

USACE WALLA WALLA DISTRICT BIOLOGICAL SERVICES: TEMPERATURE MONITORING PROGRAM AT McNARY DAM

Prepared By:	Kathleen Carter, Mainstem Fish Research; Douglas Long, Aerotek	Date:	August 1, 2016
		Report Period:	July 22 to 28, 2016
Report No.	MCN TEMP 16-9		

Fish Collection

An estimated 3,107 juvenile salmonids were collected, and 3,087 juvenile salmonids bypassed the McNary Juvenile Fish Facility (JFF; Table 1), comprising 99.6% subyearling Chinook salmon, 0.2% steelhead, and 0.2% sockeye salmon. There were a total of 20 juvenile system mortalities, comprising 6 sample mortalities and 14 facility mortalities (Figure 1).

River Conditions

Average river flow for this reporting period was 148,800 cubic feet per second (148.8 kcfs), with an average spill of 74.6 kcfs.

Weather Conditions

The weekly average daytime temperature for July 21 to 28 was 79.8 °F. The weekly average nighttime temperature was 73.6 °F. Temperatures ranged from a maximum of 96.1 °F at 1830 on July 25 to a minimum of 59.2 °F at 0630 on July 24.

Winds averaged 0.8 miles per hour (mph) and were predominately from the north (Figure 2). The wind was highest at 0930 on July 22, with winds averaging 11 mph and gusts measuring up to 29 mph.

Probe Operations

The probe at Spillway 7 was tangled in debris and dewatered two times at approximately 0300 to 0830 on July 22 and from 2330 on July 22 to 0730 July 23. Affected data points were removed from analysis.

Water Temperatures

Water temperatures varied with wind speed and air temperatures (Figure 3). The average forebay temperature (weekly average of 14 positions was 70.0 °F) was higher than the average gatewell temperature (weekly average of 14 positions was 68.9 °F) and the collection channel temperature (weekly average of positions at Units 1 and 12 was 68.9 °F). The JFF temperature (weekly average of the separator and sample tank) was 69.6 °F.

The temperature differential was highest across the dam in the latter portion of the week (Figure 4). The gatewells saw the largest average weekly temperature differential at 3.6 °F. The maximum gatewell temperature differential was 7.9 °F at 2030 on July 27 (U2 high; U1 low). The average weekly temperature differential across 14 forebay positions was 2.7 °F. The maximum forebay temperature differential was 10.4 °F at 1700 on July 25 (F14 high; F11 low). The average weekly temperature differential across the collection channel was 0.5 °F. The maximum collection channel temperature differential was 3.1 °F at 2200 on July 25. The average weekly temperature differential across JFF was 0.2 °F. The maximum temperature differential of 0.36 °F was measured 16 times throughout the week.

Temperature differentials through the dam were smaller than those seen across the dam (Figures 5 and 6). The average weekly temperature differential between the gatewells and forebay was 1.5 °F. The forebay was warmer than the gatewell on average at all 14 units. The largest temperature differential was 10.1 °F at Unit 12 at 1700 on July 25 (forebay greater than gatewell). The average weekly temperature differential between the gatewell and collection channel was 1.2 °F. The gatewell was warmer than the collection channel at Unit 1. The collection channel was warmer than the gatewell at Unit 12. The largest temperature differential was 3.8 °F at Unit 12 at 1530 on July 24 and at 1730 on July 25 (collection channel greater than gatewell).

The spillway temperatures had the same large diurnal pattern seen in the forebay. The temperature differential across the spillway was 1.6 °F. The weekly average across four

spillbay positions was 70.1 °F. The maximum temperature was 80.2 °F; the minimum temperature was 66.6 °F.

The tailwater did not experience the large diurnal patterns seen in the forebay, spillway and gatewells. The average weekly temperature of Tailwater 1, Tailwater 14 and the JFF Outflow Pipe was 68.4 °F. The temperature differential was 0.9 °F across tailwater locations on average. The maximum temperature was 70.6 °F from 0000 to 0030 on July 28. The minimum temperature was 66.6 °F from 0300 to 0500 on July 22.

