

# Summit on: A Framework to Manage the Environmental Reality of Orphaned and Abandoned Mine Lands

Convened by the Colorado School of Mines

November 14, 2017

## Summit Summary

The Colorado School of Mines convened its 2<sup>nd</sup> Summit on November 14, 2017. The first high-level CSM Summit on “Reasonable Expectations for Mine Closure” was held in 2016 and highlighted the need and desire to continue the conversation and develop collaborative strategies that lead to action. This 2017 summit was convened to discuss best practices and potential opportunities to continue the discussion of the interested community, closing in on guidance for navigating the complex environmental, political and social aspects of managing orphaned and abandoned mine lands. This document provides a summary of the Summit discussions from 2017.

Session 1 – Panel on “What do we know about our sites” facilitated by David Holm (CCWF) and Robin Bullock (CSM)

Jeff Graves, Colorado Inactive Mine Reclamation Program

Bill Bullock, Bullock Technical Services, Inc.

Greg Nottingham, National Park Service

Jeff Graves recapped the inventory process in the State of Colorado. The state considers pre-1977 abandoned or legacy mines in the “Inactive Mine Reclamation Program.” Issues include water, tailings and mine drainage, potentially hazardous mine openings, undermined neighborhoods (urban and/or community expansion), underground coal fires and environmental hazards. The program has sampled 800 such mines in a physical inventory between 1980 and 1982, and by extrapolation expect the total number to be on the order of 23,000. The state maintains an inventory database of safety closures, averaging about 300 per year. The state has several initiatives:

- 1) Draining Mines Inventory <https://erams.com/co-abandoned-mines-water-quality> In an effort to provide the most up to date and comprehensive data regarding draining mines throughout the state, the Division of Reclamation Mining and Safety (DRMS) and Colorado Department of Public Health and Environment (CDPHE) partnered to survey and sample 148 abandoned mines in 2016. The effort was championed by Governor Hickenlooper in his 2016 State of the State address. These 148 mines were a subset of roughly 230 mines DRMS, in cooperation with other state and federal agencies, identified as potentially impacting water quality. This website presents the results of the Abandoned Mine Water Quality Study.
- 2) Abandoned Mine Lands Data Hub <https://erams.com/aml> This provides an inventory of inventories including CDPHE, CGA, state and federal agencies, and includes >50,000 records.
- 3) The DOE (with DRMS) inventory of over 1,500 uranium mines, to be completed over the next 5 years.
- 4) Legacy project – focused on digitization and development of GIS referencing, and correlation with other inventories including those of the USFS, BLM and DOE.

Jeff’s thoughts on this process included the needs for:

- For coordination of existing and new inventories
- For a funding source to drive goals and prioritization with agency missions.

- To avoid inventory duplication, and avoid the problem with multiple agencies delivering multiple (but different) inventories.
- For inventories to be dynamic and focus beyond the inventories to keeping track of clean-up efforts.
- To find new technologies for the inventories, including mobile computing, LiDAR, UAVs, and being better at dealing with heavily timbered land.
- To link with NGOs and watershed groups and their data.

Bill Bullock summarized the 1990's inventory process used by the State of Montana. This effort, conducted by Pioneer Technical Services, was charged to look at the worst of the abandoned mine problems, consistently collect data, identify problems, and to compare and rank the sites using USEPA protocols. They were also to start clean-up activities. Initially 260 sites were identified, and 64 additional were added during the study. Site records were obtained from:

- Well log databases
- Rivers Information System records
- Community water supply records
- USGS streamflow data
- Population estimates
- Land ownership records
- Mine records

Mine tailings were characterized spatially and vertically, and waste rock samples were taken for XRF field analysis with 20% confirmation by CLP laboratories. The program performed all testing per USEPA, and used the Abandoned and Inactive Mines Scoring System (AMISS) developed for USEPA hazards ranking for CERCLA application. This system includes information on the releases, the waste characteristics, and the receptors in evaluating scoring. Data is presented at <http://deq.mt.gov/land/abandonedmines/priority>. When asked what he would do differently now, Bill indicated that they were lucky and the safety of field people could have received more attention, and also that satellite imagery and digital field data would enhance the inventory process.

