MEMORANDUM

June 18, 2004

FOR: FCRPS Remand File

FROM: Paul Wagner

SUBJECT: Transport Operations Protocol for the BiOp Gap Analysis

**Proposed Action Transport Operations**

The proposed hydro operation transportation protocol for juvenile Snake River salmonids called for the following actions:

(1) All fish collected at Snake River dams would be transported.

(2) Spill would be provided at Snake River collector dams when average spring (April 3-June 20) flows are projected to exceed 85 kcfs. The provision of spill reduces the efficiency of juvenile fish collection and provides the safest route of passage for fish that migrate in-river.

(3) When average spring flow in the Snake River is projected to be less than 85 kcfs, no spill will be provided at Snake River collector projects, forcing fish to use powerhouse routes and thus maximizing collection and transportation of juvenile migrants.

(4) During the summer migration season on the Snake River (June 21-August 31) spill is not provided at any of the three Snake River collector projects or McNary Dam, thus maximizing collection and transportation of Snake River fall chinook juvenile migrants.

**Reference Transport Operations**

As a result of the use of PIT-tag technology, spring transport studies conducted from 1995 through 2001 have yielded much more comprehensive information about the effects of transportation. Also, efforts have been made over the years to provide adequate passage conditions for in-river migrants by managing both spill and flow in the mainstem migration corridor. Adequate migration conditions for fish that remain in-river are essential for them to serve as a suitable control group. The findings of these studies are summarized and presented in Williams *et al.* (2004).

Following is a brief summary of NOAA Fisheries' Hydro Division's interpretation of the management implications drawn from Williams *et al.* (2004):

(1) There appears to be little consistent benefit provided to wild SR spring chinook by transportation.

(2) There appears to be a benefit provided to hatchery SR spring chinook by the transportation program. That benefit is most significant after May 1.

(3) There appears to be a benefit provided to both wild and hatchery SR steelhead from the transportation program.

(4) The benefit from transportation increases through the spring. The benefit from transportation during the month of April appears to be negligible.

(5) The benefit provided to SR fall chinook from transportation does not appear significant. However, this conclusion is based on limited data.

Decisions on transportation need to be made in the context of how in-river conditions affect the survival of juvenile migrants. New information presented in Williams *et al.* (2004) develops the concept that flow/survival thresholds likely exist for both SR steelhead and SR spring chinook. The flow value for maximum survival of spring chinook in the Snake River was calculated to be 73 kcfs, with a 95% confidence interval (C.I.) range of 70 - 99 kcfs. The Snake River flow for the maximum survival of steelhead was calculated to be 115 kcfs, with a 95% C.I. range of 79 - 133 kcfs. The management implication of this information is that transportation would be beneficial to these fish when the lowest range of these flow thresholds will not be met on a seasonal average basis. Applying this concept to a management strategy supports the following transportation protocol for the reference operation:

(1) The value of transporting migrants before May 1 is negligible. However, the effect of bypassing fish collected at dams multiple times may be negative as well. The reference operation modeling assumption is that all fish collected are transported. However, a recent draft report by Anderson *et al.* (2004) concludes that fish collected prior to April 22 should be returned to the river. After that date or when water temperatures exceed approximately 10° C, all fish collected should be transported. This report is still under review.

(2) When seasonal average flows at Lower Granite Dam are projected to be less than 70 kcfs, no spill would be provided at collector projects, and all fish collected will be transported. This flow equates to the lowest 20% of annual runoff conditions for the Lower Snake River. This operation maximizes transportation during these low-flow years. This flow threshold criterion is based on the lower range of the confidence interval at which optimal survival for spring chinook is calculated to occur (Williams *et al.* 2004). It is assumed that, below this seasonal average flow level, maximum survival would be achieved by maximizing transportation.

(3) When seasonal average flows at Lower Granite Dam are projected to range between 70 and 85 kcfs, spill would be provided at all Lower Snake River projects until May 1, or until steelhead collections predominate for three consecutive days. After that date, spill would be terminated and all non-study fish collected would be transported. The rationale for this operation is that, since SR spring chinook show no consistent benefit from transportation early in season and in all but the lowest of flow years, they should remain

in-river to the extent possible. Conversely, these flows will be near the low end of the estimated 95% C.I. survival threshold for SR steelhead. This operation would provide in-river passage for spring chinook during April but would switch to a maximum transportation strategy for steelhead when they are the majority of fish being collected.

4) When seasonal average flows at Lower Granite Dam are projected to exceed 85 kcfs, various levels of 24-hour spill would be provided at all collector projects throughout the spring season. This operation is a "spread-the-risk" strategy where some fish are transported and some remain in-river.

5) The reference operation calls for no spill at all collector projects throughout the summer season (June 21 - September 15). This is consistent with the current transport strategy for SR fall chinook, which calls for maximizing collection and transportation. This strategy is also consistent with the conclusion that "No empirical evidence exists to suggest that transportation either harms or helps fall chinook salmon" (Williams *et al.* 2004). Due to the lack of available information, and as called for in the 2000 FCRPS Biological Opinion, a formal in-river transport study evaluating whether any benefit exists from transporting fall chinook remains a high priority. This study should be performed with spill to provide adequate in-river passage conditions for non-transported fish.

**Literature Cited**

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