

COLUMBIA RIVER REGIONAL FORUM
TECHNICAL MANAGEMENT TEAM
2008 Year End Review
November 21, 2008

FACILITATOR'S SUMMARY NOTES ON FUTURE ACTIONS

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Notes: Robin Gumpert

The following notes are a summary of issues that are intended to point out future actions or issues that may need further discussion at upcoming meetings. These notes are not intended to be the “record” of the meeting, only a reminder for TMT members. Most presentations were accompanied by Power Point or other electronic information. Please go to the agenda on the TMT web page to see more detailed information.

2008 TMT YEAR END REVIEW

Please note that all power point presentations shared during the Year End Review can be found attached as links to the agenda on the COE's TMT web page:

<http://www.nwd-wc.usace.army.mil/tmt/agendas/2008.html>

Conditions Review

Weather: Kyle Dittmer, CRITFC, provided a memo and presented an overview of 2008 weather. He reported that the past year experienced La Nina conditions, that there was a long storm in December with rain and flooding and a mid-January arctic blast. Spring was dry but with a lot of accumulated snow pack. Conditions were moderate through the summer and into fall. Overall, temperatures were moderate. Likewise, overall precipitation was near normal, with 95% of “normal” precipitation overall at The Dalles. Looking ahead, Kyle reported that the oscillation index indicated the region will experience another La Nina winter which suggests cooler conditions and near normal precipitation. Kyle noted that additional 2009 climate forecasts can be found on the Oregon Chapter of the American Meteorological Society's website:

www.ametsoc.org/chapters/oregon/index.html.

- *Comment:* The Boise area has experienced a unique pattern of high precipitation in the surrounding mountains but very dry conditions in the lower areas – should this pattern be expected in the future? Kyle responded that the entire Northwest has experienced ‘zig zag’ snow trends, indicating a similar pattern to that in the Boise basin. This could be an effect of overall climate changes, and may continue as a trend.

Water Conditions: Cathy Hlebechuk, COE, and Jim Adams, COE, provided an overview of water runoff and water quality conditions from 2008, as compared to previous years. Cathy noted that The Dalles January to July runoff was 92% of normal and April-August was 100% of normal. Lower Granite Jan-July runoff was 92% of normal, and Apr-Aug was 106% of normal. Lower Granite spring-summer flows exceeded the objectives; neither objective had been met in 2007. The McNary spring flow objective was 237 kcfs and actual flows were 287 kcfs; the summer objective was 200 kcfs and actual flows were

173 kcfs. The Priest Rapids spring flow objective was 135 kcfs and actual flows were 168 kcfs. Jim Adams reported on water quality conditions, noting that because of the high flows in the Snake River this year, the system experienced 515 TDG exceedances, the second highest in 10 years. The degree of each exceedance was not reported on today, but that information can be found through the TMT web pages. Finally, Jim reported that for 2009, since the COE does not anticipate to be operating under a 'rollover' requirement from the court, the COE plans to manage water quality at each project per its respective state requirement(s).

- *Question:* Gas bubble trauma had been detected this year in fish in the Clearwater: Is this due to higher TDG levels at Dworshak? While the COE did not have direct information to respond to the question during the meeting, the Fish Passage Center offered that signs of gas bubble trauma had increased subsequent to sustained elevated levels of TDG, but not beyond NOAA's and the State of Idaho's criteria for acceptable limits. **ACTION:** It was suggested that data on gas bubble trauma detections be added to future TMT Year End Reviews.
- *Comment:* Dworshak operations were successful this year due to cooler water temperatures in the Snake; the relative proportion of flow from the Clearwater and Salmon that was greater than from Hells Canyon; and expert in-season management by the COE in coordination with TMT. All TMT members were congratulated for their efforts in successfully managing temperatures in the system again this year.

Fish Conditions:

Paul Wagner, NOAA, reported on juvenile fish conditions for 2008. He presented a comparison of 2002 and 2008 data at Lower Granite to show how the shape of runoff volume can affect fish runs by comparing two years with similar runoff volumes but different shapes. The runoff shape for 2008 was rather unique, with a later runoff timing than usual. Yearling chinook and steelhead showed a later peak this year than 2002, while sockeye run timing was similar for both years. Paul also showed data for Bonneville, showing that runs for both steelhead and yearling chinook peaked later in 2008 than 2002. Paul said the information might suggest that steelhead and yearling chinook may have been impacted by the pulling of the fish screens in the late spring due to high debris. Finally, subyearling passage run timing at McNary looked very similar in 2008 as in 2002.

- Paul suggested that good outmigration and ocean conditions in 2008 indicate good runs for 2009 and 2010 for coho and chinook – based on a tool NOAA has developed that interfaces ocean conditions with salmon run predictions.

Cindy LeFleur, Washington, reported on 2008 adult fish conditions. All adult runs were moderate to strong this year – particularly strong were sockeye (including a high Snake River component of the sockeye run), while summer steelhead were moderate (however, the summer steelhead "B" group run was high and contained a good wild component). Preliminary counts for fall chinook show a lower actual than predicted run. Cindy provided additional information in a handout, which is linked to today's agenda on the TMT web page.

- *Comment:* This report depicts strong runs that indicate hope and positive reinforcement of the work we have done to improve the health of these populations. The same cannot be said for lamprey. The numbers in the Snake basin are very dismal this year, with counts of about 35 fish at Lower Granite.

TMT should be mindful of the lamprey as we manage for all resources. (The COE responded that they have been studying and discussing lamprey with the Tribes and are committed to future work on the lamprey program – and like the Tribes, want to see improvements in lamprey.)

- *Question:* NOAA's tool showed 2005 ocean conditions in the 'red'. How well do adult returns respond to that? NOAA uses coho and spring chinook as indicators of the strength of all anadromous runs, but it is not as clear how the survival of other salmon stocks correlates with these ocean conditions. Also, the analysis is not as simple for all fish as it is for coho.

