Sacramento River Temperature Task Group Call
Thursday, April 23, 2015 | 1 p.m. – 2 p.m.

MEETING SUMMARY

Participants:

- Craig Anderson, FWS
- Don Bader, USBR
- Mike Berry, DWR
- Kenneth Emanuel, SWRCB
- Tim Hayden, Yurok Tribe
- Bob Hughes, CDFW
- Josh Israel, USBR
- Liz Kiteck, USBR
- Dan Kratville, CDFW
- Ken Kundargi, CDFW
- Beth Lawson, CDFW
- Tom Morstein-Marx, USBR
- Andrew Pike, NMFS
- Diane Riddle, SWRCB
- Jason Roberts, CDFW
- Rich Satkowski, SWRCB
- Jim Smith, FWS
- Stacey Smith, USBR
- Brycen Swart, NMFS
- Thuy Washburn, USBR
- Rod Wittler, USBR
- Garwin Yip, NMFS

Note-taking:

- Michael Larsen, Kearns & West

Key Points

- Adult winter-run trapped at Keswick has tapered, but in line with typical seasonal patterns. Adult winter-run carcass surveys will begin next week.
- Keswick releases will ramp up over the next few days, from 5,500 cfs today to 7,000 cfs Sunday.
- Trinity pulse is ramping up to 8,500 on 5/4, then will ramp down after two days.
- A warm water bypass at Shasta has been in place since April 16th and will continue for approximately another week, raising Shasta release temperatures approximately 4°F.
- The 90%-Runoff Exceedance Outlook forecasts Shasta at approximately 1.1 MAF of storage at the end of September and Trinity at approximately 540 TAF of storage at the end of September.
- Participants are interested in a format of Exceedance Outlook report that shows more data for the entire system.
- First side gate operation is expected to begin on approximately August 13th, and side gates only operation to begin on approximately October 10th.
- The 90% exceedance forecast indicates that at the end of September there will be approximately 340 TAF of water below 56°F, which is more than last year (approximately 190 TAF).
- Participants confirmed their understanding that the temperature control point at the Clear Creek CDEC gaging station is 58°F until May 15 or when fish agencies notify Reclamation that winter-run spawning is occurring (whichever comes first).

Action Items

1. At the next SRTTG call, Eric Danner will provide a brief update about plans to install additional temperature sensors in Lake Shasta.
2. Reclamation will re-assess the exceedance report format used for the SRTTG.
3. Jim Smith will circulate the graph from 2014 showing a consistent 1.3°F temperature difference between Keswick and Clear Creek throughout the summer.

Key Discussion Topics with Summary of Outcomes and Agreements:

Meeting Summary Protocol

Michael Larsen of Kearns & West will be taking notes on SRTTG calls. Larsen polled the group for suggestions regarding the level of detail that will make the meeting summaries most useful for participants. Suggestions included:

- Document agreements, decisions, and concerns raised.
- Document action items and due dates, when possible.
- If summaries take time to produce, first circulate action items separately so they needn't wait for the rest of the summary.
- No individual attribution necessary, though sometimes attribution at the agency level will be necessary.
- A general summary is sufficient unless the topic warrants otherwise.

Fisheries Update

Jim Smith, FWS, shared a brief fisheries update with the call participants.

Adult winter-run carcass surveys will begin next Tuesday, which will be relevant to the temperature control point. Later they'll begin daily carcass surveys, and Jim expects to have more information on the next call.

The number of adults trapped at Keswick has tapered from about 40 per week to less than 15 per week. Catches typically drop off this time of year as fish begin to stage for spawning lower down the river, so it is hard to say what this particular decline says about run strength.

There continues to be an unequal sex ratio, with females far outnumbering males, so adult female hatchery fish are being taken back to the river.

Hydrology & Operations Update

Keswick is currently releasing 5,500 cfs. Over the next three days Keswick will be increased as follows: 6,000 cfs on Friday; 6,500 cfs Saturday; 7,000 cfs Sunday.

Wilkins Slough is running at 3,500 cfs.

At Trinity, the pulse has begun and is ramping up. It will reach a maximum of 8,500 cfs for two days then ramp down to 450 cfs.

In response to participant questions about the monthly average releases shown in the Outlooks, Reclamation clarified that with Keswick reaching 7,000 cfs on Sunday, the average for April will be approximately 4,200 cfs.

Summary of 4/17 Sub-group Meeting; Warm Water Bypass

Upon receiving the April updated profile, Reclamation initiated releases from Shasta's 950' outlet with the goal of drawing warmer water to conserve the cold water pool. This bypass began on April 16th at 1,500 af/day and resulted in a Shasta release temperature increase of approximately 4°F (see graph in meeting handouts). Based on this result, Reclamation convened the 4/17 sub-group call to explain the result, and received support for Reclamation to continue the warm water bypass.

Reclamation continued and increased the bypass as releases out of Keswick also increased. Reclamation increased the bypass as follows: 1,500 af/day on April 16; 2,000 af/day on April 21; 2,500 af/day on April 23; 3,000 af/day on April 25. The bypass will likely continue for approximately another week.

A meeting handout that graphs Lake Shasta isothermobaths shows that water above the middle gate is warmer, and this is the reason for releasing out of 950' outlet. This graph also shows that a month ago the temperature at the 950 outlets and the TCD middle gates were similar, so there wouldn't have been a benefit to a bypass at that time.

