

Sacramento River Temperature Task Group Meeting

July 24, 2014

1:00 pm

Conference Line: 877-718-6527

Pass code: 1954134

Agenda

1. Introductions
2. Fishery update
3. Hydrology & Operations update
 - a. 90% forecasts ***
 - b. Sacramento Temperature Summary Table ***
4. Discussion of recent temperature model runs
 - a. Temperature studies packet ***
5. Next meeting

***handouts

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Temperature and Release Summary for Shasta and Trinity - July 2104

(Updated twice a week November through April)

Day	Sacramento River Water Temperatures in Degrees F Collected from CDEC (California Data Exchange Center) except for TCD, SPP and Control Point												Mean Daily Release in CFS			Mean Daily Air Temp Degrees F			
	TCD Wt. Avg.	SHD minus TCD (Diff)	Shd	SPP Wt. Avg	Kwk	Control Point 3/1 to 3/27 Bsf	Jlf	Bnd	Rdb	Lws	Control Point 3/28 to Ccr	Igo	Shasta Generation EI 815	Spring Crk Powerplant Release	Keswick Total Release	RDD	BSF	RDB	LWS
Jun	54.7		52.5	54.0	54.5	56.8	58.8	59.3	62.1	52.2	55.9	55.4	7,888	1,192	8,972	79.2	76.5	77.4	68.7
Jul																			
1	53.3	(2.7)	50.6	56.3	54.3	57.6	59.5	60.2	63.8	52.9	55.9	57.8	7,145	2,501	9,244	87.5	83.2	83.0	78.8
2	53.5	(2.9)	50.6	56.3	54.3	57.2	59.1	59.7	63.0	52.4	55.8	58.0	5,733	3,109	9,251	84.0	81.1	80.4	78.0
3	53.2	(2.9)	50.3	56.5	54.7	57.1	59.2	59.8	63.0	52.6	56.0	58.1	6,195	3,174	9,248	84.5	81.0	80.2	76.2
4	53.3	(2.9)	50.4	56.6	54.4	57.4	59.3	60.0	63.0	52.7	55.8	58.2	6,856	2,906	9,252	84.5	81.1	80.3	75.2
5	52.8	(2.6)	50.2	56.6	54.5	57.0	58.8	59.3	62.4	52.6	55.8	57.8	6,216	3,185	9,243	80.5	77.2	77.2	75.4
6	52.8	(2.6)	50.2	56.7	54.4	57.0	58.8	59.4	62.2	52.4	55.7	57.7	6,296	3,096	9,242	84.5	80.3	81.5	76.4
7	53.1	(2.9)	50.2	56.7	54.1	57.0	58.7	59.3	62.1	52.1	55.5	58.0	6,238	3,172	9,263	86.5	79.2	80.1	80.0
8	53.5	(3.3)	50.2	56.8	54.2	57.0	57.8	58.5	61.3	51.1	55.1	57.1	6,200	2,961	9,253	86.0	79.1	82.5	77.8
9	52.7	(2.3)	50.4	56.8	53.9	56.8	58.3	58.8	61.3	51.9	55.3	58.4	6,133	2,970	9,217	90.0	83.5	80.7	80.6
10	52.1	(1.5)	50.6	56.8	54.0	56.7	58.8	59.4	62.2	52.0	55.4	58.1	7,072	2,329	9,077	83.0	79.6	78.8	77.9
11	52.1	(1.4)	50.7	56.8	54.0	56.9	58.5	59.2	62.6	52.6	55.2	58.3	6,820	2,523	9,204	82.0	78.6	77.8	76.5
12	52.1	(1.4)	50.7	56.8	53.8	56.7	58.4	59.0	62.6	52.3	55.2	58.4	6,887	2,303	9,285	84.0	80.4	79.5	78.0
13	52.6	(1.1)	51.5	56.8	54.0	56.8	58.7	59.3	62.7	52.0	55.3	58.6	7,034	2,308	9,238	87.5	82.5	80.8	79.1
14	52.3	(1.5)	50.8	56.8	54.3	57.0	59.0	59.6	63.0	52.2	55.7	58.4	7,315	2,266	9,359	90.5	86.5	87.7	79.0
15	52.3	(1.6)	50.7	56.8	53.9	56.8	58.4	59.1	62.7	52.4	55.1	57.7	6,782	2,285	9,221	85.0	81.6	81.3	80.9
16	52.7	(1.6)	51.1	56.8	53.8	56.6	58.0	58.7	61.5	52.3	54.9	58.1	7,056	2,355	9,193	84.0	79.5	78.3	80.1
17	52.5	(1.5)	51.0	56.8	54.0	56.6	58.2	58.8	62.1	53.0	55.2	58.5	7,045	2,382	9,230	81.0	78.7	76.6	81.2
18	52.8	(1.5)	51.3	56.9	54.1	57.1	58.7	59.3	62.6	53.1	55.4	58.8	6,717	2,460	9,207	82.0	79.0	78.4	80.0
19	53.4	(2.0)	51.4	57.0	54.4	57.2	59.0	59.6	62.8	53.3	55.7	58.9	6,756	2,420	9,277	83.5	79.9	78.9	81.7
20	53.5	(2.1)	51.4	57.0	54.8	57.5	59.5	60.1	63.3	52.5	56.2	59.0	6,709	2,402	9,275	84.5	79.6	78.9	78.3
21	52.9	(1.8)	51.1	57.1	54.8	57.5	58.8	59.5	62.7	52.4	55.8	58.2	7,299	2,270	9,300	77.0	73.2	72.8	70.1
22	52.3	(1.6)	50.7	57.2	54.2	57.0	58.1	58.6	61.6	52.1	55.5	58.2	6,997	2,238	9,039	77.5	74.8	74.7	69.6
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Avg	52.8		50.7	56.8	54.2	57.0	58.7	59.3	62.5	52.4	55.5	58.2	6,705	2,619	9,233	84.1	80.0	79.6	77.8
Tot cfs													147,501	57,615	203,118				
Tot af													292,568	114,279	402,885				

