Columbia River Inter-Tribal Fish Commission
729 N.E. Oregon St. Suite 200
Portland, OR 97232

April 30, 2000

Department of the Army
Walla Walla District, Corps of Engineers
ATTN: Lower Snake River Study
201 North Third Avenue
Walla Walla, WA 99362-1876

Dear Sir/Madam,

The Columbia River Inter-Tribal Fish Commission (hereinafter "Commission" or "CRITFC") appreciates this opportunity to provide comments on the Lower Snake River Juvenile Salmon Migration Feasibility Report/Draft Environmental Impact Statement (December 1999). The Commission is composed of the the Fish and Wildlife Committees of the Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes of the Warm Springs Reservation of Oregon, the Confederated Tribes of the Yakama Nation, and the Nez Perce Tribe. These four tribes possess rights reserved by treaties with the federal government to take a fair share of the fish destined to pass their usual and accustomed fishing places. Among these fish are the anadromous species that originate in the Columbia River and its tributaries.

NATURE OF TREATY RIGHTS

1

The tribes' right to take fish that pass their usual and accustomed places is a right confirmed by numerous court decisions. See e.g., Sohappy v. Smith, 302 F.Supp. 899 (D. Or. 1969), aff'd, United States v. Oregon, 529 F.2d. 570 (9th Cir. 1976); Washington v. Washington State Commercial Passenger Fishing Vessel Ass'n, 443 U.S. 658 (1979) (Passenger Fishing Vessel). In addition to binding state governments, See Passenger Fishing Vessel 443 U.S. at 682 and n.25, the treaties are also binding on private citizens, See e.g., United States v. Winans, 198 U.S. 371 (1905), and, of course, the federal government. Passenger Fishing Vessel, 443 U.S.

at 682; See also Confederated Tribes of the Umatilla reservation v. Alexander, 440 F. Supp. 553 (D. Or. 1977). Absent specific authorization by Congress, Indian treaty rights cannot be abrogated. Id., citing Menominee Tribe v. United States, 391 U.S. 404, 413 (1968)).

In Passenger Fishing Vessel, the Court painstakingly examined the circumstances surrounding the negotiation of the treaties in an attempt to define the parties' long-term intentions. The Supreme Court emphasized that Governor Stevens invited the tribes to rely on the United States' good faith efforts to protect their right to a fisheries livelihood. Stevens specifically told the tribes: "This paper [the treaty] secures your fish." Id. at 667 n.ll. During the treaty negotiations, "the Governor's promises that the treaties would protect that source of food and commerce were crucial in obtaining the Indians' assent." Id. at 676 (emphasis added). As the Supreme Court stressed:

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> It is absolutely clear, as Governor Stevens himself said, that neither he nor the Indians intended that the latter "should be excluded from their ancient fisheries," . . . and it is accordingly inconceivable that either party deliberately agreed to authorize future settlers to crowd the Indians out of any meaningful use of their accustomed places to fish.

Id.

The 130 years since the treaties were signed have witnessed a truly startling number of methods by which the quantity of fish available for the taking could be reduced -- if not decimated. The courts have responded to these threats to the treaty right by declaring that the treaty right cannot be defeated by technology or other methods not anticipated by the treaty signatories. For example, in United States v. Winans, 198 U.S. 371 (1905), the defendant constructed a fish wheel (a device capable of destroying an entire run of fish) and excluded the Indians from one of their usual and accustomed fishing places. Commenting on the effects of improved fishing devices, the Court noted that:

> wheel fishing is one of the civilized man's methods, as legitimate as the substitution of the modern harvester for the ancient sickle and flail . . . It needs no argument to show that the superiority of a combined harvester over the ancient sickle neither increased nor decreased rights to the use of land held in common. In the actual taking of fish white men may not be confined

to spear or crude net, but it does not follow that they may construct and use a device which gives them exclusive possession of the fishing places, as it is admitted a fish wheel does.

Id. at 382. See also Confederated Tribes of the Umatilla reservation v. Alexander, 440 F. Supp. 553 (D. Or. 1977) (Absent Congressional authorization, no right to build dam that would destroy tribal fishery). Thus, although new technology may be brought to bear on the fishery, that technology cannot be allowed to imperil the rights secured to the parties to the treaty.

1 cont.

This result was reaffirmed by the Supreme Court in Passenger Fishing Vessel. There the Court declared that "[n]on-treaty fishermen may not rely on property law concepts, devices such as the fish wheel, license fees, or general regulations to deprive the Indians of a fair share of the relevant runs of anadromous fish in the Case area." Passenger Fishing Vessel, 443 U.S. at 684. The Court's intent is clear: absent specific treaty abrogation legislation from Congress, (Menominee Tribe v. United States, 391 U.S. 404, 413 (1968)), no one may use **any method**, to deprive treaty fishermen of their fair share of the anadromous fish.

At the time the treaties were concluded, none of the parties envisioned that non-Indian society would develop and implement an array of technology capable of extirpating entire runs of fish.[1] Yet, to preserve the tribes' right to take fish, the courts have been willing to step beyond what few contingencies might have been foreseen at the time the treaties were concluded. Both Winans and Alexander demonstrate that modern contrivances cannot be used to deprive the tribes of their treaty rights. Federal agencies are obligated to uphold the letter and spirit of the treaties and safeguard the subject matter of these treaties from the depredations of modern technology.

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1 There is at least one notable exception to this. In the Act of 1848 which established the Oregon Territory (which included present day Oregon, Washington, and Idaho) a provision declared that: "*And it be further enacted*, That the rivers and streams of water in said territory of Oregon in which salmon are found, or to which they resort, shall not be obstructed by dams or otherwise, unless such dams or obstructions are so constructed as to allow salmon to pass freely up and down such rivers and streams." Act Establishing the Territorial Government of Oregon, 1848, 13th Congress, Sess I., Ch. 177, 9 Stat. 923 (Aug. 14, 1848), section 12. Thus, it can be presumed that, during treaty-making, the federal government and the Commission's member tribes understood that decimation of the anadromous fish by dams could not occur. Isaac Stevens and Joel Palmer lacked the authority to negotiate treaties that would allow decimation of salmon by dams.

In Kittitas Reclamation District v. Sunnyside Valley Irrigation District, 763 F.2d 1032 (9th Cir.), cert. denied, 474 U.S. 1032 (1985), the Ninth Circuit affirmed a district court order to operate a Yakima water project in a manner that would preserve spring chinook salmon redds. Federal project operators had originally sought to reduce water releases in order to store water for the next irrigation season. The proposed flow reductions would have left the redds high and dry. Testimony at the district court hearing indicated that the proposed water storage would be possible if twelve redds were transplanted or if berms were constructed. Id. at 1035. However, the district court judge was "unsure of the effect of these measures, so he continued the watermaster's authority to release water as necessary." Id. Expressly declining to decide the scope of the Yakima Indian Nation's treaty fishing rights, Id. at n.5, the Ninth Circuit found that the district court judge had fashioned a reasonable remedy. Id.

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The message in Kittitas is clear. Federal agencies are obligated to exercise their authorities in a manner that will protect -- not degrade -- the habitat and flows needed to support anadromous fish. In addition, when addressing anadromous fish habitat needs, various measures may be utilized, but the final choice turns not on balancing treaty rights with other economic interests, but on the biological needs of the fish.

The federal government's duty to protect and enhance anadromous fish habitat does not cease once a fish run becomes viable. The tribes did not reserve a right to merely watch fish swim by or to take a few fish from a meager run struggling for survival. The Columbia River treaty tribes reserved the right to continue harvesting that number of fish that they had traditionally harvested. Obviously, that harvest level is not yet possible given the contemporary depleted fisheries. The Supreme Court has held that both Indian and non-Indian fishermen possess a right, "secured by treaty, to take a fair share of the available fish." Passenger Fishing Vessel, 443 U.S. at 684-85. The Court determined that Indian harvest allocation should not exceed 50% of the harvestable fish. Id. at 685-86. The Court then declared:

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> It bears repeating, however, that the 50% figure imposes a maximum but not a minimum allocation . . . .The central principle here must be that Indian treaty rights to a natural resource, that once was thoroughly exclusively exploited by the Indians, secures so much as, but no more than, is necessary to provide the Indians with a livelihood -- that

4 cont.

> is to say, a moderate living. Accordingly, while the maximum possible allocation to the Indians is fixed at 50%, the minimum is not; the latter will, upon proper submission to the district court, be modified in response to changing circumstances.

Id. at 686-87.

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Perhaps the reason why this "moderate living standard" unearthed by the Supreme Court has not proven to be a truly thorny problem in Pacific Northwest fisheries management is because no one can reasonably contend that the Indians' harvest presently yields a moderate living. This fact was implicitly acknowledged by the Supreme Court in Passenger Fishing Vessel when it stated that the 50% ceiling on the Indians' harvest allocation was necessary "to prevent their needs from exhausting the entire resource and thereby frustrating the treaty right of 'all [other] citizens of the territory.'" Id. at 686.

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Regardless of what the term "moderate living standard" means, it will eventually be defined by the judiciary -- not a federal agency. See Id. at 687. As discussed earlier, the Ninth Circuit has already determined that federal agencies must refrain from taking actions that will reduce the number of fish in a depleted run. See Kittitas, 763 F.2d at 1035. Nor does this duty cease when a run manages to increase in numbers beyond the dangerous level of mere viability. In United States v. Adair, 723 F.2d 1394 (9th Cir. 1983), cert. denied, 467 U.S. 1252 (1984), the Ninth Circuit stated that:

> Implicit in this "moderate living" standard is the conclusion that Indian tribes are not generally entitled to the same level of exclusive use and exploitation of a natural resource that they enjoyed at the time that they entered into the treaty reserving their interest in the resource, **unless, of course, no lesser level will supply them with a moderate living.**

Id. at 1415 (emphasis added).

Here the Ninth Circuit has indicated that the Klamaths must be allowed to achieve their "moderate living." No one knows what that is. The court explicitly

6 cont. stated the possibility that the "moderate living standard" may only be achieved by allowing the tribe to enjoy the "same level of exclusive use and exploitation" it had at the time the treaty was concluded. Id. The purport of this holding is clear. Federal agencies owe a duty to refrain from activities that will interfere with the **fulfillment** of treaty rights. Moreover, this duty cannot be performed by engaging in a "balancing" process between Indian treaty rights and a competing economic interest such as power generation, irrigation, cattle grazing, or timber harvest. Any such "balance" imposed by federal agencies would amount to a de facto abrogation of Indian treaty rights. In the context of federal land and water management, unless federal agencies can demonstrate that the tribes' treaty rights are presently being fulfilled, they cannot justify approving activities that will cause further degradation of anadromous fish habitat or reductions in fish populations. Similarly, federal agencies cannot decide that fulfillment of their treaty obligations can be "delayed" or even avoided altogether in order to minimize the impact on non-Indians. Further delay impermissibly perpetuates the already long period during which the tribes have been deprived of their right to take fish.[2]

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The Federal Government Cannot Pick and Choose the Laws with which it Must Comply

8, 9 The federal government's treaty and trust obligations to Indian tribes are distinct from the federal government's obligations to protect fish and wildlife and their habitat pursuant to the Endangered Species Act (ESA). The ESA does not "trump" or re-define the United States' obligations under other laws. "The Endangered Species Act and the Clean Water Act are distinct statutory schemes. Compliance with one statute does not equal compliance with the other." National Wildlife Federation v. Corps or Engineers, Civ. No. 99-442-FR (March 21, 2000) at 16, citing, Seattle Audubon Society v. Evans, 952 F.2d 297, 302 (9th Cir. 1991). Similarly, compliance with the ESA does not equal compliance with treaty and trust obligations which are separate laws with different objectives -- the tribes clearly reserved more than the remnant salmon runs sufficient to meet ESA de-listing

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7 cont. (2) For federal agencies to argue that it is permissible to "delay" recovery of degraded fish habitat (and thus depleted fish populations) in order to minimize impacts to irrigation, power generation, timber harvest or cattle grazing is like a financially-strapped bank arguing that it is permissible to withhold depositors' money in order to minimize reductions of dividends to shareholders.

8, 9 cont. criteria.

It is important that the federal government clearly identify the laws and policies with which it must comply. Different laws and policies have different objectives. The federal government's failure to be clear about what it must do by when is a significant contributing factor to the failure of the 1995 FCRPS BO. Instead of fully recognizing the magnitude of the improvements in salmon survival that were/are necessary, the goal of the BO was perceived as "increasing salmon survival." DEIS at 5.4-1. This failure to have clear objectives likely contributed to the federal government's failure to secure additional flow augmentation (as promised in the BO) and its tendency to exploit the vagueness of the BO to cut corners for the benefit of power generation and the detriment of fish. Five years after the adoption of that BO, flow targets remain largely unmet, and spill is less than called for by the BO due to TDG and power transmission constraints, yet BPA still produces some of the cheapest power in the nation and the salmon have continued their decline despite tribal conservation efforts.

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The federal government must obey all laws in a timely manner. Judge Frye's recent opinion in National Wildlife Federation, supra, makes clear that the Corps of Engineers' operation of the lower Snake River dams must comply with Washington's water quality standards. National Wildlife Federation v. Corps or Engineers, Civ. No. 99-442-FR (March 21, 2000) at 18. Therefore, if the lower Snake dams are to remain in place, they must be modified to comply with state water quality standards for temperature and dissolved gas. Thus, managing the dams, (either through operational decisions or by failing to implement structural modifications), so that they do not meet water quality standards is not an option. Accordingly, alternatives 1-3 must be re-designed to ensure compliance with, among other things, total dissolved gas standards during involuntary spill. There is no evidence indicating that salmon and resident species are not affected by elevated total dissolved gas from involuntary spill.[3] In fact, the highest dissolved gas levels generally occur during periods of involuntary spill.[4] The DEIS concedes that alternatives 1-3 will significantly violate Washington's TDG standard during times of high run-off, yet fails to propose reasonable mitigation measures (such as raised stilling basins) that

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(3) The term "involuntary spill" is somewhat inaccurate. It includes spill stemming from flows in excess of powerhouse capacity and the more controllable spill that occurs when BPA has failed to find a market for all the power it can generate.

(4) See e.g., DEIS at 5.4-17; 5.4-25; c.f., DEIS at 5.4-32 (Surface bypass collectors could ameliorate the need for voluntary spill thereby reducing associated TDG levels).

could assure that the dams would comply with the water quality standard under all operating conditions. The Corps' failure to design these alternatives so that they comply with state water quality standards biases the economic analysis by making the non-breaching alternatives appear to be less costly than they actually are.

11, 12, 13, 14 cont.

Interestingly, over the past eight years, a number of measures to bring the Lower Snake dams into compliance with the Clean Water Act Standards for temperature and dissolved gas have been proposed and examined. These were outlined and specified by the Corps and other federal agencies in the Phase I and Phase II of the System Configuration Studies (Corps 1992; Corps 1994), the Three Sovereigns Future Fish and Wildlife Costs (1998), and the May 11, 1999 Memorandum from NMFS, USFWS, EPA and Treasury to BPA.

These reviews and processes outlined specific measures and costs to implement structural measures to bring the Lower Snake dams as they are currently configured into compliance with the CWA standards. For example, the Corps' SCS process estimated $188 million to construct a raised stilling basin at the four dams (Corps 1994). For temperature control in adult fishways, the SCS Phase I study estimated that $15.4 million would be required. Estimates from the Corps in the Three Sovereigns Future Fish and Wildlife Costs (1998) for a raised stilling basin was $50-100 million per dam. However, none of these measures are included in the DEIS for any of the non-breaching alternatives. This is a critical omission[5] and inclusion of these measures must appear with associated costs in the final EIS for the non-breaching alternatives.

Salmon Protection Measures Must Not Discriminate Against the Tribes

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In their interpretation of the tribes' treaties, the federal courts have established a large body of case law setting forth certain fundamental principles. These principles, also known as the "conservation standards," set the standards for state

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11, 12, 13, 14 cont.

[5] The EPA has been very critical of the DEIS and rated the DEIS "Inadequate." The EPA found that the DEIS: improperly evaluates the water quality impacts of alternatives 1-4; does not include a strategy to comply with water quality standards; does not include the costs of achieving water quality standards under alternatives 1 through 3 in the economic analysis; and does not adequately evaluate the air quality impacts of any of the alternatives. See generally Letter (and comments) to Lieutenant Colonel William E. Bulen, Jr., Corps of Engineers, Walla Walla District; from Chuck Clark, Regional Administrator, EPA (April 27, 2000).

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and federal regulation of treaty rights.[6] For state or federal regulation of treaty fishing rights to be permissible, it must be demonstrated that the regulation is "a reasonable and necessary conservation measure...and that its application to the Indians is necessary in the interests of conservation." Antoine v. Washington, 420 U.S. 194, 207 (1975); see also Puyallup Tribe v. Dept. of Game, 414 U.S. 44, 49 (1973). Government regulation must not discriminate against Indians exercising treaty rights, either on its face or as applied. See Puyallup Tribe, supra; Lac Courte Oreilles Band of Indians v. Wisconsin, 668 F. Supp. 1233, 1237 (W.D. Wis. 1987). And, all measures must be taken to restrict non-Indian activities before treaty rights may be regulated. See e.g., United States v. Washington, 520 F.2d 676, 686 (9th Cir. 1975), cert. denied, 423 U.S. 1086 (1976); Lac Courte Oreilles Band of Indians v. Wisconsin, supra, at 1235-36.

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Alternatives 1, 2, and 3 of the DEIS violate the conservation principles. These three alternatives violate the conservation principles because they discriminate against the tribes' exercise of their treaty reserved rights to take fish. The DEIS makes clear that in order to meet NMFS' interpretation of the ESA requirements of listed fall chinook and steelhead, either the dams must be breached or the tribes' harvest of fall chinook and steelhead must be even more heavily restricted. By positing the issue as a choice between keeping the dams or curtailing harvest, including Indian fishing, the Corps misconstrues the applicable law. That choice is not available. To comply with the law, the Corps must both meet the requirements of the ESA and comply with treaties with Indian tribes. Dam breaching is the only alternative which will both meet the requirements of the ESA and eventually provide for meaningful Indian fisheries consistent with the letter and spirit of the treaties between the United States and the Commission's member tribes. Since alternatives 1, 2, and 3 all call for keeping the dams in place, thereby continuing the heavy toll exacted by the FCRPS, even the most unrealistically optimistic scenarios indicate that treaty harvest will be restrained at current levels or be pressured for further restrictions. Through reductions and restrictions on treaty fisheries, the Commission's member tribes have essentially been mitigating the impacts of the FCRPS. This discriminates against their right to take fish and is inconsistent with their treaty secured rights.

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15 cont.

6 The conservation standards should be familiar to the federal government. In addition to their articulation in a large body of case law, the conservation standards are summarized in the tribes' salmon restoration plan *Wy-Kan-Ush-Mi Wa-Kish-Wit* (Spirit of the Salmon) at page 4-2. The conservation standards were largely adopted by the Secretaries of the Interior and Commerce in Secretarial Order 3206 (June 5, 1997).

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Alternatives 1, 2, and 3 also discriminate against the tribes and violate their treaty rights with respect to spring/summer chinook because spring/summer chinook will continue their decline to extinction even if treaty fisheries are completely eliminated.(7) The federal government has so mis-managed these fish that even taking away the tribes' ceremonial and subsistence fisheries is not enough to compensate for mortality stemming from poor non-Indian land and water management. Id.

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In Alternatives 1, 2, and 3 the United States is discriminating against the tribes and violating their treaty rights by requiring the tribes to sacrifice their treaty reserved rights so that non-Indians can continue to enjoy subsidized water-borne transportation of commodities and continued access to some of the cheapest hydroelectric power in the nation. It is unjust and illegal for the federal government to elevate Lewiston's 25 year stint as a subsidized seaport over the treaty reserved rights of the Commission's member tribes and over the continued existence of salmon.

The DEIS Fails to Consider a Reasonable Range of Alternatives

On August 17, 1995, CRITFC submitted scoping comments on the Lower Snake River Salmon Migration Feasibility EIS. We incorporate those comments by reference. The CRITFC called for the Corps to include the following in developing the DEIS:

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- Consider the CRITFC comments on the Corps Phase I and Phase II System Configuration Study (SCS);
- Consider the CRITFC comments on the Corps 1994 Biological Test for Drawdown DEIS;
- Consider the CRITFC comments on the System Operational Review DEIS;

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(7) NMFS, Biological Opinion, Impacts of Treaty Indian and Non-Indian Year 2000 Winter, Spring, and Summer Season Fisheries in the Columbia River Basin, on Salmon and Steelhead Listed Under the ESA (Feb. 29, 2000) at 57.

- Include aggressive alternatives in the DEIS that emphasize substantial improvements for in-river passage in quality mainstem habitat and structural alternatives that eliminate handling and physical impacts to all anadromous fish including lamprey and sturgeon;

25 cont.

- Include alternatives in the EIS that are presented in *Wy-Kan-Ush-Mi Wa-Kish-Wit;*

- Include an alternative where full flow surface bypass system (>10 kcfs) is used without de-watering'

- Include an alternative that analyzes the effect of adding 1-1.9 MAF from the upper Snake River for flow augmentation over that in the 1995-1998 FCRPS biological opinion; and

- Include analyses of each alternative with respect to anadromous fish rebuilding goals in *Wy-Kan-Ush-Mi Wa-Kish-Wit.*

The DEIS has not addressed many these key issues. Outstanding deficiencies include an alternative that emphasizes in-river passage with full flow surface bypass systems at each dam, structural measures found in Phase I and Phase II SCS studies that bring dams and fishways closer to compliance with Clean Water Act standards for total dissolved gas and temperature, and analyses of each alternative to determine how each alternative comports with anadromous fish rebuilding goals in *Wy-Kan-Ush-Mi Wa-Kish-Wit.*

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There do not appear to be significant differences between alternatives 1, 2, and 3. Present guidance with extended length screens at Little Goose and Lower Granite dams intercept the vast majority of juvenile salmon for transportation. Surface bypass studies indicate that at most, current technology might increase diversion of juveniles for transportation by about 6-10%. It does not appear likely that the Wells Dam surface bypass standard of 90% juvenile diversion from turbines would be achievable at Lower Snake dams. Under alternatives 1-3 changes to adult passage facilities would have been similar.

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Another indicator that the DEIS fails to consider a reasonable range of alternatives is that the federal caucus is in the process of negotiating a biological assessment (BA) and BO for the FCRPS that is not reflected by the alternatives in

27 cont.

the DEIS. For example, the federal caucus is considering implementing 24 hour spill. None of the three transportation-based alternatives consider this.[8] Similarly, all four alternatives addressed by the DEIS include the same flow augmentation regime. The current FCRPS BO emphasizes the importance of acquiring additional water from the upper Snake and Columbia basins. Even so, the amount of flow augmentation for each of the alternatives, including alternative 4 (breaching), is the same (inadequate) amount that has been supplied under the current FCRPS BO.[9]

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It is difficult to understand the rationale as to why the Corps chose to provide for identical levels of flow augmentation for each alternative, particularly when their own decisions call for additional water acquisition. The DEIS states that the Bureau of Reclamation investigated the possibility of acquiring an additional 1 million acre/feet of water from the upper Snake River basin, but found that this would "involve high costs and multiple implementation issues." DEIS at 3-15. This appears to be a euphemism for "politically unpopular."[10] There is nothing in NEPA (or the ESA) that excuses federal agencies from considering a reasonable range of alternatives when to do so would require examining[11] actions that may have "high costs and multiple implementation issues." The direction in the FCRPS BO to take steps to acquire additional water for flow augmentation means that examining the issue is per se reasonable. Increased flow augmentation is an important component of attempting to make the existing configuration of the FCRPS more compatible with the needs of fish.[12] The federal government's reluctance to even examine an approach it considers relevant and important is another example of its lack of regard for salmon and Indian tribes vis a vis those who oppose flow augmentation.

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One of the benefits of breaching touted by some is that breaching alleviates the need for flow augmentation. If this is so, it makes no sense to include flow augmentation in the breaching alternative. A more acceptable approach would be to display the breaching alternative both with and without flow augmentation so that

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[8] Early on, the Commission requested development of an in-river alternative using spill and full flow surface bypass. The DEIS failed to examine such an alternative.

(9) Alternatives 1-3 all anticipate power generation and irrigation remaining the same. DEIS at 3-4-5.

(10) The DEIS notes that providing an additional million acre/feet of water from the upper Snake "did not meet Federal criteria for completeness and public acceptability." DEIS at 2-13.

(11) At this point, we are simply addressing the issue of what federal agencies must examine. We have not yet reached the issue of what the agencies must adopt.

(12) While some may try to argue that flow augmentation provides little or no benefit to spring migrants, the evidence of benefits for summer migrants is more difficult to ignore.

30, 31 cont.

the costs and benefits of flow augmentation could be assessed in the context of breaching. Yet the Corps explicitly decided not to analyze breaching without flow augmentation. The rationale? To do so would be inconsistent with the requirements of the FCRPS BO. DEIS at 3-17. This justification is undercut by the Corps' willingness to consider an alternative (2) that calls for less spill (but not more) than that called for by the BO. DEIS at 3-5. Since the Corps is clearly willing to design an alternative that does differ from the requirements of the BO when it wants to, it is difficult to escape the conclusion that the Corps' refusal to consider a breaching alternative without flow augmentation is based on bias. Inclusion of flow augmentation in the breaching alternative results in increasing the cost of implementing that alternative. The point of NEPA is to present a reasonable range of fairly presented options to facilitate informed decision-making. This the DEIS fails to do.

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Project Characteristics

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Most salmon do not survive through the hydrosystem. The 1995-1998 FCRPS biological opinion cites a juvenile spring chinook and steelhead loss with RPA measures of
24-86%; juvenile fall chinook losses at 62-100%; adult spring chinook and steelhead losses at 21% and adult fall chinook losses at 39%. These numbers should be included in the DEIS.

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This section is not complete or wholly accurate in describing the impacts of the existing system on salmon stocks, life history and overall production. These issues are explored in depth in:

- CRITFC November 14, 1991 Comments on the Corps' draft Columbia River Salmon Flow Measures Options Analysis;
- CRITFC December 7, 1992 Comments on the Corps draft Supplemental Environmental Impact Statement (SEIS) on Interim Columbia and Snake River Flow Improvement Measures for Salmon;
- *Wy-Kan-Ush-Mi Wa-Kish-Wit;*
- the CRITFC treaty tribes' *1999 Biological Assessment of Incidental Impacts on*

Salmon Species Listed or Proposed for Listing under the Endangered Species Act in the 1999 Treaty Indian Fall Season Fisheries in the Columbia River Basin as proposed by the Tribes Under U.S. v. Oregon;

- the CRITFC treaty tribes' 2000 *Biological Assessment of Incidental Impacts on Salmon Species Listed or Proposed for Listing under the Endangered Species Act in the 2000 Treaty Indian Winter and Spring Season Fisheries in the Columbia River Basin as proposed by the Tribes Under U.S. v. Oregon*;

- CRITFC's December 16, 1994 Letter and Comments regarding information developed in IDFG v. NMFS Processes from T.Strong, CRITFC to W. Stelle, NMFS;

34, 35 cont.

