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Open File Report #133

Water Resources of the Little Tonsina River, Alaska: Stream Gage Data, 2014–2020

August 2026



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Cover photo
View upstream on the Little Tonsina River.

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Water Resources of the Little Tonsina River, Alaska: Stream Gage Data, 2014–2020

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August 2026

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Abstract

This report summarizes stream gage information collected by the Bureau of Land Management (BLM) from 2014 to 2020 in the Little Tonsina River watershed. The information presented supports achievement of various BLM management goals and objectives for this watershed, with an emphasis on the Little Tonsina River corridor. The Little Tonsina River watershed drains approximately 85 square miles, with the river originating in the Chugach Range at about 4,500 feet and flowing north 19 miles to the Tonsina River, which drains into the Copper River and ultimately the Gulf of Alaska. The Little Tonsina River is a high-value anadromous stream and provides a variety of recreational, fish, wildlife, and other socioeconomic values. Management objectives established for the Little Tonsina River include maintaining the pristine, free-flowing condition of the river and tributaries, optimal and long-term utilization of its fish and wildlife resources, and high-quality primitive recreational opportunities. This report summarizes BLM long-term gage data referenced to U.S. Geological Survey historical gage data, BLM instantaneous gage data, and other relevant hydrologic and physical information to support achievement of these and other BLM management goals and objectives for the Little Tonsina watershed.

1. Introduction

This open file report summarizes continuous and instantaneous stream gage data collected by the Bureau of Land Management (BLM) from 2014 through 2020. Data collected and analyzed are within the BLM Tiekel Special Recreation Management Area and the Little Tonsina River watershed (Figure 1). Other relevant hydrologic and physical information collected in this watershed between 2014 and 2020 are also reported. This information is summarized to support various BLM management goals and objectives for the watershed.

The Little Tonsina River is a clear-running, freshwater tributary of the Tonsina River and ultimately the Copper River. It is managed under the East Alaska Resource Management Plan (BLM 2007). The Little Tonsina River receives a moderate amount of annual recreational and subsistence use, as well as a substantial amount of utility development, such as the Trans-Alaska Pipeline System and Copper Valley Telecom.

Management objectives established in the resource management plan for the Little Tonsina River and other streams within the boundaries of the plan include:

- All water sources provide water quality and quantity sufficient to meet Alaska State standards and to protect beneficial uses.
- Stream channels display the dimensions, pattern, and profile that are representative of site potential to allow floodplain aquifer recharge, moderate stream flows, and buffer the effects of flooding.

The hydrologic information reported in this publication may be used to support the adjudication and/or amendment of existing applications. This information may also be used to create new water reservation applications for additional stream reaches, as needed.

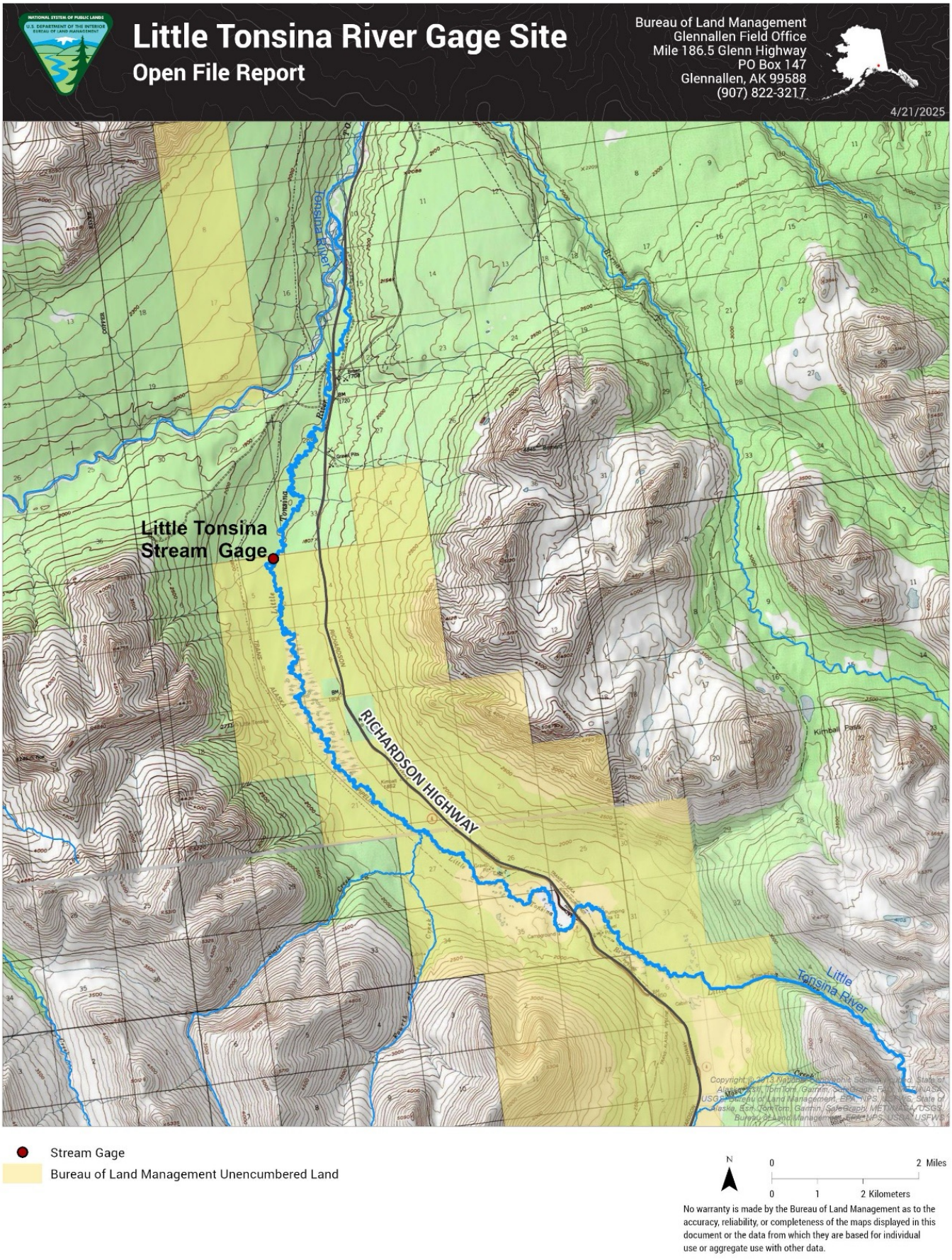


Figure 1. Location of the Little Tonsina River stream gage and surrounding land status.

