COLUMBIA RIVER TECHNICAL MANAGEMENT TEAM
August 14, 2019
DRAFT Facilitator's Summary
Facilitator: Emily Stranz; Notes: Colby Mills, DS Consulting

The following Facilitator's Summary is intended to capture basic discussion, decisions, and actions, as well as 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. Official minutes can be found on the TMT website: http://www.nwdwc.usace.army.mil/tmt/agendas/2019/.

Review Meeting Minutes & Summaries
TMT members approved minutes and facilitator's summaries for the 7/24 and 7/31 meetings.

Treaty Fishing
Kyle Dittmer, CRITFC, presented SOR 2019-C2 (posted on the TMT website) for the fall treaty fishing season. The request is to operate the John Day, The Dalles, and Bonneville pools at a 1.5-foot operating band starting August 26 at 0600 hours to August 28 at 1800 hours, and September 2 at 0600 hours to September 5 at 1800 hours. Estimated run size passing Bonneville Dam are 229,000 adult fall Chinook and 118,000 steelhead, which are both below the 10-year average, and 180,000 Coho, which is above the 10-year average. As fish runs are down this year, the fishing season will be shorter than normal, ranging from 2-3 day periods. Aaron Marshall, Corps, clarified that the John Day pool will be implemented to target a 1.5-foot operating range as a soft constraint, while maintaining a 2-foot range as a hard constraint. Doug Baus, Corps, said that the Corps plans on implementing the SOR as requested.

Kyle also updated the TMT that one of CRITFC's auxiliary services, StreamNet Library, has recently changed its name and mission, and is now known as the Columbia Basin Fish and Wildlife Library. The service will retain all of its previous functions.

Dworshak Operations
Jon Roberts, Corps, reported on current operations at Dworshak Dam. The project is ranging from 7.7 – 7.8 kcfs in total outflow, a reduction from 8.5 kcfs at midnight last night. The pool elevation is at 1,556.9 feet and continues to draft to manage the remainder of water over 1,535 feet. TDG levels are sitting around 100%. Levels have stayed constant and are expected to stay below 100% both in river and at the hatchery.

The Lower Granite tailwater is currently 66.54 degrees F and will climb throughout the day. The project is putting about 5kcfs through the turbines during the heat of the day due to Doble testing, and temperatures are projected to increase to 67.5-67.8 degrees F.

The RFC inflow forecast shows a slight influx from the rain, although nothing significant is expected for the rest of the 10-day period. The 10-day weather forecast starts off warm with a cooling-off period through the weekend, and higher temperatures again on Monday with cool trends at end of next week. The Corps plans to continue discharging 7.8 kcfs through tomorrow then will drop to approximately 7 kcfs for Friday and Saturday, and will provide the TMT with an update at the next TMT meeting.

Summary of Lower Granite RSW Closure
Jon reported on the Lower Granite RSW closure operation coordinated in response to model results showing water temperatures in the tailrace getting up to 68 F as a result of a 6-day heat wave. To cool Lower Granite forebay temperatures, the Corps increased Dworshak outflows to 11.8 kcfs on August 3. One option to help limit warm water near the surface of the forebay from being passed into the tailrace is to close the RSW, which pulls water from the 0.5-1.5 meter depth, water that was around 70F. After

consulting with Salmon Managers, the Corps closed the RSW. At that point, cooler water passed from deeper in the forebay via the conventional spillbays (10-20 meters) and the powerhouse turbines (25-30 meter range), which is quite a bit cooler.

Jon noted that for the RSW closure to be effective in cooling the tailrace, there needs to be at least a 4 degree F temperature differential in the Lower Granite forebay between the 3 and 15-meter depth; light wind and limited cloud cover; and a continued heatwave forecast to be around 95 F or hotter. Jon noted that the temporary RSW closure was from August 6 at 1400 hours through August 8 at 2400 hours. Results showed that temperatures dropped temporarily in the Lower Granite tailwater while the RSW was closed, then rose again when it was back open. The implementation was ultimately successful to decrease temperatures.

There was a concern that ladder temperature differential would also increase in connection to closing the RSW, and Salmon Managers were interested in having Jon attend FPAC to provide more information.

Operations Review
Reservoirs: Joel Fenolio, BOR, reported on Bureau of Reclamation projects:

- **Hungry Horse**: the project is currently releasing 1,800 cfs with a midnight elevation of 3,555.64 feet. After getting 1-2 inches of rain in the basin last week, the project increased to 2,000 cfs to maintain 10 feet from full. Joel expects to hit Columbia Falls minimum flow around August 25 (typically minimums are hit around mid-September), however, this summer has been dry.
- **Grand Coulee**: releasing at the mid-100,000s cfs over the past couple days, with inflows averaging at 90,000 cfs. The project is currently on track to being at 1,277.5 feet elevation at the end of August, then will start refilling to 1,283 feet in early September.

