FISH PASSAGE CENTER

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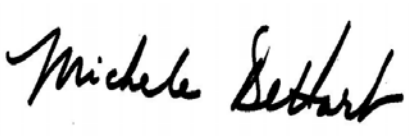
MEMORANDUM

TO: ISAB
Erik Merrill



FROM: Michele DeHart

DATE: May 7, 2010

RE: Response to Comments: Scoping for the Independent Scientific Advisory Board Review of Fish Passage Center Products

The Fish Passage Center Staff has reviewed the ISAB; report entitled, "Scoping for the Independent Scientific Advisory Board Review of Fish Passage Center Products". The ISAB reviewed the Fish Passage Center Annual Report, (and appendices) and the CSS Annual Report and appendices. The ISAB has reviewed the CSS Report and analysis many times and many ISAB members were familiar with the study design, analysis, background and context of the CSS monitoring study. The ISAB has maintained an ongoing dialog with the CSS Oversight Committee. This has not been the case for the FPC Annual Report. The ISAB has not had an on-gong dialog with the FPC staff regarding the purpose or context for the FPC Annual Report. As a result, many of the comments offered in the scoping review addressed far reaching fish management questions that were beyond the scope of the annual report or purview or assigned responsibilities of the FPC. Comments included; ISAB review of adult run-size predictions and methodologies; hydro system operations decisions "made on the fly"; hatchery production goals compared to actual releases; and others which address large region wide management issues in the areas of harvest management, hatchery evaluations, and hydro system management processes. These processes are established by federal operating agencies and the NOAA Biological Opinion. These may be valid comments but they are inappropriately directed at the FPC Annual Report or the FPC. In addition the FPC reports data, collected under protocols, which are based upon region-wide agreement among fishery and hydro system

management agencies. The FPC does not decide or determine any of these actions, but only implements programs as determined and agreed upon by state, federal, and tribal fish management and hydro system management agencies and reports the results.

To establish the actual context of the FPC Annual Report, we have added an introduction to the Annual Report for the 2009 passage year, which describes the context and objective of the Annual Report, which is to tell the fish passage story for that year. In the following response to comments, we offer general responses, context and background for the FPC Annual Report, and a specific response to each ISAB comment. We plan to incorporate ISAB comments in the Annual Report for 2009 fish passage year to the degree that they are within the scope of the annual report.

- Many of the comments, remarks and recommendations offered by the ISAB reach beyond the scope of the FPC Annual Report and the FPC assigned tasks and responsibilities.
- The FPC Annual Report describes what has happened during the year. The FPC reports actual annual run size predictions developed within the US V Oregon process and the States' Compact process. FPC does not participate in or offer comment or review regarding adult run size prediction or the harvest management process. This is outside the responsibilities of the FPC. The ISAB review of the FPC Annual Report is not the appropriate vehicle through which to implement an ISAB review of run size prediction methodology as recommended in the scoping comments. The ISAB recommendation for review of run size prediction methodology should be directed at the States' Compact agencies and the US v Oregon Technical Advisory Committee process, not the FPC Annual Report.
- The participants and process for making hydro system operations recommendations and decisions is established by the federal operating agencies and NOAA Fisheries in the NOAA Biological Opinion. The FPC reports what has happened. Comments on the management decision making process should not be directed at the FPC Annual Report. These comments may be valid but they should be directed at the hydro system management and fishery management agencies, or in comments on the NOAA Biological Opinion. The FPC can not affect the decision making process.
- The FPC Annual Report summarizes what has happened in a migration year. The terms and language reflect the terms and language utilized in the management process by the management agencies in that year. Year to year these may change, because of unique events, agreements among the agencies, or unforeseen events that are managed as they occur. The FPC does not have a decision making role, and has no ability to affect these instances. We are limited to reporting what happened for future reference and information, perhaps to inform future decisions and discussions.
- Many of the protocols for data collection and management are established by regional discussions and agreements among fishery management agencies, federal hydro system operators, and other state agencies. Again, the FPC does not have decision making authorities in these instances. The FPC is obligated to implement protocols and data collection and management as established by these regional agreements.

- The scope of the Fish Passage Center Annual Report is limited to Columbia and Snake Rivers mainstem Smolt Monitoring Program which includes; the Salmon River trap, the Imnaha trap, the Grande Ronde trap, the Lewiston trap, Lower Granite, Little Goose, Lower Monumental, Rock Island, McNary, John Day, and Bonneville dams. ISAB comments regarding the extensive programs in tributaries are outside the scope of the FPC Annual Report and the FPC.

Background and Context for the Fish Passage Center Annual Report

The purpose of the Fish Passage Center Annual Report is to tell the fish passage story for that year and to document the results of the Annual mainstem Columbia and Snake rivers Smolt Monitoring Program, the fish migration characteristics, the passage conditions, and the fish passage operations. The report includes analyses and data that were important in the particular year of the report. For example, if a great deal of discussion occurred among the managers regarding fall Chinook passage and survival, this will be reflected in the report for that year. If high levels of uncontrolled spill occurred, resulting in discussion and management decisions regarding dissolved gas bubble trauma relative to spill management decisions, that will be a prevalent discussion in that years' annual report but it might not be extensively discussed in another year in which dissolved gas was not a prevailing management issue. The report is designed to reflect the actions and discussions that prevailed in a particular year, while providing a consistent data time series of fish migration characteristics. The Annual Report is written in the terms and language of the management process that occurred in that particular year. As an example, seasonal flow targets are used as a reference because they are used as reference criteria in the Biological Opinion and the established management process. The FPC Annual report strives to report what happened and the key passage issues and discussions for that year.

The Smolt Monitoring Program is the result of regional agreement among the hydro system operators and regulators and the fishery managers. It has been designed to develop a consistent and continuous data time series that the hydro system managers and the fishery managers may use to consider and implement fish passage operations in the mainstem hydro system. The FPC does not have the authority to modify the program. Several ISAB comments contained in the Scoping Review of FPC products suggested changes in data reporting and collection. This is beyond the scope of the report. The FPC will take these comments to the fishery managers for their consideration.

Following, the FPC has responded to each specific comment in the ISAB report entitled, "Scoping for the Independent Scientific Advisory Board Review of Fish Passage Center Products". Our response and the original ISAB document will be posted on the FPC website, consistent with our normal procedures.

Response to Specific Comments

Overall Comments

There is a definite need for in-depth peer review of Fish Passage Center (FPC) products, but there are difficulties to be considered if the ISAB takes on this challenge. The assessments done by the FPC rely heavily on creative statistical approaches that are less than obvious, and there is often divergence of opinion among scientists and managers in the region on the best approaches to use, creating ongoing controversy over the validity of some FPC results.

RESPONSE

The ISAB comment mis-represents FPC analysis and methods. The statistical approaches and methods used in FPC analysis are straight forward, consistent and reflect standard methods used throughout the region. These methods in particular reflect Burnham and Anderson (1987, 2002) which have been adopted throughout the region.

Review of some sections of the FPC annual reports would be a good start and could be done every year. These sections are identified later in this review. The more potentially controversial FPC products are the Memoranda, which often are needed by the end-users within a short timeframe, but which may have policy implications. The issue becomes how to screen these memoranda, and whether to attempt to review them before or after they are released. One way to deal with the timeliness issue would be for the ISAB to perform a post-hoc review whenever a product proves to be contentious, or if a review is requested. The ISAB comments could then be appended to the original document along with any FPC response. This could provide, when needed, counterpoint and balance to the original conclusions.

RESPONSE

These ISAB comments, regarding analyses that may have policy implications, also apply to analysis by other entities, such as NOAA Fisheries and consultants for the action agencies. The ISAB should recognize the higher level of scrutiny and transparency required of FPC relative to other regional entities. Providing counter point and balance to original FPC conclusions is not possible without also reviewing the "other" analysis, by other entities. Counterpoint and balance infers contrasting against other analysis. If controversy exists over specific results, the inference is that there are alternative conclusions of differing analyses. In this case the ISAB could consider reviewing both analyses to provide balance and counterpoint to all conclusions on a particular question, not just the FPC analysis.

FPC Executive Summary

The executive summary would be more effective if it contained adequate information to provide perspective on reported outcomes. For example, a brief comparison with past years would provide a useful perspective when reporting findings such as flow targets not being met in two cases. It also would be useful to consider the relative departure, both positive and negative, from flow targets for all key periods to provide a perspective of the success of flow management. Flows and precipitation may be near average, but substantial variability appears

to exist spatially and temporally. It is of interest to know if the flow targets are met consistently or if they are met more or less frequently at some times or at some locations.

RESPONSE
We will strive to include additional detail in the executive summary in future reports.

I. Water Supply
Specific Comments
P1. 1st paragraph. "Water year was *near or above average* throughout the basin". Actually it appears that the basin as a whole (at the Dalles) was below average and that the subbasins summarized ranged from 87 to 130%. The ranks are on either side of the median. Perhaps an important question is whether the range is important to summarize. It could be useful to consider what terms like "near" imply… is a 13% to 30% departure (or 8% overall) biologically meaningful?

RESPONSE
According to Table 1, TDA Observed runoff (Jan-July) was 92% of the 1971-2000 average. In this case, "near" was meant to imply close to, but below, average; "above" was meant to imply above average. It is understood that "near" could mean close to, but either above or below average. It may have been more straightforward to have used "Water Year 2008 varied from slightly below to above average in Columbia and Snake River basins." This will be clearer in future reports.

Table 1. The specific link to the source information is helpful and should be done elsewhere as well.

Figure 1. It would be useful to provide a link to the CRITFC Hydro Program and the documents used to generate the information summarized here. A search of the CRITFC site did not produce this information. More detail on the nature of the measurements would also help. The text suggests that precipitation is somehow summarized "above" the reference point, but wording in the figure heading implies precipitation at "select locations." A water supply analysis would presumably summarize precipitation across the contributing watershed. It would be helpful to clarify the nature of the data and use consistent terminology.

RESPONSE
Data from Figure 1 did come from the CRITFC Hydro Program, specifically the Hydrologist/Meteorologist at CRITFC. The FPC did ask how CRITFC wanted the Figure cited and the response was from the CRITFC Hydro Program. This information was presented to the Technical Management Team (TMT) as part of the year end review on November 21, 2008 and can be found at:
http://www.nwd-wc.usace.army.mil/tmt/agendas/2008/1121_TMT_Wx2008.pdf.

The figure 1 key should read "above" the referenced locations. The wording error has been discussed with CRITFC, and will be correct in future reports.

P. 3 and Table 4. Although the snowpack did increase overall the ranges and means differ from those suggested in the text, depending on how the increase is calculated. For example, the late season increase in individual basins ranges from 1% to over 200% while the averages are between 14% and 58%. The major point, that snowpack increased late in the season, is supported, but the presentation and table need to be consistent and accurate. It is interesting that the snow water accumulations do not seem to match the patterns in precipitation. Some mention or explanation of this observation would be useful, particularly when there is need to draw some connection between patterns of precipitation, water supply, and actual observed flow.