Table 1
Bypass, Mortality, and River and Weather Conditions from 0700 July 21 to 0700 July 28

Date	Fish Collected	Fish Bypassed	Mortality		Avg. River Flow	Avg. Turbine Flow	Avg. Spill	Air Temperature		Wind Speed	
			Sample	Facility				Avg.	Max	Avg.	Max
Jul 21 – 22	1,421	1,414	0	7	162.9	76.6	81.6	78.2	95.4	0.8	6.0
Jul 22 – 23					137.3	63.7	68.9	71.3	83.4	3.4	11.0
Jul 23 – 24	390	389	1	0	131.8	61.1	66.0	70.9	84.3	0.9	4.0
Jul 24 – 25					141.2	65.6	70.9	74.6	89.9	0.3	3.0
Jul 25 – 26	706	695	4	7	153.4	71.9	76.8	81.4	96.1	0.0	0.0
Jul 26 – 27					150.1	70.1	75.3	80.2	95.1	0.0	0.0
Jul 27 – 28	590	589	1	0	165.0	77.5	82.8	79.0	92.1	0.0	0.0
Weekly Total	3,107	3,087	6	14	148.8	69.5	74.6	62.4		0.8	

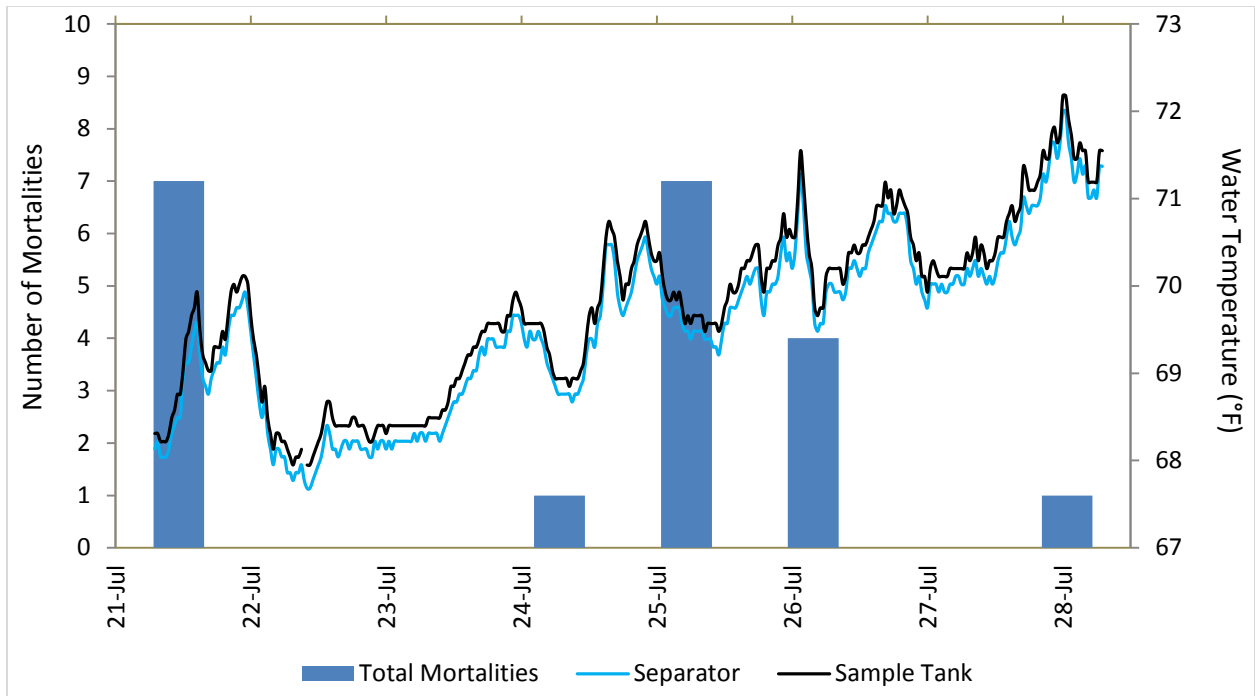


Figure 1
Juvenile Fish Facility Total System Mortalities and Three JFF Water Temperatures from 0700 July 21 to 0700 July 28 (Mortalities Reported as Time when Discovered)

