

# **Sacramento River Temperature Task Group Meeting**

**April 24, 2014**

**1:00 pm**

**Conference Line: 877-718-6527**

**Pass code: 1954134**

## **Agenda**

1. Introductions
2. Fishery update
3. Hydrology & Operations update
  - a. Daily CVP Water Supply Report \*\*\*
  - b. 90% and 50% forecasts \*\*\*
4. Discussion of recent temperature model runs
  - a. Temperature studies packet \*\*\*
5. Next meeting

\*\*\*handouts

UNITED STATES DEPARTMENT OF THE INTERIOR  
U.S. BUREAU OF RECLAMATION-CENTRAL VALLEY PROJECT-CALIFORNIA

**DAILY CVP WATER SUPPLY REPORT**

APRIL 23, 2014

RUN DATE: April 24, 2014

RESERVOIR RELEASES IN CUBIC FEET/SECOND

RESERVOIR	DAM	WY 2013	WY 2014	15 YR MEDIAN
TRINITY	LEWISTON	2,043	206	500
SACRAMENTO	KESWICK	8,044	3,488	7,015
FEATHER	OROVILLE (SWP)	2,500	800	2,300
AMERICAN	NIMBUS	1,111	1,531	2,006
STANISLAUS	GOODWIN	3,011	2,524	1,480
SAN JOAQUIN	FRIANT	1,062	167	211

STORAGE IN MAJOR RESERVOIRS IN THOUSANDS OF ACRE-FEET

RESERVOIR	CAPACITY	15 YR AVG	WY 2013	WY 2014	% OF 15 YR AVG
TRINITY	2,448	1,947	2,148	1,297	67
SHASTA	4,552	3,868	3,871	2,405	62
OROVILLE (SWP)	3,538	2,658	3,111	1,864	70
FOLSOM	977	706	673	532	75
NEW MELONES	2,420	1,639	1,509	961	59
FED. SAN LUIS	966	812	716	559	69
MILLERTON	520	379	322	203	54
TOT. N. CVP	11,360	8,972	8,917	5,754	64

ACCUMULATED INFLOW FOR WATER YEAR TO DATE IN THOUSANDS OF ACRE-FEET

RESERVOIR	CURRENT WY 2014	DRIEST WY 1977	WETTEST WY 1983	15 YR AVG	% OF 15 YR AVG
TRINITY	299	106	1,422	727	41
SHASTA	1,861	1,550	7,856	3,632	51
FOLSOM	588	222	3,988	1,409	42
NEW MELONES	208	0	1,261	486	43
MILLERTON	109	117	1,857	563	19

ACCUMULATED PRECIPITATION FOR WATER YEAR TO DATE IN INCHES

RESERVOIR	CURRENT WY 2014	DRIEST WY 1977	WETTEST WY 1983	AVG (N YRS)	% OF AVG	LAST 24 HRS
TRINITY AT FISH HATCHERY	16.08	9.27	51.97	28.88 ( 52 )	56	0.00
SACRAMENTO AT SHASTA DAM	28.75	11.04	104.96	56.20 ( 57 )	51	0.03
AMERICAN AT BLUE CANYON	39.03	15.64	96.24	59.05 ( 39 )	66	0.00
STANISLAUS AT NEW MELONES	13.20	0.00	42.10	24.69 ( 36 )	53	0.00
SAN JOAQUIN AT HUNTINGTON LK	13.97	11.50	75.30	37.81 ( 39 )	37	0.00

90% Exceedence Runoff

Storages

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

		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	
Trinity		1307	1288	1188	1058	875	720	656	599	570	572	577	606	654
	Elev.	2285	2275	2262	2240	2220	2211	2202	2197	2197	2198	2203	2210	
Whiskeytown		209	238	238	238	238	230	230	225	182	182	186	206	
	Elev.	1209	1209	1209	1209	1209	1207	1207	1205	1190	1190	1192	1199	
Shasta		2199	2252	2011	1693	1371	1110	953	931	970	1065	1188	1391	1716
	Elev.	971	958	938	916	895	881	879	883	891	902	917	940	
Folsom		436	527	537	467	380	330	295	270	258	259	271	329	450
	Elev.	420	421	412	400	392	386	382	379	380	382	392	410	
New Melones		1037	924	804	699	585	475	391	371	376	381	387	398	403
	Elev.	932	913	896	875	852	832	827	829	830	831	834	836	
San Luis		468	502	464	356	219	136	119	270	370	487	660	666	633
	Elev.	442	437	410	380	351	360	393	419	453	485	485	483	
Total		5730	5242	4511	3669	3009	2644	2670	2769	2947	3265	3575	4062	

State End of the Month Reservoir Storage (TAF)

Oroville		1716	1804	1619	1400	1141	947	877	788	809	824	811	966	1195
	Elev.	763	744	719	685	656	644	629	633	635	633	659	692	
San Luis		388	394	382	252	153	54	127	195	312	514	675	677	685
Total San Luis (TAF)		856	896	846	607	373	190	246	465	682	1001	1336	1344	1318

Monthly River Releases (TAF/cfs)

Trinity	TAF	36	92	47	28	28	27	23	18	18	18	17	18
	cfs	600	1,498	783	450	450	450	373	300	300	300	300	300
Clear Creek	TAF	11	12	9	7	5	9	12	12	12	12	11	12
	cfs	190	190	150	120	85	150	200	200	200	200	200	200
Sacramento	TAF	239	462	542	592	503	309	249	208	200	200	180	200
	cfs	4010	7510	9115	9631	8177	5195	4053	3500	3250	3250	3250	3250
American	TAF	42	59	108	119	85	60	62	51	51	49	44	49
	cfs	706	954	1820	1942	1377	1002	1001	863	837	800	800	800
Stanislaus	TAF	89	47	34	26	21	14	35	12	12	13	12	23
	cfs	1497	760	564	425	346	240	577	200	200	213	214	368
Feather	TAF	48	49	74	108	77	74	55	48	49	49	44	49
	cfs	800	800	1250	1750	1250	1250	900	800	800	800	800	800

