

Gravel Augmentation Proposals for Water Year 2021  
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February 23, 2021

Objectives

Sediment additions to the Trinity River are necessary to mitigate for sediment impounded by Trinity and Lewiston Dams. Primary objectives for the additions are to provide pebble to medium cobble-sized sediments (0.5-5 inches in diameter, hereafter “gravel”) for mobilization during spring flow releases to construct bars and associated channel complexity and provide habitat for aquatic species, including salmonids, benthic macroinvertebrates, and biofilm.

Augmentation Locations

TRRP utilizes six permitted locations for adding gravel to the channel. The locations include Trinity Hatchery (RM 112.0), (RM 111.0), Cableway (RM 110.2), Sawmill (RM 109.0), upper Lowden Meadow (RM 104.9), and Fenceline at lower Lowden Meadow (RM 104.4). Augmentations of gravel at Weir Hole, Cableway, and upper Lowden Meadow are not proposed this water year because sediments appear overly present from past augmentations at and near these sites. Additions are also not proposed at Sawmill because an augmentation at this site in spring 2019 enlarged a bar 0.2 river miles downstream to an extent that its dispersal is likely to contribute sufficient material for the 0.5 mile distance of channel upstream of Rush Creek delta pool in the near future. In contrast, the Hatchery augmentation location exhibits a strong deficit of gravel and is the preferred location for additions during this year’s spring flow release. However, discussions with the land management agency (U.S. Forest Service) regarding access and placements at this site are ongoing so Fenceline is proposed as an alternate site for the augmentation this year. Fenceline was chosen as the alternate because it is the augmentation location nearest Limekiln Gulch, where a notable deficit of gravel exists.

Water Year Type and Proposed Hydrographs

The current 50-percent exceedance forecast of full natural flow for the Trinity River at Lewiston is 613,000 acre-feet (AF). This projected volume is near the boundary between the projected full natural flow for dry (650,000 AF – 1,025,000 AF) and critically dry (<650,000 AF) water-year types defined in the ROD (2000). Hydrographs have been proposed for both water year types by Yurok Tribal Fisheries Biologist Kyle DeJulio (KD) and TRRP Fluvial Geomorphologist Todd Buxton (TB; Figure 1) so that flow schedules may be considered for whichever water year type is projected by the April 1<sup>st</sup> B120 forecast that will be published on April 8<sup>th</sup> this year. Gravel augmentations, however, are only proposed in the event the projection is for a dry water year. Augmentations are not proposed for implementation under the critically dry water year designation because computed loads (see below) are inconsequential for this water year type.

Discharge and Gravel Volume Estimates

Gravel augmentation volumes were computed for hydrographs proposed for a dry water year using power law relationships between discharge and fine ( $\geq 0.5$  to  $\leq 8$  mm) and coarse ( $> 8$  mm) bedload measured on the Trinity River at Douglas City in spring 2009, also a dry water year. Loads were computed for this location for placement at the augmentation sites because observed sediment transport rates at Douglas City are assumed to represent bed loads that are “natural” for the post-dam hydrology and sediment supply. In 2009 at Douglas City, bedload hysteresis was not measured so that a single transport relationship to discharge for increasing and decreasing limbs of the hydrographs was applied in load calculations for each size fraction. Critical flows above which bedload movement occurs were estimated by the reference transport method using shear stress partitioned for the granular bed as 993 cfs for fine bedload and 2,024 cfs for coarse bedload. River flows to compute the mass of sediment for addition to the

Fenceline site were estimated with RBM10 v.1.7.5 (Jones et al., 2016) using each hydrograph as the upstream boundary condition in the model runs. The model outputs daily average flows for calendar years 1980–2018, and these data were separated into their respective water years and the median daily average flow was computed from the results for all dry water years in the model output at Fenceline. Discharges for load computations at the Hatchery reach were simply the daily average flows in the proposed hydrographs due to this site’s proximity to Lewiston Dam. With each flow record, loads for both stations were computed in a daily timestep and summed for the water year. Results (in tons) were converted to a volume (cubic yards, cy) by assuming a sediment mass density of 2.23 tons/cy and a porosity of 20% (Table 1). The augmentation volume computed for a dry water year at the hatchery reach was then increased by 50% to help overcome the deficit of gravel at this site.

