Welcome to the CLU-IN Internet Seminar

NARPM Presents...Ecological Revitalization: Turning Contaminated Properties into Community Assets

Sponsored by: EPA Office of Superfund Remediation and Technology Innovation

Delivered: March 15, 2011, 1:00 PM - 3:00 PM, EDT (17:00-19:00 GMT)

Instructors:

Michele Mahoney, Environmental Scientist, U.S. EPA, Technology Innovation and Field Services Division (mahoney.michele@epa.gov or (703) 603-9057)

Mark Sprenger, Environmental Scientist, U.S. EPA Environmental Response Team (sprenger.mark@epa.gov or (732) 906-6826)

Moderator:

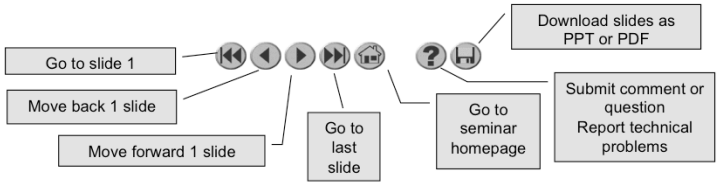
Jean Balent, U.S. EPA, Technology Innovation and Field Services Division (balent.jean@epa.gov or (703) 603-9924)

Visit the Clean Up Information Network online at www.cluin.org 1

Notes:

Housekeeping

- Please mute your phone lines, Do NOT put this call on hold
  - press *6 to mute #6 to unmute your lines at anytime
- Q&A
- Turn off any pop-up blockers
- Move through slides using # links on left or buttons



- This event is being recorded
- Archives accessed for free **http://cluin.org/live/archive/**

2

Notes:

- Although I'm sure that some of you have these rules memorized from previous CLU-IN events, let's run through them quickly for our new participants.

- Please mute your phone lines during the seminar to minimize disruption and background noise. If you do not have a mute button, press *6 to mute #6 to unmute your lines at anytime. Also, please do NOT put this call on hold as this may bring delightful, but unwanted background music over the lines and interupt the seminar.

- You should note that throughout the seminar, we will ask for your feedback. You do not need to wait for Q&A breaks to ask questions or provide comments. To submit comments/questions and report technical problems, please use the ? Icon at the top of your screen. You can move forward/backward in the slides by using the single arrow buttons (left moves back 1 slide, right moves advances 1 slide). The double arrowed buttons will take you to 1st and last slides respectively. You may also advance to any slide using the numbered links that appear on the left side of your screen. The button with a house icon will take you back to main seminar page which displays our agenda, speaker information, links to the slides and additional resources. Lastly, the button with a computer disc can be used to download and save today's presentation materials.

- With that, please move to slide 3.

Ecological Revitalization: Turning Contaminated Properties Into Community Assets

Michele Mahoney
US EPA Office of Superfund Remediation and Technology Innovation
Mahoney.michele@epa.gov

Notes:

Overview

- What is Ecological Revitalization?
- Ecological Revitalization & Superfund
- Incorporating Ecological Revitalization into Cleanup Planning and Design
- Technical Considerations for Ecological Revitalization
- Ecological Revitalization Case Studies

4

Notes:

What is Ecological Revitalization?

- Ecological <u>revitalization:</u> The *technical process* of returning contaminated land to functioning and sustainable habitat

- Ecological <u>reuse:</u> The *outcome* of a cleanup process where proactive measures have been implemented to create, restore, protect, or enhance habitat

5

Notes:

Benefits of Ecological Revitalization:

- Improves soil health
- Supports vegetation
- Sequesters carbon
- Protects surface and ground water
- Enhances property values and raises tax revenue
- Provides passive recreational opportunities
- Contributes to a green corridor or infrastructure

Mill Creek Dump, Pennsylvania

6

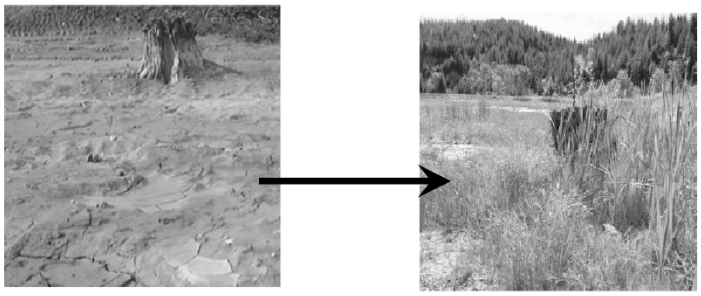
Notes:

Benefits a Variety of Stakeholders

- Cleanup Property Managers
- Potentially Responsible Parties
- Local Government
- Local Citizen Groups and Individuals
- Environmental Organizations

