0	- 6.6

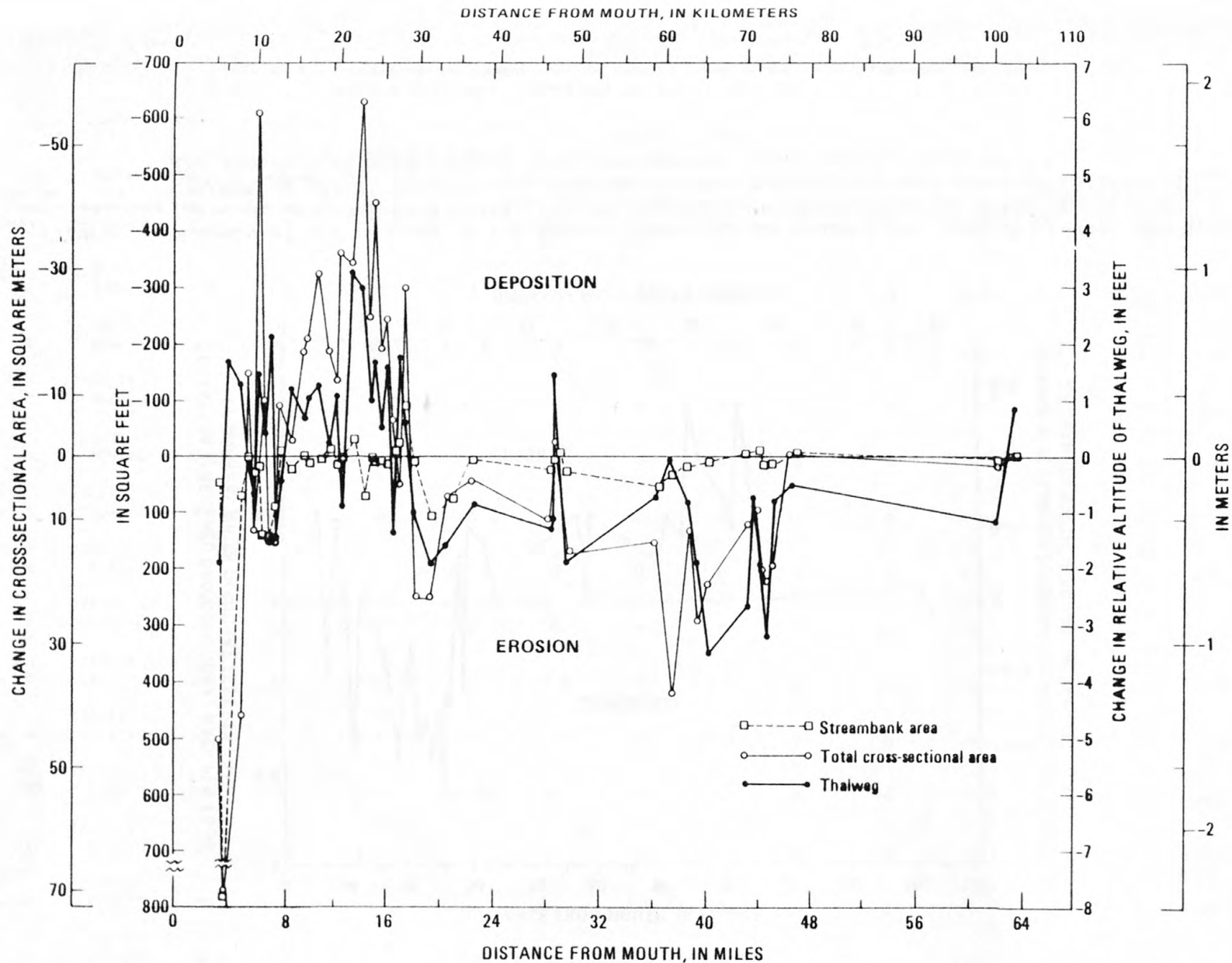


Figure 6.--Summary of net changes in the Redwood Creek stream channel at cross sections from initiation of observation to the summer of 1978. The lines connecting actual observation points have no physical meaning; these lines are shown to assist the reader in categorizing the three types of data portrayed.

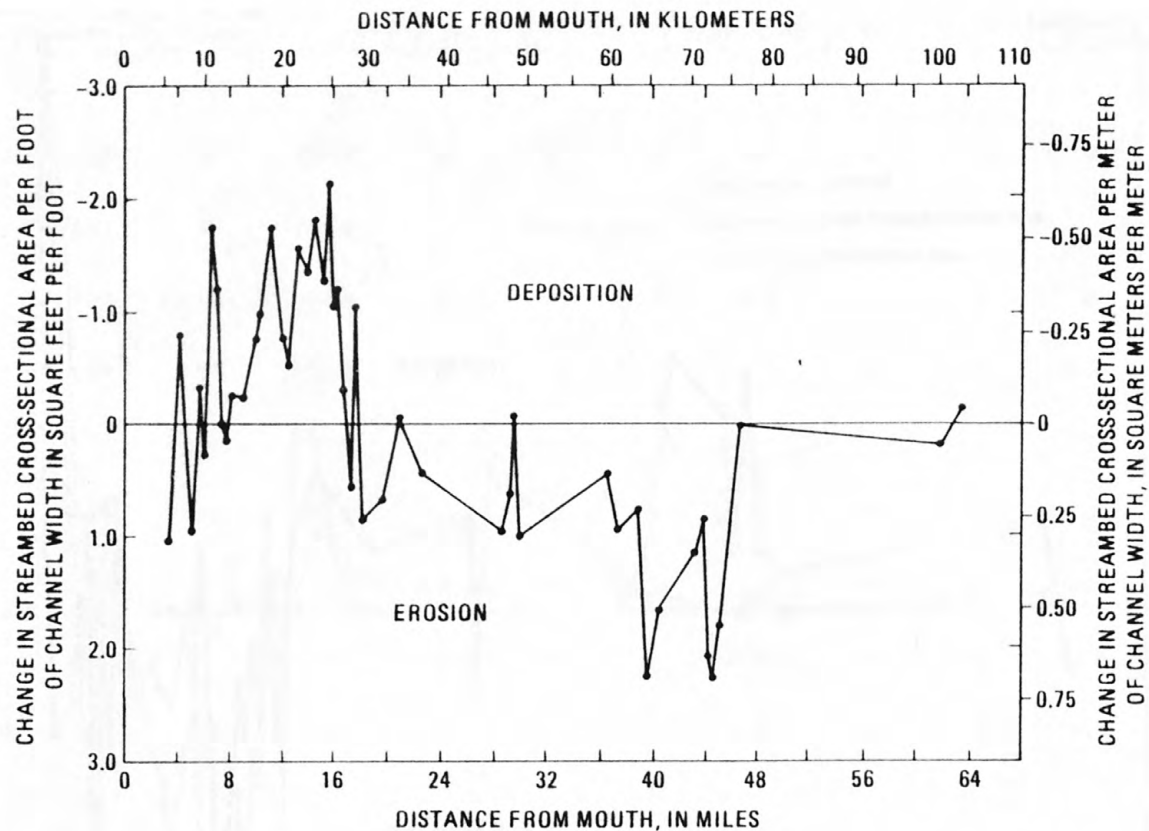


Figure 7.--Summary of net changes in the Redwood Creek stream channel per foot of channel width at cross sections from initiation of observation to the summer of 1978. The lines connecting actual observations have no physical meaning but are shown to indicate the sequence of observations along the Redwood Creek stream channel.

Table 3.--Summary of net changes in the Redwood Creek stream channel at cross sections between the summer of 1975 and the summer of 1976.

