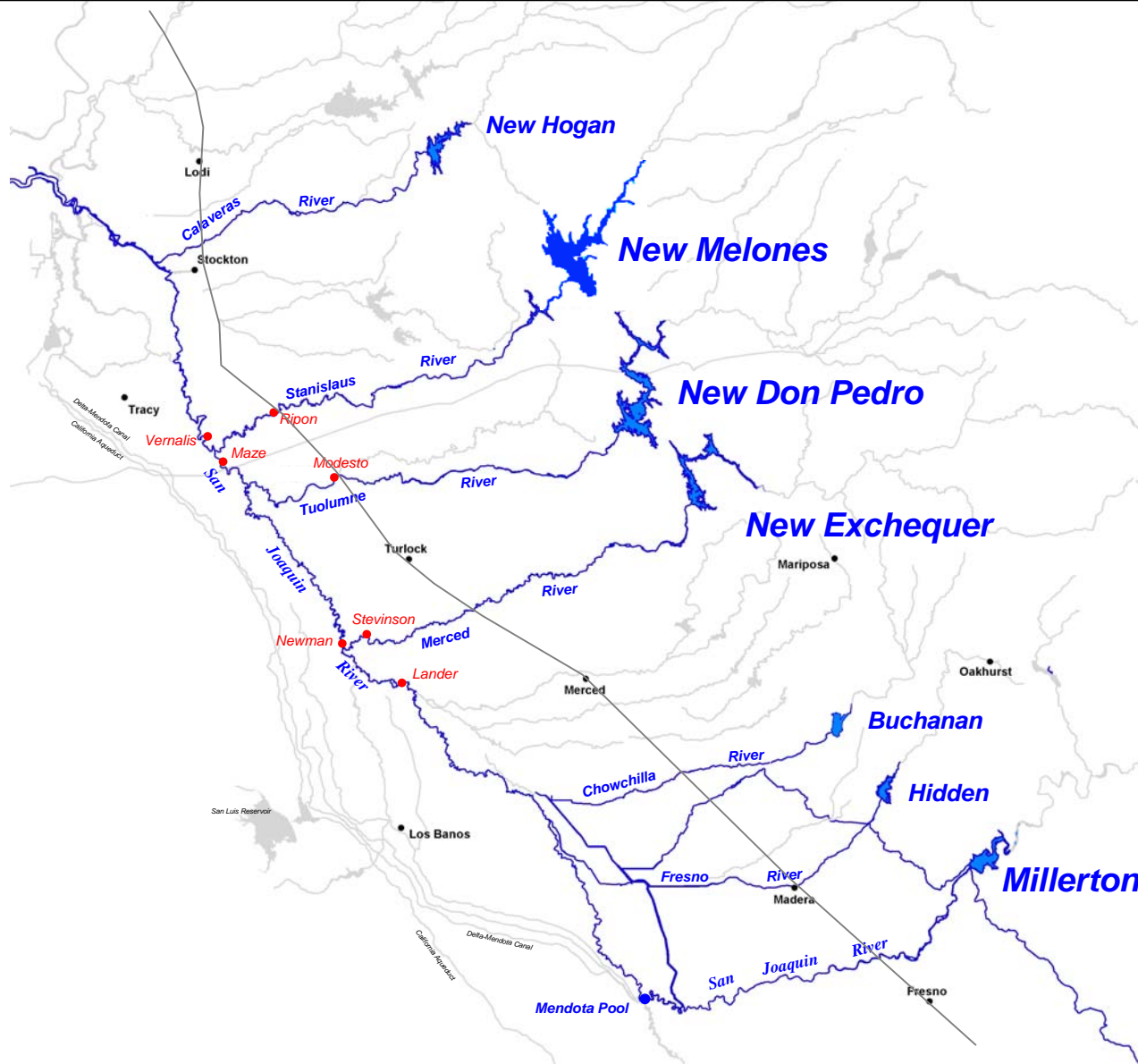


CALSIM II - San Joaquin River Basin Refinements and Results

Presentation by Dan Steiner
On behalf of the San Joaquin River Group Authority
March 14, 2005

Geographic Scope



CALSIM II San Joaquin River Basin Enhancements

- **Revised hydrology**
- **Land use based demands for Eastside water districts and adjacent areas**
- **Improved system operating rules**
- **Revised mapping of Westside and Eastside connectivity**
- **Refinement / Addition of Friant and Calaveras systems**
- **New formulation for calculation of water quality at Vernalis**

