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Issue 1 2006

reclamation matters

2006 SME Annual Meeting & Exhibit and ICARD

Scott Belden is at Home on the Range

Using Reclaimed Coal Mines to Enhance Natural Resource Education

Mitigating the Percy Mine Fire

Mud to Parks Project

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Cover:
A crane with a 10-cubic-yd bucket lifts moist Illinois sediment from barges to mining trucks for transport to a lake-front park area being developed in Chicago. See accompanying article "Returning the Soil to the Land: The Mud to Parks Project."

BY DAVID CHENOWETH, ASMR PRESIDENT

Another Great Year Ahead!

I mentioned to students the importance of being involved in professional organizations such as ASMR to network with other professionals.

As we wrap up another field season, I am reflecting on all the good things that have happened within ASMR this past year. The positive comments continue to come in regarding the success of the 2005 conference in Breckinridge. The meeting was well-attended and our membership has increased. We now offer a corporate level membership that provides benefits over the standard individual memberships. The corporate membership is also a mechanism to allow companies large and small to be recognized as members. The NEC continues to brainstorm on ways to become a stronger resource center.

I had the opportunity last month to give a presentation on environmental career opportunities to students at a local university. I mentioned to students the importance of being involved in professional organizations such as ASMR to network with other professionals. While I was preparing the presentation, I reflected on media labor statistics that indicate the upcoming shortage of qualified employees in this country. It made me realize that our industries will most likely be impacted as well. Thus, I feel ASMR could become a very important avenue to recruit, mentor, and educate our next wave of apprentices in environmental and reclamation fields. One of my goals over the next year is to visit various universities and survey the interest of students in reclamation. If sufficient interest, maybe an ASMR student club could be organized. I encourage all of our ASMR members to spend some time informing and encouraging students to join ASMR and reap the benefits as they pursue careers in our field.

ASMR members have opportunities to attend two conferences cosponsored by ASMR. The ICARD 2006 meeting will be held in March 2006 in St. Louis, Missouri, and the Billings Symposium will be held in Billings, Montana, in June 2006. These two meetings should give us more time to meet and accomplish our goals for the year and beyond. I am looking forward to seeing the results of the momentum we have all generated. Thanks to all for making this exciting times for ASMR. ■

BY DR. JEFF SKOUSEN

Is the Destination as Good as the Journey?

Experienced teachers can quickly spot students who possess curiosity and creativity. Their demeanor indicates their interest, and they have a certain sparkle in their eyes. These students are a joy to have in class because they emit a passion for discovery and expect to be challenged. They want to learn and demand to be taught!

On the other hand, a few students have the attitude of "tell me what I must know in order to pass this class." They do not want to be bothered with new ideas, nor do they want to think and form opinions about any subject. Such students feel that all they must do is stuff their brains with facts for a few moments, only to be vomited back on a fill-in-the-blank or multiple-choice test, in order to get through the course. A "C" grade is plenty good for them. Sadly, these individuals lack vision and never had or have lost interest in the learning process. While we might expect such an attitude in unmotivated high school students, I am continually amazed that so many college students at both the undergraduate and graduate levels have this attitude.

In a recent reclamation class, I mentioned to a student that he had more potential than he was showing in his test scores and homework assignments. He told me he wasn't learning anything in college that would help him in his future work. He said his future employer would train him and little of what he was doing now would prepare him for that future job. I submit that this fellow will have difficulty finding a job, and his general attitude toward learning will prevent him from holding a job for long.

The value of a college or university degree in my view is that students are exposed to a variety of ideas from many sources and disciplines, and in this exposure they begin to form opinions about the world around them. A good student necessarily develops critical thinking skills, where facts and figures are assessed against opinions and ideas of others. In the process, the student amalgamates these facts and opinions into personal knowledge and wisdom. More information and experience continue to refine his knowledge and enlarge his understanding. Learning is a life long journey, not a destination.

In today's fast-paced world, keeping current with so many new technologies and new concepts is a challenging task, especially in broad, interdisciplinary subject areas like mining engineering, and environmental and reclamation sciences. But learning must be a life-long pursuit. We must always be moving forward by gathering new information and refining our thinking. We must try new things to expand our understanding. Graduating from a college or university or any formal course or class is a destination but certainly does not conclude the journey of curiosity and inquiry.

Our joining with the SME annual meeting in St. Louis in March offers a unique opportunity to participate in a much wider array of topics than ever before. Attendance is expected to be in the thousands, with hundreds of papers and exhibits. We will have the chance to interact and learn much from others. The destination is St. Louis, but the journey of learning will provide life long benefits. ■

BY STANLEY MICHALSKI, P.G., PHILLIP GLOGOWSKI, P.E., AND WILLIAM MARKS, P.G.
GAI CONSULTANTS AND PENNSYLVANIA BUREAU OF ABANDONED MINE RECLAMATION

Mitigating the Percy Mine Fire

Introduction

Mine fires occur on abandoned mine lands throughout the coal fields in the United States. They threaten the health and safety of the local populations, destroy property values, and consume a non-renewable resource. In general, mine fires are the most costly abandoned mine lands problem to mitigate. In abandoned mines, fires started by natural or other means are likely unnoticed for many years, or are ignored or otherwise unattended until they become a threat to nearby residents.

Effective remedial measures are often combinations of mitigation technologies that depend on whether the goal is to completely extinguish or limit the spread of an underground mine fire. Such technologies include total excavation, trenching, flooding and quenching, bulk filling mine workings, surface seals, inert gas injection, chemical foams, etc. (Michalski et al., 1990). If fire control or extinguishment methods are not implemented, then the alternative is to abandon the surface and let the fire spread to its natural limits.

Case histories of mine fire projects in Pennsylvania's bituminous coal fields demonstrate successful extinguishment. This article explains why there is a fire in the Percy-Youngstown area and proposes a mitigation plan to extinguish the Percy Mine Fire.

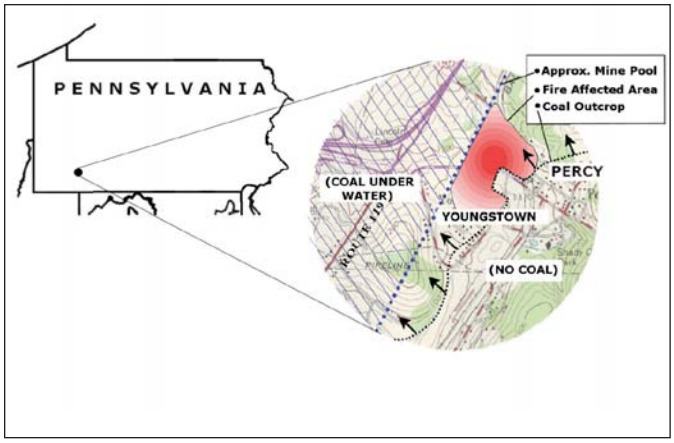

Figure 1. Location of the Percy Mine Fire.

Background

The village of Percy is located in Union Township, Fayette County, Pennsylvania. South of Percy, about one quarter mile away is the village of Youngstown. The Percy Mine Fire occupies the land between the villages and is currently encroaching on both villages (Figure 1).

Geology and Mining History

The Percy Mine Fire lies on the eastern flank of the Uniontown Syncline. The Uniontown Syncline is a down-warping of the rock strata in this portion of the Appalachian Plateau. The Pittsburgh Coal, the lowermost member of the Monongahela Group, is underlain by the Allegheny Group, which contains additional coal seams. The Monongahela Group is exposed at the ground surface and the Pittsburgh Coal rises from a low point in

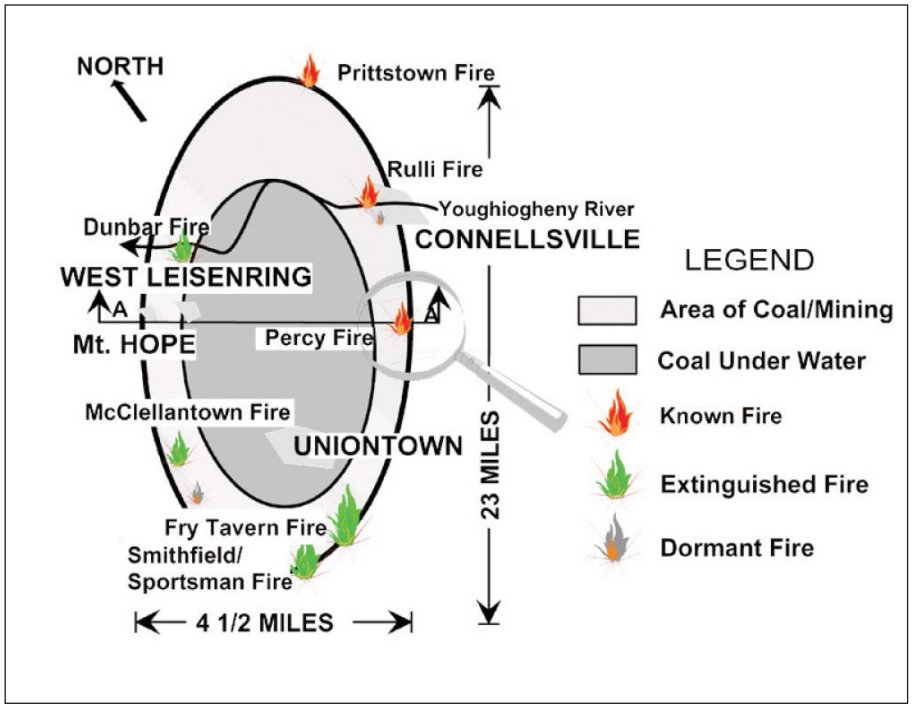

Figure 2. Uniontown Syncline with locations of the coal basin and mine fires.

