APPENDIX G

Streamside Systems Sediment Removal without Dredging:

Description and Estimate

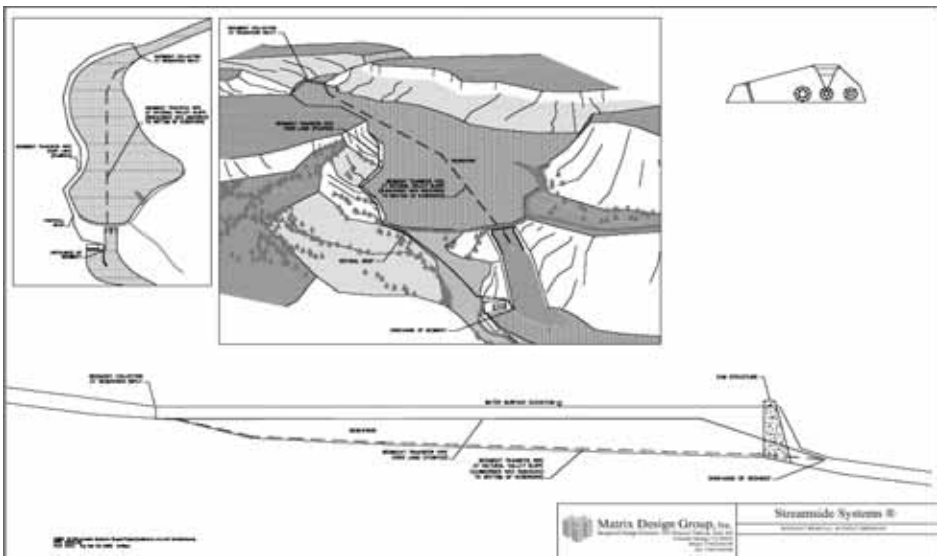
Streamside Systems®
Sediment Removal without Dredging

Streamside Systems' Sediment *Collectors*:
Collectors are designed to selectively capture and remove targeted particle sizes of sediments as they move along the stream bottom as bed load. Interchangeable screens allow flexibility in targeted sizes. Multiple-hopper Collectors are available to capture and classify bedload by size fractions from sands and finer, to gravels, and even cobble and larger. Collectors have been used successfully to capture and remove bed sediments as fine as iron floc (in a glacial outwash stream in Alaska, to restore a spawning environment favorable for survival of salmonid eggs). The Collector is installed in the stream bed, and does not impede streamflow, navigation, or recreation. In high gradient systems, Collectors can often be installed with a siphon withdrawal, so no power is required at remote mountainous locations. In lower gradient rivers, the collected sediments are pumped out, and a variety of site-specific dewatering or sediment disposal options are available.

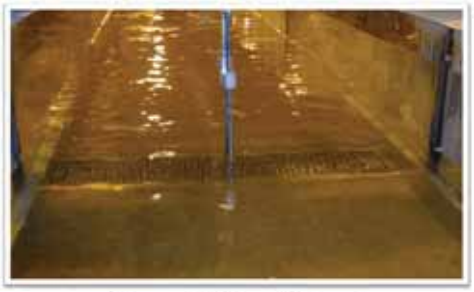
Collectors offer many advantages over traditional methods of removing sediments from rivers, such as drag lining or suction dredging. Dredging is unselective, and removes desirable habitat materials present, while Collectors selectively remove only the harmful fines and leave the beneficial coarse material in the stream. Dredging causes direct biological and water quality impacts, while Collectors can utilize a closed water loop to pump out and dewater sediments, returning the water to the hopper; this eliminates clogging issues on the hopper screens, eliminates impingement of debris or biota on the screens, and prevents any entrainment of fish eggs, macroinvertebrates, or other biota. One of dredging's most harmful impacts is morphological; by creating holes in the stream bed, accelerated erosion and incision can result in headcutting the upstream channel and tributaries throughout the watershed. In contrast, a Collector acts as a grade control structure to protect the channel from headcutting. Another traditional method of controlling sediment is the engineered fore bay sediment trap. The Collector approach is fundamentally different and truly innovative. Removing the material continuously, and in manageable high-quality quantities, prevents high-amplitude rain events from scouring full or near-full fore bay traps as well as the propensity of fore bay traps to also collect organics - that render the trapped material less valuable as a usable material. Traditional fore bay sediment trap cleaning is also fairly energy intensive and requires back hoes and other "yellow iron" equipment to remove the sediment. The Collector can discharge the harvested sediment into a roll-off container for ease of material management. Collectors are also scalable, and range from two-foot wide units to 300 and even 500-foot wide units. A high capacity thirty-foot unit was installed in Fountain Creek (Pueblo, CO) in July of this year. The largest units are intended to be used to capture bed sediments from major rivers such as the Mississippi, and can use the material to rebuild coastal wetlands.