Greg Nottingham presented the National Park Service perspective on the NPS as a Federal land manager of 417 NPS units. The NPS has CERCLA authority and can act to clean-up, something it has engaged in for about 20 years to date. NPS is charged to keep the nation's parks unimpaired for future generations in perpetuity, which NPS interprets as a 50 to 100 year viewshed in planning. Greg reported that 70% of the parks have some kind of contaminated sites. NPS operates its Contaminated Sites Program, including:

- FUDS – Formerly Used Defense Sites
- AML – Abandoned Mine Lands (estimated to be more than 58 sites, and a separate AML inventory that includes 3,421 sites as identified in 2010- 2013)
- Industrial sites (43)
- Leaking fuel tanks (57)
- Firing ranges (96)
- Landfills (96)
- And other sites with injuries to natural resources

He identified NPS needs as including:

- A. "bench" of clean-up practitioners, to complete the NPS inventory and definitions (estimated \$4 to \$6 billion is needed to address sites on NPS lands, and to merge stove-piped inventories (BLM estimates perhaps 93,000 new sites are yet to be identified).

- B. Increasing efficiencies: databases need to “talk to each other,” there needs to be more resource sharing. We need to identify best practices and what tools are needed for characterization and clean-up.
- C. Raising agency awareness to include:
  - leadership engagement
  - understanding (risk and consequences) of incidents (e.g., Animas River)
  - continue development of the NPS CS web portal based on standardized templates for information (not yet public)
  - encouraging broad participation (not site specific)
  - identifying funding streams/commitments that encourage creativity with mechanisms, avoid over-involvement of lawyers, and that expand collaborations including partners and sponsors.

Greg cited examples:

- Clark Fork and the Grant Kohrs Ranch in Montana
- Palmerton Zinc Pile NPL site (in Pennsylvania with smelter and air emissions issues) and the Superfund Operable Units impacting on the Appalachian Trail.
- Morning Star mine (Mojave National Preserve) which developed a win-win private partnership deal for gold recovery and pozzolan beneficial re-use – 11 years later, nothing has started yet.
- Nabesna mine site (Wrangell-St. Elias, Alaska) with tailings seeps into Cabin Creek with heavy metals and sulfides, impinging on private properties), and the nearby Kennecott mine with Arsenic, Lead, Asbestos, PAH problems associated with the power plant, paint and tailings.

Greg’s concluding statements addressed the following needs:

- To complete the inventory
- To clear the governance issues and standardize the processes
- Align the colors of money
- Establish strategic prioritization
- Develop site strategies that move to new directions, including cost recovery, insurance, partnerships and sponsorships.

Q&A

- 1) The USGS Mineral Resources Program was introduced, which has an inventory for their purposes. A reference provided was to “Prospect- and Mine-Related Features from USGS topographic Maps” <https://mrdata.usgs.gov/usmin/> that accesses 7.5 and 15 minute historic topographic maps in identifying sites. The USGS is also modernizing the old databases of USGS, USBM, etc. Revision 2 to be published in December 2017 – will cover all states west of the Mississippi River.
- 2) A suggestion was made that Coloradans have a state hike to cover the 1,645 miles of streams in the state. Perhaps as a public scientist effort. A panel response was that we do not need to identify sites that do not matter.
- 3) A question was posed on agency silos and data compartmentalization – and all concurred that we need to use IT better. A panelist noted that there are 7,000 software programs in use now across agencies.
- 4) A question was posed about how prioritization was accomplished. The panel response was notably pragmatic, noting that projects that are moved are typically those that have partnerships in place, have the money, or are driven by legal issues. Where is the prioritization for hazard severity?

