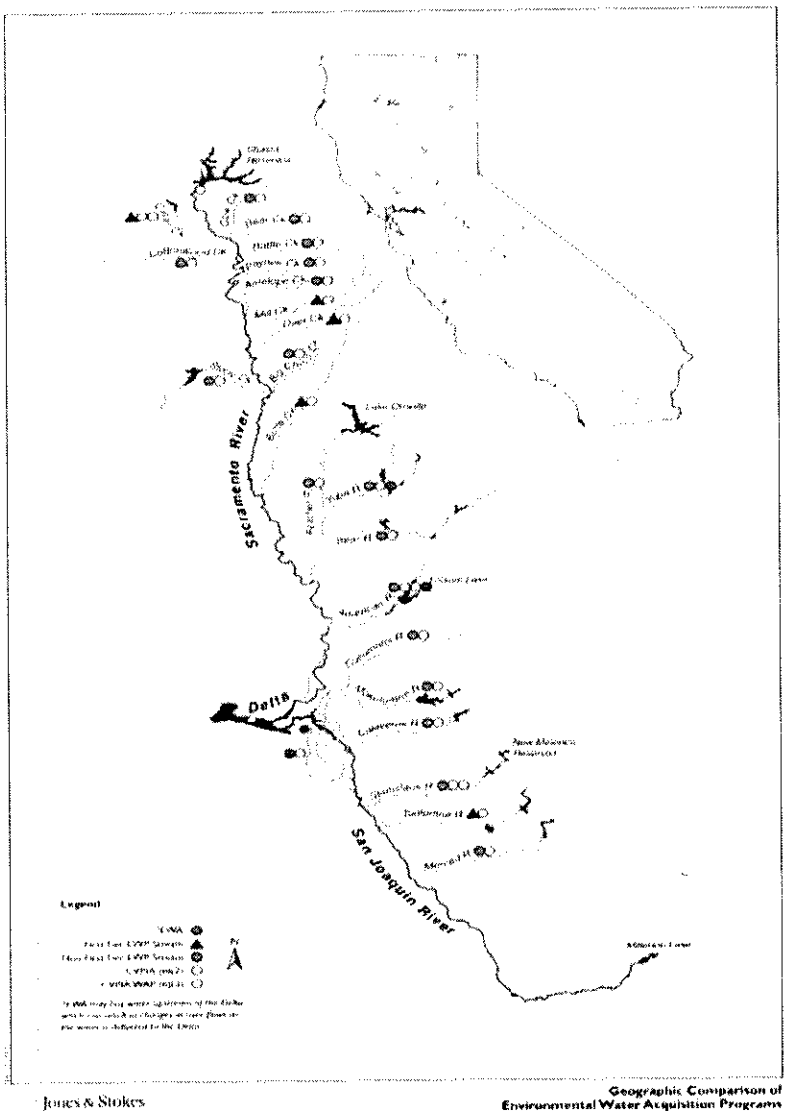
Vernalis Flow Standard and South Delta Salinity Objectives

Status of San Joaquin Basin Fall-run Chinook



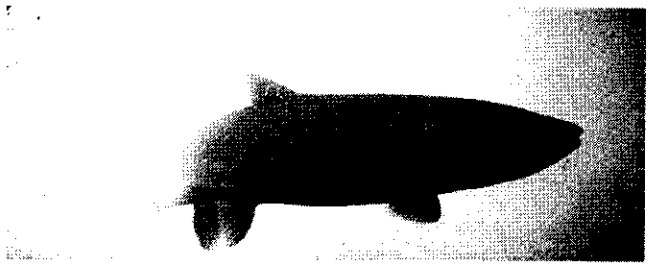
State Water Resources Control Board Workshop, April 22, 2009

Roger Guinee

USFWS, Region 8, Sacramento

Status of San Joaquin Basin Fall-run Chinook

- Interior is concerned about the continued decline of San Joaquin Basin fall-run Chinook salmon.
- In-river adult escapement into the three main San Joaquin tributaries (Stanislaus, Tuolumne, and Merced Rivers) has declined since 2000 when an estimated 37,500 adult Chinook returned to spawn.
- In 2008, preliminary estimates are that approximately 2,400 adult Chinook Salmon returned, which represents a 94% decrease since 2000.
- 2,400 is 3% of the AFRP production target of 78,000 fall Chinook for the Stanislaus, Tuolumne, and Merced Rivers
- Ocean conditions have likely been a factor in the recent decline, however ongoing long-term studies indicate that lower instream flows in the San Joaquin system are related to low numbers of salmon returning to spawn.



DRAFT 03-13-08

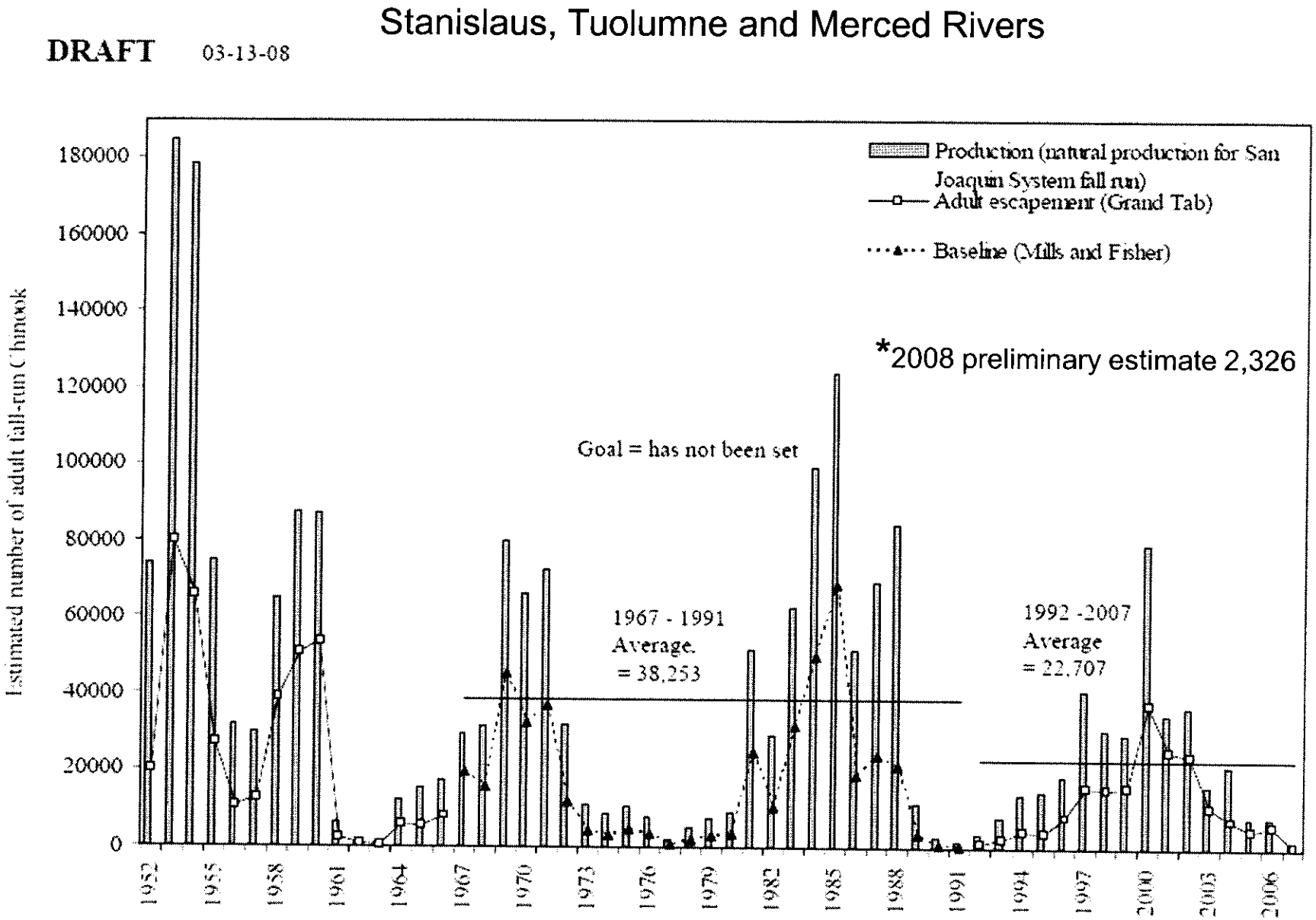


Figure 37. Estimated yearly natural production, and in river escapements of San Joaquin System adult fall-run Chinook salmon. The San Joaquin System is the sum of the Stanislaus, Tuolumne, and Merced Rivers. 1952 - 1966, and 1992 - 2006 numbers are from CDFG Grand Tab (August 20, 2007). Baseline numbers (1967 - 1991) are from Mills and Fisher (CDFG, 1994).

