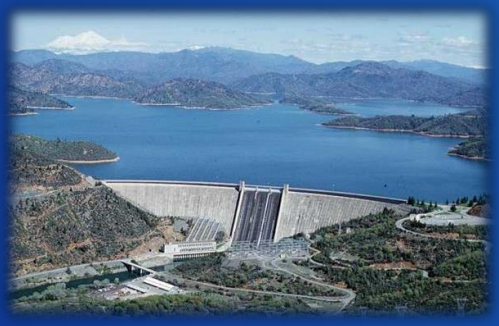
RECLAMATION

Managing Water in the West

NMFS – Reclamation Stakeholder Workshop #3

Shasta RPA Draft Proposed Amendment

June 22, 2017



U.S. Department of the Interior
Bureau of Reclamation

Introductions

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Workshop Objectives

Provide status updates, discuss, and receive input on:

1. Temperature management for the 2017 Sacramento River temperature management season

2. System-wide analyses of draft proposed amendment (issued January 19, 2017) to the Reasonable and Prudent Alternative of the 2009 NMFS Biological Opinion for the long-term operation of the Central Valley and State Water Projects related to Shasta Reservoir operations

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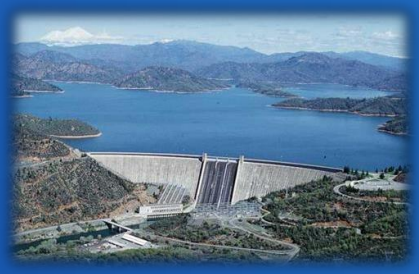
Workshop Agenda



- Introductions
- Meeting Purpose
- Update/Discussion on 2017 Temperature Management
- Update/Discussion on System-Wide Evaluations of Draft Proposed Shasta RPA
- Next Steps in System-Wide Evaluations of Draft Proposed Shasta RPA
- Discussion Q&A

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Proposed Ground Rules

- Participate!
- Be respectful
- Help us stay on track
- Speak into microphone
- Take comments in batches – in room then on phone
- Cell phones off/silent
- For those on phone – please mute phones and don't place the call on hold (sometimes creates background music)

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2017 Sacramento River Temperature Management

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Sacramento River Temperature Management Planning

- **Sacramento River Temperature Management required under:**
  - **SWRCB Order 90-5**
    - **Meet temperatures of 56° F DAT at compliance location**
  - **NMFS 2009/2011 BiOp, Action I.2.4**
    - **Development of annual plan**
    - **56° F DAT at compliance location between Balls Ferry and Bend Bridge May 15 – Oct 31**

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2017 Plan

- **Compliance**
  - 56° F DAT; Balls Ferry
  - May 15 – Oct 31
- **Target (Operational Study)**
  - 53° F DAT as surrogate to 55° F 7DADM
  - CCR Gage as surrogate to most downstream redd
    - Subject to further discussion and analysis if most downstream redd ends up significantly farther downstream
  - May 15/onset of spawning through emergence
    - Subject to further discussion and analysis if late emergence has potential to cause impacts to future cold water pool and/or significant fall run dewatering risk
  - Offramp if significant impacts

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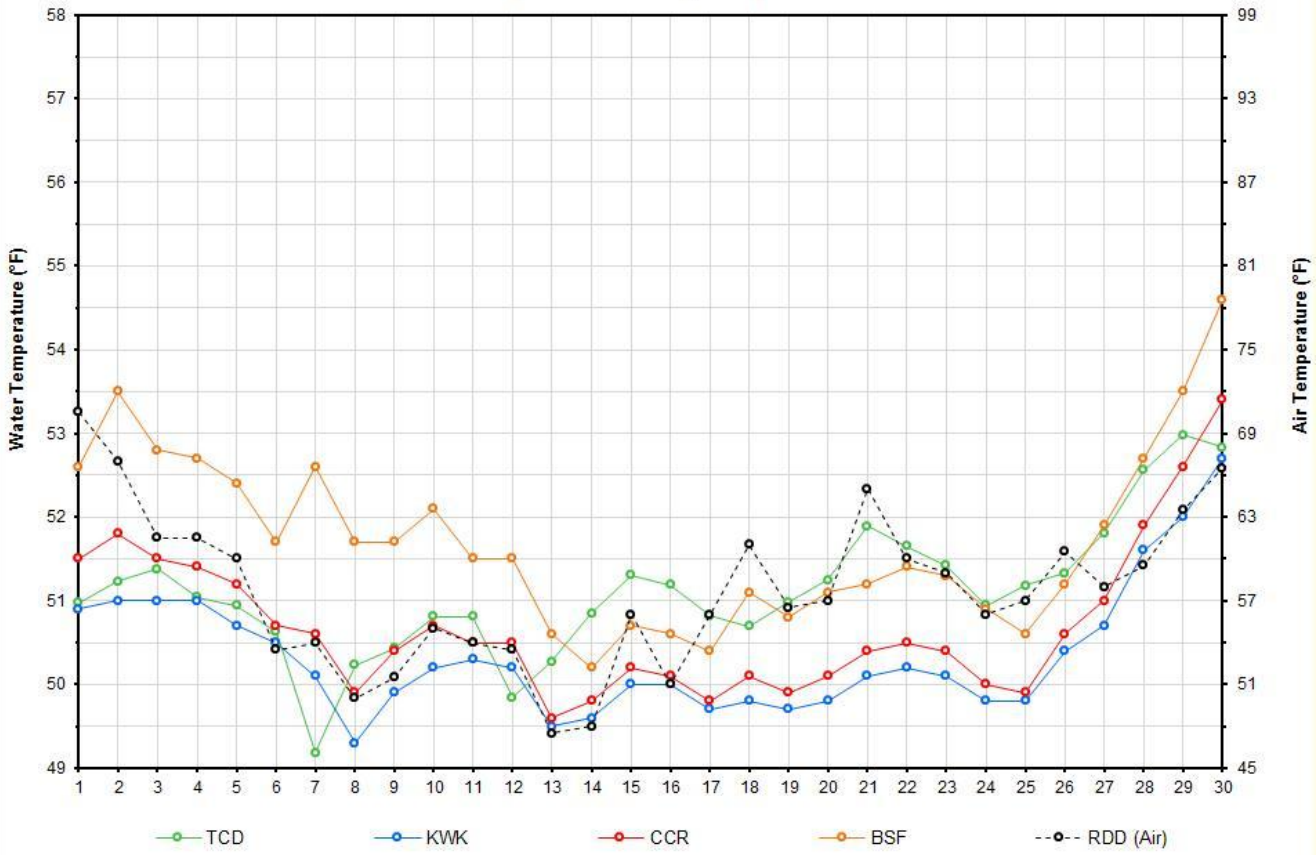
April Mean Daily Temperatures



Station Details		
Code	Body of Water	Location
TCD	N/A	Shasta Power Plant
KWK	Sacramento River	0.8 miles downstream of Keswick Dam
CCR	Sacramento River	9.7 miles downstream of Keswick Dam
BSF	Sacramento River	25 miles downstream of Keswick Dam

Temperature Control Point		
Point	Temp. (°F)	Date Range
BSF	56.0	06/17/16 - Current

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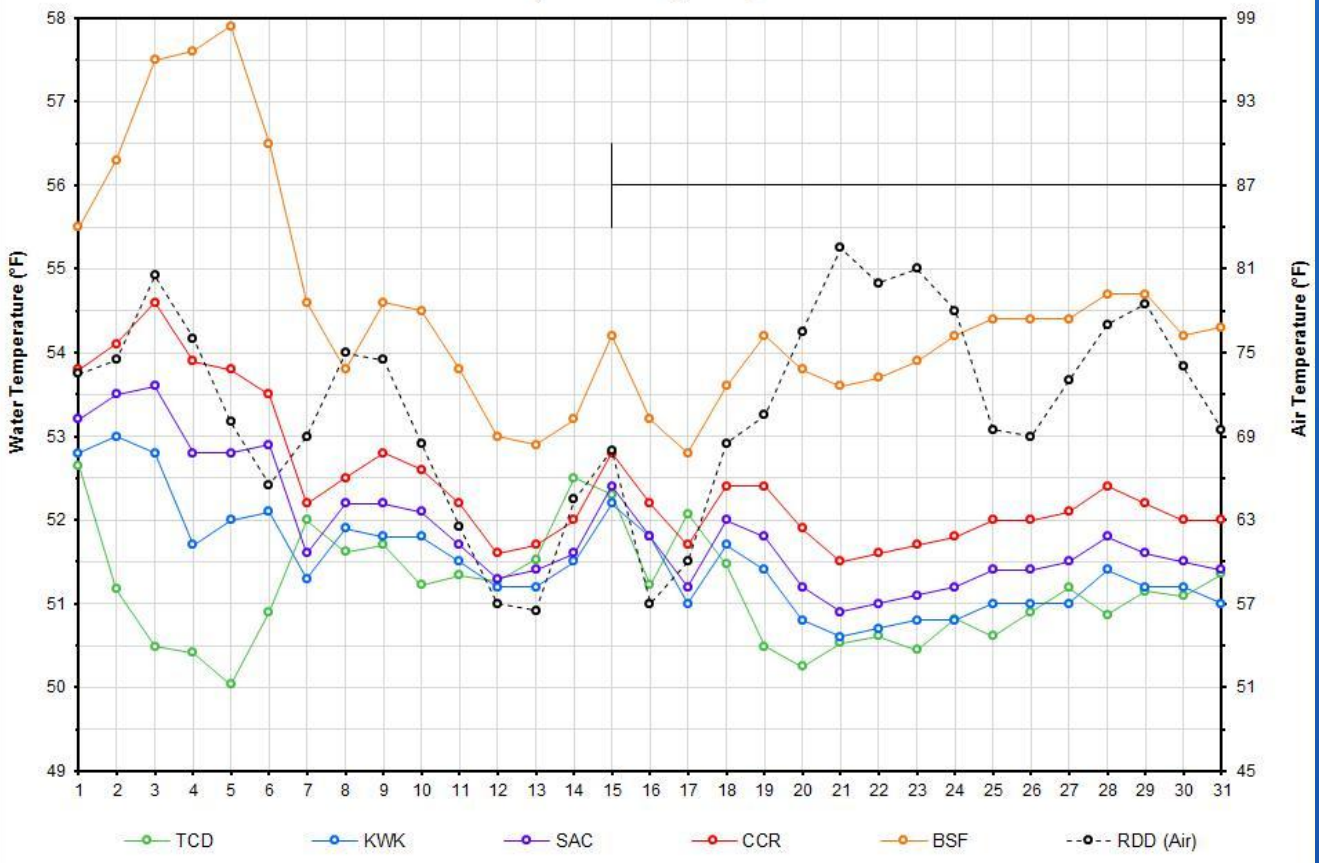
May Mean Daily Temperatures