RESPONSE

The snowpack increases mentioned in the text refer to the "average" values over each of three main basins listed in Table 3. This could have been better clarified. The statement of "increased another 15-92%" referred to the increase between the end of March and the end of April.

Table 5-6, Figures 6-7. The Priest Rapids and Lower Granite data are presented in different formats while McNary data are presented both in tabular averages and as seasonal patterns. Consistency would help avoid confusion. Do the biological flow objectives referenced in Table 5 reflect any uncertainty or variability in the flow measurements? For example, the flow objectives show a stable discharge throughout the two windows, but an unregulated flow will vary substantially with climate and discharge patterns across the basin. Is it possible to consider whether the observed flows are meaningfully different than the objective, especially given the variability in both? Presumably there is some guidance on measuring the flow departure that could be referenced here to provide useful context. It also appears that departure is seasonally quite substantial at both McNary and Lower Granite, but that is not discussed. Is a simple average biologically meaningful or is it important to break this down to finer resolution to consider how, when, and why the objectives are or are not met? Again it would be useful to reference the sources of the information.

RESPONSE

Both McNary Dam and Lower Granite Dam have both spring and summer flow objective periods (per the BiOP.) Flows at both of these projects should be listed in tabular and graphical format. At Priest Rapids Dam, there is only a spring flow period (per the BiOp) and flows at this project have only been displayed in a table format, but could also be easily displayed in graphical format. Flows used to tabulate average flows over the objective periods come directly from the COE database at http://www.nwd-wc.usace.army.mil/perl/dataquery.pl. The shape of runoff during the flow periods often varies from year to year and regularly contains periods that are above and below the actual flow objective. Flow objective periods

are referenced in the BiOp as seasonal averages, so when comparing a year's flow objective to actual flows, seasonal averages are used. The BiOp does not specify a particular shape to flows. Thus, it is not discussed in the FPC Annual Report.

P. 13. Dworshak operation references and sources of information would be helpful. It appears that the resolution of the outflow and temperature data may be sub-daily. The resolution of the information could be defined in the figure heading or referenced for the information source. In general, it appears that the presentations offered represent an eclectic collection of information various users have requested in the past, from time to time and project by project. That may serve the needs of particular users well, but it comes across in the report as a collection of odds and ends. Some effort to standardize reporting for the annual report, for each of the projects, would seem to be in order and timely. There will always be requests for one-off reports, and the FPC responds quickly and well to those voluminous requests, but the annual report should be crafted for an audience interested in the larger temporal and spatial patterns within the region.

RESPONSE

The temperatures in the Lower Granite tailrace are used to make decisions on summertime releases from Dworshak. Dworshak reservoirs contains a large volume of very cool water that is used to both moderate Snake River temperatures and augment Snake and Columbia river summertime flows. Lower Granite tailrace temperatures are monitored closely in the summer months, and when temperatures approach 68 deg F, often changes are made to Dworshak water releases (also the temperature of release water can be dictated at Dworshak). In short, summertime releases from Dworshak are often dictated by the temperatures actually recorded at the Lower Granite tailrace.

II. Spill Management

Review recommendation

This section has two parts (A and B). Part A is related to spill and has five sections: (1) an overview of the history of spill agreements since 2004; (2) a section on spill planning and operations, including a table detailing 2008 Agreement spill levels (court-ordered); (3) spill and other issues related to releases of Spring Creek Hatchery Tule Fall Chinook; (4) a series of reports by individual dam on specific 2008 spill operations in relation to river flows and court-ordered spills and (5) a brief summary and conclusions section. Part B is related to gas bubble monitoring and data reporting for 2008, and has three sections: (1) overview, (2) results and (3) a brief discussion.

This section is presented in a fairly straightforward and easy to understand format. The table of 2008 Agreement Spill Levels usefully depicted the court-ordered spill, and Figures 10-18 for individual projects clearly showed where spills met, did not meet, and exceeded required levels. Graphical representation of project specific flow and spill operations constitute much of the

remaining material in this section. This portion is primarily a report on flow and spill levels at each project and does not require ISAB review.

A good example of a place where ISAB input may be valuable is summarized on pages 22-23 of the Annual Report (even though it occurred outside of the spill season). The study by Haeseker and Wills (2008) was used in SOR 2008-1 to justify the preference for spill over the corner collector for Spring Creek Hatchery Releases. According to the Annual Report "the SOR request was discussed at the Technical Management Team… but no consensus could be reached. It eventually went to the Executive Committee for discussion. (Page 23)." In reviewing technical details of the paper by Haeseker and Wills (2008) we note that one point of logical contention might be the reliability of the data leading to the specifics of the SOR. The SAR for fish released during spill was 18% higher than the SAR for smolts released during the corner collector operation, but the results were not statistically significant. Bayesian analyses took it a step further, suggesting a high probability of a significant difference. However, this result for the single year of study data did not consider a large range of other factors that could have affected the SAR, including smolt size and condition as well as riverine, estuary, and oceanic factors. No evidence was provided to indicate that the Haeseker and Wills (2008) study that prompted SOR 2008-1 was reviewed.

RESPONSE

The ISAB does not understand the development and the relation of SORs to the Fish Passage Center as well as the purpose and intent of the FPC Annual Report. The spill section the FPC Annual Report details what occurred relative to the management of spill during that fish migration season. In that respect, the FPC report is an accurate depiction of the events as they occurred in 2008.

The ISAB comments that the SOR occurred outside of the "spill season". By "spill season" the ISAB is referring to the NOAA Biological Opinion definition of the spill season for endangered species. The ISAB is apparently not aware that the state, tribal and federal fishery agencies also have responsibility for stocks of fish other than those listed under ESA. As such this SOR was written by the agencies and tribes for the protection of Spring Creek Hatchery tule fall Chinook, a stock which is recognized to have significant importance under the Pacific Salmon Treaty as a major contributor to ocean fisheries and as a stock that decreases fishing pressure on endangered Columbia River stocks. The SORs for Spring Creek Tule Fall Chinook are within the authorities and mandates of the state, tribal and federal fishery management agencies.

The SORs are developed by the state, tribal and federal fishery agencies technical staff, and these staff members representing their agencies make use of the available technical information to develop their recommendation to the Action Agencies in an SOR. We assume that the ISAB is not questioning the expertise of these staff members and are not questioning the recommendations they make on behalf of their federal, state or tribal agency. The information that lead to the recommendation contained in the SOR 2008-1 included several additional technical issues (e.g., gap closure devices, mortality rates) in addition to the information from the study reported on by US Fish and Wildlife Service. We do not believe that the ISAB is

suggesting that they wish to review documents developed by the USFWS, or if they are suggesting that they do, then are they also going to review documents developed by NOAA Fisheries, the State Agencies, the Tribal Agencies as well as those developed by the US Army Corps of Engineers and Bonneville Power Administration. The NPCC Fish and Wildlife Program language referred specifically to review of FPC products. The review of SORs' may be outside the scope of the NPCC Fish and Wildlife Program, which directed the ISAB to review FPC products and analyses. The SORs are the product of the state, federal and tribal fishery managers.

Subsection B reports on gas bubble data and monitoring of gas bubble trauma (GBT). Sampling and monitoring issues may arise that would suggest periodic review of the protocols and analyses used to evaluate levels of GBT. For example on page 34 it was noted that some data were eliminated from the database because the data were determined to be unreliable.

RESPONSE

The GBT monitoring program is conducted in concert with the TDG physical monitoring for the in-season management of spill. The biological monitoring is conducted because the State of Oregon Department of Environmental Quality requires that a biological monitoring program be implemented whenever they grant a waiver from a water quality standard.

There is a long history of the process involved with the development of the GBT (also referred to as GBD) sampling program currently implemented. In 1994 NMFS convened an "Expert Panel on Gas Bubble Disease" to review past research and make recommendations regarding gas bubble disease monitoring and research. The recommendations of this group lead to the development of the NMFS Gas Bubble Disease (GBD) Research Plan. The goal of the NMFS GBD Research Plan was to ensure that the gas bubble disease-monitoring program accurately represented the condition of fish throughout the system and to enhance the understanding of the relation between exposure and increased levels of TDGS and mortality. There were three elements of the goal: (1) to validate the effectiveness of the GBD Monitoring; (2) to evaluate the relevance of GBD signs; and, (3) to evaluate range of TDGS in the migration paths of salmonids.

The present protocol for the GBT monitoring program was developed in coordination with researchers at the USGS-BRD. The goal was to measure signs of GBT in a non-lethal examination that related to the progression and severity of the exposure of the organism to elevated levels of total dissolved gas. The present program has been implemented for several years and has yielded consistent results that are provided by the US Army Corps of Engineers to the Water Quality Agencies on an annual basis. The ISAB (ISAB 98-8) stated that the biological monitoring at the dams could likely be discontinued without a great loss of understanding. The statement is justified based on the consistent results collected over the past years of sampling. There is agreement that there is limited in-season management application when total dissolved gas is managed within the waiver limits, and there is additional concern regarding the number of fish handled through this program. In response to those concerns, the biological monitoring program was downsized with respect to the number of sites sampled and the frequency of sampling beginning in 1999. The Oregon Department of Environmental

Quality agreed with this downsizing approach, but did not agree with eliminating the biological monitoring program. Therefore, the biological monitoring will continue as long as it is a necessary element of the dissolved gas waivers.

The GBT protocol is reviewed annually by the Fish Passage Advisory Committee and if necessary, modified at their discretion. The plan for monitoring is submitted to the Oregon Department of Environmental Quality and approved as part of their determination of a waiver.

The specific instance that is referred to on page 34 is fully described in the Annual Report and documents why the data were removed from the database as part of our QA/QC of the program. The information is provided in the spirit of full disclosure and is meant to enhance the program.

Suggested modifications
In the spill section, data collection protocols were not really detailed. For the body of the Annual Report, it is not necessary to do so. It would be desirable, however, to have references to the sources of the technical protocols cited (and put in the literature cited section at the end of the document). In that way, the documents can be accessed as needed.

RESPONSE
Flow, spill and total dissolved gas information is collected by the US Army Corps of Engineers and provided through their website. The protocol for the regionally approved GBT monitoring is provided on the Fish Passage Center's website. We can add these citations, or url addresses to the bibliography

III. Smolt Monitoring

Review recommendation
The Smolt Monitoring Program is one of the FPC's core missions, and includes collection, organization, and analysis of smolt passage and survival data, and distribution of those data and analyses to end-users via the FPC website and written documents. This is an indisputably useful service, and is used by agencies, tribes, university scientists, NGOs, and others within and outside of the region.

The smolt monitoring program at the dams is a large part of FPC operations and a critical part of managing the hydrosystem. The smolt monitoring program is an entity unto itself and might need a standing committee involving biologists, hydrologists, and statisticians. Changes in hydro operations seem to be made on the fly. Is there a danger of a major disaster if a mistake is made?