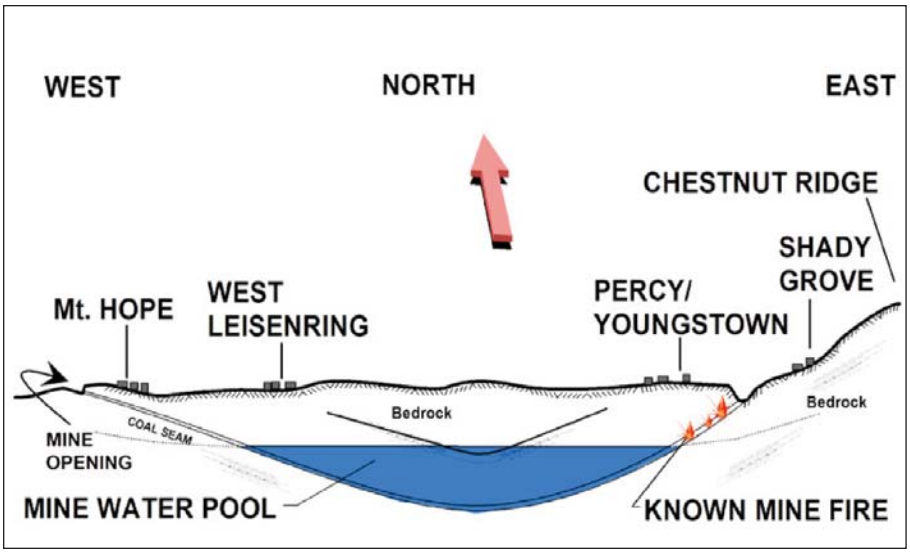

Figure 3. East-West cross section through the Uniontown Syncline.

the center of the basin to outcrop along the perimeter of the syncline (Figure 2). The basin within the Pittsburgh coal outcrop is approximately 20 miles long and five miles wide with an approximate circumference of more than 50 miles (Bureau of Topographic and Geologic Survey, 1985).

Since the beginning of the 19th Century, the Pittsburgh Coal has been nearly 100 percent mined by room and pillar methods. As mining was conducted mostly below the groundwater table, pumping water from the mines was a common and necessary practice. Subsequent abandonment has resulted in groundwater returning to these workings, leaving a large portion of the Pittsburgh Coal Seam under water. Three discrete mine pools have been identified within the basin, named the Southern, Central, and Northern pools. The Percy Mine Fire is situated on the eastern flank of the Central pool. The interval between the outcrop and the mine pool is where the mine fires can occur along the entire perimeter of the Uniontown Syncline (Figure 3).

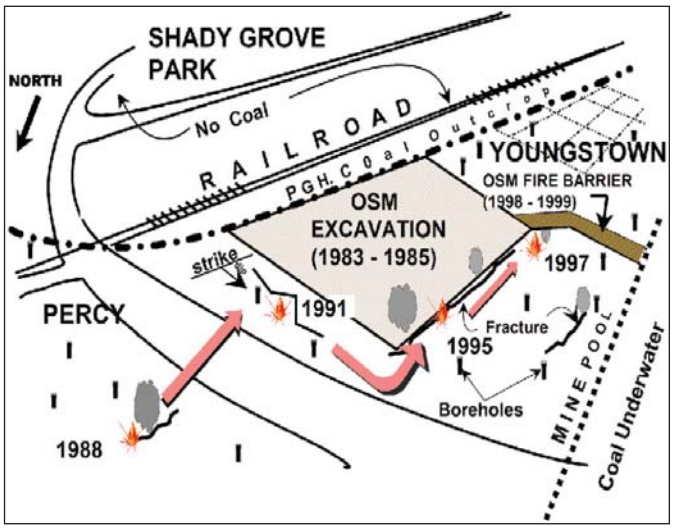

Figure 4. Historical perspective of the Percy Mine fire

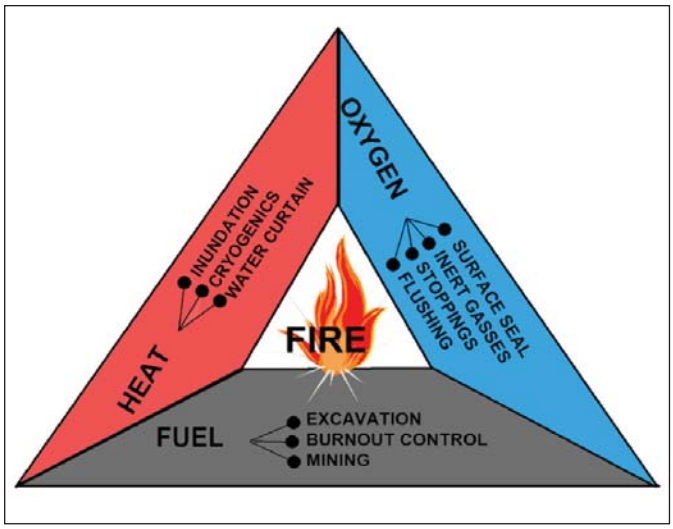

Figure 5. Fire triangle.

The mine workings beneath Youngstown and much of Percy are contained within the Youngstown Mine. Adjacent mines include the Mt. Braddock Mine to the north and the Lemont Mine to the south. Connections above the mine pool have been established between the Mt. Braddock Mine and Youngstown Mine. Presumably, similar dry connections are likely between the Youngstown and Lemont Mines. Analysis of the mine maps for the entire basin show that most adjacent mines have connections in that zone between the mine pool and the outcrop. Therefore, a fire occurring in any of the mines bounded by the outcrop has the potential of moving into the adjacent mine if left unabated. Currently, the Percy Mine Fire, we think, is wholly contained in the Youngstown Mine.

Room and pillar mining of the Pittsburgh Coal has removed approximately 50 to 60 percent of the seam, leaving a honeycomb of void space, support pillars, and collapsed workings. Those portions of the mine between the mine pool and the outcrop are susceptible to ignition either through natural spontaneous combustion processes, accident or through design.

Historical Mitigation Efforts

The Pennsylvania Department of Environmental Resources (PADER) was first notified of an underground fire threatening the B&O Railroad near the village of Percy on July 25, 1974. It is believed the coal exposed in the outcrop was ignited as a result of burning trash on or near the outcrop. Since the initial response, several projects were undertaken by both the Office of Surface Mining (OSM) and PADEPs Bureau of Abandoned Mine Reclamation (BAMR) to abate the ensuing problems. These projects consisted mostly of fly ash injection around individual homes and did not attack the fire as a whole.

In the early 1980s, OSM excavated a large cut-off trench adjacent to Youngstown and just south of Percy (Figure 4). The excavation measured approximately 450 by 500 feet and contained approximately 200,000 cubic yards. The trench began at the coal outcrop and was extended westward down the slope of the coal towards the mine pool. The purpose was to remove the fuel leg of the fire triangle (Figure 5), thus preventing the fire from crossing Rt. 26101 and moving into the mine workings beneath Youngstown. The effort did not attempt to extinguish the fire, but to simply restrain its movement. The excavation functioned as a barrier for more than 10 years, but was not extended to remove all the coal between the mine pool (downdip) and the outcrop (updip) resulting in eventual failure.

Upon completion of the OSM excavation, BAMR began monitoring the fire in 1985, the year in which the first isotherm was drawn. From 1985 to 1991, the fire remained in the center field. There was no surface evidence of burning or venting. Temperatures fluctuated but the center of heat remained stagnate. In May 1991, a linear fissure developed along the south side of Rt. 26101. This fissure was oriented parallel to the OSM excavation and was interpreted as a desiccation fracture caused by heat from the fire drying the fill material placed in the OSM trench. In the mid 1990s, the fire began moving toward Youngstown, crossing Rt. 26101 in 1991. The fire paralleled the road until it reached the downdip end of the excavation. From there, it turned south and began to burn the workings between the mine pool and the west end of the excavation. By October 1991, fumaroles developed and surface venting was seen for the first time since the excavation. An overall increase in the temperature of the fire was recorded. The fire then continued south, moving along the downdip edge of the original excavation (Figure 4).

For the first time, the fire was moving toward Youngstown. The fire seemed to be following the excavation boundaries and moving at an accelerated rate. Surface seals were placed over the fissures in an attempt to slow the fire's advancement.

In 1997, OSM and BAMR developed a project to stop the fire's advance toward Youngstown. The project entailed drilling injection holes and pumping a fly ash cement grout through a tremie pipe for the purpose of filling mine voids. The holes were laid out in a linear pattern between the zone of active burning and Youngstown. This subsurface barrier was keyed into the OSM excavation on the south, and extended toward and eventually tied into the mine pool to the east. Once this primary barrier was in place, a secondary barrier was placed between Youngstown and the area of burning (Figure 4). The barriers were not intended to extinguish the fire, only to retard its movement in the direction of Youngstown. These barriers are in place, however, their effectiveness will require long term observation. In the meantime, the fire continues to burn.

During the OSM barrier placement, it was apparent that precise data on the elevation of the mine pool was required to ensure the fire could not go around the barrier. A core-drilling contract was executed by PADEP to find the precise location of the mine pool and the lithology of the roof rock overlying the Pittsburgh Coal. The mine pool was encountered at 970 feet above mean sea level, which required that the OSM grout barriers be extended approximately 200 feet to the west toward the center of the basin. Core borings through solid coal showed the main seam to average eight feet in thickness with the roof coals or riders an additional four feet in thickness. These findings indicated that barriers (excavated or constructed) must extend into the mine pool to where at least fifteen feet of water would permanently remain above the floor of the mine.

The various emergency projects conducted to date have all produced data, which laid the groundwork for a design to attempt total extinguishment.

Saturation Grouting from Outcrop to Mine Pool

This plan is the first attempt to extinguish the underground mine fire. Projects to date have been emergency response actions designed to deal with an immediate problem and time was generally unavailable for a thorough investigation, design and implementation of a fire extinguishing program. However, now the various projects have provided sufficient background data and have slowed the progress of the fire to develop an extinguishment project.

This project is a cooperative agreement with the BAMR, Reliant Energy, Howard Concrete Pumping and GAI Consultants, Inc. This project was implemented in 2005 and is currently ongoing. The project goal is to eliminate void space by sealing the conduits whereby air enters the mine to ventilate the fire. The filling of these void spaces will be accomplished by pumping a fluid, which is a proprietary grout mix, into the mine voids.

The project will use Low Permeability Cementicious Material® (LPC Material™). LPC Material™ is a coal combustion product made at Reliant Energy's Elrama Power Station. LPC Material™ is widely used throughout western Pennsylvania as a low cost structural fill material. The LPC Material™ will be trucked in a moist state to the site where it will be mixed with water and Portland cement to form a pumpable slurry which will be injected into the mine workings through a tremie tube. The material has a construction shelf-life of two to three days before pozzolanic reaction begins to harden the material. The material will achieve a 60-day unconfined compressive strength of 200 to 300 pounds per square inch (psi) and will continue to increase in strength (600 to 1,000 psi) over longer periods of time. The material does not shrink as it cures and will provide an effective seal against the roof of the abandoned mine.

The north and south rows of barrier boreholes will be injected first with a low slump LPC Material™. A similar row of barrier holes will be placed along the mine pool side to the west. The intent of this row is to contain the LPC Material™ within the area to be treated for extinguishment. This procedure involves boxing in the fire on the north and south through the dry workings from the outcrop to the mine pool where the roof coals are permanently submersed. Once the fire has been contained, the approximately 50 acres within these barriers will be drilled and flushed with LPC Material™ in a way that will significantly fill the existing voids both in the mine workings and in the overburden (Figure 6).

