FISH PASSAGE CENTER

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MEMORANDUM

TO: Rod Sando, CBFWA

FROM: Michele DeHart

DATE: May 5, 2005

RE: Data Request for Historical Operations

In response to your recent data request, regarding historical operations efficiency and management of the hydrosystem for fish passage, the Fish Passage Center staff reviewed historical files, system operations requests and annual reports. In addition you asked about the juvenile migration conditions and operations that were in place to protect juvenile migrants that are making up the 2005 adult spring chinook return.

Most of the returning adult spring chinook migrated as juveniles from the Columbia Basin in 2002 and 2003. In response to a previous data request, the FPC staff summarized the passage data for these years in comparison to the 1998 and 1999 juvenile migration of spring chinook, which would have returned as adults in 2001. The attached graphs show the percentage of the spring chinook juveniles that migrated under the various flow conditions in those years. This is a simple visual representation of the data. It shows that in 2002 and 2003 a significant proportion of spring chinook juveniles migrated in lower than the Biological Opinion target flows. These juvenile migrants comprise the 2005 adult return of spring chinook. In contrast we also display the 1998 and 1999 juvenile migration flow conditions for out-migrating spring chinook. These juvenile migrants would have comprised most of the adult return in 2001.

The differing juvenile migration conditions for the spring chinook that are returning in 2005 and that returned in 2001 were largely determined by the runoff volume in those years. The following table shows the April final forecasts for key sites in those years.

The Dalles and Lower Granite Runoff volumes compared to the average of the 1971-2000 historical record

Year	Actual Jan-July Runoff Volume at The Dalles Average 1971-2000 107.3 MAF	Actual Jan-July Runoff Volume at L.Granite Average 1971-2000 30.0 MAF
1998	104.5 MAF	31.3 MAF
1999	124.1 MAF	36.1 MAF
2002	103.8 MAF	24.0 MAF
2003	87.7 MAF	23.8 MAF

At The Dalles, the runoff volume that occurred in 1998 at The Dalles was 97% of average and was 115 % of average in 1999. At The Dalles, in 2002 the runoff volume was 96 % of average, very close to the 1998 runoff volume. In 2003 the runoff volume at The Dalles was 81% of average.

At Lower Granite, the runoff volume in 1998 was 104% of average, in 1999 120% of average, in 2002, 80 % of average and in 2003, 79% of average. At Lower Granite, the 1998 and 1999 were above average water years, while 2002 and 2003 were below average water years. At The Dalles, 1999 was an above average water year and 1998 and 2002 had similar near average runoff volumes. At The Dalles, like Lower Granite, 2003 was a below average water year.

In our September 2000 comments to NOAA on the Draft Biological Opinion (attached) we commented that the measures described in the NOAA draft were not adequate to meet flow targets and that the 2000 draft Opinion provided less protection for spring migrants than previous Opinions, for spring flows at McNary Dam. Therefore, we were not surprised that the majority of spring migrants in 2002 and 2003 experienced lower flows during their out-migration than the out-migrations in 1999. However 2002 and 1998 had similar runoff volumes yet the spring out-migrants in 2002 experienced much lower juvenile migration flows.

We reviewed the 2002 operations and requests, and on May 14 the agencies and tribes submitted SOR 2002-3 (attached) which requested the use of system flexibility to meet Biological Opinion flow targets, including the drafting of reservoirs. This request was not implemented. Although the runoff volume in 2002 was similar to the runoff volume in 1998 the juvenile migrants in 1998 experienced better flow conditions because the shape of the runoff created higher flows throughout late April and May. In 2002 flows did not increase until late in May, after most of the spring migrants had passed McNary. Reshaping the runoff to provide higher flows to spring migrants would have required utilizing the flexibility of the hydrosystem to benefit migrants, by more drafting of reservoirs as requested by the agencies and tribes.

Spill operations during the juvenile migration can be another source of difference in conditions for 1998 and 1999 juvenile migrants versus 2003 and 2004 juvenile migrants. The following table briefly summarizes the spill operations that occurred at each project during the

spring migration. The 120% spill cap limited spill at Dworshak Dam in 1998, but waivers from the TDG standard were not provided in subsequent years and spill was limited by the 110% standard. The 110% limitation effectively controls the amount of flow that can be shaped from the Dworshak project for flow augmentation.

Notable differences in spill between 1998, 1999 and 2002, 2003 include reductions of spill at Little Goose and The Dalles dams and no spill at Lower Monumental Dam in 2002. Spill amounts at most other projects were affected by testing of different volumes and patterns in 2002 and 2003, versus what occurred in 1998 and 1999.

Project	1998	1999	2002	2003
Dworshak	Spill to 120% TDG	Spill to 110 % TDG	Spill to 110 % TDG	Spill to 110 % TDG
Lower Granite	Surface Bypass Test	98 Supplemental BIOP	RSW Testing	RSW Testing
Little Goose	60 Kcfs for 12 hours	60 Kcfs for 12 hours	45 Kcfs for 12 hours	45 Kcfs for 12 hours
Lower Monumental	40 Kcfs for 12 hours	40 Kcfs for 12 hours	No spill	Testing 40 kcfs for 24 hours vs 50% spill
Ice Harbor	24 hour gas cap spill	24 hour gas cap spill	24 hour gas cap spill	24 hour gas cap vs 50% spill
McNary	12 hour gas cap	12 hour gas cap	12 hour gas cap	12 hour gas cap
John Day	BIOP spill	BIOP spill	test of 60% nighttime vs 30% daytime/nighttime spill	test of 60% vs 45% nighttime spill
The Dalles	Spill Test of alternating 30% vs 64% days	Spill Test of alternating 30% vs 64% days	40 % of instantaneous	40 % of instantaneous
Bonneville	75 Kcfs day and gas cap at night	75 Kcfs day and gas cap at night	test of BIOP vs 24 hour gas cap spill	test of BIOP vs 24 hour gas cap spill

To conclude, out migrations in 2002 and 2003 had poorer juvenile migration conditions than previous years, due to lower run off volumes, the operators and regulators decision not to use flexibility to reshape flows to benefit the migration and the differences in spill conditions and volumes. These are simple observations of differences in migration conditions for these years. There is no attempt to provide a definitive explanation for the low return of spring chinook adults in 2005 which migrated as juveniles in 2002 and 2003, this is simply a description of some of the migration conditions they encountered compared to the better conditions encountered by the 1998 and 1999 out migrants. To summarize:

- The 2002 and 2003 spring juvenile migrants experienced lower than the biological opinion target flows for most of their migration
- They likely experienced decreased spill passage when compared to the 1998 and 1999 out migrants.
- In similar runoff volume years of 2002 and 1998, passage conditions were better for 1998 spring migrants. The agencies and tribes request to utilize system flexibility to improve migration conditions for spring migrants in 2002 was denied.
- There were opportunities to use system flexibility to draft reservoirs to reshape flows to benefit spring migrants.
- The overall approach to the implementation of BIOP measures has been to wherever possible minimize their implementation within the flexibility of the BIOP language.

