

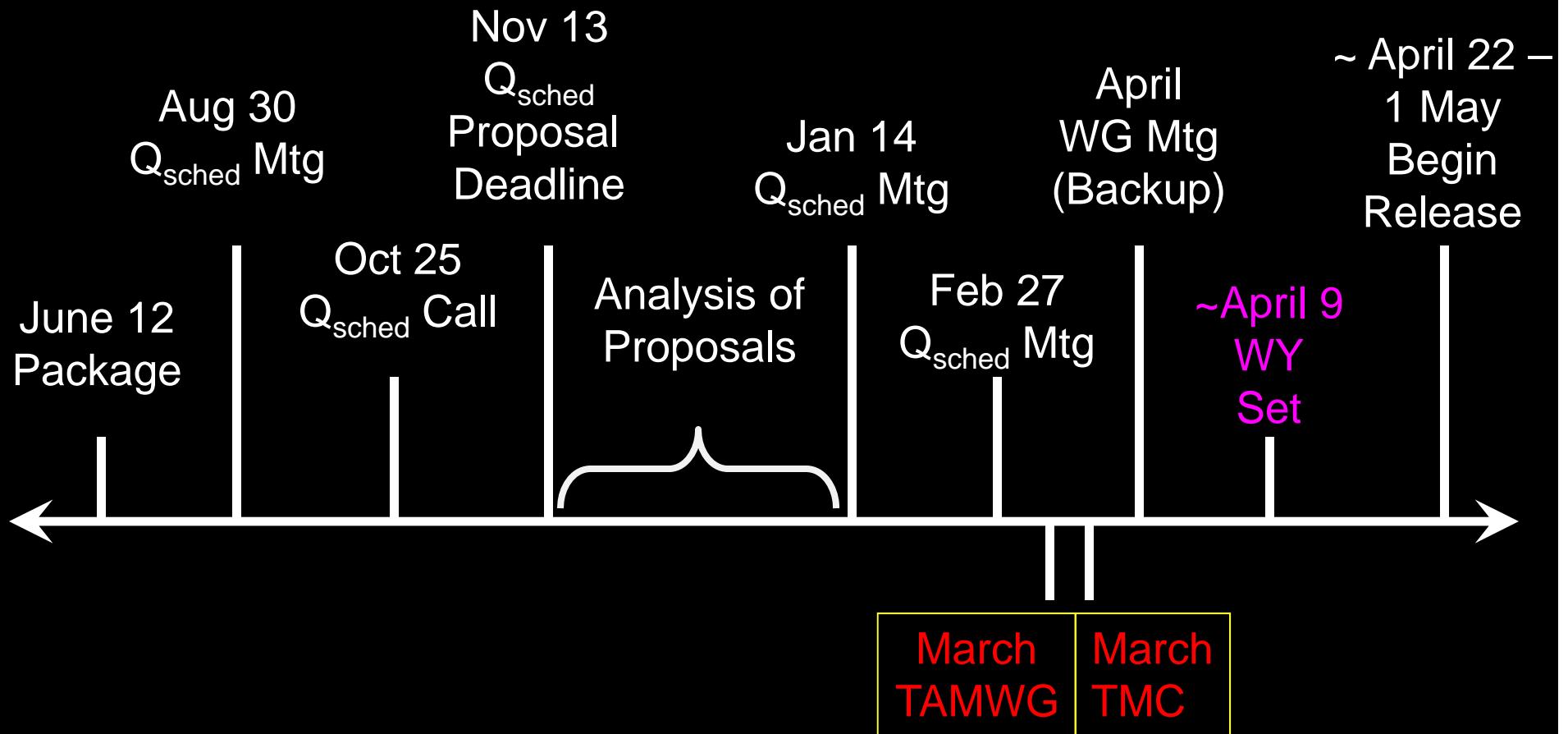
# 2014 Trinity River Hydrograph Design

TAMWG

18 March 2014



# 2014 Flow Scheduling Process





# **CURRENT CONDITIONS UPDATE**

## DAILY CVP WATER SUPPLY REPORT

MARCH 17, 2014

RUN DATE: March 18, 2014

### RESERVOIR RELEASES IN CUBIC FEET/SECOND

RESERVOIR	DAM	WY 2013	WY 2014	15 YR MEDIAN
TRINITY	LEWISTON	316	298	300
SACRAMENTO	KESWICK	4,778	2,692	4,504
FEATHER	OROVILLE (SWP)	1,750	800	1,750
AMERICAN	NIMBUS	1,886	546	1,886
STANISLAUS	GOODWIN	306	555	317
SAN JOAQUIN	FRIANT	400	141	141

### STORAGE IN MAJOR RESERVOIRS IN THOUSANDS OF ACRE-FEET

RESERVOIR	CAPACITY	15 YR AVG	WY 2013	WY 2014	% OF 15 YR AVG
TRINITY	2,448	1,786	2,027	1,288	72
SHASTA	4,552	3,505	3,691	2,062	59
OROVILLE (SWP)	3,538	2,363	2,883	1,603	68
FOLSOM	977	589	557	400	68
NEW MELONES	2,420	1,630	1,574	1,068	66
FED. SAN LUIS	966	831	772	451	54
MILLERTON	520	360	327	170	47
TOT. N. CVP	11,360	8,341	8,621	5,269	63

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

RESERVOIR	CURRENT WY 2014	DRIEST WY 1977	WETTEST WY 1983	15 YR AVG	% OF 15 YR AVG
TRINITY	195	67	1,097	486	40
SHASTA	1,344	1,287	6,091	2,775	48
FOLSOM	402	182	3,107	984	41
NEW MELONES	164	0	1,012	340	48
MILLERTON	63	105	1,411	375	17

### ACCUMULATED PRECIPITATION FOR WATER YEAR TO DATE IN INCHES

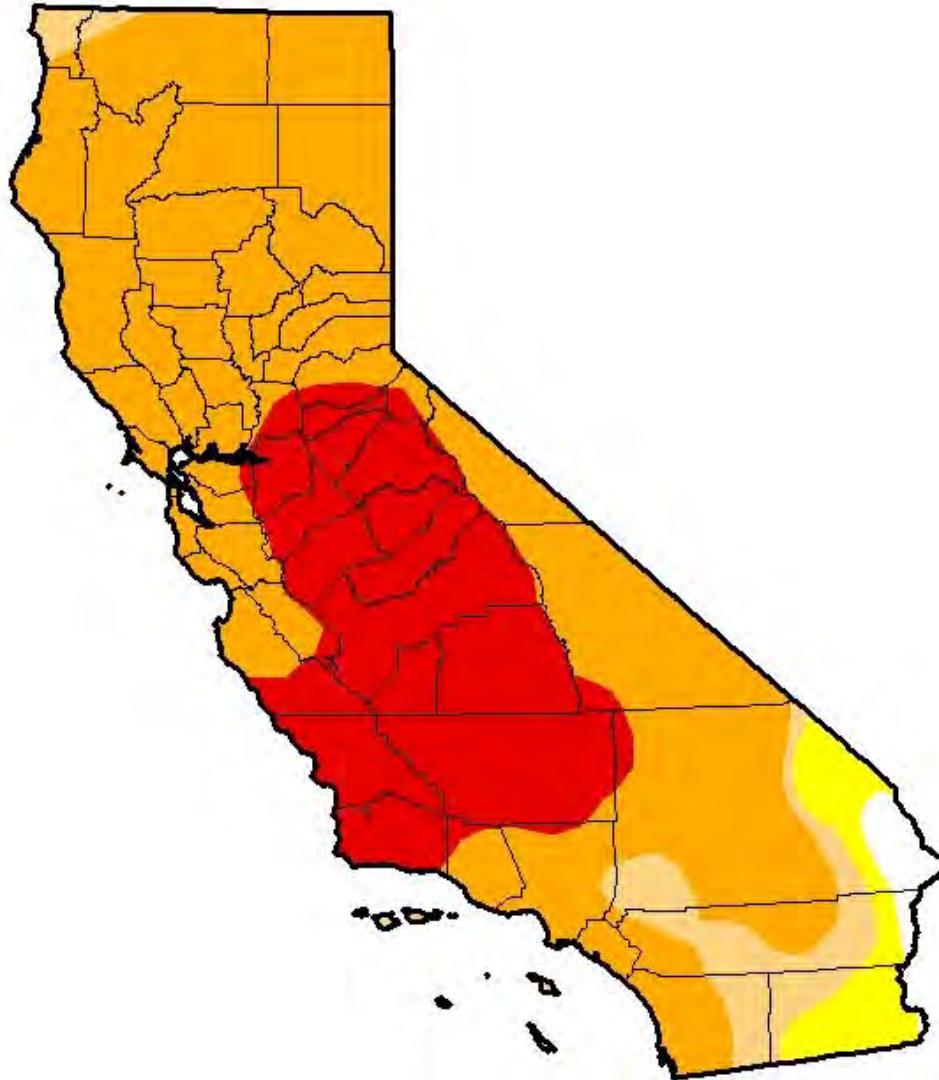
RESERVOIR	CURRENT WY 2014	DRIEST WY 1977	WETTEST WY 1983	AVG (N YRS)	% OF AVG	LAST 24 HRS
TRINITY AT FISH HATCHERY	12.81	8.67	45.04	25.43 ( 52 )	50	0.00
SACRAMENTO AT SHASTA DAM	22.12	9.78	90.36	48.85 ( 57 )	45	0.00

# U.S. Drought Monitor California

**January 7, 2014**

*(Released Thursday, Jan. 9, 2014)*

Valid 7 a.m. EST



*Drought Conditions (Percent Area)*

	None	D0	D1	D2	D3	D4
<b>Current</b>	1.43	4.32	6.71	59.94	27.59	0.00
<b>Last Week</b> <i>12/31/2013</i>	2.61	3.14	6.71	59.94	27.59	0.00
<b>3 Months Ago</b> <i>10/6/2013</i>	2.52	1.53	11.83	72.77	11.36	0.00
<b>Start of Calendar Year</b> <i>12/31/2013</i>	2.61	3.14	6.71	59.94	27.59	0.00
<b>Start of Water Year</b> <i>10/1/2013</i>	2.63	1.42	11.83	72.77	11.36	0.00
<b>One Year Ago</b> <i>1/8/2013</i>	32.42	12.56	33.65	21.37	0.00	0.00

*Intensity:*

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

*The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.*

**Author:**

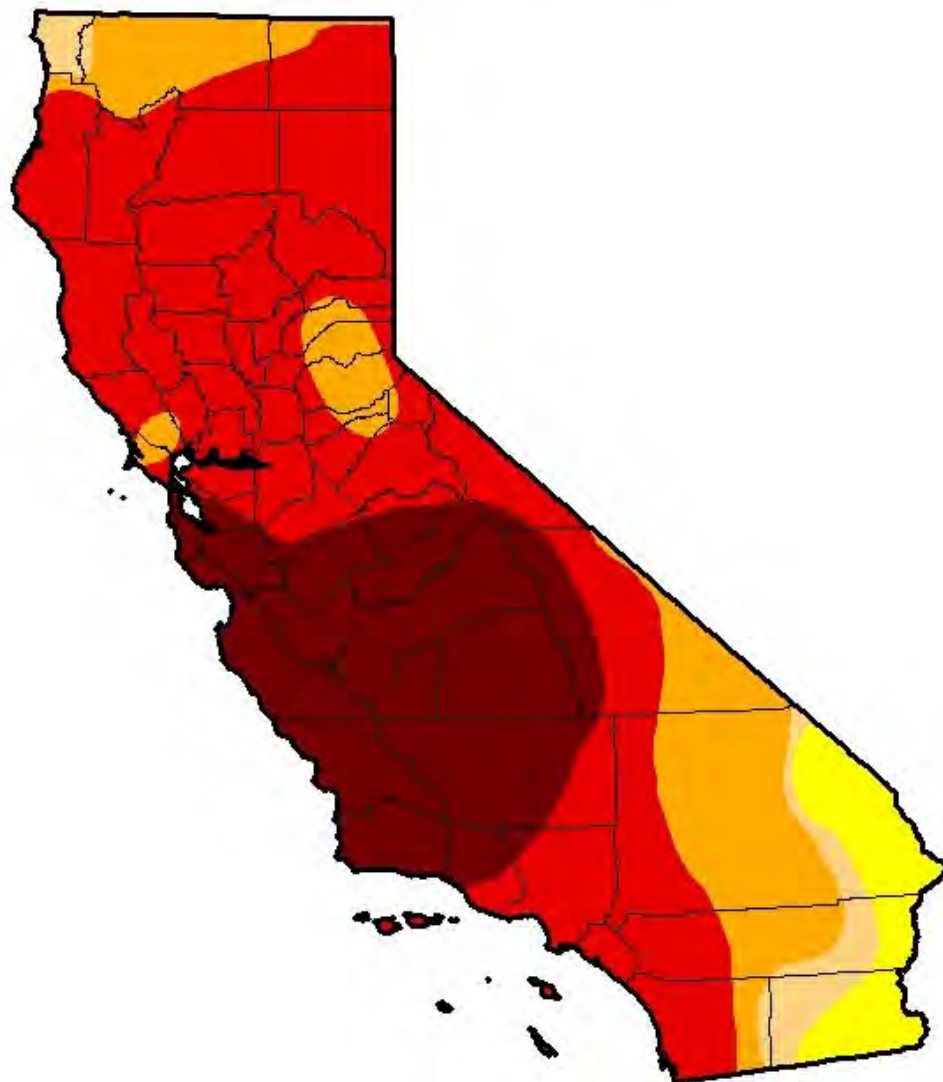
Mark Svoboda  
National Drought Mitigation Center