2. Description of the Study Area

2.1 Physiography

The Little Tonsina River watershed drains approximately 85 square miles of the northeastern portion of the Chugach Mountains in Alaska. The river begins in the Chugach Range and flows approximately 19 miles north until it reaches the Tonsina River, about 4 miles southwest of Tonsina and the Tonsina River Lodge. The Tonsina River continues to flow in a northeast direction until it drains into the Copper River and ultimately into the Gulf of Alaska. Several ponds and small lakes are scattered mostly along the upper reach of the Little Tonsina. The area through most of the reach is spruce-dominated forest with thick brush until it reaches the base of the Chugach where trees begin to thin and disappear and the low brush of the alpine dominates.

Much of the Little Tonsina drainage is soils formed in thick deposits of very gravelly till and colluvium. For the most part, the dominant soils are well drained without permafrost and are forested with white spruce, paper birch, and aspen. Poorly drained soils with permafrost occur in valleys and on steeper north-facing slopes with forests of stunted black spruce or a cover of mosses, sedges, and low shrubs (Rieger et al. 1979). Most reaches of the river consist of meandering, single thread, low gradient incised channels. The Little Tonsina is a low velocity stream with no rapids and is boated occasionally with canoes, kayaks, or pack rafts.

Stream channel width varies tremendously at different points within the Little Tonsina River system. For example, channel width ranges from about 2 feet in places along the upper reaches in the Chugach to as much as 100 feet in the lower reach where it joins with the Tonsina River and in areas influenced by beaver activity. Since the Little Tonsina is a low gradient incised stream, it meanders tightly throughout most of the reach in the valley and then straightens in the upper reach near the base of the mountains. The headwaters of the Little Tonsina originate in mountainous terrain that contains small glaciers and remnant glacial lakes. Immediately adjacent to the river channel, the landscape consists of nearly level to moderately sloping floodplains and stream terraces. Other common floodplain features include point bars, meander cutoffs, and swamps. Meander cutoffs and ponds are present on many stream terraces.

2.2 Climate

The climate of the Little Tonsina Basin is southern Alaska maritime transitional climate zone moderated by the Gulf of Alaska. It is characterized by long, cold winters and short, warm to cool summers. The mean January temperature reported between 1963 and 2012 is -5.4°F (-20.8°C) at Tonsina (Table 1), about 8 miles north of the BLM's Little Tonsina gage. Daily low temperatures of -50.0°F (-45.6°C) or less occur frequently during the winter (mid-October to April), and 2-week or longer periods of severe cold weather are common within the Little Tonsina drainage area. The mean temperature in July is 56.2°F (13.4°C) at Tonsina. Daily high temperatures in summer within the Little Tonsina drainage area occasionally exceed 80.0°F (26.7°C). Daily minimum temperatures in summer are generally between 38.0° to 43.0°F (3.3° to 6.1°C) within the river drainage area. However, freezing temperatures have been recorded in every month (WRCC 2025). At Tonsina, the mean annual precipitation reported between 1963 and 2012 is 12.7 inches (32.3 cm) and average annual snowfall is 64.2 inches (163.1 cm) (Table 1) (WRCC 2025).

Table 1. Temperature and precipitation data for Tonsina, Alaska, from 1963–2012 (WRCC 2025).

Month	Temperature			Precipitation	Snow
	Maximum Monthly Average (°F)	Minimum Monthly Average (°F)	Mean Monthly Average (°F)	Mean Monthly Total (inches)	Mean Monthly Total (inches)
January	3.3	-14.1	-5.4	0.84	9.5
February	16.0	-7.3	4.3	0.99	10.2
March	29.5	-0.4	14.5	0.48	5.7
April	43.6	17.7	30.6	0.26	2.6
May	56.0	30.0	43.0	0.51	0.5
June	66.0	38.7	52.4	1.27	0.0
July	69.1	43.2	56.2	1.80	0.0
August	65.2	38.8	52.0	1.38	0.0
September	54.6	30.0	42.3	1.31	0.9
October	36.1	17.4	26.8	1.30	9.5
November	15.4	-2.0	6.7	1.25	12.7
December	6.2	-10.6	-2.2	1.25	12.5
Yearly Average	**38.4**	**15.1**	**26.8**	**—**	**—**
Yearly Total	**—**	**—**	**—**	**12.65**	**64.2**
Extreme	**90.0**	**-61.0**	**—**	**—**	**—**
Month/Year	**June 1969**	**December 1964**	**—**	**—**	**—**

2.3 Permafrost

Since the mean annual air temperature in the region is less than 27.0°F (-2.8°C), permafrost (perennially frozen ground) underlies some of the basin (Ray 1993). Permafrost is not extensive in this area as the soils are made up of Typic Cryochrepts (very gravelly, hilly to steep association which occupies moraines and mountain foothills in the valleys). The dominant soils are well-drained without permafrost, but poorly drained soils with permafrost occur in the valleys and are under either a forest of stunted black spruce or a cover of mosses, sedges, and low shrubs (Rieger et al. 1979). Melting permafrost significantly alters streamflow by changing groundwater pathways, often leading to increased summer streamflow in some areas but also cooler summer stream temperatures due to deeper, cooler water inputs, while causing more variable flows, longer recession periods, and increased sedimentation (Sjöberg et al. 2021). The BLM recognizes that permafrost may have an impact on surface water/groundwater relationships, but this study did not identify specific impacts.

3. Methods and Data Sources

To determine the annual hydrology within a drainage basin, stream gaging is often used to generate continuous streamflow information year-round. Stream gaging is the process of measuring and monitoring the height (stage) and volume of water flow (discharge) in a stream, river, or other body of water. The stage data recorded on the gaging equipment is corrected to the elevation surveyed at the site and correlated by regression analysis to instantaneous discharge measurements. The daily, monthly, and annual discharges are then used to characterize the streamflow of the basin (USGS 2019).