Joel noted that Banks refilled in late July, and is starting a 5-foot draft.

Lisa Wright, Corps, reported on Corps of Engineers projects:

- **Libby**: midnight elevation was 2,442.2 feet, with average inflows of 9.2 kcfs and outflows of 7 kcfs to meet the bull trout minimum;
- **Albeni Falls**: midnight elevation was 2,062.3 feet, with average inflows of 10.3 kcfs and outflows of 12.2 kcfs;
- **Dworshak**: midnight elevation was 1,557 feet, with average inflows of 1.3 kcfs and outflows of 8.4 kcfs;
- **Lower Granite**: average outflows were 31.2 kcfs;
- **McNary**: average outflows were 141 kcfs; and
- **Bonneville**: average outflows of 134.7 kcfs.

Water Quality: Dan Turner, Corps, reported that TDG levels are well below the 115%/120% state standards, with projects transitioning to minimum generation and spilling the rest of the flow. He noted a membrane rupture in the gauge in The Dalles tailwater that reflected an incorrect TDG reading. The gauge has been repaired by USGS and is now functioning properly.

Fish: Paul Wagner, NOAA, reported on adult fish passage. At Bonneville Dam fall Chinook passage is at 71% of the 10-year average, fall Chinook jacks are at 67% of the 10-year average, steelhead are at 29% of the 10-year average, and wild steelhead are at 39% of the 10-year average. Sockeye are mostly done at 20% of the 10-year average. Dave Swank, USFWS, noted that lamprey counts reported on the FPC adult passage website only reflects daytime window counts, and those passing at night or via the LPS are not included. At the end of the year, the counts will be updated.

At Lower Granite summer Chinook passage is at 28% of the 10-year average, summer Chinook jacks 33%, steelhead 33%, unclipped steelhead 38%, and sockeye passage is 7% of the 10-year average. Russ Kiefer, ID, noted that 7 adult (wild/natural) sockeye have been trapped in the Stanley Basin to date.

Fall Chinook juveniles have rallied a bit at Little Goose Dam, while all other juvenile fish runs are mostly done. Lower Granite had a similar trend uptick of a couple 1,000, and Lower Monumental is showing less than 100 per day with a similar index decrease down the river.

Power System: Tony Norris, BPA, reported some warm days and wind.

The next scheduled TMT meeting is a conference call on August 21, 2019, at 9:00 AM

This summary is respectfully submitted by the DS Consulting Facilitation Team. Suggested edits are welcome and can be sent to Colby at colby@dsconsult.co.

Columbia River Regional Forum
Technical Management Team OFFICIAL MINUTES
Wednesday, August 14, 2019
Minutes: Melissa Haskin, FLUX Resources

Today's TMT meeting was chaired by Doug Baus, Corps, and facilitated by Emily Stranz, DS Consulting. See the end of these minutes for a list of today's attendees. Copies of documents discussed and meeting minutes are available on the TMT website.

1. Summaries and Minutes

Minutes and summaries from the 7/24 & 7/31 meetings were approved with no additional edits.

2. Treaty Fishing

Kyle Dittmer, CRITFC, reported on System Operational Request (SOR) 2019 C-2 for operation of the lower Columbia pools during the fall 2019 Treaty fishery for an initial 2 week season:

> Monday, August 26, 2019, 6 am, through Wednesday, August 28, 2019, 6 pm
> Monday, September 2, 2019, 6 am, through Thursday, September 5, 2019, 6 pm

The SOR requests that the Corps and BPA operate Bonneville, The Dalles, and John Day pools within a 1.5 ft band during the treaty fishing period defined above.

The latest TAC forecast of adult run size at Bonneville Dam for fall Chinook is 229,000 (below 10-year average), 118,000 steelhead (below 10-year average) and 180,000 coho (above 10-year average). Since the runs are lower than normal this year, Dittmer reported that the usual 3 to 5-day fishing periods will likely be 2 to 3 days this year and that there may not be an opportunity for October Treaty Fishing.

The Corps will implement the SOR as requested. Aaron Marshall, Corps, clarified that, as with this year's previous treaty fishing SOR, John Day will operate in a 1.5 ft range as a soft constraint with a hard constraint of 2 ft. This allows real-time operations to utilize the full 1.5 ft range.

Dittmer reminded TMT that tribal fish sales are expected to begin within the next couple weeks and will be announced on the CRITFC website.