- 5) Work needs to be done on the regulatory side of all this – each DOI bureau has its own way of doing things. Database resources need to be provided as a web service.
- 6) Complex land ownership and too much regulation and permits required at all different levels. And Federal money cannot be spent on private land, but many of the mine sites are privately held. This needs to be sorted out.

Session 2 – Panel on “Reclamation, Water and Land Use” facilitated by Mark Rudolph (CDPHE) and Linda Figueroa (CSM)

Diane Kielty, Clear Creek Watershed Foundation  
Jason Willis, Trout Unlimited  
Devon Horntved, Worthington-Miller Environmental

Diane Kelty introduced the Clear Creek Watershed Foundation (CCWF) (established in 1977). She discussed their attention to mine waste removal near streams, as the past history of the creek includes surface mining, hydraulic placer mining, lode mining, and milling. The Foundation works to identify the source of contamination in Clear Creek and its tributaries by following the water quality. In Clear Creek County, mine claim data shows 3,071 total mines, 112 active and 2,959 closed (<https://thediggings.com/usa/colorado/clear-creek-co019>). The Foundation then seeks out funding and oversees projects that mitigate sources of contamination. Diane gave an overview of an interesting project called the “North Empire Creek Restoration,” involving waste from the Conqueror, Gold Dirt and Benson/Bay State mines along tributaries to Lion Creek. <http://clearcreekwater.org/project-portfolio/>

Jason Willis discussed the focus of Trout Unlimited ([www.tu.org](http://www.tu.org)) on ecology (plants, birds, mammals and soil invertebrates) and soil in waste management. Trout Unlimited has been involved in many projects, and he provided a case study on the Minnie Lynch Mine that involved reclamation, water management, and reuse. Soil sampling began in 2009 and the three-phased project was completed between 2015 and 2017. The work was completed under CERCLA authority as a Non Time-Critical Removal Action, and an Engineering Evaluation and Cost Analysis (EE/CA) completed in 2015 guided the work. The total construction costs were \$344,070.

Devon Hornvedt discussed isolation and/or sequestration over the long term in mine planning, and provided his comments in a case study format of a project for the Newmont/Idarado Mining Company. Devon summarized what is needed to make a project “go”:

- Communication
- Clear and concise explanations of data
- Good policy
- Compromise and reasonable expectations
- Trusted/collaborative relationships – owner/state and federal agencies/NGOs/communities/contractors.
- Use local contractors where possible – that helps to make a project go, and often saves money (he gave the example of beneficial reuse of material from the region as a locally sourced cap fill material).
- Report on trials, remediation design tries for passive water treatment
- Use of Virtual Reality plus remote sensing and LiDAR with gaming applications to understand groundwater flow systems (example, in the San Juan Mountains).

## Q&A

- 1) Question about challenges in working with a community. The panel responded that best practice is: showing up and communicating, using remote sensing/mapping as very useful to show exactly what is planned, and consider using layers tuned to different parts of a project and different stakeholders.
- 2) Question about the CCWF project – all three parts of the project were on private land.
- 3) Question about phytotoxism to plant communities – concern about bio-thriving below the ground surface – from the use of compost, nutrients (example of a high pH beet pulp used to bring waste in from eastern Colorado to re-use in reclamation).
- 4) Contribution from the attendees – In Palmerton (PA), the biology was re-established using material from Allentown’s sewage waste, placed in 6 inch lifts.
- 5) Comment – for passive treatment to be successful, the design has to avoid plugging (including gypsum precipitation).
- 6) Question on liability concerns for NGOs – response was that any actor must stay within CERCLA.
- 7) Question on life-time and long-term performance/durability of remediative efforts. Panel response:
  - Try to design for return to a natural state. CCWF indicated that they typically only monitor for 12 to 18 months.
  - The concept is to remove the sources of contamination. And most CERCLA and other agencies define the monitoring requirements.
  - Who gets the results from any monitoring program is important. Maybe consider direct long-term monitoring by citizen scientists.

