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

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		Report Period:	August 5 to 11, 2016
Report No.	MCN TEMP 16-11		

Fish Collection

An estimated 311 juvenile salmonids were collected and 309 juvenile salmonids bypassed the McNary Juvenile Fish Facility (JFF; Table 1), comprising 100% subyearling Chinook salmon. There were 2 juvenile system mortalities, comprising 2 sample mortalities and 0 facility mortalities (Figure 1).

River Conditions

Average river flow for this reporting period was 141,600 cubic feet per second (141.6 kcfs), with an average spill of 71.0 kcfs.

Weather Conditions

The weekly average daytime temperature for 0700 August 4 to 0700 August 11 was 75.0 °F. The weekly average nighttime temperature was 68.3 °F. Temperatures ranged from a maximum of 93.4 °F from 1800 to 1830 on August 5 to a minimum of 57.0 °F at 0630 on August 8.

Winds averaged 1.0 miles per hour (mph) and were predominately from the north (Figure 2). The wind was highest at 1530 on August 7, with winds averaging 14 mph and gusts measuring up to 28 mph.

Probe Operations

A probe was deployed at the Wing Wall at 1100 on August 5.

Water Temperatures

Water temperatures varied with wind speed and air temperatures (Figure 3). The average forebay temperature (weekly average of 14 positions was 69.9 °F) was higher than the average gatewell temperature (weekly average of 14 positions was 69.4 °F) and the collection channel temperature (weekly average of positions at Units 1 and 12 was 69.2 °F). The JFF temperature (weekly average of the separator and sample tank) was 70.1 °F.

The temperature differential was highest across the dam when the air temperatures were highest and there was no wind detected (Figure 4). The gatewells saw the largest average weekly temperature differential at 2.1 °F. The maximum gatewell temperature differential was 5.4 °F at 17:30 on August 4 (U11 high; U1 low). The average weekly temperature differential across 14 forebay positions was 1.5 °F. The maximum forebay temperature differential was 4.7 °F at 2200 on August 5 (F1 high; F14 low). The average weekly temperature differential across the collection channel was 0.2 °F. The maximum collection channel temperature differential was 1.6 °F from 2200 to 2300 on August 4. The average weekly temperature differential across JFF was 0.2 °F. The maximum temperature differential was 0.36 °F at 1830 on August 4 and 2130 on August 5.

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 0.8 °F. The forebay was warmer than the gatewell on average at nine units. The gatewell was warmer than the forebay on average at Units 2, 4, 6, 8, and 12. The largest temperature differential was 5.8 °F at Unit 1 at 1700 on August 10 (forebay greater than gatewell). The average weekly temperature differential between the gatewell and collection channel was 0.6 °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 2.7 °F at Unit 12 from 1500 to 1530 on August 4 (gatewell greater than collection channel).

The spillway temperatures had the same diurnal pattern seen in the forebay. The temperature differential across the spillway was 1.9 °F. The weekly average across four spillbay positions was 69.6 °F. The maximum temperature was 74.9 °F; the minimum temperature was 68.0 °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, Wing Wall, and the JFF Outflow Pipe was 69.4 °F. The temperature differential was 0.9 °F across tailwater locations on average. The maximum temperature was 70.5 °F from 1900 to 1930 and from 2300 to 2330 on August 4. The minimum temperature was 68.4 °F from 0330 to 0700 on August 11.

Table 1
Bypass, Mortality, and River and Weather Conditions from 0700 August 4 to 0700 August 11

Date	Fish Collected	Fish Bypassed	Mortality		Avg. River Flow	Avg. Turbine Flow	Avg. Spill	Air Temperature		Wind Speed	
			Sample	Facility				Avg.	Max	Avg.	Max
Aug 4 – 5	88	88	0	0	152.0	71.2	76.2	75.5	92.1	0.0	0.0
Aug 5 – 6					150.0	70.0	75.3	76.0	93.4	0.0	0.0
Aug 6-7	108	107	1	0	136.5	63.3	68.4	73.3	87.2	0.0	0.0
Aug 7 – 8					131.1	60.7	65.7	69.8	81.2	4.6	14.0
Aug 8 – 9	55	54	1	0	139.8	65.0	70.1	66.6	78.5	1.8	6.0
Aug 9 – 10					135.9	63.1	68.1	68.1	80.1	0.5	3.0
Aug 10 – 11	60	60	0	0	146.0	68.2	73.2	70.9	86.1	0.1	1.0
Weekly Total	**311**	**892**	**2**	**0**	**141.6**	**65.9**	**71.0**	**62.4**		**1.0**	