Trinity Diversions (TAF)

	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Carr PP	95	40	96	160	127	36	41	24	1	9	8	21
Spring Crk. PP	69	35	89	152	120	34	30	19	36	4	5	8

Delta Summary (TAF)

	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Tracy	125	92	45	45	45	57	197	125	135	190	45	45
USBR Banks	0	0	0	0	0	0	0	0	0	0	0	0
Contra Costa	6.4	6.4	6.4	4.9	5.6	6.4	7	8.4	9.2	9.2	7	7
Total USBR	131	99	51	50	51	63	204	133	144	199	52	52
State Export	21	46	37	15	5	106	86	135	216	190	45	45
Total Export	153	145	88	65	56	169	290	268	360	389	97	97
COA Balance	-107	-169	-169	-222	-267	-198	-253	-227	-189	-189	-189	-189

Old/Middle River Std.												
Old/Middle R. calc.	-1,500	-1,688	-1,261	-999	-940	-2,433	-3,443	-3,505	-4,551	-4,908	-1,272	-1,347

Computed DOI	5883	4002	3681	3091	2993	2992	2798	3496	3497	6149	10194	10281
Excess Outflow	0	0	588	0	0	0	0	0	0	1643	3098	3172
% Export/Inflow	26%	29%	17%	12%	11%	33%	51%	51%	62%	53%	14%	13%
% Export/Inflow std.	35%	35%	35%	65%	65%	65%	65%	65%	65%	65%	45%	35%

Hydrology

Water Year Inflow (TAF)	Trinity	422	Shasta	2,511	Folsom	918	New Melones	291
Year to Date + Forecasted % of mean	35%	45%	34%	28%				

**Storages**

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

		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	
Trinity		1307	1312	1241	1116	936	784	716	692	688	721	783	894	1014
	Elev.	2287	2280	2268	2248	2229	2219	2216	2215	2220	2229	2243	2257	
Whiskeytown		209	238	238	238	238	238	206	206	206	206	206	206	
	Elev.	1209	1209	1209	1209	1209	1209	1199	1199	1199	1199	1199	1199	
Shasta		2199	2288	2112	1831	1495	1249	1074	1095	1210	1399	1812	2381	3022
	Elev.	973	964	947	925	907	892	894	903	918	946	978	1009	
Folsom		436	524	576	505	414	356	324	338	368	419	509	520	585
	Elev.	420	426	417	405	396	391	394	398	406	418	419	427	
New Melones		1037	933	832	738	644	552	485	475	494	519	555	621	693
	Elev.	933	918	903	886	868	854	852	856	862	869	882	895	
San Luis		468	515	479	317	126	4	14	123	250	493	663	758	758
	Elev.	441	435	402	375	354	365	386	424	468	499	527	544	
<b>Total</b>		5811	5477	4745	3854	3183	2850	2928	3216	3757	4528	5380	6279	

**State End of the Month Reservoir Storage (TAF)**

Oroville		1716	1804	1612	1421	1160	974	885	850	963	1124	1343	1739	2138
	Elev.	763	743	721	687	660	646	640	658	682	712	757	795	
San Luis		388	369	345	222	214	203	259	294	475	665	837	1069	1277
<b>Total San Luis (TAF)</b>		856	884	824	539	340	206	273	417	725	1158	1500	1828	2036

**Monthly River Releases (TAF/cfs)**

Trinity	TAF	36	92	47	28	28	27	28	18	18	18	17	18
	cfs	600	1,498	783	450	450	450	450	300	300	300	300	300
Clear Creek	TAF	11	12	12	5	5	9	12	13	12	12	11	12
	cfs	190	190	200	85	85	150	200	225	200	200	200	200
Sacramento	TAF	297	472	565	645	521	357	246	193	200	200	194	200
	cfs	5000	7675	9500	10500	8474	6000	4000	3250	3250	3250	3500	3250
American	TAF	63	61	123	137	108	76	61	59	61	61	250	246
	cfs	1063	1000	2072	2226	1752	1275	1000	1000	1000	1000	4500	4000
Stanislaus	TAF	86	47	32	22	23	14	35	12	12	13	12	15
	cfs	1450	760	536	364	368	240	577	200	200	213	214	243
Feather	TAF	48	49	59	166	138	104	58	57	58	58	53	49
	cfs	800	800	1000	2700	2250	1750	950	950	950	950	950	800

**Trinity Diversions (TAF)**

	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Carr PP	86	32	95	157	126	43	8	17	7	3	2	10
Spring Crk. PP	69	35	89	152	120	34	30	10	10	25	35	35

**Delta Summary (TAF)**

	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Tracy	144	120	45	45	60	140	200	170	275	200	150	85
USBR Banks	0	0	0	0	0	0	0	0	0	0	0	0
Contra Costa	6.35	6.35	4.9	5.55	6.35	7	8.4	9.2	9.15	7	7	6.35
<b>Total USBR</b>	150	126	50	51	66	147	208	179	284	207	157	91
<b>State Export</b>	21	56	60	100	122	137	142	231	275	200	275	299
<b>Total Export</b>	172	182	110	151	188	284	350	410	559	407	432	390
<b>COA Balance</b>	-134	-134	-129	-113	-65	0	0	0	0	0	0	0
Old/Middle R. std.												
Old/Middle R. calc.	-1,487	-1,815	-1,416	-2,026	-2,513	-3,833	-4,148	-5,151	-6,860	-4,875	-5,001	-4,580