- CRITFC's February 10, 1995 Letter and Comments on the NMFS *draft biological opinion on the Federal Columbia River Power System from T. Strong, CRITFC to W. Stelle, NMFS;*

- CRITFC's January 6, 1997 Comments on the *Proposed Rule for West Coast Steelhead, 61 Fed. Reg. 41541 (August 6, 1996)* from T.Strong, CRITFC to G.Griffin, NMFS;

- CRITFC's April 3, 1998 Comments on the *Draft Supplemental Biological Opinion of the Federal Columbia River Power System Including the Smolt Monitoring Program and the Juvenile Fish Transportation Program, during 1998 and Future Years* from T. Strong, CRITFC to W. Stelle;

- CRITFC's February 4, 2000 comments on the *1999Draft Supplemental Biological Opinion on Operation of the Federal Columbia River Power System including the Smolt Monitoring Program and the Juvenile Fish Transportation Program During 1999 and Future Years: A supplement to the Biological Opinions signed on March 2, 1995 and May 14, 1998 for the same Project* from D. Sampson to W. Stelle;

- *Response to the Questions of the Implementation Team regarding juvenile salmon transportation in the 1998 Season* (ISAB Report 98-2);

- CRITFC comments on NMFS 1999 white paper entitled "*Passage of Juvenile and Adult Salmonids past Columbia and Snake River dams*"(attached to these

34, 35 cont.

comments);

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We incorporate these documents by reference as comments to the DEIS.[13]

Following are additional specific comments related to "Project Characteristics."

p. 2-7

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There is no reference cited in support of the claim that the existing juvenile facilities at Lower Granite provide a "99.5 % survival." Muir et al. (1998) estimated direct survival for hatchery steelhead from the forebay trashracks to the collection facility at Little Goose at 95.3%. Hockersmith et al. (2000) found a 95.8% survival for yearling hatchery chinook from the primary de-watering structure at the Lower Monumental screened bypass system to the tailrace. Matthews et al. (1987) showed average direct mortality rates for yearling chinook of 5.7 % measured from the gatewell to the pre-separator at Lower Granite. Gilbreath et al. (1993) showed direct and partial delayed mortality of about 20% for subyearling fall chinook measured from release in the screened bypass collection channel at the Bonneville II Powerhouse to the estuary. If forebay predation, outfall passage through the pressurized pipe and tailrace predation below the Lower Granite outfall are considered, Lower Granite screened bypass system direct mortality could reasonably approach 8-12 % for yearling chinook and 15-20% for subyearling fall chinook. As indicated in the Gilbreath et al. study and PATH analyses, indirect mortality for juvenile salmon forced through screened bypass systems can be significantly higher than direct mortalty.

p. 2-9

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Truck transportation of juvenile smolts was not recommended by the ISAB (Williams et al.1998) and remains unscrutinized as to smolt-to-adult returns from the Snake River dams. The Corps opposed all of the region's fishery agencies and CRITFC proposal to implement a summer spill test in the Lower Snake River in 1997 (Arndt 1997 pers. comm.) The Corps maintains that they cannot afford to barge subyearling fall chinook (McKern 1998 person. comm.).

36 cont.

[13] If the Corps of Engineers would like us to provide copies of the comments that have been referenced in these comments, they are available upon request.

39 Despite the "goal" in the NMFS 1995 FCRPS biological opinion of only transporting half of the migrants, in reality from 69-81% of spring chinook and from 69-85% of steelhead are estimated to be transported from the lower Snake River dams (Berggren 1998).

40 The CRITFC tribes have advocated for a summer drawdown of Lower Granite pool to elevation 710 to expedite juvenile salmon passage through the slackwater pool (Nez Perce et al. 1995).

41 Turbines can and are operated outside the 1% criteria during the fish migrations for several reasons including power emergencies and fish passage research according to BPA turbine operation guidelines contained in the annual Corps Fish Passage Plans (CRITFC 2000; DFOP 1993).

p. 2-10

42 Turbine mortality cited in the section must be quantified as direct and incomplete and not representative for juvenile salmon that randomly pass through a turbine unit without the encumbrance of study apparatus. The reported 7% mortality referred to in this section is for yearling juvenile salmon released via a hose into the turbine scroll case and quickly recovered in the tailrace via a self-inflating balloon and radio-tag. Whitney et al. (1997) provide a much more inclusive range of turbine mortality which includes some indirect mortality. For example, both Giorgi and Sturehrenberg (1988 in Whitney et al. 1997) and Iwamoto et al. (1994 in Whitney et al. 1997) estimated a 16.9 % mortality for yearling chinook passing through the Lower Granite turbines and recovered downstream. The EIS should include the range of turbine mortality and specify the test conditions and protocol for these studies found in Whitney (1997).

p. 2-11

43 Recent radio-telemetry study results (Bjornn 1999 pers. comm.) indicate that spill from endbays does not impact adult passage. There is evidence that indicates that spill of 1-2 kcfs per end bay may aid in attracting adults to fishway entrances (DFOP 1993)

p. 2-13

44 As stated previously, the CRITFC tribes are not members of the NMFS Adaptive Management Process. The TMT is part of that process.

45 What are the "Federal criteria" referred to in this section that would not allow authorization or implementation of addition Snake Basin water for salmon migrations?

p. 2-14

Lower Snake Compensation Plan. Only about 16 million fish are currently produced by the Plan.

46, 47 None of the Lower Snake River dam screen bypass facilities have had comprehensive evaluations on all of the anadromous fish stocks passing through them (i.e., sockeye, Pacific Lamprey, subyearling chinook) and yearling steelhead and chinook comprehensive evaluations have not yet been completed yet at all the screen systems. Yet, these systems are operated for the migrations at large without the vital knowledge of what impacts they may be causing entire migrating populations. We incorporate the CRITFC comments to the NMFS' 1999 passage white paper *Passage of Juvenile and Adult Salmonids past Columbia and Snake River Dams* by reference as indicating the impacts of these systems on anadromous fish.

48

p. 2-17

Surface Bypass Collector Operation. According to Anglea et al. (2000), the hydro-acoustic estimate for surface bypass collector efficiency for yearling salmon relative to the entire powerhouse averaged 22.5% for the years 1997-1999. The efficiency relative to turbine units 4-6 (units covered by the collector) averaged 43.4% for the years 1996-1999.

49 The hybrid screen and surface bypass operation may divert more salmon from the turbines but the screen portion of the system has been shown to case higher levels of direct and delayed mortality that spill or surface bypass systems.[14]

[14] These issues are addressed in CRITFC comments to the NMFS' 1999 passage white paper *Passage of Juvenile and Adult Salmonids past Columbia and Snake River Dams.*

50 Power marketing affects implementation of spill, pursuant to the existing FCRPS biological opinion. BPA operates the transmission system, but it is regulated by the Federal Energy Regulatory Commission. Present limitations of the transmission system prevent biological opinion fish passage standards via spill from being implemented.

p. 2-18

51 Funding from the Corps' Columbia River Fish Mitigation Program has been used for navigation structures at Ice Harbor Dam. The structures were in response to hydraulic difficulties caused by installation of spillway deflectors to reduce total dissolve gas levels to address total dissolved gas water quality standard violations caused by involuntary spill and spill for salmon passage.

p. 3-2 -- Alternative 1 Existing Conditions

52 The specific schedule for the implementation of improvements to turbine cams, new turbine runners, new fish barges, adult fishway improvements, juvenile screen system improvements and improvements to spillways should be provided in this section. This is important because this alternative cannot be evaluated in terms of economics or biological efficacy without the schedule.

Unless hatcheries can produce both the quantity and quality of mitigation fish under the Lower Snake Compensation Plan necessary for recovery of stocks impacted by the four Lower Snake dams, appropriate mitigation is not taking place. Captive broodstock programs are completely experimental and have not yet proven they can successfully recover stocks.

Writing Off Populations

53, 54 The Corps lacks the authority to "write-off" salmon populations. Unfortunately, it appears that implementation of at least alternative 3 would likely have that result. The Corps states that it anticipates installing a surface bypass collector (SBC) at Lower Granite, but relying on ESBSs (extended length submersible bar screens) at Little Goose, Lower Monumental, and Ice Harbor.

DEIS at 3-5. The Corps opines that limiting the use of SBC to Lower Granite is legitimate because the majority of Snake River fish originate in waters upstream of Lower Granite. DEIS at 3-7. The Corps concedes that Deadmen Cr., Meadow Cr., and the Tucannon and Palouse rivers all originate below Lower Granite, but states that these streams contribute relatively small numbers of fish. Id. The DEIS does not discuss what impacts are likely to the future existence of the salmon inhabiting these waters.

53, 54 cont.

It may be that the federal government intends to rely on habitat protection and improvement to mitigate for the impacts of the FCRPS on salmon. If so, then the Snake River tributaries listed above will be forced to bear an even heavier load, for the convenience of the FCRPS, than other Snake River tributaries. However, there is no discussion addressing whether it is feasible to place the burden of maintaining and increasing salmon populations on the land-owners and managers in these tributaries.

Genetic Impacts of FCRPS

The DEIS does not acknowledge the likely repercussions on the genetic structure of salmon stemming from the operation of the FCRPS. There are many ways that the FCRPS could affect the salmon "selection" process such that it would alter the genetic structure of against salmon. These include the impacts of extended length (ESBS) screens against subyearling migrants. In addition, extended length screens also affect sockeye, which are prone to de-scaling[15] and lamprey.[16] The

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(15) Lamprey may also appear suffer significant impacts from impingement on extended length screens.

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(16) Studies indicate that extended length submersible bar screens have significant impacts on lamprey. One study, prepared for the Corps of Engineers, found that from 70% and 97% of the juvenile test lamprey were impinged on the bar screens at velocities of 1.5ft/sec. for 1 minute to 12 hour exposures, respectively. Moursund, R.A., Dauble, D.D., Bleich, M.D. Effects of John Day Dam Bypass Screens and Project Operations on the Behavior and Survival of Juvenile Pacific Lamprey (January 14, 2000). A 1995 Corps study of juvenile lamprey noted severe problems. "In the one instance in which the effects of the EBS [extended length submersible bar screens] on juvenile lamprey were observed [at The Dalles Dam] , mortality was 100%. The study also noted that it is likely that the STS's have a severe impact on juvenile lamprey. Starke, G.M., Dalen, J.T. Pacific Lamprey Passage Patterns Past Bonneville Dam and Incidental Observations of Lamprey at the Portland District Columbia River Dams in 1993 (February 9, 1995). Radio-telemetry of Pacific Lamprey also documents severe impacts to migrating adults. Vella, J.J., Stuehrenberg, L.C., Bjornn, T.C. Radiotelemetry of Pacific Lamprey in the Lower Columbia River, 1996. Annual Report of Research, US Army Corps of Engineers,

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timing of transportation is often keyed to when there are seemingly worthwhile numbers of fish to transport. This "efficiency" penalizes those fish whose run timing occurs in the tails of the bell curve (most likely wild fish). The DEIS itself recognizes that fish reaching the estuary at certain times seem to survive better than fish arriving at other times.[17] Given the pervasive influence that the FCRPS exerts on run-timing for both juveniles and adults, it is clear that the FCRPS has affected and continues to affect anadromous fish genetic structure.

56, 57

Other examples of FCRPS influence on salmon genetic structure likely include the use of spill as a tool for passing fish. Spill is significantly constrained by Bonneville's desire to maintain its position as one of the cheapest suppliers of hydroelectric power in the nation.[18] Accordingly, there is much greater reliance on barging and trucking as a means of bypassing subyearling migrants around the dams so that spill will not be implemented when power prices are higher.

58

The DEIS notes that crowding of fish into barges and raceways may facilitate disease transmission thereby affecting survival and potentially being a significant factor in differential delayed mortality. This has genetic implications, as well.This crowding of fish originating from distant watersheds into close quarters facilitates contact and disease transmission that would not occur, but for the FCRPS.[19]

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55 cont.

Contract E96950021 (March 1999).

(17) The DEIS states that spring chinook SARs for the 1995 migration are about 7 times higher for transported smolts that passed the estuary following the sec9ond wek of May. The DEIS notes that this date correlates with the spring transition shift of winds and currents in the estuary and near ocean. DEIS at 5.4-64. There is no discussion of how alternatives 1-4 might affect run-timing into the estuary.

56, 57 cont.

(18) The DEIS notes that "[t]he majority of spill occurs at night." DEIS at 3-20. The unwary reader might be led to think that spill is nocturnal. The reason why the majority of spill occurs at night is because that is when power demand is the lowest. Thus the federal government's response to power demand results in limiting the availability of a relatively safe means of passage to juvenile fish that migrate during the day. The transmission system also affects the availability of spill. The transmission system provides access to markets, such as California, with significant summer demand and high power generation costs relative to BPA's. It is difficult for juvenile summer migrant salmon to compete.

58 cont.

(19) There is a tendency to attribute genetic impacts to all things other than the FCRPS. The DEIS attributes genetic impacts to hatchery practices, predation by large steelhead and Caspian terns, DEIS at 5.4-66-67, without analysis. While it is currently in vogue to blame the terns, the tern population didn't begin to increase until well after salmon populations had already been decimated. The increase in tern predation likely correlates with the expansion of islands in the estuary resulting from the Corps of Engineers dumping dredge spoils. The DEIS hints at the possibility of FCRPS-caused genetic impacts when it references "possible changes in flow to the estuary." DEIS at 5.4-66. But it is

58 cont. There are myriad ways in which the FCRPS exercises selective pressure on salmonids and none of them appear to have been adequately discussed or considered in the DEIS.

Managing for a Normative River

59, 60 Appendices A and M of the DEIS (along with the DEIS) fail to adequately address the hypothesis, advanced by the Independent Scientific Group (ISG), that salmon restoration hinges on managing for more "normative" ecosystem conditions. This approach entails, among other things, restoration of the spring freshet to revitalize inriver habitats, stabilization of daily flow fluctuations (largely attributable to power peaking) to foster the creation and maintenance of shallow water food webs needed by rearing juveniles, and reconnecting (and restoring) mainstem and tributary habitats.[20] It is based upon the observation that decades of technical "fixes" such as mechanical bypass systems, relatively small amounts of flow augmentation, and barging and trucking of juvenile fish have resulted in the depleted salmon populations that currently exist. This approach urges avoiding substituting technological fixes for providing normative ecosystem conditions.

NMFS' Appendix A pays lip service to this approach (pp. A2-13-14) where, without citation to the ISG, it provides a distorted "summary" of the ISG's hypothesis:

> 61 It is obvious that the Snake River (and many other rivers in the Pacific Northwest) are drastically altered from their free-flowing, natural condition. Given this observation, is it not equally obvious that removing dams and returning the rivers to their natural condition is the obvious solution?

DEIS Appendix A2-14. NMFS dismisses this argument by noting that while valid

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58 cont. unclear what flows it is referring to and is unaccompanied by analysis. It is well known that operation of the FCRPS has resulted and continues to result in massive changes in flow timing and composition. There does not appear to be a discussion of which alternative(s) might produce flow regimes more closely akin to those within which anadromous fish evolved.

59, 60 cont. (20) This approach has been proposed by the Independent Scientific Group which authored Return to the River: Restoration of Salmonid Fishes in the Columbia River Ecosystem, Development of an Alternative Conceptual Foundation and Review and Synthesis of Science Underlying the Columbia River Basin Fish and Wildlife Porgram of the Northwest power Planning Council (Rept. No. 96-6).

61 cont.

and appealing, "implementing this concept in a decision framework is difficult....Which of the moves toward naturalness would do the most to promote salmon recovery?" Id. NMFS then suggests "[c]onsider, by analogy, a dream house." (It then describes the dream house.) NMFS then asks: "Now, imagine trying to build that house on a limited budget -- what do you cut out?" Id. NMFS needs to get a tighter grasp on the biology before it leaps to the question of cost. NMFS opines that its approach is that "improvements in river conditions (or naturalness) must be linked to measurable improvements in salmon survival or productivity."[(21)] Id. NMFS asserts that the proper question is: "how much salmon recovery do you get for particular management actions that return the river closer to its natural state?"

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If that is the proper question, perusal of alternatives 1-3 indicates that either:

(1) NMFS never evaluated the alternatives to assess how much salmon recovery would be achieved for management actions that return the river closer to its natural state; or

(2) NMFS did evaluate the alternatives and found little or no benefit from management actions that return the river closer to its natural state.

Alternatives 1-3 do nothing to address problems from power peaking. Alternatives 1-3 fail to expand upon flow augmentation or otherwise attempt to restore the spring freshet to foster the growth of in-river habitat. Alternatives 1-3, particularly 2 and 3, concentrate even more heavily on the use of technical fixes (particularly

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(21) Interestingly, the tribes have limited their harvest on spring and summer chinook for decades in the hope that this conservation measure would result in rebuilding. While harvest is perhaps the most measurable activity, the tribes' well documented conservation measures have not resulted in reversing the decline. Arguably, this conservation measure does not meet NMFS' requirement that conservation measures "must be linked to measurable improvements in salmon survival or productivity." The reason why the tribes' sacrifice has been to no avail is that impacts from the other H's are so much greater. The inter-dam loss rate for spring/summer chinook adults, independent of harvest (10%), is 50%. NMFS concedes that the spring/summer chinook slide to extinction will continue unless non-harvest actions are further constrained. In any case, the fact that spring/summer chinook productivity has continued to decline in the face of very limited tribal fisheries has not stopped NMFS from imposing an 8.5% cap on the tribes' 2000 spring fishery. The requirement that measurable benefits must be shown before a conservation requirement is imposed contains a patina of reasonableness, but is instead an obstacle erected by the federal government to protect the status quo. It is not a standard that is applied to the tribes.

62 cont. transportation by truck and barge) that have already failed to rebuild the salmon. In short, these three alternatives do nothing to incorporate normative river concepts and, by implication, imply NMFS' view that there is no salmon survival benefit from moving towards a more natural river.

63 Alternative four is the only alternative which appears to address normative river concepts, even though breaching is not necessarily a prerequisite for more normative management. As discussed in other parts of these comments, NMFS seems to understate the impacts of the dams on both juvenile and adult migration and tends to assume that differential delayed mortality is low and that extra mortality stems from sources other than the FCRPS. As a consequence of these assumptions and understatements, NMFS finds relatively little benefit in returning the Snake to a more natural or normative river. NMFS opines that the natural river "ideal is a rich source of hypotheses about processes needed to maintain vigorous salmon populations. But ultimately, the currency for evaluating actions has to be salmon demography and population dynamics, not the physical attributes of a river alone." Appendix A2-14.

64 At the heart of the normative river approach is the empirically-based notion that rivers in natural condition tend to foster more robust salmon populations. While NMFS' "green eye-shade" approach does have its appeal, the consistent outcome has been steadily declining anadromous fish runs. Alternatives 1-3 are propose continuation of the remove-the-fish-from-the-river management paradigm that is a thoroughly beaten dead horse. While some question whether the benefits of managing for a normative river are worth the costs, it is already very clear that the status quo measures proposed by alternatives 1-3 are not worth the cost.[22] The DEIS needs to be revised to fully address the normative river concepts developed by the ISG.

Comments on FCRPS-Induced Mortality

65 Specific comments on mortality to juveniles and adults are provided in CRITFC, Comments on the October, 1999 NMFS White Paper, Passage of Juvenile

22 The DEIS concedes that "[t]he CRI analysis, in agreement with PATH analysis, concluded that further improvements in spill, bypass systems, or transportation (e.g., alternatives 2 and 3) are unlikely to be adequate to rebuild the listed Snake River stocks." DEIS at 5.4-117.

65 cont. and Adult Salmonids Past Columbia and Snake River Dams (attached to these comments).

Adult Passage

Bjorn's research suggests that there is little to no difference in adult migration travel times through reservoirs as compared to their migration travel times in the tributaries. However, to say that dams do not impact adult migration is a flawed statement.

To truly test the impacts of dams on adult migration times a comparison of travel times on a non-dammed system, such as the Fraser, should be made and compared to the travel times of Columbia River migrants. Furthermore, adult migration characteristics are likely to change once they enter tributaries. They may start staging, competing for mates, digging false redds, and/or holding as their bodies undergo more extensive physiological changes in preparation of spawning. Staff is currently reviewing a hypothesis using coded wire tag information that 66 suggests adult's migration times may be quicker through water quality challenged waters, (i.e. temperature criteria), while adults seem to hold in waters without water quality problems. This may also explain some of the increases in straying that are 69 being seen on certain systems, i.e. the Deschutes, which provide better water quality conditions.

The statement that little or no difference in migration travel times is noted for migrants whether they pass over the dams and through the reservoirs or in tributaries. This statement ignores impacts of having adults spending longer times in water quality challenged water than what they did historically. The post-dammed system exhibits higher water temperatures for extended periods of time, where as the historical system was flashier with regards to temperature (Karr et al., 1998). Historically, there was a rapid temperature increase followed by a rapid cooling. This peak usually took place at the end of July and into the middle of August. Historically, adult runs avoided this time period. Few if any adults were in the river system at the times of these peak temperatures. By altering the shape of the temperature graph we have increased the exposure of adults to water quality challenged water.

67 70 In addition Bjorn's research only looks at migration travel times and does not measure spawning success. Thus we have no measure of the true impact to adults

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70 cont. migrants. Even if all the adults make it back to the tributaries, if their spawning success rate is low, there is an obvious impact to the population.

68 71 There is also the issue of unaccounted tag loss. Are these tag losses due to dam passage, falling back through the project, extended exposure to increased river temperatures, or a combination of these or other factors? These issues need to be investigated and addressed in order to get a better understanding of the impacts the current system has on Columbia River Basin salmon runs.

CRI Analysis

72 As its comments on the CRI process, the Commission incorporates by reference Oosterhout, Seven Questions About the Cumulative Risk Initiative (January 23, 2000) (attached to these comments); Oosterhout, Extra Mortality, Delayed Mortality, and D: An Overview (April 28, 2000) (attached to these comments); Bouwes, Schaller et al., An Analysis of Differential Delayed Mortality Experienced by Stream-Type Chinook Salmon of the Snake River: A response by State, Tribal, and USFWS technical staff (STUFA) to the 'D' analyses and discussion in the Anadromous Fish Appendix to the U.S. Army Corps of Engineers' Lower Snake River Juvenile Salmonid Migration Feasibility Study (October 4, 1999); Oosterhout et al. (STUFA), A Technical Review of the National Marine Fisheries Service Leslie Matrix Model of Snake River Spring and Summer Chinook Populations (April 28, 2000) (attached to these comments); Weber, A Contrast of Hatchery Steelhead Abundance and Spring Chinook SARs for 1990 Through 1995 (January 25, 2000).

73 The CRI alleges that Snake River spring/summer chinook can survive and recover if harvest restrictions are tightened further and significant improvements are made in both egg-to-smolt and estuary productivity. No evidence in the DEIS or in CRI is provided that would support the feasibility of these increases either in the near-term or even in the long-term. The largest land-owner/manager in the Snake River basin is the federal government. The BLM and Forest Service have been engaging in a multi-year process allegedly intended to provide for ecosystem management consistent with the requirements of the ESA. This process, entitled the Interior Columbia Basin Ecosystem Management Project (ICBEMP), has been developed by the Forest Service and BLM. Their assessment of the extent to which their land management will be able to provide the increased productivity that the

Corps and NMFS assert spring/summer chinook need is as follows:

> In analyzing the effects of the Supplemental Draft EIS [for ICBEMP] on anadromous fish populations we found that outcomes for anadromous fish above the dams in the Snake Rier and Upper Colulmbia River showed minor to no improvements as a result of the high uncertainty associated with migrant survival.[23]

73 cont. In short, the significant increase expected in habitat productivity from the largest landowner in the Snake basin, and the landowner most amenable to federal control, has made it clear that no such increase can be expected. Thus, according to the federal government, it is not feasible to make the changes that are necessary in order to save Snake River spring/summer chinook from extinction without dam breaching. Even if the ICBEMP considered itself to be in a position where it was willing to maximize the potential near-term protection and improvement of anadromous fish habitat, there is precious little evidence indicating that the productivity improvements needed (according to CRI and STUFA modeling) are ecologically possible, much less politically possible. If spring/summer chinook are to be saved, dam breaching must occur and it must occur quickly.
rther.

Is Delay an Option?

74, 75, 76, 77 If NMFS is to be taken seriously, then delay is not an option with respect to protection and restoration of Columbia River basin salmon. According to NMFS' recent biological opinion on the tribes' proposed spring fishery, lambdas (average population growth rates) for four of seven Snake River spring/summer chinook index stocks range from 0.6863 to 0.8633.[24] NMFS even concedes that eliminating all harvest of spring/summer chinook will not stem their decline to extinction.[25] For at least the last four years, NMFS has known that "substantial improvements in environmental conditions under the environmental baseline are necessary if the

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[23] Questions & Answers for the Supplemental Draft EIS Interior Columbia Basin Ecosystem Management Project (March 2000) at 7.

24 NMFS, Biological Opinion, Impacts of Treaty Indian and Non-Indian Year 2000 Winter, Spring, and Summer Season Fisheries in the Columbia River Basin, on Salmon and Steelhead Listed Under the ESA (Feb. 29, 2000) at 58.

25 Id. at 57.

74, 75, 76, 77 cont.

continued existence of this species [Snake River spring/summer chinook] is to be ensured."[26] There is no doubt that dam breaching is a crucial component of any biologically sound strategy to restore Snake River salmon within a reasonable period of time.[27] Salmon have continued to decline while the federal government has tinkered with the FCRPS. Further tinkering cannot yield the increases in smolt to adult returns (SARs) needed for salmon to survive, recover, and rebuild. DEIS at 5.4-117. Dramatic near-term increases in lambdas are needed and they cannot be achieved simply by perpetuating the federal government's discriminatory salmon policies of making the Indians mitigate for the FCRPS. Salmon cannot wait for another five or ten years while the Corps and NMFS conduct more one-sided research. Letting Snake River salmon go extinct is not an option.

