McNary Temperature Report #11b
August 28 - 31, 2015

An estimated total of 8 juvenile salmonids passed the McNary Juvenile Fish Facility (JFF) during the last four days of the temperature monitoring contract. (Figure 1 and Table 1). Subyearling fall chinook accounted for 50.0% of the passage. Daily flows for this ending period averaged 132.8kcfs. Spill averaged 61.6kcfs (50.1%). The sample mortality averaged 0.00%, and system mortality averaged 0.00%. Mortalities are being enumerated from the separator, sample tanks and raceway 9W, which is the recovery holding raceway before fish are released back to the river.

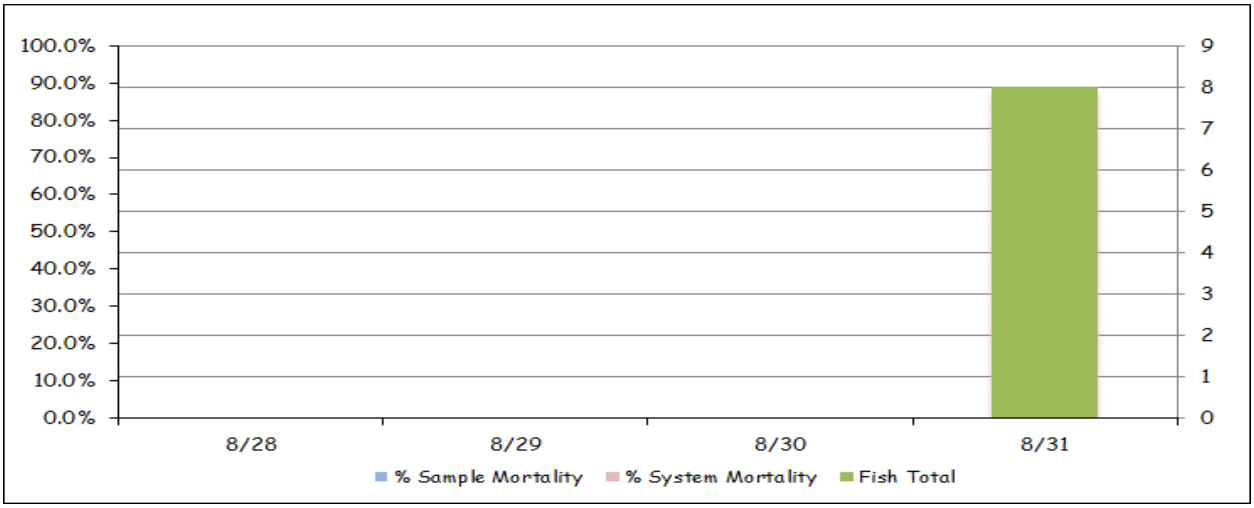

Figure 1: Collection and Mortality

Table 1: Collection and Mortality with Daily and Weekly Averages

		Mortality			Flow		Air Temp		Wind Speed	
	Collection	Sample	System	Total	Turbine	Spill	Avg.	Max.	Avg.	Max.
8/28/15				160.0	75.2	80.1	75.7	88.2	1.0	10.0
8/29/15	0	0.00%	0.00%	138.2	64.4	69.1	72.7	80.5	3.1	30.0
8/30/15				114.9	52.6	57.6	64.9	74.0	3.6	26.0
8/31/15	8	0.00%	0.00%	118.1	54.3	59.1	68.0	79.6	3.0	22.0
Weekly Average	4	0.00%	0.00%	132.80	61.63	66.48	70.3	88.2	2.7	30.0

During this report week, air temperatures averaged 70.3°F. Maximum hourly air temperature was 88.2°F, August 28, 5:00pm (Figure 2). The minimum temperature was 56.7°F, August 31, 5:00am. Winds averaged 2.68mph, with gust peaking up to 30.0mph, August 29.