Station Details		
Code	Body of Water	Location
TCD	N/A	Shasta Power Plant
KWK	Sacramento River	0.8 miles downstream of Keswick Dam
CCR	Sacramento River	9.7 miles downstream of Keswick Dam
BSF	Sacramento River	25 miles downstream of Keswick Dam

Temperature Control Point		
Point	Temp. (°F)	Date Range
BSF	56.0	06/17/16 - Current

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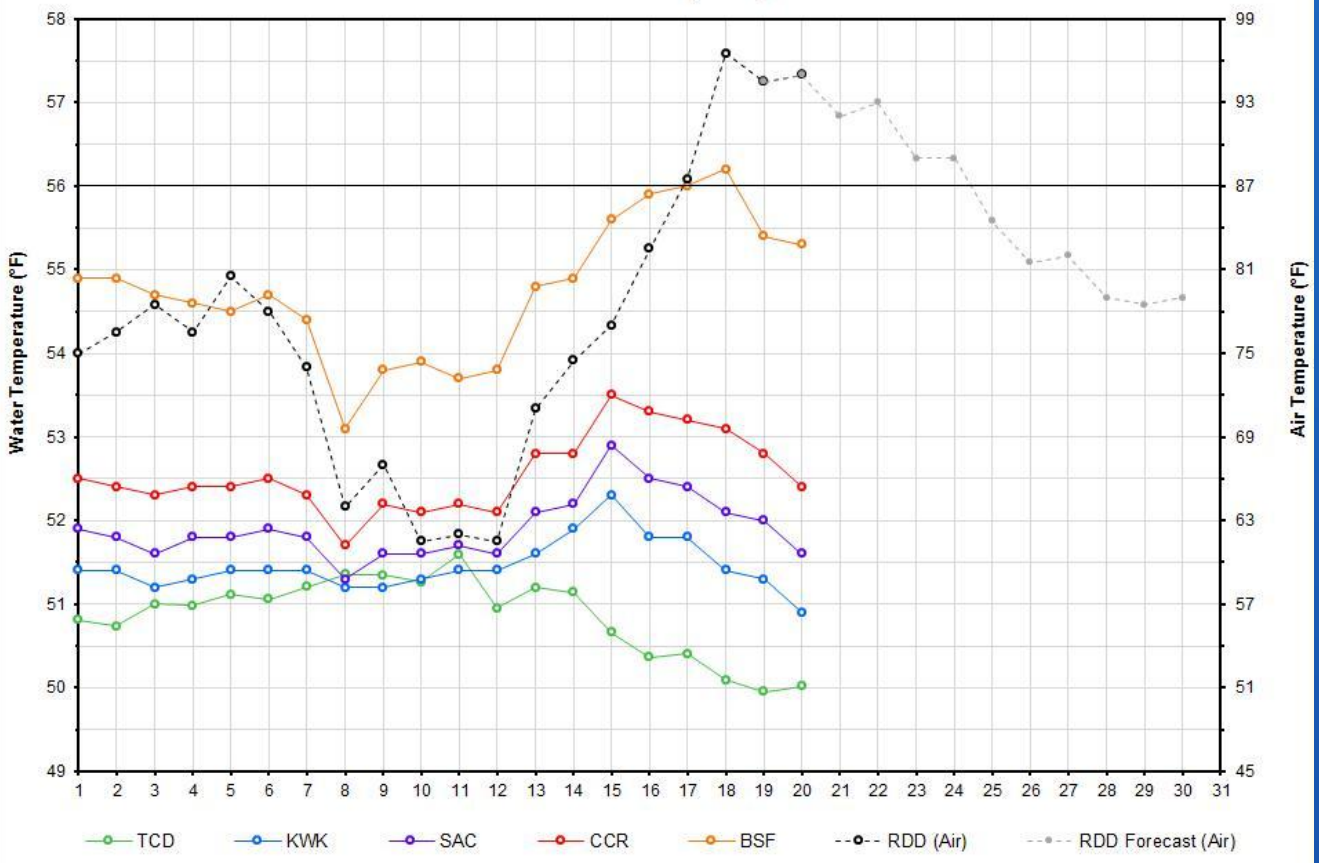
June Mean Daily Temperatures



Station Details		
Code	Body of Water	Location
TCD	N/A	Shasta Power Plant
KWK	Sacramento River	0.8 miles downstream of Keswick Dam
CCR	Sacramento River	9.7 miles downstream of Keswick Dam
BSF	Sacramento River	25 miles downstream of Keswick Dam

Temperature Control Point		
Point	Temp. (°F)	Date Range
BSF	56.0	06/01/17 - Current

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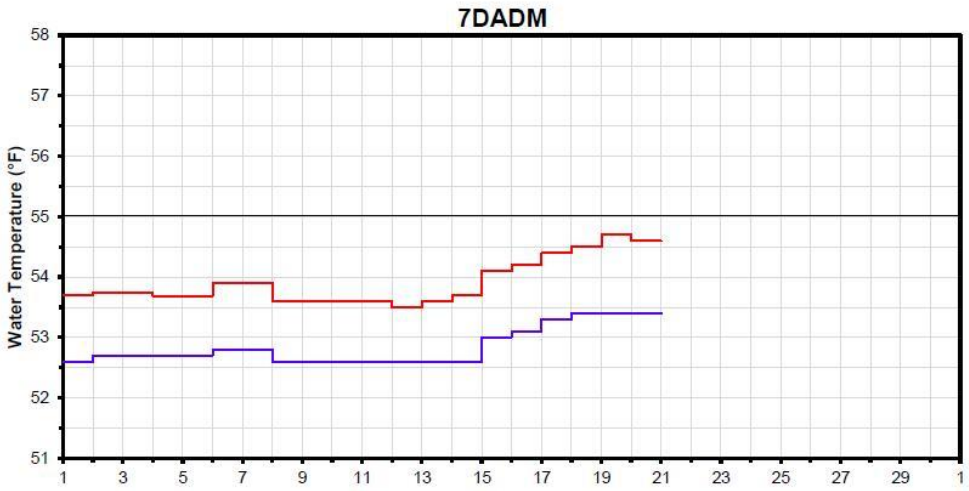
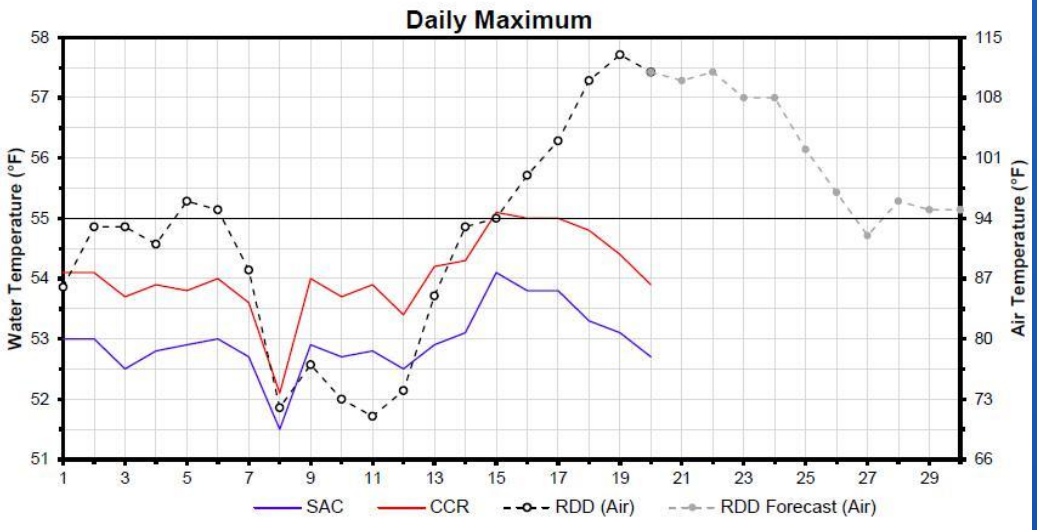
DATE	Daily Max		7DADM[1]		DAT[2]
	SAC	CCR	SAC	CCR	BSF
06/01	53.0	54.1	52.6	53.7	54.9
06/02	53.0	54.1	52.7	53.7	54.9
06/03	52.5	53.7	52.7	53.7	54.7
06/04	52.8	53.9	52.7	53.7	54.6
06/05	52.9	53.8	52.7	53.7	54.5
06/06	53.0	54.0	52.8	53.9	54.7
06/07	52.7	53.6	52.8	53.9	54.4
06/08	51.5	52.1	52.6	53.6	53.1
06/09	52.9	54.0	52.6	53.6	53.8
06/10	52.7	53.7	52.6	53.6	53.9
06/11	52.8	53.9	52.6	53.6	53.7
06/12	52.5	53.4	52.6	53.5	53.8
06/13	52.9	54.2	52.6	53.6	54.8
06/14	53.1	54.3	52.6	53.7	54.9
06/15	54.1	55.1	53.0	54.1	55.6
06/16	53.8	55.0	53.1	54.2	55.9
06/17	53.8	55.0	53.3	54.4	56.0
06/18	53.3	54.8	53.4	54.5	56.2
06/19	53.1	54.4	53.4	54.7	55.4
06/20	52.7	53.9	53.4	54.6	55.3
06/21					
06/22					
06/23					
06/24					
06/25					
06/26					
06/27					
06/28					
06/29					
06/30					
-					

