

**HH&C Community of Practice
Tri-Service Infrastructure Conference
2-5 August 2005 - St. Louis**

**US Army Corps
of Engineers®**

Abandoned Mine Lands: Eastern and Western Perspectives

Kate White, PhD, PE (CEERD)

Kim Mulhern, PG (CENWO)

August 4, 2005

**Restoration of Abandoned Mine
Sites (RAMS) - Western Region**

**Abandoned Mine Land (AML)
subCommunity of Practice**



US Army Corps
of Engineers

Scope of AML Problem

- **Estimated 200K to 500K AML sites in US (Lyon et al. estimate 550K hard-rock alone)**
 - Public health hazard
 - Safety hazards
 - Environmental degradation
- **Hard Rock**
 - \$32B to \$72B estimated for cleanup of worst sites (Lyon et al)
 - About 15K hard rock AML sites threaten surface and ground waters or contain potentially hazardous substances





Scope of AML Problem

US Army Corps



- **Coal**
 - **OSM estimates \$8.2B high priority (health and safety hazards) coal-related AML sites**
 - 80% or \$6.6B unreclaimed
 - 8 states account for 95% of estimated AML remediation costs (PA, WV, KY, KS, VA, OH, OK, IL)
 - PA has \$3.6B alone
 - **OSM estimates \$2B coal-related environmentally damaged AML sites**
 - 90% or \$1.8B unreclaimed



US Army Corps
of Engineers

Existing Corps Authorities

- **Specific Authorizations: GI Program**
- **Section 22: Planning Assistance**
- **Sections 206 : Ecosystem Restoration**
- **Section 204: Beneficial Use of Dredged Material**
- **Section 1135: Impact to Existing Corps/Military Projects**
- **Section 539 (Abandoned Coal Mine Restoration in WV, PA, MD)**
- **Section 560 (Abandoned Non-Coal Mine Restoration)**
- **Support for Others:**
 - **Cleanup of hazardous materials**
 - **Safety hazard remediation**
 - **Ecosystem restoration**
 - **Technical studies for other agencies**
 - **Major customers: USEPA, USDA FS, USNPS, USBLM**



US Army Corps
of Engineers

Potential Corps Activities

- **Clean Water Action Plan**
- **USACE-TNC Sustainable Rivers Project**
- **Apply existing Corps authorities to fill niches in watershed restoration**
- **Corps engineering support to other Federal agencies**
- **Team building with non-government organizations**
- **Technical support & oversight, investigation, design & construction of identified projects**
- **Contracting assistance**
- **Analysis of alternative measures including cost effectiveness & risk assessment**
- **Development of emerging technologies data base (RAMS)**