Dittmer also provided an update on the StreamNet library, which has been managed by CRITFC for 24 years. Effective today, the library has changed its name to "Columbia Basin Fish & Wildlife Library" and will be basically doing the same functions as before but more reflective of the regional mission over the past few years. The old website will direct to the new one for the rest of the year, then formally change over to the new website in 2020.

3. Dworshak Operations – Jon Roberts, Corps NWW

3a-g. Dworshak Dam Operations

Jon Roberts, Corps, reported on operations at Dworshak Dam. The project is currently discharging ~7.7 to 7.8 kcfs. This is a reduction from 8.5 kcfs at midnight last night. The pool's elevation is 1,556.7 ft and continuing to draft as the Corps manages the remaining water over

1,535 ft. TDG is ~100% currently at both the Dworshak tailrace and the hatchery (Figure 1). TDG dropped last Friday as spill was stopped and temperatures decreased. TDG should stay below 100% as the project remains below full powerhouse capacity.

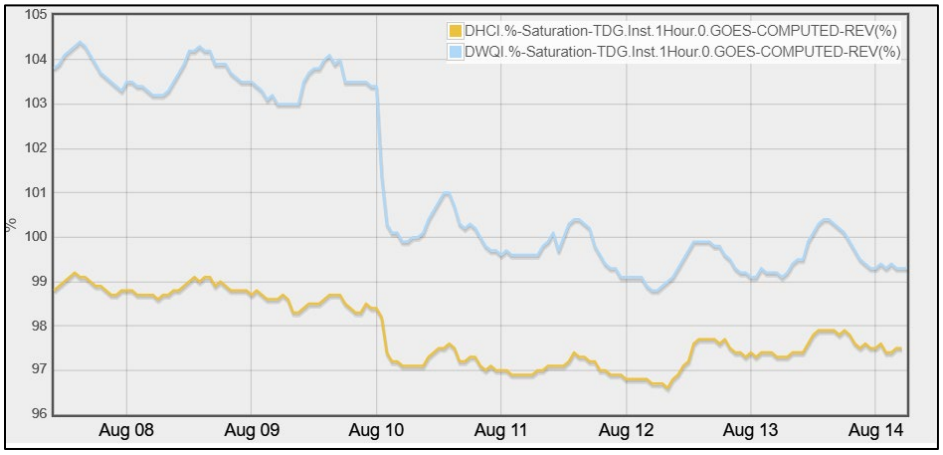


Figure 1. Total Dissolved Gas (TDG) at the Dworshak Dam tailrace (DWQI) and Dworshak Hatchery Collection (DHCI) over the last 7 days, August 8-14.

Temperature in the Lower Granite tailwater is currently 66.54°F. It should climb throughout the day to about 67.5-67.8°F, which is a little more than it typically would due to Doble testing at the project that restricts turbine flow during the heat of the day to 5 kcfs (compared to normal 12-15 kcfs) and passes less cool water from deeper in the forebay into the tailrace.

The NWRFC 10 day inflow forecast shows no significant inflow (Figure 2):

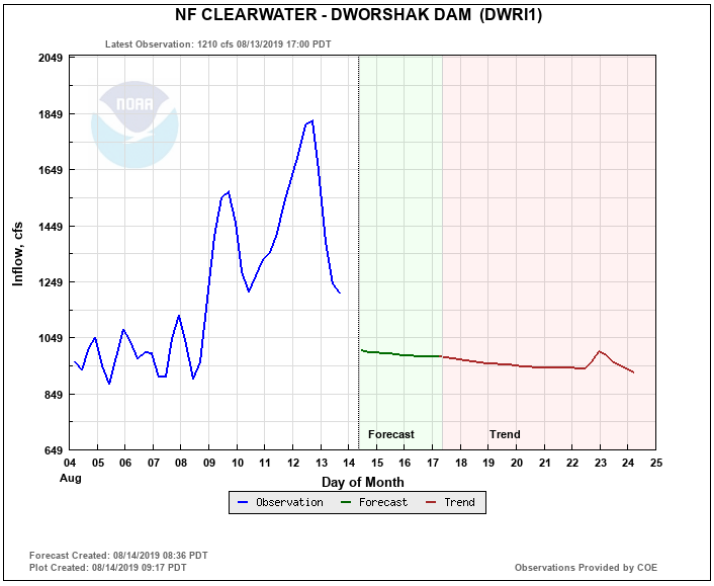


Figure 2. NWRFC observed and forecasted inflow for Dworshak Dam as of August 14.