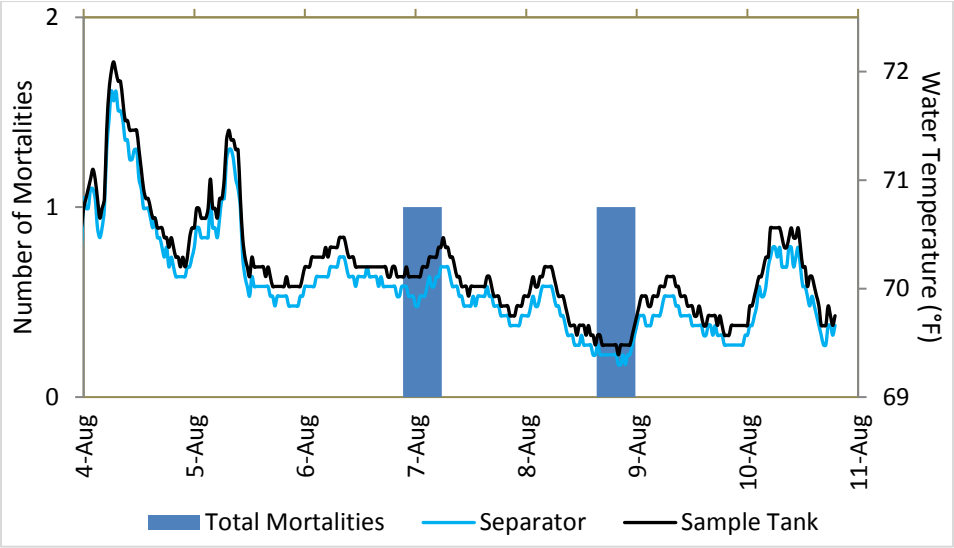

Figure 1
JFF Total System Mortalities and Three JFF Water Temperatures from 0700 August 4 to 0700 August 11
(Mortalities Reported as Time when Discovered)

