Revegetation Technology for Mine Tailings

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CESM
Center for Environmentally Sustainable Mining

THE UNIVERSITY OF ARIZONA

Srp
Superfund Research Program

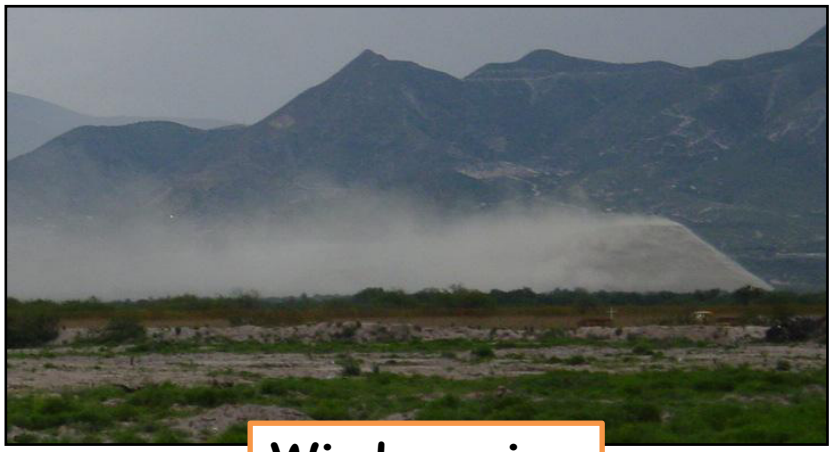
Why is mine waste reclamation important?

