

*Your Community Energy Partner*

June 25, 2018

**VIA ELECTRONIC FILING**

Kimberly D. Bose, Secretary  
Nathaniel J. Davis, Sr., Deputy Secretary  
Federal Energy Regulatory Commission  
888 First Street NE  
Washington, DC 20426

**Re: Fisheries and Habitat Monitoring Plan – 2017 Annual Report  
License Article 410**

Dear Secretary Bose:

Enclosed is Public Utility District No. 1 of Snohomish County's Fisheries and Habitat Monitoring Plan Annual Report for 2017 pursuant to License Article 410 for the Jackson Hydroelectric Project. The draft report was provided to the Aquatic Resource Committee for a 30-day review and comment period. Consultation documentation is included in the report's appendices.

If you have any questions on the Fisheries and Habitat Monitoring Plan Annual Report for 2017, please contact Keith Binkley, Natural Resources Manager, at (425) 783-1769 or [KMBinkley@snopud.com](mailto:KMBinkley@snopud.com).

Sincerely,

*/s/ Tom DeBoer*

Tom DeBoer  
Assistant General Manager of Generation, Power, Rates and Transmission Management  
[TADeBoer@snopud.com](mailto:TADeBoer@snopud.com)  
(425) 783-1825

Enclosed: FHMP Annual Report 2017

cc: Aquatic Resource Committee

# Henry M. Jackson Hydroelectric Project (FERC No. 2157)



## **License Article 410: Fisheries and Habitat Monitoring Plan – 2017 Annual Report**



Everett, WA

June 2018

**Final** – This document has been prepared for the District. It has been peer-reviewed by the District for accuracy and formatting based on information known at the time of its preparation and with that understanding is considered complete by the District. The document may be cited as:

District. 2018. License Article 410: Fisheries and Habitat Monitoring Plan 2017 Annual Report, Henry M. Jackson Hydroelectric Project, FERC No. 2157. June 2018.

This document should not be cited or distributed without this disclaimer.

## Table of Contents

---

1. INTRODUCTION .....	1
2. MONITORING OF FISH HABITAT IN THE SULTAN RIVER .....	1
2.1. Riverine Habitat Monitoring .....	1
2.2. Water Temperature Monitoring .....	1
3. MONITORING OF FISH POPULATIONS IN THE SULTAN RIVER.....	4
3.1. Spawner Abundance, Distribution, and Timing in the Sultan River.....	4
3.2. Flow Ceiling, Implemented for Chinook Salmon .....	6
3.3. Juvenile Production in the Sultan River .....	6
4. SIDE CHANNEL MAINTENANCE AND MONITORING .....	7
5. FUTURE MONITORING .....	7
6. REFERENCES .....	7
APPENDIX A	2017 Water Temperature Figures
APPENDIX B	2017 Mean Daily Water Temperature Data in Tabular Format
APPENDIX C	2017 Seven-Day Average of the Daily Maximum (7-DAD Max) Water Temperature in Tabular Format
APPENDIX D	Smolt Outmigration Report, Sultan River
APPENDIX E	Side Channel Supplemental Assessments
APPENDIX F	Consultation Documentation Regarding Draft Report
APPENDIX G	Response to Comments Regarding Draft Report

## List of Figures

---

Figure 1. Locations of water temperature monitoring, Sultan watershed.....	3
Figure 2. Locations of steelhead and salmon escapement surveys, Sultan River.....	5
Figure 3. Mean Daily Discharge in the Sultan River downstream of the Powerhouse between September 15 and October 15, 2017. ....	6

## 1. INTRODUCTION

---

Public Utility District No. 1 of Snohomish County (the District) received a license on September 2, 2011 (License) from the Federal Energy Regulatory Commission (FERC) for the Henry M. Jackson Hydroelectric Project (Project) (FERC 2011). License Article 410 approved the Fisheries and Habitat Monitoring Plan (FHM Plan) filed with the FERC on September 2, 2010, with modification. Per Section 4.1 of the FHM Plan, the District is to prepare a report by June 30 of each year detailing the monitoring efforts of the previous calendar year.

This FHM Plan Annual Report covers activities conducted in calendar year 2017. Appendices A, B, and C contain water temperature data. Appendix A contains mean daily temperature in graphical format and Appendix B contains the same data in tabular format. Appendix C contains seven-day average of the daily maximum water temperature (7-DAD Max) in tabular format. Appendix D is the Smolt Outmigration Report. Appendix E contains data from the Side Channel Supplemental Assessments. This Annual Report was provided to the Aquatic Resources Committee (ARC) [consisting of the City of Everett, City of Sultan, Snohomish County, Washington Department of Ecology, Washington Department of Fish and Wildlife (WDFW), Tulalip Tribes, U.S. Forest Service, National Marine Fisheries Service, U.S. Fish and Wildlife Service and American Whitewater] for a 30-day review and comment period. Consultation documentation is included in Appendix F, with response to the comment received from WDFW in Appendix G.

## 2. MONITORING OF FISH HABITAT IN THE SULTAN RIVER

---

### **2.1. *Riverine Habitat Monitoring***

As articulated in the FHM Plan and as prescribed in the Process Flow Plan, Marsh Creek Slide Modification Plan, Side Channel Enhancement/Large Woody Debris Plan, and the Side Channel Ramping Rate Evaluation Report, the District is required to conduct a habitat survey after a high flow event or other major event causing changes in habitat conditions. In response to the flow event of November 18, 2015, the District contracted for subsequent data collection during 2016. Stillwater Sciences conducted detailed quantitative monitoring of physical habitat to document high flow induced changes in the lower, alluvial portion of the Sultan River as well as habitat changes attributable to the large scale side channel enhancement project and placement of engineered log jams. This work was in addition to prior surveys conducted by Stillwater Sciences in 2014 and prior to license issuance in 2007 and 2010. The most recent evaluation was provided in the FHM Annual Report for 2016.

### **2.2. *Water Temperature Monitoring***

Water temperature was monitored at 12 locations (Figure 1). Nine of these locations were continuously monitored (twelve months/year) and 3 locations were seasonally monitored (April through October). Monitoring locations, in order from upstream to downstream, include:

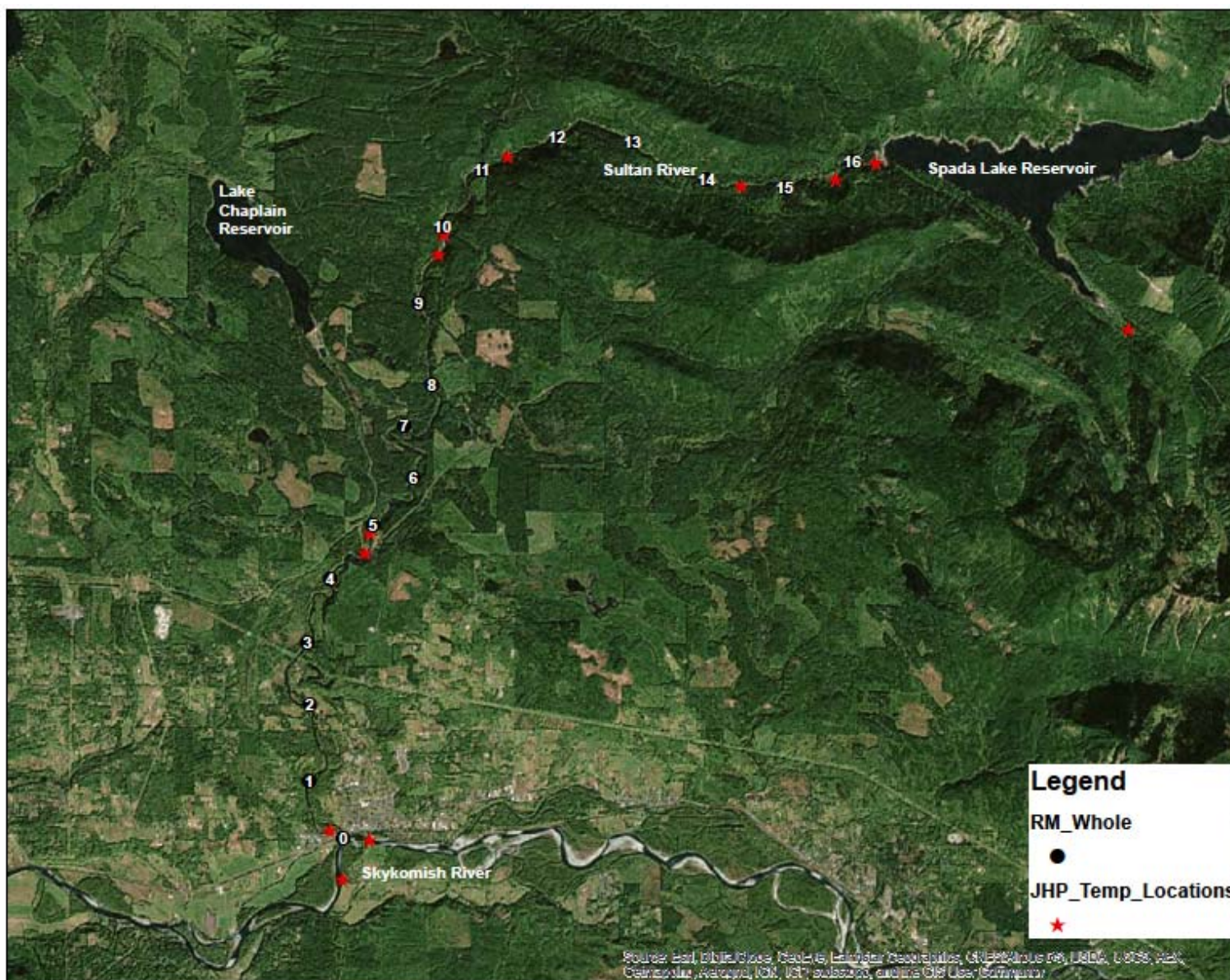
- South Fork Sultan River, upstream of Culmback Dam, near river mile (RM) 18.2 ;

- Sultan River, within the bypass reach immediately downstream of Culmback Dam, at RM 15.8;
- Sultan River, at the base of the Sultan River Canyon Trail, at RM 15.5 (April through October);
- Sultan River, within the bypass reach, near RM 14.3 (April through October);
- Sultan River, within the bypass reach, near RM 11.3 (April through October);
- Sultan River, within the bypass reach immediately upstream of the Diversion Dam, near RM 9.8;
- Sultan River, immediately downstream of the Diversion Dam, near RM 9.6 ;
- Sultan River, upstream of the Powerhouse, near RM 4.9;
- Sultan River, downstream of the Powerhouse, near RM 4.4 ,
- Sultan River, near the confluence with the Skykomish River, at RM 0.2;
- Skykomish River, upstream of the confluence with the Sultan River, at RM 14.1; and
- Skykomish River, downstream of the confluence with the Sultan River, at RM 13.2.

Water temperature monitoring at RM 14.3 and 11.3 in the Sultan River is part of the Water Temperature Conditioning Plan monitoring program; the other sites represent requirements under the original FHM Plan or subsequent revisions.

In general, water temperature in the Sultan Basin during 2017 was slightly cooler than 2016 and were consistent with those collected during 2008 and 2009 by CH2M Hill and presented in the Water Quality Final Technical Report (CH2M Hill 2009). Figures depicting water temperatures during 2017 are presented in Appendix A. A tabulation of all mean daily temperature data for 2017 is presented in Appendix B. The seven-day average of the daily maximum temperature (7-DAD Max) is presented in Appendix C.





**Figure 1.** Locations of water temperature monitoring, Sultan watershed.

### **3. MONITORING OF FISH POPULATIONS IN THE SULTAN RIVER**

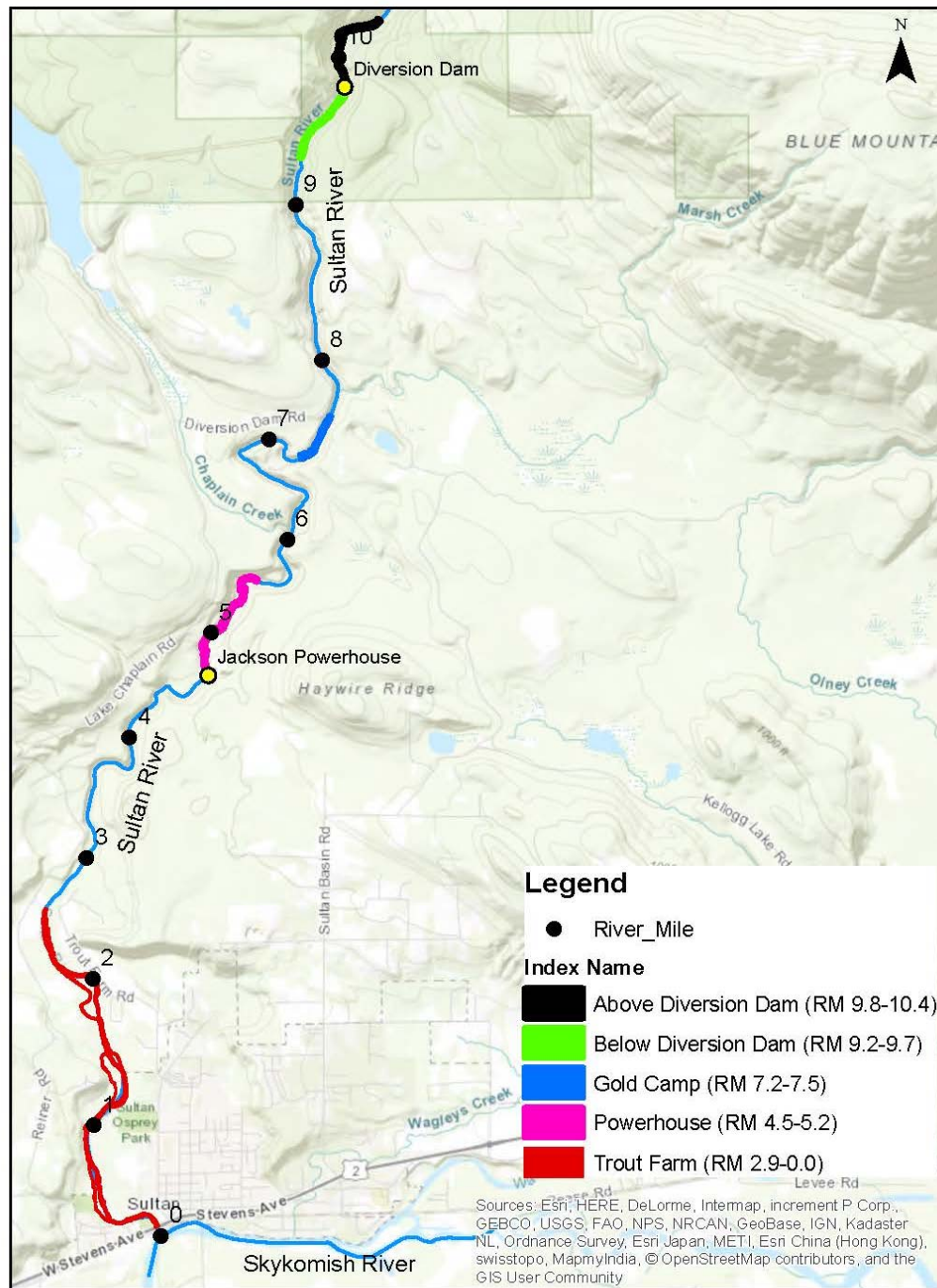
---

#### **3.1. *Spawner Abundance, Distribution, and Timing in the Sultan River***

In the Sultan River, steelhead and Chinook salmon escapement surveys are conducted during the spring and fall, respectively. These surveys are conducted, as conditions allow, within four index areas located downstream of the Diversion Dam (RM 9.7) and one index area located upstream of the Diversion Dam (Figure 2). During 2017, water visibility and flow conditions were generally favorable during both the spring and fall surveys. Spring surveys were used to develop an escapement estimate of 100 steelhead based on the direct observation of 50 redds and expanded count of 62 redds.

Fall surveys occurred between September and October 2017. These surveys were used to generate an escapement estimate of 457 Chinook based on field observations and extrapolation of 183 redds. Both the steelhead and Chinook escapement estimates were developed cooperatively with WDFW.

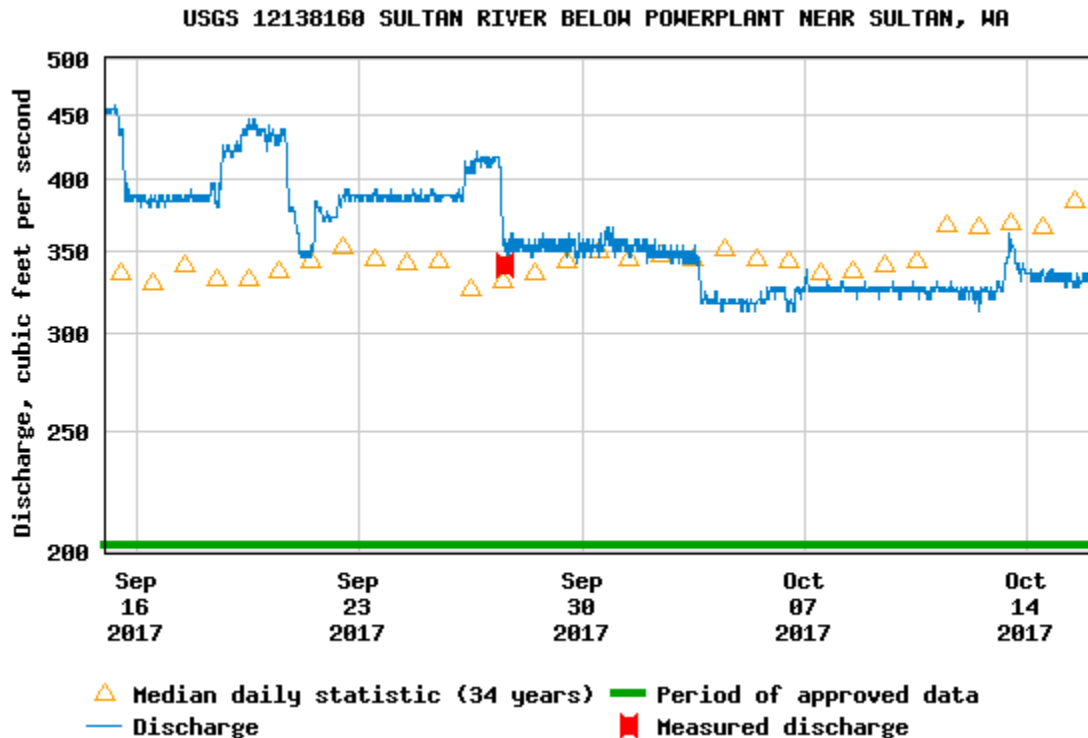




**Figure 2. Locations of steelhead and salmon escapement surveys, Sultan River.**

### 3.2. *Flow Ceiling, Implemented for Chinook Salmon*

A flow ceiling of 550 cfs is implemented annually between September 15 and October 15 in Reach 1 of the Sultan River, located downstream of the Powerhouse (RM 4.5). This ceiling ensures that areas used by spawning Chinook salmon remain wetted through the incubation and emergence periods should flows from the Project approach the minimum instream flow of 300 cfs. During 2017, mean daily discharge downstream of the Powerhouse averaged 360 cfs during the ceiling period. There were no deviations to the flow ceiling during 2017.



**Figure 3. Mean Daily Discharge in the Sultan River downstream of the Powerhouse between September 15 and October 15, 2017.**

### 3.3. *Juvenile Production in the Sultan River*

The sixth year of smolt trapping to estimate the outmigration of juvenile salmonids and production within the Sultan River was initiated on January 8, 2017. This effort involves operation of a five-foot diameter rotary screw trap positioned in the lower Sultan River near RM 0.2, just upstream of the confluence with the Skykomish River. Sampling during 2017 continued until June 29. A report presenting the results of the 2017 sampling season is presented in Appendix D.

## **4. SIDE CHANNEL MAINTENANCE AND MONITORING**

---

Since construction, the District has completed a series of detailed flow and aquatic habitat surveys in the constructed side channels in the lower Sultan River. These side channels (SC) – SC1, SC2, SC3, and SC4 – had each undergone varying degrees of construction during summer 2012 to restore and/or enhance salmonid habitat. The primary objective of the District’s surveys was to assess flow behavior and distribution and to determine whether additional downramping rate restrictions were necessary to prevent juvenile fish stranding in these side channels.

In addition to the aforementioned detailed survey effort, qualitative monitoring to assess the performance of both constructed and modified side channels, as well as the engineered log jams, was initiated after construction was completed in 2012 and has been conducted annually since. No maintenance of side channel was necessary during 2017.

Qualitative fish populations surveys (snorkel and minnow traps) were conducted during summer 2017, to document species presence, size, relative abundance, and habitat utilization of the newly constructed side channels as identified in Section 3.2.1 of the FHM Plan. Data results for these supplemental assessments are included in Appendix E.

## **5. FUTURE MONITORING**

---

The 2017 calendar year marks the sixth calendar year under the License. Monitoring methodologies employed in 2017 were consistent with those identified in the FHM Plan. Monitoring of physical habitat and water quality conditions will continue in 2018. Monitoring of spawner abundance, distribution, and timing will take place per the FHM Plan.