Cross Section Number	Interval of Measurements	Change in Altitude of Thalweg (Ft) Aggradation Scour		CHANGE IN CROSS-SECTIONAL AREA										Net Change in Area (ft ²)	
				Associated With Changing Stream Bed Altitude		At Left Bank				At Right Bank					
				Aggradation	Scour	CHANGE IN WIDTH		CHANGE IN AREA		CHANGE IN WIDTH		CHANGE IN AREA			
						Deposition	Recession	Deposition	Recession	Deposition	Recession	Deposition	Recession		
(Aa) (ft ²)	(Ab) (ft ²)	(Wd) (ft)	(Wr) (ft)	(Ad) (ft ²)	(Ar) (ft ²)	(Wd) (ft)	(Wr) (ft)	(Ad) (ft ²)	(Ar) (ft ²)						
1	7/15/75 - 4/26/76	0	1.8	162.5	0	0	0	0	0	0	0	8.0	0	10.0	-152.5
2	7/18/75 - 8/5/76	3.2	0	0	229.8	0	0	0	0	0	0	23.0	0	280.0	+509.8
3	7/15/75 - 5/4/76	0	1.3	0	139.0	0	0	0	0	0	0	2.0	0	2.5	+141.5
4	7/1/75 - 8/9/76	0.6	0	87.5	0	2.0	0	27.5	0	0	0	0	0	2.5	-112.5
5	7/1/75 - 5/4/76	0.1	0	38.6	0	0	2.1	0	10.2	0	0	5.0	0	27.1	-1.3
6	7/7/75 - 8/10/76	0	0.8	0	171.1	0	0	0	0	0	0	3.0	0	9.5	+180.6
7	7/8/75 - 8/9/76	0	0.5	15.0	0	0	0	0	0	0	3.0	0	3.0	0	-18.0
8	7/13/75 - 8/9/76	0.4	0	1.0	0	3.0	0	2.5	0	2.0	0	0	7.5	0	-11.0
9	7/8/75 - 7/9/75	0	0	100.1	0	1.8	0	23.5	0	0	0	0	0	0	-123.6
10	7/13/75 - 7/10/76	0.9	0	0	21.6	0	0	0	0	0	0	0	0	0	+21.6
11	7/12/75 - 8/11/76	0	3.0	43.0	0	0	0	0	0	0	0	0	0	0	-43.0
12	7/12/75 - 8/11/76	0	0.2	0	24.5	0	3.0	0	12.0	0	0	0	0	0.5	+37.0
13	7/10/75 - 8/12/76	0	0.7	0	4.5	0	4.0	0	9.0	2.0 ^{1/}	0	20.0	0	0	-6.5

Table 3.--Summary of net changes in the Redwood Creek stream channel at cross sections between the summer of 1975 and the summer of 1976.

Cross Section Number	Interval of Measurements	Change in Altitude of Thalweg (Ft) Aggradation Scour		CHANGE IN CROSS-SECTIONAL AREA										Net Change in Area(ft ²)	
				Associated With Changing Stream Bed Altitude		At Left Bank				At Right Bank					
				Aggradation	Scour	CHANGE IN WIDTH		CHANGE IN AREA		CHANGE IN WIDTH		CHANGE IN AREA			
						Deposition	Recession	Deposition	Recession	Deposition	Recession	Deposition	Recession		
(Aa) (ft ²)	(As) (ft ²)	(Wd) (ft)	(Wr) (ft)	(Ad) (ft ²)	(Ar) (ft ²)	(Wd) (ft)	(Wr) (ft)	(Ad) (ft ²)	(Ar) (ft ²)						
14	7/10/75 - 8/12/76	0.9	0	52.4	0	0	0	0	0	0	0	0	0	0	-52.4
15	7/13/76 - 7/9/75	0.8	0	145.2	0	0	1.0	0	2.5	0	0	0	0	0	-142.7
16	7/15/75 - 7/14/76	0.5	0	1.3	0	0	8.0	0	13.0	0	0	0	0	0	+11.7
17	7/9/75 - 7/12/76	0	1.1	0	14.0	0	0	0	4.4	0	0	0	0	0	+18.4
18	7/3/75 - 7/21/76	0	0	40.8	0	0	0	0	0	8.0	0	14.2 ^{1/}	0	0	-55.0
19	7/3/75 - 7/16/76	2.7	0	107.8	0	0	0	0	0	0	3.0	0	7.0	0	-100.8
20	7/17/75 - 7/15/76	1.6	0	82.0	0	0	6.0	0	19.2	0	0	0	0	0	-62.8
21	7/16/75 - 8/3/76	.3	0	146.0	0	0	2.2	0	10.1	0	3.6	0	12.6	0	-123.3
22	7/16/75 - 8/3/76	0.1	0	61.0	0	0	0	0	0	0	4.0	0	10.0	0	-51.0
23	7/17/75 - 7/2/76	0	0.3	156.0	0	0	0	0	0	0	0	0	0	0	-156.0
24	7/17/75 - 7/28/76	0	1.4	0	294.0	0	7.0 ^{1/}	0	26.0	0	14	0	47.5	0	+367.5
25	7/16/75 - 7/28/76	0	0.6	48.0	0	0	0	0	0	0	0	0	0	0	-48.0
26	7/18/75 - 8/16/76	0	1.3	0	37.5	0	7.0	0	37.5	3.0 ^{1/}	0	17.6	0	0	+57.4

Table 3.--Summary of net changes in the Redwood Creek stream channel at cross sections between the summer of 1975 and the summer of 1976.

Cross Section Number	Interval of Measurements	Change in Altitude of Thalweg (Ft) Aggradation Scour		CHANGE IN CROSS-SECTIONAL AREA											Net Change in Area(ft ²)
				Associated With Changing Stream Bed Altitude		At Left Bank				At Right Bank					
				Aggradation (Aa) (ft ²)	Scour (As)(ft ²)	CHANGE IN WIDTH		CHANGE IN AREA		CHANGE IN WIDTH		CHANGE IN AREA			
						Deposition (Wd)(ft)	Recession (Wr)(ft)	Deposition (Ad)(ft ²)	Recession (Ar)(ft ²)	Deposition (Wd)(ft)	Recession (Wr)(ft)	Deposition (Ad)(ft ²)	Recession (Ar)(ft ²)		
27	7/18/75 - 9/17/76	0.1	0	0	61.5	0	0	0	0	5.0	0	30.0	0	+31.5	
28	7/18/75 - 8/16/76	0	0	0	107.2	0	0	0	0	0	0	0	0	+107.2	
29	7/20/75 - 8/13/76	0	1.3	0	88.0	0	0	0	0	0	3.0	0	5.0	+93.0	
30	7/20/75 - 8/13/76	0	1.8	0	75.0	0	3.0	0	10.0	0	4.0	0	10.0	+95.0	
31	7/21/75 - 8/17/76	0	1.1	0	59.5	0	4.0	0	22.5	0	2.0	0	3.0	+85.0	
32	7/20/75 - 6/24/76	0.6	0	4.0	0	0	0	0	0	0	0	0	0	-4.0	
32A	7/22/75 - 6/16/76	0.1	0	0	45.0	0	0	0	0	0	0	0	0	+45.0	
32B	7/21/75 - 10/1/76	0	3.9	0	223.0	0	4.0	0	15.0	0	2.0	0	10.0	+248.0	
33	7/22/75 - 4/21/76	0.7	0	0	16.2	0	0	0	0	3.0	0	34.0	0	-17.8	
34	7/22/75 - 10/1/76	0	0.4	46.5	0	0	0	0	0	0	1.0	0	2.0	-44.5	
34A	7/22/75 - 5/14/76	0	0	0	6.0	0	0	0	0	0	0	0	0	+6.0	
35	7/22/75 - 8/19/76	0	1.9	0	5.5	0	0	0	0	0	3.0	0	18.0	+23.5	
36	7/22/75 - 5/26/76	0	2.3	0	138.7	0	0	0	0	0	0	0	0	+138.7	

Table 3.--Summary of net changes in the Redwood Creek stream channel at cross sections between the summer of 1975 and the summer of 1976.

