State, Federal and Tribal Fishery Agencies Joint Technical Staff

Columbia River Inter-tribal Fish Commission
Idaho Department of Fish and Game
Nez Perce Tribe
Oregon Department of Fish and Wildlife
Shoshone Bannock Tribe
US Fish and Wildlife Service
Washington Department of Fish and Wildlife

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Witt Anderson
USACOE
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RE: "Summer Spill Analyses"

Dear Mr. Delwiche, Mr. Ruff and Mr. Anderson:

In response to the January 23, 2004 request to the Federal Regional Forum, the technical staffs of the Columbia River Intertribal Fish Commission, the US Fish and Wildlife Service, the Washington Department of Fish and Wildlife, the Oregon Department of Fish and Wildlife, the Idaho Department of Fish and Game, the Shoshone Bannock Tribe and the Nez Perce Tribe have reviewed the BPA "Summer Spill Analysis" and are providing the attached written technical comments on the analysis.

Our technical comments are submitted for the Federal Forum consideration of the Bonneville Power Administration's analysis of effects of potential spill reduction and impact of proposed actions for offset measures. We hope these comments will constructively inform your discussions and decision.

Sincerely,

Russ Kiefer, IDFG

Ron Boyce, ODFW

Bob Heinith, CRITFC

Dave Statler, Nez Perce Tribe

Cindy LeFleur, WDFW

Keith Kutchins, SBT

Howard Schaller, USFWS

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Agencies and tribes review comments – Bonneville Power Administration Summer Spill Analysis

The technical staffs of the state and federal and tribal fishery managers have attended the regional forum meetings at which the Bonneville Power Administration (BPA) presented their "Summer Spill Analysis". We have also reviewed the spreadsheet and power point slides that were posted on the TMT web site for the regional forum. The conclusions of our review are summarized in the following points. A detailed discussion of each point follows our summary conclusions.

Conclusions

- The "Summer Spill" analysis has been presented verbally, with power point slides. A spreadsheet was posted. However, BPA has not prepared a written document explaining the analysis, hypothesis, assumptions, parameters and most importantly how technical comments regarding the limitations of the SIMPAS model, previously distributed from the fishery agencies and tribes, have been addressed in this analysis. The agencies and tribes have requested a written manuscript of this analysis, complete with assumptions and supportive data based upon the scientific literature and reserve the right to provide additional comments when the written document is provided.

- The "Summer Spill Analysis" is an inappropriate application of the SIMPAS model. The agencies and tribes have advised the region on several occasions regarding the limitations of the simple spreadsheet SIMPAS model. (see attached correspondence, Appendix A). SIMPAS ignores uncertainty and risk, and does not provide confidence intervals for each model parameter. The NOAA Biological Opinion specifically discusses the limitations of SIMPAS as it pertains to prediction of adult returns and delayed mortality. The BPA impact analysis results utilizing SIMPAS are highly uncertain and do not provide a robust foundation for fish passage management decisions.

- SIMPAS assumptions regarding transportation operations and benefits present serious potential for underestimating impacts on ESA-listed Snake River fall chinook.
- The offset analysis and predicted benefits from the proposed offsets are highly speculative without a supporting empirical analysis. There is a high level of uncertainty associated with the predicted benefits of offsets, so that the predicted benefits are unlikely to occur. In addition, in specific cases, the proposed offsets are not additional to those hydrosystem mitigation measures that are established as part of a separate mitigation agreement, such as those included in FERC license agreements. As such the agencies and tribes do not believe that there is adequate technical basis to support the projected benefits of the BPA proposed offsets. The predicted benefits of the proposed offsets are extremely optimistic, and uncertain. The offsets also assume that the current measures being implemented under the Biological Opinion are adequate to avoid jeopardy of listed stocks. Whether this is true will be unknown for several years after the 5 and 8 year check-in points; these check in evaluations may indicate that additional mainstem measures may be necessary to avoid jeopardy and insure survival of ESA listed stocks.

- Predation on juvenile salmonids by northern pikeminnow will likely increase in the absence of spill, adding to the number of salmonids required to be saved by any "offset" measure. Therefore, estimates of the number of salmonids that would be additionally consumed if summer spill was reduced could be large, and would likely not be offset by the relatively small increase in exploitation rate assumed in the offset proposal.

- The analysis failed to consider and include increased summer flow as a potential offset that is supported by fish passage 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.

- The BPA analysis is based upon an incremental benefits approach, analyzing spill for fish passage, independently of other measures and cumulative impacts. This is contrary to the ecosystems approach included in both the Northwest Power Planning Council Fish and Wildlife Program and the NOAA Biological Opinion and an ecosystem approach recommended in Return to the River (ISG 1996). The assessment of recovery and rebuilding is based upon a suite of measures, which compliment and interact with each other to achieve the overall goal. Therefore it is inappropriate to analyze protection measures individually against cost or recovery and rebuilding criteria. In considering the entire suite of measures in the Biological Opinion NOAA attempted to balance risks and benefits of measures. The elimination or reduction of spill should not be considered without a full evaluation of the entire suite of measures in the Opinion and other mitigation programs, allowing consideration of other measures that will balance the impact of reduced spill. These issues should not be addressed one by one but in the context of the entire NOAA Biological Opinion and other mitigation and protection programs for listed and unlisted stocks. In that way a complete analysis on the impacts to listed stocks recovery and unlisted stocks will be possible.

- The BPA analysis is presented in a narrow context of incremental benefits, average conditions and individual mitigation measures. This approach underestimates potential impacts by failing to recognize that adverse impacts are cumulative both within years and across years in life cycle terms. A single average year analysis does not provide an adequate basis for management decisions.

- BPA has presented an incomplete technical analysis regarding the impacts of a potential reduction in summer spill, and technical analysis supporting the predicted benefits of the proposed offsets are extremely uncertain. This results in a high level of uncertainty for decisions that consider the effects of reducing summer spill.