<http://droughtmonitor.unl.edu/>

# U.S. Drought Monitor California

**February 25, 2014**  
(Released Thursday, Feb. 27, 2014)  
Valid 7 a.m. EST



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	0.00	100.00	94.56	90.82	73.83	26.21
<b>Last Week</b> <i>2/18/2014</i>	0.00	100.00	94.54	90.82	68.30	14.62
<b>3 Months Ago</b> <i>11/26/2013</i>	2.61	97.39	94.15	82.53	27.59	0.00
<b>Start of Calendar Year</b> <i>12/31/2013</i>	2.61	97.39	94.25	87.53	27.59	0.00
<b>Start of Water Year</b> <i>10/1/2013</i>	2.63	97.37	95.95	84.12	11.36	0.00
<b>One Year Ago</b> <i>2/26/2013</i>	0.02	99.98	47.13	26.96	0.00	0.00

Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

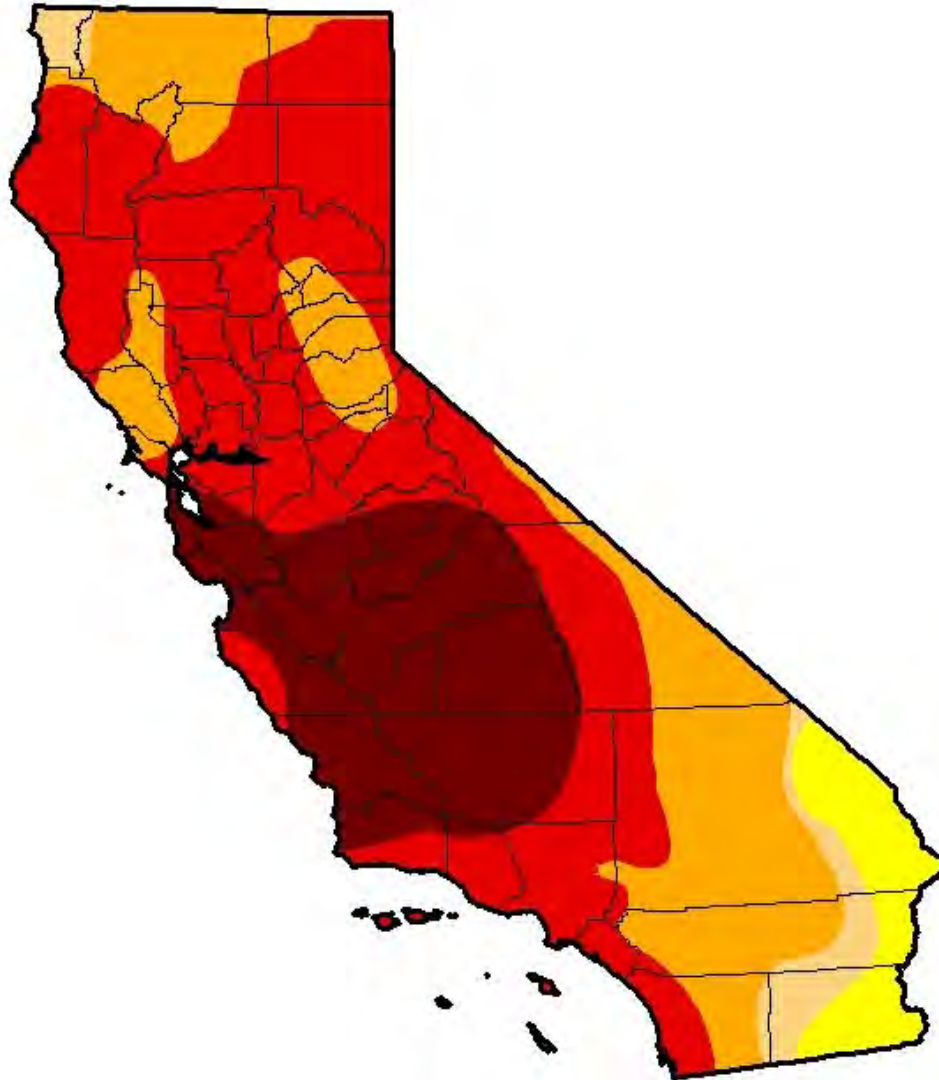
**Author:**  
Brad Rippey  
U.S. Department of Agriculture



<http://droughtmonitor.unl.edu/>

# U.S. Drought Monitor California

**March 11, 2014**  
(Released Thursday, Mar. 13, 2014)  
Valid 7 a.m. EDT



*Drought Conditions (Percent Area)*

	None	D0	D1	D2	D3	D4
<b>Current</b>	0.01	5.44	3.75	24.91	43.53	22.37
<b>Last Week</b> <i>3/4/2014</i>	0.00	5.44	3.73	24.93	43.53	22.37
<b>3 Months Ago</b> <i>12/10/2013</i>	2.61	3.24	11.62	54.94	27.59	0.00
<b>Start of Calendar Year</b> <i>12/31/2013</i>	2.61	3.14	6.71	59.94	27.59	0.00
<b>Start of Water Year</b> <i>10/1/2013</i>	2.63	1.42	11.83	72.77	11.36	0.00
<b>One Year Ago</b> <i>3/12/2013</i>	15.63	38.14	22.05	24.19	0.00	0.00

