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RESULTS OF A SUMMER RECONNAISSANCE OF THE HOLITNA RIVER BASIN, ALASKA, AUGUST 1985

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Personnel of the Alaska Division of Geological and Geophysical Surveys Water Resources Section (DGGS/WRS) performed a reconnaissance-level study of the Holitna River system in southwest Alaska in August 1985 to describe the flow characteristics and water quality of the surface water in the basin under summer flow conditions. Information in this report can be used to assess runoff conditions of the river system and to estimate the summer regimen of this southwestern Alaska river basin.

The Holitna River basin encompasses approximately 6,560 mi^2, including its major tributary the Hoholitna River, which accounts for approximately 37% of the total drainage area. Shotgun Creek and the Chukowan and Kogrukluk Rivers, which flow from the Shotgun Hills in the Tikchik Lakes area of southwest Alaska, combine to form the main stem of the Holitna, which meanders through a 1-3 mi floodplain for most of the 130 river miles to its confluence with the Kuskokwim River. The entrance of the Hoholitna River at mile 30 of the Holitna adds considerably to the river's flow and below this confluence the floodplain widens to include numerous sloughs and lakes. The mouth of the Holitna River is approximately one mile upstream of the village of Sleetmute on the Kuskokwim River.

The main stem of the Holitna River is a low-gradient stream with frequently split channels and numerous point bars. Outer meanders typically feature steep, grassy banks, frequently undercut by natural erosion. In the upper reaches of the river, below the mountain streams that combine to form the main stem of the Holitna, the occasionally vegetated point bars are primarily cobbles and gravel;

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on the lower half of the river sand and silt predominate. Spruce-hardwood forest is the dominant vegetation in the basin.

DGGS/WRS personnel navigated the Holitna River in inflatable boats from the confluence of the Kogrukluk River and Shotgun Creek to its mouth in August 1985. Discharge, water-quality and stream-channel measurements were obtained at sites on the Kogrukluk River, Shotgun Creek, the Holitna River and seven of its tributaries including the Hoholitna River. Cross-sectional profiles were developed from survey measurements taken in the field and estimated discharges under bankfull and flood conditions were calculated. This information is summarized in the figures and tables included in this report.

The author wishes to thank M.A. Maurer and R.R.W. Ireland for their assistance in gathering data for this report.

