

To: DNCT - biology team
From: Jim White
Re: Comments on 3/10/99 Rules of The Game for EWA
Date: 3/21/99

These comments are intended to clarify and add to the discussion of 3/18 regarding Bruce's draft rules for adjusting the historical salvage records and scoring the actions taken during EWA games.

Sacramento salmon smolts

1. Close DCC reduces entrainment by half.

We expect that closing the DCC gates will reduce entrainment. For the purposes of the game, your estimate of 50% is close enough.

The reduction is expected to be smaller than the percent reduction in XGEO when the gates are closed (reduction from about 30 percent XGEO to about 10 percent XGEO, or 66%). Entrainment would not be expected to decline by the same amount if the survival of salmon that end up in the interior Delta through Georgiana Slough is lower with the gates closed than it would be with them open.

We need to consider survival and productivity effects as well as entrainment when we score the game. In a overly simplified calculation of survival based on change in Sacramento flow and fish splits (70:30 with the DCC gates open and 90:10 with them closed), and survival assumed to be 90% via the Sacramento River and 10-50% via the interior Delta, the improvement in survival due to DCC closure ranges from 10-24 percent, with the greatest improvement associated with the lowest interior Delta survival rate. If survival in the River were assumed to be 80% with the gates open and 90% when the gates were closed (due to the increased flow), the survival improvement due to gate closure ranges from 19 - 35 percent across the range of Delta survival rates used. The Newman-Rice model estimate that BJ mentioned was a 25 percent improvement in survival due to DCC closure, within the range estimated from my crude calculations.

I need to retract an assertion I made Thursday at the DNCT meeting. The inadvertent corruption of a fall run CWT salmon data set during manipulation of those files by DFG led to an analysis with results suggesting that at about 7000-8000 cfs export rate the survival of Sacramento salmon would be lower with the gates closed than with them open. The problems with the data set were discovered recently when the results could not be replicated. The data set has been restored and results of subsequent re-analysis sent to me Friday do not support this conclusion. Instead they indicate that emigrating Sacramento river salmon survival is 1) higher and 2) declines less rapidly with increasing exports with the gates closed than with the gates open. Sorry for confusing the already fragile discussion we were having Thursday with this misinformation.

2. Reducing exports on a daily basis reduces entrainment proportionately.

Expect this is generally true. In addition, mortality indirectly related to exports will be reduced and survival will improve (productivity effect).

San Joaquin basin salmon smolts

1. Increasing Qwest reduces entrainment by 50% per 2000 cfs when Qwest <4000 cfs.

Probably sufficient to describe conditions in terms of San Joaquin flow and exports since Qwest will change directly in relation to changes in either Vernalis Q or exports.

2. Reducing exports on daily basis reduces entrainment proportionately.

Expect this is generally true, especially for smolts actively migrating to the ocean. For fry near the diversion points there is the same problem as for delta smelt - save them today and entrain them tomorrow. Also expect indirect losses of San Joaquin salmon are reduced (productivity effect).

3. VAMP conditions reduce entrainment 2 X proportionately.
4. HOR reduces smolt entrainment by 60%.

Obviously this is complex because these actions produce related effects. Since VAMP modifies both Vernalis flow and export rate, two types of effects are expected. Bruce describes the effect as being "2X proportionately". I am not sure exactly what that means. Without the HOR, the VAMP export shift would reduce entrainment proportionately. But it probably would be an exaggeration to reduce historical entrainment that occurred when there was no HOR by the fraction of export rate reduction for VAMP if the HOR is presumed to be there too.

Bruce's rule says the HOR would reduce entrainment by 60%. Is this the anticipated reduction in the proportion of emigrating SJ smolts that are entrained by the CVP/SWP or the percent reduction in the number entrained? On any given day, the HOR reduces the number of smolts that migrate directly to the pumps via Old River from 60% of downstream migrants, the typical portion of SJR flow that goes into Old River, to 0%. It would be an exaggeration to say that the HOR eliminates entrainment of all salmon kept out of upper Old River, because they may be entrained after traveling down the San Joaquin and approaching the pumps from the north. Without the HOR most of the SJ smolts entrained by the CVP/SWP probably got to the pumps via Old River. So if most of the smolts among the 60% redirected by the HOR actually avoid being entrained, and the chance entrainment of the other 40% of smolts which previously migrated down the SJR does not increase radically, the percent reduction in SJ smolt entrainment could be fairly high - perhaps much greater than 60%. Or if the probability of entrainment is high even for smolts in the SJ past Stockton, the entrainment reduction due to HOR may be much less. The maximum entrainment reduction attributable to HOR would be expected when exports are very low and flows are high.

In the game, we will want to determine first if the flows in April are so high as to preclude having the HOR installed or, if a concrete/steel barrier were constructed, closed. If the HOR is

in, we could try to adjust entrainment from historical. I suggest the range of effect of the HOR on SJ smolt entrainment might be a 10-20 percent reduction with low flows and high exports up to 80-90% reduction with higher flows and low exports. The combination of lower exports and higher flows is expected to improve survival, but I don't know how describe the effect in terms of entrainment. Obviously the effects of flow and export on entrainment and survival are confounded and I don't know how well our current information (or at least my understanding of it) enables us to estimate either the combined effect or to separate the effects of each factor.

Spring run salmon yearlings

I agree there is no basis for treating the effects on these fish much differently from fall run smolts in the spring. Again, we ought to account for "productivity effects" as survival improves as exports decline, but the effect is not obviously related to changes in entrainment.

Striped bass eggs and larvae

We didn't get to this. As with other species and life stage discussions, I have a concern that we don't attribute large benefits to several different measures of environmental conditions when these measures of Delta conditions change concurrently. In this case, if exports were reduced from 8000 to 6000 cfs, and Qwest increased by 2000 cfs and X2 moved 2 km downstream as a result, the rules, as I understand them, indicate striped bass E&L entrainment would be reduced by $.25 \times .25 \times .5 \times .5$, to 1.5 percent of the original rate. This seems like an overly optimistic result for this magnitude of change in Delta conditions and suggests at least some of these percentage reductions are too high. The DCC closure rule would apply only to Sacramento River spawning and would conceivably be detrimental to striped bass eggs and larvae from spawning on the San Joaquin, so even if the effect is to reduce entrainment of bass from the Sacramento side by 50%, the overall effect on entrainment would be less.

Steelhead

1. Reducing exports on daily basis reduces entrainment proportionately.

This rule is acceptable.

2. VAMP conditions reduce entrainment 2 X proportionately.

Same comments as for San Joaquin smolts.