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MEMORANDUM

TO: FPAC

FROM: Michele DeHart

DATE: October 27, 2004

RE: Comments on NPCC Draft Columbia River Basin Research Plan

At your request the Fish Passage Center staff has prepared comments on the NPCC Draft Columbia River Research Plan (Plan). The FPC has limited its comments to the hydrosystem section of the Plan and is providing them to you in order to facilitate your meeting the short deadline for comments.

General Comments

The research recommendations on hydrosystem evaluation the Council has outlined do not seem to be supported by their own background documents. The Council lists as sources for its research recommendations in Appendix D, both Independent Scientific Groups (ISG) and State of the Science Documents. In both sections, the document that addresses hydrosystem research is the Return to the River by the Scientific Review Group (SRG). The "Return to the River" document, extensively reviews scientific literature and provides hypotheses regarding fish migration behavior (e.g. "spiraling" chinook migration, diel differences in behavior, effects of size and smoltification on travel time, and depth of migration) and comparisons between free-flowing rivers and impoundments and their differing hydraulic characteristics. The following is then offered as conclusions in the hydrosystem section…

> "…Although not easy, one could envision flow management in which reservoirs are drawn down temporarily in different ways in successive years: for example, one year in three for maximal support of constant flushing behavior, and another in which floods are created to overtop riparian zones to create maximal shoreline habitat. The third year could be maintained stable. These flow strategies could be coupled with non-flow measures for salmon

such as replacement of shoreline rock rip-rap with vegetation. The occasional exceptionally dry year (that restricts planned flooding) or wet year (that floods no matter what the plan) would add a certain primal variability."

From this concluding statement it seems that the ISG suggested major alterations to the hydrosystem, such as drawdown, are necessary to achieve conditions suitable for juvenile salmonid migration as part of an adaptive management framework. But the recommendations of the draft research plan seems to emphasize continuing with the AFEP process as is (i.e. using the COE funds to evaluate survival improvements dam by dam.) Outside the COE funded research, those areas identified are ways to decrease the cost of operating the hydrosystem without a clear intent to improve in-river conditions ("summer spill reductions as well as decreased in-season flows from Libby and Hungry Horse dams and finding ways to limit total dissolved gas production to below 120% via flow alterations). In other words, the Council program adopts the current research program that is ongoing as its own and otherwise seeks ways to save money on operations. The Council has been criticized by the SRG for this very problem in 1992 and again in 2002, when the ISRP stated (according to appendix B) "that the draft (research plan) essentially defined existing research as the research program." It appears that this research plan falls under the same category. There does not appear to be any overarching framework that quantifies risk at each life stage as the foundation for prioritizing research. Nor does there appear to be an adaptive management strategy that tests hypotheses related to "Return to the River" principles in order to develop a more normative passage corridor that protects life-history diversity.

Comments on Specific Language within the draft

Section entitled Management Needs (page 8):

1. Determine more precisely the relationship between fish survival and various levels of spill at the individual dams and for the system.

We support this work, which is already being undertaken to some extent within AFEP. However, a more comprehensive look at system survival needs to be undertaken to evaluate benefits of spill, since this ties in with one critical uncertainty, which is the indirect effects of hydro-system passage. Spill volumes have traditionally been closely tied to total discharge and so the benefits of spill on system survival have been difficult to assess because of the typically high correlation between spill proportion and total discharge. With the number of RSW's being considered for installation this relationship could change and, a model of spill efficiency should change as well. Further tests should be conducted with the existing RSW's so that the region can be assured that future installations benefit fish survival.

3. Evaluate turbine operations at the different dams to determine optimum fish survival through the turbines and tailrace environment.

This is a low priority in terms of fish survival improvements, since the likely improvement in survival is low, and since the goal is to pass less than 20% of fish through

turbines, the overall improvement in survival by improving direct turbine mortality is likely small.

4. Evaluate the benefits of incremental flow augmentation and determine the mechanisms for flow/survival relationships on the Columbia and Snake rivers.

Incremental benefits are likely to be difficult to measure with current techniques if the increments are small. However, reach survival has shown to improve with increasing flows, despite statistical difficulties of detecting such improvements, and it would only follow that incremental decreases in augmentation would lead to reductions in survival that may not be statistically detectable using reach survival estimates with present PIT-tag technology. Reductions in augmentation could not be argued to improve survival, since they would likely decrease survival. How much reduction would it take to be statistically detectable depends on the tagging technology available, and the willingness to risk entire populations to experiment.

While the fish and wildlife program related to augmentation was recently amended to include the consideration of impacts on resident populations of fish, the beneficial use protected by augmentation must be weighed. And under such an analysis, we are confident that the small incremental benefits to large populations of salmonids would outweigh benefits to localized populations of resident species.

