UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SURFACE-WATER QUANTITY AND QUALITY IN THE LOWER KENAI PENINSULA, ALASKA

By Charles S. Savard and David R. Scully

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Multiply	By	To obtain
inch (in.)	25.4	millimeter (mm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
square mile (mi^2)	2.589	square kilometer (km^2)
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)
cubic foot per second per square mile [(ft^3/s)/mi^2]	0.01093	cubic meter per second per square kilometer [(m^3/s)/km^2]
ton per day (ton/d)	0.9072	megagram per day (Mg/d)
ton per square mile per year [(ton/mi^2)/yr]	0.3504	megagram per square kilometer per year [(Mg/km^2)/a]
degree Fahrenheit (°F)	(°F-32)/1.8	degree Celsius (°C)
micromho per centimeter at 25° Celsius (μmho/cm at 25 °C)	1.00	microsiemens per centimeter at at 25° Celsius (μS/cm at 25 °C)

Milligram per liter (mg/L) is a standard reporting unit for which no inch-pound equivalent is used.

SURFACE-WATER QUANTITY AND QUALITY IN THE LOWER KENAI PENINSULA, ALASKA

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ABSTRACT

Average annual runoff ranges from 11 inches per year in the lowland parts of the Kenai Peninsula to 100 inches per year in the Seldovia area. In the drainage basins of the Kenai Lowland, maximum flood runoff rates range from about 10 to 82 cubic feet per second per square mile. In the Seldovia area maximum peak discharge ranges from about 65 to 280 cubic feet per second per square mile. Low-flow discharges are higher in the Seldovia area than on the lower peninsula.

Calcium and bicarbonate ions dominate the water in streams draining the study area; the water is soft and has a low dissolved-solids content. Measured water temperatures range from 0 to 23 degrees Celsius in the Kenai Lowland streams and from 0 to 11.5 degrees Celsius in the Seldovia area streams.

INTRODUCTION

Most of the Kenai Peninsula is still undeveloped. However, population growth may be accelerated by exploration and development of petroleum resources in Cook Inlet and on the Continental Shelf and by expansion of fishing and marine activities.

To make decisions regarding the use and protection of surface-water resources, planners and designers need reliable information on streamflow and water-quality characteristics. Because stream data-collection sites were sparse throughout the lower Kenai Peninsula, available information was limited. Consequently, in July 1978, the U.S. Geological Survey, in cooperation with the Kenai Peninsula Borough, began a general, area-wide appraisal of the surface-water resources.

The purposes of this study were to: (1) define streamflow characteristics at continuous-record and crest-stage partial-record stations, (2) estimate streamflow characteristics at low-flow partial-record stations, (3) provide methodology for estimating flow characteristics at ungaged sites, (4) describe the chemical composition and temperature variation of the surface water, and (5) describe the suspended-sediment load for streams in the study area.

The appraisal consisted of reviewing existing hydrologic data and collecting and evaluating additional streamflow and water-quality data. The new streamflow data were collected at continuous-record gaging stations, crest-stage partial-record stations, and low-flow partial-record stations. Water-quality data were collected during selected streamflow measurements. The existing hydrologic data can be found in Scully and others (1978) and in the annual publications of the U.S. Geological Survey (for example, U.S. Geological Survey 1964, 1965a and b, and Water Data Reports for recent water years). Table 1 lists the sites with their period of record and type of data available.

Table 1.--Summary of surface-water gaging stations, partial-record stations, and sites of miscellaneous measurements of streamflow

[M,miscellaneous measurements; G,gaging station; L,low-flow partial-record station; P,crest-stage partial-record station]

Site No.	Station No.	Stream	Drainage area, square miles	Period of record, Water year	Average flow: Cubic feet per second	Average flow: Runoff, inches per year	Maximum observed discharge: Date	Maximum observed discharge: Discharge, Cubic feet per second	Maximum observed discharge: Discharge, Cubic feet per second per square mile	Minimum observed discharge: Date	Minimum observed discharge: Discharge, Cubic feet per second	Minimum observed discharge: Discharge, Cubic feet per second per square mile
		SELDOVIA DRAINAGE										
1	15238795	Seldovia River near Seldovia	26.2	M 1967, 1968, 1978 G Oct. 1978-Mar. 1980	205	106	Oct. 23, 1978	2,110	80.5	Mar. 27, 1980	30	1.15
2	15238800	Fish Creek at Seldovia	3.83	M 1967, 1968, 1970, 1972, 1973. L July 1978-Sept. 1980						Mar. 8, 1973	.98	.26
3	15238810	Seldovia Lagoon tributary near Seldovia	0.93	M 1967, 1968, 1970, 1972 L July 1978-Sept. 1980						Aug. 18, 1978	.06	.06
4	15238820	Barbara Creek near Seldovia	20.7	G June 1972-Sept. 1981	109	71.5	Oct. 23, 1980	1,310	63.3	Feb.27-Apr.3, 1973 Mar. 18-Apr. 15, 1975	16	.77
5	15238860	Tutka Lagoon Creek near Homer	10.8	G Aug. 1973-Sept. 1976			Sept. 17, 1976	3,020	280	Mar. 8-Apr. 15, 1975 Mar. 24-Apr. 13, 1976	6.0	.56
		NORTH SIDE KACHEMAK BAY DRAINAGE										
6	15239300	Falls Creek near Homer	2.84	L July 1978-Sept. 1980						Mar. 16, 1979	0.59	0.21
7	15239500	Fritz Creek near Homer	10.4	M 1962 P,M May 1963-Sept. 1981 L July 1978-Sept. 1980			Oct. 22, 1980	852	81.9	Jan. 13, 1969	.85	.08
8	15239800	Diamond Creek near Homer	5.35	M 1962 P,M Mar. 1963-Sept. 1981 L July 1978-Sept. 1980			Oct.22, 1980	255	47.7	Apr. 1, 1972	.56	.10
		ANCHOR RIVER DRAINAGE										
9	15239805	Anchor River near Homer	28.8	L July 1978-Sept. 1980						Mar. 14, 1979	14	0.49
10	15239807	Anchor River tributary at mouth near Homer	20.1	L July 1978-Sept. 1980						July 14, 1978	19	.95
11	15239810	Anchor River above Beaver Creek near Homer	63.2	L July 1978-Sept. 1980						Nov. 8, 1978 Mar. 14, 1979	48	.76
12	15239818	Beaver Creek near Bald Mountain near Homer	5.41	L July 1978-Sept. 1980						Mar. 16, 1979	1.0	.18
13	15239822	Beaver Creek at mouth near Homer	19.8	L July 1978-Sept. 1980						Mar. 14, 1979	7.9	.40
14	15239840	Anchor River above Twitter Creek near Homer	105	L July 1978-Sept. 1980						Aug. 16, 1978	63	.60
15	15239845	Twitter Creek near Lookout Mountain near Homer.	1.63	L July 1978-Sept. 1980						Mar. 19, 1979	.49	.30
16	15239880	Twitter Creek near Homer	16.1	G Aug. 1971-Sept. 1973 L July 1978-Sept. 1980			May 15, 1973	536	33.3	Apr. 4-6, 1973	3.9	.24
17	15239900	Anchor River near Anchor Point	137	P 1974 G June 1965-Sept. 1973 G Sept. 1978-Sept. 1981	208	20.6	Oct. 23, 1980	4,680	34.2	Jan. 1-3, 1969	28	.20
18	15239970	North Fork Anchor River above Chakok River near Anchor Point.	18.4	L July 1978-Sept. 1980						Mar. 20, 1979	10	.54
19	15239980	Chakok River near Anchor Point	38.7	L July 1978-Sept. 1980						Aug. 16, 1978 Mar. 20, 1979	14	.36
20	15239990	North Fork Anchor River at mouth at Anchor Point.	65.7	M 1951, 1952 L July 1978-Sept. 1980						Mar. 5, 1952	19	.29
21	15240000	Anchor River at Anchor Point	224	M 1949, 1951 G June 1953-Sept. 1966 L July 1978-Sept. 1980	299	18.0	Mar. 8, 1963	3,030	13.5	July 28, 1953	28	.12
		STARISKI CREEK DRAINAGE										
22	15240200	Stariski Creek near Ninilchik	27.8	L July 1978-Sept. 1980						Nov. 8, 1978	7.1	0.26
23	15240300	Stariski Creek near Anchor Point	49.4	M 1951, 1952, 1977 L July 1978-Sept. 1980						Mar. 5, 1952	14	.28

		HAPPY CREEK DRAINAGE									
24	15240400	Happy Creek at Happy Valley	7.74	L July 1978-Sept. 1980						Aug. 15, 1978	3.8	0.49
		COOK INLET TRIBUTARY DRAINAGE									
25	15240500	Cook Inlet tributary near Ninilchik	5.19	P,M June 1966-Sept. 1981			May 13, 1976	140	27.0	Sept. 8, 1969	0.76	0.15
		DEEP CREEK DRAINAGE									
26	15240600	Deep Creek above tributary No. 1 near Ninilchik.	18.9	L July 1978-Sept. 1980						Aug. 17, 1978	7.5	0.40
27	15240700	Deep Creek tributary No. 1 at mouth near Ninilchik.	16.0	L July 1978-Sept. 1980						Aug. 17, 1978	6.5	.41
28	15240800	Deep Creek above North Fork near Ninilchik	58.5	L July 1978-Sept. 1980						Nov. 8, 1978	27	.46
29	15240900	North Fork Deep Creek at mouth near Ninilchik.	38.9	L July 1978-Sept. 1980						Nov. 8, 1978	26	.67
30	15241000	Deep Creek above South Fork near Ninilchik	119	L July 1978-Sept. 1980						Nov. 8, 1978	37	.31
31	15241100	South Fork Deep Creek at mouth near Ninilchik.	29.4	L July 1978-Sept. 1980						Nov. 8, 1978	9.9	.34
32	15241200	Deep Creek above tributary No. 2 near Ninilchik.	161	L July 1978-Sept. 1980						Mar. 13, 1979	99	.61
33	15241300	Deep Creek tributary No. 2 at mouth near Ninilchik.	35.6	L July 1978-Sept. 1980						Mar. 13, 1979	10	.28
34	15241400	Clam Creek near Ninilchik	20.0	L July 1978-Sept. 1980						Aug. 15, 1978	7.2	.36
35	15241500	Deep Creek near Ninilchik	220	M 1951, 1952, 1954, 1959-1961, 1965-1968 L July 1978-Sept. 1980						Mar. 14, 1968	43	.20
		NINILCHIK RIVER DRAINAGE									
36	15241510	Ninilchik River above tributary No. 1 near Clam Gulch.	19.5	L July 1978-Sept. 1980						Nov. 8, 1978	5.7	0.29
37	15241520	Ninilchik River tributary No. 1 at mouth near Clam Gulch.	7.58	L July 1973-Sept. 1980						Mar. 13, 1979	1.9	.25
38	15241530	Ninilchik River above tributary No. 2 near Ninilchik.	46.2	L July 1978-Sept. 1980						Nov. 8, 1978	17	.37
39	15241540	Ninilchik River tributary No. 2 at mouth near Ninilchik.	6.08	L July 1978-Sept. 1980						July 10, 1978	2.4	.39
40	15241550	Ninilchik River above tributary No. 3 near Ninilchik.	59.2	L July 1978-Sept. 1980						Nov. 8, 1978	14	.24
41	15241570	Ninilchik River tributary No. 3 near Ninilchik.	22.7	L July 1978-Sept. 1980						Mar. 13, 1979	2.1	.09
42	15241590	Ninilchik River tributary No. 3 at mouth near Ninilchik.	56.8	L July 1978-Sept. 1980						Nov. 8, 1978	9.0	.16
43	15241600	Ninilchik River at Ninilchik	131	M 1951, 1952 G Apr. 1963-Sept. 1981	108	11.2	Apr. 24, 1974	1,240	9.5	July 20, 1966	30	.23
		CROOKED CREEK DRAINAGE									
44	15242080	Crooked Creek near Clam Gulch	21.9	L July 1978-Sept. 1980						Nov. 8, 1978	7.2	0.33
45	15242100	Crooked Creek near Kasilof	53.8	M 1951, 1952, 1973-1975 L July 1978-Sept. 1980						Feb. 21, 1974	18	.33

The analytical methods used in this study are described in Riggs (1969, 1972), Lamke (1979), and Freethey and Scully (1980). An appendix is included for previously unpublished temperature and specific conductance data collected during the study.

Linear regression analysis was used to test the correlations between several sets of data. Linear equations were proposed for estimating the value of an "unknown" dependent variable, given the value of an independent variable. The proposed equation was tested by comparing the values it "predicts" with those observed. A "coefficient of determination", a measure of the agreement or correlation between predicted and observed values, was computed. The standard error of the estimate was also computed; this is the value or magnitude, in appropriate units, of one standard deviation from the value estimated by the correlation equations. A more detailed discussion of regression analysis and the standard error of estimate is given in Hardyck and Petrinovich (1969) and Ezekiel and Fox (1959).

This report summarizes the results of the study. The preparation of this report was financed in part by funds from the Office of Coastal Zone Management; National Oceanic and Atmospheric Administration; and U.S. Department of Commerce, administered by the Division of Community Planning, Alaska Department of Community and Regional Affairs.

DESCRIPTION OF STUDY AREA

Physiographic and Geologic Setting

The study area, exclusive of the small basins near Seldovia, is bordered on the south and southeast by Kachemak Bay, on the west by Cook Inlet, on the north by the Kasilof River and Tustumena Lake, and on the east by the Fox River (fig. 1). The area is approximately 22 mi wide and 38 mi long (about 700 mi^2). The northwest part of the area, the Ninilchik Lowland, is generally less than 500 ft above sea level. The drainage is poorly defined, and the hummocky surface is mostly marshes and muskeg areas. In contrast, the Caribou Hills Upland, which makes up the southeast part of the area, rises to altitudes between 2,000 and 3,000 ft. Drainage channels in the Caribou Hills Upland are well defined. In the northeastern part of the study area, Crooked Creek drains through the Nikishka Lowland. The drainage channel is fairly well defined in its upper reaches but poorly defined in its lower reaches. There are no lakes of significant size in the study area. Basins near Seldovia drain from the Kenai Mountains into Kachemak and Seldovia Bays.

Sedimentary bedrock of the Tertiary Kenai Group is present near the surface in the Caribou Hills and at moderate depths in the Ninilchik Lowland. The Kenai Group comprises poorly consolidated siltstone, sandstone, and conglomerate and is locally coal bearing. Rocks of the Kenai Group are nearly continuously exposed in the bluffs from the head of Kachemak Bay to a point near Clam Gulch just south of the mouth of the Kasilof River. Most of the Seldovia area is underlain by igneous and metamorphic rocks of the Kenai Mountains.

During the Pleistocene Epoch at least five periods of glaciation affected the Kenai Peninsula but there are now no glaciers within the study area. Glaciers in the

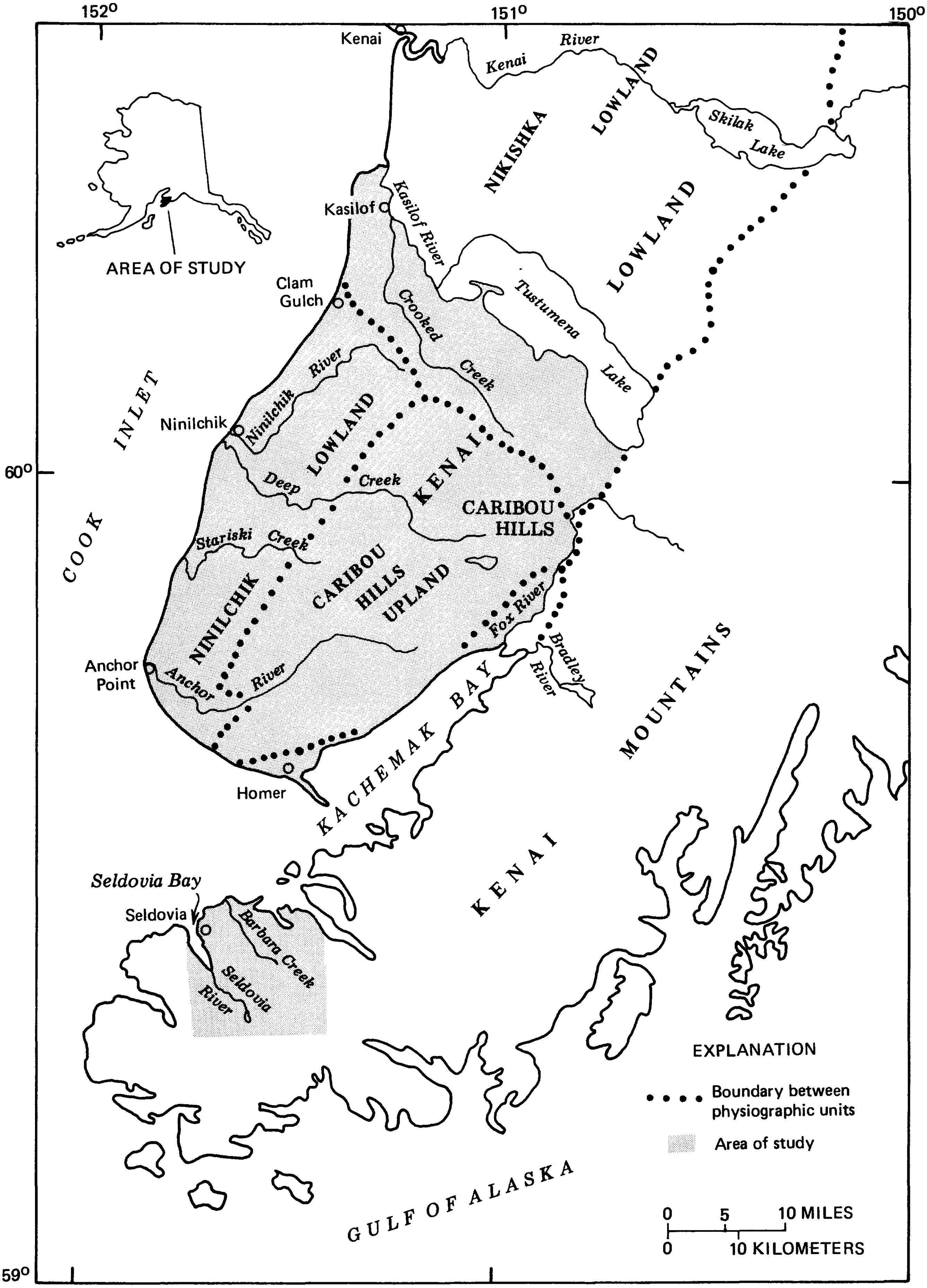


Figure 1. -- Location of study area and physiographic units.

Modified from Karlstrom, 1964

surrounding mountains deposited a complex series of moraines in the study area (Karlstrom, 1964). The present topography reflects both morainal deposition and its modification by subsequent fluvial processes.

Climate

The climate of the area is transitional between the relatively mild maritime climate of the Gulf of Alaska and the dry, cold, continental climate of interior Alaska. The area is in a rain shadow of the Kenai Mountains. The mean annual precipitation decreases gradually from south to north across the area. Mean annual precipitation is 23.78 in. at Homer (records from 1937-79), 16.60 in. at Kasilof (1946-79), and 18.98 in. at Kenai (1933-79) (table 2). Most of the precipitation falls as rain in late summer and autumn and as snow from November to March. Rain also falls during occasional warm periods in the winter.

