Recommendations on export limits

San Luis & Delta-Mendota Water Authority

Summary of Authority's Position

- Maintain existing ability to vary objective
- Require that variations be considered whenever the objective is controlling or is expected to control
  - ensures that compliance results in a reasonable use of water
- Require that effects on beneficial uses be the basis of a decision to vary
  - ensures that relevant factors will be considered

Summary of Authority's Position

- Specify the information considered include:
  - A quantification of population level effects
    - ensures assessing the important measure of environmental impacts
  - Estimates of uncertainty
    - ensures full disclosure

Summary of Authority's Position

- Require that evaluation of effects be presented in writing for SWRCB and public review
  - facilitates informed decision making and public review
  - ensures that the latest and best information is being considered

Summary of Authority's Position

- Science indicates that variations may be necessary to ensure that the objective is reasonable
  - variations needed to avoid actions where benefits to fish are insignificant or non-existent and not proportional to the water required

Summary of Authority's Position

- Estimates of population level effects can be routinely made, along with any uncertainty associated with their estimates
  - Authority is not recommending something that cannot be done

Export Limits Objective
San Luis and Delta-Mendota Water Authority

- William J. ("B.J.") Miller will now provide the SWRCB with a detailed discussion of the Authority's recommendations

Export Limits Objective
Summary of Authority's Position

- WQCP already allows variations in the export limits objective
- Expand those provisions in three important ways
  - –Mandatory consideration of variations whenever the objective controls or is expected to control exports
  - –Evaluation of effects of variations and of no variation on beneficial uses
  - –Evaluations to be quantified, uncertainties to be estimated, and results presented in writing for public review

Export Limits Objective
Summary of Authority's Position (continued)

- Role of Ops Group
  - Formulate variation alternatives
  - Evaluate effects of alternatives on all beneficial uses, including no variation
  - Evaluation must quantitatively estimate population effects
  - Uncertainties explicitly considered
  - Written report for public review
- Decision by Ops Group process
- SWRCB retains final authority
- Intent
  - Net environmental and water supply improvement

Why add evaluation and reporting requirements?

Responds directly to SWRCB members' questions about population effects. For example:

" If the Cross Channel gates are closed how many more salmon do we get?"

Why add evaluation and reporting requirements?

- Consistent with CalFed ROD language about flexibility in operations

Why add evaluation and reporting requirements?

- When 1995 plan was formulated, prevailing opinion was:
  - Delta is a riverine system
  - Absolute mortality ("body count") was important

Why add evaluation and reporting requirements?

- Now, prevailing opinion:
  - Delta is tidally dominated
  - Population level effects are important

Why add evaluation and reporting requirements?

- New information all the time
- Ensure that exports based on the latest science, not waiting until next periodic review
- Gives added urgency to improve science

Estimating population level effects

- Possible? Not if you mean comparing populations with and without action
- However, we can readily estimate the percentage change in the population for various actions
- Now being done for winter run mortality at export pumps