Cross Section Number	Interval of Measurements	Change in Altitude of Thalweg (Ft) Aggradation Scour		CHANGE IN CROSS-SECTIONAL AREA										Net Change in Area(ft ²)
				Associated With Changing Stream Bed Altitude		At Left Bank				At Right Bank				
				Aggradation	Scour	CHANGE IN WIDTH		CHANGE IN AREA		CHANGE IN WIDTH		CHANGE IN AREA		
						Deposition	Recession	Deposition	Recession	Deposition	Recession	Deposition	Recession	
(Aa) (ft ²)	(As)(ft ²)	(Wd)(ft)	(Wr)(ft)	(Ad)(ft ²)	(Ar)(ft ²)	(Wd)(ft)	(Wr)(ft)	(Ad)(ft ²)	(Ar)(ft ²)					
37	7/22/75 - 8/19/76	0	0.4	0	26.0	0	0	0	0	0	4.0	0	7.5	+33.5
38	7/22/75 - 8/20/76	0	0.8	0	16.5	0	0	0	0	0	0	0	0	+16.5
39	7/23/75 - 8/20/76	0	0.6	0	59.0	0	4.0	0	21.0	0	0	0	0	+80.0
40	7/20/75 - 5/19/76	0	0.3	0	29.0	0	2.0	0	10.0	0	0	0	0	+39.0
41	7/20/75 - 5/19/76	0	0.2	0	27.5	2.0 ^{1/}	0	5.0	0	3.0	0	18.0	0	+4.5
42	7/20/75 - 6/16/76	0.4	0	0	43.0	2.0	0	2.0	0	0	0	0	0	+41.0
43	8/8/75 - 6/25/76	0	0.7	0	42.5	0	0	0	0	0	0	0	0	+42.5
44	7/26/75 - 8/23/76	0	1.1	0	8.0	0	1.0	0	4.2	2.0	0	12.8	0	-0.6
45	7/26/75 - 8/23/76	0.3	0	2.4	0	0	2.0	0	7.2	0	0	0	1.5	+6.3

^{1/} Result of colluvium

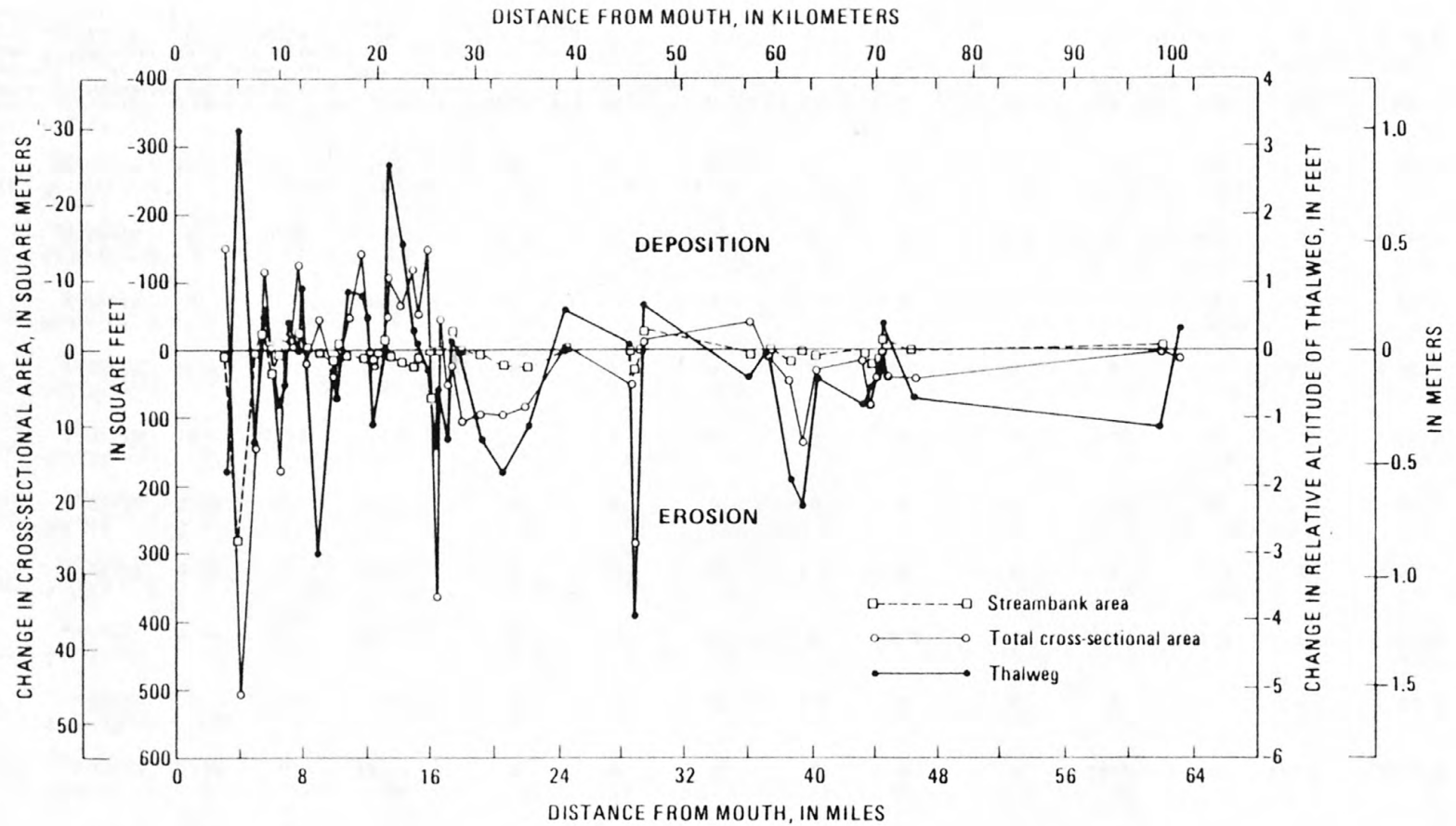


Figure 8.--Summary of net changes in the Redwood Creek stream channel at cross sections between the summer of 1975 and the summer of 1976. The lines connecting observation points have no physical meaning; these lines are shown to assist the reader in categorizing the three types of data portrayed.

Table 4.--Summary of net changes in the Redwood Creek stream channel at cross sections between the summer of 1977 and the summer of 1978.

Cross Section Number	Interval of Measurements	Change in Altitude of Thalweg (Ft) Aggradation Scour		CHANGE IN CROSS-SECTIONAL AREA										Net Change in Area (ft ²)	
				Associated With Changing Stream Bed Altitude		At Left Bank				At Right Bank					
				Aggradation	Scour	CHANGE IN WIDTH		CHANGE IN AREA		CHANGE IN WIDTH		CHANGE IN AREA			
						Deposition	Recession	Deposition	Recession	Deposition	Recession	Deposition	Recession		
(Aa) (ft ²)	(As) (ft ²)	(Wd) (ft)	(Wr) (ft)	(Ad) (ft ²)	(Ar) (ft ²)	(Wd) (ft)	(Wr) (ft)	(Ad) (ft ²)	(Ar) (ft ²)						
1	7/27/77 - 7/7/78	0.34	0	0	135.9	0	0	0	0	0	0	0	20.5	0	+115.4
2	7/28/77 - 6/23/78	1.38	0	177.3	0	0	0	0	0	0	24.0	0	330.2	0	+152.9
3	9/10/77 - 6/23/78	0	0.54	6.0	0	0	0	1.0	0	0	0	0	15.7	0	- 22.7
4	6/7/77 - 7/5/78	0.45	0	191.0	0	0	0	0	6.9	0	0	0	3.5	0	-187.6
5	6/7/77 - 6/29/78	0.02	0	120.9	0	0	0	1.4	0	0	0	0	2.7	0	-125.0
6	8/2/77 - 6/27/78	0.69	0	144.7	0	0	0	0	0	0	0	0	0	8.3	-136.4
7	8/2/77 - 6/27/78	0	1.12	22.8	0	0	0	0	0	0	0	4.0	0	5.9	- 16.9
8	8/2/77 - 6/27/78	0.38	0	62.9	0	0	0	0	4.8	0	0	0	0	3.9	- 54.2
9	8/3/77 - 6/27/78	0	1.15	99.8	0	0	0	0.4	0	0	0	0	0	0.7	- 99.5
10	8/3/77 - 6/26/78	0	0.09	0	23.2	0	0	0	0	0	2.0	0	6.7	0	+ 16.5
11	8/4/77 - 6/26/78	1.22	0	31.9	0	0	0	0	0	0	0	0	0	5.4	- 26.5
12	8/4/77 - 6/21/78	0.08	0	22.0	0	0	0	2.2	0	0	0	0	5.4	0	- 29.6
13	8/5/77 - 6/21/78	0	0.39	0	14.1	0	0	0	11.9	0	0	0	5.1	0	+ 20.9

