

reclamation *matters*



Spring 2017 Issue and Joint Conference Program

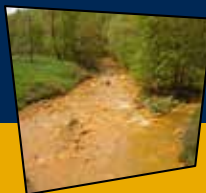
WHAT'S NEXT FOR RECLAMATION?

April 9-13, 2017

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reclamation matters

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EDITOR'S MESSAGE

Where Will You Be in 10 Years?

By Jeff Skousen

Welcome to the 2017 Joint Meeting!

We are delighted to have you in Morgantown.

Several weeks ago, my local newspaper reprinted an article written by Rex Hupke, who writes for the *Chicago Tribune*, on workplace strategies. He referred to a book written by Brian Fetherstonhaugh entitled *The Long View: Career Strategies to Start Strong, Reach High, and Go Far*, which received a 2016 Best Book Award. In his book, Fetherstonhaugh observes that careers commonly evolve through three stages. The first stage is what he calls “taking on fuel,” when young professionals “learn the ropes,” observe their colleagues work ethics and habits, try new ideas, build skills, learn different perspectives, consider options, and develop contacts and networks. The second stage occurs 10 to 15 years later, when a professional uses these skills and experiences to increase strength, examine trajectories, and expand into new arenas or stretch into bigger markets. The work performed during the first stage is rewarded during the second stage by success in an ever-widening circle of influence with recognition of skills and expertise by more and more people. In the third stage, the mature professional enjoys the fruits of the hard work in previous stages, strengthens the ties and

partnerships with others, updates and maintains skills, and gains broader experience. During the third stage, a seasoned professional can then become a valuable mentor to first and second staggers. This three-stage process varies with individuals and disciplines, is not rapid, and can be detoured with obstacles and downturns. Hence the name of the book: “The Long View...”

In another section, Fetherstonhaugh stresses evaluating careers by asking some simple questions, regardless of the career stage. The answers can have profound effects on how a professional may choose to work. “What am I learning?” is the first question. What are the new skills and experiences that I have gained during the past year? How am I enlarging my knowledge and contacts? The second is “Am I having an impact?” Am I making a difference in my organization and what positive contributions have I made to the organization this past year? “Am I having fun?” is the next. Do I go to work with anticipation and enthusiasm, or with indifference and boredom? The last is “Am I compensated for my work?” Am I rewarded fairly when looking at the full benefit package (pay, benefits,

incentives, flexibility, etc.)? With the answers, a worker can focus on what is most important to them, the good and the bad, and how things should change in the coming year.

These ideas are relevant for students as they prepare for careers, for young professionals trying to find their place, for middle managers, regulators, and professors, as well as senior personnel and company presidents who have been at their jobs for years or decades.

A good way to learn and be current on developments and new ideas is to attend professional meetings. This year’s meeting is a joint conference with three organizations with similar goals and overlapping disciplines. This is an opportunity for you to acquire new knowledge, skills, and experience. More importantly, this conference allows interaction with a broad spectrum of people in the reclamation industry and the contacts you make here may improve your chance for making an impact, enlarging your skills, widening your circle of friends, and performing better work.

Again, welcome to the conference, and I hope your time here is well worth it. Have fun and learn! ■

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Student Chapters in ASMR

By Cindy Adams



The University of Wisconsin-Platteville was the first student chapter of ASMR and was started in 1984. Today, there are three chapters. I asked each of the student chapters to answer a series of questions about their group so we all can get to know them better. Working with student chapters and sharing knowledge and experience with them are two ways to help support these groups and to prepare them as future reclamationists.

The **Saint Francis University** chapter has 14 members and was formed in 2016 (after the momentum from the 2016



Saint Francis University ASMR Student Chapter members volunteered with BioMost in Clearfield, PA, at the Morgan Run 8 Passive Treatment Wetland. From left to right are Josh Vinglish, Andrew Potopa, David Madl, CJ Spellman, Hannah Patton, Austin Zachrel, and Kevin Tomkowski (photo by Hannah Patton).

ASMR Meeting in Spokane, WA). The members are most interested in acid mine drainage remediation and the Water Management and Ecology Technical Divisions. The goal of the chapter is to provide undergraduate students in environmental engineering with opportunities to gain experience in reclamation and water remediation processes. The students also would

like to become familiar with research, applied research in the field, training and internship opportunities, and occupations in reclamation sciences. Additional goals of the chapter are to help students discuss and apply their understanding of these concepts with peers and faculty in real world situations and to promote opportunities for students to give back to the community in environmental settings. The chapter is actively engaged in a variety of activities and projects including:

In September, students participated in volunteer work in Clearfield, PA, with the environmental consulting firm BioMost to help plant a wetland at the Morgan Run 8 Passive Treatment System. Seven chapter members traveled to Clearfield on a Saturday to plant hundreds of bare-root plants at the treatment site. This volunteer work proved to be both fun and educational. Chapter members were given a tour of the entire treatment operation, which provided knowledge and insight in designing passive treatment systems and wetlands.

Student chapter members volunteered at the first annual Engineers in Action Fast Festival that was held this past November at Saint Francis. The purpose of this event was to raise awareness about the Engineers in Action 36-hour fasting fundraiser that raised money for community-requested engineering and environmental work that helped to provide access to water and improve water quality in Bolivia.

This spring semester the student chapter will help with preparations for the 2017 Joint Conference in Morgantown, WV.

Plans have also been made to visit more acid mine drainage reclamation and remediation sites.

The University of Wisconsin-Platteville chapter has 20 members and the majority of their members are interested in the Forestry & Wildlife Technical Division. Their focus is to encourage education and awareness of the profession of reclamation, and to enhance communication between students and professionals working in the environmental field. This chapter is also devoted to preservation efforts to manage local prairies and savannahs, and to establish conservation practices for management of resources for future generations. The chapter is actively engaged in a variety of activities and projects, including:

- Attended the 2016 ASMR Conference and The Prairie Enthusiast Conference,
- Participated in a prescribed burn of on-campus prairies,
- Helped in the management of Ipswich State Natural Area including burning and invasive species removal,
- Worked on native plant seeding,
- Attended the Wisconsin Sustainability Conference and Prairie Tour on campus,
- Hosted Brenda Schladweiler, ASMR President, to visit campus and speak.



The University of Wisconsin-Platteville chapter members participated in a prairie burn near the campus (photo by Michele Cliff).



Students in the ROaR chapter at the University of Wyoming help with a native plant seeding (photo by Mike Curran).

The **University of Wyoming** chapter is called **Restoration Outreach and Research (ROaR)**. The student group has about 30 members. ROaR was started in 2012 and members are most interested in the Ecology, Forestry & Wildlife, Soils & Overburden, and Land Use Planning & Design Technical Divisions. The main goal of ROaR is to provide a venue in which undergraduate and graduate students with interests in reclamation and restoration of disturbed lands can assist local organizations on environmental projects. In the process, the students hope to gain skills for success in their future careers and acquire contacts and networks with others in the field. The group is actively engaged in a variety of activities and projects including:

Cleaned up Spring Creek in association with the City of Laramie's Earth Week city beautification project,

Worked with Union Pacific Railroad and CH2M Hill on a program to create pollinator habitat along the Laramie Green Belt. It included a bike path through a phytoremediation site near a former Union Pacific site of environmental concern.

If you are interested in starting your own ASMR Student Chapter please see the procedures at: <http://www.asmr.us/Portals/0/Documents/Membership/ASMR-Student-Chapters-20150330.pdf>.

A chapter includes five or more students with interests in reclamation. The chapter will write a charter to be approved by the NEC. The charter identifies the chapter's goals/purpose, areas of interest, names of officers/advisor, and frequency of meetings.

Many students are presenting their work at the ASMR April 2017 Conference, including those from both Saint Francis University and University of Wyoming:

Hannah Patton and Lydia Mignogna – Pollution Loading Tracking to Characterize Success of an Anoxic Limestone Drain Installation on Lambert's Run, Southwestern Pennsylvania.

Charles Spellman and David Madl – Mass Transport Controls on Aluminum Removal in Limestone-based Treatment Systems.

Ashley Rovder, Staci Wolfe, David Madl, and Stefan Long – Georeferencing of American Society of Mining and Reclamation Proceedings: A New Tool and Patterns in Reclamation Research.

Sawyer Rensel, Justin Hugo, and John Gaughan – Seasonal Recovery of an Appalachian Stream Affected by Acid Mine Drainage and Municipal Wastewater.

Amy Jacobs – presentation about her work involving sagebrush restoration.

We look forward to seeing everyone at the ASMR Early Career Professionals event on Monday night, April 10th after the Exhibitors Reception at the ASMR Joint Meeting!

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What's Next for Reclamation?

Joint Conference

April 9 - 13, 2017
Morgantown, WV

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2017 Joint Conference

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APPALACHIAN REGIONAL REFORESTATION INITIATIVE

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Program Committee



Left to right: Jeff Skousen, WVU, Conference Chair; Louis McDonald, WVU, Program Coordinator; Tim Danehy, Biomost, Technical Director; Robert Darmody, ASMR, Support Services; Tiff Hilton, Exhibit Czar; Ben Faulkner, Bratton Farms, Donations

Exhibitors to date



Transportation

Morgantown, WV, is located about 80 miles south of Pittsburgh, PA. Travelers can fly to Pittsburgh, PA, rent a car and drive via I-79 to Morgantown, or fly to Morgantown. <http://www.tourmorgantown.com/>

The Waterfront Hotel provides a shuttle service from the Morgantown Airport. Call 304-296-1700 to arrange.

Elite Transportation will provide transportation to and from the Pittsburgh Airport on Sat-Sun and Wed-Fri. Please call 724-325-2626 or 800-488-7775 for times and to make your reservation. Cost for a round-trip ticket will be around \$60.



Conference Site

The **Waterfront Hotel** is the conference center and hotel. The hotel features 206 deluxe guest rooms. A block of rooms has been reserved at a rate of \$109 per night. Room block is under the name "Task Force."

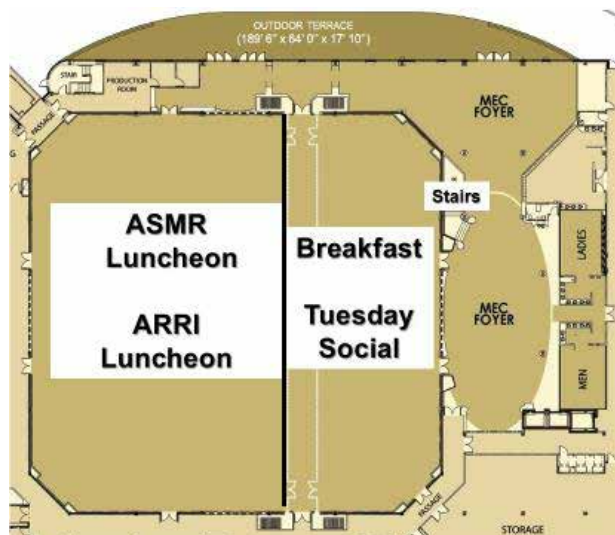
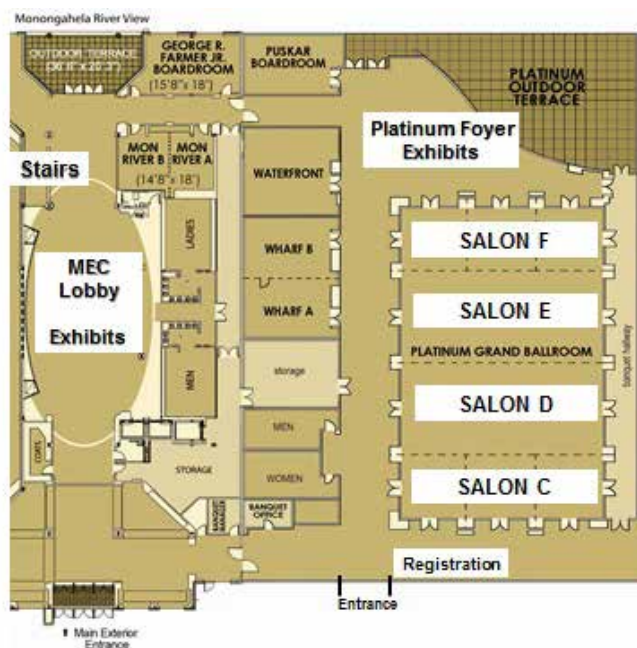
The phone number is 304-296-1700. Make your reservations today!

<http://www.waterfrontplacehotel.com/>



- All workshops and sessions will take place in Salons C, D, E, and F.
- The ASMR NEC Meetings will occur in the Puskar Boardroom (Sunday and Thursday).
- The ARRI Team Meetings will occur in the Farmer and Puskar Boardrooms on Wednesday morning.

- The Silent Auction for student scholarships will be in Wharf A&B.
- The Speaker Ready Room will be in the Farmer Boardroom from Monday to Thursday.
- Exhibits will be in the MEC Lobby and Platinum Foyer, see maps below.
- The Monday Reception will be in the MEC Lobby and Platinum Foyer.
- ASMR and ARRI Luncheons will be in the Downstairs MEC area.
- Breakfast will also be downstairs.
- The Tuesday Social will be located downstairs in the MEC Foyer.



Exhibits

4 – ARRI	34 – USP Technologies	44 – Trihydro
11 – ASMR	35 – JRW Bioremediation	45 – Greer Industries
12 – Somerset Environmental	36 –	46 – Carus Corporation
16 – Aquafix Systems	37 – WK Merriman	47 – Veolia
17 – Hedin Environmental	38 – Foam Concepts	48 – Navigator Environmental
18 – NASLR	40 – Civil and Env. Consultants	49 – St. Cloud Mining
19 – Chemstream, Inc.	41 – OSMRE	50 – Aridea Solutions
21 – RESPEC	42 – Arbogen	51 – Truax Inc.
25 – Clean Creek Products	43 – Full-Circle Mushroom	52 – REI Consultants
33 – Baker Corp	37 – WK Merriman	

Exhibit Map



- 9. Overview of decarbonation techniques
- 10. Geochemistry of CO₂ I

III. Active Mine

Drainage Treatment (1 hr)

- 11. Dense Sludge Technology
- 12. Clarification Technologies

IV. Selenium Removal (1 hr)

- 13. Selenium Chemistry
- 14. Biological
- 15. Physical Chemical

V. Sulfate and TDS Removal (1 hr)

- 16. Sulfate Desaturation
- 17. Low SO₄
- 18. Membranes: NF vs. RO
- 19. ZLD/Crystallization

Workshops

#1 Mine Drainage Treatment Workshop
Brent Means, OSMRE,
and Jill Browning, Veolia
Sunday, April 9, 2017,
8 – 5 pm. \$120.

Salon D. The course will be an overview of the chemistry of mine influenced waters as well as a review of some active treatment solutions for compliance with environmental regulations.

Agenda

I. Geochemistry of Mining-Influenced Water (2 hr)

1. Hot Acidity Titrations
2. Aluminum Chemistry
3. Ferric Iron Chemistry
4. Ferrous Iron Chemistry
5. Manganese Chemistry
6. Sulfur Chemistry

II. Decarbonation (1 hr)

7. Why is it important?
8. Scenarios when it is useful

#2 Android- and IOS-based Geo database Collection for Active and Abandoned Coal Mining Sites
Andrew Schaer and Lukus Monette
Sunday April 9, 2017 1 – 4 pm. \$20.
Salon F.