Written Analysis

Although BPA requested written comments on the "Summer Spill Analysis" they did not provide a written manuscript documenting the analysis. BPA gave detailed and summarized verbal presentations with Power Point visual aids describing their analysis. In the verbal presentation BPA responded to questions regarding the analysis by repeatedly stating that caveats associated with their analysis that could be lost in the application of the results by policy makers. This is an accurate observation, which can be avoided by presenting the caveats, and limitations in writing. Verbal presentations always differ with each presentation and with the questions asked by various audiences, this results in many different impressions of the analysis, supporting data, and results. A written document creates a definitive and common basis for response by all parties, without the vagaries and variability that results from verbal presentations.

SIMPAS - Serious application limitations for management decisions

The NMFS 2000 BIOP recognizes the limitations in the use of SIMPAS and caveats 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, and predation. NOAA has clearly recognized the limitations of SIMPAS:

- "The juvenile survival rates … are based on juvenile passage studies only and cannot be used to infer the likelihood of adult returns." (NMFS Biological Opinion. Dec 21, 2000. Appendix D. page D-9.)

SIMPAS analyses are woefully inadequate in its assessment of risk and uncertainty. Each of the SIMPAS model parameters has uncertainty (i.e., confidence intervals) and potential biases associated with them, which are completely ignored. Multiplying several estimates together, (propagation of errors) each with their own uncertainty and bias, makes for a very wide range of possible (and very plausible) survival rates. There is also significant uncertainty in the migration timing and population sizes used in the BPA analysis. The BPA analysis disregards these important uncertainties, making application of the analysis to assessing risk to the affected fish populations extremely difficult.

The SIMPAS model predictions of adult returns are greatly influenced by the lack of parameters such as delayed mortality, which affect adult returns. The BPA analysis did not consider a range of potential scenarios. Even with the serious limitations of SIMPAS, BPA could have evaluated a greater range of management scenarios. For example, Bouwes (2004) illustrated that even utilizing SIMPAS, with all of it's limitations, including realistic parameters, such as delayed mortality results in large increases in fall chinook when a spring-like spill program in the summer is considered. Obviously, it is the range of potential outcomes that is most important for good decision-making, not just the point estimates of central tendency that were provided by BPA. The BPA analysis fails to provide ranges of potential outcomes that account for: model uncertainty, migration timing uncertainty, population size uncertainty, flow uncertainty, ocean conditions uncertainty, SIMPAS parameter uncertainty, and mitigation measure uncertainty. Ignoring uncertainty in these type of assessments is counter to the internationally adopted precautionary approach to fisheries management.

In the analysis presented, each of the SIMPAS parameters is assumed to be constant over time. This clearly results in an oversimplification and underestimation of mortality. In the rare cases that actual parameter estimates are used in SIMPAS, these estimates come from research conducted during early summer. Passage (reservoir and project) survival of summer migrants in August is consistently lower than July and these temporal differences are not addressed in the BPA analysis.

The analysis has failed to describe how a reduction in summer spill will affect the probability of recovering ESA-listed stocks. The analysis fails to match offset measures with the stocks that will be impacted.

Reliance on transportation

The BPA SIMPAS analysis relies on unfounded benefits of transportation of smolts therefore potentially seriously underestimating the impact of reduced spill on listed Snake River fall chinook

The BPA analysis assumes maximization of transportation of fall chinook juvenile migrants. This assumption and the failure to incorporate delayed mortality results in the potential underestimation of the impact on listed Snake River fall chinook. Little is known about the effects of screen bypass and transportation on fall chinook (Williams et al. 2003). Studies to evaluate the effect of screen bypass and transportation on fall chinook salmon juveniles have only recently begun. Currently there is no data indicating that screen bypass and transportation provides an adult return benefit over allowing fish to migrate in-river. In fact, there is limited data suggesting that screen bypass and transportation may be more harmful than beneficial. For example, the NOAA Fisheries Technical memorandum on the effects of the FCRPS on salmon populations (Williams et al. 2003) states that for Snake River fall chinook the D-value of 0.2 used in the 2000 BiOp is reasonable, albeit highly uncertain. The Williams et al. 2003 Technical memorandum also reports that 50% of Snake River PIT-tagged fall chinook adult returns were not transported as juveniles, yet the SIMPAS spreadsheet estimates that currently only 15% of Snake River fall chinook juveniles arriving at Lower Granite Dam are not transported. This discrepancy with field information should be addressed. In addition, approximately 70% of these PIT-tagged adult returns from non-transported fall chinook juveniles were not detected at a collector project. When and how these undetected in-river fall chinook juveniles migrated is important, because available data suggests, that they are returning at a much higher rate than transported fall chinook. The SIMPAS parameters utilized regarding transportation of fall chinook do not reflect realistic potential implementation of the reduction of the summer chinook transportation program, which could significantly change the predicted impacts on Snake River fall chinook related to the proposal to reduce spill. Bouwes (2004) (Appendix A) utilizes SIMPAS with realistic parameters and illustrates that eliminating transportation of fall chinook and implementing a spring like spill program in summer months could provide significant increases of listed Snake River fall chinook.

SIMPAS predicted impacts are consistently biased low

In 2001 NMFS recognized that these direct survival estimates were too optimistic for the low flow conditions that were expected in 2001. SIMPAS dam impacts are biased low because differences in survival from reach estimates are attributed to reservoir mortality. SIMPAS survival estimates do not correspond with historic stock performance (see Agencies and Tribes, April 20, 2001 letter, APPENDIX A). Even with full implementation of the BiOp spill program, recovery targets have not always been achieved. In part this is because the Biological Opinion allows the passage spill and flow targets to be relaxed in the event of BPA declared power system or fiscal emergencies.

