IDFG comments on NOAA Fisheries Technical Memorandum: Effects of the Federal Columbia River Power System on Salmon Populations by Williams et al. December 21, 2003

Idaho Department of Fish and Game (IDFG) supports the NOAA Fisheries (NOAAF) premise that "Determining the extent to which direct and indirect effects of the hydropower system negatively affect salmon populations, in the context of all other factors influencing salmon populations, is critical for defining additional measures needed by the FCRPS to assure salmon survival." Our substantial technical concerns and issues with this memo center on a lack of a collaborative analytical framework, a lack of transparency of the analysis conducted by NOAAF, and the apparent logic problems and assumptions in the analysis which lead the agency to conclude that "non-transported fish do not experience delayed mortality (or have very little)." Our uncertainty about NOAAF interpretation of several datasets points to the poor documentation of information supporting this Memo. These comments should be considered preliminary in anticipation that a more collaborative effort could resolve many of the issues and concerns that we have identified.

Major Issues:

1. IDFG continues to have concerns about the lack of a collaborative analytical framework for decision-making. The Memo makes *ad hoc* inferences about "extra mortality" (delayed hydrosystem mortality in common to both in-river and transported migrants) without the benefit of an updated framework. IDFG continues to have concerns about a general lack of collaboration with other fish and wildlife agencies on the analyses, data and conclusions regarding stock performance. The basis for NOAAF's estimates of aggregate wild Snake River spring/summer chinook smolt-to-adult returns (SARs), which formed a major portion of the Memo's conclusions cannot be determined from information provided in the Memo. The lack of transparency in the method used prevents us from determining why the NOAAF results and conclusion are so dramatically different from a similar analysis conducted by IDFG (Kiefer et. al 2002), which was provided directly to the authors of this Memo per their request. From the limited documentation provided, it does not appear that NOAAF used *U.S. v. Oregon* Technical Advisory Committee (TAC) estimates of wild adult Snake River spring/summer chinook. If the authors believed that more wild adults returned than the regionally accepted TAC estimates, a thorough explanation of the NOAAF method and how the TAC estimates or the IDFG (Kiefer et. al 2002) run reconstructions are in error would be warranted. NOAAF participates on TAC and has an obligation to bring up alternative information if it believes TAC information is in error.

2. We find the NOAAF'-conclusion that non-transported fish do not experience delayed mortality (or have very little, p. 51) insupportable based on available information. Estimated differential SARs between unmarked and PIT tagged segments of Snake River wild spring/summer chinook are not supported with

existing information. IDFG comparisons of SARs for PIT tagged and untagged aggregate wild chinook, using the TAC estimates, did not suggest a differential survival rate through migration year 2000 (Kiefer et. al 2002). Even if the NOAAF estimates of Snake River SARs of 4% were correct, the SAR estimates from the John Day and Yakima rivers for the same years have been in the 8% range, still indicating significant differential between downstream stocks and Snake River fish. Also, even if delayed mortality were limited in one or a few recent year(s), this would not mean delayed mortality was not a problem in other years with different conditions.

3. The Memo does not adequately address the potential influence of the common year effect hypothesized in PATH to explain common annual patterns of recruitment for upriver and downriver stocks. The existence of a common year effect constrains hypotheses about delayed mortality specific to upriver stocks. The Memo appears to assume that there is no common year effect, despite general similarities in recruitment patterns of upriver and downriver stocks, and the important role of ocean conditions on SARs. Rigorous assessment would resolve this issue and would require reestablishment of an analytical framework.

IDFG and State of Idaho have commented previously to NOAAF on these issues (State of Idaho 2000a,b). Despite these major issues of contention, IDFG believes that the major focus placed on SARs and life cycle survival is appropriate. A collaborative, analytical framework should be reestablished to address hypotheses about ocean and smolt migration influences on survival through the smolt-to-adult life stage. The CBFWA Collaborative System-Wide Monitoring and Evaluation Project (CSMEP) now provides a multi-agency forum for assembling relevant stock performance information, and potentially could be the appropriate forum for a collaborative analytical framework.

Specific comments:

<u>P. 5, "Subsequent to PATH, Levin and Tolimieri (2001) and Levin (2003) found that chinook salmon populations used in the PATH life cycle models, Snake, Upper Columbia and middle Columbia, had different productivity, and productivity varied between time periods, but not consistently with changes in ocean conditions."</u> Serious issues were raised with the Levin and Tolimieri (2001) analyses in a review by the region's salmon management agency technical staff (DeHart 2003) that have not been considered by NOAAF. The review states: "If the fitted Ricker functions do not adequately describe the population dynamics, one would not expect the residuals from a poorly fit model to accurately express the productivity changes over time, nor would the resulting non-significant statistical results strongly suggest minimal impact from dams." Some of the identified technical problems include: pooling of individual stocks into a single index; improperly fitted spawner-recruit functions; failure to account for non-stationary response resulting in auto-correlated residuals; sensitivity of results to time periods selected with general lack of documentation of methods; and explicit acceptance of large

type 2 error when testing for survival changes over time. A more collaborative, analytical approach would likely avoid and resolved some of these identified problems.

