Enclosure 1

United States Department of the Interior

BUREAU OF RECLAMATION
Central Valley Operations Office
3310 El Camino Avenue, Suite 300
Sacramento, California 95821

IN REPLY
REFER TO:

MAR 17 2017

CVO-100
WTR-2.00

VIA ELECTRONIC MAIL

Ms. Maria Rea
Assistant Regional Administrator
California Central Valley Area Office
National Marine Fisheries Service
650 Capitol Mall, Suite 5-100
Sacramento, CA 95814

Subject: Transmittal of March 2017 Reservoir Operations Forecasts Per RPA I.2.3

Dear Ms. Rea:

The 2017 Water Year has been one of the wettest water years on record for the Central Valley Project (CVP), and has necessitated that Bureau of Reclamation (Reclamation) take an approach to the determination of CVP water supply allocations that has deviated from our historical practices. On February 21, 2017, Reclamation provided an email to you summarizing the extreme hydrologic conditions experienced during the month of February, and explaining why allocations to CVP contractors that take water directly from Folsom, New Melones, and Millerton Reservoirs were warranted at that time, but that allocations to portions of the CVP more directly affected by Shasta Dam operations should be deferred until March forecasts were available. This was done to ensure updated runoff forecasts could be used to project Sacramento River temperature management operations. You provided concurrence with that approach on February 23, 2017. Reclamation received updated runoff forecasts from the California Department of Water Resources on March 8, 2017, and Reclamation has used those forecasts as the basis for projections of CVP operations and Sacramento River temperature operations for the remainder of Water Year 2017.

The current status of the cold water pool at Shasta Lake is very similar to the pool conditions observed in the most recent very wet years where we have sampling available. Enclosure 1 depicts the March cold water volumes for 2006, 2011, 2012 and 2016 along with the readings for this year. As we project conditions ahead to late May this year, Enclosure 2 depicts the end

of May cold water volumes for 2006, 2011, 2012 and 2016 along with the current model projections (both the 90% and 50% exceedance hydrology) for this year. Water years 2006, 2011, 2012 and 2016 all produced excellent cold water conditions in the Sacramento River given the ample volume of cold water in the lake, higher release rates, as well as the overall volume of water allowing for full functionality of the Temperature Control Device. Based on the current projected storage values, Enclosure 3 would indicate that a seasonal temperature target location downstream of Balls Ferry is achievable based on our past experience.

Consistent with your February 23, 2017 concurrence, and the 2009 National Marine Fisheries Service (NMFS) Biological Opinion Reasonable and Prudent Actions (RPA) Action number I.2.3, please find enclosed our latest Sacramento River temperature model results for the range of projected operations over the coming spring and summer. These analyses are based on March hydrologic conditions and an updated forecast of reservoir inflows assuming both a 90% exceedance hydrology, and a 50% exceedance hydrology. In both cases, these simulations were structured to maintain a 52° F daily average temperature (DAT) for the release of water at Keswick Dam throughout the temperature management season. As was designed last year, we have targeted the 52° F Keswick release temperature as an early season surrogate to allow flexibility for in-season adjustments to temperature target metrics based on ultimate spawning locations and water temperature management strategies.

The 90% exceedance hydrologic outlook forecasts Shasta Lake storage at 4.25 million acre-feet (MAF) at the end of May 2017 and 2.90 MAF at the end of September 2017. For the 50% exceedance hydrologic outlook, Shasta Lake storage is forecasted to be 4.42 MAF at the end of May and 3.18 MAF at the end of September. For the enclosed early season temperature runs, we have used a data set to simulate meteorological conditions through the season at the historic average. The reason this exceedance was selected was that using the combination of both a 90% exceedance hydrology and historic 10% exceedance meteorology data set would produce a model run with a joint exceedance probability much higher than 90% exceedance, which does not appear to be appropriate given the current extremely wet conditions and large projected volume of cold water pool in 2017. In addition, as explained in more detail below, the focus of these model results was the release temperature at Keswick Dam, which is much less sensitive to meteorological conditions than temperature projections further downstream. Starting with next month's model updates, we anticipate using the 10% exceedance LT3M projections provided by the National Oceanic and Atmospheric Administration Climate Center, and/or other projections as appropriate.

Given the expected range of hydrology, projected system operations, and assumed meteorological conditions, maintenance of release temperatures from Keswick Dam at 52° F DAT is projected through the entire management season. As identified in previous NMFS correspondence such as your letter dated March 18, 2016, regarding forecasts in 2016, this

release temperature should be adequate to manage temperatures downstream to the gage near the confluence with Clear Creek (CCR gage location) within a 53° F DAT, as well as a target of 56° F DAT between Balls Ferry and Jellys Ferry this year. These metrics are in conformance with both the existing RPA, as well as the study described in Reclamation's January 25, 2017, letter to you. That study would provide for operations targeting 53° F DAT near the Clear Creek confluence as a surrogate for a target of 55° F seven day average daily maximum at the most downstream winter run redd this coming season.

The extremely wet hydrology this year has created very favorable water supplies conditions throughout the CVP. Based on the evolution of the hydrologic and storage conditions over the past six weeks, the management of Shasta Dam releases during the 2017 water year is projected to play much less of a role in the ability to meet CVP allocations than in most years. In 2017, we expect excess Delta outflow through the summer along with high reservoir releases throughout the system leading into next year's flood season. The South of Delta CVP allocations will also be greatly dependent on the magnitude and duration of the San Joaquin Basin snowmelt which could be at record levels this year. The runoff and operations projections for the San Joaquin River, duration of time that San Luis Reservoir is not needed to meet south of Delta water supply demands, and other operational considerations south of the Delta, are not influenced by Shasta Dam operations, but will all significantly influence the ultimate South of Delta allocations.

Given the overall projected system operations and hydrologic conditions described above, we conclude that the following initial CVP allocations are reasonable at this time:

March 90% Exceedance Municipal & Industrial Water Service Contracts – Agricultural Water Service Contracts				
	North of Delta M&I	North of Delta Agricultural	South of Delta M&I	South of Delta Agricultural
Allocation	100%	100%	90%	65%

Considering the overall conditions described above, we do not foresee any need to adjust these allocations significantly in the unlikely event that Shasta Dam operations need to be altered to continue to meet the temperature targets identified in our January 25, 2017, letter or the compliance metrics identified in RPA I.2.4. Based on the current assessment of system operations, and that the conditions discussed above are consistent with RPA I.2.3.A, we request your concurrence with our proposed operational planning efforts.

Please know that your staff has been very helpful in providing technical assistance as we prepare our temperature management operations for the coming year, and we look forward to

our continued close coordination of our final Sacramento River temperature management plan later this spring. If you have any questions, please contact Jeff Rieker at 916-979-2197.

Sincerely,

Ronald Milligan

Ronald Milligan
Operations Manager

Enclosures 4

cc: Mr. Barry Thom
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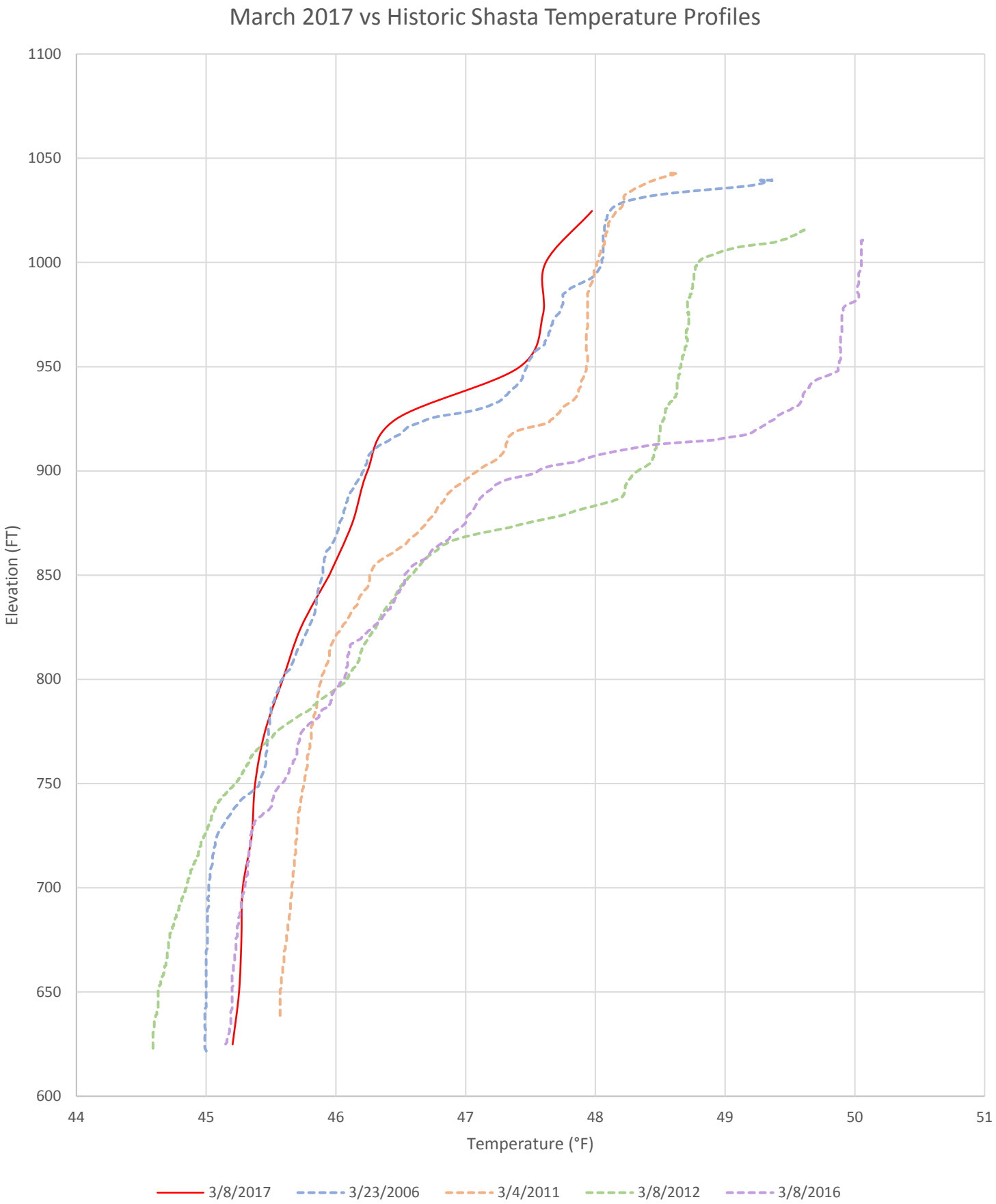
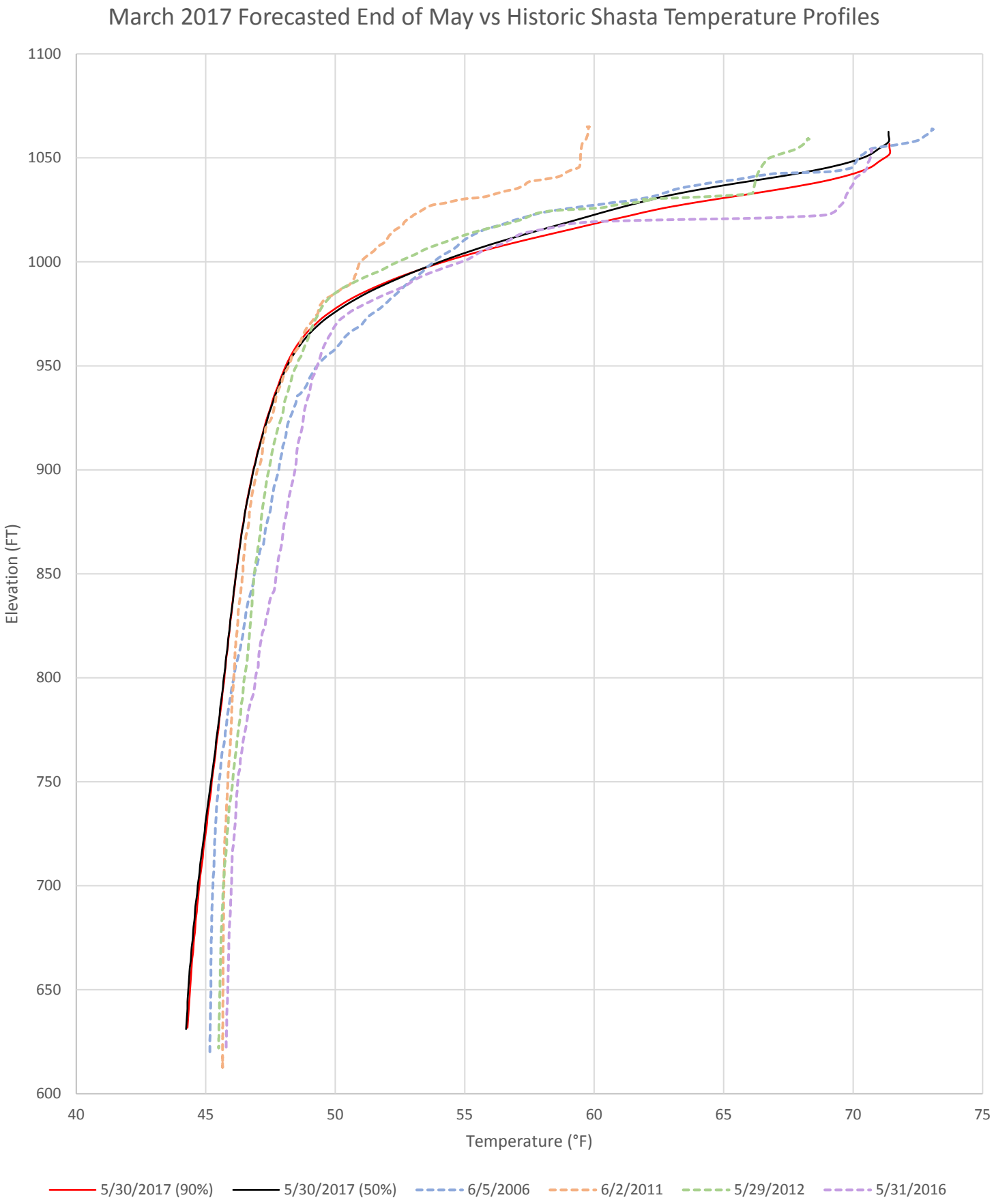
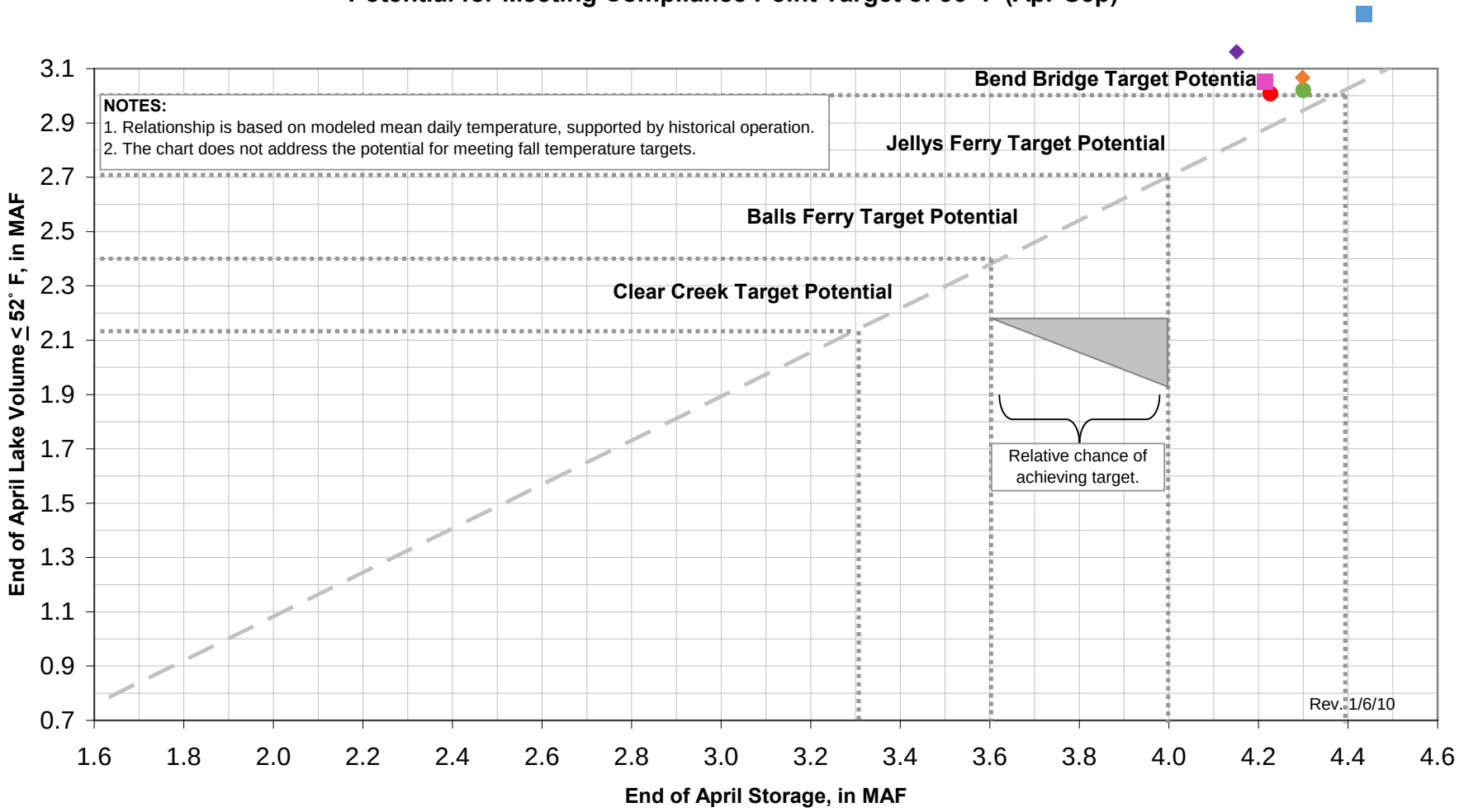

March 2017 vs Historic Shasta Temperature Profiles
1100
1050
1000
950
900
850
800
750
700
650
600
Elevation (FT)
44
45
46
47
48
49
50
51
Temperature (°F)
3/8/2017
3/23/2006
3/4/2011
3/8/2012
3/8/2016

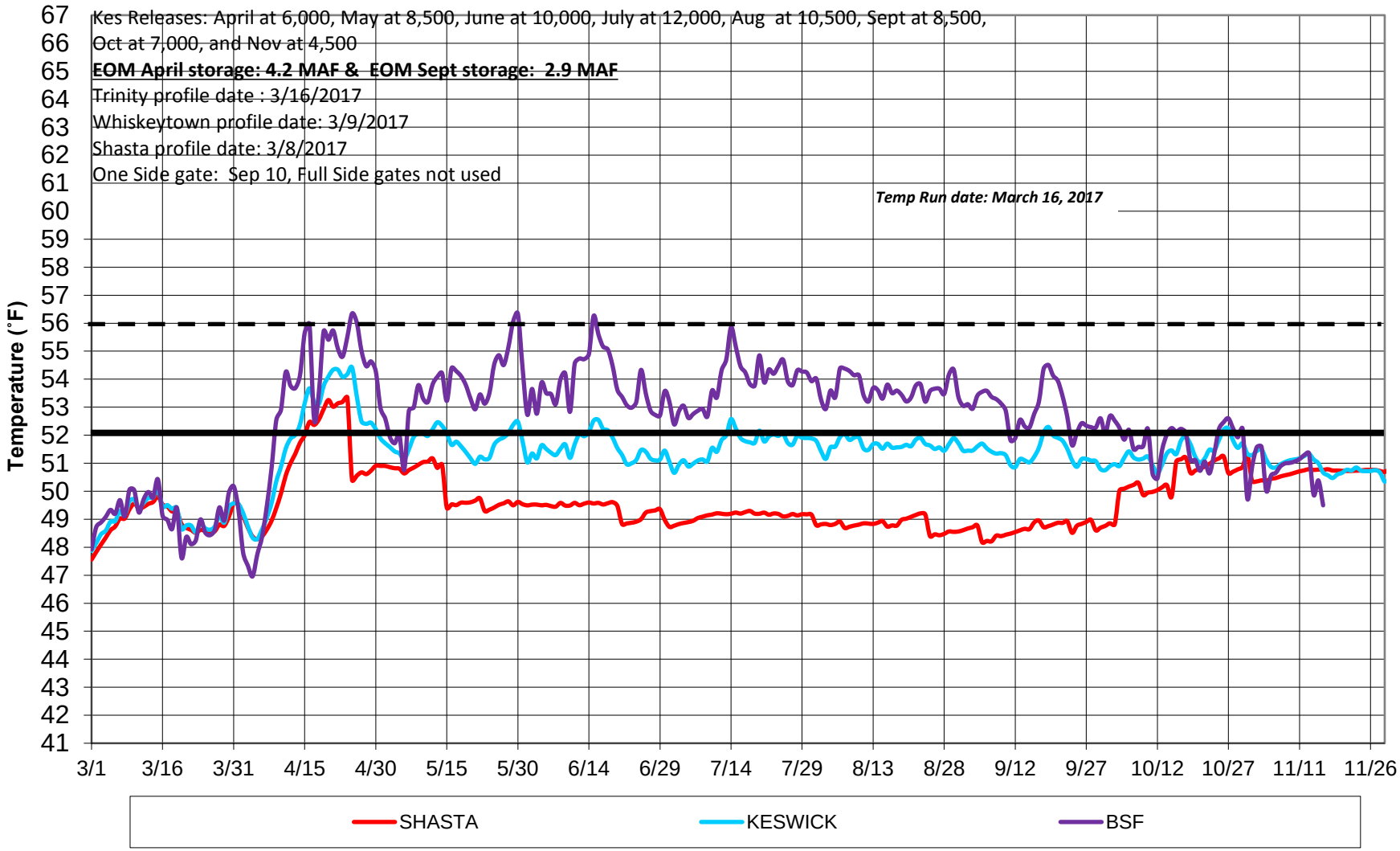

March 2017 Forecasted End of May vs Historic Shasta Temperature Profiles
Elevation (FT)
1100
1050
1000
950
900
850
800
750
700
650
600
40
45
50
55
60
65
70
75
Temperature (°F)
5/30/2017 (90%)
5/30/2017 (50%)
6/5/2006
6/2/2011
5/29/2012
5/31/2016