Mean annual air temperature also decreases from south to north. Homer (records from 1936-79), Kasilof (1932-79), and Kenai (1938-79) have mean annual air temperatures of 36.6°F, 33.9°F, and 33.1°F, respectively (table 2). January is generally the coldest month and July the warmest month of the year.

STREAMFLOW

Data Collection

Daily discharge records were obtained at three long-term gaging stations: Barbara Creek near Seldovia, Anchor River near Anchor Point, and Ninilchik River at Ninilchik (sites 4, 17, and 23 respectively, fig. 2). Streamflow was measured at 39 partial-record stations (sites 2-3, 6-16, 18-24, 26-42, and 44-45, fig. 2). The partial-record station sites were selected in order to divide the large basins into subbasins of approximately equal area (fig. 2). Two sites were at former gaging stations. From 16 to 18 discharge measurements were made at each partial-record site between July 1978 and September 1980. Twelve measurements made between September 1978 and August 1979 were used to estimate mean annual discharge. The other measurements, which were made during periods of baseflow in 1978 and 1980, were used to estimate low-flow characteristics.

Annual and Seasonal Discharge

Daily discharge hydrographs (fig. 3) for September 1978 to August 1979 for two of the long-term gaging stations, Anchor River near Anchor Point and Ninilchik River at Ninilchik, show distinct runoff periods: Fall (September through November), winter (December through March), snowmelt (April through about the first week of June), and summer (mid-June through August). The other long-term gaging station Barbara Creek near Seldovia, has a longer snowmelt period. The mountainous watershed has more snow and cooler temperatures.

The seasonal and yearly mean discharges at the three long-term gaging stations for the period September 1978 to August 1979 are shown on table 3. The seasonal mean discharge is the mean daily flow during each season. The unit discharge in cubic feet per second per square mile [$(ft^3/s)/mi^2$] for the three gages is also given on table 3. The highest seasonal unit discharge occurs during the spring snowmelt

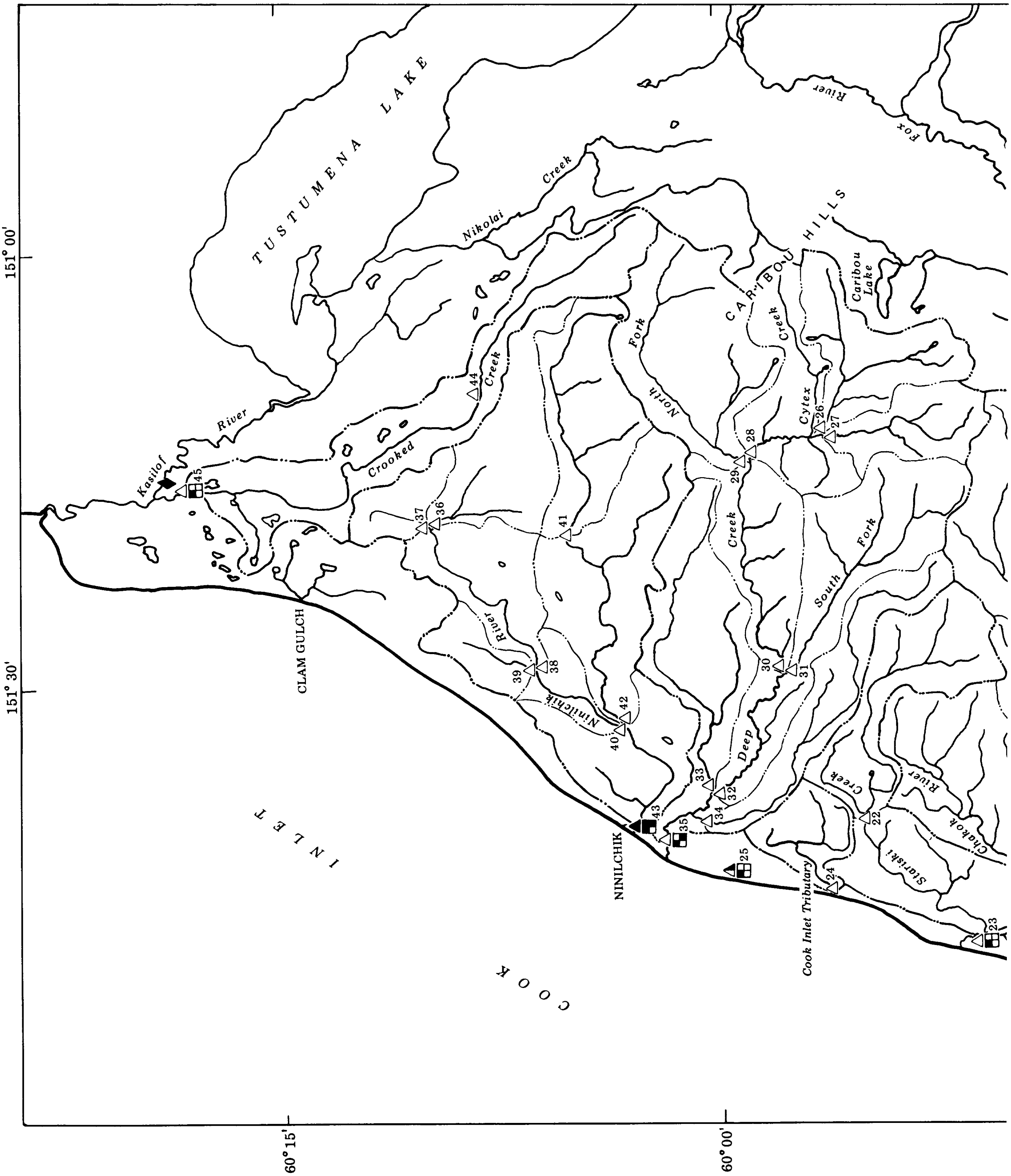
Table 2.--Summary of air temperature and precipitation data for Homer, Kasilof, and Kenai

[Climatological data from National Oceanic and Atmospheric Administration, 1979a and b]

	Period of record	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
							Mean precipitation, in inches							
Homer	1937-79	1.81	1.77	1.33	1.14	0.99	0.99	1.57	2.40	2.91	3.43	2.92	2.52	23.78
Kasilof	1946-79	.92	1.09	.85	.72	.66	1.00	1.83	2.13	2.61	1.93	1.41	1.45	16.60
Kenai	1933-79	--	--	--	--	--	--	--	--	--	--	--	--	18.98
							Mean air temperature, in degrees Fahrenheit							
Homer	1936-79	21.3	24.2	27.0	34.8	42.1	48.6	52.6	52.6	47.1	37.5	28.6	22.0	36.6
Kasilof	1932-79	11.3	17.5	21.6	33.7	43.2	50.8	54.8	53.6	46.9	35.1	22.0	13.4	33.9
Kenai	1938-79	--	--	--	--	--	--	--	--	--	--	--	--	33.1

Table 3.--Seasonal and mean annual discharge and unit discharge at gaging stations from September 1, 1978, to August 31, 1979

Site No. (fig. 2)	Station name	Discharge, in cubic feet per second					Unit discharge, in cubic feet per second per square mile				
		Fall	Winter	Snowmelt	Summer	Annual	Fall	Winter	Snowmelt	Summer	Annual
4	Barbara Creek near Seldovia.	125	45.2	125	150	104	6.04	2.18	6.04	7.25	5.02
17	Anchor River near Anchor Point.	179	121	422	112	189	1.30	.88	3.08	.82	1.38
43	Ninilchik River at Ninilchik.	89.2	71.6	208	71.4	101	.68	.55	1.59	.54	.77


TUSTUMENA LAKE
Kasilof
River
Crooked Creek
Nikolai Creek
CARIBOU HILLS
Caribou Lake
Cytex
Creek
North Fork
Creek
Deep Creek
South Fork
Ninilchik River
Chakok River
Creek
Fox River
CLAM GULCH
NINILCHIK
Cook Inlet Tributary
COOK INLET
151° 00'
151° 30'
60° 15'
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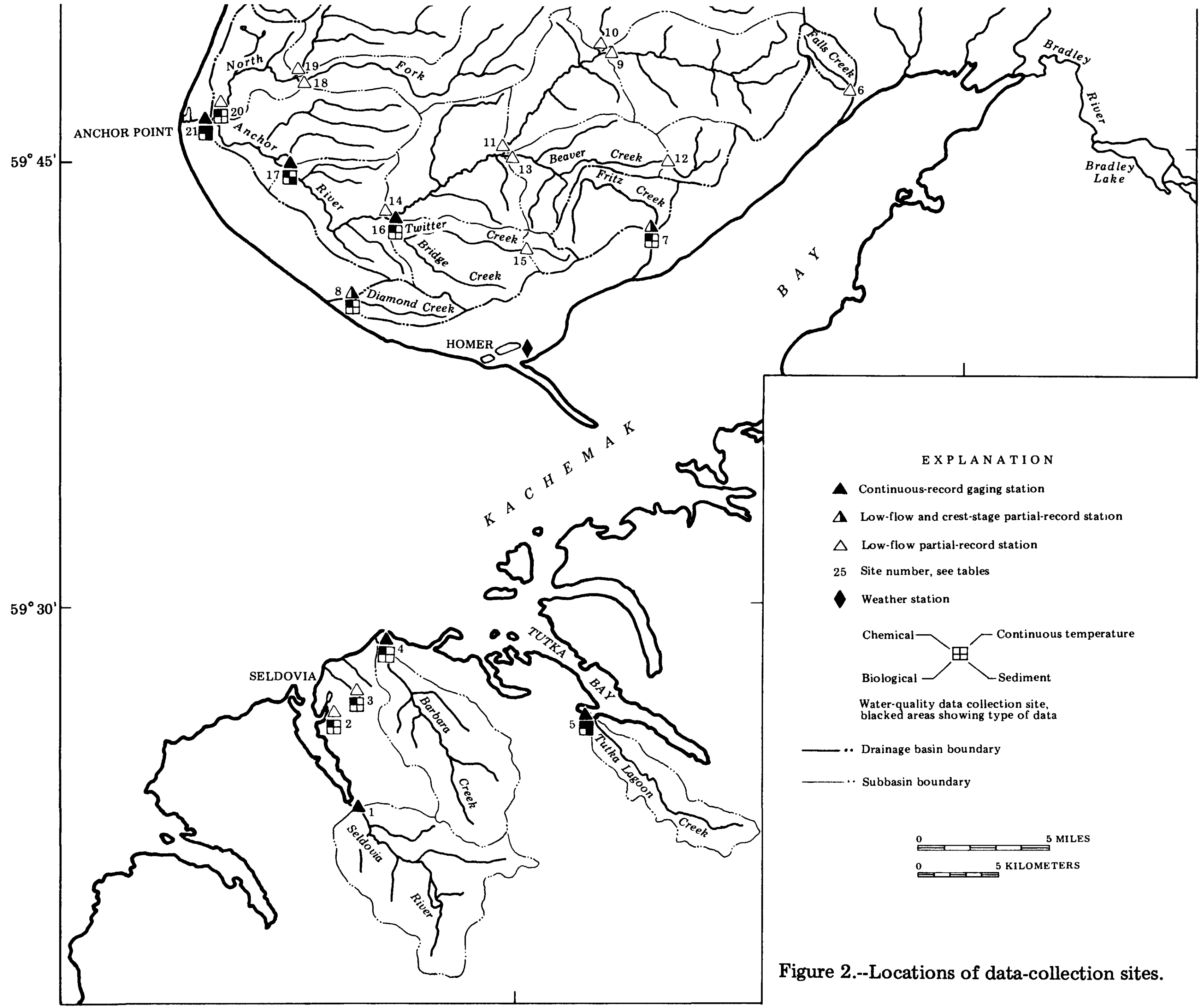

Figure 2.--Locations of data-collection sites.

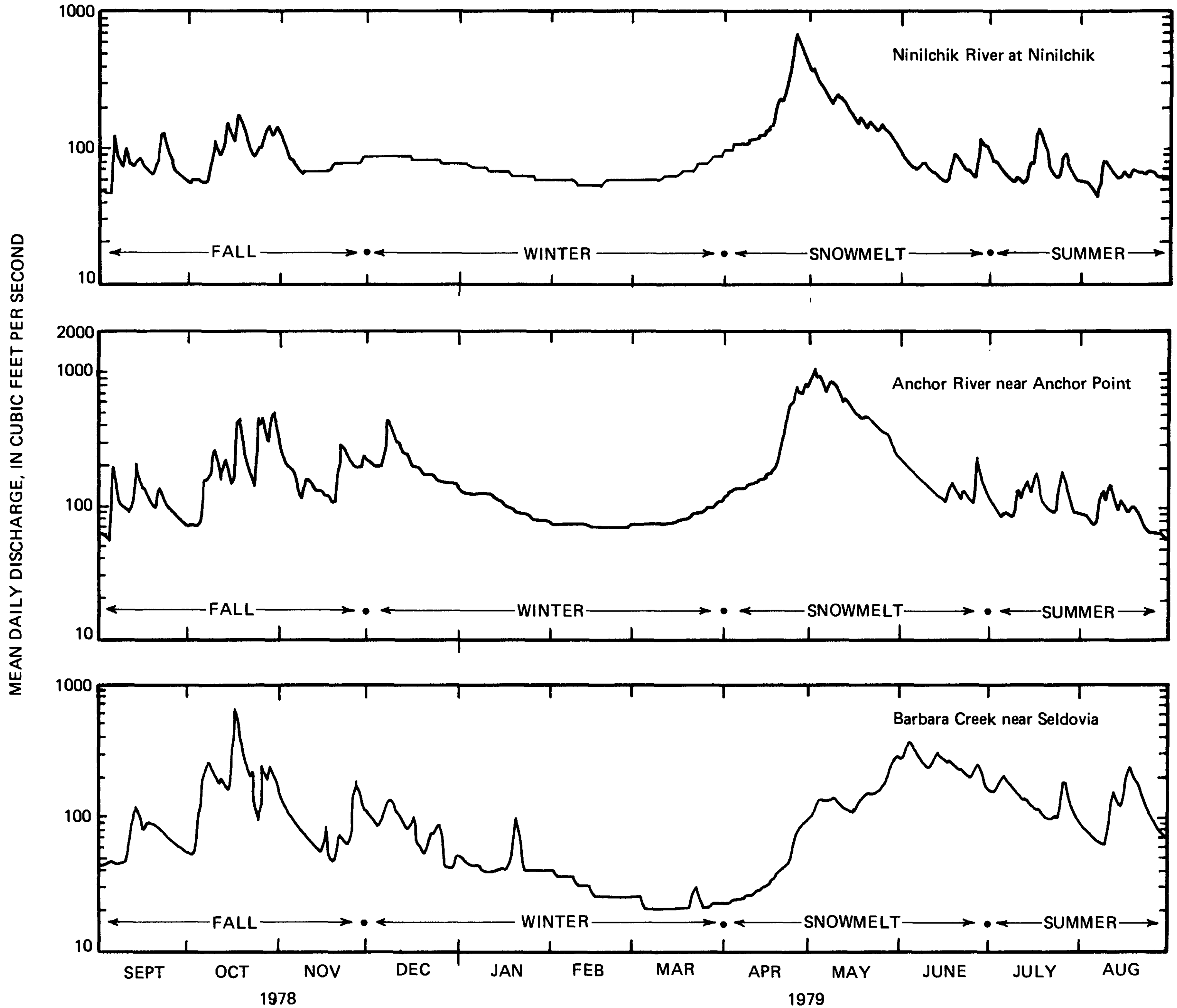

Figure 3.--Daily discharge hydrographs for three gaging stations.

period, except for Barbara Creek, where the snowmelt period extends into the summer. The lowest seasonal unit discharge for Barbara Creek occurs during winter. During the study period the summer unit discharge of Anchor River and Ninilchik River was slightly lower than the winter unit discharge. However, winter unit discharge is usually lower than summer unit discharge for streams in the study area (table 3). During the study period "warm" storms occurred early in the winter, bringing rain instead of snow at low elevations, resulting in higher than normal winter unit discharge. Also, higher than normal temperatures and below normal rainfall resulted in low summer unit discharge.

The monthly and mean annual discharge for continuous gaging stations in the study area are shown on table 4. The streamflow data for Seldovia River near Seldovia, Tutka Lagoon Creek near Homer, and Twitter Creek near Homer are for short periods and may not represent long-term monthly and annual mean discharge.

Discharge data for the partial-record stations were correlated with concurrent mean daily discharges at the gaging stations. The gaging station that correlated best was used as the index station for the partial-record station. Barbara Creek near Seldovia was used as the index station for 2 partial-record stations near Seldovia, Anchor River near Anchor Point was used for 28 partial-record stations, and Ninilchik River at Ninilchik for 9 partial-record stations. Twelve measurements were made during the year and used to define the time periods listed in table 5. The interval of time between measurements differed during the year. Each measurement was used as an estimator for a time period extending between the midpoints of the interval before and after the measurement. The mean discharge at each partial-record station for each period was then computed using an equation derived from methods developed by Riggs (1969):

$$Q = Q_a \frac{Q_p}{Q_i} \tag{1}$$

where Q is average discharge for the period at the partial-record station;

Q_a is average discharge for the period at the index station;

Q_p is instantaneous discharge measured at the partial-record station;

Q_i is mean daily discharge recorded at the index station on the day discharge was measured at the partial-record station.

A sample tabulation for Clam Creek near Ninilchik is shown on table 5. Seasonal mean discharges are the average of the mean discharges for the time periods within each season.

The accuracy of this method of computation depends on the reliability of the correlation between measurements made at the partial-record stations and mean daily discharge at the index station. If a good correlation exists (coefficient of determination ≥ 0.70), the values of discharge determined for the partial-record station are more reliable than those determined for stations whose discharge values correlate poorly (coefficient of determination < 0.70).

