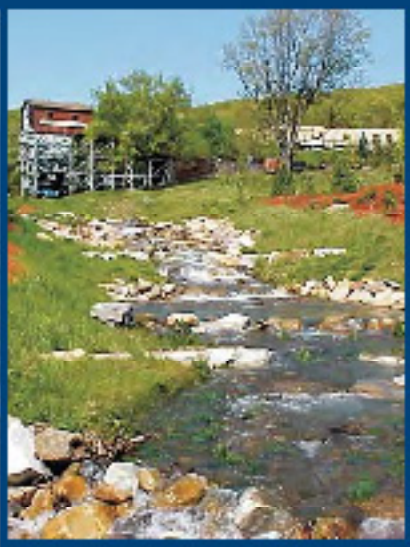
The 32nd Annual Conference of the National Association of Abandoned Mine Land Programs



Scranton, PA September 19-22, 2010

NAAMLP

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

A Welcome from Governor Rendell

COMMONWEALTH OF PENNSYLVANIA
OFFICE OF THE GOVERNOR
HARRISBURG

THE GOVERNOR

A Welcome from Governor Rendell

Welcome to Pennsylvania and the 32nd annual conference of the National Association of Abandoned Mine Land Programs.

America's mining industry transformed our young nation into an industrial superpower, providing jobs and fueling economic growth. Pennsylvania's mineral riches forged the cannons that won our independence and helped rebuild Europe following two world wars. The industry has been a cornerstone of our economy for more than 200 years, and at one time, Pennsylvania's mines produced more coal than all other states combined.

However, these mineral riches have come with a cost, and our generation is left to repair the damage caused by the unregulated mining practices of the past. After several decades of work, Pennsylvania is still scarred by more than 180,000 acres of abandoned mine lands. More than 5,000 miles of our rivers and streams are polluted or degraded by countless mine discharges. And since I took office in 2003, DEP's Bureau of Abandoned Mine Reclamation has committed more than $174 million to 278 abandoned mine reclamation projects to address these issues, reclaiming more than 6,670 acres.

It is against the backdrop of our anthracite fields, where we celebrate some of the most colorful chapters in American history and struggle with some of our most perplexing abandoned minelands challenges that you will meet with your colleagues from other states and countries to share your successes and search for solutions to our common problems.

Sincerely

Edward G. Rendell

Edward G. Rendell
Governor

NAAMLP
NATIONAL ASSOCIATION OF ABANDONED MINE LAND PROGRAMS

September 19, 2010

Dear Friends and Colleagues,

On behalf of the States and Tribes that comprise the National Association of Abandoned Mine Land Programs, I would like to welcome you to Scranton, Pennsylvania and our 32nd Annual Conference. Our host, the Pennsylvania Bureau of Abandoned Mine Reclamation, has put together an excellent agenda that promotes the sharing of new technology and highlights the abandoned mine reclamation experience of our members, consultants, and academics.

The 30 State and Tribal members of the NAAMLP have worked for 32 years to reclaim the health, safety and environmental hazards caused by abandoned mines. The NAAMLP also works to promote legislation and initiatives that support abandoned mine reclamation throughout our Nation.

Collectively we have made great strides in our reclamation efforts and will continue to move forward and improve our reclamation methods and technology. The purpose of this Annual Conference is to share our successes, failures, promote more efficient methods of reclamation and to recognize our past accomplishments. In that light, I encourage college students that are interested in pursuing a career in mining or mine reclamation to go to our web site (http://naamlp.net/) and consider applying for our scholarship program.

The NAAMLP thanks all the conference sponsors, presenters, exhibitors, planners, workers, and the Pennsylvania Bureau of Abandoned Mine Reclamation for their support and efforts to make this conference a success. I hope you enjoy the conference and find the technical sessions educational.

Sincerely,

Michael Garner

Mike Garner
President

ALABAMA ALASKA ARIZONA ARKANSAS CALIFORNIA COLORADO CROW HOPI ILLINOIS INDIANA IOWA KANSAS KENTUCKY LOUISIANA MARYLAND MISSISSIPPI MISSOURI MONTANA NAVAJO NEVADA NEW MEXICO NORTH DAKOTA OHIO OKLAHOMA PENNSYLVANIA TENNESSEE TEXAS UTAH VIRGINIA WEST VIRGINIA WYOMING

OFFICE OF THE MAYOR

Greetings:

I would like to extend a sincere welcome to the travelers of the National Association of Abandoned Land Mine Programs to the "Electric City" otherwise known as Scranton, Pennsylvania.

While here in Scranton, I invite you to take in the many sites this great city has to offer. Visit Nay Aug Park, where the famous "Tree house" is located or take a relaxing stroll along the Davis Trail. Travel back in time while descending 300 ft beneath the earth on a Lackawanna Coal Mine Tour and experience what a day's work was like for a coal miner.

The city has welcomed many new businesses, including a division of Sanofi Pasteur Pharmaceuticals, and is home to the newest medical school in Pennsylvania, The Commonwealth Medical College. Almost $400 million dollars have been invested in the City of Scranton.

Numerous shops and restaurants have opened in the downtown, and the New York Yankees recently made the Scranton area their home for its AAA Baseball Team. With so much to do and see, you can clearly see why Scranton is known as the "Electric City".

Welcome to Scranton!

Christopher A. Doherty
Mayor

SCRANTON'S HISTORY

In the late 1700s European settlers traveled from Connecticut to the Lackawanna Valley because of the rich iron ore deposits used to make iron and steel. Soon, blast furnaces and forges began populating the landscape, marketing their product to neighboring towns. Small businesses followed the forges and modest communities began to form. Slocum Hollow, located where Scranton is today, opened a post office in 1811.

Another valuable asset to the area would soon be discovered. Anthracite coal lay underneath the entire region. John, William and Maurice Wurts purchased land in what is Carbondale today and began mining, and soon formed the Delaware and Hudson Canal Company to transport coal from Carbondale's mines to Honesdale via a gravity railroad and from Honesdale to the Hudson River, New York, by a canal. With the success of the gravity railroad and canal system, additional gravity lines were extended from Carbondale down throughout the valley.

The Delaware and Hudson Canal Company was the first million-dollar private enterprise in the United States, and it led to the first suspension aqueducts that were built by John A. Roebling of Brooklyn Bridge fame and later to the first operation of a railroad locomotive in America, the "Stourbridge Lion."

In 1842, William Henry, who had been operating a blast furnace in New Jersey, arrived with his son-in-law, Seldon Scranton, and his brother George, purchased the Slocum property and began construction of the Lackawanna Furnace. By 1848, the Lackawanna Furnace and Rolling Mills Company was producing rails for market.

In 1848 the small iron-mill was enlarged to a rail-producing factory. In the same year, a U.S. Post Office was established in the town then called "Scrantonia" named after the Scranton family. Also, during this time period the first wave of immigrants from England, Wales, Ireland, and Germany was beginning to settle in the region.

The Scrantons, realizing that money was located in coal, began to concentrate on its mining and transportation in the 1850's. Their efforts led to the formation of the Delaware, Lackawanna and Western Railroad. The railroad company controlled a network of coal mines that had mined and shipped two million tons of coal by 1868.

Coal, steel and railroads played huge roles in the development of late 19th and early 20th Century America. The industrial boom was happening here, and in Europe, and these three items were in great demand. Lackawanna County happened to manufacture all three. This led to a very prosperous time in Northeast Pennsylvania. Residential settlements popped up wherever coal was mined and, despite lacking access to ports or navigable waterways, the economy ran smoothly because there was a need for "black gold", steel and rail ties.

The area enjoyed nearly a century of growth and prosperity. In the 1880's, the first electric street car system in the United States was built in Scranton, thus earning it the nickname "The Electric City". Coal breakers dominated the skyline of every community in the County and modern day America was being built off the resources of Lackawanna County. Silk factories became an important part of the local economy, with the first one opening in Scranton in 1872. Many institutions of higher learning were formed during this period as well, including Keystone College in La Plume (1869), St. Thomas College (now known as the University of Scranton, 1888), and Marywood College (now a university, 1915).

This time also saw many immigrants coming to the area in search of employment in the coal mines. Scores of Irish, Polish, Italian and Russian immigrants took to the mines and thus the rich, ethnic history of the County began to take form.

Shortly after the turn of the Century, things slowly turned for the worse in Lackawanna County. Labor strikes became more frequent as members of the coal miners' union fought for higher wages and better working conditions, the biggest taking place in 1902. That same year the Scrantons' own Lackawanna Steel Company left for Buffalo. In the following decade, oil was discovered as a cheaper, cleaner means of energy. Coal became increasingly less popular as time went by, hitting rock bottom during the Great Depression of the 1930's, seeing new life during World War II, but disappearing for all intents and purposes in the 1950's. The driving force behind Lackawanna County's economy was gone.

The last 50 years have seen two Pennsylvania Governors hail from Scranton. William Scranton, a direct descendant of the family the City is named after, served from 1964-67 and Robert Casey served from from 1986-1993.

For the past half-century, Lackawanna County has been in a transition phase and we are finally beginning to see the benefits. The County suffered population losses for decades after coal left town, but, as you would expect from ancestors of coal miners, the people have fought through the tough times and today, Lackawanna County has an extremely bright future. New commercial projects have sprung up in Dickson City, Scranton and Moosic. Minor League Baseball has come to town, and the County's infrastructure has been greatly improved.

http://www.lackawannacounty.org/history.asp

CONFERENCE AGENDA

Saturday, September 19:

3:00 pm	-	7:00 pm	Registration and Information Desk	2nd FL Hilton

Sunday, September 20:

7:00 am	-	6:30 pm	Registration and Information Desk	2nd FL Hilton
8:00 am			Golf Group meets	Lobby Hilton
9:00 am	-	5:30 pm	Exhibit Setup	2nd FL Hilton
9:30 am			Lackawanna Iron Furnaces and Steamtown Pre-conference Tour Group meets	Lobby Hilton
10:00 am			Anthracite Heritage Museum and Lackawanna Mine Pre-conference Group meets	Lobby Hilton
1:00 pm	-	5:00 pm	NAAMLP Committee Meetings	Hilton Blakely Room
1:00 pm	-	9:00 pm	Speaker Ready Room	Hilton Parlor A
6:30 pm	-	8:30 pm	Welcome Reception Meet and Greet	Hilton Casey Grand Ballroom
6:30 pm	-	8:30 pm	Exhibits Open	2nd FL Hilton
9:00 pm	-	11:00 pm	Hospitality Room Open	Hilton Dunmore/Waverly

Monday, September 20:

7:00 am	-	8:00 am	Continental Breakfast – Exhibit Area	2nd FL Hilton
7:00 am	-	6:30 pm	Registration and Information Desk	2nd FL Hilton
7:00 am	-	4:30 pm	Speaker Ready Room	Hilton Parlor A
7:00 am	-	6:30 pm	Exhibits Open	2nd FL Hilton
8:00 am	-	4:30 pm	Crossings Premium Outlets Group meets	Hilton Lobby
8:00 am	-	8:45 am	Plenary Session	Hilton Casey Ballroom A-B-C
8:45 am		9:00 am	Break – Exhibit Area	2nd Floor Hilton
9:00 am	-	10:30 am	Technical Sessions, see Technical Session Schedule, page 28	Amphitheatre, Blakely, Dalton, Mayfield and Taylor Rooms
10:30 am	-	10:50 am	Break – Exhibit Area	2nd Floor Hilton
10:50 am	-	12:20 pm	Technical Sessions, see Technical Session Schedule, page 28	Amphitheatre, Blakely, Dalton, Mayfield and Taylor Rooms
12:20 pm	-	1:35 pm	Lunch on your own	
1:35 pm	-	3:35 pm	Technical Sessions, see Technical Session Schedule, page 29	Amphitheatre, Blakely, Dalton, Mayfield and Taylor Rooms
3:35 pm	-	3:55 pm	Break – Exhibit Area	2nd Floor Hilton
3:55 pm	-	5:25 pm	Technical Sessions, see Technical Session Schedule, page 29	Amphitheatre, Blakely, Dalton, Mayfield and Taylor Rooms
6:00 pm	-	6:30 pm	Reception, Cash Bar	Hilton Casey Grand Ballroom
6:30 pm	-	9:30 pm	Awards Banquet	Hilton Casey Grand Ballroom
9:00 pm	-	11:00 pm	Hospitality Room Open	Hilton Dunmore/Waverly

CONFERENCE AGENDA (continued)

Tuesday, September 21:

6:00 am	-	9:00 am	Continental Breakfast – Exhibit Area	2nd FL Hilton
7:00 am	-	6:30 pm	Registration and Information Desk	2nd FL Hilton
7:00 am	-	8:30 pm	Exhibits Open	2nd FL Hilton
7:30 am	-	4:30 pm	Technical Tours	
			7:45 – Centralia Tour Bus Loading	Hilton Lobby
			7:45 – Huber Tour Bus Loading	Hilton Lobby
			7:45 – IPP Tour Bus Loading	Hilton Lobby
			7:45 – Lansford Tour Bus Loading	Hilton Lobby
			8:45 – Hazleton Tour Bus Loading	Hilton Lobby
			9:30 – Steamtown Train Loading	Radisson Hotel Platform (Outside – SE Corner)
6:00 pm	-	8:30 pm	Polka Party	Radisson Hotel Covered Platform (NW Corner)
9:00 pm	-	11:00 pm	Hospitality Room Open	Hilton – Dunmore/Waverly

Wednesday, September 22:

7:00 am	-	9:00 am	Breakfast – Exhibit Area	2nd FL Hilton
7:00 am	-	12:00 pm	Registration and Information Desk	2nd FL Hilton
7:00 am	-	10:00 am	Speaker Ready room	Parlor A
7:00 am	-	12:00 pm	Exhibits Open	2nd FL Hilton
8:00 am	-	5:00 pm	NAAMLP Business Meeting (NAAMLP Business Meeting Lunch)	Hilton Steamtown Hilton Steamtown
8:00 am	-	10:20 am	AML Award Winner Presentations and Technical Sessions, see Technical Session Schedule, page 30	Amphitheatre, Blakely, Dalton, Mayfield and Dunmore Rooms
10:20 am	-	10:30 am	Break – Exhibit Area	2nd FL Hilton
10:20 am	-	12:20 pm	AML Award Winner Presentations and Technical Sessions, see Technical Session Schedule, page 30	Amphitheatre, Blakely, Dalton, Mayfield and Dunmore Rooms
12:20 pm			Conference concludes, Lunch on your own	

SAFE TRIP HOME

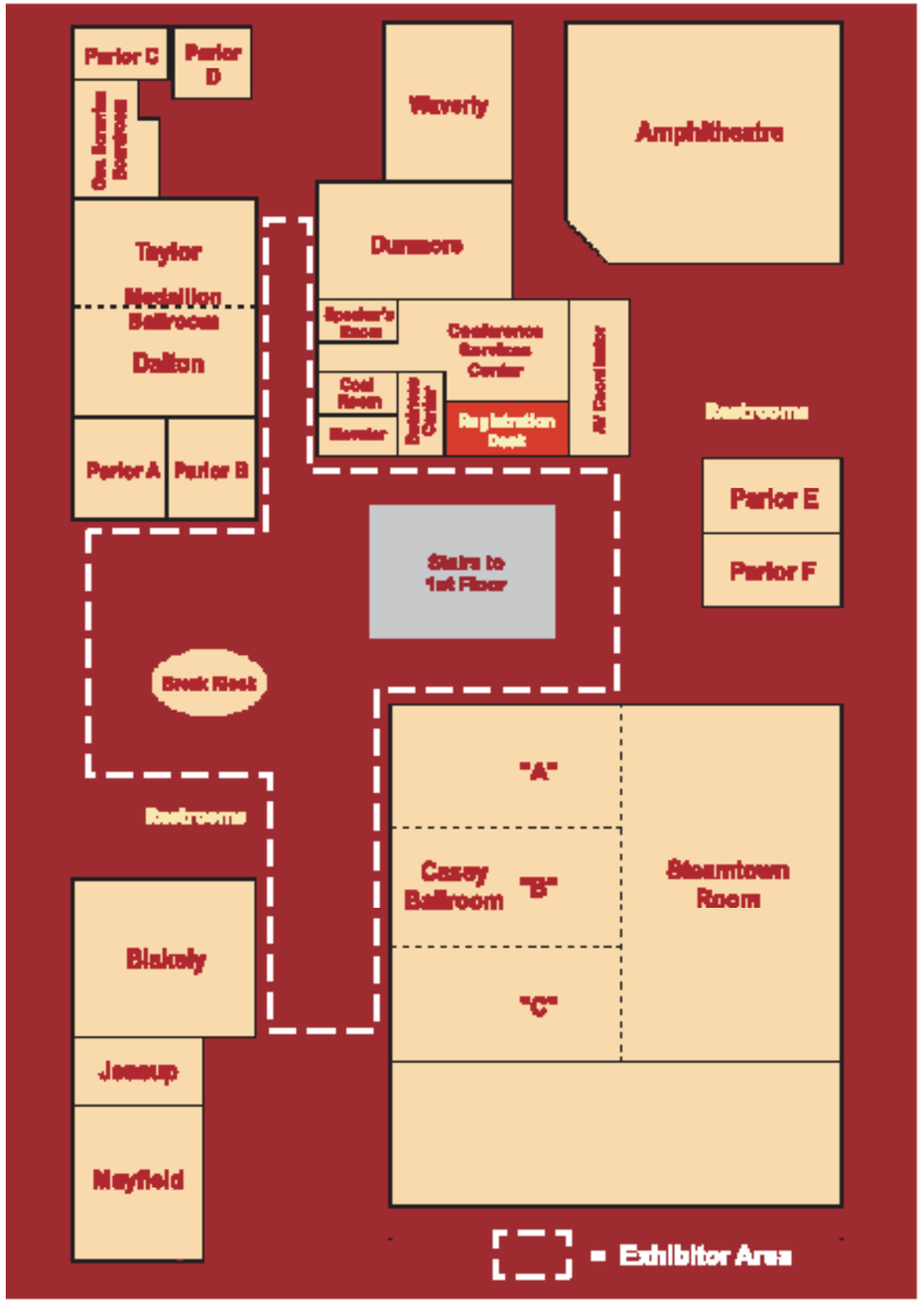
ON THE COVERS:

Front Cover (Clockwise, starting with the largest photo): Huber Breaker, Wilkes-Barre, PA; Lucky Run Creek stream rehabilitation project, fluvial geomorphic design, Scranton, PA; Audenreid Tunnel with mine drainage, East Union Township, Schuylkill County; Pennsylvania White Tail deer.

Inside back cover (Clockwise, starting with the largest photo): AML reclamation in progress; The "Wheelstack" formation, Coal Township, PA; Reclaimed AML area with rock-lined channel; Dangerous highwall and flooded pit.

Back Cover (Clockwise, starting with the largest photo): CenterPoint Commerce and Trade Park, reclaimed AML site, Luzerne County, PA; Constructed wetland on AML site; Bat gate on a dangerous mine opening; AML reclamation in progress.

MEETING ROOMS — HILTON 2nd FLOOR



2010 NAAMLP SCHOLARSHIPS

The National Association of Abandoned Mine Land Programs annually awards two $1500 scholarships to assist in the education of students who intend to work as scientists, engineers or technicians in the field of mine land reclamation. One is selected from the eastern portion of the country and one from the west. In addition, as part of the scholarship, NAAMLP pays for these outstanding students to attend our annual conference and learn by associating with reclamation experts from across the nation. Please join with the NAAMLP Scholarship Committee and Board in congratulating the winners.

The 2010 recipients are:

Casey Marie Clark

Ms. Clark, Helena MT, is a senior at Montana Tech studying Environmental Engineering and Mathematical Science with a focus on water quality and mining reclamation. During her senior year in high school, she got a US Forest Service "Youth Forest Monitoring Program" internship. After being exposed to field data collection and analysis, conservation education and mining reclamation, she knew her career would be in mining reclamation. Her USFS manager said "Casey impressed me with her maturity, analytical skills and creative ways of thinking outside the box...She is the utmost in dependability and the teams she supervised always presented top quality presentations and reports." And one of her professors recommended her by saying "Casey is extremely professional, responsible, intelligent, smart and very friendly. I find Casey as an extraordinary student and in the past 10 years at Montana Tech I have seen only a few students of this caliber." This summer she worked as an environmental intern with Peabody Energy in Gillette, Wyoming and hopes to continue working in the field of Environmental Engineering and Mine Reclamation after graduation.

Angela L. Moyer

Ms. Moyer, Schuylkill Haven PA, is a third year student at Penn State pursuing a dual major in Mining Engineering and Civil Engineering. After graduation, she plans to pursue a career that combines the practical, industrial side of mining engineering with the environmental structural side of Civil Engineering. "Angela values her education and tackles the demanding curriculum of both engineering majors with enthusiasm. Her great time management skills allow her to excel in academics while also enjoying non-academic activities," said one of her recommenders. Not only is Ms. Moyer maintaining an intensive course workload and on the Dean's List, she participates in many extracurricular activities and volunteer work, including membership in the Society for Mining Engineers, American Society of Civil Engineers, Society of Women Engineers, International Society of Explosive Engineers and many others. She is the President of the Penn State Archery Club and competes nationally for Penn State. This summer she worked as an engineering intern with Peabody Energy in Gillette, Wyoming. According to one of her professors, "Her work ethic, enthusiasm, and volunteerism are wonderful to see in a young professional, and her can-do attitude is very refreshing."

PREVIOUS NAAMLP SCHOLARSHIP RECIPIENTS

		Home state	School
2009	Melinda Ann Parsons	Alaska	Montana Tech University of Montana
2009	Colleen Michele Kenny	Missouri	University of Missouri
2008	Marlene Hanebeck	Pennsylvania	California University of Pennsylvania
2008	Heather Luinstra	Montana	Oregon State University

SCHOLARSHIPS

ABSTRACTS

Abstracts of Technical Presentations and Workshops
Listed alphabetically by author

1. Soil CO2 Flux Monitoring Protocol for AMD-Caused CO2 (SESSION T)

Kwame Awuah-Offei, Missouri University of Science & Technology; Alfred Baldassare, PA Department of Environmental Protection; Mosgabo Matlhbo, Missouri University of Science and Technology

Several cases of dangerously high (0.5% to >25%) CO_2 concentrations caused by acid mine drainage and mineral carbonate reactions have been reported in PA, OH, WV and IN in homes built on or adjacent to reclaimed mine land (Laughrey and Baldassare, 2003). This has led to research to develop techniques to monitor, predict and mitigate this problem. One of the proposed methods, the subject of ongoing research, is the use of chamber accumulation (CA) soil flux measurements to describe the spatial variation of CO_2 emission rates on reclaimed mine land. This will help regulators evaluate the potential of CO_2 migration on the reclaimed site before sanctioning any post-mining commercial or residential construction. An important aspect of the research effort is to determine the optimal grid spacing and the isotope sampling protocol for monitoring CO_2 emissions on reclaimed mine land.

The objective of this work was to: (i) determine the optimal sampling pattern to adequately describe CO_2 flux spatial variability; and (ii) develop an isotope sampling protocol to determine the $^{13}C/^{12}C$ ratio of anthropogenic CO_2 in cases where the emission rates are low. The first objective was achieved by using preliminary data to model the variogram of CO_2 flux; estimating the mean kriging variance for different grid patterns; and selecting the optimal pattern based on resource constraints and the mean kriging variance. The second objective was achieved by designing a sampling protocol based on the concept of a Keeling plot. The results indicate that available resources dictate the optimal grid pattern. The results also show that drawing three well spaced 60 ml samples during CA flux measurement provided adequate estimates of the $^{13}C/^{12}C$ ratio of the soil CO_2. The results provide a starting point for researchers and regulators to embark on soil CO_2 emission monitoring on reclaimed mine land.