In response to a question, Reclamation clarified that if depicted on the graph of Lake Shasta isothermobaths, the 950' outlet would be slightly below the second bold line from the top (along the right-hand side of the graph).

In response to a question, Reclamation clarified that the most recent profile is from April 8th, and that beginning in May there will be a profile every two weeks. Fish & Wildlife Service stated that this increased frequency—and having a profile in early May—will be important to serve their needs.

A participant asked about plans to install additional temperature sensors in Lake Shasta, and there was interest in hearing an update on this topic from NMFS the next time Eric Danner is available to join the SRTTG call.

April 90% Exceedance Outlook

Reclamation provided meeting handouts that show the 90%-Runoff Exceedance Outlook. This outlook forecasts Shasta at approximately 1.1 MAF of storage at the end of September and Trinity at approximately 540 TAF of storage at the end of September. The TUCP relaxations are incorporated into these forecasts.

A participant suggested that the disclaimers on the exceedance outlook be softened to avoid the impression that operations don't at all follow the numbers in the exceedance outlook. Participants discussed the meaning of the exceedance outlook, and Reclamation emphasized that it is a forecast, not an operations plan, that operations will necessarily vary from the listed numbers if the actual hydrology is anything other than what was estimated for that Outlook, and that there are many unforeseeable factors that impact operations. Reclamation acknowledged that if hydrology falls between 50% and 90%, operations are likely to fall in the band between the 50% Exceedance Outlook and 90% Exceedance Outlook, and that the hydrology does converge (that band narrows) in the summer months. However, operational requirements (D-1641, BIOPS, etc.) do not linearly correlate with inflow hydrology.

Reports from Reclamation featured a new format for the SRTTG that focused on the northern system and provided no information about the rest of the system. Participants expressed that the new report format focused exclusively on the northern system is less helpful—having a broader set of data, including assumptions about how much water is needed for Delta concerns, helps participants in their planning. Specific requests included (at a minimum) listing Clear Creek flows and Wilkins Slough flows (which Reclamation verbally stated is targeting 3,800 cfs), and including Trinity in the 50% Exceedance Outlook. Participants additionally requested that San Joaquin River and east side assumptions be revisited when the final plan is submitted.

Reclamation said that in response to these requests, they will re-assess the report format used for the SRTTG. The more compl set of data is also distributed through the B2 group.

April Temperature Studies

Meeting handouts include the April 2015 Preliminary Temperature Analysis, targeting 56°F at Clear Creek. With this temperature run, the first side gate operation is expected to begin on approximately August th, and side gates only operation to begin on approximately October 10th. The 90% exceedance forecast indicates that at the end of September there will be approximately 340 TAF of water below 56°F, which is more than last year (which was approximately 190 TAF).

Jim Smith noted that last year there was a consistent 1.3°F temperature difference between Keswick and Clear Creek throughout the summer and expressed concern that the model does not seem to be displaying that difference in its 2015 outputs. Jim said he would circulate the graph that shows this point.

A participant asked why side gate operation is anticipated to begin in October whereas last year it began in late August, despite similar reservoir elevation. Reclamation hypothesized the differences in Keswick releases and this year's estimated end of season cold water pool account for this difference.

A participant suggested early low-flow testing of temperature blending (after stratification but before intended use of the gates) to enable more precise temperature targeting. Reclamation responded that modeling has not been able to successfully predict TCD outputs, but that operating the TCD to hit a temperature target is fairly easy to implement in practice through experimentation and minor

adjustments. Participants expressed an interest in more advanced modeling to avoid future instances of the TCD not producing the expected results, as occurred last year due to record low water elevations.

A group of modelers led by NMFS is merging the reservoir model with the downstream temperature model, and preliminary results should be available within a few months. It was suggested that the team leading this project meet with potential users of the model, including biologists and others in the SRTTG, to help ensure that the model best serves the needs of its users.

Participants confirmed their understanding that the temperature control point at Clear Creek is 58°F until May 15 or when fish agencies notify Reclamation that winter-run spawning is occurring (whichever comes first). This measure is intended to conserve the cold water pool.

A participant asked why the Clear Creek modeled temperature (as shown in the meeting handouts) are above the target temperature, given that the la volume of Trinity water should help lower temperature. Reclamation stated that this is correct, but Clear Creek temperatures would be even higher if it were not for the Trinity water. Reclamation said that through operations, they will attempt to get the temperature down using the limited adjustments in their control. Participants acknowledged the importance of this effort, citing the role Clear Creek played last year as a refuge for fall-run.

Next Meeting

The next meeting of the SRTTG is scheduled for 30th at 1:00 p.m.

[this meeting schedule changed prior to publishing meeting summary; contact Thuy Washburn for the latest meeting information)

Sacramento River Temperature Task Group Meeting

April 23, 2015
1:00 pm

Conference Line: 877-718-6527
Pass code: 1954134

Agenda

1. Introductions
    a. Michael Larsen – Note taker

2. Fishery update

3. Hydrology & Operations update
    a. Daily CVP Water Supply Report ***

4. Summarize Sub-Group meeting on April 17 --
    a. Current Shasta ops (bypass) SHA Handout ***

5. April 90% Exceedance Outlook ***

6. April Temperature studies ***
    a. April Temperature Packet
    b. Temperature control point -- Clear Creek at 58 degree until May 15 or when fish agencies notify spawning occurring
7. Next meeting