Table 4.--Monthly and mean annual discharge for gaging stations in the study area

Site No. (fig. 2)	Station name	Period of record	Monthly and mean annual discharge, in cubic feet per second												
			Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1	Seldovia River near Seldovia.	Oct. 1978-March 1980	452	327	131	80.4	62.1	66.9	109	367	312	159	300	232	205
4	Barbara Creek near Seldovia.	June 1972-Sept. 1981	159	100	55.1	62.0	46.6	33.3	38.7	174	274	167	85.5	92.2	109
5	Tutka Lagoon Creek near Homer.	Aug. 1973-Sept. 1976	89.4	32.0	15.8	10.7	8.73	6.69	10.8	85.4	223	143	75.3	197	77.0
16	Twitter Creek near Homer.	Aug. 1971-Sept. 1973	41.6	10.6	6.04	5.04	4.65	4.47	8.29	81.5	35.5	11.7	18.6	23.9	21.2
17	Anchor River near Anchor Point.	July 1965-Sept. 1973, Sept. 1978-Sept. 1981	269	198	106	82.1	78.4	95.5	210	640	314	153	152	189	208
21	Anchor River at Anchor Point.	July 1953-Sept. 1966	351	232	135	128	121	151	323	914	392	218	247	342	299
43	Ninilchik River at Ninilchik.	May 1963-Sept. 1981	130	102	63.2	55.7	57.8	66.3	163	235	121	89.3	88.7	116	108

Table 5.--Computation of mean discharge for Clam Creek near Ninilchik

[Data in cubic feet per second; $Q = Q_a \frac{Q_p}{Q_i}$]

Measurement date	Concurrent discharges: Clam Creek near Ninilchik (Q_p)	Concurrent discharges: Anchor River near Anchor Point (Q_i)	Period	Mean discharge: Anchor River near Anchor Point (Q_a)	Mean discharge: Clam Creek near Ninilchik (Q)	Seasonal mean discharge, Clam Creek near Ninilchik
Fall			1978			
9-13-78	22	211	September	107	11	17
10-09-78	25	266	October	244	23	
11-07-78	14	159	November	183	16	
Winter			1978-79			
1-03-79	12	125	December - January	160	15	11
3-20-79	8.2	90	February - March	79.2	7.2	
Snowmelt			1979			
4-16-79	28	180	April 1-25	243	38	42
4-30-79	70	761	April 26 - May 9	826	76	
5-14-79	47	577	May 10-23	518	42	
5-29-79	18	250	May 24 - June 7	252	18	
Summer			1979			
6-13-79	11	118	June 8-30	135	13	13
7-18-79	15	113	July	116	15	
8-14-79	14	113	August	90.4	11	
Mean discharge, September 1978 to August 1979						19

To verify the method used above to estimate mean discharge on the basis of periodic discharge measurements, the seasonal and annual discharge for one of the index stations was computed by treating it as a partial-record station. Ninilchik River at Ninilchik was assumed to be the partial-record station and Anchor River near Anchor Point was used as its index station. The periodic discharge measurements made at Ninilchik River at Ninilchik were correlated with the mean daily discharge at Anchor River near Anchor Point. The mean discharge during the study year at Ninilchik River at Ninilchik was estimated to be 107 ft^3/s, which is 6 percent greater than the 101 ft^3/s computed for the same year from daily records. The deviation of the estimated mean discharge from the computed mean discharge is -7, +16, +8, and 0 percent for the fall, winter, snowmelt, and summer season, respectively.

A least squares regression between mean discharges for the period September 1978 to August 1979 and the long-term average at 13 gaging stations in the Cook Inlet area produced an equation with an intercept and slope differing only slightly from 1.0 (fig. 4). A graphical analysis between the regression and the line of equal discharge indicates that the regression coefficients both could be 1.0. This indicates that means for the study period are equal to the long-term average. Estimates for the period September 1978 to August 1979 are reasonable estimates of the long-term average at the partial-record sites. Estimates of mean discharges for the four seasons and the study period for the 39 partial-record stations are listed in table 6.

The reliability of the estimation technique is verified by the close agreement of the estimated mean of 297 ft^3/s for Anchor River near Anchor Point and the mean of 299 ft^3/s computed from 13 years of daily record (1954-66).

Low Flows

Minimum flow during the year from streams in the study area may occur either during the winter months or in late July or August of an extremely dry summer. At the time of minimum discharge, water released from storage in the ground or in lakes and ponds provides all runoff for a basin. Instantaneous minimums may also occur during periods of freezing temperatures as water goes into ice and channel storage. Minimum observed unit discharges ranged from 0.06 to 1.15 $(ft^3/s)/mi^2$ for streams in the Seldovia area and from 0.08 to 0.95 $(ft^3/s)/mi^2$ for streams draining the rest of the study area.

Low-flow frequency tables show how often over a long period of time the average discharge for a prestated number of days may be expected to equal or be lower than a specified discharge. A graphical technique described by Riggs (1972) was used to determine low-flow frequencies for four gaging stations (table 7). This method was used instead of the log-Pearson Type III analysis applied by Freethey and Scully (1980).

Low-flow characteristics, 7-day, 2-year and 7-day, 10-year low flow, for partial-record stations and continuous recording stations with short-term record were estimated by methods given in Riggs (1972). An example of this graphical method is shown in figure 5. Baseflow measurements from the partial-record station (Deep Creek above tributary 1 near Ninilchik) are plotted against the concurrent daily discharge of the index station (Anchor River near Anchor Point) on log-log paper. A

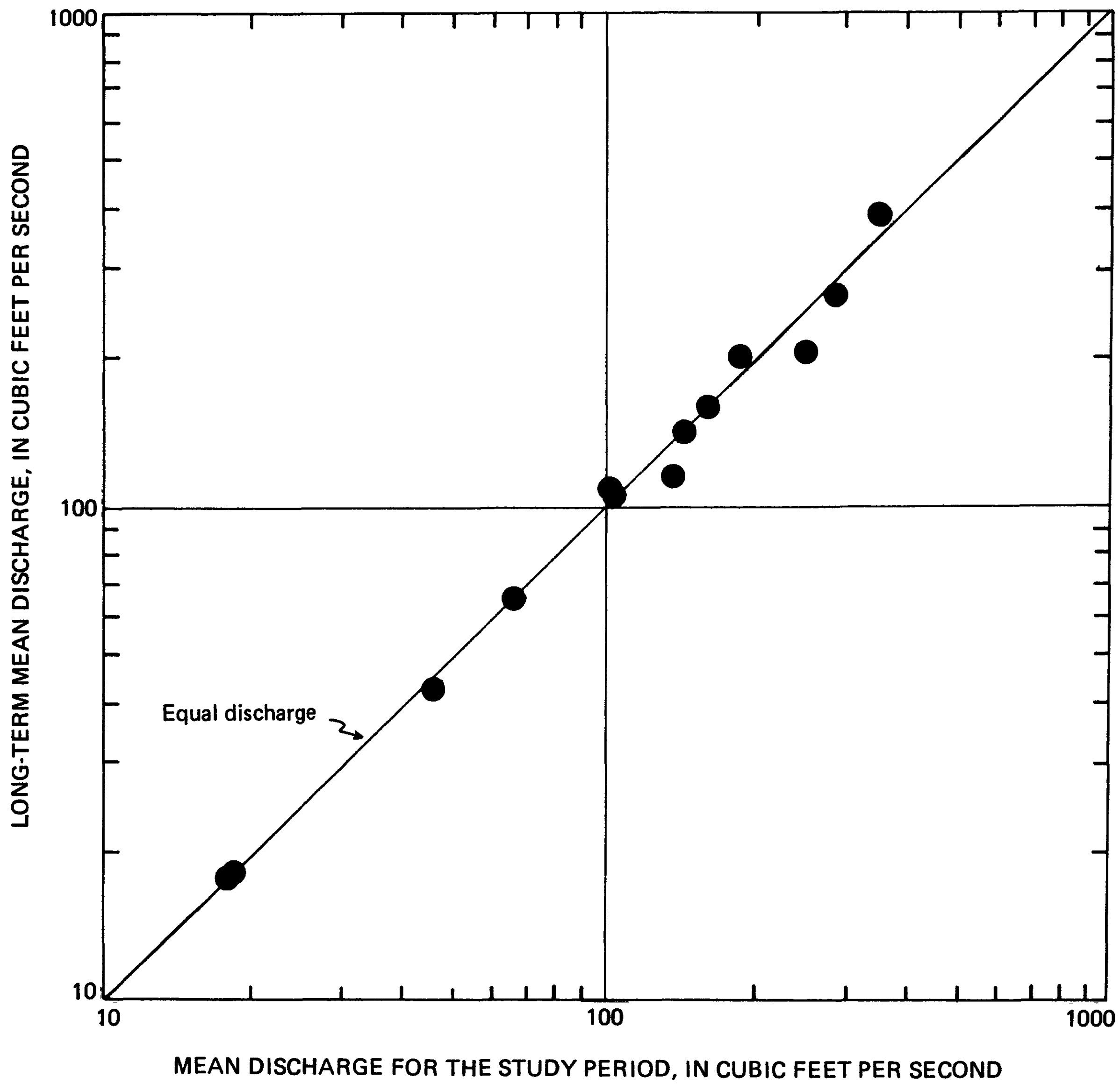

Figure 4.--Relation of mean discharge for the study period (September 1978 to August 1979) and long-term mean discharge for streamgaging stations in the Cook Inlet area.

Table 6.--Estimates of mean discharge for partial-record stations based on 12 discharge measurements in 1978 and 1979

		Mean discharge, in cubic feet per second				
Site No. (fig. 2)	Partial-record station	Fall	Winter	Snowmelt	Summer	September 1978 to August 1979a
2	Fish Creek at Seldovia	15	7.4	16	6.3	11
3	Seldovia Lagoon tributary near Seldovia	3.7	2.2	5.8	1.0	2.9
6	Falls Creek near Homer	3.0	1.1	6.9	1.6	2.7
7	Fritz Creek near Homer	11	6.8	24	5.0	11
8	Diamond Creek near Homer	5.7	3.3	14	2.2	5.7
9	Anchor River near Homer	33	17	79	19	33
10	Anchor River tributary at mouth near Homer	33	28	56	21	33
11	Anchor River above Beaver Creek near Homer	79	67	181	54	88
12	Beaver Creek near Bald Mountain near Homer	7.4	1.8	21	2.3	6.9
13	Beaver Creek at mouth near Homer	25	12	67	11	25
14	Anchor River above Twitter Creek near Homer	150	94	305	86	145
15	Twitter Creek near Lookout Mountain near Homer	1.7	1.0	6.4	1.2	2.2
16	Twitter Creek near Homer	18	10	55	9.7	20b
18	North Fork Anchor River above Chakok River near Anchor Point	31	14	51	16	253
19	Chakok River near Anchor Point	42	18	79	24	36
20	North Fork Anchor River at mouth at Anchor Point	79	33	172	48	74
21	Anchor River at Anchor Point	295	168	697	163	297c
22	Stariski Creek near Ninilchik	30	18	49	17	26
23	Stariski Creek near Anchor Point	44	31	109	28	48
24	Happy Creek at Happy Valley	11	5.7	24	5.7	10
26	Deep Creek above tributary 1 near Ninilchik	22	11	53	13	22
27	Deep Creek tributary 1 at mouth near Ninilchik	19	12	52	9.2	20
28	Deep Creek above North Fork near Ninilchik	62	36	145	46	65
29	North Fork Deep Creek at mouth near Ninilchik	47	41	87	42	51
30	Deep Creek above South Fork near Ninilchik	149	111	293	115	155
31	South Fork Deep Creek at mouth near Ninilchik	21	18	52	19	26
32	Deep Creek above tributary 2 near Ninilchik	198	121	416	134	198
33	Deep Creek tributary 2 at mouth near Ninilchik	20	14	52	16	23
34	Clam Creek near Ninilchik	17	11	42	13	19
35	Deep Creek near Ninilchik	252	157	571	190	265
36	Ninilchik River above tributary 1 near Clam Gulch	12	9.5	19	10	12
37	Ninilchik River tributary 1 at mouth near Clam Gulch	4.5	2.5	8.8	2.6	4.2
38	Ninilchik River above tributary 2 near Ninilchik	34	24	63	30	35
39	Ninilchik River tributary 2 at mouth near Ninilchik	5.7	2.8	11	3.3	5.2
40	Ninilchik River above tributary 3 near Ninilchik	39	23	79	37	41
41	Ninilchik River tributary 3 near Ninilchik	8.5	4.8	18	6.3	8.6
42	Ninilchik River tributary 3 at mouth near Ninilchik	39	27	73	26	39
44	Crooked Creek near Clam Gulch	29	25	29	21	26
45	Crooked Creek near Kasilof	57	32	104	40	54

a Mean for September 1978 to August 1979 is considered representative of long-term mean discharge.
b Mean for period of gaging station operation (1972-73 water years) is 21.2 ft^3/s.
c Mean for period of gaging station operation (1954-66 water years) is 299 ft^3/s.

Table 7.--Low-flow frequencies for long-term gaging stations through 1981, using graphical analysis

Site No. (fig. 2)	Station name	Years of record	Mean discharge for indicated number of consecutive days, in cubic feet per second: 7 days, Recurrence interval, in years: 2	5	10	20	30 days, Recurrence interval, in years: 2	5	10	20
4	Barbara Creek near Seldovia	9	18	17	16	15	19	17	16	15
17	Anchor River near Anchor Point	11	55	38	29	27	57	40	30	28
21	Anchor River at Anchor Point	13	80	59	47	44	90	62	49	46
43	Ninilchik River at Ninilchik	18	46	38	36	34	52	40	38	36

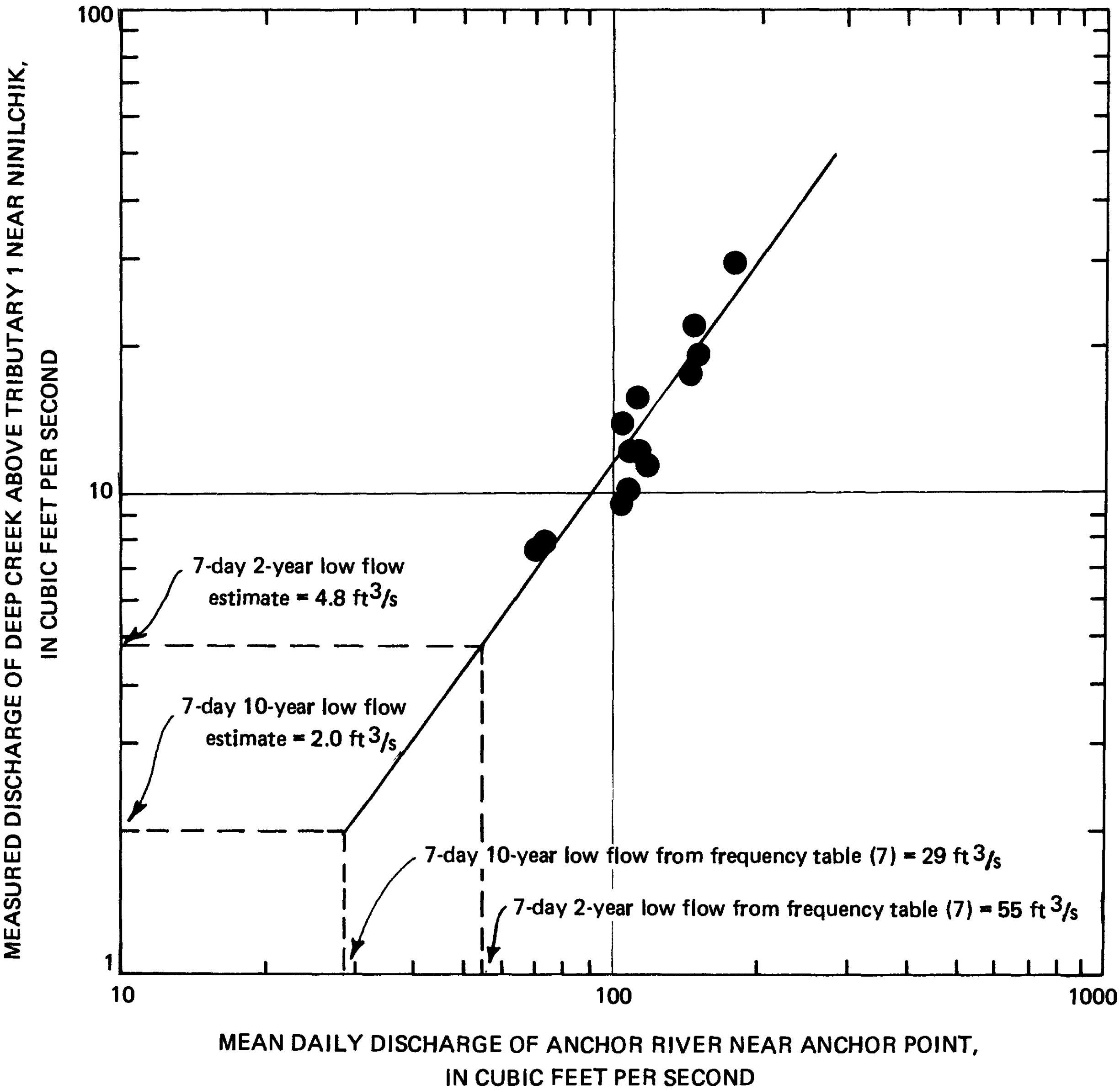

Figure 5.--Relation of base-flow measurements at a low-flow partial-record station (Deep Creek above tributary 1 near Ninilchik) to concurrent mean daily discharge at a gaging station (Anchor River near Anchor Point) for the period 1978-80.

"best-fit" line is computed using an ordinary least-squares regression technique, and discharge values which correspond to the 7-day, 2-year and 7-day, 10-year low flow at the index station are plotted on the line. Corresponding low-flow values for the partial-record station are then read from the best-fit line. The low-flow frequencies estimated using this method are listed on table 8. Values shown in table 8 were estimated using all available baseflow measurements, including the period of low-flow, partial-record station operation (designated by L in table 1) and all, or part, of other periods when miscellaneous measurements were made (M in table 1). For some stations the period of record may affect the estimate. For example, the 7-day, 10-year low flow for Deep Creek near Ninilchik is 52 ft^3/s if estimated from the entire period of available record and 65 ft^3/s if estimated from only the 1978-80 data. The estimate made using the longer period is considered more representative and is given in table 8.

The minimum observed discharge (table 1) is much lower than the estimated 7-day, 10-year low flow at Stariski Creek near Ninilchik, Deep Creek above South Fork near Ninilchik, Ninilchik River above tributary 3 near Ninilchik, Ninilchik River tributary 3 at mouth near Ninilchik, and Crooked Creek near Clam Gulch (map sites 22, 30, 40, 42 and 44). Discharges measured at these stations in November 1978 were affected by water going into ice and channel storage during freezing conditions. The discharges were not representative of basin yields, and thus were not used in the regression method to estimate the 7-day, 10-year low flow. Discharge data of this type would be important, however, if 1-day and 3-day low flows were estimated.

The 7-day, 10-year minimum flows at unmeasured sites along the mainstream channel may be estimated by interpolation between gaged points on a stream (fig. 6). Each low-flow value is plotted against distance along the main channel and the known tributary low-flow information is used to interpret the flow characteristics of any point along the main channel. For consistency within the illustration, the Deep Creek curve in figure 6 is based on 1978-80 data. Low-flow characteristics measured at gaged sites may be extrapolated upstream or downstream for short distances in proportion to the difference in drainage areas.