3.1 Continuous Gaging Location

To obtain at least 5 years of continuous mean daily flow records within the Little Tonsina drainage, the BLM operated a temporary continuous measurement gage. The location of the gage is illustrated in Figure 1 and summarized in Table 2. BLM stream gage measurement and analyses methods followed U.S. Geological Survey (USGS) procedures described in Rantz et al. (1982a, 1982b) and in Melcher and Walker (1990).

Table 2. BLM gage location and period of record used for calculating long-term stream gage hydrology in the Little Tonsina drainage.

Site Name	Operator	Site ID	Location	Period of Record
Little Tonsina Gage	BLM	None	61°33′25.40″N, 145°15′21.18″W	January 2014 through February 2020

4. Description of the Gage Site

4.1 BLM Little Tonsina Gage

The BLM Little Tonsina stream gage site (Figure 2) was located on the Little Tonsina River (61º33'25.40"N, 145°15'21.18"W) approximately 5.4 river miles upstream from the confluence with the Tonsina River. Access to the Little Tonsina gage during ice-free periods was by foot, hiking approximately 0.5 miles west from the pullout on the Richardson Highway (milepost 72) to the gage site. During the winter period, the gage site was accessed by snowmachine from the same Richardson Highway pullout.

The Little Tonsina gage was located on a straight section of the river in an area not affected by swirling eddies of sharp meander turns. Gaging started with a winter flow measurement in April 2014 and an automated gage at this site in June 2014. The gage was discontinued in February 2020, with a final winter streamflow measurement. This resulted in approximately 6 years of data. For the period of record, continuous recorded gage data were collected only during the late spring, summer, and early fall during ice-free periods, generally from late May/early June to late September/early October.

River stage data were stored and recorded onsite by a Sutron 7310 Datalogger with a Sutron Submersible Depth Transducer (accuracy -1% of full scale, 4.0 ± 0.2 mA at 22˚C). The data logger was housed in a small wooden lockable box attached to and hidden under the protection of a



Figure 2. Little Tonsina River stream gage site showing the Teledyne StreamPro ADCP Doppler. Note the spawning salmon below the doppler boat.

large spruce tree (Figure 3) and was programmed to record maximum stage and precipitation every 30 minutes. The depth transducer and approximately 3 feet of cable were inserted in a stilling well, which was installed at a 45-degree angle in the right bank. The remaining cable (approximately 20 feet) was buried approximately 2 inches underground until it reached the data logger within the housing. Water and air temperature were also collected onsite utilizing a HOBO Water Temperature Pro v2 Data Logger and a HOBO U23 Pro v2 External Temperature Data Logger.

The stream gage was surveyed to elevation benchmarks located near the gage site and to the current water level using an engineers level and stadia rod. There were three benchmarks established near the gaging area, two utilizing the base of large spruce trees with 8-inch spike nails and a third utilizing a commercial land marker near the gaging site which consisted of a 3-foot rod with a 2-inch diameter aluminum head.

Stream discharge (streamflow) measurements were made (4–5 per open water season) mostly by utilizing a Teledyne StreamPro ADCP Doppler. The doppler was operated by a rope cableway at the gage location slightly upstream of where the depth transducer was deployed (Figure 2). Some of the early discharge measurements were done utilizing a Price AA current meter to measure water velocity and a top-setting wading rod and tag line for depth and width. For the winter period, under-ice discharge measurements consisted of drilling a series of holes in the ice to define the cross section and then measuring the depth and velocity in each hole using a USGS vertical-axis, vane type current meter mounted on a graduated rod (Figure 4). The stream gaging methods used at this site were based on those described in Rantz et al. (1982a, 1982b) and in Melcher and Walker (1990). For the period of record (January 2014 through February 2020), 31 instantaneous discharge measurements were conducted at the Little Tonsina gage site. After each site visit, discharge data recorded in survey books were input into Excel spreadsheets and stored on the BLM computer server.



Figure 3. Little Tonsina River stream gage data logger.



Figure 4. Winter measurement drill holes at the Little Tonsina River stream gage site.

Previously, the USGS operated a stream gage on the Little Tonsina from September 1972 to September 1978. The USGS gage was located several miles upstream from where the BLM gage was located at a different drainage area. While these gages are somewhat comparable, the BLM gage includes a larger drainage basin and stream inputs from more tributaries.

4.2 Gage Site Methods

The techniques and standards for making discharge measurements followed what is described in Turnipseed and Sauer 2010. Site visits were made at the Little Tonsina continuous (long-term, year-round) data gage location 4–5 times a year to download data, measure discharge, perform routine maintenance, and survey water levels for quality control/assurance. The site was established to measure both continuous 30-minute stage values, along with instantaneous discharge measurements of volumetric flow rate (discharge in cubic feet per second (cfs)) throughout the entire year. These measurements were used to establish a rating curve of the stage-discharge relationship to allow computation of continuous discharge values. The values of continuous discharge were then statistically summarized into mean daily values over the full range of seasonal flows throughout the open water period, when the data recorder was operational (Sauer 2002).

A systematic process of streamflow records computation was used following processes described in Rantz et al. (1982a, 1982b), Melcher and Walker (1990), and Parks and Madison (1985). Excel spreadsheets and included functions were used to make all discharge computations. Before being converted to discharge, the stage records were corrected to reference elevation based on level surveys. The corrected stage values were used to develop rating curves, and then shifts were applied to the discharge rating curves due to fill and scour of the hydraulic control. The discharge from the rating curves was then used to compute half hourly discharge values, which are the basis

to compute mean daily, mean monthly, and mean annual flow values for the calendar year (January through December). When discharge measurements were not collected at the gage site or when recorded data were considered unreliable, such as during spring ice breakup, fall freeze-up, or when the recorder malfunctioned, measurements were estimated from a simple linear regression analysis with USGS streamflow data. The USGS Gulkana River at Sourdough gage was generally used for the open water periods, April to early October, while the USGS Phelan Creek gage was used for the winter period, mid-October to late March (USGS 2024a, 2024b; Parks and Madison 1985).

Daily mean discharge data were estimated using linear regression analyses. The statistical accuracy of the estimates was determined by the R-squared (or R^2) and standard error (SE) values. R^2 is the coefficient of determination. It is a statistical measure in a regression model that determines the proportion of variance in the dependent variable that can be explained by the independent variable. In other words, R^2 shows how well the data fit the regression model. R^2 values range from 0 to 1. The higher the R^2 value, the better a regression model fits a dataset. SE of the regression is the precision that the regression coefficient is measured; if the coefficient is large compared to the SE, then the coefficient is probably significant. The R^2 and SE values for the Little Tonsina gage site, using published data from the USGS Gulkana River at Sourdough and Phelan Creek stream gages, are listed in Table 3.