This SIMPAS analysis does not account for the additional mortality that would be imposed by spill reductions and the subsequent impact on probability of achieving recovery for ESA listed stocks. Considerable evidence suggests that "extra mortality" and delayed mortality is related to earlier hydrosystem passage experience (Budy et al. 2002). The use of SIMPAS ignores this critical finding and completely discounts the delayed impacts of eliminating spill on population viability and recovery.

For example, to illustrate limitations of SIMPAS discussed in the previous paragraphs, we compared empirical data available for spring chinook against SIMPAS predicted results for spring chinook. The following comparison clearly shows that using SIMPAS to predict adult impacts from reduced spill will probably seriously underestimate the true impacts of reducing spill (Figure 1).

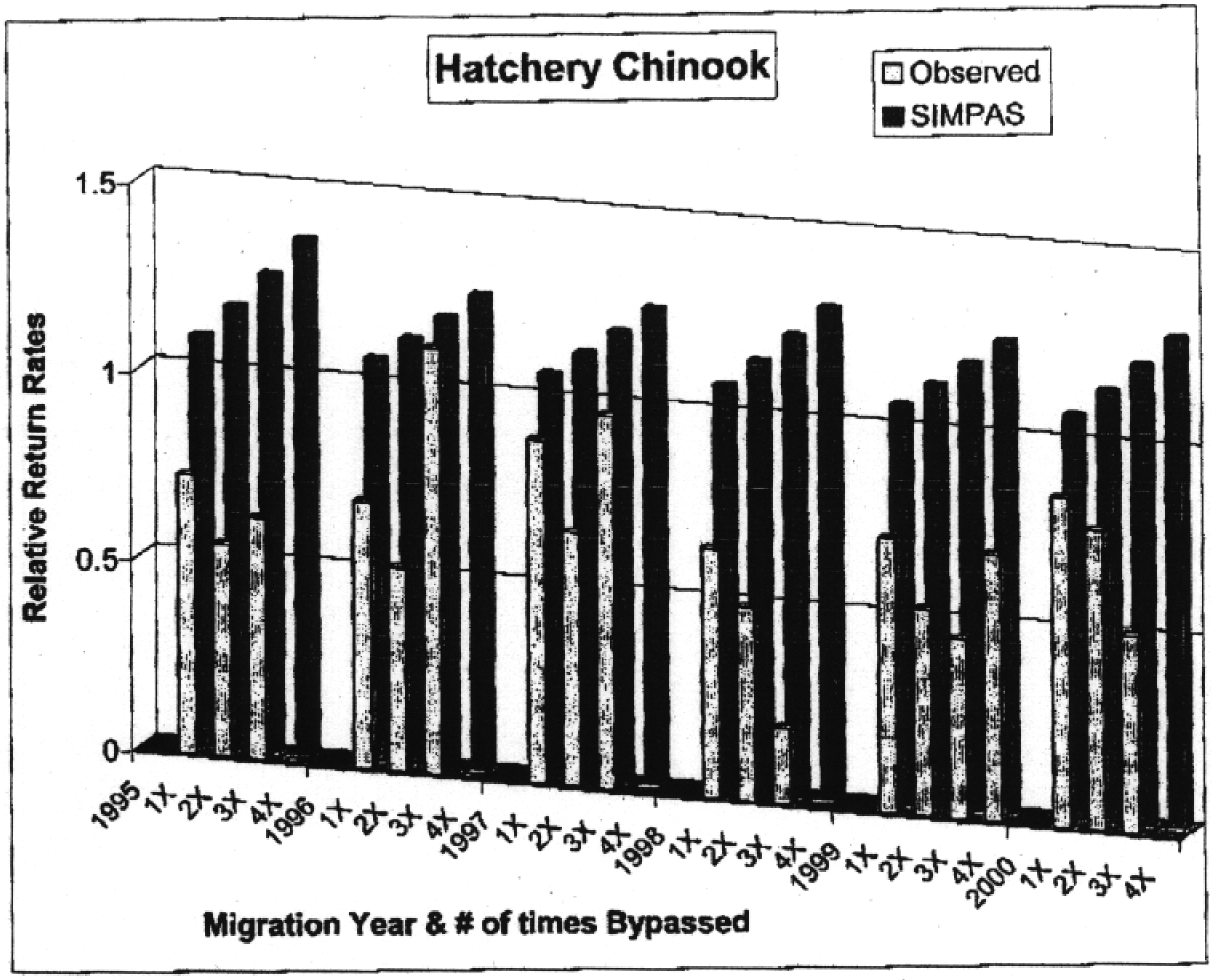

Figure 1. The observed bypassed PIT-tagged hatchery chinook salmon adult return rates relative to non-detected smolts reported in the NOAA Fisheries Technical Memorandum on the effects of the FCRPS on salmon populations (Williams et al. 2003; Figure 22.), compared to the direct survival (SIMPAS) predictions of these relative adult return rates.

This figures shows the observed adult return rate of PIT-tagged hatchery spring/summer chinook smolts relative to the NOAAF estimates for the non-detected smolt group (light blue bars), and the SIMPAS prediction of these relative adult return rates (dark red bars). Hatchery spring/summer chinook salmon smolts were selected for this evaluation of SIMPAS's adult return predictive ability because they are the species, run, and rearing group with the best PIT tag data set, and there is currently no comparable data set for Snake River fall chinook. From these empirical results, two important points concerning using SIMPAS to predict impacts to fall chinook from summer spill reductions are clear. SIMPAS does not accurately predict adult returns rates. In this example, SIMPAS consistently over estimated the adult return rates (is positively biased) relative to the observed values for the various in-river groups (Figure 1).