78, 79, 80, 81

Even though delaying salmon conservation is not an option when NMFS is assessing the biological legitimacy of the tribes' exercise of their treaty reserved right to take fish, delay does appear to be an option when NMFS examines the biological adequacy of actions to reduce salmon mortality caused by the FCRPS:

> [m]anagers may want to accept the 1 in 7 chance of extinction of one of the seven spring/summer chinook salmon stocks in the short term and explore whether aggressive management without dam breaching could recover the stocks.

DEIS at 5.4-111. NMFS and the Corps need to re-evaluate the availability of further delay as an option. More recent information produced by NMFS indicates that NMFS is beginning to concede the over-optimism of its December 1999

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26 Id. at 55.

27 IN MY OPINION Dave Hohler

Allow me to clear up a major misconception regarding the issue of breaching the four dams on the lower Snake River. This misconception was made dramatically clear in The Oregonian's news report ("Hearings sentiment leans to breaching," March 23) in which the regional commander of the U.S. Army Corps of Engineers was quoted as suggesting that science remains inconclusive on the breaching issue.

Speaking on behalf of the Oregon chapter of the American Fisheries Society, let me state unequivocally that there is no significant disagreement among fishery scientists. If society decides to recover the salmon and

steelhead stocks in the Snake River watershed at a sustainable and fishable level, the four dams must be breached and breached soon. This is a summary of a resolution adopted without any dissenting votes at our annual conference this February. The full text of this op/ed piece can be found at: http://www.oregonlive.com/oped/index.ssf?/oped/00/03/ed031832.frame

78, 79, 80, 81 cont.

analyses. It notes that several index stocks of Snake River spring/summer chinook are declining at rates in excess of 10% per year. Also, since its analytical process does not incorporate the effects of environmental variation (which would likely exacerbate the rate of decline), Snake River spring/summer chinook stocks are "clearly in substantial peril."[28] This problem cannot be addressed by further turns of the screw on harvest. Average population growth rates continue to decline even if all harvest on these fish is halted.[29] In short, for those populations declining at the rate of 10% per year, they will be extinct in 7 years.[30] A decision to not breach or even to delay breaching condemns those fish to extinction. We do not see how a decision to not breach or even to delay breaching is consistent with the ESA or with the tribes' treaty rights.

Delayed Mortality

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As its comments on delayed mortality, the Commission incorporates by reference: Oosterhout, Extra Mortality, Delayed Mortality, and D: An Overview (April 28, 2000) (attached to these comments); Bouwes, Schaller et al., An Analysis of Differential Delayed Mortality Experienced by Stream-Type Chinook Salmon of the Snake River: A response by State, Tribal, and USFWS technical staff (STUFA) to the 'D' analyses and discussion in the Anadromous Fish Appendix to the U.S. Army Corps of Engineers' Lower Snake River Juvenile Salmonid Migration Feasibility Study (October 4, 1999); Oosterhout et al. (STUFA), A Technical Review of the National Marine Fisheries Service Leslie Matrix Model of Snake River Spring and Summer Chinook Populations (April 28, 2000) (attached to these comments); CRITFC, Comments on October 1999 NMFS White Paper, Passage of

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[28] NMFS. A standardized Quantitative Analysis of Risks Faced by Salmonids in the Columbia Basin (April 10, 2000) at 91 (available at: http://research.nwfsc.noaa.gov/cri/pdf_files/12esu.pdf).

[29] Id. at Table V-7. Additional information regarding NMFS' handling of extinction probabilities is available in Oosterhout, Seven Questions About the Cumulative Risk Initiative (January 23, 2000) (This paper was posted at the NMFS CRI website, but has apparently been removed. Interestingly, it is not listed as a reference in NMFS' Standardized Quantitative Analysis of Risks. Oosterhout's paper is available upon request from the Commission.

[30] Further discussion of why it is not possible to delay action in the hope of getting decisive (in the eyes of those who'd rather not see it) information on delayed mortality in a timely manner can be found in Oosterhout, Extra Mortality, Delayed Mortality, and D: An Overview (April 28, 2000) (attached to these comments); see also Bouwes, Schaller et al., An Analysis of Differential Delayed Mortality Experienced by Stream-Type Chinook Salmon of the Snake River: A response by State, Tribal, and USFWS technical staff (STUFA) to the 'D' analyses and discussion in the Anadromous Fish Appendix to the U.S. Army Corps of Engineers' Lower Snake River Juvenile Salmonid Migration Feasibility Study (October 4, 1999).

82 cont. Juvenile and Adult Salmonids Past Columbia and Snake River Dams (attached to these comments).

83, 84, 85 It is clear that addressing delayed mortality is crucial to the existence of Columbia River basin salmon above Bonneville Dam. We believe that a Weight of the Evidence process should be implemented to fully examine all available evidence on the issue. It is essential that the issue of delayed mortality be addressed in a manner that is risk averse to salmon and which errs on the side of assuring compliance with all applicable laws, including the tribes' treaties, the Clean Water Act, and the ESA. Dam breaching is the most risk averse method of dealing with delayed mortality that maximizes the likelihood of complying with all applicable federal laws.

Problems With the DEIS Assessment of Impacts on Tribes

86, 87, 88 The Corps of Engineers has taken significant steps to try to improve its ability to assess the impacts of its actions on tribes. Through enabling tribal technical participation in the Drawdown Regional Economic Workgroup (DREW) process, Corps funding for the work leading up to the Meyer Resources, 1999 report,[31] and other information development efforts, the Corps of Engineers has been able to obtain a substantial body of tribal information relevant to their DEIS. This stands in notable contrast to the earlier "Columbia River System Operation Review Final EIS" of 1995, developed by the Corps, BPA and Bureau of Reclamation, where information development fell far short of the requisite professional standard. Unfortunately, the new information that has come to light through Meyer Resources 1999 has not been entirely to the Corps' liking. The DEIS reflects efforts to distort and suppress information that is crucial to understanding the impacts the lower Snake River dams have wrought on Indian tribes, how these impacts would continue if the dams are retained, and how some of these impacts could be addressed if the dams were breached. The Corps' failure to accurately disclose and consider the information in Meyer Resources 1999, one of the few DEIS study processes that successfully navigated through the entire DREW review process, fatally taints its environmental analysis.

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(31) The full citation for this report is: Meyer Resources, 1999. Tribal Circumstances and Impacts of the Lower Snake River Project on the Nez Perce, Yakama, Umatilla, Warm Springs and Shoshone Bannock Tribes.

Example of Efforts to Reduce and Control Information Relative to Tribes

In the Corps-led DREW study plan, completed in July, 1997, it was specified that CRITFC would "summarize Treaties and other agreements relevant to Tribal fish, fish access, and other tribal rights in the potential area impacted" (Study Plan page 5-98). On August 20, 1998, Phil Meyer, Chair of the DREW Tribal Effects Work Group, and CRITFC technical representative, provided Paul Sorensen of BST Associates (Corps contractor) with draft tribal material re. "relevant agreements." A subsequent relevant agreements draft by Mr. Sorensen excluded much of this information. When Meyer objected, Sorensen stated that the information had been deleted at Corps direction and would need to be resolved with the Corps Walla Walla office.[32] Subsequently, the Corps has not consulted with the tribes on this issue – but rather, has acted to delete key information on Tribal treaties important to the DEIS process.

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In July, 1999 the Corps circulated a "preliminary draft" of various portions of the DEIS to federal agencies, but not to the tribes. The tribes learned, during this process, that key Environmental Justice portions of the report of the Tribal Effects Team to DREW had been deleted from Corps Appendix I, and, according to the Corps, "moved elsewhere" in the document. This was also the first time the Tribal Effects Work Team and associated tribes learned of the existence of the Corps' Appendix N Cultural Resources document. The Corps was asked to distribute their tribal Environmental Justice and Cultural Resources write-ups for tribal review. The Corps declined to provide this information to the tribes prior to public release of the DEIS.

Finally, during the latter half of 1999, it emerged that the Corps was involving most key DREW Work Team leaders and consultants in writing and/or reviewing the DEIS as it developed – and in fact, that some of this activity involved writing/rewriting some tribal portions of the document. In the face of denial of technical access to tribal experts, these practices seem discriminatory – and gave the impression that the Corps was "writing around" tribal information and expertise.

DEIS Section 4.1.2 Human Environment

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(32) These conversations are summarized in a memo to Sorenson from Meyer (1/28/99).

93 This section disposes of the tribes in two generalized lines which impart no specific information useful to the analysis (DEIS at 4.1-3). It needs to be expanded by referencing Meyer Resources, 1999. This passage also begins an unfortunate practice, repeated elsewhere in the DEIS, of grouping Native Americans and other "minorities" in the same paragraph, and dealing with them sequentially. This acts to discount the treaty and trust obligations of the federal government to the tribes, and should be corrected.

DEIS Section 4.7 Cultural Resources

This section does not reference or incorporate material in two appendices developed by cultural protection staff of the Confederated Tribes of the Umatilla Indian Reservation, and of the Nez Perce Tribe for the DREW – and provided to the Corps in Meyer Resources, 1999. These reports provide direct information on the cultural importance of the study area and its resources to tribal peoples.

94 The present draft provides some narrative of general interest to understanding how cultural resources are defined and treated by the process – but this section of the DEIS provides virtually no specific and useful information concerning the present circumstances of study tribes – as they relate to the four study reservoirs, and to the diminished opportunity for harvest of salmon. Consequently, there is a critical need to incorporate information from the two cited "cultural resource" appendices and from the Meyer Resources, 1999 Main Report in Section 4.7.

95 Finally, reference to the two cited tribal resource protection appendices will identify that the DEIS report of 375 archaeological sites in the four reservoir areas (p. 4.7-4) is likely a gross underestimate, if this reference is intended to also refer to cultural properties.

DEIS Section 4.8 Native American Indians

96 This section provides 9 pages of generalized and relatively superficial information on 14 tribes/bands in the Columbia/Snake basin. This information may be of general interest to those who know nothing about these tribes, but is of "pamphlet" depth – and provides no substantial information concerning the specifics of present tribal circumstances, and the linkage of these circumstances to the four dams and to actions being considered. In addition, the explanation of why the five study tribes were selected (DEIS at 4.8-2, lines 4-7) is largely incorrect. These

96 cont. tribes were principally selected because it was felt they would experience the largest potential impacts from the proposed actions.

97 The DEIS suggestion (p. 4..8-2, lines 28-29) that tribal peoples have become "acculturated and (native) communities adapted to local American lifestyle" is unsupported by any of the evidence made available to Meyer Resources, 1999 and conflicts with it. It needs either to be substantiated or deleted.

98 The DEIS' attempt to deal substantively with relevant present tribal circumstances is thus confined to the last full paragraph on page 4.8-2, and three other pages, 4.8-9, 4.8-11 and 4.8-12. These pages provide insufficient evidence from available sources for an independent reviewer to understand present tribal circumstances, or to relate them to the subject dams and reservoirs.

99 The DEIS provides little substantial information with respect to tribal Treaty rights and affected fisheries. This should be remedied by incorporating appropriate sections of Meyer Resources, 1999. The DEIS omits information with respect to losses of tribal fisheries to the present day, provided in the DREW tribal report, (specifically Table 40 in Meyer Resources, 1999). Extensive information on the importance of affected salmon resources and tribal lands for present-day tribal culture, material well-being and health provided by the tribal report to DREW (i.e. summarized in Meyer Resources, 1999, pp. 205-6) were excluded from the Corps DEIS. Information on tribal health and death rates are systematically excluded from the DEIS by Corps writers, despite reported linkages with salmon abundance and fishing opportunities by tribal health experts in the DREW Tribal Report (i.e. Meyer Resources, 1999, p. 204-206). The DEIS conclusion that "Federal agencies have implemented actions specifically designed to benefit salmon," and that "[t]his focus is consistent with treaty and trust responsibilities" (DEIS p. 4.8-11) could be read to imply that present Corps actions meet Treaty and trust responsibilities. That inference is the exact opposite of the conclusion of the Tribal Circumstances Report commissioned by DREW – which states explicitly that the "status quo", and actions offering little change from the status quo, do not meet federal Treaty and trust responsibilities (Meyer Resources, 1999, p. 235).

100, 101, 102, 103, 104 Corps writers not only excluded essential elements of the DREW tribal report from their DEIS, and reversed a major conclusion of the DREW Tribal Effects report, but used space in the document to argue with and disparage tribal results reported by the tribes and by DREW. Judging from Appendix I, this comprehensive

re-editing of tribal sections of the DEIS took place subsequent to release by the Corps of a "preliminary" DEIS release to "federal family" agencies in July, 1999. Appendix I of the July document, which Phil Meyer reviewed in his role of leader of the DREW Tribal Effects Work Group, for the most part employed objective terminology and citation common in technical preparation of such documents. All this has changed in the present DEIS – with terminology that discriminates throughout against balanced tribal impact assessment, and meets no objective professional standard.

This Corps re-editing effort begins with a disparaging mis-identification of the report prepared by CRITFC for DREW – and continually cited in the DEIS as a principal information source. As the Corps is aware, the proper citation for this report is:

100, 101, 102, 103, 104 cont.

> Meyer Resources, 1999. Tribal Circumstances and Impacts of the Lower Snake River Project on the Nez Perce, Yakama, Umatilla, Warm Springs and Shoshone Bannock Tribes.

In their July, 1999 draft Appendix I, the Corps abbreviated this title to "Tribal Circumstances Report," Meyer, 1999. This was still reasonable, subject to a full and accurate citation in the Reference section of the DEIS. In the present DEIS, Corps editors mis-identify this source with the disparaging shorthand title "Tribal Circumstances **and Perspectives Report.**" Further, no citation is provided in the "References" section of the DEIS, for the CRITFC/DREW report (Meyer Resources, 1999). Environmental Justice portions of Meyer Resources, 1999 are excluded from Corps Appendix I, and Meyer Resources, 1999 is not included in the DEIS package sent to reviewers. As a result, reviewers are left with Corps edited interpretations and mis-interpretations of Meyer Resources, 1999 – and the DEIS provides no accurate reference path for reviewers to obtain the actual CRITFC/DREW report on tribal circumstances and impacts.

The present DEIS also replaces objective wording used in Meyer Resources, 1999 and the Corps July, 1999 "preliminary" draft with characterization of information on tribal circumstances and effects as tribal "views," "perspectives," "feelings," "beliefs," "opinions," "assertions," – and with repeated use of the disparaging phrase "according to the Tribes." Further, throughout the document, the DEIS mis-identifies objective data from the US Bureau of the Census, the US Indian Health Service, PATH, the DREW Anadromous Fish Team and many other sources,

100, 101, 102, 103, 104 cont.

cited and employed in the CRITFC/DREW tribal report as "tribal perspective." Evidence of these discriminatory editorial actions can be found on numerous pages of the DEIS. In particular, federal agencies with access to the Corps' July 1999 draft should be asked to review differences between the two documents in this regard.

A term such as "perspective" is undoubtedly appropriate with respect to some tribal "conclusions" reported by CRITFC/DREW. But pervasive application of such terms to information on tribal circumstances and impacts synthesized in a technical document with more than 500 citations, and reviewed by DREW and the Independent Economic Advisory Board (IEAB) – but not to other informational components of the DEIS – is disparaging and discriminatory.

DEIS Section 5.6: Cultural Resource Impacts

105

This section focuses primarily on biophysical impacts – not tribal cultural resources impacts. Tribal cultural protection investigators working with the DREW tribal effects team recognized positive impacts from draining of reservoirs through restored access to traditional cultural properties and also the need to develop effective cultural resource protection plans to protect those resources. It was concluded by the tribes and their experts that, on balance, the benefits from renewed access to recovered cultural properties would substantially outweigh associated management costs under dam breaching.
Section 5.6 of the DEIS leaves exactly the opposite impression – spending virtually all its space discussing negatives and costs – while mentioning positive benefits only in passing.

DEIS Section 5.7 – Impacts on Native American Indians

This Section continues the under-reporting and mis-representation of potential tribal impacts discussed previously.

106

Despite extensive information developed by DREW's Tribal Effects Work Group (Meyer Resources, 1999 pp. 210-237), no substantive information is included in the DEIS, save for PATH-based fish harvest impact estimates. The DREW/Tribal Circumstances Report main conclusion that dam breaching would represent an effective step toward meeting federal treaty and trust responsibilities, while the non-breaching alternatives would not, was excluded from the DEIS write-

106 cont.

up. No mention is made in this Section of tribal Environmental Justice (EJ) impacts, despite the fact that the DREW/Tribal Circumstances Report analysis, following EPA EJ guidelines, concluded that dam breaching would provide significant relief from environmental injustice for the tribes, while the non-breaching alternatives would perpetuate Environmental Injustice. The DEIS does incorporate DREW/Tribal Circumstances Report Environmental Justice findings much later – but without cross-reference or indexed identification (DEIS pp. 5.12-28 – 5.14-30). Even here, the DEIS continues to mis-identify the DREW-commissioned and reviewed Tribal Effects report as a "Tribal Perspectives" report. The Corps then offers a curious rebuttal: "…the Corps concludes that any alternative that brings more salmon back to the Snake River would benefit the tribes." DEIS p. 5.13-30. The Corps statement is a truism. But it says nothing concerning the magnitude of expected recovery – the key issue for presently destitute tribal peoples.

107

The DEIS erroneously states there would be no impact on tribal land use – ignoring ongoing inundation of tribal ceded lands by the four reservoirs under the non-breaching alternatives. DEIS pp. 5.7-4 & 5.7-5. These ongoing inundation effects were identified and discussed in the DREW-commissioned Tribal Circumstances Report (Meyer Resources, 1999).

DEIS Section 9.13.5 Tribal Treaties

108

Key requisite information on tribal Treaties, on their linkage with this assessment, and on requisite procedures concerning interpretation of Treaty provisions has been excluded by the Corps from this DEIS and from earlier supporting reports. The remaining narrative provided in the DEIS provides the reviewer with no effective information respecting the important relationship between tribal Treaties and this project.

Comments on Specific Appendices

Comments on Apendices A and M

Comments on anadromous Fish Appendix (Appendix A)

We appreciate the opportunity to review the latest draft of the Anadromous Fish Appendix. Although a considerable amount of work appears to have been expended, little has been done to address our principal concern from the last draft: that no management recommendations are made and, moreover, that no formal attempt to address decision making is included. It would seem that the role of the NMFS is not simply to describe problems and summarize research results. Rather, the NMFS should prescribe one or more courses of action within the context of a feasibility analysis. The following sections discuss each of the Snake River salmon stocks individually.

109

Spring/Summer Chinook

The tribes are concerned that after years of consensus building, the region is once again embroiled in debate over the science surrounding salmon recovery decisions. PATH (Plan for Analyzing and Testing Hypotheses) is an inclusive analytical approach that has incorporated a decision analysis framework, a formal weight of evidence inquiry and formal, top level peer review. PATH conducted intensive analyses of Snake River spring/summer and fall chinook and found the breaching of the four lower Snake River dams to be the only robust action for recovering the listed Snake River stocks.

110

The recently launched Cumulative Risk Initiative (CRI) is giving seemingly different management advice. Although recent CRI results are showing that the situation for Snake River spring/summer chinook stocks calls for urgent and dramatic actions, the CRI also indicates that the freshwater habitat and estuary/early ocean life stages hold the most promise for survival improvements. This result is an artifact of the high natural mortality in these life stages.[33] That recovery measures should focus on reductions in natural mortality rather than man-induced mortality is clearly unrealistic. In addition, CRI excludes delayed mortality from its analytical framework. A recently completed analysis by tribal, state and federal scientists indicates that when the CRI matrix is configured in a way that best utilizes available

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[33] The high levels of egg-to-smolt mortality found to exist through the CRI's Leslie matrices is also an artifact of NMFS' use of the matrices. By "solving" for S1 (egg-to-smolt survival) all otherwise unaccounted for mortality is necessarily attributed to the egg-to-smolt lifestage. This is "sleight of model," not sound biology. This issue is discussed at length in STUFA, A Technical Review of the National Marine Fisheries Service Leslie Matrix Model of Snake River Spring and Summer Chinook Populations (April 28, 2000).

111 cont. data, including delayed mortality, results comport with those from the PATH process. This report[34] is attached to these comments.

Although the foregoing clearly indicates the need for a feasibility analysis, the CRI has cancelled that aspect of its process.[35] As noted in STUFA (4/00), the CRI framework may not be the best tool for a feasibility analysis. It should be noted, however, that during the PATH process in which NMFS participated, a model was developed expressly for such a purpose and, in fact, a reasonably thorough feasibility analysis was conducted. The individual scientists that comprise PATH are available to conduct further feasibility work and the budget is there as well. There is no excuse for leaving this important need unmet.

112

We stress feasibility because there does not appear to be evidence indicating that improvements in any or all the other Hs will be sufficient to recover all listed stocks. If the NMFS believes that all listed Snake River stocks can be recovered without breaching the four lower Snake River dams, it should provide a technical rationale for this conclusion on a stock-by-stock basis. We would be especially interested in spring/summer chinook because it has low harvest rates and exists in areas with excellent habitat quality, including designated wilderness areas.

NMFS has also suggested that continued poor survival rates of spring/summer chinook might be due to its interactions with hatchery steelhead in association with collection and transportation. However, as shown in the attached report, Weber, E. A Contrast of Hatchery Steelhead Abundance and Spring chinook SARs for 1990 through 1995 (January 19, 2000)(Available from CRITFC), the survival rates of wild, transported Snake River spring/summer chinook are chronically low, even during periods when hatchery steelhead are absent, or present in low numbers/proportions.

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114 Finally, NMFS alludes to uncertainty about the efficacy of transportation.

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[34] STUFA, A Technical Review of the National Marine Fisheries Service Leslie Matrix Model of Snake River Spring and Summer Chinook Populations (April 28, 2000).

[35] NMFS clearly recognizes the need to conduct feasibility analyses. In fact, the CRI recognizes that need, but hasn't yet conducted the analyses. See http://research.nwfsc.noaa.gov/cri/do.htm ("Follow-up work entails examining whether such changes in survivorship are biologically feasible and what management options will yield the best results."). Of course, the time to conduct these analyses is BEFORE the management decisions are made.

114 cont.

The Smolt-to-Adult-Return (SAR) rates of wild transported fish continue to fall well below the two to six percent range established as a goal by PATH. As to the question of whether the poor survival is due to delayed mortality in the hydrosystem or some other factor, it is important to restate that, to date, no one has been able to describe a biological mechanism whereby Snake River spring/summer chinook are subject to high mortality while their downstream counterparts are not. NMFS offers, without explanation, the notion that if Ds are close to one, then some other factor must be involved. However, like the transport-to-control ratios that preceded them, Ds are simply a ratio. The finding of the transportation review (Mundy et al. 1994) is as valid for Ds as it was for the T/C ratios then in use: the ratio is "moot" if the absolute survival is not high enough to sustain the population. The treatment of Ds in the CRI model discounts the survival of transported fish relative to non-transported fish, but does not consider the substantial amount of mortality incurred by both groups. Given the large body of evidence that links the "extra' mortality with the hydrosystem and the lack of evidence that would link it with anything else, it would be irresponsible for NMFS to assume that extra mortality is anything but delayed mortality associated with bypass, collection and transportation, as previously suggested by NMFS (Williams 1989). A more complete discussion of delayed mortality appears in Oosterhout, G. Extra Mortality, Delayed Mortality, and D: An Overview (April 28, 2000)(available from CRITFC) and is attached to these comments.[36]

Fall Chinook

115

The same general concerns regarding NMFS' treatment of spring/summer chinook in the DEIS apply to fall chinook. There as a reasonably complete discussion of background material for the stock but no feasibility analysis to let the reader determine what management measures are needed to recover it. Like spring/summer chinook, there appear to be practical limitations to achieving recovery through non-hydro H's.

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[36] We also incorporate by reference Bouwes and Schaller et al. An Analysis of Differential Delayed Mortality Experienced by Stream-type Chinook Salmon of the Snake River: A response by State, Tribal, and USFWS [STUFA] technical staff to the 'D' analyses and discussion in the Anadromous Fish appendix to the U.S. Army Corps of Engineers' Lower Snake River Juvenile Salmonid Migration Feasibility Study (October 4, 1999)(Available from CRITFC).

115 cont.

Habitat and the hydro system are inexorably linked for fall chinook. As a mainstem spawner, fall chinook have been severely curtailed by hydro development in both the upper and lower reaches. Vast areas of their original spawning and rearing habitat have either been blocked (Hells Canyon Complex) or inundated (Lower Snake River dams) by hydro projects. Thus for this stock, breaching the four Lower Snake River dams would both improve the juvenile and adult migratory survival, and provide additional spawning and rearing habitat. Breaching would also alleviate some of the water quality problems associated with dams, reservoirs, and their operation, such as gas supersaturation and temperature effects. There are virtually no opportunities for improving Snake River fall chinook habitat that are not tied to changes in the configuration and operation of the hydropower system.

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Harvest rates are considerably higher for fall chinook than they are for spring/summer chinook, but there are practical limitations to survival improvements through harvest rate reductions. Meaningful improvements in fall chinook survival would only be possible through severe reductions in harvest rates by tribal people and foreign nationals, much more severe than those contained in recent treaties. In any case, regulation of harvest has been thoroughly tested as a means of mitigating for the impacts of the hydrosystem and it has been found wanting. Twenty-three years of very limited harvest on spring chinook and 35 years of very limited harvest of summer chinook has not been adequate to stem the decline of these runs. There is no reason to believe that harvest restrictions can mitigate for the impacts of the FCRPS on fall chinook. Even if it were possible for harvest to mitigate for hydro impacts, it is illegal and contrary to the treaty-secured rights of the Commission's member tribes to require the tribes to limit their harvest of fall chinook so that the FCRPS can continue to generate power at costs well below market and the Port of Lewiston can continue as a subsidized seaport as opposed to a rail terminal.

118

Hatcheries have more of a direct effect on fall chinook than for spring/summer chinook because of the Lyons Ferry supplementation program. To date this program appears to be successful in increasing the numbers of natural spawners and should be considered an asset rather than a detriment. Note that the concern raised for spring chinook, that hatchery steelhead negatively impact them, would not affect fall chinook because they migrate at different times.

119

As is the case with spring/summer chinook, the efficacy of transportation depends on the D value. Fall chinook Ds that best fit the data are extremely low. If higher values are assumed, it becomes necessary to provide a biological rationale

119 cont. explaining why the Snake River stock is performing poorly when stocks downstream are flourishing.