Lake Shasta End of April Storage
Potential for Meeting Compliance Point Target of 56˚ F (Apr-Sep)

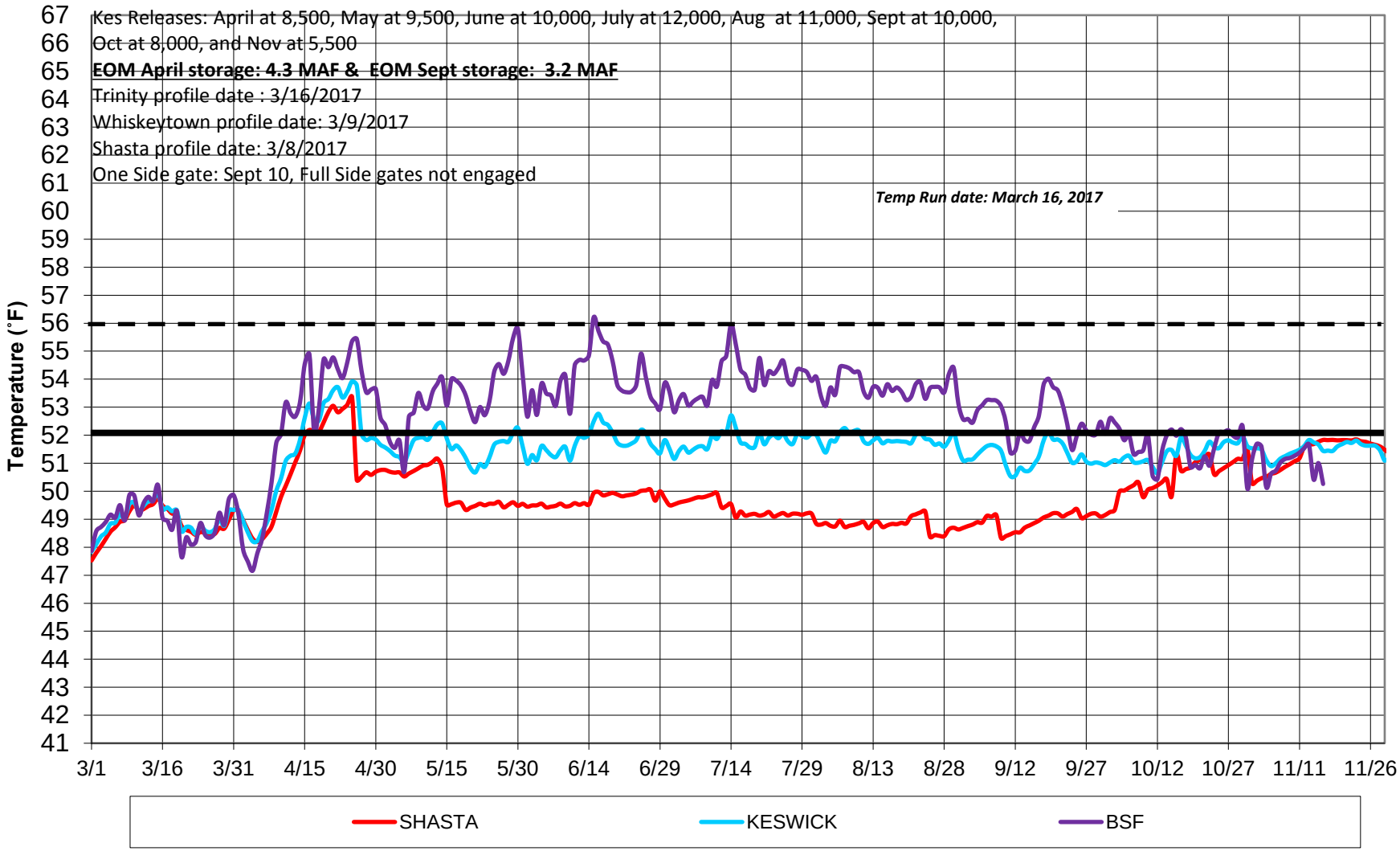


2017 (90%) 2017 (50%) 2006 2011 2012 2016

Sacramento River Modeled Temperature
2017 Mar 90%-Exceedance Water Outlook - Average Historical Meteorology
Approximately 52 degree at Keswick



Sacramento River Modeled Temperature
2017 Mar 50%-Exceedance Water Outlook - Average Historical Meteorology
Approximately 52 degree at Keswick



Estimated CVP Operations Mar 2017 90% Exceedance

Storages

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

		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Trinity	**1922**	**2007**	**2111**	**2127**	**1992**	**1846**	**1722**	**1606**	**1574**				
	Elev.	2341	2349	2350	2340	2330	2321	2312	2309				
Whiskeytown	**224**	**206**	**238**	**238**	**238**	**238**	**238**	**230**	**206**				
	Elev.	1199	1209	1209	1209	1209	1209	1207	1199				
Shasta	**3779**	**3804**	**4225**	**4248**	**4026**	**3577**	**3169**	**2903**	**2716**				
	Elev.	1040	1056	1057	1049	1032	1015	1003	995				
Folsom	**404**	**580**	**759**	**966**	**944**	**784**	**647**	**539**	**415**				
	Elev.	426	445	465	463	448	434	421	405				
New Melones	**1578**	**1668**	**1712**	**1875**	**1990**	**1973**	**1919**	**1876**	**1846**				
	Elev.	1021	1025	1041	1051	1050	1045	1041	1038				
San Luis	**923**	**966**	**938**	**828**	**624**	**323**	**133**	**113**	**71**				
	Elev.	543	534	510	480	446	424	417	404				
Total		9231	9984	10282	9814	8741	7827	7268	6829				

State End of the Month Reservoir Storage (TAF)

Oroville	
	Elev.
San Luis	
Total San Luis (TAF)	

Monthly River Releases (TAF/cfs)

Trinity	TAF	18	32	260	150	68	28	27	23
	cfs	**300**	**540**	**4,225**	**2,526**	**1,102**	**450**	**450**	**373**
Clear Creek	TAF	11	13	13	9	7	5	9	14
	cfs	**175**	**218**	**216**	**150**	**120**	**85**	**150**	**225**
Sacramento	TAF	1045	357	523	595	738	645	506	430
	cfs	**17000**	**6000**	**8500**	**10000**	**12000**	**10500**	**8500**	**7000**
American	TAF	492	357	400	387	307	246	215	159
	cfs	**8000**	**6000**	**6500**	**6500**	**5000**	**4000**	**3618**	**2588**
Stanislaus	TAF	61	83	96	56	18	18	18	49
	cfs	**1000**	**1400**	**1555**	**940**	**300**	**300**	**300**	**797**
Feather	TAF								
	cfs								

Trinity Diversions (TAF)

	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Carr PP	34	38	37	67	98	97	92	17				
Spring Crk. PP	**60**	**8**	**30**	**60**	**90**	**90**	**90**	**30**				

Delta Summary (TAF)

		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Tracy		128	104	98	262	271	272	267	95				
USBR Banks		0	0	0	0	0	0	0	33				
Contra Costa		12.7	12.7	12.7	9.8	11.1	12.7	14.0	16.8				
Total USBR		141	117	111	272	282	285	281	145				
State Export													
Total Export													
COA Balance		0	0	0	0	0	0	-15	-16				
Old/Middle River Std.													
Old/Middle R. calc.		6,339	2,807	2,527	-3,388	-8,333	-8,358	-6,706	-4,244				
Computed DOI		72048	39233	33706	18558	8182	7109	11397	11403				
Excess Outflow		42848	16776	12184	4875	179	114	0	0				
% Export/Inflow		5%	8%	8%	28%	46%	49%	38%	30%				
% Export/Inflow std.		35%	35%	35%	35%	65%	65%	65%	65%				

Hydrology

	Trinity		Shasta		Folsom		New Melones	
Water Year Inflow (TAF)	1850		8,859		6,865		2417	
Year to Date + Forecasted % of mean	153%		160%		252%		229%	

3/17/2017

Estimated CVP Operations Mar 50% Exceedance

Storages

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

		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Trinity	**1922**	**2055**	**2223**	**2289**	**2197**	**2076**	**1928**	**1814**	**1785**				
	Elev.	2345	2356	2360	2354	2346	2336	2328	2326				
Whiskeytown	**224**	**206**	**238**	**238**	**238**	**238**	**238**	**230**	**206**				
	Elev.	1199	1209	1209	1209	1209	1209	1207	1199				
Shasta	**3779**	**3854**	**4308**	**4420**	**4213**	**3809**	**3468**	**3178**	**2949**				
	Elev.	1042	1059	1063	1055	1041	1027	1015	1005				
Folsom	**404**	**618**	**739**	**957**	**945**	**889**	**698**	**574**	**451**				
	Elev.	430	443	464	463	458	439	425	410				
New Melones	**1578**	**1711**	**1763**	**1939**	**2135**	**2166**	**2109**	**2062**	**1961**				
	Elev.	1025	1030	1047	1064	1067	1062	1058	1049				
San Luis	**923**	**966**	**1057**	**958**	**774**	**387**	**133**	**79**	**215**				
	Elev.	543	536	518	502	463	436	420	417				
Total		9411	10327	10800	10502	9565	8574	7937	7567				

State End of the Month Reservoir Storage (TAF)

Oroville	
San Luis	
Total San Luis (TAF)	

Monthly River Releases (TAF/cfs)

Trinity	TAF	18	46	248	275	68	28	27	23
	cfs	**300**	**767**	**4,032**	**4,617**	**1,102**	**450**	**450**	**373**
Clear Creek	TAF	11	13	13	9	7	7	9	12
	cfs	**175**	**218**	**216**	**150**	**120**	**120**	**150**	**200**
Sacramento	TAF	1229	506	584	595	738	676	595	492
	cfs	**20000**	**8500**	**9500**	**10000**	**12000**	**11000**	**10000**	**8000**
American	TAF	492	506	523	565	307	307	238	198
	cfs	**8000**	**8500**	**8500**	**9500**	**5000**	**5000**	**4000**	**3219**
Stanislaus	TAF	74	97	120	65	26	25	24	123
	cfs	**1200**	**1633**	**1958**	**1100**	**429**	**400**	**400**	**2000**
Feather	TAF								
	cfs								

Trinity Diversions (TAF)

	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Carr PP	66	51	9	13	97	128	91	16				
Spring Crk. PP	**110**	**30**	**10**	**10**	**90**	**120**	**90**	**30**				

Delta Summary (TAF)

		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Tracy		132	253	154	262	270	273	265	270				
USBR Banks		0	0	0	0	0	0	0	44				
Contra Costa		12.7	12.7	12.7	9.8	11.1	12.7	14.0	16.8				
Total USBR		145	266	166	272	281	286	279	331				
State Export													
Total Export													
COA Balance		0	0	0	0	0	0	0	13				
Old/Middle River Std.													
Old/Middle R. calc.		6,379	6,044	4,608	-4,205	-7,227	-8,085	-5,723	-4,744				
Computed DOI		85029	72382	52755	30543	10509	10395	11800	11403				
Excess Outflow		55829	46142	26255	10220	2505	390	403	0				
% Export/Inflow		4%	6%	8%	24%	43%	44%	35%	35%				
% Export/Inflow std.		35%	35%	35%	35%	65%	65%	65%	65%				

Hydrology

	Trinity		Shasta		Folsom		New Melones	
Water Year Inflow (TAF)	2179		9,619		7,434		2687	
Year to Date + Forecasted % of mean	180%		174%		273%		254%	

3/17/2017

Enclosure 2

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
650 Capitol Mall, Suite 5-100
Sacramento, California 95814-4700

March 21, 2017

Mr. Ron Milligan
Operations Manager, Central Valley Project
U.S. Bureau of Reclamation
3310 El Camino Avenue, Suite 300
Sacramento, California 95821

Re: Transmittal of March 2011 Reservoir Operations Forecast Per RPA 1.2.3

Dear Mr. Milligan:

Thank you for the opportunity to review the U.S. Bureau of Reclamation's (Reclamation) March forecast and water supply allocations for water year 2017. Your March 17, 2017, letter included the results of the 90 and 50 percent exceedance Central Valley Project (CVP) reservoir operations forecasts, water temperature modeling, and this year's initial water supply allocations. For purposes of compliance with the reasonable and prudent alternative (RPA) Action I.2.3, described in NOAA's National Marine Fisheries Service's (NMFS) April 7, 2011, amendment of the 2009 RPA[1], NMFS' concurrence is required prior to the initial water supply allocation of the year. The objective is to use a conservative forecast as early as possible to protect the cold water pool in Shasta Reservoir so that suitable spawning and egg/alevin incubation habitat can be maintained in the Sacramento River during the summer and fall season for federally listed endangered Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawytscha*), and threatened Central Valley spring-run Chinook salmon (*O. tshawytscha*).

As noted in your March 17, 2017, letter, water year 2017 has been one of the wettest water years on record for the CVP, and Reclamation's approach to CVP water supply allocation determinations has deviated this year from historical practices. In a February 23, 2017 email, NMFS concurred with Reclamation's determination of allocations to CVP contractors that take water directly from Folsom, New Melones, and Millerton reservoirs and decision that allocations to portions of the CVP more directly affected by Shasta Dam operations would be deferred until March forecasts were available in order to ensure updated runoff forecasts could be used to project Sacramento River temperature management operations. In addition, NMFS concurred with Reclamation's determination that the runoff and operations projections for the San Joaquin River, duration of time that San Luis Reservoir is not needed to meet south of Delta water supply demands, and other operational considerations south of the Delta, are not influenced by Shasta Dam operations, but will all significantly influence the ultimate South of Delta allocations.

[1] http://www.westcoast.fisheries.noaa.gov/publications/Central_Valley/Water%20Operations/Operations,%20Criteria%20and%20Plan/040711_ocap_opinion_2011_amendments.pdf

The March 2017 CVP reservoir operations forecast is based on estimated runoff within the Sacramento River basin as of March 8, 2017. The estimated annual inflow into Shasta Reservoir is 8.60 million acre-feet (MAF) (160% of mean) in the 90 percent exceedance forecast and 9.62 MAF (174% of mean) in the 50 percent exceedance forecast. The projected storage in Shasta Reservoir is forecast to be at 4.25 MAF at the end of May 2017 and 2.90 MAF at the end of September in the 90 percent exceedance forecast, and the projected storage in Shasta Reservoir is forecast to be at 4.42 MAF at the end of May 2017 and 3.18 MAF at the end of September in the 50 percent exceedance forecast. The following table provides Reclamation's initial water supply allocations based on the 90 percent exceedance forecast:

March 90% Exceedance Municipal & Industrial (M&I) Water Service Contracts and Agricultural Water Service Contracts				
	North of Delta M&I	North of Delta Agricultural	South of Delta M&I	South of Delta Agricultural
Allocation	100%	100%	90%	65%

NMFS understands that the proposed monthly average Keswick release schedule:

- includes consideration of flows necessary to implement RPA Action 4, Estuarine Habitat During Fall (commonly referred to as fall X2) in the U.S. Fish and Wildlife Service's December 15, 2008, biological opinion on the proposed coordinated operations of the CVP and State Water Project[2].

- does not include flows that may be requested to implement the North Delta Food Web Adaptive Management Project, as part of the Delta Smelt Resiliency Strategy[3]. However, based on its implementation in 2016, the flows for the project were on the order of 400 cfs, and were within the Keswick release schedule in the Sacramento River final temperature management plan[4].

NMFS has reviewed Reclamation's March 2017 CVP reservoir operations 90 percent and 50 percent exceedance forecasts (enclosure 1), quantity and quality of the Shasta cold water pool at the beginning of March and forecasted end of May compared with historically similar years (enclosure 2), Shasta Reservoir end of April storage potential for meeting compliance point target of 56°F (enclosure 3), and corresponding water temperature model runs (enclosure 4). In addition, the NMFS-Southwest Fisheries Science Center utilized the Keswick release and temperature data from the March CVP reservoir operations 90 percent and 50 percent exceedance forecasts as input into its River Assessment for Forecasting Temperature (RAFT) and temperature-dependent mortality models (enclosure 5).

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[2] https://www.fws.gov/sfbaydelta/documents/SWP-CVP_OPs_BO_12-15_final_OCR.pdf
[3] http://resources.ca.gov/docs/Delta-Smelt-Resiliency-Strategy-FINAL070816.pdf
[4] http://www.westcoast.fisheries.noaa.gov/publications/Central_Valley/Water%20Operations/bureau_of_reclamation_s_sacramento_river_temperature_management_plan_-_june_27__2016.pdf
http://www.westcoast.fisheries.noaa.gov/publications/Central_Valley/Water%20Operations/nmfs_concurrence_on_the_bureau_of_reclamation_s_sacramento_river_temperature_management_plan-_june_28__2016.pdf

The resulting water temperature model runs based on the 90 percent exceedance hydrological forecast and average historic meteorological conditions indicate that a Keswick Dam release daily average temperature of 52°F can be maintained through the entire temperature management season (*i.e.*, May 15 through October 31) and should be adequate to obtain a 53°F daily average temperature at CCR[5] [which is comparable and a surrogate for the 55°F 7-day average of daily maximum (7DADM) temperatures at CCR] as well as a target of 56°F daily average temperature (DAT) between Balls Ferry and Jellys Ferry and will be achievable throughout the winter-run and spring-run Chinook salmon spawning and incubation period. Based on the projected end-of-September storage in Shasta Reservoir of at least 2.2 MAF and temperature model runs meeting a Balls Ferry temperature compliance point, Reclamation and NMFS agree that RPA Action I.2.3.A should be implemented this year. The following table provides the results from the temperature-dependent mortality model.

March 2017 Hydrological Exceedance Forecast	**Percent Temperature-Dependent Mortality**		
	Mean	**Median**	**95% Confidence Interval**
90%	1.83%	0.08%	0.05 – 19.17%
50%	1.69%	0.01%	0.05 – 16.02%

In reviewing the Keswick release schedules, NMFS is concerned about the potential for winter-run Chinook salmon redd dewatering prior to complete fry emergence in the fall, and also fall-run Chinook salmon redd dewatering in the late fall and into the winter. NMFS will work with Reclamation to adjust the Keswick release schedule in the coming months in order to minimize the potential for winter-run Chinook salmon redd dewatering until complete emergence, and also to stabilize flows for fall-run Chinook salmon spawning and egg incubation.

In summary, NMFS concurs with Reclamation's forecasts based on March 8, 2017, hydrologic conditions, and initial water supply allocations, that RPA Action I.2.3.A should be implemented this year, and that a 55°F 7DADM temperature will be attainable at CCR. In addition, NMFS will work with Reclamation to adjust the Keswick release schedules in order to minimize the potential for winter-run and fall-run Chinook salmon redd dewatering. Our concurrence is based on Reclamation implementing the following monthly average Keswick release schedule (in cubic feet per second):

Exceedance	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**
90%	17,000	6,000	8,500	10,000	12,000	10,500	8,500	7,000
50%	20,000	8,500	9,500	10,000	12,000	11,000	10,000	9,000

Should Reclamation need to change the release schedule, NMFS expects close coordination between our agencies to ensure that the habitat needs (*i.e.*, cold water, stable flows) of winter-run Chinook salmon continue to be met. In addition, NMFS requests to work with Reclamation on real-time management during the temperature management season. It will be critically important this year to target a 55°F 7DADM temperature at CCR (or most downstream winter-run redd) as the compliance criterion and location.

[5] Sacramento River above Clear Creek (CCR) (river mile 292) California Data Exchange Center gauge station

Thank you for the recent discussions with your staff in meeting the requirements in RPA Action I.2.3. As you know, on January 19, 2017[6], NMFS issued to Reclamation a draft proposed 2017 RPA amendment, focused on Shasta RPA Action Suite I.2. As part of the amendment process, Reclamation agreed[7] to implement a pilot program for Shasta Reservoir temperature management in water year 2017 to make Keswick releases to maintain a temperature compliance point not in excess of: (1) 58.0°F DAT at Jellys Ferry as a surrogate temperature target of 61.0°F 7DADM from March 1 through May 15, and (2) 53.0°F DAT at CCR or to the downstream-most winter-run redd, as a surrogate temperature target of 55.0°F 7DADM, from the start of winter-run spawning, based on CDFW aerial redd or carcass surveys, through 100 percent winter-run emergence. I look forward to further communication between our agencies as we work on the annual Temperature Management Plan pursuant to RPA Action I.2.4 and the pilot program pursuant to the draft proposed 2017 RPA amendment.