The NWRFC 10-day meteorological forecast calls for cooler weather over the weekend and the Corps plans to drop discharge out of Dworshak Dam. On Monday, temperatures are forecasted to rise again for several days, then cool off by the end of next week. The Corps will continue to monitor the weather forecast daily to determine an appropriate Dworshak outflow for temperature management.

The water temperature model (Figure 3) shows a divergence between the model results and actual temperatures on August 11 and 12 that was due to rain that cooled off the river. The divergence will likely continue for the next few days as the model has a tough time predicting results during Lower Granite Doble testing that has units off during the day then on at night through the rest of this week. The current plan is to hold Dworshak discharge at 7.8 kcfs through tomorrow then drop down to about 7 kcfs for Friday-Saturday. The model predicts this operation will result in temperatures in the Lower Granite tailrace hovering around 67°F.

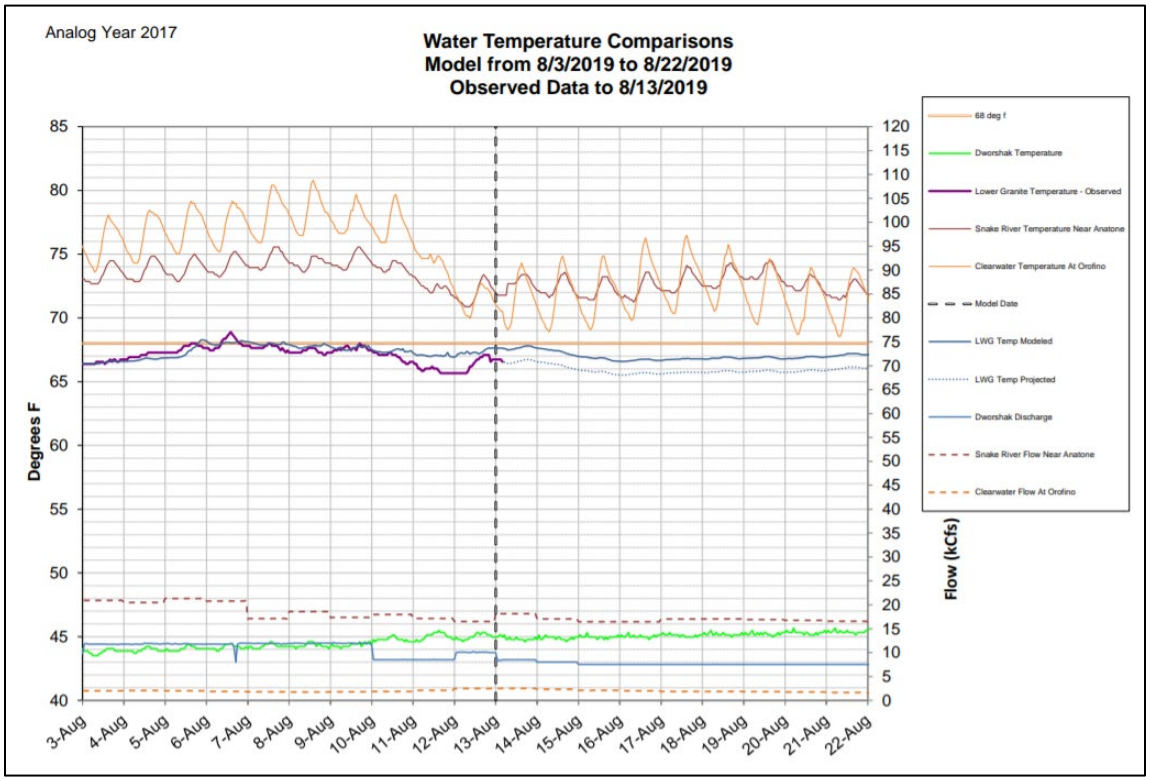


Figure 3. Water Temperature Model Results for August 3-August 22.

Charles Morrill, WA, asked about Dworshak elevation at the end of August with holding outflow at 7 kcfs for the rest of the month. Roberts replied outflow will likely need to be increased on Monday due to the forecasted warm weather but they may be able to maintain 8 kcfs for the rest of the month, which would put the pool a couple feet above 1,535 ft. He will be able to report on the end of the month elevation more clearly at next week's TMT.

