Bay-Delta Water Quality Control Plan Update and Recirculated Draft Substitute Environmental Document

November 29, December 16, 19, 20, 2016
January 3, 2017 Hearing

January 3, 2017 Staff Presentation

State Water Resources Control Board

California Water Boards
State Water Resources Control Board
Regional Water Quality Control Boards

Major Comments / Concerns

1. Carryover storage
2. Importance of June flows
3. Multiple dry years
4. More than just averages
5. Economics
6. Groundwater effects / SGMA
7. Salinity objective
8. SalSim
9. Merced River SAFE Plan
10. Tuolumne fish studies
11. Unimpaired flow (UF) and block of water
12. Flow Recommendations
13. Predation
14. Disadvantaged Communities

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1. Carryover Storage

Carryover requirements are part of the project:

"When implementing the LSJR flow objectives, the State Water Board will include minimum reservoir carryover storage targets or other requirements to help ensure that providing flows to meet the flow objectives will not have adverse temperature or other impacts on fish and wildlife or, if feasible, on other beneficial uses."

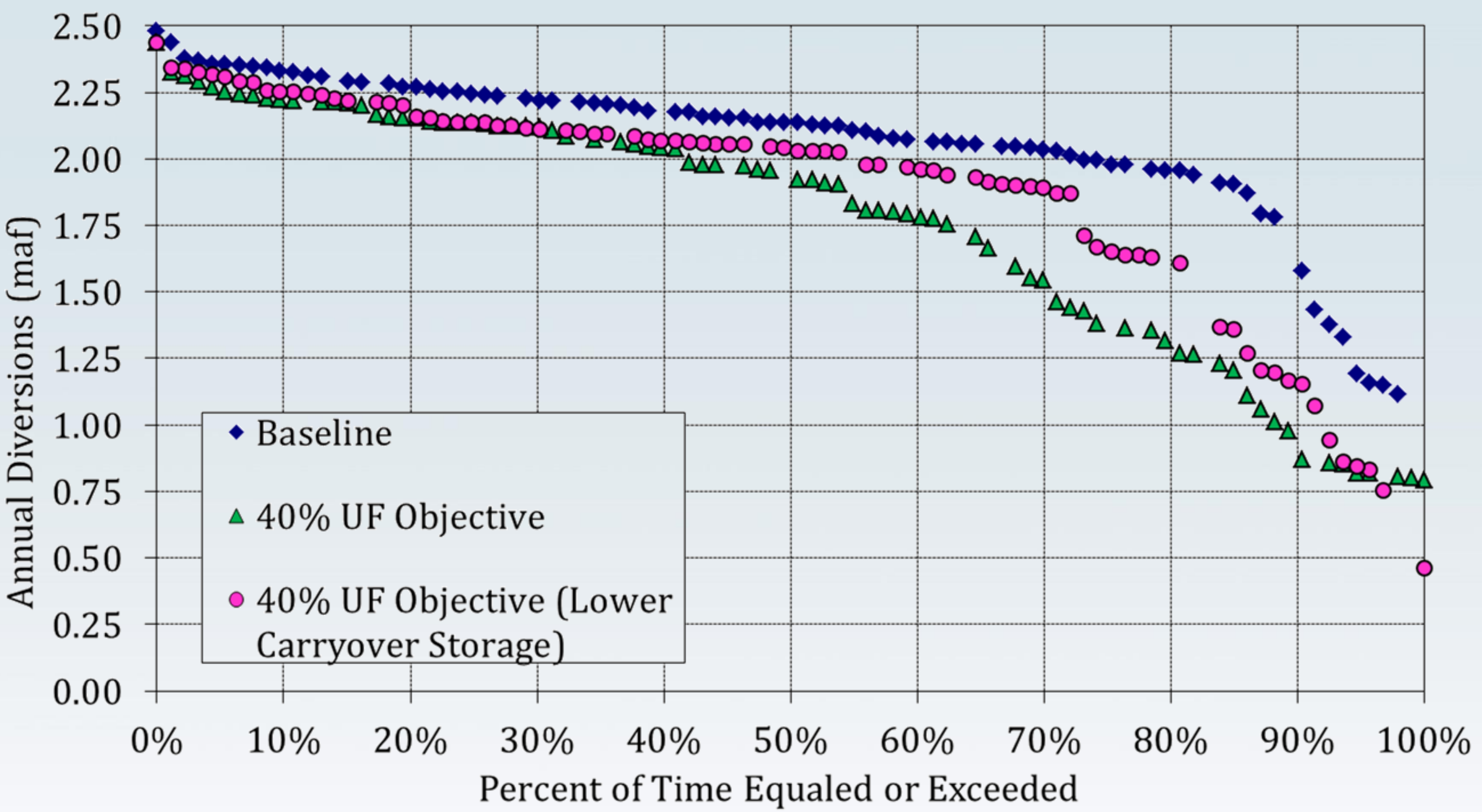
(Appendix K, page 29)

Minimum September Carryover Guideline (in TAF) for the Three Tributaries

	Stanislaus	Tuolumne	Merced
Baseline	85	800	115
40% Flow Objective	700	800	300
40% Flow Objective with lower carryover (Modified 40 %)*	85	400	115

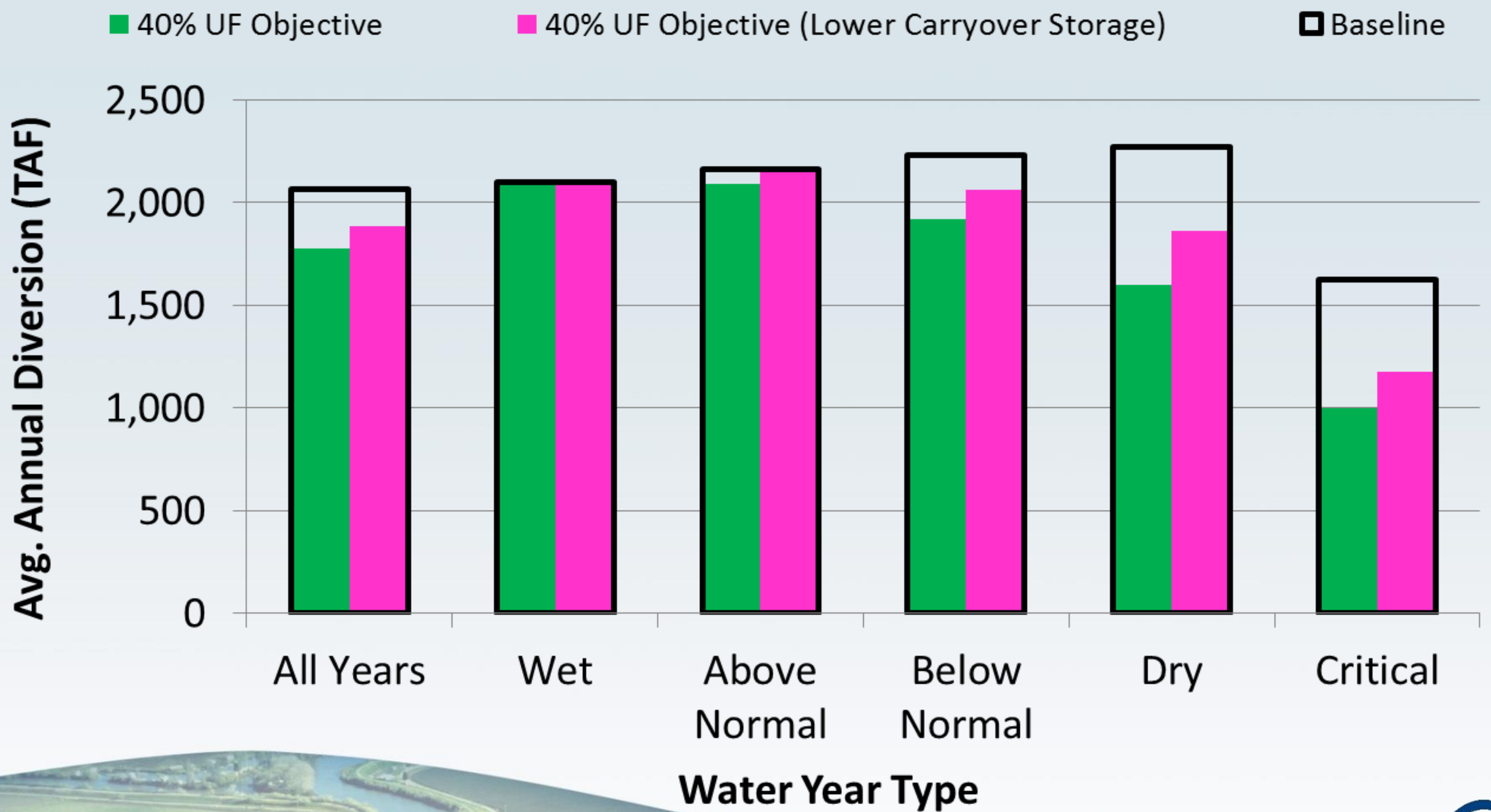
* Not analyzed in the SED because not included within the project alternatives
TAF = thousand acre-feet