NMFS also looks forward to working with Reclamation on the upcoming stakeholder engagement meetings to discuss the details of the proposed amendment to the Shasta RPA. We expect this dialogue with stakeholders will provide helpful context to supplement our ongoing conversations about how to manage Shasta resources for water supply and species over the long-term. If you have any questions regarding this letter, please feel free to contact me, or have your staff contact Mr. Brycen Swart at (916) 930-3712, or via e-mail at brycen.swart@noaa.gov.

Sincerely,

Maria C. Rea
Assistant Regional Administrator

Enclosures:

1. 90 and 50 percent exceedance forecasts (2 pages)
2. Shasta Reservoir cold water storage in the March 8, 2017, model run and forecasted end of May vs. historic data (2 pages)
3. Shasta Reservoir end of April storage potential for meeting compliance point target of 56°F
4. 90 and 50 percent exceedance temperature model runs (2 pages)
5. RAFT and temperature-dependent mortality model results for the 90 and 50 percent exceedance forecasts

cc: California Central Valley Office
Division Chron File: 151422SWR2006SA00268

[6] http://www.westcoast.fisheries.noaa.gov/publications/Central_Valley/Water%20Operations/nmfs_s_draft_proposed_2017_rpa_amendment_-_january_19__2017.pdf

[7] http://www.westcoast.fisheries.noaa.gov/publications/Central_Valley/Water%20Operations/reclamation_s_response_to_nmfs_s_draft_proposed_2017_rpa_amendment_-_january_25__2017.pdf

Electronic copy only:

Mr. Paul Souza, Regional Director, Pacific Southwest Region, U.S. Fish and Wildlife Service, 2800 Cottage Way, Sacramento, California 95825
Ms. Kaylee Allen, Field Supervisor, Bay Delta Fish and Wildlife Office, U.S. Fish and Wildlife Service, 650 Capitol Mall, Suite 8-300, Sacramento, California 95814
Mr. Chuck Bonham, Director, California Department of Fish and Wildlife, 1416 Ninth Street, Sacramento, California 95814
Mr. William Croyle, Acting Director, California Department of Water Resources, 1416 Ninth Street, Sacramento, California 95814
Ms. Cindy Messer, Chief Deputy Director, California Department of Water Resources, 1416 Ninth Street, Sacramento, California 95814
Mr. John Leahigh, Operations Control Office, California Department of Water Resources, 3310 El Camino Ave, Suite 300, Sacramento, California 95821
Mr. Pablo Arroyave, Acting Regional Director, Mid-Pacific Region, Bureau of Reclamation, 2800 Cottage Way, Sacramento, California 95825
Ms. Michelle Banonis, Area Manager, Bay-Delta Office, Bureau of Reclamation, 801 I Street, Suite 140, Sacramento, California 95814
Mr. Tom Howard, Executive Director, State Water Resources Control Board, 1001 I St, Sacramento, California 95814

Estimated CVP Operations Mar 2017 90% Exceedance

Storages

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

		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Trinity	**1922**	**2007**	**2111**	**2127**	**1992**	**1846**	**1722**	**1606**	**1574**				
	Elev.	2341	2349	2350	2340	2330	2321	2312	2309				
Whiskeytown	**224**	**206**	**238**	**238**	**238**	**238**	**238**	**230**	**206**				
	Elev.	1199	1209	1209	1209	1209	1209	1207	1199				
Shasta	**3779**	**3804**	**4225**	**4248**	**4026**	**3577**	**3169**	**2903**	**2716**				
	Elev.	1040	1056	1057	1049	1032	1015	1003	995				
Folsom	**404**	**580**	**759**	**966**	**944**	**784**	**647**	**539**	**415**				
	Elev.	426	445	465	463	448	434	421	405				
New Melones	**1578**	**1668**	**1712**	**1875**	**1990**	**1973**	**1919**	**1876**	**1846**				
	Elev.	1021	1025	1041	1051	1050	1045	1041	1038				
San Luis	**923**	**966**	**938**	**828**	**624**	**323**	**133**	**113**	**71**				
	Elev.	543	534	510	480	446	424	417	404				
Total		9231	9984	10282	9814	8741	7827	7268	6829				

State End of the Month Reservoir Storage (TAF)

Oroville	
	Elev.
San Luis	
Total San Luis (TAF)	

Monthly River Releases (TAF/cfs)

Trinity	TAF	18	32	260	150	68	28	27	23
	cfs	**300**	**540**	**4,225**	**2,526**	**1,102**	**450**	**450**	**373**
Clear Creek	TAF	11	13	13	9	7	5	9	14
	cfs	**175**	**218**	**216**	**150**	**120**	**85**	**150**	**225**
Sacramento	TAF	1045	357	523	595	738	645	506	430
	cfs	**17000**	**6000**	**8500**	**10000**	**12000**	**10500**	**8500**	**7000**
American	TAF	492	357	400	387	307	246	215	159
	cfs	**8000**	**6000**	**6500**	**6500**	**5000**	**4000**	**3618**	**2588**
Stanislaus	TAF	61	83	96	56	18	18	18	49
	cfs	**1000**	**1400**	**1555**	**940**	**300**	**300**	**300**	**797**
Feather	TAF								
	cfs								

Trinity Diversions (TAF)

	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Carr PP	34	38	37	67	98	97	92	17				
Spring Crk. PP	**60**	**8**	**30**	**60**	**90**	**90**	**90**	**30**				

Delta Summary (TAF)

		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Tracy		128	104	98	262	271	272	267	95				
USBR Banks		0	0	0	0	0	0	0	33				
Contra Costa		12.7	12.7	12.7	9.8	11.1	12.7	14.0	16.8				
Total USBR		141	117	111	272	282	285	281	145				
State Export													
Total Export													
COA Balance		0	0	0	0	0	0	-15	-16				
Old/Middle River Std.													
Old/Middle R. calc.		6,339	2,807	2,527	-3,388	-8,333	-8,358	-6,706	-4,244				
Computed DOI		72048	39233	33706	18558	8182	7109	11397	11403				
Excess Outflow		42848	16776	12184	4875	179	114	0	0				
% Export/Inflow		5%	8%	8%	28%	46%	49%	38%	30%				
% Export/Inflow std.		35%	35%	35%	35%	65%	65%	65%	65%				

Hydrology

	Trinity		Shasta		Folsom		New Melones	
Water Year Inflow (TAF)	1850		8,859		6,865		2417	
Year to Date + Forecasted % of mean	153%		160%		252%		229%	

3/17/2017

Estimated CVP Operations Mar 50% Exceedance

Storages

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

		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Trinity	**1922**	**2055**	**2223**	**2289**	**2197**	**2076**	**1928**	**1814**	**1785**				
	Elev.	2345	2356	2360	2354	2346	2336	2328	2326				
Whiskeytown	**224**	**206**	**238**	**238**	**238**	**238**	**238**	**230**	**206**				
	Elev.	1199	1209	1209	1209	1209	1209	1207	1199				
Shasta	**3779**	**3854**	**4308**	**4420**	**4213**	**3809**	**3468**	**3178**	**2949**				
	Elev.	1042	1059	1063	1055	1041	1027	1015	1005				
Folsom	**404**	**618**	**739**	**957**	**945**	**889**	**698**	**574**	**451**				
	Elev.	430	443	464	463	458	439	425	410				
New Melones	**1578**	**1711**	**1763**	**1939**	**2135**	**2166**	**2109**	**2062**	**1961**				
	Elev.	1025	1030	1047	1064	1067	1062	1058	1049				
San Luis	**923**	**966**	**1057**	**958**	**774**	**387**	**133**	**79**	**215**				
	Elev.	543	536	518	502	463	436	420	417				
Total		9411	10327	10800	10502	9565	8574	7937	7567				

State End of the Month Reservoir Storage (TAF)

Oroville	
San Luis	
Total San Luis (TAF)	

Monthly River Releases (TAF/cfs)

Trinity	TAF	18	46	248	275	68	28	27	23
	cfs	**300**	**767**	**4,032**	**4,617**	**1,102**	**450**	**450**	**373**
Clear Creek	TAF	11	13	13	9	7	7	9	12
	cfs	**175**	**218**	**216**	**150**	**120**	**120**	**150**	**200**
Sacramento	TAF	1229	506	584	595	738	676	595	492
	cfs	**20000**	**8500**	**9500**	**10000**	**12000**	**11000**	**10000**	**8000**
American	TAF	492	506	523	565	307	307	238	198
	cfs	**8000**	**8500**	**8500**	**9500**	**5000**	**5000**	**4000**	**3219**
Stanislaus	TAF	74	97	120	65	26	25	24	123
	cfs	**1200**	**1633**	**1958**	**1100**	**429**	**400**	**400**	**2000**
Feather	TAF								
	cfs								

Trinity Diversions (TAF)

	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Carr PP	66	51	9	13	97	128	91	16				
Spring Crk. PP	**110**	**30**	**10**	**10**	**90**	**120**	**90**	**30**				

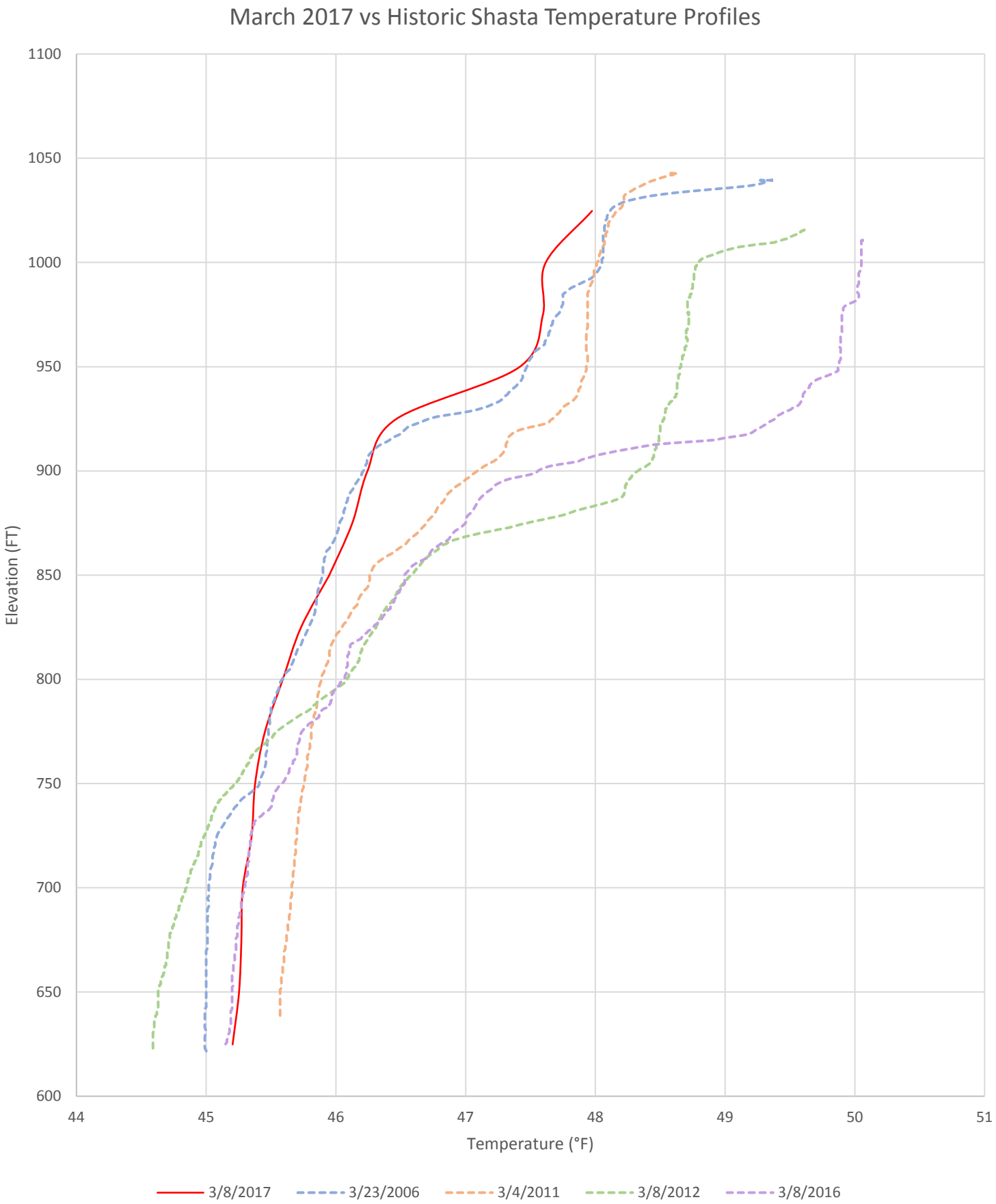
Delta Summary (TAF)

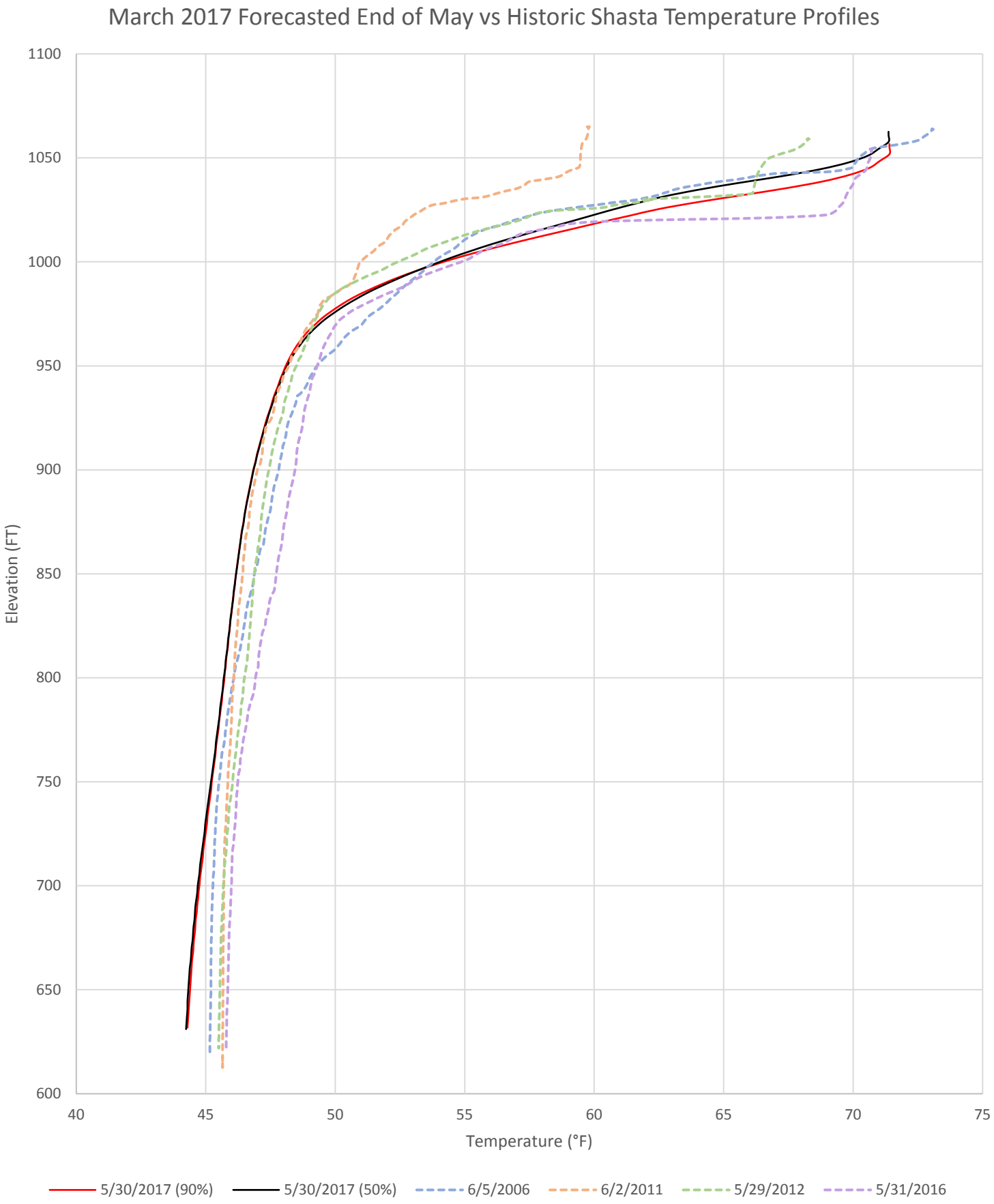
		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Tracy		132	253	154	262	270	273	265	270				
USBR Banks		0	0	0	0	0	0	0	44				
Contra Costa		12.7	12.7	12.7	9.8	11.1	12.7	14.0	16.8				
Total USBR		145	266	166	272	281	286	279	331				
State Export													
Total Export													
COA Balance		0	0	0	0	0	0	0	13				
Old/Middle River Std.													
Old/Middle R. calc.		6,379	6,044	4,608	-4,205	-7,227	-8,085	-5,723	-4,744				
Computed DOI		85029	72382	52755	30543	10509	10395	11800	11403				
Excess Outflow		55829	46142	26255	10220	2505	390	403	0				
% Export/Inflow		4%	6%	8%	24%	43%	44%	35%	35%				
% Export/Inflow std.		35%	35%	35%	35%	65%	65%	65%	65%				

Hydrology

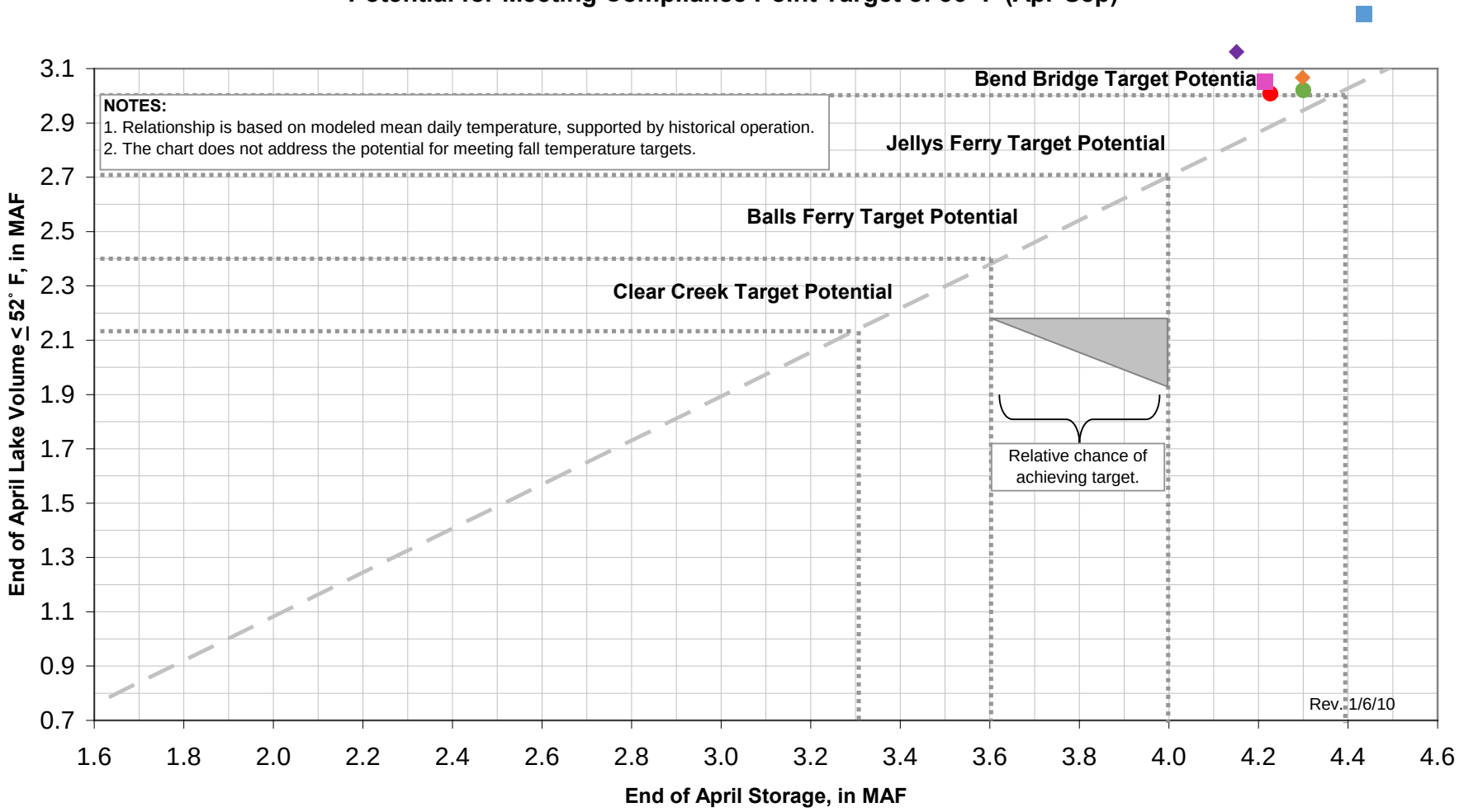
	Trinity		Shasta		Folsom		New Melones	
Water Year Inflow (TAF)	2179		9,619		7,434		2687	
Year to Date + Forecasted % of mean	180%		174%		273%		254%	

3/17/2017


March 2017 vs Historic Shasta Temperature Profiles
1100
1050
1000
950
900
850
800
750
700
650
600
Elevation (FT)
44
45
46
47
48
49
50
51
Temperature (°F)
3/8/2017
3/23/2006
3/4/2011
3/8/2012
3/8/2016

