

Sacramento River Temperature Task Group Meeting

June 26, 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

June 90%

Storages

Federal End of the Month Storage/Elevation (TAF/Feet)

		Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Trinity		1196	1061	874	717	652	590	554	540	529	566	633	628
	Elev.	2262	2240	2220	2210	2200	2194	2192	2190	2196	2207	2207	2206
Whiskeytown		237	238	238	238	230	230	225	206	206	182	182	218
	Elev.	1209	1209	1209	1207	1207	1205	1199	1199	1190	1190	1203	1209
Shasta		2177	1805	1437	1150	985	899	889	895	1033	1256	1582	1793
	Elev.	946	921	899	884	876	875	875	888	907	931	945	937
Folsom		548	473	412	351	295	255	221	195	210	270	394	535
	Elev.	413	405	396	386	379	372	366	369	382	402	421	429
New Melones		799	706	593	492	408	379	378	379	384	396	407	385
	Elev.	897	877	856	837	829	829	830	831	834	836	831	819
San Luis		510	368	208	102	60	63	96	230	365	461	515	480
	Elev.	404	370	336	342	359	390	427	461	480	493	489	477
Total		4651	3763	3049	2631	2416	2362	2445	2727	3130	3713	4044	3828

State End of the Month Reservoir Storage (TAF)

Oroville		1734	1502	1283	1109	1053	958	969	989	1068	1223	1452	1666
	Elev.	731	704	680	672	658	659	663	674	696	725	749	743
San Luis		338	190	95	18	89	175	350	523	715	825	914	901
Total San Luis (TAF)		848	558	304	120	149	238	446	754	1080	1286	1430	1381

Monthly River Releases (TAF/cfs)

Trinity	TAF	47	28	28	27	23	18	18	18	17	18	36	92
	cfs	783	450	450	450	373	300	300	300	300	300	600	1,498
Clear Creek	TAF	9	7	7	9	12	12	12	12	11	12	11	12
	cfs	150	120	120	150	200	200	200	200	200	200	190	190
Sacramento	TAF	565	621	507	298	283	208	200	200	180	200	303	489
	cfs	9500	10100	8250	5007	4600	3500	3250	3250	3250	3250	5087	7955
American	TAF	119	100	101	85	49	47	49	49	44	49	59	109
	cfs	2000	1624	1637	1430	792	794	800	800	800	800	1000	1771
Stanislaus	TAF	21	30	16	14	35	12	12	13	12	16	34	33
	cfs	350	480	267	240	577	200	200	213	214	268	563	531
Feather	TAF	125	108	89	74	58	48	49	49	44	49	48	74
	cfs	2100	1750	1450	1250	950	800	800	800	800	800	800	1200

Trinity Diversions (TAF)

	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Carr PP	97	160	129	36	42	24	7	25	1	1	102	60
Spring Crk. PP	89	152	120	34	30	19	17	20	25	8	69	35

Delta Summary (TAF)

	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Tracy	10	45	45	45	110	59	160	160	109	125	45	25
USBR Banks	28	0	0	0	0	0	0	0	0	0	0	0
Contra Costa	6.4	4.9	5.6	6.4	7	8.4	9.2	9.2	7	7	6.4	6.4
Total USBR	44	50	51	51	117	67	169	169	116	132	51	31
State Export	20	18	27	117	135	211	216	220	153	126	45	18
Total Export	64	68	78	168	252	278	385	389	269	258	96	49
COA Balance	-260	-276	-280	-181	-138	-13	-13	-13	-13	-13	-13	-26

Old/Middle River Std.												
Old/Middle R. calc.	-1,175	-1,137	-1,369	-2,563	-2,967	-3,634	-4,864	-4,908	-3,657	-3,408	-1,181	-824

Computed DOI	4236	3091	2993	3009	2993	3496	4652	6149	7096	7564	11363	4002
Excess Outflow	0	0	0	0	0	0	1155	1643	0	455	5480	0
% Export/Inflow	12%	12%	15%	33%	47%	52%	57%	53%	42%	35%	11%	11%
% Export/Inflow std.	35%	65%	65%	65%	65%	65%	65%	65%	45%	35%	35%	35%

Hydrology

	Trinity	Shasta	Folsom	New Melones
Water Year Inflow (TAF)	368	2,559	942	313
Year to Date + Forecasted % of mean	30%	46%	35%	30%

CVP actual operations do not follow any forecasted operation or outlook; actual operations are based on real-time conditions.