RESPONSE

The SMP is not an entity "unto itself" as reflected in ISAB comments. The SMP has an oversight committee, the Fish Passage Advisory Committee, which is comprised of representatives of the state, federal, and tribal fishery mangers that provide decisions on changes to the monitoring program. Because the SMP occurs at main stem hydrosystem projects managed by the US Army Corps of Engineers, the Fish Passage Operations and Maintenance Committee of the COE process is also involved in discussions of SMP implementation. In addition, each agency involved in monitoring provides a staff of biologists to provide expertise in monitoring. SMP procedures such as the use of the "passage index", and "descaling" criteria were developed by regional entities and adapted for the monitoring program. The procedures used by the SMP were developed regionally, among the fishery mangers and action agencies and have been used consistent to these regionally agreed upon approaches.

"…Changes in hydro operations seem to be made on the fly. Is there a danger of a major disaster if a mistake is made?…"

RESPONSE

This may be a valid comment; however, this comment is not appropriately directed at the FPC or the SMP. The process for hydrosystem operations and changes has been established by NOAA Fisheries and the federal action agencies in the NOAA Fisheries Biological Opinion. This is not an FPC process and the FPC does not have either a voice in the process or any influence on the process. This comment is more appropriately directed at the Federal agencies and the Biological Opinion.

"Numerous aspects of the monitoring program are amenable to periodic ISAB review, such as effectiveness of removable spillway weirs (RSWs);"

RESPONSE

We agree that studies of the effectiveness of removable spillway weirs would benefit from periodic ISAB review; however the RSW/TSW studies are not part of the Monitoring Program. The Annual Report by FPC only reports what has happened including the results that are provided to the public. The FPC does not have any voice in determining the study design or analysis of studies of removable spillway weirs. If the FPC received a request from an agency or tribe to review removable spillway weir studies or analyses, the review would be developed separately from the annual report. The RSW/TSW studies that occurred in a particular year are included in the Annual Report because they are part of the passage story for that year. When considering adult returns or passage in a particular year it is important to consider studies that were taking place because they can effect passage characteristics like in-river survival estimates. However, the FPC Annual Report is not the appropriate vehicle for initiating a review of RSW/TSW studies which are all conducted under the auspices of the COE Anadromous Fish Evaluation Program.

"…usefulness of the smolt monitoring program in the tributaries when traps have to be taken out irregularly due to flash floods and debris hazards; utility of smolt migration timing data; and efficiency of the program."

RESPONSE

Again, the context of the Smolt Monitoring Program and Annual Report must be kept in mind. The SMP data, including the major tributary traps that are included in the SMP, are useful to the fishery managers for in-season passage management decision making. The major tributary traps included in the SMP provide the first indication that juvenile fish are migrating out of tributaries. This is an important consideration for management decisions relating to drawing down mainstem reservoirs to minimum operating pool elevations, expected passage timing at downstream projects relating to decisions regarding the start dates of transportation and other potential operations decisions. The daily data from these major tributary traps included in the SMP reduce the degree of "hydrosystem decisions made on the fly" referred to earlier. The fishery managers are aware of the potential bias that is included in trap data due to trap operations and environmental conditions. Timing data from these tributary, traps is understood to have some bias due to incomplete sampling coverage. However, early season collections at the traps provides and indication of the onset of migration for fisheries managers, just as the drop in collections at these traps toward the end of the spring migration indicates an end to spring migration from these tributaries.

A primary use of the major tributary traps included in the SMP is for PIT-tag marking. The marking at these large river traps has benefits beyond marking in small tributaries that rely on screw traps and seine captures. Because these large SMP traps capture active migrants lower in the tributaries, their survival rate to the hydro-system is quite high relative to other marking programs, particularly for wild fish. So we get more migrant PIT-tagged fish into the hydro-system. Tagging from these traps allows the collection of downstream passage characteristics. As an example, the Lewiston Trap on the main stem Snake River provides the only opportunity to estimate survival from the head of LGR pool to Lower Granite Dam as a PIT-tagging and sampling site. It is important to understand that all SMP marking is coordinated with CSS study so that wild fish marked at these major tributary SMP traps can be used as part of the CSS study.

We agree that a review of the monitoring program in the tributaries as recommended by the ISAB would be useful. However, this recommendation goes beyond the present scope, responsibility, or purview of the FPC, the SMP and the FPC Annual Report. The primary purpose of the major tributary traps in the SMP is for hydrosystem management decisions and fish marking. The FPC does not have any assigned tasks (or funding) for tributary habitat or tributary productivity assessment. The FPC is continuously coordinating SMP activities with other monitoring. The FPC has not yet received directions or requests from the fishery managers to participate in tributary habitat productivity evaluations. In order for these traps to be useful for tributary productivity monitoring, a substantial increase in fish handling and effort (and funding) would have to occur in order to more accurately estimate trap efficiency. At the beginning of the SMP, the traps were evaluated for "collection probability" or "trap

efficiency". Since the traps at White Bird, Lewiston, and the Lower Grande Ronde operate in large rivers, their trap efficiency was found to be quite low; on the order of 0.05 and highly variable, if not impossible to estimate. Since trap efficiencies were low, estimates of total tributary populations was not considered possible using trap collections. At the time, the cost of increased effort and the increase in fish handling were determined to exceed the benefit, a highly variable population estimate. However, we could improve methods to estimate trap efficiency but it is not a primary purpose of these traps. It is important to understand that the SMP and FPC are identified as "Accord" projects, which means they have a fixed budget, and large modifications that would require large increases in funding, such as broadening the scope and use of the SMP traps, require agreement by all of the "Accord" parties. In addition, changes in the SMP also require the agreement of FPAC. The FPC can not implement these changes unilaterally.

The report presents many comments on apparently significant differences in smolt survival within and among years or between dams that are not supported in the text by either statistical analyses or reference to appropriate documentation. There are also many comments about whether or not smolt passage over a particular dam or in a particular year was "problematic" without sufficient explanation of for whom or why the passage was problematic.

RESPONSE

*In the SMP section of the FPC Annual Report, there is one use of the word "problematic", it occurs in the summary of operations section, and there it clearly explains the problem: "*Spring period fish passage was ***problematic*** at Bonneville Dam with high mortality observed through the bypass system. Bonneville turbine operations at the upper end of the efficiency range coupled with high debris load resulted in high Juvenile mortality." *The events that occurred at Bonneville Dam in 2008 are clearly explained in the text on page 41, where the high debris load, high bypass mortality and removal of turbine screens for most of the fish passage season is described. From a fish passage management standpoint, a statistical analysis is not required to determine that a sharp increase in bypass mortality is problematic.*

The population index discussed on page 43 is described in a technical memorandum available at the following link on the FPC web page; www.fpc.org/smolt/juvenile_popindex/35-08.pdf. Results sometimes show major differences between the population index and the passage index. It is not clear if the model developed for the population index has been peer-reviewed. If not, peer review would be appropriate.

RESPONSE

The limitations of the passage index are well known by fisheries managers, it remains a relatively useful tool for portraying fish timing. However, the population index was developed in response to requests by the fisheries managers comprising the Fish Passage Advisory Committee (FPAC) to provide an index that was more responsive to changing conditions in the river as RSWs were installed at Lower Granite Dam in particular. As with all FPC products, reviews would be beneficial. However, the ISAB should be aware that the methods we used for developing the population index were based on peer reviewed and regional standard methods for estimating detection probability.

Criteria for eliminating data such as on page 60, "The criteria were to reject survival estimates if standard errors for any dam to dam segment within the reach exceeded 0.2" need to be justified.

RESPONSE

This is based on our experience of the occurrence of unreliable estimates and their standard errors and provided a non-subjective way to remove survival estimates that were deemed unreliable. We can provide examples that demonstrate the type of estimates that were removed from consideration in analyses. Typically, survival estimates in a reach become nonsensical at these levels of variability (e.g. estimates of survival greatly exceed 1 routinely often 1.5 or higher). We use a standard error criterion to remove these estimates so as to not appear arbitrary in removing "bad estimates". When using weighted regressions, as we did in these analyses, estimates with high variability (i.e. those that we did not include) would essentially be removed by dint of not having a substantial enough weight to influence relationships. However, we will develop a more detailed rationale examining the variability, weight and precision and lack of influence on the relationships between survival and environmental factors.

Section F. "Travel Time and Survival Analyses" (pages 54-75) is a key section that would benefit from detailed review of the assumptions and results of the multiple regression analyses. Statements such as, "Given the relatively low spill proportions in 2008 it follows that survival was below average." on page 69 imply a cause and effect relationship that is quite difficult to justify in an observational situation.

RESPONSE

It is true that in a strict sense correlation does not equate to causation. Just as the correlations between smoking and cancer that existed for decades did not establish causation, the strength of the correlation, between smoking and cancer, was adequate foundation for prudent action, prior to the discovery of causation. The ISAB must recognize that the SMP is the real time foundation for fish passage management actions. This is not an academic exercise. The SMP and the FPC Annual Report simply reports what happened and over the decades, what happens when flows are higher is that survival is higher and travel time is faster. The correlation between flow and survival is well established by many researchers and monitoring programs conducted over decades. The effect of flow on survival and travel time is not controversial in the region. In fact these decades of research and monitoring are the foundation of the Northwest Power and Conservation Council Fish and Wildlife Program starting in 1982 and the NOAA Fisheries Biological Opinions.

There have been many studies and analyses showing both direct and indirect benefits of spill passage on fish survival (Smith et al 1998, Muir et al 2001, Budy et al 2002, Williams et al 2005, Zabel et al 2008)." The mechanisms presented for impacts on survival that increased spillway and spillway passage would cause include a reduction in turbine passage (i.e. more fish through spill means fewer through turbines) as turbines have been shown to result in the lowest survival of all dam passage routes (Ferguson et al 2006); decreased travel time (Zabel

et al 2008) and decreased stress (Budy et al 2002); decreased predation associated with this route of passage (Zabel et al 2008, Ferguson et al 2006).

The SMP is a Monitoring Program, and by the nature of the fact that it is a monitoring program, the data are observational. However, analysis of observational data, particularly decades of observational data provide adequate support for inferences about cause and effect for passage management decisions. In fact, regional survival models such as the NOAA Fisheries COMPASS model (Zabel et al. 2008) and Comparative Survival Study (Schaller et al 2007) model analyses are based on these observational data. Many analyses of fish survival and route of passage in particular, have shown the benefits of spill. We believe that these many studies, showing a strong relation between survival and spill provide more than adequate justifications for considering patterns in survival to be related to changes in spill proportions, especially when models indicate those changes in survival are explained by changes in spill proportion.

