

EPA Region 8 HSRC

Rocky Mountain Regional Hazardous Substance Research Center

Colorado State University (CSU)
Colorado School of Mines (CSM)

Charles D. Shackelford (CSU), Director

Rocky Mountain Regional HSRC Participants

- **Colorado State University:** Departments of Civil Engineering, Chemical Engineering, Microbiology, Fisheries and Wildlife Biology, Environmental Health, Biology, & Rangeland Ecosystem Science
- **Colorado School of Mines:** Departments of Chemistry and Geochemistry, Environmental Science and Engineering, Geology and Geological Engineering
- **Additional Collaborators:** Purdue University (Midwest HSRC), Louisiana State University (South/Southwest HSRC), Oregon State University (Western Region HSRC), Montana State University, University of Wisconsin, University of Waterloo, University of Wyoming, & the USGS

Research/Outreach Theme:

Remediation of Mine Waste Sites

- Number of Abandoned Mine Land (AML) sites in EPA Region 8 states (WGA 1998) ~ 52,000.
- About 85 % (~ 44,000) of these sites have not been reclaimed.
- Additional 6,727 AML sites located on federal lands (forests and national parks).

AMLs represent a significant potential threat to human health and the environment due to:

- Acid drainage from adits and sulfide bearing waste piles.
- Leaching of metals from relic tailings and other mine waste piles into surrounding soil, ground water, and surface water (creeks, streams, rivers).
- Erosion and migration of contaminated sediments.
- Direct groundwater contamination from seeps, ponds, pits, etc.

Potential Economic Impacts of AMLs

- Degraded water quality resulting from increased sedimentation loads to surface water bodies impacting aquatic habitats (e.g., trout fishing in Arkansas River).
- Adverse visual and aesthetic impacts resulting from degraded water quality impacting recreation and tourism.
- Reduced property values due to contamination.
- Increased water treatment costs to downstream users.

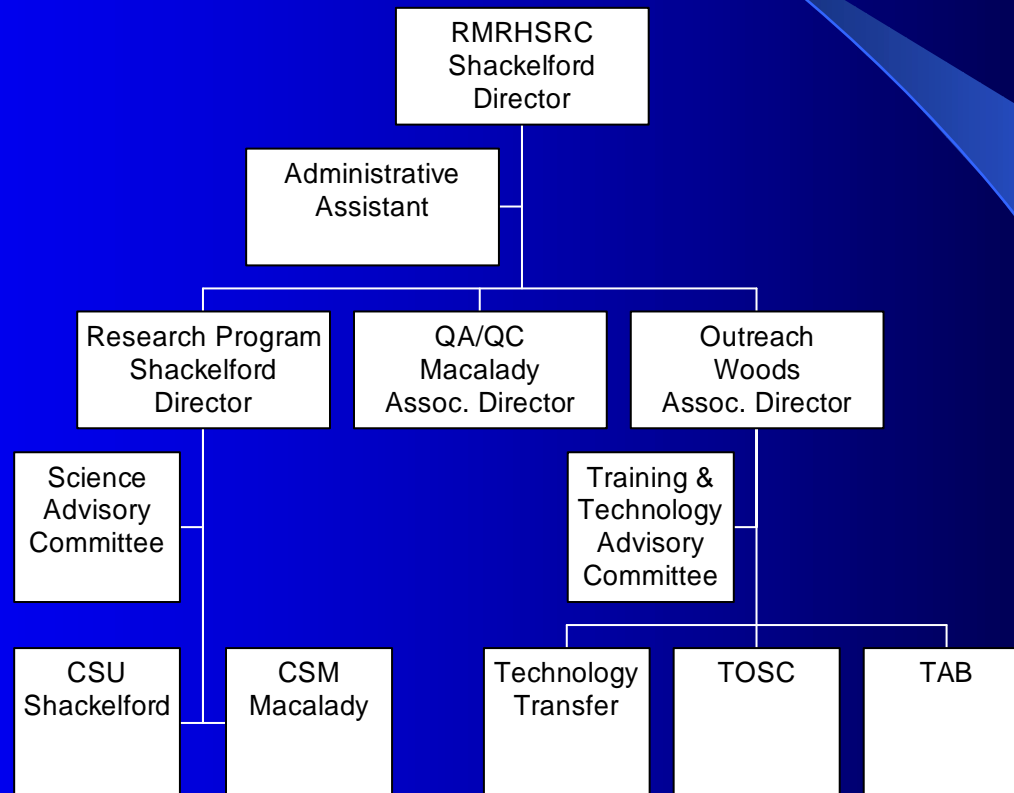
Superfund sites in EPA Region 8

- 26 of 45 active NPL sites (~ 60 %) listed for Region 8 are associated with AMLs and related activities.
- These NPL sites represent the most severe impacts from AMLs, and include:
 - 1) contamination of all media (air, ground water, soil, sediments, and surface water);
 - 2) contamination resulting from a host of metals (As, Cd, Cu, Mn, Mo, Pb, Zn);
 - 3) a wide variety of contaminant sources (acid drainage, exposed ore zones, heap-leach spoils, mine waste piles and sediments, slag piles, sludge, smelter operations, tailings and waste rock piles).

Key issues resulting from environmental impacts of AMLs that will be addressed by the RMRHSRC:

- Inadequate ability to rapidly and cost effectively characterize extent and impacts of contamination.
- Inadequate ability to accurately characterize the fate and transport of metals and other toxic chemicals.
- A paucity of cost-effective technologies that can clean up mine waste sites.
- A need to develop less costly and more rational clean-up strategies.