Example for salmon mortality at export pumps

PERCENT OF ALL TAGGED SALMON SMOLTS RELEASED DURING 1993-8 THAT SUFFERED DIRECT MORTALITY AT EXPORT PUMPS

RIVER	SOURCE OF FISH	RACE OF SALMON	RELEASE LOCATION	NUMBER OF RELEASE GROUPS	AVERAGE NUMBER OF FISH PER GROUP	PERCENT DIRECT MORTALITY PER RELEASE GROUP					
						TRACY PUMPING PLANT			BANKS PUMPING PLANT		
						MINIMUM	**AVERAGE**	MAXIMUM	MINIMUM	**AVERAGE**	MAXIMUM
SACRAMENTO RIVER SYSTEM	COLEMAN HATCHERY	LATE FALL RUN	COLEMAN HATCHERY	59	68,900	0.00	**0.02**	0.16	0.00	**0.34**	2.08
			DELTA[1]	17	39,000	0.00	**0.07**	0.35	0.00	**1.76**	10.30
		WINTER RUN	COLEMAN HATCHERY	104	1,600	0.00	**0.00**	0.00	0.00	**0.00**	0.19
		FALL RUN	COLEMAN HATCHERY	75	50,900	0.00	**0.00**	0.03	0.00	**0.00**	0.09
	FEATHER RIVER HATCHERY	FALL RUN	FEATHER RIVER HATCHERY	29	51,500	0.00	**0.00**	0.00	0.00	**0.00**	0.00
			DELTA[1]	99	41,600	0.00	**0.23**	1.87	0.00	**0.13**	1.43
		SPRING RUN	DELTA[1]	2	49,600	0.00	**0.01**	0.02	0.00	**0.13**	1.43
	TRAPPED WILD FISH	SPRING RUN	BUTTE AND MILL CREEKS	9	1,800	0.00	**0.00**	0.00	0.00	**0.00**	0.00
SAN JOAQUIN RIVER SYSTEM	MERCED HATCHERY	FALL RUN	MERCED HATCHERY	74	27,700	0.00	**0.51**	2.22	0.00	**0.69**	8.32
			DELTA[2]	21	34,700	0.00	**0.11**	0.77	0.00	**0.10**	0.65

[1] Consists of releases into the Sacramento River near Sacramento and downstream in the Delta.

[2] Consists of releases into the San Joaquin River near Mossdale and downstream in the Delta.

Conclusions about salmon mortality at pumps

- When population level effects are estimated (as opposed to absolute numbers of fish dying), conclusion about importance changes
- Appears that except for rare cases, mortality of salmon at pumps is not very important

Percentage change in population of the affected life stage "PCPALF"

- Can be estimated for many actions of interest
- Convenient basis for comparing actions and evaluating a single action
- Can be combined for overall effect of several actions
- Can make "all else being equal" estimates of population change
- Can adjust to account for non-proportional effects (density dependence)

Percentage change in population of the affected life stage "PCPALF"

The currency for rational decisions about actions to protect fish

How can the percentage change in population of the affected life stage be estimated?

- Directly: for example
  - smolt mortality at pumps ÷ number of smolts entering Delta
  - number of adults harvested ÷ (number harvested + number spawning)
- Using correlation equations

Using correlation equations to estimate PCPALS

- Correlations between the action (export rate) and effect (survival through Delta), if there is a correlation

S = f(water temp, river flow, exports?)

- If N is # smolts entering Delta

$100\%*(NS_2 - NS_1)/ NS_1$

$= 100\%*(S_2 - S_1)/ S_1 = PCPALS$

Summary of new information on percentage change in population of the affected life stage related to exports

