McNary Temperature Report #1
June 15 - 18, 2015

This is an abbreviated week as temperature monitoring started in the middle of the fish week. An estimated total of 43,889 juvenile salmonids passed the McNary Juvenile Fish Facility (JFF) (Figure 1 and Table 1). Subyearling fall chinook accounted for 95.4% of the passage. Daily flows for this week averaged 163.8kcfs. Spill averaged 74.9kcfs (45.7%). The sample mortality averaged 0.92% for the week. System mortality averaged 0.03%. 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.

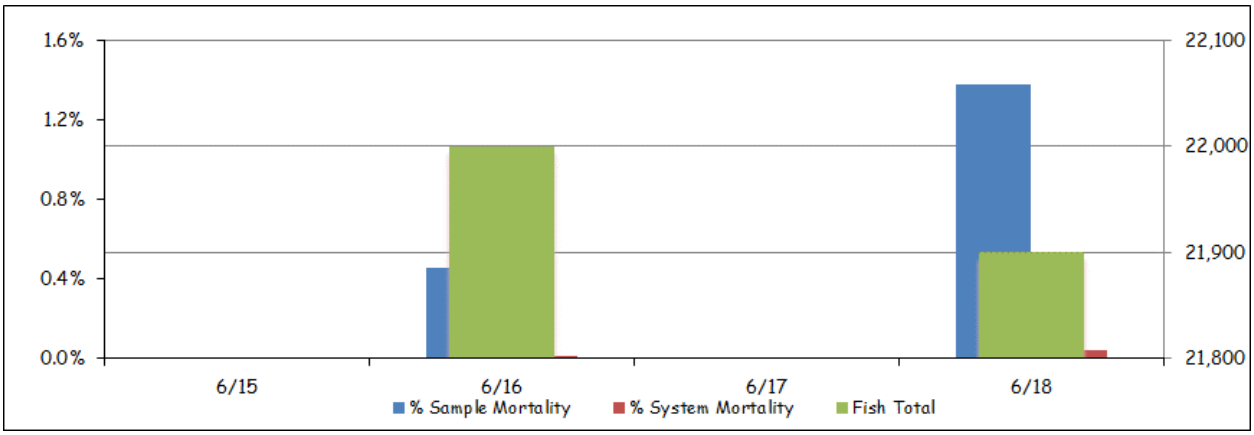

Figure 1: Collection and Mortality

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.
6/15/15	0	0.00%	0.00%	152.9	87.0	61.2	71.6	89.3	0.0	1.0
6/16/15	22,000	0.46%	0.01%	175.7	95.8	75.2	75.3	92.7	0.0	0.0
6/17/15	0	0.00%	0.00%	177.1	83.9	88.5	74.8	88.6	0.0	0.0
6/18/15	21,900	1.38%	0.04%	149.6	70.2	74.7	76.5	90.3	1.1	26.0
Weekly Average	10,975	0.92%	0.03%	163.8	84.2	74.9	74.6	92.7	0.3	26.0

During this report week, air temperatures averaged 74.6°F. Maximum hourly air temperature was 92.7°F on June 16 (Figure 2). The minimum temperature was 54.4°F on June 15 from 5:00 until 6:00am. Winds averaged 0.96mph, with gust peaking up to 26.0mph on June 16.

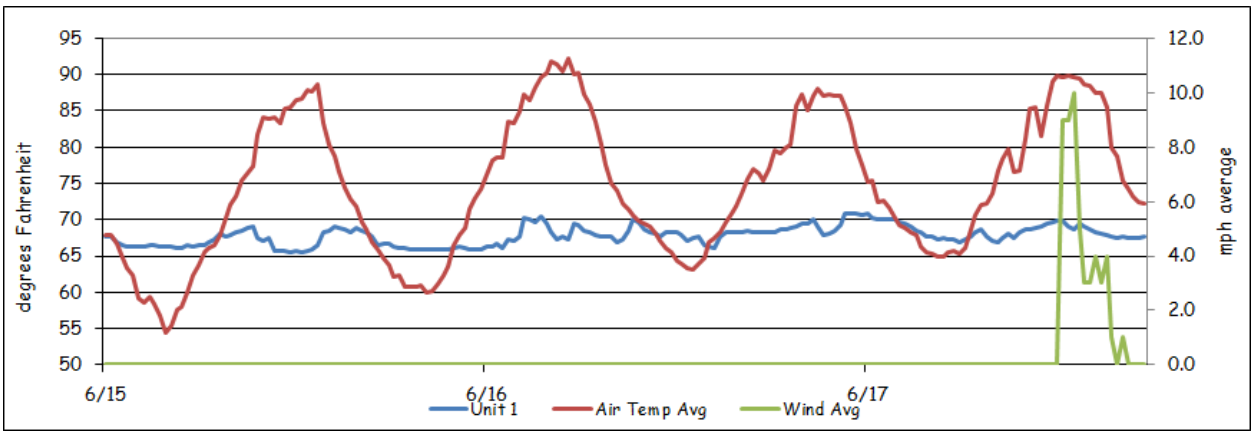

Figure 2: Weather and Forebay Water Temperature

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 this week with 76.8°F on June 16 at 6:00pm in front of unit 5. The average was 68.0°F across the forebay. Gatewell water temperatures for all units combined averaged 66.8°F (Table 3). Gatewell temperatures peaked with 74.3°F on June 18 in unit 5 at 5:00pm