The Office of Surface Mining, Technical Innovation and Professional Services (TIPS) is deploying training for Mobile GIS and GPS on different platforms for use in mining and reclamation. This includes ESRI ArcPAD



and Trimble TerraSync on various Windows operating systems and a whole suite of GIS apps for Apple IOS and Android devices. This workshop will provide an overview and demonstration of the existing and emerging mobile applications and show how they can be of use in mining and reclamation related field work.

With ArcPAD and TerraSync we will illustrate how we have been using the programs in SMCRA business practices. Using Apple IPADs (and Android) we will demonstrate the use of ESRI Collector, PDF Maps and other GIS applications. During the last year, iPads and Android devices have been tested for collecting shapefiles and geodatabase information using the ESRI Collector. In addition, PDF Maps was used to interact with complex geo-referenced maps in often very remote field locations. This has been done with both internal Apple GPS systems and external Bad Elf and Trimble GPS systems. Using these systems complex database entry is easily accomplished in field with map grade GPS accuracy.

Participants may want to bring their own iPad, smartphone or similar mobile smart device.

#3 Passive Treatment Design, Implementation, and O&M Tim Danehy, BioMost, Inc.; Cliff Denholm, Stream Restoration Incorporated Sunday, April 9, 2017, 1 – 4 pm, \$50. Salon E.

This workshop will provide an overview of the treatment technologies used in watershed restoration and mine drainage treatment with a focus on the many types of passive treatment technology including cost estimation and operation and maintenance considerations.



- Treatment Overview
- Active Treatment
- Passive Treatment
- Passive Treatment Design and Implementation
- Water chemistry basics
- Acid vs. Alkaline Drainage
- Types of passive treatment
- Wetlands/Settling ponds
- ALDs
- VFPs
- TIFs
- HFLBs
- Other technology
- Cost estimation
- Operation and Maintenance
- Typical by treatment type
- Work required
- Typical schedule/planning
- Cost Considerations

#4 Natural Process for the Restoration of Drastically Disturbed Sites David Polster, Polster Environmental Services, Ltd. Sunday, April 9, 2017, 8 – 4 pm. \$150. Salon C.

This workshop will explore how natural processes, systems and functions can be used to restore sites that humans have disturbed such as large mines, industrial disturbances, landslides, shorelines and other disturbed sites. We will look at how natural systems recover and control erosion and steep, unstable slopes and how we can design



restoration treatments to mimic these processes. We will explore the natural processes that provide nutrients and nutrient cycling capacity to ecosystems and how these can be reestablished on drastically disturbed sites. In many cases restoration treatments based on these natural processes can be used to restore anthropogenic disturbances more easily and at a lower cost than traditional reclamation treatments. Examples will be drawn from the mining and heavy construction industry. This course will be of interest to those engaged in the restoration of disturbed sites. Managers or other personnel from large mines or other sites where disturbances must be reclaimed will be interested in this course. Regulators and others looking for effective restoration strategies will find this course useful. Participants will learn a variety of treatments to control erosion, re-establish vegetation and build soil-forming processes. Specific details are provided to address issues that are commonly found at mines and industrial sites (e.g. compaction, steep slopes, adverse soil texture, toxic materials and lack of organic. A course manual will be provided at no cost.

#5 Reclamation Standards, Bonding, and Compliance Inspections for Reclamation Success at a Large Western US Surface Coal Mine (Semi-arid Shortgrass Prairie) Anna Krzyszkowska Waitkus, Environ. Consulting. Sunday, April 9, 2017, 1 – 4 pm, \$100. Wharf A&B.

The workshop will discuss regulatory performance standards, bonding, reclamation bond release procedures, and compliance inspections using a GIS/GPS approach for a western surface coal mine (semi-arid shortgrass prairie). The North Antelope Rochelle Mine (NARM), the largest surface coal mine in the US, will be used to demonstrate how State of Wyoming regulatory performance standards, along with best mine management practices resulted in successful mine reclamation and bond release. The workshop will cover three topics: regulatory environmental performance standards, reclamation bonding for coal mines in Wyoming, and the use of geospatial tools with field inspections for tracking regulatory compliance.



Regulatory performance standards

Specific information will be provided about Wyoming's environmental protection performance standards as they pertain to best mine management techniques such as:

- salvaging all suitable soil,
- locating, segregating and burying unsuitable overburden material,
- replacing backfill material and building post-mine topography,
- replacing soil material, and
- seedbed preparation and revegetation with methods using native plant species.

Reclamation bonding for coal mines in Wyoming

All coal mine permittees must obtain and update their reclamation bonds. As the permittee completes phases of reclamation by fulfilling specific criteria and performance standards they can apply for bond release through incremental bond release phases. There are four bond release phases (Area Bond, Phase 1, 2, and 3) for surface coal mines in Wyoming. The presenter will discuss:

- Bond release criteria and performance standards verification for specific bond release phases,
- Reclamation bond calculations for an Area Bond and incremental bond phases for the mine.

Field inspections and geospatial tools for tracking regulatory compliance

Regulations require documentation of areas that were verified and/or bond released through time. The Bond Release Geo-database (GIS/GPS approach) was developed for the NARM to support the tracking of areas that have satisfied various criteria and performance standards for the incremental bond release and complied with regulatory requirements and permit commitments.

This pioneering geo-database is the first spatially supported database developed in Wyoming for mined land reclamation bond release and inspection purposes. Examples will illustrate how the Bond Release Geo-database significantly reduces the time needed to track bond release progress, reach agreement between operator and regulator, and improve the state inspector's ability to assess reclamation adequacy and progress.

Field Trips

#1 Surface Mining and Post-mining Land Use Jeff Skousen, WVU; Dan Skaggs and Steve Pachol, MEPCO.

Tuesday, April 11, 1 – 5 pm. \$30.

A small 100-ac surface mine outside of Morgantown will be visited. Attendees will see mining equipment operating in the pit, observe the coal and overburden, and see reclamation practices including backfilling, topsoiling, and post-mining land use development. The second stop will be at the Steele Shaft Hydrated Lime Treatment Plant, and observe degassing of CO₂ from the water, slurry tank and mixing, and the clarifier for solids removal. The third stop will visit a 25-yr-old reclaimed area at Mylan Park where various post-mining land uses such as baseball and soccer fields, schools, recreation center, etc., have been established.



#2 Acid Mine Drainage Chemical Treatment Plants Mike Sheehan and Paul Ziemkiewicz, WVDEP and WVU.

Tuesday, April 11, 1 – 5 pm. \$30.

The West Virginia Dept. of Environmental Protection operates several AMD treatment systems in the Cheat River Watershed with several more in planning and construction. The first stop will be the T&T underground mine, which has an ammonia chemical treatment plant that is being converted to a large hydrated lime treatment under construction. A number of AMD sources in the Muddy Creek Watershed will be brought to the new plant for treatment. A second stop will be at Limestone Dosers, where lime is added to the stream for watershed restoration. Several systems will be visited and discussed with water analyses and costs.



#3 Passive Treatment of AMD Buck Neely and Tim Danehy, BioMost, Inc.

Tuesday, April 11, 1 – 5 pm. \$30.

Several treatment systems will be visited including: A multi-stage passive system installed near Kingwood, WV along the North Fork of Greens Run where highly acidic drainage with >100 ppm Fe and >60 ppm Al is treated with a series of TIFs, VFPs and wetlands. A system in the headwaters of Deckers Creek where two auto-flushing VFPs treat several acidic, aluminum-bearing discharges.



And a third, “semi-passive” system will be visited where the MixWell and A-Mixer technologies have recently been installed to enhance water-powered, lime-based, chemical treatment.

Contact bmi@biomost.com.



#4 Longview Power Plant Randy Maggard, MEPCO. Tuesday, April 11, 1 – 5 pm. \$30.

The 700-MW Longview coal-fired power plant was constructed in 2007 at a cost of \$2 billion. It uses a super-critical pulverized coal-fired boiler, a high efficiency turbine generator, and advanced integrated pollution control systems including particulate matter removal by filters, flue gas desulfurization system to remove SO_x, NO_x removal by a catalytic reduction system, and CO₂ reduction. It is one of the cleanest burning power plants in the US. Attendees will observe the fuel supply system from an adjacent underground coal mine, tour the plant, and see the residual materials. <http://longviewpower.com/our-technology>



#5 ARRI Reforestation of Mined Lands – Flight 93 Site Scott Eggerud and Brad Edwards, OSMRE. Tuesday, April 11, 7:30 am – 5 pm, \$50.

On Tuesday morning, September 11, 2001, the U.S. came under attack when four commercial airliners were hijacked and used to strike targets on the ground. Nearly 3,000 people tragically lost their lives. Because of the actions of the 40 passengers and crew aboard one of the planes, Flight 93, the attack on the U.S. Capitol was thwarted. The Flight 93 Memorial Site and Visitor's Center, near Shanksville, PA, will be visited. Attendees will also see that over 90,000 trees have been planted on 125 acres using the Forestry Reclamation Approach. Red oak, red maple, and white pine were the major species, and 5,000 “Restoration 1.0” American chestnuts have also been planted. Dutch-elm-disease-resistant American elms have also been planted and the higher elevations have had stands of red spruce planted. Tree planting activities may be ongoing and attendees may be able to plant trees. A common phrase used at the Memorial is “we are healing our souls by healing the land.” www.nps.gov/flni/



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Registration

**Sunday through Thursday,
April 9-13, 2017, 7 am to 5 pm**

The Registration Table will be open for the conference on all days. It is located at the front of the Platinum Foyer. Information and help can be obtained from those situated at the table.



Welcome Reception

**Sunday, April 9, 2017,
6 to 8 pm**

The Welcome Reception will be held in the MEC Lobby and the Platinum Foyer for all conference attendees. Reacquaint yourself with old friends and meet new ones as you talk with others at the reception.

Plenary Session

Monday, April 10, 8:50 am to 12 noon Salons D & E

The Plenary Session will be composed of three presentations that are intended to introduce all three organizations to attendees that are sponsoring this meeting. Jeff Skousen will give a history of the WV Mine Drainage Task Force, Pete Stahl will present the American Society of Mining and Reclamation goals and history, and Jim Burger will provide an introduction to the Appalachian Regional Reforestation Initiative.



ASMR Awards Luncheon

**Monday, April 10,
12 to 1:30 pm**

The ASMR Awards Luncheon is one of the highlights of the annual meeting. Awards are given for the William T. Plass Award, the

Barnhisel Reclamation Researcher of the Year Award, the Reclamationist of the Year Award, Pioneers in Reclamation Award, the Early Career Award, as well as student scholarship awards. The cost is included in the conference registration. Additional tickets can be purchased for \$25.

ARRI Awards Luncheon

Wednesday, April 12, 12 to 1:30 pm

The ARRI Awards Luncheon is an additional highlight for this year's meeting. Recognition will be given to the ARRI Excellence in Reforestation Awards. ARRI presents two awards within each state: one for AML (Title IV) and one for Active Operations (Title V). ARRI presents one Regional Award chosen from the state level award winners from each of the member states.

Early Career Professional Social

Monday, April 10, 7 pm

The Early Career Professionals will meet on Monday night, April 10, at 7 pm after the Monday Evening Reception at a nearby restaurant within walking distance of the hotel. The purpose of the event is to provide individuals who are just starting their careers in mining and reclamation an opportunity to interact with others in a similar situation. It will be a great opportunity for networking, learning, and gathering knowledge from others. Please sign up for the social either during pre-registration (\$10) or you may purchase a ticket at the meeting. Please contact Cindy Adams for further information (cindya@sgm-inc.com).

Poster Session and Music Reception

Tuesday, April 11, 2017

After the field trips on Tuesday, a reception and poster session will be held downstairs of the MEC Lobby. A reception and cash bar will also be available. Posters will be displayed and the presenters will be available to discuss their work with participants.

The Ron Retzer Trio will be providing music during and after the poster session. Ron Retzer, Bob Wolfe and Jennifer Galownia had been singing together in a touring group for two years, and decided to branch out as a trio in 2013. They perform music of all genres, classic ballads, country, oldies, southern gospel, and even some pop and rock and roll, too!



Silent Auction

All Week, Wharf Rooms

The organizers have collected and will be collecting items to contribute to ASMR's Silent Auction. Items will be on display in the Wharf A&B rooms where bidding can go on throughout the week. It will close at 11:30 am on Wednesday, April 12, 2017. The auction raises funds for student scholarships, presentation awards, and travel grants to our meetings.

Guest Activities



Monday and Wednesday, April 10 and 12, 2017

The Morgantown area has several unique historical and cultural attractions. Plans are being made to visit Prickett's Fort (<http://www.prickettsfortstatepark.com/>). The state park is a re-creation of the original Prickett's Fort of 1774, which served as a refuge from Native American war parties on the western frontier of Colonial Virginia. Rebuilt in 1976 by the Prickett's Fort Memorial Foundation, the fort serves as a living history site where interpreters recreate the lifestyle with period attire and demonstrations of a variety of colonial crafts.



Another unique industry in the Morgantown area was glass making. The Davis-Lynch Glass Company (<http://davis-lynchglass.com/>) is the only factory left in Morgantown and plans are being made to visit the site. It is one of the few remaining hand-blown glass factories in the United States. The Company specializes in opal and crystal glass lampshades, globes and cylinders. It has its own decorating department. More information is available from Jeff and Debbie Skousen (jksousen@wvu.edu).

Wild Women of Reclamation



Monday, April 10, 7 am, Breakfast area and Salon F

Started in 2013, the Wild Women of Reclamation was organized to provide mentorship and professional development for women in the society as well as those in the profession. Every woman is welcome. Presentations are sometimes given on choosing a career path, juggling a career with family and community obligations, and mentoring. Each year we separate individuals into "more experienced" persons, i.e., greater than five years in a career, vs. "less experienced," i.e., less than five years. One person from each group is paired with one from the other group. Those mentors and mentorees are given the assignment to keep

in touch with each other throughout the coming year. Wild Women will convene on Monday at 7 am in Salon F (breakfast will be available). We have two incredible women as speakers on the agenda: Dr. Gwendolyn Geidel and Hannah Angel. There is no membership - just show up at 7 am in Salon F. For more information, please contact Michele Coleman (mcoleman@nbpower.com) or Cindy Adams (cindya@sgm-inc.com).

Haulin' ASMR



6:30 am, Sunday through Thursday

Haulin' ASMR is an informal running activity during each morning of the conference. It is a low-key running group that meets at 6:30 am. We usually run for 30-50 minutes depending on the conference schedule. The pace is approximately 5-6 mph, but is generally based on the ability of the participants. Some people stay with the group for part of the run and then branch off to either go faster, farther, or slow down. Running is a wonderful way to meet new people, get some exercise in the morning, and to explore the lovely trail system in Morgantown during the quiet of the morning. Remember to bring your running shoes to Morgantown in 2017!