ATTACHMENT

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MEMORANDUM

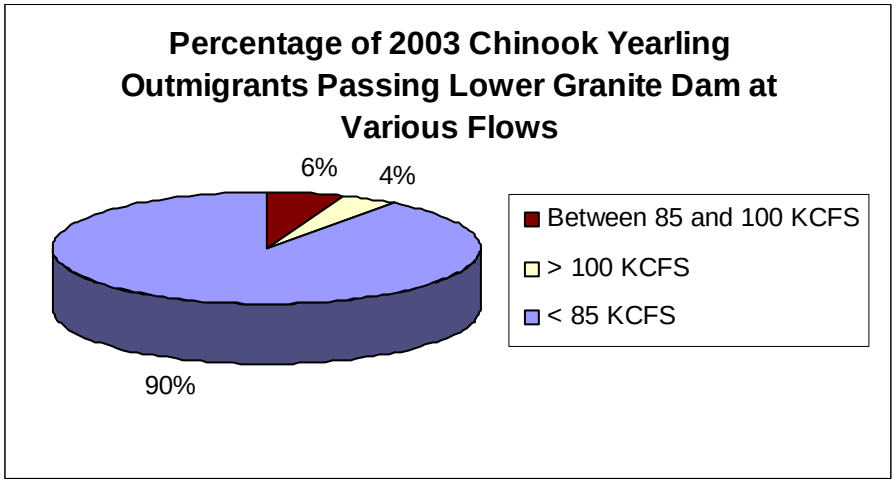
TO: Liz Hamilton

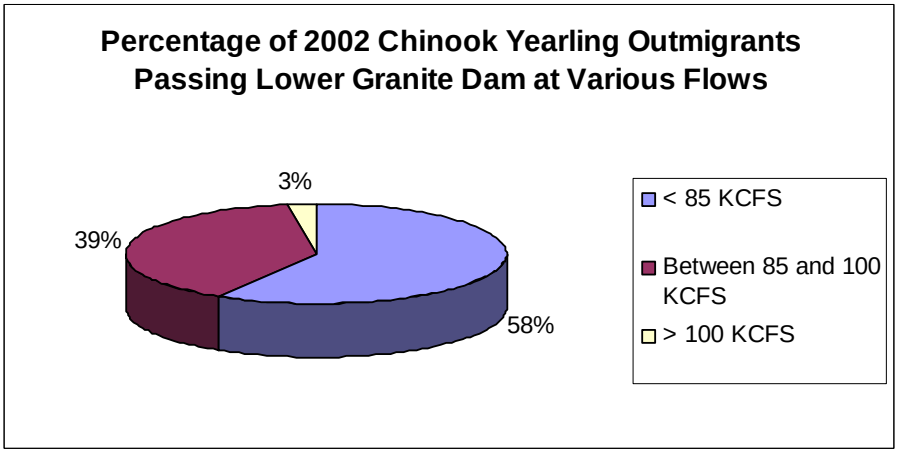
FROM: Michele DeHart

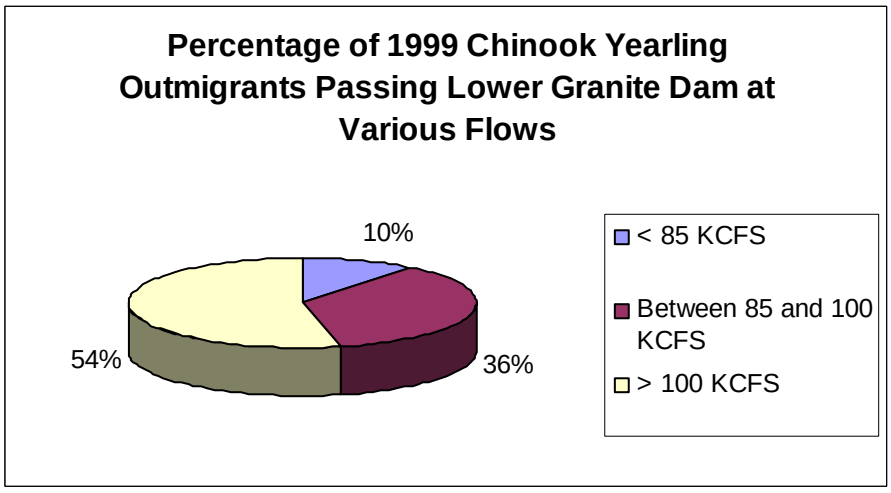
DATE: April 19, 2005

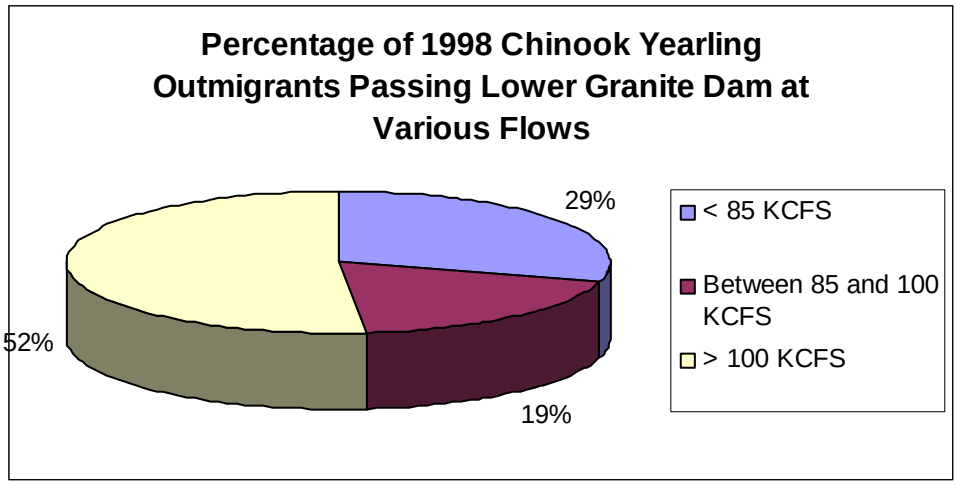
RE: Data Request

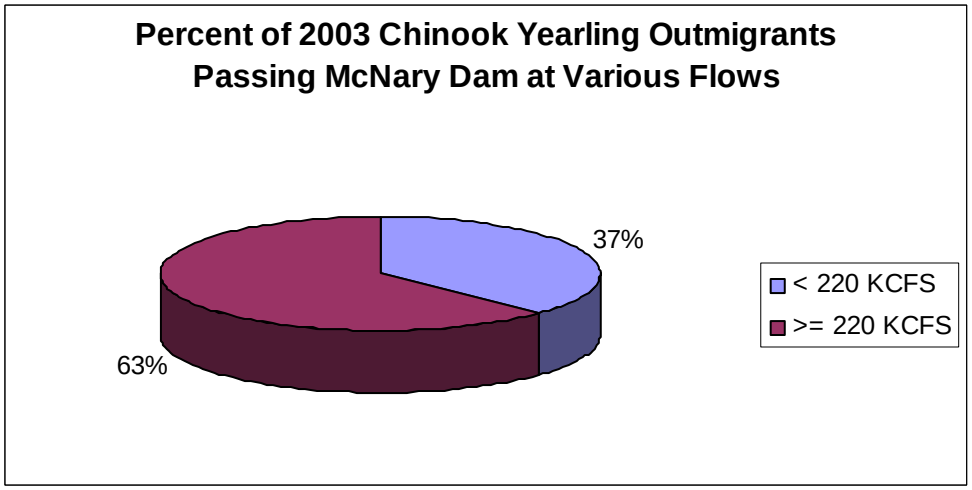
In response to your request we have reviewed the outmigration flow conditions experienced by the 2001 and 2005 spring Chinook adult returns. The 2001 returning adults primarily migrated as juveniles during 1998 and 1999. The 2005 adult return would have primarily migrated during 2002 and 2003. The attached graphs show the percentage of juveniles that migrated under the various flow conditions in those years. Feel free to contact us if you need any further information.

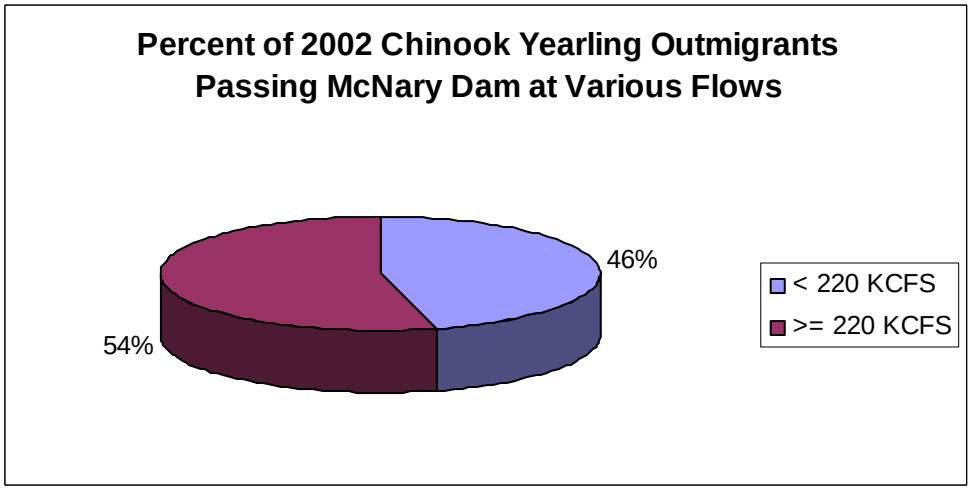

Percentage of 2003 Chinook Yearling Outmigrants Passing Lower Granite Dam at Various Flows
6%
4%
90%
Between 85 and 100 KCFS
> 100 KCFS
< 85 KCFS

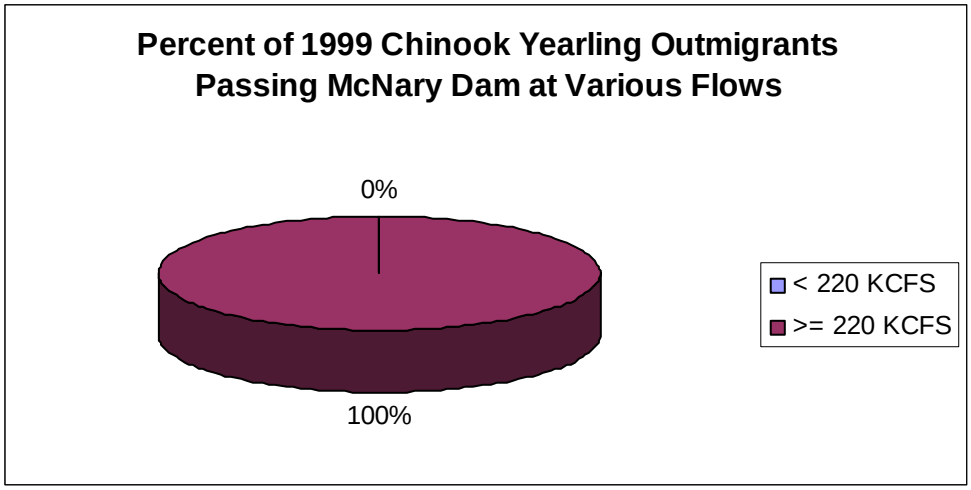

Percentage of 2002 Chinook Yearling Outmigrants Passing Lower Granite Dam at Various Flows
3%
39%
58%
< 85 KCFS
Between 85 and 100 KCFS
> 100 KCFS

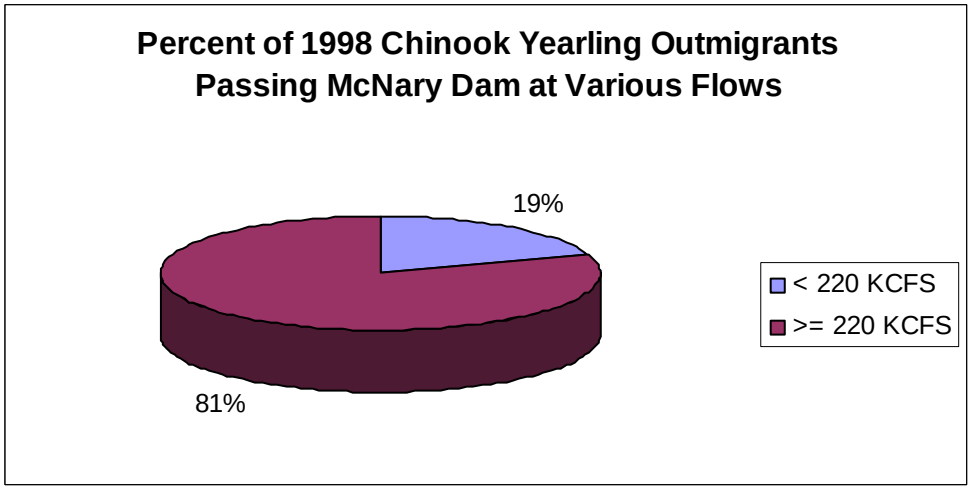

Percentage of 1999 Chinook Yearling Outmigrants Passing Lower Granite Dam at Various Flows
10%
54%
36%
< 85 KCFS
Between 85 and 100 KCFS
> 100 KCFS


Percentage of 1998 Chinook Yearling Outmigrants Passing Lower Granite Dam at Various Flows
29%
52%
19%
< 85 KCFS
Between 85 and 100 KCFS
> 100 KCFS


Percent of 2003 Chinook Yearling Outmigrants Passing McNary Dam at Various Flows
37%
63%
< 220 KCFS
>= 220 KCFS


Percent of 2002 Chinook Yearling Outmigrants Passing McNary Dam at Various Flows
46%
54%
< 220 KCFS
>= 220 KCFS


Percent of 1999 Chinook Yearling Outmigrants
Passing McNary Dam at Various Flows
0%
100%
< 220 KCFS
>= 220 KCFS


Percent of 1998 Chinook Yearling Outmigrants
Passing McNary Dam at Various Flows
19%
81%
< 220 KCFS
>= 220 KCFS

SYSTEM OPERATIONAL REQUEST: #2002-3

- ***The following State and Federal Salmon Managers have participated in the preparation and support this SOR: Oregon Department of Fish & Wildlife, U.S. Fish & Wildlife Service, Columbia River Inter-tribal Fish Commission, Washington Department of Fish and Wildlife, Idaho Department of Fish and Game and The National Marine Fisheries Service.***

TO:	**BG Fastabend**	**COE-NWD**
	William Branch	**COE-Water Management**
	Cindy Henriksen	**COE-RCC**
	Witt Anderson	**COE-P**
	Col. Randall J. Butler	**COE-Portland District**
	LTC Wagenaar	**COE-Walla Walla District**
	J. William McDonald	**USBR-Boise Regional Director**
	Steven Wright	**BPA-Administrator**
	Greg Delwiche	**BPA-PG-5**

Raymond R. Boyce

FROM: **Ron Boyce, Chairperson, Salmon Managers**

DATE: **May 14, 2002**

SUBJECT: Implementation of the NMFS Biological Opinion

SPECIFICATIONS: Provide at least the minimum juvenile fish migration flows specified in the NMFS 2000 Biological Opinion at McNary and Lower Granite Dams, utilizing Grand Coulee, Dworshak and Brownlee operations.