3h. Summary of RSW Closure

Roberts also reported on the Lower Granite RSW closure last week and provided a summary of observed conditions (Figures 4 and 5) and a modeled projection of temperatures if the RSW had remained open (Figure 6). This operation was in response to a heat wave in the Snake River basin from August 3 through August 9, with air temperatures of 99°F to over 100°F, concurrent with high outflows from Hells Canyon in the range of 20 kcfs. To manage downstream temperatures, the Corps increased Dworshak outflow from 9.9 kcfs (full powerhouse) to 11.8 kcfs starting at midnight on Friday, August 2. On Monday, August 5, Roberts sent the latest temperature model results to Salmon Managers and suggested that closing the Lower Granite

RSW could potentially provide a reduction of about 0.5°F in the Lower Granite tailrace, which was projected to exceed 68°F Monday-Wednesday. Salmon managers discussed this at their Tuesday FPAC meeting. *[NOTE: per email notification to TMT from Doug Baus on August 6, the Corps closed the RSW at 1400 hours on Tuesday, August 6, through midnight Thursday, August 8. This operation was implemented based on feedback from salmon managers present at the August 6 FPAC meeting.]*

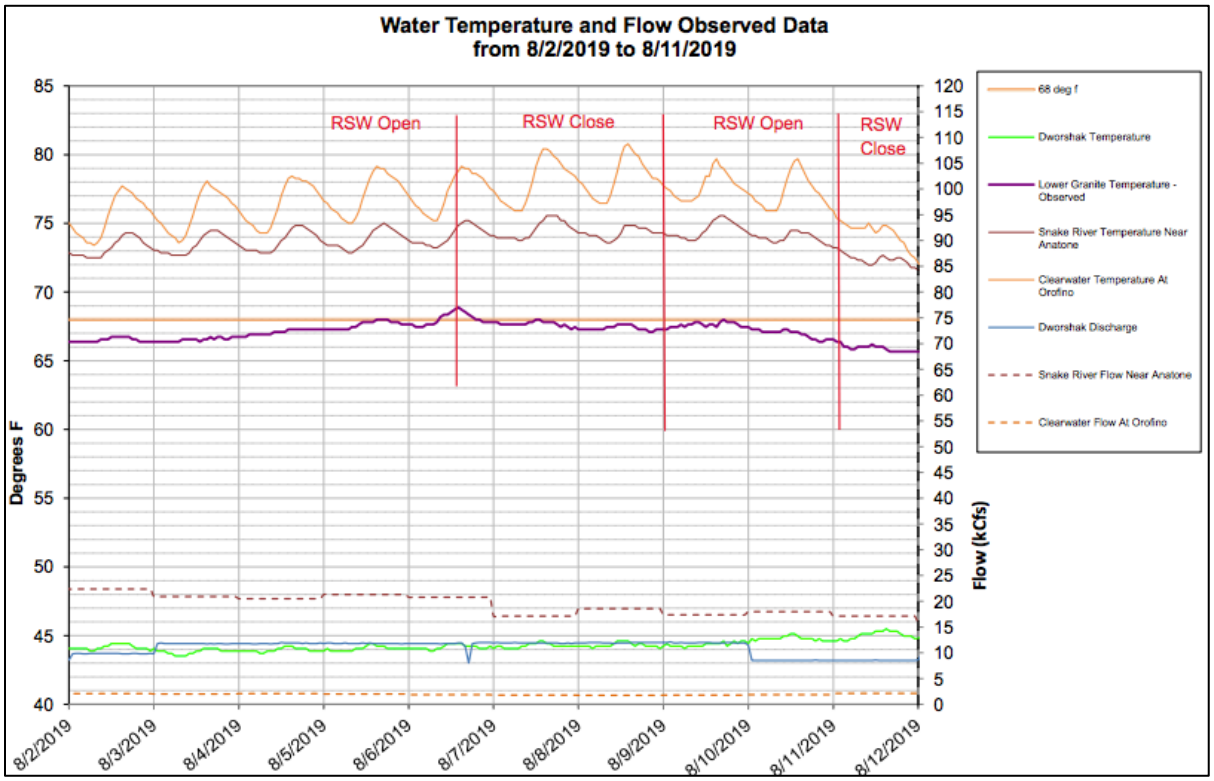


Figure 4: Observed temperature and flow data before, during, and after RSW closure August 6-8.

Conditions for LWG from 8/5 to 8/10 during RSW closure from 8/6 at 1400 to 8/9 at 0000
WY2019

