

## Sacramento River Temperature Task Group Meeting

September 27, 2018 | 1:00 pm – 3:00 pm

Location JOC – Joint Operations Center, 3310 El Camino Ave, Sacramento CA 95821

Conference Line: 877-718-6527

Participant code: 1954134

### Agenda

- Introductions
- Meeting Purpose and Overview
- Fishery update
- Hydrology & Operations update (information is available on web-pages)
  - Daily Operation
  - Summary
  - 8-Station Index and Snow Water Content
  - Operations Outlook
  - Mean Daily Water Temperatures
  - Redding 10-Day Forecasted Air Temperatures
  - Sac River Gage temp plot and air temp plot
  - Lake Shasta Isothermobath Plot
  - Lake Shasta Isotherm Statistics Plots
  - Lake Shasta Current TCD Configuration
  - Trinity Lake Isothermobath Plot
  - Whiskeytown Lake Isothermobath Plot
- Temperature Studies
  - September 90% Runoff Exceedance and 10% Historical Meteorology
  - September 90% Runoff Exceedance and 50% Historical Meteorology
  - Cold Water Pool Tracking
- Updates
- Next Meeting : October 25, 2018 1:00 pm – 3:00 pm

**DAILY CVP WATER SUPPLY REPORT**

SEPTEMBER 25, 2018

RUN DATE: September 26, 2018

RESERVOIR RELEASES IN CUBIC FEET/SECOND

RESERVOIR	DAM	WY 2017	WY 2018	15 YR MEDIAN
TRINITY	LEWISTON	450	464	462
SACRAMENTO	KESWICK	8,438	7,616	7,503
FEATHER	OROVILLE (SWP)	7,500	6,000	3,500
AMERICAN	NIMBUS	3,579	1,848	1,602
STANISLAUS	GOODWIN	404	303	205
SAN JOAQUIN	FRIANT	350	409	344

STORAGE IN MAJOR RESERVOIRS IN THOUSANDS OF ACRE-FEET

RESERVOIR	CAPACITY	15 YR AVG	WY 2017	WY 2018	% OF 15 YR AVG
TRINITY	2,448	1,419	1,803	1,508	106
SHASTA	4,552	2,426	3,425	2,446	101
FOLSOM	977	462	683	476	103
NEW MELONES	2,420	1,322	2,025	1,788	135
FED. SAN LUIS	966	285	708	389	136
TOTAL NORTH CVP	11,363	5,914	8,644	6,607	112
MILLERTON	520	262	367	276	105
OROVILLE (SWP)	3,538	1,779	1,394	1,403	79

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

RESERVOIR	CURRENT WY 2018	WY 1977	WY 1983	15 YR AVG	% OF 15 YR AVG
TRINITY	543	218	2,884	1,211	45
SHASTA	3,583	2,572	10,748	5,202	69
FOLSOM	2,520	352	6,514	2,660	95
NEW MELONES	908	0	2,739	1,063	85
MILLERTON	1,392	370	4,669	1,676	83

ACCUMULATED PRECIPITATION FOR WATER YEAR TO DATE IN INCHES

RESERVOIR	CURRENT WY 2018	WY 1977	WY 1983	AVG (N YRS)	% OF AVG	LAST 24 HRS
TRINITY AT FISH HATCHERY	19.58	15.44	58.10	32.21 ( 56 )	61	0.00
SACRAMENTO AT SHASTA DAM	38.67	24.23	116.50	62.34 ( 61 )	62	0.00
AMERICAN AT BLUE CANYON	64.57	17.57	104.31	66.84 ( 43 )	97	0.00
STANISLAUS AT NEW MELONES	21.01	0.00	46.58	27.35 ( 40 )	77	0.00
SAN JOAQUIN AT HUNTINGTON LK	32.89	17.60	83.40	42.10 ( 43 )	78	0.00

## Upper Sacramento River Summary Conditions – September (On-going):

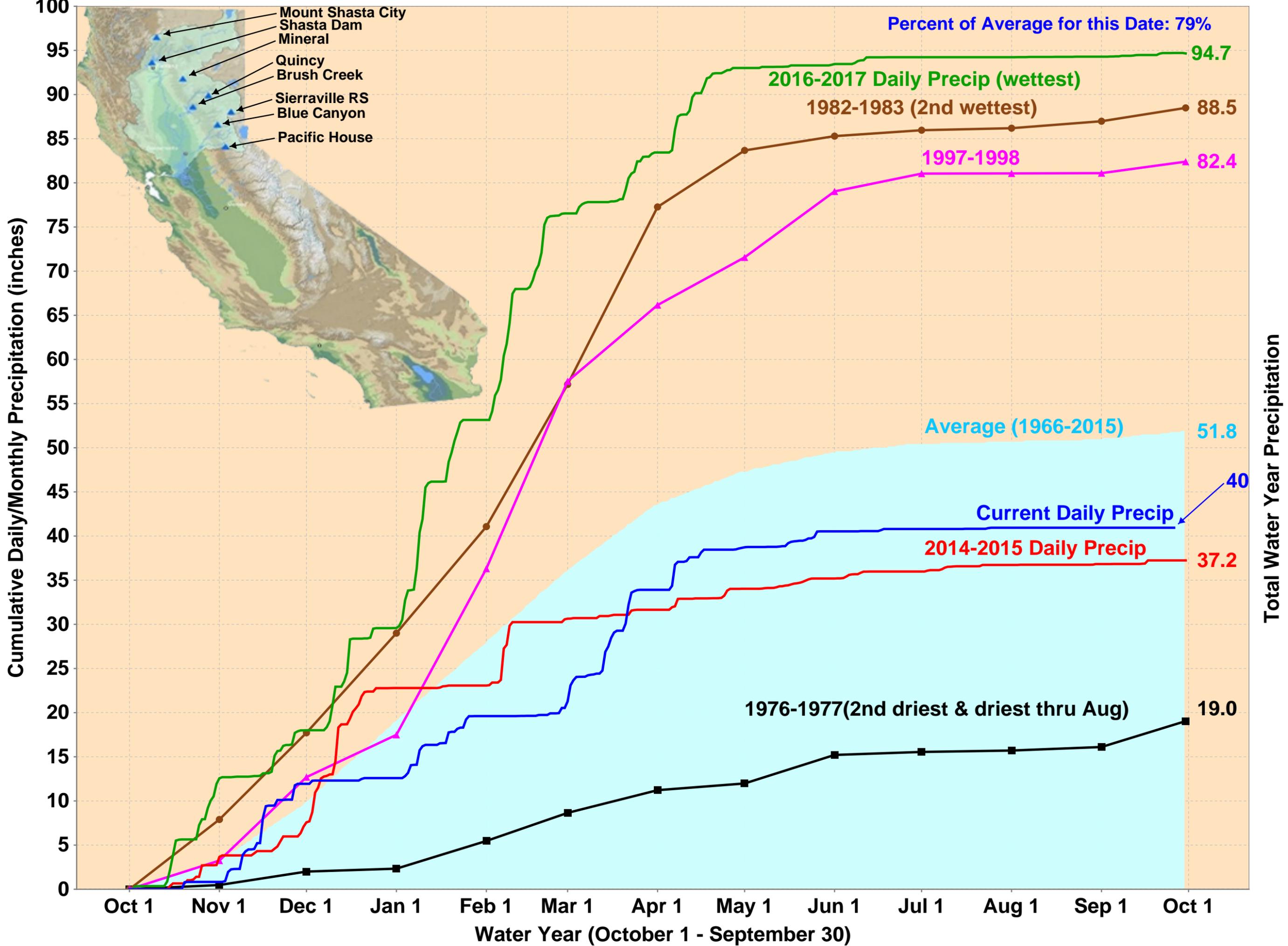
### Storage/Release Management Conditions:

- Meteorological Uncertainty: Shorter term forecasts (8-14 day) are increased chances of precipitation. Forecasted precipitation depths through Oct 1<sup>st</sup> are less than 0.1 inch (low confidence).
- Longer term forecasts (three-month outlook: Oct - Dec) suggest equal chances for above, below, or normal precipitation
- Actual inflow is approximately equal to the projected 90% runoff exceedance for the month of September
- Current release from Keswick Dam: 7,250 cfs for storage conservation. A monthly average of approximately 8,000 cfs is expected for September
- Fall Sacramento River release reductions discussions on-going with agencies on balancing tradeoffs between winter-run, fall-run, in-stream demands, and storage conservation.

### Temperature Management:

- Active temperature management: Managing to Balls Ferry BSF compliance (56°F) and target at the Sacramento River at Clear Creek CCR (53.5°F) temperatures
- Releases made from Pressure Relief Gates and Side Gates – full utilization of the cold water pool
- Meteorological Uncertainty: Shorter term forecasts (8-14 day) suggest normal temperatures; longer term forecasts (three-month outlook Oct – Dec) suggest above normal temperatures.
- Tracking cold-water-pool expectations – actual volumes are slightly greater than projected

# North Sierra Precipitation: 8-Station Index, September 26, 2018



# CVP Northern System Operation Outlooks

DRAFT September 2018

## Updates Expected in Near-Term

### 90% Runoff Exceedance Outlook:

Inflow based on the 90% Historical Inflows Oct and future months

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

	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Shasta	2378	2233	2245				
Elev.	978	970	971				

#### Monthly River Releases (cfs)

Sacramento	8000	6000	3873				
Clear Creek	150	200	200				

#### Trinity Diversions (TAF)

	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Carr Power Plant	26	17	25				
Spring Creek PP	20	30	15				

### 50% Runoff Exceedance Outlook:

Inflow based on the 50% Historical Inflows Oct and future months

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

	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Shasta							
Elev.							

#### Monthly River Releases (cfs)

Sacramento							
Clear Creek							

#### Trinity Diversions (TAF)

	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Carr Power Plant							
Spring Creek PP							

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.

# Northern CVP Water Temperature Report

## September - 2018

Page	Description
1	- Mean Daily Water Temperature, Release Flow Rates and Air Temperatures with Monthly Averages
2	- Redding 10-Day Forecasted Air Temperatures
3	- Sacramento River Mean Daily Water Temperature, Air Temperature and 10-Day Forecasted Air Temperature Plot - Water Temperature Measuring Station Details - Temperature Control Point Details
4	- Daily Maximum and 7DADM
5	- Shasta Lake Isothermobaths Plot
6	- Trinity Lake Isothermobaths Plot
7	- Whiskeytown Lake Isothermobaths Plot
x	- <a href="#">TCD Configuration</a> (External Link)



All Data in this Report is Preliminary and Subject to Change

DATE	Mean Daily Water Temperatures (°F)													Mean Daily Release (CFS)			Mean Daily Air Temperatures (°F)			
	TCD <sup>1</sup>	SHD	SPP <sup>1</sup>	KWK	SAC	CCR	BSF <sup>2</sup>	JLF	BND	RDB	IGO	LWS	DGC <sup>3</sup>	Shasta Generation	Spring Creek P.P.	Keswick Total	RDD	BSF	RDB	LWS
Aug	52.0	51.2	56.7	52.4	52.9	53.4	54.9	55.9	56.3	57.6	57.4	52.9	-	9842	-	10191	79.7	74.2	74.3	71.3
09/01	51.0	50.2	# -	51.2	51.8	52.3	54.2	55.4	56.2	57.9	59.1	52.9	56.4	8625	-	8684	79.0	73.0	77.2	68.4
09/02	51.2	50.3	# -	51.1	51.7	52.3	53.8	54.9	55.6	56.9	59.1	52.8	56.4	8874	-	8687	82.0	75.5	75.7	71.7
09/03	51.3	50.3	# -	51.3	51.8	52.3	53.9	55.0	55.6	56.9	59.1	52.6	56.0	8099	-	8634	82.0	75.6	76.1	72.0
09/04	51.4	50.5	# - ?	51.3	52.1	52.6	54.2	55.3	55.9	57.0	59.3	52.5	56.1	8837	-	8633	81.5	75.2	75.2	72.1
09/05	51.2	50.3	# - ?	51.8	52.5	53.0	54.6	55.6	56.2	57.4	59.5	52.5	56.3	7628	-	8412	80.5	73.9	74.9	72.2
09/06	51.4	50.4	! -	51.7	52.4	52.9	54.6	55.7	56.3	57.6	59.2	52.7	56.1	7682	-	8198	76.0	71.1	70.8	69.8
09/07	51.4	50.5	56.5	51.6	52.2	52.7	54.3	55.4	56.1	57.3	58.7	52.5	55.6	8004	345	8218	81.0	73.0	75.4	68.2
09/08	51.6	50.6	56.5	51.5	52.1	52.6	54.0	55.0	55.7	56.9	59.0	52.0	55.3	8039	350	8223	78.0	71.9	74.0	66.2
09/09	51.5	50.7	56.8	51.6	52.1	52.6	54.0	55.0	55.6	56.6	58.7	52.2	55.1	8072	14	8234	77.0	71.2	73.9	65.8
09/10	51.7	51.0	56.3	51.4	52.0	52.6	53.9	54.8	55.3	56.4	58.7	52.3	55.2	8383	14	8301	77.0	71.2	73.2	66.3
09/11	51.7	50.8	56.4	51.6	52.1	52.6	53.8	54.6	55.1	56.0	58.4	52.2	55.0	7870	14	8286	72.0	68.2	72.3	63.2
09/12	51.9	51.0	56.4	51.5	52.0	52.5	53.9	54.7	55.2	55.9	58.2	51.9	54.1	7834	14	8379	67.5	64.7	67.3	58.9
09/13	52.3	51.0	56.5	51.7	52.3	52.8	54.1	55.0	55.4	56.3	58.0	51.7	54.2	7535	14	8371	67.5	64.1	64.6	58.3
09/14	52.1	51.2	56.4	52.0	52.6	53.0	54.1	55.2	55.4	56.4	55.8	51.4	54.2	7879	14	8362	67.5	62.4	65.0	59.1
09/15	52.1	51.1	56.5	52.0	52.6	53.1	54.3	55.4	55.6	56.5	55.6	51.1	53.6	7468	14	8367	67.5	62.8	63.7	57.3
09/16	52.2	51.4	56.5	51.9	52.5	53.0	54.1	55.2	55.3	56.4	55.6	51.1	53.5	7663	14	8366	66.0	60.6	62.5	58.3
09/17	52.1	51.4	? 56.6	52.0	52.5	53.0	54.0	55.0	55.1	56.1	55.2	50.9	53.5	7421	360	8356	66.0	60.8	64.0	59.0
09/18	52.4	51.6	! -	52.2	52.8	53.3	54.3	55.3	55.3	56.2	55.4	51.1	53.5	7651	641	8372	68.0	62.8	65.6	60.5
09/19	51.8	51.2	57.2	52.5	53.0	53.4	54.5	55.5	55.6	56.6	55.7	51.0	53.7	7361	14	7980	71.0	65.8	69.9	61.7
09/20	51.0	50.4	56.7	52.4	53.3	53.8	55.0	56.0	56.1	56.9	55.9	51.0	53.2	6458	599	7784	82.5	71.3	75.1	60.6
09/21	51.3	50.4	56.8	51.6	52.4	53.0	54.5	55.8	56.1	57.4	55.2	51.9	53.3	6371	514	7714	72.0	66.6	70.0	63.0
09/22	51.7	50.8	56.6	51.6	52.3	52.8	54.1	55.4	55.6	56.9	53.7	51.6	54.5	6733	536	7570	72.0	67.3	69.4	62.8
09/23	51.5	50.7	? 56.7	52.1	52.8	53.3	54.5	55.7	55.8	56.9	54.1	51.9	55.1	6251	574	7563	74.0	68.7	70.0	65.1
09/24	51.4	50.5	56.8	52.2	52.9	53.5	54.5	55.6	55.8	56.8	53.7	51.4	53.8	6053	577	7576	79.5	67.4	72.2	60.5
09/25	51.4	50.4	57.5	52.1	52.9	53.3	54.5	55.7	55.8	56.9	53.8	51.6	53.7	6456	30	7616	80.0	70.0	75.0	62.5
09/26																				
09/27																				
09/28																				
09/29																				
09/30																				
-																				
Sep	51.6	50.7	56.7	51.8	52.4	52.9	54.2	55.3	55.7	56.8	57.0	51.9	54.7	7570	245	8195	74.7	68.6	70.9	64.1

