National Park Service
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Mount Rainier National Park

Stream stage, stream temperature, stream turbidity, precipitation and air temperature for the Nisqually River at Longmire

Water year 2017

Water-Data Report NPS/MORA/WDR—2020/006

ON THE COVER

Snow-covered enclosure and transmitter for the Longmire Stream Gage, additionally showing the temperature sensor and precipitation gauge. Photo taken December 5, 2016 at 12:57 PM.

Photograph by: Scott Beason, Mount Rainier National Park

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U.S. Department of the Interior
National Park Service
Mount Rainier National Park

Care has been taken to assure accuracy of raw data values, but a thorough analysis and interpretation of the data has not been completed. Consequently, the initial analyses of data in this report are provisional and subject to change. Mention of trade names or commercial products does not constitute endorsement or recommendation for use by the U.S. Government.

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Introduction

Mount Rainier is a 4,392 m (14,410 ft) volcano in southwestern Washington State. Braided rivers radiate away from the volcano and are generally glacially-sourced. Approximately 4.17 km^3 (1.0 mi^3) of ice and perennial snows cover Mount Rainier (Driedger and Kennard, 1986). The mountain receives an average of 16.3 m (53.4 ft) of snow at Paradise and melting snow causes high flows in spring and summer months (NPS, 2011). Fall and winter storms lead to periodic flooding and higher flows. Generally, the lowest river flows occur late in the summer prior to the onset of fall storms and in the middle of winter. Most streams in the park exhibit a braiding or anastomosing character due to their glacial source, however, several of the lower order streams that have non-glacial sources exhibit pool-riffle morphology with very coarse median grain sizes. Average stream gradient ranges from 1 to 4%.

The Nisqually River is one of six major stream networks that drain a significant portion of the volcano (the others being the Puyallup, Carbon, West Fork White, White, and Ohanapecosh). The Nisqually River watershed (Figure 1) begins at the Nisqually Glacier and ends at the Nisqually National Wildlife Refuge, emptying into the Puget Sound. The Nisqually River at Longmire has a watershed size of 48.7 km^2 (18.8 mi^2), a mean basin elevation of 1,814 m (5,950 ft) and drains from the summit of Mount Rainier down to 853 m (2,800 ft) at Longmire (Table 1). The drainage basin includes three glaciers (Nisqually, Wilson and Van Trump Glaciers) and the permanent Muir Snowfield. Mean basin slope is 48.2% and has 39.0% canopy cover. Mean annual precipitation in the watershed is approximately 262 cm (103 in) (USGS Stream Stats, 2011). The Nisqually River's headwaters start at the terminus of the Nisqually Glacier, at approximately 1,585 m (5,200 ft). From there, the river cascades down a steep braided stream with very coarse sediment. The river character is a classic braided system with multiple debris flow inputs from Van Trump Creek and other small streams.

Stream gage data from the Nisqually River at Longmire within Mount Rainier National Park are presented for water year 2017 (WY2017; October 1, 2016 – September 30, 2017). The Longmire location is now one of two year-round real-time gaging stations at the park; the other being on the White River at White River Bridge (see associated water-data reports for that location). Stream statistics are obtained via pressure transducers that are mounted within a stilling well at Longmire. Data from WY2017 was collected by a solar and battery-powered data collector and transmitted to the GOES West satellite where the data was then disseminated to a web-accessible database.

Stream gage data is useful for determining critical in-stream flows for aquatic habitats as well as showing the range of temperatures exhibited in park streams during the year.

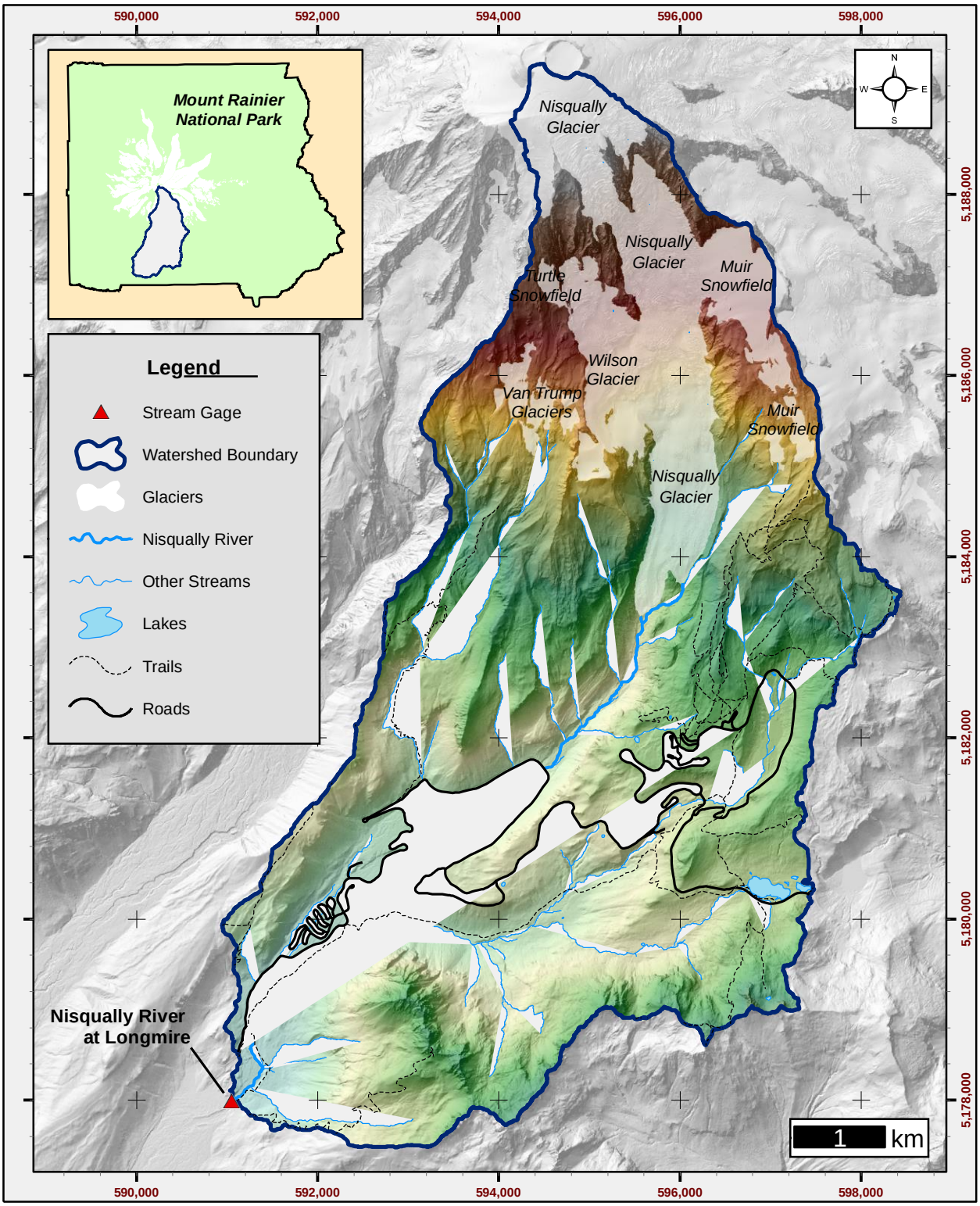

Figure 1: Overview map of the Nisqually River Watershed at Longmire showing major glaciers and snowfields, rivers, lakes, roads and trails. (Grid: NAD 1983 UTM Zone 10N, Meters; Scale: 1:65,000)

Table 1: Stream gage information for the Nisqually River at Longmire. Watershed data is derived from surveys, 2008 LiDAR basemap of park (Watershed Sciences, 2009) and GIS layers at Mount Rainier National Park.

Location Description:	NE ¼, NW ¼, Section 33, T15N, R08E, Pierce County, Washington. On bedrock of river-right bank, approximately 15 feet upstream of the Longmire Back-Gate Road suspension bridge.
Location:	NAD 1983 Washington State Plane Coordinate System, South Zone, US Survey Feet: N: 519,055.200 feet E: 1,312,570.088 feet NAD 1983 UTM Zone 10 North, Meters N: 5,177,989 meters E: 591,050 meters Geographic, WGS1984 Latitude: 46º 44' 57.30405" (46.7492511º) Longitude: -121º 48' 28.55694" (-121.8079325º)
Elevation *(Gage Cap)*:	2,795.849 feet (NAVD 1988) 852.175 meters (NAVD 1988)
Drainage Area:	18.80 square miles 48.69 square kilometers 12,032.72 acres 48,694,675.76 square meters
Period of Record:	October 1, 2016 to September 30, 2017, with noted outages in Table 2.
Recording Interval:	15 minutes
Gage Equipment *(Stilling Well)*:	15 foot total height in three 5-foot sections: (1) White 5 foot by 2 inch schedule 40 PVC pipe with 0.020" slots. (2 and 3): White 5 foot by 2 inch schedule 40 PVC riser pipe. Mounted to bedrock exposure with expansion bolts and steel brackets. PVC well cap on the top locked with a National Park Service/Mt. Rainier 17-2 padlock.
Gage Equipment *(Pressure transducers)*:	Stage: Solinst® Levelogger® Gold 10 meter/30 foot pressure transducer hung approximately 15 feet from the cap, measuring water pressure and water temperature at 15-minute intervals. Barometric: Solinst® Barologger® Gold 1.5 meter/5 foot pressure transducer hung approximately 1 foot from the cap, measuring air pressure and air temperature at 15-minute intervals.
Measured Variables:	(1) Water Pressure (Automated pressure transducer measurement) (2) Water Temperature (Automated pressure transducer measurement) (3) Air Pressure (Automated pressure transducer measurement) (4) Air Temperature (Automated pressure transducer measurement) (5) Stage (Calculated, Variable 1 - Variable 4) (6) Turbidity Level (7) Precipitation
Landscape Types in Watershed:	*Glaciers and Permanent Snowfields:* 3.02 mi^2 (7.82 km^2), 16.06% *Alpine:* 4.27 mi^2 (11.05 km^2), 22.69% *Subalpine:* 4.89 mi^2 (12.66 km^2), 25.99% *Forest:* 6.59 mi^2 (17.08 km^2), 35.07% *Lakes:* 0.04 mi^2 (0.09 km^2), 0.19%

Methods

Stage Computation

Stage heights were calculated with a Solinst® Levelogger® Gold 10 meter/30 foot pressure transducer mounted in the stream bed, above the low flow stage height. The pressure transducer measures the weight of the column of air and water above the transducer. A Solinst® Barologger® Gold 1.5 meter/5 foot pressure transducer mounted above the high water line records air pressure and corrects the water pressure transducer to the effects of changing air pressure. A photo of the completed stream gage site and pressure transducers used in this study is shown in Figure 2.

During the field season and when the equipment was removed, the pressure transducers were downloaded. Barometric compensation was performed to remove the variable of changing air pressure to arrive at the true stage height. Equipment was changed on September 29, 2014 to a new real-time reporting method which eliminated the need for site visits to download data.

Figure 2: (A) Nisqually River stream gage (stilling well) at Longmire and (B) Solinst® Levelogger® and Barologger® pressure transducers used in this study.

Air and Water Temperatures

Air and water temperatures are recorded automatically by the mounted pressure transducers in the stilling well. Air temperature is recorded by the barometric pressure transducer mounted at the data collector/transmitter. Water temperature is recorded by the stage transducer which is mounted at the base of the stilling well. This data is recorded at the same time as pressure measurements and is an inherent function of the Solinst® pressure transducers.

Turbidity

Turbidity is defined as the presence of suspended particles in water and measured in Nephelometric Turbidity Units (NTU). The park was able to acquire an FTS DTS-12 SDI-12 turbidity sensor which was mounted next to the stilling well mentioned previously. The sensor uses a laser diode light source and a coherent narrow near-infrared spectral beam to measure the number of suspended particles in the water column (FTS, 2020b), which is then calculated in NTU. The sensor also has a "wiper blade" that cleans the sensor face to reduce fouling. Turbidity levels were measured at the same rate/interval as water pressure and temperature measurements.