- Meet Biological Opinion flow objectives through drafting of Grand Coulee Reservoir and utilizing the options of reshaping outflows from other storage reservoirs to provide higher flows at Lower Granite Dam and McNary Dams.

JUSTIFICATION:
The re-shaping of outflows and drafting of reservoirs is needed to meet Biological Opinion flow objectives. Presently, flows are below the NMFS Biological Opinion flow objectives and objectives have not been met for most of the spring migration period in the Snake and Columbia rivers. Several discussions have occurred relative to the need to improve migration conditions. However, to-date reservoir operators have declined to reshape runoff volumes to provide migration flows for juvenile steelhead and chinook salmon. Migration flow conditions have resulted in lower flows in the Mid Columbia and Snake Rivers at this time of the year than in the last five years, except for the extremely low flows of 2001 (Figures 1 and 2). The chinook and steelhead migration is underway and has demonstrated delayed timing and passage distributions. Spring migrating juvenile chinook and steelhead experienced the poorest migration conditions in recent history in 2001, which resulted in the lowest in-river juvenile survivals in recent record. Because juvenile salmon outmigrants from a particular year return in several year classes, two

subsequent years of poor outmigration conditions will seriously impact adult returns for several years.

An abundance of smolt monitoring travel time data exists. There is regional agreement that there is a flow/travel time relation for spring migrating steelhead and chinook salmon. Smolt monitoring data for 2002 shows that the low flows which have occurred in the Snake River are delaying the arrival of yearling chinook and steelhead at Lower Granite Dam and together with lower river flows have lengthened the travel time of smolts from Lower Granite Dam to the mouth of the Columbia River. Based on the historic cumulative passage timing plot, the number of yearling chinook and steelhead appears to be less than half of what is expected, through May 12. Historically, the current proportion of the run of yearling chinook would have occurred 15 days ago, and that of steelhead 10 days ago. Smolts have been currently migrating at flows averaging 67 kcfs since the historic 10% passage dates at Lower Granite Dam when Biological Opinion flows should have been 97 kcfs. At present flows the additional travel time expected based on the flow-travel time relation presented in the FPC 2001 annual report, is on average, approximately 5 days for yearling chinook and 6 days for steelhead. Together the delayed arrival into the hydro system and longer travel time of in-river migrating smolts through the hydro system will cause these in-river migrating smolts to reach the mouth of the Columbia River about 20 days later for yearling chinook and 16 days later for steelhead than their average ocean entry period (Figures 3 and 4).

In addition smolt-monitoring personnel at the Lewiston trap have reported a decrease in spring migrant steelhead condition. Past data has shown that steelhead are particularly sensitive to flow conditions and may residualize if migration is delayed.

The attached Memorandum (Attachment 1) of discussions held on May 7, illustrate that a more flexible approach to the operation of Grand Coulee project is possible, with a draft below elevation 1240 feet, which would increase flows at McNary Dam while protecting cultural resources of the Spokane and Colville Tribes. This operation is consistent with anticipated operations in the NMFS Biological Opinion, which states “meeting the spring flow objectives occasionally requires reservoir drafting.”

Options exist for managing outflows and drafting reservoirs to increase flows at Lower Granite Dam. Review of the information available for the Dworshak project (Attachment 2) indicates that flexibility exists to improve the migration conditions in the Snake River for most of May. Project inflows and run off volume information indicates that Dworshak could operate at a flow level of at least 10 Kcfs through most of May, and then reduce outflow in June to minimum while still meeting refill requirements of the Biological Opinion. (CRITFC and the Nez Perce Tribe support the operation of Dworshak in this manner if a high degree of certainty of refill by June 30th can be maintained.)

The Brownlee reservoir is currently (5-13-02, midnight) only 8.6 feet from its full pool elevation. Brownlee outflows over the past week have averaged several Kcfs below inflows: therefore, if Brownlee were to simply pass inflows or provide a moderate draft, several Kcfs of water could be added to Lower Snake and Columbia River flows.

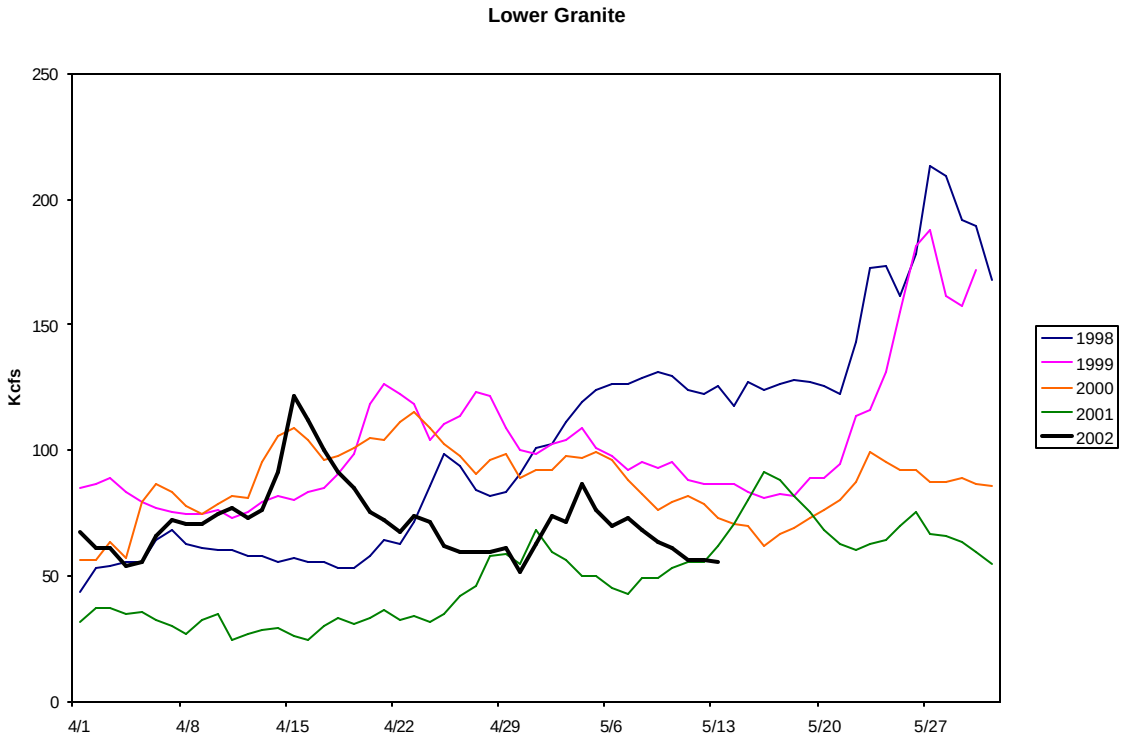


Figure 1. Lower Granite Flows over the last five years.

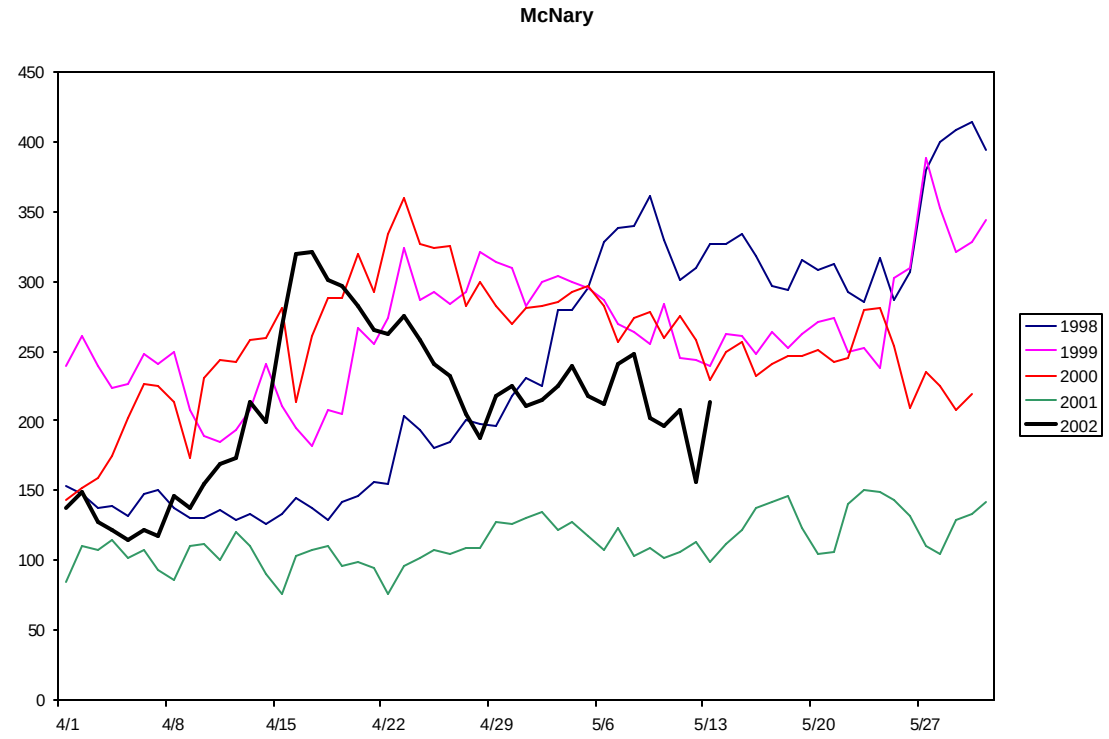
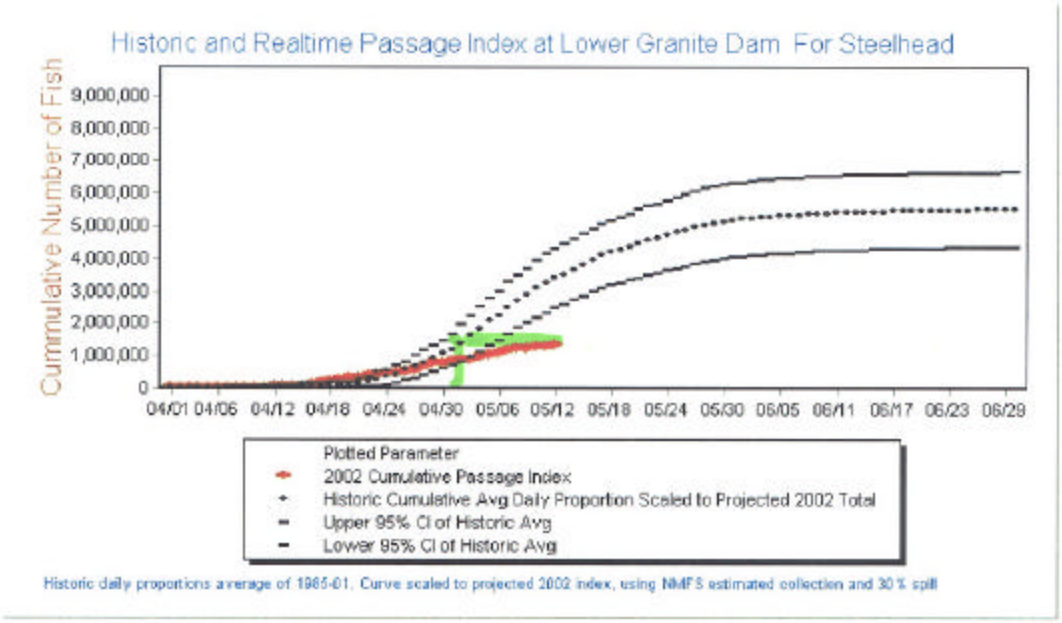


Figure 2. McNary Flows over the last five years.