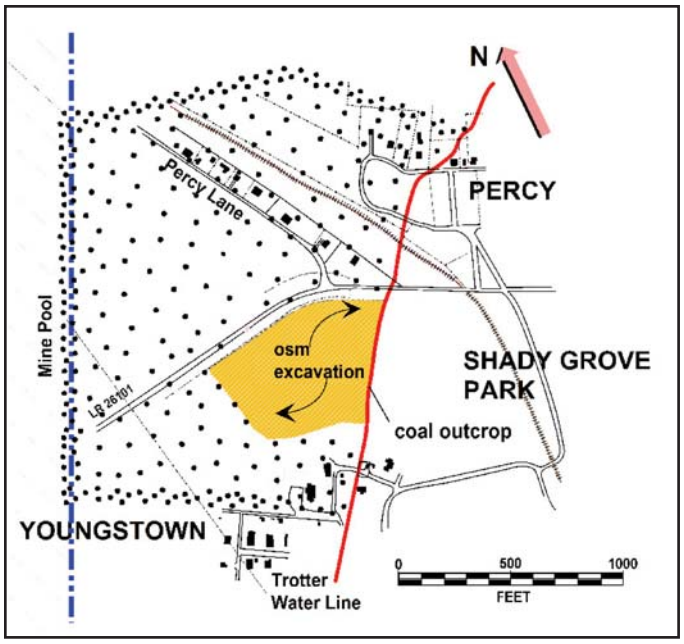

Figure 6. Proposed extinguishment plan.

Injection hole spacing will be tightened if 100 percent saturation of the mine workings is not achieved by using the proposed 100-foot center grid spacing. Drilling assurance/monitoring borings after an area is completed will determine the effectiveness of the LPC Material™ as a bulk fill. A monitoring program, which will monitor subsurface temperatures and mine pool elevations, will continue for one year or more following completion of the project. The projected cost for this plan is $3.2 million. This cost is nearly half the cost of conventional cement grouting.

Successful completion of this project will result in extinguishing the Percy Mine Fire and will minimize or eliminate the potential for future subsidence in the area treated. This action will remove the constant threat to the health, safety and welfare of the residents and restore the property values of those living above and within the vicinity of the fire.

If total extinguishment of the Percy Mine Fire is achieved by this method, future fires occurring along the perimeter of the Uniontown Syncline, or within other similar geologic structures, can be abated rapidly and in one design phase. This will eliminate the years of monitoring and small emergency action projects that do not attempt total extinguishment. ■

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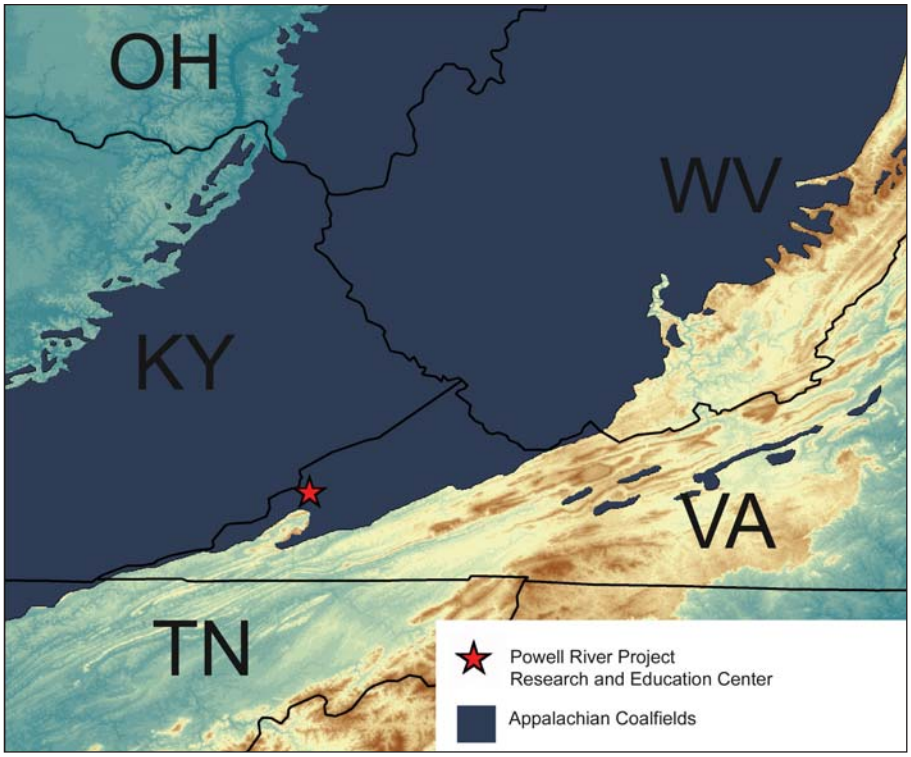
BY JON ROCKETT AND CARL ZIPPER
POWELL RIVER PROJECT, VIRGINIA TECH

Using Reclaimed Coal Mines to Enhance Natural Resource Education

"Environmental education" is a concept that is not commonly associated with coal mining. However, experience at the Powell River Project Research and Education Center (PRP-REC) in Wise County, Virginia (Picture 1), demonstrates that a reclaimed coal mine is the ideal place to teach about reclamation's role in the mining process while illustrating sound natural resource management principles and contributing to science education.

The Powell River Project began in 1980 and is a program of Virginia Tech that involves major landowners, coal companies, mine regulatory agencies, interested citizens, and educational institutions. One corporate landowner, Penn Virginia Resources Partners LP, has made available 1,100 acres for long term research and education activities. The site is comprised of areas mined for coal prior to the Surface Mining Control and Reclamation Act, lands mined and reclaimed since the Act, and forested lands managed for timber production (Picture 2). The site also contains an operating network of natural gas wells and pipelines, roadways utilized for coal haulage from active mines, and mine reclamation research and demonstration sites.

Within view at the Center are reclaimed mines of various ages, current surface and underground mines, and coal refuse disposal. When entering the Center, visitors cross a rail line and are often able to see unit trains in the process of being loaded. Activities on the reclaimed mine areas include cattle grazing, horticultural production, and forest regeneration. The site presents opportunities to learn about natural resources—both the non-renewable and renewable varieties—land and water restoration, and methods for restoring land and water resources affected by coal mining.



Picture 1: The location of Powell River Project's Research and Education Center (PRP-REC), in far southwestern Virginia's Wise County

Education programs for schools began in the 1980s. Early programs simply exposed students to surface mining and reclamation, largely in response to the observation that many local students—even those with a parent working on the mines—were not familiar with coal mining. Such "field trips" proved to be popular, especially on beautiful spring and fall days. During the 1990s, however, we realized that these visits could do much more and we began working with teachers to develop methods for using these visits to aid educational achievement in the classroom. Today, efforts are made to link coal mining to economic development and community livelihood, and to integrate post-mining land use and reclamation to provide

Photo by J. Rockett

Picture 2: Powell River Project Research and Education Center, as viewed from an adjacent active coal mine. Some facilities and buildings are visible in the cleared area at the photo's upper right.

Photo by A.O. Abaye

Picture 3: Jon Rockett, Area Extension Agent and manager of Powell River Project Research and Education Center, talks with student visitors at the Center.

Table 1. Virginia Standards of Learning (SOLs) addressed in educational presentations at Powell River Project Research and Education Center, by grade level.

Fourth Grade
4.4 – Life Processes
a) the structure of typical plants
c) photosynthesis
4.5 – Living Systems
c) flow of energy through food webs
d) habitats and niches
f) influence of human activity on ecosystems
4.7 – Earth Patterns, Cycles, and Change
b) the causes for the Earth's seasons
4.8 – Resources
a) watershed and water resources
b) animals and plants
d) forests, soil, and land

Sixth Grade
6.2 Force, Motion, & Energy
b) role of the sun in the formation of most energy sources
c) nonrenewable energy sources
d) renewable energy sources
6.5 Matter
g) importance of protecting and maintaining water resources
6.7 Living Systems
a) health of ecosystems and the abiotic factors of a watershed
c) divides, tributaries, river systems, and river & stream processes
d) wetlands
f) major conservation, health, and safety issues associated with watersheds
g) water monitoring and analysis using field equipment
6.9 Resources
a) management of renewable resources
b) management of nonrenewable resources
c) mitigation of land-use and environmental hazards through preventive measures.
d) cost/benefit tradeoffs in conservation policies

long-term productivity and sustainability.

Current education programs at PRP-REC are not just breaks from in-school classes—they are structured learning activities that reinforce curricula addressing Virginia Standards of Learning (SOLs), which are state-mandated standards of academic achievement that students must surpass in order to move to the next grade level (Table 1). Education programs at the Center are targeted to individual SOLs established for specific grade levels.

For example, the PRP-REC coordinates with the local school system to conduct fall and spring 4-H Outdoor Classroom field trips for fourth grade students. Students learn by walking, observing, and talking about what they observe on the reclaimed mine. Such walks typically begin by addressing Virginia SOL 4.4 - Life Processes, which require students to understand plant structure and the role of photosynthesis in sustaining plant life. These topics are addressed by viewing the grasses, shrubs, and trees that grow in abundance on the reclaimed mine, and talking about structural differences among plant types.

Such a lesson is typically followed by SOL 4.5 – Living Systems. This unit focuses on how plants and animals interact with the environment's non-living components, such as water, soil, and sun, to form ecosystems. Specific learning objectives concern the "flow of energy through food webs," and "habitats and niches." Birds and wildlife are abundant on the reclaimed land so students can see and hear the ecosystem components as they learn about them.

This SOL unit also requires that students understand "the influence of human activity on ecosystems," providing an opportunity to address the manner in which active coal mines, such as those visible in the distance, can be transformed into the productive landscapes they see. Since "seeing is believing," these visits allow the students to learn more about mined-land

Photo by A.O. Abaye

Picture 4: Virginia Tech students, working with Dr. A.O. Abaye, collect and identify samples of vegetation growing on the reclaimed mine areas of the Powell River Project Research and Education Center site.

Photo by A.O. Abaye

Picture 5: Virginia Tech researcher Lee Daniels speaks with visitors at Powell River Project Research and Education Center, discussing mine soil properties while standing by a soil pit.

reclamation, including legal and ethical dimensions of natural resource management as exemplified by the reclamation process, than would be possible in the classroom. This lesson often leads to discussion of SOL Unit 4.8 – Resources, which includes learning objectives related to "watershed and water resources," "animals and plants," and "forests, soil, and land."