***handouts

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

DAILY CVP WATER SUPPLY REPORT

APRIL 22, 2015 RUN DATE: April 23, 2015

RESERVOIR RELEASES IN CUBIC FEET/SECOND

RESERVOIR	DAM	WY 2014	WY 2015	15 YR MEDIAN
TRINITY	LEWISTON	314	401	309
SACRAMENTO	KESWICK	3,684	4,689	6,049
FEATHER	OROVILLE (SWP)	800	1,300	1,300
AMERICAN	NIMBUS	1,522	597	1,786
STANISLAUS	GOODWIN	2,503	260	1,480
SAN JOAQUIN	FRIANT	174	197	211

STORAGE IN MAJOR RESERVOIRS IN THOUSANDS OF ACRE-FEET

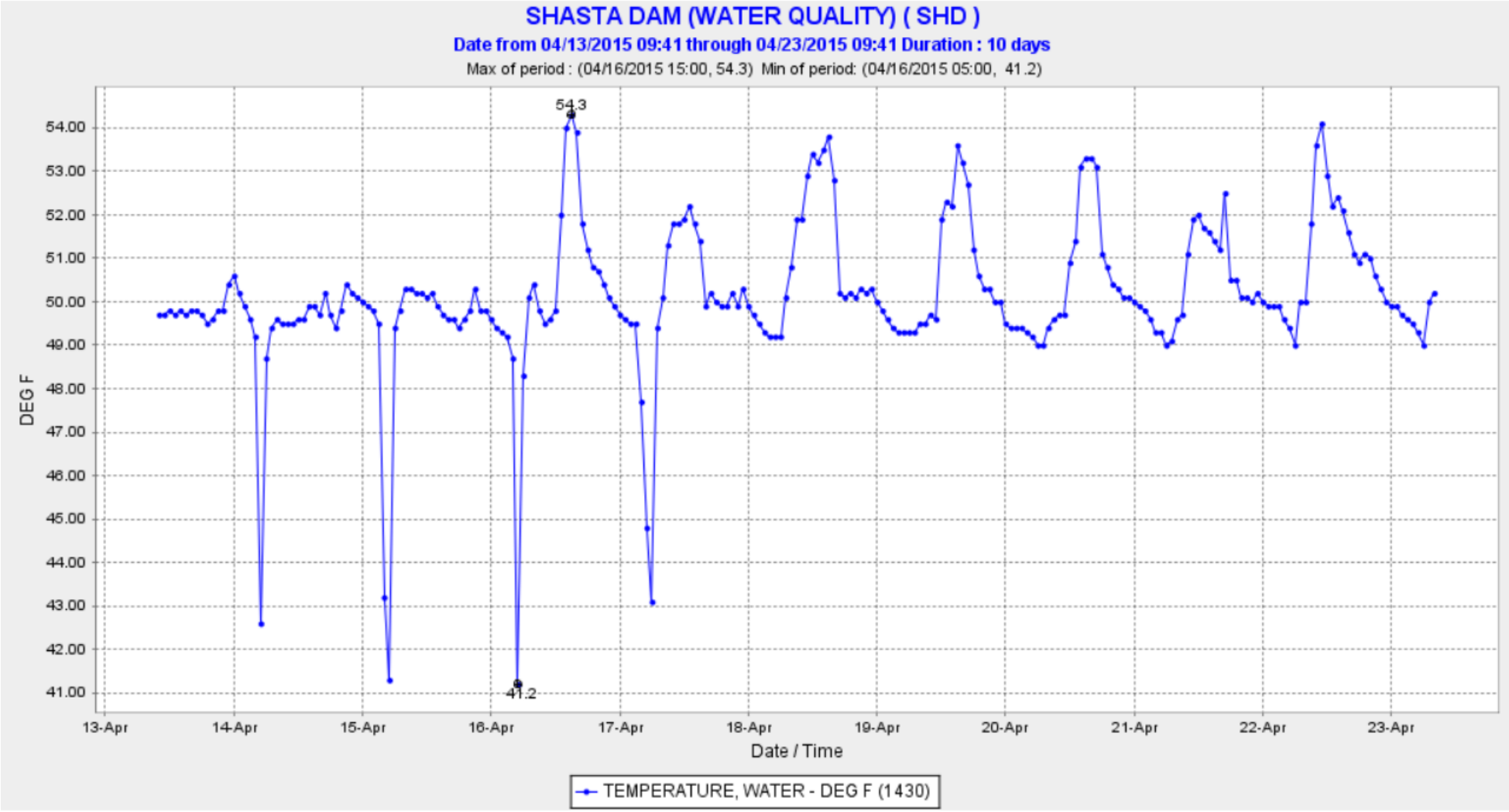
RESERVOIR	CAPACITY	15 YR AVG	WY 2014	WY 2015	% OF 15 YR AVG
TRINITY	2,448	1,870	1,298	1,199	64
SHASTA	4,552	3,770	2,404	2,714	72
OROVILLE (SWP)	3,538	2,568	1,862	1,803	70
FOLSOM	977	694	533	571	82
NEW MELONES	2,420	1,540	967	501	33
FED. SAN LUIS	966	779	558	385	49
MILLERTON	520	358	199	196	55
TOT. N. CVP	11,360	8,654	5,760	5,370	62