= Station out of service ^ - estimated (7 hours or less available) ? = Avg. includes estimated data
 ! = 17 hours or less of readings & = 18 to 23 hours of reading ND = No hourly readings or incorrect

Control Point: Balls Ferry 3/1/2014 to 3/27/2014 56.0; Clear Creek 3/28/2014 to 4/24/2014 58.0; Clear Creek 4/25/2014 to present 56.0.

PRELIMINARY

July 23, 2014

Upper Sacramento River – July 2014 Preliminary Temperature Analysis

Summary of Temperature Target Results by Month

Initial Target Location	JUL	AUG	SEP	OCT
90%-Exceedance Outlook				
Sac. R. above Clear Creek (CCR)	CCR	CCR	CCR to 58°F	CCR~58°F to 59+°F

Temperature Model Inputs, Assumptions, Limitations and Uncertainty:

1. Operation is based on the July 2014 Operation Outlooks (monthly flows and reservoir release) for the 90% exceedance.
2. **The latest available profiles for Shasta, Trinity and Whiskeytown were taken on July 16, July 22, and July 16, respectively.**
3. Guidance on forecasted flows from the creeks (e.g., Cow, Cottonwood, Battle, etc.) between Keswick Dam and Bend Bridge is not available beyond 5 days. Model input side flows (Cottonwood Cr & Bend Bridge local flow w/o Cottonwood Cr) were selected from the historical record, and are consistent with the forecast exceedance frequency. During spring, the relatively warm creek flows can be a significant percentage of the flows at Bend Bridge.
4. Although mean daily flows and releases are temperature model inputs, they are based on the mean monthly values from the operation outlooks. Mean daily flow patterns are user defined.
5. Cottonwood Creek flows, Keswick to Bend Bridge local flows, and diversions are mean daily synthesized flows based on the available historical record for a 1922-2002 study period.
6. Meteorological inputs were derived from a database of 86 years of meteorological data (1920-2005). The NOAA-NWS Local Three-Month Temperature Outlook (L3MTO), as a means of estimating air temperature expectation, was used to select each month's meteorology from the database.
7. Meteorology, as well as flow volume and pattern, significantly influences reservoir inflow temperatures and downstream tributary temperatures; and consequently, the development of the cold-water pool during winter and early spring.

Temperature Analysis Results:

Note that Lake Shasta storage this year was too low to utilize the upper gates of the TCD. This TCD limitation, along with the relatively small cold-water pool volume, significantly impacts temperature management. Lake Shasta spring storage is the lowest since the TCD was constructed.

Alternative 1: 90%-Exceedance without Trinity Dam Auxiliary Outlet Works (AOW):

A temperature target location on the Sacramento River above Clear Creek is possible through mid-September (Figure 1). By September, the TCD intake level will be through the side gates, the lowest intake level. The end-of-September volume of water that's 56°F, or less, is below the lowest outlet elevation.

Figure 2 shows temperature results for Clear Creek at Igo.

Figure 3 includes results for the Trinity River at Lewiston Dam. The dashed lines are the 2009 mean daily temperatures at selected locations. (**NOTE:** 2009 was the last time the auxiliary outlet works (AOW) was used for fall temperature management; however, there are no releases through the AOW in this alternative.)

Alternative 2: 90%-Exceedance with Trinity Dam Auxiliary Outlet Works:

Figures 4 through 6 include results of an alternative which utilizes the Trinity Dam AOW. For this alternative, operation of the AOW was assumed from late August through mid-October; however, criteria will need to be developed for both initiating and terminating AOW operations.