Total CFS	189247	4652	204886
Total AF	375364	9227	406383

Legend

Notes

- ? = 1-9 hours of data missing (Average includes estimations)
- ! = 10 or more hours of data missing (Average not calculated)
- # = Station out of service
- ↑ = Record high air temperature
- ↓ = Record low air temperature
- ☐ = Monthly Averages

- <sup>1</sup> Temperatures are weighted averages based on individual penstock flow and temperature
- Highlighted cells in the TCD column indicate a TCD change was made on that day
- <sup>2</sup> Current control point (see page 3 for more details)
- <sup>3</sup> DGC is only reported in September

D A T E	Redding (RDD) Daily Air Temperatures (°F)																																				
	Actual			Forecasted																																	
	Previous Day			Current Day			1 Day			2 Days			3 Days			4 Days			5 Days			6 Days			7 Days			8 Days			9 Days			10 Days			
	↓	↑	Avg	↓	↑	Avg	↓	↑	Avg	↓	↑	Avg	↓	↑	Avg	↓	↑	Avg	↓	↑	Avg	↓	↑	Avg	↓	↑	Avg	↓	↑	Avg	↓	↑	Avg	↓	↑	Avg	
09/01	58	93	75.5	58	98	78.0	60	101	80.5	61	100	80.5	60	100	80.0	59	95	77.0	56	93	74.5	55	92	73.5	60	93	76.5	59	96	77.5	60	94	77.0	61	95	78.0	
09/02	57	101	79.0	60	103	81.5	61	102	81.5	61	99	80.0	62	96	79.0	58	95	76.5	57	94	75.5	56	93	74.5	62	95	78.5	62	100	81.0	63	97	80.0	62	95	78.5	
09/03	59	105	82.0	63	103	83.0	60	100	80.0	59	97	78.0	57	96	76.5	57	95	76.0	56	92	74.0	54	93	73.5	63	100	81.5	64	103	83.5	65	99	82.0	62	96	79.0	
09/04	62	102	82.0	64	100	82.0	58	97	77.5	58	96	77.0	57	98	77.5	59	96	77.5	56	96	76.0	56	97	76.5	63	100	81.5	64	100	82.0	61	93	77.0	57	88	72.5	
09/05	63	100	81.5	62	96	79.0	56	95	75.5	57	99	78.0	59	95	77.0	57	95	76.0	55	95	75.0	52	92	72.0	61	89	75.0	59	87	73.0	58	86	72.0	59	91	75.0	
09/06	62	99	80.5	58	94	76.0	57	98	77.5	57	95	76.0	56	96	76.0	55	95	75.0	55	90	72.5	51	82	66.5	57	82	69.5	56	80	68.0	58	85	71.5	55	89	72.0	
09/07	57	95	76.0	62	99	80.5	57	94	75.5	57	96	76.5	55	94	74.5	53	89	71.0	50	82	66.0	49	82	65.5	56	87	71.5	56	87	71.5	55	87	71.0	57	91	74.0	
09/08	61	101	81.0	59	95	77.0	56	96	76.0	55	93	74.0	52	89	70.5	49	84	66.5	48	85	66.5	49	89	69.0	57	90	73.5	56	90	73.0	55	89	72.0	57	89	73.0	
09/09	59	97	78.0	58	96	77.0	56	93	74.5	54	88	71.0	50	82	66.0	47	81	64.0	47	87	67.0	48	91	69.5	55	91	73.0	55	88	71.5	56	89	72.5	58	92	75.0	
09/10	57	97	77.0	58	94	76.0	53	87	70.0	48	80	64.0	45	80	62.5	46	86	66.0	48	90	69.0	49	87	68.0	56	88	72.0	57	92	74.5	61	92	76.5	59	92	75.5	
09/11	57	97	77.0	54	87	70.5	49	81	65.0	46	78	62.0	44	83	63.5	45	81	63.0	46	85	65.5	47	89	68.0	57	89	73.0	57	91	74.0	58	87	72.5	56	88	72.0	
09/12	53	91	72.0	54	81	67.5	45	78	61.5	45	80	62.5	44	80	62.0	45	84	64.5	48	86	67.0	49	88	68.5	57	87	72.0	56	89	72.5	55	85	70.0	54	87	70.5	
09/13	52	83	67.5	56	79	67.5	44	81	62.5	44	80	62.0	44	83	63.5	47	85	66.0	49	87	68.0	50	89	69.5	58	91	74.5	57	95	76.0	58	90	74.0	56	88	72.0	
09/14	54	81	67.5	53	83	68.0	47	80	63.5	45	82	63.5	48	85	66.5	50	87	68.5	51	86	68.5	51	85	68.0	58	84	71.0	56	89	72.5	57	87	72.0	54	86	70.0	
09/15	51	84	67.5	55	82	68.5	45	83	64.0	48	86	67.0	49	87	68.0	51	89	70.0	52	91	71.5	53	90	71.5	60	89	74.5	58	92	75.0	59	90	74.5	56	90	73.0	
09/16	54	81	67.5	48	83	65.5	48	84	66.0	50	86	68.0	52	89	70.5	50	91	70.5	50	87	68.5	49	85	67.0	56	82	69.0	54	85	69.5	55	87	71.0	55	87	71.0	
09/17	48	84	66.0	47	84	65.5	49	86	67.5	51	90	70.5	53	93	73.0	53	90	71.5	52	87	69.5	48	85	66.5	57	82	69.5	56	83	69.5	55	83	69.0	55	87	71.0	
09/18	47	85	66.0	51	86	68.5	49	90	69.5	52	93	72.5	53	93	73.0	54	88	71.0	51	86	68.5	49	86	67.5	58	89	73.5	57	94	75.5	57	90	73.5	56	89	72.5	
09/19	49	87	68.0	52	90	71.0	53	93	73.0	54	94	74.0	54	92	73.0	53	91	72.0	53	92	72.5	54	93	73.5	59	96	77.5	57	95	76.0	57	89	73.0	56	89	72.5	
09/20	51	91	71.0	68	94	81.0	53	94	73.5	54	92	73.0	53	90	71.5	55	95	75.0	58	97	77.5	57	96	76.5	60	96	78.0	60	90	75.0	58	88	73.0	57	93	75.0	
09/21	68	97	82.5	51	94	72.5	53	89	71.0	54	88	71.0	52	94	73.0	55	97	76.0	56	98	77.0	57	96	76.5	59	92	75.5	57	85	71.0	55	82	68.5	55	87	71.0	
09/22	51	93	72.0	54	90	72.0	52	88	70.0	50	93	71.5	54	98	76.0	55	97	76.0	55	95	75.0	54	92	73.0	57	88	72.5	55	88	71.5	55	84	69.5	52	84	68.0	
09/23	54	90	72.0	59	88	73.5	52	93	72.5	54	98	76.0	56	99	77.5	56	97	76.5	55	93	74.0	53	86	69.5	58	82	70.0	55	87	71.0	56	85	70.5	56	87	71.5	
09/24	57	91	74.0	63	94	78.5	56	98	77.0	58	100	79.0	59	99	79.0	59	92	75.5	51	82	66.5	49	81	65.0	56	80	68.0	56	85	70.5	55	79	67.0	53	85	69.0	
09/25	63	96	79.5	75	98	86.5	55	100	77.5	56	99	77.5	57	93	75.0	51	79	65.0	49	79	64.0	50	82	66.0	59	87	73.0	55	87	71.0	57	86	71.5	56	88	72.0	
09/26	60	100	80.0	52	101	76.5	56	100	78.0	56	93	74.5	51	77	64.0	50	78	64.0	50	76	63.0	50	83	66.5	57	87	72.0	60	92	76.0	59	89	74.0	58	88	73.0	
09/27																																					
09/28																																					
09/29																																					
09/30																																					
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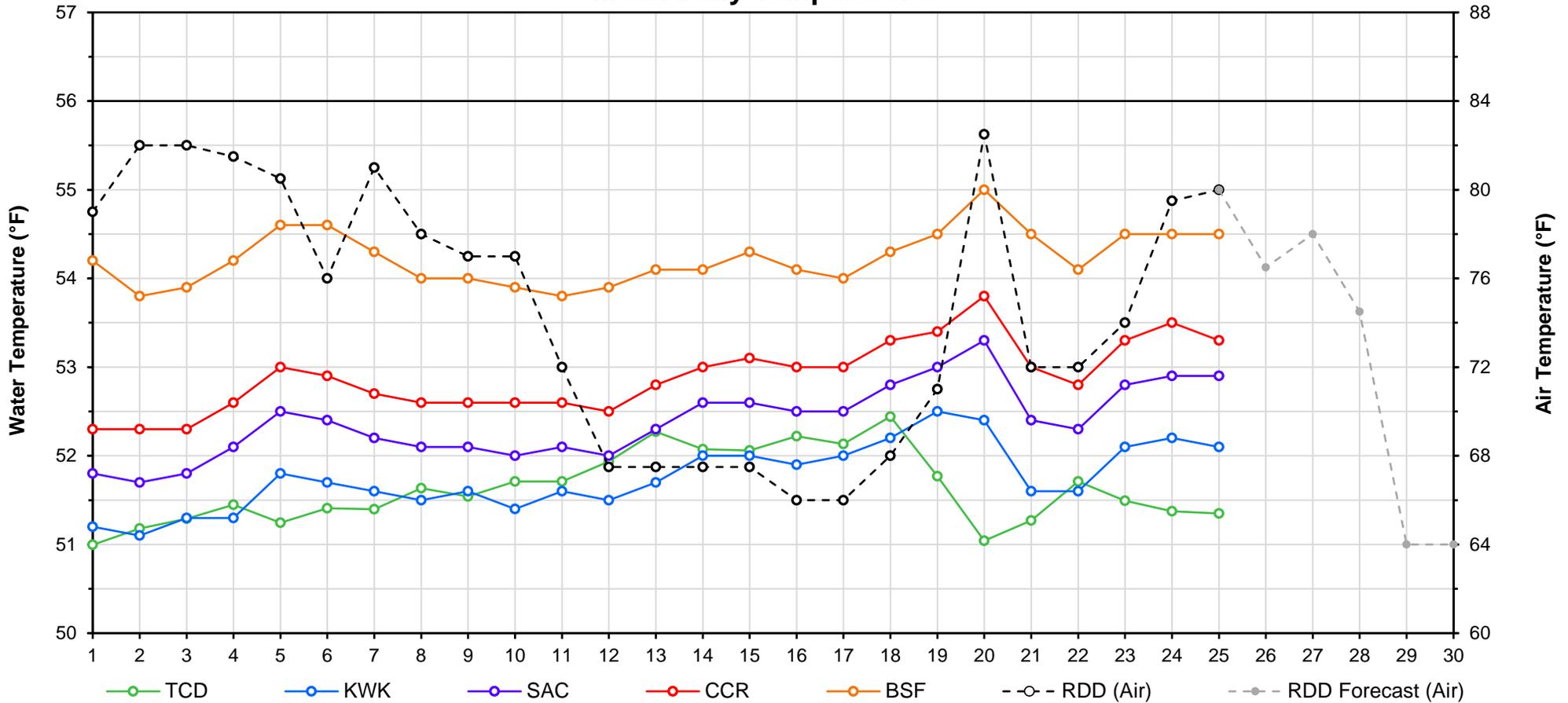
Web Links

- [10-Day Min/Max Forecast](#)
- [Previous Days Min/Max Actuals](#)