Section entitled Critical Uncertainties (page 8):

…The present flow management strategy does not take into account the complex migratory behaviors of juvenile salmonids…

We agree that this is an important uncertainty. In the context of the "Return to the River" document, this statement would mean that attempts should be made to mimic natural hydrograph and natural river morphology and hydrodynamics. To evaluate this uncertainty, there should be an evaluation of draw-down; an evaluation of our ability to mimic the success of the Hanford Reach for producing a self-sustaining population of wild fish both in terms of spawning and rearing habitat, and as a natural migration corridor. This could be attained by drawdown of McNary and John Day pools, and drawdown or mothballing and circumventing Little Goose Dam. Little Goose Pool could provide a large section of river available for fall chinook spawning, and as a natural river provide rearing habitat for wild Snake River fall chinook migrating through that section of river.

…The role of hydrodynamic features other than mid-channel velocity in fish migration needs to be explored. A proven link to such features as stage waves and turbulent bursts, or pulsing flows may offer opportunities for water management that might be more effective in moving fish with less water than current procedures. The secondary effects of flow differences on nearshore habitat conditions of present-day reservoirs (temperature, flow, and food production) need to be measured and evaluated. The effects of shoreline modifications along reservoirs (riprap, erosion, and permanent sloughs) compared to the riverine condition need to be evaluated…

We agree with these uncertainties and maintain that drawdown remains the best way to evaluate some of these options. Benefits from "s*tage waves and turbulent bursts, or pulsing flows"* are likely to be highest in a drawn-down reservoir.

Little is known about the cumulative effects on survival of both adults and juvenile salmon from spilling water to gas supersaturation limits of 120 percent in the tailrace and 115 percent in the forebay at all mainstem projects. The relationship between inriver gas supersaturation levels and salmonid inriver survival is not well understood because (a) the supersaturation-exposure histories of inriver fish are not well understood, and these variable exposures are not easily related to laboratory dose-response experiments, and (b) injured fish can be lost through predation, disease, or other ecological factors that are not well quantified at the present time.

We would agree in principle with the idea of trying to achieve water quality standards in spillways. High gas levels, in the reservoirs likely affect fish survival, but not significantly, at the levels identified here. Higher gas levels are unrelated to passage measures. We believe the monitoring and evaluation to date, suggest that TDGS above 125% at tailwater monitors would likely be detrimental to migrant salmonids, with greater impacts likely to resident fish at lower gas levels. Research in reservoirs does not suggest that the incidence of signs of GBT are greater than those seen at the dams via monitoring. Further, studies suggest that fish move up and down in the water column thereby limiting effects of high TDGS. These issues would be worth considering in relation to other goals, such as trying to achieve normative hydrograph. But the costs of achieving lower TDGS levels, either in terms of further structural modifications to the dams, or by altering hydrograph to reduce spring peak flows and thereby reduce benefits of flows to juvenile migrants are probably prohibitive of improving much beyond present conditions. Assuming RSW's become the prevalent in future years, high gas levels will only occur during involuntary spill, which will only occur during very wet years.

Section entitled The Council's Research Recommendations (page 9 and 10):

2.1 – The Council recommends designing a comprehensive research program relating specific passage research at each dam with overall system survival evaluations. This is an admirable and important goal. We agree that there needs to be a comprehensive approach to research that should not be limited to specific agency realms. Although we strongly support this approach, a more detailed discussion of how this could be done is needed. The AFEP program continues to assess route specific survival at dams. However, it is imperative that the integration of passage research should be associated with overall system survival benefits in terms of survival to adults.

2.2 – We do not agree with this recommendation. Implementing a summer spill test should include the full range of ability. At this time there is no summer spill at McNary Dam and at the Snake River and spill is limited to volumes less than the gas cap volumes at other projects. Spill is also limited by date, ending on August 30 regardless of fish passage into September. An evaluation of spill should include not just a reduction of spill in summer, but also an increase in spill to all projects at full gas cap spill into September.

2.3 – We agree with this recommendation. Surface passage systems for passing larger numbers of fish via spillway weirs are an admirable goal. The region is presently embarking on this course so this is not really different that status quo. However, the present approach to evaluating RSWs should include spill up to the gas cap in order to determine when the maximum passage of fish via non-turbine routes occurs. In addition, these tests need to include a survival downstream component and survival to adult component in order to determine the impact of potentially reduced spill on predator abundance and success as well as to determine if any delayed mortality can be ascribed to these passage alternatives. Another key to this recommendation is the concept of fully testing these passage systems and the impact on adult survival. .Further tests should be conducted with the existing RSW's so that the region can be assured that future installations benefit fish survival.