The Waterfront Hotel is located on the Monongahela River Trail (<http://www.montrails.org/rail-trail-maps/>), which goes both north and south of the hotel. This trail also connects a short distance away to the Deckers Creek Rail Trail, a slightly upward climb through Morgantown. People with a desire to join the group for a short run should meet at 6:30 am in the Hotel Lobby. <http://www.morgantownwv.gov/residents/recreation/morgantown-biking-walking-trails/>



Program Overview

Sunday, April 9, 2017

Workshops

7 am to 5 pm	Registration	Platinum Foyer Entrance
9 am to 5 pm	ASMR NEC Meeting	Puskar Boardroom
8 am to 5 pm	#1 Mine Drainage Treatment Workshop	Salon D
1 pm to 4 pm	#2 Android- and IOS-based Geodatabase Collection	Salon F
1 pm to 4 pm	#3 Passive Treatment Design, Implementation and O&M	Salon E
8 am to 4 pm	#4 Natural Process for the Restoration of Disturbed Sites	Salon C
1 pm to 4 pm	#5 Reclamation Standards, Bonding and Compliance	Wharf A & B
1 pm to 5 pm	Exhibitor Set up	MEC/Platinum Foyer
6 pm to 8 pm	Opening Reception	MEC/Platinum Foyer

Monday, April 10, 2017

6:30 to 7:30 am	Haulin' ASMR	Hotel Lobby
7:00 am to 9 am	Continental Breakfast	Downstairs MEC
7:00 am to 8:30 am	Wild Women of Reclamation	Breakfast and Salon F
8:00 am to 5 pm	Speaker Ready Room	George Farmer Boardroom
8:00 am to 5 pm	Silent Auction	Wharf A&B
8:00 am to 5 pm	Exhibits	MEC/Platinum Foyer
9:00 am to 12 pm	Guest Tour	Registration Area

Monday Morning Plenary Sessions

8:50 to 9:00 am	Welcome – Charlie Miller and Louis McDonald	Salons D & E
9:00 to 9:30 am	History of the WV Mine Drainage Task Force – Jeff Skousen, Member of Task Force	
9:30 to 10 am	The American Society for Mining and Reclamation – Pete Stahl, President of ASMR	
10 to 10:30 am	Appalachian Regional Reforestation Initiative – James Burger, Science Team Member of ARRI	
10:30 to 11 am	BREAK	MEC/Platinum Foyer

	Salon D	Salon E
	Policy and Law	Reclamation Technology
11:00 to 11:30 am	Legislative Update on Mining, Reclamation and Water Quality in West Virginia Jason Bostic WV Coal Assn.	Why Aren't All Reclamationists Considered Ecological Engineers? Robert Nairn University of Oklahoma
11:30 to 12:00 pm	Future Reclamation Needs in a Changing Coal Sector Paul Ziemkiewicz West Virginia University	Overview and Update on Passive Treatment Systems Art Rose Penn State University (retired)
12 to 1:30 pm	ASMR Awards Luncheon	Downstairs MEC

Concurrent Technical Sessions

	Salon C	Salon D	Salon E	Salon F
1:30 to 3:00 pm	Social/Economic	ARRI, Forestry & Ecology	Active AMD Treatment	Reclamation Technologies
3 to 3:30 pm	BREAK			MEC/Platinum
	Salon C	Salon D	Salon E	Salon F
3:30 to 5:00 pm	Social/Economic	ARRI, Forestry & Ecology	Active AMD Treatment	Reclamation Technologies
5:30 to 8:00 pm	RECEPTION			MEC/Platinum
7:00 to 9:00 pm	Early Career Professional Social			Mt. State Brewing

Tuesday, April 11, 2017

6:30 to 7:30 am	Haulin' ASMR	Hotel Lobby
7:00 to 9:00 am	Full Breakfast	Downstairs MEC
8:00 am to 5 pm	Registration	Registration Area
8:00 am to 5 pm	Speaker Ready Room	George Farmer Boardroom
8:00 am to 5 pm	Silent Auction	Wharf A&B
8:00 am to 5 pm	Exhibits	MEC/Platinum Foyer
7:30 am to 5 pm	ARRI Field Trip Departure – Load Buses	Registration Area

Concurrent Technical Sessions

	Salon D	Salon E	
8:00 to 9:30 am	Imaging and Modeling	Passive AMD Treatment	
9:30 to 10:00 pm	BREAK		MEC/Platinum
10:00 to 11:30 am	Imaging and Modeling	Passive AMD Treatment	
11:30 am	BOX LUNCHES		Registration Area

Tuesday Afternoon Field Trips				
11:30 am	Field Trips – Load Buses			Registration Area
11:30 am to 5 pm	#1 Surface Mining, AMD, and Land Use	#2 AMD Chemical Treatment	#3 Passive Treatment	#4 Longview Power Plant
5:30 to 6:00 pm	Poster Set up			Downstairs MEC
6 to 9 pm	Poster Session, Reception, Music			Downstairs MEC

Wednesday, April 12, 2017

6:30 to 7:30 am	Haulin' ASMR	Hotel Lobby
7:00 am to 9 am	Full Breakfast	Downstairs MEC
8:00 am to 5 pm	Registration	Registration Area
7:00 am to 8 am	ARRI Core Team Meetings	Puskar Boardroom
7:00 am to 8 am	ARRI Science Team Meeting	Farmer Boardroom
8 am to 5 pm	Exhibits	Platinum Foyer
8 am to 5 pm	Speaker Ready Room	Farmer Boardroom
8 am to 5 pm	Silent Auction	Wharf A&B
9 am to 12 pm	Guest Tour	Registration Area

Concurrent Technical Sessions

	Salon C	Salon D	Salon E
8:00 to 10:00 am	Reclamation in Arid Regions	ARRI, Forestry & Ecology	Passive Treatment - Hydrology
10:00 to 10:30 am	BREAK		
10:30 to 12:00 pm	Reclamation for AMD Control / Beneficial Uses	ARRI, Forestry & Ecology	Imaging and Modeling

11:30 am	Silent Auction Winners	Wharf A & B
12 to 1:30 pm	ARRI Awards Luncheon	Downstairs MEC

Concurrent Technical Sessions

	Salon C	Salon D	Salon E
1:30 to 3:00 pm	Reclamation for AMD Control/ Beneficial Uses	ARRI, Forestry & Ecology	Imaging & Modeling
3 to 3:30 pm	BREAK		MEC/Platinum
3:30 to 5 pm	Reclamation for AMD Control / Beneficial Uses	Passive Treatment - Sulfate	Imaging & Modeling
	Free Evening		

Thursday, April 13, 2017

6:30 to 7:30 am	Haulin' ASMR	Hotel Lobby
7:00 am to 9 am	Continental Breakfast	Downstairs MEC
8:00 am to 12 pm	Registration	Registration Area
8:00 am to 10 pm	Exhibits – Tear Down at 10 am	MEC/Platinum Foyer
8:00 am to 12 pm	Speaker Ready Room	George Farmer Boardroom

Concurrent Technical Sessions

	Salon C	Salon D	Salon E
8 to 10:00 am	Surface Water - Hydrology	Surface Water – Aquatic Impacts	Groundwater and Mine Pools
10 to 10:30 am	BREAK		
10:30 am to 12:00	Surface Water - Modeling & Prediction	Surface Water - Aquatic Impacts	Passive AMD Control
10:00 to 11:30 am	Exhibitor Tear Down		MEC/Platinum
12:00 pm	Adjourn		
1:00 to 5:00 pm	ASMR NEC Meeting		Puskar Boardroom

Poster Session – Downstairs MEC

Tuesday, April 11, 2017 6 to 8 pm

Stand Level Nutrient and Carbon Content Across One Rotation of Loblolly Pine Plantations on a Reclaimed Surface Mine.

Angel*, Hannah. Z., J. P. Stovall, B. P. Oswald, Y. Weng, and H. M. Williams

Competition among understory plants varies depending on reclamation soil and fertilization. **Buss*, Jennifer**, K. Stratechuk and B. Pinno.

Seasonal recovery of an Appalachian stream affected by acid mine drainage and municipal wastewater. **Gaughan***, John, S. Rensel*, J. Hugo*, M. Whited*, W. H.J. Strosnider, P. M. Smyntek

Utilizing an Unmanned Aerial System and a High Resolution Multi-Spectral Sensor to Evaluate Ecosystem Health and Predict Surface Water Quality. **Holzbauer-Schweitzer*, K. Brandon**, and R.W. Nairn

Reclassification of the Upper Little Juniata River Based on Continuous In-Stream Monitoring. **Long*, Stefan T.**, W. Strosnider and J. Eckenrode

Labware Evaluation for Selenium Sorption Experiments. **McGrail*, Rebecca K.** and L.M. McDonald

Acid Mine Drainage Water Testing and Metals Analysis at Morris Creek, WV Serafin, Juliana and L. Cox

Geomorphic Reclamation and Landscape Heterogeneity: A landscape approach to quantify geomorphic stability and vegetation community diversity. **Pennino***, Amanda, K. Fleisher, K. Vaughan, K. Hufford, T. Kelleners, J. Norton, Peter S., C. Strom

Evaluation of Risk Posed by Trace Metals in Soils of a Mining-Impacted Agricultural Watershed. **Sikora***, **Amy Lynn** and R.W. Nairn

Mass Transport Controls on Aluminum Removal in Limestone-Based Treatment Systems. **Spellman Jr. * Charles**, D. Madl, A. Rose, E. Zovinka, J. Bandstra, W. Strosnider

Drone Imagery Acquisition to Perform Volumetric Analysis for Landscape Mapping. **Strager***, M. P., P. Kinder, J. A. Kimmert, and A. Hentz

Phosphorus, Iron and Trace Metal Interactions at the Sediment Layer-Water Column Interface: The Role of Recovered Mine Drainage Residuals. **Tang*, Zepei** and R. W. Nairn

A Seasonal Comparison of the Passive Abandoned Coal Mine Remediation System at Wingfield Pines. **Valkanas***, **Michelle** and N. Trun

A Draggable Limestone Bed Constructed in a Botanic Garden. **Watzlaf***, G. R., R. S. Hedin, and B. C. Hedin

Cluster planting: a new prescription for enhancing structural diversity in reclaimed boreal forest. **Pinno***, Brad, A. Schoonmaker and R. Albrich

Pollution Loading Tracking to Characterize Success of an Anoxic Limestone Drain Installation on Lambert's Run, Southwestern Pennsylvania. **Mignogna*, Lydia, K.** Tomkowski, and J. Vinglish



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Detailed Concurrent Sessions

Monday, April 10, 2017

Plenary Session 1. Salon D & E

8:50-10:30	Welcome: Charlie Miller, Task Force & Louis McDonald, WVU Jeff Skousen, WVU & Task Force Member: History of the WV Mine Drainage Task Force Pete Stahl, UW & President ASMR: The Society for Mining and Reclamation James Burger, VT & ARRI Science Team Member: ARRI History and Purposes	
10:30-11:00	Break MEC/Platinum Foyer	
	Plenary Session 2a. Salon D	Plenary Session 2b. Salon E
11:00-11:30	Legislative Update on Mining, Reclamation and Waer Quality in WV. Jason Bostic, WV Coal Assoc	Why Aren't All Reclamationists Considered Ecological Engineers. Robert Nairn, Univ. of OK.
11:30-12:00	Future Reclamation Needs in a Changing Coal Sector. Paul Ziemkiewicz, WVU	Overview and Update on Passive Treatment Systems. Art Rose, PSU (retired)
12:00-1:30	ASMR Awards Luncheon	Downstairs MEC

Colors designate Topic Areas in Sessions:

Orange - AMD

Blue – Water related

Green – Forestry, Wildlife

Yellow – Reclamation

Tan – Other, Social, Imaging, Economics

Names in Bold are in the student presentation competition

	Social & Economic Factors - Salon C	ARRI, Forestry & Ecology 1 - Salon D	Active Treatment - Salon E	Reclamation Technologies - Salon F
1:30-2:00	Governing Unconventional Legacies: Lessons from the Coalbed Methane Boom in Wyoming. K. Walsh (student)	Upland forest development in a reconstructed watershed after oil sands mining in northern Alberta, Canada. B. Pinno	Practical Outfall Mine Water Treatment Applications– Challenges and Solutions. B. Riley	Woods-run Chips as a Filter Sock Matrix. S. Grushecky
2:00-2:30	Bond release verification requirements for successful reclamation at Wyoming surface coal mines. A.K. Waitkus	Reclamation Experiments on the Allegheny Front: The Push for Bio-Energy, Habitat, and Timber. Bart Caterino (student)	A Geochemical Kinetics Module for AMD Treat to Estimate the Effects of Aeration on Rates of Decarbonation and Iron Oxidation. C. Cravotta	A Pathway to Walk-Away? – 30 Year Old Technology to Suppress Acid Rock Drainage Revisited. J. Gusek
2:30-3:00	Assessing the benefits of at source vs. in stream AMD treatment: Implications for managing water liabilities under the WVDEP's Bond Forfeiture Program. M.P. Sheehan	Surface and Subsurface Tillage Effects on Soil Properties and Tree Growth at an East Texas Lignite Surface Mine. Hannah Angel (student)	The Maelstrom Oxidizer - Astonishing Aeration System. J. Hayden	New Soil Reconstruction Method for Reclaiming Subsidied Land with Yellow River Sediments. Z. Hu
3:00-3:30	Break MEC/Platinum Foyer			
3:30-4:00	Water Treatment: Planning for Forever, New Options. D.Eyde	Survival and Growth of Woody Plants on Four Reclaimed Mine Sites. Alexis Monteleone (student)	High Sulfate Mining Wastewater Treatment by Two-Stage Chemical Precipitation Process. K. Banerjee	Utilization of Extractable Soil Test Sulfate as an Indicator for Acid Producing Pyritic Sulfur. D. Lang

4:00-4:30	Local Government Entities in Improving AMD Impaired Waters. D.L. Wagner	The Effects of <i>Castor canadensis</i> (North American Beaver) Repopulation on a Mine Drainage Impacted Stream. Nicholas Shepherd (student)	A Case Study Evaluating Effluent Quality Following Chemical and Electrochemical Precipitation for Metals Removal from Acid Mine Drainage Water. B. Lesikar	Initial Evaluation of Ripper and Tillage Methods on Reclaimed Heavy Mineral Mine Soils. Z. Orndorff
4:30-5:00		Effect of Grading on Productivity of High-Value Tree Species in Appalachian Surface Mines. Wesley Dement (student)	Water Management TD Business Meeting	Pollution Loading Tracking to Characterize Success of an Anoxic Limestone Drain Installation on Lambert's Run, Southwestern Pennsylvania. H. Patton (student)
5:00-5:30	Ecology, Forestry & Wildlife TD Business Meetings	Flight 93 National Memorial Reforestation Project. M. Tyree		Soils & Overburden, Geotechnical Engineering, International Tailings TD Business Meetings

Tuesday, April 11, 2017

7:30-8:00	ARRI/Flight 93 Field Trip Departs		
		Imaging & Modeling 1 - Salon D	Passive Treatment - Metals - Salon E
8:00-8:30		Geocoding locations of historic reclamation research sites using Google Earth. Ruopu Li	Zinc and Nickel Sorption and Desorption Using a Mixed Algae Community Collected from a Mine Drainage Passive Treatment System. Ellen Fielding (student)
8:30-9:00		Georeferencing of American Society of Mining and Reclamation Proceedings: A New Tool and Patterns in Reclamation Research. Ashley Rovder (student)	Evolution of Trace Metal Removal Products in Field-scale Vertical Flow Bioreactors. J. Labar
9:00-9:30		Detecting the Presence of Coal Mining Impacts by Predicting Acid Mine Drainage Impacted Streams Using Aerial Imagery. J. Bowman	Metal Reclamation Units (MRUs Wetlands in a Box) for AMD and Nutrient Cycling. C. Lennox
9:30-10:00		Unmanned Aerial Vehicle (UAV) Survey for Year-End Mining Reclamation Estimation. M. Maguire	Advancements in Iron Terrace Design for Metal Mine Sites. J. Gusek
10:00-10:30		Break	MEC/Platinum Foyer
		Student Presentations - Salon D	Passive Treatment AMD Control 1 - Salon E
10:30-11:00		A Feasibility Study for the Automated Monitoring and Control of Mine Water Discharges. Christopher Vass (student)	Geochemical Controls on Limestone Utilization in Abandoned Mine Land Reclamation. P. Giri (student)
11:00-11:30		Understanding Storm Response of AMD Impacted Streams. Zebulon Martin (student)	Effective Modification to the Design and Application of Constructed Wetlands and Limestone Beds. B. Means