For ungaged streams in the study area, minimum flow for selected frequencies can be estimated using the method given in Freethey and Scully (1980). Low-flow equations for the Cook Inlet basin were derived through multiple-regression analysis using the gaging station low-flow characteristics in concert with basin and climatic characteristics. The regional regression equations have the form:

$$M_{d,ri} = aA^b \, (LP + 1)^c \, (J + 10)^d$$

where M is dependent variable, the minimum flow;

d is number of consecutive days of the minimum flow;

ri is recurrence interval, the average number of years between minimum flow equal to or less than M;

a is regression constant;

b,c,d are regression coefficients for the independent variables (basin characteristics);

Table 8.--Low-flow discharge values for partial-record and continuous recording stations

Site No. (fig. 2)	Station name	Drainage area (mi²)	Annual low flow, 7 consecutive days (ft³/s) Recurrence interval, in years 2	10	[(ft³/s)/mi²] Recurrence interval, in years 2	10
1	Seldovia River near Seldovia	26.2	35	33	1.40	1.30
2	Fish Creek at Seldovia	3.83	1.5	1.4	.40	.36
3	Seldovia Lagoon tributary near Seldovia	.93	.19	.17	.20	.18
4	Barbara Creek near Seldovia	20.7	18	16	.87	.77
5	Tutka Lagoon Creek near Homer	10.8	9.5	8.1	.88	.75
6	Falls Creek near Homer	2.84	.55	.22	.19	.08
7	Fritz Creek near Homer	10.4	2.4	1.1	.23	.11
8	Diamond Creek near Homer	5.35	1.1	.45	.20	.08
9	Anchor River near Homer	28.8	11	6.7	.39	.23
10	Anchor River tributary at mouth near Homer	20.1	17	14	.87	.68
11	Anchor River above Beaver Creek near Homer	63.2	38	26	.60	.42
12	Beaver Creek near Bald Mountain near Homer	5.41	.55	.15	.10	.03
13	Beaver Creek at mouth near Homer	19.8	5.8	2.9	.29	.15
14	Anchor River above Twitter Creek near Homer	105	51	31	.49	.30
15	Twitter Creek near Lookout Mountain near Homer	1.63	.59	.29	.36	.18
16	Twitter Creek near Homer	16.1	4.8	2.2	.30	.13
17	Anchor River near Anchor Point	137	55	29	.40	.21
18	North Fork Anchor River above Chakok River near Anchor Point	18.4	8.5	5.2	.46	.28
19	Chakok River near Anchor Point	38.7	10	5.0	.26	.13
20	North Fork Anchor River at mouth at Anchor Point	65.7	20	9.4	.30	.14
21	Anchor River at Anchor Point	224	80	47	.36	.21
22	Stariski Creek near Ninilchik	27.8	13	10	.49	.38
23	Stariski Creek near Anchor Point	49.4	16	8.9	.33	.18
24	Happy Creek at Happy Valley	7.74	3.1	1.7	.40	.22
25	Cook Inlet tributary near Ninilchik	5.19	.58	.21	.11	.04
26	Deep Creek above tributary 1 near Ninilchik	18.9	4.8	2.0	.25	.10
27	Deep Creek tributary 1 at mouth near Ninilchik	16.0	4.9	2.5	.30	.16
28	Deep Creek above North Fork near Ninilchik	58.5	22	12	.38	.21
29	North Fork Deep Creek at mouth near Ninilchik	38.9	32	27	.83	.69
30	Deep Creek above South Fork near Ninilchik	119	80	58	.67	.48
31	South Fork Deep Creek at mouth near Ninilchik	29.4	13	9.7	.45	.33
32	Deep Creek above tributary 2 near Ninilchik	161	85	55	.53	.34
33	Deep Creek tributary 2 at mouth near Ninilchik	35.6	11	8.1	.31	.23
34	Clam Creek near Ninilchik	20.0	6.3	3.6	.31	.18
35	Deep Creek near Ninilchik	220	90	52	.41	.24
36	Ninilchik River above tributary 1 near Clam Gulch	19.5	6.5	5.2	.33	.27
37	Ninilchik River tributary 1 at mouth near Clam Gulch	7.58	1.5	1.1	.20	.14
38	Ninilchik River above tributary 2 near Ninilchik	46.2	17	12	.36	.27
39	Ninilchik River tributary 2 at mouth near Ninilchik	6.08	2.2	1.7	.36	.27
40	Ninilchik River above tributary 3 near Ninilchik	59.2	21	16	.36	.28
41	Ninilchik River tributary 3 near Ninilchik	22.7	2.9	1.6	.13	.07
42	Ninilchik River tributary 3 at mouth near Ninilchik	56.8	20	18	.36	.31
43	Ninilchik River at Ninilchik	131	46	36	.35	.27
44	Crooked Creek near Clam Gulch	21.9	17	15	.78	.68
45	Crooked Creek near Kasilof	53.8	29	23	.53	.43

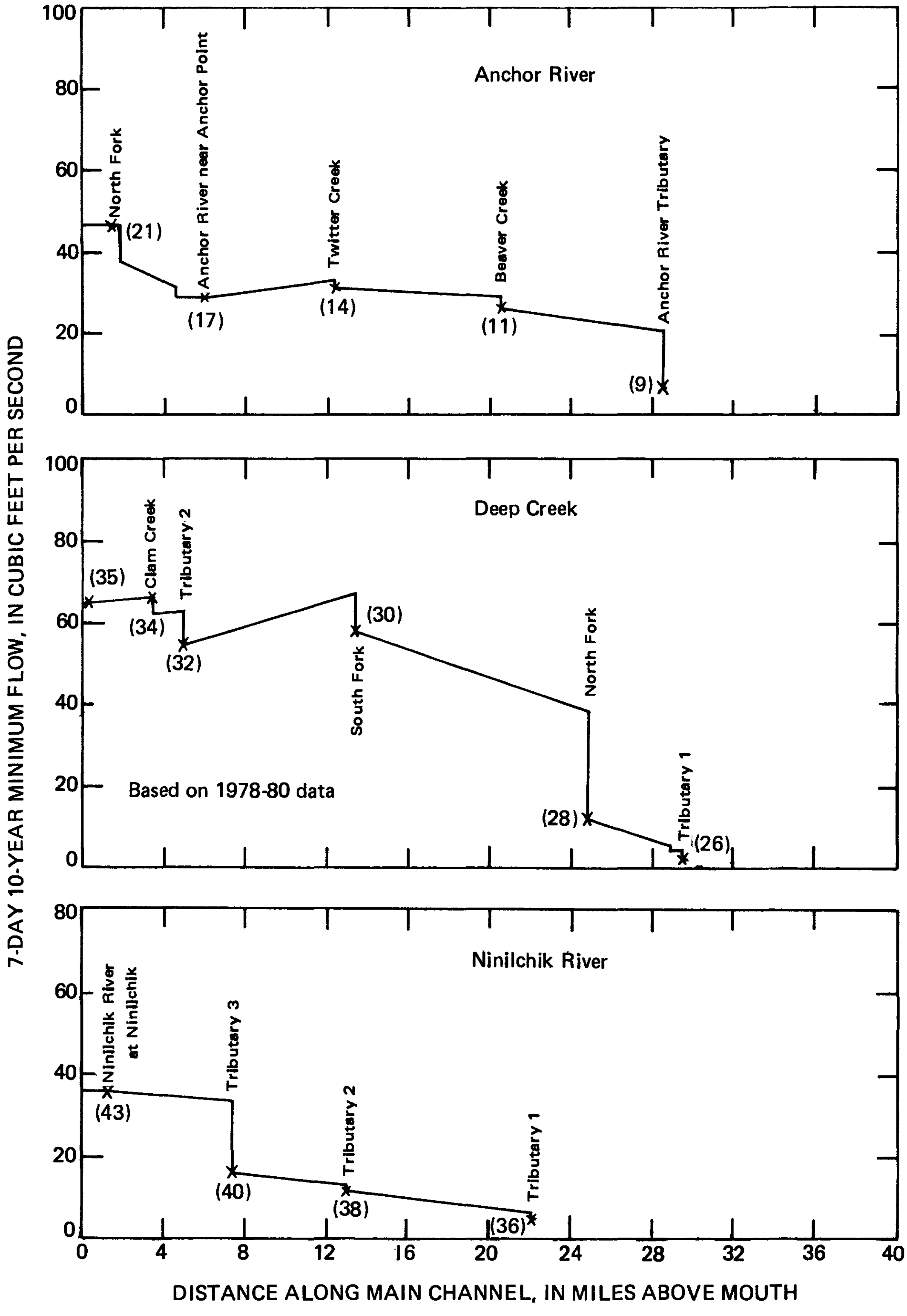

Figure 6.--Seven-day 10-year minimum flows for main channels in the lower Kenai Peninsula. (x refers to site number in table 8 and figure 2.)

A is drainage area, in square miles;

LP is area of lakes and ponds, in percent; and

J is mean minimum January temperature, in degrees Fahrenheit, from a map by Johnson and Hartman (1969).

The results of the regression analysis are shown on table 9.

The reliability of the 7-day, 10-year discharge ($M_{7,10}$) estimated from the regional low-flow regression method can be evaluated by comparing it to the 7-day, 10-year discharge ($M_{7,10}$) calculated from the gage record for streams in the study area having nine or more years of daily-flow record. For streams draining the lowlands (such as Anchor River and Ninilchik River) low-flow estimates using the regression method are reliable (fig. 7). For Barbara Creek, however, such estimates do not agree well with low-flow values calculated from the gage record. This may be because the Barbara Creek area is more mountainous and has a more maritime climate than the Kenai lowland area.

Peak Flows

Floods in the study area are caused primarily by spring snowmelt and by summer and fall rainstorms. Rain or snowmelt during short warm periods in the winter may also cause flooding, and river stages then may be higher than those during open-water periods. The higher stages result from water flowing over ice or from backwater caused by ice-debris jams. The severity of such winter and spring flooding cannot be predicted reliably by any known method. Table 1 shows the maximum discharge for streams in the study area during the period of record. Maximum rates of unit discharge during floods are from drainage basins that receive the greatest amounts of precipitation and have the most topographic relief. The maximum recorded rate of unit discharge for mountain streams in the study area is 280 $(ft^3/s)/mi^2$, for Tutka Lagoon Creek near Homer (actually on south shore of Kachemak Bay; see fig. 2). Maximum rates of unit discharge for the low-relief drainage basins in the study area north of Homer range from about 10 $(ft^3/s)/mi^2$ to 82 $(ft^3/s)/mi^2$.

Peak-discharge records for seven stations having nine or more years of annual peak discharge data were analyzed using the log-Pearson Type III method recommended by the U.S. Water Resources Council (1981). The flood frequency curves for the seven stations are shown in figure 8. The October 23, 1980 peak discharge for Anchor River near Anchor Point was determined to be a high outlier using the analytical techniques recommended by the U.S. Water Resources Council. The systematic record of 12 years (1966-74, 1979-81) was adjusted to a historic record of 28 years (1954-81) based on flow and peak discharge records at other gaging stations in the area. Field data for Anchor River at Anchor Point were not adequate to permit a determination of peak discharge for the October 1980 event. The lack of a discharge value prevented a historic adjustment for the site and caused the computed discharge for a 50-year flood to be less than at the upstream site, Anchor River near Anchor Point.

Table 9.--Elements of the regression analysis, low flows

[$M_{d,ri} = aA^b(LP+1)^c (J+10)^d$; from Freethey and Scully, 1980]

Dependent variable $M_{d,ri}$	Regression constant a	Regression coefficient b	c	d	Standard error of estimate +	-
$M_{7,2}$	0.135	0.98	0.21	0.29	26	21
$M_{7,10}$	.0861	.98	.16	.36	36	26
$M_{7,20}$	.0671	.99	.16	.41	42	29
$M_{30,2}$	.132	.98	.20	.31	27	21
$M_{30,10}$	.0839	.98	.16	.38	36	26
$M_{30,20}$	.0656	.99	.15	.43	41	29

Table 10.--Elements of the regression analysis, peak flows

[$Q_t = aA^b(LP+1)^c P^d$; from Freethey and Scully, 1980]

Dependent variable Q_t	Regression constant a	Regression coefficient b	c	d	Standard error of estimate +	-
Q_2	0.154	0.97	-0.31	1.28	56	36
Q_5	.275	.93	- .31	1.27	51	34
Q_{10}	.385	.90	- .32	1.26	52	34
Q_{25}	.565	.88	- .32	1.26	56	36
Q_{50}	.737	.86	- .33	1.25	61	38

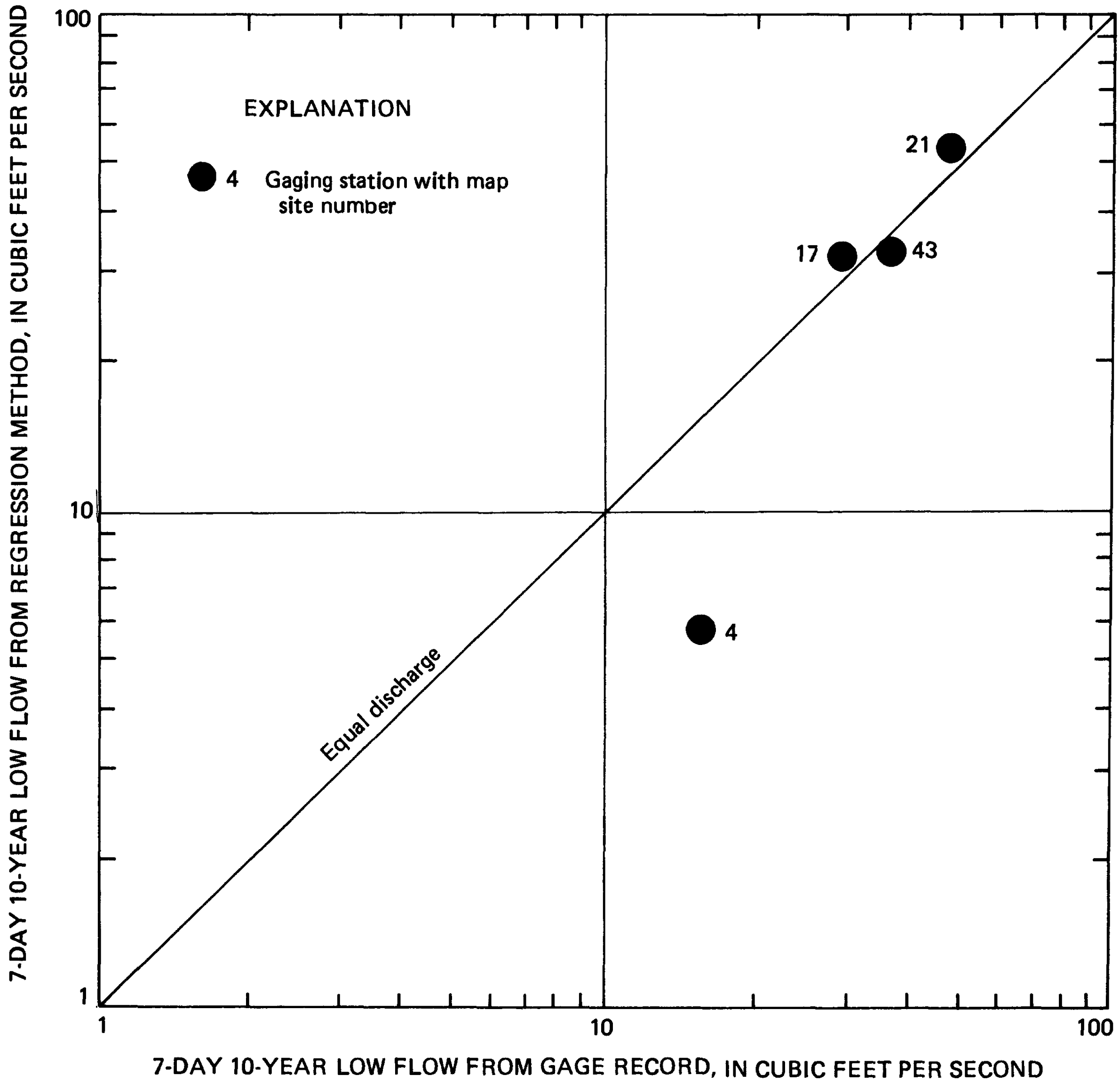

Figure 7.--Estimated 7-day 10-year low flow from regression method (Freethey and Scully, 1980) compared to 7-day 10-year low flow from gaging station record.

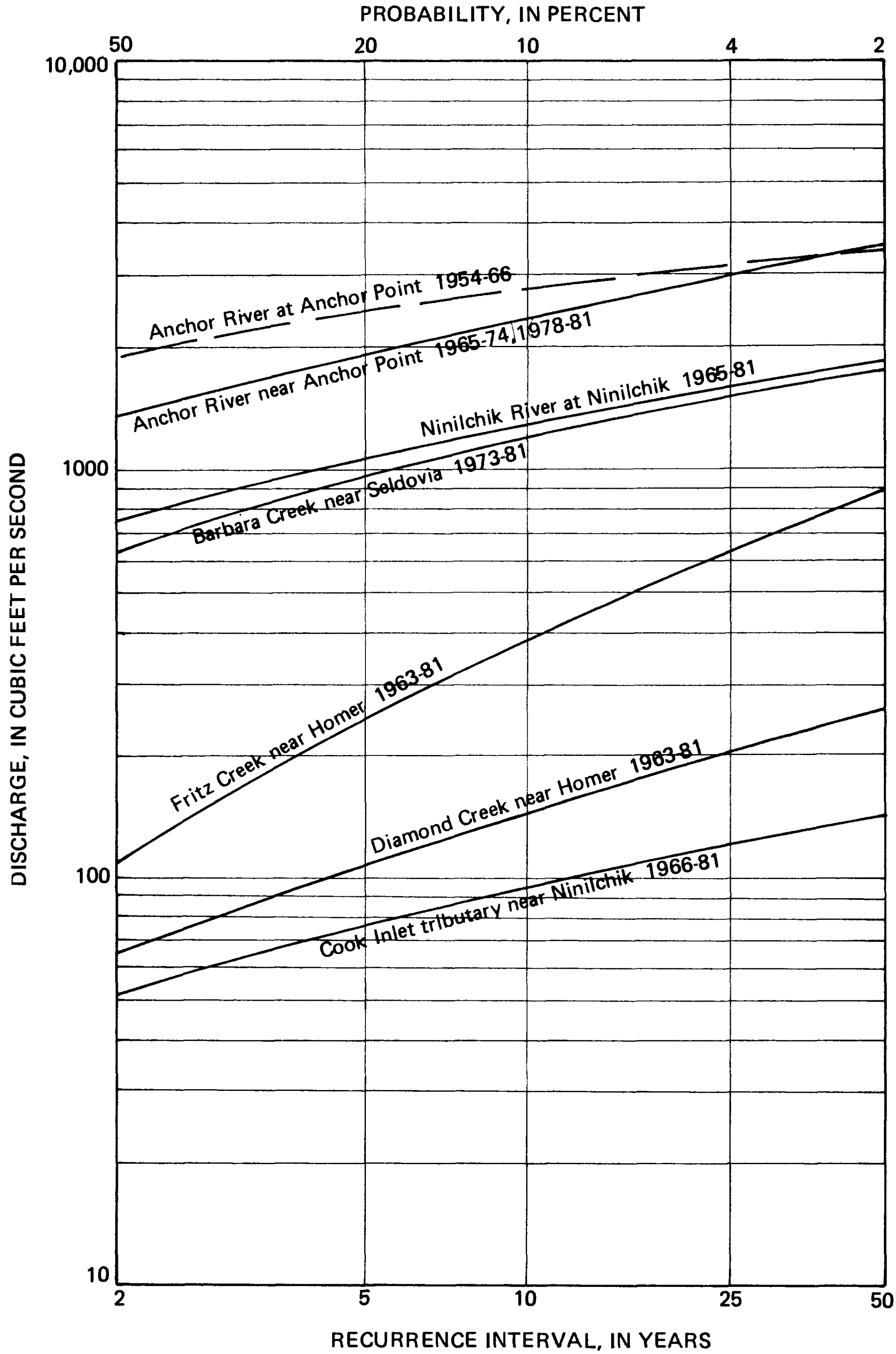

Figure 8.--Flood-frequency curves for gaged and partial-record stations with more than 9 years of annual peak data.