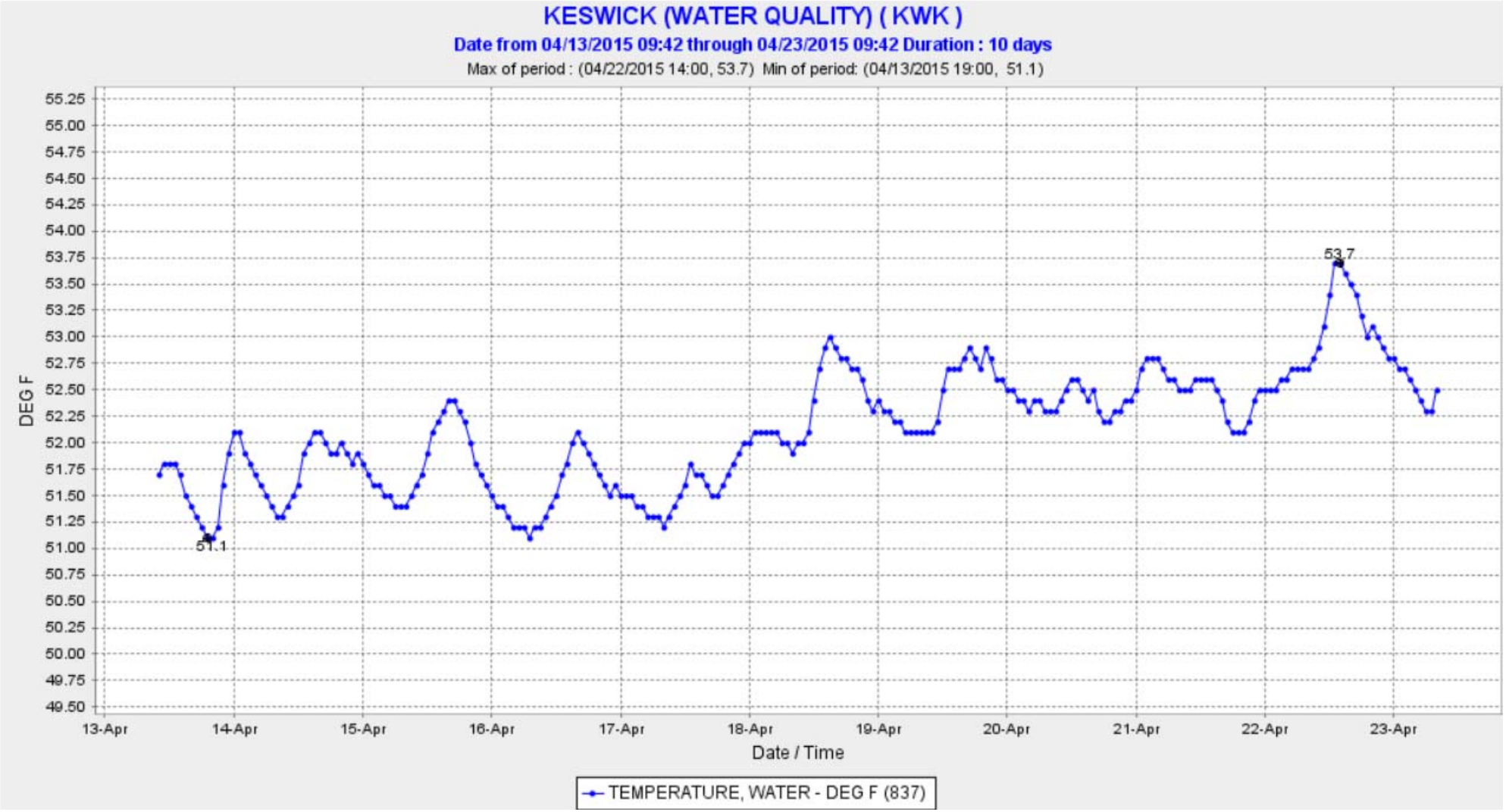
ACCUMULATED INFLOW FOR WATER YEAR TO DATE IN THOUSANDS OF ACRE-FEET

RESERVOIR	CURRENT WY 2015	DRIEST WY 1977	WETTEST WY 1983	15 YR AVG	% OF 15 YR AVG
TRINITY	797	105	1,403	702	114
SHASTA	2,769	1,546	7,811	3,464	80
FOLSOM	617	220	3,967	1,318	47
NEW MELONES	216	0	1,253	458	47
MILLERTON	91	116	1,847	516	18

ACCUMULATED PRECIPITATION FOR WATER YEAR TO DATE IN INCHES

RESERVOIR	CURRENT WY 2015	DRIEST WY 1977	WETTEST WY 1983	AVG (N YRS)	% OF AVG	LAST 24 HRS
TRINITY AT FISH HATCHERY	24.08	9.27	51.11	28.69 (53)	84	0.00
SACRAMENTO AT SHASTA DAM	47.83	11.04	104.32	55.90 (58)	86	0.00
AMERICAN AT BLUE CANYON	41.06	15.64	96.24	58.47 (40)	70	0.07
STANISLAUS AT NEW MELONES	16.92	0.00	42.10	24.43 (37)	69	0.00
SAN JOAQUIN AT HUNTINGTON LK	11.52	11.50	75.30	37.07 (40)	31	0.00


SHASTA DAM (WATER QUALITY) (SHD)
Date from 04/13/2015 09:41 through 04/23/2015 09:41 Duration : 10 days
Max of period : (04/16/2015 15:00, 54.3) Min of period: (04/16/2015 05:00, 41.2)
54.3
41.2
54.00
53.00
52.00
51.00
50.00
49.00
48.00
47.00
46.00
45.00
44.00
43.00
42.00
41.00
DEG F
13-Apr
14-Apr
15-Apr
16-Apr
17-Apr
18-Apr
19-Apr
20-Apr
21-Apr
22-Apr
23-Apr
Date / Time
TEMPERATURE, WATER - DEG F (1430)