Tuesday, April 11, 2017 - Afternoon Field Trips

11:30-5:00	Field Trips – Box Lunch, Meet at Registration Table #1) Surface mining, AMD and Land Use #2) AMD Chemical Treatment #3) AMD Passive Treatment #4) Longview Power Plant
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Wednesday, April 12, 2017


	Reclamation in Arid Regions - Salon C	ARRI, Forestry & Ecology 2 - Salon D	Passive Treatment - Hydrology - Salon E
8:00-8:30	Objectives and Design Solutions of a 1000-year Evapotranspiration-Capillary Surface Barrier System. Z.F. Zhang	Some thoughts on planting native tree species in mine land reforestation. M. B. Adams	Challenges of Designing and Building a Passive Treatment System with Limited Topography, Hydraulic Head, and Available Land Area. R. Nairn
8:30-9:00	Revegetation success at several Montana sites using soil amendments. S.R. Jennings	Regeneration dynamics of seedling origin aspen: Working towards resiliency in forest restoration. Carolyn King (student)	Seasonal Storm-Induced metal transport dynamics Between Oxidative passive Treatment cells. Leah Oxenford (student)
9:00-9:30	Restoration Techniques to Increase Survival and Vigor of Wyoming Big Sagebrush Seedlings. Amy Jacobs (student)	Tree seedling survival after planting under varying treatments on reclaimed mine land. P. Boleman	Quantifying Hydraulic Conductivity in Mine Drainage Passive Treatment System Vertical Flow Bioreactors. Brian Page (student)
9:30-10:00	Soil changes during stockpiling and after reclamation at three Wyoming natural gas production areas. J. Norton	Growth Rates of Hardwood Trees Nine Years after Reclamation in Response to Substrates and Amendments. K. Dallaire	Iron Transport and Removal Dynamics in the Oxidative Unit of a Passive Treatment System: A Five-Year Performance Evaluation. Leah Oxenford (student)
10:00-10:30	Break MEC/Platinum Foyer		
	Reclamation for AMD Control & Beneficial Uses - Salon C	ARRI, Forestry & Ecology 3 - Salon D	Imaging & Modeling 2 - Salon E
10:30-11:00	Sludge Impact on the Stabilization of the Fire Road Mine in New Brunswick. M. Coleman	Establishment of Hybrid Poplar on a Reclaimed Mine Site in Southern West Virginia. A. Hass	Applying land forming to reclamation: A case study in Central Appalachia. L. Hopkinson
11:00-11:30	Reclamation of Refuse Piles using Fluidized Bed Combustion Ash in the Blacklick Creek Watershed, Pennsylvania. R. Martin	Loblolly Pine Survival and Growth on a Reclaimed Mineral Sands Mine in Southeastern Virginia. S. Klopff	Subsidence wetland formation and transition in the high ground water table coal mining areas. Z. Hu.
11:30-12:00	Transforming Abandoned Mine Lands into a Botanic Garden. G. Watzlaf	Ecological Restoration on the Mower Tract within the Monongahela National Forest, WV. C. Barton	3D Modeling of the Sand Coulee Basin Abandoned Mine Lands. K. Brown
12:00-1:30	ARRI Awards Banquet, Student Awards		Downstairs MEC
	Reclamation for AMD Control & Beneficial Uses - Salon C	ARRI, Forestry & Ecology II - Salon D	Imaging & Modeling I - Salon E
1:30-2:00	Metals got you Down? A Look at Effective Mining-Influenced Water Treat. P. Dugan	Conservation of Northern Long-eared Bat Habitat at an Aggregate Mine in Westmoreland County, Pennsylvania. C. Rockey	Exploration of a Multi-Sensor Approach for the Detection and Mapping of Coal Mine Fires in the United States. A. Sivitskis

2:00-2:30	Preventing Acid Rock Drainage Can Source Control Really Be Successful? P. Eger	Natural Processes for the Restoration of Large Mines. D. Polster	Communicating Maintenance of Acid Mine Drainage Treatment Projects in Ohio. S.D.L. Cornwell
2:30-3:00	What Happens to a Mine after Mining? Making Mine Land Reclamation More of a Community Asset. M. Korb	Cost-effective Strategies for the restoration of large disturbances. D. Polster	Coupling Technical Assistance with Student Service Learning in Mine Water Reclamation. K.J. Green
3:00-3:30	Break		MEC/Platinum Foyer
	Reclamation for AMD Control & Beneficial Uses - Salon C	Passive Treatment - Sulfate - Salon D	Imaging & Modeling I - Salon E
3:30-4:00	Production of an iron oxide product from mine water: 15 year report. R. Hedin	A Field Demonstration of an alternative coal waste disposal technology - Geochemical findings. P Behum	Development of International Standards for Mine Reclamation. W.L. Daniels
4:00-4:30	Yields and Ethanol Production Potential of Switchgrass and Miscanthus on Reclaimed Mine Lands. S. Scagline	Sulfate Removal in Biochemical Reactors and Scrubbers Treating Neutral Low-Metal Concentration Mine Influenced Water (MIW). G. Fattore	Carbon Dioxide: A Global Problem in Search of a Rational Global Solution. K.C. Vories
4:30-5:00	Native vegetation in reclamation: improving habitat and ecosystem function through using prairie species in mine land reclamation . R. Swab	Passive Treatment of Sulfate from Mine-Influenced Water. B.T. Thomas	Development of a low-cost remote water quality monitoring system in acid mine drainage impaired watersheds. N. Kruse
5:00-5:30	JASMR Editorial Board Meeting	Three Year Performance Evaluation of a Sulfate Reducing Bioreactor for Mine Water Treatment in PA: Sulfate Removal, Sulfide Control, and TDS Reduction. W. Walker	Land Use Planning & Design TD Business Meeting

Thursday, April 13, 2017

	Surface Water - Hydrology - Salon C	Surface Water - Aquatic Impacts - Salon D	Groundwater and Mine Pools - Salon E
8:00-8:30	Hydrological and Geophysical Methods to Investigate Streamflow Losses and Restoration Strategies in Abandoned Mine Lands of Schuylkill River Watershed, Pennsylvania, USA, 2012-2015 C. Cravotta	Relationship between aqueous and sediment chemistry and biological recovery across a gradient of acid mine drainage impairment. N. Kruse	Groundwater Modeling Used to Design of a Tailings Impoundment Removal near Yellowstone National Park. T.H. Henderson
8:30-9:00	Mine Reclamation Applications of a New Water Budget Model: Wetbud. W. L. Daniels	The Appalachian stream syndrome: complex local conditions and regional metacommunity degradation caused by the accumulation of multiple stressors. E. Merriam	Seasonal Recharge and Groundwater Storage in a Below Drainage Mine-pool. E. Perry
9:00-9:30	Assessing How Hydrologic Isolation of Coal Mine Spoils Affects Streamflow Mechanisms and Water Chemistry Using Open Source Wireless Technology. S. Fulton student	The Impacts of Acid Mine Drainage Remediation Projects on Water Quality, Aquatic Macroinvertebrate, and Fish Populations in the Deckers Creek Watershed, Monongalia and Preston Counties, West Virginia. N. Revetta	North Branch Potomac River Mine Pool Assessment Study. N.D. Pointon

9:30-10:00	Seasonal recovery of an Appalachian stream affected by acid mine drainage and municipal wastewater. M. Whited	Water quality and biotic condition in mining-influenced Appalachian headwater streams: an overview of a long-term study. S. Schoenholtz	Groundwater tracing in mine pools above the Cabin Creek oilfield in Kanawha County, West Virginia. A. Schaer
10:00-10:30	Break		MEC/Platinum Foyer
	Surface Water - Modeling & Prediction - Salon C	Surface Water - Aquatic Impacts - Salon D	Passive AMD Control 2 - Salon E
10:30-11:00	Field Predictors for TDS Generation Potential from Appalachian Mine Spoils. D. Johnson	Effects of Longwall Mining on Aquatic Resources at the Bailey Mine in Southwestern Pennsylvania. M. Shema	Passive Treatment of Highly Contaminated Iron-Rich Acid Mine Drainage. C. Neculita
11:00-11:30		Selenium Dynamics in Mining-Influenced Headwater Streams of Central Appalachia. K. Whitmore (student)	The Complicated Role of CO ₂ in Mine Drainage Treatment. R. Hedin
11:30-12:00		Water Quality and Freshwater Mussel Status in Mining-Influenced Virginia-Tennessee Rivers. C. Zipper	
12:00-1:00	Adjourn		



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REGISTRATION TYPE AND FEES	Through Feb 28, 2017	After Feb 28, 2017
Basic Registration*	\$350	\$475
Student Registration*	\$100	\$150
One Day Registration (Mon, Tue, Wed, Thu)** Which day? _____	\$150	\$150
Special Registration***	variable	variable

*Basic and Student Registration includes program materials, all food functions (breakfasts, lunches, breaks, receptions), and admittance to all sessions. Workshops and field trips are not included.

**One-day registration includes the basic registration items listed above for that day.

***Please select if you are an exhibitor, sponsor, award or scholarship recipient, non-profit, spouse, or other special designee. Registration code will be given to you (contact jskousen@wvu.edu). Workshops and field trips are not included.

EXHIBITORS – 1 basic registration comes with each exhibit Price based on location in lobbies (map available from Tiff Hilton)
Contact Tiff Hilton, 304-667-1952 or wopec@suddenlink.net

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GOLD (includes 4 basic registrations)	\$10,000
SILVER (includes 3 basic registrations)	\$5,000
BRONZE (includes 2 basic registrations)	\$2,500
COAL (includes 1 basic registration)	\$1,500

WORKSHOPS (Sunday, April 9, 2017)	Through Feb 28, 2017	After Feb 28, 2017
1 Mine Drainage Treatment Workshop	\$100	\$125
2 Android- and IOS-based Geodatabase Collection	\$20	\$50
3 Passive Treatment Design, Implementation, and O&M	\$50	\$75
4 Natural Process for the Restoration of Drastically Disturbed Sites	\$150	\$175
5 Reclamation Standards, Bonding and Compliance Inspections	\$100	\$125

FIELD TRIPS (Tuesday, April 11, 2017)	Through Feb 28, 2017	After Feb 28, 2017
1 Surface Mining and Post-mining Land Use (1/2 day)	\$30	\$50
2 Acid Mine Drainage Chemical Treatment Plants (1/2 day)	\$30	\$50
3 Passive Treatment of AMD (1/2 day)	\$30	\$50
4 Longview Power Plant (1/2 day)	\$30	\$50
5 ARRI Reforestation of Mined Lands – Flight 93 Site	\$50	\$100

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Send to Becky Casteel, G209 Agric. Sci. Bldg., West Virginia

University, Morgantown, WV 26506-6108, 304-293-2565

Get Registration Form

3. Off-line registration with credit card by phone or credit card by mail

Send this completed registration form and

a) Call Becky Casteel to give Credit Card information for payment, 304-293-2565.

b) Complete information below on form and send to

Becky Casteel, G209 Agric. Sci. Bldg.,
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CANCELLATION POLICY

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in writing before the following dates:

Through April 1, 2017 Full refund

After April 1, 2017 NO REFUND

The cancellation dates apply only to the meeting registration fees. Ticketed events may be canceled due to minimum attendance requirements. Refunds will be issued for CANCELED ticketed events only. There will be NO REFUNDS for non-canceled ticketed events. All approved refunds will be issued after the meeting in the form in which payment was made.



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William T. Plass Award



Dr. Robert W. Nairn

This award is named after one of the co-founders of the society and recognizes William Plass's significant contributions over his lifetime to the development of reclamation science and practice. The award is given to a person who has distinguished themselves in the field of mined land reclamation at the local, regional, national and international levels. The award is the highest honor the society has and recognizes those in teaching, research, outreach and administration.

Dr. Robert W. Nairn received his B.S. in Environmental Science from Juniata College in Huntingdon, PA, and his Ph.D. in Environmental Science from The Ohio State University, Columbus, OH. Dr. Nairn is the Sam K. Viersen Family Presidential Professor in the School of Civil Engineering and Environmental Science at the University of Oklahoma, Norman, OK. He is Director of the Center for Restoration of Ecosystems and Watersheds, Associate Director of the Water Technologies for Emerging Regions Center, and Adjunct Professor of Biology at the University of Oklahoma. He teaches both undergraduate and graduate courses in environmental science and engineering. His general research areas include watershed biogeochemistry, ecological engineering, ecosystem restoration, and wetland science. His research involves reclamation of the Arkoma Basin coal fields of Oklahoma and Arkansas, and the Tri-State Lead-Zinc Mining District of Oklahoma, Missouri, and Kansas. He also has significant research in the Bolivian Andes near Cerro Rico de Potosi. He currently serves as President of both Watershed Restoration Inc. and Engineers in Action, both non-profit organizations. He has served as President of ASMR and received the Richard I. and Lela M. Barnhisel Reclamation Researcher of the Year Award. He has received the University of Oklahoma Vice President's Outstanding Research Impact Award. It is with great honor and pleasure that the Society awards Dr. Robert Nairn the William T. Plass Award. Dr. Nairn was nominated by Margaret Dunn.

Richard I. and Lela M. Barnhisel Reclamation Researcher of the Year Award



Dr. Jennifer Franklin

The Richard I. and Lela M. Barnhisel Reclamation Researcher of the Year Award recognizes substantial contributions to the advancement of reclamation science and/or technology through scientific research.

Dr. Jennifer Franklin is ASMR's selection for the Reclamation Research of the Year Award. Dr. Franklin received her B.S. in Plant Biology from the University of British Columbia in Vancouver and her Ph.D. in Renewable Resources and Tree Physiology from the University of Alberta in Edmonton. She is an Associate Professor in the Department of Forestry, Wildlife, and Fisheries at the University of Tennessee-Knoxville, TN. Her current research includes tree compatible ground cover for forestry reclamation, health and effectiveness of trees in storm water retention basins, and American chestnut establishment and growth on reclaimed mine sites. She has published eight journal articles and 28 conference proceedings articles. Dr. Franklin teaches three undergraduate courses and two graduate-level courses and advises several graduate students. She serves as a member of the Science Team for the Appalachian Regional Reforestation Initiative. She is also serving as co-chair of the Forestry and Wildlife Technical Division of ASMR. It is with great pleasure that ASMR's 2017 Richard I. and Lela M. Barnhisel Reclamation Researcher of the Year Award is presented to Dr. Jennifer Franklin. Dr. Franklin was nominated by Richard Barnhisel.

Pioneer in Reclamation Award



Dr. Paul Ziemkiewicz

The Pioneer of Reclamation Award recognizes an individual who has had significant impact and advanced the art and science of land reclamation over their entire career. The research or reclamation accomplishments must pass the test of time.