Legend

- NR = Forecasted temperatures not recorded
- 100** = Previous day actual temperatures in red and bolded indicate a record temperature for that date

# Mean Daily Temperatures



Station Details			
Code	Body of Water	Location <sup>1</sup>	CDEC Link
TCD	N/A	Shasta Power Plant	N/A
SHD	Sacramento River	0.3 miles downstream of Shasta Power Plant	<a href="#">Click Here</a>
SPP	N/A	Spring Creek Power Plant	N/A
KWK	Sacramento River	0.8 miles downstream of Keswick Dam	<a href="#">Click Here</a>
SAC	Sacramento River	4.8 miles downstream of Keswick Dam	<a href="#">Click Here</a>
CCR	Sacramento River	9.7 miles downstream of Keswick Dam	<a href="#">Click Here</a>
BSF	Sacramento River	25 miles downstream of Keswick Dam	<a href="#">Click Here</a>
JLF	Sacramento River	34 miles downstream of Keswick Dam	<a href="#">Click Here</a>
BND	Sacramento River	41 miles downstream of Keswick Dam	<a href="#">Click Here</a>
RDB	Sacramento River	58 miles downstream of Keswick Dam	<a href="#">Click Here</a>
IGO	Clear Creek	7.3 miles downstream of Whiskeytown Dam	<a href="#">Click Here</a>
LWS	Trinity River	1.1 miles downstream of Lewiston Dam	<a href="#">Click Here</a>
DGC <sup>2</sup>	Trinity River	19 miles downstream of Lewiston Dam	<a href="#">Click Here</a>
NFH <sup>3</sup>	Trinity River	38 miles downstream of Lewiston Dam	<a href="#">Click Here</a>

Temperature Control Point		
Point	Temp. (°F)	Begin Date
<b>BSF</b>	<b>56.0</b>	<b>05/25/2018</b>

### Notes

<sup>1</sup> Distances are approximate

<sup>2</sup> DGC is only reported in September

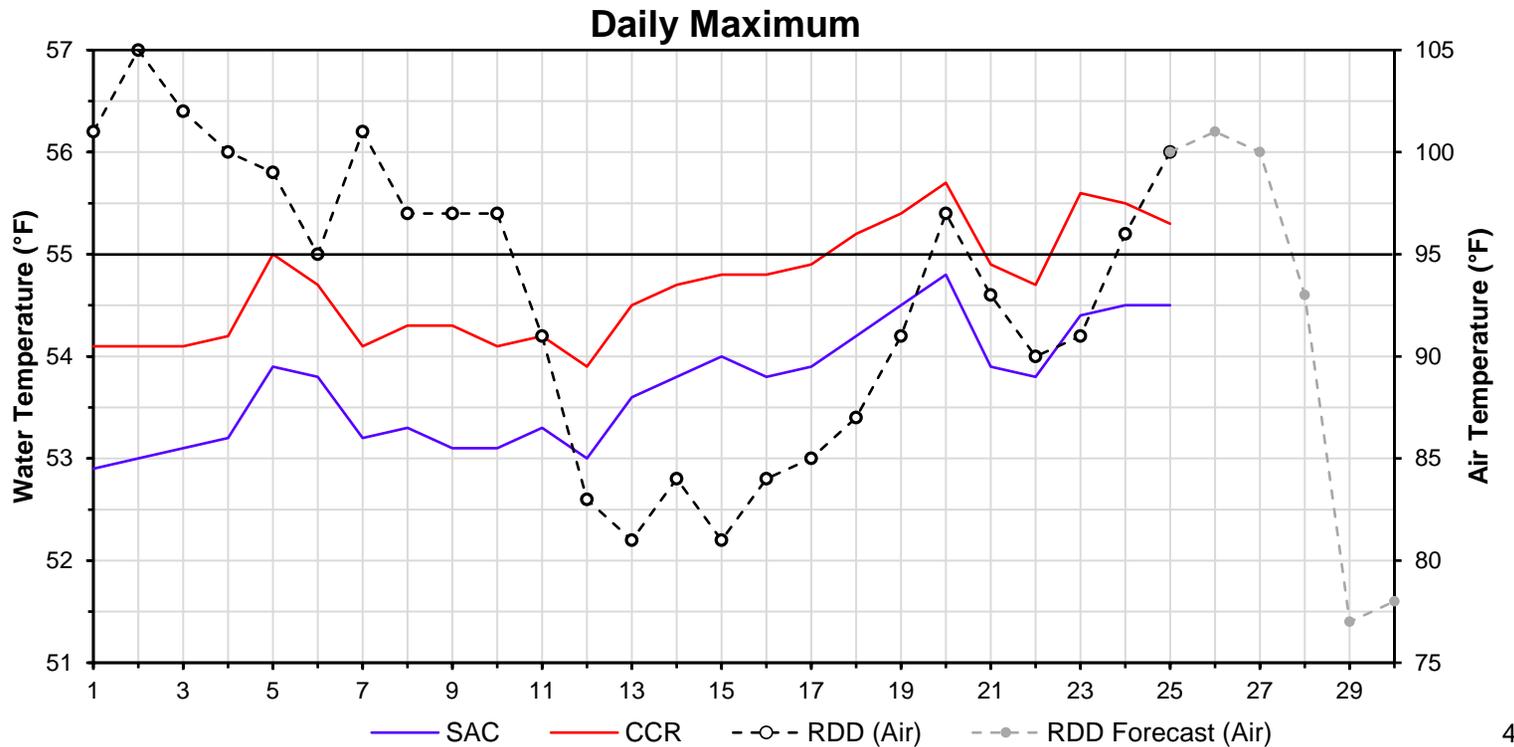
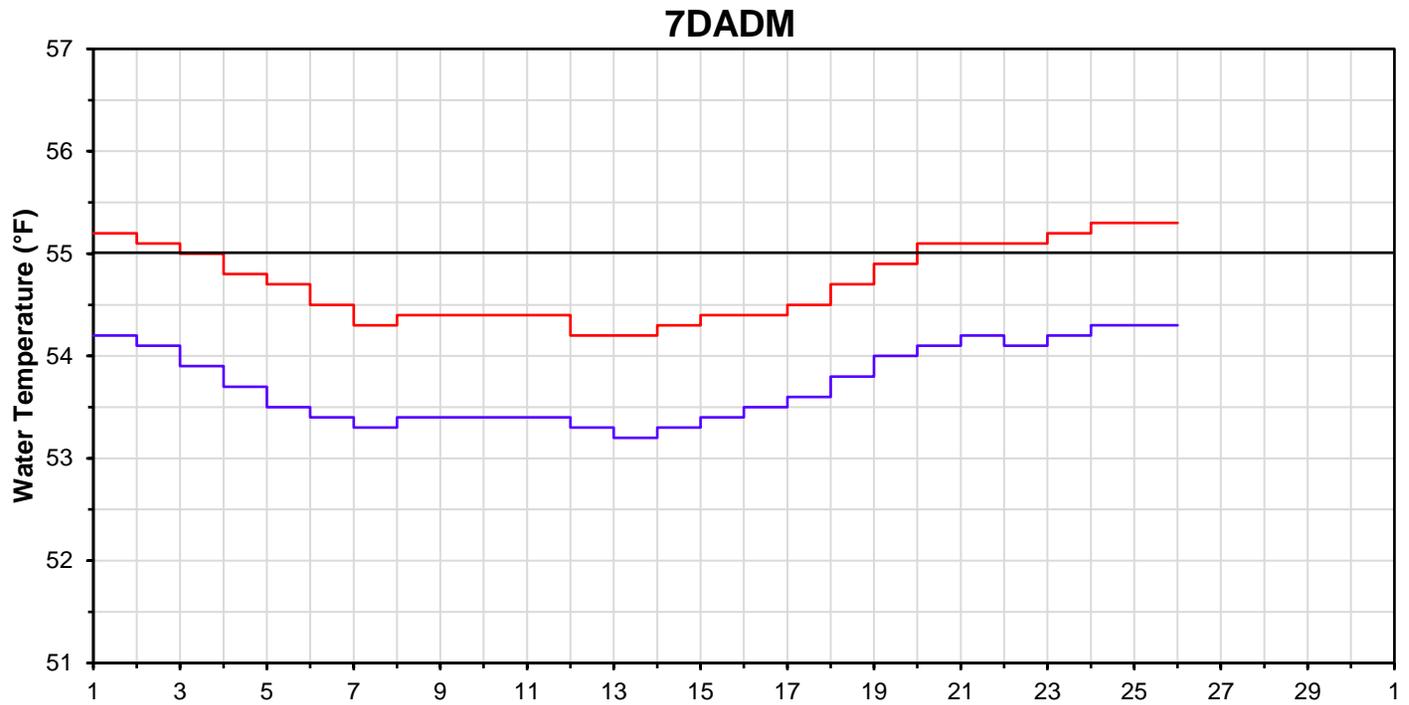
<sup>3</sup> NFH is only reported in October, November and December

DATE	Daily Max		7DADM <sup>1</sup>		DAT <sup>2</sup>
	SAC	CCR	SAC	CCR	BSF
09/01	52.9	54.1	54.2	55.2	54.2
09/02	53.0	54.1	54.1	55.1	53.8
09/03	53.1	54.1	53.9	55.0	53.9
09/04	53.2	54.2	53.7	54.8	54.2
09/05	53.9	55.0	53.5	54.7	54.6
09/06	53.8	54.7	53.4	54.5	54.6
09/07	53.2	54.1	53.3	54.3	54.3
09/08	53.3	54.3	53.4	54.4	54.0
09/09	53.1	54.3	53.4	54.4	54.0
09/10	53.1	54.1	53.4	54.4	53.9
09/11	53.3	54.2	53.4	54.4	53.8
09/12	53.0	53.9	53.3	54.2	53.9
09/13	53.6	54.5	53.2	54.2	54.1
09/14	53.8	54.7	53.3	54.3	54.1
09/15	54.0	54.8	53.4	54.4	54.3
09/16	53.8	54.8	53.5	54.4	54.1
09/17	53.9	54.9	53.6	54.5	54.0
09/18	54.2	55.2	53.8	54.7	54.3
09/19	54.5	55.4	54.0	54.9	54.5
09/20	54.8	55.7	54.1	55.1	55.0
09/21	53.9	54.9	54.2	55.1	54.5
09/22	53.8	54.7	54.1	55.1	54.1
09/23	54.4	55.6	54.2	55.2	54.5
09/24	54.5	55.5	54.3	55.3	54.5
09/25	54.5	55.3	54.3	55.3	54.5
09/26					
09/27					
09/28					
09/29					
09/30					
-					

