

December 3, 2009

FILE MEMORANDUM

FROM: Gary Fredricks

SUBJECT: McNary 2010 Spillway Configuration and Operation

Background: In preparation for the 2010 fish passage season at McNary Dam, the region has four basic decisions to make on the following issues:

1. Spring spill percentage
2. Spring TSW location
3. Summer spill percentage
4. Summer TSW location

To help with these decisions, I have summarized the passage and survival results from the active tag studies that have been conducted yearly since 2005 (Appended Tables 1-3) and I will be referring to these tables for the following recommendations. Of particular interest are the studies for the last three years (2007-09), which had TSWs installed in the spillway. However, 2006 may also be informative since the spillway was operated in a simulated TSW configuration (high gate openings in bays 20 and 22).

Recommendation for 2010 spring spill level: The past operation has been 40% spill with one TSW in spillbay 20 and the other in various locations (Bay 22, 19 and 4). The fishery managers have in the past asked for a test of a higher spill level in the spring. At first glance it would seem that the 40% level provided sufficient survival. The steelhead paired release survival estimates were quite high in 2008 and 2009, and the 2009 paired release spring Chinook dam survival estimates (Table 1) were nearly 100%. However, the same spring Chinook parameter from the 2007 and 2008 studies were at or below the BiOp dam survival standard which indicates that it may be prudent to test a higher spring spill level at this project at some future date. Also of interest is the involuntary late season 50% spill “treatment” that occurred in 2008. While not a full season block treatment estimate, this spill level did provide dam survival estimates a bit above the performance standards. In any case, the lack of a survival test in 2010 likely precludes the consideration of this option, leaving the **40% spill level as the default operation for 2010.**

Recommendation for 2010 spring TSW placement: The placement of TSWs in 2009 was a regionally contested issue. The movement of a TSW from bay 19 to bay 4 in 2009 was exploratory to see if spill passage efficiencies could be improved. While some thought there might be some benefit to passage efficiency, others thought there might be increased risk of lower efficiency and lower survival. The 2009 study results indicated that survival through this bay was very good for yearling Chinook and steelhead (as was bay 20), however, spill passage efficiency was the lowest for both species for the three year TSW study period. There seems to be little benefit of placing a TSW in bay 4 again and I **recommend going back to the placement of TSWs in bays 19 and 20 in 2010.**

Recommendation for 2010 summer spill level: Starting in 2006, the summer survival study treatment spill levels were 40% and 60%. In each year of this test ('06-'08), the 60% spill level provided the highest point estimate dam survivals. In all years the 40% level provided dam survivals lower than the BiOp performance standards while the 60% level provided dam survival higher than the standard. Because of uncontrolled early summer spill levels in 2008, the researchers were able to separate out an early season 50% spill treatment which returned a very high (99%) dam survival estimate. This prompted the move to a single 50% summer spill treatment in 2009. Unfortunately, with the addition of the full passage season, this operation returned a dam survival level (89.2%) that was no better than the 40% treatment result from the previous three years and was well under the 93% BiOp dam survival standard. **Given the results of these tests, the 60% spill level is clearly the survival “winner” and should be the level chosen for future operations.** If a 50% level must be used for whatever reason in 2010, then other survival benefits need to be considered (see next recommendation).

Recommendation for 2010 TSW placement: While TSW passage efficiency for subyearling Chinook has generally been similar to yearling Chinook, survival has not. Subyearling survival through the TSW's has also been generally worse than survival through the standard spill bays for all three years of TSW evaluation. In comparison, standard spillbay survival has been quite good at 95-100% for all treatments in all years of evaluation going back to 2005, with the higher survival levels resulting from the higher spill levels. Given the higher general spillway survival in the earlier tests, it may be possible that the combination of 50% spill and no TSWs could pull the dam survival estimate up to the BiOp standard. Also, these structures are still considered test structures. Since the benefit for subyearling passage is still in doubt, they should not be used during a non-test year. **I recommend removing the TSWs after the spring spill season.** I realize that there are logistical issues that will need further discussion.

Table 1. Yearling Chinook Passage and Survival at McNary Dam (NT=Not Tested, SR=Single Release Model, PR=Paired Release Model).

