Attachment A

"Effects of the FCRPS on Salmon Populations"

D-Value/Delayed Mortality/Extra Mortality

A collaborative framework dealing with the issue of differential mortality between transported and in-river survival ("D") is absolutely essential to the formulation of the new BiOp. The white paper highlights the dramatic effects that river operations and management have on migrating salmon and steelhead. For years, the region's scientists, fishermen, small businesses, and conservationists have urged the federal agencies to make the river act more like a river by increasing flows during certain times of the year, spilling fish over dams, and removing the four dams on the lower Snake River. Instead, transportation has been the lynchpin of the strategy for survival. The paper's estimates of D demonstrate that much greater survival benefits can be gained by reforming the operation of the hydrosystem.[1] In the best-case scenario, the paper concludes that transportation for wild Snake River spring-summer chinook was a wash, with post-Bonneville survival being equal for transported and non-transported fish.[2] Fish that survive the journey down river (and through the hydrosystem) on their own are more likely to return as adults. A regime that operates to support greater numbers of fish migrating without transportation, especially early in the season, would produce benefits without the need for costly and intrusive transportation.

Even with transportation occurring, the paper highlights the need to return to the spread-the-risk strategy that has been all but abandoned by the action agencies and NOAA in recent years. For example, the data in the paper substantiates that transportation at certain times of the year negatively affects some stocks.[3] Maximizing transportation, as has been done the past several years (especially in 2001) ignores these vital differences that exist even between fish in the same ESU and does more harm than good. In sum, rather than transporting fish, these data show that the federal agencies should be ensuring river conditions that support fish migration.

Smolt-to-Adult Return Ratios (SAR)

Data presented in this white paper regarding smolt-to-adult return (SAR) ratios does not appear to comport with previously published literature. For example, Figure 5 in the paper presents a misleading graph showing SAR rates from the late 1960s as high as roughly 4.5%. However,

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[1] See Williams, J. G. et al., *Effects of the Federal Columbia River Power System on Salmon Populations*, Preliminary Draft, Northwest Fisheries Science Center, (December 21, 2003), p. 46 (concluding that, on average for all four species over six years, "survival for transported fish from below Bonneville Dam as a juvenile to return as an adult has averaged less than two-thirds that of the non-transported fish that arrived below Bonneville Dam."); see also p. 54 "The data also clearly show transported fish have a differential survival (D) (they survive at lower rates) downstream of Bonneville Dam compared to fish that migrated thorough the hydrosystem (they survive at higher rates).").

[2] *Id.* p. 54.

[3] See *Id.* p. 56 (Transporting early-migrating spring/summer chinook puts these fish in the estuary too early resulting in high delayed mortality).

previously published data by NOAA Fisheries shows pre- lower Snake River Dam SAR rates reaching up to 8%.[4] The graph, therefore, is misleading because it gives the reader a false impression that more recent SAR rates equal pre-dam rates. There also appears to be little explanation for how and why marked and unmarked data was used for more recent returns showing SAR rates up to 4.5%. We note that annual SARs presented in the report for wild Snake River spring/summer chinook using PIT-tag data at Lower Granite Dam showed 1.30%. 2.59%, and 1.07% in 1998, 1999, and 2000 respectively.[5] This data must be reconciled before NOAA can rely on it in a rewritten BiOp.

Flow and Survival

The discussion of flow and its relationship to survival, travel time, and temperature is woefully limited and, in parts, misleading. The discussion of flow and survival for yearling migrants relies on a study conducted by NOAA Fisheries scientists (Smith et al. (2002)).[6] The paper summarizes the conclusion of this study by stating: "…in this limited segment [yearling chinook and steelhead] showed strong, consistent relationships between flow volume and travel time, and little to no relationship between flow volume and survival."[7] In February 2003, the Independent Scientific Advisory Board (ISAB) also reviewed Smith et al. (2002) in a study on flow augmentation. Their conclusions about the data in the report, however, stand in stark contrast to the conclusions set forth in this white paper.

According to the ISAB, Smith et al. "reveals that there is a *strong effect of flow on survival of yearling chinook and steelhead when average weekly flows in the Snake River are below the 100 kcfs* breakpoint…" (emphasis added).[8] This finding is significant because 100 kcfs is the upper bound of the 2000 FCRPS BiOp's spring flow target on the Snake River when many yearling chinook would be migrating to the ocean. State, federal, and tribal fishery managers have also concluded recently that a relationship exists between water travel time and survival for spring migrating chinook and steelhead.[9]

Single-stock focus

Much of the paper is dedicated to Snake River spring/summer chinook. That is fine as far as it goes, but other listed ESUs are affected differently by the hydrosystem. For example, after mentioning several studies which suggest that physiological development (such as degree of smoltification) might have more effect on migration rates than flow volume for spring/summer chinook, the paper merely notes that "flow volume (hence water velocity) apparently continues

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[4] Williams, J.G. et al. 2001, *Survival estimates for downstream migrant yearling juvenile salmonids through the Snake and Columbia rivers hydropower system, 1966-1980 and 1993-1999*, North American Journal of Fisheries Management, 21:310-317.