Notes:

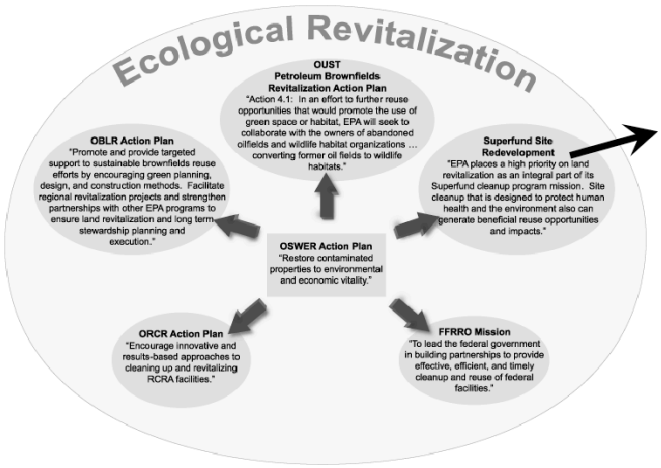
Improves Habitat



Bunker Hill Superfund Site in Idaho

Notes:

Ecological Revitalization & Superfund



Superfund Site Redevelopment

"EPA places a high priority on land revitalization as an integral part of its Superfund cleanup program mission. Site cleanup that is designed to protect human health and the environment also can generate beneficial reuse opportunities and impacts".

9

Notes:

General Programmatic Considerations

- Protectiveness
- Enhancement
- Stakeholder Involvement

Jasper County Superfund Site, Missouri

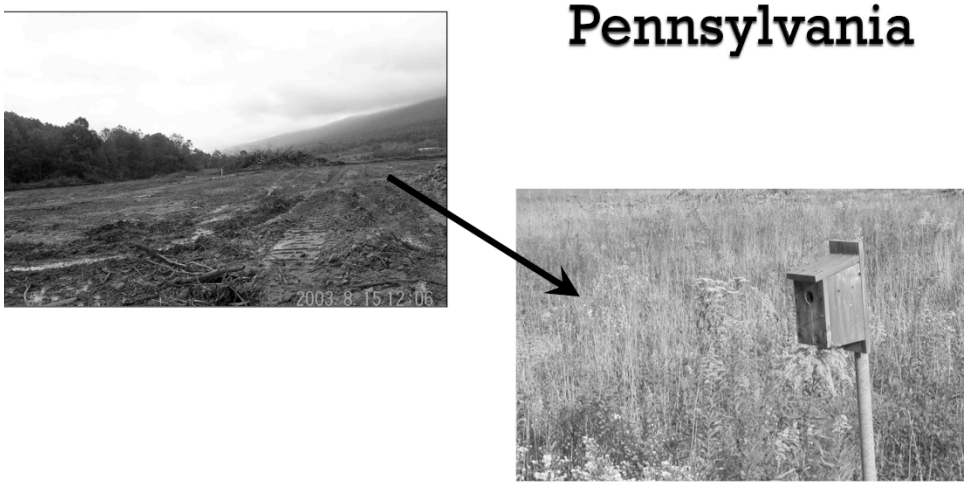
Before

After

10

Notes:

Jacks Creek/Sitkin Smelting & Refining, Inc. Superfund Site, Pennsylvania



11

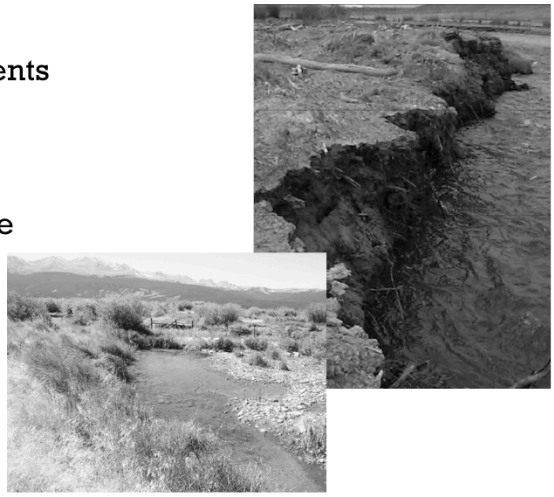
Notes:

Calumet Container Superfund Site, Hammond, Indiana

Notes:

Cleanup Planning and Design

- Amendments
- Regulatory Requirements
- Attractive Nuisance
- Equipment and Utility Location
- Hydrology and Surface Water Management
- Surface Vegetation



California Gulch Superfund Site, Colorado

13

Notes:

