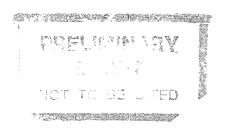
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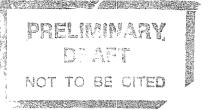
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UNITED STATES DEPARTMENT OF THE INTERIOR GEOLOGICAL SURVEY,

SEDIMENT DISCHARGE DATA FOR THE SUSITNA RIVER BASIN, ALASKA 1981-82

By James M. Knott and Stephen W. Lipscomb

27/- 4384

U.S. GEOLOGICAL SURVEY

OPEN-FILE REPORT 83-

Prepared in cooperation with the ALASKA POWER AUTHORITY

Anchorage, Alaska 1983

UNITED STATES DEPARTMENT OF THE INTERIOR JAMES G. WATT, Secretary

GEOLOGICAL SURVEY

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CONVERSION TABLE

Multiply	<u>by</u>	to obtain
foot (ft)	0.3048	meter (m)
square mile (mi²)	2.590	square kilometer (km)
acre-foot (acre-ft)	1,233	cubic meter (m³)
foot per second (ft/s)	0.3048	meter per second (m/s)
cubic foot per second (ft³/s)	0.02832	cubic meter per second (m³/s)
ton, short	0.9072	megagram (Mg) or metric ton
ton per day (ton/d)	0.9072	megagram or metric ton per day (Mg/d)
degree Fahrenheit (°F)	°C=5/9 (°F-32)	degree Celsius (°C)

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

National Geodetic Vertical Datum of 1929 (NGVD of 1929): The reference surface to which relief features and altitude data related; formerly called mean sea level.

By James M. Knott and Stephen W. Lipscomb

INTRODUCTION

The Susitna River is one of the major rivers in Alaska, ranking fifth in drainage area and annual runoff. The upper reaches of the river are under consideration as possible sites for several dams and reservoirs that will be used as part of a large power-generation system in south-central Alaska.

This report constitutes a summary of sediment and hydraulic data collected in the ——
Susitna River basin in the area between the proposed damsites and Sunshine (fig.

1). These data were collected during 1981-82 to determine total-sediment discharge of the Susitna, Chulitna, and Talkeetna Rivers prior to any construction. The data-collection effort is part of a cooperative program between the Alaska Power Authority and the U.S. Geological Survey.

Figure 1 near here

DESCRIPTION OF AREA

The Susitna River basin (fig. 1) lies on the southern flank of the Alaska Range in south-central Alaska. The basin, which has a drainage area of about 19,400 mi², is a contrast of steep rugged mountains towering above wide valley lowlands. Elevations range from 20,320 ft at Mt. McKinley to sea level where the Susitna River empties into Cook Inlet.

Tributaries to the Susitna River are commonly referred to as glacial or nonglacial streams. The nonglacial streams are noted for their clarity, even during intense summer rainstorms. Glacial streams are generally turbid throughout most of the open-flow season (May through October). The Susitna River and its larger tributaries are all affected to a large degree by glacial runoff.

Because of the remoteness of the area and rugged landscape, population is sparse and development of the basin has been slow. The economy is based principally on recreation and tourism. The many forests, streams, and mountains are extremely popular with recreationists who enjoy the good hunting, fishing, and scenic beauty of the area.

CLIMATE

The climate of the Susitna River basin is divided into two broad categories according to maps prepared by Searby (1968). Higher elevations of the basin are included in the Continental Zone, where diurnal and annual temperature variations are great and precipitation is relatively low. Mean annual temperature ranges from 15 to 25°F (Hartman and Johnson, 1978). The lowlands lie in the Transition Zone where temperatures are less variable than in the Continental Zone. Mean annual temperatures generally range from 25 to 35°F.

Climatological records for the Talkeetna weather stations are probably representative of lowland areas. A summary of climatological data for this station (Selkregg, 1974) indicates that summer temperatures range from 38 to 62°F, winter temperatures range from -9 to 18°F, and extremes range from -44 to 85°F. Annual precipitation averages 28 in., about 60 percent of which is rainfall.

DATA COLLECTION AND ANALYSIS

Systematic measurements of sediment discharge and hydraulic data were obtained at four sites in the basin during the 1982 water year (October 1981 - September 1982). Samples were obtained at weekly intervals from the Susitna, Talkeetna, and Chulitna Rivers near Talkeetna and from the Susitna River at Sunshine. The measurements were initiated to define the amount and distribution of sediment transport by the Susitna River and its major tributaries between Gold Creek and Sunshine (fig. 1). The program included:

- (1) Measurement of suspended-sediment concentration, bedload discharge, and cross-sectional dimensions at weekly intervals following spring breakup.
- (2) Analysis of selected samples for particle-size distribution.
- (3) Supplemental samples of streambed material.

Streamflow characteristics were defined from data available for existing stream-gaging stations. At sampling sites that did not coincide with streamgaging sites, sufficient discharge measurements were obtained to develop stage-discharge relations. All measurements were made from a boat; either a cableway or sextant were used for stationing.

Suspended-sediment samples were collected with a standard depth-integrating P-61 sampler (Guy and Norman, 1970). Samples were collected at selected verticals in the stream cross section and analyzed to determine average suspended-sediment concentration and particle-size distribution of sediment in the water-sediment mixture. Samples of suspended sediment contain particles (usually finer than 2.0 mm) transported in the stream between the water surface and a point about 0.5 ft above the streambed.

Sediment transported on or near the streambed (0.3 ft) was sampled using a bedload sampler (Helley and Smith, 1971, p. 1-18) designed for collecting coarse sediment (0.062-76.2 mm). Sampling time, number of sampling points, stream width and depth, and dry sediment were recorded to determine bedload discharge. Trap efficiency of the sampler was assumed to be 1.0. The Helley-Smith sampler is not yet considered "standard" equipment for determining bedload discharge because testing and calibration research has not been completed. In the interim, the Geological Survey uses a provisional method to calculate bedload discharge (U.S. Geological Survey, written comm., 1979) based on field calibration tests (Emmett, 1980).

A few bed-material samples were obtained at each site using a 6-inch diameter pipe dredge. At some sites, deep and swift rivers, armoring, and the presence of coarse particles on the streambed made sampling difficult. Results range from poor at Susitna River near Talkeetna to good at Chulitna River near Talkeetna.

Measurements of depth and width at sampling sections were generally obtained during bedload measurements. Depths were measured by sounding with the Helley-Smith sampler at 18 to 25 verticals in the cross section. Stream width was determined from station markings on cableways or from sextant readings. Average velocity was determined by dividing the rated discharge of the stream by the cross-sectional area.

SEDIMENT DISCHARGE

Sediment Transport

Sediment is transported in suspension, as bedload, or as a combination of both. Suspended sediment, as the name implies, consists of particles which are trans-

ported in a stream while being held in supension by the turbulent components of the flowing water. Coarse sediment that is transported on or near the streambed constitutes the bedload. Clay and silt particles usually are moved in suspension and gravel particles move on or near the streambed. Sand particles may be transported either as suspended load or as bedload, or both.

Suspended-Sediment Discharge

Suspended-sediment sampling for this study was initiated during the 1981 water year. Samples were obtained at monthly intervals at Susitna River at Gold Creek (15292000), Chulitna River near Talkeetna (15292400), Talkeetna River near Talkeetna (15292700), and Susitna River at Sunshine (15292780). In 1982, the program was modified to include weekly sampling at the Chulitna, Talkeetna, and Sunshine sites and to establish a new site, designated "Susitna River near Talkeetna" (15292100). Sediment-transport rates for the new site are more comparable to those for the other sites than is Gold Creek because of its closer proximity to the other sites.

Suspended-sediment data obtained during the 1981-82 water years are listed in table

1. Comparison of data from the five sites indicates both similarities and differences between the amount of sediment transported by the Susitna River and its
tributaries.

Table 1 near here

During the winter period (November - March) suspended-sediment concentrations are generally less than 10 mg/L at all sampling sites. The rivers are generally ice

covered and streamflow is at its annual mininum--precipitation is stored as snow or ice and glacier melting is at a minimum.

Spring breakup usually occurs in May. Concentrations of suspended sediment increase rapidly to several hundred milligrams per liter soon after the breakup period. Samples collected in late May and early June typically contain a large percentage of sand, which may indicate that coarse sediment is being primarily eroded from stream channels or banks. Water levels are generally high during this period. Large parts of the river flood plain are covered by ice, so that flow is confined and diverted toward the other bank. Bank erosion by ice-block abrasion may be severe.

Suspended-sediment concentrations at the different sampling sites are most variable during the summer (July-August). The Susitna and Talkeetna Rivers are moderately affected by glacial runoff; glaciers account for 5 to 7 percent of the drainage areas. Concentrations for the sites on these rivers "near Talkeetna" (nos. 15292100 and 15292700) ranged from 90 to 768 mg/L during July and August 1982. The larger concentrations typically occur during periods of storm runoff.

About 28 percent of the drainage area above the Chulitna sampling site (15292400) is covered by glaciers. Concentrations of suspended sediment at this site ranged from 766 to 1,270 mg/L during July and August 1982. Concentrations during periods of maximum glacial mclt were roughly equivalent to those during periods of storm runoff. During July and August 1982 suspended-sediment concentrations for the Sunshine site (15292780) ranged from 424 to 1,430 mg/L and represent a complex mixture of sediment and streamflow contributions from the Susitna, Chulitna, and Talkeetna Rivers near Talkeetna.

Particle-size data for July and August indicate significant differences in the composition of suspended sediment for the sampling sites. The Susitna River near Talkeetna typically transports a small percentage of sand (21 percent) compared to the Chulitna River (29 percent) and the Talkeetna River (55 percent). The Susitna River at Sunshine transports an average of 28 percent sand.

Relation Between Suspended-Sediment Discharge and Water Discharge

A common method for analyzing sediment-transport characteristics at a site is to construct a graph of sediment discharge versus water discharge. This relation is generally expressed as a plot on logarithmic paper and is referred to as a sediment-transport curve. Sediment-transport curves showing the relation between instantaneous sediment discharge and water discharge for the Susitna, Chulitna, and Talkeetna River sites are shown in figures 2-5. Similar curves were prepared for the silt-clay and sand fractions to examine possible differences in sediment supplied from glacial runoff and storm runoff. Coefficients of determination (r²) were computed to provide a qualitative measure of the variance of sediment discharge to water discharge.

Figures 2-5 near here

The transport curves are probably representative only for sediment transport during June to September 1982. Although runoff during the 1982 water year was about average in total flow, maximum water discharges were well below extremes for the period of record and minimum flows were well above low flows for most years.

Suspended-sediment discharge characteristics were quite similar at all sampling sites, in that sediment discharge increased at about the same rates relative to water discharge. Sediment discharge increased exponentially at a faster rate than water discharge. Exponents of water discharge, Q, in the equation (figs. 2-5) ranged from 2.11 for Susitna River at Sunshine to 2.37 for Chulitna River near Talkeetna; r² ranged from 0.75 to 0.91. Division of suspended sediment into silt-clay and sand fractions, however, indicated some extreme differences between individual sites.

At Susitna River near Talkeetna, the amount of suspended sand carried by the stream increased at more than twice the rate of silt-clay with increases in water discharge. At the lowest discharge sampled, sand discharge was 1,090 ton/d compared to a silt-clay discharge of 8,840 ton/d. At the highest discharge sampled, sand and silt-clay discharges were both about 35,000 ton/d.

At the Chulitna and Talkeetna Rivers, sand and silt-clay discharges both increased at a approximately the same rates. Silt-clay discharge increased at a slightly faster rate than sand discharge at the Chulitna River and at a slightly slower rate at the Talkeetna River.

At the Sunshine site, sand discharge increased at a much faster rate than silt-clay discharge. For all ranges of discharge sampled, however, the amount of sand transported was less than the silt and clay sized material.

Bedload Discharge and Hydraulic Characteristics

The bedload and hydraulic data for the three sampling sites near Talkeetna and the Susitna River at Sunshine are summarized in table 2. Bedload is expressed both in tons per day and in terms of the particle size distribution, as percent finer than the indicated sieve size. Samples were collected monthly starting in July 1981 and weekly beginning in June 1982.

Table 2 near here

The bedload discharge for the Susitna River near Talkeetna ranged from 106 to 2840 ton/d during the 1982 water year. During this same period, the water discharge ranged from 16,900 to 44,400 ft 3 /s. In contrast, in 1982, the bedload rate at the Chulitna River site ranged from 2560 to 18,300 ton/d, with water discharge varying from 12,500 to 33,400 ft 3 /s.

During the summer of 1981, bedload samples were collected at Susith. River at Gold Creek (table 2). In 1982 the sampling site was relocated downstream to the new station, Susitha River near Talkeetha. A comparison of data from the two sites indicates that, for a given discharge, similar amounts of sediment are transported past them. The grain-size distribution for both locations showed a fairly even mixture of sand and gravel at the beginning of the summer with a steady decrease in gravel size material as the summer progressed and flows diminished. This trend is interrupted only during the major storms of the summer, which occurred near the end of July and in mid-September. During these periods of higher flows there is a shift to increasing grain size but the median still remained in the sand range.

The particle-size distribution on the Chulitna River tended toward a higher percentage of gravel than sand. A typical mixture of 30-40 percent sand and 60-70 percent gravel was fairly constant throughout the summer. Storm-runoff events produced only a slightly larger median particle size. Low flows seemed to produce variable results, sometimes increasing and sometimes reducing the median size of bedload.