The above examples describe activities related to fourth grade SOLs. Education programs are also tailored to other grade levels, including high school. For example, the PRP-REC provided leadership in organizing Natural Resource Awareness Days, a joint project with the local school system, the Chamber of Commerce, and local offices of state environmental agencies. All sixth grade students spent the day at the PRP-REC rotating through 13 "learning stations," each of which was located to exemplify an SOL and was targeted toward one or more sixth grade SOL learning objectives.

Teachers reveal that items covered at the PRP-REC are recalled vividly when discussed in the classroom. Some teachers have remarked that discussion of watersheds is especially effective. A mountain ridge runs from northwest to southeast across the area. A walk up to the ridgeline, where the land drops off sharply to either side, with discussion of the landscape below makes the concept of watershed divides clear to the students. A landscape comprised of active mining disturbances, reclaimed lands, undisturbed forests, roads, and homes is visible from the ridge, and further complements the idea of multiple land uses.

Use of reclaimed mined lands at PRP-REC for natural resource education has proved both popular and enduring. Since these programs began in 1988, more than 30,000 visits by students and teachers from local grammar schools, high schools, and colleges have been recorded. The fact that teachers voluntarily return to the Center year after year is evidence of the outdoor education programs' effectiveness.

In addition to the fourth and sixth grade programs, the PRP-REC is the research site host for the University of Virginia's College at Wise Summer Governor's School program. This is a college level science and English three week residence class. Several Virginia Tech classes also utilize the REC in their educational curricula (Picture 3). One such class is the junior level "Plants for Environmental Restoration," which utilizes the PRP-REC visit for student research required for the term project (Picture 4). Powell River Project researchers also conduct programs for coal industry and reclamation agency personnel at the Center (Picture 5)

Tours of the PRP-REC can also be arranged for college and professional groups by contacting Jon Rockett by e-mail, jrockett@vt.edu, or by phone, (276) 328-0162. ■

BY JOHN C. MARLIN AND ROBERT G. DARMODY

Returning the Soil to the Land: The Mud to Parks Project

Giant floating cranes digging in Lower Peoria Lake, northbound barges filled with mud, and mining trucks pouring 20-ton mud pies onto Chicago slag fields are part of an ambitious pilot project to return displaced soil to the land. The mud, soil eroded from farm fields and stream banks, was choking the life from Illinois River backwaters, and the slag fields had no topsoil. The "Mud to Parks" project highlights a rare opportunity to simultaneously generate environmental, recreational, and economic benefits in two distinct areas of the state.

Large-scale beneficial use of sediment can restore aquatic habitat along the Illinois River, which is filling with soil at an alarming rate. The Illinois State Water Survey determined that by 1985 more than 70 percent of backwater storage capacity was gone and today few areas outside the main channel exceed 18 inches in depth. The Peoria lakes alone contain enough sediment to cover a football field to a depth of 10.5 miles, and 60,000 acres of water that once supported the nation's second largest fishery are now too shallow for even small recreational boats.

Restoration efforts must recognize the altered hydrology of the watershed and the presence of navigation dams and levees. Thus, various methods are likely to be used. One method could convert degraded levees to wetlands, which are relatively isolated from the river. Another method constructs low levees, which are favored by waterfowl advocates. A third method involves periodically removing sediment from portions of connected backwaters and side channels to restore a variety of depths to the river system. Connectivity is especially important to fish during high water for feeding, spawning, and finding shelter. The deep-water pockets also provide habitat away from the main channel for overwintering fish.

Removing enough sediment to restore even minimal amounts of aquatic habitat is daunting. It must be excavated from the water and moved to a placement site or transfer location. The availability of land for placement, distance from the dredge site to the area, and public involvement all factor into a project's feasibility.

Picture 1. The old U.S. Steel South Works Site in Chicago after building removal. The site was essentially composed of slag and devoid of topsoil.

Picture 2. A crane excavates high solids mud from the bottom of the Illinois River near Peoria, IL. The sediment is as much as 25 feet thick in this area. It is placed in a standard 1500-ton hopper barge for shipment to Chicago.

Bipartisan Action Addresses River Issues

The past 25 years saw increasing public concern over the declining health of the Illinois River and its floodplain. Illinois governors Thompson, Edgar, Ryan, and Blagojevich all encouraged restoration efforts. The legislature created the Illinois River Coordinating Council to promote integrated management. The Illinois Department of Natural Resources and the U.S. Army Corps of Engineers were lead agencies in developing strategies that included emphasis on floodplain restoration, upland erosion control, and backwater rehabilitation.

Is Illinois River Sediment Topsoil?

Dredged material was traditionally considered "spoil" and was "disposed of" often in confined disposal sites. Such concerns are warranted for sediment from urban and industrial areas due to contamination. However, sediment derived primarily from rural, freshwater areas has potential beneficial uses including fill, landscaping soil, soil amendments, or as topsoil at strip mines, old industrial sites, and other areas.

Illinois River sediment is largely derived from Illinois topsoils, which are among the best in the world. Sediment from most locations has physical and chemical properties, including texture, favorable for optimal plant growth. Silt-sized particles are the most common so the silty texture of the sediment provides good soil moisture storage for plants. The sediment also has organic matter content similar to productive Illinois agricultural topsoils. Favorable chemical properties of Illinois River sediment include high calcium content and consequently an elevated pH. This encourages growth of most farm and garden crops. Micronutrients such as zinc are also plentiful.

These favorable properties of Illinois River dredged material emerge only after the material undergoes dewatering and soil formation processes known as weathering. When initially applied to the land, sediment is wet and in the form of a runny to thick paste simply described as "mud." During weathering it hardens and cracks, forming blocklike polygons, and assumes the appearance of cracked concrete. However, this material quickly breaks down with wetting and drying, freezing and thawing, or tillage,

Picture 3. After a 168-mile river journey, the barges were unloaded to mining trucks in Chicago. Note the low water content of the mud.

to form granular soil structure. We have found that sediment applied in the fall that freezes while still very wet forms a thin layered soil structure by the following spring.

Several field and greenhouse demonstrations show that plants grow readily in weathered sediment. In one experiment, sediment was applied to sandy topsoil in layers 3-, 6-, and 12- inches deep in large research plots. Corn yields were as much as four times greater in sediment plots. This demonstrated that sandy soils could be improved for crop growth by the addition of sediment. We have also successfully grown prairie plants and turf grasses in sediment without tillage, fertilizer, or irrigation.

Because sediment from more industrial areas is often contaminated with toxic materials, we conducted greenhouse experiments to determine if plants grown in Illinois River sediment from the study area accumulated any toxic materials. While analyses of sediment shows that some industrial-related chemicals are elevated as compared to pristine topsoils, our results indicate that toxic industrial metals such as mercury, lead, and cadmium are not a serious problem in the river reach we studied, nor did plants growing in these sediments accumulate metals at levels that would cause concern for human consumption. However, because there are no firm standards for most

Picture 4. High solids mud being end-dumped on the slag field. The consistency obviated the need for a containment berm.

chemicals in topsoil, it is important to consider the risks associated with soil from any source. The results of all the field and greenhouse studies shows that sediments from the portions of the Illinois River we have researched makes excellent topsoil after dewatering and weathering.

The Project: Moving Mud

The City of Chicago and the Chicago Park District expressed interest in using river sediment at the 573-acre U.S. Steel South Works redevelopment site on Chicago's south side. About 100 acres bordering Lake Michigan will be reclaimed to become part of the lakefront park system, but is covered with steel-mill slag devoid of topsoil (Figure 1). Moving reclaimed soil by barge directly to the site was attractive compared to taking it from suburban construction sites, an option that would require thousands of large trucks moving over congested urban highways and through neighborhoods. In June 2003, a meeting was called to determine if a project was possible. Sampling, risk assessment, and permitting preceded signing agreements in April of 2004. Chicago received a $1.4 million Illinois Department of Commerce and Economic Opportunity grant to obtain reclaimed topsoil. The Fon du Lac Park District's Spindler Marina access channel at East Peoria was the sediment source. The channel extends about 1,000 yards from shore to the navigation channel and needed dredging to restore depth for recreational boats. The sediment in the area had been tested for contaminants and could be excavated to the 11-foot depth needed to load hopper barges.

Picture 5. Slag field in June of 2004 covered with mud in various stages of drying. Mud was initially placed about a foot deep and bulldozed into piles as high as eight feet as it dried, making room for later placement.

Picture 6. The former slag field supports vigorous vegetation in September 2005 one year after dredging. During the prior fall it was graded with a dozer to a depth of approximately 2.5 feet and seeded with grass.

Midwest Foundation, a company in Tremont, IL, that builds bridges and navigation structures, excavated the sediment. Most of the material was removed with a clamshell bucket designed to minimize turbidity. The bucket brought up 5.5 cubic yards of mud weighing about 7 tons with each swing, and dropped it into barges, each of which held 1,500 tons of mud (Figure 2). Once the barges were filled, three companies, each with a specific function, relayed them 168 miles to Chicago.

ARTCO Fleeting of Peoria was the prime contractor. It provided barges and handled fleeting, which is similar to a railroad switchyard operation. Individual barges were towed 5 miles to a staging area. Loaded mud barges were combined with others into groups of 15 and taken to Lemont by Illinois Marine Towing. In the narrow man-made Cal-Sag Channel between Lemont and Chicago, Holly Marine used towboats with telescoping pilothouses that lower to pass under bridges.

Beemsterboer, Inc., which has considerable experience handling steel-mill slag and wet soils, unloaded and placed the mud. A large crane with a tight-closing bucket lifted 10-cubic-yard dollops of mud from barges to mining trucks with minimal spillage (Figure 3). The plan was to spread the material about a foot thick so that it would dry rapidly and could then be pushed into piles 6 to 8 feet high after a week or two, freeing up the space for more mud. About 35 acres would be covered with mud for drying.

