



FACT SHEET

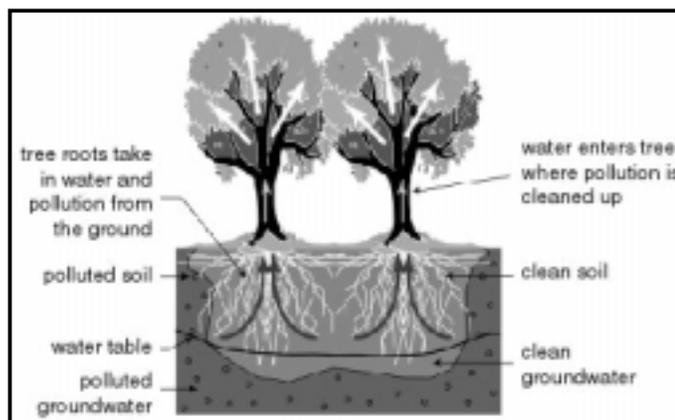
Phytoremediation

What is Phytoremediation?

Phytoremediation uses plants to clean up pollution in groundwater and surface water. Plants can help clean up many kinds of pollution including metals, pesticides, explosives, and oil. The plants also help prevent wind, rain, and groundwater from carrying pollution away from sites to other areas.

The concept of using plants to clean up contaminated environments is not new. About 300 years ago, plants were proposed for use in the treatment of wastewater. But, it was not until the early 1980's that the idea was reintroduced and further developed. Phytoremediation emerged as an effective, cost-efficient cleanup technique in the mid to late 1990's.

How does Phytoremediation work?



Put simply, phytoremediation means letting trees do the cleanup work by drawing up tainted groundwater through their roots and converting the contaminants to non-toxic constituents.

Phytoremediation works best at sites with low to medium amounts of pollution. Plants remove harmful chemicals from the ground when their roots take in water and

nutrients from polluted soil, streams, and groundwater. Plants can clean up chemicals as deep as their roots can grow. Tree roots grow deeper than smaller plants, so they are used to reach pollution deeper in the ground.

Once inside the plant, chemicals can be:

- stored in the roots, stems, or leaves,
- changed into less harmful chemicals within the plant,
- changed into gases that are released into the air as the plant transpires (breathes).

Phytoremediation can occur even if the chemicals are not taken into the plant by the roots. For example, chemicals can stick or *sorb* to plant roots. Or they can be changed into less harmful chemicals by bugs or *microbes* that live near plant roots. The plants are allowed to grow and take in or sorb chemicals. Afterward, they are harvested and destroyed, or recycled if metals stored in the plants can be reused. Usually, trees are left to grow and are not harvested. Plants grown for phytoremediation also can help keep harmful chemicals from moving from a polluted site to other areas. The plants limit the amount of chemicals that can be carried away by the wind or by rain that soaks into the soil or flows off the site.

How has the Navy implemented Phytoremediation?

The Navy have implemented phytoremediation at the Naval Undersea Warfare Center (NUWC) in Keyport, Washington. This site was originally established in 1913 to perform routine maintenance and repair work on underwater weapons. As a result of its mission, the main contaminant in the landfill was volatile organic compounds (VOCs). The Navy used this innovative and non-intrusive method of phytoremediation as part of the remedy to clean up the VOCs at its landfill on NUWC, Keyport. Over 1,00 hybrid poplar trees, in over two acres were planted over the contaminated site. The trees are expected to have a dramatic effect on both the flow of the groundwater beneath the landfill, but also on the amount of concentration left in it.



View of Keyport phytoremediation site after one growing season showing poplar trees' successful growth from the stick starts. Given one more growing season, the roots of these trees will begin their designed purpose of drawing in VOC-contaminated groundwater and naturally converting it to non-toxic constituents.

References

- A Citizen's Guide to Phytoremediation. EPA's A Citizen's Guide Series
- The Use of Plants for the Removal of Toxic Metals from Contaminated Soil. Mitch M. Lasat
- American Association for the Advancement of Science (Environmental Science and Engineering Fellow), 2000
- Phytoremediation Using Constructed Wetlands at the Milan Army Ammunition Plant, Milan, Tennessee, A Field Demonstration. 1998
- Phytoremediation at NUWC Division Keyport, Navy Remedial Project Manager, Sandy Kienholz

For further information please visit:

<http://clu-in.org/techfocus/>

<http://www.frtr.gov/cost/>