*Intensity:*

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

*The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.*

**Author:**  
Richard Tinker  
CPC/NOAA/NWS/NCEP



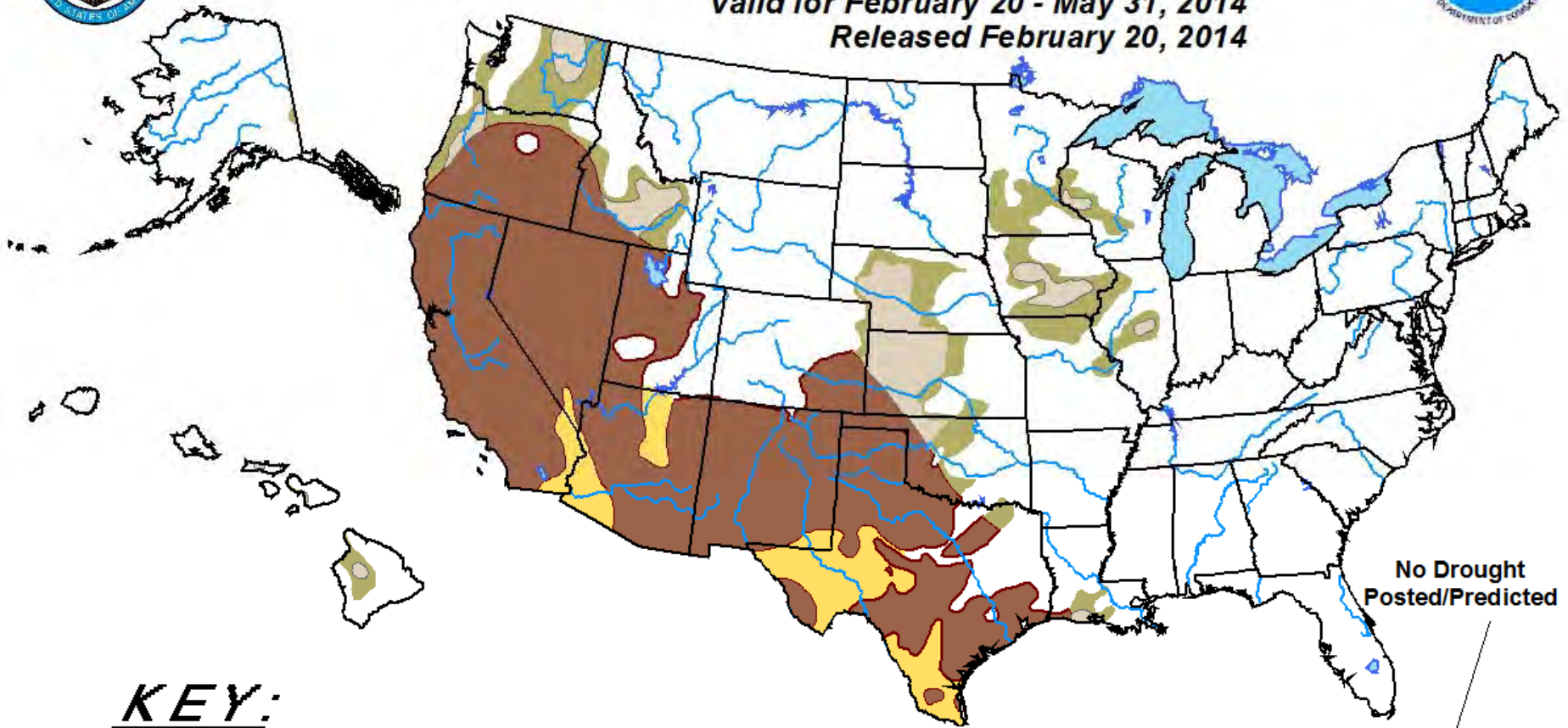
<http://droughtmonitor.unl.edu/>



# U.S. Seasonal Drought Outlook

## Drought Tendency During the Valid Period

Valid for February 20 - May 31, 2014  
Released February 20, 2014



### KEY:

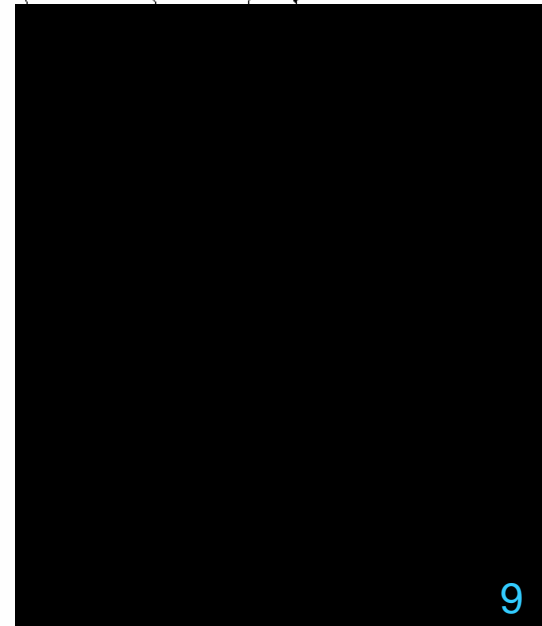
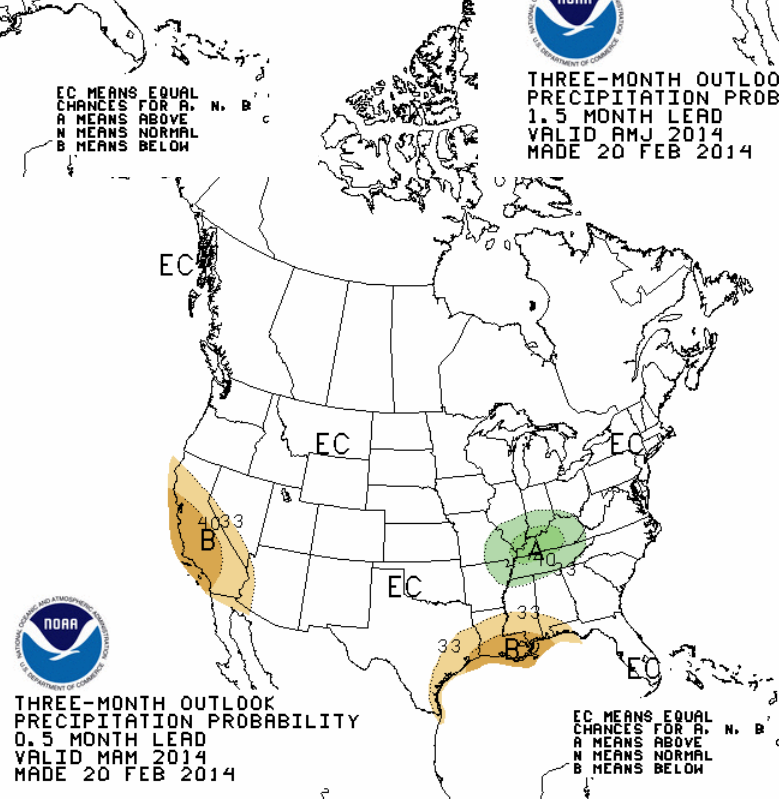
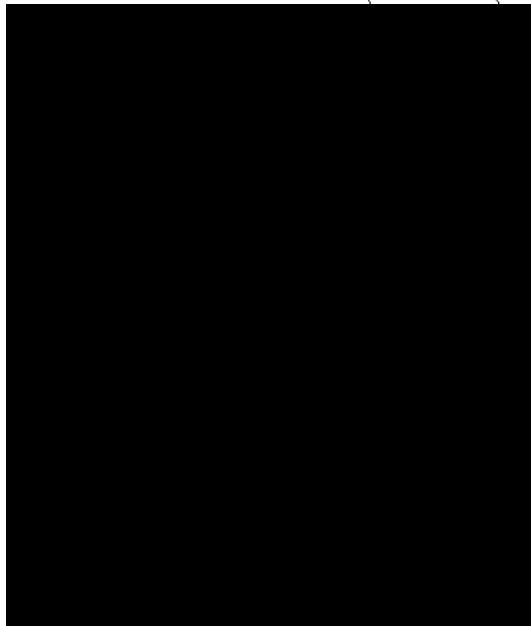
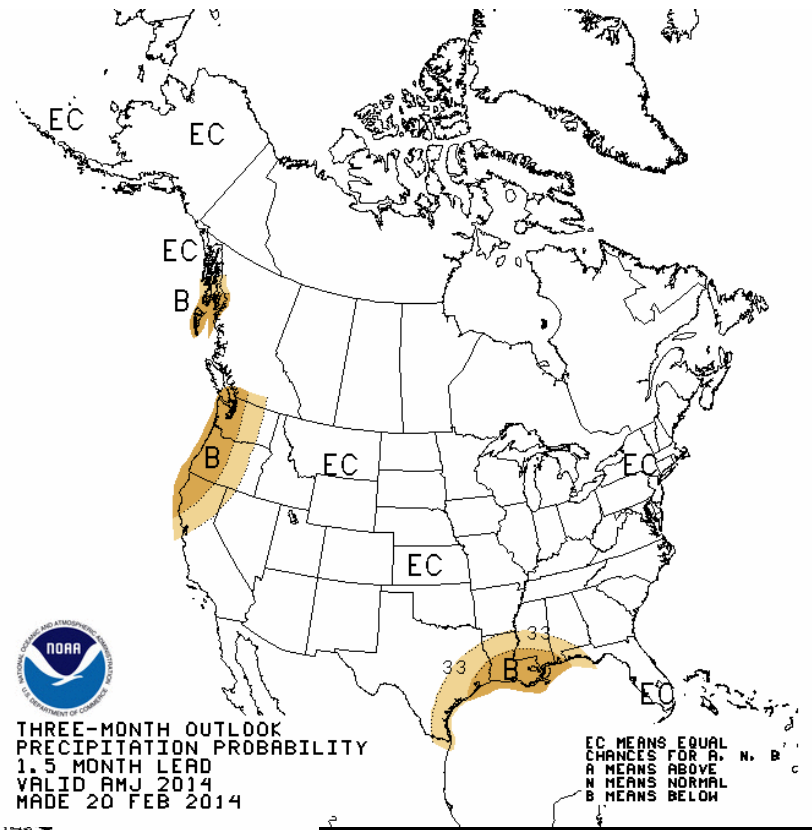
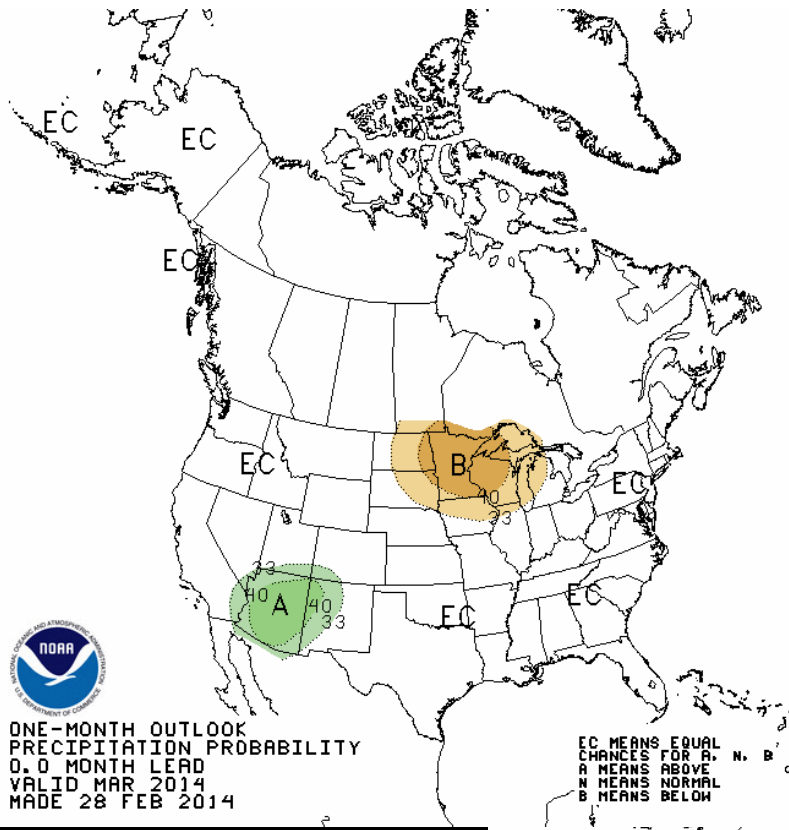
- Drought persists or intensifies
- Drought remains but improves
- Drought removal likely
- Drought development likely

**Author: Adam Allgood, Climate Prediction Center, NOAA**  
[http://www.cpc.ncep.noaa.gov/products/expert\\_assessment/season\\_drought.html](http://www.cpc.ncep.noaa.gov/products/expert_assessment/season_drought.html)

Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Short-term events -- such as individual storms -- cannot be accurately forecast more than a few days in advance. Use caution for applications -- such as crops -- that can be affected by such events. "Ongoing" drought areas are approximated from the Drought Monitor (D1 to D4 intensity). For weekly drought updates, see the latest U.S. Drought Monitor.

NOTE: The tan area areas imply at least a 1-category improvement in the Drought Monitor intensity levels by the end of the period although drought will remain. The Green areas imply drought removal by the end of the period (D0 or none)