Notes

[1] 7DADM = 7-Day Average Daily Maximum

[2] DAT = Daily Average Temperature





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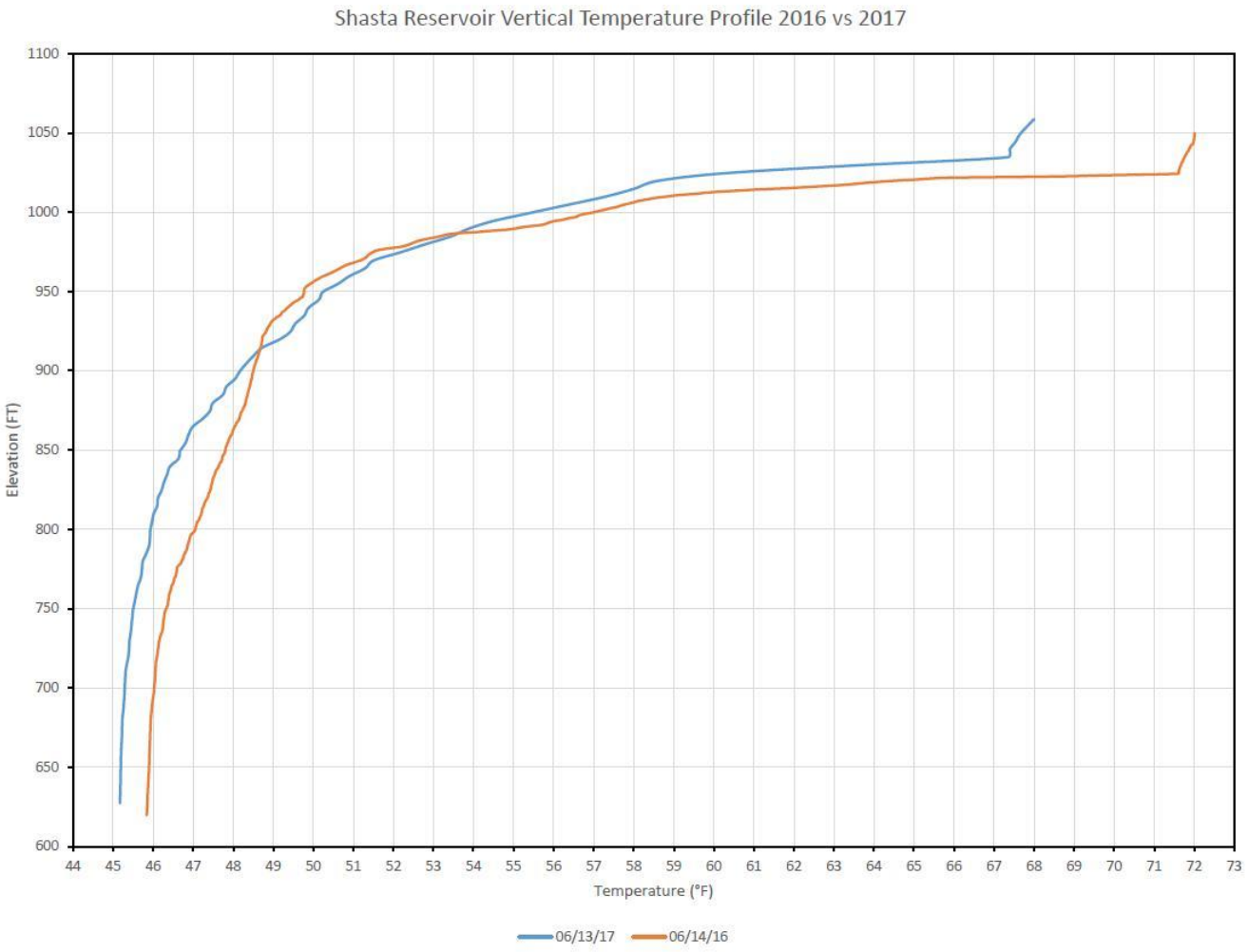

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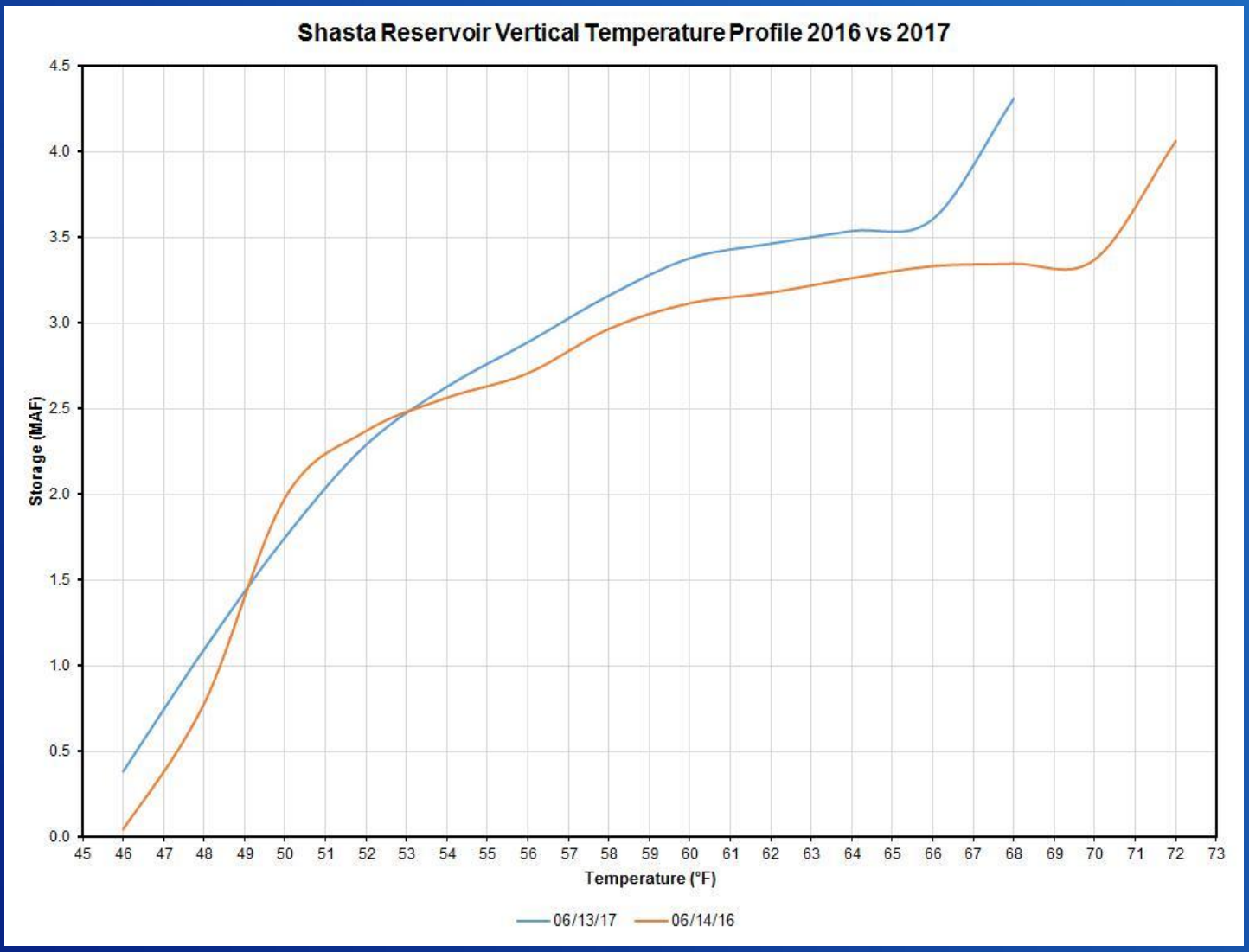

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2017 Temperature Management

- **Next Steps**
  - **Continue operational study**
  - **Continue to gather, analyze, and assess data**
    - **2017**
    - **2016**
    - **Previous Years**

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Discussion

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System-Wide Evaluations of Draft Proposed Amendment

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Storage and Flow Targets/Restrictions

- Spring/Fall Storage Targets
  - Vary by water year type
    - Spring storage: ranges between 3.5 to 4.2 MAF
    - Fall storage: ranges between 1.9 to 3.2 MAF
- Spring Flow Restrictions
  - Vary by water year type
    - April flow: ranges between 4,000 to 8,000 cfs
    - May flow: ranges between 7,500 to 12,000 cfs
    - (June through October forecast flow run scenario)
- Action I.2.1
- Action I.2.3
  - Actions I.2.3.A-C

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Analyses – Storage and Flow Targets/Restrictions

- CalSim analysis
  - Feasibility of targets/restrictions
  - Impacts/changes to other parts of the CVP/SWP system required to meet targets/restrictions

Analyses – Storage and Flow Targets/Restrictions

- Initial CalSim sensitivity analysis
  - Two scenarios – both use ELT Climate Change (Q5):
    - "Current Ops"
    - "NMFS Amendment"

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Analyses – Two Scenarios

- "Current Ops"
  - Attempts to replicate some reduced deliveries to help protect storage
  - Does not implement reductions to D-1641 requirements in extreme drought conditions (potential refinement for ongoing studies)
- "NMFS Amendment"
  - No specific logic that guarantees Shasta storage levels
  - Allows for any shortage allocation necessary in attempt to meet proposed operational objectives
    - Not a policy or necessarily realistic strategy, but used to test ability to reach targets under essentially any supply condition
  - Shasta-Folsom balance adjusted to target "Current Ops" range of conditions

Analyses – Fall Storage Targets

- **Draft Proposed September Storage Targets**
  - **Critically dry: 1.9 MAF**
  - **Dry: 2.2 MAF**
  - **Below Normal: 2.8 MAF**
  - **Above Normal: 3.2 MAF**
  - **Wet: 3.2 MAF**

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Analyses – Fall Storage Targets

- Compliance under “Current Ops”
- Compliance with modified CVP delivery allocation
  - Allocations consider fall storage target in computing CVP delivery capability