Depth In Meters	05 Aug 0000	05 Aug 1200	06 Aug 0000	06 Aug 1200	07 Aug 0000	07 Aug 1200	08 Aug 0000	08 Aug 1200	09 Aug 0000	09 Aug 1200	10 Aug 0000	10 Aug 1200
0.5	72.6	74.3	75.8	75.7	77.1	75.3	75.7	77.3	75.8	76.0	75.8	75.4
1.5	72.3	72.8	75.2	74.1	75.2	74.6	75.3	75.5	75.1	75.9	75.5	74.7
3	71.8	72.3	73.1	73.6	74.6	74.3	73.5	74.3	73.3	75.6	74.1	72.0
5	71.5	71.5	72.0	73.3	73.8	72.9	71.9	71.9	72.2	72.8	72.5	70.9
10	69.3	69.9	69.8	71.3	70.6	70.7	70.5	70.3	70.5	69.7	70.0	69.4
15	68.3	68.7	67.9	69.3	68.3	68.9	68.1	68.6	68.6	67.9	68.1	68.5
20	66.7	67.2	66.3	66.6	66.5	65.2	64.6	65.7	64.9	65.3	64.1	63.7
25	64.2	64.5	64.4	64.7	64.6	64.5	64.3	64.2	63.8	63.5	63.3	63.2
30	63.8	63.9	64.0	64.1	64.4	64.3	64.4	64.0	63.7	63.5	63.3	63.2
35	62.7	62.8	62.8	62.9	63.0	63.1	63.0	63.1	63.0	62.9	62.7	62.6

• Denotes missing data <72°F 70°F to 71°F 70°F to 67°F 66°F to 64°F 60°F to 64°

SILW Air Max/Low Temp	05 Aug		06 Aug		07 Aug		08 Aug		09 Aug		10 Aug	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
°F	65.1	101.4	66.6	103.6	71.6	103.4	70.8	99.7	70.4	87.0	67.7	89.5
LWG Tailwater	67.33	68.13	67.60	69.06	67.41	68.02	67.12	67.77	67.30	68.00	66.38	67.46

Figure 5. Observed temperatures in the Lower Granite forebay and tailrace before, during, and after RSW closure.

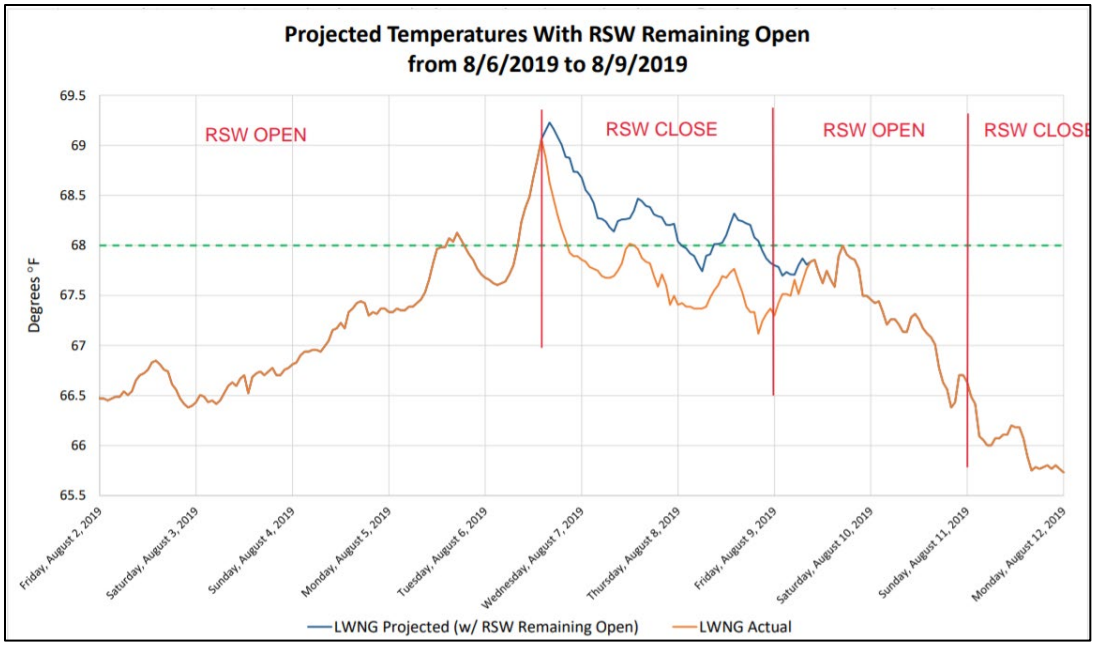


Figure 6: Observed temperatures with RSW closed vs projected temperatures with RSW open.

Roberts reviewed the Lower Granite forebay string temperature data (Figure 5) and noted the extreme differentials between water at 3 meters deep that passes through the RSW (~74°F) compared to 15 meters deep that passes through the normal spillbays (~69°F) and 25-30 meters deep that passes through the turbines (~64°F). In order for the RSW closure to be effective at reducing tailrace temperatures, there needs to be a fairly significant differential (~4°F) between 3 and 15 meters deep, as there was in this case. The forebay differential stayed relatively constant but the maximum tailrace temperature was lower on the days the RSW was closed. Before the RSW was closed, the maximum tailrace temperature was 69.06°F. Once the RSW was closed, the temperature dropped to 68.2°F and then further the next day. Once the RSW was opened again, the temperature climbed back to 68°F briefly, and then rain cooled the system down.