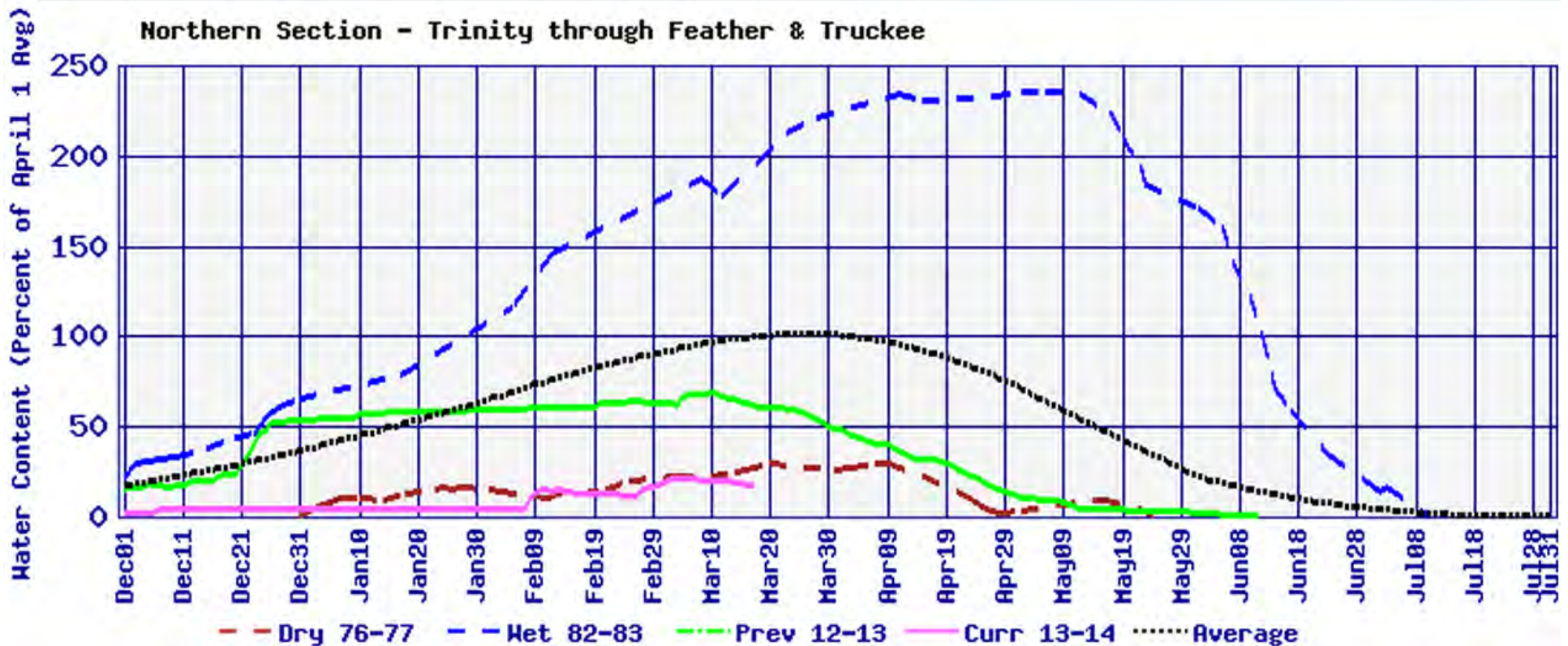




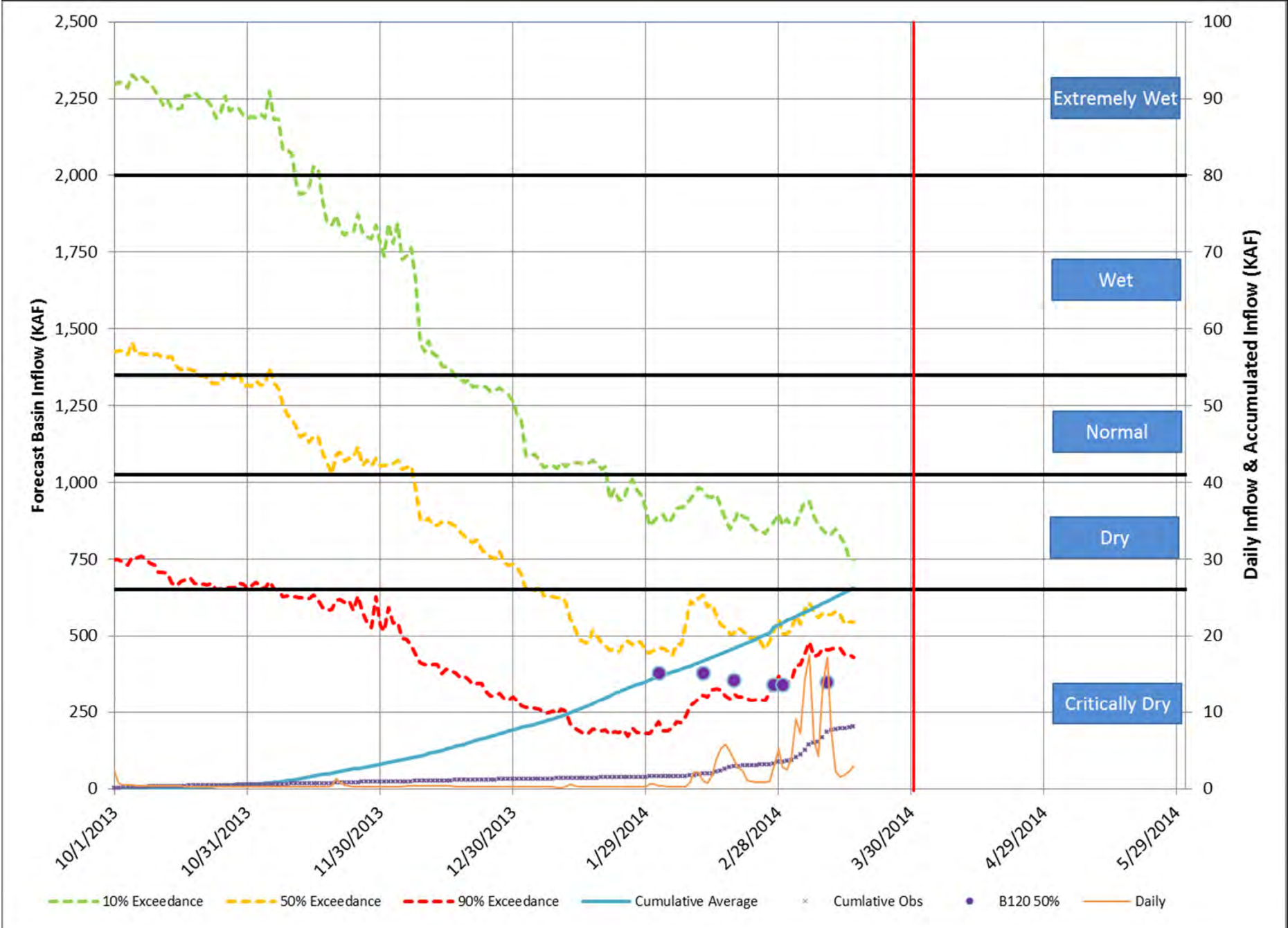
# California Snow Water Content

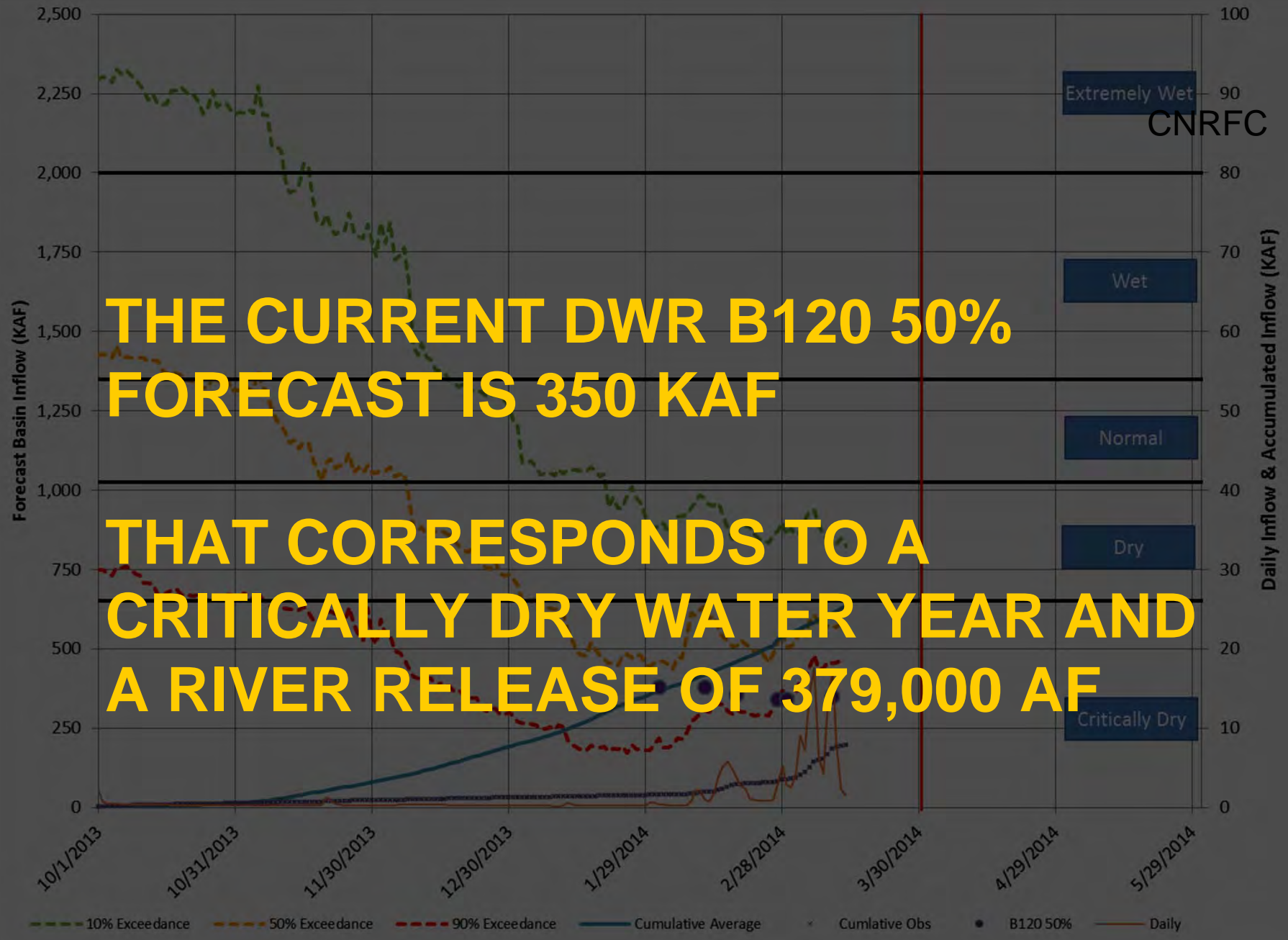
## California Snow Water Content

PERCENT OF APRIL 1 AVERAGE, MARCH 18, 2014



# B120 & CNRFC Annual Inflow Forecasts





**THE CURRENT DWR B120 50% FORECAST IS 350 KAF THAT CORRESPONDS TO A CRITICALLY DRY WATER YEAR AND A RIVER RELEASE OF 379,000 AF**

CNRFC  
Extremely Wet  
Wet  
Normal  
Dry  
Critically Dry

# Feb 2014 50% b2 Forecast

## Storages

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

		Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	
Trinity		1162	1187	1257	1302	1178	993	818	636	457	434	431	463	526
	Elev.	2275	2282	2286	2274	2254	2233	2208	2177	2172	2171	2178	2189	
Whiskeytown		205	206	206	238	238	238	238	238	238	206	206	206	206
	Elev.	1199	1199	1209	1209	1209	1209	1209	1209	1199	1199	1199	1199	
Shasta		1656	1795	1942	1993	1995	1770	1462	1221	1155	1139	1235	1424	1837
	Elev.	945	954	957	957	943	923	904	899	898	905	920	948	
Folsom		164	290	405	419	454	367	328	286	238	283	343	378	422
	Elev.	385	404	406	411	398	392	385	375	384	394	400	406	
New Melones		1046	1055	1054	994	891	774	656	539	452	438	456	480	514
	Elev.	950	950	942	927	909	888	866	847	844	848	853	861	
San Luis		333	403	419	366	256	95	18	16	166	302	485	735	905
	Elev.	429	445	430	408	380	350	348	368	394	430	469	501	
<b>Total</b>		4935	5282	5311	5013	4236	3520	2937	2707	2802	3155	3686	4410	


## Monthly River Releases (TAF/cfs)

Trinity	TAF	17	18	36	92	47	28	28	27	28	18	18	18
	cfs	300	300	600	1,498	783	450	450	450	450	300	300	300
Clear Creek	TAF	11	12	12	12	12	5	5	9	12	13	12	12
	cfs	200	200	200	200	200	85	85	150	200	225	200	200
Sacramento	TAF	194	200	297	384	550	610	536	357	283	212	200	200
	cfs	3500	3250	5000	6250	9250	9923	8723	6000	4602	3562	3250	3250
American	TAF	28	31	97	42	128	74	77	74	31	30	77	108
	cfs	500	500	1630	686	2149	1207	1250	1251	500	500	1250	1750
Stanislaus	TAF	12	15	29	25	32	22	23	14	35	12	12	13
	cfs	214	245	480	410	536	364	368	240	577	200	200	213

## Trinity Diversions (TAF)

	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
Carr PP	3	10	50	118	156	155	156	154	8	17	7	3
Spring Crk. PP	35	35	30	120	150	150	150	145	30	10	10	25

# Feb 2014 90% b2 Forecast – Min Reg Stds

## Storages

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

		Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	
Trinity		1162	1148	1150	1111	963	795	639	484	334	302	#N/A	#N/A	#N/A
	Elev.	2271	2271	2267	2251	2230	2208	2182	2158	2142	#N/A	#N/A	#N/A	
Whiskeytown		205	206	206	238	238	238	238	230	206	201	186	206	
	Elev.	1199	1199	1209	1209	1209	1209	1209	1207	1199	1197	1192	1199	
Shasta		1656	1678	1703	1566	1326	948	442	194	150	84	93	152	276
	Elev.	937	939	930	913	880	819	765	751	722	727	752	786	
Folsom		164	290	310	312	316	273	210	174	127	133	143	165	196
	Elev.	385	389	389	390	382	369	360	346	348	351	358	366	
New Melones		1046	1051	1026	962	876	782	675	569	491	472	474	479	483
	Elev.	949	946	937	924	910	892	872	856	852	852	853	854	
San Luis		333	342	350	344	310	245	170	124	189	335	464	617	777
	Elev.	415	413	404	389	374	356	341	354	391	431	464	494	
Total		4714	4744	4533	4028	3281	2375	1781	1521	1532	#N/A	#N/A	#N/A	


### Monthly River Releases (TAF/cfs)

Trinity	TAF	17	18	36	92	47	28	28	27	23	18	18	18
	cfs	300	300	600	1,498	783	450	450	450	373	300	300	300
Clear Creek	TAF	11	12	12	12	9	7	5	9	12	12	12	12
	cfs	200	200	200	200	150	120	85	150	200	200	200	200
Sacramento	TAF	180	200	351	483	631	738	467	268	295	230	218	200
	cfs	3250	3250	5900	7850	10600	12000	7595	4501	4800	3873	3552	3250
American	TAF	28	31	33	33	54	65	49	58	31	30	31	31
	cfs	500	500	556	534	908	1054	798	973	500	500	500	500
Stanislaus	TAF	12	16	29	25	33	24	22	14	35	12	12	13
	cfs	214	268	480	410	561	396	352	240	577	210	200	213

### Trinity Diversions (TAF)

	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
Carr PP	6	1	39	76	127	128	127	122	17	15	10	29
Spring Crk. PP	5	8	10	70	120	120	120	120	30	10	17	4

# Feb 2014 90% b2 Forecast – Min Releases

## Storages

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

		Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	
Trinity		1162	1148	1150	1111	963	795	639	484	334	302	#N/A	#N/A	#N/A
	Elev.	2271	2271	2267	2251	2230	2208	2182	2150	2142	#N/A	#N/A	#N/A	
Whiskeytown		205	206	206	238	238	238	238	230	206	201	186	206	
	Elev.	1199	1199	1209	1209	1209	1209	1209	1207	1199	1197	1192	1199	
Shasta		1656	1678	1703	1625	1462	1244	928	707	690	654	692	762	885
	Elev.	937	939	934	923	906	878	855	853	849	853	861	874	
Folsom		164	290	310	315	321	302	273	254	235	240	251	272	303
	Elev.	385	389	390	391	388	382	379	375	376	378	382	388	
New Melones		1046	1051	1026	962	876	782	675	569	491	472	474	479	483
	Elev.	949	946	937	924	910	892	872	856	852	852	853	854	
San Luis		333	342	350	344	310	245	170	106	64	107	230	374	524
	Elev.	414	412	402	386	372	356	340	331	360	399	434	466	
Total		4714	4744	4595	4170	3607	2924	2358	2043	1981	#N/A	#N/A	#N/A	