2. Innovative Landslide Repair Concepts, Including the Use of Ballistic Soil Nails for Shallow Landslide and Erosion Mitigation (SESSION C)

Colby E. Barrett, J.D., E.I.T., President, Soil Nail Launcher, Inc.

This presentation will focus on case histories of multiple landslides of various magnitude repaired using innovate Design/Build/Warranty contracting and new technologies including ballistic (or launched) soil nails. The case histories have a specific focus on landslides and severe erosion problems repaired on AML sites, gas transmission pipelines, and energy/mine access roads.

Design/Build/Warranty contracting is particularly suited to landslide mitigation and severe erosion repair. This contracting approach combines designer and contractor into an integrated team able to respond quickly to unforeseen conditions and continued slope/slide movement before and during construction. During this portion of the presentation, multiple large landslides repaired using this contracting technique will be examined from initial site visit through stability modeling and design to construction techniques and challenges.

The second part of the presentation will outline new technologies for shallow landslide and severe erosion repair, including launched soil nails. Developed in Europe in the late 1980s to repair shallow landslides and severe erosion problems at a fraction of the time, cost, and environmental impact of traditional repair techniques, the technology was never successfully commercialized in Europe, and only recently gained momentum in the United States. Based on a multitude of successful installations in America after 2001, the use of launched nails has expanded to New Zealand, Canada, and Australia. A brief introduction to the principal design manual for ballistic soil nails – the Joint USFS/FHWA Engineering Manual EM 7170-12A/FHWA-FLP-93-003 ("Application Guide for Launched Soil Nails, Vol. 1") will be included, along with a brief description of how launched nails can be designed using PC-based limit equilibrium and finite element slope stability analysis programs.

3. Passive Treatment of High Volume Net Acidic Mine Drainage: The Enos Reclamation Project, Indiana (SESSION J)

Paul T. Behum, Sr. Hydrologist, OSM-MCR; Don R. House, Mining Engineer and Mark A. Stacy, Environmental Specialist, IDOR; Tracy D. Branam, Research Scientist, IGS

The Enos Gob Pile, located in Pike County, Indiana, is a 250-acre refuse disposal area constructed and abandoned prior to the August 3, 1977 enactment of the Surface Mining Control and Reclamation Act (SMCRA).

Two passive treatment systems totaling approximately 64-acres were constructed in 2005 by the Indiana Department of Natural Resources, Division of Reclamation (IDOR) to treat AMD discharging from the refuse disposal area. IDOR, with the assistance of the Office of Surface Mining Reclamation and Enforcement (OSMRE), Mid-Continent Regional Office (OSM-MCR) designed the passive treatment system at the site that includes: 1) addition of alkaline water [alkalinity = 242 mg/L calcium carbonate equivalent (CCE)] from adjacent pre-SMCRA mine impoundments, 2) construction of two vertical flow ponds (VFP) for additional alkalinity enhancement, and 3) excavation of a series of oxidation ponds and aerobic wetlands for metal precipitation. The system was designed to handle a large amount of acidic runoff during storm events (1.5 to 2.0 CFS). Mine spoil with a favorable neutralization potential underlies the refuse pile and partially treats the AMD. As a result of this pretreatment water entering each VFP is relatively low in iron (18.5 mg/L), manganese (2.90 mg/L), and total acidity (130 mg/L CCE). However, the designers were concerned that a significant amount of aluminum (2.54 mg/L) may reduce the life expectancy. Early results show nearly complete iron removal (discharge total iron = 0.28 mg/L) and a net alkalinity (58 mg/L CCE). Although no specific structures were incorporated in the design for manganese removal, a limited amount of manganese was removed by the wetland system (2.9 mg/L in the VFP inlet, 1.5 mg/L at the system outlet). Unexpectedly, both vertical flow ponds began to fail in 2008 following a large increase in metal loading and required reconstruction in 2009. Use of "compost" consisting of almost entirely of straw and accumulation of metals precipitates are believed to be the principle cause of the early VFP failure. One structure was rebuilt as a conventional VFP while the second as an anaerobic sulfate-reducing bioreactor. This study presents an evaluation of the failure conditions and preliminary results of the reconstruction. Additional topics include: remobilization of metals during system failure, a comparison of two parallel VFPs one with dolomitic limestone and one with high-calcium limestone, and manganese removal. The Indiana Geological Survey (IGS) is assisting in the post-construction evaluation.

4. Open Pit Sand Mine Reclamation as a Keystone Component of a Comprehensive Watershed Restoration Project (SESSION K)

Joe Berg, Biohabitats, Inc.

The reclamation of the Lizardhill sand mine is viewed as a keystone component of a restoration project that involves the creation of a mosaic of wetland treatment system, upland reforestation, removal of an historic sheet pile dam, and conversion of an 'in-line' community pond to an 'off-line' pond. This project involves capturing and treating agricultural runoff from farmland fertilized with chicken manure prior to discharge to a coastal stream. In addition, the removal of an existing sheetpile dam on the coastal stream will restore anadromous fish access to the watershed and facilitate the conversion of a hyper-eutrophic shallow 'in-line' 4-ac pond to an 'off-line' pond. Initially, the inactive sand mine was acquired by the owner as a location to place sediments dredged from the 'in-line' pond in an effort to restore water depth and 'open water character' in the community pond. However, as our understanding of site conditions developed, the restoration design evolved from a typical 'regrading and revegetation approach' to mine reclamation into an approach that reduced coastal nutrient pollution through mine reclamation with an ecologically engineered wetland treatment system connected to its watershed and with additional improvements to the receiving stream system's hydrodynamics and material processing. The overall approach consists of an in-stream weir designed to divert storm flows draining from a square mile drainage area of ditched farmland into a sand seepage reservoir. This reservoir conveys water through a mosaic of wetland pools, seepage wetland layers, under the cover of adjacent areas planted in coastal forest, before discharging into the receiving coastal stream. This stream flows through a swamp system ~½ mile long before entering tidal waters.

5. TECCO Slope Stabilization System Workshop (WORKSHOP VI)

Joseph Bigger, PE, Regional Manager, Geobrugg North America LLC; William F. Kane, PhD, PG, PE, President, KANE Geotech Inc.

The TECCO Slope Stabilization System (TECCO System) was developed to stabilize soil and highly weathered rock slopes and can be considered as a green alternative to concrete walls, gabion baskets and shot-crete solutions. The components are TECCO Mesh G65, Spike Plates, Compression Claws and Soil Nails/Rock Bolts. Additionally, an erosion control fabric can be placed under the TECCO Mesh to help with erosion control and seeding. The system is a designed system using the Ruvolum Dimensioning Program developed by Geobrugg .

The workshop is broken into the following 3 parts:

Introduction and review of the basic forces involved with shallow slope instabilities as well as deeper sliding surfaces. Introduction to various slope stabilization methods.

Slope Stabilization Design using the RUVOLUM® concept for designing tensioned wire mesh systems.

ABSTRACTS

Participants will learn about the interaction of the mesh and anchors of these systems with slope materials, the basic theory behind the dimensioning concept, and proper use of the concept and software. Slope stabilization case histories including hands-on exercises using the design software.

The workshop will take 2 hours and participants will receive a copy of the software along with a 3-ring binder with related information.

The system has successfully stabilized many slopes in the United States including a coal refuse fill in West Virginia. The system also has been used to stabilize block walls, failing gabion walls and as temporary shoring.

6. Dolph Abandoned Mine Fire Control Project (SESSION K)

Robert W. Brohn, P.E., GAI Consultants, Inc.; Thomas A. Gray, Project Manager, Tetra Tech

The Dolph Mine Fire site is located in Lackawanna County, PA, approximately three miles northeast of the City of Scranton. The fire has involved both coal refuse (culm) and underground anthracite mine workings and reportedly began as a rubbish fire on top of the culm bank. The Office of Surface Mining retained GAI Consultants, Inc. in 2005 to conduct a site investigation to define the extent of the fire and to recommend fire control measures. Plans and specifications were prepared in late 2006 for a cut-off trench to block the progress of the fire. The project was bid and a contractor selected in early 2007. The trench construction was completed in 2007. This paper focuses on the investigation, the selection of the fire control method and its design.

7. Lessons Learned from the Last Decade of GeoFluv Fluvial Geomorphic Reclamation (SESSION B)

Nicholas Bugosh, GeoFluv and Carbon Software

Disturbed land reclamation made great advances during the last century, with much of the improvement driven by reclamation of mined lands. By the end of the 20th century, reclamation workers recognized that some traditional reclamation grading designs were not meeting all the desired performance goals after construction. Erosion problems were requiring maintenance expense, delaying bond release, and the sediment discharge related to the erosion was causing water quality concerns. Many believed that the long-constant gradient, and mostly uniform aspect, slopes were favoring vegetation monocultures and frustrating vegetation diversity goals. The un-naturally uniform landforms minimized niches for wildlife uses and the artificial appearance of many of the landforms often did not satisfy the desire for reclamation that blended with surrounding natural lands. An alternative method for reclamation landform design based on fluvial geomorphic principles was proposed to address these concerns and provide reclamation landform performance comparable to undisturbed, mature, natural landforms. This method, called GeoFluv, has been used to design landforms at a wide variety of mining sites representing different climatic conditions. Some of those who were interested in the method, but unfamiliar with it, raised questions about: the difficulty of construction of the more complex landforms, how the costs compared with traditional methods, how these landforms would perform when subjected to extreme storm events, how their runoff water quality compared with that from traditionally-designed landforms, how vegetation would respond to the fluvial geomorphic landforms, and how the constructed landforms would satisfy the desires for a natural appearance. This presentation will provide answers to these questions as learned through the design, construction, and monitoring of these fluvial geomorphic reclamation projects over the last decade.

8. Beneficial Use of FGD Materials in Abandoned Mine Land Reclamation (SESSION B)

Tarunjit S. Butalia, William Wolfe, Harold Walker and Robert Bolen, The Ohio State University Department of Civil and Environmental Engineering and Geodetic Science

FGD by-products (fluorid sulfite rich FGD and sulfite rich FGD gypsum) can be used in mine reclamation applications for abatement of acid mine drainage (AMD), reduction of offsite sedimentation, subsidence control, and elimination of safety hazards (such as dangerous highwalls). Many coal-fired power plants are located in the vicinity of existing and abandoned underground as well as surface mines. In many instances, coal combustion by-products (especially FGD materials) can be used to reclaim these mined areas and improve significantly the environmental and safety problems caused by these unreclaimed sites.

The newer scrubbers currently being installed or planned to be installed across the US will produce a different type of FGD gypsum (sulfite) material than the older type of scrubbers (that produce a sulfite rich fluorid by-product) that will have different engineering and chemical properties. The engineering and leachate characteristics of various mixes of FGD gypsum, Class F fly ash, and lime are presented so as to develop mixes suitable for various mine reclamation applications. In particular, the potential solubility of the FGD gypsum material as a highwall backfill material was studied and will be presented. The results of this laboratory study are being implemented in full-scale demonstration projects to be constructed and monitored in Ohio.

9. Building Bridges in Reclamation: Partnerships with Community Watershed Groups (WORKSHOP I)

Allan Comp, Josh Larsen, Chris Studgus, Lisa Gaudet, Megan Williams Blackmon, and Scott Fanelle, VISTA Leader 2, Appalachian Coal Country Watershed Team

Dr. T Allan Comp and OSM/VISTA Volunteers will examine three communities that have initiated innovative reclamation and community revitalization projects based on agency partnerships with community watershed groups in Appalachian Coal County. Comp directs teams of OSM/VISTA volunteers, full time college graduates volunteering to help support and grow community watershed groups in historic mining communities. The Appalachian Team is possible because of an innovative partnership between the Office of Surface Mining (where Comp is employed), AmeriCorps*VISTA (Volunteers In Service to America, likened to the domestic PeaceCorps), and our partner watershed groups.

Issues examined include a lack of community involvement in reclamation projects, the need for stakeholder support for reclamation on private lands, multiple agencies involved in a project, and addressing community issues and reclamation issues jointly. The authors will present three case studies examining solutions put forth in different communities and the innovative and complex partnerships developed to garner success. Communities are projected to include Indiana, PA, Scranton, PA and Clintwood, VA. Findings vary according to the specific needs of the community, the reclamation needs and environmental concerns, but one thing remains clear—the complexity and multitude of partnerships and the high community involvement shows a high success rate not only for projects implemented successfully but also community health, education, and socio-economic improvements.

10. Stream-water-Quality Improvement and the Return of Fish Coincident with the Treatment and Abatement of Abandoned Mine Drainage in the Swatara Creek Basin, Southern Anthracite Coalfield, Pennsylvania (SESSION K)

Charles A. Cravotta II, USGS PA Water Science Center; Daniel J. Koury, PA Department of Environmental Protection

Acidic mine drainage (AMD) from legacy anthracite mines degrades Swatara Creek in eastern Pennsylvania. Intermittently collected base-flow data for 1969–1995 indicate that fish were absent immediately downstream from the mined area where pH ranged from 3.5 to 7.2 and concentrations of sulfate, dissolved iron, and dissolved aluminum were as high as 250, 2.0, and 4.7 mg/L, respectively. However, in the 1990s, fish returned to upper Swatara Creek, coinciding with implementation of AMD treatment (limestone drains, limestone diversion wells, limestone sand, constructed wetlands) in the watershed. During 1996-2006, as many as 25 species of fish were identified immediately downstream from the mined area, with base-flow pH from 5.8 to 7.6 and concentrations of sulfate, dissolved iron, and dissolved aluminum as high as 120, 1.2, and 0.43 mg/L, respectively. Several of the fish taxa are intolerant of pollution and low pH, such as river chub (*Nocomis micropogon*) and longnose dace (*Rhinichthys cataractae*). Cold-water species such as brook trout (*Salvelinus fontinalis*) and warm-water species such as rock bass (*Ambloplites rupestris*) varied in predominance. Storm flow data for 1998-2007 indicated pH, alkalinity, and sulfate concentrations decreased as the stream flow and associated storm-runoff component increased, whereas iron and other metal concentrations were poorly correlated with stream flow because of greater concentrations during rising stage than falling stage. Prior to 1998, pH < 5.0 was recorded during several storm events; however, since the implementation of AMD treatments, pH has been maintained near neutral. Flow-adjusted trends for 1997-2006 indicated significant increases in calcium; decreases in hydrogen ion, dissolved aluminum, dissolved and total manganese, and total iron; and no change in sulfate or dissolved iron in Swatara Creek immediately downstream from the mined area. The increased pH and calcium from limestone in treatment systems improved pH buffering, reduced metals transport, and helped decrease metals toxicity to fish.

11. Reclamation Project of the Newport North Site near Nanticoke, PA (SESSION W)

John J. Curley, P.E., Senior Civil Engineer, Pennsylvania Department of Environmental Protection

Anyone associated with abandoned mine programs understands the danger that has been left from the years of mining. The Newport North site near Nanticoke, PA might be one of the most somber examples of how dangerous even the most remote and unassuming abandoned mine feature could be. A small waterbody, less than a half-acre in size and about two miles into the woods, was the site of six fatalities in a seven year span. The paper being submitted about the Newport North site will discuss the history of the mining, the unfortunate fatal events that occurred and the reclamation to restore the area.

The Newport North site is located within the anthracite coal fields of northeastern Pennsylvania. Coal mining first occurred in the late 1800's and continued sporadically until the 1950's. In the late 1950's, strip mining became the predominate method for coal removal. In the 1960's, the mining operations ceased leaving abandoned pits and piles that are characteristic to many abandoned mine sites.

Over the years the site, though remote, had become a popular location for individuals with four-wheel drive trucks and all-terrain vehicles. Numerous dirt roads and trails traverse very close to dangerous features left behind by the mining. In 1998, a small waterbody was the location of a vehicle accident that claimed five lives. This was followed by a second vehicle accident in 2004 which claimed another life. For an 11 year time span, this feature alone accounted for over 2% (5/293) of the non-employee fatalities on active and abandoned mine lands in the country.

Reclaiming this site was deemed high priority because of the obvious concern for public safety and from political pressure. The property owner was receptive to having the site reclaimed and worked with the Department. Another concern was that property owner has an agreement that allows hunting on their property heightening the potential for further incidents.

In 2008, the project to reclaim this site was bid for $727,050.00. The project entailed reclaiming 35 acres and grading 387,000 cubic yards of material. The project utilized on-site materials to grade the project to 3 to 1 or less slopes. To prevent erosion and promote wildlife habitat, the reclaimed site was seeded to reestablish vegetation. The project was completed in fall of 2009 restoring a safe and aesthetically pleasing condition to the site.

During the projects construction, an event was held at the site with Pennsylvania DEP, Mine Safety and Health Administration (MSHA), Pennsylvania State Police and the property owner to promote the Stay Out, Stay Alive program. DEP Secretary John Hanger was in attendance and spoke about the program and the dangers with abandoned mine lands. Television and newspaper media covered the event.

12. Active and Passive Treatment Cost Evaluation (SESSION I)

Timothy P. Danehy, G. Tilf Hilton, Clifford F. Denholm, Shaun L. Busler, Bryan J. Page, and Margaret H. Dunn, BioMost, Inc.

Numerous grass-roots watershed groups, state agencies, environmental professionals and mine operators are involved in the design, implementation, and operation and maintenance (O&M) of mine drainage treatment systems. These systems utilize various technologies to provide long-term treatment of abandoned and postmining discharges and require on-going O&M to insure satisfactory performance. Mechanisms utilized to provide the resources needed to fund O&M include the establishment of financial assurance mechanisms such as trust funds (trusts). The trust amount is calculated using current and projected operating and capital costs in conjunction with applicable financial assumptions and can be significant for even relatively small systems. Evaluating treatment options and implementing appropriate technology in order to reduce annual costs can lead to substantial reductions in cash outlays needed for trust establishment. Seven post-mining discharge treatment sites that utilized active, passive and hybrid (combination of active and passive) systems were upgraded to utilize only passive technology. The cost evaluation presented illustrates that an additional capital investment of about $0.2M reduced the calculated trust amount by about $1.3M.

13. The Schuylkill Action Network's Innovative Approach to Watershed Restoration and Source Water Protection (SESSION C)

Tom Dovidock, SAN Coordinator, Partnership for the Delaware Estuary; Chuck Kanetsky, Source Water Protection Program Manager, U. S. EPA Region III

Over the past five years, the Schuylkill Action Network (SAN) has completed more than 40 projects addressing some of the biggest threats to source water in the Schuylkill River Watershed. This work includes installation of agricultural best management practices on 20 farms, the daily treatment of 8.5 million gallons of Abandoned Mine Drainage (AMD), construction of innovative stormwater practices, plus many other activities addressing the restoration and protection of the watershed. The SAN functions through a system of project partners organized by issue-specific workgroups, including Agriculture, Pathogens, Stormwater, Land Protection, and AMD. The SAN has utilized this approach to prioritize projects and leverage funding to strategically implement a source water protection plan for the entire Schuylkill River Watershed.

In the Schuylkill headwaters, the SAN has worked with local stakeholders through an AMD workgroup to address the metal and pH loadings to the watershed, which is responsible for over 24% of its impaired rivers and streams. This presentation will discuss the method by which the SAN has contributed to the existing AMD remediation efforts in the watershed, describing the benefits of joint funding ventures, attracting new partners, and prioritizing projects. The presentation will present information on several AMD implementation projects that were completed with the support of the SAN and demonstrate the benefits of the SAN model. This presentation will also highlight SAN's new focus on web-based communication and outreach, its network of partners and connections with drinking water utilities, and its forward-looking vision. The presentation will also report on SAN's prioritized approach to watershed restoration and highlight the importance of maintaining a coordinated and cooperative effort throughout the watershed.

Additionally, potential partners and stakeholders will learn about opportunities to connect with SAN and become involved in its issue-specific workgroups.

14. Wyoming Department of Environmental Quality AML Project 173, Northwest Wyoming Coal, Kleenburn Site Reclamation (SESSION W)

Mark Donner, P.E., Assistant Project Manager, Beau Hill, E.I.T, Project Engineer, Trihydro Corporation; Chris Walia, P.E., Project Manager and Dan Adams, C.P.G, Construction Manager, PHC Reclamation; Jack Smith, Project Manager, Wyoming Department of Environmental Quality/Abandoned Mine Land Division

PHC Reclamation and Trihydro teamed with the Wyoming Abandoned Mine Land Division (AML) to address physical and environmental hazards associated with a former surface coal mine north of Sheridan, Wyoming. The reclamation work was coordinated with Sheridan County, the Wyoming Game and Fish Department (WyG&F), and the Army Corps of Engineers and resulted in the creation of a public recreation area.

Historical open-pit mining operations at the site, located adjacent to the Tongue River, resulted in two pits that filled with water. Overburden piles, areas of coal slack, and concrete foundations also remained from mining operations. The area was donated to Sheridan County by Padlock Ranch and was open to public use. The pits, known as the Kleenburn Ponds, provide habitat for fish, reptiles, birds, and other species. In addition to fishing, the site attracts frequent use from the public including camping, target shooting, and off-road vehicle use (ORV). Un-vegetated overburden piles were the primary focus of ORV users. The overburden piles were adjacent to the ponds and posed significant hazards due to the steep slopes above the water's edge.

The Project Team completed grading designs that reduced overburden slopes adjacent to the ponds, incorporated geomorphically stable landforms, and encapsulated coal slack. Coversoils were amended with compost, mycorrhizal fungi, and seeded. In addition to the overburden regrading, handicapped accessible walking paths were constructed around the regraded areas and adjacent to the water, and the site was fenced to preclude motorized access. The engineering design incorporated a channel to connect the two ponds to promote fish passage, and minimize winter-kill (based on WyG&F recommendations); a pedestrian bridge was installed over the constructed channel.

Construction was completed in November of 2009. Moving forward, the site will be managed jointly between Sheridan County and the WyG&F as the Kleenburn Recreation Area.

15. Passive Treatment Systems: Operation and Maintenance Experience (SESSION H)

Margaret H. Dunn, PG, CPG; T. P. Danehy; C. F. Denholm; S. L. Busler; B. J. Page, BioMost, Inc.

Passive systems have been installed to treat abandoned mine drainage in the bituminous coalfields of western Pennsylvania for more than a decade. In the headwaters of the 410-sq. mi. Slippery Rock Creek Watershed, about a dozen passive systems have been installed from 1995 through 2008. The improvement to local tributaries and to the main stem of Slippery Rock Creek has been dramatic with the return of fish in about 11 miles of streams after more than half a century. The passive systems, however, have required some limited maintenance to sustain performance. These activities, which vary depending upon the treatment components installed, have been performed by the Slippery Rock Watershed Coalition and project partners and have included removal of vegetation from spillways, backflushing, cleaning of pipes, installing minor upgrades, "stirring" of treatment media, and removal of accumulated sludge. To date, the treatment media has not been replenished at any of the sites. In order to provide the financial resources necessary to maintain these systems, a trust fund has been established for long-term operation and maintenance. This trust fund was initially established through contributions from project partners and is now being supported by the recovery and use of manganese and low-pH iron solids. Even though the average cost per system has been about $500 per year, with the anticipated additional removal of accumulated sludge in the near future, the O&M cost per system for estimating purposes is $1000 to $2000 per year.

