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USACE Walla Walla District Biological Services: Temperature Monitoring Program at McNary Dam

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		Report Period:	July 15 to 21, 2016
Report No.	MCN TEMP 16-8		

Fish Collection

An estimated 10,900 juvenile salmonids were collected, and 10,894 juvenile salmonids bypassed the McNary Juvenile Fish Facility (JFF; Table 1), comprising 100% subyearling Chinook salmon. There were a total of 6 juvenile system mortalities, comprising 3 facility mortalities and 3 sample mortalities (Figure 1).

River Conditions

Average river flow for this reporting period was 163,400 cubic feet per second (163.4 kcfs), with an average spill of 81.9 kcfs.

Weather Conditions

The weekly average daytime temperature for July 14 to 21 was 74.5 °F. The weekly average nighttime temperature was 69.8 °F. Temperatures ranged from a maximum of 91.6 °F at 1830 on July 14 to a minimum of 59.5 °F from 0600 to 0630 on July 16.

Winds averaged 1.0 miles per hour (mph) and were predominately from the north (Figure 2). The wind was highest at 2300 on July 17, with winds averaging 22 mph and gusts measuring up to 42 mph.

Probe Operations

The probe at Gatewell 5 failed. The issue was first detected on July 18 when reported Gatewell 5 temperatures were 3 °F higher than all other gatewell temperatures. The probe from Spillbay 12 was moved to the Gatewell 5 position. No replacement probe will be

deployed at Spillbay 12. Data from the faulty Gatewell 5 probe was removed from the analysis.

The lost Gatewell 2 probe was replaced with the probe from Recovery Raceway 9W at 1400 on July 14. The probe at Recovery Raceway 9W will not be replaced.

The probe at Collection Channel 8 failed and was removed at 1100 on July 19. It will not be replaced.

Water Temperatures

Water temperatures varied throughout the week (Figures 3 and 4). The average forebay temperature (weekly average of 14 positions was 68.4 °F) was higher than the average gatewell temperature (weekly average of 14 positions was 67.7 °F; average of eight operational unit gatewell positions was 68.2 °F; average of six standby unit gatewell positions was 67.0 °F). The collection channel had the lowest average temperatures (weekly average of positions at Units 1, 8, and 12 was 67.8 °F). The JFF (weekly average of the separator, sample tank, and Recovery Raceway 9W) was 68.2 °F.

The temperature differential was highest across the forebay and across the gatewells on July 13 (Figure 5). The gatewells saw the largest average weekly temperature differential at 2.9 °F. The maximum gatewell temperature differential was 8.3 °F at 1600 on July 14 (U1 high; U4 low). The average weekly temperature differential across 14 forebay positions was 2.3 °F. The maximum forebay temperature differential was 7.7 °F at 1630 on July 14 (F2 and F4 high; F14 low).

The warmer waters had a smaller effect on differential temperatures through the dam (Figures 6 and 7). The average weekly temperature differential between the gatewells and forebay was 1.7 °F. In six units, the gatewell was warmer than the forebay on average (Units 3, 6, 7, 8, 9, and 14). In eight units, the forebay was warmer than the gatewell on average. The largest temperature differential was 10.9 °F at Unit 4 at 1530 on July 14 (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 Units 8 and 12. The largest temperature differential was 3.6 °F at Unit 12 at 1830 on July 14 (collection channel greater than gatewell).

The spillway temperatures followed the same trends seen in the powerhouse. Water temperatures averaged ±0.6 °F across the spillway for each half-hour time period and had a weekly average of 68.2 °F across five spillbay positions.

