

Meeting Summary
FLOW WORK GROUP
Monday January 30, 2023
TRRP office Weaverville, MS Teams

Monday, January 30, 2023: 9:00 AM

Participants

Core members: Justin Alvarez (HVTFP), Galen Anderson (USFS), Todd Buxton (USBR/TRRP), Kyle De Julio (YTFP), Patrick Flynn (Trinity Co.), Ken Lindke (CDFW, coordinator), Trevor Morgan (CDWR), Seth Naman (NMFS), Bill Pinnix (USFWS)

Other participants: John Baer (McBain Assoc.), Mike Dixon (USBR/TRRP), Chris Laskodi (USBR/YTFP/TRRP), James Lee (USBR/TRRP), Eric Peterson (USBR/TRRP), Karl Seitz (HVTFP)

Action Items Derived During the Meeting

Action Item 1: Ken will compile a list of objectives and considerations for hydrograph development for Normal and Wet water year types (included in meeting summary).

Action Item 2: Ken will distribute the functional flows considerations document developed by Todd in 2020 (attached to meeting summary).

Action Item 2: Eric will update the flow scheduler and redistribute it to workgroup members.

Action Items Outstanding from Previous Meetings

None

Summary of Meeting by Agenda Item

Status report on Flow Synthesis Report (Alvarez, Naman, De Julio)

Kyle started the update for the group. An outline is complete and has been shared with and approved by the Flow Workgroup. The report will be based on seasonal components of hydrographs, what has been done over the past 30 or so years, what has been learned, and a discussion of other completed synthesis reports as they pertain to flow management. ROD objectives will be revisited to evaluate of how well they have been met with flows that have been implemented. There is no plan for new analyses other than revisiting the probabilities of each water year type and a comparison to those probabilities as of the 2000 signing of the ROD.

Mike D. asked why the project has stalled. Kyle responded that this report was intended to follow other synthesis reports, some of which are yet to be completed. Also, PIs have been busy with other assignments, but plan to re-engage soon. PIs will likely reach out to authors of other synthesis reports to ensure they are interpreting those reports accurately. Ken asked if there are additional resources the PIs need to re-engage and/or complete the report. The general consensus among PIs is that time is the limiting factor. Someone also noted that Scott McBain will be a co-author.

Review of hydrologic conditions (Lindke)

Ken provided a review of hydrologic conditions to date, and a pdf of the presentation is available on the Flow Workgroup page of the TRRP website for this meeting. To date we have received more precipitation than we have in several years, but reservoir inflow volumes and snow pack are close to the long-term average. Current forecasts are for a Wet water year, but forecasted inflow to Trinity Reservoir are declining daily and there is little precipitation in the 6-day forecast. A Normal water year seems likely. Chris stated that Shasta Reservoir might fill this year. There was more precipitation in that watershed and more fell as rain as compared to more snow in the Trinity. Full reservoirs in the Central Valley might relieve some pressure on the Trinity this summer. There was some question about how snow pack is being reported or measured this time of year. General consensus was that physical measurements will not be collected until sometime in February. For now it is from gages or remote sensing. Kyle suggested asking Josh Smith from the Hayfork Watershed Center to give a presentation on how snow pack is measured and reported.

Update on flow synchronization monitoring to date (Peterson, Buxton)

Eric and Todd led a discussion on monitoring of the North Fork gage for a trigger flow after TMC approved the winter variable flow hydrographs. Note, synchronized flows were not implemented due to a legal challenge by the Hoopa Valley Tribe. Eric was largely responsible for monitoring the flow forecast due to holiday time off for other TRRP staff. Shortly after the December TMC meeting Todd developed an hourly schedule for a 60 kaf synchronized flow that could be moved to coincide with a forecasted tributary accretion event.

There were three flow events that exceeded the 4,500 cfs trigger at the Trinity River at North Fork gage before monitoring ended (due to HVT lawsuit and practical time investment), but only two of these were forecasted far enough in advance to have triggered a synchronized flow release, on January 8th and 9th. For the January 8th event, Eric updated the hourly schedule to synchronize with the forecasted flow as best he could. If it had been implemented, it would have missed the peak at the North Fork by approximately 10 hours, but general consensus among workgroup members was that this would have been really good for a first attempt. While doing a dry run, so to speak, several questions arose.

