Eklutna Hydroelectric Project

Stream Gaging

Year 1 Interim Report

DRAFT

Prepared by:
Charles Sauvageau
Dennis Schult
McMillen Jacobs Associates

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Terms, Acronyms, and Abbreviations

AWWU	Alaska Water and Wastewater Utility
°C	Celsius
cfs	cubic feet per second
ft	feet
FSP	Final Study Plans
PME	protection, mitigation, and enhancement
RM	river mile
USGS	United States Geological Survey

1 INTRODUCTION

The Stream Gaging Study was initiated in 2021 in accordance with Section 3.6 of the May 2021 Final Study Plans (FSP). As noted in the FSP and based on early outreach efforts, the main goals of the agencies and interested parties is to find a new balance amongst the uses of water in the Eklutna River basin, including power production, potable water supply, and fish habitat. Potential flow related protection, mitigation, and enhancement (PME) measures include the potential for providing a flow regime into the Eklutna River that would accomplish habitat restoration and increase the anadromous fish production of the river.

Stream flows in the Eklutna River downstream from Eklutna Lake have been altered by several management actions over the past century, primarily from controlled water withdrawals and storage in constructed reservoirs. As a requirement of the 1991 Fish and Wildlife Agreement, a comprehensive study program is being implemented to assess the biological community, instream flow-fish habitat relationships, and geomorphological processes within the Eklutna River. Quantitative documentation of stream flow volumes and conveyance at select Eklutna River locations is an important component to assist with evaluating the effectiveness of potential future flow releases and other aquatic habitat improvement measures.

This Year 1 Interim Report provides continuous or monthly instantaneous discharge records from mid-May through early October of 2021 at four monitoring stations within the lower Eklutna River watershed. Accretion data (i.e., stream flow gains or losses) are also presented along the longitudinal profile of the lower Eklutna River from RM 1.3 to RM 10.3 under existing conditions and a 25 cfs flow release from the Eklutna Lake Dam. The monitoring of stream gages will continue over the winter and through the fall of 2022. The discharge record for the 2022 field season will be summarized and presented in the Year 2 Final Report.

2 STUDY OBJECTIVES

The goals of this study were to gain a better understanding of the current flow regime in the Eklutna River and to support other aquatic studies being conducted in parallel with this assessment. To achieve these goals, the primary objective of this study was to generate a flow record in the Eklutna River, Lach Q'atnu Creek, and the unnamed tributary to the pond upstream of the existing dam throughout the 2021 and 2022 study program. A secondary objective was to collect instantaneous flow measurements under stable low-flow conditions, as well as during one of the study flow releases, in order to assess accretion along the longitudinal profile of the Eklutna River. It is notable that the stream gaging effort is ongoing, and this report should be viewed as an interim update given that a final discharge record will be provided after the 2022 monitoring season.

3 STUDY AREA

Two stream gaging stations were installed in the lower Eklutna River. One of the stream gages was installed upstream of the Thunderbird Creek confluence, while the second stream gage was installed below the Thunderbird Creek confluence near the Old Glenn Highway bridge and location of United States Geological Survey (USGS) gage station 15280200 that operated from

2002-2007. A third stream gage was installed near the mouth of Lach Q'atnu Creek (Tributary 1) while the unnamed tributary to the pond (Tributary 2) lacked suitable conditions for installation of a stream gage. Therefore, only instantaneous measurements were taken at Tributary 2 during the 2021 study period. Stream gaging and instantaneous flow monitoring locations are shown in Figure 3-1.

To assess accretion in the Eklutna River, instantaneous flow measurements were collected at five locations in the river downstream of the Eklutna Lake Dam. The accretion monitoring stations are also shown in Figure 3-1 and described below.

- The Eklutna River downstream of Thunderbird Creek near the railroad bridge - RM 1.3
- The Eklutna River downstream of Thunderbird Creek at the Old Glenn Highway bridge (stream gage station) - RM 2.3
- The Eklutna River upstream of Thunderbird Creek (stream gage station and co-located with Water Quality-1 station) - RM 3.0
- The Eklutna River near the downstream terminus of the AWWU access road (co-located with Water Quality-2 station) - RM 5.5
- The Eklutna River near RM 10.3

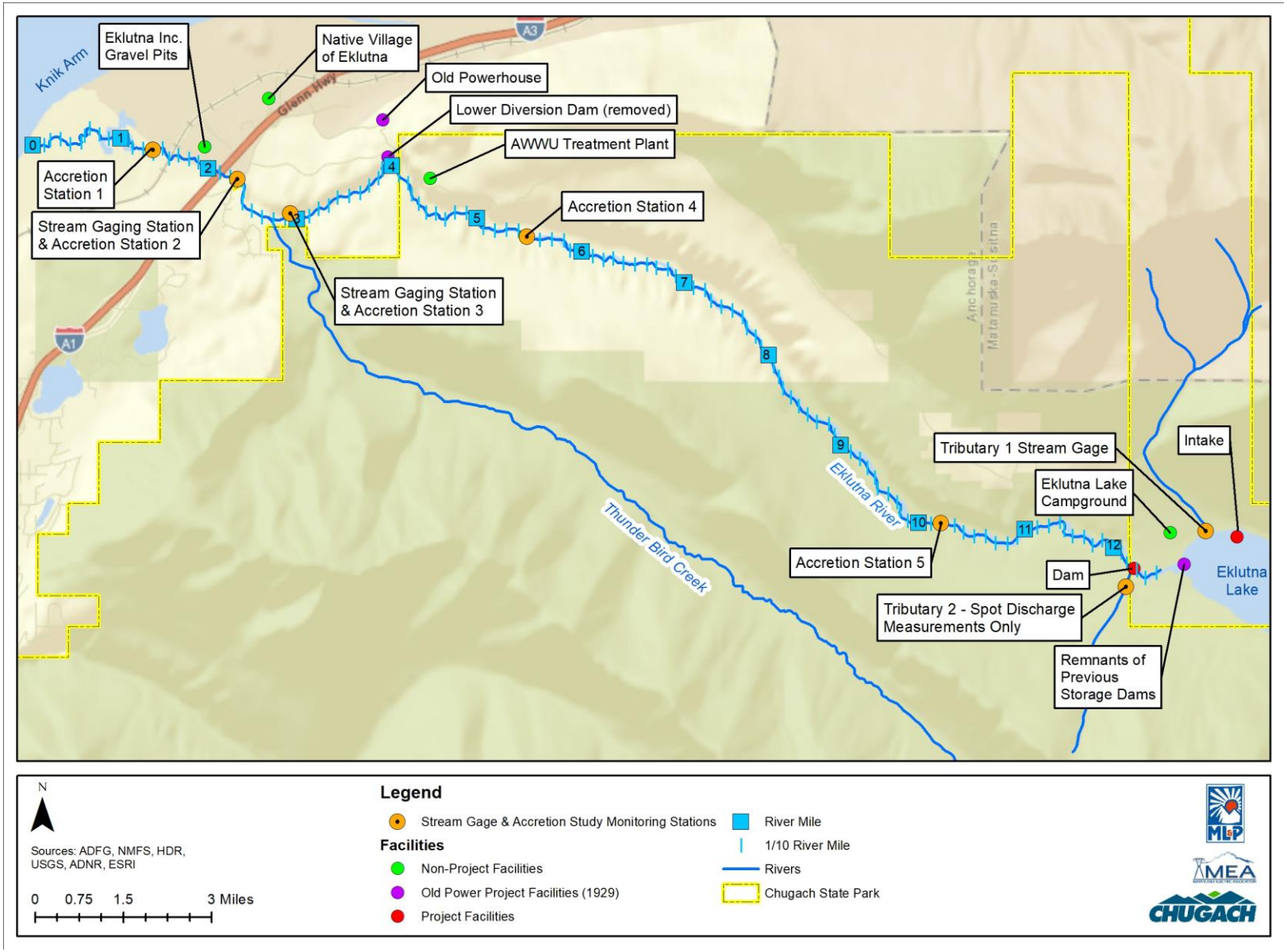

Figure 3-1. Stream gages, spot discharge measurement, and accretion study locations within the lower Eklutna River watershed.