Table 1
Bypass, Mortality, and River and Weather Conditions from 0700 July 14 to 0700 July 21

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 14 – 15					163.4	76.8	81.8	73.6	91.6	0.3	5.0
Jul 15 – 16	7,150	7,148	1	1	167.5	78.9	84.0	70.1	83.0	0.7	3.0
Jul 16 – 17					170.3	80.2	85.4	71.8	85.3	0.5	3.0
Jul 17 – 18	2,750	2,747	1	2	139.3	64.7	69.9	75.7	86.7	4.4	22.0
Jul 18 – 19					181.4	85.8	90.9	69.8	78.3	0.6	4.0
Jul 19 – 20	1,000	999	1	0	164.7	77.3	82.7	69.1	79.8	0.4	3.0
Jul 20 – 21					157.0	73.6	78.7	73.5	88.8	0.1	3.0
Weekly Total	**10,900**	**10,894**	**3**	**3**	**163.4**	**76.8**	**81.9**	**62.4**		**1.0**	

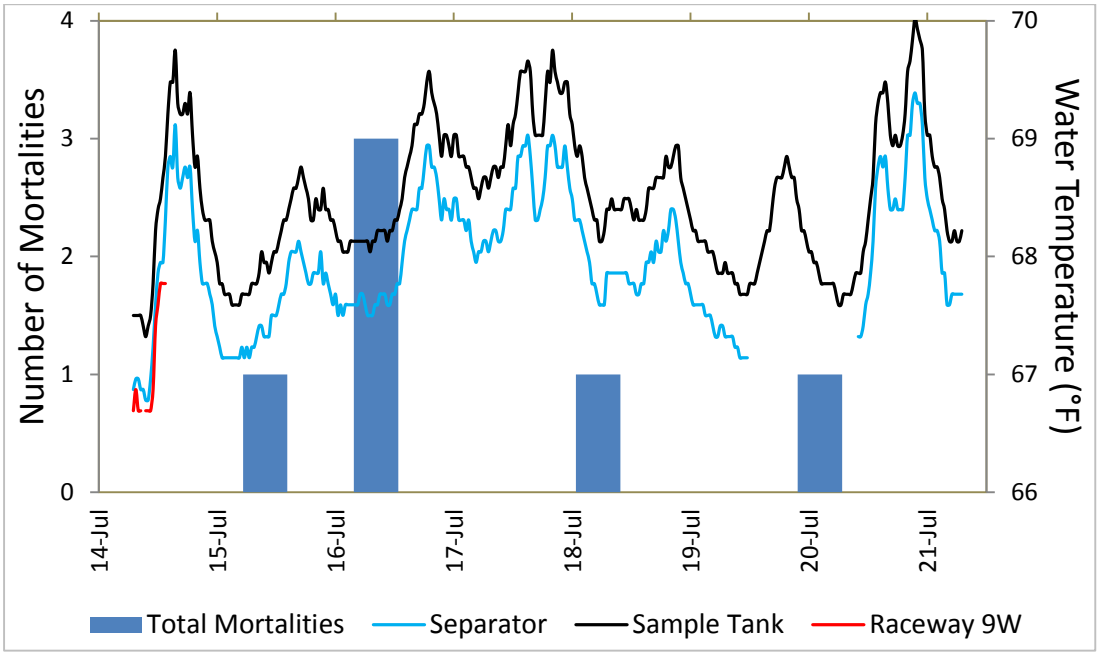

Figure 1
Juvenile Fish Facility Total System Mortalities and Three JFF Water Temperatures from 0700 July 14 to 0700 July 21 (Mortalities Reported as Time when Discovered)

