Draft Lower San Joaquin River Fish and Wildlife Flow Objective Should Explicitly Reference Salmon Doubling

Doug Obegi

NRDC

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History of the Salmon Doubling Goal

- Salmon, Steelhead Trout, and Anadromous Fisheries Program Act of 1988 (State)
- Central Valley Project Improvement Act of 1992 (Federal)
- 1995 Bay Delta Water Quality Control Plan
- Anadromous Fish Restoration Program Final Plan of 2001

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AFRP Salmon Production Targets

River	Production Target
Stanislaus River	22,000 fall run Chinook salmon
Tuolumne River	38,000 fall run Chinook salmon
Merced River	18,000 fall run Chinook salmon

Source: 2001 AFRP Final Restoration Plan, Appendix B-1

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Why the Narrative Objective Should Reference Salmon Doubling

- This objective needs to be consistent with existing Bay Delta Water Quality Control Plan narrative salmon doubling objective
- The salmon doubling objective protects California's salmon fishery
- We need AFRP production target to guide adaptive management

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Evaluation of Flows Necessary to Sustain Public Trust Fisheries on the San Joaquin River and San Francisco Bay-Delta

Jon Rosenfield, Ph.D.

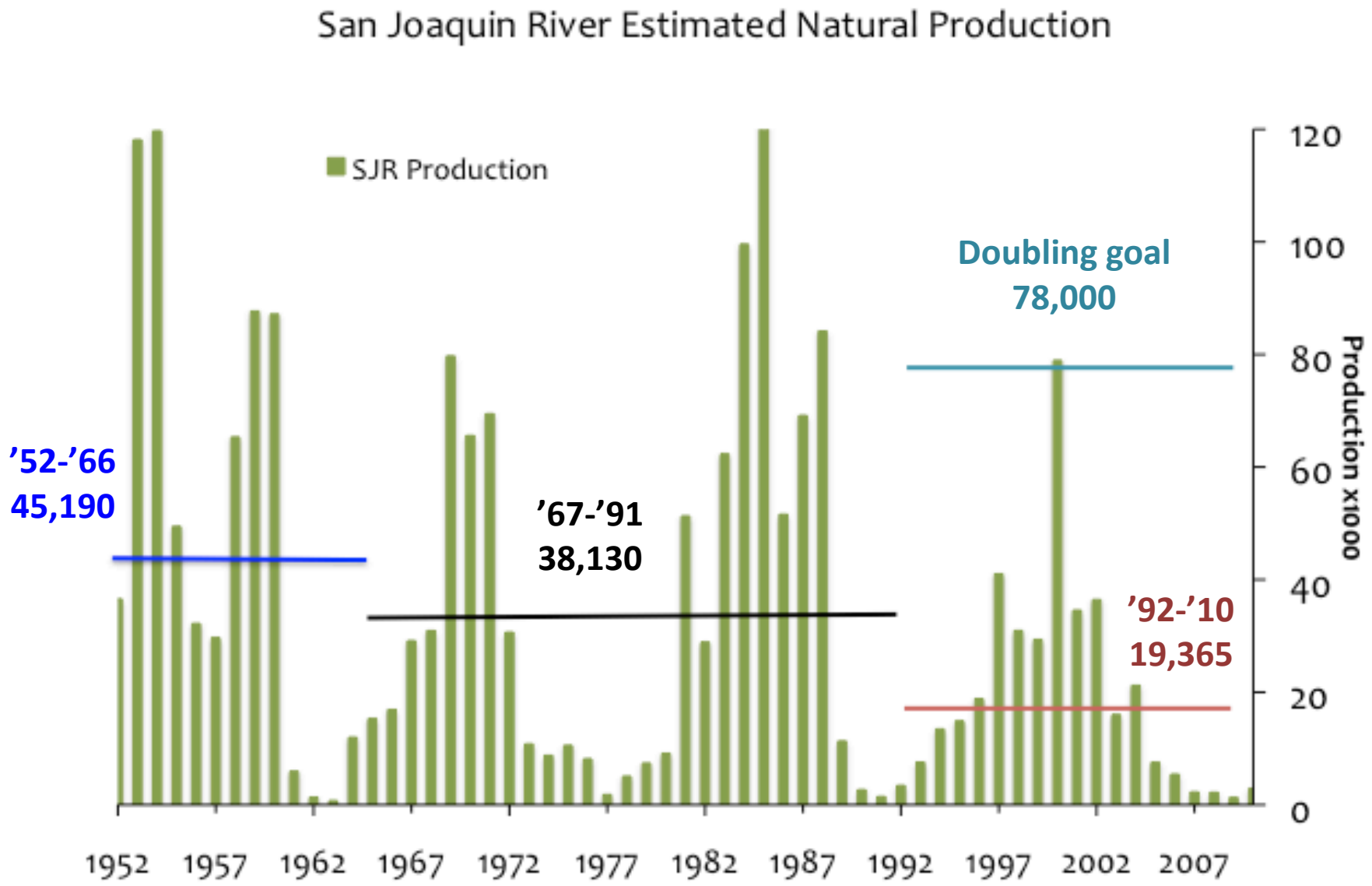
The Bay Institute

March 20, 2013

Overview

- Native fishes of the Bay-Delta & San Joaquin River are imperiled
- Fresh water flows in the San Joaquin are severely diminished
- Scientific evidence that increased diversion of fresh water has driven decline of fish & wildlife species is *overwhelming*
- Strong scientific support for flow thresholds that support restoration of salmon & other fisheries
- Draft SED's Preferred Alternative (35% UIF w/ caps, 14-d average, Feb-Jun) is inadequate
- Preliminary analyses of flows needed to restore fisheries:
  - flows >50% of UIF during Feb-Jun
  - minimum flows of ~2 Kcfs at Vernalis year-round
  - improved fall pulse flow

Decline of San Joaquin River Fall Run Chinook salmon



Salmon Migration on the San Joaquin “River”

Imperiled Resources Influenced by San Joaquin River Flow Levels

- Fall run Chinook salmon
- Spring run Chinook salmon
- Green sturgeon
- White sturgeon
- Steelhead
- Delta smelt
- Longfin smelt
- Sacramento splittail

Food web productivity in and beyond the Delta

Increased San Joaquin Freshwater Flow

Essential to restore public trust fisheries

- *"… restoration for both salmon and steelhead in the SJR primarily hinges on obtaining sufficient magnitude, duration and frequency of spring time flows…"* (emphasis added)

  DFW 2010, Exhibit #3

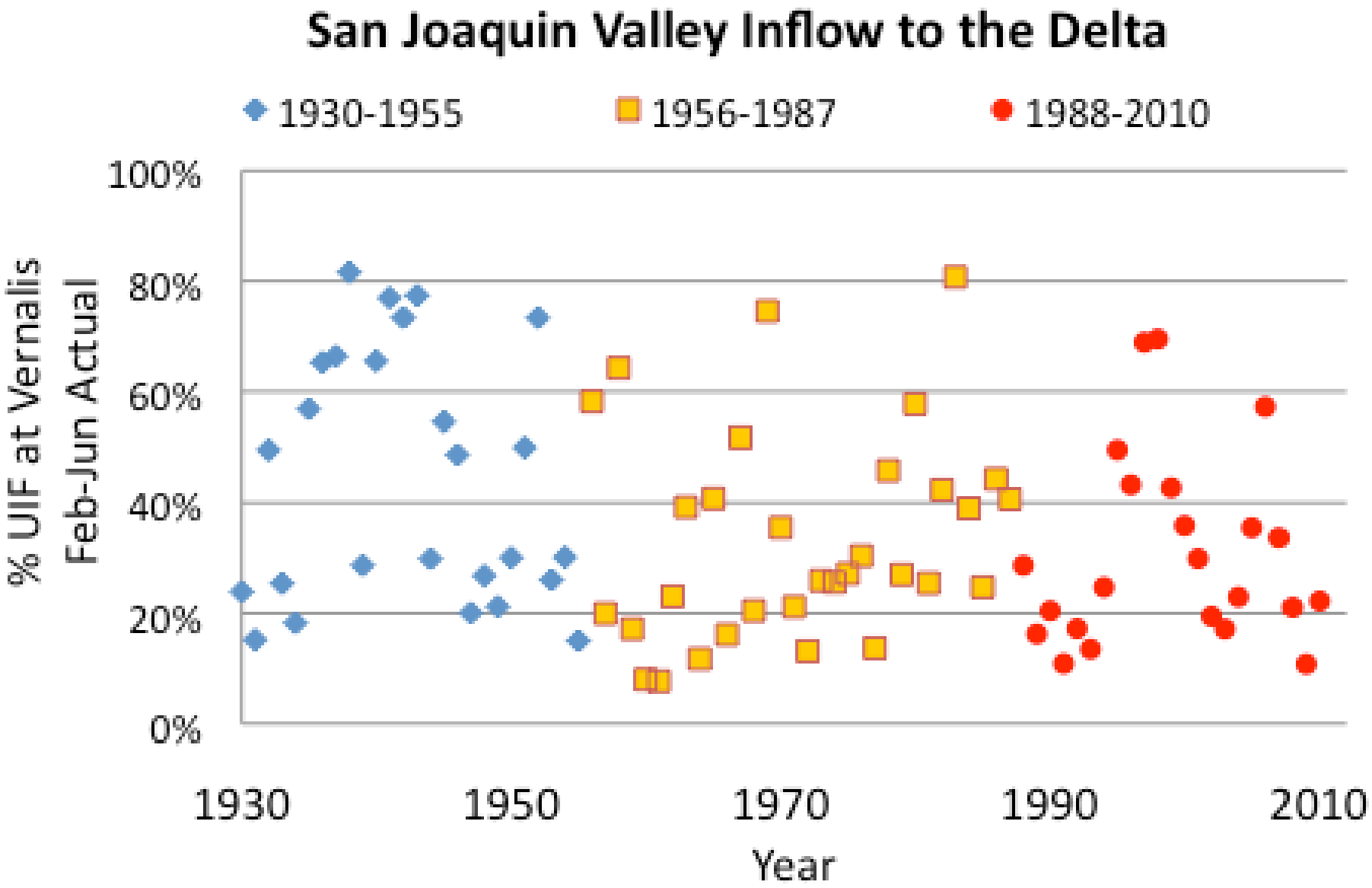
- *"…while there are other stressors to fish, a more natural flow regime is necessary if the fish are to recover. Indeed, I would further conclude that the other stressors such as contaminants and non-native fishes will be less consequential for salmon and steelhead in a more natural flow … regime."*

