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McNary Temperature Report #3
June 28 – July 4, 2013

A total of 473,609 juvenile salmonids were collected at the McNary Juvenile Fish Facility (JFF) (Figure 1 and Table 1). Subyearling fall chinook accounted for 99.5% of the total collection. Daily flows for this week averaged 282.4kcfs. Spill averaged 159.5kcfs (56.5%). The sample mortality averaged 0.82% for the week. System mortality averaged 0.01%. 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.

Fish are bypassed to the river daily. Units 3, 4 and 11 are unavailable due to maintenance. Unit 14 was returned to service at 2:30pm July 3. All orifices are open.

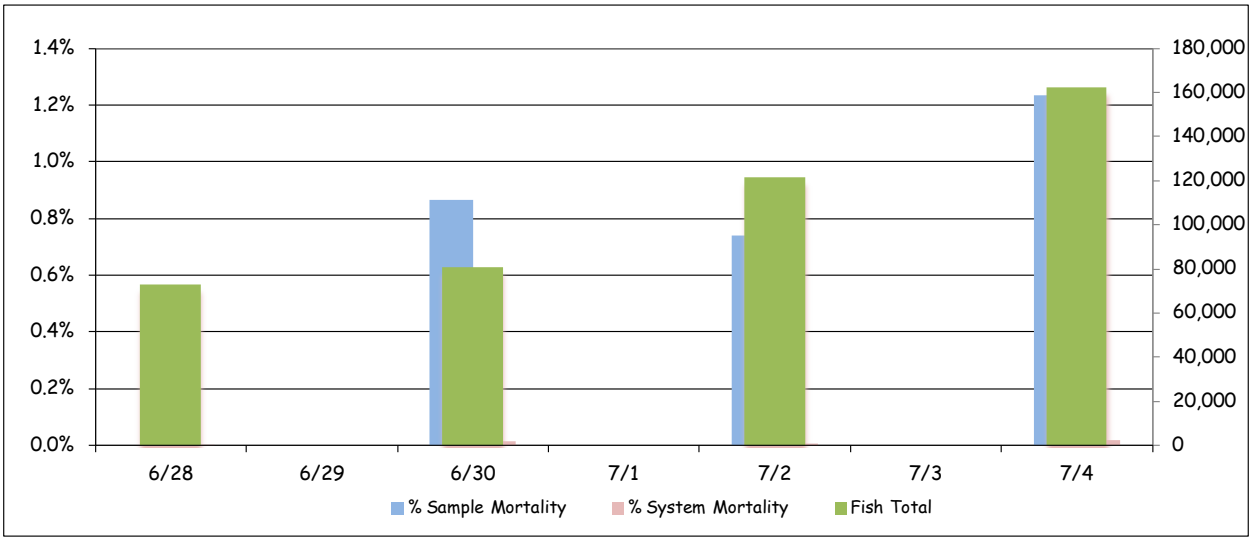

Figure 1: Collection and Mortality

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.
6/28/13	73,002	0.00%	0.00%	269.3	129.4	135.2	77.5	94.5	1.4	16.0
6/29/13	0			281.1	115.6	163.8	80.0	93.2	3.9	32.0
6/30/13	81,002	0.86%	0.01%	288.1	115.7	167.7	81.4	96.8	5.7	38.0
7/1/13	0			284.6	118.1	161.8	85.0	105.1	3.0	26.0
7/2/13	121,502	0.74%	0.01%	281.4	115.2	161.6	84.7	103.1	2.4	12.0
7/3/13	0			284.2	116.5	163.0	80.4	95.1	1.9	14.0
7/4/13	162,103	1.23%	0.02%	287.9	119.9	163.4	74.6	85.3	2.5	15.0
Weekly Average	62,516	0.82%	0.01%	282.4	118.6	159.5	80.5	105.1	3.0	38.0

Air temperatures at the McNary JFF averaged 80.5°F for the week. Maximum hourly air temperature was 105.1°F on July 1 (Figure 2). The minimum temperature was 63.1°F on June 28 from 6:00 until 7:00am. Winds over the course of the week averaged 3.0mph with gust peaking up to 38.0mph on June 30.