4 METHODS

4.1. Stream Gages

Following USGS guidelines, the Eklutna River and tributary stream gages consisted of a staff gage and a continuous stage data logger, each anchored individually to the stream bank and near the shoreline to avoid debris and damage during high flow conditions. The data loggers were a pressure transducer system with an accuracy of +/-0.02 feet or +/-0.15% full scale (0.0 to 13.0 feet). The data logger accurately records pressure, which is related to the water surface elevation at the staff gage. Data loggers recorded the following parameters at 15-minute intervals:

- Date and time
- Temperature (°C)
- Pressure/Water level (feet)

Staff gages were 3.3 feet long and mounted vertically in the stream channel to measure water levels to the nearest hundredth of a foot for the full range of flow conditions. The data loggers were housed in a shoreline enclosure consisting of 2-inch PVC pipe located within the wetted channel. Figure 4-1 provides a schematic and example of a typical data logger and staff gage installation.

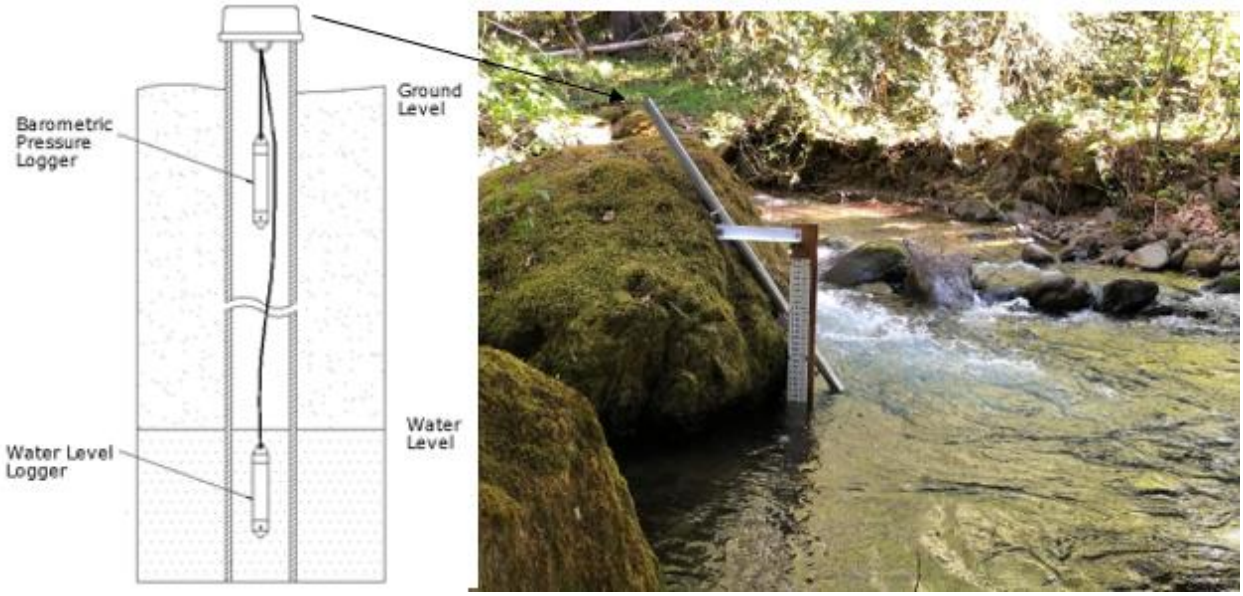

Figure 4-1. Schematic and example of a typical data logger and staff gage installation.

Following gage installation from May18-20, 2021, trained staff maintained and calibrated the stream gaging stations approximately monthly during the study period. During each calibration and maintenance effort, discharge data were collected to develop and maintain a stage-discharge rating relationship at the Eklutna River and tributary stream gages. Discharge measurements followed field procedures laid out in Rantz et al (1982) and continued for the duration of the

2021 study program through early October to ensure an accurate rating equation was maintained at the monitoring locations. At each maintenance and calibration event, the following occurred:

- Comparison of electronic stage levels to reference staff gage
- Discharge measurement (safe wading conditions only)
- Downloading of electronic stage record

During the typical low-flow winter period, it is likely that surface waters at some or all of the gaging stations will be frozen and will not provide an accurate continuous stage record. During this November-April timeframe, stage recorders will remain in place with visual site inspections conducted on a bi-monthly basis to document site conditions and confirm the expected low-flow discharge condition. Supplemental maintenance and monitoring activities that occurred during the 2021 study program included establishment of the vertical datum for the reference staff gage, as well as a cross-section profile at the three stream gaging locations.

4.2. Accretion Assessment

For the accretion portion of the study, discharge measurements were collected at five locations in the Eklutna River (see Figure 3-1) under a stable base flow or zero-flow release condition on June 22, 2021. Discharge measurements in support of the accretion assessment were also conducted at the same five monitoring stations during the 25 cfs controlled flow release on September 30, 2021.

Field crews read the staff plates at both Eklutna River stream gaging stations then immediately moved upstream to conduct a discharge measurement at Accretion Station 5 located at RM 10.3. After completing the discharge measurement at Accretion Station 5, field staff continued downstream to conduct a discharge measurement at Accretion Station 4 (RM 5.5). Once efforts in the upper reach were completed, field staff moved downstream to measure discharge at Accretion Station 1 near the railroad bridge at RM 1.3. Following the measurement at Accretion Station 1, field staff continued upstream and completed discharge measurements at Accretion Stations 2 and 3. The final step was to re-read staff plates at the Eklutna River stream gages to verify a stable runoff condition during the 8-hour measurement period.

5 RESULTS

5.1. Eklutna River below Thunderbird Creek

5.1.1. Discharge Measurements and Rating Equation

As summarized in Table 5-1, a total of six discharge measurements were taken to assess and validate the stage-discharge relationship at the Eklutna River below Thunderbird Creek and provide 101 days of mean daily flow data in 2021.

Table 5-1. Eklutna River below Thunderbird Creek discharge measurements.

