COLUMBIA RIVER REGIONAL FORUM TECHNICAL MANAGEMENT TEAM
2021 Year End Review
December 1, 2021

FACILITATOR'S SUMMARY
Facilitator: Emily Stranz; Notes: Colby Mills, DS Consulting

The following Facilitator's Summary is intended to provide a brief recap of the 2021 Year End Review presentations and to signal future discussion needs at the TMT. This summary is 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/2021/.

Welcome and Introductions

DS Consulting facilitator, Emily Stranz, welcomed the group to the Columbia River Technical Management Team's (TMT) 23rd annual Year End Review (YER). She explained that the review is an opportunity for TMT members and other interested parties to step out of the regular meeting format, review selected management decisions and operations of the 2021 season, and consider lessons that might enhance discussions and decision-making for 2022.

Upper Snake Above Brownlee Flow Augmentation Operation

Joel Fenolio, BOR, reported on flow augmentation operations on the Upper Snake River above Brownlee. Joel's presentation can be viewed here, and on the TMT website. Although 2020 was a dry year, carry over storage on November 1 indicated decent potential for filling accounts in the 2021 irrigation season. Joel reviewed conditions, forecasts, and flow augmentation releases for the Boise, Payette, and Upper Snake River Basins, noting overall below average snowpack and no snow accumulation throughout the early spring. A dry 2021 water supply was not projected until the April – September forecasts reflected as such.

In 2021, Upper Snake flow augmentation sources included storage from the Boise, Payette, and upper Snake Rivers (Reclamation uncontracted space, rentals and powerhead), as well as via natural flows. Historically, flow augmentation volumes have hit 427 kaf, and in more recent years, regularly have hit the 487 kaf target. This year volumes barely hit 427 kaf. At the end of the 2021 irrigation season, the carry over storage heading into 2022 looked very different than the previous year: the Upper Snake above Milner Dam is 46% of average, 71% of average in the Boise River system, and 83% of average in the Payette. To reach 487 kaf, the Snake River Basin will need a water supply that is 110-120% of average, and will need help from rentals and irrigation districts.

Regarding constraints in the timing of flow augmentation releases, Joel noted that there are significantly stricter constraints on the Payette Basin, while the Boise and Milner Basins have fewer limitations outside of withdrawal capacity. There is some flexibility to adjust timing, although it is constrained by the lack of knowledge in advance on how much water will be available. Also, in dryer years there is more leeway on timing.

Water Supply Forecasting

Joel next presented on Phase 1 of Reclamation's water supply forecast update. Joel's presentation can be viewed here, and on the TMT website. Reclamation has been working to update its water supply forecasting processes. In the first phase of this effort, they tested new software and forecast development, techniques and tools to test whether they might provide better results. The next step for Phase 1 is a peer review which is anticipated for December 2021. Phase 2 of the process will establish new equations for

30 sites; Phase 3 will look at different equations using SNODAS and PRISM data, soil moisture (including NASA data sets in real-time), and 6-week precipitation forecasts.

Reclamation utilizes forecasting for flood control, BiOp operations, refill projections, water supply allocation, and facilities operation and maintenance planning.

Gas Bubble Trauma Monitoring of Native, Resident Non-Salmonids

Ken Tiffan, USGS, provided an update on gas bubble trauma (GBT) monitoring of native, resident non-salmonids (NRN) downstream of Snake and Columbia River dams. Ken's presentation can be viewed here, and on the TMT website. This GBT monitoring (contracted with USGS) during spring spill is in response to the state water quality rule change increasing the TDG gas cap to 125%. NRN fish are monitored for GBT below Ice Harbor, McNary, and Bonneville Dams.

In 2021, TDG did not reach the 125% gas cap at USGS sample sites, and incidence of GBT (via SMP GBT monitoring criteria) did not exceed levels that would have triggered changes to the spill program. Ken noted that sculpin appear to be more sensitive to GBT than the other species sampled; showing GBT in areas on the body and paired fins, unpaired fins and eyes. Also of note, was that monitoring via backpack electrofishing was effective, and it appeared that impacts to salmonids were minimal. Ken noted that electrofishing samples were taken in shallow water (1 meter max), and 6-foot seines were used in deeper areas; sampling occurs where exposure and risk from TDG would be the highest. Representation of the population at large (i.e., fish utilizing deeper habitat) is difficult to determine. Frequent high winds below McNary Dam posed a significant challenge to sampling efficiency.