Sacramento River Modeled Temperature 2014 July 90%-Exceedance Outlook

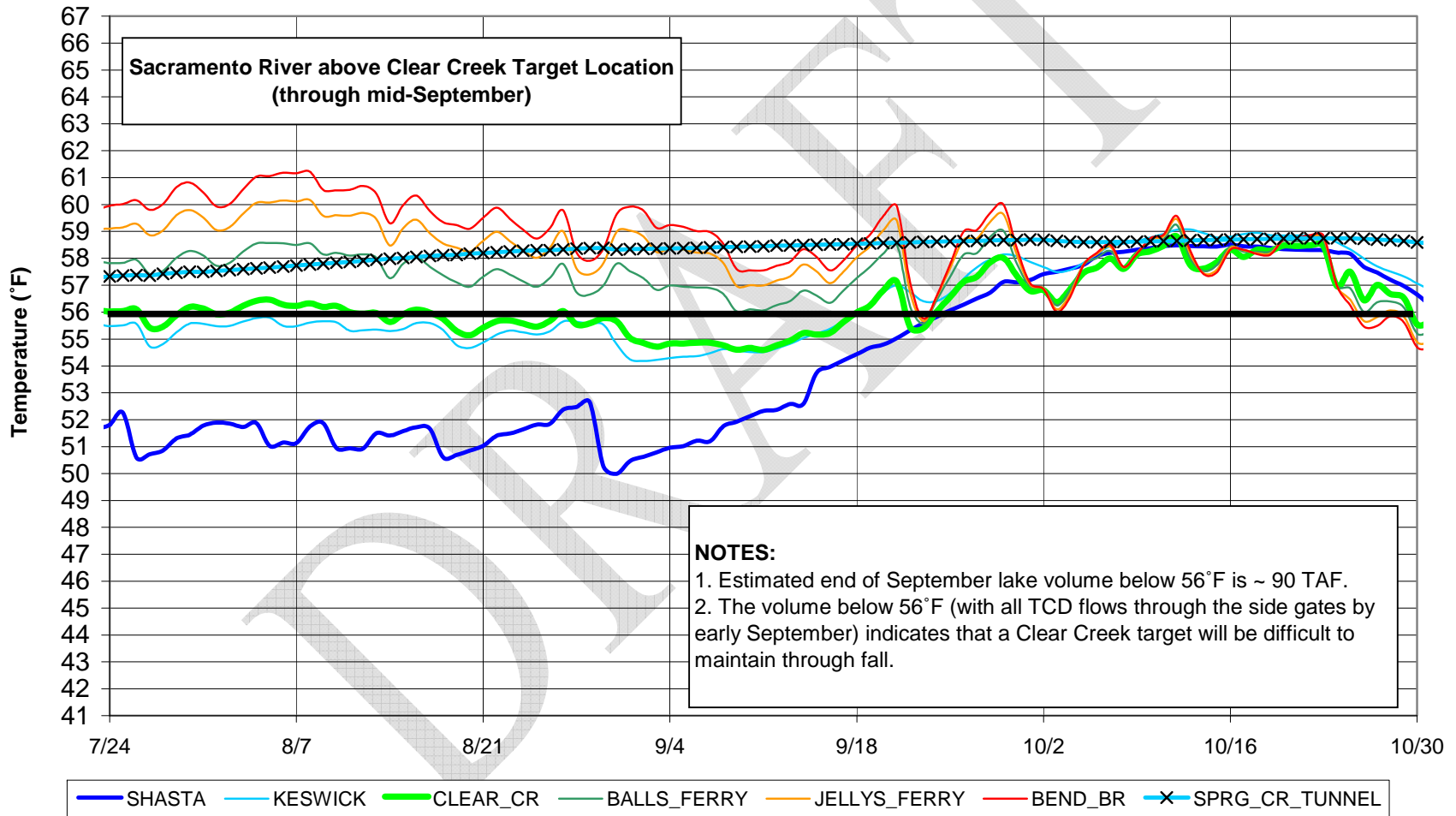


Figure 1

Clear Creek - Igo Modeled Temperature