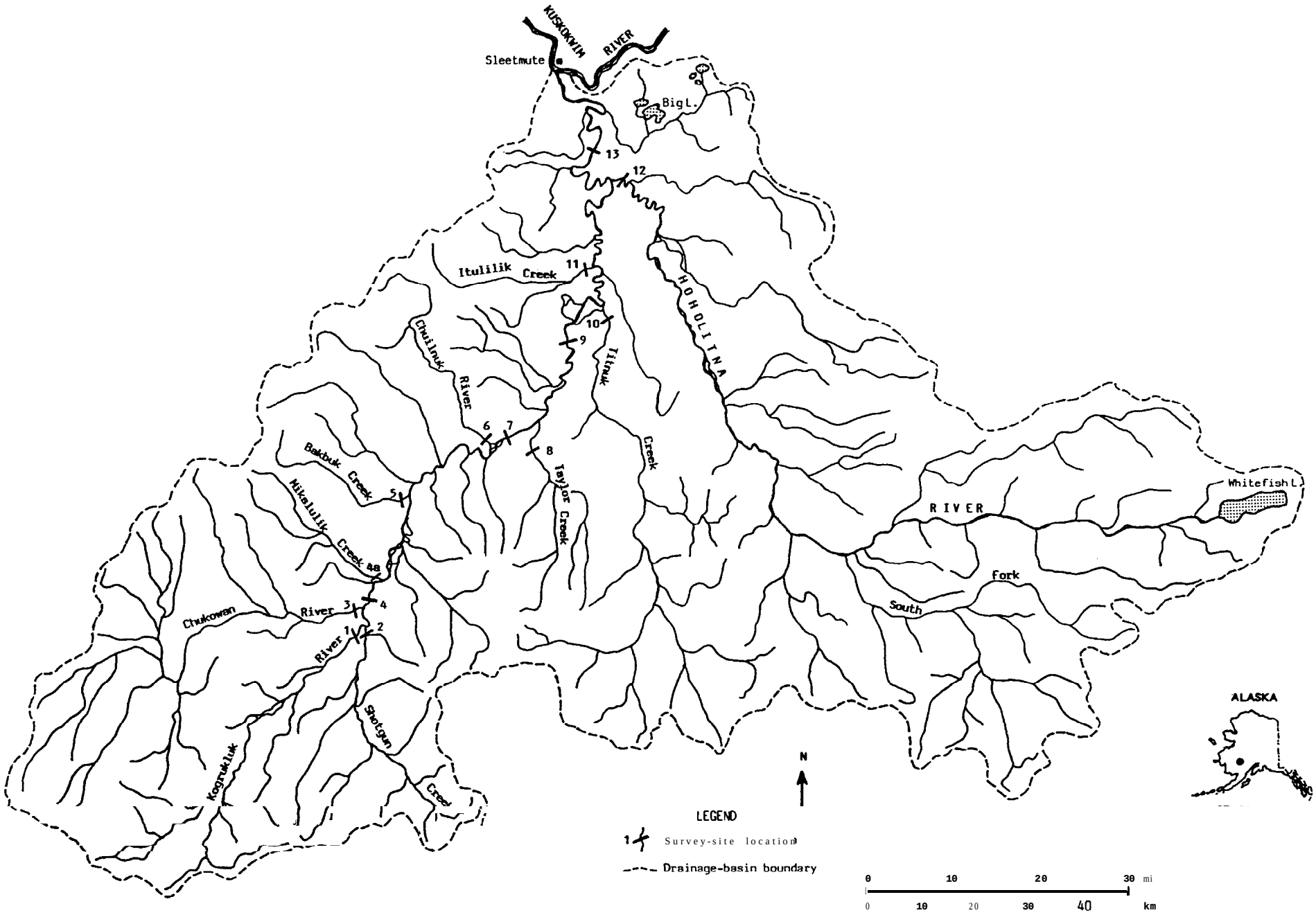


Figure 1. Map of the Holitna River basin showing locations of survey sites in August 1985.