Date	Stream Gage Level (ft)	Measured Discharge (cfs)	Rated Discharge (cfs)	Percent Difference
5/18/2021	0.62 [1]	33.1	32.6	1.5%
6/22/2021	0.88 [1]	93.6	89.7	4.4%
6/25/2021	1.26 [2]	93.6	91.5	2.3%
7/12/2021	1.13	66.8	69.2	-3.5%
8/23/2021	0.93	42.5	42.0	1.3%
9/30/2021	1.13	66.2	69.2	-4.3%
10/7/2021	0.95	44.9	44.3	1.3%

Notes:
1 Stage data from initial stream gage location
2 Stable stage and flow conditions verified through 6/25/2021. Measured discharge of 93.6 cfs applied to initial stage reading at second gaging location.

Due to hydraulic conditions creating noisy stage data at the original gaging location, a second gaging station was installed approximately 350 feet upstream on June 25, 2021. This second location provided more accurate and stable stage data as well as a reliable stage-discharge relationship. Therefore, 2 unique gaging stations were utilized to generate the 2021 discharge record. Standard log-log analysis methods of these discharge measurements yielded the following rating curves at both gaging locations. From May 19 to June 25, the following rating curve was utilized from the initial gaging location:

Flow (cfs) = 129.74 * (stage)^2.888

After June 25, the following rating curve was applied from the second gaging station located 350 feet upstream of the initial gaging location:

Flow (cfs) = 50.56 * (stage)^2.567

Graphical displays summarizing the predictive accuracy or R^2 value of each rating equation is provided in Appendix 2.

5.1.2. Discharge Record

Figure 5-1 shows the daily mean discharge recorded for the Eklutna River below Thunderbird Creek. These data are also tabulated in Appendix A. The 2021 peak mean daily flow volume of 215 cfs occurred on September 17, 2021 and was directly influenced by the flow releases conducted in support of the Instream Flow Study.

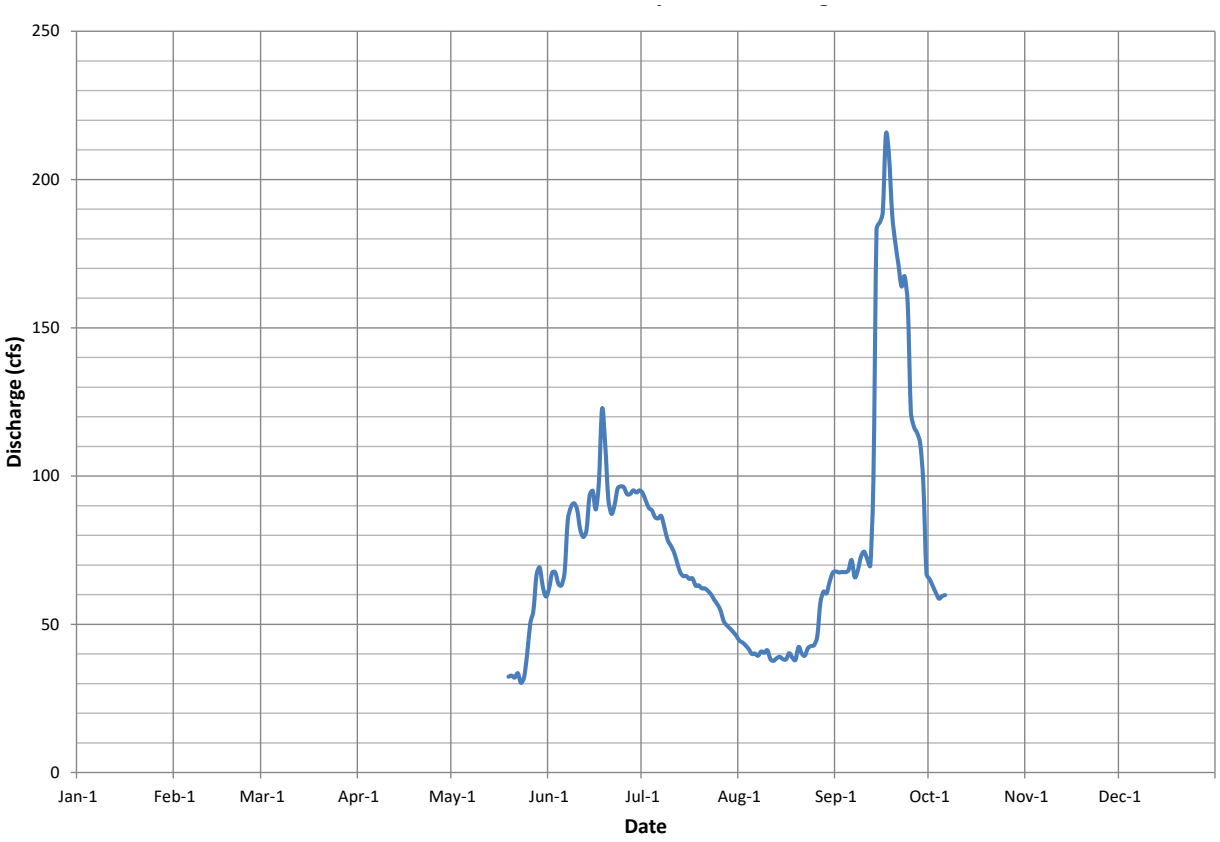

Figure 5-1. Eklutna River below Thunderbird Creek daily mean discharge, calendar year 2021.

5.2. Eklutna River above Thunderbird Creek

5.2.1. Discharge Measurements and Rating Equations

As summarized in Table 5-2, a total of seven discharge measurements were taken to assess and validate the stage-discharge relationship at the Eklutna River above Thunderbird Creek and provide 100 days of mean daily flow data in 2021.

Table 5-2. Eklutna River above Thunderbird Creek discharge measurements.

Date	Stream Gage Level (ft)	Measured Discharge (cfs)	Rated Discharge (cfs)	Percent Difference
5/19/2021	0.68	6.9	6.1 [1]	12.6%
6/22/2021	0.69	6.1	6.3 [1]	-3.1%
7/12/2021	0.68	5.7	6.1 [1]	-6.9%
8/23/2021	0.66	5.7	5.8 [1]	-1.5%
9/29/2021	1.14	65.5	64.0 [2]	2.4%
9/30/2021	0.80	23.8	25.3 [2]	-6.0%
10/7/2021	0.51	8.0	7.8 [2]	2.6%

1 Discharge calculation from Rating Equation 1
2 Discharge calculation from Rating Equation 2

Due to scouring of the streambed during the study flow releases, there are two unique rating curves applied during the study period. Up until September 13, 2021, the following rating curve was used to generate the flow record at the gaging station:

Flow (cfs) = 12.70 * (stage)^1.890

After September 13, 2021, the following rating curve was utilized:

Flow (cfs) = 45.41 * (stage)^2.619

Graphical displays summarizing the predictive accuracy or R^2 value of each rating equation is provided in Appendix B.

5.2.2. Discharge Record

Figure 5-2 shows the daily mean discharge recorded for the Eklutna River above Thunderbird Creek. These data are also tabulated in the Appendix A. The 2021 peak mean daily flow volume of 97 cfs occurred on September 24, 2021 and was directly influenced by the study flow releases conducted in support of the Instream Flow Study.