  Quinn 2011, Peer-Review of SWRCB 2010

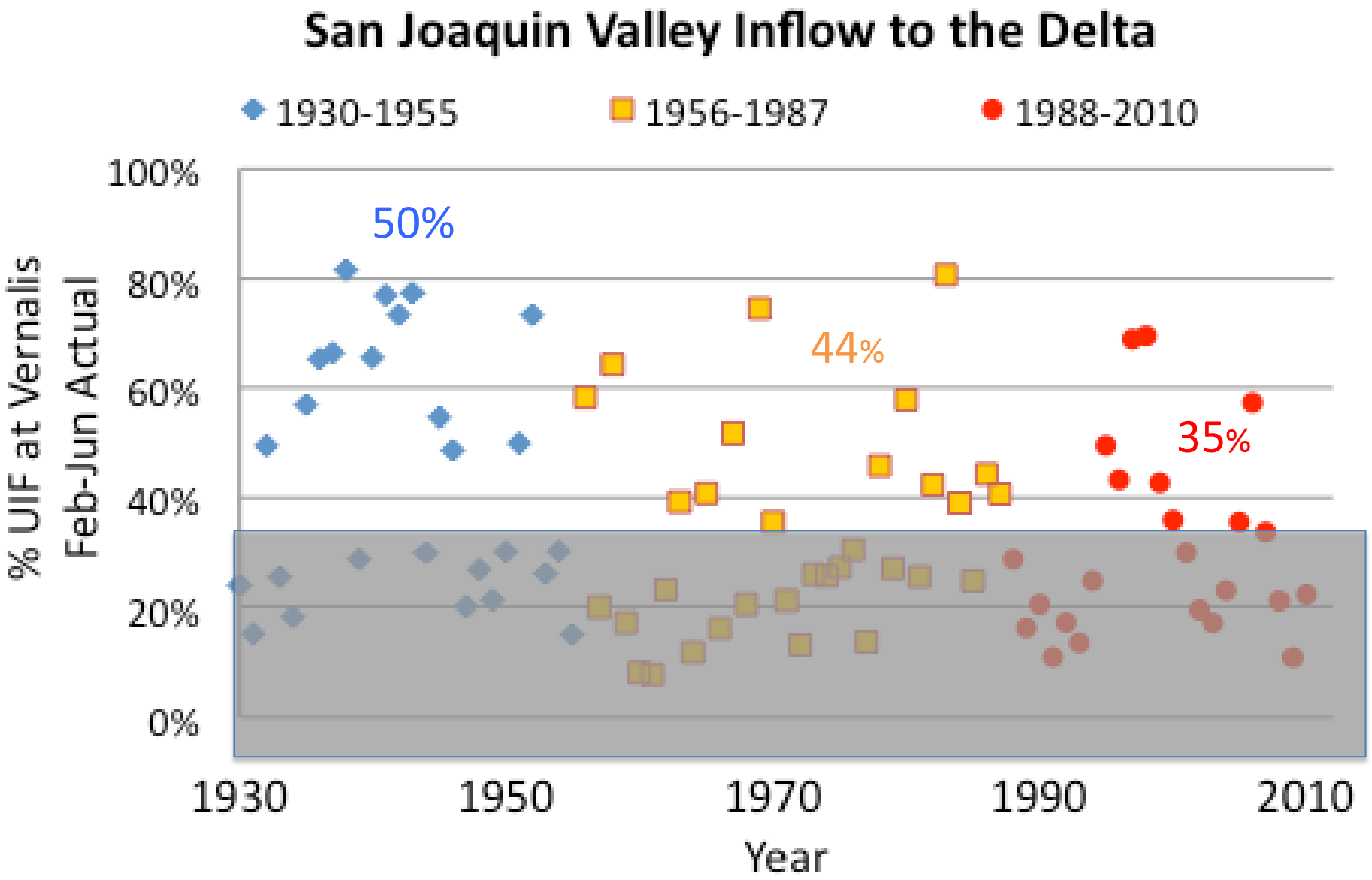
- *"There is sufficient scientific information to support the need for increased flows to protect public trust resources …"*

  SWRCB 2010, Final Report

Decreasing Share of SJR flows to the Delta



Flows >35% UIF are Now Rare



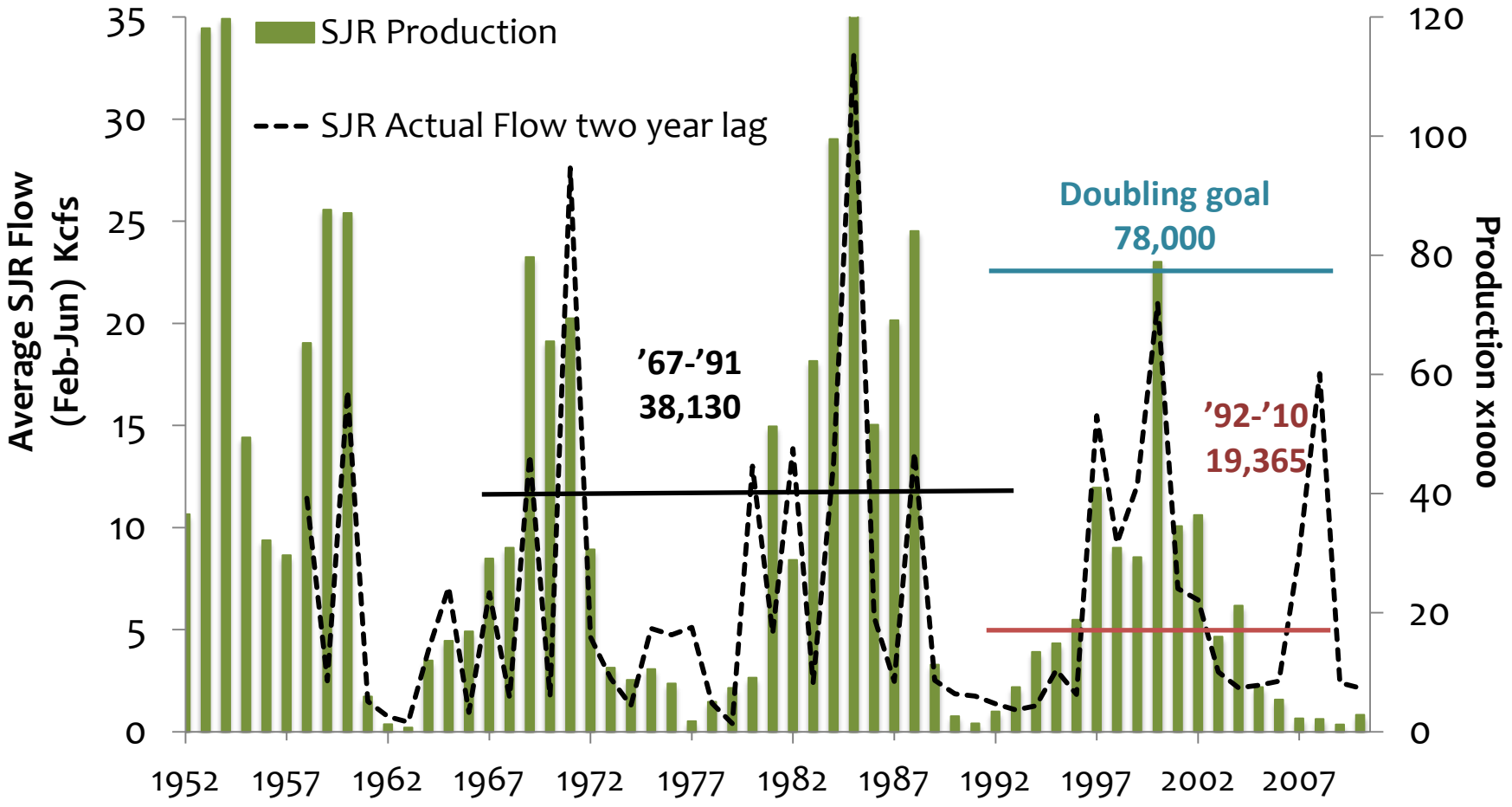
San Joaquin River
Doing Less Than Its Share for the Bay-Delta

WY Type	Critical	Dry	Below Normal	Above Normal	Wet
Vernalis UIF v. Delta Outflow UIF	22%	22%	22%	23%	25%
Vernalis Actual v. Delta Outflow Actual	10%	7%	6%	7%	10%

San Joaquin Salmon & Flows

A shared history of decline

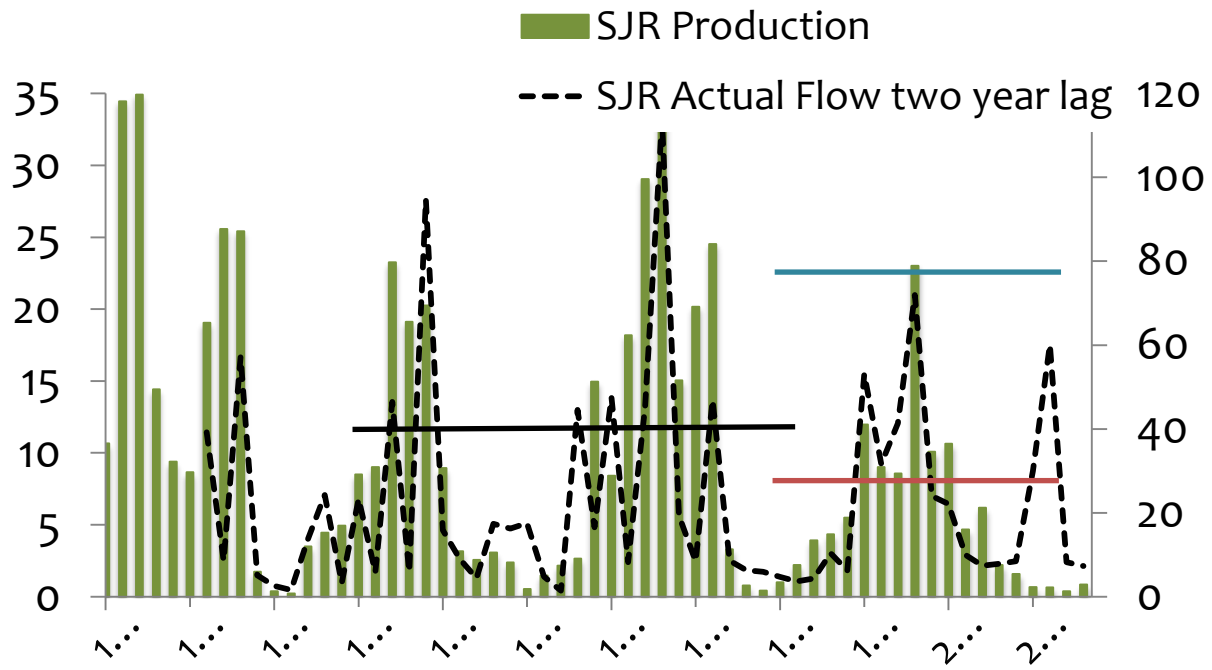
San Joaquin River Natural Chinook Salmon Production
vs. Vernalis Flow



Scientific Basis For Particular Levels of Flow

As freshwater flow rates increase, benefits to migratory fishes increase. Improvements include:

- transport of juveniles and cues to migrating adults
- water quality (dissolved oxygen, temperature, contaminants)
- habitat volume and surface area increase
- decreased predation



Analysis: Two Types of Key Flows

Average flows over spring season (Mar-June)

(5 Kcfs & 10 Kcfs)

- Hard to “shape”
- Achievement largely determined by %UIF (water budget)

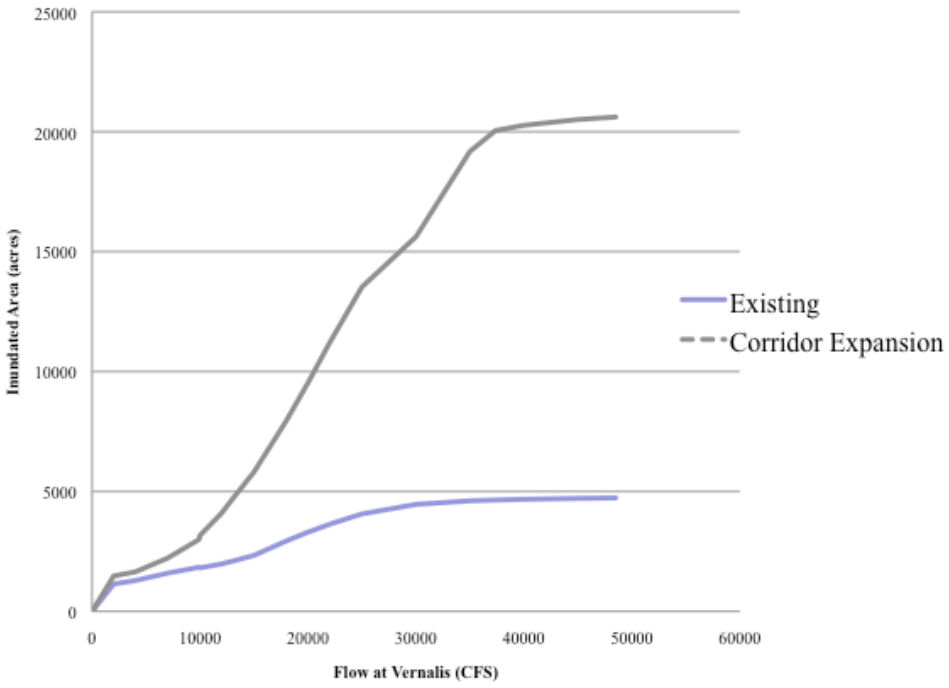
Daily flows (threshold effects)