Exceedance Plot of Diversion Delivery For the Three Tributaries

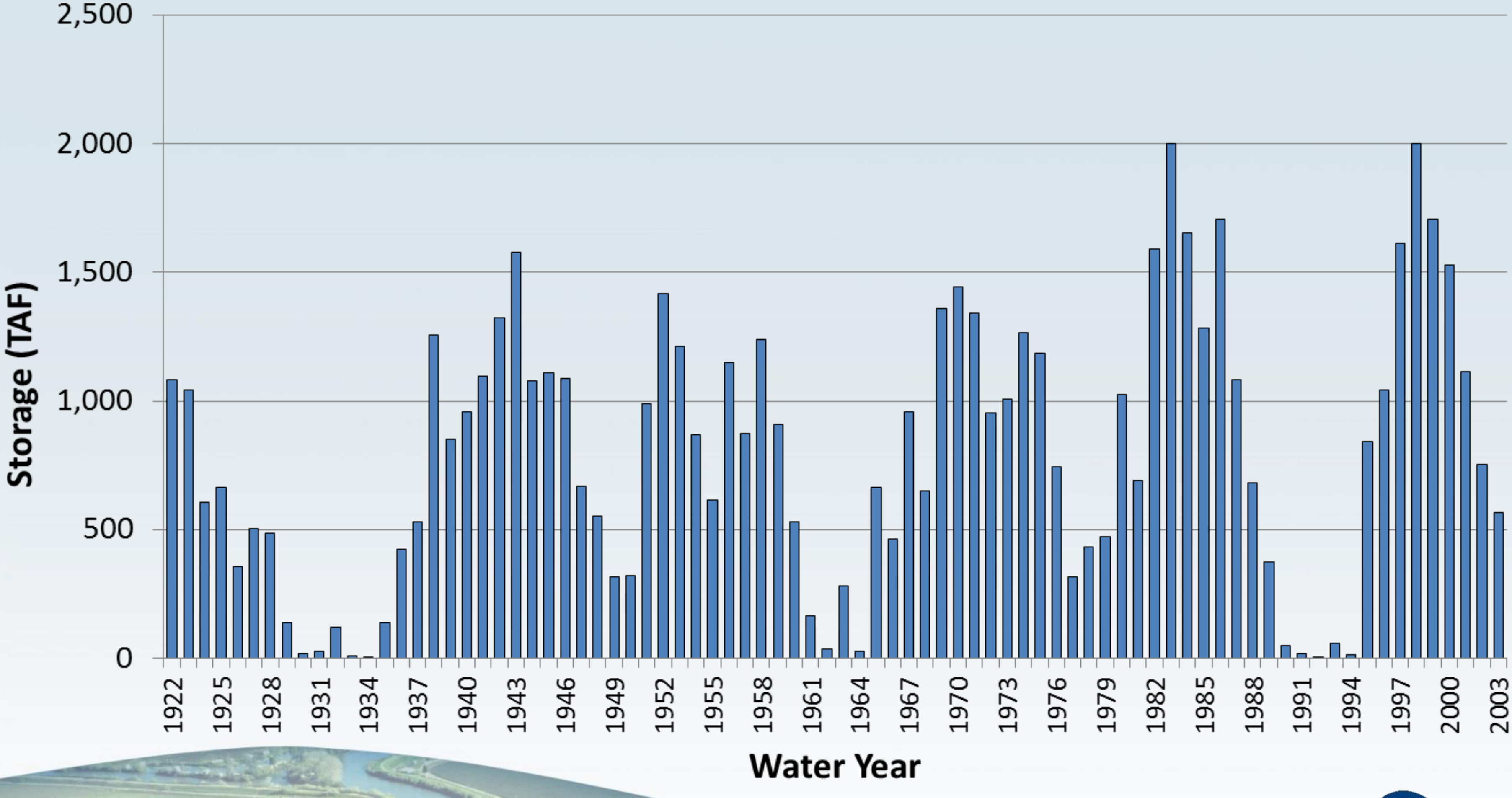


maf = million acre-feet

Average Annual Diversion on the Three Tributaries by Year Type

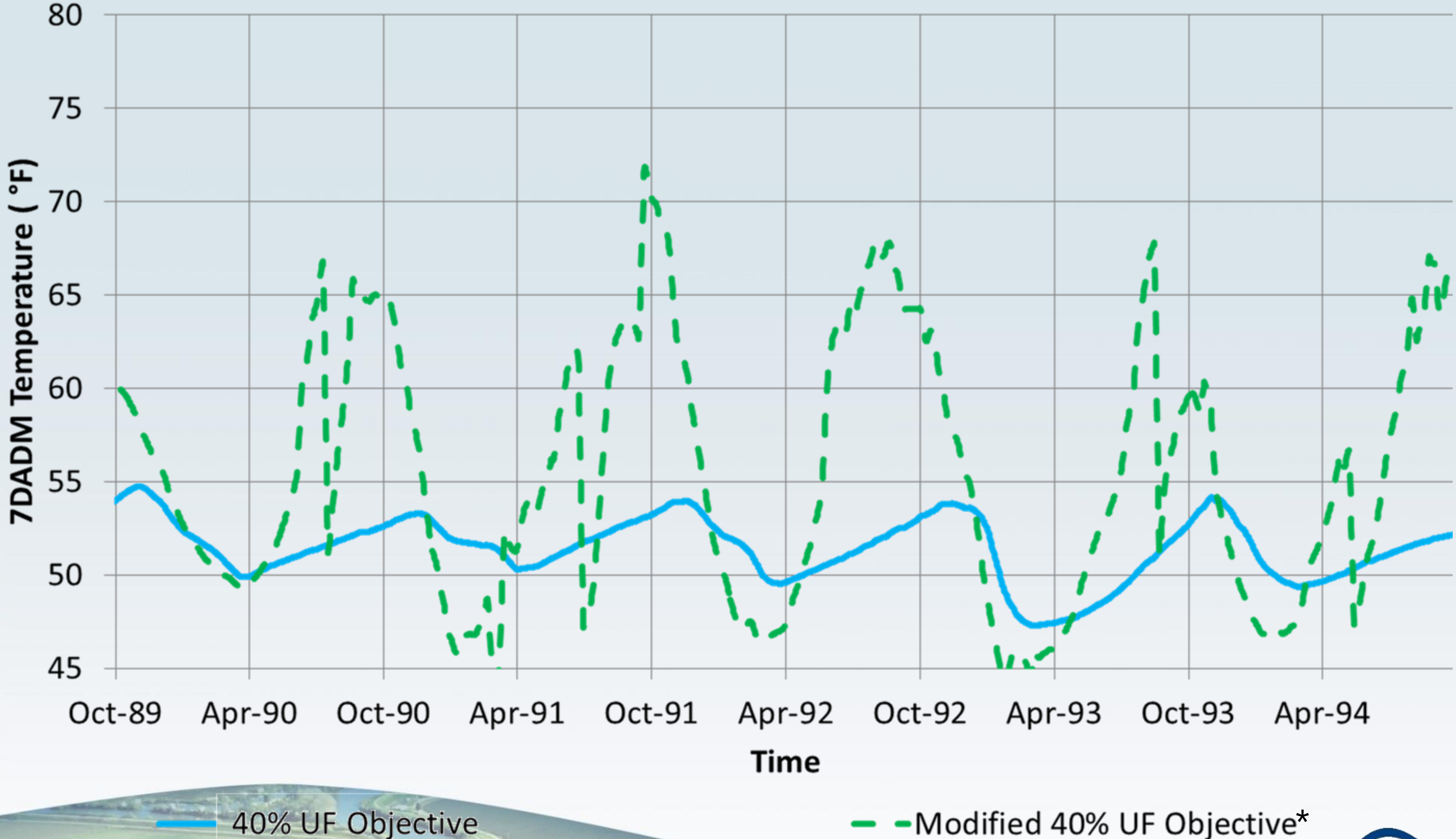


New Melones Storage (End of Sep.) Modified 40% Alternative*



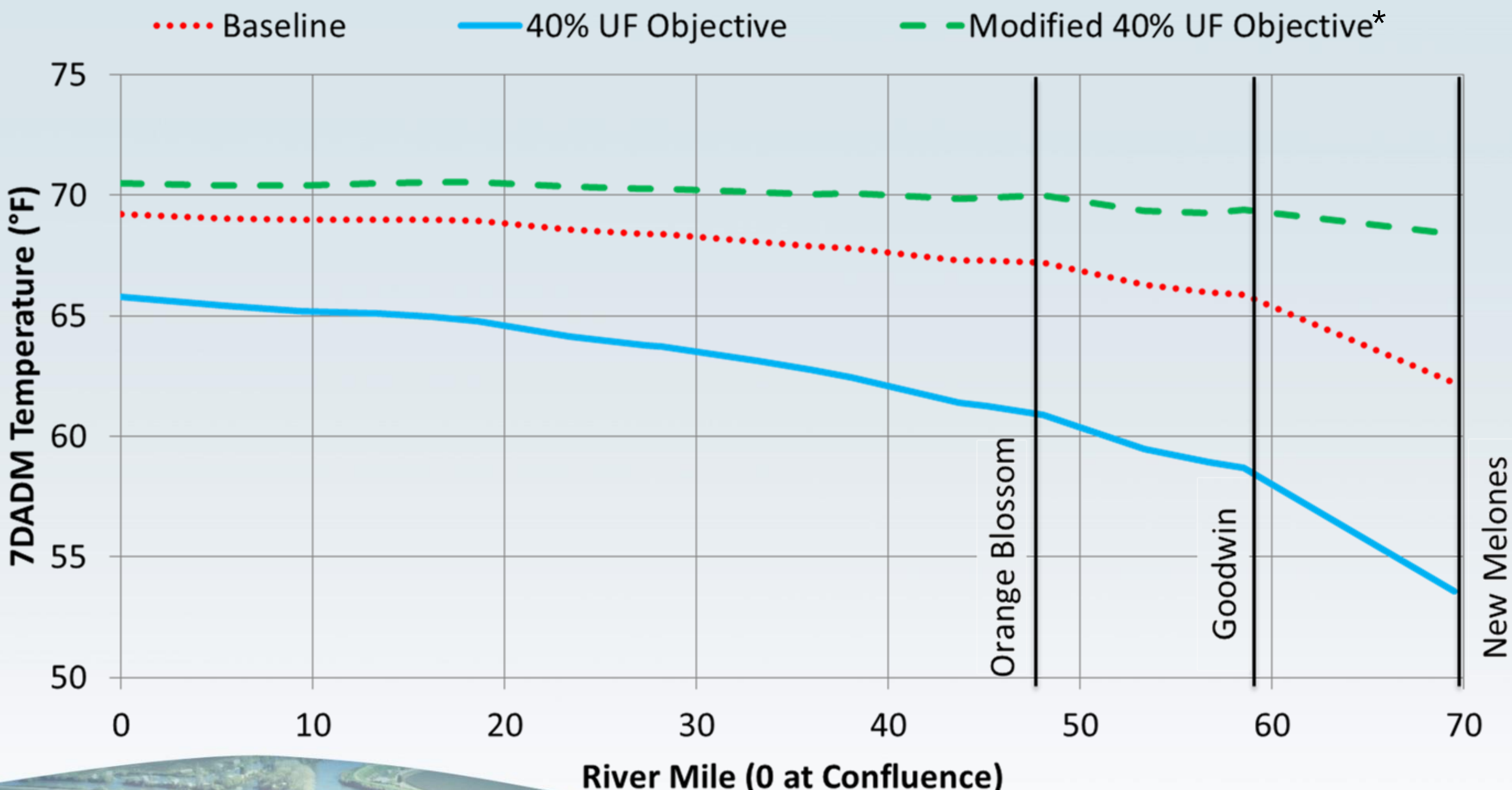
* Not analyzed in the SED because not included within the project alternatives.
  Has no carryover storage, no refill criteria, and no flow shifting.

Stanislaus Daily 7DADM Temperature at New Melones Release (Oct. 1989 – Sep. 1994)



* Not analyzed in the SED because not included within the project alternatives. Has no carryover storage, no refill criteria, and no flow shifting.

Stanislaus River Longitudinal Temperature Profile for October (1991)



* Not analyzed in the SED because not included within the project alternatives. Has no carryover storage, no refill criteria, and no flow shifting.