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

Water erosion

<u>Reclamation Strategy</u>: Revegetation

- **Current technology is cap and plant**
- **Innovation is direct planting**

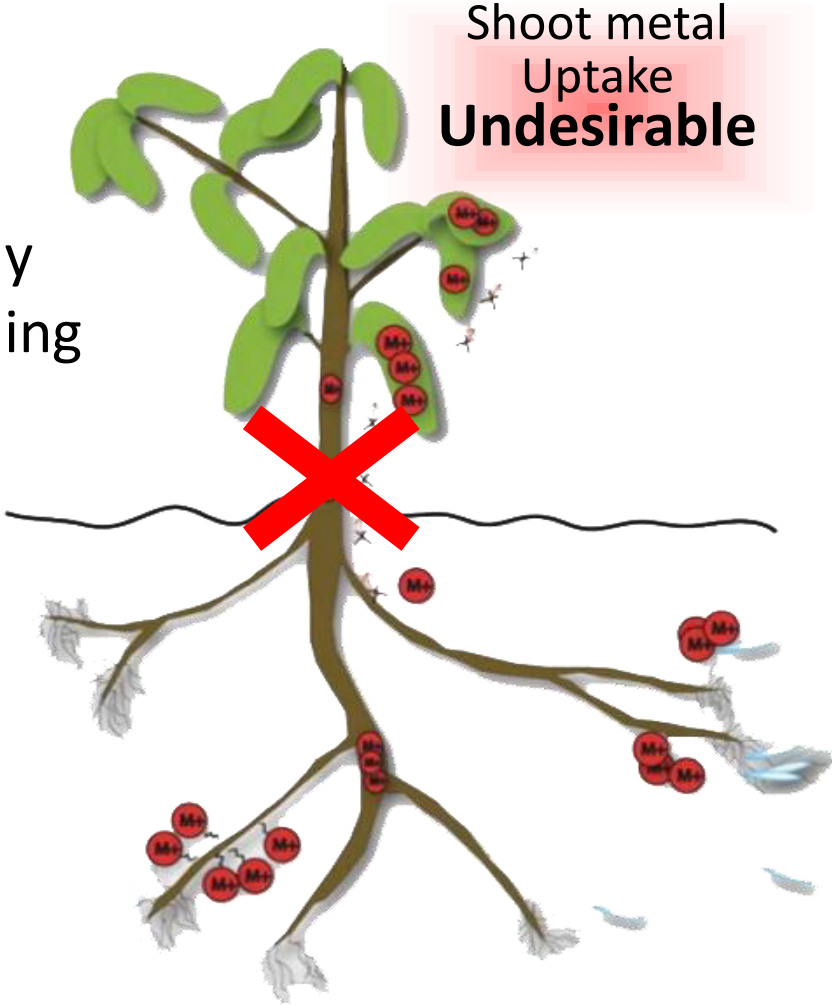


Wind erosion

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



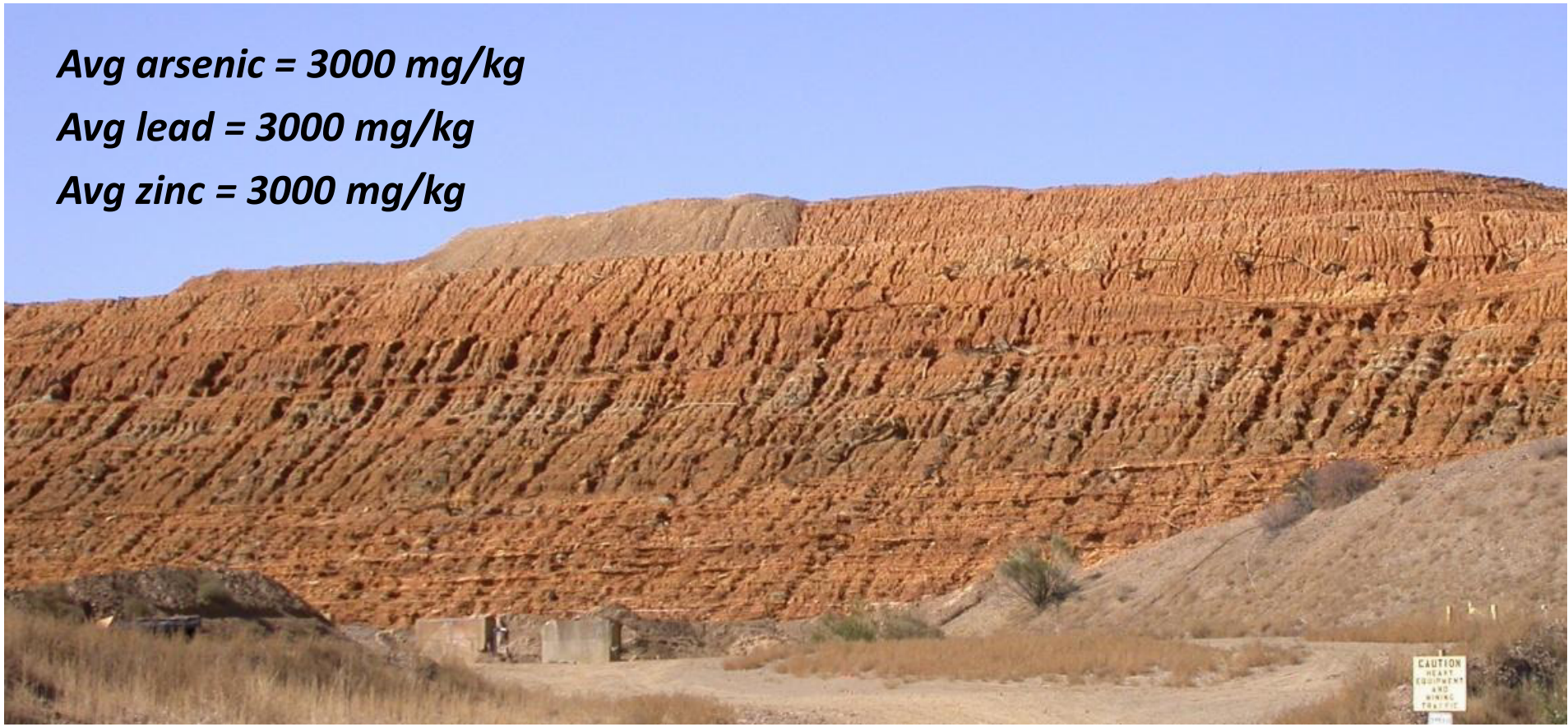
Source: Mendez and Maier, 2008. Environ. Health Perspec.