General Steps for Planning & Implementation

- Determine pre-disturbance and reference conditions
- Conduct a property inventory
- Establish revitalization goals and objectives
- Evaluate revitalization alternatives
- Develop a property-specific ecological design
- Prepare specifications for construction contractors
- Construct habitat features
- Conduct maintenance and monitoring activities

14

Notes:

Cleanup Planning & Design Issues

TABLE 3-1: Cleanup Planning and Design Issues When Waste is Left on Site and Other Considerations for Ecological Revitalization

Issue	Property Type[2]	Potential Impact	Solution/Consideration
Attractive Nuisance Issues: An area, habitat, or feature that is attractive to wildlife and has, or has the potential to have, waste or contaminants left on site that are harmful to plants or animals after a property is cleaned up	Landfill Mining Site Brownfield Military Installation Foundry Gas Station Metal Plating Facility Refinery Tannery	• Harm wildlife if (1) an exposure pathway exists from contaminants left on site that could directly harm wildlife or travel up the food chain; or (2) wildlife interfere with the cleanup, thereby creating an exposure pathway	• Consider potential ecological risks throughout the cleanup process • Conduct a thorough ecological risk assessment to avoid potential attractive nuisance issues • Carefully consider plant species and the type of animals that those species will attract; protect newly planted species until they are established • For additional information, refer to EPA's fact sheet titled "Ecological Revitalization and Attractive Nuisance Issues" (EPA 2007c)
Managing Gases: Depending on the waste composition, some containment sites have the potential to generate gas	Landfill	• Provide fuel for fire or explosions • Stress vegetation • Damage cover system • Infiltrate nests or other wildlife homes • Create other health or safety hazards	• Determine ability of waste to generate gas during planning stage (EPA 1991) • Build gas collection systems • Place components where they (1) do not interfere with planned uses, (2) minimize noise and odors, and (3) are not easily accessible to trespassers or wildlife • For additional information, refer to the EPA fact sheet "Reusing Cleaned Up Superfund Sites: Commercial Use Where Waste is Left On Site" (EPA 2002a) and "Landfill Gas Control Measures" (www.atsdr.cdc.gov/HAC/landfill/PDFs/Landfill_2001_ch5.pdf)

http://cluin.org/ecotools/pub.cfm

Notes:

Minimizing Ecological Damage During Cleanups

- Develop and Communicate Ecology Awareness and Procedures
- Design a Property-Wide Work Zone and Traffic Plan
- Minimize Excavation and Retain Existing Vegetation
- Phase Site Work

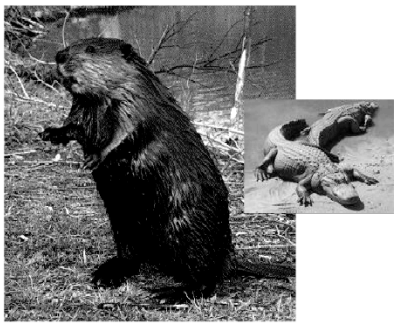
Rocky Mountain Arsenal, Colorado

16

Notes:

Minimizing Ecological Damage During Cleanups

- Consider Property Characteristics
- Protect On-Site Fauna
- Locate and Manage Waste and Soil Piles to Minimize Erosion
- Design Containment Systems with Habitat Considerations
- Reuse Indigenous Materials Whenever Practical



17

Notes:

Wetlands Cleanup & Restoration

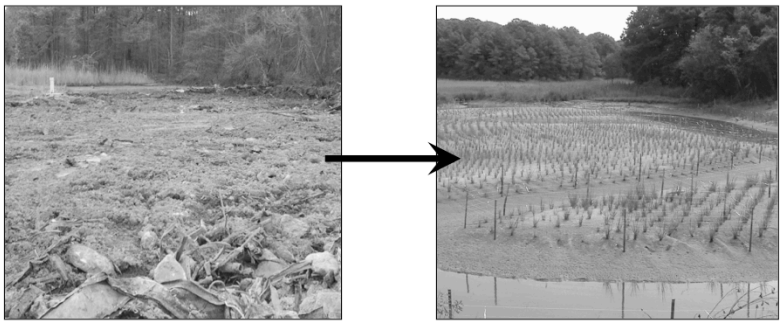
- Factors to consider if a cleanup will affect a wetland:
  - Wetland characteristics
  - Regulatory requirements
  - Vegetation and hydrology
  - Wildlife
  - Maintenance
  - Additional considerations for treatment wetlands

Wetland Creation at Naval Amphibious Base Little Creek, Virginia

18

Notes:

Wetlands Cleanup & Restoration: Naval Amphibious Base Little Creek, Virginia



19

Notes:

Stream Cleanup & Restoration

- Considerations Critical to Successful Stream Cleanup and Restoration:
  - Stream Channel
  - Streambank Stabilization
  - Streambank Vegetation
  - Watershed Management

Cache La Poudre River Superfund Site, Colorado

20

Notes:

Stream Cleanup & Restoration: Cache La Poudre River Superfund Site, Colorado

Notes:

Terrestrial Ecosystem Cleanup & Reuse

- General Revegetation Principles:
  - Soil Type
  - Organic Matter
  - Plant Selection
  - Timing

Palmerton Before

Palmerton After

22

Notes:

Successful O & M Program

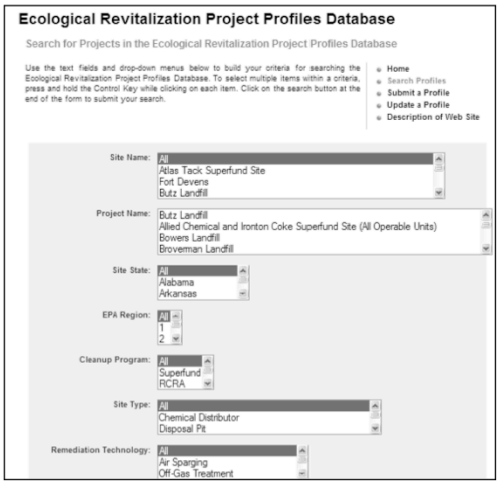
- Plan early for long-term stewardship
- Identify and complement general O&M activities
- Establish a monitoring program
- Use Institutional Controls

23

Notes:

Ecological Revitalization Case Studies

http://www.clu-in.org/products/ecorev/er_search.cfm

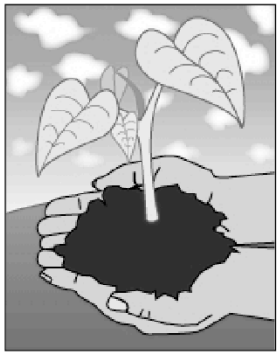


Notes:

EcoTools Tools for Ecological Land Reuse

Topics on EcoTools Web site

- EPA Presentations
- Principles for Ecological Land Reuse
- Soil Amendments
- Terrestrial Carbon Sequestration
- Plants and Revegetation
- Urban Gardens
- Act Locally
- Organizations and Resources
- Land Revitalization Assistance
- Case Study Profiles



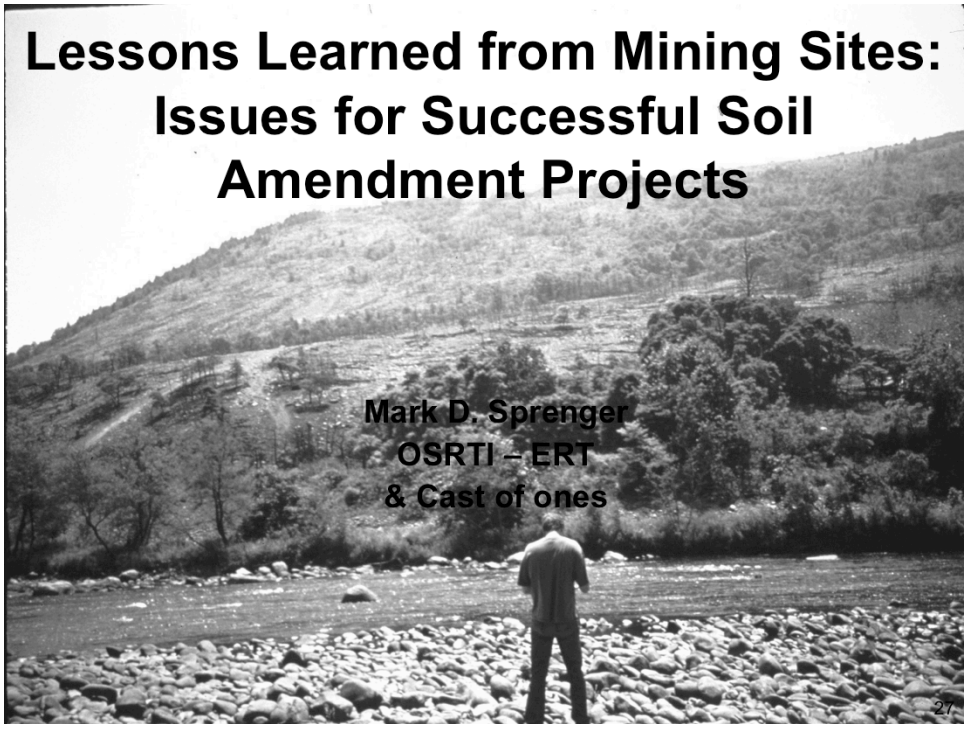
http://www.cluin.org/ecotools

25

Notes:


Michele Mahoney
US EPA OSWER
Technology Innovation & Field Services Division
Phone: (703) 603-9057
Email: Mahoney.Michele@epamail.epa.gov
www.cluin.org/ecotools
26

Notes:


Lessons Learned from Mining Sites:
Issues for Successful Soil Amendment Projects
Mark D. Sprenger
OSRTI – ERT
& Cast of ones
27

Notes:

Mine sites come is all sorts of sizes but size is not the only issue or impediment to remedy selection

28

Notes:

Palmerton, PA, 1980; Blue Mountain.

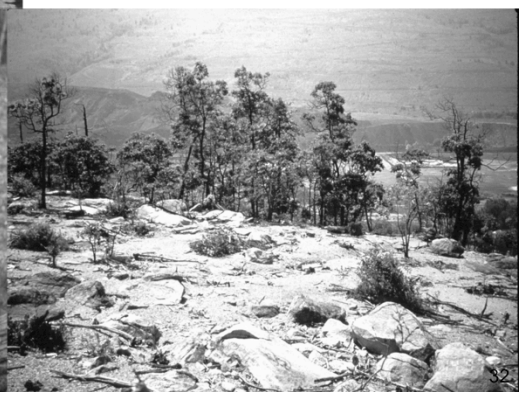
Palmerton, PA, 1990

Notes:

Notes:

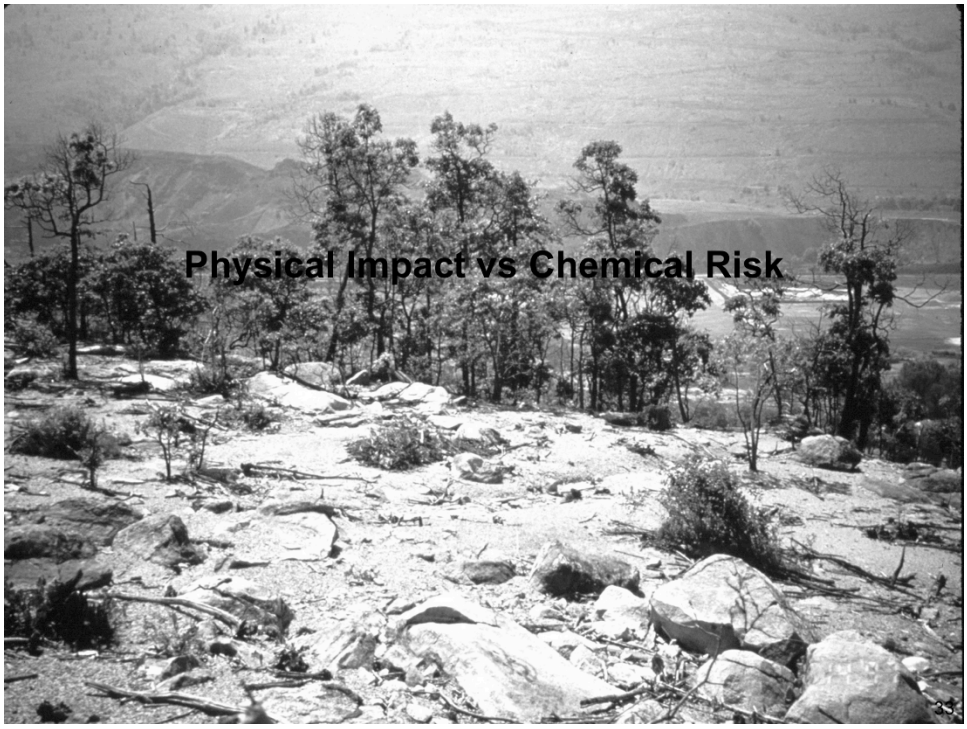
Notes:

First step in the remedy is a good risk assessment



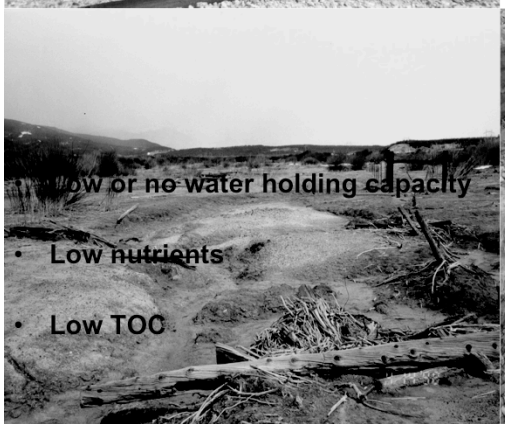
32

Notes:



Notes:

If you are in the mine, on the waste rock, standing on tailings or bag house material you are standing on something that has few characteristics of a soil:



Notes:

Critical Exposure Pathways

35

Notes:

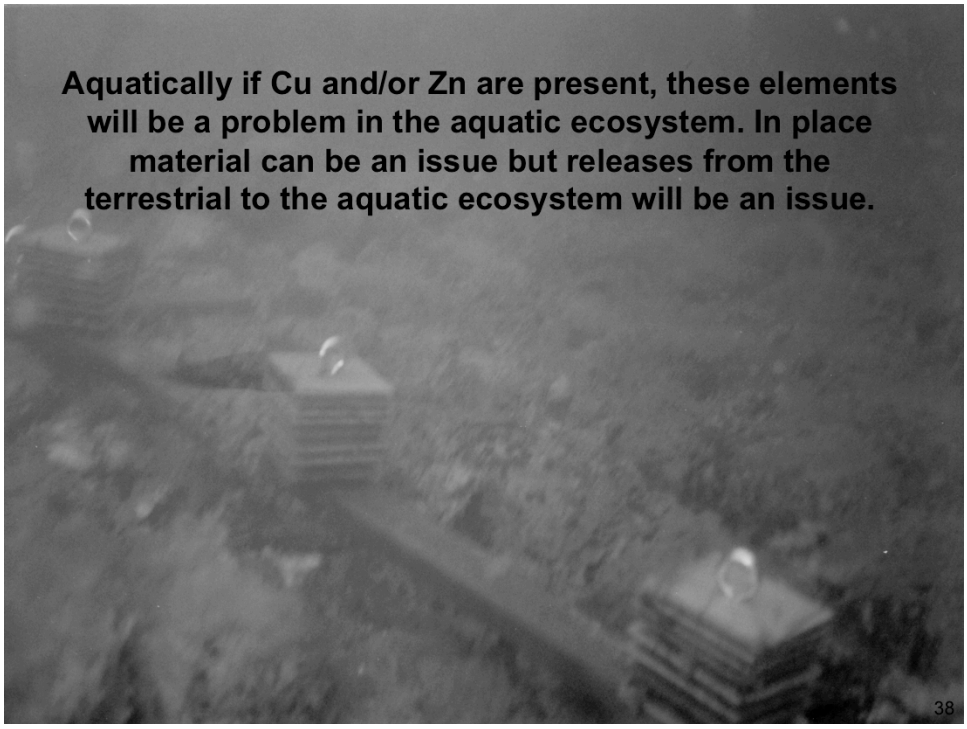
Terrestrially the problem elements may include:

- **Pb (direct exposure/ingestion of soil)**
- **Cd food chain dietary exposure**

Notes:

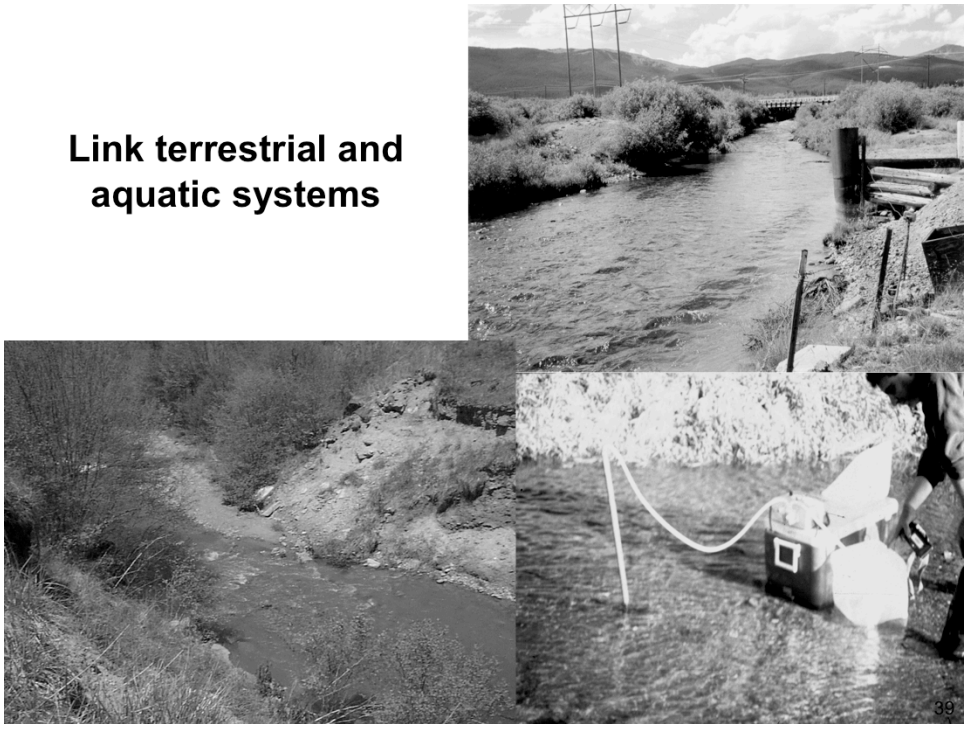
Critical risks posed by mining sites can be specific to site conditions and change within the site depending upon the specific habitat