Initial guidance from the winter variable flow report was to use the 5-day forecast for the trigger. Eric pointed out this is too vague, that actual forecasts are updated twice daily and are for 116 (approximately 8 am daily) hours or 111 hours (approximately 1 pm daily). Consensus was that either of these could act as the trigger, but nothing shorter. After accounting for time to ramp up to the peak, providing at least 72 hours notice to the public, and time to establish the flow schedule and provide it to CVO, there is a very limited window in which the decision to proceed can be made. Kyle suggested that a different forecast(s) (e.g., the ensemble instead of deterministic) could be used to set the plan in motion, then a final decision on releasing the flow could be made with on a shorter timescale. Mike informed the group that in addition to public notification, CVO needs at least 72 hours notice to inform power customers and establish contracts, after which time CVO is contractually obligated to release the water.

James asked whether a different trigger threshold would be better if the release occurred on the falling limb of a storm peak rather than synchronized to the peak. For example, maybe sediment mobility thresholds are different on the falling limb and the release could be timed to something other than 4,500 cfs. Todd responded that it is unknown at this time but may be something we have a better handle on after we've implemented for a few years. He also said there are forecast tools that we aren't leveraging, e.g. weather forecasts more than 5 days out indicating that we will experience multiple peaks. Could this information be combined with professional judgement to decide which peak to synchronize with? Maybe we don't want to hit the first opportunity every time.

Eric pointed out that if faster ramp down rates were used, we could get a 6,500 cfs peak using only 35 kaf of water, which could allow us to do two synchronized releases in a year. Mike stressed that we can't evaluate the effectiveness of the rule set and proposal that was approved if we don't actually implement as planned. It is food for thought for the future.

Mike provided an update on winter variable flow implementation, or rather, lack thereof. Following approval of winter flows at the December TMC meeting the Hoopa Valley Tribe filed a preliminary injunction against Reclamation to prevent implementation of winter variable flows, pursuant to litigation unrelated to the specific winter variable flow issue. Despite this filing, federal courts have not provided any order to Reclamation to prevent implementation. Instead, Reclamation decided not to implement to be cautious because the litigation is larger than the winter variable flow issue itself. When the preliminary injunction hearing was canceled, Reclamation filed a notice that they intended to make a decision on whether or not to proceed with implementation. However, as of the time of this meeting the regional directors of Reclamation and USFWS had not made a final policy decision on whether to concur with the TMC recommendation and implement the next phase of winter variable flows (elevated baseflows).

WY23 hydrograph objectives and considerations (All)

The group reviewed Normal and Wet water year-specific objectives from the flow study, discussed modifications of those objectives, and objectives from the winter variable flow project report. Potential needs for ongoing studies, data collection, and infrastructure maintenance were also discussed. Diurnal flow variability to mimic snowmelt will be incorporated into sub-daily schedules after one is identified for implementation and will follow the equations developed by Todd in 2019. A list of objectives and considerations for this year are below. Objectives that are outside the normal planning period for flows (i.e., are accounted for by summer or winter baseflow) are excluded for brevity. Objectives agreed upon by the workgroup are identical for Normal and Wet water years with the exception of the peak release.

- **Normal Water Year:** Achieve a peak release of 6,000 cfs for sediment mobilization, fine sediment deposition on floodplains, encourage riparian establishment on floodplains, and scour 1 year old woody riparian vegetation on channel margins (Flow Study Table 8.7).
- **Wet Water Year** Achieve a peak release of 8,500 cfs for sediment mobilization and channel migration at rehab sites, create floodplains, encourage riparian establishment on floodplains, and scour up to 2 year old woody riparian vegetation on channel margins (Flow Study Table 8.7).

Normal or Wet Water Years

- Spring release hydrographs should start on 16 April because the elevated baseflow hydrographs go through the 15th.
- Remain within maximum allowable ramp up and ramp down rates (Flow Study Table 8.7, included in Eric's flow scheduler, from 2000 Final EIS Appendix C, also in functional flow considerations).
- Flow changes between days cannot be less than 50 cfs due to infrastructure constraints.
- Return to summer baseflow as early as possible after consideration of other objectives to reduce the effects of temperature suppression on growth of rearing salmonids (i.e., increase growth) and provide thermal cues for smoltification and downstream migration earlier in the year (Winter variable flow report).
- Elevated flows 600-1,000 cfs during hatchery releases near the full moons occurring monthly March-June to encourage downstream migration of juvenile salmonids from TRH.
- Remain below 2,000 cfs to allow the macroinvertebrate study to continue collecting data and prevent equipment loss. Consider sampling benches of 24-28 hours at approximately 2,000 cfs between pulses.
- Achieve a peak of 8,500 cfs but no more, then include flow variability on the scale of days to facilitate the hyporheic flow study and prevent equipment loss.
- Functional flow considerations compiled by Todd in 2020 (attached).