On the first day, a bulldozer pushed up a 2-foot-high dike of slag to contain the wet mud. However, it was soon apparent that this was unnecessary because the material formed stationary

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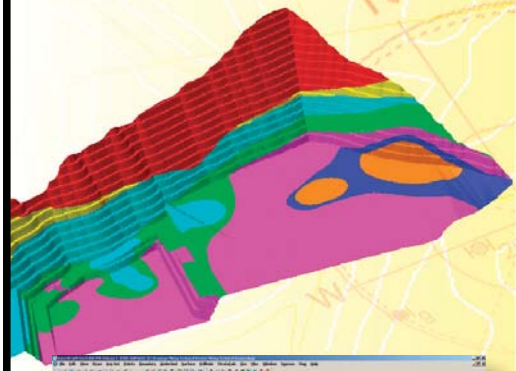

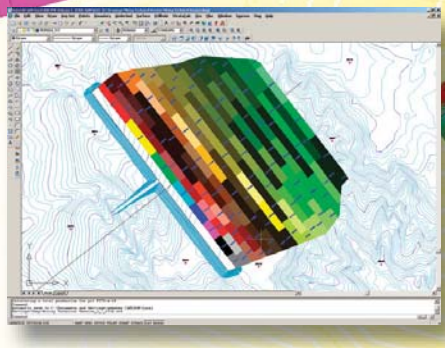

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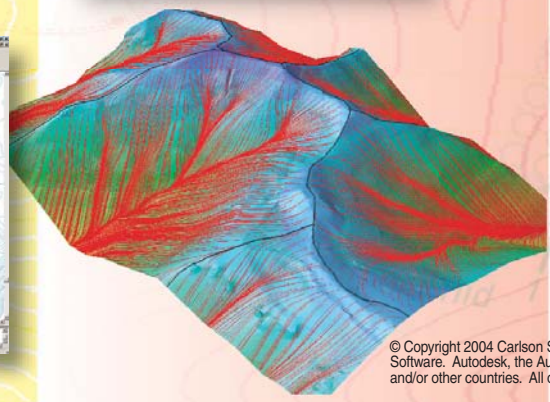

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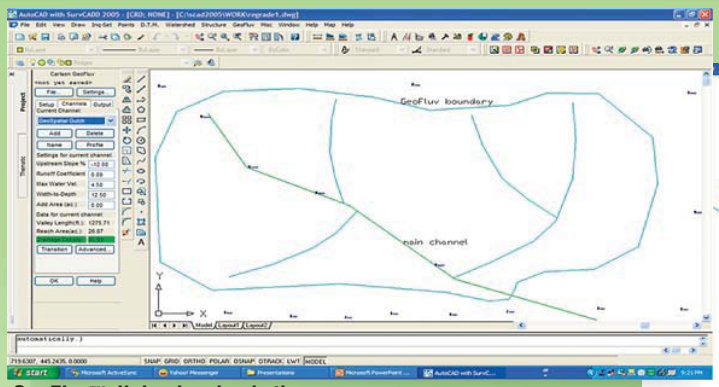

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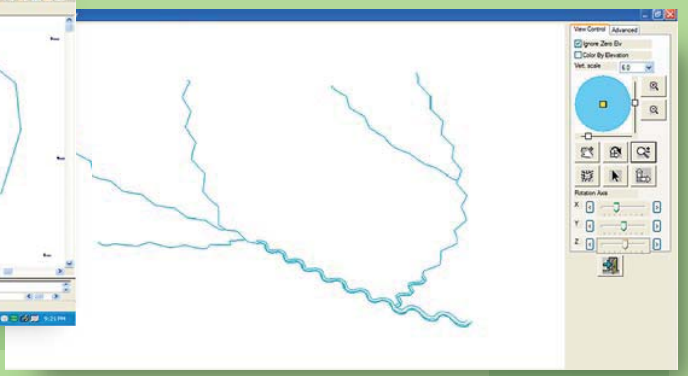

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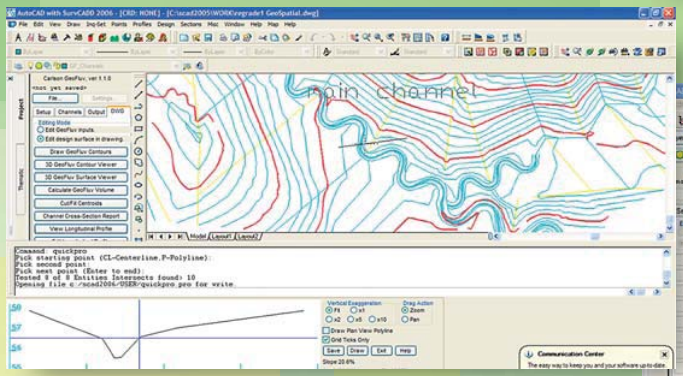
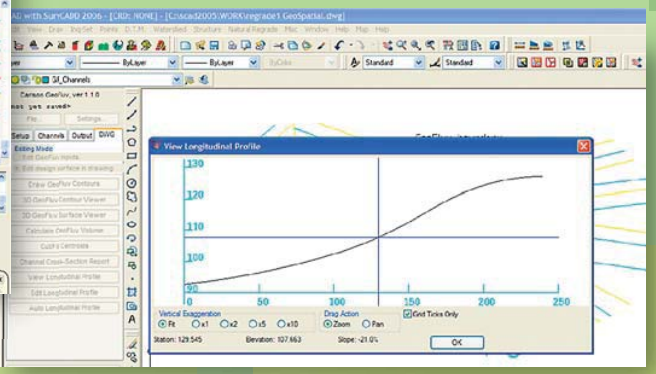
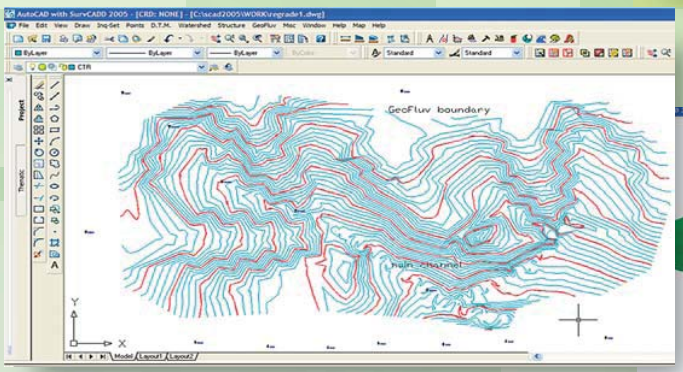


Plan view and cross-sectional channel geometry based on bankfull discharge has additional floodprone area



GeoFluv creates complex slope profiles with convex-to-concave inflection point determined locally



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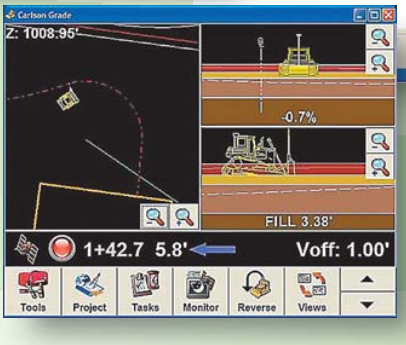

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cohesive piles about 2.5 feet deep and 20 feet across when poured from the trucks (Figure 4). The depth could be increased by dumping loads over each other, or decreased by dumping from moving trucks. A bulldozer had no difficulty spreading it immediately after dumping (Figure 5).

After drying for a week, the top 8 inches of material was pushed into piles, which supported a person's weight within a day. Erosion was not a problem because the cracks in the drying sediment collected rainwater. The process continued until the 68th barge was unloaded in July 2004. In mid-September a low-ground-pressure bulldozer spread the soil on the southern field to a depth of 2 to 4 feet, and it was seeded with rye grass. The grass was well established by December 2004 (Figure 6).

Rye grass was planted in April and germinated within 10 days. Seeds grew best in cracks where roots found moisture after drying crusted the top. Volunteer weeds on the bulldozed piles grew up to 6 feet tall by September. The Illinois Natural History Survey identified 79 species of vascular plants in the southern sediment piles. Seventeen of them were wetland species. The others either were on site initially and were mixed in with the sediment, or were in the sediment seed bank (Figure 7).

Moving to the Future

The soil in our rivers and lakes is a valuable, though out-of-place, resource. The Mud to Parks project clearly demonstrates the technical feasibility of transporting river sediment long distances for use as soil in a variety of potential applications. The ability of this type of project to provide benefits in two or more geographic areas raises the potential for cost savings and sharing across projects. We believe this concept merits consideration as the social, economic, and environmental costs and benefits of the way we currently use soil and water resources are evaluated. ■

John C. Marlin is a senior scientist for the Illinois Department of Natural Resources' Waste Management and Research Center, Robert G. Darmody is a professor of pedology in the Department of Natural Resources and Environmental Sciences, College of Agricultural, Consumer and Environmental Sciences, University of Illinois at Urbana-Champaign. Photos by Robert Darmody and John Marlin.

Additional information about this project is available at www.wmrc.uiuc.edu under "Illinois River Project." Other useful Web sites include: http://ilrdss.sws.uiuc.edu/ and www.mvr.usace.army.mil/Products/Projects.asp.

This paper was adapted from an article published in The Illinois Steward Magazine. a quarterly publication that promotes the preservation and wise use of Illinois' natural resources. For subscription information, visit http://ilsteward.nres.uiuc.edu.

Picture 7. Bob Darmody standing among weeds growing on the site a few months after sediment placement and seeding.

BILLINGS LAND RECLAMATION SYMPOSIUM

Symposium Registration Will Begin In April, 2006

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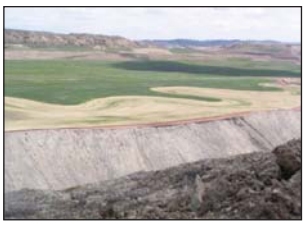

Reclamation: Supporting Future Generations

The Billings Land Reclamation Symposium is scheduled for the week of June 4 - 8, 2006 in Billings, Montana. The Symposium is an established mining and reclamation conference with a 25-year history. The Symposium provides a forum for the dissemination of information and discussions that may lead to change and innovations in public policy, mining, restoration, reclamation, and land management issues through research, field tours and workshops. For more information go to: http://billingslandreclamationsymposium.org/.