## **6. REFERENCES**

---

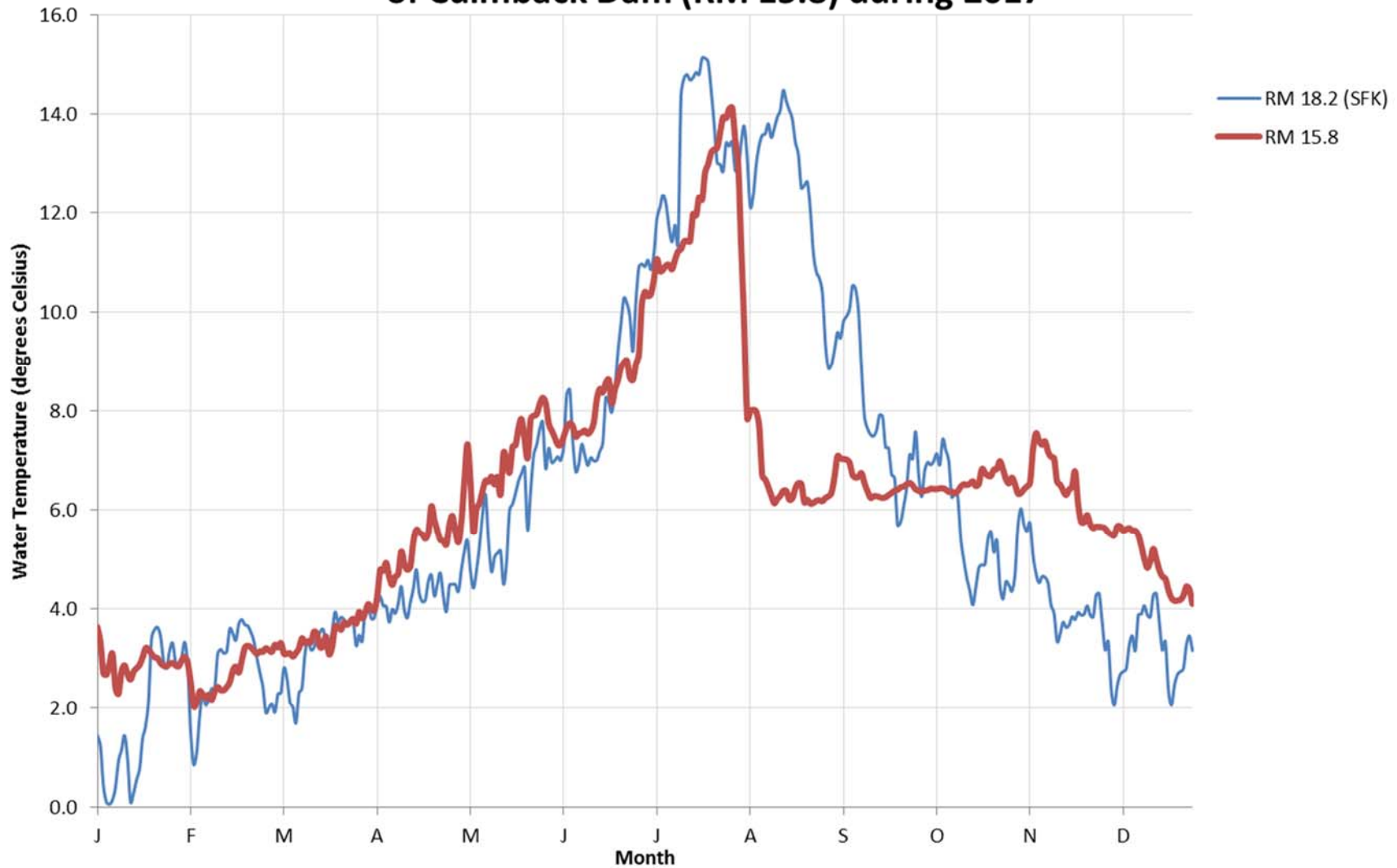
FERC. 2011. Order Issuing New License, Project No. 2157-188. 136 FERC ¶ 62,188. September 2, 2011. Available at:  
<http://www.snopud.com/Site/Content/Documents/relicensing/License/20110902LICENSE.pdf>

## **APPENDIX A**

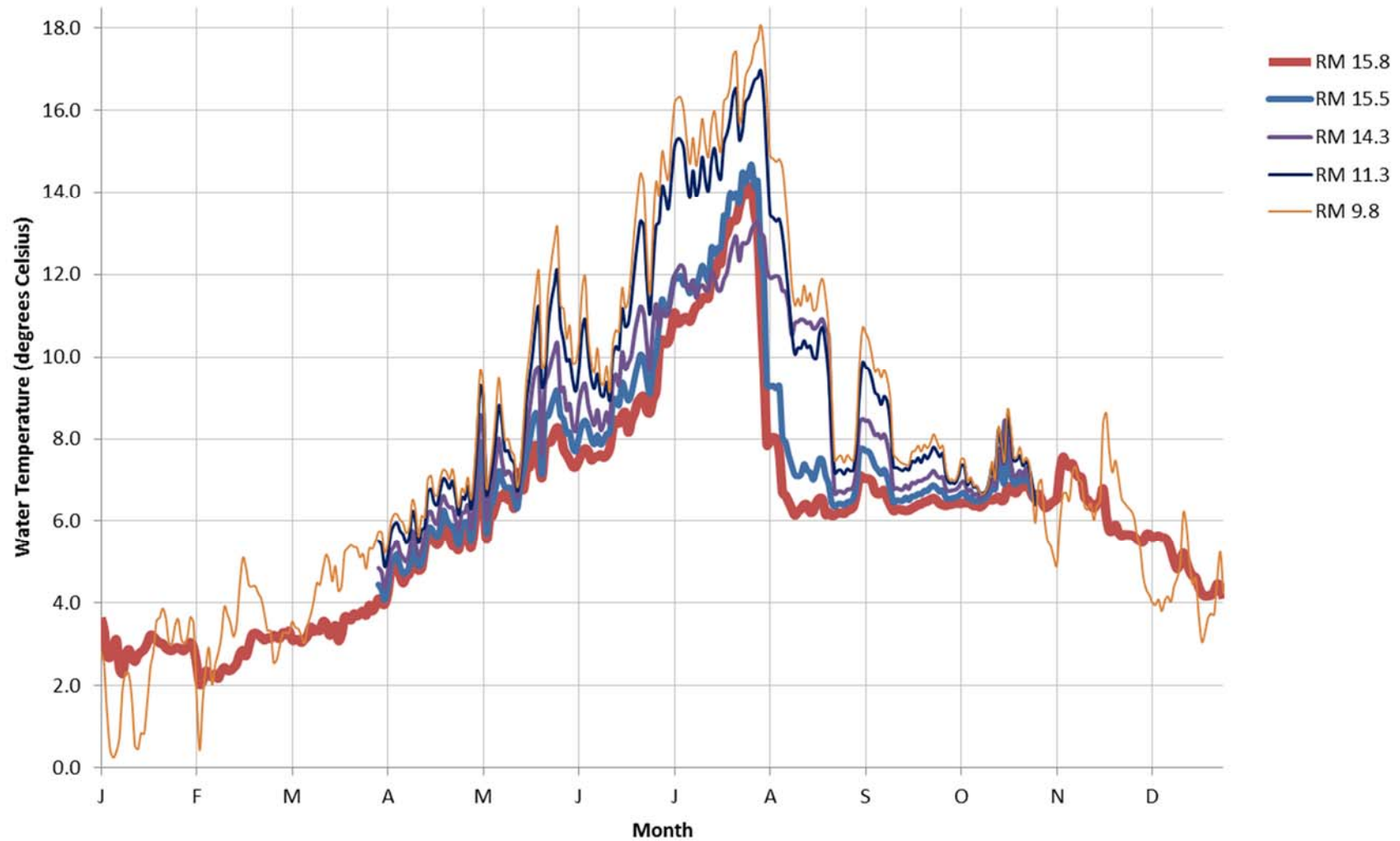
---

### *2017 Water Temperature Figures*

**Figure A-1. Mean Daily Water Temperature in the South Fork Sultan (RM 18.2), and the mainstem Sultan River immediately downstream of Culmback Dam (RM 15.8) during 2017**

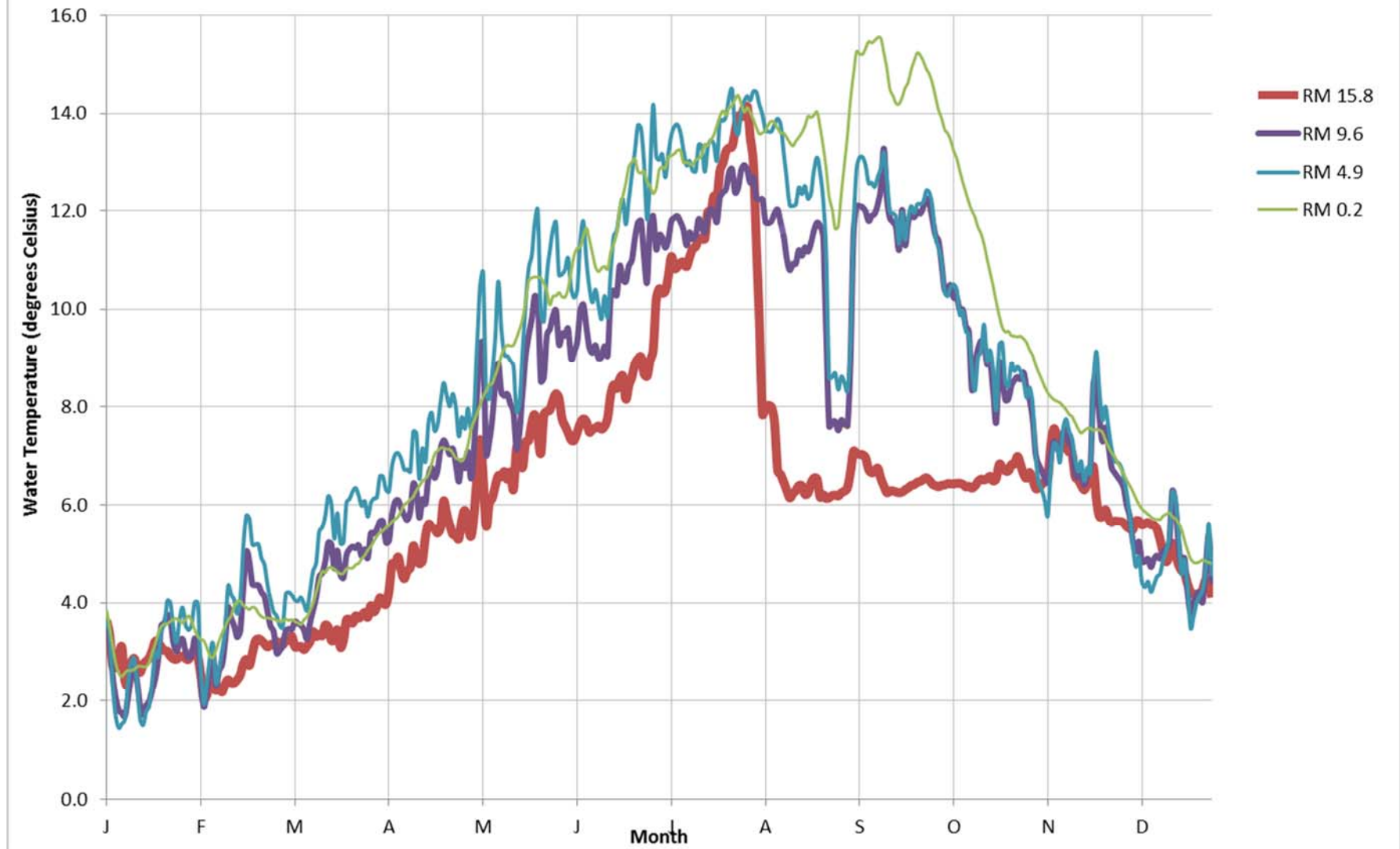


**Figure A-2. Longitudinal Depiction of Mean Daily Water Temperature in the Bypass Reach (Reach 3) of the Sultan River during 2017**

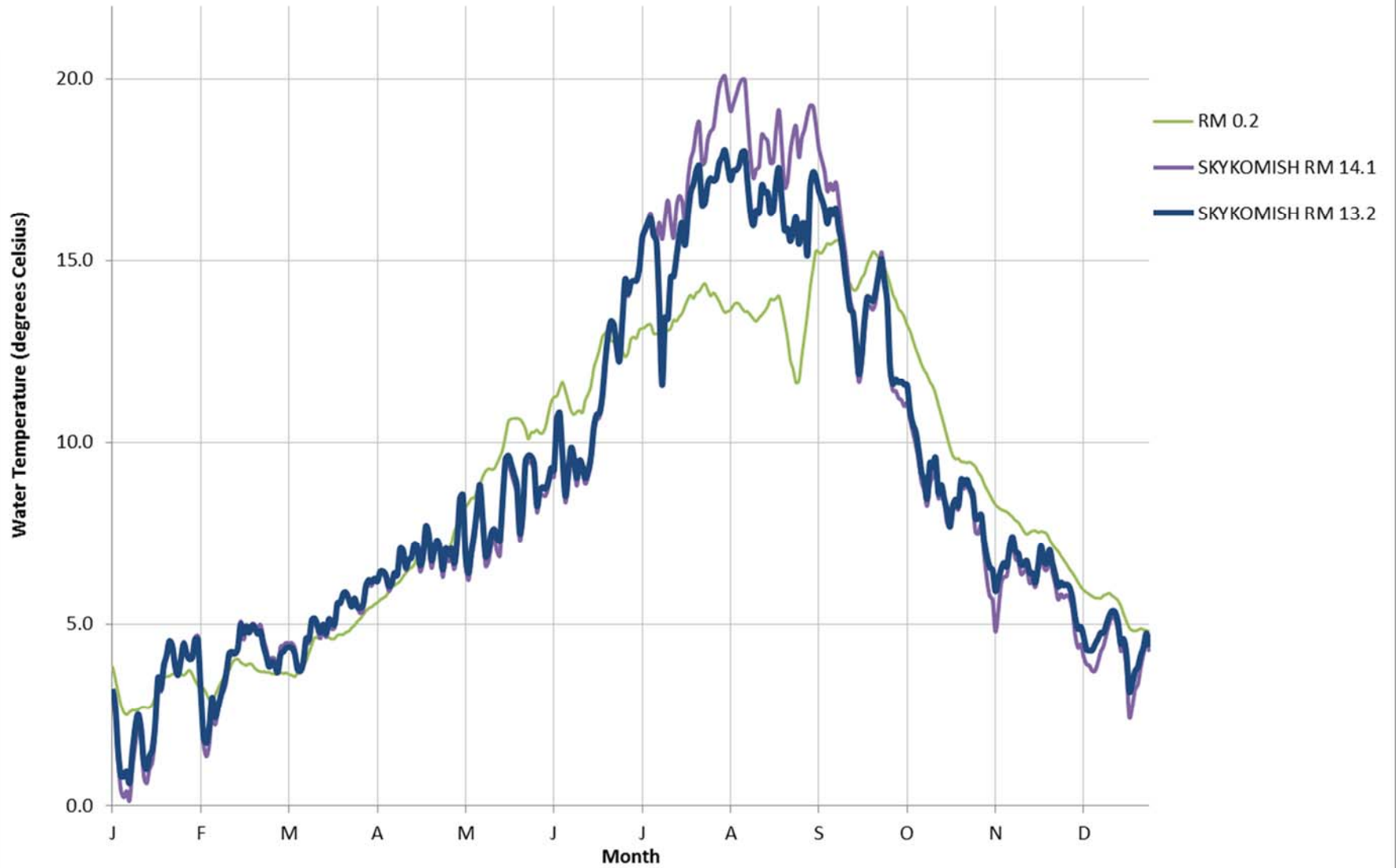




**Figure A-3. Longitudinal Depiction of Mean Daily Water Temperature, Sultan River downstream of Culmback Dam during 2017**



**Figure A-4. Mean Daily Water Temperature  
near confluence of Sultan and Skykomish rivers during 2017**



## **APPENDIX B**

---

*2017 Mean Daily Water Temperature (in degrees Celsius) Data in Tabular Format*

DATE	RM 18.2 (SFK)	Sultan River									Skykomish River	
		RM 15.8	RM 15.5	RM 14.3	RM 11.3	RM 9.8	RM 9.6	RM 4.9	RM 4.4	RM 0.2	RM 14.1	RM 13.2
1/1	1.5	3.6				2.8	3.6	3.6	5.3	3.9	3.0	3.2
1/2	1.2	3.3				2.5	3.3	3.4	5.2	3.5	2.5	2.7
1/3	0.4	2.7				1.3	2.5	2.3	4.8	3.1	1.2	1.5
1/4	0.1	2.7				0.4	2.1	1.7	4.3	2.8	0.4	0.8
1/5	0.1	2.9				0.2	1.8	1.4	3.0	2.6	0.2	0.8
1/6	0.2	3.1				0.4	1.8	1.5	2.6	2.5	0.4	0.9
1/7	0.4	2.4				0.8	1.7	1.6	1.8	2.6	0.2	0.6
1/8	0.9	2.3				1.9	2.1	2.3	2.3	2.6	1.0	1.5
1/9	1.2	2.7				2.3	2.5	2.8	2.8	2.6	1.7	2.1
1/10	1.5	2.9				2.3	2.7	2.9	2.9	2.6	2.1	2.5
1/11	1.0	2.7				1.7	2.4	2.4	2.6	2.7	1.8	2.1
1/12	0.1	2.6				0.5	1.9	1.6	2.1	2.7	0.8	1.2
1/13	0.3	2.7				0.4	1.7	1.5	1.9	2.7	0.6	1.0
1/14	0.6	2.8				0.8	1.9	1.8	2.1	2.7	1.0	1.4
1/15	0.8	2.9				0.8	2.0	1.9	2.2	2.8	1.2	1.5
1/16	1.4	3.0				1.6	2.2	2.4	2.5	3.0	2.0	2.2
1/17	1.6	3.2				2.4	2.5	3.0	2.8	3.2	3.5	3.5
1/18	2.2	3.2				2.8	2.9	2.9	2.9	3.4	3.1	3.2
1/19	3.4	3.1				3.6	3.5	3.4	3.4	3.5	3.8	3.8
1/20	3.6	3.0				3.6	3.6	3.6	3.3	3.6	4.1	4.1
1/21	3.6	3.0				3.9	3.8	4.0	3.5	3.6	4.5	4.5
1/22	3.5	2.9				3.7	3.6	4.0	3.3	3.6	4.4	4.4
1/23	3.0	2.9				3.1	3.2	3.5	3.0	3.7	3.8	3.8
1/24	2.8	2.9				3.0	3.0	3.2	2.9	3.7	3.6	3.6
1/25	3.2	2.9				3.4	3.2	3.7	3.0	3.6	4.0	4.0
1/26	3.3	2.9				3.6	3.3	3.9	3.2	3.6	4.5	4.5
1/27	2.9	2.9				3.1	3.0	3.6	3.0	3.7	4.3	4.2
1/28	2.9	2.9				3.0	2.9	3.5	2.9	3.7	4.1	4.0
1/29	3.0	3.0				3.2	2.9	3.6	2.9	3.6	4.1	4.1
1/30	3.3	3.0				3.7	3.3	4.0	3.2	3.5	4.6	4.6
1/31	2.9	2.9				3.5	3.2	4.0	3.3	3.3	4.7	4.6

DATE	RM 18.2 (SFK)	Sultan River									Skykomish River	
		RM 15.8	RM 15.5	RM 14.3	RM 11.3	RM 9.8	RM 9.6	RM 4.9	RM 4.4	RM 0.2	RM 14.1	RM 13.2
2/1	1.5	2.5				1.8	2.4	2.7	2.6	3.3	3.2	3.1
2/2	0.9	2.0				0.4	1.9	1.9	2.2	3.2	1.7	1.9
2/3	1.1	2.1				1.6	2.2	2.4	2.4	3.1	1.4	1.7
2/4	1.8	2.4				2.4	2.6	2.9	2.8	2.9	1.7	2.2
2/5	2.3	2.3				2.9	3.0	3.2	3.1	2.9	2.6	3.0
2/6	2.1	2.2				2.0	2.3	2.4	2.4	3.0	2.2	2.4
2/7	2.2	2.3				2.5	2.6	2.7	2.4	3.2	2.6	2.7
2/8	2.4	2.2				2.8	2.7	3.0	2.3	3.4	3.1	3.0
2/9	2.4	2.4				3.2	3.2	3.5	3.1	3.5	3.2	3.3
2/10	3.1	2.4				3.9	3.9	4.3	4.0	3.6	3.4	3.7
2/11	3.2	2.4				3.7	3.7	4.2	3.9	3.7	4.1	4.2
2/12	3.1	2.4				3.5	3.5	4.1	3.7	3.9	4.2	4.2
2/13	3.2	2.4				3.2	3.3	3.8	3.3	4.0	4.2	4.2
2/14	3.6	2.5				3.5	3.4	4.1	3.0	4.0	4.4	4.3
2/15	3.5	2.8				4.4	4.3	5.1	3.7	4.0	5.1	5.0
2/16	3.4	2.9				5.1	5.0	5.8	4.5	3.9	4.6	4.7
2/17	3.7	2.7				4.9	4.8	5.7	3.8	3.9	4.8	4.9
2/18	3.8	3.0				4.4	4.4	5.2	3.5	3.9	4.7	4.8
2/19	3.7	3.2				4.4	4.4	5.2	3.5	3.9	5.0	5.0
2/20	3.7	3.3				4.4	4.4	5.2	3.5	3.8	5.0	4.9
2/21	3.5	3.2				4.2	4.2	4.9	3.4	3.7	4.9	4.7
2/22	3.4	3.2				4.1	4.1	4.8	3.5	3.7	5.0	4.8
2/23	3.0	3.1				3.7	3.8	4.4	3.3	3.7	4.6	4.4
2/24	2.7	3.2				3.3	3.5	4.1	3.2	3.7	4.3	4.1
2/25	2.4	3.1				3.3	3.4	3.8	3.1	3.7	4.0	3.8
2/26	1.9	3.2				2.6	3.0	3.7	3.2	3.6	4.1	4.0
2/27	2.0	3.2				2.6	3.0	3.5	3.2	3.6	4.0	3.9
2/28	2.1	3.1				3.0	3.1	3.5	3.2	3.6	3.7	3.7

DATE	Sultan River										Skykomish River	
	RM 18.2 (SFK)	RM 15.8	RM 15.5	RM 14.3	RM 11.3	RM 9.8	RM 9.6	RM 4.9	RM 4.4	RM 0.2	RM 14.1	RM 13.2
3/1	1.9	3.3				3.3	3.4	4.2	3.3	3.7	4.4	4.2
3/2	2.3	3.2				3.3	3.5	4.2	3.4	3.6	4.4	4.2
3/3	2.3	3.3				3.3	3.5	4.2	3.4	3.7	4.5	4.4
3/4	2.8	3.1				3.6	3.6	4.1	3.4	3.6	4.5	4.4
3/5	2.6	3.1				3.4	3.6	4.0	3.3	3.6	4.5	4.3
3/6	2.1	3.1				3.4	3.5	4.1	3.2	3.6	4.3	4.2
3/7	2.0	3.1				3.2	3.4	4.0	3.1	3.7	3.8	3.8
3/8	1.7	3.1				3.0	3.3	3.8	3.1	3.7	3.8	3.7
3/9	2.3	3.2				3.5	3.6	4.2	3.2	3.9	4.1	3.9
3/10	2.4	3.4				3.7	3.9	4.6	4.2	4.0	4.5	4.6
3/11	3.1	3.3				4.1	4.1	4.8	4.1	4.2	4.5	4.6
3/12	3.4	3.4				4.5	4.5	5.5	4.5	4.4	5.0	5.1
3/13	3.2	3.3				4.4	4.6	5.5	4.7	4.6	5.1	5.2
3/14	3.2	3.6				4.8	4.8	5.8	5.1	4.6	4.8	5.0
3/15	3.4	3.5				5.2	5.2	6.2	4.9	4.7	4.6	4.8
3/16	3.5	3.2				5.0	5.2	6.0	4.4	4.7	4.9	5.0
3/17	3.6	3.3				4.5	4.7	5.3	3.9	4.7	4.6	4.7
3/18	3.4	3.5				4.9	5.1	5.8	4.4	4.6	5.0	5.1
3/19	3.2	3.1				4.3	4.6	5.2	4.1	4.6	4.9	5.0
3/20	3.5	3.2				4.4	4.5	5.2	3.9	4.6	4.9	5.0
3/21	3.9	3.7				5.2	5.0	6.0	4.2	4.7	5.5	5.6
3/22	3.7	3.7				5.3	5.1	6.1	4.2	4.7	5.5	5.6
3/23	3.8	3.6				5.4	5.1	6.3	4.3	4.7	5.9	5.8
3/24	3.8	3.7				5.4	5.1	6.3	4.4	4.8	5.9	5.9
3/25	3.7	3.7				5.3	5.2	6.2	4.5	4.8	5.7	5.7
3/26	3.8	3.7				5.1	4.9	6.0	4.3	4.9	5.5	5.5
3/27	3.8	3.8				5.2	5.1	6.1	4.5	5.0	5.7	5.7
3/28	3.3	3.7				4.8	4.9	5.8	4.6	5.1	5.4	5.5
3/29	3.5	3.9				5.3	5.4	6.0	5.1	5.1	5.3	5.4
3/30	3.4	3.8				5.3	5.4	6.1	5.3	5.3	5.4	5.5
3/31	4.0	3.9				5.5	5.5	6.2	5.1	5.4	5.9	6.0