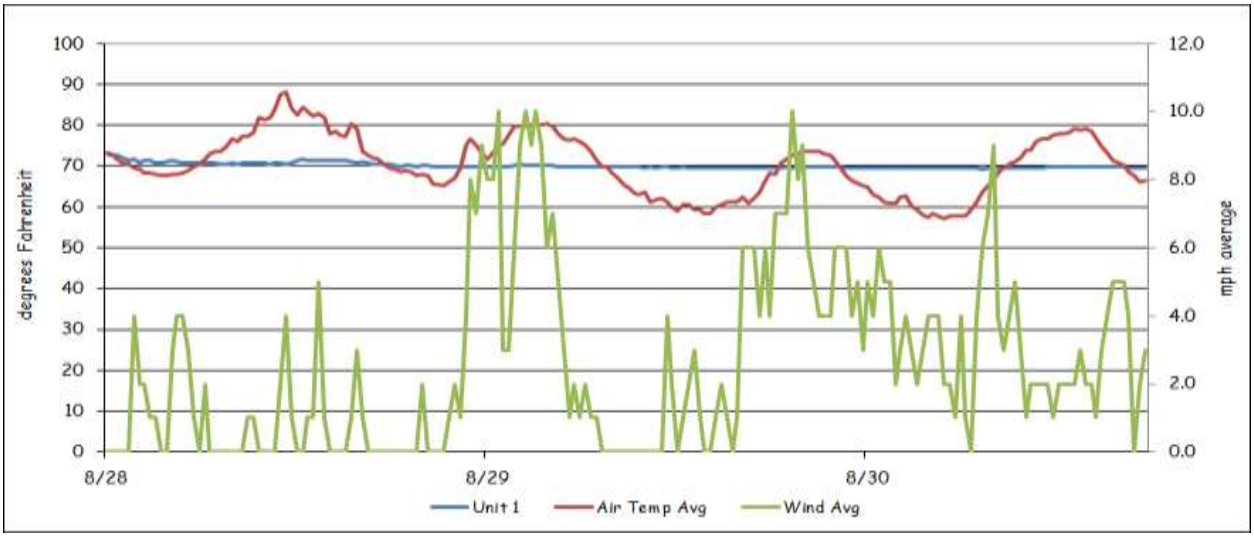

Figure 2: Weather and Forebay Water Temperature

There are 37 temperature probes located throughout the Project and the JFF. These probes are set to record temperatures at 30-minute intervals. These probes are located at the following locations:

1) Forebay, near elevation 335 approximately 5 feet below the surface. These are attached to the pier noses in front of turbine units 1, 3, 5, 7, 8, 10, 12, and 14.
2) In front of spillbays 22, 17, 12, 7 and 2, approximately 5 feet below the surface. These probes are hung in the center of the spillbay, on the tailrace side.
3) Attached to the handrail in the center of the "B" turbine gatewell slots, approximately 2 to 3 feet below the surface, in all 14 turbine units.
4) Tailwater locations are at turbine unit 1 and 14 (tailrace), and the wingwall of the navigation lock. These were placed 5 feet below the water surface.
5) The collection channel had probes installed below turbine units 12, 8 and past unit 1 at the beginning of the transition screen.
6) The barge transportation dock.
7) Fish separator.
8) Sample fish recovery raceway #9W.
9) Sample holding tank.

Forebay water temperatures (Table 2) peaked with 73.0°F, August 28, midnight; in front of unit 1 and 3. The average was 69.9°F across the forebay. Gatewell water temperatures for all units combined averaged 69.6°F (Table 3). Gatewell temperatures peaked with 73.0°F, August 28, unit 1 at midnight.