As the Collector removes the finer bed load sediments, coarser materials pass over the Collector and remain in the channel. A progressive coarsening of the stream substrate generally improves the downstream habitat for fish and macroinvertebrates. Collectors can easily be incorporated into stream restoration projects, such as by installing a Collector at the invert of a cross-vane; this economizes by allowing use of a smaller Collector (roughly 1/3 of the channel width) rather than a complete cross-section, and Collectors can easily be retrofitted to existing cross vanes in any streams with excess sediment problems. Collectors can be conveniently located at road crossings by incorporating them into culvert designs; a central Collector will address low flow transport, while lateral Collectors can be installed at a higher elevation for intermittent operation only during high flows, at a “flood plain” stage.

Applications for Collectors are as numerous as the types of sediment impacts themselves. Collectors can be used for emergency response, to prevent downstream transport of harmful or contaminated sediments following spills, dam breaks, or BMP failures. Collectors can be used to protect fish and habitat from accelerated erosion and ash runoff after forest fires or eruptions. Installation of Collectors at the mouths of tributaries to reservoirs, to reduce reservoir sedimentation, to maintain storage and hydroelectric generating capacity, and to reduce flood risk is being evaluated by the US Bureau of Reclamation and the US Army Corps of Engineers. Because stream channels downstream from reservoirs often are sediment-starved and incising, a “reservoir bypass Collector” can capture tributary bedload and reintroduce it below the dam (at the natural bedload transport rate), to maintain natural channel morphology and spawning habitat. Alternatively, the sediment can just be beneficially reclaimed and removed in a “clean-washed” condition. Similarly, the use of Collectors to prevent downstream sediment impacts below dam-removal projects is a rational streams and/or other impoundments. Collectors are also well suited to coastal applications, and bi-directional Collectors can be used in tidal waterways and navigation channels.



With a product output of clean-washed river sand, the commercial applications for Collectors are also significant, while reducing the adverse impacts associated with alternative methods of instream mining. It is a very “Green Solution” to take a pollutant and “Turn it into a Valuable Commercial Product”. Looking at large Collectors in major rivers as grade control structures that can offset the need to dredge, while maintaining navigation depths, the output sediment could also be used (e.g., Missouri and Mississippi Rivers) to raise the height of existing levees to reduce flood risk, to stockpile sand bags and material for future floods, to build new critical infrastructure at higher elevations, and (e.g., with a reservoir bypass system to maintain storage capacity) to significantly reduce flood risk.



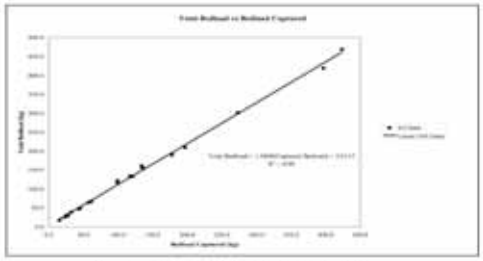


Figure 22. Plot of Total Bedload versus Captured Bedload

Removal Efficiency Testing of Streamside Systems' Bedload Monitoring Collector

Prepared for:
Streamside Systems

Prepared by:

Chad M. Lipscomb, PE.
Andrew Darrow,
Christopher I. Thornton, P.h.D., PE

Colorado State University
Engineering Research Center
March 2005

Colorado State

The Hydraulics Laboratory at the Engineering Research Center at Colorado State University documented the Collector capture efficiency (pdf copy of report available online at link below). Using a variety of substrates, current velocities, and depths, the regression equation for mobilized bed load versus material captured by the Collector showed r-squared = 0.99, confirming the exceptional suitability of Collectors not just for efficiently addressing the sediment and habitat issue, but for accurately measuring the actual transport rates of bedload sediments. (The same test with a Helly-Smith Bedload Sampler gave an r-squared of 0.43). This confirms the accuracy and suitability of Streamside Collectors for developing or improving the bedload monitoring aspect of watershed sediment budgets, on any scale. The obvious solution to the extreme temporal and spatial variability of traditional bedload sampling, is to completely eliminate the variability by monitoring bedload on a complete stream cross-section, continuously, for days, weeks, or even years. For routine monitoring throughout watersheds, two and four-foot Collectors are ideal, and can be easily transported and installed by one person, and the data can be used to identify priority source areas or tributaries of concern, or to develop Total Maximum Daily Loads (TMDL's) specifically for the bedload fines that are most responsible for biological and habitat impacts.

ESTIMATE

STREAMSIDE SYSTEMS – SEDIMENT COLLECTOR SYSTEMS
LAKE WAYNOKA PROPERTY OWNERS – LAKE WAYNOKA, OH

Equipment ----------

Qty	Item Description	Unit Price	Price
4	48" Stainless Steel High Capacity Collector ** 5% Quantity Discount	$ 8,400.00	$ 33,600.00 - $ 1,680.00 $ 31,920.00
1	3" x 100 Linear ft. Attachment Hose with Cam lock Fittings	$ 843.25	$ 843.25
2	3" x 100' Discharge Hose w/ Camlock Fittings - 400' per pumping system - Estimated distance	$ 718.40	$ 1,436.80
1	24" x 8" SS Suction Distribution Tank	$ 1,800.00	$ 1,800.00
1	3" MP Pump Flomax 15, 7.5HP, Unmounted	$ 3,993.00	$ 3,993.00
1	Pump Enclosure with mounting bracket	$ 675.00	$ 675.00
1	Wall Mounted VFD Pump Controller, 230, 3Ph	$ 3,484.00	$ 3,484.00
2	48" Drop Box Sediment Dewatering Filter for Discharge into roll-off container (250 GPM/)	$ 7,245.00	$ 14,490.00
	Equipment Cost		**$ 58,642.05**

Installation Cost ----------

	Installation Fee (3 Field Technicians)	$ 4,365.00
	Equipment Rental	$ 350.00
	Total Installation Cost	**$ 4,715.00**

Delivery Cost ----------

Shipping from Findlay, OH to Lake Waynoka, OH
402 Miles Round-Trip at $1.50/Mile $ 603.00

Total Delivery Cost **$ 603.00**

Project Total- **$63,960.05**

Terms and Conditions ----------

- 80% of Project Total with order, Balance Due prior to Shipment
- Delivery 6-8 Weeks ARO
- Estimate good for 30 days

CUSTOMER RESPONSIBLE FOR DISCHARGE OF MATERIAL, POWER POLE, DISCONNECT, AND ELECTRICAL FEED TO CONTROL BOX FOR PUMPED SYSTEMS. STREAMSIDE SYSTEMS IS NOT RESPONSIBLE FOR ACQUIRING ANY NECESSARY PERMITTING. WARRANTY INCLUDES STREAMSIDE SYSTEMS FABRICATED MATERIAL ONLY, WARRANTY ON PUMPS AND ELECTRIC CONTROLS BASED ON MANUFACTURER WARRANTIES. CUSTOMER RESPONSIBLE FOR OPERATION AND MAINTENANCE OF SYSTEM. STREAMSIDE SYSTEMS MAY BE CONTRACTED AT STANDARD RATE FOR MAINTENANCE OF COLLECTOR SYSTEMS.