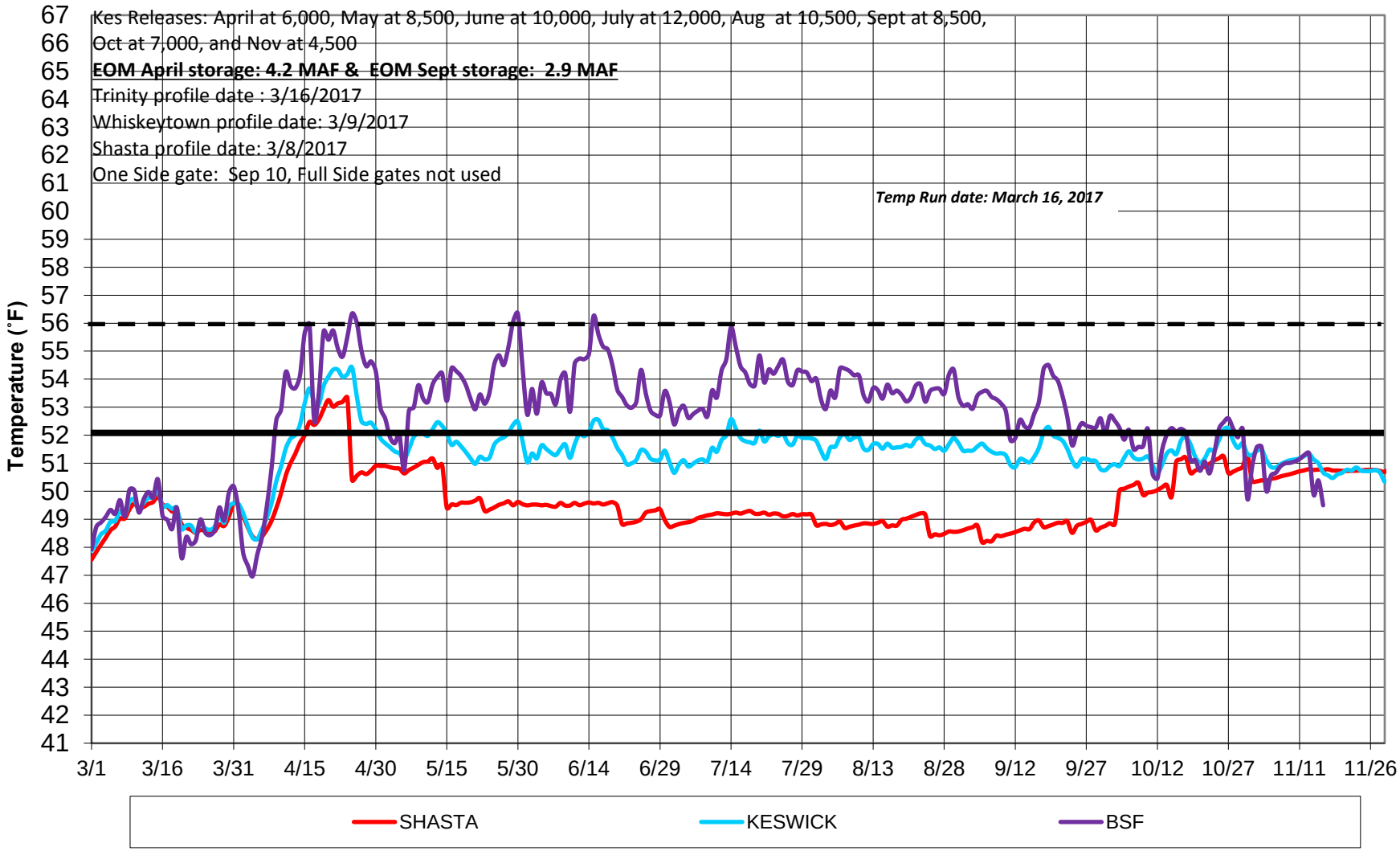

March 2017 Forecasted End of May vs Historic Shasta Temperature Profiles
Elevation (FT)
1100
1050
1000
950
900
850
800
750
700
650
600
40
45
50
55
60
65
70
75
Temperature (°F)
5/30/2017 (90%)
5/30/2017 (50%)
6/5/2006
6/2/2011
5/29/2012
5/31/2016

Lake Shasta End of April Storage
Potential for Meeting Compliance Point Target of 56˚ F (Apr-Sep)

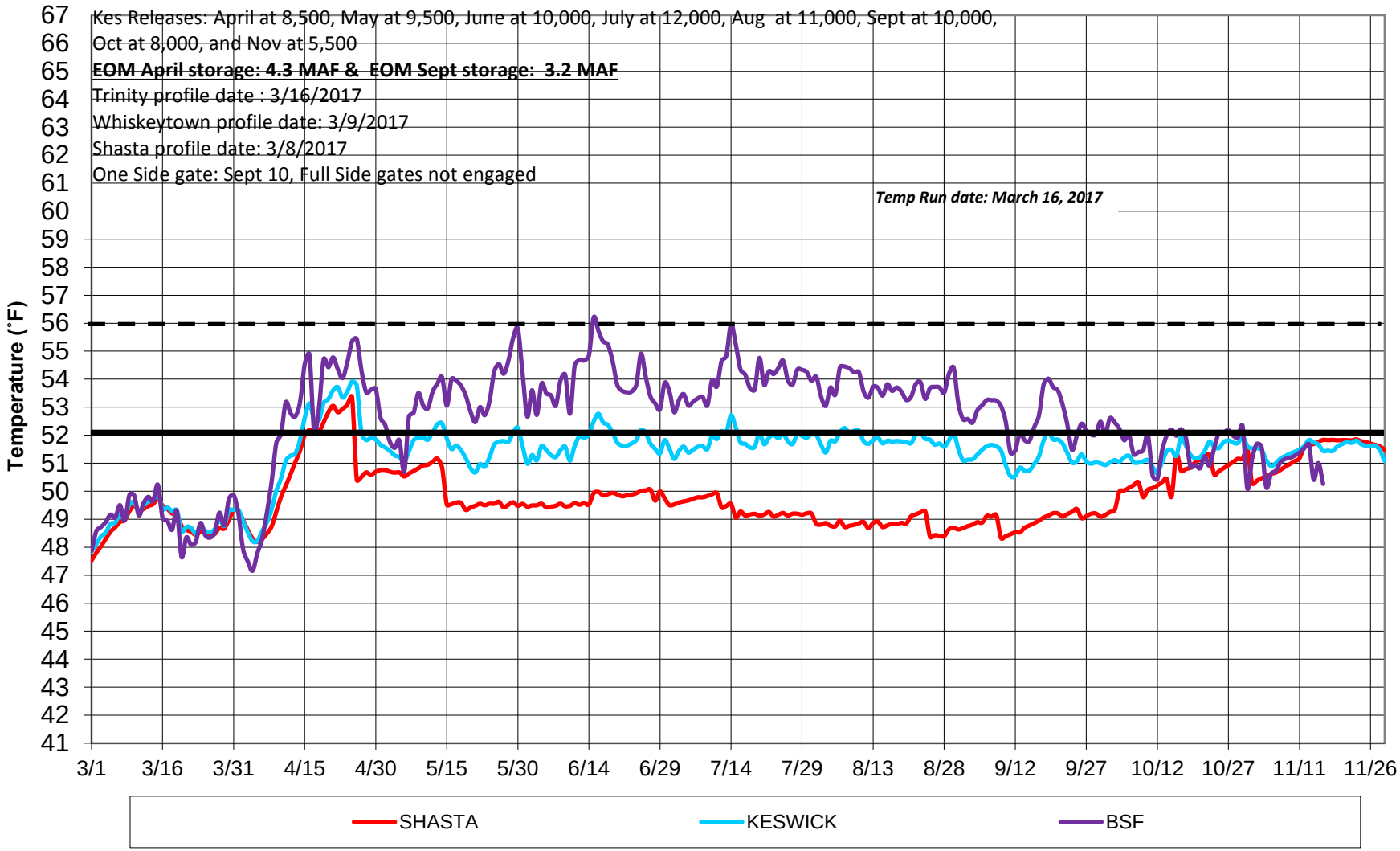


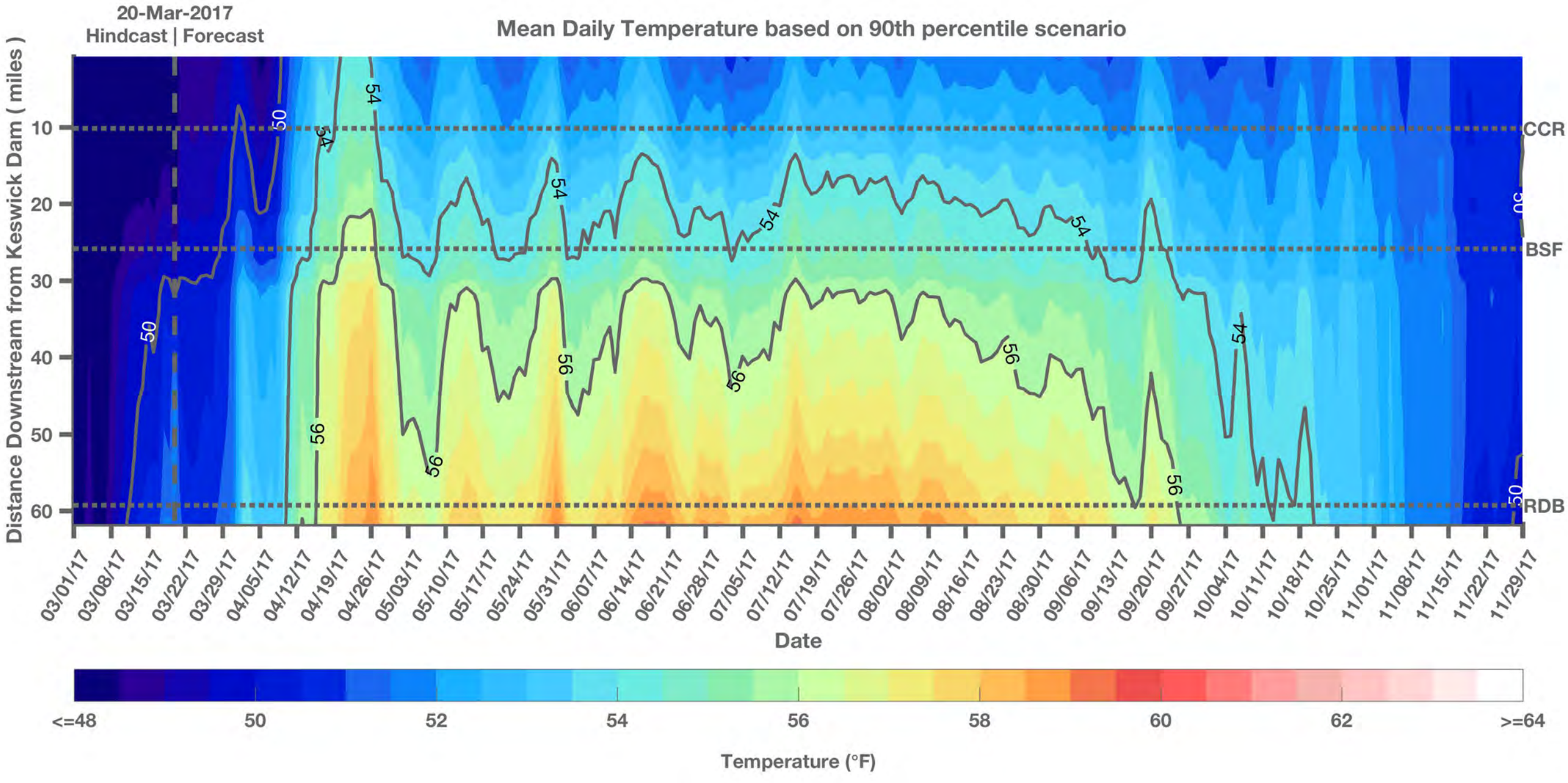
2017 (90%) 2017 (50%) 2006 2011 2012 2016

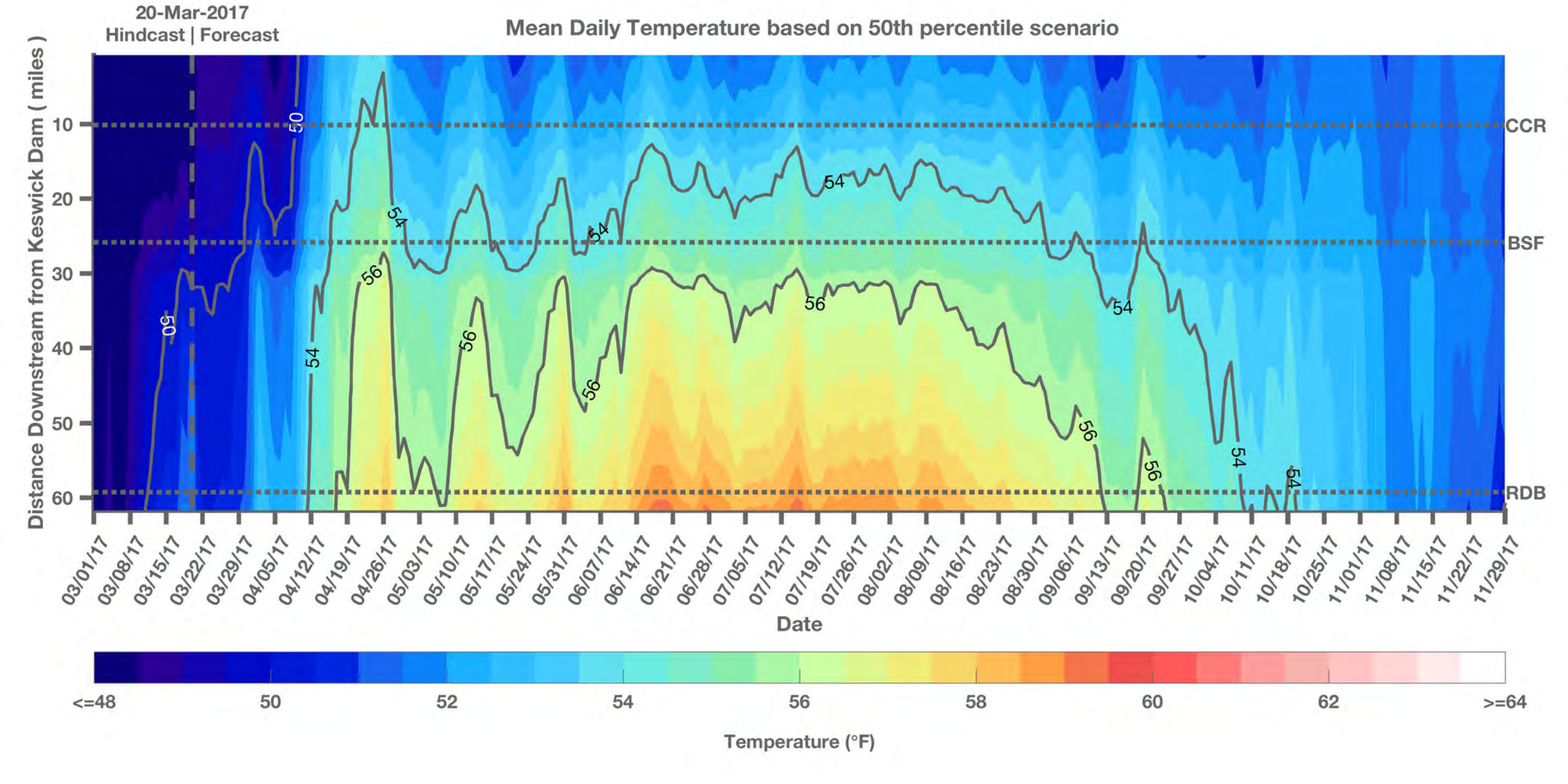
Sacramento River Modeled Temperature
2017 Mar 90%-Exceedance Water Outlook - Average Historical Meteorology
Approximately 52 degree at Keswick

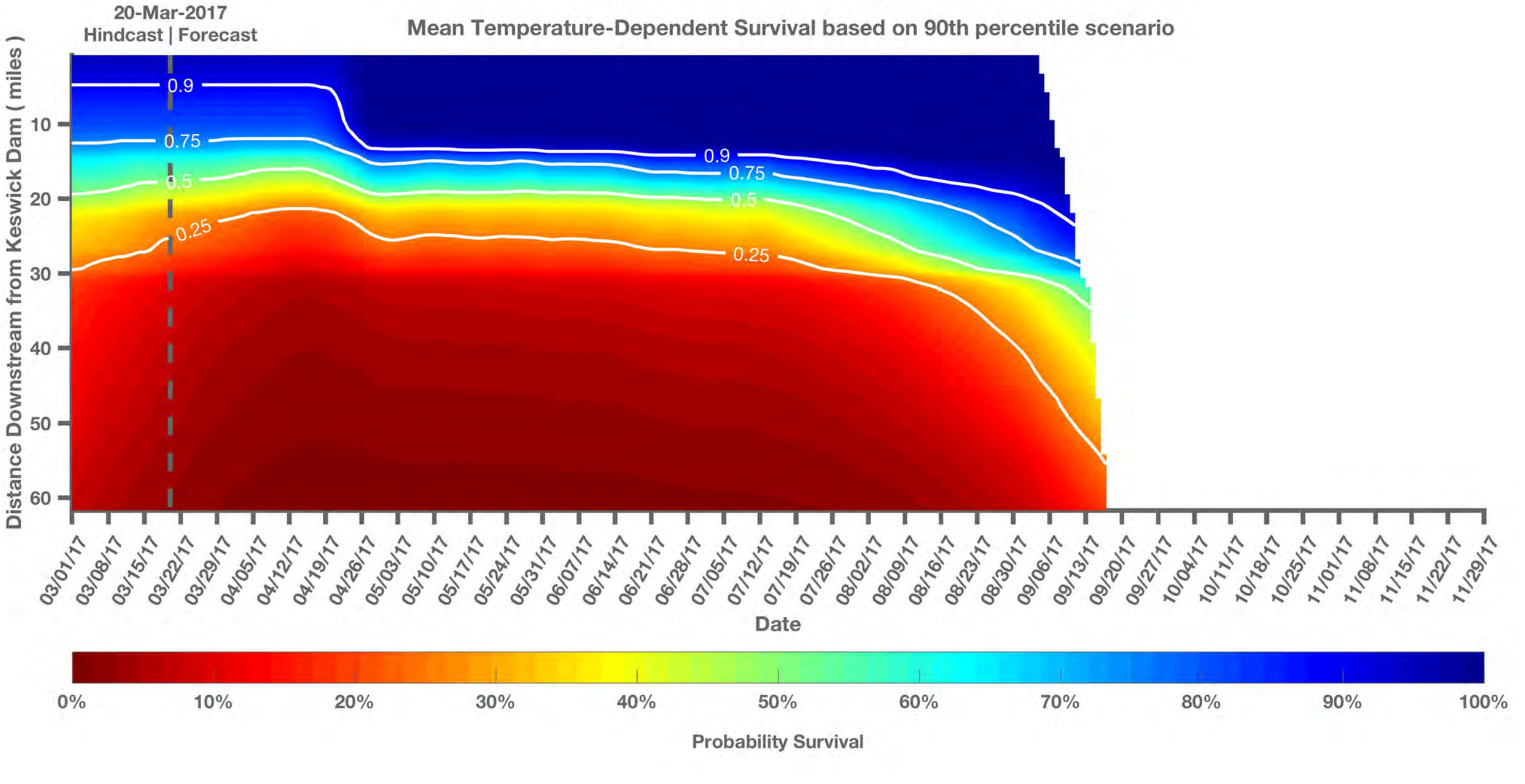


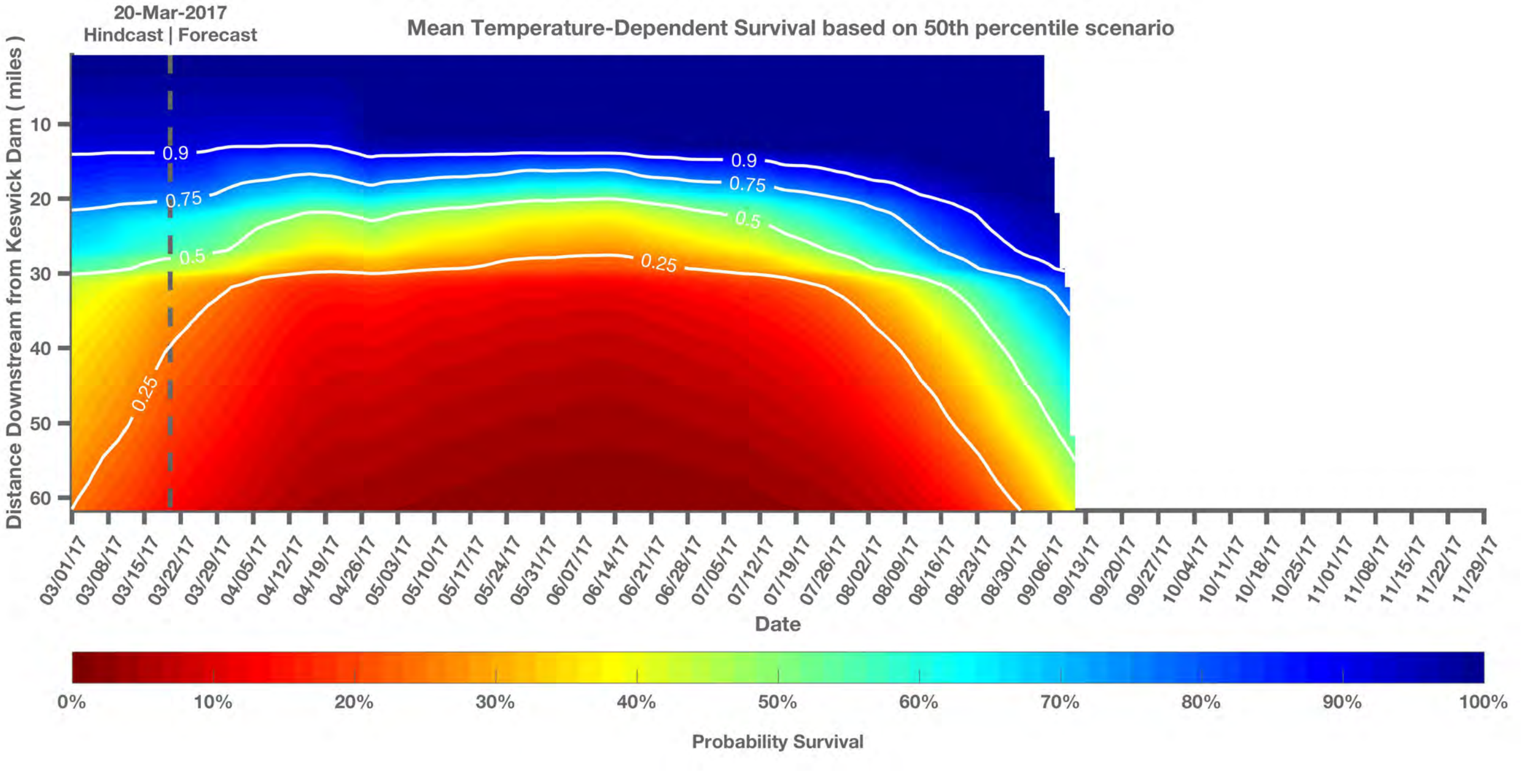
Sacramento River Modeled Temperature
2017 Mar 50%-Exceedance Water Outlook - Average Historical Meteorology
Approximately 52 degree at Keswick