Table 2: Forebay Water Temperatures

	Daily Average								Daily
	1F	**3F**	**5F**	**7F**	**8F**	**10F**	**12F**	**14F**	**Max**
8/28/15	71.0	70.8	71.2	71.1	71.0	71.3	71.0	71.3	73.0
8/29/15	69.8	69.7	69.9	69.8	69.8	70.9	69.8	70.3	72.0
8/30/15	69.5	69.4	69.5	69.4	69.4	69.6	69.4	69.9	71.1
8/31/15	69.4	69.3	69.3	69.2	69.2	68.9	69.2	69.6	70.0
Weekly Average	69.9	69.8	70.0	69.9	69.9	70.0	69.8	70.3	73.0

Table 3: Gatewell Water Temperatures for Units 1, 7 & 14

	Daily Avg.			Daily Max.			Daily Min.		
	1	**7**	**14**	**1**	**7**	**14**	**1**	**7**	**14**
8/28/15	71.1	71.0	70.1	73.0	72.1	70.5	70.3	70.3	69.8
8/29/15	70.1	69.9	69.9	70.9	70.7	70.5	69.8	69.6	69.6
8/30/15	69.7	69.5	69.6	69.8	69.6	69.6	69.6	69.4	69.4
8/31/15	69.6	69.3	69.4	70.0	69.6	69.6	69.3	69.1	69.3
Weekly Average	70.1	69.9	69.8	70.9	70.5	70.1	69.8	69.6	69.5

The differences in temperatures between the gatewell at unit 1 and the gatewell at unit 14 are illustrated in Figure 3. This graph takes the temperature in the gatewell and subtracts unit 14 from that gatewell (unit 1 – 14). It then continues down the powerhouse subtracting unit 14 from each consecutive unit. A negative number indicates that unit 14 was the warmer unit. Conversely, a positive number indicates that unit 14 was cooler. This shows the reader the amount of variance from one end of the powerhouse to the other that can be seen throughout a 24-hour period.

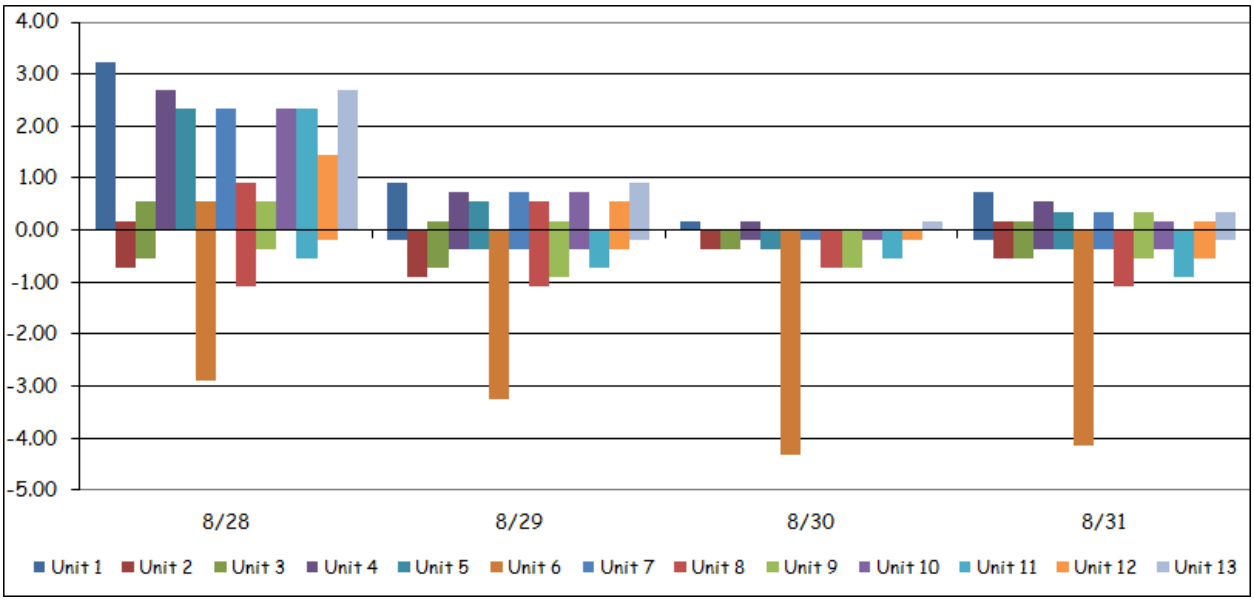

Figure 3: Average Gatewell Temperature Differentials for Units 1 - 14

Forebay differentials (Figure 4) are calculated by taking the forebay temperature and subtracting the corresponding gatewell temperature from it (1F – unit 1). A negative number would indicate that the gatewell was warmer. Conversely, a positive number indicates that the forebay is warmer. Again, this shows the reader the amount of variance that can be seen between the forebay and the gatewell throughout a 24-hour period.