Section H, Evaluation of the estimated 2008 reach survivals for yearling Chinook in the lower Columbia River between McNary and Bonneville dam, uses an information-theoretic approach (Akaike information criterion, AIC) to rank alternative models for describing survival of Chinook salmon and steelhead in different river reaches. Because the information-theoretic approach requires some judgment calls, this is a good example of an exercise in data interpretation by the FPC that could benefit from external peer review.

RESPONSE

This comment appears to be directed to Section F, where we use information-theoretic methods to examine associations between environmental variables and juvenile survival rates. We utilized the multi-model inference tools described in Burnham and Anderson (2002) specifically to limit the degree to which "judgment calls" influenced the results. Instead of selecting a single, "best fit" model based on AICc (as has been used in many studies), we used model averaged regression coefficients to generate survival predictions. These predictions formally and quantitatively incorporate model selection uncertainty, something that is often ignored in other studies because of "judgment calls" that simply select for the model with the lowest AICc value. Nevertheless, consistent with FPC policies we welcome external peer review of our approach.

Suggested modifications

Including information on fish when they are handled for tagging or other purposes would be a very useful addition to survival tables. These data should include, at a minimum, length and weight.

RESPONSE

We will provide these data as part of appendices.

Recent evidence shows a high rate of smolt mortality in the lower river/estuary. Connections between the smolt monitoring program and efforts in those reaches should be strengthened.

RESPONSE
The SMP does not extend to the river reach below Bonneville Dam and does not estimate survival below Bonneville Dam. The SMP was designed to provide data for fish passage management decisions at mainstem hydro system projects. However, the FPC will coordinate with and collaborate with any activities in the estuary when requested

Efforts at uniformity of presentation would be helpful. For example, results are presented as proportions in one sentence and as percentages in the next. Differences are presented in absolute differences in one sentence and as a proportionate change in another sentence. Editing would greatly improve the report. The entire Annual Report could be improved by providing definitions for technical terminology. Not all readers know, for example, what the criterion is for a fish examined at a fish passage facility to be considered "descaled", or the definition of "spillway passage efficiency." Once prepared, a glossary could be included in each new annual report with little effort except to occasionally add new definitions similar to the list of commonly used acronyms in Appendix L.

RESPONSE
We agree that it is more important to have clarity and we will strive for greater clarity. We also agree that an index or appendix of terms would be useful.

This section contains examples where tables are misidentified in the text and mistakes are made such as identifying a CV of 0.24 as being associated with a low precision value $>25\%$. Also, justification for using 25% as a cutoff for low precision should be justified.

RESPONSE
We believe you are now actually referring to section H and not Section F. We have found the two references to Table 34 that were incorrect; the one on page 83 should be Table 38 and the other on page 85 should be Table 37.

A survival rate estimate was described as having low precision when its coefficient of variation CV was greater than 25%. A CV of 25% implies that the 95% confidence interval around the survival rate estimate θ would be approximately ± 50% of θ, since $\theta \pm 2 \cdot SE = \theta \pm 2 \cdot (SE/\theta) \cdot \theta = \theta \pm 2 \cdot CV \cdot \theta = \theta \pm 0.50 \cdot \theta$. Although a subjective determination, it is reasonable to consider a confidence bound this wide as reflecting low precision of the estimate. The survival estimate with a CV of 24% was footnoted in the table, although not greater than the 25% CV criteria, since it also reflected an estimate of low precision. It may have been redundant to footnote the 25% CV criteria in each table. Simply stating the criteria once in the text prior to presenting the results may have sufficed.

Lamprey passage at dams such as Bonneville was not reported in the main report. Apparently FPC maintains lamprey passage data, as shown in their response to a request from the Oregonian (Appendix A). Lamprey are a species of concern, so annual reporting might be worthwhile.

Likewise counts of kelts were not documented. A section covering miscellaneous species that are enumerated at the dams could be useful.

RESPONSE
We agree, and will raise this question with the FPAC regarding adding a lamprey passage section. Since concern about lamprey have been growing perhaps a section on lamprey passage would be useful. There are many incidental species encountered in the monitoring. It may be useful to remind readers that data are available via the FPC web page for those that find web access a good method for retrieving/reviewing the data.

IV. Adult Fish Passage

Review recommendation
Forecasts of adult returns are based largely upon jacks from the same brood year. In some years and for some species, forecast and realized run sizes are widely divergent, for example those for spring/summer Chinook and sockeye. Investigation of strategies for improving forecasts should be initiated, including ISAB review of methods to forecast run sizes.

RESPONSE
The recommendation may be valid; however, it is beyond the scope and purview of the FPC. Again, the Annual Report is only telling the story for that year, in order to provide a historical perspective for future readers. The Technical Advisory Committee (TAC) of US v Oregon is responsible for forecasts. The recommendation is more appropriately directed to the US v Oregon parties. TAC provided us with the data reported in this section of the report.

The marine mammal section is devoted to litigation related to trapping and killing of sea lions at Bonneville. This material is interesting but not useful in estimating the impacts of sea lions and harbor seals on returning adults (see Tackley et al. 2008; Stansell et al. 2009). An assessment of the numeric impact of pinnipeds on returning salmon and what happens when the pinnipeds are removed would be useful. Such assessments would be appropriate for review.

RESPONSE
This comment may be valid; however, it is beyond the scope and purview of the FPC. Again the FPC is only telling the story, of that year reflecting the prevailing issues that were discussed in that year. This marine mammal section of the annual report presents information from researchers/agencies working with marine mammals in the mainstem. It is a description of the work done by others and is included because it was a point of significant discussion in that year. Providing an assessment of the numeric impact of pinnipeds on returning adults is currently not in our scope of work. This comment is better directed at NOAA Fisheries, and the fishery management agencies participating in the Program.

A special enquiry presented on pages 101 and 102 involves a comparison of adult mortality on the upper Columbia versus the Snake River. The reply states that the differences were not

significant, but additional tabular information should accompany the statement or be cited and available in an appendix. There are other special requests that warranted special highlighting in the report. As a general rule, any request that is worthy of highlighting in the annual report should be treated with the understanding that if it is worth mention, it is worth presentation. Relevant links to appendix pages or reports should be provided for special requests. Special enquiries are good candidates for reviewable material.

RESPONSE
All FPC data requests are contained in the memorandum appendix as a part of the FPC's annual reporting requirements. Data requests made during the year regarding adult salmon were summarized in the adult section. Links to the memorandum(s) in the appendix will be added.

Also on page 101, the report indicates that the adult mortality estimates from NOAA's Draft BiOp were adjusted for estimated harvest and straying rates but the FPC staff did not adjust adult mortality to account for harvest or straying. Justification for not collecting the harvest and straying rates used by NOAA for FPC analysis should be provided.

RESPONSE
All FPC data requests are contained in the memorandum appendix as a part of the FPC's annual reporting requirements. Data requests made during the year regarding adult salmon were summarized in the adult section. Methods and specific data analyzed are detailed in the memorandum. Links to the memorandum(s) in the appendix will be added.

Suggested modifications
The literature cited is useful and the links to papers are especially appreciated.

The reader is reminded at several points to view comparisons against the decadal average with caution, due to BiOp-mandated changes in harvesting. However, the report does not indicate precisely what the reader is supposed to watch out for. Are this year's numbers biased upward, downward, irrelevant, or misleading, considering such changes in practice? In the interest of clarity, it would help to provide more elaboration.

RESPONSE
The 2000 BiOp identified actions that the federal action agencies could do to mitigate for the affect of the hydrosystem, including restrictions in harvest. Harvest levels and data are collected by the states and federal action agencies. Harvest data are not available in the current season. They are not available until at least a year later. Evaluation of harvest data is currently not a part of the FPC scope of work.

The statement about the 10 year average makes the reader aware about how the 10 year average and the adult dam counts are affected by management policies, such as harvest policies, and other factors such as changes in hatchery programs. We will strive for additional clarity in future reports.

The harvest section should include the percentage of the run harvested by species, stock, and hatchery versus wild. It may be important to know what percentage of the runs are counted within the counting period in Table 42 if run timing shifts to earlier or later runs, as indicated for some runs in Section I.

RESPONSE
Harvest levels and data are collected by the states and federal action agencies. Harvest data are not available for the year of the FPC Annual Report within the contractual time frame of the FPC Annual Report. They are not available until at least a year later. Evaluation of harvest data is currently not a part of the FPC scope of work.

Counts of other species such as lamprey, shad, and sturgeon should be mentioned in the text.

RESPONSE
We have lamprey and shad data in our database. Sturgeon do not ascend adult ladders and so sturgeon counts at ladders are not collected by the Corps of Engineers.

Since presence or absence of adipose fins are noted at the counting windows, percentage of hatchery vs. wild fish for salmonid run sizes would be informative to see if they are correlated.

RESPONSE
There are only data for 2008 and 2009 clip/unclip Chinook and coho counts. The wild steelhead data reported in the adult counts are actually unclipped steelhead. However, not all hatchery steelhead are clipped. Hence, an unclipped steelhead is not necessarily wild.

An evaluation of major factors controlling water temperatures in the river would be useful. Information on how releases from dams, such as Dworshak Dam, affect downstream and reservoir temperature would be useful if presented in this section or referenced here.

There is information about water temperatures in the river in the water management section of the report. An assessment/evaluation of water temperature and its relation to migrating adult salmon is currently not a part of the FPC scope of work as described in the Water Management Section of the Annual Report, the temperatures in the Lower Granite tailrace are used to make decisions on summertime releases from Dworshak. Dworshak reservoirs contains a large volume of very cool water that is used to both moderate Snake River temperatures and augment Snake and Columbia River summertime flows. Lower Granite tailrace temperatures are monitored closely in the summer months, and when temperatures approach 68 deg F, often changes are made to Dworshak water releases (also the temperature of release water can be dictated at Dworshak). In short, summertime releases from Dworshak are often dictated by the temperatures actually recorded at the Lower Granite tailrace. This is managed in real time by the fishery management agencies, based on water temperatures occurring at Lower Granite Dam.

Significant shifts in run timing are shown in Figures 39, 40, and 46. It would be useful to see measures of variation around the 10-year averages to gauge the extent of deviation of aberrant years. Tentative explanations for shifts in run timing that are supported by data should be presented. Changes in run timing for hatchery and wild fish should be compared.

RESPONSE

The agencies and tribes have not requested that the FPC complete an analysis of the measures of variation around the 10-year average adult return. This is currently not a part of the FPC scope of work. These types of analysis are generally conducted through the TAC process. If the FPC was directed to complete that analysis it would be developed separately from the annual report and included in an appendix as a separate analysis.

There are only data for 2008 and 2009 clip/unclip Chinook and coho counts. The wild steelhead data reported in the adult counts are actually unclipped steelhead. However, not all hatchery steelhead are clipped. Hence, an unclipped steelhead is not necessarily wild.

In the tables with adults and jacks, tagged and non-tagged, hatchery and wild counted it would be useful to have proportions of each category reported. Such separation would be graphically useful, particularly for the time trends.

