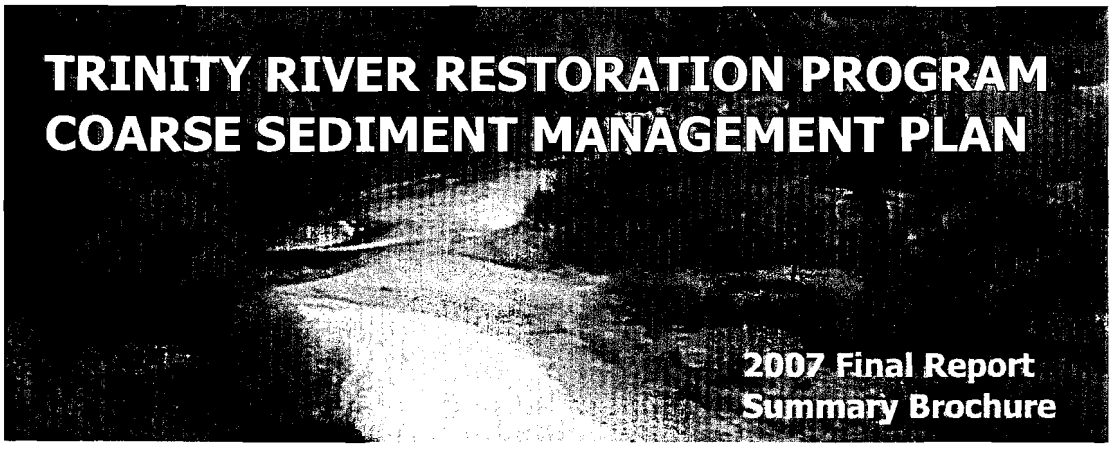
OTHER DOC #

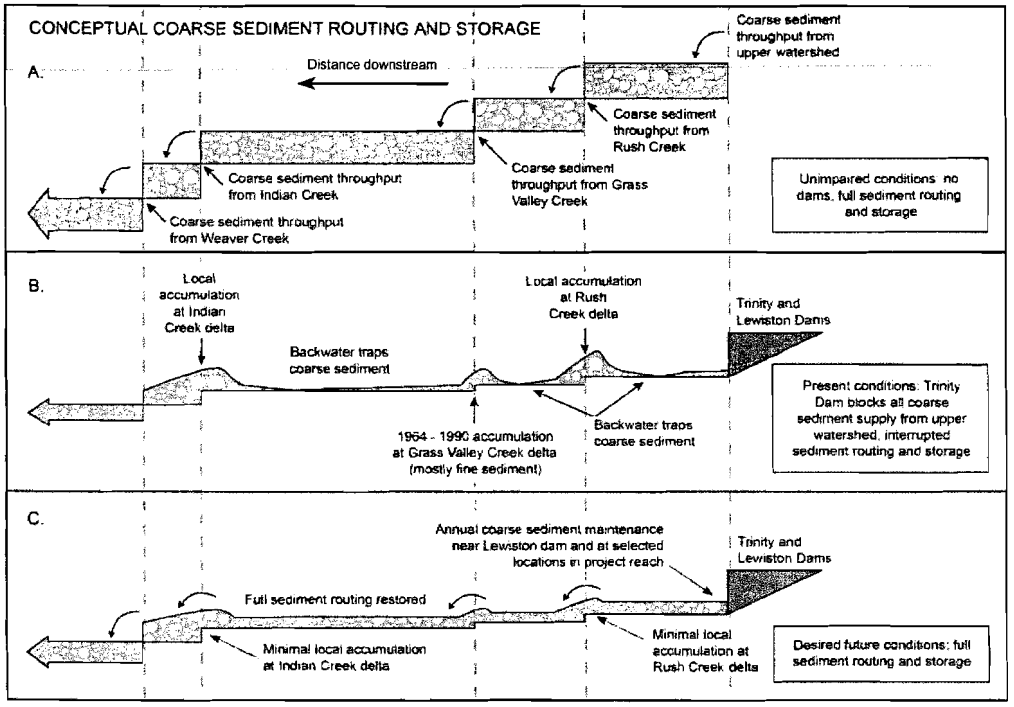
TRINITY RIVER RESTORATION PROGRAM COARSE SEDIMENT MANAGEMENT PLAN



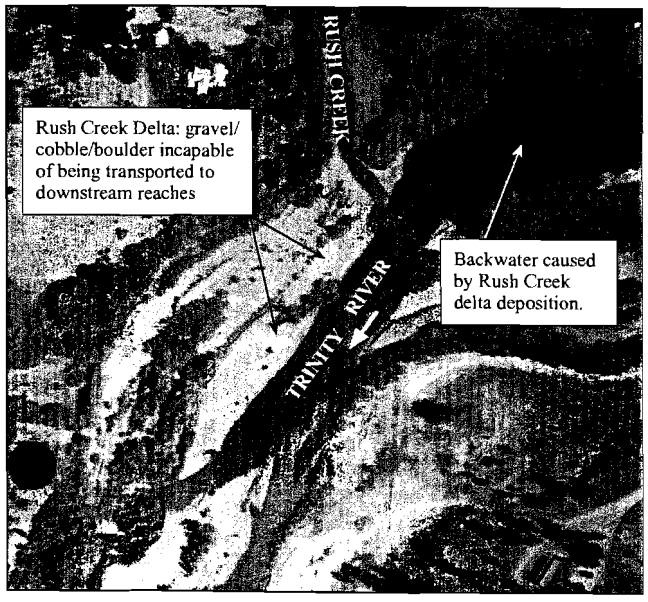
2007 Final Report Summary Brochure

Introduction

Rivers need sediment as much as fish need water. Construction of the 538 foot high Trinity Dam abruptly eliminated the headwaters of the Trinity River from supplying any gravel and cobble to the mainstem Trinity River immediately below Lewiston Dam. Most river channel features that once provided abundant and high quality salmon habitat, such as point bars and side-channels, were lost. The Coarse Sediment Management Plan contributes to recovering these alluvial channel features and habitats by identifying coarse sediment introduction methods, volumnes, and locations that will help restore a dynamic balance between coarse sediment replenished below Lewiston Dam and streamflows released from Lewiston Dam as part of the Trinity River Restoration Program Record of Decision.



Conceptual diagram showing coarse sediment routing and storage on the Trinity River in the management reach from Lewiston Dam to the confluence with Weaver Creek. Thickness of the line represents relative coarse sediment storage in the channel.