P. 5, "Due to perceived complexity of PATH products by some Northwest Fisheries Science Center scientists not involved with PATH, a matrix model was developed in mid- to late 1999 to evaluate the status of listed Snake River spring-summer chinook salmon stocks." We do not believe that "perceived complexity" is an adequate reason to abandon a 5-year collaborative analytical process. Clearly, the underlying hypotheses and assumptions are critical to life cycle analyses (e.g., Wilson 2003). The same critical uncertainties identified and evaluated in formal decision analyses in PATH, are now being addressed in an *ad hoc* fashion by NOAAF in this Memo rather than in a specific decision framework.

Pp. 7-8, Snake River spring/summer chinook SARs, non-tagged population. IDFG cannot determine from available information whether NOAAF's wild and hatchery partitioning and run-at-large SAR estimates are scientifically supportable. The methods used to derive SARs and intermediate steps (including estimated proportion adipose-clipped and adipose-unclipped hatchery smolts and adults) need much better documentation. Accounting for wild and hatchery smolts and adults at Lower Granite Dam has become more complicated in recent years because of increased use of supplementation hatchery fish, which have marks other than adipose fin clips. Because wild fish are estimated as a residual after accounting for hatchery fish in this method, wild fish estimates may be especially sensitive to accounting errors during years with large hatchery returns (such as 1999-2003).

IDFG recommends that NOAAF work collaboratively with other salmon managers through TAC and CSMEP on the partitioning of wild and hatchery adults to develop SAR estimates. NOAAF estimates of adult age structure using PIT tag ratios should also be compared to IDFG estimates using the video-monitored length frequency at Lower Granite Dam and age-at-length sampling on the spawning grounds (Kiefer et al. 2002), which were provided to the authors of this Memo.

P. 8, "We did not have detailed data for stocks other than wild Snake River spring-summer chinook salmon." IDFG is aware of a very good data set on smolts/spawner and SARs from the Yakima River system and recent PIT tag SARs from the John Day River. Clearly a collaborative effort could, and still should, correct this deficiency in this analysis.

P. 17, Reference to CSS. The Memo should cite the actual annual CSS reports (Bouwes et al. 2002; Berggren et al. 2003). In general, there is little acknowledgement of the contributions and findings of the other anadromous fish managers through CSS, Fish Passage Center, Smolt Monitoring Program for tag releases and estimates of in-river survival, SARs, T/I ratios, and estimates of "D". This suggests poor investigation of the current information about these issues by NOAAF.

P. 17, "We based our evaluation of transportation on comparisons of return rates from fish PIT-tagged as juveniles that migrated through the hydropower system versus fish collected and transported." This statement is incorrect in a subtle but important way. The first two paragraphs are devoted primarily to explaining why the authors used PIT-tagged juveniles that were collected and bypassed at least once at a collector dam to represent the untagged population of in-river migrants, even though the untagged population was not collected and bypassed. There is ample evidence (including data tables in this report) to conclude that collecting and bypassing in-river juveniles reduces their adult return rate, and bypassed juveniles therefore should not be used to represent the adult return rate of the untagged population.

P. 20, "Zabel et al. (In review)…demonstrated that smaller fish are consistently detected at higher rates than larger ones at all three dams and for all fish groups examined (Figures 2 and 3)." The Memo did not provide the methods, information on the variability of the trend lines displayed, explanation for missing years, discussion of alternate hypotheses such as residualism of larger steelhead or precocity of larger chinook, or analysis of how much difference these trends would make if they are real. From the figures presented and the data displayed in Tables 25 and 26, it does not appear likely that these trends would make much difference in any of the results.

P. 21, Collection and bypass mortality. In this Memo NOAAF questions the veracity of several peer-review publications concluding that collecting and bypassing in-river juveniles reduces their probability of returning as adults. These authors restricted their analysis to "results only in cases where at least 5 adults returned for any one category." While excluding categories with small sample sizes may be warranted, using an adult return criterion is inappropriate. The identified adult return criterion could exclude datasets with adequate juvenile sample size that experienced smolt to adult survival (and thus low adult return) and include datasets with inadequate juvenile sample size, which random error resulted in at least 5 adult returns. A better approach would be set the criteria based upon the number of juveniles in a particular category.

P. 21, "Our null hypothesis was that the number of juvenile detections (equates to number of bypass systems) had no impact on adult return, against the alternative that increased detections led to decreased (or increased) adult returns." A null hypothesis that collecting and bypassing in-river smolts does not reduce their adult return rate, and a one-tailed instead of a two-tailed hypothesis test would be more appropriate. NOAAF should consider whether an α of 0.05 is too stringent of a significance level for this type of data.