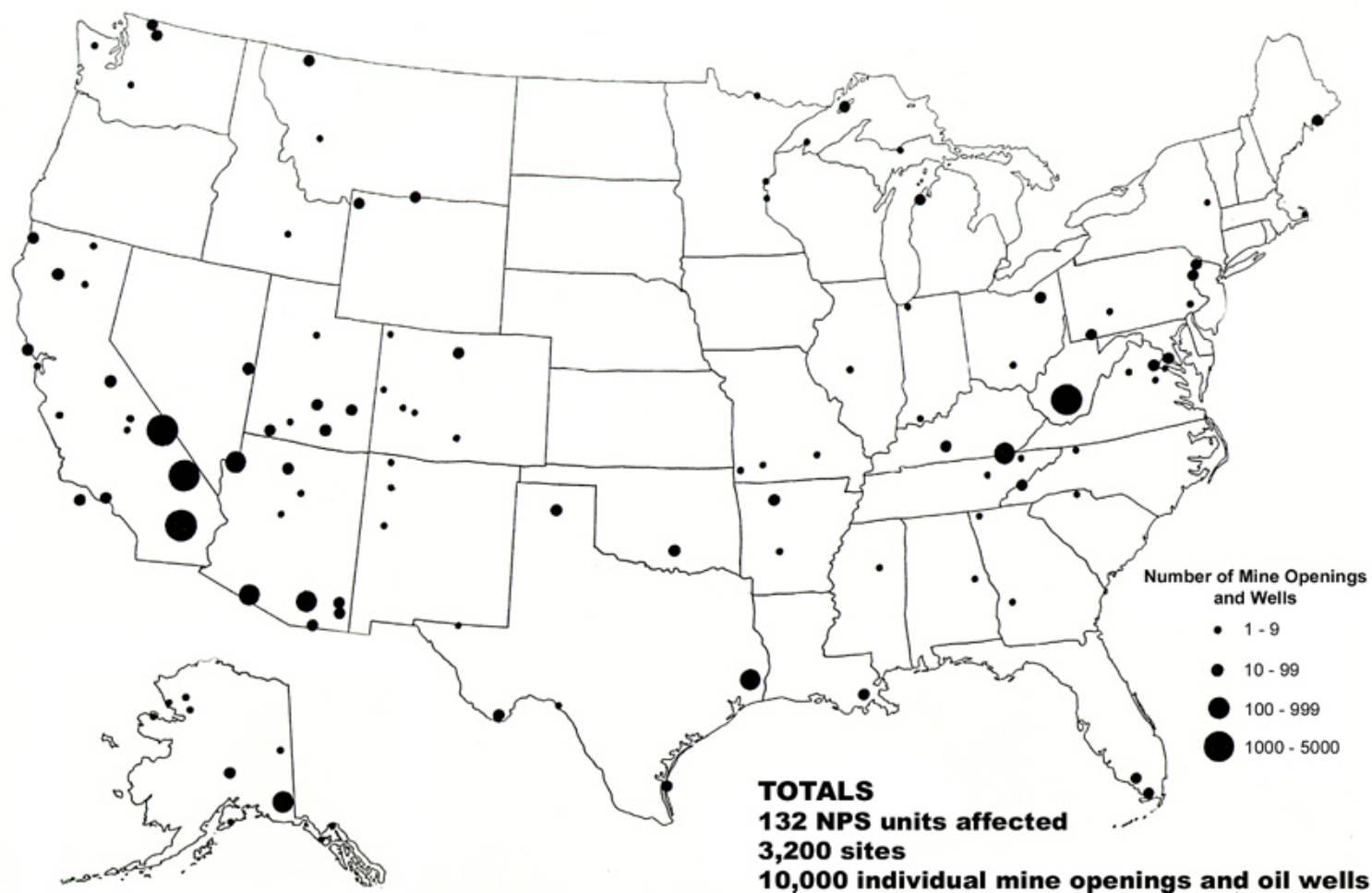


US Army Corps
of Engineers

AML: Eastern and Western

- **Eastern:**
 - Termed “humid” or “wet”
 - Mostly coal (perception)
 - Focus is largely on WQ issues
 - NAL/LRD AMD team
- **Western:**
 - Termed “dry”
 - Mostly hard rock (perception)
 - Focus on capping/vegetation/geotech
 - RAMS (NWD, POD, SPD, SWD)
- **Both: members of eCoP’s AML sub-CoP**