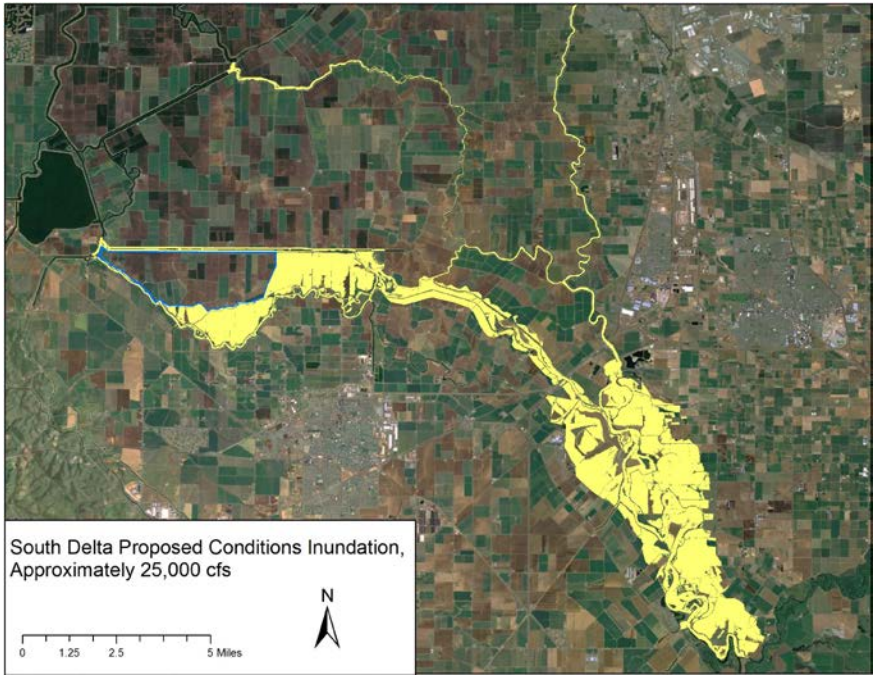
(2 Kcfs, 5 Kcfs, 15 Kcfs)

- Frequency of attainment determined by both %UIF & 14-day averaging window
- Can be “engineered” provided enough water available

Key Daily Flows

Attribute: Ecosystem Productivity → Floodplain Inundation
Species: Chinook salmon; Sacramento splittail; blackfish; Delta resident species





Flow Indicator: **Daily** Flows ~ 15 Kcfs

Key Seasonal (Average) Flows

Attribute: Population Abundance → Production Targets
Species: Fall run Chinook salmon

"A flow rate of 10,000 for 60 days … [doubles] Chipps Island predicted smolt abundance … "
DFW et al 2010, Exh. #3

"Average springtime flows of greater than 10,000 cfs appear necessary to produce annual escapements that meet the doubling objective."
TBI et al 2010, Exh. #3

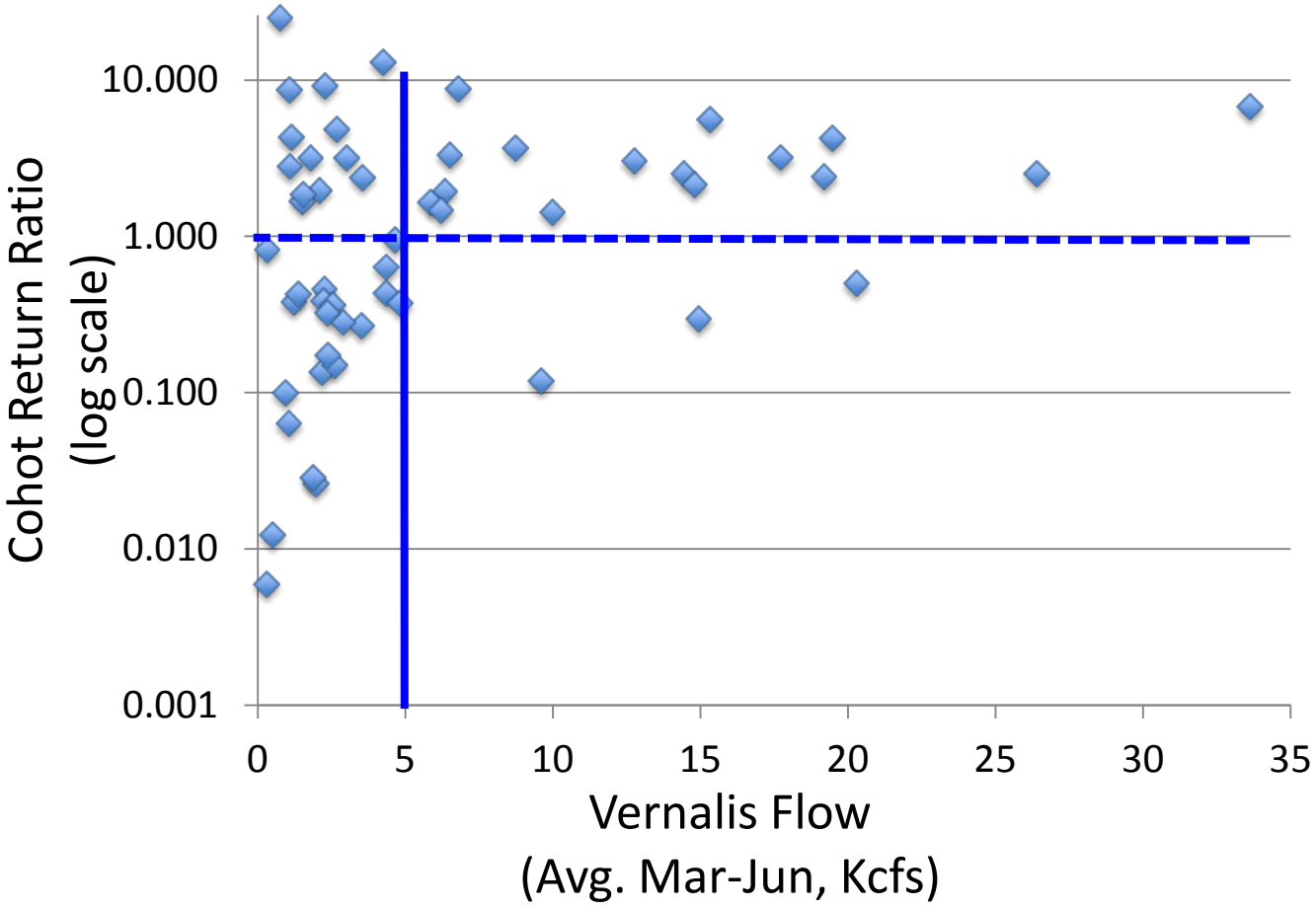
"Available scientific information indicates that average March through June flows … of 10,000 cfs … may provide conditions necessary to achieve doubling of San Joaquin basin fall-run."
SWRCB, 2010, p. 119

Flow Indicator: **Average** Spring Flows @ Vernalis Flows of 10 Kcfs

Key Seasonal (Average) Flows

Attribute: Population Growth

Species: Fall run Chinook salmon

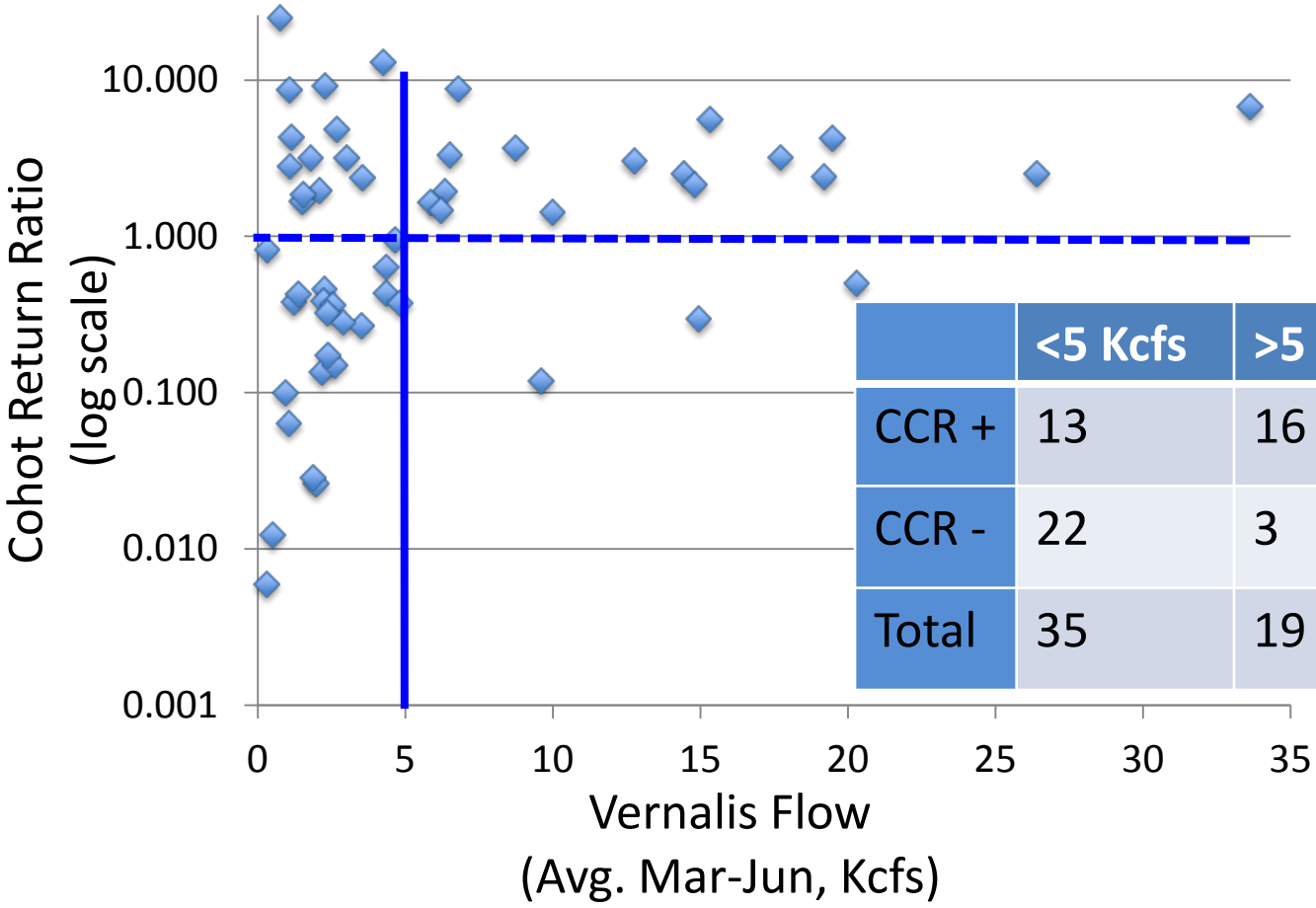


Flow Indicator: **Average** Spring Flows @ Vernalis Flows of 5 Kcfs

Key Seasonal (Average) Flows

Attribute: Population Growth

Species: Fall run Chinook salmon



	<5 Kcfs	>5 Kcfs	Total
CCR +	13	16	29
CCR -	22	3	25
Total	35	19	

Flow Indicator: **Average** Spring Flows @ Vernalis Flows of 5 Kcfs

Key Daily Flows

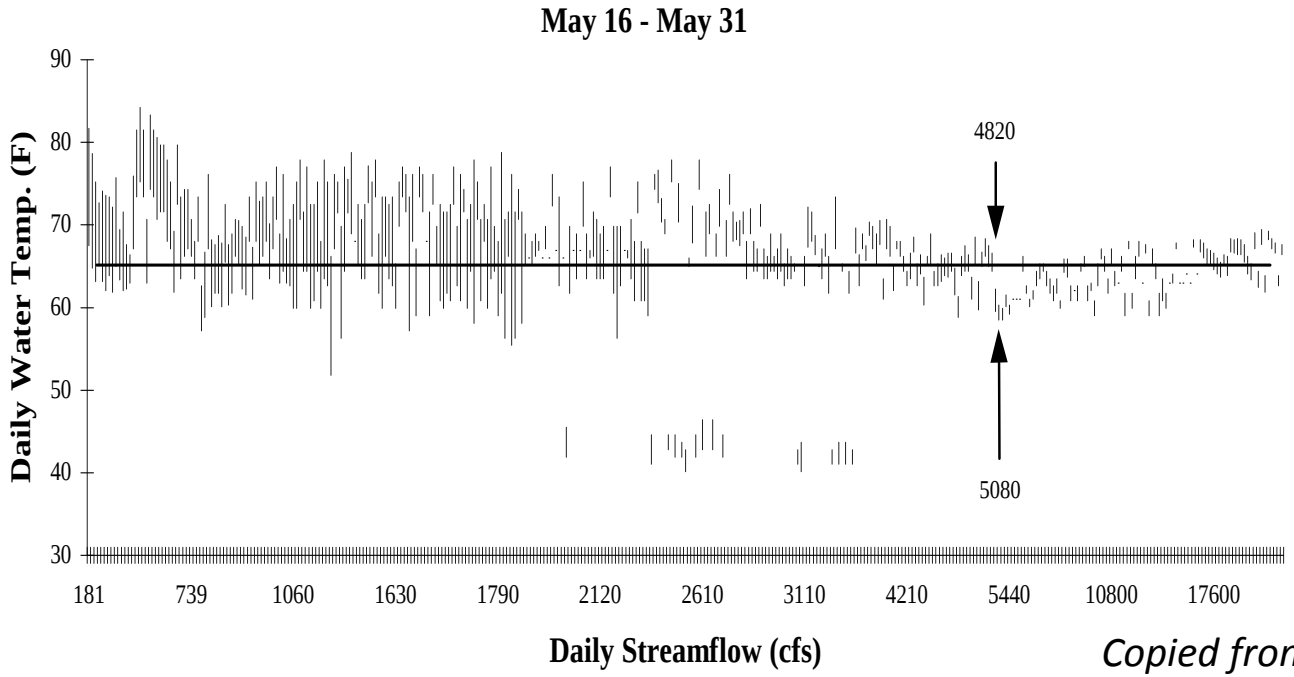
Attribute: Open Migratory Corridor

Species: All migratory species

Water Quality Barriers to Migration

Key Daily Flows

Attribute: Open migratory corridor -- spring
Species: Spring run & Fall run Chinook salmon



