720 Olive Way, Suite 1900
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131
www.anchorqea.com

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

Prepared By:	Kathleen Carter, Mainstem Fish Research; Douglas Long, Aerotek	**Date:**	September 6, 2016
		Report Period:	August 26 to 31, 2016
Report No.	MCN TEMP 16-14		

Fish Collection

An estimated 72 juvenile salmonids were collected and 71 juvenile salmonids bypassed the McNary Juvenile Fish Facility (JFF; Table 1), comprising 94% subyearling Chinook salmon and 6% steelhead. There was 1 sample mortality. (Figure 1).

Table 1
Bypass, Mortality, and River and Weather Conditions from 0700 August 25 to 0700 August 31

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 25 – 26					121.8	56.1	61.0	73.3	89.5	0.6	18.0
Aug 26 – 27	20	20	0	0	138.2	64.3	69.2	74.6	90.5	0.0	0.0
Aug 27 – 28					119.4	55.0	59.7	76.2	90.1	3.2	14.0
Aug 28 – 29	28	27	1	0	113.9	52.2	57.0	74.3	91.0	0.0	0.0
Aug 29 – 30					145.2	67.7	72.8	75.8	93.4	0.0	0.0
Aug 30 – 31	24	24	0	0	120.1	55.1	60.3	69.9	78.5	0.0	0.0
Weekly Total	**72**	**71**	**1**	**0**	**126.4**	**58.4**	**63.3**	**62.4**		**0.6**	

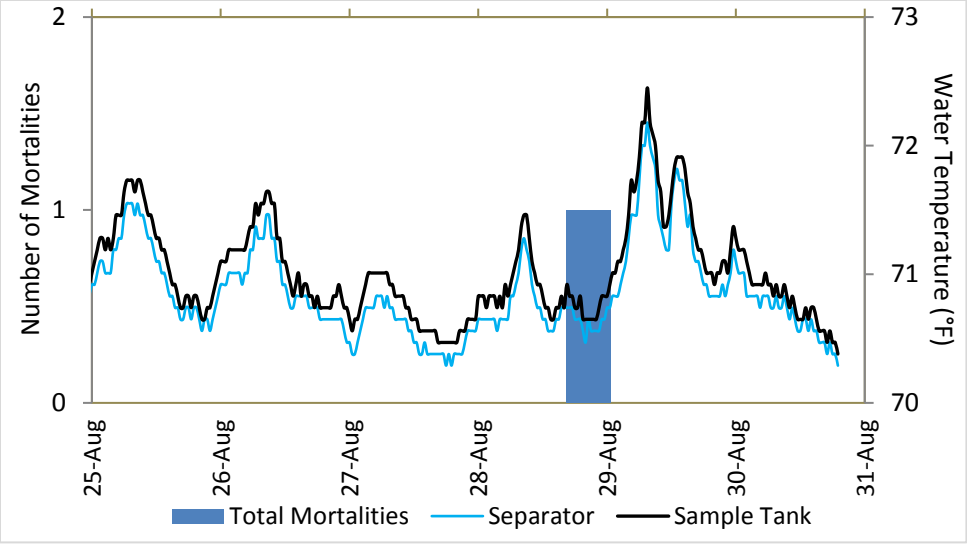

Figure 1

JFF Total System Mortalities and Two JFF Water Temperatures from 0700 August 25 to 0700 August 31

River Conditions

Average river flow for this reporting period was 126,400 cubic feet per second (126.4 kcfs), with an average spill of 63.3 kcfs.

Weather Conditions

The weekly average daytime temperature for 0700 August 25 to 0700 August 31 was 77.9 °F. The weekly average nighttime temperature was 70.4 °F. Temperatures ranged from a maximum of 93.4 °F at 1700 on August 29 to a minimum of 58.3 °F at 0700 on August 25.

Winds averaged 0.6 miles per hour (mph) and were predominately from the north (Figure 2). The wind was highest at 1100 on August 27, with winds averaging 14 mph and gusts measuring up to 34 mph.