In the 1982 water year, bedload discharge at the Talkeetna River site ranged from 243 to 5790 ton/d for flows ranging from 5960 to 19,100 ft³/s. The particle sizes on the Talkeetna River were typically 70-90 percent sand. Exceptions occurred during snowmelt runoff in early June. For this period the size distribution changed to about 65 percent gravel and 35 percent sand. During a September storm the amount of gravel again rose to 73 percent. Although the size of the material was related to stream discharge, the amount of bedload transported seemed to be independent of discharge. In June and again in August and September bedload discharges typically ranged from 1000 to 2000 ton/d. For several weeks in July bedload discharge decreased to less than 1000 ton/d. Even during the storm on July 27-28, when streamflow was 14,300 ft³/s at the time of the sampling, the bedload discharge was only 885 ton/d. Then in August it rose to its earlier levels and remained at those levels throughout the summer and fall.

At Susitna River at Sunshine in 1982, bedload discharge ranged from 1050 to 13,600 ton/c; streamflow from 38,500 to 99,000 ft³/s. During most of the 1982 sampling period, (June-September), the total bedload discharge at the three upstream sites was two to five times larger than that at Sunshine. This indicates that the excess material, moved through the three sites above Talkeetna, is either deposited in the

Susitna River between Talkeetna and Sunshine or in the Chulitna River downstream of (which is 18 miles long!) the sampling site. The only exceptions to this were on July 26 and again on September 18, when the total of the three upstream sites was slightly less than that measured at Sunshine. These two dates correspond to the two peak flows at Sunshine during 1982. Thus, the data indicate that material deposited above Sunshine during low and medium flows is transported during high flows.

At Sunshine, the sand and gravel fractions of bedload discharge varied with season and water discharge. In the early part of June the mixture was about 20 percent sand and 80 percent gravel. This coincided with the high runoff flows during that period. Later during August, when the water discharge was low, the gravel proportion decreased to about 15 percent, with sand increasing to 85 percent. This mixture was affected during the storm events in July and September when gravel increased to 75 percent.

Selected channel cross sections for the four sites, with a corresponding plot of bedload discharge at individual sampling points are shown on figure 6-9. In most cases the location of the active bedload movement is within the deeper part of the channel where the velocities are greatest. The bedload values for each individual point across the section were estimated during sampling, as most analyses were composited from samples obtained at more than one point. The estimated values were used, together with the actual weight of the cumulative sample, to give a weighted estimate of each point sampled in the cross section. This method gives a qualitative approximation for the lateral distribution of bedload movement.

Figures 6-9 near here

Relation Between Bedload Discharge and Water Discharge

A relation can be defined between bedload discharge and water discharge, using similar methods as for suspended sediment. Log-transformed data and a least-squares method are used to obtain a best-fit line through the plotted points. Transport curves and corresponding equations describing the relations are shown in figures 10-13.

Figures 10-13 near here ----

The small scatter of data points for the Susitna River near Talkeetna suggests that water discharge has a strong influence on bedload discharge; an increase in water discharge results in an exponential increase in bedload discharge. Data for the Chulitna and Talkeetna Rivers have considerably more scatter, indicating that bedload discharge is influenced by several factors. It is likely that glacial processes are partly responsible for this increased scatter. Other factors may include the available supply of coarse material, bedload-suspended sediment interaction (sand sizes), and timing of sampling visits with respect to storm events. Most visits in 1982 were made during recession periods after peak discharge or during extended base-flow periods.

During some periods when either glacial or storm processes were dominant, the slope for the bedload to water discharge relation was similar to that for suspended-sand discharge. Transport curves developed from correlations between bedload and suspended-sand discharge were used where coefficients of determination (r^2) for regression equations were unusually low.

BED-MATERIAL DATA

Bed-material samples, representative of the sediment occurring in the submerged parts of the river channels, were extremely difficult to obtain because the rivers were too deep and swift for direct access to streambeds. Representative samples, were obtained, however, at Chulitna River near Talkeetna (15292400) and at most sampling points at Susitna River at Sunshine (15292780). A few samples were obtained at the Talkeetna River (15292700) and Susitna River near Talkeetna (15292100) sites. Most samples obtained at the latter sites consisted of a few coarse particles. Bed-material data for 1981-82 are listed in table 3.

Table 3 near here

ESTIMATED SEDIMENT YIELD, MAY TO SEPTEMBER 1982

The sediment yield from a drainage basin is commonly expressed in terms of weight (short or metric tons) or volume (acre-feet or cubic meters). Sediment yields may be estimated by several methods, depending generally on the amount and type of available data. If daily records of streamflow are available, but sediment discharge has been measured only infrequently, the method most commonly used involves defining a relation between instantaneous sediment discharge and water discharge

'and applying this relation to daily values of water discharge. This method was initially used to estimate sediment yield for this study.

At some sites, however, a single sediment-transport curve could not be applied for the entire period because of seasonal changes in the amount and particle-size distribution of sediment for given water discharges. At the Chulitna River site the scatter of bedload-discharge data was such that even the definition of a bedload-water discharge relation is subject to individual interpretation. Several alternative methods were selected to estimate sediment yield for the period May to September 1982.

Suspended-sediment yield was estimated using the Colby shift-control method (Colby, 1956). According to Colby, part of the scatter of sediment data in sediment-transport relations is due to random or very short-term fluctuations in concentration, particularly the concentration of the coarse sediments. Part may be due to inflow from tributaries or an actual change that may persist for days, weeks, or seasons. In the opinion of the authors, most of the observed scatter is probably due to seasonal changes and complex mixing of sediment produced from glacial melt and storm runoff, and Colby's method would result in more accurate estimates.

Colby suggests that if a change in the relation persists for several days or more the transport curve could be shifted to pass through or near each individual measurement. The method is subjective in that judgment is used to decide whether the measurement is representative of an actual change or a random fluctuation. An important advantage in using this method is that the accuracy of fit of the transport-curve is of small importance.

Bedload yield also was estimated using the Colby shift-control method. At sites where the scatter in data on bedload discharge was extreme, the initial transport curve was constructed based on transport curves of suspended sand. Sediment-transport curves were constructed for silt-clay, sand, and gravel components for both suspended-sediment and bedload discharge measurements.

Estimated sediment yields for the period May to September 1982 are given in table 4. Total sediment yields (sum of bedload and suspended-sediment yield) for the sites near Talkeetna ranged from 1.5 million tons for the Talkeetna River to 8.2 million tons for the Chulitna River. The Susitna River near Talkeetna transported about 2.8 million tons of sediment from May to September 1982.

Table 4 near here

Sediment composition was predominantly silt-clay for the Susitna (68 percent) and Chulitna (62 percent) Rivers near Talkeetna and sand (54 percent) for the Talkeetna River. The amount of gravel ranged from 0.3 percent of total sediment yield for the Susitna River near Talkeetna site to 7.3 and 8.3 percent for the Talkeetna and Chulitna River sites respectively. The total sediment yield transported past the three sites near Talkeetna (12,500,000 tons) agrees reasonably well with that estimated for the site at Sunshine (13,000,000 tons). Examination of the bedloadsize data, however, indicates that less than half of the gravel transported past the upper sites reached Sunshine during 1982.

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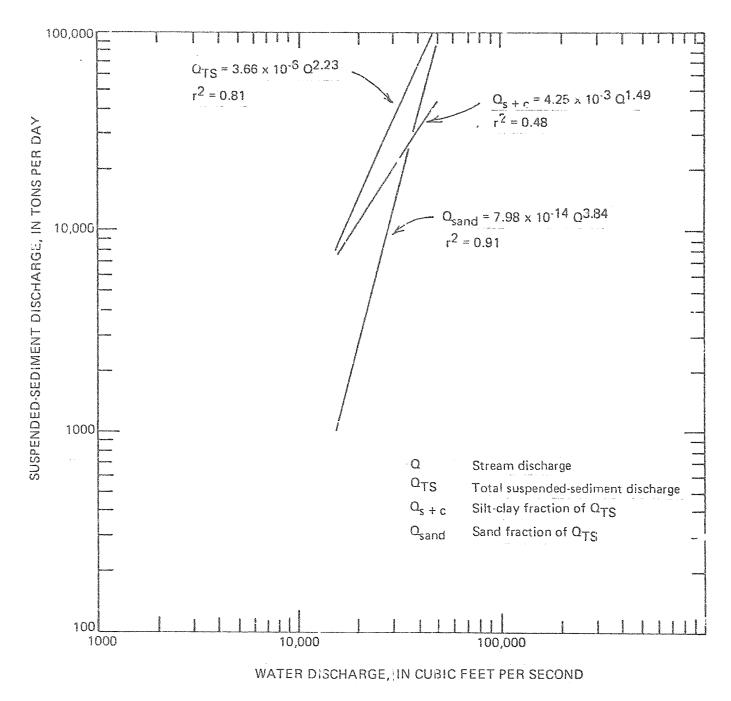


Figure 2.--Relation between suspended-sediment discharge and water discharge for Susitna River near Talkeetna, 1982 water year.

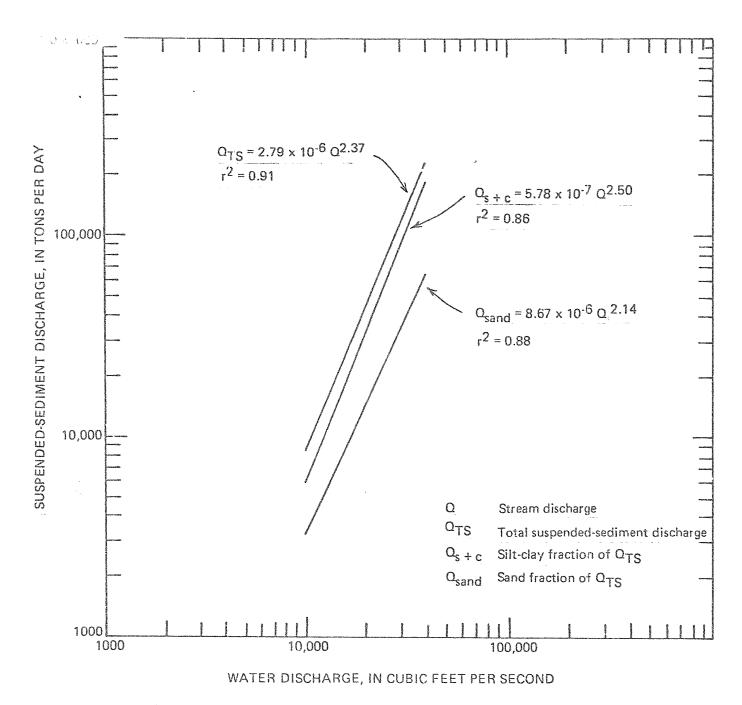


Figure 3.-Relation between suspended-seeiment discharge and water discharge for Chulitna River near Talkeetna, 1982 water year.

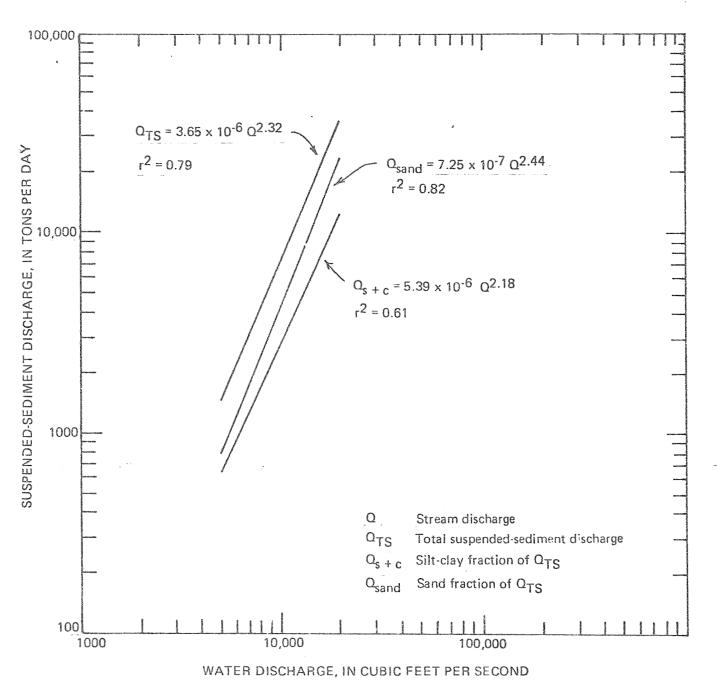


Figure 4.--Relation between suspended-sediment discharge and water discharge for Talkeetna River near Talkeetna, 1982 water year.

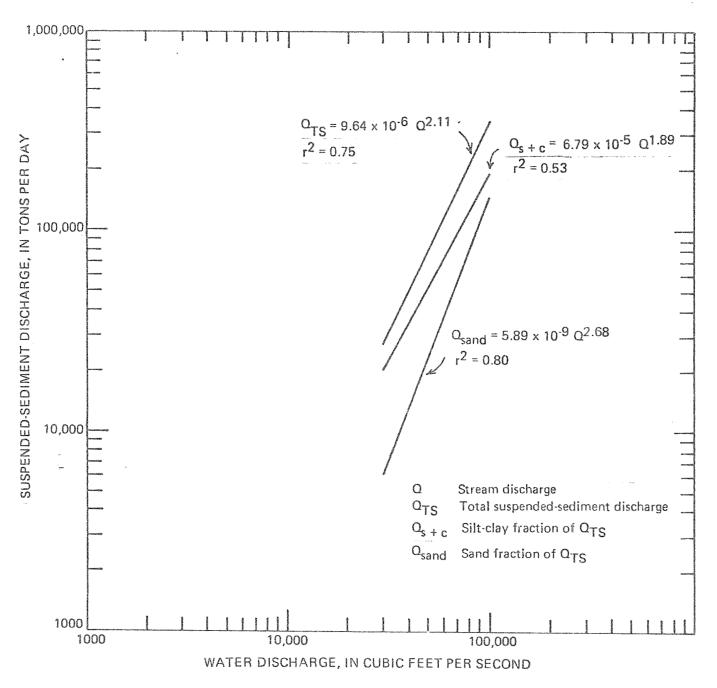


Figure 5.--Relation between suspended-sediment discharge and water discharge for Susitna River at Sunshine, 1982 water year.