Revised Hydrology

- **Stream Accretions**

Mass balance approach using long-term gages

Accounts for water entering and leaving stream reaches

- + Downstream Gage

- Upstream Gage

- + Diversions

- Return Flows

- + Runoff Adjustment

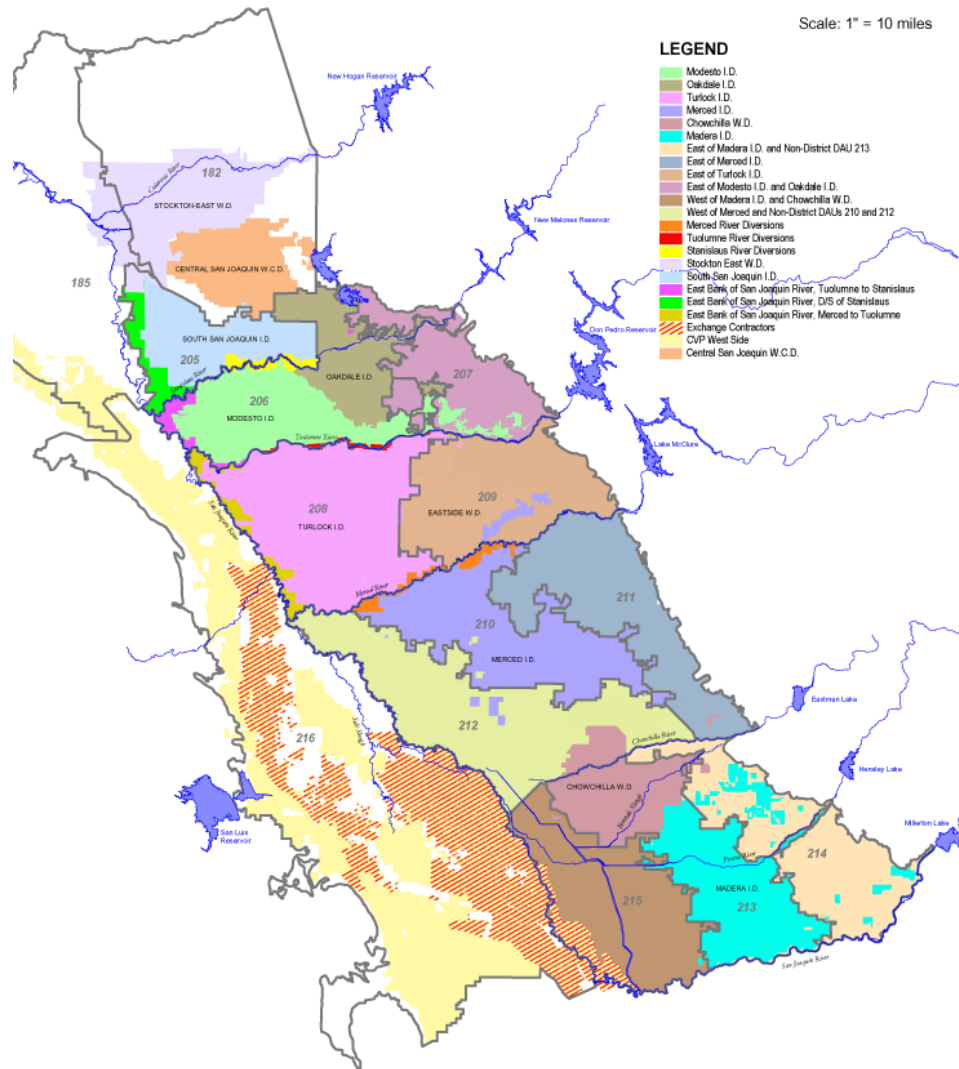
- **Resultant Value Represents**

Precipitation runoff

Historical stream-groundwater interaction

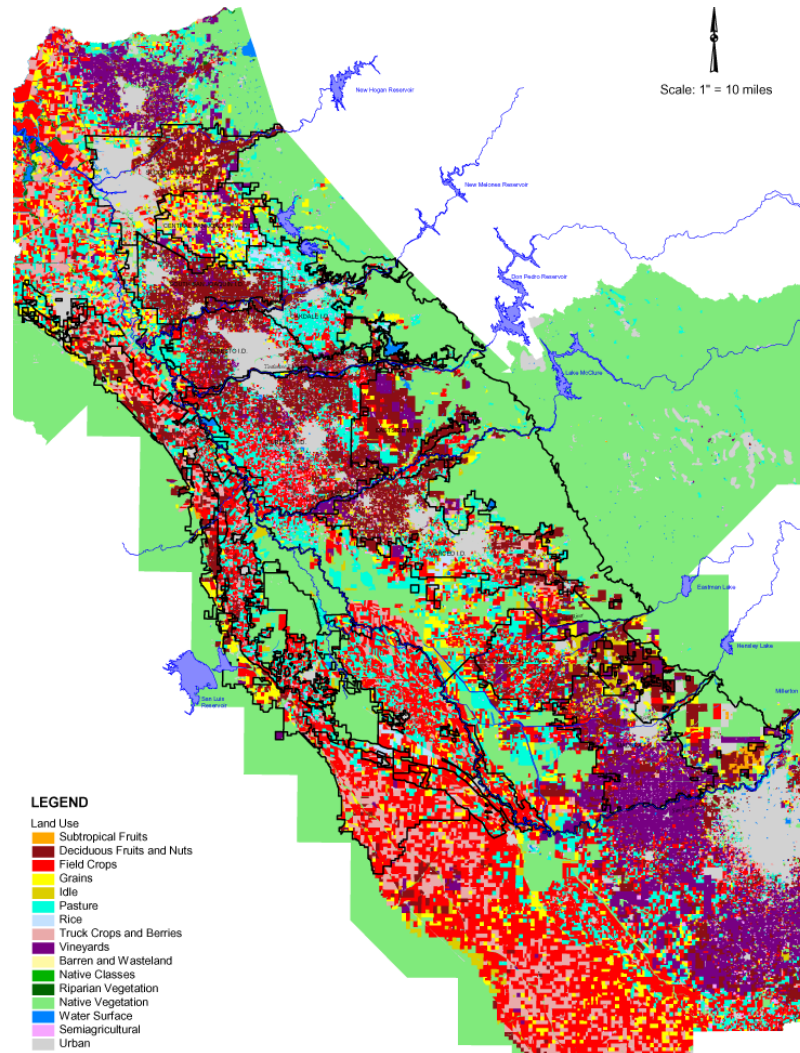
Gage errors

Representation of Land-use Based Demands Water Use Areas

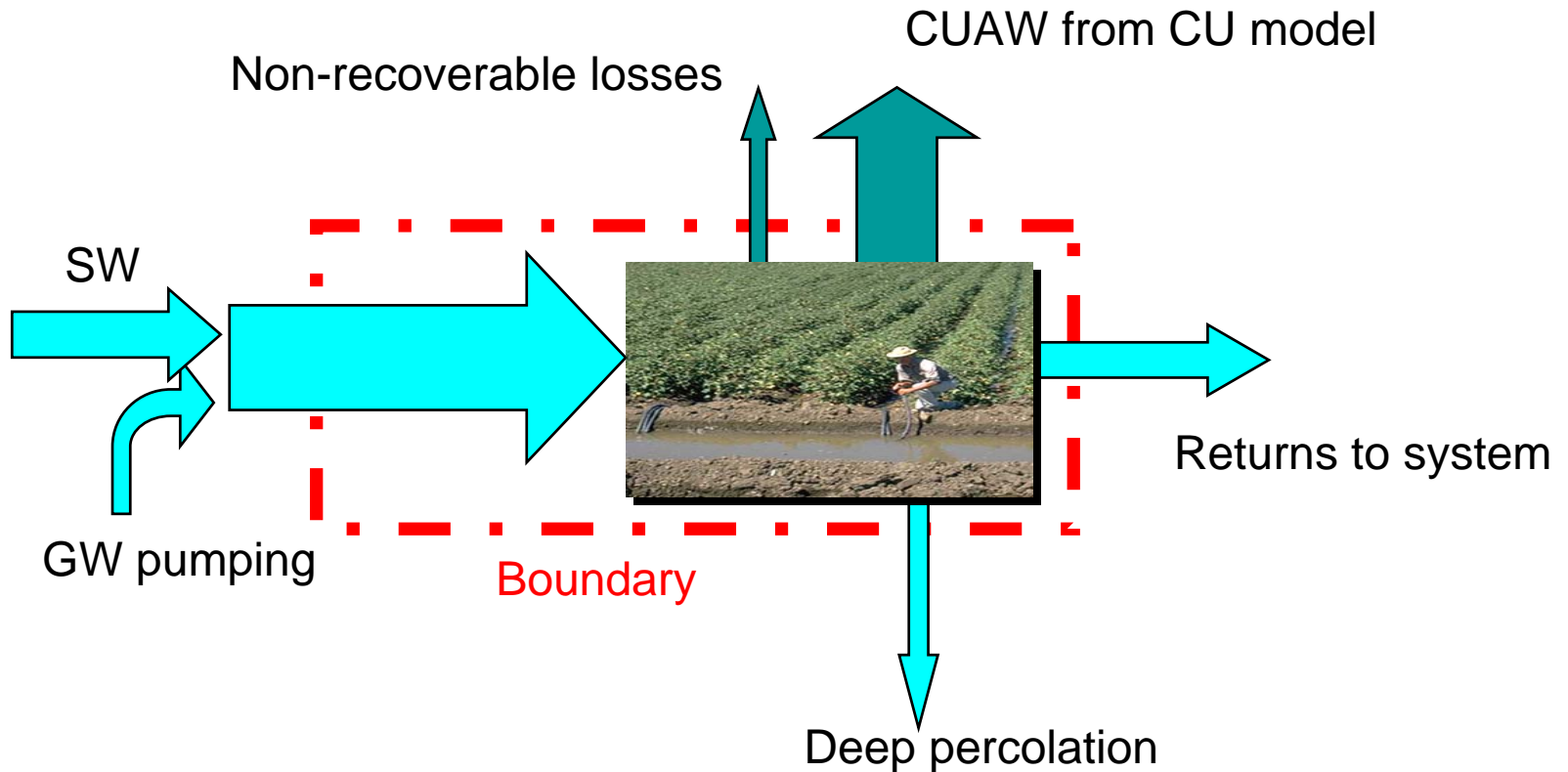


Representation of Land Use Based Demands