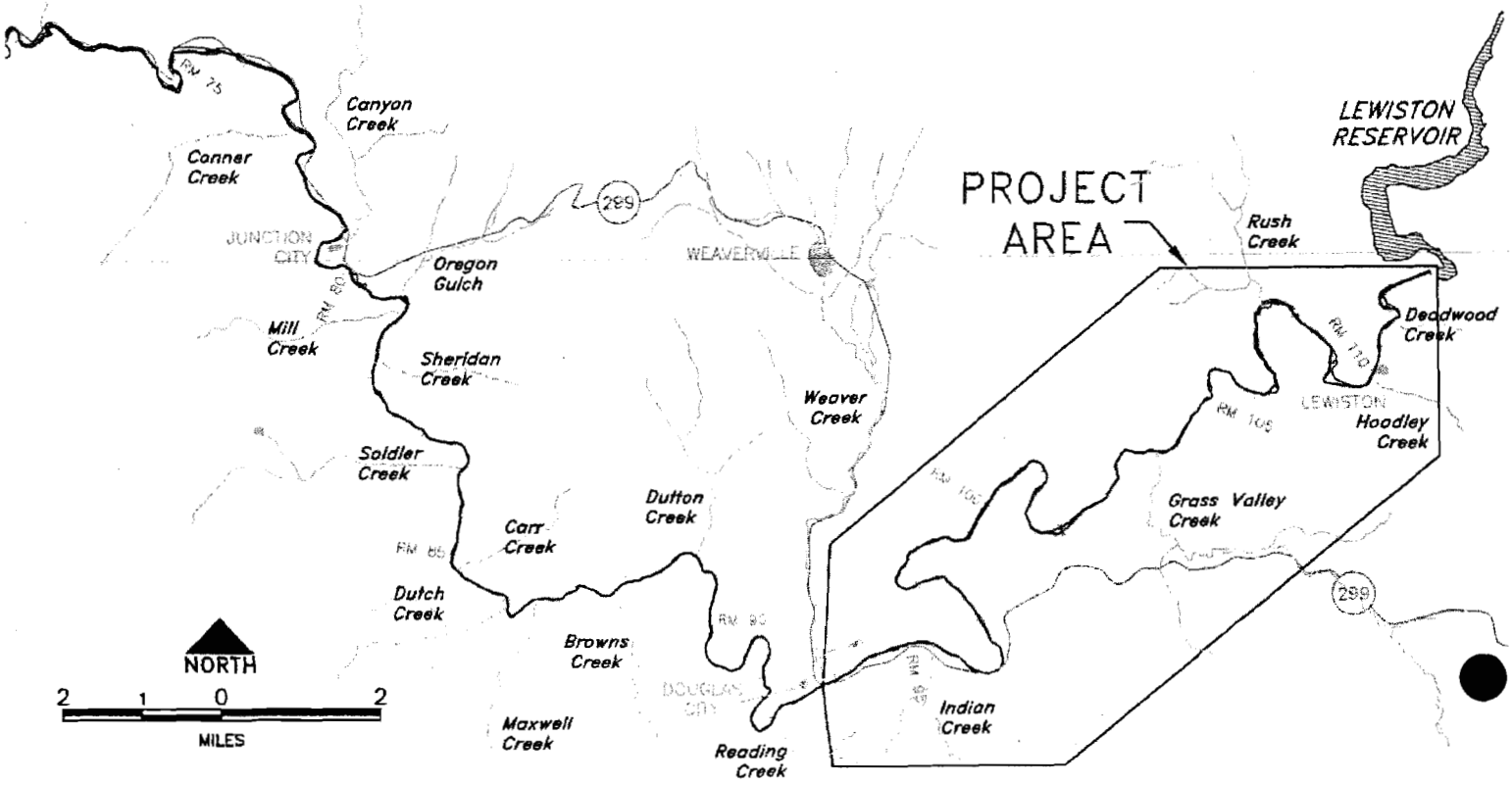
2005 aerial photograph of Rush Creek Delta showing accumulation of local sediment and upstream backwater.

The disruption in the dynamic flow-sediment balance downstream of Lewiston Dam resulted in:

- Channel incision and/or river bed coarsening (i.e. from cobbles to boulders) below Lewiston Dam;
- Reduced coarse sediment storage (bars & riffles) in most reaches;
- Local coarse sediment deposition at major tributaries (Rush Creek, Grass Valley Creek, and Indian Creek) creating deltas that the Trinity River could no longer transport downstream;
- Riparian vegetation encroachment and riparian berms forming on previously mobile gravel bars, narrowing and simplifying the channel;
- Reduced aquatic habitat for yellow-legged frogs, benthic macroinvertebrates, and other aquatic species;
- Reduced Chinook salmon spawning habitat;
- Reduced Chinook salmon fry rearing habitat (determined to currently limit production on the Trinity River).