Table 4.--Summary of net changes in the Redwood Creek stream channel at cross sections between the summer of 1977 and the summer of 1978.

Cross Section Number	Interval of Measurements	Change in Altitude of Thalweg (Ft) Aggradation Scour		CHANGE IN CROSS-SECTIONAL AREA										Net Change in Area (ft ²)
				Associated With Changing Stream Bed Altitude		At Left Bank				At Right Bank				
				Aggradation	Scour	CHANGE IN WIDTH		CHANGE IN AREA		CHANGE IN WIDTH		CHANGE IN AREA		
						Deposition	Recession	Deposition	Recession	Deposition	Recession	Deposition	Recession	
(Aa) (ft ²)	(As) (ft ²)	(Wd) (ft)	(Wr) (ft)	(Ad) (ft ²)	(Ar) (ft ²)	(Wd) (ft)	(Wr) (ft)	(Ad) (ft ²)	(Ar) (ft ²)					
27	7/27/77 - 6/9/78	2.05	0	0	0	0	0	0	35.4	0	0	0	0	+35.4
28	7/27/77 - 6/9/78	0	0.18	0	145.2	0	0	30.5	0	0	0	4.0	0	+110.7
29	4/26/77 - 6/6/78	0	1.16	13.9	0	0	0	0	42.9	0	0	0	20.3	+49.3
30	7/26/77 - 6/6/78	0	0.84	0	1.6	0	0	0	6.2	0	0	15.4	0	- 7.6
31	7/26/77 - 6/6/78	0.03	0	0	13.5	0	0	0.9	0	0	0	0.4	0	+12.2
32	7/26/77 - 6/6/78	0	0.14	0	27.2	0	0	0	3.5	0	0	3.0	0	+27.7
32a	7/18/77 - 6/2/78	0	0.41	0	101.8	0	0	0.1	0	0	0	0.2	0	+101.5
32b	7/18/78 - 6/2/78	1.68	0	0	100.8	0	0	0	10.0	0	0	0.7	0	+110.1
33	7/19/77 - 6/2/78	0	1.31	0	77.8	0	0	19.9	0	0	0	0	25.1	+83.0
34	7/19/77 - 6/1/78	0	1.14	10.2	0	0	0	5.3	0	0	0	0	0	- 15.5
34a	7/19/77 - 6/1/78	0	0.38	0	304.5	0	0	0	2.4	0	0	18.1	0	+288.8
35	7/20/77 - 6/1/78	0	1.02	0	116.2	0	0	0	18.2	0	0	0	1.1	+135.5
36	7/20/77 - 5/25/78	0	1.38	0	63.1	0	0	0	8.6	0	0	0	0	+71.7

Table 4.--Summary of net changes in the Redwood Creek stream channel at cross sections between the summer of 1977 and the summer of 1978.

Cross Section Number	Interval of Measurements	Change in Altitude of Thalweg (Ft) Aggradation Scour		CHANGE IN CROSS-SECTIONAL AREA										Net Change In Area (ft ²)	
				Associated With Changing Stream Bed Altitude		At Left Bank				At Right Bank					
				Aggradation	Scour	CHANGE IN WIDTH		CHANGE IN AREA		CHANGE IN WIDTH		CHANGE IN AREA			
						Deposition	Recession	Deposition	Recession	Deposition	Recession	Deposition	Recession		
(Aa) (ft ²)	(As) (ft ²)	(Wd) (ft)	(Wr) (ft)	(Ad) (ft ²)	(Ar) (ft ²)	(Wd) (ft)	(Wr) (ft)	(Ad) (ft ²)	(Ar) (ft ²)						
37	7/20/77 - 5/25/78	0	1.16	0	23.4	1.0	0	17.4	0	0	0	0	0	4.6	+10.6
38	7/21/77 - 5/30/78	0	0.73	0	237.8	0	0	0	0	0	0	0	0	0	+237.8
39	7/21/77 - 5/30/78	0.44	0	0	23.6	0	0	0	6.7	0	0	3.0	0	0	+27.3
40	7/21/77 - 5/30/78	0	0.32	0	13.4	0	0	3.2	0	0	0	0	0	7.0	+17.2
41	7/21/77 - 5/24/78	0	0.75	0	26.9	1.0	0	0	0	0	0	0	0	0	+26.9
42	7/22/77 - 7/10/78	0	0.19	0	35.2	0	0	0	2.2	0	0	1.7	0	0	+35.7
43	7/22/77 - 7/10/78	0	0	0	81.8	0	0	0	0	0	0	0	0	6.1	+87.9
44	4/21/77 - 8/3/78	0.69	0	4.0		0	1.5	0	0.16	0	0	0	0	3.3	-0.5
45	7/25/77 - 8/3/78	0	0.19	0	5.0	0	0	1.2	0	0	0	1.2	0	0	+2.6

27

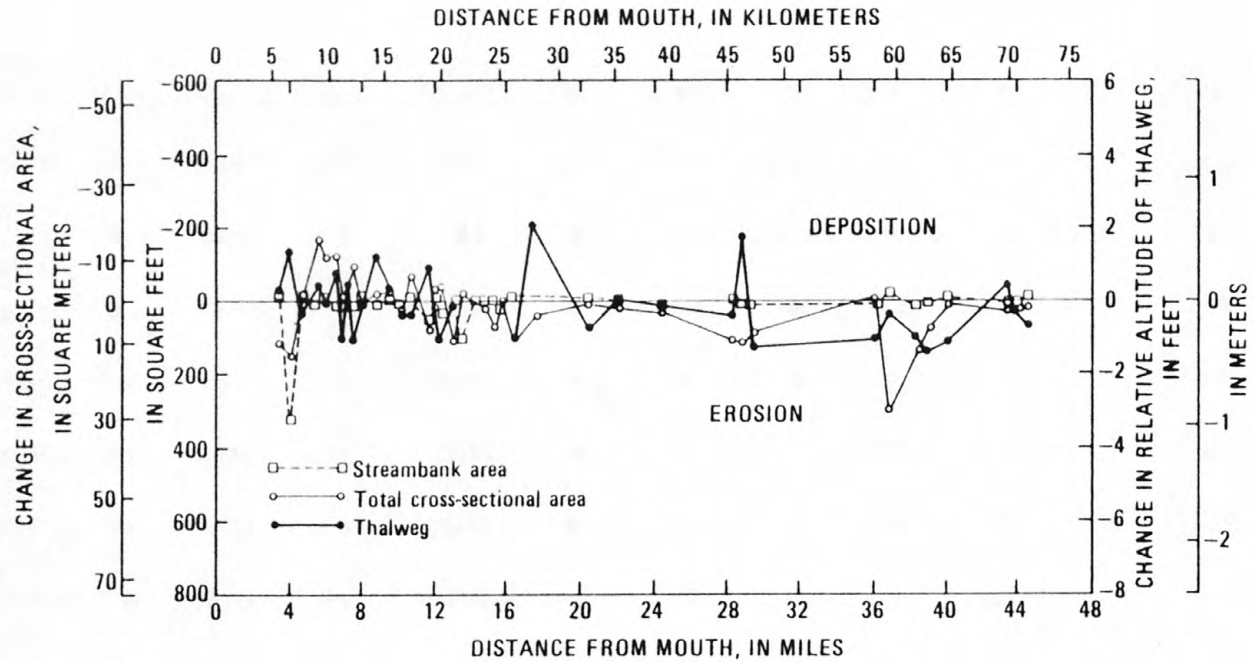


Figure 9.--Summary of net changes in the Redwood Creek stream channel at cross sections between the summer of 1977 and the summer of 1978. The lines connecting actual observation points have no physical meaning; these lines are shown to assist the reader in categorizing the three types of data portrayed.