Stanislaus River

DRAFT 03-13-08

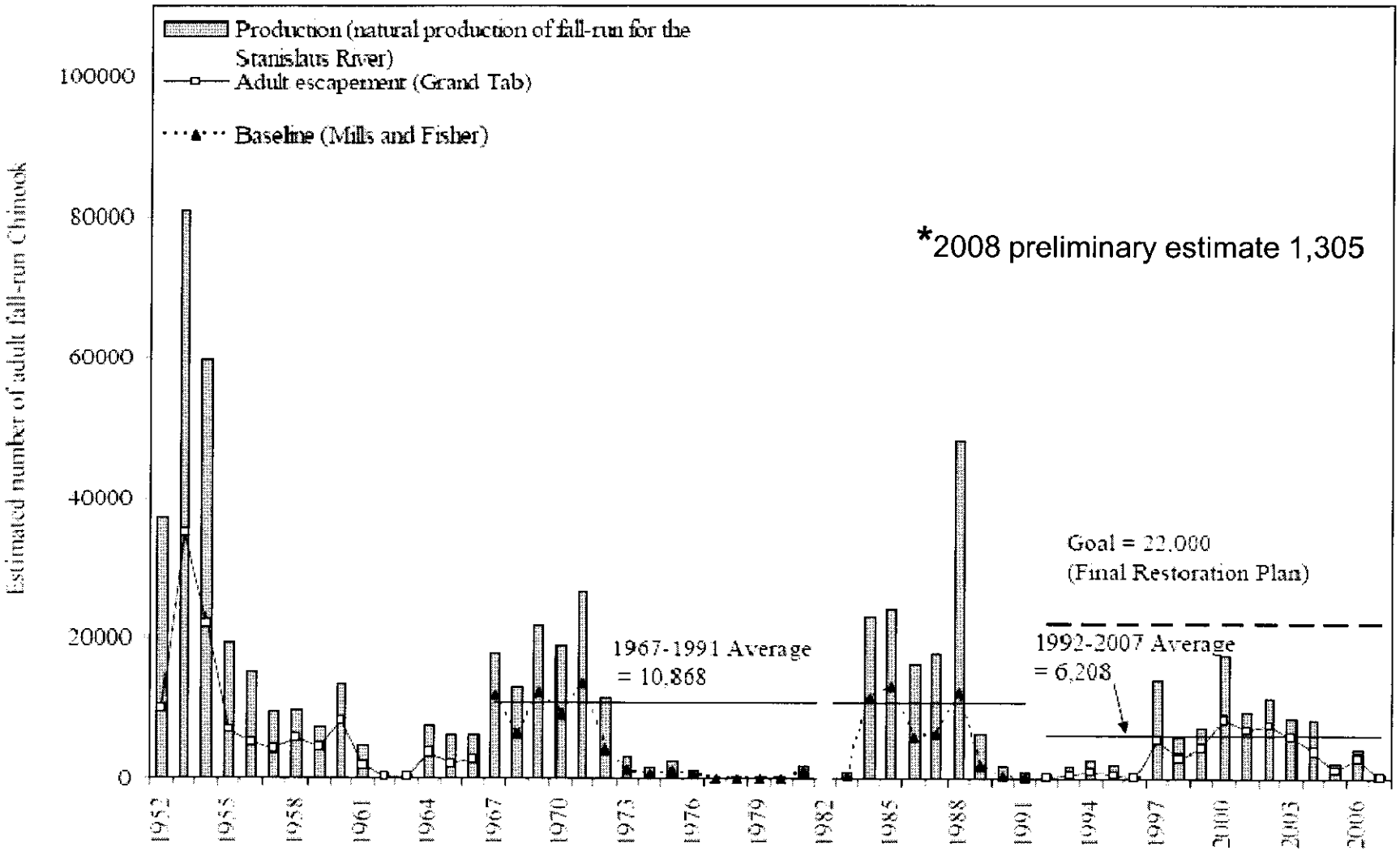


Figure 34. Estimated yearly natural production, and in river escapements of Stanislaus River adult fall-run Chinook salmon. 1952 – 1966, and 1992 - 2007 numbers are from CDFG Grand Tab (March 1, 2008). Baseline numbers (1967 - 1991) are from Mills and Fisher (CDFG, 1994). ▭ = data was not available for 1982.

Tuolumne River

DRAFT 03-13-08

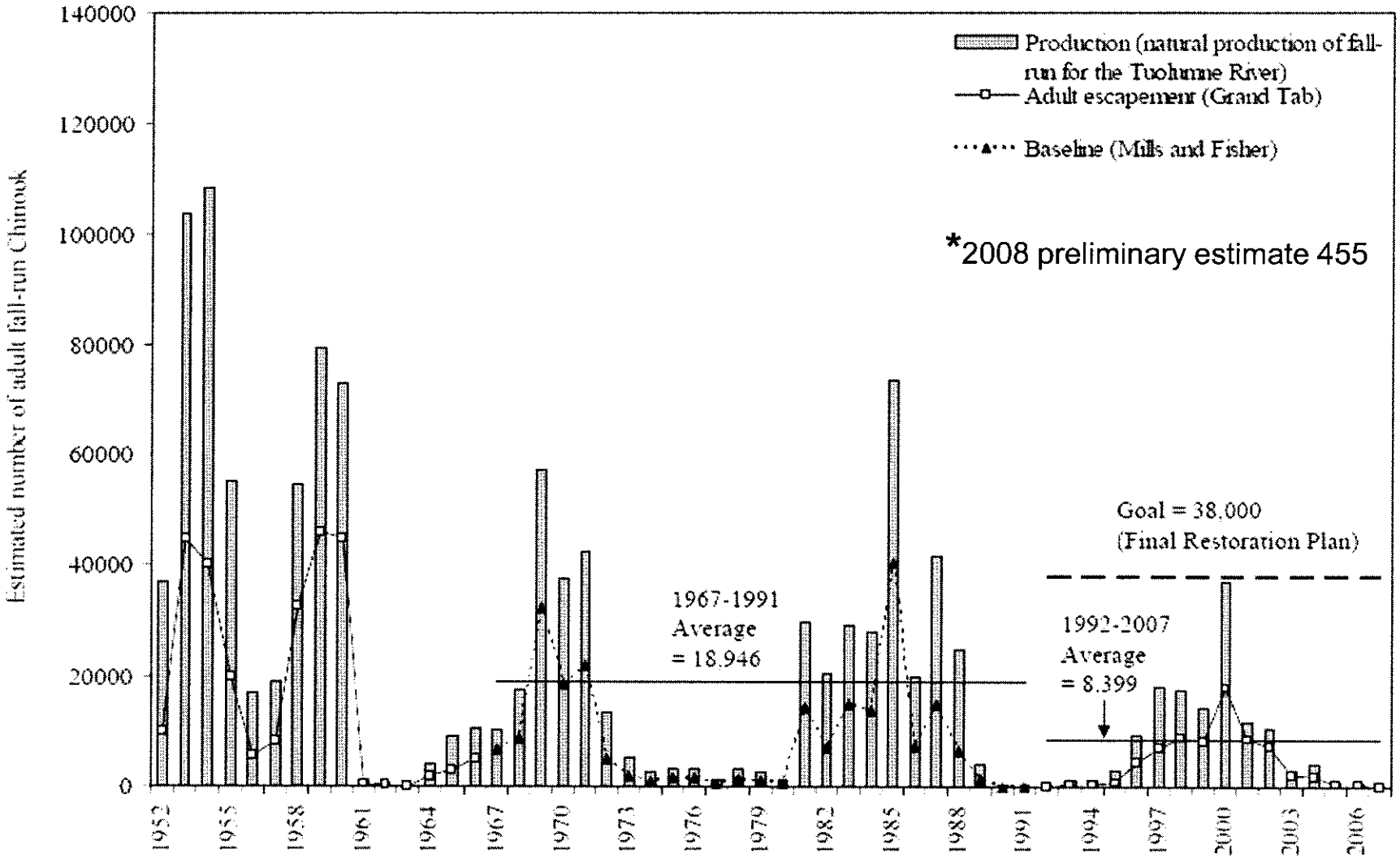


Figure 35. Estimated yearly natural production, and in river escapements of Tuolumne River adult fall-run Chinook salmon. 1952 - 1966, and 1992 - 2007 numbers are from CDFG Grand Tab (March 1, 2008). Baseline numbers (1967 - 1991) are from Mills and Fisher (CDFG, 1994).