UA Research Site – Legacy Mine

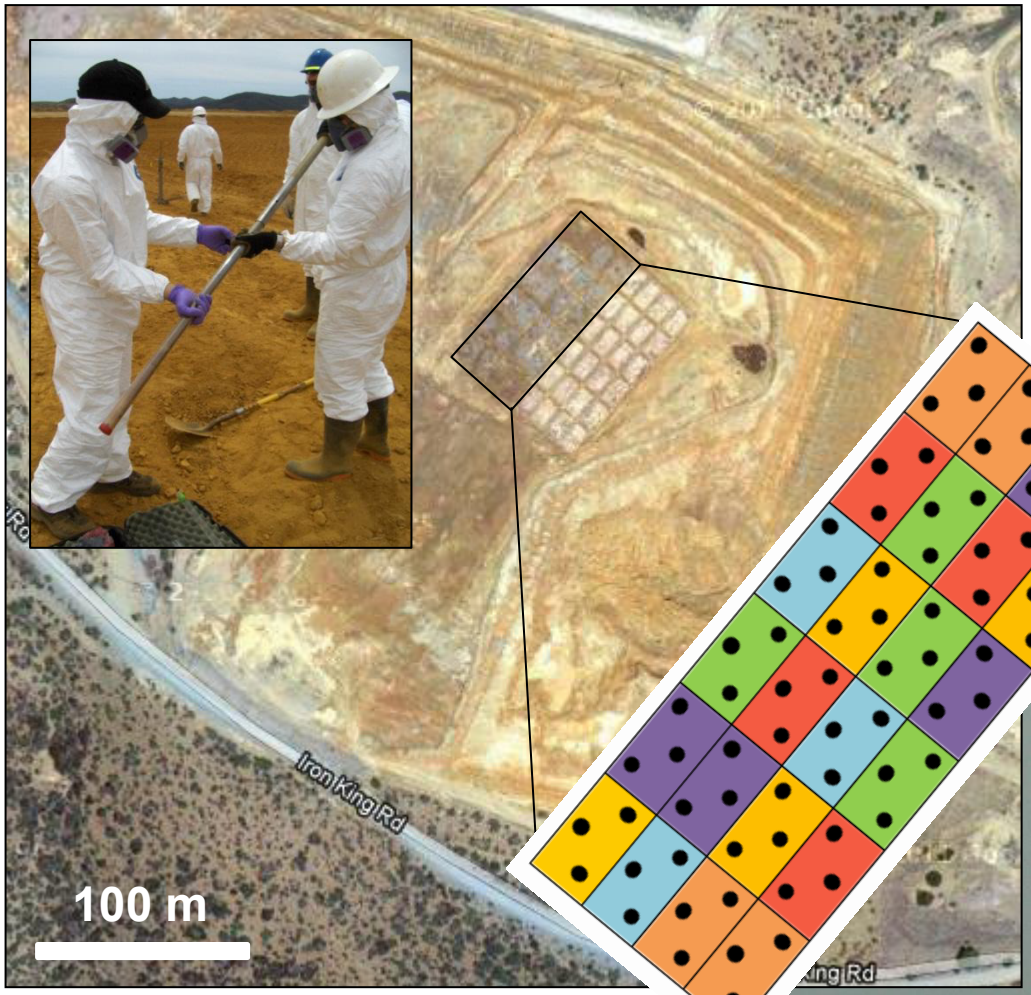
Iron King Mine Humboldt Smelter Superfund Site (IKMHSS)