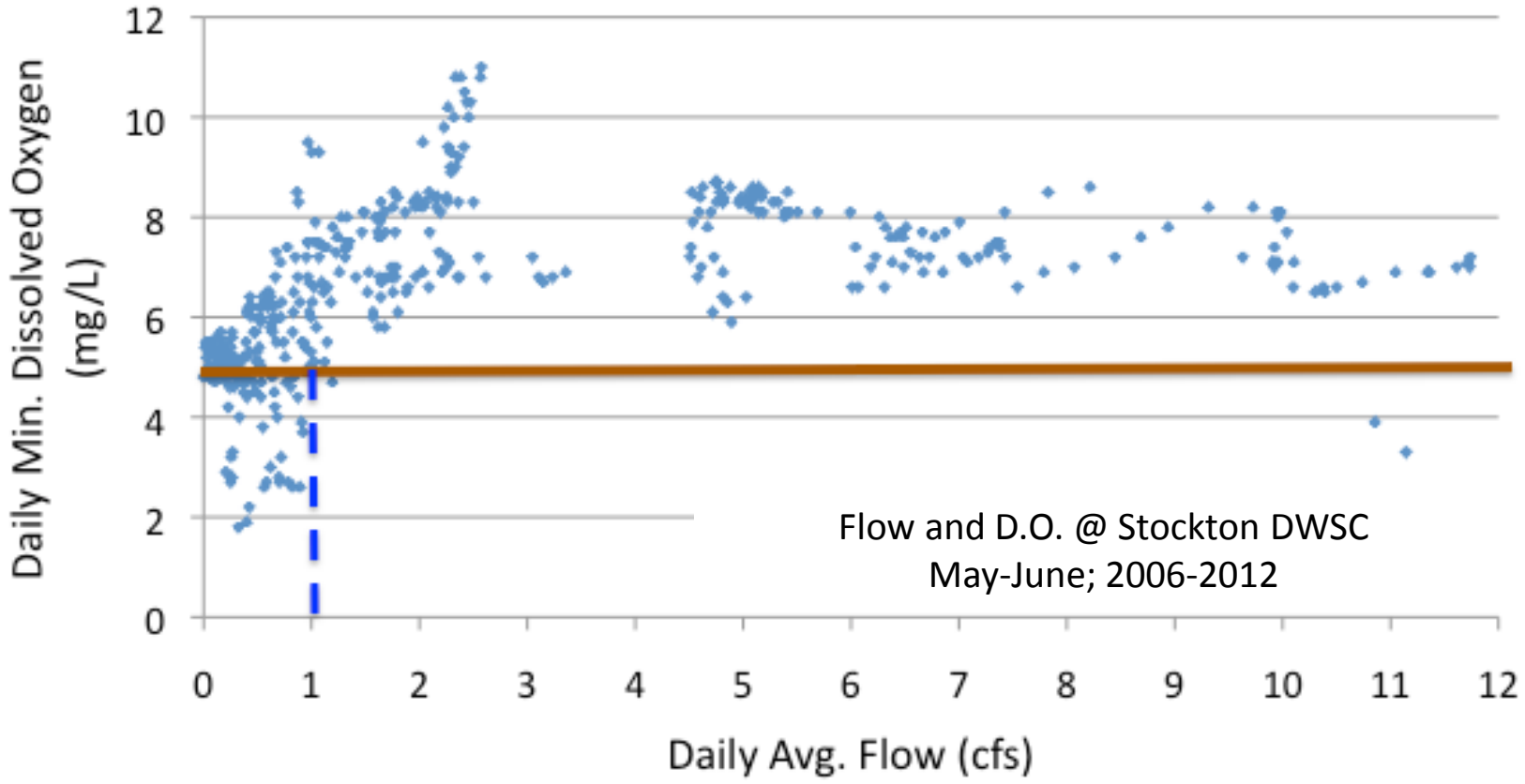
Copied from Cain 2003

Flow Indicator: **Daily** Vernalis Flows of >5 Kcfs

Key Daily Flows

Attribute: Open migratory corridor -- spring

Species: Spring run & fall run Chinook salmon; steelhead; green & white sturgeon

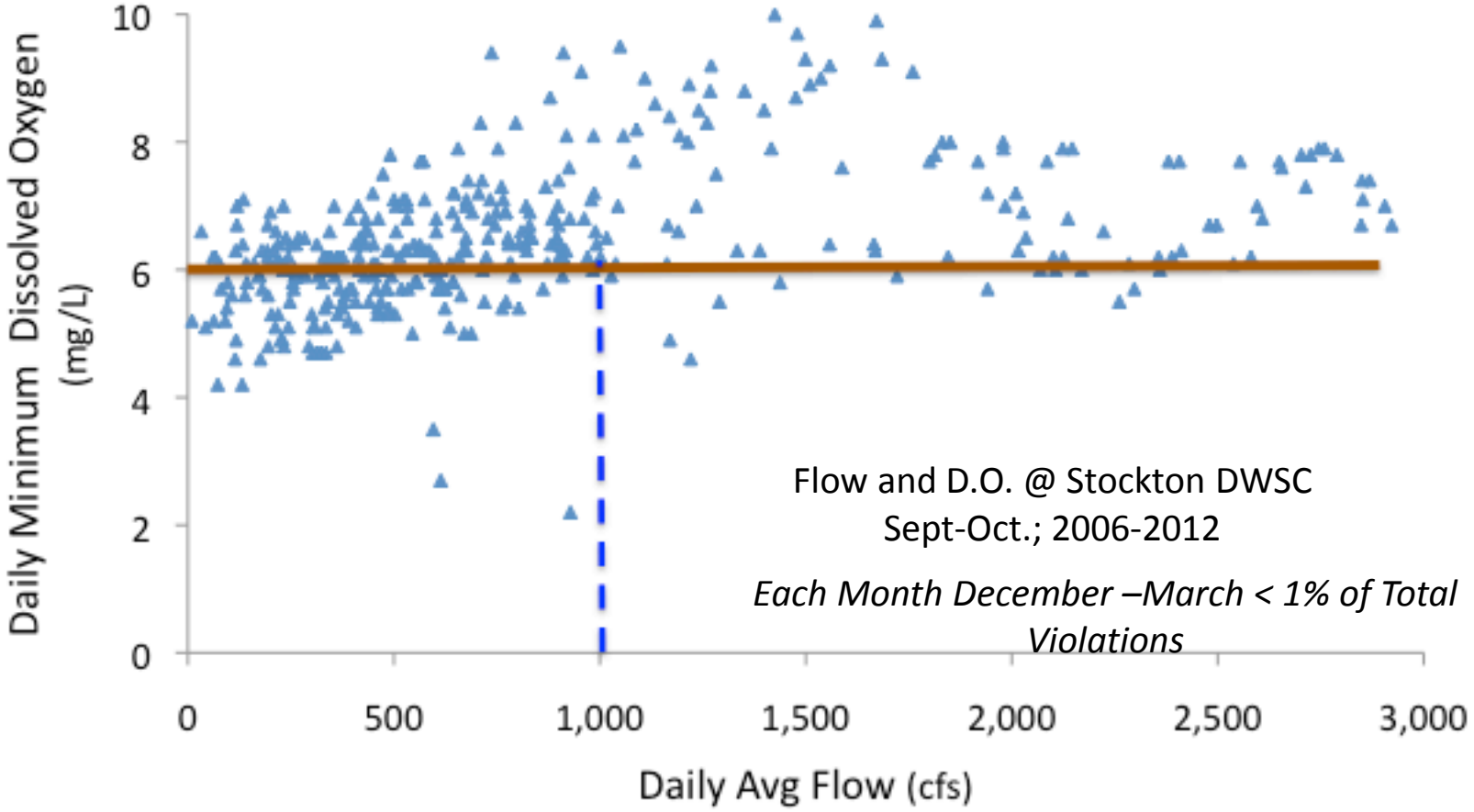


Flow Indicator: **Daily** Vernalis Flows of 2 Kcfs

Key Daily Flows

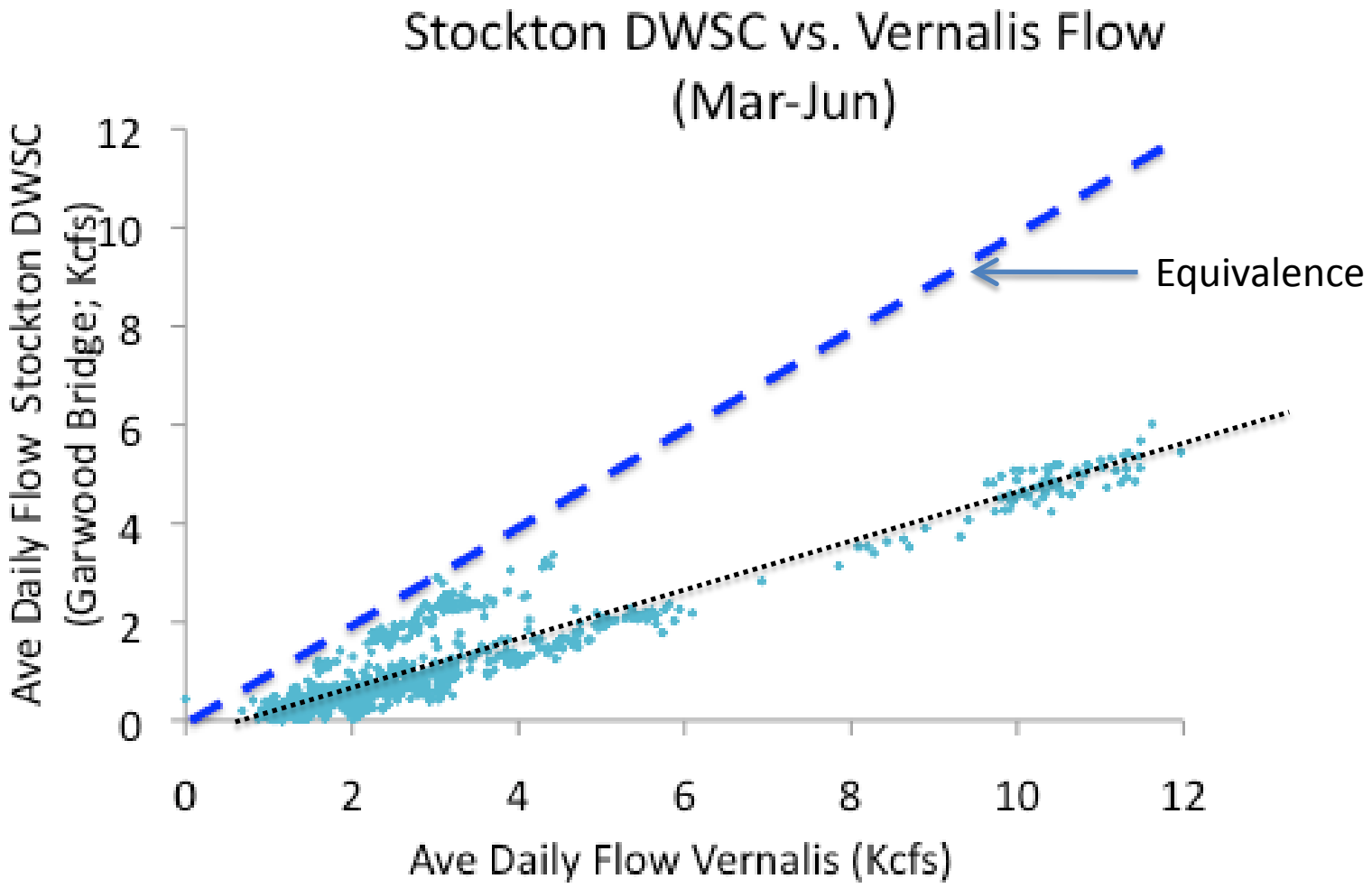
Attribute: Open migratory corridor -- fall