In 2022, USGS will add sampling below Lower Granite Dam. There will also be laboratory experiments conducted to examine potential effects of electrofishing on GBT (as it can affect fish physiology) and GBT progression and mortality.

The following clarifications were made in response to questions from TMT Members:

- Sampled fish are released away from collection sites to avoid recapture. Collected fish were not marked, however, could potentially be fin clipped in the future.
- Fish were only sampled during the spring spill season, and there were no analyses on a correlation with gas or GBT incidence; GBT is variable, and more data is needed to determine those relationships. Depending on temperatures this year, BPA could potentially consider monitoring for a couple weeks post-spring spill.
- In terms of seining versus electrofishing, there is no standardized methodology for sampling yet.
- A habitat assessment within the study areas could help put GBT incidence rates in context of population.
- Future considerations could be made regarding sculpin sensitivity to GBT; expulsion of gas through skin could be a mechanism by which electrofishing could interact with GBT.
- Regarding how to control for holding time and depth once fish are captured: 1) GBT effects probably would not dissipate quickly and 2) a control for different sampling depths has yet to be determined.
- Fish resorb gas bubbles through depth compensation, and then exhibit new symptoms when they reenter shallow water. In the late 1990's spill tests below Libby Dam, cumulative injuries, like split fin rays and tissue damage, were observed to increase over time.
- Due to funding constraints, there has not been a lot of research conducted in the past on sculpin and other NRN fishes.
- Regarding monitoring plan changes/adjustments: Action Agencies (AAs) met with water quality (WQ) agencies last month and they are supportive of gathering more info (including the addition of a second monitoring site in lower Snake River). The study plan has not yet been approved.

→ **ACTION**: Fish Managers requested that BPA keep communications open and coordinate a path for TMT members to see revisions and provide input to the study design.

Dworshak Operations: Minimizing Impacts of Extreme Temperature

Willow Walker, Corps, reported on temperature and flow management at Dworshak and Lower Granite dams. Willow's presentation can be viewed here, and on the TMT website. Within recent history (2015 and onward), summers have been hot and dry, with low flow conditions. In response to these conditions, recommendations were made via NOAA's *2015 Adult Sockeye Salmon Passage Report* to Snake River managers that led the Corps Walla Walla District to adopt a 3-year plan to enhance short term modeling using a long-term risk analysis approach.

Willow reviewed the 2021 conditions and operations, including spring refill, the historic summer heatwave (several consecutive days of record setting heat), and the alternative operational scenarios intended to mitigate the effects of the extreme temperatures. Willow reminded the group of SORs 2021-3, 4, & 5, and the associated impacts on tailwater temperatures and water availability.

Goals for the 2021 September operations included: avoiding rapid flow and temperature changes and providing thermal refuge. All operational targets were met during the month of September, including not exceeding 68 degrees F in the Lower Granite Dam tailwater and 70 degrees F at the adult trap. Other helpful aspects of the in-season management included Walla Walla and FPAC working closing together to share information and ideas, the ability to look ahead 30-60 days for planning, and the coordination of flow augmentation above the Brownlee and Hells Canyon releases. Willow noted that 2015 and 2021 saw similar temperature operation challenges, however, applying lessons-learned and targeted improvements made a significant difference in 2021. She highlighted that brainstorming and exploring options together is necessary to best prepare for similar conditions moving forward. Future considerations include accounting for earlier refill, continuing to improve the refill transition, and improving the Corps' official forecast.

The following clarifications were made in response to questions from TMT Members:

- Targeting refill for earlier in the summer (mid-June) is important to consider in dry years.
- Forecasting and rule curves dictate the flood risk management needs; the Corps is looking at how to improve forecasting methods.
- Regarding deviation requests: system flood controls tend to be deeper than local flood controls. In 2021, operations met local flood control targets because due to the dry year, there was not a need to meet deeper system flood control targets.
    - Dworshak is a key reservoir and a system project. The project cannot shift system space around because it needs to be at elevation if there is an actual risk for flood control in the system, and flood control always takes precedent. If there is no risk to the system, there is an opportunity to evaluate on a case-by-case basis as a tool in the toolbox.
    - The deviation request process is based on risk and mitigation; a request to deviate from the approved plan for the project is approved at the Corp' Division level.
    - The Corps' deviation process is a national requirement, and a way for the Corps to assess risk for something different than planned operations that have rigorous analysis. Most deviations seen are around flood risk management and the Corps adapting to real-time conditions. The process is agency-wide and applies to all Corps projects.