BPA did not consider the mortality rate associated with adult fall back through turbines under a no spill condition.
CRITFC has estimated that 1500 additional adults would be lost due to mortality of fallback through turbines and bypass system instead of through the spillway, which has a much lower mortality for fallbacks than turbines, or the bypass systems. BPA did not consider adult fallback in their analysis.

The SIMPAS analysis does not consider impacts on genetic diversity of the no-spill option
Genetic diversity is also a factor that was not discussed in the analysis. The juvenile migrants that will be impacted will be the tails of the run, which represent unique characteristics that may not be present in the bulk of the run. By increasing the impact to this portion of the run, we run the danger of reducing the genetic diversity for these stocks of fish as discussed by the Independent Scientific Group, "Return to the River" (ISG 1996). In addition, Tiffian et al. (2000) noted that the middle and late segments of the Hanford juvenile fall chinook migration contributed the majority of the older and larger age-class adults to, 1) in-river and ocean harvest and, 2) back to the spawning grounds. These larger age class fish represent greater fecundity and ability to successfully spawn. It is precisely the critical element of this extremity of the stock composition that would be impacted by reduction or cessation of summer spill through the Lower Columbia dams. It is extremely difficult if not impossible to mitigate for this. We have seen no suggestion about mitigation that would help offset this potential loss of genetic diversity. None of the mitigation identified in the offset committee adequately address this impact.

Tiffian, K.F., D.W. Rondorf and P.G. Wagner. 2000. Physiological development and migratory behavior of subyearling fall Chinook salmon in the Columbia River. North American Journal of Fisheries Management. 20:28-40

White Sturgeon:
White sturgeon currently spawn in dam tail-races, where their eggs incubate for approximately two weeks prior to hatch. The Dalles and John Day reservoir white sturgeon populations are chronically under-recruited due to physical characteristics of tailrace channel morphology (wide shallow channel), which limits water velocities. We expect that interruption of spill likely would have a negative impact on spawning success for white sturgeon, particularly at John Day and McNary dams during cooler water years when water temperatures have not exceeded 18°C. The more natural aspects of spill, particularly 24h spill, emulate natural river conditions, stimulating spawning activity by adults and protecting deposited eggs from a host of predators. The constant flows during spill provide protection for the eggs by physically displacing many predators from the spawning areas.

Pacific Lamprey:
The BPA evaluated potential summer spill reduction is also likely to decrease survival of out migrating juvenile lamprey via increase impingement rates on submerged bar screens (SBS) and increased turbine passage. Juveniles not impacted on SBS that pass through the turbine units would have an increased risk of predation by birds and fishes as a result

of being moved to the water's surface from the turbine boil. Studies have shown that about half of radio-tagged adult lamprey do not pass over a single dam, thus adult passage through mainstem projects is currently marginal; any decline in attraction flows will or increase in turbine fallback would exacerbate this situation. Empirical information indicates that adult lamprey pass dams though low velocity flows on the side of spillgates, cessation of spill would eliminate this passage route, which could be critical.

PROPOSED OFFSETS ARE INADEQUATE

Northern Pikeminnow Management Program Heavy-Up

The objective of this offset is to decrease predation on juvenile salmonids through increased harvest of northern pikeminnow. Northern pikeminnow are currently harvested by a sport-reward fishery as part of the Northern Pikeminnow Management Program (NPMP). It is proposed that the most logical and feasible approach to increase fishery performance would be to increase the reward structure, using a temporary increase implemented in 2001 as a model. Based on results from the 2001 "heavy-up", it is hypothesized that an increased catch of 20,000 to 40,000 fish can be reasonably expected in 2004. It is further hypothesized that such an increase in annual harvest would represent a 1 percent to 2 percent increase in exploitation rate, and would result in savings of 0.7 to 1.4 million juvenile salmonids across the projected lifespan of the northern pikeminnow caught. Savings in 2004 would be far fewer (number not specified, but analyses giving the lifespan total yield within-2004 estimates of about 100,000 to 200,000 juvenile salmonids saved.

Such analyses fail to consider (1) confounding factors affecting exploitation rates, (2) longer-term trends in seasonal exploitation rates, (3) variation inherent in all exploitation rate and predation estimates, (4) affects of a "heavy-up" on human behavior, and (5) direct effects of discontinuing spill on predation. We begin our comments with a brief refresher on the NPMP. We then address each of the five points in order.

Northern Pikeminnow Management Program Refresher

The goal of the NPMP is to reduce predation on juvenile salmonids through sustained harvest of northern pikeminnow. The NPMP is based primarily on four premises: (1) development of the Columbia River basin hydropower system has increased fish predation on out-migrating juvenile salmonids, (2) northern pikeminnow are responsible for the overwhelming majority of this predation, (3) population dynamics and behavior of northern pikeminnow facilitate relatively large reductions in predation from relatively low exploitation, and (4) compensation by surviving northern pikeminnow or other predators is unlikely. Support for these premises is based on 20 years of predation research in the Columbia River basin.

The primary control mechanism for the Northern Pikeminnow Management Program is the cumulative effect of exploitation, which systematically reduces the number of older piscivorous individuals through time. Northern pikeminnow are long-lived and slow growing, and become increasingly piscivorous with age. Salmonids are generally an important diet component only for large, old individuals, and consumption rates of juvenile salmonids by northern pikeminnow increase as size increases. As would be expected with a previously unexploited population such as northern pikeminnow, the biggest relative benefits (in terms of population re-structuring) were realized in the first few years of the program. Sustained exploitation now serves mainly to maintain the new population structure; substantial increases in exploitation greater than 1-2 percent would be necessary to increase benefits by further restructuring the northern pikeminnow population.