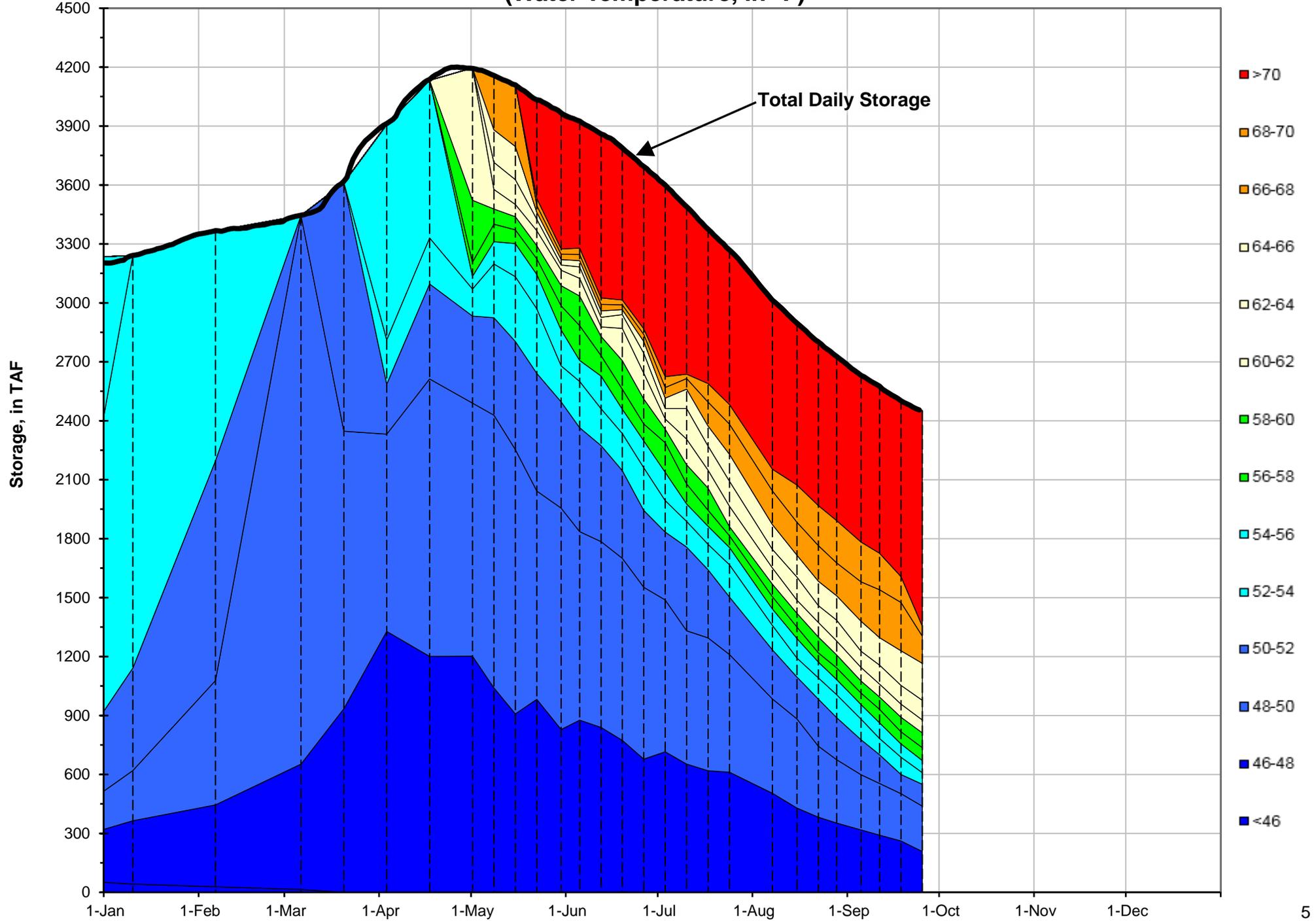
**Notes**

<sup>1</sup> 7DADM = 7-Day Average Daily Maximum

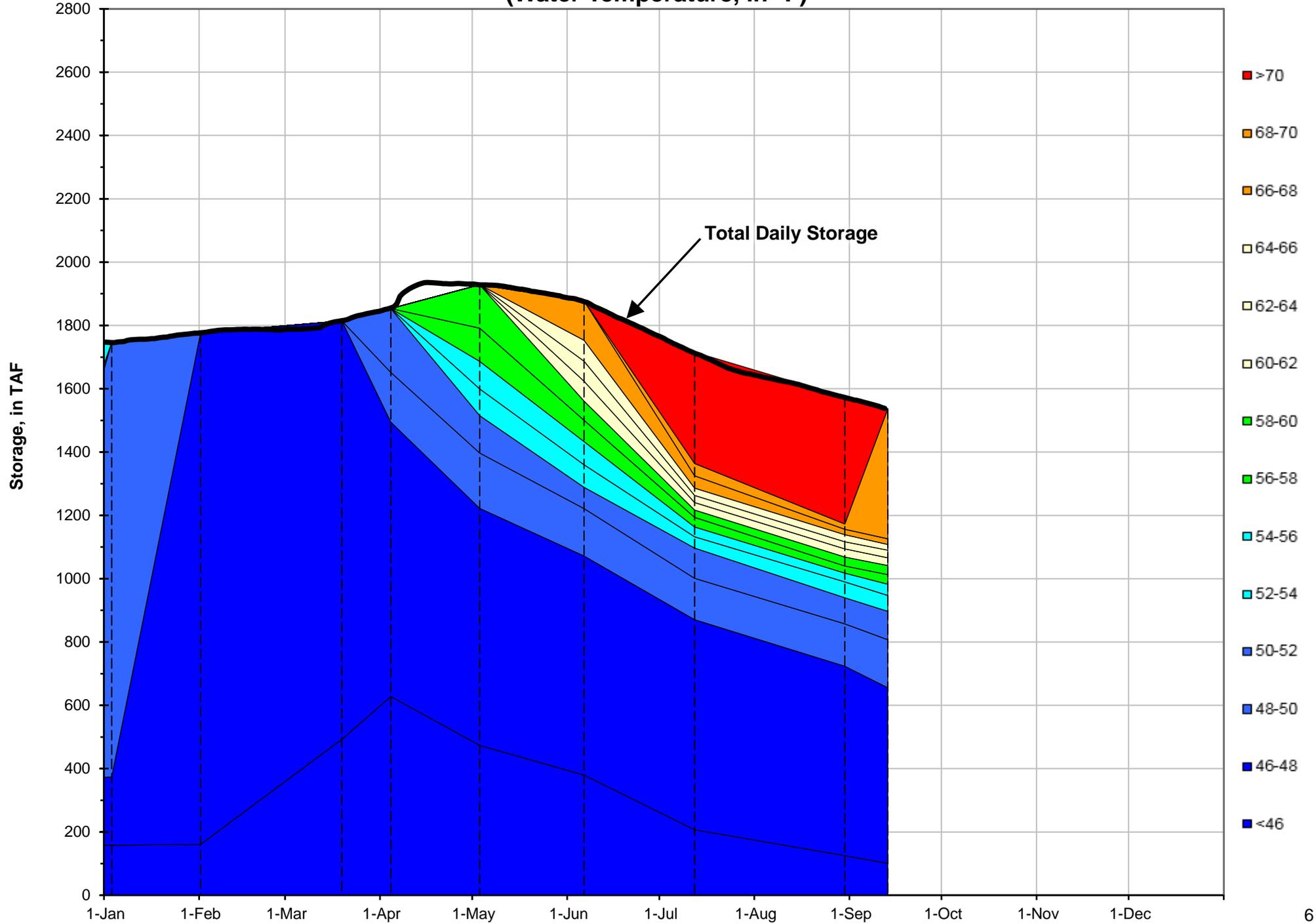
<sup>2</sup> DAT = Daily Average Temperature



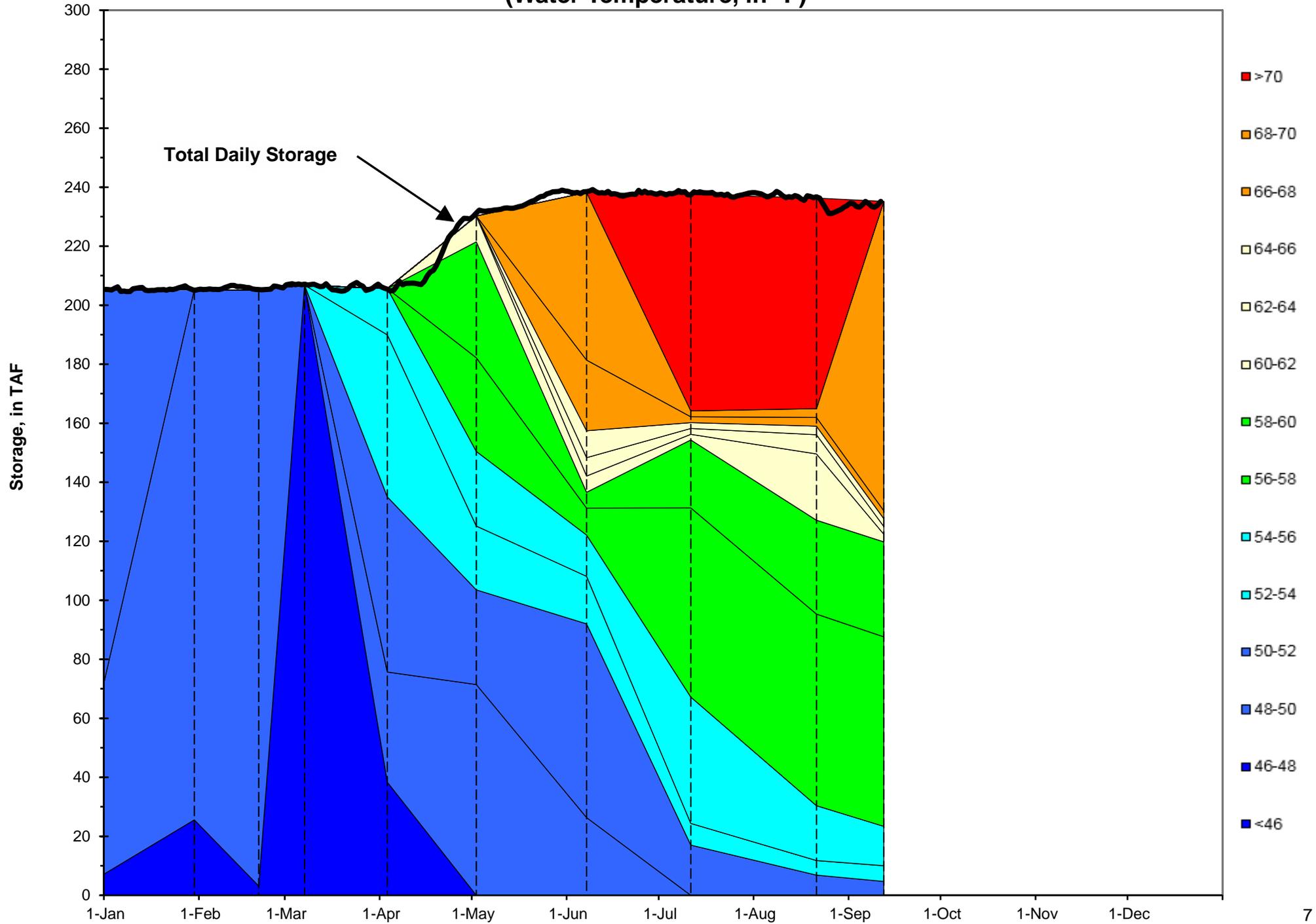
### Shasta Lake Isothermobaths - 2018 (Water Temperature, in °F)