Specific Operations Review

1998-2008 Juvenile Spring-Summer Fish Review: Jerry McCann, Fish Passage Center, reported on juvenile steelhead, wild yearling chinook and subyearling chinook spring runs. He noted that more juveniles were transported in 2008 given the late runs (although fewer subyearlings were transported this year than in 2005). He also showed that late May to mid-July survival estimates were relatively high compared to the 10-year average, including the latest run in mid-July, which showed 75% survival. High flows and spill volumes combined with cooler temperatures provided good conditions for in-river migrants. Steve Smith, NOAA, also showed survival data, and discussed a data anomaly that showed up at the McNary-John Day reach, depicting 107% survival followed by the John Day-Bonneville reach, depicting 74.7% survival. Steve described how this could happen, and suggested that the statistical errors at both projects, overall, became a 'wash' in terms of total survival percentages for the Snake River trap to Bonneville reach. The combined survival estimate was 46% for chinook and 48% for steelhead. The estimated percentage of juvenile spring Chinook transported this year was 54% of the wild and 45% of the hatchery spring Chinook and 50.5% of the wild and 46% of hatchery steelhead. It was also reported that spill and bypass passage showed similar survival percentages and in some cases, bypass survival was higher. This result was not seen 10 years ago.

- *Question:* What about holdover fish? In this analysis, they were counted as mortalities.
- *Question:* Were there impacts to survival from cormorants at the Ice Harbor-McNary reach? Yes. Mortality from avian predation was 5% at a minimum, and has ranged from 4-21% over the last 10 years. The percentage of take goes up when more fish are transported. *Comment:* It is important to note that the condition of the smolts plays a factor in tern predation – injured fish are more likely to be preyed on. Also, terns usually prefer steelhead for their size and spawning location, but prey switching could influence the mortality figures.
- **CONCLUSIONS:**
 - Low spill (high transport) years result in lower survival results, in part, simply from fewer fish in the river.
 - The estimate of in-river survival would have been higher if bypassed fish had been returned to the river.
 - The converse is also true: the estimate of in-river survival increases with increasing spill through indirect effect of reducing individual vulnerability to predation. Direct or indirect effects of increased spill may not improve smolt to adult survival for the population.

Bonneville Debris and Guidance Screen Removal: Dan Feil, COE, reported that the timing and volume of runoff in 2008 led to high debris build up at Bonneville, which caused descaling in juvenile fish. Due to the TIE crane being out of service, the gantry crane was used to remove and clean the screens. Using the gantry crane for this purpose was a much more time consuming and less efficient method than had the TIE crane been functional and available for use. Once debris load increased to the point of being unmanageable, the COE and TMT made an adaptive management decision to remove the fish guidance screens on May 21-23. Screen re-installation began on June 16 and was completed on June 18. Once the guidance screens were removed, some fish continued to enter the juvenile fish bypass system. However, de-scaling was much reduced.

- **LESSONS LEARNED:** The TIE crane is an essential component necessary for cleaning the vertical barrier screens. Updated guidance protocols are needed for future high debris events – these are being developed through FPOM and will be included in the 2009 Fish Passage Plan. Actual survival impacts on juvenile salmonids passing the dam is unknown at this time, however survival estimates with screens in vs. screens out may be available from the acoustic telemetry survival study conducted at the project during the season.
- *Question:* How effective was your ability to guide the fish with flow vanes? *Response:* The acoustic telemetry study conducted this year should provide fish guidance efficiency information during the time the screens were in place.
- *Question:* Have coordination issues around the project operators' work schedule, which played a factor this year, been resolved? *Response:* The holiday schedule issue (the incident occurred over Memorial Day weekend) has been resolved; the 4-day work week issue (also a factor this year), will require longer term resolution.
- *Question:* What were the impacts to lamprey? *Response:* The COE did not enumerate the type or number of fish mortalities that occurred. In addition, there are currently no tags of appropriate size that can be used on juvenile lamprey, so estimating the survival of juvenile lamprey as they pass COE dams in the context of operational impacts is not feasible at this time.

Lower Granite MOP and Adult Trap Operations: Dan Feil, COE, also reported on a specific operation at Lower Granite. As adult passage and brood stock collection efforts at Lower Granite increase, additional water is needed to maintain hourly refilling of six adult holding tanks, which requires the project to operate outside MOP. While MOP + 1.3 was granted this year, trap operators have reported that this is still not enough water to fill all six tanks. Are there remedies available to provide hourly refill of all six tanks without impacting MOP? Were all six tanks needed or used this year? What are the impacts of more frequent fish transport? While several questions could not be answered today, the group discussed next steps and possible solutions:

- Next step: More investigation of what would be needed to fill all six tanks.
- Next step: More investigation of fish facility redesign – this will happen through FPOM and FFDRWG.
- Possible solution: Pump water in to fill the tanks.
- Short-term solution being investigated by the COE: Fix the leaks in the system.
- Long-term solution: Complete re-design of the fish facility.

- **ACTION:** Dan Feil will gather more details about what happened this year, and provide that information for discussion with TMT at a January or February meeting.

Little Goose MOP/Lower Granite Tailwater Navigation Issues: Paul Wagner, NOAA, reported on an issue that came up in late August in the Snake River, requiring an in-season management decision to balance needs at multiple projects for adult passage and safe navigation. The salmon managers recommended a constant spill at Little Goose as opposed to a percentage of spill, which was implemented and resulted in less wave action and safer navigation. No negative impacts to adult passage were observed.

- **LESSON LEARNED:** This operation provides an example of a successful, adaptive management decision that was made through consensus at TMT.
- **Next Steps:** Paul Wagner will do a more in-depth inquiry into any impacts to adult passage from the operation that was implemented. The COE will check with Bernard Klatt to determine support, from a navigation perspective, of including this operation into written guidance for future years. TMT will use this information to discuss the issue in early 2009, well in advance of the need to make an in-season decision.

McNary Summer Transportation: Paul Wagner, NOAA, reported that barge transportation navigation requiring McNary to shut off spill at intermittent intervals had very little effect on overall spill volume at the project. Also, 350,000 fish were transported from July 16-August 15 via barge, and at this time Paul did not have information on how transporting these fish as juveniles affects the rate at which they return as adults.

- **Action:** Paul will look further into this issue and report back to TMT in early January.