Location

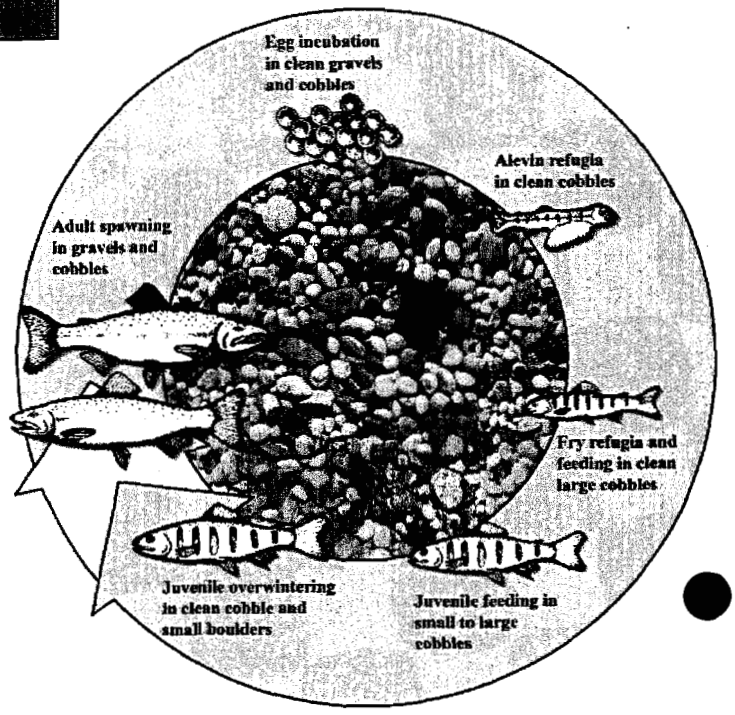
The Trinity River Coarse Sediment Management Plan (CSMP) focuses on the reach between Lewiston Dam and the confluence with Weaver Creek, where coarse sediment impacts by the Trinity River dams have been most severe. Because Indian Creek, Wea Creek, Reading Creek, and Browns Creek deliver substantial volumes of coarse sediment to the Trinity River, coarse sediment introduction focuses on the reach from Lewiston Dam to just upstream of Indian Creek confluence. Delta management focuses from Lewiston Dam through the Indian Creek delta to the Weaver Creek confluence.



Project area map and coarse sediment management reach.

