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www.epa.gov/superfund/sites
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EPA

A Citizen's Guide to Phytoremediation

The Citizen's Guide Series

EPA uses many methods to clean up pollution at Superfund and other sites. Some, like phytoremediation, are considered new or *innovative*. Such methods can be quicker and cheaper than more common methods. If you live, work, or go to school near a Superfund site, you may want to learn more about cleanup methods. Perhaps they are being used or are proposed for use at your site. How do they work? Are they safe? This Citizen's Guide is one in a series to help answer your questions.

What is phytoremediation?

Phytoremediation uses plants to clean up pollution in the environment. 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.

How does it work?

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:

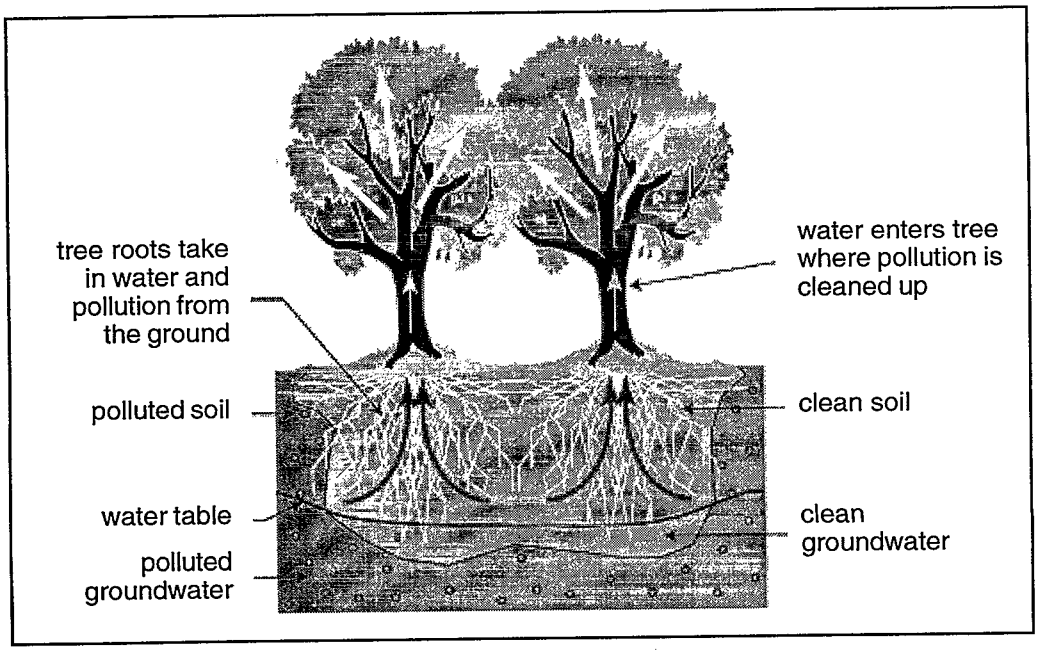
- stored in the roots, stems, or leaves
- changed into less harmful chemicals within the plant
- changed into gases that are released into the air as the plant transpires (breathes).

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. (Please see *A Citizen's Guide to Bioremediation [EPA 542-F-01-001]*.) 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.

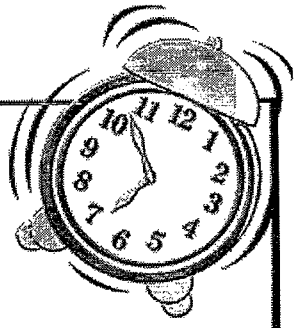
Is phytoremediation safe?

Before phytoremediation begins, EPA studies whether plants grown to clean up pollution can be harmful to people. EPA tests the plants and air to make sure that the plants do not release harmful gases into the air.



Some insects and small animals may eat the plants used for phytoremediation. Scientists are studying these animals to see whether the plants can harm them. Scientists also are studying whether these animals pose harm to the larger animals that eat them. In general, as long as plants are not eaten, they are not harmful to people.

How long will it take ?



The time it takes to clean up a site using phytoremediation depends on several factors:

- type and number of plants being used
- type and amounts of harmful chemicals present
- size and depth of the polluted area
- type of soil and conditions present

These factors vary from site to site. Plants may have to be replaced if they are destroyed by bad weather or animals. This adds time to the cleanup. Often it takes many years to clean up a site with phytoremediation.

Why use phytoremediation?

EPA uses phytoremediation because it takes advantage of natural plant processes. It requires less equipment and labor than other methods since plants do most of the work. Trees and plants can make a site more attractive as well. The site can be cleaned up without removing polluted soil or pumping polluted groundwater. This allows workers to avoid contact with harmful chemicals. Phytoremediation has been successfully tested in many locations, and is being used at several Superfund sites.

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Further information also can be obtained at **www.cluin.org** or **www.epa.gov/superfund/sites.**