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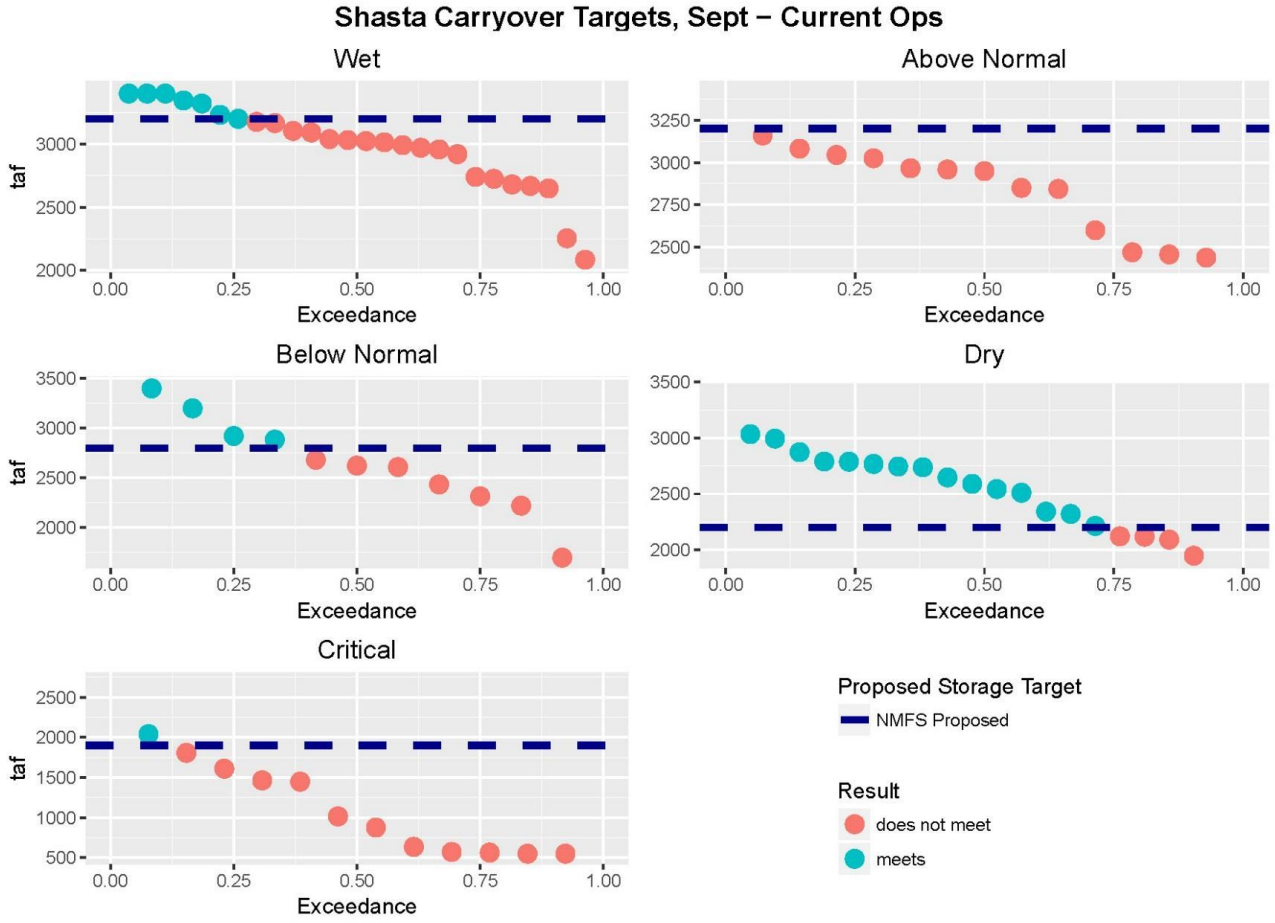
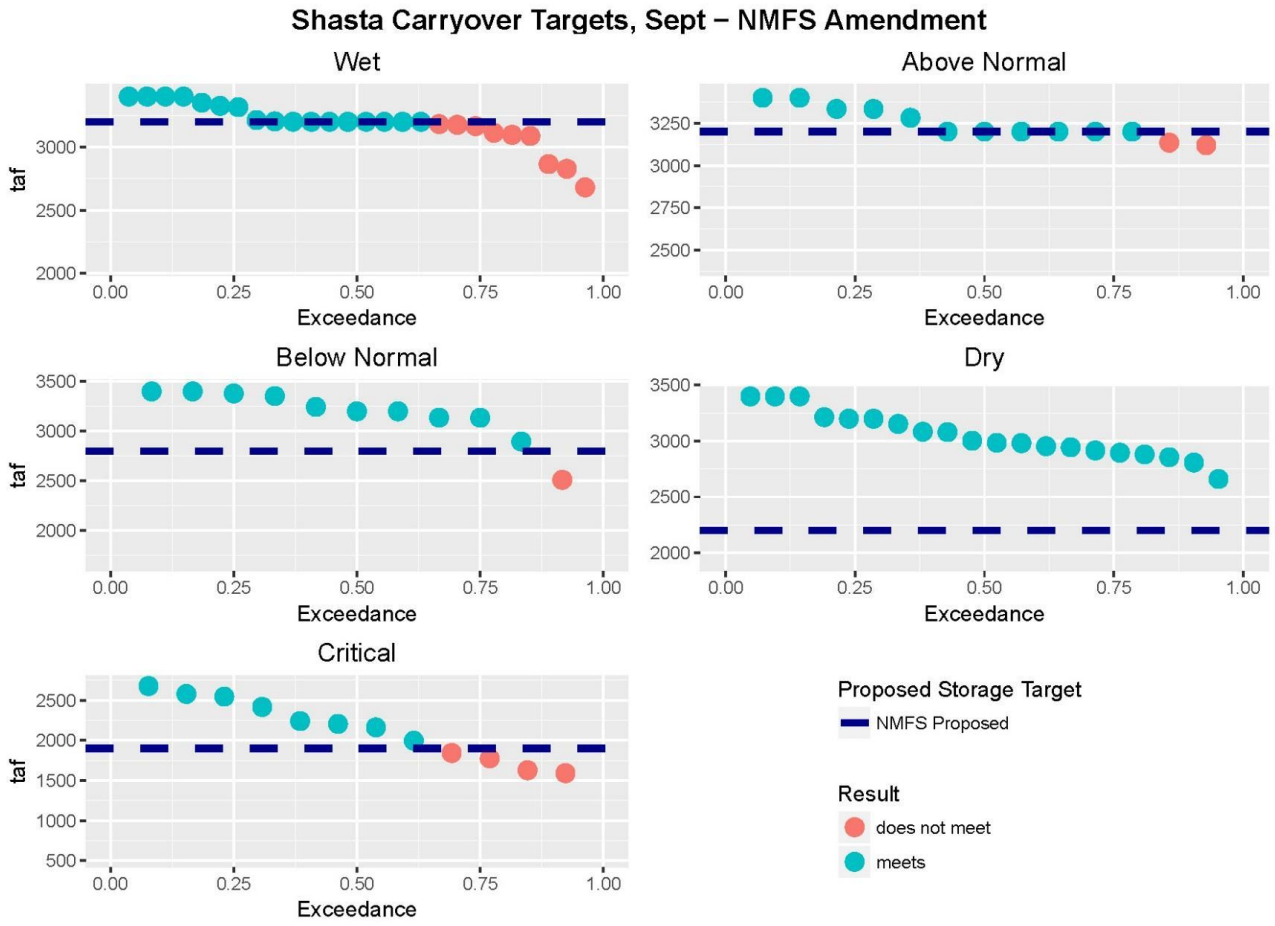

Shasta Carryover Targets, Sept – Current Ops
Wet
Above Normal
Below Normal
Dry
Critical
taf
Exceedance
0.00
0.25
0.50
0.75
1.00
2000
2500
3000
3500
1500
1000
500
2750
3250
Proposed Storage Target
NMFS Proposed
Result
does not meet
meets


Shasta Carryover Targets, Sept – NMFS Amendment
Wet
Above Normal
Below Normal
Dry
Critical
taf
Exceedance
0.00
0.25
0.50
0.75
1.00
Proposed Storage Target
NMFS Proposed
Result
does not meet
meets

June-Sept Sacramento Controls for years not meeting September target
version: NMFS Amendment

Year	WY Type	May Target	Met May Target?	Sept Target Diff	Month Fell Below Sept Target	June		July		August		Sept			Max Fill	Max Fill Month
1924	Crit	3500	-654	-272	8	NDO	WS	NDO	WQ	NDO	WQ	NDO	RV		3429	3
1931	Crit	3500	-775	-124	8	NDO		NDO		NDO	WQ	NDO	WS	RV	3171	3
1934	Crit	3500	-584	-309	8	X2		NDO		NDO	WQ	NDO	RV		3123	3
1977	Crit	3500	-913	-57	8	NDO		NDO		NDO	WQ	NDO	K	RV	2838	10
1939	BN	4200	-587	-288	7	NDO	WQ	NDO	WQ		WQ	NDO			3900	3
1928	AN	4200	Yes	-80	9	X2	WQ	NDO	WQ	NDO	WS			X2	4510	4
1940	AN	4200	Yes	-65	8	X2	WS	NDO	WQ	NDO	WS			X2	4251	5
1938	Wet	4200	Yes	-103	9		WS	NDO	WS	NDO	WS			X2	4552	5
1953	Wet	4200	Yes	-24	9		FC	NDO		NDO	WQ			X2	4552	5
1956	Wet	4200	Yes	-34	9		WS	NDO	WS	NDO	FC			X2	4552	5
1958	Wet	4200	Yes	-18	9		FC	NDO	FC	NDO	FC			X2	4552	2
1963	Wet	4200	Yes	-335	9	X2	WS	NDO	WQ	NDO	WS			X2	4552	5
1970	Wet	4200	-98	-520	8	X2	WQ	NDO	WQ	NDO	WS			X2	4109	4
1984	Wet	4200	Yes	-87	9	X2		NDO	WQ	NDO	FC			X2	4552	5
1986	Wet	4200	-324	-112	8	EI	WS	NDO	WQ	NDO	WS			X2	3876	5
1997	Wet	4200	-274	-373	9	X2	WS	NDO	WQ	NDO	WS			X2	4038	4

WS	Wilkins Slough
RV	Rio Vista
FC	Flood Control
X2	Fall X2

Analyses – Spring Storage Targets

- **Draft Proposed Spring Storage Targets**
  - **Critically dry: 3.5 MAF**
  - **Dry: 3.9 MAF**
  - **Below Normal: 4.2 MAF**
  - **Above Normal: 4.2 MAF**
  - **Wet: 4.2 MAF**