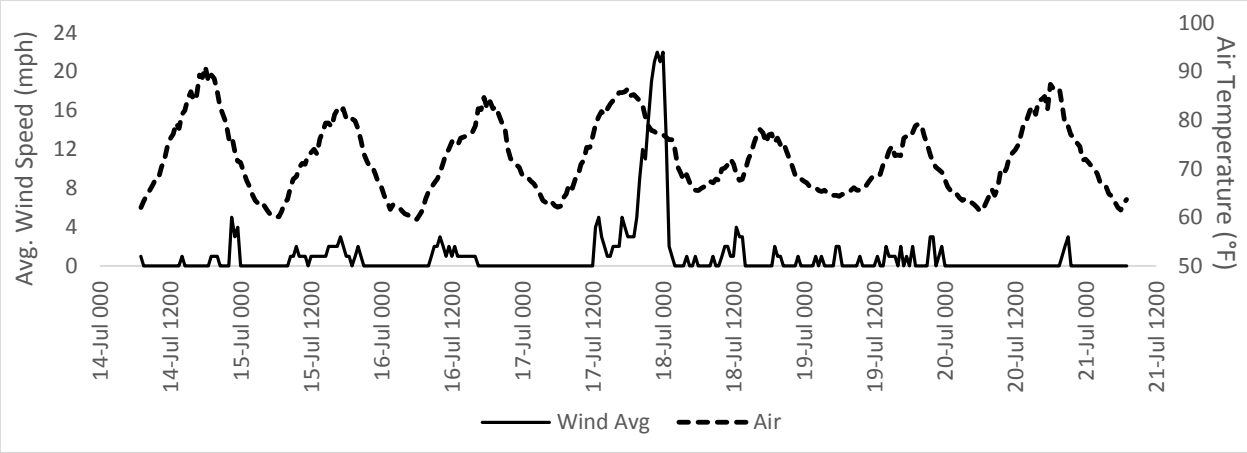

Figure 2
Average Wind Speed from 0700 July 14 to 0700 July 21

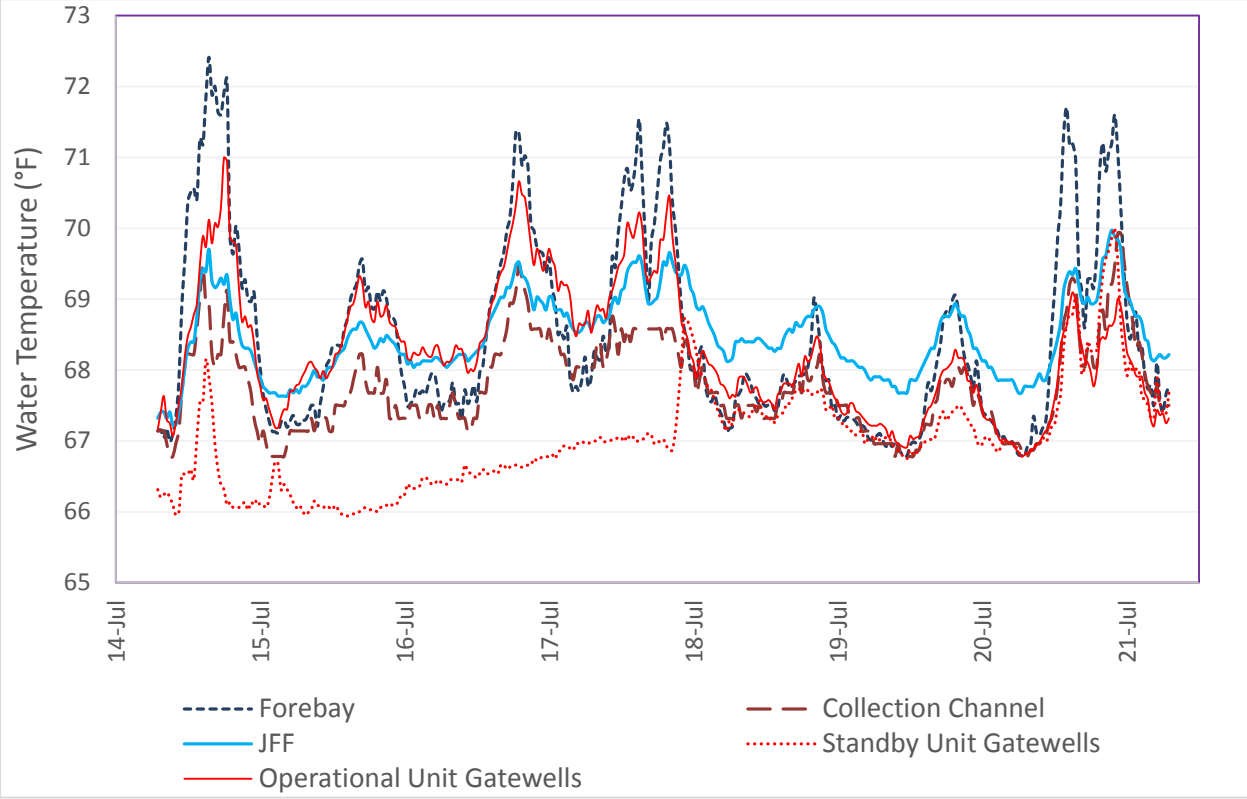

Figure 3
Average Water Temperatures for Four