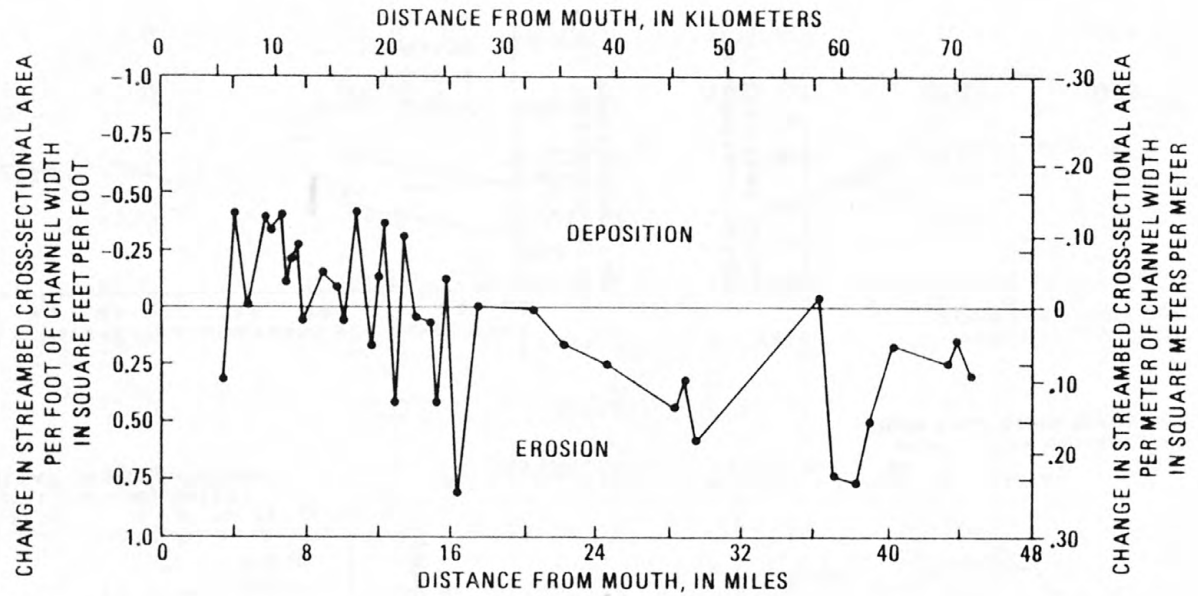


Figure 10.--Summary of net changes in the Redwood Creek stream channel, per foot of width between the summer of 1977 and the summer of 1978. The lines connecting actual observations have no physical meaning but are shown to indicate the sequence of observations along the Redwood Creek stream channel.

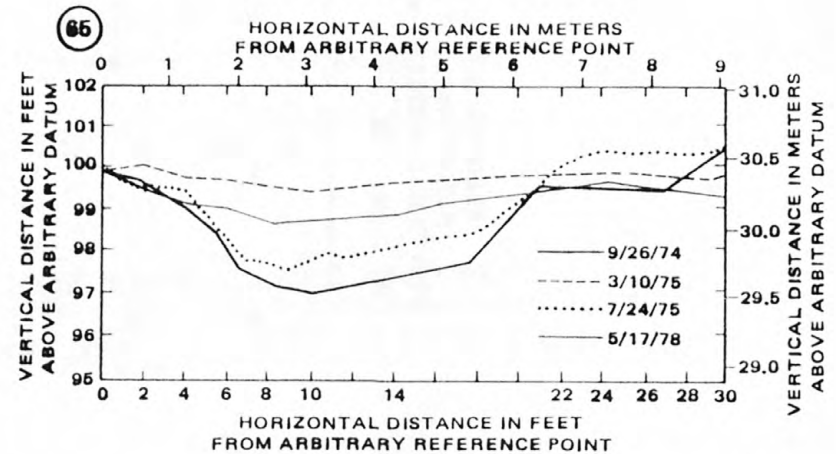
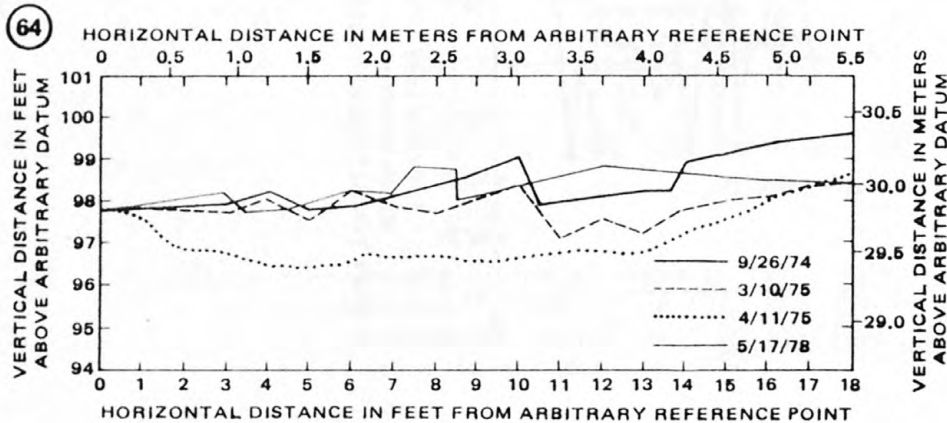
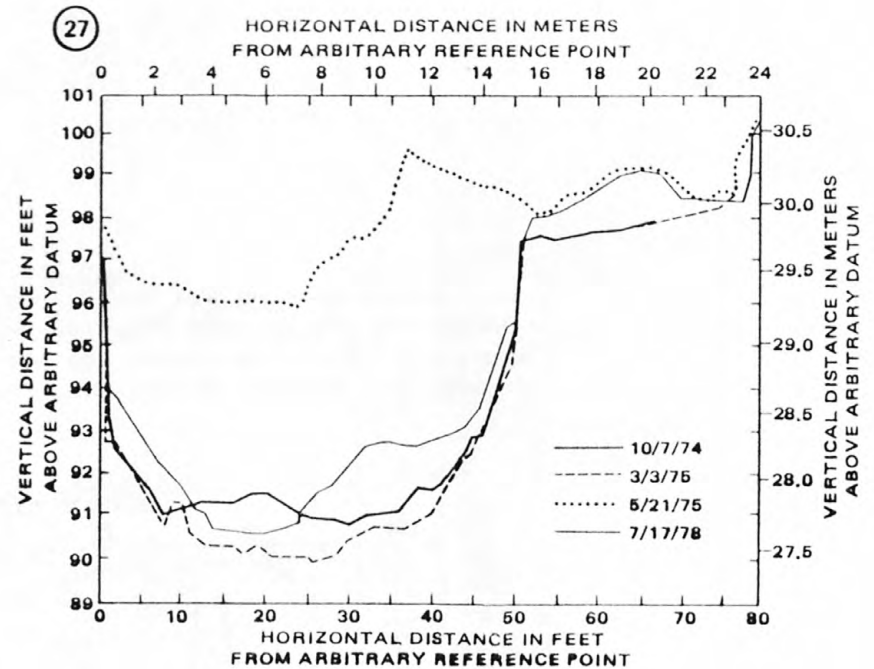
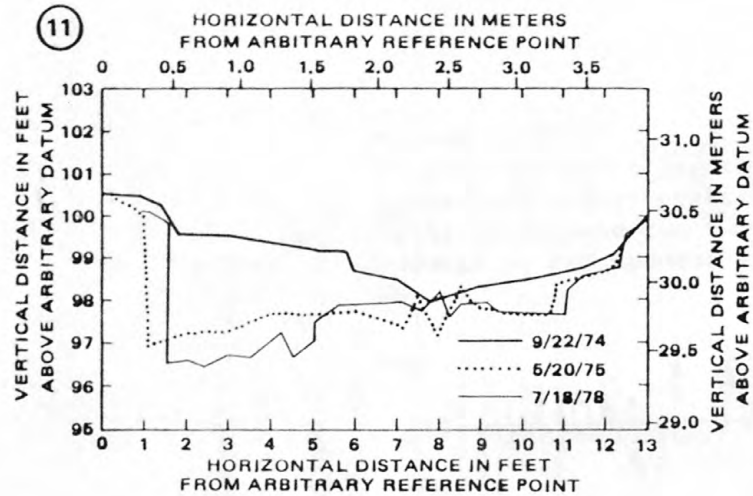