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WORKSHOPS:

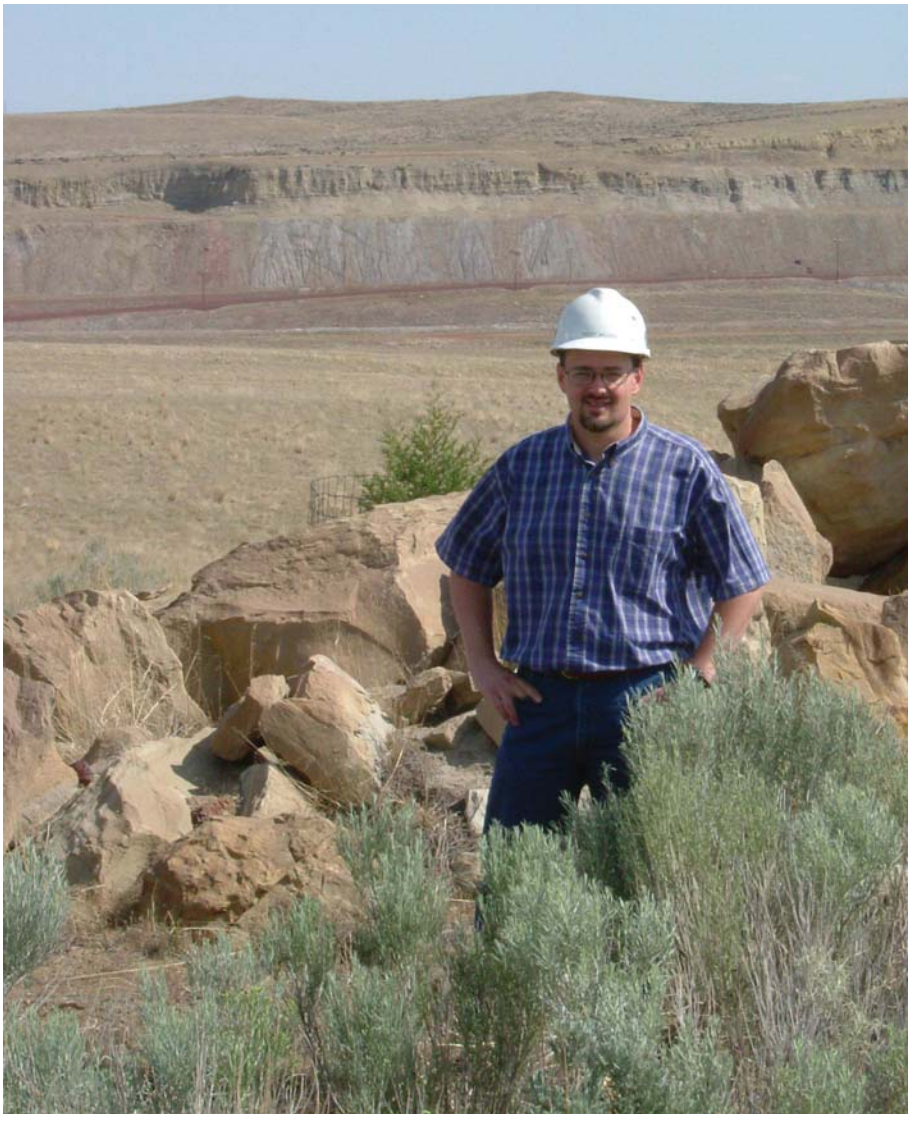
Eight workshops will be offered including: Soil Ecology in Relation to Land Restoration, Principles of Successful Riparian Restoration, Invasive Species Management, Geomorphic Design, Stormwater BMPs, Passive Treatment of Mine Waters, Mobile Computing Technology Developments for Reclamation Applications, and EPA Hazardous Substances Research.

FIELD TOURS:

Scheduled field tours include: Willows & Wolves-Restoration in Yellowstone National Park, Coal Mine Reclamation and Coal Bed Methane Development, Roadside Restoration, Stillwater Platinum/Palladium Mine, and Boulder River & Upper Clark Fork River Mine Land Remediation Tour.

BY GAYLA HOFFMAN

Scott Belden Is at Home on the Range



This article is reprinted from the July 2005 issue of Coal People Magazine, Al Skinner, editor.

Little did Scott Belden dream when he was growing up in Casper, Wyo., that an appreciation of the land gained from family and Boy Scout camping trips would lead to his future career and to his being honored as 2004 Reclamationist of the Year by the American Society of Mining and Reclamation (ASMR).

ASMR cited Belden's continuing work on joint committees of the Wyoming Department of Environmental Quality and the Wyoming Mining Association to analyze revegetation and bond release guidelines, which has improved reclamation practices in the state. Belden, now Manager of Environmental Permitting and Reclamation at Peabody Energy's Powder River Coal Company operations, was previously Environmental and Reclamation Coordinator. But as a high school graduate, his connection to the land was yet to emerge.

A a college freshman at Casper College, Belden, for reasons he can't remember, declared psychology as his major. Later, while attending a small college in Oklahoma, Belden read a book titled, Christian Stewardship of Natural Resources and discovered he wanted to be involved in natural resource management. "My wife and I – by this time I was married – got homesick for Wyoming," he recalled.

"So I came back, and my uncle, a professor in the College of Agriculture at the University of Wyoming at Laramie, suggested that I look into range management in the College of Agriculture."

One of his professors was Ed DePuit, a professor in the Range Department. "He introduced me to the whole field of reclamation, which was his specialty, and I got hooked," Belden said.

There was no formal degree in reclamation, so Belden went for a B.S. degree in range management in 1983, with course emphasis on reclamation of disturbed lands. A master's degree in soil science in 1987 also emphasized disturbed lands, reclamation field problems, soil chemistry and microbiology.

As a graduate student, he worked with another professor, Gerald E. Schuman, a scientist for the U.S. Department of Agriculture's Agricultural Research Service, "at the forefront of research on reclaimed mine lands," who would become his mentor, co-author of scientific journal articles and friend.

Belden's work with Schuman on reclamation of abandoned bentonite mines using sawmill by-products was the subject of his master's thesis and subsequent scientific journal articles. Research carried out by Belden and others resulted in reclamation technology that was adopted by the Wyoming Abandoned Mine Land Program to reclaim more than 16,000 acres of abandoned bentonite mines in Wyoming. "While I can't claim credit for the idea, I am very pleased to have been involved with the applicable research," he said.

Belden's first job was as a mine operations environmental compliance specialist for the Wyoming Department of Environmental Quality's Land Quality Division. "I was there for three years, but I always knew I'd rather 'do' than 'review,'" he said. "I wanted to make it happen, to create and implement."

His opportunity to "do" came in 1989 when Powder River Coal Company offered him an environmental specialist position. "North Antelope and Rochelle mines were growing by leaps and bounds and in 1999 combined operations into one mining complex," he said. He progressed through several environmental and reclamation positions and has worked with the environmental teams at all the Powder River Coal Company mines.

"Reclamation is really a team effort – and involves many disciplines," he said. "It takes operations people in the field and people in the office that cooperate and respond in a timely manner to make it work. We have some of the most talented environmental and operations teams in the industry, and that enables us to take an innovative approach to reclamation so that we can return the land to better condition than before mining."

A good working relationship with regulators is also important. Many agencies – both state and federal – are involved in reviewing and approving reclamation plans for post-mine land use. "My philosophy is that mining companies and regulatory agencies need to get along with each other because we're all in this for the long haul," Belden said.

Schuman, who has worked with Belden since his undergraduate days, said, "Scott is one of the more conscientious reclamationists I have known. And he's just nice to be around."

In nominating Belden for Reclamationist of the Year, Schuman noted that "Scott is sought out by industry reclamationists and by the state to participate in solving problems related to mine reclamation because of his broad knowledge, problem-solving ability and his overall willingness and ability to work successfully with people. He is an outstanding team player in such collaborative efforts and is selected for committees because of these several strong points."

Schuman also noted that "Scott has not been afraid to address research issues and needs that might require greater effort on the part of the mining industry as it relates to reclamation. He is first and foremost interested in ensuring that the natural resources are conserved and the lands reclaimed to productive post-mine land uses."

Reclamation in the arid West is more complicated than in the Midwest or Eastern United States. And the plant species are often more diverse – more than 100 species may exist pre-mining. Not only does reclamation have to support livestock forage, but it also provides habitat for wildlife and birds.

"This is a cold desert climate and we've had drought conditions for the last several years," said Belden. "Although it's somewhat up to Mother Nature, I and others here have applied research findings and developed new protocols with seed mixes and seeding practices to improve overall reclamation success and enhance plant diversity," he said.

One of his biggest challenges is re-establishing sagebrush, which is important in providing cover and food for livestock and wildlife. "It's ironic that when we're successful and get a nice plant going, it often gets eaten by wildlife – one of the main reasons we plant it. Big game and small mammals love young sagebrush," he said.

Belden says he is looking forward in the next few years to final bond release on

Little did Scott Belden dream when he was growing up in Casper, Wyo., that an appreciation of the land gained from family and Boy Scout camping trips would lead to his future career and to his being honored as 2004 Reclamationist of the Year by the American Society of Mining and Reclamation (ASMR).

land that was mined 20 years ago and has been reclaimed – the first such bond release since Peabody Energy began operating in Wyoming in 1983. (Mining companies must post bonds before mining begins that would cover the costs of restoring mined lands should the company fail to do so.) "We've used the land temporarily for mining and now we are returning it in better condition than we found it," he said.

His service on joint committees of the Wyoming Department of Environmental Quality and the Wyoming Mining Association involves a multidisciplinary effort to evaluate state and federal regulations that define "successful reclamation," the criteria that results in final bond release. "I'm proud to be part of that process," he said. "There are some gray areas in the current rules. Proposed rule changes would make definitions less complicated, more straightforward and offer more options."

"Scott's strong commitment to ensuring conservation of natural resources and continued environmental improvement in land reclamation embodies Peabody's mission and longstanding commitment to stewardship," said Powder River Basin Operations Group Executive Kemal Williamson. "We are proud to have him on our team."

The environmental teams at Peabody's Wyoming mines have been cited several times in the last two years for award-winning reclamation.

Last year North Antelope Rochelle Mine earned the Wyoming Wildlife Federation's Corporation of the Year Award for "going beyond its normal business practice to promote, improve or support sustainable use of Wyoming's natural resources." A voluntary three-year study that tracked greater sage grouse, their movements and their habitat using radio collars identified ways to improve their nesting areas and prevent disease . Powder River Coal Company also conducts voluntary winter counts of antelope and mule deer.

In 2004, Powder River Coal also received the Wyoming Game and Fish Department's Industry Reclamation and Wildlife Stewardship Award for developing high-quality wetland and riparian habitat at North Antelope Rochelle, Caballo and Rawhide mines.

And in 2003, Caballo Mine was recognized by the U.S. Department of the Interior with a National Reclamation Excellence Award for improving wildlife habitat.

"It's personally satisfying to work for a company like Powder River Coal Company that considers stewardship of the land a core value," said Belden. "The support we get from Peabody management to accomplish reclamation has been strong and the resources we need are made available. Peabody's mission statement says that we will leave the land in a condition that is equal to or better than we found it, and we do. It's a commitment that comes from all levels within the company and is demonstrated through sustainable practices."

Belden is among several Peabody employees who have been honored by ASMR. Big Sky Coal Company Reclamation Manager E. Reginald Hoff earned the honor in 2000; Peabody Western Coal Company's Senior Environmental Scientist Vern R. Pfannenstiel earned a special reclamation award for developing an innovative cultural plant restoration program on Native American lands in 1996; and retired Peabody Coal Company Senior Environmental Specialist R. Brent Gray was Reclamationist of the Year in 1995.