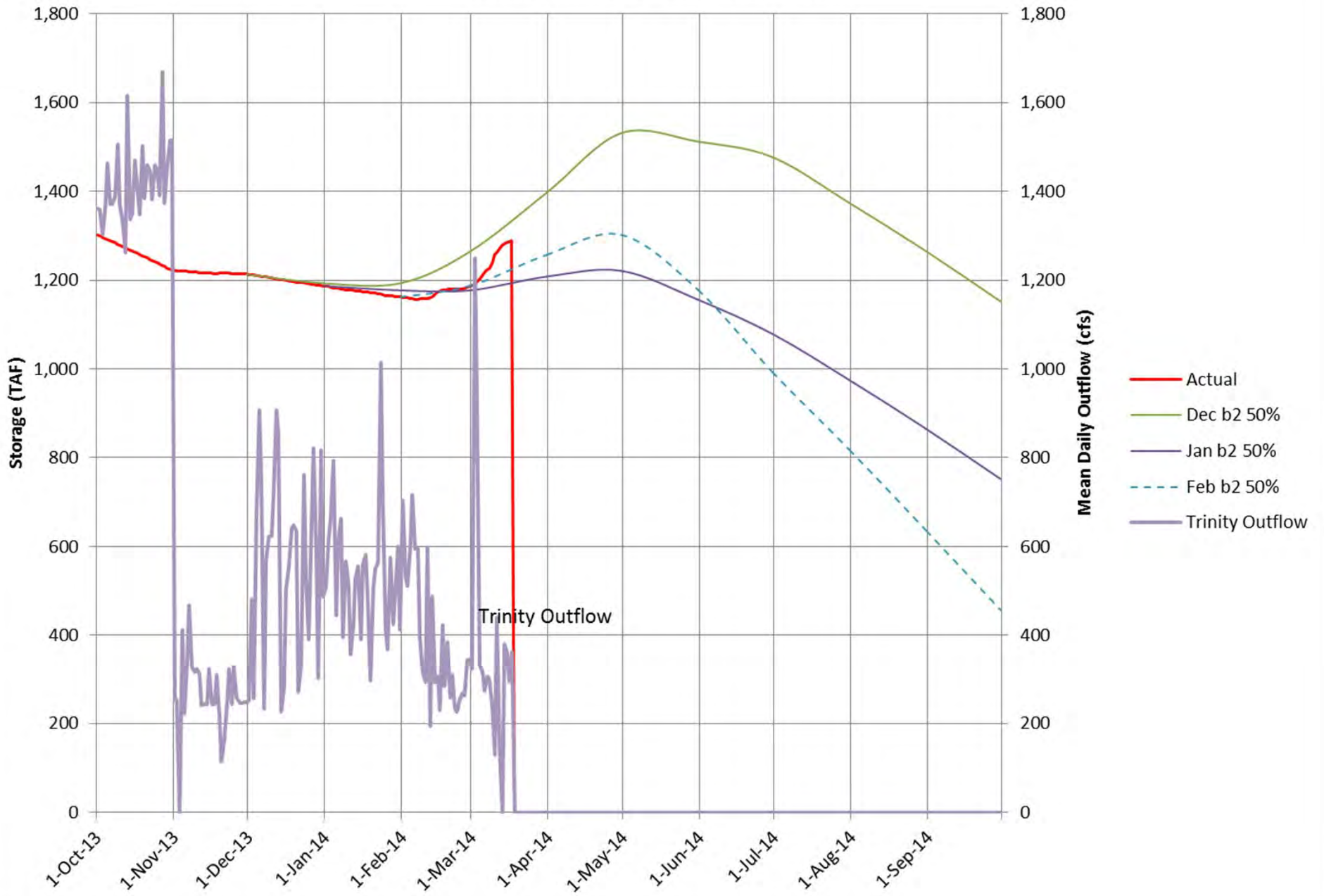

## Monthly River Releases (TAF/cfs)

Trinity	TAF	17	18	36	92	47	28	28	27	23	18	18	18
	cfs	300	300	600	1,498	783	450	450	450	373	300	300	300
Clear Creek	TAF	11	12	12	12	9	7	5	9	12	12	12	12
	cfs	200	200	200	200	150	120	85	150	200	200	200	200
Sacramento	TAF	180	200	292	406	470	546	436	238	264	201	200	200
	cfs	3250	3250	4900	6600	7900	8889	7095	4001	4300	3373	3250	3250
American	TAF	28	31	30	31	30	31	31	30	31	30	31	31
	cfs	500	500	500	500	500	500	500	500	500	500	500	500
Stanislaus	TAF	12	16	29	25	33	24	22	14	35	12	12	13
	cfs	214	268	480	410	561	396	352	240	577	210	200	213

## Trinity Diversions (TAF)

	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
Carr PP	6	1	39	76	127	128	127	122	17	15	4	29
Spring Crk. PP	5	8	10	70	120	120	120	120	30	10	11	4

# Trinity Reservoir Storage



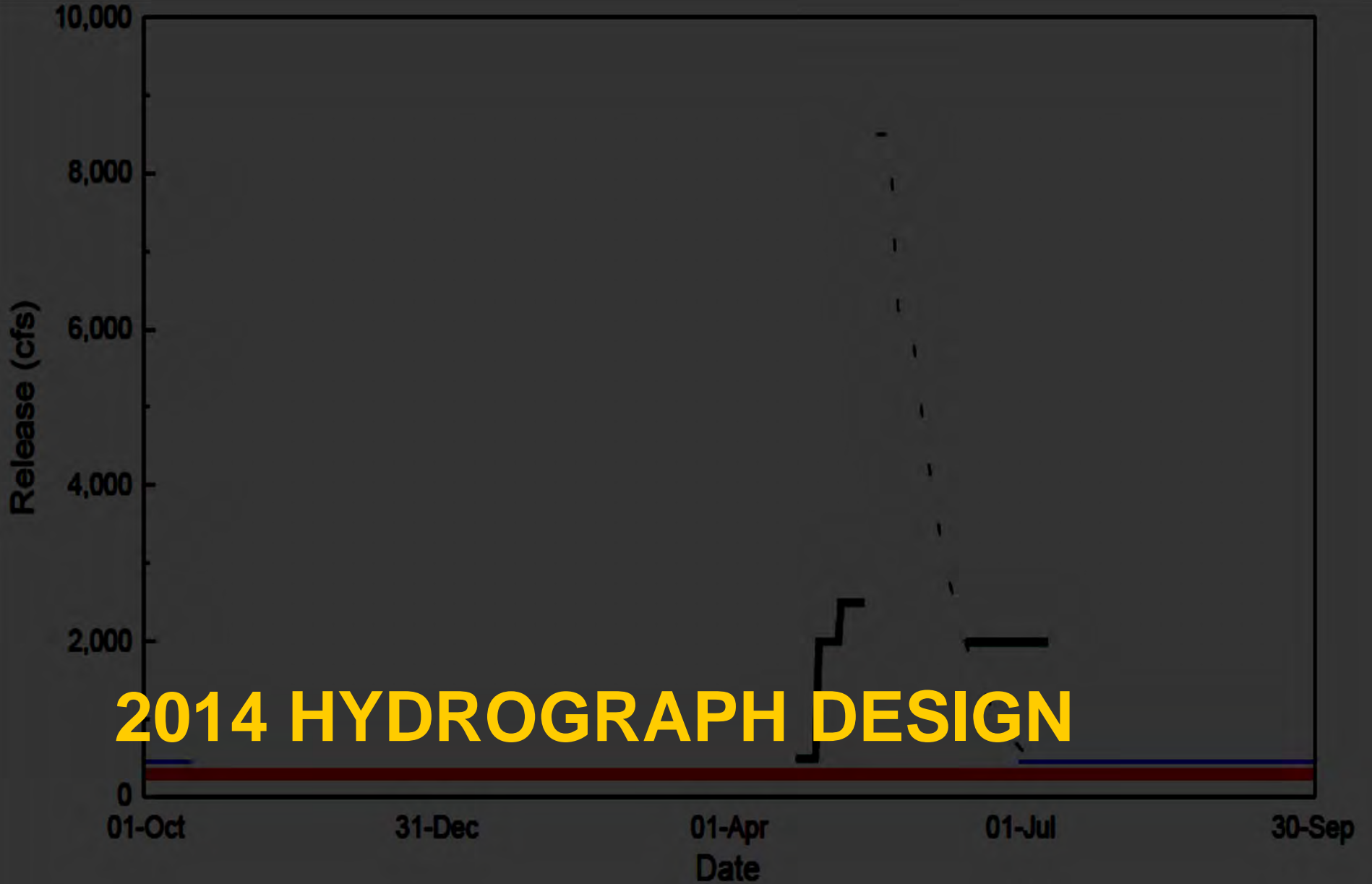


# b2 Summary

## Dec 2013

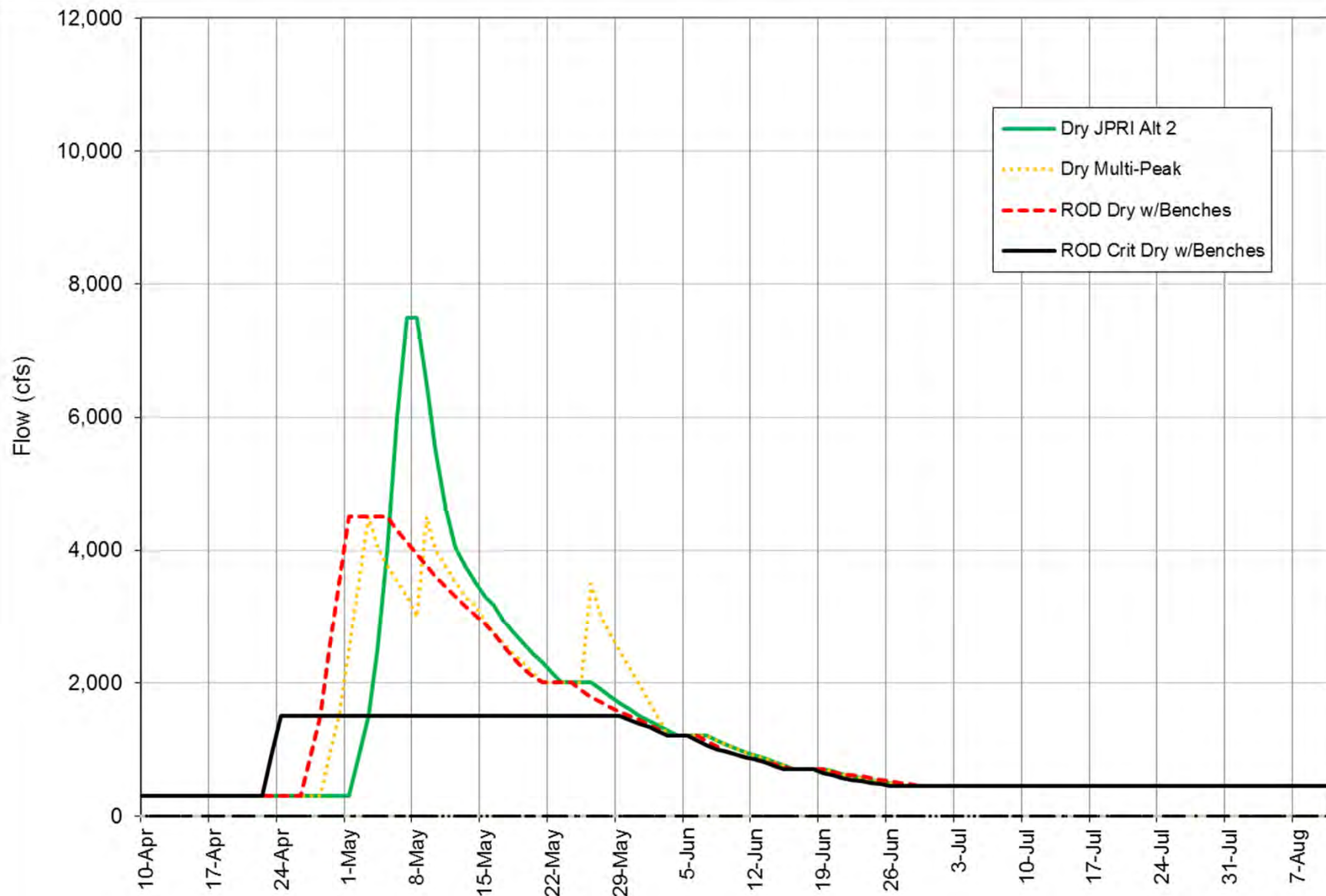
## Feb 2014

- 50% Exceedance
    - EOS Storage
      - 1,152 KAF
    - 2014 Carr Export
      - 461 KAF
  - 90% Exceedance
    - EOS Storage
      - 507 KAF
    - 2014 Carr Export
      - 812 KAF
- 50% Exceedance
    - EOS Storage
      - 457 KAF
    - 2014 Carr Export
      - ~ 896 KAF
  - 90% Exceedance – Min Reg.
    - EOS Storage
      - 334 KAF
    - 2014 Carr Export
      - ~ 720 KAF
  - 90% Exceedance – Min Rel.
    - EOS Storage
      - 334 KAF
    - 2014 Carr Export
      - ~ 720 KAF



