

TMT Year-End Review

Survival and Passage studies at Ice Harbor Dam, 2003

In 2000 and 2002 NOAA Fisheries conducted spill survival studies at Ice Harbor Dam as post construction evaluation of the flow deflector installation. Results of these spillway survival studies had shown low survival rates. In response to the low levels of spill survival observed in the previous years, an alternate spill operation was proposed for testing in the spring and summer this year (2003). Funding was prioritized through the System Configuration Team. The Fish Facility Design Work Group (FFDRWG) and Studies Review Work Group (SRWG) designed a study to compare passage and survival in both spring and summer between 50% spill 24 hours per day, and the Biological Opinion operation of 45 Kcfs day and DGAS cap (90%-100% up to 100 Kcfs) at night. The 45 Kcfs was expected to improve tailrace egress and flow deflector performance. Spill patterns were coordinated through the Fish Passage Operations (FPOM) committee. The operations required were coordinated with RCC and BPA through weekly calls.

Spring Operations – 2 Treatments

1. “BiOp” 45 Kcfs day and DGAS cap (90 - 100 Kcfs) at night.
2. 50% Spill 24 hrs.

Evaluation Techniques:

Radiotelemetry – Passage Efficiency, spill survival, and project survival.
PIT tag – Turbine survival and collection channel through tailrace survival
Direct Injury – Spillway injury rates.
Hydroacoustics – Passage Efficiency and behavior

In Season Coordination- Spring

The spring direct injury study reported very high injury rates. Normandeau Associates Inc. proposed adding a day to look at a larger gate opening in response to trends in the data. COE staff discussed this with NOAA Fisheries, RCC, and FPOM.

Operation - An additional treatment was tested with 5ft gate openings (pattern change only).

Coordination – Summer Operations

The preliminary results from the 2003 spring tests of the experimental spill operation indicated that serious levels of injury occurred under both study treatments. This information caused significant concern about exposing ESA listed Snake River fall Chinook to these operating conditions for a third year of study. A new test condition was developed to help identify the project operations that could provide the best project survival for summer fish. The test treatments include a no spill treatment, which was controversial. A modified study was presented to SRWG. The issue was in turn raised to SCT and the Implementation Team (IT). Technical Management Team (TMT) also scheduled a meeting to discuss the altered summer study. IT supported going ahead with the study.

Rationale developed for the altered summer study:

Fall chinook spillway studies conducted in 2000 and 2002 using PIT tag detection, estimated survival at 88 and 89%, which is much lower than BiOp estimate of 98%. These studies were conducted under BiOp spill volumes and Fish Passage Plan spill patterns. No empirical data are available for fall chinook survival through the powerhouse passage routes. Resolution of the low survival was expected to be achieved by modifying the spill operations to provide good tailrace egress and skimming flow over the spill deflectors.

Preliminary results from direct injury (spring Chinook) studies at spillbays in 2003 indicated a 10-22% fish injury rate. Injuries included bloody eyes, decaling, loss of eyes, torn operculum. These are the highest estimates of injury rates recorded in the Snake and Columbia rivers with this type of testing (balloon tags).

OBJECTIVE: Test a Project operation at IHR Dam that will improve fish survival.

PROPOSED ACTION: Develop a survival study at IHR for summer 2003 that would assist in providing information for more fish safe operation of the Project. This action would be designed to protect fish in 2004, and would lead to improved fish survival in the future.

The current spill tests include 2-day blocks of BiOP spill levels vs. 50% spill. Based on past years survival results for fall Chinook and recent direct injury tests this spring, there is significant concern that fall Chinook survival will be poor in 2003 under both operations as they were previously coordinated. Survival tests conducted in 2000 and 2002 estimated survival of fall Chinook passing via spillway between 85 and 88% with radio telemetry.

Proposed test at ICR for summer 2003 would be similar to the originally proposed test. It will still include 2 treatments, however the treatments will be changed. One treatment will be BiOP spill with a spill condensed to 3 spill bays. Second treatment will be without spill. Fish survival will be estimated with PIT tags at spillway, bypass, and turbine.

JUSTIFICATION FOR A MODIFICATOIN OF STUDY PLAN:

Summary of recent spillway studies at ICR

Study Year	Species	Spillway Survival
2000	fall Chinook	88.5%
2001	fall Chinook	no spill
2002	fall Chinook	89.4%

▪ Data indicates poor spillway survival for fall Chinook in both years studied. Data also indicates poor survival of spring Chinook in 1 of the two years of study.

▪ 2003 direct injury studies were conducted in late April 2003. Results from this study showed injury rates (bloody eyes, decaling, loss of eyes, torn operculum) of up to 20%.