## Session 3 – Panel on “Policy and Partnerships” facilitated by Doug Young (Keystone) and Marcie Bidwell (Mountain Studies Institute)

Joel Chavez, Montana Department of Environmental Quality

Mark Rudolph, CDPHE

Ryan Ellis, Interstate Mining Compact Commission

Joel Chavez presented a case history from the Little Orphan Boy mine in Montana. He noted that around small sites, care is needed as it is easy to get people hurt. In Montana there are about 6,500 sites, of which 200 are abandoned mine sites, and 15 are on the Abandoned Mine Lands priority list. His approach is to not go after the water seeps – that is pointless – you need to focus on the waste source. His estimate is that on small sites, waste management costs can be \$50/CY total cost for a project, a number that might be reduced to \$25/CY for larger sites. Five Montana-based state and federal agencies were involved in this project. For his work, making collaborative relationships with agencies is important – e.g., the USEPA allowed access to an area as a repository, and USFS allowed them to use heavy trucks on its roads.

Mark Rudolph talked about mixed ownership and abandoned mine collaborations as a forum that can pool funding from several sources, and has the potential to identify and implement pilot projects. He described a multi-agency sampling event that involved state agencies (e.g., CDPHE, DRMS), county units, federal agencies (e.g., USEPA, BLM) and private owners.

Ryan Ellis gave a briefing on Good Samaritan legislative history, and on HR2937 that is focused on pre-1977 mining of coal only (not for hard rock applications). The content of the bill has been advocated for by the Interstate Mining Compact Commission (IMCC), a forum for member states related to coal mine related issues including abandoned mine land programs. He discussed the CRPA (Community

Reclamation Partnerships Act) as a model for state/NGO partnerships, and working toward Good Sam liability relief for coal AML by working under SMCRA Title IV. The problem for Good Sam legislation continues to be the retained liability from the Clean Water Act. He also identified both NGOs and industry itself as taking on the role of community reclamation partners using Title IV federal/state MOUs. The state can accept ultimate responsibility on behalf of a project – so the community partners effectively act as contractors to the state in terms of liability management.

#### Q&A

- 1) Need statutory changes to address the water issues
- 2) Question about what states have been at the table for HR 2937 – response: PA and MD, and some from the Midwest.
- 3) Comment on the importance of keeping hard rock AML out of the bill – would have been political death to keep it in.
- 4) Comment on going after the water versus getting the benefit of clean water as a side benefit. Problem – you can benefit the water and not touch it, but when you try passive or active treatment on the water itself, you own it.
- 5) The environmental community doesn't support any bill that might potentially undermine the Clean Water Act provisions.
- 6) Comment: Politicians listen to those speaking what they want to hear.
- 7) Need to elevate the profile of the problem of AML in the U.S. Should the Clean Water Act be amended? – Yes, but not likely!
- 8) This problem is less a question of shedding liability than about who will be assigned the liability.

Session 4 – Panel on “Stakeholder Perspectives” facilitated by Nicole Smith (CSM)  
Laura Skaer, American Exploration & Mining Association  
Dr. Joe Ryan, CU Boulder  
Bonie Pate, CDPHE, Water Quality Control Division  
Michelle Hamilton, Silverton  
Brian Lorch, Snake River NGO

Laura Skaer of AEMA ([www.MiningAmerica.org](http://www.MiningAmerica.org)) stated that the number one impediment to voluntary clean-up is liability under state and federal laws. Good Sam legislation has been worked on for more than 20 years. Why so little progress?

- Influence of anti-mining groups
- Lack of liability relief
- The perfect is the enemy of the good
- Citizen suits cannot be in a Good Sam bill
- AML fees
- Full CWA and CERCLA liability for any Good Sam permit violations
- Too many disincentives.