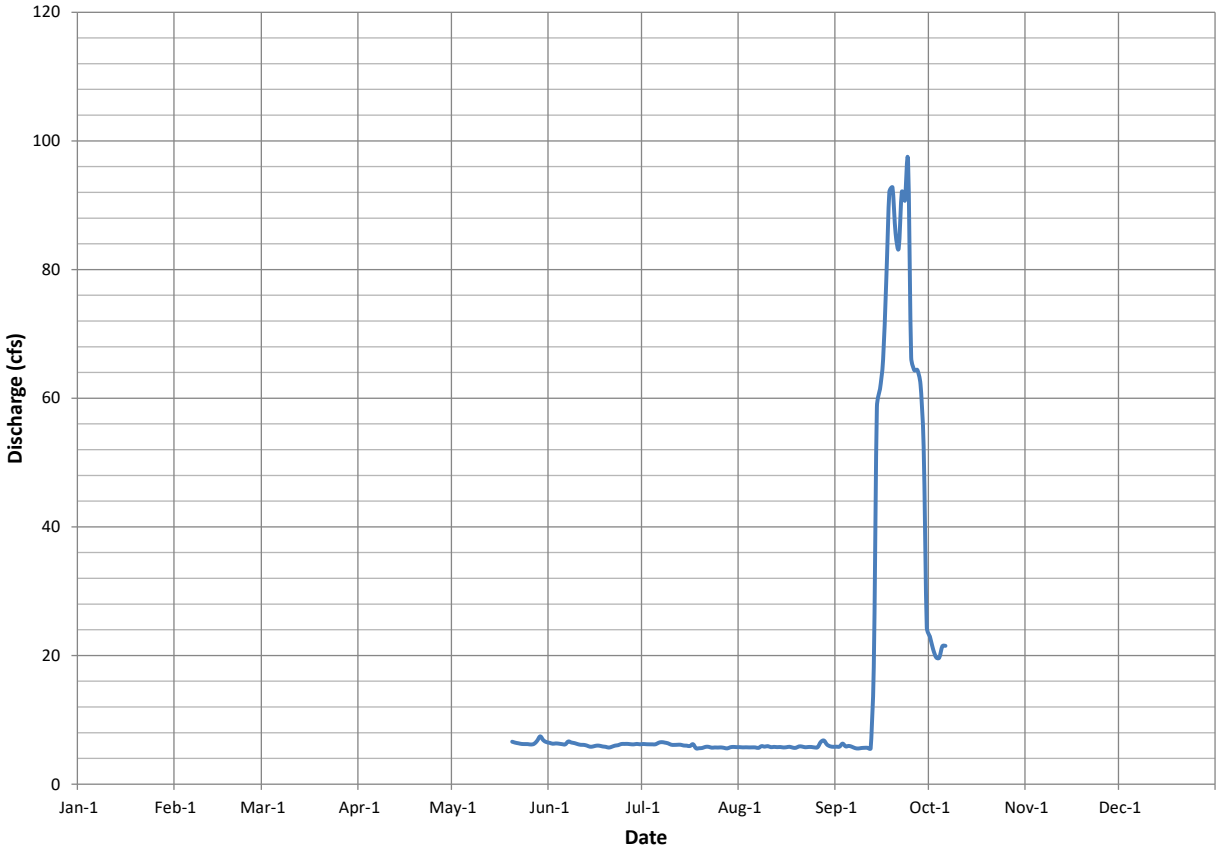

Figure 5-2. Eklutna River above Thunderbird Creek daily mean discharge, calendar year 2021.

5.3. Lach Q'atnu Creek

5.3.1. Discharge Measurements and Rating Equation

As summarized in Table 5-3, a total of five discharge measurements were taken to assess and validate the stage-discharge relationship at Lach Q'atnu Creek and provide 102 days of mean daily flow data in 2021.

Table 5-3. Lach Q'atnu Creek discharge measurements.

Date	Stream Gage Level (ft)	Measured Discharge (cfs)	Rated Discharge (cfs)	Percent Difference
5/18/2021	13.50	6.1	6.1	0.5%
6/23/2021	13.45	4.7	4.7	-0.5%
7/13/2021	13.32	2.0	2.0	-0.7%
8/26/2021	13.29	1.6	1.6	0.7%
9/28/2021	13.35	2.5	2.5	-0.9%

Standard log-log analysis methods for these discharge measurements yielded the following rating curve for the station:

Flow (cfs) = 33.38 * (stage – 13.0)^2.460

Graphical displays summarizing the predictive accuracy or R^2 value of the rating equation is provided in Appendix B.

5.3.2. Discharge Record

Figure 5-3 shows the daily mean discharge recorded for Lach Q'atnu Creek. These data are also tabulated in Appendix 1. The 2021 peak mean daily flow volume of 12.2 cfs occurred on May 28, 2021. Discharge from this tributary represents the natural runoff condition and is not influenced by operation of the hydroelectric or drinking water projects.