In addition, air temperature and precipitation data from the Tonsina climatological site were used to help estimate gaps in data. The Little Tonsina air temperature and precipitation data were used to help smooth rating curves, but since routine quality assurance measures and inspections were not performed for these parameters at this site, the use of these data was cursory.

For the winter period (mid-October through April) when no gage readings were recorded, streamflow was computed from instantaneous winter under-ice discharge measurements by regressing discharge between measurements at the site. This method assumes that once ice and snow cover isolate the stream from precipitation and temperature changes, the flow to the stream recedes uniformly as the water table is lowered by reduction of water volume in the aquifer (Rogers and Armbruster 1990). Temperature and precipitation data from the Tonsina climate site were used to help determine when freeze-up and spring breakup occurred. Where data gaps occurred between gage removal and freeze-up and between spring breakup and gage installation, flow values were estimated from a regression analysis with USGS data from the Gulkana River at Sourdough and Phelan Creek gages.

Table 3. Regression statistics for the Little Tonsina gage site using USGS stream gage data.

	Gulkana River at Sourdough Gage		Phelan Creek Near Paxson Gage	
Year	R^2	SE	R^2	SE
2014	0.87	0.31	0.78	0.37
2015	0.70	0.46	0.70	0.34
2016	0.83	0.36	0.87	0.37
2017	0.75	0.38	0.88	0.20
2018	0.73	0.56	0.74	0.48
2019	0.85	0.37	0.74	0.33
2020	0.85	0.37	0.74	0.33

5. Results

The instantaneous discharge measurements and time series daily mean discharge values for the Little Tonsina gage site are listed in Appendix A (Table A1) and Appendix B (Tables B1–B7). The monthly mean discharge data, calculated from the daily flow values for the BLM gage site, are listed in Table 4. The peak and minimum recorded data, calculated from the daily flow values for the same site, are listed in Table 5. Hydrologically, the Little Tonsina gage site (see Figure 1 and Table 2 for location information) is characterized by low winter flow, large increases in flow during spring breakup, occasional summer peaks in response to rainfall, and a gradual decline during autumn, as shown by the concurrent data plot in the hydrograph (Figure 5).

Table 4. Monthly mean discharge (cfs) for the Little Tonsina gage site (2014–2020).

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
2014	ND	ND	ND	97	289	295	248	100	111	61	48	39
2015	31	25	22	28	158	183	78	85	65	58	47	42
2016	38	34	31	42	265	370	119	71	55	44	34	27
2017	22	17	15	48	70	163	100	58	82	53	41	32
2018	25	19	16	15	173	611	287	124	63	43	34	26
2019	20	16	13	17	102	243	108	56	49	59	40	30
2020	22	17	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mean	**26**	**21**	**19**	**41**	**176**	**311**	**157**	**82**	**71**	**53**	**41**	**33**

ND = not determined. The first measurement was performed April 2014, and prior flows for the year were not estimated. Final flows for 2020 were measured in February, and the remainder of 2020 flows were not estimated.

Table 5. Instantaneous peak and minimum recorded discharge values (cfs) for the Little Tonsina gage site (2014–2020).

Year	Peak	Date	Minimum	Date
2014	508	July 2	22	Apr. 5–9
2015	395	June 2	21	Mar. 11–21
2016	592	May 24	30	Mar. 22–30
2017	445	June 11	15	Mar. 2–Apr. 5
2018	970	June 20	13	Apr. 3–4
2019	290	June 15	13	Mar. 18–Apr. 1 and 3
2020	ND	ND	ND	ND

ND = not determined (partial year). The first measurement was performed April 2014, and prior flows for the year were not estimated. Final flows for 2020 were measured in February, and the remainder of 2020 flows were not estimated.