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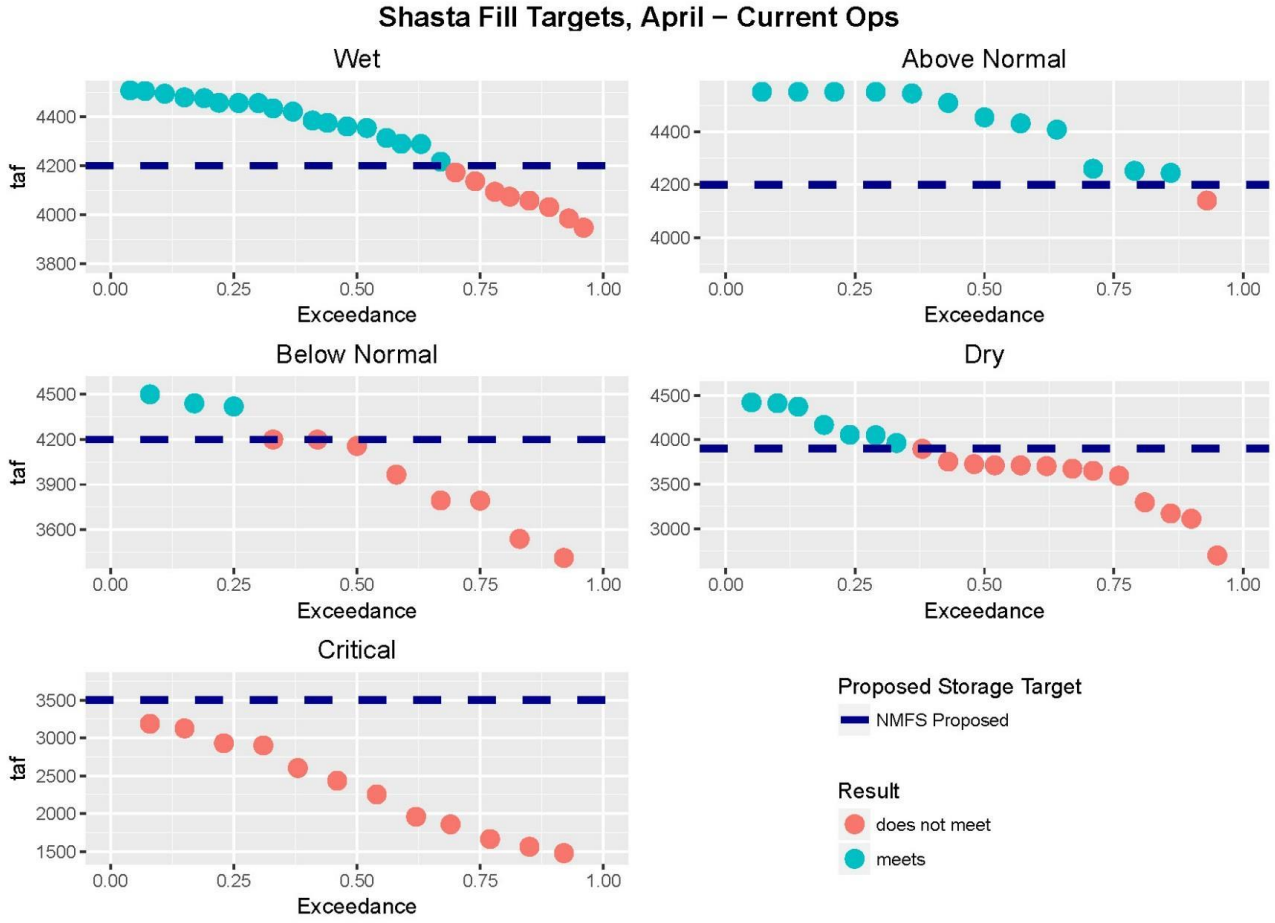
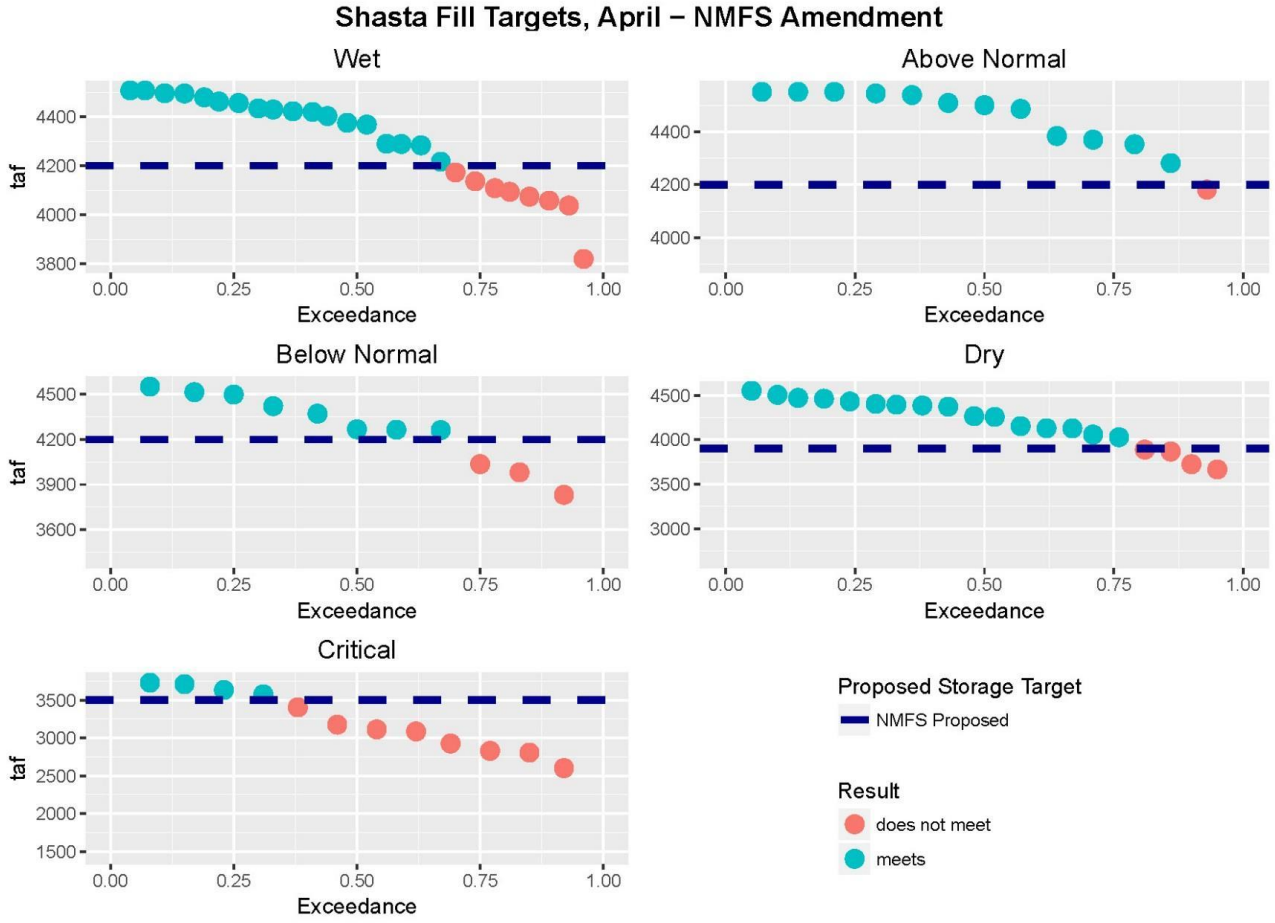
Analyses – Spring Storage Targets

- Compliance under “Current Ops”
- Compliance with modified CVP delivery allocation
  - No specific effort to modify October-March operations
  - Demonstrates ability to fill given September target


Shasta Fill Targets, April – Current Ops
Wet
Above Normal
Below Normal
Dry
Critical
taf
Exceedance
0.00
0.25
0.50
0.75
1.00
4400
4200
4000
3800
4500
3900
3600
3500
3000
2500
2000
1500
Proposed Storage Target
NMFS Proposed
Result
does not meet
meets