Reservoir Operations Review

Libby Summer Operations: Joel Fenolio, Seattle District COE, shared an overview of summer operations at Libby. He highlighted the sturgeon pulse that was implemented per an SOR from the multi-stakeholder Kootenai Valley Resource Initiative; the peak 2445 feet summer elevation that was reached rather than refill – due to an unpredictably cold June, dropping July flows and the desire to avoid a ‘double peak; and the Libby/Arrow storage swap that exchanged 60 ksf to Libby on August 12 and was returned to Arrow later in the year.

- **For Future Consideration:** For any future Libby/Arrow swap, the COE would likely use forecasting tools to target flows rather than target a strict elevation.
- **2009 Operations:** The project’s current target is elevation 2435 feet by the end of November, and based on a 104% of average forecast, the project will target 2411 feet by the end of December. Summer operations will likely see a new draft target of 10 feet from full by the end of September, which could impact flexibility of summer operations and the potential for a swap.
- **Comment:** Regarding pre-season forecasts: It is important to the salmon managers to understand how the COE sets its December targets using pre-season forecasts. How does the COE’s forecast compare to other forecasts? *Response:* Pre-season forecasts are developed and used because, while there will be no

impact on fish, there is value to move water into November and December for other resource (power) uses.

Albeni Falls: Joel Fenolio read a statement on behalf of Lynn Melder, Seattle District COE, who has been the lead on the Albeni Falls project for the COE. She noted that this year's operation met a successful refill and drawdown, that great working relationships and smooth coordination occurred in and outside the COE and because of this, good process was brought to the TMT.

Dworshak Operations: Steve Hall, Walla Walla District COE, summarized three operations at Dworshak this year – high runoff volumes that changed during spring refill, the Grand Coulee/Dworshak shift, and a regulating outlet (RO) outage that challenged summer operations. While primary operational goals were successfully met, they offer lessons learned for future consideration.

- **Lesson Learned:** Forecasts can change abruptly, and if the change is extreme enough to warrant a change in operations that will impact fish manager requests, the COE and TMT should look more closely at the forecasts and determine the best decision for moving forward. **Needs/Next Steps:** Additional funding for additional snow stations could assist in getting a more complete picture of conditions for making critical operating decisions at Dworshak. **Next Steps:** The COE will take steps to better coordinate RFC ESP forecasts before presenting them to TMT in the future.
- **For Future Consideration:** The COE would like to develop additional guidance for decisions around if and to what extent a Grand Coulee flood control shift can be achieved that would still allow the COE to reach its April 15 flood control target elevation, given the amount of water in the system and the Dworshak release capacities. High flow years such as 2008 would likely be excluded from shifts.
- **Comment:** Walla Walla COE was acknowledged for their hard work coordinating Dworshak operations this year, given the RO outage. A request was made for the COE to have a contingency plan in place in the event that this issue arises again, so all can be prepared.

Hungry Horse Operations: John Roache reviewed the 2008 Hungry Horse operations, noting that the inflow volume was 112% of normal for the January to July period, and of that, most of the volume was pushed into May-July. Refill came late, on July 13.

- **Question:** Why is the minimum so much higher than the natural flow?
Response: This is a requirement for Columbia Falls minimum for bull trout, and to maximize the habitat requirement. A more detailed response would come from Brian Marotz, Montana, who was not available today.

Grand Coulee Operations: John Roache continued with a review of Grand Coulee operations: The project hit its April 10 target elevation of 1244.5 feet, and refill began on May 16, reaching 1290 feet on July 14. Lake Roosevelt drafted to elevation 1280 feet on August 31. An SOR was presented last spring to provide additional storage from Grand Coulee, if necessary, in order to maintain a minimum flow at McNary of 180 kcfs until the freshet arrived. There was some concern that when Grand Coulee

reached its flood control elevation on April 30 then started passing inflow that there would be a sudden decrease in lower river flows. This interfaced with the need to maintain a minimum elevation for a ferry crossing the reservoir. The conditions were such that meeting both operations was a challenge – and both needs were met successfully.

- **Next Steps:** John Roache and Tony Norris, BPA, plan to investigate the ferry concern further and explore alternative options for future events. One possible solution is to use an alternative ferry landing at a lower elevation, if needed. The Action Agencies have also been exploring options to extend Grand Coulee's flood control draft into May by a week or so based on forecasts of unregulated flow at The Dalles and timing of the Initial Control Flow (ICF) Date. It was noted that an abrupt velocity change is the biggest concern for the migration. All agreed that working through these issues well in advance of the need to make operational decisions will support success.

Concluding Observations:

Weather conditions being cool and wet, for the most part, were favorable for FCRPS operations and good survival this year. A late runoff and structural issues posed in-season management challenges. Overall, the following conclusions and future considerations were offered throughout today's Year End Review:

- With more extreme weather patterns, consider looking at mid-month flood control forecasts (RFC or NRCS), at least for TMT discussion. Perhaps look at patterns within forecasts?
- Congratulations to TMT for handling the Bonneville screen and debris issue so well – a unique constraint was presented, and TMT responded quickly and with innovation, resulting in improvements to the situation. Putting in screens that can handle frye would also address lamprey. A solution is being planned for 2009.
- Investigation is underway on MOP at Lower Granite and impacts to adult holding facilities – an answer will be presented in early 2009 about whether this year's operation should be included as guidance in the 2009 Fish Passage Plan.
- NOAA is still considering transportation operations at McNary during the period mid-July to August, and whether transportation is of value to the smolt-to-adult returns (SARs).
- ESP forecasts at Libby may help in future summer operations. A new draft level may impact a future Libby/Arrow swap.
- High water years create constraints on Dworshak in releasing water, due to TDG concerns. The issue of how much Dworshak/Grand Coulee flood control shift should be provided in a high water year needs to be addressed. These issues warrant further review and perhaps more written guidance.
- Be cautious with use of early forecasts.
- Continue discussions to ease flood control/refill issues. Possible data needed – SNOTEL.
- RO issues are being resolved for 2009.

- Chum should be a year end review topic, set up as a special meeting. TMT would discuss chum criteria, system capabilities, management options, study needs and support needs.
 - **ACTION**: DS Consulting will help coordinate a chum meeting between TMT and FPAC and perhaps others, sometime before the end of January.
- **ACTION**: TMT will look at the list of ‘needs more improvement’ from this year’s review at a meeting in the New Year and set a course for making those improvements.