Precipitation

Precipitation was measured by a non-heated FTS RG-T tipping-bucket rain gauge. The equipment funnels and filters water into a mechanism that tips when 0.01 in (0.03 cm) of precipitation accumulates into the bucket (FTS, 2020c). A cable runs from the rain gauge to data collector and appends 0.01 to the previous precipitation measurement. At 15-minute intervals, the water year total precipitation is then logged and reported to the database. The more tips that occur in a 15-minute period, the higher the intensity of precipitation that is occurring. The sensor is un-heated which means that it cannot discriminate between melted and solid precipitation. Additionally, in periods of frozen precipitation, it is extremely likely that measurements are not accumulating as would be expected in a heated sensor.

Data Collection Platform

All sensors at this site are wired to communicate to a common data logger, which is currently the FTS Axiom H1RS data logger (FTS, 2020a). The H1RS data logger receives power from a 12-volt battery, has an on-board solar regulator and utilizes a 50-watt solar panel. The H1RS logs all data received from each remote sensor and transmits four 15-minute data packets to the GOES West geostationary satellite every hour. The data is then downloaded by an automated computer script from the GOES Wallops server, processed, and appended to a real-time, web-accessible website (http://waterdata.morageology.com/station.php?g=4B300A32).

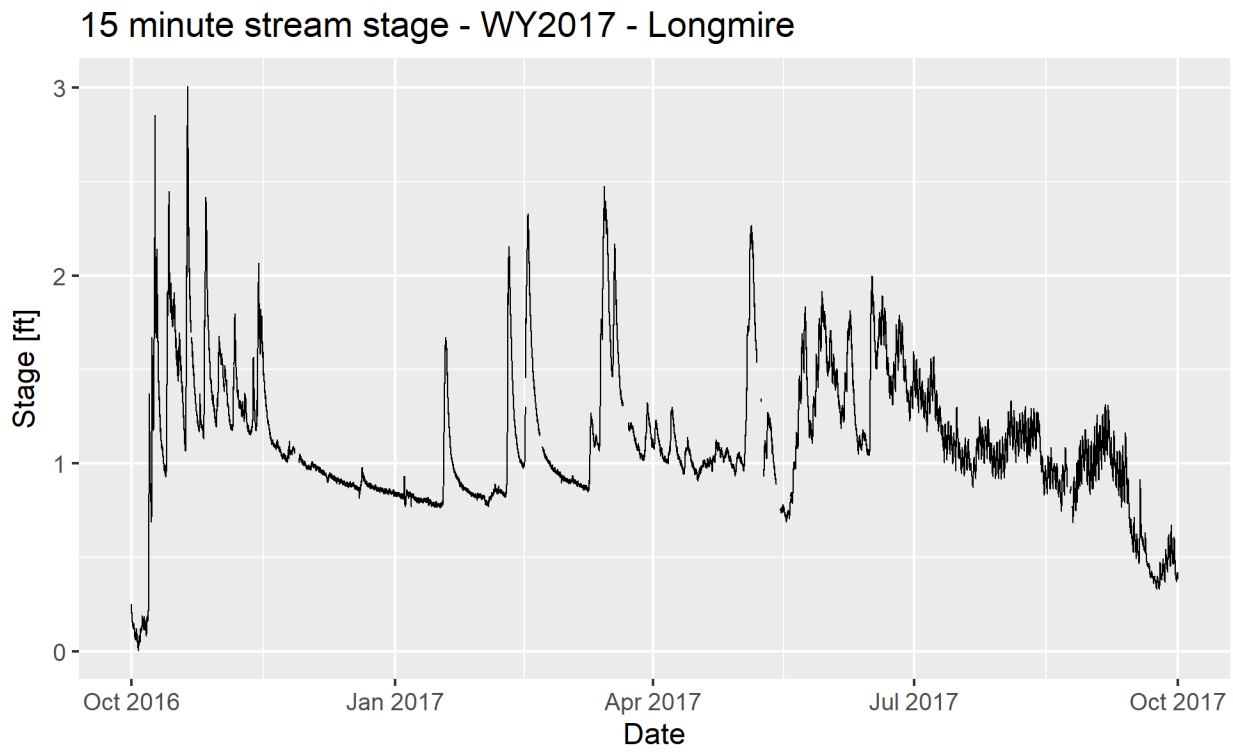

Figure 3: Stream stage during water year 2017 at Longmire.

Results

Stream Stage

Fifteen-minute stage heights were recorded in WY2017 and shown in Figure 3. Stage ranges from 0.0058 ft (0.0018 m) which occurred October 3, 2016 at 11:15 AM to 3.0046 ft (0.9158 m) which occurred October 20, 2016 at 1:15 PM. Rain events and small floods are clearly shown in the record, as well as diurnal increases in daily runoff in the spring to summer months associated with snowmelt. Daily minimum, mean and maximum stream stage for every day in WY2017 are shown in appendixes A-1, A-2 and A-3, respectively.

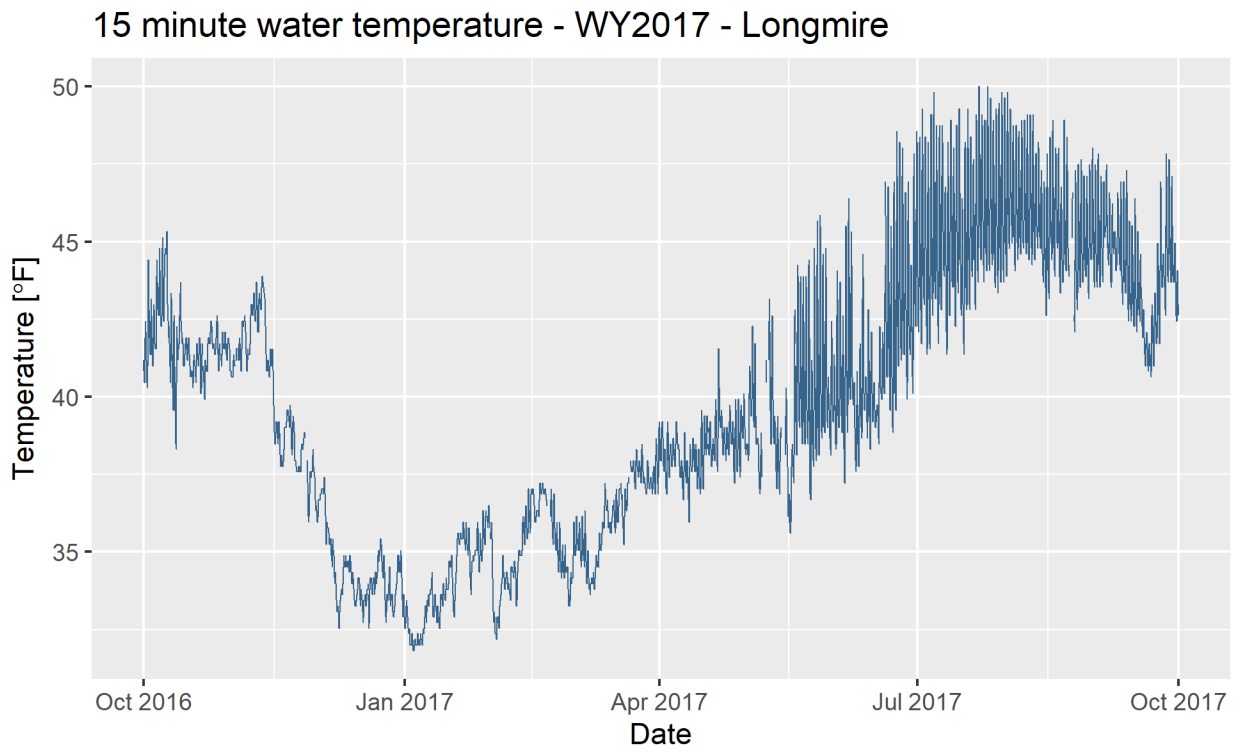

Figure 4: Stream temperature during water year 2017 at Longmire.

Stream Temperature

Figure 4 shows the 15-minute water temperatures during WY2017. The lowest water temperature recorded was 31.82 ºF (-0.10 ºC) on January 4, 2017 at 12:45 AM while the highest water temperature was 50.00 ºF (10.00 ºC) on July 22, 2017 at 4:45 PM. Daily minimum, mean and maximum water temperatures for every day in WY2017 are shown in appendixes B-1, B-2 and B-3, respectively.

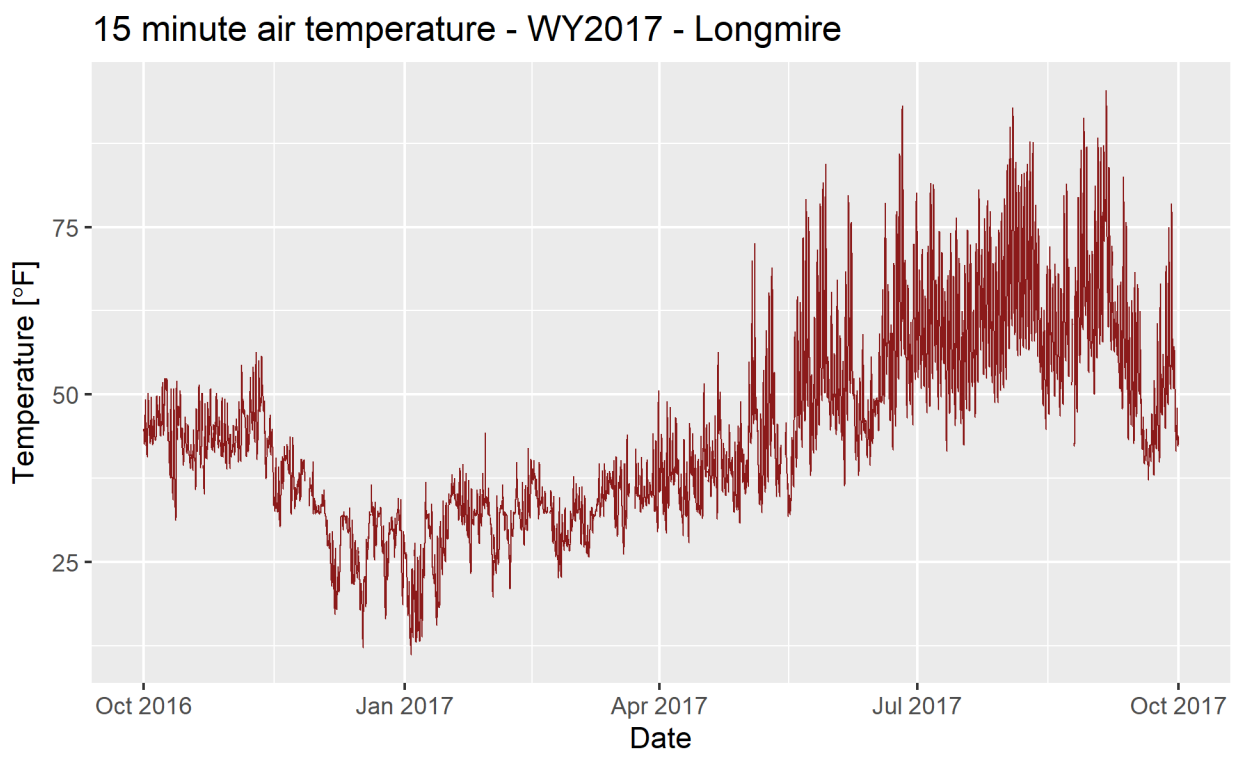

Figure 5: Air temperature during water year 2017 at Longmire.