Species: Fall run Chinook salmon; steelhead; green & white sturgeon



Flow Indicator: **Daily** Vernalis Flows of 2 Kcfs

Flows at Vernalis Required to Open Migratory Corridor in Stockton DWSC

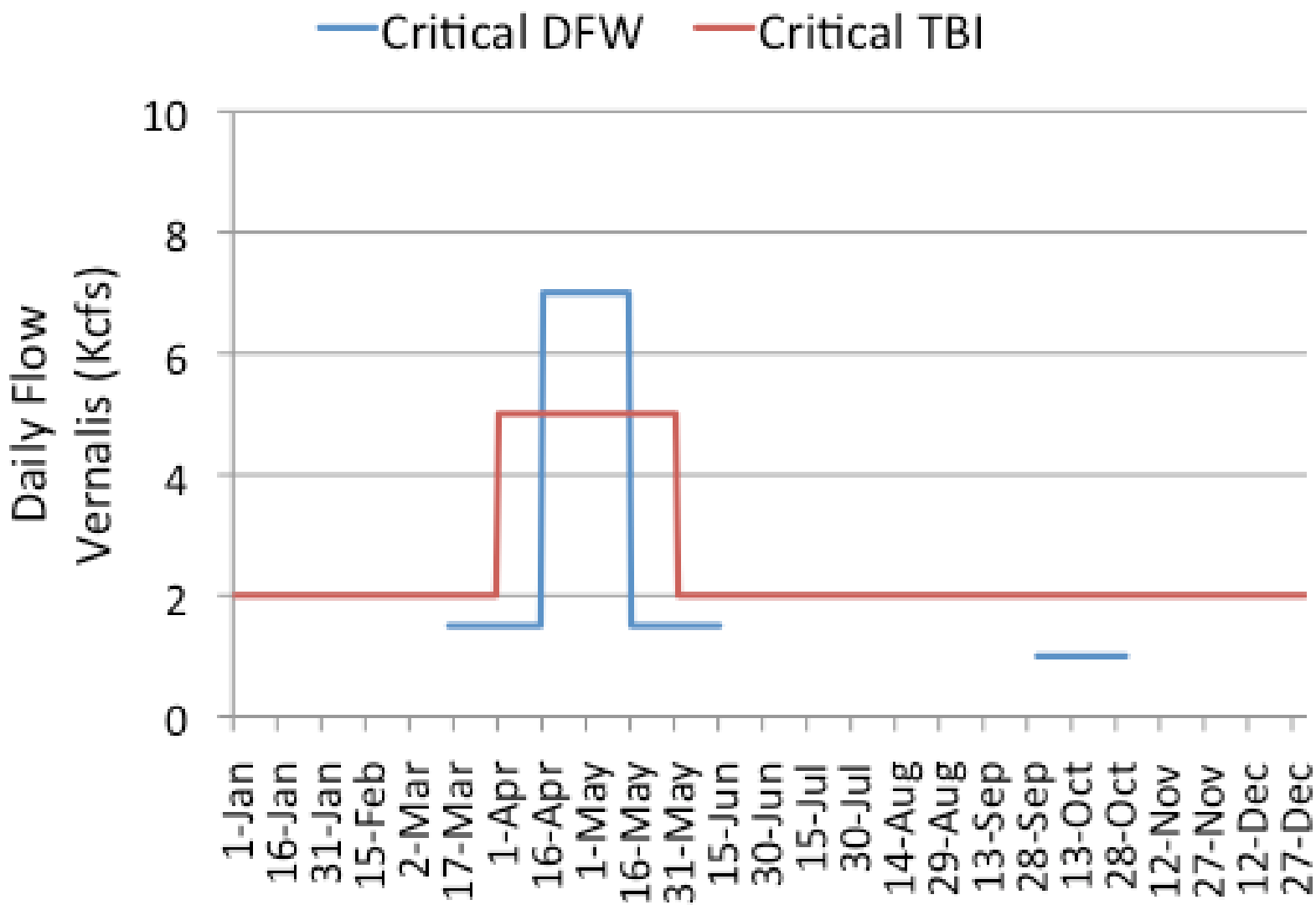


Recommendation: Year-Round 2 Kcfs @ Vernalis ~ 1 Kcfs @ Stockton DWSC

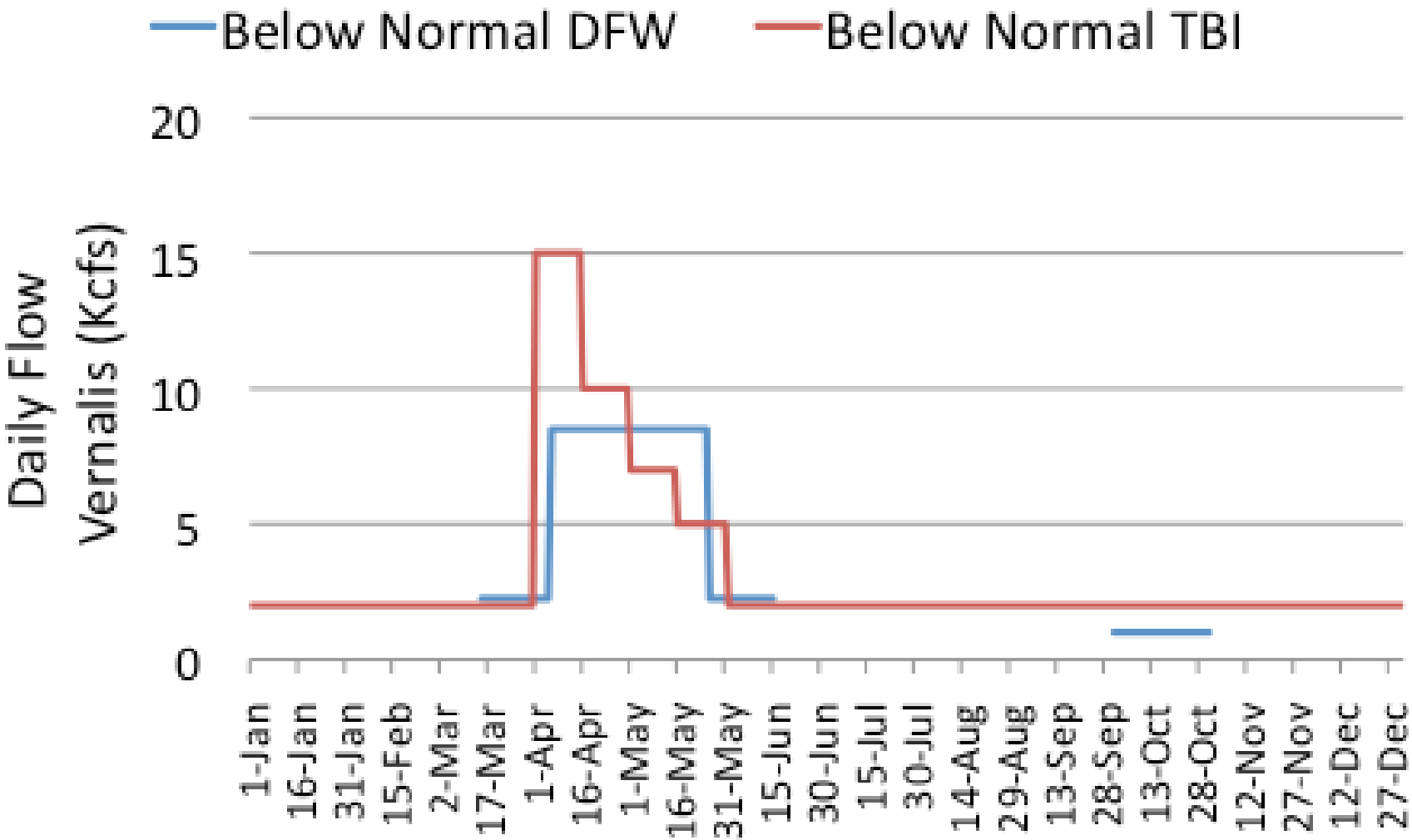
Hydrographs Recommended Previously

- TBI et al. & DFW (2010) present fully engineered hydrographs
- Support the SWRCB proposal of a %UIF as a 14-d moving average ("proportional hydrograph")
  - Mimics natural cues and processes (including those for which we have little data)
  - Simple to understand and plan around
  - Distributes risks more evenly
  - Does not require advanced forecasting
  - Can be modified to support "shaping" of the hydrograph to meet particular flow needs

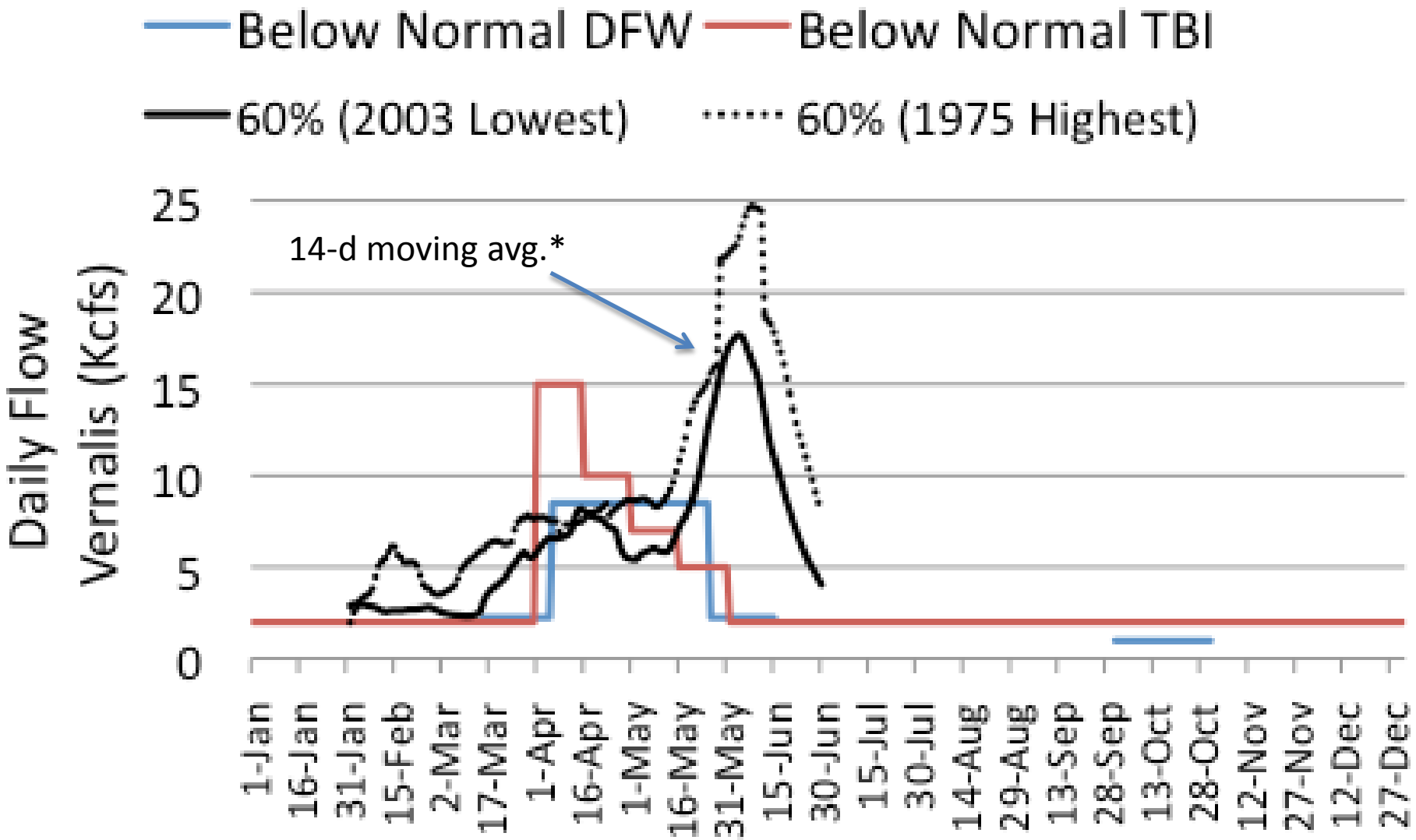
Engineered Hydrographs
TBI et al. & CDFW (2010)