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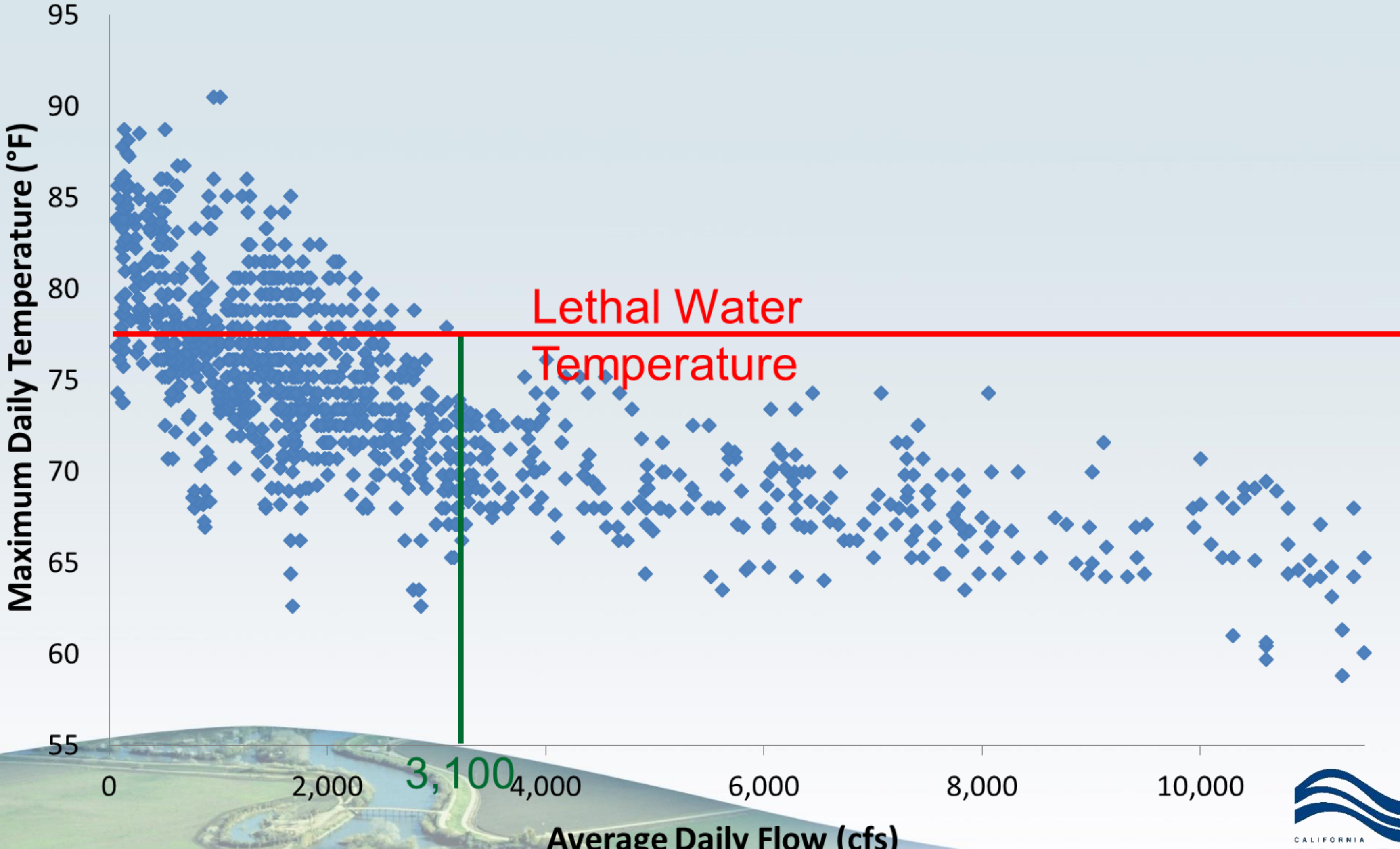
2. Importance of June Flows

- Salmon and steelhead growth and migration period
- Spawning period for sturgeon and splittail
- Higher flows can disrupt and displace non-native species, including predatory fish and water hyacinth
- June extends the window of opportunity available to native fish, and allows for additional life history diversity
- Flows are important for migration through the San Joaquin River and Delta

Historic June Water Temperatures Versus Historic Flow Near Vernalis



cfs = cubic feet per second

3,100 cfs is achieved approximately 30% more often under the 40% unimpaired flow alternative at Vernalis

San Joaquin River at Vernalis						
Flow (cfs)	June					
	Base	20%	30%	40%	50%	60%
1,000	**90%**	6%	9%	9%	9%	9%
2,000	**57%**	11%	18%	24%	27%	33%
3,000	**41%**	13%	22%	30%	33%	38%
4,000	**26%**	4%	28%	35%	40%	46%
5,000	**23%**	1%	9.8%	28%	37%	43%
6,000	**21%**	0%	2%	12%	28%	37%
7,000	**20%**	0%	0%	5%	20%	32%
8,000	**16%**	0%	0%	2%	12%	26%
9,000	**15%**	0%	-1%	-1%	9%	16%
10,000	**13%**	0%	0%	0%	2%	11%
15,000	**6%**	0%	1%	1%	1%	2%

cfs = cubic feet per second

SED Table 19-27

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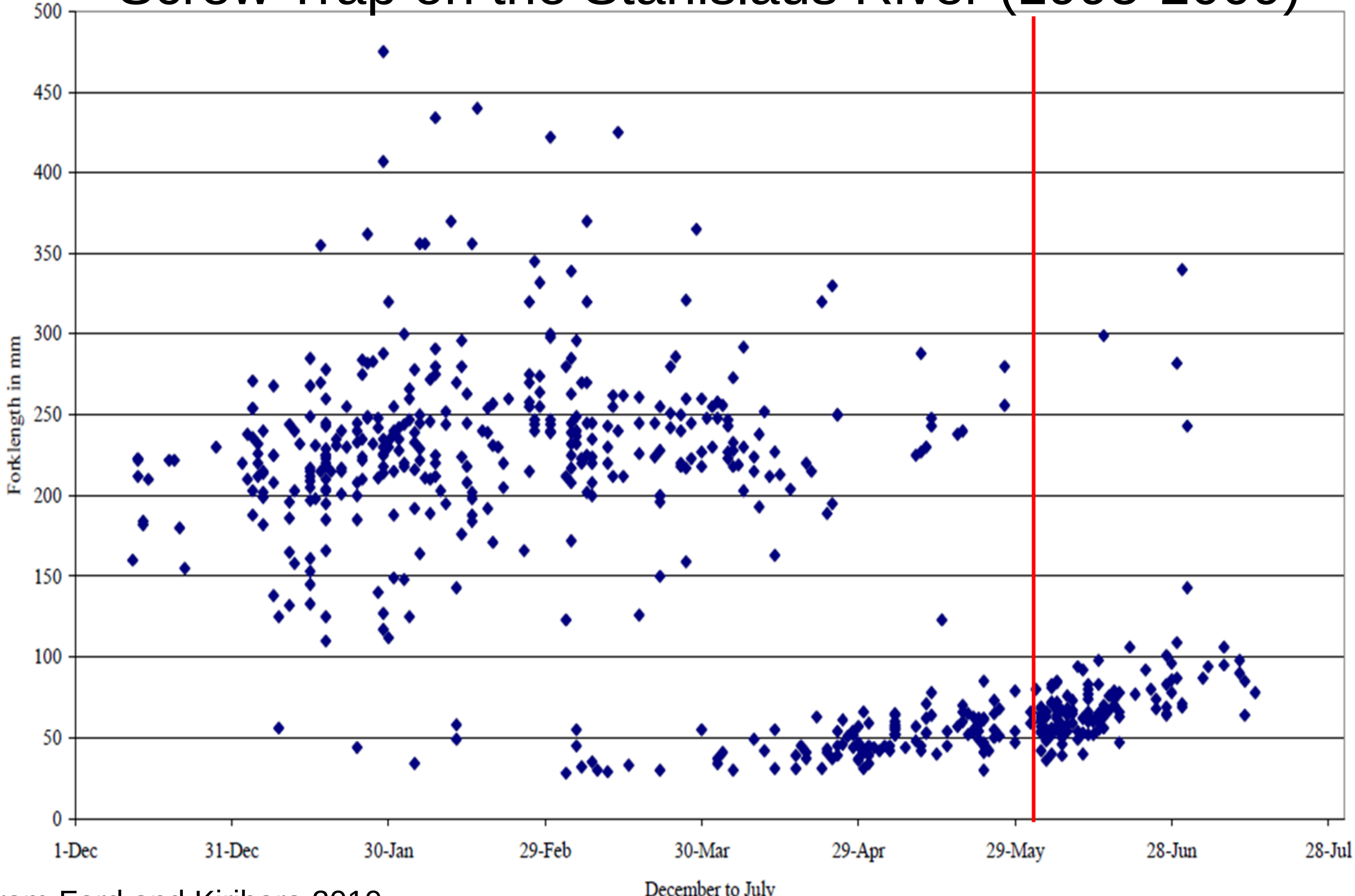
Juvenile Steelhead Captured at the Oakdale Screw Trap on the Stanislaus River (1995-2009)



From Ford and Kirihara 2010

Chinook Salmon Passage on Tuolumne River (2006)