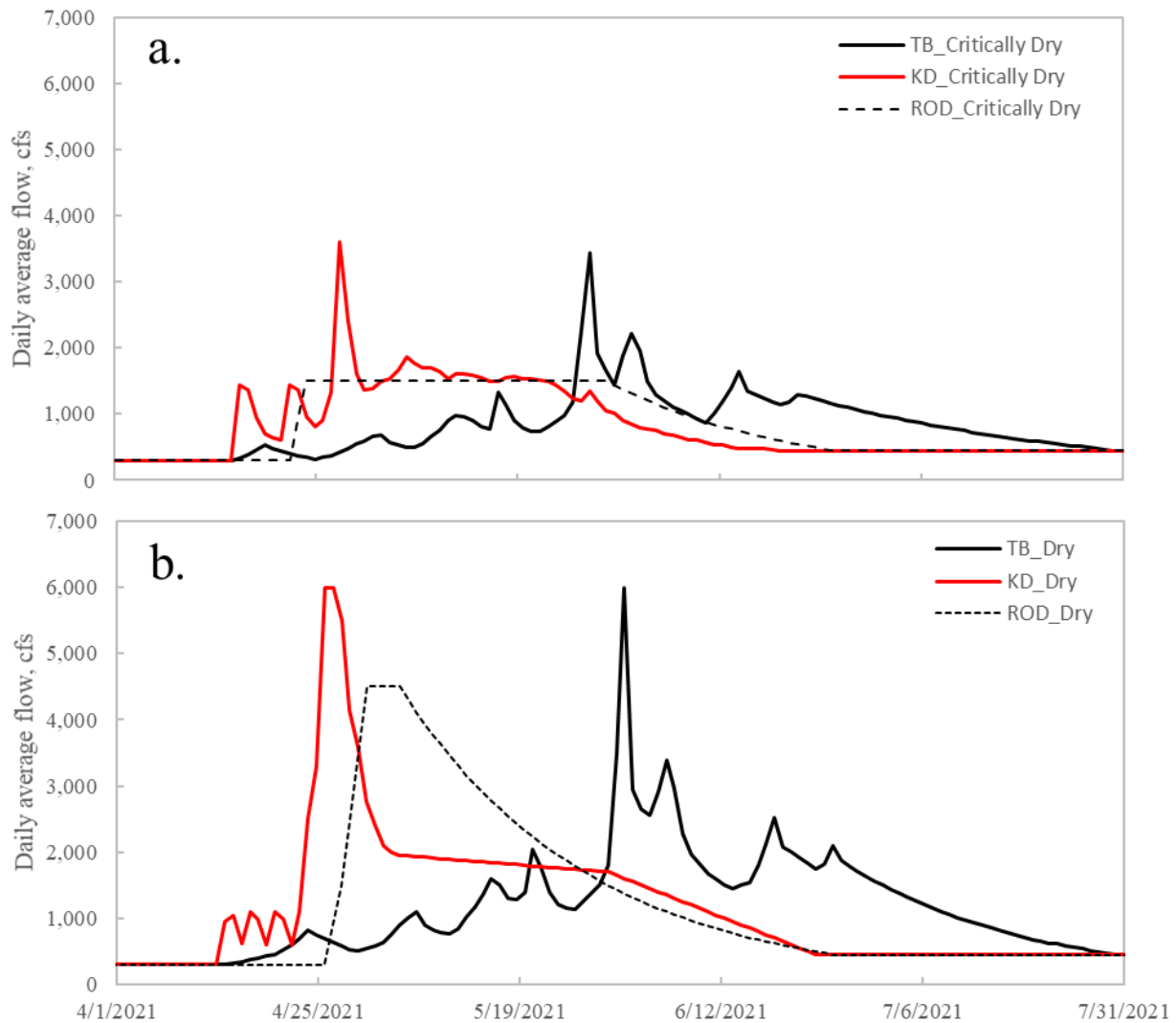


Figure 1. Hydrographs proposed by Kyle DeJulio (KD) and Todd Buxton (TB) for release from Lewiston Dam in a critically dry (a.) or dry (b.) water year is projected by the April 1 B120.

Table 1. Gravel augmentation volumes proposed for addition during the spring flow release at the Hatchery reach and Fenceline site in a dry water year.

Hydrograph	Hatchery reach (RM 112.0)	Fenceline at Lowden (RM 104.4)
TB_dry	400 cy	280 cy
KD_dry	980 cy	680 cy