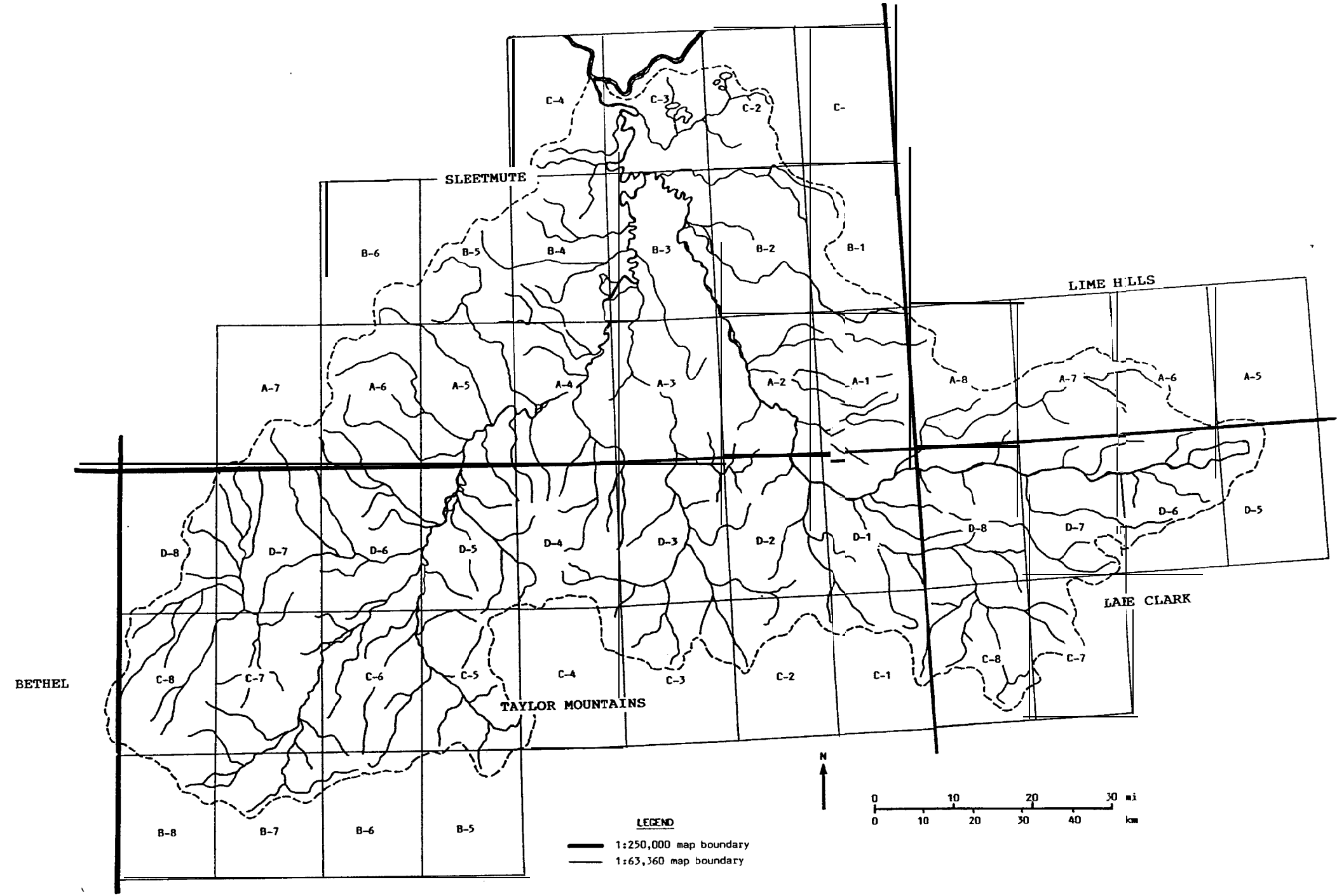


Figure 2. Index of U.S. Geological Survey topographic maps for the Holitna River basin, Alaska.

