

Western SARE How-To



Quick Guide

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Growing Mushrooms to Remediate Contaminated Soil



Photo by Cheetah Tchudi.

Fungi are nature's decomposers. They secrete digestive enzymes onto a food source and acquire nutrition by absorbing dissolved molecules.

Mushrooms, as a type of fungi, follow this basic biological process and are capable of breaking down complex hydrocarbons that other decomposers, like some bacteria, can't always manage. Knowing this, and finding studies that show certain mushrooms also have the ability to uptake some types of heavy metals, rancher and mushroom farmer Cheetah Tchudi of Turkey Tail Farm in Butte County began

experiments to show if mushrooms could be used to remediate contaminated soils.

The answer – like many answers when dealing with complex biological systems – is a qualified yes. Mushrooms can bioremediate certain contaminated soils, although it's not a simple or foolproof process. But for someone interested in mushrooms or already growing them, it can be worth the effort.

Where Mushrooms Can Be Used

There are two types of contamination that mushrooms can help remediate. The first is breaking down oils and other complex hydrocarbons the U.S. Environmental Protection Agency labels as "persistent organic pollutants." Because oils repel water, bacteria aren't effective in reaching and breaking down the bonds between the carbon and hydrogen molecules in these products, but fungi can. They secrete an enzyme designed

What Are Quick Guides?

SARE and state Extension services produce a variety of how-to publications, bulletins and project reports.

Western SARE Quick Guides distill this information into a short, easy-to-digest format. They are intended as a supplement to these more extensive publications.

Producers adopting new practices are encouraged to consult with local Extension agents and ag professionals.

Using Mushrooms for Bioremediation

to break down lignin – the organic polymer that makes plants like trees rigid and hard – and that enzyme also degrades organic pollutants.

Mushrooms can't clean an old and persistent oil spill that's leached deep into the soil, but can be valuable when incorporated into erosion and runoff control mechanisms, with the fungi providing an extra cleaning process as runoff or contaminated soil moves slowly past it. In these cases, mushrooms are seeded into straw bails, jute landscape fabric or even burlap coffee bags that are then strategically placed to intercept or inhibit runoff.

Tchudi has also had success bioremediating some heavy metal contamination on his farm, deploying mushrooms on the sites where several vehicles were burned in a recent wildfire. As with all mushrooms grown for bioremediation, these should never be eaten and signs should always be posted warning others of the contamination and that the mushrooms are not edible.



Photo by Cheetah Tchudi.

Mushrooms being used to help clean runoff.

Getting Started with Mushroom Bioremediation

Growing mushrooms for food or for bioremediation is a specialized, nuanced process that requires sterilized growth medium, access to mushroom spawn to start new growth and damp conditions.

Tchudi has produced several excellent videos demonstrating the whole process at his website for Butte Remediation, the bioremediation service he runs in addition to his farm. See them at butterremediation.com.

He recommends burlap coffee sacks as a growth material, sourced from a local coffee roaster if possible. The sacks – or anything used to grow mushrooms – will need to be sterilized and he recommends calcium hydroxide – available as Type S masons' lime – from any large home improvement store. (Masons' lime isn't the ideal calcium hydroxide source but it is the most economical and readily available.)

For the mycelium needed to start mushrooms, Tchudi suggests visiting an established mushroom grower and explaining your bioremediation plans. Growers probably won't want to share their stock to help a competitor get their start in the commercial mushroom-production business, but might be willing to provide spent mushroom substrate that's still producing but not at commercial quantities. His videos show how to incorporate some wood chips as food between layers of burlap sacks – mushroom lasagna, in a sense – and those would be placed in the area that needs remediation with good contact between the growth material and the ground. (Don't give the mushrooms too much food, though, or they'll just consume that and not work on the contaminated soil.)

The Bottom Line

The bottom line is mushrooms can bioremediate some soil contamination, but it's not a simple, speedy or sure process. But, for someone who wants to use a nature-powered method to cleanse and improve their soil, and is willing to learn the skills and put in the time, mushrooms can absolutely be a part of the solution.

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