CVP operational forecasts or outlooks represent general system-wide dynamics and do not necessarily address specific watershed/tributary details.

CVP releases or export values represent monthly averages.

CVP Operations are updated monthly as new hydrology information is made available December through May.

Temperature and Release Summary for Shasta and Trinity - June 2014

(Updated twice a week November through April)

Day	Sacramento River Water Temperatures in Degrees F Collected from CDEC (California Data Exchange Center)												Mean Daily Release in CFS			Mean Daily Air Temp Degrees F			
	TCD Wt. Avg.	SHD minus TCD (Diff)	Shd	Spp	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
May	52.8		52.0	51.5	53.0	55.7	57.6	58.2	60.1	50.9	54.3	53.8	6,867	197	6,839	69.6	67.7	69.7	60.6
Jun																			
1	55.6	(1.6)	54.0	51.9	54.9	56.8	58.9	59.4	61.6	51.3	56.2	54.9	7,767	699	8,494	75.0	71.0	72.6	67.5
2	54.6	(1.3)	53.3	51.9	55.4	57.1	59.3	59.8	62.3	51.3	56.6	55.0	7,819	793	8,467	74.5	72.0	74.2	67.9
3	54.8	(1.8)	53.0	51.9	54.8	57.3	59.5	60.1	62.4	51.4	56.4	55.0	7,571	698	8,217	73.5	71.6	71.6	67.7
4	55.1	(2.4)	52.7	52.0	54.6	56.6	59.1	59.7	62.5	51.1	56.0	55.2	7,012	890	8,245	78.0	76.5	78.3	69.3
5	55.0	(2.3)	52.7	52.0	54.6	56.8	59.4	60.0	62.7	51.6	56.1	55.4	7,401	1,245	8,244	81.5	79.7	79.1	72.0
6	54.4	(2.4)	52.0	52.2	55.0	57.1	59.8	60.4	63.4	51.4	56.5	55.6	7,105	1,423	8,254	84.0	81.8	81.5	72.9
7	53.7	(1.7)	52.0	52.6	54.5	57.2	60.0	60.7	63.5	51.2	56.3	55.8	7,056	1,543	8,200	84.5	82.5	86.0	74.4
8	54.0	(2.3)	51.7	52.8	54.1	57.0	59.6	60.4	63.4	51.3	55.8	56.0	6,764	1,293	8,188	90.5	86.0	88.6	73.4
9	53.7	(1.8)	51.9	52.7	53.9	56.7	59.4	60.0	63.1	51.6	55.7	56.1	6,914	1,299	8,184	92.5	83.4	84.2	73.5
10	54.5	(2.6)	51.9	52.9	54.1	56.6	59.2	59.9	62.9	51.8	55.7	56.2	5,646	1,451	8,186	90.5	87.0	89.2	73.4
11	54.3	(2.3)	52.0	52.8	53.9	56.6	59.3	59.8	62.9	51.7	55.6	56.1	7,654	950	8,162	82.5	77.0	76.3	70.0
12	54.3	(2.5)	51.8	53.4	54.1	56.6	58.9	59.5	62.8	51.5	55.6	56.0	7,160	1,530	8,582	74.0	71.7	70.3	64.6
13	55.5	(2.5)	53.0	53.9	53.9	56.5	58.3	58.8	61.5	51.8	55.5	55.7	7,887	1,543	8,563	70.5	70.5	73.2	62.0
14	55.0	(2.4)	52.6	53.8	54.9	56.4	57.7	58.2	60.7	51.6	55.4	55.3	7,325	1,567	8,589	76.5	74.5	74.1	63.2
15	54.9	(2.6)	52.3	54.0	54.5	56.8	58.5	58.8	60.8	51.5	56.0	56.0	6,964	1,589	8,624	75.5	72.5	73.9	64.1
16	54.0	(2.1)	51.9	54.3	54.4	56.7	58.5	58.9	61.5	51.7	55.7	56.0	7,473	1,476	8,628	69.5	69.0	70.3	61.5
17	54.6	(2.5)	52.1	54.7	54.3	56.5	58.2	58.6	60.8	52.1	55.7	55.9	7,350	1,394	8,656	72.0	71.3	71.8	60.1
18	54.3	(2.4)	51.9	54.5	53.9	56.3	58.0	58.5	61.5	51.8	55.2	56.2	7,557	1,375	9,165	77.0	74.1	75.4	64.0
19	53.8	(2.1)	51.7	54.7	54.0	56.4	58.1	58.5	61.5	51.9	55.4	56.4	7,503	1,374	9,150	77.0	73.2	74.9	68.7
20	54.7	(2.0)	52.7	54.9	53.8	56.4	58.0	58.5	61.8	52.3	55.2	55.1	8,526	1,256	10,256	76.5	75.9	77.4	68.8
21	54.9	(2.1)	52.8	54.9	54.5	56.2	57.9	58.2	61.4	52.5	55.8	53.5	9,192	977	9,933	77.5	75.8	77.5	68.1
22	55.3	(1.7)	53.6	55.1	54.6	56.5	58.3	58.6	61.6	52.8	55.8	53.7	9,190	980	9,839	79.0	77.5	76.5	70.3
23	55.1	(2.4)	52.7	55.3	55.4	56.8	58.8	59.0	61.7	53.4	56.6	54.1	8,969	961	9,873	79.5	77.3	76.6	71.3
24	55.6	(2.0)	53.6	55.6	54.9	57.1	59.0	59.5	62.4	53.5	56.2	54.5	9,665	988	9,925	79.5	79.4	81.1	69.9
25		0.0																	
26		0.0																	
27		0.0																	
28		0.0																	
29		0.0																	
30		0.0																	
Avg	54.7		52.5	53.5	54.5	56.7	58.8	59.3	62.1	51.8	55.9	55.4	7,645	1,221	8,776	78.8	76.3	77.3	68.3
Tot cfs													183,470	29,294	210,624				
Tot af													363,913	58,105	417,773				