2.5 - Spill passage will never be cost effective unless spill is in excess of hydraulic capacity or in excess of generation needs. At all other times it is not cost effective. That does not negate its biological effectiveness. While SBC look promising in terms of passing large numbers of fish with little water, it remains to be seen what the system wide impacts are related to this objective.

2.6, 2.7, and 2.8: It is unclear how the reduction in present mitigation would be evaluated or how it would improve survival for migrant juvenile salmonids. The evaluation of the limited draft at Libby and Hungry Horse on flow augmentation should be expanded and also include additional drafting of these reservoirs. Proposed studies must include analysis for a range of summer flows, and varying operations of Grand Coulee (1278 or 1280 draft), Albeni Falls (2051 of 2055 draft) and Canadian Projects.

2.9 –2.10 –While the recommendation for modifying turbine designs has some merit, we consider it a very low priority for funding since the survival improvements likely from this area research are minimal. And any gains in direct survival at individual projects, may be offset by decreases in reach or system survival and delayed mortality. This means costly evaluations that may have little impact. Therefore we recommend very low priority in overall system improvements.

2.11 – 2.13 – This is underway under COE's AFEP process. The transportation experiments that are on-going will address some of the Council's recommendations. The most outstanding inadequacy is how the Council refers to the Snake River fall chinook studies. There is adequate information on the transportation of Snake River fall chinook to suggest that it does not provide benefit over in-river migration routes and will not be able to achieve recovery goals for this stock. Therefore, it is imperative that any research plan immediately address the comparison of transport versus migration through the corridor with improved inriver passage via summer collector project spill programs to the spill cap. We would recommend a more aggressive summer spill program that provides greater spill in the Snake River so that a true spread-the-risk approach is tested. With a more aggressive spill program, a transport versus in-river evaluation would lead to useful conclusions. Based on recent findings, the transportation program for fall chinook in the Snake River survival is not as good as that for fish that have been bypassed, suggesting that if a greater portion of fish were spilled in the Snake the benefits of transportation would be even lower. This should be evaluated in a way that mimics the best in-river conditions possible and is implement able in 2005. With the inclusion of RSWs at Snake River dams, the

volume of spill necessary to pass larger portion of fish may decreased, but again the total effect of RSWs has not yet been addressed and this too should be further evaluated.

2.15 -2.16 – We would agree in principle with the idea of trying to achieve water quality standards in spillways. Operational procedures and project modifications have been very successful at limiting total dissolved gas to the 120% level when flow is less than hydraulic capacity. Short of removing projects, there is no way in a high flow to assure that gas does not exceed the limit. Considerable effort has already been taken to study the effects of these waiver gas levels on migrating salmonids. High gas levels, in the reservoirs likely affect fish survival, but not significantly, at the levels identified here. We believe the monitoring and evaluation to date, suggest that TDGS above 125% at tailwater monitors would likely be detrimental to migrant salmonids, with greater impacts likely to resident fish at lower gas levels. Research in reservoirs does not suggest that the incidence of signs of GBT are greater than those seen at the dams via monitoring. Further, studies suggest that fish move up and down in the water column thereby limiting the effects of high TDGS. These issues would be worth considering in relation to other goals, such as trying to achieve normative hydrograph. But the costs of achieving lower TDGS levels, either in terms of further structural modifications to the dams, or by altering hydrograph to reduce spring peak flows and thereby reduce benefits of flows to juvenile migrants are probably prohibitive of improving much beyond present conditions. Assuming RSW's become the prevalent in future years, high gas levels will only occur during involuntary or over generation spill. We believe there is little survival benefit to be gained for migrant salmonids in the Columbia River system by reducing TDGS from 120% to 110% and in the context of the original Risk Assessment, which was re-evaluated by NOAA Fisheries for the 2000 Biological Opinion, the benefit to salmon of passing via spill are in excess of the detriments encountered at these spill levels.

Section entitled Identifying Research priorities (page 40):

Given the whole breadth of critical uncertainties and questions raised elsewhere in the document it remains unclear as to why the short-term research recommendations are so selective. Three of the four short term recommendations offered in the Council's Plan propose testing reductions from the present mitigation by limiting flow augmentation from the Montana Reservoirs. This approach favors viable non-jeopardized resident populations while potentially placing listed species at further risk.

The long-term research recommendation for transportation of fall chinook should clearly include the provision of testing improved in river conditions.

Therefore, in conclusion, the Council's Research Plan for the hydrosystem continues the COE's AFEP process, but outside of this process the Plan only identifies ways to decrease the cost of operating the hydrosystem without a clear intent to improve in-river conditions and improve fish survival.