DRAFT 03-13-08

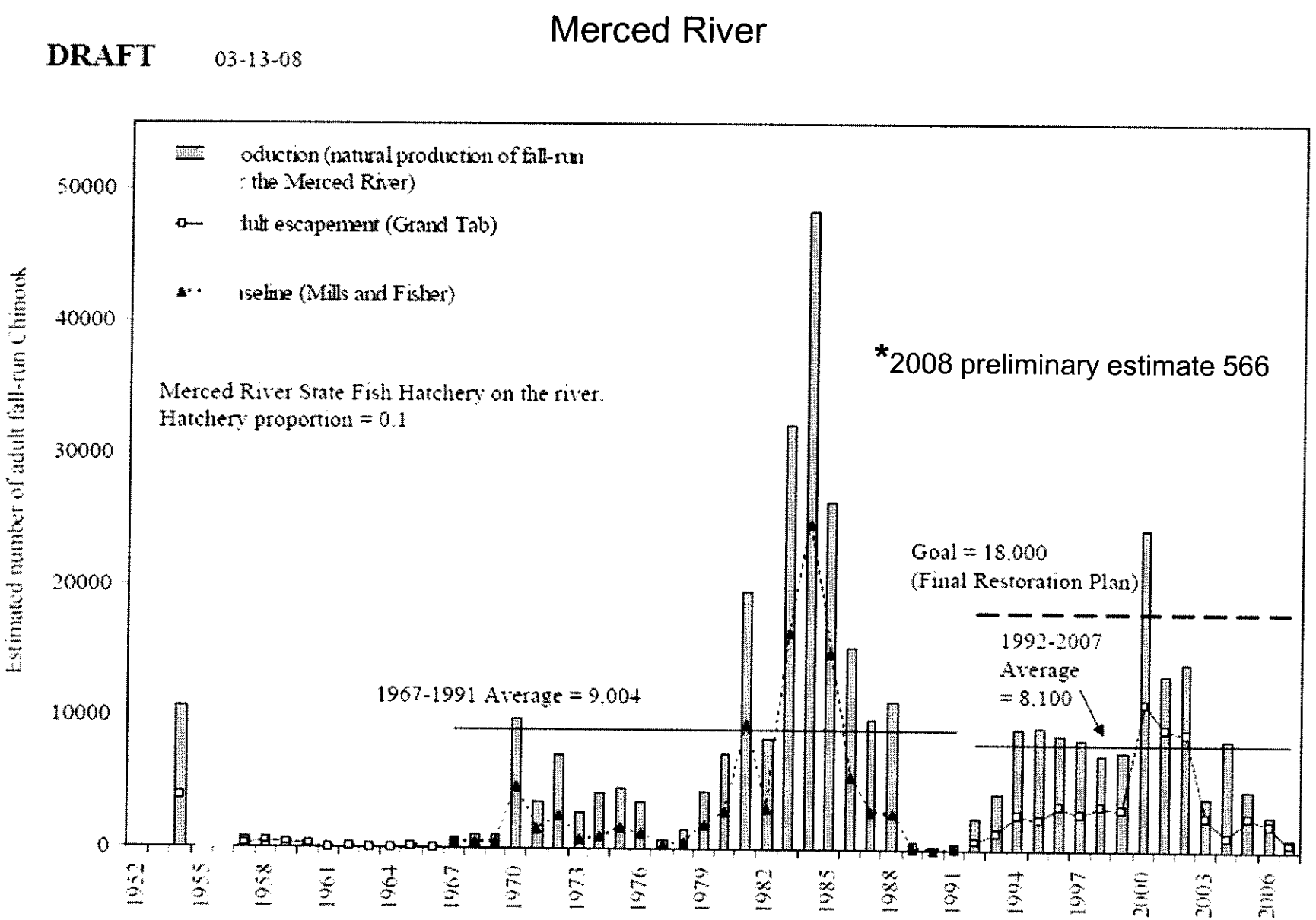


Figure 36. Estimated yearly natural production, and in river escapements of Merced River adult fall-run Chinook salmon. 1952 - 1966, and 1992 - 2007 numbers are from CDFG Grand Tab (March 1, 2008). ▭ = data was not available for 1952 - 1953, and 1955 - 1956. Baseline numbers (1967 - 1991) are from Mills and Fisher (CDFG, 1994).

Survival of Chinook salmon smolts in the Sacramento-San Joaquin Delta and Pacific Ocean. Baker and Morhardt, 2001.

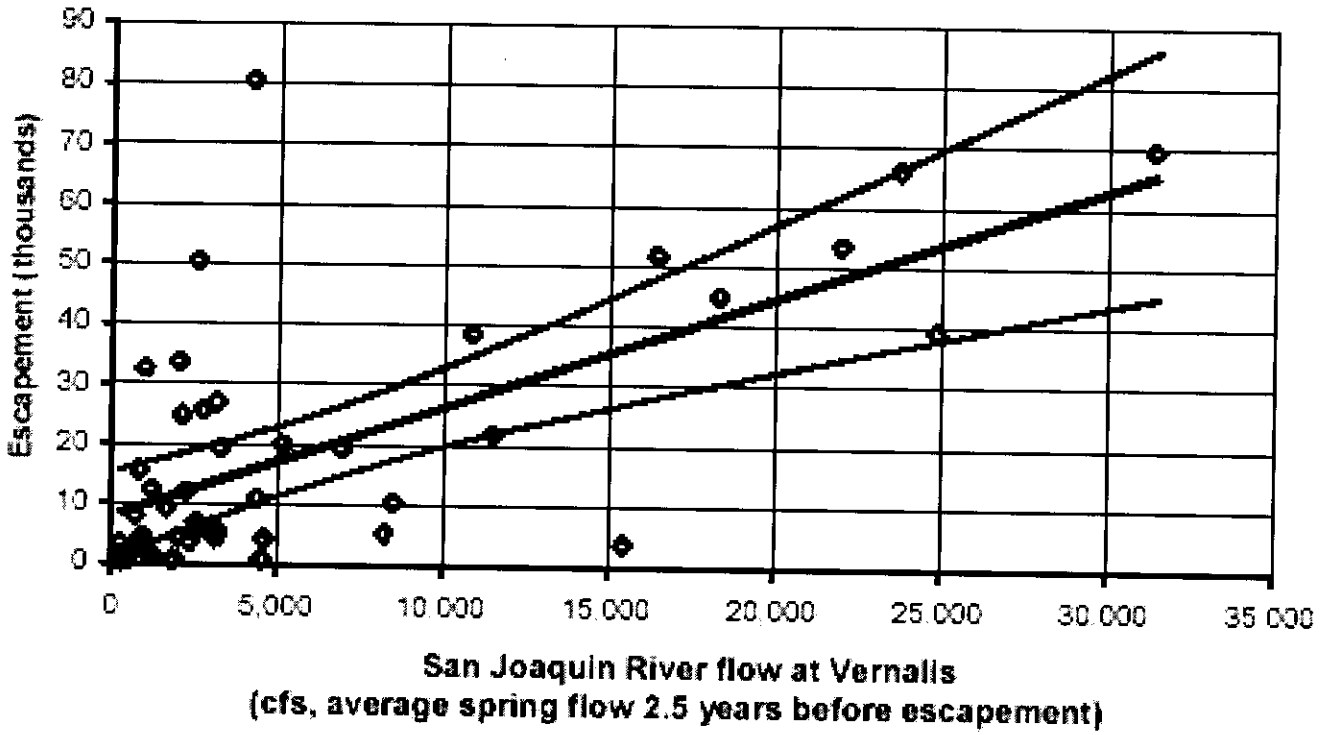
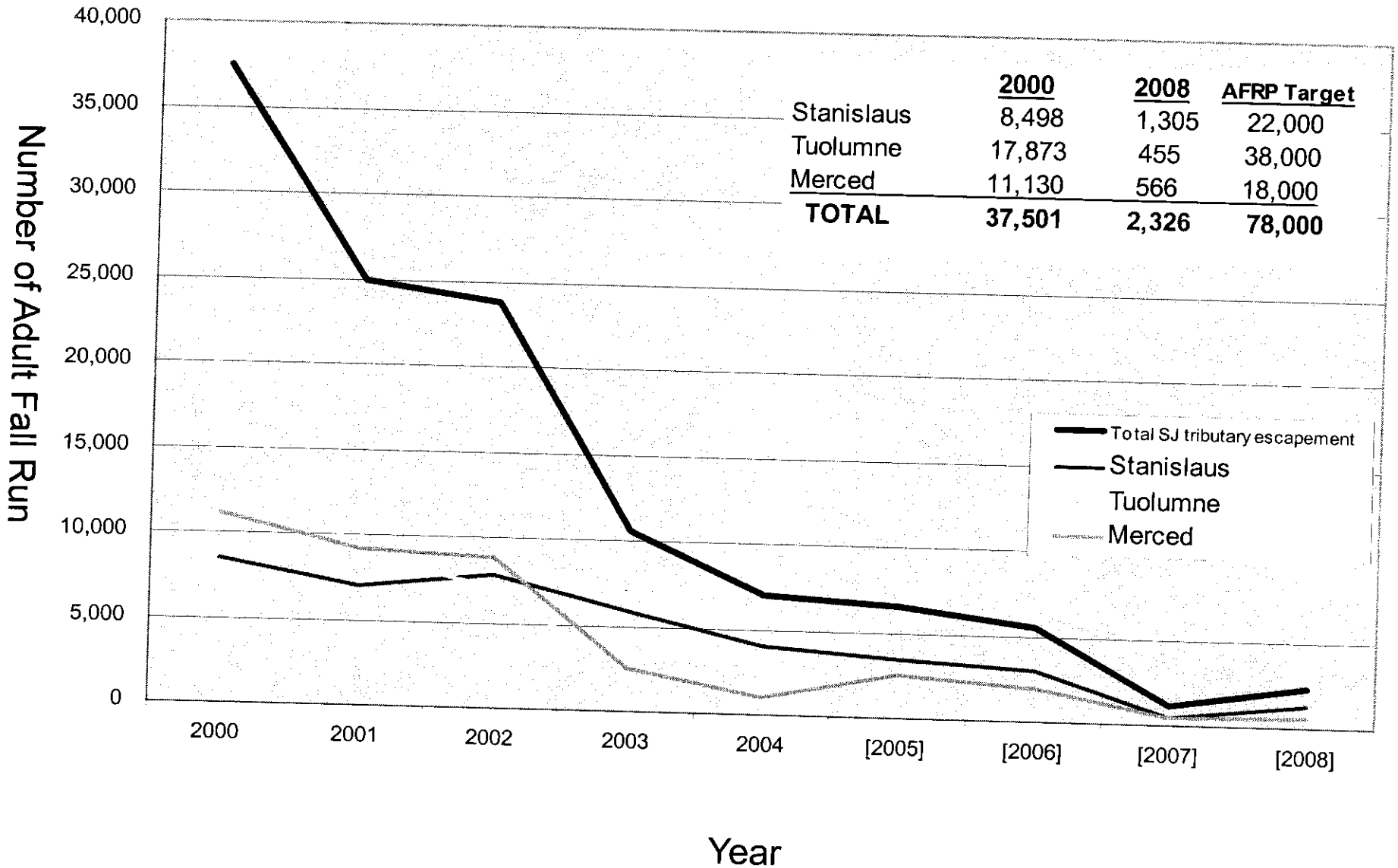