Shasta Fill Targets, April – NMFS Amendment
Wet
Above Normal
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Dry
Critical
taf
Exceedance
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Proposed Storage Target
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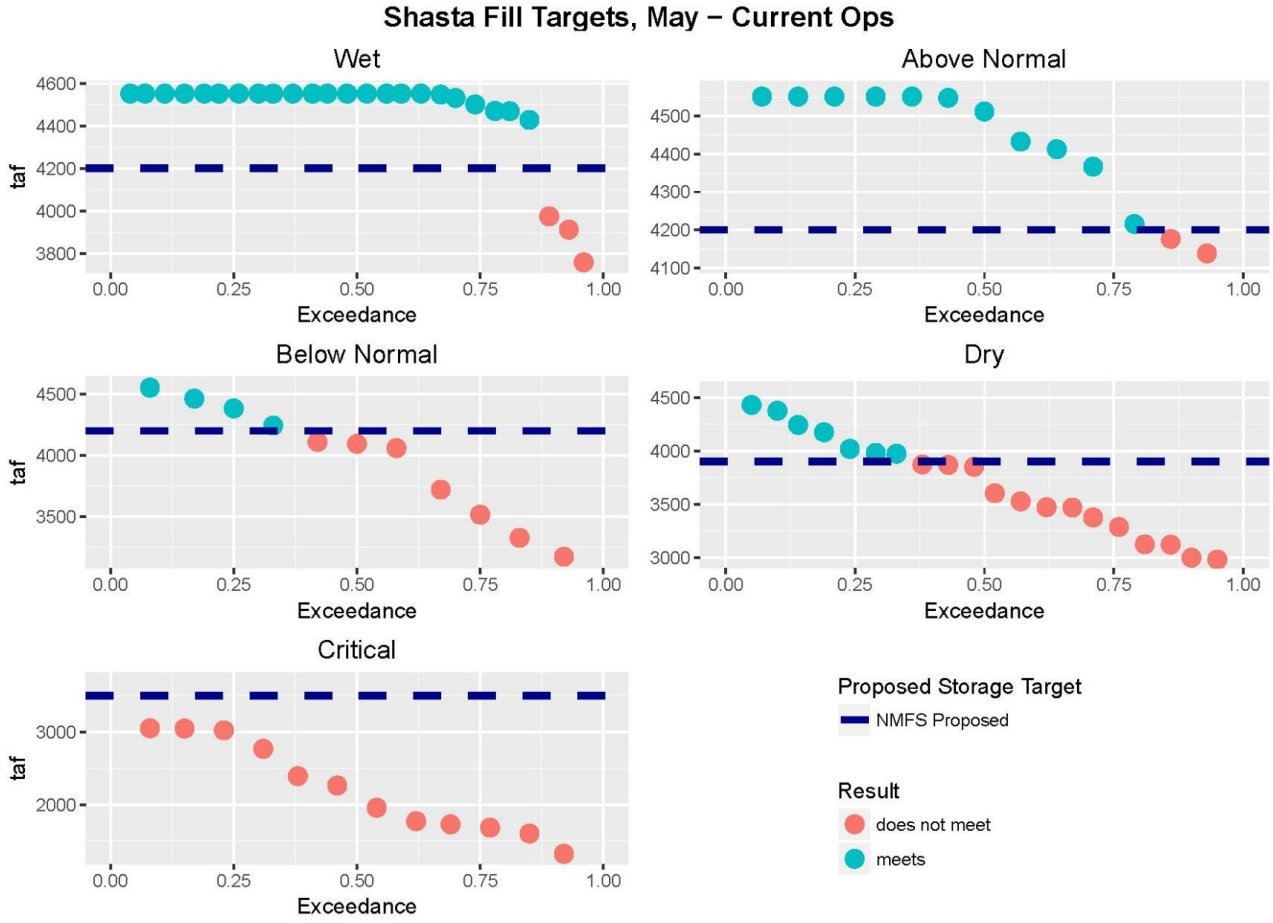
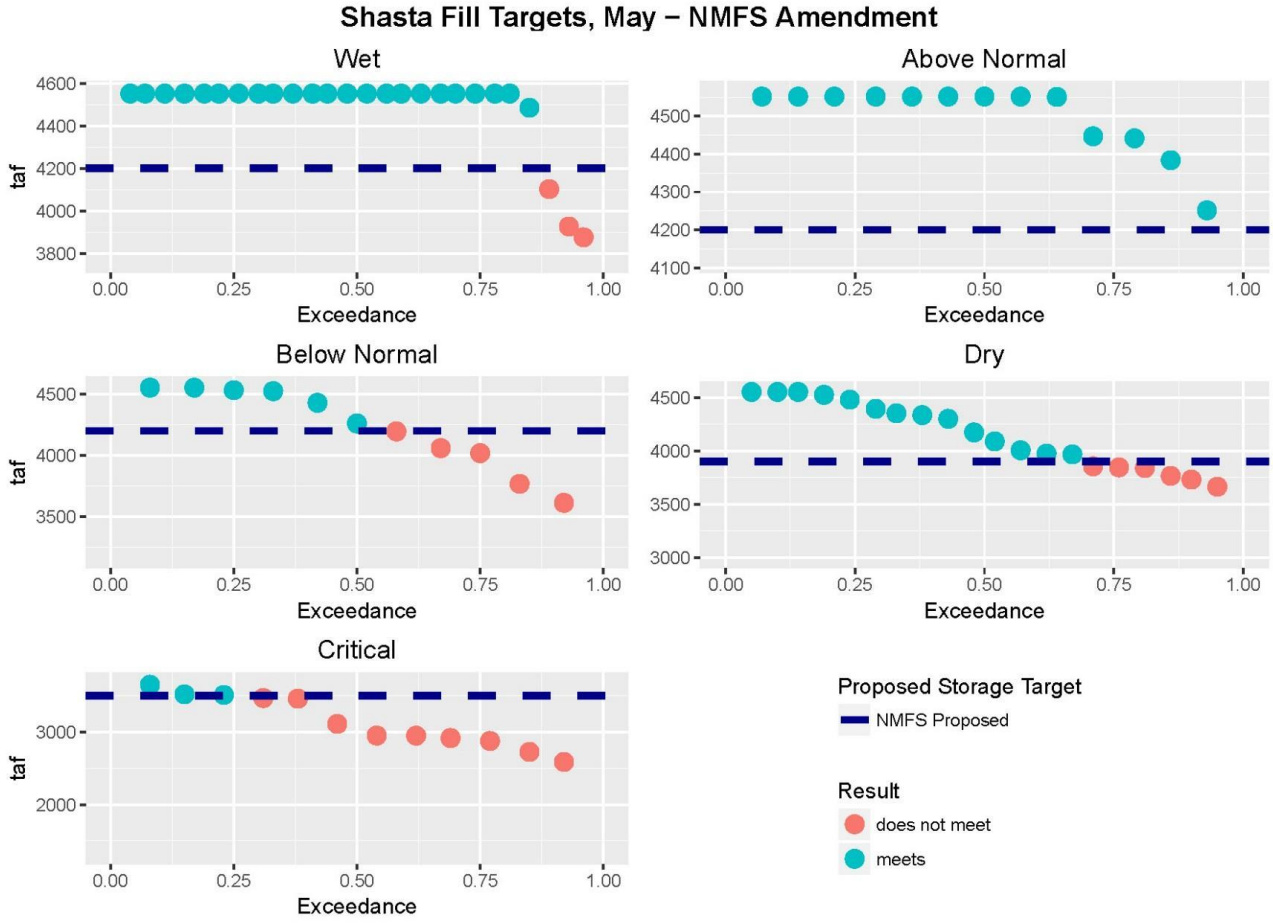

Shasta Fill Targets, May – Current Ops
Wet
Above Normal
Below Normal
Dry
Critical
taf
Exceedance
0.00
0.25
0.50
0.75
1.00
4600
4400
4200
4000
3800
4500
4300
4100
3500
3000
2000
Proposed Storage Target
NMFS Proposed
Result
does not meet
meets


Shasta Fill Targets, May – NMFS Amendment
Wet
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0.00
0.25
0.50
0.75
1.00
4600
4400
4200
4000
3800
4500
4300
4100
3500
3000
2000
Proposed Storage Target
NMFS Proposed
Result
does not meet
meets

Oct-May Sacramento Controls for years not meeting May target version: NMFS Amendment

Year	WY Type	Prev. WY Type	Met Prev Sept Target?	May Fill Target	May Target Diff	Oct			Nov		Dec		Jan		Feb		Mar		Apr		May		Max Fill	Max Fill Month
1924	Crit	BN	Yes	3500	-624	NDO			NDO	WS	NDO	K	WQ	K		K	X2	K	X2	WS	NDO	WS	3429	3
1931	Crit	Dry	Yes	3500	-775	NDO	WS	RV	NDO		NDO	K	WQ	K		K		K	X2		NDO	WS	3171	3
1932	Crit	Crit	No	3500	-551	NDO	WS	RV	NDO	K	WQ	K		K		K		K		WS		WS	2949	5
1933	Crit	Crit	Yes	3500	-550	NDO	WS	RV	NDO	WS	WQ/NDO	K		K		K		K	X2	K	X2	WS	2950	5
1934	Crit	Crit	Yes	3500	-584	NDO	WS	RV	NDO	K		K		K		K	X2	K	X2	WS	X2	WS	3123	3
1977	Crit	BN	Yes	3500	-913	NDO			NDO		NDO	K	WQ/NDO	K	X2	K	X2		X2		NDO	WS	2838	10
1991	Crit	Crit	Yes	3500	-388	NDO		RV	NDO	RV	WQ/NDO	K	NDO	K	WQ/X2			K		K		WS	3114	4
1992	Crit	Crit	Yes	3500	-31	NDO	WS	RV	NDO	RV	WQ/NDO	K	WQ	K	WQ	K	WQ	K		K	X2	WS	3712	4
1994	Crit	AN	Yes	3500	-41	X2			X2		EI/NDO	K	WQ	K		K		K		WS		WS	3752	3
1944	Dry	Wet	Yes	3900	-169	X2			X2		EI/NDO	K		K		K		K		WS	WQ	WS	3731	5
1947	Dry	AN	Yes	3900	-55	X2	WS		X2			K		K		K		K		WS	WQ/X2		4154	4
1964	Dry	Wet	No	3900	-134	X2		K	X2		EI	K		K	EI	K	EI	K	WQ/X2	WS	WQ/X2	WS	3990	3
1976	Dry	Wet	Yes	3900	-235	X2			X2		EI	K		K		K		K	WQ	WS	WQ/NDO		3889	4
1987	Dry	Wet	No	3900	-45	X2		K	X2		NDO	K		K		K		K	X2	WS	WQ/X2		4149	3
2001	Dry	AN	Yes	3900	-60	X2			X2		NDO			K		K		K		WS	WQ/X2		4059	4
1923	BN	Wet	Yes	4200	-141	X2						K		K		K		K		K		WS	4265	4
1936	BN	Dry	Yes	4200	-182	NDO			NDO	K	NDO	K	WQ	K		FC		K		K		WS	4036	4
1939	BN	Wet	No	4200	-587	X2	WS		X2		EI/NDO	K		K		K		K	X2		WQ/NDO		3900	3
1959	BN	Wet	No	4200	-5	X2			X2		EI/NDO	K		FC		FC	EI	K	X2	WS	WQ/X2		4262	4
1985	BN	Wet	No	4200	-433	X2		K		FC		FC		K		K		K		WS	X2		3981	4
1970	Wet	Wet	Yes	4200	-98	X2			X2			FC		FC		FC		K		WS	WQ/X2		4109	4
1986	Wet	BN	Yes	4200	-324	NDO			NDO	K	WQ	K		FC		FC		FC		K		WS	3876	5
1997	Wet	Wet	Yes	4200	-274	X2		WS	X2	FC		FC		FC		K		K		WS	WQ	WS	4038	4