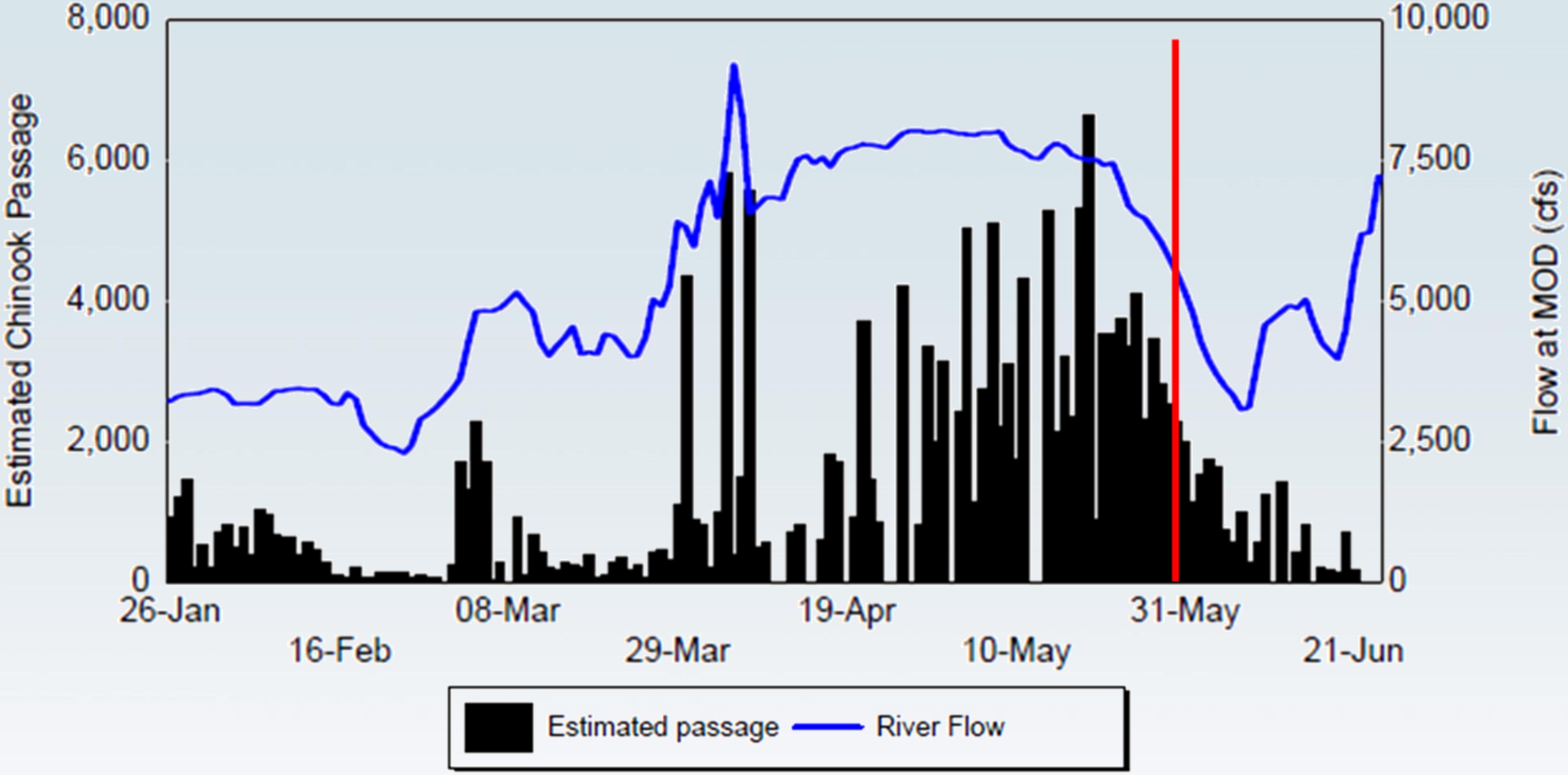
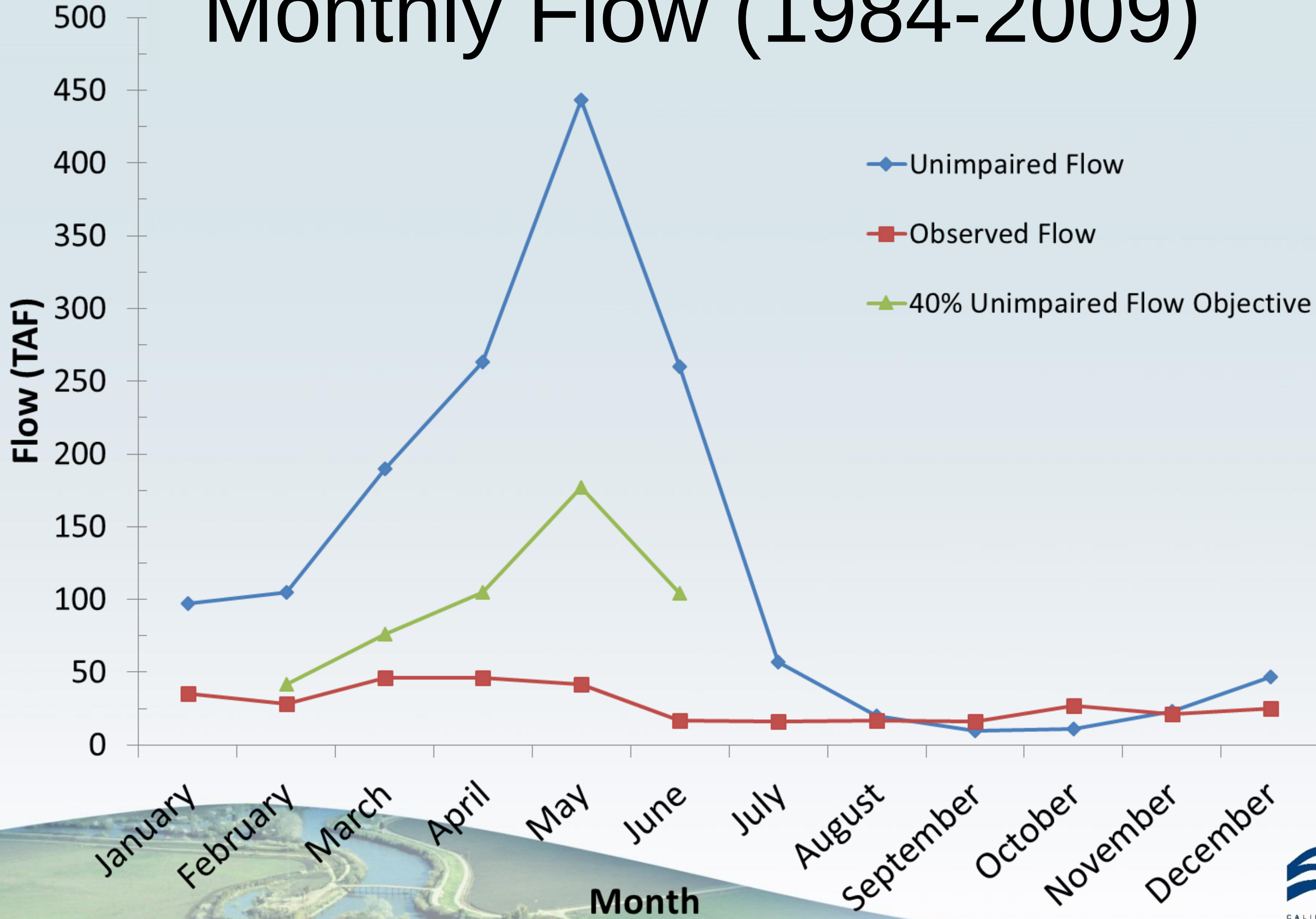


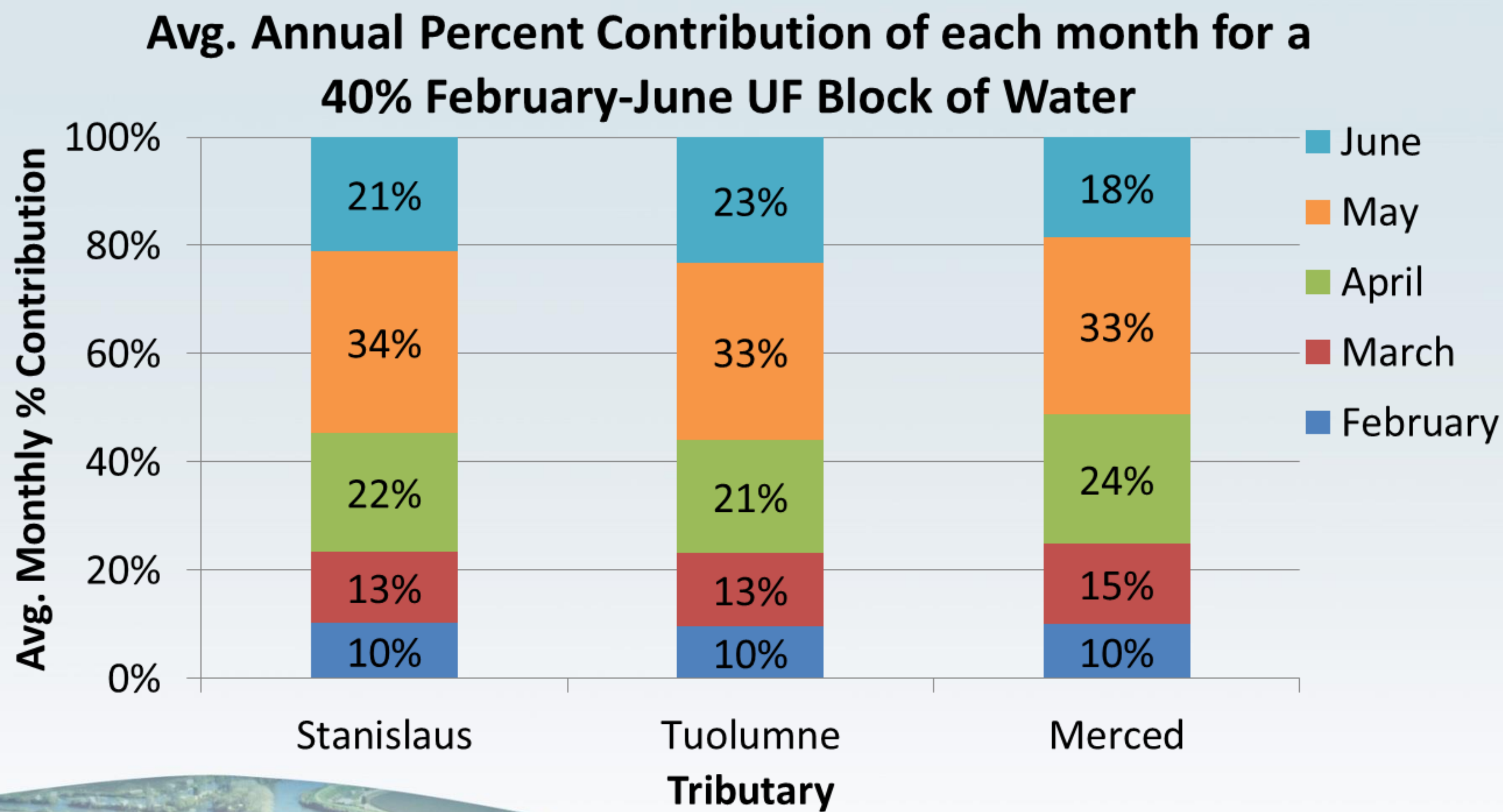
Figure 10. Daily estimated passage of unmarked Chinook salmon at Grayson and river flow at Modesto (MOD) during 2006.

Tuolumne River from Fuller et al. 2007

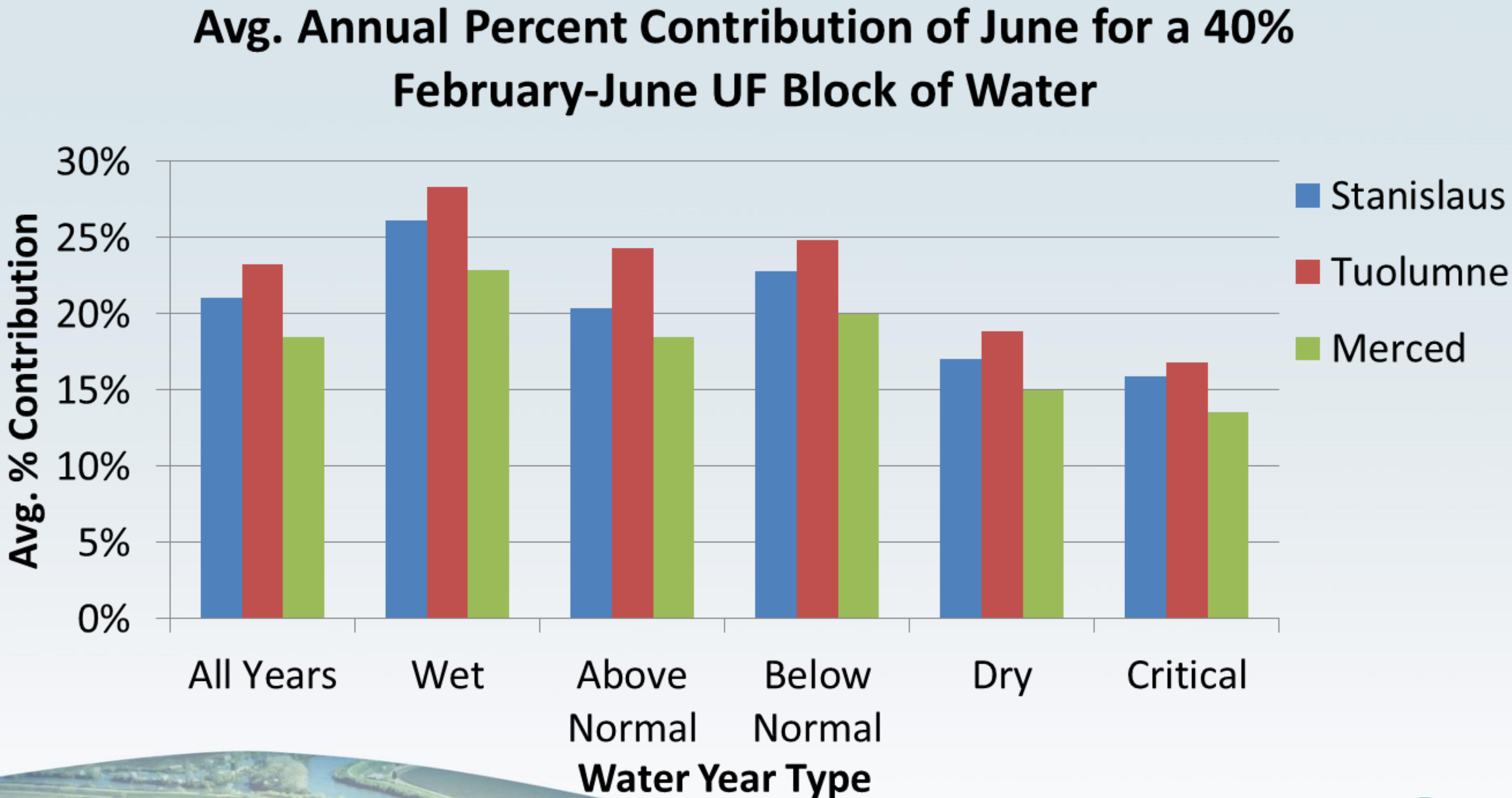
Tuolumne River Median Monthly Flow (1984-2009)