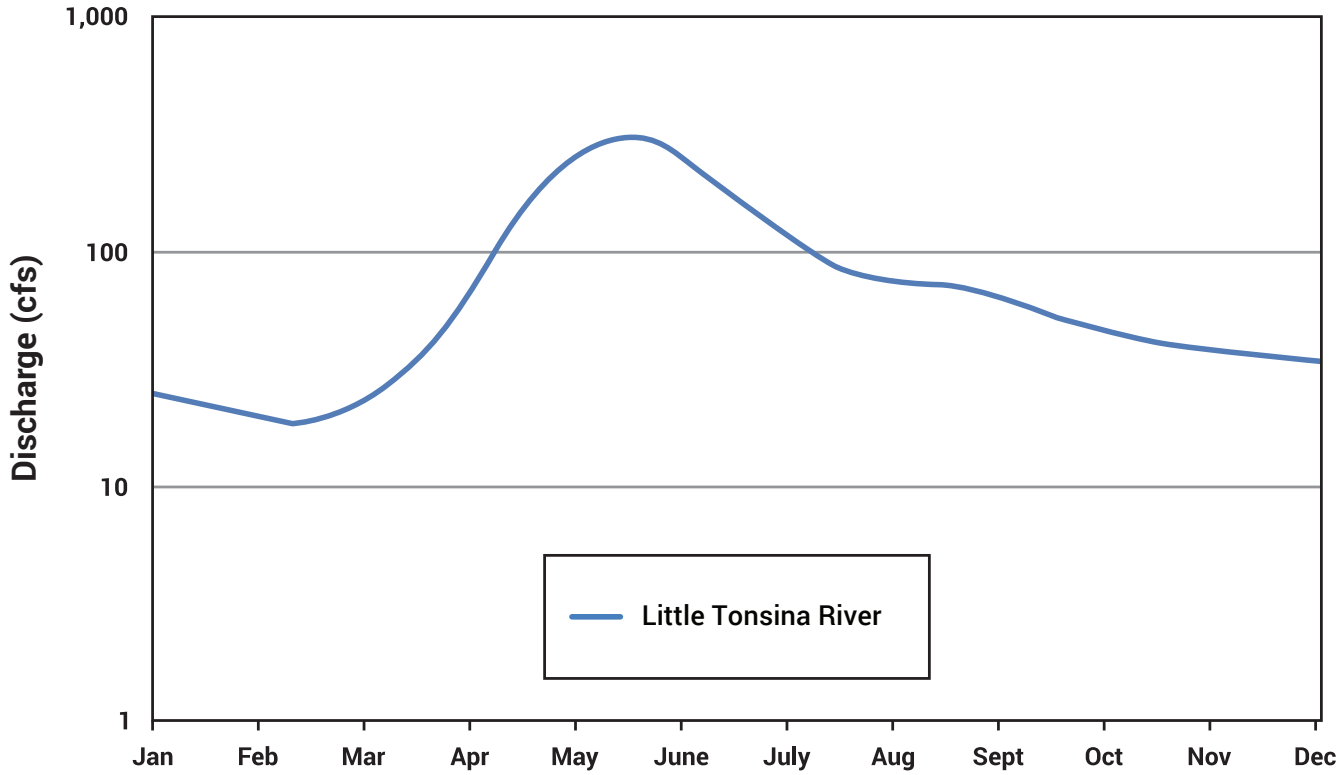


Figure 5. Monthly mean annual discharge hydrograph for the BLM Little Tonsina gage site.

Flow-duration data are often used to statistically characterize streamflow. The exceedance probability, also referred to as the flow-duration percentile, is usually expressed as a percentage of a specified time interval (Risley et al. 2008). For example, the 50% flow-duration value would be exceeded about half of the time (and is the same as the median value). For the Little Tonsina gage site, the monthly discharge values for the period of record are used to determine at what percentile a certain discharge would be exceeded. The calculated flow-duration values for the site are listed in Table 6.

Table 6. Flow-duration percentile of monthly discharges (cfs) for the Little Tonsina gage site (2014–2020).

Flow-Duration Percentile	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
0%	38	34	31	97	289	611	287	124	111	61	48	42
5%	36	32	29	85	283	551	277	118	104	61	48	41
10%	34	30	27	73	277	490	268	112	96	60	47	40
15%	33	27	25	60	271	430	258	106	89	59	47	39
20%	31	25	24	48	265	370	248	100	82	59	47	39
25%	29	24	22	47	242	351	216	96	78	59	46	37
30%	28	22	20	45	219	332	183	92	73	59	44	35
35%	26	21	19	44	196	314	151	89	69	58	43	34
40%	25	19	18	42	173	295	119	85	65	58	41	32
45%	24	19	17	38	169	282	116	81	64	57	41	31
50%	23	18	16	35	165	269	113	78	64	55	40	31
55%	23	18	16	31	161	256	111	74	64	54	40	30
60%	22	17	15	28	158	243	108	71	63	53	40	30
65%	22	17	15	25	144	228	106	68	61	50	38	29
70%	22	17	15	23	130	213	104	64	59	48	37	29
75%	22	17	15	20	116	198	102	61	57	46	36	28
80%	22	17	15	17	102	183	100	58	55	44	34	27
85%	21	17	14	17	94	178	94	58	54	44	34	27
90%	21	16	14	16	86	173	89	57	52	44	34	27
95%	21	16	14	16	78	168	83	56	51	43	34	26
100%	20	16	13	15	70	163	78	56	49	43	34	26

6. Discussion

The hydrograph of monthly mean annual discharge for the Little Tonsina gage site is shown in Figure 5. The hydrograph is characterized by long cold winters, generally from November to late April. The stream surface forms ice, and the land surface is snow covered, isolating both the stream and soils from precipitation. Under-ice stream discharge over the winter period gradually decreases and is driven by groundwater base flow. The winter period is followed by a 2–3-week spring breakup starting approximately the third week of April and ending approximately the second week of May. During this period, rising air temperatures, increased solar exposure, and accelerated snowmelt, along with rain, result in river ice melt and fracture; a very rapid increase in flows creates high water and sometimes flooding conditions. Starting in mid-May to the first week of June, peak flows occur at the gage site. This is followed by a steady recession of flow due to warmer temperatures and drier climatic conditions, extending to mid-July. From August through the middle of October, the hydrograph is influenced by more frequent rainfall with a moderate increase in flows through August and early September and a slight decrease in flow going into October.

7. Recommendations

Future data collection for this and other locations with relevant hydrologic characteristics of this watershed should include anadromous fisheries data and be periodically reported through open file reports or equivalent reporting and be cross-referenced to the electronic online version of this report.

Appendix A. Instantaneous Discharge Measurements for the Little Tonsina River

The following table contains instantaneous discharge measurement data for the Little Tonsina stream gage site. All streamflow data are from January 2014 through February 2020. Refer to Figure 1 and Table 2 in the report for the gage site location.

Table A1. Instantaneous discharge measurements for the Little Tonsina stream gage site (2014–2020).

Date	Stage (ft)	Discharge (cfs)	Width (ft)	Area (sq ft)	Average Velocity (fps)	Average Depth (ft)
4/9/2014	ND	22	15	22	1.00	1.45
6/4/2014	4.30	197	41	139	1.42	3.39
7/22/2014	3.59	152	25	61	2.48	2.50
8/14/2014	2.85	88	22	40	2.19	1.84
10/8/2014	2.59	63	21	36	1.77	1.74
3/4/2015	ND	22	21	27	0.81	1.29
5/13/2015	2.38	86	23	41	2.08	1.84
6/23/2015	3.33	145	23	56	2.59	2.41
8/6/2015	2.08	54	21	41	1.33	1.91
9/22/2015	2.15	53	22	40	1.33	1.85
3/7/2016	ND	32	23	35	0.91	1.52
5/11/2016	2.58	92	22	48	1.92	2.19
7/21/2016	2.70	99	23	50	1.98	2.16
8/15/2016	2.52	80	22	52	1.55	2.36
10/6/2016	1.93	44	22	45	0.98	2.07
3/6/2017	ND	15	21	26	0.58	1.24
5/11/2017	1.76	49	22	45	1.07	2.10
6/20/2017	3.39	141	23	66	2.15	2.85
8/1/2017	2.37	69	22	50	1.39	2.29
10/4/2017	2.20	59	21	49	1.21	2.29
2/22/2018	ND	18	18	21	0.83	1.17
5/15/2018	3.92	196	24	78	2.52	3.22
7/27/2018	3.37	141	23	69	2.04	2.96
9/5/2018	2.51	73	23	56	1.32	2.45
10/4/2018	2.11	47	23	52	0.92	2.23
2/28/2019	ND	14	19	17	0.82	0.89
5/6/2019	2.06	59	23	51	1.16	2.22
6/14/2019	5.09	274	24	130	2.11	5.42
8/30/2019	1.97	42	22	56	0.75	2.53
10/3/2019	2.55	78	22	65	1.20	2.95
2/27/2020	ND	15	20	25	0.60	1.25

ND = not determined (data recorder not deployed during winter months when water level is affected by ice).