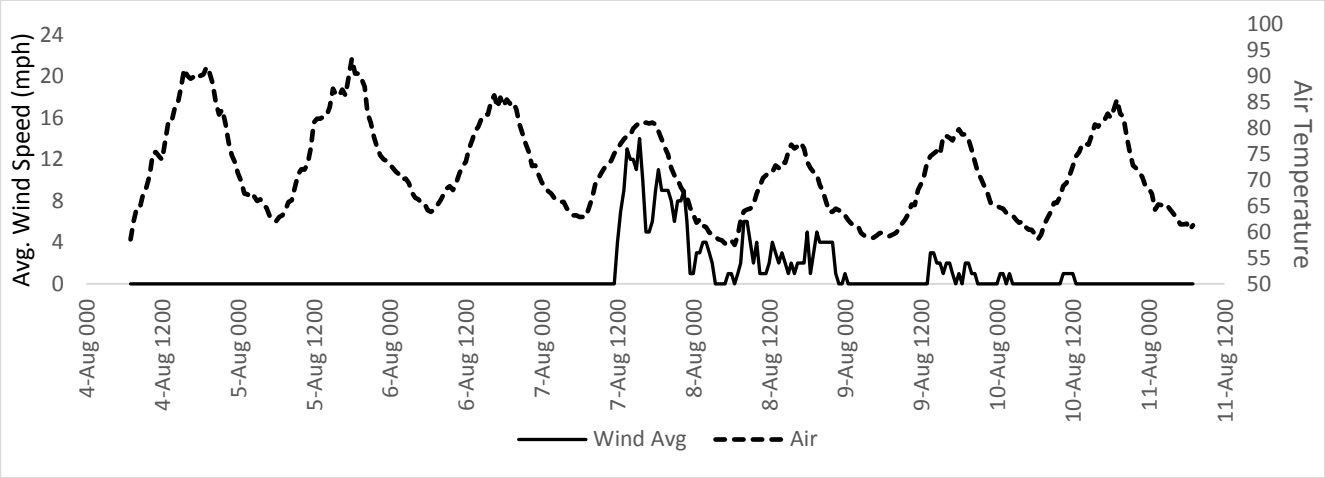

Figure 2

Average Wind Speed from 0700 August 4 to 0700 August 11

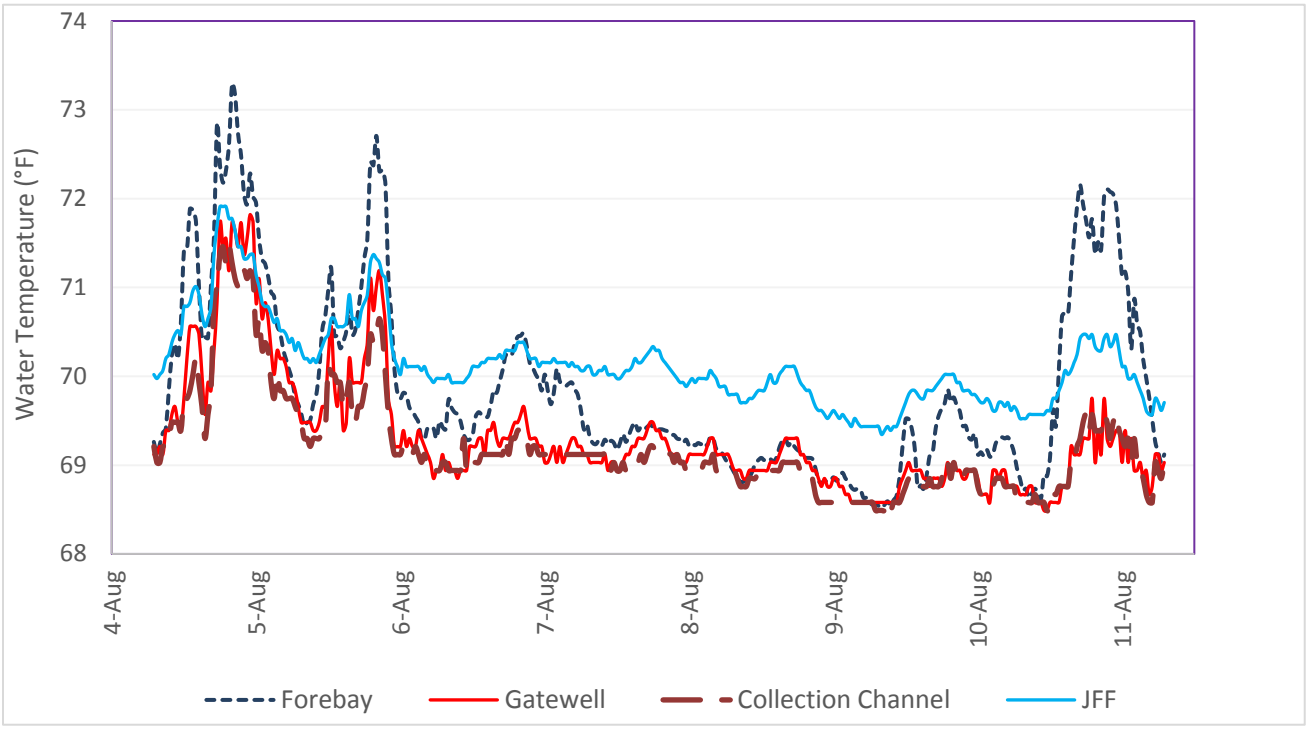

Figure 3

Average Water Temperatures for Four Dam Locations from 0700 August 4 to 0700 August 11

