Evaluation of the Hydrologic Effects of the Trestle Pool Project

We are conducting a stage/discharge study to provide pre- and post-project water levels at the Trestle Pool over a wide range of flows. The old trestle abutments and center pier currently act as a pinch point in the river. At higher flows, the water piles up above the pinch point which slows it down. This reduced velocity results in bed load deposition in this area. This deposition results in a "filling in" of the river channel. With the channel filled in, high flow events tend to cut into the riverbanks rather than scouring the existing channel causing more erosion and the formation new channels. Note that the river is heavily braided above the project site. The project is designed to facilitate proper bedload transport by eliminating the pinch point. We will remove the center pier and the south abutment and re-establish a flood plain on the south side of the river by excavating a portion of the old railroad grade. There are also additional aspects of the project that will improve habitat for fish and other aquatic organisms.

We anticipate that the water levels exceeding bankfull at the project site will increase slower relative to increases in discharge when the project is complete since the existing impediment to velocity will be gone and water will have the freedom to spread out horizontally at these higher flows. This is designed to eliminate the piling up of water and the associated bedload deposition above the pinch point that is occurring prior to its removal.

We installed a staff gauge on the north abutment of the trestle to monitor water levels at the project site (Figure 1). There is also a USGS gage located a short distance downstream of the project site. We developed a simple linear regression model using natural log-transformed discharge measurements at the gage to predict the natural log transformed gage readings (i.e., water levels) at the project site. The log transformations were useful for the regression because the relationship using the original units was slightly curvilinear, but the transformations made the relationship linear.

Figure 1. Staff gage installed on the north abutment at the Trestle Pool.

Pre-Project Stage-Discharge

We collected pre-project data from 10/28/22 through 4/2/23 at the project site that ranged from 425 to 3140 ft^3s^{-1}. Note that the range of flows occurring during the monitoring period never exceeded bankfull. The summer minimum baseflow of 185 cfs at the Lighthouse Hill Reservoir was scheduled to begin 1 May but flows have remained higher than that with the amount of water in the system.

The discharges at Pineville did an excellent job of predicting water levels at the Trestle Pool over the range of flows that occurred during the pre-project monitoring period (R^2=0.997, p<0.001, 92 df, Figure 2).

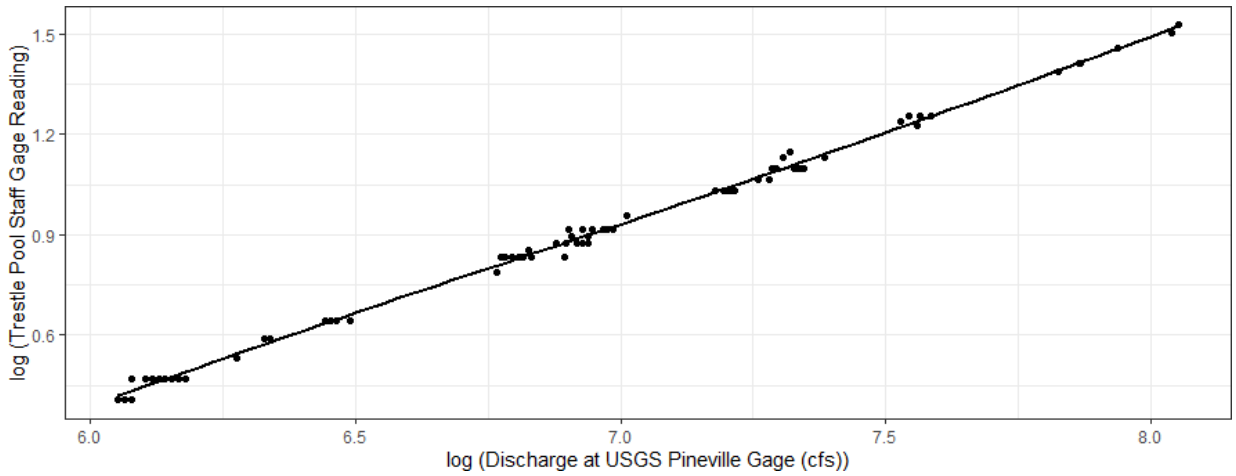

Figure 2. Regression plot for the pre-project predictions of water levels at the Trestle Pool at various levels of discharge at the USGS gage at Pineville (R^2=0.997, p<0.001, 92 df).

As expected from the results of the regression model, the discharge measurements do an excellent job of predicting the water levels at the Trestle Pool over the range of flows that occurred during the pre-project monitoring period (Figure 3). Also note the curvilinear nature of the relationship of the results back transformed to the original units.