Foundation

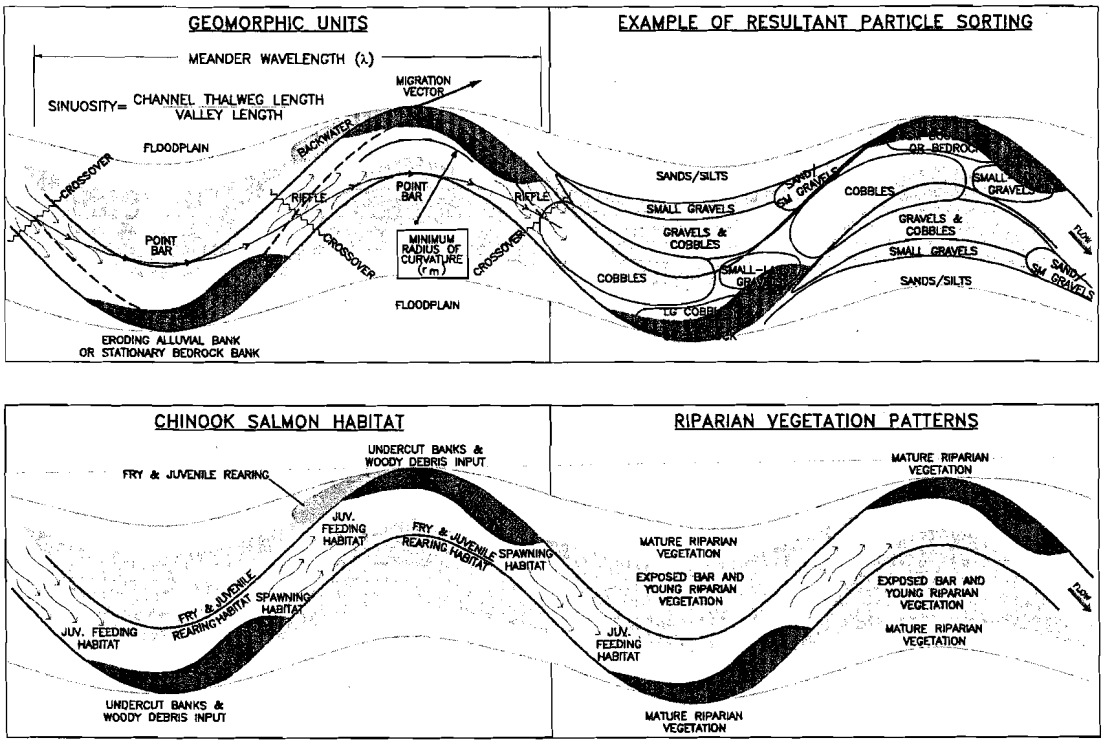
The Trinity River Mainstem Fishery Restoration Record of Decision (ROD), signed by the Secretary of the Interior in 2000, attempts to reverse impacts to the river below Lewiston Dam using high flow releases from Trinity and Lewiston dams, coarse sediment management, fine sediment management, and channel rehabilitation. The Trinity River Flow Evaluation Final Report (TRFEFR) and ROD provided recommendations for coarse sediment management. Significant work to better understand sediment transport dynamics on the Trinity River has occurred since these recommendations were developed for the TRFEFR, and thus, the CSMP adds considerably more detail to the initial TRFEFR recommendations. Consistent with the TRFEFR and ROD, the CSMP adopts the strategy of restoring and maintaining fish habitat by restoring fluvial geomorphic processes. To accomplish this, the CSMP must: (1) replace a portion of the upstream coarse sediment sources lost by the dam by introducing coarse sediment below Lewiston