Snake River Sockeye Conversion

Trevor Conder, NOAA, reported on 2021 Snake River sockeye conversion. Trevor's presentation can be viewed here, and on the TMT website. NOAA concluded that the recent Snake River sockeye conversions are highly variable and appear to be worsening with increasing ambient temperatures. Specifically, high

river temperatures in some years in the lower Snake and Columbia Rivers have led to ladder temperatures and differentials that do not support successful adult sockeye migration. It was noted that while the Corps has been very successful in maintaining temperatures below 68 degrees F at Lower Granite, accomplishing this was not enough in 2015 and 2021 to reduce mortality and maintain acceptable conversion rates of adult sockeye salmon.

A proposed path forward is to develop a new approach to managing temperatures within the sockeye tolerance zone, managing temperatures throughout the entire lower Snake River to support effective passage. Another suggestion is to work aggressively to install ladder cooling structures to reduce high temperatures and excessive differentials.

Smolt Survival and Travel Time & Transportation Analyses

Steve Smith, NOAA, provided an update on 2021 smolt survival and travel time, and transportation analyses. Steve's presentation can be viewed here, and on the TMT website. The presentation included detailed data and analysis on migration conditions, travel time and survival of PIT-tagged smolts through the hydropower system.

Smolt Survival and Travel Time Analysis

In 2021, flow was well below average, with water temperatures above average for most of the season and record high spill percentage. Travel times were slightly shorter than in other recent low-flow years. Less than 10% of the Snake River smolts were transported. Very low numbers of fish passed dams via the juvenile bypass systems. Steve noted that the spring survival estimates were generally imprecise due to low detection rates: Snake River yearling Chinook survival was near average, Snake River steelhead were below average, and McNary to Bonneville was below average for multiple stocks. Steve noted that bird-colony PIT-recoveries were not used for estimates in this presentation, however, will be incorporated into the data for revised estimates for NOAA's eventual annual survival report.

Low PIT-tag detection rates meant generally lower precision in all estimates, measures had to be taken for broad-scale estimates, and data resolution was overall degraded. It was more difficult to investigate the effects of seasonally changing conditions.

Smolt Transportation Seasonal Analysis

Steve presented yearling Chinook and steelhead data from migration years 2016-2019, and included adult returns through November 29, 2021, smolt migration year 2019, and data from fish that entered the juvenile bypass system (JBS) at Lower Granite, Little Goose and Lower Monumental Dams.

For spillway PIT detection at Lower Granite, there is likely to be interest in comparing spillway-passing versus JBS-passing fish, including SARs. However, so few fish pass the JBS at current spill levels that such comparisons will not have much power, especially for SARs. To make such comparisons would require more JBS-passed fish, requiring consideration of decreasing spill for some periods. The spillway-detector gives us a time-stamp on non-bypassed fish for the first time. No extra effort is required to get this data, and the success of the spillway detector means we have plenty!

The following clarifications were made in response to questions from TMT Members:

- Daily percentage spill averages would be helpful to provide for the Lower Columbia River projects.
  - → **ACTION**: Steve will work on producing this analysis for the TMT.
- It was noted that the intent of high spill operations was to have fish go over the spillways and not through the detection routes; and the intended outcome comes with an impact to the monitoring data.

    - To increase monitoring under the new spill regime, the addition of some form of spillway detection at McNary Dam would likely be the most effective and efficient solution. The annual passage report will elaborate on recommendations to best monitor the new spill operation. [Facilitator's Note: Steve later noted that these recommendations will likely emphasize Bonneville and downstream-of-Bonneville detection more than he previously stated.]
- At this time information comparing passage timing at Lower Granite between spillway detection and JFF data is unavailable, this will be looked at in the future.
- Adding detection in the spillway has likely decreased the bias that occurs because the spillway fish are now represented. NOAA is continuing to pursue this.
- The current transportation start date was guided by higher T:B ratios at the end of April.
- It was noted by a TMT representative that while looking at T:B ratios and which performs better, it's still important to look at the big picture on sufficiency.