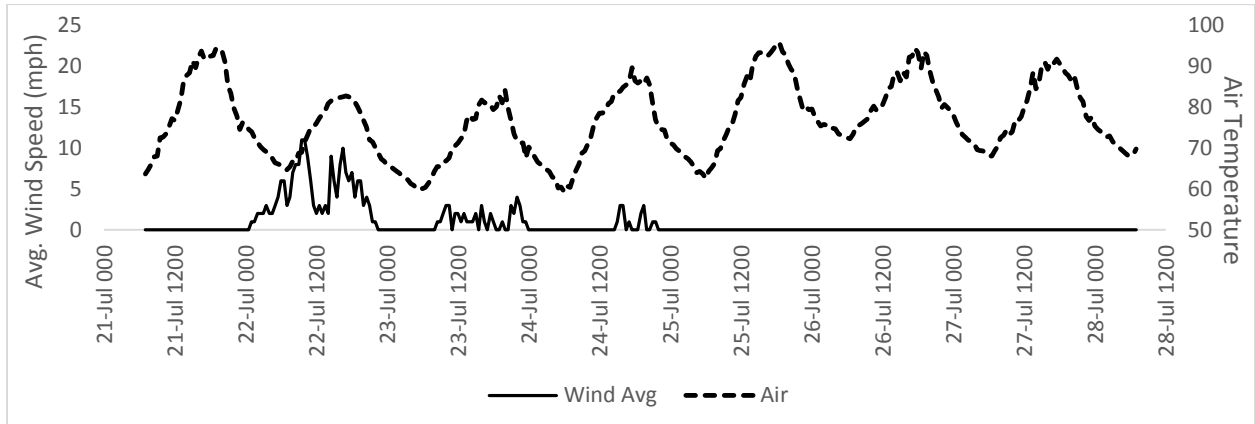


Figure 2
Average Wind Speed from 0700 July 21 to 0700 July 28

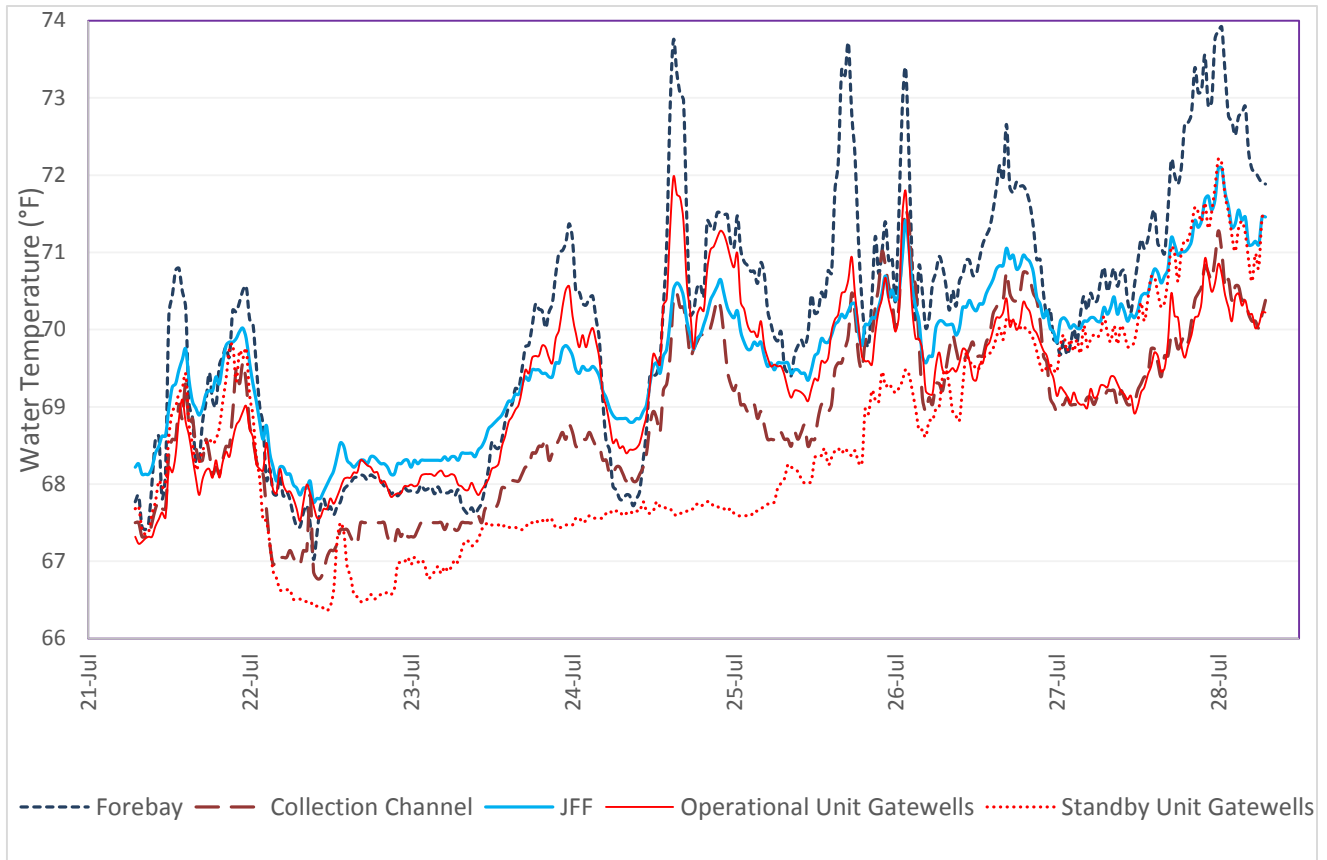


Figure 3
Average Water Temperatures for Four