DATE	RM 18.2 (SFK)	Sultan River									Skykomish River	
		RM 15.8	RM 15.5	RM 14.3	RM 11.3	RM 9.8	RM 9.6	RM 4.9	RM 4.4	RM 0.2	RM 14.1	RM 13.2
4/1	4.1	4.1	4.4	4.8	5.5	5.7	5.7	6.6	5.2	5.4	6.1	6.2
4/2	3.8	4.0	4.3	4.7	5.4	5.7	5.7	6.6	5.1	5.5	6.0	6.1
4/3	3.8	4.0	4.1	4.4	4.9	5.2	5.2	6.3	4.9	5.5	6.2	6.2
4/4	4.1	4.2	4.4	4.7	5.2	5.4	5.3	6.3	4.8	5.6	6.2	6.2
4/5	4.3	4.8	5.0	5.2	5.7	6.0	5.8	6.8	5.3	5.7	6.4	6.4
4/6	4.1	4.8	5.0	5.4	5.9	6.2	6.1	7.0	5.5	5.7	6.4	6.4
4/7	4.1	4.9	5.2	5.5	6.0	6.2	6.1	7.1	5.5	5.8	6.2	6.3
4/8	3.7	4.7	4.9	5.2	5.8	6.0	5.9	6.9	5.6	5.9	5.9	6.0
4/9	4.0	4.5	4.7	5.1	5.7	5.9	5.8	6.7	5.3	6.0	6.1	6.1
4/10	3.9	4.7	4.8	5.0	5.5	5.7	5.7	6.7	5.5	6.1	6.4	6.4
4/11	4.1	4.7	4.9	5.2	5.6	5.9	5.9	6.7	5.6	6.1	6.3	6.3
4/12	4.5	5.2	5.4	5.8	6.2	6.5	6.4	7.5	5.9	6.2	7.1	7.1
4/13	4.0	4.9	5.1	5.4	6.0	6.3	6.3	7.5	5.8	6.3	7.0	7.0
4/14	3.8	4.8	4.9	5.1	5.5	5.6	5.7	6.5	5.6	6.4	6.5	6.5
4/15	4.1	4.9	5.0	5.3	5.8	6.1	6.1	7.2	5.6	6.5	6.8	6.8
4/16	4.4	5.4	5.4	5.6	5.9	6.1	6.0	6.9	6.0	6.5	6.8	6.8
4/17	4.8	5.6	5.8	6.2	6.7	7.0	6.6	7.7	6.1	6.6	7.2	7.2
4/18	4.3	5.5	5.8	6.2	6.8	7.1	6.8	7.9	6.3	6.8	7.1	7.1
4/19	4.2	5.5	5.7	6.0	6.5	6.7	6.6	7.5	6.4	7.0	6.4	6.6
4/20	4.2	5.4	5.6	5.9	6.4	6.6	6.7	7.6	6.5	7.1	6.7	6.8
4/21	4.6	5.5	5.8	6.4	6.7	7.0	7.2	8.1	7.0	7.2	7.6	7.7
4/22	4.7	6.1	6.3	6.6	7.0	7.2	7.3	8.5	7.5	7.2	7.3	7.5
4/23	4.3	5.8	6.1	6.4	7.0	7.2	7.2	8.2	6.9	7.1	6.5	6.7
4/24	4.5	5.6	5.9	6.3	6.8	7.0	7.0	8.0	6.5	7.1	6.9	7.0
4/25	4.7	5.4	5.9	6.3	7.0	7.3	7.2	8.3	6.3	7.1	7.2	7.3
4/26	4.3	5.4	5.7	6.0	6.6	6.8	6.8	8.0	6.3	7.0	7.0	7.1
4/27	4.0	5.3	5.4	5.8	6.1	6.3	6.5	7.4	6.4	6.9	6.3	6.5
4/28	4.5	5.7	5.8	6.2	6.6	6.8	6.9	7.8	6.7	6.9	6.9	7.1
4/29	4.5	5.9	6.0	6.2	6.5	6.7	6.8	7.6	6.7	7.0	6.7	6.9
4/30	4.5	5.6	6.0	6.4	6.9	7.1	7.1	8.0	6.6	7.2	6.9	7.1

DATE	RM 18.2 (SFK)	Sultan River									Skykomish River	
		RM 15.8	RM 15.5	RM 14.3	RM 11.3	RM 9.8	RM 9.6	RM 4.9	RM 4.4	RM 0.2	RM 14.1	RM 13.2
5/1	4.4	5.4	5.5	5.8	6.3	6.5	6.5	7.5	6.3	7.5	6.5	6.7
5/2	4.8	5.8	6.1	6.4	6.9	7.2	7.2	7.9	6.9	7.7	7.1	7.3
5/3	5.2	6.6	7.1	7.4	8.0	8.3	8.2	9.3	7.5	7.9	8.3	8.5
5/4	5.4	7.3	7.9	8.6	9.3	9.7	9.3	10.5	8.2	8.0	8.4	8.6
5/5	4.8	6.6	7.6	8.2	9.0	9.3	9.3	10.7	8.4	8.2	6.6	6.8
5/6	4.4	5.6	5.7	6.1	6.6	6.8	7.0	8.3	7.6	8.3	6.2	6.4
5/7	4.8	6.0	6.3	6.6	6.9	7.2	7.3	8.2	7.3	8.5	6.8	7.0
5/8	5.3	6.1	6.5	6.9	7.4	7.7	7.8	8.7	7.3	8.5	7.3	7.5
5/9	5.9	6.4	6.8	7.4	8.0	8.6	8.5	9.4	7.4	8.7	8.0	8.2
5/10	6.3	6.6	7.2	8.0	8.8	9.5	8.9	10.6	7.8	8.8	8.7	8.8
5/11	5.4	6.6	7.0	7.5	8.4	8.7	8.3	9.6	8.6	9.1	7.6	7.9
5/12	4.8	6.7	6.8	7.1	7.7	8.0	8.2	9.1	8.8	9.2	6.6	6.8
5/13	5.0	6.5	6.8	7.2	7.7	8.0	8.3	9.1	8.7	9.3	6.7	7.0
5/14	5.1	6.7	6.8	7.1	7.5	7.7	8.1	8.9	8.8	9.3	7.1	7.5
5/15	5.2	6.3	6.6	6.9	7.4	7.6	7.9	8.8	8.6	9.3	7.3	7.6
5/16	4.5	7.2	6.3	6.6	6.7	6.8	7.1	7.9	8.1	9.4	7.0	7.4
5/17	5.0	7.0	6.9	7.1	7.2	7.3	7.5	8.1	8.1	9.6	6.9	7.3
5/18	6.0	6.8	7.2	7.7	8.0	8.3	8.3	9.1	8.6	9.8	8.2	8.4
5/19	6.1	7.3	7.6	8.2	8.9	9.5	9.0	10.1	9.3	10.2	9.3	9.5
5/20	6.4	7.3	8.0	8.7	9.5	10.1	9.5	10.8	9.5	10.6	9.4	9.6
5/21	6.6	7.7	8.4	9.3	10.1	10.8	9.8	11.1	9.6	10.6	9.2	9.4
5/22	6.7	7.8	8.6	9.7	10.8	11.6	10.3	11.7	10.3	10.7	8.9	9.1
5/23	6.9	7.4	8.5	9.7	11.2	12.1	10.2	12.0	10.0	10.7	8.6	8.8
5/24	5.6	7.1	7.1	7.6	9.3	9.7	8.5	9.9	8.6	10.6	7.3	7.5
5/25	6.4	7.8	8.6	9.3	9.5	9.9	8.6	9.8	8.4	10.5	7.8	8.0
5/26	7.1	7.9	8.5	9.6	10.7	11.5	9.5	10.7	9.1	10.4	9.3	9.5
5/27	7.3	7.9	8.8	9.9	11.3	12.3	9.6	11.2	9.3	10.1	9.5	9.6
5/28	7.6	8.1	9.0	10.1	11.7	12.8	9.9	11.6	9.5	10.3	9.4	9.6
5/29	7.8	8.3	9.2	10.3	12.1	13.1	10.0	11.8	9.6	10.3	9.2	9.4
5/30	6.8	8.2	8.6	9.2	10.8	11.3	9.3	10.7	9.2	10.3	8.1	8.3
5/31	7.3	7.8	8.5	9.2	10.4	11.2	9.5	10.7	9.1	10.3	8.5	8.7

DATE	RM 18.2 (SFK)	Sultan River									Skykomish River	
		RM 15.8	RM 15.5	RM 14.3	RM 11.3	RM 9.8	RM 9.6	RM 4.9	RM 4.4	RM 0.2	RM 14.1	RM 13.2
6/1	7.0	7.6	8.1	8.7	9.9	10.5	9.5	10.8	9.0	10.3	8.6	8.8
6/2	7.0	7.5	8.2	8.8	9.9	10.8	9.6	11.0	8.9	10.4	8.5	8.7
6/3	7.1	7.3	7.8	8.3	9.4	9.9	9.0	10.4	8.8	10.8	8.8	8.9
6/4	7.0	7.3	7.7	8.2	9.2	9.9	9.1	10.2	8.8	11.1	9.1	9.3
6/5	7.3	7.5	8.0	8.9	9.7	10.4	9.3	10.4	8.8	11.2	9.0	9.2
6/6	8.3	7.7	8.3	9.2	10.6	11.6	10.0	11.4	9.3	11.3	10.5	10.6
6/7	8.4	7.8	8.4	9.3	10.9	12.0	10.1	11.8	10.0	11.5	10.6	10.8
6/8	7.4	7.7	8.3	8.8	10.1	10.5	9.6	11.0	9.8	11.6	9.4	9.6
6/9	6.8	7.5	8.0	8.5	9.4	9.9	9.2	10.4	9.4	11.4	8.4	8.5
6/10	6.9	7.6	7.9	8.3	9.2	9.6	9.1	10.1	9.4	11.1	8.9	9.1
6/11	7.3	7.6	8.1	8.7	9.6	10.2	9.3	10.4	9.4	10.9	9.7	9.8
6/12	7.1	7.6	7.9	8.2	9.1	9.4	9.0	10.1	9.3	10.8	9.4	9.6
6/13	6.9	7.5	8.0	8.4	9.0	9.3	9.0	9.8	9.2	10.8	8.8	9.0
6/14	7.1	7.6	8.1	8.6	9.4	9.8	9.3	10.3	9.3	10.9	9.3	9.5
6/15	7.0	7.8	8.2	8.4	8.9	9.1	9.1	9.8	9.2	10.8	9.2	9.3
6/16	7.0	8.2	8.9	9.4	10.0	10.3	10.2	10.8	9.7	11.2	8.9	9.0
6/17	7.2	8.5	9.0	9.6	10.3	10.7	10.4	11.5	9.4	11.3	9.1	9.2
6/18	7.4	8.4	8.8	9.3	10.2	10.6	10.3	11.6	9.6	11.6	9.4	9.6
6/19	8.3	8.6	9.4	10.1	11.2	11.7	10.9	12.0	9.7	12.1	10.2	10.4
6/20	8.2	8.6	9.2	9.7	10.7	11.2	10.6	12.2	9.7	12.3	10.6	10.8
6/21	8.0	8.2	8.9	9.8	10.8	11.4	10.6	11.7	9.5	12.6	10.7	10.8
6/22	8.4	8.4	9.1	10.0	11.4	12.1	10.9	12.2	9.7	12.9	11.2	11.3
6/23	9.2	8.6	9.5	10.6	12.1	13.1	11.0	12.8	10.0	13.0	12.1	12.2
6/24	9.8	8.9	9.8	10.9	12.8	13.9	11.4	13.2	10.2	13.1	12.9	13.0
6/25	10.3	9.0	10.1	11.2	13.3	14.5	11.8	13.8	10.4	12.8	13.2	13.3
6/26	10.2	9.0	9.9	11.1	13.2	14.2	11.8	13.7	10.3	12.8	13.1	13.3
6/27	9.9	8.7	9.5	10.3	11.9	12.7	11.1	13.0	10.0	12.8	12.6	12.7
6/28	9.2	8.6	9.1	9.7	11.0	11.5	10.6	11.8	9.7	12.6	12.2	12.3
6/29	10.2	9.0	9.7	10.8	12.1	13.1	11.8	12.8	10.0	12.5	13.3	13.3
6/30	10.9	9.2	10.1	11.3	13.2	14.3	11.9	14.2	10.4	12.4	14.4	14.5

DATE	Sultan River										Skykomish River	
	RM 18.2 (SFK)	RM 15.8	RM 15.5	RM 14.3	RM 11.3	RM 9.8	RM 9.6	RM 4.9	RM 4.4	RM 0.2	RM 14.1	RM 13.2
7/1	11.0	10.2	10.8	10.7	13.3	13.9	11.2	13.1	10.2	12.5	14.0	14.1
7/2	10.9	10.4	11.4	11.1	14.1	15.0	11.5	13.1	10.1	12.8	14.4	14.4
7/3	11.1	10.3	11.0	11.0	13.9	14.6	11.5	13.2	10.3	12.9	14.5	14.4
7/4	10.9	10.4	11.1	11.1	13.6	14.3	11.3	12.7	10.1	12.9	14.5	14.5
7/5	11.2	10.7	11.6	11.5	14.3	15.3	11.4	13.2	10.4	13.1	14.8	14.8
7/6	11.9	11.1	11.9	12.0	15.1	16.2	11.8	13.6	10.5	13.1	15.7	15.6
7/7	12.1	10.8	11.9	12.1	15.3	16.3	11.9	13.7	10.6	13.2	15.9	15.8
7/8	12.4	10.9	12.0	12.2	15.3	16.3	11.9	13.8	10.6	13.2	16.1	16.0
7/9	12.2	10.9	11.8	12.1	15.1	16.0	11.8	13.6	10.6	13.2	16.3	16.2
7/10	11.7	11.0	11.7	11.7	14.3	15.2	11.6	13.2	10.5	13.0	15.9	15.7
7/11	11.4	10.9	11.5	11.6	13.9	14.7	11.3	12.9	10.4	13.0	15.6	15.5
7/12	11.8	11.1	11.8	11.8	14.5	15.3	11.6	13.0	10.5	13.0	16.0	13.8
7/13	11.4	11.2	11.7	11.4	13.9	14.6	11.4	12.8	10.5	12.9	15.6	11.6
7/14	11.7	11.3	11.9	11.7	14.2	15.1	11.5	12.8	10.5	13.1	16.2	13.4
7/15	12.1	11.4	12.2	11.7	14.9	15.8	11.8	13.4	10.8	13.1	16.7	13.4
7/16	11.6	11.4	12.0	11.6	14.3	15.2	11.7	13.3	10.8	13.2	16.1	14.6
7/17	11.3	11.4	11.9	11.6	14.0	14.9	11.6	12.8	10.7	13.4	15.6	14.6
7/18	12.1	12.0	12.6	12.1	14.8	15.7	11.9	13.3	10.9	13.3	16.5	15.1
7/19	12.2	12.0	12.5	11.9	15.1	16.0	12.0	13.5	11.0	13.5	16.8	15.7
7/20	11.9	12.3	12.6	11.6	14.5	15.3	12.0	13.4	11.0	13.6	16.6	16.0
7/21	12.1	12.3	12.6	11.6	14.3	15.0	11.8	13.0	10.9	13.8	16.0	15.4
7/22	12.6	12.8	13.4	11.9	15.2	16.2	12.3	13.9	11.2	13.9	17.2	16.2
7/23	13.1	13.0	13.4	12.0	15.4	16.3	12.4	13.8	11.3	14.1	17.8	16.9
7/24	13.1	13.2	14.0	12.4	15.8	16.6	12.5	13.9	11.4	14.0	18.1	17.1
7/25	13.6	13.3	13.9	12.7	16.4	17.3	12.8	14.3	11.6	14.1	18.6	17.5
7/26	13.7	13.3	14.0	12.9	16.5	17.4	12.9	14.5	11.7	14.2	18.8	17.6
7/27	13.4	13.6	13.7	12.3	15.3	15.7	12.4	13.7	11.5	14.3	17.7	16.5
7/28	13.4	13.9	14.5	12.7	15.5	16.0	12.5	13.6	11.5	14.4	17.7	16.6
7/29	13.4	13.9	14.2	12.7	16.2	16.8	12.8	14.0	11.8	14.2	18.3	17.1
7/30	13.5	14.1	14.5	12.8	16.3	17.0	12.9	14.2	11.9	14.0	18.6	17.3
7/31	13.7	14.1	14.7	13.1	16.5	17.2	12.8	14.4	11.5	14.1	18.7	17.2



DATE	Sultan River										Skykomish River	
	RM 18.2 (SFK)	RM 15.8	RM 15.5	RM 14.3	RM 11.3	RM 9.8	RM 9.6	RM 4.9	RM 4.4	RM 0.2	RM 14.1	RM 13.2
8/1	14.2	13.5	14.1	13.2	16.7	17.6	12.6	14.3	10.8	11.8	19.2	17.3
8/2	12.9	13.0	14.3	13.3	16.8	17.7	12.7	14.4	11.0	13.9	19.8	17.7
8/3	13.4	11.3	12.5	13.0	17.0	18.1	12.3	14.4	11.1	13.7	20.0	17.9
8/4	13.8	9.7	11.9	12.9	16.2	17.5	12.2	14.2	11.4	13.6	20.1	18.1
8/5	13.1	7.9	9.3	12.1	14.8	16.3	12.2	14.0	11.4	13.6	19.6	17.6
8/6	12.1	8.0	9.3	11.9	13.5	14.9	11.8	13.7	11.3	13.6	19.1	17.2
8/7	12.4	8.0	9.3	11.9	13.4	14.8	11.7	13.6	11.3	13.8	19.3	17.5
8/8	13.0	8.0	9.2	12.0	13.3	14.7	11.8	13.6	11.2	13.8	19.6	17.5
8/9	13.4	7.7	9.3	11.9	13.3	14.8	11.9	13.8	11.3	13.8	19.8	17.6
8/10	13.6	6.7	8.0	11.6	12.9	14.6	12.0	13.9	11.6	13.7	20.0	18.0
8/11	13.6	6.6	7.9	11.6	12.3	13.9	11.8	13.8	11.6	13.6	20.0	18.0
8/12	13.8	6.5	7.6	11.2	11.5	12.9	11.5	13.2	11.4	13.6	18.9	17.1
8/13	13.5	6.3	7.4	10.5	10.6	11.8	11.0	12.7	11.2	13.5	17.9	16.3
8/14	13.7	6.1	7.1	10.8	10.1	11.3	10.8	12.1	11.1	13.4	17.3	16.0
8/15	13.9	6.2	7.1	10.9	10.2	11.4	10.9	12.1	11.3	13.3	17.5	16.4
8/16	14.1	6.3	7.1	10.9	10.2	11.2	10.9	12.1	11.3	13.4	17.6	16.3
8/17	14.5	6.4	7.4	10.9	10.4	11.7	11.2	12.5	11.5	13.5	18.5	17.1
8/18	14.3	6.4	7.2	10.8	10.2	11.3	11.1	12.4	11.5	13.6	18.4	16.9
8/19	14.1	6.2	7.2	10.8	10.3	11.5	11.3	12.5	11.6	13.7	18.3	16.9
8/20	13.9	6.2	7.0	10.7	10.0	11.1	11.2	12.2	11.6	13.9	17.7	16.3
8/21	13.4	6.4	7.2	10.7	10.0	11.2	11.3	12.4	11.7	13.9	17.7	16.4
8/22	13.2	6.6	7.5	10.9	10.6	11.7	11.6	12.8	12.0	14.0	18.6	17.2
8/23	12.5	6.5	7.5	10.9	10.7	11.9	11.8	13.1	12.2	14.0	19.1	17.5
8/24	12.6	6.2	7.1	10.7	10.3	11.4	11.7	12.8	12.1	13.7	18.1	16.7
8/25	12.6	6.2	6.9	10.5	9.5	10.7	11.5	12.2	12.0	13.3	17.0	15.8
8/26	12.0	6.1	6.4	7.9	8.1	9.0	9.6	11.1	11.3	12.9	17.2	15.9
8/27	11.2	6.2	6.4	6.7	7.2	7.5	7.6	8.6	8.7	12.3	18.0	15.5
8/28	10.8	6.2	6.4	6.7	7.2	7.6	7.7	8.6	8.7	12.0	18.5	15.9
8/29	10.7	6.2	6.4	6.7	7.2	7.6	7.7	8.7	8.8	11.6	18.7	16.2
8/30	10.4	6.2	6.4	6.7	7.1	7.4	7.5	8.4	8.4	11.7	17.9	15.5
8/31	9.4	6.3	6.5	6.8	7.3	7.6	7.7	8.6	8.7	12.4	18.4	16.0

DATE	RM 18.2 (SFK)	Sultan River									Skykomish River	
		RM 15.8	RM 15.5	RM 14.3	RM 11.3	RM 9.8	RM 9.6	RM 4.9	RM 4.4	RM 0.2	RM 14.1	RM 13.2
9/1	8.9	6.3	6.5	6.8	7.2	7.5	7.6	8.5	8.6	13.0	18.6	16.0
9/2	8.9	6.4	6.6	6.8	7.2	7.5	7.6	8.3	10.5	13.6	19.0	15.2
9/3	9.2	6.7	6.9	7.3	7.9	8.2	8.9	9.3	13.6	14.3	19.3	17.1
9/4	9.6	7.1	7.7	8.4	9.1	9.8	11.5	11.6	13.1	14.8	19.2	17.4
9/5	9.5	7.1	7.8	8.5	9.9	10.7	12.1	12.9	13.4	15.3	18.7	17.3
9/6	9.8	7.0	7.7	8.4	9.8	10.6	12.1	13.1	13.6	15.2	18.1	16.9
9/7	9.9	7.0	7.7	8.4	9.7	10.4	12.1	13.1	13.7	15.2	17.8	16.7
9/8	10.1	7.0	7.5	8.3	9.5	10.0	12.0	12.9	13.7	15.3	17.5	16.4
9/9	10.5	6.7	7.3	8.1	9.1	9.6	11.8	12.6	13.7	15.5	16.9	16.0
9/10	10.5	6.7	7.2	8.1	9.1	9.7	11.9	12.6	13.8	15.4	17.1	16.4
9/11	10.0	6.7	7.1	8.0	8.8	9.5	11.9	12.5	13.9	15.5	16.9	16.3
9/12	8.9	6.8	7.2	8.1	9.0	9.7	12.1	12.7	14.0	15.5	17.2	16.4
9/13	7.9	6.5	7.1	7.9	8.9	9.4	12.5	12.9	14.1	15.5	16.6	15.9
9/14	7.7	6.4	6.8	7.5	8.4	8.9	13.3	13.2	14.1	15.2	16.0	15.5
9/15	7.5	6.3	6.5	6.8	7.3	7.6	12.2	12.7	13.1	14.9	15.4	14.8
9/16	7.5	6.3	6.5	6.8	7.3	7.5	11.9	12.0	12.8	14.5	14.7	14.2
9/17	7.6	6.3	6.5	6.8	7.3	7.4	11.8	12.0	12.8	14.4	13.9	13.7
9/18	7.9	6.3	6.5	6.8	7.2	7.4	11.7	11.9	12.7	14.2	13.6	13.6
9/19	7.9	6.3	6.6	6.9	7.3	7.4	11.2	11.3	12.4	14.2	12.6	12.8
9/20	7.3	6.3	6.5	6.8	7.2	7.4	12.0	12.0	12.9	14.3	11.7	11.9
9/21	7.3	6.3	6.6	6.9	7.5	7.7	11.3	11.4	12.9	14.5	12.1	12.4
9/22	6.7	6.4	6.6	6.9	7.4	7.7	11.8	11.9	13.2	14.6	13.1	13.4
9/23	6.6	6.4	6.7	7.0	7.5	7.8	11.9	12.1	13.4	14.9	13.7	14.0
9/24	5.7	6.4	6.7	7.0	7.4	7.7	11.9	12.0	13.4	15.1	13.8	13.9
9/25	5.8	6.5	6.7	7.0	7.6	7.9	12.0	12.1	13.5	15.2	13.7	13.9
9/26	6.1	6.5	6.7	7.1	7.5	7.8	11.9	12.1	13.5	15.2	13.9	14.2
9/27	6.5	6.5	6.8	7.1	7.6	7.9	12.1	12.2	13.5	15.1	14.6	14.7
9/28	7.1	6.6	6.9	7.2	7.8	8.1	12.3	12.4	13.6	14.9	15.2	15.0
9/29	7.0	6.5	6.8	7.1	7.7	8.0	12.1	12.4	13.5	14.8	14.5	14.5
9/30	7.6	6.4	6.7	7.1	7.6	7.8	11.8	12.1	13.2	14.6	13.8	13.9



