Coarse Sediment Budget

Initial Assumption: Placement of coarse sediment (>5/16 inch) is needed to restore spawning gravels lost through mainstem transport between Lewiston Dam and Rush Creek and possibly further downstream. Annual supplementation of coarse sediment is needed to balance the coarse sediment budget.

Action: Place gravel between Lewiston Dam and Rush Creek, including the cableway reach, and supply coarse sediment at the weir above Lewiston. Conduct sediment monitoring to determine if supplementation rates are alleviating coarse sediment deficit.

Result: Coarse sediment storage between Lewiston dam and Limekiln Gulch has increased.

Lessons Learned: Sediment budget analysis alone is insufficient to inform sediment management. Focus coarse sediment management on supporting long-term transport rates rather than generally increasing storage, but also identify areas where local coarse sediment deficit may be limiting habitat quality.

Uncertainty: Estimated 20th-century sediment fluxes are highly uncertain, so there is a small probability that a general sediment deficit relative to pre-dam conditions remains.

Management uncertainty: Develop hypothesis and explicit goals for each gravel augmentation based on the broader goals for supplementing material to the reach.

Pool Depth Changes

Initial Assumptions: Existing fine sediment control efforts (Hamilton ponds, Buckhorn Dam, and watershed rehabilitation projects) combined with flow releases, will transport fine sediment at a rate greater than input, which will increase in the number and depth of pools (TRFES). Pools are filling with gravel throughout the Trinity River (TAMWG).

Action: Collect sonar bathymetery in pools and other deep areas.

Result: Only a few pools have filled substantially, whereas at least half the pools in the river have deepened slightly.

Lessons Learned: Gravel augmentation has not caused widespread pool filling; gravel augmentation near Lewiston has no effect on downstream pools; where pool filling has occurred it is related to terrace lowering rather than gravel augmentation alone.

Uncertainty: Uncertainly is low during the time period analyzed. Changes in pool depth that occurred prior to the analysis period is less certain.

Future Action: Avoid excessive floodplain excavation and channel widening adjacent to valuable holding habitats.

Management uncertainty: Locating holding habitats that should be protected in their current condition.

Coarse Sediment Transport

Initial Assumption: The flow rate and duration of ROD hydrographs are designed to transport coarse material delivered to the Trinity River by tributary channels, but the transport from tributaries is unknown. Under the ROD flow regime, the Trinity River will transport around 10,000 cubic yards of gravel per year on average.

Action: Implement ROD flow regime and conduct sediment monitoring.

Result: Coarse sediment transport rates in the Trinity River are an order of magnitude lower than originally anticipated.

Lessons Learned: Original transport estimates are higher than currently measured transport rates.

Uncertainty: Low – the difference between former and current transport estimates are much larger than the uncertainty. The cause for the downward shift in transport rates is unknown.

Management implication: Long-term coarse sediment augmentation rates have been revised downward.

Fate of Gravel Augmentations

Initial Assumption: Gravel move through the river in an orderly conveyor-belt-like way; gravel introduce into the river can fill pools many miles downstream.

Action: Analysis of rectified orthophotography and topographic change.

Result: Most gravel augmentation material remain relatively close to it point of introduction.

Lessons Learned: In most years, gravel transport distances are short; gravel typically deposits in the first location that is favorable to deposition and within the same geomorphic unit where the gravel is injected; much longer transport distances are possible during especially large flood events so that most transport takes place in just a few large events. Long gravel transport distances may occur during more moderate floods if channel form is very simple and lacks suitable depositional areas; mechanical intervention may be needed to encourage deposition and increase channel complexity.

Uncertainty: There are currently no data that can be used to estimate transport distances during large event.

Management implication: Continue topographic monitoring and attempt to use particle tracking to better quantify transport characteristics.

Gravel Augmentations Effects on Channel Form and Habitat

Initial Assumption: Gravel additions and ROD flows will increase channel complexity and create habitat for all salmonid life stages.

Action: Habitat assessments, temperature/POM monitoring, topographic monitoring.

Result: Gravel bars created by dynamic construction in the Lowden reach created new mainstem physical habitat with no net increase in storage. Channel complexity decreased in an area where a large amount of gravel was deposited.

From 2006 to 2011, there were small, but measurable geomorphic changes, but these were generally limited to gravel-augmentation sites in the upper river, mechanical channel-rehabilitation sites, tributary confluences, and lower river reaches that had sufficient transport capacity and sediment supply.

Lessons Learned: Bars that are deposited naturally are superior to most designed bars. The naturally deposited bars have more hyporheic flow, increased nutrient retention, and more effectively moderate temperature swings as compared to designed bars. Topographic complexity can increase without increasing sediment storage and increased storage does not necessarily correspond to increased complexity.

Uncertainty: low

Management implication: Build bars via dynamic construction or design them with a more natural form that includes a hydraulic control. Design low flow gravel placements to produce hydraulics that resemble those of naturally occurring bars.

Fine Sediment

Initial Assumption: Fine sediment storage in the streambed and on riparian berms is far too great. Substantial reduction in fine sediment is required to improve all salmonid habitat. The continued operation of fine sediment control efforts (Buckhorn dam, Hamilton Ponds, and watershed-rehabilitation projects) combined with ROD flow releases will transport fine sediment at a rate greater than the input, and will decrease fine sediment storage in the mainstem Trinity River.

Action: Continue dredging Hamilton Ponds, funding sediment abatement projects in the watershed, and implementing prescribed ROD flows.

Result: Sediment budgets indicate a decrease in fine sediment storage since 2000.

Lessons Learned: Spring flow releases evacuate fine sediments from pools.

Uncertainty: Unknown what component of the streambed surface and subsurface grain-size distribution is composed of fines, and what amount of fines is natural for the Trinity River.

Management implication: Need to quantify fine sediment loading in the Trinity River and develop targets for fine sediment management based on these results.