Dewey-Humboldt, AZ

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



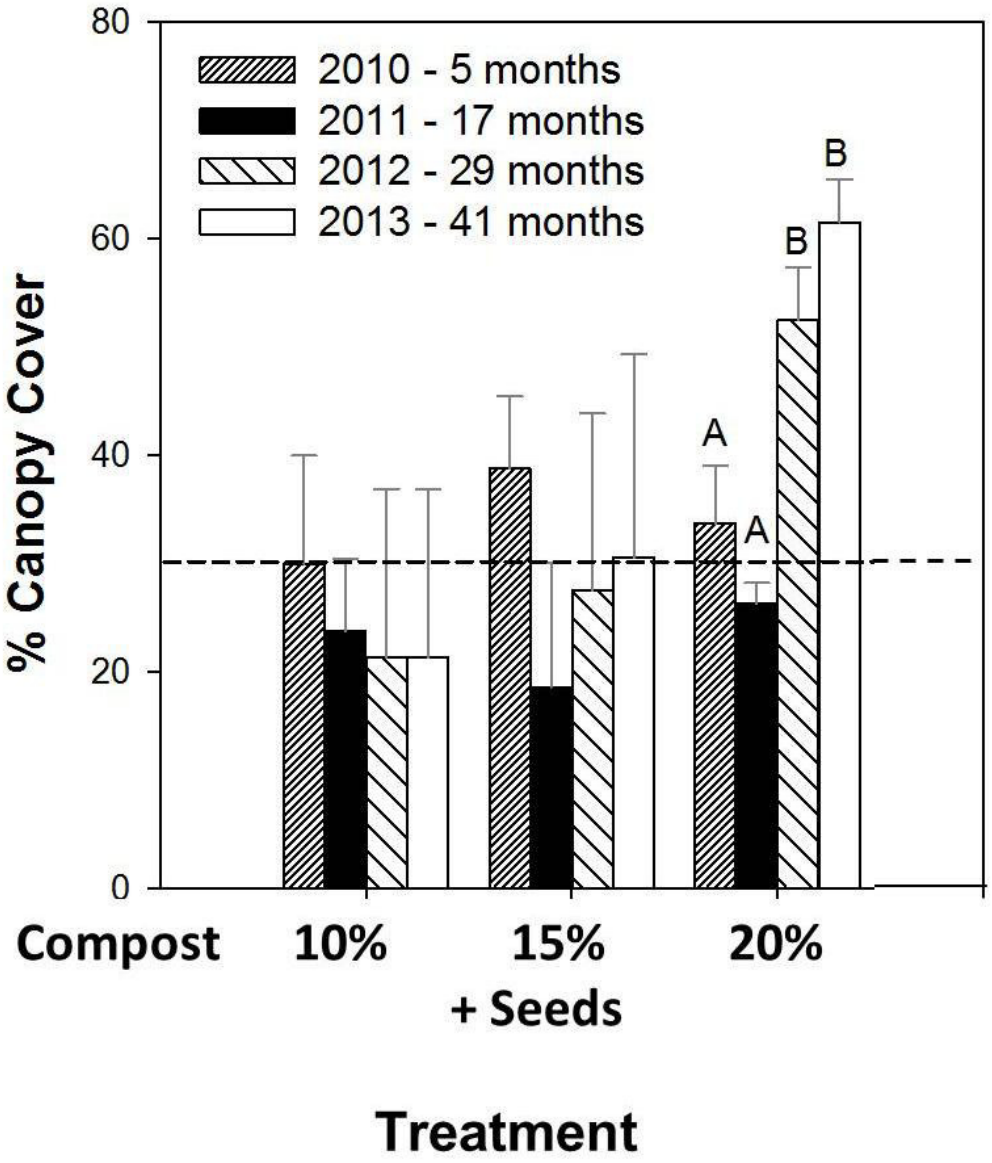
Field Study- Iron King Mine and Humboldt Smelter Superfund site



