Phytoremediation of Industrial Metals in Local Rivers

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Phytoremediation is the ability of plant roots to absorb pollutants from their respective environments, followed by either physical removal by man or removal by currents that move such plants into the ocean. An alternative scenario involves plants remaining fixed in the environment upon uptake of pollutants. Aquatic plants, such as rice plants and submerged grass species in Merrymeeting Bay, have phytoremediation potential and such potential is crucial due to the contamination of Merrymeeting bay with heavy metal contaminants. Wild rice plants and tapegrass in Merrymeeting Bay have phytoremediation potential. This is crucial because of historical contamination of Maine’s’ rivers in the 19th century industrial era, with metals associated with industrial waste from paper mills, sulphite mills, and tanneries. The rise of industry brought about the ecological collapse of Maine’s rivers. Assessing the current state of Maine’s rivers is environmentally relevant and helps correlate the relationship between environmental recovery and levels of heavy metal contamination.

Wild rice plants are annual plants and tapegrass are perennial plants and both can be found in the intertidal zone of Merrymeeting Bay. Wild rice is transported yearly while tapegrass remain fixed in its respective environment. Last summers’ research on plant capabilities of hexavalent chromium uptake indicated that wild rice plants are capable of phytoremediation and that wild rice plants are potentially better able for uptake of toxic pollutants than tapegrass. The ability of wild rice to take up toxic material and transport the material to a different location is interesting and further exploration of wild rice was the focus of this summers’ research.

Background levels of metals found in the sediment of the Androscoggin and Kennebec River were established. I analyzed several metals associated with industry such as As, Cd, Co, Cr, Cu, Ni, P, S, Ti, and Zn. Sediment core samples using polyethylene coring tubes, and also collected plant and sediment samples from six sites (bay bridge, pleasant point, bowdoinham, abbagadasett river, northern side of abbagadasett river, and green point) along the Androscoggin and Kennebec river. These samples were collected during mid-summer season. The Omni-Milk program of the CEM-Mars5 Microwave digester was used to nitric acid digest all the samples collected from the six sites. Inductively Coupled Plasma-Optical Emission Spectrometry (ICP-OES) was used for analysis of total metal content in the wild rice samples.

In the future I will determine the total biomass of the aquatic plants along Merrymeeting Bay and estimate the concentration of industrial metals being transported by aquatic plants out of the local rivers in annually. Areas near Bath Iron Works, a shipbuilding industry, will be compared to areas farther away from industry to compare the levels of industrial metals.

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Funded by the Merck-AAAS Fellowship