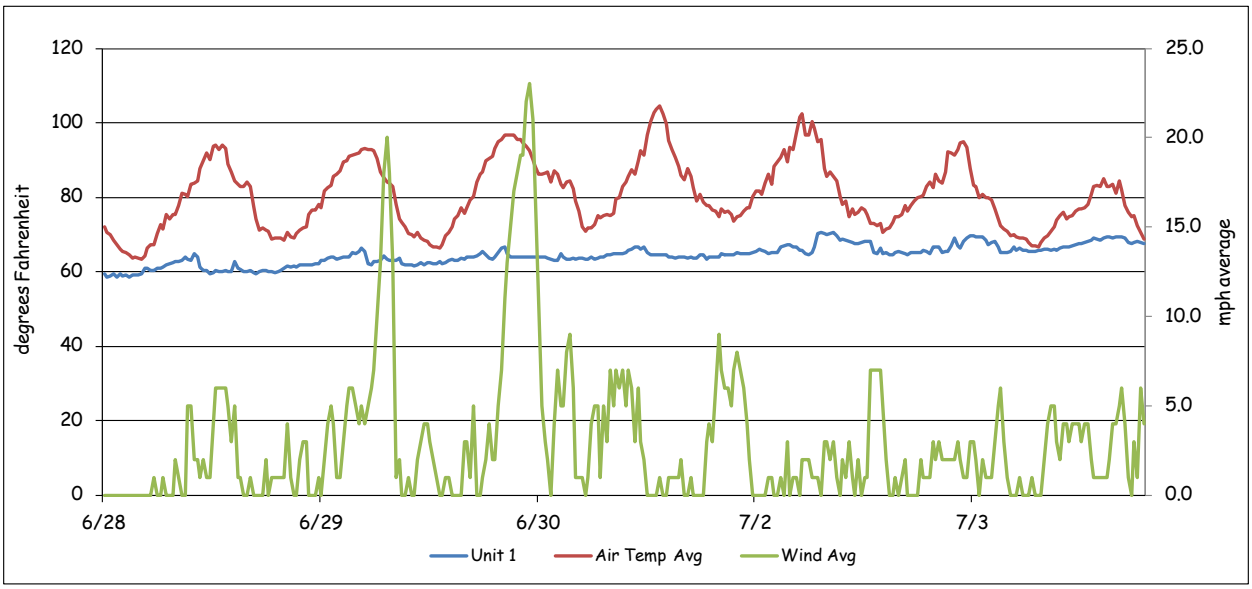

Figure 2: Weather and Forebay Water Temperature

There are 36 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 at a depth of 2 – 3 feet.
9) Sample holding tank.

Please note that points #8 & 9 are a change from previous years where the raceway probe was in transportation raceway #1; and there was not one in the sample tank. These changes were made in response to concerns over water temperatures where fish are being held. Raceway 9W is the only raceway that has continuous use since bypass operation is standard procedure.

Forebay water temperatures (Table 2) peaked this week with 75.7°F on July 2 at 5:00p.m., in front of unit 7. The average was 64.6°F across the forebay. Gatewell water temperatures for all units combined averaged 63.5°F (Table 3). Gatewell temperatures peaked at 72.3°F on July 2 in unit 13 at 4:30p.m.

Table 2: Forebay Water Temperatures

	Daily Average								Daily
	1F	**3F**	**5F**	**7F**	**8F**	**10F**	**12F**	**14F**	**Max**
6/28/13	62.6	61.1	61.2	62.5	61.7	61.7	63.0	62.7	68.5
6/29/13	63.4	62.1	62.7	63.0	62.7	62.2	63.6	63.1	68.7
6/30/13	63.9	63.1	63.3	63.2	62.7	62.3	63.7	63.6	68.0
7/1/13	64.6	64.1	64.3	65.0	64.8	63.7	65.2	64.6	70.7
7/2/13	67.5	64.7	66.1	67.7	66.7	65.0	67.3	65.8	75.7
7/3/13	67.2	64.7	65.9	68.2	67.5	65.7	67.5	66.4	71.4
7/4/13	67.1	65.6	66.2	66.7	66.2	64.8	66.6	66.5	69.8
Weekly Average	65.2	63.6	64.2	65.2	64.6	63.6	65.3	64.7	75.7

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**
6/28/13	60.7	61.7	59.3	64.8	64.8	60.3	58.6	60.3	58.8
6/29/13	62.4	62.5	60.0	66.2	66.0	62.1	59.4	61.0	59.4
6/30/13	63.4	62.8	61.3	66.6	63.9	63.3	61.5	62.1	60.3
7/1/13	64.3	63.9	62.0	66.7	65.8	63.7	63.1	63.0	61.3
7/2/13	66.1	65.0	62.6	70.5	69.1	66.0	63.3	63.3	61.5
7/3/13	66.7	66.0	63.4	69.6	68.5	65.7	64.4	64.6	62.2
7/4/13	67.1	66.2	64.6	69.4	67.5	66.2	65.1	64.8	63.3
Weekly Average	64.4	64.0	61.9	67.7	66.5	63.9	62.2	62.7	61.0

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 through out a 24-hour period.