RESPONSE

The only "wild" fish currently reported in this section of the report are wild steelhead. These data have been historically reported in the adult dam counts and included in this section of the report. The wild steelhead data reported in the adult counts are actually unclipped steelhead. However, not all hatchery steelhead are clipped. Hence, an unclipped steelhead is not necessarily wild. There arealso count data for 2008 and 2009 clip/unclip Chinook and coho.

Statements such as the following, which appears on page 109, need correcting, "The 2008 count at McNary Dam of 101,869 was 1.78 times greater than the 2007 count of 57,172. When compared with the 10-year average count of 109,202, the count was about 93.4% of the 2008 count." The statement seems to be claiming that 109,202 is about 93.8% of 101,689, when the reverse is intended. Another example from page 126 states, "The 2008 wild steelhead count of 105,093 was about 1.30 times greater then (sic) the 2007 count of 320,931."

RESPONSE

These statements will be revised.

On page 110 it is noted that, "It was stated that the mini-jacks being observed in the Mid-Columbia River in 2008 were likely late arriving hatchery summer Chinook that were released as yearlings above PRD and WAN in the spring of 2008." As a general rule the annual report should identify who made such statements and what evidence is provided to support the claims.

RESPONSE

All FPC data requests are contained in the memorandum appendix as a part of the FPC's annual reporting requirements. Data requests made during the year regarding adult salmon were summarized in the adult section. Methods, specific data analyzed, and literature reviewed for the analysis is detailed in each memorandum. Links to the memorandum(s) in the appendix will be added.

Including a map showing how the upriver run partitions out into the various basins, illustrating losses along the way would be useful. The information is provided in the text, but it is hard to see the larger picture. A map similar to one showing the fate of Bonaparte's army on its march to Russia and back as presented by Tufte (1990) would be very effective.

RESPONSE
Accounting for losses of Bonaparte's Army on the way to Russia was apparently more straight forward than accounting for losses in upstream migration of salmonids. In order to accurately portray the adult salmonid migration as presented by Tufte (1990) a great deal of data would be required including harvest data by area, straying data, tributary turn off counts, estimates of between dam mortality, fall back rates, between dam mainstem spawning, count differentials between dams and the fact that the steelhead return straddles a calendar year. In addition we assume that Tufte (1990) had an advantage that all of Bonaparte's Army was all going to the same place, moved as a unit, marched at the same time, and did not wander around too much. Loss data are sparse, and harvest data are not available for at least a year later. We understand the comment, but we are uncomfortable with the lack of data and large number of assumptions required for a Tufte (1990) type of representation. We provide the counts at the dams on the maps and the basins and major rivers are labeled. We will investigate the possibility of a very general picture of the upstream migration but we are uncomfortable with required assumptions and lack of data, to develop an ***empirical*** *representation such as Tufte (1990).*

Note that the Fitzpatrick 1999 paper refers to Chinook not steelhead.

RESPONSE
An additional reference for Fitzpatrick 1999 needs to be added to the reference section:

Fitzpatrick, Martin. 1999. Coastal Steelhead Trout: Life in the Watershed. Oregon Sea Grant, Corvallis, Oregon. Available online at:
http://seagrant.oregonstate.edu/sgpubs/onlinepubs/g99011.html

V. Sockeye/Fall Chinook Adult Returns

The ISAB's comments regarding Section V of the 2008 Fish Passage Center Annual Report (Sockeye/Fall Chinook Adult Returns), do not recognize the context of the FPC analysis established by the request which precipitated the analysis. On June 25, 2008 the FPC received

a data request regarding the high adult sockeye returns in 2008. In particular, the data request asked the FPC to investigate: 1) what effects the Court-ordered spill program may have had on the increased returns in 2008, 2) what year(s) did the returning sockeye adults out-migrate, 3) what time of year did they out-migrate, 4) does spill help sockeye juveniles, and 5) to what extent are sockeye juveniles transported. An analysis in response to this request was posted to the FPC web-site on July 14, 2008. This analysis relied on data from migration years 1998 to 2007. Subsequently, the FPC received several questions regarding this sockeye analysis and posted memos in response to these questions on the web-site on July 21, 2008 (http://www.fpc.org/documents/memos/111-08.pdf) and August 18, 2008 http://www.fpc.org/documents/memos/132-08.pdf). Furthermore, FPC received a review of the sockeye analysis from NOAA and posted a response to this review on August 6, 2008 (http://www.fpc.org/documents/memos/121-08.pdf).

Again, the purpose of the Annual Report is to tell the story of that year. Given the amount of interest and the amount of effort expended on the sockeye questions, in that year, Section V was added to the 2008 Annual Report as an update to the original sockeye memo (with migration 2008 included) to address the increased adult returns for fall Chinook that were also seen in 2008.

Review recommendation

In Section V, FPC staff document large adult returns of sockeye and Chinook salmon in 2008. They also attempt to explain these large returns by analyzing changes in reach survival and migration time, in-river conditions, and the magnitude of hatchery releases.

The section includes 6 Tables and 4 Figures that summarize data for 2008 relative to trends over the last 10 years. The section also includes 2 Tables and 3 Figures that summarize results from statistical analyses, and which help to substantiate conclusions in the report. In this respect, Section V offers considerably more scope for ISAB review than some other sections of the Annual Report. This section deserves special consideration for possible ISAB review.

Suggested modifications

Statistical analyses with supporting tables and figures are used to support conclusions in the text that the large adult returns in 2008 are associated with favourable in-river conditions for juvenile migration in 2006 and 2007. However, a number of (minor) deficiencies and missed opportunities could undermine the defensibility of these conclusions. These include:

No explanation is given for what was weighted in the regression analyses. Presumably the weighting was an attempt to address unequal sample sizes used to estimate river reach survival probabilities.

RESPONSE

Weighting was not done to in order to address unequal sample sizes. Weighting was done in order to account for unequal variances between the reach survival estimates. Page 134 of Section V clearly states how the regression analyses were weighted. Weighting for the untransformed regressions was based on the inverse variance of the survival estimates.

Weighting for the transformed regressions (logarithmic transformation) was based on an estimate of the variance of a log-transformed variable. Equation 1 of Section V provided an explanation of how a variance of the log-transformed variable was estimated (pg. 134). The transformed regressions were weighted by the inverse of this variance estimate.

A logistic regression (i.e., logit transformation of survival probabilities) would have been more appropriate than either of the regressions performed. The untransformed regression seems inappropriate, for the reasons stated, and presumably is only included to show that log transformation does not greatly change the results.

RESPONSE

We disagree that a logit transformation of survival probabilities would have been substantively more appropriate than a log transformation of survival probabilities. There is both a theoretical basis (Hilborn and Walters 1992: 264-266) and empirical evidence (Peterman 1981) supporting the assumption that survival rates tend to be log-normally distributed. In addition, a log transformation helps to reduce the correlation between the mean and variance of survival rate estimates (Burnham et al. 1987) and can help reduce heteroscedasticity that is often observed with these types of survival data (Schaller et al. 2007). Because of these reasons, we log-transformed the in-river survival rates. In order to maintain consistency with previous analyses, which did not utilize a log transformation, we presented regressions with both untransformed and log transformed data. These regressions demonstrated that the conclusions were robust and did not change based on whether untransformed or log transformed data were used. In future analyses, we will consider using a logit transformation as well, but it appears unlikely that the results will substantively change.

There is considerable discussion (on page 136) of how spill percent changed at John Day Dam (JDA), yet it remains unclear how (or whether) spill at JDA is thought to have affected survival rates from Rock Island Dam (RIS) to JDA. Presumably any beneficial effect of increased spill percent at JDA would be evident in improved survival in the next reach, i.e., after passing JDA. On the other hand, perhaps increased spill percent at JDA affected the *reliability of the estimate* of survival in the RIS to JDA reach. More explanation is required to clarify the significance of changes in spill percent at JDA.

RESPONSE

The discussion regarding changes to JDA spill was intended to illustrate the lack of variability in the percent spill variable for the mid-Columbia sockeye analysis. This lack of variability could partially explain the lack of a significant effect of percent spill on juvenile reach survival (RIS-JDA) for mid-Columbia sockeye. At the same time that spill is being reduced at PRD, spill at JDA and MCN is increasing. Using Jolly-Seber methodology for estimating reach survivals, the estimates of survival are from tailrace to tailrace. Therefore, spill at JDA could effect survival of juvenile sockeye to the JDA tailrace, which is why they were included in this analysis. Furthermore, survival to the JDA tailrace relies on juvenile detections below JDA (i.e., detections at BON and/or the estuary trawl).

Contrary to the claim on page 137, the numbers of sockeye salmon smolts emigrating from the Okanagan River are estimated annually based on hydroacoustic surveys of Osoyoos and Skaha lakes conducted by the Okanagan Nations Alliance. The following data were provided by Dr. Kim Hyatt (Fisheries and Oceans Canada, Pacific Biological Station, Nanaimo, BC): Hatchery fry plants to Skaha Lake have accounted for less than 10% of the total number of smolts migrating down the Okanagan River. The total smolt migration from the Okanagan River was estimated at 2.0 million in 2006 (7.3% from Skaha) and 1.6 million in 2007 (8.1% from Skaha). Thus, the total smolt migration was considerably larger in 1999, 2002, and 2003 (estimated at 3.8, 2.9, and 2.1 million, respectively).

RESPONSE

Contrary to the ISAB comment, the FPC staff did not ***"claim"*** *anything regarding sockeye hatchery releases, referencing page 137. Our estimates of hatchery releases to the mid-Columbia River came directly from the releasing agencies, including Fisheries and Oceans Canada (Stephan Wolski from Shuswap Hatchery). The ISAB comment misses the point. We simply recognized the fact that hatchery production occurred, in order to conservatively describe the possible factors affecting adult returns. The data provided by the ISAB in the above comment do not dispute the fact that the fry releases to Lake Skaha occurred. In fact, the FPC analysis stressed the unknown contribution of these fry releases to the population of out-migrants by stating, "…there is no estimate of survival from fry to smolt for these individuals so there is no way of knowing to what degree they contributed to the adult returns in 2008." The FPC did not include estimates of the contribution of these fry out-plants to Lake Skaha to the smolt population out-migrating in the Okanogan River. However, these new data referenced by the ISAB do not change the conclusions of the FPC analysis; they simply suggest that hatchery production had less of an impact on the 2008 adult return, which suggest that the decreased water transit times in the mid-Columbia in 2006 may have had an even more significant impact on the adult returns seen in 2008 than discussed.*

Without careful review of the analysis, and review of the conclusions of the management agencies conducting the sockeye hatchery production in Lake Skaha, the FPC is hesitant to report conclusions that this hatchery production provided no contribution to the out-migrating population in the Okanagan River. In addition it is important to note that the FPC has not participated in assessments of sockeye hatchery program in Lake Skaha and assessment of production programs is beyond the scope of the FPC.

