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ANCHOR QEA

Weekly Temperature Report
McNary Dam

June 19, 2017

Prepared by: Kathleen Carter, Mainstem Fish Research;

Report Period: June 9 to 15, 2017

Report No. MCN TEMP 17-1

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

Probe Operations

New HOBO U22 water temperature data loggers were purchased for the 2017 temperature monitoring season. A total of 27 temperature loggers were deployed throughout the McNary Dam powerhouse and Juvenile Fish Facility (JFF) on June 8, 2017, at approximately 1100 hours. The temperature loggers were deployed as follows:

- Powerhouse forebay (referred to herein as forebay), near elevation 335 in the trolley pipes fitted to each "C" pier nose of Units 1, 3, 5, 7, 8, 10, 12, and 14 (8 total). The probes are in approximately 10 feet of water.
- Gatewells, in the center of each "B" slot at each Unit (14 total) in approximately 3 feet of water.
- Collection channel, downstream of gatewell orifices 12B and 8B, and upstream of the incline dewatering screen, south of Unit 1 (3 total).
- JFF, in the fish separator underneath the bars of the "B" section and Sample Tank "B" in approximately 2 feet of water (2 total).

One additional temperature logger will be deployed on the JFF outfall pipe once flows decrease to allow safe access.

Temperature monitoring officially started June 14, 2017, at 0700 hours. The first daily temperature report was distributed on June 15, 2017. However, temperatures were collected daily between June 9 and June 14, 2017, to insure equipment was working properly before the official season start. These data are included in this report. Comments and suggestions regarding weekly report format and content are welcomed.

On June 12, the header for the Unit 5 forebay logger file became corrupted and data could not be exported. The error most likely occurred due to movement of the coupler during download. The

technique used to download the loggers was adjusted to prevent this in the future. The file was sent to the logger manufacturer for data retrieval. The manufacturer technical service representative gave their assurance that this type of error is extremely rare.

Fish Collection

An estimated 81,206 juvenile salmonids were collected and 81,197 bypassed the McNary JFF (Table 1), comprising 98.4% subyearling Chinook salmon, 0.4% yearling Chinook salmon, 0.4% sockeye, and 0.4% steelhead. There were 9 total facility mortalities, comprising 2 sample mortalities and 7 facility mortalities.

River Conditions

Average river flow for this reporting period was 408,700 cubic feet per second (408.7 kcfs), with an average spill of 240.9 kcfs.

Weather Conditions

The weekly average daytime temperature for June 9 to 15, 2017, was 65.3 °F. The weekly average nighttime temperature was 57.8 °F. Temperatures ranged from a maximum of 75.4 °F at 1500 hours on June 12 to a minimum of 47.0 °F from 0500 to 0530 hours on June 10 (Figure 1).

Winds averaged 4.0 miles per hour (mph) and were predominately from the north. The day with the lowest average wind speed was June 11. The wind was highest from 1730 to 1900 hours on June 12, with winds averaging 16 mph and gusts up to 34 mph.

Water Temperatures

Average water temperatures within dam locations varied with air temperatures and wind velocities (Figure 2). The weekly average temperature within dam locations were: 58.4 °F, forebay, (weekly average of 8 positions); 58.1 °F, gatewells, (weekly average of 14 positions); 58.1 °F, collection channel, (weekly average of positions at Units 1, 8, and 12); and 58.2 °F, JFF, (weekly average of the separator and sample tank). The forebay at Units 8, 10, and 12 had the highest weekly average temperature, 58.5 °F (Figure 3). The maximum temperature, 64.9 °F, was recorded in the forebay at 1400 hours on June 11 at Unit 7.

The average weekly temperature differentials within dam locations were: 0.6 °F, forebay; 0.5 °F, gatewells; 0.2 °F, collection channel; and 0.1 °F, JFF. Temperature differentials within the forebay and gatewells were largest between 1100 and 2130 hours on June 11 (Figure 4). The largest temperature differential, 4.7 °F was recorded in the forebay at 1400 hours on June 11 (Unit 3 low, Unit 7 high).

The average weekly temperature differential between the forebay and corresponding gatewell was 0.3 °F. The forebay was warmer than the corresponding gatewell on average across the powerhouse.

The largest temperature differential was 5.7 °F at Unit 7 at 1400 hours on June 11 (forebay greater than gatewell). The average weekly temperature differential between the gatewell and collection channel was 0.2 °F. The gatewell was warmer than the collection channel at Unit 12 on average. The collection channel was warmer than the gatewell at Units 1 and 8. The largest temperature differential between the gatewell and corresponding collection channel location was 1.1 °F at Unit 1 at 1600 on June 11.