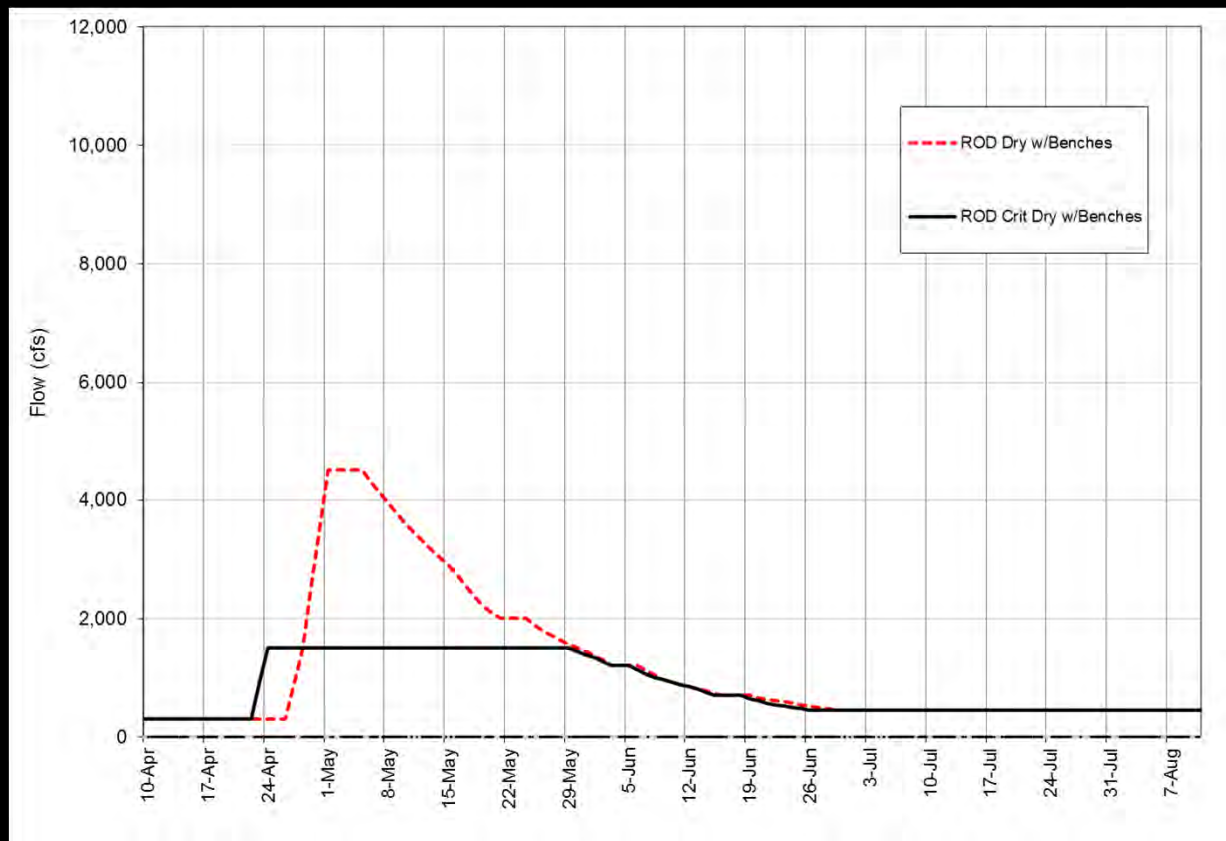
<b>Initial Array of Hydrograph Alternative</b>	<b>Hydrograph Alternatives Subjected to Evaluation</b>	<b>Hydrograph Alternatives Relevant to WY2014</b>
<b>(EW) ROD*</b>	(EW) ROD*	-
<b>(EW) Riparian Initiation</b>	(EW) Riparian Initiation	-
<b>(W) ROD</b>	(W) ROD	-
<b>(W) Alt 1</b>	(W) Alt 1	-
<b>(W) Alt 2</b>	(W) Alt 2	-
<b>(W) Multi-peak 1</b>	(W) Multi-peak 1	-
<b>(W) Multi-peak 2</b>	(W) Multi-peak 2	-
<b>(W) 11,000 cfs</b>	-	-
<b>(N) ROD</b>	(N) ROD	-
<b>(N) Multi-peak 1</b>	(N) Multi-peak 1	-
<b>(N) Multi-peak 2</b>	(N) Multi-peak 2	-
<b>(N) 2004 Modified</b>	-	-
<b>(N) 2008 Modified</b>	-	-
<b>(N) Riparian Descending Limb</b>	-	-
<b>(N) Riparian/Wildlife Peak plus Monitoring</b>	-	-
<b>(N) 7000 cfs Model Calibration</b>	-	-
<b>(N) Joint Physical-Riparian</b>	(N) Joint Physical-Riparian	-
<b>(D) ROD</b>	(D) ROD	(D) ROD
<b>(D) Multi-peak</b>	(D) Multi-peak	(D) Multi-peak
<b>(D) Monitoring Benches</b>	-	-
<b>(D) Spring Habitat Bench</b>	-	-
<b>(D) Joint Physical-Riparian Alt 1</b>	-	-
<b>(D) Joint Physical-Riparian Alt 2</b>	(D) Joint Physical-Riparian Alt 2	(D) Joint Physical-Riparian Alt 2
<b>(CD) ROD</b>	(CD) ROD	(CD) ROD

# 2014 Hydrographs



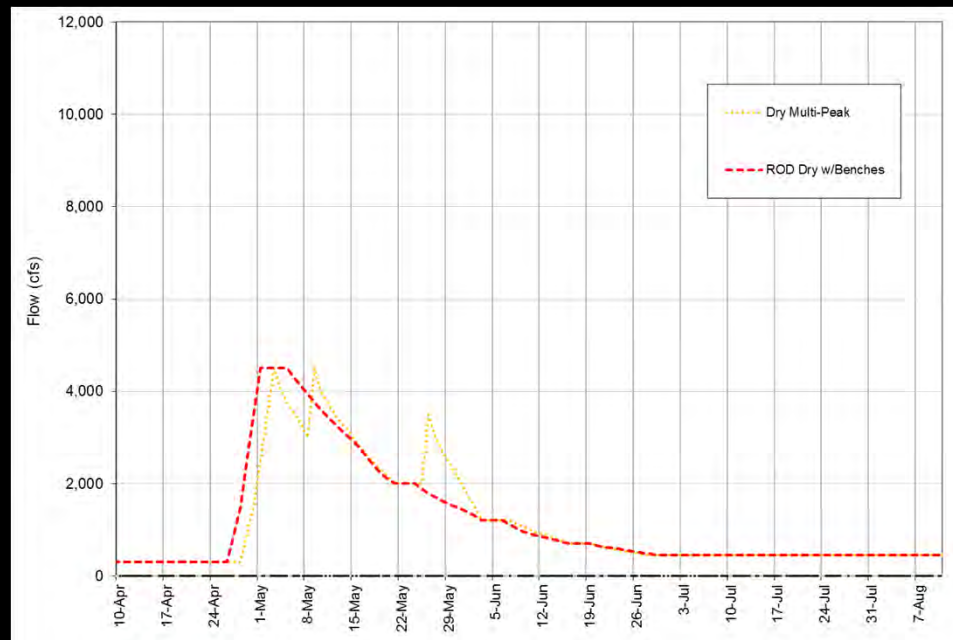
# ROD Critically Dry & Dry

- Chapter 8 of the Trinity River Flow Evaluation Final Report (USFWS and HVT 1999) describes the ROD Critically Dry and Dry hydrographs



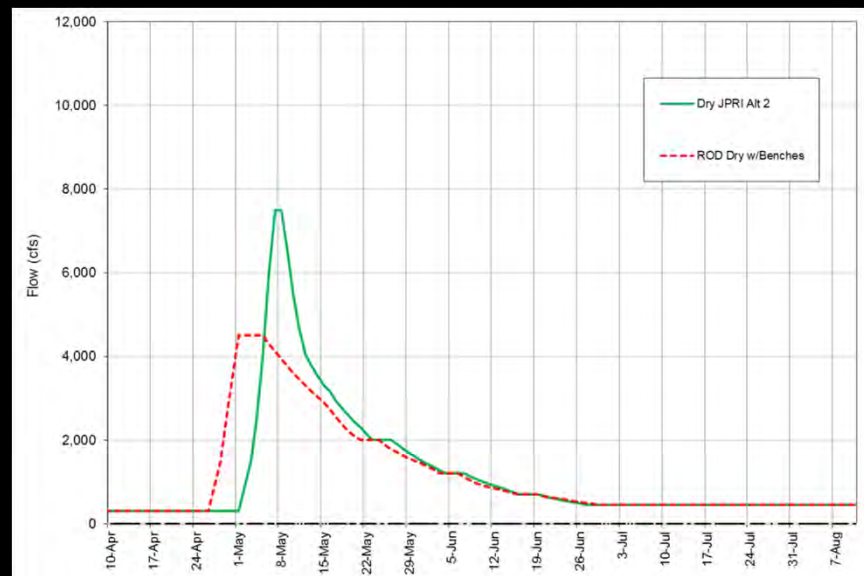
# Dry Water Year Multi-peak

- tests the effect of multiple flow peaks on sediment transport
- mimics natural flow regime of multiple snowmelt peaks
- achieves temperature and smolt migration objectives for a dry water year
- provides diverse rearing and feeding conditions for salmonid juveniles and smolts



# Dry Water Year Joint Physical Riparian Initiation Alternative 2

- The peak of the ROD Dry hydrograph is modified from five-days @ 4,500 cfs to two-days @ 7,500 cfs
  - Increase sediment transport to closer meet sediment transport objectives defined in the Trinity River Flow Evaluation Final Report
  - Increase the mobilization of sediments from the Rush Creek Delta
  - Induce fine sediment flushing and gravel sorting at the Upper Junction City rehabilitation site constructed in 2012



# Analyses – Evaluation Factors

- Temperature Compliance (Appendix C)
- Sediment Transport (Appendix D)
- Salmonid Rearing Habitat (Appendix E)
- Riparian Initiation & Scour
- Outmigrant Timing
- Learning Opportunities



# Dry Year Evaluation Results

Factor Hydrograph	Temperature Compliance	Sediment Transport	Riparian Scour	Bed Scour / Mobility	Rearing Habitat	Riparian Initiation / Inundation	Juvenile Outmigration	Learning Opportunity
ROD	2	1.5	1.5	2	1.5	3	2	1
Multi Peak	2	1.5	1.5	1	1.5	1.5	2	2.5
JPRI Alt 2	2	3	3	3	3	1.5	2	2.5

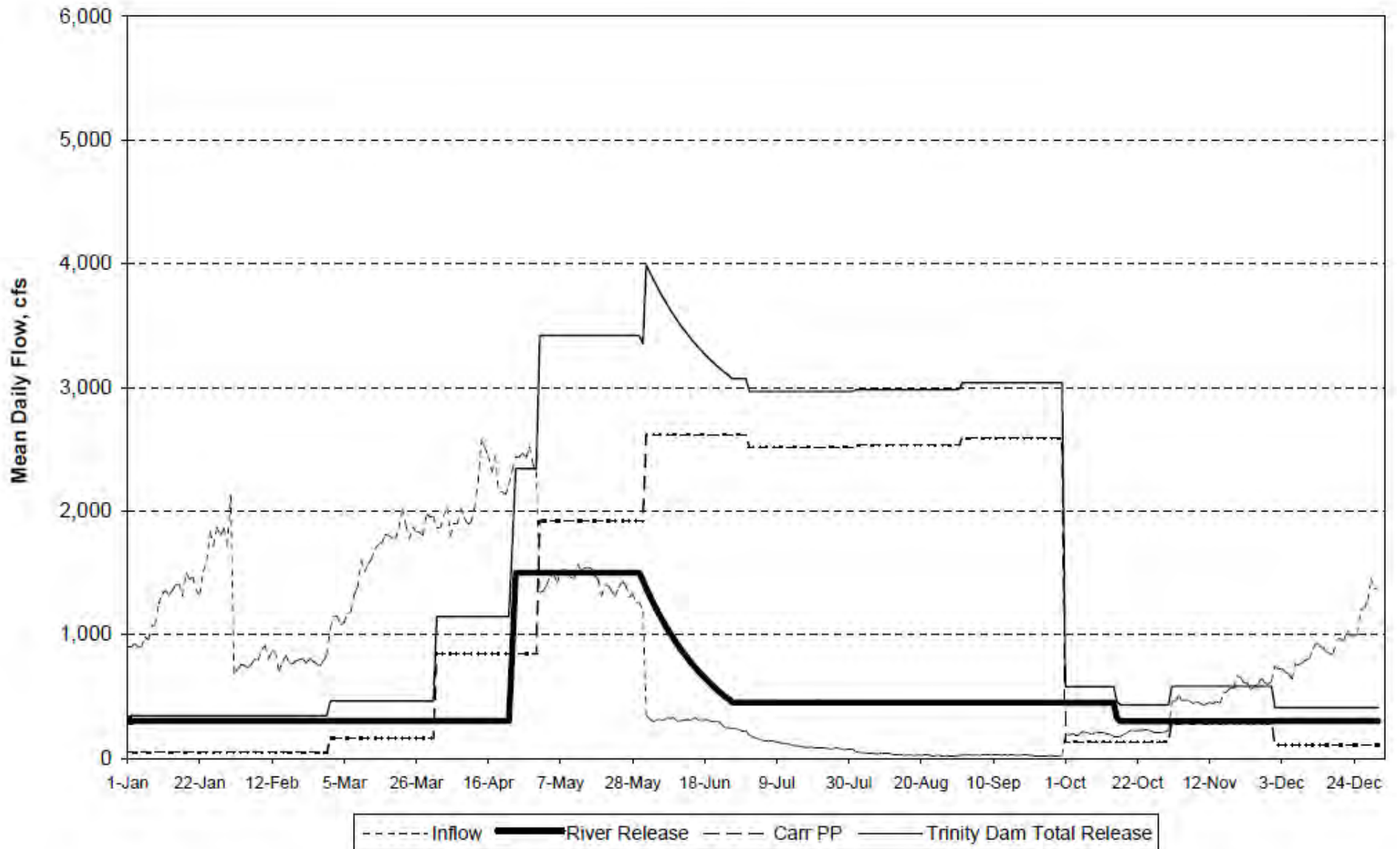
# Consensus Recommendation by the Flow Workgroup

- If it is a Critically Dry year the group recommends the ROD hydrograph.
- If it is a Dry year the group recommends JPRI Alt. 2.