Notes:


Aquatically if Cu and/or Zn are present, these elements will be a problem in the aquatic ecosystem. In place material can be an issue but releases from the terrestrial to the aquatic ecosystem will be an issue.
38

Notes:

Link terrestrial and aquatic systems



Notes:

Why do all that?

Notes:

Risk reduction can be demonstrated through measures of toxicity and contaminant mobility.

The risk assessment is the basis and baseline for the evaluation of the performance of the remedy.

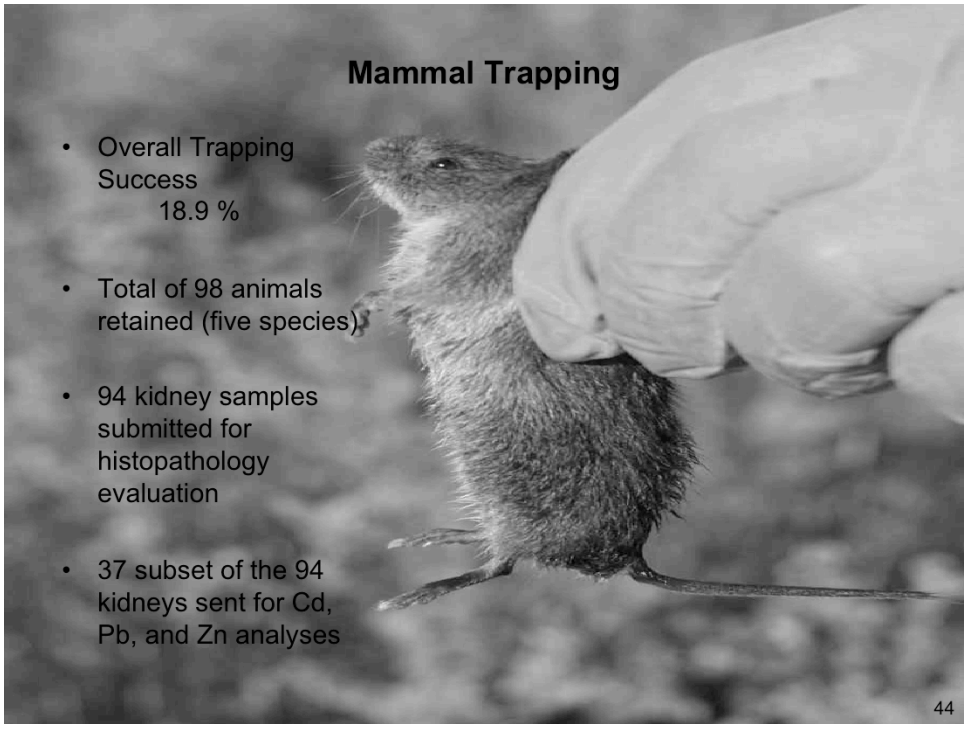
However, the acceptability of the remediation may remain an issue.

Notes:


Earthworm (Eisenia foetida) Assays - Survivorship & Biomass/Organism
Sample
Untreated
Survival (%)
Biomass (mg)
Treated
Survival (%)
Biomass (mg)
CL 0 NA 100.0 329.3
CO 0 NA 98.9 323.0
MB/ME 0/0 NA 90.0 372.0
RA/RB 0/0 NA 10.0* 280.3
Ref. A - - 98.7 244.0
Upst. Ref. - - 96.7 196.0
Lab Con. 100 not measured 100.0 258.6
* significantly < reference samples and/or control sample
42

Notes:

Notes:


Mammal Trapping
• Overall Trapping Success 18.9 %
• Total of 98 animals retained (five species)
• 94 kidney samples submitted for histopathology evaluation
• 37 subset of the 94 kidneys sent for Cd, Pb, and Zn analyses
44