Computed DOI	6724	4474	4001	4002	2993	3009	3611	3648	5905	13111	21630	20058
Excess Outflow	0	472	0	0	0	0	114	151	2408	8605	10230	8654
% Export/Inflow	26%	33%	21%	23%	31%	46%	52%	61%	60%	35%	27%	24%
% Export/Inflow std.	35%	35%	35%	65%	65%	65%	65%	65%	65%	65%	35%	35%

**Hydrology**

	Trinity	Shasta	Folsom	New Melones
Water Year Inflow (TAF)	467	2,846	1,043	387
Year to Date + Forecasted % of mean	39%	51%	38%	37%

April 24, 2014

Upper Sacramento River – April 2014 Preliminary Temperature Analysis

Summary of Temperature Target Results by Month

Initial Target Location	JUN	JUL	AUG	SEP	OCT
<b>90%-Exceedance Outlook</b>					
Sac. R. above Clear Creek (CCR)	CCR	CCR	CCR	CCR	CCR~56°F to 57+°F
<b>50%-Exceedance Outlook</b>					
Sac. R. above Clear Creek (CCR)	CCR	CCR	CCR	CCR	CCR~56°F to 57+°F

**Temperature Model Inputs, Assumptions, Limitations and Uncertainty:**

1. Operation is based on the April 2014 Operation Outlooks (monthly flows, reservoir release, and end-of-month reservoir storage) for the 90% and 50% exceedances.
2. The profiles used for Shasta, Trinity and Whiskeytown were taken on April 9, April 16, and April 9, 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 for all exceedances, Lake Shasta storage 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.

Also, temperature results for both exceedances are almost identical because operations are not significantly different, especially the Lake Shasta maximum storage (end of April) which differs by only about 30 TAF.

### **90%-Exceedance:**

A temperature target location above Clear Creek is possible through September (Figure 1). By early September, the TCD intake level will be through the side gates.

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 auxiliary outlet works (AOW) in this analysis.

### **50%-Exceedance:**

A temperature target location above Clear Creek is possible through September (Figure 4). By late September, the TCD intake level will be through the side gates.

Figure 5 shows temperature results for Clear Creek at Igo.

Figure 6 includes results for the Trinity River at Lewiston Dam.