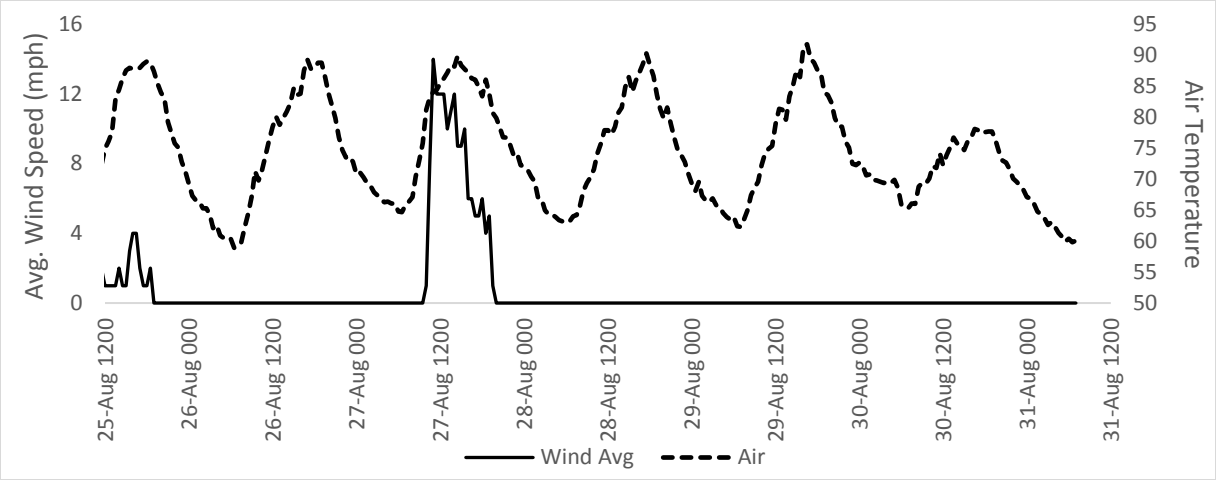

Figure 2
Average Wind Speed and air temperature from 0700 August 25 to 0700 August 31

Probe Operations

All temperature monitoring activities proceeded as normal this week.

Water Temperatures

Water temperatures varied with air temperatures (Figure 3). The average forebay temperature (weekly average of 14 positions was 70.7 °F) was higher than the average gatewell temperature (weekly average of 13 positions, Units 2 through 14, was 70.1 °F) and the collection channel temperature (weekly average of positions at C1 and C12 was 70.5 °F). The JFF temperature (weekly average of the separator and sample tank) was 70.9 °F.

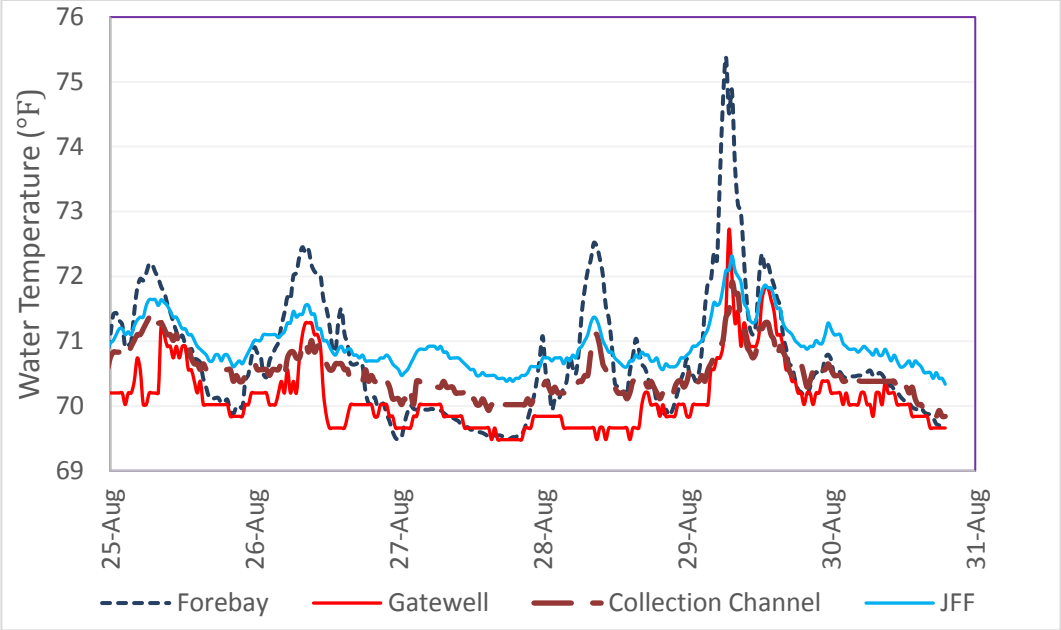

Figure 3

Average Water Temperatures for Four Dam Locations from 0700 August 25 to 0700 August 31