### Gravel Placement Methods and Timing

If a dry water year is projected, gravel placement at the Hatchery reach will involve trucking material for placement from the Sawmill processing site in 10-yard loads utilizing Trinity Dam Boulevard near Lewiston and then USFS road 33N80 for a 0.5 mile decent to the river (Figure 2). Trucks will then back 1,280 ft upstream on an existing two-track road on river right and dump on the roadbed surface. Prior to trucking, the two-track road will require a loader remove rocks that have fallen onto it the first 900 ft and widen the road approximately 5 ft for the remaining distance. If road widening is not allowed, truckloads of gravel will be dumped at the 900 ft location instead. However, it is desirable to add gravel as close to the dam as possible to maximize the channel distance improved by the additions. As gravel is dumped on the roadbed, a loader will relocate it into transverse piles oriented 15-20 degrees in the upstream direction for mobilization by high flows (Figure 3). The direction of placement with respect to the flow is expected to help disperse the gravel across most of the channel width in close downstream proximity to the augmentation for utilization by salmon spawners. The transverse piles will extend from the riverbank at locations that minimize impacts to the sparse riparian vegetation that is present. The piles will be constructed 2-3 ft above the water line and extend 50-75 feet into the channel at an oblique upstream angle. The loader will avoid contacting the river's flow when constructing the piles. Start and end dates for trucking and placement of gravel at this site for each proposed hydrograph are listed in Table 2. No augmentation of material at this site is proposed for a critically dry water year.

Table 2. Approximate start and end dates for trucking and gravel placement at the Hatchery reach and Fenceline sites in a dry or critically dry water year. The actual dates for placement will be developed in consultations between the contractor for gravel placement and TRRP.

Hydrograph	Hatchery reach (RM 112.0)		Fenceline at Lowden (RM 104.4)	
	Start date	End date	Start date	End date
TB_dry	May 10	May 26	May 10	May 29
KD_dry	April 14	April 23	April 14	April 24

If gravel augmentations are not allowed at the Hatchery reach, the Fenceline location will be utilized instead (Figure 4). In this case, gravel for addition at the Fenceline site will be transported in an articulated dump truck from the existing stockpile at the upper Lowden site. Material will be dumped near the bank's edge at Fenceline and relocated with a bulldozer into the channel. The bulldozer will construct the material into a trapezoidal berm extending toward the thalweg in a downstream angle of approximately 30 degrees. This angle of the berm to flow will help facilitate left bank (facing downstream) erosion and associated channel migration to promote point bar formation in the meander complex that is evolving at the Fenceline site (Figure 4). Start and end dates for trucking and placement of gravel at this site for each proposed hydrograph are listed in Table 2.

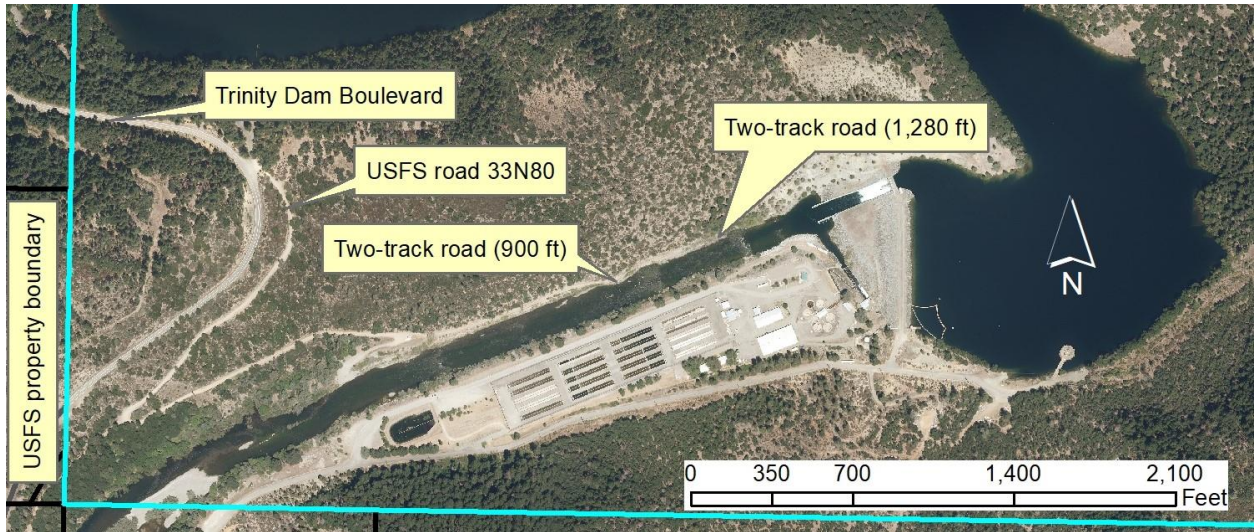


Figure 2. Site layout showing Lewiston Dam, property ownership, access roads, and placement locations on the two-track road on the right bank of the Trinity River.