[5] Williams, J.G. et al., 2003, pg 39.

[6] Smith, S.G., et al. 2002. *Factors associated with travel time and survival of migrant yearling chinook salmon and steelhead in the lower Snake River*, North American Journal of Fisheries Management, **22**:385-405.

[7] Williams, J.G. et al., 2003, pg. 36.

[8] Independent Scientific Advisory Board, *Review of Flow Augmentation: Update and Clarification*, ISAB 2003-1 (February 10, 2003). Incorporated by reference herein.

[9] State, Federal, and Tribal Anadromous Fish Managers, *Comments on the Northwest Power Planning Council Draft Mainstem Amendments as they Relate to Flow/Survival Relationships for Salmon and Steelhead* (January 2003). Incorporated by reference herein.

to heavily influence steelhead travel time."[10] This is important information because steelhead migrate at the same time as spring/summer chinook. Thus, management actions, such as lowering flows based solely on the effects to spring/summer chinook, would harm steelhead.[11] This type of information deserves greater emphasis in the final draft in order to ensure that decision-makers and the public do not focus myopically on measures that would benefit one ESU of Snake River fish, especially if those benefits come at the expense of others.

Furthermore, Snake River sockeye are still returning at numbers that are too low to sustain even survival. Only two sockeye returned to Idaho's Redfish Lake this year. Even though these fish have been listed longer than any others, there is very little information presented in this white paper or elsewhere about the causes of their continuing decline, the role of the hydrosystem in this decline, or the effects of transportation on these fish. Indeed, the white paper contains only one paragraph of information about sockeye.[12] The region needs to know more about why, even in the face of above-average returns for some other stocks, sockeye salmon -- first listed in 1991 -- continue to flirt with extinction. In the final paper, we urge NOAA to set aside a single-stock emphasis in favor of detail and emphasis on Snake River sockeye and all stocks in the basin, or at least identify the data gaps and determine what studies are necessary to fill those gaps.

The Hydro White Paper Lacks a Transparent Conclusion

There are no conclusions or recommendations included in the paper.[13] The white paper fails to fulfill the entire purpose of providing such drafts for other scientists in the regions to review. Where the rubber hits the road is in the process of taking this data (once it is fully evaluated) and drawing conclusions that will be used to develop management actions to benefit fish. This process should already be underway and should involve the entire region, including co-managers and independent scientists. For a resource as important as salmon, it is unacceptable for NOAA to publish the data with no conclusions for comment and then work in isolation to interpret and apply that data. We urge NOAA to meaningfully collaborate with the co-managers as it completes the analysis presented in this draft white paper.

[10] Williams, J.G. et al. 2003, p. 36.

[11] *Id.* See p. 57 (cautioning that "[o]ptions to change collection strategies at dams to potentially benefit spring chinook salmon, of course, may have no effect or negative effect for other species.").

[12] See Williams, J. G. et al. 2003. p. 64

[13] See *Id.* ("Conclusions/Summary" section left blank).

"Passage of Juvenile and Adult Salmonids at Columbia and Snake River Dams"

Spill Management

Regional scientists, fishermen, small business and conservationists have long held that spill for juvenile salmon is an essential component of any so-called "aggressive non-breach" mitigation effort. The "passage" white paper reconfirms long-held scientific conclusions about spill: "regional fishery managers have long regarded spill as the safest passage route for juvenile salmonids."[14] It is particularly disconcerting, therefore, that despite this conclusion regional federal executives are promoting the elimination or reduction of the 2000 FCRPS BiOp's summer spill requirements.

The white paper itself provides no commentary on the effects of such proposals, leading the reader to conclude that decisions about the fate of this critical mitigation tool are occurring strictly at the policy level with no real connection to the best available science. Eliminating or reducing summer spill as an experiment under the guise of the BiOp's inherent "flexibility" would be a substantial deviation from even the minimum mitigation actions required under the Endangered Species Act (ESA). There is no apparent connection between the best available science on spill and policy decisions to make substantial deviations from the BiOp. This is a particularly serious concern.

It is also worth noting, as the white paper points out, that spill is not solely meant to benefit listed salmonids. In fact, spill has been a component of regional mitigation efforts since the early 1980s – nearly a decade before Pacific salmon were listed under the ESA – as part of the government's requirements under the Northwest Power Act to "protect, mitigate, and enhance fish and wildlife affected by the development, operation, and management" of the FCRPS.