Steelhead

120 The complexity of their early life histories makes steelhead more difficult to model than chinook stocks. PATH concluded that because of similar survival rates in various life stages, and the similarity in problems facing steelhead and spring/summer chinook, measures that are adequate to recover spring/summer chinook will probably recover steelhead. That makes the decisions for spring/summer chinook doubly important. However, that should not be taken to mean that steelhead should be set aside during scientific deliberations. If only qualitatively, NMFS along with regional scientists, should assess the extent to which management actions across all the H's will move steelhead toward recovery. The tribes agree that the situations for spring and summer chinook and steelhead are similar and believe that if a non-breach decision is reached, it is incumbent on NMFS to explain how their prescribed course of action will lead to recovery for steelhead.

Sockeye

121 Information necessary for a quantitative assessment of Snake River sockeye is lacking. PATH provided information on the unusually high de-scaling rates of sockeye that encounter screened bypass systems. Consequently, PATH concluded that the status of sockeye was unlikely to improve as long as the current configuration of the hydrosystem remains. Therefore, it again seems incumbent on NMFS to discuss the feasibility of recovering sockeye with whatever course of action they prescribe.

Comments on Coordination Act Report (Appendix M)

122 We appreciate the opportunity to review the latest draft of the Coordination Act Report. Our initial impression is mixed. To its credit, the CAR appears to be well written and well organized. In addition, the document contains a considerable amount of information about listed stocks and the research that has been conducted on them. We are concerned, however, that no management recommendations are made and, moreover, that the CAR makes no formal attempt to address decision-

122 cont. making. The tribes are concerned that after years of consensus building, the region is once again embroiled in debate over the science surrounding salmon recovery decisions. Accordingly, we feel it is imperative that the Fish and Wildlife Service clarify the issues being debated.

We are particularly interested in a side by side comparison of the model frameworks that are at the center of the debate: PATH and CRI. What are the strengths and weaknesses of the two approaches and how should these frameworks be used in the context of the decision on Snake River salmon? To what extent are the models' results consistent with each other and to what extent are each consistent with existing scientific information?

One specific concern is an apparent shift in emphasis away from the hydro system and toward the other Hs. PATH (Plan for Analyzing and Testing Hypotheses) is an inclusive analytical approach that has incorporated a decision 123 analysis framework, a formal weight of evidence inquiry and formal, top level peer review. PATH conducted intensive analyses of Snake River spring/summer and fall chinook and found the breaching of the four lower Snake River dams to be the only 129 robust action for recovering the listed Snake River stocks.

In contrast, the CRI is indicating that the most promising life stages for improving survival are freshwater habitat and the estuary. This conclusion is based on the high natural mortality experienced by spring/summer chinook during these life stages and the fact that CRI did not distinguish between natural and man-induced mortality. It is particularly unrealistic to assume that stocks in wilderness areas will reach recovery through habitat improvement. Oosterhout et al. (STUFA) (April 28, 2000) (cited earlier and attached to these comments) addresses what we feel are serious concerns with the CRI approach. It also concludes that the CRI modeling framework provides results consistent with PATH when the full range of available data on freshwater survival, delayed mortality and smolt-to-adult-return (SAR) rates are utilized.

124, 125 There does not appear to be evidence indicating that improvements in any or all the other Hs will be sufficient to recover all listed stocks. Does the Fish and Wildlife Service (F&WS) believe all stocks can be recovered without breaching? If that is the case we feel that the F&WS should provide the technical basis for this conclusion on a stock by stock basis. We are especially interested in spring/summer 130 chinook and sockeye, both of which have low harvest rates and exist in areas with

124, 125 cont. 130 cont.

excellent habitat quality, including designated wilderness areas.

The NMFS has suggested that continued poor survival rates of spring/summer chinook might be due to its interactions with hatchery steelhead in association with collection and transportation. However, as shown in Weber, A Contrast of Hatchery Steelhead Abundance and Spring Chinook SARs for 1990 through 1995 (cited earlier and attached to these comments), the survival rates of wild, transported Snake River spring/summer chinook are chronically low, even during periods when hatchery steelhead are absent or present in low numbers/proportions. Does the USF&WS agree that hatchery steelhead are a major source of chinook mortality? If so, please provide the technical basis for this conclusion. Does the USF&WS view the potential problem as one concerning hatcheries or the FCRPS? If the USF&WS believes that hatchery steelhead are a major source of chinook mortality, in what ways should hatcheries be managed differently and what effects would such changes have on listed stocks, including steelhead?

126 131

It has been apparent for many years that the efficacy of transportation is at the center of recovery discussions. Clearly transported spring/summer chinook are surviving at Smolt-to-Adult-Return (SAR) rates well below the two to six percent range established by PATH as the goal consistent with survival and recovery. Some federal agencies have suggested that other factors may be masking what otherwise would be acceptable survival rates of transported fish. They further suggest that high values of D would indicate that other factors are the cause of the poor survival of Snake River chinook. Does the F&WS believe that there is evidence that factors unrelated to the hydro-system are to blame for the poor survival of Snake River fish in general and transported fish in particular? Does the F&WS believe that there is a logical basis for the supposition that high values of D indicate that poor survival is unrelated to the hydro-system? In short, does the F&WS believe that the considerable levels of unexplained mortality described by Deriso et al. (1996) and Schaller et al. (1999) are delayed mortality due to bypass, collection, transportation, etc. or "extra" mortality due to some other phenomenon?

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The upcoming decision on the hydro system is extremely important to tribal people and non-tribal people alike. We are concerned that the federal agencies are poised to make decisions about management actions without any particular regard for the feasibility of the actions leading to recovery. It is imperative that feasibility analyses occur and that the appropriate personnel from tribal and state agencies be involved. Such analyses should focus first and foremost on critical issues such as D

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128 cont. 133 cont.

values for spring/summer and fall chinook and the potential for survival increases through habitat improvement. Where disagreements arise, a Weight Of Evidence (WOE) should be invoked.

APPENDIX D NATURAL RIVER DRAWDOWN

General:

134

We feel that this section is lacking in detail and that critical assumptions were not adequately described or rationalized. We have serious concerns about 1) some of these activities that were included in the cost estimates, 2) the need for their implementation, and 3) cost estimates for certain activities. Refer to Table 1 for a list of the specific items and their cost estimates. The items of concern are highlighted and will be discussed in more detail in the following sections.

135

The costs per individual item in each action are not presented; instead the cost of the whole action was presented. Example, the Turbine Modification Section has seven different items listed but no individual cost for each item is presented; only their sum. In addition, some of the cost estimates do not describe which action was estimated; example, Hydropower Facilities Decommissioning. There are two options described but only one cost is listed. Which option does this cost represent?

136

Appendix D contains two cost estimates, 1) embankment removal with additional actions and 2) concrete removal with similar additional actions. There is however no low cost estimate for just embankment or complete dam removal alone. Both of the estimates referred to as Option A-3a and A-3b respectively in Annex X table X1, include additional actions that should not be included in the cost estimatea in Appendix D. There needs to be a true low cost estimate for just the dam removal and the necessary modifications to insure fish and human safety (i.e. fish handling during the breaching and protection of bridge piers).

137

Details defining what other actions were discarded, needs to be provided. The acceptance or rejection of these actions hinges on criteria used to evaluate them. Between this document and the last iteration, a lot has changed; these changes are not available for review. This is especially true for the railroad realignment, the water system, and the partial structure removal option. These are all large cost items that CRITFC should be allowed to review and make comments

137 cont. on.

There was little or no discussion on alternatives for dam breaching. Only earthen embankment and complete removal were used in the estimates. CRITFC has made rough estimates for the cost of using a temporary diversion channel, while the spillway is demolished. This preliminary estimate is lower than the estimates included in Appendix D. These estimates are based on COE figures from two years ago. The COE conducted a study of partial removal (spillway and part of the locks) which cut structure removal costs in approximately half. The process would include; 1) creating a temporary channel around the dams 2) taking out the spillways, and 3) using the spillway section and the temporary channel as the new river section at the dams, thereby, providing a wider more passable river at the dams sites with a lower cost.

138

Using this information, savings of $150 million can be realized by taking out the spillway and protecting a smaller adjacent channel. The assumptions used about channelization and excavation need to be confirmed, however, the cost savings did not include railroad relocation. Additional savings might be realized by relocating the railroads. Railroad embankment protection and repairs are a significant portion of the overall estimate in both options A-3a and A-3b.

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Additional cost savings could be realized by changing the modifications to the irrigation system after drawdown. Instead of upgrading the individual systems, the Corps chooses to create one very large system at an enormous cost. The solution under consideration at the Elwha project is available to the COE, an infiltration gallery that would solve sediment problems, and could be constructed in numerous locations for a far less total cost. The COE did not consider this option. We were not provided with detailed cost estimate for this item but based on the length and size of the distribution pipeline, most of the cost comes from the need for great quantities of very large diameter buried pipes (12 foot diameter).

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- *Summary: The Corps approach is not least cost and doesn't provide the best passage section for fish.*

SECTION 4.0 RESERVOIR EVACUATION PLAN

Section 4.4 Turbine Modification and Operation Plan

Overall:

142 These items were not broken out in the cost estimates so we have no idea how costly the individual actions are. There are certain items that we feel are unnecessary and thus could add extensively to the cost of the operation. All the costs for the individual actions should be itemized and presented in the document to help justify the final cost estimates in Appendix D.

Trashrack Modifications:

143 What is the justification to study or actually perform the strengthening of the current trashracks? In a drawdown condition, there will be less static head on the racks and head across the racks will not vary any more than current operations of the dam. Furthermore, embankment removal will be done during the seasonal low for flow and debris. When debris loads increase, the embankment section will be removed. Trashrack debris racking can still be performed during the embankment removal, if it is needed. Lastly, if the racks are not able to meet the load requirements why not just remove them? The operation will be performed during the low flow and debris season with the log booms still in place to protect against large floating debris.

Turbine Blade Removal:

144 What is the cost of turbine blade removal? During discussions, early in the writing of the DEIS, it seemed that operation of the current turbines would be adequate to handle the flow out of the Snake River, which is usually in the 30 to low 20 kcfs range. What has changed since there are now recommendations of removing the runners from a number of the turbines at each project? Annex A, Turbine Passage Modification Plan describes looking at maximum flows through one turbine up to 20,000 cfs. Is this a realistic upper bound? With six units this would pass a flow of 120,000 cfs. The average runoff for the Snake River at Ice Harbor is 40,550 cfs in July, 20,950 in August, 22,240 cfs in September, 25,240 cfs in October, 29,000 cfs in November, 33,880 cfs in December, 35,670 cfs in January, 41,970 cfs in February, and 53,170 cfs in March. These averages are from historical means for the water years 1927 through 1990 from the *BPA Adjusted Streamflow and Storage Tables July 1993*. It seems that these upper bounds might be too high and unreasonable since excavation is suppose to take anywhere from 21 days at Little Goose, to a maximum of 61 days at Ice Harbor. This does not even

144 cont. take into account the possibility of using upper reservoirs to limit flows so as to aid in the excavation process.

145 Why is the Corps concerned with cavitation if the project is to be mothballed? With an average inflow of 50,000 cfs, the six units at each project would only have to pass 8,333 cfs each, which can be done with the units under their current configuration (reduced head from a lowered forebay). Even if the turbines as they are, were operated at conditions that might cause vibration and cavitation, it would be for a short duration, due to the short excavation schedule. The turbines may be damaged to a degree during the operation, but once the excavation work was completed, they would be mothballed indefinitely, if not forever. These projects are approaching their scheduled service life. These projects are scheduled for turbine replacement with Ice Harbor being first in the next 5 to 10 years. Operations that risk damaging the turbines to a limited and safe extent should be considered to reduce costs. Were other means of gas abatement besides running the turbines considered? Other viable options that should be investigated include, temporary downstream cofferdams to balance head differential or energy dissipaters. Removing blades and not running turbines would appear to be less expensive.[37]

SECTION 5.0 DAM EMBANKMENT REMOVAL PLAN

Overall:

146 Costs for excavating a new channel and providing embankment protection for Ice Harbor and Lower Monumental comes to $174 million. Previous Corps studies looked at partial removal of these spillway structures. Costs in 1997 dollars were about $80 million. Removing the spillway structures and excavating the channel using natural erosion, as described below, would provide a much lower cost and provide a much wider channel.

147 Appendix D, Annex B, pages D5-1. Insufficient detail was provided to comment on rejected screening level alternatives. Criteria used for evaluation and

[37] One of the reasons for not removing turbines is "significant loss of power" (D4-2 Section 4.3). Is significant loss of power generation really a consideration or does it indicate a bias in the study?

147 cont. specific results of analysis of these alternatives should be provided, to ensure credible analysis. However, rationale for rejection includes impacts to navigation, which will be terminated subsequent to breaching.

148 Erosion of the embankment material would significantly lower excavation costs. This could be accomplished using removable cofferdams to control upstream elevations. This exact method was used in the removal of the Edwards Dam in Augusta, Maine, in the summer of 1999. The method was considered and first proposed by two independent engineering firms, rejected in the design documents and finally used by the contractor as the means to accomplish the removal at the least cost. This approach would save much of the $161 million associated with excavation of the new channels.

149 Ten feet of freeboard is provided throughout the embankment protection. What is the difference in elevation between the 100 and 500-year flood? Typically for a river of this size it will not be 10 feet higher in a 500 or even a 1000-year flood, thus 10 feet of freeboard is excessive.

150 Has controlled sluicing been considered as an alternative to full-scale mechanical excavation? Controlled sluicing would involve using the head differential in front of the embankment excavation to direct water into a pipeline that would allow flow through the area to be excavated. Flow would be controlled so that unwanted excavation would not occur. Costs for this approach would save most of the heavy excavation and disposal costs.

151 Why provide embankment protection for Railroad alignments at all? If railroads were moved close to the river after dam construction can they be moved back to their previous alignment? Or, if railroads were moved away from the river during the construction of the dams, then no protection is needed because the railroad lines were not there before.

SECTION 6.0 RIVER CHANNELIZATION PLAN:

Overall:

152 We feel that this section is not needed and these costs should be excluded from the breaching cost estimate. The concept that the river needs to routed around

152 cont. the remaining dam structure to make a smooth transition seems peculiar to us. Water tends to flow downhill and in the past has been able to transition around obstacles, so the remaining dam structure should not pose a problem.

6.4 Fish Passage Feature:

153 The criteria used to determine if velocities in the breached section of the dam create a passage barrier for adults are highly questionable. The criteria (FFHA, 1990) is based on velocities for culvert passage. Culverts have more uniform velocity and do not contain areas of large turbulence. The breached section of the dam may have areas of turbulence which can create seams of lower velocities that will allow salmon passage. Furthermore, the passage concerns are only for flows over 170,000 cfs in the Snake River. The mean peak annual flow in the Snake is 169,000 cfs. This value is presented in Appendix H Fluvial Geomorphology. This peak flow is usually short lived and does not usually coincide with peak adult passage times. Historically, it was after or before the peak flow when adults started migrating up the rivers.

154 In addition, what are the risks to fish that are forced to hold until flows subside, so that they can pass potentially high velocity areas? At the time of year when the effected adult migration occurs there are no water quality concerns to negatively-impact holding fish. Lastly, the COE states that passage problems appear to only occur at the Ice Harbor and Lower Monumental breaches. If this is the case, why do they need fish passage features and levees at the other two dams? These are large cost items that are not required and should thus be eliminated from the embankment cost estimate.

155 If the spillway sections were removed and the new channel began at the powerhouse rather than the locks, the need for channelization would mostly be eliminated, due to the river being straighter. Removing the spillway structures would allow a smaller side channel to be constructed, the size of which would be dependent on the size needed to get optimal fish passage flows.

156 **SECTION 7.0 OTHER IMPLEMENTATION PLAN MODIFICATIONS**

7.3 Railroad and Highway Embankment Protection:

We are uncertain of the need and the extent to which the embankment protection is being applied. Many of the thoroughfares were relocated during the construction of the lower Snake projects. The option of relocating the thoroughfares back to their original location was not investigated. These original sites should still be usable. The cost of embankment protection at all the projects is $178,000,000. Do we need this extent of protection for these thoroughfares since they are not major arteries and with the removal of projects may be used even less? Can these thoroughfares be put at larger risk due to their reduced use and what are the criteria for protecting these systems?

Furthermore, other options of protection were not looked at, such as more modern "soft/green" embankment protection techniques (i.e. vegetative stabilization). It is highly questionable to return the system to a more natural state and then rip-rap large sections of the river. Adding rip-rap will impact the riverine ecosystem. This is in direct contradiction to the purpose of breaching the dams, to return the lower Snake River to a more natural state.

156 cont.

We want to see other options itemized for embankment protection; 1) increasing the potential risk to the roadways to reduce the need for embankment protection, 2) relocating the thoroughfares back to their original locations or other locations, and 3) consider other options of embankment protection i.e. "green techniques".

The embankment protection is extended 10 feet above the 100-year flood. To provide this amount of protection appears unnecessary since a flood of that level is an extreme event. In previous correspondence, we estimated that as much as $28 million dollars could be saved by reducing this level of freeboard.

Better timing and placement of the rip rap material could reduce the thickness of the rip-rap. This comment was made in the previous draft. This iteration seems to have developed and used this concept. However, without the technical background or the costs of techniques investigated since the earlier report, it is impossible to determine the change in cost. In the earlier analysis, we estimated that as much as $10 million could be saved by controlling the thickness rather than randomly bottom-dumping the material.

157 Of all the elements in the Natural Drawdown this is the most expensive, yet extremely gross assumptions were made about the requirements needed for

thickness and the extent of coverage. The limits of embankment material placement seem to be greater than required. Using the toe location of a quarter of the river width instead of midway, (the first assumption on page 4 of Annex F, Appendix D) may result in significant cost savings. Assuming the protection needs to go to 5 feet higher than the 100-year flood level increases the protection well beyond the 100-year level. More detailed analysis should be conducted to determine the actual toe elevations at various locations to check assumptions. Extension above the 100-year flood should not exceed the limits of accuracy of that prediction. For instance, if the 100-year flood elevation can be predicted within 2 feet, then the erosion protection should not extend beyond 2 feet above the predicted elevation.

157 cont.

The estimated thickness of erosion protection is up to 30 feet. This appears excessive. Fabric mats, engineered materials, and natural plantings all compete in cost at this thickness. Detailed cost and quantity analysis should be provided for review.

7.4 Drainage Structures Protection:

We understand that modifications to some of the drainage might be needed, but the extent contemplated is of concern. Discussions of unplugging upper drainage structures were outlined. Why is this being accounted for under breaching? These structures are currently in use and require annual maintenance for their upkeep. Why is this upkeep being credited to breaching? What has changed?

158

Furthermore, installing downstream drainage structures was outlined in the appendix. Why is this necessary? Would not natural drainage channels be adequate to allow drainage back to the river? There are no structures below the embankments to protect, so why do we need these drainage structures?

7.5 Railroad and Roadway Damage Repair:

The total cost of this item is $130,000,000, with most of the cost being incurred at Lower Granite Dam with a cost of $109,000,000. We could not determine why the cost for Lower Granite was so high; no details were available. Will these lines still be used or can they be retired after breaching? Are these lines critical or can the traffic be moved to other railroad arteries? The document did not provide information about the extent and use of the railroads. Lastly what is the cost of moving some or all the lines compared to repairing them? Certain lines will

159

159 cont. be more at risk of damage. These lines should be under consideration for moving or retiring. Can preventive work be done to reduce the potential impact of the drawdown? Vegetative stabilization, increasing drainage in the areas to reduce pore pressure, or other means of reducing slump failures could reduce the cost and need of repairs. None of these options or other potential options were shown or investigated in the appendix.

160 A 75% contingency was used for the cost estimate. This seems excessive. We have never encountered one this large before. This implies that the Corps has not conducted enough investigation in this measure to determine a feasible solution.

7.7 Habitat Management Unit Modifications:

161 It is our understanding that these were originally built as mitigation for the construction of the four Lower Snake dams. The DEIS needs to discuss the rationale for expenditures to mitigate mitigation for the project we are taking out. There needs to be an assessment of how long they will be needed as the ecosystem returns to its more natural riverine state.

7.8 Reservoir Revegetation:

162 The total cost for all four projects is $33,640,000.00. Mother Nature abhors a void and will fill it without our assistance. Letting mother nature replant sections of the newly exposed soil is acceptable in sections, however, there may be a need for coordinated revegetation plans in areas to control non-native and noxious weeds. Vegetation can aid in reinforcing slopes to reduce slumping and slope failures that can contribute to increased fines in the river. A healthy riparian zone is very beneficial for aquatic and terrestrial ecosystems

163 The need for immediate application of seed and fertilizer via aerial methods is unclear. Aerial application of fertilizer near a waterbody is a risky operation due to contamination from spraying. The breaching is scheduled to occur late in the year starting in August. This is the end of the growing season for most plants; thus revegetation could be scheduled later and be performed by other means. There are currently many groups and organizations that can perform this work at lower costs. Salmon CORP is one such potential group. We request that this item be removed from the list, or be modified. Additional studies should be considered to determine

163 cont. other low cost options.

7.9 Cattle Watering Facilities Modifications:

164 The estimated cost of $6,800,000 for drilling approximately 50 wells for cattle watering seems excessive. Well drilling can be done for less and there may be other facilities or additional options to meet the watering needs. No other options were considered or estimated. The required flow rates for the wells may be excessive which could require more costly drilling. Other options and sources of water need to be considered. Lastly, the number of wells recommended should be verified for current and future demand.

SECTION 9. HYDROPOWER FACILITIES DECOMMISSIONING

General:

165 The DEIS does not disclose whether the abandon option or the mothball option is used in the cost estimate. It makes little sense to use the mothball option since these projects will not be put back in use, nor will any of the equipment be of use, even if that option was considered in the future. These projects are approaching their service life. Ice Harbor is scheduled for turbine replacement within the next 5 to 10 years. The other projects are also approaching their service life span for their major systems. We require clarification regarding which option was costed out.

ANNEX X COMPREHENSIVE BASELINE COST ESTIMATE

134 cont.

Table 1: Natural River Drawdown Estimated Costs

Task	Ice harbor	Monumental	Goose	Granite	Total
Real Estate	$ 0.34	$ 0.27	$ 0.20	$ 0.27	$ 1.08

134 cont.

Decommissioning	$ 1.48	$ 1.54	$ 1.47	$ 1.52	$ 6.01
Cultural Resources	$ 2.28	$ 1.58	$ 1.44	$ 1.54	$ 6.83
Cattle Watering Facilities	$ 1.39	$ 2.46	$ 1.97	$ 1.04	$ 6.86
Drainage Structures	$ 1.87	$ 2.06	$ 1.79	$ 2.84	$ 8.56
Lyons Ferry Hatchery		$ 9.71			$ 9.71
HMU Mitigation	$ 3.24	$ 2.43	$ 2.64	$ 1.75	$ 10.06
Recreation Access	$ 2.47	$ 2.04	$ 3.26	$ 7.97	$ 15.74
Railroad Relocations	$ 6.26	$ 13.92			$ 20.18
Turbine Modifications	$ 7.86	$ 7.86	$ 7.86	$ 8.13	$ 31.71
Re-vegetation	$ 8.24	$ 6.58	$ 11.10	$ 7.73	$ 33.64
Fish Handling	$ 19.70		$ 18.50		$ 38.20
Bridge Protection		$ 6.41	$ 12.77	$ 32.67	$ 51.86
RR Damage Repair	$ 6.02	$ 4.75	$ 9.81	$ 109.42	$ 130.01
River Channelization	$ 35.35	$ 31.85	$ 53.46	$ 27.54	$ 148.20
Embankment Removal	$ 65.52	$ 41.44	$ 26.57	$ 28.38	$ 161.91
Embankment Protection	$ 44.89	$ 38.13	$ 39.72	$ 56.09	$ 178.84
Total	$ 206.90	$ 173.04	$ 192.56	$ 286.88	$ 859.39

Total of Items We Have Concerns with
Did not Include Embankment Removal..... 573.78

134 cont. | Total for Just Drawdown & Safety Related Items. No Changes in Embankment Cost..... 261.67

Table 2: The Percentage of the Total that the Task Reprensents

	Percentage of Total	Ice Harbor	Monumental	Goose	Granite
Real Estate	0.10%	0%	0%	0%	0%
Decommissioning	0.70%	1%	1%	1%	1%
Cattle Watering Facilities	0.80%	1%	1%	1%	0%
Cultural Resources	0.80%	1%	1%	1%	1%
Drainage Structures	1.00%	1%	1%	1%	1%
HMU Mitigation	1.20%	2%	1%	1%	1%
Lyons Ferry Hatchery	1.80%	0%	6%	0%	0%
Recreation Access	1.80%	1%	1%	2%	3%
Railroad Relocations	2.30%	3%	8%	0%	0%
Turbine Modifications	3.70%	4%	5%	4%	3%
Re-vegetation	3.90%	4%	4%	6%	3%
Fish Handling	4.40%	10%	0%	10%	0%
Bridge Protection	6.00%	0%	4%	7%	11%
RR Damage Repair	15.00%	3%	3%	5%	37%
River Channelization	17.10%	17%	18%	28%	9%
Embankment Removal	18.70%	32%	24%	14%	10%
Embankment Protection	20.70%	22%	22%	21%	19%
Total	100.00 %	100%	100%	100%	100%

166

167 1. Chapter 5 (Snake River Geography): Their statement "Many of the soils…are highly erodible" fails to mention that overgrazing by cattle and over tillage by farming for several decades has left the land surrounding the Snake River more susceptible to wind and rain erosion. Human activities dominate over nature as the catalyst for soil erosion. From our review of the DEIS it is our understanding the sediment movement will be covered in Appendix H Fluvial Geomorphology.

168 2. Chapter 9 (Snake River Discharge Characteristics): Plate 9-1 shows Lower Granite inflows for mostly dry water years, 1976-1981, with water year 1977 being one of the worst and driest El Nino water years of the late 20th century. The COE cut off the period of record before the wettest three water years, 1982-84, of the 1980s. If the COE included the full record, from water years 1976 to 1999, the overall flow average would rise. Such a low-end bias of the flow record would support the notion that flushing out the sediment of a post-breach lower Snake would take much longer, than it would if an unbiased average were used. A higher flow regime would be more conducive for flushing out sediments faster.

169 3. Chapter 11 (Early Snake Explorations): Most of this section is irrelevant to the study. The first paragraph describes the land at the lower Snake as a "bleak, dreary waste." The third paragraph quotes the 1905 Calkin report that supports the idea of subjugating natural streams to the will of mankind. The tone of this section is biased towards river development.