Table 2: Forebay Water Temperatures

	Daily Average								Daily
	1F	**3F**	**5F**	**7F**	**8F**	**10F**	**12F**	**14F**	**Max**
6/15/15	67.3	66.3	67.8	68.2	68.1	67.6	67.4	68.0	71.2
6/16/15	69.0	66.2	68.9	69.0	68.9	67.3	67.3	69.1	76.8
6/17/15	69.2	68.7	69.1	68.5	68.5	67.9	67.7	68.0	73.2
6/18/15	68.4	67.8	68.2	67.9	67.5	67.3	66.8	67.7	70.2
Weekly Average	68.5	67.2	68.5	68.4	68.3	67.5	67.3	68.2	76.8

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**
6/15/15	67.1	67.5	67.2	69.1	69.4	68.4	65.5	66.2	66.0
6/16/15	67.2	67.6	67.6	70.5	70.9	73.4	65.8	65.5	65.8
6/17/15	68.7	68.0	67.1	70.9	70.3	69.8	66.0	66.4	65.7
6/18/15	68.3	67.8	66.9	70.0	69.1	68.4	66.9	66.6	65.8
Weekly Average	67.8	67.7	67.2	70.1	69.9	70.0	66.1	66.2	65.8

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.

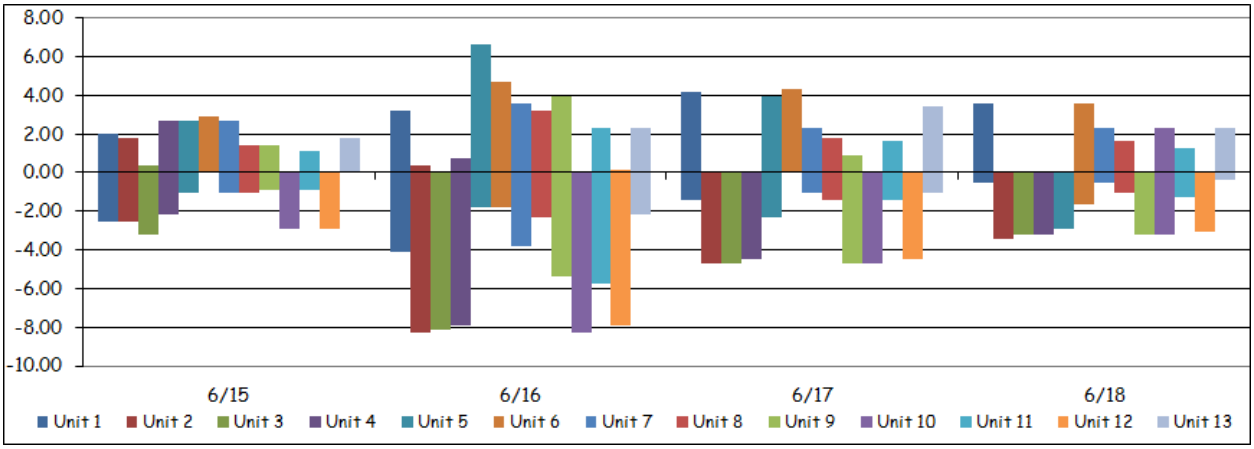

Figure 3: Average Gatewell Temperature Differentials for Units 1 - 14

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.