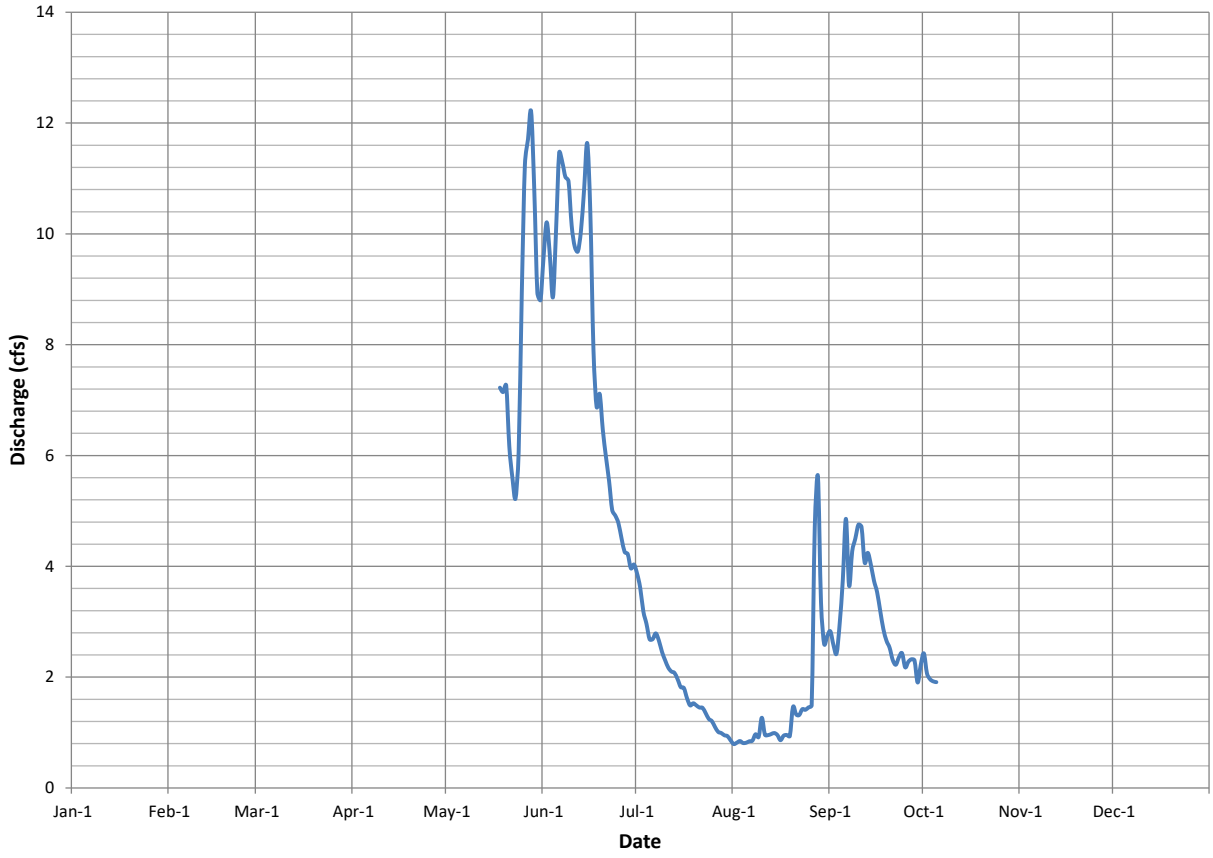

Figure 5.3. Lach Q'atnu Creek daily mean discharge, calendar year 2021.

5.4. Unnamed Tributary to Pond

5.4.1. Discharge Measurements

Table 5-4 summarizes the five instantaneous discharge measurements collected during the 2021 study season. A peak mean instantaneous flow volume of 0.9 cfs was measured on May 19, 2021.

Table 5-4. Unnamed pond tributary (Tributary 2) discharge measurements.

Date	Measured Discharge (cfs)
5/19/2021	0.9
6/23/2021	0.5
7/14/2021	0.5
8/25/2021	0.5
9/28/2021	0.3

5.5. Accretion Study

5.5.1. Discharge Measurements

Tables 5-5 and 5-6 summarize the instantaneous discharge measurements collected in support of the accretion study. Maximum instantaneous flow volumes occur at RM 3.0 above Thunderbird Creek and at RM 2.3 downstream of the Thunderbird Creek confluence. Accretion patterns along the Eklutna River reveal a consistent pattern under the existing conditions or 25 cfs flow release from Eklutna Lake Dam.

Table 5-5. Eklutna River discharge measurements on 6/22/2021.

Location	Measured Discharge (cfs)
Railroad bridge (RM 1.3)	88.2
Old Glenn Highway bridge (RM 2.3)	93.6
Gage above Thunderbird Creek (RM 3.0)	6.1
Mid-reach (RM 5.5)	3.2
Upper (RM 10.3)	0.2

Table 5-6. Eklutna River discharge measurements on 9/30/2021.

Location	Measured Discharge (cfs)
Railroad bridge (RM 1.3)	63.0
Old Glenn Highway bridge (RM 2.3)	66.2
Gage above Thunderbird Creek (RM 3.0)	23.8
Mid-reach (RM 5.5)	22.1
Upper (RM 10.3)	19.4

6 INTERIM STUDY CONCLUSIONS AND YEAR 2 STUDY EFFORT

Computed stage-discharge relationships predicted streamflow measurements within 10% at all established gaging locations except for one instance above Thunderbird Creek. As would be expected, flows below Thunderbird Creek were relatively high in spring, tapered off mid to late summer, then peaked during the flow release study in September. Flows above Thunderbird Creek were relatively stable through the spring-summer monitoring period until the onset of the study flow releases. Similarly, flow in Lach Q'atnu Creek peaked in spring, decreased substantially during summer, and increased again in response to fall rains. Monthly spot discharge measurements taken at the unnamed tributary to the pond indicate minimal flow volumes (<1.0 cfs) that continually decreased through late September.

The accretion study shows that measurable stream flows do not occur under the existing conditions for approximately 2.0 miles downstream of the Eklutna Lake Dam. Also, both sets of accretion measurements indicate minimal flow accumulations ranging from 4-6 cfs from RM 10.3 downstream to just above the confluence with Thunderbird Creek at RM 3.0. Downstream of the Thunderbird Creek confluence there is a slight, but consistently measured flow loss averaging about 4 cfs from the Old Glenn Highway bridge downstream to the railroad bridge. The minor flow loss in this 1-mile stream reach of the Eklutna River represents a decrease of less than 5.8 percent of the total flow volume.

As mentioned in Section 1 (Introduction) of this Year 1 Interim Report, study efforts will continue over the winter and through the fall of 2022 to build upon the 2021 discharge record. In addition, continued stream gaging efforts will provide discharge data for other Year 2 study efforts that will benefit from this background information. Given the consistent findings and stable flow conditions in which the accretion study was conducted, data from the Year 1 accretion study effort represents the completion to this component to the stream gaging study.

7 VARIANCES FROM FINAL STUDY PLAN AND IMPLEMENTED MODIFICATIONS

There were two notable variations from the FSP. As described in Section 2, a stream gage was not installed at the unnamed tributary to the pond. This was due to a braided, steep channel in which a single gaging location would not accurately represent flow volumes. Monthly, instantaneous discharge measurements were conducted to assess the seasonal flow conditions from May-September.

The second variance from the FSP was the relocation of Accretion Site 5 from RM 8 upstream to RM 10.3. The formation of a substantial beaver pond downstream of RM 10 limited reliable access to RM 8 of the Eklutna River. Therefore, a site was chosen that had measurable surface water flows under a zero-spill condition and was not going to experience a backwater effect from the beaver pond.

8 REFERENCES

Rantz, S.E., and others. 1982. Measurement and Computation of Streamflow, Volume 1: Measurement of Stage and Discharge. U.S. Geological Survey Water Supply Paper 2175.

Appendix A: Daily Mean Discharge Tables

Table A1-1. Eklutna River below Thunderbird Creek.

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	m	m	m	m	m	62	94	45	68	65	m	m
2	m	m	m	m	m	67	92	44	67	63	m	m
3	m	m	m	m	m	68	89	43	68	61	m	m
4	m	m	m	m	m	64	88	42	68	59	m	m
5	m	m	m	m	m	63	86	40	68	60	m	m
6	m	m	m	m	m	68	86	40	72	60*	m	m
7	m	m	m	m	m	85	87	39	66	m	m	m
8	m	m	m	m	m	89	83	41	68	m	m	m
9	m	m	m	m	m	91	79	40	73	m	m	m
10	m	m	m	m	m	89	77	41	75	m	m	m
11	m	m	m	m	m	82	75	38	72	m	m	m
12	m	m	m	m	m	79	71	38	70	m	m	m
13	m	m	m	m	m	82	68	39	99	m	m	m
14	m	m	m	m	m	93	66	39	183	m	m	m
15	m	m	m	m	m	95	66	38	186	m	m	m
16	m	m	m	m	m	89	65	38	189	m	m	m
17	m	m	m	m	m	98	65	40	215	m	m	m
18	m	m	m	m	m	123	63	39	208	m	m	m
19	m	m	m	m	32*	111	63	38	188	m	m	m
20	m	m	m	m	33	92	62	42	179	m	m	m
21	m	m	m	m	32	87	62	40	171	m	m	m
22	m	m	m	m	34	90	61	39	164	m	m	m
23	m	m	m	m	30	96	60	42	167	m	m	m
24	m	m	m	m	32	97	58	43	158	m	m	m
25	m	m	m	m	40	96	57	43	122	m	m	m
26	m	m	m	m	50	94	55	46	117	m	m	m
27	m	m	m	m	55	94	51	57	115	m	m	m
28	m	m	m	m	67	95	50	61	111	m	m	m
29	m	---	m	m	69	94	49	60	97	m	m	m
30	m	---	m	m	63	95	47	64	67	m	m	m
31	m	---	m	---	59	---	46	67	---	m	---	m
Mean	m	m	m	m	46	88	68	44	119	61	m	m
Min	m	m	m	m	30	62	46	38	66	59	m	m
Max	m	m	m	m	69	123	94	67	215	65	m	m

Notes:

1. m – missing data

2. * - mean daily flow computed from partial record

Table A1-2. Eklutna River above Thunderbird Creek.