Two questions commonly asked about the benefits of the NPMP are (1) do northern pikeminnow feed mostly on dead salmonids, thereby making actual benefits less than estimated, and (2) do remaining northern pikeminnow compensate for removals by increasing consumption, growth, fecundity, etc.? Estimates of predation losses are relatively unbiased by consumption of dead or injured juvenile salmonids (Beamesderfer et al. 1996). Petersen et al. (1994) marked and released live and dead salmonids into a tailrace in a 10% dead proportion (similar to turbine mortality) and found that 22% of the marked salmonids subsequently recovered from northern pikeminnow were dead before release. If dead fish constitute 22% of northern pikeminnow prey near dams, dam effects extend 10km upstream and downstream, and 69% of predation occurs in that zone (Petersen 1994), then 85% of the estimated predation would be on live fish (1-(0.69x0.22).

Rieman and Beamesderfer (1990) concluded that compensation by surviving northern pikeminnow was unlikely because (1) fecundity is much lower than fecundity of species considered resilient, (2) growth is slow and mortality low compared with other species, and (3) density-dependent growth was not obvious. Knutsen and Ward (1999) and Zimmerman et al. (2000) reported that northern pikeminnow compensation has not been observed to date.

Confounding Factors Affecting Exploitation

On first glance, harvest data from 2000-03 (the period in which the minimum size for reward fish has been approximately 200 mm fork length) appears to support the argument that the 2001 "heavy-up" increased catch and exploitation rate (Table 1).

Table 1. Catch and exploitation rate of northern pikeminnow in the sport-reward fishery, 2000-03. Minimum reward size was reduced from 250 to 200 mm fork length in 2000.

Year	Catch	Exploitation Rate (95% Confidence Intervals)
2000	189,054	10.9% (6.8% - 16.8%)
2001	240,894	15.5% (10.0% - 25.0%)
2002	200,445	10.6% (5.8% - 19.6%)
2003	195,974	10.5% (8.1% - 14.4%)

Catch and exploitation rate differ little among 2000, 2002, and 2003, but are notably less than exploitation in 2001, when rewards were significantly increased on July 10. However, relatively large confidence bounds preclude statistical differences among years.

Exploitation rates for fish >250 mm fork length (minimum size until 2000) were 11.9%, 16.2%, 12.3%, and 13.0% for 2000 through 2003. Again, exploitation was highest in 2001, although the difference was not as great, and exploitation varied more among other years.

The increase in catch and exploitation in 2001 is at least partially explained by the environmental conditions that lead to the "heavy-up" (i.e., low river flow). Information collected since 1995 indicates that exploitation of northern pikeminnow (>250 mm) by the sport-reward fishery is highly correlated with river flow (mean gage height below Bonneville Dam) during the fishery (Figure 1). The analysis is limited to fish >250 mm to ensure consistency among years.

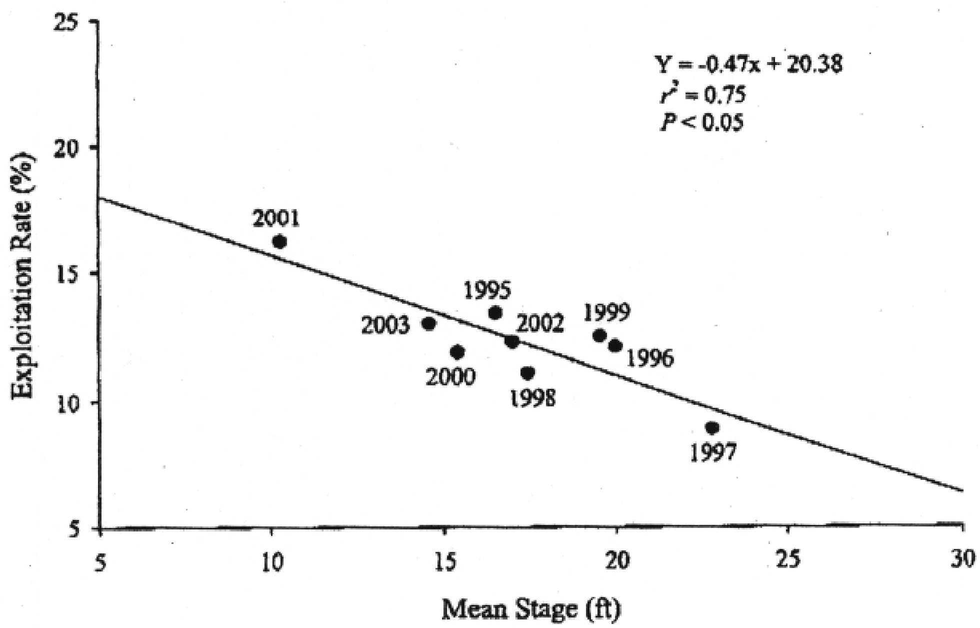

Figure 1. Relationship between sport-reward exploitation and mean gage height below Bonneville Dam during the fishery season, 1995-2003.

Although variation should be considered when using this information to make specific recommendations, it is apparent that differences in flow alone, and not increases in rewards, could account for exploitation in 2001 being approximately 3% higher than exploitation in 2000, 2002, and 2003 (observed differences in point estimates ranged from 3.2% to 4.3%). Exploitation rate in 2001 was slightly higher than would be predicted from the relationship (Figure 1); however, this is also true for 1995, 1996, and 1999.

As explained previously, the most important factor in changing the size and age structure of the northern pikeminnow population is exploitation rate, not total catch. Catch may be affected by variations in northern pikeminnow year-class strengths, but exploitation rate estimates are not. Catch totals also include northern pikeminnow caught illegally (e.g., out of the project area), but exploitation estimates do not. We have found that catch is not a reliable predictor of exploitation rate (Figure 2; P > 0.05).