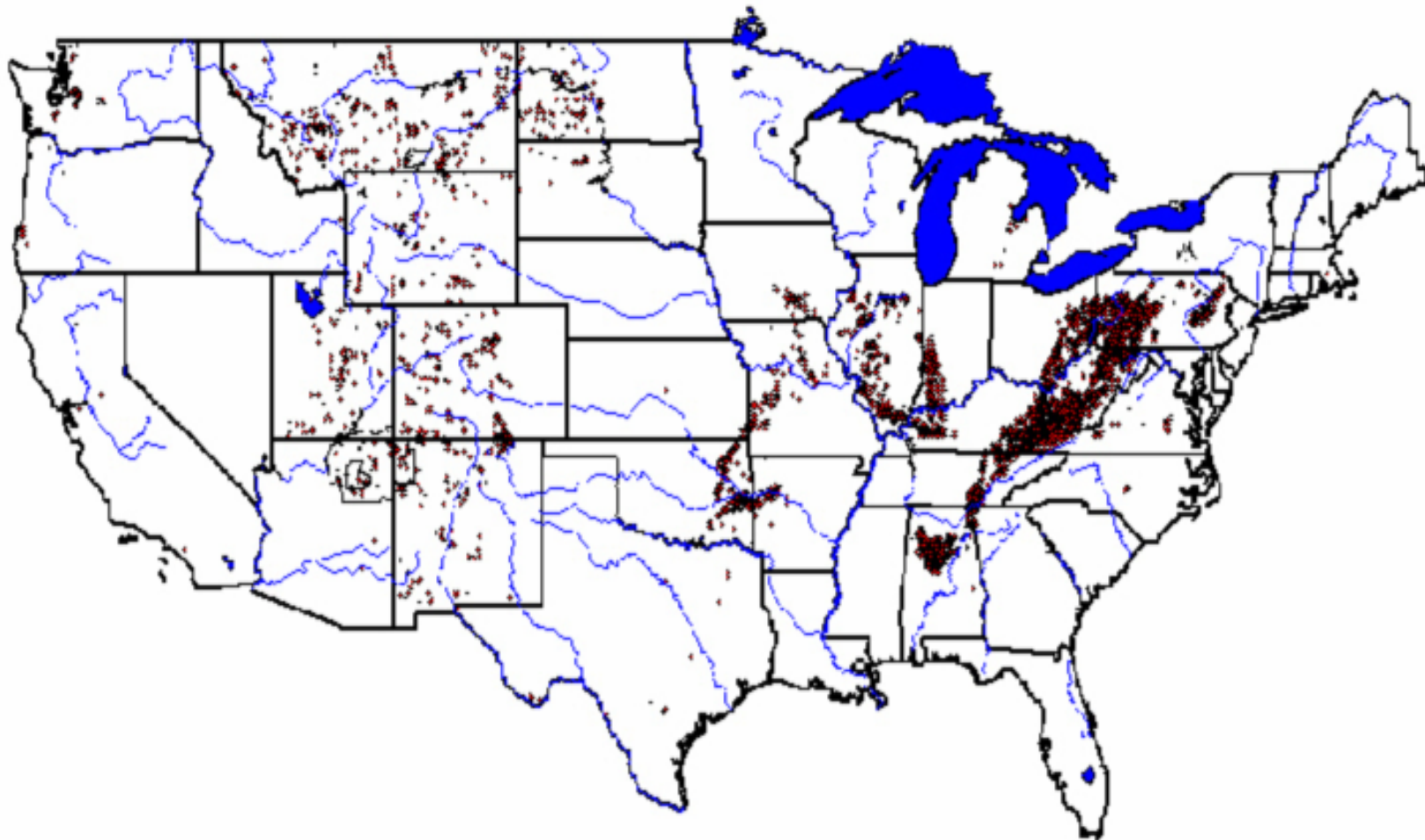
NATIONAL PARK SYSTEM UNITS WITH ABANDONED MINERAL LANDS



Known hard rock AML sites on lands administered by the US Park Service (USPS 2001)

Restoration of Abandoned Mine Sites (RAMS) - Western Region

Abandoned Mine Land (AML) subCommunity of Practice



OSM AMLIS high priority coal AML sites in continental US (OSM 2002)