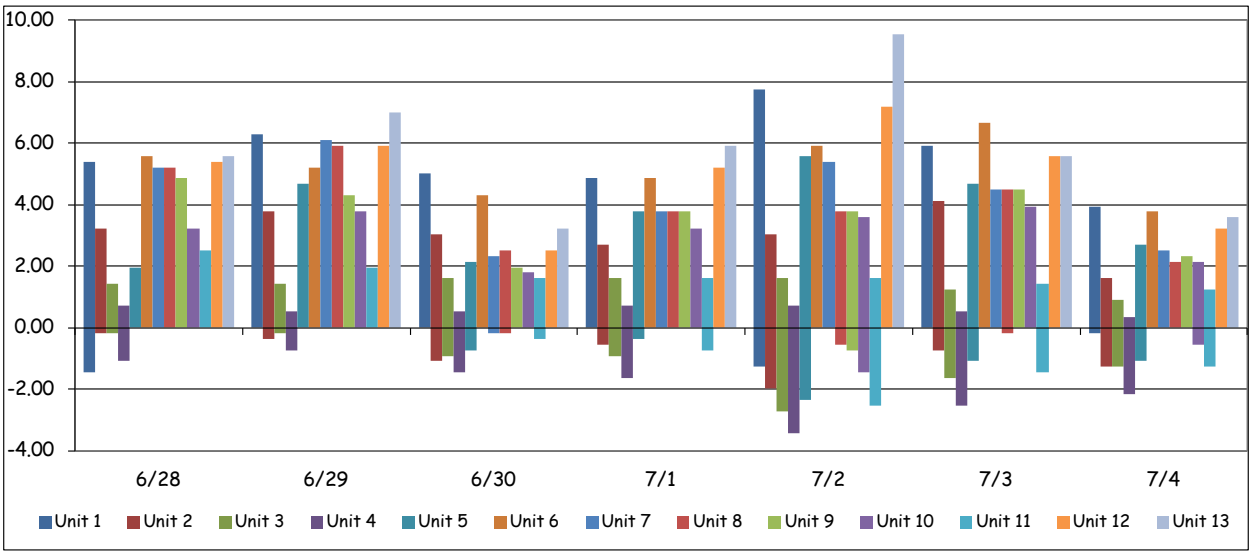

Figure 3: Average Gatewell Temperature Differentials for Units 1 - 14

Forebay differentials (Figure 4) are calculated by taking the forbay 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.

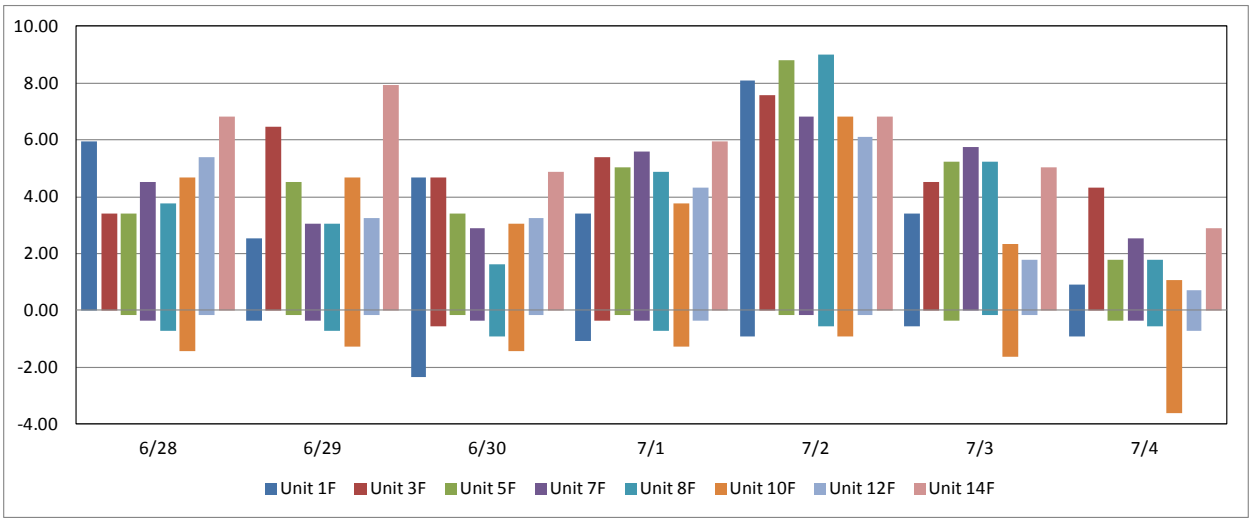

Figure 4: Average Temperature Differentials Between Forebay and Gatewell

Average water temperature in the collection channel was 63.8°F (Table 4) for the week. A maximum temperature of 68.2°F was recorded on July 3 from 6:30 until 7:30pm, below Unit 8. Temperatures at the separator averaged 64.4°F for the week with a maximum daily temperature of 67.8°F (Table 5). The temperature in raceway 9W averaged 63.7°F with a high of 67.1°F July 4 from 5:30 until 6:30pm. The sample holding tank had a high of 66.9°F on July 4 from 4:00 until 7:30pm. The average was 63.6 °F.

