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# Soil Amendments for Site Remediation & Reuse

## A COST-EFFECTIVE IN SITU TECHNOLOGY

**Contaminated or disturbed soils at Superfund sites and other sites can often be addressed effectively and directly through the application of soil amendments. The use of soil amendments can be a cost-effective in situ process for remediation, revitalization and reuse.**

**This fact sheet provides an overview of how soil amendments can be used to address on-site contamination and summarizes some of the resources that are available to assist with this cleanup approach.**

## DID YOU KNOW?

**Technical Assistance** for using soil amendments to address contaminated soils is available through **EPA's Office of Superfund Remediation and Technology Innovation (OSRTI)**. For more information, please contact Michele Mahoney by phone at 703-603-9057 or via e-mail at: mahoney.michele@epa.gov.

## Why use soil amendments at contaminated sites?

Soil amendments can be used to address two primary categories of problems at contaminated sites: (1) contaminant bioavailability and phytoavailability; and (2) poor soil health and ecosystem function.

## What types of sites are good candidates for remediation using soil amendments?

- hard rock mining sites
- coal mining sites
- smelting and refining sites
- construction and mixed-contaminant sites
- other sites (i.e., sites with excess amounts of soluble salts or pyretic materials)

## What are soil amendments?

Soil amendments are materials added to soils in order to improve soil quality and establish plant growth. Commonly used soil amendments include:

- municipal biosolids, such as water treatment residuals
- animal manures and litters
- sugar beet lime
- wood ash
- foundry sands, steel slag or dredged materials
- log yard waste
- residential yard waste
- ethanol production by-products
- neutralizing lime products
- composted biosolids
- composted agricultural byproducts and traditional agricultural fertilizers

## What are the advantages of using soil amendments?

Soil amendments can **reduce the bioavailability** of a wide range of contaminants while simultaneously **enhancing revegetation success** and thereby protecting against off-site movement of contaminants by wind and water. They can be used in situations ranging from time-critical contaminant removal actions to long-term ecological revitalization projects.

Using residual materials (such as industrial byproducts) as soil amendments offers the potential for **significant cost savings** compared to traditional alternatives. In addition, land revitalization using soil amendments can provide **significant ecological and community benefits**, including wildlife habitat, species diversity, food control, aesthetics and recreation.

### Notes from the Field

*At the California Gulch site in Leadville, Colorado, tailings along the Upper Arkansas River had low soil pH and elevated concentrations of metals. Lime was used to amend the soil pH and biosolids were applied to the tailings. A wide range of earthworm, fish and small mammal testing was conducted to determine whether the revitalized habitat was creating an attractive nuisance. Results showed that the bioavailability of heavy metals present on the site was dramatically reduced following the application of soil amendments and wildlife exposure was within acceptable limits.*

## Determining whether soil amendments are right for a particular site

***What types of contamination can soil amendments address?***
Soil amendments have been demonstrated to successfully address soils contaminated with inorganics, including aluminum, arsenic, borate, high cadmium-to-zinc ratio, chromate, copper, lead, manganese, molybdenum, nickel, selenium, sulfate and zinc.

***Can soil amendments be incorporated into the site's remedy?***
Sites that are between the remedial investigation and feasibility study stages of the cleanup process are in a good position for the evaluation and incorporation of soil amendment recommendations as part of the remedy. For sites where a Record of Decision is in place, soil amendments may be a technology for consideration during remedial design stage.

***How will the site be used in the future?***
Soil amendments can remediate soil and "jump-start" the ecological revitalization of a site, leading to ecological uses such as wetlands and wildlife habitat. Recreation areas and open space can also benefit from this approach.

***What resources are available to support the use of soil amendments?***
Technical assistance is available through OSRTI. Examples of this assistance include identifying local sources of soil amendments, conducting plot studies to determine the effectiveness of soil amendment and re-vegetation techniques, providing guidance for the ecological reuse of sites, and identifying subject matter experts. For additional resources, please see below.

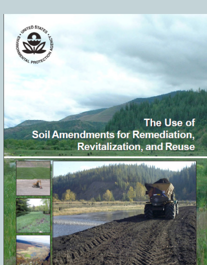
## Notes from the Field

*The underlying soil of the West Page Swamp at the Bunker Hill site in Shoshone County, Idaho, consisted of highly contaminated tailings (up to 3 percent lead and 1.5 percent zinc). These materials were sufficiently toxic that there was no evidence of ecosystem function in the swamp and waterfowl routinely developed acute lead toxicity from ingesting the contaminated sediment. Remediation included capping contaminated soils with surface amendments consisting of biosolids compost and wood ash to restore ecosystem function and reduce the bioavailability of underlying metals left in place at the site.*

## Additional Resources

A range of EcoTools are available online at www.clu-in.org/ecotools/soil.cfm.

For additional information on soil amendments, please reference the EPA publication ***The Use of Soil Amendments for Remediation, Revitalization, and Reuse***: www.clu-in.org/download/remed/epa-542-r-07-013.pdf.




**The Ecological Revitalization Project Profiles Database** contains information about completed and ongoing projects where ecological revitalization was part of the solutions used to address environmental concerns: www.clu-in.org/ecotools/case.cfm.


***Ecological Revitalization: Turning Contaminated Properties Into Community Assets*** provides technical information to assist property managers and other stakeholders better understand, coordinate and conduct ecological revitalization at contaminated properties during cleanup: www.clu-in.org/ecotools/assistance.cfm.