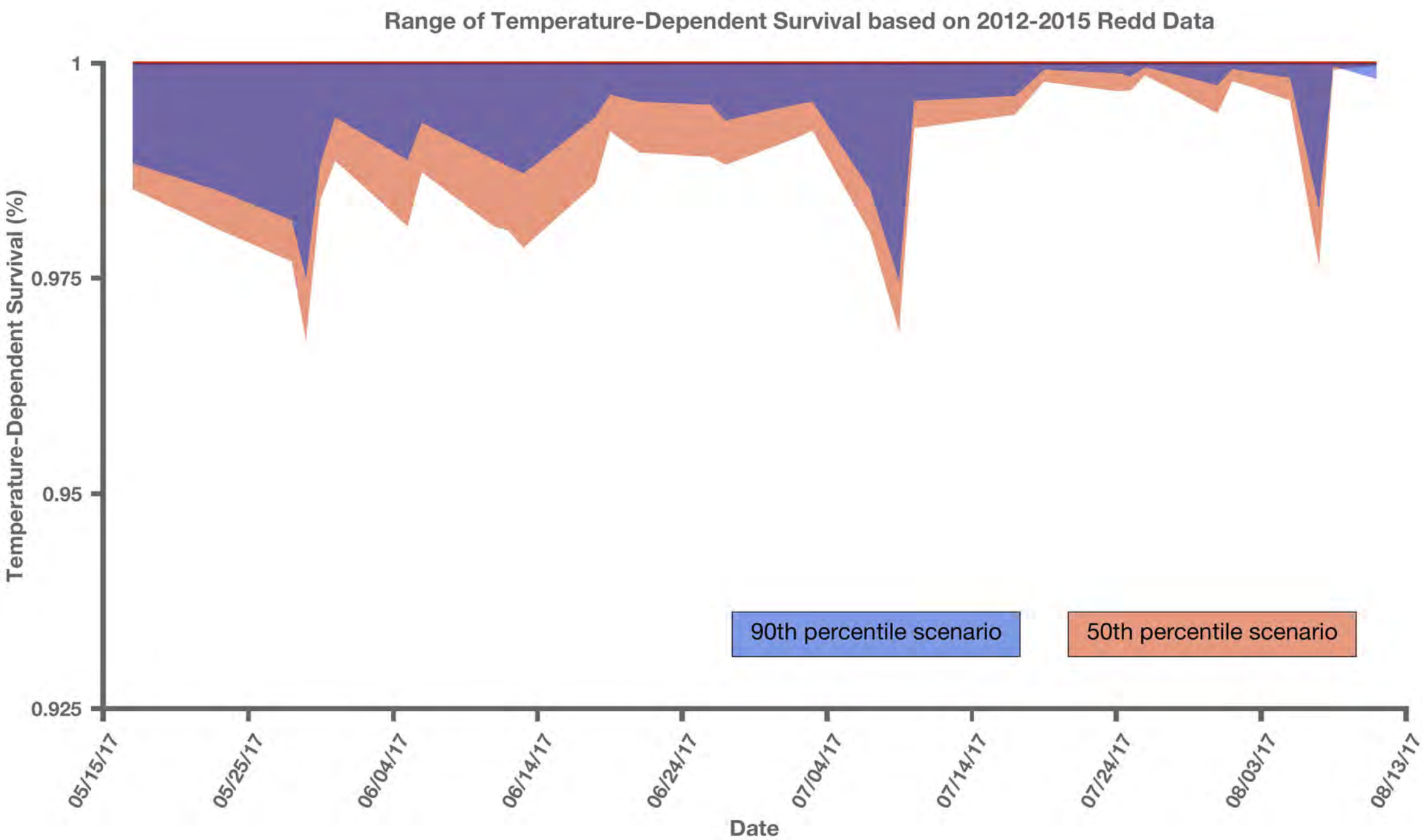



20-Mar-2017
Hindcast | Forecast
Mean Daily Temperature based on 90th percentile scenario
Distance Downstream from Keswick Dam (miles)
10
20
30
40
50
60
CCR
BSF
RDB
50
54
56
Date
03/01/17
03/08/17
03/15/17
03/22/17
03/29/17
04/05/17
04/12/17
04/19/17
04/26/17
05/03/17
05/10/17
05/17/17
05/24/17
05/31/17
06/07/17
06/14/17
06/21/17
06/28/17
07/05/17
07/12/17
07/19/17
07/26/17
08/02/17
08/09/17
08/16/17
08/23/17
08/30/17
09/06/17
09/13/17
09/20/17
09/27/17
10/04/17
10/11/17
10/18/17
10/25/17
11/01/17
11/08/17
11/15/17
11/22/17
11/29/17
<=48
50
52
54
56
58
60
62
>=64
Temperature (°F)


20-Mar-2017
Hindcast | Forecast
Mean Daily Temperature based on 50th percentile scenario
Distance Downstream from Keswick Dam (miles)
10
20
30
40
50
60
CCR
BSF
RDB
50
54
56
03/01/17
03/08/17
03/15/17
03/22/17
03/29/17
04/05/17
04/12/17
04/19/17
04/26/17
05/03/17
05/10/17
05/17/17
05/24/17
05/31/17
06/07/17
06/14/17
06/21/17
06/28/17
07/05/17
07/12/17
07/19/17
07/26/17
08/02/17
08/09/17
08/16/17
08/23/17
08/30/17
09/06/17
09/13/17
09/20/17
09/27/17
10/04/17
10/11/17
10/18/17
10/25/17
11/01/17
11/08/17
11/15/17
11/22/17
11/29/17
Date
<=48
50
52
54
56
58
60
62
>=64
Temperature (°F)


20-Mar-2017
Hindcast | Forecast
Mean Temperature-Dependent Survival based on 90th percentile scenario
Distance Downstream from Keswick Dam (miles)
10
20
30
40
50
60
0.9
0.75
0.5
0.25
0.9
0.75
0.5
0.25
03/01/17
03/08/17
03/15/17
03/22/17
03/29/17
04/05/17
04/12/17
04/19/17
04/26/17
05/03/17
05/10/17
05/17/17
05/24/17
05/31/17
06/07/17
06/14/17
06/21/17
06/28/17
07/05/17
07/12/17
07/19/17
07/26/17
08/02/17
08/09/17
08/16/17
08/23/17
08/30/17
09/06/17
09/13/17
09/20/17
09/27/17
10/04/17
10/11/17
10/18/17
10/25/17
11/01/17
11/08/17
11/15/17
11/22/17
11/29/17
Date
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Probability Survival


20-Mar-2017
Hindcast | Forecast
Mean Temperature-Dependent Survival based on 50th percentile scenario
Distance Downstream from Keswick Dam (miles)
10
20
30
40
50
60
0.9
0.75
0.5
0.25
0.9
0.75
0.5
0.25
03/01/17
03/08/17
03/15/17
03/22/17
03/29/17
04/05/17
04/12/17
04/19/17
04/26/17
05/03/17
05/10/17
05/17/17
05/24/17
05/31/17
06/07/17
06/14/17
06/21/17
06/28/17
07/05/17
07/12/17
07/19/17
07/26/17
08/02/17
08/09/17
08/16/17
08/23/17
08/30/17
09/06/17
09/13/17
09/20/17
09/27/17
10/04/17
10/11/17
10/18/17
10/25/17
11/01/17
11/08/17
11/15/17
11/22/17
11/29/17
Date
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Probability Survival


Range of Temperature-Dependent Survival based on 2012-2015 Redd Data
Temperature-Dependent Survival (%)
1
0.975
0.95
0.925
90th percentile scenario
50th percentile scenario
05/15/17
05/25/17
06/04/17
06/14/17
06/24/17
07/04/17
07/14/17
07/24/17
08/03/17
08/13/17
Date

Percent Temperature-dependent Mortality

Run	Mean	Median	2.5 - 97.5 Percentiles
Scenario_50_Percentile	1.83	0.08	0.047 - 19.17
Scenario_90_Percentile	1.69	0.079	0.049 - 16.02

Enclosure 3

United States Department of the Interior

BUREAU OF RECLAMATION
Central Valley Operations Office
3310 El Camino Avenue, Suite 300
Sacramento, California 95821

IN REPLY
REFER TO:

APR 12 2017

CVO-100
WTR-2.00

VIA ELECTRONIC MAIL

Ms. Maria Rea
Assistant Regional Administrator
California Central Valley Area Office
National Marine Fisheries Service
650 Capitol Mall, Suite 5-100
Sacramento, CA 95814

Subject: Transmittal of March 2017 Reservoir Operations Forecasts Per RPA I.2.3

Dear Ms. Rea:

This letter is in response to your March 21, 2017, letter regarding transmittal of the March 2017 Reservoir Operations Forecast pursuant to the National Marine Fisheries Service (NMFS) Biological Opinion. The Bureau of Reclamation (Reclamation) appreciates the rapid response you provided to our transmittal of the operational forecasts. However, Reclamation would like to clarify several items from your response. We believe that these clarifications will be important as we prepare for this year's temperature management plans for the Sacramento River.

Page 3 of your letter states that *"NMFS concurs with Reclamation's forecasts based on March 8, 2017, hydrologic conditions, and initial water supply allocations, that RPA Action I.2.3.A should be implemented this year, and that a 55°F 7DADM temperature will be attainable at CCR."*

Reclamation's transmittal does not comment on the ability to meet a 55°F seven day average daily maximum (7DADM) temperature, but instead outlines likely accomplishment of daily average temperature (DAT) metrics. Our transmittal states that the release temperature from Keswick Dam used for our forecasts *"should be adequate to manage temperatures downstream to the gage near the confluence with Clear Creek (CCR gage location) within a 53° F DAT, as well as a target of 56° F DAT between Balls Ferry and Jellys Ferry this year."*

Page 3 of your letter states that *"It will be critically important this year to target a 55°F 7DADM temperature at CCR (or most downstream winter-run redd) as the compliance criterion and location."* In addition, page 4 of your letter states that *"As part of the amendment process, Reclamation agreed to implement a pilot program for Shasta Reservoir temperature management in water year 2017 to make Keswick releases to maintain a temperature*

compliance point not in excess of: (1) 58.0°F DAT at Jellys Ferry as a surrogate temperature target of 61.0°F 7DADM from March 1 through May 15, and (2) 53.0°F DAT at CCR or to the downstream-most winter-run redd, as a surrogate temperature target of 55.0°F 7DADM, from the start of winter-run spawning, based on CDFW aerial redd or carcass surveys, through 100 percent winter-run emergence."

Reclamation does not agree with these statements. Our January 25, 2017 letter to NMFS (which is cited in the second statement) outlined the operational study during 2017, to be *"a study in which the CVP is operated to meet a temperature target of 53.0° daily average temperature (DAT) near the Clear Creek Confluence as a surrogate for a target of 55.0° seven day average daily maximum (7DADM) at the most downstream winter-run redd during the 2017 temperature management season."* Reclamation's March 17, 2017, transmittal further reiterated that concept, stating: *"That study would provide for operations targeting 53° F DAT near the Clear Creek confluence as a surrogate for a target of 55° F seven day average daily maximum at the most downstream winter run redd this coming season."* Reclamation also did not commit to the holding temperature operations, nor a compliance criterion and location of 55°F 7DADM at the CCR gage location, nor a location at the downstream-most winter-run redd.

Specific to the issue of the location of temperature compliance under the proposed study, Reclamation notes that operations to attain temperature at a particular redd are not practicable due to the lack of continuous, telemetered, quality-assured temperature monitoring at a potentially variable location. For this reason, Reclamation has specifically identified the "CCR" gage as a surrogate to the most downstream redd, subject to development of an alternative strategy as outlined in the footnote of our January 25, 2017, transmittal in the event that a redd is detected considerably further downstream of the majority of the redds. Also for clarification, the study was not necessarily intended to run through full 100% of winter-run emergence, but rather, the end date may need to be a topic of further discussion based on other considerations such as flowrates going into the fall and winter, and how those relate to storage and cold water pool management as well as fall run redd dewatering.

Page 3 of your letter states that NMFS's *"concurrence is based on Reclamation implementing the following monthly average Keswick release schedule"*, and provides the projected flowrates from the 90% exceedance and 50% exceedance forecasts. Reclamation notes that the two CVP operational outlooks are based on different hydrologic runoff conditions, each yielding distinct operational scenarios. These outlooks, with different probabilistic hydrologic input assumptions, do not suggest a certain actual future outcome, but rather the statistical likelihood of the event occurring. NMFS's concurrence is therefore based on the likelihood that an average monthly operational performance, for example, may be greater 90% of the time and 10% of the time may be less (in the case of the 90% exceedance forecast).

Similarly, the flows provided in Reclamation's operational outlooks represent average monthly flows, thus performance would be expected to be greater or less than that value 50% of the time. For these reasons, Reclamation does not view these outlooks as providing an exact flowrate or schedule that may be expected, but a general release projection that will likely fall within the ranges of uncertainty outlined above. During the course of the season, actual flowrates are likely

to vary within those ranges based on hydrologic and operational considerations at that time. The forecasted operational information will be updated monthly (or more often) and provided to NMFS as updated data becomes available, and the uncertainties amongst the projections can be expected to decrease as the season progresses.

We hope these clarifications provide a clearer understanding of the information transmitted by Reclamation to NMFS, and will be helpful as we interact on the development of our temperature management plan over the next two months. We look forward to the development of that plan, and a successful temperature management season in 2017. Should you have questions or wish to discuss these items in further detail, please do not hesitate contact me at 916-979-2199.

Sincerely,

Ronald Milligan
Operations Manager

cc: Mr. Barry Thom
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1201 Northeast Lloyd Blvd., Suite 1100
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Continued on next page.

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Enclosure 4

United States Department of the Interior

BUREAU OF RECLAMATION
Central Valley Operations Office
3310 El Camino Avenue, Suite 300
Sacramento, California 95821

IN REPLY
REFER TO:

CVO-100
WTR-2.00

MAY 23 2017

VIA ELECTRONIC MAIL AND U.S. MAIL

Ms. Maria Rea
Assistant Regional Administrator
California Central Valley Area Office
National Marine Fisheries Service
650 Capitol Mall, Suite 5-100
Sacramento, CA 95814

Subject: Transmittal of 2017 Final Sacramento River Temperature Management Plan per Reasonable and Prudent Alternative (RPA) I.2.4 of the National Marine Fisheries Service 2009 Coordinated Long-term Operation of the Central Valley Project (CVP) and State Water Project (SWP) Biological Opinion (NMFS 2009 BiOp)

Dear Ms. Rea:

This letter transmits the Sacramento River Temperature Management Plan (SRTMP) for Water Year 2017. The Bureau of Reclamation (Reclamation) is requesting concurrence from the National Marine Fisheries Service (NMFS) on the SRTMP as required by NMFS 2009 BiOp RPA Action I.2.4.

NMFS 2009 BiOp RPA Action I.2.4 requires Reclamation to submit a series of forecasts of CVP operations and corresponding Sacramento River temperature modeling runs to NMFS for review and concurrence. In accordance with this requirement, Reclamation has provided several sets of forecasts and temperature model runs and worked with NMFS during early spring 2017 to develop a SRTMP to protect the cold water pool in Shasta Reservoir. As you are aware, appropriate management of the Shasta Reservoir cold water pool is important so that suitable spawning and egg/alevin incubation can be maintained in the Sacramento River during the summer and fall season for federally-listed endangered Sacramento River winter-run Chinook salmon and threatened Central Valley spring-run Chinook salmon. This is especially critical given poor conditions for winter-run Chinook salmon during the recent drought years. On March 21, 2017, and clarified by Reclamation in a letter transmitted on April 12, 2017, NMFS concurred with Reclamation's proposed operation and initial water supply allocation based on associated release and temperature management projections, and committed to work with Reclamation to adjust the Keswick release schedules to minimize the potential for winter-run and fall-run Chinook salmon redd dewatering.

The SRTMP represents a balanced approach to management of the cold water pool in Shasta Reservoir during the summer and fall of 2017. Reclamation is recommending an approach that

focuses on maintaining a reasonable temperature target that will maximize protection of the species, while ensuring that the cold water will be able to be fully utilized through the season. This approach will help Reclamation meet other obligations and maintain commitments for operation of the CVP and SWP. The SRTMP has also been developed to limit impacts to other beneficial uses, such as Folsom Reservoir levels, American River temperature management for species protection, Delta water quality, and water supplies for contractors throughout the CVP and SWP. Reclamation has developed this plan utilizing our current understanding of anticipated conditions this summer and fall related to management and operations of other components of the Central Valley's rivers and facilities, including potential operations of Oroville Dam as well as summer and fall fisheries management in the Delta. The plan includes an operation to meet Fall X2 requirements from the Fish and Wildlife Service's 2008 Biological Opinion, assuming adequate contributions from releases at Oroville Dam. Should the expectations of these operations and conditions change, we will coordinate with you and other applicable agencies on the effects of those changes on the SRTMP.

As clarified in Reclamation's April 12, 2017, correspondence the SRTMP consists of a compliance point at Balls Ferry, using 56°F daily average temperature (DAT) metric from May 15 through October 31. The proposed temperature management operation also includes an evaluation study targeting 53°F DAT at the Sacramento River-Clear Creek (CCR) gaging station during the same time frame. This acts as a surrogate location and temperature for 55°F seven day average daily maximum at the most downstream winter-run redd. If redds are monitored farther downstream from the CCR gaging station, the agencies will further discuss any potential changes to the proposed operational study. The study is anticipated to run through winter-run emergence but, as previously noted in Reclamation's April 12, 2017, correspondence and associated discussions between the agencies, this topic may be reevaluated based on other considerations such as anticipated fall and winter releases, storage and cold water pool management, and fall-run redd dewatering.

Preliminary temperature operation modeling results were distributed at the April 27, 2017, Sacramento River Temperature Task Group meeting and again to NMFS on May 10, 2017. Reclamation solicited feedback from members on the proposed operation/simulation results and no comments were received as of the writing of this letter. Additional modeling results are attached based on the most recent runoff forecasts. Please find attached four graphs of the latest temperature modeling results that combine both the 50% and 90% exceedance hydrology forecasts for May with both the 10% and 50% exceedance 3-month meteorological forecasts.

Operational release performance was based on the two probabilistic hydrologic assumptions rather than fixed flowrates; actual release operations are expected to be within the specified ranges based on the hydrologic and operational considerations at that time. Results show end of September storage in Shasta Reservoir of about 3.3 million acre-feet. The suite of results indicated high likelihood of accomplishing temperature management and that partial side gate use of the Shasta Reservoir Temperature Control Device would begin between late August and early September.

As you know, RPA Action I.2.4 requires that Reclamation achieve DATs between May 15 and October 31 "[n]ot in excess of 56°F at compliance locations between Balls Ferry and Bend Bridge" from June through October of each year. It also requires Reclamation to manage Shasta Reservoir in a way that provides "cold water releases from Shasta Reservoir to provide suitable

habitat temperatures . . . in the Sacramento River between Keswick Dam and Bend Bridge, while retaining sufficient carryover storage to manage for next year's cohorts." Given the terms of RPA Action I.2.4 and the commitments above, Reclamation believes this proposed SRTMP is fully compliant with the NMFS 2009 BiOp and the guidance provided in your March 21, 2017, concurrence letter and Reclamation's clarification on April 12, 2017. We therefore request your concurrence on the SRTMP as required under RPA Action I.2.4.

Reclamation proposes to conduct monitoring and tracking of the performance of this SRTMP through the Sacramento River Temperature Task Group (SRTTG). The Shasta Water Interagency Management group that has been developed in recent years would only become involved if necessary to address issues that cannot be resolved through the SRTTG.