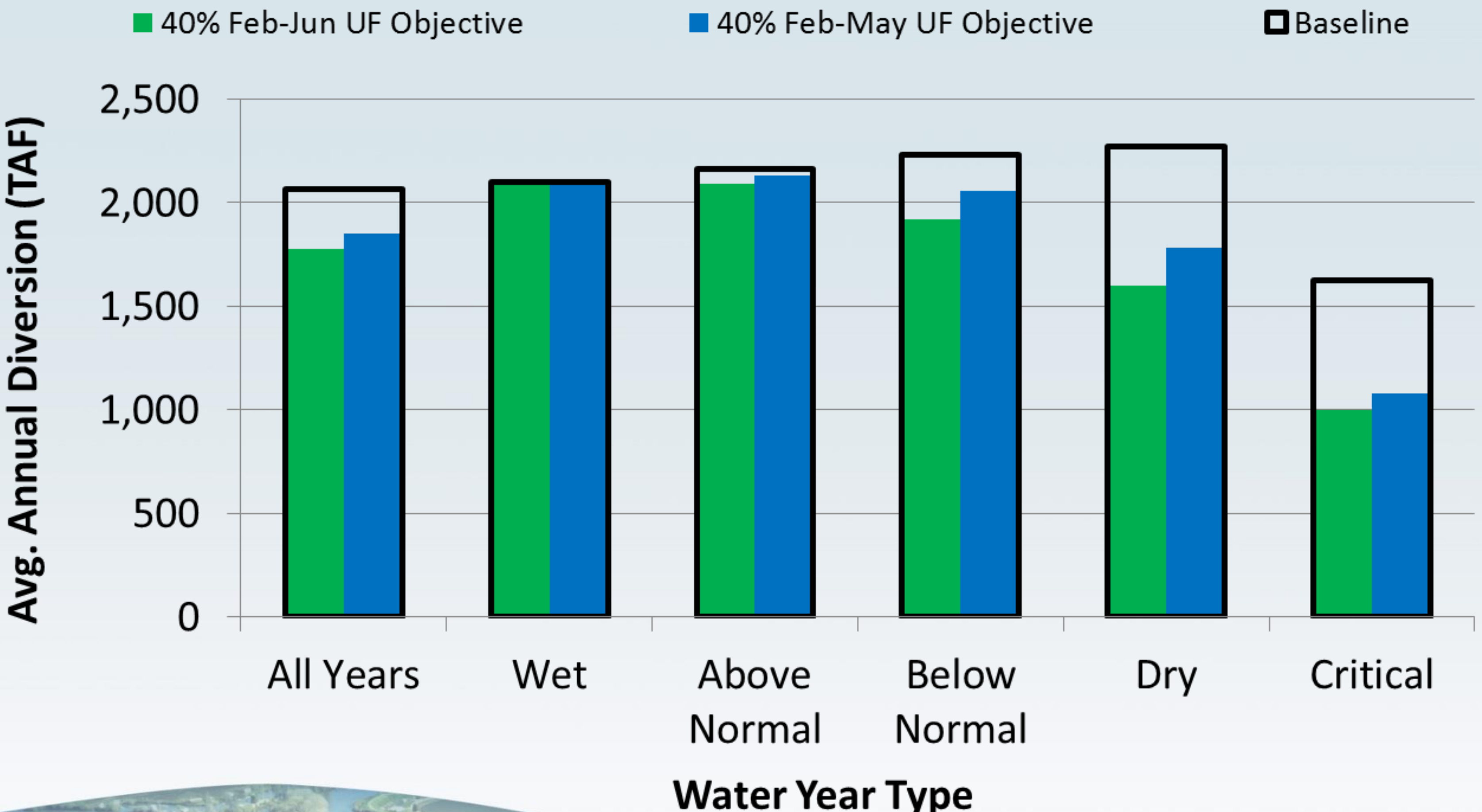
Monthly Contributions to February through June Flow Requirement



June Contribution to Flow Requirement by Year Type



June Effect on Diversions



3. Multiple Dry Years

- Drought years are represented by summary statistics for critically dry and dry years, and exceedance plots

Estimated Effect on Average Annual Surface Water Diversion – Baseline and 40% Unimpaired Flow

	Stanislaus (TAF)	Tuolumne (TAF)	Merced (TAF)	Total (TAF)
Baseline - average of all years	637	851	580	2,068
40 % UF - average of all years	558	732	485	1,775
Baseline - Critical Year average	520	689	416	1,625
40 % UF - Critical Year average	303	426	272	1,001
40 % UF - 1987 to 1992 average*	328	442	279	1,049

* Based on data from WSE surface water diversions– "WSE SW Diversions" tab in on-line spreadsheet "GW and SW use analysis 09142016

TAF = thousand acre-feet per year

4. SED Has More Than Averages

- The SED presents much more than simple averages
- The SED provides summary statistics for different year types, as well as exceedance plots and tables for:
  - River flows
  - Reservoir storage
  - Surface water supply reductions
  - Cropping

Cumulative Distribution of Surface Water Diversions (Table F.1-69)

	Unimpaired Flow	Tuolumne Diversions (TAF)						Tuolumne Deficit Indicator (TAF)					
		Baseline	20%	30%	40%	50%	60%	Baseline	20%	30%	40%	50%	60%
Minimum	384	557	371	371	341	215	214	477	663	663	693	819	820
10%	836	685	652	543	408	322	229	349	382	491	625	712	805
20%	1,055	796	781	715	563	395	287	237	253	319	471	639	747
30%	1,166	828	822	777	641	511	378	205	211	257	393	523	656
40%	1,413	855	852	823	763	652	460	179	182	211	271	382	574
50%	1,783	878	869	851	802	751	538	156	165	183	232	283	496
60%	2,036	891	889	871	828	802	673	143	145	163	206	231	361
70%	2,198	915	910	890	859	828	763	119	124	144	175	206	271
80%	2,490	932	930	911	887	857	820	102	104	123	147	177	214
90%	3,090	960	957	938	908	890	853	74	77	96	126	144	181
Maximum	4,630	1,034	1,034	1,004	1,004	1,004	907	0	0	30	30	30	127
Average	1,851	851	831	795	732	657	553	183	203	239	302	376	481

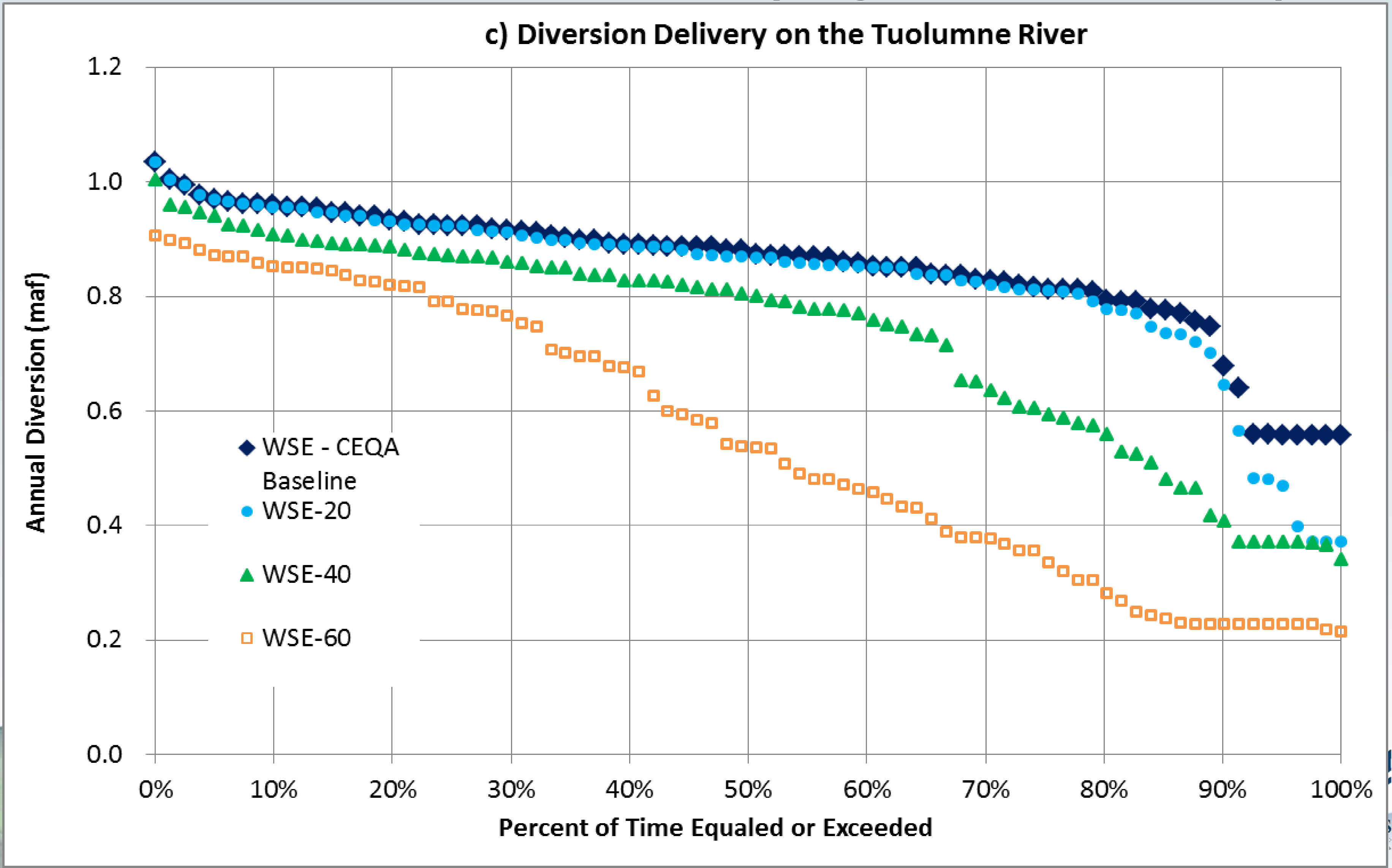
Cumulative Distribution of Surface Water Diversions (Table F.1-69) – Detail 1

	Unimpaired Flow	Tuolumne Diversions (TAF)					
		Baseline	20%	30%	40%	50%	60%
Minimum	384	557	371	371	341	215	214
10%	836	685	652	543	408	322	229
20%	1,055	796	781	715	563	395	287
30%	1,166	828	822	777	641	511	378
40%	1,413	855	852	823	763	652	460
50%	1,783	878	869	851	802	751	538
60%	2,036	891	889	871	828	802	673
70%	2,198	915	910	890	859	828	763
80%	2,490	932	930	911	887	857	820
90%	3,090	960	957	938	908	890	853
Maximum	4,630	1,034	1,034	1,004	1,004	1,004	907
Average	1,851	851	831	795	732	657	553