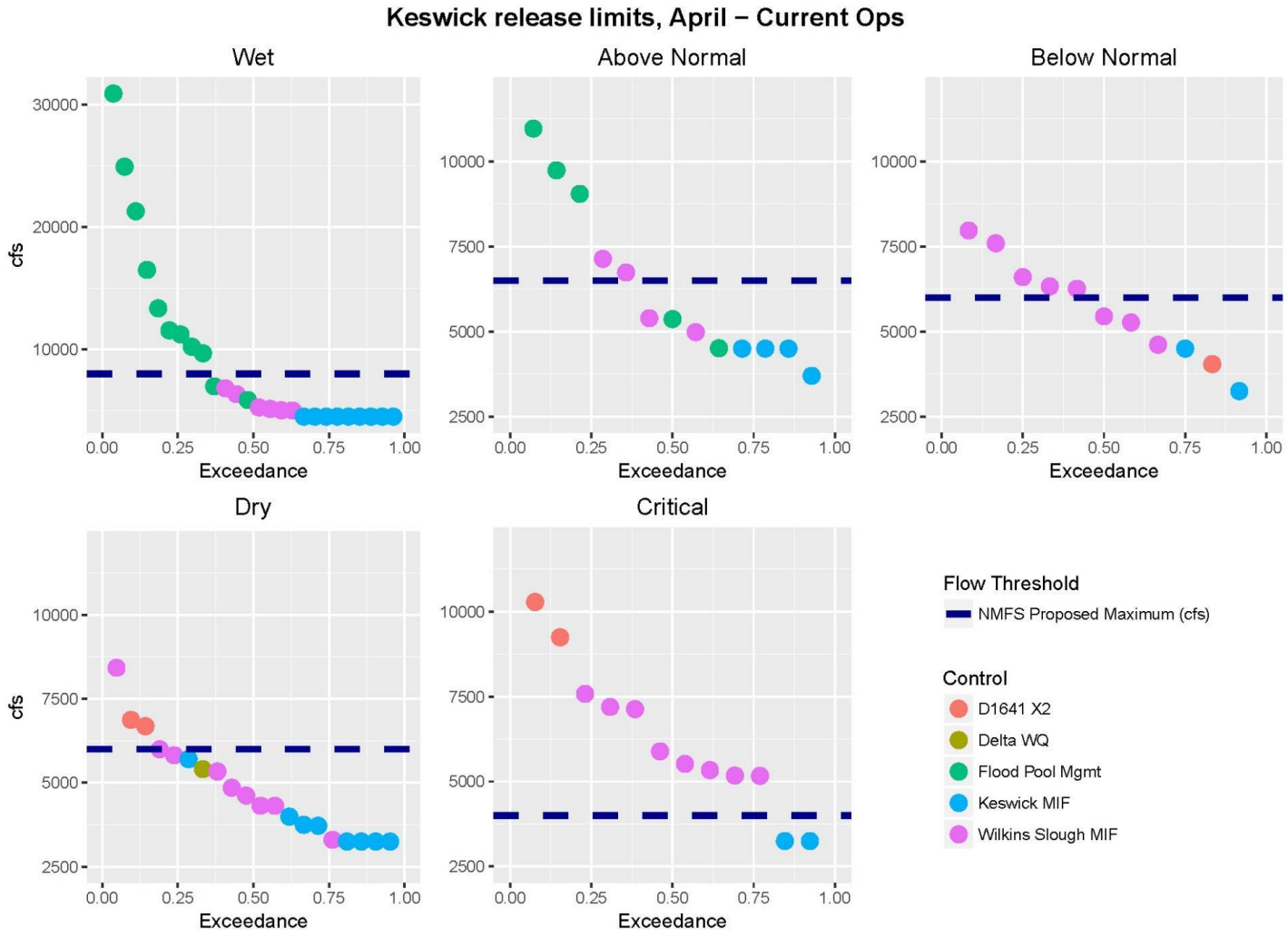
Analyses – Spring Release Limits

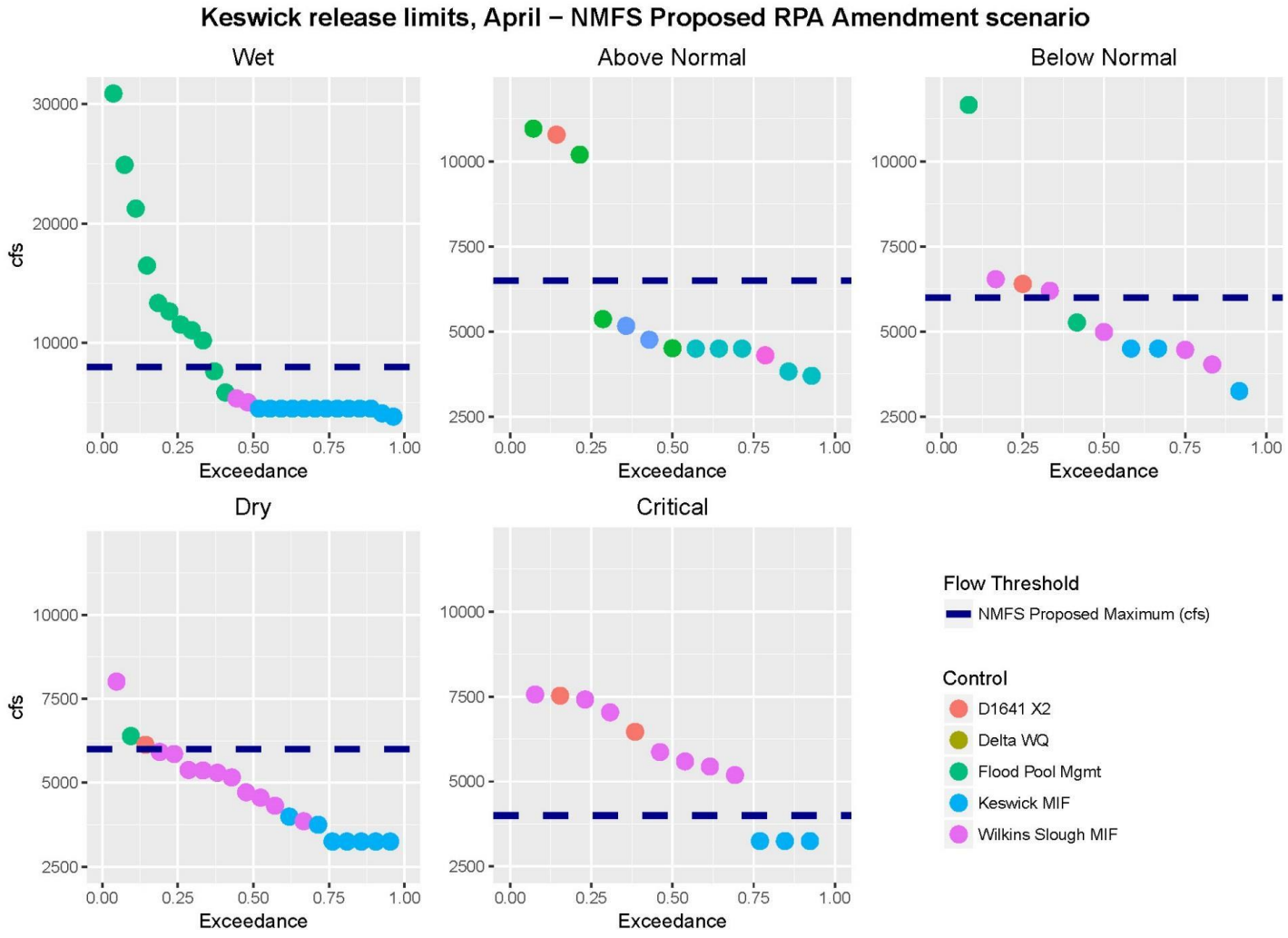
- **Draft Proposed Spring Release Limits**
  - **April:**
    - **Critically Dry: 4,000 cfs**
    - **Dry: 6,000 cfs**
    - **Below Normal: 6,000 cfs**
    - **Above Normal: 6,500 cfs**
    - **Wet: 8,000 cfs**
  - **May:**
    - **Critically Dry: 7,500 cfs**
    - **Dry: 8,000 cfs**
    - **Below Normal: 9,000 cfs**
    - **Above Normal: 11,000 cfs**
    - **Wet: 12,000 cfs**