Table 1
Bypass, Mortality, and River and Weather Conditions from 0700 Hours June 9 to 0700 Hours June 15

Date	Fish Collected	Fish Bypassed	Mortality		Avg. River Flow	Avg. Turbine Flow	Avg. Spill	Air Temperature		Wind Speed	
			Sam.	Fac.				Avg.	Max	Avg.	Max
6/9-10					433.5	159.2	269.6	58.3	71.5	2.7	18.0
6/10-11	33,001	33,000		1	440.7	162.6	273.3	58.5	69.6	2.9	12.0
6/11-12					423.7	162.7	256.3	63.8	75.1	0.6	5.0
6/12-13	24,700	24,697	2	1	401.9	162.9	234.3	63.3	75.4	8.2	16.0
6/13-14					386.8	164.5	217.6	61.0	70.9	8.5	15.0
6/14-15	23,505	23,500		5	385.1	165.5	214.9	63.9	71.6	1.2	10.0
Weekly Total	**81,206**	**81,197**	**2**	**7**	**408.7**	**163.2**	**240.9**	**61.6**		**4.0**	

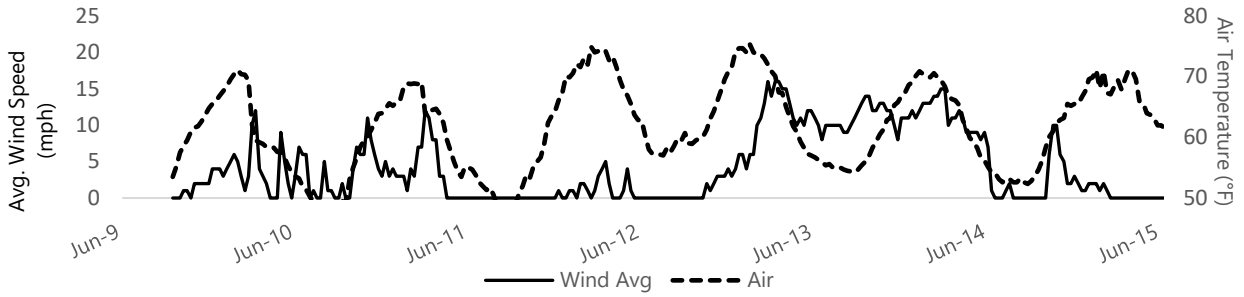

Figure 1
Average Wind Speed and Air Temperature from 0700 Hours June 9 to 0700 Hours June 15

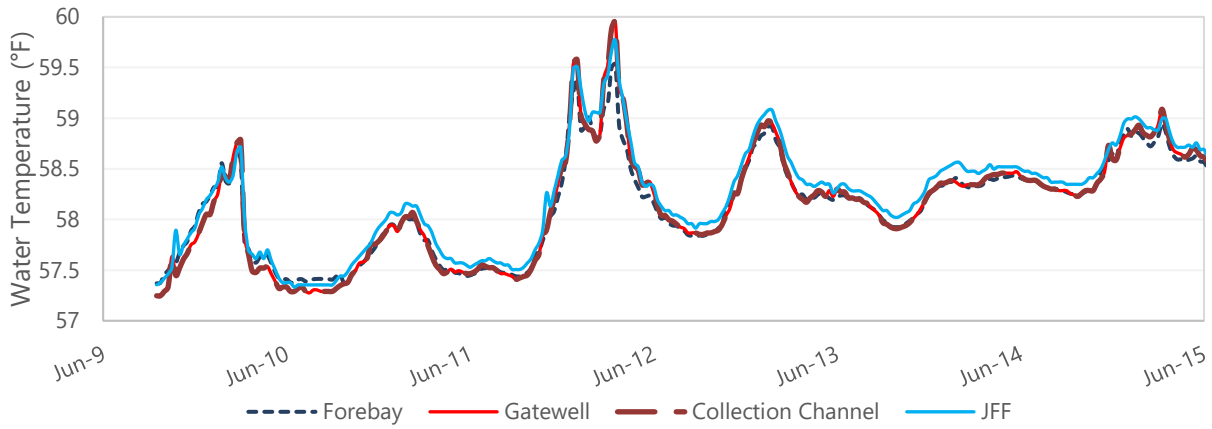

Figure 2
Average Water Temperatures by Time for Four Dam Locations from 0700 Hours June 9 to 0700 Hours June 15