Dam, and (2) place introduced coarse sediment sizes and volumes in proportion to the ROD high flows to transport, deposit, and shape these introduced coarse sediments into diverse and complex fish habitat.



General habitats provided by coarse sediments for fall-run Chinook salmon life-stages.

Impacts to the Fishery

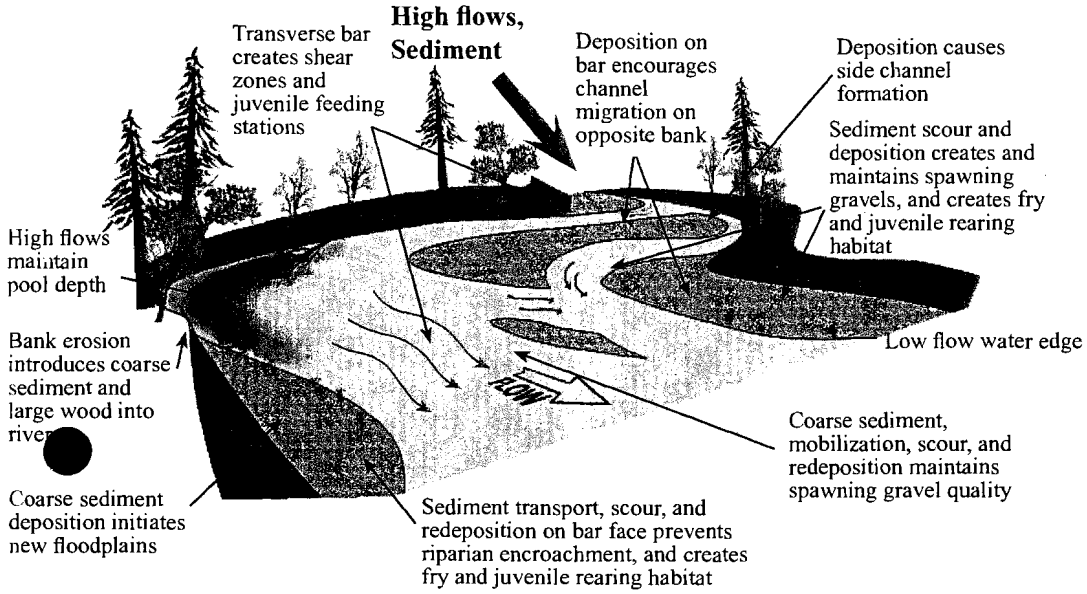
Salmon, steelhead and other aquatic and terrestrial species on the Trinity River depend on channel complexity to develop channel shape, flow patterns, and vegetation for their health and production. An improved high flow regime and coarse sediment supply encourages diverse bars to form, which in turn creates complex habitat such as pools, riffles, alcoves, side channels, and young riparian vegetation, used by salmonids during their various life stages. Coarse sediment is not only important for spawning habitat, but is also important for creating fry and juvenile rearing habitat, identified in the TRFEFR as the current factor limiting salmon production from the Trinity River.