Land Use



Conceptual Area Water Balance Based on Land Use Demands



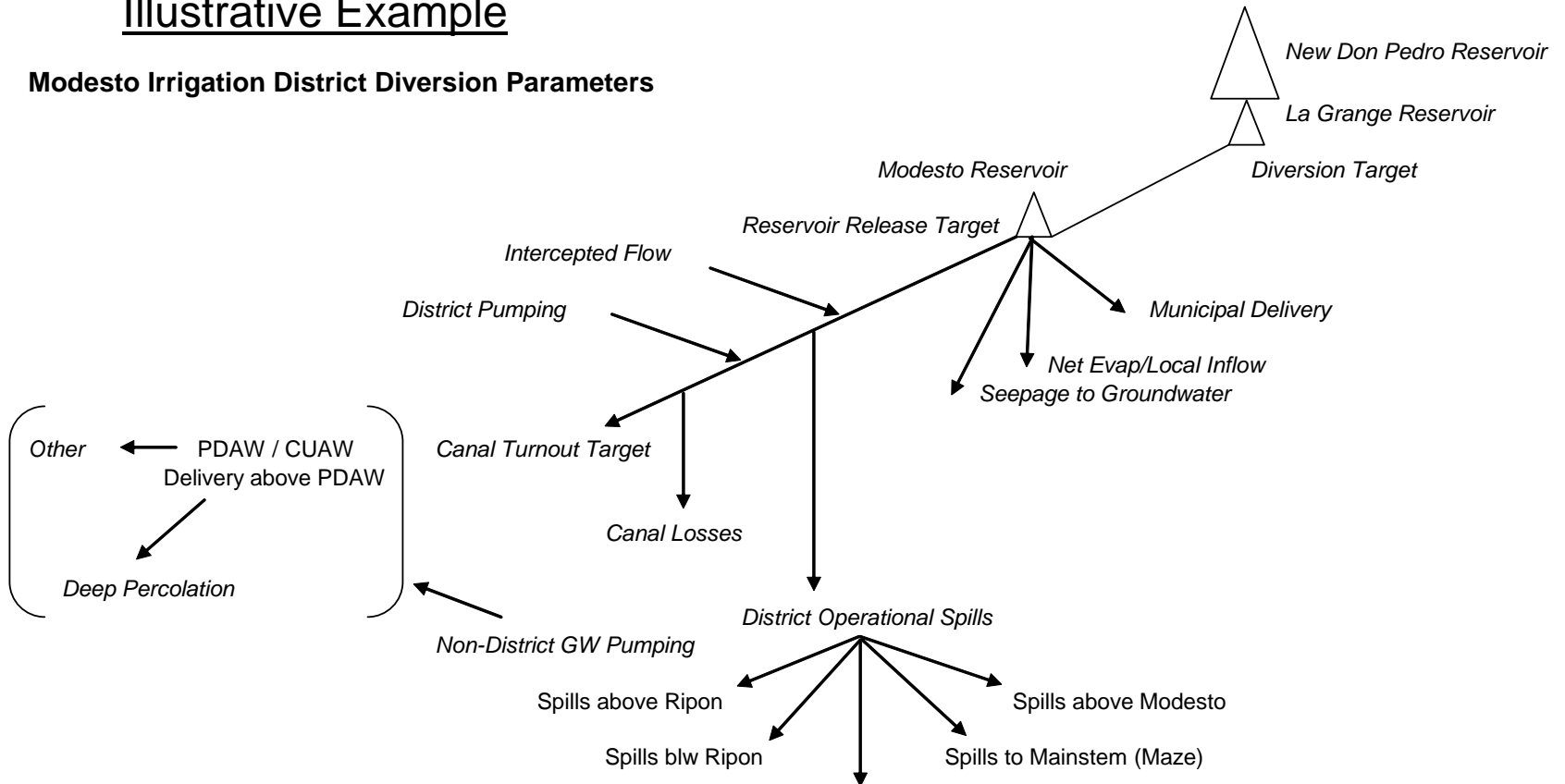
Water Budgets and Representation of System Operations

- **Use historical land use to estimate consumptive use**
- **Use historical operations data to perform water budgets**
- **Results of water budgets are used to develop**
 - Stream diversion requirements**
 - Groundwater use parameters**
 - District Operations**
- **Approach varies depending on available data**
- **Validation of system operations**
 - Ensure model simulation depicts recent operations**