2014 July 90%-Exceedance Outlook

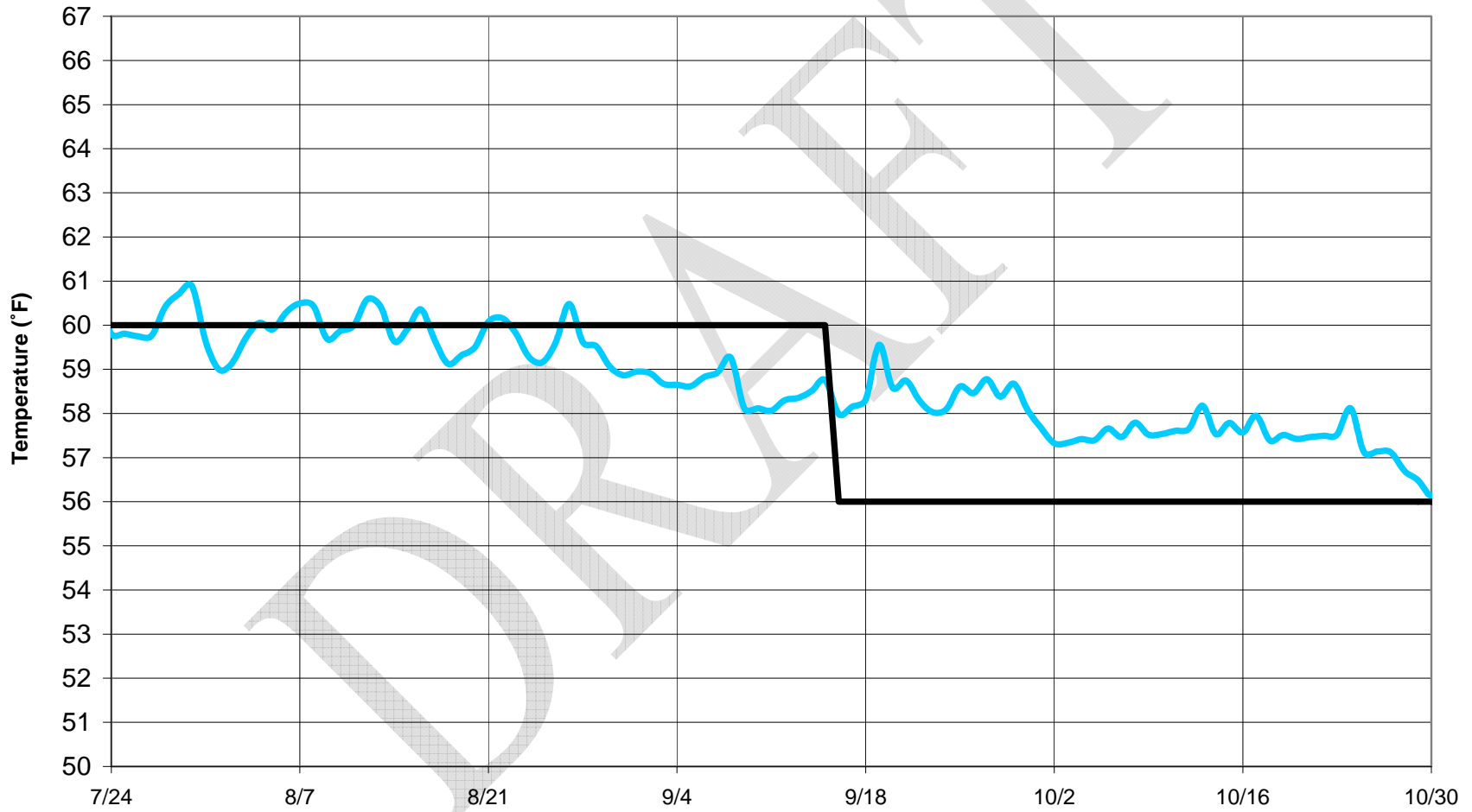


Figure 2

**Trinity River - 2014 July 90%-Exceedance Outlook
"Critically Dry Year" Release Schedule