The AML problem is finite, and there are reasonable conservation groups to partner with who can help generate both state and federal support, although there will be some roadblocks. We need a new approach, which should include one bite at a time pilot projects – bringing a focus on one or more demonstration projects at a time. We also need to exhibit calm concern about protecting and not opening the CWA for modification. By piloting and working with industry (most abandoned mines are in districts with active mining), and applying incentives (e.g., cap and trade), progress can be made.

Joe Ryan asserted that academe has played a role in the AML issues, including thinking about costs, liability, general thermodynamics, and technology. Too many are unnecessarily hesitant about Good Sam projects – need to form coalitions and co-opt all of the stakeholders. He indicated that we need to decide how to actually move forward on Abandoned Mine Land clean-up. Pragmatic prioritization about where to put the money for the biggest bang, and look for synergies and opportunities to develop downstream partners who can co-invest in projects. Joe indicated the importance of training people for the future, and in tempering the media response to incidents (e.g., Animas River) through media education. He also believes that the prioritization methodology needs to be understood and agreed to in making decisions.

Bonie Pate noted that many sites in the western US are at high altitude with seasonal impacts on project schedule and the success of passive treatments (<https://erams.com/map/>). In addition, there is a strong need to prioritize with the limited funding available. For her, the most polluted site has the most restoration potential, less resources required for impact – go after the low hanging fruit. Also she commented on the need to establish/consider metrics from natural background in establishing metrics to be achieved in remediation. Considering the significant length of potentially impacted streams in Colorado (she suggested a number over 1,800 miles would be more appropriate), need to develop integrated watershed planning, removing mine wastes from streams, mine waste consolidation (and consider reprocessing), hydrologic controls and in situ treatment. She also talked about the use of USEPA Action Memoranda to relieve CWA and CERCLA liability concerns.

Michelle Hamilton noted the high costs of work and the lack of incentives. This involves local culture, and ability to communicate effectively with all stakeholders, including downstream users, environmental issues and climate, and agency coordination- clear explanations are needed. She looks for the logical step forward, and wants to see the opportunity for outreach and educational programs involving youth and citizens of all ages. She looks for more innovative technology to be used, and agreements so that trials/tests can be accomplished without worries. She wants to see all funds spent responsibly, involving local resources and contractors, continuing partnerships and supporting the next generation by finding sustainable solutions.

Brian Lorch noted land ownership and liability as big issues. Many have the desire to do something, but need to use the carrot, not the stick. Think holistically to include creating incentives, e.g., consider the other property investments that can be included or traded off beneficially in solving the problems of the focus site. Brian also summarized some of the Summit County efforts to keep homes on AML from being built, and acting as a facilitator in many mine clean-ups. This approach allows them to make progress, if not get the job done, without stepping directly into liability.

What we heard: Summary of the Summit by Priscilla Nelson

I heard about four main issues:

1) Inventories

- A lot of work completed to date, but more to do.
- MANY versions, no standard formats, categories, questions or spatial registration of observations and locations
- Inconsistent definitions
- Merging is required. Who should do this? If we made a Wiki, would everyone come? Not likely. Universities would do this if there was a source of funds.
- If we do not roll up all of the information from all agencies, states, owners, we will never know how big a problem we have. As things are now, we can pretend this is a low-grade

- infection on the environment. Rolled up, we may identify a high fever and the aggregate costs would intimidate starting.
- Too many lawyers, owners, pyramids, nonstandard processes.
- 2) Prioritization
    - Seems no consistent methodology
    - Competing priorities for different agencies and stakeholders. We must work to establish a consistent approach to prioritization
      - Human health and safety
      - Environmental impact
      - Who is paying
      - Legal drivers
      - Teams with history of working together – partnerships in place
      - Likelihood for success
  - 3) Time. Reasonable expectations need to be established for
    - Schedule
    - Extent of isolation/sequestration
    - Long-term performance
  - 4) Remediation problem definition
    - We do not always understand correctly what the existing condition is, and what the problem to be solved is
    - We are hesitant to apply or develop new technology.
    - We need to be provided with authorization to try/monitor/fail. We cannot expect success for every intervention.
  - 5) Funding – needs to be faster, more creative, partnered, accepting of risks of innovation.
  - 6) Partnerships/trusted relationships are very important for funding, liability, policy (CRPA and CWA), communication and establishing common and reasonable expectations. The public becomes jaded about actually getting something accomplished. We should be engaging them as citizen scientists. Note that the voices from the mining industry were not sufficiently heard at this Summit.
  - 7) We need to be taking a holistic watershed approach to understand the extent of environmental harm – including surface water and groundwater systems.