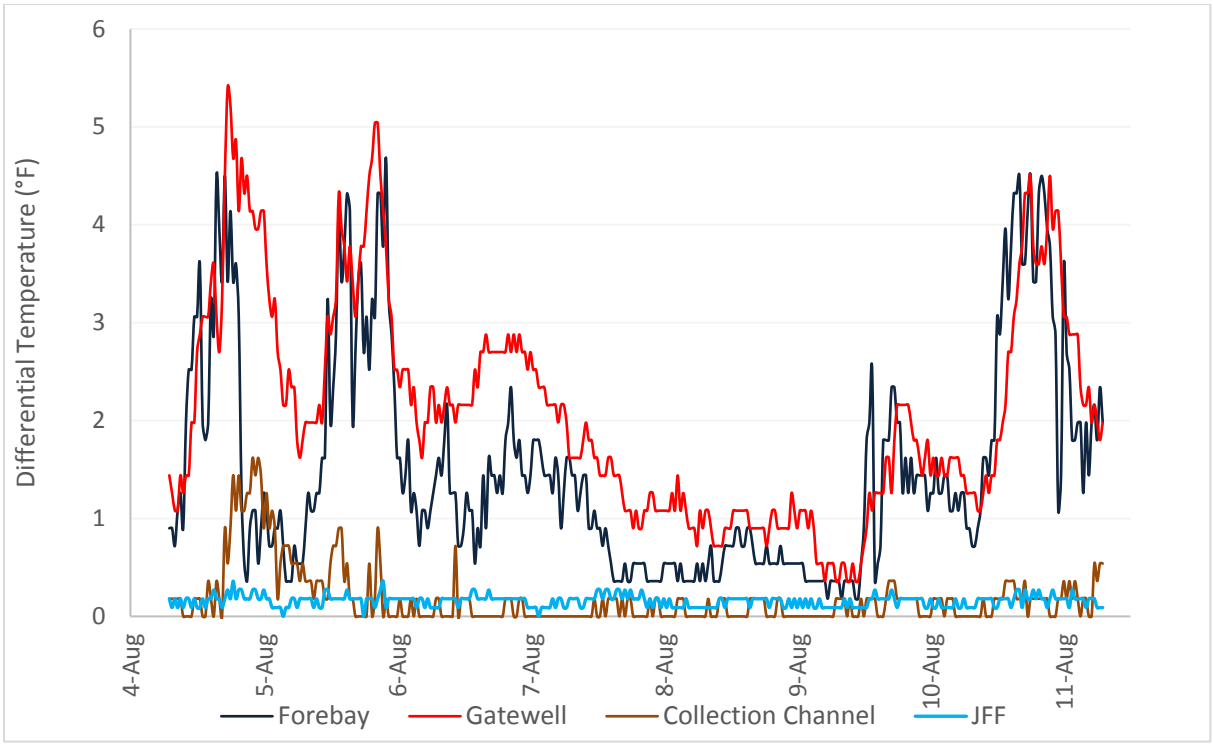

Figure 4

Average Differential Temperatures within Four Dam Locations from 0700 August 4 to 0700 August 11

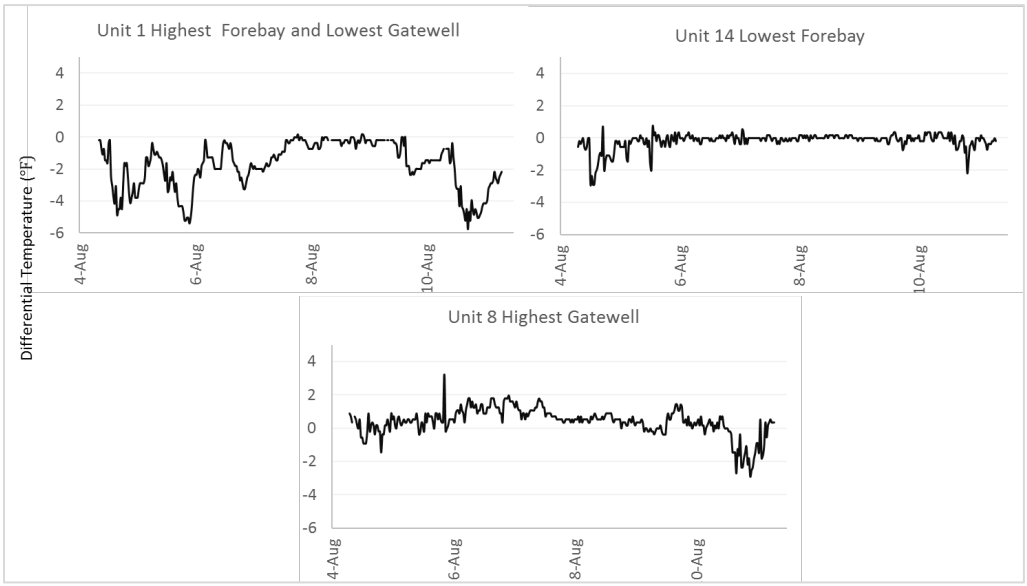

Figure 5

Gatewell and Forebay Differential Temperatures (Gatewell minus Forebay) for Units with the Highest and Lowest Weekly Average Temperature from 0700 August 4 to 0700 August 11

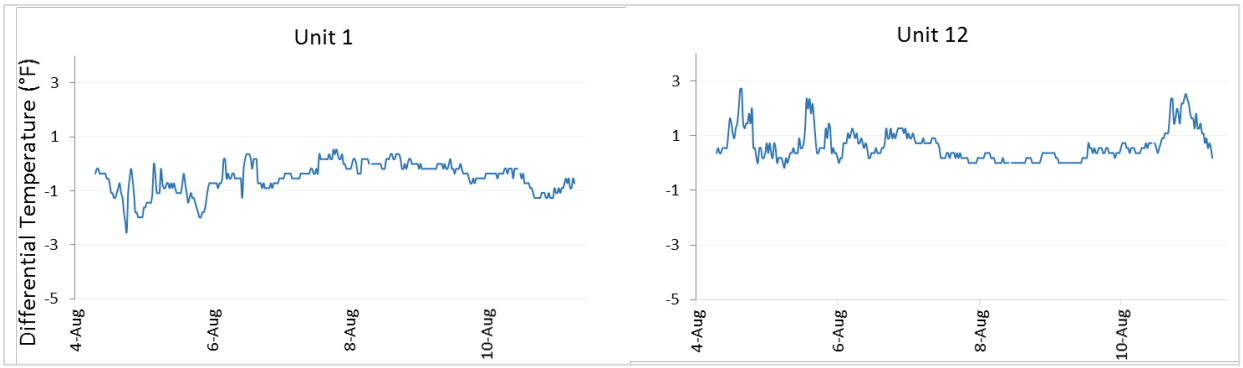

Figure 6

Gatewell and Collection Channel Differential Temperatures (Gatewell minus Collection Channel) for Units 1, and 12 from 0700 August 4 to 0700 August 11