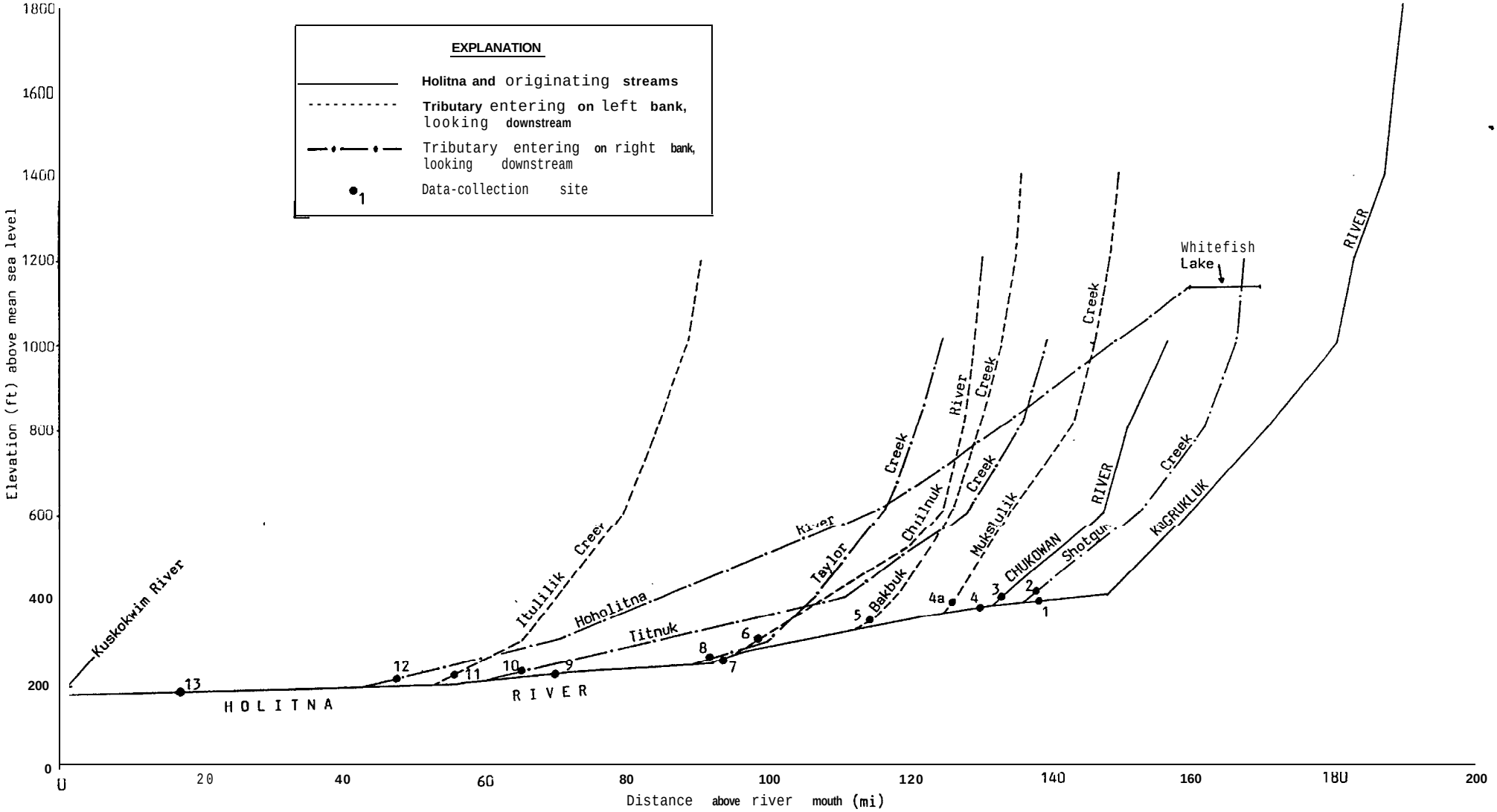


Figure 3. Profile of the Holitna River and major tributaries, Alaska.