Roberts provided an analysis of projected tailrace temperatures had the RSW been left open (Figure 6). Based on the results, closing the RSW reduced tailrace temperatures by an estimated 0.6°F on an hourly increment. However, Roberts shared that some very specific conditions have to occur for the RSW closure to potentially reduce tailrace temperatures:

1. Water temperatures in the LWG forebay (specifically between 3m and 15m) need to have a difference of 4°F or greater.
2. The forecast calls for light wind and limited cloud cover.
3. There is a continued heat wave forecasted for the duration of the operation with air temperatures of greater than 95°F.

Morrill noted that one of the challenges of these decisions is understanding the behavior of subyearlings. He asked if there is a measure of the relative amount of water that is pulled from 10-20 meters through the RSW. Roberts replied that this information is modeled and changes every few days as heat builds up in the system. Morrill noted this kind of information would be helpful to FPAC.

Dave Swank, USFWS, noted that his concern was that in the hours after the RSW was closed, he observed an increase in the ladder temperature differential. Specifically, there was an increase in the exit pool. He wonders if there is a connection between the increased temperature at the ladder exit in the forebay and closing the RSW. He thinks this would be worth looking at because if closing the RSW to improve tailwater conditions is causing unanticipated problems in the ladder, salmon managers would want to know. He asked if it is possible to model expected temperatures at the exit pool of the fish ladder. Roberts said the Corps does look at that. He also noted that the tailwater elevation is a major contributor since solar radiation during the day penetrates deeper at lower elevations. He said the Corps will continue to model it and do the best they can.

Russ Kiefer, ID, added that before there were ladder cooling pumps at Lower Granite, the salmon managers considered different operations for closing the RSW to reduce tailrace temperatures and he objected over the same concern about the potential for increasing temperatures at the ladder exit in the forebay. His rationale was that not using the RSW to move hot water out of the forebay would heat up the pool more and increase the ladder temperature differential, which could cause problems with adult passage. However, for that differential to have an effect on adult passage, it has to be pretty big since the cooling pumps work well at reducing the differential, he said.

Swank asked more specifically if there is a way to discern if the increase in temperature at the ladder exit is due to the hot weather or due to closing the RSW. The facilitator suggested that Roberts join an FPAC or FPOM call to provide additional details.

4. Operations Review

4a. Reservoirs – Joel Fenolio, Reclamation, and Lisa Wright, Corps

Hungry Horse – Hungry Horse is releasing 1,800 cfs. The forebay's midnight elevation was 3,555.7 ft. The project recently saw a few inches of precipitation after having none in July and Reclamation will increase flows to 2,000 cfs to target being 10 feet from full on Sept 30. It has been a dry year for the project.

Grand Coulee – Inflows have been averaging ~90,000 cfs. Midnight elevation was 1,281.9 ft. It should hit 1,277.5 ft. by the end of August. Banks Lake filled in late July.

Libby Dam – Midnight elevation 2,442.2 ft., yesterday's average inflows were 9.2 kcfs and outflows were 7 kcfs (bull trout minimum). At the last TMT, there was discussion of having to decrease outflow below 7 kcfs to avoid operating turbines in the "rough zone". Wright noted that the hourly data indicate outflow has not been reduced below 7 kcfs over the past week.

Albeni Falls – Midnight elevation 2,062.3 ft., yesterday's average inflows were 10.3 kcfs and outflows were 12.2 kcfs. Charles Morrill, WA, asked to see the forebay temperatures to see if they exceed 68°F. He mentioned there have been some discussions regarding Albeni Falls operating range in September and the potential for dropping it a few feet down, but it sounds like it is still in the discussion phase.

Dworshak Dam – Midnight elevation 1,557 ft., yesterday's average inflows were 1.3 kcfs and outflows were 8.4 kcfs.

Lower Granite – Yesterday's average outflows were 31.2 kcfs.

McNary Dam – Yesterday's average outflows were 141 kcfs.

Bonneville – Yesterday's average outflows were 134.7 kcfs.

4b. Water Quality – Dan Turner, Corps

TDG below is below the 115/120% state water quality standards. Due to dropping flows, some projects are transitioning to minimum generation and spilling the rest. There was one instance of a gauge at The Dalles tailrace (TDDO) malfunctioning due to a membrane rupture.