Long-Term Trends in Seasonal Exploitation Rates and Catch

Benefits of the 2001 "heavy-up" are attributed by BPA to increased catch and exploitation rate after July 10, when rewards were increased. An examination of exploitation rates before and after July 10 for all years since 1995 does not support this argument. Although we found no apparent relationship between exploitation rates before and after July 10 (Figure 3; P > 0.05), exploitation after July 10 was always less than that before July 10, and the seasonal change in 2001 was

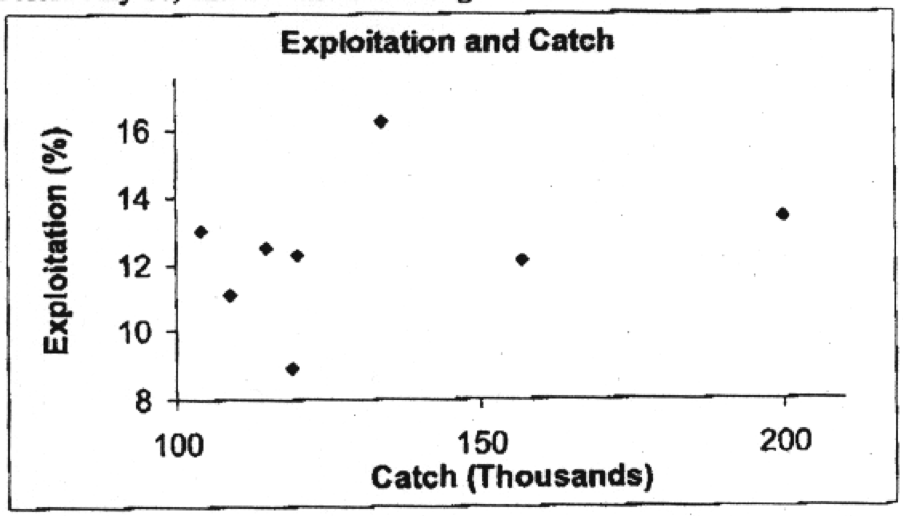

Figure 2. Relationship between catch of northern pikeminnow (>250 mm) and exploitation rate, 1995-2003.

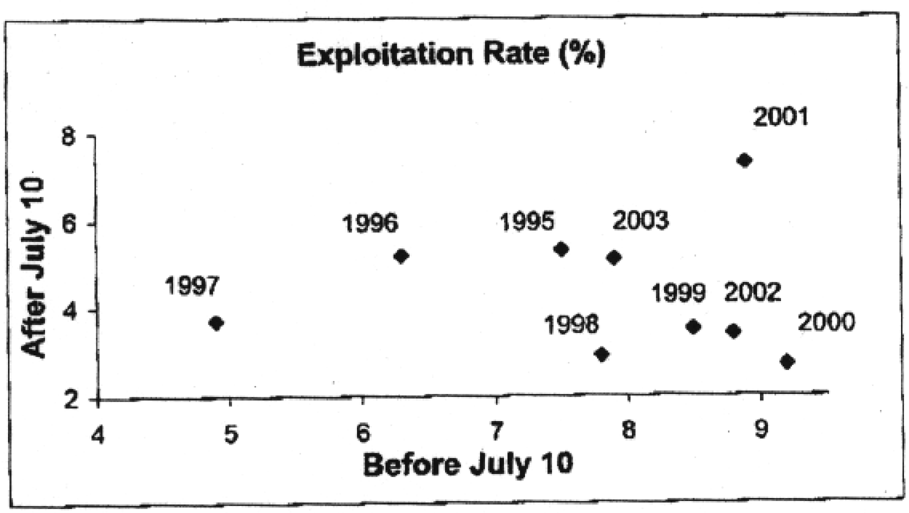

Figure 3. Relationship between exploitation rate on northern pikeminnow before and after July 10, 1995-2003. Although not included here, confidence limits around each point are relatively wide, and similar in proportion to those in Table 1.

similar to that in many other years. Exploitation after July 10 in 2001 appears much greater than would be expected based on 1998-2000 and 2002 data; however, the pattern of exploitation in 2001 is similar to that observed from 1995-97 and in 2003. Differences in flow among years with seasonal similarities in exploitation patterns (Figures 1 and 3) further exemplify the difficulty in attributing changes in exploitation to a particular cause.

We also found no significant relationship between catch of northern pikeminnow before and after July 10 (Figure 4; $P > 0.05$). Examination of the information indicates that the seasonal change in 2001 was similar to that in most other years. The relationship between catch before and after July 10 in 2001 was similar to that from all years except 1995 and 1997.

Variation in Exploitation Rate and Predation Estimates

An objective of the "heavy-up" is to increase exploitation rate on northern pikeminnow by 1 to 2 percent. Confidence limits around estimates of exploitation are much wider than this (Table 1), making it unlikely that such an increase can be detected with any confidence. Confidence limits for all years overlap, even when the point estimate for a year such as 2001 is compared to years of consistent exploitation such as 2000, 2002, and 2003.

The goal of the NPMP is to change the size (age) structure of the northern pikeminnow population to reduce the number of large, piscivorous individuals, and thereby decrease predation on juvenile salmonids. Evidence indicates that the size structure has been altered somewhat (Figure 5). Although reduced in number, large piscivourous northern pikeminnow are still present, indicating that substantial increases in exploitation may result in some further decreases in predation.

An increase of 1-2 percent is not substantial enough to realize any detectible reductions in predation. Results from a model developed by Friesen and Ward (1999) indicate that long-term (15 year duration) exploitation rates of 12%, with lower and upper bounds of 8% and 16% (observed bounds are actually greater than these) result in estimates of predation ranging from 60% to 87% of predation prior to implementation of the NPMP. Increasing exploitation to 13%, with corresponding bounds (8.7% to 17.3%) results in predation estimates of 58% to 86% of prior levels. Differences between the two estimates are indistinguishable.