Restoration of Abandoned Mine
Sites (RAMS) - Western Region

Abandoned Mine Land (AML)
subCommunity of Practice



US Army Corps
of Engineers

RAMS Background

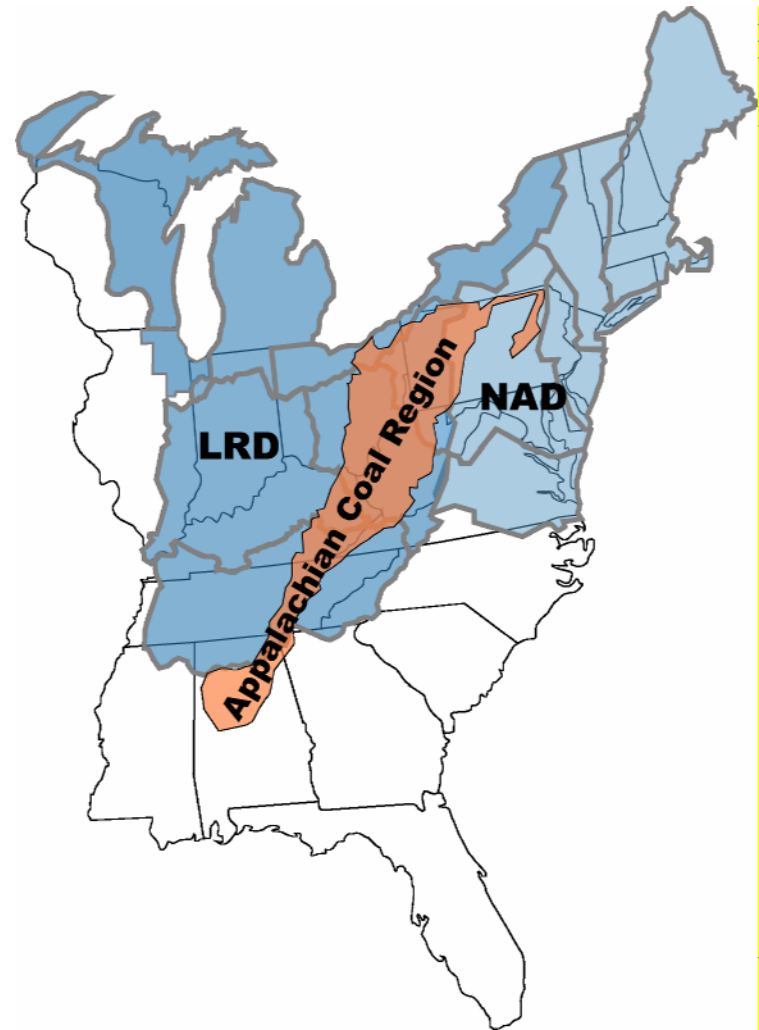
- **December 1998: Internally formalized through a MOU between NWD, POD, SPD (SWD joined in 2004)**
- **August 1999: Congress formalizes through Section 560 of WRDA 1999 (study authority)**
- **January 2001: Western Region RAMS Program Management Plan approved**
- **Total funding of \$11 million to date - 560, SFO, 206**
- **Over 80 RAMS Projects completed or on-going in 11 states**



US Army Corps
of Engineers

NAD/LRD AMD PDT Background

- April 2004 NAD/LRD PDT forms
- June 2004 Draft PMP developed
- 23 Projects - 206, 1135, PAS, SFO, 313 (S. Central PA), 303 and 503 (upper Susquehanna)
- ~\$10-12M
- AMD Demonstration Program supported by WV, VA, MD, OH, PA, KY, AL ⇒ WRDA underway
- Flooding of mine pools is major current and future issue
 - WQ, TMDL
 - H&H





US Army Corps
of Engineers

Partnering Mechanisms

- **Both: Stakeholder-driven program**
 - Allows the Corps to assist agencies meet their abandoned mine land priorities
- **Both: Division-level interactions**
 - Allows program to regionally maximize
 - in-house technical staff and
 - specialized contractors available to our partners
- **RAMS:**
 - Corps provides funding assistance with minimal additional requirements, needs construction authority
- **NAD/LRD et al:**
 - CAP programs have cost-sharing and other requirements