Thank you to all the presenters who took the time to put together very good presentations from which everyone could learn and benefit.

NOTE: All power point presentations from the TMT Year End Review can be found linked to the agenda on the TMT web page. Thank you all for your participation!

**Columbia River Regional Forum
Technical Management Team 2008 Annual Review
November 21, 2008**

1. Introduction

Today's meeting was facilitated by Donna Silverberg (DS Consulting) with representatives from COE, NOAA, USFWS, BPA, BOR, NPCC, FPC, CRITFC, the Nez Perce Tribe, Idaho, Washington, Montana and others participating. The focus was on lessons learned in 2008, which were addressed in the context of each presentation, not as a separate agenda item. What follows is a summary (not a verbatim transcript) of the discussion and issues raised during the review. Anyone with questions or comments about these notes should provide them to the TMT chair or bring them to the next regular TMT meeting.

2. Conditions Review. *What were the water, weather and fish conditions that existed throughout the year? How did this year compare to others? Is there something we can learn from this? Anything unique that bears sharing?*

A. Weather. Kyle Dittmer (CRITFC) gave a retrospective of weather conditions in 2008 and predictions for 2009. He distributed handouts and showed TMT statistics that are linked to this item on today's agenda.

This has been a highly unusual year in terms of wet and dry weather. Autumn started out wet, with a record-setting 36-hour storm on Dec. 3, then an arctic blast in mid-January. Mountain snowpack accumulation continued heavily throughout March, while weather in the valleys was more typical. Then the weather turned drier than normal in summer. September was very dry, and The Dalles had only about 90% of normal precipitation with the dry spell included, although 2008 is a La Nina year.

Conditions for 2009 look good, and sunspot activity suggests continuation of the La Nina trend – a good sign for ocean conditions that are beneficial to fish. Sea surface temperature forecasts by NOAA suggest cool conditions in 2009. Using 20 analog years, Dittmer did a regression forecast which he then compared with other forecasts from the National Weather Service. CRITFC's latest forecast for 2009 is 109 maf, 102% of normal, while the River Forecast Center's latest forecast is 102 maf, 95% of normal. Dittmer predicted winter will get off to a cold, early start. At the recent annual weather forecasters' conference in Portland, a wet spring was predicted, unlike the drying trend of 2008. We could see an extended cold snow season in 2009, following the La Nina trend for temperatures to be colder than usual. The last la Nina year, 1999, was a very good one for fish. Dittmer noted a general trend for snowpack accumulation to follow a stairstep pattern where it used to be smoother; perhaps this is an effect of climate change. In general, we can expect to see more wet and dry extremes. A long-term dry trend in a La Nina year like 2008 is highly unusual.

B. Water. Cathy Hlebechuk (COE) reviewed flow objectives vs. actual runoff volumes for spring and summer 2008, and then Jim Adams (COE) reviewed water quality in 2008 as measured by total dissolved gas levels and water temperatures. Hlebechuk presented graphs, linked to today's agenda, depicting objectives and actual flow volumes for McNary, Lower Granite and Priest Rapids. She also presented a chart comparing annual observed runoff volumes for 2006-2008, as compared with flow objectives for dams on the Columbia and Snake.

Lower Granite outflows peaked in May. {Editor's correction: The spring objective was 100 kcfs and actual flows were 99 kcfs.} The summer objective was 52 kcfs and the actual flows were 57 kcfs. The flow objectives were met, unlike 2007 when neither the spring or summer objectives were met. Editor's correction: For McNary the 2008 spring objective was 260 kcfs and actual flows were 287 kcfs; the summer objective was 200 kcfs and the actuals were 173 kcfs, so the spring objective was met but not the summer objective. Last year, the McNary spring objective was met but not the summer. For Priest Rapids the 135 maf objective was met in both 2007 and 2008. The spring and summer objectives were both met at Lower Granite this year, with 99 maf actual for spring (the objective was 85 maf) and 57 maf for summer (the objective was 52.5 maf). Last year, neither of the objectives for Lower Granite were met.

Jim Adams discussed total dissolved gas levels and water temperatures throughout the 2008 spill season. He presented a series of tables and graphs, linked to today's agenda, that show temperature and TDG comparisons. The total number of exceedances in 2008 was 515, the second highest in the past 10 years. This was the result of high flows for a month and a half that caused exceedances all along the Snake River. Over the same 10-year period, most of the exceedances occurred at the Camas Washougal gage. In 2008, there were 55 exceedances at the Ice Harbor forebay and 54 at Lower Monumental gage. During a two-day spill episode in early May 2008, TDG levels on the Snake went as high as 132% as a daily average. By contrast, there were no involuntary spills in 2007, and the COE was able to manage flows to the spill caps for the entire season. In 2008, 400 of the 515 TDG exceedances were due to spilling past the spill caps during high flows; in 2007 that number was zero. Of the exceedances in 2008, 64 were due to professional uncertainty, as compared to 93 in 2007. When the river is running high, it's possible to record 15 exceedances at one gage in a single day, Rudd Turner (COE) pointed out.

Jim Ruff (NPCC) asked about symptoms of gas bubble trauma in fish during periods of high flows and high gas. When TDG levels were 130% at Lower Monumental Dam, about 12% of the fish sampled showed increased symptoms, but these did not exceed NOAA criteria, Margaret Filardo (FPC) reported.

A change in water quality regulations will affect 2009 operations but didn't affect 2008 operations, Adams explained. In 2006 the state of Washington issued new regulations calling for an average of readings from 12 consecutive hours.

The previous TDG calculation method, still used by Oregon, takes the average of the 12 highest values from 24 instantaneous readings from midnight to midnight for each hour that day. The Washington method can result in a higher number of exceedances when flows are high. When managing flows close to the spill cap, a small difference in TDG calculations will increase the number of exceedances. Adams presented a statistical example in which using the Oregon method resulted in 513 exceedances, while using the Washington method for the same flows at the same location resulted in 550 exceedances. The COE intends to analyze more thoroughly why this is occurring.