Belden and his wife, Jonni, live in Gillette, where Jonni, a registered nurse, works in risk management at the local hospital. They are the parents of three children. Their oldest son, Kyle, has just finished his first year at Oklahoma Wesleyan University, where he is studying to be a minister. Their daughter, Ana, will be a senior in high school, and their nine-year old son, Gabriel, will be in fourth grade. ■

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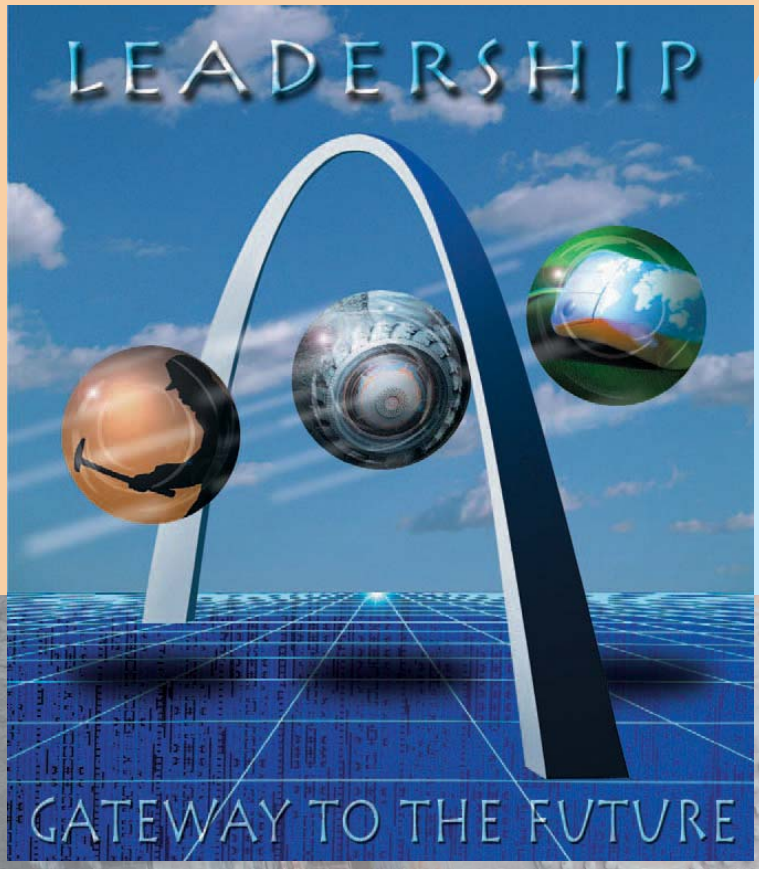

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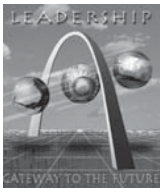

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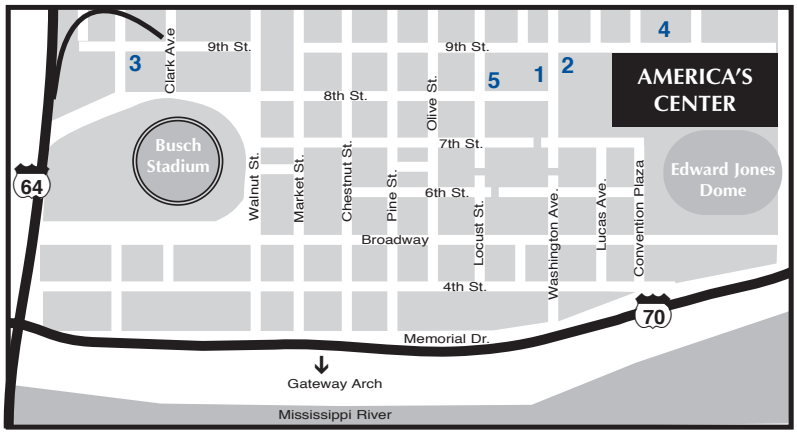

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On-line Room Reservations will be available after 11-1-05

Hotel Preference: *(Please select in order of preference to ensure placement).*

1. _____ **3.** _____ **5.** _____

2. _____ **4.** _____

Type of Accommodations Needed:

- ☐ Single (1 Bed, 1 Person)
- ☐ Double (1 Bed, 2 People)
- ☐ Double/Double (2 Beds, 2 People)
- ☐ Add rollaway to room *(based on availability at the time of check-in)*
- ☐ Non-smoking
- ☐ Suite *(For suite availability and rates, contact SME directly).*
- ☐ Handicap accessible room

Payment:

☐ American Express ☐ Diners Club ☐ Discover
☐ MasterCard ☐ VISA

Name (as listed on credit card): _____

Card Number: _____

Signature: _____ Exp. Date ______ (MO. YR.)

Cancellation Policy: One night's deposit is required with a valid credit card. Your credit card will be charged on or after February 24, 2006. Reservations guaranteed by a credit card may be cancelled without penalty until 5:00 PM MST on Tuesday, February 24, 2006. After February 24, 2006, a $25.00 cancellation/processing fee will be charged. **All reservations:** your full deposit will be forfeited if you cancel within **72 hours of your arrival date.**

Short Courses

1. Accelerated Development Program

Sunday, March 26, 2006

Overview: The Accelerated Development Program is designed to shorten the development cycle of social competencies in today's workforce by training incoming professionals.

Instructors: Leigh Freeman, Steve Rosene, and Andi Rosene

.7 CEU
$300 Member
$400 Nonmember
$200 Student Member

2. Grinding and Classification Models for Making Plant Improvements

Sunday, March 26, 2006

Overview: This course is intended to provide plant technical staff, whether they are metallurgists or technicians, or process engineers, or processing operations management, with knowledge of the mathematical tools that are available to characterize their circuit's performance.

Instructor: Robert E. McIvor

.7 CEU
$300 Member
$400 Nonmember
$200 Student Member

3. New Belt Conveyor Design Methods

Saturday and Sunday, March 25-26, 2006

Overview: This course will review all the changes, new technical methods and belt industry practices recently published by CEMA.

Instructors: Allen V. Reicks, Mark Alspaugh, and Todd Swinderman

1.4 CEU
$550 Member
$650 Nonmember
$450 Student Member

4. Optimization and Strategic Risk Management for Open Cut Mines

Sunday, March 26, 2006

Overview: This one-day course provides an opportunity for to learn about new developments in strategic mine planning, focusing on uncertainty/risk-based approaches to mine design and scheduling.

Instructors:David Whittle and Roussos Dimitrakopoulos

.7 CEU
$300 Member
$400 Nonmember
$200 Student Member

5. State of the Art Techniques for Mine Waste Closure Planning: Characterization, Monitoring and Modeling

Saturday and Sunday, March 25-26, 2006

Overview: This proposed short course is intended for industry, consultant and regulatory professionals who are currently practicing in the field of mine reclamation and closure, and desire to learn more about advanced characterization, monitoring and modeling techniques.

Instructors: William M. Schafer, Michael A. Milczarek, Murray Fredlund

$450 Member
$550 Nonmember
$350 Student Member

6. Treating Mine Drainage: A Detailed Review of Available Options and Their Advantages

Saturday and Sunday, March 25-26, 2006

Overview: This course will focus on active and passive treatment.

Instructors: Bernard Aube, Janice Zinck, Helmar Bayer, Thomas R. Wildeman, Jim Higgins, James J. Gusek

$450 Member
$550 Nonmember
$350 Student Member

Field Trips

1. Bonne Terre Lead Mine and Nearby Lead Tailing Piles

Date: Sunday, March 26, 2006
Time: 6:30 AM – 4:30 PM
Departs: Renaissance Grand
Cost: $66
Includes: Transportation, Tour, and Lunch
Tour two separate lead tailing piles in various stages of remediation. The tailing piles have significantly impacted Big River and Flat River Creek, mainly through sediment contamination by particulate transport. A tour of flooded areas of the Bonne Terre lead mine follows lunch.

2. Perry County, Illinois Wetlands/ Stream Restoration

Date: Sunday, March 26, 2006
Time: 7:00 AM – 3:45 PM
Departs: Renaissance Grand
Cost: $64
Includes: Transportation, Tour, and Lunch
Tour begins at the Illinois Department of Natural Resources Captain Mine Fish and Wildlife area complex. This site includes an award winning restoration of Pipestone Creek. The Captain complex is the CONSOL Burning Star No. 4 mine that includes two diverted restored streams and floodplain habitat. For contrast, a permanent diversion of Galum Creek below the No. 4 mine will also be visited.

3. Brushy Creek Mine and Mill (Doe Run)

Date: Thursday, March 30, 2006
Time: 7:15 AM – 5:00 PM
Departs: Renaissance Grand
Cost: $52
Includes: Transportation, Tour, and Lunch
Mining, equipment, geology, concentrating, and tailings storage will be observed and discussed. The Brushy Creek facility combines a large production underground mine with an associated surface concentrator. The surface facilities are very compact. The mine is connected by a central haulage drift to other mines located to the north and south. It is one of the six operating Viburnum Trend base metal mines that produce sulfide ore containing lead, zinc, and copper from Cambrian carbonate host rocks. The tour will include a mine and concentrator visit. It will also include a view of the tailings disposal facility. Visitors will descend approximately 1,000 feet down a vertical shaft to observe a large production underground mine. Mining is by room and pillar method with selective pillar recovery using remote loading. The mine openings are large and rubber tired equipment is used. Ore from the mine is hoisted to a three product flotation concentratorwhere lead, zinc, and copper concentrates are produced and loaded into trucks for transportation to customers. All necessary safety equipment will be provided. Please wear clothing suitable for underground. Finger Rings are not to be worn for safety precaution

4. Iron Mountain Mine and Missouri Igneous Geology

Date: Thursday, March 30, 2006
Time: 8:30 AM – 5:30 PM
Departs: Renaissance Grand
Cost: $62
Includes: Transportation, Tour, and Lunch
This trip includes stops at Iron Mountain mine and Trap Rock quarry, various stops along the trip will illustrate local geological relations and economic deposits of the Missouri Precambrian. Some hiking will be involved. Requires hard hat, boots and safety glasses.