Figure 11 Total escapement to San Joaquin tributaries, 1951 through 1996, and spring flow in the San Joaquin River at Vernalis 2.5 years earlier. Fitted regression line and envelope of 95% confidence region for fitted line are shown.

San Joaquin Fall-run Escapement (in-river)
(data from draft GrandTab 03-09-09)



	2000	2008	AFRP Target
Stanislaus	8,498	1,305	22,000
Tuolumne	17,873	455	38,000
Merced	11,130	566	18,000
TOTAL	**37,501**	**2,326**	**78,000**

[ ] indicates preliminary data

San Joaquin Flow Standards

- Interior recognizes that the Board requested "information to conduct detailed discussions" regarding amendments to the 2006 WQCP; Vernalis flows and implementation.

- At this time Interior is not prepared to provide detailed flow recommendations.

- Because new information is now available to SWRCB, Interior recommends a thorough, open *process* to establish and implement flow and salinity objectives in the San Joaquin basin.

San Joaquin Flow Standards

Interior Recommendations:

- San Joaquin flows should be evaluated and addressed in an open, cooperative *process* among federal and state agencies and interested parties.

- Consider that relying on Vernalis flows solely from the Stanislaus is not reasonable and does not address the fishery needs on the Tuolumne or Merced rivers.

San Joaquin Flow Standards

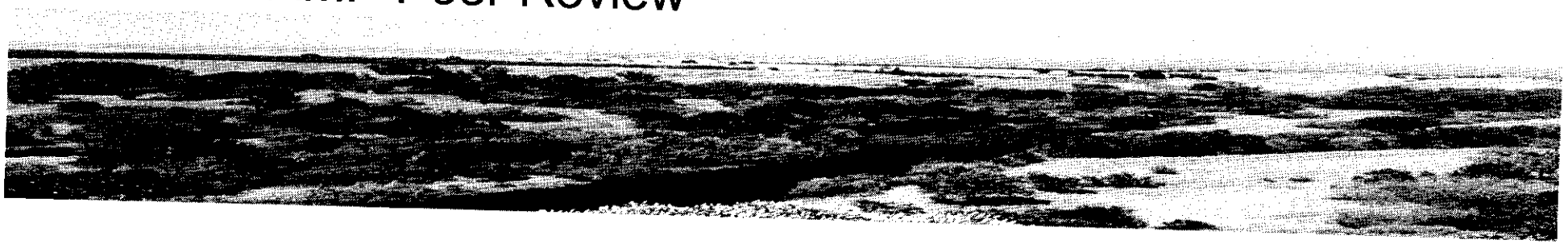
Interior Recommendations:

- This open, cooperative *process* should include evaluation and synthesis of:
  - The interrelated water management programs
  - Salinity management
  - Water supply reliability
  - Flow needs for instream fishery management
  - New biological opinions on long-term operation of CVP/SWP

San Joaquin Flow Standards

Interior Recommendations:

- This *process* will benefit from new information and new tools developed in the past few years:
  - Improved hydrology information
  - Improvements to CalSim2
  - San Joaquin basin temperature model
  - CVPIA Anadromous Fish Restoration Program (AFRP)
  - CDFG's San Joaquin River Salmon Population Model
  - Analyses completed for the new biological opinions on long-term operation of CVP/SWP
  - VAMP Peer Review

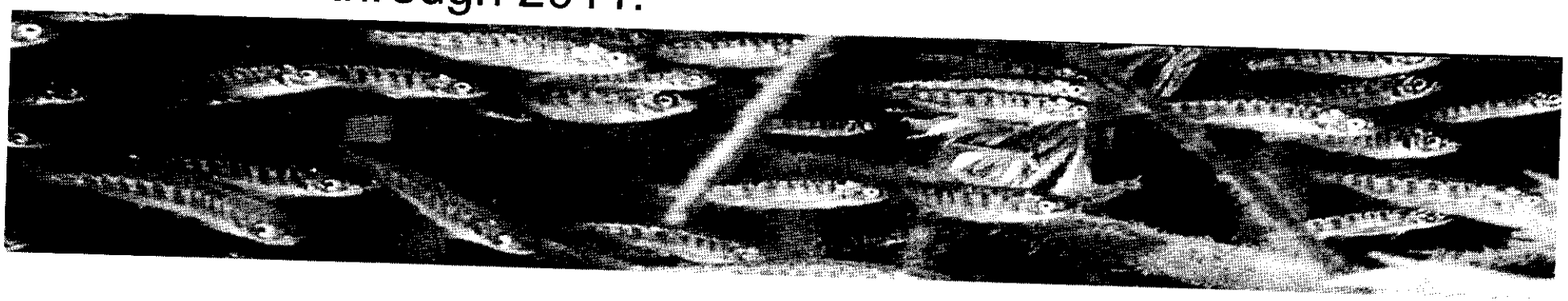


San Joaquin Flow Standards

- Interior believes sufficient flows at Vernalis are important for emigrating salmonids and federally listed delta smelt.

- Sufficient flows on each of the tributaries are important for spawning, rearing, and outmigration of salmonids in the San Joaquin basin.

- Interior is currently working with the interested parties to extend the existing San Joaquin River Agreement and VAMP through 2011.



San Joaquin Flow Standards

- Interior urges the board to use the next two years to evaluate and address flow standards in the San Joaquin basin in an open, cooperative process.

- This process should result in the Board adopting and implementing a plan for apportioning responsibility for San Joaquin basin flow standards among all basin water users.