Mean Daily Water Temperature**

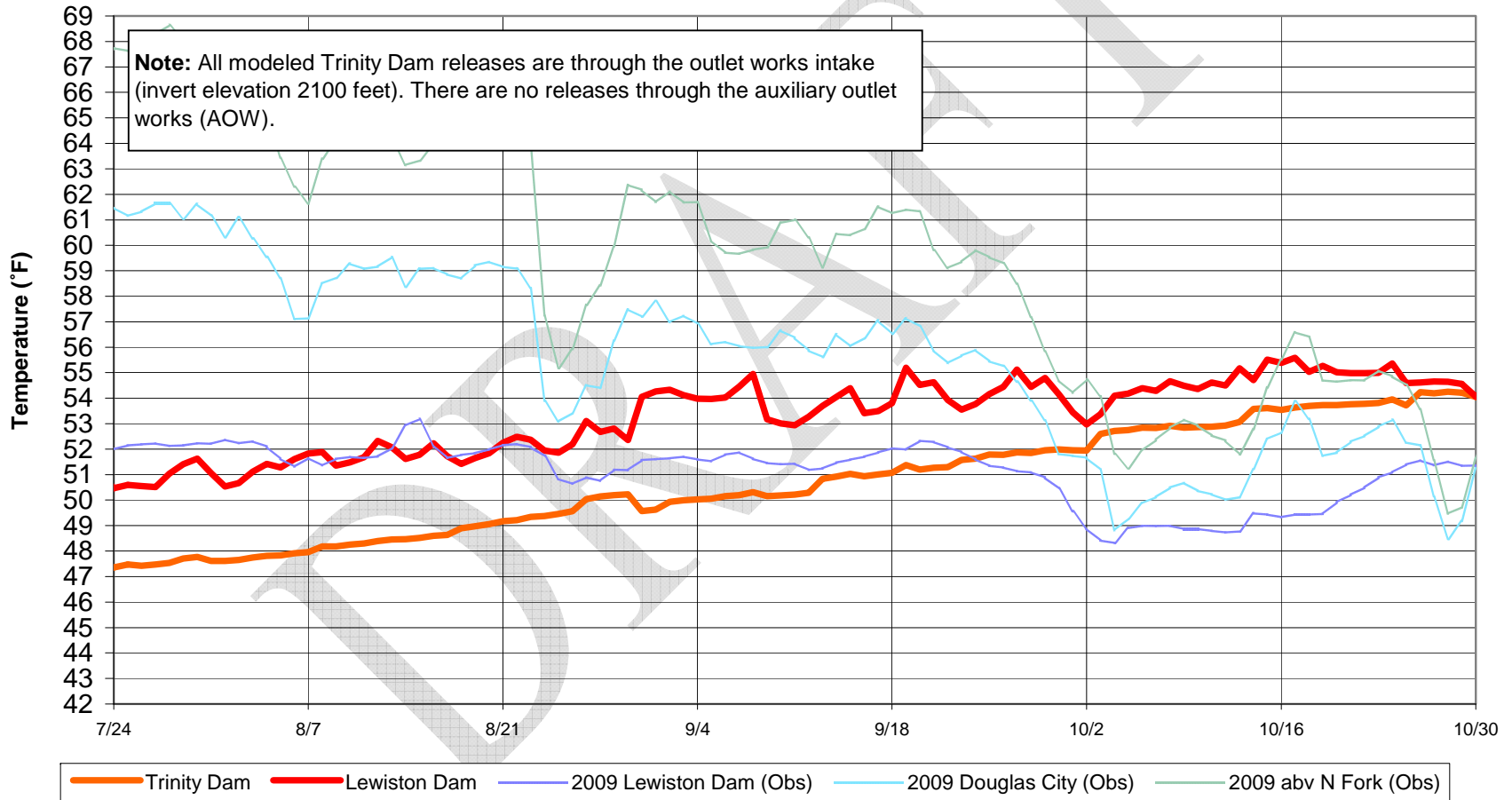


Figure 3

Sacramento River Modeled Temperature 2014 July 90%-Exceedance Outlook

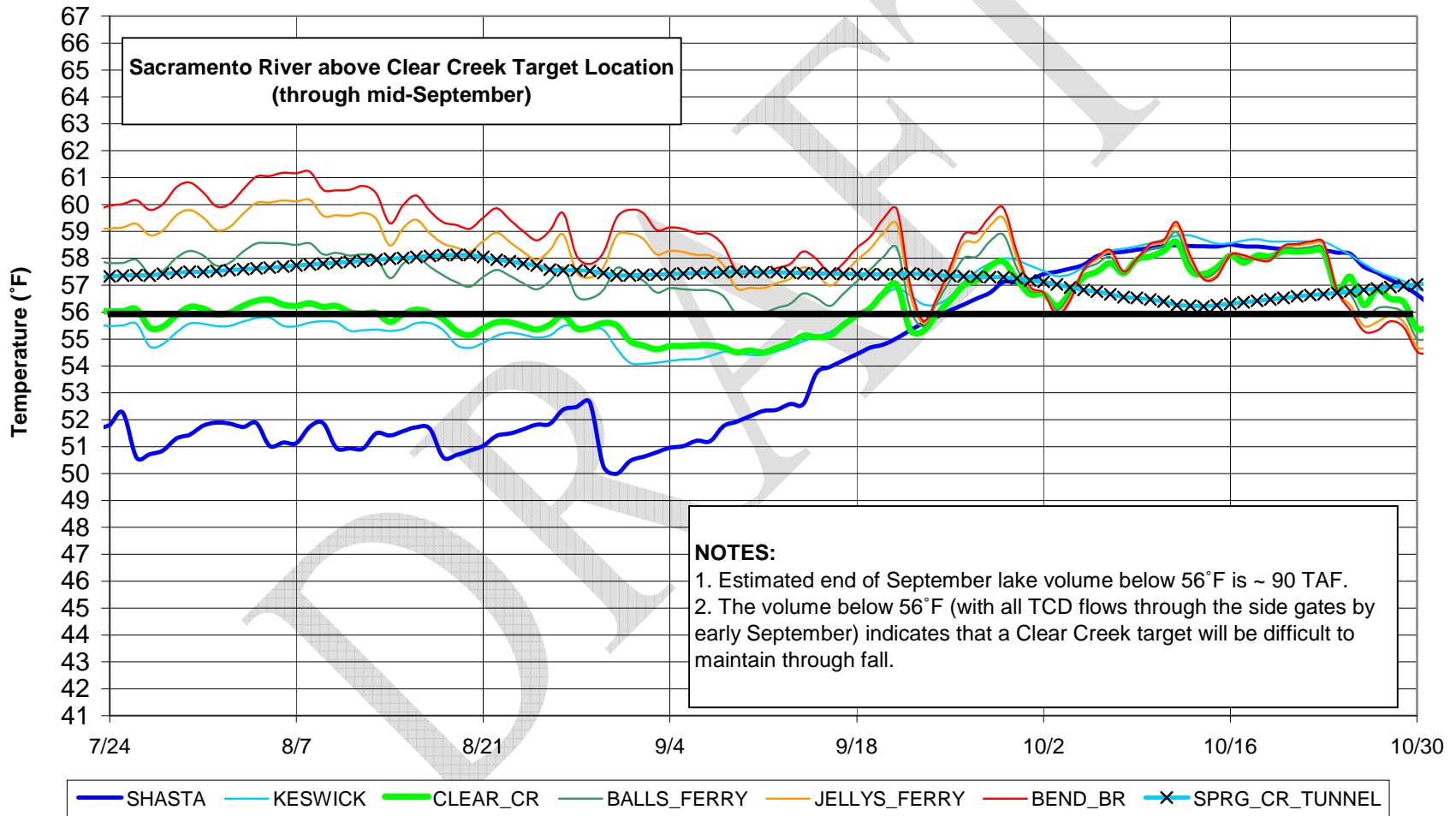