The peak unit discharge at the 50-year recurrence interval is commonly required for engineering design purposes. This value is computed by dividing the 50-year recurrence interval discharge by the drainage area. For Barbara Creek in the Seldovia area, the expected peak unit discharge for the 50-year recurrence interval is 85 $(ft^3/s)/mi^2$. The low-relief drainage basins in the study area north of Homer have expected peak unit discharge for the 50-year recurrence interval in the range 15 to 85 $(ft^3/s)/mi^2$.

For ungaged streams in the study area, the flood discharges for selected frequencies can be estimated using the regional flood-flow equations for Cook Inlet basin developed by Freethey and Scully (1980). The multiple-regression equations have the form:

$$Q_t = aA^b (LP + 1)^c P^d$$

where Q is dependent variable, the annual peak discharge;

t is recurrence interval, the average number of years between peak flows greater than Q;

a is regression constant;

b,c,d are regression coefficients for the independent variables (basin characteristics);

A is drainage area, in square miles;

LP is area of lakes and ponds, in percent; and

P is mean annual precipitation, in inches, from National Weather Service (1972).

The results of the regression analysis are shown in table 10.

The 50-year peak discharge estimated from the regional flood-flow regression equations (Freethey and Scully, 1980) were compared to the 50-year peak discharges calculated from gage records for streams in the study area having five or more years of record (fig. 9). For five of the gages, Barbara Creek near Seldovia, Anchor River near Anchor Point, Anchor River at Anchor Point, Cook Inlet tributary near Ninilchik, and Ninilchik River at Ninilchik, (map sites 4, 17, 21, 25, and 43 respectively), 50-year peak discharges computed from the regional regression equation compare very well with the log-Pearson Type III estimates from the gage record.

The 50-year peak discharges computed using these two methods do not agree quite as well for Fritz Creek near Homer, and Diamond Creek near Homer (map sites 7 and 8, respectively). The regional regression equations were developed using peak data through 1977. The October 1980 peak, a localized event, influenced the log-Pearson Type III peak estimates for the record at these three gages. For the 25, 10, 5, and 2-year recurrence intervals, results from the two methods compared better than those for the 50-year event.

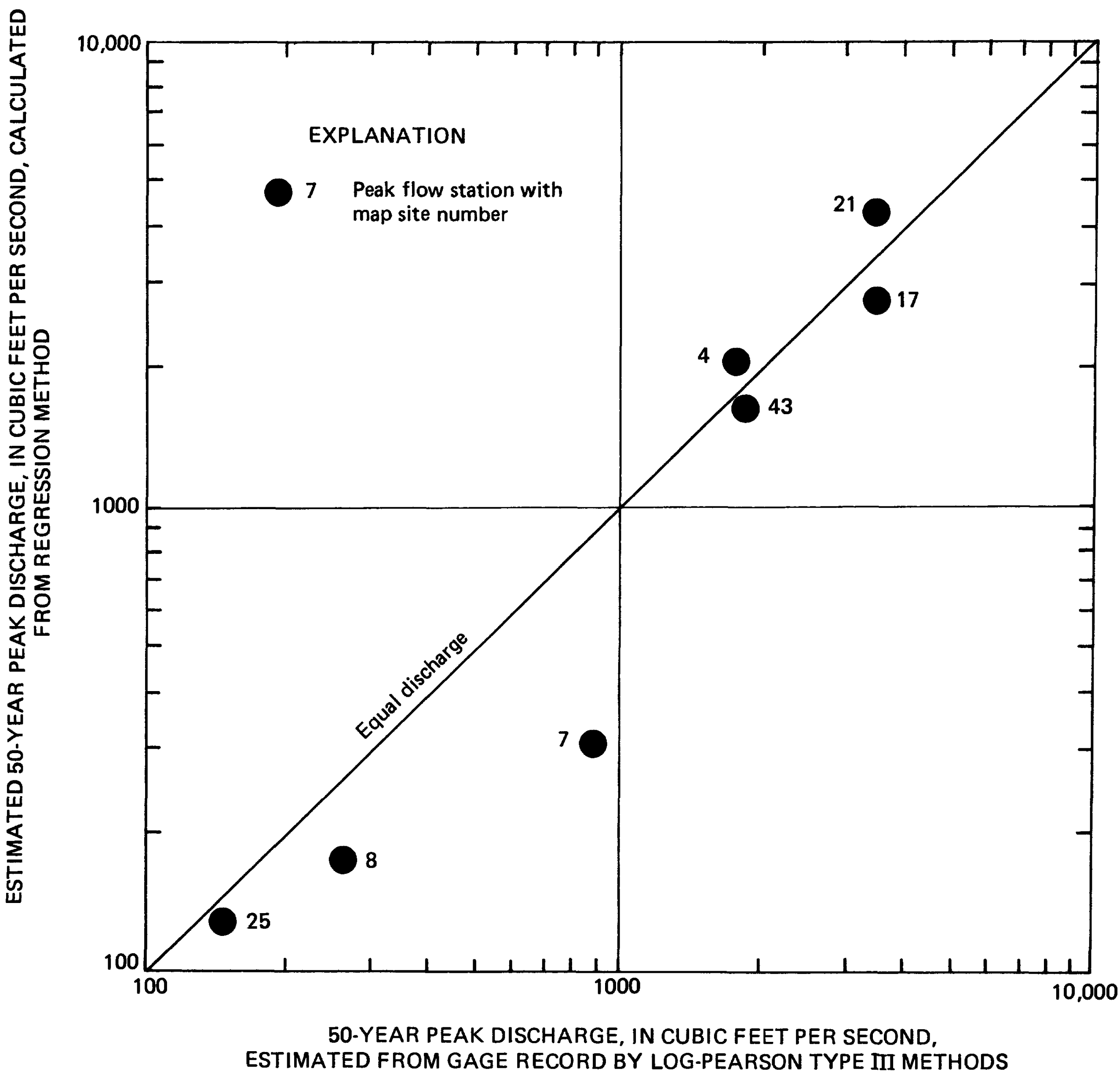

Figure 9.--Estimated 50-year peak discharge from regression method (Freethey and Scully,1980) compared to log-Pearson Type III estimate using actual peak data.

WATER QUALITY

Historic Data and Data Collection

Water-quality samples of surface water in the lower Kenai Peninsula have been collected since 1951 (table 11). Some streams have been sampled over a wide range of flow whereas others have been sampled only during low-flow periods. Analyses of the samples are published in the Geological Survey's "Water Resources Data for Alaska" for the appropriate water year.

During this study, samples were collected from the Anchor River, Stariski Creek, Deep Creek, Ninilchik River, and Crooked Creek drainages. At all partial-record and index stations, specific conductance and temperature were measured each time a discharge measurement was made.

Chemical Quality

The range, mean, and standard deviation of values from chemical analyses of all samples are shown in table 12. Although limited data are available from the Seldovia area, it appears that concentrations of dissolved solids and silica are lower there than in the rest of the study area.

A diagram of chemical analyses of samples from Deep Creek near Ninilchik shows that calcium and bicarbonate ions predominate (fig. 10). Water from the other stations had similar percentages of anions and cations.

A good relation between discharge and specific conductance exists at most stations in the study area. The relation between specific conductance and discharge for Anchor River at Anchor Point is shown in figure 11. Regression equations defining the relation between specific conductance and discharge were developed for the partial-record and index stations (table 13). Due to an insufficient number of samples, no relation could be defined for six stations where sampling was done.

Calculations were also made to show relations between specific conductance and several dissolved constituents. The only reasonably good relations found were those between specific conductance and the following constituents: dissolved solids, hardness, and bicarbonate (table 14). Although only nine samples were available for the Seldovia area, there are apparent differences between that area and the rest of the study area (figs. 12 and 13).

Water Temperature

Water temperature has been measured at 10 stations in the study area (table 15). Examples of ranges and fluctuations of water temperatures at daily record stations are shown in figures 14 and 15. The graphs indicate that maximum water temperatures in the study area north of Homer are occasionally above 15°C, but seldom greater than 20°C. Near Seldovia the water temperatures are occasionally above 10°C. The annual maximum water temperature usually occurs in midsummer after all snow in the basins has melted.

Table 11.--Stations in the lower Kenai Peninsula for which chemical water-quality data (other than specific conductance) are available

Site No. (fig. 2)	Station name	Years water-quality data available
2	Fish Creek at Seldovia	1967, 1970
3	Seldovia Lagoon tributary near Seldovia	1967, 1970
4	Barbara Creek near Seldovia	1970, 1973
5	Tutka Lagoon Creek near Homer	1974
7	Fritz Creek near Homer	1951, 1962, 1967-68, 1970-71
8	Diamond Creek near Homer	1951, 1955, 1967-68, 1970
--	Beaver Creek near Homer	1970
--	Bridge Creek near Homer	1970-71, 1974
16	Twitter Creek near Homer	1970-72
17	Anchor River near Anchor Point	1967-70
--	Anchor River above North Fork at Anchor Point	1953
20	North Fork Anchor River at mouth at Anchor Point	1951-53
21	Anchor River at Anchor Point	1951-52, 1953-54[1], 1955, 1959-66[1], 1978-79
23	Stariski Creek near Anchor Point	1951-52, 1956, 1967, 1978-79
25	Cook Inlet tributary near Ninilchik	1967-68, 1970
35	Deep Creek near Ninilchik	1952-53, 1955-58, 1967-68
43	Ninilchik River at Ninilchik	1952-53, 1955-58, 1967-68, 1970, 1975, 1978-79
45	Crooked Creek near Kasilof	1952, 1973, 1978-79

[1] Daily

Table 12.--Summary of water-quality analyses for Kenai Lowland and Seldovia area

[Chemical analyses by U.S. Geological Survey laboratories except field-determined specific conductance; constituents in milligrams per liter, except as noted]

	Kenai Lowland				Seldovia area			
Constituent	Number of samples	Range	Mean	Standard deviation	Number of samples	Range	Mean	Standard deviation
Specific conductance (µmho/cm at 25°C).	669	25 -210	79	24	48	45 -126	72	22
Dissolved solids	106	30 -116	75	18	9	36 - 67	46	9.3
Silica, dissolved	106	8.0- 50	29	8.0	9	4.5- 11	8.6	2.5
Hardness	107	10 - 53	32	9.9	9	17 - 52	27	11
Bicarbonate	107	2.5- 82	45	16	9	18 - 52	26	11
Calcium, dissolved	106	1.6- 14	7.0	2.4	9	4.4- 15	7.6	3.2
Magnesium, dissolved	106	.4- 6.7	3.6	1.3	9	.9- 3.5	1.9	.8
Sodium, dissolved	101	1.9- 12	5.5	1.6	9	2.0- 4.5	3.3	.8

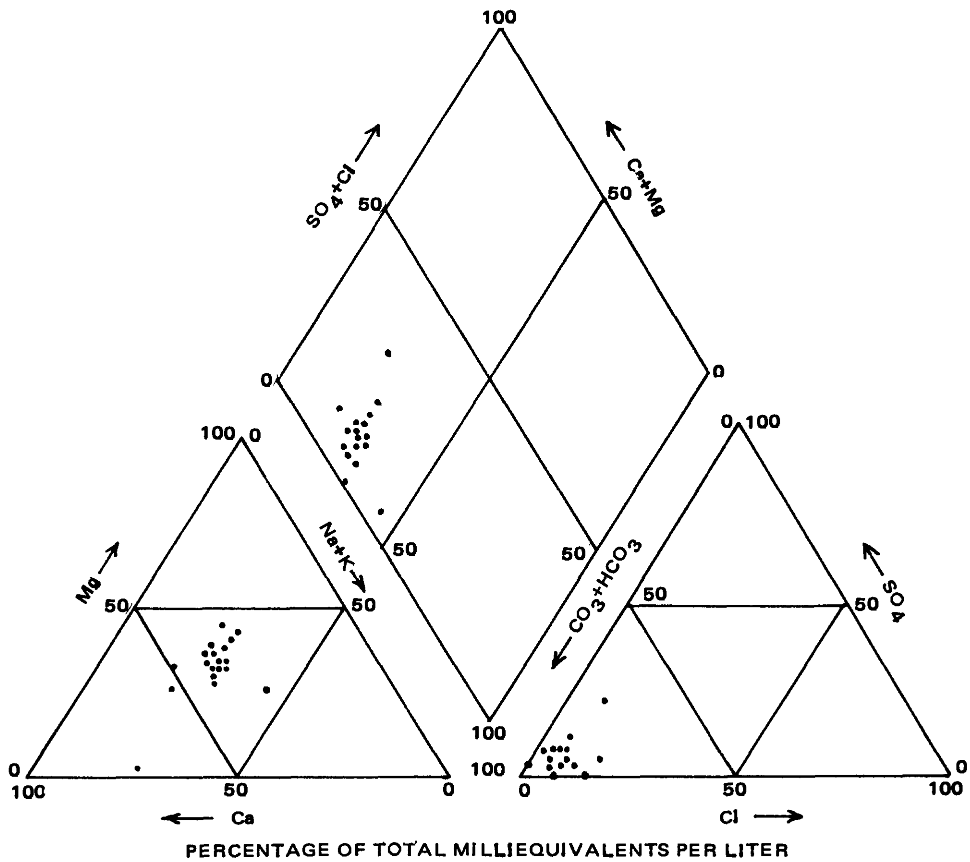

Figure 10. – Trilinear diagram of water analyses for Deep Creek near Ninilchik.

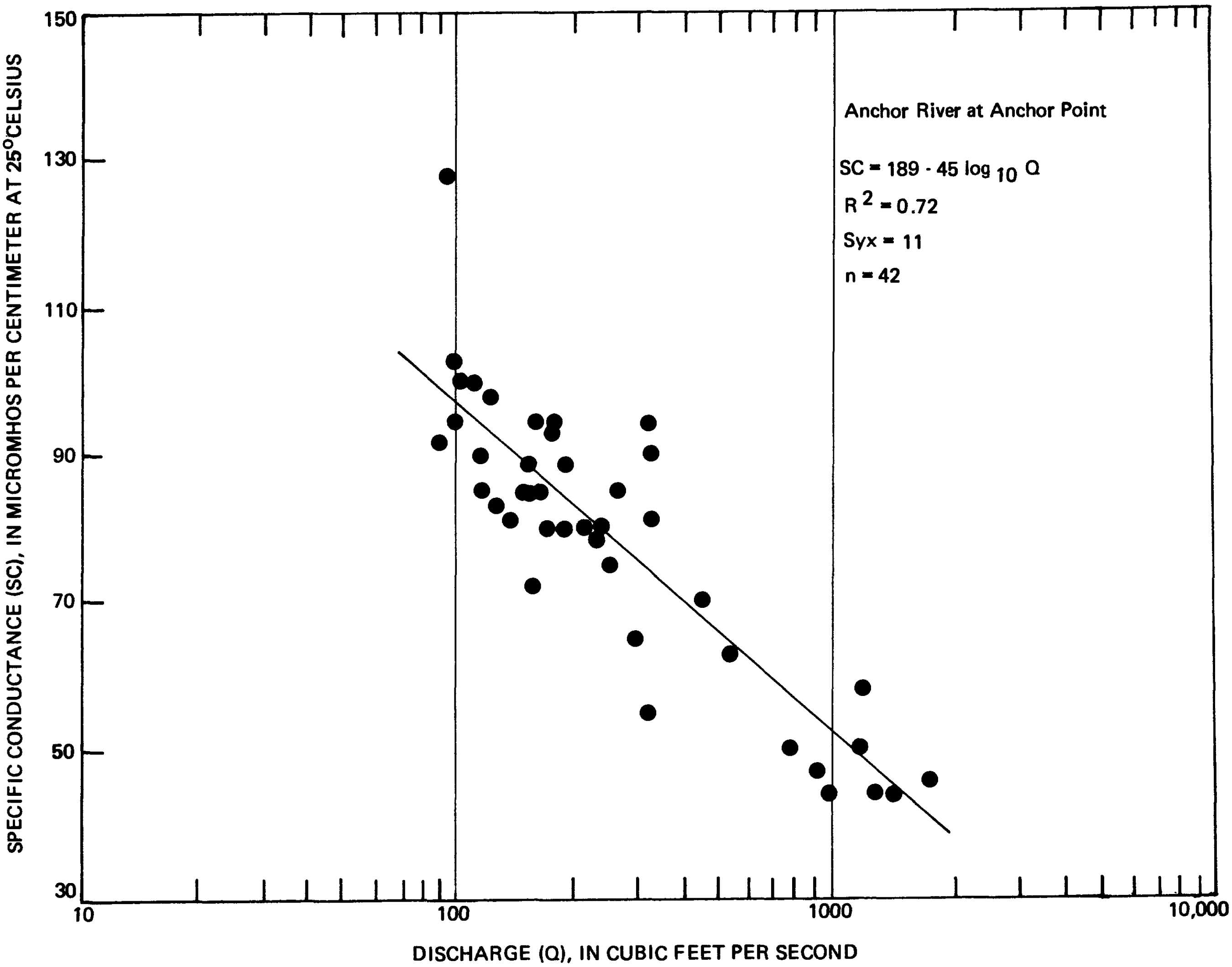

Figure 11.--Relationship between discharge and specific conductance for Anchor River at Anchor Point.