We look forward to working with you and your staff as we manage water resources and temperature this water year. Should you have questions or wish to discuss further, please feel free to contact me at 916-979-2199.

Sincerely,

Ronald Milligan
Operations Manager

Enclosures –6

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Continued on next page.

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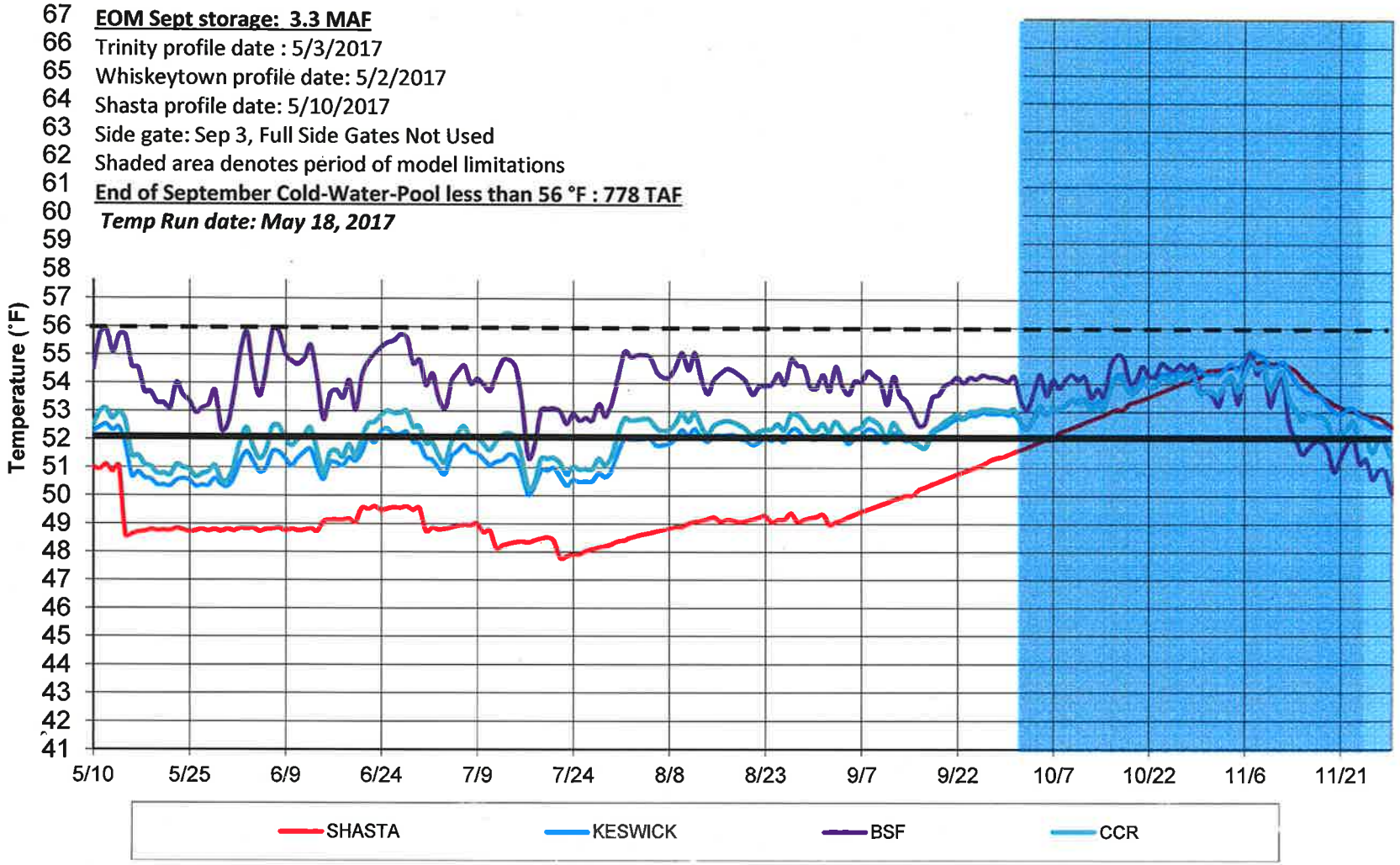
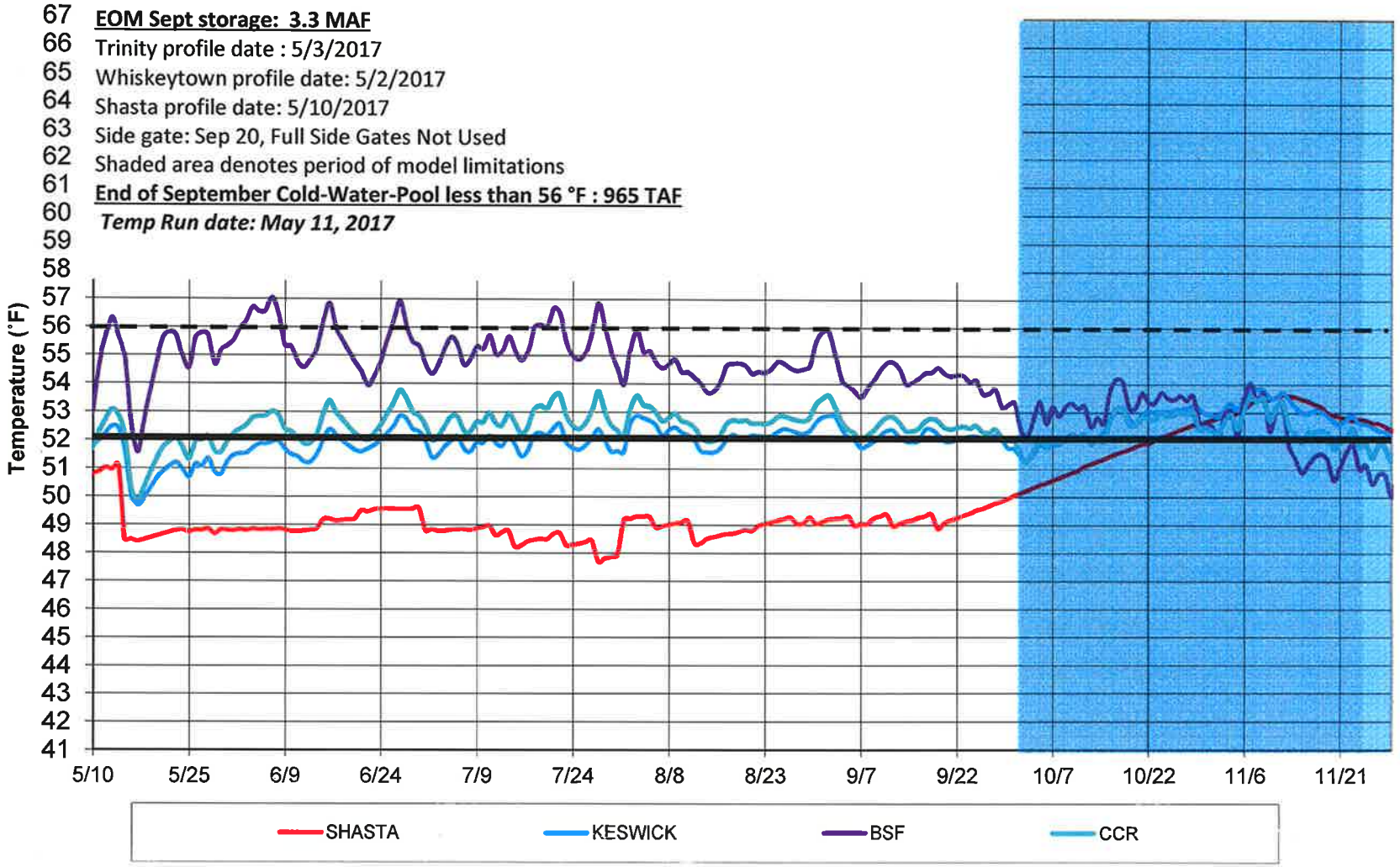
(w/encl to each)

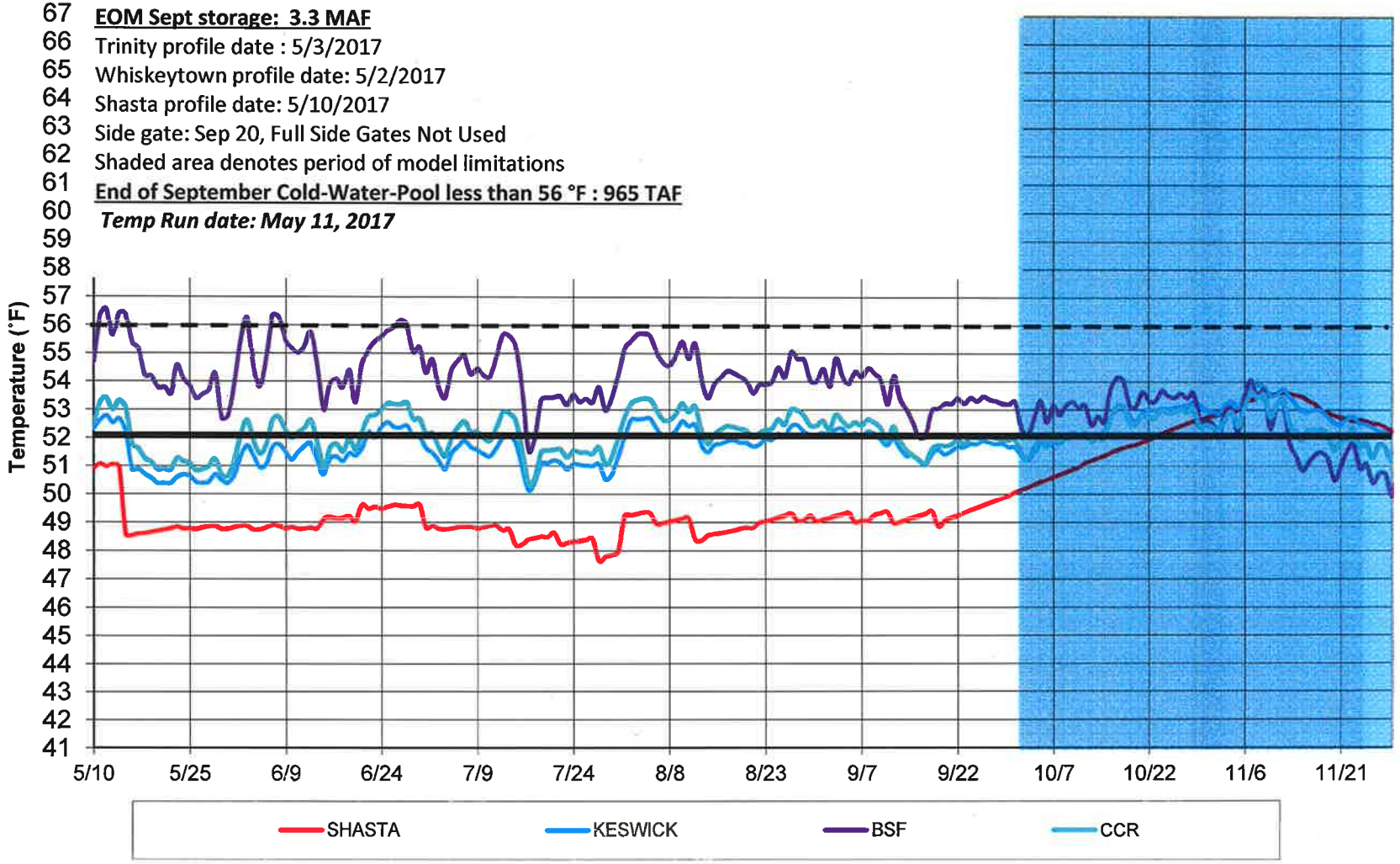
Sacramento River Modeled Temperature
2017 May 50%-Exceedance Water Outlook - L3MTO 50% Meteorology
Target: Approximately 52 degree at Keswick



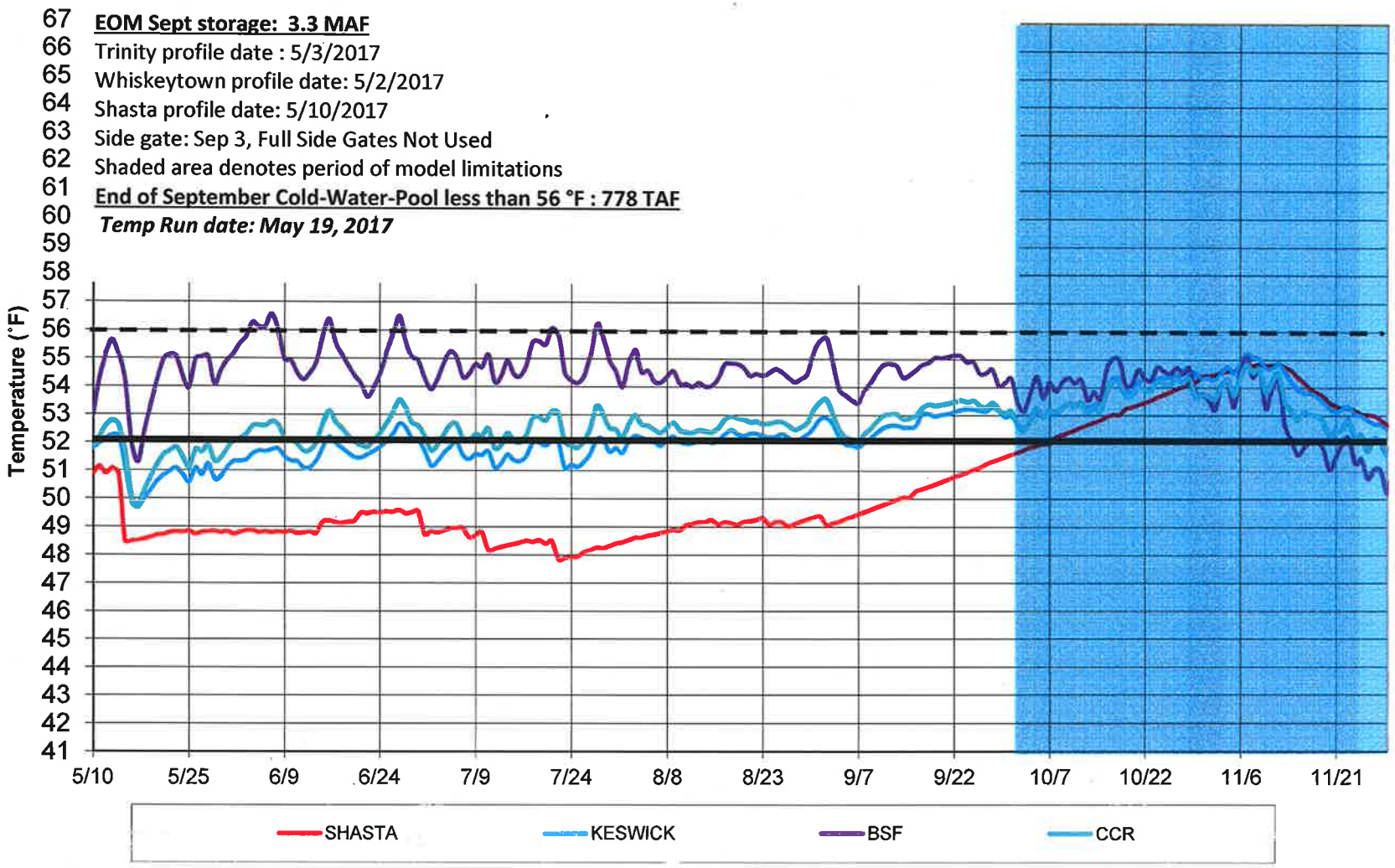
Sacramento River Modeled Temperature
2017 May 90%-Exceedance Water Outlook - L3MTO 10% Meteorology
Target: Approximately 52 degree at Keswick



Sacramento River Modeled Temperature
2017 May 90%-Exceedance Water Outlook - L3MTO 50% Meteorology
Target: Approximately 52 degree at Keswick



Sacramento River Modeled Temperature
2017 May 50%-Exceedance Water Outlook - L3MTO 10% Meteorology
Target: Approximately 52 degree at Keswick



Estimated CVP Operations Apr 50% Exceedance

Storages

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

		May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Trinity	2302	2303	2256	2132	1982	1818	1789						
	Elev.	2361	2358	2350	2340	2328	2326						
Whiskeytown	232	238	238	238	238	230	206						
	Elev.	1209	1209	1209	1209	1207	1199						
Shasta	4263	4409	4269	3898	3571	3345	3116						
	Elev.	1062	1057	1044	1031	1022	1013						
Folsom	724	934	946	925	750	658	597						
	Elev.	462	463	461	445	435	428						
New Melones	2002	1988	2158	2141	2035	1941	1911						
	Elev.	1051	1066	1065	1055	1047	1044						
San Luis	966	909	725	338	83	30	119						
	Elev.	526	506	453	406	387	364						
Total		10781	10591	9671	8659	8022	7737						

State End of the Month Reservoir Storage (TAF)

Oroville	2622	2739	2451	1991	1511	1202	1046						
	Elev.	845	822	782	732	693	671						
San Luis	1032	911	854	664	488	395	151						
Total San Luis (TAF)	1998	1820	1578	1002	571	425	269						

Monthly River Releases (TAF/cfs)

Trinity	TAF	261	172	78	31	77	23						
	cfs	4,246	2,899	1,269	503	1,290	373						
Clear Creek	TAF	13	17	7	7	9	12						
	cfs	216	288	120	120	150	200						
Sacramento	TAF	799	714	738	676	535	492						
	cfs	13000	12000	12000	11000	9000	8000						
American	TAF	553	595	307	307	208	135						
	cfs	9000	10000	5000	5000	3500	2201						
Stanislaus	TAF	307	89	74	74	71	52						
	cfs	5001	1500	1200	1200	1200	842						
Feather	TAF	799	714	553	553	416	184						
	cfs	13000	12000	9000	9000	7000	3000						

Trinity Diversions (TAF)

	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Carr PP	125	111	102	128	91	16						
Spring Crk. PP	120	100	95	120	90	30						

Delta Summary (TAF)

		May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Tracy		195	262	270	273	265	222						
USBR Banks		0	0	0	0	0	44						
Contra Costa		12.7	9.8	11.1	12.7	14.0	16.8						
Total USBR		208	272	281	286	279	283						
State Export		195	390	410	410	395	142						
Total Export		403	662	691	696	674	425						
COA Balance		0	0	0	0	0	0						
Old/Middle River Std.													
Old/Middle R. calc.		3,759	-4,041	-7,089	-7,505	-7,495	-4,412						
Computed DOI		66110	41738	16463	14185	13918	11403						
Excess Outflow		37480	17869	8459	10183	2521	0						
% Export/Inflow		9%	20%	35%	38%	40%	34%						
% Export/Inflow std.		35%	35%	65%	65%	65%	65%						

Hydrology

	Trinity		Shasta		Folsom		New Melones	
Water Year Inflow (TAF)	2436		10,264		7,760		2854	
Year to Date + Forecasted % of mean	202%		185%		285%		270%	

5/22/2017

Estimated CVP Operations 90% Exceedance

Storages

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

		May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Trinity	2302	2306	2249	2117	1967	1800	1770						
	Elev.	2361	2358	2349	2339	2327	2324						
Whiskeytown	232	238	238	238	238	230	206						
	Elev.	1209	1209	1209	1209	1207	1199						
Shasta	4263	4356	4220	3867	3533	3315	3097						
	Elev.	1060	1056	1043	1030	1021	1012						
Folsom	724	933	956	889	698	614	514						
	Elev.	462	464	458	439	430	418						
New Melones	2022	2028	2170	2110	2010	1921	1890						
	Elev.	1055	1067	1062	1053	1045	1042						
San Luis	966	919	713	412	221	194	159						
	Elev.	532	506	472	446	442	411						
Total		10781	10546	9633	8667	8075	7636						

State End of the Month Reservoir Storage (TAF)

Oroville	2622	2677	2447	1938	1406	1078	953						
	Elev.	840	822	777	719	676	657						
San Luis	1032	974	867	783	711	703	457						
Total San Luis (TAF)	1998	1893	1580	1195	932	897	616						

Monthly River Releases (TAF/cfs)

Trinity	TAF	261	172	78	31	77	23						
	cfs	4,246	2,899	1,269	503	1,290	373						
Clear Creek	TAF	13	17	7	7	9	12						
	cfs	216	288	120	120	150	200						
Sacramento	TAF	676	654	676	645	506	461						
	cfs	11000	11000	11000	10500	8500	7500						
American	TAF	523	506	307	307	196	135						
	cfs	8500	8500	5000	5000	3300	2196						
Stanislaus	TAF	280	56	68	68	65	49						
	cfs	4550	940	1100	1100	1100	797						
Feather	TAF	768	595	523	523	416	154						
	cfs	12500	10000	8500	8500	7000	2500						

Trinity Diversions (TAF)

	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Carr PP	87	115	103	129	92	16						
Spring Crk. PP	75	100	95	120	90	30						

Delta Summary (TAF)

		May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Tracy		162	260	271	272	260	102						
USBR Banks		0	0	0	0	0	33						
Contra Costa		12.7	9.8	11.1	12.7	14.0	16.8						
Total USBR		175	270	282	285	274	152						
State Export		206	260	410	410	395	58						
Total Export		381	530	692	695	669	210						
COA Balance		0	0	0	0	0	0						
Old/Middle River Std.													
Old/Middle R. calc.		2,792	-4,021	-7,512	-7,538	-7,476	-2,325						
Computed DOI		51535	28996	12526	11761	11548	11403						
Excess Outflow		22904	9884	4522	7760	151	0						
% Export/Inflow		10%	21%	39%	41%	43%	19%						
% Export/Inflow std.		35%	35%	65%	65%	65%	65%						

Hydrology

		Trinity		Shasta		Folsom	New Melones
Water Year Inflow (TAF)		2388		9,974		7,584	2736
Year to Date + Forecasted	% of mean	198%		180%		279%	259%

5/22/2017

Enclosure 5

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
650 Capitol Mall, Suite 5-100
Sacramento, California 95814-4700

JUN 01 2017

Mr. Pablo Arroyave
Acting Regional Director
Mid-Pacific Region
U.S. Bureau of Reclamation
2800 Cottage Way
Sacramento, California 95825

Re: 2017 Final Sacramento River Temperature Management Plan

Dear Mr. Arroyave:

Thank you for your May 23, 2017, letter transmitting the 2017 Final Sacramento River Temperature Management Plan (SRTMP). For purposes of compliance with the reasonable and prudent alternative (RPA) Action I.2.4[1], described in NOAA's National Marine Fisheries Service's (NMFS) biological opinion (issued June 4, 2009) on the long-term operations of the Central Valley Project and State Water Project (CVP/SWP Opinion), the U.S. Bureau of Reclamation (Reclamation) is required to submit a SRTMP to NMFS for concurrence. The SRTMP is required to meet a daily average water temperature (DAT) not in excess of 56°F at a compliance location between Balls Ferry and Bend Bridge from May 15 through September 30 for protection of Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawytscha*), and not in excess of 56°F DAT at the same compliance location from October 1 through October 31 for protection of Central Valley spring-run Chinook salmon (*O. tshawytscha*), whenever possible. The objective of RPA Action I.2.4 is to manage the cold water storage within Shasta Reservoir and make cold water releases from Shasta Reservoir to provide suitable habitat temperatures for winter-run Chinook salmon, spring-run Chinook salmon, California Central Valley steelhead (*O. mykiss*), and the Southern distinct population segment of North American green sturgeon (*Acipenser medirostris*) in the Sacramento River between Keswick Dam and Bend Bridge, while retaining sufficient carryover storage to manage for next year's cohorts.