P. 22, SARs for ESUs other than Snake River spring/summer chinook. NOAAF states (correctly) that empirical SARs data do not exist for most populations other than the Snake River spring/summer chinook. There are some notable exceptions. An empirical time series of SARs and smolt/spawner data exists for Yakima River wild spring chinook beginning in brood year 1983 (Yakima Subbasin Summary; Fast et al. 2001); SARs have averaged over 2% through the time series including poor ocean years and have ranged to over 8% (Fast et al. 2001; Table 13). ODFW in coordination with the CSS project, has also begun PIT tagging wild John Day River spring chinook. SARs for smolt year 2000 were 7.9% from smolts in the John Day subbasin to adults to Bonneville Dam (pers. comm., R. Boyce, J. Ruzycki, ODFW).

P. 22, Results, Trends in Populations. NOAAF statement that "SARs (catch + escapement) of Snake River spring/summer chinook from the 1999 and 2000 outmigrations returned to levels only previously observed prior to construction of the final mainstem dams" appears to be in error. Figure 5 suggests SARs (catch + escapement) in the 1/960s were in the range of 2.5% to 4.5%. However, this conflicts with the SARs presented in PATH FY98 report (Marmorek et al. 1998; Table B.3-7), which reports an SAR median of 4.3% (range 3.73% - 7.25%; SAR2 for smolt years 1964-1969). In addition, Williams et al. (2001; Figure 2) also shows SAR estimates in the 4% - 7% range for the 1960s.

IDFG cannot determine from available information whether NOAAF's wild and hatchery partitioning and run-at-large SAR estimates are scientifically supportable for recent smolt years. In any case, the statement that the 2001 estimate of SAR (estimated by NOAAF as 1.5%) "already exceeds total SARs for all Snake River wild spring/summer chinook outmigrations between 1976 and 1997" contradicts the information in Marmorek et al. (1998; Table B.3-7), which shows SAR estimates in the range of 1.8% to 2.8% for the 1982-1984 outmigrations. Preliminary CSS results (Berggren, FPC, pers. comm.) for wild spring/summer chinook transported from Snake River dams in 2001, indicates SAR of less than 1% (through 2-ocean returns). IDFG recommends that NOAAF work collaboratively with other salmon managers through TAC and CSMEP on the partitioning of wild and hatchery adults to develop SAR estimates that have regional support and understanding.

Pp. 23-24, "Mean estimated survival from Snake River Basin hatcheries to the tailrace of Lower Granite Dam (average for hatcheries combined) has ranged from a low of 0.494 in 1997 to 0.697 in 2000 with an increase in survival since 1998 compared to earlier years (Table 2). A strong inverse relationship exists between survival and migration distance ($r^2 = 0.941$, $p<0.001$)." The NOAAF authors do not discuss any hypothesis for the increased survival of hatchery fish from upriver hatcheries since 1998. IDFG suggests that this survival improvement may be a result of reduced BKD incidence at the Pahsimeroi and Sawtooth hatcheries. The strong inverse relationship between survival and migration distance appears to be partially (if not mostly) attributable to BKD prevalence at these two hatcheries in the pre-1998 migration years. Redoing this analysis with just the 1998-2003 data set may provide a less confounded relationship between migration distance and juvenile hatchery chinook survival to Lower Granite Dam, or it may provide additional support for hypothesis development.

Pp. 27-29, Juvenile survival from Lower Granite Dam to Bonneville Dam. The discussion of avian predation on reach survival should more clearly make the connection between low flows in 2001, reduced fish travel time and increased predation rate index (% PIT tags recovered in McNary Dam reservoir). The relationship between flow and fish travel time has been well established. Further, the predation rate index (Memo Table 7) appears to be highly correlated with fish travel times through the reach (p. 23) for both yearling chinook and steelhead (Attached Figure 1). Did avian predation play the significant role in the losses of juveniles (as stated in the Memo), or did low flows and the resulting slow fish travel times play a significant role in losses to avian predators? The only hypothesis put forward in this Memo to explain the higher predation rate in 2001 was that a higher proportion of the untagged fish were removed from the system via barges. Yet Table 11 contains similar avian predation PIT tag recovery data from upper Columbia releases that show the same temporal pattern, but with dramatically lower recovery rates. Thus, either these two groups of fish do not mix in McNary Reservoir and the avian predators feed in areas with more Snake River fish, or these data reflect higher cumulative stress and migration delays caused by Lower Snake River dams without spill than are caused by mid-Columbia River dams with spill, with the avian (and probably other) predators keying in on the more stressed, Snake River fish.

P. 30, Snake River subyearling chinook. The Memo notes that 36% of PIT-tagged fall chinook adult returns are from undetected juveniles, and 14% are from the few juveniles detected in September and October. Depending on the proportion of transported fall chinook, these data seem to suggest the adult return from nontransported juveniles may be disproportionate to the proportion of juveniles that were not transported, i.e. nontransported juveniles make up a larger than expected portion of the adult return.