170 4. Chapter 12 (Pre-Project Water Temperature): Although the historical data presented is interesting, the data has no comparative value unless project temperature data is listed. A relevant comparison should include post-1975 reservoir tri-level thermograph data.

171 5. Chapter 14 (Snake River Fish Passage): There is no reference supporting the claim that adult and juvenile anadromous fish passage extends through December. There is no description or relation of how the nearby Clearwater affects passage to the lower Snake.

172 6. Chapter 15 (Effects of Turbidity on Fish): This rambling summary of articles makes few connections with Pacific Northwest anadromous fish. Some of the article synopses lead the reader to a pre-formed opinion to support a no-breaching

172 cont. position. For example, the last paragraph of page F15-1 (Martin et. al. 1984), says in regard to the post Mt. St. Helens blast of 1980, "sediment problems and channel instability on the debris avalanche are expected to diminish in 30 to 35 years." The reader is planted with the idea that when the four lower Snake dams are breached, that a similar time frame may follow. If the COE had bothered to incorporate current research and observations from the 1990's, such as Costa (1994), the reader would see that the total Mt. St. Helens sediment yield had stabilized to pre-1980 eruption background loads by the late 1980s. Gage shift corrections to the gage data network around Mt. St. Helens ceased by 1990, as the channels stabilized.

173 7. Chapter 15 (Effects of Turbidity on Fish): If you want to find a scientific study that supports our conclusion, try Lucas (1986). He shows that gravels in the Toutle drainage were clean enough of silt and mud by autumn 1983, only 3 years later since the eruption, that winter steelhead redds were abundant again.

174 8. Chapter 16 (Snake River Sedimentation): The Russell report of 1897 is extremely outdated. Recent studies incorporate modern knowledge of dynamic geomorphology, which better relates hydro-meteorological event-driven process geomorphology to sedimentation.

175 9. Chapter 17 (Snake River Basin Soils): The 1936 Renner report (first paragraph) infers that erosion problems in the Boise basin can apply to the Salmon basin. During a site inspection with the BOR, a CRITFC employee visited the Boise and Salmon basin last summer, and the Salmon basin has much more forest and ground cover to minimize erosion than does Boise. Farming is conveniently not listed as the primary cause and catalyst for soil erosion problems of the 20th century. The COE fails to include pre-farm development sediment yields for comparison to current yields. The claim that precipitation is "heavy" in the east slope portion of the Palouse basin is incorrect. The normal precipitation totals are only 8-18 inches a year in that region.

176 10. Chapter 18 (Prior Snake Basin Sedimentation Studies): The 1967 Kaiser report (first paragraph) claims that soil erosion is linked to "antecedent ground temperature" is non-sensical as is the claim that erosion rates follow 10-15 year cycles (science basis?). Recent climate research, such as the 20-30 year periodicity of the Pacific Decoded Oscillations (PDO) is ignored.

177 11. Chapter 20 (Sedimentation Due to Dam Breaching): The Mt. St. Helens 1980

177 cont.

eruption is a good analogy here. The work of Pearson (1986) and Meyer and Janda (1986) show the debris avalanche that eroded from May 1980 to September 1983 is 100 million cubic yards (mcy)—this is equivalent to the volume of sediment behind the four Snake dams. The St. Helens sediment load was a poorly sorted mix of mud, silt, sand, and boulders. By the end of WY 1980, a sediment yield of 15 mcy eroded from the volcanic debris avalanche. By WY 1981, the sediment yield was 31.5 mcy (47% of the cumulative total). By WY 1982, the sediment yield was 34 mcy (75% of the cumulative total). By WY 1983, the sediment yield was 19 mcy (almost 100%). Sediment yields fell to pre-eruption levels by the late 1980s. The annual sediment discharge from the Toutle River basin decreased by a factor of about 20 between 1982 and 1990. Erosion around the volcano sharply declined after 1983, just three years after a major eruption.1

178

12. Chapter 21 (Dam Breaching Effects on Fish Passage): How does an 1894 report that rambles on about river miles along the entire length of the Snake relate to the present issue? The COE fails to present any research findings from the post-breach Teton dam, or any other breached dam from around the world, and the impact on fish passage.

179

13. Chapter 25 (Time Required…New Equilibrium): The COE fails to mention in their analyses that the lower Snake River would return to its equilibrium bed-load and suspended load yields, as soon, if not sooner, than Mt. St. Helens. The lower Snake River sediments, unlike the eruption debris of Mt. St. Helens, have been reworked by fluvial action and are already well-sorted medium-to-course sands and gravels. It would be a useful comparison if the COE plotted the sediment size data from the USGS 1980 report with that of the work the USGS has extensively conducted on Mt. St. Helens.2

The COE states "erosion…is extremely hard to assess because of the uncertainties in weather prediction," and continues to ignore advances in weather and climate

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[1] The COE poorly estimated when the eruption sediment yield would decline. Costa (1994) shows the COE 1985 projections versus the observed data through 1993:
http://vulcan.wr.usgs.gov/Imgs/Gif/Projects/Sediment_Trans/OFR94-313/figure2.gif

[2] Slope and relief considerations are ignored. A log-log plot of sediment yield to flow discharge reveals a proportional relationship that is shown in classic hydrology texts such as Linsley (1982). The relationship is driven by the drainage basin's slope and relief. The Mt. St. Helen's drainage basin is fairly steep (relief = 4960 – 160 ft = 4800 ft) and so the sediment yield and erosion rates are relatively high. The relief from Lower Granite forebay to the McNary forebay is much less in comparison, 735-335 ft = 400 ft. Hence, erosion rates for the post-breached lower Snake reach would be minimal.

179 cont. forecasting.
Given our current climate regime, the wet PDO cycle, higher than normal precipitation and subsequent flow should be available to enhance and thus reduce the time required to flush sediments out of the lower Snake.[38]

APPENDIX G HYDROREGULATIONS

180 The COE failed to incorporate any CRITFC hydro model alternatives into their analyses. Mr. Bob Heinith of CRITFC sent comments to Joe Johnson, COE, on March 12, 1999 based on Kyle Martin's, CRITFC, early Hydro-Sim runs. He requested that Johnson incorporate CRITFC's alternatives, as none of the alternatives listed in the JSMFS modeling group adequately met tribal recovery plan flows and did not meet the full range of alternatives that should be considered. As of August 1999, CRITFC was informed that the work would not be incorporated. The CRITFC alternatives include a Base-case, modified flood control, and 5 dam draw-down.

181 1. In the Forward, Abstract, and Introduction, 1.1 (Scope): COE claims they solicited input from the tribes, but there is no evidence anywhere in Appendix G of tribal input. Refer to CRITFC letter dated 3/12/99.

182 2. Chapter 3.5 (Columbia River Models), G3-9/11: Hydro-regulation models do not have predictive capability and assume static weather and climate data input. This is a major concern as the climate paradigm is shifting to a warmer wetter climate. How will the assessments predict impacts of a shifting climate on future hydro

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[38] References: Costa, J.E. 1994. Evolution of Sediment Yield from Mount St. Helens, Washington, 1980-1993: USGS Open-File Report 94-313. On-line report: http://vulcan.wr.usgs.gov/Projects/Sediment_Trans/OFR94-313/OFR94-313.html
Kinsley, R.K., Kohler, M.A., and J. Paulhus. 1982. Hydrology for Engineers. McGraw-Hill Publishing, New York.
Lucas, R. 1986. Recovery of Game Fish Populations Impacted by the May 18, 1980 Eruption of Mt. St. Helens: Winter-run Steelhead in the Toutle River Watershed. In Mount St. Helens, Five Years Later. S. Keller (ed.). Eastern Washington University Press, Cheney, WA, pp. 276-292.
Meyer, D.F. and R.J. Janda. 1986. Sedimentation Downstream from the 18 May 1980 North Fork Toutle River Debris Avalanche Deposit, Mt. St. Helens, Washington. In Mount St. Helens, Five Years Later. S. Keller (ed.). Eastern Washington University Press, Cheney, WA, pp. 68-86.
Pearson, M.L. 1986. Sediment Yields from the Debris Avalanche for Water Years 1980-1983. In Mount St. Helens, Five Years Later. S. Keller (ed.). Eastern Washington University Press, Cheney, WA, pp. 87-107.

182 cont. operations?

183 3. Chapter 4.2.2 (Rule Curves), p. G4-7: Using observed runoff to calculate a rule curve is incorrect, as the method incorporates perfect hindsight knowledge. The procedure would be better served using the runoff volume forecasts, as this method would replicate real-time, real-world conditions. The NWPPC endorses this approach. The COE opposes it.

184 4. Chapter 5, Table 5-7 (McNary regulated flow), p. G5-19: Tribes object to using McNary as a lower Columbia summation point. The Dalles has been the historic summation point prior to the 1995 NMFS BiOp and should continue as such. By using The Dalles as the operation point regulations of John Day can be incorporated.

185 5. Chapter 5, Tables 5-10/11 (Meeting Flow Objectives), p. G5-20: Corps fails to incorporate the many CRITFC model results to compare with listed alternatives.

186 6. Annex A (Comparison Tables), pp. A-1 to A-9: It would be useful to show the number of Julys when Grand Coulee did not refill. Listed tables only present the Snake. Impacts to the Columbia arm need to be considered.

APPENDIX H FLUVIAL GEOMORPHOLOGY

General:

187 Overall this appendix seems like a competent piece of work with the limited review we have been able perform. The model studies indicate that within 2 years the majority of sediments will be removed from the Lower Granite section of the Snake River. This was the study area since this portion of the river has the highest sediment accumulation. This reservoir should therefore take the longest to clear of sediments. In certain locations of the Lower Granite section of the Snake, the forebays directly in front of the dams, may take longer, up to 10 years to have sediment removed, but this is all based on the historical runoff values. No mention was made of augmenting the natural flow through manipulation of upstream reservoirs to increase flow and increase the rate of sediment removal. We feel this calculation should be done to determine a best case scenario with historical runoff values.

Views of Dennis Gathord Regarding Total Dissolved Gas Structural Modifications:

1. Numerous approaches to reducing supersaturation have been studied by the Corps of Engineers. The least expensive alternative is adding flip lips or deflectors to the bottom of the spillways to lower gas concentrations. This is not the most effective method since gas concentrations vary significantly with flow using only deflectors.

2. Deflectors are installed at all the dams.

3. Deflectors don't reduce gas saturation below 113%, according figure 2.1 of the *Dissolved Gas Abatement Technical Report Phase II* 30% Draft Study conducted by the Corps of Engineers in 1997. I was responsible for developing part of that study. The Study investigated deflectors, raised stilling basins, raised tailraces, and submerged discharge as alternatives to reduce gas supersaturation. I was directly responsible for developing the submerged passage way alternative. I was a project manager for the engineering consulting firm, now defunct, Summit Technology, which conducted that part and other structural alternative in the study.

188, 189

4. Deflectors do not reduce gas to 110% saturation.

5. Of the alternatives and combinations of alternative studied by the Corps, including flip lips, raised stilling basin, raised tailrace, deflector, and submerged passageways; submerged passageways provide the best gas saturation abatement characteristics.

6. Deflectors with raised tailrace and raised stilling basin provide the next lowest gas supersaturation characteristics over a range of flows.

Costs for the Maximum Transportation plus System Improvements alternatives should include the cost for the alternative most likely to meet 110% saturation requirements. This system would be the submerged outlet solution. Estimates based on the 30% document, which did not investigate a submerged outlet at all four Lower Snake River Dams, suggests that costs for the submerged outlet approach

188, 189 cont.

would be approximately in the range of $150 to 200 million per dam. This cost added to the stated cost for Alternative 3 would raise the cost above Alternative 4, the Dam Breaching approach.

Appendix I Section 3.4: Impacts on Water Supply

DEIS water supply economic impacts appear in Appendix I, Section 3.4, and are then forwarded to Main DEIS Section 5.10, and the "Summary" section entitled "Effects on Water Supply and Irrigation.

190

With respect to *Water Supply to Irrigated Agriculture*, all DEIS sections represent the work of the Corps, not of DREW. The Corps cut of work group interaction on this subject in early 1999. Results have consequently not been agreed to by DREW, its Water Supply Work Team, or (to the best of our knowledge) by NPPC's Economic Advisory Board (IEAB). In fact, the Corps estimated annual irrigated agriculture cost of between $1.3 million and $9.2 million under A4 (Appendix I, Table 3.4-16) is undoubtedly high – perhaps by a factor of two. Principal calculating problems involve over-estimation of affected farm area, importing data from other farm areas without appropriate adjustments, and failure to account for all relevant farm costs in net economic impact calculations.

191

With respect to *Water Supply to Municipal and Industrial (M&I)*, reviewers face the same difficulties as with Implementation & Avoided costs – as again, the Corps refused to supply DREW or the tribes with underlying technical studies justifying their calculations. Some of the estimates seem "made up." But without any opportunity to review underlying data and calculations, there is no way of telling. Corps estimates of annual economic effect range from $115,000 to $3.8 million (Table 3.4-16).

192

With respect to *Privately Owned Wells*, the Corps estimates an annual impact between $564,500 and $2.7 million under A4 (Table 3.4-16). These estimates are small in magnitude, but large in imagination. Again, we have no underlying data to check them against. During DREW discussions, the Corps has asserted that these expenditures are required "to meet legal obligation" – but they have not furnished said legal authorities, despite repeated requests.

Review of Appendix I, Section I.3-8 -- Implementation Costs and Avoided Costs

This review considers Section 3.8 of DEIS Economic Appendix I. The results of this Section are also forwarded by the Corps to Main DEIS Table 5.15-1, and to a table titled "Summary of Average Annual NED Cost/Benefits in the DEIS "Summary".

Section 3.8 of Corps DEIS Appendix I provides Corps estimates of **Implementation Costs** for each project alternative – and **Avoided Costs** if Alternative 4 (dam breaching) is selected, and the 4 Lower Snake dams are not further operated.

193

In the Corps "federal family" draft of July, 1999, the Corps provided *implementation cost* and *avoided cost* estimates, and then summed them to provide an estimate of *the net cost effects* under each project alternative. In this DEIS, the Corps has provided individual estimates for *implementation costs* and *avoided costs*, but not summed them in a table. Because the distinction between these cost categories is largely one of "accounting", they are summed here, drawing from DEIS Appendix I Table 3.8-4 for *implementation cost estimates*, and from DEIS Appendix I Table 3.8.5 for *avoided cost estimates*.

Project	6.875% Discounting			4.75% Discounting			0.0% Discounting		
Alternative	**Impl.**	**Avoided**	**Total**	**Impl.**	**Avoided**	**Total**	**Impl.**	**Avoided**	**Total**
	Cost	Cost	Cost	Cost	Cost	Cost	Cost	Cost	Cost
	----------in millions of dollars per year----------								
Dams Retained:									
A1	15	--	15	12	--	12	5	--	5
A2	12	--	15	9	--	9	4	--	4
A3	21	--	21	16	--	16	6	--	6
Dams Breached:									
A4	64	<29>	35	47	<29>	18	13	<29>	<16>
Total Cost A4-A1:			**20**			**6**			**<11>**

These data show that **annual estimated (implementation + avoided) costs are very close between alternatives** – and highlight two important concerns for DEIS reviewers. Whether Alternative 4 (breaching) is less expensive than Alternatives 1,

193 cont. 2 or 3 (not breaching) is an artifact of the **discount rate chosen for the analysis.** Further, the omission by the Corps of substantial potential expenditures associated with Clean Water Act requirements at existing dams biases their findings against Alternative 4, and in favor of the non-breaching alternatives – and likely affects the comparisons of "expensiveness" between projects in their report.

The Effect of Discount Rate Selection on Corps Reported Cost Results.

194 It can be readily observed from the prior table that the Corps' conclusion that Alternative 1 is less costly than Alternative 4 depends on selection of a relatively high discount rate. **At any rate lower than about 4 percent, however, Corps calculations would show A4 to be equal to, or less expensive than A1, considering both implementation costs and avoided costs.**

The Corps used three discount rates of *institutional accommodation* developed by DREW. These are:

6.875% favored by the Corps;
4.75% preferred by BPA;
0.0% designed to reflect tribal preference for long term valuation of resources, particularly Treaty assets.

195 These rates were chosen *to accommodate participating parties* in DREW. They do not reflect any underlying dialogue by experts in discounting, as to what appropriate rates for real discounting should be. Economic experts and agencies have, however, discussed appropriate discount rates to use in federal projects – notably Lind, R.C. et al, 1982, **Discounting for Time and Risk in Energy Policy**; and Lind, Hartman, Lyon, Howe and Moore and Viscusi in a special discounting issue of the **Journal of Environmental Economics and Management** (1989). These discussions arrived at a general consensus that real discount rates of about 2 percent, sensitized upward and downward for variant conditions should generally pertain.

196 It has also been identified that the highest rate favored by the Corps in this DEIS results from an error at OMB – who cite the recommendations of the (late) US Water Resources Council to use **real discount rates** in analysis, but then incorrectly recommend actual rates in higher **nominal** terms.

197 In sum, if the Corps DEIS had applied discount rates recommended by economic experts, or even used a rate a point or slightly more higher, their DEIS conclusion would have been that dam breaching **is cheaper than leaving the dams in place when both implementation costs and avoided costs are considered.**

The Effect of Ignoring Substantial Water Quality Compliance Costs in the Corps DEIS Analysis.

198, 199 Staff estimates by fish and wildlife agencies and the tribes have identified that substantial levels of additional cost may be faced by the Corps if the four lower Snake River dams are retained. As discussed earlier, the Corps of Engineers must comply with state water quality standards. National Wildlife Federation v. Corps or Engineers, Civ. No. 99-442-FR (March 21, 2000) at 18. The Corps' failure to include the structural and operational measures necessary to ensure compliance with the Clean Water Act in the non-breaching alternatives taints the economic analysis and fails to meet minimum legal requirements. Without inclusion of the measures necessary to provide for compliance with state water quality standards, alternatives 1-3 are not viable.

In sum, Corps data in the DEIS identify that dam breaching is less expensive than leaving the dams in place at any level of discounting that would be considered reasonable by economic experts in the discounting field. If the Corps DEIS had included potential costs associated with future water quality compliance by the existing dams in its analysis – this conclusion would be accentuated further.

200 Finally, this review utilizes cost data provided by the Corps in its DEIS. It should be noted that the Corps refused to provide the detail underlying either its *implementation cost* or *avoided cost* data to either DREW or the tribes for review prior to publication of this DEIS – and still has not provided underlying reports to the tribes.

Review of Appendix I, Section I.9 -- Cost Effectiveness

This section appears in the DEIS Economic Appendix I, and does not appear to be cited in the main DEIS. This section suffers from three major problems.

The cost-effectiveness methodology developed by the Corps and its

consultants is erroneous, and follows neither sound economic procedure, nor requirements in the Corps' own cost effectiveness manual.

Economic errors and manipulation by the Corps in prior DEIS sections (particularly recreation, avoided cost and irrigation/water supply) are imported into this section, and reverse the rank order conclusions with respect to alternatives that the Corps reaches/displays. This has the effect of making the dam breaching alternative appear as least attractive, when, in fact, it is most attractive.

Despite the fact that the DREW cost-effectiveness process worked out a consensus procedure to also recognize attainment of tribal responsibilities/objectives under each alternative, the Corps/its consultants have not included such analysis in this DEIS section.

The Cost-Effectiveness Procedures Developed by the Corps are Erroneous.

The DREW Study Plan correctly defines the key condition for use of cost-effectiveness analysis.

Both cost-effectiveness and incremental cost analysis assume that several alternatives will exist to meet some environmental output goal.
(DREW PSP at 5..5.16)

201

DEIS Section I.9 clearly identifies that, with respect to Spring/Summer Chinook the non-breaching alternatives do not meet NMFS "Survival Standards" after 24 years, do not meet NMFS recovery standards after 48 years, and do meet NMFS survival standards after 100 years. Breaching does not meet survival standards after 24 years, but does meet the 48 year recovery standard and the 100 year survival standard (DEIS Table 9-1).

With respect to fall chinook, all alternatives meet the 24 year and 100 year survival standard, but only dam breaching meets the 48 year recovery standard.

In short, only dam breaching meets the objective of recovering salmon of the Snake River system.

Yet the Corps DEIS fails to "screen out" the alternatives that fail to meet

salmon recovery objectives, and provides a "so-called" cost-effectiveness analysis across all project alternatives 1-4 (DEIS Tables 9-4 & 9-5, and associated graphs. In so doing, the Corps disregards the fundamental requirement for correct use of cost-effectiveness analysis – that all alternatives considered by the analysis meet the stated project goal.

201 cont.

The DEIS then pushes this envelope of incorrect economic application still further, to produce a "cost per fish" comparison between all project alternatives (Tables 9.4, 9.5 & 9.6). Of course, alternatives that (allegedly) cost far less and do not meet required goals will look quite attractive in such comparisons, if one ignores requisite project purposes.

The Corps Imports its own prior Errors and Manipulations with respect to Economic Impacts into this Section.

Economic conclusions in this DEIS section are based on calculations developed elsewhere in Appendix I by the Corps and its consultants – and imported into Table 9-3 (p. I9-7). As noted elsewhere, some of these underlying calculations have been manipulated by the Corps – and are erroneous. Of particular concern are the Corps' downward adjustment of recreation benefits from alternative 4, the Corps' failure to provide adequate consideration of water quality costs that could be avoided under alternative 4, and their failure to consider passive use benefits at all in this analysis. Proper inclusion of benefits/costs in any one of these sectors would be sufficient to reverse the conclusions reached in this Section I.9 by itself.

202

The Corps Failed to Provide a Cost-Effectiveness Comparison with respect to how each Project Alternative Meets Tribal Treaty Requirements and associated Federal Responsibilities.

Early on, the DREW Cost-Effectiveness Work Team recognized that cost-effectiveness analysis, properly employed, can be used to assess the least cost way of meeting any range of project alternatives – including the responsibility of the federal government with respect to tribes. No such analysis is provided by the Corps in Cost-Effectiveness Section I.9 of this DEIS.

203

204 **Review of Recreation Benefits and Passive Use Values Contained in DEIS**

Recreation

The Corps DEIS primarily deals with Recreation in Sections 2.1.12, 4.13 and 5.12. Impact data reported in Section 5.12 is primarily based on five surveys conducted by consultants to the Corps.

204 cont.

Due to pressures exerted by Corps officials on the consultant expert, and post-survey downward revisions of recreational benefits associated with dam breaching by Corps officials, subsequent to survey completion, estimates of recreational benefits finally recommended for use in DEIS summary calculations are four times lower than "middle estimates" reported by underlying survey data. If more liberal interpretations are applied to survey results, the degree of downward adjustment made by the Corps results in a DEIS underestimate that reports down to less than one percent of recreational benefits from breaching in the DEIS (DEIS, pp. I3-52 to I3-55), depending on assumptions used.

To understand how this underestimate is arrived at in the DEIS, some understanding of prior process is necessary. At the outset of work by the Corps-chaired multi-agency Drawdown Regional Economic Work Group (DREW), it was identified that information in the Columbia River System Operation Review (SOR) FEIS (1995) had not sufficiently distinguished between recreation opportunities based on the present reservoir system along the lower Snake River, and an alternative more natural system should the four reservoirs be breached – so that these earlier data could not simply be updated, and further survey work was required.

205

As with other elements of DREW research, a DREW Recreation Work Team, with participation from various agencies was formed to provide technical oversight for the recreation work, and to bring completed work back to DREW for its consideration. The Corps then hired a number of consultants to work with the DREW Recreation Work Group on survey design, to conduct surveys and to write-up survey results. The lead role in surveying and analysis of recreation (and passive use) benefits associated with dam breaching was assigned to Dr. John Loomis, a well known resource economist at Colorado State University.

After extensive review and iteration with the DREW Recreation Work Group, and separately with Corps officials, Dr. Loomis conducted the recreation survey briefly described in DEIS Appendix I – and reported results in approximately

March of 1999. When finally tabulated and checked, the results of the Loomis survey reported an annualized recreational benefit of dam breaching between $205 million/yr and $1.6 billion/yr, with a middle estimate of $390 million per year (with 6.875% discounting) (DEIS p. I3-53, right hand column of Table 3.2-5).

205 cont.

Dr. Loomis immediately received intensive pressure from Corps officials to reduce the results of the survey – with an E-mail written by Greg Graham, project leader, that the reported results were "too high." This pressure was exerted directly on Dr. Loomis by Corps officials in Walla Walla, Portland and Washington, D.C. – and the DREW Recreation Work Group was kept out of these discussions. Principal among these pressures were efforts by the Corps to isolate or detach California results from main survey reporting – and an attempt to replace the recreation day values reported by respondents to the Loomis survey with far lower values representative of more localized reservoir recreation use – in effect, assuming that values associated with reservoir recreation and natural area recreation in the Pacific Northwest are the same. This assumption – valuing reservoirs and natural rivers the same – essentially reinstates the flaw in the 1995 SOR FEIS that led DREW to conclude that further survey data needed to be gathered in the first place.

206

The DREW Recreation Work Group learned of this pressure, and at their request, a Recreation Work Team meeting was held on June 15, 1999. At that meeting, the DREW Recreation Work Group concluded that honest reporting required that results of the Loomis survey needed to be reported "as received" from respondents – not only after adjustment by Corps officials. They further agreed, that, from the range of possible assumptions and values offered by Loomis, that dam breaching economic analysis should focus on the "middle value" from his work. This is the $390.4 million annualized recreation benefit from the right hand column of DEIS Table 3.2-5 (DEIS p. I3-53).

207

Subsequent to that decision, the Corps has reported the values recommended by the DREW Recreation Work Group, but has also retained their lower value adjustment which assumes similar per day/trip values for reservoir and natural river recreation. These are essentially the range of values associated with dam breaching reported in the second column from the right in DEIS Table 3.2.4 through 3.2.7 (DEIS pp. I3-53 – I3-54). Employing the middle estimates recommended by the DREW Recreation Work Group, DEIS Table 3.2.7 displays an annual net economic recreation benefit (at 6.875% discounting) of $336.85 million per year if the survey results developed by Dr. Loomis are reported in a straightforward manner (DEIS p.

207 cont. I3-54). If the Corps assumption that reservoir values should be substituted in is employed, this reduces the annual benefit estimate to $56 million (again, DEIS Table 3.2.7).

208 Having placed both reported and reduced values in their DEIS tables, Corps officials then initiated a final downward manipulation of the data – where they suggest a compromise between the reported survey middle results, and their own adjusted lower figure. On this basis they arbitrarily associate an annualized recreation benefit of $82 million, report it in the main DEIS report (DEIS p. 5.12.19) and use it in subsequent DEIS analysis.