KESWICK (WATER QUALITY) (KWK)
Date from 04/13/2015 09:42 through 04/23/2015 09:42 Duration : 10 days
Max of period : (04/22/2015 14:00, 53.7) Min of period: (04/13/2015 19:00, 51.1)
DEG F
55.25
55.00
54.75
54.50
54.25
54.00
53.75
53.50
53.25
53.00
52.75
52.50
52.25
52.00
51.75
51.50
51.25
51.00
50.75
50.50
50.25
50.00
49.75
49.50
53.7
51.1
13-Apr
14-Apr
15-Apr
16-Apr
17-Apr
18-Apr
19-Apr
20-Apr
21-Apr
22-Apr
23-Apr
Date / Time
TEMPERATURE, WATER - DEG F (837)

Draft 4/23/2015

Temperature and Release Summary for Shasta and Trinity - April 2015

(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	Bsf	Jlf	Bnd	Rdb	Lws	Control Point 4/1 Ccr	Igo			Shasta Generation El 815	Spring Crk Powerplant Release	Keswick Total Release		RDD	BSF	RDB	LWS
Mar	50.4			49.7	51.1	50.9	56.1	54.8	55.1	56.0	50.6	52.2	51.5			2,939	40	2,992		60.7	62.2	59.9	51.4
Apr																							
1	50.5	(0.8)	?	49.7	51.8	51.7	54.7	55.8	56.2	57.8	52.0	53.0	51.9			3,189	15	3,055		56.5	53.2	56.1	44.3
2	50.5	(50.5)	!		51.7	51.4	54.3	55.1	55.4	56.6	52.3	52.9	51.9			3,141	26	3,221		59.0	56.8	58.8	45.9
3	50.4	(50.4)	!		51.8	50.9	54.2	55.2	55.5	56.6	52.5	52.6	52.1			2,783	14	3,138		56.0	53.8	58.3	48.1
4	50.1	(0.8)	?	49.3	51.9	51.0	54.4	55.5	55.9	57.0	52.9	52.5	52.8			2,857	15	3,044		58.0	56.5	59.5	49.8
5	50.5	(1.3)	?	49.2	51.9	50.8	53.0	54.0	54.3	55.5	52.2	51.5	51.6			2,888	14	2,962		47.5	48.4	51.5	42.3
6	50.3	(1.0)		49.3	51.9	50.7	52.4	52.7	52.7	53.5	51.2	51.4	50.6			2,830	14	2,878		49.0	47.9	48.6	40.7
7	50.5	(1.1)		49.4	51.7	50.3	51.6	52.5	52.8	53.0	51.4	50.5	50.6			2,978	16	2,745		49.5	47.5	48.8	41.5
8	50.5	(1.0)		49.5	51.6	49.9	52.2	52.4	52.5	53.3	51.6	51.3	51.1			3,424	16	2,719		52.0	49.7	50.8	44.2
9	50.9	(1.2)		49.7	51.7	50.1	53.3	54.2	54.5	54.9	51.4	51.6	51.9			2,203	16	2,964		53.5	50.3	52.6	48.1
10	50.6	(1.0)		49.6	51.8	50.5	54.3	55.4	55.9	56.5	51.4	52.1	52.5			2,811	14	2,968		57.0	54.3	56.6	49.7
11	50.7	(1.1)		49.6	51.9	51.2	55.2	56.4	57.1	57.9	51.7	52.7	52.8			2,586	14	2,969		61.5	59.8	62.0	53.4
12	50.9	(0.4)		50.5	51.9	51.6	55.2	56.6	57.3	58.4	51.8	53.3	53.1			2,199	20	2,971		66.5	60.0	62.1	52.7
13	51.0	(2.0)		49.0	51.8	51.5	56.2	57.6	58.2	59.0	52.0	53.7	53.3			3,105	19	2,968		62.5	59.0	61.7	52.2
14	50.7	(1.2)		49.5	52.1	51.8	55.4	56.8	57.5	58.5	51.7	53.0	53.0			2,776	14	2,967		57.5	55.1	56.2	47.1
15	50.8	(1.6)		49.2	52.4	51.8	54.9	55.9	56.4	57.5	52.1	53.3	52.7			3,051	14	2,967		61.5	60.3	61.2	48.3
16	50.9	(0.7)		50.2	52.9	51.5	56.0	57.0	57.5	58.2	52.7	53.6	53.5			2,714	15	3,332	^	69.5	64.2	64.3	54.8
17	51.1	(1.3)		49.8	52.6	51.5	56.0	57.4	58.3	59.6	52.9	53.5	53.9			3,353	17	3,716	^	65.0	62.4	64.8	59.1
18	51.0	(0.1)		50.9	52.5	52.4	56.5	58.1	58.9	60.1	53.2	54.2	54.5			3,148	16	3,690	^	70.0	65.6	66.0	61.1
19	51.1	(0.6)		50.5	52.5	52.5	57.4	59.1	59.9	61.0	53.2	54.7	54.7			2,734	20	3,689	^	76.0	68.5	70.7	62.3
20	51.0	(0.6)		50.4	52.5	52.4	57.4	59.2	60.1	61.7	53.2	54.7	54.7			3,120	16	3,689		71.5	66.5	69.3	62.3
21	51.2	(0.8)		50.4	52.6	52.5	57.7	59.5	60.5	62.0	53.1	54.9	55.1			3,370	14	4,187		69.0	65.5	66.1	60.6
22	51.2	(0.2)		51.0	52.6	53.0	57.5	59.4	60.4	62.2	53.0	54.8	55.1			3,476	14	4,689		70.0	67.5	68.3	59.6
23		0.0																					
24		0.0																					
25		0.0																					
26		0.0																					
27		0.0																					
28		0.0																					
29		0.0																					
30		0.0																					
Avg	50.7			49.8	52.1	51.4	55.0	56.2	56.7	57.8	52.3	53.0	52.9	####		2,943	16	3,251		60.8	57.9	59.7	51.3
Tot cfs																64,736	353	71,528					
Tot af																128,404	700	141,876					