Dam Locations from 0700 July 21 to 0700 July 28.

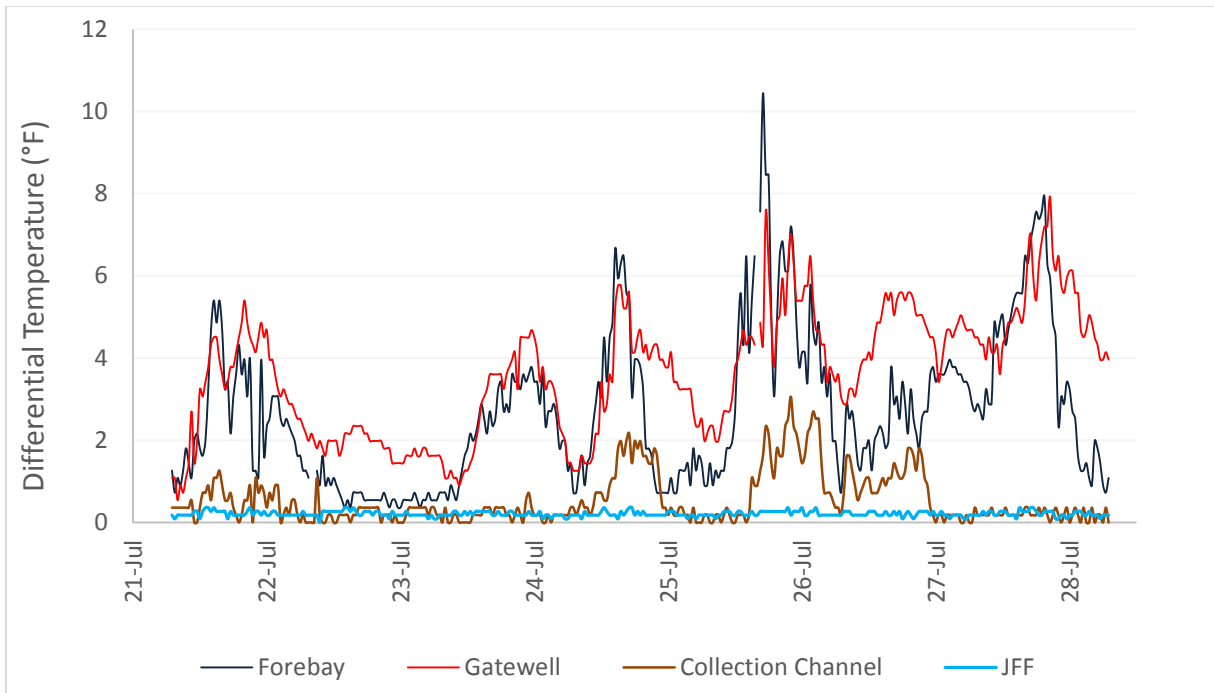


Figure 4
Average Differential Temperatures within Four Dam Locations from 0700 July 21 to 0700 July 28