209 This manipulation of data from the survey commissioned by DREW meets no professional standard, and has neither been reviewed nor agreed with by either DREW or the DREW Recreation Work Group. We conclude:

210 1) The net recreation benefits reported in the DEIS understate annualized benefits associated with dam breaching by 4 times or more. This underestimate is the result of Corps downward manipulation of survey results – and meets no professional or plausible standard.

211 2) The DEIS erroneously identifies DREW as the source of their recreational findings (i.e. Table 5.12-5, DEIS p. 5.12-19). As shown, final downward manipulations of reported results were initiated by Corps officials, and were neither reviewed nor agreed to by DREW or the DREW Recreation Work Team.[39]

Passive Use

212 Passive use values are treated in Appendix I of the DEIS (pp. I4-1 to I4-8). However, these results are not brought forward into final NED analyses, or into the main DEIS report. There are three passages of concern.

213 The DEIS misrepresents the reason for failure to develop direct passive use values via survey. The DEIS states, in Appendix I (p. I4-2):

> DREW originally requested that a passive use survey be conducted by the DREW Recreation Workgroup. This survey was designed and pretested.

39 Documents describing these events are in the possession of the Corps.

213 cont.

> **Controversy surrounding the pretest mailing and contingent valuation methodology prevented this survey from being conducted**.

(emphasis added). In fact, it is extensively documented in both Corps and DREW memoranda that passive use was deleted by the Corps, after pressuring from Senator Slade Gorton – and this was objected to by DREW and the DREW Recreation Work Group.

The Corps then uses lack of direct information on passive use in the study area as an excuse for not reporting "transfer values" developed by Dr. Loomis in DEIS main calculations.

> The passive use values compiled in this study are not included in the NED account.... (F)indings suggest that there is a passive use value associated with increases in wild Snake River salmon and steelhead stocks, but the wide possible range identified for this value - $66 million to $879 – underlines the difficulty in estimating this type of value from benefit transfer. The DREW Recreation Team also identified an annual passive use value of $420 million associated with returning the lower Snake River to a free-flowing condition, independent of any effect on salmon populations.... But this estimate should be viewed with caution because existing studies on which it is based evaluated different geographic regions, and those studies were performed under a different policy context than this study.

214

DEIS at Appendix I4-8. The Corps cannot have it both ways. They cannot use their own decision not to collect direct survey data on passive use value from residents of the study referent area as an excuse not to report values from studies in adjacent areas. Either they erred in failing to survey for passive use values – or they have erred in concluding that direct data particular to lower Snake River DEIS circumstances are necessary before passive use values can be fully incorporated in analysis.[40] We conclude that the Corps decided not to survey passive use values in preparation for this DEIS – and is now using lack of such data as an excuse for not

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40 Finally, it should be noted that the DEIS section on passive use value represents Corps work product, not that of DREW or the DREW Recreation Work Group. The Corps work product appears to be overly negative about employment of passive use values in analysis. Further, its reference to Kealy, 1999 refers to internal draft work product of the Multi-Species Framework Human Effects Workgroup, that had not been finalized when the DEIS was written and which has subsequently been revised.

214 cont. incorporating them in economic analysis. This is inconsistent, and represents a failure in the DEIS process to deal fully with potentially large benefits from dam breaching.

DEIS Appendix I – Economics (Tribal Elements)

215 Pervasive discriminatory reediting of tribal information/reports has been discussed previously. That discussion also applies fully to tribal elements of Appendix I. The Corps has entirely excluded treatment of Environmental Justice (EJ) impacts from Appendix I, despite the fact that analysis of this issue following EPA EJ guidelines was a central element of the Meyer Resources, 1999 report prepared for CRITFC/DREW. Structurally, this exclusion is inconsistent with economic principle, as distribution of benefits and costs (however measured) is a standard field for economic analysis – and that is the central concern of the EPA EJ Guidelines. Further, the Corps has not provided any identified referenced chapter or subchapter in the DEIS where EJ issues, which are of central importance in the CRITFC/DREW report, are identified and discussed. Rather, Environmental Justice concerns are buried in a few unindexed pages 475 pages deep in the main document – and appear nowhere else in the DEIS main report or in DEIS appendices.

Appendix I: ES 2.6

216 At DEIS Appendix I ES-13, and at several other places in the document (i.e. II-3, I3-146, I5-1), the DEIS characterizes all information on tribal circumstances and impacts as "qualitative". This is in error, as CRITFC/DREW tribal analysis relies on a substantial amount of quantitative information, as well as qualitative information.

Appendix I: Section 3.5 – Anadromous Fish

217 Subsequent to the Corps excluding tribal technical experts from DEIS development in May/June, 1999 (see earlier discussion), the Corps contracted with other non-tribal experts to place a dollar value on tribal catch. The DEIS noted that such dollar calculations have limited significance for the values tribal peoples associate with salmon. Further, the calculating procedures of the Corps' consultants disregarded tribal technical advice (Appendix I3-144). It is consequently incorrect to represent these estimates of tribal dollar impacts as "as findings of the

217 cont. Anadromous Fish Economic Analysis prepared by the DREW Anadromous Fish Work Group" (I3-119). Rather, they represent subsequent calculation by the Corps and non-tribal consultants – not agreed with by the tribes and their technical experts.

Appendix I: Section 5. Tribal Circumstances

218 Prior discussion of Corps re-editing and exclusion of Environmental Justice discussion applies fully to this section. In addition, Corps editors have used the footnotes associated with their Table 5-2 (p. I5-4) to express their opinions. These changes conflict with Meyer Resources, 1999, and are not agreed to. Consequently, indication that Meyer Resources, 1999 is their "source" of the footnotes is professional misrepresentation. Corps editors have also changed some numbers in the table.

219 Corps editors have reduced 29 summary pages and extensive supporting discussion concerning the effects of lower Snake River project alternatives on the tribes provided in the CRITFC/DREW report to 6 pages in the DEIS (I5-8 to I5-13). DREW/CRITFC provided specific estimates of losses in harvest from the four lower Snake dams (Beaty, et al., 1999); identified the present extent of tribal harvest above and below the lower Snake River dams (Meyer Resources, Table 43); and specifically evaluated impacts and cumulative impacts of the alternative actions being considered by the Corps. The CRITFC/DREW report then provided a summary assessment of project alternatives with respect to the two issues most central to tribal concern: meeting of federal treaty and trust responsibilities and achievement of environmental justice (Meyer Resources, 1999, pp. 230-235). That report concluded that breaching of the dams would have substantial positive impacts on these two key criteria, and that actions involving retaining the dams would continue adverse conditions. Virtually all of this information has been excluded by Corps DEIS writers – with virtually all the space in Section 5.6 of Appendix I talking only about fish numbers. Finally, on DEIS page I5-13, twelve lines and one summary table (Table 5-9) are offered to explain the totality of human effects of project actions on tribal peoples. And even here, reference to Treaties has been edited out of the original information contained in the CRITFC/DREW report (Meyer Resources, 1999, Table 54). Hence, the independent reviewer is left with little information, and no sustaining facts to support the conclusions summarized in DEIS Table 5-9.

220 In sum, DEIS writers have largely disregarded, marginalized and in some

cases altered the extensive body of evidence that the Corps and DREW commissioned, and DREW and IEAB reviewed, in apparent deference to the Corps' own beliefs regarding tribal circumstances and impacts. This has included substantial revision of their own prior July 1999 draft. The consequences of these actions are predicted by the DEIS itself:

220 cont.

> [T]he Tribal Circumstances report identifies that in almost all prior processes concerning Columbia/Snake River system dams, tribal concerns and impact on the tribes have been ignored or marginalized. ...[I]f marginalization occurs during the present process, the cumulative transfer of the river system's wealth from tribal to non-tribal residents of the region will continue – tribal peoples will continue to suffer and be disempowered, regardless of existing Treaty protections – and environmental injustice, as defined by EPA, will be exacerbated.

DEIS at Appendix I8-24. As presently written, the DEIS under review here can reasonably be expected to have precisely this effect.

Appendix N

221

DEIS Appendix Q states that a copy of the Cultural Resources Appendix was distributed to "the five participating tribes" in May, 1999 – and that no review response was received through September 30, 1999. This statement is misleading and disingenuous. Formal technical contact points between the Corps and the tribes with respect to assessment of Feasibility Study alternatives had previously been established by creation of the Tribal Effects Workgroup by DREW. The Corps chaired DREW, was fully aware of this arrangement, and Corps cultural resource specialists from the Corps' Walla Walla office were represented on the Tribal Effects Work Team. Further, the Tribal Effects Team has passed all their draft material to Corps cultural resource specialists at Walla Walla for review and comment. In contrast, Corps cultural resource specialists at Walla Walla worked independently on their Appendix N, and did not pass this work to the DREW Tribal Effects Work Team for review. Subsequently, in July, they also failed to provide this document, per an oral request for same.

222

Similarly, at a "government to government" level, to the best of our knowledge, the Corps failed to formally convey this document to any tribal

222 cont. government for review. Instead, the Corps states they "distributed" Appendix N to a group of unidentified tribal persons at a meeting in Walla Walla held for a separate purpose. We are not aware of any cover letter with that distribution that would have reasonably led to passage of the draft into tribal hands working on the project. So tribal non-response to the "distributed" Appendix N was assured by actions the Corps took.

223 In any case, the tribes provided substantial cultural resources information to the Corps in Meyer Resources, 1999, which would have corrected errors in the Corps draft. To date, this information has not been incorporated in Appendix N.

224 In sum, with respect to Appendix N: Cultural Resources, it appears that the Corps bypassed the technical process for consultation they had agreed to, failed to distribute the report to the tribes in any effective way, and failed to incorporate corrective information from Meyer, 1999. They have consequently not met their federal tribal obligations with respect to Appendix N.

Appendix Q

The DEIS mentions treaties with Indian tribes, even includes relevant excerpts of treaty language in Appendix Q, but never addresses the significance of these treaties and their effect on Corps actions and options. The only "discussion" of the significance of our member tribes' treaties is contained in the glossary of Appendix Q:

> **Treaty:** An agreement or contract between two or more nations or sovereigns.... A treaty is not only a law, but a contract between two nations and must, if possible, have all its parts given full force and effect (Black's Law Dictionary 1968).

225

Appendix Q9-1. Assuming that the definition the Corps chose is accurate, what does this mean in the context of the DEIS? How do alternatives 1-3 give full force and effect to the treaties between the United States and the Commission's member tribes? The DEIS does not address this issue. It makes no attempt to give full force and effect to the treaties between the United States and Indian tribes. To the extent that the DEIS does consider an alternative that would provide a chance for rebuilding salmon to the levels secured by the tribes' treaties, alternative 4, the DEIS attempts to undermine that alternative by tacking on unnecessary costs and

225 cont. minimizing potential benefits.

The DEIS offers alternatives 1-3 as being reasonable alternatives. They are not. Management of the FCRPS by the Corps, Bureau of Reclamation, Bonneville, and NMFS has resulted in continuing declines of Columbia basin anadromous fish populations. The bottom line is clear -- continuation of the status quo means salmon extinction. Alternatives 2 and 3 are so similar to the no-action alternative that they too will likely perpetuate the' accelerating slide to extinction of spring/summer chinook, fall chinook, and steelhead. The most charitable thing that can be said about alternatives 1-3 is that under some assumptions, that do not withstand scrutiny, they might yield salmon population increases to sufficient to meet some of the criteria of the ESA, but they do not produce results that "give full force and effect" to the tribes' treaties.

226

Appendix Q discusses the federal government's Regional Forum as if it provided a meaningful forum for the Commission's member tribes. The tribes did their best to participate in good faith in this process. The CRITFC tribes formally withdrew from the Process in May 1997 due to, among other things, the federal government's insistence that federal government middle managers should have the authority to make policy decisions regarding the protection and restoration of treaty-reserved resources. A specific issue that prompted the tribes to withdraw from the process was the Corps' and NMFS' insistence on continuing to fund the Lower Granite surface collector project. This project had not accomplished fishery manager passage goals. Continuation of the project in the face of a breaching decision would represent a waste of limited capital construction resources that could be used at Lower Columbia dams. The tribes expect that such decisions to be made in government-to-government consultation forums at the highest possible policy level. We incorporate by reference the May 16, 1997 letter from Ted Strong, CRITFC to Will Stelle, NMFS, on this subject.

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Conclusion

The Commission appreciates this opportunity to provide comments. These comments were prepared by a number of CRITFC staff and consultants. If you have questions regarding these comments, we will arrange to make the appropriate staff available to address your questions. We look forward to working with you to ensure that Columbia River basin salmon are rebuilt to the levels reserved in the treaties between the Commission's member tribes and the federal government.

Sincerely,

Donald Sampson
Executive Director

attachments

A Contrast of Hatchery Steelhead Abundance and Spring chinook SARs for 1990 through 1995.

By
Earl Weber
Columbia River Inter-Tribal Fish Commission
January 19, 2000

Introduction

I compared the passage indices for spring/summer chinook (combined hatchery and wild) and hatchery steelhead along with the combined hatchery and wild SARs for spring chinook to determine if there was a relationship between the abundance of hatchery steelhead and the survival of spring/summer chinook. The purpose was to explore the feasibility of reducing the production hatchery steelhead as a means of increasing spring/summer chinook survival to levels consistent with ESA survival and recovery goals.

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Methods

Passage indices (PIs) for spring/summer chinook (hatchery and wild combined) and hatchery steelhead were provided by Penelope Sanders, Fish Passage Center, for 1990 through 1995. Alan Byrne, Idaho Fish and Game, provided weekly SAR data for the same years for both wild and hatchery chinook tagged both above and at Lower Granite Dam. The data, from the PTAGIS data base, was pooled to maximize weekly sample sizes. The 1990 – 1995 period was chosen because prior to 1990 hatchery and wild steelhead were not distinguished in samples. In 1996 data plots showed that PIs did not provide the desired contrast early in the year when spring chinook are becoming increasingly abundant while hatchery steelhead are either not present or at least not abundant. 1997 and 1998 are more promising in that regard but cohorts are incomplete.

Correlation coefficients were calculated between hatchery steelhead abundance and spring/summer chinook SARs. In these calculations, and in the accompanying graphics, SARs in weeks in which less than 100 spring/summer chinook were PIT tagged were excluded. Weekly sample sizes appear below.

231

Year/ Week	1990	1991	1992	1993	1994	1995
04/01/90	7	7	37	0	1	45
04/08/90	291	183	314	10	1	3,564
04/15/90	1682	833	1155	170	607	17,370
04/22/90	1695	2643	909	999	4453	23,781
04/29/90	631	2192	1661	1955	785	35,383
05/06/90	1052	1994	869	1413	2339	19,109
05/13/90	337	895	313	1093	212	4,895
05/20/90	460	799	302	411	84	1,556
05/27/90	564	215	305	238	48	2,576
06/03/90	142	171	255	91	27	1,754
06/10/90	84	149	38	60	19	760
06/17/90	47	132	33	63	38	573
06/24/90	51	121	50	9	8	405
07/01/90	22	49	6	10	2	53
07/08/90	25	39	6	1	19	27
07/15/90	6	29	4	3	11	2
07/22/90	0	21	3	4	4	6
07/29/90	0	2	0	0	0	3
08/05/90	0	1	0	0	2	5
Total	7096	10475	6260	6530	8660	111867

Results

In contrasting annual plots of PIs and SARs for 1990 through 1995 (see attached graphics) no clear relationship between the abundance of hatchery steelhead and spring/summer chinook emerges. Low SARs at the onset of spring/summer chinook annual migrations are probably not due to hatchery steelhead whose migrations typically don't begin for two or three weeks. In some years low abundance of steelhead resulted in slight elevations in chinook SARs early in the migration season but in other years SARs were extremely low despite an apparent near absence of hatchery steelhead. In 1995, the year with by far the most tagged fish, chinook SARs increased as the abundance of hatchery steelhead rose and did not decline until the steelhead abundance dropped.

232

In half the years (1992, 1993 and 1994) a modest rise in chinook SARs was followed by decreases later on when steelhead abundance increased. But in other half (1990, 1991 and 1995) the chinook SARs increased as hatchery steelhead increased in abundance.

Also, under no conditions in any year did the SARs approach the two percent minimum goal established by PATH over the course of the season, regardless of steelhead abundance.

Correlation coefficients depict a similar situation. Correlation coefficients were weak and evenly divided between positive and negative. Correlation coefficients for each year appear on the graphics.

Discussion

Visual observations provide no relationship between spring/summer chinook survival and hatchery steelhead abundance. There are periods of low steelhead abundance with extremely low chinook SARs as well as periods of relatively high steelhead abundance accompanied by relatively high chinook SARs.

233

Correlation coefficients also indicate that the relationship between hatchery steelhead abundance and spring/summer chinook survival is poor. Correlation coefficients were weak and only half showed the negative relationship that would be expected if hatchery steelhead were the cause of poor chinook survival.

Regardless of steelhead abundance, transported spring/summer chinook survived at low rates. Only in three weeks within the six years did the SARs meet or exceed one percent. Note that these SARs are from Lower Granite Dam only where transport survival is typically the highest. Lower dams such as Lower Monumental and McNary, if added to this type of analysis, have historically show even lower SARs for chinook.

234

While it is certainly realistic to suspect that hatchery steelhead could consume, injure or at least stress the smaller spring/summer chinook, these results indicate that even the total elimination of the steelhead hatchery program would not result in the restoration of spring/summer chinook to the level of survival (approximately two percent), far less recovery (approximately four percent.) Thus while hatchery steelhead likely contribute to the poor performance of spring/summer chinook, there are clearly other contributing factors and these other factors appear to pose greater limitations to chinook survival and recovery than hatchery steelhead.

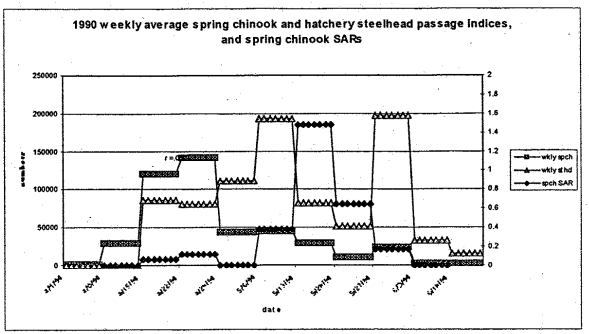
235

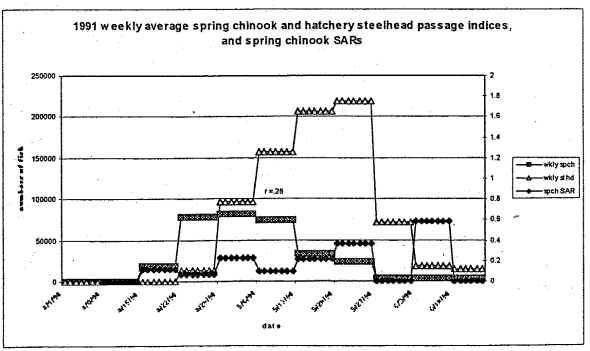
Finally, to the extent that hatchery steelhead lower chinook survival, they do so only within the context of the transportation program. In light of the evidence presented herein, the benefits of reducing or eliminating hatchery steelhead would not be anywhere near those required for survival or recovery of Snake River spring/summer chinook. At the same time, such actions would have the potential to severely inhibit the survival and recovery of Snake River steelhead.

236

First set of graphics: spring chinook SARs versus numbers of hatchery steelhead and spring chinook, 1990 through 1995.

232 cont.





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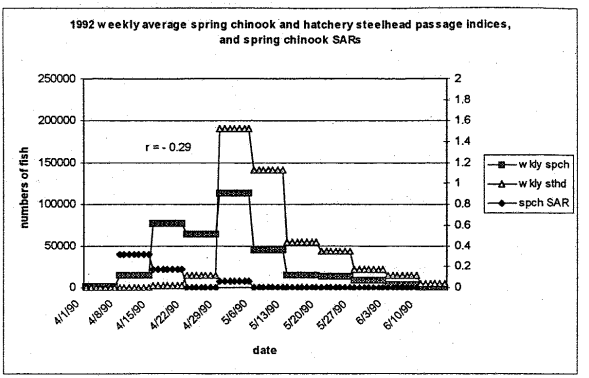
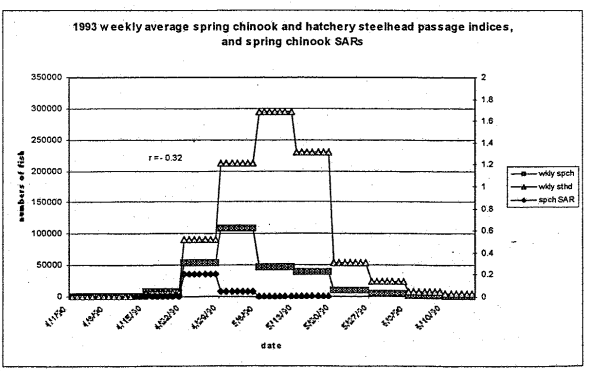

1992 weekly average spring chinook and hatchery steelhead passage indices, and spring chinook SARs
numbers of fish
r = - 0.29
date
wkly spch
wkly sthd
spch SAR
4/1/90
4/8/90
4/15/90
4/22/90
4/29/90
5/6/90
5/13/90
5/20/90
5/27/90
6/3/90
6/10/90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numbers of fish
r = - 0.32
date
wkly spch
wkly sthd
spch SAR
4/1/93
4/8/93
4/15/93
4/22/93
4/29/93
5/6/93
5/13/93
5/20/93
5/27/93
6/3/93
6/10/93

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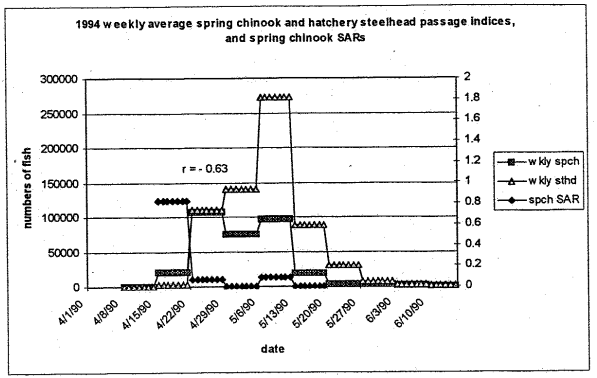
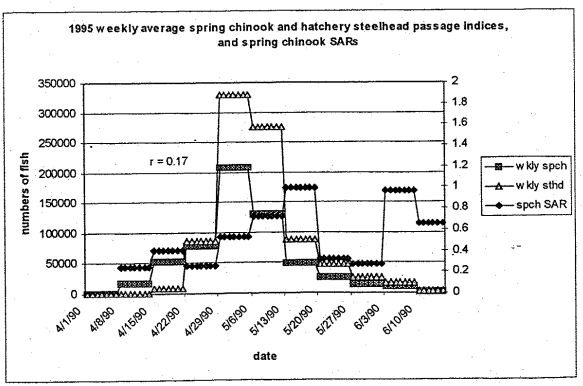
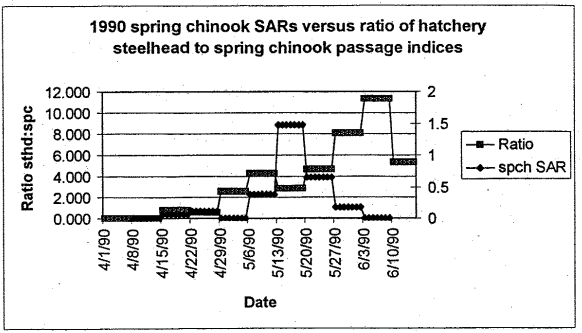

1994 weekly average spring chinook and hatchery steelhead passage indices, and spring chinook SARs
numbers of fish
300000
250000
200000
150000
100000
50000
0
r = - 0.63
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
wkly spch
wkly sthd
spch SAR
4/1/90
4/8/90
4/15/90
4/22/90
4/29/90
5/6/90
5/13/90
5/20/90
5/27/90
6/3/90
6/10/90
date


1995 weekly average spring chinook and hatchery steelhead passage indices, and spring chinook SARs
numbers of fish
350000
300000
250000
200000
150000
100000
50000
0
r = 0.17
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
wkly spch
wkly sthd
spch SAR
4/1/90
4/8/90
4/15/90
4/22/90
4/29/90
5/6/90
5/13/90
5/20/90
5/27/90
6/3/90
6/10/90
date

Second set of graphics: spring chinook SARs versus the ratio of hatchery steelhead to spring chinook, 1990 through 1995.