Representation of System Operations

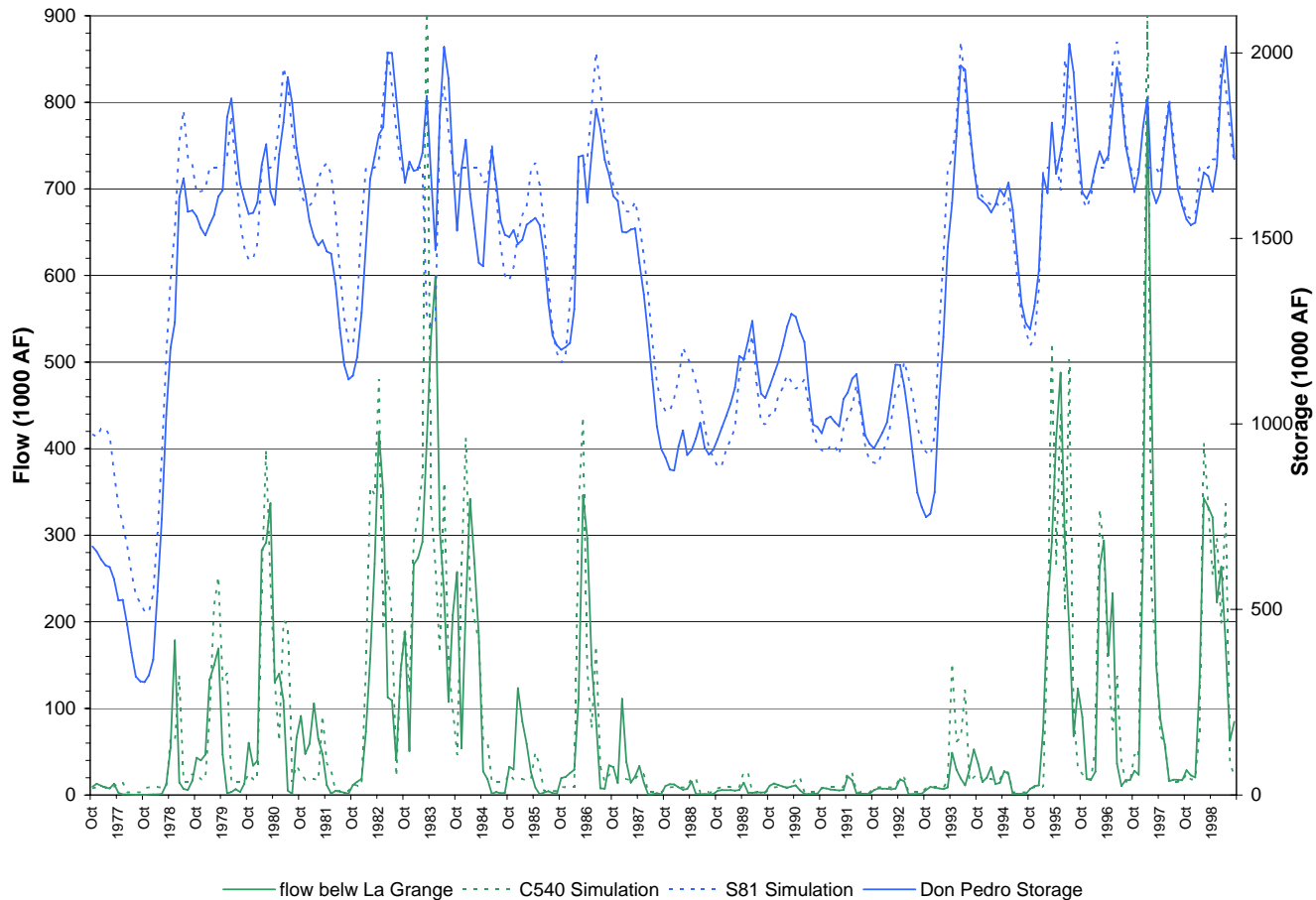
Illustrative Example

Modesto Irrigation District Diversion Parameters

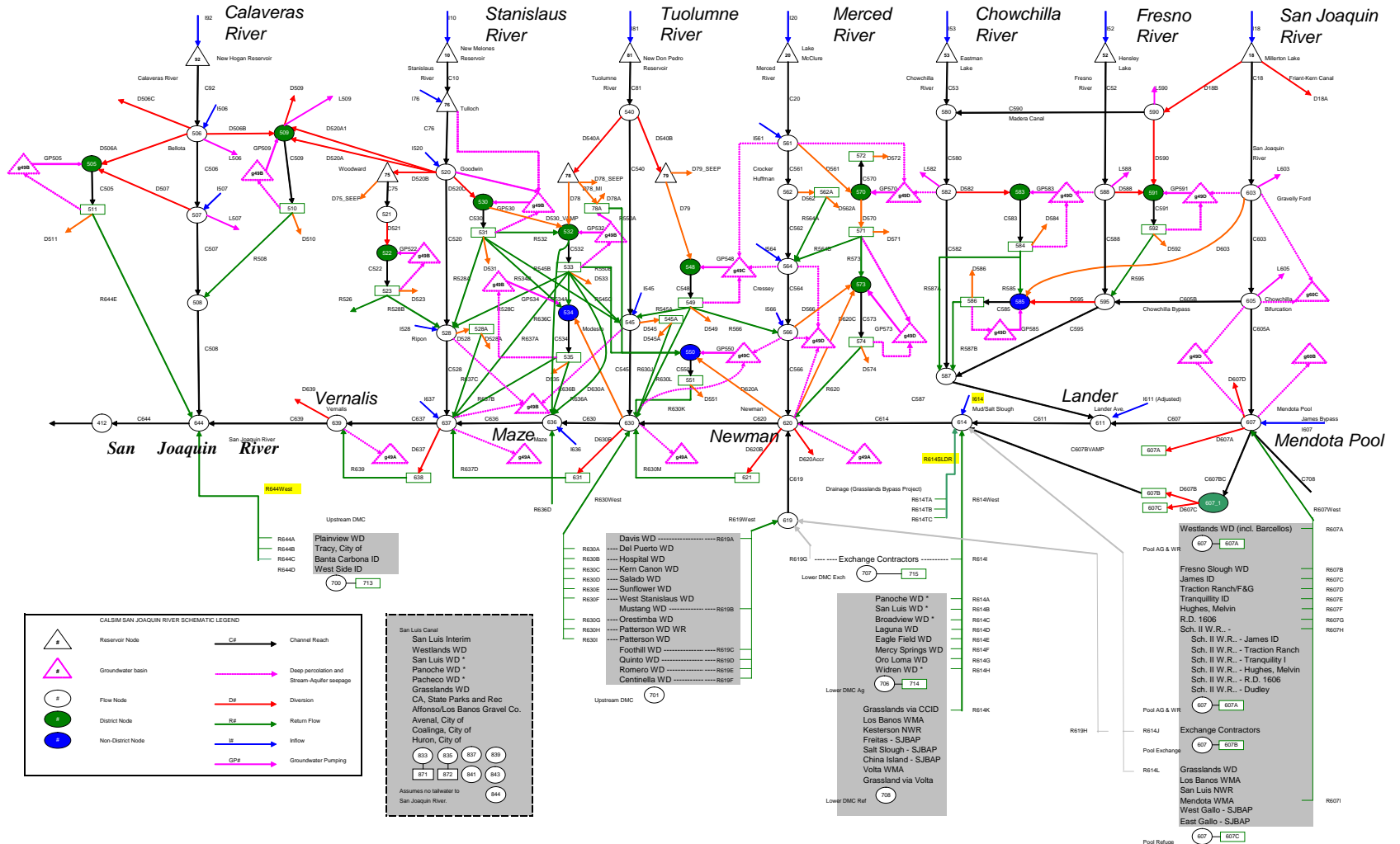


Validation of System Operations

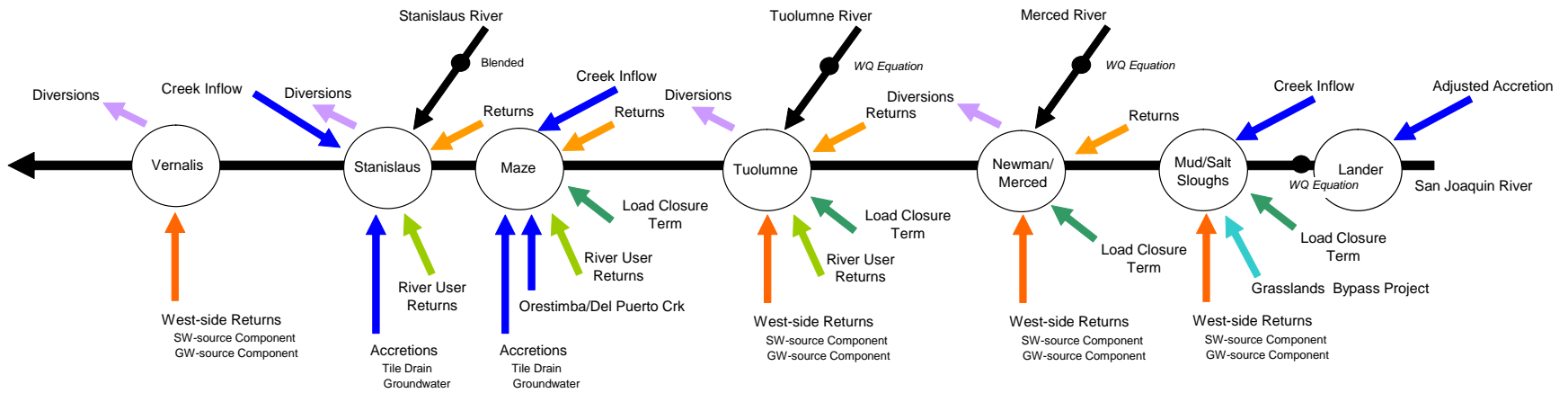
New Don Pedro Operations



Comprehensive San Joaquin River Basin Model



Comprehensive San Joaquin River Basin Model Simple Version Including Water Quality



CALSIM II Current Conditions Test Simulation

- **CALSIM II fully integrated model logic, last modifications through January 2005.**
