latent fishing power among other fishermen within the same fleet can often negate any perceived savings unless overall quotas are also likewise reduced by the average harvest capacity of the bought out permits. Even when time and/or area management actions are used as the vehicle for fishery impact reduction, there is often a compensatory response when fishing is again allowed, resulting in reduced overall savings from calculated values.

The State of Alaska Department of Fish and Game and the Alaska Trollers Association have both sent letters in strong opposition to the Action 3 Offset proposal. Both point out that the Pacific Salmon Treaty is predicated on honoring current commitments of responsible harvest management and habitat protection rather than finding ways to offset and mitigate relaxation of habitat protection actions (e.g., the reduction in the summer spill program). Under the Aggregate Abundance Based Management (AABM) framework of the Pacific Salmon Treaty, Columbia River bright fall chinook are one of the key stock components. Any significant reduction in survival of the bright fall chinook stock, and corresponding reduced stock abundance, could have a direct effect in reducing allowable harvest quotas in the AABM fisheries. If the SE Alaska troll fishery is targeted for further reductions as an offset to provide "equivalent " escapement back to the Columbia River, this fishery would suffer a double dose of restrictions to mitigate the summer spill reduction action.

Relaxation of habitat protection actions stand in sharp contrast to the tenants and commitments of the U.S. government in the implementation of the Pacific Salmon Treaty, especially as it relates to the Habitat and Restoration section of the Treaty (Attachment E). Attachment E states, "... the Parties agree: 1) To use their best efforts, consistent with applicable law, to: a) protect and restore habitat so as to promote safe passage of adult and juvenile salmon and achieve high levels of natural production, b) maintain, and as needed, improve safe passage of salmon to and from their natal streams, and c) maintain adequate water quality and quantity..." The Pacific Salmon Treaty language is quite clear that safe passage, at a minimum, must be maintained, and if possible improved. In this regard, any action that relaxes habitat protection for "safe passage" is in direct conflict with U.S. commitments under the Treaty. Therefore, it appears that any proposed actions dealing with summer spill reductions must, at a minimum, be "survival neutral" and that the concept of mitigation offsets to account for reduced survival is in direct conflict with the Pacific Salmon Treaty language. It is strongly recommended that the proponents of the summer spill reduction program and all affected parties review the tenants and commitments of the U.S. government under the Pacific Salmon Treaty, to clearly understand what may and may not be supportable under the law, before any final action is taken on changing the current summer spill program. There is no basis for the predicted benefits of commercial harvest reductions and therefore they cannot be considered adequate to offset the impacts of reducing spill particularly on Hanford Reach fall Chinook. The following points illustrate a few of the fishery management realities that BPA did not consider in their proposed harvest offset which make the predicted benefits improbable.

- Delivering more adult chinook to the river is not going to result in more fish if in-river conditions are insufficient due to low water flows reducing the survival of progeny of the returning adults.

- Alaska's harvest of chinook salmon is managed according to the abundance based management provisions of the bilateral Pacific Salmon Treaty. These treaty agreements were approved by NOAA Fisheries in their Biological Opinion. There is no need or obligation to further alter fishing regimes.

- Fishermen in Alaska do not hold harvest rights to fish; there are no annual fishing quotas or rights that can be bought to result in a lower harvest. Permit buyback, even if it was something that was desired in the troll fishery--which is unlikely and impossible before the upcoming season. Fewer permits does not translate into a lower harvest as catch numbers are established under the abundance-based management provisions of the Pacific Salmon Treaty to which Alaska remains committed.

- Alaska's harvest of ESA fish is extremely small. Reductions in Alaska's harvest would have a negligible affect on ESA listed stocks.

Hanford Reach

Consistent with the other impact and offset analyses, there is no written documentation describing the methods and assumptions that were used in this analysis, only spreadsheets without sufficient supporting data or rationale. .

There is no detailed explanation of how the starting population estimates were derived. Grant PUD has defined their Juvenile Fall Chinook Protection Program for spring operations 1999-2003 and Grant PUD is expected to continue these operations in 2004. In 2003 they failed to meet even their own program criteria 48% of the time. The Juvenile Fall Chinook Protection Program criteria have not universally been determined to be adequate by all of the fishery co-managers. Assessment of the impact of fluctuations has been limited due to imprecision and small spatial coverage (limited to the middle third of the Hanford Reach). Because the impact assessment has been limited to the middle third, estimates of the full impacts of Priest Rapids fluctuations may have been biased.

The Hanford Reach Fall Chinook Program limits daily flow fluctuations within a 24-hour period but does not address between day decreases in discharge and will not totally eliminate losses when discharges are reduced during decreased load demands on the weekends. The between day impacts can be substantial if large daily reset operations are needed to meet criteria for the following day, which often occur. These resets occur during early morning hours when juvenile fall chinook are quietly holding in shallow near shore areas. Recent USGS research indicates that juvenile salmon are particularly vulnerable to stranding and entrapment impacts during nighttime periods. Therefore it is highly probable that potential benefits from implementing the fall chinook flow program will be less than predicted by the action agencies.