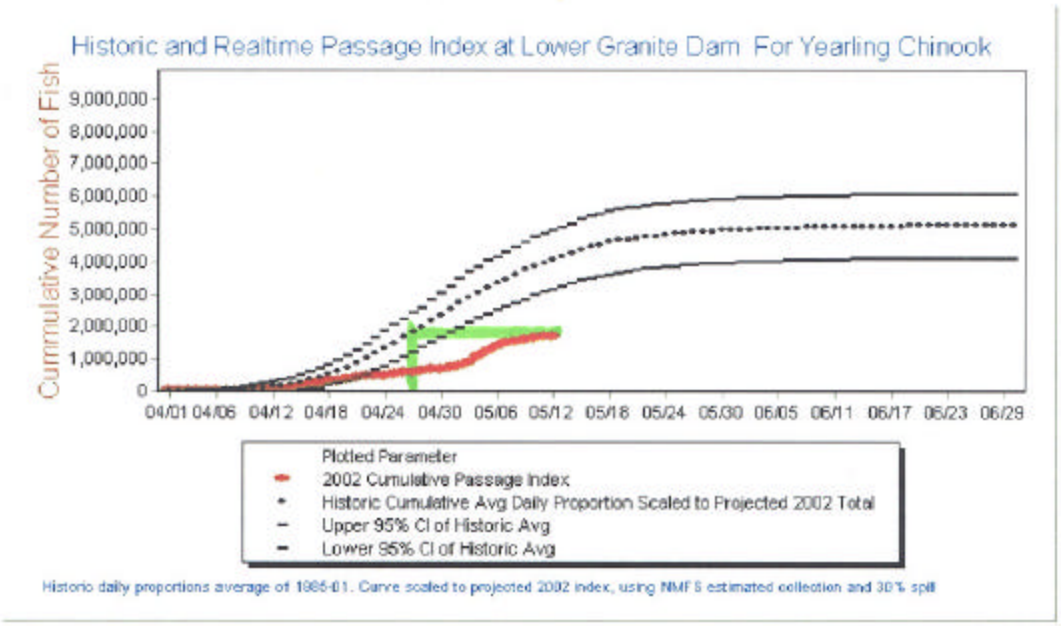


Figure 3. Projected migration delay for Snake River chinook and steelhead.

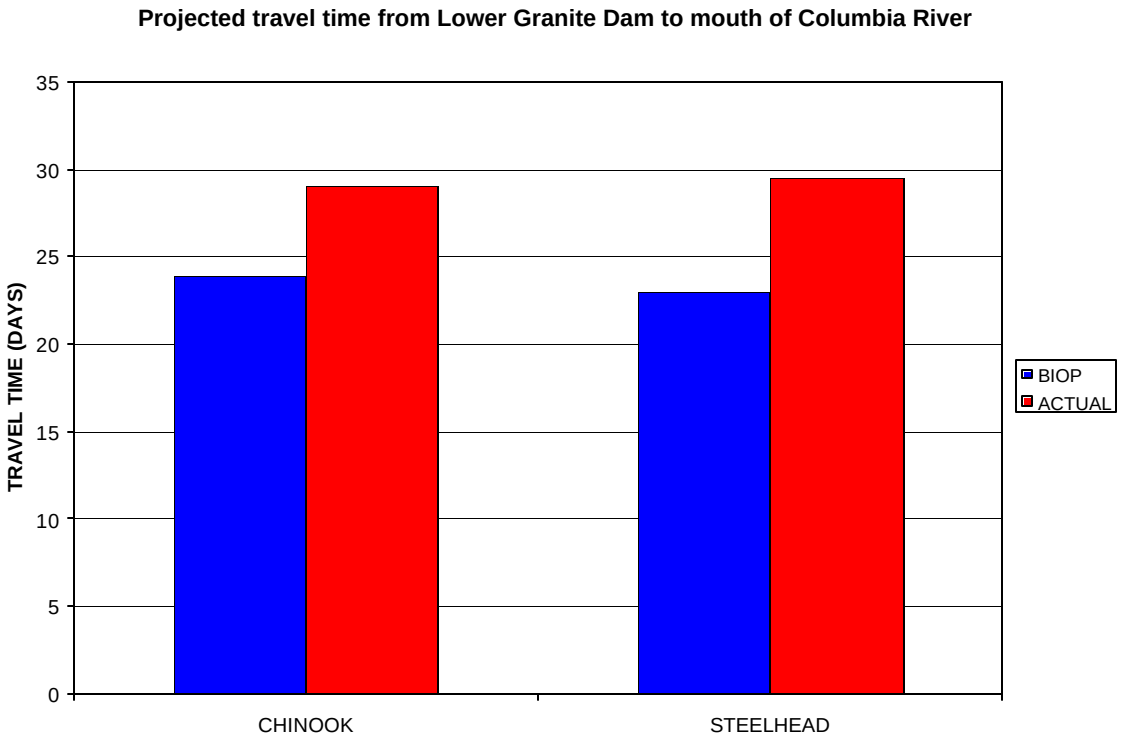


Figure 4. Increase in salmonid travel time at lower flows.

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MEMORANDUM

TO: Jim Fodrea, USBR

FROM: Fish Passage Advisory Committee

DATE: May 10, 2002

RE: Operations of Grand Coulee Reservoir

On May 7, 2002 a joint FPAC and CBFWA Members Management group meeting was held to discuss the current and proposed operations of Grand Coulee project, reservoir elevations and operations. An attendance list is attached.

The group discussed potential solutions to the 1240-foot draft limitation being maintained by the USBR. Because of the cooler than normal weather causing a delay in runoff, the migration flows at McNary Dam have been much lower than the NMFS 2000 Biological Opinion flow target. The USBR has taken and maintained the position that the reservoir should not be drawn down below elevation 1240 feet, even though the runoff volume forecast is large enough to project refill by June 30 with a high degree of certainty. Concern has been heightened since the reservoir actually filled slightly over the past week, while flows at McNary were far below the flow target (see attached memo to FPAC).

Tribal cultural resources representatives from the Colville and Spokane tribes addressed the issue of protection and survey of tribal burial and cultural sites. The tribal representatives explained that they had contracts with the USBR to implement archeological and security surveys of the sites exposed as the reservoir is drafted. The contract that is in place at the present time is limited to surveys that would take place as the reservoir is drafted to elevation 1240 feet. Tribal representatives explained that contract modifications would be required to cover additional costs, of surveys and security patrols if the reservoir is drafted below elevation 1240 feet.

After discussion the state, federal and tribal representatives present agreed to support additional USBR funding through contract modifications to continue to conduct additional archeological surveys and security patrols. The group agreed that the additional funding should be provided to allow the reservoir to draft to elevation 1240 feet through this week and then to elevation 1235 to support fish migration flows at Priest Rapids and McNary dams, although the group recognized that this would likely not provide the flow target flows. The purpose of this operation is to improve migration flows through the mid-Columbia Reach and at McNary Dam by reshaping the timing of flows through the spring migration. The proposed shaping operation would also reduce the likelihood of a high flow event in the Columbia River later in May or early June that could result in high forced spill conditions and exceedence of the state water quality gas variances throughout the river.

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MEMORANDUM

TO: Michele DeHart/Margaret Filardo

FROM: David A. Benner

DATE: May 14, 2002

RE: Dworshak Flow Augmentation

The USACE has provided a volume forecast for the Dworshak reservoir, updated on May 13th, 2002, available on the TMT web page (see attachment). According to this forecast, three April-June water supply forecast scenarios are possible, each with varying degrees of confidence (30, 50, and 70). According to this plot, a water supply of 2965 Kaf has a 70% confidence of occurring; this is the "worst case" scenario that USACE provides on their plot. From USACE calculations, 267 Kaf of water would be available to augment flows (assuming the WSF was 2965 Kaf) from May 13th to June 30th. The 267 Kaf of available water assumes that the entire period would contain a minimum outflow of 1.5 Kcfs and Dworshak would fill. Based on this flow augmentation volume, the following operations scenario has been developed:

Minimum outflows = 2 kcfs from May 13th to June 30th
All extra available water used in last 14 days of May

To bring minimum outflows to 2 Kcfs, the following volume of water would be needed:

Need an additional 0.5 kcfs (above the 1.5 Kcfs) to reach 2.0 Kcfs
May 14th to June 30th = 48 days

0.5 Kcfs = 500 cfs = 43200000 cfd * 48 days = 47603 acre-feet = 47.6 Kaf

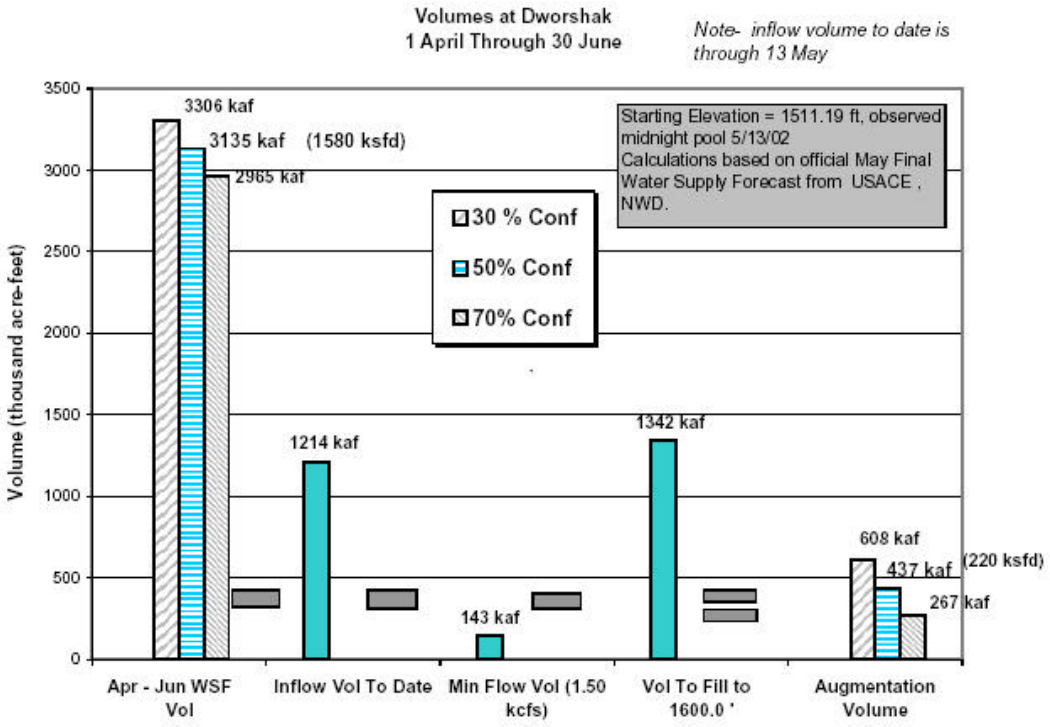
267 Kaf (augmentation volume) – 47.6 Kaf (volume to bring outflows to 2.0 Kcfs) =

= 219.4 Kaf
(Available for last two weeks in May)

219.4 Kaf / 14 days =
= 15.67 Kaf/d = 15671 acre-feet/day = 682647429 cfd =

7901 cfs =
7.9 Kcfs

Therefore, if the above scenario were implemented, a continuous outflow of 9.9 Kcfs (7.9 Kcfs + minimum outflow of 2.0 Kcfs) would be available at Dworshak for the last two weeks in May. It should be pointed out that this is the worst-case water supply scenario that USACE presented in their volume forecast plot. If the best-case scenario were used, 20.2 Kcfs of additional water, beyond the minimum flow of 2.0 Kcfs, would be available in the last two weeks of May.