16. Use of Biosolids on Abandoned Mine Reclamation Projects Located on State Game Lands in Northcentral Pennsylvania (SESSION C)

Dennis Ducco, Regional Director, PA Game Commission Northcentral Region; Michelle Marrow, PE, Alder Run Engineering

The Pennsylvania Game Commission is the second largest landowner in the Commonwealth of Pennsylvania. With ownership of over 1.4 million acres of gamelands scattered throughout the state, management of each parcel is dictated by the type of terrain that exists on each tract.

Sizes of gamelands range from a few acres to the largest complex being over fifty thousand acres. Each gamelands has a separate management plan aimed at providing guidance to field personnel for carrying out wildlife habitat work.

One of the more interesting aspects regarding gamelands acquisition and subsequent management is how these activities are funded. The Game Commission receives no general fund tax monies. Hunters buying licenses is the support of the bulk of funding needed to operate the Game Commission. With this limited funding source, there are never enough funds available to attempt what might be needed to conduct habitat enhancements on gamelands. This is particularly true on gamelands that have abandoned mine lands associated with them. These damaged and disturbed parcels were obtained years ago when land values were more reasonable and just getting inexpensive land to provide hunting opportunities was a top priority.

With an emphasis on reclaiming damaged properties, the DEP and OSM has provided funding and oversight in cleaning up someone else's mess created years ago because of unregulated mining practices. With modern technology making daily advances, a win-win business opportunity developed as a result of a growing problem. The problem being what to do with the ever increasing amount of human waste being generated by an ever increasing population. With landfill acreage becoming a valuable commodity, new ways were being formulated to dispose of this waste product. Biosolids was the new name that was coined to describe this product. With acres upon acres of mine land that could use a shot of nutrients to restore some of type of productive life on some of these landscapes, biosolids seem to be the logical choice to eliminate problems with one action.

A PowerPoint program showing the use of biosolids on abandoned and reclaimed mine lands will demonstrate exactly how the Game Commission is revitalizing these properties. What is particularly worthy of note is this practice comes at no cost to the taxpayer while at the same time conserving valuable landfill space. With nationally recognized reclamation projects being awarded to companies doing work on gamelands, this program will demonstrate the use of biosolids to jump start vegetation growth to restore these disturbed lands to productive wildlife habitat.

17. Earth Conservancy: A Model for Mine Land Reclamation (SESSION C)

Michael A. Dziok, President/CEO, Earth Conservancy

Michael Dziok, President and Chief Executive Officer of Earth Conservancy (EC), will discuss the model created by EC to remediate mine scarred lands in Luzerne County, which addresses the environmental hazards left in the wake of the end of the coal era in Northeast Pennsylvania.

EC was formed as a non-profit, 501(c)(3) corporation in 1992 with a mission to reclaim and re-utilize former coal company-owned lands through partnerships with government, businesses, other conservation organizations and educational institutions.

After obtaining a $14 million federal grant in 1993 and $2 million from the private sector, EC purchased 16,300 acres from the estate of the former Blue Coal Corporation, which had declared bankruptcy in the mid-1970s. The purchase was finalized in 1994, and EC began to focus on returning the lands to productive use.

To date, EC has reclaimed 1,278 acres at a cost of $21.7 million and has an additional 1,218 acres in-process at an estimated cost of $60.4 million. It has donated 205 acres to 20 community and non-profit groups, valued at $1.9 million.

In its 16 years, EC has become a model for success in mine land reclamation, from its land reclamation and watershed restoration to its strong partnerships with federal, state and local environment agencies and non-government organizations (NGO). EC has worked with and form lasting productive relationships with key partners from each of these sectors.

EC was designed for success by the creation of an active board of directors and multiple long-range land use plans that laid the groundwork for reclaiming, reutilizing and managing its 16,000+ acres. EC has established a foundation of success for every project it undertakes by utilizing the plans, obtaining successful project funding, working closely with consultants and contractor, creating effective community notification and partnering with stakeholders to achieve a successful project outcome.

18. Technology, Resources for Reclamation (SESSION L)

Martin Edwards, Dean Baker, and Dennis Polizzino, Pennsylvania Department of Environmental Protection

We have a variety of tools from satellites to microcomputers that can make our jobs easier and more accurate. Plan your reclamation projects with every ancient drill hole, mine opening, buried highwall, and more, for feet or miles around, just a zoom away.

All this technology is at our fingertips, so we can see the past become the reclaimed future on our PCs and GPS units.

Our examples include a refuse fire from a Pittsburgh mine where historic air photos and records helped define the extent and nature of the fire. Maps, images, property and hydrologic layers, from local, state and federal sources, plus years of Pennsylvania DOT construction drawings helped in development and design of the project through the power of Geo-Referencing. LIDAR topography from Pennsylvania's PAMAP program allowed for accurate estimates of excavation volumes without surveying. We used physics in the field; microcomputers continuously monitored subsurface temperatures while infrared cameras and hand held lasers guided excavation. Fire suppressant foam was used to inject boreholes, quench burning material during excavation and eliminate the potential for dust flare-ups.

We will also show how a century of subsidence problems in anthracite measures were evaluated with electronic mapping. We used three dimensional CADD to strip away the layers of glaciation and multiple level mining. GPS units give us the x-ray vision into the earth; we loaded and referenced underground mine maps to survey subsidence over the workings of mining past. GIS database and mapping was used to spatially compare the geology and mining to a history of complaints and projects. LIDAR coverage of the study area, with elevation accuracy to the foot, confirmed the subsidence trends and refined the problem area boundaries.

19. Implementing the Forestry Reclamation Approach (FRA) on Abandoned Mine Lands (AML) in Appalachia (SESSION T)

Scott D. Eggerud, Forester, United States Department of Interior, Office of Surface Mining Reclamation and Enforcement

The Appalachian Regional Reforestation Initiative (ARRI) has been promoting reforestation of mined lands using the Forestry Reclamation Approach (FRA) on both active mining operations, and on legacy mine sites such as Abandoned Mine Lands (AML). Reforestation of these sites will return disturbed lands to forest habitat that closely resembles the pre-mining native forests, faster and more efficiently than traditional reclamation methods. The goals of the Appalachian Regional Reforestation Initiative (ARRI) are to plant more high-value hardwood trees on reclaimed coal mined lands in Appalachia, increase the survival rates and growth rates of planted trees, and to expedite the establishment of forest habitat through natural succession on active mining operations, previously reclaimed mine sites, and on AML sites. The Forestry Reclamation Approach (FRA) is a five step process promoted by ARRI that 1: creates the best possible forestry growth medium with materials on site, 2: reduces compaction of the growth medium by utilizing alternative methods of placement or reduced grading, 3: uses tree compatible ground covers, 4: plants a mixture of early and later successionary, native hardwood tree species and, 5: uses proper tree planting techniques. Using these techniques, ARRI is working with the Regulatory Authorities (RA), the coal industry, contractors and consultants to promote the use of the FRA on active and proposed operations, on previously reclaimed mine sites where reforestation was not attempted or the results were unproductive, and on AML sites. General FRA recommendations have been provided to RA's and site specific recommendations have been provided to RA's and consultants. New techniques are being developed, to place growth mediums while avoiding compaction, and to mitigate post over-compaction. RA AML sections have also partnered with ARRI to enhance post reclamation efforts by utilizing FRA site preparation techniques (ripping) and tree planting to promote proper reforestation.

20. An Introduction to Publicly Accessible USGS Databases and Software for Watershed Characterization in Pennsylvania (WORKSHOP IV)

Lee W. Eicholtz, Hydrologic Technician, Marla H. Stuckey, Hydrologist, Linda F. Zorr, Computer Assistant, USGS Pennsylvania Water Science Center

The USGS Pennsylvania Water Science Center investigates the occurrence, quantity, quality, distribution, and movement of surface and underground waters throughout the Commonwealth of Pennsylvania and disseminates data and results of interpretive studies to the public, State and local governments, public and private utilities, and other Federal agencies. Internet access to this information is available through a variety of databases and software including the following:

StreamStats, a Web-based Geographic Information System (GIS), provides streamflow statistics, drainage-basin characteristics, and other information for user-selected sites on streams.
http://water.usgs.gov/osw/streamstats/pennsylvania.html

National Water Information System (NWIS) Mapper provides access to water quantity and quality data from over 53,000 surface and groundwater sites in Pennsylvania. NWIS includes a map of all sites with links to available water data for individual sites.
http://wdr.water.usgs.gov/nwisgmap/?state=pa

WaterWatch provides a map that shows the location of more than 300 long-term USGS streamgages in Pennsylvania and displays maps, graphs, and tables describing real-time, recent, and past streamflow conditions.
http://waterwatch.usgs.gov/?m=real&w=map&r=pa

WaterQualityWatch provides access to real-time water-quality monitor data including water temperature, specific conductance, pH, dissolved oxygen, and turbidity. It also provides real-time streamflow data.
http://waterwatch.usgs.gov/wqwatch/map?state=pa&pcode=00010

Groundwater Watch groups related wells and data from the USGS Groundwater Site Inventory. This database contains records for about 34,000 wells in Pennsylvania that have been compiled over the past 100 years.
http://groundwaterwatch.usgs.gov/googlemaps/PA_gm.html

Groundwater Recharge provides maps and tables showing estimated groundwater recharge rates for 197 watersheds in Pennsylvania. http://pa.water.usgs.gov/recharge/state_map.html

(Note: This is intended to be an interactive workshop and attendees are encouraged to bring a laptop computer with wi-fi capability)

21. Stream and Wetland Mitigation in High-Gradient Watersheds (SESSION C)

Philip R. Elswick, P.E., Summit Engineering, Inc.

Stream and wetland restoration has been conducted in the Honey Branch and State Hollow watersheds of Eastern Kentucky.

The Honey Branch watershed in Martin County, Kentucky has a long history of mining activities. At one point, this watershed had a series of five sediment ponds in place to support various mining operations. Over time, three of the pond embankments were breached with no additional stream restoration efforts. Currently, there are multiple gas wells and three valley fills in the upper reaches of the watershed resulting from adjacent mining operations.

As a result of these past activities and abandoned mine structures, Honey Branch was characterized by increased sinuosity for its channel type, heavy deposition of sand and fine material, bar formations, iron deposition, and channelization. The riparian zone consisted mainly of grasses with significant areas of wetland vegetation resulting from abandoned sediment ponds. The channel was fully exposed due to a lack of tree canopy cover.

The stream was restored to an appropriate dimension, pattern, and profile in accordance with Natural Stream Channel Design techniques. The stream is in its fourth monitoring year and moving towards meeting all established success criteria. Conductivity has decreased over time and the macroinvertebrate community is flourishing.

A wetland and stream project at a partially reclaimed deep mine in the State Hollow watershed has also been completed. Significant volumes of water are continuously discharged from the deep mine portals. This water is collected and diverted to two constructed wetlands connected by a created stream. Currently, in its first monitoring year, the project is moving towards meeting all established success criteria.

This presentation will provide histories of the watersheds including previous mining and conditions prior to restoration, discuss the design of the streams and wetlands, and provide current conditions of the projects' chemical, physical, and biological functionality.

22. Effective Strategies for Engaging Rural Watershed Volunteers (WORKSHOP II)

Jenna Fehr, OSM/VISTA Volunteerism Coordinator, Appalachian Coal Country Watershed Team

Volunteers are essential to rural watershed groups and their efforts to make their communities, currently impoverished by environmental degradation, healthier places to live and work. Recruiting and effectively supporting volunteers, however, is often a challenge for many groups in our nation's most under-resourced and environmentally damaged communities. Effective volunteer recruitment and management strategies that have been analyzed across a network of rural watershed organizations will be presented in this session, bringing careful, tested research and specific examples from Appalachian coal country and the Western hardrock mining region to participants.

The OSM/VISTA Teams are comprised of non-profit organizations working to engage local communities in the issues surrounding poverty, their mining heritage, and environmental issues in rural Appalachian and Rocky Mountain communities. The OSM/VISTA Teams place AmeriCorps VISTA/Office of Surface Mining Volunteers with community-based watershed organizations for three-year capacity building projects that facilitate economic development, environmental reclamation, and community engagement.

With funding provided by the EPA's Office of Wetlands, Oceans, and Watersheds, the OSM/VISTA Teams have undertaken the "Volunteers for Rural Watersheds" research project. This initiative has encouraged rural community organizations to partner with a variety of local like-minded community groups and individuals, while simultaneously exploring the question of who is volunteering and for what reasons. It has also looked at what management practices groups are engaged in that get volunteers involved and keep them coming back.

Participants will learn about volunteer recruitment, management, and retainment "best practices" for volunteers in rural contexts. These community outreach strategies have been documented and tested in a diverse network of up to 35 different volunteer-based organizations in Appalachian and Western mining regions. Through the use of interactive small-group discussions, informational handouts, and the creation of basic, take-home toolkits, participants will be trained to apply relevant "best practices" to their own volunteer-based organizations.

23. Cooks Run Watershed Restoration Efforts, East Keating Township, Clinton County, Pennsylvania (SESSION F)

David J. Fromell, P.E.; Daniel R. Helfrich, P.E.; Ronald L. Henry, P.G.; Stephen Fisanick III, P.E., Pennsylvania Department of Environmental Protection

An abandoned surface mine site known as the Fran Camp Run No. 2 Mine, located in Sproul State Forest near Renovo, Pennsylvania, is one of the main sources of pollution to Cooks Run. Cooks Run, designated as a High Quality stream, discharges into the West Branch Susquehanna River approximately three miles downstream of the mine site. Fran Contracting, Inc. began mining operations in 1975, and completed the 46-acre surface reclamation in 1977. Shortly after reclamation, numerous abandoned mine drainage (AMD) seeps appeared below the mine site impacting two tributaries to Cooks Run, Camp and Rock Runs. Prior to being impacted, the Pennsylvania Fish and Boat Commission listed these sections of Camp and Rock Runs as streams supporting the natural reproduction of trout. Many endeavors to abate and treat the AMD were attempted over the years following reclamation, but none of the efforts significantly improved the water quality in Rock, Camp, and Cooks Runs.

Since 2001, the DEP's Bureau of Abandoned Mine Reclamation has been working with Trout Unlimited, governmental agencies, and private industry, with the goal of restoring the water quality in Camp, Rock, and Cooks Runs. Collaborating with these agencies will help minimize costs and maximize restoration efforts. Completed or ongoing work includes the construction of a Fran mine site AMD collection system, construction of a pilot-scale passive treatment system, design of proposed passive treatment systems, on-site drilling, collecting and analyzing numerous spoil, coal, and overburden samples for potential re-mining and alkaline addition, and a rigorous water sampling and monitoring program.

24. "A Mine is a Terrible Thing to Waste" - Kentucky's Portal 31 Exhibition Mine (SESSION E)

J. Steven Gardner, P.E., Engineering Consulting Services, Inc.

In 1917, the U.S. Steel opened Mine 31 in Lynch, Harlan County, Kentucky. In 1996 Arch Coal, the current owner of the site, donated the property to Harlan County for public use. In 2009, after 13 years of fundraising, engineering and construction, the Southeast Education Foundation Inc. and the Kentucky Coal Museum opened their Portal 31 Exhibition Mine to the public.

Engineering Consulting Services, Inc. (ECSI) worked with museum and exhibit designers to transform a deactivated mine portal into a high-tech museum showcasing Kentucky's coal mining heritage, from the days of picks and shovels to today's modern equipment. Interactive lifecast figures tell the story of Kentucky coal mining. While riding a specially built mantrip on light rail, simulated mining scenes demonstrate how working conditions improved with technological innovations.

Portal 31 is the last leg of area attractions designed to bring much-needed tourism dollars to this part of the state. The project team ensured the exhibit area was safe for visitors by designing a combination roof control plan utilizing a high-strength fiber mesh/resin bolting system. Walls were stabilized with an experimental high-tensile sealant that binds the rock face. ECSI designed a pump and drainage system, ventilation plans, and new mine seals.

ABSTRACTS

The project was recently selected as one of the top 24 (out of 183 entries throughout the nation) engineering projects by the American Council of Engineering Companies (ACEC) as preeminent engineering achievements for 2009. Judging for the prestigious Engineering Excellence Awards took place in February, conducted by a distinguished panel of more than 30 engineers and architects, along with representatives from government, media, and academia. Criteria for awards include uniqueness and originality, technical, social and economic value, complexity, and success of the projects in meeting goals. The Kentucky Chapter of ACEC awarded Portal 31 its Grand Conceptor Award in March.

25. Three-Dimensional Evaluation of an Abandoned Coal Mine Fire (SESSION L)

Christopher Gutmann, Tetra Tech, Inc.; Jim Pfeiffer, Zapata Incorporated, Blackhawk Division

Fires in the seams associated with abandoned underground coal mines represent a significant risk to the public due to the potential for ignition of forest fires, exposure to combustion by-product gases, and surface subsidence. The Grand Hogback in Garfield County, Colorado contains 20-25 underground coal fires. One particularly high-profile burning coal-seam fire near Rifle, Colorado attracted national attention in the mid-1990s when the Colorado Division of Minerals and Geology experimented with a new approach to extinguishing coal fires involving the drilling and injection of foamed-grout.

Temperature probe data showed that the grouting program was successful at significantly reducing ground temperatures, no additional subsidence was noted, and plants had begun to establish over the capped burn areas. However, high surface temperatures recorded at a number of locations five years later indicated that the fire continued to burn and was becoming increasingly active. The surface temperature at one of these hot-spots was measured at nearly 850 degrees Fahrenheit in 2009. Part of the reason for the ultimate lack of success with the previous efforts is believed to be related to the difficulty in accurately drilling holes to target the coal seams, associated fire and voids, and positioning grout injection. The fire is burning in strata dipping approximately 57-59 degrees from horizontal, beneath surface topography steep enough to limit access to specialized tracked drilling equipment.

To assist with additional efforts at the Site, a three-dimensional modeling approach was designed for the Site in 2009, integrating borehole data, geophysical surveys, thermal imagery, and combustion by-product evidence such as mapped locations of air intakes and thermal exhaust zones. The result is a block model that may be evaluated in three dimensions to facilitate a wider conceptual understanding of the underlying stratigraphy, location of burning coal underground, and to assist in future fire control efforts.

26. Jeddo Tunnel Reservoir Potential for Water Storage and Hydro Power (SESSION I)

Peter Hoentjens, EMARR, Inc.

Water storage capacity within the Hazleton Basin offers tremendous potential to diminish drought impacts in the Susquehanna River Basin and improve impacted waterways at the same time. The SRBC proposes a comprehensive evaluation of mine pools located in the Eastern and Northern Anthracite Fields to determine if they can be used to improve water quality and mitigate consumptive use through low-flow augmentation.

The Jeddo tunnel network drains a 33 square mile surface area over underground coal mines. Tunnel X drains the Hazleton Basin which accounts for more than half the discharge at the Little Nescopeck Creek, or more than 20 mgd. Unlike most other coal mine pools the Jeddo Reservoir sits on top of a mountain with drainage more than 500 feet below surface. The Hazleton Shaft is located at the entrance of Tunnel X and could feasibly be used to dam the flow to Tunnel X, potentially raising the water level in the Hazleton Basin by as much as 500 feet without significant consequences to surface drainage or hydraulic pressure on a ridge face.

An underground Hydro-electric station could be constructed at the Tunnel X entrance which would have the potential to generate nearly 1mw of renewable electricity. Other mine pools within the Anthracite Region would require large pumps to remove the water consuming large quantities of electricity produced by fossil fired power plants.

This presentation will consider the benefits and risks of this proposition.

27. Producing Electricity at the Audenreid Tunnel Passive Treatment System (SESSION M)

Peter Hoentjens, EMARR, Inc.

Funded by an Energy Harvest Grant, EMARR (Eastern Middle Anthracite Revery, Inc., a non-profit corporation) installed micro-hydro turbines and a local distribution grid at the Audenreid Passive Treatment System to provide auto electric cycling of the flushing valves.

The treatment project, conceived by the Catawissa Creek Restoration Association, treats over 12 million gallons of water per day and will restore about 34 miles of the Catawissa Creek. The discharge water is diverted into a series of three, 12 feet high and 120 feet wide, circular concrete treatment cells filled with limestone. The discharged water reacts with high calcium limestone, which raises the pH of the water and causes the metals to precipitate out of solution. Each treatment cells contains about 4,800 tons of limestone and provides about two hours of retention time.

The system must be flushed extensively and frequently in order to manage the accumulation of aluminum hydroxide solids and keep them out of the stream. The siphon valves were intended to operate automatically without significant labor however that proved not to be so as they were not reliable and required extensive manual operation.

EMARR installed a 3.5 kw micro-hydro turbine on each of the three reaction tanks. They are driven by the flow from the tanks to the settling pond which is about twelve feet lower in elevation. The produced electricity is delivered to a main control panel which distributes the electricity back to local control panels and then to motor actuators installed on the drain valves. The flushing cycles are run automatically and unattended by plc controllers, which reduces operating labor hours and improves treatment efficiency. There is not electric service at the site.

28. History of Coal Mine Subsidence in Rock Springs, Wyoming (SESSION V)

Dave Hallman and Jeffrey Nuttall, Tetra Tech MM, Inc.; Bill Locke and Vicky Zimmerman, Wyoming DEQ, Abandoned Mine Lands Division

Coal mining in Rock Springs, Wyoming began in 1868 during construction of the Transcontinental Railroad and continued until the 1990s. Mining was conducted using room and pillar methods and eventually resulted in approximately 900 acres of the city being undermined at depths of up to 450 feet.

Surface subsidence associated with the underground coal mining at Rock Springs has been documented from as early as 1878. Subsidence mitigation efforts date from 1911 when drill holes advanced into the mine workings were lined with steel pipes through which concrete was poured into the mine workings. However, this practice was not widespread and the subsidence hazards went unchecked.

Beginning in 1967, extensive subsidence in the eastern portion of the city had damaged a number of houses, streets and sidewalks, water and sewer lines, and gas mains. Subsidence sinkholes continued to develop sporadically in other parts of the city as well. In 1969, the US Bureau of Mines (USBM) conducted an investigation of subsidence in Rock Springs at the request of the local authorities and concluded that similar conditions existed in 15 other areas of the city, comprising a total of approximately 230 acres.

Subsidence mitigation efforts were initiated in these areas by the USBM but were discontinued due to lack of funding. In 1977 the Surface Mining Control and Reclamation Act established a trust fund to reclaim abandoned mine lands damaged by coal mining prior to 1977. The State of Wyoming established the Abandoned Mine Land Division of the Department of Environmental Quality to reclaim abandoned mine sites using the funds collected. Since 1977 the AML Division has instigated subsidence investigations and mitigation efforts in Rock Springs, which continue today.

This paper presents an overview of the coal mining history of Rock Springs and subsequent subsidence hazards and mitigation efforts.

29. Use of Satellite Imagery for Mine Subsidence Monitoring in Rock Springs, Wyoming (SESSION V)

Dave Hallman and Jeffrey Nuttall, Tetra Tech MM, Inc.; Brian Young and Giacomo Falorni, TRE Canada Inc.; Vicky Zimmerman, Wyoming DEQ, Abandoned Mine Lands Division

Intrinsic to any assessment of subsidence hazards associated with abandoned underground mines, is an understanding of where subsidence has occurred previously and where active movements are occurring as these areas represent the highest risk for future damage. With trough subsidence, deformation often consists of broad gentle warping that can encompass large areas where identifying active ground movements requires careful measurement and monitoring.

Where the undermined area is limited, subsidence monitoring can be accurately and cost effectively performed using conventional surveying equipment to periodically measure a series of monument points established throughout the area in question. However, for larger areas, this approach quickly becomes very time consuming and cost prohibitive.