San Joaquin Basin Water Budget and Scoping Analysis Issues

1995 WQCP Analysis Flaws

DWR PLANNING SIMULATION MODEL (DWRSIM) ASSUMPTIONS FOR SWRCB STUDY WITH MAY 1995 WQCP DELTA STANDARDS
(FLOW ALTERNATIVE 3) 1995C6F SWRCB 606

Study 469 (Joint POD Alternative 3) assumptions are modified in accordance with the SWRCB Revised Modeling Request dated April 5, 1997. The Central Valley Project and the State Water Project are operated to achieve full compliance with all objectives in the 1995 Bay-Delta Plan.

1. San Joaquin River flows are modified with revised releases from New Melones, Don Pedro, Lake McClure, Eastman Lake and Hensley Lake as per Table No's 1 to 5 for Alternative 3, provided in the Request. These quantities of water must be released at these reservoirs and conveyed to Vernalis and the Delta.

2. San Joaquin River flows are modified by holding back monthly quantities of water which are not diverted in the San Joaquin Basin as a result of curtailment of direct diversion as per Table No's 10 to 16 for Alternative 3, provided in the Request. The values in these tables are subtracted from actual diversions at the indicated Control Points. If the values in these tables exceeded the modeled diversions, the modeled diversions are set to Zero.

3. If the additional water provided upstream of the Stanislaus is insufficient to meet the SWRCB's May 1995 Water Quality Control Plan flow objectives at Vernalis, additional releases are made from New Melones Reservoir.

4. In years when New Melones Reservoir approaches its minimum storage of 80 TAF, additional water is not provided to meet salinity requirements and violations are possible.

STUDY: 1995C05F-SWRCB-469 DWRSIM: 8.18, 27 Nov 98

Alternative 3 - Supplemental Water for Vernalis Objective (Add(3)) (TAF)

Add Water from Don Pedro and Lake McClure (CP 677 Downstream Flow) + New Melones Release for Vernalis Pulse and X2 Flow

YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
1922	0	0	0	0	0	0	29	102	0	0	0	0	143
1923	0	0	0	0	0	52	52	109	0	0	0	0	213
1924	0	0	0	0	0	0	18	43	0	0	0	0	61
1925	27	0	0	0	0	0	23	70	0	0	0	0	120
1926	27	0	0	0	0	32	34	88	8	0	0	0	189
1927	27	0	0	0	0	0	24	113	90	0	0	0	254
1928	0	0	0	0	0	0	39	91	2	0	0	0	132
1929	27	0	0	0	0	0	0	23	0	0	0	0	50
1930	27	0	0	0	0	0	15	20	0	0	0	0	62
1931	0	0	0	0	0	0	23	45	0	0	0	0	68
1932	0	0	0	0	0	0	0	68	32	0	0	0	100
1933	0	0	0	0	0	0	31	57	23	0	0	0	111
1934	27	0	0	0	0	0	10	42	0	0	0	0	79
1935	27	0	0	0	0	0	0	0	0	0	0	0	27
1936	0	0	0	0	0	0	0	49	13	0	0	0	62
1937	0	0	0	0	0	0	0	0	0	0	0	0	0
1938	0	0	0	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	0	45	12	0	0	0	57

Figure IX-19

Percent Probability of Exceedance

of Plan Salinity Objectives at SJR at Airport Way Bridge (Vernalis)

For April - August

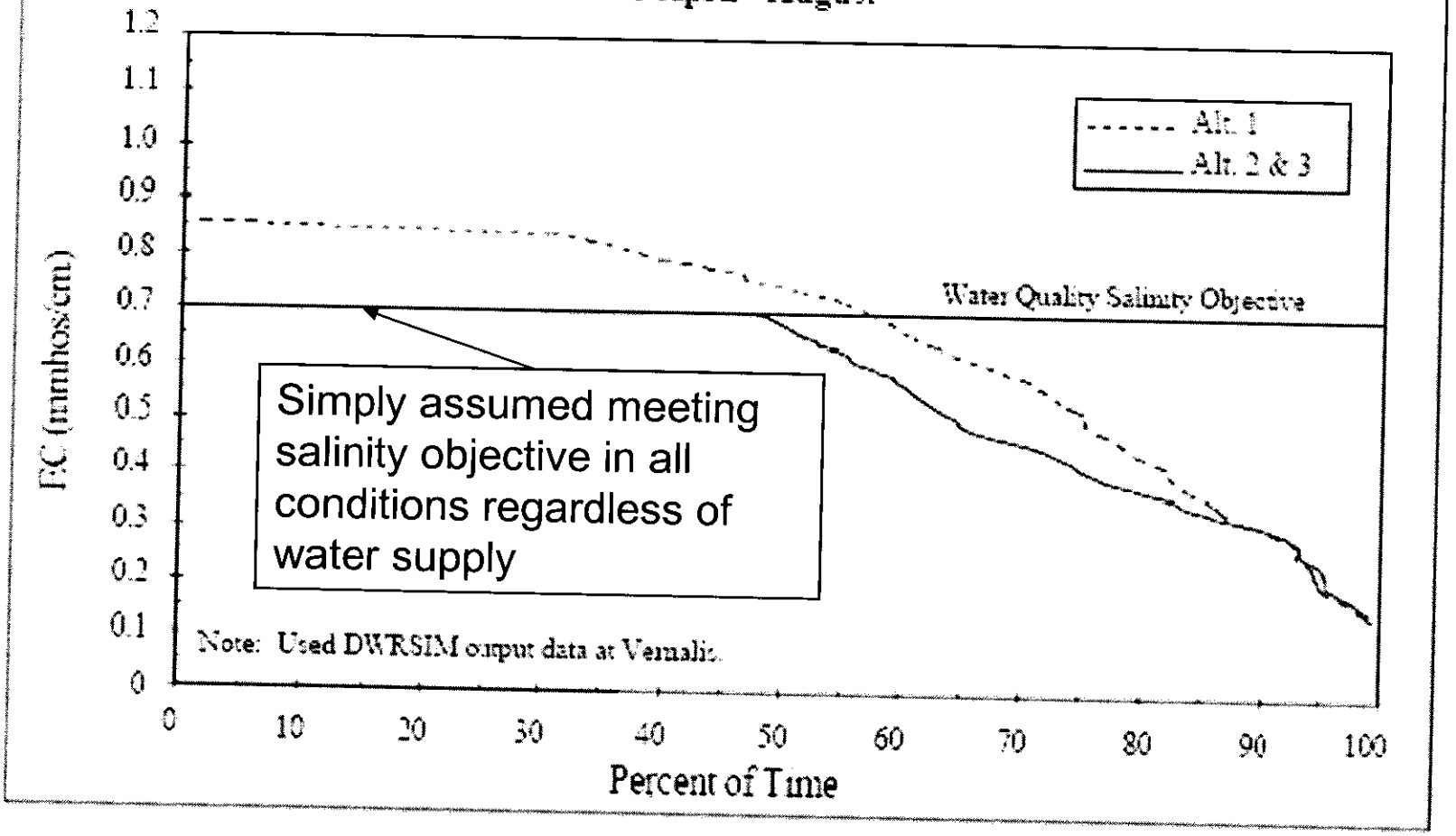
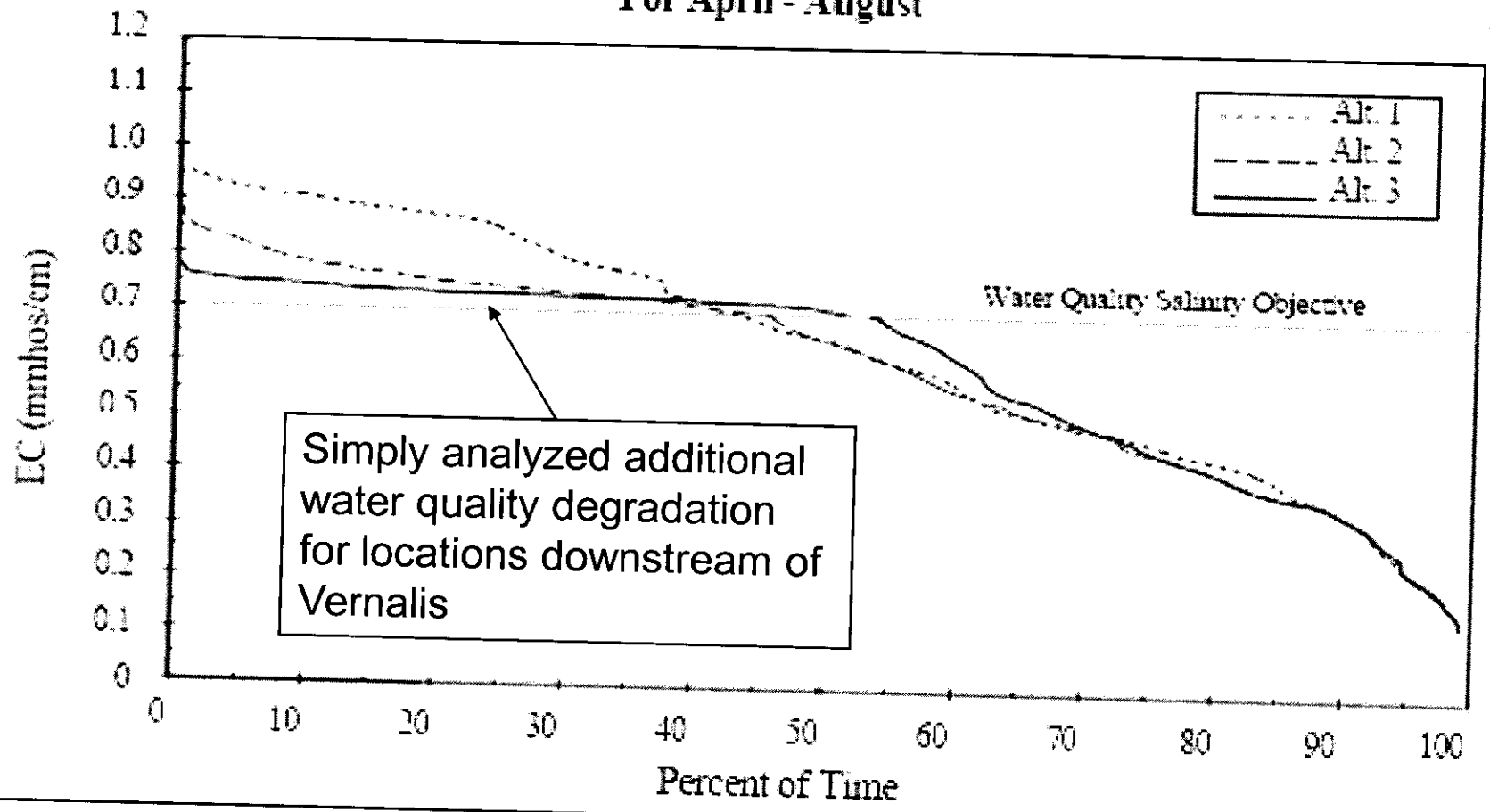