Figure 11.--Downstream view of vertically exaggerated Redwood Creek tributary cross sections 11, 27, 64, and 65. Data for changes between 1974 and 1975 were published by Nolan and others, 1976.

Table 5.-- Summary of net changes at channel cross sections on selected tributaries to Redwood Creek.

Section	Drainage Area (mi ²)	Bank to Bank Width (Ft)	Bank-Full Width (Ft)	Measurement Interval		Change in Altitude of Thalweg (Ft)		Change in Cross Section Area (Ft ²)	
				From	To	Aggradation (-)	Scour (+)	Aggradation (-)	Scour (+)
1	1.62	86.0	92.0	3/23/76	6/20/78	0	3.3	0	181.8
2	4.50	27.0	36.0	3/23/76	6/20/78	0	0.4	0	4.8
3	11.15	50.0	56.5	3/25/76	7/24/78	0.0	0.0	0	2.8
4	12.69	55.0	60.0	10/02/75	7/24/78	2.2	0	112.4	0
5	13.05	87.0	91.0	10/02/75	7/24/78	0.2	0	0	8.0
6	16.76	66.0	81.0	10/24/75	7/10/78	0	0.8	0	39.6
7	7.78	46.0	52.0	1/12/77	7/06/78	0	1.6	0	96.2
8	2.23	52.0	59.0	11/02/76	7/18/78	0	2.2	0	20.4
9	4.41	72.0	76.0	11/02/76	7/18/78	0	0.3	0	2.4
10	4.94	65.5	72.0	10/29/76	7/18/78	1.0	0	0.8	0
11	0.52	11.0	12.0	5/20/75	7/18/78	0	0.6	0	1.2
11a	0.50	22.0	23.0	3/29/76	7/18/78	0	0.2	0	3.8
11b	0.53	6.4	6.8	2/25/76	7/18/78	0	0.4	0	0.7
12	7.00	41.0	42.0	12/12/76	7/06/78	0.4	0	14.2	0
13	2.61	35.0	41.0	10/22/76	7/06/78	0	0.2	6.0	0
14	2.78	29.0	33.0	10/22/76	7/06/78	0.2	0	9.8	0
15	0.04	13.0	14.0	3/11/76	7/12/78	0.2	0	0	1.6

Table 5.-- Summary of net changes at channel cross sections on selected tributaries to Redwood Creek.

Section	Drainage Area (mi ²)	Bank to Bank Width (Ft)	Bank-Full Width (Ft)	Measurement Interval		Change in Altitude of Thalweg (Ft)		Change in Cross Section Area (Ft ²)	
				From	To	Aggradation (-)	Scour (+)	Aggradation (-)	Scour (+)
16	0.07	16.0	18.0	3/11/76	7/12/78	0.4	0	0.9	0
16a	0.04	4.0	11.0	3/11/76	5/27/77	0.0	0.0	0	0.9
17	0.12	9.0	9.0	3/12/76	5/27/77	0.0	0.0	0	0.2
18	0.05	3.0	7.0	3/11/76	7/12/78	0	0.4	0	1.9
19	0.10	7.0	7.0	3/11/76	7/12/78	0	0.2	0	1.3
20	0.14	7.0	7.0	3/12/76	7/12/78	0	0.3	0	1.0
21	0.68	26.0	30.0	11/18/76	6/12/78	0.0	0.0	0	15.6
22	0.69	31.0	32.0	11/18/76	6/12/78	0.2	0	0	2.4
23	0.04	6.5	7.0	3/11/76	7/13/78	0	0.1	0	1.2
24	8.72	36.0	44.0	11/02/76	7/17/78	0	0.2	0	2.4
25	10.64	- <u>1</u> /	- <u>1</u> /	11/01/76	7/17/78	0	0.6	0	80.2
26	11.34	41.0	44.0	3/12/76	7/17/78	0	1.9	0	149.4
27	11.60	78.0	79.0	5/21/75	7/17/78	0	5.3	0	257.6
28	0.57	22.0	26.0	10/26/76	7/05/78	0	0.1	0	0.2
29	1.88	38.0	43.0	5/27/75	6/28/78	0.5	0	0	0.8
30	2.04	36.0	40.0	5/27/75	6/28/78	0.2	0	0.6	0
32	2.64	24.0	27.0	5/27/75	6/28/78	0	0.3	0	2.0
33	2.95	27.0	30.0	8/22/75	5/24/77	1.5	0	16.5	0

Table 5.-- Summary of net changes at channel cross sections on selected tributaries to Redwood Creek.

Section	Drainage Area (mi ²)	Bank to Bank Width (Ft)	Bank-Full Width (Ft)	Measurement Interval		Change in Altitude of Thalweg (Ft)		Change in Cross Section Area (Ft ²)	
				From	To	Aggradation (-)	Scour (+)	Aggradation (-)	Scour (+)
34a	2.96	35.0	45.0	9/30/75	6/10/78	0	0.6	30.5	0
35	5.88	31.0	32.0	11/02/76	6/21/78	0	0.1	3.4	0
36 <u>2/</u>	6.85	32.0	- <u>1/</u>	5/12/75	6/21/78	0.2	0	2.6	0
37	6.86	70.0	78.0	3/12/76	6/21/78	0	0.9	0.2	0
38	0.33	7.0	8.0	11/15/76	7/26/78	0.2	0	0.8	0
39	3.09	35.0	36.0	5/07/75	8/02/78	0.5	0	0	12.3
40	0.20	- <u>1/</u>	- <u>1/</u>	10/27/76	7/05/78	0	0.2	0	3.9
41	0.30	24.0	31.0	10/27/76	7/07/78	0.0	0.0	5.3	0
42	0.67	16.0	20.0	5/08/75	6/26/78	0.4	0	11.2	0
43	0.67	15.0	- <u>1/</u>	5/08/75	6/26/78	0	0.3	0	0.1
44	0.92	12.0	18.0	5/08/75	6/26/78	0.1	0	13.3	0
46	1.23	16.0	25.0	5/08/75	6/26/78	0.2	0	0	9.1
47 <u>3/</u>	1.36	- <u>1/</u>	- <u>1/</u>	5/05/77	6/22/78	0.0	0.0	4.8	0
48	1.37	27.0	34.0	5/07/75	6/22/78	0	1.6	0	30.0
49	0.18	12.0	- <u>1/</u>	11/15/76	7/26/78	0.0	0.0	0.8	0
50	1.06	20.0	27.0	5/12/76	7/25/78	0.0	0.0	0	1.6
50a	1.06	25.0	33.0	11/17/76	7/25/78	0.0	0.0	0	0.7
51	0.05	9.0	12.0	11/16/76	7/25/78	0	0.3	0	13.3

Table 5.-- Summary of net changes at channel cross sections on selected tributaries to Redwood Creek.