Kyle noted that a single release of 11,000 cfs scours willows just about as good as two 8,500 cfs peaks. If the hyporheic flow study is underway, folks should prioritize two lower peaks to accommodate this study. Kyle also noted there is a lot of fine sediment in the upper mainstem, delivered by fire-affected tributaries to the unsynchronized flows in the mainstem. It would be good to meet or exceed peak release objectives to flush these sediments. If the elevated baseflow component of winter variable flows is implemented, there should be no need to take additional measures to prevent early breeding of foothill yellow-legged frogs. If other flow scheduling results in a return to baseflow by June, folks should consider a flow increase to 600-1,000 cfs to coincide with the June hatchery release.

Flow scheduler training (Peterson)

Eric provided a detailed training on the flow scheduler Excel file he developed. It is an extension of a flow scheduler originally developed by Andreas Kraus, updated to, among other things, easily develop flow components consistent with the winter variable flow project (e.g., synchronized flows and elevated baseflows). A few errors were identified and Eric will correct them and send the scheduler to the workgroup.

Eric asked if April 15th should be considered the elevated baseflow period or spring release, reiterating the importance of not dropping to winter baseflow between the two. Kyle noted that it could be either or both. If the elevated baseflow schedule went through the 15th, spring release water could be added on top of that. The same would be true if part of a synchronized flow release extended into the elevated baseflow period. Flows would just be additive in the overlapping period.

Hydrograph development and modeling schedules (Lindke)

Ken quickly reminded the group that the next meetings are on March 9th and 20th. Candidate hydrographs will be examined and some will be selected for modelling on the 9th. Model results will be reviewed and a final hydrograph will be selected on the 20th. The timeline will be later than usual and much more compressed than in previous years, assuming elevated baseflows of the winter variable flows are implemented.

Field visits

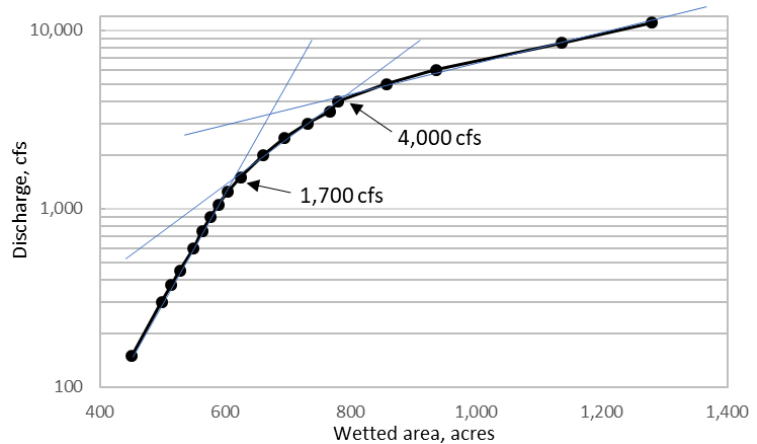
Most of the folks that attended the meeting in person headed to the field in the afternoon, checking out fine sediment impacts at the Deadwood delta, near Trinity House Gulch, and just upstream of the Douglas City 299 bridge. A considerable and concerning amount of fine sediment was delivered to a low and static mainstem river (300 cfs Lewiston release) during recent storms. Due to the lack of a synchronized flow release, fine sediment blanketed the mainstem stream bottom several inches deep in some places. Salmon and steelhead redds were covered, likely increasing mortality of eggs. The effects were greatest downstream of Deadwood

creek, but still considerable near Trinity House Gulch. Sediment dynamics appeared much closer to normal near Douglas City.

12:30 PM Adjourn

Functional flow considerations in hydrograph development

Primary production, macroinvertebrates: Prior to June 15, inundate surfaces for 28d for establishment of biofilm, 35d for macroinvertebrate establishment, and 63d for peak macroinvertebrate production. See figure for wetted area of mainstem channel-connected area versus discharge relationship modeled for the restoration reach with SRH2D using 2016 topography.



Foothill yellow legged frogs (FYLF): vary flows before peak discharge to delay FYLF breeding until after the peak flow event to prevent scour of egg masses on bars. Duration for tadpole development from egg masses is ~25 days in typically cold water in Trinity River and ~2 weeks in warmer water.

Riparian recruitment: Maintain moist soil on surfaces wetted by 2,000 - 4,500 cfs for cottonwood recruitment beginning in the average seed dispersal period (May 15-May 28) and lasting 21-29 days. During targeted period, flow stage should be ≤0.25 m below targeted surface. Following peak discharge in targeted period, recede stage ≤0.10 ft per day at Trinity River at NF Trinity River gage. Note that riparian plants can survive steeper recessions (i.e., recessions closer to 0.10 ft/day) later in the year.