= 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

June 25, 2014

Upper Sacramento River – June 2014 Preliminary Temperature Analysis

Summary of Temperature Target Results by Month

Initial Target Location	JUN	JUL	AUG	SEP	OCT
90%-Exceedance Outlook					
Sac. R. above Clear Creek (CCR)	CCR	CCR	CCR	CCR to 57.5°F	CCR~57.5°F to 59+°F

Temperature Model Inputs, Assumptions, Limitations and Uncertainty:

1. Operation is based on the June 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 June 18, June 4, and June 3, 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 is 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 storage since the TCD was constructed.

90%-Exceedance:

A temperature target location on the Sacramento River above Clear Creek is possible through mid-September (Figure 1). By early 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 analysis.)

Sacramento River Modeled Temperature 2014 June 90%-Exceedance Outlook

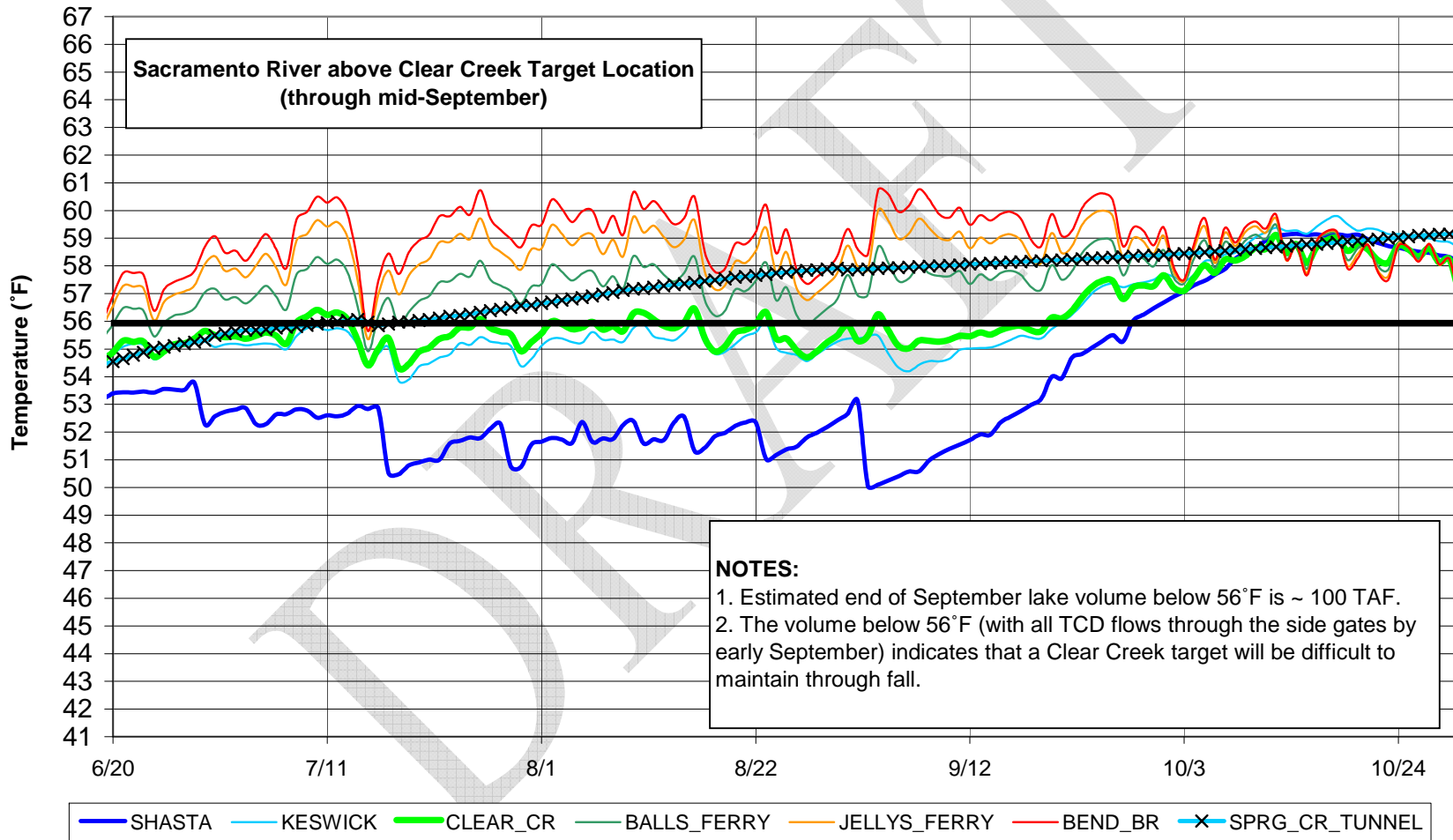


Figure 1

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

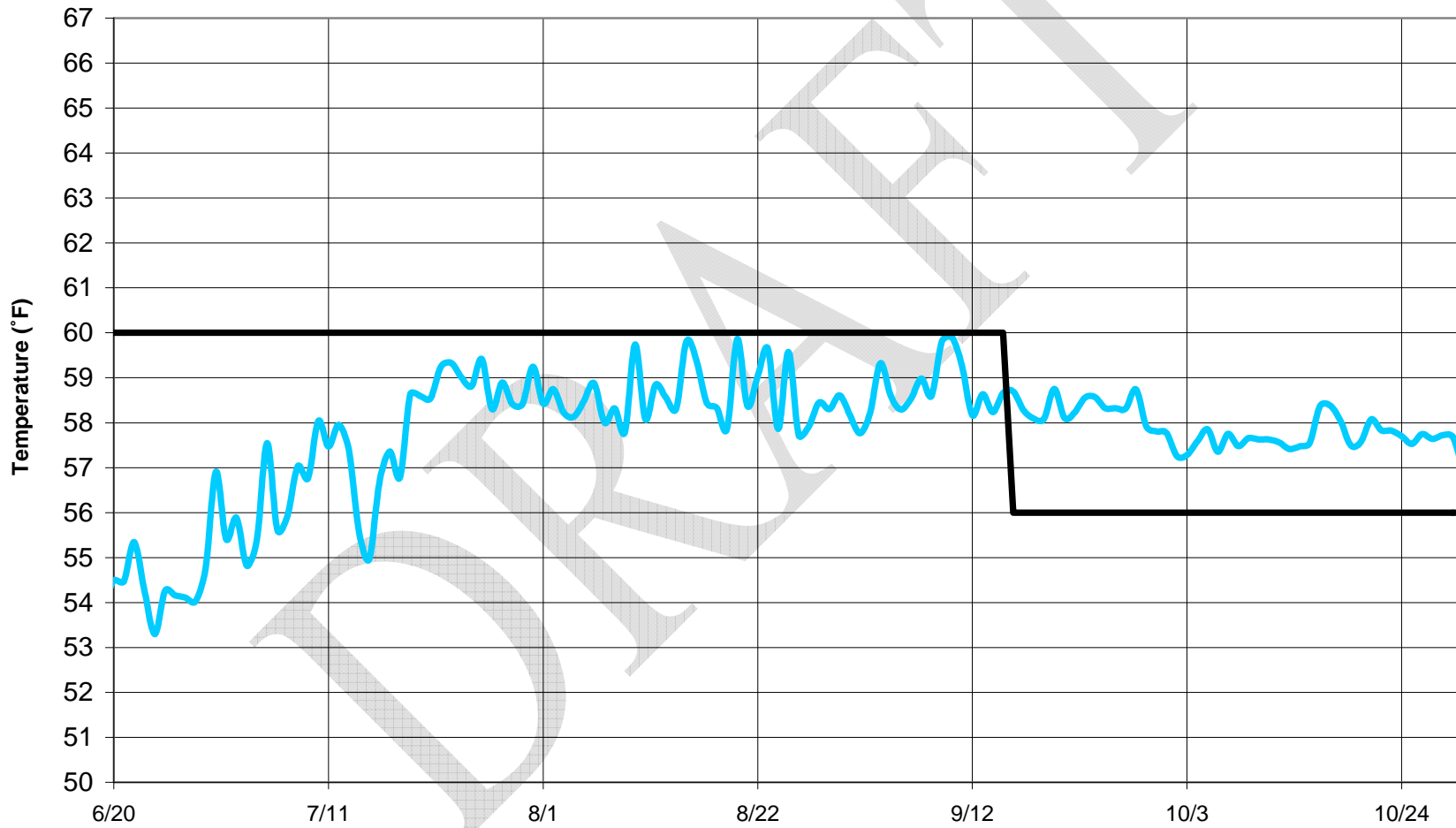


Figure 2

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

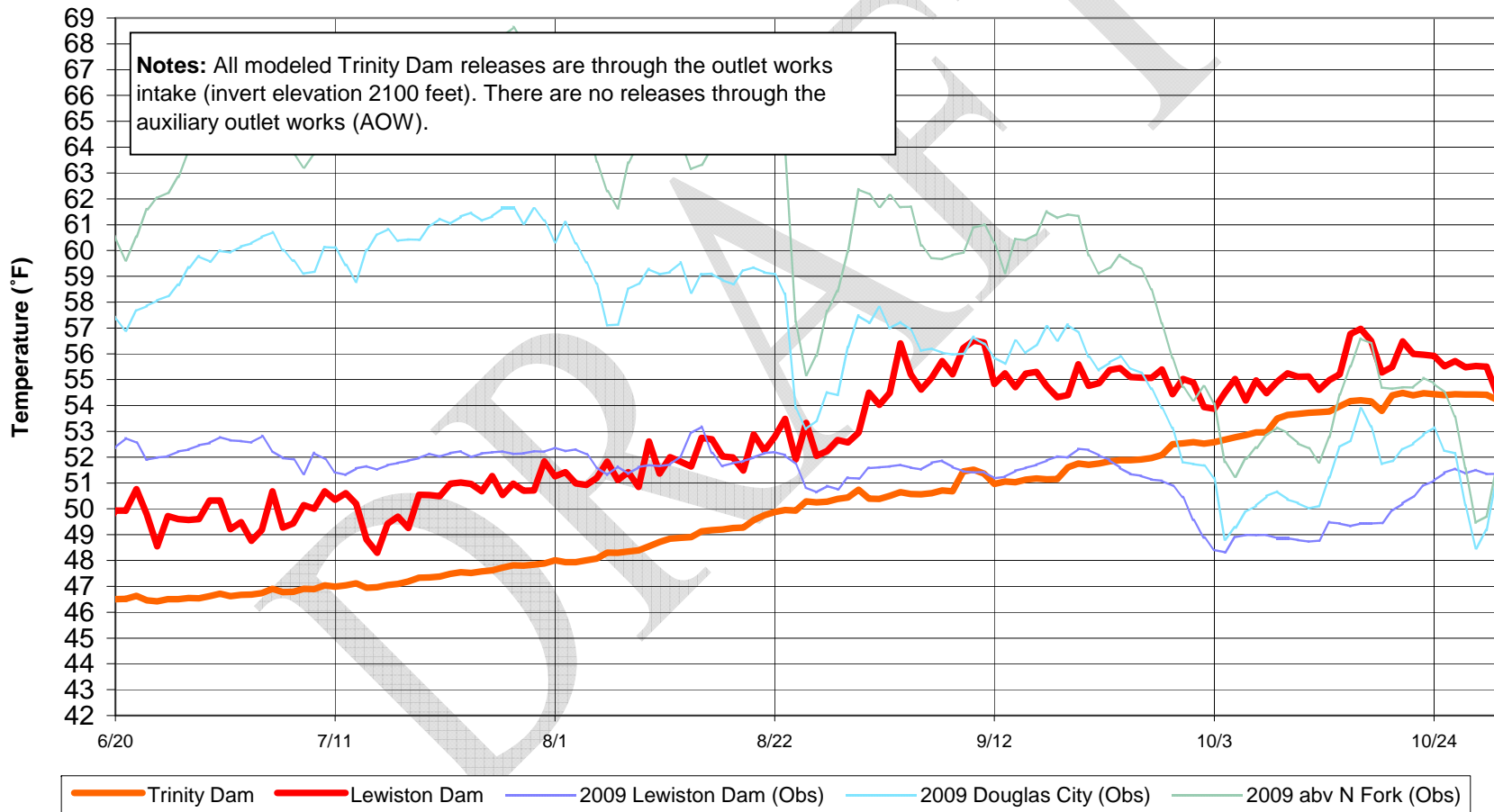
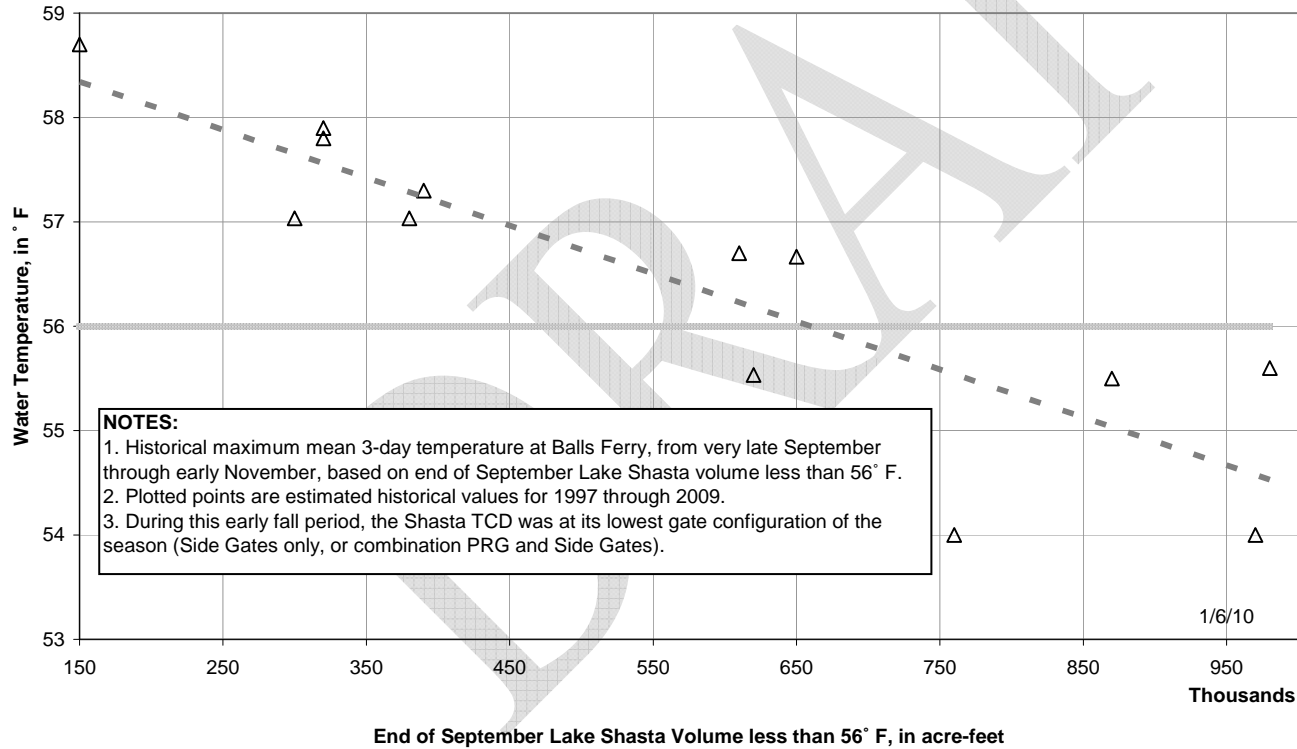