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MEMORANDUM

TO: Brian Brown, NMFS
FPAC

Michele DeHart

FROM: Michele DeHart

DATE: September 29, 2000

RE: Hydrosystem Operations – Draft Opinion 2000

In response to your request the FPC staff has reviewed the Draft Biological Opinion (Opinion) 2000. We compared the Hydrosystem Operation measures with the Opinion measures presently being implemented and described in the 1995 and 1998 Biological Opinions. We also provide additional comments addressing other aspects of the Opinion, such as spill, the 4H recovery strategy, off-site mitigation, water quality, and the analytical methods utilized.

The fundamental hydrosystem measures do not include major improvements in migration flow measures. On closer inspection, however, it appears that some of the modifications in the Opinion will actually result in less protection for juvenile out migrants. The modifications appear to be designed to facilitate the action agencies hydrosystem operations for other than the protection of listed stocks. The modifications weaken the protection for salmon. The modifications do not improve the original Opinion measures, and in some cases actually reduce the measures.

The Opinion did not include an analysis of the anticipated effect of these measures compared with past years' and there were no technical appendices provided which allowed a comparison of actual projected flow regimes. Because of this lack of resources there was not enough time allotted in the NMFS review period to reconstruct any of the analyses conducted by NMFS of the measures included in Opinion 2000. Consequently, our comments are preliminary.

The most significant difference between Opinion 2000 and previous Opinions is that this Opinion relies almost totally on an undefined, non-specific recovery strategy outlined in the "all-H paper", "Conservation of Columbia Basin Fish". Although this is the lynch pin of

the recovery strategy there are no specific measures. Although the Opinion discusses water quality and temperature, it does not include consultation or reasonable and prudent measures relative to major federal actions and federal agencies impacting habitat. The Federal Environmental Protection Agency has responsibility for oversight of the implementation for the standards of the Clean Water Act. The Bureau of Land Management maintains the land lease-grazing program, which affects tributary habitat and water quality. The U.S. Forest Service manages logging on federal lands. These federal actions should be addressed in this Opinion to begin to pursue the "all-H" strategy. Since these are federal actions, we are confused as to the logic in mitigating the impact of the federal actions instead of more fully mitigating of hydrosystem development and operation. NMFS has clearly identified impacts of federal actions in tributaries, such as water quality and water temperature, that should be mitigated in addition to, not instead of, impacts to the federal hydrosystem.

The conclusion of our review is that the extensive mortality to adult and juvenile listed and unlisted salmonids that occurs as they migrate through the hydrosystem will not be reduced by the Draft Opinion measures. These measures are not adequate to meet flow targets in average and below average flow years. Transportation of smolts does not meet recovery levels for smolt to adult returns. There are no specific "all-H", particularly habitat measures identified, even those managed by federal action agencies. The analytical tools used by NMFS, primarily SIMPAS, do not in any way address smolt to adult returns and recovery of listed stocks.

General Comments

- The 2000 draft Opinion incorporates considerations of additional listed species, sturgeon and bull trout with additional listed stocks of salmon, However, the addition of these new species occurs without additional hydrosystem measures to provide protection to these species beyond the original salmon protection measures. This could result in an overall reduction in the flexibility and probability of meeting salmon protection measures. Adding additional species requirements, while maintaining protection of reservoir elevations leaves the potential that salmon measures will be met less often, particularly in the summer period.
- Although NMFS specifically discusses the available data indicating the requirements for additional summer flow augmentation, there are few hydrosystem measures included to address that need. Little potential for additional summer flow augmentation is provided. In fact, the potential of shifting flow for summer migrants into the fall is introduced by including language in the 2000 Opinion that provides for the cut-off of summer flows if passage indices "decrease sharply". The purpose of reducing flows for summer migrants is to provide flows for **additional** listed species below Bonneville Dam. (Please see the attached memorandum discussing the appropriate use of passage indices). In the instance described in this measure in the 2000 Opinion protection for summer migrants is reduced over past Opinions, which identified August 31 as the end of the summer flow augmentation period. Again, this is an example of forcing species, and or stocks, to compete against one another for the use of limited resources, rather than including additional hydrosystem measures.

- The below Bonneville measures described for the natural spawning of stocks below Bonneville Dam are not adequate and do not reflect the available biological information, (see attached memorandum).
- In general, the 2000 Opinion does not provide adequate flow, and fish passage protection measures in average and below average run-off volume years. The 2000 passage and migration year clearly illustrate this point. Flow targets were not met at all in the summer period, and were not met for a significant part of the spring period. (Attached graphs)
- The spill measures proposed in the Draft Opinion are the same as presently implemented with two exceptions. Spill at Lower Monumental Dam increased from 12 to 24 hour duration, and spill at The Dalles decreased from an instantaneous level of spill equal to 64% of flow, to only 40% of instantaneous. In-season implementation of the Opinion measures can significantly curtail spill in less than average flow years, such as occurred during the 2000 migration season.
- There is no apparent biological justification for reducing the present spill measure at The Dalles Dam. The decision to decrease the amount of spill at The Dalles Dam from 64% of instantaneous to only 40% of instantaneous based on the results of the NMFS survival study is seriously flawed. Differences in travel time of study fish compared to run-at-large migrants suggest that test fish are not representative and thus results of this research can not be used to extrapolate a cost or benefit to overall population of operational changes. Grouping of different species, differences in recapture probability of test and control groups and the lack of power to detect differences in survival given operational changes at the dam could all lead to a false acceptance of hypothesis that there is no difference between 40% and 64% spill. Additionally, based on preliminary data collected in 2000 turbine mortality was greater than, and FGE less than, previously assumed resulting in a greater proportion of fish passing through the turbines.
- The use of SIMPAS modeling to compare alternatives may be biased high by overestimating actual operations such as spill.
- The SIMPAS model was the tool used by NMFS to compare hydrosystem alternatives. This simple spreadsheet model relies on point estimates and a limited range of conditions to reach decisions. NMFS uses fine scale changes in survival throughout the hydrosystem to demonstrate how “aggressive” management actions will improve survival. They project survival improvement via these incremental changes as if the resulting numbers were real fish. NMFS gives all data inputs equal weight; whether the data is based upon reach survival estimates, fyke net experiments, hydroacoustic monitoring, projections, assumptions or professional judgment. This gives the illusion that there are no data gaps for fish survival in the hydrosystem, and that changes of a few percentage points in the output of this model are meaningful for making fine scale management decisions. This oversimplification is dangerous because it does not take into account cumulative, nor delayed effects of the hydrosystem. In addition, no assessments are made in terms of adult survival.
- While NMFS bills their Draft Opinion as incorporating all fours H’s – hydro, habitat, harvest and hatcheries, little is offered in the mainstem habitat for improvements to water quality. The total dissolved gas improvements incorporate only minor

modifications and further study. The Opinion contains no specific measures for improvements to temperature issues, nor does NMFS include consultation with EPA or BLM, who oversee federal actions impacting water quality, such as NPDES permitting and grazing permits.

- For Clean Water Act water quality issues to be meaningful they need to be included as part of the decision criteria with specific measurable goals at the midpoint evaluations for determining whether or not to pursue a breaching path.
- 1999 and 2000 subyearling survival estimates confirm previous years' flow survival relationship for subyearlings to Lower Granite Dam.

Specific Comments

I. FLOW

A. In-season Management

The 2000 Opinion includes general modifications of the Technical Management Team process and a reduction in the state agencies roles in week-to-week implementation decisions. The 2000 Opinion describes a process in which the action agencies implement the Opinion according to an undefined set of criteria. Since the criteria are undefined it is hard to determine what the effect of this will be on actual passage conditions. In the worse case scenario this change in the TMT could be defined as a limitation of fish protection measures. Any available flexibility in system operations could be utilized to benefit power production.

B. Flow management objectives weekly instead of seasonal

Flow management objectives are modified in the 2000 Opinion to be defined as met on a weekly average basis as compared to a seasonal basis in past Opinions. This is a positive change on the basis of good intent, but in practical terms does nothing to improve migration conditions in average and below average run-off volume years as illustrated by the 2000 migration season. (Attached graphs)

C. Sliding scale flow targets based on volume runoff

Previous Opinions established flow targets at McNary Dam for the spring period based upon the January-July runoff volume forecast. A minimum target of 220 kcfs was established for runoff volume years less than 80% of average**. The 2000 Opinion provides less protection than previous Opinions for spring flows at McNary.** The 2000 Opinion includes provision of a minimum flow target of 220 KCFS at McNary in years when runoff volume forecast was less than 85% of average. The effective flow target has decreased for years with runoff volume between 80 and 85%. In addition the 2000 Opinion modifies the basis for establishing the flow target for spring migrants at McNary. The 2000 Opinion establishes spring flow targets on the basis of the April-August runoff volume forecast instead of the January-July runoff volume forecast. This assures that the Action Agencies will have a higher probability of meeting the flow target, but the effective flow target is lower. We simulated the implementation of this measure in past years' and concluded that the only practical difference in operations represented by this measure would be to lower the spring flow target at McNary

Dam. It did not improve the flow target in years when the runoff volume was above average and the system was operated for flood control, it did not improve the target flows in years when the runoff volume was below 80%. It did reduce the flow target when flows were in the average and below average range.

Previous Opinions established the summer seasonal flow target at Lower Granite on the basis of the April to July runoff volume forecast. The 2000 Opinion establishes the summer flow target on the basis of the May runoff volume forecast. **On average this will probably result in a lower summer flow target,** since most often the May forecast declines.

D. Probability of refill to April flood control rule curves

Probabilities of refill are unchanged from previous Opinions. Dates of refill are the same as the 1998 Opinion, which established April 10 as the refill date. This could improve flow in the April 10 to April 20 period at Priest Rapids in average and below average run-off volume years. However, it will not be adequate to meet the flow target.