Figure 4

Clear Creek - Igo Modeled Temperature
2014 July 90%-Exceedance Outlook

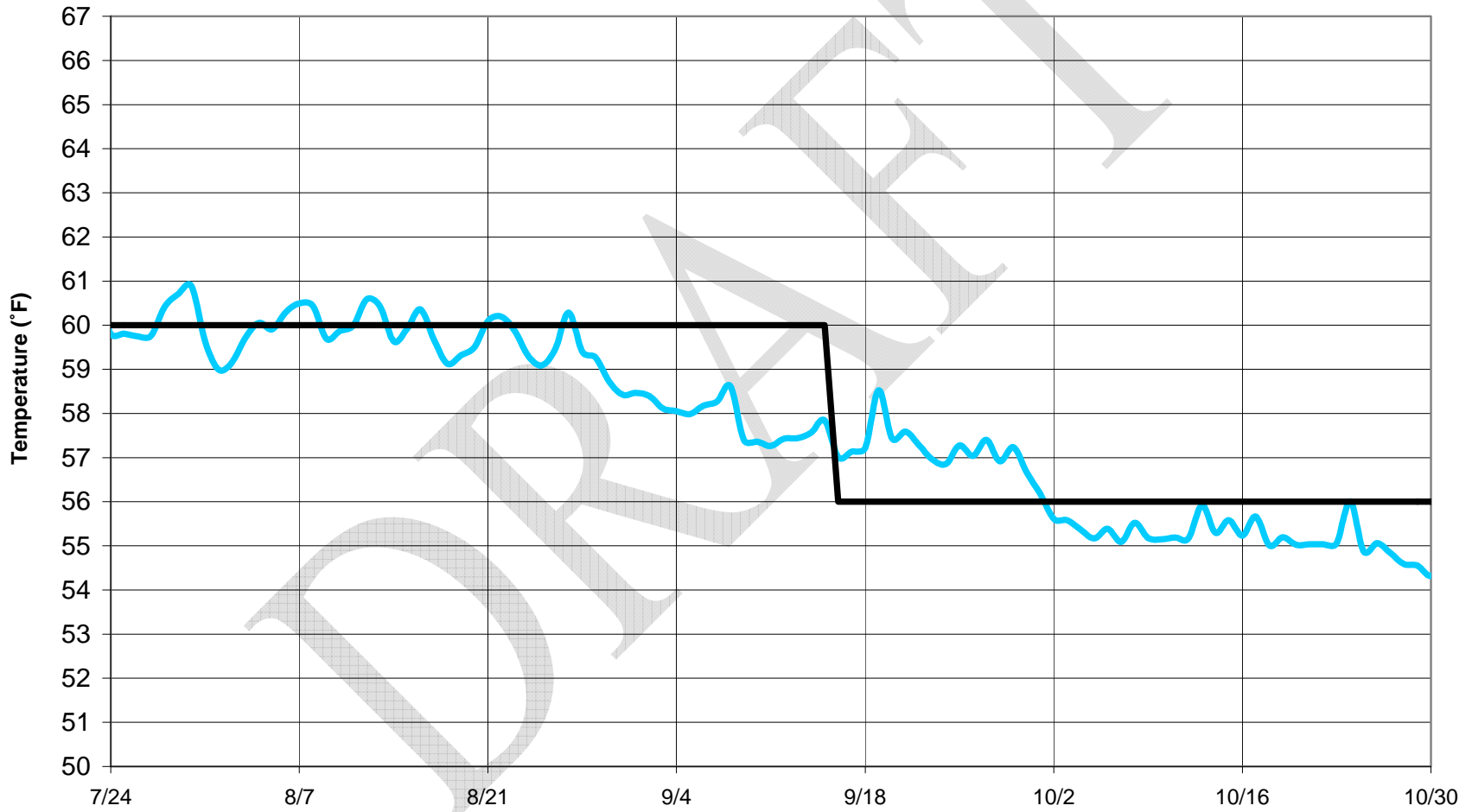


Figure 5

**Trinity River - 2014 July 