US Army Corps
of Engineers

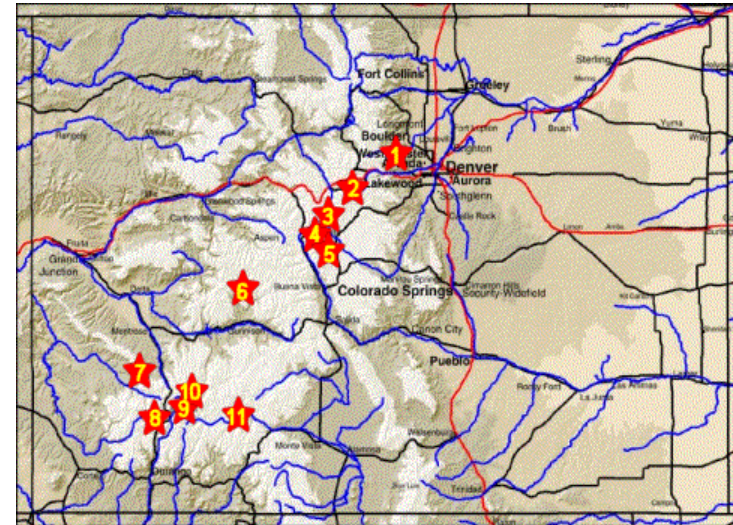
RAMS

- **Program Successes**

- Nevada Interagency Abandoned Mine Lands Environmental Task Force
- Montana projects
- Colorado projects

- **On The Horizon**

- WRDA 2005 – Senate has proposed reauthorizing program at \$45 million annually
- FY 06 Requests – Stakeholders nationwide have requested nearly \$20 million for RAMS projects
- Continue to meet partners goals on projects





US Army Corps
of Engineers

Easy Junior Mine, NV

Heap Leach Pad



Restoration of Abandoned Mine
Sites (RAMS) - Western Region

Abandoned Mine Land (AML)
subCommunity of Practice



US Army Corps
of Engineers



Main Haul Road



Crusher Area

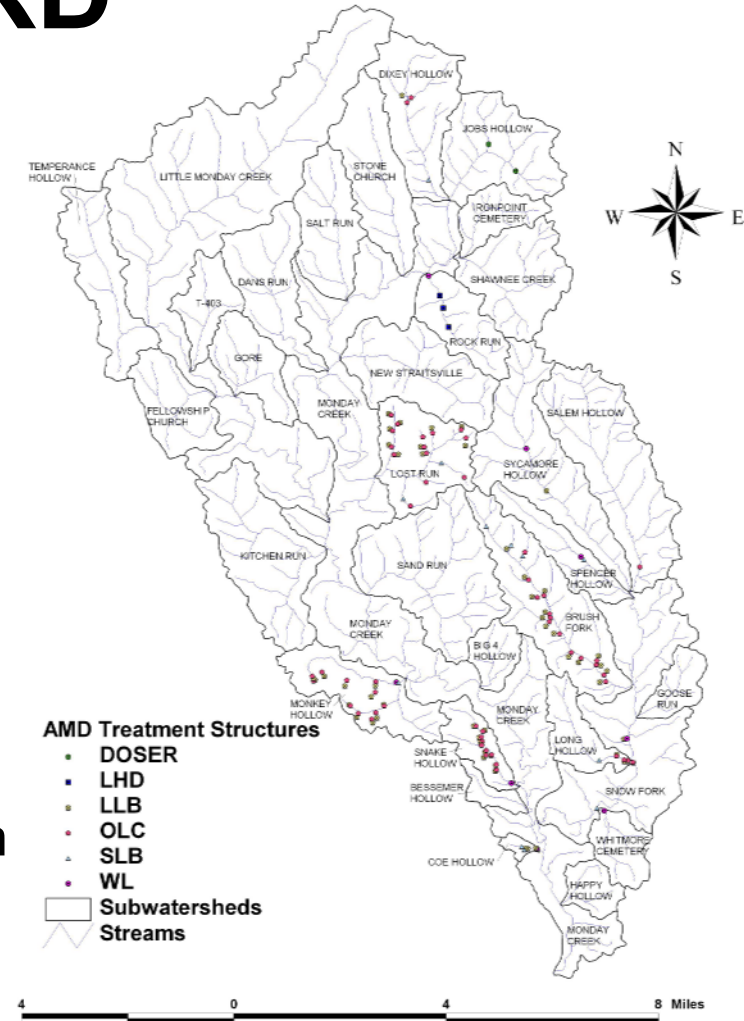


US Army Corps
of Engineers

NAD/LRD AMD Treatment Structures

Monday Creek

- **Successes**
 - Monday Creek OH
 - 116 Square Miles (74,240 Acres)
 - ~10% of Flow to the Hocking River
 - Heavily mined for coal past 180 Years (4,000 surface acres and 15,000 underground acres)
 - Elizabeth Mine Superfund Buttress Stabilization
- **On the Horizon**
 - AMD Demo Program
 - Southern Anthracite Coal Region
 - Formalizing Regional Business Center