### Sacramento River Modeled Temperature 2014 April 90%-Exceedance Outlook

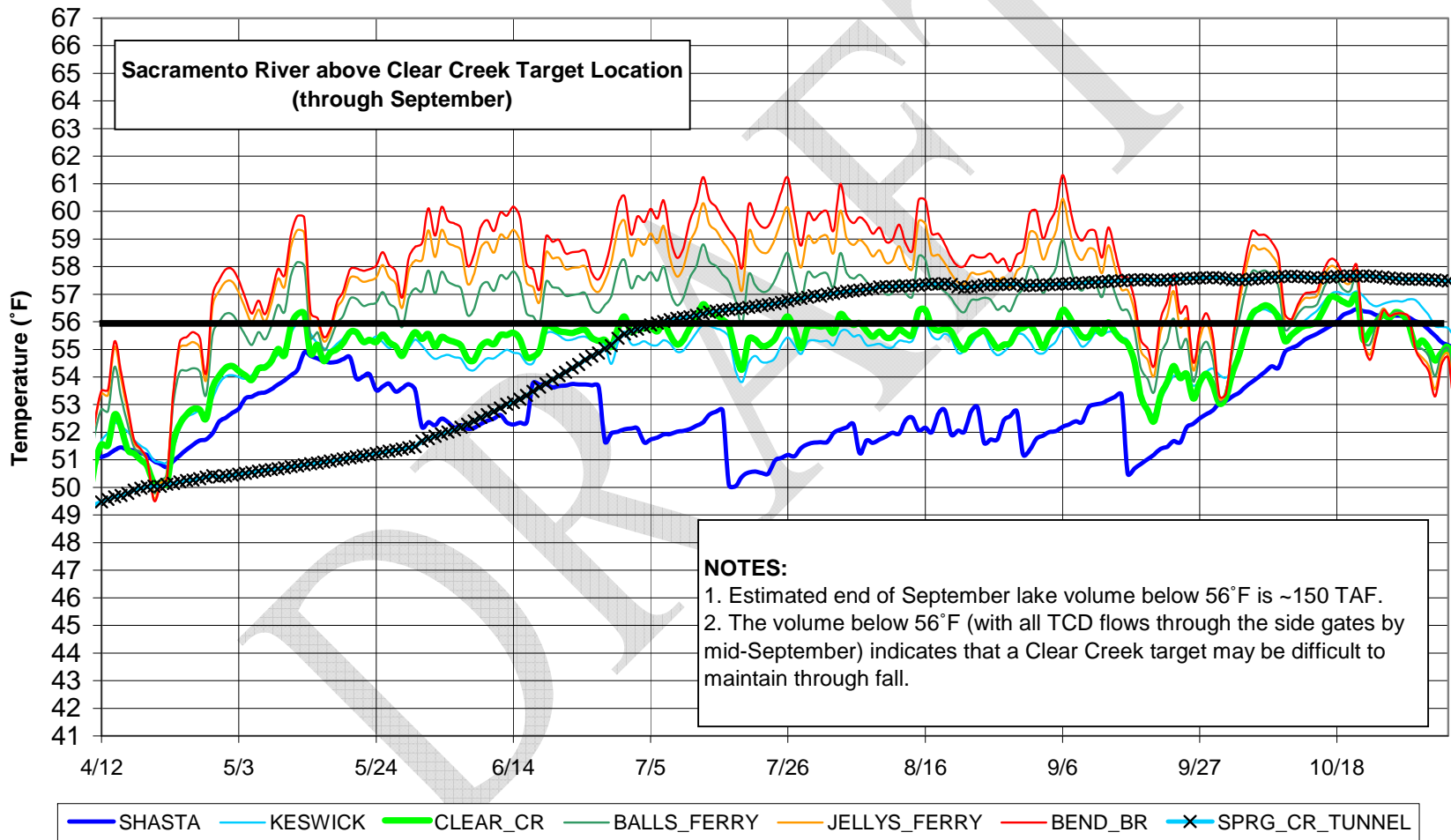


Figure 1

**Clear Creek - Igo Modeled Temperature  
2014 April 90%-Exceedance Outlook**

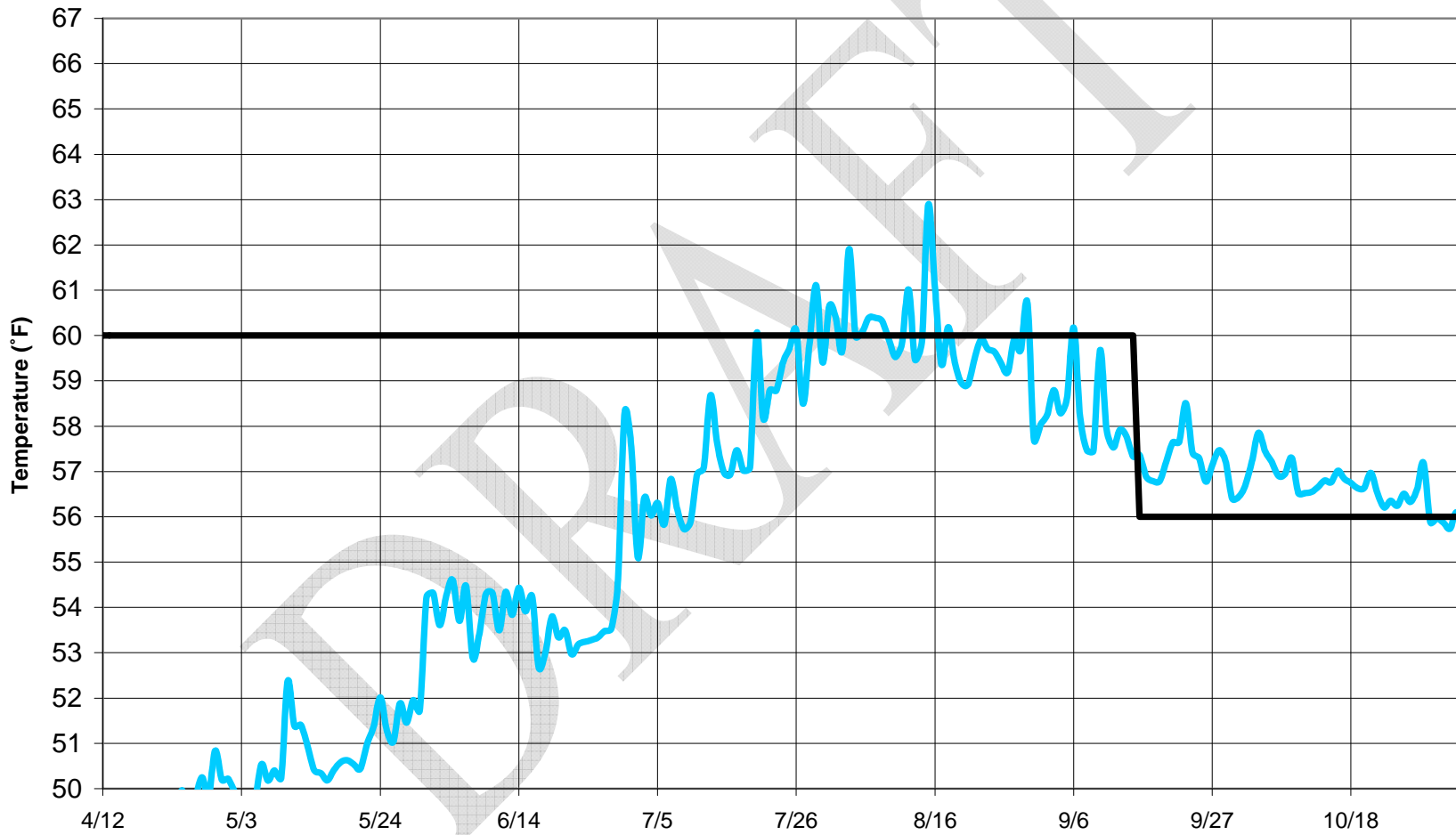