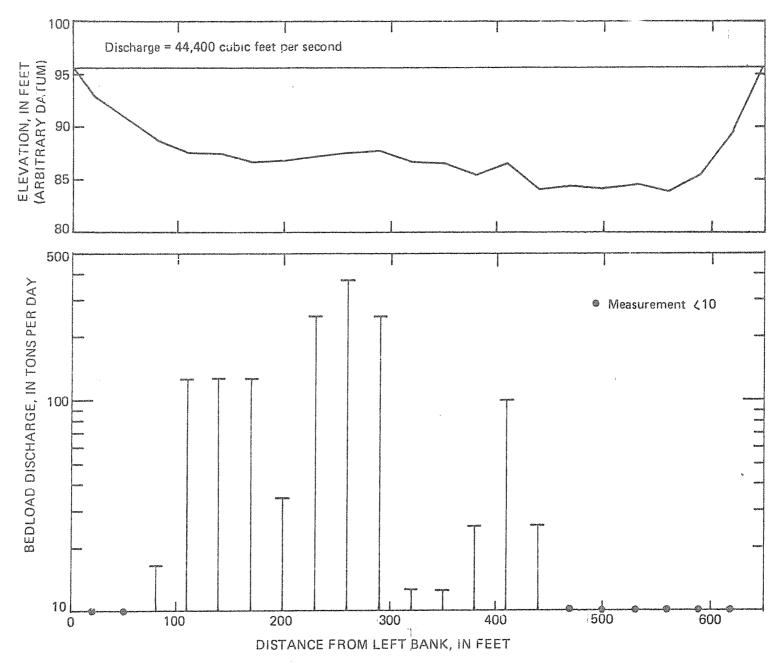


Figure 6a.--Cross section and distribution of bedload discharge, Susitna River near Talkeetna, June 8, 1982.

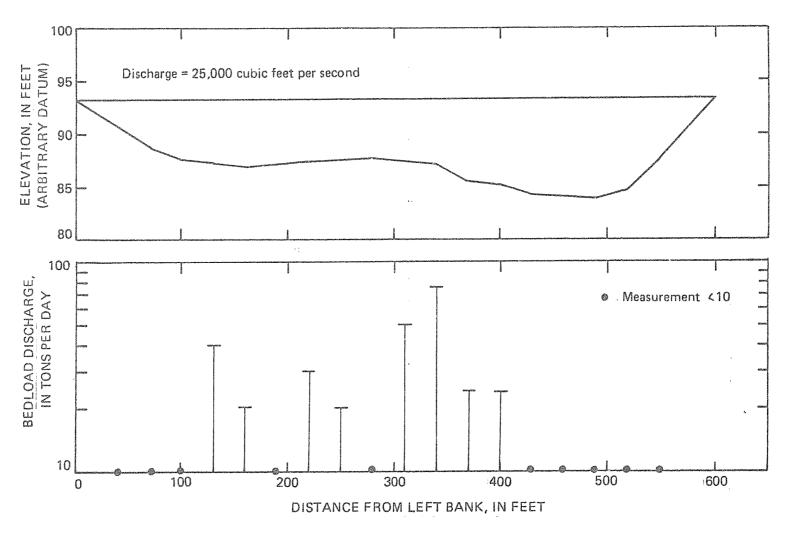


Figure 6b.--Cross section and distribution of bedload discharge, Susitna River near Talkeetna, July 21, 1982.

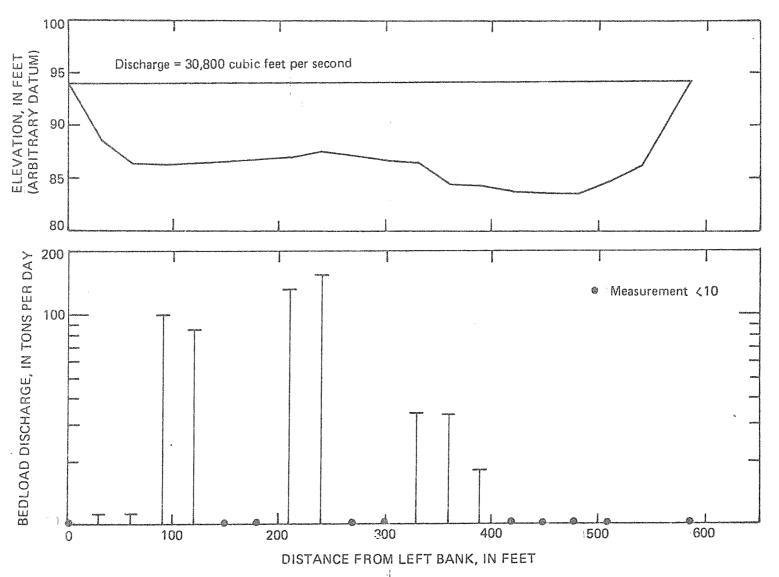


Figure 6c.--Cross section and distribution of bedload discharge, Susitna River near Talkeetna, July 28, 1982.

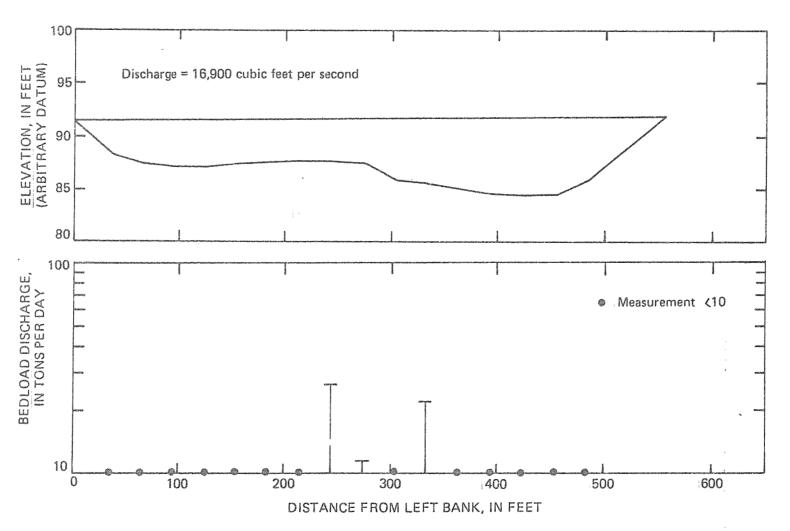


Figure 6d.--Cross section and distribution of bedload discharge, Susitna River near Talkeetna, August 25, 1982.

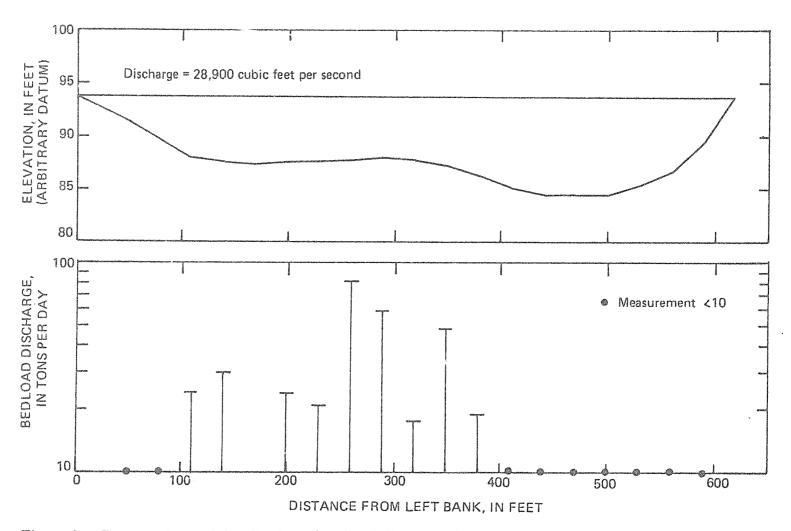


Figure 6e.--Cross section and distribution of bedload discharge, Susitna River near Talkeetna, September 19, 1982.

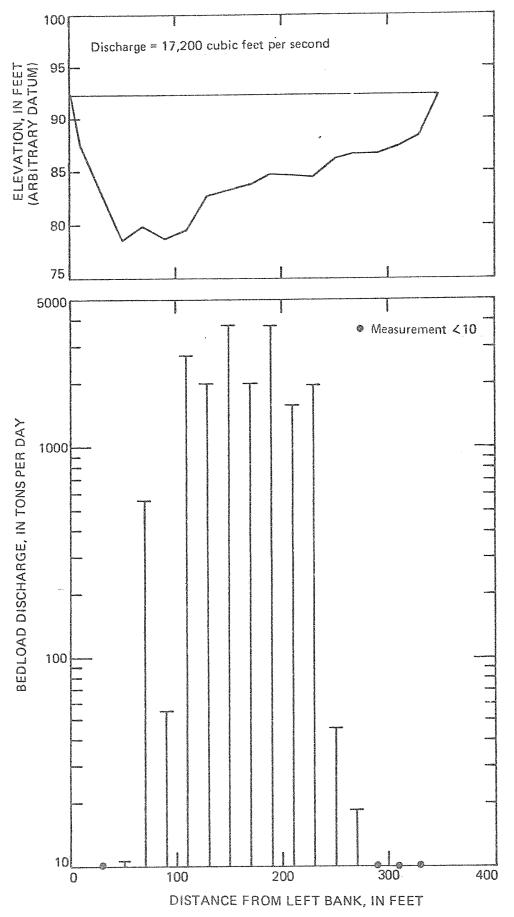


Figure 7a.--Cross section and distribution of bedload discharge, Chulitna River near Talkeetna, June 9, 1982.

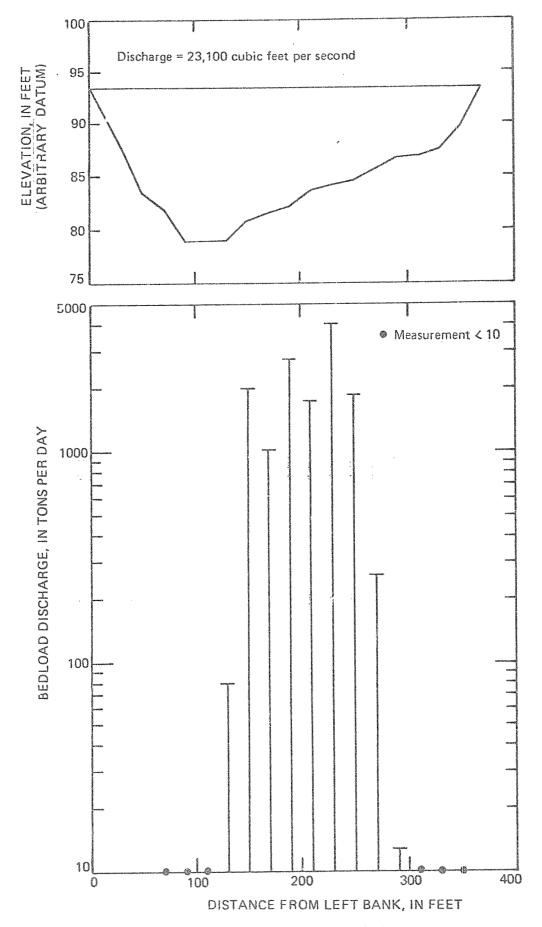


Figure 7b.-Cross section and distribution of bedload discharge, Chulitna River near Talkeetna, July 20, 1982.

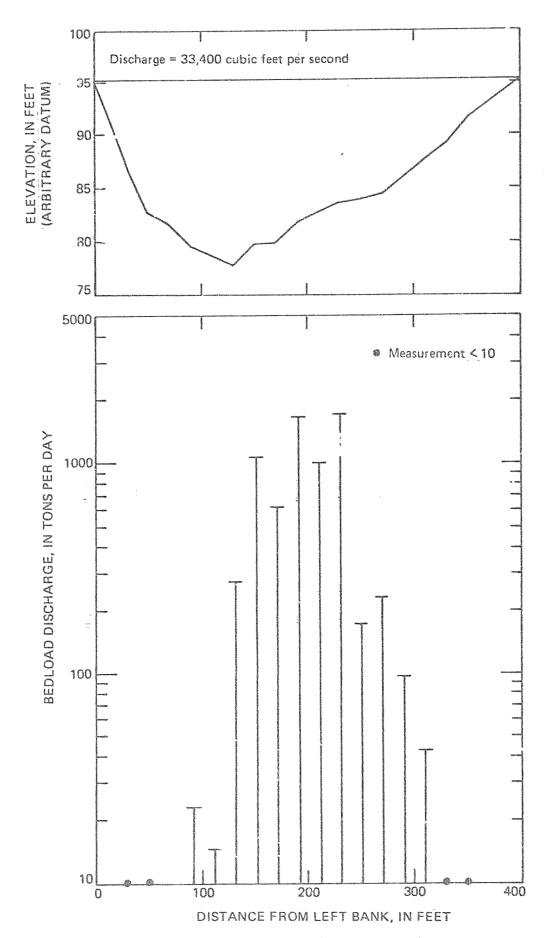


Figure 7c.--Cross section and distribution of bedload discharge, Chulitna River near Talkeetna, July 27, 1982.