**Elizabeth Mine (copper)
Strafford VT
New England District SFO for
EPA Region 1**

**Emergency buttress
stabilization of tailings dam**

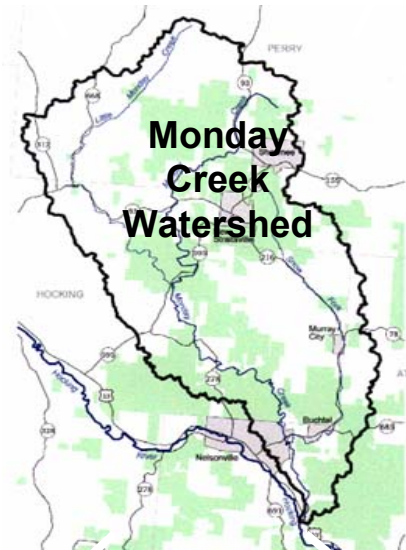
Funding
Real Estate
AMD Remediation Exp
Cost Data on AML
Projects



US Army Corps
of Engineers®

Funding
AMD Remediation Exp
Watershed Planning
Feasibility Report/NEPA

Biological
Sampling &
Analysis
Set Biological
Targets



Real Estate
Recreation Benefits
Haul Road & Tree
Cutting Plans

Master Data Base
Social & Cultural Data
AMD Remed Exp



Endangered
Species Analysis

Site Knowledge
Water Quality
Sampling
Public Involvement



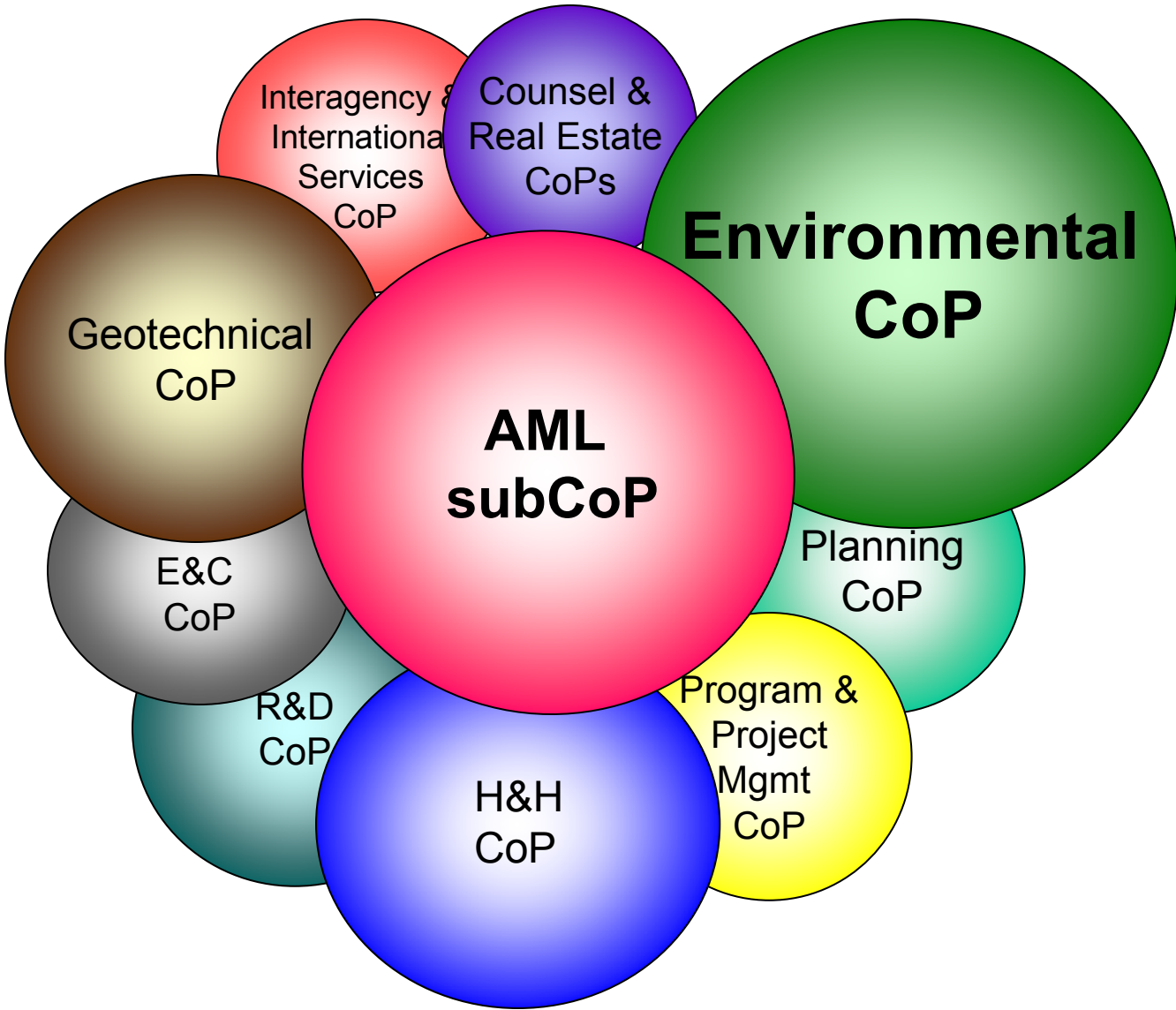
Mass Balance
AMD Remed Exp
Model Oversight