Conceptual alternate bar unit showing relationship of bar units to particle diversity, salmonid habitat, and riparian vegetation. An improved coarse sediment supply and high flow regime is important in order to create and maintain habitat diversity.

The Strategy

The CSMP proposes implementing a strategy of short- and long-term coarse sediment introductions. Short term introductions will occur at multiple locations between Lewiston Dam and Indian Creek to quickly replenish coarse sediment storage. Fifty-seven potential short-term coarse sediment introduction sites have been identified in the CSMP, although the actual number of sites implemented will likely be lower. Short-term introduction sites could range from as small as a few hundred cubic yards to over 10,000 cubic yards. Where possible, channel rehabilitation projects upstream of Indian Creek will incorporate coarse sediment introduction into the design. Coarse sediment volume and placement will be unique to each site, based on local hydraulic and geomorphic conditions. The final choice of placement locations, augmentation volume, and method(s) will be determined through a multi-agency design process, responsive to the environmental permitting process and public involvement. Long-term introductions will occur at a small number of locations to maintain coarse sediment storage. Annual replenishments will occur at the long-term sites to approximately match the volume transported by the ROD high flows (currently estimated at approximately 10,000 cubic yards per year).



Conceptual diagram of how coarse sediment supply, transport, and deposition creates diverse aquatic habitat for fish and other species.

Coarse sediment is defined as sediment particle sizes 0.08 in (2 mm) and larger. Proposed coarse sediment introduction sizes range from between 0.3 in (8 mm) to 6 in (152 mm), with most between 0.3 in (8 mm) and 4 in (102 mm).

Coarse Sediment Placement Methods

Site specific conditions at each introduction location should dictate which of four methods is best suited and is most appropriate, given the following considerations:

- Topography and high flow hydraulics at each site;
- Maximizing long-term geomorphic benefit;
- Maximizing short- and long-term fish habitat benefits;
- Minimizing construction related impacts on fisheries and landowners;
- Preserving/restoring site aesthetics;
- Placement feasibility and cost effectiveness;
- Analysis of site specific environmental assessment;
- Permitting requirements.

Additional methods may be developed as site conditions and learning dictate.