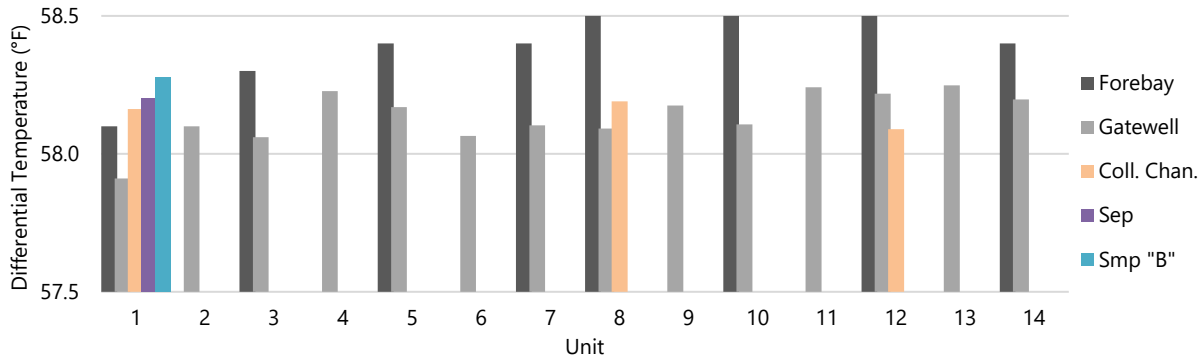

Figure 3
Average Weekly Water Temperatures by Position for Five Dam Locations from 0700 Hours June 9 to 0700 Hours June 15

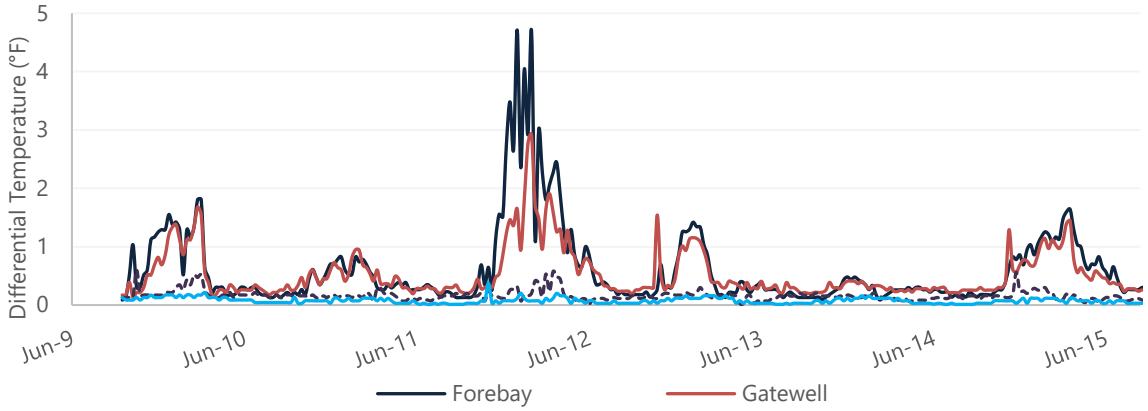

Figure 4
Average Differential Temperatures Within Four Dam Locations from 0700 Hours June 9 to 0700 Hours June 15

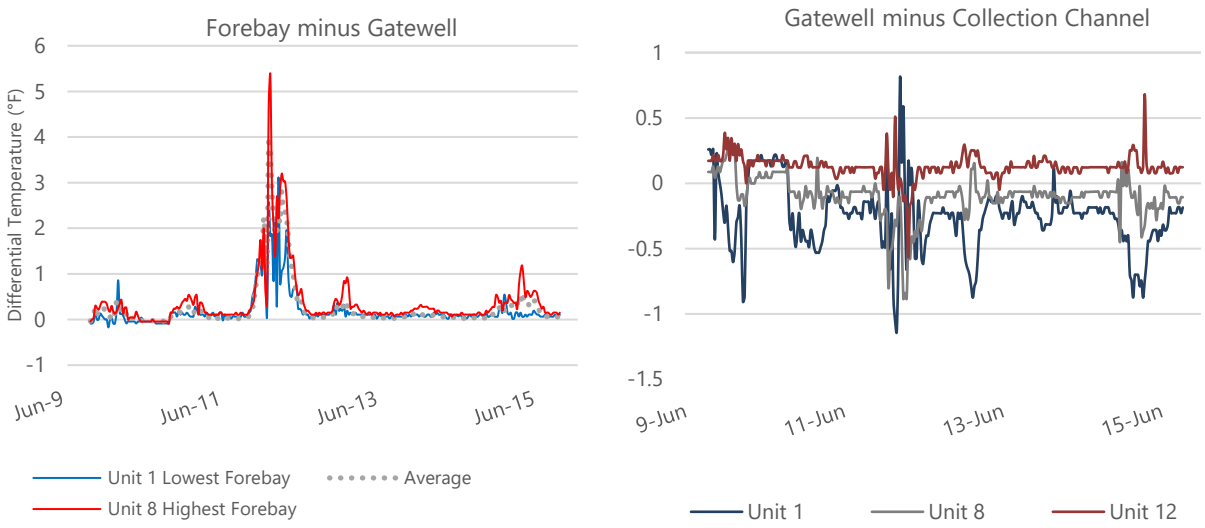

Figure 5
Average Differential Temperatures Across Three Dam Locations from 0700 Hours June 9 to 0700 Hours June 15