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

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		Report Period:	July 29 to August 4, 2016
Report No.	MCN TEMP 16-10		

Fish Collection

An estimated 900 juvenile salmonids were collected, and 892 juvenile salmonids bypassed the McNary Juvenile Fish Facility (JFF; Table 1), comprising 99.9% subyearling Chinook salmon and 0.1% steelhead. There were 8 juvenile system mortalities, comprising 6 sample mortalities and 2 facility mortalities (Figure 1).

River Conditions

Average river flow for this reporting period was 155,700 cubic feet per second (155.7 kcfs), with an average spill of 78.1 kcfs.

Weather Conditions

The weekly average daytime temperature for 0700 July 28 to 0700 August 4 was 79.5 °F. The weekly average nighttime temperature was 71.8 °F. Temperatures ranged from a maximum of 105.1 °F at 1930 on July 29 to a minimum of 57.3 °F at 0600 on August 4.

Winds averaged 1.2 miles per hour (mph) and were predominately from the north (Figure 2). The wind was highest at 1500 on August 2, with winds averaging 16 mph and gusts measuring up to 35 mph.

Probe Operations

Probe operation and data collection proceeded normally this week.

Water Temperatures

Water temperatures varied with wind speed and air temperatures (Figure 3). The average forebay temperature (weekly average of 14 positions was 71.2 °F) was higher than the average gatewell temperature (weekly average of 14 positions was 70.5 °F) and the collection channel temperature (weekly average of positions at Units 1 and 12 was 70.2 °F). The JFF temperature (weekly average of the separator and sample tank) was 71.2 °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 2.8 °F. The maximum gatewell temperature differential was 6.7 °F from 1700 to 1800 on July 28 (U9 and U14 high; U1 low). The average weekly temperature differential across 14 forebay positions was 2.3 °F. The maximum forebay temperature differential was 7.4 °F at 1800 on July 28 and at 1430 on August 1 (F14 and F12 high; F6 and F1 low). The average weekly temperature differential across the collection channel was 0.3 °F. The maximum collection channel temperature differential was 1.3 °F from 1300 to 1400 on July 29. The average weekly temperature differential across JFF was 0.2 °F. The maximum temperature differential of 0.36 °F was measured 4 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 1.0 °F. The forebay was warmer than the gatewell on average at 13 units. The gatewell was warmer than the forebay on average at Unit 2. The largest temperature differential was 8.6 °F at Unit 11 at 1730 on July 28 (forebay greater than gatewell). The average weekly temperature differential between the gatewell and collection channel was 0.9 °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 4.1 °F at Unit 12 at 1700 on July 28 (gatewell greater than collection channel).

The spillway temperatures had the same diurnal pattern seen in the forebay. The temperature differential across the spillway was 1.1 °F. The weekly average across four spillbay positions was 71.0 °F. The maximum temperature was 78.1 °F; the minimum temperature was 69.1 °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 69.8 °F. The temperature differential was 0.4 °F across tailwater locations on average. The maximum temperature was 70.7 °F on 7 different occasions throughout the week. The minimum temperature was 68.8 °F at 0930 on August 2.

Table 1
Bypass, Mortality, and River and Weather Conditions from 0700 July 28 to 0700 August 4

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 28 – 29					165.2	77.6	82.9	81.5	97.8	0.0	0.0
Jul 29 – 30	505	503	2	0	168.7	79.4	84.6	84.9	105.1	0.0	0.0
Jul 30 – 31					149.2	69.6	74.9	77.7	93.6	1.2	10.0
Jul 31 – Aug 1	175	170	3	2	164.3	77.2	82.4	72.1	86.5	0.6	3.0
Aug 1 – 2					169.2	79.7	84.8	74.1	87.8	0.0	0.0
Aug 2 – 3	220	219	1	0	141.6	65.9	71.0	68.2	77.9	6.3	16.0
Aug 3 – 4					131.6	61.0	65.9	69.9	84.1	0.0	0.0
Weekly Total	**900**	**892**	**6**	**2**	**155.7**	**72.9**	**78.1**	**62.4**		**1.2**	