Dr. Paul Ziemkiewicz's contributions to mined land reclamation span more than 40 years. He began his biological science training as an undergraduate at Utah State University and graduated with a B.S. degree in Biology. He then received his M.S. in Range Ecology at Utah State University and his Ph.D. in Forest Ecology at the University of British Columbia. In 1978, he organized Alberta's reclamation research program in coal and oil sands mining. In 1988, he moved to West Virginia University to serve as Director of the National Mine Land Reclamation Center and the West Virginia Water Research Institute. His research accomplishments include many of the passive acid mine drainage treatment technologies in use today as well as watershed restoration planning methods. He has helped to initiate new policy and practice in mined land reclamation. He worked with the Office of Surface Mining to develop the Acid Mine Drainage Policy of 1997, the Acid Drainage Technology Initiative, and the West Virginia Department of Environmental Protection's Coal Ash Policy of 1998.

Dr. Ziemkiewicz received the E.M. Watkin Award for Outstanding Contribution to the Betterment of Land Reclamation from the Canadian Reclamation Association. He also received the Environmental Conservation Distinguished Service Award from the Society for Mining, Metallurgy and Exploration. Paul is the Director of the West Virginia Water Research Institute which includes programs in mine drainage, watershed management, biofuels, industrial site restoration and treatment of drilling brines. Congratulations to Dr. Paul Ziemkiewicz for being selected as the 2017 Pioneer in Reclamation by ASMR. Paul was nominated by Dr. Jeff Skousen.

Early Career Award in Reclamation



Dr. William H.J. Strosnider

The Early Career Award recognizes a young professional involved in reclamation research, teaching, and application of reclamation technologies. The recipient must have been employed for a minimum of three years, but not more than 10 years, and is doing outstanding work.

Dr. William "Bill" Strosnider is ASMR's selection for the Early Career Award in Reclamation. Bill received his Ph.D. in Environmental Engineering at the University of Oklahoma in 2010 and began his career that fall as a tenure-track professor at Saint Francis University in central Pennsylvania. He also serves as the Director of the Center for Watershed Research and Service at St. Francis. The Center provides technical assistance to international and domestic nonprofit organizations focused on watershed protection and restoration. Bill's focus has been identifying water quality issues and advancing sustainable engineering solutions to improve human and ecosystem health. He follows in the mine reclamation research he began under Dr. Robert Nairn at the University of Oklahoma.

In his short professional career, Bill has 26 journal publications and numerous conference proceedings. He has formative service, research and engineering expertise in Bolivia, Peru, Guatemala, Nicaragua, and Haiti. One of his more productive research efforts has been in the passive co-treatment of acid mine drainage with wastewater and sewage. He also advises the Student Chapter of ASMR at St. Francis University. It is an honor to present the 2017 ASMR Early Career Award in Reclamation to William "Bill" Strosnider. We look forward to his leadership and career development in the field of land reclamation. William was nominated by Kelsea Palmer.

Reclamationist of the Year Award



Timothy Danehy

The Reclamationist of the Year Award recognizes individuals demonstrating outstanding accomplishments in the practical application or evaluation of reclamation technology. It also rewards individuals responsible for implementing innovative practices or designs for new reclamation strategies.

Timothy Danehy is the 2017 recipient of the Reclamationist of the Year Award. He received his B.S. in Environmental Science from Slippery Rock University. Tim began his career with the Slippery Rock Watershed Coalition by addressing the impacts of mine drainage on local watersheds. He is presently Co-Founder of BioMost, Inc., and Director of Stream Restoration, Inc. His professional career centers in the development and implementation of practical and innovative technology to lower the cost of mine water treatment and enhance the sustainability of watershed restoration and protection efforts. His work and development in this field has led to the development of five patents. He has published numerous papers, journals, books and proceedings. He has also received several honors and awards from regional and national organizations for the innovative approaches he has developed and recommended to the industry and governments for reclamation and water quality enhancement. One of Tim's supporters clearly stated his strongest attributes: "Tim, with his enthusiasm, has the ability to pass along his knowledge to the rest of us through his numerous presentations at various meetings and symposiums." It is with great pleasure that the Society confers the 2017 Reclamationist of the Year Award on Timothy Danehy. He was nominated by William H.J. Strosnider.

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The 39th Anniversary of the Formation of the West Virginia Mine Drainage Task Force: A Historical Perspective

By Jeff Skousen, Professor and Reclamation Specialist, West Virginia University, Morgantown, WV; and Wayne Stanley and Charlie Miller, Industrial Resources, Fairmont, WV

Introduction

On September 15, 1978, David Callaghan, Director of the West Virginia Department of Natural Resources (WVDNR), held a meeting in Elkins, WV, to address the problem of acid mine drainage (AMD) associated with surface mining the Kittanning coal seams in the central part of West Virginia. Director Callaghan appointed an interdisciplinary committee composed of industry and regulatory representatives, West Virginia University researchers, and persons from mining consulting firms. The committee was charged with defining the AMD problem in the region and outlining procedures that would allow surface mining in areas that had historically produced degraded water quality after mining. Techniques and procedures were needed to mine and reclaim areas so that good water quality resulted after mining. Subsequently, the committee became known as the West Virginia Surface Mine Drainage Task Force.

First Task Force Publication

After much deliberation at monthly meetings during the next year (1978-1979), members of the Task Force developed a landmark publication in 1979 entitled *Suggested Guidelines for Method of Operation in Surface Mining of Areas with Potentially Acid-Producing Materials* (Figure 1). The bulletin outlined several basic characteristics for which a mine site must be examined prior to mining and included consideration of:

1. ground and surface water,
2. overburden analysis and quality,
3. topography and land use,
4. geology,
5. mining equipment, and
6. economic feasibility.

The bulletin further identified specific techniques for handling surface water, ground water, and overburden during the mining process that would help control AMD. Concepts that were emphasized included:

1. accurately sampling and analyzing overburden to identify alkaline- or acid-producing materials,
2. mixing acid-producing materials with alkaline materials or ameliorants for acid neutralization, and
3. strategically placing acid-producing materials in the back-fill where air and water contact are minimized.

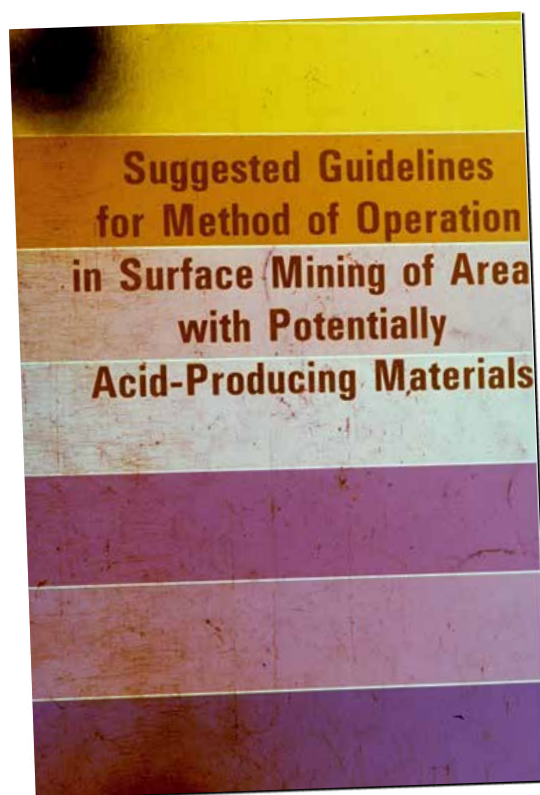


Figure 1. The 1979 Bulletin published by the WV Surface Mine Drainage Task Force. It outlined concepts and procedures for eliminating AMD during mining and reclamation.

The 1979 bulletin represented state-of-the-art technology for the control of AMD and became the standard throughout Appalachia for mining in areas with potentially acid-producing materials.

Annual Symposia

After writing this bulletin, members of the Task Force realized that many other ideas and procedures were being developed to control and treat AMD. Therefore, the members of the Task Force established new objectives in addition to the original man-

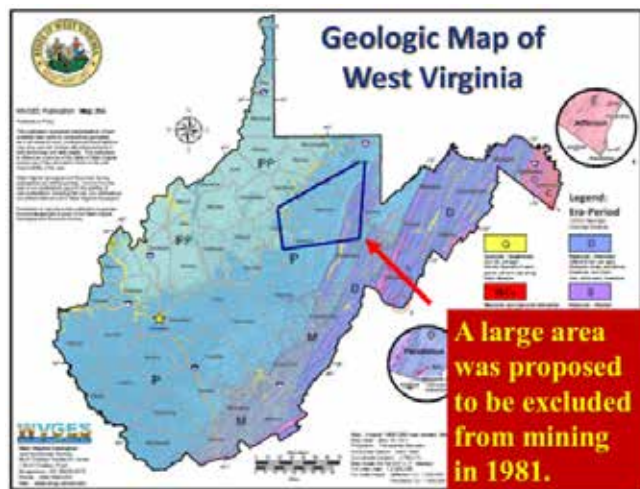


Figure 2. Portions of a six-county area (500 square miles) in central West Virginia were proposed to be prohibited from surface mining in 1981.

date from Director Callaghan. The objectives of the Task Force were to keep current on new developments in AMD research including AMD treatment and control practices, and to present this information at annual symposia.

In April 1980, the first Task Force symposium was held in Clarksburg, WV, to a relatively small audience of 100 people. Since 1980, symposia have been held every spring (usually in Morgantown, WV). Attendance at the meetings has fluctuated over the years due to changes in the mining and reclamation industry and in regulations, but has steadily grown to annual attendance figures of 250 to 300. Attendees come from all areas of the US and several foreign countries. Many attendees consider Task Force meetings to contain the most current and important work in AMD in the world. Proceedings have been published and given to attendees each year. A website was developed in 2006 (www.wvmdtaskforce.com), which includes all past symposium papers, and is updated each year. The web site now includes power-point presentations starting with the 2005 symposium.

History: Complexity and Moratorium

After establishment by Director Callaghan, the Task Force examined the procedures and practices being employed at West Virginia surface mines to control AMD. They made visits to many surface mines to observe these practices and learned of their effectiveness on the site. After several years of implementation of these 1979 guidelines on active sites in the early 1980s, the results showed mixed success. There was a net effect of lower acid production on most sites, but nearly all operations were still producing acid in areas with acid-producing materials. On some sites, even with special precautions of overburden analyses and special handling, there appeared to be no acid reduction at all. It was obvious that the AMD problem was very complex and that the members of the Task Force, being a volunteer group with career and family demands, were unable to devote more time to developing sophisticated approaches to solving the problem.

In September of 1981, a petition was served requesting the WVDNR Director to designate 500 square miles in a six-county area (Preston, Taylor Tucker, Upshur, Barbour, and Randolph) unsuitable for mining (Figure 2) because of potential AMD production after reclamation. Director Callaghan was faced with the possibility of locking up millions of tons of high quality coal because of the potential of AMD formation. Mining companies were outraged that their coal reserves were suddenly banned from mining. This sparked a renewed interest in resolving the AMD problem (Skousen et al., 1987).

AMDTAC

Director Callaghan's approach to address the AMD problem was to form the Acid Mine Drainage Technical Advisory Committee (AMDTAC). This committee was made up of recognized experts in AMD research, some of whom were serving on the Task Force. The committee developed a proposal that they felt would lead to a solution of the problem, and with the Office of Surface Mining (OSM) paying the greatest share of the cost, initiated research aimed directly at stopping the formation of acid. The first set of proposals was funded from 1982 through 1985 at an approximate cost of \$800,000. A second set of proposals was funded in 1985 at about the same level of funding.

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Figure 3. Members of the Acid Mine Drainage Technical Advisory Committee in 1982, who were tasked with providing solutions to the AMD problem in West Virginia. Top row: Dr. Frank Carruccio, Dr. Gwendolyn Geidel, Dr. John Sencindiver, Dr. Jack Renton. Second row: Dr. Robert Kleinmann (US Bureau of Mines), Dr. Alfred Stiller (WVU), Bottom row: Mr. Roger Hall (WVDNR), Director David Callaghan (WVDNR), Mr. Pete Pitsenbarger (WVDNR), and Mr. Charlie Miller (Grafton Coal Company).

The rationale behind organizing the Committee was based on tracing a drop of rain from the time it hit the land surface, to its infiltrating the soil profile, permeating into the backfill, interacting with various rock and mineral materials and eventually emerging as a seep or spring. At each stage of water migration, key elements were described and experts who were actively doing research in these fields were identified and asked to become part of AMDTAC (Caruccio, 1982).

Within the framework of a reclaimed mine and starting at the uppermost layer of soil, where the chemistry of the infiltrating rain water becomes quickly established and affects the geochemistry of the mine backfill system, the importance of vegetation cover, mine soil identification, and mine soil development was readily recognized. Levels of alkalinity are determined at this horizon and can radically affect the amount of acidity that may be produced. Dr. John Sencindiver, Division of Plant and Soil Science, West Virginia University, was identified as the scientist who could contribute most to the understanding of this facet of the problem and was asked to co-chair the Committee (Caruccio, 1982).

Once the water migrates through the mine soil, it permeates the pore space of the backfill and begins to react with the rocks and minerals in the overburden material. Initially the quality of the drainage will be affected by the alkalinity and acidity of the rocks it encounters. Dr. Gwendolyn Geidel, Department of Geology, University of South Carolina, was selected to assist the understanding of how rock-water interactions take place in the backfill and affect drainage chemistry (Caruccio, 1982).

The identification of the actual flow paths within the backfilled mine is critical to understanding the effectiveness of the techniques. Several key questions required answering. Are clay seals effective? Does water only contact the acid material and not the alkaline zones? Does most of the water bleed from the highwall

of a backfilled mine and travel along the pavement, never contacting the overburden material? Where in the backfill does acid drainage form? These are some of the fundamental questions regarding the hydrology and geochemistry of the reclaimed mine, which were to be addressed by Dr. Frank Caruccio, Department of Geology, University of South Carolina and who is also Co-chairman of the Committee (Caruccio, 1982).

At this stage of mine drainage flow, it is important to know not only the leachate quality (whether it will be acid or alkaline) but the amount (load) of acidity or alkalinity produced. In this way a balance between the two can be made to predict the mine drainage quality that could be expected and whether or not the amount of neutralizing material blended in the backfill is effective. Dr. Jack Renton, Department of Geology, West Virginia University, had been doing considerable research in this area and joined the Committee to aid understanding of the rates of rock-water interactions and the geochemistry of AMD (Caruccio, 1982).

Under certain conditions, as the mine drainage migrates through the backfill, the amount of acidity generated will be low, in which case moderate amounts of alkalinity produced by admixed limestone will be sufficient to neutralize the acid. Iron-oxidizing bacteria are known to accelerate acid production. Inhibiting the bacteria will reduce the acid loads and make limestone-generated alkalinity a reasonable and economical acid neutralizer. Dr. Bob Kleinmann, Acid Mine Drainage Research Section, U.S. Bureau of Mines, Pittsburgh, PA, had been doing outstanding research in the control of iron-oxidizing bacteria using detergents and formed an integral part of the development of on-site control mechanisms for AMD generation (Caruccio, 1982).

Along these same lines, if iron can be complexed in the early stages of acid production, acidity will not be formed. Dr. Al Stiller, Department of Chemical Engineering, West Virginia University, had been researching various iron-complexing agents and the methods of application. Controlling iron solubility and availability in the backfill was determined to be a key to AMD prevention and became a primary effort in AMD prevention (Caruccio, 1982).