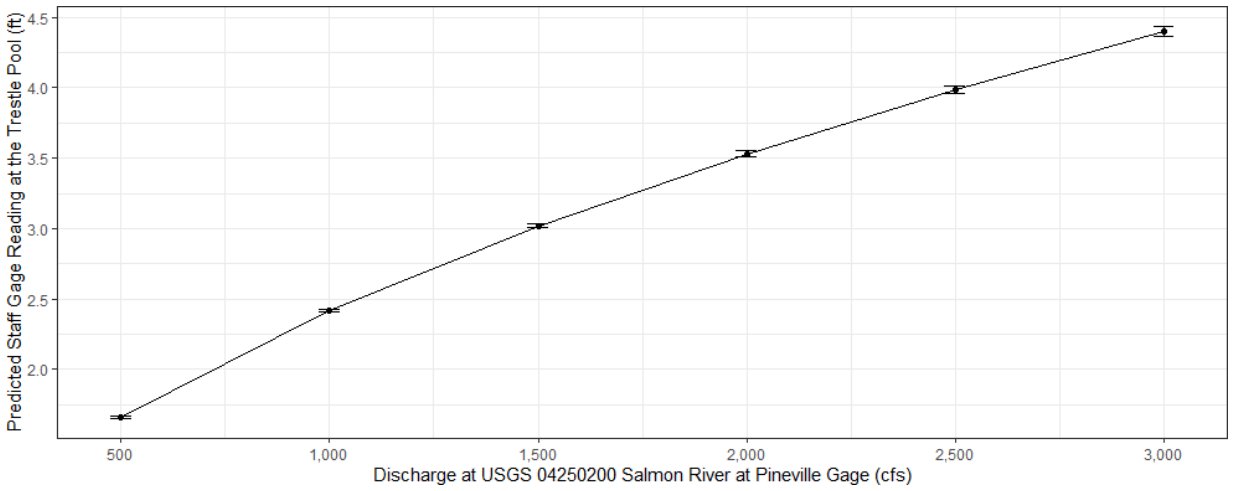

Figure 3. Pre-project regression predictions of water levels at the Trestle Pool based on the discharge at Pineville. The error bars represent 95% confidence intervals, and the axis labels are back transformed to the original units.

Mid-Project Stage-Discharge

We collected mid-project stage-discharge data from the USGS Pineville gage and staff gage readings at the Trestle Pool from fall, 2023 through spring, 2024. The discharge levels the Pineville gage are an excellent predictor of the water levels at the Trestle Pool (R^2 > 0.99). Pre-project data were collected from fall 2022 through spring 2023. Mid-project data have been collected since fall 2023 and will be collected through spring 2024. The only practical difference in below bankfull channel configuration between the periods is that the center pier was removed summer 2023 slightly increasing channel capacity between the footers of the bridge abutments. That is likely the cause of the slightly reduced slope for the mid-project period. The slopes of the regression lines for the periods, however, are not significantly different (p = 0.32). Installation of the J-hook in 2024 may change things at the below bankfull flows but the largest anticipated

difference and benefit of the project will occur when flows exceed bankfull, and water is allowed to escape to the newly constructed flood plain. We constructed the flood plain by excavating the old railroad grade concurrent with the removal of the south bridge abutment, which was removed down to bankfull elevation but have yet to see an above bankfull flow in either period. The frequency of high and low flow events is markedly reduced by the reservoir management strategy employed for hydro-electric production and maintenance of the FERC license mandated seasonal baseflows. Flows exceeding bankfull are inevitable but rare and the biggest benefit of the project will occur during these events resulting in improved sediment transport facilitated by the removal of the "pinch point" formerly created by the abutments and center pier.

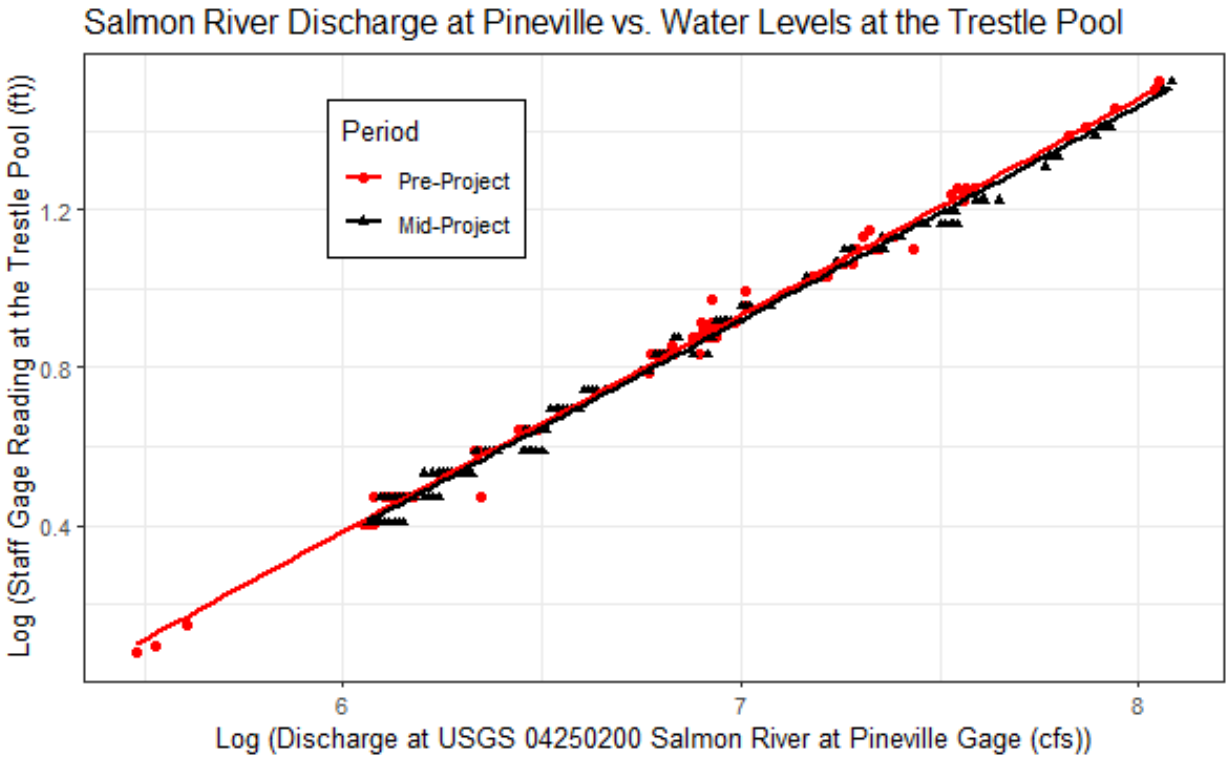

Figure 4. Regression plot for the pre- and mid-project predictions of water levels at the Trestle Pool at various levels of discharge at the USGS gage at Pineville (pre-project R^2=0.997, mid-project R^2=0.99).