Administrative Structure of RMRHSRC



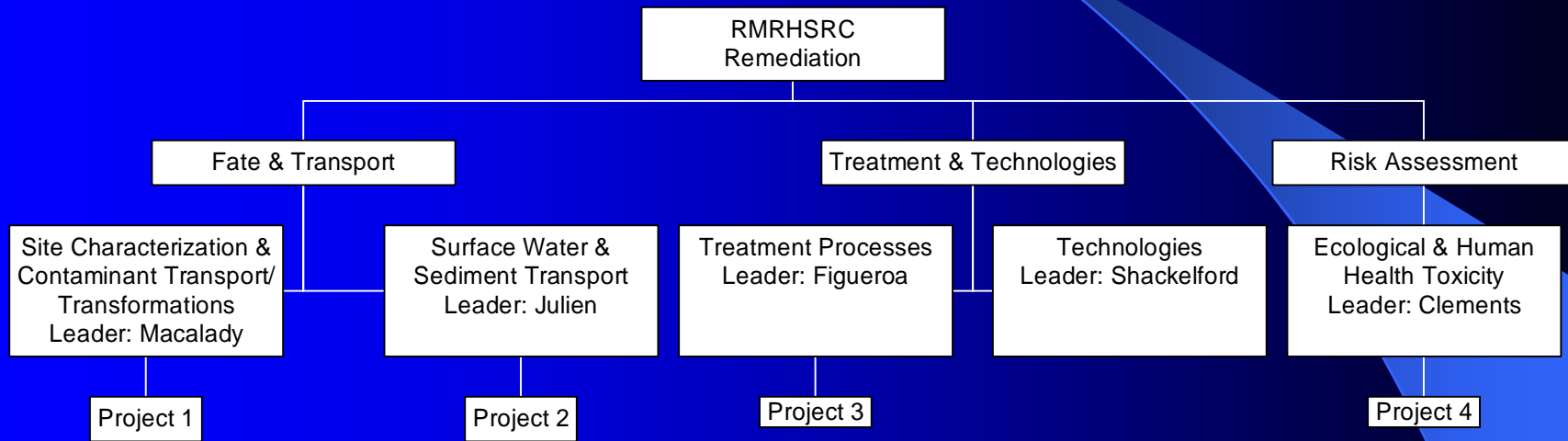
Administrative Goals

- To further develop relationships between faculty and institutions for continued cooperation:
 - Faculty appointments (within departments and institutions); student committees;
 - Monthly Center activities.
- To develop linkages to other HSRCs to leverage research and outreach:
 - Research partnerships: Oregon State University (John Westall, Western Region HSRC, Project 1); Purdue University (Kathy Banks and Paul Schwab, Midwest HSRC); Louisiana State University (Danny Reible, South/Southwest HSRC)
 - Outreach partnerships: developing linkages to other HSRCs to exchange expertise and provide support w/r to metals contamination

Goal of RMRHSCRC Research

To extend our knowledge of the geochemical, biological, hydrological/mineralogical and engineering aspects of environmental problems associated with mining and mine wastes and, based on this knowledge, develop new or improved methods or technologies that are cost effective and lead to clean ups that protect human health and the environment.

Research Focus Areas



Project 1: Redox Transformations, Complexation and Soil/Sediment Interactions of Inorganic Forms of As and Se in Aquatic Environments: Effects of Natural Organic Matter

PI:

Don Macalady (CSM)

Co-PIs:

Dianne Ahmann (CSM)

John Westall (OSU)

John Garbarino (USGS)

Joseph Meyer (U. Wyo.)

Project 2: Fate and Transport of Metals and Sediment in Surface Waters

PI:

Pierre Julien (CSU)

Co-PIs:

Brian Bledsoe (CSU)

Chester Watson (CSU)

Project 3: Metal Removal Capabilities of Passive Bioreactor Systems: Effects of Organic Matter and Microbial Population Dynamics

PI:

Linda Figueroa (CSM)

Co-PIs:

Dianne Ahmann (CSM)

Tom Wildeman (CSM)

David Blowes (Waterloo)

Ken Reardon (CSU)

Ken Carlson (CSU)

Chuck Shackelford (CSU)

Nancy Duteau (CSU)

Sandy Woods (CSU)

Project 4: Evaluating Recovery of Stream Ecosystems from Mining Pollution: Integrating Biochemical, Population, Community and Ecosystem Indicators

PI:

Will Clements (CSU)

Co-PI:

James Ranville (CSM)

Outreach Activities

- Technology Transfer
- Technical Outreach for Communities (TOSC)
- Technical Assistance to Brownfields (TAB)

Technology Transfer

- Background: Participated in Western Region HSRC; attended Technology Transfer Conference (Fallen Leaf Lake, 1991)
- Technology Transfer Cycle
 - Idea generation
 - Information transfer
 - Laboratory and pilot-scale testing
 - Demonstration and application

TOSC and TAB

- Working with Blase Levin at Kansas State (the Great Plains/Rocky Mountain HSRC) for the successful transfer of projects.
- Continuity in providing support to communities is important.
 - Collaboration
 - Providing support to individuals who have a history with communities in Region 8
 - TOSC examples include: Libby, MT (Asbestos Emergency Response); Oglala Lakota Sioux (Badlands Bombing Range)
 - TAB examples include: Crow Nation, MT; Fort Belknap, MT; Turtle Mountain Chippewa, ND
- Draw on expertise of faculty at multiple institutions.

Self-Sufficiency Vision

- Engage the industry:
 - 1) through personal contacts (12 RMRHSRC investigators have identified 51 personal contacts);
 - 2) professional interactions (e.g., annual TMW Conferences).
- Involve local, state, regional, national, and international stakeholders.
- Identify funding sources such as DOD and DOE; current funding in excess of \$24M, and \$16M pending support.
- Emphasize field demonstrations; 24 active field sites.