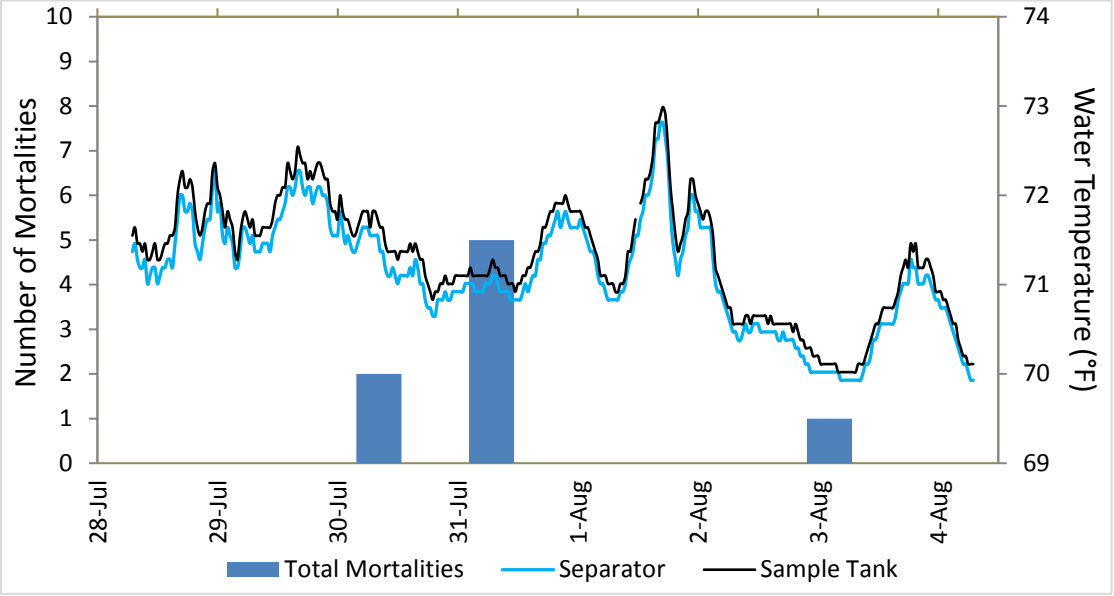

Figure 1
JFF Total System Mortalities and Three JFF Water Temperatures from 0700 July 28 to 0700 August 4
(Mortalities Reported as Time when Discovered)