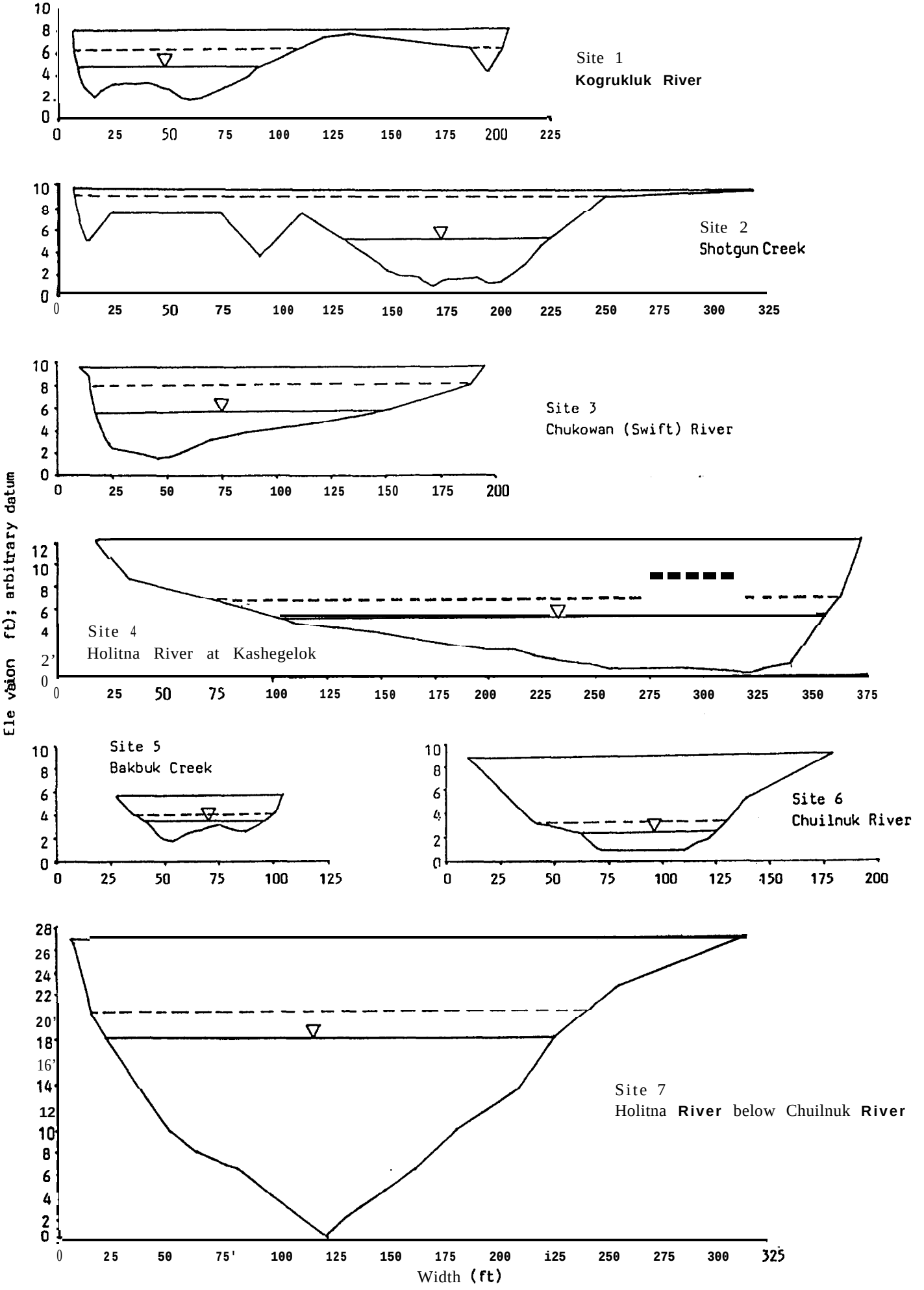
