
# Welcome to the CLU-IN Internet Seminar

## Technology Transfer and Training Resources for Mining Sites

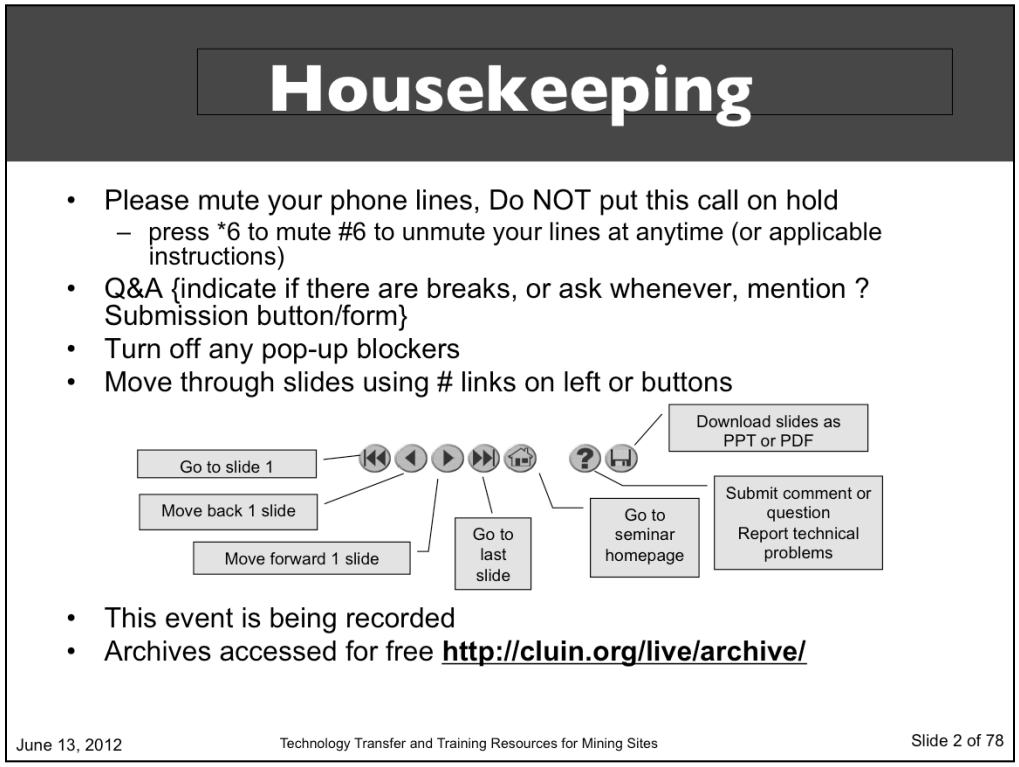
**Sponsored by:** EPA Technology Innovation and Field Services Division (TIFSD)

**Delivered:** June 13, 2012, 1:00-3:00 PM EST

**Instructors:** Michele Mahoney (EPA OSWER), Cherri Baysinger (ITRC), Doug Grosse (EPA ORD), Carol Russell (EPA Region 8)

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

Slide 1 of 78




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 interrupt 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.

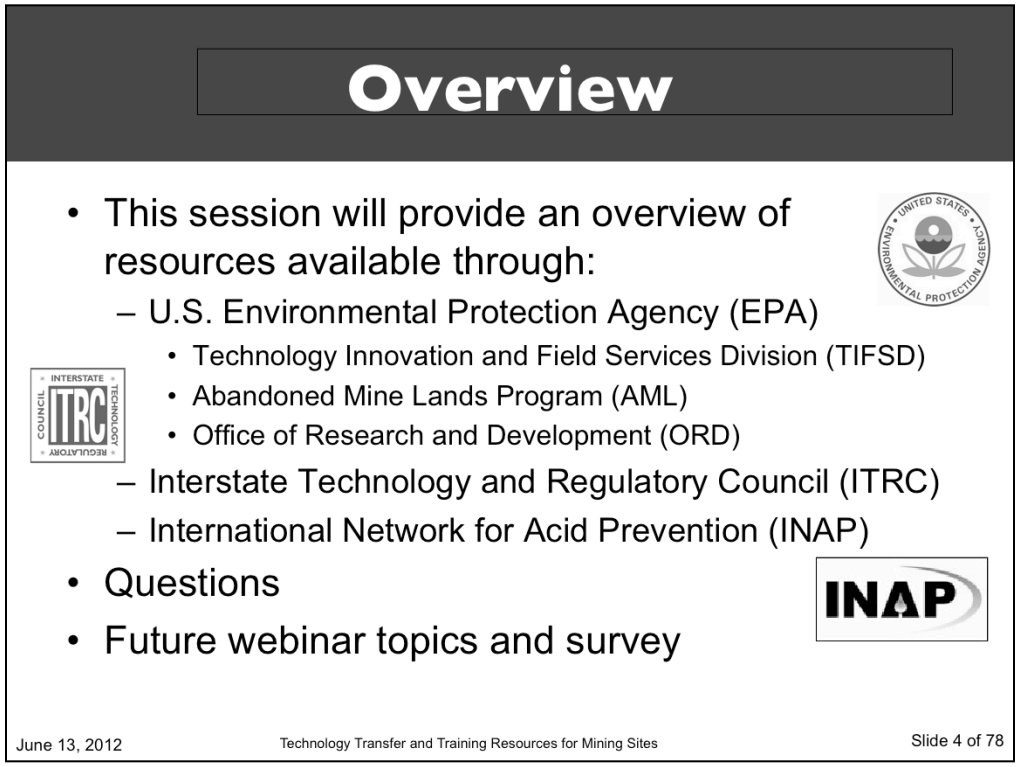
With that, please move to slide 3.

# Overview

- TIFSD CLU-IN Webinar Series on Mining Sites
  - Purpose: To provide relevant and current information on abandoned mine land issues, treatment technologies, revitalization options, and technical resources
- Today's webinar – technology transfer and training tools and resources



Today's seminar is the first of a new webinar series being launched by Technology Innovation and Field Services Division. The purpose of this new series we are launching today is to provide our audience – site managers, regulatory agencies, consultants, the general public, and others – relevant and current information on abandoned mine land issues and available treatment technologies. Today's seminar is to provide background on some of the resources available through regulatory agencies and organizations that conduct extensive work or research, and provide support for the characterization, cleanup, and restoration/revitalization of abandoned mining sites.




We will cover five topics during today's seminar. We'll begin with an overview of resources available through the U.S. Environmental Protection Agency, or the "EPA." EPA regulates mining activities in the United States in the three general categories of hardrock mining, non-metals mining, and coal mining. However, what we'll discuss here is the different support options available for cleanup and restoration of abandoned mine lands through EPA, including but not limited to technology transfer, such as through its Technology Innovation and Field Services Division or "TIFSD," and its direct work with other federal agencies, states, tribes, communities, and mine operators through its Abandoned Mine Lands Program and the Office of Research and Development. Next, we'll hear about the training and technical resources for mining waste available through the Interstate Technology and Regulatory Council or "ITRC," which is a cooperative organization consisting 50 states, the District of Columbia, multiple federal partners, industry participants, and other stakeholders. Finally, we'll hear about the technical resources – such as the Global Acid Rock Drainage Guide - available through the International Network for Acid Prevention, or "INAP," which is industry group created to help meet the challenge of acid drainage. We'll conclude our seminar with an opportunity to ask any questions that weren't answered during our speakers' presentations. We'll also briefly touch on the next webinar that TIFSD is going to be hosting in September, and would appreciate your feedback on our proposed topic and would like to learn if this is something you would be interested in hearing about.

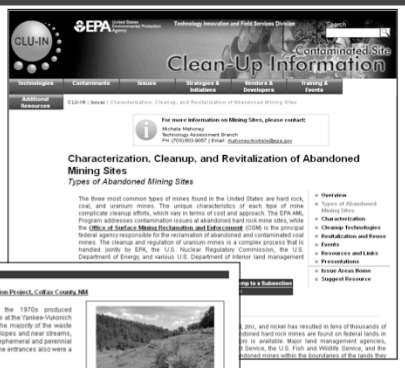

We'll begin with the "Characterization, Cleanup, and Revitalization of Abandoned Mining Sites" focus area on the CLU-IN site. This new focus area was launched in January of this year with the aim of being a "one-stop shop" for information on the resources available to assist with characterization, cleanup, and revitalization of abandoned mining sites.

You can access it by going to www.cluin.org/mining

The site gives a general overview of the various U.S. agencies involved in the characterization, cleanup, and revitalization of abandoned mine lands and provides links to their respective web pages on abandoned mine lands.

# CLU-IN Mining Sites Focus Area: Overview

- Most common types of mines found in the United States
  - Background information
  - Responsible agencies
  - Case studies



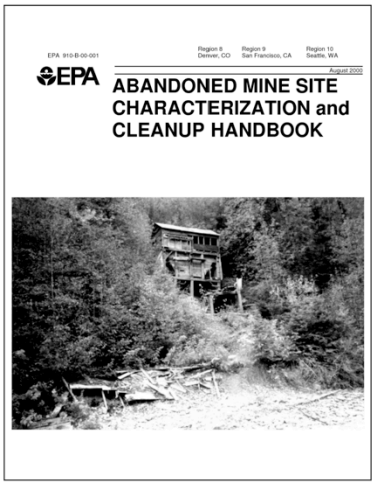




Next, the site provides some background information on the most common types of abandoned mines found in the U.S., and links to specific case studies where cleanup and revitalization of the site was successful and/or used innovative or notable techniques.

# CLU-IN Mining Sites Focus Area: Characterization

- Characterization
  - EPA Abandoned Mine Site Characterization and Cleanup Handbook
  - Appendix C: Characterization of Ore, Waste Rock, and Tailings (From EPA and Hardrock Mining: A Source Book for Industry in the Northwest and Alaska)






The characterization page provides links to two U.S. EPA documents that can be a source of information and ideas for project managers involved in the characterization and cleanup of inactive mine sites. The EPA Abandoned Mine Site Characterization and Cleanup Handbook is a compendium of information gained during many years of experience on mine site cleanup projects and provides information on dealing with issues important in site investigation, cleanup, or long-term management.

The second document, an appendix to an EPA Hardrock Mining Handbook, presents methods that can be used to determine the physical and chemical characteristics of waste materials, describes the environmental tests used to assess contaminant mobility, outlines the conceptual models used to analyze contaminant fate and transport, and discusses the elements of quality assurance and quality control.

This web page will be populated with additional resources as the site evolves.