Figure 2



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

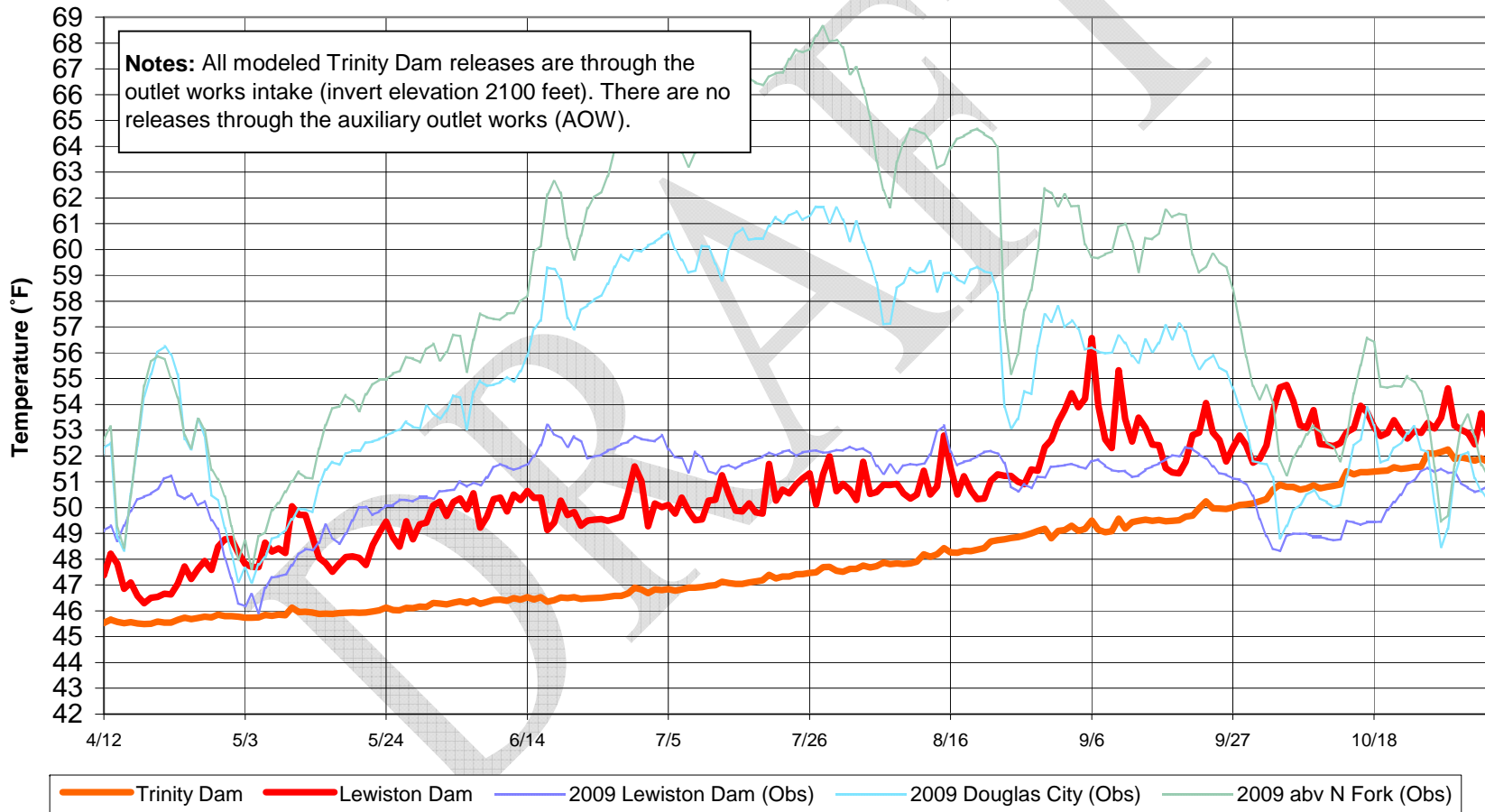


Figure 3

### Sacramento River Modeled Temperature 2014 April 50%-Exceedance Outlook

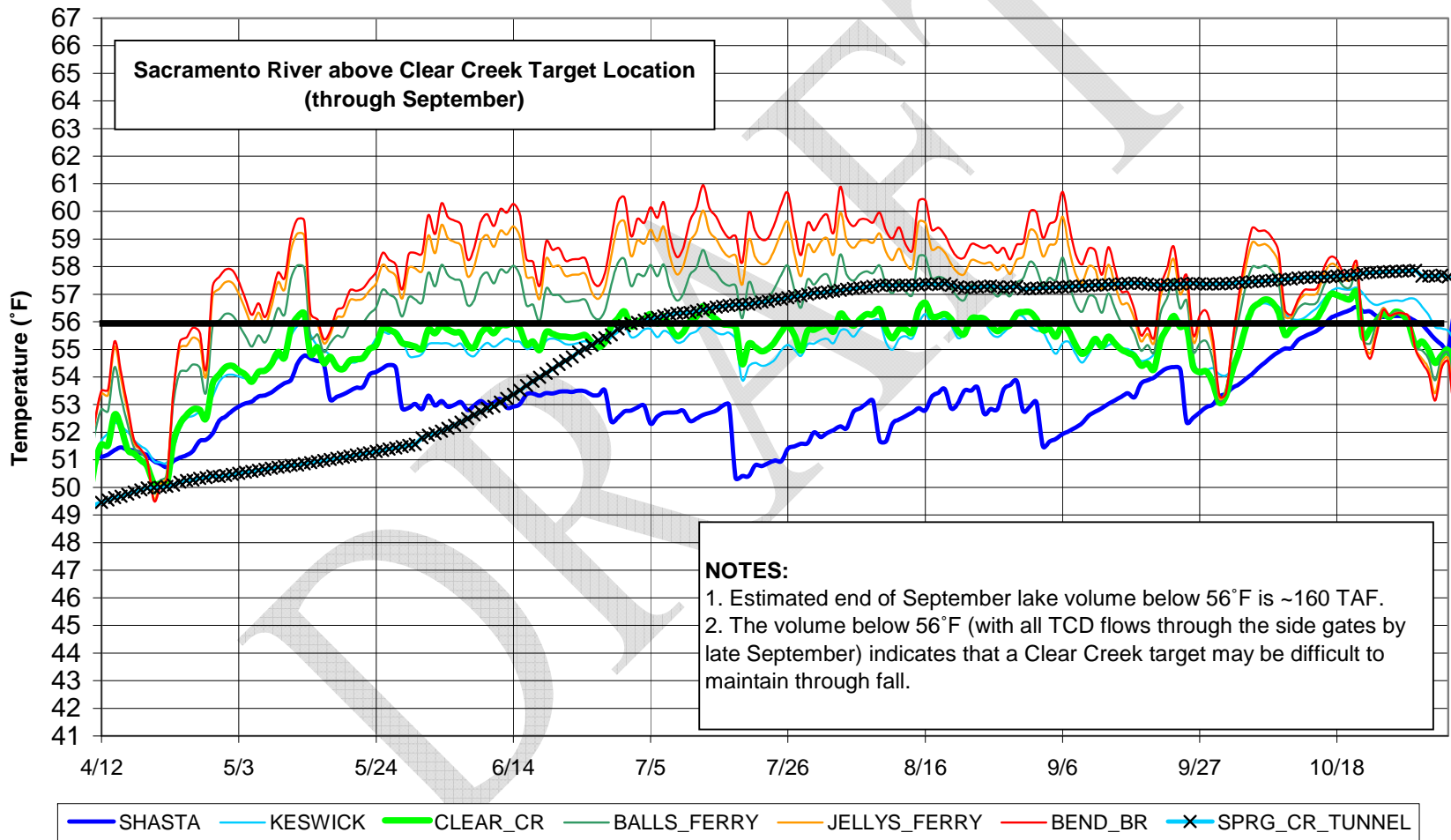


Figure 4