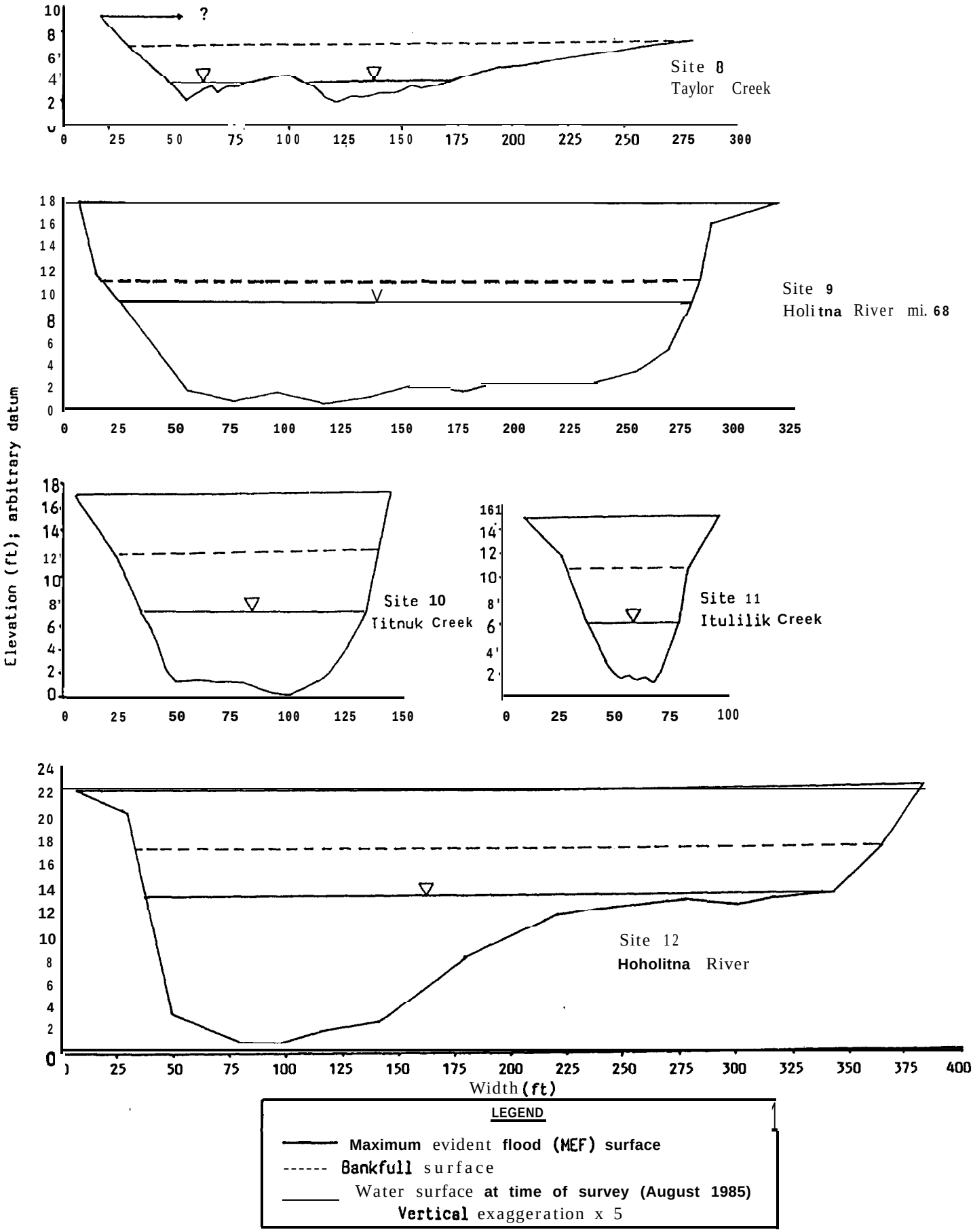