90%-Exceedance Outlook
"Critically Dry Year" Release Schedule
Mean Daily Water Temperature**

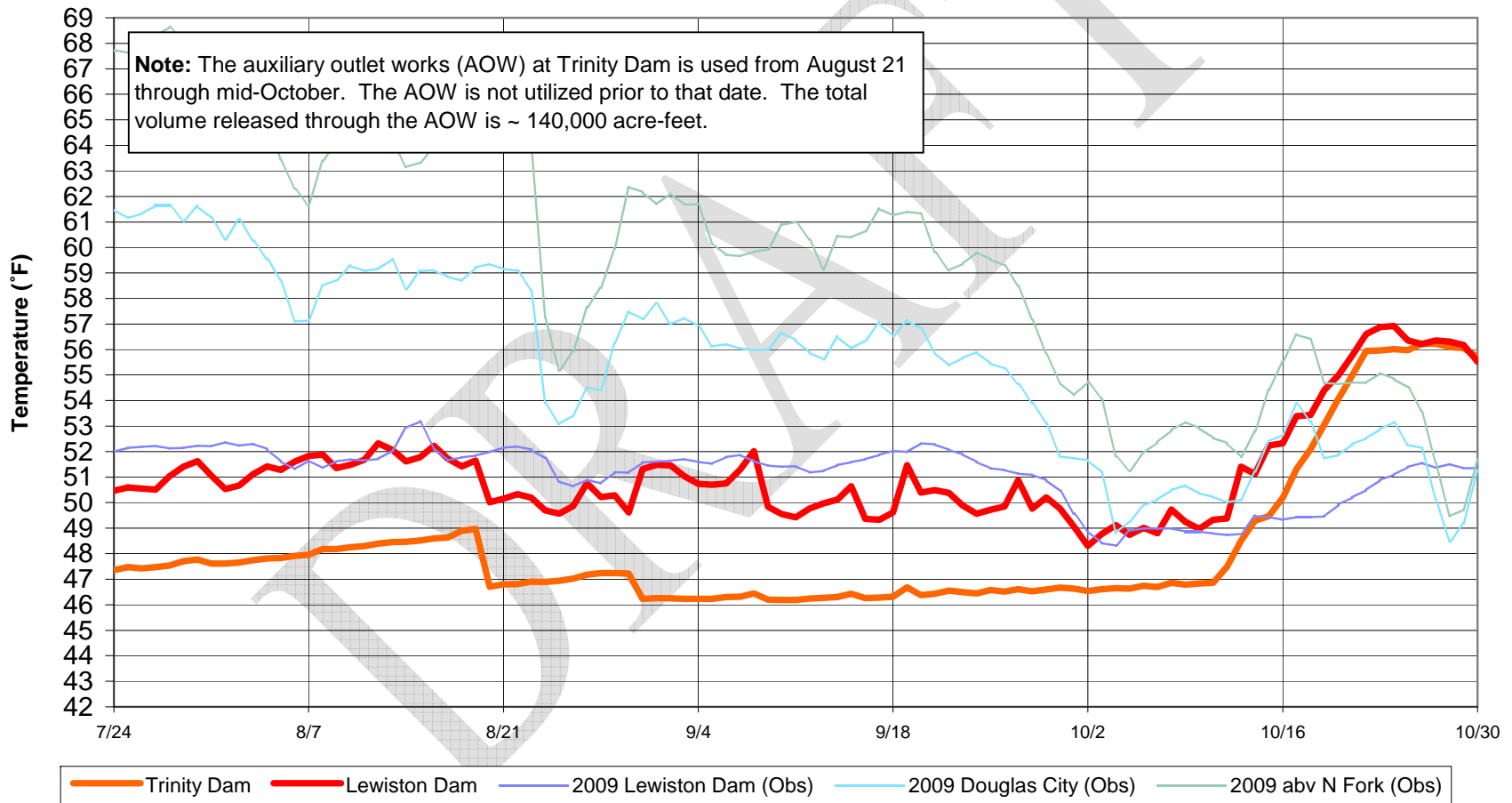
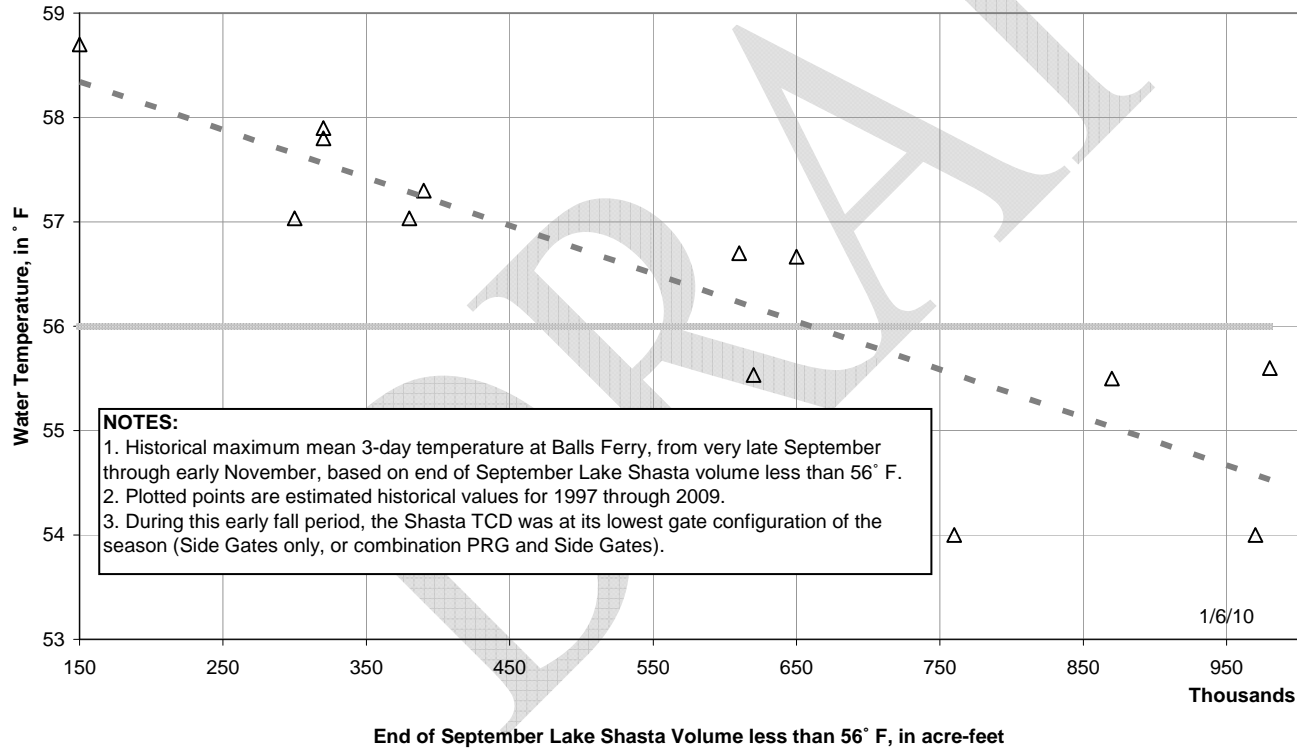


