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

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		Report Period:	August 12 to 18, 2016
Report No.	MCN TEMP 16-12		

Fish Collection

An estimated 96 juvenile salmonids were collected and 95 juvenile salmonids bypassed the McNary Juvenile Fish Facility (JFF; Table 1), comprising 100% subyearling Chinook salmon. There was 1 juvenile system mortality, comprising 1 sample mortality and 0 facility mortalities (Figure 1).

River Conditions

Average river flow for this reporting period was 135,800 cubic feet per second (135.8 kcfs), with an average spill of 68.0 kcfs.

Weather Conditions

The weekly average daytime temperature for 0700 August 11 to 0700 August 18 was 81.6 °F. The weekly average nighttime temperature was 74.5 °F. Temperatures ranged from a maximum of 97.1 °F at1830 on August 14 and 17 to a minimum of 60.4 °F at 0700 on August 11.

Winds averaged 0.0 miles per hour (mph; Figure 2). One gust of wind measured at 18 mph was detected at 2030 on August 11.

Probe Operations

A probe at Gatewell 8 failed on August 15. It was replaced with the Gatewell 1 probe. Unit 1 is undergoing maintenance and is out of service.

Water Temperatures

Water temperatures varied with air temperatures (Figure 3). The average forebay temperature (weekly average of 14 positions was 71.5 °F) was higher than the average gatewell temperature (weekly average of 14 positions was 70.2 °F) and the collection channel temperature (weekly average of positions at Units 1 and 12 was 70.1 °F). The JFF temperature (weekly average of the separator and sample tank) was 70.9 °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 3.2 °F. The maximum gatewell temperature differential was 6.1 °F at 1530 and 1730 on August 11 (U14 and U11 high; U1 low). The average weekly temperature differential across 14 forebay positions was 3.2 °F. The maximum forebay temperature differential was 7.0 °F at 1500 and 1600 on August 11 and 1430 on August 15 (F9, F13, and F14 high; F6, F9, and F5 low, respectively). The average weekly temperature differential across the collection channel was 0.5 °F. The maximum collection channel temperature differential was 3.4 °F at 0830 on August 11 (C12 high). The average weekly temperature differential across JFF was 0.2 °F. The maximum temperature differential was 0.36 °F at 1600 on August 12.

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 12 units. Gatewells 10 and 12 were warmer than the forebay on average. The largest temperature differential was 7.9 °F at Unit 9 at 1500 on August 11 (forebay greater than gatewell). The average weekly temperature differential between the gatewell and collection channel was 0.8 °F. The gatewell was warmer than the collection channel at Unit 12. The collection channel was warmer than the gatewell at Unit 1; however, Gatewell 1 was only monitored for temperature until August 15. At that time the probe was moved to Gatewell 8. The largest temperature differential was 2.7 °F at Unit 12 at 0830 on August 11 (collection channel greater than gatewell).

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

spillbay positions was 71.7 °F. The maximum temperature was 77.2 °F; the minimum temperature was 68.6 °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, Wing Wall, and the JFF Outflow Pipe was 70.0 °F. The temperature differential was 1.1 °F across tailwater locations on average. The maximum temperature was 71.5 °F at 1800 on August 17 and from 0430 to 0700 on August 18. The minimum temperature was 68.4 °F, measured 31 times on August 11 and August 12.

Table 1
Bypass, Mortality, and River and Weather Conditions from 0700 August 11 to 0700 August 18

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 11 – 12					156.4	73.3	78.4	73.6	88.6	0.0	18.0
Aug 12 – 13	40	40	0	0	151.3	70.8	75.8	77.4	94.3	0.0	0.0
Aug 13 – 14					142.4	66.3	71.4	78.8	92.5	0.0	0.0
Aug 14 – 15	32	32	0	0	122.3	56.4	61.3	79.8	97.1	0.0	0.0
Aug 15 – 16					122.2	56.3	61.2	78.2	94.9	0.0	0.0
Aug 16 – 17	24	23	1	0	130.0	60.3	65.1	78.4	93.8	0.0	0.0
Aug 17 – 18					125.8	58.2	62.9	78.6	97.1	0.0	0.0
Weekly Total	**96**	**95**	**1**	**0**	**135.8**	**63.1**	**68.0**	**62.4**		**0.0**	