Figure IX-23
Percent Probability of Exceedance
of Plan Salinity Objectives at Brandt Bridge on SJR
For April - August



Conclusions of 1995 WQCP Analysis

- Significant Water Budget Flaws existed in WQCP analysis
  - 'Add water' incorporated into analysis
  - Simple assumption that Vernalis salinity objective is met. Water is 'missing' from analysis.
  - No additional flow was assumed downstream of Vernalis salinity dilution objective for interior south delta water quality management.
- These types of technical flaws create serious questions about the total water budget and other beneficial uses in the San Joaquin Basin
- Need to develop a baseline for further analysis under CEQA.

Refined Analysis Tool – CALSIM II

- Due to many technical concerns regarding previous flow-salinity relationships, Reclamation sponsored activities to recalibrate salinity relationships.
- Significant changes were made to CALSIM II data to update both the salinity relationships and hydrologic inputs
- New water planning information set was peer reviewed
- New water planning info represents a much better characterization of current flow and salinity dynamics in the San Joaquin Basin

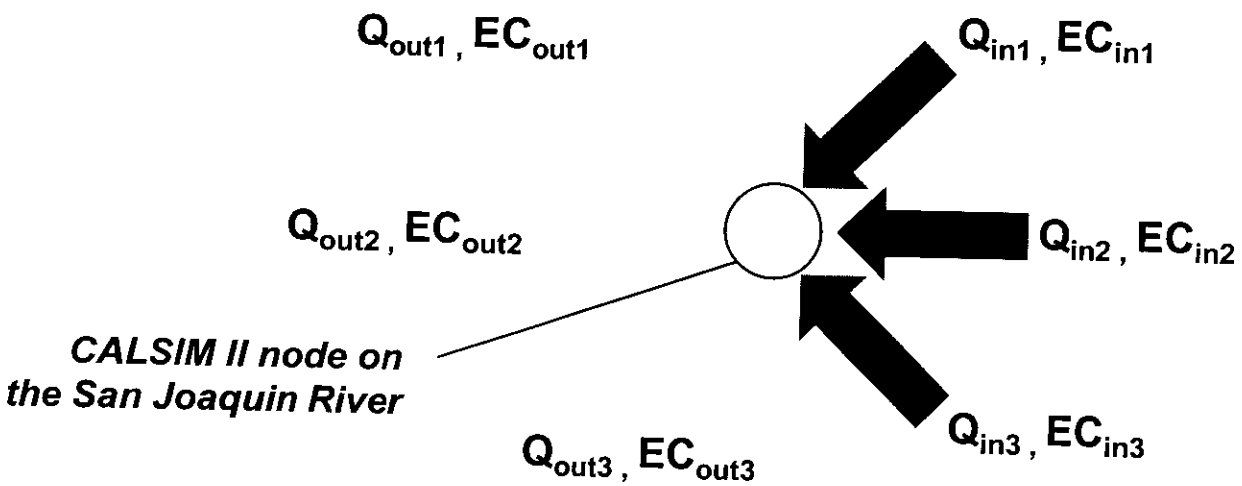
Presentation Overview

- CALSIM II Water Quality Module
- Seasonality of Vernalis Objectives
- Basin Hydrology & Drought Risk Assessment
- Salinity Relationship between Vernalis and South Delta stations
- Scoping Considerations

New Water Quality Module

- Future and application oriented approach
- Primary Objectives
  - Improve the accuracy of Maze EC estimates
  - Increase the flexibility of water quality simulation
  - Increase the model consistency and integration

Mass Balance in Flow and Salt



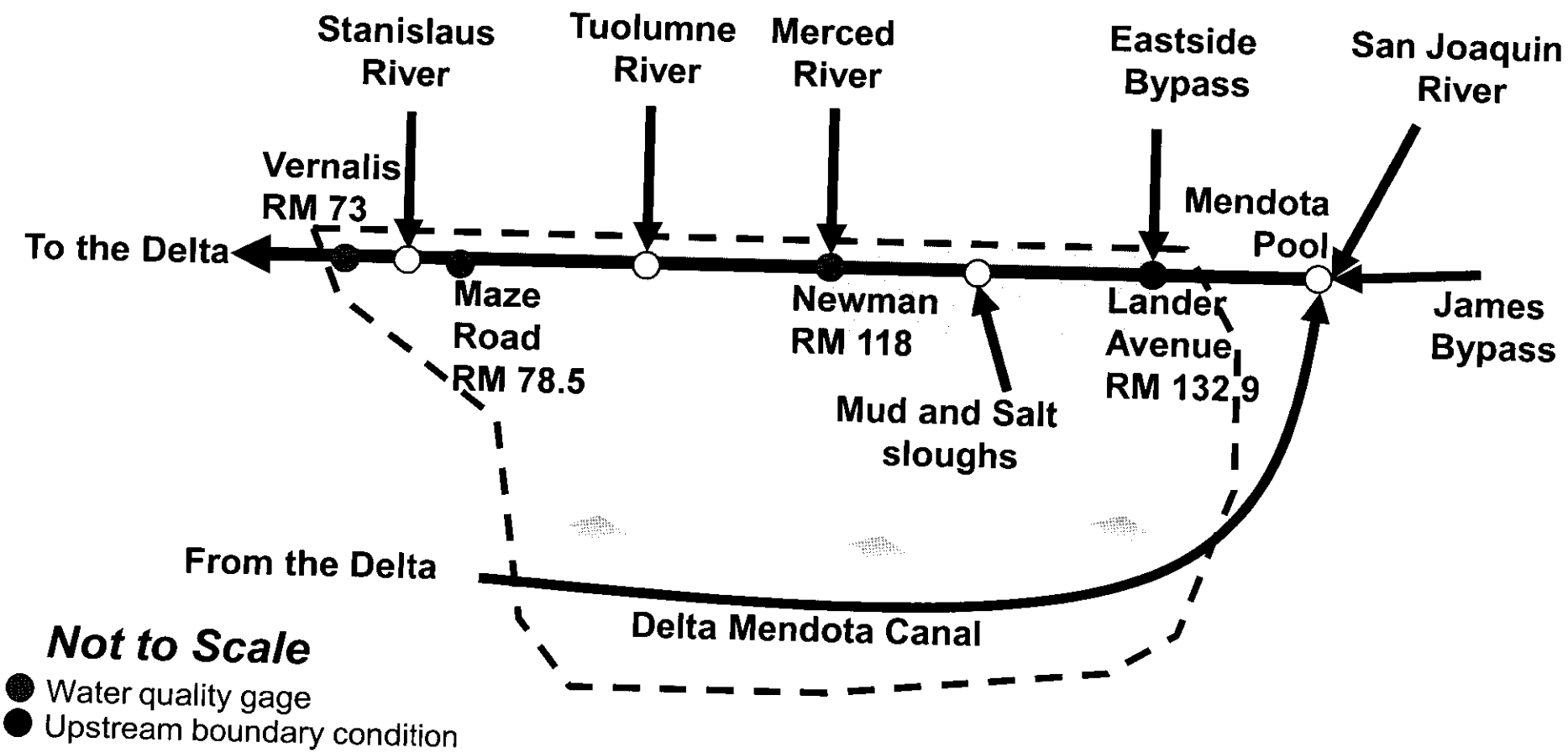
Flow Balance: $\Sigma Q_{in} = \Sigma Q_{out}$