2005	24 Hr Spill (~40%, Range 35-50%)							12 hr Spill						
	TSW1	TSW2	Spill	Turbine	Bypass	Dam	Fby	TSW1	TSW2	Spill	Turbine	Bypass	Dam	Fby
Passage %	NT	NT	49.8	14.1	36.1			NT	NT	34.5	27.2	38.3		
PR Survival %	NT	NT	97.2	93.3	95.7	96.1	96.4	NT	NT	95.5	89.7	94.6	93.6	96.9
2006	Test Spill Pattern @ 40% Spill (simulated TSW pattern)							FPP Spill Pattern @ 40%						
	TSW1	TSW2	Spill ¹	Turbine	Bypass	Dam	Fby ²	TSW1	TSW2	Spill ¹	Turbine	Bypass	Dam	Fby ²
Passage %	NT	NT	61.2	11.2	27.6			NT	NT	66.1	13.7	20.2		
SR Survival %	NT	NT	96.1-96	90.2	94.3	94.9	99	NT	NT	97.2-93.7	78.2	94.7	92.5	99
PR Survival %	NT	NT	99.1-98.9	92.5	97.1	97.8		NT	NT	99-95.3	78.6	96.3	94	
2007	40% Spill (2006 spill pattern)							40% spill (2007 pattern)						
	TSW1	TSW2	Spill/Total ³	Turbine	Bypass	Dam	Fby	TSW1	TSW2	Spill/Total ³	Turbine	Bypass	Dam	Fby
	Bay 22	Bay 20						Bay 22	Bay 20					
Passage %	17.8	8.3	33.4/59.5	14.7	25.6			16.8	7.3	30.5/54.6	13.7	31.7		
SR Survival %	94	95	96.1	83.9	92.3	92.9	99.3	92.8	89	95.4	80.9	90.8	91	99.1
PR Survival %	93.8	94.8	95.9	84.7	92.1	92.8		94.9	91	97.6	81.6	92.8	93	
2008	40% Spill (season wide estimate)							Late Season (~50% spill, after May 18)						
	TSW1	TSW2	Spill/Total ³	Turbine	Bypass	Dam	Fby	TSW1	TSW2	Spill/Total ³	Turbine	Bypass	Dam	Fby
	Bay 19	Bay 20						Bay 19	Bay 20					
Passage %	10.2	7.7	47.5/65.4	13	21.6			3	3.2	72.1/78.3	6.5	15.2		
SR Survival %	90.5	96.7	96.2	90.2	94.7	94.5	99.7	96.1	96.7	98.4	80.3	96	96.7	NA
PR Survival %	92.3	98.5	97.2	91.7	96.3	95.9		97.3	97.7	98.9	80.8	97	97.3	

2009	40% Spill							No second treatment in 2009						
	TSW1 Bay 4	TSW2 Bay 20	Spill/Total ³	Turbine	Bypass	Dam	Fby	TSW1	TSW2	Spill/Total	Turbine	Bypass	Dam	Fby
Passage %	4.4	9	41/54.4	13.6	31.9									
SR Survival %	98.4	96.2	95.5	87.3	94.7	94.3	99.5							
PR Survival %	103	101	101	91.6	99.8	99.2								

Data sources: USGS annual reports (2005, 2006, 2007, 2008) and preliminary 2009 data summary.

¹2006 Spill survivals reported for south (16-22) and north (1-15) bays, respectively.

²2006 forebay survival given only for season (treatments combined).

³ Spill = fish passage for non-TSW gates, Total = passage through all spillgates including TSW. Survival is for non-TSW spillgates only.

2009	40% Spill							No second treatment in 2009						
	TSW1	TSW2	Spill/Total ³	Turbine	Bypass	Dam	Fby	TSW1	TSW2	Spill/Total	Turbine	Bypass	Dam	Fby
	Bay 4	Bay 20												
Passage %	10.3	24.6	34.6/69.5	6.3	24.3									
SR Survival %	96.7	96.2	94.2	80.2	95	94.3	99.6							
PR Survival	102	102	100	85	101	100								

* Spill = fish passage for non-TSW gates, Total = passage through all spillgates including TSW. Survival is for non-TSW spillgates only.
 Data sources: USGS annual reports (2005, 2006, 2007, 2008) and preliminary 2009 data summary.

¹2006 Spill survivals reported for south (16-22) and north (1-15) bays, respectively.

²2006 forebay survival given only for season (treatments combined).

³ Spill = fish passage for non-TSW gates, Total = passage through all spillgates including TSW. Survival is for non-TSW spillgates only.

2008	40% Spill (Late Season)							60% Spill (Late Season)						
	TSW1	TSW2	Spill/Total*	Turbine	Bypass	Dam	Fby	TSW1	TSW2	Spill/Total*	Turbine	Bypass	Dam	Fby
	Bay 19	Bay 20						Bay 19	Bay 20					
Passage %	12	9	32.6/53.6	31.7	14.7			10.4	8.9	59.8 ⁵ /79.1	12.6	8.3		
SR Survival %	89.7	90.4	91.1	71.2	79.1	82.8	99.4	86.6	93.5	88.6	65.6	81.8	85.4	99.4
PR Survival %	97.3	98.5	98.4	77.4	87	89.9		98	105	99.6	75.6	94.6	96.5	
2009	50% Spill (Season Wide)							No second treatment in 2009						
	Bays ⁶ 16-19	TSW2 Bay 20	Spill/Total*	Turbine	Bypass	Dam	Fby							
Passage %	14.3	13.1	37/64.4	19	16.7									
SR Survival %	82.2	84.7	87.5	67.2	85.5	82.2	97.6							
PR Survival %	89.9	91.5	94.5	73.2	93.1	89.2								

* Spill = fish passage for non-TSW gates, Total = passage through all spillgates including TSW. Survival is for non-TSW spillgates only.
Data sources: USGS annual reports (2005, 2006, 2007, 2008) and preliminary 2009 data summary #3 (entire season data).

¹ 2006 Spill survivals reported for south (16-22) and north (1-15) bays, respectively.

² 2006 forebay survival given only for season (treatments combined).

³ 2006 Spill survivals reported for south (16-22) and north (1-15) bays, respectively.

⁴ 2006 forebay survival given only for season (treatments combined).

⁵ Corrected by Noah Adams, pers com, 11/5/09 (56% in final report is incorrect).

⁶ In 2009, the TSW 1 was in bay 19, however, the passage data were lumped for bays 16-19.