Sediment mobility

Means Objective: Maintain sediment mobility at thresholds that aide physical and biological processes.

Fundamental Objective: Promote channel complexity, intergravel flow, and river meandering.

Target: Maintain critical Shields stress for the median grain size (τ^*_{c50}) between 0.025 and 0.085.

Localities: Sediment monitoring stations at Lewiston, Limekiln Gulch, and Douglas City.

Frequency: During spring flow releases in water years designated dry and wetter.

Methodology: With shear stress partitioned for the granular bed, extrapolate physically sampled mass transport rates of bed load size fractions, D_i, ≥0.5 mm to a dimensionless reference value of 0.002 for each D_i. Compute fractional Shields stresses, τ^*_{ci}, for D_i and plot against D_i/D_{50}, where D_{50} is sampled on the bed surface near the respective sediment monitoring stations prior to the spring high flow release. Use the hiding function of Parker et al. (1982; $\tau^*_{ci} = \tau^*_{c50}\ (D_i/D_{50})^b$) to estimate τ^*_{c50} with power functions of τ^*_{ci} on the ordinate versus D_i/D_{50} on the abscissa.

Fine sediment storage

Means Objective: Promote coarse sediment mobility, riparian plants, lamprey populations, and groundwater storage.

Fundamental Objective: Maintain fine sediment storage at levels that promote healthy river functioning.

Targets: Maintain the exponent (b) in the hiding function of Parker et al. (1982; $\tau^*_{ci} = \tau^*_{c50}\ (D_i/D_{50})^b$) >-0.9, which indicates that fines are more mobile than coarse grains because they are sufficiently present on the bed to not be sheltered from flow by coarse grains. Also maintain ratios of the median surface grain diameter before spring flow releases (D^*_{surface}) and the average subsurface median grain size ($D^*_{\text{subsurface}}$) both to the median bed load diameter >1.0 during high spring flow releases. After Paola and Seal (1995), D^*_{surface} and $D^*_{\text{subsurface}} \leq 1$ infer bed load is dominated by surface particles and bar and riffle material and ratios >1 indicate dominance of fine sediment entrained by local scour exposing subsurface sediments and mobilization of fines from channel banks, lee areas, and patches in the channel.

Localities: Sediment monitoring stations at Lewiston, Limekiln Gulch, and Douglas City.

Frequency: Compute b, D^*_{surface}, and $D^*_{\text{subsurface}}$ with bed load samples taken during spring flow releases and bed material sample data collected before spring flow releases in water years designated dry and wetter.

Methodology: For b, see methodology for sediment mobility target. Data for computation of D^*_{surface} and $D^*_{\text{subsurface}}$ is obtained by physically sampling bed load at the sediment monitoring stations and dry sieving the material in half-phi size intervals for computing the median bed load diameter by mass for each discharge that samples are taken. This is the divisor in the ratios. Conduct a Wolman (1954) sample of 300 grains in the upstream vicinity of the monitoring stations before the spring flow release. This is the dividend in D^*_{surface}. Collect 3 or more bulk samples of subsurface sediment following criterion in Church et al. (1987) for requisite sample size. The sampling domain for subsurface sediments extends below the depth of the local D_{84}.

Riparian Aquifer Storage

Means Objective: Maintain groundwater storage in riparian aquifers following recharge by high river flows to promote insect populations and off-channel rearing habitats for salmonids, frogs, and toads.

Fundamental Objective: Promote biological productivity in the Trinity River corridor.

Targets: IN DEVELOPMENT

Localities: Off-channel depressions (swales, pits, pools, ect.) that are topographically isolated and do not fully drain by surface flow to the Trinity River and are located on floodplains between Old Lewiston Bridge and North Fork Trinity River.

Frequency: Every 5 years.

Methodology: Establish a local benchmark with 3D coordinates surveyed for a rebar installed near each monitored depression feature. Also install a rebar in each depression and at several locations extending up the channel bank from the Trinity River at moderate and higher flow stages and survey their top relative to the local benchmark. Closely monitor water levels in the depressions during the spring flow releases to determine 1) river discharges that inundate them with a) subsurface flow and b) surface flow and measure down from the rebar tops to the water surface for defining local river stage relationships to water depth in each depression. These data will enable determination of off-channel rearing habitat relationships to discharge in depression features and lag times for aquifer drainage as a function of discharge, location on the floodplain, and river mile. The lag times can be related to aquifer properties, including porosity and hydraulic conductivity for assessing substrate conditions for plants and water storage in floodplain areas.

Channel Migration

Means Objective: Promote meandering to increase channel complexity and floodplain development and shift the channel outside meanders to reset riparian forests by eroding banks fossilized by roots.

Fundamental Objective: Increase resilience to disturbance by creation of a laterally mobile channel.

Targets: “Naturally” construct or further develop meanders with flows and sediment management that have wavelengths, amplitudes, and radius of curvatures predicted with information in the TRRP channel design guide (HVT et al., 2011). Also, laterally shift the Trinity River channel outside meander bends by statistically significant distances every 5 years.

Localities: Throughout the Trinity River restoration reach.

Frequency: Every 5 years.

Methodology: Utilize geo-rectified aerial photographs to map the channel and determine its change in location since the previous survey using AutoCAD Civil 3D. Use continuous lines traced at the wetted summer baseflow to determine vectors of magnitude and direction of change in set increments that are determined through trial and error to best represent the observed shifts in channel position. Estimate error in estimates of shifts in channel position with estimates of horizontal accuracy provided by the contractor for aerial photography. Bin the vectors and their associated error by river miles representing geomorphic provinces in the river and perform t-test to determine whether the observed shifts ±error in channel position are statistically significant. Additionally, use AutoCAD Civil 3D to estimate changes in meander properties mentioned and t-tests to determine if the changes are significant or within the range of error. From these analyses, effectiveness meeting targets for channel migration can be evaluated.