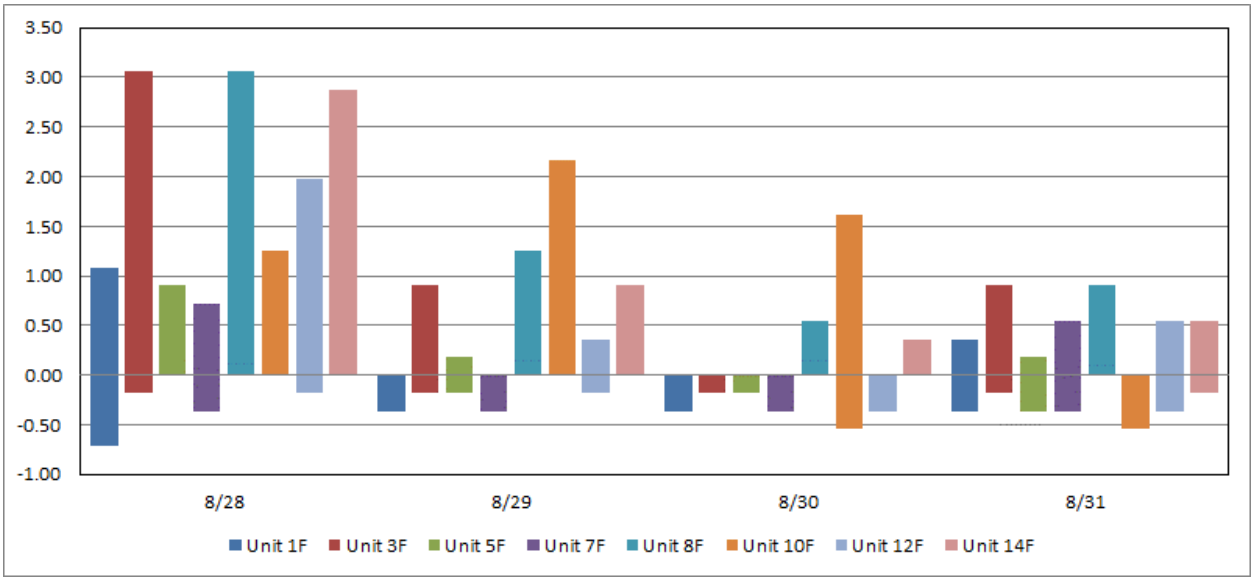

Figure 4: Average Temperature Differentials between Forebay and Gatewell

Average water temperature in the collection channel was 70.3°F (Table 4). Again, only four days in this period. A maximum temperature of 72.7°F was recorded below Unit 1, August 28, at midnight. Temperatures at the separator averaged 69.6°F, with a maximum daily temperature of 70.5°F (Table 5). The sample holding tank had a high of 70.7°F, August 2, at midnight for one hour. And again from 7:00 until 8:30pm. Average was 69.7°F. The temperature in raceway 9W averaged 69.5°F.