The large return of adult sockeye to the Mid-Columbia in 2008 is attributed to a combination of (1) good in-river conditions (low water transit time and increased spill percent at McNary and John Day dams) resulting in increased reach survival of juveniles in 2006, and (2) increased hatchery output in 2006 and 2007. The large return of adult sockeye to the Snake River in 2008 is attributed to a combination of (1) good in-river conditions (low water transit time in 2006 and high spill percent in 2006 and 2007) resulting in increased reach survivals of juveniles in 2006 and 2007, and (2) low transportation proportions in 2006 and 2007. The FPC conclusions seem plausible, but other factors might have played an even larger role. It is

difficult to understand how the reported increases in reach survival (no more than 2-fold in the Snake River, or 2.7-fold in the Mid-Columbia, for any year excluding 2001) could alone explain increases in adult returns of 15 times and 3.6 times the 10-year average in the Snake and Mid-Columbia rivers, respectively. Increased hatchery production (fry plants to Skaha Lake) alone cannot account for the larger returns to the Mid-Columbia because this component contributed less than 10% of the total smolt migration, and total smolt production was as high or considerably higher in 1999, 2002, and 2003. Insufficient consideration is given to the possible role of increased marine survival in combination with improved freshwater survival.

RESPONSE

There is nothing in the sockeye analysis that disputes the importance of ocean conditions on adult returns. However, in order for juvenile fish to take advantage of good ocean conditions, they must first survive the in-river migration corridor. In a memo posted on July 21, 2008 (http://www.fpc.org/documents/memos/111-08.pdf), the FPC responded to a question from the Bonneville Power Administration (BPA) regarding the 2008 adult return and ocean productivity. One point from this July 21st memo is that "good ocean" conditions have occurred in past years, namely 1998-2002. However, these "good ocean" years did not result in high adult sockeye returns, particularly for Snake River sockeye. Our analyses illustrated that these "good ocean" years often had less favourable in-river conditions, higher transport-proportions, and lower juvenile survivals, particularly for Snake River sockeye. Prior to 2008, the last high sockeye return to the Snake River was a return of 299 adult sockeye to LGR in 2000. Most of these individuals would have out-migrated in 1998.

There is disagreement within NOAA as to whether 1998 was a "good" or "bad" ocean year. According to Scheurell and Williams (2005), 1998 can be characterized as a "good" ocean year. According to NOAA's web-site: "Forecasts of Adult Returns for Coho in 2010 and Chinook salmon in 2011", 1998 is considered the second lowest ranking for ocean conditions of the 12 years of data (1998-2009) (http://www.nwfsc.noaa.gov/research/divisions/fed/oeip/g-forecast.cfm). Based on our analysis, juveniles out-migrating in 1998 would have experienced the lowest water transit times and second highest spill percentage among the years we analyzed. If 1998 was a "bad" ocean year, than the 2000 returns (i.e., 1998 out-migration) illustrate the importance of good flow and spill passage conditions, as these conditions in 1998 appear to have been enough to overcome a "poor" ocean year. If 1998 was a "good" ocean year, the high adult returns in 2000 (i.e., 1998 out-migration) support the importance good of downstream passage conditions and survival in order to take advantage of "good" ocean conditions. The FPC encourages the ISAB to also look at the memo that was posted on August 18, 2008 (http://www.fpc.org/documents/memos/132-08.pdf) for more explanation about this topic.

As mentioned above, NOAA provided a review of the original FPC analysis, which the FPC posted a response to on August 6, 2008 (http://www.fpc.org/documents/memos/121-08.pdf). One of NOAA's main points of contention in their review was the FPC's "…failure to consider how variability in ocean productivity may have affected the number of returning adults …".

Below is a brief synopsis of the FPC's response to this review. First, these analysis were conducted in response to a specific data request (see above), which did not ask how variability in ocean productivity may have affected the adult return in 2008. Second, if "good ocean" conditions were the primary reason for increased adult returns in 2008, similar increased in returns should be evident for other sockeye populations along the northwest coast. However, this was not the case for Lake Washington or Fraser River sockeye returning in 2008.

The large return of fall Chinook to the Snake River in 2008 is attributed (implicitly but not explicitly) to increased hatchery releases in 2006. In this case, the analyses do suggest that the increase in hatchery production is adequate, other things being equal, to account for the increase in adult returns. Although summary data and statistics are provided to support conclusions, these data are not complete enough to repeat the analyses described in this section. For example, sample sizes used to compute the reach survivals are not indicated. As suggested above, Canadian estimates of sockeye smolt production from Skaha and Osoyoos lakes are available and should be considered in any comparable analyses in the future. A more comprehensive analysis would also include analyses of smolt-to-adult returns and explicit consideration of the possible role of marine climate conditions.

RESPONSE

Prior to the 2009 smolt out-migration, Snake River sockeye mark group data are limited and, therefore, estimation of SARs is not possible. This is primarily due to the lack of PIT-tagged adult returns.

The practice of reducing the window of time in order to improve reliability of estimation of environmental variables may cause biased results that should be noted and investigated (see page 138).

RESPONSE

The practice of reducing the window of time for the estimation of environmental variables has been used by the FPC in many similar analyses. The purpose of this methodology is to make sure that the estimation of environmental variables is as objective as possible and represents the most likely conditions that the cohorts in the analysis would have experienced. Based on PIT-tags, the time window (May 8-June 4) used for Snake River sockeye accounted for 78-96% (geometric mean: 86%) of the PIT-tag detections at LGR among the years analyzed.

As a general practice the effect of potentially influential observations should be investigated and reported when interpreting data presented such as those in Figures 55 and 56.

RESPONSE

The FPC assumes that the ISAB is referring to the fact that our analysis includes migration year 2001. This similar to a comment received by NOAA, to which the FPC responded in our August 6, 2008 memo (http://www.fpc.org/documents/memos/121-08.pdf). There is simply no logical basis for removing 2001 from our analysis, or any other analysis. The conditions seen in 2001 did actually happen and the results are real. Migration year 2001 provides an important example of how juvenile reach survivals can be effected by lack of spill for fish

passage and/or lack of migration flow. For migration year 2001, the FPC estimated that 95% of the juvenile Snake River sockeye population would have been transported. Despite this high transportation proportion in 2001, the sockeye adult returns to Lower Granite Dam in 2002 and 2003 were low (55 and 11, respectively). This simply validates the importance of spill in overall juvenile reach survival, particularly those migrating in-river.

Also, the FPC would like to remind the ISAB that the regression analyses presented in Table 57 and Figures 55 and 56 are weighted regressions. This was done in order to account for unequal variances between the reach survival estimates. Given the relatively wide confidence intervals for migration year 2001, it is unlikely that this migration year had significant weight in the analysis.

VI. Columbia River Basin Hatchery Releases

General comments

The hatchery release chapter in the FPC report is fairly routine, simply describing hatchery release data. The FPC hatchery release database seems to differ from that maintained by the Pacific States Marine Fisheries Commission (PSMFC) in that the FPC database provides in-season reporting, whereas the PSMFC database relies upon annual data provided by agencies. PSMFC's primary charge is related to Coded Wire Tags (CWTs) and associated releases, but PSMFC does provide hatchery releases not associated with CWTs when provided by agencies (sometimes the data are incomplete). The FPC database is much less comprehensive than the PSMFC database, which has separate records for each release and many more database fields.

RESPONSE

In 2000, the Independent Scientific Review Panel (ISRP) reviewed many of the databases that are funded through the Columbia Basin Fish and Wildlife Program and found no problems with the FPC and PSMFC hatchery databases (ISRP 2000). The FPC hatchery database reports hatchery releases of juvenile salmonids to the Columbia River Basin (CRB). These data are collected from the state, federal (U.S. and Canada), and tribal entities that conduct these releases, regardless of tagging efforts and what types of tags are being used. The FPC is in constant contact with these release agencies and maintains a good working relationship with them. The FPC hatchery database was designed for use by fisheries managers primarily for informing in-season hydro system management decisions. Tagging information for hatchery release is provided in one field (Comments). This makes it easier for fisheries managers to quickly reference the information they need in order to make hydro system management decisions.

The PSMFC database is for the entire Pacific Region, which includes releases in California, Oregon (including non-CRB), Washington (including non-CRB), Idaho (including non-CRB), Alaska, and Canada and was not designed for use by fisheries managers for in-season management decisions. Given the geographical scope of data in the PSMFC database, it is not surprising that it contains many more records than does the FPC database. There is a substantial amount of effort within the region to avoid duplication of efforts, with respect to

databases. Although they have similar data, the PSMFC and FPC hatchery databases serve very different purposes and, thus, should be compared with caution.

ISAB review and comment on the hatchery release section of the FPC report are not recommended on a regular basis. However, the ISAB should make use of the online availability of the report as it does contain very useful and timely information that is relevant to the big Columbia River Basin picture.

Specific comments

On page 148, the report states that fry releases are excluded but the meaning of fry releases should be defined more clearly.

RESPONSE

The FPC relies primarily on the release agencies to identify fry and egg releases. The same is true for pre-smolt and parr releases. When a particular release is identified as a fry, egg, pre-smolt, or parr release by the releasing agency, the FPC makes a note of this in the Comments field and adjusts the migration year accordingly. If a release is not identified by the release agency, the FPC uses other criteria to investigate further. For example, when a release has a "fish per pound" estimate that is unusually high (e.g., >100), the FPC will contact the releasing agency and verify whether these releases are fry, egg, pre-smolts, parr, etc.

Although the FPC is not responsible for the area below Bonneville, Table 60 should include the below Bonneville zone. On page 149, the report states that there were 1.46 M salmonids released below Bonneville Dam, mostly by WDFW, but those fish are not tallied further. Some arrangement should be made to include them and their fate in the database. A complete perspective of hatchery production throughout the entire basin is needed including fry that will migrate in the year after release.

RESPONSE

Hatchery releases below Bonneville Dam (BON) are currently included in the FPC hatchery database, and have been since 1987. The FPC will incorporate a summary of releases below Bonneville Dam in its 2009 Annual Report.

Most of the text describes whether hatchery releases were higher or lower than previous years. It would be worthwhile to provide a table listing the cumulative release goal by species, life stage, and river zone so the users can track the overall goal for each zone and how total hatchery production relates to the goal.

RESPONSE

The FPC hatchery database is primarily used for in-season management of the hydro system and not hatchery performance evaluation. Hatchery production release goals are determined by the

various hatchery programs (e.g., Lower Snake Compensation Plan, U.S. vs. Oregon, etc.) and mitigation agreements such as Idaho Power Company. These goals and an evaluation of the accomplishment of hatchery programmatic goals is the appropriate subject of the reports and mitigation agreements from these hatchery programs.

It would be useful to list releases by subyearling/yearling stages and "fry" that would likely migrate during the following year. These life stages will behave differently in the river and will have different survival rates.