Air Temperature

Figure 5 shows the 15-minute air temperature during WY2017. The daily, monthly and yearly range of air temperatures is much more variable than water temperatures. The minimum air temperature was 11.1938 ºF (-11.5590 ºC) on January 3, 2017 at 8:00 AM and the highest air temperature was 95.3816 ºF (35.2120 ºC) on September 3, 2017 at 2:30 PM. Daily minimum, mean and maximum air temperatures for every day in WY2017 are shown in appendixes C-1, C-2 and C-3, respectively.

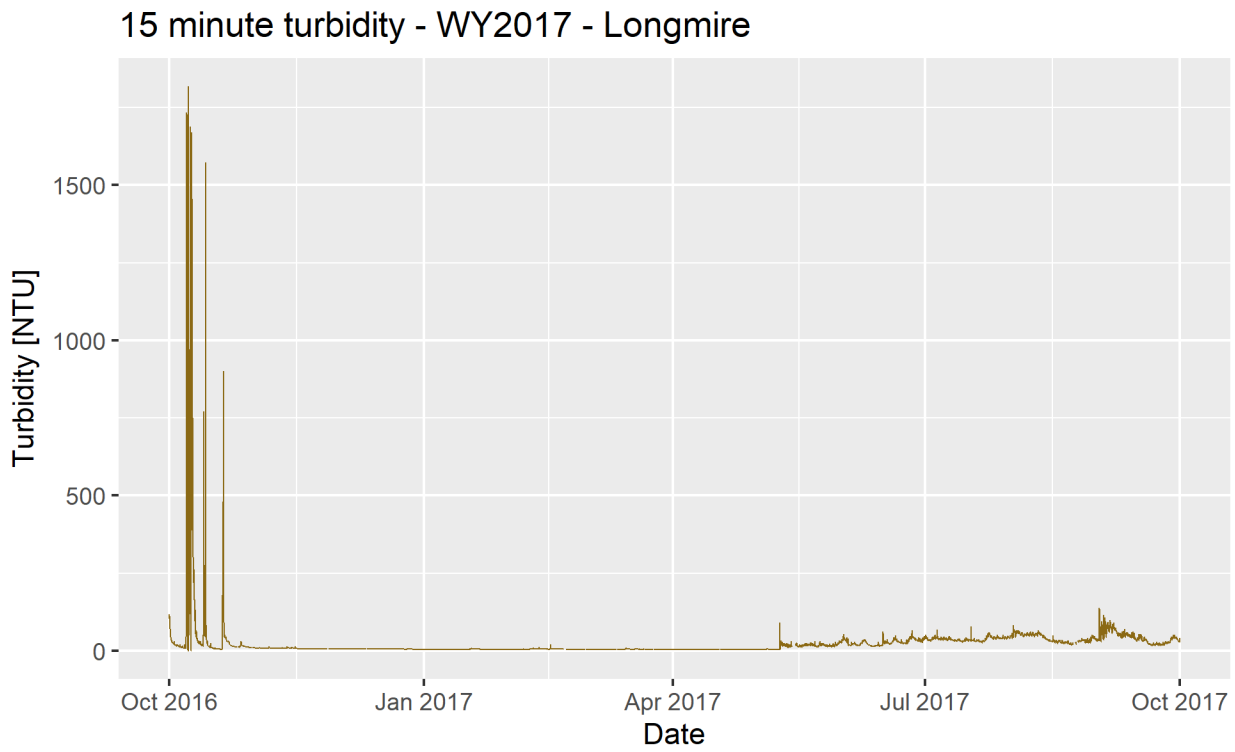

Figure 6: Turbidity during water year 2017 at Longmire.

Turbidity

Figure 6 shows the 15-minute turbidity levels during WY2017. Turbidity is highly variable depending on prevailing river stage and shows peaks during periods of high stage. The minimum turbidity level was 0.32 NTU (Nephelometric Turbidity Unit, the measure of a turbidity of a fluid) which occurred 15 minutes prior to the highest turbidity level of 1818.04 NTU (the unit's maximum value) on October 7, 2016 at 10:30 PM. The presence of an extremely low value just prior to and during a period of very high turbidity tends to indicate that the sensor was not reading correctly due to overwhelming sediment transport. Ignoring the see-saw values on October 6-7, 2016, the new low value for WY2017 is 3.58 NTU on May 9, 2017 at 1:45 PM. Daily minimum, mean and maximum turbidity levels for every day in WY2017 are shown in appendixes D-1, D-2 and D-3, respectively.

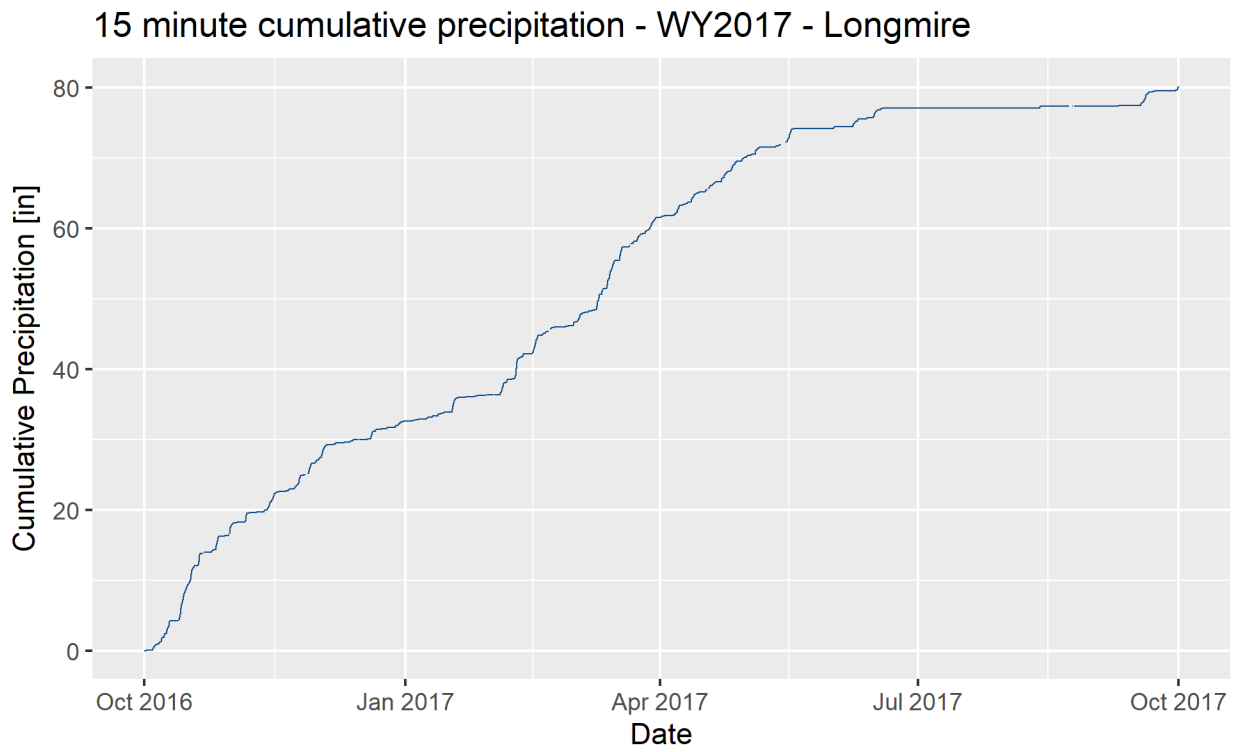

Figure 7: Cumulative precipitation during water year 2017 at Longmire.

Precipitation

Figure 7 shows the cumulative precipitation recorded in the tipping bucket rain gauge at the Longmire Stream Gage in WY2017. Overall, this sensor recorded a total of 80.19 in (203.68 cm) of precipitation. The most precipitation recorded during any day was 2.48 in (6.30 cm) on February 9, 2017. Daily precipitation totals for WY2017 are shown in appendix E-1.

It should be noted that this sensor is not heated and likely did not record precipitation during times of snow, hail, sleet, graupel, and other frozen precipitation types. The levels presented here are a minimum bound of the actual precipitation recorded in WY2017.

Data Outages

During WY2017, data occasionally was not transmitted from the data logger to GOES West satellite and imported into the stream gage database. These outages are shown in Table 2. This occurred for a wide variety of reasons, from hourly transmit/import errors (which generally meant that a whole hour's worth of data (4 data points) would not be imported, to sensor or logger errors (including power-related failures) which resulted in several hours to days of outages (usually greater than 50 data points). Overall, a total of 1,090 of 35,040 data points are missing from WY2017, which equates to 3.11% of the data in the water year missing or not acquired correctly. If enough data points were missing from a date, the data is then excluded from analysis and tabulation in the appendixes.

Table 2: Data outages during WY2017 on the Nisqually River at Longmire. Data affected can be all data from station, or AT (Air Temperature), WT (Water Temperature), or Stage (Stream Stage). If significant data points were missing from a day, that day's data was excluded from analysis and noted in the "Dates excluded from analysis" column.

Start Date	End Date	# Data Points	Data Affected	Dates excluded from analysis
2016-10-13 01:15	2016-10-13 02:00	4	All	-
2016-10-21 13:15	2016-10-22 00:00	20	All	-
2016-10-25 13:15	2016-10-25 14:00	4	All	-
2016-10-27 20:15	2016-10-27 21:00	4	All	-
2016-10-30 21:15	2016-10-30 22:00	4	All	-
2016-11-02 11:15	2016-11-02 12:00	4	All	-
2016-11-05 16:15	2016-11-05 16:45	3	All	-
2016-11-26 22:15	2016-11-27 13:30	62	All	2016-11-27
2016-11-27 13:45	2016-11-28 09:15	79	AT, Stage	2016-11-28
2016-12-11 05:15	2016-12-11 06:00	4	All	-
2016-12-13 15:15	2016-12-13 16:00	4	All	-
2016-12-15 17:15	2016-12-15 18:00	4	All	-
2016-12-19 05:15	2016-12-19 06:00	4	All	-
2016-12-20 04:15	2016-12-20 05:00	4	All	-
2017-01-04 11:15	2017-01-04 12:00	4	All	-
2017-01-29 14:15	2017-01-29 16:00	8	All	-
2017-01-31 03:15	2017-01-31 04:00	4	All	-
2017-02-01 09:15	2017-02-01 10:00	4	All	-
2017-02-14 23:15	2017-02-15 00:00	4	All	-
2017-02-15 09:15	2017-02-15 10:00	4	All	-
2017-02-20 10:15	2017-02-21 08:15	90	All	2020-02-20 and 2020-02-21
2017-02-21 10:15	2017-02-21 11:00	4	All	-
2017-02-28 07:15	2017-02-28 08:00	4	All	-
2017-03-11 15:15	2017-03-11 15:45	3	All	-
2017-03-11 18:00	2017-03-11 18:45	4	All	-
2017-03-12 02:00	2017-03-12 02:45	4	All	-
2017-03-21 10:15	2017-03-21 17:30	30	All	-
2017-03-21 17:45	2017-03-23 09:15	159	AT, Stage	2020-03-21 to 2020-03-23
2017-03-24 18:15	2017-03-24 21:00	12	All	-
2017-04-17 21:15	2017-04-17 22:00	4	All	-
2017-04-18 00:15	2017-04-18 03:00	12	All	-
2017-05-07 04:15	2017-05-08 16:00	144	WT, Stage	2020-05-07
2017-05-08 18:00	2017-05-09 13:00	77	WT, Stage	2020-05-08
2017-05-13 20:15	2017-05-15 09:45	151	All	2020-05-13 to 2020-05-15
2017-05-18 21:15	2017-05-18 22:00	4	All	-
2017-06-19 13:15	2017-06-19 14:00	4	All	-
2017-08-23 11:15	2017-08-24 10:00	92	All	2020-08-23
2017-08-24 16:15	2017-08-25 06:00	56	All	2020-08-24
2017-09-07 18:15	2017-09-07 19:00	4	All	-

Raw Data

Raw tabular data from this study is available as a Microsoft Excel file and includes two worksheets: "15 Minute Data" and "WY2017 Stats." "15 Minute Data" includes the raw 15-minute data from WY2014 with the following columns (35,041 rows): Date/Time, Day of Water Year, Stage, Water Temperature, Air Temperature, Turbidity Level, and Cumulative

Precipitation. “WY2017 Stats” is the daily summary data of the 15 minute data for WY2017 and includes the following columns (366 rows): Date; Day of Water Year; Number of Measurements; Minimum, Average and Maximum Stage; Minimum, Average and Maximum Water Temperature; Minimum, Average and Maximum Air Temperature; Minimum, Average and Maximum Turbidity; and Daily and Cumulative Precipitation. The data is available as download at the following link or by contacting the author of this report: https://irma.nps.gov/DataStore/Reference/Profile/2272242.