HARZA - EBASGO SUSITNA JOINT VENTURE

RECORD OF TRANSMITTAL

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UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY Water Resources Division 1515 E. 13th Avenue Anchorage, Alaska 99501 OCT 1 1 1983
ALASKA POWER AUTHORITY

October 7, 1983

Mr. Eric P. Yould Executive Director Alaska Power Authority 334 West Fifth Avenue, Second Floor Anchorage, Alaska 99501

Attention: Eric Marchegiani

Dear Mr. Yould:

Enclosed e 10 copies of the report "Sediment discharge data for the Susitna Ri er basin, Alaska, 1981-82" by James M. Knott and Stephen W. Lipscomb. The report has not yet been reviewed for conformance with U.S. Geological Survey editorial standards nor approved for formal publication. Although the data may be used within your agency and by your planning and design contractors, we request that neither the report nor its contents be quoted nor distributed further at this time.

Bill

We will be submitting this manuscript to our regular review process so that it can be released as an Open-File report. We would welcome any comments or suggestions for changes to be incorporated in the final version. Please direct any comments or questions on the technical aspects of the report to Jim Knott at this office, phone number 271-4138. Thank You.

Sincerely,

Philip A. Emery

District Chief

Enclosures

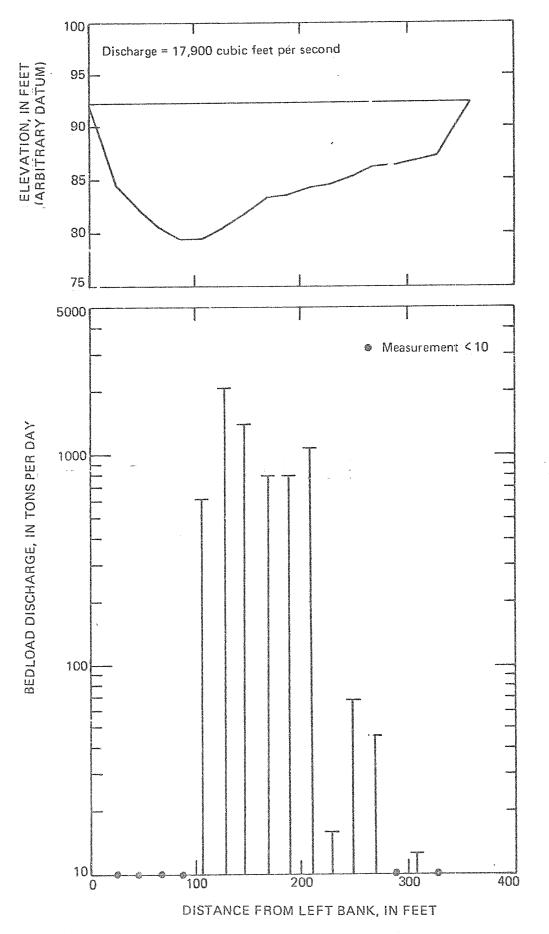


Figure 7d.--Cross section and distribution of bedload discharge, Chulitna River near Talkeetna, August 24, 1982.

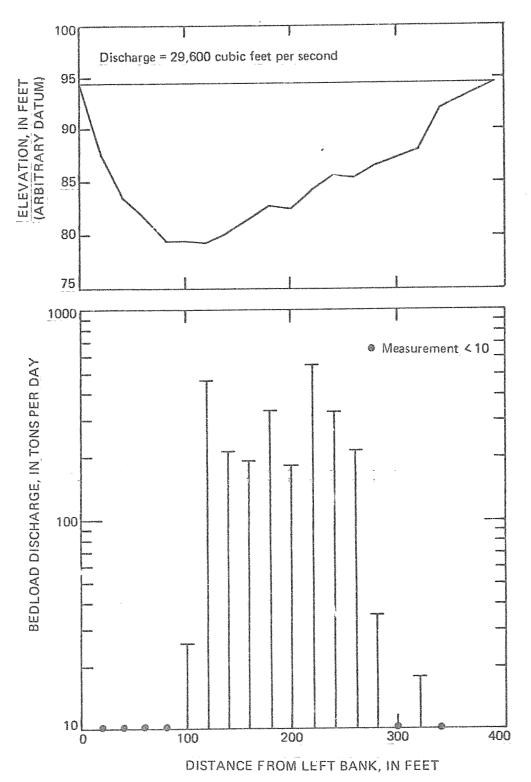


Figure 7e.--Cross section and distribution of bedload discharge, Chulitna River near Talkeetna, September 18, 1982.

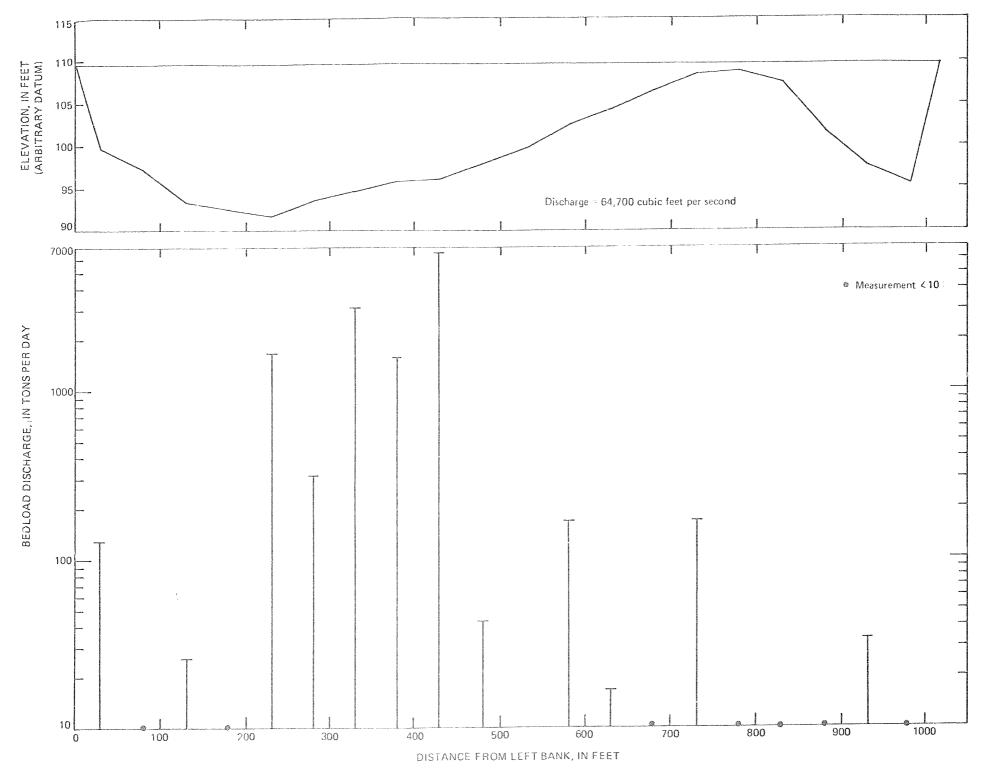


Figure 9a.-Cross section and distribution of bedload discharge, Susitna River at Sunshine, June 10, 1982.

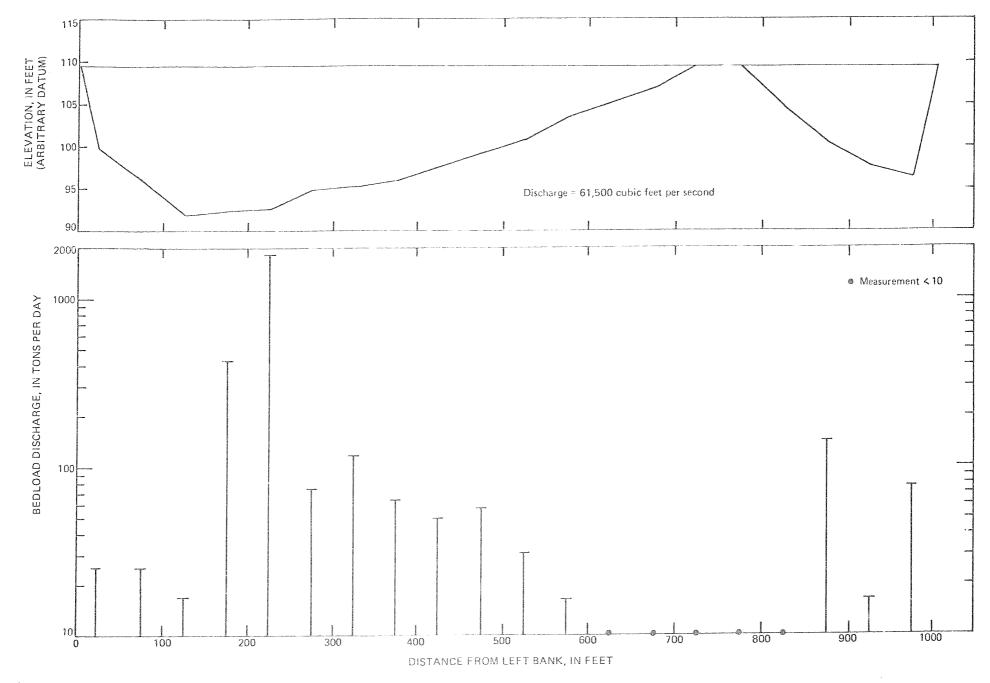


Figure 9b.--Cross section and distribution of bedload discharge, Susitna River at Sunshine, July 19, 1982.

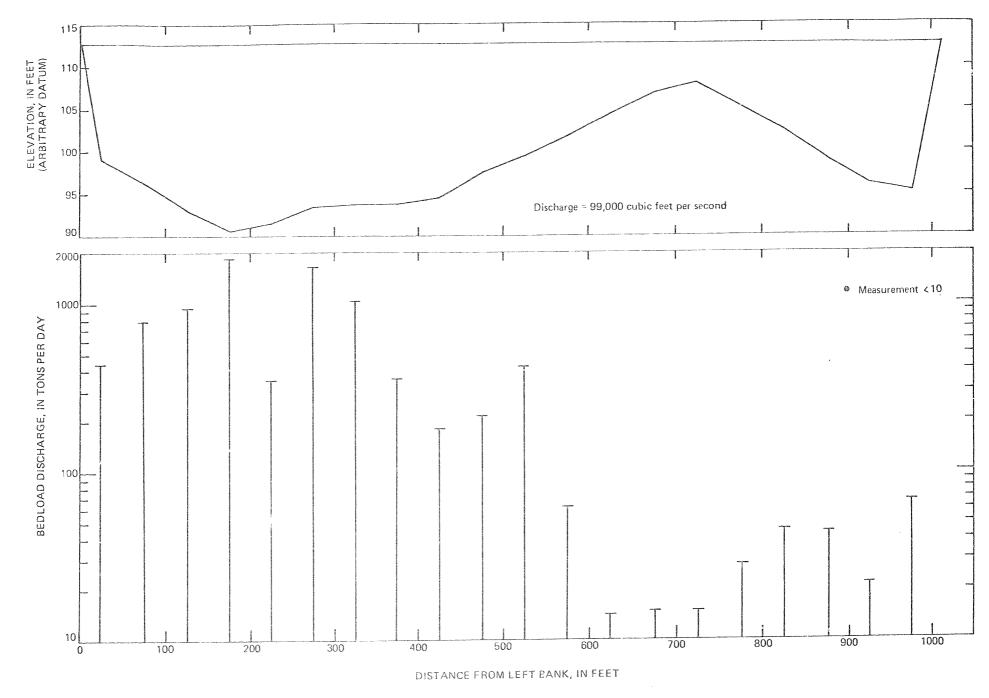
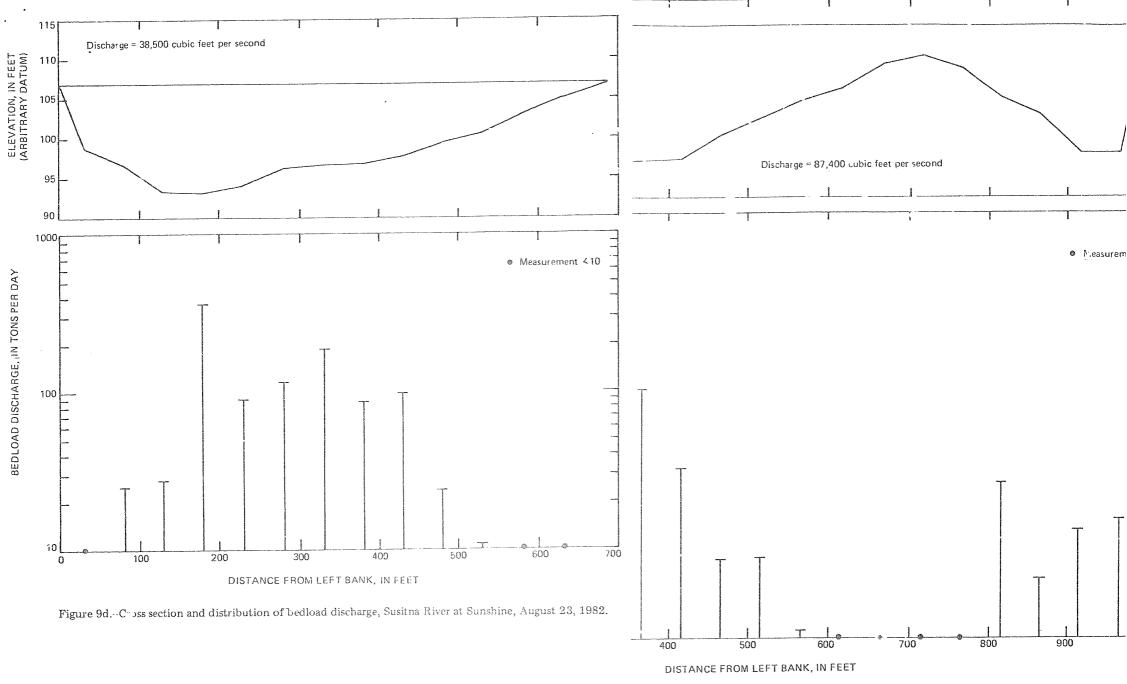


Figure 9c.-Cross section and distribution of bedload discharge, Susitna River at Sunshine, July 26, 1982.



listribution of bedload discharge, Susitna River at Sunshine, September 17, 1982.