Salt Balance: $EC_{out} = \Sigma (EC_{in} * Q_{in}) / \Sigma Q_{out}$

Performed on a monthly basis

Scope of Water Quality Module

Most Recent gage records at Newman and Maze



Two-stage Disaggregation

CALSIM II
Flows into SJR

Grouped by
- **Geographic region**
- **Contract type**
- **Others**

Flow Disaggregation

Deliveries
- **Source**
- **Location**
- **Quantity**

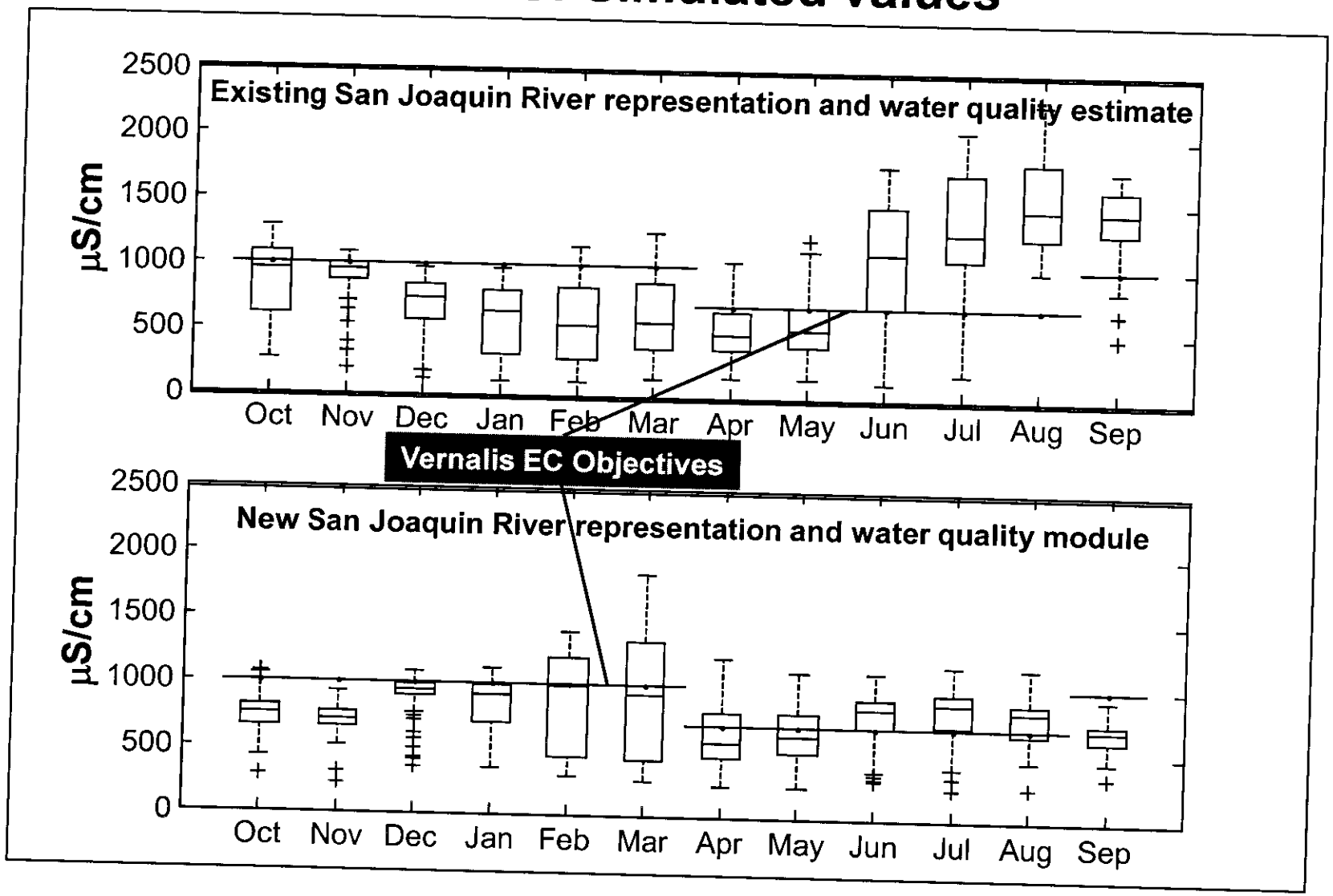
Returns
- **Source**
- **Location**
- **Quantity**