Affects of a "Heavy-up" on Human Behavior

As mentioned previously, catch totals include northern pikeminnow caught illegally. As rewards increase, the incentive to harvest fish outside the project area and turn them in for rewards increases. The 2001 reward increase led to a large increase in angler fraud (Eric Winther, Washington Department of Fish and Wildlife, personal communication). Such fraud makes it difficult to assess the actual affect of increased rewards on the northern pikeminnow population within the project area.

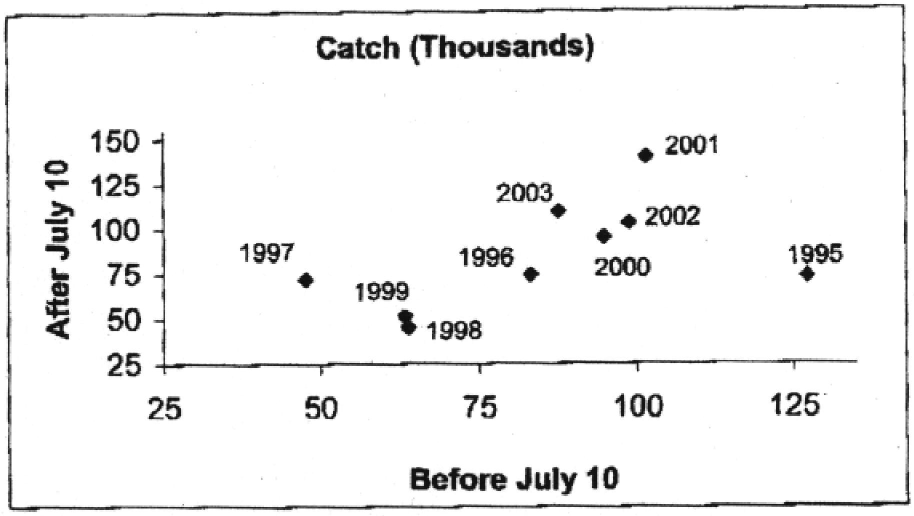

Figure 4. Relationship between catch of northern pikeminnow before and after July 10, 1995-2003.

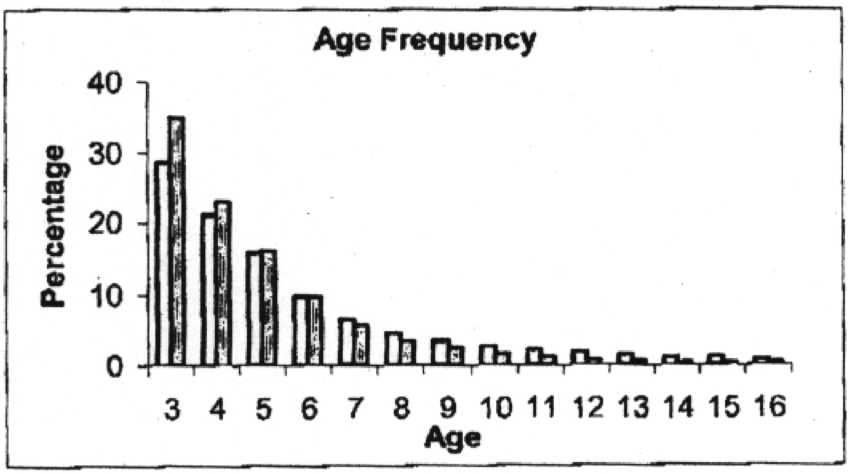

Figure 5. Estimated age structure of northern pikeminnow in the Columbia River before implementation of the NPMP (white bars) and after sustained implementation (gray bars).

Direct Effects of Discontinuing Spill on Predation

Predation on juvenile salmonids by northern pikeminnow will likely increase in the absence of spill, adding to the number of salmonids required to be saved by any "offset" measure. Faler et al. (1988) found that northern pikeminnow in the tailrace below McNary Dam remained in protected shoreline areas when discharge rates were high (e.g., during spill), but moved close to the dam and the juvenile bypass outflow area when discharge rates were low. Trends in movement of northern pikeminnow were similar between short-term (short closures of the spillway) and long-term (spring flows vs. summer flows) changes in water velocity. Faler et al. (1988) noted that predation by northern pikeminnow at fish passage facilities may be reduced by providing high water velocity. Reducing predation in these near-dam areas is critical, because Ward et al. (1995) estimated that 33% of all predation by northern pikeminnow occurred in tailrace boat-restricted zones.

Laboratory findings (Mesa and Olson 1993) support the hypothesis that discharge and water velocity will affect predation by northern pikeminnow. Based on northern pikeminnow swimming performance, Mesa and Olson (1993) found that water velocities >100 cm/s may exclude or reduce predation by northern pikeminnow near Columbia River dams. High velocities also increase migration rates of juvenile salmonids near dams (Berggren and Filardo 1993), which may reduce encounter times between predators and prey.

Zimmerman and Ward (1999) discussed observed effects of spill on predation. They compared predation on juvenile salmonids by northern pikeminnow between pre-NPMP years (1990-92) and years after implementation of the NPMP (1994-96). Zimmerman and Ward (1999) speculated that large reductions in observed predation (44-91%) relative to reductions predicted by a model (14-38%; Friesen and Ward 1999) may be at least partly attributable to spill levels at dams. Total discharge and volume of water spilled averaged higher from 1994-96 than during 1990-92.

Any estimate of the actual number of juvenile salmonids lost that can be attributed to discontinuing summer spill is fraught with uncertainty. The following premises however, are based on peer-reviewed findings:

- The un-exploited northern pikeminnow population may have consumed approximately 16 million juvenile salmonids per year (Beamesderfer et al. 1996)
- The NPMP has resulted in an approximate 25% reduction in predation (Friesen and Ward 1999; 4 million smolts saved annually),
- Approximately 33% of predation occurs in near-dam tailrace areas (boat restricted zones) during low-spill years (Ward et al. 1995)
- Information from Zimmerman and Ward (1999) indicates that spill may reduce this predation by at least 50%
- Predation is greater in the summer than spring (Ward et al. 1995; Zimmerman and Ward 1999)

Therefore, estimates of the number of salmonids that would be additionally consumed if summer spill was reduced could easily reach 1 million, and would likely not be offset by the relatively small increase in exploitation rate assumed in the offset proposal.

