Revegetation Technology for Mine Tailings

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Why is mine waste reclamation important?

Residual mine waste is currently one of the largest waste streams in the world.

Reclamation Strategy: Revegetation

- Current technology is cap and plant
- Innovation is direct planting
Direct Planting, the Challenge:

Ecosystem reconstruction

- Transition mine waste from a highly disturbed matrix to a plant-sustaining soil ecosystem
- Expedite the process in a cost effective manner
- Provide quantitative measures of success/failure

UA Research Site – Legacy Mine

Iron King Mine Humboldt Smelter Superfund Site (IKMHSS)

Dewey-Humboldt, AZ

Operated 1904-1969 as a lead, gold, silver, zinc, and copper mine

Avg arsenic = 3000 mg/kg
Avg lead = 3000 mg/kg
Avg zinc = 3000 mg/kg
Field Study - Iron King Mine and Humboldt Smelter Superfund site

Compost-assisted direct planting
Based on greenhouse work
IKMHSS field trial - Initiated May 18, 2010

Unamended irrigated control – 29 months

29 Months

Off-site vegetation

% Canopy Cover

Compost 10% 15% 20%
+ Seeds

Treatment

2010 - 5 months
2011 - 17 months
2012 - 29 months
2013 - 41 months
Translating Innovation into Practice

or

How to Escape the Academic Silo
University of Arizona Center for Environmentally Sustainable Mining

Mission Statement:
To develop educational and research initiatives, as well as specialized professional training, that address environmental issues related to mining activities in arid and semi-arid urban environments.
INDUSTRY PARTNERS

Technical Advisory Committee
Arizona Rock Products Association
ASARCO
Barrick Gold
Freeport McMoRan
Golder Associates
KGHM International
Resolution Copper
Peabody Coal
Salt River Materials

Priority Areas
Dust control
Water
Reclamation
Education
A New Paradigm

Industry-Academic Cooperative

Example: Reclamation of Mine Tailings

Partnership

ASARCO + Carlota + Resolution + UA

• Together addressing a critical component of active mining operations
• Shared information
• Shared expertise
• Solving real problems while reducing operating costs
• Supported by State + industry dollars
ASARCO Mission Mine
Grupo Mexico
Sahuarita, Arizona

- Revegetation of tailings storage facilities
- Required by Tohono O’odham Nation to reclaim native American land
- Cost $22M

Project Objective:

- Evaluate source and quality of borrow materials for soil cap
Industry-Academic Cooperative Example: Reclamation of Mine Tailings Partnership

ASARCO + Carlota + Resolution + UA

• Supported by State + industry dollars

West side borrow pit: Top spoil

West side borrow pit: Subsoil

ASARCO Mission Mine Sahuarita, AZ Grupo Mexico
Monitoring: Biological Health

KGHM Carlota Copper
Miami, Arizona
Waste rock dump

Lower West Slope
Hydroseeded in 2012

East Slope
Hydroseeded, 2009

Natural soil

Heterotrophic Bacterial Counts
Biogeochemical indicators have been identified that correlate with time since seeding and status of plant growth.

Most promising indicators are:
- Total nitrogen
- Total soil biomass (based on DNA)
- NHCs (culturable bacterial counts)
Meeting Mining Sustainability Challenges Optimally Requires Cooperation

- World class mines => meeting demand, need for technology
- Mining Industry => need for competitive edge
- Universities => supply training, social infrastructure, new technology and knowledge
- State/Country => supplies infrastructure and effective policy
Gracias!

University of Arizona
Julie Neilson
Jon Chorover
Scott White, field expert
Juliana Gil Loaiza
Lydia Jennings

Funding and Support
KGHM International, Carlota Copper
Resolution Copper, Rio Tinto
ASARCO Mission Mine, Grupo Mexico
NIEHS Superfund Research Program
UA Center for Environmentally Sustainable Mining
North American Industries

NIEHS
National Institute of Environmental Health Sciences

The University of Arizona