E. Refill reservoirs by June 30

There is no difference from previous Opinions. Refill by June 30 can shift spring flow augmentation into the summer.

F. Flow targets

There is no difference in **summer** flow targets at McNary, that is to say the Opinion provides no improvement. There is no difference in the **spring** target at Priest Rapids. It is still defined as seasonal rather than weekly as at McNary and Lower Granite.

G. Additional summer flow augmentation volumes

The 2000 Opinion introduces potential additional sources of summer flow augmentation, but only in low water years. Grand Coulee provides 155 KAF of water in below average years at The Dalles. Hungry Horse provides an additional 225 KAF and may be drafted to 3530 feet when the runoff volume forecast at the Dalles is less than 88% of average.

H. Variable Q

Hungry Horse and Libby

Var Q was established in the 1998 Opinion. It can increase spring flows at The Dalles less than 10 kcfs on average for a range of one to 120 days. Libby provides 60% of the flow and Hungry Horse provides 40% of the flow. This reduces the fall and winter draft and, therefore, may impede the ability to provide flows for the Ives Pierce Islands spawning areas.

Grand Coulee

The 2000 Opinion incorporates a Var Q operation for Grand Coulee that was not included in previous Opinions. This operation may result in a small increase in flows at McNary in May and June, but may also result in lower flows in the fall and winter specifically reducing protection for Ives/Pierce islands natural spawners. The Var Q operation at Grand Coulee does not improve flow conditions in April for listed steelhead.

I. Other

Banks Lake

There is a wording change from the 1998 Opinion. The 1998 Opinion referred to reduction in pumping to Banks Lake by 130 KAF, whereas the 2000 Opinion refers to 130 KAF of additional water released into the Mid-Columbia. In either case the effect is the elevation of Grand Coulee reservoir. There is no real difference in the Opinion measures in 2000 when compared to earlier measures.

Hells Canyon Operations

There is no difference in the 2000 Opinion from past Opinions.

Canadian Operations

The 2000 Opinion discusses treaty versus non-treaty operations but there are no proposals or measures, that change the present operations or address an improvement in meeting spring and summer flow targets.

Upper Snake River Basin

There are no improvements or modifications of migration flow augmentation measures in the 2000 Opinion.

Measures to evaluate and adjust the amount of water available to support flow objectives

The 2000 Opinion includes an extensive list of studies to be done by the action agencies. These do not include any actual implementation actions that would improve passage conditions.

II. SPILL

A. Spill Comparison of 95-98 Opinion to 2000 Opinion and 2000 Implementation

The Draft 2000 Biological Opinion essentially repeats all the measures of the 1995 and 1998 Biological Opinion Spill Programs, with two exceptions. Spill at Lower Monumental Dam is increased in duration from 12 hours to 24 hours and spill at The Dalles Dam is decreased from 24 hours at an instantaneous level of 64% to 24 hours at an instantaneous level of 40%. Spill is scheduled to occur to the 120% gas cap at each project during the spring migration with some projects (Ice Harbor and Bonneville) having daytime limits on the amount of water that is spilled, and summer spill scheduled to occur at Ice Harbor, John Day, The Dalles and Bonneville dams.

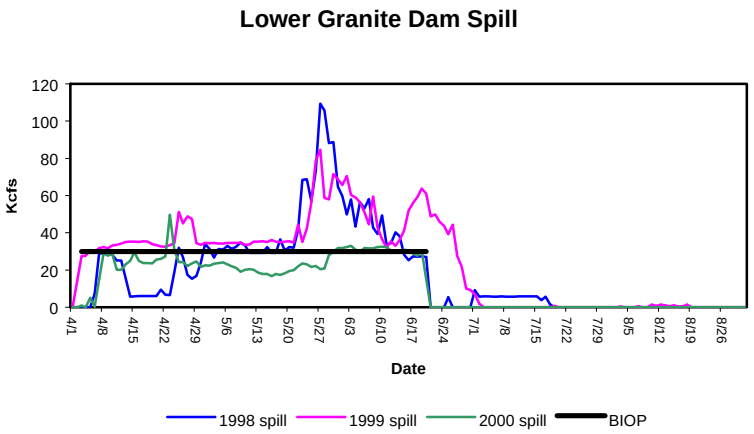
The Draft Opinion does include system actions (page 9-74) to improve the capability of providing spill and these actions are a welcome addition. However, the Draft Opinion does not make the connection between the completion of the activities and the provision of additional spill that was previously limited because of these transmission limitations, i.e. twenty for hour spill at all the Snake projects.

It is difficult to assess the statement included on page 9-83, "To the extent that greater spill duration and/or volumes are required for the purpose of spill evaluation at some projects, efforts will be made to minimize or offset additional effects to the power system." As we have seen in several of the years where surface bypass research has been conducted at Lower Granite Dam, Opinion spill levels have been curtailed because of the research with no additional mitigation added at other projects. While some efforts were made to increase the

duration of spill on a daily basis, the impact on survival is unknown, but likely less than what would have occurred under Opinion spill. On the other hand, part of the decision to reduce spill at The Dalles was tied in with the provision of a daytime test at John Day, and this was further modified by the addition of a daytime test at Bonneville that could only occur on the days when John Day Dam was not spilling. While we appreciate the provision of no net change to the power system, this limitation may preclude the development of the most effective bypass program leading to significant hydrosystem survival improvements.

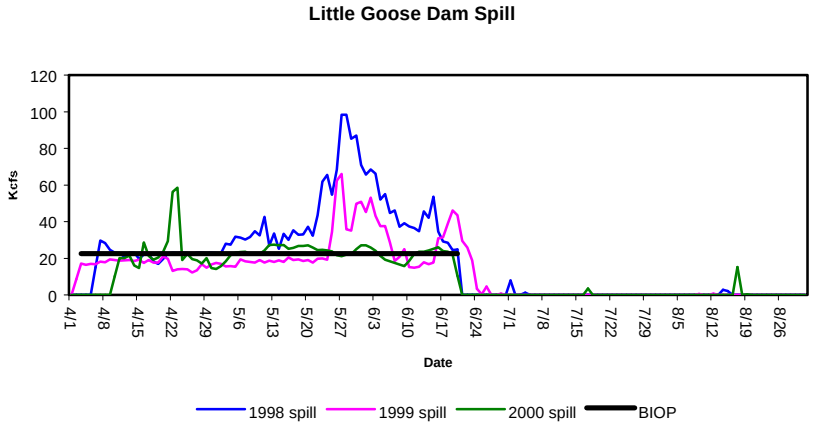
The federal agencies issued the Biological Opinion Spill Program prior to the 2000 migration season. The intent was to implement the new aggressive actions prior to the release of the 2000 Biological Opinion. The results of the implementation of this new aggressive plan were documented for 2000 and compared to the amount of spill that occurred over the last two years. The present high return of adult salmonids is a result of the conditions that took place in 1997-1999. Both 1997 and 1996 were extremely high flow years, with spill levels far in excess of those that occurred in 1998 and 1999 and therefore, only the last two years are shown in the graphs.

LOWER GRANITE



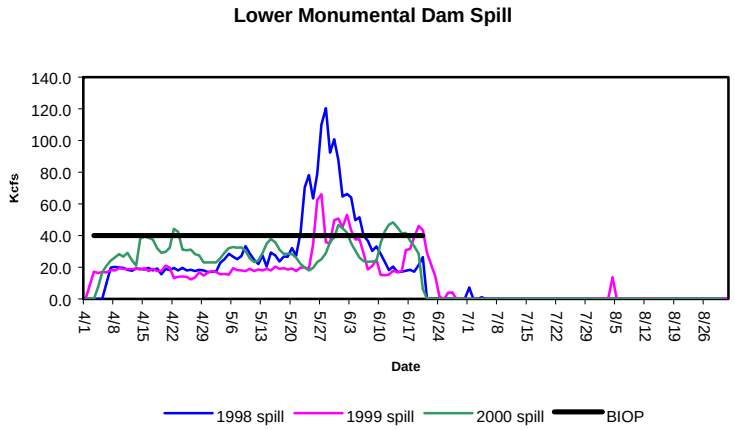
For the last several years, spill at Lower Granite Dam has been dictated by the conditions necessary for the execution of the Surface bypass tests. Most of the spill has occurred during the uncontrolled runoff periods, when flow exceeded the hydraulic capacity of the project. It is hard to determine if this project would have spilled at the proposed Opinion levels in 2000. During periods when the spill was not constrained by research, it appears that spill did achieve the levels specified in the Opinion.

LITTLE GOOSE



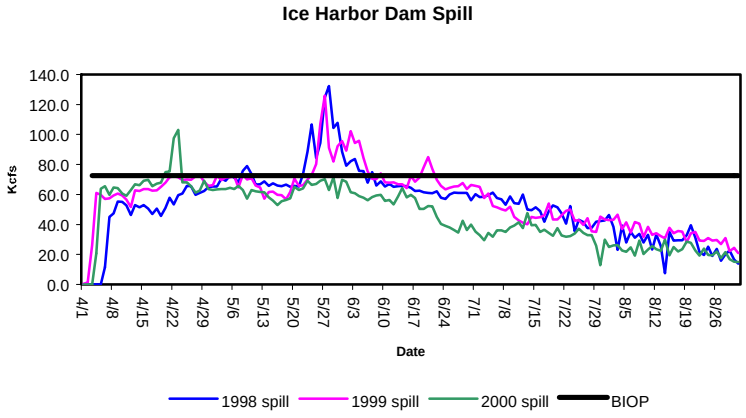
It appears from the information collected that for the most part, spill at Little Goose was near the amount specified in the Opinion for the year 2000. However, spill during the year 2000 was considerably less than occurred in 1998 and 1999.

LOWER MONUMENTAL



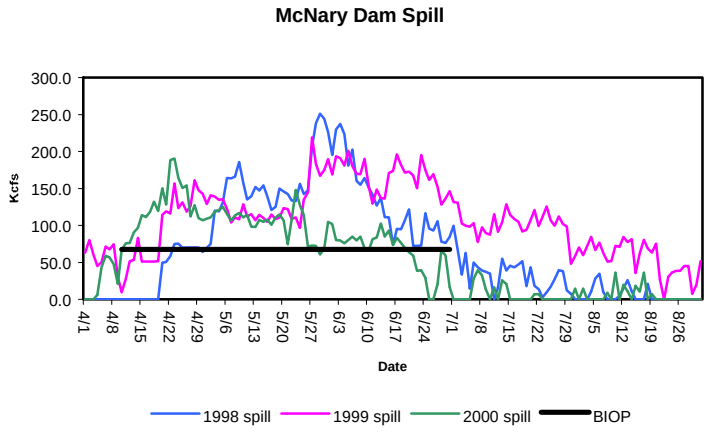
The most significant change to the 2000 Opinion was to change spill from 12-hour duration to 24-hour duration at this project. As can be seen from the graph above the actual provision of spill was far below what was assumed in the Opinion. In actual practice, spill at Lower Monumental Dam was constrained by the COE to affect the total dissolved gas readings at Ice Harbor Dam forebay (to be further discussed).