To overcome this difficulty in Rock Springs, Wyoming, where as much as 900 acres of the city are undermined, a system incorporating the use of satellite imagery to monitor ground displacements has been adopted. Specifically, Interferometric synthetic aperture radar, or InSAR, is being used to measure surface movements. Radar sensors mounted on satellites transmit microwave signals toward a target area, some of which are reflected back to the satellite. Sophisticated software then compares pairs of images of the same target to detect displacement that has occurred in the time span between the two image acquisitions. Persistent Scatterer Interferometry (PSI), an advanced form of InSAR, analyzes a stack of images generating a history of displacement over several years, with millimeter accuracy.

In Rock Springs, data from a PSI analysis is being integrated with traditional land based surveying in several key areas, GPS to measure geodetic movements, and extensometers installed in boreholes penetrating the mine workings to measure subsurface movements. This paper describes the InSAR technique, historical satellite image processing, its comparison to observed effects in Rock Springs, and the subsidence monitoring system subsequently being established.

30. A New Geophysical Approach to Investigate IH Mine Fire, Rifle, Colorado (SESSION D)

Kanaan Hanna, Jim Pfeiffer, Steve Hodges, and Fred Tolen, Zapata Incorporated, Blackhawk Division; Tara Taft and Steve Renner, Colorado Division of Reclamation, Mining and Safety; Dave Hallman, Tetra Tech

Fires associated with abandoned coal mines are of major concern to various state and federal agencies involved in mine reclamation because of their potential for causing public health and safety hazards, environmental pollution, and loss of potential energy resources. One of the greatest health and safety threats posed by coal fires is the potential occurrence of dangerously hot subsidence openings.

The IH mine fire site is located at an elevation of approximately 7,000 feet on the west side of Hass Canyon, north of Rifle, Colorado. This fire is one of a series of mine fires burning since 1948 along the Grand Hogback in Garfield County. The mine operated from 1940 to 1945, extracting coal along a seam that dips steeply at an angle of approximately 57 to 60 degrees to the southwest. Since 1948, and intermittently until 1998, numerous attempts at mitigation were conducted, including blasting and grouting mine voids in an attempt to control the fire. These projects temporarily reduced the fire activity; however, the fire has become increasingly active over the past few years and again presents a risk to public health and safety as well as a wildfire hazard.

This paper presents the results and findings of a comprehensive geophysical investigation conducted by Zapata Incorporated and its subcontractor Tetra Tech, in cooperation with the Colorado Division of Reclamation, Mining and Safety. The investigation was designed using a variety of high-resolution geophysical and imaging technologies. The DC-resistivity and electromagnetic techniques provided electrical measurements of the subsurface materials. The magnetometry delineated the extent of burning and non-burning coal seams. The smoke tracer tests provided the location of the air intake points and determined connectivity of the voids between seams, while thermal imagery provided the location of hot exhaust vents throughout the site.

31. The "Pit" Falls in Developing Abandoned Mine Lands (SESSION U)

Jean L. Hauk, P.G., L. Robert Kimball & Associates, Inc.

In 2005, L. R. Kimball was contracted by the Clearfield Foundation to prepare a Commercial/Industrial Master Site Plan for a 178-acre reclaimed mine site located near Clearfield, Pennsylvania, known as the Clearfield Firemen's Industrial Park. Initial investigations indicated that the site had been surface-mined with deep mining occurring peripheral to the main area. However, subsequent geotechnical investigations revealed undocumented deep-mine workings on a coal bed lying below the surface-mined area within the southern portion. Regrading this area would bring the deep-mine workings to within 35 feet of the surface, posing a risk of potential future subsidence. As a result, it was decided to remove the remaining coal pillars and backfill the void with the overburden. A drilling program using a 100-foot grid spacing was implemented to provide an estimate of the tonnage of coal remaining and to obtain coal samples for laboratory analysis, with the intent to sell the coal to partially offset project costs. The mined coals were deposited in an oxygen-poor environment, resulting in acid-producing pyrite in the overburden.

Under a consent order from the Pennsylvania Department of Environmental Protection to prevent post-construction acidic discharges, overburden analyses were required to determine the amount of neutralizing material required to be incorporated into the spoil and the deep-mine overburden during site regrading. Included in the overburden analyses was a "mountain" of spoil stockpiled during construction of a Wal-Mart on an adjacent parcel. For the overburden analysis, L.R. Kimball divided the Wal-Mart stockpile, the deep-mine overburden, and the remainder of the 90 acres into "logical" geometric shapes to which the results of the overburden analysis were applied. In addition, the application rate was converted to pounds per square yard per eight-inch lift in order to facilitate application of the proper amount of alkaline material during fill placement by the construction contractor.

32. Sustainable Communities Start with Abandoned Mine Lands (WORKSHOP III)

Nicole Henderson, Senior Consultant, SRA International, Inc.; Panel: Michael Dziak, President, Earth Conservancy; Michael Taylor, President, Vita Nuova; and Larry Newman, Greater Wilkes-Barre Chamber of Business & Industry

The decline of industry across the U.S. has not only left scars on the physical landscape, but also on community members, who feel the effects of the economic decline long after industry has left town. The abandoned mine lands left behind are located in hundreds of communities, often impacting land located close to historic neighborhood centers. Much of this land can offer communities an opportunity to reclaim its environmental and economic sources and improve its sustainability when revitalized sustainably.

Sustainable planning and design of abandoned mine lands seeks to balance ecological, economic, and cultural considerations by sensitively reusing land to rebuild the tax base, and strengthen community fabric. It responds to environmental concerns, as well as the community's economic history, trends of the region, and market competition and potential. Sustainable abandoned mine land revitalization projects build from a community's assets to produce a flexible and viable, long-term set of values and principles that guide the redevelopment process. Further, by considering reclamation and redevelopment activities on abandoned mine lands in conjunction with each other, project savings can be realized for both reclamation and redevelopment planning. Integrating sustainable elements into revitalization can also help insulate communities from further environmental and possibly economic decline.

This presentation will tackle questions including:

What is sustainability and how can it be integrated into abandoned mine land revitalization?
How can sustainable project design elements make your project more attractive to the market and to investors?
What resources are available to support sustainable planning and project design elements?
Where has sustainable planning been used to revitalize abandoned mine lands?

The presentation will include a case study of the sustainable reuse planning process used to revitalize Earth Conservancy's abandoned mine land holdings in northeastern Pennsylvania.

33. 3-D Mine Pool Mapping Development in the Anthracite Region of PA (SESSION L)

Robert E. Hughes, Executive Director and Mike A. Hewitt, Program Manager, Eastern PA Coalition for Abandoned Mine Reclamation (EPCAMR)

EPCAMR will discuss the utilization of borehole water elevations, AMD discharge surface elevations, historic mining, structural contour geology, and geologic cross section maps to recreate mine pools that we've termed multi-colliery hydrogeologic units in EarthVision 3-D modeling software & ArcGIS INFO. It allows one to see underneath the surface of abandoned mine lands in the Anthracite Region of PA. Our focus area, due to funding limitations has been the W. Middle & S. Anthracite Coal Fields. Future work is planned with the SRBC & the Lackawanna River Corridor Association at the Old Forge AMD Borehole & in the Scranton-Metro Mine Pool in the N. Coal Fields. EPCAMR is actively seeking funds to work in the Wyoming Valley & the E. Middle Coal Fields. EPCAMR has partnered with the PA DEP BAMR, Bureau of Deep Mine Safety, Dauphin County Conservation District, SRBC, PA DEP Pottsville DMO, USGS, and the OSMRE, Pittsburgh to work on developing more accurate models to estimate conservatively the water storage potential or reservoir capacity within the mine pools. They have had 50 years to fill up and to flow into others

The mine pools may be viewed as both a curse and a blessing. Extensive groundwater pollution and thousands of miles of streams degraded by AMD are the curse of more than 200 years of mining anthracite coal. The blessing in disputes to the potential availability of billions of gallons of water and high volume AMD discharges as a resource for present and future uses, as well as the potential market for the metal precipitates for resource recovery.

EPCAMR will touch on general framework concepts related to future economic redevelopment, mine pool re-use, underground storage potential, water withdrawal requests, AMD treatment, potential for frac water usage, hydroelectric potential, fisheries recovery, industrial use, and resource recovery of metals..

34. Extinguishing a Coalbed Fire: CO_2 Pilot Injection Design, Implementation, and Results (SESSION R)

Taku Ide, Stanford University Department of Energy Resources and Engineering

Underground coal fires pose environmental, social, health, and economic hazards. Many coal fires burn persistently over time scales of many years to decades, despite efforts to control them. Results of research performed at a subsurface coal fire near Durango, CO, are used to delineate the life cycle of a natural coal fire. Methods to identify oxygen influx points (mapping of surface fissures), combustion zone boundaries (subsurface temperature, surface snow melt, and magnetometer data), and coal consumption rates (combustion product gas flux estimates) are described. Based on the locations of the mapped subsurface combustion zone, a CO_2 pilot injection test was designed and conducted at this site. Results of this pilot project demonstrate that (1) air required to support continued combustion flows through a zone of fractured rocks that forms where coal has burned previously, (2) the primary driving force for air flow is the density-driven flow of hot combustion product gases through surface fissures that form as a result of subsidence as the coal burns, and (3) CO_2 injected into the air flow zone is drawn by the density-driven flow into the combustion zone, replacing a portion of the air flow that sustains combustion. The pilot test results suggest that a CO_2 injection scheme can be designed to control these fires if sufficient CO_2 (or other inert gas) is available to reduce the oxygen flow to the combustion zone below levels required to support continued combustion, and if the combustion region can be cooled sufficiently to prevent resumption of the air flow when injection ceases.

35. Copper Reclamation from Acid Rock Drainage (SESSION W)

Dr. Patrick James, President, Blue Planet Strategies

Blue Planet Strategies (BPS) is commercializing a technology developed under NIEHS Superfund Research Program funding for the profitable recovery and reclamation of copper present in Acid Rock Drainage (ARD). Sale of the recovered copper covers the reclamation process costs and provides a new revenue source. This technology hopes to be critical example of a new paradigm of "Converting Wastes into Resources." An overview of the technology, its application to ARD, and discussion of its value generation will be provided. Case study results from a technology/process demonstration being performed this summer (2010) at the Summitville mine Superfund ARD site will also be presented as available. Discussion of the broader environmental implications resulting from applications of the metal recovery technology and process to other metals and environmental contamination scenarios will also be highlighted.

36. Long-Term Water Quality Assessment of an AMD Passive-Treatment Facility in Beech Creek Watershed, Clinton County, PA (SESSION N)

Md. Khalequzzaman and John H. Way, Department of Geology & Physics, Lock Haven University of Pennsylvania

Acid mine drainage (AMD) plagues most tributaries throughout the heavily forested plateau of the 171-square-mile Beech Creek watershed, a northcentral PA basin contributing acidity to the West Branch Susquehanna River. One remediation effort involves the PA DEP's AMD passive treatment facility constructed in the eastern portion of this watershed (BAMR's Abandoned Mine Land Reclamation Project: BF 438-1021.1).

Partnering with the Beech Creek Watershed Association (BCWA), we initiated this multi-year research project when this system went online in the spring, 2008. The 2008-10 field seasons have yielded geochemical data from this site, including pH, TDS, conductance, net acidity, alkalinity, DO, ORP, major anions, cations, and several trace metals, from collection and treatment ponds, artificial wetlands, and its natural, down-gradient drainage system.

Field observations and data analyses demonstrate that the effectiveness of this passive treatment system has declined progressively throughout the sampling period. This facility does not appear to be achieving its original design goal, specifically—to provide significant water-quality improvement to its surface discharge watercourse, the Middle Branch of Big Run – a tributary to the Beech Creek.

Currently, this facility requires major maintenance in order to return it to original-design functionality. As a direct result of this ongoing monitoring program, several recommendations have been provided to the BCWA and the DEP relative to modifications and retrofits to this treatment system. The findings of this study also have implications applicable to design standards used for other passive AMD-treatment facilities in Pennsylvania and elsewhere. We plan to continue this long-term monitoring research project through the upcoming 2010 field season and beyond.

37. Evaluating Tree Colonization on Reclaimed Mines in the Northern Anthracite Fields of Pennsylvania (SESSION X)

Kenneth M. Klemow, Ph.D., Wilkes University

Since the late 1970s, sites impacted by coal mining have been reclaimed by re-grading and subsequently planting them with mixtures of cool-season grasses and legumes.

While the meadows resulting from that approach have higher ecological value than unreclaimed sites, they represent artificial plant communities, especially in the eastern United States. Such meadows appear to resist invasion by native woody species, thus inhibiting succession to forest. Long-term investigations of such sites are rare, however. A 220-acre anthracite mine in northeastern Pennsylvania reclaimed using grasses and legumes in 1997 showed little evidence of tree colonization by 2003. Follow-up visits in 2008 showed portions of the site to be wooded by black locust (Robinia pseudoacacia), which is considered invasive in that part of the state. An analysis was conducted to investigate whether black locust could facilitate the colonization of later successional hardwood trees, especially from remnant forest bordering to the south. Stem density of woody plants, herbaceous plant cover, and presence of tree seedlings were determined in plots systematically arrayed throughout the site beginning in July 2009.

All plots contained high densities (85%) of cool-season grasses, legumes, and other broadleaf herbs. Black locust trees growing to 15-20' tall were found in 75% of the plots. Plots also included non-native trees introduced during community planting projects in the past five years. No native tree species typical of regional mature forests were noted in any of the plots, however, even as juveniles under black locust canopy. Nor was any evidence of colonization by natives seen at the edge of the mine adjoining the intact forest. An assessment of the seed bank conducted in summer 2010 revealed that the only seeds present were those of weedy herbs; trees were not present. Taken together, these results suggest that even though the site is shifting from meadow to forest, it does not appear to be on a trajectory leading to a species composition typical of regional forests. Thus, introduction of such species may be needed, following a Forest Reclamation Approach (FRA).

38. Regional Differences in the Anthracite Mining Industry (SESSION R)

Michael Knies, Weinberg Memorial Library, University of Scranton

Although the four anthracite fields only cover approximately 500 square miles in 11 Pennsylvania counties, there are significant variations in the corporate, economic, urban, and labor arrangements within the anthracite region. Fundamentally, many, but not all, of these variations originated in the geological differences between the Southern, Eastern and Western Middle, and Northern anthracite fields. This presentation will provide an overview to the industry discussing the differences between the fields, with an emphasis on the Northern and Southern fields, and how these differences impacted the politics, commercial arrangements, mining practices, urban development, and labor organization during the growth and decline of the anthracite industry.

39. Restoring Our Natural Heritage – Wildlife Habitat Improvement in Abandoned Mine Reclamations (SESSION A)

Christina Kobland, President, Native Return, LLC

The United States is a rich country indeed, considering its abundance of natural resources. Unfortunately, our harvesting of these resources has had devastating effects on the much overlooked, original inhabitants of this great nation - our magnificent wildlife. Deforestation, acid mine drainage and other results of mining often leave pristine wilderness areas contaminated and lifeless. Could the extraction of these materials be trading one precious natural resource for another?

Native Return, LLC works with landholders to create and manage native plant and animal habitat. Our expertise enhances the habitat restorations taking place on abandoned mine sites. These places represent valuable opportunities to reclaim our biodiversity. Native Return specializes in restoring damaged ecosystems to healthy ones. Our award winning native grassland meadows and stream restorations are two examples of the key ways we can bring balance to these disturbed sites.

Loss of biodiversity has reached alarming proportions, perhaps surpassing global warming in its potential worldwide consequences. Re-creation of a native habitat is the best way to counteract this loss. These complex systems require expert knowledge to be restored successfully. Christina Kobland, president of Native Return, LLC will speak on these issues and demonstrate how we can share our land with wildlife in a sustainable way, even after the most harsh disturbance.

40. An Innovative Alternative Reclamation Technique to Stabilize Coal Mine Refuse Using an Alkaline Clay By-product (SESSION G)

Thomas E. Kovalchuk, PG, Pennsylvania Department of Environmental Protection; Saw K. Fu, PE, PhD, Peter Koranchie-Boah, Environmental Engineer, Dennis Fulmer and Judodine Patterson, Alcoa Technology Center

Since April 2009, a field trial demonstrating a coal mine refuse reclamation technique using alkaline clay (AC) and compost has been on-going in Mather, PA.

ABSTRACTS

The project objectives include: a) neutralization of acidic soils, b) establishment of sustainable vegetative cover by creating a more soil like material and, c) minimizing acidic leachate from the refuse. Four 0.8 ha (half acre) numbered plots were constructed where mine refuse was mixed with the following materials: refuse only-control, no mixing in plot 1, plot 2, 10% alkaline clay , plot 3, 10% AC and 5% compost, plot 4, 30% limestone. Alkaline clay is a by-product from alumina refining of bauxite ore. This innovative use of AC refers to a one-time application to a blended top 61 cm. (24 inches) of refuse followed by hydro-seeding and mulching. The AC provides a slow releasing alkalinity for acid neutralization, enhanced soil texture and nutrient retention for plant growth.

Sampling and analysis was carried out to compare the performance of the four test plots. Results collected to date support the following: i) the AC amended plots show a healthy diversity of vegetation while the limestone amended plot had taller grass growth but stunted legumes, and; ii) established vegetation served to lower surface temperature ~10°C (from 35°C to 25°C); iii) lysimeter water quality data showed >90% reduction in metals between the amended and control plots. The pH of the lysimeter water in the amended plots ranged from 6-7 compared to 2.5-3 in the control. The field trial will be monitored through 2010 to demonstrate the sustainability of AC amended refuse material.

41. Mine Closures Using Toroid Tire Plugs (SESSION C)

John A. Kratzmann, P.E., Program Manager, New Mexico Abandoned Mine Land Program

Closure of abandoned mine openings can present significant engineering design challenges, especially where rock conditions at the opening are poor, collapse has occurred, the opening is large and the preservation of bat habitat and historic features are concerns. The Lake Valley abandoned mine project in southwestern New Mexico included several large, collapsed open stopes with these conditions. The New Mexico Abandoned Mine Land (AML) Program concluded that commonly used measures, including fencing, high strength mesh and polyurethane foam plugs, would be inadequate.

Making a decision to try a new technology to meet the challenges of the site, the AML Program consulted with Norm and John Tribe, mining and reclamation consulting engineers from British Columbia. Using a technique they developed, the Tribes had designed and overseen installation over 15 years of more than 250 toroid tire plugs, none of which had failed. Openings are plugged using spent tires from large earthmoving equipment. Cabled tire mats (assembled using spent highway truck tires), geogrid and geotextile cloth placed above the large tire plug strengthen the fill zone. With help from the Tribes, the AML Program installed tire plugs for 15 shaft, stope openings and declines in Lake Valley and has plans to use the technique elsewhere.

Toroid tire plugging of mine openings puts to use the inherent properties of large tires – structural strength, flexibility and longevity. Although the technique requires a skilled operator and the use of a large track hoe with a thumb to handle the heavy tires, toroid tire plugs have proven to be a viable and, in many cases, lower cost alternative to more commonly used methods. Tire plugs also offer the environmental benefits associated with putting waste products to beneficial reuse.

42. Steel Slag Leach Beds: Improving Design for More Consistent Performance (SESSION K)

Natalie Kruse, Amy Mackay, and Jennifer Bowman, Voinovich School of Leadership and Public Affairs, Ohio University

Increasingly, steel slag leach beds are the first line of defense against acid mine drainage in southern Ohio. In Raccoon Creek Watershed, multiple steel slag leach beds have been built at both Flint Run and East Branch treatment projects. Although the beds were designed by the same design standards, their performance is inconsistent. Anecdotal evidence points to several potential causes for this inconsistency, including high dissolved oxygen in the bed or the outflow from the bed, high percentage fines, cementation in the beds and high solids loads in the influent water. To test some of these hypotheses and to develop potential new design concepts for steel slag leach beds, several lab column experiments are in progress. Each column is three feet tall with a foot of porous material. Two taps on the side of each column are used to determine the permeability of the bed based on head difference between the two points. The porous materials used for the initial four columns are 100% steel slag, 20% wood chips mixed with 80% steel slag (by volume), 20% river gravel mixed with 80 % steel slag (by volume) and steel slag with a top layer of wood chips equivalent to 20% of the total volume of the porous material. Tap water is used to feed the columns to simulate the 'clean' water that is used to feed field systems. Alkalinity in the outflow from each column is tested every two days to determine differences in alkalinity production between the different treatments. Initial results demonstrate that mixing the steel slag with other materials does not greatly reduce the alkalinity produced in the column, but does increase the permeability of the column, although this will likely change over time.

43. Use of Surface Water Reactive Transport Models to Evaluate the Effectiveness of Remedial Alternatives Downstream of Legacy Mine Sites (SESSION P)

Jon C. Ludwig, Christine E. Mellors, Samuel P. Wilkes, Hua Zhang, and Bruce T. Marshall, Tetra Tech, Inc.; Kathryn Hernandez, Helene Drago and Kuo-Liang Lai, PE., USEPA; David Mandell, West Virginia Department of Environmental Protection

The scale, complexity, and significant costs of legacy mine site cleanups makes it imperative that remedial decisions be based on sound scientific principles that provide decision-makers a high degree of confidence that the selected strategy will yield the intended results. To select the optimal remediation strategy for watersheds impaired by legacy mine sites, there is a need for a tool to assess the effectiveness of the various available remedial scenarios.

Tetra Tech has developed two customizable models that can accommodate site-specific data for sources over a range of water-quality conditions. After calibration, the models can be used to evaluate a range of cleanup scenarios. The pollutant reductions for each cleanup alternative can be evaluated based on cost effectiveness to implement the most economical alternative.

The Chemical Speciation Model was used in the Silver Creek, Utah and California Gulch, Colorado watersheds. The mining-related point and non-point source metals concentrations, and stream sediment and water column metals concentrations were represented in the models under high and low flow conditions to determine cadmium and zinc loadings to the streams. After establishing baseline conditions, cleanup scenarios were run to determine which actions were most appropriate in terms of efficacy and cost.

The Mining Data Analysis System was developed to model the dynamic and complex reaction networks of acid/base, complexation, cation exchange, precipitation-dissolution of iron and aluminum minerals, and biotransformation of nitrogen compounds. In the Cheat River, West Virginia watershed, the model was applied to simulate the spatial and temporal variation of stream chemistry at both the subwatershed scale and for the entire Cheat River watershed (3,683 km2). The model was used to develop TMDLs and to evaluate the performance of acid reduction practices. Results demonstrate that the model is a practical tool to evaluate management practices on both a small scale and regional basis.

44. Wind Turbine Site Selection Over Abandoned Mined Land (SESSION M)

Yi Luo, Ph.D., P.E., Associate Professor, Department of Mining Engineering, West Virginia University

Building wind farms on abandoned mined lands (AML) has many advantages (e.g., federal incentives, cheaper land use cost, etc.) over that on regular lands. However, the site for each of the wind turbines should be carefully selected so that the past mining operations will not affect the stability and integrity of the heavy and tall turbine structures.

In assessing the stability of the abandoned mined lands, knowledge on the possibility, development process, state and magnitude of a potential long-term surface subsidence associated with the past mining operations is essential. The US underground coal mines primarily use two mining methods, the room and pillar, and the longwall methods. The possibility and development process of long-term subsidence depend heavily on the mining method employed in the old mines. For longwall mines, the long-term surface subsidence may occur in the area over and near the chain pillar systems between two panels. The stability of the chain pillar system dedicates the long-term subsidence process and a method developed by the author can be used for the required prediction task. For room and pillar mines without pillar extraction, recovery ratio is the key. When pillars were extracted, the approach for longwall mines can be applied.