Model Study
AMD Remed Exp
Historical Cost Data



US Army Corps
of Engineers





US Army Corps
of Engineers

Abandoned Mine Land eCoP sub CoP

- **Representatives of the AML CoP**
 - share a concern with improving and restoring water resources that have been impacted by abandoned mine lands
 - will increase the efforts, cooperation and partnership among us to restore and protect the streams and watersheds affected by mine drainage
- **Mission:**
 - The AML CoP provides expertise in all technical and policy areas of abandoned mine land remediation and restoration to effectively plan, characterize, design, and construct AML-related projects with its partners in a timely and cost-effective manner



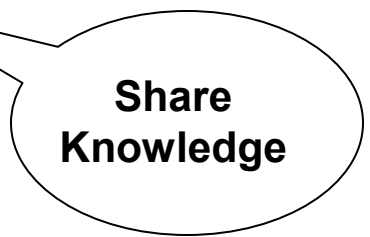
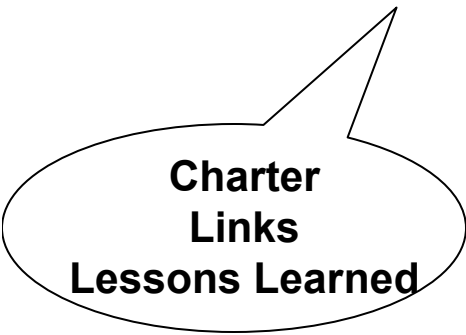
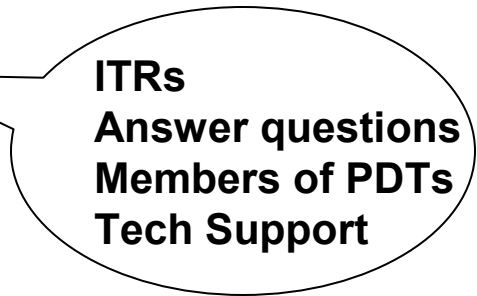
US Army Corps
of Engineers