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Appendix A: WY2017 stream stage data tables

Note: Dates marked with a single dash (-) indicate those days excluded from analysis in Table 2 and described in “Outages” section of report.

Appendix A-1: Minimum daily stream stage (in feet) recorded at the Longmire stream gage during water year 2017.

Date	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	0.12	1.47	0.97	0.83	0.78	0.90	1.07	0.99	1.48	1.35	0.92	0.86
2	0.06	1.38	0.97	0.81	0.77	0.89	1.12	0.96	1.42	1.27	1.01	0.91
3	0.01	1.27	0.98	0.81	0.80	0.90	1.04	1.06	1.39	1.29	1.10	0.91
4	0.06	1.18	0.96	0.77	0.83	0.89	1.01	1.70	1.29	1.24	1.07	0.97
5	0.11	1.18	0.95	0.82	0.84	0.88	1.00	2.04	1.19	1.17	1.01	1.01
6	0.08	1.36	0.94	0.77	0.84	0.87	1.00	1.60	1.22	1.27	1.04	1.04
7	0.31	1.29	0.92	0.80	0.83	0.86	1.08	-	1.38	1.33	1.08	0.99
8	0.71	1.25	0.90	0.79	0.82	0.86	1.10	-	1.66	1.23	1.07	0.91
9	1.67	1.22	0.92	0.79	0.99	0.85	1.02	0.93	1.36	1.17	1.00	0.87
10	1.22	1.16	0.91	0.79	1.41	1.15	0.98	1.02	1.16	1.13	1.04	0.83
11	1.04	1.15	0.89	0.79	1.16	1.09	0.94	1.19	1.05	1.00	1.08	0.77
12	0.93	1.19	0.89	0.78	1.04	1.08	0.98	1.00	1.07	1.02	1.07	0.79
13	0.93	1.17	0.89	0.77	1.00	1.07	1.04	-	1.12	1.05	1.11	0.76
14	1.80	1.42	0.88	0.77	0.98	1.66	0.98	-	1.05	1.00	0.95	0.60
15	1.73	1.49	0.87	0.77	0.99	2.20	0.94	-	1.04	0.96	0.83	0.53
16	1.52	1.30	0.88	0.76	1.84	1.67	0.91	0.72	1.79	1.02	0.84	0.49
17	1.44	1.18	0.86	0.77	1.49	1.46	0.93	0.69	1.50	0.95	0.86	0.47
18	1.31	1.10	0.85	1.16	1.30	1.53	0.98	0.71	1.51	0.93	0.87	0.57
19	1.07	1.09	0.81	1.14	1.18	1.53	0.97	0.79	1.63	0.97	0.86	0.51
20	1.24	1.07	0.88	0.99	-	1.32	0.98	0.97	1.63	0.96	0.82	0.44
21	1.70	1.06	0.89	0.94	-	-	0.96	1.08	1.47	0.87	0.75	0.39
22	1.40	1.02	0.87	0.90	1.01	-	1.00	1.32	1.34	0.92	0.83	0.36
23	1.24	1.01	0.87	0.88	0.99	-	1.07	1.48	1.31	1.02	-	0.33
24	1.17	1.01	0.86	0.86	0.97	1.18	1.03	1.30	1.38	1.02	-	0.33
25	1.15	1.05	0.85	0.85	0.95	1.10	1.01	1.14	1.49	1.00	0.68	0.38
26	1.13	1.05	0.84	0.84	0.94	1.07	1.03	1.11	1.58	1.03	0.75	0.37
27	1.63	-	0.84	0.82	0.90	1.03	1.01	1.25	1.43	1.00	0.87	0.42
28	1.38	-	0.84	0.82	0.91	1.01	0.97	1.40	1.33	0.93	0.89	0.45
29	1.26	0.99	0.84	0.80	---	1.04	0.93	1.60	1.23	0.92	0.96	0.46
30	1.19	0.97	0.84	0.81	---	1.18	0.98	1.71	1.29	0.92	0.88	0.37
31	1.30	---	0.83	0.81	---	1.09	---	1.46	---	0.92	0.84	---
Minimum	**0.01**	**0.97**	**0.81**	**0.76**	**0.77**	**0.85**	**0.91**	**0.69**	**1.04**	**0.87**	**0.68**	**0.33**
Mean	**1.03**	**1.18**	**0.89**	**0.84**	**1.02**	**1.16**	**1.00**	**1.20**	**1.36**	**1.06**	**0.93**	**0.64**
Maximum	**1.80**	**1.49**	**0.98**	**1.16**	**1.84**	**2.20**	**1.12**	**2.04**	**1.79**	**1.35**	**1.11**	**1.04**

Appendix A-2: Mean daily stream stage (in feet) recorded at the Longmire stream gage during water year 2017.

Date	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	0.16	1.55	0.98	0.84	0.80	0.91	1.14	1.02	1.59	1.45	1.04	0.99
2	0.09	1.44	0.98	0.83	0.79	0.91	1.17	0.99	1.54	1.39	1.12	1.06
3	0.05	1.35	0.99	0.83	0.83	0.91	1.08	1.34	1.46	1.37	1.22	1.06
4	0.13	1.21	0.98	0.83	0.86	0.90	1.03	1.88	1.39	1.32	1.18	1.11
5	0.14	1.36	0.97	0.84	0.86	0.89	1.02	2.18	1.26	1.29	1.13	1.15
6	0.16	1.54	0.96	0.83	0.85	0.89	1.05	1.78	1.31	1.39	1.15	1.17
7	0.89	1.33	0.94	0.82	0.84	0.88	1.24	-	1.51	1.45	1.17	1.09
8	1.35	1.29	0.92	0.81	0.85	0.87	1.16	-	1.73	1.35	1.18	1.03
9	2.01	1.30	0.94	0.81	1.82	0.91	1.06	1.02	1.52	1.25	1.12	0.98
10	1.50	1.20	0.92	0.80	1.64	1.22	1.01	1.12	1.24	1.21	1.15	0.94
11	1.11	1.17	0.91	0.81	1.26	1.12	0.97	1.23	1.11	1.11	1.18	0.92
12	0.98	1.35	0.91	0.80	1.10	1.12	1.07	1.10	1.10	1.11	1.17	0.96
13	1.58	1.24	0.90	0.79	1.02	1.36	1.08	-	1.15	1.14	1.19	0.88
14	1.99	1.77	0.89	0.78	0.99	2.05	1.01	-	1.09	1.09	1.01	0.68
15	1.81	1.68	0.89	0.78	1.54	2.31	0.96	-	1.26	1.12	0.92	0.61
16	1.66	1.39	0.89	0.78	2.13	1.93	0.93	0.75	1.87	1.11	0.94	0.57
17	1.55	1.24	0.88	0.84	1.66	1.54	0.96	0.72	1.62	1.02	0.97	0.60
18	1.44	1.14	0.87	1.54	1.40	1.93	1.00	0.75	1.65	1.03	0.95	0.63
19	1.17	1.10	0.86	1.31	1.25	1.69	0.99	0.85	1.74	1.04	0.94	0.56
20	2.21	1.10	0.94	1.05	-	1.41	1.01	1.02	1.74	1.01	0.88	0.47
21	1.90	1.08	0.90	0.97	-	-	1.00	1.20	1.59	0.94	0.86	0.42
22	1.53	1.04	0.89	0.93	1.04	-	1.04	1.45	1.43	1.01	0.96	0.39
23	1.31	1.03	0.88	0.90	1.01	-	1.10	1.64	1.41	1.13	-	0.37
24	1.22	1.03	0.87	0.88	0.98	1.20	1.06	1.54	1.53	1.13	-	0.39
25	1.21	1.07	0.87	0.86	0.96	1.14	1.03	1.21	1.64	1.10	0.81	0.43
26	1.65	1.08	0.86	0.85	0.95	1.09	1.06	1.20	1.67	1.14	0.85	0.45
27	1.97	-	0.86	0.84	0.94	1.05	1.04	1.36	1.53	1.08	0.98	0.51
28	1.50	-	0.85	0.83	0.92	1.03	0.99	1.55	1.40	1.02	1.03	0.54
29	1.33	1.01	0.85	0.83	---	1.17	0.96	1.72	1.32	1.02	1.06	0.52
30	1.24	1.00	0.85	0.83	---	1.24	1.03	1.78	1.41	1.02	1.03	0.41
31	1.53	---	0.84	0.82	---	1.13	---	1.60	---	1.02	0.95	---
Minimum	**0.05**	**1.00**	**0.84**	**0.78**	**0.79**	**0.87**	**0.93**	**0.72**	**1.09**	**0.94**	**0.81**	**0.37**
Mean	**1.24**	**1.25**	**0.91**	**0.88**	**1.13**	**1.24**	**1.04**	**1.31**	**1.46**	**1.16**	**1.04**	**0.73**
Maximum	**2.21**	**1.77**	**0.99**	**1.54**	**2.13**	**2.31**	**1.24**	**2.18**	**1.87**	**1.45**	**1.22**	**1.17**

Appendix A-3: Maximum daily stream stage (in feet) recorded at the Longmire stream gage during water year 2017.