Outstanding questions not posed to the panels:

- 1) How much has the NPS discussed with industry (mining) regarding standardizing a) baseline information, and b) assessment and closure processes?
- 2) Has there been an attempt to “overlay” a geologic context to inventories to refine hazard indices (i.e. applying geoenvironmental models, GEMs)?
- 3) For the Montana inventory – If 1993 had been a dry year, would the priority list be significantly different? Answer – Probably not significantly. Stream sediment sampling was also used to document releases and receptors would not have changed. The only major difference would have been the magnitude of releases documented and the possibility of missing some of the sources.
- 4) After all of the inventory work to date, do we have a good sense of the top 25% of the sites that need remediation work?
- 5) Are the AML sites given a priority in the databases (i.e. how important are they for clean-up management)?
- 6) How are the sites that are not water quality issues ranked (e.g., asbestos in Libby, Montana)?

- 7) Another killer to clean-up: regulations. Endless investigation, endless review, non-approval of any project because “you can’t be sure it will work.” How can we fix this?
- 8) After completing the Lilly Orphan Boy stream restoration, you might watch for metals adsorption (e.g., Pb, Cu, Cd, etc.) on manganese oxide (mother nature’s activated carbon) downstream from the site. Dissolved iron will interfere with this.
- 9) When you build a passive treatment “wetland”, you increase evaporative losses which means that your impact a downstream water right (probably senior). Does this situation impede Good Sam projects? Who’s going to buy/pay for the perpetual water rights impacts?

#### Attendee inputs at the end of the Summit

##### A. Inventory

- 1) There’s a lot of inventory information/data in place – please add all web sites available.
- 2) There is an opportunity for Mines to be a coordinator of information (in conjunction with the USGS and CGS), plus long term monitoring.
- 3) Use Mines field sessions to supplement inventory information – work with the state annually to target sites.
- 4) Let the community of users know/be aware of the USGS dataset that complements AML inventories. USGS intends to compile this dataset for all of the conterminous U.S. states – anticipate that it will take 2 to 3 more years to complete.
- 5) Westar Solutions has partnered with Montana DEQ, USFS, BLM, USEPA, and OSM to successfully develop a dynamic field form (on a tablet) to update AML inventories throughout the west. This data can then be housed in a single location and exported to populate each agency’s database.

##### B. Good Sam

- 1) Ways to move forward without Good Sam:
  - a. Non-point source issues – EPA comfort letters, state permit for stormwater, lots of public outreach using public funds.
  - b. NGOs and/or states, tribes or industry can be named as implementing contractor under CERCLA to provide liability protection.
  - c. Provide for smaller focused discussions which allow larger opportunity to exchange ideas. Need to figure out how to get the right people in the room.

##### C. Case Histories

- 1) Enjoyed seeing reclamation efforts. Stunned by the number of sites on federal lands. Nice discussion of Good Sam issues. Next year – want to see USEPA superfund site discussions, and more focus on tribal inputs.
- 2) Need for locally established community groups to be conveners, in leadership, and performing long-term maintenance.
- 3) Why isn’t the mining industry included in partnerships. The next Summit should have examples.
- 4) Include many case studies and pilot projects.