Pp. 36-38, Relationships among flow, temperature, travel time and survival. The Memo should cite analyses and results from other salmon managers in these sections, summarized in SFTAFM (2003). The SFTAFM (2003) analyses and results complement those presented in the Memo, as well as providing some contrasting perspectives. The SFTAFM methods to establish cohorts (minimum cohort size and coefficient of variation criteria) differed from those used by NOAAF, and juvenile survival rates were significantly related to water travel times for both yearling chinook and steelhead. The best juvenile survival models included water travel time, spill proportion and water temperature for Snake River yearling chinook and water travel time and spill proportion for Snake River steelhead. From the adult data sets, SFTAFM (2003) concluded "[j]uvenile migration conditions and ocean climate conditions were both influential in explaining patterns of adult recruitment of Snake River spring and summer chinook (spawner to spawner ratio) … and SARs in Snake River spring and summer chinook and steelhead."

P. 37, Annual SARs for Snake River spring migrants. The discussion should include that, through CSS, additional wild yearling chinook smolts have been PIT-tagged since 2002, and the dam research protocols were already changed to divert more of the first-time detections into transport for wild PIT-tagged yearling chinook and steelhead (Berggren et al. 2003). This will improve the ability to estimate SARs from wild PIT tagged groups in the future.

Pp. 42-45, Tables 17-20. Use of the term "non-detected" to mean collected at LGR, tagged, and subsequently undetected at transport projects should be avoided since these tag groups appear to have lower SARs than true in-river migrants. Note that SARs for non-detected wild chinook tagged above LGR (Table 13) were 86% greater than those collected and tagged at LGR (Table 17) and not detected thereafter, 1995-2000 (geometric mean of annual SAR ratios). For hatchery chinook, the non-detected group had 57% higher SARs than those collected and tagged at LGR and not detected thereafter. Non-detected wild and hatchery steelhead SARs were 149% and 67% greater, respectively, than those collected and tagged at LGR, 1998-2000 (Tables 14 and 18).

P. 42, "Annual SARs for PIT-tagged juvenile steelhead marked at Lower Granite Dam during outmigration years 1998 to 2000 ranged from a low of 0.24% for non-transported to 4.43% for transported fish (Table 18)." This statement is possibly misleading. Table 18 indicates that the low SAR of 0.24% was for hatchery steelhead transported from Lower Monumental Dam in 1998, while the high of 4.43% was for wild steelhead transported from Lower Monumental Dam in 2000. Clarification is warranted.

P. 42, "Annual adult returns for wild spring-summer chinook salmon collected and marked at Lower Granite Dam were high enough…. to indicate significantly higher annual SARs for transported fish in 1995 and 1999, but not in 1996, 1998, and 2000 (Table 19)." This sentence is both misleading and incorrect. The comparisons reported to have significantly higher transport SAR have a known negative bias for the in-river group that the authors attempt to reduce in their study protocol starting in 2000. Specifically, the in-river comparison groups have the additional stress and resulting delayed mortality from mechanical bypass when compared to only transport from Lower Granite Dam. This bias can also be observed in transport from Lower Granite Dam significantly outperforming transport from Little Goose or Lower Monumental dams in some of these years. Table 19 actually provides supporting evidence that collecting and bypassing juvenile fish causes stress that results in delayed mortality. The authors attempt to reduce this known bias to their study design with protocols starting in 2000 that include mechanical bypass stress in both the in-river and transport comparison groups. When fish that are bypassed at Lower Granite Dam and not detected again are more fairly compared to fish that are bypassed at Lower Granite Dam and then transported from Little Goose or Lower Monumental dams, (Table 19), then no significant transport benefit is detected. The new protocol, which includes bypass stress experienced by both groups, is an improvement. However, we do not yet know if the resulting delayed mortality is manifested equally between in-river and subsequent transport groups. Use of "NA" and "–" in most of these tables is unclear and the data meaning should be explained.

Pp. 42-43, "The annual SARs of transported wild and hatchery steelhead were significantly higher for transported fish than non-transported fish from both the 1999 and 2000 outmigration (Table 20). Too few fish returned from marking in 1998 to determine differences in return rates." There are two errors in the first sentence. There is also a lack of discussion about the apparent opposite results in 1998, which could lead to an incorrect interpretation by readers. First, there are only "–NA" listed for hatchery steelhead in 2000; apparently no hatchery study was conducted, so the statement that transported hatchery steelhead SARs were significantly higher in 2000 is unsupported. Second, a review of the table shows SARs for wild steelhead in 2000 that are virtually identical between transported and non-detected fish. Even if only the SAR of the transport site that performed the best (Little Goose) is selectively used in the analysis, it is unlikely that a SAR of 1.47% is significantly higher than 1.44%. The data reported for 1998, especially if one assumes that the "–" listed in two of the transport columns indicates zero adults and some number of juvenile transported, infers that the non-detected wild steelhead may have returned at a higher rate than those, which were transported. All of this ignores the SAR bias against the in-river comparison group resulting from collection, tagging, and bypassing them at Lower Granite Dam.

<u>Pp. 45-50, Annual estimates of differential post-Bonneville Dam survival, "D"</u>. The important conclusion from this section is that substantial delayed mortality of transported smolts is apparent from available estimates of "D". Previous NOAAF decision and support documents (2000 BiOp, 1999 Anadromous Fish Appendix, CRI assumptions) and previously cited IDFG and State of Idaho comments discussed the efficacy of alternative management options depending on whether "D" values were high or low. Uncertainty about the "true" level of "D" was used as partial justification for the current BiOp, and assumptions about "D" are built into the hydrosystem performance standards. Also, NOAAF estimates of "D" for Snake River spring/summer chinook should be contrasted with those from CSS.