- **Logic and results are currently under review with Reclamation**
- **Represents current basin operations**
 - Decision 1641**
 - Decision 1422**
 - New Melones Interim Operations Plan**
 - San Joaquin River Agreement**

CALSIM II Current Conditions Test Simulation

- **First, results are presented for “Maze”, the San Joaquin River upstream of the Stanislaus confluence**

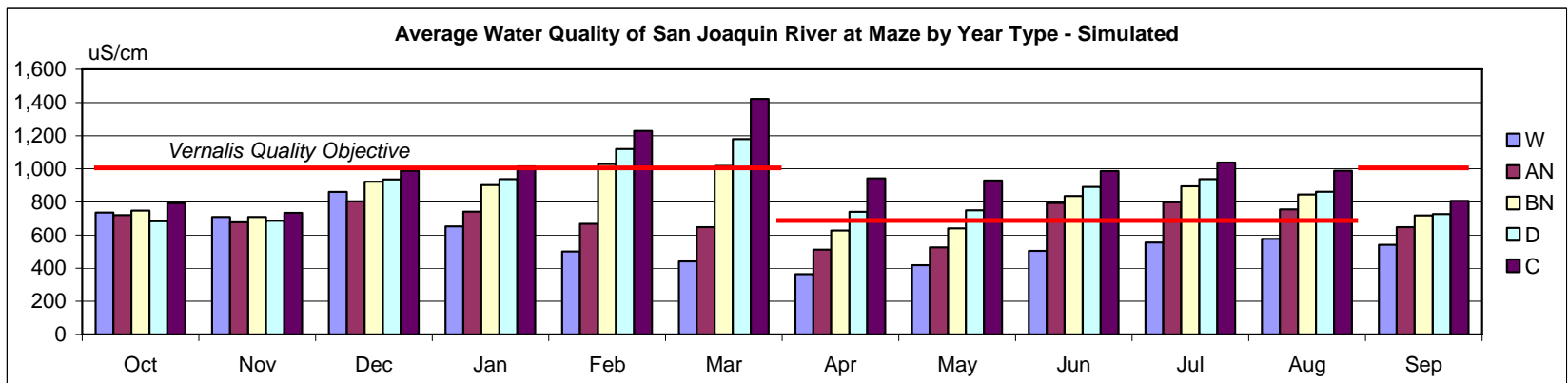
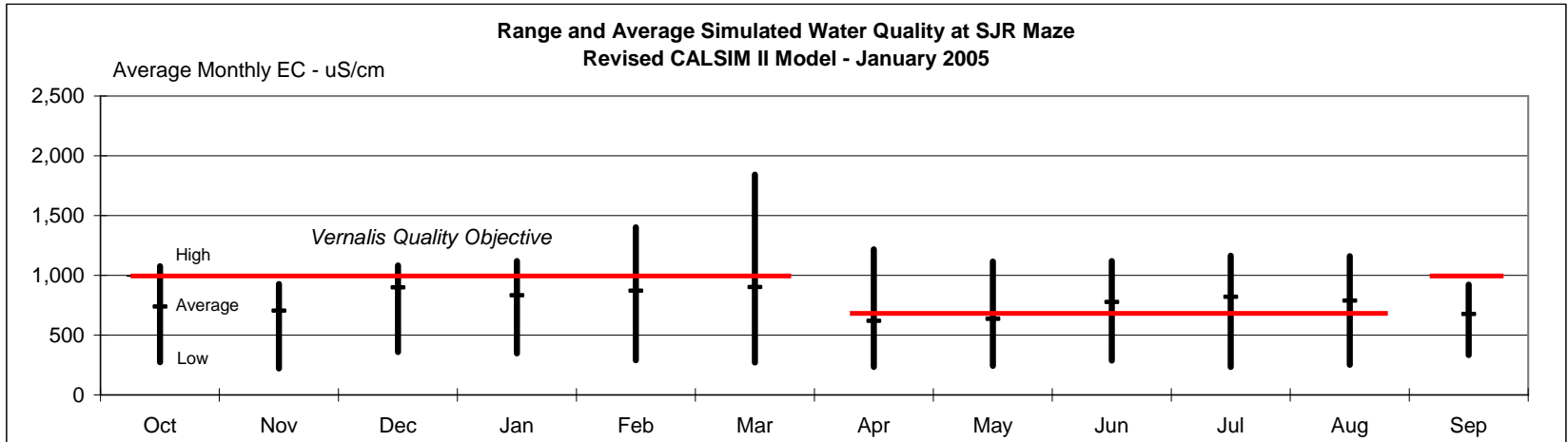
Captures the effects of upstream operations of the Merced River and Tuolumne River, and the occasional flow from the upper San Joaquin River and Kings River