DATE	Sultan River										Skykomish River	
	RM 18.2 (SFK)	RM 15.8	RM 15.5	RM 14.3	RM 11.3	RM 9.8	RM 9.6	RM 4.9	RM 4.4	RM 0.2	RM 14.1	RM 13.2
10/1	6.7	6.4	6.7	7.1	7.6	7.8	11.5	11.5	12.7	14.3	11.9	12.1
10/2	6.3	6.4	6.6	6.8	7.1	7.3	11.4	11.2	12.6	14.1	11.4	11.6
10/3	6.8	6.4	6.5	6.7	6.9	7.0	10.9	10.9	12.4	13.9	11.4	11.8
10/4	7.0	6.4	6.6	6.7	6.9	7.0	10.4	10.4	12.2	13.7	11.2	11.6
10/5	6.9	6.4	6.6	6.8	6.9	7.0	10.4	10.3	12.1	13.6	11.2	11.7
10/6	7.0	6.4	6.6	6.8	7.1	7.2	10.5	10.4	12.1	13.5	11.0	11.6
10/7	7.1	6.4	6.7	6.9	7.4	7.5	10.2	10.5	12.1	13.2	11.1	11.6
10/8	6.9	6.4	6.7	7.0	7.3	7.5	10.3	10.4	12.0	13.1	10.6	10.9
10/9	7.4	6.4	6.6	6.7	6.9	7.0	10.0	9.9	11.7	12.8	10.3	10.5
10/10	7.2	6.4	6.6	6.8	7.0	7.1	10.0	10.0	11.6	12.6	9.9	10.3
10/11	7.0	6.4	6.5	6.6	6.8	6.9	9.7	9.6	11.1	12.4	9.5	9.8
10/12	6.3	6.4	6.5	6.7	6.8	6.9	9.5	9.5	11.0	12.2	8.9	9.2
10/13	6.4	6.3	6.5	6.6	6.7	6.7	8.4	8.8	10.3	12.0	8.7	9.0
10/14	6.3	6.4	6.5	6.6	6.7	6.7	8.9	8.3	10.0	11.9	8.3	8.5
10/15	5.4	6.5	6.6	6.7	6.7	6.7	9.2	9.0	10.4	11.7	8.8	9.4
10/16	5.0	6.5	6.7	6.8	7.0	7.0	9.4	9.1	10.4	11.5	9.1	9.3
10/17	4.6	6.5	6.8	7.0	7.3	7.4	9.3	9.7	10.6	11.3	9.4	9.6
10/18	4.4	6.5	6.8	6.9	7.0	7.0	8.9	8.9	10.2	11.0	8.5	8.6
10/19	4.1	6.6	7.5	7.8	8.2	8.3	8.9	9.2	9.7	10.7	8.8	8.8
10/20	4.4	6.5	7.2	7.4	7.8	7.9	8.3	8.8	9.1	10.5	8.4	8.5
10/21	4.8	6.5	6.9	8.4	7.4	7.4	7.7	7.9	8.5	10.2	7.8	8.1
10/22	4.9	6.8	7.8	8.0	8.6	8.7	8.9	9.3	9.3	9.9	7.8	7.7
10/23	4.9	6.8	7.2	7.5	8.1	8.3	8.6	9.3	9.2	9.6	8.3	8.2
10/24	5.4	6.7	6.9	7.1	7.5	7.5	8.1	8.5	8.7	9.5	8.3	8.4
10/25	5.6	6.7	6.9	7.1	7.5	7.5	8.2	8.4	8.7	9.6	8.2	8.3
10/26	5.1	6.8	7.0	7.2	7.6	7.8	8.4	8.9	8.9	9.5	8.9	9.0
10/27	5.4	6.8	7.0	7.1	7.3	7.4	8.6	8.7	8.9	9.5	8.7	8.9
10/28	4.5	7.0	7.2	7.3	7.5	7.5	8.6	8.8	9.0	9.4	8.9	9.0
10/29	4.2	6.8	7.0	7.1	7.3	7.4	8.6	8.7	8.9	9.5	8.6	8.7
10/30	4.5	6.6	6.7	6.8	6.9	6.8	8.7	8.5	9.1	9.4	8.4	8.6
10/31	4.5	6.5	6.5	6.5	6.4	6.0	8.4	8.2	8.8	9.3	7.5	7.9

DATE	RM 18.2 (SFK)	Sultan River									Skykomish River	
		RM 15.8	RM 15.5	RM 14.3	RM 11.3	RM 9.8	RM 9.6	RM 4.9	RM 4.4	RM 0.2	RM 14.1	RM 13.2
11/1	4.4	6.7				6.9	8.1	8.4	8.8	9.2	7.5	7.9
11/2	4.7	6.5				7.0	7.8	8.1	8.9	9.1	7.7	8.0
11/3	5.7	6.3				6.0	7.0	7.0	8.6	8.9	6.9	7.3
11/4	6.0	6.4				5.5	6.8	6.5	8.3	8.7	6.2	6.8
11/5	5.7	6.4				5.4	6.7	6.3	8.3	8.6	5.8	6.5
11/6	5.6	6.5				5.1	6.5	6.1	8.1	8.4	5.7	6.5
11/7	5.7	6.6				4.9	6.5	5.8	7.9	8.3	4.8	5.9
11/8	5.1	7.2				6.0	7.0	6.7	7.9	8.2	5.4	6.2
11/9	4.7	7.6				6.7	7.3	7.3	7.8	8.2	6.1	6.5
11/10	4.5	7.4				6.7	7.2	7.2	7.7	8.1	6.3	6.7
11/11	4.7	7.3				6.5	7.1	6.9	7.5	8.1	6.3	6.6
11/12	4.6	7.4				7.2	7.5	7.5	7.7	8.0	6.9	7.1
11/13	4.5	7.2				7.3	7.5	7.8	7.7	7.9	7.2	7.4
11/14	4.1	7.1				7.0	7.3	7.5	7.6	7.9	6.8	7.0
11/15	3.9	7.1				6.9	7.2	7.4	7.5	7.8	6.7	6.9
11/16	3.4	6.6				6.4	6.6	6.9	7.2	7.7	6.4	6.6
11/17	3.5	6.5				6.3	6.6	6.7	7.0	7.6	6.4	6.6
11/18	3.7	6.4				6.4	6.7	6.9	7.1	7.5	6.5	6.7
11/19	3.6	6.3				6.0	6.4	6.5	7.0	7.5	6.1	6.4
11/20	3.7	6.4				6.4	6.6	6.8	7.0	7.6	6.2	6.4
11/21	3.9	6.5				6.5	6.7	6.6	6.8	7.6	6.0	6.1
11/22	3.8	6.8				8.4	8.4	8.5	7.9	7.5	6.4	6.6
11/23	3.9	6.1				8.6	8.7	9.1	7.7	7.5	6.9	7.1
11/24	3.9	5.8				7.7	7.8	8.3	7.2	7.5	6.5	6.7
11/25	3.9	5.8				7.2	7.3	7.7	7.0	7.5	6.5	6.7
11/26	4.1	5.9				7.5	7.6	8.0	7.2	7.3	6.8	7.0
11/27	3.9	5.7				7.0	7.2	7.6	7.0	7.2	6.4	6.7
11/28	3.8	5.6				6.5	6.8	7.2	6.8	7.1	6.1	6.4
11/29	4.3	5.7				6.4	6.7	6.9	6.7	7.0	5.7	6.0
11/30	4.3	5.7				6.3	6.6	6.9	6.6	6.9	5.8	6.1

DATE	Sultan River										Skykomish River	
	RM 18.2 (SFK)	RM 15.8	RM 15.5	RM 14.3	RM 11.3	RM 9.8	RM 9.6	RM 4.9	RM 4.4	RM 0.2	RM 14.1	RM 13.2
12/1	3.7	5.7				6.3	6.5	6.8	6.6	6.8	5.7	6.1
12/2	3.2	5.6				6.1	6.3	6.6	6.5	6.6	5.8	6.1
12/3	3.3	5.5				5.6	6.0	6.2	6.3	6.5	5.7	6.0
12/4	2.4	5.5				5.4	5.8	5.8	6.2	6.4	5.4	5.7
12/5	2.1	5.5				4.6	5.3	5.2	6.0	6.3	4.7	5.2
12/6	2.5	5.7				4.3	5.0	4.7	5.9	6.1	4.4	4.9
12/7	2.7	5.7				4.2	5.2	4.9	5.7	6.0	4.4	4.9
12/8	2.7	5.6				4.0	4.8	4.4	5.6	5.9	4.1	4.6
12/9	2.8	5.6				4.0	4.8	4.3	5.4	5.9	3.9	4.3
12/10	3.3	5.6				4.1	4.9	4.4	5.5	5.8	3.9	4.3
12/11	3.5	5.6				3.8	4.7	4.2	5.5	5.8	3.7	4.3
12/12	3.2	5.6				4.1	4.9	4.4	5.5	5.7	3.7	4.4
12/13	3.9	5.5				4.2	5.0	4.5	5.5	5.7	4.0	4.6
12/14	3.9	5.3				4.0	4.9	4.6	5.5	5.7	4.2	4.8
12/15	4.1	5.0				4.4	5.1	4.9	5.3	5.8	4.4	4.8
12/16	3.9	4.8				4.6	5.1	5.1	5.3	5.8	4.7	5.0
12/17	3.8	5.0				4.9	5.2	5.3	5.4	5.8	5.0	5.2
12/18	4.3	5.2				6.2	6.3	6.3	6.2	5.8	5.2	5.4
12/19	4.3	5.0				5.9	6.0	6.2	6.1	5.7	5.1	5.3
12/20	3.7	4.8				5.0	5.2	5.4	5.4	5.6	4.8	5.0
12/21	3.2	4.7				4.5	4.8	4.6	5.0	5.5	4.3	4.5
12/22	3.3	4.6				4.6	4.9	4.9	5.0	5.3	4.4	4.6
12/23	2.4	4.4				3.7	4.2	4.4	4.8	5.1	3.8	4.2
12/24	2.1	4.2				3.1	3.8	3.5	4.6	4.9	2.4	3.2
12/25	2.5	4.2				3.3	4.0	3.7	4.5	4.8	2.7	3.4
12/26	2.7	4.2				3.6	4.2	4.0	4.5	4.8	3.2	3.7
12/27	2.7	4.2				3.7	4.2	4.1	4.5	4.8	3.4	3.8
12/28	2.8	4.3				3.7	4.0	4.3	4.4	4.9	3.8	4.1
12/29	3.3	4.5				4.6	4.7	4.7	4.7	4.8	4.2	4.4
12/30	3.5	4.4				5.2	5.4	5.6	5.3	4.8	4.6	4.7
12/31	3.2	4.1				4.2	4.4	4.6	4.5	4.8	4.2	4.4

## APPENDIX C

---

*2017 Seven-Day Average of the Daily Maximum (7-DAD Max) Water Temperature  
(in degrees Celsius) in Tabular Format*

DATE	RM 18.2 (SFK) 7 Day	RM 15.8 7 Day	RM 15.5 7 Day	RM 14.3 7 Day	RM 11.3 7 Day	RM 9.8 7 Day	RM 9.6 7 Day	RM 4.9 7 Day	RM 4.4 7 Day	RM 0.2 7 Day	Skykomish Above	Skykomish Below
	Avg Max	Avg Max	Avg Max	Avg Max	Avg Max	Avg Max	Avg Max	Avg Max	Avg Max	Avg Max	7 Day Avg Max	7 Day Avg Max
1/1	1.8	3.6				2.9	3.6	3.7	5.4	3.9	3.0	3.2
1/2	1.4	3.5				2.4	3.2	3.3	5.0	3.5	2.6	2.8
1/3	1.0	3.4				1.9	2.9	2.9	4.6	3.1	2.1	2.4
1/4	0.8	3.3				1.6	2.5	2.5	4.1	2.8	1.6	1.9
1/5	0.7	3.1				1.4	2.3	2.4	3.7	2.6	1.3	1.7
1/6	0.7	3.1				1.4	2.2	2.3	3.4	2.5	1.2	1.6
1/7	0.8	3.0				1.5	2.2	2.3	3.1	2.6	1.3	1.7
1/8	1.0	3.0				1.7	2.3	2.4	2.8	2.6	1.5	1.9
1/9	1.0	3.0				1.8	2.3	2.4	2.7	2.6	1.6	2.0
1/10	1.0	2.9				1.8	2.3	2.4	2.6	2.6	1.6	2.0
1/11	1.0	2.9				1.8	2.3	2.4	2.6	2.7	1.8	2.1
1/12	1.0	2.9				1.6	2.3	2.4	2.6	2.7	1.9	2.2
1/13	1.0	2.9				1.6	2.3	2.4	2.5	2.7	2.0	2.2
1/14	1.1	3.0				1.6	2.2	2.4	2.5	2.7	2.2	2.4
1/15	1.4	3.1				1.8	2.4	2.5	2.6	2.8	2.4	2.6
1/16	1.8	3.1				2.2	2.6	2.7	2.8	3.0	2.8	2.9
1/17	2.3	3.2				2.6	2.8	3.0	3.0	3.2	3.2	3.4
1/18	2.7	3.2				3.1	3.1	3.3	3.2	3.4	3.7	3.8
1/19	3.1	3.2				3.5	3.4	3.6	3.3	3.5	4.1	4.2
1/20	3.3	3.2				3.6	3.5	3.8	3.4	3.6	4.3	4.3
1/21	3.5	3.1				3.7	3.6	3.8	3.4	3.6	4.3	4.3
1/22	3.5	3.1				3.8	3.6	3.9	3.4	3.6	4.4	4.4
1/23	3.5	3.1				3.8	3.6	4.0	3.3	3.7	4.5	4.5
1/24	3.4	3.0				3.7	3.5	4.0	3.3	3.7	4.6	4.5
1/25	3.3	3.0				3.6	3.4	3.9	3.2	3.6	4.5	4.5
1/26	3.3	3.0				3.6	3.3	3.8	3.2	3.6	4.5	4.4
1/27	3.3	3.0				3.7	3.3	3.9	3.2	3.7	4.6	4.5
1/28	3.4	3.0				3.7	3.3	4.0	3.2	3.7	4.7	4.7
1/29	3.2	3.0				3.6	3.2	3.9	3.2	3.6	4.7	4.6
1/30	2.8	2.9				3.2	3.0	3.6	3.1	3.5	4.3	4.2
1/31	2.6	2.8				3.0	2.9	3.5	3.0	3.3	3.8	3.9

DATE	RM 18.2	RM 15.8	RM 15.5	RM 14.3	RM 11.3	RM 9.8	RM 9.6	RM 4.9	RM 4.4	RM 0.2	Skykomish	Skykomish
	(SFK) 7 Day Avg Max	7 Day Avg Max	7 Day Avg Max	7 Day Avg Max	7 Day Avg Max	7 Day Avg Max	7 Day Avg Max	7 Day Avg Max	7 Day Avg Max	7 Day Avg Max	Above 7 Day Avg Max	Below 7 Day Avg Max
2/1	2.5	2.7				2.9	2.9	3.4	3.0	3.3	3.5	3.6
2/2	2.4	2.6				2.8	2.9	3.3	3.0	3.2	3.3	3.5
2/3	2.2	2.5				2.7	2.8	3.2	2.9	3.1	3.0	3.2
2/4	2.1	2.4				2.5	2.7	3.0	2.8	2.9	2.7	2.9
2/5	2.1	2.3				2.5	2.7	3.0	2.7	2.9	2.6	2.8
2/6	2.4	2.4				3.0	3.0	3.2	3.0	3.0	2.8	3.0
2/7	2.7	2.4				3.2	3.2	3.5	3.2	3.2	3.1	3.3
2/8	2.9	2.4				3.5	3.4	3.7	3.3	3.4	3.5	3.6
2/9	3.0	2.4				3.6	3.5	3.8	3.4	3.5	3.7	3.8
2/10	3.2	2.5				3.7	3.6	4.0	3.5	3.6	4.0	4.1
2/11	3.4	2.5				3.9	3.8	4.3	3.7	3.7	4.3	4.3
2/12	3.6	2.6				4.2	4.0	4.6	3.9	3.9	4.5	4.6
2/13	3.7	2.7				4.3	4.2	4.9	4.1	4.0	4.7	4.8
2/14	3.8	2.7				4.5	4.3	5.1	4.1	4.0	4.9	5.0
2/15	3.8	2.8				4.6	4.4	5.2	4.0	4.0	5.0	5.0
2/16	3.9	2.9				4.7	4.5	5.4	3.9	3.9	5.1	5.0
2/17	4.0	3.0				4.8	4.6	5.5	3.9	3.9	5.1	5.1
2/18	3.9	3.1				4.9	4.7	5.5	3.9	3.9	5.1	5.1
2/19	3.9	3.2				4.8	4.7	5.5	3.8	3.9	5.1	5.1
2/20	3.9	3.2				4.7	4.5	5.2	3.6	3.8	5.2	5.1
2/21	3.8	3.3				4.5	4.3	5.0	3.5	3.7	5.1	5.0
2/22	3.6	3.3				4.4	4.2	4.8	3.5	3.7	5.0	4.8
2/23	3.4	3.3				4.2	4.1	4.7	3.4	3.7	4.9	4.7
2/24	3.2	3.2				4.0	3.9	4.5	3.4	3.7	4.8	4.6
2/25	3.0	3.2				3.8	3.8	4.3	3.3	3.7	4.7	4.5
2/26	2.8	3.2				3.7	3.7	4.2	3.3	3.6	4.6	4.4
2/27	2.7	3.3				3.5	3.6	4.2	3.3	3.6	4.6	4.3
2/28	2.6	3.3				3.5	3.6	4.2	3.4	3.6	4.5	4.3



DATE	RM 18.2	RM 15.8	RM 15.5	RM 14.3	RM 11.3	RM 9.8	RM 9.6	RM 4.9	RM 4.4	RM 0.2	Skykomish	Skykomish
	(SFK) 7 Day Avg Max	7 Day Avg Max	7 Day Avg Max	7 Day Avg Max	7 Day Avg Max	7 Day Avg Max	7 Day Avg Max	7 Day Avg Max	7 Day Avg Max	7 Day Avg Max	Above 7 Day Avg Max	Below 7 Day Avg Max
3/1	2.6	3.3				3.6	3.6	4.3	3.4	3.7	4.6	4.4
3/2	2.7	3.3				3.6	3.7	4.3	3.5	3.6	4.7	4.5
3/3	2.7	3.3				3.7	3.7	4.3	3.5	3.7	4.8	4.5
3/4	2.7	3.2				3.6	3.7	4.4	3.5	3.6	4.7	4.5
3/5	2.6	3.2				3.7	3.7	4.3	3.5	3.6	4.6	4.4
3/6	2.6	3.2				3.7	3.8	4.4	3.4	3.6	4.6	4.4
3/7	2.7	3.3				3.8	3.8	4.4	3.6	3.7	4.6	4.4
3/8	2.7	3.3				3.8	3.9	4.5	3.7	3.7	4.6	4.5
3/9	2.8	3.4				3.9	4.0	4.7	3.8	3.9	4.7	4.6
3/10	2.9	3.4				4.1	4.1	4.9	4.1	4.0	4.7	4.7
3/11	3.1	3.5				4.3	4.4	5.2	4.4	4.2	4.9	4.9
3/12	3.3	3.6				4.6	4.6	5.6	4.7	4.4	5.0	5.1
3/13	3.5	3.5				4.8	4.9	5.8	5.0	4.6	5.1	5.2
3/14	3.7	3.5				5.0	5.0	5.9	4.9	4.6	5.2	5.3
3/15	3.8	3.6				5.1	5.1	6.0	5.0	4.7	5.2	5.3
3/16	3.9	3.6				5.2	5.1	6.1	4.9	4.7	5.3	5.4
3/17	4.0	3.6				5.3	5.2	6.1	4.8	4.7	5.3	5.4
3/18	4.1	3.6				5.3	5.2	6.1	4.6	4.6	5.4	5.5
3/19	4.2	3.6				5.4	5.2	6.1	4.5	4.6	5.5	5.6
3/20	4.2	3.7				5.5	5.2	6.2	4.3	4.6	5.7	5.7
3/21	4.2	3.7				5.6	5.3	6.3	4.4	4.7	5.9	5.9
3/22	4.2	3.7				5.6	5.3	6.4	4.4	4.7	6.0	6.0
3/23	4.3	3.7				5.7	5.4	6.4	4.4	4.7	6.0	6.0
3/24	4.3	3.8				5.7	5.4	6.5	4.5	4.8	6.1	6.1
3/25	4.2	3.8				5.7	5.4	6.5	4.5	4.8	6.1	6.1
3/26	4.1	3.9				5.7	5.5	6.5	4.7	4.9	6.1	6.1
3/27	4.0	3.9				5.7	5.5	6.5	4.9	5.0	6.0	6.0
3/28	4.1	4.0				5.8	5.7	6.5	5.0	5.1	6.1	6.2
3/29	4.2	4.0				5.8	5.7	6.6	5.1	5.1	6.2	6.3
3/30	4.2	4.1				6.0	5.9	6.7	5.2	5.3	6.3	6.4
3/31	4.3	4.1				6.1	6.0	6.8	5.3	5.4	6.5	6.5