Figure 6

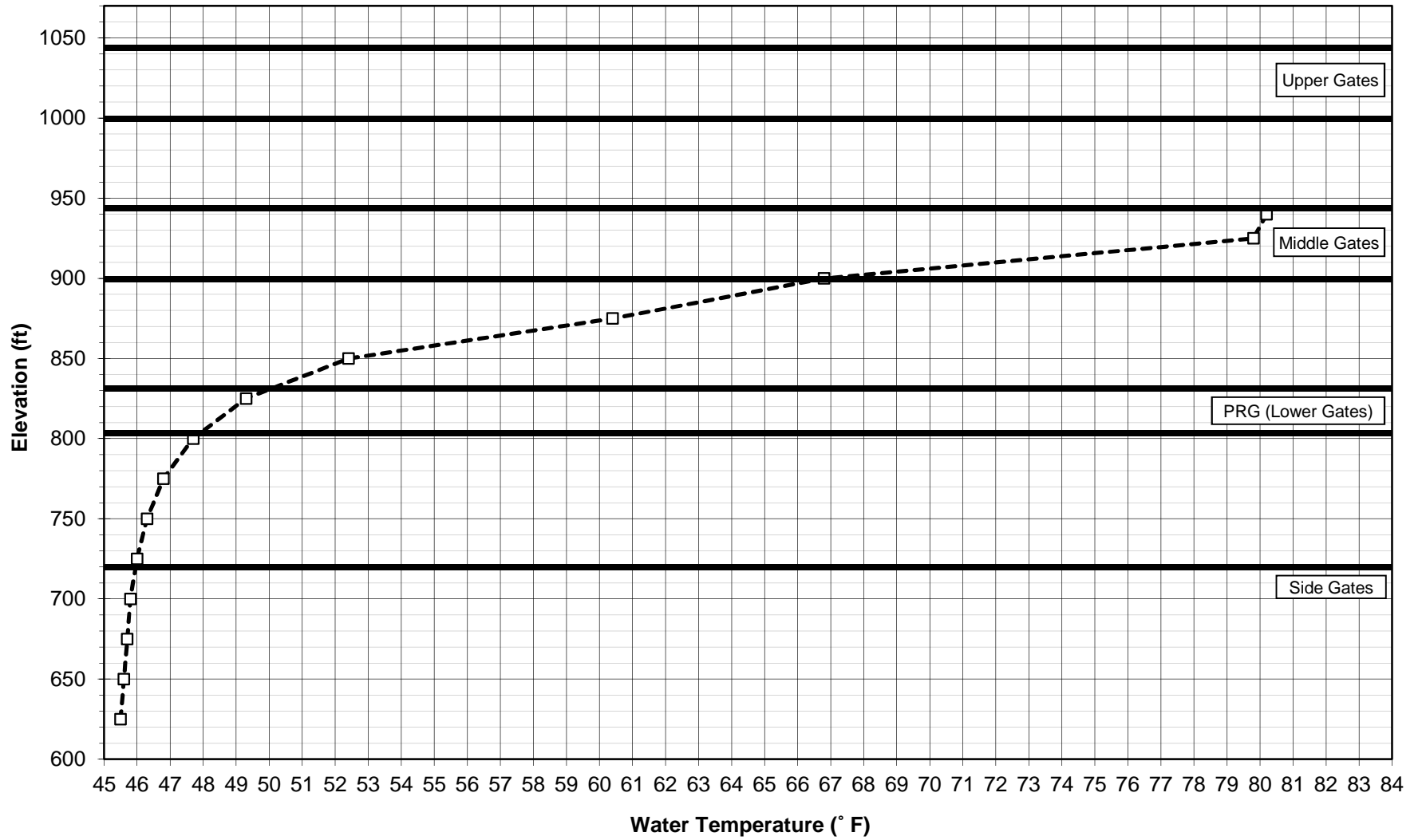
Model Performance and Fall Temperature Index:

1. Based on past analyses, the temperature model does not perform well from late September through fall. One factor is that the modeled release temperatures are cooler than has historically been achieved when all release is through the side gates (lowest gates), especially when there's a large temperature gradient between the pressure relief gates (PRG) and the side gates.
2. Based on historical records, the end-of-September Lake Shasta volume below 56°F is a reasonable indicator of fall water temperature in the river reach to Balls Ferry.
3. For river temperatures not to exceed 56°F downstream to Balls Ferry, the end-of-September lake volume less than 56°F should be greater than about 650 TAF, see figure below:

**Sacramento River - Lake Shasta
Early Fall Water Temperature at Balls Ferry**



Lake Shasta Temperature Profile - 7/16/14



Trinity Lake Temperature Profile - 7/22/14