### Trinity Lake Isothermobaths - 2018 (Water Temperature, in °F)



### Whiskeytown Lake Isothermobaths - 2018 (Water Temperature, in °F)

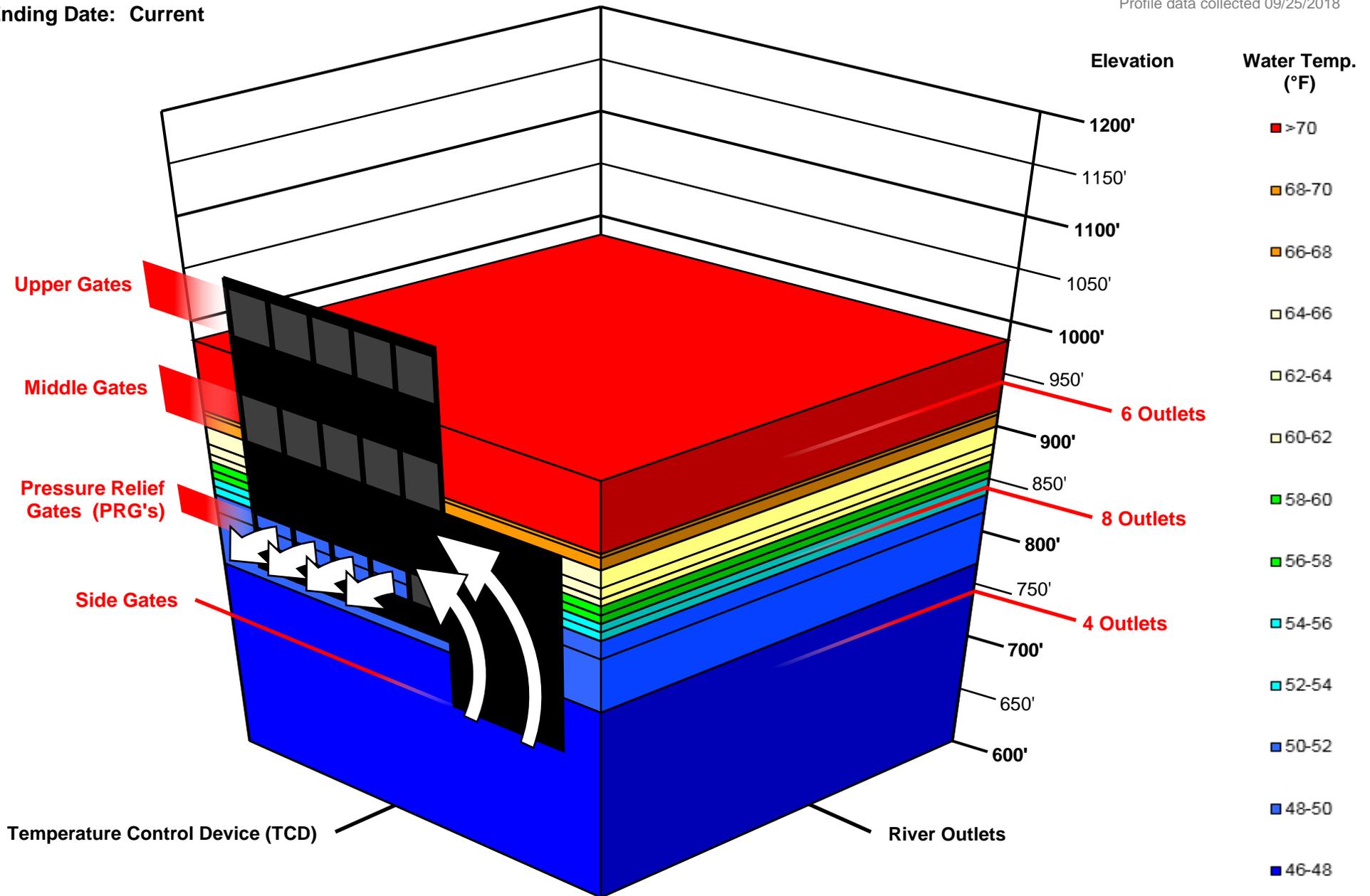


# Shasta TCD Configuration

Starting Date: 09/25/2018

Ending Date: Current

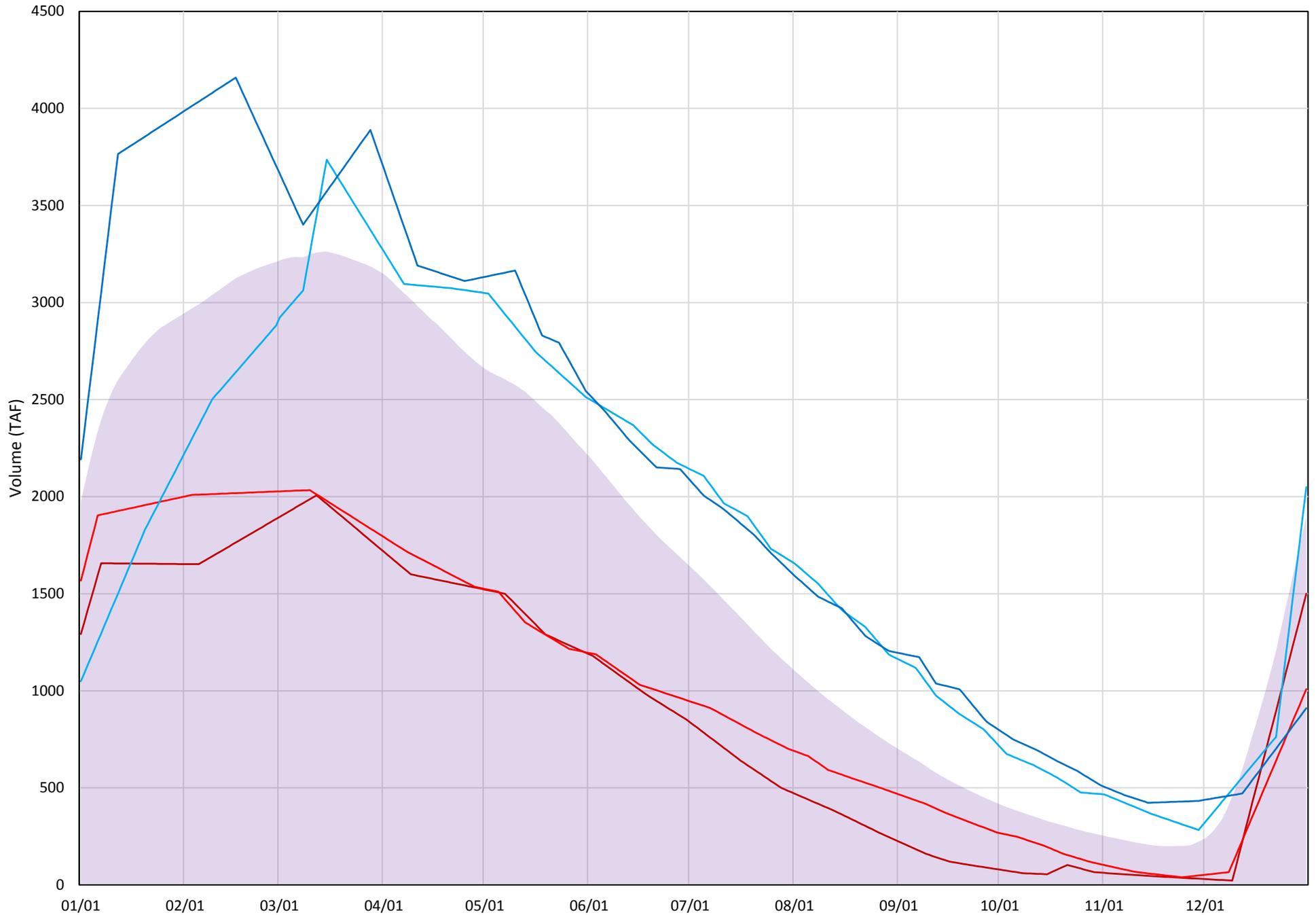
Profile data collected 09/25/2018



Arrows indicate open Gate or Outlet (i.e. Water flowing from this location)