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1 http://www.westcoast.fisheries.noaa.gov/publications/Central_Valley/Water%20Operations/Operations,%20Criteria%20and%20Plan/040711_ocap_opinion_2011_amendments.pdf

Consultation History

On March 17, 2017, Reclamation sent NMFS water temperature modeling results and the initial water supply allocations for 2017 based on the 50% and 90% exceedance reservoir operations forecasts, and a data set that simulated meteorological conditions through the season at the historic average. Reclamation projected maintenance of release temperatures from Keswick Dam at 52°F through the entire management season, which is associated with the ability to manage DAT not to exceed 56°F between Balls Ferry and Jellys Ferry. Reclamation also projected that the pilot study target of 53°F DAT at the Clear Creek California Data Exchange Center gaging station (CCR) could also be achieved for the brood year 2017 temperature management season. Both the 50% and 90% exceedance forecasts projected end-of-September storage in Shasta Reservoir of at least 2.2 MAF.

On March 21, 2017, based on the projected end-of-September storage in Shasta Reservoir of at least 2.2 MAF and temperature model runs meeting a Balls Ferry temperature compliance point, NMFS concurred with Reclamation, that RPA Action 1.2.3.A should be implemented in Water Year 2017. In addition, NMFS committed to work with Reclamation to adjust the Keswick release schedules to minimize the potential for winter-run Chinook salmon redd dewatering and to stabilize flows for fall-run Chinook salmon spawning and egg incubation.

On April 12, 2017, Reclamation sent NMFS a response to the March 21, 2017 concurrence letter which clarified commitments for temperature management and Keswick releases. Specifically,

- Reclamation commits to, under the pilot study, meet a 53°F DAT near the Clear Creek confluence (measured at the "CCR" gaging station) but not a 55°F 7-day average of the daily maximum temperatures (7DADM) either at the CCR gage location, nor at the location of the downstream most winter-run redd.

- Reclamation did not commit to running the study through the entire winter-run emergence, but rather, stated that the end date needed to be a topic for future discussion.

- Reclamation noted that the projected Keswick release schedules were based on 50% and 90% exceedance forecasts and that actual flowrates were expected to vary within those ranges based on hydrologic and operational considerations at the time.

Reclamation's May 23, 2017, Sacramento River Temperature Management Plan

On May 23, 2017, Reclamation submitted its SRTMP to NMFS and requested concurrence that it was consistent with RPA Action I.2.4 in NMFS' CVP/SWP Opinion. In summary, Reclamation's plan consists of:

- Compliance point at Balls Ferry using the 56°F DAT metric from May 15 through October 31.
- Partial side gate use of the Shasta Reservoir Temperature Control Device would begin between late August and early September

- An evaluation study that will target 53°F DAT at the CCR gaging station during the same time frame. This acts as a surrogate location and temperature for 55°F 7DADM at the most downstream winter-run redd.

    - The study will evaluate the system-wide impacts of revised temperature management values, locations, and metrics on CVP operations, the environment, and/or impacts to other ESA listed species.
    - If redds are observed downstream of the CCR gaging station, the agencies will discuss potential changes to the evaluation study.
    - The study is anticipated to run through full winter-run emergence, but the duration may be re-evaluated based on other considerations such as anticipated fall and winter releases, storage and cold water pool management, and fall-run redd dewatering.

- Monitoring and tracking of the performance of the SRTMP through the Sacramento River Temperature Task Group (SRTTG), with the Shasta Water Interagency Management (SWIM) group convened only if necessary to address issues that can't be resolved by the SRTTG.

Summary and Expectations

The following are NMFS' summary conclusions and expectations based on Reclamation's proposed SRTMP:

- NMFS has reviewed Reclamation's proposed SRTMP. Within the range of hydrologic and meteorological scenarios modeled, the SRTMP is expected to provide generally suitable water temperatures for incubating winter-run Chinook salmon eggs and fry in brood year 2017.

- NMFS notes that Reclamation has been operating to achieve the 53°F DAT compliance point at CCR since May 2, 2017.

- Reclamation will operate in a manner to avoid any exceedance of 56.0°F DAT at Balls Ferry, and Reclamation will promptly implement steps to reduce the temperature to the compliance criterion to deal with any unforeseen transitions to periods of very high air temperatures and to assure that any exceedance is minimized.

- Enclosed is a summary document comparing the four SRTMP scenarios provided by Reclamation on May 23, 2017, to the 50% exceedance scenario provided on March 17, 2017.

    - Inputs from each scenario were used to generate daily average Sacramento River water temperatures using the River Assessment for Forecasting Temperatures (RAFT) model and associated temperature-dependent egg mortality, and survival estimates were generated using the NMFS temperature-dependent mortality model for the 2017 temperature management season.

- Mortality estimates assumed that redds would be distributed according to the composite distribution of redds observed 2012-2015.
- The document provides a summary plot, a summary table of temperature-dependent egg mortality estimates, and detailed plots for the temperature outlook and temperature-dependent mortality for each scenario.
- The RAFT model predicts that all scenarios generally meet the 56°F DAT compliance point at Balls Ferry for the duration of the season under proposed operations.
- The four May scenarios have a slight increase in estimated mean mortality (3.2-5.1%) compared to the March scenario (2%). The increase is most likely due to warmer Keswick discharge temperature after September (as seen in Figure 1 of the enclosure).

- The timing for reductions in flows in September and October shall be scheduled in coordination with the fish agencies to reduce the risk of dewatering existing winter-run or spring-run Chinook redds, and to discourage, to the extent possible, the spawning of fall-run Chinook redds in areas that could be dewatered when Keswick releases are reduced further later in the year.

In conclusion, NMFS concurs that Reclamation's proposed SRTMP is consistent with RPA Action I.2.4. We are making this finding based on the modeling results attached to Reclamation's May 23, 2017 letter, our understanding of the water temperature needs of winter-run Chinook salmon, results from the SWFSC application of the RAFT and NMFS temperature-dependent mortality models, and our conclusion that the potential effects of implementing the SRTMP in water year 2017 were considered in the underlying analysis of the CVP/SWP Opinion. Furthermore, the best available scientific and commercial data indicate that implementation of the SRTMP will not exceed levels of take anticipated for implementation of the RPA specified in the CVP/SWP Opinion.

We look forward to continued close coordination with you and your staff throughout this water year.

If you have any questions regarding this letter, please contact me at barry.thom@noaa.gov or (503) 231-6266, or Maria Rea at maria.rea@noaa.gov or (916) 930-3600.

Sincerely,

for Barry A. Thom
Regional Administrator

Enclosure

cc: California Central Valley Office
Division Chron File: ARN 151422SWR2006SA00268

Electronic copy only:

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Summary Document for May 24th, 2017 Shasta/Keswick Operational Scenarios
Prepared by the Southwest Fisheries Science Center on May 25th, 2017

Below are results comparing the March 16th 2017 Input_50 scenario using historical meteorology to four scenarios received May 24th, 2017. Scenarios differ by hydrology (Input 50 or 90 percent exceedance) and air temperature (10 or 50 exceedance of L3MTO). Inputs from scenarios are used to generate daily average Sacramento River water temperatures using the RAFT model and associated temperature-dependent egg mortality and survival estimates using the NMFS temperature mortality model (Martin et al. 2017) for the 2017 temperature management season.

Further details of modeling methods are at: http://oceanview.pfeg.noaa.gov/CVTEMP/

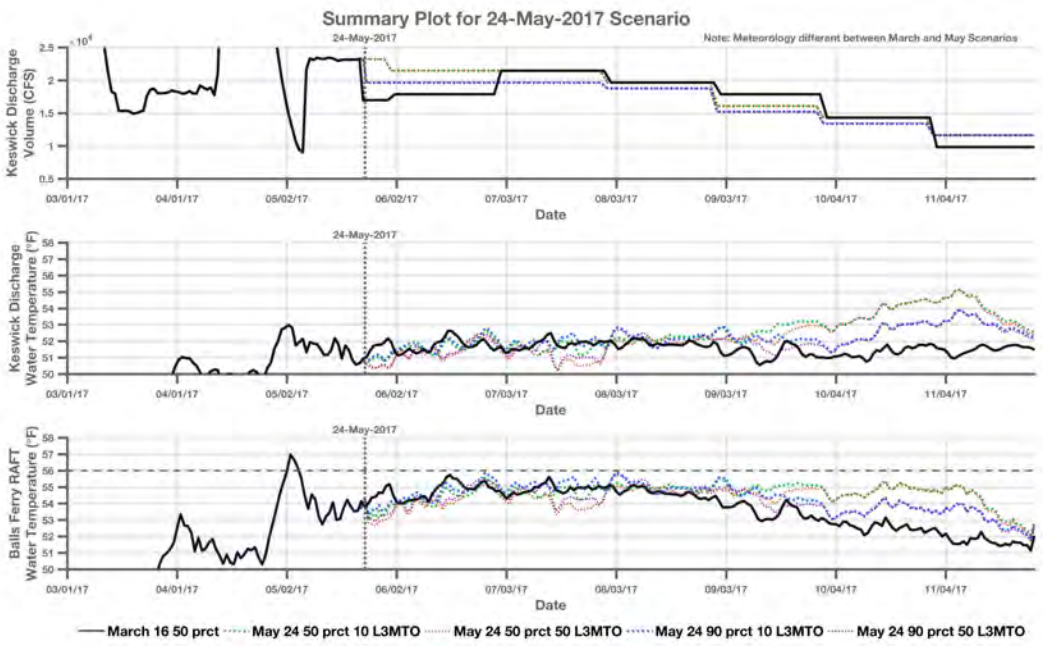

Figure 1: Summary plots showing differences in Keswick discharge volume and temperature, and Balls Ferry RAFT predicted temperature for five scenarios assessed.

Table 1: Estimated temperature-dependent egg mortality under different scenarios assuming a 2012-2015 spatial and temporal redd distribution.

Scenario	Mean (%)	Median (%)	Lower (%)	Upper (%)
March_16_2017_INPUT_50_OUTPUT_50	2.02	0.15	0.63	19.94
May_24_2017_INPUT_50_OUTPUT_50_10L3MTO	5.12	1.02	0.35	37.89
May_24_2017_INPUT_50_OUTPUT_50_50L3MTO	4.09	1.77	0.94	31.31
May_24_2017_INPUT_90_OUTPUT_90_10L3MTO	3.62	0.10	0.45	35.15
May_24_2017_INPUT_90_OUTPUT_90_50L3MTO	3.19	0.75	0.39	26.58

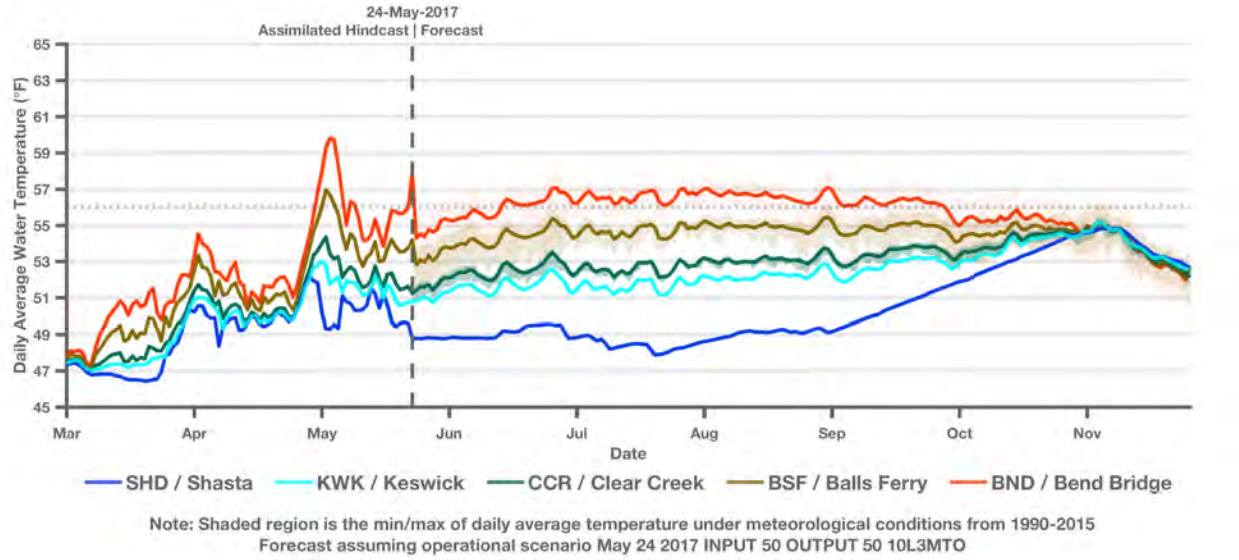

Figure 2: Estimated daily average water temperature produced by scenario input (Shasta and Keswick) and the RAFT model (Clear Creek, Balls Ferry, and Bend Bridge) under the May 24th 2017 Input_50_10_L3MTO scenario.

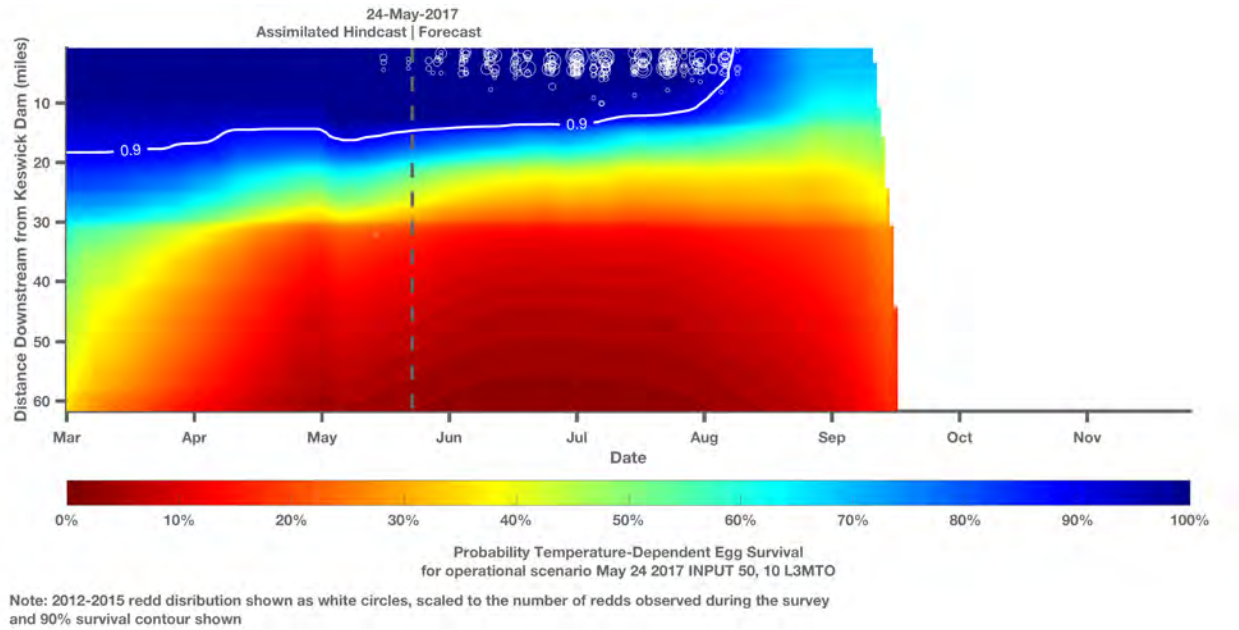

Figure 3: Estimated temperature-dependent egg survival produced by the NMFS temperature mortality model under the May 24th 2017 Input_50_10_L3MTO scenario.

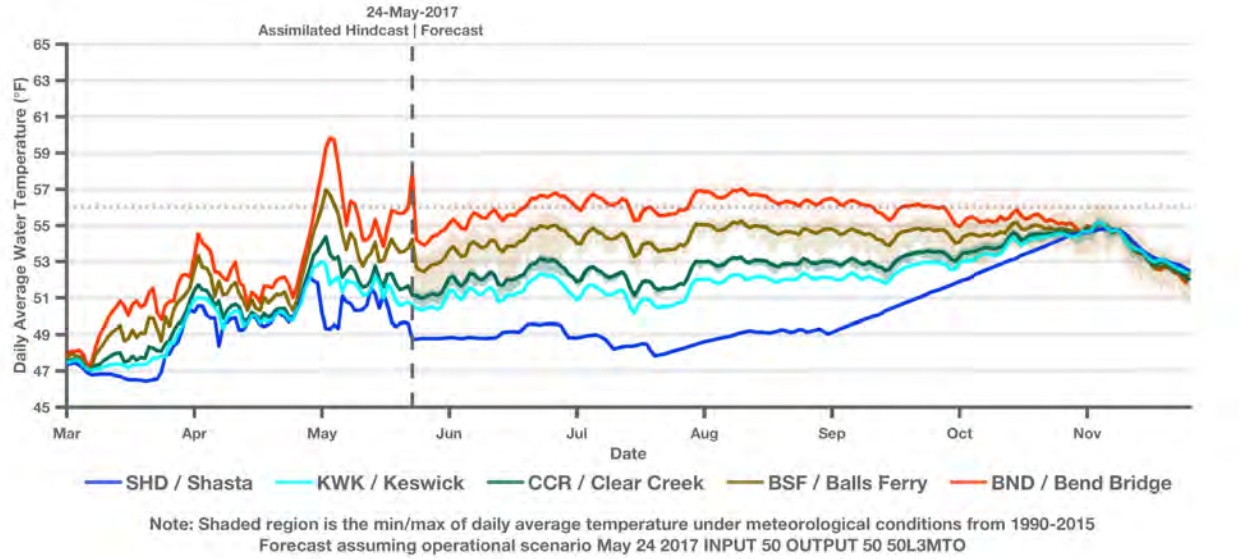

Figure 4: Estimated daily average water temperature produced by scenario input (Shasta and Keswick) and the RAFT model (Clear Creek, Balls Ferry, and Bend Bridge) under the May 24th 2017 Input_50_50_L3MTO scenario.

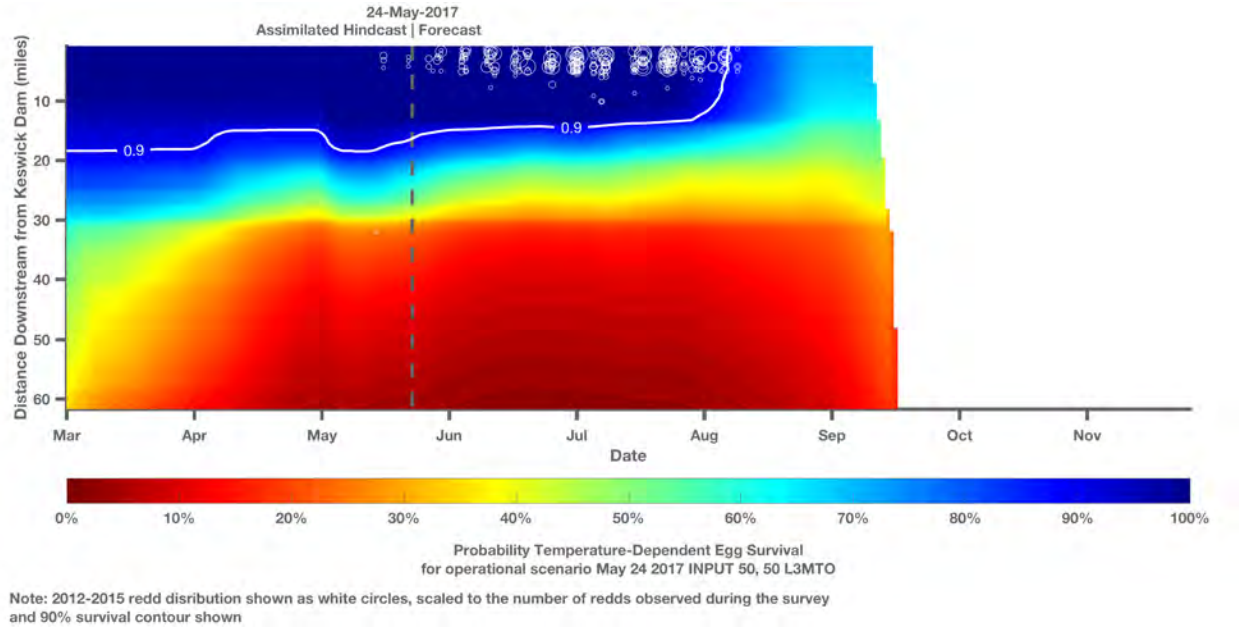

Figure 5: Estimated temperature-dependent egg survival produced by the NMFS temperature mortality model under the May 24th 2017 Input_50_50_L3MTO scenario.