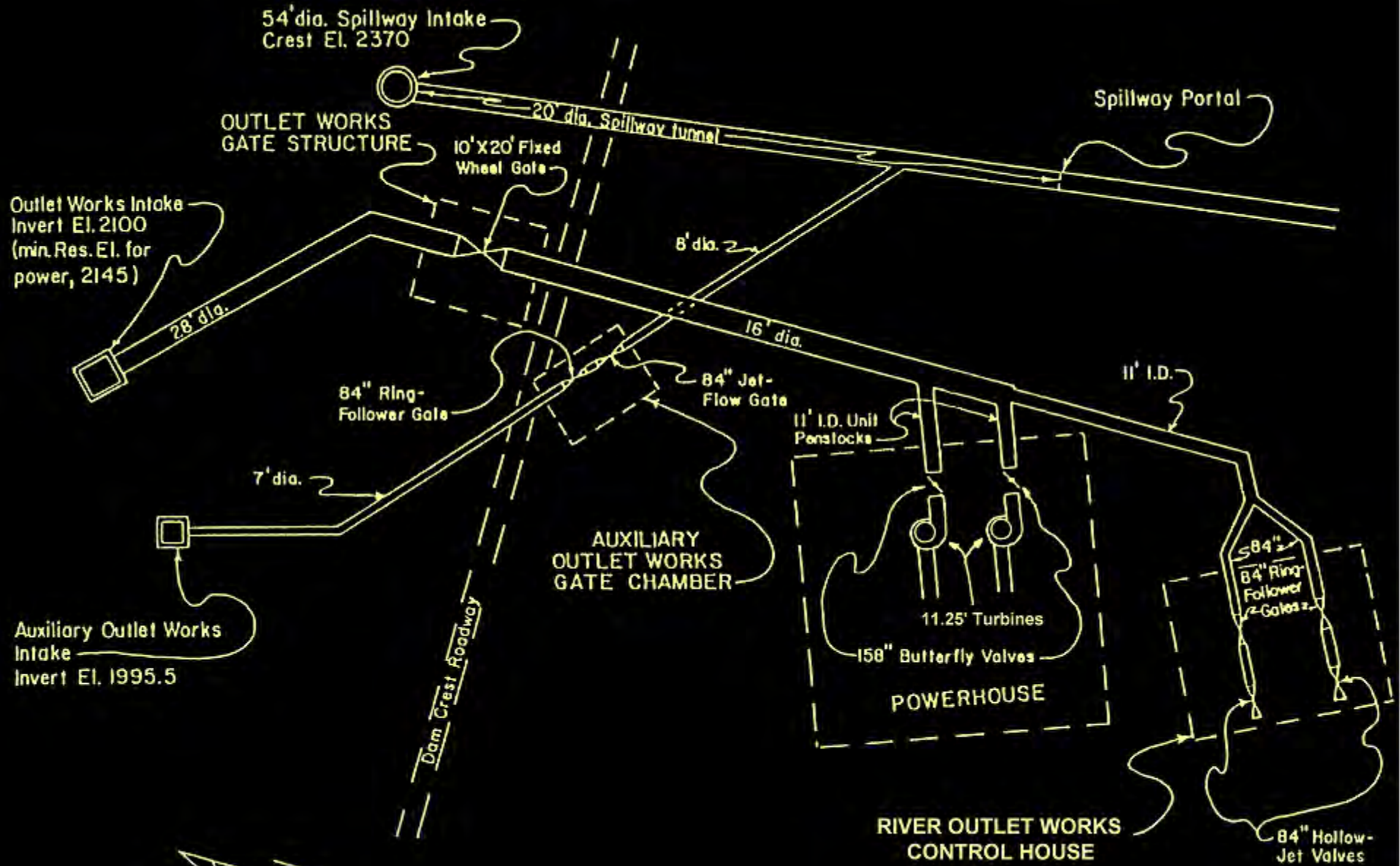


# TRD Operations Forecast

Trinity River



# Trinity Dam Outlet Works

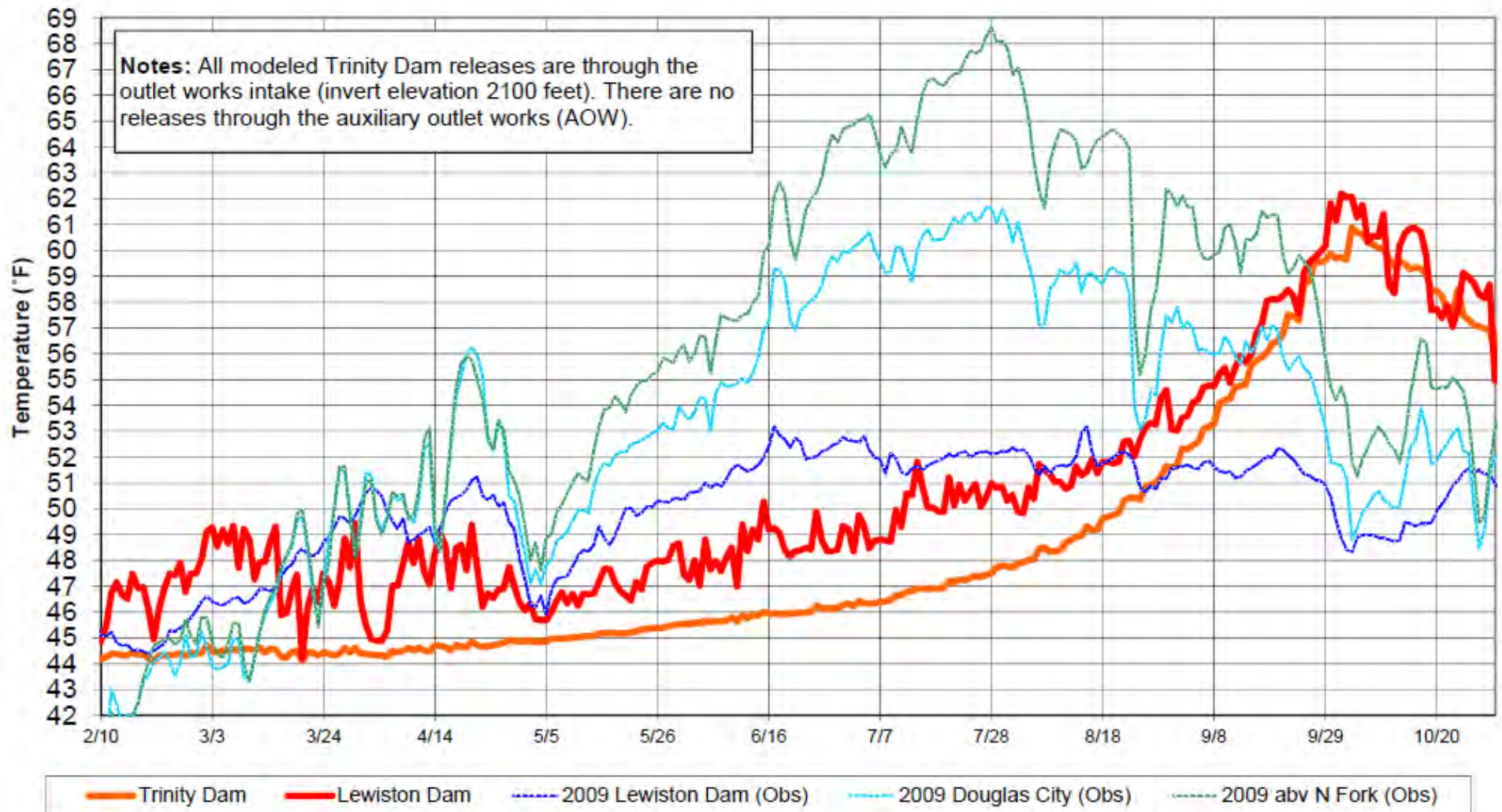


# Trinity River Temperature Targets

Source	Target Reach	Dates	Temperature Objective
Basin Plan for the North Coast Region (Regional Water Quality Control Board, 1994)	<ul style="list-style-type: none"> <li>Lewiston to Douglas City</li> <li>Lewiston to Douglas City</li> </ul>	<u>All Years</u>	
		• July 1 to September 15	≤ 60° F
		• September 15 – 30	≤ 56° F
WR 90-5 ROD	• Lewiston to North Fork Trinity River	• October 1 to December 31	≤ 56° F
Spring-Time Objectives of the Record of Decision for the Trinity River EIS/EIR (USFWS et. al., 2000)	Lewiston to Weitchpec	<u>Normal &amp; Wetter Water Years</u>	
		• April 15 to May 22	≤ 55° F
		• May 23 to June 4	≤ 59° F
		• June 5 to July 9	≤ 62.5° F
		<u>Dry and Critically Dry Water Years</u>	
		• April 15 to May 22	≤ 59° F
• May 23 to June 4	≤ 62.5° F		
		• June 5 to June 15	≤ 68° F