Table 4: Collection Channel Average and Maximum Water Temperatures

	Daily Avg.			Daily Max.		
	1	**8**	**12**	**1**	**8**	**12**
6/28/13	61.2	62.1	60.4	62.6	64.2	62.2
6/29/13	62.2	63.0	61.2	64.2	64.9	63.3
6/30/13	62.9	63.6	61.9	64.0	65.3	63.9
7/1/13	63.8	64.6	62.9	65.3	66.4	65.1
7/2/13	64.8	65.4	63.9	66.6	67.3	67.1
7/3/13	65.7	66.5	65.0	67.3	68.2	67.3
7/4/13	66.0	66.7	65.4	67.3	68.0	66.9
Weekly Average	63.8	64.6	63.0	65.3	66.3	65.1

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**
6/28/13	62.0	61.1	61.0	63.3	62.4	62.2
6/29/13	62.9	62.1	62.0	64.8	63.9	63.9
6/30/13	63.7	62.8	62.8	64.8	64.0	64.0
7/1/13	64.6	63.8	63.7	66.0	65.1	65.1
7/2/13	65.5	64.6	64.6	67.1	66.2	66.0
7/3/13	66.4	65.5	65.4	67.8	66.9	66.9
7/4/13	66.0	65.8	65.7	66.9	67.1	66.9
Weekly Average	64.4	63.7	63.6	65.8	65.1	65.0

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 through out the week.

Table 6: Average Differences between Forebay and Collection Channel

	1	**8**	**12**
6/28/13	1.4	-0.4	2.6
6/29/13	1.2	-0.3	2.3
6/30/13	1.1	-0.9	1.8
7/1/13	0.7	0.1	2.3
7/2/13	2.7	1.3	3.4
7/3/13	1.5	1.0	2.5
7/4/13	1.1	-0.6	1.3
Average	1.4	0.0	2.3
Maximum	10.3	7.7	8.6
Minimum	-1.6	-2.7	-1.1

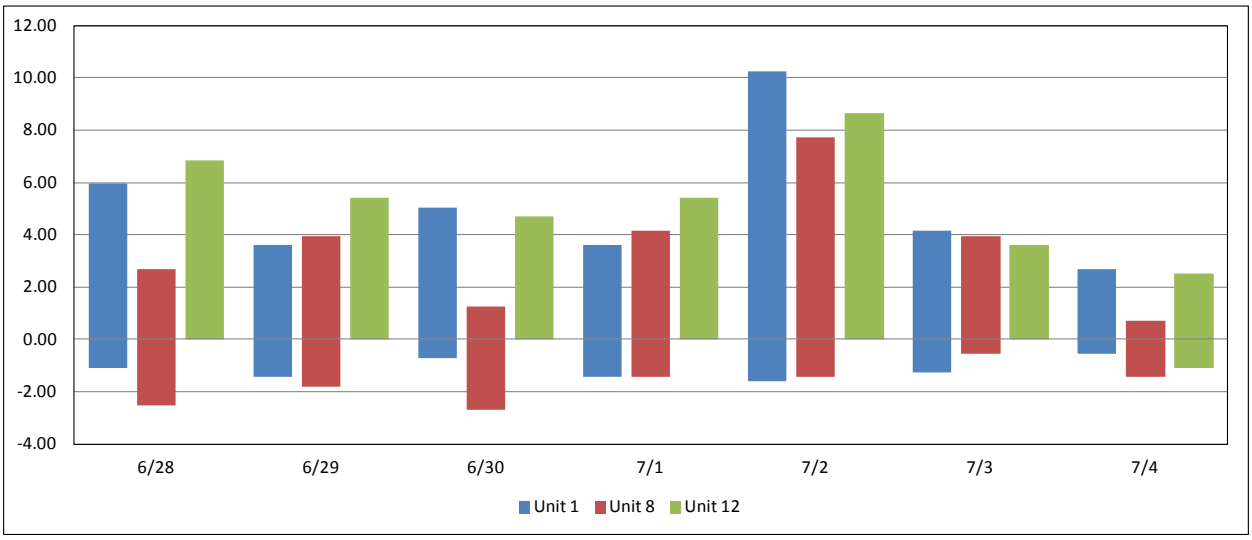

Figure 5: Average Temperature Differentials Between Forebay and Collection Channel