Table 13.--Regression analysis results: discharge versus specific conductance for gaging stations and partial-record stations on the lower Kenai Peninsula

[Q, discharge in cubic feet per second; SC, specific conductance in micromhos per centimeter at 25°C]

Site No.	Station name	Number of observations	Regression equation	Coefficient of determination	Standard error of estimate (umho/cm at 25°C)
4	Barbara Creek near Seldovia	15	$SC=170-40 \log_{10}Q$	.86	5.9
6	Falls Creek near Homer	12	$SC= 88-52 \log_{10}Q$	.74	12
7	Fritz Creek near Homer	21	$SC=164-72 \log_{10}Q$	.78	13
8	Diamond Creek near Homer	21	$SC= 94-32 \log_{10}Q$	.74	6.9
9	Anchor River near Homer	14	$SC=124-40 \log_{10}Q$	.81	6.9
10	Anchor River tributary at mouth near Homer	14	$SC=178-69 \log_{10}Q$	.88	6.3
11	Anchor River above Beaver Creek near Homer	14	$SC=184-56 \log_{10}Q$	.88	5.9
12	Beaver Creek near Bald Mountain near Homer	11	$SC= 68-23 \log_{10}Q$	.81	6.5
13	Beaver Creek at mouth near Homer	13	$SC=131-47 \log_{10}Q$	.68	8.1
14	Anchor River above Twitter Creek near Homer	14	$SC=185-51 \log_{10}Q$	.78	8.2
15	Twitter Creek near Lookout Mountain near Homer	14	$SC= 74-33 \log_{10}Q$	.64	10
16	Twitter Creek near Homer	19	$SC=124-40 \log_{10}Q$	.70	9.5
17	Anchor River near Anchor Point	45	$SC=189-49 \log_{10}Q$	.63	14
18	North Fork Anchor River above Chakok River near Anchor Point.	15	$SC=138-48 \log_{10}Q$	.77	8.0
19	Chakok River near Anchor Point	13	$SC=153-47 \log_{10}Q$	.48	11
20	North Fork Anchor River at mouth at Anchor Point	16	$SC=178-57 \log_{10}Q$	.84	7.7
21	Anchor River at Anchor Point	42	$SC=189-45 \log_{10}Q$	.72	11
22	Stariski Creek near Ninilchik	15	$SC=133-43 \log_{10}Q$	.62	9.7
23	Stariski Creek near Anchor Point	18	$SC=182-64 \log_{10}Q$	.84	7.6
24	Happy Creek at Happy Valley	15	$SC=101-33 \log_{10}Q$	.52	9.5
26	Deep Creek above tributary 1 near Ninilchik	13	$SC=103-38 \log_{10}Q$	.57	12
27	Deep Creek tributary 1 at mouth near Ninilchik	14	$SC=102-36 \log_{10}Q$	.82	7.1
28	Deep Creek above North Fork near Ninilchik	14	$SC=135-41 \log_{10}Q$	.76	7.6
29	North Fork Deep Creek at mouth near Ninilchik	14	$SC=186-69 \log_{10}Q$	.81	7.3
30	Deep Creek above South Fork near Ninilchik	14	$SC=227-73 \log_{10}Q$	.84	6.0
31	South Fork Deep Creek at mouth near Ninilchik	15	$SC=141-51 \log_{10}Q$	.82	6.5
32	Deep Creek above tributary 2 near Ninilchik	14	$SC=173-45 \log_{10}Q$	.62	9.9
33	Deep Creek tributary 2 at mouth near Ninilchik	14	$SC=138-51 \log_{10}Q$	.72	9.3
34	Clam Creek near Ninilchik	16	$SC=120-44 \log_{10}Q$	.79	6.0
35	Deep Creek near Ninilchik	23	$SC=175-43 \log_{10}Q$	.64	11
36	Ninilchik River above tributary 1 near Clam Gulch	14	$SC-186-92 \log_{10}Q$	.54	16
39	Ninilchik River tributary 2 at mouth near Ninilchik.	14	$SC=155-86 \log_{10}Q$	.66	17
40	Ninilchik River above tributary 3 near Ninilchik	14	$SC=298-114 \log_{10}Q$	.79	12
41	Ninilchik River tributary 3 near Ninilchik	15	$SC=118-49 \log_{10}Q$	.52	15
43	Ninilchik River at Ninilchik	30	$SC=267-85 \log_{10}Q$	.90	8.9

Table 14.--Regression equations relating specific conductance to dissolved chemical constituents

[SC, specific conductance in micromhos per centimeter at 25°C]

Constituent (mg/L)	Regression equation	Coefficient of determination	Standard error of estimate (mg/L)	Number of observations
Kenai Lowland				
Dissolved solids (DS)	DS = 10.5 + 0.75 (SC)	0.88	6.2	168
Hardness (H)	H = -1.3 + 0.38 (SC)	.79	4.5	154
Bicarbonate (HCO_3)	HCO_3 = 10.6 + 0.65 (SC)	.90	5.0	154
Seldovia area				
Dissolved solids (DS)	DS = 9.2 + 0.51 (SC)	.87	4.0	9
Hardness (H)	H = -11.7 + 0.54 (SC)	.94	2.7	9
Bicarbonate (HCO_3)	HCO_3 = -10.9 + 0.53 (SC)	.85	4.5	9

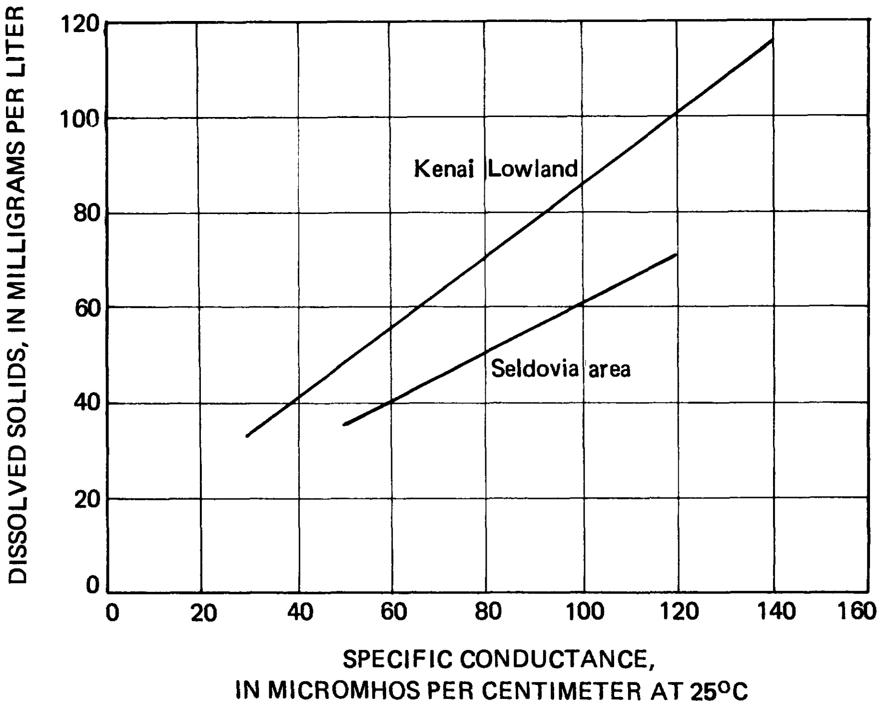

Figure 12.--Relation between dissolved solids and specific conductance for the lower Kenai Peninsula.

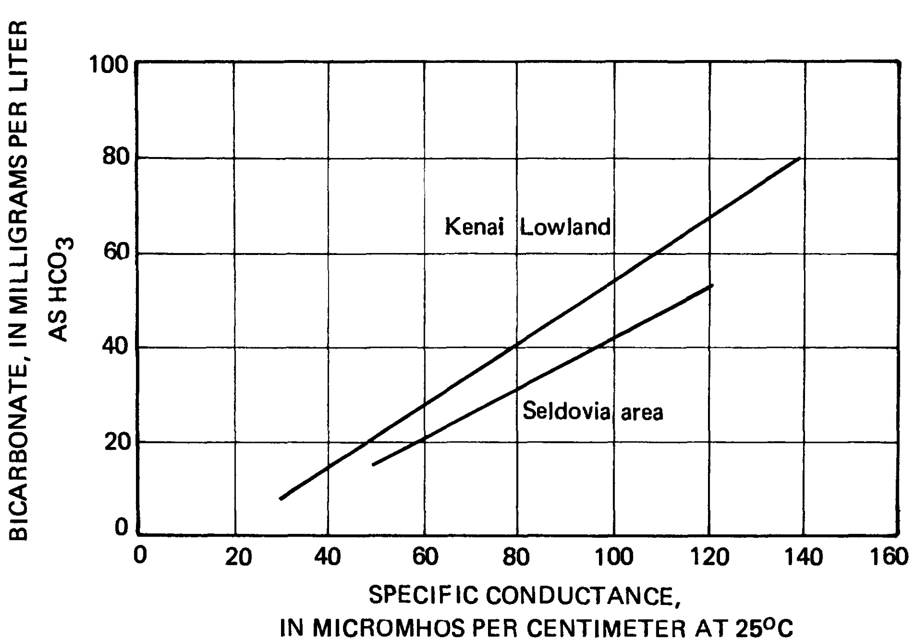

Figure 13.--Relation between bicarbonate and specific conductance for the lower Kenai Peninsula.

Table 15.--Stations in the lower Kenai Peninsula for which water-temperature data are available

Site No. (fig. 2)	Station	Period of record	Number of observations
1	Seldovia River near Seldovia	Sept. 1978 - Apr. 1980	10
4	Barbara Creek near Seldovia	May 1972 - Aug. 1980	56
5	Tutka Lagoon Creek near Homer	Oct. 1973 - Sept. 1976	Continuous.
7	Fritz Creek near Homer	May 1962 - Aug. 1980	57
8	Diamond Creek near Homer	May 1962 - Aug. 1980	50
16	Twitter Creek near Homer	Mar. 1971 - Oct. 1974 July 1978 - Aug. 1980	32
17	Anchor River near Anchor Point	Aug. 1965 - Oct. 1974 July 1978 - Aug. 1980	70
21	Anchor River at Anchor Point	Open water: 1953-54, 1959-66 July 1978 to Aug. 1980	Once daily. Do. 14
25	Cook Inlet tributary near Ninilchik.	July 1966 - Aug. 1980	29
43	Ninilchik River at Ninilchik	May - Oct. 1963 Oct. 1964 Apr. - July 1965 Nov. 1966 - Aug. 1980	Once daily. 101

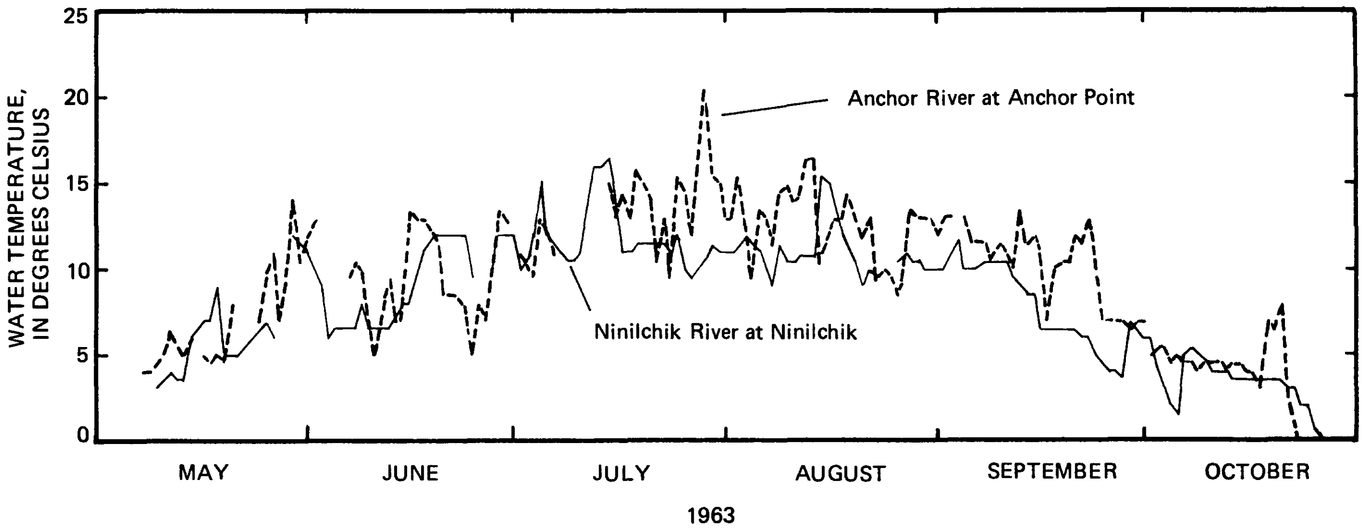

Figure 14.--Once-daily water temperatures, Anchor River at Anchor Point and Ninilchik River at Ninilchik, May to October 1963.

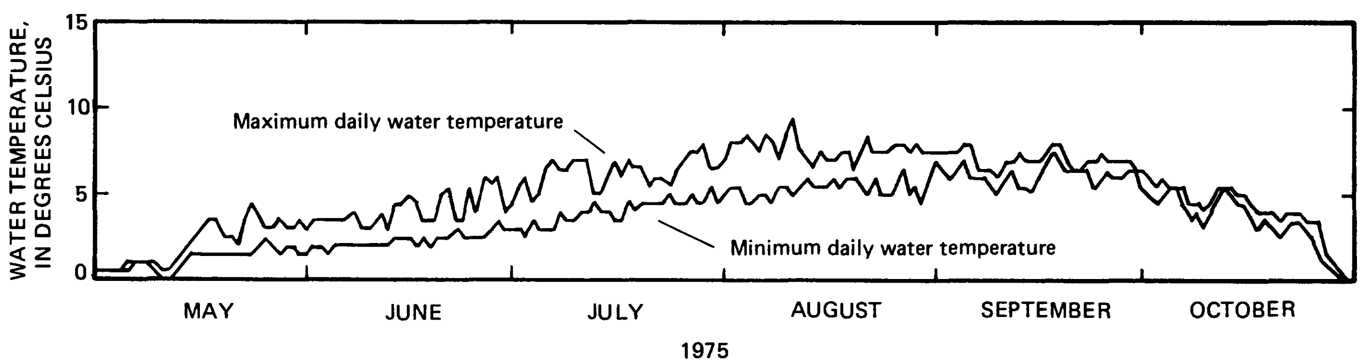

Figure 15.--Daily maximum and minimum water temperatures, Tutka Lagoon Creek near Homer, May to October 1975.

Table 16.--Summary of suspended-sediment data for four streams in the study area

Site No. (fig. 2)	Station name	Number of samples	Suspended-sediment concentration (mg/L)		Suspended-sediment discharge (ton/d)		Maximum discharge sampled (ft^3/s)
			Maximum	Minimum	Maximum	Minimum	
17	Anchor River near Anchor Point.	20	59	2	75	0.4	472
21	Anchor River at Anchor Point.	31	92	1	60	.3	890
35	Deep Creek near Ninilchik.	29	400	2	1600	.8	1480
43	Ninilchik River at Ninilchik.	478	298	2	300	.4	788

Table 17.--Summary of suspended-sediment discharge and yield using a statewide regression equation, for three streams draining the Kenai Lowland

[$\log_{10}$ (ton/d) = -3.218 + 1.135 $\log_{10}$ (drainage area) + 0.719 $\log_{10}$ (basin elevation); standard error of estimate = 0.455]

Site No. (fig. 2)	Station name	Mean daily suspended-sediment discharge (ton/d)	Suspended-sediment yield [(ton/mi^2)/yr]
17	Anchor River near Anchor Point	25	67
21	Anchor River at Anchor Point	39	64
43	Ninilchik River at Ninilchik	16	45

Suspended Sediment

Suspended-sediment samples have been collected at four stations in the Kenai lowland; no sediment data are available for the Seldovia area. Suspended-sediment samples were collected daily at Ninilchik River at Ninilchik, and samples were collected periodically at the remaining three stations. The number of samples, the range in sediment concentration, the sediment discharge, and maximum sampled discharge for all four stations are shown in table 16.

The mean daily suspended-sediment discharge was estimated (table 17) using a statewide regression equation developed by Bruce Parks and R. J. Madison (U.S. Geological Survey, unpub. data, 1983) for three stations. These estimates gave a mean yield range of 45 to 67 $(ton/mi^2)/yr$ for streams draining the Kenai Lowland. The estimated sediment yield for Ninilchik River at Ninilchik, 45 $(ton/mi^2)/yr$, has a large range in standard error, -16 to +27 $(ton/mi^2)/yr$. The measured value of 33 $(ton/mi^2)/yr$ for the period May 1963 to April 1965 is within the prediction error of the regression equation. Caution is advised in use of the equation because of the large standard error. Lack of suspended-sediment samples at higher discharges, greater than the 2-year flood discharge, prevented detailed individual station analysis for the three gages. If suspended-sediment data are needed for design considerations, a better understanding is needed of the discharge and suspended-sediment relationship for the desired site.

SUMMARY

- Long-term annual mean discharge for 39 partial-record stations in the Lower Kenai Peninsula was estimated on the basis of discharge records from three gaging stations in the Cook Inlet area.

- Low-flow frequency curves were developed for four gaging stations. By correlating low-flow discharge measurements made at the partial-record stations to discharges at the gaging stations, the 7-day low flows for 2-year and 10-year intervals were determined for the partial-record sites. These curves showed the highest low flows at Barbara Creek near Seldovia. Low-flow equations can be used to estimate low flows at ungaged sites for streams draining lowlands on the Kenai Peninsula.

- Peak discharges in the study area range from 280 $(ft^3/s)/mi^2$ near Seldovia to 80 $(ft^3/s)/mi^2$ for the Kenai Lowland. Flood frequency curves for seven stations show that streams near Seldovia have higher peak discharges than those in the northern part of the study area. Flood frequency equations can be used to determine peak discharges at ungaged sites.

- Calcium and bicarbonate are the dominant ions in surface water of most of the study area. More silica is found in surface water of the Kenai Lowland than in the Seldovia area. Regression analyses indicated that at a given discharge, higher concentrations of dissolved constituents will be found in the Kenai Lowland than in the Seldovia area.

- Limited water-temperature data indicate that water in the lower Kenai Peninsula is warmer than that in the Seldovia area. In both areas, the annual maximum water temperature usually occurs in midsummer after all snow has melted.

- Suspended-sediment data, available only for the Kenai Lowland, are not detailed enough for individual station analysis. Statewide regression equations may be used for preliminary suspended-sediment load calculations.