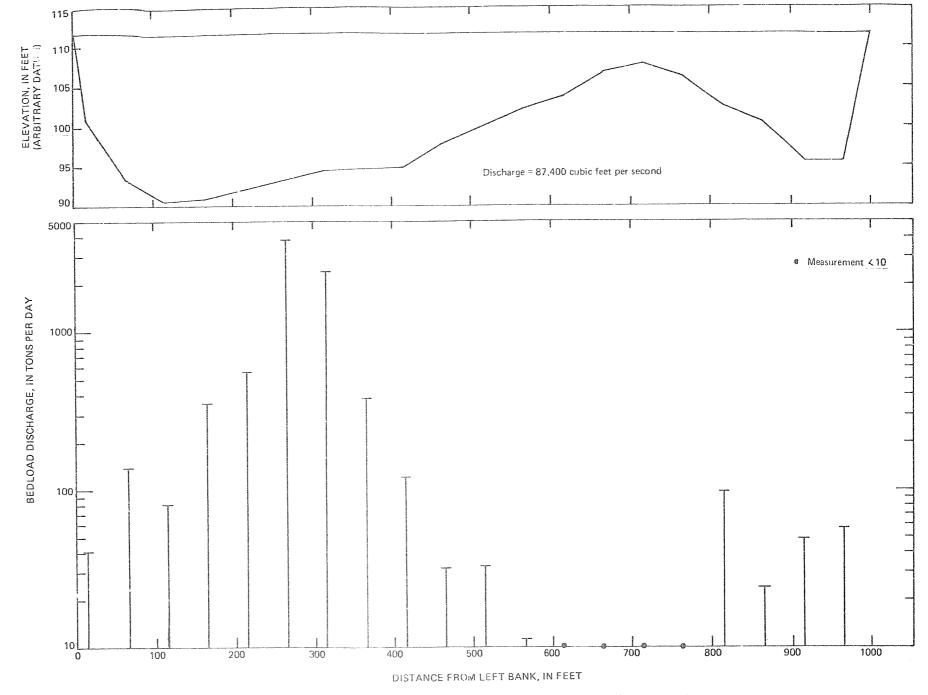


Figure 9e.--Cross section and distribution of bedload discharge, Susitna River at Sunshine, September 17, 1982.

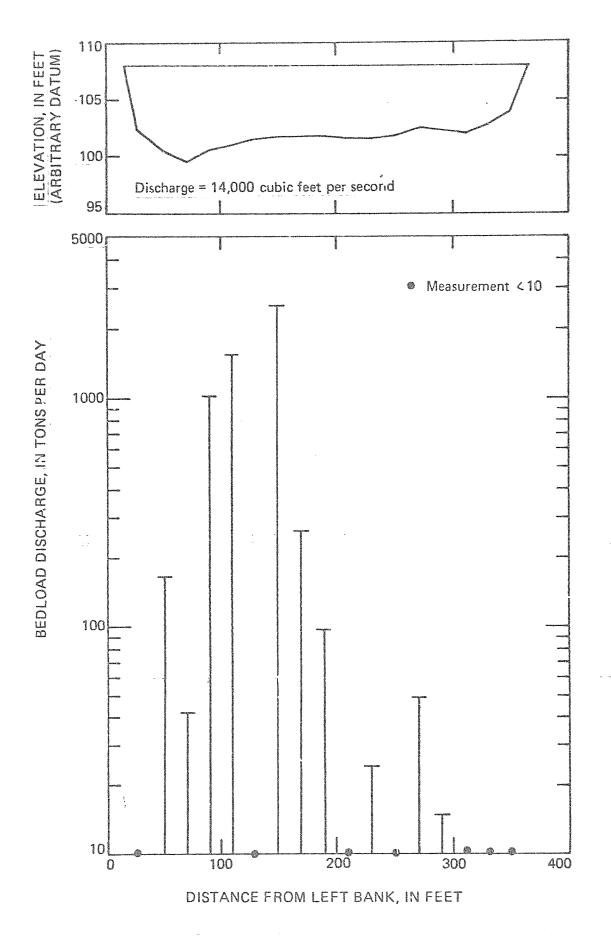


Figure 8a.--Cross section and distribution of bedload discharge, Talkeetna River 1.ear Talkeetna, June 9, 1982.

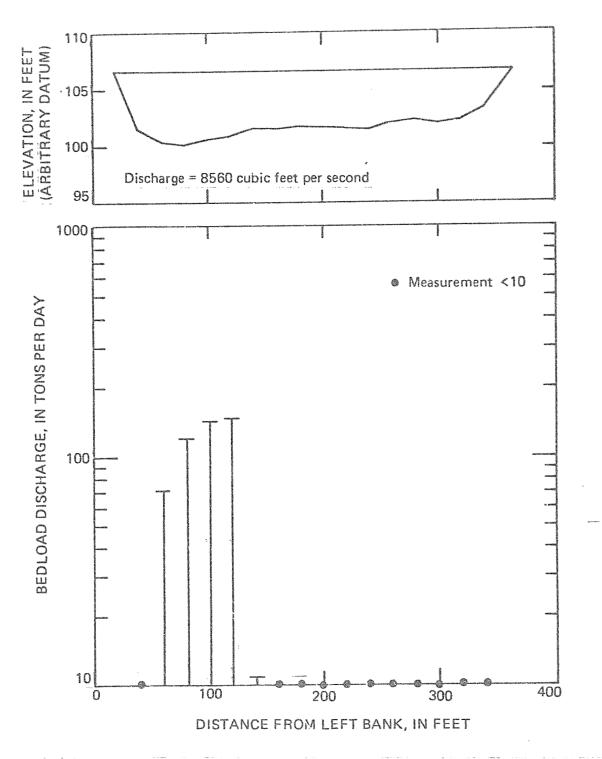


Figure 8b.--Cross section and distribution of bedload discharge, Talkeetna River near Talkeetna, July 20, 1982.

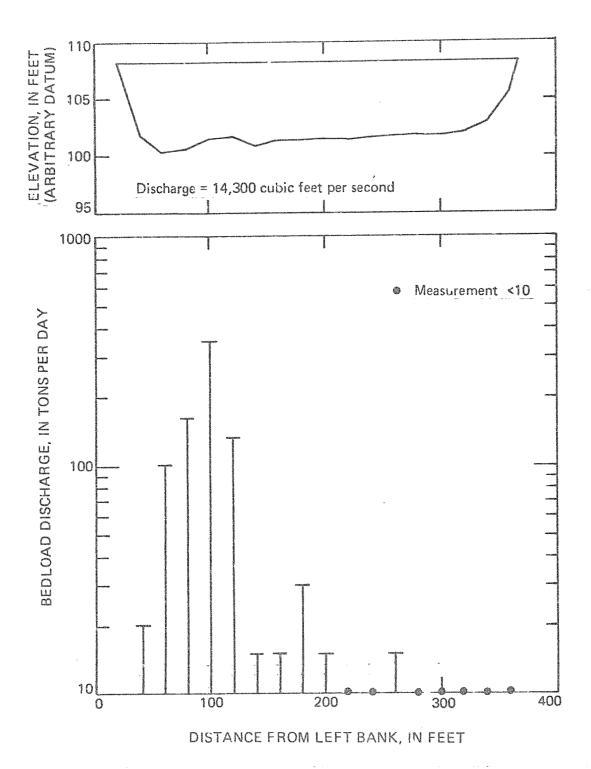


Figure 8c.--Cross section and distribution of bedload discharge, Talkeetna River near Talkeetna, July 28, 1982.

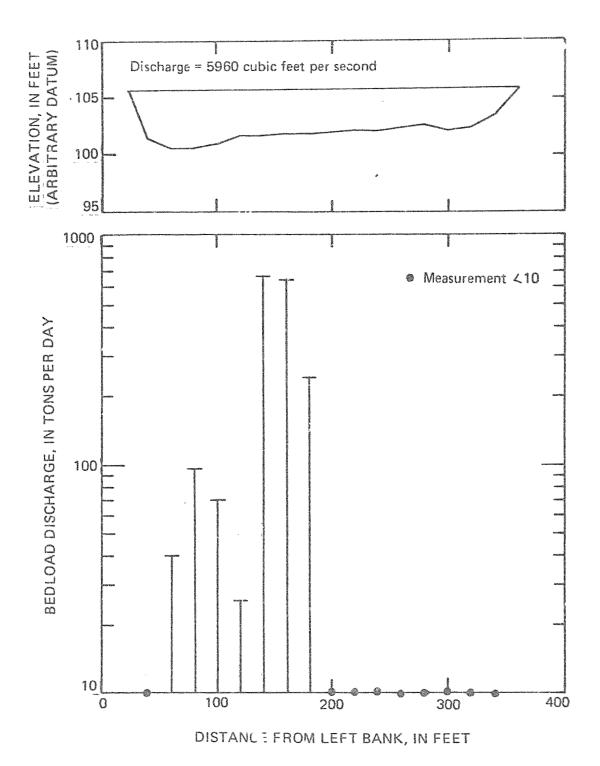


Figure 8d.--Cross section and distribution of bedload discharge, Talkeetna River near Talkeetna, August 24, 1982.

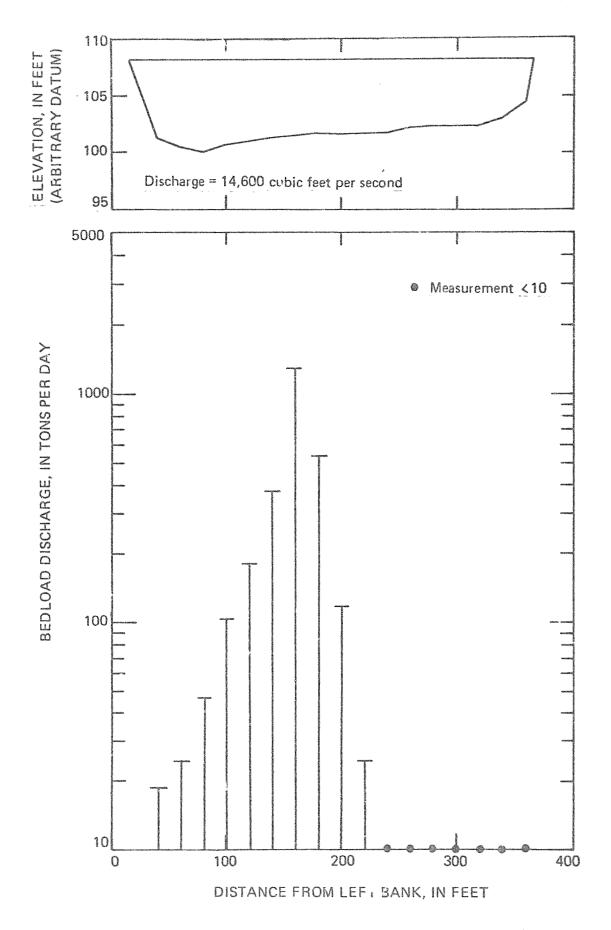


Figure 8e.--Cross section and distribution of bedload discharge, Talkeetna River near Talkeetna, September 20, 1982.

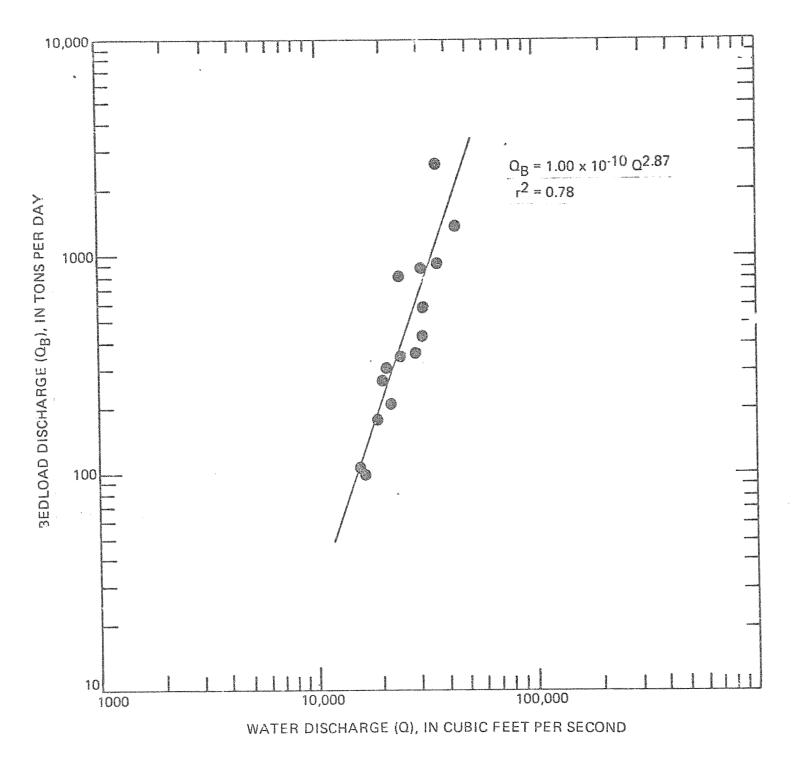


Figure 10.-Relation between bedload discharge and water discharge, 1982 water year, Susitna River near Talkeetna (15292100).