Salt Disaggregation

Quality per
- **Source**
- **Location**

Simulated Operations

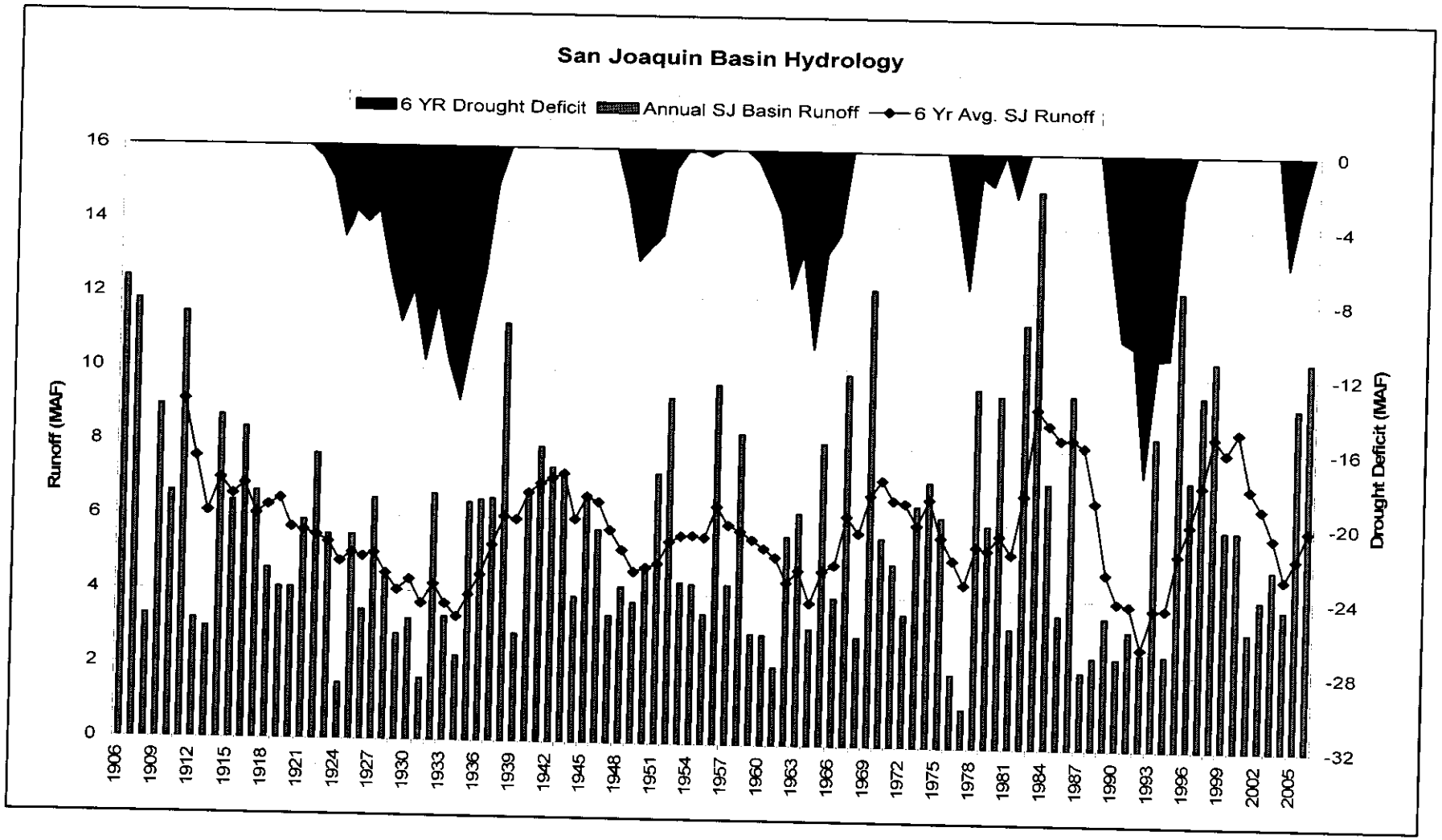
Maze EC: Simulated values



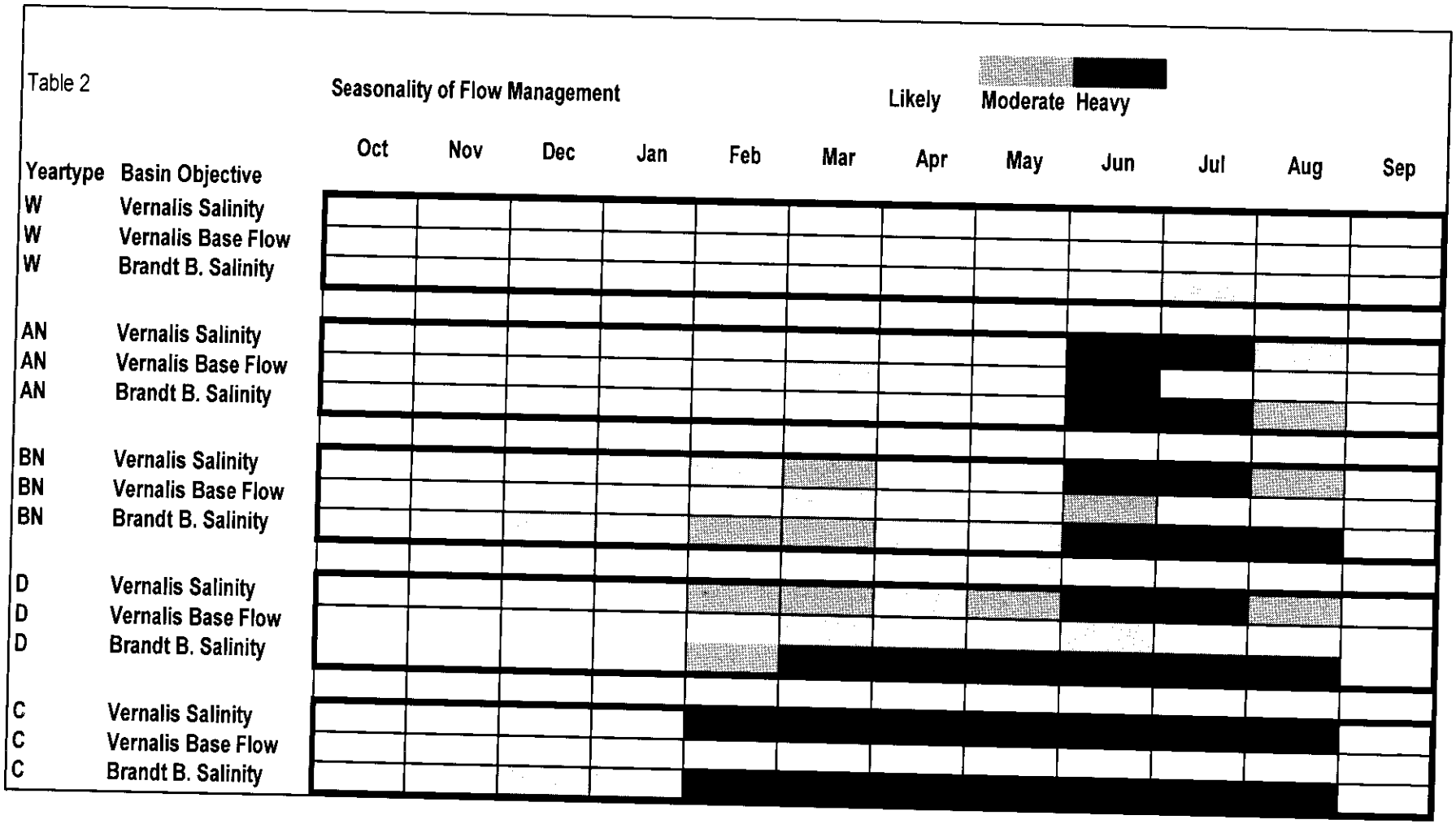
General Conclusions of Salinity Representation Changes

- With updated representation of salinity relationships
  - Lesser dilution water need during irrigation season.
    - Likely a cumulative effect of increased water conservation systems, more re-use of water supplies, and reduction of total water supply to west side irrigators.
  - Greater dilution water need during late winter-early spring timeframe
    - Likely a cumulative effect of increased drainage of refuge lands during this timeframe and 'pre-irrigation' leaching effects.

San Joaquin Basin Hydrology



Seasonality of San Joaquin Basin Objectives



Water Budget Issues

- Previous analysis had seriously flawed techniques and assumptions to draw any meaningful conclusion on beneficial uses.
- Seasonality of flow needs for fishery and salinity objectives can compete for limited water resources.
- Basin wide drought management not incorporated.
- Concern over linkage of Sacramento Basin hydrology to San Joaquin Basin flow objective designs. (Volumetric and timing)
- New information and tools exist today to better characterize these key relationships.

New Analysis

- New analysis will be required in order to understand key beneficial use seasonal flow dynamics and tradeoffs.
  - Well scoped basin wide approach
  - Systematic analysis approach
  - Knowledge of water supply risk relationships
    - Inter-year risk
    - Multi-year drought risk

Baseline Problem

- Since the analysis for the 1995 WQCP (and D-1641) had serious technical flaws, the previous analysis cannot be used as a baseline.
- Need to re-evaluate the 1995 baseline for the purpose of CEQA scoping.

Basin-wide Strategic approach for development of alternatives

- Value Engineer through scoping, potential alternatives and modeling analysis approaches
  - "Top-Down" Approaches – essentially updating min. flows from major tributaries in a meaningful way.
  - "Bottom-Up" Approaches – requiring a min. flow objective on the mainstem SJR (Ex. Vernalis and/or other locations)
  - Drought water supply indexes – when does total water supply outlook affect beneficial use management goals
  - Salinity Dilution management – How many locations and what goals

Investigate Multi-objective Tradeoffs

- Use tradeoff evaluation process to inform future implementation.
  - Fishery objectives and salinity objectives often have different seasonality and can COMPETE for limited water supplies.
  - Interior South Delta salinity objectives would COMPETE for water supplies with the Vernalis salinity objective – if interior south delta salinity becomes a flow objective.
  - The above river management objectives can COMPETE for limited water supplies for other beneficial uses such as M&I, agriculture, reservoir coldwater resources, and dissolved oxygen objectives.
- Recognize tradeoffs of implementing water quality objectives.

Investigate Multi-objective Tradeoffs

- Need to create metrics to capture and measure potential changes to San Joaquin Basin management objectives (examples)
  - Reservoir Spills
  - Reservoir releases for Salinity management
  - Reservoir releases for Fishery management
  - Changes to consumptive beneficial uses
  - Changes to reservoir storage (and inherently reservoir coldwater availability)
- Evaluate how change of river management objectives will affect the performance of other river management objectives.

Keys to a successful analysis process

- Basis of analysis assumptions needs to be well documented (reports) and vetted in an open collaborative process
- Modeling tools need to be well understood for strengths and weaknesses
- Alternatives need to be wide ranging and grouped for consistent themes.
- Alternatives need to be structured for operational implementation ability.

Other future programs in SJ Basin will affect overall San Joaquin River management

- Restoration of flows below Friant Dam.
  - Will change the 'connection' nature of managed flows to lower San Joaquin River.
  - Will change the 'connection' nature of flood flows to the lower San Joaquin River.
  - The magnitude and nature of these changes is unknown at this point in time.
- Westside Drainage Management Solutions
  - Will change the timing and total load movement of salts into the San Joaquin River.
  - The magnitude and nature of these changes is unknown at this point in time.
- TMDL Process and Implementation
- Central Valley Salinity and Nutrient Management Planning
- Potential New FERC Flows