ICE HARBOR DAM



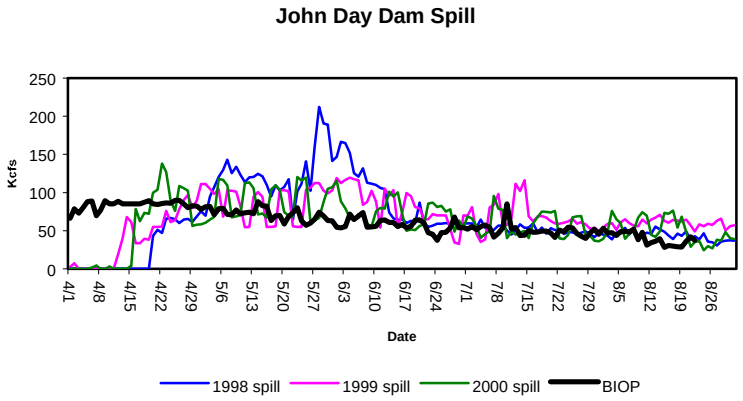
Spill at Ice Harbor Dam was generally below what was included in the Opinion. This was for the most part due to in-season management modifications made to address the forebay monitor readings for total dissolved gas on the Oregon side of McNary Dam. The levels of spill during the summer months are lower than past years reflecting the recommendation made to operate the project at a minimum powerhouse flow.

McNARY DAM



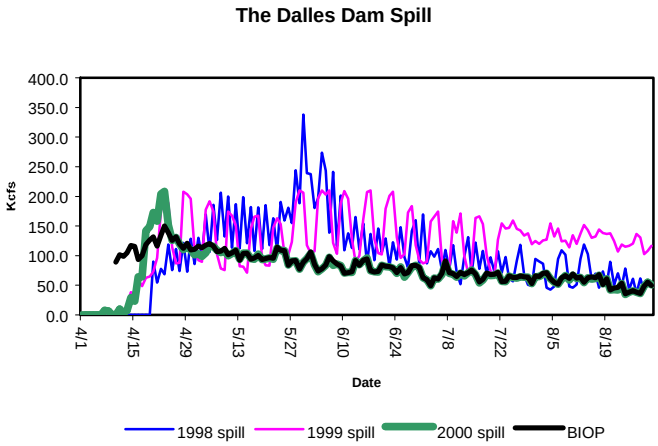
The extremely limited hydraulic capacity of the McNary Project results in spill that usually exceeds the Opinion levels. Spill is mostly uncontrolled and generally extends through the summer period regardless of the fact that no spill is required under the Opinion for the summer period.

JOHN DAY



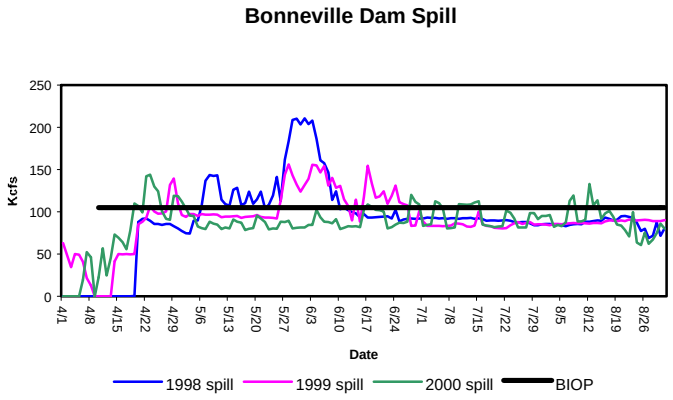
Spill at John Day Dam during 2000 was mostly determined by the conduct of the daytime spill study. Spill levels alternated between the current Opinion levels and increased levels due to the addition of nighttime spill. For the most part spill was at the Opinion levels on off days. However, spill levels in general were less than observed in the past two years during the spring migration.

THE DALLES



Spill at The Dalles was reduced to 40% of instantaneous. In general, the project spilled exactly that amount for the entire spring/summer season. However, the decision to decrease the amount of spill from 64% of instantaneous to only 40% of instantaneous based on the results of the NMFS survival study is seriously flawed. Differences in travel time of study fish compared to run-at-large migrants suggest that test fish are not representative and thus results of this research can not be used to extrapolate a cost or benefit to overall population of operational changes. Grouping of different species, differences in recapture probability of test and control groups and the lack of power to detect differences in survival given operational changes at the dam could all lead to a false acceptance of hypothesis that there is no difference between 40% and 64% spill. Additionally, based on preliminary data collected in 2000 turbine mortality was greater than, and FGE less than, previously assumed resulting in a greater proportion of fish passing through the turbines.

BONNEVILLE



Spill at Bonneville Dam was constrained throughout the year 2000 spill period on the basis of downstream forebay total dissolved gas readings. The net result was that less spill occurred than anticipated by the Biological Opinion. These low levels occurred in spite of the fact that daytime spill levels were increased for the conduct of a spill study this year.

In summary, the 2000 migration period was the first year during that the 2000 Opinion spill program was implemented. Less spill occurred than occurred in recent past years' as a result of the lower flows that occurred this year limiting the amount of excess hydraulic capacity and excess generation spill. Additionally, and perhaps more problematic, less spill occurred than was outlined in the Opinion because of in-season management of the program.

B. Spill and SIMPAS Modeling

Spill was evaluated for the years for which survival values were estimated (1994-1999). The actual levels of spill modeled using SIMPAS for the Opinion, may be based on levels of spill greater than what actually occur in the system under less than average, or near average flow years. The Opinion may overestimate the benefits of spill based on an analysis that "presumes" a level of spill occurs up to the 120% gas cap. In actuality, spill can be managed to significantly less than that assumed in the Opinion.

C. In-Season Spill Management

While NMFS has been the agency that has requested a spill waiver over the past several years (since 1994) the COE has been the agency that has regulated spill levels. NMFS established a very conservative total dissolved gas level in 1994 of 120%. They then went further to add a reduced TDG level of 115% in the forebay. The actual monitoring system and measurements that are taken are problematic. The tailrace monitoring may not be representative of the entire tailrace conditions in most situations, but we have been monitoring these areas for several years and have not identified fish mortality associated with the controlled spill program. Given the biological information considered in the original Risk Assessment, and the considerable supporting information collected since the beginning of the controlled spill program, the continued reliance on the tailrace monitors is appropriate.

The continued use of the forebay monitors is more problematic. The levels of spill that NMFS assumes for the Opinion are those that yield a 120% reading at the tailrace monitors. The spill program is an important part of NMFS' "aggressive" hydro plan. However, in 2000 most of the adjustments of spill have been done on the basis of the forebay monitor at the next downstream project, or in some cases further downriver than the first project. The result was the implementation of a less effective spill program than assumed in the Opinion. The relationship between gas and temperature is defined such that increases in temperature yield increases in total dissolved gas. The forebay monitors often report localized high readings of total dissolved gas coincident with increases in temperature. The temperature in the forebay is affected by the local solar heating that occurs on the surface. Often these monitors read above 100% TDG levels even when no spill is occurring in the hydrosystem. This is particularly pronounced when the turbine flow is increased and warmer surface water is drawn down past the monitors and a reading is taken that is not representative of the water column.

Two things need to be assessed because of this observed inconsistency in the Opinion. One is what the impact of decreased spill is going to have on overall juvenile survival, particularly since NMFS credits increased spill as an important factor in increased juvenile survival estimates. Second, NMFS includes the recommendation for the 115% forebay as a control for spill. **This is not a biologically based criterion**. NMFS should review the efficacy of using this measurement and its impact on the Opinion spill program during years when spill

levels are manageable. NMFS should consider removing reference to 115% forebay TDG in the Opinion.

III. WATER QUALITY PLAN

The 2000 Opinion contains little change to the existing system to actually affect meeting CWA standards. Small modifications to the hydrosystem with respect to adding spillway deflectors and additional studies of divider walls are included for addressing total dissolved gas levels. However, it is already known that while these modifications will decrease total dissolved gas levels, they will not allow the system to meet CWA standards. The 2000 Opinion offers even considerably less for addressing the temperature reductions necessary to meet the standards.

The midpoint evaluations do not specifically address water quality improvements in the system when considering the breaching decision outside of a reference to a vague water quality plan. Certainly if the Opinion is intended to incorporate both the needs of the CWA and ESA water quality improvement must be considered and added in a specific fashion to the criteria for the breaching path.

A. Total Dissolved Gas

The Opinion proposes that the COE should be responsible for acquiring the annual total dissolved gas waivers from the Water Quality Agencies. While this recommendation is appropriate based on the COE's role in building and operating the dams, as well as managing the spill program, the COE has repeatedly taken the position that they will not apply for the waiver. Consequently, NMFS should remain vigilant and assure the continuity of the waiver for the spill program.

In section 9.6.1.7.2 there is a proposal to develop a Water Quality Improvement Team (WQIT) of senior policy analysts. We recognize the need to address both the requirements of ESA and CWA and recognize NMFS attempts to incorporate a water quality plan in this Opinion. However, we oppose the recommendation to create an additional committee. A more appropriate alternative to address the defined need of melding CWA and ESA would be to add additional water quality policy members to the existing Implementation Team. It would be counter-productive to create an additional committee that would work in isolation of the IT, or because of the need to include ESA considerations would require members of the IT to participate in the WQIT. The latter situation would stretch the already limited resources of the state fish and wildlife agencies, potentially limiting their ability to participate meaningfully. Again, the intent of this recommendation would best be met within the existing framework.

B. Water Temperature

The water temperature criteria are routinely violated in the present system configuration. The Dworshak flow augmentation water has been has been used as optimally as possible to address multiple problems in the Snake River. The Opinion allows for continued maximization of this water. This water alone does not begin to address the issues of temperature in the hydrosystem. The water temperature section of the Opinion only contains the addition of three actions relative to temperature. Two of these actions are modeling

activities, while the third is for data collection for the modeling activities. While we do no disagree to some extent with the development of the models for planning purposes, the present Opinion falls short in its recommendation for temperature improvement.

IV. SIMPAS

A. Inappropriate Use of SIMPAS for Management Determinations

In Appendix 2 of the Draft 2000 Opinion NMFS writes "Although there may be uncertainty about the accuracy of the resulting pool and dam survival estimates, the BET and NMFS found that the model output for the years 1994-99 was reasonable and produced reach survival estimates similar to the empirical estimates. Once the model was calibrated to data for the current operation, the BET and NMFS considered it had a reasonable base case from which to make comparisons of additional model studies over a range of water conditions represented by water years 1994-99 of potential future juvenile fish passage actions (see **Table 9.3-3** for SIMPAS model results of aggressive RPA hydro actions)."

This description of model calibration using terms such as reasonable and similar do not adequately describe any variability, any degree of uncertainty about the data generated by the model nor how well it fits the data used to calibrate it. Nowhere does NMFS show how model was calibrated, or how well the data fit the calibration. It is difficult to judge the efficacy of using this model.