Thus the Committee felt that the total mine drainage system, from the beginning where water falls on the land surface, through the inner workings of the geochemistry of the backfill, until the water emerges as a mine drainage flow, is covered in all respects by the six scientific experts appointed to the Committee. Although the solution to the problem looked good in the laboratory, the manner in which it must be implemented to work in the field must be economically and practically feasible. Further, all science must be blended with the ground truth of field experience so that the solutions to the problems will, in fact, be realistic. Two engineers were chosen to provide the Committee with this dimension: Mr. Charles Miller, Grafton Coal Company, Weston, WV, and Mr. Hans Naumann, Island Creek Coal Company, Craigsville, WV. Finally, in rounding out the Committee to allow WVDNR representation, Director David Callaghan, Mr. Pete Pitsenbarger and Mr. Roger Hall were appointed (Caruccio, 1982; Figure 3).

AMDTAC Reports at Task Force Symposia

The first papers given by AMDTAC members was in the 1982 Task Force Symposium (<https://wvmdtaskforce.com/past-symposium-papers/1982-symposium-papers/>).

Reports on the activities and the first research results from AMDTAC members were presented at the 1983 Task Force Symposium (Caruccio, 1983) (<https://wvmdtaskforce.com/past-symposium-papers/1983-symposium-papers/>).

Results involved particle size distribution of overburden materials, bactericide control, application of phosphate, rates of acid production from acid-producing rocks, surface reclamation techniques, and liners. Some of these ideas were quite new and innovative at the time. Here are listed some of the titles and presenters:

“Assessing Acid Loads of Coal Mine Overburden as Related to Grain Size Distribution”, Dr. Gwendelyn Geidel, Research Fellow, Department of Geology, University of South Carolina, Columbia.

“At-Source Control of AMD”, Dr. Robert Kleinmann, Supervisory Geologist, U.S. Bureau of Mines Research Center, Pittsburgh, PA.

A Method for Prevention of AMD: An Update Progress Report”, Dr. A. H. Stiller, Assistant Professor, Chemical Engineering Department, West Virginia University, Morgantown, WV.

“Laboratory Studies of Acid Generation from Coal Associated Rocks”, Dr. John J. Renton, Professor of Geology, West Virginia University, Morgantown, WV.

“Effects of Selected Reclamation Methods on Minesoil Properties: A Progress Report”, Dr. John C. Sencindiver, Assistant Professor of Agronomy, Division of Plant & Soil Sciences, West Virginia University, Morgantown, WV.

“The Effect of Plastic Liner on Acid Loads: DLM Site”, Dr. Frank T. Caruccio, Associate Professor of Geology, University of South Carolina, Columbia, SC.

“Field Applications of Phosphate and PVC Covering”, Hans E. Naumann, Chief Engineer, Island Creek Coal Company, Craigsville, WV.

Further study, monitoring, and new ideas were presented at subsequent symposia by AMDTAC researchers and others (<https://wvmdtaskforce.com/past-symposium-papers/1984-symposium-papers/>). Some of those new ideas involved alternate topsoil materials, apatite rock to control AMD, alkaline recharge trenches, acid and alkaline loads in overburden materials, and the impact of clay and synthetic liners to control AMD.

1986 Task Force Bulletin

In 1985, the West Virginia Surface Mine Drainage Task Force determined that an update or revision of the 1979 Suggested Guidelines Manual was needed especially due to the information generated from the AMDTAC research. Dr. John Sencindiver, a member of the Task Force and an AMDTAC researcher, developed a proposal to develop a new manual, entitled *A Review of Procedures for Surface Mining and Reclamation in Areas with Acid-Producing Materials* (Figure 4), authored by Jeff Skousen, John Sencindiver, and Richard M. Smith (Skousen et al., 1987). The revision contained results from AMDTAC research and new material from other sources outside of Appalachia that were applicable to abatement of AMD.

This update re-emphasized the use of overburden sampling

techniques and analysis of overburden materials by Acid-Base Accounting and leaching techniques to predict their acid-producing potential. In addition, new developments in acid prevention such as alkaline trenches, liners and seals, bactericides, special handling procedures, and revegetation practices were detailed. New chemical treatment technologies were also highlighted, as well as introducing the concept of AMD treatment by passive methods such as wetlands. Now, even after 30 years, the principles and practices in the 1987 manual are still implemented on mine sites to control AMD and these procedures have become standard practice on mining sites.

Current Task Force Activities

Today, the 27 Task Force members represent the coal mining industry, regulators, private consultants, and research scientists (Table 2). The Task Force remains active by holding quarterly meetings, preparing handouts, sponsoring the spring symposium, and hosting a fall field tour (Figures 5-10). In this way, the Task Force members continue to keep current on new technologies and practices in AMD control and treatment. The fall tours allow members to see and discuss new ideas and technologies with operators and researchers. Presentations at the following meeting are often made by those who were visited in the fall tour. The Task Force celebrates the 39th anniversary of its creation in 2017 at this symposium.

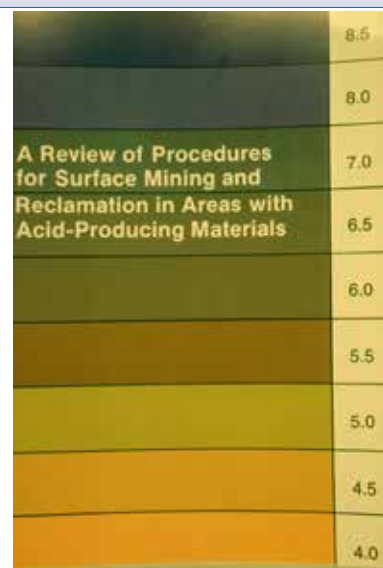


Figure 4. The 1987 Bulletin by Skousen, Sencindiver, and Smith.

Table 2. List of members who have served on the Task Force.

Jim Ashby*	Roger Hall	B.S. Saluja
John Belcastro*	Rick Herd	Nick Schear*
Jason Bostic*	Ron Hamric*	Jim Seckman*
Mike Carico*	David Hibbs	John Sencindiver
Mike Castle*	Tiff Hilton*	Mike Sheehan*
Thomas Cook	Mike Isabell*	Frank Shreve*
Jim Copley*	Ken Johnson*	John Sturm*
Danny Cox	Steve Keen	Jeff Skousen*
Tim Danehy*	Tom Kovalchuk*	John Sturm*
Joann Erwin	Sarah Kreitzer*	Wayne Stanley*
Ben Faulkner*	Bruce Leavitt	Gary Tinnel
Dennis Fredericks	Randy Maggard*	Paul Ziemkiewicz*
John Freeman	Al Meek	
Ben Greene*	Charles Miller*	
Brady Gutta*	Rocky Parsons*	*current members

If interested, all papers from previous Task Force symposia, as well as the 1979 and 1987 bulletins, can be viewed or downloaded from the Internet at <http://wvmdtaskforce.com/> (Figure 11).

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Surface Mine Drainage Task Force. 1979. Suggested guidelines for method of operation in surface mining of areas with potentially acid-producing materials. West Virginia Mining and Reclamation Association, Charleston, WV. Green Lands 9: 21-40. <https://wvmdtaskforce.files.wordpress.com/2015/12/80-suggested-guidelines.pdf>



Figure 7. Task Force picture taken during the fall tour in September 1990. Front row: Ben Greene, Roger Hall, Jim Corsaro, John Belcastro, Wayne Stanley, Pete Pitsenbarger, Courtney Black, Tiff Hilton, Ben Faulkner, and Gary Persinger. Middle row: ?, Ron Lilly, Dave Martin, Roger Green, Randy Maggard, Charlie Miller, Jim Copley, ?. Back row: Rocky Parsons, dozer operator, Paul Ziemkiewicz, Jim Ashby, Bruce Leavitt, and Jim Seckman. (Photo by Jeff Skousen).



Figure 5. Proceedings of all Task Force Meetings were available at each annual meeting and given to participants.



Figure 8. Task Force members at a Patriot Mine site during the fall tour in October 2006. Kneeling from left to right are Ben Faulkner, Nick Schaer, and Ron Hamric. First row: John Belcastro, Wayne Stanley, Charlie Miller, Jeff Skousen, Bob Hartman, Tom Kovalchuk. Back Row: Ben Green, Jim Seckman, Bruce Leavitt, Tiff Hilton, Jim Copley, Joe Donovan, Paul Ziemkiewicz, Rick Herd, Brownie Stuart.



Figure 9. Task Force members in a picture taken during the 2002 Task Force Symposium. Bottom left to right: Randy Maggard, Jeff Skousen, Al Meek, Wayne Stanley, Paul Ziemkiewicz; Middle Row: Bruce Leavitt, Frank Shreve, Jim Ashby, John Belcastro, Charlie Miller, John Sencindiver, Ben Faulkner; Top Row: Jimmy Seckman, Courtney Black, Mike Isabell, Ken Johnson.



Figure 6. Task Force members have prepared several handbooks on mining, reclamation, and water quality issues.



Figure 10. Task Force members at the 2014 fall tour in PA. From left to right: Randy Maggard, Jim Ashby, Ben Faulkner, Ken Johnson, Mike Isabell, Wayne Stanley, Jimmy Seckman, Tim Danehy, Ron Hamric, and Louis McDonald. (Photo by Jeff Skousen)



Figure 11. West Virginia Mine Drainage Task Force website.

The American Society of Mining and Reclamation: From Advisory Council to National Organization

By Jeff Skousen, Bill Plass,
Richard Barnhisel, and Robert Darmody

Introduction

The American Society for Mining and Reclamation (ASMR) is a professional Society composed of about 400 current members and with a list of over 1200 people who are past members or retirees. Members include representatives of mining companies, corporate offices, and consulting services (40%); employees of academic and research institutions (25%); employees of federal and state regulatory agencies (30%); and students (5%). A majority of the members are involved in coal, metal, and aggregate mining and the reclamation of disturbed areas.

The objectives of the society are:

- A. To encourage communication among research scientists, the mining industry, regulatory agencies, and landowners with respect to mining and reclamation research and practices.
- B. To promote and support research relating to land reclamation.
- C. To provide technical expertise to those agencies, organizations, or others who seek assistance in the development and execution of research, demonstration projects, or reclamation plans.
- D. To promote and support educational programs relating to reclamation of lands disturbed by mineral extraction.

Original Organization

The Society developed from smaller organizations initially established in West Virginia. Foresighted individuals in the late 1960's recognized the importance of research in the development of mining and reclamation practices and policies, and in the mitigation of environmental impacts from mining.

In 1968, a tripartite agreement was reached among the West Virginia Department of Natural Resources - Division of Reclamation (Ben Greene, chief), the West Virginia Surface Mining and Reclamation Association (Dick Vande Linde, executive director), and the U.S. Forest Service (Bill Plass, reclamation researcher). These three men, representing their respective organizations, agreed to form an advisory board to discuss reclamation research. The U.S. Forest Service established an office in Princeton, WV, and assigned Bill Plass to devote his position to mine land reclamation research. The three organi-

zations requested assistance from the U.S. Soil Conservation Service (represented by Frank Glover) and West Virginia University (represented by Richard M. Smith). These five individuals composed the "Steering Committee for Surface Mine Research in West Virginia" (Figure 1).



Figure 1. Reclamation Pioneers. These gentlemen (top row: Bill Plass, USDA Forest Service; Dick Vande Linde, West Virginia Mining and Reclamation Association; Ben Greene, West Virginia Division of Natural Resources; bottom row: Richard M. Smith, West Virginia University; and Frank Glover, USDA Soil Conservation Service) were responsible for establishing the roots of the organization that would become the American Society for Mining and Reclamation (ASMR).

Organizational Growth

The semi-annual meetings of the Steering Committee were publicized and soon became a popular forum for discussion of reclamation research. After two years, the number of participants increased and representatives from surrounding states attended the meetings. It became apparent that such meetings were needed to disseminate research results, discuss mutual problems, and coordinate research programs. Since the concept proved successful in West Virginia, the Steering

Committee determined that a regional organization with similar objectives could succeed.

A regional organization was formed in Charleston, WV, on May 16, 1973. Ben Greene, chief of WV-DNR's Reclamation Division, invited representatives from WV Surface Mining and Reclamation Association (Ben Lusk, president), West Virginia University, USDA-Soil Conservation Service, USDA-Forest Service, the Tennessee Valley Authority, the Ohio Reclamation Association, and the Interstate Mining Compact Commission. A decision was made to form the "Council for Surface Mining and Reclamation in Appalachia." The basic objectives were the same: 1) to discuss current research, 2) to identify research priorities, and 3) to create opportunities for dissemination of reclamation technology. The Council continued to meet semi-annually within the Appalachian region and interest in the meetings grew.

Expansion Again

During this initial phase of the Council, there were two meetings per year. In November 1978, at Oak Ridge, TN, the decision was made to extend the geographical base of the organization to the 100th meridian. The name was changed to the "American Council for Reclamation Research." Semi-annual meetings were held at locations in the Midwest and Appalachian regions. This group continued to meet twice a year for the next four years. Reclamation professionals from the western US became interested, and their involvement in Council activities increased during this time.

National Organization

Support and interest in this reclamation council was now national, and in 1982, the Council once again changed its name to reflect the widening scope of its activities. The "American Society for Surface Mining and Reclamation" (ASSMR) was established with Eastern and Western Divisions within the Society.

The name was changed again in 2001 to its current one, "American Society of Mining and Reclamation," or ASMR. The structure of the Society has changed in small ways in the past decade with the adoption of new by-laws in 2002 and a modification of its governing board known as the National Executive Council (NEC). Bill Plass served as the Executive Secretary during the early years of the organization (1984-1998). In 1999, Richard Barnhisel became the Executive Secretary and the Society office moved from Princeton, WV, to Lexington, KY. In 2013, Robert Darmody was appointed as the Executive Secretary with the society office being moved to Champaign, IL (Figure 2).

The focus of the society is unchanged. However, the ever-increasing interests in land use and protection, the development of technologies to disturb and reclaim land, and the expanding and changing regulatory and political climate make the society even more relevant today than when it started in 1982. These continual changes in information and technology have resulted in a greater need and broader spectrum to identify, protect, re-establish, and enhance mineral and environmental resources. Society programs and projects



Figure 2. ASMR Executive Secretaries: Bill Plass (1982-1999), Richard Barnhisel (1999-2014), and Robert Darmody (2014-present).

acknowledge the multidisciplinary nature of land reclamation and provide opportunities for specialized interests, distinct publications, unique technical sessions and workshops, and new ideas. The basic objective of the Society is to keep the membership informed of cutting edge research, new regulations, and applied reclamation policies and practices.

The **National Meeting** is the largest and most important annual event for the Society. Each year the location is rotated between eastern and western North America to provide opportunities for its members and guests to become familiar with diverse reclamation challenges and accomplishments. Field trips highlight local reclamation activities and provide unique features of reclamation at the meeting location (Figures 3-5). Locations of our past annual meetings are given in Table 1. The presentations and abstracts at the meetings provide valuable references for those concerned with land reclamation and represent the Society's most important product. Proceedings papers presented at the annual meet-

Table 1. Locations of annual meetings of ASMR since 1984.

Owensboro, KY	1984	Lexington, KY	2002
Denver, CO	1985	Billings, MT	2003
Jackson, MS	1986	Morgantown, WV	2004
Billings, MT	1987	Breckenridge, CO	2005
Pittsburgh, PA	1988	Billings, MT	2006
Calgary AB	1989	Gillette, WY	2007
Charleston, WV	1990	Richmond, VA	2008
Durango, CO	1991	Billings, MT	2009
Duluth, MN	1992	Pittsburgh, PA	2010
Spokane, WA	1993	Bismarck, ND	2011
Pittsburgh, PA	1994	Tupelo, MS	2012
Gillette, WY	1995	Laramie, WY	2013
Knoxville, TN	1996	Oklahoma City, OK	2014
Austin, TX	1997	Lexington, KY	2015
St. Louis, MO	1998	Spokane, WA	2016
Scottsdale, AZ	1999	Morgantown, WV	2017
Tampa, FL	2000	St. Louis, MO	2018
Albuquerque, NM	2001		2019



Figure 3. Attendees of one of the field trips at the 1989 Meeting in Calgary, Alberta, Canada. (Photo by Jeff Skousen).