? = Average includes 1-9 estimated hourly readings ! = No Average (10-17 hours missing) & = No Average (18 to 23 hours missing)

= Station out of service ND = No hourly readings or incorrect

When available:
^ = Redding Air Temp Record High
* = Redding Air Temp Record Low

Control Point: Clear Creek 4/1/2015 to present 56.0.

PRELIMINARY

DRAFT April 2015

90%-Runoff Exceedance Outlook:

Inflow based on the DWR April 2015 B120 Apr-Sep and 90% Historical Inflows Oct-Dec

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

		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Trinity		1179	1012	877	754	629	539	508	476	460
Shasta	2689	2633	2337	2035	1673	1353	1146	1065	1075	1100
Elev.		991	976	959	937	915	898	891	892	894

Monthly River Releases (cfs)

Keswick	4300	7500	8500	9000	8500	6500	5000	4000	4000

Trinity Diversions (TAF)

Carr PP	39	22	97	98	97	62	15	28	19
Spring Crk. PP	8	15	90	90	90	60	30	19	12

April Forecast Assumptions:

With TUCP relaxations

SRSC coordination diversion ops

Please note:

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

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

CVP releases represent monthly averages.

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

April 23, 2015

Upper Sacramento River – April 2015 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~56˚F to 56.5+˚F)	CCR	CCR	CCR	CCR	CCR

Temperature Model Inputs, Assumptions, Limitations and Uncertainty:

1. Operation is based on the April 2015 Operation Outlooks (monthly flows, reservoir release, and end-of-month reservoir storage) for the 90% exceedances.
2. The profiles used for Shasta, Trinity and Whiskeytown were taken on April 8, April 15, and April 8, 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.

DRAFT

<u>Temperature Analysis Results</u>:

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.

<u>90%-Exceedance</u>:
A temperature target location above Clear Creek is possible through September (Figure 1). By October, the TCD intake level will be through the side gates.

Figure 2 shows temperature results for Clear Creek at Igo.