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APPENDIX

Streamflow, temperature, and specific conductance data for streams on the lower Kenai Peninsula, 1978-80

(Data for Seldovia River near Seldovia and Cook Inlet Tributary have been previously published in the U.S. Geological Survey's annual reports "Water Resources Data for Alaska)

15238800 Fish Creek at Seldovia

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	TEMPER-ATURE (DEG C) (00010)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)
JUL , 1978				
15...	1105	3.6	7.0	55
AUG				
18...	1310	2.1	9.0	60
SEP				
16...	1120	6.4	7.5	115
OCT				
11...	1420	26	6.0	70
NOV				
03...	0750	17	2.5	60
DEC				
07...	1415	20	2.0	--
MAR , 1979				
16...	0725	2.7	--	--
APR				
19...	1600	14	1.0	--
MAY				
03...	1445	21	3.0	60
17...	1300	14	3.5	60
JUN				
01...	1455	26	6.0	55
15...	1100	8.5	5.0	55
JUL				
20...	1420	1.5	12.0	60
AUG				
17...	1055	18	7.0	65
MAR , 1980				
07...	1150	7.8	1.5	65
JUL				
25...	1130	4.6	8.0	50
SEP				
04...	1420	3.4	6.0	60

15238810 Seldovia Lagoon tributary near Seldovia

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	TEMPER-ATURE (DEG C) (00010)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)
JUL , 1978				
15...	1245	.42	6.0	--
AUG				
18...	1620	.06	9.0	55
SEP				
15...	1600	.97	7.5	50
OCT				
11...	1320	6.3	5.5	60
NOV				
03...	0915	4.7	1.5	55
DEC				
07...	1355	7.0	1.5	--
MAR , 1979				
16...	0815	.28	.0	--
APR				
19...	1710	3.5	--	--
MAY				
03...	1330	10	2.5	60
17...	1145	7.8	3.0	55
JUN				
01...	1510	7.6	5.5	45
15...	0940	1.3	5.5	55
JUL				
20...	1520	.16	6.0	60
AUG				
17...	1110	3.2	9.0	55
MAR , 1980				
06...	1230	1.9	1.0	60
JUL				
25...	1205	.76	8.0	60
SEP				
04...	1515	.71	5.5	60

15238820 Barbara Creek near Seldovia

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	TEMPER-ATURE (DEG C) (00010)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)
AUG , 1978				
18...	1645	50	10.0	115
SEP				
16...	1030	88	6.0	90
OCT				
10...	1600	221	5.0	90
JUN , 1979				
01...	1330	340	6.5	75
JUL				
20...	1705	87	10.0	95
AUG				
17...	0915	221	7.0	90
MAR , 1980				
07...	1000	50	2.5	110
JUL				
25...	0930	158	5.5	80
SEP				
04...	1115	58	4.0	100

15239300 Falls Creek near Homer

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	TEMPER-ATURE (DEG C) (00010)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)
JUL , 1978				
11...	1335	2.2	9.5	70
AUG				
18...	1055	.92	9.0	85
SEP				
15...	1110	2.0	7.0	--
OCT				
10...	1125	3.8	4.0	65
NOV				
09...	1020	2.3	.0	--
JAN , 1979				
12...	0930	1.2	.0	--
MAR				
16...	1220	.59	.0	--
APR				
19...	1010	2.5	1.0	--
MAY				
01...	1640	19	1.5	30
15...	1205	8.0	2.5	40
30...	1115	3.7	8.0	25
JUN				
15...	1425	1.8	7.0	75
JUL				
20...	1005	1.4	9.0	80
AUG				
16...	1515	1.2	9.0	95
MAR , 1980				
05...	1330	1.8	.5	80
JUL				
23...	1050	2.6	9.0	70
SEP				
04...	1815	1.6	4.0	80

15239500 Fritz Creek near Homer

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	TEMPER-ATURE (DEG C) (00010)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)
JUL , 1978				
11...	1015	6.1	8.0	95
AUG				
16...	1005	3.2	7.5	120
SEP				
15...	1045	8.8	7.5	100
OCT				
10...	1435	12	5.5	60
NOV				
09...	1345	8.9	.0	--
JAN , 1979				
05...	0850	6.7	.0	--
MAR				
14...	1715	4.8	.0	--
APR				
17...	1815	14	1.0	85
MAY				
01...	1445	53	3.5	55
15...	1025	27	2.5	60
30...	1400	11	9.5	75
JUN				
15...	1000	5.0	7.0	100
JUL				
20...	0830	4.9	9.0	115
AUG				
16...	1100	3.6	9.5	155
MAR , 1980				
05...	1630	7.7	.5	105
JUL				
23...	0745	8.9	8.0	95
SEP				
05...	0720	5.5	2.0	110

15239800 Diamond Creek near Homer

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	TEMPER-ATURE (DEG C) (00010)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)
JUL , 1978				
11...	1645	3.2	9.5	70
AUG				
16...	1145	2.0	9.0	80
SEP				
13...	0850	5.3	5.5	80
OCT				
09...	1850	7.9	5.0	75
NOV				
09...	0930	5.7	--	--
JAN , 1979				
05...	1530	3.6	.0	--
MAR				
15...	1010	2.0	.0	90
APR				
17...	1325	9.7	1.0	--
MAY				
01...	1335	36	2.5	45
15...	0905	12	2.5	50
30...	0910	4.3	6.0	70
JUN				
15...	1140	2.1	9.0	75
JUL				
18...	1955	1.7	11.5	80
AUG				
16...	0840	2.5	9.0	--
MAR , 1980				
06...	1720	5.3	.0	85
JUL				
23...	1600	4.0	12.0	70
SEP				
02...	1940	3.2	5.0	80

15239805 Anchor River near Homer

DATE	TIME	STREAM-FLOW, INSTANTANEOUS (CFS) (00061)	TEMPERATURE (DEG C) (00010)	SPECIFIC CONDUCTANCE (UMHOS) (00095)
JUL , 1978				
14...	1610	17	9.5	65
AUG				
17...	1640	15	13.5	75
SEP				
14...	1650	32	8.5	65
OCT				
11...	1744	26	4.5	65
NOV				
08...	--	22	--	--
JAN , 1979				
11...	1330	15	3.0	--
MAR				
14...	0845	14	--	--
APR				
18...	0905	18	.5	75
MAY				
02...	--	217	1.0	35
16...	0950	105	2.0	40
31...	0920	54	6.0	50
JUN				
14...	0850	23	8.0	60
JUL				
19...	0935	19	10.0	70
AUG				
15...	0830	15	9.0	90
MAR , 1980				
05...	1100	19	.5	75
JUL				
24...	1950	31	11.5	60
SEP				
03...	1720	24	6.5	80

15239807 Anchor River tributary at mouth near Homer

DATE	TIME	STREAM-FLOW, INSTANTANEOUS (CFS) (00061)	TEMPERATURE (DEG C) (00010)	SPECIFIC CONDUCTANCE (UMHOS) (00095)
JUL , 1978				
14...	1625	19	10.0	80
AUG				
17...	1655	20	13.0	90
SEP				
14...	1645	31	8.5	80
OCT				
11...	--	25	4.5	85
NOV				
08...	--	24	.0	--
JAN , 1979				
11...	1500	26	.0	--
MAR				
14...	1035	22	--	--
APR				
18...	0905	24	--	90
MAY				
02...	1000	123	1.5	40
16...	--	74	2.0	40
31...	--	40	5.5	60
JUN				
14...	0855	22	6.5	80
JUL				
19...	0835	21	.0	85
AUG				
15...	0840	20	9.0	90
MAR , 1980				
05...	1150	22	.5	90
JUL				
24...	1950	28	12.0	85
SEP				
03...	1655	24	7.0	80

15239810 Anchor River above Beaver Creek near Homer

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	TEMPER-ATURE (DEG C) (00010)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)
JUL , 1978				
14...	1720	52	11.5	80
AUG				
17...	1755	49	15.0	90
SEP				
14...	1750	82	9.0	80
OCT				
11...	1820	66	4.5	90
NOV				
08...	1635	48	--	--
JAN , 1979				
08...	1440	66	.0	--
MAR				
14...	1354	48	.0	--
APR				
18...	0745	62	.5	90
MAY				
02...	0745	E460	.5	40
16...	0855	245	2.0	45
31...	0745	111	6.0	60
JUN				
14...	0745	57	7.5	80
JUL				
19...	0740	53	12.0	85
AUG				
15...	0740	51	10.5	95
MAR , 1980				
05...	1305	66	.0	85
JUL				
24...	2055	77	14.0	75
SEP				
03...	1740	68	7.5	80

15239818 Beaver Creek near Bald Mountain near Homer

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	TEMPER-ATURE (DEG C) (00010)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)
JUL , 1978				
13...	1100	1.6	9.5	55
AUG				
18...	1240	1.2	12.0	60
SEP				
15...	1230	6.6	8.0	--
OCT				
10...	1310	9.6	4.5	40
NOV				
09...	1230	4.0	--	--
JAN , 1979				
12...	1220	2.0	.0	--
MAR				
16...	1500	1.0	.0	--
MAY				
02...	0910	76	.5	25
16...	0910	21	1.5	40
30...	1240	6.5	9.0	--
JUN				
15...	1600	2.3	7.0	60
JUL				
20...	1120	2.7	12.0	55
AUG				
16...	1720	1.2	10.5	75
MAR , 1980				
05...	1440	2.6	.5	60
JUL				
23...	0915	3.5	10.0	50
SEP				
04...	1940	2.4	5.0	70

15239822 Beaver Creek at mouth near Homer

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	TEMPER-ATURE (DEG C) (00010)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)
JUL , 1978				
14...	1740	11	10.0	70
AUG				
17...	1750	9.5	13.0	85
SEP				
14...	1730	23	8.0	70
OCT				
11...	1810	22	4.5	70
NOV				
08...	1635	14	--	--
JAN , 1979				
08...	1435	12	.0	--
MAR				
14...	1450	7.9	.0	--
APR				
18...	0740	25	--	70
MAY				
16...	0750	62	2.0	45
31...	0745	31	7.5	55
JUN				
14...	0740	14	9.0	65
JUL				
19...	0800	10	11.0	80
AUG				
15...	0745	9.4	9.5	100
MAR , 1980				
05...	1400	14	--	80
JUL				
24...	2050	20	12.0	80
SEP				
03...	1800	14	6.0	75

15239840 Anchor River above Twitter Creek near Homer

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	TEMPER-ATURE (DEG C) (00010)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)
JUL , 1978				
11...	1700	87	13.0	80
AUG				
16...	1425	63	12.0	100
SEP				
13...	1120	227	7.0	80
OCT				
11...	0905	129	4.0	90
NOV				
07...	1630	108	.0	--
JAN , 1979				
04...	1400	92	.0	--
MAR				
19...	1820	70	.0	--
APR				
17...	1230	126	--	80
MAY				
01...	1230	683	3.0	45
14...	1830	432	4.0	45
30...	0830	192	7.0	60
JUN				
13...	2020	89	14.0	75
JUL				
18...	1915	88	16.0	85
AUG				
14...	1950	87	13.0	95
MAR , 1980				
06...	1615	103	.0	85
JUL				
22...	2100	140	15.0	70
SEP				
02...	1910	103	7.5	85

15239845 Twitter Creek near Lookout Mountain near Homer

DATE	TIME	STREAM-FLOW, INSTANTANEOUS (CFS) (00061)	TEMPERATURE (DEG C) (00010)	SPECIFIC CONDUCTANCE (UMHOS) (00095)
JUL , 1978				
13...	1400	1.7	8.0	55
AUG				
18...	1528	1.2	11.5	70
SEP				
15...	1215	1.1	7.5	75
OCT				
10...	1551	1.4	4.0	70
NOV				
09...	1505	2.1	--	--
JAN , 1979				
12...	1450	1.2	.0	--
MAR				
19...	1215	.49	.0	--
APR				
17...	1615	1.0	--	75
MAY				
03...	0945	14	1.5	45
15...	1530	12	2.5	45
30...	1530	4.2	10.0	<25
JUN				
15...	1025	1.5	8.0	65
JUL				
19...	1920	.88	12.0	75
AUG				
16...	0955	.97	10.0	85
MAR , 1980				
05...	1450	1.1	.0	80
JUL				
23...	1320	2.4	10.0	65
SEP				
04...	0740	1.4	2.5	70

15239880 Twitter Creek near Homer

DATE	TIME	STREAM-FLOW, INSTANTANEOUS (CFS) (00061)	TEMPERATURE (DEG C) (00010)	SPECIFIC CONDUCTANCE (UMHOS) (00095)
JUL , 1978				
11...	1810	13	12.0	70
AUG				
16...	1332	7.9	11.0	85
SEP				
13...	1120	19	7.0	80
OCT				
11...	0800	13	4.0	100
NOV				
07...	1550	21	.0	55
JAN , 1979				
04...	1520	12	--	--
MAR				
19...	1615	5.5	.0	--
APR				
17...	1155	16	.5	75
MAY				
01...	1310	132	2.5	50
14...	1830	95	3.5	45
30...	0755	29	7.0	60
JUN				
13...	2025	12	11.5	70
JUL				
18...	1800	7.9	15.5	80
AUG				
14...	1940	10	12.0	90
MAR , 1980				
06...	1610	15	.5	85
JUL				
22...	2110	22	14.0	65
SEP				
02...	1925	14	6.5	80

15239900 Anchor River near Anchor Point

DATE	TIME	STREAM-FLOW, INSTANTANEOUS (CFS) (00061)	TEMPERATURE (DEG C) (00010)	SPECIFIC CONDUCTANCE (UMHOS) (00095)
JUL , 1978				
11...	1830	104	13.0	80
AUG				
16...	1645	71	12.5	100
SEP				
13...	1200	256	8.0	85
OCT				
11...	0830	150	4.0	80
MAR , 1979				
14...	1830	76	.0	100
APR				
16...	1830	181	--	75
MAY				
01...	0745	953	1.5	45
15...	0800	520	2.5	45
29...	2015	248	11.0	60
JUN				
13...	1910	118	--	75
JUL				
18...	1745	104	16.5	90
AUG				
18...	0950	102	11.0	100
MAR , 1980				
07...	1640	142	.0	80
JUL				
23...	1510	163	15.0	55
SEP				
02...	1805	121	8.0	80
OCT				
23...	1815	1370	4.5	40
24...	1210	1030	4.5	46

15239970 North Fork Anchor River above Chakok River near Anchor Point

DATE	TIME	STREAM-FLOW, INSTANTANEOUS (CFS) (00061)	TEMPERATURE (DEG C) (00010)	SPECIFIC CONDUCTANCE (UMHOS) (00095)
JUL , 1978				
12...	1115	14	11.5	80
AUG				
16...	1430	11	12.0	95
SEP				
13...	1459	23	8.0	80
OCT				
13...	1200	54	4.0	70
NOV				
07...	--	19	.0	--
JAN , 1979				
04...	0925	14	.0	--
MAR				
20...	1330	10	.0	90
APR				
17...	1035	29	.5	65
MAY				
01...	1000	121	2.0	40
14...	1605	54	5.5	40
29...	1755	24	12.5	60
JUN				
13...	1720	13	13.0	80
JUL				
18...	1550	16	16.0	80
AUG				
14...	1735	20	13.0	85
MAR , 1980				
06...	1110	18	.0	75
JUL				
22...	1730	20	16.5	75
SEP				
02...	1650	18	7.5	80

15239980 Chakok River near Anchor Point

DATE	TIME	STREAM-FLOW, INSTANTANEOUS (CFS) (00061)	TEMPERATURE (DEG C) (00010)	SPECIFIC CONDUCTANCE (UMHOS) (00095)
JUL , 1978				
12...	1015	20	11.0	85
AUG				
16...	1305	14	12.0	110
SEP				
13...	1400	33	8.0	95
OCT				
13...	1100	65	4.0	80
NOV				
07...	1545	42	.0	--
JAN , 1979				
04...	--	21	.0	--
MAR				
20...	1150	14	.0	95
APR				
17...	0830	62	.0	--
MAY				
01...	0930	E180	--	--
14...	--	68	5.5	55
29...	1900	30	11.0	75
JUN				
13...	1720	19	12.5	90
JUL				
18...	1630	26	16.0	85
AUG				
14...	--	29	13.0	100
MAR , 1980				
06...	1005	28	.0	70
JUL				
22...	1730	27	16.0	85
SEP				
02...	1710	25	8.0	90

15239990 North Fork Anchor River at mouth at Anchor Point

DATE	TIME	STREAM-FLOW, INSTANTANEOUS (CFS) (00061)	TEMPERATURE (DEG C) (00010)	SPECIFIC CONDUCTANCE (UMHOS) (00095)
JUL , 1978				
11...	2015	40	13.5	80
AUG				
16...	1120	28	13.0	95
SEP				
13...	1815	62	10.0	--
OCT				
12...	1700	86	5.5	90
NOV				
07...	--	78	.5	70
JAN , 1979				
04...	1430	34	.0	85
MAR				
20...	0925	33	.0	--
APR				
16...	1715	138	--	55
30...	1700	317	4.0	30
MAY				
14...	1445	146	5.5	50
29...	1645	64	12.5	70
JUN				
13...	1600	40	14.5	80
JUL				
18...	1350	44	18.0	80
AUG				
14...	1620	63	14.0	80
MAR , 1980				
03...	1815	81	.0	70
JUL				
22...	1930	60	16.5	80
SEP				
02...	1545	51	9.5	90

15240000 Anchor River at Anchor Point

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	TEMPER-ATURE (DEG C)	SPE-CIFIC CON-DUCT-ANCE (UMHOS)
JUL , 1978				
11...	1920	155	13.5	85
AUG				
16...	1000	111	12.5	100
SEP				
13...	1715	326	9.0	95
OCT				
12...	--	326	5.5	90
NOV				
07...	1420	263	.5	85
JAN , 1979				
03...	1450	174	--	80
MAR				
12...	1915	104	.0	100
APR				
16...	1715	449	--	70
30...	1900	1170	3.5	50
MAY				
14...	1500	762	4.0	50
29...	1715	321	12.0	55
JUN				
13...	1545	163	13.0	85
JUL				
18...	1420	160	17.0	85
AUG				
14...	1615	182	14.0	95
MAR , 1980				
03...	1900	247	.0	80
JUL				
22...	1845	251	16.5	75
SEP				
02...	1530	195	8.5	80

15240200 Stariski Creek near Ninilchik

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	TEMPER-ATURE (DEG C) (00010)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)
JUL , 1978				
14...	0758	16	8.5	75
AUG				
17...	0745	18	9.0	90
SEP				
14...	0735	22	7.0	75
OCT				
11...	1036	18	3.0	85
NOV				
08...	0815	7.1	.0	80
JAN , 1979				
10...	0945	16	--	--
MAR				
13...	0945	14	.0	95
APR				
18...	1850	28	--	--
MAY				
02...	1040	124	1.5	40
16...	1905	48	4.0	50
31...	--	25	8.0	65
JUN				
14...	0930	16	11.0	70
JUL				
19...	1720	17	14.5	80
AUG				
15...	0935	16	--	95
MAR , 1980				
04...	0915	19	.0	75
JUL				
24...	1110	29	11.0	80
SEP				
03...	0930	21	4.0	80

15240300 Stariski Creek near Anchor Point

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	TEMPER-ATURE (DEG C)	SPE-CIFIC CON-DUCT-ANCE (UMHOS)
JUL , 1978				
12...	1020	27	13.0	85
AUG				
16...	1600	22	12.5	95
SEP				
13...	1530	40	9.5	90
OCT				
12...	--	34	5.0	100
NOV				
07...	--	53	.5	70
JAN , 1979				
04...	1220	35	.0	85
MAR				
12...	1545	24	.0	100
APR				
16...	1615	86	.0	55
30...	1600	204	4.0	35
MAY				
14...	1300	95	6.0	50
29...	1530	41	12.5	70
JUN				
13...	1415	24	12.5	85
JUL				
18...	1245	31	16.0	75
AUG				
14...	1515	32	14.0	95
MAR , 1980				
03...	1650	43	.0	80
JUL				
22...	1540	46	15.0	70
SEP				
02...	1425	34	8.5	85

15240400 Happy Creek at Happy Valley

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	TEMPER-ATURE (DEG C) (00010)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)
JUL , 1978				
12...	1333	5.9	12.0	70
AUG				
15...	1920	3.8	12.0	85
SEP				
13...	1816	6.7	9.0	75
OCT				
13...	1310	16	4.5	75
NOV				
07...	1345	13	.5	55
JAN , 1979				
04...	0945	6.7	.0	70
MAR				
12...	1500	4.3	--	--
APR				
16...	1350	22	--	50
30...	1340	47	6.5	50
MAY				
14...	1250	13	6.5	50
29...	1350	6.9	11.5	60
JUN				
13...	1420	5.2	11.0	75
JUL				
18...	1005	5.0	13.0	80
AUG				
14...	1345	7.4	11.5	90
MAR , 1980				
03...	1450	6.4	.5	75
JUL				
22...	1430	6.8	13.0	--
SEP				
02...	1330	7.8	7.0	80

15240600 Deep Creek above tributary No. 1 near Ninilchik

DATE	TIME	STREAM-FLOW, INSTANTANEOUS (CFS) (00061)	TEMPERATURE (DEG C) (00010)	SPECIFIC CONDUCTANCE (UMHOS) (00095)
JUL , 1978				
14...	1250	9.5	10.5	55
AUG				
17...	1342	7.5	13.0	70
SEP				
14...	1404	30	8.0	50
OCT				
11...	1505	19	4.0	45
NOV				
08...	--	10	--	--
JAN , 1979				
10...	1610	11	--	--
MAR				
13...	--	7.8	--	--
APR				
18...	1040	10	--	70
MAY				
02...	1730	146	1.0	30
16...	1045	79	1.5	<25
31...	1540	33	10.0	35
JUN				
14...	1415	12	14.0	50
JUL				
19...	0940	14	12.0	55
AUG				
15...	1420	12	10.0	95
MAR , 1980				
05...	0935	17	--	65
JUL				
24...	1645	22	14.0	55
SEP				
03...	1415	16	6.5	55