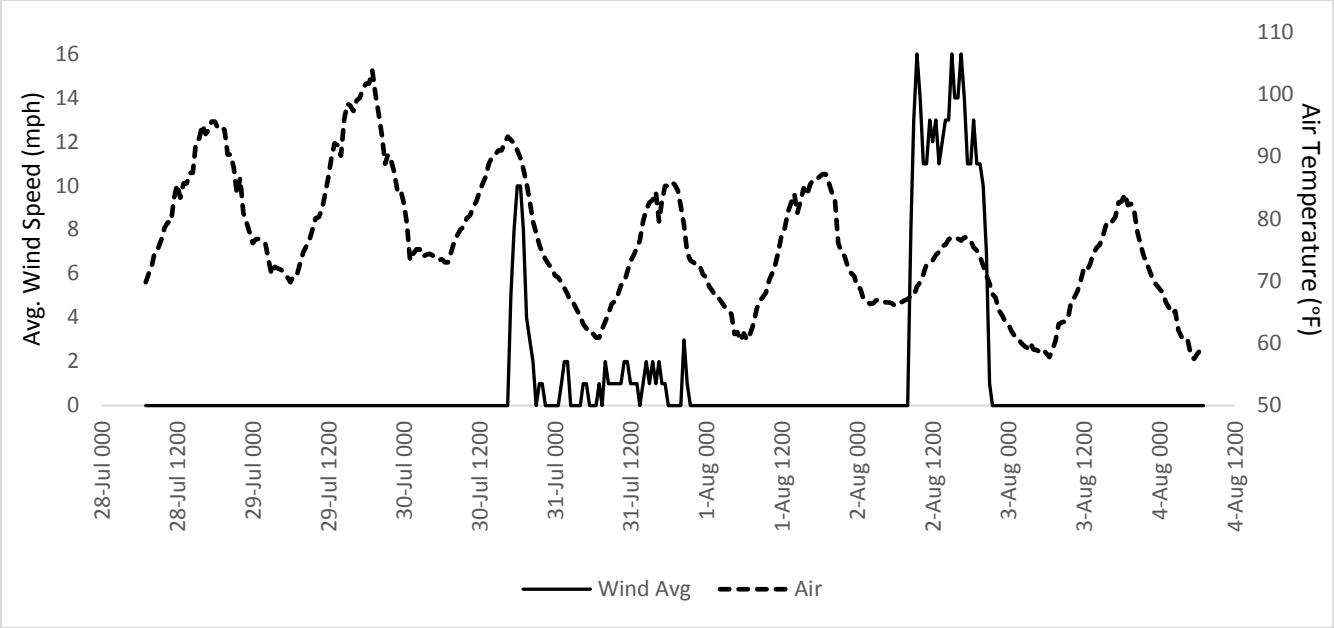

Figure 2

Average Wind Speed from 0700 July 28 to 0700 August 4

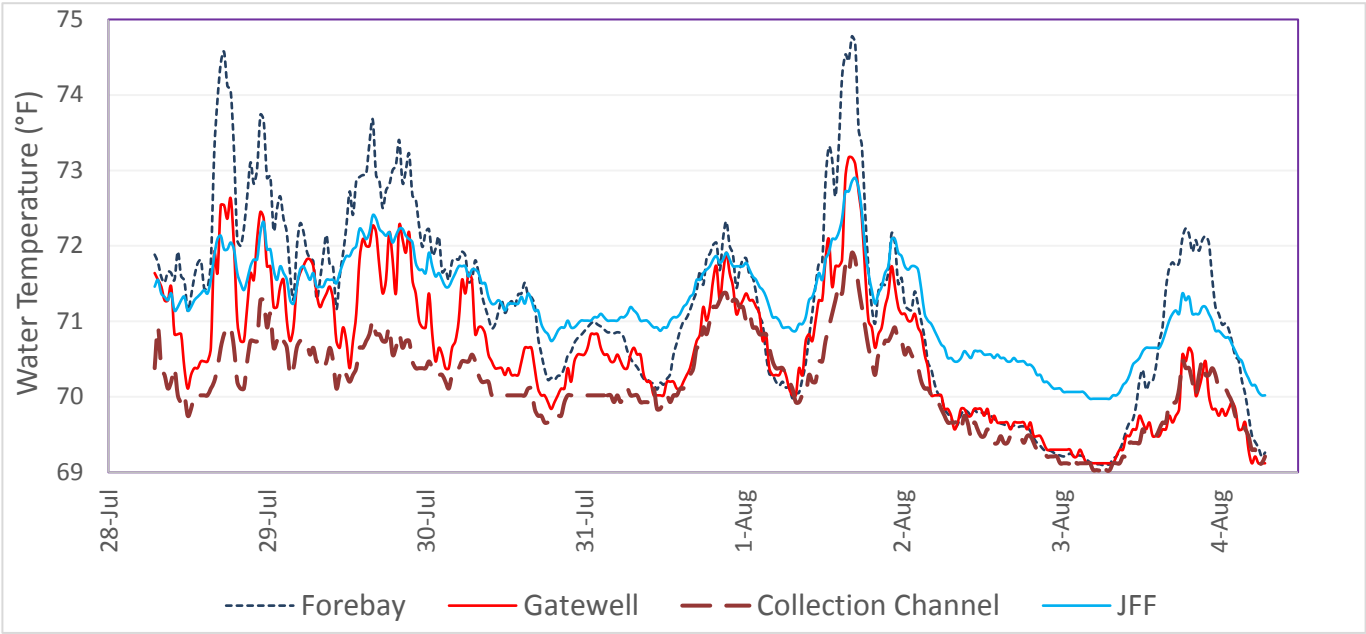

Figure 3

Average Water Temperatures for Four Dam Locations from 0700 July 28 to 0700 August 4