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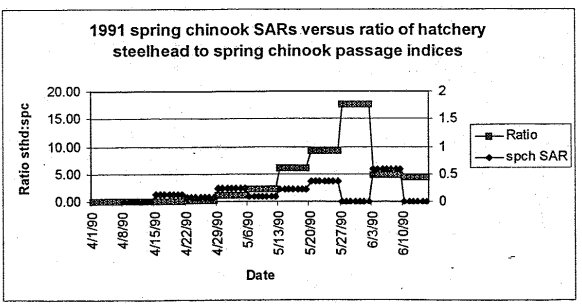

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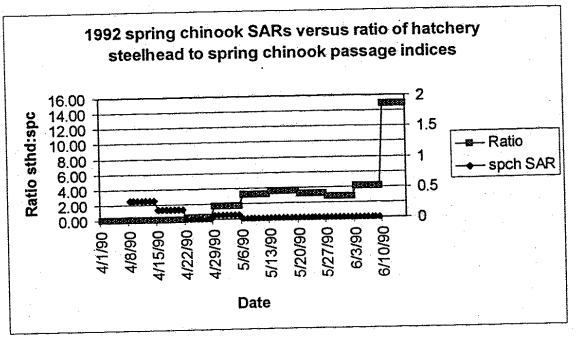
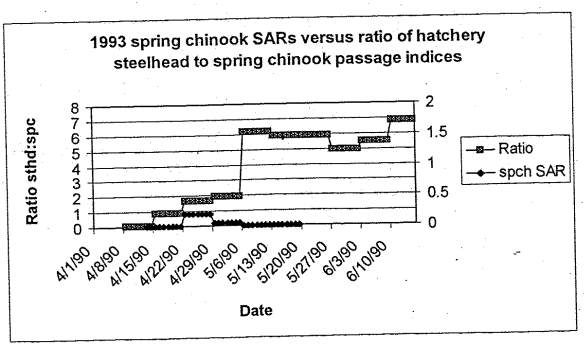
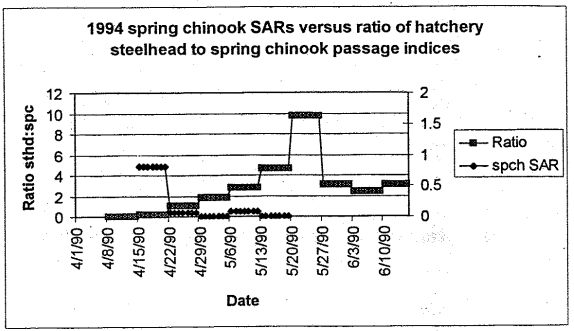

1992 spring chinook SARs versus ratio of hatchery steelhead to spring chinook passage indices
Ratio sthd:spc
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
2
1.5
1
0.5
0
Ratio
spch SAR
4/1/90
4/8/90
4/15/90
4/22/90
4/29/90
5/6/90
5/13/90
5/20/90
5/27/90
6/3/90
6/10/90
Date


1993 spring chinook SARs versus ratio of hatchery steelhead to spring chinook passage indices
Ratio sthd:spc
8
7
6
5
4
3
2
1
0
2
1.5
1
0.5
0
Ratio
spch SAR
4/1/90
4/8/90
4/15/90
4/22/90
4/29/90
5/6/90
5/13/90
5/20/90
5/27/90
6/3/90
6/10/90
Date


1994 spring chinook SARs versus ratio of hatchery steelhead to spring chinook passage indices
Ratio sthd:spc
12
10
8
6
4
2
0
2
1.5
1
0.5
0
Ratio
spch SAR
4/1/90
4/8/90
4/15/90
4/22/90
4/29/90
5/6/90
5/13/90
5/20/90
5/27/90
6/3/90
6/10/90
Date

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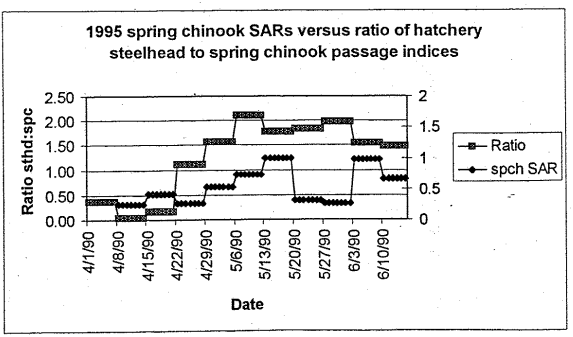
cont.


1995 spring chinook SARs versus ratio of hatchery steelhead to spring chinook passage indices
Ratio sthd:spc
2.50
2.00
1.50
1.00
0.50
0.00
2
1.5
1
0.5
0
Ratio
spch SAR
4/1/90
4/8/90
4/15/90
4/22/90
4/29/90
5/6/90
5/13/90
5/20/90
5/27/90
6/3/90
6/10/90
Date

Extra mortality, delayed mortality, and *D*: an overview

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GLOSSARY

Term	Definition
Barged fish	See "Transported fish." Most transported fish are transported by barge now, but in the past more were transported by truck.
CBFWA	Columbia Basin Fish and Wildlife Authority.
CRI	Cumulative Risk Initiative, conducted by the Northwest Fisheries Science Center, which is part of NMFS.
CRiSP	Computer model of smolt passage and transport survival.
CRITFC	Columbia River Inter-Tribal Fish Commission.
D	Differential delayed transport mortality: "...the differential survival rate of transported fish relative to fish that migrate in-river, as measured from BON tailrace to adult returning to Lower Granite Dam (LGR). A 'D' equal to one indicates that there is no difference in survival rate (after hydrosystem passage), while a 'D' less than one indicates that transported fish die at a higher rate after release, than fish that have migrated through the hydrosystem" (Bouwes et al. 1999, p. 3).
DEIS	Draft Environmental Impact Statement ("A-Fish" Appendix to the U. S. Army Corps of Engineers' Lower Snake River juvenile salmonid migration feasibility report/Environmental Impact Statement, December 1999 draft.
Delayed mortality	Mortality that occurs in a later life stage than the cause of the mortality. Equivalent to extra mortality, but "delayed"emphasizes that mortality occurs some time after the causal mechanism.
Direct mortality	Mortality that occurs in the same life stage as the cause of the mortality.
Estuary	Zone of transition from freshwater to salt water, beginning

	approximately below Bonneville dam.
Extra mortality	Another term for delayed mortality.
FLUSH	Computer model of smolt passage and transport survival.
IDFG	Idaho Department of Fish and Game.
In-river fish	Outmigrating juvenile fish from the time they leave their rearing areas, to the time they either (1) are picked up by a truck or barge or (2) arrive below Bonneville dam.
ln(R/S)	Natural logarithm of Recruits/Spawner. *Recruits* are surviving offspring of *Spawners*. In this paper, the number of recruits is assumed to be at the Columbia River mouth (i.e., before upstream migration mortality has reduced their numbers). The number of spawners is assumed to be at the tributary spawning grounds.
NMFS	National Marine Fisheries Service.
ODFW	Oregon Department of Fish and Wildlife.
PATH	Plan for Analyzing and Testing Hypotheses.
PIT tag	A small (about the size of a grain of rice) transponder that is implanted in the gut of a juvenile fish, which can be detected as the fish goes downstream or upstream through detectors at several of the Columbia and Snake River dams.
SAR	Smolt-to-adult return rate: definitions vary, but STUFA assumes this survival is the ratio of adults returning to the Columbia River mouth, divided by the number of outmigrating juveniles above Lower Granite dam. It is often defined round-trip from above Lower Granite, in order to include upstream migration mortality due to the hydrosystem and mainstem harvest.
Smoltification	Physiological changes that occur as a young (about 1½ years old)

	salmon migrates from freshwater out to the estuary and ocean, which allow the fish to "breathe" saltwater.
STUFA	State, Tribal and U.S. Fish Agencies.
Transported fish	Outmigrating juvenile fish from the time they are picked up by a truck or barge to the time they arrive below Bonneville dam.
USFWS	U.S. Fish and Wildlife Service.

Introduction

After many years of analysis by biologists from a multitude of state, federal, tribal, and other organizations, the two basic questions about what to do to save ESA listed Snake River salmon that remain are:

Can we save them without breaching the 4 lower Snake River dams?

And if we do breach the dams, will it work?

The most intense analyses have been conducted recently by PATH (Plan For Analyzing and Testing Hypotheses), the Northwest Fisheries Science Center's CRI (Cumulative Risk Initiative), and STUFA (State, Tribal and U.S. Fisheries Agencies). These groups have used a variety of models and analytical methods, though they use much of the same data, and they have all finally reached the same conclusion: the answer to the questions about whether we should breach the dams in order to save Snake River salmon depends on how much of the demise of these populations is due to the hydro system. It is not so much the direct effects of the hydrosystem that has gotten most of the attention; at this point, the arguments center instead on indirect effects. PATH came up with a parameter, D, that has drawn much of the attention around the issue of indirect effects. However, the real issue is not so much D, but rather how it relates to two other confusing terms: extra mortality and delayed mortality.

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Transportation and in-river juvenile migration

There are two ways for Snake River juvenile spring and summer chinook to get from their natal streams to the Columbia River estuary. They can swim down, or they can be transported down by barge or truck. Snake River juvenile and adult salmon must migrate past 8 hydroelectric dams on their way to and from the ocean (Figure 1).

If they are collected into a barge or truck and carried downstream, about 98% of them will still be alive when they are released from the barge 3 or more days later below Bonneville Dam[1].

[1] Bonneville dam is the lowermost dam on the Columbia River, about 100 miles upstream from the ocean. For all intents and purposes, the freshwater-to-salt water transition zone, or estuary, begins below Bonneville.

Each barge transports 350,000 steelhead smolts, or 500,000 to 1,000,000 juvenile chinook. If the barge makes no stops, its travel time to below Bonneville (where the juveniles are released, about 100 miles upstream from the ocean) is about 36 hours.

233 cont.

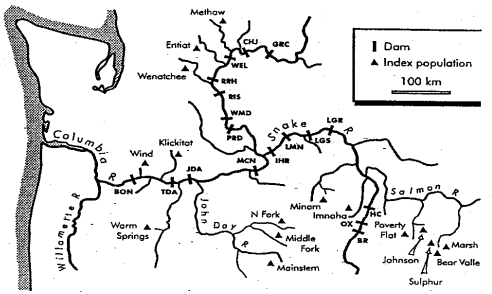

Figure 1. Map of the Columbia and Snake Rivers showing the 8 hydroelectric dams from Lower Granite Dam on the Snake down to Bonneville Dam, the lowermost dam on the Columbia River.

Since there are 3 potential pickup points (Lower Granite, Little Goose, and Lower Monumental dams, on the lower Snake River), each barge may stop on its way down to load at any other sites where fish might be migrating.

Because the Corps of Engineers operates several barges, the loading occurs nearly every day during the migration season. During peak outmigration, a smaller barge might be deployed to work a lower collection site. Though barges depart daily, collection and holding of fish can typically add a day or more to the time for most fish. When fish numbers are small, barges might be tied up a day to wait for more fish, in order to make the trip more economical. In the early season, when there are fewer migrants, the Corps uses tanker trucks which can handle 25,000 to

[2] Bonneville dam is the lowermost dam on the Columbia River, about 100 miles upstream from the ocean. For all intents and purposes, the freshwater-to-salt water transition zone, or estuary, begins below Bonneville.

30,000 juvenile fish. Trucking is being phased out because trucks are inefficient and also because the survival rates are low (explanation of barging provided by Olaf Langness, WDFW).

At this stage the juvenile chinook are about a year and a half old and are about 4 inches long. If they make their own way down through the hydrosystem, about 33% to 50% will survive to below Bonneville. Although it seems obvious that the safest route to the ocean for a smolt is in a barge, there is evidence that barged fish do not make it back to spawn at nearly the rate that in-river fish do. People do not agree about how big the difference is between barged and in-river fish, but there is consensus that there is a difference (Peters et al. 2000).

In addition to the barged-vs-in-river survival differences, there are also differences in ocean survival between fish that only have to get past 1 to 3 dams, and fish that have to get past 8 or more (Schaller et al. 1999). Regardless of how upriver fish make it past the 8 or more dams to the ocean, they do not appear to survive as well after that as fish do who don't have to deal with so many dams.

233 cont.

What are the different kinds of mortality?

These spring and summer chinook salmon lay their eggs (spawn) in freshwater streams in late summer, and then die shortly thereafter. The juveniles hatch around 6 months later and rear in freshwater until they migrate to the ocean, primarily in April and May the following year. During the time from when they leave their freshwater rearing tributaries, to when they arrive at the ocean, they undergo a process called smoltification. Historically this process took a couple of weeks. It allows them to "breathe" salt water.

After 1-3 years in the ocean, the survivors return to the same freshwater streams to spawn and die. Based on counts of spawning salmon in freshwater streams and returning adults from these original spawners, scientists can estimate the survival rates of salmon over their life cycle. They can also compartmentalize that survival into the various life stages: 1) egg to juvenile (rearing in freshwater), 2) downstream migration (smolt stage), 3) survival in the estuary (from below Bonneville dam through the first few months in the ocean), 4) survival during the next 1-3 years in the ocean, and 5) survival during upstream migration as adults.

Direct mortality

For some of the life stages, there is data that can be used to estimate the mortality that occurs in that life stage. For example, for fish that are harvested in the ocean and in freshwater, there are records which can be used to estimate how many fish were caught and killed and thus what the survival rate of salmon was in that life stage. Mortality that occurs in the same life stage as the cause of the mortality is called direct mortality.

Delayed mortality

What is less certain and more difficult to estimate, however, is how a fish's experience in one life stage may affect its survival in a later life stage. This mortality is called delayed mortality and is similar to the case of cigarette smoking and lung cancer. People do not die at the moment they smoke their first cigarette, but may die later as a result of the interaction between this earlier experience and long term health and fitness.

233 cont.

The main reason delayed mortality became an issue is that in 1996 PATH conducted an extensive analysis comparing survival of 6 Snake River spring and summer chinook populations with 6 comparison stocks from farther downstream in the Columbia River. They found that the upstream populations have declined more rapidly than the downstream populations (Deriso et al. 1996). The difference in rate of decline between upriver and downriver populations was greater than could be accounted for statistically by juvenile passage models. The most obvious difference between the 6 Snake River populations and the 6 lower Columbia River populations was the fact that there are 8 dams between the upriver populations and the ocean, but only 1-3 for the lower Columbia River populations. The evidence suggested that the most plausible explanation was some delayed effect from the hydrosystem, and so the unexplained additional mortality came to be known as delayed mortality (Deriso et al. 1996).

Because some objected that this portion of mortality may not be due to the hydrosystem (the mechanisms are discussed in "Key Issues," below), delayed mortality is also referred to as extra mortality.

The dams have sensors that can detect fish that carry tiny emitters about the size of a grain of rice, called PIT tags. These detectors allow researchers to estimate their survival from the top of the hydrosystem in the Snake River (from the uppermost dam, Lower Granite) down to below

the lowermost dam in the Columbia River, near the estuary (Bonneville), or over some stretch in-between. PIT-tags carried by returning adults can also be detected. The direct mortality that occurs when these juveniles (or adults) migrate past each of the dams determines the survival in that life stage.

The direct mortality of fish that are transported by barge or truck around the dams appears to be quite low (close to 2%), in fact considerably lower than the direct mortality of fish that travel in the river and have to migrate past the dams. Research shows that in-river survival rates go up with increased flow, and that the more the Columbia River system behaves like a free-flowing river, the higher the survival rates (Cada et al. 1997); depending mainly on flow velocity, in-river smolt mortality ranges from 50% to 67% total for Snake River fish[3].

233 cont.

As discussed above, direct mortality for transported or in-river smolts is only one component of the overall mortality through adulthood. After they leave the estuary, these fish are also subject to very high mortality rates in the near-shore ("early ocean") period, due to a combination of direct effects and delayed effects from migration (transported or in-river). After they leave the estuary, they also suffer what are probably lower rates of mortality as they grow and mature during the next couple of years in the ocean.

Although no one knows when delayed mortality occurs, most people assume it occurs shortly after the fish leave the hydrosystem (from about the estuary through the first few months in the ocean). The current estimate is that delayed effects from the hydrosystem result in mortality rates of 79% to 82% (STUFA 2000).

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What is *D*?

It turns out that, although fish that get down to the ocean in barges have a higher probability of reaching the ocean than do fish that go down the river on their own, fish that are transported suffer higher rates of delayed mortality and have a lower probability of returning to spawn. For both groups of fish—those that are transported and those that travel in-river—many scientists believe that the delayed mortality that occurs in the estuary and early ocean is related to their

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[3] The latest CRI matrix models assume direct mortality since 1980 has been over 85%. Previous CRI models assumed it was 67.8%.

experience either swimming down through the hydrosystem or during collection and transportation.

D is the parameter which describes the difference between the delayed mortality of transported fish and fish that migrate in-river. *D* is a ratio. *D* would be equal to 1.0 if there were no difference in estuary and ocean survival between the two groups of fish. If *D* is 1.0, and estimates of delayed mortality are correct, then the estimated delayed effect of the hydrosystem, for barged as well as in-river fish, would be a delayed mortality rate of about 79% to 82% (STUFA 2000). If transported fish survive better after they leave the barges than do in-river fish, then *D* is greater than 1.0. If fish that travel in-river survive better after they leave the hydrosystem, then *D* is less than one.

235 cont.

A major source of confusion in the debate about *D* is that if *D*=1.0, that does not mean the effect of the hydrosystem is negligible. It only means that delayed mortality of barged fish is no worse than delayed mortality of in-river fish. Even if *D* were 1.0, delayed mortality due to the hydrosystem would still be very high, if the estimates are correct.

In what way would the hydrosystem cause delayed mortality?

There is abundant evidence that fish from higher in the system survive at lower rates from the time they leave their freshwater rearing areas, until they return as spawners, than do fish from lower in the system (Deriso et al. 1996, Marmorek and Peters 1998a, 1998b, Marmorek et al. 1998, Schaller et al. 1999). A variety of mechanisms to explain this difference have been proposed, but the most obvious one is, of course, the hydrosystem. Due to the stress of collection and bypass at the dams, and crowding during transportation in a barge or truck, transported fish may be more vulnerable to disease and predators (Williams 1989). Similarly, Snake River fish that travel in-river must successfully migrate past the turbines, bypass systems, and reservoir predators of 8 hydroelectric dams. Stress or injury from this experience may also cause the fish to be vulnerable to disease and predation, either later down in the hydrosystem or while the fish are in the estuary and ocean.

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Mechanisms for direct mortality of in-river fish seem clear enough: irrigation diversions, water temperature, and pollution problems in Columbia River tributaries impair the ability of the juveniles to get from their spawning beds down to the Columbia or Snake River; fish that

evolved to find their way to the ocean via a free-flowing river have a difficult time making their way through a series of connected reservoirs (and then back again as adults); large predator populations such as pike minnows (formerly squaw fish) have developed to take advantage of the juvenile fish that are not only concentrated below the spillways but also may be stunned or injured after making their way through a dam; and then of course there are the bypass systems and gas-bubble disease, not to mention the turbine blades.

Researchers at OSU conducted a variety of studies from 1992-1998 in an effort to determine what the post-Columbia River system survival rate is for transported and in-river fish (Schreck et al. in development). They studied how juvenile fish respond physiologically to repeated stressors that they would experience either traveling past or through multiple dams, or traveling in barges; and they tracked radio tagged fish as they traveled down the hydrosystem, and subsequently after they arrived at the estuary.

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What they found is that undergoing repeated stressors takes a toll on juvenile salmon just as it does on other animals, and the evidence is in the endocrine system, particularly the cortisol levels. Each time a salmon or a human encounters a stressor, cortisol and other stress hormone levels rise, and then drop after the stressor goes away. As anyone who has come down with a cold or suffered a collapse during a period of prolonged stress can attest, repeated stresses like this impair overall functioning, but in particular the immune system.

Salmon are undergoing a dramatic physiological change during this period as they adapt from the freshwater natal streams to the very different marine environment. Schreck and other researchers found that these stresses can delay or even prevent smoltification, so that the fish have to remain in the estuary longer than they normally would, just in order to complete the maturation process. The evidence is suggestive, but so far not definitive, that what may be happening is that these fish—barged or in-river—arrive at the estuary stressed out, potentially vulnerable to disease, and undergoing the physiological change called smoltification all at once. They may then be relatively easy pickings for predators like Caspian terns and cormorants. Unfortunately for the researchers, they cannot track the tagged fish in seawater. Although they can track them for a ways down through the estuary, once the fish finish the smoltification process, and swim deeper under the seawater, then no one knows what happens to them until they return as adults. Researchers studying Caspian tern predation make good use of information from transponders

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237 cont.

that end up on one of the islands, to estimate impacts of the terns on wild, hatchery, barged, and in-river fish. As for the smolts that escape such predation, however, the only inferences that can be made about delayed mortality of barged or in-river fish is via the few that were tagged and survive to return 1-3 years later.

One might guess that because barged fish only have to coast down the river in a barge for a few days, compared to in-river fish that take a couple of weeks to get through the 8 dams and reservoirs, that the in-river fish would be much more vulnerable to these stress-related problems. But that is not what Schreck et al. found. Mortality rates in the estuary appear to be just as high for barged fish as for in-river fish, and the physiological evidence of stress is just as bad. Schreck cites several studies that have shown that transportation reduces smolt-to-adult survival due to stress (Schreck et al. 1989), impaired ability to avoid predators (Olla and Davis 1989, Olla et al. 1992, 1995; Mesa 1994, Schreck et al. 1997), preparedness for saltwater (smoltification; McInerney 1964, Schreck 1982, 1992), and disease resistance (Maule et al. 1989, Schreck et al. 1993, Schreck 1996, Maule and VandeKooi 1999).

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Salmon evolved to make the freshwater to seawater transition over the period of a couple of weeks, as they migrate down a river to the sea; nothing in their evolutionary history would have prepared them to make that transition in a truck or barge in a few days. The barges stop at lower dams to pick up more fish, and sometimes wait at a dock for days until enough fish migrate down from that tributary. It is difficult to separate chinook smolts from steelhead smolts because, although steelhead tend to be bigger, there is enough size overlap that separator bars used to screen out steelhead also screen out some chinook. Steelhead, bigger and more aggressive, are a major cause of stress to smaller chinook; in the laboratory, adding a steelhead smolt to a tank containing a chinook smolt causes the chinook to go into a panic that is clearly marked by its stress hormone levels. It takes only a few steelhead in a barge to have the same effect, aside from the fact that the steelhead will eat the spring chinook (hence, no doubt, the stress).

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The net result of direct and delayed migration effects, as well as the rigors of ocean survival itself, is that since 1980, on average, less than 1 out of 100 outmigrating juveniles has been making it back to the river mouth, and the rate has overall been in decline (Figure 3). In recent years, the average SAR has been about 5/1,000. Today these returnees suffer another 50% or so

reduction in numbers migrating back up the Columbia River and lower Snake River to their spawning grounds. Historically 3 to 5 smolts made it back to the Columbia River mouth as adults.

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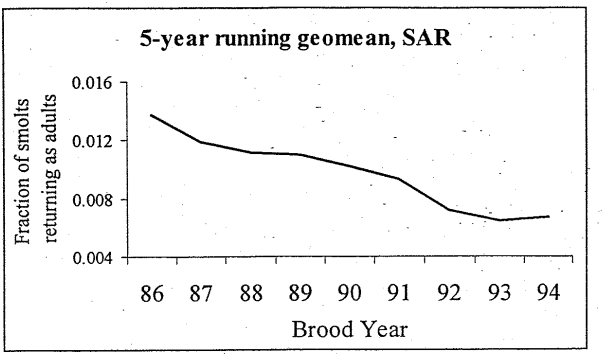

Figure 3. 5-year running average (as geometric mean) of smolt-to-adult return (SAR) rates. Running mean shown for 1986 brood year is the geometric mean of 1982-1986 brood years, and reflects returns through 1989. SAR is given from smolts above Lower Granite, to adults returning to Columbia River mouth.

240 Mortality rates have thus always been high for salmon, as they are for other animals that produce high volumes of offspring. It is important for decision-makers to distinguish between natural mortality that would be difficult for managers to reduce, and mortality that is caused by human activity (the 4 "H's:" Habitat, Harvest, Hatcheries, and Hydro). Mortality in the first year and a half of life even in good habitat is over 90% (5% is considered good survival for Idaho wilderness streams); in order for the population to persist, over the long run the rate of survival over the entire life cycle has to be high enough for offspring to replace their parents.

241 There is no disagreement that smolt-to-adult survival rates are too low to sustain these dwindling populations, and that they have been for some time. There is extensive evidence that at least for the Snake River index populations, spawning and rearing habitat quality is, for the most part, at least as good as it was before the dams went in (Schaller et al. 1999). Since transported smolts

have higher survival rates than in-river fish down to below Bonneville, and mortality just below Bonneville appears to be about the same for transported and in-river fish, the question about how to save these fish boils down to what happens after that. There has been a great deal of interest in *D*, because *D* is a reflection of whether barged fish survive the ocean as well as fish that have to make their own way down through 8 hydroelectric projects. But the question about whether these populations can survive without breaching 4 Snake River dams, is about total delayed mortality: even if $D = 1.0$, delayed mortality would still be an estimated 80% (STUFA 2000).

241 cont.

What is *D* these days?

The higher *D* is, the better barging looks. Using the most recent PIT tag data, NMFS estimates that *D* is at least 0.8 (Peters 2000), though the most recent CRI report states that a *D* of 0.5 would be optimistic (CRI 2000). Using the same PIT tag data, but different assumptions, other agencies (USFWS, IDFG, ODFW, CBFWA, and CRITFC), estimate that *D* is about 0.59 (Nick Bouwes, ODFW pers. comm. 1999). PATH used a variety of assumptions about *D*, but basically, the value assumed for *D* depended on whether the CRiSP or the FLUSH passage model was assumed. For brood years 1980-1990, the FLUSH model assumed a geomean *D* of 0.27, whereas CRiSP assumed 0.8.

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What does this mean for dam breaching?

Ideally, smolts that are transported will return to spawn at least as successfully as those that swam down the river. Unfortunately, although people do not agree on how big the difference is, there is consensus that transported fish have a lower probability of returning to spawn than do in-river fish. The only way to tell which of the returning spawners went out in barges and which swam out as smolts is if they carry PIT tags. PIT tag data are sparse, partly because the sampled populations were small to begin with and partly because the smolt-to-adult survival rate has recently been so low.

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In addition, calculating *D* requires making a number of assumptions. Thus, to date there has been no way to get an estimate of *D* that everyone can agree on. State, federal, and tribal biologists have used a variety of different assumptions and models to analyze data collected over the past several years, and PATH conducted a formal Weight of Evidence process to try to come up with an estimate that everyone would accept. They failed.

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In contrast to PATH and STUFA, the CRI does not explicitly employ the concepts of D and delayed mortality in their analytical framework. Instead, the CRI argues that breaching the 4 dams would have to increase survival through the years in the ocean by 60-120% (depending on other assumptions about current conditions), and asks what field data support the conclusion that such a large improvement can be made. In PATH, dam breaching has a low probability of recovering these fish only if (1) there is no difference between the survival of transported and in-river fish from the time they leave the hydrosystem until they return as adults (D =1), and (2) the overall survival of both groups is unrelated to hydrosystem experience.

244 cont.

Thus, whether barging or dam breaching is likely to save Snake River spring and summer chinook depends in large part on what the true value of D is, and whether or not delayed mortality is related to the hydrosystem experience. If D is low, then barging produces much lower ocean survival rates than in-river migration. Dam breaching would be necessary if Snake River spring and summer chinook are to have any chance. If D is high, then whether or not breaching would be required depends on how much delayed mortality there is, and the cause: high D and hydrosystem-caused delayed mortality means breaching would be necessary for saving Snake River salmon. High D and some other cause of delayed mortality implies breaching will not be much better than other options.

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Uncertainty

PATH, the CRI, and STUFA all came to the conclusion that the biggest uncertainty affecting the dam breaching question is essentially extra, or delayed, mortality[4]. The three processes evaluated uncertainty using different approaches: PATH evaluated uncertainties in a formal decision analysis in terms of how various uncertainties impact the likelihood that DEIS alternatives would meet jeopardy standards. CRI matrix models have not been used to investigate uncertainty per se, but rather to investigate the sensitivity of modeled population growth rates to variation in survival, by life stage. They nonetheless concluded that whether or

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[4] To be precise, PATH identified the two most significant uncertainties as (1) juvenile passage models (CRiSP vs FLUSH), and (2) extra mortality. One of the major differences between CRiSP and FLUSH however, is what they assume about extra mortality: CRiSP is the version that NMFS favors, and it assumes D is 0.8. FLUSH scored higher in the Weight of Evidence process, and assumed D was a range of values, significantly less than 0.8.