Dam Locations from 0700 July 14 to 0700 July 21.

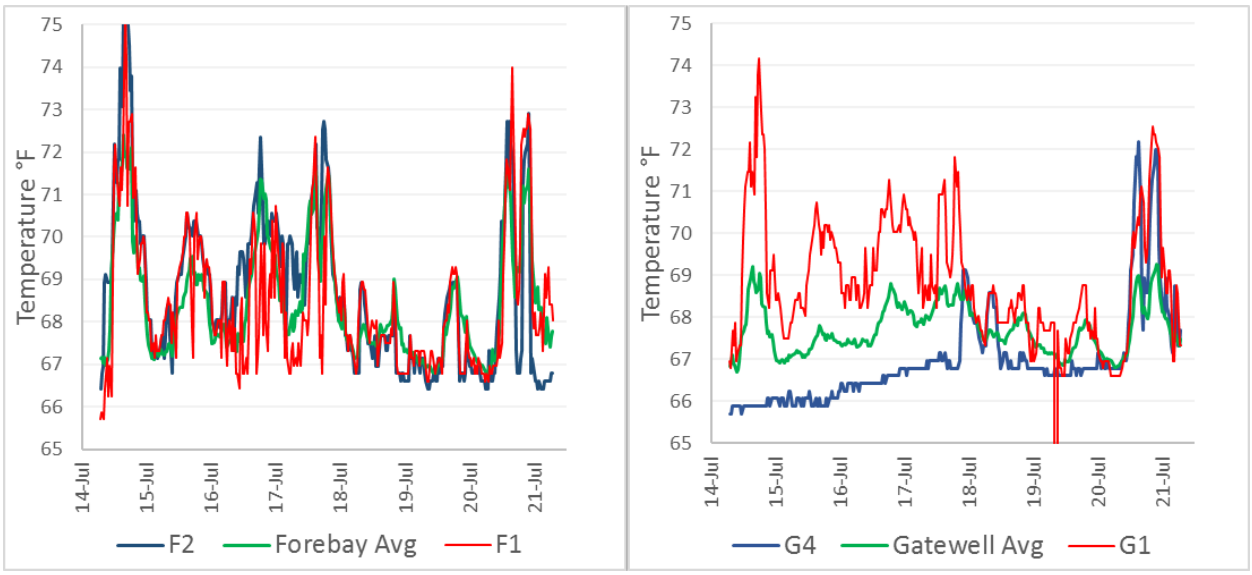

Figure 4

High, Average, and Low Forebay and Gatewell Temperatures from 0700 July 14 to 0700 July 21