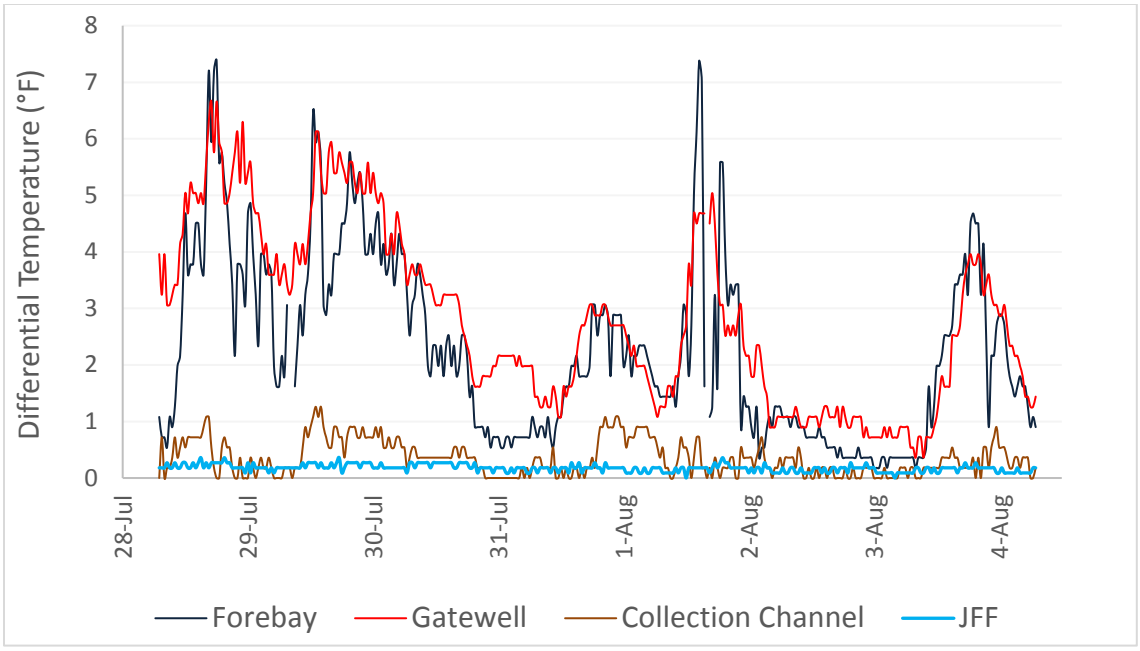

Figure 4

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

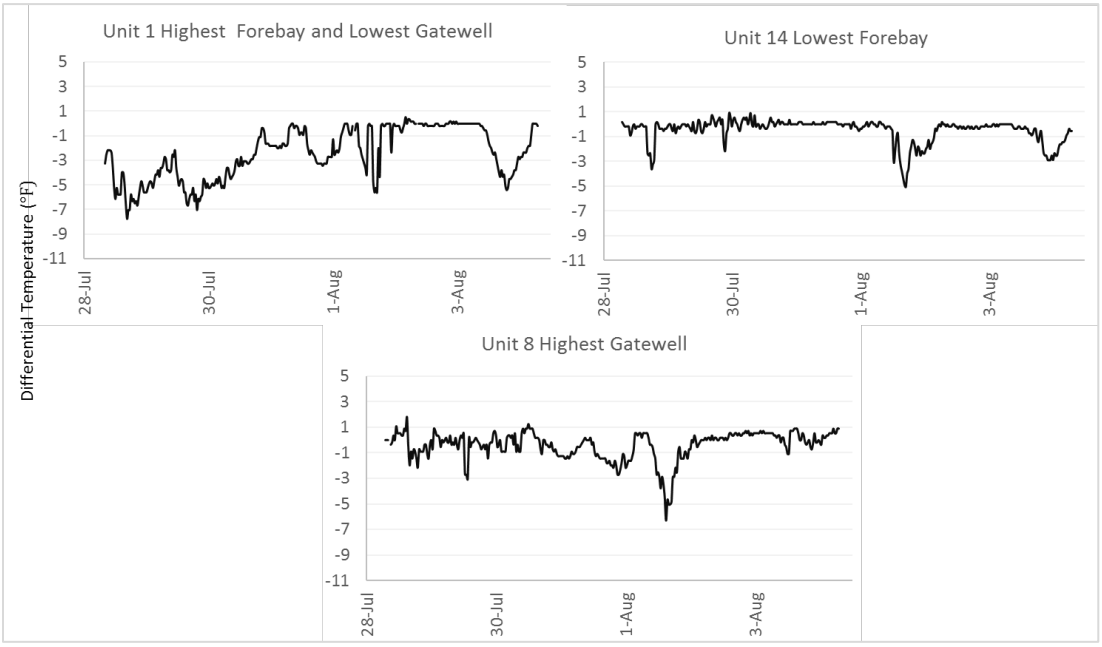

Figure 5

Gatewell and Forebay Differential Temperatures (Gatewell minus Forebay) for Units with the Highest and Lowest Weekly Average Temperature from 0700 July 28 to 0700 August 4

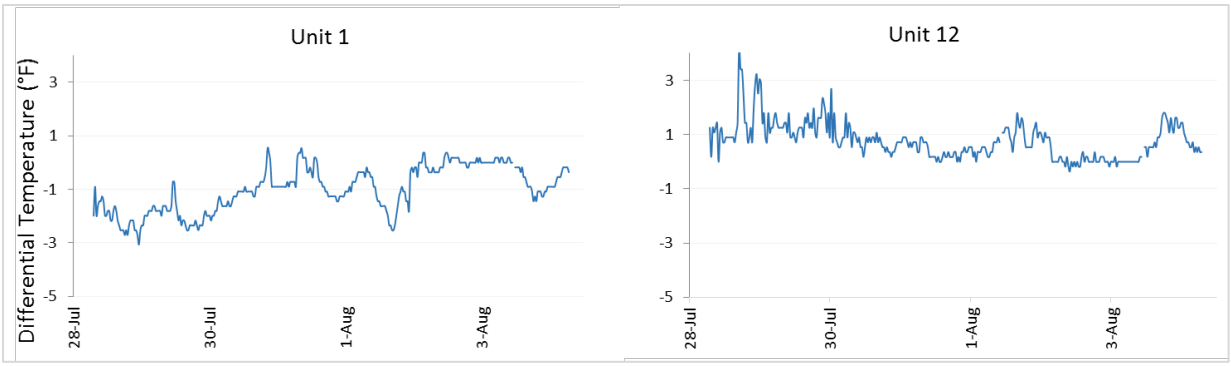

Figure 6

Gatewell and Collection Channel Differential Temperatures (Gatewell minus Collection Channel) for Units 1, and 12 from 0700 July 28 to 0700 August 4