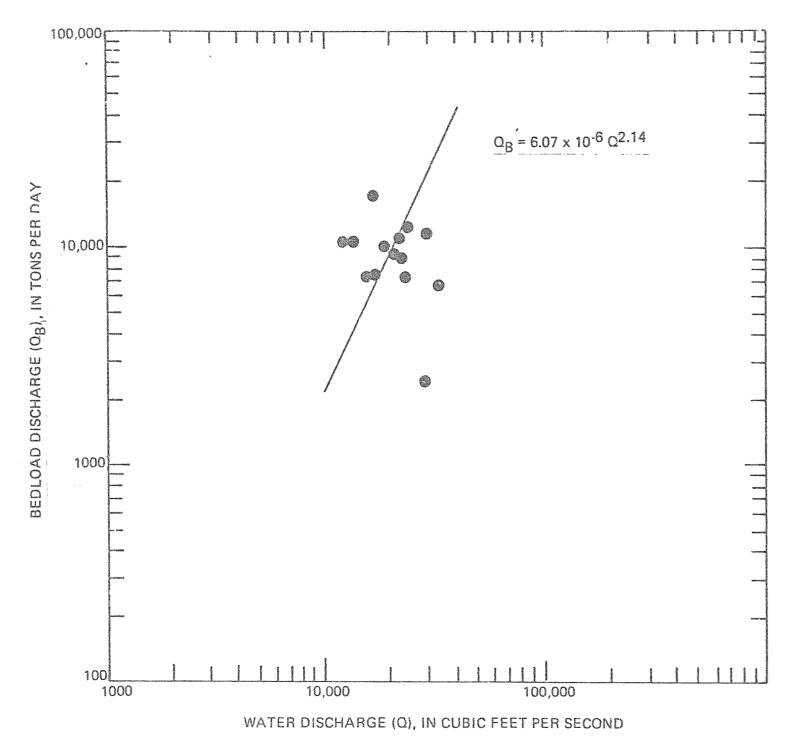


Figure 11.-Relation between bedload discharge and water discharge, 1982 water year, Chulitna River near Talkeetna (15292400).

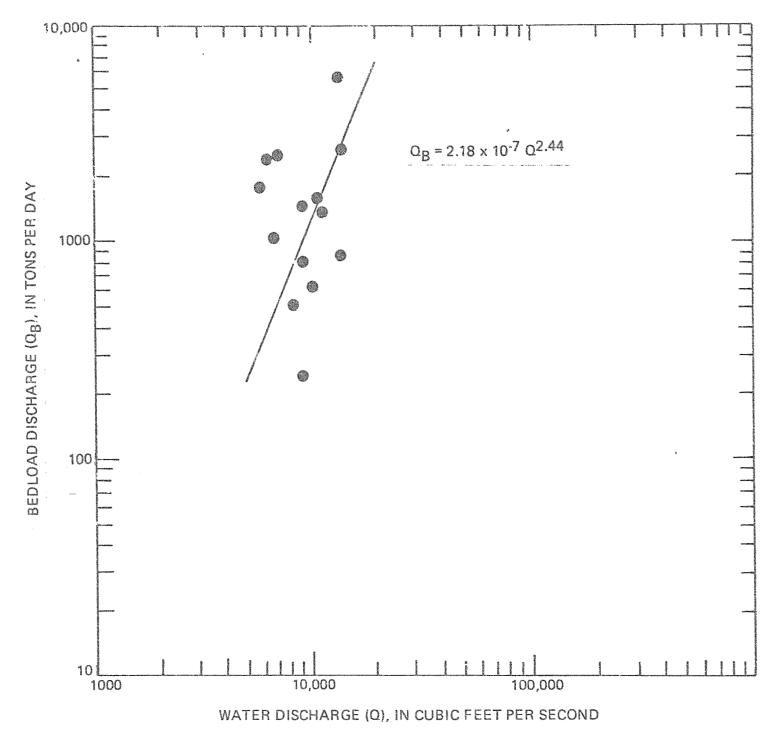


Figure 12.-Relation between bedload discharge and water discharge, 1982 water year, Taikeetna River near Talkeetna (15292700).

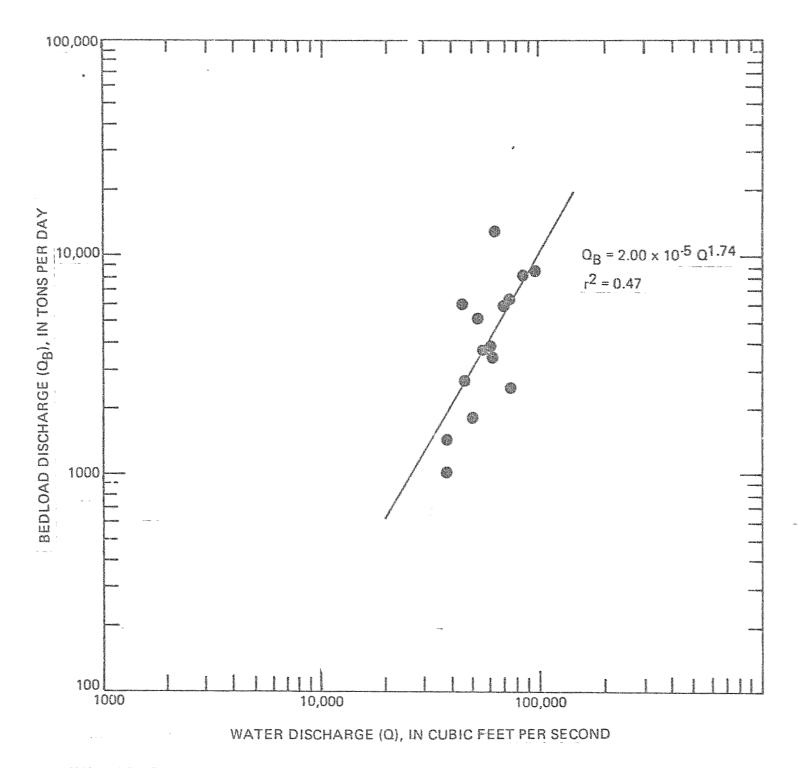


Figure 13.-Relation between bedload discharge and water discharge, 1982 water year, Susitna River at Sunshine (15292780).

Table 1.--Suspended-sediment data for selected stations in the Susitna River basin, 1981-82 water years

	Water tem-			Sediment		One year control and advisor delicing of the control of the contro				Susp	ended se	<u>ediment</u>	en vagas-katasataren paateer ganen kalen vääre , di en vagas-katasataren paateer ganen kalen vääre en vagas-katasataren paateer ganen kalen väären en vagas-katasataren paateer paateer en vagas-katasataren en vagas-k	reconsistant disk fraction in plant and consistent	radiomis () diversità di missioni del discontinuo serio, en Il continuo di missioni di mis	APAICENTENARIO NEO ESCAPA ESCAPA A CONTRA CO
Station name	pera- ture	Date of	Discharge	concen- tration	Sediment discharge			Downen'	+ finar	· thon c	ize indi	instad	in mil	Timotoni	_	
and number	(°C)	collection	(ft ³ /s)	(mg/L)	(ton/d)	0.002	0.004									2.00
CITA HUIIINA I		COLICACION		(11197 = 7	10011701		0.007	<u> </u>	0,010	U.UU.	V. VVC	Volley	Vo L. UU	V. VV	1,000	2.00
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	.0	Mar. 24	1,680	2	9.1	mile one	entre some	cole was	010 sgs	400 ath	en us	400k 400p	enta 490	us en	56% G20	497 dis-
	10.0	May 27	15,900	164	7,040	8	10	14	19	26	37	51	79	98	100	429 GSF
	12.5	June 23	17,800	327	15,700	26	37	46	57	64	70	77	86	98	100	And sus
	10.5	July 21	42,500	680	78,000	60 KG	17	23	31	39	49	58	80	97	100	422 503
	12.0	Aug. 27	26,600	158	11,300	7	10	21	27	36	49	64	86	100	ette erw	eta and
	. 5	Sept. 28 1982	•	44	1,020	NES SUB-	alla qua	*** ***	dept from	863 AV	639 E39	eta es-	500 (800)	elle mis	era cab	409 Mass
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	.0	Mar. 30	1,520	8	33	ens ens	WPW SEG	revo eath	ebility (Elite	eth 445	0.0		esc ess	NR 409	~~	****
	5.0	May 27	23,600	524	33,400	20	40	data data	cc	639 WC	26 60	43	76	96	99	100
	10.0 10.5	July 1 Aug. 19	24,500 13,200	303 238	20,000	29 36	40 51	state comp	55 71	490A 600D	69	76 87	88	99	100	tale and
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	7.5	3eμιe	34,000	017	/3,500	400 400	All sep-	wild com	463 està	ann est	40	670 19 %	data qua	cas ess	4992 4673	ent ma
Susitna River		1982														
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(15292100)	7.5	June 9	46,600	548	68,900	11	14		24	ACR CUS	46	59	82	100	asu em	up eup
	8.0	June 15	24,200	181	11,800	4.0	*** ex	श्रीके श्राप्त	400 aus	€ම සට	40	47	75	100	Sub alla	NO 803
	10.0	June 22	37,000	438	43,800	13	16	9475 684	27	6/9 (8/5)	46	59	82	100	16M 4CD	*** **
•	11.5	June 30	30,200	438	35,700	22	34	SAID COM	52	asto, earn	73	79	90	100	COES EMB	152 40
	14.5 12.0	July 8 July 14	20,700 30,800	145 768	8,100	20	42	50	50	71	76	80	92	100	em em	4CJ 1893
	13.5	July 14 July 21	30,800 24,900	768 383	63,900 25,700	30 29	42 35		59 56	71	80 72	87 78	94	100	100	60 XA
	13.3	July 28	30,800	383 461	25,700 38,300	29 21	35 27	32	56 44	58	72 68	78 75	86 88	97 99	100	HEER PROD.
	13.0	Aug. 4	22,700	341	20,900	30	39	<i>ټ</i> د س س	63	20	77	75 82	90	100	100	ecess water
	10.0	Aug. 10	20,000	289	15,600	30	43	600 GES	71	675, 449 875 (4)	87	90	90 96	100	ans esp	es 110
	10.5	Aug. 18	17,700	285	13,600	43	51	54	77	88	92	93	97	100	and one	440 \$700 440 4045
	12.0	Aug. 25	16,800	219	9,930	32	44	W 15	68	~ ~ ~	89	92	97	100	Mater Selection	400 vals
	9.0	Aug. 31	19,300	251	13,100	23	29	ant es	48	ora esp	72	80	94	100	ese ess	60 s.a
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Table 1.--Continued

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and number		COLICACION	(16./3/	71119/ 上/	(con/ u /	0.002	U.UUT	0.000	0.010	0.001	U. UUL	U. LLV	U & L U U	V.JUV	T a A A A	£ , UU
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•	usik 405	July 20	34,000	1,010	92,700	16	24	35	46	55	62	71	86	98	100	and only
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	014 E23	Sept. 28	5,950	129	2,070	spile artis	G0 60	eg 43	466 136	900 9006	53	865 GG.	863 F/6	est seci	offic wars	en es
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	ero eso	Apr. 8	1,100	383	1,140	and and	9005 4809	466 405	MR 600	UPS 450	en co	4/5 AND	005-00A	ess year	**** *****	400 Mg
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	4.5	June 16	14,500	428	16,800	24	36	cur un	48	MATE SUS	62	68	84	100	\$15 cts	ess dis
	7.5	June 22	19,500	880	46,300	19	25	32	39	47	58	64	75	98	100	and sep
	7.0	June 29	29,000	1,600	125,000	34	45	56	62	70	77	83	94	100	CHO? AND	600 em
	9.0	July 7	20,700	1,000	55,900	26	36	51	60	69	78	84	93	100	40 40	eta eta
	6.5	July 13	22,700	1,270	77,800		es en	ew es	en 10	and acc	71	76	83	99	100	980 75e
	9.0	July 20	23,100	1,140	71,100	30	44	54	65	77	78	84	92	100	***	es en
	6.0	July 27	31,900	1,110	95,600	16	25	30	42	51	60	70	85	98	99	100
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	6.0	Aug. 11	21,300	766	44,100	23	34	40	51	60	68	75	85	99	100	675 594
	5.0	Aug. 17	21,900	1,180	69,800	25	37	48	59	68	75	80	87	97	100	60 56
	5.5	Aug. 24	18,200	830	40,800	24	34	42	54	65	75	81	93	100	STORY MILLS	WITH MISS.
	6.0	Sept. 1	17,300	506	23,600	17	26	000 600 810 600	42		64	68	84	100	PO 013	alle ditte
	5.0	Sept. 18	29,200	1,680	132,000	33	43	52	58	68	74	86	96	99	100	ant ma