DATE	RM 18.2 (SFK) 7 Day Avg Max	RM 15.8 7 Day Avg Max	RM 15.5 7 Day Avg Max	RM 14.3 7 Day Avg Max	RM 11.3 7 Day Avg Max	RM 9.8 7 Day Avg Max	RM 9.6 7 Day Avg Max	RM 4.9 7 Day Avg Max	RM 4.4 7 Day Avg Max	RM 0.2 7 Day Avg Max	Skykomish Above 7 Day Avg Max	Skykomish Below 7 Day Avg Max
4/1	4.5	4.2	4.7	5.3	5.9	6.3	6.1	6.8	5.4	5.4	6.6	6.6
4/2	4.6	4.3	4.8	5.4	5.9	6.3	6.2	6.9	5.4	5.5	6.6	6.7
4/3	4.7	4.5	4.9	5.4	6.0	6.4	6.3	7.0	5.3	5.5	6.8	6.8
4/4	4.6	4.6	5.0	5.4	6.0	6.4	6.2	7.1	5.4	5.6	6.7	6.7
4/5	4.5	4.7	5.0	5.5	6.0	6.5	6.3	7.1	5.4	5.7	6.6	6.7
4/6	4.6	4.7	5.1	5.5	6.1	6.5	6.3	7.1	5.5	5.7	6.7	6.7
4/7	4.6	4.8	5.1	5.6	6.1	6.5	6.3	7.2	5.6	5.8	6.6	6.6
4/8	4.6	4.9	5.2	5.8	6.2	6.6	6.4	7.2	5.7	5.9	6.7	6.7
4/9	4.7	4.9	5.3	5.8	6.4	6.8	6.6	7.4	5.8	6.0	6.9	6.9
4/10	4.7	5.0	5.3	5.8	6.4	6.8	6.6	7.4	5.8	6.1	6.9	6.9
4/11	4.7	4.9	5.3	5.8	6.3	6.8	6.6	7.4	5.9	6.1	7.1	7.1
4/12	4.8	5.0	5.3	6.0	6.4	6.9	6.7	7.5	5.9	6.2	7.3	7.2
4/13	4.9	5.1	5.5	6.2	6.5	7.0	6.8	7.6	6.0	6.3	7.4	7.4
4/14	5.1	5.3	5.7	6.3	6.7	7.2	6.9	7.7	6.1	6.4	7.5	7.5
4/15	5.0	5.4	5.8	6.2	6.8	7.3	7.0	7.9	6.2	6.5	7.5	7.5
4/16	5.0	5.4	5.8	6.3	6.8	7.3	6.9	7.8	6.2	6.5	7.4	7.4
4/17	4.9	5.5	5.8	6.6	6.9	7.3	7.0	7.9	6.3	6.6	7.4	7.4
4/18	5.2	5.6	6.0	6.8	7.2	7.7	7.3	8.2	6.6	6.8	7.6	7.6
4/19	5.1	5.8	6.2	6.8	7.3	7.7	7.4	8.4	6.9	7.0	7.7	7.8
4/20	5.0	5.9	6.3	6.9	7.3	7.8	7.5	8.5	7.0	7.1	7.6	7.7
4/21	5.0	5.9	6.3	6.9	7.4	7.7	7.6	8.6	7.1	7.2	7.6	7.7
4/22	5.1	5.9	6.3	6.9	7.4	7.8	7.7	8.7	7.1	7.2	7.6	7.7
4/23	5.1	5.9	6.3	7.0	7.4	7.8	7.7	8.7	7.0	7.1	7.7	7.8
4/24	5.1	5.9	6.3	6.8	7.4	7.8	7.7	8.8	7.1	7.1	7.7	7.8
4/25	5.0	5.9	6.3	6.8	7.4	7.7	7.6	8.6	6.9	7.1	7.6	7.6
4/26	5.0	5.8	6.3	6.8	7.3	7.6	7.5	8.5	6.8	7.0	7.4	7.5
4/27	5.0	5.8	6.3	6.6	7.3	7.7	7.6	8.5	6.8	6.9	7.5	7.6
4/28	4.9	5.8	6.2	6.7	7.2	7.6	7.4	8.4	6.8	6.9	7.4	7.5
4/29	5.0	5.9	6.2	7.0	7.3	7.7	7.5	8.4	6.9	7.0	7.5	7.5
4/30	5.2	6.1	6.5	7.6	7.6	8.0	7.9	8.7	7.1	7.2	7.7	7.8

DATE	RM 18.2 (SFK) 7 Day Avg Max	RM 15.8 7 Day Avg Max	RM 15.5 7 Day Avg Max	RM 14.3 7 Day Avg Max	RM 11.3 7 Day Avg Max	RM 9.8 7 Day Avg Max	RM 9.6 7 Day Avg Max	RM 4.9 7 Day Avg Max	RM 4.4 7 Day Avg Max	RM 0.2 7 Day Avg Max	Skykomish Above 7 Day Avg Max	Skykomish Below 7 Day Avg Max
5/1	5.5	6.4	6.9	7.8	8.2	8.7	8.4	9.2	7.4	7.5	8.0	8.1
5/2	5.5	6.6	7.2	7.8	8.5	9.1	8.7	9.7	7.7	7.7	8.1	8.2
5/3	5.4	6.6	7.2	7.9	8.6	9.1	8.8	9.9	7.8	7.9	8.0	8.2
5/4	5.6	6.7	7.3	8.2	8.7	9.3	9.0	10.0	7.9	8.0	8.1	8.3
5/5	5.8	6.8	7.5	8.4	8.9	9.6	9.3	10.2	8.0	8.2	8.3	8.5
5/6	6.0	6.9	7.7	8.6	9.1	9.9	9.6	10.4	8.1	8.3	8.5	8.6
5/7	6.4	6.9	7.7	8.2	9.2	10.2	9.7	10.6	8.2	8.5	8.6	8.7
5/8	6.2	6.8	7.5	8.1	9.0	9.8	9.3	10.4	8.3	8.5	8.6	8.7
5/9	6.2	6.8	7.4	8.3	8.7	9.6	9.2	10.1	8.4	8.7	8.4	8.6
5/10	6.4	6.9	7.6	8.3	8.8	9.8	9.3	10.1	8.5	8.8	8.5	8.6
5/11	6.4	7.0	7.6	8.3	8.9	9.8	9.3	10.1	8.6	9.1	8.4	8.6
5/12	6.3	7.0	7.6	8.0	8.8	9.6	9.2	10.1	8.8	9.2	8.4	8.6
5/13	5.9	7.1	7.4	7.7	8.4	9.0	8.8	9.8	8.9	9.3	8.1	8.3
5/14	5.6	7.1	7.3	7.8	8.1	8.5	8.5	9.4	8.8	9.3	7.8	8.1
5/15	5.8	7.1	7.3	8.1	8.0	8.5	8.6	9.3	8.7	9.3	7.8	8.1
5/16	6.1	7.2	7.5	8.4	8.4	8.9	8.8	9.6	8.9	9.4	8.2	8.5
5/17	6.3	7.4	7.8	8.9	8.7	9.3	9.0	9.8	9.1	9.6	8.6	8.9
5/18	6.7	7.6	8.2	9.6	9.2	10.0	9.4	10.3	9.3	9.8	9.0	9.3
5/19	7.1	8.0	8.7	10.4	9.9	10.9	9.9	10.8	9.6	10.2	9.3	9.6
5/20	7.6	8.1	9.1	10.5	10.8	11.9	10.5	11.5	9.9	10.6	9.7	9.9
5/21	7.6	8.2	9.2	10.9	11.2	12.4	10.6	11.9	10.0	10.6	9.9	10.1
5/22	7.8	8.4	9.5	11.3	11.6	12.8	10.7	12.0	10.0	10.7	9.9	10.1
5/23	7.9	8.5	9.7	11.6	11.9	13.2	10.7	12.2	9.9	10.7	10.0	10.2
5/24	8.2	8.5	9.8	11.7	12.4	13.6	10.7	12.3	9.9	10.6	10.1	10.2
5/25	8.3	8.5	9.9	11.8	12.6	13.9	10.6	12.4	9.8	10.5	10.1	10.3
5/26	8.5	8.4	9.9	11.4	12.9	14.1	10.5	12.5	9.6	10.4	10.2	10.4
5/27	8.3	8.5	9.8	11.7	12.8	13.9	10.3	12.2	9.6	10.1	10.2	10.4
5/28	8.7	8.6	9.9	11.3	12.9	14.2	10.5	12.3	9.7	10.3	10.3	10.5
5/29	8.6	8.5	9.7	11.1	12.8	14.0	10.6	12.4	9.8	10.3	10.3	10.5
5/30	8.5	8.4	9.6	10.5	12.6	13.8	10.5	12.3	9.8	10.3	10.2	10.4
5/31	8.3	8.3	9.2	10.0	12.1	13.1	10.3	12.1	9.7	10.3	10.0	10.2

DATE	RM 18.2 (SFK) 7 Day Avg Max	RM 15.8 7 Day Avg Max	RM 15.5 7 Day Avg Max	RM 14.3 7 Day Avg Max	RM 11.3 7 Day Avg Max	RM 9.8 7 Day Avg Max	RM 9.6 7 Day Avg Max	RM 4.9 7 Day Avg Max	RM 4.4 7 Day Avg Max	RM 0.2 7 Day Avg Max	Skykomish Above 7 Day Avg Max	Skykomish Below 7 Day Avg Max
6/1	8.1	8.1	8.9	9.7	11.6	12.6	10.2	11.9	9.6	10.3	10.0	10.1
6/2	8.0	8.1	8.7	10.0	11.3	12.3	10.2	11.7	9.5	10.4	9.9	10.1
6/3	8.4	7.9	8.7	10.1	11.3	12.5	10.3	11.9	9.4	10.8	10.2	10.3
6/4	8.6	7.8	8.8	10.1	11.4	12.7	10.4	12.0	9.6	11.1	10.4	10.6
6/5	8.8	7.8	8.8	10.0	11.5	12.8	10.4	12.1	9.7	11.2	10.7	10.9
6/6	8.7	7.8	8.7	10.0	11.3	12.5	10.3	12.0	9.8	11.3	10.6	10.8
6/7	8.6	7.9	8.8	10.2	11.2	12.5	10.3	11.9	9.9	11.5	10.6	10.8
6/8	8.7	7.9	8.9	9.8	11.3	12.6	10.4	11.9	9.9	11.6	10.7	10.9
6/9	8.5	7.9	8.7	9.4	11.0	12.1	10.2	11.8	10.0	11.4	10.7	10.9
6/10	8.1	7.9	8.6	9.2	10.6	11.5	9.9	11.4	10.0	11.1	10.4	10.6
6/11	7.8	7.9	8.5	9.2	10.2	11.0	9.7	11.1	9.8	10.9	10.3	10.4
6/12	7.7	7.9	8.5	9.2	10.0	10.7	9.7	10.9	9.7	10.8	10.1	10.3
6/13	7.7	8.0	8.6	9.4	10.1	10.8	9.9	10.9	9.8	10.8	10.2	10.3
6/14	7.8	8.1	8.8	9.4	10.3	11.0	10.2	11.1	9.8	10.9	10.2	10.3
6/15	7.7	8.3	8.9	9.9	10.3	10.9	10.3	11.2	9.8	10.8	10.0	10.2
6/16	8.0	8.4	9.2	10.1	10.8	11.4	10.7	11.5	9.8	11.2	10.2	10.3
6/17	8.2	8.6	9.4	10.4	11.0	11.7	10.9	11.8	10.0	11.3	10.4	10.6
6/18	8.4	8.6	9.5	10.9	11.5	12.1	11.3	12.1	10.0	11.6	10.6	10.8
6/19	8.8	8.7	9.8	11.3	12.1	12.9	11.8	12.6	10.1	12.1	11.0	11.2
6/20	9.3	8.8	10.0	11.7	12.7	13.5	11.9	13.0	10.1	12.3	11.6	11.8
6/21	9.8	8.8	10.2	12.2	13.3	14.2	12.1	13.4	10.2	12.6	12.3	12.4
6/22	10.4	8.9	10.5	12.4	14.0	15.0	12.3	13.8	10.3	12.9	12.9	13.1
6/23	10.7	9.0	10.6	12.6	14.3	15.4	12.4	14.1	10.4	13.0	13.2	13.4
6/24	11.1	9.1	10.7	12.4	14.6	15.6	12.4	14.2	10.5	13.1	13.5	13.6
6/25	11.1	9.2	10.6	12.5	14.3	15.3	12.2	14.0	10.5	12.8	13.7	13.8
6/26	11.3	9.3	10.7	12.5	14.5	15.5	12.3	14.2	10.6	12.8	14.1	14.2
6/27	11.6	9.3	10.7	12.3	14.6	15.6	12.4	14.4	10.7	12.8	14.4	14.5
6/28	11.7	9.6	10.9	12.2	14.7	15.4	12.2	14.3	10.7	12.6	14.5	14.5
6/29	11.8	9.8	11.1	12.1	14.9	15.5	12.2	14.2	10.7	12.5	14.6	14.7
6/30	11.9	10.1	11.2	12.1	14.8	15.4	12.0	14.1	10.8	12.4	14.9	14.9

DATE	RM 18.2 (SFK) 7 Day Avg Max	RM 15.8 7 Day Avg Max	RM 15.5 7 Day Avg Max	RM 14.3 7 Day Avg Max	RM 11.3 7 Day Avg Max	RM 9.8 7 Day Avg Max	RM 9.6 7 Day Avg Max	RM 4.9 7 Day Avg Max	RM 4.4 7 Day Avg Max	RM 0.2 7 Day Avg Max	Skykomish Above 7 Day Avg Max	Skykomish Below 7 Day Avg Max
7/1	12.1	10.3	11.5	12.5	15.2	15.8	12.1	14.2	10.7	12.5	15.2	15.2
7/2	12.6	10.5	12.0	12.5	16.0	16.7	12.3	14.6	10.8	12.8	15.6	15.7
7/3	12.8	10.8	12.4	12.5	16.4	17.1	12.2	14.7	10.9	12.9	15.9	16.0
7/4	13.0	11.2	12.6	12.7	16.6	17.3	12.1	14.6	10.9	12.9	16.1	16.2
7/5	13.2	11.3	12.8	12.8	16.9	17.8	12.3	14.8	10.9	13.1	16.5	16.6
7/6	13.3	11.5	12.8	12.9	16.9	17.8	12.3	14.8	11.0	13.1	16.8	16.9
7/7	13.4	11.6	12.9	13.0	17.0	18.0	12.3	14.9	11.0	13.2	17.0	17.0
7/8	13.4	11.6	12.9	13.0	16.9	18.0	12.3	14.9	11.1	13.2	17.3	17.3
7/9	13.5	11.7	12.9	12.8	16.9	17.9	12.3	14.9	11.1	13.2	17.4	17.2
7/10	13.3	11.8	12.7	12.8	16.5	17.5	12.2	14.6	11.1	13.0	17.3	16.4
7/11	12.5	11.8	12.8	12.6	16.4	17.4	12.2	14.5	11.1	13.0	17.4	16.2
7/12	13.7	11.9	12.8	12.4	16.3	17.3	12.1	14.5	11.2	13.0	17.5	15.8
7/13	12.1	11.9	12.9	12.5	16.1	17.1	12.1	14.4	11.2	12.9	17.5	15.5
7/14	13.7	11.9	13.1	12.6	16.4	17.3	12.1	14.5	11.2	13.1	17.6	15.5
7/15	13.8	12.1	13.3	12.6	16.7	17.5	12.2	14.6	11.2	13.1	17.8	15.5
7/16	12.5	12.2	13.4	12.6	16.7	17.6	12.3	14.7	11.3	13.2	17.9	15.7
7/17	13.1	12.4	13.6	12.5	16.7	17.6	12.3	14.8	11.4	13.4	18.2	16.4
7/18	14.0	12.5	13.6	12.5	16.5	17.4	12.3	14.7	11.4	13.3	18.1	16.6
7/19	14.0	12.7	13.7	12.6	16.5	17.5	12.4	14.7	11.4	13.5	18.2	17.1
7/20	12.4	12.9	13.9	12.7	16.7	17.7	12.5	14.8	11.5	13.6	18.5	17.5
7/21	13.4	13.2	14.3	12.8	17.0	18.0	12.7	15.0	11.6	13.8	18.9	17.9
7/22	14.1	13.3	14.5	13.0	17.2	18.2	12.8	15.1	11.7	13.9	19.2	18.2
7/23	14.7	13.5	14.7	13.1	17.4	18.4	12.9	15.3	11.8	14.1	19.5	18.6
7/24	15.0	13.8	14.9	13.4	17.5	18.5	13.0	15.3	12.0	14.0	19.7	18.6
7/25	15.5	14.1	15.4	13.6	17.9	18.8	13.2	15.5	12.1	14.1	20.0	18.9
7/26	15.5	14.4	15.6	13.8	18.1	18.9	13.2	15.6	12.2	14.2	20.2	19.0
7/27	14.9	14.6	15.9	13.9	18.3	19.1	13.3	15.7	12.3	14.3	20.4	19.2
7/28	15.1	14.9	16.1	14.0	18.4	19.2	13.4	15.8	12.4	14.4	20.4	19.2
7/29	15.1	15.0	16.1	14.0	18.4	19.2	13.3	15.7	12.4	14.2	20.6	19.1
7/30	15.2	15.1	16.1	14.2	18.4	19.2	13.3	15.7	12.3	14.0	20.7	19.0
7/31	15.4	14.7	16.0	14.1	18.8	19.7	13.3	15.9	12.1	14.1	21.1	19.3



DATE	RM 18.2 (SFK) 7 Day Avg Max	RM 15.8 7 Day Avg Max	RM 15.5 7 Day Avg Max	RM 14.3 7 Day Avg Max	RM 11.3 7 Day Avg Max	RM 9.8 7 Day Avg Max	RM 9.6 7 Day Avg Max	RM 4.9 7 Day Avg Max	RM 4.4 7 Day Avg Max	RM 0.2 7 Day Avg Max	Skykomish Above 7 Day Avg Max	Skykomish Below 7 Day Avg Max
8/1	15.9	14.1	15.5	13.9	18.8	19.8	13.2	15.9	12.1	14.0	21.4	19.4
8/2	16.3	13.0	14.6	13.6	18.4	19.5	13.2	15.8	12.0	13.9	21.4	19.3
8/3	16.4	12.0	13.7	13.3	17.9	19.1	13.0	15.6	12.0	13.7	21.4	19.2
8/4	16.4	11.0	12.8	13.0	17.3	18.7	12.8	15.5	11.9	13.6	21.5	19.2
8/5	14.7	10.1	12.0	12.7	16.8	18.3	12.7	15.3	11.9	13.6	21.5	19.2
8/6	14.8	9.2	11.2	12.5	16.3	17.8	12.6	15.3	12.0	13.6	21.5	19.1
8/7	14.9	8.6	10.5	12.3	15.7	17.3	12.6	15.2	12.0	13.8	21.5	19.2
8/8	15.0	7.9	9.9	12.2	15.1	16.8	12.5	15.1	12.1	13.8	21.4	19.2
8/9	15.0	7.7	9.6	12.0	14.7	16.3	12.4	15.0	12.1	13.8	21.3	19.1
8/10	15.0	7.5	9.3	11.9	14.1	15.7	12.3	14.8	12.1	13.7	21.0	18.8
8/11	14.9	7.2	8.9	11.7	13.6	15.1	12.1	14.5	12.0	13.6	20.7	18.6
8/12	14.7	6.9	8.6	11.5	13.1	14.7	12.0	14.3	12.0	13.6	20.4	18.6
8/13	14.6	6.7	8.3	11.4	12.6	14.0	11.8	14.0	12.1	13.5	20.0	18.4
8/14	14.4	6.6	8.2	11.3	12.1	13.6	11.7	13.8	12.0	13.4	19.8	18.3
8/15	14.1	6.5	8.0	11.2	11.7	13.2	11.5	13.5	12.1	13.3	19.6	18.1
8/16	13.9	6.5	8.0	11.2	11.6	13.1	11.5	13.5	12.1	13.4	19.5	18.2
8/17	13.6	6.5	8.0	11.2	11.6	13.1	11.5	13.5	12.1	13.5	19.6	18.3
8/18	13.3	6.6	8.0	11.1	11.7	13.1	11.6	13.6	12.2	13.6	19.7	18.3
8/19	13.0	6.6	8.0	11.1	11.7	13.2	11.7	13.7	12.2	13.7	19.8	18.4
8/20	12.6	6.7	8.1	11.1	11.8	13.3	11.8	13.8	12.3	13.9	20.1	18.7
8/21	12.2	6.6	8.0	11.1	11.8	13.2	11.8	13.8	12.4	13.9	19.9	18.5
8/22	11.7	6.6	8.0	11.0	11.8	13.2	11.9	13.8	12.4	14.0	19.7	18.4
8/23	11.2	6.6	7.8	10.4	11.4	12.9	11.9	13.6	12.5	14.0	19.6	18.2
8/24	10.7	6.6	7.7	9.9	10.9	12.3	11.5	13.1	12.1	13.7	19.7	18.2
8/25	10.4	6.5	7.5	9.3	10.3	11.6	11.0	12.5	11.8	13.3	19.8	18.0
8/26	10.2	6.4	7.2	8.7	9.7	10.8	10.5	11.8	11.4	12.9	19.7	17.8
8/27	10.1	6.3	6.9	8.2	9.0	10.1	10.0	11.1	10.9	12.3	19.5	17.4
8/28	10.0	6.3	6.8	7.7	8.6	9.5	9.6	10.5	10.4	12.0	19.6	17.5
8/29	10.1	6.3	6.7	7.2	8.1	9.0	9.1	10.0	10.0	11.6	19.8	17.5
8/30	10.3	6.3	6.7	7.4	7.9	8.5	8.7	9.5	10.3	11.7	20.1	17.4
8/31	10.5	6.5	6.8	7.7	8.0	8.7	9.1	9.6	11.0	12.4	20.2	17.5