Water quality estimated with new CALSIM II mass balance approach

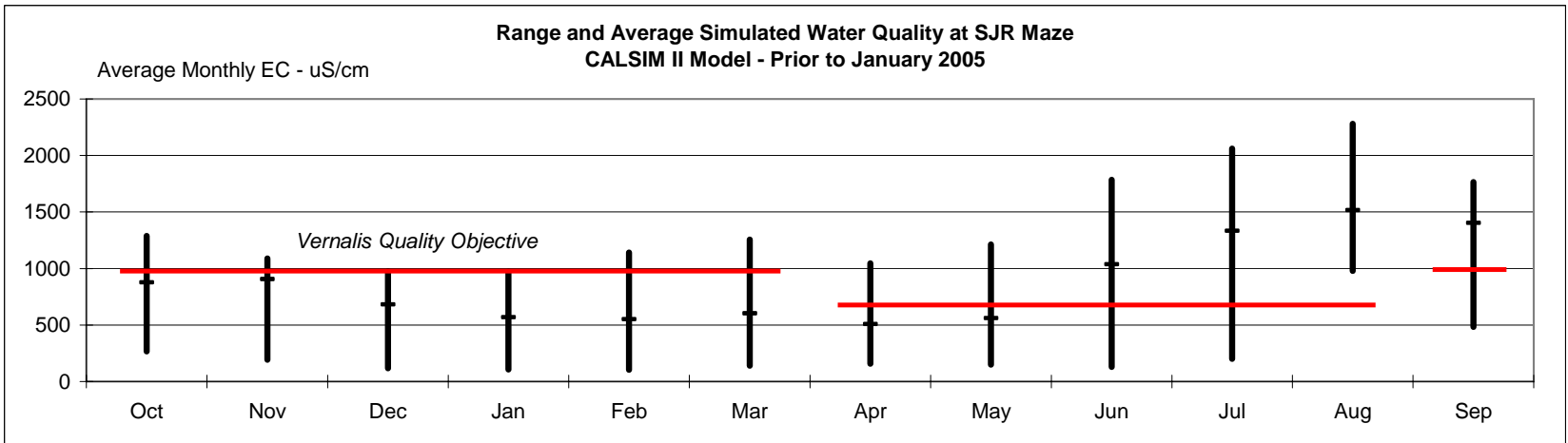
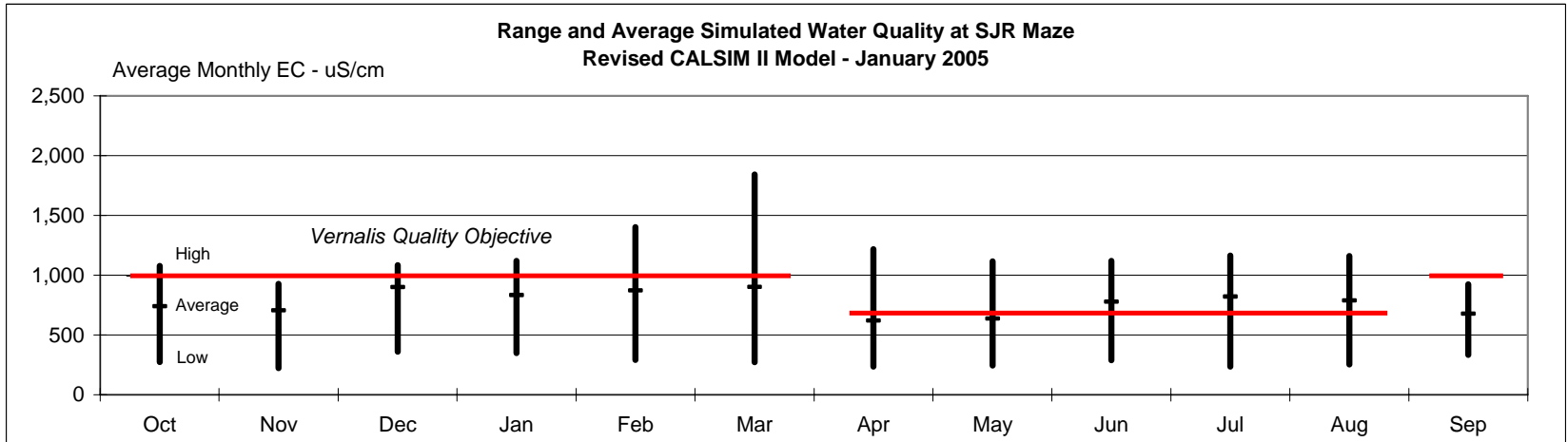
- **Results are then presented for “Vernalis”, as the conditions are affected by the Stanislaus River and the operation of New Melones**

Captures the effects of New Melones operating to the Interim Plan of Operation, sometimes specifically for Vernalis flow and quality objectives