Date	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	0.25	1.61	0.99	0.85	0.83	0.93	1.23	1.06	1.71	1.56	1.16	1.20
2	0.13	1.52	1.01	0.85	0.83	0.92	1.23	1.05	1.69	1.51	1.28	1.26
3	0.09	1.45	1.01	0.84	0.85	0.94	1.13	1.73	1.57	1.46	1.33	1.21
4	0.19	1.27	1.00	0.93	0.89	0.92	1.07	2.22	1.50	1.39	1.29	1.26
5	0.19	1.77	0.98	0.86	0.88	0.91	1.04	2.27	1.32	1.45	1.24	1.32
6	0.30	1.80	0.97	0.85	0.88	0.90	1.09	2.02	1.48	1.56	1.27	1.31
7	1.37	1.39	0.96	0.84	0.86	0.89	1.30	-	1.72	1.57	1.27	1.23
8	1.94	1.33	0.94	0.83	0.98	0.89	1.23	-	1.81	1.51	1.31	1.18
9	2.85	1.37	0.95	0.82	2.15	1.13	1.11	1.11	1.75	1.35	1.24	1.07
10	1.97	1.29	0.94	0.82	1.94	1.27	1.04	1.27	1.36	1.31	1.29	1.07
11	1.22	1.19	0.93	0.82	1.41	1.16	0.99	1.27	1.16	1.21	1.29	1.10
12	1.05	1.57	0.93	0.82	1.16	1.15	1.13	1.21	1.14	1.22	1.28	1.16
13	2.12	1.38	0.92	0.81	1.05	1.77	1.14	-	1.18	1.22	1.27	1.05
14	2.45	2.07	0.91	0.80	1.01	2.48	1.05	-	1.15	1.16	1.10	0.75
15	1.91	1.82	0.90	0.80	2.09	2.41	0.99	-	1.88	1.30	0.99	0.72
16	1.85	1.50	0.91	0.79	2.33	2.25	0.97	0.78	2.00	1.24	1.04	0.63
17	1.70	1.30	0.90	1.14	1.87	1.67	0.99	0.75	1.81	1.09	1.09	0.92
18	1.60	1.19	0.89	1.67	1.50	2.17	1.02	0.84	1.80	1.14	1.00	0.81
19	1.30	1.13	0.89	1.54	1.32	1.93	1.03	0.98	1.89	1.13	1.00	0.63
20	3.00	1.13	0.98	1.15	-	1.53	1.04	1.15	1.84	1.12	0.97	0.52
21	2.23	1.12	0.93	1.00	-	-	1.04	1.45	1.79	1.04	0.99	0.46
22	1.67	1.07	0.91	0.95	1.06	-	1.13	1.69	1.52	1.13	1.09	0.42
23	1.40	1.06	0.90	0.92	1.03	-	1.12	1.80	1.54	1.25	-	0.40
24	1.37	1.10	0.89	0.90	1.00	1.22	1.10	1.83	1.74	1.22	-	0.48
25	1.30	1.12	0.89	0.88	0.98	1.18	1.07	1.32	1.79	1.20	0.93	0.50
26	2.42	1.09	0.88	0.87	0.97	1.11	1.09	1.36	1.76	1.24	1.00	0.55
27	2.39	-	0.87	0.85	0.96	1.09	1.07	1.58	1.70	1.19	1.10	0.62
28	1.66	-	0.87	0.84	0.94	1.06	1.03	1.77	1.52	1.10	1.15	0.67
29	1.39	1.04	0.87	0.85	---	1.32	1.00	1.92	1.41	1.11	1.18	0.61
30	1.34	1.02	0.87	0.84	---	1.32	1.06	1.88	1.60	1.13	1.13	0.49
31	1.68	---	0.86	0.84	---	1.19	---	1.76	---	1.15	1.12	---
Minimum	**0.09**	**1.02**	**0.86**	**0.79**	**0.83**	**0.89**	**0.97**	**0.75**	**1.14**	**1.04**	**0.93**	**0.40**
Mean	**1.49**	**1.35**	**0.92**	**0.92**	**1.22**	**1.35**	**1.08**	**1.47**	**1.60**	**1.27**	**1.15**	**0.85**
Maximum	**3.00**	**2.07**	**1.01**	**1.67**	**2.33**	**2.48**	**1.30**	**2.27**	**2.00**	**1.57**	**1.33**	**1.32**

Appendix B: WY2017 water temperature data tables

Note: Dates marked with a single dash (-) indicate those days excluded from analysis in Table 2 and described in “Outages” section of report.

Appendix B-1: Minimum daily water temperature (in degrees Fahrenheit) recorded at the Longmire Stream Gage during water year 2017.

Date	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	40.46	40.64	35.96	32.54	32.36	33.98	37.94	38.12	39.02	42.08	43.88	43.52
2	40.28	41.00	36.68	32.00	32.18	34.88	37.58	37.94	38.30	41.72	44.78	43.52
3	41.36	41.18	36.68	32.00	32.54	35.06	36.86	39.38	39.02	42.98	44.96	43.52
4	41.00	40.82	35.24	31.82	33.62	34.52	37.40	38.84	38.84	41.36	44.06	43.70
5	41.54	42.08	35.24	32.00	33.80	34.52	37.76	37.58	37.22	41.54	44.42	45.14
6	42.44	40.82	34.52	32.00	33.80	33.98	37.76	36.86	38.84	42.62	44.60	44.24
7	42.26	41.36	33.44	32.00	33.44	33.62	37.94	-	39.92	43.16	44.78	43.52
8	42.44	42.62	32.54	32.72	34.16	33.80	37.40	-	38.48	41.72	44.60	44.06
9	41.90	42.44	32.90	33.26	33.26	33.80	36.68	40.64	37.58	42.80	44.42	44.06
10	40.46	42.08	33.62	32.90	34.52	34.52	37.22	38.48	37.76	43.88	44.24	44.06
11	39.56	42.80	34.52	32.90	34.88	35.06	35.96	38.12	38.66	41.36	44.42	42.98
12	38.30	42.08	34.34	32.72	35.24	35.78	37.58	37.04	39.56	42.62	44.78	43.34
13	41.18	40.82	33.80	32.54	35.42	35.78	37.58	-	38.66	43.52	44.78	42.44
14	41.18	40.64	33.26	33.26	35.60	35.60	37.04	-	38.30	42.26	43.70	42.44
15	41.00	39.02	33.44	33.44	35.96	35.60	36.86	-	39.20	43.34	42.62	42.26
16	41.18	38.48	33.26	33.80	35.96	35.60	37.04	35.96	39.02	42.62	43.16	42.08
17	40.64	38.48	32.72	33.80	36.14	35.96	38.12	35.60	38.48	41.36	44.42	42.44
18	40.28	37.76	33.26	32.90	36.86	35.96	38.12	37.22	39.92	42.80	43.88	41.90
19	40.46	37.76	32.54	33.98	36.68	35.24	37.76	38.12	40.10	42.80	44.78	41.00
20	41.00	39.02	33.62	35.24	-	36.32	37.94	39.02	40.64	43.88	43.34	40.82
21	40.10	38.84	33.62	35.42	-	-	37.58	38.48	39.56	42.80	43.70	40.64
22	39.92	38.12	33.98	35.06	35.24	-	39.02	38.48	38.84	43.70	44.06	41.00
23	40.82	37.58	34.88	34.88	35.06	-	38.12	38.12	39.56	44.42	-	41.72
24	41.72	37.58	34.16	33.62	34.34	37.40	37.94	36.68	41.00	43.70	-	41.72
25	41.54	37.58	32.72	34.70	34.16	37.22	38.12	37.76	41.18	44.06	42.08	43.52
26	41.36	38.30	33.44	35.06	34.16	37.22	38.48	37.94	41.36	44.06	42.80	42.62
27	40.82	-	32.90	34.34	33.26	36.86	37.22	38.12	39.92	44.24	43.52	43.70
28	41.00	-	32.90	34.70	33.26	37.04	37.58	38.66	41.36	43.52	43.70	43.70
29	41.54	37.40	33.80	35.24	---	36.86	37.40	38.84	40.10	43.34	43.88	43.70
30	41.18	36.32	34.34	35.78	---	36.86	38.66	39.02	42.26	43.70	43.16	42.44
31	40.64	---	32.72	34.70	---	36.86	---	38.12	---	43.70	44.42	---
Minimum	**38.30**	**36.32**	**32.54**	**31.82**	**32.18**	**33.62**	**35.96**	**35.60**	**37.22**	**41.36**	**42.08**	**40.64**
Mean	**40.95**	**39.77**	**33.90**	**33.59**	**34.46**	**35.57**	**37.62**	**38.04**	**39.42**	**42.96**	**44.00**	**42.86**
Maximum	**42.44**	**42.80**	**36.68**	**35.78**	**36.86**	**37.40**	**39.02**	**40.64**	**42.26**	**44.42**	**44.96**	**45.14**

Appendix B-2: Mean daily water temperature (in degrees Fahrenheit) recorded at the Longmire Stream Gage during water year 2017.

Date	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	41.34	40.86	36.31	32.98	33.10	34.88	38.48	38.45	39.93	44.61	46.30	45.18
2	42.10	41.22	36.88	32.47	32.50	35.36	38.16	39.20	40.57	44.90	46.67	45.28
3	42.06	41.51	37.13	32.11	33.10	35.40	37.81	40.44	40.80	45.05	46.55	45.04
4	41.71	41.54	35.82	31.95	34.23	35.23	38.05	39.84	40.11	44.30	46.08	45.11
5	42.66	42.41	35.50	32.09	34.10	35.21	38.17	38.46	40.62	44.62	46.19	45.96
6	43.22	41.26	34.99	32.12	34.02	34.43	38.29	37.61	41.95	45.56	46.30	45.14
7	43.10	41.97	34.16	32.31	33.97	33.90	38.50	-	41.88	45.34	46.43	44.56
8	44.10	42.97	33.04	33.05	34.43	34.09	37.66	-	39.88	44.79	46.30	44.78
9	43.39	42.97	33.52	33.52	33.86	34.51	37.57	42.24	38.89	45.42	46.26	45.14
10	41.77	42.62	34.32	33.82	34.91	34.96	37.63	40.30	39.56	45.07	46.28	45.12
11	40.82	43.30	34.66	33.24	35.41	35.39	37.18	38.90	41.14	44.29	45.92	44.49
12	40.18	43.22	34.68	33.01	35.83	36.34	38.00	38.07	40.08	45.32	46.12	44.89
13	42.05	41.12	34.20	33.07	36.06	36.37	38.05	-	40.53	45.27	45.75	43.86
14	42.15	41.05	33.43	33.59	36.33	35.78	37.66	-	40.22	45.10	44.98	43.69
15	41.40	40.76	33.89	33.72	36.69	36.28	37.90	-	39.73	45.92	44.83	43.76
16	41.58	38.90	33.64	34.16	36.20	36.28	38.19	37.00	39.41	44.30	45.32	43.41
17	40.95	38.84	33.24	34.59	36.63	36.43	38.75	37.04	40.27	44.26	46.12	43.27
18	40.87	37.97	33.59	33.29	37.06	36.82	38.62	39.58	40.80	45.47	45.74	42.46
19	41.10	38.44	33.49	34.94	36.92	36.05	38.16	40.77	42.66	45.30	45.90	41.53
20	41.54	39.31	33.95	35.42	-	36.75	38.67	40.91	43.03	45.39	44.80	41.31
21	40.74	39.31	34.06	35.62	-	-	39.26	40.68	41.96	45.65	45.49	41.67
22	40.62	38.74	34.53	35.46	35.96	-	39.42	40.44	42.03	46.46	45.79	42.16
23	41.30	38.07	35.10	35.27	35.38	-	38.72	40.65	43.08	46.44	-	43.11
24	42.02	37.64	34.48	34.31	35.04	37.69	38.50	38.45	43.75	46.05	-	43.87
25	41.72	38.03	33.32	34.85	34.61	37.76	38.81	40.22	43.95	46.45	44.59	44.03
26	41.83	38.59	33.86	35.37	34.45	37.39	38.76	40.78	43.28	46.46	44.73	44.69
27	41.48	-	33.38	34.96	34.14	37.33	38.40	40.99	42.89	46.25	45.22	45.22
28	41.45	-	33.29	35.34	33.79	37.28	38.59	40.87	42.54	45.93	45.04	44.96
29	41.72	37.76	34.42	35.68	---	37.25	38.55	41.11	43.45	45.95	45.10	44.16
30	41.51	36.93	34.59	36.11	---	37.67	39.23	39.70	44.81	46.26	44.97	43.09
31	41.16	---	33.38	35.56	---	37.95	---	39.98	---	46.23	45.77	---
Minimum	**40.18**	**36.93**	**33.04**	**31.95**	**32.50**	**33.90**	**37.18**	**37.00**	**38.89**	**44.26**	**44.59**	**41.31**
Mean	**41.73**	**40.26**	**34.35**	**34.00**	**34.95**	**36.10**	**38.32**	**39.72**	**41.46**	**45.43**	**45.71**	**44.03**
Maximum	**44.10**	**43.30**	**37.13**	**36.11**	**37.06**	**37.95**	**39.42**	**42.24**	**44.81**	**46.46**	**46.67**	**45.96**

Appendix B-3: Maximum daily water temperature (in degrees Fahrenheit) recorded at the Longmire Stream Gage during water year 2017.