Figure 3

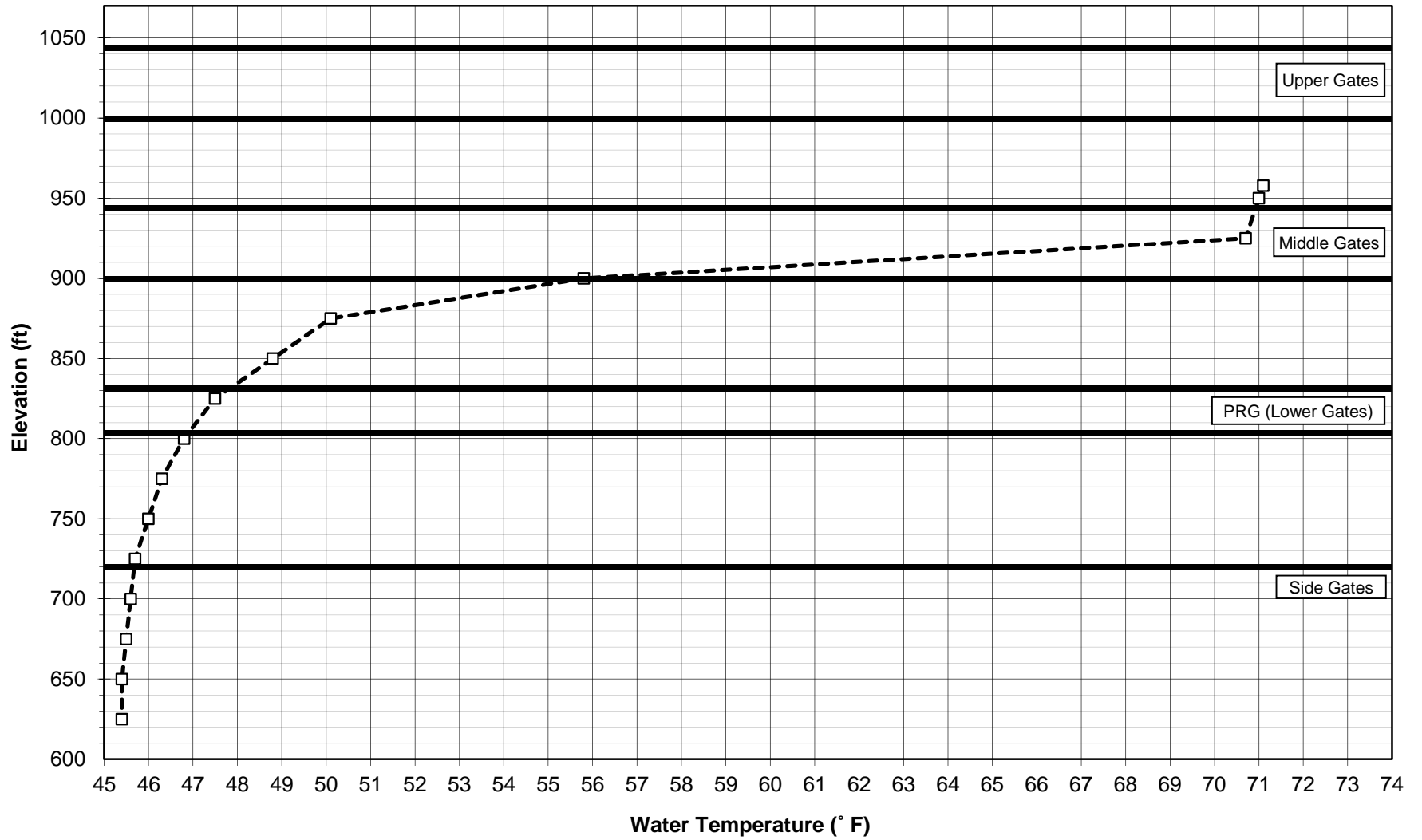
Model Performance and Fall Temperature Index:

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 - 6/18/14



Trinity Lake Temperature Profile - 6/4/14