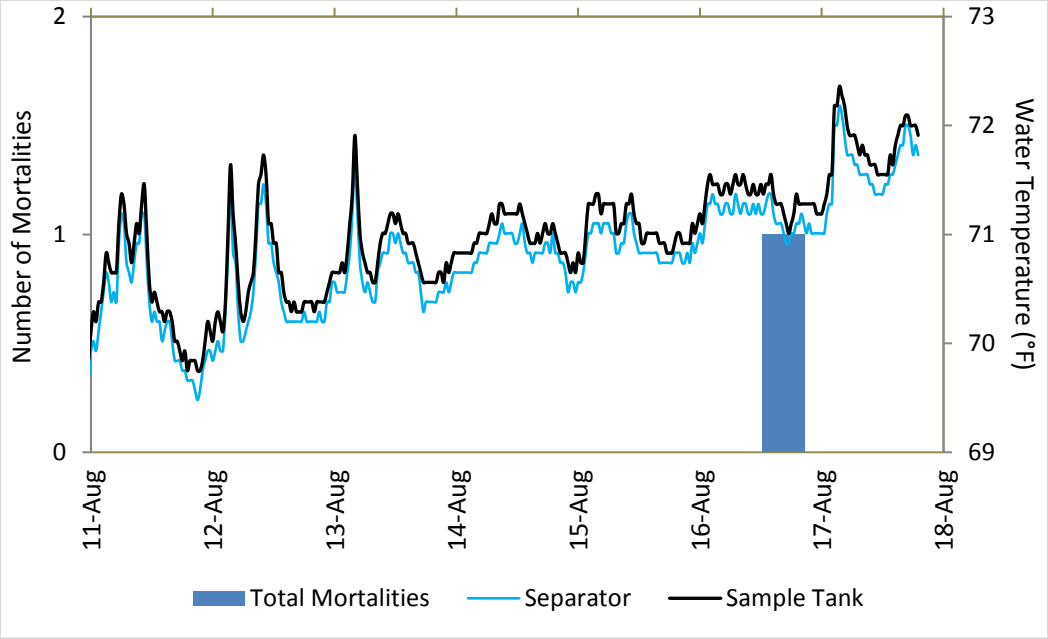

Figure 1

JFF Total System Mortalities and Three JFF Water Temperatures from 0700 August 11 to 0700 August 18

(Mortalities Reported as Time when Discovered)