Fine sediment transport: Depending on the targeted area for transport of fines, discharge should be increased above 3,000, 1,000, and 2,000 cfs at Lewiston, Limekiln Gulch, and Douglas City, respectively. Continue to increase flow above threshold discharge to maintain entrainment and routing of fines. Increase flow above 4,500 cfs to deposit fines outside the main channel.

Bed load transport: Increase flow above 3,500, 2,500, and 2,000 cfs at Lewiston, Limekiln Gulch, and Douglas City to mobilize the coarse armor layer. Afterwards, flow increased steeply to a short peak followed by a rapid decrease in flow generally maximizes loads per unit volume of water due to clockwise hysteresis that is common on the Trinity River. Successive high, short peak discharges typically transport a cumulatively higher load and route more coarse sediment than a high peak that is maintained for a protracted period.

Geomorphic change: Rapid decreases in flow from stages that inundate banks waterlogs and promotes collapse of banks that encourages adjustment of channel position (meandering), wood recruitment, and formation of diverse edge habitats for fish.

EIS up- and down-ramp rates

Lewiston Dam Release (ft ³ /s)	When Increasing Flow [a]	When Decreasing Flow [b]
At or above 6,000	1,000 cfs per 2 hours	500 cfs per 4 hours
6,000 to 4,000	1,000 cfs per 2 hours	400 cfs per 4 hours
2,000 to 4,000	500 cfs per 2 hours	200 cfs per 4 hours
500 to 2,000	250 cfs per 2 hours	100 cfs per 4 hours
300 to 500	100 cfs per 2 hours	50 cfs per 4 hours

Water temperatures for salmonids:

1) The 7-day moving average of daily average temperatures should be maintained between 13.0 – 16.5 C at the Trinity River above NF Trinity River gage between April 1 and July 31.

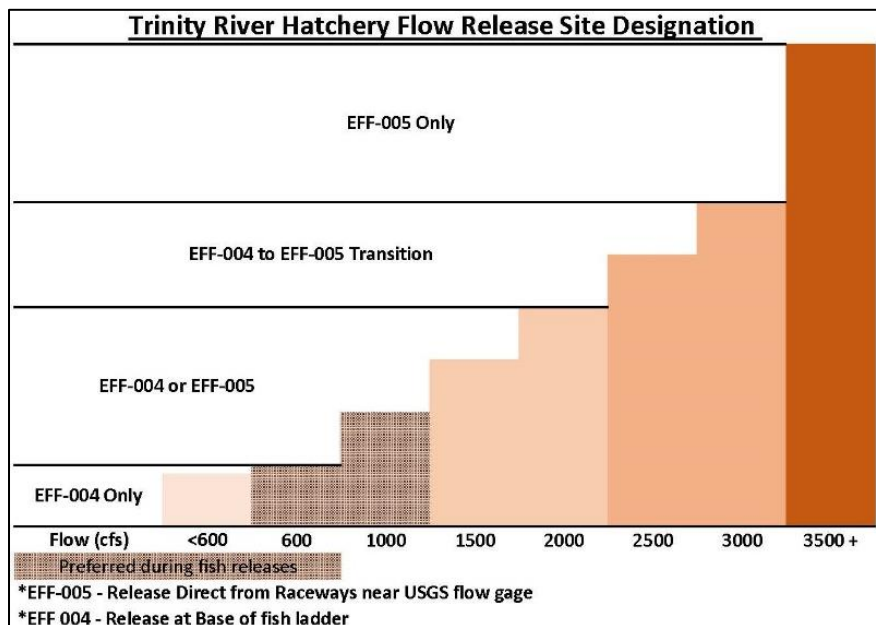
2) Meet temperature targets for juvenile salmonids (in Celsius)

	Start date	End date
Juvenile outmigrant temperature criteria	22-Apr	22-May
normal and wetter	13	13
dry and drier	15	15
	23-May	4-Jun
normal and wetter	15	15
dry and drier	17	17
	5-Jun	9-Jul
normal and wetter	17	17
dry and drier	20	20

3) Meet temperature targets for adult salmonids (in Celsius)

Temperature criteria for adult salmonids	Start date	End date
at Douglas City (RM 93.8)	1-Jul	14-Sep
	15.6	15.6
	15-Sep	30-Sep
	13.3	13.3
at NF Trinity River (RM 72.4)	1-Oct	31-Dec
	13.3	13.3

Hatchery fish: Provide 600 – 1,000 cfs and increasing flows for a week following that start of hatchery fish releases (April 20 (steelhead), May 18, June 15 (chinook) targeted for WY20).



In-channel construction: Release discharge from Lewiston Dam ≤1000 cfs from July 15 - September 15.