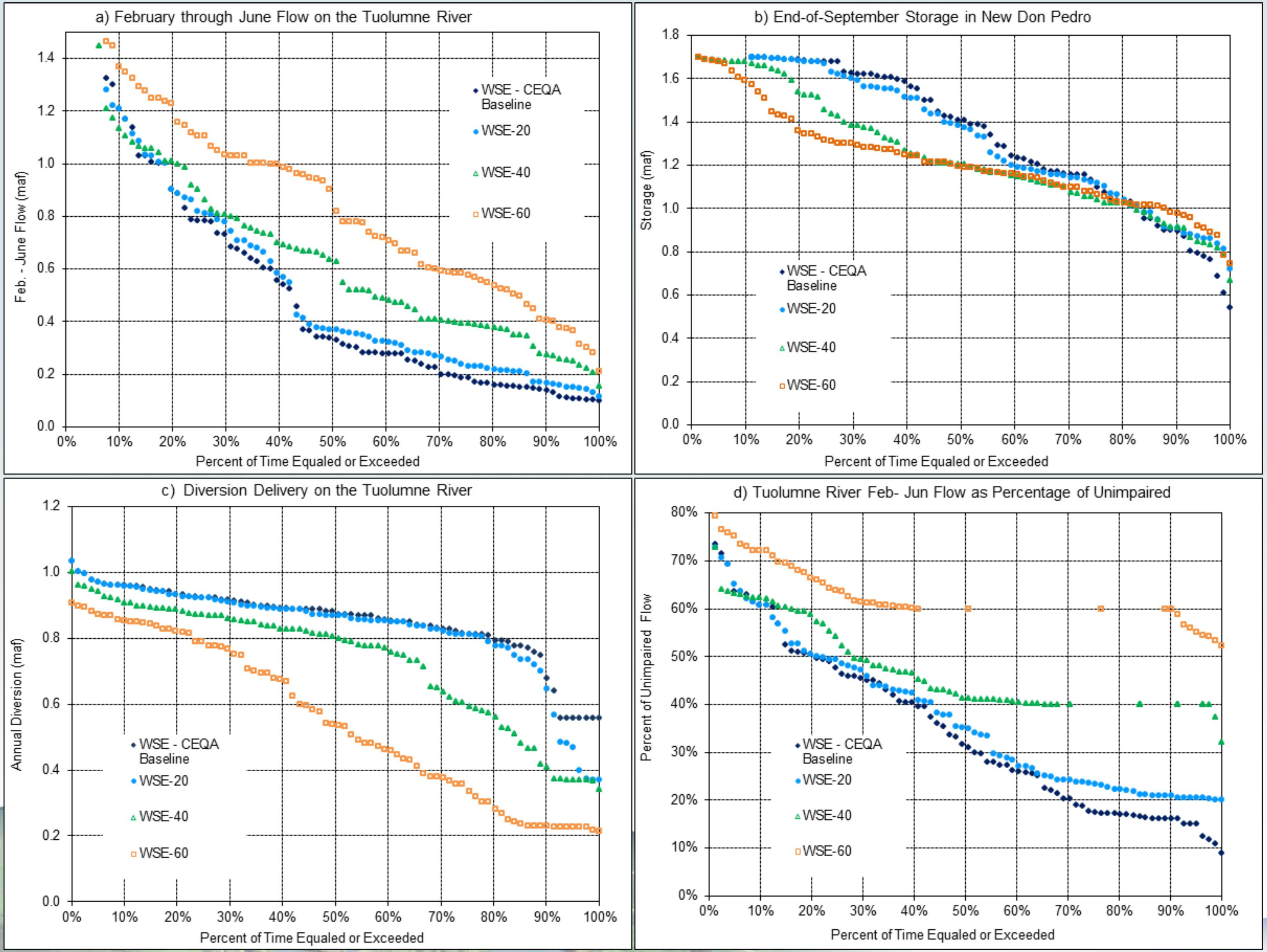
Cumulative Distribution of Surface Water Diversions (Table F.1-69) – Detail 2

	Unimpaired Flow	Tuolumne Deficit Indicator (TAF)					
		Baseline	20%	30%	40%	50%	60%
Min	384	477	663	663	693	819	820
10%	836	349	382	491	625	712	805
20%	1,055	237	253	319	471	639	747
30%	1,166	205	211	257	393	523	656
40%	1,413	179	182	211	271	382	574
50%	1,783	156	165	183	232	283	496
60%	2,036	143	145	163	206	231	361
70%	2,198	119	124	144	175	206	271
80%	2,490	102	104	123	147	177	214
90%	3,090	74	77	96	126	144	181
Max	4,630	0	0	30	30	30	127
Average	1,851	183	203	239	302	376	481

Tuolumne River Diversion Exceedence in WSE Alternatives (Figure F.1.3-4c)



Tuolumne River (Figure F.1.3-4)
Slide 102 (December 5, 2016 Workshop)



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5. Economics

- To illustrate Statewide Agricultural Production Model (SWAP) results, the full range of results (82 years) is shown using exceedance curves for individual crops and total irrigated acres for each irrigation district in Chapter 11
- This information is also combined for all crops to determine effects on total economic output

What are the Impacts of the Flow Proposal?

Implementing the 40% flow proposal could result in:

- 14% reduction (293 TAF) in water available for surface water diversion (7% to 23% reduction for 30% to 50% range of unimpaired flow)
- Increase groundwater pumping by an average of 105 thousand acre-feet per year (TAF/yr)
- Increase unmet agricultural water demand by 69 TAF/yr (2014 baseline GW pumping) to 137 TAF/yr (2009 baseline GW pumping) in the plan area
- An average annual decrease in economic output of $64 million (2.5% reduction from baseline annual average agricultural economic sector output of $2.6 billion)

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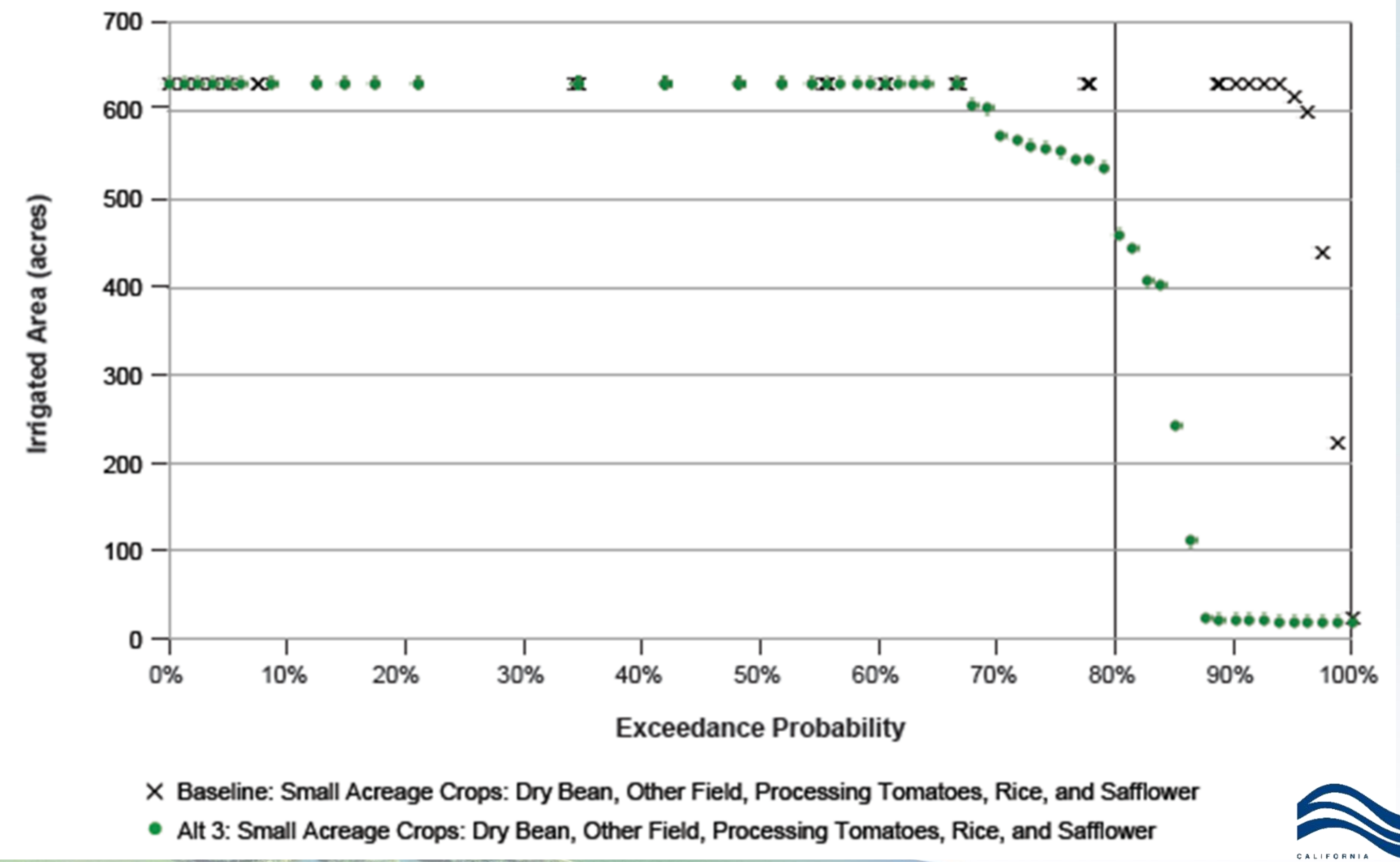
Example Exceedance Curve: Irrigated Acreage in SSJID for Small Acreage under Alternative 3 (Figure 11-11-15c)



SSJID = South San Joaquin Irrigation District

Figure G.5-1. Exceedance Plot of Total Economic Output Related to Agricultural Production in the Irrigation Districts for the LSJR Alternatives and Baseline across 82 Years of Simulation