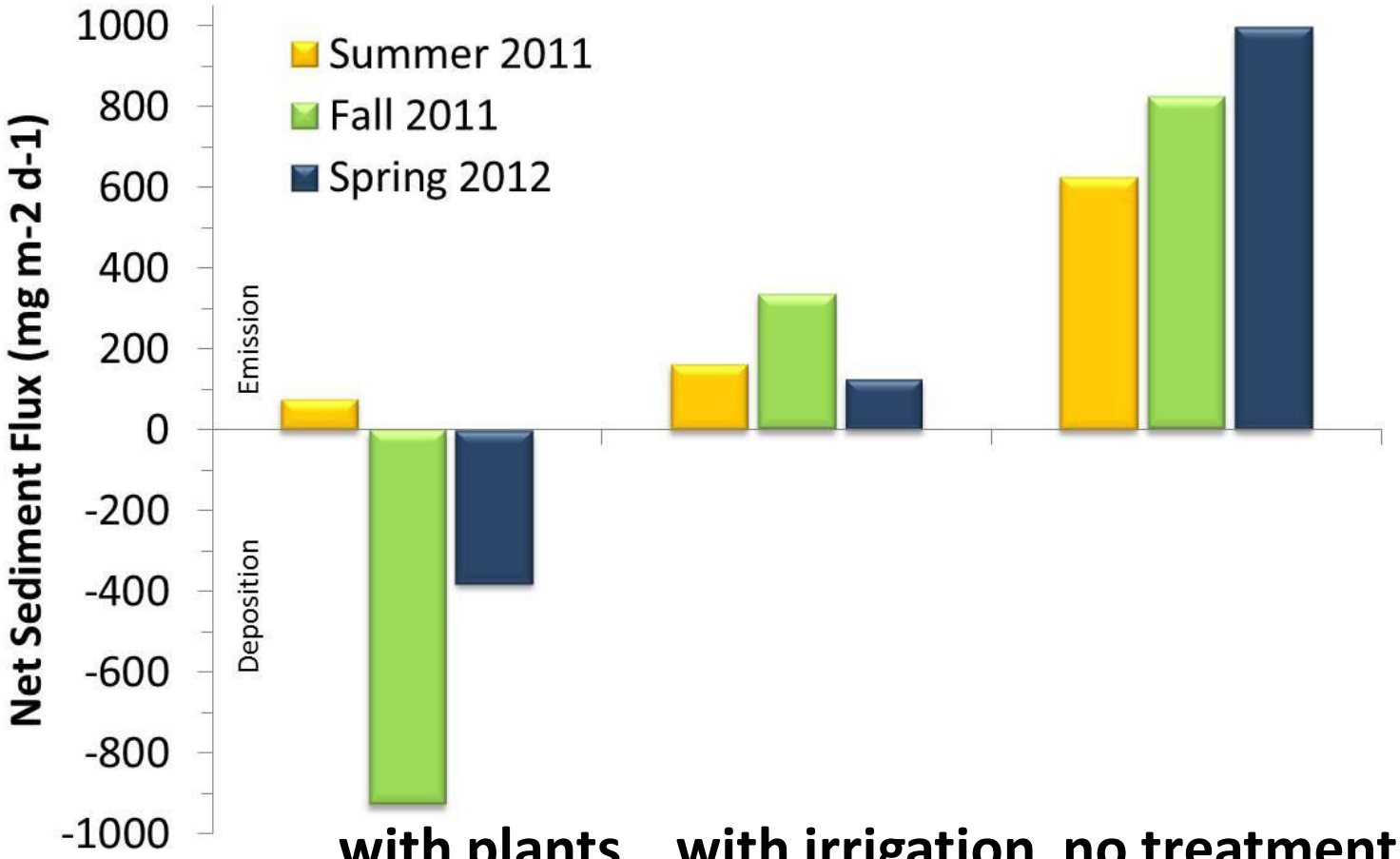
- 0% Compost
- 10% Compost + seeds
- 15% Compost + seeds
- 20% Compost + seeds
- 15% Compost, no seeds
- 20% Compost, no seeds