<u>P. 50, Temporal SARs for spring migrants</u>. Temporal patterns are apparent in SARs of transported and non-transported yearling chinook. It should be emphasized that the non-transported study fish were collected and tagged at LGR and had reduced SARs compared to true in-river migrants (p. 45). The observed temporal differences may imply a potential selectivity by the FCRPS and current management against some stocks or life history strategies, depending on passage timing or level of smoltification. A review of Figures 17 & 18 suggests a consistent pattern that transportation may work best late in the migration season after the majority of juveniles have already migrated past the dams.

The Memo states "the variation in both transport and non-transport SARs observed during this series of transport studies show [sic] that annual T/I should not be used as the basis for management decisions," yet no clear alternative management recommendation is provided. The Memo suggests different temporal patterns for chinook and steelhead for best survival from transportation. Highest benefit to yearling chinook may have negative consequence to juvenile steelhead. This byproduct of subverting natural life history functions of different species should not be surprising. Given these potential consequences, we suggest that the temporal information appears still to support a "spread-the-risk" management of the current FCRPS, with spill at collector projects. The temporal management implication is no different from that based on the current annual T/I ratios of approximately 1.0 and "D" values substantially less than 1.0.

<u>P. 51, Temporal "D" within season</u>. The Memo should emphasize that temporal "D" estimates should be used only in a relative sense. In-river migrants collected and tagged at LGR experienced lower SARs (p. 45), tending to inflate the temporal "D" estimates.

<u>P. 51, Delayed mortality</u>. NOAAF's speculation that non-transported fish do not experience delayed mortality (or have very little) is highly speculative and not supported

by the information available to IDFG. The conclusion that SARs are currently 4% for the unmarked Snake River wild spring/summer chinook is not documented well enough for IDFG to determine whether it is scientifically supportable. However, NOAAF's SAR estimates exceed SARs for PIT-tagged in-river migrants in these years. Past comparisons (Kiefer et al. 2002) have shown PIT tag SAR estimates were similar to the unmarked population (Figure 2). This BPA report, as well as the current annual draft report, which continues to show similar SAR estimates between these two methods, was provided to the authors of this Memo. We believe a discussion on the differences between the NOAAF and IDFG unmarked population SAR estimates is warranted. However, not enough detail was provided with respect to the NOAAF methodology to determine why the results and conclusions were so dramatically different between these two analyses. NOAAF should consider this disparity and engage in collaborative effort to resolve it.

There are several logic problems with the speculation that non-transported fish do not experience delayed mortality (or have very little). The delayed mortality experienced by in-river fish ("extra mortality") would be unchanged if somehow "D" could be improved to 0.8 (in-river SARs would still be 4% under this speculative scenario). NOAAF also assumes that the maximum annual SAR is 6%, but empirical evidence does not support this as a maximum annual value. Snake River SARs (catch plus escapement) exceeded this value in individual years during the 1960s (Marmorek et al. 1998), and untagged Yakima River spring chinook had an estimated SAR of 8% in one recent year (Fast et al. 2001). PIT-tagged John Day River spring chinook experienced 7.9% SAR for migration year 2000 (pers. comm. R. Boyce, J. Ruzycki, ODFW). Finally, even if in one or a few years delayed mortality of in-river migrants were minimal, this would not mean that delayed mortality was not a problem in other years.

Aside from these logic problems, the Memo makes *ad hoc* inferences about "extra mortality" (delayed hydrosystem mortality in common to both in-river and transported migrants) without the benefit of an updated framework. The Memo does not adequately address the potential influence of the common year effect, hypothesized in PATH to explain common annual patterns of recruitment for upriver and downriver stocks. The existence of a common year effect constrains hypotheses about delayed mortality specific to upriver stocks. The Memo appears to assume that there is no common year effect, despite general similarities in recruitment patterns of upriver and downriver stocks and the important role of ocean conditions on SARs. Rigorous assessment will require reestablishing a collaborative analytical framework.

<u>Pp. 51-52, Differential SARs by detection history</u>. The primary conclusion from these comparisons appears to be that in most years and groups of spring migrants, detected smolts (collected and bypassed) had a reduced SAR compared to undetected smolts. In Figures 22-23, 47 out of 59 point estimate comparisons (80%) indicated a reduction in the relative return rates for detected smolts; 27 out of 59 comparisons (46%) indicated a statistically significant SAR reduction for detected smolts. Wild chinook (and possibly wild steelhead) in 2000 appeared to be the exception to this pattern. The Memo emphasizes the exception, rather than the rule.