Because 2008 was a rollover operation, the COE continued to use the old methodology this year. Beginning in 2009, the COE will manage spill according to the requirements of each state. Gages that are strictly in Washington will be managed using the new methodology. For gages on the Columbia that border Oregon and Washington, the COE will apply both methods and set spill caps based on the method that shows the higher TDG level. There was discussion of whether the number of exceedances could actually decrease in 2009 because it is not a rollover operation, meaning that readings from the Camas Washougal gage, where most of the exceedances occur, will not be included.

In terms of water temperatures, 2008 was a cool year. Outflows at both Lower Granite and Little Goose remained below 68 degrees F, which is unusual. In previous years, Dworshak outflows of 43-45 degrees F were needed to cool the river. However, releases from Dworshak have been around 48-50 degrees F throughout most of 2008.

C. Fish. Paul Wagner (NOAA) and Cindy LeFleur (Washington) gave presentations on juveniles and adults, respectively. Wagner presented a statistical comparison of 2008 to 2002, a year with equivalent runoff volumes at the Snake and Columbia projects. Runoff in 2008 at Lower Granite was 24 maf, or 106% of average; in 2002, it was 20 maf. 2007 was unique in terms of runoff, with a bump in late March, and again in late May-early June. In 2008, the April-August runoff volume at The Dalles was 93 maf, 100% of average. In 2002, it was 93.8 maf, 95% of average.

There were big peaks in yearling Chinook passage at Lower Granite on May 7 and May 20. In 2002, yearling Chinook passage peaked on March 16 and May 3. In general, when the flows came, the fish came. Yearling Chinook results this year were confounded by the effect of pulling the Bonneville fish screens in May when they became clogged with debris. Steelhead passage season in 2008 was very short and almost two months later than in 2002, when steelhead passage was more protracted. There was a big steelhead peak on May 7, 2008, but the numbers fell off quickly after May 18, while in 2002 the steelhead migration continued in large numbers until June 2. Apparently, steelhead were more affected by the pulling of the Bonneville fish screens this year than were yearling Chinook. Sockeye did very well in 2008, with the last outmigration at Lower Granite occurring from May 7-28. The sockeye passage timeframe was similar in 2002, occurring from May 5-23.

Although runoff patterns were similar in 2002 and 2008, there was a significant difference in when peak passage time for subyearlings occurred. This year the peak was June 5, but subyearling passage was over by July. In 2002, there were peaks on July 1 and July 21, almost a month later than this year. Subyearling passage at McNary was almost identical in 2002 and 2008, peaking from June 25 through July 8-9 in both years, which is remarkable given that the two years had different flow shapes. Apparently, subyearling passage at McNary is quite consistent. This year offered them good ocean conditions, and overall outmigration was good, which bodes well for runs in 2010, Wagner predicted.

In 2008, WDFW predicted 270,000 adults upriver spring Chinook destined for locations upstream of Bonneville Dam, but the actual count was a little less than 180,000 adults, Cindy LeFleur reported. However, a strong jack return this year indicates that 2009 could be a good year for these fish. Summer Chinook also did well in 2008, with 55,000 compared to a prediction of 52,000. Sockeye returns were way under-predicted – 75,000 compared to an actual count of 230,000, the largest sockeye return since 1959. Summer steelhead have been migrating in about the same numbers for several years, but this year the big news is that Group B steelhead, destined for the Snake River, came in at 97,000, a very strong return with a wild component of 13,000, the largest since 1984. Preliminary fall Chinook counts are around 460,000, a strong return compared to WDFW's prediction of 377,000.

Dave Statler (Nez Perce Tribe) commented that, while upriver spring Chinook jacks, sockeye, and Snake River fish have enjoyed strong returns lately, the outlook for lamprey in the Columbia basin isn't so positive. Adult returns to the Snake River have been grim recently – around 35 adults at Lower Granite before 2008, and 51 adults in 2008. The COE has been working on this problem and hopes to see the situation change soon, Rudd Turner said. Coho have been a really troubled species, and they will need more attention as well, Bill Tweit (Washington) noted. Coho and lower river fall Chinook are some of the best indicators of conditions for all fish. Things look good for coho in 2009 because there was a strong jack return this year, Cindy LeFleur (Washington) said. However, some upriver stocks, such as fall Chinook, are not doing so well. Ocean conditions for far north migrants were poor in 2008, and the lateness of flows this year was not good for coho.

3. Review of Specific Operations. *What was learned about specific operations that were requested by TMT members or other regional entities? How effective were these operations in achieving the intended goal? Should they be continued or modified in future years? Why or why not?*

A. 6-year Review of Juvenile Spring Survival Transport Percentages, Travel Time and Delay Observed under Various Spill Conditions: For this presentation, Jerry McCann (FPC) combined data on reach survival estimates for spring and summer migrants at McNary with in-river conditions to get an idea of what the 2008 passage year was like in the context of previous years. For the Lower Granite to McNary reach, there were survival estimates at four dam locations, beginning at Lower Granite tailwater and ending at McNary tailwater.

McCann presented data on water transit time and survival for steelhead, wild yearling Chinook and other species. Survival rates were generally high throughout – 2008 was generally a good year for fish. Steelhead survival rates were particularly high compared to the previous 10 years.

Transit times in 2008 varied widely depending on the season. For example, early migrants tended to experience low flow conditions and longer migration times. Yearling Chinook (both hatchery and wild) had almost a 50% probability of being transported in 2008, which was quite a bit higher than in 2007, mostly due to the late flows this year. By the end of April 2008, only 20% of the yearling Chinook population had passed Lower Granite Dam, as compared to almost half the population in April 2007. Apparently, many more fish used bypass systems in 2007. Steelhead had a 40-45% probability of being transported in 2008, a rate similar to 2007 but lower than 2006. In general, 2008 provided good in-river conditions for spring migrants, with high flows and cool temperatures. Survivals in 2008 were relatively high compared to 10 years ago. Temperatures at Lower Granite were some of the lowest in recent years which, combined with high spill and high flows, led to good survival rates. Spill proportions were high and transit times short, making this a very good year for active outmigrants.