Appendix B. Daily Mean Discharge Values for the Little Tonsina River

Tables B1–B7 contain daily mean discharge data for the Little Tonsina stream gage site. All continuous streamflow data are from January 2014 through February 2020. Refer to Figure 1 and Table 2 in the report for the gage site location. All data are listed in cubic feet per second (cfs).

Table B1. Daily mean discharge (cfs) data for the Little Tonsina River for 2014.

2014									
Day	**Apr.**	**May**	**June**	**July**	**Aug.**	**Sept.**	**Oct.**	**Nov.**	**Dec.**
1	23	370	215	445	118	106	75	53	43
2	23	345	215	501	112	96	70	53	42
3	23	339	215	462	108	89	69	52	42
4	23	396	201	415	111	86	70	52	42
5	22	390	205	400	122	102	75	52	42
6	22	361	254	412	111	108	74	51	41
7	22	373	283	426	102	140	66	51	41
8	22	338	284	376	97	143	63	50	41
9	22	322	292	319	95	125	63	50	40
10	24	314	330	290	91	116	62	50	40
11	27	302	342	283	89	110	62	49	40
12	31	289	319	276	91	105	61	49	40
13	36	273	296	260	90	102	61	49	39
14	43	261	273	245	91	108	60	48	39
15	53	246	294	207	92	140	60	48	39
16	64	245	310	176	94	171	59	48	38
17	74	251	307	164	99	166	59	47	38
18	79	252	279	160	136	139	59	47	38
19	90	250	241	159	138	126	58	47	38
20	95	261	224	164	117	119	58	46	37
21	106	273	261	159	103	113	57	46	37
22	117	283	295	148	94	107	57	46	37
23	140	300	262	152	89	100	57	45	37
24	151	278	316	161	87	95	56	45	36
25	186	263	422	142	91	89	56	45	36
26	222	250	469	131	87	84	55	44	36
27	258	240	427	136	83	82	55	44	36
28	270	236	352	147	79	88	55	44	35
29	307	227	314	131	79	84	54	43	35
30	345	219	349	125	97	82	54	43	35
31		215		125	107		53		35
Mean	**97**	**289**	**295**	**248**	**100**	**111**	**61**	**48**	**39**
Maximum	**345**	**396**	**469**	**501**	**138**	**171**	**75**	**53**	**43**
Minimum	**22**	**215**	**201**	**125**	**79**	**82**	**53**	**43**	**35**

The Little Tonsina gage operated from June 3–October 8. Estimates were calculated from measurements at the gage and data obtained at the USGS Phelan Creek gage for April 1–9 and October 9–December 31. Estimates were calculated from data obtained from the USGS Gulkana River at Sourdough gage for April 10–June 2.

Table B2. Daily mean discharge (cfs) data for the Little Tonsina River for 2015.

2015												
Day	**Jan.**	**Feb.**	**Mar.**	**Apr.**	**May**	**June**	**July**	**Aug.**	**Sept.**	**Oct.**	**Nov.**	**Dec.**
1	34	27	22	24	45	376	99	61	76	111	49	45
2	34	27	22	24	49	382	98	63	71	91	49	44
3	34	27	22	24	56	342	93	62	69	77	49	44
4	34	27	22	24	61	295	87	61	76	71	49	44
5	33	27	22	24	71	262	87	60	85	67	49	44
6	33	26	22	24	86	212	88	57	83	63	48	44
7	33	26	22	24	121	177	93	57	79	62	48	44
8	33	26	21	25	189	158	98	54	76	60	48	43
9	32	26	21	25	194	145	91	53	73	59	48	43
10	32	26	21	25	148	135	86	61	73	57	48	43
11	32	26	21	25	90	126	86	62	74	55	48	43
12	32	25	21	25	81	117	87	61	70	53	47	43
13	31	25	21	25	84	117	88	55	67	55	47	43
14	31	25	21	25	93	122	84	52	66	55	47	43
15	31	25	21	25	104	141	79	49	65	53	47	42
16	31	25	21	25	112	183	75	48	64	53	47	42
17	31	24	21	25	120	194	73	51	64	54	47	42
18	30	24	21	25	119	195	73	89	62	54	47	42
19	30	24	21	25	124	199	70	144	59	52	46	42
20	30	24	21	28	137	191	68	156	57	51	46	42
21	30	24	21	28	152	174	67	116	55	51	46	42
22	30	24	22	28	166	161	66	95	54	51	46	41
23	29	23	22	28	201	152	65	136	50	51	46	41
24	29	23	22	28	265	146	63	173	46	51	46	41
25	29	23	22	28	250	146	61	142	42	51	45	41
26	29	23	23	31	235	145	63	117	40	50	45	41
27	28	23	23	34	222	138	73	109	40	50	45	41
28	28	23	23	37	264	128	68	112	43	50	45	41
29	28		23	38	327	115	64	102	59	50	45	40
30	28		23	39	351	105	61	94	102	50	45	40
31	28		24		367		62	86		49		40
Mean	**31**	**25**	**22**	**28**	**158**	**183**	**78**	**85**	**65**	**58**	**47**	**42**
Maximum	**34**	**27**	**24**	**39**	**367**	**382**	**99**	**173**	**102**	**111**	**49**	**45**
Minimum	**28**	**23**	**21**	**24**	**45**	**105**	**61**	**48**	**40**	**49**	**45**	**40**

The Little Tonsina gage operated from May 12–September 22. Estimates were calculated from measurements at the gage and data obtained at the USGS Phelan Creek gage for January 1–March 21 and October 6–December 31. Estimates were calculated from data obtained at the USGS Gulkana River at Sourdough for March 22–May 11 and September 23–October 5.

Table B3. Daily mean discharge (cfs) data for the Little Tonsina River for 2016.