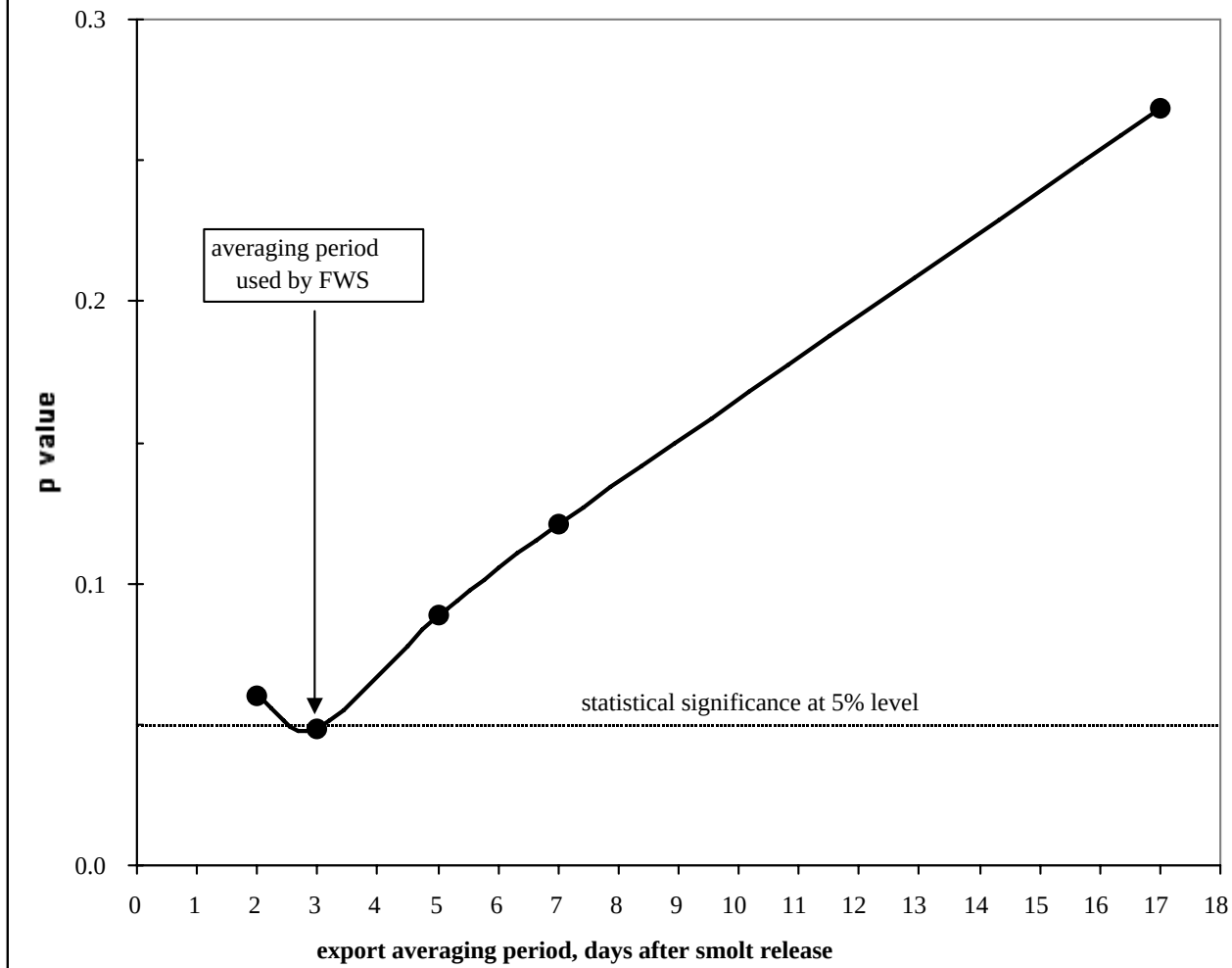
Summary: new information on PCPALS re exports

- Not being presented to argue that export requirements should be revised
- Only to argue that variability should be maintained and evaluation and reporting requirements required

Sacramento salmon

- December-January experiments
  - Statistically significant effect of smolt survival vs. exports
  - Only if exports averaged over 3 days
  - Otherwise, not statistically significant
  - Implication:
    - 2-4% increase in smolts leaving Delta
    - If 1,000 cfs for 90 days, 180,000 acre-feet
  - Conclusions:
    - Questionable effect?
    - Significant water supply cost

statistical significance (p values)
vs. export averaging period
for
correlation of relative smolt survival vs. export rate