Direct and Indirect Benefits of Spill

The discussion of spill's benefits also appears to be incomplete. We note that in addition to direct mortality advantages over other passage routes, decreasing passage delay and forebay predation, spill provides a number of indirect benefits not fully vetted in the report. For example, spill reduces delayed mortality and cumulative passage effects of hydrosystem passage.[15] Research has also shown that juvenile salmon passing through multiple dam screen system had lower smolt-to-adult returns compared to spill passage.[16] It is critical that the full scope of both direct and indirect spill benefits be considered to inform the upcoming revised BiOp.

Turbine Efficiency

Despite the 2000 FCRPS BiOp's requirement to operate dam turbines within 1% of peak unit efficiency during the juvenile outmigration period, the white paper concludes that "a statistical

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[14] Ferguson, J.W., et al. 2003. *Passage of Juvenile and Adult Salmonids at Columbia and Snake River Dams*, NOAA Technical Memorandum, Preliminary Draft (December 2003).
[15] Columbia River Inter-Tribal Fish Commission, *The Biological Benefits of Summer Spill*, January 15, 2004.
[16] *Id.*, Referencing Bouwes et al (2002).

relationship between fish survival and Kaplan turbine unit efficiency for Snake and Columbia River dams does not exist."[17] Federal agencies, such as the Bonneville Power Administration, are promoting proposals to discontinue the 1% peak efficiency requirement in the 2000 FCRPS BiOp.

In analyzing available data on turbine efficiency, state, federal, and tribal fishery managers have come to a different conclusion. In fact, regional fishery experts conclude: "Our review of historic and recent data *only finds evidence that supports maintaining the 1% peak efficiency limits included in the NOAA Biological Opinions*" (emphasis added).[18] Moreover, they conclude that proposal to abandon the requirement "shifts the burden of proof of risks to the fishery resource in favor of apparently more certain economic benefits for the hydropower system…[and] abandons the precautionary approach to hypothesis testing."[19]

In light of these starkly contrasting conclusions, it is critical that further development of this issue in the context of the revised BiOp be done with the input and cooperation of regional fishery managers. Without a reconciliation of available data, management decisions are not likely to be based on fishery priorities using the best available science.

[17] Ferguson, et al. 2003. p.98.

[18] State, Federal, and Tribal Fishery Agencies, Joint Technical Staff, *Letter to U.S. Army Corps of Engineers, NOAA Fisheries, Bonneville Power Administration, Re: 1 % turbine efficiency operating criteria at McNary Dam in 2003*, May 29, 2003.

[19] *Id.*

"Role of the Estuary in the Recovery of Columbia River Basin Salmon and Steelhead: An Evaluation of Limiting Factors"

More Information Needed

Estuary restoration is an important component of the 2000 FCRPS Biological Opinion, but knowledge of the effect of estuary habitat conditions on the survival of listed salmon and steelhead species was limited at the time of the release of the 2000 BiOp, and remains so today. An incomplete understanding of the estuary remains a concern. The draft estuary white paper acknowledges this: "[w]hile ongoing research efforts will significantly upgrade our knowledge base in upcoming years, much of what we now know is conceptual or based on research in other areas such as Puget Sound;"[20] "[M]uch of the estuary...has not been studied at all;" and many of the observations they base their conclusions about wild salmonids use of the estuary "may apply to hatchery fish not wild fish."[21]

Link estuary improvements to increase in survival rates

The white paper contends estuary improvements would allow a greater expression of a diversity of habitats that benefit life history diversity for wild stocks. We commend the Science Center for recognizing the importance of life history diversity. We strongly support estuary restoration efforts based on this hypothesis, but there is a need to link survival rates increases to the specific actions including dike removal and flow-related estuary improvements. There is no doubt that estuary improvements are helpful to listed salmon and steelhead, but they are not a "silver bullet." Necessary survival improvements still need to be obtained in areas with more direct impact on several Columbia and Snake river ESUs, such as the hydrosystem. More information, including more information the effect of various estuary actions on the estuarine residence time of each ESU, would be helpful to prioritizing the importance of estuary restoration for the various listed species.

No Acknowledgement of Ongoing and Planned Federal Activities Related to Columbia River Federal Navigation Channel

To fairly evaluate the efficacy of estuary restoration efforts, it is crucial to acknowledge and analyze the effects of concurrent federal activities that may harm estuary habitat, such as plans to maintain and deepen the Columbia River Federal Navigation Channel. There is no such acknowledgement or analysis of the interaction of federal salmon recovery activities with these other federal activities in the draft estuary white paper. We encourage such an analysis in the final white paper.

