



USGS Abandoned Mine Lands Research

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USGS Abandoned Mine Lands Work

- **Geologic Discipline**
 - ◆ Mineral Resources Program
 - ◆ Energy Resources Program
- **Water Resources Discipline**
 - ◆ State offices
 - ◆ National Research Program
- **Biological Resources Discipline**

Some things we DON'T do*

- Inventory abandoned mine sites
- Assess physical hazards
- Design/engineer remediation strategies
- Evaluate individual mine sites
- Long term site monitoring
- Give grants for remediation projects

Some things we DO do

- **Process studies and technology transfer**
 - ◆ Metal deposits
 - ◆ Ground and surface waters (incl. pit lakes)
 - ◆ Effects on bio-receptors
 - ◆ Coal deposits
 - **Characterization studies**
 - ◆ Backgrounds and baselines
 - ◆ Geoenvironmental models
 - **Broadly multi-disciplinary research**
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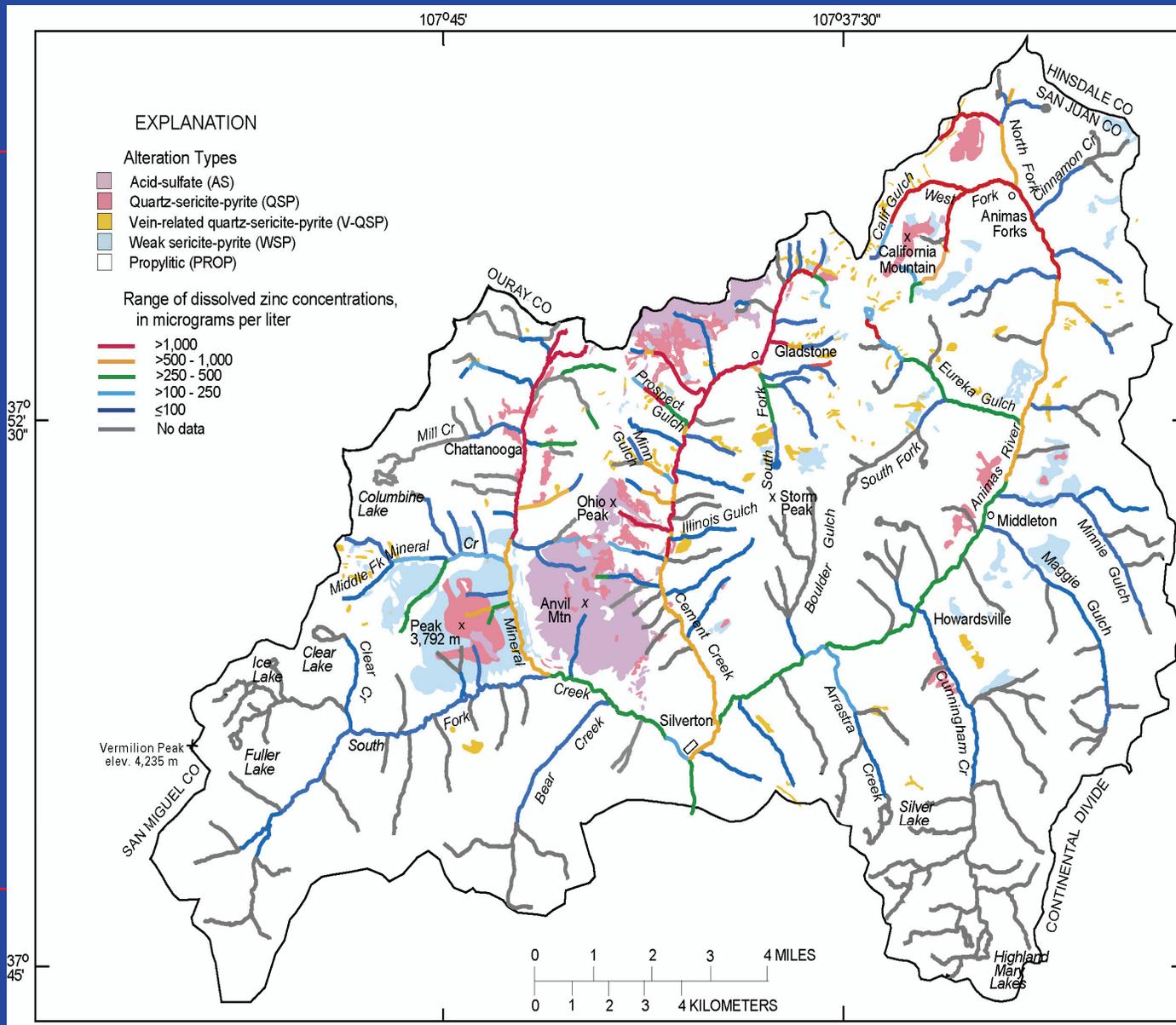
USGS Watershed-Scale Research

- **USGS AML Initiative (1997-2001)**
 - <http://amli.usgs.gov/>
 - ◆ **Animas River watershed in Colorado**
 - ◆ **Professional Paper 1651 to be published in 2006**
 - ◆ **Boulder River watershed in Montana**
 - ◆ **Professional Paper 1652 published in 2004**
- **Partnership with BLM, USDA-FS, EPA, states of Colorado and Montana, and watershed citizen's group (ARSG) in Silverton**