**Clear Creek - Igo Modeled Temperature  
2014 April 50%-Exceedance Outlook**

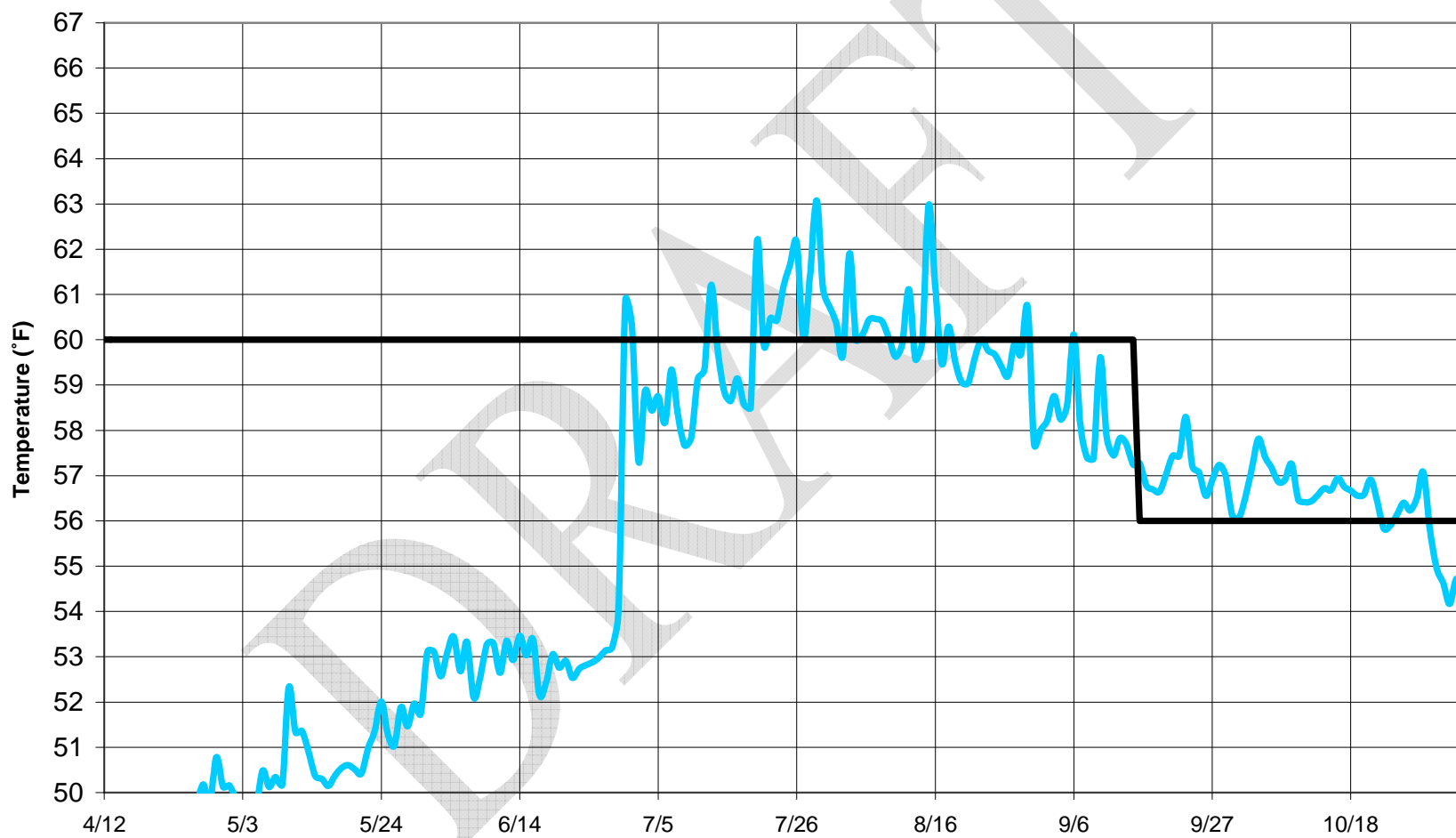


Figure 5

### Trinity River - 2014 April 50%-Exceedance Outlook "Critically Dry Year" Release Schedule Mean Daily Water Temperature