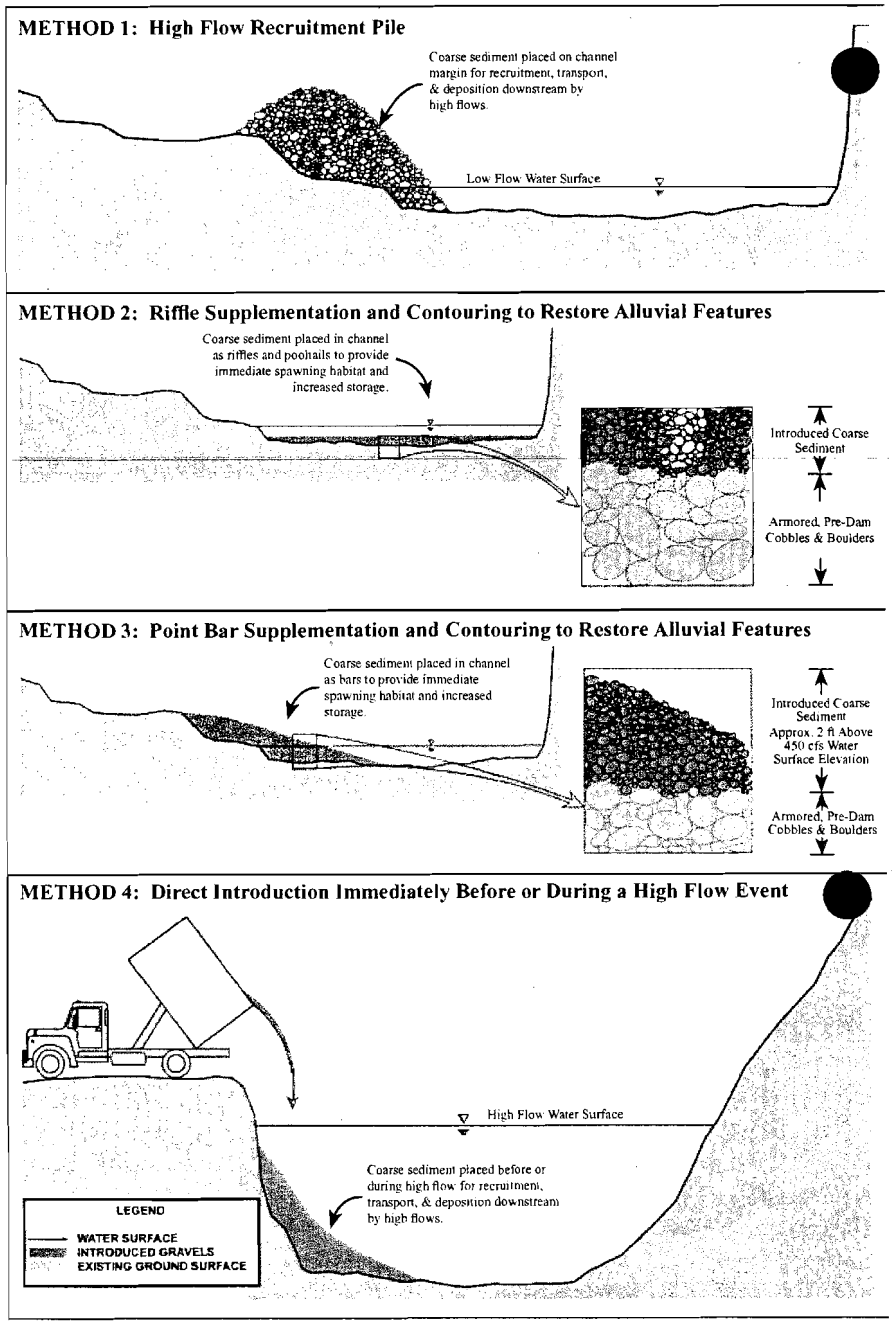


Illustration of conceptual coarse sediment placement methods.

Performance Monitoring and Adaptive Management

The Trinity River Restoration Program will assess how well individual and cumulative coarse sediment introductions achieve CSMP and ROD goals and objectives. Topographic monitoring will assess how storage changes with high flow releases. Sediment transport measurements during high flow releases will help evaluate how fast coarse sediment moves downstream, which will inform subsequent coarse sediment introductions and high flow releases. Habitat monitoring will assess how coarse sediment introductions, transport, and deposition improve salmon spawning and rearing habitat quality, quantity, and diversity.

Sediment sampling during high flows measure the effectiveness of dam releases in routing gravel and sand through the Trinity River. (Photo courtesy of Graham Matthews and Associates).

For more information, contact:

Trinity River Restoration Program
1313 South Main St.
Weaverville, CA 96093
Phone (530) 623-1800