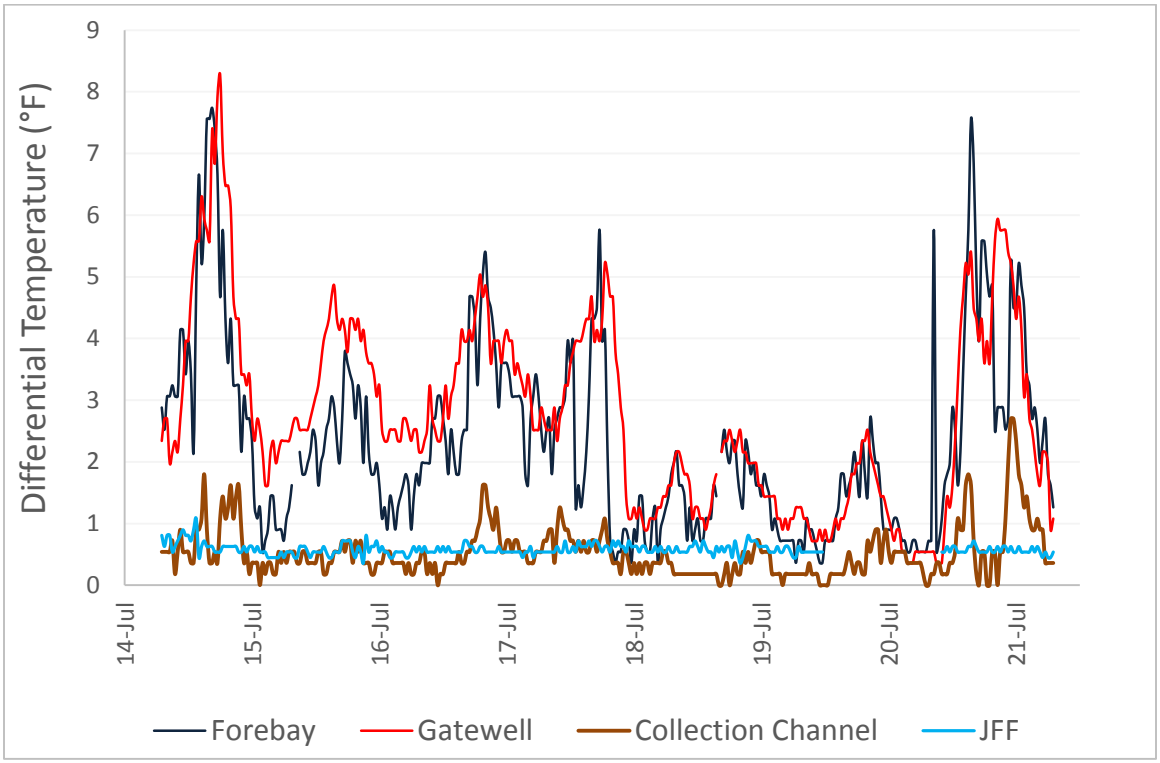

Figure 5

Average Differential Temperatures within Four Dam Locations from 0700 July 14 to 0700 July 21