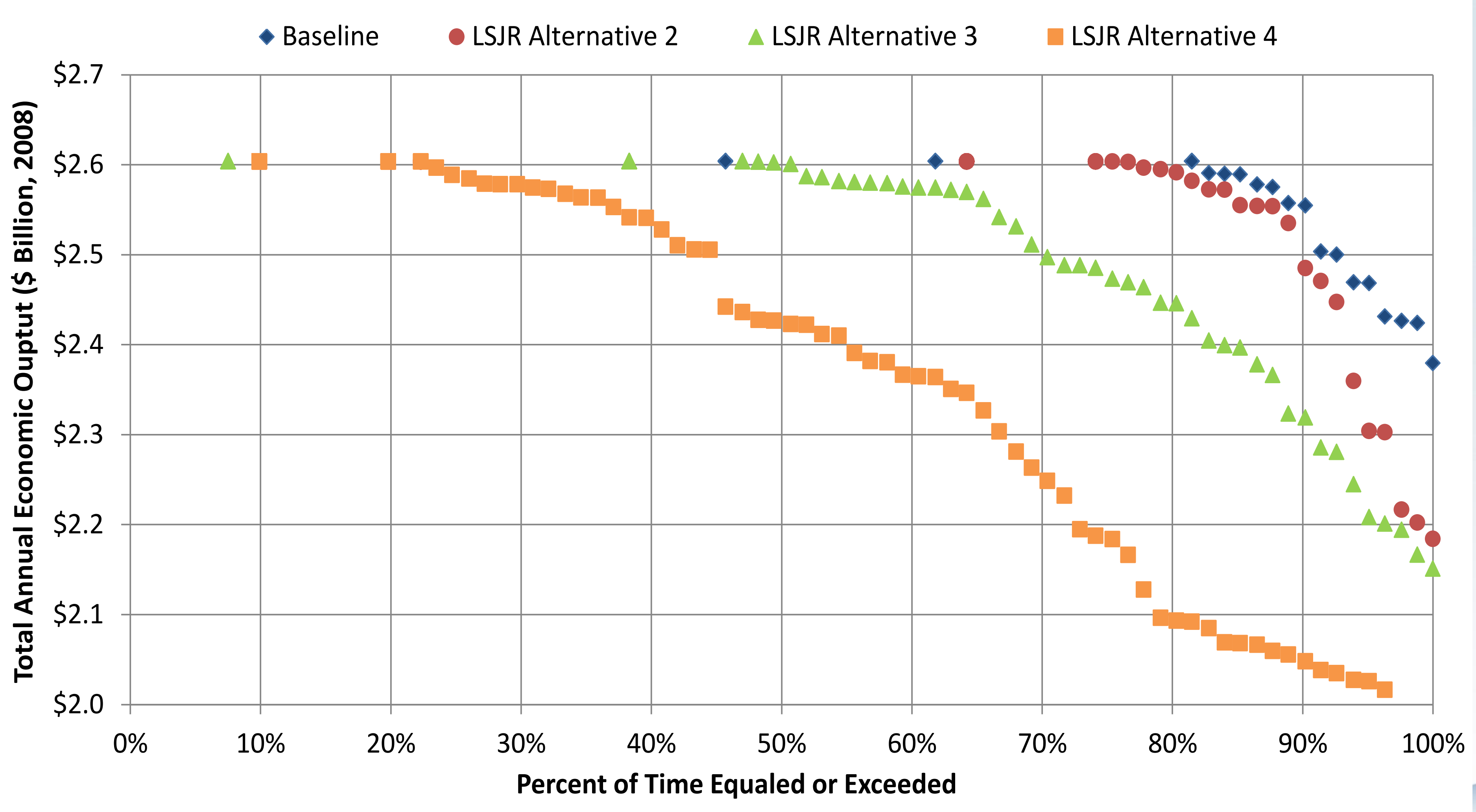


Table G.5-5. Baseline Statistics for Total Economic Output Related to Agricultural Production in the Irrigation Districts and the Change in those Statistics for each of the LSJR Alternatives

	Baseline	LSJR Alternative 2 (20% Unimpaired) Difference from Baseline		LSJR Alternative 3 (40% Unimpaired) Difference from Baseline		LSJR Alternative 4 (60% Unimpaired) Difference from Baseline	
	($2008 Million/yr)	($2008 Million/yr)	% Change	($2008 Million/yr)	% Change	($2008 Million/yr)	% Change
Avg	$2,586	-$17	-0.6%	-$64	-2.5%	-$206	-8.0%
Min	$2,379	-$195	-8.2%	-$228	-9.6%	-$408	-17.1%
90th Percentile	$2,555	-$64	-2.5%	-$235	-9.2%	-$506	-19.8%
80th Percentile	$2,604	-$11	-0.4%	-$158	-6.1%	-$510	-19.6%
70th Percentile	$2,604	$0	0.0%	-$103	-3.9%	-$351	-13.5%
60th Percentile	$2,604	$0	0.0%	-$29	-1.1%	-$238	-9.1%
50th Percentile	$2,604	$0	0.0%	-$2	-0.1%	-$179	-6.9%
40th Percentile	$2,604	$0	0.0%	$0	0.0%	-$68	-2.6%
30th Percentile	$2,604	$0	0.0%	$0	0.0%	-$26	-1.0%
20 Percentile	$2,604	$0	0.0%	$0	0.0%	$0	0.0%
10th Percentile	$2,604	$0	0.0%	$0	0.0%	$0	0.0%
Max	$2,604	$0	0.0%	$0	0.0%	$0	0.0%

6. Groundwater Effects / SGMA

- Information provided by irrigation districts used to determine groundwater pumping
- SGMA and groundwater sustainability
  - Long-term response to reduced surface water availability and changes in recharge are speculative
  - Implementation of SGMA on groundwater supply considered in cumulative impacts in general discussion– considered in cumulative impacts

7. Salinity Objective

- Reasonable protection of agricultural uses
- Policy and legal reasons for reevaluation
  - City of Tracy v. State Water Resources Control Board -- municipal dischargers

Salt Tolerance of Crops (Hoffman Report) – Main Conclusions

- Salinity in southern Delta surface waters appears suitable for all agricultural crops
- Salinity could be increased up to 0.9 to 1.1 deciSiemens per meter (dS/m) and be protective of all crops normally grown in the southern Delta (based on modeling in report and other model studies)
  - Might lead to yield loss of about 5% during low rainfall years

Salinity Objective

- Board must evaluate Water Code section 13241 factors with respect to the current or any revised objectives, and must also adopt a program of implementation
  - Past, present, and future beneficial uses of water
  - Consider economics
  - Water quality conditions that could reasonably be achieved through control of all factors that affect water quality
  - Need for developing housing
  - Need to develop and use recycled water

8. SalSim

- Board staff did not rely on SalSim for analysis of fish benefits
- Chapter 19 Introduction to SalSim (page 19-74):

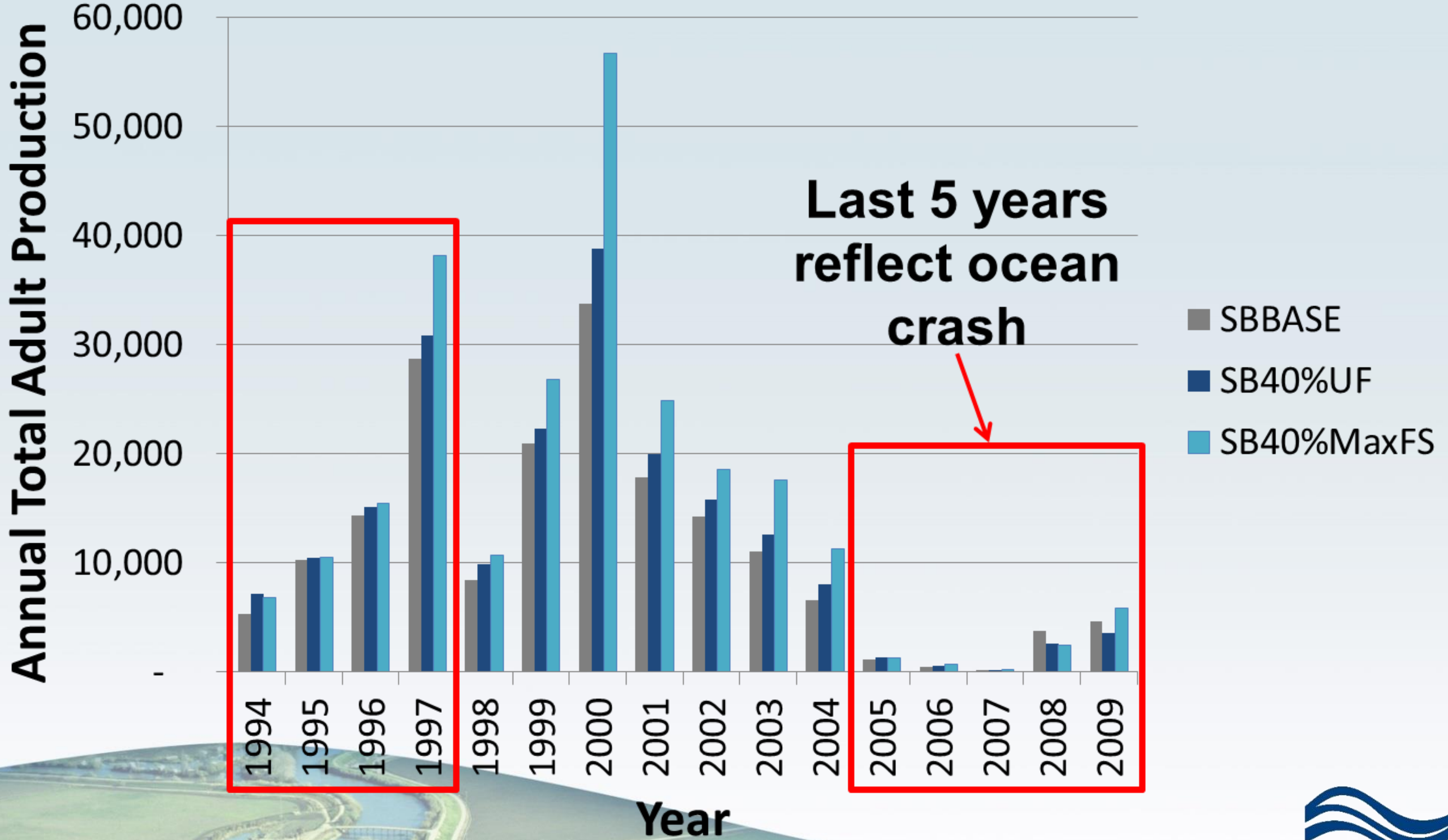
  "During the exploration and use of this model State Water Board staff discovered that the treatment of two of the most important salmon habitat attributes related to flow in the project area, water temperature and floodplain inundation, are not represented by the model in a manner that is consistent with current scientific information…

  …SalSim appears to underrepresent the benefit of habitat improvements related to floodplain and water temperature conditions during the spring time period that result from different flow scenarios which were evaluated for this project."

Limitations of SalSim

- First 4 years are “priming years”
- Includes an ocean crash which affects adult returns during 2005-2009
- Data used to construct the model has many uncertainties

SalSim only has 7 years that reflect comparative production; first 4 years are "priming years"



Adapted from Figure 19-14

Average Salmon Production Using SalSim

(Total Adult Chinook Salmon Production)

SalSim Run	16-year Average	Difference from Baseline	7-year Average	Difference from Baseline
Baseline	11,373	0	16,151	0
40% Unimpaired Flow	12,476	1,103	18,210	2,059
40% Unimpaired Flow with Maximum Flow Shifting	15,512	4,138	23,788	7,637

Adapted from Table 19-32

Why is SalSim not useful for SED?