2016												
Day	**Jan.**	**Feb.**	**Mar.**	**Apr.**	**May**	**June**	**July**	**Aug.**	**Sept.**	**Oct.**	**Nov.**	**Dec.**
1	40	36	33	32	81	458	190	71	51	50	38	31
2	39	36	33	32	76	478	175	69	50	52	38	30
3	39	36	32	32	79	526	163	71	49	53	38	30
4	39	35	32	32	75	519	158	68	48	52	37	30
5	39	35	32	34	73	487	153	74	49	49	37	30
6	39	35	32	34	70	443	148	83	51	47	37	29
7	39	35	32	34	70	381	140	83	53	46	37	29
8	39	35	32	34	68	340	132	87	49	46	36	29
9	39	35	32	34	76	331	127	88	48	45	36	29
10	38	35	32	36	85	382	125	81	46	45	36	29
11	38	35	32	36	88	407	123	74	44	45	36	28
12	38	35	31	36	104	398	117	76	58	44	35	28
13	38	34	31	36	142	356	117	93	65	44	35	28
14	38	34	31	36	195	354	114	99	63	44	35	28
15	38	34	31	36	264	370	118	84	60	43	34	28
16	38	34	31	36	319	384	117	74	60	43	34	27
17	38	34	31	36	355	408	129	67	60	43	34	27
18	37	34	31	36	375	462	123	65	55	43	34	27
19	37	34	31	36	349	453	113	64	53	42	33	27
20	37	34	31	38	353	407	105	62	52	42	33	27
21	37	34	31	38	397	354	99	61	52	42	33	26
22	37	33	30	39	490	311	100	59	70	41	33	26
23	37	33	30	41	571	303	102	57	80	41	32	26
24	37	33	30	43	575	311	99	57	67	41	32	26
25	37	33	30	46	496	305	93	60	62	40	32	26
26	37	33	30	51	408	281	91	68	59	40	32	25
27	36	33	30	53	357	254	87	66	55	40	31	25
28	36	33	30	68	369	231	87	62	52	39	31	25
29	36	33	30	99	393	210	81	59	50	39	31	25
30	36		30	88	417	196	78	55	49	39	31	25
31	36		30		438		74	53		39		24
Mean	**38**	**34**	**31**	**42**	**265**	**370**	**119**	**71**	**55**	**44**	**34**	**27**
Maximum	**40**	**36**	**33**	**99**	**575**	**526**	**190**	**99**	**80**	**53**	**38**	**31**
Minimum	**36**	**33**	**30**	**32**	**68**	**196**	**74**	**53**	**44**	**39**	**31**	**24**

The Little Tonsina gage operated from May 11–October 6. Estimates were calculated from measurements at the gage and data obtained at the USGS Phelan Creek gage for January 1–March 31 and October 6–December 31. Estimates were calculated from data obtained from the USGS Gulkana River at Sourdough gage for April 1–May 10.

Table B4. Daily mean discharge (cfs) data for the Little Tonsina River for 2017.

2017												
Day	**Jan.**	**Feb.**	**Mar.**	**Apr.**	**May**	**June**	**July**	**Aug.**	**Sept.**	**Oct.**	**Nov.**	**Dec.**
1	24	19	16	15	159	70	117	72	69	51	46	36
2	24	19	15	15	161	79	113	68	63	53	46	36
3	24	19	15	15	153	92	111	68	57	59	46	35
4	24	19	15	15	135	135	102	67	55	58	45	35
5	24	19	15	15	109	123	97	64	70	58	45	35
6	23	19	15	16	89	110	100	64	181	58	44	35
7	23	18	15	17	69	111	103	62	215	57	44	34
8	23	18	15	18	54	154	111	61	168	57	44	34
9	23	18	15	19	52	222	164	59	134	56	43	34
10	23	18	15	21	51	350	148	59	114	56	43	33
11	22	18	15	23	47	429	125	58	99	55	43	33
12	22	18	15	25	49	288	128	61	89	55	42	33
13	22	18	15	27	49	189	120	62	82	54	42	33
14	22	17	15	29	50	154	118	67	78	54	42	32
15	22	17	15	32	49	143	112	59	75	53	41	32
16	22	17	15	34	50	142	106	53	73	53	41	32
17	21	17	15	36	52	152	99	51	71	53	41	32
18	21	17	15	38	49	150	95	49	69	52	40	31
19	21	17	15	40	48	141	90	50	66	52	40	31
20	21	17	15	45	46	139	88	50	63	51	40	31
21	21	17	15	50	48	145	84	51	62	51	39	31
22	21	16	15	58	60	151	81	52	62	50	39	30
23	21	16	15	66	59	147	79	51	60	50	39	30
24	20	16	15	73	57	151	78	50	59	50	38	30
25	20	16	15	84	58	165	78	49	58	49	38	30
26	20	16	15	96	58	178	78	48	56	49	38	29
27	20	16	15	110	54	175	74	46	56	48	37	29
28	20	16	15	123	54	152	74	45	56	48	37	29
29	20		15	136	59	138	71	51	55	48	37	29
30	19		15	148	61	125	78	77	54	47	36	28
31	19		15		62		75	83		47		28
Mean	**22**	**17**	**15**	**48**	**70**	**163**	**100**	**58**	**82**	**53**	**41**	**32**
Maximum	**24**	**19**	**16**	**148**	**161**	**429**	**164**	**83**	**215**	**59**	**46**	**36**
Minimum	**19**	**16**	**15**	**15**	**46**	**70**	**71**	**45**	**54**	**47**	**36**	**28**

The Little Tonsina gage operated from May 11–October 4. Estimates were calculated from measurements at the gage and data obtained at the USGS Phelan Creek gage for January 1–April 5 and October 5–December 31. Estimates were calculated from data obtained at the USGS Gulkana River at Sourdough gage for April 6–May 10.

Table B5. Daily mean discharge (cfs) data for the Little Tonsina River for 2018.