These methods for assessing long-term AML subsidence has been applied in the site selection process for a planned wind farm in a northern Potomac Highlands area, one of the best wind farm fields in the east US. The proposed area has been extensively mined under decades ago using both coal mining methods. At each of the proposed turbine sites, the possibility, the ultimate final subsidence, the amounts of subsidence at the construction time and at its end of life can be estimated. Such estimations were used to select the turbine sites for required stability.

45. Carbondale Coal Mining Area, Pitkin and Garfield Counties, Colorado - An Example of Mined Land Data Capture, Conversion and 3D Editing in ArcGIS 10 (SESSION L)

Willy Lynch, Professional Geologist and Mining Industry Specialist, Environmental Systems Research Institute (ESRI

The Carbondale Coal Mining Area is located from near Redstone, Pitkin County, Colorado to Glenwood Springs, Garfield County, Colorado along the western margin of the Rocky Mountains. The mining area is perhaps best known for the coal mine disasters in the Dutch Creek mines which killed a total of 24 miners.

No active mining is currently occurring in the area but mining does continue to the south in the Somerset-Peanis coal fields. In the Carbondale area, geologic mapping and coal resource assessments were completed in late 1970's by the USGS and were published as black and white Open-File maps (USGS Open-File Report 80-709). These maps are cataloged and made available by the USGS National Geologic Map Database Project (NGMDP) and USGS Coal Resource assessments. The State of Colorado Department of Natural Resources Division of Minerals and Geology currently has long term reclamation projects at a variety of sites across the area.

As a case study of new 3D GIS functionality and GIS mapping tools in ESRI ArcGIS10, the original USGS NGMDP map files and data were exported, georeferenced and digitized to capture the geologic data and mining data. The new GIS data was loaded into ESRI file geodatabase format using a field oriented geologic data model and 2D and 3D maps were created. Reclamation and mine permit activity was also incorporated into the GIS geodatabase. The digital data and newly available high resolution ESRI online basemap maps and images were combined to allow better documentation of coal seam outcrops, geology and reclamation efforts. This case study highlights ESRI technology as an effective tool for mine land mapping.

46. Partnerships: The Key to Successful AML Reclamation and Treatment (SESSION K)

Amy Mackey, Raccoon Creek Watershed Coordinator; Jen Bowman, Environmental Projects Manager; Natalie Kruse, Assistant Professor, Veinovich School of Leadership and Public Affairs

The Raccoon Creek Partnership (RCP) is a member based, nonprofit (501 (c) (3)) organization that was formed in 2007 to improve and protect water quality in the Raccoon Creek Watershed. This 684 square mile watershed in rural southeast Ohio has been heavily impacted by acid mine drainage from pre-law coal mining in the Appalachian region. In the 1980's, an early predecessor of RCP, The Raccoon Creek Improvement Committee, realized that the effects of historic mining on the Raccoon Creek watershed were far too extensive for any one agency or community group to remediate. By bringing together local, county, state, and federal agencies, as well as private landowners and concerned citizens, the Raccoon Creek Partnership was formed.

As a Partnership, the RCP has secured funding (~$9 mil) to complete mine reclamation and treatment projects, with three to be constructed by 2011, and eight more projects currently in the planning stages. These projects have resulted in the reduction of acidity in Raccoon Creek by nearly 800 ton per year, and the restoration of 24 stream miles, which now meet their target Aquatic Life Use criteria (Warm Water Habitat). Cooperation between our partners has also allowed RCP to hire a watershed coordinator, water quality specialist, AmeriCorps members, and ODNR-DMRM summer interns. This group of skilled employees assists with the ongoing chemical and biological monitoring throughout the watershed, documenting success of completed projects, as well as the need for future treatment. Another successful partnership has resulted in the acquisition of a former state laboratory for the establishment of an Aquatic Education Center in the watershed. The Center has allowed RCP to create a hands-on learning laboratory for local youth, educators, and school groups. Through these experiences, RCP has learned that establishing thriving partnerships is the key to successful watershed planning and remediation projects.

47. A Model for Re-"Mediation": Balancing Historic Preservation and Environmental Remediation at Bodie State Historic Park, Mono County, California (SESSION E)

Gregory Marquis, Engineering Geologist, California Department of Conservation

In the late 1800s to early 1900s, the town of Bodie was part of a major California gold mining district. In 1962, the town and adjacent area became Bodie State Historic Park (SHP). The Department of Parks and Recreation (State Parks), which owns and manages the Park, preserves Bodie SHP in a state of "arrested decay" and maintains the appearance and historical setting of mining, including structures, artifacts, tailings, and other cultural resources. From 2005-9, the Department of Conservation's Abandoned Mine Lands Unit, using funding appropriated by the State Legislature, partnered with State Parks and the U.S. Environmental Protection Agency Region 9 Emergency Response Section (EPA) to investigate and remediate chemical hazards at Bodie SHP generated by historic mining activities. Sampling and remediation procedures were designed to fully characterize and remediate contaminants and protect human health, while project activities were reviewed and monitored by park archaeologists to preserve cultural resources and artifacts. During sampling, EPA identified areas with elevated concentrations of lead (used in assay processes), mercury (used as amalgamate with gold to enhance recovery), and arsenic (commonly associated with gold deposits and occurring naturally in the area). Remediation included removal of lead-contaminated soil at former assay areas, HEPA vacuum removal of lead contaminated dust inside a historic building, installation of a system to reduce mercury vapor concentrations at Bodie's Standard Mill, and installation of erosion control measures for mine tailings next to Bodie Creek. The completed project at Bodie SHP is a model for protecting visitor and employee health and safety while preserving historic and cultural values.

48. Abandoned Taylor Anthracite Coal Colliery Redevelopment Project (SESSION W)

Thomas J. Mattnas, P.E., Pennsylvania Department of Environmental Protection; Brian W. Kaufman, Vice President, Kaufman Engineering, Inc.

The Taylor Planning Commission, with oversight by Taylor Borough Council, has been developing a plan for the reclamation/redevelopment of the 150-acre Taylor Colliery property located in the heart of Taylor Borough. Said plan includes abandoned mine reclamation of a majority of the area by The PA Department of Environmental Protection / Bureau of Abandoned Mine Reclamation of Wilkes-Barre. Following reclamation, the Taylor Redevelopment Authority is proposing a new town center which includes residential, commercial and light industrial uses for the site.

The PA Department of Environmental Protection / Bureau of Abandoned Mine Reclamation of Wilkes-Barre has planned, designed and completed a reclamation project that covered 85 acres of the redevelopment site. The purpose of the reclamation project was to eliminate public health and safety hazards such as dangerous mine spoil piles & embankments, vertical mine shafts, hazardous mining equipment and structural debris left from former coal mining operations at the colliery site. In addition, a portion of the Keyser Creek channel exhibiting heavy amounts of sedimentation from red ash material has been reconstructed and stabilized.

Kaufman Engineering has been involved in the overall Taylor Colliery redevelopment project for several years providing engineering and project management support for the Taylor Planning Commission. During monthly meetings, the Planning Commission and Kaufman Engineering have been completing background reports and have initiated environmental clean-up efforts that serve as the foundation for a successful development plan for the entire 150-acre Taylor Colliery property.

49. Outreach and Education for Abandoned Mine Reclamation in Pennsylvania (SESSION E)

Andy McAllister, WPCAMR

In Pennsylvania, outreach and education are effective tools in advancing abandoned mine reclamation. Through outreach efforts, the general public gains an understanding of the issues and reclamation projects gain support from the community. This presentation will focus on how The Western PA Coalition for Abandoned Mine Reclamation (WPCAMR) works with its partners to educate, advocate for, and encourage support for Abandoned Mine Reclamation in western PA.

WPCAMR is a coalition of 24 county conservation districts, industry, and watershed groups. WPCAMR is a non-profit organization whose purpose is to encourage and implement the reclamation of abandoned mine lands and degraded waters of Western Pennsylvania. This includes returning abandoned mine lands to productive use, improving water quality, and reducing hazards to health and safety, thereby improving the local economy and enhancing the quality of life.

50. Out of the Ground: Western Pennsylvania's Coal Mining Experience (WORKSHOP III)

Andy McAllister, WPCAMR

The place we call Pittsburgh and the surrounding region in Southwestern Pennsylvania has been profoundly shaped by its industrial past. A unique set of circumstances converged here that destined Pittsburgh to become the Steel City, the capital of the world's industrial might for nearly a century. The history of the region's steel industry has been fairly well chronicled and is generally known as part of our heritage. Not so well known is the story of the supporting industry that literally provided the fuel of the Pittsburgh region's meteoric rise to prominence, the fuel of the Industrial Revolution, coal.

With particular focus on our largely immigrant ancestors who lived, worked, and died in the region's coal mining communities from the late 19th to mid 20th centuries, "Out of the Ground", a documentary film featuring music by national recording artist Ken Bonfield, chronicles the challenges that western Pennsylvania's mining families faced as they struggled to carve out a living. It is a fascinating journey through the lives of coal mining families who, in spite of fear and oppression, built strong communities; places where memories of our coal mining past still linger.

Andy McAllister, writer and director of "Out of the Ground" will facilitate an open discussion of our mining history after the film.

Technical Session Schedule for Monday Morning

9/20	Blakely Meeting Room	Taylor Meeting Room (1/2 of Medallion Ballroom)	Mayfield Meeting Room	Dalton Meeting Room (1/2 of Medallion Ballroom)	Amphitheatre Meeting Room
8:00 - 8:45	Plenary Session (In Casey Ballroom A, B and C)				
8:45 - 9:00	Break / Set Up				
9:00 - 10:30	Session A	Session B	Session C	Session D	Workshop I
9:00 - 9:30	The Welsh in Scranton *Sarah Piccini*	GeoFlux Fluvial Geomorphic Reclamation *Nicholas Bugosh*	Government Financed Construction Contracts *Joe Sassaman*	A New Geophysical Approach to Investigate IHI Mine Fire *Kanaan Hanna, Jim Pfeiffer, Steve Hodges, Fred Tobe, Tara Tall, Steve Ranner, Dave Heilman*	Building Bridges in Reclamation: Partnerships with Community Watershed Groups *Allen Comp, Scott Fanella, Chris Sludgas, Josh Larsen, Megan Williams Blackmon, Lisa Goodell*
9:30 - 10:00	A History of Underground Maps *Eric Nystrom*	Long Term Performance of an Integrated Bioreactor *Stephanie Cobil, Linda Figueroa, Thomas Wildeman*	Mine Closures using Toroid Tire Plugs *John Kretzmann*		
10:00 - 10:30	Restoring Our Natural Heritage *Christine Kobland*	Calcium Reagents and Their Application *Julie Mercer*	Innovative Landslide Repair Concepts, Including Soil Nails *Colby Barrett*	Recent Coal Fires in NE PA *Daniel Vice, Harold Aurand, Melissa Holler*	
10:30 - 10:50	Break				
10:50 - 12:20	Session E	Session F	Session G	Session H	Workshop II
10:50 - 11:20	Bodie State Historic Park, Mono County, CA *Gregory Marquis*	Cooks Run Watershed Restoration Efforts *Dave Fromell, Dan Hallock, Ron Henry, Steve Floerick*	Earth Conservancy: A Model for Mine Land Reclamation *Michael Dziak*	VA Abandoned Mine Land Inventory System *Jesse Whitt*	Effective Strategies for Engaging Rural Watershed Volunteers *Janne Fetr*
11:20 - 11:50	Outreach and Education for Abandoned Mine Reclamation in PA *Andy McAllister*	Impact of AMD Project Liabilities on Future Revenue Streams *Michael McAvoy*	Alkaline Clay for Refuse Stabilization *Thomas Kovalchuk, Jew Fu, Peter Koranchie-Boah, Dennis Fulmer, Jadedina Peterson*	Assessing the Use of High Resolution Satellite Imagery *Dianne Osborne, Daniel Kestner, Richard Davis, Jesse Whitt, William Whitlock, Scott Williams*	
11:50 - 12:20	Brownfield Redevelopments Spurs Job Creation *Andrew Sisk*	Acidy Decay of Above Drainage Underground Mines in WV *J. Skousen, B. Mack, L.M. McDonald*	Use of Biosolids on AML Projects on Gamelands in Northcentral PA *Dennis Dopsa, Michelle Monroe*	Horizontal Drilling for Mine Pools *Carol Vareno, George Steiner*	
12:20 - 1:35	Lunch on Your Own				

(NOTE: Red numbers correspond to the Abstract No. included in the Abstracts of Technical Presentations and Workshops starting on page 8)

Technical Session Schedule for Monday Afternoon

9/20	Blakely Meeting Room	Taylor Meeting Room (1/2 of Medallion Ballroom)	Mayfield Meeting Room	Dalton Meeting Room (1/2 of Medallion Ballroom)	Amphitheatre Meeting Room
1:35 - 3:35	Session I	Session J	Session K	Session L	Workshop III
1:35 - 2:05	Drifton Estates Mining Legacy *David Mlinarcz, Joan Hawk*	Guidelines for the AMD Set Aside Program in PA *Pamela Milavec*	Dolph Mine Fire *Robert Breha, Thomas Gray*	3D Evaluation of an Abandoned Coal Mine Fire *Christopher Guinan, Jim Pfeiffer*	Out of the Ground: Western PA Coal Mining Experience *Andy McAllister*
2:05 - 2:35	A Landscape Approach to Abandoned Mine Safety Remediation *Nicole Walgert*	Passive Treatment of High Volume Net Acidic Mine Drainage *Paul Behum, Dan Haas, Mark Stacy, Tracy Branam*	Open Pit Sand Mine Reclamation as a Component of a Comprehensive Watershed Restoration Project *Joe Berg*	Mine Land Data Capture, Conversion and 3D Editing in ArcGIS 10 *Willy Lynch*	
2:35 - 3:05	Environmentally Beneficial Alternative Energy *Jeff McNelly*	Treatment Cost Evaluation *Tim Danehy, Tiff Hilton, Clifford Denholm, Shaun Busler, Bryan Page, Margaret Dunn*	Git-R-Done Landslide Remediation *Michael Shapela*	3-D Mine Pool Mapping Development *Robert Hughes, Mike Hewitt*	Sustainable Communities Start with Abandoned Mine Lands *Nicole Henderson, Michael Dziak, Michael Taylor, and Larry Newman*
3:05 - 3:35	Jeddo Tunnel Reservoir Water Storage and Hydro Power *Peter Hawrijenz*	Sustained Treatment of AMD *Neil Wolfe*	AMD Treatment in Beaver Creek Basin *Charles Cravotta III, Daniel Koury*	Technology Resources for Reclamation *Martin Edwards, Dean Baker, Dennis Palladino*	
3:35 - 3:55	Break				
3:55 - 5:25	Session M	Session N	Session O	Session P	Workshop IV
3:55 - 4:25	Producing Electricity at Passive Treatment Systems *Peter Hawrijenz*	Long Term Water Quality of AMD Passive Facility *Md. Khalequzzaman, John Way*	Schuylkill Watershed Restoration and Source Water Protection *Tom Davidock, Chuck Kanetsky*	Using GIS to Identify Subsidence Prone Areas in SW Indiana *Laura Montgrain, Steve Herbert*	Publicly Accessible USGS Databases and Software *Lee Eicholtz, Mark Stuckey, Linda Zarr*
4:25 - 4:55	Wind Turbine Site Selection Over Abandoned Mined Land *Yi Luo*	History of the Old Forge Borehole and How the Chemical Properties of the Outflow Can be Used to Refine a Remediation Method *Ronald Supkowski, Christopher Gillis*		Surface Water Reactive Transport Models *Jon Ludwig, Christine Mellors, Samuel Wilson, Hua Zhang, Kathryn Hernandez, Helena Drago, Kuo-Liang Lai, David Morrell, Bruce Marshall*	
4:55 - 5:25	Carbon Accounting for Mining Waste-to-Energy Facilities *Steven Porto*	O&M Passive Treatment Systems *Margaret Dunn, T. Danehy, C. Denholm, S. Busler, B. Page*	Stream and Wetland Mitigation in High Gradient Watersheds *Philip Elswick*	GIS Based Hydrogeologic Flow Modeling of Groundwater *Benjamin Turner, Joshua Snodden*	
	Get Ready for Annual Awards Banquet				

(NOTE: Red numbers correspond to the Abstract No. included in the Abstracts of Technical Presentations and Workshops starting on page 8)

Technical Session Schedule for Wednesday Morning

9/22	Blakely Meeting Room	Dunmore Meeting Room	Mayfield Meeting Room	Dallon Meeting Room (1/2 of Medallion Ballroom)	Amphitheatre Meeting Room
8:00 - 10:00	Session Q	Session R	Session S	Session T	Workshop V
8:00 - 8:30	Small AML Program Award Presentation	Regional Differences in the Anthracite Mining Industry *Mike Kolea*	Beneficial Use of FGD Materials in AML Reclamation *Tarunjit Butalia, William Wolfe, Harold Walker, Robert Baker*	The Pittsburgh Botanic Garden, a Garden Sprouting Atop Abandoned Mines *Greg Nero, Judy Wojeicki*	Surveying and Mapping for the Abandoned Mine Reclamation Professional *James Pahel, Jeffrey Gilmore*
8:30 - 9:00	Appalachian Regional AML Award Presentation	An Overview of Pennsylvania's Mine Subsidence Insurance Program *Lawrence Ruane, Edward Malyckl*	Kentucky's Portal 31 Exhibition Mine *J. Steven Gardner*	Implementing the Forestry Reclamation Approach on Abandoned Mine Lands in Appalachia *Scott Eggerud*	
9:00 - 9:30	Mid-Continent Regional AML Award Presentation		Burlington Mine Site Voluntary Cleanup *Robert Singer, James Cowart, et al*	American Chestnut Restoration on Surface Mined Sites *Robert Paris*	
9:30 - 10:00	Western Regional AML Award Presentation	Extinguishing a Coalbed Fire: CO_2 Pilot Injection Design, Implementation, and Results *Toby Ide*	Paste Technology for Ute-Ulay Tailings Impoundments *Tara Tafi, David Lazorchak*	Soil CO_2 Flux *Kwame Awuah-Offei, Alfred Baldassare, Mosesbo Mathibe*	
10:00 - 10:20	Break				
10:20 - 12:20	Session U	Session V	Session W	Session X	Workshop VI
10:20 - 10:50	National AML Award Presentation	Evaluating Subsidence with Too Much Data *Edward Saboll, David Mosser*	NE WY Kleenburn Site Remediation *Mark Conger, Beau Hill, et al*	Performance of Steel Slag Leach Beds *Guy Riefler, Elaine Goetz*	TECCO Slope Stabilization System Workshop *Joseph Bigger, William Kane*
10:50 - 11:20	The Pit Falls in Developing Abandoned Mine Lands *Joan Hanek*	History of Coal Mine Subsidence in Rock Springs *Dave Hallman, Jeffrey Nuttall, Bill Locke, Vicky Zimmerman*	Taylor Coal Colliery Redevelopment Project *Thomas Mellman, Brian Kaufman*	Steel Slag Leach Bed Design Improvements *Natalie Kruse, Amy Mackey, Jennifer Bowman*	
11:20 - 11:50	Remediation and Environmental Art *Linda Dugan Partridge*	Satellite Imagery for Mine Subsidence Monitoring in Rock Springs *Dave Hallman, Jeffrey Nuttall, et al*	Copper Restoration from Acid Rock Drainage *Patrick Jarose*	Partnerships: Key to Successful AML Reclamation *Amy Mackey, Jen Bowman, Natalie Kruse*	
11:50 - 12:20	Patricia Johanson's Marywood University Land Remediation *Pamela Parsons*	Monitoring the Threat of Sinkhole Formation Under a Portion of US 18 in Cerro Gordo County, Iowa *Kevin O'Connor, Matthew Thimmt*	Newport North Site Reclamation *John Cantey*	Evaluating Tree Colonization on Reclaimed Mines *Kenneth Klemow*	
	Conference Ends - Enjoy the Rest of Your Stay in Pennsylvania				

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51. Examining the Impact of AMD Project Liabilities on Future Revenue Streams (SESSION F)

Michael J. MAvoy, PE, Natural Resources Engineer III, Acid Mine Drainage Program, ODNR Division of Mineral Resources Management

The SMCRA Abandoned Mine Land (AML) fund reauthorization is allowing AML programs to continue reclamation of abandoned coal mines, including treatment of acid mine drainage (AMD). Mitigation of AMD has resulted in the recovery of hundreds of stream miles through passive and active treatment systems installed over the last two decades. This significant capital investment by AML programs is responsible for the recovery of historically damaged watersheds. However, these systems now represent a future funding liability if restorations are to be maintained in perpetuity. AML programs now understand that treatment systems require maintenance, and passive systems often have a useful life of ten years or less. Additional costs of system operation, maintenance, and replacement must be analyzed against future revenue streams to ensure that restorations are sustained. As SMCRA funds may not extend beyond 2025, and other funding dwindles, AML programs cannot afford construction of new AMD systems without considering their impact on revenue streams after their useful life has expired. AML programs should consider performing economic analyses of their revenues, future capital expenditures, and existing project liabilities to ensure they have the capability to sustain watershed restorations. AML programs may also consider ceasing construction of new AMD projects to ensure existing recoveries can continue to be fully maintained. Utilizing an economic analysis, the AML unit of the Ohio Department of Natural Resources is reviewing revenue streams, new project costs, and existing project liabilities for the purpose of creating a set-aside fund to maintain AMD projects in the future. While many aspects of future revenue streams are challenging to predict given the economic conditions of the federal and state governments, analyzing of data from Ohio's AMD treatment activities is allowing for the preparation of the long term operation and maintenance of AMD systems.

52. Environmentally Beneficial Alternative Energy (SESSION I)

Jeff A. McNelly, ARIPPA

Thirty years ago, the most visible signs of the Anthracite and Bituminous Coal mining industry were the tall, dilapidated coal breakers and their attendant waste coal piles (waste from coal mines, consisting of low BTU fine coal, coal dust, and dirt). Most of the breakers are gone, removed by the coal operators as liabilities or under the AML Program as hazards. The waste coal (boney-culm) piles have also been disappearing, mainly due to a US federal law passed about the same time as SMCRA, the Public Utility Regulatory Policies Act of 1978 (PURPA), CFB technology and non-utility alternative energy generation power plants.

In Northeastern Pennsylvania the first circulating fluidized bed (CFB) technology plant in the USA to convert waste coal to alternative energy was developed. Private industry (with the support of governmental agencies and certain retirement funds) went on to utilize the PURPA law, CFB technology, and needed support to develop a total of fifteen non-utility generation power plants in PA, generating alternative energy from waste coal. These plants have reclaimed more than 4500 acres of AML damaged lands and streams by removing culm piles and applying beneficial use ash in a regulated controlled manner. In 1989 the plants formed an organization called the Anthracite Region Independent Power Producers Association known today as simply "ARIPPA".

My power point presentation will outline and emphasize the historical perspective of the coal mining legacy and industry efforts to improve the environment while generating alternative energy. Ash which is produced in the waste coal to alternative energy process is used to reclaim abandoned surface mines. The CFB technology utilized at ARIPPA plants often produce steam for generation of electricity and thermal energy to heat greenhouses or nursing homes within close proximity of a plant. Slides will clearly demonstrate the acres of re-mined/reclaimed culm banks and reclaimed streams that today serve as proof of the industry's "environmentally beneficial alternative energy" slogan.

53. Types of Calcium Reagents and Their Application in Acid Mine Drainage and Abandoned Mine Land Reclamation (SESSION B)

Julio K. Mercer, Carmeuse Lime & Stone Co.