- Conditions proposed in the SED are different than conditions used to construct SalSim
- SalSim is inaccurate with regard to temperature:
    - Oversensitive relative to egg mortality during egg incubation
    - Juvenile mortality is under sensitive relative to lethal temperatures in SalSim
- SalSim underestimates the benefits of floodplain inundation during the spring time period

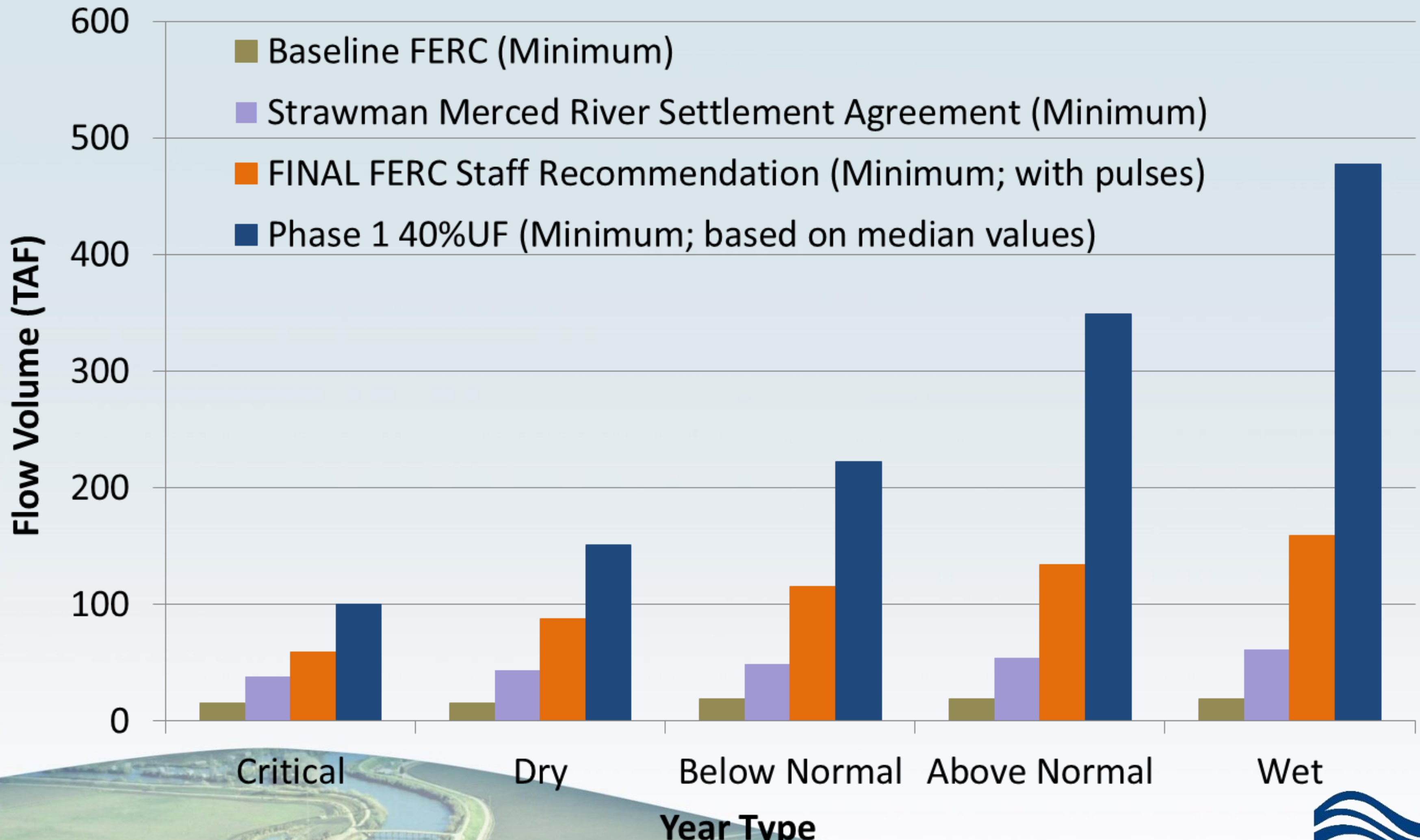
SED Quantified Benefits

- Temperature habitat to evaluate temperature benefits
- Floodplain habitat to evaluate floodplain benefits

9. Merced River SAFE Plan

- Limited details
- Flow element of plan is only one bar chart of flows by year type at Shaffer Bridge
  - Amount and timing of flows unclear

Feb-June Flow Volume Comparison for Proposed Merced River Minimum Flow Alternatives



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10. Tuolumne Fish Studies

- Temperature Study - Farrell et al. 2015. Thermal Performance of Wild Juvenile Oncorhynchus mykiss in the Lower Tuolumne River: A Case for Local Adjustment to High River Temperature. Prepared for TID and MID, California.
- Predation Study - FISHBIO. 2013. Predation Study Report. Don Pedro Project. FERC No. 2299. Prepared for TID/MID, California.
- Chinook Salmon Population Model Study - Stillwater Sciences. 2013. Chinook Salmon Population Model Study Report. Don Pedro Project. FERC No. 2299. Prepared for TID and MID, California.

Tuolumne Fish Studies

- Temperature Study
  - Recommendation did not evaluate temperature effects on:
    - Growth
    - Disease vulnerability
    - Predation vulnerability
    - Behavioral responses
- Predation Study
  - Did not consider effects over a full range of conditions and year types (wet to dry years)
  - Site selection was limited to specific habitat types, so should not be basis for river wide estimates
- Salmon Population Model
  - Did not account for: mortality due to high water temperatures; increased productivity resulting from floodplain; or predator effects

11. Unimpaired Flow and Block of Water

- Unimpaired flow is a simple way of quantifying a volume of water that varies seasonally and annually
- It is reflective of the frequency, timing, magnitude, and duration of flows to which the species being protected adapted
- If information is available to support it, flow shifting, using a block of water, allows a limited quantity of water to be shaped to achieve optimal functional benefits

12. Flow Recommendations

- Board received many flow recommendations, including:
  - Contra Costa County Department of Conservation and Development
  - California Department of Fish and Wildlife
  - California Water Impact Network and California Sportfishing Protection Alliance
  - The Bay Institute and Natural Resources Defense Council
  - The American Rivers and Natural Heritage Institute
  - Department of Interior based on Central Valley Project Improvement Act Anadromous Fish Restoration Project Report

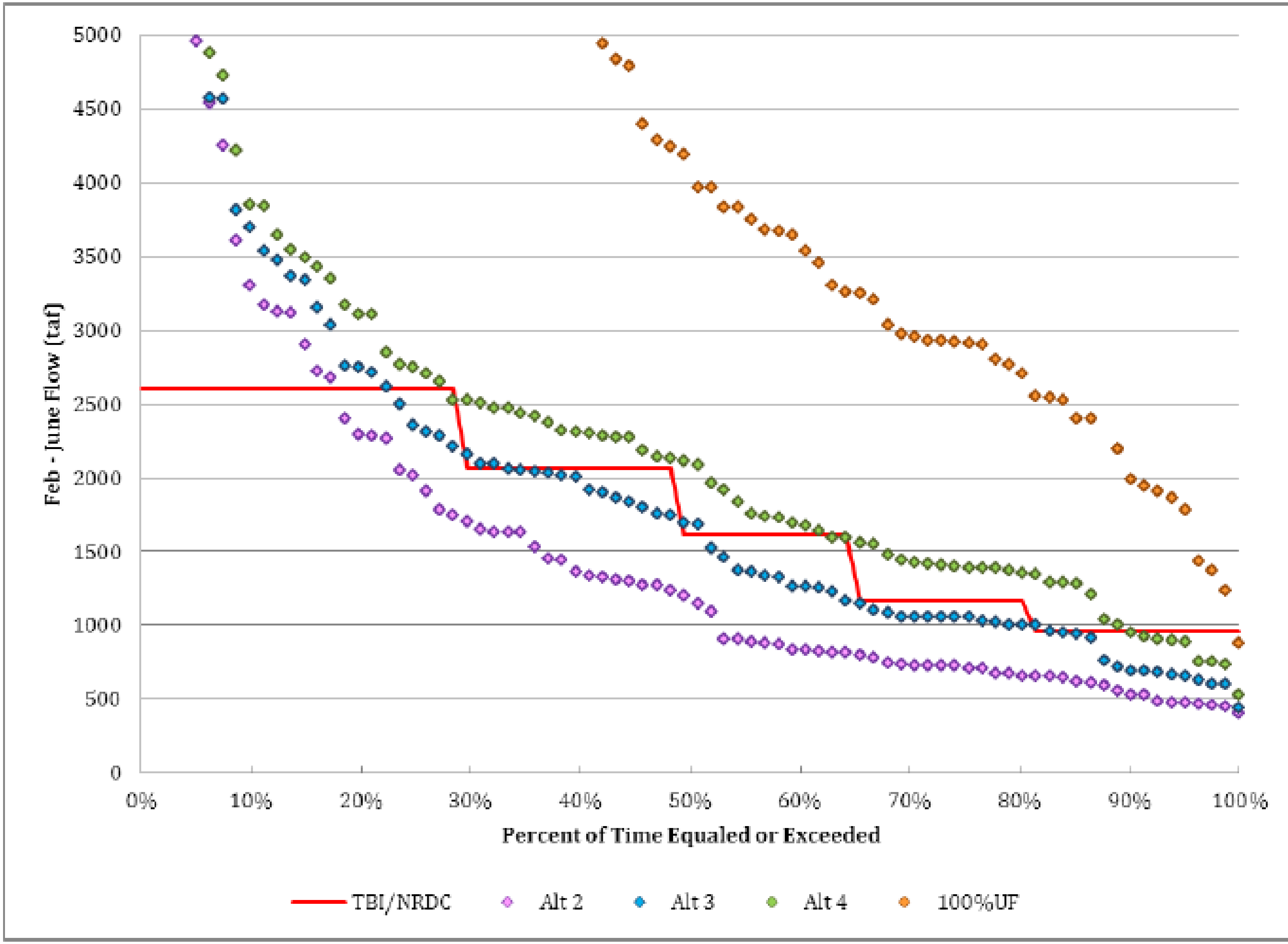

Figure 3-5. Flow Exceedance Plot of The Bay Institute and Natural Defense Council's (TBI/NRDC) Flow Recommendations and State Water Board's LSJR Alternatives (TAF = thousand acre-feet; UF = unimpaired flow)

13. Predation

- Underlying conditions favor non-native predatory fish in San Joaquin Basin
  - Less seasonality – variable conditions gone
  - Temperatures more constant and warmer
  - Flows more constant and lower
- Rearing and juvenile migrating salmon exposed to poor temperature and habitat conditions are more prone to predation

Predation

- The conditions that salmon use to deal with predators are no longer available to them
  - Safety in numbers -- not enough fish to satiate predators
  - Juvenile migration -- high turbidity / high velocity / high volume pulses of water have been dramatically reduced

Predation study by FISHBIO (2013) shows very little survival at low flows

	Release Group		
	1	**2**	**3**
Total Released at Waterford (RM 31.6)	75	74	73
Release Date	May 9-10	May 16-17	May 21-22
Average Flow at Modesto	1,692*	482*	495*
Total Survival Passed SRP 10 (RM 25.4)	43	11	2

Based on Table 5.4-2. Summary of fate determination for acoustic tagged Chinook salmon in Tuolumne River.

* TID/MID Table 5.4-2 showed flows at La Grange release. We are showing flows through the actual study reach.

14. Disadvantaged Communities

- Chapter 22 recognizes:
  - There is a long-standing legacy issue in the San Joaquin Valley of a lack of access to clean safe drinking water for many disadvantaged communities
  - Requiring additional instream flow to reasonably protect fish and wildlife could exacerbate this ongoing problem
- The State Water Board is implementing programs to help disadvantaged communities with funding, technical assistance and also directing consolidations, where appropriate
- Addressing serious and ongoing impacts to disadvantaged communities is, and will be, a crucial local issue in SGMA plans

Phase 1 Next Steps

- Draft SED & Plan Comments due: by 12:00 noon on March 17, 2017
  - Send comments to: commentlettters@waterboards.ca.gov with "Comment Letter – 2016 Bay-Delta Plan Amendment & SED" in the subject line.
- Anticipated Final SED & Plan Release: July 2017
- Anticipated Board meeting to adopt: Sept. 2017

For more information visit: http://waterboards.ca.gov/DeltaWQCP-Phase1