AML SubCoP Goals

- **Cooperate as a clearinghouse to share and exchange data and information**
- **Raise the level of awareness on the serious environmental problems associated with mine drainage from abandoned coal mines**
- **Work with public and private organizations to target streams and watersheds which have been degraded by abandoned mine lands**
- **Increase the understanding and applications of the best technology available for remediating and preventing mine drainage, and to support the development of new technologies**
- **Provide a forum for the purpose of transferring technologies**
- **Develop shared information management systems to minimize overlap in data collection and development, to save resources and maximize the usefulness of data developed**
- **Meet periodically to discuss the current status of ongoing efforts to improve and restore degraded watersheds**



US Army Corps
of Engineers



**Restoration of Abandoned Mine
Sites (RAMS) - Western Region**

**Abandoned Mine Land (AML)
subCommunity of Practice**



US Army Corps
of Engineers



Restoration of Abandoned Mine Sites (RAMS) - Western Region

Abandoned Mine Land (AML) subCommunity of Practice



US Army Corps
of Engineers

Corps AML Workshops

- **5 workshops to date**
 - St. Louis, MO, 14-15 November 2000
 - Fairmont, MT, 16-18 October 2001
 - Gallup, NM, 22-25 July 2002
 - McHenry, MD, 29 July-1 August 2003
 - Hanover, NH July 8-10 2004
- **19 Districts (LRH, LRL, LRN, LRP, MVP, MVR, NAB, NAN, NAP, NWK, NWO, NWS, NWW, POA, SAM, SPK, SPL, SWL, SWT)**
- **3 Divisions (NAD, NWD, and SPD), HQUSACE, ERDC**
- **Other Federal agencies: BLM, USEPA, USDA Forest Service, USDOE, OSM, USGS, US Park Service**
- **9 states (CO, IL, MD, MN, NM, OH, PA, VA, WV)**
- **Universities (WVU, Penn State, Montana Tech, University of Utah)**
- **Tribal representatives (Navajo Nations)**
- **Consulting Engineers**



US Army Corps
of Engineers

Corps AML Workshops

- **Overview of current technology in coal & noncoal remediation Briefs by BLM, FS, USGS, DOE, EPA, ERDC on Federal R&D**
- **Briefs by Districts on Corps AML experiences**
- **Breakout sessions similar to Corps Listening Sessions**
- **Field Trips: reclaimed mines**
 - **MO Lead Mine: cap/cover/surface drainage, biosolids application**
 - **IL Coal Mine: cap/cover, anoxic limestone drain with polishing ponds**
 - **MT Silver Bow Creek Channel Restoration**
 - **MT High Ore Creek Reclamation Project and Comet Mine: removal of fluvial tailings deposits into two repositories, bank stabilization, and stream reconstruction**
 - **AZ Cove and Red Valley Uranium reclamation: cap/cover**
 - **NM McKinley Mine: Coal reclamation (#29 largest US coal mines)**
 - **MD and WV Coal AML: ALD, lime addition**



- **Defining Issues**
- **Technology Demonstration**
- **Relationship Building**



US Army Corps
of Engineers

Challenges Identified During Workshops

- **Planning/Policy Issues**
 - Funding and authorities
 - Staff development
 - Clarify Corps role in AML
 - Project issues (e.g., PCA, O&M, NGO)
 - Process improvements
- **Technology Issues**
 - Technology transfer
 - Site characterization
 - Standards and criteria for restoration/remediation
 - Improved technology
 - Monitoring



US Army Corps
of Engineers

Opportunities

- **AML sub-CoP develops**
- **AMD teams form across stovepipes and technical areas**
- **WRDA 539 amendment**
 - MD, OH, PA, VA, WV, KY, SMCRA tribe
 - Demonstration program similar to RSM, 227 programs
- **GI R&D**
 - Could move up schedule for implementing TAMDL in HEC-RAS
 - Hire experts within the labs for easy access
- **Planning CX**
- **Technical support for AML projects by Districts**
 - Direct technical support
 - Tech transfer
 - Field demonstrations