- **The Hanford Reach offset represents double-counting of a mitigation measure.** The Hanford Reach mitigation offset proposed by BPA was previously negotiated as a component of the Grant County PUD FERC license renewal agreement. The Hanford Reach offset is therefore cannot be considered an additional measure since it already exists as part of the Grant County settlement..
- **The impact comparison of pre- versus post-Juvenile Fall Chinook Protection Program is erroneous and invalid.** Completely different sampling methods were used in the two time periods (1998 and 1999-2003). Due to the limitations of the 1998 sampling program, a completely different sampling program was developed for 1999-2003. Because both the biological sampling and the affected area calculations are not consistent across the two time periods, any comparison between the two is erroneous and invalid.
- **Omission of the high stranding estimate for 2001 is inappropriate and groundless.** Fish stranding and entrapment in the Hanford Reach are due to fluctuations in discharge volumes at Priest Rapids Dam. If there were no fluctuations (regardless of flow volume), then no stranding and entrapment would occur. By ignoring the high mortality estimate due to stranding and entrapment in 2001 (approximately 6.9 million fry), the BPA analysis ignores the large impact year and focuses instead on the small impact years. Incidentally, the large 2001 impact occurred while Grant PUD was operating under their Juvenile Fall Chinook Protection Program.
- **This is not an offset, as the operation described has been underway for the past five years.** Grant PUD has defined their Juvenile Fall Chinook Protection Program for spring operations 1999-2003 and Grant PUD is expected to continue these operations in 2004. In 2003 they failed to meet even their own program criteria 48% of the time. The Juvenile Fall Chinook Protection Program criteria have not been fully endorsed by all of the fishery co-managers.

McMichael, G.A. and eleven coauthors. 2003. Subyearling chinook salmon stranding in the Hanford Reach of the Columbia River. Batelle-Pacific Northwest Division Report, PNWD-3308, 245 pp.

BPA did not consider flow augmentation as an offset for reductions in spill although this offset is clearly supported by the empirical data.

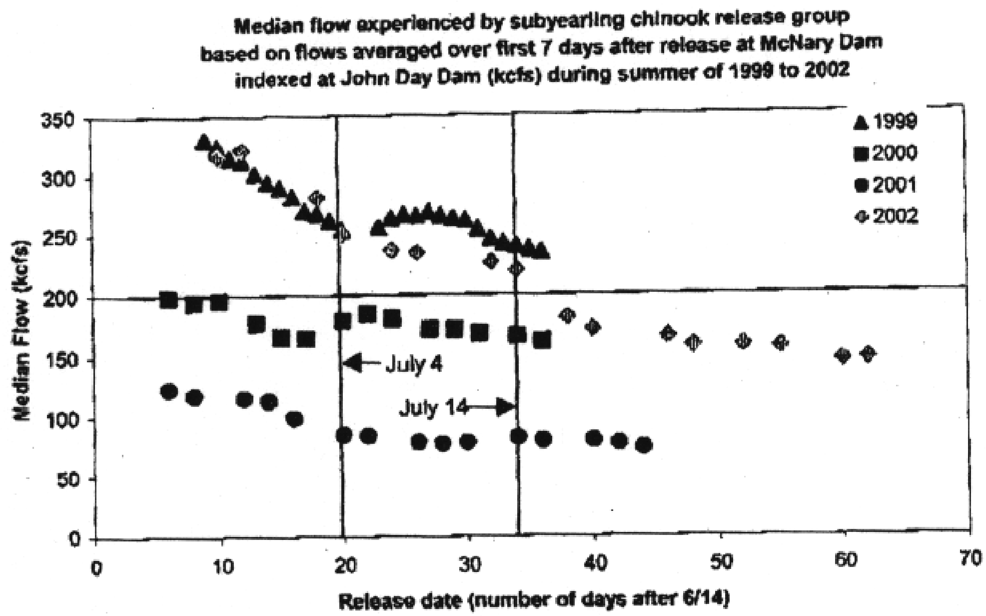
Flow augmentation is a potential offset that could provide real time mitigation for impacts based on empirical research (Connor et al. 2003). Despite this potential, it and other options were not considered in this document. Offsets and reductions in BIOP measures should be considered as an integrated ecological program, balancing measures and impacts and benefits in a cohesive program. In this way the interaction of measures, cumulative impacts and impacts on unlisted and listed stocks can be considered in the same decision analysis. The incremental analysis of individual measures and offsets precludes the holistic decision analysis that is required.

The following analysis is presented in the context of the BPA Summer Spill impacts and offsets. The following analysis presents the empirical data, which shows that increasing summer flows to at least 220 kcfs in the lower Columbia River will accelerate the passage of fall chinook through that reach. By shifting the passage distribution to earlier the adverse impact of reducing spill in the late summer could be reduced. Increasing summer flow represents a realistic real time offset to the BPA proposal to reduce the implementation of the summer spill protection measure included in the Biological Opinion.