4c. Fish – Paul Wagner, NOAA

Adults: At Bonneville, fall Chinook adults for the year so far are 6,000 (71% of the 10-year average) and jacks are 1,064 (67% of the 10-year average). Steelhead YTD are 41,819 (29% of the 10-year average), of which 24,000 were unclipped (39% of the 10-year average). Sockeye are done for the season at 62,999 (20% of the 10-year average).

Lamprey are at 18,000, which is good but not as good as last year's counts, which were well above average. Swank pointed out the counts only include daytime window counts and will be updated with the night video counts at the end of the season. A lot of lamprey are counted during the night through the LPS so the total number is more like 61,000. This could go up or down based on the end of year correction factor after video review.

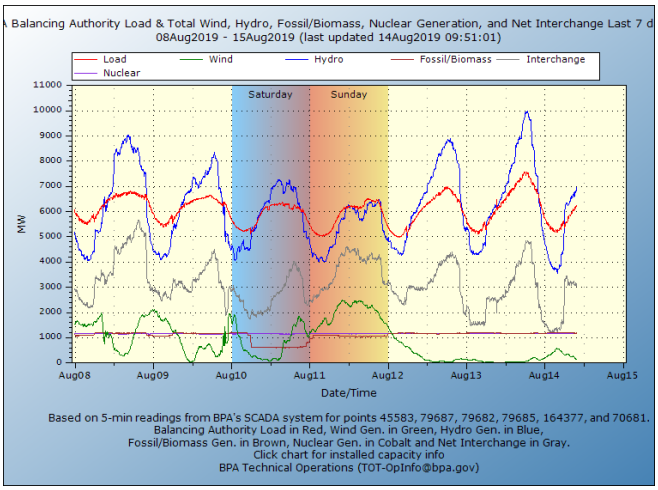
At Lower Granite, summer Chinook adults are at 4,329 (28% of average) and jacks are 2,114 (33% of 10-year average). Steelhead are 4,320 (33% of the 10-year average), of which 2,182 were unclipped (38% of the 10-year average). Sockeye counts are only 71 (7% of the 10-year average). Lamprey have not been showing consistently at Lower Granite the last few years. At 43 this year, they are above the 10-year average (180% of the 10-year average).

Kiefer noted that the update on sockeye is that 7 adults have been trapped and they are all naturals. In many years, clipped versus unclipped trapped fish help with count differentials to help determine if fish are mid-Columbia strays or hatchery fish. Usually, wild naturals are a small component of Snake River returns. This year, like the last few years, will be difficult because there were some water chemistry issues with the startup of the Crystal Spring hatchery. Over the past few years, survival upon release has been low due to water chemistry issues. This year, the clipped/unclipped data did not provide much information on if the fish were mid-Columbia strays or not. Kiefer said 4 PIT-tagged fish out of 600 have been observed at Bonneville and then also showed up at Snake River projects, including Lower Granite, but all 4 genotyped to mid-Columbia fish. He thinks this shows that the count differential could be due to mid-Columbia strays. Snake River fish probably passed fine but there were probably only a few of them, he said. At the end of the year, IDFG should have a better idea. They will complete more sampling.

Juveniles: Fall Chinook juveniles have shown a bit of a rally, which is surprising for this time of the year. All of the other juveniles are done for the season. The index increased by several thousand daily at both Lower Granite and Little Goose. Counts are less than 100 per day at Lower Monumental, which is typical for this time of year.

4d. Power – Tony Norris, BPA

It has been warm. There is not much to report.



5. Next TMT

The next meeting is a conference call on August 21, 2019.

Today's Attendees:

Agency	TMT Representative
Army Corps of Engineers	Doug Baus (Chair), Julie Ammann, Lisa Wright
Bonneville Power Administration	Tony Norris, Scott Bettin
Bureau of Reclamation	Joel Fenolio
NOAA Fisheries	Paul Wagner, Claire McGrath
US Fish & Wildlife Service	Dave Swank
Washington	Charles Morrill
Oregon	Erick Van Dyke
Idaho	Russ Kiefer
Montana	Jim Litchfield, Brian Marotz
Nez Perce Tribe	Jay Hesse
Umatilla Tribe/CRITFC	Tom Lorz
Colville Tribe	N/A
Warm Springs Tribe	N/A
Kootenai Tribe	N/A
Spokane Tribe	N/A

Other Attendees (non-TMT members):

CRITFC – Kyle Dittmer
Corps – Jon Roberts, Alfredo Rodriguez, Steve Hall, Aaron Marshall, Ann Setter, Dan Turner
DS Consulting – Emily Stranz (Facilitator), Colby Mills
FLUX Resources – Melissa Haskin (Note taker)
Columbia Basin Bulletin – Mike O'Bryant
Clearing Up – K.C. Mehaffey