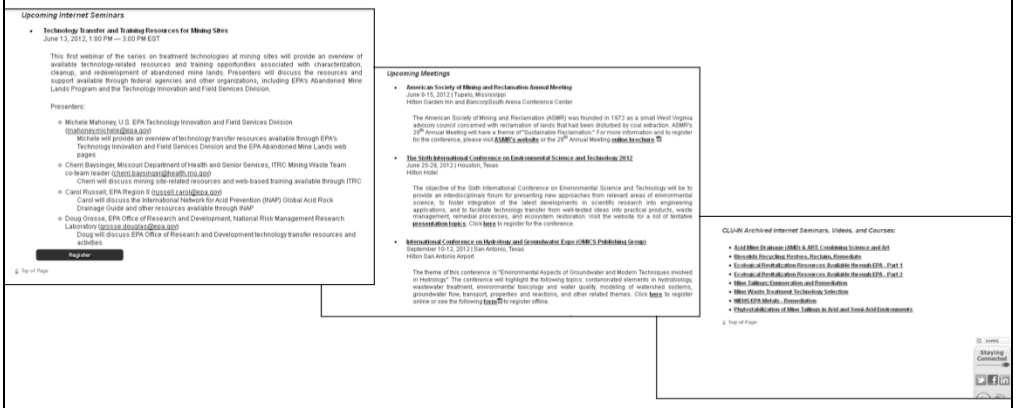

The next section of the CLU-IN Mining Sites Focus Area deals with cleanup technologies. A range of traditional and innovative technologies that may be appropriate for cleanup of mining sites exist. This page directs site users to where they can find information on selecting cleanup technologies – the ITRC Mining Waste Treatment Technology Selection, for example – and where they can receive assistance, such as through the EPA Office of Research and Development's Engineering Technical Support Center. ETSC provides assistance to EPA regional offices, states, and communities on the design, function, and application of treatment technologies.

This page of the focus area also lists currently available treatment technologies, organized by the type of media the technology is generally used to address. The information on treatment technologies on this page was adapted from the ITRC Mining Waste Treatment Technology Selection website; links to the page with the original information are provided.


The revitalization and reuse page provides links to a variety of EPA resources that contain reports, fact sheets and technical resources related to revitalization of mine lands. These resources describe tools for reuse of former mining sites and various revitalization techniques and projects, such as use of soil amendments for revitalization and the RE-Powering America's Lands initiative that encourages development of renewable energy on current and formerly contaminated land and mine sites.

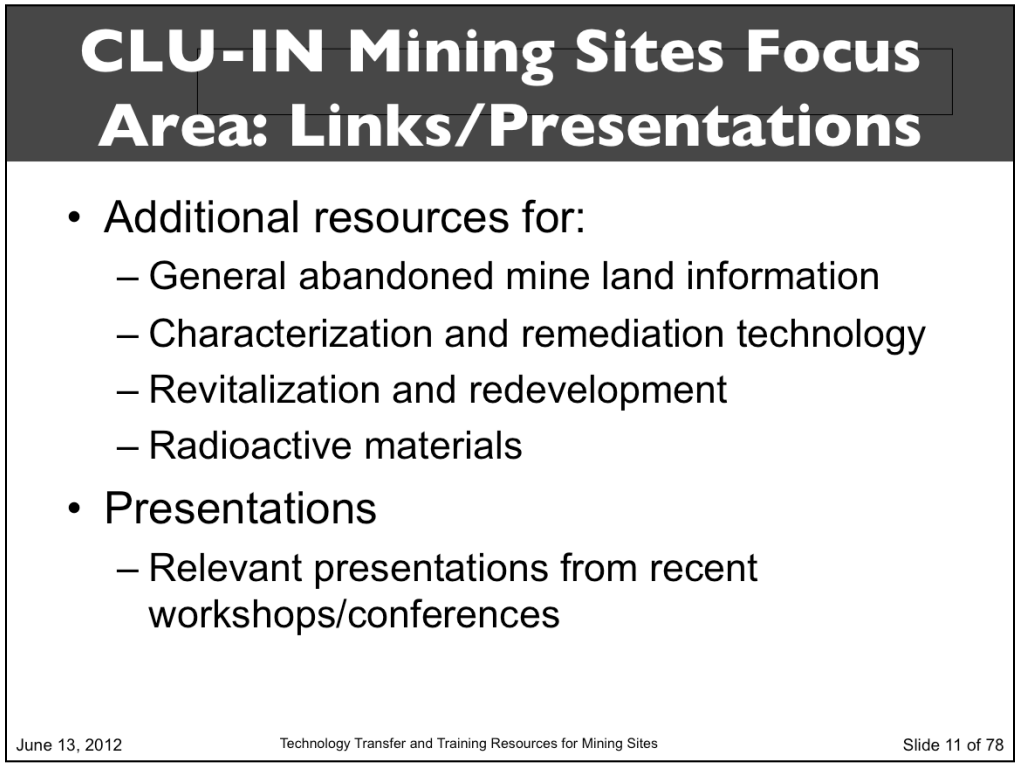
# CLU-IN Mining Sites Focus Area: Events

- Upcoming and archived internet seminars
- Upcoming professional meetings






The events page of the Mining Sites focus area is updated regularly and contains a list of upcoming internet seminars, such as our webinar today, upcoming professional meetings – largely in North America – related to mining sites, as well as links to archived internet seminars. After today's webinar is over, it will be listed on this page.

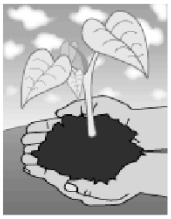



Additional resources complementary to the characterization, cleanup technology, and revitalization and reuse sections, can be found on the “Resources and Links” page. These include links to pages maintained by other agencies, organizations, and academic institutions.

Finally, the “Presentations” page in the mining sites focus area contains sets of presentations from past meetings. We currently have several presentations posted from the EPA Rare Earth Elements workshop that was held last month, however, we anticipate this section of the focus area growing as the site evolves and gains additional users.

## CLU-IN EcoTools Focus Area

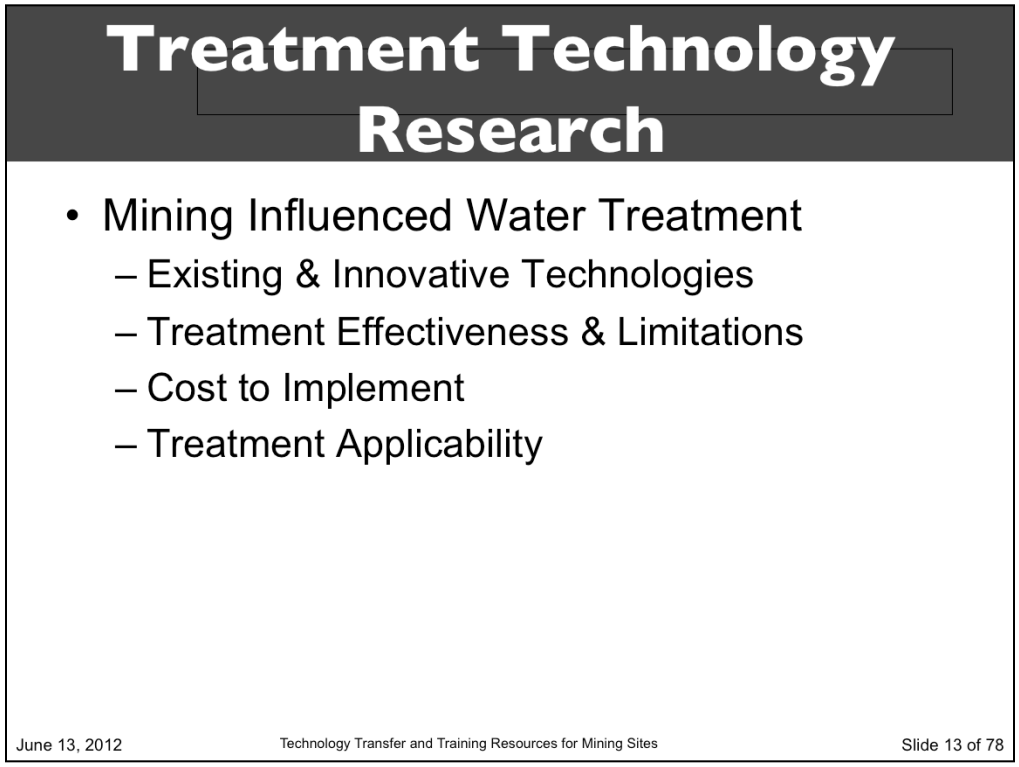
- Ecological Revitalization of Contaminated Lands
- Principles for Ecological Land Reuse
- Soil Science and Amendments
- Terrestrial Carbon Sequestration
- Native Plants
- Urban Gardens
- Technical Assistance
- Local Resources, Case Studies, Publications



EcoTools Tools for Ecological Land Reuse



TIFSD also maintains a focus area on tools for ecological land reuse, or “Eco-Tools.” This focus area offers information, resources, and technical assistance related to ecological reuse and revitalization of contaminated lands. Resources include a list of principles proven critical to the success of revitalization and reuse projects; a discussion of soil-related issues such as the use of soil amendments; an introduction to the use of native plants and vegetation; and information on urban gardening and agriculture. The site also contains case studies on successful ecological revitalization projects on contaminated lands, and links, organized by region, to local sources of information and assistance related to ecological land reuse. While EcoTools is not specifically geared toward abandoned mine lands, several of the principles, information, and resources can prove useful to those wanting to bring an abandoned mine site to productive reuse.

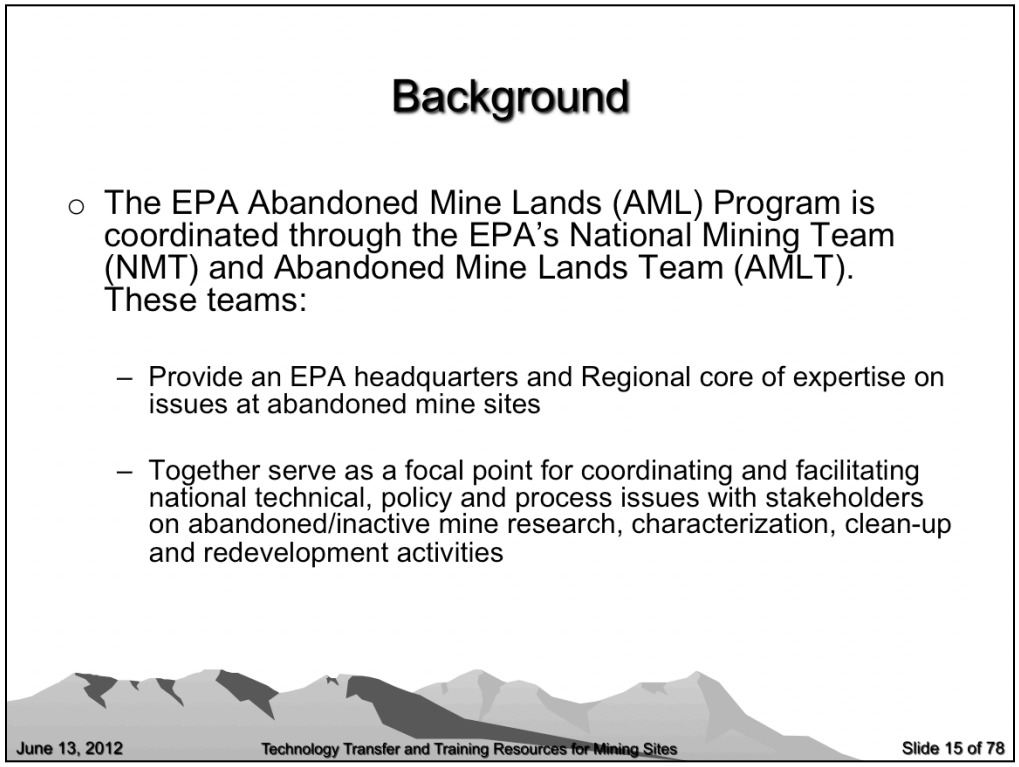



My division is leading an effort to evaluate mine influenced water treatment technologies and develop materials to support selection of appropriate and cost-effective treatment technologies. Mine influenced water at mine sites comes from mine drainage, process water, and storm water and needs to be characterized to determine regulatory constraints and potential source control, treatment, metals recovery, or other management options. EPA wants to evaluate mine influenced water treatment technologies (existing and innovative), treatment effectiveness and limitations, cost to implement, and applicability of treatments. TIFSD intends for the developed materials to further inform decision makers about the diverse technologies available for mine influenced water treatment as well as better understand the importance of weighing the upfront installation costs with the long-term operation and maintenance of various technologies.