Objectives of Watershed-Scale Studies

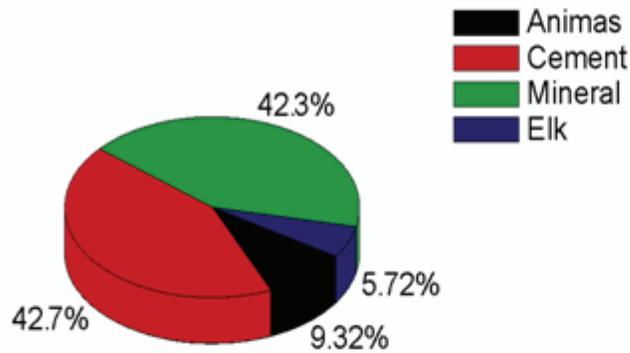
- To develop scientifically rigorous watershed-scale characterization methodologies
 - To evaluate what scientific tools need to be applied, given the geologic setting, to adequately assess the effects of historical mining on the watershed
 - To assess the effectiveness of individual scientific approaches to evaluate watersheds impacted by historical mining
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Animas River Watershed, Colo.

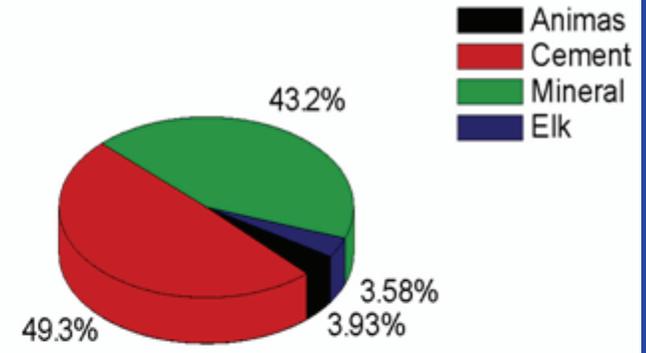


Summary of Water Quality Data from Tracer Studies

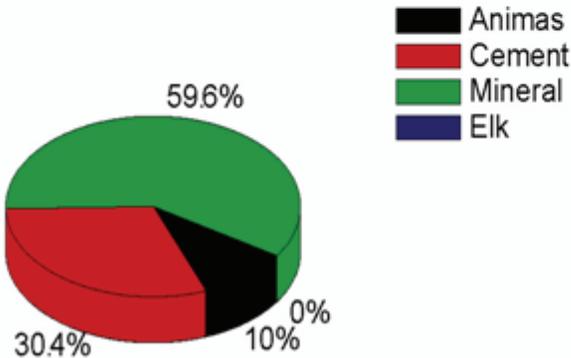
(A) Aluminum



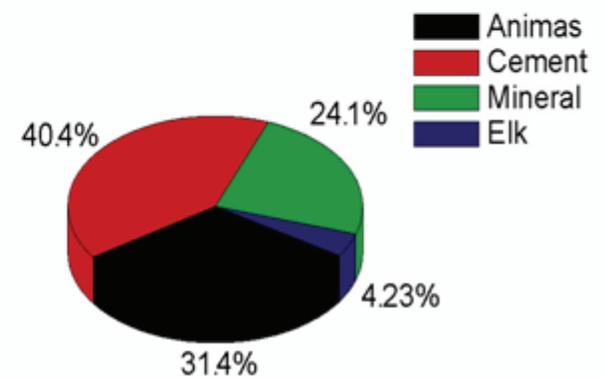
(B) Iron



(C) Copper



(D) Zinc



Lessons Learned from the AML Initiative

- **Geologic setting controls watershed morphology, baseline soil and water geochemistry, and plant ecology**
 - **Mineral deposit type controls metals available for production**
 - **Economics and deposit characteristics control commodities produced as well as those discarded during milling**
 - **Milling methods and commodity recovery control the composition of sediment in the streams**
 - **Extent of hydrothermal alteration and amount of pyrite in mine wastes and surrounding the deposit control water chemistry and drive selection of remediation technologies**
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Regional-Scale Methods to Assess the Effects of Inactive and Abandoned Mines on Watersheds

Central Colorado Assessment (2004-2008)

http://minerals.cr.usgs.gov/projects/colorado_assessment

- Examine 300 watersheds selected on the basis of geology, hydrothermal alteration, and historical mining activity
- Water chemistry and sediment geochemistry
- Macro invertebrate (MI) populations from 150 watersheds
- Metal burdens in about 700 individual MI to determine toxicity effects

Some research challenges, part 1

- Can we increase the effectiveness of small-scale measurements so that we grasp the entirety of the large-scale processes we attempt to model and predict?
 - Can we apply modern digital analysis techniques to create multidimensional models of the life cycles of mineral commodities?
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Some research challenges, part 2

- **How can we best describe and quantify the nature and importance of the links between geologic processes and human health?**
- **Can we determine the relative effects of geochemical and geophysical fluxes on human health?**

How can you influence USGS work?

- Understand that we are primarily a nation-wide natural science research institution
- Contact us (Kate Johnson at kjohnson@usgs.gov, Stan Church at schurch@usgs.gov, or other USGS staff you know) to talk about your interests
- Help us to understand your needs
- Help us partner with others
- Be involved

On the Internet

- USGS: <http://www.usgs.gov/>
- Mineral Resources Program: <http://minerals.usgs.gov/>
- AML Initiative (data and published reports): <http://amli.usgs.gov/>
- Colorado project: <http://minerals.cr.usgs.gov/projects/>

For more information

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- Visit our web site:
 - ◆ <http://www.usgs.gov/>
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