Engineered Hydrographs
TBI et al. & CDFW (2010)

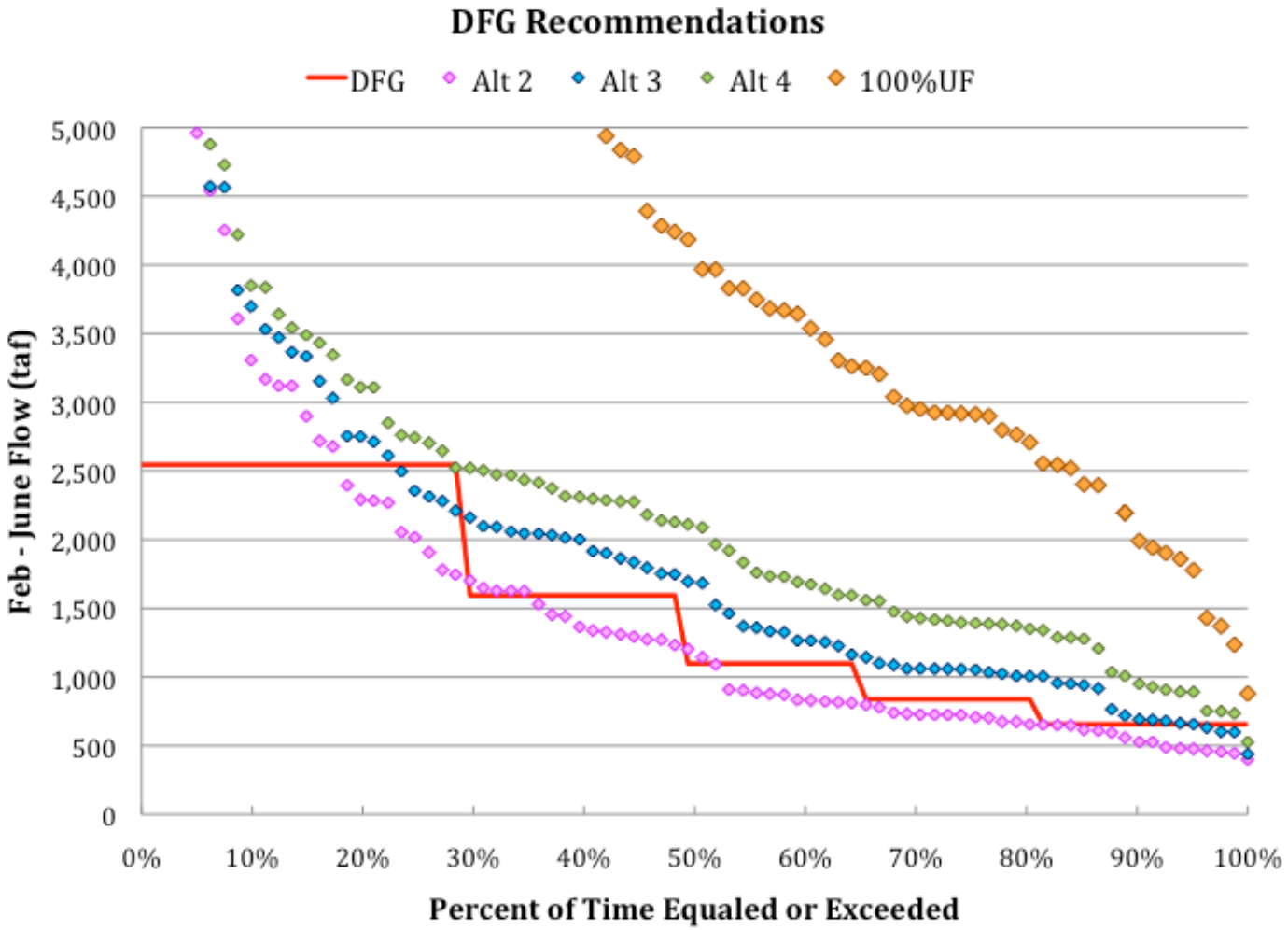


Engineered vs. Proportional Hydrograph



* Assumptions used to estimate this hydrograph described elsewhere

WSE Model Analysis Does **Not** Demonstrate that Preferred Alternative will Produce CDFW's Flow Recommendations



SED Fig. 3-2 (Redrawn)

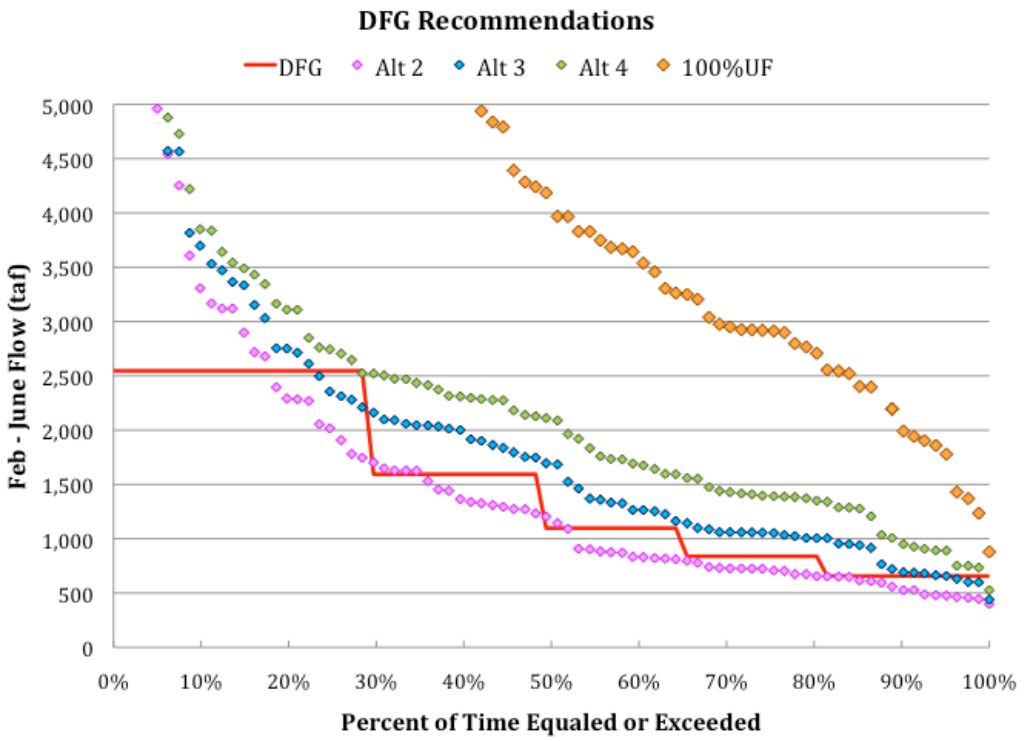
WSE Model Analysis Does **Not** Demonstrate that Preferred Alternative will Produce CDFW's Flow Recommendations

The SED's presentation of alternatives (Ch. 3) is potentially misleading because:

A. Operators do not have precise control over flows (Omnipotence)

B. Operators do not have perfect forecasting (Omniscience)

C. Flows for the SED Alts are total of Feb-Jun, while other recommendations analyzed occur in a narrower time frame (e.g. Apr-May)



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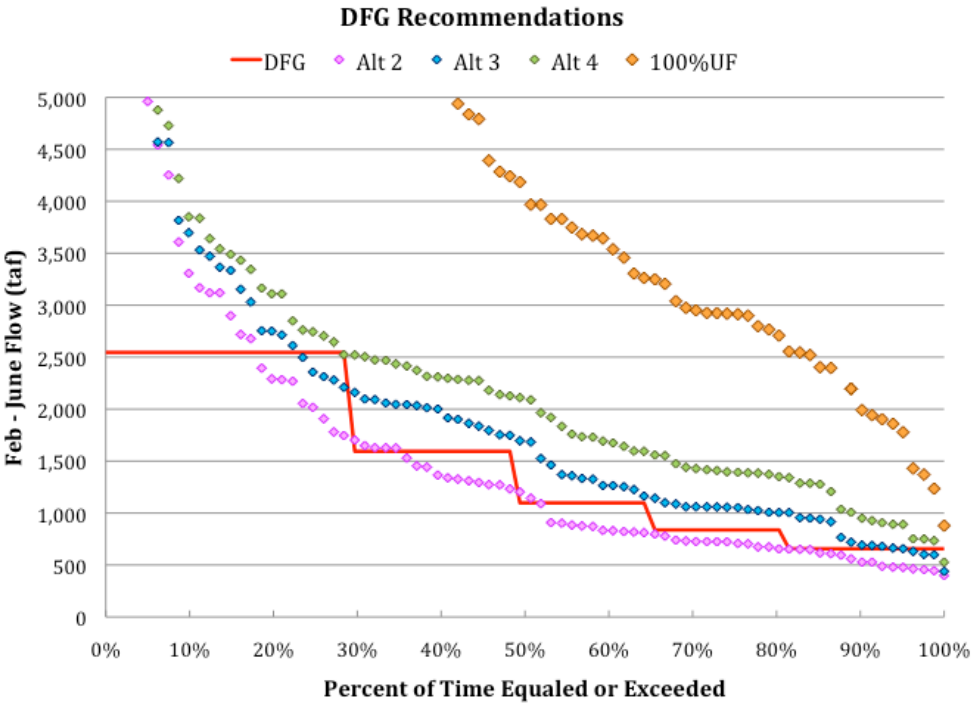


SED Fig. 3-2 (Redrawn)

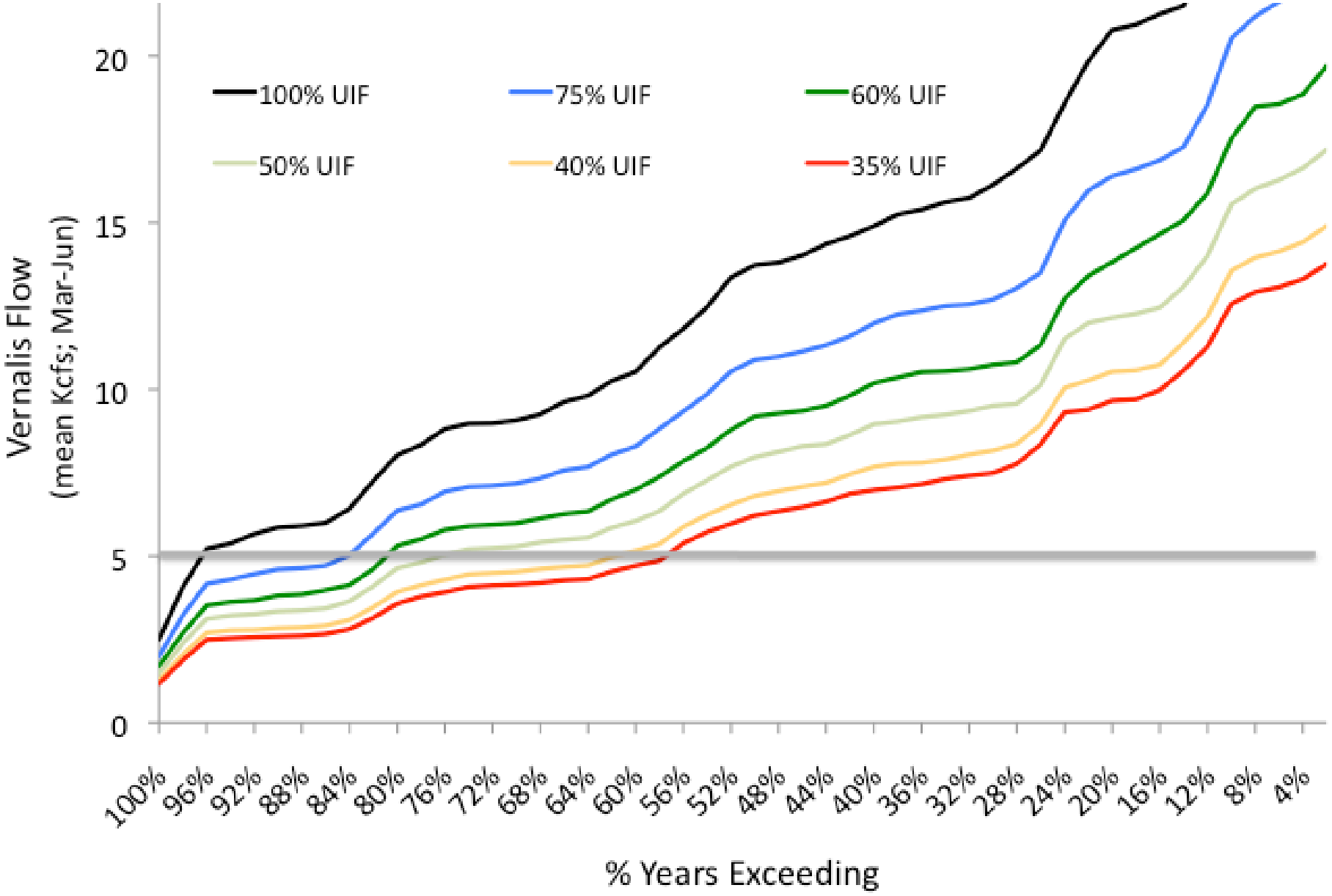
The SED's Evaluation Demonstrates that Flows Needed to Meet DFW or TBI Alternatives will be >> 35% UIF