B. Juvenile Spring Survival: Steve Smith (NOAA) discussed conditions for spring migrants in the Snake. He noted that his findings regarding travel times and the likelihood of being transported are not qualitatively different from the Fish Passage Center's information. In 2008 NOAA encountered a data problem regarding the relationship between spill, smolt populations, and avian predation. Russ Kiefer (Idaho) requested that a graph showing average survival estimates for stream-type Chinook from various hatcheries to Lower Granite Dam be recalculated to determine whether problems with upstream hatcheries in the 1990s skewed the results.

Over the past 10 years, the average survival rate has been 61.6%, Smith reported. The overall 2008 survival estimate for passage from the Snake River trap to Bonneville Dam is 46% for Chinook and 48% for steelhead. The data problem caused survival estimates for some of the reaches to exceed 100%. NOAA's estimate of non-tagged fish that were transported is around 50%. The

higher estimates of wild fish than their hatchery counterparts are due partly to timing and partly to wild fish being valued more.

The data problem has to do with how and where fish are detected, Smith said. Fish are especially vulnerable to mortality when they are exiting the bypass system. Also, some of the mortalities that probably should have been assigned to the McNary-John Day reach were assigned to the McNary-Bonneville reach instead. NOAA has determined for sure that the John Day-Bonneville reach estimates were affected by the data problem. Nevertheless, it's possible that lower survival estimates for the Bonneville-McNary reach are real, despite post-detection problems at John Day. It's also possible that two studies proceeding in 2009, an acoustic survival study of the John Day RSW and the spillway study at Bonneville, will shed light on the data problems.

There was discussion of predation problems in the Ice Harbor-McNary reach. On Crescent Island below McNary Dam is the second largest tern and cormorant colony in North America. PIT tag scans indicate that smolt predation is high at this location, which means it's probably high for non PIT-tagged fish as well. What this means for survival in relation to spill at McNary pool is that the total take of smolts at this location will depend more on the number of birds present than on the number of smolts passing by. Terns tend to select the more injured or de-scaled steelhead, Kiefer noted, so the estimates of take might include some fish that would have died anyway. The estimated rate of predation for Chinook at this location is lower than that for steelhead – from 4-20%.

While studies 10 years ago indicated that spillways generally had higher direct survival rates than the bypass systems, current studies are showing similar survival rates, and a recent Lower Monumental study showed that direct survival via the bypass system was actually higher than the spillway. The low survival rates associated with low-spill, high-transport years stemmed in part from having fewer fish in the river. This also suggests that, in those same years, survival rates would have been higher without transport. However the converse is also true: increasing spill can increase in-river survival rates indirectly by putting more fish through the McNary reach. Statistically, this reduces the vulnerability of each individual. NOAA has found that survival increases when spill does, through direct and indirect effects. However, almost all the transport data for steelhead indicate that transported fish return at higher rates than in-river fish. Thus the cumulative effect of spill has to offset the effect of having fewer fish in the barges in order to positively affect life cycle survival.

C. Bonneville Screens and Debris: The annual review moved to specific operations, beginning with a presentation by Dan Feil (COE) on the removal of screens at the Bonneville 2nd powerhouse when they became clogged with debris in late May 2008. When elevated levels of descaling and mortality were observed at the Bonneville fish facility, TMT made a difficult decision to remove the screens in order to prevent further injuries. Natural contributing factors were the volume and timing of runoff this year. A technological contributing factor was structural boom failure of the TIE crane that is normally used to move the giant

vertical barrier screens. The back-up crane couldn't lift the screens completely, so debris simply washed back into the gatewells each time the screens were cleaned, causing the workload to overwhelm project staff. It took 3 days (May 21-24) to remove the screens and 3 days (June 16-18) to reinstall them.

The findings from this situation were surprising. Without the guidance screens, which were designed to shunt fish up the gatewell, many fish somehow still found their way into the bypass system, although their numbers did drop. Descaling and mortality rates decreased once the screens were removed. Modeling of times when the screens were present or absent showed a negligible difference in survival rates for fish passing the project.

The biggest lesson learned here was that keeping the TIE crane functional is an absolute necessity. It will be repaired in time for the 2009 fish passage season and available to clean the screens efficiently. The screen-clogging incident brought to light the issue that project staff needs guidance on what to do in this kind of situation. Russ Kiefer (Idaho) asked whether the difference in ability to guide fish through the flow vanes is worth the risk of debris accumulation. Are the flow vanes cost effective? Two studies planned for 2009, the gatewell study and the acoustic tag study, will both aid in the evaluation of these screens arrayed across the powerhouse. Removing the flow vanes could cause problems with the screens, Tony Norris (BPA) cautioned. Given that the screens can clog in 24 hours, Margaret Filardo (FPC) asked whether anything had been done to address the 4-day work week issue which is part of a union contract. It will take at least a year to resolve the union contract issue, Feil said. In 2009 the 4-day workweek won't occur over Memorial Day weekend, which is what made it such a problem in 2008. Filardo expressed hope that future studies will shed light on survival estimates at Bonneville if they are less than anticipated. About 5% of all fish passing the project go through the bypass system so the proportion of fish affected is small, Feil noted.

There was discussion of whether trash buildup on the Bonneville fish screens affects lamprey. None were observed on the guidance screens this spring, Feil said and Tweit agreed that lamprey would not be able to pass through the fine mesh. Dave Statler asked whether actual data were collected on lamprey mortalities in the screens. Lamprey are difficult to track because even a PIT tag is too large for their bodies, Feil said. The COE is working on finding a tagging method that works for lamprey.

Rudd Turner (COE) expressed gratitude for the way TMT rose to the occasion and decided quickly that the screens needed to be pulled. This prompt action helped to prevent more fish losses.

D. Lower Granite Adult Trap MOP Operation: Dan Feil addressed problems that have occurred in operating the 6 fish tanks at Lower Granite pool for the collection of fall adult broodstock. There is confusion regarding the water elevation needed to fill the tanks when the forebay elevation is at MOP. It appeared that MOP+1.3 feet is needed to refill all 6 tanks, which involves a

tradeoff for juvenile passage. There has been a lot of technical uncertainty surrounding this tradeoff, and NOAA believes there's no difference between MOP and MOP+1.3 in terms of sufficient water supply to fill the tanks. It has been difficult for TMT to get clarity on this issue. Apparently MOP+1.3 feet provides only enough water to fill 3 of the 6 tanks. Norris asked about the possibility of transporting more often. That was the solution this year, and it involved more frequent truck trips, Wagner said. Norris suggested investigating whether pumping water into the tanks would fill them all.