Figure 4. Field trip to the Molycorp Mine in June 2001. The 2001 Meeting was held in Albuquerque, NM. (Photo by Jeff Skousen).



Figure 5. Attendees of the field trip to the Rochelle Mine in June 2007. The meeting was held in Gillette, WY.



Figure 6. Field trip at an active surface coal mining site in eastern Kentucky. The 2015 Meeting was a joint meeting with ASMR and ARRI in Lexington, KY.

ings were published from 1984 to 2012, and copies of past proceedings are available for a nominal fee. Publication of the proceedings was discontinued in 2012. However, beginning in 2013, presentations made during the annual meetings as well as abstracts are available on the ASMR.US web site.

The Society developed an online Journal which began publication in 2012 in an effort to replace the proceedings. Five volumes (2012 to 2016) with two issues each year have been developed and are available on the web site. The official name of the publication is the Journal of American Society of Mining and Reclamation (JASMR). The articles are peer reviewed and upon acceptance are printed in JASMR.

Reclamation Matters is a bi-annual magazine published since 2004 by the Society. It is composed of articles of general interest from the meeting presentations or proceedings and includes announcements of upcoming national meetings and other matters of society interest.

Technical Divisions

The Society recognizes the diverse and multidisciplinary nature of land reclamation. In order to integrate and offer programs for the variety of topics and issues in land reclamation, seven technical divisions are currently organized:

- Ecology
- Forestry/Wildlife
- Geotechnical Engineering
- International Tailings Reclamation
- Land Use Planning and Design
- Soils/Overburden
- Water Management.

Members of technical divisions lead the group, and interest and activity in the division rises and falls with developments in technology and policy changes. Some of these technical divisions are active with wide-ranging interest and future directions, while others are not as active. Names of divisions

have shifted based on interest levels and due to changing technologies. But additional divisions can be established with by making a proposal to the NEC and by showing the appropriate levels of interest.

The basic objective of these divisions is to keep the membership informed of basic and applied science in reclamation technology, both nationally and internationally. The Society's goal is also to provide a mechanism to encourage both written and verbal technology transfer.

International Relationships

The formation of the International Affiliation of Land Reclamationists (IALR) has evolved as a means to expedite technology transfer between members of similar organizations and interests in Canada, China, Australia, Great Britain, and the United States. All members of ASMR are automatically affiliate members of the IALR as well.

ASMR Legal Organization

ASMR is officially registered in West Virginia and is organized as a tax exempt 501(c)(3) corporation.

Society Awards and Student Support

The Society also presents annual awards to deserving individuals. Seven categories are available for recognizing individuals and their achievements:

- 1) Plass Lifelong Reclamation Achievement Award,
- 2) Barnhisel Reclamation Researcher Award,
- 3) Reclamationist of the Year Award,
- 4) Pioneers in Reclamation Award,
- 5) Distinction in Reclamation Award,
- 6) Early Career Award, and
- 7) the Special Recipient Award.

The Society also provides other Awards to student members. These include Memorial Scholarships and Student Travel Grants. In addition, student presenting papers at the annual meetings are eligible to compete for awards in a student presentation competition event. Support for ASMR awards is generated from donations, fund-raising activities, and earned on ASMR endowments and investments. Each of the above provide monetary awards which are generated from interest earned from specific financial endowments.

The society recognizes and sponsors student clubs at several Universities with reclamation related programs. The purpose of these student clubs is to foster communication and encourage students to pursue careers in reclamation related professions.

2017 Annual Meeting

The 2017 Joint Meeting in Morgantown, WV, will be held April 9-13, 2017. It combines three reclamation groups: The WV Mine Drainage Task Force, ASMR, and the Appalachian Regional Reforestation Initiative (ARRI). The conference is being held at the Waterfront Place Hotel and will be one of the largest mining, reclamation, and mine drainage meetings in the US in 2017. We anticipate an audience of 400 to 500 people, over 100 presentations, and more than 40 exhibitors.

Authors

Jeff Skousen is a professor of soil science and reclamation specialist at West Virginia University. He served as President of ASMR in 1991 and 2004, organized the 1990, 2004, and the 2017 ASMR annual meetings, and edits the Society's Reclamation Matters magazine. He also coordinates the WV Mine Drainage Task Meeting each year, and serves on the Science Team of the Appalachian Regional Reforestation Initiative.

Bill Plass, who retired from the US Forest Service after almost 40 years, served as Executive Secretary of ASMR from 1982 to 1999. He was a dominant force in the organization of



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reclamation policy and practice in the eastern US and reclamation research throughout the country. He published extensively throughout his career. He served during WWII as an Army Engineer in Southeast Asia, and received a BS in Forestry from Iowa State University and an MS in forestry from the University of Missouri. He died in 2008 at the age of 86.

Dick Barnhisel, retired from the University of Kentucky, served ASMR as its Executive Secretary from 1999 to 2014. During his career as a professor of agronomy, he published over 60 articles on reclamation and had over 45 students completing degrees associated with reclamation. He specialized in reclamation of prime farmland disturbed by coal mining. He is currently editing the Society's on-line journal, the Journal of the American Society for Mining and Reclamation. He also served as president of American Council for Reclamation Re-

search. He and his wife Lela have made a significant donation to ASMR to establish the endowment that provides the financial portion of the reclamation researcher award.

Robert Darmody, retired from his position as Professor of Pedology at the University of Illinois, and is currently serving as Executive Secretary of ASMR since 2014. His University career spanned more than 33 years and he has published over 100 articles in journals and other publications. His areas of research were in soil handling techniques to avoid compaction and mitigation of impacts produced by underground longwall and high extraction coal mining. He received several teaching awards at Illinois and advised 31 graduate students in their academic programs. He served as president of ASMR in 2006 and chair of the Soils and Overburden Technical Division for many years.



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The Appalachian Regional Reforestation Initiative: History, Organization, Outcome, and Future Role

By James Burger, Patrick Angel, and Carl Zipper

ARRI Goals and Approach

The Appalachian Regional Reforestation Initiative (ARRI) was organized in 2004 by the U.S. Office of Surface Mining Reclamation and Enforcement (OSMRE). ARRI is a cooperative effort among agencies, industry, and other non-governmental entities in the coal-mining states of Appalachia to encourage restoration of high-quality forests on reclaimed coal mines. ARRI's goals are to communicate and encourage mine reforestation practices that (1) plant more high-value hardwood trees on reclaimed coal mined lands in Appalachia; (2) increase the survival rates and growth rates of planted trees; and (3) expedite the establishment of forest habitat through natural succession. By using a combination of private and governmental resources, the Initiative facilitates and coordinates the coal industry, university researchers, the environmental community, conservation groups, land-owners, and State and Federal government agencies that have an interest in creating productive forests on reclaimed mines (Angel et al., 2005).

To accomplish its goals, ARRI and participating parties work together to promote and encourage planting trees on mined land using the Forestry Reclamation Approach (FRA). The FRA is a five-step reclamation process developed by forest scientists to ensure tree survival, vigorous growth, and native plant diversity that will facilitate restoration of the native Appalachian hardwood forest (Burger et al. 2005; Burger and Zipper 2011; Zipper et al. 2011b). The five FRA steps are listed in Table 1.

Table 1. The five steps of the Forestry Reclamation Approach (FRA).

- 1 Create a suitable rooting medium for good tree growth that is no less than four feet deep and comprised of topsoil, weathered sandstone and/or the best available material;
- 2 Loosely grade the topsoil or topsoil substitutes established in step one to create a non-compacted growth medium;
- 3 Use ground covers that are compatible with growing trees;
- 4 Plant two types of trees; early succession species for wildlife and soil stability, and commercially valuable crop trees;
- 5 Use proper tree planting techniques.



Figure 1. Succession and invasion of native species over five decades formed this mined-landscape in eastern Tennessee. After being mined, the site was planted with pine species and black locust in 1959 on un-compacted and weathered mine spoil. Through natural succession, the planted trees have been replaced by deciduous hardwoods and other native plants (photo by Victor Davis).



Figure 2. Bond-released mined land in Wise County, VA, reclaimed to "hayland/pasture" as the post-mining land use. After 10 years without management for its intended use, it has been overcome by autumn olive and other invasive species (photo by Jim Burger).

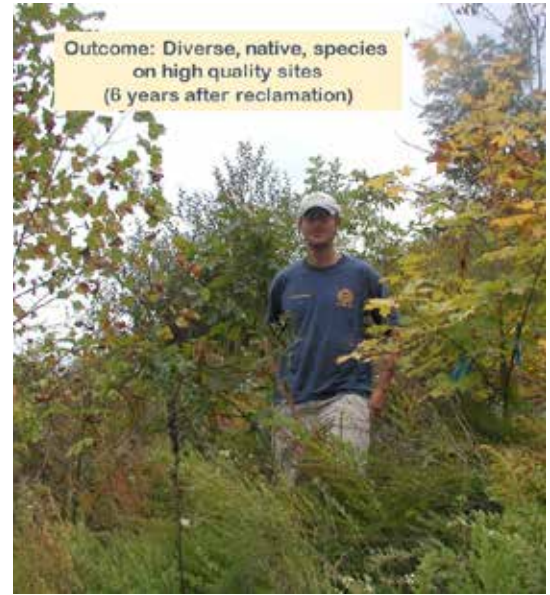


Figure 3. Six-year-old diverse, native hardwood trees on a high quality reclaimed mine site in Wise County, VA. This is an example of a mined site reclaimed using the Forestry Reclamation Approach (photo by Jim Burger).

ARRI's goals using the FRA techniques as described above may appear common sense, straight-forward, and unremarkable; but the complex history of mined land reclamation and reforestation with its interdependent elements of biology, economics, engineering, culture, politics, and policy shows that ARRI, its approach, and its outcomes, amount to a remarkable achievement. Mine reclamation procedures over much of the Appalachian coalfield have changed because of ARRI.

Brief History of Mined Land Reforestation

The Appalachian coalfield lies within the eastern deciduous forest of the eastern United States, one of the most diverse, contiguous, valuable forests in the world (Ricketts et al. 1999). These forests have provided products and services to local communities for centuries. According to the American Forest and Paper Association (<http://www.afandpa.org/our-industry/economic-impact>), the eastern coal producing states (PA, VA, MD, WV, KY, TN, OH) during 2016 had more than 1,000 wood products manufacturing facilities that employed over 190,000 workers. The overall value of annual wood products shipments exceeded \$54 billion. The ecosystem services provided by forests, including watershed control, water quality protection, carbon sequestration, and biodiversity and habitat preservation are reportedly more valuable than the wood products they provide (Costanza et al. 1997; Heal 2000). There is a rich history of human communities using these diverse forests for products, sustenance, and shelter (Bolgiano 1998); therefore, there are many compelling economic, environmental, and social reasons to restore the forest on land disturbed by mining.

Land disturbance from coal mining reportedly began in the 19th century with mule scrappers near Lancaster, Pennsylvania (Utley 2008). Mechanized strip mining using Otis steam shovels and Vulcan railroad shovels were used in Kentucky a century later to remove overburden tens of feet thick to expose buried coal seams.

Electric stripping shovels were used as early as the 1920s and continue to be used today throughout the Appalachian coalfields. Early on, stripping followed coal outcrops, but by the 1980s the scale of mechanization was such that entire ridgelines and mountaintops consisting of several hundred contiguous acres were being removed in the process of harvesting multiple coal seams hundreds of feet deep. Today, Appalachian mining disturbances are evident over thousands of contiguous acres in some locations. Given the tremendous change in scale and mining methods over time, the laws and regulations controlling mining also changed along with reclamation approaches.

Except for tree planting and some seeding of agricultural grasses, rehabilitation of areas disturbed by mining was negligible on most mines until the passage of the Surface Mining Control and Reclamation Act (SMCRA) in 1977. Most Appalachian states had rudimentary reclamation laws with provisions for revegetation, but few required highwall and pit backfilling or replacement of topsoil. According to Medvick (1980), Indiana in 1928 was the first state to organize a tree planting program for mined land. Over the next four decades, tree planting became synonymous with reclamation. State coal operator associations enlisted the aid of state, federal and academic forestry researchers to develop guidelines for reclaiming pre-law sites (Davis 1965; Vogel 1981). Planted native hardwood species generally grew well on loose, deep, overburden materials and many of these forest stands have become quite valuable (Ashby 1996; Rodrigue et al. 2002). Despite widespread tree planting during the decades of the 1950s, '60s, and '70s, and the success of tree planting programs on mined land, environmental and human safety issues remained, ultimately leading to passage of SMCRA.

SMCRA greatly changed the way coal surface mines were reclaimed. Relative to landscape and revegetation issues, pits

and highwalls were backfilled and the landscape was returned to approximate original contour. Strict sedimentation rules were interpreted to require sowing agricultural grasses and legumes for erosion control. Topsoil containing forest seed pools and soil organisms promoting forest health was seldom salvaged and reapplied to reclaimed surfaces. Alternative overburden materials were allowed in lieu of native soil if the coal operator could show equal or better capability based on certain performance standards such as number of woody stems per unit area or, more frequently, herbaceous ground cover.

Given their previous pre-law experiences with tree planting, some mining operators planted trees after implementing the new SMCRA rules, but generally with little to no success. The extensive grading with heavy equipment encouraged by early SMCRA enforcement severely compacted mine surfaces, and, when available, alkaline, unweathered rock was often used as topsoil substitutes for growing grasses and legumes. These mine soils had the wrong chemistry for native trees; while the ground cover sown for erosion control overtopped planted seedlings causing high mortality rates, stunted growth, and low species diversity (Groninger et al. 2006; Holl 2002). Where and when trees survived, they grew poorly, demonstrating that only part of the original pre-mining capability was restored (Burger and Evans 2010). As a result, within just a few years after implementation of the new federal law, coal operators were reclaiming most mined lands to alternative land uses such as hayland/pasture and wildlife habitat.

Very few of the approximately one million acres reclaimed during the 20-year period from 1980 to 2000 were managed and used for their prescribed post mining land use. There is no significant livestock industry in the central Appalachians and most mined sites are remote, without water for livestock, and difficult to fence and manage. Without management the “pastures” and wildlife plantings were quickly (within 10 years) overcome with invasive, exotic species such as *Sericea lespedeza* and autumn olive and resided in a state of arrested succession (Holl 2002; Williamson and Gray 1996; Zipper et al. 2011a). By the mid-1990s, landowners, ecologists, and the general public expressed concerns to coal operators and regulators about the low value and poor condition of reclaimed land. By the turn of the century, it was clear to many in the mining and reclamation community that a different approach to rehabilitation of mined land was needed.

A Forestry Reclamation Approach

In 1980, shortly after the implementation of SMCRA, Virginia Tech University established the Powell River Project (PRP) (www.prp.cses.vt.edu) with a mission to conduct research and education to enhance reclamation of mined land for the benefit of communities and businesses in the coalfield region. A broad range of issues were addressed, one of which was forest restoration. The PRP reforestation research program was built upon several decades of pre-law research by agency, university and industry scientists. However, even in SMCRA's early years, it was clear to forest scientists that heavily-graded, compacted topsoil substitutes with alkaline chemistry might be suitable for grassland establishment, but would not allow the establishment and growth of native forest vegetation, especially when aggressive, agricultural grasses and legumes were sown for initial ground cover as the new rules required. Therefore, PRP research

was done on selection and placement of mine soils suitable for native forest restoration, development of erosion-control ground covers compatible with native trees, and methods for increasing diversity, productivity, and value of restored forests.