B. Specific Comments on SIMPAS

- PATH identified in-river survival as a key uncertainty in their modeling process. Accordingly, the PATH team suggested that "well-planned" experiments needed to be developed to answer questions about passage model assumptions. These experiments have not been developed nor have the questions been answered by SIMPAS. Rather, NMFS has enveloped SIMPAS in assumptions, replacing any lack of data with "professional judgment".
- The SIMPAS model was calibrated based on five (fall chinook) to six years of data. These six years 1994 to 1999 are the years in which flows were near or above normal in terms of water storage and flows. Except 1994 which might be considered a low flow year.
- Project survival is fixed. Survival is not linked to flows. In other words, flows of 100 kcfs in the lower Columbia would contribute the same survival benefit as 400 kcfs.
- Assumptions are not tested. For example, survival estimates from Snake River are projected for the lower Columbia where data is not available. Thus, equal per mile survival is assumed for all segments of the river. No attempt is made to provide alternative analyses for other possible assumptions. For example, the effect on hydrosystem survival if per dam survival differed by 10 in the Lower Columbia is not considered.
- Turbine survival is also fixed. The possibility that turbine survival as measured is inaccurate due to bias in study design, or due to an error in professional judgment, and how this would affect system operations and survival is not addressed. The Dalles

Survival Study in 2000 reported turbine survival near 80% based on PIT-tag recapture data. A study at Little Goose in 1996 using PIT tags reported 86% survival. NMFS should test the assumption that turbine survival might be lower.

- NMFS assumes that the Minimum Gap Runner Turbines will improve survival. NMFS attributes a 2% increase in turbine survival to these turbines. How is this justified? What evidence is available and how much confidence should be placed upon those data.
- At The Dalles, SIMPAS shows the greatest improvement in dam passage survival (for spring chinook) will occur over "existing conditions" where survival from 90.8% to 97.8% under "aggressive mix" option. This represents a 7% improvement in dam passage survival which would translate to a project survival improvement from 90.8*0.983 = 0.8925 under existing conditions to "aggressive mix" (0.973*0.983) yields a project survival of 0.956. This improvement is achieved by increasing spillway survival to 98% by reducing spill proportion from 64% to 40%, and by increasing sluiceway survival from 94 to 96% (by repositioning the outfall). But research results from 2000 show spillway survival at approximately 94%, while turbine survival dips to 80%. The resulting improvement might be 0.929 for dam survival, while overall project survival would reach only 0.913. Are these numbers statistically different? Probably not, but NMFS ignores variability and uses these data points to evaluate what direction management should take.
- These numbers don't appear to reflect a significant improvement in survival. Indeed, it is unclear how the 98% spillway survival is achieved under the 40% spill option. Again, it is unclear if NMFS relies on best professional judgment.
- SIMPAS is tuned to a data set (1994 to 1999 PIT-tag survival data) and then partitioned according to professional judgment. But data are tuned to fit the base case. In situations where data do not fit (Lower Monumental) data are scaled to fit. A true test of the model is quite difficult if it is both tuned to, and used to, calculate conditions for the data from which it is created.
- All numbers in the model are treated equally, whether those numbers are empirical (based on reach survival estimates), calculated (derived by partitioning a survival estimate into parts for each parameter identified (e.g. NMFS uses a survival estimate from the Lower Snake River to determine a per mile survival, then projects that to the lower river projects)) or based on professional judgment. These numbers are entered into an equation, and the result is used to compare assumptions and assess improvements.
- The danger of this approach is that it gives a false sense that the data are all of uniform value. This illusion is carried through to the point of developing hydro-system survival for Snake River, Mid-Columbia ESU's of chinook and steelhead. But these endpoint survival numbers only range (in NMFS Opinion) depending upon the RPA option chosen. No statistical analysis of variability is provided to give a sense of the precision of the estimates. It's hard to imagine comparing 92% survival at a particular dam versus 96% survival then explain how this improvement will affect adult returns.
- A mortality improvement" (0.001 per pool) factor is used for comparing existing conditions to "aggressive hydro options". Presumably this is a flow benefit to survival that is only applied to management actions and not to climatic conditions. This means

that a naturally wet year would not improve survival, yet if NMFS calls for aggressive flow targets that would translate to survival benefits to fish. Given that NMFS often does not meet flow targets during water supply years like 2000 it is unclear how they can assume a benefit to this type of management action.

- NMFS has used the SIMPAS model to produce precise estimates of survival improvements for individual actions based on incomplete data. For example, the projected benefit in the Risk Assessment for spilling to the 115/120% TDG standard is estimated at 5.7% for spring chinook using the SIMPAS model. Given the amount of uncertainty within the model assumptions, such an estimate gives the illusion of precision and accuracy. A better approach would be to develop error bounds on the estimates and to determine relative improvements.

VI. SPECIFIC COMMENTS ON SPILL REDUCTION AT THE DALLES

In 2000 spill was greatly reduced at The Dalles Dam. The NMFS 1995 to 1999 Opinion called for 64% spill during spring migration to provide for safe passage of juvenile salmonids. However, based upon survival research conducted at The Dalles Dam from 1997 to 1999, NMFS has chosen to reduce spill to 40% this year. According to the study results, NMFS finds no significant difference in survival of fish released at 30% spill versus fish released at 64% spill. In fact NMFS shows a slightly lower, though statistically insignificant difference in survival for juvenile salmon released in the forebay of the dam versus reference release groups in the tailwater. From this study result NMFS has recommended decreasing spill at the dam. We have conducted a detailed analysis of the NMFS study and have found serious flaws in both the study design and the analysis. Based on an analysis of NMFS data and new research results for 2000 the reduction in spill is not justifiable.

A. Review of The Dalles survival study

The Dalles survival study was reviewed by the ISAB, who stated in their summary response "The studies of 1997-1999 did not include all relevant factors influencing the mortality of juvenile salmon...". They were not critical of the conduct of the study, but their description agreed with our finding, that there was a great deal of variability in the survival data when compared to physical conditions at the dam

B. Specific comments on TDA survival study

- The NMFS survival study at The Dalles Dam does not support the conclusion that spill should be reduced from 64% to 30%. This is in large part because the test condition is not adequately defined in the test relative to the mortality mechanisms that are hypothesized to occur. The NMFS analysis is not adequate to determine an optimum spill condition or a change in spill measure.
- The 1998 test of 30% versus 64% in the spring of 1998 did not produce statistically significant differences in survival between spillway and sluiceway at 64% or 30%. The 30% versus 64% condition was only tested in 1998 under 1998 conditions.

- Although a statistically significant difference occurred in the summer period test of the 30% versus 64% condition, fish utilized in the test came from two separate sources. Test fish in the first half of the test were collected at Bonneville Dam and transported **upstream**, 45.5 miles to their release at The Dalles and the fish in the second half of the test were collected at McNary and transported 100 miles **downstream** to their release point at The Dalles. While the composition of the samples may be the same regardless of whether they are collected at Bonneville or McNary dams, the samples certainly differ physiologically between the two collection points. Review of the data shows that the lowest survivals occurred in the second half of the test.
- The 1997 test results for summer migrants were reviewed relative to the volume of water spilled. It appears that survival averaged 84% for groups that passed in spill volumes less than 200 kcfs; while survival averaged 98.3% for the groups passing in spill volumes above 200 kcfs.
- A detailed analysis of spring 1999 data showed a pattern of increasing survival among 3-day blocks of releases suggesting a handling effect that would bias results.
- A consistently higher recapture proportion was found for daytime release groups than nighttime release groups. This had more to do with operations at Bonneville at the time when fish arrived at that downstream project, than any operations at TDA.
- Travel time analysis of Spring 1999 groups showed that arrival at Bonneville was always protracted for test fish compared to reference release groups; suggesting differences in distribution of these migrating groups which would violate the assumption of homogeneous migrating conditions for reference and test fish.
- The grouping of coho and spring chinook in release groups was inappropriate because their recapture probabilities were significantly different, especially when time of day of release was taken into consideration. The proportion of coho used in each group varied seasonally (with generally low numbers early in season, higher numbers as coho increased, then declined again as coho numbers decreased). Also, the relative proportion of coho varied between forebay and tailwater release groups within a given release date.
- The travel time of run-at-large fish detected at both John Day and Bonneville dams was 6h to 10h shorter than mean travel time for test fish through this same reach.

C. Implications of 2000 Study Results

If we were to accept the NMFS approach to decision making based on the TDA research results and SIMPAS analysis, it could be concluded that spill return to 64% based on new data collected in 2000. The 2000 data suggest that overall survival at the project may be lower than in previous years due to changes in survival and FGE at the project under the new lower flow regime. Using SIMPAS model inputs from BET "existing conditions for spring chinook with 64% spill" and inputting results of 2000 research with 40% spill, the dam survival was equal under both scenarios. If you consider the delay caused by decreasing spill and the resulting mortality due to predation in forebay (which the SIMPAS model does not account for), the result would undoubtedly be higher survival for the 64% spill scenario.

D. Conclusions

Differences in travel time of study fish compared to run-at-large migrants suggest that test fish are not representative of run-at-large migrants and thus results of research can not be used to extrapolate a cost or benefit to overall population of operational changes evaluated in that research.

Grouping of chinook and coho could bias results as unequal proportions are used in test and control groups.

Large differences in recapture probabilities between day and night release groups demonstrate the importance of arrival time at Bonneville in calculation of survival. Differences in arrival timing at Bonneville of test and control fish could affect their recapture probability and therefore this may bias survival estimates.

Variability of data suggests no power to detect differences in survival given operational changes at the dam. This could lead to a false acceptance of hypothesis that there is no difference between 40% and 64% spill. Coupled with biases and questions regarding the study, this study has no application in determining small differences in survival at The Dalles.

Research to-date does not justify reducing spill. The NMFS Opinion states that spill is the preferred route of passage and bases this statement on a good deal of research conducted in the last 30 years. However, NMFS has made an exception to this rule at The Dalles and based it upon PIT-tag research that is seriously flawed. Without a definitive result from that research showing that the benefits of 40% spill outweigh those of 64% spill NMFS should choose that management alternative that is most protective of the fish. At The Dalles that means providing the higher spill level.

VII. Subyearling Survival

A review of subyearling survival estimates based on data collected in 1999 and 2000 from acclimation pond releases to Lower Granite Dam, show that subyearling survival was over 65% when flows were above 60 kcfs and dropped to 54% when flows averaged 41 kcfs.

	Big Canyon Creek AP (KM 57 in Clearwater R)			Pittsburg Landing AP (KM 346 in Snake R)	Captain John Rapids AP (KM 263 in Snake R)	
	1999 June 3	2000 June 1	2000 June 23	2000 May 26	1999 June 5	2000 May 20
Survival	0.667	0.695	0.540	0.648	0.902	0.723
90% date	8/7	7/3	7/15	7/2	8/4	6/30
AvgFlow	86.1	60.8	40.9	65.8	85.9	70.5

Note: 90% date of passage at Lower Granite Dam is computed from set of fish from given release that had been detected at both Lower Granite and McNary dams.
AvgFlow is the flow averaged over period from day of release to date of 90% passage at Lower Granite Dam.