Section	Drainage Area (mi ²)	Bank to Bank Width (Ft)	Bank-Full Width (Ft)	Measurement Interval		Change in Altitude of Thalweg (Ft)		Change in Cross Section Area (Ft ²)	
				From	To	Aggradation (-)	Scour (+)	Aggradation (-)	Scour (+)
52	0.66	12.0	12.0	3/16/76	7/25/78	0.3	0	0.6	0
53	0.69	15.0	- 1/	5/12/76	7/25/78	0	0.4	0	1.6
54	0.52	16.0	- 1/	2/11/76	7/25/78	0	0.1	0	0.3
54a	0.38	- 1/	- 1/	2/11/76	7/25/78	0.1	0	0	2.7
55	0.52	17.5	18.0	2/11/76	7/25/78	0.0	0.0	0	0.4
56	2.48	30.0	37.0	6/05/75	7/21/78	0	0.2	0	11.5
57	0.20	10.0	10.0	3/18/76	7/21/78	0.0	0.0	0.2	0
58	0.27	8.0	11.0	2/11/76	7/21/78	0	0.1	1.0	0
58a	0.27	8.0	13.0	3/18/76	7/21/78	0.2	0	0	0.1
59	3.73	18.0	25.0	6/05/75	6/23/78	0	0.5	0	1.8
60	0.19	4.0	4.5	5/18/76	6/23/78	0	0.1	0.0	0.0
61	0.06	12.0	- 1/	1/15/76	5/26/78	0.0	0.0	0	0.1
62	0.20	7.0	10.0	3/16/76	5/17/78	0.3	0	0.3	0
63	0.24	11.0	12.0	3/16/76	5/17/78	0	0.1	1.4	0
64	0.52	- 1/	- 1/	4/11/75	5/17/78				
65	0.58	27.0	27.0	7/24/75	5/17/78	0	0.8	0	13.6
66	0.58	8.0	12.0	9/26/74	5/17/78	0.9	0	30.6	0
67	3.60	37.0	49.0	5/15/75	5/23/78	0.0	0.0	0	1.2

Table 5.-- Summary of net changes at channel cross sections on selected tributaries to Redwood Creek.

Section	Drainage Area (mi ²)	Bank to Bank Width (Ft)	Bank-Full Width (Ft)	Measurement Interval		Change in Altitude of Thalweg (Ft)		Change in Cross Section Area (Ft ²)	
				From	To	Aggradation (-)	Scour (+)	Aggradation (-)	Scour (+)
68	3.78	88.0	106.0	8/28/74	5/23/78	0	5.7	0	263.6
69	3.96	29.0	30.0	5/15/75	5/23/78	0	0.4	0	15.6
70	3.97	67.0	83.0	5/15/75	5/23/78	0	0.2	0.6	0
71	0.44	14.0	16.0	3/10/76	5/23/78	0.0	0.0	0	2.1
72	0.92	20.0	23.0	3/10/76	5/26/78	0.9	0	4.7	0
73 ^{4/}	1.69	45.0	- ^{1/}	11/13/75	5/26/78	0.0	0.0	0	0.8
74	3.46	23.0	26.0	5/10/76	6/30/78	0.0	0.0	1.2	0
75	3.55	22.0	23.0	3/10/76	7/19/78	0.0	0.0	0	2.6
76	3.64	15.0	30.0	4/08/76	7/07/78	0.4	0	6.4	0
76a	0.07	2.0	11.0	3/10/76	7/20/78	0.4	0	1.0	0
77	0.12	46.0	48.0	4/08/75	5/22/78	0.8	0	39.0	0
78	0.39	52.0	55.0	4/08/75	5/22/78	0	0.6	0	6.6

^{1/} Lack of distinct banks makes width determination impossible.

^{2/} Was published as section number 35 in Nolan and others, 1976.

^{3/} Channel construction activity performed prior to 1977 survey.

^{4/} Was published as section number 72 in Nolan and others, 1976.

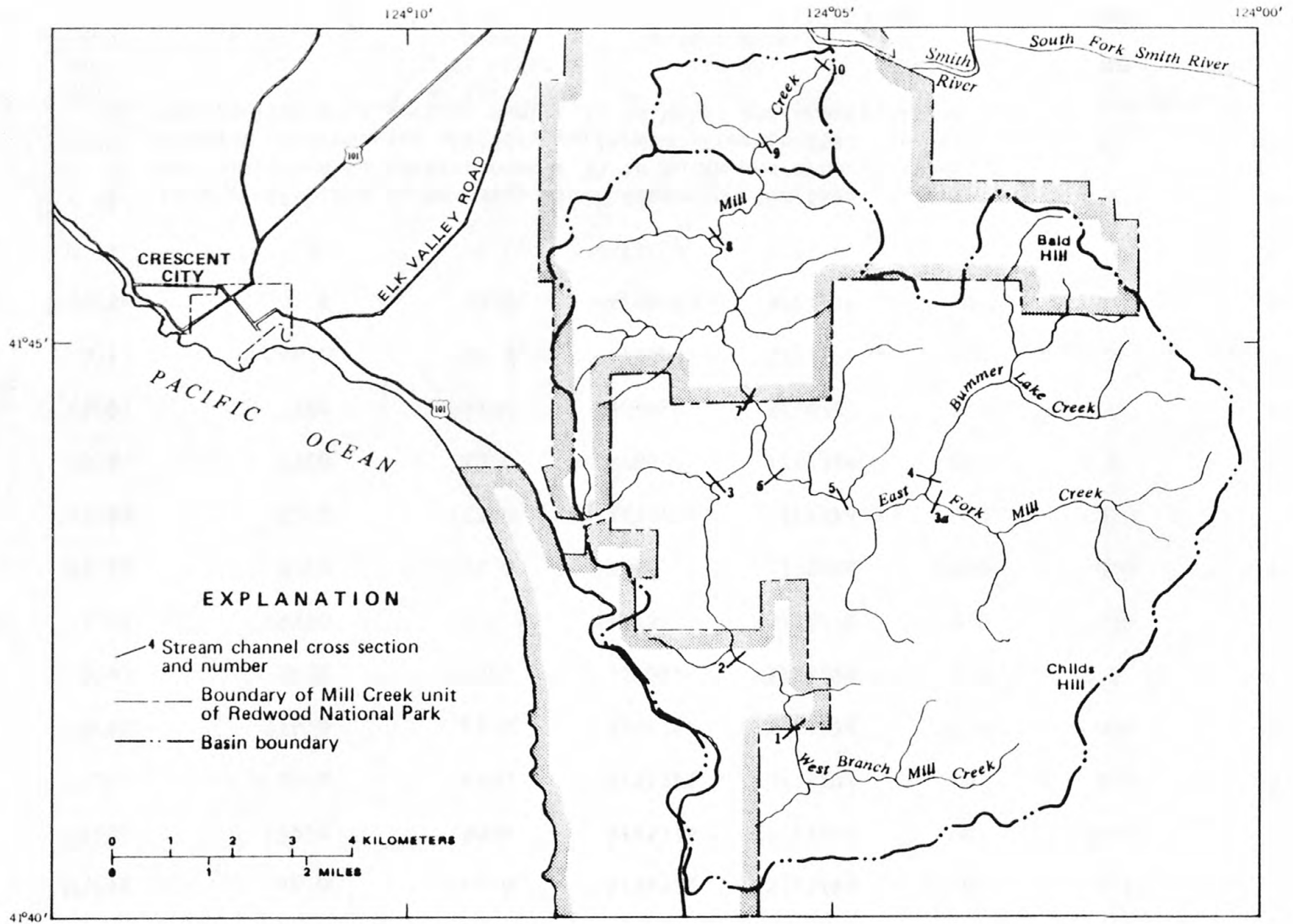


Figure 12.--Location of stream-channel cross sections in the Mill Creek drainage basin.