15240700 Deep Creek tributary No. 1 at mouth near Ninilchik

DATE	TIME	STREAM-FLOW, INSTANTANEOUS (CFS) (00061)	TEMPERATURE (DEG C) (00010)	SPECIFIC CONDUCTANCE (UMHOS) (00095)
JUL , 1978				
14...	1242	7.5	9.5	65
AUG				
17...	1320	6.5	13.5	75
SEP				
14...	1345	25	7.5	50
OCT				
11...	1500	15	4.0	55
NOV				
08...	--	10	--	--
JAN , 1979				
10...	1540	12	--	--
MAR				
13...	1630	8.6	--	--
APR				
18...	1040	8.5	.5	70
MAY				
02...	1730	137	2.5	30
16...	1045	79	1.0	30
31...	1600	36	8.0	35
JUN				
14...	1415	8.1	12.5	60
JUL				
19...	1000	9.2	11.5	60
AUG				
15...	1355	10	12.0	70
MAR , 1980				
04...	1655	9.1	.0	70
JUL				
24...	1645	14	13.0	70
SEP				
03...	1440	12	6.5	75

15240800 Deep Creek above North Fork near Ninilchik

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	TEMPER-ATURE (DEG C) (00010)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)
JUL , 1978				
14...	1352	35	10.0	65
AUG				
17...	1400	32	14.0	80
SEP				
14...	1430	86	8.0	60
OCT				
11...	1600	56	4.5	55
NOV				
08...	1345	27	--	--
JAN , 1979				
10...	1550	31	--	--
MAR				
13...	1730	29	.0	80
APR				
18...	1130	36	--	--
MAY				
02...	1620	346	3.5	40
16...	1205	212	2.5	35
31...	1635	111	10.0	35
JUN				
14...	1500	43	13.0	60
JUL				
19...	1045	46	11.0	65
AUG				
15...	1455	48	11.0	70
MAR , 1980				
04...	1630	51	.0	70
JUL				
24...	1745	62	14.5	60
SEP				
03...	1520	49	7.0	70

15240900 North Fork Deep Creek at mouth near Ninilchik

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	TEMPER-ATURE (DEG C) (00010)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)
JUL , 1978				
14...	1400	37	10.0	70
AUG				
17...	1447	37	12.5	80
SEP				
14...	1439	48	7.5	75
OCT				
11...	1637	43	4.0	--
NOV				
08...	1345	26	.0	--
JAN , 1979				
10...	1550	34	.0	--
MAR				
13...	1840	35	.0	85
APR				
18...	1120	32	--	85
MAY				
02...	1615	129	4.0	50
16...	1200	129	2.5	40
31...	1515	98	7.0	40
JUN				
14...	1500	47	13.0	55
JUL				
19...	1010	42	9.5	70
AUG				
15...	1445	33	10.0	85
MAR , 1980				
04...	1730	38	.0	80
JUL				
24...	1740	53	12.0	75
SEP				
03...	1500	44	6.0	75

15241000 Deep Creek above South Fork near Ninilchik

DATE	TIME	STREAM-FLOW, INSTANTANEOUS (CFS) (00061)	TEMPERATURE (DEG C) (00010)	SPECIFIC CONDUCTANCE (UMHOS) (00095)
JUL , 1978				
14...	1435	96	11.0	75
AUG				
17...	1529	95	14.5	90
SEP				
14...	1550	172	9.5	70
OCT				
11...	1710	129	4.0	75
NOV				
08...	1510	37	.0	--
JAN , 1979				
11...	1220	88	--	--
MAR				
14...	1330	104	.0	85
APR				
18...	1240	108	.0	80
MAY				
02...	1830	E590	--	--
16...	1310	417	3.0	40
31...	1815	246	10.0	45
JUN				
14...	1615	120	16.0	65
JUL				
19...	1110	116	11.0	75
AUG				
15...	1615	106	11.0	85
MAR , 1980				
05...	1010	125	.0	75
JUL				
24...	1900	146	15.0	65
SEP				
03...	1555	124	7.5	70

15241100 South Fork Deep Creek at mouth near Ninilchik

DATE	TIME	STREAM-FLOW, INSTANTANEOUS (CFS) (00061)	TEMPERATURE (DEG C) (00010)	SPECIFIC CONDUCTANCE (UMHOS) (00095)
JUL , 1978				
14...	1507	18	10.5	65
AUG				
17...	1530	16	13.0	85
SEP				
14...	1535	24	9.0	75
OCT				
11...	1634	20	4.5	75
NOV				
08...	1510	9.9	--	--
JAN , 1979				
11...	1300	18	.0	--
MAR				
14...	1400	13	.0	85
APR				
18...	1240	19	.0	80
MAY				
02...	1830	128	3.5	40
16...	1300	67	3.0	40
31...	1730	36	8.5	50
JUN				
14...	1600	16	13.0	75
JUL				
19...	1145	19	11.5	75
AUG				
15...	1610	21	10.5	80
MAR , 1980				
05...	1110	18	.0	75
JUL				
24...	1850	25	14.0	75
SEP				
03...	1615	23	6.5	70

15241200 Deep Creek above tributary No. 2 near Ninilchik

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	TEMPER-ATURE (DEG C) (00010)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)
JUL , 1978				
12...	1820	131	14.5	75
AUG				
17...	0825	115	10.0	90
SEP				
14...	0900	225	8.0	70
OCT				
09...	1417	311	5.0	65
12...	1230	237	4.0	80
NOV				
09...	--	129	--	--
JAN , 1979				
11...	1010	106	.0	--
MAR				
13...	--	99	.0	--
APR				
18...	1805	142	--	--
MAY				
02...	1145	E930	1.0	50
16...	1845	E560	5.5	40
31...	1110	334	9.0	40
JUN				
14...	1720	134	16.0	65
JUL				
19...	1615	140	15.5	75
AUG				
15...	1630	122	12.5	85
MAR , 1980				
04...	1015	173	.0	75
JUL				
24...	1210	196	12.5	60
SEP				
03...	1010	157	5.0	75

15241300 Deep Creek tributary No. 2 at mouth near Ninilchik

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	TEMPER-ATURE (DEG C) (00010)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)
JUL , 1978				
12...	1830	18	13.0	70
AUG				
17...	0824	15	8.0	95
SEP				
14...	0827	23	7.0	80
OCT				
09...	1300	30	4.5	70
12...	1230	20	3.5	80
NOV				
09...	--	18	--	--
JAN , 1979				
11...	1145	13	.0	--
MAR				
13...	1150	10	.0	--
APR				
18...	1805	25	--	--
MAY				
02...	1200	153	2.0	30
16...	1845	53	4.0	40
31...	1045	20	7.0	60
JUN				
14...	1710	14	13.0	70
JUL				
19...	1620	17	13.0	75
AUG				
15...	1710	15	9.5	85
MAR , 1980				
04...	1110	14	--	70
JUL				
24...	1210	19	11.0	75
SEP				
03...	1030	16	4.5	75

15241400 Clam Creek near Ninilchik

DATE	TIME	STREAM-FLOW, INSTANTANEOUS (CFS) (00061)	TEMPERATURE (DEG C) (00010)	SPECIFIC CONDUCTANCE (UMHOS) (00095)
JUL , 1978				
12...	1515	12	14.0	70
AUG				
15...	1930	7.2	13.5	75
SEP				
13...	1705	22	8.0	65
OCT				
09...	1625	25	5.0	70
NOV				
07...	1230	14	.5	65
JAN , 1979				
03...	1000	12	.0	--
MAR				
20...	1635	8.2	.0	80
APR				
16...	1410	28	--	55
30...	1345	70	3.5	35
MAY				
14...	1300	47	4.0	40
29...	1415	18	10.5	60
JUN				
13...	1310	11	10.5	70
JUL				
18...	1110	15	13.0	65
AUG				
14...	1405	14	11.5	80
MAR , 1980				
03...	1440	15	.0	70
JUL				
22...	1415	16	14.0	65
SEP				
02...	1330	15	6.0	75

15241500 Deep Creek near Ninilchik

DATE	TIME	STREAM-FLOW, INSTANTANEOUS (CFS)	TEMPERATURE (DEG C)	SPECIFIC CONDUCTANCE (UMHOS)
JUL , 1978				
12...	2020	157	14.0	75
AUG				
15...	2000	125	14.5	85
SEP				
13...	1400	370	8.5	95
OCT				
12...	1410	284	5.0	80
NOV				
07...	1230	177	.5	70
JAN , 1979				
03...	1220	152	.0	80
MAR				
12...	1410	111	.0	90
APR				
16...	1225	209	--	75
30...	1200	851	2.5	50
MAY				
14...	1150	834	3.5	35
29...	1245	553	9.0	40
JUN				
13...	1200	188	11.0	80
JUL				
18...	0945	214	13.0	70
AUG				
14...	1230	177	13.0	80
MAR , 1980				
03...	1250	203	.0	70
JUL				
22...	1225	247	14.5	70
SEP				
02...	1215	211	6.5	75

15241510 Ninilchik River above tributary No. 1 near Clam Gulch

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	TEMPER-ATURE (DEG C) (00010)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)
JUL , 1978				
14...	0950	9.2	5.5	90
AUG				
17...	1108	8.6	6.5	125
SEP				
14...	1127	12	7.5	90
OCT				
11...	1236	12	3.5	100
NOV				
08...	1055	5.7	.0	--
JAN , 1979				
10...	1110	7.8	--	--
MAR				
13...	1436	8.5	--	--
APR				
18...	1500	13	.5	40
MAY				
02...	1440	45	3.5	40
16...	1540	18	5.0	65
31...	1330	10	8.0	80
JUN				
14...	1205	9.4	9.5	90
JUL				
19...	1410	12	10.5	90
AUG				
15...	1145	8.9	7.5	100
MAR , 1980				
04...	1440	12	.0	95
JUL				
24...	1440	11	10.0	90
SEP				
03...	1250	11	4.0	95

15241520 Ninilchik River tributary No. 1 at mouth near Clam Gulch

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	TEMPER-ATURE (DEG C) (00010)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)
JUL , 1978				
14...	1005	2.9	9.0	90
AUG				
17...	1115	3.2	10.0	125
SEP				
14...	1120	5.4	8.5	95
OCT				
11...	1244	4.4	4.5	100
NOV				
08...	1055	2.6	--	--
JAN , 1979				
10...	1145	2.8	--	--
MAR				
13...	1355	1.9	--	--
APR				
18...	1500	6.7	--	--
MAY				
16...	1540	4.1	5.5	65
31...	1340	2.9	7.0	85
JUN				
14...	1205	2.0	9.0	100
JUL				
19...	1400	2.5	12.5	100
AUG				
15...	1200	2.6	10.0	200
MAR , 1980				
03...	1540	3.8	.0	115
JUL				
24...	1430	2.1	12.0	140
SEP				
03...	1220	3.9	5.5	100

15241530 Ninilchik River above tributary No. 2 near Ninilchik

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	TEMPER-ATURE (DEG C) (00010)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)
JUL , 1978				
10...	1820	23	14.5	110
AUG				
17...	1014	25	9.0	145
SEP				
14...	1030	39	7.0	120
OCT				
11...	1205	37	4.5	110
NOV				
08...	1010	17	--	--
JAN , 1979				
10...	1030	22	.0	--
MAR				
13...	1200	23	.0	150
APR				
18...	1545	42	1.0	--
MAY				
02...	1327	145	4.5	50
16...	1620	44	6.0	80
31...	1245	28	7.5	110
JUN				
14...	1110	23	9.0	120
JUL				
19...	1500	31	13.0	110
AUG				
15...	1110	27	9.5	210
MAR , 1980				
04...	1325	29	.0	115
JUL				
24...	1350	28	12.0	125
SEP				
03...	1140	36	5.5	115

15241540 Ninilchik River tributary No. 2 at mouth near Ninilchik

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	TEMPER-ATURE (DEG C) (00010)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)
JUL , 1978				
10...	1830	2.4	10.5	100
AUG				
17...	1018	2.9	9.0	135
SEP				
14...	1035	3.9	7.0	110
OCT				
11...	1212	5.3	4.0	90
NOV				
08...	1010	5.7	--	--
JAN , 1979				
10...	1100	2.7	.0	--
MAR				
13...	1235	2.6	.0	150
APR				
18...	1545	9.2	--	--
MAY				
02...	1327	24	4.0	45
16...	1630	7.8	5.0	60
31...	1245	4.1	6.5	85
JUN				
14...	1125	2.6	8.0	100
JUL				
19...	1455	3.2	12.0	100
AUG				
15...	1100	3.1	10.0	130
MAR , 1980				
04...	1250	3.0	.0	115
JUL				
24...	1350	3.6	12.0	110
SEP				
03...	1155	5.0	5.0	95

15241550 Ninilchik River above tributary No. 3 near Ninilchik

DATE	TIME	STREAM-FLOW, INSTANTANEOUS (CFS) (00061)	TEMPERATURE (DEG C) (00010)	SPECIFIC CONDUCTANCE (UMHOS) (00095)
JUL , 1978				
14...	0915	33	10.0	115
AUG				
17...	0910	32	9.5	135
SEP				
14...	1000	46	7.5	120
OCT				
11...	1140	46	4.0	105
NOV				
08...	0910	14	--	--
JAN , 1979				
11...	0930	20	.0	--
MAR				
14...	--	25	.0	150
APR				
18...	1700	64	--	--
MAY				
02...	1230	163	4.5	50
16...	1715	55	5.5	80
31...	1150	37	8.0	105
JUN				
14...	1015	29	9.0	120
JUL				
19...	1535	37	14.0	110
AUG				
15...	1020	35	10.5	140
MAR , 1980				
04...	1135	47	.0	115
JUL				
24...	1305	37	13.0	120
SEP				
03...	1115	43	6.0	120

15241570 Ninilchik River tributary No. 3 near Ninilchik

DATE	TIME	STREAM-FLOW, INSTANTANEOUS (CFS) (00061)	TEMPERATURE (DEG C) (00010)	SPECIFIC CONDUCTANCE (UMHOS) (00095)
JUL , 1978				
14...	1130	4.9	8.0	75
AUG				
17...	1230	5.3	10.0	90
SEP				
14...	1240	7.7	7.5	80
OCT				
11...	1410	7.7	4.5	75
NOV				
08...	--	5.3	--	--
JAN , 1979				
10...	1255	5.6	--	--
MAR				
13...	1520	2.1	.0	85
APR				
18...	1340	9.4	--	75
MAY				
02...	1550	40	3.5	40
16...	1430	26	3.5	40
31...	1500	9.4	10.0	55
JUN				
14...	1320	5.2	13.5	70
JUL				
19...	1210	7.8	10.5	70
AUG				
15...	1325	5.2	8.5	125
MAR , 1980				
04...	1510	7.6	.0	80
JUL				
24...	1540	6.9	11.5	80
SEP				
03...	1345	7.6	6.0	75

15241590 Ninilchik River tributary No. 3 at mouth near Ninilchik

DATE	TIME	STREAMFLOW, INSTANTANEOUS (CFS) (00061)	TEMPERATURE (DEG C) (00010)	SPECIFIC CONDUCTANCE (UMHOS) (00095)
JUL , 1978				
14...	0850	26	9.0	80
AUG				
17...	0948	26	9.5	110
SEP				
14...	0930	33	7.0	95
OCT				
11...	1140	33	4.0	80
NOV				
08...	0910	9.0	.0	--
JAN , 1979				
11...	1015	26	--	--
MAR				
14...	1115	20	.0	100
APR				
18...	1710	47	--	--
MAY				
02...	1230	164	3.5	45
16...	1720	74	5.0	50
31...	1150	41	9.5	70
JUN				
14...	1015	24	11.5	80
JUL				
19...	1600	28	14.5	85
AUG				
15...	1005	26	9.5	170
MAR , 1980				
04...	1305	28	--	85
JUL				
24...	1255	30	13.0	90
SEP				
03...	1055	34	5.0	90

15241600 Ninilchik River at Ninilchik

DATE	TIME	STREAMFLOW, INSTANTANEOUS (CFS) (00061)	TEMPERATURE (DEG C) (00010)	SPECIFIC CONDUCTANCE (UMHOS) (00095)
JUL , 1978				
12...	2045	67	13.5	105
AUG				
15...	1730	57	14.5	110
SEP				
13...	1130	94	8.0	110
OCT				
12...	1020	87	4.0	100
NOV				
07...	1220	77	--	90
JAN , 1979				
03...	0950	76	.0	105
MAR				
12...	1315	64	.0	130
APR				
16...	1200	154	--	80
30...	1100	406	2.5	50
MAY				
14...	1100	192	5.5	60
29...	1215	103	12.0	80
JUL				
18...	1000	90	13.0	90
AUG				
14...	1240	70	12.5	120
MAR , 1980				
03...	1245	88	.0	100
MAY				
01...	1415	387	5.5	45
JUL				
22...	1215	83	15.0	100
SEP				
02...	1150	92	7.0	100
OCT				
23...	1630	394	4.0	52

15242080 Crooked Creek near Clam Gulch

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	TEMPER-ATURE (DEG C) (00010)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)
JUL , 1978				
14...	1035	19	7.0	85
AUG				
17...	1147	20	8.5	105
SEP				
14...	1200	25	6.5	90
OCT				
11...	1325	25	4.0	90
NOV				
08...	1140	7.2	.0	--
JAN , 1979				
10...	--	21	.0	--
MAR				
13...	1405	21	.0	90
APR				
18...	1415	23	.5	95
MAY				
02...	1515	45	3.5	70
16...	1515	26	5.0	75
31...	1410	23	9.5	80
JUN				
14...	1250	19	12.0	80
JUL				
19...	1300	22	9.5	95
AUG				
15...	1235	19	7.0	90
MAR , 1980				
04...	1430	20	.0	85
JUL				
24...	1515	24	10.0	90
SEP				
03...	1305	25	4.5	85

15242100 Crooked Creek near Kasilof

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	TEMPER-ATURE (DEG C)	SPE-CIFIC CON-DUCT-ANCE (UMHOS)
JUL , 1978				
10...	1215	32	12.5	95
AUG				
15...	1500	33	12.5	95
SEP				
13...	1000	58	7.5	95
OCT				
09...	1035	80	4.5	100
NOV				
07...	1015	40	.0	90
JAN , 1979				
02...	1518	33	.0	100
MAR				
12...	1215	30	.0	105
APR				
16...	1025	96	--	45
30...	0930	155	2.5	60
MAY				
14...	1000	81	6.0	75
29...	1105	51	11.0	90
JUN				
13...	1035	40	10.0	100
JUL				
18...	0800	51	11.0	70
AUG				
14...	1115	36	10.0	105
MAR , 1980				
03...	1055	44	.5	90
JUL				
22...	1005	56	13.0	90
SEP				
02...	1000	53	5.5	100