2018												
Day	**Jan.**	**Feb.**	**Mar.**	**Apr.**	**May**	**June**	**July**	**Aug.**	**Sept.**	**Oct.**	**Nov.**	**Dec.**
1	28	21	17	14	16	306	432	118	88	49	38	29
2	28	21	17	14	16	312	604	115	83	49	37	29
3	27	21	17	13	16	357	647	125	80	48	37	29
4	27	21	17	13	17	398	601	166	77	48	37	29
5	27	21	16	14	18	461	564	179	75	47	37	28
6	27	21	16	14	20	549	527	156	73	47	36	28
7	26	20	17	14	23	587	476	145	72	47	36	28
8	26	20	16	14	28	576	440	146	70	46	36	28
9	26	20	17	14	36	657	419	168	68	46	35	28
10	26	20	16	14	52	657	386	164	66	45	35	27
11	26	20	16	14	126	721	355	132	65	45	35	27
12	25	20	16	14	251	806	318	124	63	45	34	27
13	25	19	16	15	250	707	254	124	62	44	34	27
14	25	19	16	16	215	610	222	121	61	44	34	26
15	25	19	16	16	191	555	215	116	61	44	34	26
16	25	19	16	16	176	610	199	108	60	43	33	26
17	24	19	16	16	170	757	186	100	59	43	33	26
18	24	19	16	16	194	806	177	93	59	42	33	26
19	24	18	15	16	227	941	163	89	59	42	33	25
20	24	18	15	16	246	948	156	87	57	42	32	25
21	24	18	15	16	250	866	151	122	58	41	32	25
22	23	18	15	16	254	803	150	164	56	41	32	25
23	23	18	15	15	261	739	149	147	55	41	31	24
24	23	18	15	15	260	656	147	124	54	40	31	24
25	23	17	15	15	255	593	140	112	54	40	31	24
26	23	17	14	15	253	564	138	104	52	40	31	24
27	22	17	14	15	279	523	141	99	52	39	30	24
28	22	17	14	15	299	466	144	102	53	39	30	23
29	22		14	15	319	411	137	97	52	39	30	23
30	22		14	16	332	380	131	92	50	38	30	23
31	22		14		321		126	91		38		23
Mean	**25**	**19**	**16**	**15**	**173**	**611**	**287**	**124**	**63**	**43**	**34**	**26**
Maximum	**28**	**21**	**17**	**16**	**332**	**948**	**647**	**179**	**88**	**49**	**38**	**29**
Minimum	**22**	**17**	**14**	**13**	**16**	**306**	**126**	**87**	**50**	**38**	**30**	**23**

The Little Tonsina gage operated from May 15–October 4. Estimates were calculated from measurements at the gage and data obtained at the USGS Phelan Creek gage for January 1–April 13 and October 5–December 31. Estimates were calculated from data obtained at the USGS Gulkana River at Sourdough gage for April 14–May 14.

Table B6. Daily mean discharge (cfs) data for the Little Tonsina River for 2019.

2019												
Day	**Jan.**	**Feb.**	**Mar.**	**Apr.**	**May**	**June**	**July**	**Aug.**	**Sept.**	**Oct.**	**Nov.**	**Dec.**
1	23	18	14	13	41	223	197	70	44	63	45	34
2	22	17	14	14	44	232	189	68	43	79	45	34
3	22	17	14	13	54	225	178	65	44	77	44	34
4	22	17	14	14	70	236	166	65	44	75	44	33
5	22	17	14	14	65	254	157	66	44	76	44	33
6	22	17	14	14	58	256	148	67	43	74	43	33
7	21	17	14	14	59	254	140	66	43	65	43	32
8	21	17	14	15	66	257	132	64	42	62	42	32
9	21	16	14	15	75	268	123	63	43	63	42	32
10	21	16	14	16	76	263	115	60	43	63	42	31
11	21	16	14	16	77	270	111	64	43	72	41	31
12	21	16	13	16	72	278	106	60	44	81	41	31
13	20	16	13	16	70	282	101	57	44	74	40	31
14	20	16	13	16	68	277	95	57	43	63	40	30
15	20	16	13	17	69	284	90	58	43	53	40	30
16	20	15	14	17	74	277	86	57	43	53	39	30
17	20	15	14	17	78	257	84	57	44	52	39	29
18	20	15	13	17	79	236	80	57	46	52	39	29
19	19	15	13	17	81	220	77	54	47	51	38	29
20	19	15	13	17	84	212	75	53	49	51	38	29
21	19	15	13	17	87	222	79	51	64	50	38	28
22	19	15	13	17	91	230	82	49	68	50	37	28
23	19	15	13	17	103	228	76	48	61	49	37	28
24	19	14	13	18	110	228	75	47	54	49	37	28
25	19	14	13	18	108	239	74	46	56	48	36	27
26	18	14	13	18	123	248	96	45	66	48	36	27
27	18	14	14	19	218	233	103	44	62	47	36	27
28	18	14	14	24	276	214	89	43	55	47	35	27
29	18		13	30	266	202	82	43	53	47	35	26
30	18		13	39	226	200	77	43	54	46	35	26
31	18		13		208		73	43		46		26
Mean	**20**	**16**	**13**	**17**	**102**	**243**	**108**	**56**	**49**	**59**	**40**	**30**
Maximum	**23**	**18**	**14**	**39**	**276**	**284**	**197**	**70**	**68**	**81**	**45**	**34**
Minimum	**18**	**14**	**13**	**13**	**41**	**200**	**73**	**43**	**42**	**46**	**35**	**26**

The Little Tonsina gage operated from May 6–October 3. Estimates were calculated from measurements at the gage and data obtained at the USGS Phelan Creek gage for January 1–April 14 and October 15–December 31. Estimates were calculated from data obtained at the USGS Gulkana River at Sourdough gage for April 15–May 5 and October 4–14.

Table B7. Daily mean discharge (cfs) data for the Little Tonsina River for 2020.

2020		
Day	**Jan.**	**Feb.**
1	26	19
2	25	19
3	25	19
4	25	19
5	25	18
6	24	18
7	24	18
8	24	18
9	24	18
10	24	18
11	23	17
12	23	17
13	23	17
14	23	17
15	22	17
16	22	17
17	22	16
18	22	16
19	22	16
20	21	16
21	21	16
22	21	16
23	21	16
24	21	15
25	20	15
26	20	15
27	20	15
28	20	15
29	20	15
30	19	
31	19	
Mean	**22**	**17**
Maximum	**26**	**19**
Minimum	**19**	**15**

The Little Tonsina gage operated until February 29. Estimates were calculated from measurements at the gage and data obtained at the USGS Phelan Creek gage for January 1–February 29.

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