- A flow-travel time relation for subyearling chinook migrating from McNary Dam to Bonneville Dam was documented through multivariate regression analyses utilizing run-at-large subyearling chinook collected and PIT tagged at McNary Dam by NOAA and detected again at Bonneville Dam.
- Three predictor variables, reciprocal of flow, fish length at tagging, and release (serial) date, together explained 44% of the variation about the smolt travel time data. Travel times were shorter as flows increased, fish lengths increased, and release date (number of days after June 14) increased. Based on the standardized coefficients (std coef in table) of these three predictor variables, the greatest proportion of the variation about the smolt travel time data was "explained" by the flow-related predictor variable.

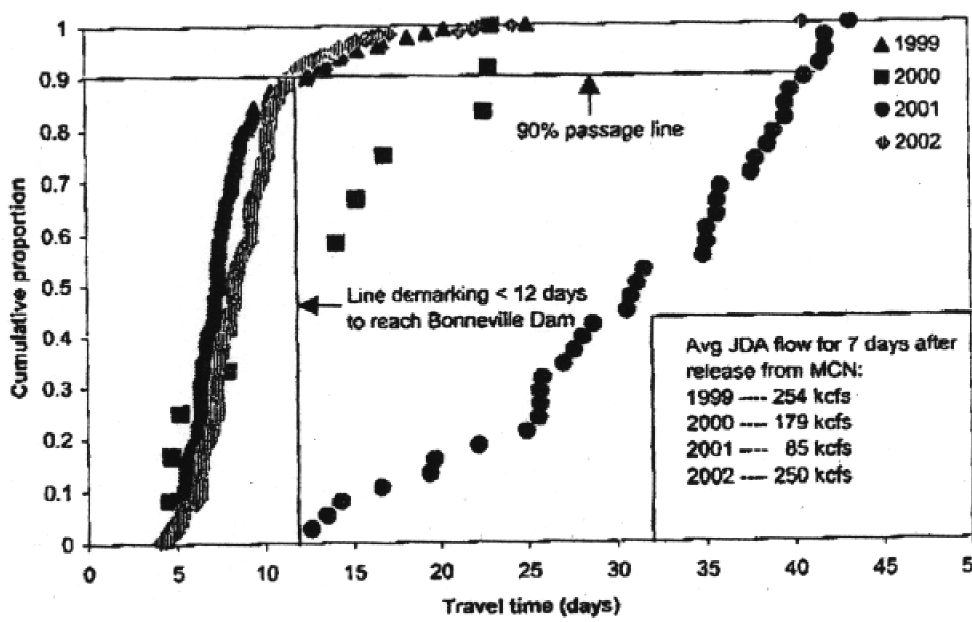
Effect	Coefficient	Std Error	Std Coef	Tolerance	t-test	Prob
Constant	16.136	0.5994			26.9	<0.001
1/Flow	1644.662	23.5905	0.659	0.889	69.7	<0.001
Length	-0.119	0.0057	-0.191	0.960	-20.9	<0.001
Serial date	-0.094	0.0061	-0.147	0.867	-15.3	<0.001

- Flows were averaged over a 7-day period following release at McNary Dam and indexed at John Day Dam to reflect the flow experienced by a release group during its first week of migration in the lower Columbia River. For the PIT tag releases from McNary Dam in 1999 to 2002, the average flows experienced by subyearling smolts in July were above the BiOp 200 kcfs minimum in July of 1999 and 2002, but below that minimum in 2001 and 2000.

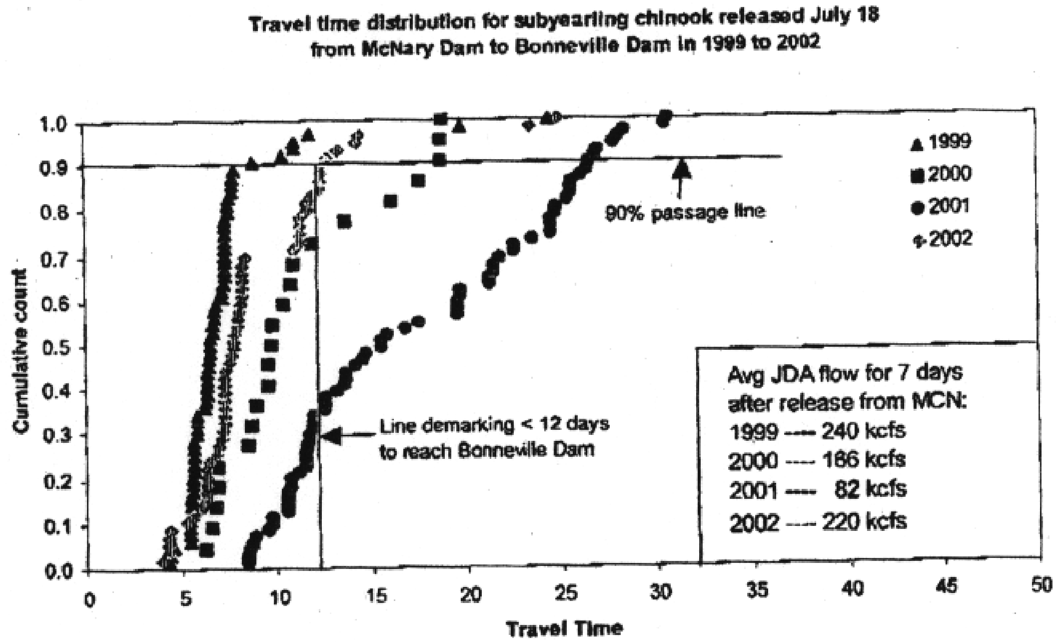


- Travel time estimates were generated for two groups of fish released at McNary dam. The first group was released in early July (July 4) and the second group was released in late July (July 18). The early releases were compared to each other over four years with varying flows. The late releases were compared to each other over the same years of varying flows.
- The early July groups of sub-yearling chinook had shorter travel times in the higher flow years of 1999 and 2002. These shorter travel times resulted in an earlier passage distribution of 90% of the smolts at Bonneville Dam than in the years of lower flows.