Compost-assisted direct planting
Based on greenhouse work

IKMHSS field trial - Initiated May 18, 2010



Dust Trapping ability of Plants



with plants **with irrigation** **no treatment**

Translating Innovation into Practice

or

How to Escape the Academic Silo

University of Arizona Center for Environmentally Sustainable Mining

CESM
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

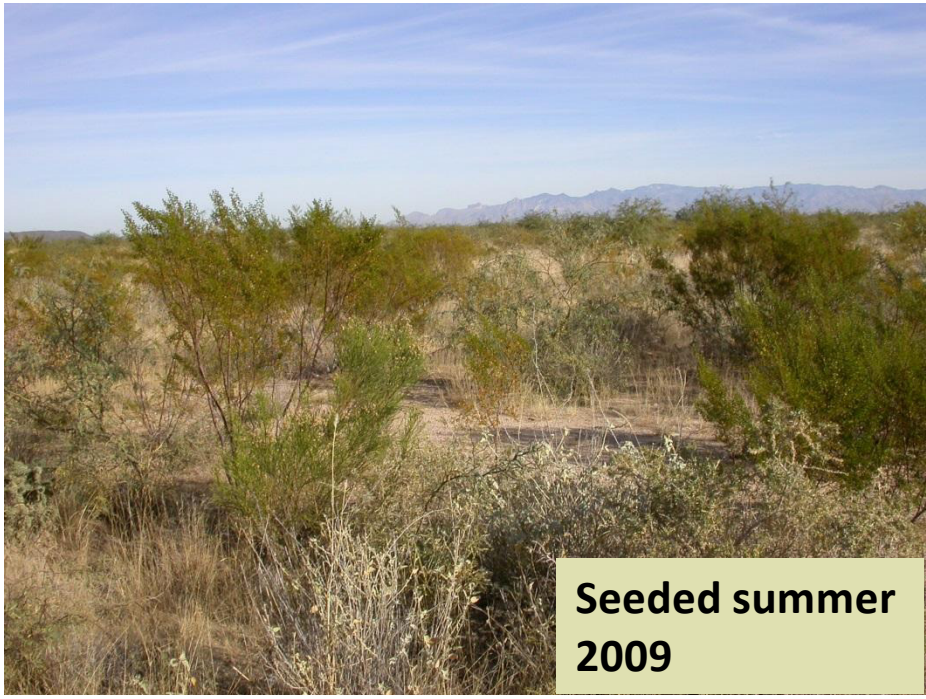
Partnership

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

Improving Existing Technology: Two Examples of Cap and Plant

ASARCO Mission Mine
Grupo Mexico
Sahuarita, Arizona



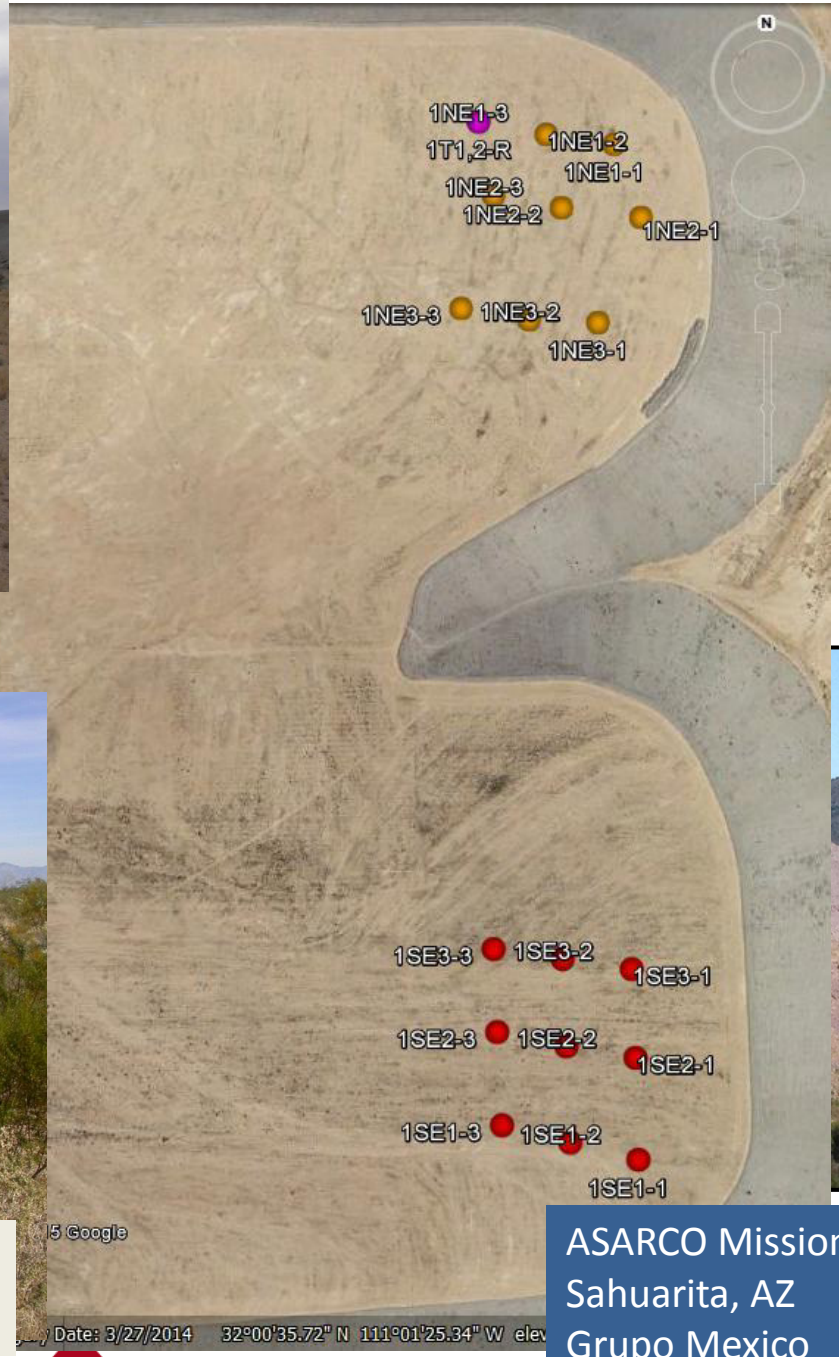
- Revegetation of tailings storage facilities
- Required by Tohono O'odham Nation to reclaim native American land
- Cost $22M