DRAFT

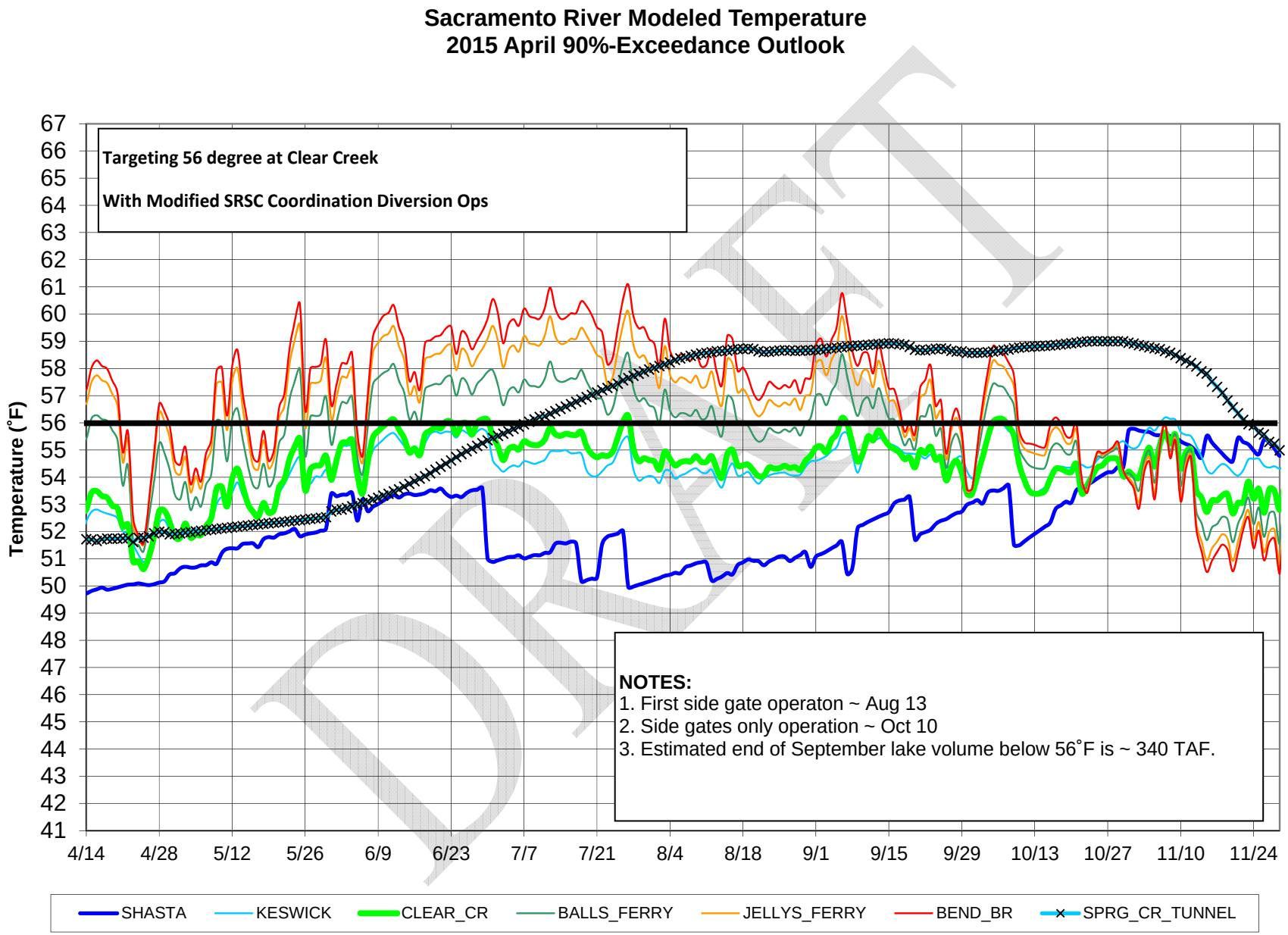

Sacramento River Modeled Temperature
2015 April 90%-Exceedance Outlook
Targeting 56 degree at Clear Creek
With Modified SRSC Coordination Diversion Ops
NOTES:
1. First side gate operaton ~ Aug 13
2. Side gates only operation ~ Oct 10
3. Estimated end of September lake volume below 56˚F is ~ 340 TAF.
Temperature (˚F)
67
66
65
64
63
62
61
60
59
58
57
56
55
54
53
52
51
50
49
48
47
46
45
44
43
42
41
4/14
4/28
5/12
5/26
6/9
6/23
7/7
7/21
8/4
8/18
9/1
9/15
9/29
10/13
10/27
11/10
11/24
SHASTA
KESWICK
CLEAR_CR
BALLS_FERRY
JELLYS_FERRY
BEND_BR
SPRG_CR_TUNNEL