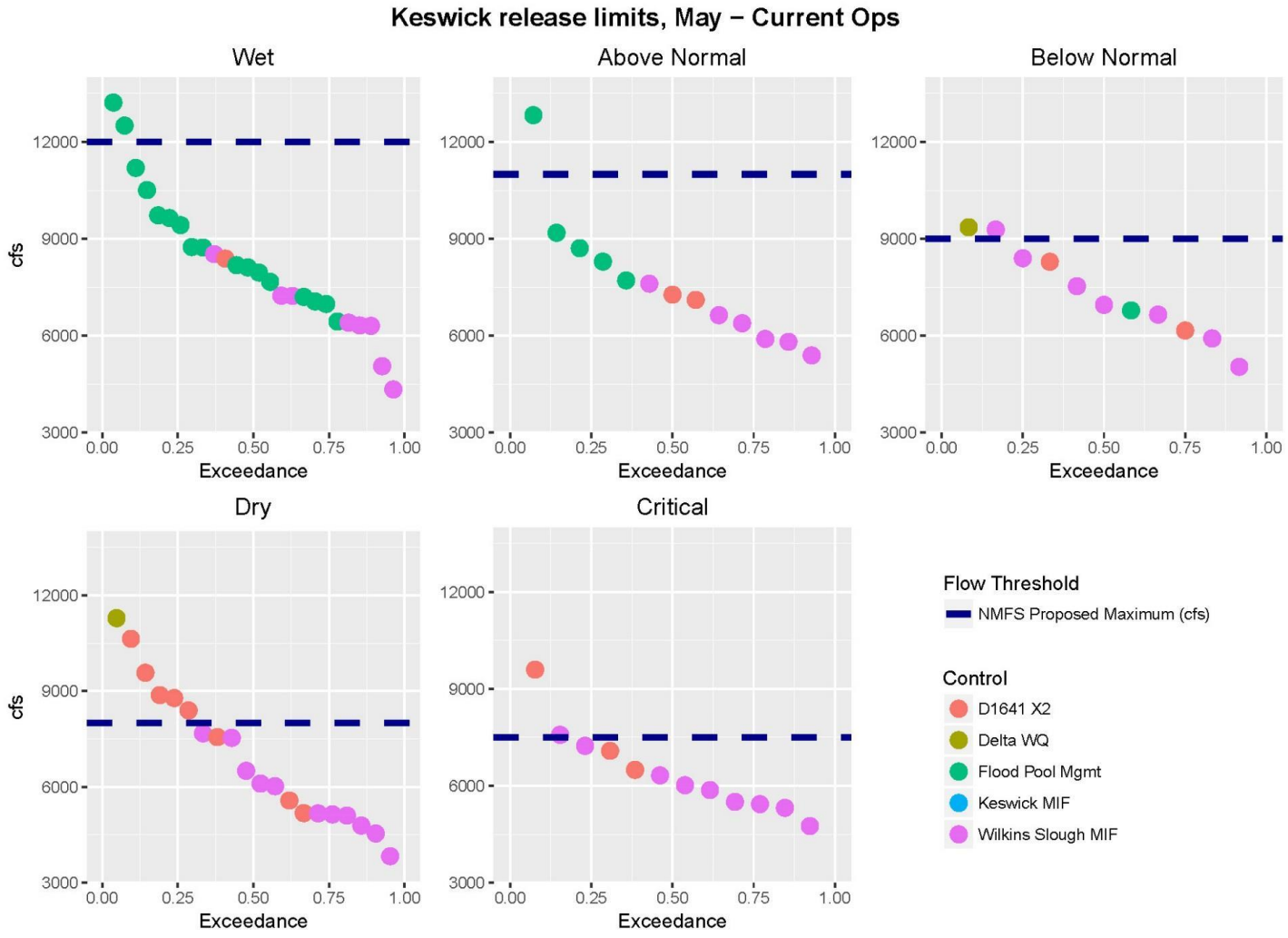
Analyses – Spring Release Limits

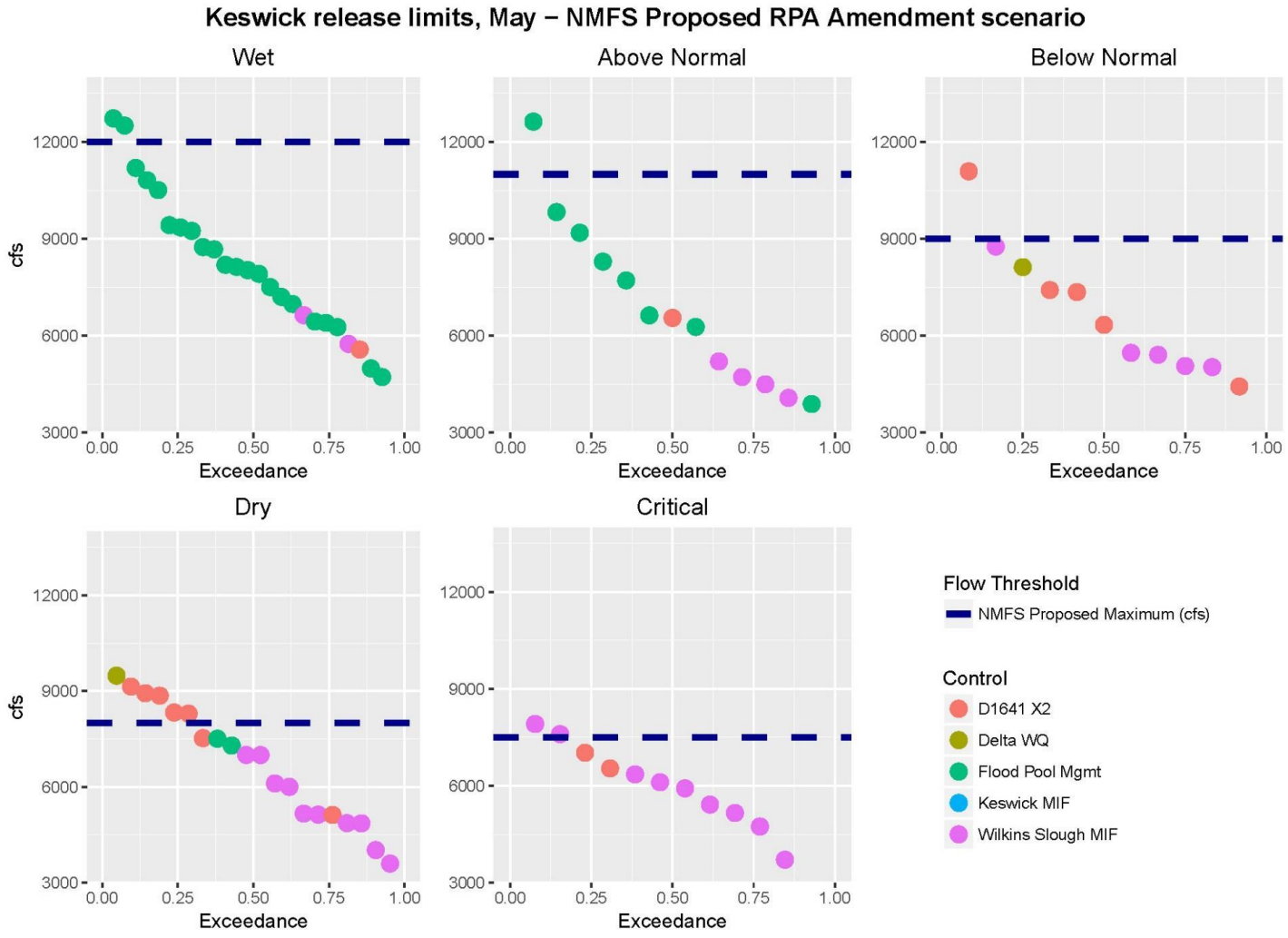
- Compliance under “Current Ops”
- Compliance with modified CVP delivery allocation
  - No specific limits set on releases
  - Operation affected solely by allocation and storage conditions

RECLAMATION


Keswick release limits, April – Current Ops
Wet
Above Normal
Below Normal
Dry
Critical
cfs
Exceedance
30000
20000
10000
7500
5000
2500
0.00
0.25
0.50
0.75
1.00
Flow Threshold
NMFS Proposed Maximum (cfs)
Control
D1641 X2
Delta WQ
Flood Pool Mgmt
Keswick MIF
Wilkins Slough MIF


Keswick release limits, April – NMFS Proposed RPA Amendment scenario
Wet
Above Normal
Below Normal
Dry
Critical
cfs
Exceedance
30000
20000
10000
7500
5000
2500
0.00
0.25
0.50
0.75
1.00
Flow Threshold
NMFS Proposed Maximum (cfs)
Control
D1641 X2
Delta WQ
Flood Pool Mgmt
Keswick MIF
Wilkins Slough MIF


Keswick release limits, May – Current Ops
Wet
Above Normal
Below Normal
Dry
Critical
cfs
12000
9000
6000
3000
0.00
0.25
0.50
0.75
1.00
Exceedance
Flow Threshold
NMFS Proposed Maximum (cfs)
Control
D1641 X2
Delta WQ
Flood Pool Mgmt
Keswick MIF
Wilkins Slough MIF

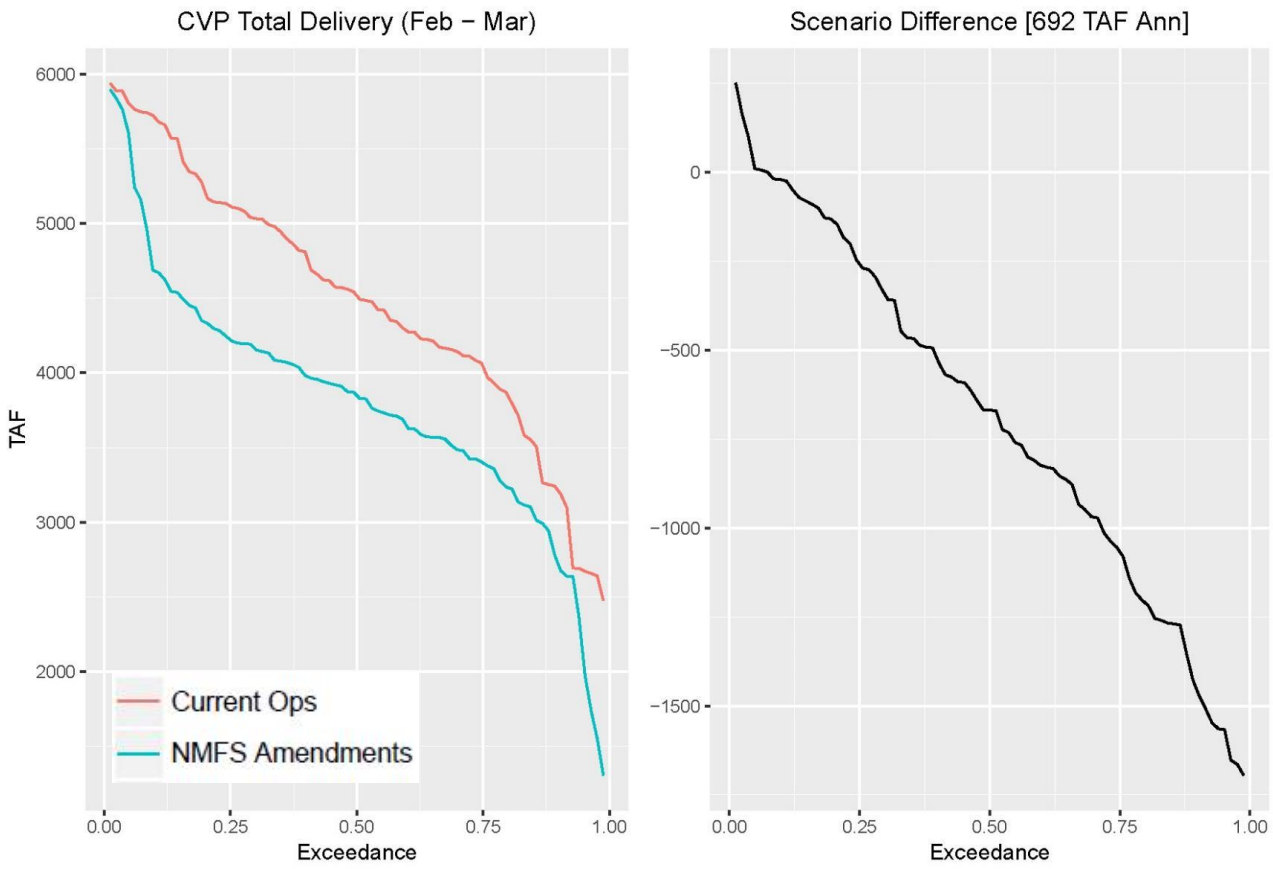

Keswick release limits, May – NMFS Proposed RPA Amendment scenario
Wet
Above Normal
Below Normal
Dry
Critical
cfs
12000
9000
6000
3000
0.00
0.25
0.50
0.75
1.00
Exceedance
Flow Threshold
NMFS Proposed Maximum (cfs)
Control
D1641 X2
Delta WQ
Flood Pool Mgmt
Keswick MIF
Wilkins Slough MIF

Analyses – Effects on Other System Operations

- Folsom Storage
- Delta Outflow
- SWP Operations
- CVP Delivery

RECLAMATION

Overall change in CVP Delivery



Discussion

RECLAMATION

Next Steps

System-Wide Evaluations of Draft Proposed Amendment

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Analyses – Storage and Flow Targets/Restrictions

- Further refinements to CalSim analysis
  - Refinements to storage target accomplishment
  - Refinements to impact distribution
  - Additional QA/QC

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Temperature Compliance (location/value/metric)

- 55° F 7DADM and/or 53° F DAT at CCR (May 15->)
  - Action I.2.3.A-C
  - Action I.2.4

- 61° F 7DADM and/or 58° F DAT at Jellys Ferry (March 1 – May 15)
  - Action I.2.3

Analyses – Temperature Compliance (location/value/metric)

- HEC-5Q analysis
  - Feasibility/frequency
    - Existing
    - In conjunction with storage/flow targets/restrictions
  - Potential impacts of meeting the requirements (requires additional formulation)
- Data from 2016/2017/Previous Years

Analyses – Biological Impacts

- SacPas, SAIL, MAST
  - Potential biological impacts on other species residing in other components of system
    - Sacramento/American salmon, steelhead, Delta smelt, others

Biological Objectives

- Temperature-dependent mortality objectives
  - Varies by water year type
    - 3% to 30%
  - Action I.2.1

RECLAMATION

Analyses – Biological Objectives

- Analyses into feasibility based on outputs of CalSim/HEC-5Q model runs

Analyses – Others

- Wilkins Slough Operations
  - Action I.4
  - Discussions with SRSC/North-of-Delta water users
- Others?

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Discussion

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Next Steps

- Previous Meeting Notes
- Future Workshops
  - September 21 – Status/Updates

RECLAMATION