Figure 4. Views looking downstream of channel cross sections, **Holitna** River **basin, Alaska, August 1985. (Legend** on following **page.)**



NOTES: Bankfull-channel stage was determined from flood plain surface and lower limits of permanent vegetation (Childers and Kernodle, 1983). Maximum evident flood stage was extrapolated from high-water marks found on riverbanks.

Figure 4. Views looking downstream of channel cross sections, Holitna River basin, Alaska, August 1985 (cont.).

Table 1. Summary of observed discharge and cross-sectional data, Holitna River basin, Alaska, August 1985.

Data-collection site	Date	Time	Bed material	Slope (ft/ft)	Cross-sectional area (ft^2)	Water-surface width (ft)	Mean depth (ft)	Maximum depth (ft)	Mean velocity (fps)	Maximum velocity (fps)	Discharge (cfs)	Unit runoff (cfs/mi^2)
1. Kogrukluk River above Shotgun Creek	8/6/85	1130	cobbles, gravel	.0037	147	a3	1.7	2.8	3.6	5.5	627	1.53
2. Shotgun Creek above Kogrukluk River	8/6/85	1300	cobbles, gravel	.0024	260	94	2.6	4.2	1.7	2.5	518	1.32
3. Chukowan (Swift) River	8/6/85	1500	cobbles, gravel	.0012	288	133	2.1	4.0	3.4	5.1	1,190	1.64
4. Holitna River at Kashegelok	8/6/85	1630	cobbles, gravel	.0003	749	249	3.3	5.0	3.2	5.2	2,720	1.75
5. Bakbuk Creek	8/7/85	0900	cobbles, gravel	.0040	50	56	1.0	1.7	3.5	5.1	194	2.23
6. Chuilnuk River	8/7/85	1230	cobbles, gravel	.0015	a7	64	1.3	1.7	1.9	2.5	184	1.50
7. Holitna River below Chuilnuk River	8/7/85	1415	boulders, cobbles	.0007	1,990	208	9.3	17.5	1.6	3.1	3,470	1.42
8. Taylor Creek	8/7/85	1630	gravel	.0052	68	94[a]	0.7	1.8	2.0	5.1	237	1.35
9. Holitna River at mi. 68	8/8/85	1130	gravel, sand	.0002	1,750	265	5.9	a.5	2.0	3.8	4,310	1.54
10. Titnuk Creek	8/8/85	1410	sand, silt	.0008	541	107	4.9	7.0	1.2	2.0	794	1.16
11. Itulilik Creek	8/8/85	1640	sand, silt	.0001	123	38	3.1	4.8	0.1	0.4	15	0.13
12. Hoholitna River	8/9/85	0915	sand, silt	.0003	1,670	311	5.2	12.0	1.3	3.0	3,260	1.33
13. Holitna River at mi. 17	8/9/85	1200	sand, silt	-[c]		500b						

[a] Total width of two separate channels.
[b] Estimate.
[c] No measurement made.

Table 2. Summary of calculated discharge and cross-sectional data, Holitna River basin, Alaska, August 1985.

Data-collection site	Calculated bankfull characteristics						Calculated MEF characteristics			Drainage basin characteristics[a]					Predicted flood		
	Cross-sectional area (ft^2)	Water-surface width (ft)	Mean depth (ft)	Maximum depth (ft)	Mean velocity (fps)	Discharge[b] (cfs)	Cross-sectional area (ft^2)	Discharge[b] (cfs)	Unit runoff (cfs/mi^2)	Area (mi^2)	Mean annual precip. (in)	Mean minimum Jan. temp. (°F)	Area of basin forested (%)	Area of basin lakes (%)	42 2-year flood[c] (cfs)	Q_{50} 50-year flood (cfs)	Froude number (8/85 flow)[d]
1. Kogrukluk River above Shotgun Creek.....	362	114	3.2	4.2	5.1	2,070	670	4,700	11.4	411	24	-4	48	0	3,600	8,790	0.49
2. Shotgun Creek above Kogrukluk River.....	934	243	3.8	8.1	6.8	6,330	1,070	7.580	19.3	393	24	-4	53	0	3,400	8,350	0.19
3. Chukowan (Swift) River..	660	180	3.7	6.3	4.7	3,160	938	4,960	6.8	727	24	-4	59	0	5,950	13,500	0.41
4. Holitna River at Kashegelok.....	1,190	285	4.2	6.4	3.2	3,850	2,920	12,700	8.2	1,550	24	-4	56	0	12,200	25,000	0.31
5. Bakbuk Creek.....	96	90	1.1	2.1	3.8	364	211	1,040	12.0	87	23	-6	71	0	713	2,360	0.62
6. Chuilnuk River.....	169	91	1.9	2.1	3.3	551	1,110	7,230	58.8	123	23	-6	73	0	1,060	3,100	0.29
7. Holitna River below Chuilnuk River.....	2,490	231	10.8	19.1	5.9	14,120	4,310	31,100	12.8	2,440	23	-6	60	0	17,800	35,400	0.09
8. Taylor Creek.....	550	248	2.2	4.6	1.3	4,020	-[e]			176	23	-6	72	0	1,490	4,150	0.42
9. Holitna River mi.68.....	2,230	295	7.6	10.3	3.3	1,380	4,140	16,800	6.0	2,800	22	-8	63	0	19,400	39,000	0.15
10. Titnuk Creek.....	1,080	126	8.5	11.9	4.1	5,050	1,720	9,490	13.9	685	22	-8	76	0	5,080	12,200	0.10
11. Itulilik Creek.....	297	51	5.8	9.5	1.2	362	612	947	8.0	118	22	-8	76	0	984	2,970	0.01
12. Hoholitna River.....	2,950	337	8.8	15.8	4.4	12,810	4,650	23,580	9.6	2,450	21	-10	53	2	13,800	28,800	0.10
13. Holitna River mile 17...	-									6,340	21	-10	62		35,400	65,500	