Travel time distribution for subyearling chinook released July 4 from McNary Dam to Bonneville Dam in 1999 to 2002



- Similar to the results of the early migrating groups, the late migrating release groups of sub-yearling fall chinook had shorter travel times in the higher flow years of 1999 and 2002 and therefore, an earlier passage distribution of 90% of the smolts at Bonneville Dam than in the years of lower flows.



Note: Horizontal jump in cumulative at 0.7 in 2002 is due to an apparent equipment problem at Bonneville Dam Powerhouse 2 detectors during period of July 27- 28. The result is a shifting to the right of the cumulative curve above 0.7 in a magnitude more than actually occurred that year.

- Flows above 220 kcfs in 1999 and 2002 have resulted in 90% passage of PIT tagged subyearling chinook released from McNary Dam in early July and in late July to pass Bonneville Dam within 12 days of initial release. Flows below the BiOp minimum of 200 kcfs in 2000 in the 166-179 kcfs range resulted in the 90% passage of PIT tagged subyearling chinook being 1.5-2 times longer than in 1999 and 2002. The extremely low flows of 2001 in the 82-85 kcfs range resulted in the 90% passage at Bonneville Dam being over 2-3 times later than in 1999 and 2002.

Budy, P., G.P. Thiede, N. Bouwes, C.E. Petrosky, and H. Schaller. 2002. Evidence linking delayed mortality of Snake River salmon to their earlier hydrosystem experience. North American Journal of Fisheries Management 22:35-51.

Connor, W.P, H.L. Burge, J.R. Yearsley, T.C. Bjornn. 2003. Influence of flow and temperature on survival of wild subyearling fall Chinook salmon in the Snake River. North American Journal of Fisheries Management 23:362-375.

APPENDIX A

Consists of the following documents:

October 16, 2002 Letter to Larry Cassidy from Rod Sando – page 27

January 29, 2004 Letter to Rodney Sando from Nick Bouwes – page 31

January 29, 2004 Review of the Bonneville Power Administration's analysis of the biological impacts of alternative summer spill operations – page 33

April 20, 2001 Joint Technical Staff Letter to Mark Walker – page 49

UMATILLA INDIAN RESERVATION · SHOSHONE-BANNOCK TRIBES · WASHINGTON FISH & WILDLIFE · SALISH KOOTENAI TRIBES · NATIONAL MARINE FISHERIES SERVICE · YAKAMA INDIAN NATION · IDAHO FISH & GAME · WARM SPRINGS RESERVATION · BURNS PAIUTE · KOOTENAI TRIBE · SPOKANE TRIBE · MONTANA FISH, WILDLIFE & PARKS · COLVILLE RESERVATION · OREGON FISH & WILDLIFE · NEZ PERCE TRIBE · KALISPEL TRIBE · U.S. FISH & WILDLIFE · SHOSHONE-PAIUTE TRIBE · COEUR D'ALENE TRIBE

COLUMBIA BASIN FISH & WILDLIFE AUTHORITY

October 16, 2002

Mr. Frank L. Cassidy, Jr.
Chairperson
Northwest Power Planning Council
851 S.W. Sixth Avenue, Suite 1100
Portland, Oregon 97204

Dear Mr. Cassidy:

We recognize that the Northwest Power Planning Council (NWPPC) is presently reviewing new recommendations for the Fish and Wildlife Program Amendments. As you proceed with that review several tools will be used to evaluate the efficacy of proposed actions. Within that context we urge the NWPPC to consider our previous comments regarding the use of the SIMPAS model in determining the impacts of specific hydrosystem alterations (see Joint Technical Staff comments to the NWPPC, April 20, 2001). We are alerting the NWPPC that reliance on a single passage model such as SIMPAS is not appropriate determining which fish passage options should be implemented. We agree with the recommendation of the Independent Scientific Advisory Board (ISAB) to the NWPPC, that it is not appropriate to develop a long-term management plan on the basis of SIMPAS analysis. Management alterations of the magnitude being considered by the NWPPC should be approached in a much more scientific manner as recommended by the ISAB.