DATE	RM 18.2	RM 15.8	RM 15.5	RM 14.3	RM 11.3	RM 9.8	RM 9.6	RM 4.9	RM 4.4	RM 0.2	Skykomish	Skykomish
	(SFk) 7 Day Avg Max	7 Day Avg Max	7 Day Avg Max	7 Day Avg Max	7 Day Avg Max	7 Day Avg Max	7 Day Avg Max	7 Day Avg Max	7 Day Avg Max	7 Day Avg Max	Above 7 Day Avg Max	Below 7 Day Avg Max
9/1	10.6	6.6	7.1	7.9	8.3	9.1	9.6	10.0	11.5	13.0	20.3	17.8
9/2	10.6	6.8	7.3	8.2	8.7	9.6	10.2	10.6	12.1	13.6	20.2	17.8
9/3	10.5	6.9	7.5	8.4	9.0	10.0	10.9	11.2	12.8	14.3	20.1	18.0
9/4	10.2	7.0	7.7	8.6	9.3	10.3	11.6	11.8	13.4	14.8	19.9	17.9
9/5	9.9	7.1	7.8	8.7	9.6	10.6	12.3	12.2	14.0	15.3	19.6	17.8
9/6	9.5	7.2	7.9	8.9	9.8	10.8	12.3	12.8	13.9	15.2	19.1	17.7
9/7	9.1	7.1	7.9	8.8	10.0	11.0	12.4	13.3	13.9	15.2	18.8	17.7
9/8	8.7	7.1	7.9	8.8	9.9	10.9	12.4	13.3	14.0	15.3	18.5	17.6
9/9	8.4	7.0	7.8	8.7	9.9	10.9	12.5	13.4	14.1	15.5	18.4	17.5
9/10	8.3	6.9	7.7	8.6	9.7	10.6	12.7	13.3	14.2	15.4	18.2	17.4
9/11	8.2	6.8	7.6	8.4	9.6	10.5	12.8	13.5	14.3	15.5	18.0	17.3
9/12	8.1	6.7	7.4	8.3	9.3	10.2	13.0	13.5	14.2	15.5	17.9	17.3
9/13	7.9	6.7	7.3	8.0	9.1	10.0	13.1	13.5	14.1	15.5	17.6	17.1
9/14	7.7	6.6	7.2	7.8	8.8	9.6	13.2	13.3	14.0	15.2	17.1	16.5
9/15	7.5	6.5	7.0	7.5	8.5	9.1	13.6	13.2	13.8	14.9	16.4	16.0
9/16	7.2	6.4	6.9	7.4	8.2	8.7	12.6	13.0	13.6	14.5	15.7	15.3
9/17	7.0	6.4	6.8	7.2	7.9	8.4	12.3	12.9	13.5	14.4	14.9	14.8
9/18	6.9	6.3	6.8	7.2	7.7	8.1	12.3	12.5	13.3	14.2	14.3	14.2
9/19	6.9	6.4	6.8	7.2	7.7	8.1	12.2	12.4	13.2	14.2	14.0	14.0
9/20	7.0	6.4	6.8	7.3	7.7	8.1	12.2	12.3	13.3	14.3	14.0	14.0
9/21	7.1	6.4	6.8	7.4	7.8	8.2	12.2	12.4	13.4	14.5	14.1	14.2
9/22	7.2	6.4	6.9	7.4	7.8	8.3	12.3	12.4	13.5	14.6	14.1	14.2
9/23	7.3	6.5	6.9	7.6	7.9	8.4	12.4	12.5	13.6	14.9	14.4	14.6
9/24	7.3	6.5	7.0	7.6	8.0	8.6	12.4	12.5	13.6	15.1	14.9	15.1
9/25	7.4	6.5	7.0	7.6	8.1	8.6	12.5	12.6	13.7	15.2	15.4	15.5
9/26	7.3	6.6	7.1	7.6	8.1	8.6	12.5	12.7	13.8	15.2	15.6	15.6
9/27	7.2	6.6	7.0	7.5	8.0	8.5	12.4	12.6	13.7	15.1	15.5	15.5
9/28	7.1	6.5	7.0	7.5	8.0	8.5	12.4	12.5	13.6	14.9	15.1	15.1
9/29	7.1	6.5	7.0	7.5	8.0	8.4	12.3	12.4	13.5	14.8	14.9	14.9
9/30	7.2	6.5	7.0	7.4	7.9	8.3	12.1	12.2	13.4	14.6	14.5	14.6

DATE	RM 18.2 (SFK) 7 Day	RM 15.8	RM 15.5	RM 14.3	RM 11.3	RM 9.8	RM 9.6	RM 4.9	RM 4.4	RM 0.2	Skykomish	Skykomish
	Avg Max	7 Day Avg Max	7 Day Avg Max	7 Day Avg Max	7 Day Avg Max	7 Day Avg Max	7 Day Avg Max	7 Day Avg Max	7 Day Avg Max	7 Day Avg Max	Above 7 Day Avg Max	Below 7 Day Avg Max
10/1	7.3	6.5	7.0	7.3	7.8	8.2	11.9	11.9	13.2	14.3	14.0	14.1
10/2	7.3	6.5	6.9	7.3	7.6	8.0	11.6	11.6	13.0	14.1	13.4	13.5
10/3	7.2	6.5	6.9	7.3	7.5	7.9	11.4	11.3	12.8	13.9	12.8	13.1
10/4	7.1	6.5	6.9	7.3	7.5	7.8	11.1	11.1	12.6	13.7	12.4	12.8
10/5	7.0	6.5	6.9	7.2	7.5	7.8	11.0	11.0	12.6	13.6	12.2	12.5
10/6	6.8	6.5	6.9	7.2	7.4	7.7	10.8	10.8	12.4	13.5	12.0	12.4
10/7	6.5	6.5	6.8	7.1	7.4	7.7	10.6	10.6	12.3	13.2	11.6	12.0
10/8	6.1	6.5	6.8	7.1	7.4	7.6	10.5	10.5	12.1	13.1	11.3	11.7
10/9	5.7	6.5	6.8	7.0	7.4	7.6	10.3	10.3	11.9	12.8	10.8	11.2
10/10	5.4	6.5	6.7	7.0	7.3	7.5	10.1	10.1	11.7	12.6	10.5	10.8
10/11	5.1	6.5	6.8	7.0	7.2	7.4	10.0	9.9	11.4	12.4	10.1	10.4
10/12	4.9	6.5	6.7	7.0	7.1	7.3	9.8	9.7	11.2	12.2	9.9	10.2
10/13	4.8	6.5	6.7	7.0	7.2	7.3	9.7	9.6	11.0	12.0	9.8	10.0
10/14	4.8	6.5	6.8	7.1	7.2	7.3	9.6	9.6	10.9	11.9	9.7	9.9
10/15	4.9	6.5	6.9	7.3	7.3	7.4	9.5	9.5	10.7	11.7	9.5	9.7
10/16	5.1	6.6	7.1	7.4	7.5	7.5	9.4	9.5	10.6	11.5	9.4	9.6
10/17	5.2	6.6	7.2	7.6	7.6	7.7	9.4	9.5	10.4	11.3	9.3	9.5
10/18	5.3	6.6	7.4	7.7	7.7	7.8	9.2	9.3	10.1	11.0	9.2	9.3
10/19	5.4	6.7	7.6	7.8	8.0	8.0	9.1	9.4	10.0	10.7	8.9	9.0
10/20	5.3	6.7	7.6	7.8	8.1	8.2	9.0	9.3	9.8	10.5	8.7	8.8
10/21	5.2	6.8	7.7	7.7	8.1	8.2	8.8	9.2	9.6	10.2	8.6	8.6
10/22	5.1	6.8	7.6	7.6	8.1	8.2	8.7	9.1	9.3	9.9	8.5	8.6
10/23	5.0	6.8	7.5	7.6	8.0	8.2	8.6	9.1	9.2	9.6	8.6	8.6
10/24	4.9	6.9	7.4	7.5	7.9	8.1	8.6	9.1	9.1	9.5	8.6	8.7
10/25	5.1	7.0	7.3	7.4	7.9	8.1	8.7	9.2	9.2	9.6	8.8	8.9
10/26	5.3	7.0	7.2	7.3	7.7	8.0	8.6	9.1	9.1	9.5	9.0	9.1
10/27	5.4	7.0	7.1	7.2	7.6	7.8	8.6	9.0	9.1	9.5	9.0	9.1
10/28	5.6	6.9	7.1	7.2	7.4	7.7	8.7	8.9	9.1	9.4	8.9	9.1
10/29	5.8	6.9	7.1	7.1	7.3	7.6	8.7	8.9	9.1	9.5	8.8	9.0
10/30	5.9	6.9	7.0	7.0	7.2	7.4	8.6	8.8	9.0	9.4	8.6	8.8
10/31	5.9	6.8	6.8	7.0	7.1	7.3	8.4	8.6	9.0	9.3	8.4	8.6

DATE	RM 18.2	RM 15.8	RM 15.5	RM 14.3	RM 11.3	RM 9.8	RM 9.6	RM 4.9	RM 4.4	RM 0.2	Skykomish	Skykomish
	(SFK) 7 Day Avg Max	7 Day Avg Max	7 Day Avg Max	7 Day Avg Max	7 Day Avg Max	7 Day Avg Max	7 Day Avg Max	7 Day Avg Max	7 Day Avg Max	7 Day Avg Max	Above 7 Day Avg Max	Below 7 Day Avg Max
11/1	5.7	6.7				6.9	8.1	8.2	8.9	9.2	7.9	8.2
11/2	5.4	6.6				6.6	7.9	7.9	8.8	9.1	7.5	7.9
11/3	5.3	6.5				6.4	7.6	7.5	8.7	8.9	7.1	7.6
11/4	5.1	6.6				6.2	7.3	7.2	8.5	8.7	6.7	7.2
11/5	4.8	6.7				6.1	7.1	7.0	8.4	8.6	6.4	7.0
11/6	4.7	6.9				6.1	7.1	6.8	8.2	8.4	6.2	6.8
11/7	4.5	7.0				6.1	7.1	6.8	8.1	8.3	6.1	6.8
11/8	4.3	7.2				6.3	7.1	6.9	8.0	8.2	6.2	6.8
11/9	4.2	7.3				6.6	7.2	7.1	7.9	8.2	6.4	6.9
11/10	4.0	7.4				6.9	7.4	7.3	7.8	8.1	6.5	7.0
11/11	3.9	7.5				7.1	7.4	7.5	7.8	8.1	6.8	7.1
11/12	3.8	7.4				7.1	7.4	7.6	7.7	8.0	6.9	7.2
11/13	3.8	7.3				7.1	7.4	7.5	7.6	7.9	6.9	7.2
11/14	4.0	7.2				7.0	7.3	7.5	7.5	7.9	6.9	7.1
11/15	4.0	7.0				7.0	7.2	7.4	7.5	7.8	6.9	7.1
11/16	4.1	6.9				6.8	7.1	7.3	7.4	7.7	6.8	7.0
11/17	4.1	6.8				6.7	7.0	7.2	7.3	7.6	6.6	6.8
11/18	4.2	6.7				6.8	7.0	7.1	7.2	7.5	6.6	6.8
11/19	4.2	6.7				7.0	7.2	7.3	7.3	7.5	6.6	6.8
11/20	4.2	6.6				7.4	7.5	7.6	7.4	7.6	6.7	6.9
11/21	4.2	6.5				7.6	7.7	7.9	7.5	7.6	6.7	6.8
11/22	4.2	6.5				7.7	7.8	8.0	7.5	7.5	6.6	6.8
11/23	4.1	6.4				7.9	8.0	8.3	7.5	7.5	6.7	6.9
11/24	4.0	6.3				8.0	8.0	8.3	7.5	7.5	6.8	7.0
11/25	3.9	6.1				7.9	7.9	8.4	7.5	7.5	6.8	7.0
11/26	3.7	5.9				7.6	7.7	8.1	7.2	7.3	6.6	6.9
11/27	3.4	5.8				7.2	7.3	7.7	7.0	7.2	6.4	6.7
11/28	3.2	5.8				7.0	7.1	7.5	6.9	7.1	6.3	6.6
11/29	3.0	5.8				6.8	7.0	7.3	6.8	7.0	6.2	6.5
11/30	3.0	5.7				6.5	6.7	7.0	6.7	6.9	6.0	6.3

DATE	RM 18.2 (SFK) 7 Day Avg Max	RM 15.8 7 Day Avg Max	RM 15.5 7 Day Avg Max	RM 14.3 7 Day Avg Max	RM 11.3 7 Day Avg Max	RM 9.8 7 Day Avg Max	RM 9.6 7 Day Avg Max	RM 4.9 7 Day Avg Max	RM 4.4 7 Day Avg Max	RM 0.2 7 Day Avg Max	Skykomish Above 7 Day Avg Max	Skykomish Below 7 Day Avg Max
12/1	3.0	5.7				6.3	6.5	6.8	6.6	6.8	5.9	6.2
12/2	3.0	5.7				6.0	6.3	6.6	6.5	6.6	5.7	6.1
12/3	3.2	5.7				5.7	6.1	6.2	6.4	6.5	5.6	5.9
12/4	3.3	5.7				5.4	5.9	6.0	6.3	6.4	5.4	5.8
12/5	3.4	5.7				5.1	5.7	5.7	6.1	6.3	5.2	5.6
12/6	3.5	5.7				4.8	5.5	5.4	6.0	6.1	5.0	5.4
12/7	3.8	5.7				4.6	5.3	5.1	5.9	6.0	4.8	5.2
12/8	3.8	5.7				4.3	5.2	4.9	5.8	5.9	4.5	5.0
12/9	4.0	5.7				4.3	5.1	4.7	5.7	5.9	4.4	4.9
12/10	4.0	5.7				4.3	5.1	4.7	5.6	5.8	4.3	4.8
12/11	4.1	5.7				4.3	5.0	4.6	5.6	5.8	4.3	4.8
12/12	4.1	5.6				4.3	5.0	4.7	5.5	5.7	4.3	4.8
12/13	4.2	5.5				4.4	5.1	4.8	5.5	5.7	4.4	4.9
12/14	4.2	5.4				4.6	5.2	5.0	5.5	5.7	4.6	5.0
12/15	4.2	5.4				5.0	5.4	5.2	5.6	5.8	4.8	5.1
12/16	4.2	5.3				5.2	5.6	5.5	5.7	5.8	4.9	5.2
12/17	4.2	5.2				5.3	5.7	5.7	5.8	5.8	5.0	5.3
12/18	4.1	5.1				5.4	5.6	5.7	5.8	5.8	5.0	5.2
12/19	4.0	5.1				5.4	5.6	5.7	5.7	5.7	5.0	5.2
12/20	3.9	5.0				5.4	5.5	5.6	5.6	5.6	4.9	5.1
12/21	3.7	4.9				5.0	5.3	5.4	5.5	5.5	4.5	4.8
12/22	3.4	4.7				4.6	5.0	5.0	5.2	5.3	4.2	4.5
12/23	3.2	4.5				4.3	4.7	4.7	5.0	5.1	3.9	4.3
12/24	3.0	4.4				4.1	4.5	4.4	4.8	4.9	3.7	4.1
12/25	3.0	4.4				4.0	4.4	4.4	4.7	4.8	3.7	4.1
12/26	3.0	4.4				4.1	4.5	4.4	4.7	4.8	3.7	4.1
12/27	3.0	4.4				4.2	4.6	4.5	4.8	4.8	3.7	4.1
12/28	3.2	4.4				4.4	4.7	4.7	4.8	4.9	4.0	4.3
12/29	3.3	4.3				4.5	4.7	4.8	4.8	4.8	4.1	4.4
12/30	3.4	4.3				4.5	4.7	4.8	4.8	4.8	4.2	4.4
12/31	3.5	4.3				4.5	4.7	4.9	4.8	4.8	4.4	4.5

## **APPENDIX D**

---

### *Smolt Outmigration Report, Sultan River*

---

# Smolt Out-Migration Report

## Sultan River

---

Annual Monitoring Report 2017

---

Jackson Hydroelectric Project  
FERC No. 2157







---

## Table of Contents

---

<b>1. Introduction.....</b>	<b>1</b>
<b>2. Methods .....</b>	<b>1</b>
2.1 Trap Description, Location, and Operation.....	1
2.2 Estimating Total Migration .....	4
2.3 Egg-to-Migrant Survival .....	5
<b>3. Results and Discussion .....</b>	<b>6</b>
3.1 Catch.....	6
3.2 Out-Migration Timing.....	7
3.3 Total Out-migration.....	8
3.4 Egg-to-Migrant Survival (Chinook).....	10
3.5 Fork Lengths .....	11
3.6 Catch per Unit Effort for 2012-2017 .....	11
<b>4. Summary.....</b>	<b>12</b>
<b>5. Literature Cited .....</b>	<b>13</b>

Appendix A Statistical Weeks and Corresponding Months

Appendix B Fork Lengths

## List of Figures

Figure 1.	Aerial photograph depicting the location of the Sultan River smolt trap.....	2
Figure 2.	Catch per unit effort by week of Chinook, yearling coho (1+), and chum salmon, Sultan River smolt trap, 2017.....	8
Figure B-1.	Range (mean, minimum, and maximum) of Chinook fork lengths (mm), by statistical week, Sultan River smolt trap, 2017. ....	B-1
Figure B-2.	Range (mean, minimum, maximum) of yearling coho (1+) fork lengths (mm) by statistical week, Sultan River smolt trap, 2017. ....	B-2
Figure B-3.	Range (mean, minimum, maximum) of chum fork lengths (mm) by statistical week, Sultan River smolt trap, 2017.....	B-3
Figure B-4.	Range (mean, minimum, maximum) of steelhead/rainbow trout fork lengths (mm) by statistical week, Sultan River smolt trap, 2017. ....	B-4

## List of Tables

Table 1.	Number and percentage of hours operated by week, Sultan River smolt trap, 2017.....	3
Table 2.	Total number of fish captured by species and life stage, Sultan River smolt trap, 2017.	6
Table 3.	Number of salmon and trout caught by statistical week, Sultan River smolt trap, 2017.	7
Table 4.	Summary of mark-recapture tests of capture efficiency for wild Chinook, hatchery Chinook, chum, and all combined species, Sultan River smolt trap, 2017.....	8
Table 5.	Chinook migration estimate, fish used for efficiency test with capture efficiency in parentheses, 95% confidence level, and variance, Sultan River smolt trap, 2017. ....	9
Table 6.	Chum migration estimate, fish used for efficiency test with capture efficiency in parentheses, 95 percent confidence level, and variance, Sultan River smolt trap, 2017. ....	9
Table 7.	Yearling coho (1+) migration estimate, fish used for efficiency test with capture efficiency in parentheses, 95 percent confidence level, and variance, Sultan River smolt trap, 2017.....	9
Table 8.	Estimated number of Chinook redds, salmon eggs deposited in gravel (based on fall spawning surveys), estimated total out-migration, calculated percent egg-to-migrant survival, and recorded peak flow in cubic feet per second (cfs) during incubation (August 15-February 15). ....	10
Table B-1.	Mean fork length (mm), standard deviation (SD), minimum and maximum length, number sampled, number captured, and percent sampled of Chinook by statistical week, Sultan River smolt trap, 2017. ....	B-1

---

Table B-2. Mean fork length (mm) standard deviation (SD), minimum and maximum length, number sampled, number captured, and percent sampled of yearling coho (1+) by statistical week, Sultan River smolt trap, 2017. ....	B-2
Table B-3. Mean fork length (mm), standard deviation (SD), minimum and maximum length, number sampled, number captured, and percent sampled of chum by statistical week, Sultan River smolt trap, 2017. ....	B-3
Table B-4. Mean fork length (mm), standard deviation (SD), minimum and maximum length, number sampled, number captured, and percent sampled of steelhead/rainbow trout by statistical week, Sultan River smolt trap, 2017. ....	B-4
Table B-5. Fork lengths (mm) of steelhead/rainbow trout smolt, parr, and YOY by statistical week, Sultan River smolt trap, 2017. ....	B-5
Table B-6. Mean fork length (mm), standard deviation (SD), minimum and maximum length, number sampled, number captured, and percent sampled of cutthroat trout by statistical week, Sultan River smolt trap, 2017. ....	B-6
Table B-7. Mean fork length (mm), standard deviation (SD), minimum and maximum length, number sampled, number captured, and percent sampled of sockeye salmon by statistical week, Sultan River smolt trap, 2017. ....	B-7

## **1. Introduction**

In 2012, Public Utility District No. 1 of Snohomish County (the District) began monitoring the out-migration of juvenile salmonids (smolts) as a measure (index) of reproductive success in the Sultan River near Sultan, Washington. This monitoring is one component of the Fisheries and Habitat Monitoring Plan (FHMP), as outlined in Article 410 of the License issued by the Federal Energy Regulatory Commission (FERC) on September 2, 2011, for the continued operation of the Jackson Hydroelectric Project (Project). This report presents the results of the sixth year (Year 6) of operation of the rotary screw trap (smolt trap) located on the lower Sultan River. Year 6 is the sixth of six consecutive years of initial operation, as outlined in the FHMP. Beginning in 2018 and extending to the end of the 45-year License term, the District will continue to operate the smolt trap for 2 out of every 6 years, as determined by the Project's Aquatic Resource Committee (ARC).

The FHMP also stipulates that, subject to the results of monitoring, the District will commence operation of the smolt trap on February 1 and continue operations through June 30 of each sampling year. The District will operate the trap between 30 and 40 percent of the hours in any given week during the sampling year, except during severe flow events, and scheduled to fish for 4-day and 4-night periods per week, with each fishing period lasting a minimum of 6 hours. During periods when few fish are emigrating, the frequency of trapping can be reduced to fewer days per week. The FHMP also stipulates that the trap will be located in the lower mile of the Sultan River and that the District will collect, compile, analyze and report the following trap data by species and life stage: number captured, size distribution, timing (diel and seasonal), fish population estimates, and trap efficiency.

## **2. Methods**

### **2.1 Trap Description, Location, and Operation**

The Sultan River smolt trap, manufactured by E.G. Solutions, is 5 feet in diameter and designed to sample out-migrating fish over a range of flow conditions (discharge, depth, and velocity). The trap is seasonally positioned in the Sultan River at a location approximately 0.2 miles upstream of the confluence with the Skykomish River (Figure 1).





**Figure 1. Aerial photograph depicting the location of the Sultan River smolt trap.**

During 2017, the trap was operated from January 8 to June 29, fishing 66 percent of the total hours during that time period (67 percent of the day hours and 65 percent of the night hours). Table 1 summarizes total hours and percentage of time fished, by statistical week.



**Table 1. Number and percentage of hours operated by week, Sultan River smolt trap, 2017.**

Statistical Week <sup>1</sup>	Sample Block Start Date	Hours Operated	Percent Hours Operated
2	8-Jan	119	71
3	16-Jan	77	46
4	22-Jan	118	70
5	29-Jan	122	72
6	5-Feb	76	46
7	12-Feb	92	54
8	20-Feb	95	57
9	26-Feb	120	71
10	6-Mar	98	58
11	12-Mar	125	74
12	20-Mar	105	63
13	26-Mar	102	61
14	4-Apr	74	44
15	9-Apr	122	72
16	16-Apr	126	75
17	23-Apr	125	74
18	30-Apr	163	97
19	7-May	128	76
20	14-May	120	71
21	21-May	117	70
22	29-May	102	61
23	4-Jun	121	72
24	11-Jun	121	72
25	18-Jun	117	70
26	25-Jun	92	55

<sup>1</sup> Throughout this report, weekly data is presented by statistical week. A table of statistical weeks and the corresponding months is given in Appendix A.

During operation, the trap was constantly monitored for cone revolutions and directly observed through video surveillance. Site visits occurred at a minimum of once per day and more frequently depending on operating conditions. The number of cone revolutions per minute was recorded at the beginning and end of each trapping period (set). Discharge information from upstream of the trapping site was obtained from the U.S. Geological Survey Gaging Station No. 12138160 (Sultan River below Powerplant; River Mile 4.5).

At the end of each set, captured fish were enumerated and sorted by species and life history stage. Steelhead/rainbow trout were classified as smolt, parr, or young of the year (YOY).

Smolts exhibit silvery body coloring, thin shape, blackened fin margins, and deciduous scales while parr retain their freshwater coloration (parr marks) (Loch et al., 1988). YOY were identified based on size (< 40 mm) and standard identification keys (Pollard et al., 1997).

Throughout the sampling season, on a weekly basis, a subsample of fish were measured for length (fork length in millimeters). Prior to measurement, fish were anesthetized with Tricaine Methanesulfonate (MS-222). Prior to release, fish were placed in a freshwater tank and allowed to recover.