This paper can be used as a reference for industry about the various forms of calcium reagents available for treatment of abandoned mine drainage and abandoned mine land reclamation. The types, origin, and physical characteristics of a variety of calcium reagents are discussed. The paper also discusses application methods for calcium reagents and the effect preparation has on the utilization efficiency of the reagent, as well as how proper preparation can maximize the economic benefit for a specific application.

A research project undertaken by Carmeuse Lime & Stone (CLS) examined the effects of water temperature and water to lime ratio on the reaction between quicklime and water. While mine drainage water was not specifically used for the experiments, certain extrapolations can be made based on the results. Suggestions will be given to maximize utilization efficiency for quicklime products.

Cool slaking water temperature retards reaction rate, lowers final slaking temperature, and decreases the utilization efficiency of reagent. Testing showed an increase in particle size as slaking water temperature was decreased. Low utilization efficiency and larger particle size increases the amount of residue left at the end of slaking.

Water chemistry can have a large impact on slaking and should be of interest when using lime for the treatment of mine drainage. Waters containing more than 500 mg/l of sulfites, sulfites, or bisulfites are typically considered unsuitable for slaking, but may be suitable for making lime slurry from dry, hydrated lime.

Calcium reagent costs can differ greatly, as can their relative utilization efficiency in a given process. Low reagent cost does not always equate to lowest operating cost if utilization efficiency is low. A simple comparison is presented to illustrate the relative costs of a variety of calcium reagent materials and forms.

54. The Development of Program Implementation Guidelines for the AMD Set Aside Program in Pennsylvania (SESSION J)

Pamela J. Milavec, Pennsylvania Department of Environmental Protection

With the reauthorization of Title IV of the Surface Mining Control and Reclamation Act (SMCRA) in 2006, the substantial increases in AML funding to states and tribes, including the provision to set aside up to 30% of the AML for acid mine drainage (AMD) abatement projects, prompted Pennsylvania to seek public input in developing new program implementation guidelines for the AMD set aside program. To solicit public input ten public town hall meetings were held throughout the coal regions of Pennsylvania in 2007.

Previous to the public outreach effort, the Office of Surface Mining (OSM) and PA DEP began an initiative to evaluate passive treatment systems built with public funds by both government agencies and private entities. As a result of these evaluations and in order to address some of the comments received during the town hall meetings, a joint DEP and OSM workgroup was established to develop program implementation guidelines for the AMD set aside program. The workgroup developed draft guidelines that were released for public comment in June 2008.

In November 2008, PA DEP undertook a data collection effort to collect information for the 279 publicly funded treatment systems built in Pennsylvania. All of the information received was converted to electronic format and, through a collaborative effort with the Western Pennsylvania Coalition for Abandoned Mine Reclamation, is being uploaded to a publicly available website, www.dabashed.org .

Based on all the public input and review of data for existing systems final guidelines were developed and put into effect in July 2009. The AMD Set Aside Program Implementation Guidelines now serve as the primary method for evaluating all newly proposed watershed restoration plans and the projects identified within these hydrologic units, and for evaluating expenditures for operation and maintenance of existing systems.

55. Drifton Estates: An Unanticipated Mining Legacy (SESSION I)

David Minnear, PE and Joan L. Hawk, PG, L. Robert Kimball & Associates, Inc.

Drifton Estates is located at the northern limit of the Eastern Middle Anthracite Field along State Route 940 between the towns of Freeland and Drifton, Luzerne County, Pennsylvania. Below Drifton Estates, the remains of the Buck Mountain Coal vein are honeycombed by the abandoned workings of the Drifton Colliery. The colliery, operated by Coxe Brothers & Company, Inc., began operations in the late 1800's, with "mining" continuing into the 1960's. A series of mining-related subsidence problems have occurred at Drifton Estates between 1979 and 2008, which has swallowed vegetation and caused structural damage to several residences. These events shocked many of the residents—they were unaware that their homes were undermined. The Pennsylvania Department of Environmental Resources (PADER), predecessor to the Pennsylvania Department of Environmental Protection (PADEP), investigated and mitigated the damage shortly after it occurred. However, subsequent subsidence events prompted the PADEP to investigate the cause and potential solutions to these subsidence events that periodically afflict Drifton Estates. In 2008, PADEP contracted with L.R. Kimball to perform the mine subsidence evaluation. L.R. Kimball reviewed and assessed data acquired during the previous investigations, prepared detailed topographic mapping, and implemented drilling and geophysical investigations to more fully characterize the mine workings.

Existing, but incomplete, mine maps have been accurately geo-referenced onto the detailed topographic mapping. Superimposing the locations of the residences and a contour map showing the elevation of the Buck Mountain Coal allowed the determination of depths to the mine workings with respect to each of the residences. This, in conjunction with an assessment of the overburden lithology, facilitated identification of three areas to be targeted for future grouting programs. What we have not been able to identify is the source of a "mysterious" geophysical anomaly and the exact location of the "subway".

56. Using GIS to Identify Subsidence-Prone Areas and High-Priority Improvements for Preemptive Mine Void Grouting in Southwest Indiana (SESSION F)

Laura Montgomery and Steve Herbert, Indiana Department of Natural Resources

This project was originally designed by Nathan Eaton (Indiana Geological Survey) and Jim Metzger (DOR) to identify areas that are at high risk for catastrophic underground mine subsidence, and could therefore be the loci of preemptive mine void grouting efforts in Indiana. For this analysis, Eaton and Metzger's procedure was refined to identify not only subsidence-prone areas but also high-priority improvements to be targeted for preemptive grouting. GIS coverages were used to define subsidence-prone areas using three criteria, derived from the observation that most catastrophic subsidences in Indiana occur over relatively shallow mine voids (< 100 feet deep) and in populated/developed areas. First, underground mines less than 100 feet deep (Criterion 1) were selected, resulting in an area of approximately 50,000 acres or about 25 percent of the total undermined area in Indiana. Then, only portions of these 50,000 acres that were within 1/4 mile of a populated/developed area (Criterion 2) were selected, resulting in approximately 20,000 acres or 10 percent of the total undermined acreage. Within these 20,000 acres, only those mines that exhibited past subsidence, or were within 30 feet of a known subsidence (Criterion 3), were selected. The resulting subsidence-prone areas constituted about 7,000 acres or 3.5 percent of the total undermined acreage. Within these 7,000 subsidence-prone acres, improvements within 300 feet of two or more known emergency subsidences (which occur suddenly and are extremely hazardous) were defined as "high-priority" for grouting and were digitized. Improvements such as schools and airports that were adjacent to subsidence-prone areas were also digitized. In total, 116 acres of high-priority improvements were identified for possible preemptive grouting. Additional analysis, including the development of overburden coverages, may allow risk areas to be further prioritized.

57. The Pittsburgh Botanic Garden, a Garden Sprouting Atop Abandoned Mines (SESSION T)

Greg Nace, President, and Judy Wojanis, Pittsburgh Botanic Garden

In 1988, a group of civic minded garden lovers in Western Pennsylvania had a dream to create a botanic garden. After a ten year search to find an appropriate site, the not-for-profit Botanic Garden Board signed a lease with Allegheny County for 452 acres near the airport, twenty minutes from downtown Pittsburgh.

A nationally known Pittsburgh-based landscape architectural firm, MTR was commissioned to draft the master plan. Finished in 2002, the plan called for buildings and gardens to celebrate the rich botanical heritage and natural environments of the Western Allegheny Plateau. With plans in hand, there was an atmosphere of excitement to begin construction. However, the site was not ready.

Upon closer inspection, there was subsidence from abandoned deep mines dating back to 1925, unsafe "high walls", and Acid Mine Discharge (AMD). Even though it meant a considerable delay, the Garden's Board decided to remove the mines.

In an innovative approach, a reclamation contract was signed with the Mashuda Corporation which delayed payment until coal was sold on behalf of the Garden. Also, a Federal stimulus grant was received to cover the cost of SAS ponds which would later become permanent irrigation ponds.

This reclamation work has just gotten started. The question is: will the price from selling the coal cover the contract with Mashuda, re-contouring and re-vegetating the hilltops? Based on estimates of the amount of coal to be removed, it will, and hopefully excess funds will be available to help implement the master plan for the new Pittsburgh Botanic Garden.

If successful, we will not only have addressed the problems associated with the site, but also brought the property to a high level of reuse with beautiful gardens that will be the pride of Pittsburgh.

58. Mapping Mine Lands: A History of Underground Maps in America (SESSION A)

Eric C. Mystrom, Assistant Professor of History, Rochester Institute of Technology

Historic mine maps are an important tool used to help deal with abandoned mine lands, and while we might evaluate the importance or reliability of particular historic maps, the history of the development of mine mapping in America has been largely overlooked. The techniques, and products, of underground mapping developed in America in the late 19th and early 20th centuries initially from European antecedents, but were often changed to reflect American conditions.

My illustrated presentation will broadly cover the history of underground mapping in American mining engineering of the late 19th and early 20th centuries, with an emphasis on the major factors that influenced the evolution of the form and content of the maps themselves. Since the practice and products of underground mapping varied by region and changed over time, I will show examples from a variety of mining districts, including the Pennsylvania anthracite region, and from different points in time. My hope is to provide some broad historical perspective on the creation, uses, and limitations of these critical tools that enabled their users, both then and now, to visualize underground mining landscapes.

59. Monitoring the Threat of Sinkhole Formation Under a Portion of US 18 in Cerro Gordo County, Iowa. (SESSION V)

Kevin M. O'Connor, P.E., GeoTOR, Inc.; Matthew Tratnyek, Geologist III, Iowa Department of Transportation

Sinkhole formation is a common occurrence in northeast Iowa and U.S. 18 in Cerro Gordo County was constructed over an area where sinkhole formation had only been locally known and had not been recorded or identified in the Iowa DNR database at the time. Since 2004, sinkholes have developed along the right of way but it has not been possible to definitively identify the cause based on geophysical surveys. Detailed information obtained with soil borings indicates that shale overlying the carbonate rock has been eroded and allowed karst dissolution of the carbonate rock. Without removing the structural fill and site soils to expose the rock, it will not be possible to arrest the natural processes occurring. An alternative approach was adopted and consisted of: removing the existing pavement, installing coaxial cables in trenches excavated within the subgrade, replacing the pavement as double reinforced pavement (including shoulders), and monitoring the cables using Time Domain Reflectometry (TDR). The cables are interrogated several times a day and data is transmitted via cellular modem to Iowa DOT facilities. Among the data transmitted is a log file of deformation activity along each of the cables which is evaluated and an action plan is initiated based on information in the activity file and updated plots for each cable.

60. Long-Term Performance of an Integrated Bioreactor and Wetland Treatment System at the Forest Queen Mine Site in Silverton, Colorado (SESSION B)

Stephanie Odell, Bureau of Land Management; Linda A. Figueroa and Thomas Wildeman, Colorado School of Mines

The Bureau of Land Management (BLM) has constructed two biochemical reactor systems (BCRs) to treat mining influenced water from the Forest Queen Mine near Silverton, CO. The bioreactors coupled with a natural wetland provide treatment to the Forest Queen Mine drainage. The central objective of this paper is to review the performance of the bioreactors and wetland treatment system. The bioreactors have been in operation for nine years and along with the natural wetland are still removing a high percentage of the influent metals.

61. Assessing the Use of High Resolution Satellite Imagery to Inventory Abandoned Mine Land Features in Virginia (SESSION H)

Dianne Osborne, Remote Sensing Specialist, U.S. Office of Surface Mining Reclamation and Enforcement; Scott Williams; Daniel Kestner, Mapping Supervisor; Richard Davis, Minerals Specialist; Jesse Whitt and William Whitlock, AML Specialists, State of Virginia, Department of Mines, Minerals and Energy

The State of Virginia (VA), Division of Mined Land Reclamation (DMLR), and the Office of Surface Mining used high resolution satellite imagery along with other Geographic Information System tools to assist in the inventory of abandoned mine land (AML) sites in southwestern VA. Inventory of AML sites was conducted through feature extraction of QuickBird-2 and GeoEye-1 satellite imagery to identify new AML sites and more precisely locate existing AML sites.

The AML features identified as priority for mapping by VA DMLR were dangerous highwalls, apple cores, gob piles, clogged streams, clogged stream lands, portals, subsidence, acid mine drainage, hazardous equipment and facilities, spoil piles containing high coal content, and areas that have been previously mined.

The initial results of the image feature extraction include locating acid mine drainage areas, gob piles and spoil piles, clogged streams and clogged stream lands and determining linear feet of dangerous highwalls and apple cores.

These inventory results will be evaluated by the VA DMLR for potential inclusion into their existing AML inventory.

62. Surveying & Mapping for the Abandoned Mine Reclamation Professional (WORKSHOP V)

James E. Patzel, P.L.S., C.P., P.S.M., R.P.P., S.P. and Jeffrey P. Gilmore, Land & Mapping Services

The workshop is intended for the technician or engineer and will cover the wide range of surveying, photogrammetric and remote sensing services that are available in today's industry. We will discus specific services and products and there relationship to the field of environmental engineering. Topics discussed will include: cost benefits, photography scales, accuracies & expected data content, photography acquisition (fixed wing & rotary wing), control requirements, site monumentation, targeting & photo ID's, airborne GPS, analytical aero-triangulation, collection of map data, map edit, digital orthophotos, QC, courthouse record investigation, historic photographic sources, underground utilities, GIS Systems, and more.

63. American Chestnut Restoration on Surface Mined Sites in the Appalachian Region (SESSION T)

Robert L. Paris, Ph.D., Research Geneticist, The American Chestnut Foundation®

The majority of the Appalachian coal field lies beneath mixed-species, hardwood forests that provide landowners with a valuable, renewable resource. However, in the past, extraction of coal by means of surface mining, limited the options of landowners to return their land to forests due to site reclamation practices such as grading and compaction which discourages forest production. Recently, research conducted in the Appalachian region by the Appalachian Regional Reforestation Initiative (ARRI) has focused on reclamation methods, known as the Forestry Reclamation Approach (FRA), that promote rapid, healthy tree growth on previously surface mined areas. ARRI and The American Chestnut Foundation (TACF), through employment of the FRA, have conducted research projects evaluating American chestnut on previously surface mined areas. Results from these experiments indicate that American chestnut grows very well on these sites. American, Chinese, and three levels of American-backcross chestnut were used in the study. The objective of the study was to determine if differences in performance and growth exist between the five genotypes of chestnut when grown on formerly surface mined lands. Sites were chosen in Kentucky, Tennessee, West Virginia, Maryland, and Ohio, and at three locations in Pennsylvania that reflected reclamation practices as recommended by ARRI and the FRA. Results indicate that there are no significant differences among the growth rates of American, Chinese, and the three levels of American backcross chestnuts when grown on previously surface mined sites when grown using the FRA. Based on these results, TACF's potentially blight-resistant backcross chestnut should provide a suitable level of growth and performance in a mixed-species hardwood stand on these surface mined sites. Chestnut as part of a mixed-species hardwood forest should provide additional value and management options to landowners as they explore different post-mined land uses.

64. Common Ground II: Patricia Johanson's Marywood University Land Remediation (SESSION U)

Ms. Pamela Parsons, Associate Professor, Marywood University

NEPA's coal legacy includes thousands of unproductive, defaced acres. As surrounding communities prosper, these abandoned tracts serve as poignant reminders of the region's mining history. Marywood University, situated atop multiple levels of underground chambers, has contracted environmental artist Patricia Johanson to design a five-acre remediation plan.

In *Mary's Garden*, Johanson employs water features, native plantings, seating, and trails to outline a walk-through lily and rose, highlighting diverse ecological zones. Her concept pays homage to the geological processes and the social history of Marywood's central role in this multi-ethnic mining community. When completed, the site will become a living demonstration of effective stormwater management and purification, alleviate seepage into polluted underground water tables, restore habitat for indigenous species, and provide a community resource for recreation and education.

I propose discussing the design's specific details, how it addresses unique challenges of this locale, and how, from concept to completion, Johanson solicits and incorporates community input. I will also discuss the artist's future plans to expand the design along the impaired Carter Creek corridor, and her interest in a passively-treated, pumped minewater feature. The artist's busy schedule permitting, she will be available to discuss her design and field questions during this session. *Mary's Garden* will become a common ground for healing, honoring our heritage, and inspiring a livable, aesthetic, and sustainably designed future.

65. Common Ground 1: Remediation and Environmental Art (SESSION U)

Dr. Linda Dugan Partridge, Associate Professor, Marywood University

Problem-solving at its best is both a creative and analytical process. In the 1970s, "environmental artists" began to make art in the landscape, not simply about it, offering new visions of our relationship with nature and helping restore damaged ecosystems. The process depends on the artists' substantial engagement with the sciences and local communities.

In this first of two linked sessions, I propose to consider a number of successful art/remediation efforts. Artist Mel Chin worked with scientists in designing the model *Revival Field*, one of the first phytoremediation experiments. Helen and Newton Harrison's European commissions have resulted in plans to preserve the open "Green Heart of Holland:" they advocate for land planning predicated on geophysical, not political boundaries. Jackie Brookner designs interactive, sculptural water purification systems. The AMD&Art team, under Dr. T. Allan Comp of the Department of the Interior, revivified a contaminated brownfield in the Western PA town of Vintondale. Finally, Patricia Johanson's global career spans four decades and leads to her interest in our mine-scarred Scranton tract. Like the others discussed here, she collaborates with specialists and her own expertise is multi-faceted (she is an artist/architect with engineering and landscape experience). These artists design with respect for land's natural and social histories and the needs of end users.

Common ground here is twofold: science and art together have enormous potential to create healthy, inviting habitats for human and nonhuman species; and remediated land literally is our society's common ground, designed to be shared with future generations.

66. The Welsh in Scranton: Ethnic Tensions in Labor Relations (SESSION A)

Sarah Piccini, University of Scranton (Master's recipient)

The City of Scranton gained the nickname "Anthracite Capital of the World" for its role in fueling America's Industrial Revolution through the export of anthracite "black diamonds." As the region progressed from quiet farmland to a booming industrial center in the mid-1800s, it also inherited the seemingly unavoidable clashes of a labor-fueled society, the struggles between the bosses and the bossed. Yet the full story cannot be told without examining the workers themselves; the stories of the immigrant groups to come to America to build a new life. In Scranton in the 1870s, nearly half the population was foreign born. The workforce was dominated by the Irish, Germans, British, and Welsh. At one time, the Welsh community in Scranton was the greatest concentration of Welsh people outside of Wales. The story of the Irish and Welsh presents an interesting paradox by virtue of arriving in the region slightly earlier and with ready experience mining coal, the Welsh held higher positions in the coal mines and a status above the larger population of Irish. Tensions between the Welsh and Irish were inevitable. The 1871 "Welsh Strike" in Scranton was predicated on a common goal: higher wages for all who worked in anthracite mining. However, the insistence of the Welsh to continue the strike prompted an already-oppressed Irish population to view the strike as a Welsh-Irish struggle rather than a labor-capital struggle. The long strike destroyed organized labor and affected ethnic relationships for generations. Welsh experience in coal mining gave the industry the needed boost to turn it into the regional cash cow. Their strong national ties created a cohesive community willing to stand together, for better or worse. The duration of the 1871 is a testament to Welsh nationalism, and also a cautionary tale of isolationism.

67. Carbon Accounting for Mining Waste-to-Energy Facilities (SESSION N)

Steven Porto, Development Partners

Naturally occurring mining waste combustion poses multiple threats to the global environment because it emits greenhouse gases—carbon dioxide (CO_2), and methane (CH_4)—as well as mercury (Hg), carbon monoxide (CO), and other toxic substances. Although these emissions are recognized by the Intergovernmental Panel on Climate Change and other stakeholders, they are not accounted for in national or state emissions levels. This oversight has potentially large implications due to the magnitude of these emissions. Accounting for these emissions has four main implications: (i) Achieves a more true and complete measurement of current and future GHG emissions; (ii) Acknowledges the current and future reduction in emissions resulting from the remediation of mining waste piles; (iii) Creates framework for the accurate calculation of the effective emissions from mining waste-to energy facilities; (iv) Creates significant revenue source, through emission offsets, for costly abandoned mine site reclamation. A method of removing mining waste from the landscape and remediating abandoned mine sites is to utilize this material as fuel in a mining waste-to-energy facility. These facilities beneficially convert mining waste into electricity and stop current and future combustion of mining waste piles and the resulting emissions. When these avoided emissions are acknowledged and included in the emission accounting for mining waste-to-energy facilities, their effective CO_2 emission levels are lower than those of natural-gas fired power plants.

68. Remediation of Acid Mine Drainage: Performance of Steel Slag Leach Beds (SESSION X)

Guy Riefler and Elaine Goetz, Department of Civil Engineering, Ohio University

Acid mine drainage (AMD) is a widespread problem in southeastern Ohio's coal country, resulting in discolored creeks with impaired ecosystems. In order to raise the pH in the creeks to levels that will support aquatic life, the Ohio Department of Natural Resources, Division of Mineral Resources (ODNR-DMRM), has undertaken a large scale project, installing steel slag leach beds (SSLBs) throughout the region. Steel slag is a waste product from the steel industry which has large quantities of calcium and magnesium oxides trapped in a glassy amorphous rock. When in contact with water, the oxides dissolve into the water, producing high alkalinity concentrations and raising the pH in the acid mine drainage affected creeks. These beds have the potential to be highly effective, however, SSLB design has yet to be optimized and little performance data exists.

Twelve of the ODNR-DMRM SSLBs in the Raccoon Creek and Monday Creek watersheds were monitored quarterly for a year. Chemical and hydraulic analyses were completed for each site, and results were compared to past site data. Results show that SSLBs can be an effective treatment for AMD-effected waterways over long time periods (>4 yrs), if influent flow rates are properly controlled. After start-up periods, alkalinity loadings were directly correlated to influent flow rates, but only at 2-22% of design targets. However, influent flow rates were also only fractions of the design targets (0.6 -66%). Furthermore, each SSLB had its own intrinsic concentration gradient which was nearly constant for varying residence times. Several potential failure mechanisms have been identified and investigated including cementation of the slag and calcite precipitation clogging the underdrains.

69. A Landscape Approach to Abandoned Mine Safety Remediation (SESSION I)

Christopher Ross, Ph.D. and Nicole Weingart, BLM Nevada State Office

The State of Nevada has more abandoned mine land sites – an estimated 300,000 – than any other western state – a reflection of its complex geology and the fact that most land there is publicly owned. Recent incidents and government audits have increased pressure to close hazards permanently in the interest of public safety. Increased funding has created new opportunities for local employment. Complicating this work are the needs to preserve associated wildlife habitat and cultural resources. Mining claimants also prefer that sites be left open for mineral access. Because of the scope of the problem of physical safety and the various interests involved, it is necessary to address the issue on a landscape-level scale rather than site by site. This session will discuss various methods of resolution of these conflicting interests and will elaborate on the wide variety of partnerships that help the Bureau of Land Management (BLM) reclaim sites. Projects and partnerships range from the very complex with all the attendant bureaucratic contracting and financing to the very informal, with only a shared goal to guide the agencies and participants and little to no paperwork. Thus local communities and business entities are heavily involved and invested in the task of improving the safety and environmental integrity of the public lands that surround them and upon which their business is conducted.