RESPONSE

Although the tables do not break down releases by release age, the detailed discussion in the text does provide these breakdowns for each of the release zones, where applicable. Also, there is a separate section (Section E) that provides a breakdown of the egg, fry, and adult releases for each of the release zones (LCOL, MCOL, and SNAKE). Finally, Appendix F provided a list of all releases for that migration year (above BON), summarized by agency, hatchery, species, race, age, and release date(s). In the 2009 Annual Report, this appendix will also provide this information for releases below Bonneville Dam.

The ISAB previously identified interactions between juvenile hatchery and wild salmon as a key uncertainty in the basin. Release dates of hatchery fish are described by FPC. To what extent do release dates of hatchery fish overlap with wild fish migrations? Also it is not clear how well the different life stages released were separable in the database or in tabular form.

RESPONSE

See above comment in response to the uncertainty of releases of different life-stages. The FPC hatchery database has a field for age, which should aid in identifying what life-stage each release pertains too. In addition, fry, egg, parr, pre-smolt, and adult releases are indicated in the Comments field. Most of the hatchery releases occur in mainstem tributaries. There are little data in these tributaries on the timing of wild smolt migration. Without these data, matching hatchery releases into tributaries with the migration timing of wild fish would be problematic. The Smolt Monitoring Program does provide passage timing data at mainstem projects and a couple traps in larger tributaries. However, in recent years a larger proportion of hatchery fish are unclipped. This means that the hatchery versus wild designation is becoming more difficult to determine and should be interpreted with caution.

In the database, the comment field specifies the percentage of fish receiving a CWT or other type of mark (also see Appendix F). Hatchery marks are the key tool used to separate hatchery vs. wild salmon. The percentages of smolt that leave the hatchery tagged versus untagged should be indicated in the tallies, hatchery by hatchery and date by date. It would be worthwhile to provide the percentage of fish receiving each mark type in a separate column in the database so that the number of each mark type and unmarked fish can easily be calculated. Presumably the reported percentage of fish receiving marks is based on sampling of fishes at

the hatchery. Note that when mass marking initially began in Puget Sound some hatcheries were simply assuming 100% of the fish received a visible fin clip—which was not accurate.

RESPONSE

Marking data (e.g., clips, CWTs, PIT-tags, Elastomer) in the FPC hatchery database come directly from the release agencies. How each release agency determines these numbers is up to the agency. The FPC simply reports the data that we receive. Furthermore, the marking data that the FPC receives from the release agencies are not standardized, which complicates the issue of determining exactly how many fish from each release receive a particular clip/mark combination. Again, the FPC hatchery database was designed as a tool that fisheries managers could use to inform in-season hydrosystem management decisions, not as a tool to evaluate interactions of hatchery and wild juveniles.

Appendix A – Memoranda & Other

Review recommendation

An examination of all of the appendices and memoranda for technical content indicated that there are several areas related to spill and salmon migration that could usefully be reviewed as needed. Not all memoranda in Appendix A warrant ISAB review, but it may be useful for the ISAB to review memoranda and their technical responses when new analyses are introduced, when new conditions bring the old analyses into question, and especially when consensus cannot be reached on the science.

The situation where ISAB evaluation may be most useful is when newly established statistical relationships between spill and fish (mortality etc.) are used either to justify SORs or in contentious spill decisions. ISAB input may be especially useful when consensus among entities regarding the science behind spill decisions or proposed decisions cannot be obtained. Nearly all of these relevant areas will be in the technical details often appearing in the appendices, as scientific documents and memoranda, rather than in the summary portions of the report.

Suggested modifications

The Appendix contains interesting and useful analyses. A concern is that documentation of these memoranda for the historical record may be "lost" because the title of the memoranda are not prominently identified and referenced.

There is a statement from page A-9, to the effect that: "These results indicate that a very small proportion (<15%) of surviving hatchery fall Chinook holdovers overwinter above LGR. Therefore, it is likely that a significant proportion of hatchery fall Chinook partially migrate through the hydrosystem before overwintering somewhere in the hydrosystem." Data on holdover Chinook, also known as reservoir-type Chinook, are important and have been published in the primary literature by authors such as Connor et al. (2005) and mentioned by ISAB. However, there are no references to these other studies in the FPC report. The interpretation of results would benefit from comparison to other studies.

RESPONSE
We will strive to include pertinent references to past and similar analysis in future reports. The SORs and attached analysis are products of the state, tribal, and federal fishery mangers. They often relate to Biological Opinion analyses, Fish Operations Plans, or other agreements. These are not FPC products. Therefore review of these products may be beyond the scope of the NPCC program language requiring review of FPC products. Again these documents are included in the annual report to tell the story of what happened in that year for future reference.

Appendix I – Technical Letters

Review recommendation
On occasion ISAB review of selected technical letters would be valuable. Selection criteria could be similar to that used for identifying memoranda in Appendix A.

RESPONSE
Joint staff technical letters and memorandum are not products of the FPC, but rather the state, federal and tribal fishery managers. Since the task assigned to the ISAB is to review FPC products, this might be beyond the scope of the NPCC Program language. The technical memorandums and letters are included in appendices to tell the story of the particular fish passage year for future readers.

Appendix J – Maps

Suggested modifications
The maps showing the recent adult counts by species at each dam in relation to the recent 10-yr average are good, easily understood summaries. A link to a clickable map with all the major dams on it with links to information such as who operates each dam, who monitors the smolts, a summary of smolt transportation that year, and adult counts by species would be very useful.

RESPONSE
On the main menu of the FPC web-site (www.fpc.org) we have a link entitled Reporting Sites. It is a clickable map of the major dams in the region. When users click on a dam, information about the dam's location, operating agency, webpage, smolt monitoring program sampling schedule, SMP project leader, passage index formula, traditional adult return reporting dates appear. To find adult counts by dams, we have several queries available. For user convenience, we added a quick links box in the center of the front page that links to our most used pages, including our most popular page is the Adult Dam Counts and our Adult Dam Count Graphs. There is also a menu item entitled Adult Data which links to these queries. We have a menu item called Smolt Data that allows the user to query smolt data including passage index, collection count, sample count, mortalities, descaling and sampling comments. Graphs are also available for passage index data.

Appendix K – Web Statistics and Data Requests Summaries

Suggested modifications

This appendix provides an effective summary of access by users of several online databases and documents. An additional index of how useful the compiled data actually are might further document FPC contributions. Such an index might report acknowledgement from users in scientific papers, reports, and studies. It is interesting that the primary user of the FPC online database is Colorado with more than double that of any Northwest state and California. This summary begs for an explanation.

RESPONSE

The geographic locations included in this appendix are based on where the domain name of the visitor is registered. In some cases, the domain name is not registered in the same location as the visitor. For example, the domain name for the USFWS is in Colorado. Therefore, if a USFWS employee in Montana, Washington, Oregon, or Idaho accesses the FPC web site, that visit will be logged as coming from Colorado. The maps and web statistics will be changed to include "registered domain name locations" in the titles and explanations. Users of the FPC website request information and we respond. This appendix can be considered a usability index. The web data requests statistics and the memorandum appendix document user requests and our responses.

Comments on 2009 CSS Annual Report

The report is very nicely written and clear, an improvement over previous reports. Both the procedures and the logic for them are apparent. This report continues the improvements made in the 10-year retrospective report in giving a much more enlightening view of the CSS project.

Review recommendation

Much of the data presentation, analyses, and interpretations in the 2009 CSS Annual Report have recently received extensive ISAB/ISRP review. When new analyses are introduced they often appear in FPC memoranda prior to inclusion in the CSS annual report. Portions of the annual report that have not been previously reviewed should be reviewed when new analyses are introduced, when new conditions bring the old analyses into question and when consensus cannot be reached on the science involved. In Chapter 5 use of a random-effects model where the true effect size is assumed to vary from study to study qualifies as a new methodology that should be reviewed. Unfortunately, the ISAB timeline for this review does not allow for a complete evaluation of that strategy at this time.

RESPONSE

The random-effects model presented in Chapter 5 did not appear in FPC memoranda prior to inclusion in the 2009 CSS annual report. The random-effects models presented in the 2009 report are an extension of the work on methods for accounting for environmental stochasticity, which was presented in Chapter 4 of Schaller et al. (2007). Nevertheless, we would welcome an ISAB review of this work at any time.

Suggested modifications

ISAB/ISRP-2007-6 had suggested that the fish transported from LGS and LMN not be lumped with those from LGR, as a means of assessing whether it makes any difference from which project transportation begins. It is clear from the delivery and Eq. [2.1] that CSS has chosen not to do that separation. Although CSS has "adjusted" for S_2 and $S_2 \bullet S_3$ in its treatment of fish transported from LGS and LMN, respectively, these fish are still being lumped with those transported from LGR. There are sample size considerations involved, but it would still be useful to be able to evaluate the efficacy of allowing the smolts to "run the river" for that extra project or two, before transportation. Allowing for in-river mortality, the question is whether beginning transportation at LGS or LMN, instead of at LGR will improve subsequent survival and precision of homing on the journey from BON outward and back upriver. The ability to compare $SAR_{LGR \rightarrow LGR}$ for fish transported from LGR with those transported from LGS, with those transported from LMN, along with those tagged and returned to the river at LGR (C_1) and those that "run the river" without handling (C_0) would be beneficial. Using Eq. [2.1], which probably does have lower error of estimation, to compute the "collective experience with transportation" should be continued, but evaluation of the finer details is needed if the overall results presented here are any guide.

RESPONSE

The CSS has maintained a consistent approach for evaluating transportation that includes smolts that are transported at the three transportation dams: Lower Granite, Little Goose and Lower Monumental dams. One of the reasons for this approach is that management decisions regarding the onset of transportation across these three dams have historically been made as a combined unit. That is, all three have been transporting or all three have been bypassing collected smolts. Management decisions to date have not contemplated transporting at only a subset of those three dams. Operating a subset of these dams may be a management decision considered in the future, so towards that end we will work toward calculating and presenting dam-specific SARs and TIRs. It should be noted that project-specific SAR distributions are estimated and compared for transported (T_0) and in-river (C_0) SARs in Chapter 4 of the 10 year retrospective report (Schaller et al. 2007). Additionally, we've provided dam-specific transportation SARs in several past reports and are currently in tables B-23 through B-30 in the 2009 report (Tuomikoski et al. 2009). We agree that the information on efficacy of specific dam transportation programs would be interesting and will further work toward that end in future reports.

The model fitting section involves many transformations and data manipulations that may or may not be necessary. Furthermore selection of parameters to estimate such as the median of

log transformed observations and examination of only one model fitting criterion, R^2, is not making the best use of statistical tools developed for that purpose.

RESPONSE

In Chapter 3 of the 2009 CSS report (Tuomikoski et al. 2009) we log-transformed the data on median fish travel time (FTT). This was done to help reduce heteroscedasticity and to better approximate normality in the subsequent regressions, as was stated on page 34 of the report. The analyses that were conducted in the 10-year retrospective summary report (Schaller et al. 2007) indicated that there was heteroscedasticity in the median FTT data when plotted against some of the environmental variables, so we believe that estimating the FTT relationships using a log-transformation was appropriate and necessary.