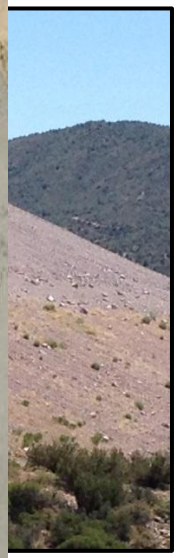
<u>Project Objective:</u>

- Evaluate source and quality of borrow materials for soil cap

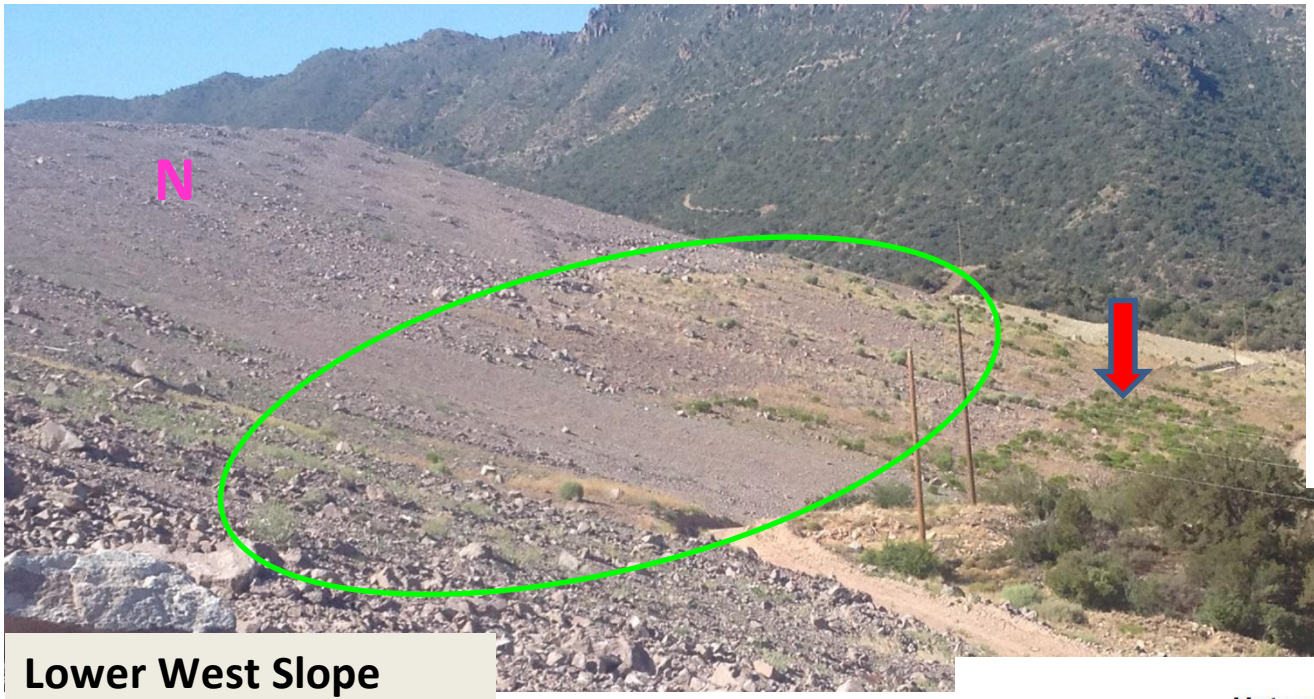
West side borrow pit: Subsoil

West side borrow pit: Top spoil





ASARCO Mission Mine
Sahuarita, AZ
Grupo Mexico

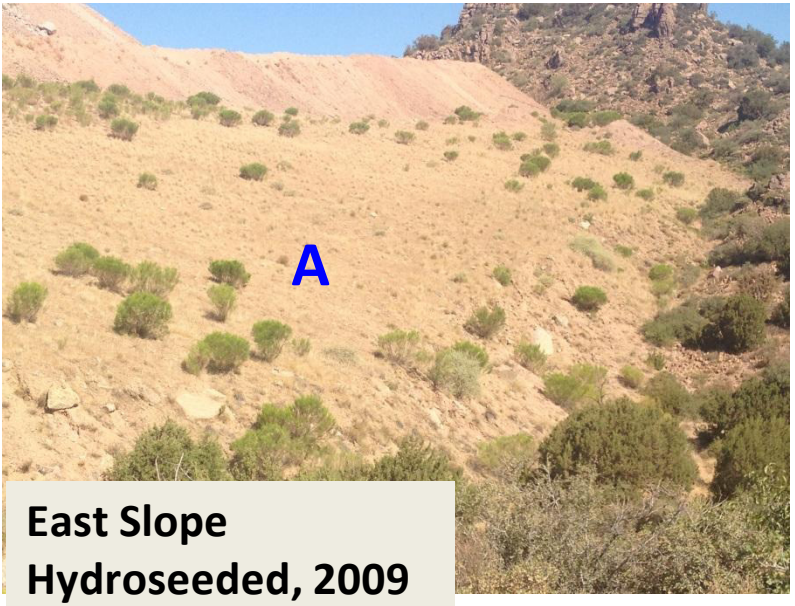


Lower West Slope
Hydroseeded in 2012

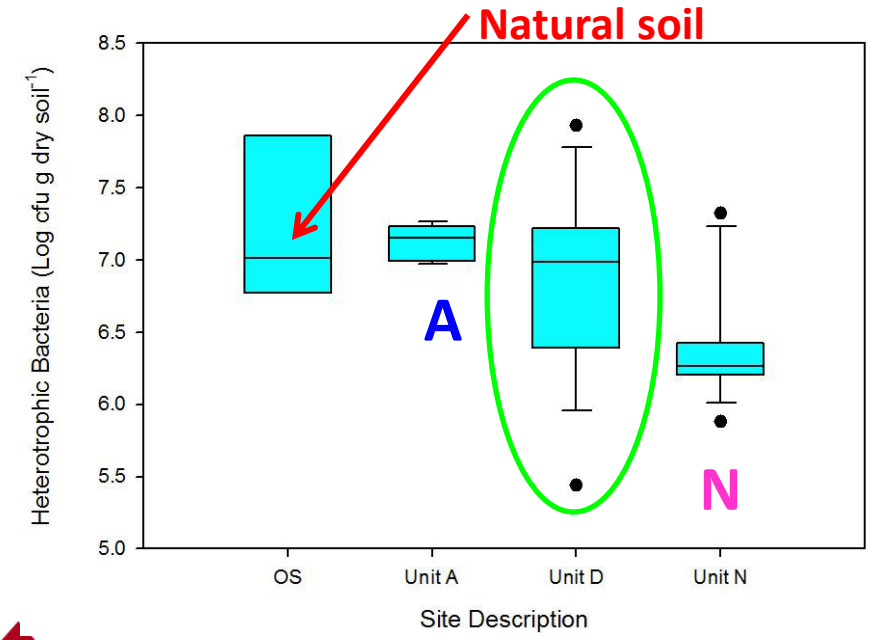
Monitoring:

Biological Health

KGHM Carlota Copper