Assumptions for TBI Modeling of SWRCB %UIF Approach

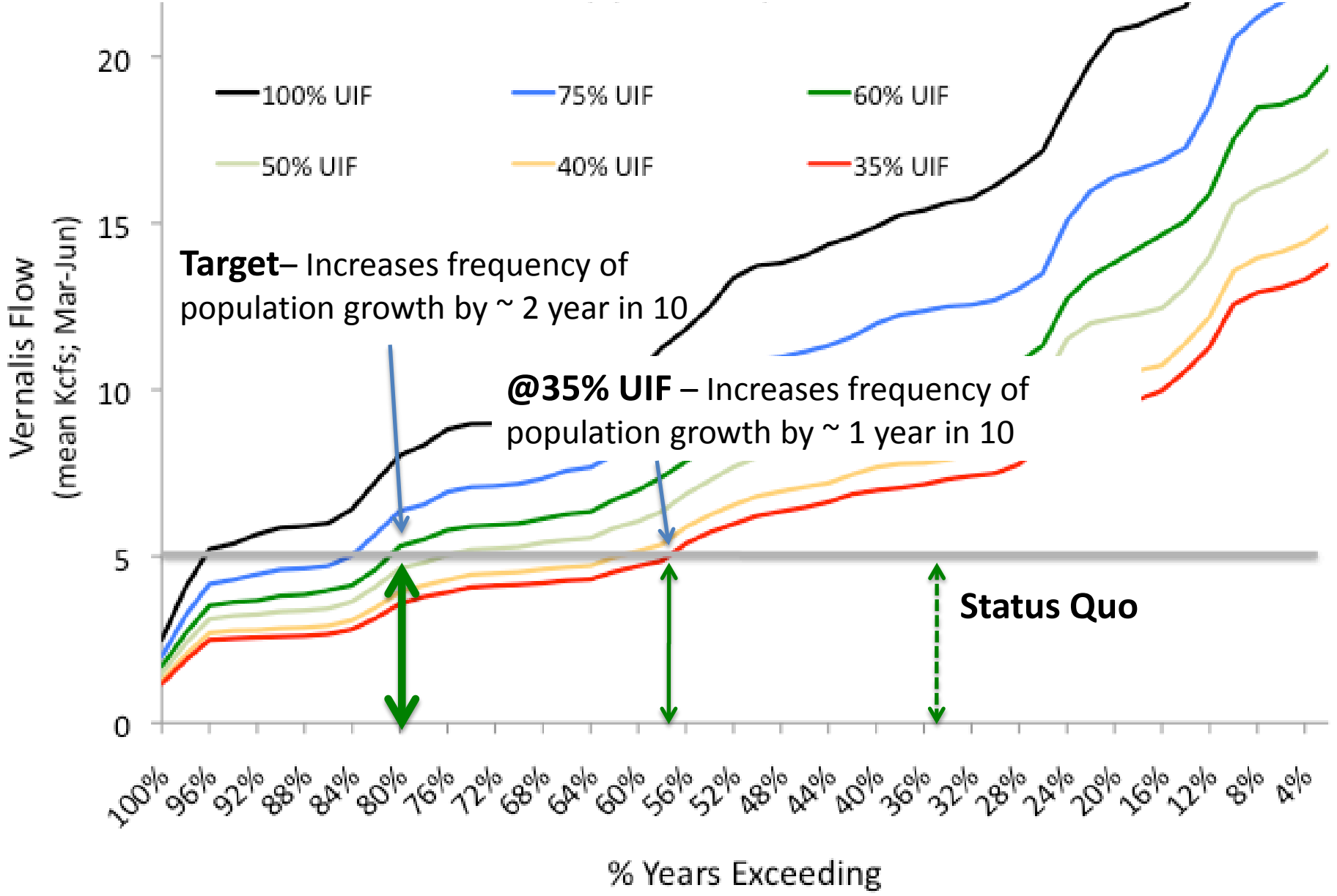
Seasonal Average Flows

- % UIF applied only (& equally) to the three tributaries
- Friant settlement flows reach Vernalis & are unchanging within a given month/WY type
- 100% of miscellaneous & valley floor flows reach Vernalis
- **No caps** applied to tributary flows
- 1962-2011 data set

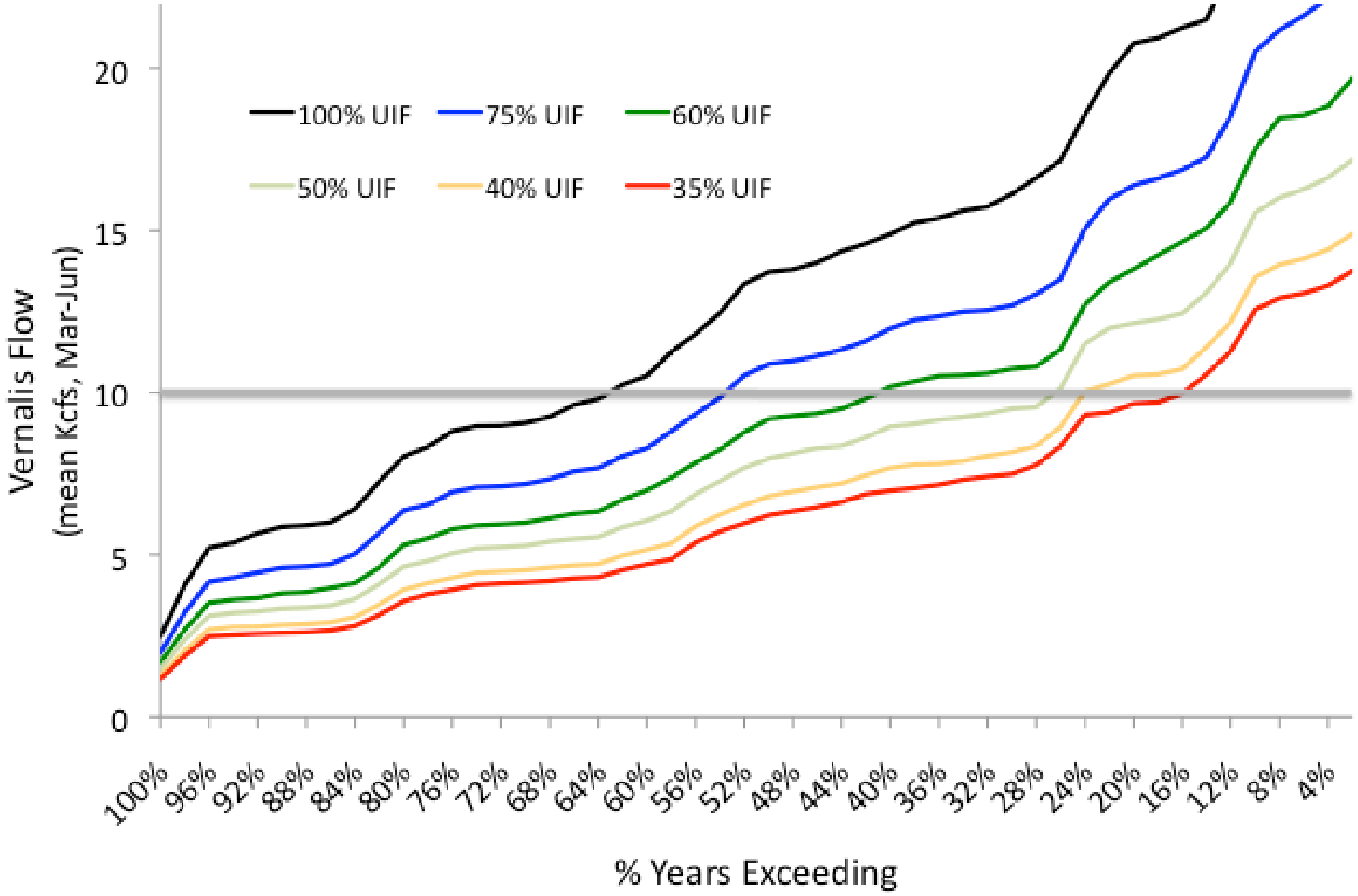
Flows to Support Chinook Salmon Population Growth