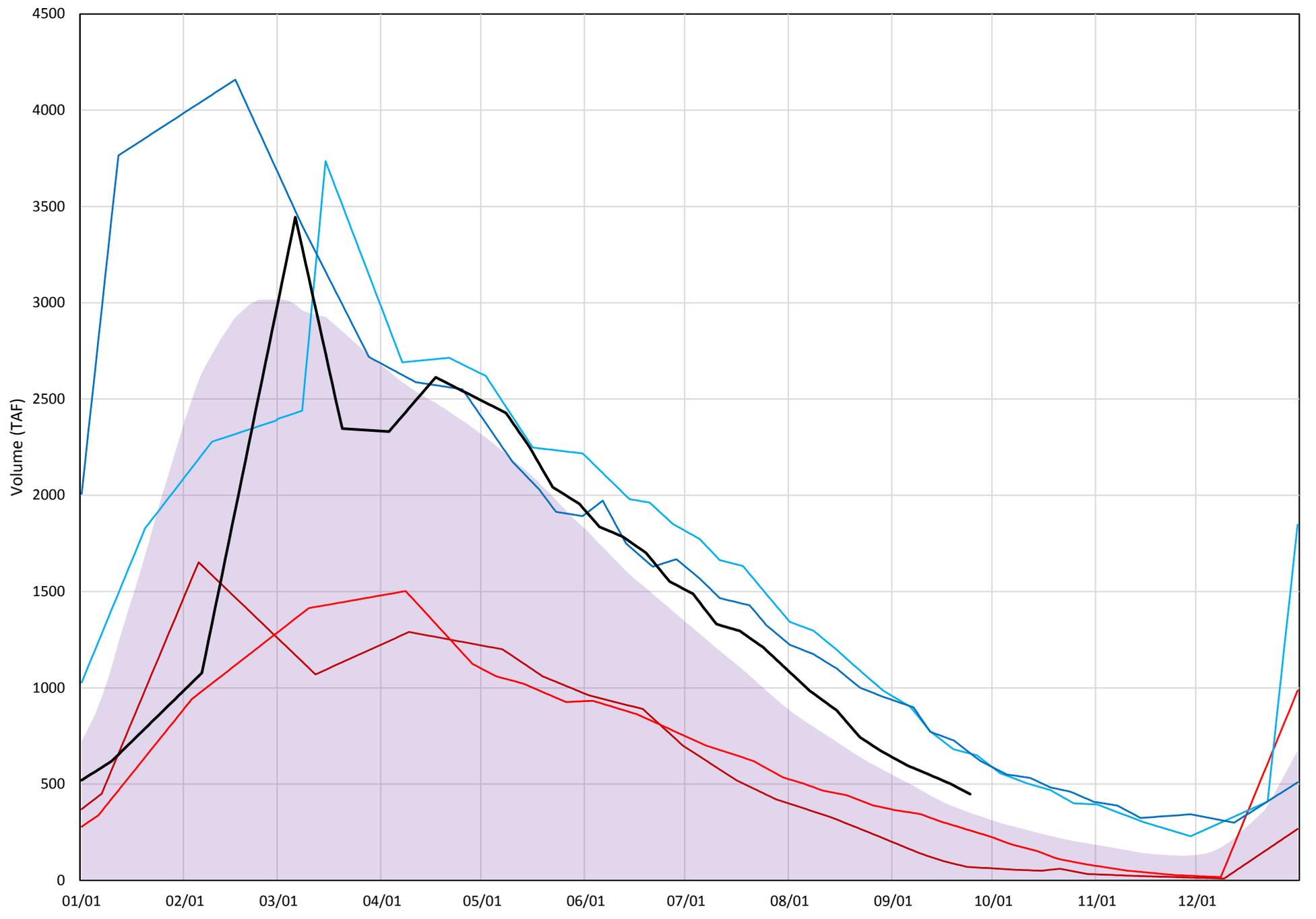
# ≤52°F - Shasta Cold Water Pool Volume

Avg (1998-2017) 2014 2015 2016 2017 2018



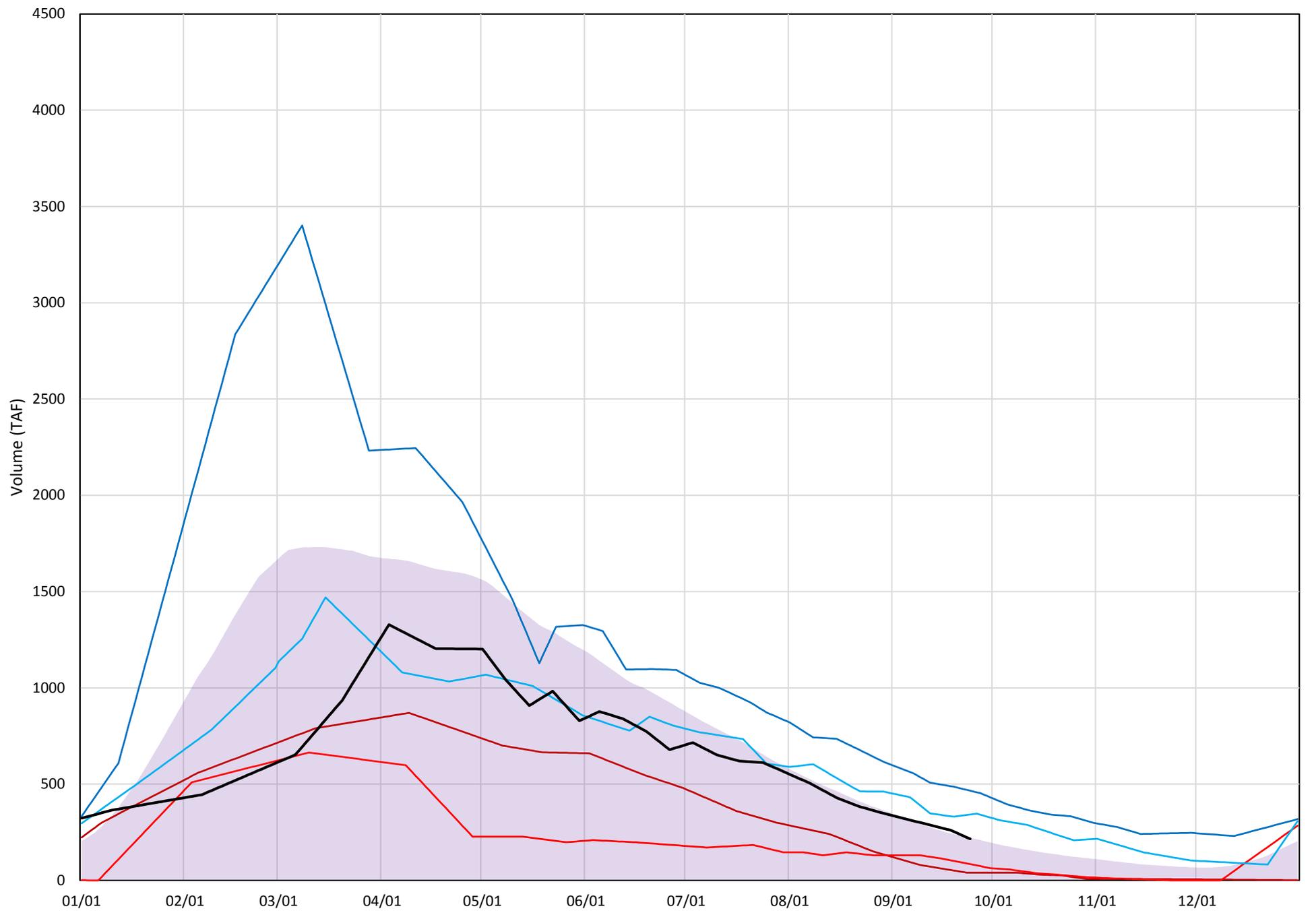
# ≤50°F - Shasta Cold Water Pool Volume

Avg (1998-2017) 2014 2015 2016 2017 2018



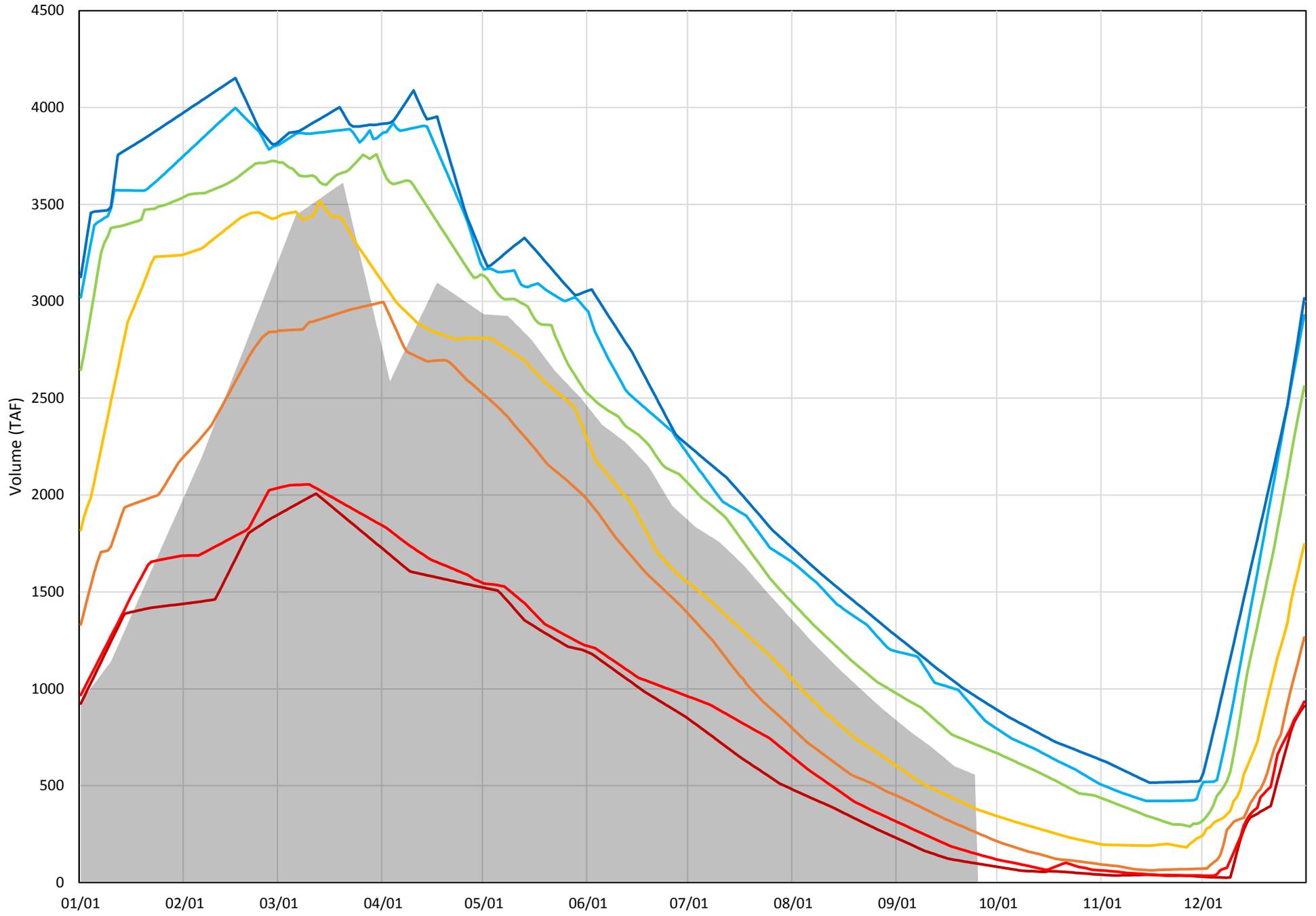
# ≤48°F - Shasta Cold Water Pool Volume

Avg (1998-2017) 2014 2015 2016 2017 2018



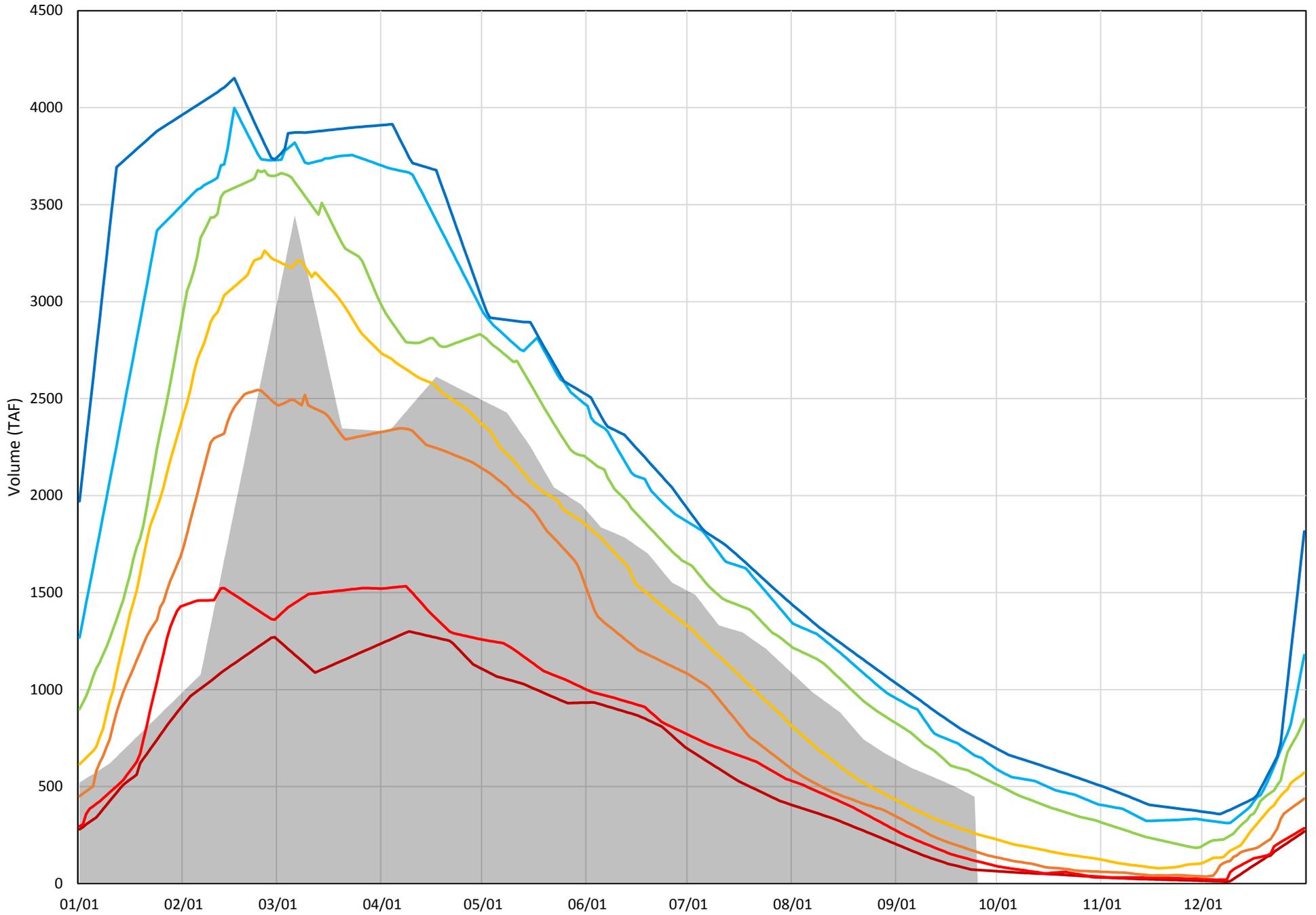
≤52°F - Shasta Cold Water Pool Volume Percent Exceedances (1998-2017)

2018 95 90 75 50 25 10 5



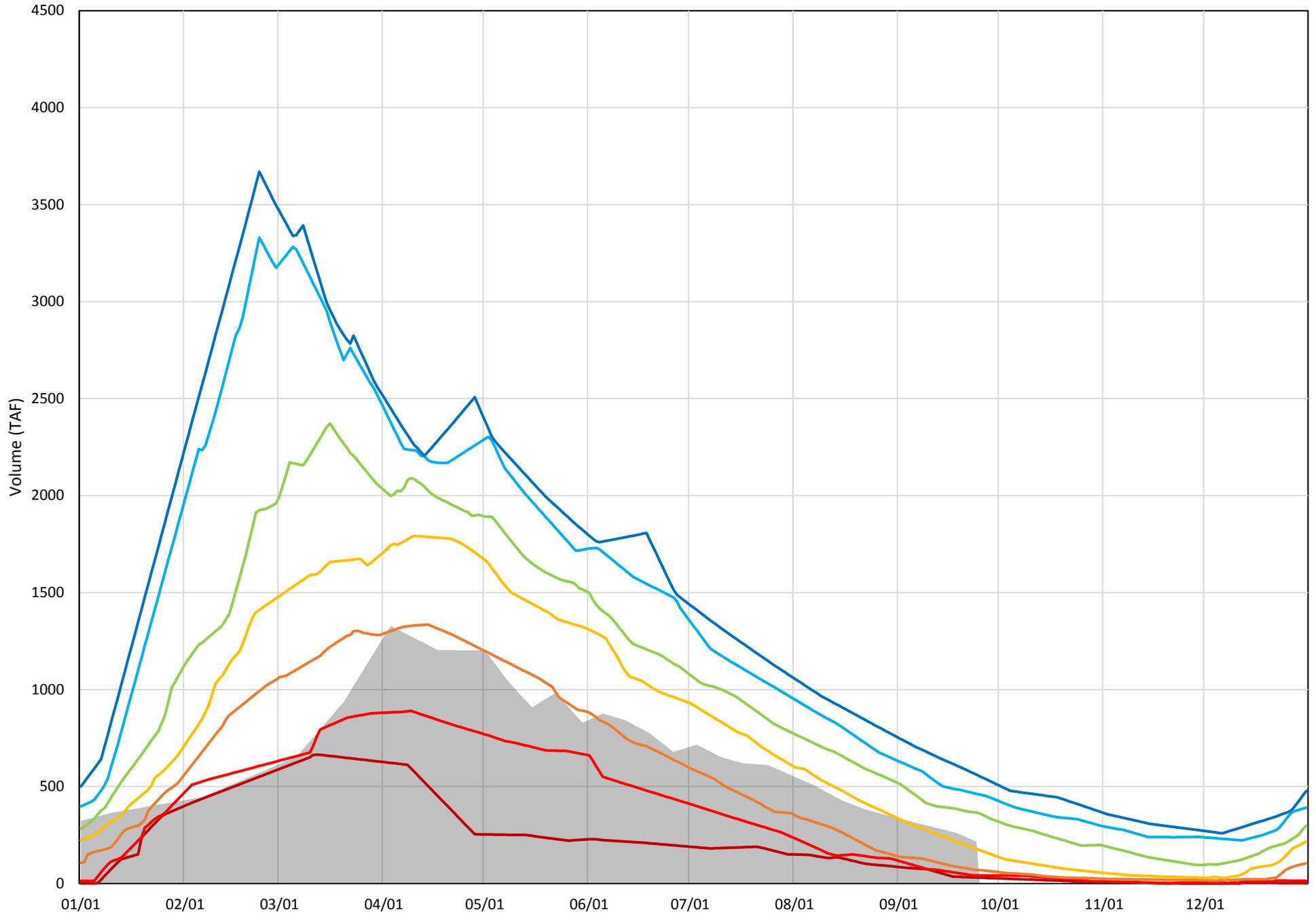
≤50°F - Shasta Cold Water Pool Volume Percent Exceedances (1998-2017)

2018 95 90 75 50 25 10 5



≤48°F - Shasta Cold Water Pool Volume Percent Exceedances (1998-2017)

2018 95 90 75 50 25 10 5



September 26, 2018

## Upper Sacramento River – September 2018 Preliminary Temperature Analysis

Summary of Temperature Results by Month (Monthly Average Temperature °F)

Location	SEP	OCT	Late Sep- Oct Uncertainty Estimation
<b>September 90%-Exceedance Outlook – 10% Historical Meteorology</b>			
Keswick Dam KWK	51.4	51.9	54-57
Sac. R. abv Clear Creek CCR	51.5	52.0	54-58
Balls Ferry BSF	52.7	53.2	55-58
<b>September 90%-Exceedance Outlook – 50% Historical Meteorology</b>			
Keswick Dam KWK	51.6	51.8	54-57
Sac. R. abv Clear Creek CCR	51.7	51.9	54-58
Balls Ferry BSF	53.1	53.0	55-58

\* The HEC5Q model output is displayed above for the months Sept through October. Based on past analysis, the temperature model does not perform well in late September and October. One factor is that the modeled release temperatures are cooler than has historically been achieved when all release is through the side gates (lowest gates), especially when there's a large temperature gradient between the pressure relief gates (PRG) and the side gates. For the months of September and October, an uncertainty estimate is provided based on the Fall Temperature Index (graphics below). This is based on a historical relationship between end-of-September Lake Shasta Volume less than 56°F and likely downstream temperature performances (historical maximum three-day mean water temperature) for the early fall months. The range represents the 90% confidence interval based on that data. Refinement of the concepts for those estimates is underway.

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

1. The latest available profiles for Shasta, Trinity, and Whiskeytown were taken on September 25, September 13, and September 12 respectively. Model results are sensitive to initial reservoir temperature conditions and the model performs best under highly stratified conditions. The model performs well after the reservoir stratifies, typically in late spring.
2. Guidance on forecasted flows from the creeks (e.g., Cow, Cottonwood, Battle, etc.) between Keswick Dam and Bend Bridge are not available beyond 5 days. Creek flows developed from the historical record that most closely reflects current conditions were used for all model runs. The resulting low creek flows can cause significant additional warming in the upper Sacramento River during spring.
3. Operation is based on the Sep 2018 Operation Outlooks and DWR Bulletin 120 inflow projections (monthly flows, reservoir release, and end-of-month reservoir storage) for the 90%-exceedances (when available). Trinity Lake inflows are updated with the CNRFC 90% runoff exceedance for the 90% runoff exceedance studies. Due to fire activity and recovering facilities and communications, the Trinity River diversion may not reflect actual operations. This representation likely overestimates the ability to move water through Trinity, Lewiston, and Whiskeytown to the Sacramento River.
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 and are generalized representations. It is important to note that these outlooks do not suggest a certain actual future outcome, but rather the statistical likelihood of an event occurring, including, but not limited to, projected storage and releases. Thus, the outlooks do not provide exact end of month storages or flow rates but general projections that will likely fall within the range of uncertainty based on the different hydrologic runoff conditions between the 90% and 50% runoff exceedance hydrology.
5. Cottonwood Creek flows, Keswick to Bend Bridge local flows, and ACID diversions are mean daily synthesized flows based on the available historical record for a 1922-2002 study period. Inflows were adjusted to a 95% historical exceedance for both the 90% and 50% runoff exceedance studies.
6. Meteorological inputs represent historical (1985 – 2017) monthly mean equilibrium temperature exceedance at 10% and 50% patterned after like months on a 6-hour time-step, or as noted. Assumed inflow temperature remain static inputs and do not vary with the assumed meteorology.
7. Meteorology, as well as the 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.
8. Modified model coefficients more closely represent actual Keswick Dam temperatures. As a result, temperature predictions downstream of Keswick Dam are likely to be warmer than actual. Model re-calibrations efforts are underway.

Model Run Date September 26, 2018

**Temperature Analysis Results:**

Modeling runs explore Sacramento River compliance performance above Clear Creek confluence and Balls Ferry locations by varying hydrology and temperature compliance target location and temperature. The temperature results for the Sacramento River between Keswick Dam and Balls Ferry are shown in Figures 1-2. The fall uncertainty estimation relationship between end-of-September lake volume below 56°F and a Balls Ferry compliance through fall is based on the Figures 3-5.