The SIMPAS (simulated passage) spreadsheet model was initially developed by the National Marine Fisheries Service staff to evaluate potential actions for the 1995 FCRPS Biological Opinion. This model was subsequently used for generating point estimates of potential actions associated with the 2000 FCRPS Biological Opinion. The following comments describe the serious limitations of utilizing the SIMPAS model and must be considered within a management context:

- Many passage models have been employed over the years as a tool to compare alternate scenarios in a qualitative sense. Using the models beyond this application in a relative sense is inappropriate. The relations and point estimates used in these simple passage models are far too simple to adequately capture the complexity of salmonid survival relations and are, therefore, inappropriate as the primary basis for management decisions

- The NMFS 2000 BIOP recognizes the limitations in the use of the SIMPAS model and caveats SIMPAS results because the model does not account for the potential effects of various fish passage options (such as spill) on forebay passage in terms of reducing delay, residence time, or predation.

- The SIMPAS model was not designed to make inferences about the likelihood of adult returns (see Caveats to SIMPAS Modeling Results NMFS 2000 BIOP). This is due, in part, to the fact that SIMPAS simulations were not designed to include delayed hydrosystem mortality, i.e., "extra" mortality. This class of models has limited application for realistically predicting the overall effects of an action on salmon survival.

- SIMPAS is calibrated to reach survival estimates from primarily high flow years. Even the lowest flow year in the data set used extrapolations for a shorter reach in 1994. In 2001 NMFS recognized that this direct survival estimates are too optimistic for low flow conditions expected in 2001.

- A key concern is that although SIMPAS assumes NMFS' BIOP values of delayed mortality for transported fish ('D') it does not explicitly consider delayed hydrosystem mortality that is common to both transported and in-river migrants. SIMPAS survival estimates do not simulate historic stock performance.(see April 20, 2001 letter)

- Considerable evidence suggests that the source of "extra" mortality, which occurs in the estuary and early ocean, is related to earlier hydrosystem experience, i.e., delayed hydrosystem mortality (Budy 2001; Sections 3.3.1.1. and 3.3.1.2. in ODFW 2000). Evidence from the literature suggests numerous mechanisms that would explain this delayed mortality in relation to a fish's experience through the hydrosystem. Based on recent tagging data, there is direct evidence of delayed mortality by route of passage through the hydrosystem, including transportation and in-river routes (specifically collection/bypass). Spawner and recruit data demonstrate that there is a portion of delayed mortality specific to Snake River spring/summer chinook stocks that is coincident with the completion of the hydrosystem and greater for upriver stocks relative to downstream stocks (Fig. 1, 2, 3 in April 20, 2001). In addition, life-cycle survival for Snake River stocks is associated with annual smolt passage conditions, mainstem flows, and spill (Fig. 1 and 2 in State of Idaho 2000). The April 20, 2001 analysis (referenced in the first paragraph), regarding spill ignored this critical assumption of SIMPAS, and completely discounted these delayed impacts of eliminating spill on population viability and recovery.

In addition to our comments, we urge the NWPPC to heed the advice of their ISAB who commented on the use of SIMPAS on April 19, 2001. They urged caution in the emphasis placed on the model results and noted specific limitations:

"While the assumptions behind the input values used in the modeling are consistent with the available data, and are also consistent with professional judgment of many scientists (they represent committee consensus), these are only "point estimates" and are subject to a considerable degree of uncertainty. For this reason, it is not appropriate to develop a long-range management plan just on the basis of results from assuming that these uncertain estimates are true. "Best science" under these circumstances would explore the results from a range of assumptions corresponding to the range of the uncertainty. "Best professional judgment" under these circumstances would recommend a course of action that was predicted to perform acceptably throughout the range of predicted possible outcomes. "Precautionary" best professional judgment would be sensitive to plausible worst cases within the range of predicted possible outcomes. Although not possible before decisions must be made this year, the importance of uncertainty in assessments of this type needs to be evaluated carefully."

We hope that our comments provide some guidance for the NWPPC regarding the appropriate use of the SIMPAS model in this phase of NWPPC decisions. If you need any further input please feel free to contact me.

Sincerely,

Rod Sando

Rodney W. Sando
Director
Columbia Basin Fish and Wildlife Authority

CITATIONS

Budy, P. 2001. Analytical approaches to assessing recovery options for Snake River chinook salmon. Utah Cooperative Fish and Wildlife Research Unit UTCFWRU 1:1 -86. Logan Utah.

ODFW (Oregon Department of Fish and Wildlife). 2000. Comments of the Oregon Department of Fish and Wildlife on the Draft 2000 Biological Opinion of the Federal Columbia River Power System Including the Juvenile Fish Transportation Program and the Bureau of Reclamation's 31 Projects, Including the Entire Columbia Basin Project. September 13, 2000.

State of Idaho. 2000. State of Idaho's Comments on Draft Biological Opinion of the Federal Columbia River Power System Including the Juvenile Fish Transportation Program and the Bureau of Reclamation's 31 Projects, Including the Entire Columbia Basin Project (Dated July 31, 2000). September 29, 2000.

Independent Scientific Advisory Board. ISAB consultation recommendations on Council Staff's Draft Issue Paper: "Analysis of 2001 Federal Columbia River Power System Operations on Fish Survival." Northwest Power Planning Council Document 200 1-4.

Joint Technical Staff Letter to Mr. Mark Walker, Northwest Power Planning Council, April 20, 2001.