##### D. Inter-agency

- 1) This Summit clearly confirms the intra-agency complexity of any AML clean-up program. The same statement applies on any clean-up project, i.e. complexity of law and regulations. From an industry perspective, the time frame to plan, execute, and complete an AML restoration program seems extremely lengthy! Planning, execution and completion should take less time.

- 2) The AML problem was approached with narrow focus: attendees gave agency and NGO perspectives without industry participation.
  - a. I note an issue with double standard being employed – agency/NGO clean-ups escape scrutiny and limits imposed on industry.
  - b. I note an issue with project longevity: agency/NGO projects are years/decades in duration and are effectively research projects – career employment guarantees for agency staff. This is versus the short time frames and tight limits imposed on industry.
  - c. It is ironic that agency/NGO clean-ups emphasize “bang for the buck” yet unlimited expenditures and rigid performance standards are imposed on industry participants that are willing to conduct clean-ups.

#### E. Next Summit Organization

- 1) The next Summit should have working group discussions; exercise the brain trust in the room to get to “next steps”.
- 2) Put affiliation on name tags. Really good panel discussions – done in an order that made sense and had flow. The room was full of a great mix of perspectives.
- 3) Next Summit – invite the Colorado delegation, Western Governors Association, NWWA and AWRA, community/city water providers, utilities organizations, Healthy Headwaters Alliance. Some legal experts.
- 4) Who wants to form a working group – ask and form!
- 5) Great organizing this event. Highly recommend including time for breakout sessions or round tables in order to continue to inform these groups on what is really going on. Also focus on one or two topics in order to really dig into innovative solutions.
- 6) Need students to present out of the box ideas
- 7) Need more career fields to attend (ex., Ramona Graves introduction to lunch).
- 8) One day similar to today followed by one day of students presenting alternatives to issues. Include journalism students.
- 9) Next time, set a screen/projector set-up so the entire audience can see the entire screen, not just the upper 50%.
- 10) Get microphones that work and turn them on.

#### F. Ideas

- 1) Allow brownfields (i.e. solar, wind, etc.) as public good as a form of reclamation or repurposing (Energy Engineering) without worrying about restricting revenue used.
- 2) Look at subsoil bio-activity, bacteria, fungi, as sources of filtering and nutrient transfer for surface plant growth – all to help improve water quality in perpetuity.
- 3) For on-going mines, also, how to have community jobs and viability part of reclamation.
- 4) How to repurpose mines to research, industry equipment testing, etc., so that today’s mines do not become tomorrow’s abandoned mines.
- 5) Bring in industry and new technologies.
- 6) What are the areas with high natural backgrounds?
- 7) What about technical enhancements?
- 8) Give a presentation at the Colorado Water Congress.
- 9) Discuss new clean-up technologies and reclamation techniques.
- 10) “A Decade Later” – what worked well, how to make it better, what did not work well, pitfalls to avoid. Specifically interested in short- and long-term phytostabilization effectiveness.
- 11) How can larger institutions partner with local communities for the greatest positive impact?

- 12) How/what can communities do to make themselves provocative for large institutions to bring to the field schools/extension universities/capstone projects, et. To associated superfund districts?
- 13) How can we provide easier access for testing innovative technologies in an equitable way for institutions, start-ups and entrepreneurs. How do we market that?
- 14) Some focus on technology applications to AML. Include treatment methods, survey applications, geophysics.
- 15) Focus on the state of technology and application in the next Summit.

Attachments:

Summit Flyer

Summit agenda

Attendee List

Organizers Biographies

Facilitators Biographies

Speakers Biographies

Flyer for April 2018 MMSA Summit

Flyer with link to the Mines survey participation request

Overview of the Community Reclamation Partnerships Act CRPA HR 2937 as discussed at the Summit

Community Reclamation Partnerships Act CRPA HR 2937 – passed version

Presentation Slide Sets

1B Bullock

1C Nottingham

2A Kielty

2B Willis

3A Chavez

3C Ellis

4A Skaer

4B Ryan

4C Pate