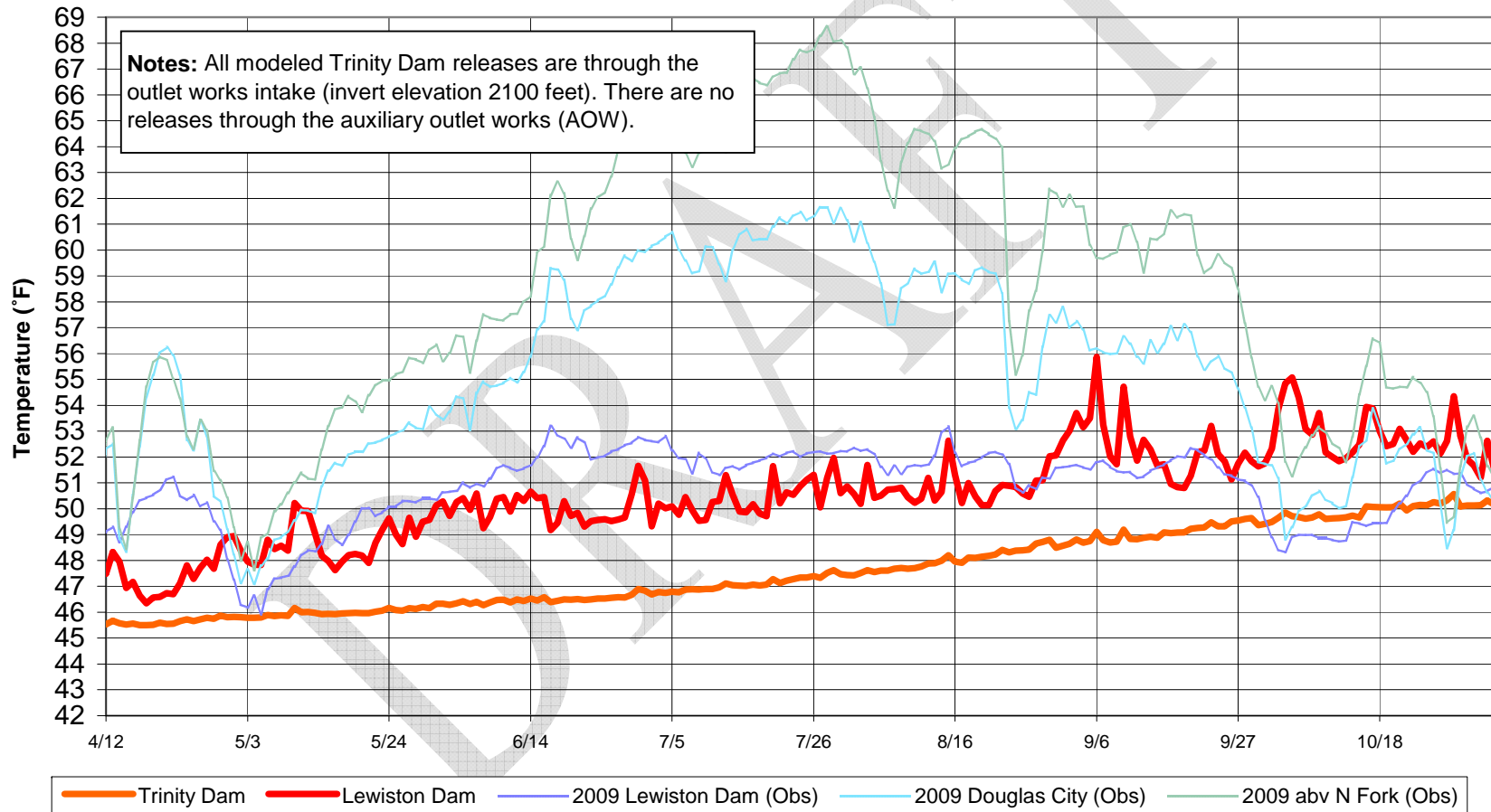
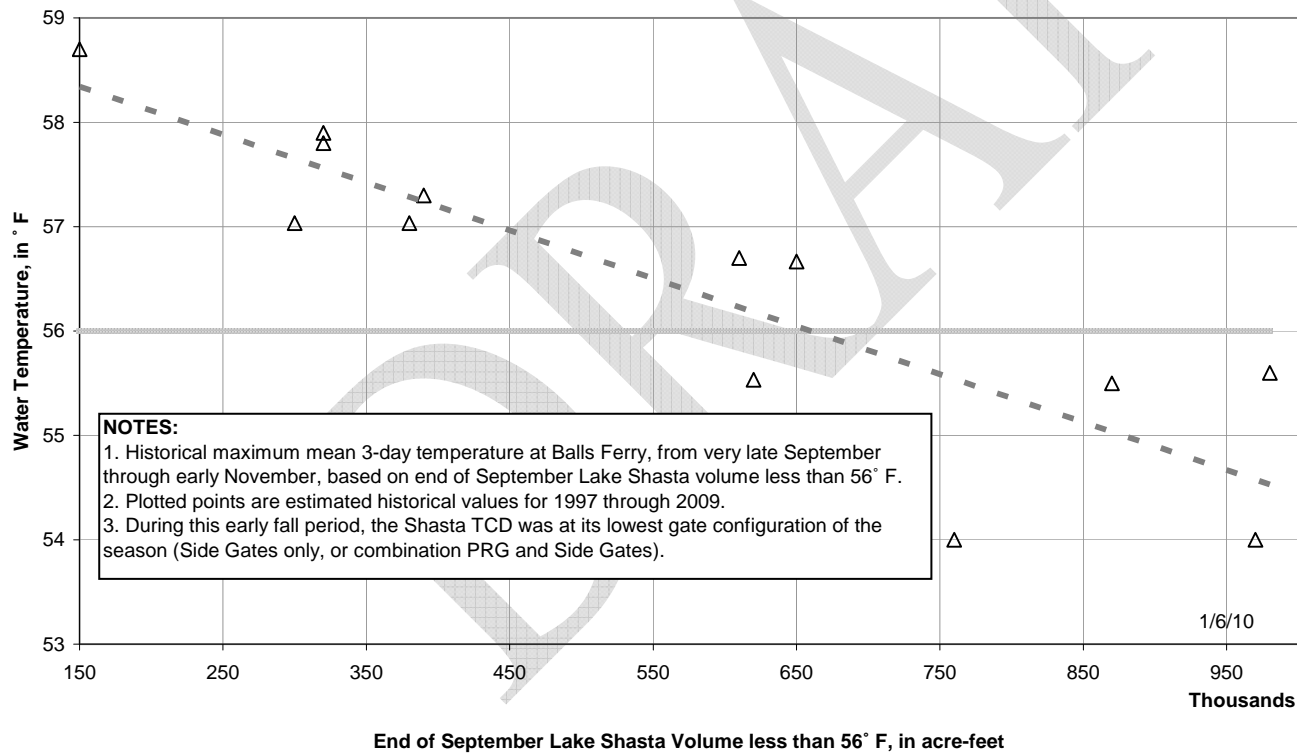