The Memo points out that juveniles detected and bypassed at either Little Goose or Lower Monumental dams had lower adult return rates in most cases when compared against the non-detected group or those only bypassed at LGR (Figures 24 and 25). This pattern is similar to the reported lower adult return rates for juveniles transported from Little Goose or Lower Monumental dams (Tables 13 – 24). This consistent pattern of lower adult return rates the further downstream that the juveniles are detected (whether bypassed or transported) is the direct opposite of what would be expected from the direct survival estimates (in the absence of delayed mortality). These patterns are consistent with the hypothesis that migrating through the Lower Snake River hydrosystem causes cumulative stress resulting in delayed mortality that is not detected by the direct survival estimates (Budy et al. 2002).

P. 52, Selective Mortality. The plots in Figure 26 do not have legends, so readers cannot distinguish species and migration routes. The Memo provides adequate supporting data concerning the authors' conclusion (which is not contentious) that larger juveniles return at a higher rate than smaller juveniles. We agree with the authors' hypothesis that better ocean conditions may reduce the survival disadvantage of smaller juveniles. Better ocean conditions may also reduce the delayed mortality that the stress of collection and bypass causes juvenile Snake River fish, although this is not addressed in the Memo. What is missing is the same level of detail for the authors' more contentious conclusions, such as smaller fish are more likely to be collected at the dams for bypass or transport and the SARs of the unmarked population are significantly higher than the corresponding PIT tag group.

Pp. 53-54, Discussion, Snake River spring/summer chinook, general. The conclusion that wild PIT-tagged chinook have lower SARs than the untagged population is unsupported, and therefore hypotheses about the reasons for the phenomenon are premature. The CSS results for hatchery fish (Berggren et al. 2003) were based on accounting at the hatchery racks (not LGR-LGR), and may or may not be consistent with the purported pattern. The cause of the CSS results is not resolved (Berggren et al. 2003) but may be due to detection problems at the hatchery racks. Previous IDFG comparisons did not show a reduced SAR for PIT-tagged wild spring/summer chinook compared to the untagged population (Kiefer et al. 2002), nor do the updated estimates (attached Figure 2). IDFG recommends that NOAAF work collaboratively with other salmon managers through TAC and CSMEP on the partitioning of wild and hatchery adults to develop SAR estimates for untagged population.

The statement that transported smolts now have an "equivalent survival as high or higher than stocks that migrated through 4 dams in the hydrosytem in the 1960s" is unsupported". The NOAAF estimate of nearly 4% SAR for a few recent years (if validated), clearly does not exceed the median or higher range of SARs (catch + escapement) from the 1960s (Marmorek et al. 1998). These types of hypotheses would be better explored through a collaborative analytical framework, than through the *ad hoc* approach taken in the Memo.

Pp. 55-56, Discussion, Snake River spring/summer chinook, transportation. Evaluation of the hypothesis that transported fish arrive in the estuary before environmental conditions are favorable should consider the timing and performance of downriver stocks, whose timing is less disrupted by the FCRPS. For example, do the John Day River spring chinook enter the estuary at about the same time as transported Snake River stocks, and do they survive similarly? The Memo hints at a management option, delaying the arrival below Bonneville Dam for early migrating stocks, which we believe would be logistically very difficult and biologically unwise. The temporal D-value estimates in Figures 17 and 18 were developed with in-river comparison groups that have a known survival disadvantage (collection, tagging, and bypassing at Lower Granite Dam). Even with this bias, Figure 17 indicates that transportation does not provide a survival benefit for wild spring-summer chinook salmon until approximately 50% of the juveniles have passed Lower Granite Dam. The logistics of holding (delaying) 50% of the wild spring-summer chinook salmon run is daunting. If the hydrosystem causes delay and stress resulting in delayed mortality, then delaying (holding) wild juveniles likely would result in increased stress and delayed mortality. We believe these data indicate that providing better in-river spring migration conditions and that reducing collection and transportation early in the season is much more likely to provide better adult return rates, with much less risk of causing additional harm.

IDFG disagrees with the Memo's interpretation that the "hypothesis that transportation induced stress (Budy et al. 2002) causes lower adult returns is not supported by the temporal variability in measured values of D and SARs." The hypothesis that survival is influenced by compromised fish condition (due to the hydrosystem) does not imply that SARs would be constant across the migration season. A stressed fish will be likely more vulnerable to other stressors and environmental conditions, constant or fluctuating.

The Memo should also discuss the physiology studies by Congleton (2001, 2002), which indicated smolts are in a negative energy balance throughout their migration. The low flows in 2001 caused fish to undergo a migration that was significantly longer and the low flows and extended travel times resulted in both the exhaustion of lipid reserves at points further upstream and greater use of protein reserves than in earlier years. The use of protein reserves means that muscle mass is metabolized and the activities of critical rate-limiting enzymes involved in metabolism, saltwater adaptation, and other vital functions may be reduced (Congleton, 2002).