National Marine Fisheries Service, 2000 FCRPS Biological Opinion December 21, 2000.

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ECO LOGICAL RESEARCH

Eco Logical Research
Nick Bouwes, Ph.D.
Environmental Consultant
456 South 100 West
Providence, UT. 84332
phone/fax: (435) 753-8472
email: nbouwes@comcast.net

To: Rodney Sando

From: Nick Bouwes, Eco Logical Research

Re: Review of the Bonneville Power Administration's analysis of the biological impacts of alternative summer spill operations

Date: January 29, 2004

Dear Rodney,

As requested, I have reviewed the Bonneville Power Administration's analysis of the biological impacts of alternative summer spill operations. I believe the approach used to evaluate these impacts suffers from several deficiencies as to limit the utility of their results. The BPA analysis takes a dangerous approach by using a simple juvenile passage model to estimate the difference in the number of adults under different management scenarios. Adult numbers are compared against potential revenue gains to justify a management strategy. No context is given for the value of an adult fall chinook relative to fall chinook populations or to management. This approach suggests that the rarer a species becomes the less mitigation strategies should be applied to ensure its survival. The uncertainties inherent in this analysis (e.g. survival estimates, smolt-to-adult return rates, benefits of offset mitigation, etc.) are not considered, thus the risks to the populations in question are not assessed placing the burden of proof once again on species in need of protection.

Specifically, the analysis ignores the caveats providing by NOAAF who developed this tool. The BPA approach is inappropriate because; the model cannot predict the likelihood of adult returns; does not include sources of uncertainty thus no evaluation of risk is possible; the model is based on seasonal averages and thus does not include a time or seasonal component and cannot evaluate seasonal changes in spill patterns; and the model is not mechanistic and cannot evaluate direct and indirect mortality by different routes of passage. In addition, the results are highly dependent on stating juvenile numbers and smolt-to-adult return rates, which are likely too low. Some mistakes in the formulas or model inputs are noted. Also the benefits to offset mitigation are highly uncertain, optimistic, and untested.

The model can be used to evaluate an alternative scenario not considered by BPA, but one that is more consistent with the BiOp and a spread the risk strategy. If used in a BPA type analysis, the SIMPAS model suggests that ceasing transportation and providing a spring-like spill program in the summer provides large increases in adult numbers over current BiOp and no spill scenarios. If the BPA analysis is emphasized in developing alternative spill programs, then I suggest that this alternative scenario also be considered.

Sincerely,

Nick Bouwes

Review of the Bonneville Power Administration's analysis of the biological impacts of alternative summer spill operations

by Nick Bouwes,
Eco Logical Research

Prepared for
Columbia Basin Fish and Wildlife Authority

January 29, 2004

Executive Summary

The Bonneville Power Administration is considering reducing or eliminating the summer spill program at the lower Columbia River dams, currently used to aid the migration of subyearling chinook. This consideration is based on an evaluation that uses a juvenile migration model, SIMPAS, as a means to assess the number of juvenile fish that are lost as spill levels decrease below levels prescribed in the Reasonable and Prudent Alternative (RPA) of the 2000 Biological Opinion on the Operation of the Federal Columbia River Power System (FCRPS). Upon review of the BPA spill analysis, I find that the proposal to reduce or eliminate the summer spill program is based upon inappropriate methods resulting in highly suspect results. The BPA analysis takes a dangerous approach by using a simple juvenile passage model to estimate the difference in the number of adults under different management scenarios. Adult numbers are compared against potential revenue gain to justify a management strategy. No context is given for the value of an adult fall chinook relative to the fall chinook populations or to management. This approach suggests that the rarer a species becomes the less mitigation strategies should be applied to ensure its survival. The uncertainties inherent in this analysis (e.g. survival estimates, smolt-to-adult return rates, benefits of offset mitigation, etc.) are not considered, thus the risks to the populations in question are not assessed placing the burden of proof once again on species in need of protection. The following observations of the BPA analysis are worth noting:

- **The use of SIMPAS model in the BPA analysis ignores the caveats providing by NOAAF who developed this tool.** The BPA approach is inappropriate because; the model cannot predict the likelihood of adult returns much less the absolute difference in the number of adult returns under subtle differences in management options; does not include sources of uncertainty, which are extremely large for subyealing chinook and thus no evaluation of risk is possible; the model is based on seasonal averages and thus does not include a time or seasonal component and cannot evaluate seasonal change in spill patterns as attempted in the analysis; the model is not mechanistic and cannot evaluate direct and indirect mortality by different routes of passage such as delay in the forebay, increased forebay predation and stress, and increased delayed mortality.

- **Results are highly dependent on stating juvenile numbers and smolt-to-adult return rates, which are likely too low.** This dependence is in large part due to the metric of choice to measure the benefits of an action (i.e. difference in absolute adult numbers). If juvenile numbers and SARs are based on recent or historic information (i.e. since the mid-1980s), then the benefits of spill are based on empirical information from a population before such a strategy was implemented. In essences this assumes no benefits exist to the prescribed mitigation efforts. This analysis assumes an estuary to Lower Granite SAR, but appears to use a Lower Granite to Lower Granite SAR. Review of past information suggests that a 4% estuary to Lower Granite SAR is at best moderate for a severely depressed stock (brood years 1985-1994). The 2%-6% Lower Granite to Lower Granite SAR goal described in the Mainstem amendments equates to a nearly 7%-20% estuary to Lower Granite SAR. An estuary to Lower Granite SAR of at least 10% appears more appropriate for this analysis.