Figure 1

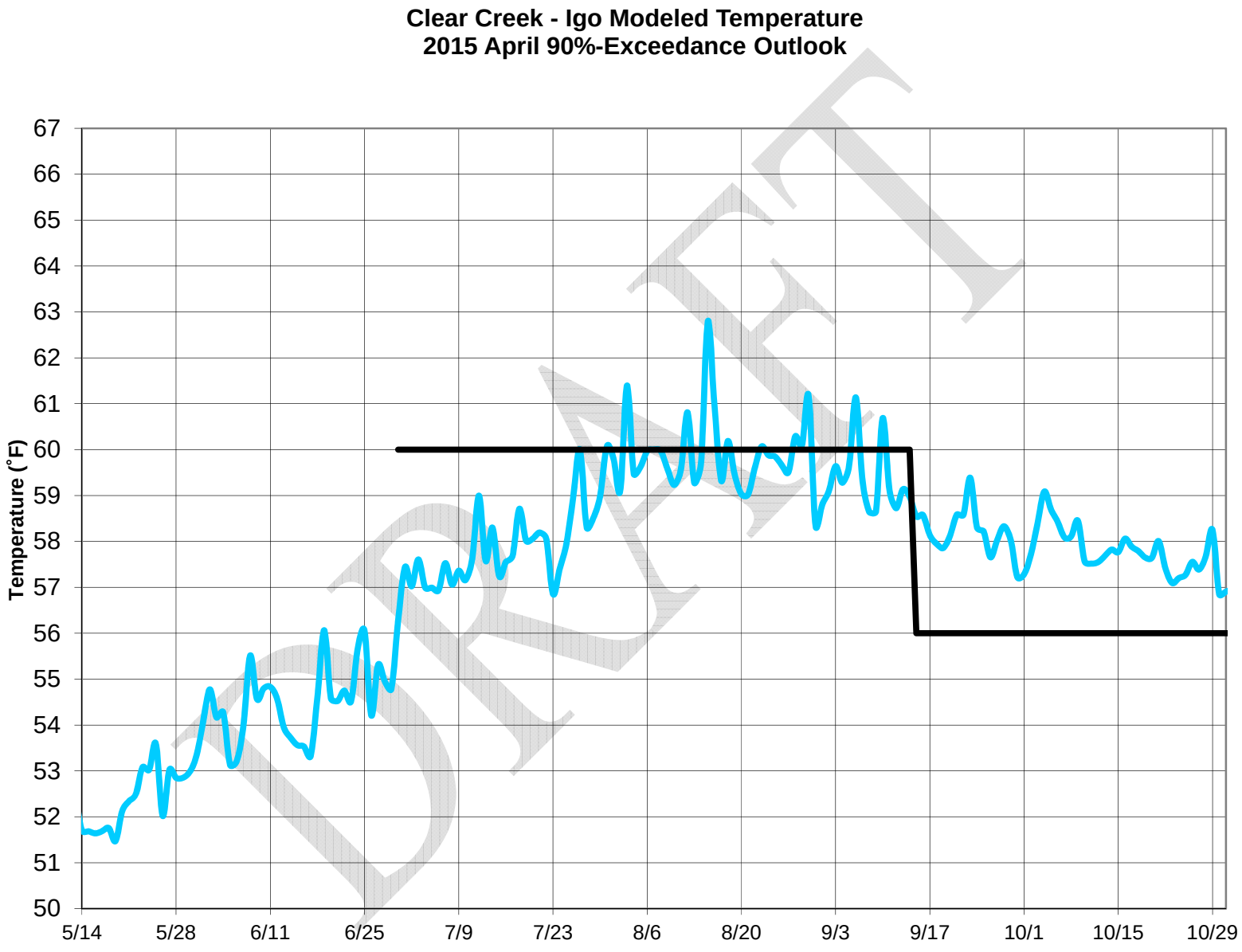
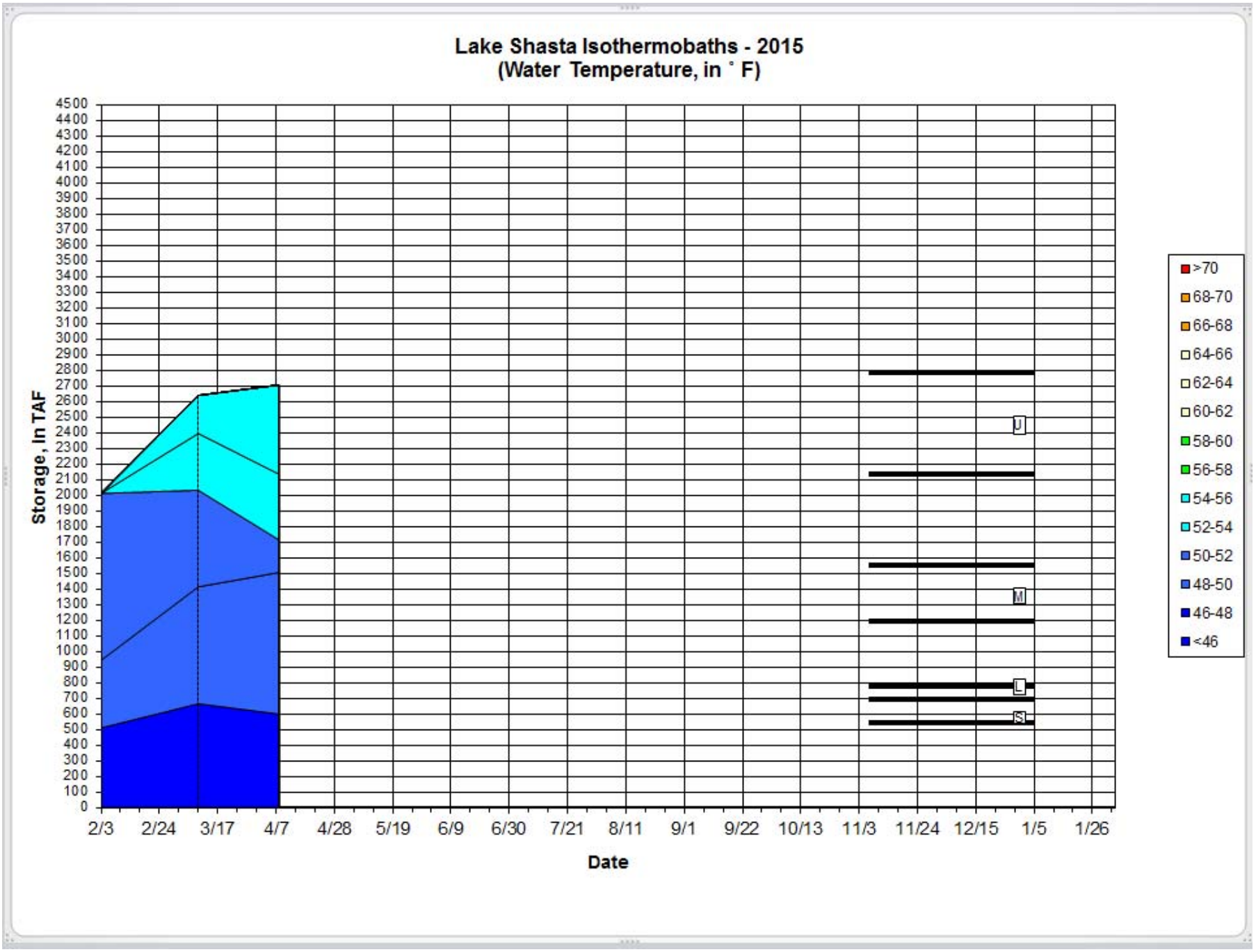

Clear Creek - Igo Modeled Temperature
2015 April 90%-Exceedance Outlook
Temperature (°F)
67
66
65
64
63
62
61
60
59
58
57
56
55
54
53
52
51
50
5/14
5/28
6/11
6/25
7/9
7/23
8/6
8/20
9/3
9/17
10/1
10/15
10/29
DRAFT

Figure 2


Lake Shasta Isothermobaths - 2015
(Water Temperature, in ˚ F)
Storage, In TAF
4500
4400
4300
4200
4100
4000
3900
3800
3700
3600
3500
3400
3300
3200
3100
3000
2900
2800
2700
2600
2500
2400
2300
2200
2100
2000
1900
1800
1700
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
2/3
2/24
3/17
4/7
4/28
5/19
6/9
6/30
7/21
8/11
9/1
9/22
10/13
11/3
11/24
12/15
1/5
1/26
Date
U
M
L
S
>70
68-70
66-68
64-66
62-64
60-62
58-60
56-58
54-56
52-54
50-52
48-50
46-48
<46