Explanation of flow impacts on recovery needed

Although NOAA identifies flow as a limiting factor in the estuary, the white paper lacks any thorough discussion of alternate flows or the effects of the current regime on efforts to restore the

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[20] Fresh, K. L. et al. 2003. *Role of the Estuary in the Recovery of Columbia River Basin Salmon and Steelhead: An Evaluation of Limiting Factors*, NOAA Technical Memorandum, *Preliminary Draft* (December 2003).

[21] Fresh, K. L. et al., p. 20.

estuary. The authors refer to the effects that changes in the flow regime – a shift from a macro to micro-detritus food web, changes in the salinity and turbidity regimes linked to forage and predator cover, and changes in the plume – have on habitat for listed fish. These changes are primarily due to operation of the hydrosystem and irrigation withdrawals upstream of the estuary. NOAA must examine the effects of these actions in the estuary before it can determine the relative value of actions such as removing dikes and restoring shallow-water habitat. We doubt that the improvements NOAA hopes to make are feasible and will achieve the survival benefits needed if these critical upstream factors are ignored. The final paper must include a more thorough evaluation of this critical issue.

"A Review of Relative Fitness of Hatchery and Natural Salmon"

Long-Term Impacts Ignored

The paper is essentially a review of the scientific literature on how reproductively successful hatchery fish are (hatchery fish intentionally or unintentionally spawning naturally in the wild) as compared to wild fish (this is called "relative fitness"). NOAA's white paper reviews 31 studies on the relative fitness of hatchery and natural fish in the natural environment. Its scope is very general, and the literature it reviews examines a broad range of hatchery and natural populations, including coho, chinook, steelhead, anadromous brown trout in Sweden, and Atlantic salmon in Norway. At the same time that this broad-brush review of different situations was completed, the authors of this white paper emphasize that their review does not address the *long-term* genetic or ecological effects of hatchery production on wild fish populations (page 5). Understanding the long-term impacts of hatchery fish on wild salmon populations should be a key aspect of determining what, if any, steps are necessary to address hatchery impacts on securing self-sustaining, harvestable populations of salmon and steelhead in the Basin.

Interrelationship of Hatchery & Wild Reproductive Rates Not Explored

It appears that a main purpose of this analysis was to eliminate some of the scientific uncertainty in evaluating population growth rates for hatchery fish in the basin (originally ranging from 20%-80%). This analysis would allow NOAA Fisheries to better project the size of future populations, especially populations that are made up of mostly hatchery fish (as is the case in much of the Columbia Basin). What is needed is a better understanding of the interrelationship of hatchery fish on wild salmon and steelhead restoration efforts (i.e. if the presence of hatchery fish is depressing the wild population's reproduction through competition, predation, genetic introgression etc.). NOAA's white paper on populations and trends highlighted the need for such understanding as key to the rewrite of a new Biological Opinion. However, in direct contradiction to the population trends analysis' call for this information, this white paper does not explore that interrelationship, but rather just looks at the relative differences. NOAA must explore and understand the interrelationship in order to adequate address any impacts from the hatchery system on listed fish.

Local, Multiple Generation Hatcheries Need Adult-to-Adult Analysis

The third hatchery practice explored in the white paper is the local, multiple generations approach. This is a practice that is becoming more and more common in the Columbia Basin and has been touted as a successful approach to hatchery reform. However, instead of having analysis of this practice that was as specific and definitive as the two other reviewed practices, the data set for this practice was far more diverse and less definitive. The studies examined only the adult to juvenile stages and never across the entire lifetime (adult to adult). A measurement of the adult-to-adult stages is imperative before this practice can be compared fairly to the other practices and to the needs of wild salmon and steelhead in the Columbia Basin. To illustrate the importance of this point, the growth rates in the other practices showed the greatest decline in the juvenile-to-adult stage, the stage that was not analyzed in the local, multiple generations approach.

The Hatchery White Paper Lacks a Transparent Conclusion

Finally, as is problematic throughout the white papers, this white paper lacks transparency in its conclusions and thus in future management prescriptions. In fact, the paper is completely devoid of any management prescriptions, except to suggest that the range of assumptions and values being used by researchers can be narrowed by applying the information distilled from the literature review to specific hatchery scenarios (i.e., non-local/domesticated, local/natural origin, local/multi-generational, or captive/farmed). We believe that the hatchery system as operated in the past is in need of a serious overhaul. However, it is unclear given the lack of conclusions and prescribed management measures in this white paper whether NOAA agrees with this premise. In order to more accurately and fully comment on the document, NOAA must provide more transparency in its conclusions and management prescriptions based on this information.