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 1.6 °F. The maximum gatewell temperature differential was 5.8 °F at 1830 on August 29 (U6 high; U3 low). The average weekly temperature differential across 14 forebay positions was 1.4 °F. The maximum forebay temperature differential was 5.8 °F at 2000 on August 29 (F1 high; F4 low). The average weekly temperature differential across the collection channel was 1.1 °F. The maximum collection channel temperature differential of 1.8 °F was measured five times on August 25 (C12 high; C1 low). The average weekly temperature differential across JFF was 0.2 °F. The maximum temperature differential of 0.27 °F was measured 29 times from August 26 to August 30.

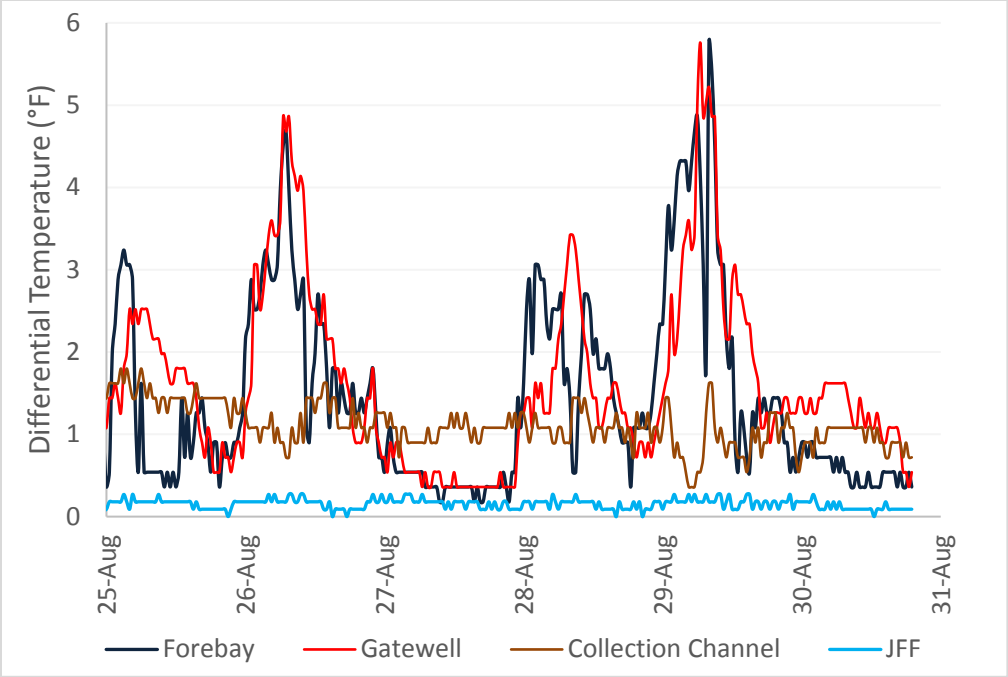

Figure 4

Average Differential Temperatures within Four Dam Locations from 0700 August 25 to 0700 August 31

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 0.7 °F. The forebay was warmer than the gatewell on average at 12 units. The gatewell at Unit 2 was warmer than the forebay at Unit 2 on average. The largest temperature differential was 7.0 °F at Unit 5 at 1800 on August 29 (forebay greater than gatewell). The average weekly temperature differential between the gatewell and collection channel at Unit 12 was 0.6 °F. The collection channel was warmer than the gatewell at Unit 12 on average. The largest temperature differential was 2.0 °F at Unit 12 at 2000 on August 29 (gatewell greater than collection channel).