Flows to Support Chinook Salmon Population Growth



Flows to Support Attainment of AFRP Targets



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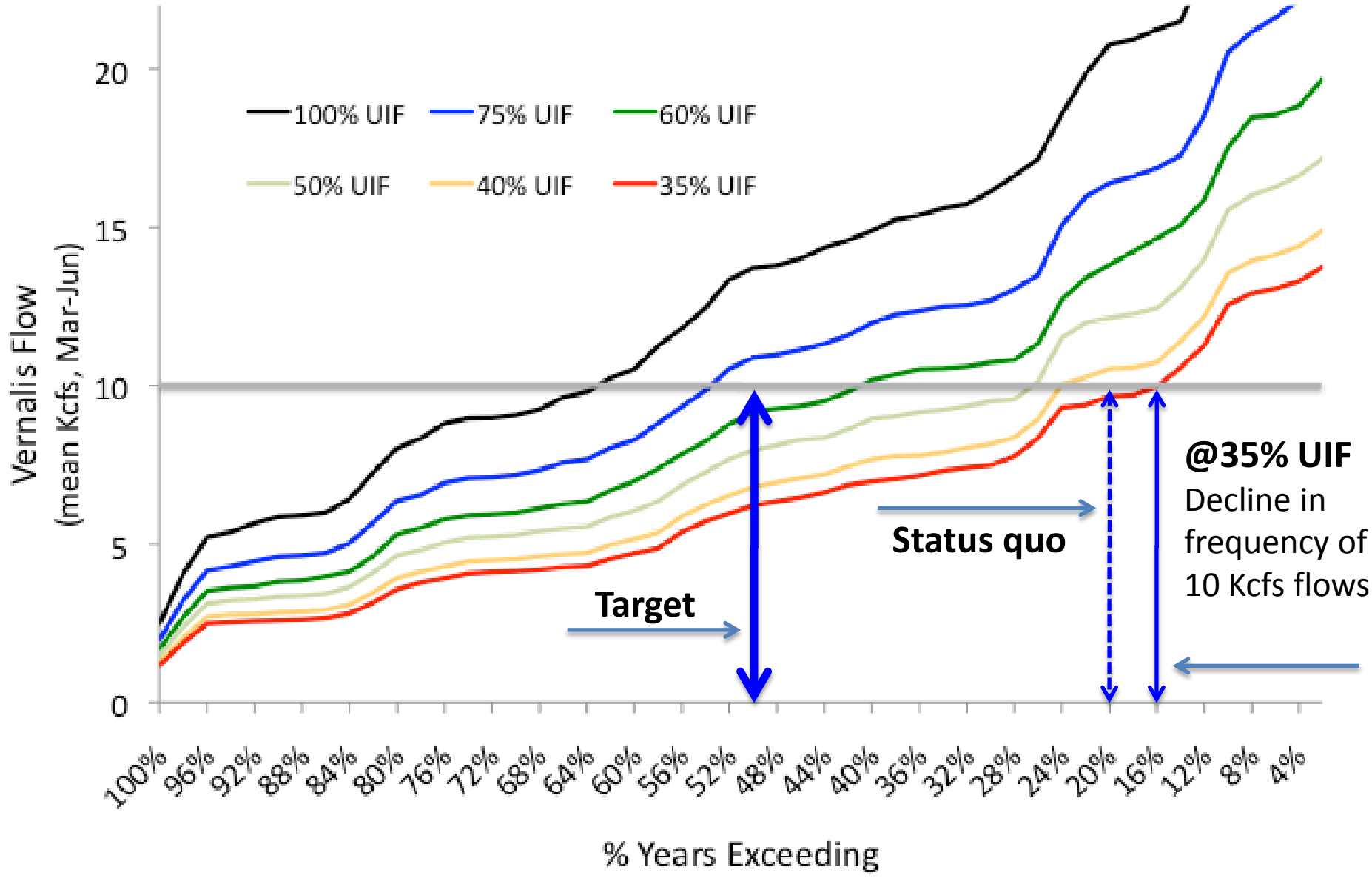
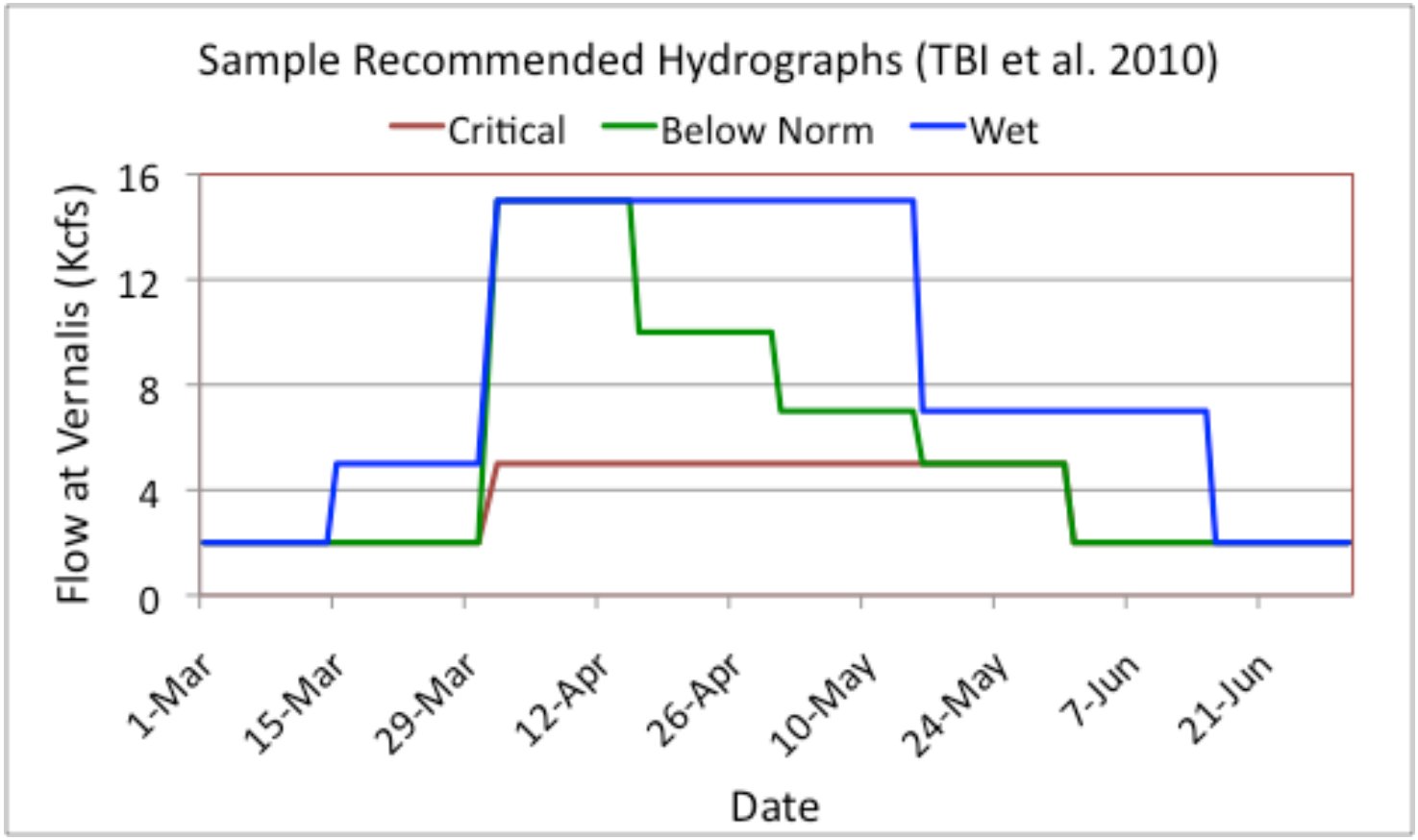
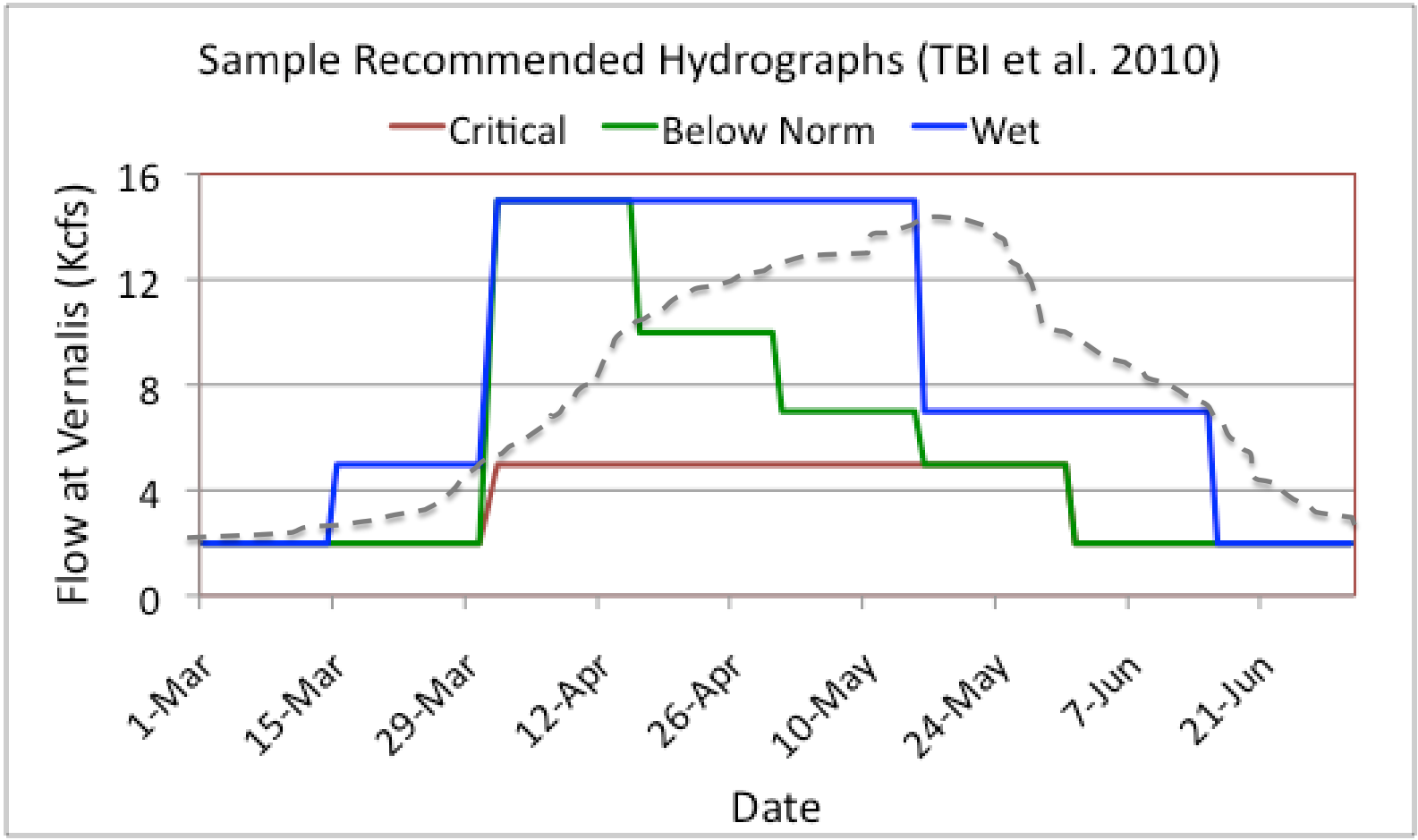


Daily Attainment of Key Flows: From Engineered to Proportional Hydrographs



Magnitude, Timing, and Duration of Flow Were Scaled to Account for the Availability of Water (i.e. WY Types)

Daily Attainment of Key Flows
From Engineered to Proportional Hydrographs



Natural Hydrographs Vary Continuously Within and Across Years

Assumptions for TBI Modeling of SWRCB %UIF Approach

Daily Attainment of Key Flows

- Same data & assumptions as for seasonal flow analysis
- Daily flows at rim stations translate directly to Vernalis flows
  - No accretion or loss b/w release point and Vernalis
- Daily attainment of key flows levels reflects number of days the 14-d running average exceeded flow target
- WY Types represent 20% exceedence bands
  - (e.g. Wet years =81-100%, Above Normal =61-80%, etc.)
- "Loose" interpretation of flow duration
  - Key flows begin as recommended but may occur thru 6/15 regardless of recommended end date

Attainment of Key Daily Flows at 35% UIF

Most daily flow thresholds are not attained for recommended durations in most years

35% UIF	C	D	BN	AN
5,000				
10,000				
15,000				

Median Year % of Duration (Days) Attained
>80%
50-80%
20-50%
<20%

Increasing Attainment of Key Daily Flows with Increasing %UIF

Median Year % of Duration (Days) Attained
>80%
50-80%
20-50%
<20%

35% UIF	C	D	BN	AN
5,000				
10,000				
15,000				

45% UIF	C	D	BN	AN
5,000				
10,000				
15,000				

Increasing Attainment of Key Daily Flows with Increasing %UIF

Median Year % of Duration (Days) Attained
>80%
50-80%
20-50%
<20%

35% UIF	C	D	BN	AN
5,000				
10,000				
15,000				

45% UIF	C	D	BN	AN
5,000				
10,000				
15,000				

50% UIF	C	D	BN	AN
5,000				
10,000				
15,000				

Increasing Attainment of Key Daily Flows with Increasing %UIF

Median Year % of Duration (Days) Attained
>80%
50-80%
20-50%
<20%

35% UIF	C	D	BN	AN
5,000				
10,000				
15,000				

45% UIF	C	D	BN	AN
5,000				
10,000				
15,000				

50% UIF	C	D	BN	AN
5,000				
10,000				
15,000				

60% UIF	C	D	BN	AN
5,000				
10,000				
15,000				

Spring Flow Conditions for Salmon

	35% UIF				50% UIF				60% UIF			
Biological Purpose[1]	C	D	BN	AN	C	D	BN	AN	C	D	BN	AN
Eliminate D.O. Barrier	✗[2]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Population Growth (+CRR)	✗	✗	✓	✓	✗	✓	✓	✓	✗	✓	✓	✓
Eliminate T^o Barrier	✗	✗	✗	✓	✗	✗	✓	✓	✗	✓	✓	✓
AFRP Production	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✓

("Wet" Years Not Depicted)

[1]Reflects attainment of benefits at ≥ 90% of recommended duration/frequency

[2]Recommend dissolved oxygen migration barrier be addressed by setting a 2 Kcfs min. flow

Key Points

- Strong scientific evidence for flow thresholds that will lead to restoration of salmon and other fisheries
- Draft SED's preferred alternative will **not** provide flows necessary to achieve AFRP population targets and other ecosystem necessary improvements → may not even halt long-term ecosystem decline
- Preliminary analyses indicate that flows >50% of UIF during Feb-Jun plus minimum flows of ~2 Kcfs at Vernalis year-round are necessary to restore public trust fisheries of the San Joaquin River and Bay-Delta
- Fall pulse flow improvements needed as well