<b>Model Run</b>	<b>End of September Cold Water Pool &lt;56°F (TAF)</b>	<b>First Side Gate</b>	<b>Full Side Gates</b>
(1) 90% Hydro, 10% Historical Meteorology	618	9/19	9/24
(2) 90% Hydro, 50% Historical Meteorology	618	9/19	9/24

## Sacramento River Modeled Temperature 2018 September 90%-Exceedance Water Outlook - 10% Historical Meteorology

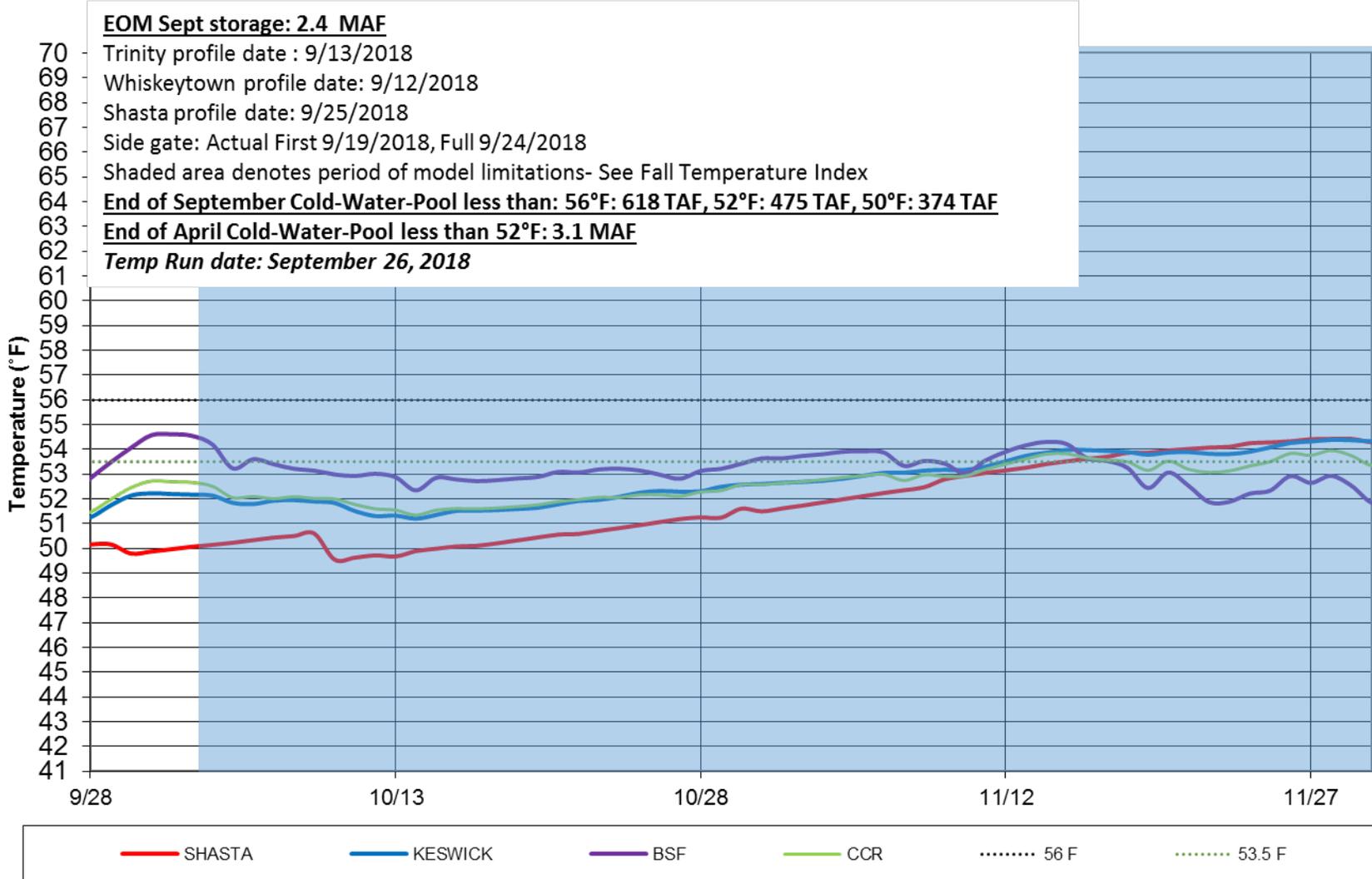


Figure 1

## Sacramento River Modeled Temperature 2018 September 90%-Exceedance Water Outlook - 50% Historical Meteorology

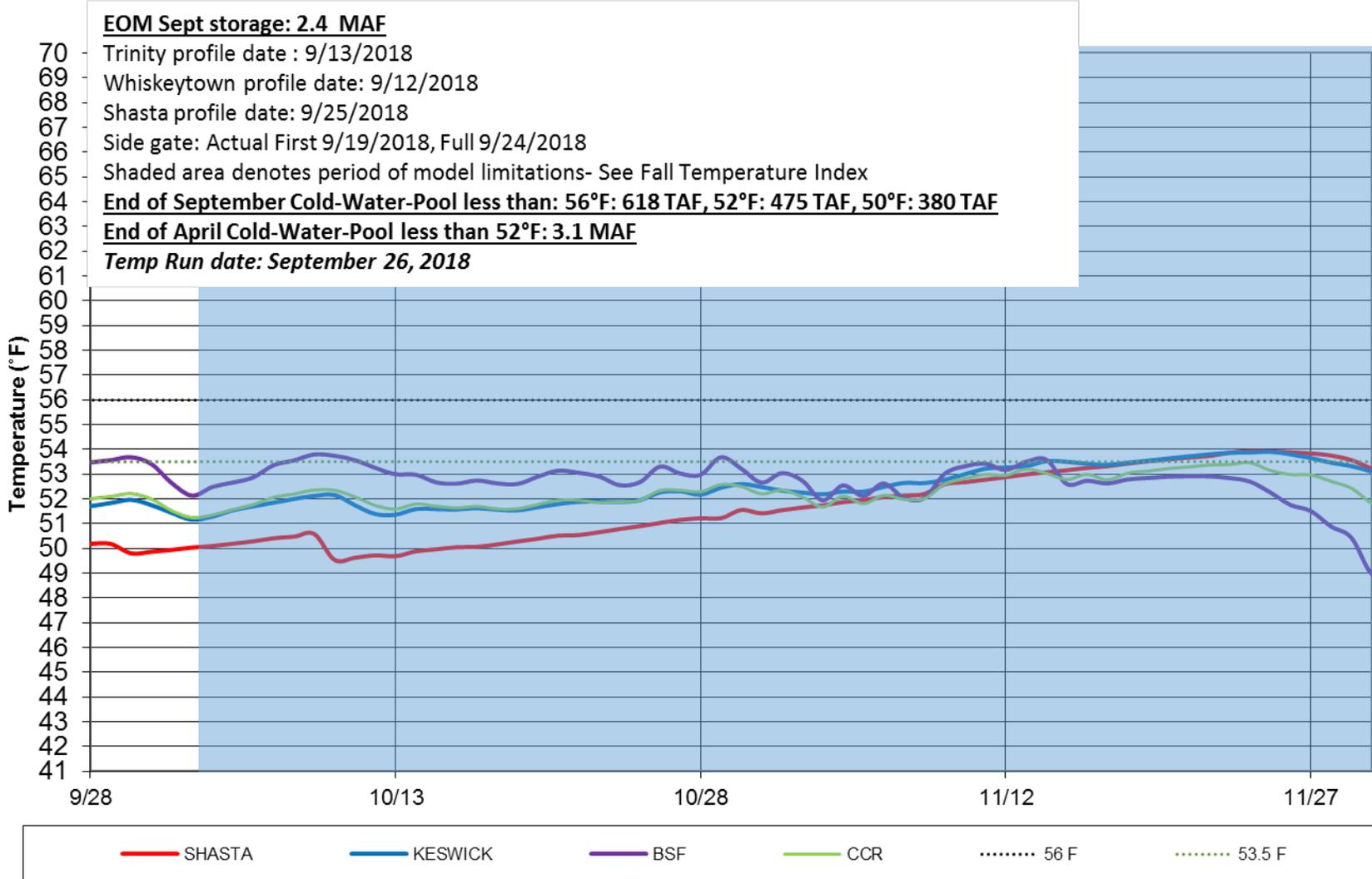


Figure 2

Figures 3-5 Model Performance and Fall Temperature Index:

1. Based on past analyses, the temperature model does not perform well in late September and October. One factor is that the modeled release temperatures are cooler than has historically been achieved when all release is through the side gates (lowest gates), especially when there's a large temperature gradient between the pressure relief gates (PRG) and the side gates.
2. Based on historical records, the end-of-September Lake Shasta volume below 56°F can be used as an indicator of fall water temperature in the river reach to Balls Ferry.
3. Based on these records and estimates, the index below illustrates a range of uncertainty in the ability to meet for river temperatures not to exceed 56 °F downstream based on the end-of-September lake volume less than 56°F; see charts below.
4. Refinement of these estimates and concepts is currently underway.

### Sacramento River - Lake Shasta Early Fall Water Temperature - Keswick (KWK)

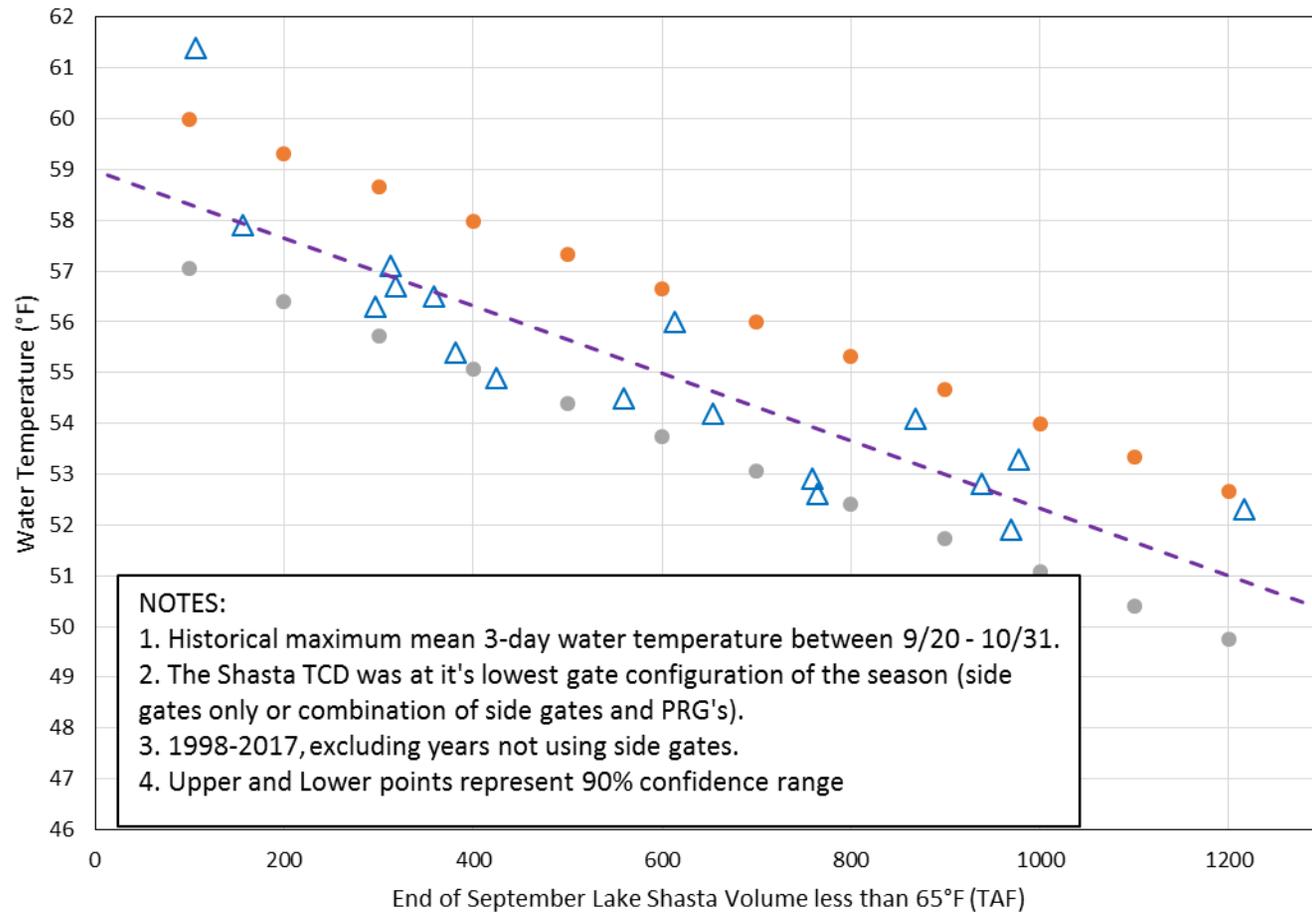


Figure 3

Sacramento River - Lake Shasta  
 Early Fall Water Temperature - Sac River above Clear Creek (CCR)