In Chapter 3 we also estimated instantaneous mortality rates (Z) as –log(Survival)/FTT and fit regressions for characterizing variation in Z. This approach for estimating Z, which can be viewed as a data manipulation of the survival and FTT data, was necessary in order to estimate the instantaneous mortality rates. It was unclear whether the Z estimates needed to be subsequently log-transformed or not, so we based this decision the method that maximized the r^2 values for the predictions on the arithmetic scale, as was mentioned on page 34. Information theoretic statistics such as AIC, AICc and BIC are certainly useful for variable selection in model development and fitting, but are not useful for decisions of whether or not to transform the dependent variable because transformations of the dependent variables change the magnitude of the information theoretic statistics and are therefore not comparable between transformed and untransformed dependent variable data sets. It should be noted that we conducted an extensive and comprehensive evaluation of model development and variable selection using information theoretic statistical methods (AICc and BIC) along with traditional goodness of fit statistics (R^2 and adjusted R^2) in Schaller et al. (2007). The 2009 annual report was primarily focused on updating the model forms that were selected using information theoretic criteria in Schaller et al. (2007) with the new data from the 2007 migration year, as was mentioned on page 35 of Tuomikoski et al. (2009).

For the log-linear modeling tables, presentation of both R^2 and AIC_C values would be useful. The plots of the *Z*-values have considerable scatter. That may be a scale issue, but the plots do not inspire any explanatory confidence.

RESPONSE

When only one model form is presented, the AICc value for that model is meaningless because there is no context. It is only in comparing different model forms with a fixed dependent variable data set, that the AICc values, relative to each other, have utility and meaning. An extensive and comprehensive examination of various model forms based on AICc and BIC was conducted in Schaller et al. (2007) and the 2009 annual report was primarily focused on updating the model forms that were selected in Schaller et al. (2007), as was mentioned on page 35 of Tuomikoski et al. (2009). The presentation of the R^2 values was intended to simply communicate the proportion of the variation that was captured by the various models, updated

with the 2007 migration year data, and was not used for examining alternative model forms, which had previously been done in Schaller et al. (2007).

In Figures 3-18 and 3-19 of Tuomikoski et al. (2009) we present the Z estimates, 95% confidence intervals for the Z estimates, and model-predicted Z values for Chinook and steelhead in the LGR-MCN and the MCN-BON reaches. For the LGR-MCN reach, we believe that the Z estimates and their confidence intervals are relatively precise with only a few exceptions (e.g., the last period of 1998 for wild Chinook and the last period of 2000 for hatchery Chinook). The model-predicted Z values fit the observations well, capturing 35-49% of the variation in Z (Table 3-1). We believe that these plots in Figure 3-18 justify some degree of explanatory confidence. In contrast, the Z estimates and the 95% confidence intervals for the Z estimates for Chinook and steelhead presented in Figure 3-19 have much greater uncertainty. This is due to greater uncertainty in the survival estimates in the MCN-BON reach. Despite this uncertainty, the model-predicted Z values fit the observations fairly well, capturing 25% (Chinook) and 54% (steelhead) of the variation in observed Z values. The question of whether or not Figure 3-19 should inspire explanatory confidence is a subjective one, but we believe that the model predictions, even in the MCN-BON reach, merit some degree of explanatory confidence. Increased sample sizes of PIT-tagged fish are necessary to reduce uncertainty in the Z estimates in the MCN-BON reach. Recent increases in the number of PIT-tagged fish in this reach should help reduce this uncertainty in upcoming years.

Additional justification of Z as a useful statistic is needed. Z gives an instantaneous mortality rate. This is useful as long as the fish's experience in fairly uniform over the period considered. However, if there are intervals where the probability of death differs widely, these may bias the result. Take, for example, the passage through dams. If the time passing through a dam is much riskier than the time spent in the river or reservoirs and if the time passing through dams is always more or less the same, then the experience of passing through the dam plays a larger role in the calculation of Z than when fish travel time is shorter. As a result, the Z value increases even when the instantaneous rate excluding the dams is the same and the risk passing through the dams is the same. Project to project survival rates which may include varying mortality risks but are not confounded by incorporating varying time spans or survival through segments of the life history provide a more informative mortality rate and appear to be more useful measure of the fish's experience.

RESPONSE

We have provided justification of why instantaneous mortality is a useful statistic in Tuomikoski et al. (2009) and Schaller et al. (2007). We stated that the instantaneous mortality approach "provides a useful framework for understanding the interrelationships between instantaneous mortality rates, time, and survival" (page 33). One of the reasons we developed methods to estimate instantaneous mortality rates, which had not been estimated in the Columbia River Basin prior to the CSS, is because the ISAB in their review of the CSS, stated that "an interpretation of the patterns observed in the relation between reach survival and travel time or flow ***requires an understanding of the relation between reach survival, instantaneous mortality, migration speed, and flow****" (ISAB 2003-1, emphasis added). Instantaneous*

mortality rates also serve as a foundational basis for most fisheries population dynamics and assessment models (Quinn and Deriso 1999) and the instantaneous mortality rate approach for predicting survival rates consistently outperformed existing methods for predicting survival rates (see Table 2.4 of Schaller et al. [2007]). We believe that understanding instantaneous mortality rates and the sources of variation in those rates greatly improves understanding of how and why survival rates vary in the ways that they do, and how this variation relates to migration rates and environmental conditions. Therefore we do not understand why the ISAB contend that "additional justification of Z as a useful statistic is needed."

We strongly disagree with the proposition that instantaneous mortality rate estimates are only "useful as long as the fish's experience is fairly uniform over the period considered." As was stated in Schaller et al. (2007, page 15) and Tuomikoski et al. (2009, page 33):

> *If instantaneous mortality rates vary over time, Z represents the arithmetic mean mortality rate over the time period (Keyfitz 1985:18-19). This property of Z may be useful for capturing mortality rates for smolts in the Columbia Basin, which may experience different mortality rates over time. For example, if mortality rates experienced through a reservoir differ from mortality experienced through a dam, then the instantaneous mortality rate Z represents the arithmetic mean mortality rate over that period of migration through the reservoir and dam combination.*

The Keyfitz (1985) results indicate that differences in mortality rates between dams and reservoirs will not "bias the result." Rather, the correct interpretation of Z, which was clearly stated in Schaller et al. (2007) and Tuomikoski et al. (2009), is that the rates represent the arithmetic mean mortality rate over the migration time period. In our application, estimates of Z were presented for the LGR-MCN and the MCN-BON reach, and thus represent the arithmetic mean mortality rate across the combined effects of each reservoir and dam traversed within those reaches. We do not believe that the reach survival estimates and the fish travel time estimates (which are used to estimate instantaneous mortality rates) are "*confounded by incorporating varying time spans or survival through segments of the life history." Rather, the instantaneous mortality rate estimates incorporate any differences in lethality and migration time span between the multiple dams and reservoirs traversed into an arithmetic mean rate. These mean rates are highly informative in examinations of sources of variation in those rates within and across years in combination with estimates of migration rates and their sources of variation within and across years.*

The results from added spill for 2007, relative to 2005, are encouraging. Clearly, if there is virtually no water to spill, as in 2001, then the decision to transport fish is influenced. Interpretations of results that are not significant should be stated carefully. For example on page 72 the statement, "It appears that since transport SARs were only significantly greater than in-river SARs in 2 years for PIT-tagged wild Chinook and Dworshak Hatchery Chinook smolts, and post-BON mortality of transported fish was not significantly less than post-BON mortality of in-river fish, then transportation provides no greater survival advantage over allowing wild Chinook and Dworshak Hatchery Chinook to migrate in-river." Note that "no significant difference" does not translate as "NO effect."

RESPONSE

There is always water that can be directed through spill gates as opposed to turbines, even under the conditions that were present in 2001, but hydrosystem operators elected to terminate spill at all the dams in that year (not just the transportation dams). Low-flow conditions are also present every summer, and summer spill can be provided if hydrosystem operators elect to do so (this has occurred every summer since 2005). The only hypothetical condition when it would not be possible to spill is if the reservoirs were lowered to the elevation of spillway crests, which has never occurred. Decisions as to whether or not to provide spill certainly impact the survival rates of transported and in-river migrants. We agree that caution is warranted when interpreting the results of statistical tests. We recognize that non-significant differences imply either real equality between measurements or a lack of power to detect a true difference that exists due to sample size (i.e., a type-II error).

On page 77 the observation that TIRs decrease as in-river survival S_R increases seems obvious because TIRs are defined in terms of the reciprocal of S_R.

RESPONSE

We have found that for many, the concept is not intuitive and it is of practical management relevance to outline this relationship explicitly. Specifically, changes in in-river conditions and smolt survival are expressed in the TIR. We feel this relationship is important to include in the report because TIRs are used throughout the region to evaluate the transportation program. If TIR is the tool used by managers to evaluate transportation, then they should be made aware of this relationship in quantitative terms. Smolt survival in the barge is approximately 98% and allows little room for improvement but in-river survival could be improved or depressed through manipulation of the hydrosystem, which directly affects the TIR.

In chapter 5 the meta-analyses for TIR and D provided an interesting overview of these statistics. The results are not surprising, but it seems a worthy exercise. Chapters 6 and 7 provide a detailed look at success of fish in specific segments of their migration and in the ocean as well as more detail on the composition of the run. The biological processes involved in D, remain a challenge but it is useful to separate survival estimates for the BON to BON segment and for the BON to LGR segment and display them by return year.

The logistic modeling is extended from the CSS 10-year report to include hatchery and wild steelhead. Chapter 6 also provides the available information on the observations of straying fish and calculates a straying rate for in-river and transported outmigrants. Estimation and interpretation of D and straying are often contentious so a complete review may be necessary at some point in time.

Analyses in Chapter 7 address the extent to which wild Snake River spring/summer Chinook and steelhead population aggregates may be meeting the NPCC (2009) biological objectives. Although the primary objective in this chapter is to update the long-term SAR data series for CSS study fish, there are a few issues that may need more attention, such as partitioning first year ocean survival from SARs and comparing SARs estimated from fish that are pre-assigned to

a strategy prior to release to SARs estimated from fish that are not pre-assigned to a strategy prior to release.

Chapter 8 is a work in progress responding to a recommendation by ISAB/ISRP that the CSS conduct a comprehensive study to determine why the PIT-tagged Snake River wild spring/summer Chinook are producing lower SARs than the unmarked wild Chinook. Chapter 8 notes that because of the challenges inherent in estimating run-reconstruction SARs and properly characterizing the statistical precision of those SARs for unmarked wild Chinook, it remains unclear whether run-reconstruction SARs are or are not lower than PIT-tag SARs. No ISAB review of this ongoing work is recommended at this time, but a future review of more complete work could be useful.

No response is necessary.

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