In future, the COE will have solutions for using all 6 tanks without impacting MOP, Feil assured TMT. First there's repair of 30-year-old leaky valves – that might solve the problem. Next steps would involve further investigation and possibly a redesign of the entire fish facility at Lower Granite. That work is scheduled to start in 2012, according to the BiOp. In a month or two TMT will revisit this issue at one of its regular meetings.

E. Little Goose MOP and Lower Granite Tailwater Navigation Issues.

In late August 2008, flows on the Snake dropped dramatically, Wagner recalled. The Little Goose operational plan called for running one turbine unit and spilling the rest while maintaining MOP. However, the dual requirements to maintain MOP and spill 30% conflicted with each other. Wagner explained why the 30% spill requirement is a key to Little Goose operations. The difference between running 1 and 2 units is substantial in terms of providing steady outflows. In late August 2008, the second unit came online, and the Little Goose pool was drafted too low, creating a wave effect that caused navigation problems. The water elevation in Lower Granite navigation lock dropped too low for the transportation barge to cross the tailwater. The issue came to TMT for resolution, Russ Kiefer suggested spilling a constant amount at Little Goose around the clock, e.g. 11 kcfs instead of 30% spill, and it worked. This solution eliminated the need to alternate between a 1 and 2 unit operation, as well as wave effects in the pool, and allowed navigation at Lower Granite to return to normal. There was no effect on adult passage because the 30% criterion was designed to address adult passage issues, Wagner said in response to questioning. Feil reminded everyone that 30% spill might not be the future operation at Little Goose once the TSW is in place. Next steps include follow-up with FPOM, and possibly adding a blurb about Little Goose operations to the Water Management Plan or the Fish Passage Plan.

F. McNary Summer Transport Operation: Last year McNary was modified so the TSWs could be turned on and off while the barge crossed the forebay to load and unload fish, Paul Wagner recalled. There's a debate over whether doing this has any value, as well as the effects it has on spill duration and volume. In 2008 the BiOp called for adaptive management from July 15 to Aug. 1, with transportation from Aug. 1-15 because the data suggest that fish most likely benefit from transportation at McNary toward the end of August. The juvenile bypass below the project is in a bad location, with low survival rates. NOAA believes this problem has become worse since spill was added to the McNary operation because spill forces the fish into an area with heavy predation.

Survival estimates before and after spill need to be verified to see if there's actually been a difference. Wagner presented a chart showing times of reduced spill. Less than a 1% reduction in spill occurred over a 24-hour period, when hourly reductions were taken into account. An estimated 350,000 fish were transported at McNary in 2008, a relatively small number when compared to the millions of fish passing the project. Until 2005, all fish arriving at McNary were transported and there was no spill.

Wagner asked TMT to consider whether to continue transporting fish at Mc Nary. Should all fish be bypassed when bypass survival has been poor? At this point, there appears to be a benefit in transporting fish. TMT will be asked to make this decision in 2009.

4. Reservoir Operations Review. *How effective were the proposed actions or SORs at achieving the desired results? What changes might be necessary to enhance results in the future?*

A. Libby Summer Operations: Steve Hall (COE) recalled the two major operational events at Libby in 2008: the sturgeon pulse SOR and the Libby-Arrow treaty storage swap. Joel Fenolio (COE Seattle) discussed the SOR, which was submitted to the COE on May 30 by USFWS on behalf of the Kootenai Valley resource initiative, a collaboration of agencies and tribes. Per the BiOp, the sturgeon pulse SOR is based on the May final volume forecast, which in 2008 was 1.04 maf. Two days after the SOR was received, the project went to full powerhouse, and 2 days after that, project operation dropped to 4 units in order to accommodate repairs of water temperature control equipment. The project returned to full powerhouse on June 7 and remained there until June 27 when the full 1.04 maf was exhausted.

Libby reservoir did not achieve its target elevation at the end of August 2008, and Fenolio explained why not. The June forecast was slightly higher than 103% of normal, but actual flows in late June and July were only 89% of normal. If the sturgeon pulse of 1.04 maf had been based on actual volume, it would have been 0.8 maf, which would have raised the end of August reservoir elevation by another 5 feet. The reduction in Libby inflows were the result of a phenomenon called snowpack sublimation, in which snowpack is lost but streamflows doesn't rise.

The other major Libby operation in 2008 was the Libby-Arrow swap, finalized on Aug. 12. The agreement with Canada authorized the exchange of 60 ksfd and allowed Libby to be at elevation 2,439 feet by August 31. The outlook for 2009 is for the forecast to be 104% of normal. Next year is the beginning of a new requirement to draft the reservoir to 10-20 feet from full pool elevation by the end of September. That requirement could make it more difficult to do Libby-Arrow swaps in future.

B. Dworshak Spring/Summer Operations: One of the lessons learned in operating Dworshak Dam this year was that analysis is needed of how to

manage the Dworshak/Grand Coulee shift differently in high and low water years, Steve Hall (COE Walla Walla) reported. One of the rules of the shift is that projects must return to their normal flood control elevation by April 15. Criteria are needed to guide a decision either to adjust the shift or not do it in high water years, as 2008 looked to be in the spring. One limitation associated with the shift is that the current configuration of Dworshak tends to cause TDG exceedances when spill goes above 15 kcfs. Over the past few years, typically temperature augmentation starts around the first week of July with spill of 12-14 kcfs. The 2008 runoff was both late and high, and the lack of temperature control issues at Lower Granite meant Dworshak was operated at full powerhouse. That helped Lower Granite meet its flow targets later in the year.

Another challenge occurred this summer when the COE relied on RO outlets to move water out of Dworshak above the powerhouse limits, after drafting below the spillway crest. During the operation RO#2 failed, almost causing Dworshak to miss its end of August elevation at 1,535 feet. The COE is working to repair the RO gates as soon as possible. Building a second bulkhead is an option, but an expensive one that would take 1-1/2 to 2 years to complete. The COE will consider another bulkhead if necessary. Issues with the trunnion design are also being addressed. Dave Wills (USFWS) thanked the COE for its response to the RO gate problem this year and expressed hope that the COE would have a plan ahead of time in case this problem arises in 2009.

