Reuse of Damaged Lands with Soil Amendments

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Damaged/Contaminated Lands

- Hard rock mining sites
- Coal mining sites
- Sand and Gravel mining sites
- Smelting and Refining sites
- Construction & Mixed-Contaminant Sites

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Types of sites where soil amendments can be used.

Damaged lands are sites with contaminated or disturbed soils with problems that can often be address with the addition of soil amendments.

Soil Issues on Damaged Lands

- Toxicity from metals
- pH
- Sodicity
- Salinity
- Undesirable soil physical properties
- Nutrient deficiencies

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Mining depletes carbon reserves

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Pic Leadville, CO
Historic mine tailings washed down and accumulated in deposit of 2 feet.
Soils contaminated, Deposits toxic to vegetation, Lots of erosion

Remediation Goals

- Reduce bioavailability of contaminant in place (In-situ treatment)
- Rebuild soil or build new soil
- Restore soil function
- Establish native plant ecosystem

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Why use soil amendments...

- Reduce contaminant bioavailability and phytoavailability
- Improve soil health and ecosystem function
- Putting waste by-products to good use
- Economical Large-scale solution
- The Use of Soil Amendments for Remediation, Revitalization, and Reuse,

  EPA 542-R-07-013, December 2007

  http://www.clu-in.org/download/remed/epa-542-r-07-013.pdf

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Organic amendments accelerate the carbon accumulation process in soils and potentially result in increased soil carbon concentrations.

Organic amendments heal the soil so that vegetation can be establish and potentially sequester carbon.

Table 1, page 5, list types of problems addressed by soil amendments

Types of Soil Amendments

Organic	pH	Mineral
Biosolids	Lime	Foundry sand
Manures	Wood ash	Steel slag
Compost	Coal Combustion Products	Dredged material
Digestates	Sugar beet lime	Gypsum
Pulp sludges	Cement kiln/Lime kiln	Water treatment residuals
Yard/wood trimmings	Red mud	Coal Combustion Products
Ethanol production by-products	Lime-stabilized biosolids	

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Application Rates

- Depends on site concern
- Approaches
  - Total OM at your site
  - Rates at similar sites
  - Laboratory procedures
  - Qualitative decision

- State permitting & regulations

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Logistics of Using Soil Amendments

- Availability
- Transportation
- Storage
- Application
- Blending
- Public Concern
- Cost

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Revegetating Amended Soil

- Plant selection
  - Seed or seedling
  - Native and non-invasive
- Irrigation
- Monitoring plan
  - Invasive and weed species
  - Manage wildlife

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Benefits of Revitalizing Damaged Land

- Remediates contaminants
- Improves water quality
- Creates wildlife habitat
- Reuses devoid land
- Increases property value
- Reduces erosion
- Carbon management

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Terrestrial Carbon

- Highly related to soil management practices
- Soil amendments build soil organic carbon
  - Stimulates plant growth
  - Decreases soil disturbance
- Incentive for remediating large, isolated properties
- Benefits for the environment

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Soil erosion

No till

Plant growth – photosynthesis – permanent vegetative cover can store CO2 as organic carbon; land cover is greatly effected by land use/management

Soil disturbance – removes carbon from soil carbon pol --- erosion, tilling are major factors in soil degradation and loss of OM. Significant amts of CO2 are lost after tillage

Carbon at Soil-Amended Sites

- Field protocol
- Carbon management & accounting system
- Field tests starting this summer/fall
  - Leadville, CO
  - Minersville, PA

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Talk about additions of carbon at our sites, carbon storage, and carbon sequestration.

There is limited research focused specifically on total carbon in restored soils following addition of amendments.

It's necessary to develop methodology to quantify the amount of carbon stored in amended soils and resulting biomass.

Leadville, CO
Before

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Leadville, CO
After

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Pic 2005

West Page Swamp, ID
Before

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West Page Swamp, ID
After

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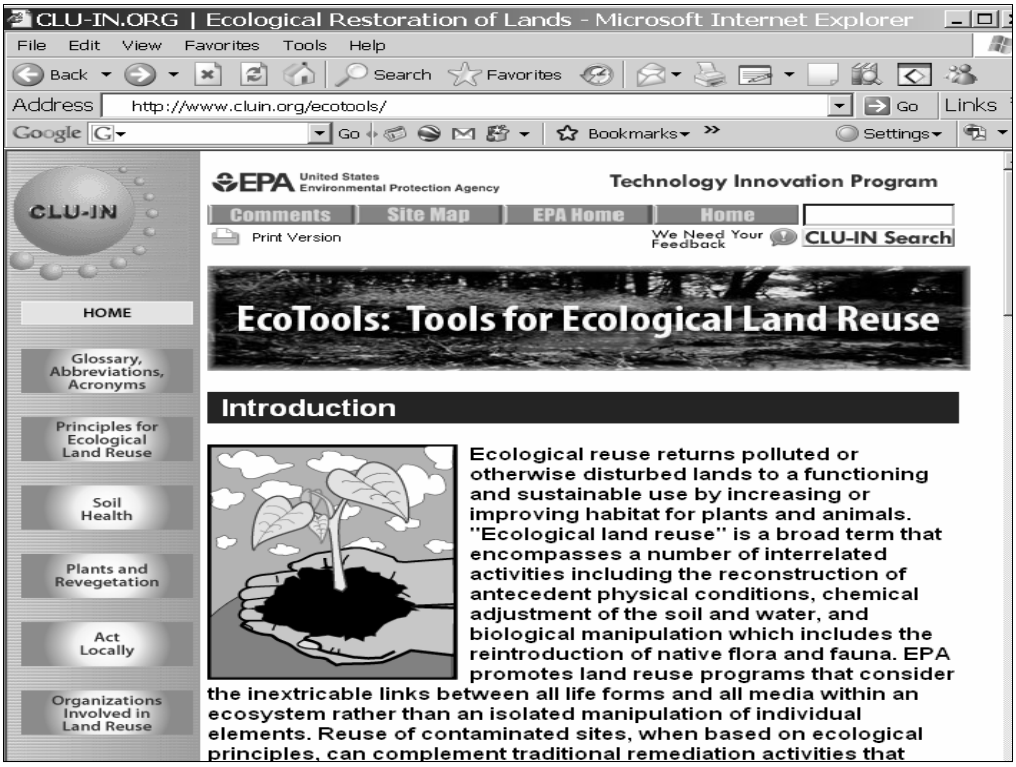
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EcoTools: Tools for Ecological Land Reuse
Introduction
Ecological reuse returns polluted or otherwise disturbed lands to a functioning and sustainable use by increasing or improving habitat for plants and animals. "Ecological land reuse" is a broad term that encompasses a number of interrelated activities including the reconstruction of antecedent physical conditions, chemical adjustment of the soil and water, and biological manipulation which includes the reintroduction of native flora and fauna. EPA promotes land reuse programs that consider the inextricable links between all life forms and all media within an ecosystem rather than an isolated manipulation of individual elements. Reuse of contaminated sites, when based on ecological principles, can complement traditional remediation activities that

For more information...

www.cluin.org/ecotools

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