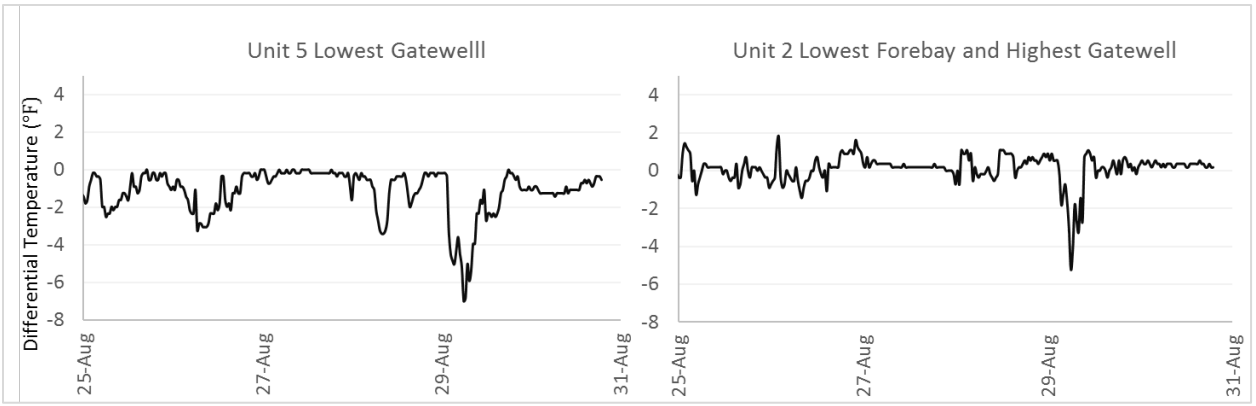

Figure 5

Gatewell and Forebay Differential Temperatures (Gatewell minus Forebay) for Units with the Highest and Lowest Weekly Average Temperature from 0700 August 25 to 0700 August 31

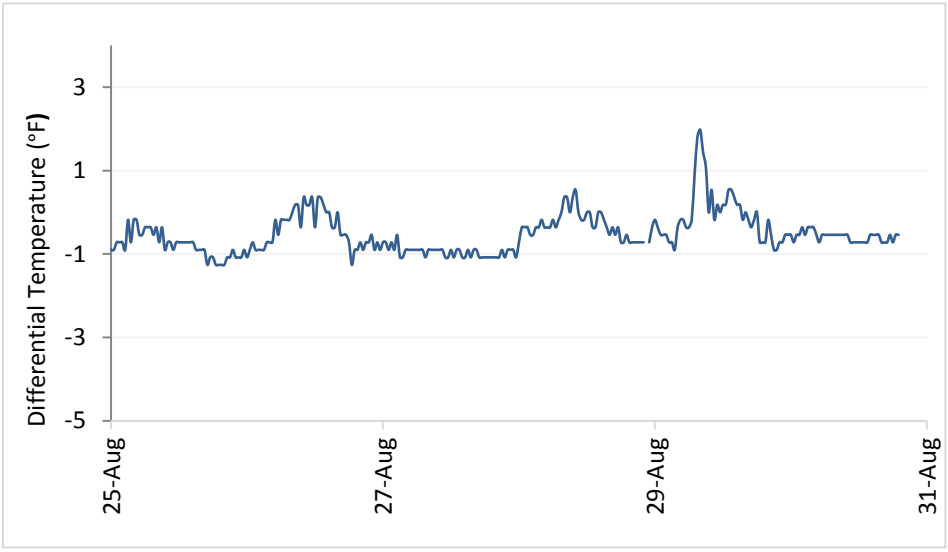

Figure 6

Gatewell and Collection Channel Differential Temperatures (Gatewell minus Collection Channel) for Unit 12 from 0700 August 25 to 0700 August 31

The spillway temperatures had the same diurnal pattern seen in the forebay. The temperature differential across the spillway was 2.0 °F. The weekly average across four spillbay positions was 70.9 °F. The maximum temperature was 78.3 °F; the minimum temperature was 69.3 °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 70.2 °F. The temperature differential was 1.0 °F across tailwater locations on average. The maximum temperature was 71.5 °F at 2030 on August 29. The minimum temperature was 69.5 °F, measured 16 times on August 27 through August 31.