Environmental Impact of Ongoing Sources on Recontamination of Remediated Aquatic Ecosystem

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Background/Objectives. Sediments are valuable resources; they support a large biodiversity, and sediment organisms are ecologically important and an integral part of aquatic food webs. Because sediments are also a sink for contaminants, these organisms are often exposed to far higher concentrations of contaminants than organisms that occupy the water column. Contaminated sediments can be remediated by dredging, capping, and other methods, but the benefits of these expensive processes can be completely negated by the continued influx of contaminants from uncontrolled sources following remediation. We conducted a mesocosm study that compared the effectivness of different types of sediment remediation when challenged by the continued influx of contaminants.

Approach/Activities. Our hypothesis was that the chemically active sequestering agents in active caps and in situ treatment will bind metals (arsenic, chromium, cadmium, cobalt, copper, nickel, lead, selenium, and zinc) from ongoing sources, thereby reducing their bioavailability and protecting the aquatic environment.

Results/Lessons Learned. Metal concentrations in surface water remained significantly lower in mesocosms with sequestering agents used in active caps and in situ treatments than in mesocosms with inert material (sand) or uncapped sediment throughout the 2520 hour experiment. Metal concentrations were significantly higher in *Lumbriculus variegates* from untreated sediment and sediment capped with sand than in *Lumbriculus* from active caps. Pearson correlations between metal concentrations in *Lumbriculus* and metal concentrations in the top 2.5 cm of sediment or cap measured by diffusive gradient in thin film (DGT) sediment probes were strong (as high as 0.98) and significant ($p<0.05$) for almost all tested metals. Metal concentrations in both *Lumbriculus* and sediment/cap were lowest in mesocosms with apatite and mixed amendment caps and in situ activated carbon treatments. These findings show that sequestring agents in active caps and in in situ treatment can protect remediated sediments by reducing the bioavailable pool of metals in ongoing sources of contamination.