## **2.2 Estimating Total Migration**

In order to estimate total out-migration, the capture efficiency (percentage of total out-migrating fish captured) of the trap was determined through a series of tests conducted over the range of operating conditions. Capture efficiency tests were performed by releasing marked groups of wild Chinook (2,328), chum (1,382), and hatchery Chinook (3,750). Wild Chinook and chum were marked with Bismarck Brown dye prior to their release. Hatchery Chinook were adipose fin-clipped. Wild Chinook were released on 26 days, chum on 19 days, and hatchery Chinook on 5 days in batches of 750 fish. Catches of wild coho were low, which precluded their use for efficiency trials.

The release site for all efficiency tests was at Reese Park, approximately 0.2 miles upstream of the trap. This distance was sufficient to allow for mixing of fish across the stream channel and within the water column, but short enough to reduce the likelihood of predation before released fish arrive at the trap. In order to assure that marked and unmarked fish have the same probability of capture, the trap operated continuously for a minimum of 72 hours after each release to allow all marked fish to migrate past the trap.

A modified Peterson mark-recapture approach was used to estimate total migration for the season (Volkhardt et al., 2007).

The following 5 assumptions must be met in order to estimate total migration:

- 1) The population is closed;
- 2) All fish (marked and unmarked) have an equal opportunity of capture;
- 3) Marking does not affect catchability;
- 4) Marked fish mix at random with unmarked fish; and
- 5) All marks are detected and reported.

Peterson's equation is slightly biased. Therefore, we used Seber's adjustment (Seber, 1982) to Peterson's equation because it assumes that the second sampling is done without replacement. Because we did not sample all hours during the season, we've modified Seber's equation to adjust for our sampling effort. Our modified Seber's estimator is:

$$U_{2017} = \left( \frac{u_{2017} + 1}{p_{2017}} \right) \left( \frac{M_{2017} + 1}{m_{2017} + 1} \right)$$

Where:

$U_{2017}$  = Estimated number of fish migrating past the trap including hours not fished

$u_{2017}$  = Number of fish captured at the trap

$p_{2017}$  = Percent of hours fished

$M_{2017}$  = Number of fish marked and released during efficiency trials

$m_{2017}$  = Number of marked fish captured during efficiency trials

An approximate variance estimate of  $U_{2017}$  is:

$$\widehat{Var}(U_{2017}) = \frac{(u_{2017} + 1)(M_{2017} + 1)(u_{2017} - m_{2017})(M_{2017} - m_{2017})}{p_{2017}^2(m_{2017} + 1)^2(m_{2017} + 2)}$$

and the approximate 95% confidence interval is:

$$U_{2017} \pm 1.96 \sqrt{\widehat{Var}(U_{2017})}$$

## 2.3 Egg-to-Migrant Survival

The 2017 Chinook egg-to-migrant survival was estimated using data collected during fall 2016 spawning surveys in conjunction with the juvenile migration estimate.

Egg-to-migrant survival is estimated by:

$$S_{2017} = \left( \frac{E_{2016}}{U_{2017}} \right)$$

Where:

$S_{2017}$  = Chinook egg-to-migrant survival in 2017

$U_{2017}$  = Estimate of 2017 Chinook juvenile migration

$E_{2016}$  = Number of Chinook eggs deposited in gravel in 2016

The number of Chinook eggs deposited in the gravel is calculated by multiplying the number of redds estimated during fall spawner surveys, by the average number of eggs per female from Wallace River Hatchery data (4,510 eggs/female). Spawner surveys for chum and coho did not occur in the Sultan River in 2016; therefore, it is not possible to generate egg-to-migrant survival for these species. Typically the river is too turbid to get accurate fish counts during their respective spawning seasons.

### 3. Results and Discussion

#### 3.1 Catch

A total of 10,993 fish were captured during the 2017 sampling year (Table 2). Although scales were not collected, all Chinook were determined to be age 0+ based on size and identification keys (Pollard et al., 1997).

**Table 2. Total number of fish captured by species and life stage, Sultan River smolt trap, 2017.**

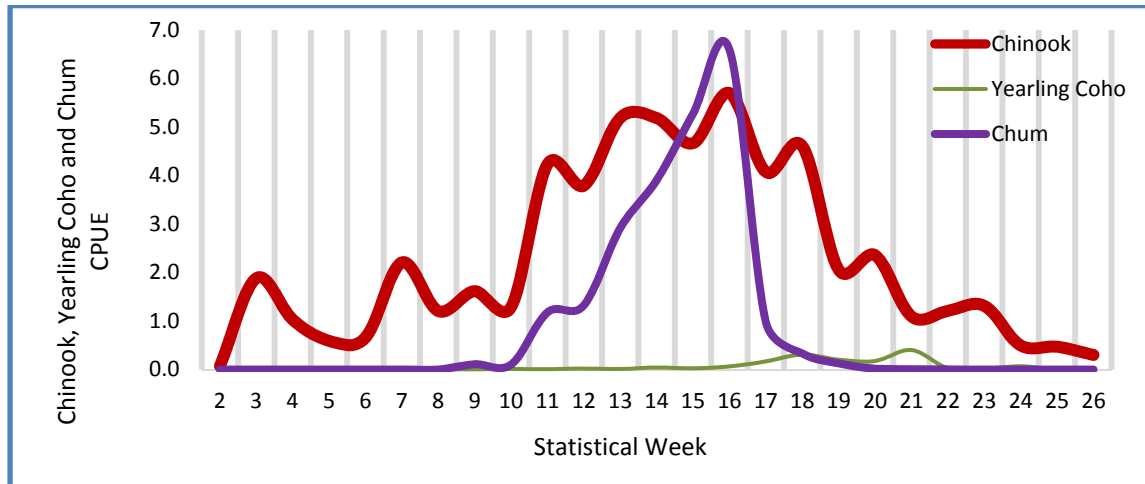
Species	Total
Chinook Salmon	6,516
Chum Salmon	2,564
Coho (0+) Salmon	719
Coho (1+) Salmon	199
Sockeye (0+) Salmon	5
Sockeye (1+) Salmon	1
Steelhead/Rainbow Trout	128
Cutthroat Trout	20
Dace unident	679
Lamprey unident	80
Sculpin unident	71
Sucker unident	6
Peamouth	2
Largemouth Bass	2
Mountain Whitefish	1

### 3.2 Out-Migration Timing

Out-migration timing was determined using weekly catch data (Table 3). Data were converted to catch per unit effort (CPUE) for Chinook, yearling coho, and chum to evaluate timing throughout the season (Figure 2). The Year 6 (2017) sampling effort was the first year that sockeye have been captured at the trap. During fall 2015, one active sockeye redd was observed during a spawner survey. Also, in 2016, two active sockeye redds were observed during fall spawner surveys.

**Table 3. Number of salmon and trout caught by statistical week, Sultan River smolt trap, 2017.**

Statistical Week	Sample Block Start Date	Hours Fished	Chinook	Sockeye	Coho (1+)	Coho (0+)	Chum	Steelhead / Rainbow	Cutthroat
2	8-Jan	120	9	0	0	0	0	0	0
3	16-Jan	77	145	0	0	0	0	0	0
4	22-Jan	118	121	0	0	0	0	0	0
5	29-Jan	122	72	0	0	0	0	0	0
6	5-Feb	76	50	0	0	0	0	0	0
7	12-Feb	92	202	1 (0+)	1	0	0	3	1
8	20-Feb	96	115	0	0	0	0	0	2
9	26-Feb	120	193	2 (0+)	1	5	13	0	2
10	6-Mar	98	126	2 (0+)	1	7	10	0	0
11	12-Mar	125	527	0	1	22	147	0	2
12	20-Mar	105	398	0	2	18	139	1	1
13	26-Mar	103	532	0	1	17	299	3	1
14	4-Apr	78	381	0	3	17	287	1	0
15	9-Apr	122	567	0	3	41	641	6	2
16	16-Apr	127	721	0	8	106	834	10	2
17	23-Apr	125	507	0	21	63	121	6	1
18	30-Apr	163	751	0	50	61	54	4	2
19	7-May	129	264	0	26	19	16	6	0
20	14-May	120	283	0	21	44	2	8	0
21	21-May	117	128	1 (1+)	47	14	1	6	4
22	29-May	103	124	0	3	96	0	1	0
23	4-Jun	121	159	0	2	113	0	5	0
24	11-Jun	121	60	0	8	32	0	8	0
25	18-Jun	117	55	0	0	39	0	14	0
26	25-Jun	93	26	0	0	5	0	46	0
<b>Season Total</b>		2,788	6,516	6	199	719	2,564	128	20



**Figure 2. Catch per unit effort by week of Chinook, yearling coho (1+), and chum salmon, Sultan River smolt trap, 2017.**

### 3.3 Total Out-Migration

In order to estimate total out-migration, groups of wild Chinook, hatchery Chinook and wild chum salmon were used to assess capture efficiency throughout the season. Table 4 summarizes results of efficiency trials by species.

**Table 4. Summary of mark-recapture tests of capture efficiency for wild Chinook, hatchery Chinook, chum, and all combined species, Sultan River smolt trap, 2017.**

Fish Used	Total Marked and Released	Total Recaptured	Percent Trap Efficiency
Wild Chinook	2,328	54	2.3
Hatchery Chinook	3,750	63	1.7
Chum	1,382	36	2.6
All Combined	7,460	153	2.1

A modified Peterson mark-recapture approach was used to determine capture efficiency and estimate total migration of Chinook, yearling coho, and chum salmon.

If possible, efficiency trials should be conducted for each species whose production is to be estimated (Volckhardt et al., 2007). Different species exhibit different migratory behavior (Groot and Margolis 1991) and estimates of trap efficiency generally vary between species (Seelbach et al., 1985) and among fish sizes within a species (Dambacher 1991).

The catch of wild Chinook and chum was sufficient to be used for efficiency estimates of these two species without using other species or hatchery Chinook as a surrogate (Table 5 and 6).



However, the number of yearling coho caught was insufficient to be used for efficiency trials; therefore, the efficiency of all combined (2.1%) increased the sample size and was used to estimate the capture efficiency for yearling coho (Table 7).

**Table 5. Chinook migration estimate, fish used for efficiency test with capture efficiency in parentheses, 95% confidence level, and variance, Sultan River smolt trap, 2017.**

Chinook Migration Estimate	Fish Used for Efficiency Test and Capture Efficiency	95 Percent Confidence Level		Migration Variance
		High	Low	
424,858	Wild Chinook (2.3 percent)	537,140	316,967	3.15E+09

**Table 6. Chum migration estimate, fish used for efficiency test with capture efficiency in parentheses, 95 percent confidence level, and variance, Sultan River smolt trap, 2017.**

Chum Migration Estimate	Fish Used for Efficiency Test and Capture Efficiency	95 Percent Confidence Level		Migration Variance
		High	Low	
148,866	Chum (2.6 percent)	190,159	99,850	5.31E+08

**Table 7. Yearling coho (1+) migration estimate, fish used for efficiency test with capture efficiency in parentheses, 95 percent confidence level, and variance, Sultan River smolt trap, 2017.**

Yearling Coho Migration Estimate	Fish Used for Efficiency Test and Capture Efficiency	95 Percent Confidence Level		Migration Variance
		High	Low	
14,675	All Combined (2.1 percent)	15,750	13,560	3.12E+05

The Peterson mark-recapture approach is based on five assumptions. These assumptions must be met, or accommodated, in order to ensure an unbiased abundance estimate. A determination was made that all five assumptions were satisfied.

1. The population is closed with no immigration or emigration.

This assumption was satisfied because all fish that passed the trap were migrating from only the Sultan River. Because we were far enough upstream (0.2 miles) from the mouth, we do not believe any fish that passed the trap were emigrating from the Skykomish River.

2. All fish (marked and unmarked) have an equal opportunity of capture.

In order to be assured that marked fish and unmarked fish have the same probability of capture, the trap was fished continuously for a minimum of 48 hours after each release. All efficiency releases were at a site 0.2 miles upstream of the trap. This distance was great enough to allow for mixing of fish across the stream channel and within the water column, but short enough to reduce the likelihood of predation that would result in the loss of fish before they have an opportunity to arrive at the trap.

### 3. Marking does not affect catchability

After marking wild Chinook and chum with Bismarck Brown, the fish were held in aerated totes for a minimum of one hour prior to release. The fish showed no unusual behavior or stress as a result of marking. The Wallace Hatchery Chinook were adipose fin-clipped at the hatchery. These fish were held in aerated totes when being transferred from the hatchery to the release site. Water temperature was constantly monitored in the aerated totes.

### 4. The fish do not lose their marks.

The use of Bismarck Brown for Chinook and chum and the adipose fin-clip for hatchery Chinook satisfied this assumption.

### 5. All recovered marks are detected and reported.

Bismarck Brown marked Chinook and chum and adipose fin-clipped hatchery Chinook were easily detected and recorded immediately.

## 3.4 Egg-to-Migrant Survival (Chinook)

During the fall of 2016, a total of 275 Chinook redds were estimated during spawner surveys in the Sultan River, upstream of the trap site. Assuming an out-migrant estimate of 424,858 fish, the egg-to-migrant survival for brood year 2016 was 34.3% (Table 8). This is a much higher rate than the 2015 brood year in which egg-to-migrant survival was only 7.4%. The 2015 low survival is likely the result of a high water event (peak of 7,320 cubic feet per second) that occurred in November 2015. A flow of this magnitude likely resulted in significant scour. The highest (peak) flow that occurred during 2016 Chinook incubation was 2,970 cfs and would not have resulted in scour (Stillwater Sciences, Meridian Environmental, 2008).

**Table 8. Estimated number of Chinook redds, salmon eggs deposited in gravel (based on fall spawning surveys), estimated total out-migration, calculated percent egg-to-migrant survival, and recorded peak flow in cubic feet per second (cfs) during incubation (August 15-February 15).**

Year of Trap Operation	Chinook Redds (Year)	Number of Eggs Deposited in Gravel	Total Out-Migration	Percent Egg – to- Migrant Survival	Peak Flow During Egg Incubation (cfs)
2017	275 (2016)	1,240,250	424,858	34.3	2,970
2016	156 (2015)	703,560	52,294	7.4	7,320
2015	146 (2014)	658,460	231,397	35.1	3,520
2014	184 (2013)	829,840	124,770	15.0	3,800
2013	390 (2012)	1,758,900	443,789	25.2	2,290
2012	53 (2011)	239,030	45,986	19.2	3,360

### 3.5 Fork Lengths

#### **Chinook**

Chinook fork lengths averaged 40.9 mm through week 23 (first week of June). Beginning in Week 24, Chinook lengths increased rapidly, averaging 63.8 mm during the last three weeks of the season. This considerable difference in length is an indicator that some Chinook migrate past the trap soon after emergence and others stay in the river and grow prior to migrating.

It is interesting to note that even though mean length increased rapidly during the last three weeks of the season, thirteen of the fifty-two (25 percent) Chinook sampled were between 37 and 42 mm, indicating protracted emergence and/or slow growth for some fish.

#### **Yearling Coho (1+)**

Fork lengths averaged 84.3 mm through week 15. Lengths increased rapidly beginning in week 16 and averaged 97.3 mm from week 16 through the end of the season. The cause of this increase in length beginning in week 16 (mid-April) is likely due to the fact that during winter months, feeding virtually ceases and growth stops. Fish begin feeding in early spring, which results in a rapid increase in growth (Groot *et al.*, 1991).

#### **Chum**

Chum fork lengths averaged 39.9 mm and showed little variation throughout the season (SD 1.2). This small variation in length indicates that the vast majority of chum spend minimal time in the river and migrate past the trap soon after emergence.

#### **Steelhead/Rainbow Trout**

The first steelhead smolt was captured in week 17 (late April) and the last one in week 24 (early June). Smolt fork lengths averaged 162.2 mm for the season. The first YOY rainbow trout was captured in week 25. Young of the year fork lengths averaged 28.0 mm.

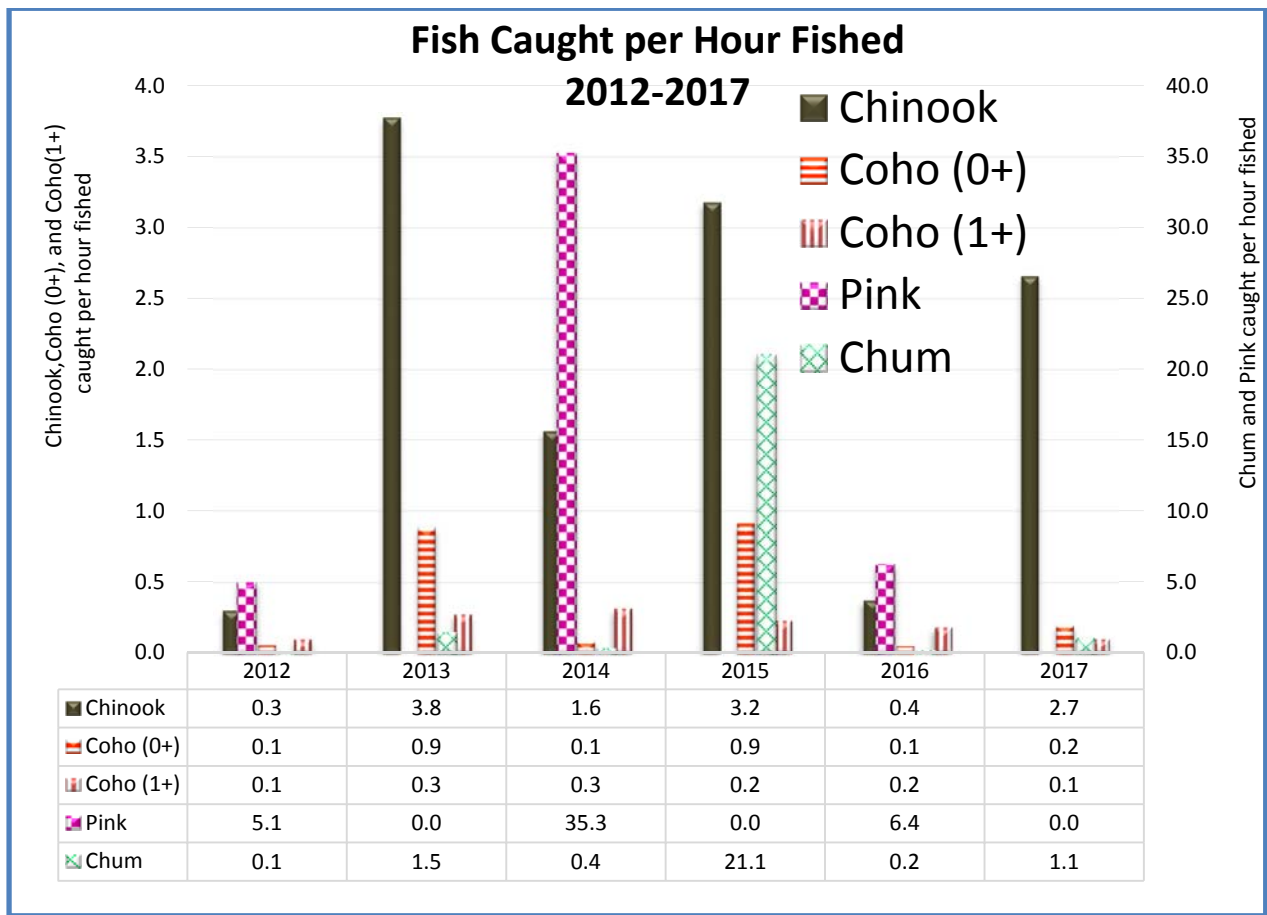
#### **Sockeye**

Newly emerged sockeye were caught in weeks 7, 9, and 10 and fork length averaged 21 mm. One yearling sockeye was caught in week 21 and fork length was 95 mm.

Detailed information regarding fork lengths of salmon and trout is given in Appendix B.

### 3.6 Catch per Unit Effort for 2012-2017

The smolt trap has been in the same location during the first six years of operation, and in all likelihood will continue to be operated in the same location in future years. Figure 3 summarizes CPUE (catch/hour) for Chinook, sub-yearling coho (0+), yearling coho (1+), and chum salmon for 2012-2017.



**Figure 3. Catch per unit effort of Chinook, sub-yearling coho (0+), yearling coho (1+), and chum salmon during 2012-17, Sultan River smolt trap.**

#### 4. Summary

This report presents the results of the sixth year of operation of the rotary screw trap located at River Mile 0.2 of the Sultan River. In 2017, the trap was operated from January 8 to June 29 and fished 66 percent of the total hours during that time period.

Chinook egg-to-migrant survival in 2017 was estimated at 34.3 percent. No high water events occurred during incubation that would have resulted in scour.

Chinook, chum, and yearling coho salmon production estimates were calculated using a modified Peterson mark-recapture approach. An estimated 424,858 Chinook, 148,866 chum, and 14,675 yearling coho migrated during the trapping period.

## 5. Literature Cited

- Dambacher, J. M., 1991. *Distribution, abundance, and emigration of juvenile steelhead (Oncorhynchus mykiss) and analysis of stream habitat in the Steamboat Creek basin, Oregon*. Master's thesis. Oregon State University, Corvallis.
- Groot, C., Margolis, L., 1991. *Pacific salmon life histories*. UBC press. 564 p.
- Loch, J.J., Leider, S. A., Chilcote, M., W., Cooper, R., and Johnson, T. H., 1988. *Differences in yield, emigration-timing, size, and age structure of juvenile steelhead from two small western Washington streams*, California Fish and Game 74: p. 106-118.
- Pollard, W. R., Hartman, G. F., Groot, C., and Edgell, P., 1997, *Field Identification of Coastal Juvenile Salmonids*, Harbour Publishing, British Columbia, Canada, 32 p.
- Seber, G.A. F. 1982. *The Estimation of Animal Abundance and Related Parameters*, 2<sup>nd</sup> edition. Charles Griffin and Company. London, 654 p.
- Seelbach, P. W, Lockwood, N., and Alexander, G. R., 1985, *A modified incline-screen trap for catching salmon smolts in large rivers*. North American Journal of Fisheries Management, 5: p. 494-498.
- Stillwater Sciences and Meridian Environmental, 2008. *Study Plan 22: Sultan River Physical Process Studies*. Prepared by Stillwater Sciences and Meridian Environmental, Seattle, WA for Snohomish County Public Utilities District, Everett, WA, 83 p.
- Volkhardt, G.C., Johnson, S.L., Miller, B.A., Nickelson, T.E., and Seiler, D.E., 2007, *Rotary Screw Traps and Inclined Plane Screen Traps, In Salmonid Field Protocols Handbook: Techniques for Assessing Status and Trends in Salmon and Trout Populations*, American Fisheries Society, Bethesda, Maryland, p. 235-266.