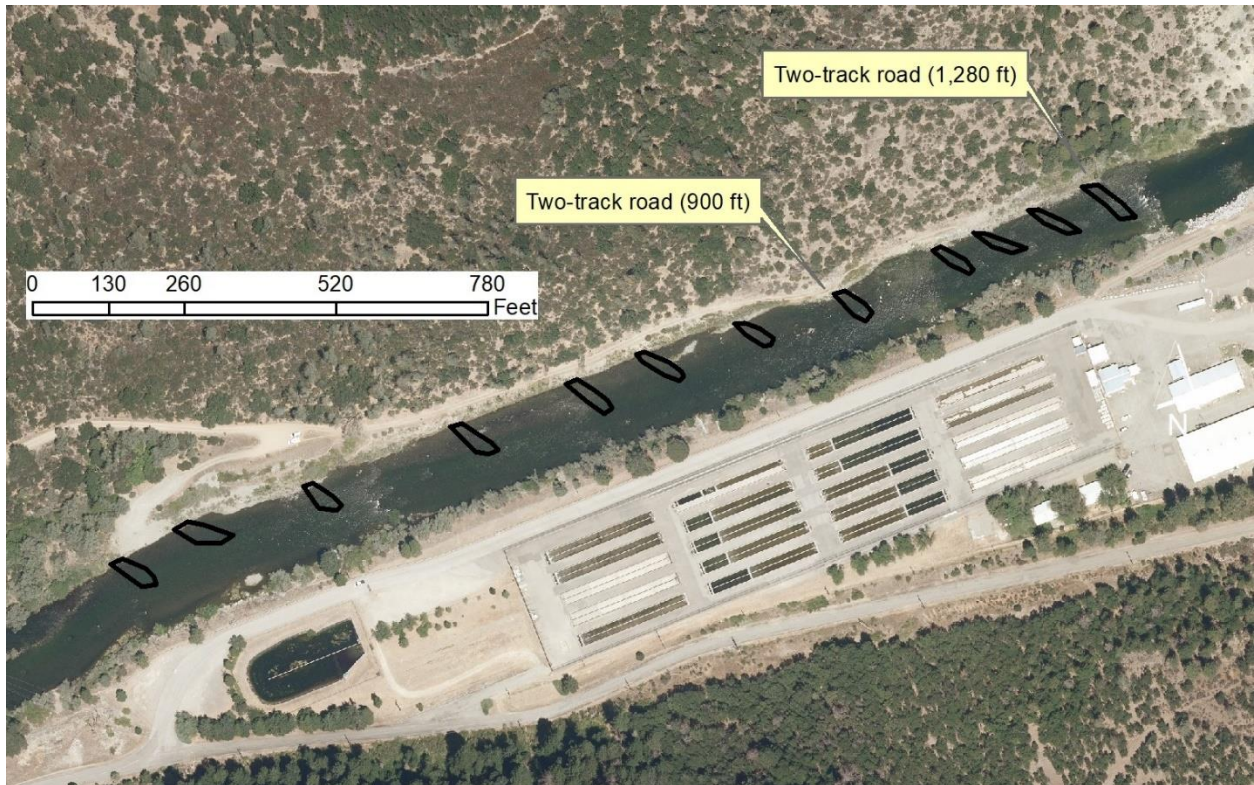


Figure 3. Approximate location of gravel additions and number of piles placed in the Hatchery Reach of the Trinity River. If access to the end of the two-track road is not possible (at 1,280 ft), gravel additions will be limited to the 900 ft location on the road and downstream.

Concerns regarding large cobble from past gravel augmentations at the Fenceline and upper Lowden Meadow augmentation sites has been raised in the past. This oversized material originates from the existing gravel augmentation stockpile and will continue to be contributed to the channel unless the pile is reprocessed and the large cobbles removed. The decision by TRRP to not undertake this work has already been made, so an alternative is to use an excavator to move this material from the surface of the bed and transport it for storage with a loader to the vicinity of the augmentation stockpile at upper Lowden Meadow. This action, however, is not recommended until after the material stockpile is exhausted by placement in the channel. At this time, all oversized material at the augmentation locations can then be removed from the surface of the bed and stored as described above. The delay in removing the oversized rocks is not expected to substantially affect the river's morphology and functioning because the volume of this material involved is presently small, and a substantially larger coarse lag deposit exists at Indian Creek delta without any noticeable detrimental effects.



Figure 4. Fenceline site location and access roads at Lowden Meadows.

#### Construction Oversight and Turbidity Monitoring During Augmentation

TRRP will provide personnel for oversight of construction activities and turbidity monitoring to ensure all permit requirements for the gravel augmentations are met, including maintaining turbidity within 500 ft downstream of the augmentation site at 20% above background turbidity. Construction of the sediment berms will therefore proceed toward completion at the discretion of the onsite inspector to meet the permitted standards.