Results of this research will be compiled and made available to decision makers as well as the public. Information could be disseminated through website, webinar or another to-be-determined outlet.

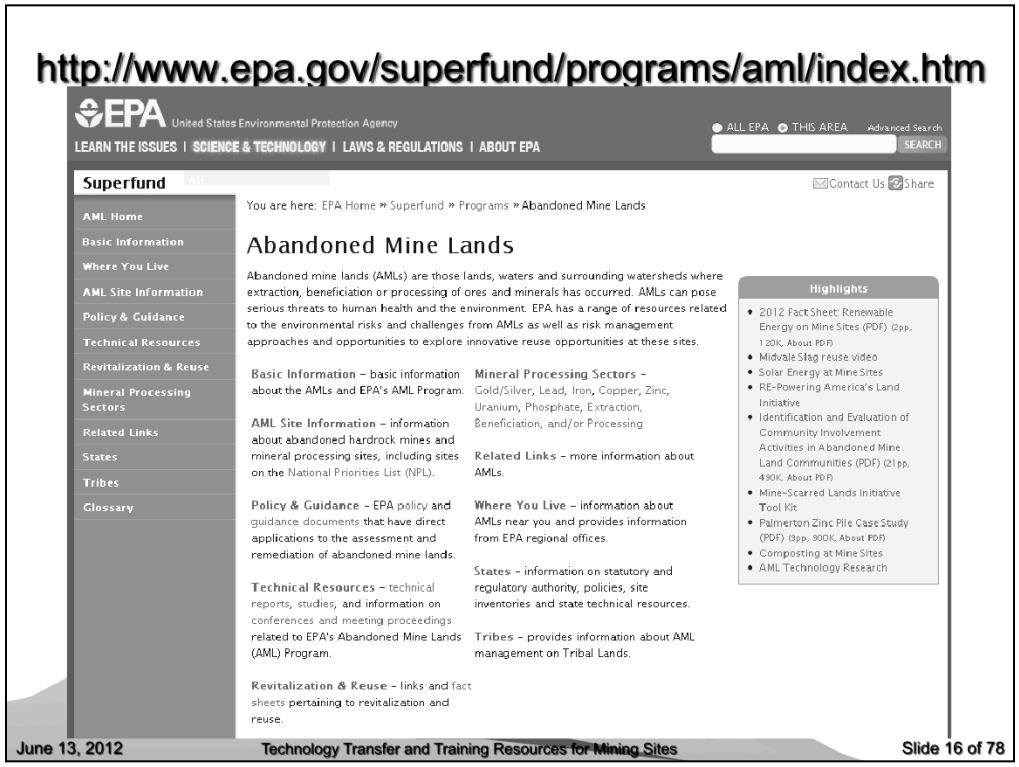
# EPA Mining Initiatives
# Abandoned Mine Lands Program

**Presented by Michele Mahoney, US EPA,**
on behalf of Shahid Mahmud, US EPA
Abandoned Mine Lands Team




The goal of EPA's Abandoned Mine Lands Program is to identify ways to protect human health and the environment by using all of the non-regulatory and regulatory approaches available to the Agency. The Abandoned Mine Lands program is coordinated through the Agency's National Mining Team and Abandoned Mine Lands Team. EPA's Abandoned Mine Lands Team was initially created to provide EPA Headquarters and regions access to expertise on issues at abandoned mine sites. The team was created as a subgroup to the already existing EPA National Mining Team, for the purpose of addressing issues related to abandoned mine sites. Together, these two teams provide expertise on issues at abandoned mining sites and serve as a focal point to coordinate and facilitate issues with stakeholders.

You can access the AML program website through the link provided in the presentation.


http://www.epa.gov/superfund/programs/aml/index.htm
EPA United States Environmental Protection Agency
LEARN THE ISSUES | SCIENCE & TECHNOLOGY | LAWS & REGULATIONS | ABOUT EPA
ALL EPA THIS AREA Advanced Search
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Superfund
Contact Us Share
AML Home
Basic Information
Where You Live
AML Site Information
Policy & Guidance
Technical Resources
Revitalization & Reuse
Mineral Processing Sectors
Related Links
States
Tribes
Glossary
You are here: EPA Home » Superfund » Programs » Abandoned Mine Lands
Abandoned Mine Lands
Abandoned mine lands (AMLs) are those lands, waters and surrounding watersheds where extraction, beneficiation or processing of ores and minerals has occurred. AMLs can pose serious threats to human health and the environment. EPA has a range of resources related to the environmental risks and challenges from AMLs as well as risk management approaches and opportunities to explore innovative reuse opportunities at these sites.
Basic Information – basic information about the AMLs and EPA's AML Program.
AML Site Information – information about abandoned hardrock mines and mineral processing sites, including sites on the National Priorities List (NPL).
Policy & Guidance – EPA policy and guidance documents that have direct applications to the assessment and remediation of abandoned mine lands.
Technical Resources – technical reports, studies, and information on conferences and meeting proceedings related to EPA's Abandoned Mine Lands (AML) Program.
Revitalization & Reuse – links and fact sheets pertaining to revitalization and reuse.
Mineral Processing Sectors – Gold/Silver, Lead, Iron, Copper, Zinc, Uranium, Phosphate, Extraction, Beneficiation, and/or Processing
Related Links – more information about AMLs.
Where You Live – information about AMLs near you and provides information from EPA regional offices.
States – information on statutory and regulatory authority, policies, site inventories and state technical resources.
Tribes – provides information about AML management on Tribal Lands.
Highlights
2012 Fact Sheet: Renewable Energy on Mine Sites (PDF) (2pp, 120K, About PDF)
Midvale Slag reuse video
Solar Energy at Mine Sites
RE-Powering America's Land Initiative
Identification and Evaluation of Community Involvement Activities in Abandoned Mine Land Communities (PDF) (21pp, 490K, About PDF)
Mine-Scarred Lands Initiative Tool Kit
Palmerton Zinc Pile Case Study (PDF) (3pp, 300K, About PDF)
Composting at Mine Sites
AML Technology Research
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AML website


Through its National Mining Team and Abandoned Mine Lands Team, EPA continuously seeks opportunities for: (1) identifying innovative cleanup technologies to address source areas and mine-influenced waters, including recovering metals from mining influenced water; (2) recycling and/or reusing mining wastes in a beneficial way; (3) reusing and/or revitalizing mining sites – for example, exploring options for development of renewable energy on current and formerly contaminated lands and mining sites; and finally (4) reprocessing mining waste (into other materials)

# Identifying Innovative Approaches to Mine Site Cleanups

- Conventional Technologies such as capping, on-site disposal, lime treatment selected for mine site remediation
- Seeking opportunities to use innovative technologies such as bioreactors for treatment of mine influenced waters.
- Can metals be recovered from mine influenced waters to offset remediation costs?
- Are there innovative source control technologies?

# Reuse of Mining Waste

- OSWER is currently developing a CERCLA Guidance on the Beneficial Management of Mine Waste
- EPA developed the Chat Rule for the reuse on Chat in Oklahoma
- EPA is interested in considering the reuse of copper slags.

# Renewable Energy Development at Contaminated Lands and Mining Sites

- EPA is seeking ways to facilitate the use of contaminated properties, and active and abandoned mine sites as renewable energy generating areas.

- EPA is taking a multi-prong approach for this initiative as follows:
  1. Working with the Department of Energy's National Renewable Energy Lab (NREL) to overlay renewable energy resources
  2. Working on pilot sites in a number of states
  3. Seeking input to determine the need for additional site redevelopment and reuse tools

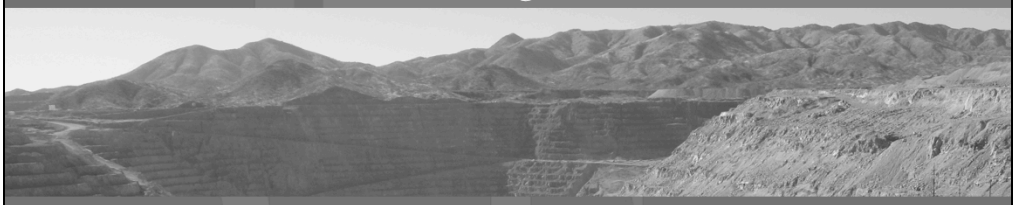
# Reprocessing of Mining Wastes

- Evaluate whether specific types of mining wastes can be reprocessed in an environmentally protective manner.
- There are a couple of potential sites being pursued in CO and MT.
- No site has been officially selected but EPA is interested in moving forward.