References

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Smallmouth Bass Control

The objective of this offset is to decrease predation on juvenile salmonids through removal of smallmouth bass. It is hypothesized that large smallmouth bass (> 200 mm) may consume one juvenile salmon per day in some seasons and areas, and that control by removal is very feasible with sanction by fishery managers. Proposed methods for removal include agency electrofishing, a bass derby in Lower Granite Reservoir, and manipulation (short-term drawdown) of Lower Granite Reservoir. Success of these methods are potentially limited by (1) the biological benefits of removals (likelihood of decreasing predation), (2) feasibility of implementing active removals of a popular gamefish, and (3) logistics of manipulating a reservoir to control smallmouth bass. We limit our comments here to the biological benefits of removing smallmouth bass.

Background

Smallmouth bass are found throughout the lower Columbia and Snake rivers; however, smallmouth bass density is generally lowest below Bonneville Dam, intermediate in Columbia River reservoirs, and highest in Snake River reservoirs (Zimmerman and Parker 1995). Abundance in Columbia River reservoirs and below Bonneville Dam is far lower than abundance of northern pikeminnow (Beamesderfer and Rieman 1991; ODFW, unpublished data). Because of differences in abundance and consumption rates, predation on juvenile salmonids by smallmouth bass is minimal compared to predation by northern pikeminnow (Rieman et al. 1991; Vigg et al. 1991; Ward and Zimmerman 1999; Zimmerman 1999).

Abundance and Density

Beamesderfer and Rieman (1991) found that on average, abundance of smallmouth bass (>200 mm) was less than 40% that of northern pikeminnow (>250 mm) in John Day reservoir. Only in reservoirs of the Snake River, particularly Lower Granite and Little Goose reservoirs, does abundance of smallmouth bass approach or exceed that of northern pikeminnow (Curet 1993; Zimmerman and Parker 1995; ODFW, unpublished data).

Consumption

A few studies have found smallmouth bass to be major predators of juvenile salmonids in the Columbia and Snake Rivers (Curet 1993; Tabor et al. 1993), but these are generally limited to localized areas. Comprehensive studies in the Columbia River basin indicate that smallmouth bass eat few juvenile salmonids relative to northern pikeminnow

(Rieman et al. 1991; Ward and Zimmerman 1999; Zimmerman 1999). Results from Tabor et al. (1993) were limited to a small area of the Hanford Reach, and Curet (1993) studied predation in Lower Granite and Little Goose reservoirs, where smallmouth bass are very abundant. Ward and Zimmerman(1999) and Zimmerman (1999) collected data from numerous sites throughout the Columbia and Snake rivers, and Rieman et al. (1991) published information from an extensive multi-year study of John Day Reservoir. Consumption rates approaching or exceeding one juvenile salmonid per day were limited to times of peak migration in very few areas (Zimmerman 1999). Ward and Zimmerman (1999) found consumption of juvenile salmonids by smallmouth bass to be zero in 74 of 104 estimates. Consistent evidence of predation on juvenile salmonids was found only in the upper reach of Lower Granite Reservoir in spring, and in the forebay of John Day Reservoir in summer.

Smallmouth Bass Population Dynamics and Behavior

Unlike northern pikeminnow, smallmouth bass possess a number of characteristics that may further limit the benefits of a removal program. Smallmouth bass grow relatively quickly, are not especially long-lived, and become piscivorous at a young age (Ward and Zimmerman 1999). Salmonids are generally not the most important diet component for any size or age group of smallmouth bass (Zimmerman 1999). Smallmouth bass vulnerability to most fishing gears decreases with size (Beamesderfer and Rieman 1988), instead of increasing with size like northern pikeminnow.

Potential Benefits of Removing Smallmouth Bass

Removing smallmouth bass is not an efficient way to increase survival of juvenile salmonids. Relatively low abundance will make removals of large numbers difficult. Relatively low consumption rates result in the benefit per fish removed being minimal. Population dynamics and behavior of smallmouth bass further decrease the likelihood of removals resulting in increased survival of juvenile salmonids.

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Commercial Harvest Reduction

BPA has proposed the commercial harvest reductions as an offset without presenting any management specifics or technical analysis.

Technical Considerations

Not enough information is given in the Description of Proposed Action or the Methods section of the Offset Action 3 document to determine how the estimates of " benefit to Columbia River fall Chinook escapement may range between 1,000 and 6,000 adults at an estimated economic value (market value * 2x multiplier) of $125,000 to $275,000" were calculated. There is no information identifying which commercial fisheries were targeted for reduction to save summer spill affected stocks nor how those fishery reductions would be implemented (e.g., reduce overall quotas, buy out individual fishing permits, implement time and area restrictions, or some combination thereof). Without this type of detail, it is impossible to judge whether this offset alternative has any chance of delivering the projected outcome of increased bright fall Chinook back to the Columbia River. There are a number of issues that can be identified that suggest substantial caution must be taken into account concerning the reliance on benefits accruing back to escapements from fishery restriction actions, especially those that are targeted at mixed stock fisheries distant from the escapement area.

Intervening fisheries, unless strictly controlled, often degrade the "savings" from prior targeted fishery reductions. This would be most problematic if the fishery impact reductions were targeted for the S.E. Alaska commercial fisheries, the most distant fisheries. Secondly, if the plan is to buy out individual fishing permits within a fleet,