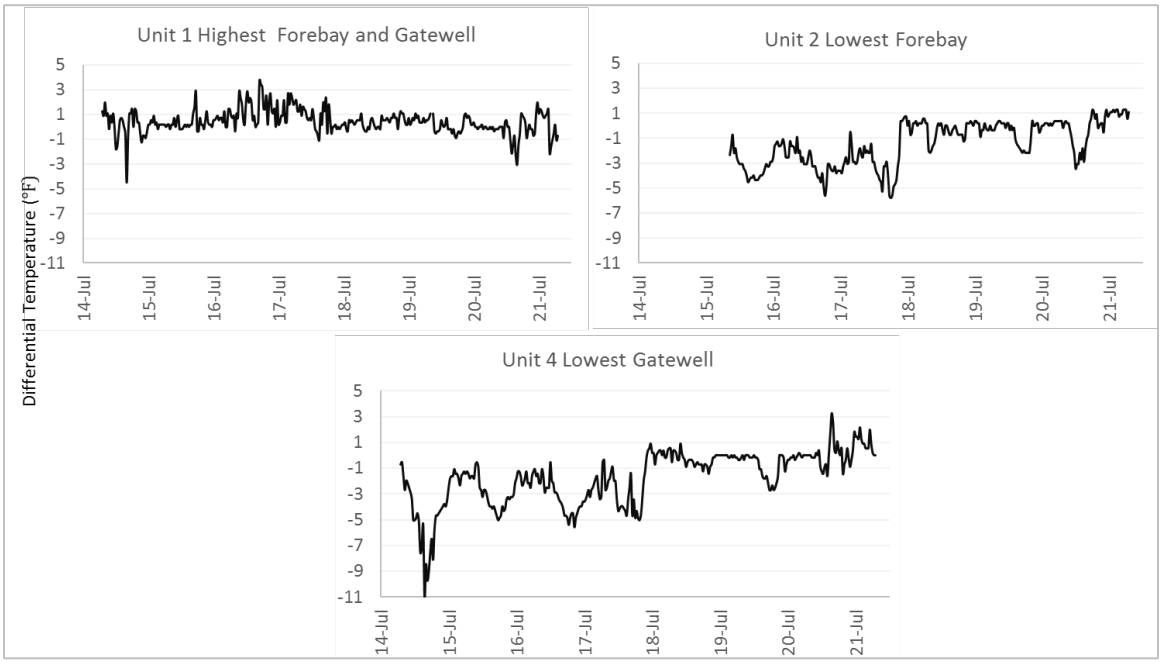

Figure 6

Gatewell and Forebay Differential Temperatures (Gatewell minus Forebay) for Units with the Highest and Lowest Weekly Average Temperature from 0700 July 14 to 0700 July 21

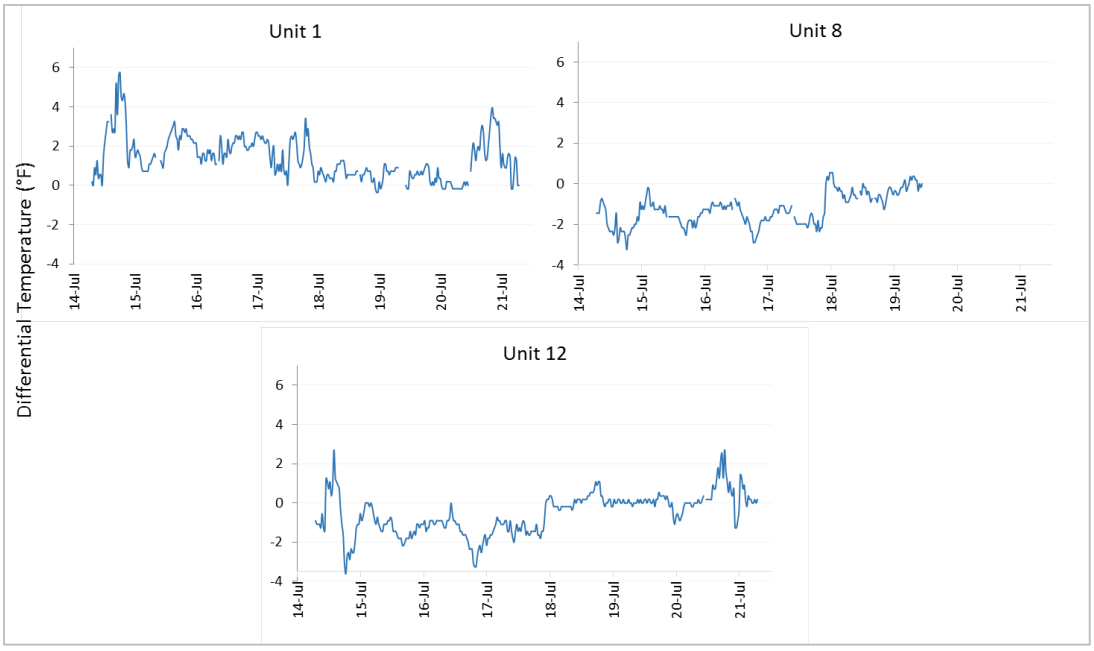

Figure 7

Gatewell and Collection Channel Differential Temperatures (Gatewell minus Collection Channel) for Units 1, 8, and 12 from 0700 July 14 to 0700 July 21