- Results of spillway studies in 2000 and 2002, have shown a high level of mortality. These studies were conducted under BiOP spill volumes and patterns. Therefore, the Corps cannot accept a study in 2003 that will include a condition that has shown poor survival.

JUSTIFICATION FOR A “NO SPILL” TREATMENT

BiOP estimates used for survival estimates at IHR

Spillway 98%

Juvenile bypass 98%

Turbine 90%

FGE 54%

- Using the assumptions of BiOp , estimates of survival under a no-spill operation is calculated at 94.3%

Estimates based on recent data

Juvenile bypass 99% (2001,2002 draft)

Turbine 88% (preliminary 2003 data)

Powerhouse 96% (NMFS, 2001)

- Using these estimates, Project survival for a no-spill option is calculated at 95.3%.
- Based on the data from 2000 and 2002, BiOp spill operations will result in a Project survival around 90%
- Using the above estimated survival estimates, it is possible that a “no spill” condition would improve survival of juvenile fall Chinook passing Ice Harbor.

ADDITIONAL CONCERNS:

Water Quality: It is anticipated that condensing spill to three bays may increase TDG in the spillway and downstream of IHR. Corps and NMFS representatives conducted a “test” spill of 45kcfs spilled through bays 2, 3, and 4 on 3/17/03. This operation was run for over 2 hours with an initial TDG level of 113 at the downstream monitor. Over the test TDG increase to 120 and stabilized at that level. Therefore, it is expected that 45kcfs will be the upper limit of spill for the spill test condition. TDG will likely increase as river flow decreases due to a higher proportion of total river flow being spilled. This will be monitored during the study and modified as need to keep TDG below 120.

Summer Operations – 2 Treatments

1. Bulked Spill about 45 Kcfs 24 hrs per day.
2. No Spill

2003 Results:

Project and route specific survival estimates for yearling Chinook using RT
 Spillway and turbine fish survival estimates for sub-yearling Chinook salmon
 Direct injury studies (spillbay 5)
 Sensor “fish” studies (spillbay 5)
 Hydroacoustic evaluation of fish passage.

1: Summary of preliminary RT survival studies (Yearling Chinook)

	Yearling Chinook Survival Estimates (RT)	
	BiOp spill levels	Test (50% spill)
Turbine	86.2% (77.8 - 95.5%)	87.8% (84.1 - 91.6%)
Bypass	98.1% (89.4 - 107%)	97.4% (88.7 - 107%)
Spillway	94.8% (91.5 - 98.1%)	92.8% (86.0 - 100%)
Project	93.7% (91.1 - 96.3%)	91.9% (85.9 - 98.3%)

2: Summary of preliminary PIT survival studies (Sub-yearling Chinook)

	Subyearling Survival Estimates
	Bulk Spill
Turbine	89% (85 - 94%)
Bypass	100% (96 - 103%)
Spillway	96% (91 - 102%)

3: Summary of Direct Injury Studies.

Spring study		
	50% spill	100% spill
Injury Rate	21%	10%

Summer study			
	Bulk		FPP pattern
	Deep release	Shallow release	Deep release
Injury Rate	21%	10%	23%

Summary of Yearling Chinook Data

	2000	2001	2002	2003 Spring
				BiOp Pattern
Turbine	Not estimated	not estimated	not estimated	50% spill
Bypass	not estimated	99.6% (94.7 - 104%)	not estimated	86.2% (77.8 - 95.5%)
Spillway	97.8% (94.1 - 102%)	No spill in 2001	89.1% (86 - 95%)	87.8% (84.1 - 91.6%)
Project	not estimated	93.6% (89.5 - 97.7%)	not estimated	98.1% (89.4 - 107%)
				94.8% (91.5 - 98.1%)
				92.8% (86.0 - 100%)
				93.7% (91.1 - 96.3%)
				91.9% (85.9 - 98.3%)

Summary of Subyearling Chinook Data

	2000	2001	2002	2003
				Bulk Spill
Turbine	not estimated	not estimated	not estimated	89% (85 - 94%)
Bypass	not estimated	not estimated	not estimated	100% (96 - 103%)
Spillway	88.5% (85.6 - 91.5%)	not estimated	89.4% (86 - 93%)	96% (91 - 102%)
Project	not estimated	not estimated	not estimated	not estimated

2004 Coordination

SRWG and FFDRWG met to discuss these results and plan next year's studies on 15 July, 31 July, and 1 October 2003. We will again discuss it 6 November 2003. Specific study designs will not be developed until the new 1:20 hydraulic model of the spillway is available. Any changes to spill patterns would be coordinated through RCC and FPOM. As much detail as possible will be included in Appendix A of the Fish Passage Plan. In season coordination with RCC and BPA will be through weekly telephone calls.