United States Environmental Protection Agency

# U.S. EPA ORD's Engineering Technical Support Center (ETSC) Technical Assistance and Guidance for the Characterization/ Cleanup/ Revitalization of Mining Sites

*CLU-IN Webinar on Mining Sites - June 13th, 2012*



*Douglas Grosse*
*U.S. EPA/ORD/NRMRL*

Office of Research and Development

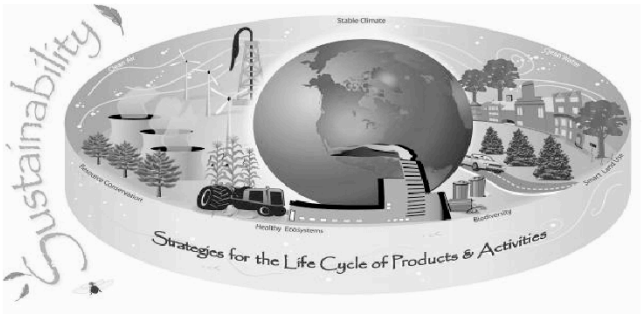
EPA United States Environmental Protection Agency

# Objectives

- Present An Overview of Past and Current EPA ORD Mining Remediation Research and Technical Support
- Provide Current Projects & Activities by ETSC & Staff

## Can We Efficiently?

- Extract and utilize resources (including by-products)
- Manage wastes
- Reclamation/restoration
- Produce socio-economic advantages
- Advancing Solutions for a New Legacy

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Sustainable development that applies to the industrial minerals sector include:

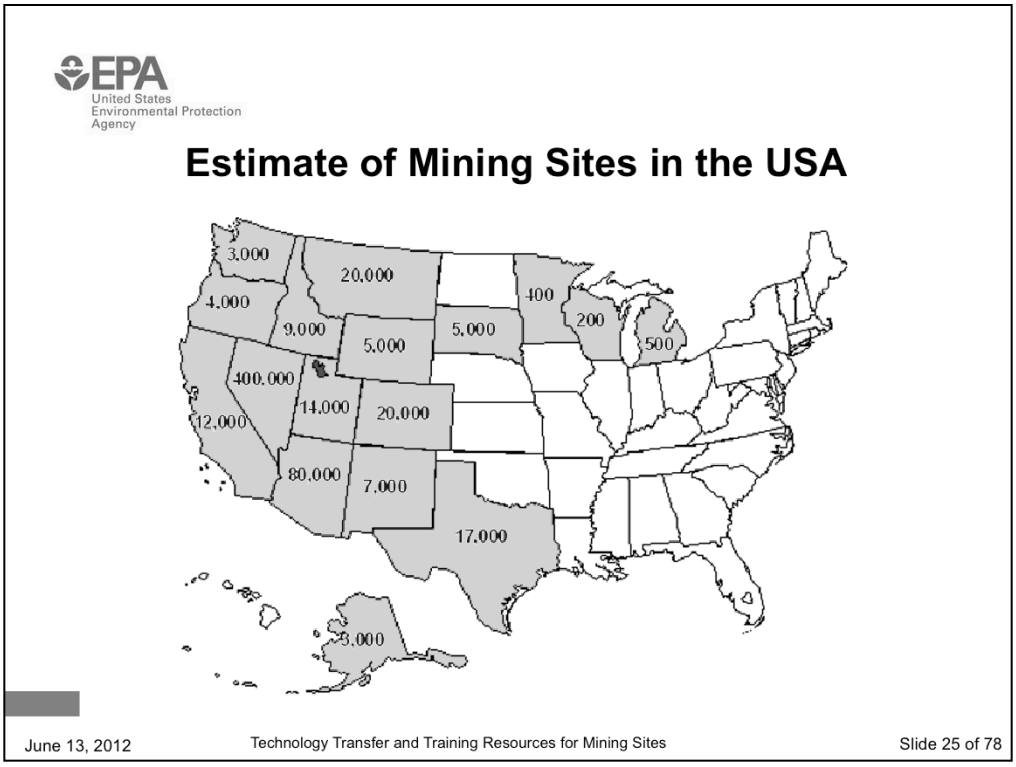
How can we extract and utilize resources (including by-products) more efficiently?

How can we manage wastes more efficiently?

How can we reclame and restore the lands we used for mining more efficiently

How can we produce more socio-economic advantages (i.e profitability, closure, liability, etc)?

How can we accomplish best practices with maximum economical effects while still incorporating a life cycle approach?




Mining waste generated by active and inactive mining production facilities and its impact on human health and the environment are a growing problem for government entities, private industry, and the general public.

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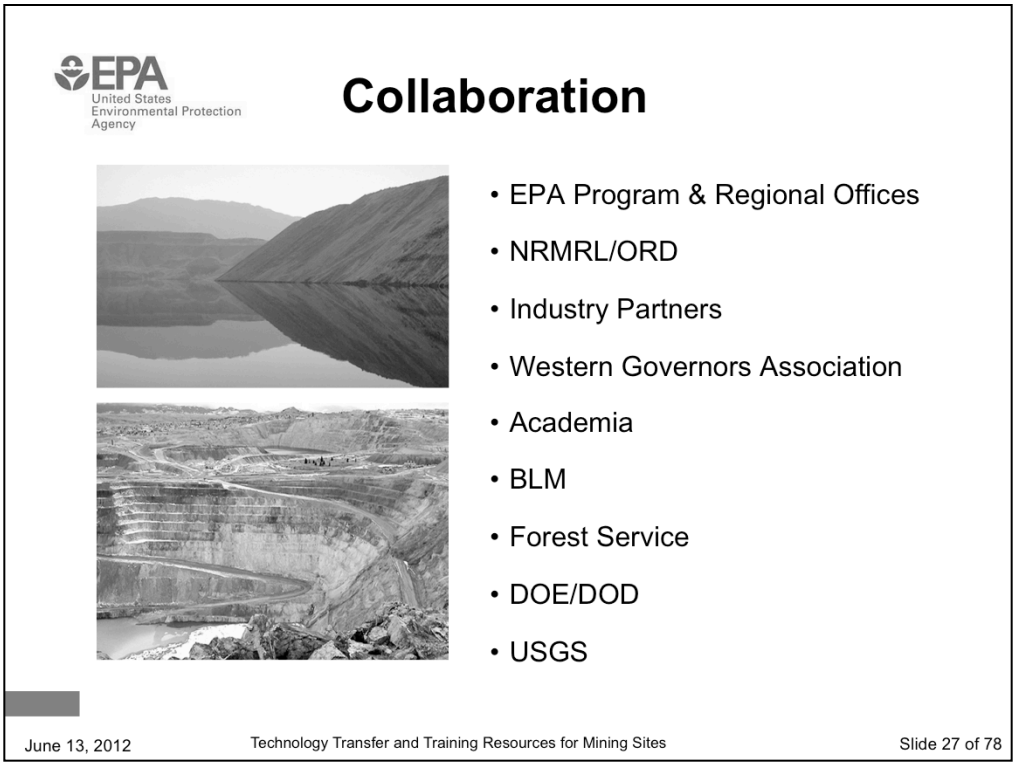
## ORD's Mining Programs

- Mine Waste Technology Program
- Engineering Technical Support Center
- Technology Transfer Program



Two big mining efforts in ORD are the :1.) Mine Waste Technology Program and 2.) Engineering Technical Support Center




The MWTP has multiple partnerships industry, academia, BLM, Forest Service, DOE, Western Governors Association. It is critical to the MWTP's success to collaborate with others. It is also been critical to identify a certain personality type that is willing to try new things:

•Bill Adams, EPA Region 10

•Ken Wangerud, EPA Region 8

•Mike Bishop, EPA region *

•Shannon Dunlap and Bill Upton all with Placer Dome

Over the history of the MWTP, we have collaborated with dozens of entities

EPA United States Environmental Protection Agency

# NRMRL ETSC

- Constructed Wetlands
- Bioremediation
- MIW Treatment Processes
- Liquid/Solid Partitioning
- Electrolytic Processes
- Sequestration
- Capping

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In an era of shrinking funding, treatment technologies must be cost-effective, with low operating and maintenance costs, and be sustainable treatment technologies. ETSC researchers are testing low-cost and innovative biochemical reactors that combine bacterial reactions with chemical processes (lime dissolution)

to increase the pH of the acidic mine water.

Constructed Wetlands with Bioreactors – Peerless Jenny Mine in Montana

Sulfate Reducing Bioreactors – Leviathan Mine Site in California

Biochemical Reactors – Luttrell Repository in Montana

EPA United States Environmental Protection Agency

# Mine Water Treatment Options

- Active treatment
  - Expensive, Labor-intensive, Power Needs
- Passive treatment
  - Lower Cost, Reduced Maintenance, Gravity
- Combination active/passive (hybrids)
- Recycle systems

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# Historical Technical Support Efforts

- Big 5 and Burleigh Tunnels
- Lime, Alkaline Channels, Lagoons
- Summitville Tests – Early 90's Aquafix

EPA United States Environmental Protection Agency

# Biochemical Reactors

*Luttrell Repository, MT*

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**Gravity-fed Substrate Reactor : This BCR was built in 2001 to treat leachate from the repository in comparison with active treatments completed on the same water**

# Colorado Mines

*Standard Mine, Crested Butte*

*Burleigh Tunnel*

*Aquafix*

*North Fork Clear Creek*

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Chitorem

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## Cement Creek RCTS Demonstration (IWT)



This photo shows the equipment used during the demonstration. From right to left, key components include the lime makedown tank, the reaction tank (big white tank), and the RCTS unit.

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# Completed Projects by ETSC Staff

- Developed Treatability Study Plan for Scientific Testing
- Conducted Bench and Field-Scale Studies
- Tested Different Substrates for BCRs
- Compared Solid Substrate vs. Liquid Reactors
- Researched Lab / Field Measurements for Sulfates & Sulfides
- Sampled, Analyzed and Identified Bacteria Inside BCR
- Developed a Year 'round Sustainable Treatment System (with renewable energy and gravity-feed)
- Refined and Developed WASP Meta4 Model for Metals Loading

# Completed Projects by ETSC Staff *(cont.)*

- Tested Remote Remedial Data Delivery (R2D2) Systems
- Conducted Pilot Studies for Mine Water Remediation > 10,000 feet amsl
- Researched Changes in Stressed MIW Bacterial Communities
- Created Problem-Solving Workshops on Real Mine Drainage Issues
- Held Conferences for Technology Transfer and Development Purposes
- Built Larger & Sustainable Gravity-Fed BCRs
- Tested Low Power Mobile Treatment Systems
- Establish Performance Guidance for BCRs (ITRC)
- Effluent Toxicity Studies and Treatment Methods

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# Peerless Jenny Constructed Wetlands

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# Peerless Jenny Chemistry

**(average values; mg/L)**

| Metal or Measure | Year 1 | | Year 2 | | Year 3 | |
|---|---|---|---|---|---|---|
| | *Adit* | *BCR Effluent* | *Adit* | *BCR Effluent* | *Adit* | *BCR Effluent* |
| Al | .16 | .05 | .04 | .03 | .06 | .03 |
| Ca | .36 | 35 | 42 | 37 | 36 | 36 |
| Cd | .02 | .004 | .001 | BDL | .007 | .003 |
| Cu | .03 | BDL | .03 | .04 | .03 | .04 |
| Fe | .48 | .007 | .32 | .012 | .42 | .44 |
| Mg | 8.62 | 8.21 | 9.32 | 7.11 | 7.8 | 7.6 |
| Mn | 5.63 | 2.38 | 4.2 | .08 | 3.6 | 1.3 |
| S | 36 | 33 | 53 | 42 | 32 | 33 |
| Zn | 1.88 | .71 | .93 | .2 | 1.1 | .51 |
| pH | 6.3-6.9 | | | | | |
| Flow | 116,000 (L/day) | | | | | |

# Current ETSC Mining Projects

Region 1
- Callahan
- Elizabeth
- Elly

Region 4
- Copper Hill
- Barite Mine

Region 6
- Molycorp
- Homestake

Region 7
- Big River
- Doe Run
- Tri-State Mining District

Region 8
- Ten Mile Creek
- Park City, Utah
- Basin area Crystal / Bullion Mines
- Captain Jack Standard Mine
- Gladstone

Region 9
- Sulfur Bank
- Sheldon
- Blue Ledge
- Anaconda Yerington

Region 10
- Formosa
- Black Butte
- Coeur d' Alene / Bunker Hill / Canyon Creek
- Midnite / Blackbird / Bucktail

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# LRPCD & ETSC Mining Technology Transfer

- Hard Rock Mining Conferences
- Mining Workshops
- RARE, ReSERV current projects
- CRADA 3M under development
- ITRC 2 TEAMS, Web Site
- Engineering Issue Paper
- Rare Earth Elements Document
- Training


These are the major meetings that have come out from ORD…….they are mostly Mine Waste Technology Program sponsored but you don't need to say that.