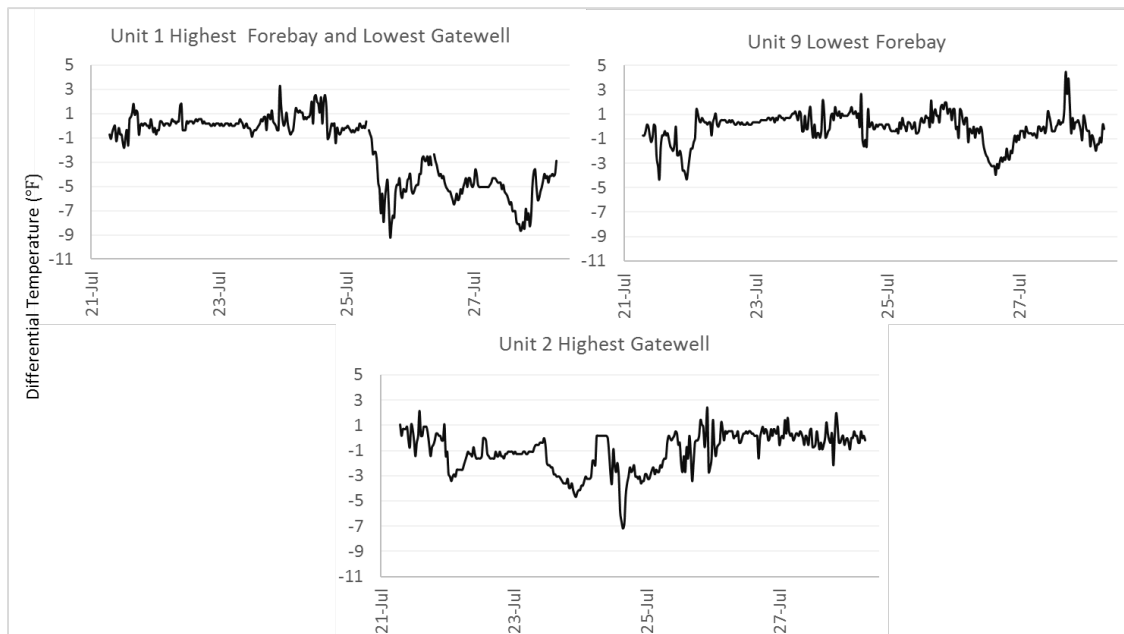


Figure 5
Gatewell and Forebay Differential Temperatures (Gatewell minus Forebay) for Units with the Highest and Lowest Weekly Average Temperature from 0700 July 21 to 0700 July 28

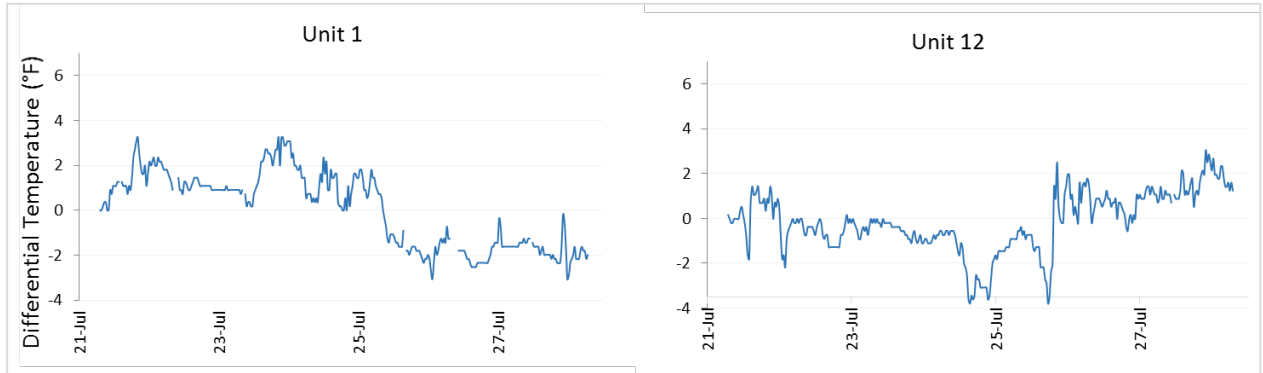


Figure 6
Gatewell and Collection Channel Differential Temperatures (Gatewell minus Collection Channel) for
Units 1, and 12 from 0700 July 21 to 0700 July 28