Notes:

Histopathology Results

- All Kidney Samples
- 9 could not be evaluated
- 61 no evidence of pathology
- 22 pathology consistent with metals exposure
- 2 pathology concludes metals exposure

- 37 kidney subset
- 1 could not be evaluated
- 27 no evidence of pathology
- 7 pathology consistent with metals exposure (included shrew)
- 2 pathology concludes metals exposure

45

Notes:

Metals in Soil and Kidney (mg/kg dw)

	Area			
	A	B	C	D
Cd				
Kidney – median	12	19	3.6	6.9
(range)	(1.4 – 28)	(3.4 – 32)	(1.7 – 11)	(2.2 – 36)
shrew n=1				60
Soil	15	15	3.2	4.9
Pb				
Kidney – median	3.8	15	1.8	0.6
shrew n=1				5.6
Soil	300	2100	160	110
Zn				
Kidney – median	71	73	74	70
shrew n=1				115
Soil	2100	2200	510	630

Notes:

Kidney Summary Relative to Cd

27 kidneys with no apparent pathology
(Cd range 1.4 – 36 mg/kg dw)

7 kidneys with pathologoly consistent with metals exposure
(Cd range 2.1 – 60 mg/kg dw)

2 kidneys with evidence of metals exposure
(Cd 2.7 and 4 mg/kg dw)

Notes:

Cadmium

- Twenty four percent of the organisms evaluated showed some evidence of cellular level response to metals (Cd) exposure.
- There was no dose response relationship found.
- The conclusion of the pathology report was that there was some evidence of pathology in the kidneys of some of the animals but that the level of kidney effect was insufficient to “completely interfere with normal function”.

Notes:

Body burden data can also be used as input to dietary exposure models.

However the decision point can not be statistically significant accumulation over background.
There will be accumulation.
The question is whether or not the amount of accumulation is acceptable? This question is answered through the risk assessment process.

Notes:

Future land use plays a part in the acceptability of the remediation technology especially in relation to human health risk

Notes:

A site strategy must be developed to accomplish the site goals and establish realistic expectations and remedy success evaluation benchmarks, remember:
The total soil concentrations will not significantly change.
There will be statistically significant accumulation over background of something, however that does the action was not a success.

Notes:

Standard Mine
Crested Butte, CO

Notes:

53

Notes:

Notes:

55

Notes:

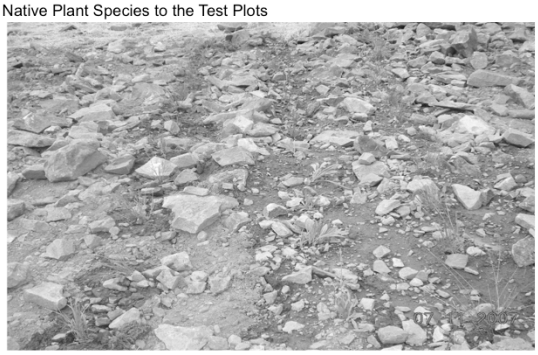
Notes:

Standard Mine Site
Crested Butte, CO

A: Longleaf Arnica (*Arnica longifolia*)
B: Arctic Bluegrass A (*Poa spp*)
C: Arctic Bluegrass B (*Poa spp*)

Notes:

Figure 4. Transplanting of Native Plant Species to the Test Plots
Standard Mine Site
Crested Butte, CO

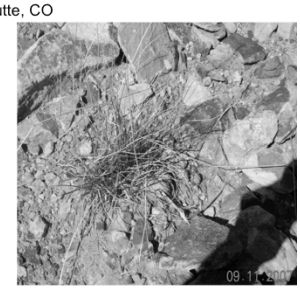


A: Three rows of native plant species were transplanted into the control plot.

Notes:

Notes:

Figure 12. Effect of Soil Amendments on the Growth of Transplanted Arctic Bluegrass
(60 Days after Transplanting) Standard Mine Site
Crested Butte, CO



A: Control

B: +5% Biosolids compost

C: +10% Biosolids compost

D: +5% Biosolids compost with fertilizer

Notes:

Notes:

Notes:

NARPM ANNUAL MEETING
May 16-20, 2011

TRAINING SESSION

ECOLOGICAL REVITALIZATION: EXPERIENCES IN COST-EFFECTIVE REMEDIES

http://www.epanarpm.org/

Notes:

Resources & Feedback

- To view a complete list of resources for this seminar, please visit the **Additional Resources**
- Please complete the **Feedback Form** to help ensure events like this are offered in the future

Need confirmation of your participation today?

Fill out the feedback form and check box for confirmation email.

64

Notes: