

What is Phytoremediation?

The prefix “Phyto-” means plant, and the suffix “-remediation” means reversal of damage. Thus, phytoremediation is the use of plants to remediate or clean up environmental pollutants [1]. Phytoremediation projects commonly involve growing plants in areas with polluted soil to absorb or break down the pollutants. We will explore phytoremediation and other environmental applications of plants in this extension bulletin.

Why is it Important?

Phytoremediation can enable YOU to make a difference. With a bit of planning and planting, you can help make your community a cleaner, greener place.

Scientists have used phytoremediation for decades to clean up contaminated sites with plants, but it is often difficult to bring that technology to places like schools [2]. This is a chance for you to be the activist. Phytoremediation is often a better choice than traditional methods of soil cleanup, such as excavating the soil or treating it with chemicals [3]. Not only is it less expensive and more aesthetically pleasing than those methods, but it also has potential for students like you to get involved in the process.

One of the biggest hurdles in phytoremediation today is that it is not widely understood or known about among the public [3]. Simply by implementing projects at your school, you are raising awareness and educating others about this greatly underused tool, which is a huge step in the right direction. You will gain practical, hands-on experience rather than just reading about phytoremediation in a textbook.

How Do I Do It?

1. Choose a Project

The first step in implementing a phytoremediation project is to walk around your campus and look for areas where plants could provide environmental benefits. Ask teachers for help in identifying these sites. Here are a few ideas:

- **Create a buffer between the school and local streams.** A plant “buffer” protects waterways from pollutants that may be coming from your school.
- **Prevent erosion in local parks or school campus.** Plants with extensive root systems can stabilize hillsides and keep soil from washing away.
- **Trap roadside or parking lot runoff.** Cars release numerous pollutants while parked or idling in a parking lot. Rainfall on such parking lots creates polluted runoff. Plants can absorb and filter this runoff to prevent contamination of groundwater or local waterways (Figure 1).

“Simply by implementing projects at your school, you are raising awareness and educating others about this greatly underused tool, which is a huge step in the right direction.”

- Stavney (2019)



Figure 1: Plants surrounding a parking lot [4]

2. Choose Your Plants

When scientists decide which plants to use for a large-scale project, they ask themselves a few questions. You are the scientist now, so use these questions to guide your plant decision:

Is the plant native? It is important to use plants that would naturally be found in your area, whenever possible. These plants tend to survive the best, and cannot become invasive species like non-native plants. See examples of native plants in the table below.

What problem are you trying to solve? Usually when professionals use phytoremediation, they choose plants that can break down a particular contaminant from a specific source, such as lead from a nearby factory. Since your sites probably have a variety of unknown pollutants, it is best to think broadly about the problem you are trying to solve with your project. For example, if you are trying to use a plant to suck up contaminated water, it would be a good idea to choose a plant with an extensive root system.

What habitat or conditions does the plant need? In addition to the requirements of your project, it is important to consider the needs of the plant itself. Visit the site of interest and match the plant with the environment. Considerations may include sunlight, temperature, rainfall, space needed, etc. Make sure to choose a site that will not be disturbed or walked through [5]. You can use just one species, or multiple. If you use more than one, make sure they will be able to coexist.

Here are some common plants to get you started [6]:

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| <p>Willow</p> <p>Habitat: Shade tolerant, needs water.</p> <p>Uses: Erosion control, water absorption, pollutant uptake</p> <p>Notes: Easy to plant. Cuttings from willow branches will grow if stuck into the soil. Great next to streams.</p> | <p>Indian Mustard</p> <p>Habitat: Cool temperature, hardy.</p> <p>Uses: Great at reducing heavy metals, which are present in pollutants from cars.</p> <p>Notes: It can even remediate radioactive materials! (Do not try this)</p> |
| <p>Poplar</p> <p>Habitat: Direct sun, needs water.</p> <p>Uses: Erosion control, water absorption, pollutant uptake.</p> <p>Notes: Do not plant near buildings, as their roots are extensive. Same ease of planting as willow.</p> | <p>Sunflower</p> <p>Habitat: Loves sun.</p> <p>Uses: Pollutant remediation. [4]</p> <p>Notes: Fast growing, aesthetically pleasing. Do not eat the seeds (or any other edible part of a plant used for phytoremediation).</p> |

3. Experiment!

Much of science is learned through trial and error. You can test ideas with small-scale experiments by growing the plants you selected in pots or smaller plots, and collecting data on how well they survive or remediate under certain conditions. Ask your science teacher or club president if they can help you with these experiments. Try these projects at home, school, or advocate for your city to implement them!

Remember!

Always wear protective gear (gloves, appropriate clothing) and have adult supervision
Ask your school for permission to start projects on campus

Sources

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Additional Resources

A Citizen's Guide to Phytoremediation

https://clu-in.org/download/Citizens/a_citizens_guide_to_phytoremediation.pdf

Phytoremediation

<https://www.sciencedirect.com/topics/earth-and-planetary-sciences/phytoremediation>

DIY Phytoremediation Kickstarter

<https://www.kickstarter.com/projects/1205934734/field-guide-to-phytoremediation>