P. 56, "We tentatively conclude that D-values for fish transported from McNary Dam are lower than for dams farther upstream." We agree with this conclusion but are concerned with a lack of discussion about this result that would point out inconsistency with many of the hypotheses embedded in this Memo. The Memo implies that transportation gets early migrating fish to the estuary prematurely. However, we note that because McNary Dam is further downstream, this timing should actually be less of a problem than from upriver dams. Another Memo hypothesis is that there is no (or very little) extra mortality. However, if weaker fish die between Lower Granite and McNary Dams, as also implied in the Memo, transport survival should be highest from McNary. Although the data suggest that smaller fish are more likely to be collected, if this was true, then the population arriving at McNary should be larger and exhibit higher survival. These Memo hypotheses suggest higher D-values from McNary in the absence of delayed mortality. However, the actual result is that D-values are lower from McNary, which is consistent with the hypothesis that migrating through the four lower Snake River dams is stressful and results in delayed (extra) mortality.

<u>P. 57, Discussion, Snake River spring/summer chinook, differential guidance and implications to results</u>. IDFG disagrees with the Memo interpretation that "transportation evaluations of PIT-tagged fish marked above a dam, then collected and barged compared to non-detected fish serving as controls may produce biased results" because of size selectivity in guidance systems at the dams. The information provided is not detailed enough to determine whether the authors' interpretation that the juveniles collected are so significantly smaller than the uncollected juveniles that this size selectivity is the main cause of results indicating delayed mortality of in-river fish and poor performance of transported fish. Even if true, these are the management groups, smaller fish are more likely to be collected, and the estimated SARs of these management groups may reflect some differing attributes (e.g., size). If the larger, healthier fish are not collected and migrate in-river, we should shift resources and effort away from transportation and into providing better conditions for the juveniles more likely to survive.

<u>P. 57, Discussion, Snake River spring/summer chinook, effects of changing ocean conditions</u>. The Memo should also cite Deriso et al. (2001) and address the hypothesized common year effect. As noted above, this will require an analytical framework.

<u>P. 60, "Recent evidence links chinook salmon from the Columbia River basin to cyclic changes in ocean-climate conditions."</u> This seems to support the common year effect hypothesis from PATH (Deriso et al. 2001), and points to the need to incorporate this effect into an analytical framework.

<u>P. 61, Snake River steelhead, general</u>. IDFG provided NOAAF with *preliminary* steelhead SAR estimates for 1995-2000 smolt migration years (C. Petrosky email to C. Toole, 12/22/03), which were generated for use in Subbasin Planning. The updates use the same basic methods, tables and formats as the SAR estimates compiled in 1998 for PATH (Marmorek et al. 1998) and the NOAAF 1998 Supplemental BiOp. The updates used NOAAF 1997-2000 estimated wild smolt numbers (Peter Dygert TAC/NOAAF) and adult wild A-run and B-run estimates from TAC. Updated adult age structure information was from LGR scale sampling for 1995-2001 run years (NOAAF, IDFG, USFWS, USGS/USU). IDFG recommends that NOAAF work collaboratively with other salmon managers through TAC and CSMEP on the accounting of wild and hatchery smolts and adults to develop SAR estimates.

<u>P. 62, Snake River steelhead, flow, temperature, and migration timing</u>. The Memo attributes the extremely poor Snake River steelhead survival observed in 2001 in part to avian predation. As noted above, a higher level of avian predation appears to be due partially to the low flow and reduced fish travel time (and possibly deteriorating fish condition).

P. 62, "Thus, likely greater than 95% of live steelhead smolts immediately downstream of Bonneville Dam arrived via transportation." The Memo fails to discuss that approximately 15% of PIT-tagged adult returns were non-detected as smolts. This fact suggests that the few fish migrating through spillways and turbines have higher SARs than transported or bypassed steelhead smolts. If 95% of smolts were transported, little room remains for size selection to make much of a difference.

P. 64, Snake River Sockeye Salmon. Excluding 2001, there is no mention of the poor adult returns in recent years, which are in contrast to the sections on other species showing better returns.

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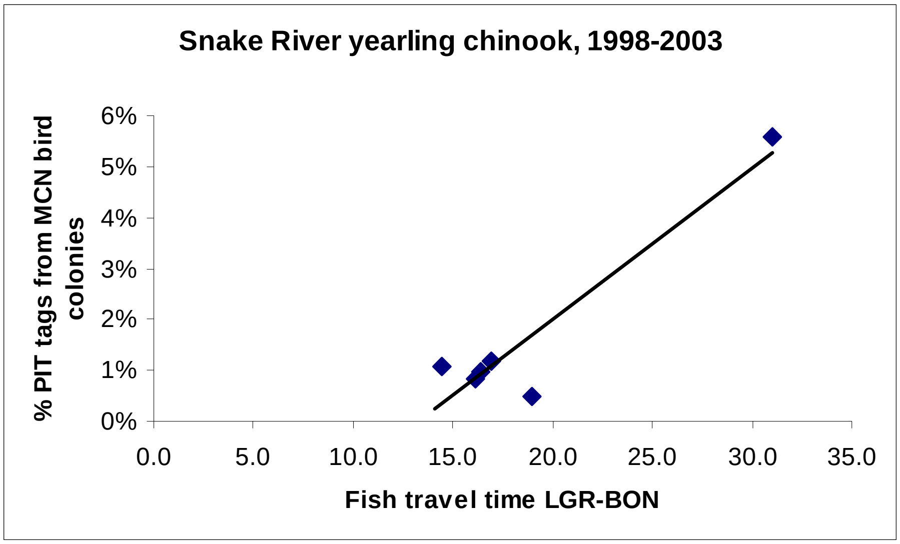