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	m	m	m	m	m	6.4	6.2	5.8	5.8	23	m	m
2	m	m	m	m	m	6.3	6.2	5.7	5.8	21	m	m
3	m	m	m	m	m	6.3	6.2	5.7	6.3	20	m	m
4	m	m	m	m	m	6.3	6.2	5.7	5.9	20	m	m
5	m	m	m	m	m	6.2	6.2	5.7	5.9	21	m	m
6	m	m	m	m	m	6.2	6.4	5.7	5.8	22*	m	m
7	m	m	m	m	m	6.6	6.5	5.6	5.6	m	m	m
8	m	m	m	m	m	6.5	6.5	5.9	5.5	m	m	m
9	m	m	m	m	m	6.4	6.4	5.8	5.6	m	m	m
10	m	m	m	m	m	6.2	6.1	5.9	5.7	m	m	m
11	m	m	m	m	m	6.1	6.1	5.7	5.7	m	m	m
12	m	m	m	m	m	6.1	6.1	5.8	5.6	m	m	m
13	m	m	m	m	m	6.0	6.1	5.8	18	m	m	m
14	m	m	m	m	m	5.8	6.0	5.8	59	m	m	m
15	m	m	m	m	m	5.9	6.0	5.7	61	m	m	m
16	m	m	m	m	m	6.0	5.9	5.7	66	m	m	m
17	m	m	m	m	m	6.0	6.2	5.8	78	m	m	m
18	m	m	m	m	m	5.9	5.6	5.7	92	m	m	m
19	m	m	m	m	m	5.8	5.6	5.7	93	m	m	m
20	m	m	m	m	6.6*	5.7	5.6	5.9	86	m	m	m
21	m	m	m	m	6.4	5.8	5.8	5.8	83	m	m	m
22	m	m	m	m	6.4	6.0	5.8	5.7	92	m	m	m
23	m	m	m	m	6.3	6.1	5.7	5.8	91	m	m	m
24	m	m	m	m	6.2	6.2	5.7	5.8	97	m	m	m
25	m	m	m	m	6.2	6.3	5.7	5.7	66	m	m	m
26	m	m	m	m	6.2	6.3	5.7	5.8	64	m	m	m
27	m	m	m	m	6.3	6.2	5.6	6.6	64	m	m	m
28	m	m	m	m	6.7	6.2	5.6	6.8	62	m	m	m
29	m	---	m	m	7.4	6.3	5.7	6.2	52	m	m	m
30	m	---	m	m	6.8	6.2	5.8	5.9	24	m	m	m
31	m	---	m	---	6.5	---	5.8	5.8	---	m	---	m
Mean	m	m	m	m	6.5	6.1	6.0	5.8	44	21	m	m
Min	m	m	m	m	6.2	5.7	5.6	5.6	5.5	20	m	m
Max	m	m	m	m	7.4	6.6	6.5	6.8	97	23	m	m

Notes:

1. m – missing data

2. * - mean daily flow computed from partial record

Table A1-3. Lach Q'atnu Creek.

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	m	m	m	m	m	9.6	3.9	0.79	2.8	2.4	m	m
2	m	m	m	m	m	10	3.6	0.82	2.6	2.1	m	m
3	m	m	m	m	m	9.6	3.2	0.85	2.4	2.0	m	m
4	m	m	m	m	m	8.9	3.0	0.81	3.0	1.9	m	m
5	m	m	m	m	m	10	2.7	0.82	3.8	1.9*	m	m
6	m	m	m	m	m	11	2.7	0.84	4.9	m	m	m
7	m	m	m	m	m	11	2.8	0.85	3.7	m	m	m
8	m	m	m	m	m	11	2.7	0.97	4.3	m	m	m
9	m	m	m	m	m	11	2.5	0.92	4.5	m	m	m
10	m	m	m	m	m	10	2.3	1.3	4.8	m	m	m
11	m	m	m	m	m	9.8	2.2	0.96	4.7	m	m	m
12	m	m	m	m	m	9.7	2.1	0.95	4.1	m	m	m
13	m	m	m	m	m	10	2.1	0.97	4.2	m	m	m
14	m	m	m	m	m	11	2.0	0.99	4.0	m	m	m
15	m	m	m	m	m	12	1.8	0.96	3.7	m	m	m
16	m	m	m	m	m	10	1.8	0.86	3.5	m	m	m
17	m	m	m	m	m	7.9	1.6	0.94	3.2	m	m	m
18	m	m	m	m	7.2*	6.9	1.5	0.96	2.9	m	m	m
19	m	m	m	m	7.1	7.1	1.5	0.94	2.7	m	m	m
20	m	m	m	m	7.3	6.5	1.5	1.5	2.5	m	m	m
21	m	m	m	m	6.2	6.0	1.5	1.3	2.3	m	m	m
22	m	m	m	m	5.6	5.5	1.4	1.3	2.2	m	m	m
23	m	m	m	m	5.2	5.0	1.4	1.4	2.4	m	m	m
24	m	m	m	m	6.1	4.9	1.2	1.4	2.4	m	m	m
25	m	m	m	m	8.9	4.8	1.2	1.5	2.2	m	m	m
26	m	m	m	m	11	4.5	1.1	1.5*	2.3	m	m	m
27	m	m	m	m	12	4.3	1.0	4.7	2.3	m	m	m
28	m	m	m	m	12	4.2	0.99	5.6	2.3	m	m	m
29	m	---	m	m	11	4.0	0.95	3.3	1.9	m	m	m
30	m	---	m	m	8.9	4.0	0.94	2.6	2.2	m	m	m
31	m	---	m	---	8.8	---	0.86	2.7	---	m	---	m
Mean	m	m	m	m	8.4	8.0	1.9	1.5	3.2	2.1	m	m
Min	m	m	m	m	5.2	4.0	0.86	0.79	1.9	1.9	m	m
Max	m	m	m	m	12	12	3.9	5.6	4.9	2.4	m	m

Notes:

1. m – missing data

2. * - mean daily flow computed from partial record

Appendix B: Station Rating Curves

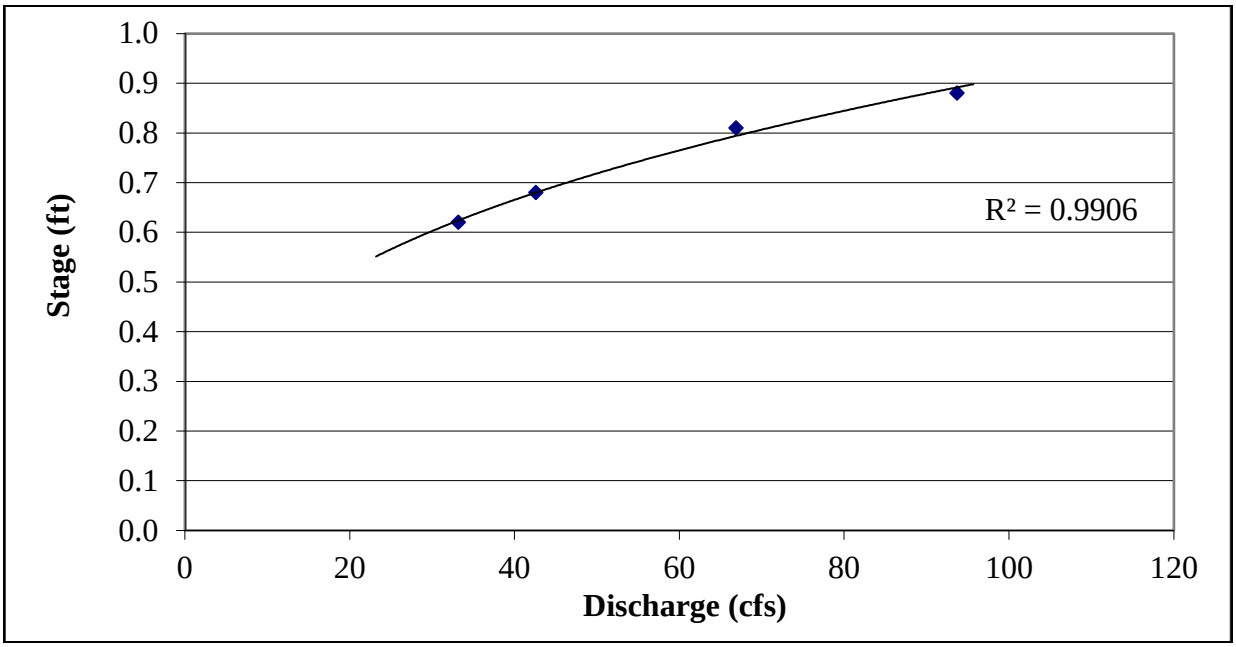

Figure A2-1. Eklutna River below Thunderbird Creek (Site 1).

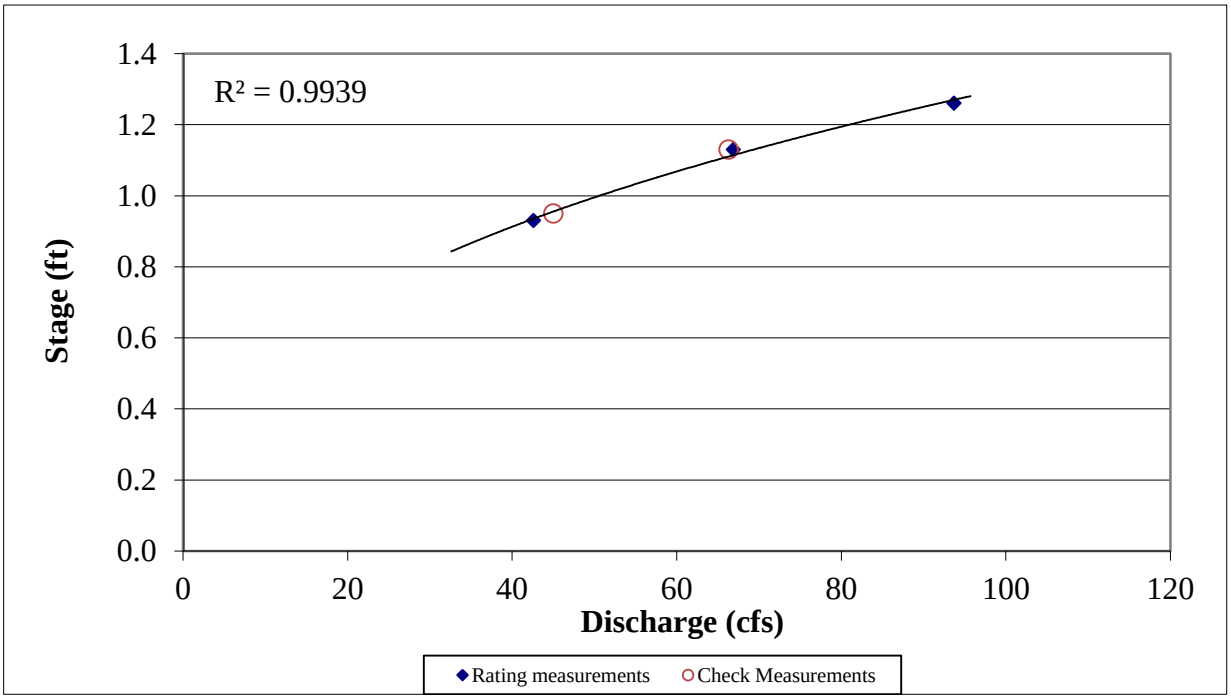

Figure A2-2. Eklutna River below Thunderbird Creek (Site 2).