EPA United States Environmental Protection Agency

# Acknowledgements


- Doug Grosse, ORD
- David Reisman, ORD
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- Pat Clark, ORD
- Rob Weber, Region 7
- Todd Luxton, ORD
- Kirk Scheckel, ORD
- Robert Ford, ORD
- Jennifer Goetz, ORD
- John McCready, ORD
- Brian Dyson, ORD
- Diana Blesss, ORD

Supervisors: Scott Jacobs, John McKernan, Randy Parker, Dennis Timberlake and Dave Carson

EPA United States Environmental Protection Agency

# U.S. EPA Websites

EPA's Abandoned Mine Lands Program:
***http://www.epa.gov/superfund/programs/aml***

**Mine Waste Technology Program:**
*http://www.epa.gov/nrmrl/std/mwt/*

NRMRL:
*www.epa.gov/nrmrl*



Some of the mine related websites

The Interstate Technology and Regulatory Council

# Mine Waste Treatment Technology Selection Guidance


**Cherri Baysinger**

Missouri Department of Health and Senior Services

**Paul Eger**

Minnesota Department of Natural Resources, retired

(currently with Golder Associates)

**Co-Team Leaders**

**ITRC Mine Waste Team**


# The ITRC is . . .

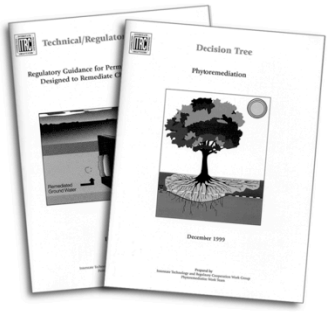
- State-led, national coalition
  - State Agencies
  - Federal Agencies
  - Industry Representatives
  - Public Stakeholders
- Started in 1995

# Goals

- Achieve better environmental protection through innovative technologies
- Reduce the technical/regulatory barriers to the use of new environmental technologies
- Build confidence about using new technologies


# What ITRC Does

- Technical and Regulatory Guidance
- Technology Overviews
- Case Studies
- Peer Exchange
- Classroom Training Courses
- Internet-Based Training Sessions



# Training

- Internet-based Training Through Clu-In
  - June 26, Development of Performance Specifications for Solidification/ Stabilization
  - July 19, Green and Sustainable Remediation
  - July 24, Integrated DNAPL Site Strategy
  - July 26, Project Risk Management for Site Remediation
  - **August 14, Mine Waste Treatment Technology**
- Classroom
  - Light Nonaqueous-Phase Liquids: Science, Management and Technology
- For more information:

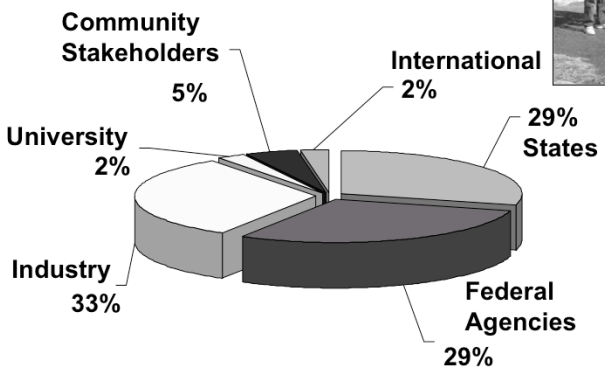
  http://www.itrcweb.org/ibt.asp

  training@itrcweb.org

  402-201-2419

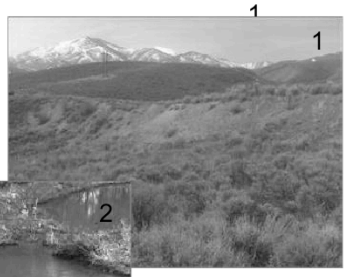
# ITRC Mining Waste Team

- Team was diverse (35 participants)

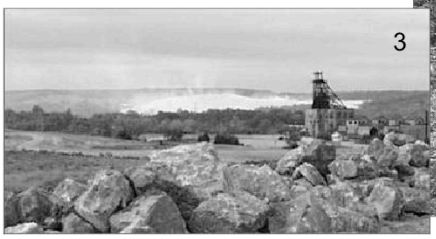



# Mining

- Mining is important
  - Need materials
  - Lack of mined land reclamation and restoration laws
- Sites tend to be large
- All media affected

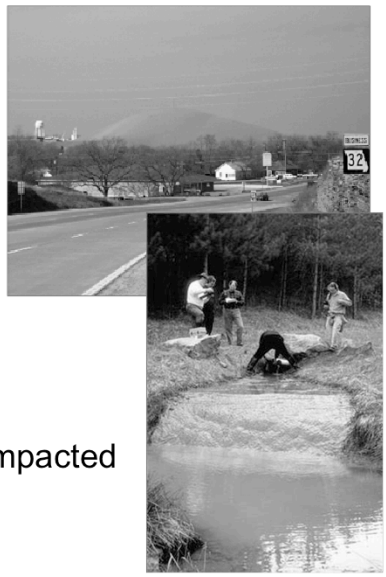






# Mining Waste

- Solid Mining Waste
  - Contain residual metals or other chemicals
  - Hundreds of square miles Affected
  - May affect residential areas
- Mining Influenced Water
  - Low pH
  - Residual metals
  - Over 10,000 stream miles impacted
  - Groundwater impacts



# Objectives of the Guidance

- Select applicable technology(s)
- Provide information on technologies
- Remediate mine waste contaminated sites

Flambeau Mine, WI
During mining

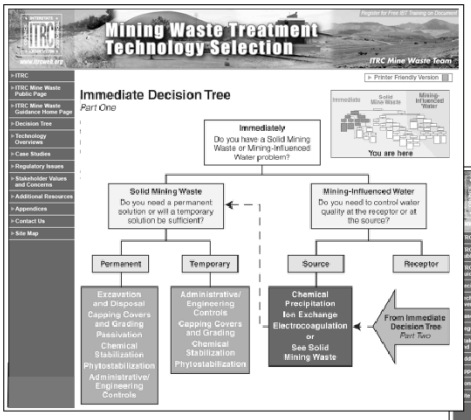
Flambeau Mine, WI
After reclamation

# Content of Guidance

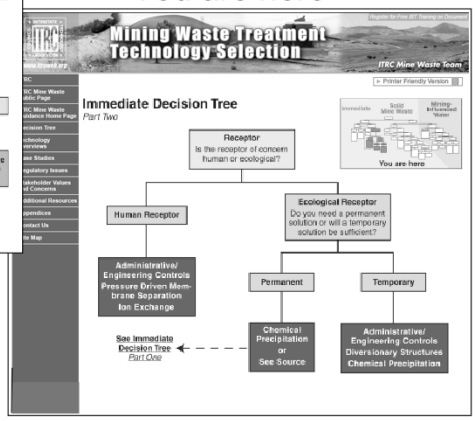
www.itrcweb.org/miningwaste-guidance


- Overview
- Decision Trees
- Technology Overviews
- Case Studies
- Regulatory Issues
- Stakeholders Concerns
- Additional Resources

# Decision Trees




- Navigation aids
  - Labels
  - Color
  - "You are here"

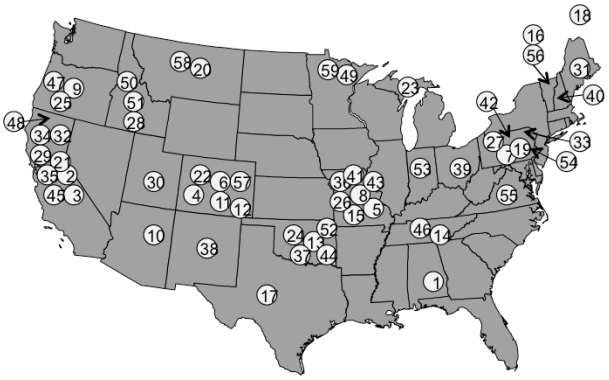



- Links to Technology Overviews
- Links to other Decision Tees

# Technology Overviews

- Overviews of 22 technologies
  - Newer technologies
  - New uses of conventional technologies
- Provide case studies and additional references

# Case Studies




**Total of 59 Case Studies**
(as of August 2010)

(#) Mining Case Studies

- Site Information
- Remedial Actions and Technologies
- Performance
- Cost
- Regulatory challenges
- Stakeholder Challenges
- Other Challenges/ Lessons Learned
- References

# Additional Sections

- Regulatory Issues
  - Water quality
  - Solid mine waste
- Stakeholder Concerns
  - Competing values may slow the cleanup
  - Full vs. partial cleanup
  - Economics
- Additional Resources

# Biochemical Reactors Team

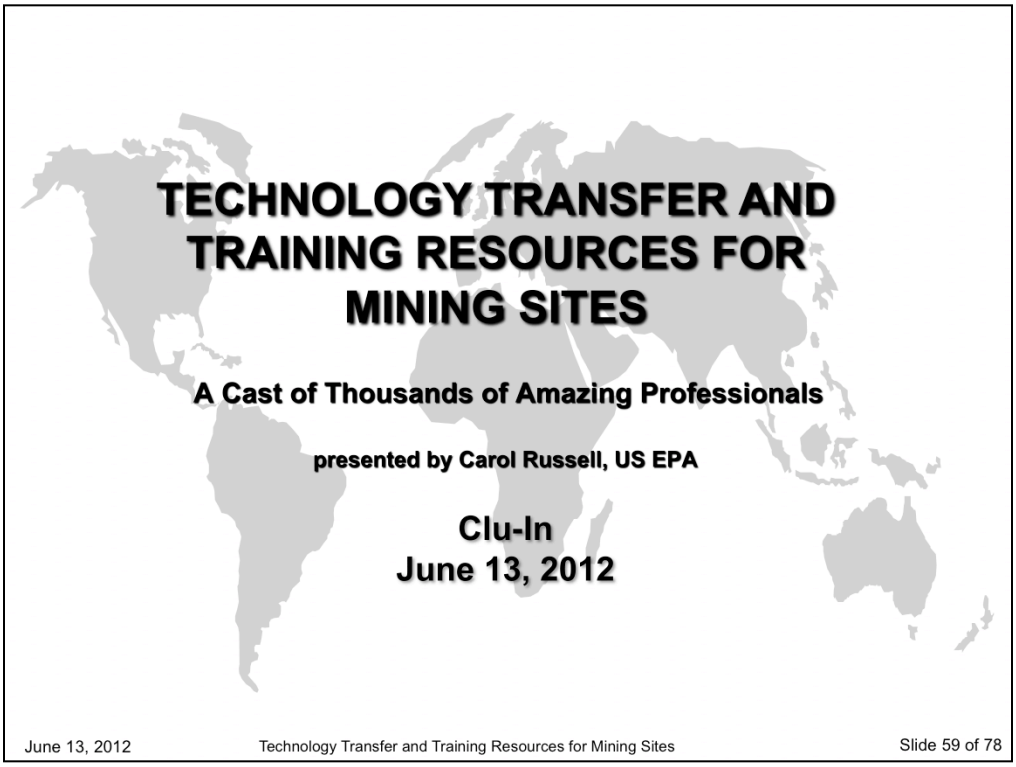
***Engineered treatment systems that use an organic substrate to drive microbial and chemical reactions to reduce concentrations of metals, acidity, and sulfate in mining-influenced water.***