70. An Overview of Pennsylvania's Mine Subsidence Insurance (MSI) Program Including a Case Study of Extended Coverage for Losses Resulting from Mine Pool Discharges (SESSION R)

Lawrence V. Rivone and Edward J. Mokycki, P.E., Pennsylvania Department of Environmental Protection

Abandoned underground coal mining affects more than a million acres in Pennsylvania, much of it located in populated areas. Paramount among the hazards that can emanate from abandoned underground mines are the collapse of mine voids and the resulting deformation of the earth's surface, "mine subsidence," and damage that can result from the sudden discharge of an underground mine water pool onto the earth's surface, "blowout." These hazards can cause significant damage and financial losses to real property, both improved and unimproved. Collaborate efforts between the Federal Office of Surface Mining and the Pennsylvania Department of Environmental Protection's Bureau of Abandoned Mine Reclamation, Mine Safety, District Mining Operations and Mining and Reclamation, together with efforts from the private sector, such as the private insurance industry, all help to assure that losses are minimized and that resources are available to compensate for most financial losses. As a result of these collective efforts, the owners of structures in Pennsylvania affected by mine subsidence and blowouts are mutually able to insure one another against most financial losses to their structures.

This presentation begins with a brief historical perspective of Pennsylvania's MSI Fund and Program and its mission to offer a reliable source of low-cost coverage to all those at risk. It then emphasizes the importance of cooperation, collaboration and communication between the various agencies and private insurance industry for the MSI Program to successfully accomplish its mission. A demonstration of MSI's online systems, which deliver and renew coverage with electronic premium payments (ecommerce) and which include underground mine maps that allow applicants to determine their need for coverage, leads into a case study of the importance and success of coverage that has been extended provide compensation for losses caused by blowouts. In conclusion, through collaborate and expanding efforts, MSI coverage continues to evolve and become more accessible and affordable.

ABSTRACTS

71. Government Financed Construction Contracts: How Pennsylvania Implements the AML Enhancement Rule (SESSION C)

Joe Sassaman, Geologic Specialist, Pennsylvania Department of Environmental Protection

Pennsylvania was one of the first states to implement the AML Enhancement Rule, which revised 30 CFR parts 707 and 874 to allow government financed construction with less than 50% government funding. Pennsylvania was granted primacy of its reclamation program in July of 1982 and made reclamation plan amendments to engage in Government Financed Construction Contracts (GFCCs) in 1997, which were accepted by OSM in March of 1999. GFCCs involve cooperation between both active mining and abandoned mine land programs within Pennsylvania. This paper examines the process which the Pennsylvania Department of Environmental Protection (PA DEP) has developed to implement that rule. Applying for a GFCC begins by contacting the District Mining Office (DMO) responsible for the region (county) where the project is located. The DMO assists applicants in finishing their application. Abandoned mine lands staff ensure the project meets Title IV eligibility and a contract is issued. Coal removal is permitted with a GFCC contract but must be incidental and meet the conditions of the reclamation contract. A GFCC is not a mining permit and reclamation is the primary goal of the program. Performance bonds are posted by the operation and must be forfeited if the contract is broken. Since its inception Pennsylvania's GFCC program has provided for the reclamation of over 1900 acres with a cost savings of over $7 million. This equals 15.5%, by acreage, of all reclamation projects completed between 1999 and 2009. All of these projects have taken place in the bituminous region in the western part of Pennsylvania. Over the years these projects have increased and will continue to provide opportunities for mine operators to provide an economic reclamation alternative.

72. Evaluating a Subsidence Area With "Too Much Data" (SESSION V)

Edward Sciulli, PG and David Himmer, PE, L. Robert Kimball & Associates, Inc.

The City of Pittston, Luzerne County PA, has been plagued by the collapse of voids resulting from past underground mining activities. The Pennsylvania Department of Environmental Protection (PADEP) Bureau of Abandoned Mine Reclamation (BAMR), as well as the U.S. Department of the Interior/Office of Surface Mining, Reclamation and Enforcement (OSMRE), investigated these areas periodically since the late 1970's. More recently, PADEP initiated a project to further investigate the cause and potential solutions of this subsidence resulting in the identification of 24 potential high risk mine subsidence areas throughout the city. Of these areas, Area 1C (the Mill Street area), located within the central portions of the city, was identified for further exploration. In 2008, BAMR contracted L. Robert Kimball & Associates, Inc. (L.R. Kimball) to further investigate Area 1 C and develop recommendations regarding mitigation of the subsidence problems.

Given the tremendous amount of data available from numerous past studies, L.R. Kimball geologists prepared an innovative approach to create a functional, multi-layered, three-dimensional model of the study area, using a combination of a relational database of existing boring information and geographic information system (GIS) software. A total of 235 historic boring logs were reviewed and entered into the database. Utilizing the ArcGIS 3D-Analyst extension, a three-dimensional representation of the site stratigraphy and observations within each coal vein was produced. The study area model was used to evaluate a number of site properties and subsurface conditions including: geologic cross-sections and fence diagrams; three-dimensional representations of the borings; stratigraphy in relation to existing mine maps, mine voids and flushed areas; and, finally, isopach (variation in thickness) contours of stratigraphic layers of interest. Utilizing the functional three-dimensional model, L.R. Kimball was able to identify "high risk" areas within the study limits and evaluate possible remedies to future subsidence.

73. "Git-R-Done with the Dirt You Got" Landslide Remediation (SESSION K)

J. Michael "Mike" Shapiro, Jr., PE, PLS, United States Department of Interior, Office of Surface Mining Reclamation and Enforcement

The presentation is a Power-Point overview of a recent AML landslide emergency in eastern Kentucky. This project demonstrates the concept of "back to basics" just utilizing the native soils, geogrid, welded wire facing units and turf reinforcement matting which are integrated into in a stable matrix to create a gravity wall. These techniques have shown promise in highway construction for years in steep slope remediation and now have been added to the toolbox for abating emergencies worked on by the team at OSM Federal Reclamation Projects Division Ashland Office.

The Shawna Wells Landslide II site is located in the Cedar Hills Subdivision in Pikeville, KY. The hillside adjacent to the residence was comprised of native soils with some marginal engineering qualities. This fact made it feasible to use most of the material in a retaining structure along with the fact that the slide material was not totally saturated.The retaining structure or gravity wall was constructed as an integrated system primarily by stacking geogrid wrapped compacted layers of native soil. "L" shaped welded wire facing units lined with geogrid and turf reinforcement mat helped maintain some reasonable structural geometry.

Some of the engineering and construction methodologies implemented were:

Constructing a reasonably firm foundation
Geogrid reinforcing the compacted fill material
Maintaining a blanket drain isolating the compacted fill from infiltrating water
Sequencing construction to limit excavation area exposure
The structure to ultimately support vegetative growth
Limiting disturbed area
Protecting stockpiled material from rainfall events
Addressing drainage issues

74. Burlington Mine Site Voluntary Cleanup: Innovative Design for Mine Site Remediation (SESSION S)

Robert Singer, PhD.; James B. Covert P.E.; Mark Levitz; Keith Bowers; Julie E. Ash, P.E.; Warren C. Rider; and Maureen O'Shea-Stone, Ecology and Environment, Inc.

The remediation of the Burlington Mine Site, an inactive fluorspar mine located in the foothills of Boulder County, near the Town of Jamestown, Colorado, incorporated many innovative techniques and relied on geologic and geotechnical investigations, including a seismic refraction survey, drilling, and tomographic imaging. Innovative design treatments exceeded basic closure requirements, protected closures long-term, prevented future collapse within the mine workings, initiated natural form and function, and enhanced wildlife habitat. Treatments were required to meet multiple project goals and accommodate the abundant constraints and challenges at the mine site. Innovations included measures to address drainage issues at pit and adit closures, channel design to imitate natural form and function, waterfowl protection, and a specialized revegetation plan to restore riparian habitat and enhance habitat value on the site for future wildlife usage. These measures are important improvements over more traditional mine site remediation, which has always addressed safe conveyance of onsite water, but not necessarily how to restore natural form and function or how to use the water to maximize habitat value for wildlife. Exceeding minimum requirements resulted in a remediated mine site with more natural and ecologically functional systems that help soften the harsh aesthetics of the old mine site and improve wildlife habitat.

75. Acidity Decay of Above-Drainage Underground Mines in West Virginia (SESSION F)

J. Skousen, Division of Plant and Soil Sciences, West Virginia University; B. Mack, Water Research Institute; L.M. McDonald

Acidity of water from abandoned underground mines decreases over time, and the rate of decrease can help formulate remediation approaches and treatment system designs. The objective of this study was to determine an overall acidity decay rate for above-drainage underground mines in northern West Virginia from a large data set of mines that were closed 50 to 70 yr ago. Water quality data were obtained from 30 Upper Freeport and 7 Pittsburgh coal seam mines in 1968, 1980, 2000, and 2006, and acidity decay curves were calculated. The mean decay constant, k, for Upper Freeport mines was 2.73×10^{-2} yr^{-1}, with a 95% confidence interval of ± 0.0052, whereas the k value for Pittsburgh mines was not significantly different at 4.26×10^{-2} yr^{-1} ± 0.017. Acidity from the T&T mine, which was closed 12 yr ago, showed a k value of 11.25×10^{-2} yr^{-1}. This higher decay rate was likely due to initial flushing of accumulated metal salts on reaction surfaces in the mine, rapid changes in mine hydrology after closure, and treatment. Although each site showed a specific decay rate (varying from 0.04×10^{-2} yr^{-1} to 13.1×10^{-2} yr^{-1}), the decay constants of 2.7×10^{-2} yr^{-1} to 4.3×10^{-2} yr^{-1} are useful for predicting water quality trends and overall improvements across a wide spectrum of abandoned underground mines. We found first-order decay models improve long-term prediction of acidity declines from above-drainage mines compared with linear or percent annual decrease models. These predictions can help to select water treatment plans and evaluate costs for these treatments over time.

76. Brownfield Redevelopments Spurs Job Creation (SESSION E)

Andrew C. Sirip, SLIBCO

Creation/retention of jobs, real estate development and facilitation of incentive financing for Lackawanna County, PA is the focus of the SLIBCO/LIFE/Scranton Plan team. Since 1946 the team has accomplished the following:

357 development projects
25,000 created jobs
$637 million community investment
15 developed business parks

SLIBCO/LIFE has a proven tract record of acquiring abandoned, mine scarred lands and redeveloping them into thriving economic hubs, consisting of a diverse industrial mix. Benchmark projects include:

Mount Pleasant Corporate Center
Technology Incubator Facility
Jessup Small Business Center (JSBC)
Valley View Business Park (VVBP) Phase I & II

Mount Pleasant Corporate Center, a reclamation project developing 23 acres of abandoned mine lands was home to Mount Pleasant and Diamond Coal Breakers. Deep/strip mining associated with anthracite coal left this site a blighted downtown parcel. Site reclamation work included:

Structural demolition
Removal of breaker foundations
Unsuitable soil materials
Wetlands mitigation
Underground storage tanks removal

SLIBCO development has created a corporate office park consisting of five building pads with extended infrastructure.

WVBP/JSBC is a three-phase redevelopment project consisting of 895 acres. These projects serve as a case study showing how public/private partnership can be used to transform an environmentally degraded brownfield site into a prosperous, regionally competitive greenfield location. More than $19 million was invested from federal, state and private sources, converting degraded, mine spoiled lands into an economic community resource. Today, WVBP/JSBC is home to seven businesses, 895,000 square feet, employing 1,054 with a capital investment of $102 million.

Technology Incubator Facility within the JSBC is currently in the planning phase. Details of the facility include:

45,000 square feet
Business incubation space Units ranging from 350-50,000 square feet
TPC-$8.7 million project

77. History of the Old Forge Borehole and How the Chemical Properties of the Outflow Can be Used to Refine a Remediation Method for the Site (SESSION H)

Ronald Sapkowski, Ph.D., Associate Professor of Chemistry, King's College; Christopher Gillis, President, Solution Mining, Inc.

Our work involves the partnership between Christopher Gillis of Solution Mining, Inc. and Ronald Sapkowski of King's College to study the chemistry of the outflow from the Old Forge Borehole. This outflow, the largest single source of acid mine drainage (AMD) in the Chesapeake basin, is a remnant of coal mining in the Northern Anthracite region and is typical of acid mine drainage from other sites, with the associated damage to the environment. The chemistry is being studied to develop a method to remediate the continual environmental damage caused by the outflow in a way that will produce not only environmental benefits but commercial ones as well. Solution Mining, Inc. is currently developing plans for a treatment facility which will produce clean water, minerals, and geothermal energy while simultaneously abating a major source of environmental contamination. The presentation will include a brief review of the history of the site, current and future development of the borehole and adjacent mine sites, as well as the results of recent laboratory experiments that show the amount of iron in the outflow, its speciation into iron (II) and iron (III), and the outflow's changing chemistry during its treatment. The discussion of the laboratory data will include how the chemical properties of the outflow are advantageous to the proposed remediation method for the site.

78. Utilizing Paste Technology for Reclamation of the Ute-Ulay Tailings Impoundments, Lake City, Colorado (SESSION E)

Tara Tafi, Environmental Protection Specialist, Colorado Division of Reclamation, Mining and Safety; David Lazorchak, Geologist/AML Specialist, Bureau of Land Management

The Ute-Ulay Mining complex, located approximately five miles west of Lake City, Colorado, is an inactive gold, silver, and zinc mining/milling operation that operated from the 1880's until the 1970's, and sporadically into the late 1990's. The mining complex is comprised of several levels of underground mine workings, a flotation mill, and an abandoned town site. During operation, milled tailings were pumped upstream from the mine/mill site in a sluice box and deposited into five tailings impoundments, which cover approximately six acres on public lands managed by the Bureau of Land Management (BLM). Prior to reclamation, windblown tailings from the impoundments were exposing the public to potentially harmful dust and the tailings from the lowest pond were washing into Henson Creek, and potentially contaminating groundwater. An estimated 9,000 cubic yards (yd^3) of fine grained tailings were located in the impoundments adjacent to Henson Creek. An additional 4,000 yds^3 of mine and mill wastes from three other BLM sites located along Henson Creek had previously been hauled to the site, and were incorporated into this project.

Reclamation of the approximately 13,000 yds^3 of mine and mill waste materials was completed using paste technology. All waste materials were screened and separated on-site, and the fine-grained waste materials were mixed with cement to form the paste. The repository was constructed using a layered design, with paste forming the base and cap, and coarse wastes placed as a middle layer within the enclosing paste. Following repository completion, the site was graded, channels were constructed, and six acres were revegetated. All materials to complete the reclamation including topsoil, rip-rap, sand, and gravel were excavated and processed on-site.

This project serves as a demonstration project for future use of paste technology, and was completed as a partnership between the DRMS and the BLM.

79. GIS-Based Hydrogeologic Flow Modeling of Groundwater Flow Through Deep Mines (SESSION F)

Benjamin F. Turner and Joshua J. Snedden, Penn State DuBois

Discharge from abandoned deep mines presents a significant water quality threat throughout the coal-producing regions of the United States. For practical reasons related to the remediation of mine water, it may be desirable to control, limit, or even relocate the point of discharge for such mines. Furthermore, mine pools can potentially be used to supply water to industry or as a geothermal heat source or sink. If discharge for a particular mine is to be controlled, managed or modified, then it is imperative to develop the capability to make quantitative predictions of the response of the hydrologic system to change. Numerical hydrogeologic models have potential to be powerful predictive tools for such systems. Given that much data useful to developing hydrogeologic models is available in maps and other georeferenced formats, developing such models within a GIS-based framework has advantages for both model parameterization and analysis of simulation results.

We developed 2D and 3D hydrogeologic flow models using the r.gwflow and r3.gwflow modules of the GRASS GIS system for abandoned deep mines located near DuBois, PA. One of the mines was accessed by a vertical mine shaft and currently has 1100 gal/min discharging from the shaft, and the others were drift mines. Hydrogeologic models were parameterized in GIS using commonly available topographic and groundwater resources data for the area. The 2D models utilize a river module to simulated exchange of water between the mine and overlying rock, while the 3D models use a 3D raster grid to represent the overlying aquifer. Model results indicate very shallow hydraulic gradients within the mines. Predictions of exchange of water between the mines and overlying rock are found to be dependent on the simplifying assumptions inherent in the 2D and 3D models.

80. Horizontal Directional Drilling to Control Mine Pool Discharges in Pennsylvania (SESSION H)

Carol M. Morano, P.E. and George M. Steiner, P.E., Pennsylvania Department of Environmental Protection

Abandoned underground mine pools and associated discharges in Pennsylvania frequently present substantial challenges in mitigating environmental damage and alleviating health and safety impacts to residents and public infrastructure. Impaired private drinking water supplies and mine blow-outs are a constant concern in many areas. Horizontal directional drilling has been used extensively in underground mining applications for coal bed exploration and degasification, old works delineation, and water removal from overlying and adjacent mines. Recently, the Pennsylvania Department of Environmental Protection's, Bureau of Abandoned Mine Reclamation utilized directional drilling to intercept flooded mine workings, relocate discharges to control mine pool hydraulic head and reduce risk to homes and infrastructure.

Directional drilling may offer some distinct advantages over overland trenching or piping to relocate a deep mine discharge. Directional drilling allows for greater flexibility in selecting the point to access the mine workings, in routing the flow to the treatment or discharge location, and in controlling the final mine pool elevation. Because horizontal directional drilling is a trenchless technology, there is a single staging area which minimizes property disturbances, utility and infrastructure conflicts, and problems associated with difficult terrain. This presentation will focus on Pennsylvania horizontal directional drilling case studies. The Kelp and Metcraft Mine Pool Dewatering and Treatment Projects involved two abandoned underground mine sites that exhibited significant water quality and public health and safety problems. Remediation efforts at both sites relied on in-seam directional drilling to facilitate control of the mine pools and collection of the mine discharges for passive treatment. The Dora 6 mine drainage control project involved an inundated abandoned underground mine complex with discharges that impacted public roadways, a trout nursery water supply, and private drinking wells. Remediation efforts involved in-seam and in rock directional drilling to lower the mine pool, reduce blowout potential and restore stream water quality.

81. Recent Coal Fires in Northeastern Pennsylvania (SESSION D)

Daniel H. Vice, Penn State Hazleton; Harold Aurand, Jr., Penn State Schuylkill; Melissa A. Noller

There have been several recent mine fires in the anthracite coal fields of Northeastern Pennsylvania. These include fires near Clyphant, Mildred, Palo Alto and Shamokin. The response to recent mine fires, unlike other fires, such as Centralia, has been rapid and decisive. In part, this is because of the negative example of Centralia, which demonstrates the dangers of an uncontrolled mine fire.

These fires represent hazards in that they disrupt communities and threaten lives. According to their 1990 book The Real Disaster Is Above Ground: A Mine Fire and Social Conflict J. Stephen Kroll-Smith and Steven Robert Couch mine fires are an example of manmade technological disasters, which can tear a community apart, both physically and socially. These fires are costly to fight and the public often lacks the knowledge to understand or interpret what is going on which makes the situation worse. Groups with alternative theories regarding the risks posed by the disaster, and appropriate responses factionalize the community, and can affect the way government responds.

Mine fires in Northeastern Pennsylvania are one of the problems resulting from the lack of land reclamation. With many of the mine companies no longer functioning, there is no one to police the coal land. Many of the isolated and unreclaimed open mine pits are inviting places to dump garbage, and fires in the garbage ignite underground deposits of coal. What is not inevitable is how the community responds to the fires. Understanding these coal fires and how the community responds to them requires a broad, interdisciplinary view of the fires and the communities they impact.

82. Establishment and Expansion of Virginia's Abandoned Mine Land Inventory System (SESSION H)

Jesse L. Whitt, AML Mapping Specialist, Virginia Department of Mines, Minerals & Energy

This presentation documents the establishment and expansion of Virginia's abandoned mine land (AML) inventory system. DMME uses an integrated approach that incorporates historical, tabular, and GPS field data into a Geographic Information System (GIS).

In 2009 DMME created a data model that utilizes Spatial Database Engine to house tabular and spatial data. This data model allows for department wide access to AML data as it is updated in real time as well as controlled editing and data input to ensure standardization and data quality.

The GIS contains layers for AML feature data that is populated with information such as feature type, comments, priority level, data collection method, reclamation method, unique identifier, and feature photographs. Boundary layers representing problem areas, planning units, and project areas are also part of the GIS. The project area layer is linked with tabular AML data that can be used to run spatial reports that are capable of showing project attributes all the way down to line item costs. This allows for advanced queries and mapping based on multiple attribute values. Project documentation, additional photographs, and engineering design information is also linked to the project area layers to give staff access to information on AML projects while maintaining a spatial component.

Field data is collected on Trimble Nomad GPS devices using ArcPAD mobile GIS software. Data collection is streamlined with dropdown menu choices for field data collection. The user checks out a temporary version of the AML geodatabase, adds or edits data in the field, then checks the temporary version into the geodatabase to be quality checked and reconciled to the default version of the database.

Virginia's AML inventory system is a multifaceted GIS that allows users to perform advanced mapping, analysis, and tracking of AML features in the coalfields of the Commonwealth.

83. Sustained Treatment of AMD Containing Al and Fe3+ with Limestone Aggregate (SESSION J)

Neil Wolfe, Geoscientist, Hedin Environmental

Limestone aggregate is a preferred alkaline reagent for the treatment of acid mine drainage (AMD) because of its low cost, its non-hazardous nature, and its natural solubility limits. Its use for AMD treatment has been limited because the reactivity of the limestone is commonly compromised by the accumulation of metal solids. Limestone aggregate is particularly prone to fouling by AMD containing dissolved Al and Fe^{3+}. This paper describes our experiments into the use of limestone aggregate to passively treat mine water with 3.0 pH, 226 mg/L acidity, 27 mg/L Al, 8 mg/L Fe, and 15 mg/L Mn. The AMD was introduced into two 30 CY roll-off containers containing 32 tons of limestone aggregate and equipped with AgriDrain Smart Drainage systems. The limestone aggregate was 0.5 – 1.0 inch diameter with 97% $CaCO_3$ content. Two side-by-side units were operated in parallel. Flow rate and drainage frequency were experimentally modified. Samples of the effluent from the units were collected and analyzed for pH, alkalinity, acidity, total and dissolved metal concentrations. The limestone beds were able to produce an alkaline discharge with low metal concentrations. The best short-term performance was obtained when the bed was fully flooded and acted as a vertical flow reactor. However, the effluent from this configuration became acidic within 30 days of continuous operation. Draining the bed every 3-7 days eliminated the short-term performance decline. The optimal configuration occurred when the system operated as fully flooded vertical flow system and was drained empty every 7 days. One unit, which has received AMD for 30 months, has operated for this mode for the last 18 months and produced an average effluent with pH 6.9, <50 mg/L acidity, 0.8 mg/L Fe, 2.5 mg/L Al, and 2.3 mg/L Mn. The paper will describe the experiments and discuss their importance for AMD treatment.

Welcome to the 2010 Technical Tours of the Anthracite Region! We have prepared a glimpse into the rich history of Anthracite mining in Pennsylvania. Join us for one of these fascinating tours. A boxed lunch will be provided with each tour.

Centralia – You will visit the town of Centralia, which has been on fire for over fifty years. Next, you will enter the Pioneer Tunnel to experience an Anthracite drift mine, then tour completed AML reclamation sites and an active Anthracite coal operation. The tour concludes with a visit to the oldest brewery in the nation, Yuengling Brewery.

Hazleton – You will visit the village of Eckley, a company-owned mining town that provided everything for the miners and their families. The tour continues with site visits to completed AML reclamation sites including the 1997 OSM national award winning reclamation site. This tour includes a visit to an active Anthracite surface mining site in the Mammoth Vein.

Lansford – You will tour the workings of the Lansford No. 9 underground mine and examine artifacts from Pennsylvania's rich mining history in their museum. This tour includes visits to several reclaimed AML sites and an acid mine drainage treatment system and concludes with a visit to the oldest brewery in the nation, Yuengling Brewery.