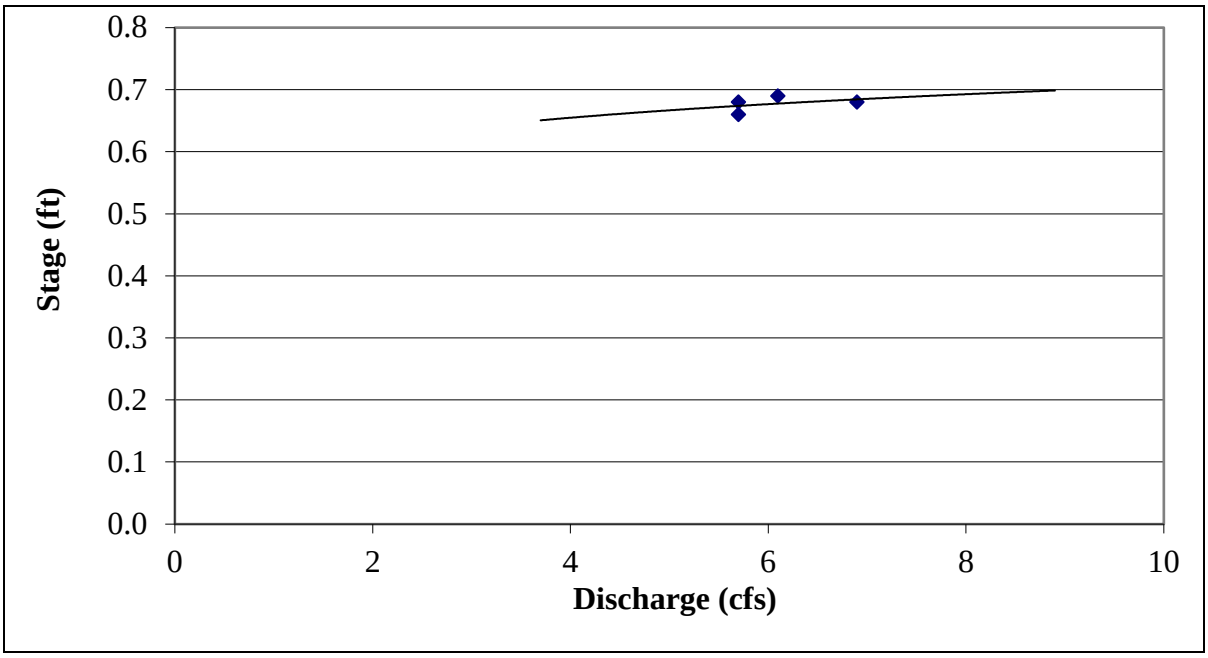

Figure A2-3. Eklutna River above Thunderbird Creek, pre-release.

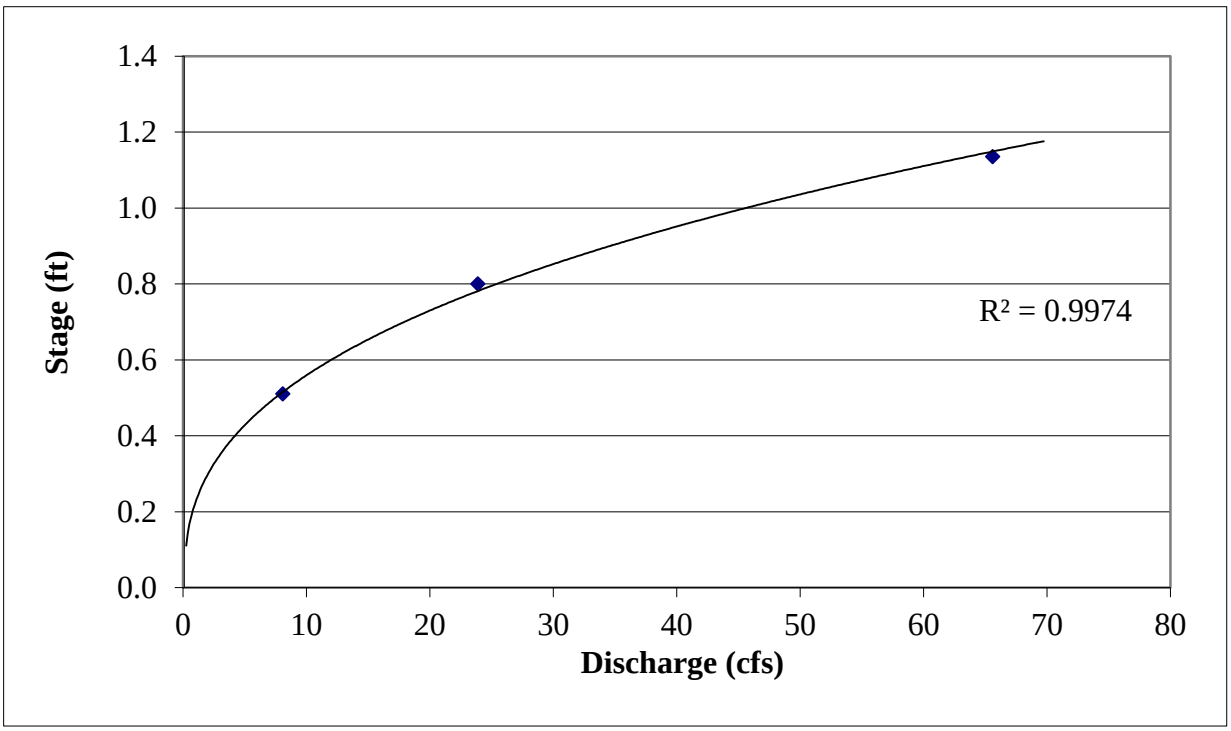

Figure A2-4. Eklutna River above Thunderbird Creek, post-release.

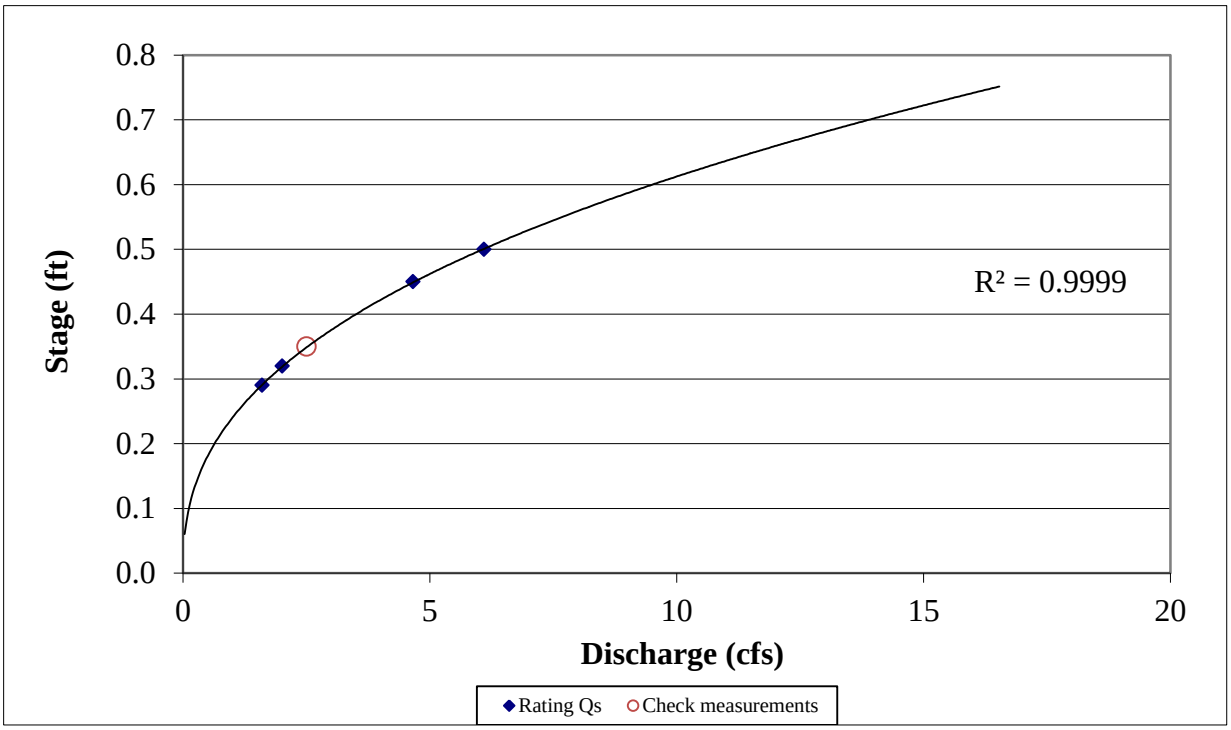

Table A2-5. Lach Q'atnu Creek.