Kootenai White Sturgeon Upstream Migration, Flow, and Water Temperature Management

Ryan Bart, USFWS, provided an update on Kootenai River white sturgeon upstream migration, flow, and water temperature management. The presentation can be viewed here, and on the TMT website. Kootenai River white sturgeon are endemic to the Kootenai River and Kootenay Lake. They make annual spawning migrations from the Lake to the River.

High spring flows are the cue for sturgeon to move upstream, while spawning is cued in the descent from peak flows. Upstream movement increases the likelihood of sturgeon spawning over suitable substrate including rock and cobble.

The construction of Libby Dam (1972) had a significant effect to the sturgeon system, as it acted as a nutrient sink and changed the temperature and flow regimes in the river. This led to recruitment failure and eventual ESA listing of the species. Recovery actions for the Kootenai white sturgeon include flow and temperature management, habitat enhancement, a nutrient addition site at the Idaho/Montana border, and the Kootenai Tribe of Idaho's Conservation Hatchery program.

The current white sturgeon wild population consists primarily of pre-Libby year-classes, with very little recruitment to the spawning population. The hatchery population is representative of pre-Libby broodstock, with early year-classes reaching sexual maturity. The Hatchery program has been able to increase the family groups and improve genetic diversity and survival of the species.

The path forward for the species is to better understand how the current ecosystem and population can be managed to support natural recruitment through resiliency, redundancy, and representation. Ryan emphasized that management decisions are long-term, given that fish don't mature for 25+ years.

Kootenai River White Sturgeon and Burbot Restoration Program

Shawn Young, Kootenai Tribe of Idaho, provided an update on the Kootenai River Native Fish Conservation Aquaculture Program to restore white sturgeon and burbot. The presentation can be viewed here, and on the TMT website. The program balances aquaculture production with genetic management and ecosystem carrying capacity in an effort to restore self-sustaining sturgeon and burbot populations in the Kootenai River ecosystem.

The two major objectives of the program are to rebuild the population abundance in order to jumpstart recruitment and investigate habitat dynamics through experimental early life stage releases. The program has been exceeding expectations with the opening of its Twin Rivers Hatchery in 2015. After 10 years of

program development and 13 years of releases, the program has released over 1.5 million juveniles, 18 million larvae, and 27 million fertilized eggs.

The program is also working to address habitat limitations, through late winter and spring water management (via Libby Dam discharge and Kootenay Lake water management). The program uses adaptive management and considers operational priorities and the needs of modern society.

Emily thanked the presenters and meeting participants for their engagement and meaningful conversations throughout the year of TMT coordination. And with that, the meeting was adjourned.

All presentations and handouts can be found on the TMT website.

Present for all or part of the meeting:

Julie Ammann (USACE), Ryan Bart (USFWS), Leon Basdekas (USACE), Doug Baus (USACE), Scott Bettin (BPA), Ruth Burris (PGE), Paula Calvert (BPA), Eric Chow (USACE), Trevor Conder (NOAA), Erin Cooper (FPC), Kyle Dittmer (CRITFC), Catherine Dudgeon (USACE), Jonathan Ebel (ID), Joel Fenolio (BOR), Jay Fintz (Chelan Co PUD), Jen Graham (CTWS), Melissa Haskin (FLUX Resources/Notetaker), Ben Hausmann (BPA), Lance Hebdon (IDFG), Jay Hesse (Nez Perce), Greg Hoffman (Corps), Tom Iverson (YNF), Nate Jensen (KToI), Micah Koller (BPA), Mark Kruzel (West Power Trading), Tom Lorz (UT/CRITFC), Brian Marotz (MT), Aaron Marshall (USACE), Claire McGrath (NOAA), K.C. Mehaffey (Clearing Up), Alexis Mills (USACE), Colby Mills (DSC), Charles Morrill (WA), Shawn Nelson (Corps), Bret Nine (CT), Tony Norris (BPA), Mike O'Bryant (CBB), Chris Peery (USACE), Christine Petersen (BPA), Joshua Rasmussen (EGPS), Jon Roberts (Corps), Gabe Scheer (FPC), Mike Shapley (Snohomish PUD), Tom Skiles (CRITFC), Steve Smith (NOAA), Scott St. John (USACE), Emily Stranz (DSC), Cynthia Studebaker (USACE), Leah Sullivan (BPA), Dave Swank (USFWS), Josie Thompson (NOAA), Ken Tiffan (USGS), Dan Turner (Corps), Erick Van Dyke (OR), Willow Walker (Corps), Lisa Wright (USACE), Shawn Young (KToI).