Field studies, begun as early as 1981 (Torbert et al. 1988; Torbert et al. 2000) at the PRP, showed definitively that a very different approach was needed for restoring native forests compared to creating grassland for livestock pastures. Based on a combination of field experiments at the PRP, a reforestation method that became known as the “Forestry Reclamation Approach” or FRA was developed by Virginia Tech researchers. The PRP presented mine reforestation guidelines in extension publications and during field demonstrations beginning in the late 1980s. The latest iteration of the PRP reforestation guidelines are described in the Virginia Cooperative Extension Publication 460-123 entitled “How to Restore Forests on Surface-Mined Land (Burger and Zipper 2011). In 2004 and 2005, Virginia Tech and University of Kentucky researchers worked with personnel from OSMRE to formalize the “five steps” that constitute the FRA as we know it today (Burger et al. 2005).

Each of the FRA steps is underpinned by multiple studies published in research journals and have been reinforced by extensive work by forest scientists in several Appalachian states. The University of Kentucky Starfire Project and reforestation studies based at West Virginia University and University of Tennessee show the applicability of the FRA across the Appalachian coalfield region. The FRA is consistent with SMCRA and state regulations throughout Appalachia, thus its use is advocated by OSMRE and it was adopted by ARRI as the basic method for achieving its primary goals of re-establishing healthy, diverse, native hardwood forests on mined land.

Formation of the Appalachian Regional Reforestation Initiative

The OSMRE formally began addressing the problems associated with reforestation of surface mines by creating ARRI. It was formed as a result of a fortuitous “alignment of the planets” that entailed 1) pressure from the public for better reclamation of Appalachian mined land; 2) an admission by OSMRE that rules allowing conversion of native forests to grasslands that become covered with invasive species creating a state of arrested succession were not in the interest of any mining community stakeholder; 3) the development of the FRA, its operational demonstration, and published scientific underpinnings; 4) advocacy of a number of forestry-trained OSMRE employees; and 5) vision and leadership by several OSMRE Directors and their associates under different administrations. The initiative was an effort to facilitate better reclamation by increasing knowledge of alternative methods and changing attitudes about planting trees on surface mines (Angel et al. 2005).

ARRI consists of an agency or Core Team that includes an OSMRE employee from each state and a member from each State regulatory authority in the Appalachian region. The Core Team develops reforestation partnerships, promotes ARRI's goals, and works to eliminate the cultural, technical, and regulatory barriers that exist for reforestation of surface mines. In addition, a Science Team comprised of forest scientists, soil scientists, and other experts work with the Core Team to develop the science-based methods for reclaiming surface mined land to forestland within the provisions of SMCRA.

Table 2. A listing of the thirteen ARRI Forest Reclamation Advisories that have been published to date, and the fourteenth Advisory which, as of this writing, is being finalized.^a

#	Title	Content
1	The Appalachian Regional Reforestation Initiative	In this first advisory, the goals of ARRI and the function of these Forest Reclamation Advisories are explained.
2	The Forestry Reclamation Approach (FRA)	The FRA is the science-based technique for reclaiming coal-mined land to forest while complying with the existing State and Federal mining laws. This advisory explains the 5 steps of the FRA.
3	Low Compaction Grading to Enhance Reforestation Success on Coal Surface Mines	This advisory describes final-grading techniques that can be used during reclamation to prepare coal-surface mines to support a forested post-mining land use.
4	Loosening Compacted Soils on Mined Sites	Some areas of mine sites become compacted due to machinery operation, traffic, and storage. This advisory describes practices for ripping compacted areas to loosen soils necessary to achieve successful reforestation.
5	Mine Reclamation Practices to Enhance Forest Development Through Natural Succession	Succession is a term used to describe natural changes in plant community composition over time. This advisory describes the ways in which reclamation methods can encourage rapid succession and accelerate development of high quality post-mining forests.
6	Tree Compatible Ground-covers for Reforestation and Erosion Control	The FRA uses a slow growing, noncompetitive, tree-compatible ground cover. Advisory No. 6 addresses FRA's 3rd step and describes methods for establishing ground cover vegetation to control erosion without hindering the survival and growth of the trees
7	Planting Hardwood Tree Seedlings on Reclaimed Mine Land in Appalachia	Proper care and planting of tree seedlings is essential to any reforestation effort. Appalachian coal mines reclaimed using the FRA will often be rough, rocky, and on steep terrain. Thus, hand planting is the usual method for planting hardwood tree seed
8	Selecting Materials for Mine Soil Construction When Establishing Forests On Appalachian Mine Sites	When native forest re-establishment is the post-mining land use and reclamation goal, the guidelines reviewed in Advisory No. 8 can aid mine operators in ensuring that mine soils, applied at a minimum of 4 feet in thickness, will restore land capability
9	Selecting Tree Species for Reforestation of Appalachian Mined Land	More than 100 native tree species and numerous native shrub species grow within Appalachian forests. This diversity reflects the many site conditions found across the region.
10	Reforestation to Enhance Appalachian Mined Lands as Habitat for Terrestrial Wildlife	Although small breaks in the forest canopy are important to wildlife diversity, most native Appalachian wildlife species require primarily forested habitats. This Forest Reclamation Advisory provides guidance on reforestation practices to provide high quality habitat for native forest wildlife on Appalachian coal mines.
11	Establishing Native Trees on Legacy Surface Mines	Establishing productive forests on such lands will aid restoration of ecosystem services provided by forests – services such as watershed protection, water quality enhancement, carbon storage and native wildlife habitat -- and will enable mined lands to produce valued products such as commercial timber.
12	Re-establishing American Chestnut on Mined Lands in the Appalachian Coalfields	American chestnut has suffered severe decline throughout the USA; today, few living and mature American chestnut trees remain. This Forest Reclamation Advisory describes efforts to develop new American chestnut varieties, and reclamation and planting techniques for chestnut on mined lands.
13	Tree and Shrub Species Selection for Mine Reclamation in the Midwest Region of USA	This advisory provides guidance for selecting tree and shrub species for planting on mine sites that are reclaimed using the FRA in the USA's Midwestern coalfield (Illinois, Indiana, and western Kentucky).
14	Re-establishing Pollinator Habitat on Mined Lands Using the Forest Reclamation Approach	This advisory (still under development) will describe mine reforestation strategies that can encourage and support pollinator conservation in the eastern US.

^a ARRI Advisories can be obtained at: <https://arri.osmre.gov/Publications/Publications.shtm#FRAs>



Figure 4. Examples of Forestry Reclamation Advisories developed and written by ARRI's Science Team (photo by Jim Burger).

In addition to conducting and contributing their own research, Science Team members provide advice through consensus publications called Forestry Reclamation Advisories. These advisories describe methods for achieving cost-effective regulatory compliance for coal operators while creating productive forests that generate value for their owners and services for the public. At this point thirteen advisories have been published (Table 2).

Accomplishments and Outcomes of ARRI

ARRI partners work on both active and abandoned mined land, and on so-called legacy lands that have met SMCRA requirements but require additional management to become productive forests. To promote reforestation on active mines, the OSMRE and state Core Team members pursue ARRI's goals in a number of ways including modification of rules

that encourage tree planting, providing FRA training to coal operators and stakeholder organizations, participation in Arbor Day events, judging and presenting reclamation awards, and holding and participating in an annual ARRI conference that updates and communicates reforestation progress. For the 12-year period from 2005 to 2016 approximately 108.3 million trees have been planted on 159,000 acres using FRA practices, equivalent to 43% of the approximately 430,000 acres of land reclaimed and bond-released in the Appalachian coalfields region during this period. ARRI led a significant organizational initiative to recruit participating landowners, financial sponsors, and volunteer tree planters to convert legacy lands from their current state to diverse, productive, native forest. Initially, this effort was led quite successfully by OSMRE foresters, but the scale of activity relative to need suggested a more comprehensive approach and broader goals.

In early 2009, a conversation among ARRI collaborators about the need for economic development and environmental improvement in Appalachia laid the groundwork for Green Forests Work (GFW), now a 501(c) (3) non-governmental organization that evolved from ARRI's early efforts to reforest legacy lands. GFW's mission is to re-establish healthy and productive forests on formerly mined lands (<http://www.greenforestswork.org/>). From 2009 through 2016, GFW and ARRI partnered with state and federal agencies, watershed groups, coal operators, universities, colleges and school groups, and other organizations to complete 259 tree planting projects throughout Appalachia. These events involved over 1,358 partner organizations and 13,841 volunteers resulting in over 1,831,000 trees planted on nearly 3000 acres (GFW 2017). ARRI's and GFW's role in these endeavors is to facilitate communication, provide technical assistance and supplies, and to match funding sources with suitable mined land and volunteer groups. Working with ARRI Core and Science Team members, GFW foresters coordinated site selection and evaluation, herbicide treatments, ripping activities, species selection, tree planting, and follow-up surveys.

These projects not only accomplish ARRI's and GFW's core mission of reforestation of mined land, they also provide community service opportunities, help raise awareness of environmental issues, and empower young people to take action toward improving mine-scarred lands. The cultural barriers that existed for decades against planting trees on surface mines are gradually being broken down as thousands of young Americans are engaged in the mitigation of site conditions that impedes natural succession and reforestation on legacy mines. As a result, the public is embracing forestry as the post-mining land use of choice as conventional grassland reclamation methodologies are gradually being replaced by the Forestry Reclamation Approach.

Recognition and Awards

During its relatively short 15-year lifespan, ARRI has received some well-deserved recognition for its efforts (Table 3).

These awards were made possible through the hard work of the ARRI Core and Science Teams and the hundreds of individuals and representatives of industry, environmental groups,



Figure 5. A collage of volunteer tree planters reforesting legacy mined sites in several different sites in the Appalachian coalfields (photos by Patrick Angel and Associates).



Figure 6. The U. S. Department of Interior Partners in Conservation Award presented to ARRI Science Team members and OSMRE administrators (photo by USDO).

academic institutions, citizen's groups, landowners, and federal, state and local government who have worked to implement the Forestry Reclamation Approach when planting trees throughout Appalachia.

ARRI's Future Role in a Changing Appalachian Coalfield

Today, it has become common knowledge that FRA techniques can re-establish native trees on mine sites and these techniques are being widely applied on both active and legacy mines throughout the Appalachian coalfields.

But what does the future hold? We believe ARRI's objectives

can and should be expanded from "planting more native trees for diverse healthy forests" to include a greater emphasis on reclamation techniques that restore all the services the forest provided prior to mining, such as those described by Burger (2015). A healthy forest ecosystem begins with a stable landscape with slopes, catchments, and drainage patterns that provide watershed control. Selection and placement of low TDS materials help ensure good water quality for aquatic life in restored stream channels, and placement of native soil and coarse woody debris on the mine surface promotes rapid establishment of an abundance of terrestrial life far beyond planted trees. Elements of an ecosystem reclamation approach are illustrated in Figure 7. Mining and reclamation techniques and approaches evolve over time. We believe it is time to overtly recognize that we have the science, operational capability, and need to restore forest

ecosystems and all their functions in addition to simply reclaiming mined land so trees grow well. ARRI is capable and poised to play this expanded role.

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Table 3. Awards received by ARRI.

Award	Recognition:
Partners in Conservation Award from the Secretary of the Interior (October 18, 2012) Presidential Migratory Bird Federal Stewardship Award (May 25, 2011)	Recognizes a single project or action conducted by or in partnership with a Federal agency focusing on migratory bird conservation that reduces existing or potential adverse impacts to migratory birds and their habitats, restores or enhances migratory bird habitat, and incorporates conservation of migratory birds and their habitat into agency plans, guidance, or other activities.
Arbor Day Award from the National Arbor Day Foundation (May 10, 2011)	Recognizes outstanding individuals, environmental leaders and innovative organizations for their sustainable conservation efforts on an international, national, state and community level. Winners have demonstrated the very best in tree planting and care, Arbor Day celebrations, partnerships, community projects, and environmental education.
Cooperative Conservation Award from the Secretary of the Interior (May 9, 2007)	Recognizes cooperative conservation achievements that involve collaborative activity among a diverse range of entities that may include Federal, State, local and tribal governments, private for profit and nonprofit institutions, other non-governmental entities, and individuals.

Ecosystem Reclamation Approach

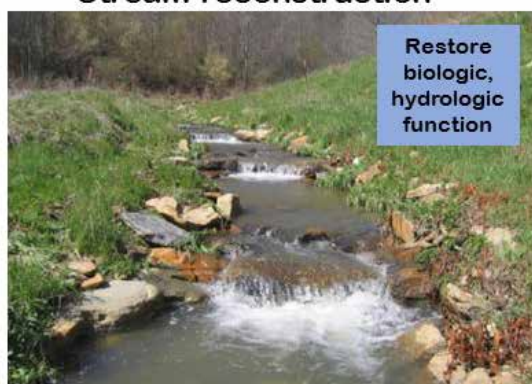
Geomorphic landform design



Replace topsoil



Stream reconstruction



Reforestation



Figure 7. Elements of a Forest Ecosystem Reclamation Approach that includes 1) geomorphic landform design with placement of low TDS materials to ensure good water quality; 2) stream reconstruction to restore biologic and hydrologic function; 3) replacing native topsoil, organic matter, seed pools, and coarse woody debris; 4) use of the Forestry Reclamation Approach to establish new forests (photos by Jim Burger).

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The National Association of Abandoned Mine Land Programs Annual Conference will be held in Lexington Kentucky

The conference will run from Sunday evening September 24th through Wednesday afternoon on the 27th. Registration is open to all who have an interest in AML programs and reclamation projects. Conference information can be found at the following website: <http://aml.ky.gov/NAAML2017/Pages/NAAML2017.aspx>

Monday will have an opening plenary session, technical presentations unique to abandoned mine land (AML) reclamation, and an awards banquet honoring National Reclamation Award winners. The technical sessions provide valuable exchanges of issues specific to reclamation specialists and have helped to make the conference a great value for all who attend. The networking opportunities between state employees, federal employees, engineers, contractors, and suppliers have been one of the key components of the NAAML Conference.



Field trips on Tuesday will feature stream restoration sites, AML reclamation sites, limestone quarries that host the University of Kentucky underground blast laboratories, and a tour of the Toyota Manufacturing Plant which has benefited from low electricity rates from the abundance of Kentucky Coal.

Lexington is famous for Bluegrass Music, Thoroughbred Horses, Bourbon, and Kentucky Wildcat Basketball. Tours will also be available to horse farms, bourbon distilleries, the Kentucky Horse Park, Keeneland Thoroughbred Race Track, and other beautiful Bluegrass destinations.



The National Association of Abandoned Mine Land Programs (NAAML) originated in the early 1980's as a support organization to help states and tribes develop programs associated with reclaiming historic coal mines. Title IV of the Surface Mining Control and Reclamation Act of 1977 (SMCRA) established the national Abandoned Mine Land (AML) Reclamation Program under the Office of Surface Mining Reclamation and Enforcement (OSMRE), U.S. Department of the Interior. The program was developed to reclaim land and water resources adversely affected by past coal mining and left abandoned or inadequately restored.

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