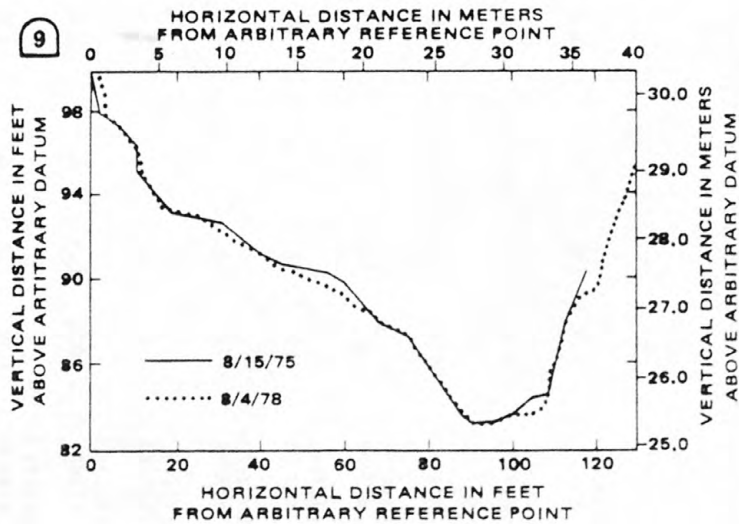
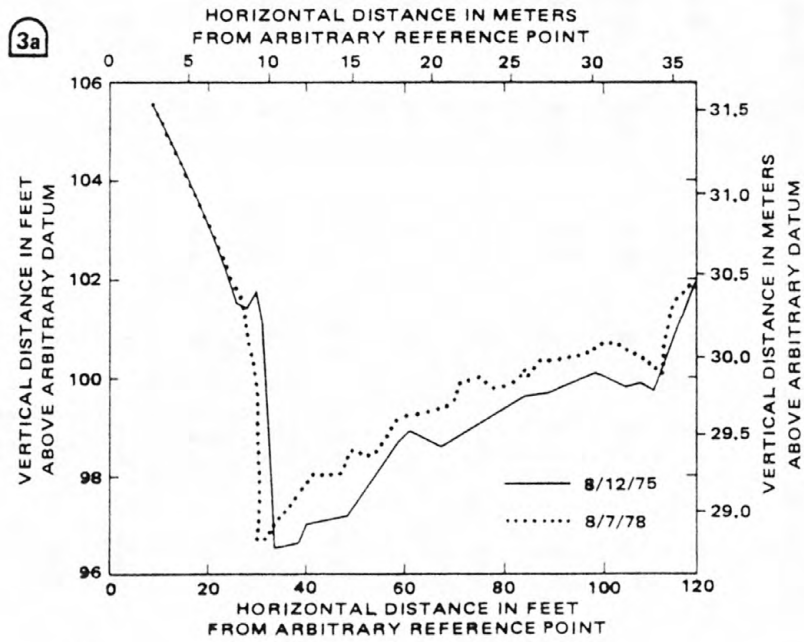
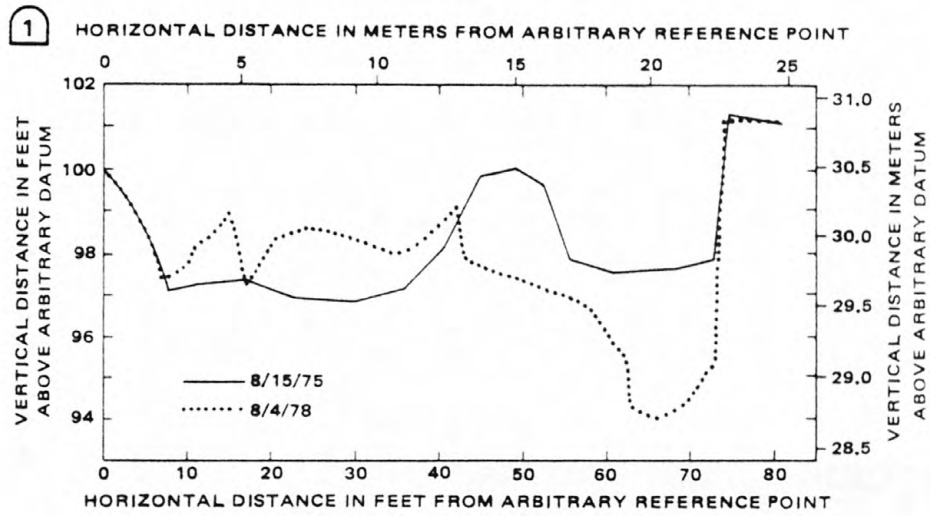


Figure 13.--Downstream view of vertically exaggerated Mill Creek cross sections 1, 3a, and 9.

Table 6.-- Summary of net changes at channel cross sections at selected sites in the Mill Creek drainage basin between August 1975 and August 1978.

Cross Section Number	Interval of Measurements	Change in Altitude of Thalweg (Ft) Aggradation Scour		CHANGE IN CROSS-SECTIONAL AREA											Net Change in Area(ft ²)
				Associated With Changing Stream Bed Altitude		At Left Bank				At Right Bank					
				Aggradation	Scour	CHANGE IN WIDTH		CHANGE IN AREA		CHANGE IN WIDTH		CHANGE IN AREA			
						Deposition	Recession	Deposition	Recession	Deposition	Recession	Deposition	Recession		
(Aa) (ft ²)	(As)(ft ²)	(Wd)(ft)	(Wr)(ft)	(Ad)(ft ²)	(Ar)(ft ²)	(Wd)(ft)	(Wr)(ft)	(Ad)(ft ²)	(Ar)(ft ²)						
1	8/15/75 - 8/4/78	0	2.8	0	38.2	0	1.0	0	0.6	0.0	0.0	0.6	0	+38.2	
2	8/13/75 - 8/14/78	1.3	0	0	8.8	0	12.0	0	72.0	0.0	0.0	0.0	0.0	+80.8	
3	8/15/75 - 8/7/78	1.1	0	61.6	0	0	2.0	0	2.0	0.0	0.0	2.4	0	-62.0	
3a	8/12/75 - 8/17/78	0.1	0	60.4	0	0	1.0	0	12.8	0.0	0.0	3.2	0	-50.8	
4	8/11/75 - 8/7/78	0	0.6	0	11.4	0.0	0.0	0	1.0	0.0	0.0	0	6.6	+19.0	
5	8/12/75 - 8/7/78	0.9	0	1.6	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	- 1.6	
6	8/11/75 - 8/7/78	0.4	0	0	7.4	0	1.0	0	5.8	0.0	0.0	0	0.8	+14.0	
7	8/15/75 - 8/7/78	0.1	0	0	2.4	0	1.0	0	0.8	0	2.0	0	4.8	+ 8.0	
8	8/14/75 - 8/4/78	0	0.3	0	1.2	0.0	0.0	0	1.6	0.0	0.0	0	4.0	+ 6.8	
9	8/15/75 - 8/4/78	0.0	0.0	0	15.2	0	2.0	0	2.4		Slide			+17.6	
10	8/14/75 - 8/4/78	0.0	0.0	22.0	0	1.0	0	1.6	0	6.0	0	20.0	0	-43.6	

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