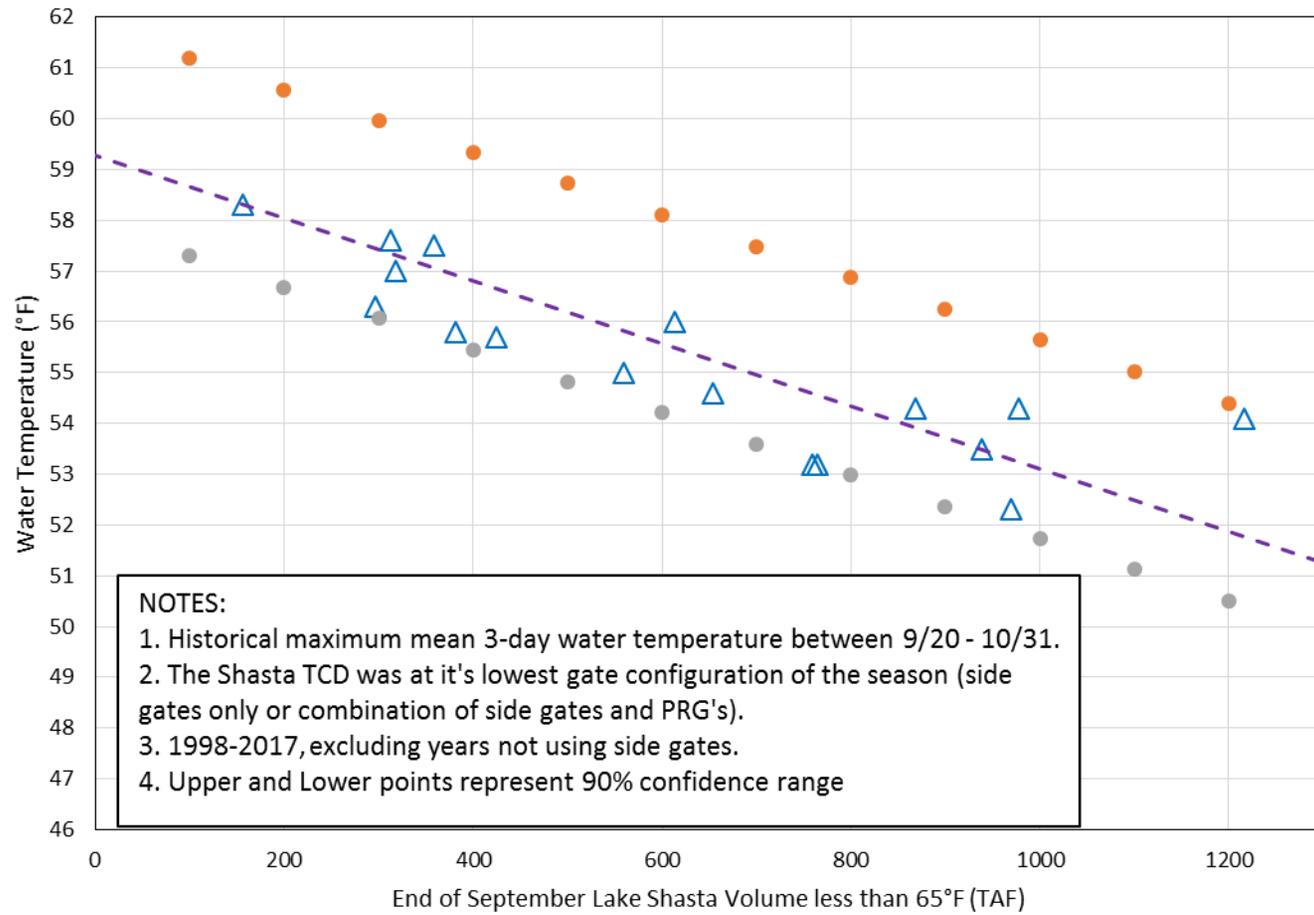


Figure 4

### Sacramento River - Lake Shasta Early Fall Water Temperature - Balls Ferry (BSF)

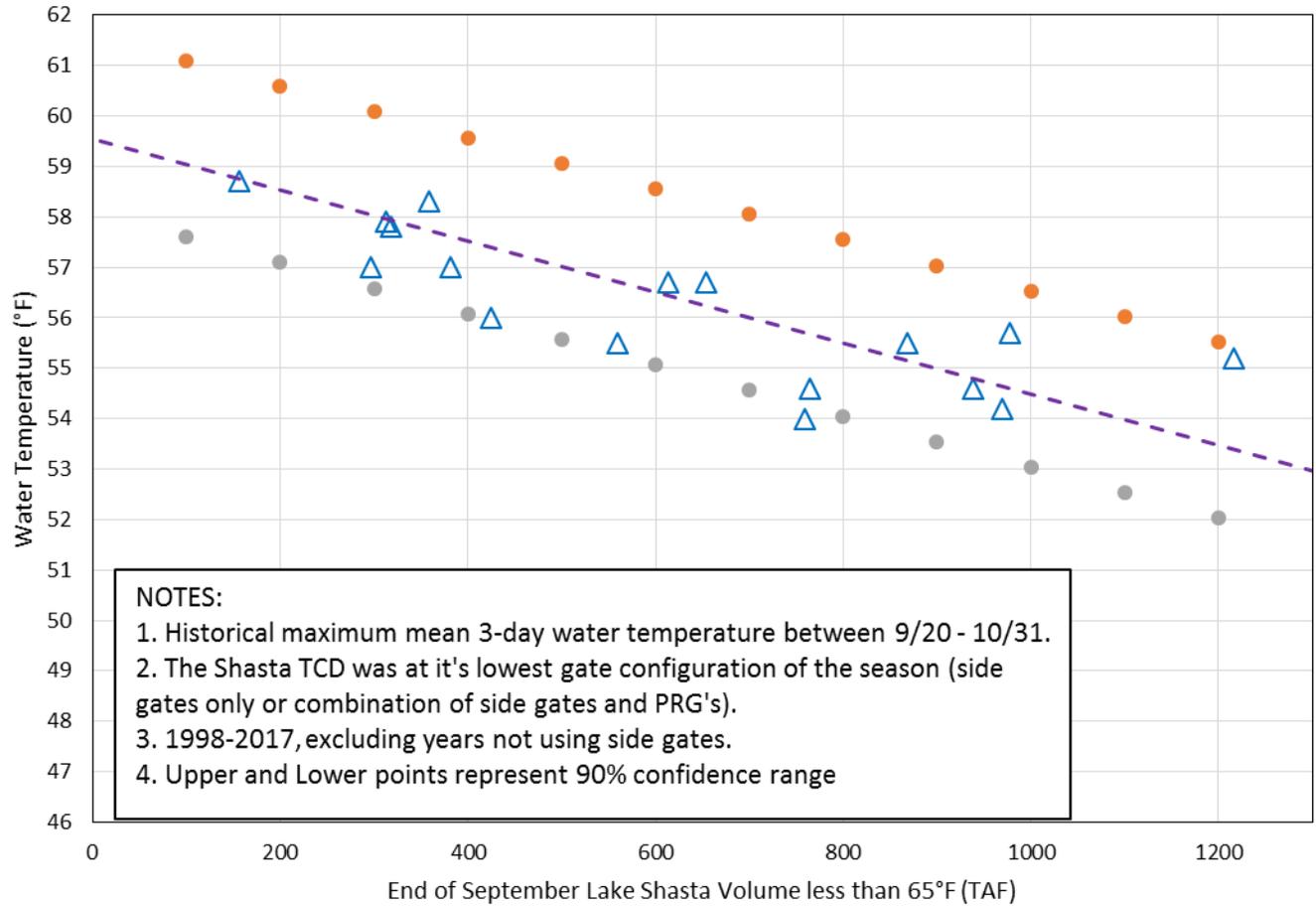
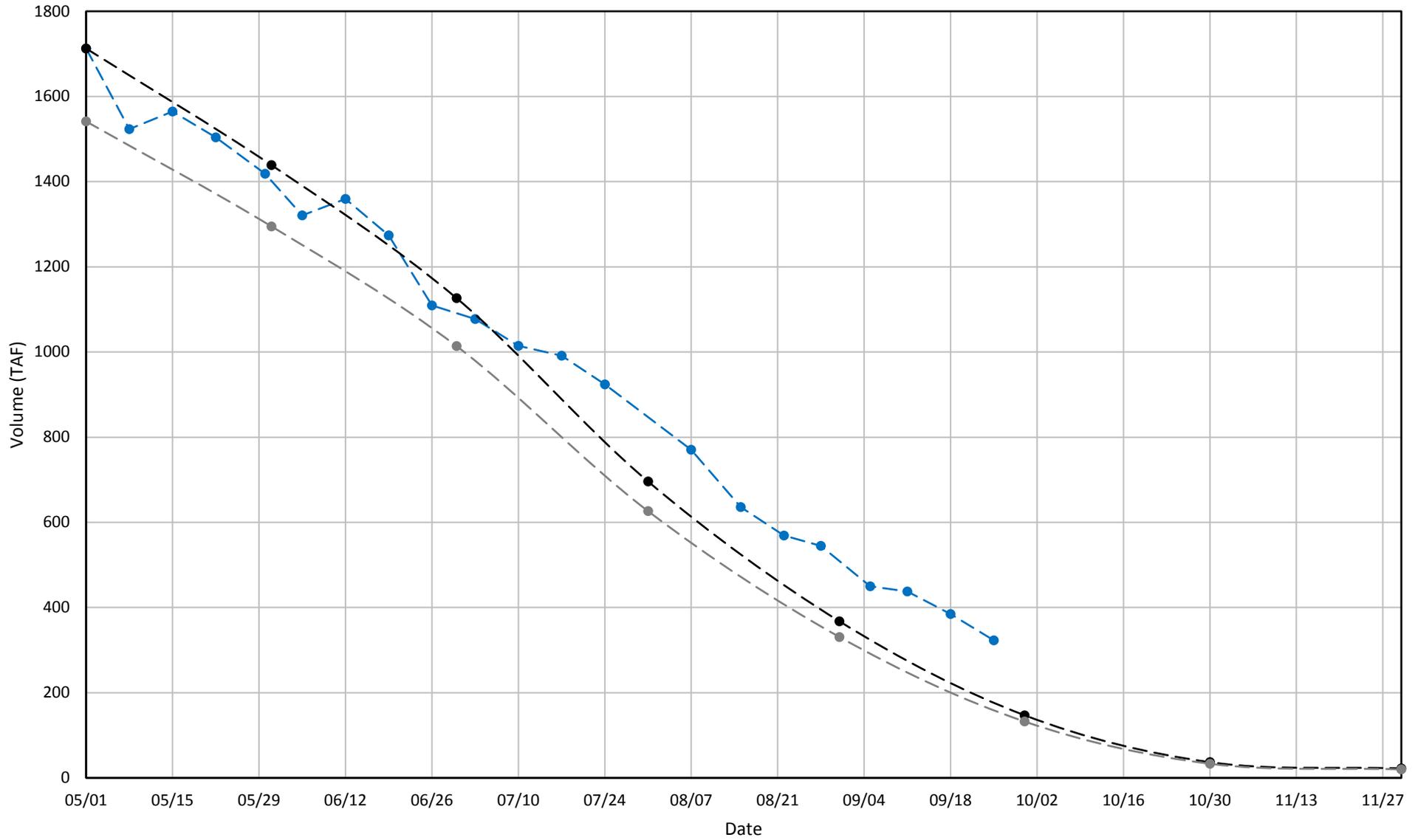


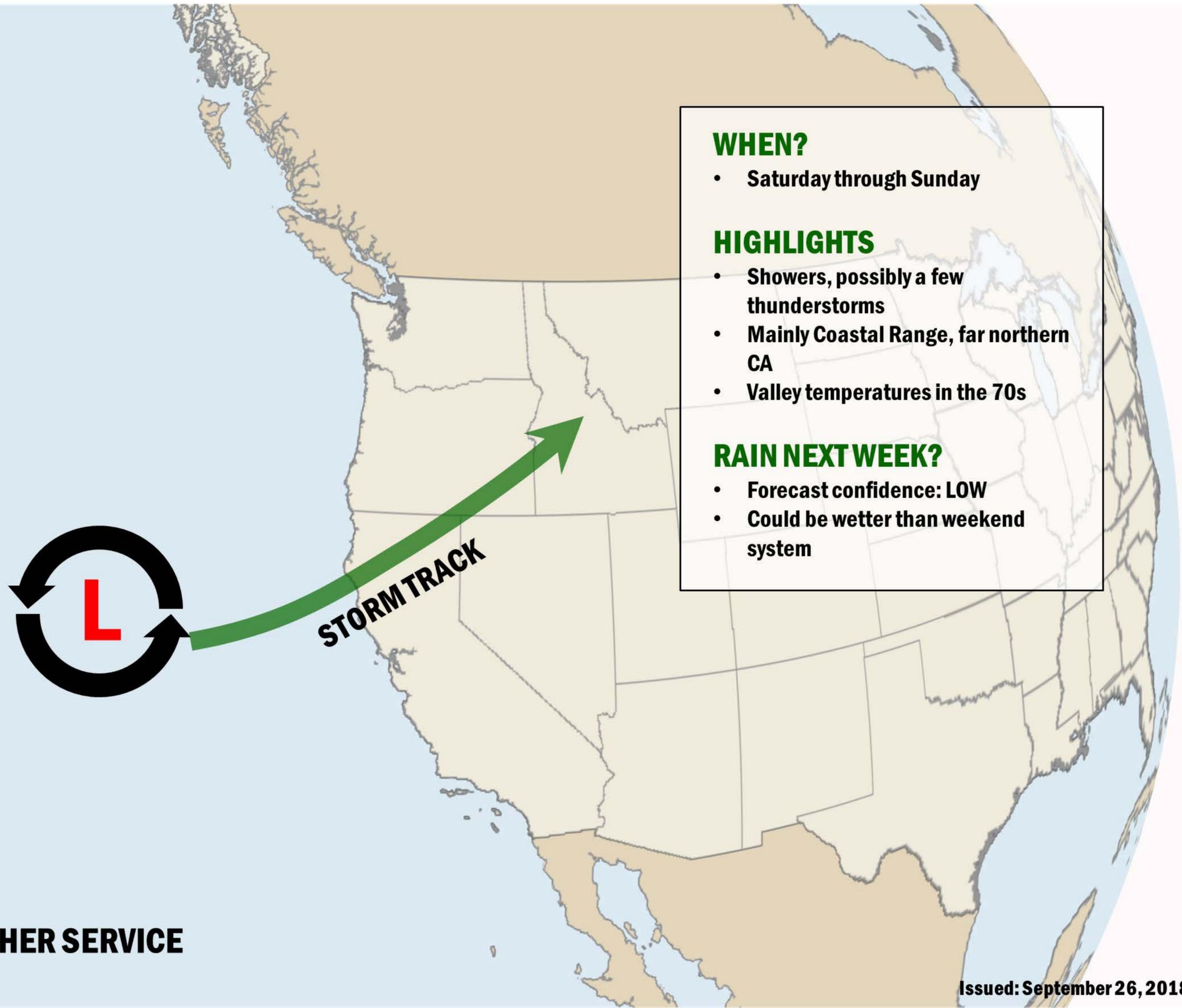
Figure 5

### 2018 Shasta Cold Water Pool Volume $\leq 49^{\circ}\text{F}$

—●— Actual    —●— Model Run 2018.05.09 - 35.5°F CCR 90%Hydro 10%Hist Met    —●— 10% Deficit



# COOLER, SHOWERY WEATHER THIS WEEKEND





# Precipitation Forecast

Saturday - Sunday