Table 1.--Continued

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Station name	pera- ture	Date of	Discharge	concen- tration	Sediment discharge			Dorcont	finar	than c	ize indi	cated	in mill	limatars	<u>.</u>	
and number	(°C)	collection	(ft ³ /s)	(mg/L)	(ton/d)	0.002	0.004	0.008	0.016	0.031	0.062	U. 125	0.250	0.500	1.000	2.00
and number		COLLCCION	110/3/	\mg/ _/	(6011/4)	0.002		0.000	0,010	0,001	0,002	C. 8 C.	V 6 to V V		# 8 0 0	
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•	8.5	May 29	7,300	222	4,380	***	es en	400 600	e/0 e/0	015 0m	44	59	86	98	100	HICH STATE
	10.0	June 24	7,750	407	8,520	15	17	29	43	56	65	74	85	98	100	Que en
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	maio ettis	June 16	11,400	171	5,260	ett3 ejülő	are ent	412 045	60 GG	eas east	29	44	68	92	100	*** ##
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	and nin	July 2	8,240	204	4,540	Stre esto	enti enti	milit yale	679 rap	800 cc3	29	37	65	100	010 Wal	x9 ec
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	9.0	July 28	14,200	696	26,700	17	22	27	35	47	56	66	79	94	100	and the
	11.0	Aug. 3	8,980	206	4,990	evo ess	202 e05	490 400	+m 65	ena ega	40	56	74	100	940 659	est me
	9.0	Aug. 10	6,980	203	3,830	HICP MISS	zia# 6/79	540 540	ena aqu	ena p.c.	32	43	62	100	वक सक	WICH 450
	9.0	Aug. 17	6,230	212	3,570	49 M	step 405	est with	and esta	stray with	41	54	74	100	\$100 GES	60 M
	W/0 403	Aug. 24	5,920	179	2,860	4902 0008	468 429	6/9 460	enth ente	cha qui	51	62	79	100	cure only	613-60
•	8.5	Aug. 31	9,120	276	6,800	with sold	era san	*03 259	400 603	this with	32	46	82	100	650 to	NID 54
	6.0	Sept. 17	17,000	612	28,100	7	9	400 aus	16	Bestir costa	34	48	73	92	100	ans es
	6.0	Sept. 20	14,800	301	12,000	eath eath	(29 (2)	575 675	00 es		32	41	66	91	96	100

Table 1.--Continued

anticipals company gar a span-state of the region of the date of uniformly confidence forms	Water tem-	ngan angka at talah ngga magga at at a sainta firoto ti a Chimir All son gono dibunmar	AMPARAM COMMENTAL THE PROPERTY AND A PROCESSION OF THE PROPERTY AN	Sediment	ottom Omi jakoja adaljum tilaka pamajim tilaka juu i alama			and grand growth (1967) for the property of th	ugginnatista een kittisten kajamanaja palatisten een teksisten kajamanaja kastele kajamanaja kastele kajamanaj Kastele kastele kastele kajamanaja kastele kajamanaja kastele kajamanaja kastele kajamanaja kastele kajamanaja	Suspe	ended se	ediment	nin maniferration, m _e nggjajjyvespiratijskinsteles Startings		allymmetrik galagon sitt School 2000 kinne den som styre sennen en Hen som sit skinne sit s	COMPANY AND
Ctation name	pera-	Dada of	Dicabassa	concen-	Sediment			Downont	· finan	than ci	iza indi	icstad	in mil	limatero		
Station name and number	ture (°C)	Date of collection	Discharge (ft³/s)	tration (mg/L)	discharge (ton/d)	0.002	0.004		0.016			0.125	in mil 0,250	0.500	1.000	2.000
and number		COLICCION	110/3/	(1119/1-)	(011/0)	0.002	0.007	0.000	0,010		01001	96250	A C 22 A A			
Susitna River		1981														
at Sunshine	.0	Mar. 25	3,800	2	21	979 grg	ena suo	kitch qua	900 cis	and the	445 479	ee0 675	000 409	600 400	and can	ණ සම
(15292780)	9.0	May 28	41,500	508	56,900	15	21	29	37	45	58	71	86	98	100	ese em
,	11.5	June 25	55,000	735	109,000	em ea	36	49	60	69	75	81	90	99	100	430 etg
	10.5	July 23	86,300	713	166,000	room water	23	32	40	50	57	68	87	99	100	state with
,	11.5	Aug. 28	62,400	625	105,000	13	24	36	47	54	60	70	80	100	and one	***
	1.5	Sept. 29	19,100	76	3,920	and any	Site and	tota anta	403 619	and day	57	CHR CHAY	440 940	P13 423	600 600	eas ens
		1982														
	.0	Mar. 2	2,660	1	7.2	90% acc	F12 000	em esa	473 yes	era sup	400 402	seek engs	400 e00	4004 40034	630 1/7	MOT: MOD
	em me	June 3	73,800	847	169,000	COS sale	Fig. sts	50 60	600 000	608 105	42	62	85	97	99	100
	7.5	June 10	64,500	414	72,100	16	20	catis scre-	32	467, 469	52	62	95	100	eles esp	ext ma
	7.0	June 17	50,800	360	49,400	em ea	40 mb	909 ND	*** ***	esta did	35	42	62	100	68 63	168 00
	7.0	June 21	78,300	683	144,000	17	20	27	37	4.8	60	76	93	100	\$60 400	asia em
	11.0	June 28	75,700	702	143,000	25	33	43	53	62	73	82	92	100	es es	980 53
	625-100	July 2	58,700	659	104,000	32	41	49	57	66	72	78	90	100	CERTA SALED	60 em
	10.0	July 6	46,600	503	63,300	25	40	45	54	62	67	72	84	100	ens non	out etch
	erite 4ep	July 12	59,800	800	129,000	60p 250	tens one	-10°2 600	400 year	WE 400	75	82	90	100	com ess	alls 1885
	9.5	July 19	60,800	548	90,000	27	39	47	60	69	78	85	93	99	100	C29 669
	9,5	July 26	96,800	1,430	374,000	13	18	27	36	47	59	74	90	99	100	ess ess
	11.0	Aug. 2	62,400	704	119,000	Military acide	bes and	atigh offer	spile week	J10 400	61	ente ente	curso esso	190 409	statile states	em# 4500
	10.5	Aug. 9	54,000	813	119,000	28	33	43	55	66	75	81	89	100	- party and	en en
	10.5	Aug. 16	47,800	726	93,700	37	42	55	67	77	83	88	93	100	and som	ato 423
•	10.0	Aug. 23	38,600	527	54,900	27	41	50	62	73	81	86	94	100	400 460	40 00
	9.0	Aug. 30	39,8^0	424	45,600	19	27	34	49	62	72	80	90	99	100	45 400
	7.0	Sept. 15	70,100	1,620	307,000	6	9	11	22	39	60	79	.91	99	100	637 679
	6.5	Sept. 17	86,500	1,300	304,000	28	38	46	54	65	72	82	94	99	100	em 093

Table 2.--Hydraulic and bedload data for selected stations in the Susitna River basin, 1981-82 water years

Consequences appropriately to the consequence of the consequence of the contraction of th		Water	Average		Average	der vice del litter de graph product que s'écher product que s'écher product que s'écher product que s'écher p	Bedload	and on history that the state of									diment	t	
		discharge	depth	Width	velocity		discharge	and the second s	Percer	itage,	by i	weigh		iner t	han s	ize (n	mm) ind	dicated	
Station name and number	Date	(ft³/s)	(ft)	(ft)	(ft/s)	(ft/ft)	(ton/d)	.062	.125	.25	.5	1.0	2.0	4.0	8.0	16.0	32.0	64.0	76.0
Susitna River at	1981																		
Gold Creek (15292000)	July 22	37,200	(P) 600	trin mile	850 GEA	ere 100	1,970	679 419	623 499	2	20	28	33	36	38	44	61	89	100
	Aug. 26	25,900	usp des	ea + -	spik end	and and	350	was 110s	eto esa	5	41	51	55	58	59	66	72	82	100
	Sept. 28	8,540	ga as	1173. 1018	103 469	779 WG	1.3	Sec 255	est. xea	15	78	88	97	100	904 809	-700 430	400 AM	#11 449	400 ass
Susitna River near	1982																		•
Talkeetna (15292100)	June 3	35,800	7.76	625	7.38	407 009	2,840	5003 SMB	400 MD	3	37	47	48	49	52	54	58	74	100
,	June 8	44,400	8.26	660	8.15	0.0014	1,500	wa 60	1	3	53	63	69	71	75	79	86	100	ech epp
	June 15	24,200	5.27	619	7.42	66 uit	831	404 604	600 AGQ	680 ats	24	32	32	33	35	38	44	76	100
	June 22	37,000	7.37	645	7.78	.0015	992		4600 maga	2	47	58	60	60	61	61	62	64	100
	June 30	30,200	6.52	623	7.44	.0018	442	400 008	print solle	1	33	39	40	41	43	46	94	100	90 ED
•	July 8	20,800	5.15	596	6.78	.0013	324	es (P)	es es	90 80	65	94	96	97	99	99	100	No 100	tes ven
	July 14	30,800	6.66	622	7.43	.0014	906	60 ME	AND 440	1	51	71	74	75	77	81	- 1	100	ASSE 0000
	July 21	25,000	5.87	603	7.06	.0015	360	and 1000	440 665	1	65	90	92	93	94	96	107	609 AG	****
	July 28	30,800	7.28	618	6.84	.0016	600	579 429	60 40	1	70	85	86	88	91	93	100	PO 40	m
	Aug. 4	22,800	5.53	604	6.82	.0014	215	em 150	C75 400	2	78	98	99	99	99	100		****	439 920
	Aug. 10	20,200	5.07	596	6.68	.0013	282	cra 60		1	66	94	96	96	96	97	100	atto cus	NO 412
	Aug. 18	17,800	4.96	557	6.45	.0014	106		e** mic	1	69	97	99	100	050 460	en co	COS SHIP	**	and den
	Aug. 25	16,900	4.54	557	6.68	.0013	110	489 498	***	1	69	97	99	100 97		00	100	OND 443	, ma star
	Aug. 31 Sept. 19	19,400 28,900	4.74 6.06	585 616	7.00 7.75	.0013 .0014	188 372	200 em	1	1 2	73 63	95 78	97 80	80	98 82	98 84	100 91	100	***
	3ept. 19	20,900	0.00	010	7.75	.0014	3/2	ado um	R15 H10	4	03	70	80	80	02	04	91	100	44 10
Chulitna River near	1981																		
Talkeetna (15292400)	July 22	31,900	10.90	420	6.97	ED 624	2,970	40 40	010 WO	2	15	22	26	30	45	70	93	96	100
	Aug. 26	22,500	10.24	295	7.45	000 ESD	3,870	20 SM	60 to	1	12	19	27	40	56	73	89	97	100
	Sept. 29	6,000	5.95	215	4.69	500 MB	2,900	netw max	60 40	total casts	15	29	44	55	77	91	99	100	***
	1982																		
	June 4	12,500	6.50	343	5.61	.00080	11,400	479-489	***	1	14	28	35	54	74	90	99	100	40 48
	June 9	17,200	8.01	347	6.19		18,300	ens one	um me	1	15	38	47	54	67	82	95	100	-M 400
	June 16	14,600	7.33	345	5.77	.00068	11,400	1257 PED	90 AU9	1	11	40	52	. 63	74	83	93	100	ALC: 400
	June 22	19,400	8.07	357	6.74	.0012	10,200	ma um	ulcal Stells	1	28	53	58	64	71	79	91	100	(4p mp
	June 29	28,900 20,600	9.46	389	7.85	.0014	13,000	M9 40	419 483	2	26	38	45	57	74	87	98	100	MED 1975
	July 7 July 13	20,800	8.23 8.67	357 375	7.01 7.02	.0012 .0011	9,610	600 may	409 1629	1	17 11	47 20	53 24	58 34	68 50	80	94	100	100
	July 20	23,100	8.94	368	7.02	.0011	9,110 13,800		409 404	1	12	35	40	45		69	88	99	100
•	July 27	33,400	10.07	405	8.19	.0012	6,900	em em	WIR 400	1	15	28	35	45 42	57 53	67 63	85 84	100 100	600 ED
	Aug. 3	23,500	8.22	377	7.58	.0014	7,490	20 WD	600 MGA	1	16	38	46	53	62	75	90	98	100
	Aug. 11	21,700	8.25	361	7.28	.0014	9,670	919 30h	62 60	-500 max	13	30	35	41	51	67	90	100	100
	Aug. 17	22,000	8.50	361	7.23	.0010	12,100	60 40	100 au	1	12	39	46	54	66	80	93	100	40 40
	Aug. 24	17,900	7.99	358	6.26	.0010	7,560	925 GE2	665 CDD	1	12	25	29	37	52	70	91	100	80 40
	Sept. 1	17,100	7.68	354	6.29	.00092	7,480	ancal form	COM 65/0	1	17	40	56	64	75	86	95	100	****
	Sept. 18		9.16	391	8.27	.0012	2,560	CD CO	60 90	$\overline{1}$	22	36	41	45	53	64	82	100	cies can