**Appendix A**  
**Statistical Weeks and Corresponding Months**

Statistical Weeks	Corresponding Months
1-5	January
6-9	February
10-13	March
14-17	April
18-22	May
23-26	June



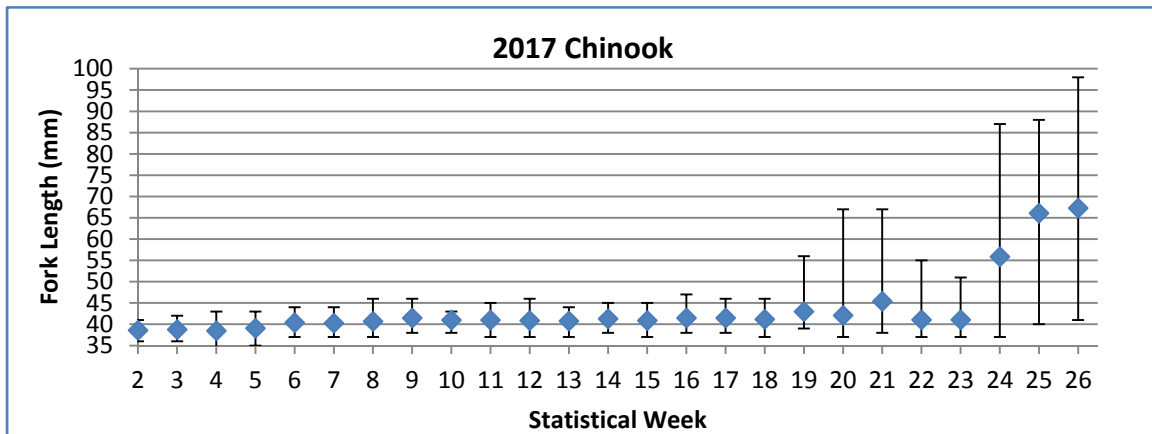
## Appendix B

### Fork Lengths

#### Chinook

**Table B-1. Mean fork length (mm), standard deviation (SD), minimum and maximum length, number sampled, number captured, and percent sampled of Chinook by statistical week, Sultan River smolt trap, 2017.**

Statistical Week	Mean	SD	Min	Max	Sampled	Captured	Percent Sampled
2	38.6	1.67	36	41	9	9	100
3	38.8	1.7	36	42	21	145	14
4	38.5	2.6	34	43	58	121	48
5	39.1	2.4	35	43	31	72	43
6	40.4	2.2	37	44	21	50	42
7	40.3	1.8	37	44	44	202	22
8	40.7	2.2	37	46	41	115	36
9	41.5	1.5	38	46	46	193	24
10	41.0	1.2	38	43	35	126	28
11	41.0	1.5	37	45	122	527	23
12	40.9	1.6	37	46	115	398	29
13	40.8	1.5	37	44	80	532	15
14	41.3	1.5	38	45	48	381	13
15	40.9	1.6	37	45	57	567	10
16	41.5	2.2	38	47	55	721	8
17	41.5	1.7	38	46	74	507	15
18	41.2	1.5	37	46	88	751	12
19	43.0	4.3	39	56	25	264	9
20	42.1	5.0	37	67	50	283	18
21	45.4	8.0	38	67	14	128	11
22	41.1	2.9	37	55	49	124	40
23	41.1	3.8	37	51	35	159	22
24	55.9	19.7	37	87	15	60	25
25	66.1	17.8	40	88	11	55	20
26	67.3	14.6	41	98	26	26	100
Season Summary	42.0	6.4	34	98	1,170	6,516	18



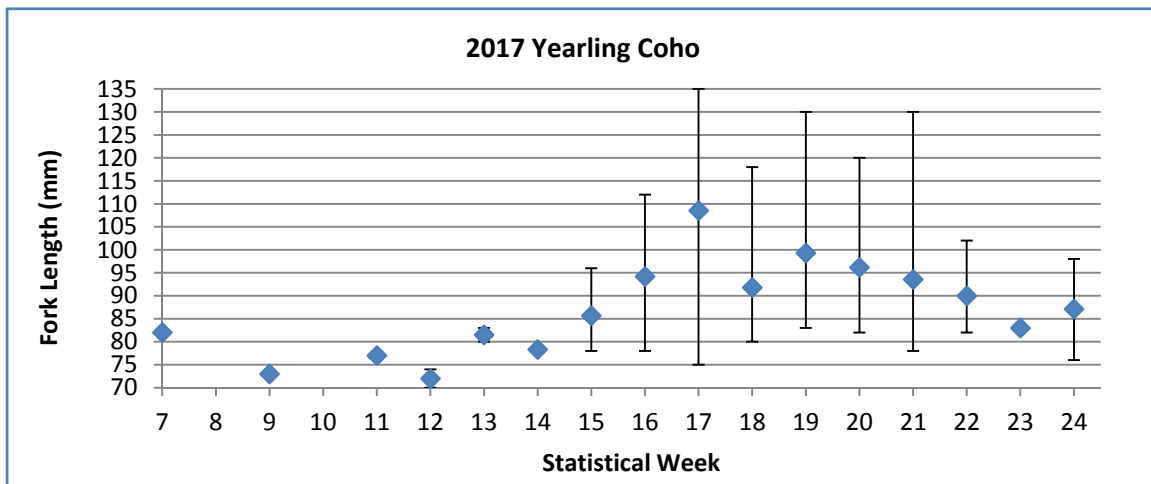
**Figure B-1. Range (mean, minimum, and maximum) of Chinook fork lengths (mm), by statistical week, Sultan River smolt trap, 2017.**

## Yearling Coho

The first yearling coho was captured in week 7 and the last one in week 24.

**Table B-2. Mean fork length (mm) standard deviation (SD), minimum and maximum length, number sampled, number captured, and percent sampled of yearling coho (1+) by statistical week, Sultan River smolt trap, 2017.**

Statistical Week	Mean	SD	Min	Max	Sampled	Captured	Percent Sampled
7	82.0		82	82	1	1	100
8						0	
9	73.0		73	73	1	1	100
10					0	1	0
11	77.0		77	77	1	1	100
12	72.0	2.8	70	74	2	2	100
13	81.5	2.1	80	83	1	1	100
14	78.3	0.6	78	79	3	3	100
15	85.7	9.3	78	96	3	3	100
16	94.2	16.3	78	112	5	8	63
17	108.5	23.1	75	135	21	21	100
18	91.8	21.3	80	118	45	50	90
19	99.3	11.5	83	130	26	26	100
20	96.2	13.9	82	120	21	21	100
21	93.6	13.2	78	130	14	47	30
22	90.0	8.8	82	102	4	3	133
23	83.0		83	83	1	2	50
24	87.1	7.4	76	98	8	8	100
Season Summary	96.0	14.8	73	135	157	199	79



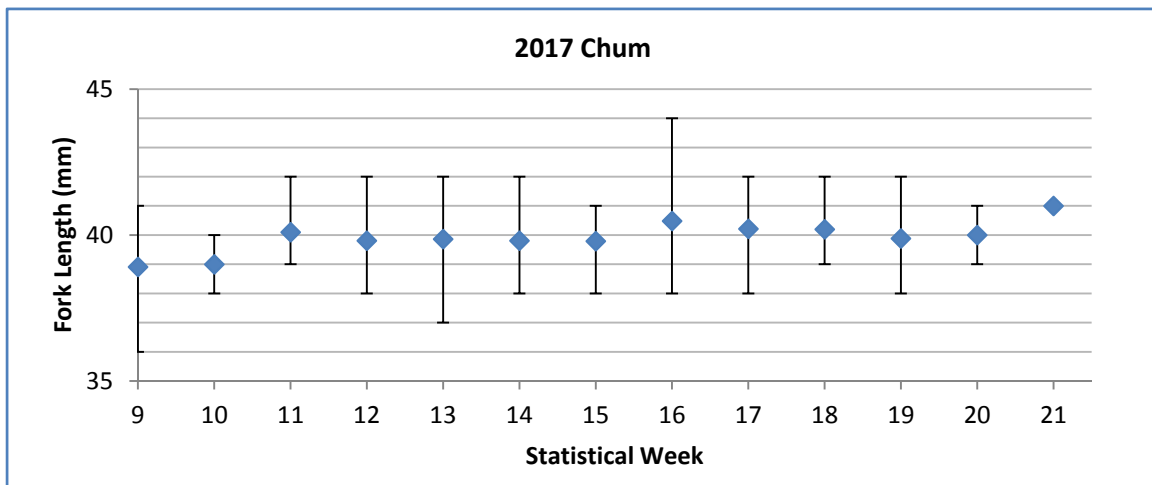
**Figure B-2. Range (mean, minimum, maximum) of yearling coho (1+) fork lengths (mm) by statistical week, Sultan River smolt trap, 2017.**

**Chum**

The first chum was caught in week 9 and the last one in week 21.

**Table B-3. Mean fork length (mm), standard deviation (SD), minimum and maximum length, number sampled, number captured, and percent sampled of chum by statistical week, Sultan River smolt trap, 2017.**

Statistical Week	Mean	SD	Min	Max	Sampled	Captured	Percent Sampled
9	38.9	1.4	36	41	11	13	85
10	39.0	0.8	38	40	7	10	70
11	40.1	0.9	39	42	29	147	20
12	39.8	1.3	38	42	26	139	19
13	39.9	1.1	37	42	45	299	15
14	39.8	1.0	38	42	37	287	13
15	39.8	0.9	38	41	24	641	4
16	40.5	1.4	38	44	29	834	3
17	40.2	1.00	38	42	23	121	19
18	40.2	0.9	39	42	10	54	19
19	39.9	1.5	38	42	9	16	56
20	40.0	1.4	39	41	2	2	100
21	41.0		41	41	1	1	100
Season Summary	39.9	1.2	36	44	253	2,564	10



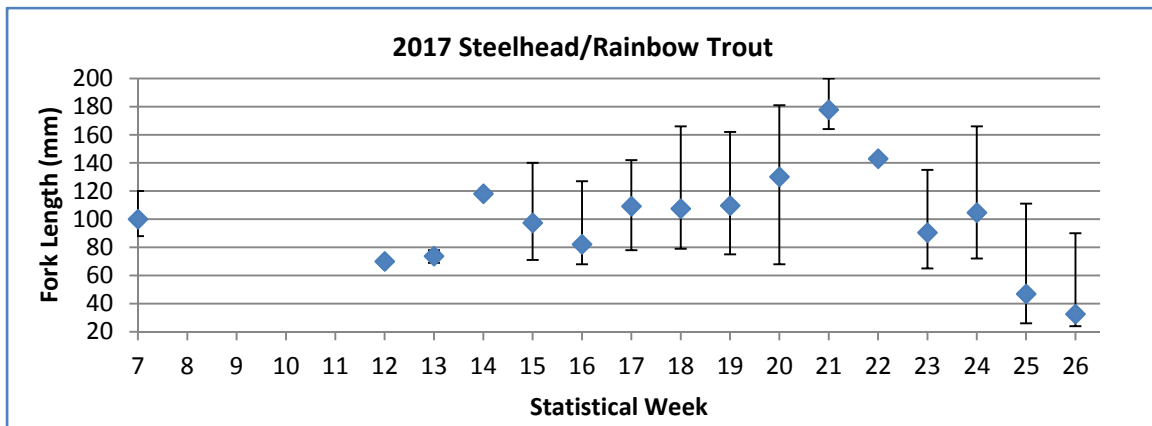
**Figure B-3. Range (mean, minimum, maximum) of chum fork lengths (mm) by statistical week, Sultan River smolt trap, 2017.**

## Steelhead/Rainbow Trout

The first steelhead/rainbow trout was captured in week 7 and the last one in week 26. The first smolt was captured in week 17 and the first young of the year steelhead/rainbow trout was captured in week 25.

**Table B-4. Mean fork length (mm), standard deviation (SD), minimum and maximum length, number sampled, number captured, and percent sampled of steelhead/rainbow trout by statistical week, Sultan River smolt trap, 2017.**

Statistical Week	Mean	SD	Min	Max	Sampled	Captured	Percent Sampled
7	100	17.4	88	120	3	3	100
8						0	
9						0	
10						0	
11						0	
12	70.0		70	70	1	1	100
13	73.7	4.5	69	78	3	3	100
14	118.0		118	118	1	1	100
15	97.3	29.9	71	140	6	6	100
16	82.1	17.7	68	127	10	10	100
17	109.2	29.8	78	142	6	6	100
18	107.5	40.8	79	166	4	4	100
19	109.7	40.1	75	162	6	6	100
20	130.1	47.4	68	181	8	8	100
21	177.8	16.1	164	200	4	6	67
22	143.0	143	143	143	1	1	100
23	90.4	26.9	65	135	5	5	100
24	104.6	34.1	72	166	8	8	100
25	46.9	30.6	26	111	14	14	100
26	32.6	16.1	24	90	46	46	100
Season	73.0	46.9	24	200	126	128	98



**Figure B-4. Range (mean, minimum, maximum) of steelhead/rainbow trout fork lengths (mm) by statistical week, Sultan River smolt trap, 2017.**

**Table B-5. Fork lengths (mm) of steelhead/rainbow trout smolt, parr, and YOY by statistical week, Sultan River smolt trap, 2017.**

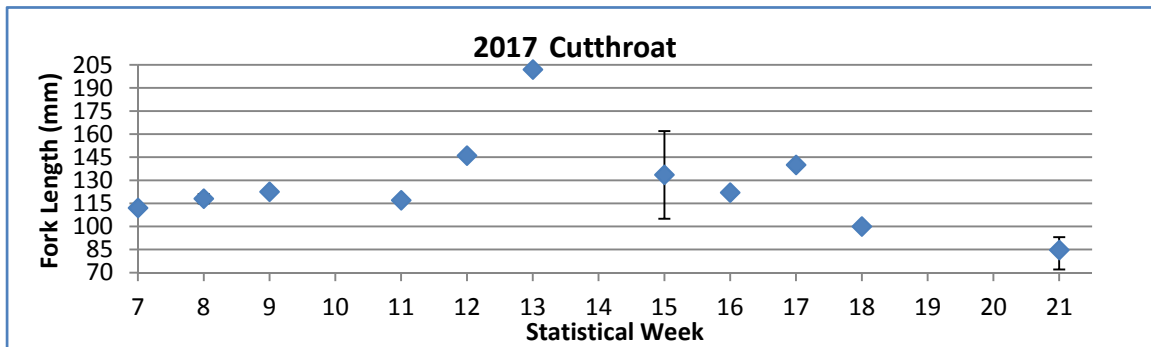
Statistical Week	Smolt fork length (mm)	Parr fork length (mm)	YOY fork length (mm)
7		88,92,120	
8			
9			
10			
11			
12		70	
13		69,74,78	
14		118	
15		71,75,77,92,129,140	
16		68,69,71,72,73,81,82,85,93,127	
17	142,142	78,81,90,122	
18	166	79,80,105	
19	160,162	75,82,88,91	
20	155,168,178,181	68,70,94,127	
21	164,168,179,200		
22	143		
23	135	65,76,83,93	
24	148,166	72,79,87,89,90,106	
25		68,87,100,111	26,28,28,29,29,30,30,30,30,30
26		78,83,84,90	24,25,25,25,25,26,26,26,26,26,27,27, 27,27,27,27,27,28,28,28,28,28,28,28, 28,28,28,29,29,29,29,29,29,29,29,30, 30,30,30,31,32

## Cutthroat Trout

The first cutthroat was captured in week 7 and the last one in week 21.

**Table B-6. Mean fork length (mm), standard deviation (SD), minimum and maximum length, number sampled, number captured, and percent sampled of cutthroat trout by statistical week, Sultan River smolt trap, 2017.**

Statistical Week	Mean	SD	Min	Max	Sampled	Captured	Percent Sampled
7	112.0		112	112	1	1	100
8	118.0	4.2	115	121	2	2	100
9	122.5	0.7	122	123	2	2	100
10						0	
11	117.0		117	117	1	2	50
12	146.0		146	146	1	1	100
13	202.0		202	202	1	1	100
14						0	
15	133.5	40.3	105	162	2	2	100
16	122.0		122	122	1	2	50
17	140.0		140	140	1	1	100
18	100.0		100	100	1	2	50
19						0	
20						0	
21	84.7	11.2	72	93	1	4	25
Season Summary	120.1	30.3	72	202	15	20	75



**Figure B-5. Range (mean, minimum, maximum) of cutthroat trout fork lengths (mm) by statistical week, Sultan River smolt trap, 2017.**



**Sockeye**

Newly emerged sockeye were caught in weeks 7, 9, and 10. One yearling sockeye was caught in week 21.

**Table B-7. Mean fork length (mm), standard deviation (SD), minimum and maximum length, number sampled, number captured, and percent sampled of sockeye salmon by statistical week, Sultan River smolt trap, 2017.**

Statistical Week	Mean	SD	Min	Max	Sampled	Captured	Percent Sampled
7	24.0		24	24	1	1	100
9	19.5		19	20	2	2	100
10	20.0		20	20	1	1	100
21	95.0		95	95	1	1	100

## **APPENDIX E**

---

### *Side Channel Supplemental Assessments*

Jackson - Sultan River, Results of 2017 Snorkel Survey									
Site			Date	Discharge (cfs)		Coho	Avg Size (mm)	Trout	Avg Size
				Mainstem	Side Channel	Number		Number	
Side Channel #1 (historic)	Just upstream of confluence with redundant	VISUAL SURFACE (too shallow)	16-Aug	353	~3	112	75	7	120
Side Channel #1 (historic)	u/s of middle bridge	VISUAL SURFACE (too shallow)	16-Aug	353	~6	23	75	1	
Side Channel #1 (historic)	below middle bridge, start u/s of jam	VISUAL SURFACE (too shallow)	16-Aug	353	~6	23	75	0	
Side Channel #1 (redundant)	entire channel	VISUAL SURFACE (too shallow)	16-Aug	353	~3	58	75	2	120
							75		120
Side Channel #2	u/s of fjord	Snorkel	18-Aug	353	~10	35	75	5	120
Side Channel #2	further upstream	Snorkel	18-Aug	353	~10	12	75	0	
Side Channel #2	further but before RB inflow	Snorkel	18-Aug	353	~10	19	75	3	120
Side Channel #3	d/s of "s" near lower boulder placement	Snorkel	18-Aug	353	~20	11	75	1	
Side Channel #3	u/s of "s"	Snorkel	18-Aug	353	~20	6	75	0	
Side Channel #3	near LWD on LB	Snorkel	18-Aug	353	~20	5	75	2	120
Side Channel #4		Snorkel	21-Aug	365	~30	77	75	0	

Jackson - Sultan River, Results of 2017 Minnow Trapping Efforts									
Trap #	Site	Date Deployed	Date Checked and Removed	Description	Number Fish Captured				
					coho	rainbow	cutthroat	sculpin	dace
Trap 1	Side channel #1 (historic)	16-Aug	18-Aug	20' downstream inlet			1	2	
Trap 2	Side channel #1 (redundant)	16-Aug	18-Aug	15' downstream inlet	2	1			
Trap 3	Side channel #1 (historic)	16-Aug	18-Aug	50' upstream middle bridge	9	1			
Trap 4	Side channel #1 (historic)	16-Aug	18-Aug	30' downstream middle bridge	8				
Trap 5	Side channel #1 (extension)	16-Aug	18-Aug	250' upstream outlet	14				1
<b>TOTAL</b>					<b>33</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>1</b>
Trap 6	Side channel #2	18-Aug	21-Aug	80' downstream inlet	14				2
Trap 7	Side channel #2	18-Aug	21-Aug	150' downstream inlet	9			1	
Trap 8	Side channel #2	18-Aug	21-Aug	300' downstream inlet	11				
Trap 9	Side channel #2	18-Aug	21-Aug	200' upstream outlet	1	2			1
Trap 10	Side channel #2	18-Aug	21-Aug	100' upstream outlet	8	2			1
<b>TOTAL</b>					<b>43</b>	<b>4</b>	<b>0</b>	<b>1</b>	<b>4</b>
Trap 11	Side channel #3	18-Aug	21-Aug	150' downstream inlet	6				
Trap 12	Side channel #3	18-Aug	21-Aug	250' downstream inlet	4				
Trap 13	Side channel #3	18-Aug	21-Aug	300' upstream outlet	0	1			
Trap 14	Side channel #3	18-Aug	21-Aug	200' upstream outlet	9	2			
Trap 15	Side channel #3	18-Aug	21-Aug	40' upstream outlet	3		1		
<b>TOTAL</b>					<b>22</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>0</b>

## **APPENDIX F**

---

### *Consultation Documentation Regarding Draft Report*

## Presler, Dawn

---

**From:** Applegate, Brock A (DFW) <Brock.Applegate@dfw.wa.gov>  
**Sent:** Friday, June 15, 2018 1:00 PM  
**To:** Presler, Dawn; 'Vacirca, Richard -FS'; 'Anne Savery'; Pacheco, James (ECY); 'Rustay, Michael'; 'Jim Miller (JMiller@everettwa.gov)'; 'Thomas O'Keefe'; 'Janet Curran - NOAA Federal'; 'Asman, Lindsay'; 'nate.morgan@ci.sultan.wa.us'  
**Cc:** Binkley, Keith; Whitney, Jennifer L (DFW)  
**Subject:** WDFW Comments for Jackson Fish and Habitat Monitoring Plan 2017 Annual Report for 30-day review and comment by June 16 -- Jackson Hydro  
**Attachments:** RE: [EXTERNAL] Re: Jackson Hydroproject (FERC No. 2157) - ARC mtg agenda and standard conditions; 2017 FHMP DRAFT Annual Report.pdf

### CAUTION: THIS EMAIL IS FROM AN EXTERNAL SENDER.

Do not click on links or open attachments if the sender is unknown or the email is suspect.

---

Hi Dawn, WDFW does not have any substantive comments. We do recommend that SnoPUD add unit measurements to the tables in the appendices. WDFW noticed the lack of degrees Celsius to tables in Appendices B and C and millimeters in table in Appendix E.

WDFW would like to thank the SnoPUD for the creation, production, and availability of this information.

Sincerely, Brock

---

**From:** Presler, Dawn [mailto:DJPresler@SNOPUD.com]  
**Sent:** Thursday, May 17, 2018 10:48 AM  
**To:** Applegate, Brock A (DFW) <Brock.Applegate@dfw.wa.gov>; 'Vacirca, Richard -FS' <rvacirca@fs.fed.us>; 'Anne Savery' <asavery@tulaliptribes-nsn.gov>; Pacheco, James (ECY) <JPAC461@ECY.WA.GOV>; 'Rustay, Michael' <mike.rustay@co.snohomish.wa.us>; 'Jim Miller (JMiller@everettwa.gov)' <JMiller@everettwa.gov>; 'Thomas O'Keefe' <okeefe@americanwhitewater.org>; 'Janet Curran - NOAA Federal' <janet.curran@noaa.gov>; 'Asman, Lindsay' <lindsay\_asman@fws.gov>; 'nate.morgan@ci.sultan.wa.us' <nate.morgan@ci.sultan.wa.us>  
**Cc:** Binkley, Keith <KMBinkley@SNOPUD.com>  
**Subject:** JHP (FERC No. 2157) - draft FHMP 2017 Annual Report for 30-day review and comment by June 16

Dear ARC Members,

Attached is the draft Fisheries and Habitat Monitoring Plan 2017 Annual Report for a 30-day review and comment period. Please provide comments, if any, back to me (with cc: to Keith) by June 16. I've also attached the Smolt Trap Report that was previously emailed to you on April 20 that will be included in the appendix. If you have any general questions on the reports, please contact Keith.

*Dawn Presler*  
Sr. Environmental Coordinator  
Generation Resources  
(425) 783-1709

PUD No. 1 of Snohomish County  
PO Box 1107  
Everett, WA 98206-1107



## **APPENDIX G**

---

### *Response to Comment Regarding Draft Report*

Comment	District Response
<b>B. Applegate, WDFW, via email dated 6/15/2018</b>	
...add unit measurements to the tables in the appendices. WDFW noticed the lack of degrees Celsius to tables in Appendices B and C and millimeters in table in Appendix E.	Unit measurements were added to the appendices as recommended to either the table title or column titles.