Phytoremediation on Vashon-Maury Islands?

Finding a solution to soils contaminated with arsenic, lead, and cadmium has been on the minds of many community members. Most conventional forms of soil clean-up are expensive and environmentally invasive. The Institute for Environmental Research and Education (IERE), funded in part by the Vashon-Maury Island Community Council (VMICC) conducted a study to determine which native and naturalized vegetation found on the Islands would be best suited as candidates for conducting phytoremediation.

Phytoremediation is an innovative, energy efficient cleanup approach that uses plants to remove contamination from area soils. It is a passive technique that utilizes solar energy as the driving force and is useful for treating a variety of harmful contaminants. Many plants naturally absorb metals from soil and water to utilize for growth, including heavy metals that can be toxic to the environment. These pollutants can then be removed from the site by harvesting the plants for proper disposal.

Phytoremediation is aesthetically pleasing, and leaves topsoil structure in a usable condition. However, it's a slower process than conventional methods and the right plants must be used. Plants are limited in their ability to remove or degrade contaminants based on the growing season and onsite environmental conditions.

It is also important to stress that phytoremediation is not a "cure-all" answer. Care should be taken to prevent erosion and flooding in areas where the process is being used. Additionally, remediation can be limited to areas that are reached by the roots of the plants. There remains quite a bit of information yet to be learned about this natural process.

Working with IERE, trained volunteers sampled 61 native and naturalized plant species, to test levels of lead, arsenic and cadmium in these plants relative to soil concentrations. The results of this study found little to no lead or arsenic concentrations in most plant species. However, most species sampled were bioconcentrating, or taking up, cadmium from the soil. Tansy (medicinal), Foxglove, Chickweed, Holly, Violet, Miners lettuce, Cleavers, Himalayan blackberry, Salmonberry and Wall lettuce were among the species sampled. The study found that Foxglove absorbed the highest concentrations of cadmium, averaging 25.1 ppm (parts per million) with medicinal Tansy coming in second with an average of 13.8 ppm.

A bioconcentration factor is used for determining the best species for phytoremediation. This value is the ratio of the contaminant concentration in the plant to the contaminant concentration in the soil. Foxglove is considered to be a viable candidate with an average bioconcentration factor of 13.4.

The first step to taking advantage of phytoremediation is having your soil tested. Next look for Foxglove on your property. Foxglove is an attractive, tall, slender plant with bell shaped, pink or white flowers that may already be in the process of phytoremediating. At the end of its two-year life cycle, Foxglove should be disposed of in the trash rather than composted, and new plants sown repeatedly to complete this process. It is assumed that the volume of plant material disposed of will have a negligible impact on the area landfill.

The Washington State Dept. of Ecology was asked to comment on these results, and released the following statement: "We continue to explore how individual plants affect removal of all three metals of concern (arsenic, lead and cadmium.) We aren't yet certain how much of the metal(s) will be removed with one planting, and issues around disposal of large quantities of metals locally need to be clarified. Phytoremediation appears to be a feasible, cost-effective method for Islanders and we continue to research these issues with confidence in desirable results."

Compared to conventional treatment methods, phytoremediation is a more environmentally and economically sound method that may be performed on a small scale. For more information on plants useful in this remediation process see The Vashon Heavy Metal Phytoremediation Study on this page.

This summary was written by Earthworks Environmental, a technical consultant under contract to Vashon Island Remediation & Public Participation Center (IRPPC).