Table 4: Collection Channel Average and Maximum Water Temperatures

	Daily Avg.			Daily Max.		
	1	**8**	**12**	**1**	**8**	**12**
8/28/15	72.2	70.3	70.3	72.7	70.5	70.9
8/29/15	71.7	69.9	69.8	72.0	70.3	70.5
8/30/15	71.4	69.5	69.5	71.4	69.6	69.6
8/31/15	71.2	69.2	69.2	71.4	69.4	69.4
Weekly Average	71.6	69.7	69.7	71.9	70.0	70.1

Table 5: Separator, Sample Holding Tank and Recovery Raceway 9W Maximum and Average Water Temperatures

	Daily Avg.			Daily Max.		
	Separator	**Raceway 9W**	**Sample Tank**	**Separator**	**Raceway 9W**	**Sample Tank**
8/28/15	70.3	70.2	70.4	70.5	70.5	70.7
8/29/15	69.7	69.6	69.8	70.2	70.0	70.2
8/30/15	69.4	69.2	69.5	69.4	69.4	69.6
8/31/15	69.1	69.0	69.2	69.4	69.3	69.4
Weekly Average	69.6	69.5	69.7	69.9	69.8	70.0

Collection channel differentials (Table 6) are calculated by taking the forebay temperature and subtracting the collection channel temperature from it at the three corresponding points. This is an average of the variances between the forebay and the collection channel. A negative number indicates that the collection channel was warmer.

A positive number indicates the forebay was warmer. The graph (Figure 5) shows the variance throughout the week.

Table 6: Average Differences between Forebay and Collection Channel

	1	8	12
8/28/15	-1.2	0.7	0.6
8/29/15	-1.9	0.0	0.0
8/30/15	-1.9	-0.1	-0.1
8/31/15	-1.8	0.0	0.0
Average	-1.7	0.1	0.1
Maximum	0.5	1.8	1.6
Minimum	-2.2	-0.4	-0.4

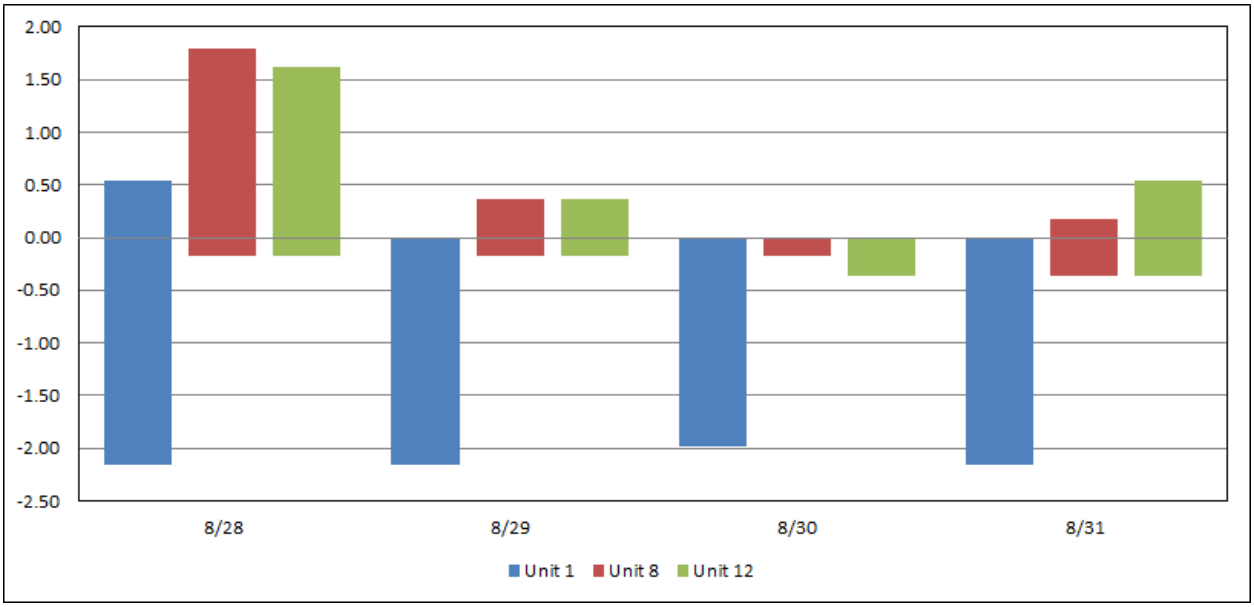

Figure 5: Average Temperature Differentials between Forebay and Collection Channel