The Dworshak/Grand Coulee shift works by moving system flood control space to Grand Coulee, which allows the flood control elevation at Dworshak to go higher, Hall explained. When the shift expires and Dworshak must get to its normal flood control elevation, it becomes necessary to release water. If the flood control elevation requirement at Dworshak drops after April 15, it might be impossible, at the rate of 15 kcfs per day, to release enough water in time for the Dworshak reservoir to reach its April 30 flood control elevation. Hall showed TMT graphics depicting flood control rule curves and a composite April-July inflow volume forecast for Dworshak, linked to today's agenda.

On May 6, 2008, TMT discussed the declining ESP forecast. On May 8, using 44 years of record, the COE calculated that observed inflows of 3.4 maf would have led to 6 years in which the reservoir didn't refill in time, even if Dworshak operated at minimum flows. In hindsight, the predictions were wrong, and actual outflows were significantly higher than forecasted. The forecasting error impacted both Dworshak and Libby operations in 2008. There was discussion of how to do a better job of forecasting in the future, as well as a request for the COE to be more cautious with early forecasts which are often wrong. The COE has no funding to acquire additional snowtel stations beyond the existing 8 stations it has had for years, and it will be difficult to improve forecasting accuracy without more data, Hall replied. Nor is it advisable to move existing stations because that would confound historical records. Normally, runoff occurs earlier than it did in 2008. TMT will keep this issue on its radar in the coming year.

C. Hungry Horse and Grand Coulee Operations: The January-July outflow volume from Hungry Horse Dam was 112% of normal, while January outflows were 100% of normal, John Roache (BOR) reported. The May-July outflow volume at Hungry Horse was 130% of normal. During summer flow augmentation, Hungry Horse released flat flows of about 6.5 kcfs, with a brief drop for body recovery following a drowning on the South Fork. Hungry Horse will probably continue to operate at minimum flows for the rest of the year, until the January forecast is made and releases might be needed for flood control. There was discussion of the fact that minimum flows were higher this year than natural flows would have been, in order to meet the Columbia Falls minimum and provide augmentation for bull trout in Montana. Wagner asked what outflows would be if the target reservoir elevation is 3,540 feet; Roache estimated 7 kcfs.

Grand Coulee reservoir hit elevation 1,244.5 feet on April 10, 2008, and refilled to 1,290 feet by July 14; that elevation was maintained through the end of August. On April 27, Grand Coulee flows were reduced in an effort to reach the April 30 elevation target without any significant drops in outflows. Then the low flows began impacting ferry operation at Grand Coulee. TMT will continue to work on defining the exact minimum elevation required for the ferry to operate safely, which is somewhere in the range of 1,225-1,228 feet. A second Grand Coulee issue this year, described above, was managing the Dworshak/Grand Coulee flood control shift. Dave Wills asked whether the ferry landing could be moved to a lower elevation. BPA and BOR are working on that, Norris replied.

5. Summary of Today's Meeting

Good weather and unusually late runoff led to favorable conditions for fish in 2008. Survival rates were high, but late runoff created some problems. Juvenile passage numbers indicate that adult returns from this year will be good.

The solution to the screen debris issue at Bonneville in 2009 is to keep a large crane operational at the site. Several TMT members expressed interest in having a special TMT meeting possibly before the end of January to discuss how the system might be operated better to meet current chum criteria.

An investigation of MOP issues and the fish tanks at Lower Granite is underway, and TMT can expect new information in January 2009.

Is continued transportation at McNary worth the negative impacts it has on adult passage? NOAA will make a recommendation on this sometime in 2009.

Information regarding the effects of Little Goose MOP operations on adults might be added to the Fish Operations Plan after NOAA has reviewed it.

There was discussion of how to predict Libby inflows more accurately and reliably. More ESP analysis could help solve this problem, and additional snowtail sites would provide the COE with better hydrologic data. New drafting

requirements could impact the Libby/Arrow swap in 2009 and beyond, so TMT will keep this issue on its radar.

Review is needed of how difficult it is to release sufficient flows at Dworshak in a high water year like 2008 without exceeding TDG regulations when the Libby/Dworshak flood control shift ends. Flood control issues are currently being addressed. There was discussion of ways to improve modeling and forecasting efforts regarding Dworshak, and a request was made for additional snowtel sites which would provide the COE with more complete hydrologic data. Appreciation was voiced for the COE's careful management of the RO gate problem at Dworshak this year.

BPA and BOR will continue to seek the "magic ferry" minimum elevation at Grand Coulee.

There was extended discussion of how to handle the forecasting process better next year. The Nez Perce Tribe advocated more caution in the use of early forecasts of Dworshak inflows. Given increased variability in forecasts and a tendency toward extreme weather patterns, CRITFC urged TMT to begin considering mid-month water supply forecasts although they're not official. WDFW expressed interest in following forecasting trends more closely.

6. Next TMT Meeting

The next regular TMT meeting is Dec. 3, 2008. This meeting summary prepared by consultant and writer Pat Vivian.

Name	Affiliation
Dave Statler	Nez Perce Tribe
Rudd Turner	COE
Bill Muir	NOAA Science Center
Laura Hamilton	COE
Dan Feil	COE
Cathy Hlebechuk	COE
David Wills	USFWS
Russ Kiefer	Idaho
Ruth Burris	PGE
Tony Norris	BPA
Lori Postlethwait	BOR
Gerald Ross	BPA
Paul Wagner	NOAA
John Roache	BOR
Mark Bagdovitz	USFWS
Cindy LeFleur	Washington
Bill Tweit	Washington
Jim Ruff	NPCC
Richelle Beck	DRA
Mary Mellema	BOR

Todd Maguire	BOR
Dave Benner	FPC
Margaret Filardo	FPC
Kyle Dittmer	CRITFC
Karl Kanbergs	COE
Jim Adams	COE
Steve Hall	COE Walla Walla
Jim Litchfield	Montana
Tim Heizenrader	Centaurus
Steve Smith	NOAA Science Center
Dan Spear	BPA
Dennis Schwartz	COE
Joel Fenolio	COE