Steamtown – All aboard! This train tour will take you past active and completed AML reclamation sites while riding a vintage railroad. You will learn the history of the early Anthracite railroads in the Lackawanna and Lehigh Valleys and visit the Carbondale Historical Society and Museum to learn about the historic gravity railroad.

Huber Breaker – You will get an up-close look at the last remaining coal breaker of its kind, the Huber Breaker and attend an informative presentation on the tragic Knox Mine Disaster which ended deep mining in the region. This tour includes visits to the 2009 OSM national award winner and other AML reclamation sites.

Independent Power Producers – You will visit several cogeneration plants to see how fluidized bed technology is helping to reclaim abandoned mine lands and turn mountains of mine waste into electricity at no cost to the taxpayers.

Clothing – Late September weather in north-central Pennsylvania is generally warm during the day and cool at night. The high temperature is usually in the upper 60s to 80 degrees but can change quickly. Bring a jacket, dress in layers and wear comfortable clothes and walking shoes or boots.

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Michael Baker Jr., Inc., (Baker), has been providing abandoned mine land services since before the federal government enacted legislation to establish the Office of Surface Mining (OSM). The company's early experience in Abandoned Mine Lands/Acid Mine Drainage is exemplified by participation in Pennsylvania's "Operation Scarlift," performance of numerous projects for the Appalachian Regional Commission culminating with management of their "Comprehensive Program for Dealing with Mine Subsidence" studies, and U.S. Bureau of Mines research in the 1970s.

Baker provides a full spectrum of land reclamation and mine drainage abatement services, including surveying; mapping; aerial photography; environmental assessments; data acquisition and interpretation; geotechnical engineering; subsidence evaluations and design; hydrologic & hydraulic analyses; stream restoration; site grading and development; engineering design; plan/specifications preparation; and construction management. The firm has a wealth of related experience on similar projects performed directly for mining and mineral companies, and as a function of performing transportation infrastructure, site development, and water resource projects.

Baker provides architecture, engineering and construction services for its clients' most complex challenges worldwide. The firm's primary business areas are aviation, defense, environmental, facilities, geospatial, homeland security, municipal & civil, pipelines & utilities, rail & transit, transportation and water. With more than 2,500 employees in nearly 50 offices across the United States, Baker is focused on creating value by delivering innovative and sustainable solutions for infrastructure and the environment.

The Department of Environmental Protection (DEP), Bureau of Abandoned Mine Reclamation (BAMR) administers and oversees the Abandoned Mine Reclamation Program in Pennsylvania. The Bureau is responsible for resolving problems such as dangerous highwalls, underground mine fires, mine refuse fires, mine subsidence, mine openings, dilapidated mine buildings, clogged streams and other hazards which have resulted from past mining practices, and for abating or treating acid mine drainage from abandoned mines.

BAMR maintains field offices in Ebensburg and Wilkes-Barre which address abandoned mine issues in the bituminous and anthracite regions respectively.

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Mericle owns and manages more than 12 million square feet. Among its many tenants and clients are 50 Fortune 1000 firms. Mericle is a full-service company with an in-house construction division that boasts one of the region's top excavation teams. Mericle is a true Master Builder and self performs all aspects of its projects including planning, design, site work, construction and property management.

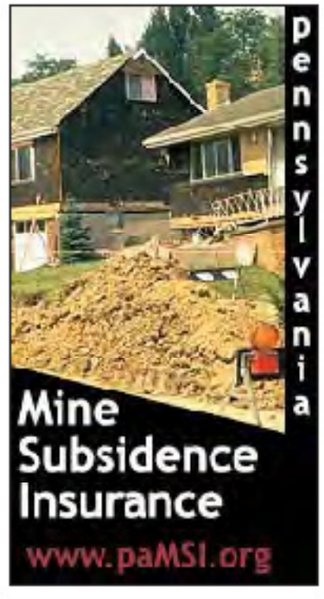
Mericle is the developer and owner of CenterPoint Commerce & Trade Park, a new business park that was built near I-81 and I-476 in Jenkins and Pittston Townships in Luzerne County. A cooperative effort to reclaim mine scarred lands in what is now CenterPoint received the Office of Surface Mining's 2009 National Award for Abandoned Mine Reclamation.

Sixteen industrial and flex buildings totaling more than 4.7 million square feet have been developed by Mericle in the park since 2006.

Over one million Pennsylvania homes sit on top of abandoned mines. Most homeowners' policies do not cover damage caused by the collapse of underground coal and clay mines. Mine Subsidence Insurance (MSI), a non-profit fund administered by the Department of Environmental Protection, can protect your investment, often for less than $100 a year.

Each year, numerous homes throughout Pennsylvania crack, tilt or collapse as abandoned mine workings give way. These events are unpredictable, and as the mines grow older, the risk of subsidence grows greater.

The non-profit Mine Subsidence Insurance Fund was created in 1961 to offer inexpensive coverage for Pennsylvania homeowners. MSI covers damage to insured buildings and their appurtenances that occur anytime during the life of the policy if the damage is caused by mine subsidence or from a sudden, unexpected breakout of water from an underground mine. Go to www.paMSI.org or call 1-800-922-1678 for more information on Mine Subsidence Insurance.



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SRA International, Inc. headquarters is located in Fairfax, VA with offices across the country and abroad. We have spent over 10 years supporting Abandoned Mine Lands (AML) programs focused on developing policy, programmatic, scientific, and technical solutions for our customers dedicated to mitigating and remediating environmental and physical safety hazards that cause environmental damage, acute and chronic illness, and direct injury to people and ecosystems. SRA has more than 600 professionals within our Energy and Environmental (E&E) business unit that support:

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- Strategic planning and accountability;
- Federal, state, and local sustainable economic development;
- Scientific peer review and technical assistance;
- Partnership coordination;
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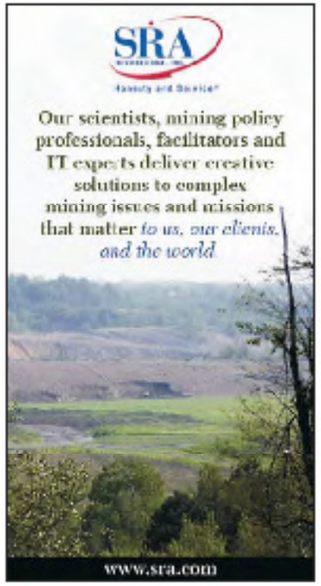
- Web design and development.

SRA is fully committed to helping our customers work toward their program missions and achieve success in identifying, cleaning up, and reusing AMLs.



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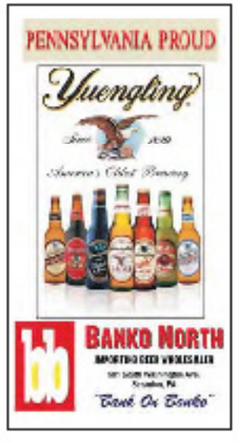

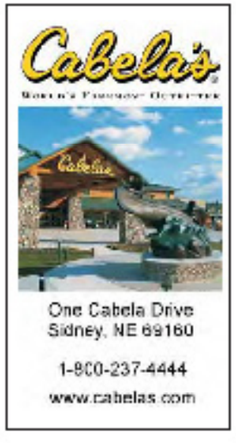

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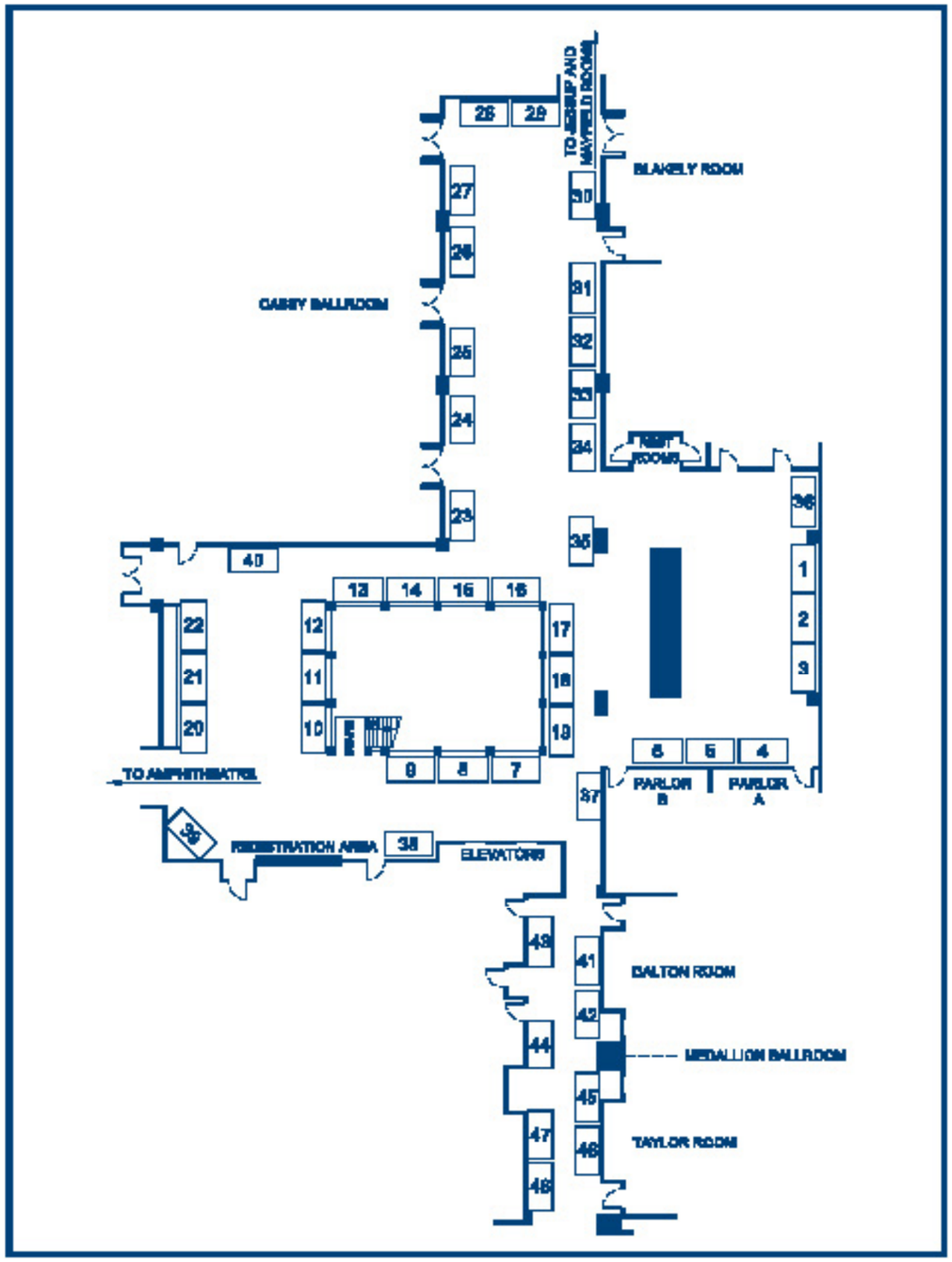

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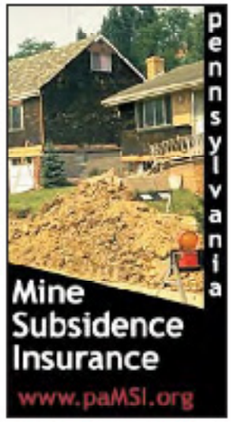
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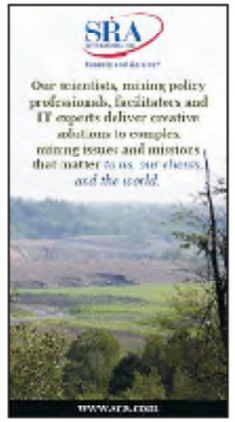
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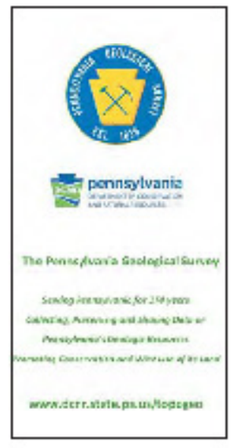
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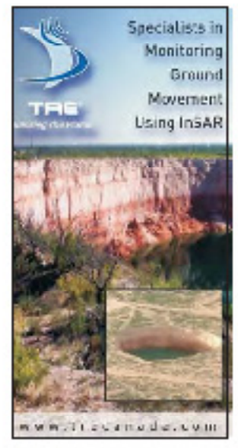
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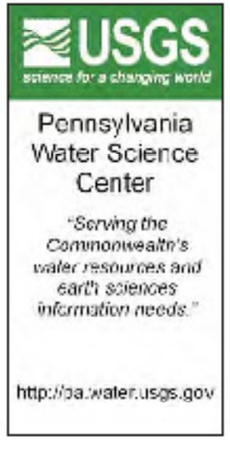
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Sunday Evening!

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Enjoy music and interpretation by Van Wagner Sunday Night. Van worked underground in an anthracite coal mine in Schuylkill County. He is now an Environmenta and Earth Science teacher at Lewisburg High School. He is a published author currently touring with his book *Coal Dust, Rust and Saw Dust*. His music hes been featured on multiple national programs about mining in America. His newest CD is titled *The Woolnch Coat*.

Van Wagner!

The Breaker Boys!

Also Sunday, we will be entertained by music of The 'Breaker Boys'. Tommy Symons and Stu Richards are dedicated to preserving the culture, customs, and heritage of the anthracite coal miner. Through story, song, or poem, they relive an era that was the backbone of this nation – when anthracite coal fueled the Industrial Revolution that pushed the boundaries of America westward.

John Richards has worked extensively in living history programs for the National Park Service, Eckley Miners Village and the Schuylkill County Council for the Arts. *"You know as hard a life as these men, our ancestors, had, I never heard a word of complaint, only pride in what they did."* His coal mining books include, *Early Coal Mining in the Anthracite Region*, and *Death in the Mines*.

Thomas Symons was co-host and Producer of the *Orange & Green Radio Show*, an Irish music program on Pottsville and Mt. Carmel radio for 14 years. He is currently the Division Historian for the Jack Kehoe Division of the Girardville Ancient Order of Hibernians and President of the Minersville Area Historical Society. *"Just an old lad from the coal regions that loves history...reading it, researching it, or portraying it."*

Miss Pennsylvania 2010!

Courtney Thomas, a senior biological sciences major at Drexel University, was crowned Miss Pennsylvania in June. During her year as Miss Pennsylvania, Courtney will utilize her title of Miss Pennsylvania to promote her platform, *Don't C.O.P.P. Out: Consequences Of Peer Pressure*. The goal of this program is to encourage children and teens to make better decisions when faced with peer pressure. The 21-year old Sge, Pa. native will be competing in the Miss America pegeant in Las Vegas in January 2011. Courtney wil meet attendees, have pictures taken, and sign autographs at the Meet and Greet session.

Tuesday Evening!

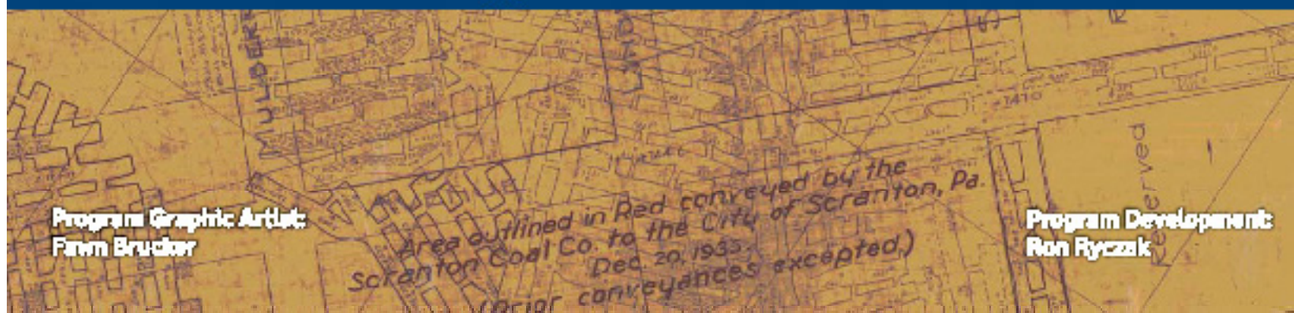
Stanky and the Coal Miners!

John "Stanky" Stankovic has been entertaining people of all ages with his polka magic for 65 years. In 1945, at the age of nine, Stanky and some friends landed a job playing polka music at a three-day wedding in Nanticoke, his home town.

From that beginning, Stanky and the Coal Miners, as he and his band have been known since 1962, have gone on to play all over the world. John has composed more than 40 songs. His most popular is *Apples, Peaches, Pumpkin Pie*, which is also the title of his 2006 autobiography. His *Hats Off To Pennsylvania* polka was once considered for the state song. *"Hats off to Pennsylvania, hats off to our great State...hats off to all the people who helped to make her great!"*

Stanky learned to play the accordion from his father, Joe, a Czech immigrant who came to America at age 16 and went straight to work in the coal mines. When Stanky was a young man, he was more interested in being a professional baseball player. However, his father wisely made sure he practiced his music one hour a day before going out to play ball, and audiences around the world have benefited from Stanky's ultimate career choice. The group will be entertaining us at Tuesday night's Polka Party – *"Cieszyć się!"*

The background image on this page and on the cover depicts the mining of the No. 1 Dunmore Vein of the Pine Brook Colliery underneath the Hilton Conference Center and downtown Scranton. The vein is located about 215 feet below the surface and is the fifth of seven veins underlying the area.



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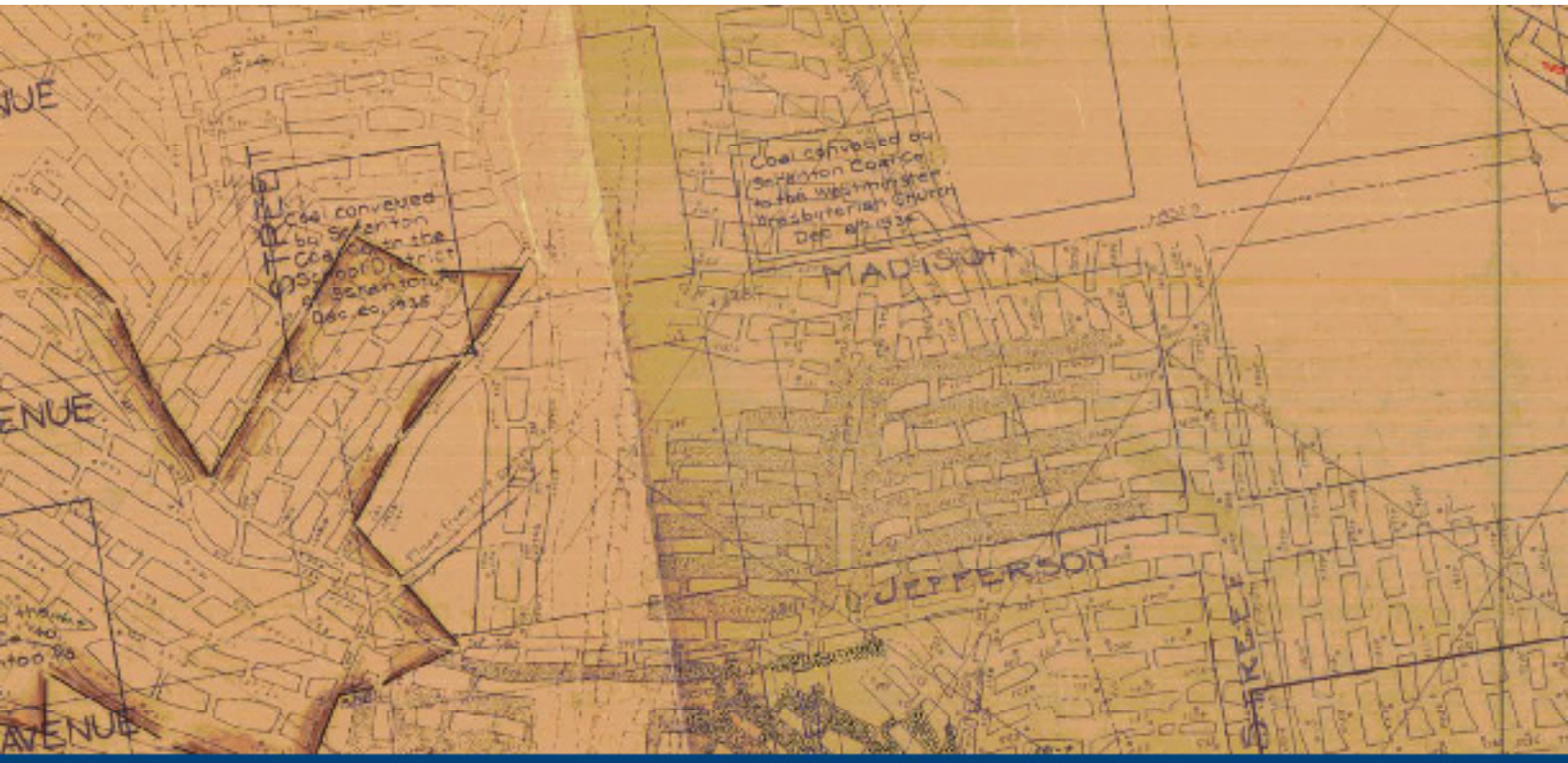
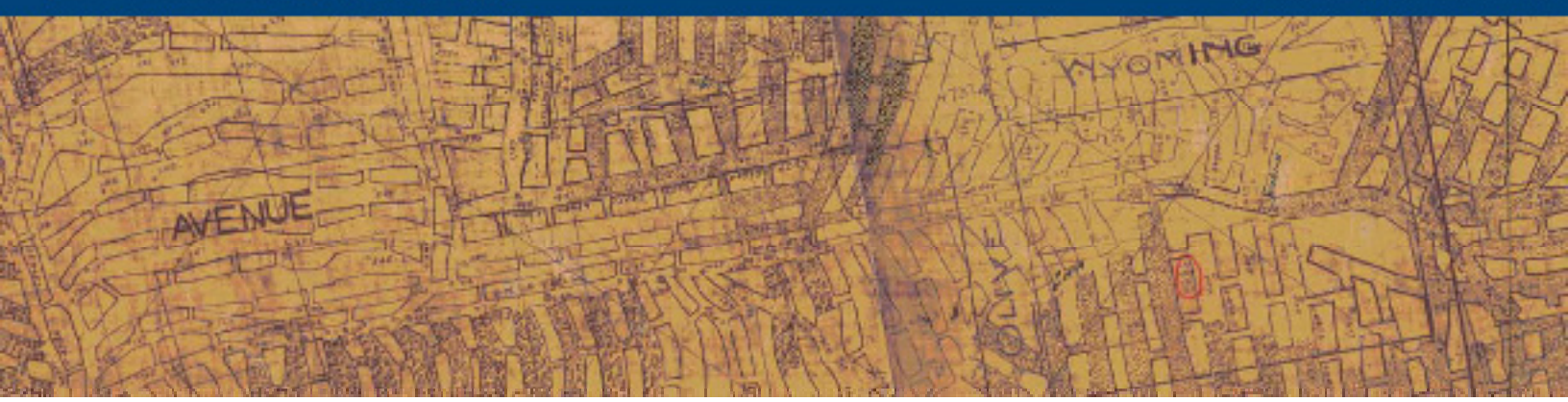

Coal conveyed by Scranton Coal Co. to the Westminster Presbyterian Church Dec. 20, 1935
MADISON
JEFFERSON


WYOMING
AVENUE