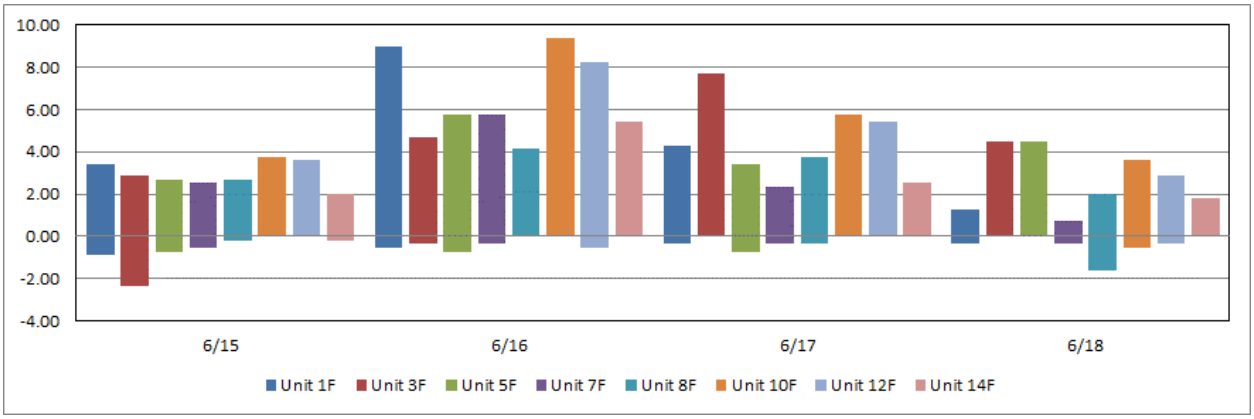

Figure 4: Average Temperature Differentials between Forebay and Gatewell

Average water temperature in the collection channel was 67.3°F (Table 4) for the week. A maximum temperature of 70.0°F was recorded below Unit 1 on June 16 at 7:00pm. Temperatures at the separator averaged 66.5°F for the week with a maximum daily temperature of 67.8°F (Table 5). The sample holding tank had a high of 67.8°F on June 15 at midnight. The average was 66.5°F. The temperature in raceway 9W averaged 66.3°F.

Table 4: Collection Channel Average and Maximum Water Temperatures

	Daily Avg.			Daily Max.		
	1	**8**	**12**	**1**	**8**	**12**
6/15/15	68.5	66.9	67.1	69.3	67.6	68.2
6/16/15	68.2	66.8	66.9	70.0	69.1	68.5
6/17/15	68.4	66.7	67.2	69.4	67.6	69.1
6/18/15	67.9	66.4	67.0	68.5	66.9	68.4
Weekly Average	68.2	66.7	67.1	69.3	67.8	68.5

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**
6/15/15	66.7	66.6	66.8	67.6	67.6	67.8
6/16/15	66.4	66.2	66.5	67.8	67.6	67.8
6/17/15	66.5	66.4	66.6	67.6	67.6	67.6
6/18/15	66.2	66.1	66.3	66.6	66.6	66.9
Weekly Average	66.4	66.3	66.6	67.4	67.4	67.6

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
6/15/15	-1.2	1.2	0.3
6/16/15	0.8	2.2	0.3
6/17/15	0.8	1.8	0.6
6/18/15	0.4	1.0	-0.2
Average	0.2	1.6	0.3
Maximum	7.0	6.7	6.3
Minimum	-3.2	-0.4	-2.3

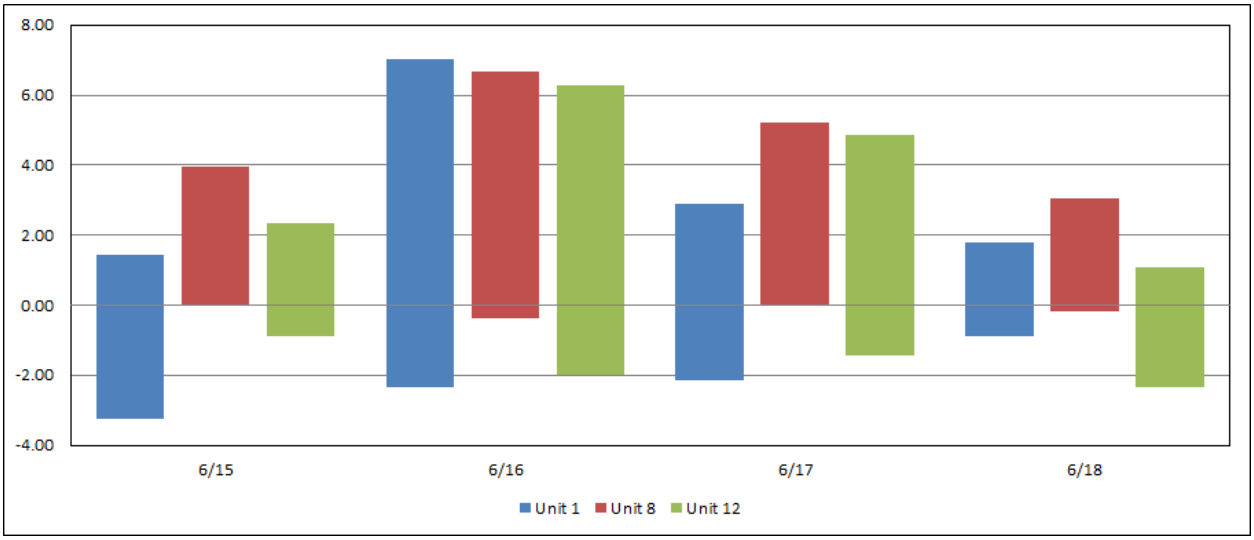

Figure 5: Average Temperature Differentials between Forebay and Collection Channel