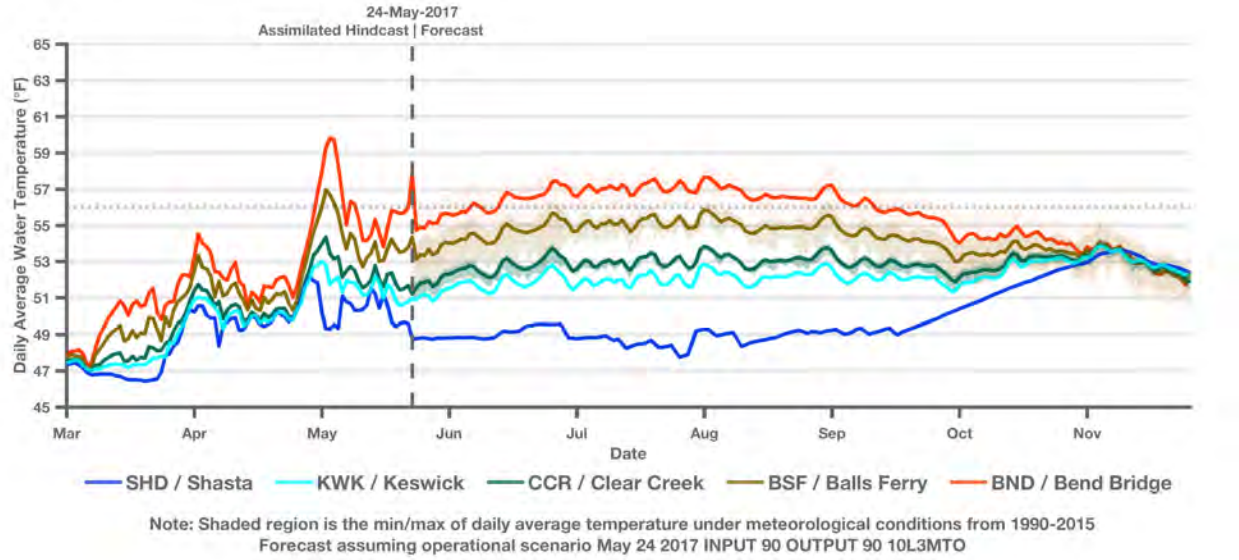

Figure 6: Estimated daily average water temperature produced by scenario input (Shasta and Keswick) and the RAFT model (Clear Creek, Balls Ferry, and Bend Bridge) under the May 24th 2017 Input_90_10_L3MTO scenario.

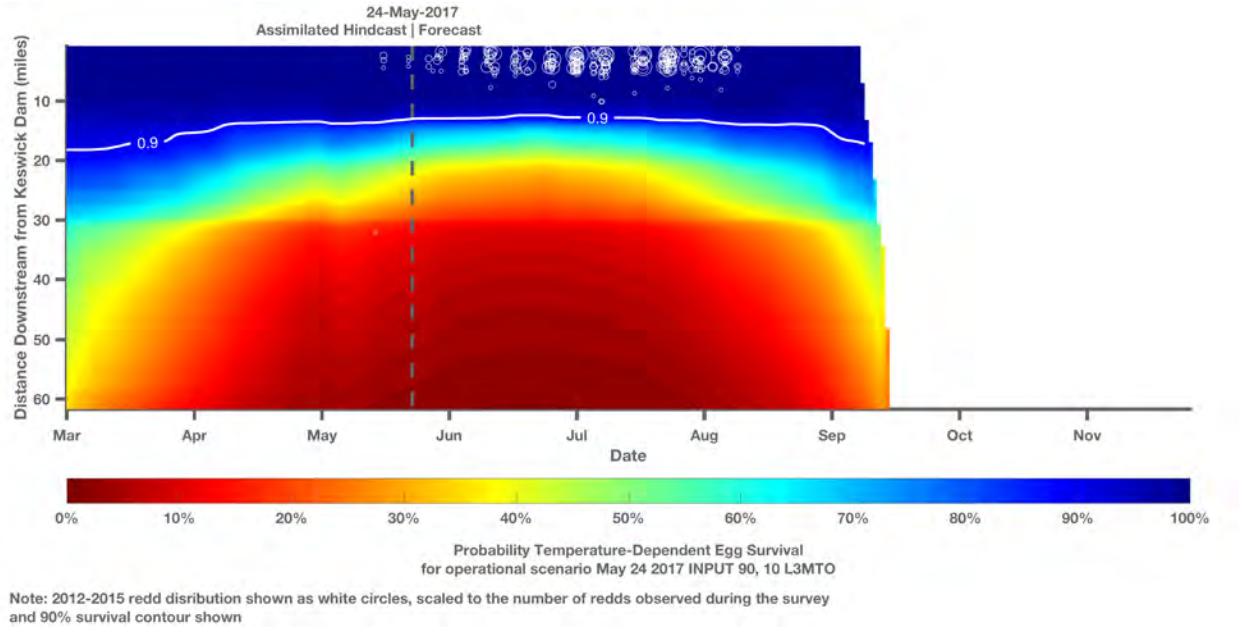

Figure 7: Estimated temperature-dependent egg survival produced by the NMFS temperature mortality model under the May 24th 2017 Input_90_10_L3MTO scenario.

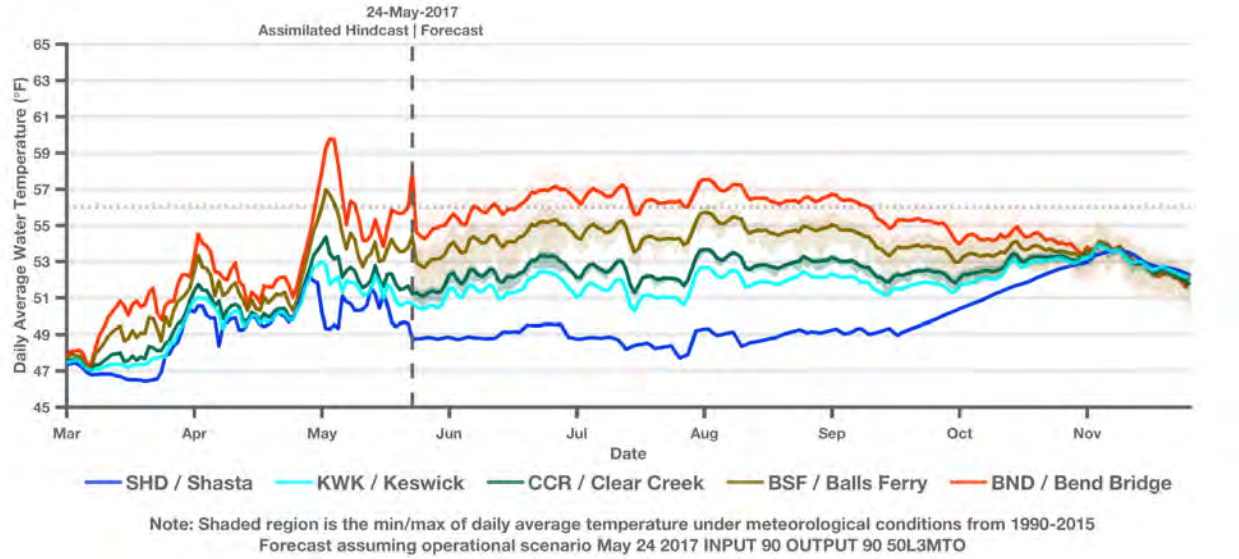

Figure 8: Estimated daily average water temperature produced by scenario input (Shasta and Keswick) and the RAFT model (Clear Creek, Balls Ferry, and Bend Bridge) under the May 24th 2017 Input_90_50_L3MTO scenario.

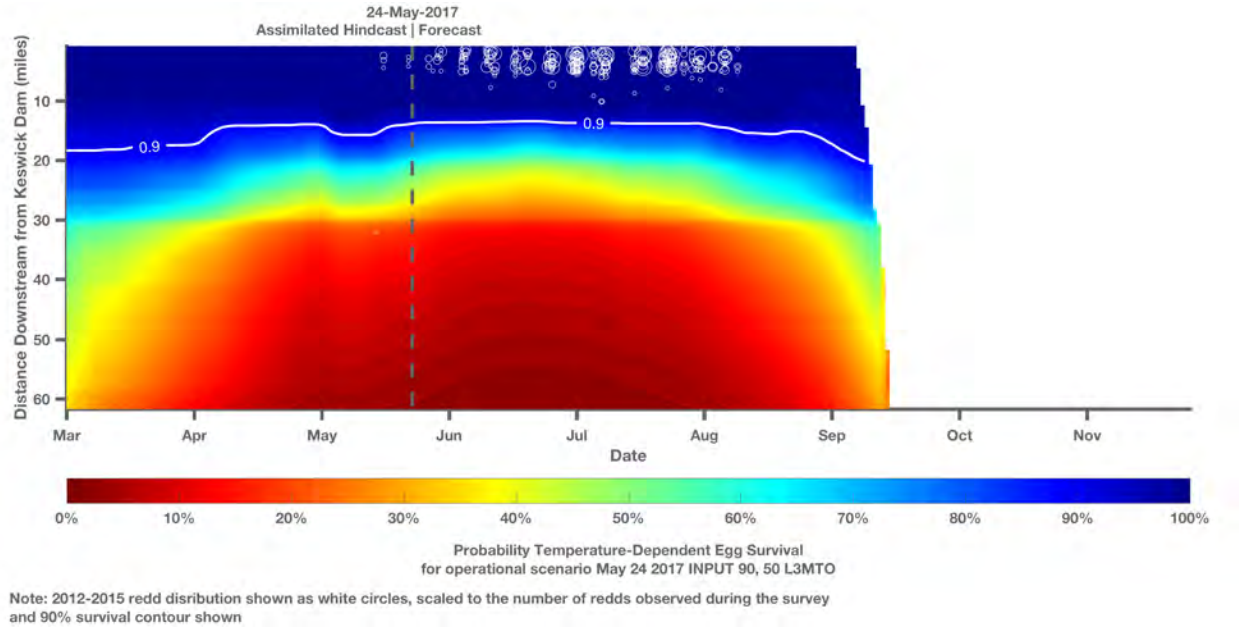

Figure 9: Estimated temperature-dependent egg survival produced by the NMFS temperature mortality model under the May 24th 2017 Input_90_50_L3MTO scenario.

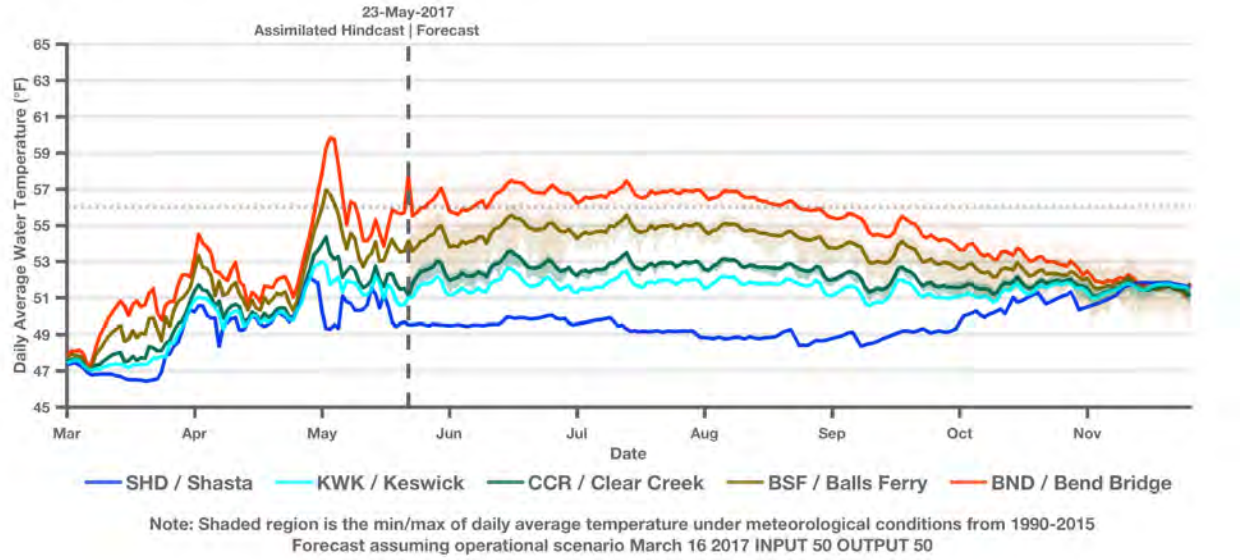

Figure 10: Estimated daily average water temperature produced by scenario input (Shasta and Keswick) and the RAFT model (Clear Creek, Balls Ferry, and Bend Bridge) under the March 16th 2017 Input_50 scenario.

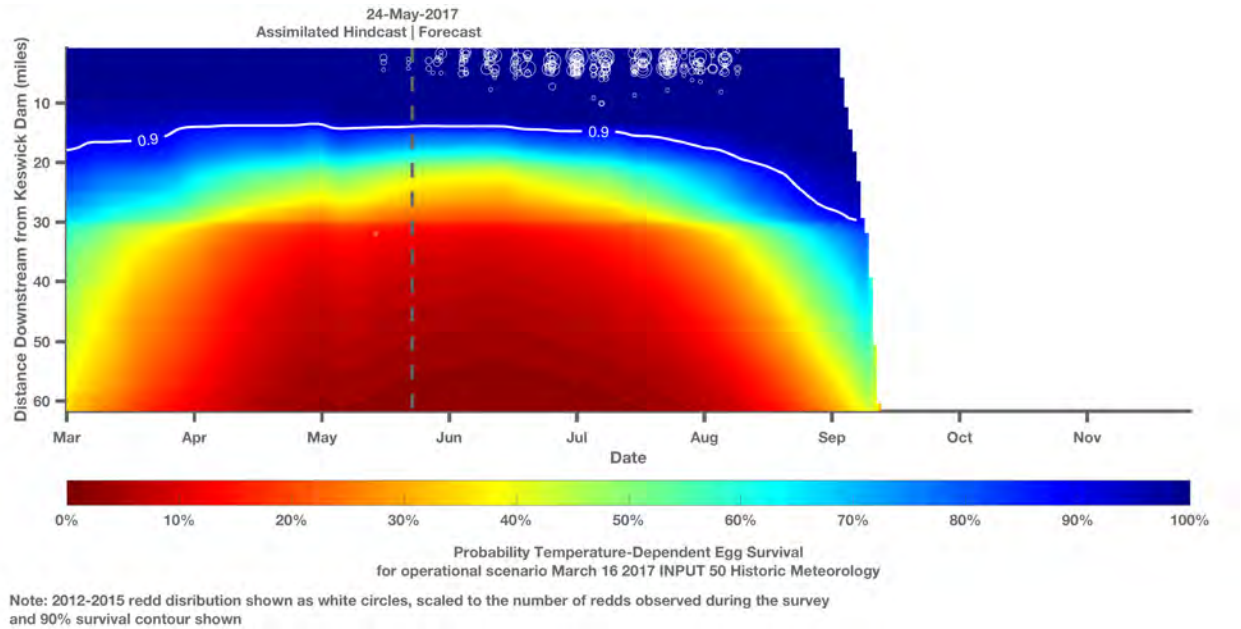

Figure 11: Estimated temperature-dependent egg survival produced by the NMFS temperature mortality model under the March 16th 2017 Input_50 scenario.

Reference:

Martin, B. T., Pike, A., John, S. N., Hamda, N., Roberts, J., Lindley, S. T. and Danner, E. M. (2017), Phenomenological vs. biophysical models of thermal stress in aquatic eggs. Ecology Letters 20: 50–59. doi:10.1111/ele.12705

Enclosure 6

Clarification of Concurrence pursuant to Action I.2.4

Milligan, Ronald <rmilligan@usbr.gov> Fri, Jun 23, 2017 at 8:54 AM
To: "Rea, Maria" <Maria.rea@noaa.gov>
Cc: Jeffrey Rieker <jrieker@usbr.gov>, Garwin Yip - NOAA Federal <garwin.yip@noaa.gov>

Maria,

Thank you for NMFS' June 1, 2017, concurrence with Reclamation's Sacramento River Temperature Management Plan pursuant to Action I.2.4 of the NMFS Biological Opinion (BiOp). As has recently been discussed by staff from our respective offices, we'd like to clarify a few of the statements in the concurrence letter as we move through this season's operations, specifically, the following:

1) On page 2, the first bullet point under the "Consultation History" section states "Reclamation commits to, under the pilot study, meet at 53°F DAT near the Clear Creek confluence (measured at the "CCR" gaging station) […]".

> Reclamation notes that as outlined in our plan, our intent is to use the 53°F DAT metric as an operational target, and would like to clarify that the word "meet" in the statement in the NMFS letter should be "target".

2) On page 2, the third bullet point under the "Consultation History" section states that "Reclamation noted that the projected Keswick release schedules were based on 50% and 90% exceedance forecasts and that actual flowrates were expected to vary within those ranges […]".

Reclamation notes that Reclamation's referenced statement also included a discussion on the fact that the release schedules represented average monthly flows, and as such, would be expected to be greater than or less than the projected flowrates 50% of the time. As such, we do not necessarily anticipate that the actual flowrates will vary only within the ranges of the 50% to 90% forecasts, but also within a range surrounding each specific forecast based on the concept of the projections being monthly averages. Reclamation believes a clarified statement would read "Reclamation noted that the projected Keswick release schedules were average monthly flows based on 50% and 90% exceedance forecasts […]"

3) On page 3, the first hollow bullet point under the first main bullet concerning the 53°F DAT at CCR operational study states "The study will evaluate the system-wide impacts of revised temperature management […]".

Reclamation does not see the operational study that is part of the Temperature Management Plan as being a study to evaluate system-wide impacts. The operational study is a study to evaluate the performance and feasibility of operating to a 53°F DAT metric at a specific location, and how that compares to other metrics (such as the 55° seven day average of the daily maximums) as well as the metrics and locations in the current BiOp.

Reclamation is concurrently undertaking an evaluation of the system-wide impacts of the revised temperature management approach, but this evaluation is based on modeling simulations and data analyses, and is not a part of this year's operations or directly linked to the Temperature Management Plan. As previously noted, Reclamation does not anticipate significant impacts to other parts of the system as a result of this year's temperature operations due to the unusually wet hydrology that has been experienced in 2017.

4) On page 3, the second bullet point under the “Summary and Expectations” section states “NMFS notes that Reclamation has been operating to achieve the 53°F DAT compliance point at CCR since May 2, 2017.”

The Temperature Management Plan only has a single compliance point of 56°F DAT at Balls Ferry; the statement should identify the 53°F DAT metric as a target, not a compliance point.

In addition, Reclamation does not view the temperature management season as beginning on May 2. Rather, due to the availability of sufficient cold water and unusual conditions of low releases coupled with abnormally high air temperatures, a short-term action was taken beginning on that date to address downstream temperatures. Water temperatures responded over the subsequent days, and formal confirmation of spawning initiation occurred during the following week.

Reclamation believes a clarified statement would read, “NMFS notes that Reclamation took an initial short-term water temperature management action beginning on May 2, 2017 to address unusual flow and temperature conditions, and has been operating to target 53°F DAT at CCR since mid-May.”

If you are amenable to these clarifications, please let me know and Reclamation will include this email exchange as an attachment in our submittal of the Temperature Management Plan to the State Water Resources Control Board in compliance with Order 90-5.

Please let me know if you have questions or would like to discuss this matter further.

Thanks,

Ron

Clarification of Concurrence pursuant to Action I.2.4

Maria Rea - NOAA Federal <maria.rea@noaa.gov> Fri, Jun 23, 2017 at 10:54 AM
To: "Milligan, Ronald" <rmilligan@usbr.gov>
Cc: Jeffrey Rieker <jrieker@usbr.gov>, Garwin Yip - NOAA Federal <garwin.yip@noaa.gov>

Ron,

Thank you for your e-mail, and careful read of NMFS' June 1, 2017, concurrence on the Sacramento River Temperature Management Plan. NMFS agrees with your clarifications.

- Maria

Maria Rea
Assistant Regional Administrator, California Central Valley Office
NOAA Fisheries West Coast Region
650 Capitol Mall, Suite 5-100
Sacramento, CA 95814
(916) 930-3600

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> Ron