Date	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	42.44	41.36	36.68	33.44	34.52	35.96	39.20	39.38	41.36	48.38	49.82	47.48
2	44.42	41.54	37.04	33.08	32.90	36.14	39.02	41.00	44.06	49.28	49.28	47.84
3	43.16	41.90	37.40	32.36	33.62	35.96	39.20	42.26	43.70	48.38	48.74	47.12
4	42.98	42.44	36.68	32.18	34.88	36.14	38.84	41.72	42.62	48.20	48.74	46.94
5	44.42	42.62	35.78	32.36	34.34	36.32	38.66	38.66	45.50	49.10	48.56	47.48
6	44.78	42.08	35.42	32.36	34.34	35.06	39.20	38.84	46.40	49.82	48.92	46.58
7	45.14	42.98	34.88	32.72	34.52	34.16	39.02	-	45.32	48.74	48.92	46.22
8	44.78	43.34	33.44	33.26	34.70	34.34	37.94	-	40.64	48.74	49.10	45.32
9	45.32	43.70	33.80	33.62	34.52	34.88	38.84	43.16	40.82	48.74	49.10	46.58
10	43.34	43.34	34.88	34.34	35.06	35.60	38.30	42.62	41.72	46.76	49.10	46.94
11	42.62	43.88	34.88	33.62	36.14	35.96	38.48	39.92	44.60	48.20	47.84	46.94
12	42.26	43.70	34.88	33.26	36.50	37.22	38.66	39.38	40.64	48.92	48.20	47.30
13	43.52	41.90	34.70	33.62	37.04	36.68	38.48	-	42.80	48.02	47.30	45.68
14	43.70	41.54	33.80	33.98	37.04	35.96	38.30	-	42.08	48.74	46.94	45.50
15	41.90	41.54	34.16	34.16	37.04	36.68	39.56	-	40.46	49.28	47.84	46.40
16	41.90	39.20	34.16	34.70	36.32	37.04	39.38	38.30	39.74	46.40	48.38	45.32
17	41.54	39.20	33.62	34.88	37.22	37.04	39.38	38.48	42.26	48.20	48.92	44.60
18	41.36	38.48	33.80	33.98	37.22	37.22	39.20	42.80	42.08	49.28	48.02	43.34
19	41.72	39.02	34.16	35.60	37.04	37.04	38.66	44.24	46.94	48.38	48.02	42.08
20	41.90	39.56	34.16	35.60	-	37.22	39.92	43.88	46.76	47.66	46.76	41.72
21	41.72	39.74	34.34	35.96	-	-	41.54	43.88	45.50	49.10	48.92	42.98
22	41.18	39.38	35.06	35.96	36.86	-	40.64	43.88	46.94	50.00	48.38	43.34
23	41.90	39.02	35.42	35.78	35.96	-	39.20	44.42	48.56	49.10	-	44.96
24	42.44	37.76	34.88	34.88	35.96	38.12	39.02	41.18	48.20	48.92	-	46.94
25	42.26	38.48	34.16	35.06	35.24	38.48	39.74	44.78	48.02	50.00	47.30	44.60
26	42.62	38.84	34.52	35.96	35.24	37.94	39.20	45.68	46.58	49.64	47.48	47.84
27	42.44	-	33.62	35.60	34.52	37.94	39.92	45.86	46.94	48.92	47.66	47.66
28	42.08	-	33.80	36.32	34.34	37.58	39.92	44.60	44.24	49.28	47.12	47.12
29	42.08	38.30	34.88	36.32	---	37.76	39.74	44.78	47.84	49.46	47.12	44.96
30	41.90	37.58	35.06	36.50	---	38.66	40.10	40.64	48.56	49.82	47.48	44.06
31	41.72	---	34.34	35.96	---	39.20	---	42.44	---	49.64	48.02	---
Minimum	**41.18**	**37.58**	**33.44**	**32.18**	**32.90**	**34.16**	**37.94**	**38.30**	**39.74**	**46.40**	**46.76**	**41.72**
Mean	**42.76**	**40.80**	**34.79**	**34.43**	**35.50**	**36.73**	**39.24**	**42.18**	**44.40**	**48.81**	**48.21**	**45.73**
Maximum	**45.32**	**43.88**	**37.40**	**36.50**	**37.22**	**39.20**	**41.54**	**45.86**	**48.56**	**50.00**	**49.82**	**47.84**

Appendix C: WY2017 air temperature data tables

Note: Dates marked with a single dash (-) indicate those days excluded from analysis in Table 2 and described in “Outages” section of report.

Appendix C-1: Minimum daily air temperature (in degrees Fahrenheit) recorded at the Longmire Stream Gage during water year 2017.

Date	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	41.90	41.31	32.15	20.18	19.71	29.95	35.45	35.17	46.08	52.53	52.24	50.03
2	40.72	40.99	32.23	13.55	23.33	31.14	32.08	36.29	44.03	50.89	56.79	55.49
3	42.71	39.94	32.13	11.19	24.81	31.65	29.35	42.72	45.60	51.23	60.30	57.45
4	42.51	40.04	27.43	13.07	31.96	27.56	33.04	45.67	41.79	47.27	58.96	57.89
5	43.13	44.96	24.00	13.10	29.68	27.25	36.58	35.80	36.38	48.22	55.72	68.09
6	43.84	40.77	21.40	13.18	25.38	25.76	36.50	33.27	46.11	52.32	55.89	60.09
7	43.94	42.61	17.19	13.87	20.98	26.11	33.85	-	50.26	53.81	56.99	56.60
8	44.19	44.73	17.94	24.06	28.84	29.35	31.35	-	43.78	47.78	56.84	56.38
9	41.82	40.31	22.16	28.46	32.49	31.93	28.94	36.96	40.19	49.69	56.63	53.78
10	37.56	41.16	29.74	23.49	30.09	31.69	31.78	40.77	37.93	50.66	57.96	50.90
11	34.28	48.29	29.45	19.79	29.03	31.98	27.85	38.66	43.12	41.56	57.96	47.87
12	31.25	38.22	26.58	15.51	27.46	31.80	36.23	34.74	43.34	47.13	55.66	52.34
13	43.42	37.45	21.79	18.26	29.70	34.18	33.45	-	40.55	50.26	51.69	43.21
14	39.47	40.96	21.65	23.08	31.64	35.25	32.24	-	39.41	45.39	48.31	45.43
15	39.54	33.42	22.60	24.97	37.06	34.86	31.71	-	42.68	50.45	44.75	42.71
16	40.85	32.56	17.88	28.48	33.34	29.89	31.54	31.83	46.66	45.62	47.05	46.74
17	38.94	30.48	12.23	33.81	31.43	28.85	37.67	32.11	44.60	42.45	53.37	45.02
18	38.71	30.25	18.36	34.11	32.40	29.80	35.25	36.19	48.85	47.83	49.73	39.61
19	35.84	35.92	26.28	31.99	32.23	26.16	34.74	39.16	48.56	47.56	52.03	39.82
20	40.04	39.02	31.92	31.25	-	30.00	36.39	44.94	51.69	51.23	46.81	37.25
21	39.08	32.13	25.32	30.53	-	-	31.45	42.08	46.12	46.59	48.50	40.05
22	35.12	33.04	27.70	30.38	27.75	-	38.76	46.01	41.71	51.88	55.02	37.99
23	40.38	32.97	28.23	27.30	25.33	-	35.44	48.20	45.30	56.64	-	41.92
24	42.04	35.12	21.12	23.27	22.66	34.53	34.92	37.91	52.33	52.98	-	39.88
25	41.44	34.11	16.55	30.51	22.72	32.44	35.39	41.26	55.72	52.44	42.28	46.93
26	41.36	37.01	22.54	30.57	26.75	32.96	34.31	41.72	54.16	54.13	47.35	44.99
27	42.00	-	29.58	27.79	27.31	33.40	32.46	45.40	46.51	51.71	54.69	48.51
28	40.65	-	25.66	30.35	26.67	33.72	32.78	49.09	48.47	48.75	59.69	50.83
29	39.74	32.15	29.11	32.97	---	34.61	30.80	50.24	45.45	48.76	61.73	44.99
30	38.82	32.19	23.97	31.85	---	31.84	36.61	47.39	52.22	50.61	53.32	41.52
31	38.95	---	18.62	22.53	---	29.51	---	44.68	---	51.01	55.57	---
Minimum	**31.25**	**30.25**	**12.23**	**11.19**	**19.71**	**25.76**	**27.85**	**31.83**	**36.38**	**41.56**	**42.28**	**37.25**
Mean	**40.14**	**37.58**	**24.31**	**24.31**	**28.11**	**31.01**	**33.63**	**40.70**	**45.65**	**49.66**	**53.58**	**48.14**
Maximum	**44.19**	**48.29**	**32.23**	**34.11**	**37.06**	**35.25**	**38.76**	**50.24**	**55.72**	**56.64**	**61.73**	**68.09**

Appendix C-2: Mean daily air temperature (in degrees Fahrenheit) recorded at the Longmire Stream Gage during water year 2017.

Date	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	45.04	42.73	32.75	25.00	24.65	33.01	39.15	37.50	50.48	59.89	67.33	63.63
2	44.95	43.79	33.09	18.10	27.54	32.90	35.36	43.75	53.55	61.25	71.83	68.63
3	45.12	43.86	34.00	15.72	29.73	33.31	36.57	50.59	50.86	57.06	74.62	69.76
4	44.04	45.71	29.88	20.29	33.47	31.09	37.59	51.98	47.66	59.27	71.21	71.46
5	46.34	47.36	27.59	17.64	31.71	29.61	38.88	44.35	52.02	64.38	68.11	80.34
6	46.39	42.63	24.35	18.51	28.58	27.42	39.91	38.12	60.46	66.75	68.46	69.03
7	46.60	47.03	20.63	21.04	26.86	30.17	38.45	-	61.56	60.12	69.28	63.18
8	49.48	47.94	21.21	31.21	31.15	31.34	33.83	-	49.42	61.05	69.38	59.30
9	46.34	46.88	28.78	30.91	35.35	32.62	34.94	49.84	43.71	60.70	70.70	58.57
10	42.15	47.46	31.50	29.22	32.30	34.81	34.55	53.24	45.38	58.45	71.41	56.90
11	39.74	51.01	30.93	22.78	31.49	34.62	35.90	45.19	49.75	54.90	66.99	61.82
12	40.17	46.25	29.83	20.28	31.39	35.22	39.89	38.81	45.46	59.97	64.84	62.15
13	47.07	40.95	24.79	24.15	33.70	35.93	36.60	-	43.98	57.79	56.63	52.37
14	43.28	43.53	24.72	27.50	35.67	37.04	34.35	-	47.13	60.91	54.40	52.89
15	43.04	39.89	24.69	28.38	38.16	37.01	35.90	-	46.43	59.51	56.21	53.43
16	42.72	34.86	20.64	31.73	35.72	33.90	41.03	34.47	48.40	52.88	59.17	55.25
17	40.60	33.92	18.63	35.41	34.50	33.71	40.50	37.56	50.78	55.43	59.27	51.60
18	40.82	35.83	23.70	35.57	34.18	35.86	39.35	46.30	54.11	60.88	58.79	43.32
19	41.52	39.31	30.35	33.74	33.08	31.43	38.77	50.73	60.27	59.89	58.17	41.78
20	45.93	40.78	33.18	34.69	-	35.41	39.31	51.59	58.87	56.63	56.18	40.35
21	43.34	38.36	29.12	32.93	-	-	43.03	55.39	53.19	59.94	61.37	42.98
22	40.83	37.73	31.18	33.14	30.08	-	44.73	58.74	55.09	65.74	66.53	43.98
23	43.89	34.76	31.70	31.31	27.39	-	38.57	59.19	61.18	63.57	-	47.66
24	46.40	36.60	26.89	28.86	27.75	36.05	37.71	44.63	67.70	63.40	-	49.65
25	42.82	37.14	21.77	31.61	27.34	35.29	39.72	50.17	71.79	64.98	57.88	50.64
26	46.50	39.12	27.41	32.76	28.92	34.61	38.34	55.60	62.21	65.29	61.33	54.77
27	44.05	-	30.49	31.17	28.04	35.75	35.46	59.50	56.16	59.93	67.73	57.72
28	43.57	-	28.64	33.68	28.85	35.07	37.62	62.21	53.42	60.05	71.54	59.79
29	43.30	35.47	31.77	34.96	---	37.40	39.06	62.61	59.03	61.50	71.39	52.13
30	42.92	33.33	30.10	33.64	---	35.80	39.49	50.91	65.45	63.13	61.72	44.17
31	41.72	---	24.29	29.20	---	37.48	---	53.54	---	64.02	61.45	---
Minimum	**39.74**	**33.33**	**18.63**	**15.72**	**24.65**	**27.42**	**33.83**	**34.47**	**43.71**	**52.88**	**54.40**	**40.35**
Mean	**43.89**	**41.22**	**27.70**	**28.23**	**31.06**	**34.07**	**38.15**	**49.48**	**54.18**	**60.62**	**64.62**	**55.98**
Maximum	**49.48**	**51.01**	**34.00**	**35.57**	**38.16**	**37.48**	**44.73**	**62.61**	**71.79**	**66.75**	**74.62**	**80.34**

Appendix C-3: Maximum daily air temperature (in degrees Fahrenheit) recorded at the Longmire Stream Gage during water year 2017.