Figure 6

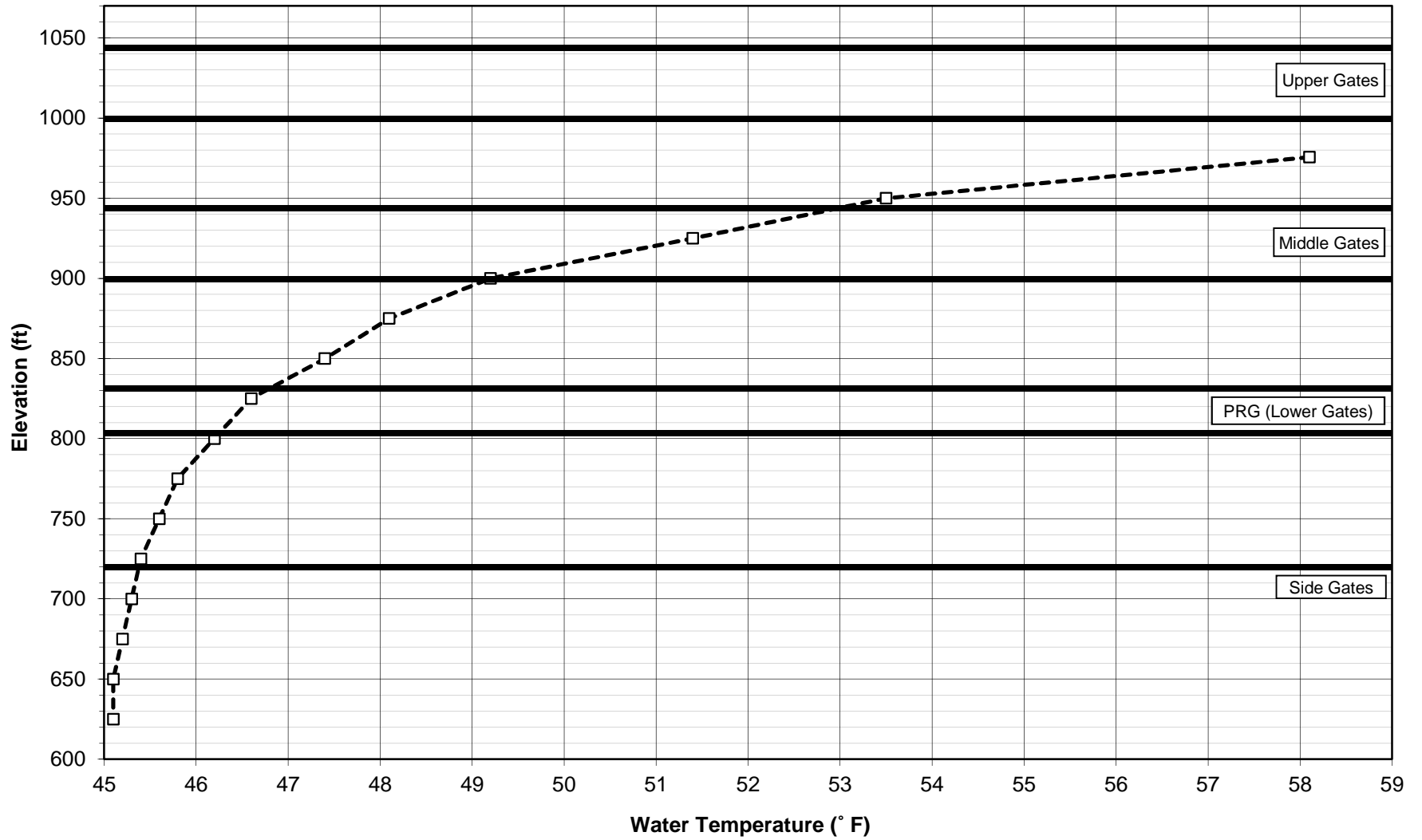
Model Performance and Fall Temperature Index:

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 - 4/9/14



Trinity Lake Temperature Profile - 4/16/14