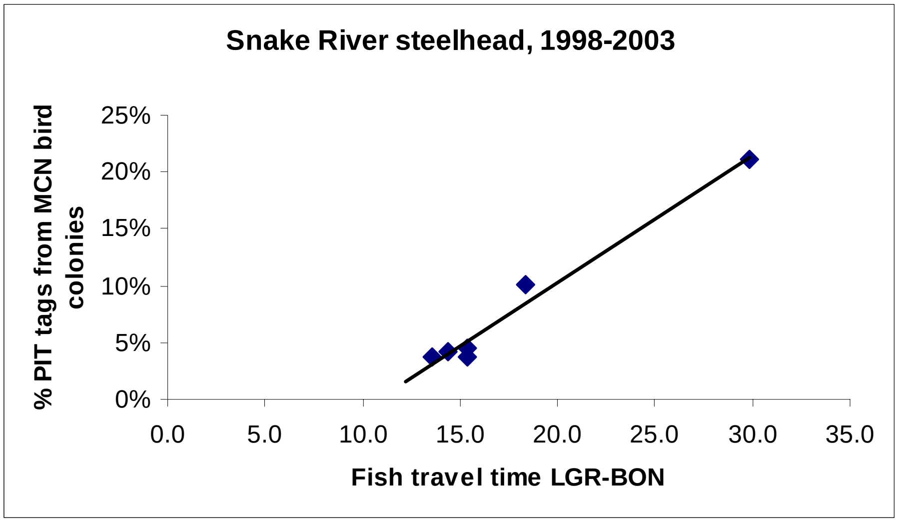

Figure 1. Index of avian predation rate (% of PIT tags recovered from McNary pool bird colonies) versus fish travel times for Snake River yearling chinook and steelhead. Source: Table 7 and p. 23 of Memo.

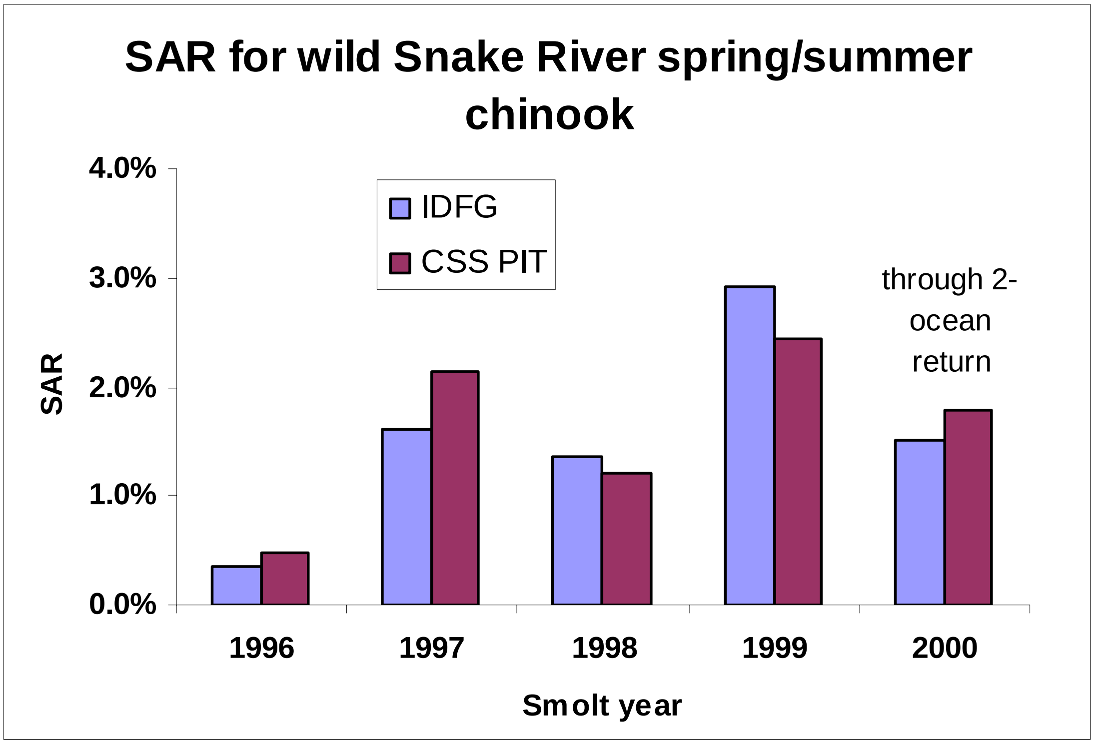

Figure 2. Estimated SARs for wild Snake River spring/summer chinook, for the run-at-large (untagged; IDFG), and for PIT-tagged smolts from the Comparative Survival Study (PIT CSS). Figure updated from Kiefer et al. (2002).