- **The SIMPAS model does not include a D-value for mid-Columbia stocks transported from McNary Dam.** This assumes D is equal to 1.0. Based 1995 and 1996 coded wire tag studies, D is more likely around 0.5. This value needs to be included into SIMPAS when evaluating trade-offs between spill and transportation for mid-Columbia stocks.

- **The SIMPAS model suggests that ceasing transportation and providing a spring-like spill program in the summer provides large increases in adult numbers over current BiOp and no spill scenarios.** Using SIMPAS in the same manner as in the BPA analysis (but including a mid-Columbia River D value of 0.5) in this no transport/spring-like spill scenario suggests an increase of over 3,000 (or 6 times the 1985-1994 average) in Snake River fall chinook over the current BiOp RPA. For all stocks, the model predicts an increase of 44,000 and 139,000 adults over the BiOp and no spill scenarios, respectively. This increase benefit under a no transport scenario occurs because T/I ratios are less than 1.0 for subyearling chinook. Consistent with a spread-the-risk approach and RPA action 51, this argues for a spring-like spill program during the summer migration.

- **Benefits to offset mitigation are highly uncertain, optimistic, and untested.** The benefits to the predator removal programs applied when evaluating the RPA of the BiOp (NMFS 2000b) were likely much too high. These benefits are likely inflated because the maximum impact of the predator removal program occurred in 1996-1997 with a reduction and leveling off of 15% in later years, is implicitly included in the 1995-1999 PIT-tag survival estimates used in SIMPAS. The RPA then assumes an additional 10% predator mortality reduction on top of this maximum reduction. The assumed benefits to the predator removal program in the BiOp is likely greater than the combined gains estimated from the offset measures. BPA proposes to add additional gains to this inflated benefit. Also, (all) predator removal benefits fail to consider compensation from growth rates, and numeric and functional response by the predator community. Trading spill mitigation measures for even more uncertain and untested mitigation measures, places the burden of proof on populations already in need of further protection.

Introduction

The Bonneville Power Administration is considering reducing or eliminating the summer spill program at the lower Columbia River dams, currently used to aid the migration of subyearling chinook. This consideration is based on an evaluation that uses a juvenile migration model, SIMPAS, as a means to assess the number of juvenile fish that are lost as spill levels decrease below levels prescribed in the Reasonable and Prudent Alternative (RPA) management action of the 2000 Biological Opinion on the Operation of the Federal Columbia River Power System (FCRPS). The spreadsheet model used in this analysis is posted on the Technical Management Team website (**www.nwd-wc.usace.army.mil/tmt/agendas/2004/0204.html**). The number of juvenile fish that are lost under reduced or no spill scenarios are converted to the number of adults lost under a fixed smolt-to-adult survival rate and compared to the amount of revenue that could potentially be generated if the summer spill program were ceased. Alternative mitigation efforts are described as potential offsets to the losses expected based on the model exercise.

Benefits of spill

Spill has long been considered the safest and least stressful route of passage past a dam (NMFS 2000a, NMFS 2000b, Giorgi et al., 2002). Studies estimating survival through different routes of passage at a hydroproject indicate that the direct mortality is lowest through the spillways (NMFS 2000a, Giorgi et al., 2002). In addition, review of smolt-to-adult return rates (SARs) by different routes of passage suggests that a smolt's experience at a dam can affect the probability of surviving below the hydrosystem (Budy et al. 2003). For example, after correcting for direct mortality by the different routes of passages, estimates of SARs have been demonstrated to be higher for smolts that did not pass the dams through bypass/collection facilities, suggesting that the lower survival of the bypassed fish must have occurred after but as a result of their experience at the dam (Bouwes et al. 1999, Budy et al. 2003). The National Oceanic and Atmospheric Administration Fisheries (NOAAF) presents recent evidence to suggest that this pattern no longer exists (Williams et al. 2004), however this analysis fails to consider direct mortality differences by route of passage that can obscure the delayed mortality impacts. When these direct mortality impacts are accounted for, delayed mortality of fish not detected in the bypass systems appears greater than for smolts not detected (Petrosky personal communication). Non-detected smolts are comprised of smolts passing a dam through a combination of spillways and turbines. Because passage through the turbines has been demonstrated to be the passage route with the highest mortality, it stands to reason that spill survival is not only the route of passage with the least direct mortality but also the least delayed mortality.