- Team started in 2011
- Guidance should be complete late 2013/ early 2014

# Got Mine Waste?

Cherri Baysinger
Missouri Department of Health and Senior Services
Cherri.baysinger@health.mo.gov
573-751-6206

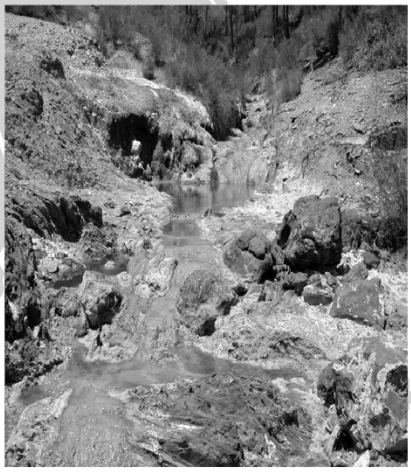
Paul Eger
Golder Associates
paul_eger@golder.com
(651) 697-9737



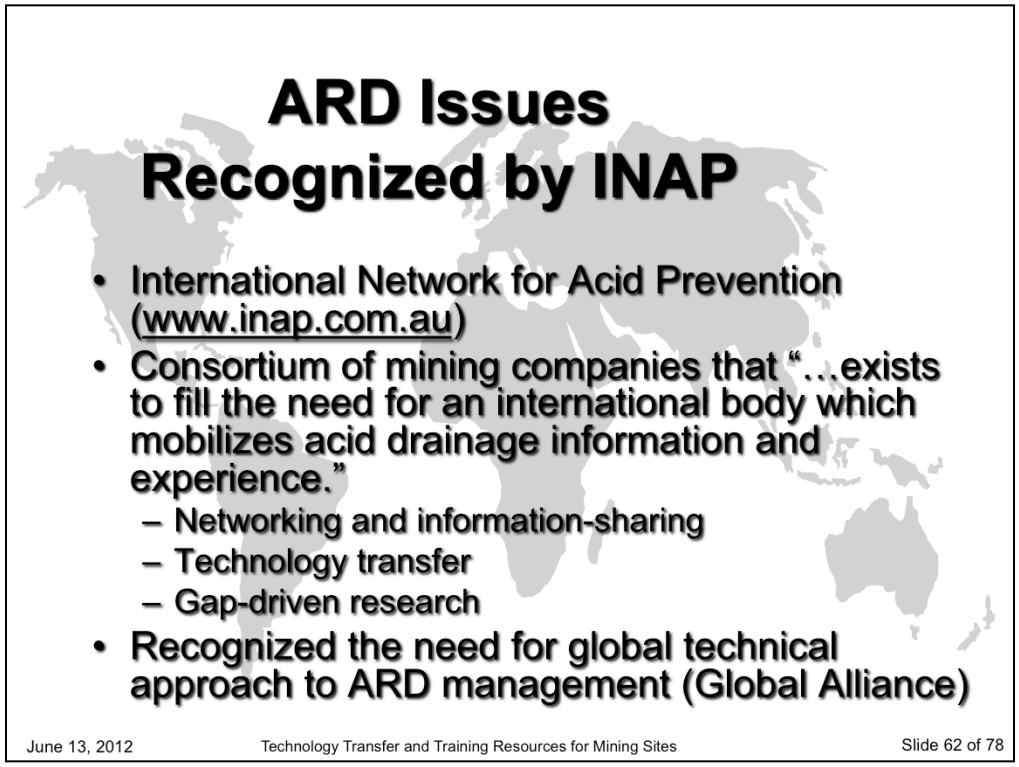

I would like to acknowledge my co-authors and organizations, INAP Terry Chatwin, Keith Ferguson (who was one of the visionaries who conceived the GARD Guide), the ADTI volunteer organization,  and Many other dedicated professionals.

# Summary

- Who are these people and what are they trying to do?
  - ADTI, MEND, PADRE, SANAP, CNAMD, INAD, SMIKT, Water Research Commission
- International Network for Acid Prevention (INAP)
- What is the Guide Global Acid Rock Drainage (GARD) Guide and other resources available through INAP
- Using the GARD Guide



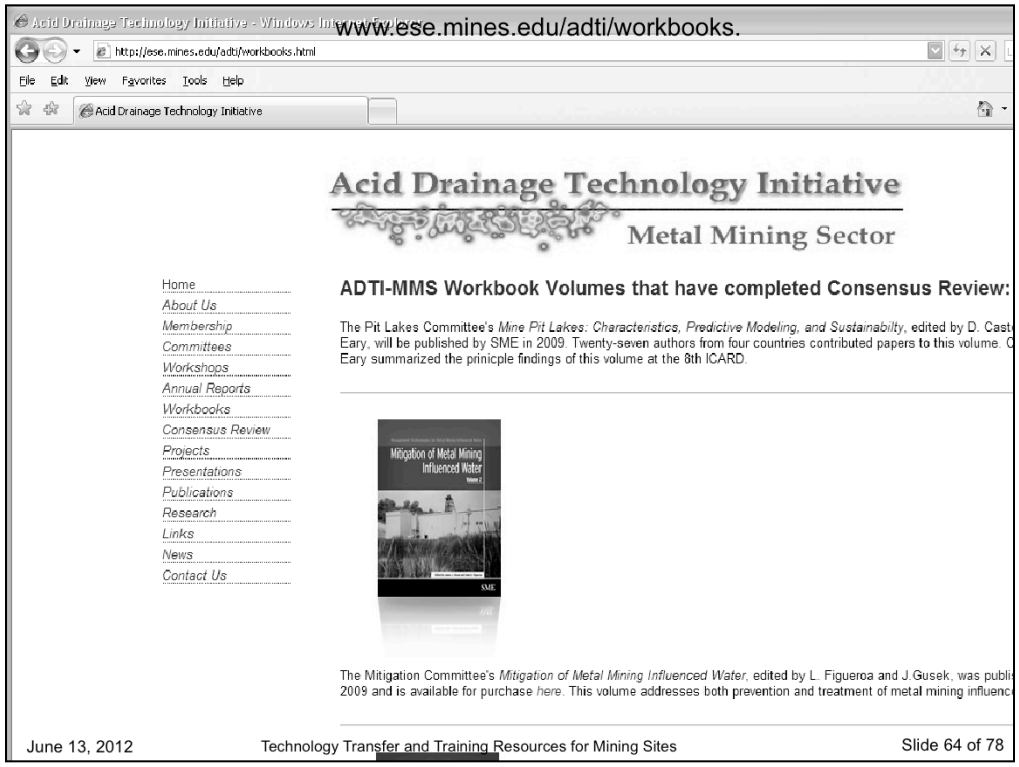

The Global Alliance
INAP
Acid Drainage Technology Initiative
PADRE
CNAMD
INAD
MEND
SANAP
SMI
Knowledge Transfer
Water Research Commission
June 13, 2012
Technology Transfer and Training Resources for Mining Sites
Slide 61 of 78

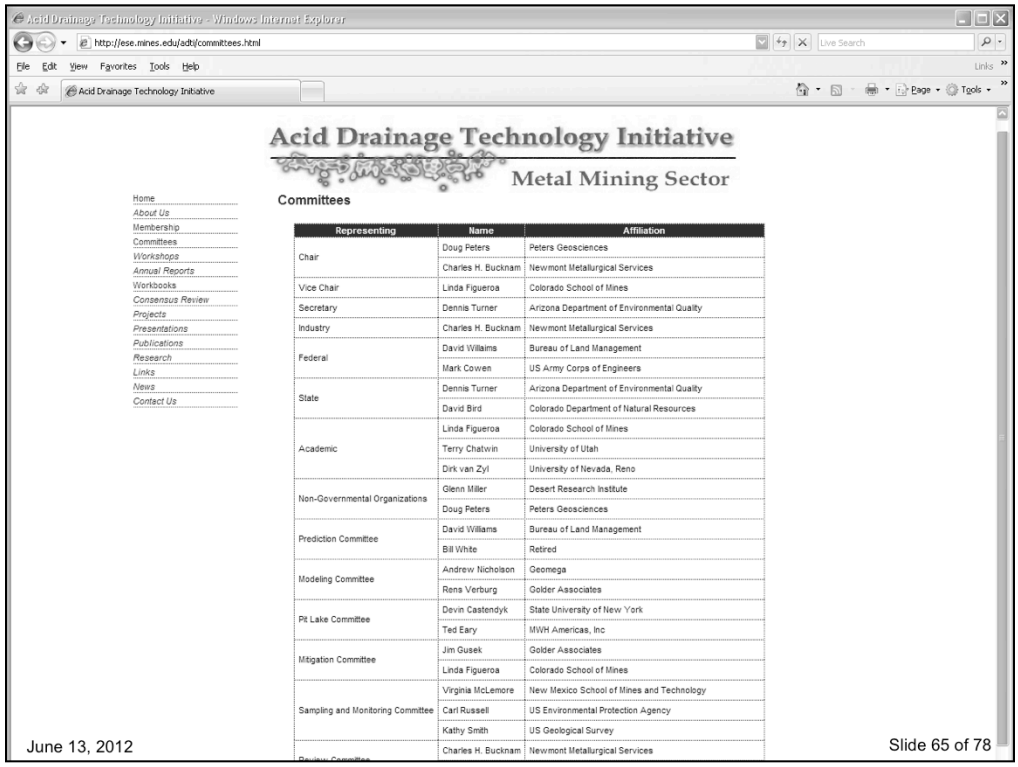



In keeping with the mining industries commitment to our stakeholders and the environment, the International Network for Acid Prevention was formed in 1998 to mobilize acid drainage knowledge and experience and to coordinate global research on the management of sulphide mine wastes.


In keeping with the mining industries commitment to our stakeholders and the environment, the International Network for Acid Prevention was formed in 1998 to mobilize acid drainage knowledge and experience and to coordinate global research on the management of sulphide mine wastes. Present members of INAP include Anglo American, Antofagasta Minerals, BHP Billiton, Barrick Gold, Freeport McMoRan Copper & Gold, Kinross Gold, Newcrest Mining, Newmont Mining, Rio Tinto, Vale Inco and Xstrata. One of the key activities of INAP during the last two years has been the development of the GARD Guide.

www.ese.mines.edu/adti/workbooks.