246 cont.

not dam breaching would be necessary for saving Snake River spring and summer chinook depends on whether extra mortality is actually due to the dams themselves, as opposed to some other aspect of the system that would not be addressed via breaching the dams. STUFA both analyzed uncertainties directly and also conducted sensitivity analyses.

Key issues

Recall that the fundamental questions offered at the beginning of this paper were:

Can we save them without breaching the 4 lower Snake River dams?

And if we do breach the dams, will it work?

On one side of the debate are the Corps of Engineers, the entire congressional delegation from the Pacific Northwest, the governors of Idaho, Montana, and Washington, and NMFS (or at least the NWFSC and the CRI).

On the other side of the debate are USFWS, IDFG, ODFW, the Tribes, CBFWA, Idaho chapter of the American Fisheries Society, Oregon chapter of the American Fisheries Society, and Western Division of the American Fisheries Society, most environmental groups, and the governor of Oregon.

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The most compelling discussions of the key arguments in this debate are found in two sources: the PATH Weight of Evidence process (Marmorek et al. 1998a), and Schaller et al.'s 1999 paper in the Canadian Journal of Fisheries. The Weight of Evidence process was a formal judgment elicitation effort that was conducted by professional judgment elicitation facilitators using methods from the field of formal decision analysis. It was designed as a way of evaluating the evidence, pro and con, for the uncertainties which their modeling and analysis had determined were most critical. The experts whose judgments were being elicited were well respected, knowledgeable authorities from outside the Columbia and Snake River region. They evaluated arguments presented formally by PATH scientists for and against different assumptions about the critical uncertainties in the PATH decision analysis.

The Schaller et al. paper describes a detailed statistical analysis of temporal and spatial patterns in productivity and survival rates of spring and summer chinook salmon in 3 regions of the Columbia River system: Upper Columbia, lower Columbia, and the Snake. Their analyses

247 cont. indicated that upriver stocks showed greater declines than downriver stocks, and that these declines corresponded to construction and completion of the hydrosystem (Schaller et al. 1999) They argued that this discrepancy could not be explained by habitat quality, harvest, or hatcheries.

248 To successfully argue that breaching dams is not necessary to save these populations, it would be necessary to show one or more of the following:

1. Schaller et al.'s analysis and conclusions were wrong[5].

NMFS has tried to show that Schaller et al.'s statistical analysis and conclusions are wrong (CRI 2000, Zabel and Williams in review). They argue that upriver and downriver chinook populations are not comparable to one another, and that differences in survival might be due to something other than the magnitude of impact from the hydrosystem. In other words, the reason populations that have to deal with 8 or more dams have declined so much more than populations that have to deal with 1-3 dams in the same mainstem river is not because of the hydrosystem (i.e., the dams, reservoirs, increased migration time, and flow reductions); NMFS is arguing that the upriver stocks are in worse shape than downriver stocks because of 249 some unknown, perhaps genetic difference, or a tendency to go to different places in the ocean.

Schaller et al.'s analysis was extensively peer-reviewed not only through the PATH independent peer review process but also through the prestigious Canadian Journal of Fisheries' publication process, whereas none of the NMFS critique has been formally peer reviewed. Schaller et al. rely on extensive evidence from the literature, and built their analysis within a broad context of stream-type chinook from the Columbia River and Snake River systems as well as Alaska and Canada. NMFS is using undocumented data with admittedly few data points. In contrast, the statistical methods used by Schaller et al. are standard textbook tools, applied to well documented, thoroughly reviewed data.

250 2. Some other mechanism which had nothing to do with the dams suddenly became effective right after the dams were completed.

[5] Because previous PATH analyses (Deriso et al. 1996) of some of the same populations came to similar conclusions, it would also be necessary to show that Deriso et al.'s analyses were wrong.

The PATH Weight of Evidence process (PATH Scientific Review Panel 1998) examined the plausibility of other mechanisms extensively, and did not find any of them particularly compelling. They considered 3 hypotheses for the causes of delayed ("extra") mortality: (1) the hydrosystem; (2) some kind of disease or other factors that occurred at about the same time as the dams were completed and will continue into the future, dams or no dams; (3) some kind of climatological pattern that began to have serious impacts around the time the dams were completed, and affected upper Columbia River and Snake River stocks more strongly than lower Columbia River stocks.

250 cont.

What the Weight of Evidence indicated was this: 2 of the 4 experts found the hypothesis that extra mortality is strongly associated with the hydrosystem more plausible because the mechanism is most consistent with historical data and the explanatory mechanism is clear. The other two experts also found the hydro hypothesis plausible as well, but no more plausible than the hypothesis that extra mortality is caused by irreversible effects due to disease, genetic changes, or habitat changes. None found the hypothesis of a climatological change convincing.

3. Snake River spring and summer chinook could be saved, without breaching the dams.

The CRI has examined this possibility extensively, concluding most recently that "...drawdown [dam breaching] and the habitat/harvest actions are roughly equivalent in their effect on population growth, and neither, by themselves, is likely to recover Snake River chinook salmon" (CRI 2000, p. 61). STUFA also examined this possibility. While they disagreed with NMFS that any combination of actions short of dam breaching could be equivalent to dam breaching, they agreed with PATH that the only management options that had a significant chance of preventing extinction were those that included dam breaching (STUFA 2000).

251

Here is a summary of the debates about the key evidence in this debate.

1. As more dams were built, the declines got worse for Snake River and Columbia River spring and summer chinook. After the last Snake River dams were completed, declines got even worse for populations that are farther up the river.

There is no question that Snake River spring and summer chinook populations have been declining since the completion of the upper Columbia River dams (1968) and Snake River dams (1975). There is evidence of declines that started in the 1950's, and the aggregate rate of decline has increased as the number of dams completed increased. The rate of decline has accelerated noticeably since the late 1960's, and Schaller et al. (1999) showed that the overall survival rate
252 of upriver stocks became sharply worse after the last dams were completed. They also showed that this change in survival did not occur for downriver stocks.

Other human impacts have, of course, also increased in this region: urbanization, pollution, logging, grazing, perhaps even global warming (harvest levels were high early on but have been very small during the recent period of dramatic decline). There is no doubt about the extent of human impacts throughout the Pacific Northwest, but if the more serious rate of decline for upriver stocks were correlated with human impacts, then the Snake River stocks that spawn in wilderness areas should be doing better than lower river stocks that spawn in areas subject to grazing, logging, and water quality problems, not worse.

Some argue that one of PATH's and Schaller et al.'s major arguments is simply wrong, that the decline did not in fact start when PATH and Schaller et al. say it did, but rather, long after hydrosystem development was complete[6], starting with the 1975 brood year (Zabel and Williams in review). To make this point, they use a simple graph of ln(R/S), in contrast to the statistical analyses Schaller et al. did. This graph is so "noisy" that it is hard to say exactly what it shows,
253 which is one of the reasons biologists use statistical analyses to draw conclusions. Analysis of covariance (ANCOVA) analyses described in Schaller et al. show clearly that the declines began for Snake River and upper Columbia River stocks around the late 1960's, becoming most distinct in the mid-1970's (panels (a) and (b) in Figure 5). They also show that although lower Columbia River stocks were quite variable, they did not exhibit a trend (panel (c) in Figure 5).

[6] The last upper and lower Columbia River dams were completed in 1968, the last Snake River dam was completed in 1975.

253 cont.

Zabel and Williams also ignore the role of density dependence[7] in survival rates as well as the fact that it is not only the number of dams that were important to the upper Columbia River declines, but also the increased number of turbines (more turbines were added to existing dams) and decreased flows from the upper Columbia.

[7] "Density dependence" means that survival rates decrease as a population approaches or exceeds carrying capacity, and increase at lower population densities. A related phenomenon is depensation, in which population numbers get so low that instead of increasing, survival rates decline dramatically because reproductive success declines (there are so few fish that they can't find mates, for example).

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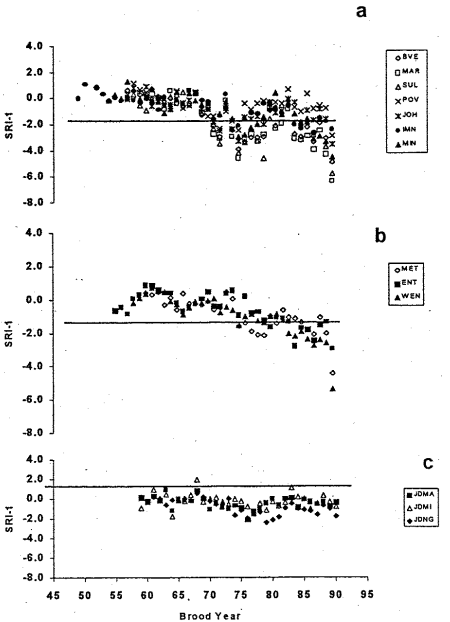

Figure 5. Deviations of ln(observed R/S)/predicted (R/S)] from ANCOVA fit to the pre-1970 data for the (a) Snake, (b) upper Columbia, and (c) lower Columbia regions, brood years 1949-1990. Abbreviations are: MIN, Minam; IMN, Imnaha, BVE, Bear Valley; MAR, Marsh; SUL, Sulphur; POV, Poverty Flat; JON, Johnson; WEN, Wenatchee; ENT, Entiat; MET, Methow; WIN, Wind; KLI, Klickitat; WS, Warm Springs; JDMA, mainstem John Day; JDMI, Middle Fork John Day; JDNG, North fork John Day. From Figure 5 in Schaller et al. 1999 (p. 1039).

2. *It's unlikely the declines were caused by poor spawning and rearing habitat quality for Snake River stocks.*

Schaller et al. (1999) and PATH (Marmorek et al. 1996, Marmorek and Peters 1998a, 1998b, Marmorek et al. 1998) showed that most Snake River spawning and rearing habitat degradation had occurred before the dams were completed. They also showed that patterns of decline were similar for populations in degraded and good habitat. But the clearest picture of what might have caused these declines may be a comparison of survival rates for the freshwater and ocean parts of the life cycle (Figure 7).

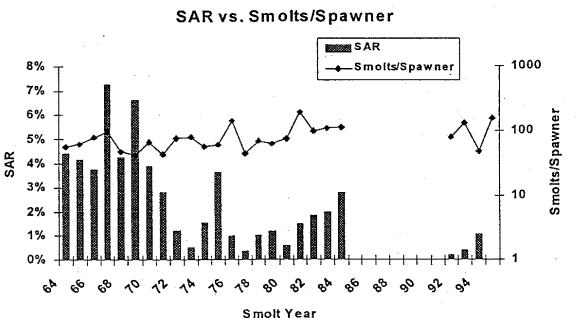

Figure 7. Patterns of SAR and smolts/spawner (natural log scale) for Snake River wild spring/summer chinook, smolt years 1962-1994. Smolt/spawner estimates represented by SP1 and FGE = 0.56 assumptions. "Smolt year" is the year of outmigration, namely 2 years after "brood year" (the year the smolts were spawned). No SAR data were available for 1986-1992. (Sources: Petrosky and Schaller 1996, 1998; Raymond 1988).

The freshwater survival rate is represented by smolts per spawner, and the ocean survival rate is

[8] "Density dependence" means that survival rates decrease as a population approaches or exceeds carrying capacity, and increase at lower population densities. A related phenomenon is depensation, in which population numbers get so low that instead of increasing, survival rates decline dramatically because reproductive success declines (there are so few fish that they can't find mates, for example).

represented by smolt-to-adult returns (SAR). Figure 7 shows that what changed for Snake River spring and summer chinook after the dams were completed was the SAR survival rate, not the egg-to-smolt (freshwater) survival rate.

Downstream migration and delayed mortality are included in SAR, and so the analysis summarized in Figure 7 supports the contention that it is not freshwater habitat that is somehow the cause of delayed mortality, nor of the decline of Snake River spring and summer chinook.

254 cont.

It is also important to note that upstream migration could also play an important role. Currently only about half of the adults arriving at the Columbia River mouth make it to above Lower Granite dam. The main source of mortality for them is due to the rigors of migrating back up through the 8 dams and reservoirs, though there is also an additional harvest mortality of about 8%.

It is not known how much the upstream migration mortality would be reduced by breaching the dams, but Marmorek et al. (1998) estimated that adult survival through the Snake River (from the Columbia River confluence to the spawning grounds) before the dams were built was around 97%. He based this on a comparison of historical and current survival rates between Ice Harbor dam (the lowest dam on the Snake River) and the spawning grounds. Without the dams, that would translate to about a 94% upstream survival rate from the ocean to spawning grounds, compared to about 48% today (ignoring mortality from Lower Granite to the spawning grounds).

255

Although the CRI relies on the constant percent sensitivity analysis method and its indication that egg-to-smolt and early ocean survivals are the most important, the textbook sensitivity analysis method (elasticity) indicates that adult survival is the most important variable (CRI 2000). The reason that elasticity is widely accepted is because at this point in the life cycle, each spawner represents a tremendous investment on behalf of the species in the next generation; the loss of over half the population at this point in the life cycle is important.

256

4. It's unlikely the declines were caused by hatcheries or harvest.

On a regional basis it is impossible to separate the effects of overall hatchery production and dam construction (since they occurred hand-in-hand). However, Schaller et al. (1999) and PATH (Marmorek et al. 1996, Marmorek and Peters 1998a, 1998b, Marmorek et al. 1998) found little to no correspondence between hatchery production and declines in individual sub-basins. If

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hatcheries or harvest were the driving mechanism behind delayed mortality, then it would be necessary to explain how hatcheries or harvest impacted upriver stocks more than downriver stocks, or transported fish more than in-river fish. It is also unlikely that hatchery effects would have affected only smolt-to-adult survival but not egg-to-smolt survival, as indicated in Figure 7.

257 cont.

5. It's unlikely the declines were caused by Snake River fish going to different, more hazardous places in the ocean than lower river fish.

NMFS suggests that there is evidence that upper and lower river stocks go to different places in the ocean, and that this could explain the differential mortality (Zabel and Williams in review). They base this argument on a small, undocumented set of ocean harvest data. The dataset NMFS used indicates recovery proportion differences at the sixth decimal place, and applies only to adult fish, whereas year class strength is widely believed to be determined by the estuary and early ocean environments, where all these stocks overlap in space and time.

258

PATH studies indicated that data on where these fish go in the ocean is too sparse, and catch data is not representative. One of the main reasons catch data is not representative is that the period of most interest is the first few months when the young fish first get to the ocean, and not a year or two later when they would be harvested. PATH studies also indicated that statistical tests have failed to show a relationship between where they end up being harvested, and total smolt-to-adult survival rates (Marmorek et al. 1998a).

6. It's unlikely the declines were caused by Snake River stocks staying in the ocean longer.

Snake River stocks are more likely to return at age 5 than age 4 (Beamesderfer et al. 1996), giving ocean mortality additional time to affect Snake River fish. There is no evidence about survival versus years in the ocean. There is, however, evidence that most ocean mortality happens within the first few months in the ocean, in that the size of the returning three-year-old population ("Jacks") is a good predictor of how many 4- and 5- year-olds from that same brood year there will be. CRI (CRI 2000), Schaller et al. (1999), STUFA (2000) and PATH (Marmorek et al. 1997) sensitivity analyses have all indicated that analytical results were relatively insensitive to age structure assumptions.

259

7. It's unlikely the declines were caused by Snake River stocks simply having to travel a lot farther

Schaller et al. examined 52 years of stream-type chinook runs: 7 from the Snake, 3 from the Upper Columbia, and 6 from the Lower Columbia. Poor ocean and climate conditions existed during the early part of this series, and also again in the period since the late 1970's. They found that despite heavy harvest levels and poor climatic conditions, productivity and survival rates of the upriver stocks were relatively stable until major hydropower development began. Because upriver chinook runs are heavily weighted by populations that have to migrate the farthest, we would expect that under periods of climatic stress, they would have exhibited a dramatic
260 downturn, compared to populations farther down in the system. But they did not. Only since the dams have been completed have the upriver populations declined more than the downriver populations.

If travel distance were the reason that upper Columbia River and Snake River stocks are in worse trouble than lower Columbia River stocks, then historical data would show this pattern. And there would be some plausible way to explain the pattern developing only after the hydrosystem was completed, not before. If anything, upriver stocks were historically more productive than downriver stocks, not less (Figure 5).

8. We cannot resolve this uncertainty in time by gathering more data.

There already is a tremendous amount of data, not to mention analysis, about the many factors that may have played a role in bringing almost all salmon populations in the Pacific Northwest under the umbrella of the ESA; but so many of those factors are confounded with one another
261 that scientists cannot agree on their relative contributions to the problem, let alone predict how efforts to change them would play out. Even where extensive data over a long time period are available, and have been exhaustively analyzed and reanalyzed by some of the best scientists in the country, some continue to debate the validity of the conclusions.

The most fundamental experimental design question is:

How much more data would it take for decision-makers to accept the results?

262 Experimental design requires defining clearly what the questions are, and how likely it is that a particular experiment will answer those questions. The analyses by PATH, the CRI, and STUFA

have produced a remarkable consensus on what scientists would like to know, and all 3 concluded that the key uncertainties driving the dam breaching question have to do with delayed mortality. Delayed mortality involves two critical issues: (1) basic evidence of delayed effects of the hydrosystem; and (2) mortality of transported smolts compared to in-river migrants (*D*).

262 cont.

PATH and NMFS have both begun the process of designing experiments to address the most critical uncertainties (CRI 2000, Peters et al. 2000), and it may be useful here to give an example of what might be involved in resolving one of the most important uncertainties, namely *D*. *D* is not a parameter that can be measured. *D* is a calculated estimate that requires knowing many things. For example: how many smolts are picked up by barge at Lower Granite, Little Goose, and Lower Monumental dams during at least the 2-month migration peak? How many smolts travel through the hydrosystem before they are picked up by barges, at each pickup point? How many smolts travel all the way through the hydrosystem on their own? And what are the survival rates to adulthood for each of those groups? Other factors that could affect the results are inter- or intra-annual variation in Fish Guidance Efficiencies[9], spill effectiveness, and collection system survival; inland and ocean climate patterns; and adult migration survival rates. Schreck et al. (in development) found that survival rates drop during the April-to-June migration peak, and so that might have to be taken into account as well. And finally, there is considerable interest in hatchery vs. wild fish survival rates.

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The only way to estimate these fractions and survival rates for smolts is through PIT-tag tracking. Hatchery fish can be PIT-tagged at the hatchery, but wild fish have to be intercepted and tagged at some collection point. There aren't very many wild fish left, and tagging a large enough sample of non-hatchery fish is a problem. And finally, on average, less than 5 out of 1,000 smolts has recently been making it back to spawn (Figure 3; C. Petrosky, IDFG, pers. comm.); in 1999 the total run of Snake River index populations consisted of about 652 spawners at the Columbia River mouth. About half of those would survive to the spawning grounds. Thus, determining the smolt-to-adult return rates for transported versus in-river fish becomes more problematic. Data would be needed from multiple run years, and then because the adults do not return for 1 to 3 years, it would be close to a decade before the first data collection was

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[9] FGE: the rate at which in-river smolts who have ended up in the powerhouse of any of the 3 Snake River dams are diverted to the barges—the remainder go through the turbines.

264 cont. complete[10].

How many smolts would need to be tagged? Sample size calculations depend on experimental design requirements such as how exact a prediction is needed and how confident decision-makers need to be in the result, as well as what the hypothesized values are that are being tested. To take a simple example, assuming the true *D* is as high as NMFS thinks it is (at least 0.8), in order to be able to tell if the true *D* is less than 0.65 (which the other agencies think it is), just for
265 one year, for one dam, would require tagging 114,800 barged smolts and 183,600 in-river smolts (Peters et al. 2000). To get some idea of how this sample size relates to the population, if this is a typical year, next spring there will probably be no more than about 35,000 smolts total migrating out from all 7 index streams[11]. The index populations make up about 10%-20% of the total Snake River run, and wild fish make up about 10%-15% of the total.

Paul Wilson (CBFWA) carried these calculations out in more detail to estimate how many years of study might be required, and he found that if the true *D* is actually what NMFS thinks it is, it could take over 40 years of data to determine that they're right; but if *D* is actually closer to, or
266 less than what the other agencies think it is, it would take even longer (and/or the sample sizes would need to be larger). If the populations continue to decline, CRI risk estimates indicate that many of the Columbia and Snake River stocks could be gone by then (CRI 2000).

This is not an argument that such experiments are not needed. The issue is that these populations are already in steep decline, with high probabilities of extinction, even with what NMFS admits are optimistic extinction models. PATH and STUFA have concluded that although experiments
267 like these are important, CRI's own extinction analyses show that waiting for such experiments to be designed, carried out and analyzed, means accepting a high probability of extinction in the meantime for many of the Columbia and Snake River salmon populations.

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[10] Some tagged fish have returned from earlier years, already, and although the numbers are very small, these returns are the source of the estimates of *D* that are now so contentious.

[11] 652 (adults at the Columbia River mouth in 1999) * 0.5 (Bonneville-basin survival, harvest, prespawning mortality) * 0.5 (females) * 0.9 (prespawning mortality) * 4700 (eggs) * 0.05 (egg-to-smolt) = 34,470. The index streams are the 7 streams in the Snake River basin analyzed in PATH, the CRI, and STUFA models.

Conclusions

Ed Bowles (IDFG) summarized the debate with a Powerpoint presentation that included a summary of what he called "dueling hypotheses." Originally the "duel" was said to be between BPA and the state and federal agencies, but since other parties have joined the fray, a revised version of that is shown in Figure 9.

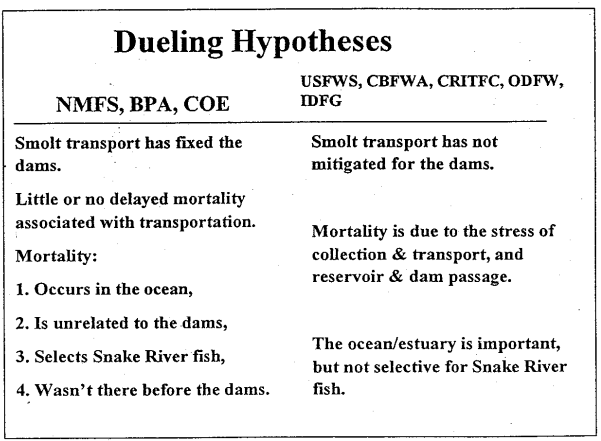

Figure 9. Summary of dueling hypotheses (source: talk given by Ed Bowles [IDFG] at the 1999 Western Division annual meeting of the American Fisheries Society).

What Figure 9 indicates is that the debate is between people who think barging solves the delayed mortality problem, versus people who think it doesn't. In order to accept that barging works, and thus that saving Snake River spring and summer chinook would not require breaching the dams, one has to accept that there is little or no delayed mortality suffered by barged fish, and that what delayed mortality there is (1) occurs in the ocean, (2) is unrelated to the dams, (3) primarily affects Snake River fish but not John Day, Deschutes, Klickitat or Wind River fish, and (4) was not there before the dams.

Scientists from IDFG, ODFW, USFWS, CBFWA, and CRITFC do not find it plausible that something in the ocean, independent of the hydrosystem, grew in importance as the hydrosystem was developed, and preferentially kills Snake River and upper Columbia River salmon. The Oregon chapter of the American Fisheries Society unanimously endorsed a resolution that agreed with these state, federal, and tribal agencies, and the Idaho chapter and Western Division chapter
269 passed similar resolutions. These scientists believe that barging has not fixed the problem, and that delayed mortality is most likely due to effects of the hydrosystem—in particular, the stresses of collection and transport for barged fish, or reservoir and dam passage for in-river fish, let alone upstream migration for returning spawners. Finally, spawning habitat quality has not followed the pattern that smolt-to-adult survival has followed, which indicates that the most plausible explanation is the hydrosystem, and that barging has never worked.

Perhaps because delayed mortality is a complicated issue, people often debate about *D*, not recognizing that the problem is not *D*. The problem is the source of delayed mortality. If delayed mortality is caused by the hydrosystem, then even if (1) all fish were barged, and (2) *D* equals 1.0, it only means that barged Snake River fish fare no worse after they leave the
270 hydrosystem than fish that swam down through (and returned through) 8 hydroelectric projects would have. There would have to be almost a 3-fold increase in survival, and it would have to occur for many years (likely for decades), in order to have confidence that *D* is as high as NMFS hopes it is. Scientists agree that a 3-fold increase in survival is also approximately the same increase in life-cycle survival that is needed to recover these populations.

Even if *D* is as high as NMFS hopes, it would not be enough to save Snake River spring and summer chinook unless barging also greatly reduces delayed mortality. There is, to date, little evidence that it does. The required 3-fold increase in survival is not likely to come from freshwater habitat improvements because many of the few remaining populations spawn in good
271 habitat already; the CRI says little increase in direct survival is likely to come from mainstem passage improvements, even with 100% barging (CRI 2000); harvest of these populations has already been almost eliminated; and there is no imaginable way for human management efforts to do anything soon about direct mortality in the ocean.

272 That leaves upstream migration and delayed mortality. Upstream migration losses are now over 50%, whereas historically they were probably less than 10%. If delayed mortality for juveniles

272 cont. is as high as analyses and models suggest it is, then barging has not even come close to allaying it, and there is no evidence that it soon will.

273 It is highly likely that these populations will continue to exhibit high rates of variability: it is probably just as likely that they will experience a few years of higher survival, as it is that they will experience a few years of worse survival. If they experience the same, or worse, survival rates compared to the average over the past 20 years, then several more Snake and upper Columbia River populations will most likely be gone before too long (Mundy 1999, CRI 2000). If they experience better survival rates, which it is hoped (as it has been hoped since the early 1980's) that improving ocean conditions will provide, the debate will still not be over.

274 Because survival rates of these populations are so inherently variable, it would take many years to have much confidence that the problem of delayed mortality has been solved. If agencies other than NMFS (i.e., the state, federal, and tribal agencies identified above), and the American Fishery Society scientists who voted to support those resolutions, are right, then the problem of delayed mortality will not be reduced significantly until the dams are breached.

If the dams are not breached—and soon—then if these agencies and professional organizations are right, the good news is that the debate will soon be over. The bad news is that it is difficult to imagine anyone feeling that they have won.

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