Sacramento salmon

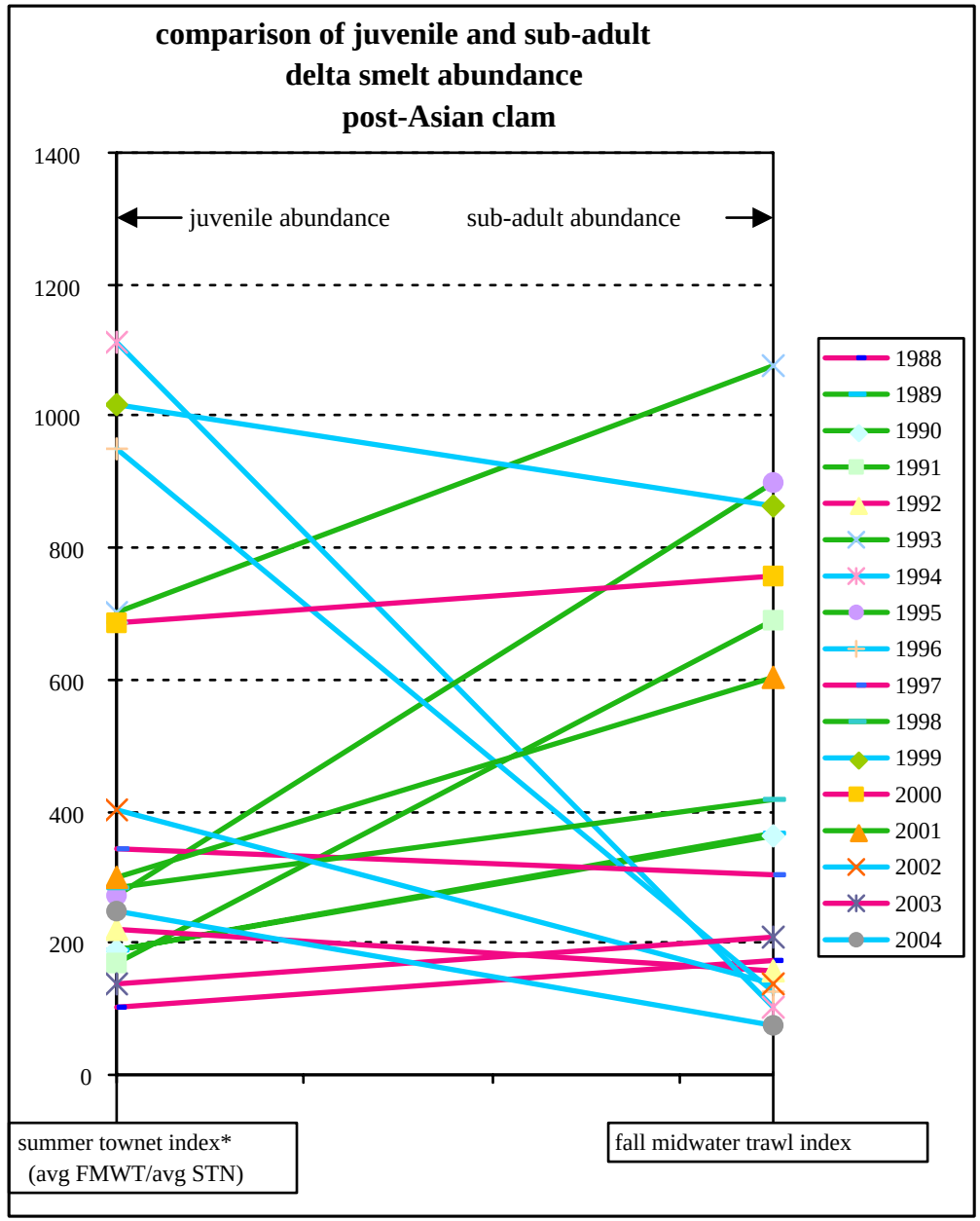
- Newman analysis of fall run
  - Presumably most sensitive race
  - 61 upstream releases matched with 19 downstream ones
  - 40,000-100,000+ fish per release
- Manly analysis of Newman:
  - Considerable uncertainty about export effects
  - More work needed

San Joaquin salmon

- Manly analysis of VAMP data collected to date
  - No statistically significant effect of exports on smolt survival with barrier at head of Old River

Delta smelt

- No statistically significant relationship between juvenile abundance and subsequent sub-adult abundance
- % juveniles entrained at export pumps does not appear to affect adult population for entrainment in range of 0-25%.


comparison of juvenile and sub-adult
delta smelt abundance
post-Asian clam
1400
1200
1000
800
600
400
200
0
juvenile abundance
sub-adult abundance
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
summer townet index*
(avg FMWT/avg STN)
fall midwater trawl index

Conclusion

- Effects of export curtailments on population of salmon and delta smelt cannot be assumed to be significant
- Ongoing critical examination of export curtailments is necessary using the latest and best science

Table 3	WATER QUALITY OBJECTIVES FOR FISH AND WILDLIFE BENIFICIAL USES	(continued)