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http://ese.mines.edu/adti/committees.html
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Acid Drainage Technology Initiative
Metal Mining Sector
Home
About Us
Membership
Committees
Workshops
Annual Reports
Workbooks
Consensus Review
Projects
Presentations
Publications
Research
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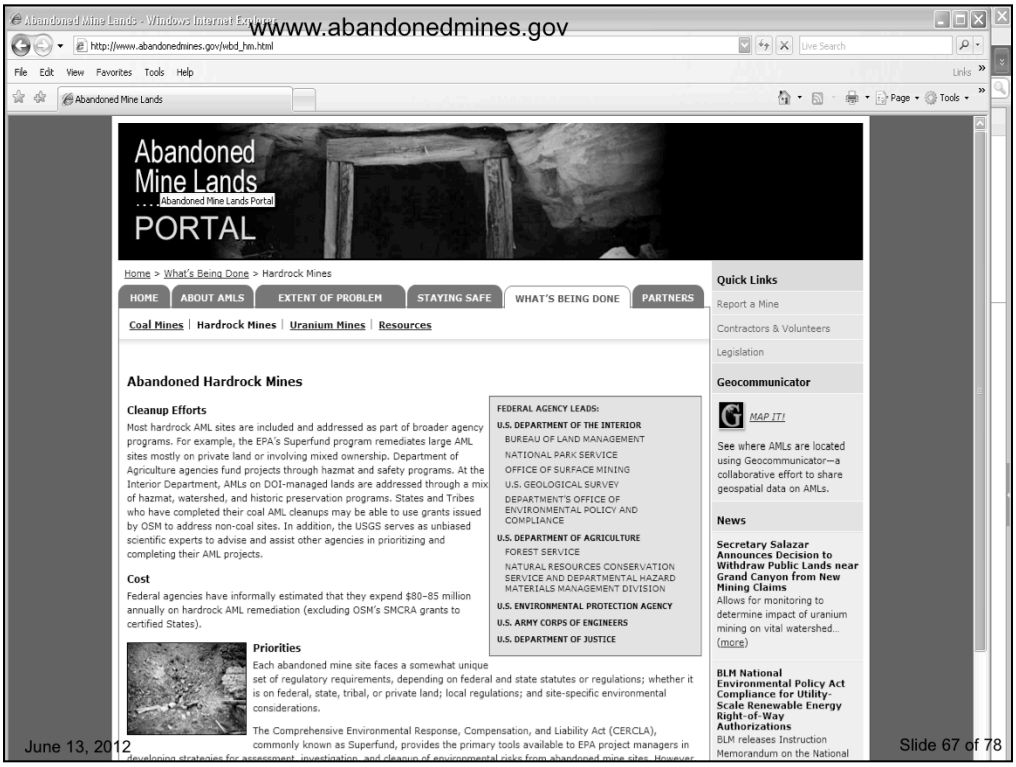
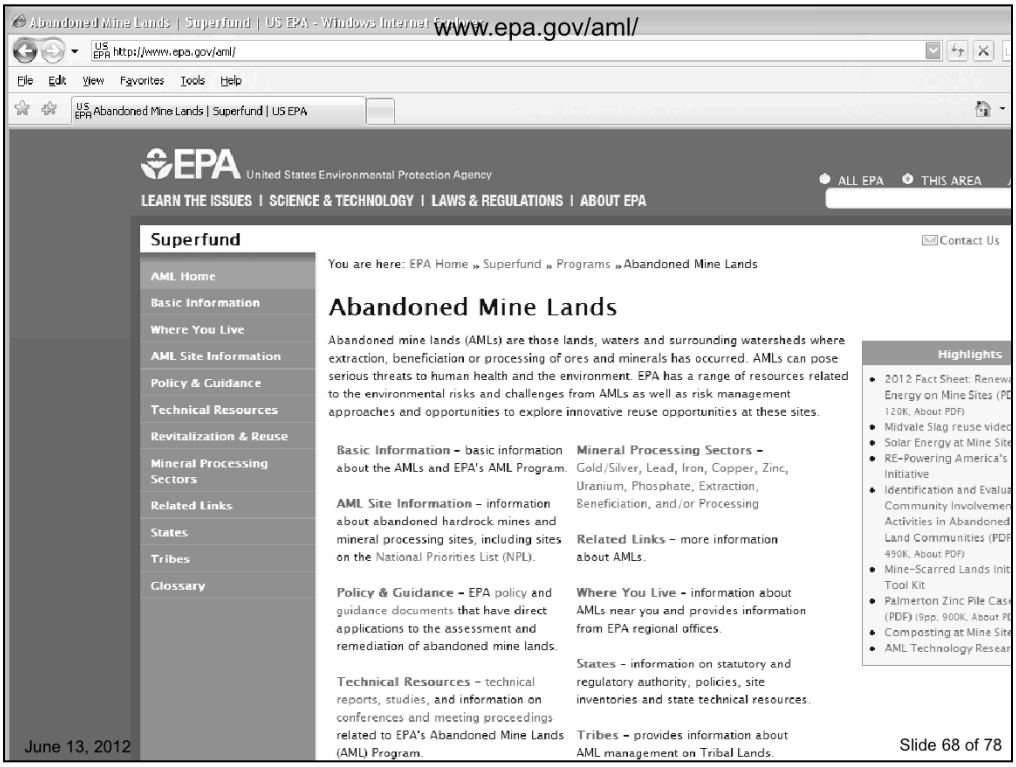
Committees
Representing | Name | Affiliation
Chair | Doug Peters | Peters Geosciences
Charles H. Bucknam | Newmont Metallurgical Services
Vice Chair | Linda Figueroa | Colorado School of Mines
Secretary | Dennis Turner | Arizona Department of Environmental Quality
Industry | Charles H. Bucknam | Newmont Metallurgical Services
Federal | David Willaims | Bureau of Land Management
Mark Cowen | US Army Corps of Engineers
State | Dennis Turner | Arizona Department of Environmental Quality
David Bird | Colorado Department of Natural Resources
Academic | Linda Figueroa | Colorado School of Mines
Terry Chatwin | University of Utah
Dirk van Zyl | University of Nevada, Reno
Non-Governmental Organizations | Glenn Miller | Desert Research Institute
Doug Peters | Peters Geosciences
Prediction Committee | David Williams | Bureau of Land Management
Bill White | Retired
Modeling Committee | Andrew Nicholson | Geomega
Rens Verburg | Golder Associates
Pit Lake Committee | Devin Castendyk | State University of New York
Ted Eary | MWH Americas, Inc
Mitigation Committee | Jim Gusek | Golder Associates
Linda Figueroa | Colorado School of Mines
Sampling and Monitoring Committee | Virginia McLemore | New Mexico School of Mines and Technology
Carl Russell | US Environmental Protection Agency
Kathy Smith | US Geological Survey
Charles H. Bucknam | Newmont Metallurgical Services


www.mend-nedem.org



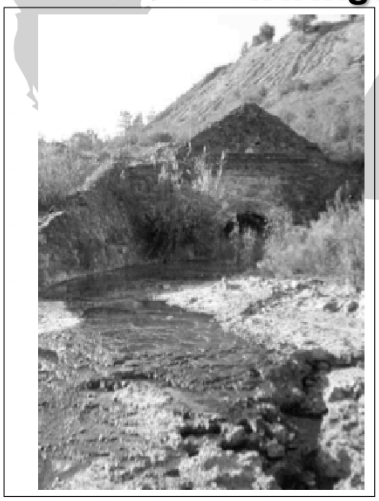

www.abandonedmines.gov




www.epa.gov/aml/

# Global ARD Guide (GARD Guide)

**www.gardguide.com**



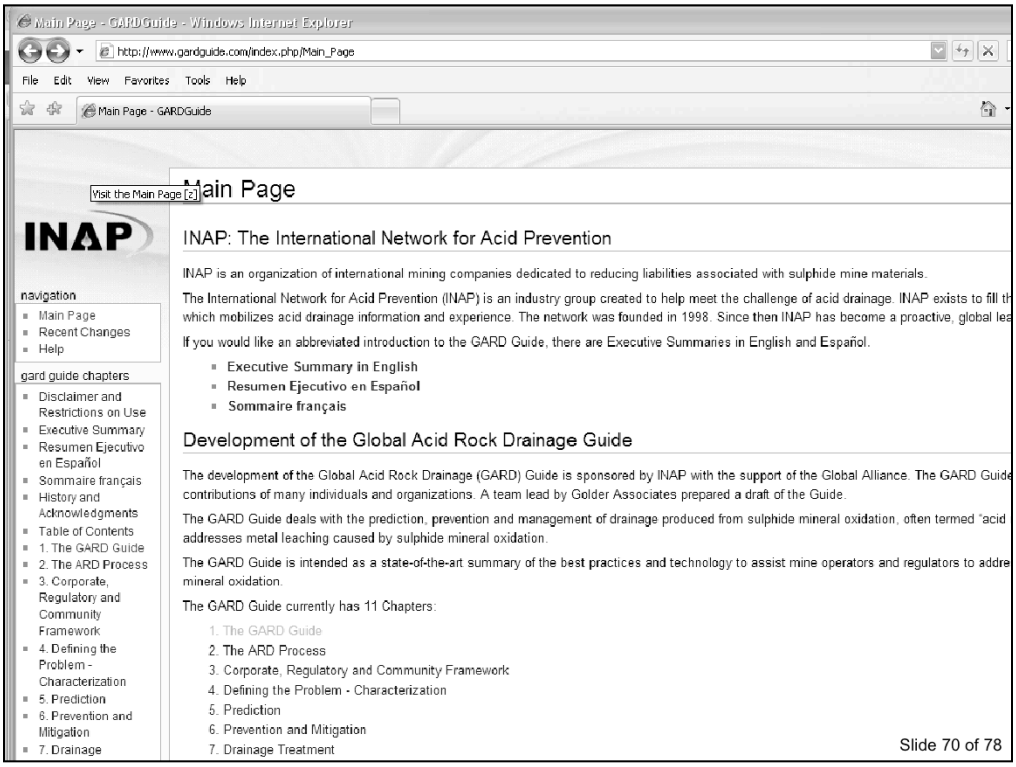
"An international guide for facilitating world-wide best practice in prediction, control, and mitigation of acid rock drainage."

"The guide will become a reference document for all stakeholders involved in ARD and waste management issues."



The GARD Guide is world-wide best-practice guide to assist in the prevention and mitigation of Acid Rock Drainage.

Since the Roll Out of the GARD Guide at the 8th ICARD in Sweden, INAP has focused on promoting the GARD Guide to all stakeholders: industry, regulators, financiers, communities, NGOs, academics. We believe that the GARD Guide has value to all.