[a] Drainage-basin characteristics are used to calculate predicted 2-yr and 50-yr floods by using Lamke's method (1979). Mean annual precipitation and mean minimum January temperature from Lamke; other characteristics planimetrically determined from USGS topographic maps.

[b] Approximate discharge for bankfull and MEF conditions are calculated from channel cross sections with the simplified slope-area method (Riggs, 1979). The bankfull discharge indicates the maximum amount of flow that may be expected without flooding; HEF discharge indicates the maximum instantaneous peak discharge at the site in recent years (Childers and Kernodle, 1983).

[c] A 2-yr flood has a 50-percent chance of being exceeded in a particular year; a SO-yr flood has a 2-percent chance of being exceeded.

[d] Froude number, a mathematical relationship between mean velocity, mean depth and the gravitational constant, is used to compare states of flow at survey sites. In a rectangular channel, the flow is tranquil if the Frwde number is less than 1.0 and is rapid if greater than 1.0 (Dalrymple and Benson, 1968).

[e] No measurements made.

Table 3. Field water quality at selected sites, Holitna River basin, Alaska, August 1985.

Data-collection site	Date	Time	Water temperature (°C)	pH	Specific conductance (umhos/cm@25°C)	Dissolved oxygen (mg/l)	%Dissolved oxygen @ saturation	Bicarbonate alkalinity (mg/l HCO_3)	Turbidity (NTU)	Air temperature (°C)	Barometric pressure (in.)	Discharge (cfs)
1. Kogrukluk River above Shotgun Creek	8/6/85	1200	11.0	6.95	66	12.1	100	36.5	1.1	17.0	29.60	627
2. Shotgun Creek above Kogrukluk River	8/6/85	1330	12.7	6.75	50	11.0	100	24.5	2.1	16.5	29.57	518
3. Chukowan (Swift) River	8/6/85	1520	12.1	1.05	79	12.2	100	40.5	1.4	17.7	29.58	1,190
4. Holitna River at Kashegelok	8/6/85	1635	12.4	7.10	73	12.2	100	37.5	1.8	17.5	29.55	2,720
4a. Mukslulik Creek	8/6/85	1915	9.0	5.85	53	11.3	98	23.0	0.7		29.55	
5. Bakbuk Creek	8/7/85	0900	9.6	6.95	58	11.1	99	29.5	1.3	10.5	29.14	194
6. Chuilnuk River	8/7/85	1230	13.0	6.80	77	10.6	100	46.0	2.0	13.0	29.25	184
7. Holitna River below Chuilnuk River	8/7/85	I426	12.4	7.00	63	11.3	100	33.5	2.3	15.5	29.23	3,470
8. Taylor Creek	8/7/85	1630	12.2	7.20	94	10.8	100	58.0	2.9	10.5	29.20	237
9. Holitna River at mi.68	8/8/85	1135	11.1	7.10	72	11.1	100	39.0	4.2	11.2	29.60	4,310
10. Titnuk Creek	8/8/85	1450	12.3	1.45	140	11.2	100	88.5	5.1	16.5	29.61	794
11. Itulilik Creek	8/8/85	1700	9.7	7.45	163	12.1	100	101.0	3.0	17.5	29.62	15
12. Hoholitna River	8/9/85	0910	11.1	7.10	95	10.2	93	56.0	5.5	9.5	29.64	3,260
13. Holitna River at mi.17	8/9/85	1140	11.9	6.80	90	11.3	100	-[a]	5.6	10.1	29.56	

[a] No measurement made.