Date	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	49.26	45.49	33.56	27.44	29.11	37.83	44.07	40.28	56.16	68.67	84.33	81.17
2	50.23	46.37	35.01	22.11	34.93	36.72	40.22	54.95	67.14	71.75	89.96	88.34
3	49.66	48.98	35.77	24.10	33.50	36.15	48.98	69.95	58.83	64.78	92.81	86.92
4	46.78	54.39	32.27	27.88	36.61	36.25	48.14	72.56	54.99	72.15	84.67	87.23
5	49.88	49.35	29.31	25.81	32.52	34.91	44.34	49.61	68.33	81.52	81.23	95.38
6	49.74	47.02	29.62	27.72	32.21	30.59	46.59	47.15	79.76	81.37	82.86	83.90
7	51.84	52.63	27.11	27.08	32.78	32.61	45.34	-	75.76	67.09	83.06	72.23
8	52.39	54.14	24.39	36.96	32.46	33.24	38.23	-	53.54	74.35	84.42	63.87
9	52.41	56.29	31.90	32.25	39.91	33.84	43.34	65.25	50.59	71.22	87.78	66.28
10	50.91	55.10	32.56	33.70	34.02	39.71	40.05	68.94	52.51	65.44	87.67	66.88
11	50.87	55.79	31.91	26.11	36.92	38.66	45.78	53.28	59.05	67.83	78.33	82.50
12	52.06	50.24	33.15	28.95	36.51	39.69	44.22	45.64	46.50	74.06	74.80	75.77
13	50.56	43.52	31.28	31.17	41.99	38.28	41.05	-	49.26	67.66	62.99	63.13
14	47.55	47.02	28.25	34.21	40.41	38.56	40.42	-	55.64	76.41	62.64	64.11
15	46.66	44.88	27.24	33.89	40.24	40.23	43.84	-	49.41	70.37	69.23	68.32
16	45.53	40.60	24.27	35.21	37.89	40.78	51.63	38.18	49.58	62.41	72.06	66.49
17	42.61	39.28	22.80	38.11	39.94	37.85	45.51	43.62	59.09	69.32	66.60	62.50
18	44.76	40.74	28.41	37.53	36.28	40.19	45.83	59.39	65.70	74.57	69.48	46.73
19	47.98	42.31	32.51	35.27	35.62	39.70	43.15	64.62	78.58	72.37	68.10	44.91
20	51.47	42.58	36.55	39.09	-	44.02	46.87	63.78	66.43	62.69	65.90	42.47
21	50.25	43.70	33.95	39.66	-	-	56.37	73.48	60.46	72.54	79.71	47.19
22	48.66	43.59	32.65	38.27	34.83	-	50.46	79.15	69.60	80.62	81.42	52.17
23	48.88	37.36	33.26	37.28	30.73	-	42.82	76.52	77.37	71.72	-	60.64
24	50.88	38.35	30.46	35.98	34.67	39.79	41.55	52.95	85.92	76.31	-	66.57
25	45.57	40.38	28.12	32.97	32.15	40.68	45.58	61.62	93.08	78.95	69.07	56.04
26	50.21	40.29	30.91	35.78	33.08	36.39	40.69	71.60	70.10	77.33	79.42	69.27
27	46.66	-	31.75	35.89	29.75	40.29	42.99	78.48	66.39	69.60	86.47	74.99
28	49.57	-	31.62	38.26	32.64	36.99	45.35	81.63	60.84	72.14	91.32	78.50
29	49.32	39.98	34.53	44.28	---	44.25	48.99	84.44	72.52	74.54	86.96	57.17
30	48.80	34.53	34.37	36.10	---	43.20	42.02	55.71	80.10	77.15	70.83	48.01
31	44.16	---	29.56	32.11	---	50.63	---	65.34	---	79.21	71.40	---
Minimum	**42.61**	**34.53**	**22.80**	**22.11**	**29.11**	**30.59**	**38.23**	**38.18**	**46.50**	**62.41**	**62.64**	**42.47**
Mean	**48.91**	**45.53**	**30.94**	**33.26**	**35.07**	**38.64**	**44.81**	**62.24**	**64.44**	**72.46**	**78.12**	**67.32**
Maximum	**52.41**	**56.29**	**36.55**	**44.28**	**41.99**	**50.63**	**56.37**	**84.44**	**93.08**	**81.52**	**92.81**	**95.38**

Appendix D: WY2017 turbidity data tables

Note: Dates marked with a single dash (-) indicate those days excluded from analysis in Table 2 and described in “Outages” section of report.

Appendix D-1: Minimum daily turbidity (in NTU) recorded at the Longmire Stream Gage during water year 2017.

Date	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	27.15	8.27	5.23	4.61	4.32	4.32	4.09	3.63	31.62	33.41	39.69	29.87
2	17.57	8.13	5.22	4.59	4.25	4.30	4.05	3.62	23.68	31.35	43.11	28.56
3	14.75	8.10	5.13	4.60	4.36	4.28	4.03	3.60	16.67	30.55	54.32	34.00
4	12.25	8.17	5.04	4.62	4.54	4.26	3.99	3.85	15.79	37.07	48.50	43.39
5	8.54	8.05	4.96	4.65	4.51	4.25	3.95	4.22	17.38	34.24	44.63	58.88
6	7.73	7.71	4.92	4.65	4.45	4.22	3.94	3.96	16.20	34.46	47.59	55.70
7	0.32	7.27	4.92	4.66	4.43	4.22	3.92	-	16.26	32.83	46.42	63.21
8	0.39	7.33	4.97	4.65	4.44	4.22	3.90	-	23.21	32.88	47.44	46.96
9	177.13	7.83	5.01	4.61	4.87	4.22	3.87	3.58	22.68	32.49	44.49	41.55
10	36.14	8.41	4.95	4.59	5.03	4.32	3.84	14.21	17.11	33.08	46.24	41.14
11	21.25	8.14	4.91	4.58	4.87	4.32	3.78	13.15	14.67	30.55	49.20	43.61
12	16.06	8.25	4.89	4.58	4.83	4.29	3.89	10.55	14.28	29.63	40.26	42.20
13	15.00	7.64	4.85	4.59	4.90	4.28	3.91	-	15.16	29.88	35.56	39.90
14	15.92	7.27	4.86	4.57	4.64	4.36	3.83	-	13.98	27.32	31.02	36.09
15	10.48	6.84	4.83	4.56	4.62	4.81	3.80	-	15.42	29.81	27.71	30.72
16	6.68	6.58	4.82	4.56	5.07	4.63	3.79	10.92	21.60	30.15	25.42	31.67
17	5.43	6.23	4.84	4.57	4.90	4.52	3.80	11.53	23.60	30.45	22.11	30.59
18	4.76	6.00	4.86	5.33	4.75	4.57	3.79	14.57	20.62	30.05	25.30	31.22
19	4.25	5.94	4.82	4.90	4.73	4.61	3.82	16.20	25.51	29.01	21.80	19.70
20	5.86	5.89	4.88	4.74	-	4.57	3.78	15.13	27.75	27.77	22.66	16.61
21	29.39	5.80	4.83	4.64	-	-	3.75	15.11	25.96	23.49	21.81	16.67
22	18.06	5.71	4.80	4.59	4.51	-	3.78	12.46	23.35	28.37	18.05	17.21
23	14.00	5.59	4.75	4.57	4.43	-	3.72	11.15	22.46	35.52	-	16.52
24	12.56	5.53	4.70	4.54	4.40	4.34	3.71	15.95	21.93	42.15	-	17.01
25	11.23	5.46	4.64	4.52	4.40	4.30	3.71	14.91	29.15	36.23	26.89	17.71
26	10.86	5.30	4.74	4.52	4.40	4.27	3.67	12.19	37.66	36.45	29.20	22.53
27	14.74	-	4.69	4.49	4.37	4.26	3.65	13.14	31.99	38.82	24.10	23.76
28	11.98	-	4.68	4.50	4.36	4.24	3.66	12.12	30.33	38.58	24.35	33.80
29	10.61	5.21	4.66	4.47	---	4.24	3.64	12.70	26.94	37.71	24.97	36.41
30	9.68	5.22	4.63	4.53	---	4.15	3.64	16.02	26.50	36.87	33.52	27.90
31	8.72	---	4.62	4.43	---	4.13	---	24.83	---	39.13	33.22	---
Minimum	**0.32**	**5.21**	**4.62**	**4.43**	**4.25**	**4.13**	**3.64**	**3.58**	**13.98**	**23.49**	**18.05**	**16.52**
Mean	**18.05**	**6.85**	**4.86**	**4.61**	**4.59**	**4.34**	**3.82**	**11.28**	**22.32**	**32.91**	**34.47**	**33.17**
Maximum	**177.13**	**8.41**	**5.23**	**5.33**	**5.07**	**4.81**	**4.09**	**24.83**	**37.66**	**42.15**	**54.32**	**63.21**

Appendix D-2: Mean daily turbidity (in NTU) recorded at the Longmire Stream Gage during water year 2017.