Miami, Arizona
Waste rock dump



East Slope
Hydroseeded, 2009



Improving Existing Technology: Two Examples of Cap and Plant

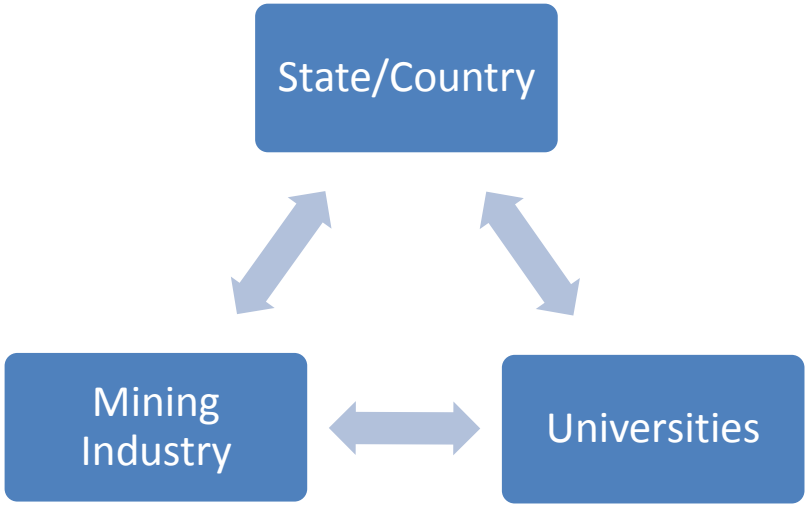
Results:

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**

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Gracias!

Srp Superfund Research Program

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National Institute of Environmental Health Sciences

The University of Arizona