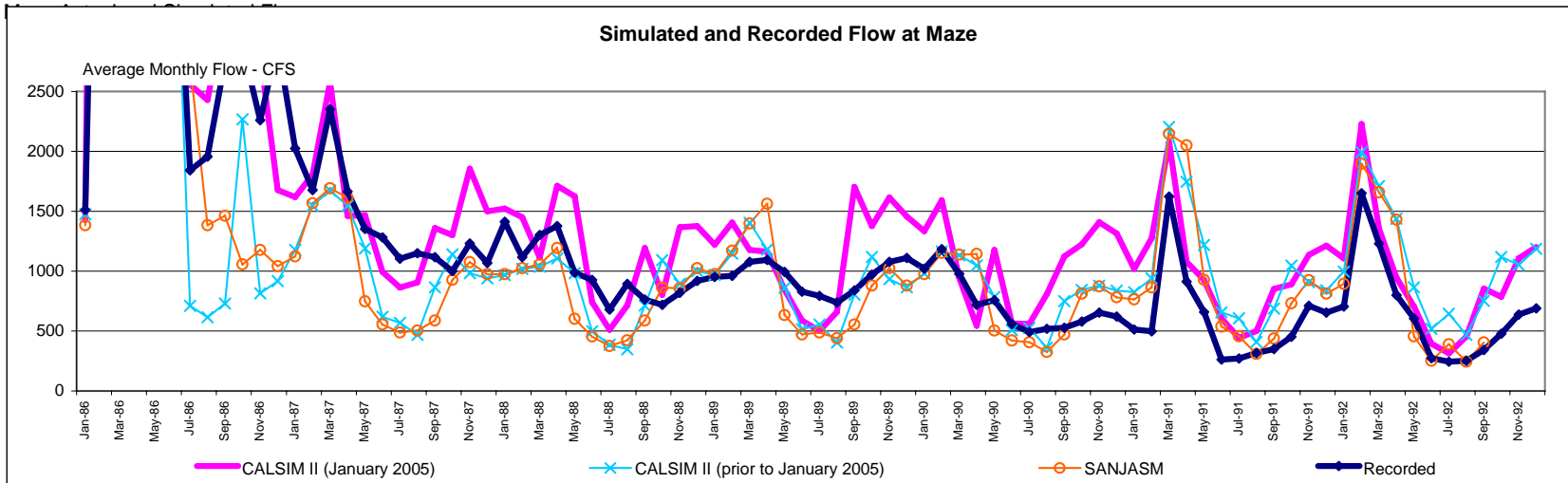
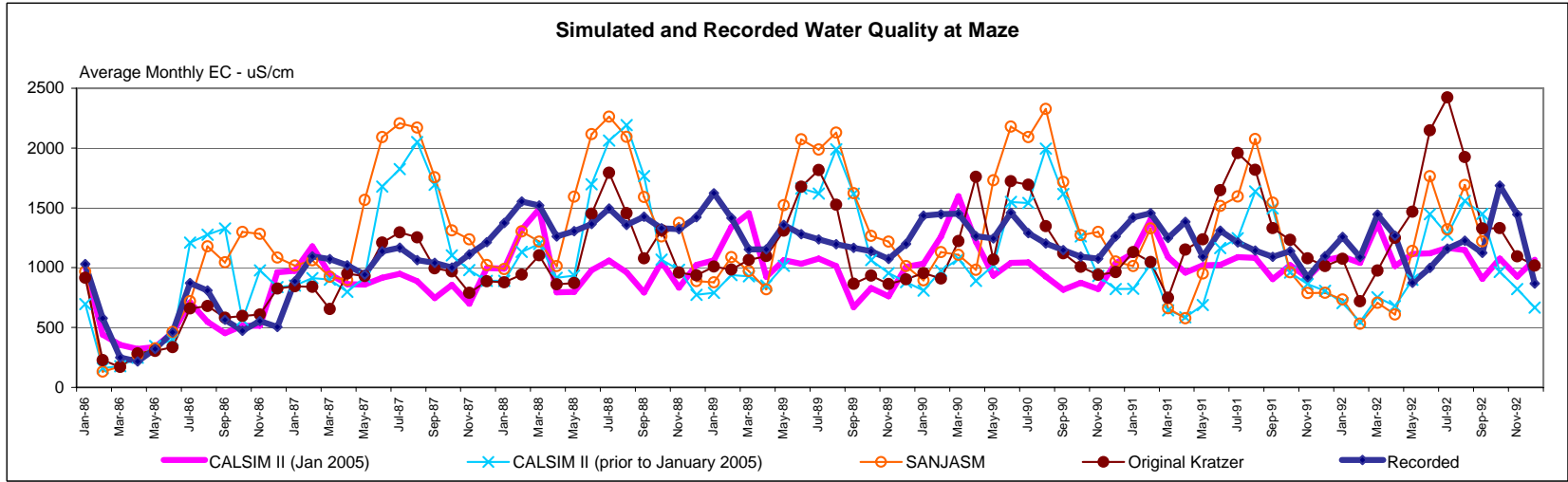
Simulation of San Joaquin River at Maze



Simulation of San Joaquin River at Maze Comparison to Previous Modeling



Simulation of San Joaquin River at Maze Comparison to Previous Modeling



Simulation of San Joaquin River at Vernalis Stanislaus River Interim Plan of Operations

New Melones Storage Plus Inflow		Fishery		Vernalis Water Quality		Bay-Delta		CVP Contractors*	
From	To	From	To	From	To	From	To	From	To
0	1,400	0	98	0	70	0	0	0	0
1,400	2,000	98	125	70	80	0	0	0	0
2,000	2,500	125	345	80	175	0	0	0	59
2,500	3,000	345	467	175	250	75	75	90	90
3,000	6,000	467	467	250	250	75	75	90	90

* CVP Contractors: Stockton East Water District and Central San Joaquin Water Conservation District

1. Releases for the fishery according to an assumed pattern associated with the allocated volume.
2. Releases up to the amount needed above the fishery release to meet the Vernalis water quality requirement, these accumulated releases cannot exceed the annual Vernalis water quality allocation.
3. Releases for DO at Ripon (surrogated as a flow requirement at Goodwin), with no volume limitation except the flow requirement itself.
4. Releases for the Vernalis D-1641 Bay-Delta flow requirement. The IPO assumed that the Vernalis flow requirement release occurred as the second step; however, for modeling simplicity the release is modeled last. Results are rarely affected by the shift in order.