Table 2.--Continued

	aanayen oordenningi, saarkiib seddoody kijo sayat rekliib sagariin dake ero-	Water	Average	HILOMOTOR OF THE PROPERTY OF T	Average		Bedload										ediment		
Station name and number	Date	discharge (ft³/s)	depth (ft)	Width (ft)	velocity (ft/s)	Slope (ft/ft)	discharge (ton/d)	.062	Percer .125	tage, .25	<u>by</u>	<u>weigh</u> 1.0		<u>ner t</u>	<u>han s</u> 8.0	ize (n 16.0		licated 64.0	
Station name and number	Date	(16-73)		(16)	(16/3)	(16/16)	(011/4)	.002	. 120			1.0	2.0	7.0	0.0	10.0	J£ . U	UT. U	70.0
Talkeetna River near Talkeetna (15292700)	1981 July 21 Aug. 25 Sept. 29		8.63 5.19 3.07	351 335 310	5.54 5.69 3.05	con soo	2,340 756 25	COS 4005 COS 4000 COS 4000	1	12 5 6	46 68 86	54 85 99	56 87 100	57 88	59 89	64 91	78 93	97 100 	100
	June 2 June 9 June 16 June 23 June 29 July 7 July 13 July 20 July 28 Aug. 3 Aug. 10 Aug. 17 Aug. 24 Aug. 31 Sept. 2	5,840 9,020 8,560 14,300 9,140 7,070 6,260 5,960 9,200	7.11 6.03 5.63 5.73 5.70 4.35 4.78 4.83 6.26 4.83 4.35 3.83 3.73 4.53 6.55	357 350 344 349 331 344 348 348 337 335 351 348	7.52 6.64 5.79 6.29 5.48 4.75 5.53 5.16 6.56 5.51 4.81 4.85 4.77 5.79 6.40	.00096	2,800a 5,790 1,630 1,410 620 1,080 243 516 885 802 2,470 2,380 1,800 1,460 2,740		1	3 1 1 2 18 1 3 2 1 1 1	35 12 13 32 44 39 66 42 52 38 55 23 14 18 12	90 30 31 60 73 91 89 64 81 62 97 82 84 84 26	94 34 35 64 76 93 91 65 85 64 98 93 92 27	96 36 38 66 77 93 92 65 88 65 99 96 97	97 41 71 79 93 65 90 67 99 98 98 94 33	100 56 46 82 83 94 95 65 92 69 99 99 99	85 59 98 91 96 67 95 78 100 100 99 82	100 86 100 100 100 100 100 100 84 	100
Susitna River at Sunshine (15292780)	July 22 Aug. 26 Sept. 3 1982 June 3 June 10 June 17 June 21 June 28 July 6 July 12 July 19 July 26 Aug. 2 Aug. 9 Aug. 16 Aug. 23 Aug. 30 Sept. 1	61,900 19,100 71,000 64,700 50,700 78,900 75,400 46,700 59,200 61,500 99,000 63,600 53,800 48,100 38,500 39,200	12.73 9.99 7.70 10.20 10.10 8.98 12.18 11.10 8.94 9.67 9.70 14.55 10.30 9.40 9.39 8.52 8.81 13.30	990 975 583 1,020 1,020 967 1,010 1,000 939 1,000 1,010 1,000 859 685 675 1,000	7.06 6.36 4.25 6.83 6.28 5.84 6.41 6.79 5.80 6.52 6.34 6.73 6.17 6.02 5.96 6.59 6.59 6.59	.0015 .0014 .0018 .0014 .0015 .0022 .0024 .0022 .0019 .0016 .0017 .0015	3,540 3,040 385 6,080 13,600 1,870 2,510 6,390 6,020 3,800 3,960 8,750 3,480 5,220 2,740 1,050 1,480 8,120	1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	13 22 7 2 2 2 12 3 2 3 2 4 5 2 1	42 76 62 15 12 47 18 17 35 52 40 18 60 62 61 55 44 12	47 79 70 22 17 65 50 22 46 75 54 28 73 81 83 85 63 20	49 81 70 26 17 65 51 23 47 77 58 30 74 82 84 88 64 23	54 83 72 27 18 66 53 25 49 80 62 33 74 83 85 89 64 26	60 87 73 30 20 66 57 27 57 85 69 39 75 86 90 65 37	70 92 77 38 29 69 62 46 71 88 75 53 78 89 92 92 66 60	85 98 83 64 54 75 64 86 96 84 77 93 98 92 70	100 100 100 100 96 100 95 100 100 100 100 100 100	100

a Estimated

Table 3.--Bed-material data for selected sites in the Susitna River basin [Sampling point stationing from left bank]

And the second s		and the second section of the section of the second section of the section of the second section of the section of th					Вез	d mate	erial					
	Date of	Sampling		Perc	ent fi	ner th	nan siz	ze ind	dicate	ed, i	n mill	imeter	^S	
Station name and number	collection	point	0.062	0.125	0.25	0.50	1.0	2.0	4.0	8.0	16.0	32.0	64.0	128.0
Susitna River at	1981													
Gold Creek (15292000)	Sept. 28	100a	Arris 1958	~ ~	~ ~							ma -sa		100
dora breek (Telsilos)	33633	130b	ee 100	V4 NO	200 May	~ ~	ere 405						- 74 400	
		160b	***			***	*** ***		~					***
		190b			*** ***		- **							
		220b	~	~	es- =4								****	
		25 0 b		www. 1004										
		28 0b	***		~ -	~ ~		wa		***		and an analysis		
		310a				*** ***		~ •		***	0	1	27	100
		370b		-m -m		-		~ •	*** ***			*** ***		
Susitna River near	1982													
Talkeetna (15292100)	July 28	550a				··· ···				***		and city	0	100
		410a	helv 1999								0	100	***	
		290b										~~ •=		en us
		200b				WG 88	419 MA				***	*** #2	enz etta	*** ***
		120b	~ ~	***	NO NO	w/r 048						***	PH 40	
	Aug. 4	130b	ons 400	~~ ***				***					war 2000	***
		210b	Por HIP										****	***
		310c	100								0	7	53	100
		400c	-	min mine						0	1	6	42	100
		540b												
	Sept. 19	140a	r= +10		***							0	18	100
		210a	era 49a	-F -FF			****					*** ***	0	100
		300a		ander sadily	Ow -19			*** ***		-	۸	4	30	100
		430a	~ **	and made	~ ~						0	2	19	100
		570a	** ***			min with						0	5	100
Chulitna River near	1981								_		0.1	0.4	: 00	
Talkeetna (15292400)	Sept. 29	90c		-40			**	0	7	52	81	94	100	
		110c	WW 1881	**** *****	0	1	1	2	10	57	92	100	***	*** ###
		130c	date seeks	** ***	0	2	5	15	30	68	90	100	100	400 400
		150c		urm. Anid	0	2	10	18	30	59	83	98	100	No
		170c	**** ****	end	0	4	60	76	79	84	91	99	100	ent ans
		190c	***	~	0	1	26	47	53	65	78	94	100	APR 108
		210b			~ ~		100	** ***	~ **	-70 mg	***	****	** ***	
	1000	230c	0	2	24	84	100	unt was	*** ***	****	*** ***	***	was end-	PROF. 6780
	1982	300					0	1	3	1	n c	771	00	100
	July 27	180c	Mark Name	at top	Annh million		0	1	3	15	46	71	89	100
		240c	NAME AND DESCRIPTION OF THE PERSON NAMED IN	noir 1990		 E	20	1 34	5 36	18	44	72 57	93	100
		290c			0	5	29			42	52		100	100
		330c	m** ***	214 404			 5	 6			13	5 36	24 87	100
		380c			0	2		0	0	Ö	13	30	٥/	100

a Few particles obtained, non-representative sample b Streambed too coarse for obtaining samples c Representative sample obtained

Table 3.--Continued [Sampling point stationing from left bank]

							Be	d mat	erial					
	Date of	Sampling		Perc	ent fi	ner th	an si	ze in	dicat	ed, i	n mill	imete	^S	
Station name and number	collection	point	0.062	0.125	0.25	0.50	1.0	2.0	4.0	8.0	16.0	32.0	64.0	128.0
Talkeetna River near	1981													
Talkeetna (15292700)	Sept. 29	60a	· ·					~ ~		***			0	100
•		90c				0	3	8	8	8	8	8	13	100
		120c			*** ***		***	~ **			0	2	52	100
		150c								0	1	3	100	ente acte
		180a				*** ***				*** 4.9	0	7	100	
		210a		***				~~	~ ~		0	2	18	100
		240a							with	~ ~		0	11	100
		270a					A-100 VIDE		***		wa 800	0	45	100
		30 0c		***		***			***			0	35	100
	1982													
	July 28	50b	***				-HG 078		~	~ ••	***		*** ***	unt was
		70b	~ ~			***			~ ~	~ ~				*** ***
		110c	~ ~	0	1	7	50	74	84	91	95	100	100	
		180c		40 MB			****			0	4	25	100	160 5%
		240a				*** ***					0	7	100	
		300a	~ ~	40 HB	ch	~ 10	150			*** ***	-	0	100	
	0 1 00	340b	~ ~	*****				AT 143				***		****
	Sept. 20	4.01												
		40Ь	~		****	***	***	** ***				0	6	100
		80c 140c	10				***		0	5	22	65	100	100
			no este			rov am				0	4	38	80	100
		200c 270c	*** ***		~ ~					0	1	30	30	100
Coddan Diversion	1981	2700	w. ca	***	*** ***				~ ~	U	1	3	30	100
Susitna River at		49 0 a										***	0	100
Sunshine (15292780)	Sept. 30	560a	**** ast;	*** ***						*** ***		0	58	100
		625 a	****	***								0	100	100
		690a									0	18	100	mer eggs
		755a	000 aug	~ ~		***		***	***	****	0	41	100	
		820c	***	0	2	47	64	67	69	74	8ô	96	100	***
		885a	W 44			~/				/ "7		0	36	100
		950a	******							***		0	52	100
	1982	2300							_		_	9	Lu	100
	July 26	230c		anim minija	WW REP	***		***	***	0	2	18	100	•** •
	041y 20	530c		erer kelle	979 MOR	wie MS	nen ugue	****	om. +==		0	8	54	100
		650c	100 mm		No. of						0	4	31	100
		800c			0	1	3	5	11	23	38	53	62	100
		830c	***							0	1	15	100	
		900c	***	*** ***	*** 994	0	2	4	6		23	64	100	**9 ***

a Few particles obtained, non-representative sampleb Streambed too coarse for obtaining samples

c Representative sample obtained

Table 4.--Water discharge and estimated sediment yields at selected sites in the Susitna River basin, May to September 1982

	Drainage	er men energeleite die de konstitutie alleite gewalt zwei versität men gewalte gewalte gewalte gewalte gewalte	Water		ended			and the state of the	er of a "small" i "ill de simil announce in "Harter an Equip a announce planten	m an resident of Campanage and State	rosen alkulusun noordatti kita piraksi saanin jahoi nellätyövääläytein kajule juulittiin ki Jananavalainen
	area	m	discharge	sedimen		Bedload			Total sed	iment (tons	
Station name and number	(mi²)	Period	(acre-ft)	Silt-clay	Sand	Sand	Gravel	Silt-clay	Sand	Gravel	Total
Susitna River near Talkeetna (15292100)	6,320	May June July August September May - September	920,000a 1,700,000a 1,500,000a 1,000,000a 1,100,000a 6,200,000a	170,000 430,000 680,000 310,000 330,000 1,900,000	100,000 320,000 210,000 48,000 140,000 820,000	3,200 12,000 11,000 4,100 4,700 35,000	1,100 5,300 1,900 100 900 9,300	170,000 430,000 680,000 310,000 330,000 1,900,000	100,000 330,000 220,000 52,000 140,000 840,000	1,100 5,300 1,900 100 900 9,300	270,000 770,000 900,000 360,000 480,000 2,800.000
Chulitna River near Talkeetna (15292400)	2,570	May June July August September May – September	386,700 1,092,000 1,575,000 1,252,000 1,085,000 5,390,700	88,000 880,000 1,900,000 1,000,000 1,200,000 5,100,000	45,000 400,000 760,000 400,000 300,000 1,900,000	28,000 210,000 150,000 110,000 54,000 550,000	48,000 230,000 190,000 150,000 66,000 680,000	88,000 880,000 1,900,000 1,000,000 1,200,000 5,100,000	73,000 610,000 910,000 510,000 350,000 2,500,000	48,000 230,000 190,000 150,000 66,000 680,000	210,000 1,700,000 3,000,000 1,700,000 1,600,000 8,200,000
Talkeetna River near Talkeetna (15292700)	2,006	May June July August September May – September	203,700 770,200 680,900 447,100 568,600 2,670,000	34,000 150,000 280,000 55,000 85,000 600,000	26,000 250,000 180,000 65,000 160,000 680,000	2,000 34,000 22,000 54,000 17,000 130,000	1,900 63,000 14,000 4,600 23,000 110,000	34,000 150,000 280,000 55,000 85,000 600,000	28,000 280,000 200,000 120,000 180,000 810,000	1,900 63,000 14,000 4,600 23,000 110,000	64,000 500,000 500,000 180,000 280,000 1,500,000
Susitna River at Sunshine (15292780)	11,100	May June July August September May – September	1,633,000 3,738,000 3,876,000 2,083,000 2,906,000 14,236,000	280,000 1,500,000 2,800,000 1,800,000 1,900,000 8,300,000	250,000 1,200,000 1,300,000 600,000 830,000 4,200,000	8,400 45,000 76,000 60,000 48,000 240,000	15,000 130,000 75,000 14,000 46,000 280,000	280,000 1,500,000 2,800,000 1,800,000 1,900,000 8,300,000	260,000 1,200,000 1,400,000 660,000 880,000 4,400,000	15,000 130,000 75,000 14,000 46,000 280,000	550,000 2,900,000 4,300,000 2,500,000 2,800,000 13,000,000

a Estimated