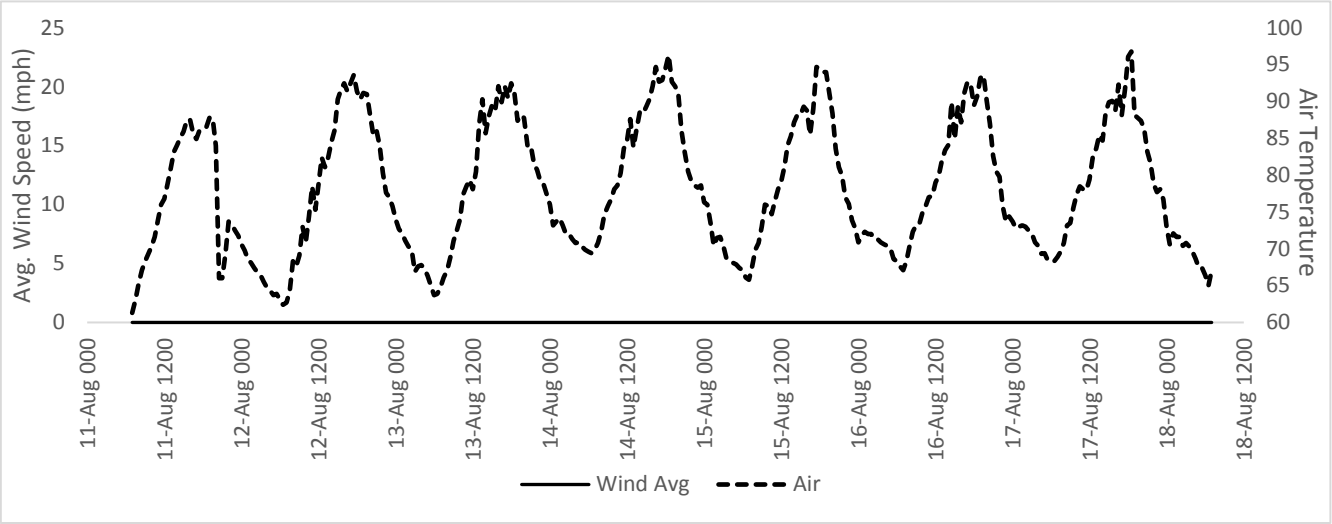

Figure 2

Average Wind Speed from 0700 August 11 to 0700 August 18

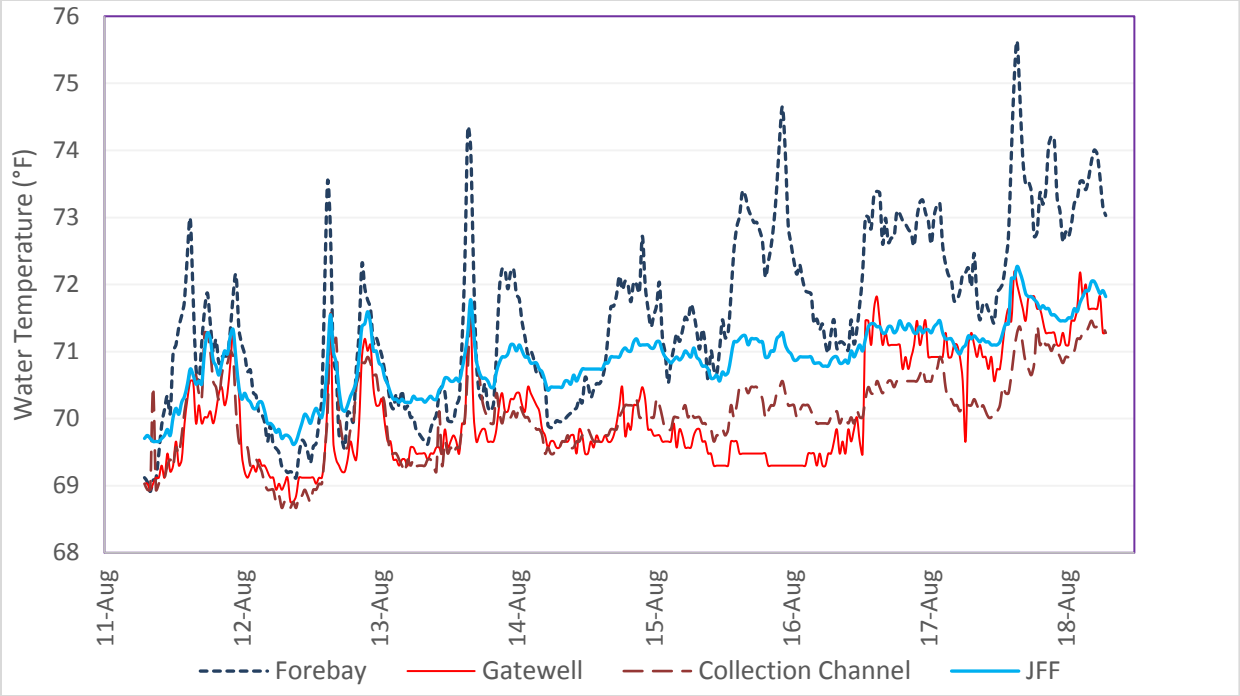

Figure 3

Average Water Temperatures for Four Dam Locations from 0700 August 11 to 0700 August 18