Simulation of San Joaquin River at Vernalis

Vernalis Objectives

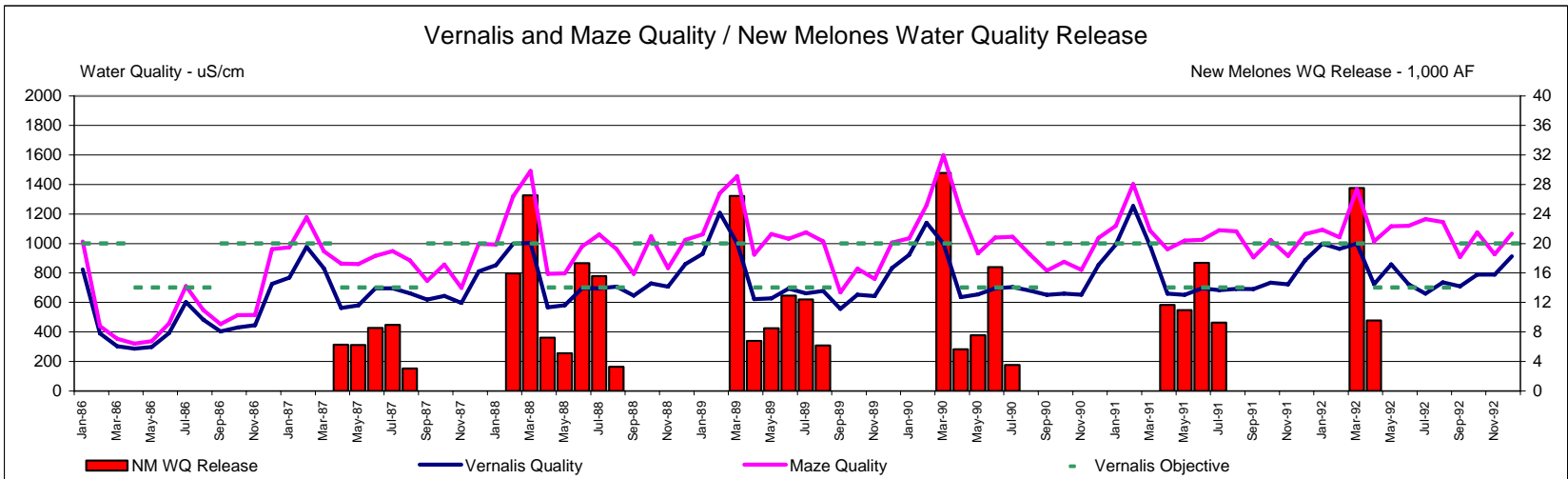
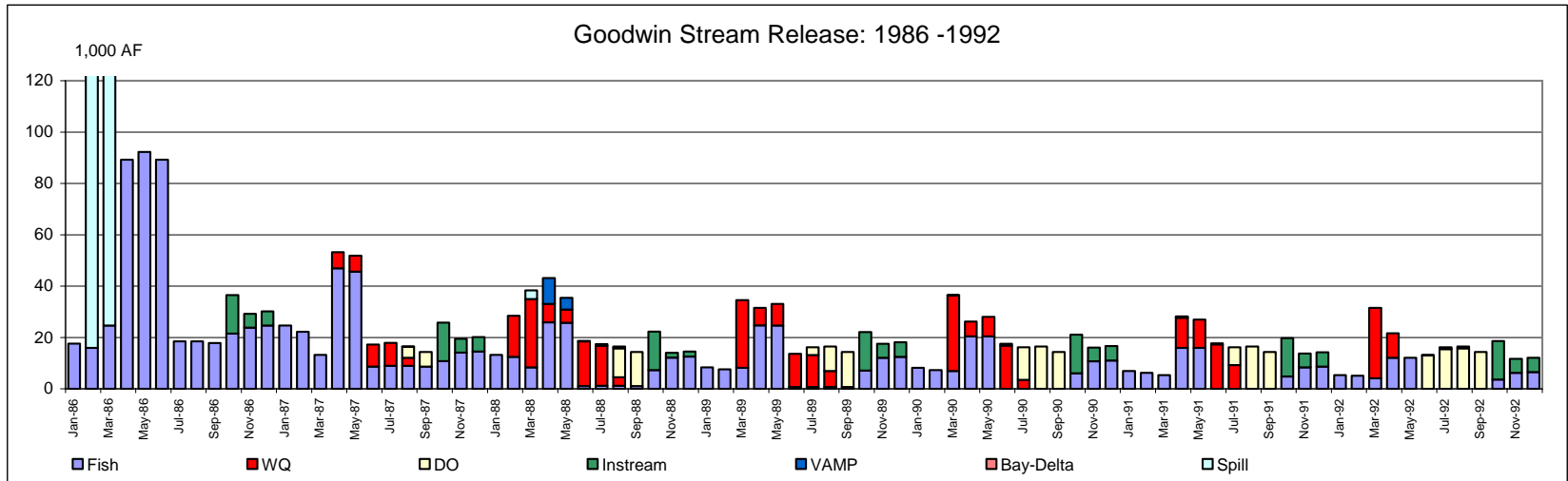
The current water quality objective at Vernalis is a running 30-day average of 700 uS/cm for April 1 through August 31, and 1000 uS/cm for September 1 through March 31.

For the February through June non-pulse period (cfs):

San Joaquin Basin Index	X2 Required At or West of Chipps	X2 Required East of Chipps
Wet	3420	2130
Above Normal	3420	2130
Below Normal	2280	1420
Dry	2280	1420
Critical	1140	710

October objectives

Simulation of San Joaquin River at Vernalis New Melones Operations and Vernalis



Simulation of San Joaquin River at Vernalis Vernalis Water Quality Compliance

Average Monthly Water Quality at Vernalis - Simulated (uS/cm)												
WY	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1935	C	C	C	C	1080	C	C	C	C	C	C	C
1961	C	C	C	C	1058	C	C	C	C	C	717	C
1977	C	C	C	C	C	C	C	C	C	C	710	C
1988	C	C	C	C	C	C	C	C	C	C	708	C
1989	C	C	C	C	1207	C	C	C	C	C	C	C
1990	C	C	C	C	1139	C	C	C	C	C	C	C
1991	C	C	C	C	1253	C	C	C	C	C	C	C
1992	C	C	C	C	C	C	749	1011	723	C	737	C
1994	C	C	C	C	C	C	C	C	735	718	725	C

Notes: "C" means water quality was within compliance for month. Exceedence during April or May is during non-pulse flow period.

Water Quality Objective - uS/cm												
Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
1000	1000	1000	1000	1000	1000	700	700	700	700	700	1000	

Estimated Additional New Melones Release Needed to Provided Water Quality Compliance - 1,000 acre-feet												
WY	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1935					10							
1961					7						2	
1977											1	
1988											1	
1989					20							
1990					15							
1991					22							
1992							6	21	1		3	
1994									4	1	2	

End of Month New Melones Storage - 1,000 acre-feet												
WY	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1935	584	580	583	616	640	690	820	1012	1127	1074	1001	958
1961	1201	1216	1231	1239	1243	1224	1186	1132	1079	1023	966	934
1977	1448	1444	1436	1428	1400	1339	1273	1209	1181	1124	1069	1047
1988	1443	1424	1410	1414	1404	1361	1298	1222	1182	1145	1109	1081
1989	1045	1029	1022	1020	1029	1079	1047	1002	984	932	882	886
1990	906	908	923	936	952	920	856	786	733	676	633	609
1991	598	580	589	587	584	626	594	558	521	461	404	385
1992	382	371	386	400	450	467	441	361	308	252	194	166
1994	716	738	772	802	825	775	723	675	619	552	490	455