Main Page - GARDGuide - Windows Internet Explorer
http://www.gardguide.com/index.php/Main_Page
File Edit View Favorites Tools Help
Main Page - GARDGuide
Visit the Main Page [z]
Main Page
INAP
INAP: The International Network for Acid Prevention
INAP is an organization of international mining companies dedicated to reducing liabilities associated with sulphide mine materials.
The International Network for Acid Prevention (INAP) is an industry group created to help meet the challenge of acid drainage. INAP exists to fill th
which mobilizes acid drainage information and experience. The network was founded in 1998. Since then INAP has become a proactive, global lea
If you would like an abbreviated introduction to the GARD Guide, there are Executive Summaries in English and Español.
Executive Summary in English
Resumen Ejecutivo en Español
Sommaire français
Development of the Global Acid Rock Drainage Guide
The development of the Global Acid Rock Drainage (GARD) Guide is sponsored by INAP with the support of the Global Alliance. The GARD Guide
contributions of many individuals and organizations. A team lead by Golder Associates prepared a draft of the Guide.
The GARD Guide deals with the prediction, prevention and management of drainage produced from sulphide mineral oxidation, often termed "acid
addresses metal leaching caused by sulphide mineral oxidation.
The GARD Guide is intended as a state-of-the-art summary of the best practices and technology to assist mine operators and regulators to addre
mineral oxidation.
The GARD Guide currently has 11 Chapters:
1. The GARD Guide
2. The ARD Process
3. Corporate, Regulatory and Community Framework
4. Defining the Problem - Characterization
5. Prediction
6. Prevention and Mitigation
7. Drainage Treatment
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Recent Changes
Help
gard guide chapters
Disclaimer and Restrictions on Use
Executive Summary
Resumen Ejecutivo en Español
Sommaire français
History and Acknowledgments
Table of Contents
1. The GARD Guide
2. The ARD Process
3. Corporate, Regulatory and Community Framework
4. Defining the Problem - Characterization
5. Prediction
6. Prevention and Mitigation
7. Drainage
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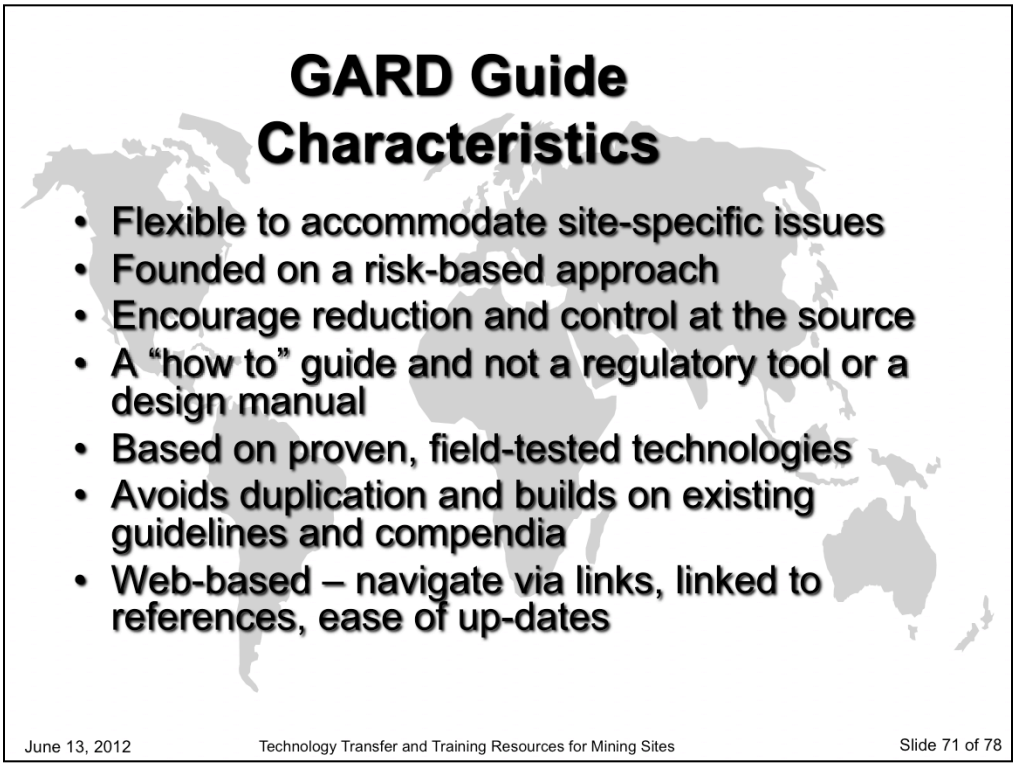



Here is a list of some of the characteristics that were integrated into the Guide:

Flexibility to accommodate site-specific issues -- Inclusive – building on existing guidelines

Founded on a risk-based approach -- Pro-active encouraging reduction and control at the source

A how to guide -- Based on proven, field-tested methods

Address the full life-cycle of a mine – from cradle to cradle

# GARD Guide Structure and Authors

1. **GARD Guide -** INAP
2. **ARD Process –** Dr. Rens Verburg
3. **Corporate, Regulatory and Community Framework**
   - Mr. John Wates (Fraser Alexander, Jo'burg)
4. **Defining the Problem – Characterization**
   - Dr. Devin Castendyk (SUNY Oneonta)
     Ms. Cheryl Ross (Golder, Redmond)
5. **Prediction**
   - Dr. Kirk Nordstrom (USGS Denver)
     Dr. Rens Verburg
6. **Prevention and Mitigation**
   - Dr. Ward Wilson (UBC, Vancouver),
     Dr. Ben Wickland (Golder, Vancouver)

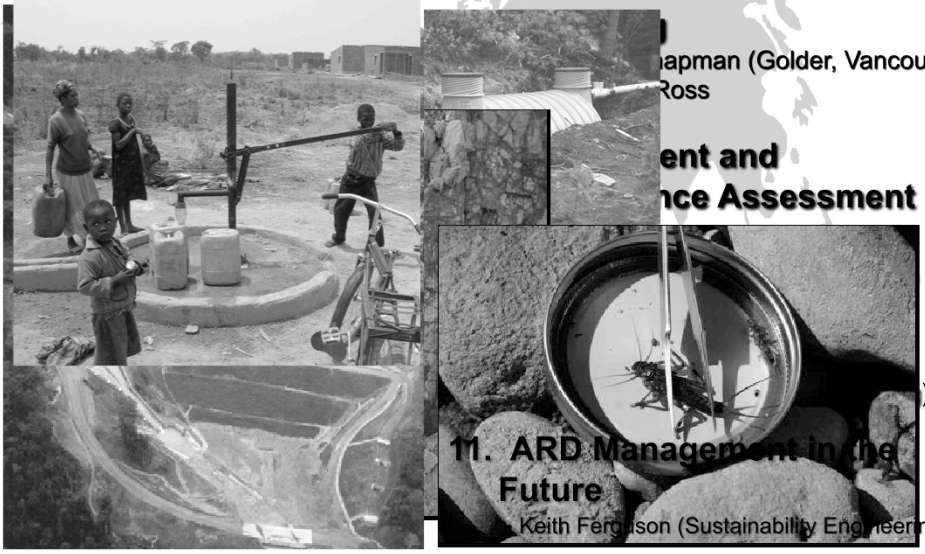
# GARD Guide Structure and Authors

**7. Treatment**

- Dr. Andre van Niekerk (Golder, Jo'burg)

apman (Golder, Vancouver),
Ross

ent and
nce Assessment



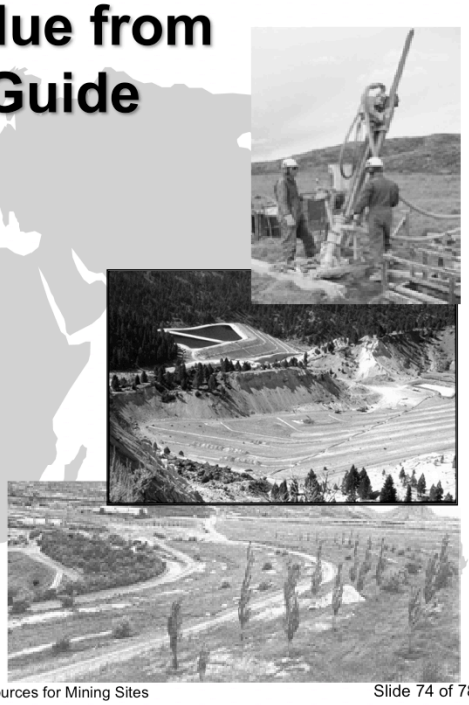
)

**11. ARD Management in the Future**

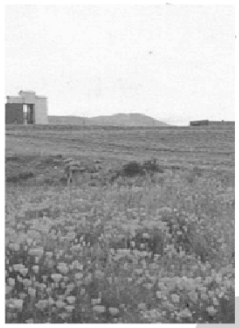
Keith Ferguson (Sustainability Engineering)

# How to Get Value from the GARD Guide

- **Prevent ARD rather than treat it**
  - **Minimize and characterize disturbed material**
  - **Plan and design for closure from the start**
  - **Integrate the GARD into operations**
  - **Update closure costs regularly**
- **Engage all stakeholders in the process – shared responsibility**



# Conclusions



- ARD or MIW management is critical to the success of a mine and the reputation of the mining industry as a whole
- Measurement and ongoing improvement of the ARD management are required throughout the life of mine
- Successful implementation of an ARD management relies on commitment from company management and the systematic use of ARD management tools including engaging all stakeholders



Lake Ore-be-gone near Gilbert, MN is the result of natural flooding of three iron ore mines: the Gilbert, the Schley, and the Pettit.

# Next Webinar

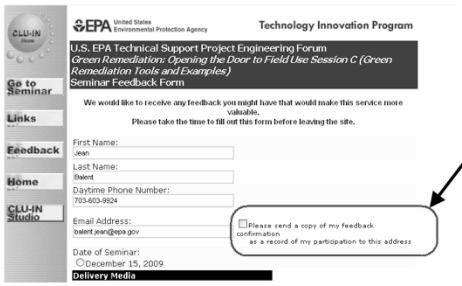
- Next webinar is scheduled for September 12, 2012, 1:00-3:00 PM EST
- Theme – Mining-Influenced Water: Issues and Remediation Techniques
- Potential presentations: (1) PCBs, mining, and water pollution; (2) Case study on acid rock drainage remediation

**We want your feedback!**

**Are these topics interesting to you?**
**Do you want to hear about them on the next webinar? Any other suggestions?**
**Leave us your comments on this webinar's feedback form.**

# 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.



Thank you again for your attention and comments. I want to remind each of you that we are looking for your specific responses to many of the issues discussed today in our feedback form following this session.

Also, there are several resources and related documents included in the links to more resources on this page.

If you have any additional questions or comments, please feel free to contact me or fill out a comment form on CLUIN.

Thank you and have a great afternoon.

# New Ways to stay connected!

- Follow CLU-IN on Facebook, LinkedIn, or Twitter


https://www.facebook.com/EPACleanUpTech


https://twitter.com/#!/EPACleanUpTech


http://www.linkedin.com/groups/Clean-Up-Information-Network-CLUIN-4405740