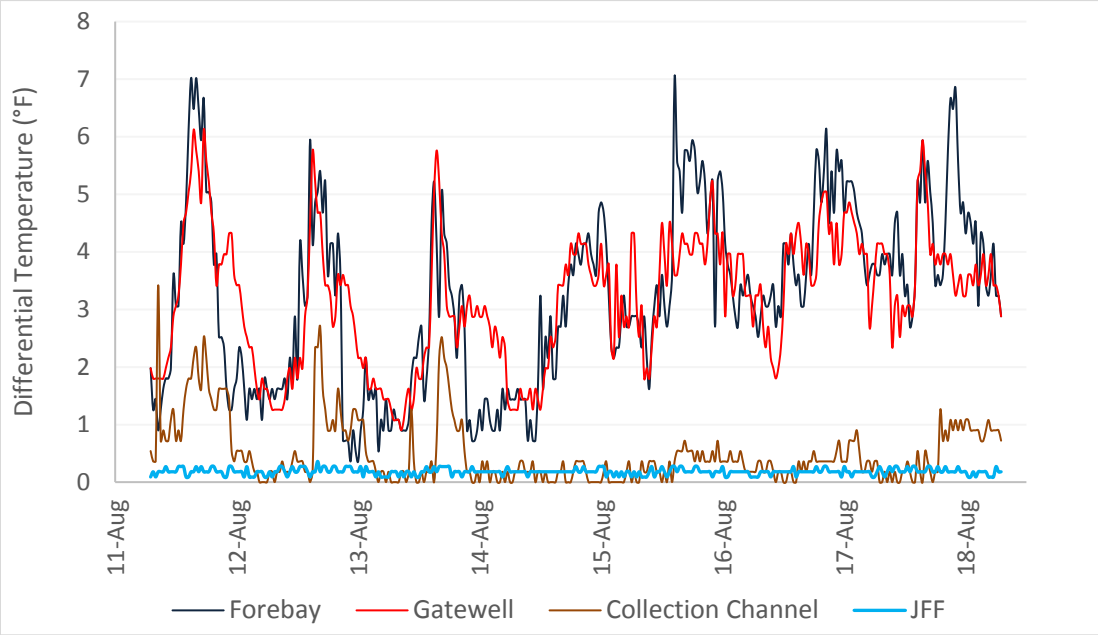

Figure 4

Average Differential Temperatures within Four Dam Locations from 0700 August 11 to 0700 August 18

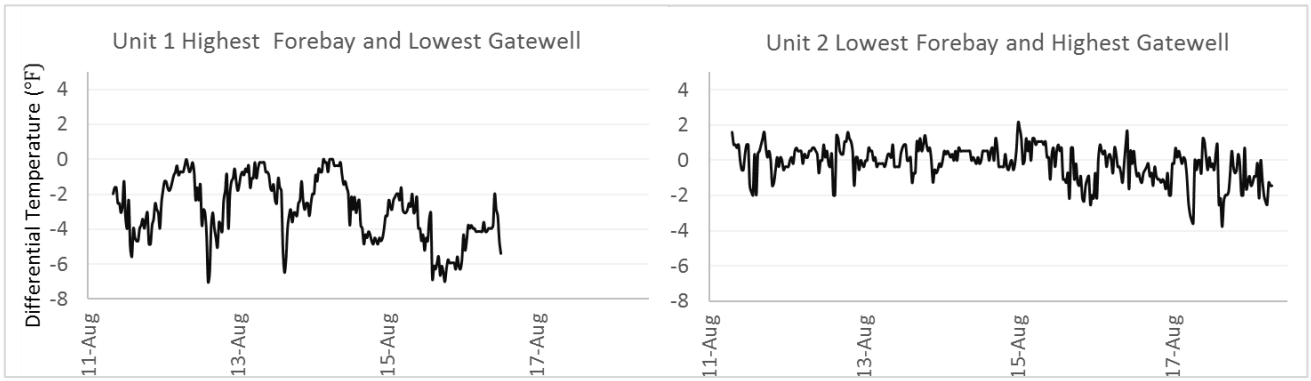

Figure 5

Gatewell and Forebay Differential Temperatures (Gatewell minus Forebay) for Units with the Highest and Lowest Weekly Average Temperature from 0700 August 11 to 0700 August 18

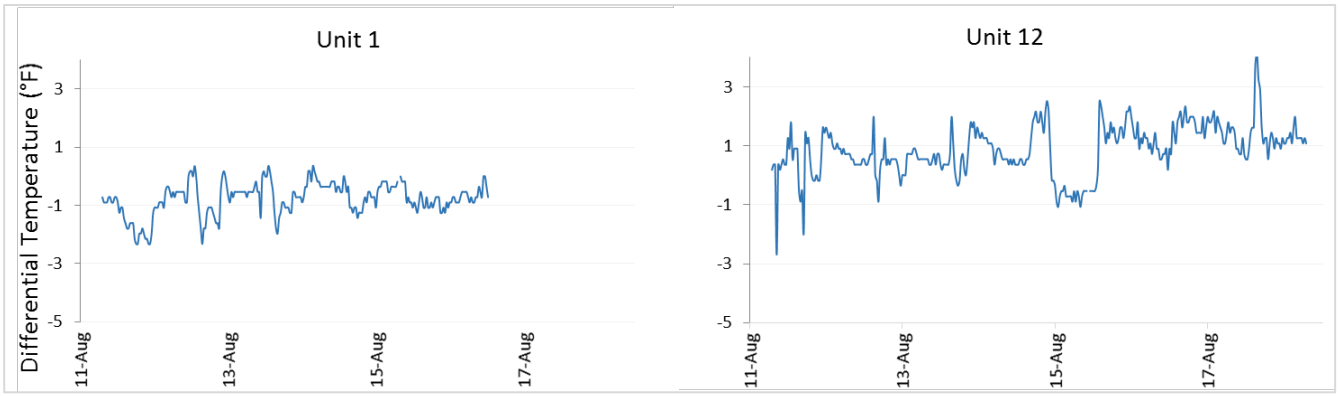

Figure 6

Gatewell and Collection Channel Differential Temperatures (Gatewell minus Collection Channel) for Units 1 and 12 from 0700 August 11 to 0700 August 18