Date	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	56.74	8.58	5.34	4.64	4.40	4.37	4.13	3.65	38.52	40.57	49.52	41.22
2	23.02	8.34	5.38	4.61	4.31	4.35	4.07	3.68	33.30	33.64	56.75	59.29
3	17.41	8.31	5.24	4.64	4.49	4.38	4.08	3.69	19.96	37.30	60.34	61.99
4	15.20	8.39	5.10	4.67	4.58	4.30	4.03	4.19	19.70	42.12	55.70	69.32
5	11.08	8.84	5.03	4.67	4.57	4.27	4.00	4.68	22.32	41.99	50.60	76.15
6	9.87	8.26	4.96	4.67	4.51	4.25	3.97	4.06	18.16	38.04	52.54	72.79
7	954.65	7.49	4.95	4.67	4.46	4.24	4.05	-	19.77	38.50	51.70	73.78
8	545.39	7.68	5.04	4.68	4.84	4.23	3.93	-	29.48	37.78	54.12	56.70
9	585.76	8.17	5.07	4.64	6.57	4.27	3.91	10.04	30.31	38.41	51.53	49.56
10	84.60	8.71	4.99	4.61	5.17	4.38	3.88	19.35	19.31	37.24	53.07	50.18
11	27.35	8.29	4.94	4.60	5.05	4.35	3.85	17.83	15.92	33.63	54.68	52.72
12	18.77	9.20	4.91	4.61	4.93	4.32	4.00	15.71	14.87	33.18	47.56	50.34
13	104.10	8.14	4.88	4.62	4.98	4.37	4.03	-	16.52	33.32	40.29	48.18
14	112.63	8.82	4.89	4.60	4.86	5.09	3.86	-	17.53	31.05	34.96	43.27
15	13.32	7.60	4.86	4.58	7.26	5.47	3.84	-	22.38	33.51	31.35	36.78
16	8.98	6.71	4.85	4.59	5.76	4.78	3.82	14.33	26.39	35.53	31.70	44.25
17	7.01	6.44	4.88	4.94	5.00	4.56	3.84	15.36	25.93	35.02	28.87	35.51
18	5.49	6.07	4.89	6.10	4.83	5.25	3.87	18.09	23.06	32.84	30.79	36.68
19	4.83	6.02	4.85	5.04	4.75	4.72	3.92	19.32	32.27	31.49	26.97	26.47
20	172.94	5.95	4.94	4.81	-	4.61	3.81	19.38	37.49	31.92	26.35	19.38
21	39.93	5.89	4.87	4.70	-	-	3.79	17.92	28.48	29.46	26.19	19.46
22	25.88	5.77	4.82	4.65	4.58	-	3.82	15.53	26.10	32.85	21.94	20.54
23	15.77	5.67	4.81	4.61	4.52	-	3.79	16.03	24.32	46.05	-	19.64
24	13.32	5.60	4.74	4.56	4.45	4.36	3.73	19.59	28.79	51.27	-	19.31
25	11.76	5.54	4.71	4.54	4.42	4.36	3.75	18.69	39.09	40.97	30.65	22.00
26	15.35	5.40	4.77	4.57	4.43	4.30	3.71	15.64	46.10	40.80	33.08	26.01
27	16.66	-	4.74	4.53	4.40	4.27	3.69	15.93	37.68	42.28	31.79	30.32
28	13.23	-	4.71	4.54	4.39	4.27	3.68	16.81	32.90	40.56	30.03	41.82
29	11.23	5.30	4.68	4.53	---	4.28	3.67	18.16	31.29	42.46	31.96	42.24
30	10.14	5.34	4.68	4.55	---	4.22	3.66	21.10	37.44	41.98	42.43	32.94
31	9.38	---	4.65	4.50	---	4.18	---	27.94	---	43.43	39.78	---
Minimum	**4.83**	**5.30**	**4.65**	**4.50**	**4.31**	**4.18**	**3.66**	**3.65**	**14.87**	**29.46**	**21.94**	**19.31**
Mean	**95.54**	**7.16**	**4.91**	**4.69**	**4.87**	**4.46**	**3.87**	**14.49**	**27.18**	**37.72**	**40.59**	**42.63**
Maximum	**954.65**	**9.20**	**5.38**	**6.10**	**7.26**	**5.47**	**4.13**	**27.94**	**46.10**	**51.27**	**60.34**	**76.15**

Appendix D-3: Maximum daily turbidity (in NTU) recorded at the Longmire Stream Gage during water year 2017.

Date	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	117.71	9.23	5.48	4.66	4.48	4.41	4.70	3.71	52.40	51.11	81.87	137.42
2	30.58	9.58	5.55	4.63	4.38	5.73	4.14	3.76	42.15	37.55	69.19	138.42
3	19.71	8.56	5.39	4.66	4.74	4.70	4.30	3.90	38.10	45.47	65.85	115.20
4	20.71	8.73	5.20	4.91	4.72	4.44	4.17	5.10	27.53	51.49	63.45	96.96
5	17.03	13.84	5.10	4.70	5.03	4.31	6.05	5.40	27.70	68.33	58.59	99.00
6	23.98	11.99	5.03	4.70	4.72	4.33	4.03	4.21	21.16	44.82	58.91	92.93
7	1818.04	7.78	4.99	4.69	4.54	4.30	4.48	-	26.58	44.19	57.54	89.40
8	1688.37	8.27	5.12	4.70	5.44	4.25	4.20	-	35.85	45.47	61.93	66.95
9	1669.96	8.65	5.15	4.67	8.72	4.46	4.36	89.34	37.27	46.40	59.72	57.55
10	187.14	9.18	5.04	4.70	5.43	4.60	4.05	32.53	24.18	43.60	63.15	63.36
11	40.60	8.53	5.00	4.61	11.17	4.40	3.95	25.27	18.73	36.53	64.55	69.58
12	29.91	13.63	4.95	4.69	5.12	4.42	4.20	23.39	15.69	37.34	53.00	59.42
13	770.06	9.05	4.91	4.74	5.07	4.63	4.12	-	19.46	38.09	47.25	58.39
14	1572.92	11.62	4.93	4.84	5.51	9.74	3.98	-	28.34	32.79	39.63	60.57
15	23.48	13.47	4.89	4.61	20.28	7.08	4.10	-	62.17	41.87	36.18	42.74
16	12.30	7.05	4.91	5.93	7.46	5.05	3.98	20.63	33.27	40.05	48.86	53.83
17	10.07	6.58	4.93	7.94	5.18	4.62	4.64	20.85	35.78	78.62	34.97	53.27
18	7.25	6.22	5.08	7.34	4.94	6.45	4.02	21.66	27.23	39.98	34.78	45.10
19	6.06	6.11	4.89	5.46	4.79	4.82	4.04	23.85	43.30	37.32	34.64	33.94
20	900.78	6.02	5.20	5.00	-	4.94	3.84	25.81	49.76	36.65	31.31	23.60
21	48.80	5.98	5.28	4.75	-	-	4.23	24.17	33.32	33.88	33.38	26.30
22	30.23	5.82	4.85	4.71	4.75	-	3.94	30.26	37.36	41.10	27.18	28.61
23	18.47	5.74	4.86	4.70	5.21	-	3.84	25.83	26.66	56.51	-	25.58
24	14.26	5.70	4.80	4.59	4.50	4.38	3.94	31.02	37.38	59.03	-	29.25
25	12.73	6.07	4.80	4.56	4.45	5.57	3.85	23.65	47.88	46.00	35.65	28.24
26	30.05	5.49	4.90	4.60	4.64	4.46	3.79	20.38	66.10	45.00	40.90	31.10
27	25.17	-	4.85	4.63	4.47	4.31	3.82	21.43	43.89	50.52	37.49	40.89
28	14.86	-	4.94	4.58	4.45	4.32	3.72	23.22	41.95	43.52	40.11	51.29
29	11.96	5.40	4.72	4.61	---	4.35	4.08	28.99	40.52	51.18	43.91	50.39
30	10.96	5.49	4.74	4.71	---	4.34	3.74	27.05	47.93	47.17	50.37	41.60
31	10.12	---	4.69	4.73	---	5.89	---	34.00	---	49.44	46.37	---
Minimum	**6.06**	**5.40**	**4.69**	**4.56**	**4.38**	**4.25**	**3.72**	**3.71**	**15.69**	**32.79**	**27.18**	**23.60**
Mean	**296.59**	**8.21**	**5.01**	**4.95**	**5.93**	**4.98**	**4.14**	**23.05**	**36.32**	**45.84**	**48.99**	**60.36**
Maximum	**1818.04**	**13.84**	**5.55**	**7.94**	**20.28**	**9.74**	**6.05**	**89.34**	**66.10**	**78.62**	**81.87**	**138.42**

Appendix E: WY2017 precipitation data table

Notes:

Dates marked with a single dash (-) indicate those days excluded from analysis in Table 2 and described in “Outages” section of report.

Precipitation equipment at this site is unheated and will not record accurately during times of frozen precipitation.

Appendix E-1: Total daily precipitation (in inches) recorded at the Longmire Stream Gage during water year 2017.

Date	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	0.09	0.19	0.35	0.00	0.01	0.46	0.20	0.23	0.28	0.00	0.00	0.00
2	0.01	0.08	0.93	0.00	0.00	0.23	0.04	0.14	0.00	0.00	0.00	0.00
3	0.06	0.02	0.78	0.16	0.49	0.93	0.00	0.06	0.00	0.00	0.00	0.00
4	0.63	0.00	0.10	0.02	1.22	0.15	0.05	0.53	0.00	0.00	0.00	0.00
5	0.14	0.94	0.01	0.09	0.32	0.07	0.02	0.44	0.00	0.00	0.00	0.00
6	0.41	0.34	0.10	0.07	0.09	0.17	0.37	0.01	0.00	0.00	0.00	0.00
7	0.55	0.05	0.17	0.00	0.11	0.09	1.01	-	0.01	0.00	0.00	0.00
8	0.87	0.00	0.00	0.20	0.35	0.10	0.11	-	0.65	0.00	0.00	0.01
9	1.35	0.08	0.01	0.07	2.48	1.18	0.13	0.00	0.36	0.00	0.00	0.03
10	0.03	0.00	0.10	0.12	0.25	1.05	0.25	0.00	0.02	0.00	0.00	0.00
11	0.00	0.01	0.01	0.01	0.44	0.82	0.07	0.21	0.00	0.00	0.00	0.00
12	0.01	0.32	0.10	0.31	0.01	0.01	0.93	0.06	0.13	0.00	0.00	0.00
13	1.93	0.55	0.20	0.11	0.00	1.36	0.24	-	0.08	0.00	0.24	0.00
14	1.74	0.85	0.00	0.16	0.03	1.44	0.15	-	0.00	0.00	0.00	0.00
15	1.07	0.92	0.00	0.01	1.39	1.10	0.04	-	0.81	0.00	0.00	0.00
16	0.69	0.15	0.00	0.00	1.17	0.01	0.01	1.15	0.30	0.00	0.00	0.00
17	1.76	0.10	0.00	1.08	0.01	0.86	0.36	0.54	0.13	0.00	0.00	0.41
18	0.56	0.00	0.13	0.86	0.27	1.05	0.52	0.01	0.15	0.00	0.00	0.46
19	0.08	0.06	0.26	0.08	0.24	0.02	0.35	0.00	0.00	0.00	0.00	0.85
20	1.60	0.20	0.78	0.00	-	0.04	0.18	0.00	0.00	0.00	0.00	0.25
21	0.03	0.12	0.26	0.07	-	-	0.00	0.00	0.00	0.00	0.00	0.06
22	0.00	0.14	0.02	0.08	0.05	-	0.53	0.00	0.00	0.00	0.00	0.08
23	0.05	0.48	0.12	0.00	0.01	-	0.54	0.00	0.00	0.00	-	0.00
24	0.20	1.11	0.02	0.01	0.00	0.77	0.38	0.00	0.00	0.00	-	0.00
25	0.12	0.22	0.11	0.08	0.00	0.14	0.19	0.01	0.00	0.00	0.00	0.03
26	1.63	0.03	0.01	0.08	0.13	0.33	0.77	0.00	0.00	0.00	0.00	0.00
27	0.26	-	0.01	0.01	0.04	0.23	0.45	0.00	0.00	0.00	0.00	0.00
28	0.02	-	0.31	0.00	0.06	0.72	0.01	0.00	0.00	0.00	0.00	0.00
29	0.09	0.05	0.36	0.06	---	0.66	0.27	0.00	0.00	0.00	0.00	0.04
30	0.29	0.43	0.20	0.00	---	0.34	0.30	0.01	0.00	0.00	0.00	0.57
31	1.32	---	0.01	0.03	---	0.00	---	0.04	---	0.00	0.00	---
Minimum	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Mean	**0.57**	**0.27**	**0.18**	**0.12**	**0.35**	**0.51**	**0.28**	**0.13**	**0.10**	**0.00**	**0.01**	**0.09**
Maximum	**1.93**	**1.11**	**0.93**	**1.08**	**2.48**	**1.44**	**1.01**	**1.15**	**0.81**	**0.00**	**0.24**	**0.85**

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