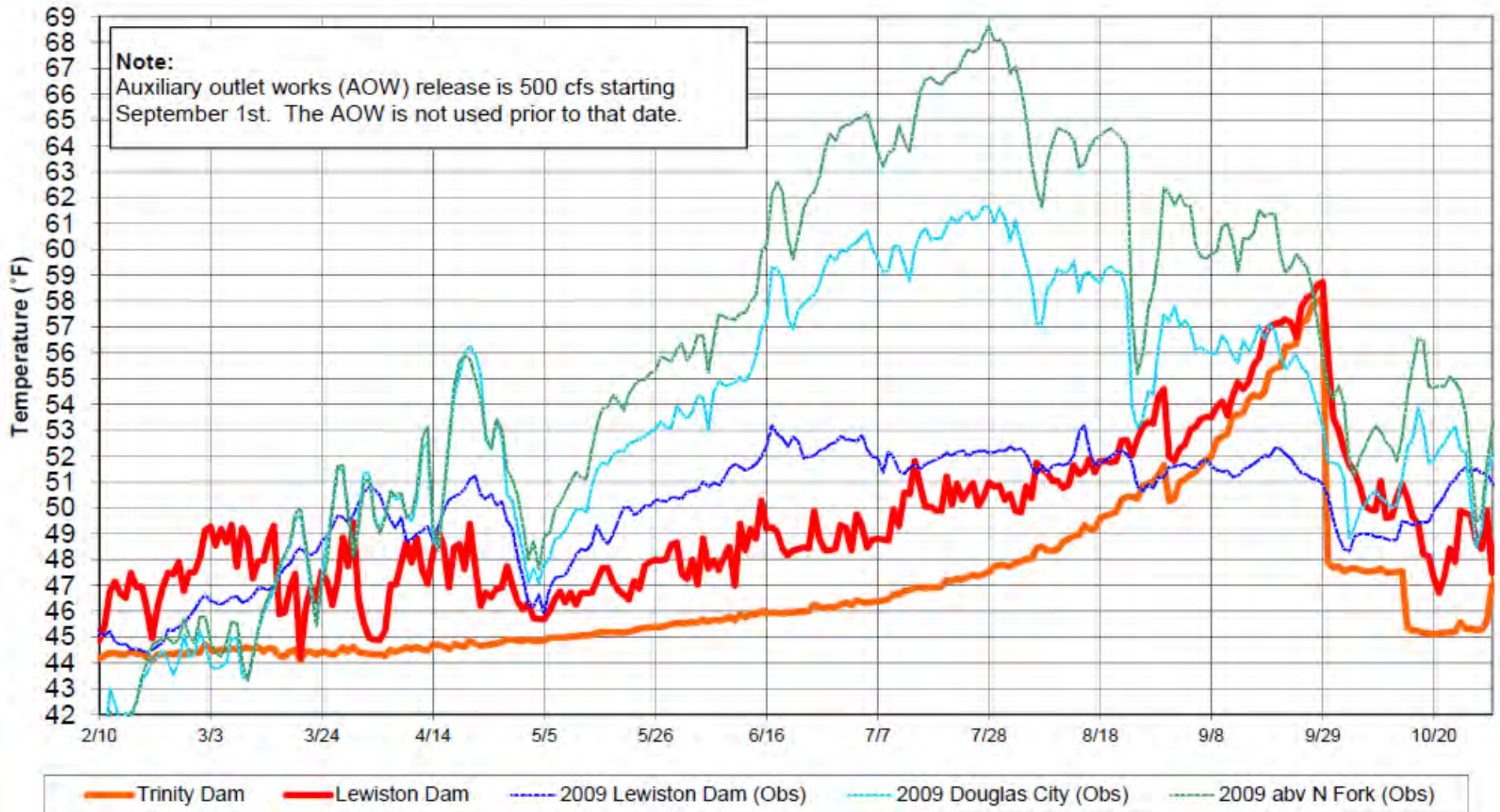
# TRD Ops Forecast - BASE

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



# TRD Ops Forecast – AOW Alt 1

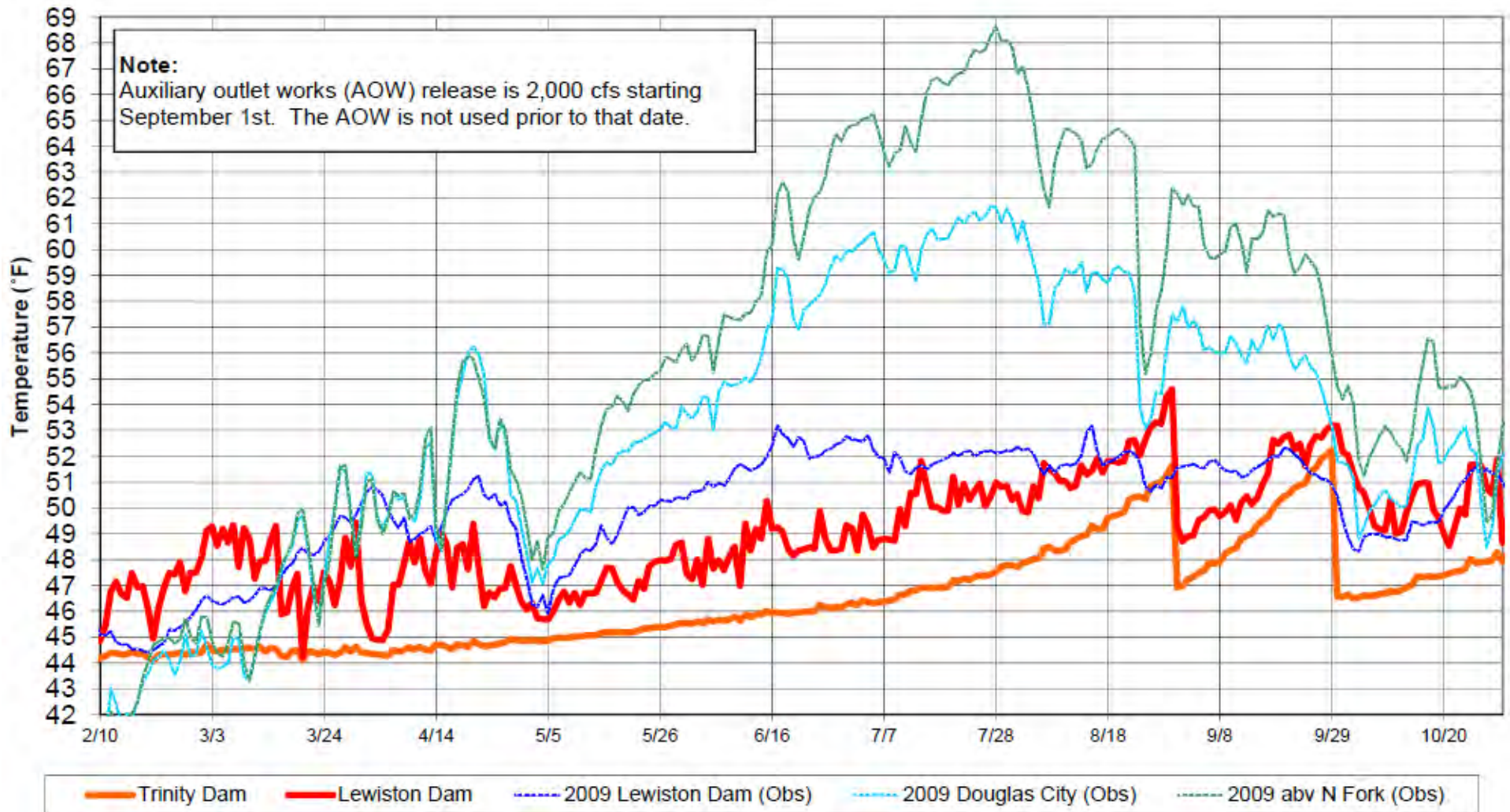
Trinity River - 2014 February 50%-Exceedance Outlook  
"Critically Dry Year" Release Schedule  
Mean Daily Water Temperature



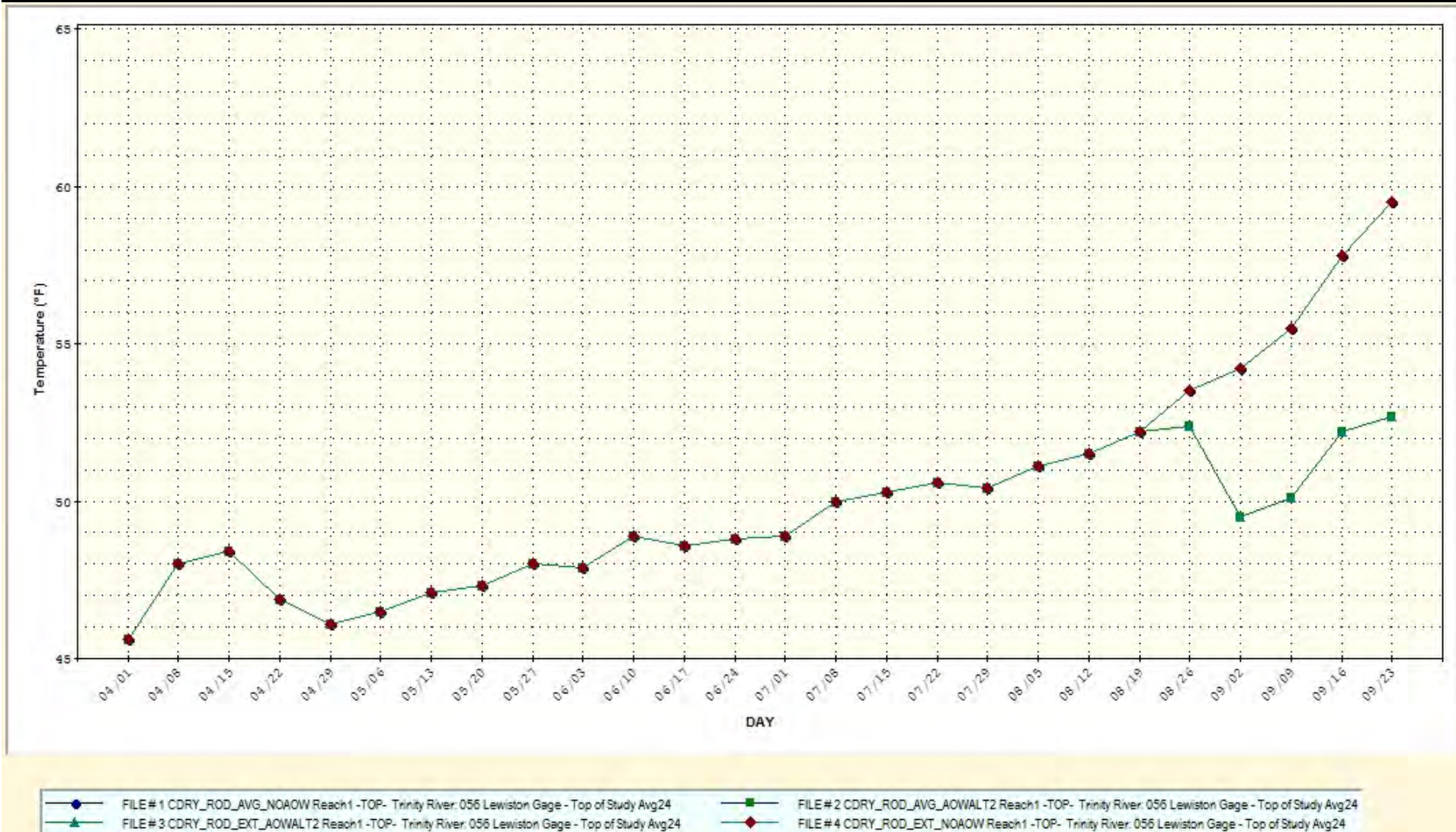


# TRD Ops Forecast – AOW Alt 2

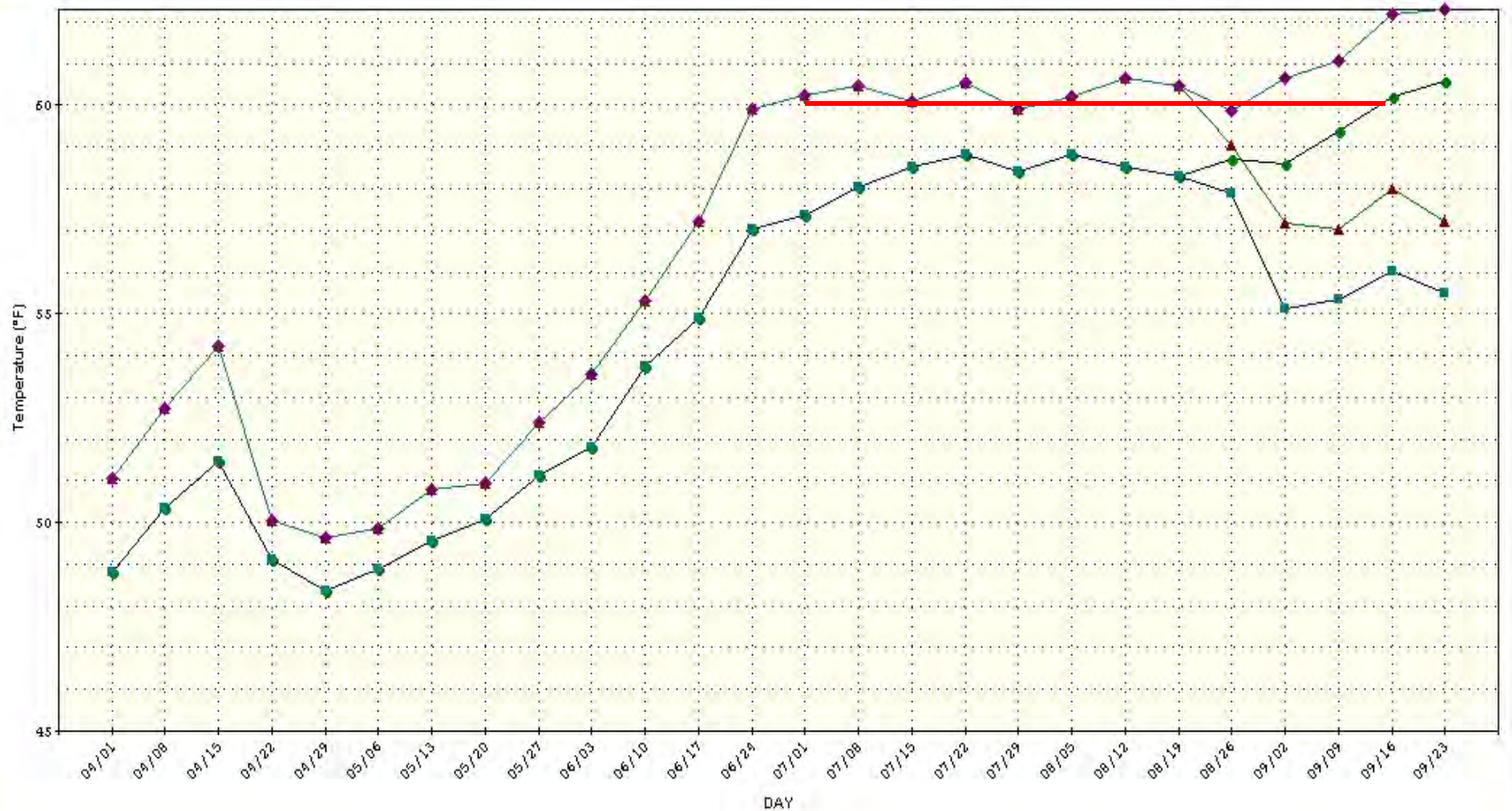
Trinity River - 2014 February 50%-Exceedance Outlook  
"Critically Dry Year" Release Schedule  
Mean Daily Water Temperature



# Critically Dry – Avg & Extreme – Lewiston



# Critically Dry – Avg & Extreme – Douglas City



FILE #1 CDRY\_ROD\_AVG\_NOA00W Reach15-BOTTOM- Trinity River: 083 Douglas City Temp Site (V-Node) Aug24  
FILE #2 CDRY\_ROD\_AVG\_A0WALT2 Reach15-BOTTOM- Trinity River: 083 Douglas City Temp Site (V-Node) Aug24  
FILE #3 CDRY\_ROD\_EXT\_A0WALT2 Reach15-BOTTOM- Trinity River: 083 Douglas City Temp Site (V-Node) Aug24  
FILE #4 CDRY\_ROD\_EXT\_NOA00W Reach15-BOTTOM- Trinity River: 083 Douglas City Temp Site (V-Node) Aug24



Questions?

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