Several mechanisms can explain these empirical survival benefits of passing a dam through the spillways over other passage routes. Hydroacoustic studies have demonstrated that in the absence of spill, juvenile salmonids are found milling in the forebays of dams (Giorgi et al. 1985, Sheer et al. 1997), particularly for subyearling chinook (Vendetti and Kraut 1999). When spill was provided, forebay delays were reduced. Predators have exploited this holding area for migrating juveniles, making the forebay one of highest areas of smolt losses to predation (Poe et al. 1991, Beamesderfer and Rieman 1991). During the summer months forebay temperatures can exceed lethal levels introducing greater stress and mortality in these areas for subyearling smolts (Coutant 1983). In addition, forebay delays can affect estuary arrival timing, resulting in delayed saltwater entry after physiological changes to deal with the saline environment have occurred. This introduces a whole host of problems for migrating smolts such as increases in susceptibility to predation and pathogens in the estuary (for review see Budy et al. 2002).

Adults, in addition to smolts may also realize the survival benefits through a spill program at the hydroprojects. Survival of adults has been shown to be higher for returning fall chinook during times of spill. These increases in survival are presumably a result of fallback occurring at the spillways rather than through the turbines where mechanical injury and mortality are much higher (NMFS 2000a). Based on this information and reasoning, the RPA of the 2000 FCRPS Biological Opinion (BiOp) calls for spring and summer spill programs to help provide the benefits to listed stocks needed to avoid jeopardy.

SIMPAS

SIMPAS is a spreadsheet model developed by the NOAAF used to describe the impact of the FCRPS on juvenile salmon and steelhead. The model is an effective tool for summarizing empirical information regarding the general impacts of the different routes of passage through the FCRPS on juvenile survival. The different routes of passage at a hydroproject include bypass/collections systems, spillways, and turbines. Smolts are divided into those migrating through the reservoirs and dams (in-river), and those placed in barges and trucks at collector project, transported and released below Bonneville Dam (transport). Passage survival rates are based on passage route specific studies where possible, and in-river survival estimates through the reservoirs and dams are based on PIT tag studies. The model is deterministic and does not include measures of uncertainty for parameter estimates. The model is also not mechanistic such that impacts of changes is environmental conditions are not possible.

All models have limitations, due to an attempt in balancing the qualities of a simple understandable approach with the adequate detail to evaluate goals. In the BiOp (Appendix D), NOAAF acknowledges the limitations of SIMPAS and offers the following 'important' caveats:

1. The juvenile survival rates ... are based on juvenile passage studies only and cannot be used to infer the likelihood of adult returns.
2. The juvenile survival rates shown, as well as the input passage parameters, are point estimates, i.e., confidence intervals are not calculated or implied.
3. The model does not contain a time-step function, so both inputs and outputs are scaled to seasonal averages.

4. The model does not account for the potential effects of various fish passage options on forebay passage in terms of reducing delay, residence time, or predation.

5. Best professional judgment was used to develop some of the passage parameters, e.g., in some cases, fish passage data gathered at one dam during a single passage season were applied to several other similar hydrosystem projects.

BPA spill evaluation

BPA attempts to use the SIMPAS model to predict the changes, in some cases subtle changes, in the summer spill program on adult return numbers of fall Chinook in the Snake and Columbia River. The BPA analysis is an extension of the spill analysis conducted by the Northwest Power Planning Council (NPPC). I reviewed the BPA spill analysis spreadsheet provided on the TMT website. Because this spreadsheet only included values rather than formulas for the SIMPAS results, I also reviewed the SIMPAS spreadsheet analysis, which included model formulas, conducted by the NPPC. The BPA analysis used more recent estimates of survival rates over different routes of passage. A simple copy of the these modified inputs from BPA spreadsheet pasted into the NPPC spreadsheet, allowed for an exact replication of the SIMPAS survival rates produced in the BPA analysis. Other worksheets in the BPA spreadsheet evaluated changes in adult numbers over a greater complement of stocks then the NPPC analysis. The results of the NPPC spreadsheet could be pasted into the SIMPAS results worksheet of the BPA spreadsheet to estimate the changes to this larger complement of stocks to evaluate modifications to BPA analysis if needed.

After thorough review of the analysis provided BPA, I find the conclusions, which will presumably be used in the decision in the implementation of the spill program, to be highly questionable for several reasons.

<u>The BPA analysis ignores NOAAF caveats of the SIMPAS model</u>

Many of the deficiencies of the BPA analysis can be organized into the caveats provided in the BiOp of the SIMPAS model. The first caveat is extremely important in that the static juvenile model "cannot be used to infer the likelihood of adult returns" much less precise point estimates in the difference of return numbers expected under multiple scenarios of changes in spill timing and volume, as it used in the BPA analysis. The BPA analysis adds even greater uncertainties to the model by inputting an estimated number of subyearlings produced in the Columbia River Basin above Bonneville Dam (BON) and converting this number into adults over an assumed range of SARs.

There are several problems with using the SIMPAS model to estimate differences in adult returns. First, because the model is specific to the smolt life-stage the impacts to following life-stages cannot be evaluated. For example, spill can provide safer passage to adults by allowing fallback to occur over the spillway rather than through the turbines (NMFS 2000a). This could substantially change the value of spill but is not considered in this analysis because the same SAR is applied to all scenarios. Second, the experience of the smolt life-stage on subsequent survival can also not be addressed in the life-stage specific approach (see above description on delayed mortality). If delayed mortality is