COMPLIANCE LOCATION	INTERAGENCY STATION NUMBER(RKI 1[])	PARAMETER	DESCRIPTION (UNIT) [2]	WATER YEAR TYPE [3]	TIME PERIOD	VALUE
EXPORT LIMITS [NEW FOOTNOTE]						
		Combined export rate [20]	*Maximum 3-day running average (cfs)*	*All*	*Apr 15-May 15 [21]*	*[22]*
			Maximum percent of Delta inflow diverted [23]~~[24]~~	*All*	*Feb-Jun*	*35% Delta inflow [25]*
				All	*Jul-Jan*	*65% Delta inflow*

[**New Footnote**] Variations to the maximum export rates are authorized and shall be considered whenever these maximum export rates are controlling or are expected to control exports. Upon notification by either the DWR or the USBR of such a condition, the operations group established under the Framework Agreement shall consider a variety of possible operations. For each variation considered, the operations group must compare the potential effects of the proposed variation with a lack of change on the beneficial municipal and industrial, agricultural, and fish and wildlife uses of the water involved. The evaluation of fish and wildlife uses must include, but need not be limited to, a quantitative consideration of the effects of the variation or lack thereof on the population levels of fish species including those protected under the State or federal endangered species acts. Evaluation of all uses should explicitly consider the uncertainties in the estimates of effects. Disputes within the operations group will be resolved by the CALFED policy group. Within 5 days of the notification by either the DWR or the USBR, a description of the comparisons described above and the results of their evaluations by the operations group shall be presented in a report (1) to the CALFED policy group in the event of a dispute, and (2) to the SWRCB in all circumstances. This flexibility is intended to result in net environmental and water supply benefits and no net water supply cost annually within the limits of the water quality and operational requirements of this plan. Any agreement on variations will be effective immediately. The SWRCB, or its Executive Director, shall have 5 days to order an action other than that decided by the operations group or policy group. If the SWRCB, or its Executive Director, does not order an action within 5 days, the decision by the operations group or policy group will remain in effect.

* * *

[22] Maximum export rate is 1,500 cfs or 100% of 3-day running average of San Joaquin River flow at Vernalis, whichever is greater. ~~Variations to this maximum export rate are authorized if agreed to by the operations group established under the Framework Agreement. This flexibility is intended to result in no net water supply cost annually within the limits of the water quality and operational requirements of this plan. Variations may result from recommendations of agencies for protection of fish resources, including actions taken pursuant to the State and federal Endangered Species Act. Disputes within the operations group will be resolved by the CALFED policy group. Any agreement on variations will be effective immediately and will be presented to the Executive Director of the SWRCB. If the Executive Director does not object to the variations within 10 days, the variations will remain in effect.~~

* * *

~~[24] The percent Delta inflow diverted values can be varied either up or down. Variations are authorized subject to the process described in footnote 22.~~

- Variations to the maximum export rates are authorized and shall be considered whenever these maximum export rates are controlling or are expected to control exports.

- Upon notification by either the DWR or the USBR of such a condition, the operations group established under the Framework Agreement shall consider a variety of possible operations.
  - For each variation considered, the operations group must compare the potential effects of the proposed variation with a lack of change on the beneficial municipal and industrial, agricultural, and fish and wildlife uses of the water involved.
  - The evaluation of fish and wildlife uses must include, but need not be limited to, a quantitative consideration of the effects of the variation or lack thereof on the population levels of fish species including those protected under the State or federal endangered species acts.
  - Evaluation of all uses should explicitly consider the uncertainties in the estimates of effects.
  - Disputes within the operations group will be resolved by the CALFED policy group.

- Within 5 days of the notification by either the DWR or the USBR, a description of the comparisons described above and the results of their evaluations by the operations group shall be presented in a report (1) to the CALFED policy group in the event of a dispute, and (2) to the SWRCB in all circumstances.

- This flexibility is intended to result in net environmental and water supply benefits and no net water supply cost annually within the limits of the water quality and operational requirements of this plan.

- Any agreement on variations will be effective immediately.
- The SWRCB, or its Executive Director, shall have 5 days to order an action other than that decided by the operations group or policy group.
- If the SWRCB, or its Executive Director, does not order an action within 5 days, the decision by the operations group or policy group will remain in effect.