5. Illinois Coal Revival

Date: Thursday, March 30, 2006
Time: 7:00 AM – 5:00 PM
Departs: Renaissance Grand
Cost: $64
Includes: Transportation, Tour, and Lunch
The first stop will be Knight Hawk Coal Company's Prairie Eagle Mine in Perry County, Illinois. Prairie Eagle is the most high tech "state of the art" surface mining operation in the region. They have gone after small isolated reserves of coal left by larger coal operations in the past, the mine is adjacent to pre-law surface operations and they are reclaiming those sites as well. The mine employs 50 people; they utilize 2 Cat D-11 dozers to move the overburden and a Komatsu 1250 excavator to mine the coal. A Superior Highwall Miner is also in use where the overburden is too deep to surface mine but not enough cover for an underground operation. Knight Hawk Coal Company has four mines and two carbon recovery units. They are also in the process of opening an underground operation. They sell their coal all over the Midwest and recently they have made shipments to Europe. The second stop will be the Illinois Coal Development Park in Carterville, Illinois. The ICDP is on a branch campus of Southern Illinois University Carbondale and houses SIUC Coal Research Center, the Dragline Productivity Center as well as the Illinois Clean Coal Institute. The Coal Park is also the site of the energy related research projects which are being conducted. Areas of interest are: coal extraction, coal preparation, coal combustion and utilization of the associated by-products from the combustion process. No personal safety equipment required except closed toed shoes.

SME Technical Sessions at-a-Glance

Monday, March 27 Afternoon

- Advances in Comminution: Comminution Practices
- Aeration of Sulfide Stockpiles – Is the Truth Really Out There?
- Bulk Material: Innovative Solutions to Bulk Material Handling Coal and Energy Utilization
- Dreyer Lecture
- Froth Phase in Flotation: Control I
- Functional Fillers I: Plenary
- GEM: A Four-Legged Stool: Community Sustainability
- Geology I
- How to Get Involved with SME: Your Ticket to Involvement
- ICARD: Forestry and Wetlands as Post-Mining Land Uses
- ICARD: Management
- ICARD: Mining Legacy
- ICARD: Plenary: International Scope and Programs
- ICARD: Social, Government and Sustainability Issues
- Limestone: Nature's Miracle Rock
- Resource Evaluation and Planning
- Surface Mining
- Valuation

Tuesday, March 28 Morning

- Advances in Comminution: Mill Design
- Bulk Material: Optimizing Conveyor Systems
- Froth Phase in Flotation: Control II
- Functional Fillers II: Nanocomposites and Nanofluids
- Gaudin Lecture
- Geology II
- Geomechanics: Extreme GroundConditions
- Health and Safety SME Technical Sessions at-a-Glance
- ICARD: Case Studies: Lessons Learned I
- ICARD: Characterization I: In the Field: Case Studies
- ICARD: Impacts I: Surficial Impacts
- ICARD: Treatment I
- IMAR-7 I: Markets and Uses for Industrial Minerals I
- Mining Industry of the Future Portfolio Review
- Underground Mining
- Underground Mining: Gold Rush Miners
- Underground Mining in an Urban Environment

Tuesday, March 28 Afternoon

- Advances in Comminution: Advanced Comminution Technologies
- Bulk Material: Conveyor Components and Their Engineering
- Coal Preparation
- Dude, What is My Job and How Did I Get There?
- Environmental
- Functional Fillers III: Functional Fillers
- Health and Safety Compliance Puzzles for Aggregates
- ICARD: Case Studies: Lessons Learned II
- ICARD: Characterization II: Formation and Process
- ICARD: Impacts II: Subsurface Impacts
- ICARD: Modeling
- IMAR-7 II: A Sneak Peek
- Innovative and Aggressive Machines
- International
- Operator's Open Forum: How Many Metallurgists Does It Take To?
- Pyrometallurgical Processing – Ye Ouch! Now That is Hot Stuff

Wednesday, March 29 Morning

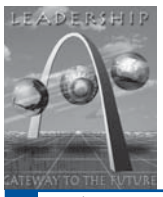
- Advances in Comminution: Liberation and Breakage
- Automated Process Control for Aggregate Production
- Bulk Material: Conveyor System and Component/ Engineering Guidelines
- Design and Safety of SX-EW Plants
- Functional Fillers IV: Formation and Characterization of Nanoparticles/Surfaces
- ICARD: IMWA-Mine Water and Environment
- ICARD: Prediction
- ICARD: Soils and Overburden I
- ICARD: Treatment II
- Instream Mining
- Mine Performance Improvements
- Open Pit Mining I
- Underground Ventilation
- Wadsworth Lecture

Wednesday, March 29 Afternoon

- Advances in Comminution: Instrumentation and Simulation
- Functional Fillers V: Applications of Nanomaterials and Nanominerals
- ICARD: Emerging Technologies
- ICARD: Pit Lakes/Backfill Issues
- ICARD: Prevention and Control
- ICARD: Soils and Overburden II Open Pit Mining II
- Research and Development: Mine Fire Prevention
- Underground Mining and Reuse of Mined Space

Thursday, March 30 Morning

- ICARD: Closure and Land Use Issues



Advance Registration Form

2006 SME Annual Meeting & Exhibit

March 26-29, 2006 St. Louis, Missouri

REGISTER... www.smenet.org

INSTRUCTIONS

- A $25 processing fee will be assessed on substitutions received after February 24, 2006.
- Registration may be sent via FAX only if payment is by credit card [FAX 801-355-0250 secure line].
- General registration questions – contact SME Conference Registration at 1-800-915-0618. email: registration@saltlake.org. Conference program questions – contact SME Meetings Dept. at 303-973-9550.
- Mail form and payment by February 24, 2006, to above address.
- Checks should be payable to SME in US funds.
- All cancellations must be submitted in writing by email: registration@saltlake.org or fax: 801-355-0250 and are subject to a $100 processing fee. No refunds after February 24, 2006.
- Registration is required to purchase tickets; however registrants may purchase more than one ticket.

HOW TO REGISTER

MAIL: SME Meeting Registration:
90 South West Temple
Salt Lake City, UT 84101
FAX: (801) 355-0250 (Secure Line)
ONLINE: www.smenet.org

Please Note: **This Icon ☞ represents MANDATORY COMPLETION for processing of your registration.**

If a Nonmember, are you applying for membership? ☐ **YES**
☐ **Check here if this is an address change.**
☐ **YES, I am interested in being a MENTOR.**
☐ **YES, I am interested in being a MENTEE.**

☞ ATTENDEE REGISTRATION

First Name _____ Last Name _____ To appear on badge (if different): _____

Job Title _____

Company _____

Address _____

City _____ State _____ Country _____ Zip/Postal Code _____

Day Phone _____ Evening Phone _____ FAX _____

E-mail _____ **Member #***(required for discount)* _____ **Member of:** ☐ SME ☐ TMS ☐ ISS ☐ SPE

Special Needs _____

SPOUSE/GUEST REGISTRATION – $75 (Check the Spouse/Guest Box in REGISTRATION FEES below.)

Spouses must register to attend the Exhibit. Fee covers: daily exhibit access, Monday luncheon, Sunday & Wednesday receptions and Tuesday refreshment break.

First Name _____ Last Name _____ To appear on badge (if different): _____

City _____ State _____

☞ REGISTRATION FEES

	BEFORE 2/24/06		AFTER 2/24/06		
	FULL	1-DAY	FULL	1-DAY	
☐ Member (M)	$420	$195	$495	$255	$ _____
☐ Student Member (SM)	$ 70	$ 70	$ 85	$ 85	$ _____
☐ Retired Senior Member (RM)	$200	$200	$235	$235	$ _____
☐ Legion of Honor Member (LH)	$200	$200	$235	$235	$ _____
☐ Nonmember Author (AT)	$420	$195	$495	$255	$ _____
☐ Nonmember (NM)	$545	N/A	$620	N/A	$ _____
☐ Student Nonmember (SN)	$ 90	$ 90	$105	$105	$ _____
☐ Spouse/Guest (SG)	$ 75	$ 75	$ 75	$ 75	$ _____
☐ 1-day Exhibit Hall Only (EXO)	N/A	$ 50	N/A	$ 50	$ _____

If you are registering for the MEMBER-ONLY 1-DAY REGISTRATION or 1-DAY EXHIBIT HALL ONLY PASS, indicate which day:

☐ **SUNDAY** ☐ **MONDAY** ☐ **TUESDAY** ☐ **WEDNESDAY**

SOCIAL FUNCTIONS

(No refunds or exchanges on social function tickets after February 24, 2006).

Monday, March 27

____ M&MSA Dinner [$50] RG — MMD $ _____

Tuesday, March 28

____ Coal & Energy Division Luncheon [$38] AC — CDL $ _____
____ ICARD Dinner [$38] RG — ID $ _____
____ ICARD Poster Session Luncheon [$35] AC — IPL $ _____
____ Industrial Minerals Division Luncheon [$38] AC — IML $ _____
____ Scotch Nightcap [$50] RG — SN $ _____
____ Women of SME Breakfast [$30] RG — WSB $ _____

Wednesday, March 29

____ Mining & Exploration Division Luncheon [$38] AC — MEL $ _____
____ Mineral & Metallurgical Proc. Div. Luncheon [$38] AC — MPL $ _____
____ **SME Dinner:**
____ Individual Tickets [$60] RG — SD $ _____
____ Table of 10 [$600] RG — SDT $ _____

TOURS

(Tours are subject to cancellation based on participation. No refunds or exchanges after February 24, 2006).

Sunday, March 26

____ Gateway to the West [$49] — GW $ _____
____ St. Charles Past and Present [$50] — STC $ _____

Monday, March 27

____ Discover St. Louis [$48] — DIS $ _____

Tuesday, March 28

____ Taste of St. Louis [$53] — TSL $ _____

Wednesday, March 29

____ Baseball and Beer in St. Louis [$56] — BB $ _____
____ Homes and Gardens [$50] — HAG $ _____

FIELD TRIPS

(Field Trips are subject to cancellation based on participation. No refunds or exchanges after February 24, 2006).

Sunday, March 26, 2006

____ Bonne Terre Lead Mine and Nearby Lead Tailing Piles [$66] — BTL $ _____
____ Perry County, Illinois Wetlands/Stream Restoration [$64] — PCI $ _____

Thursday, March 30

____ Brushy Creek Mine and Mill (Doe Run) [$52] — BCM $ _____
____ Iron Mountain Mines and Missouri Igneous Geology [$62] — IMM $ _____
____ Illinois Coal Revival [$64] — ICR $ _____

SYMPOSIA PROCEEDINGS

(Available for pick-up at the meeting in the SME Bookstore).

____ Advances in Comminution — AC $ _____
[$99 Member, $129 Nonmember/List, $79 Student Member]

____ Bulk Material Handling by Conveyor Belt VI — BM $ _____
[$69 Member, $89 Nonmember/List, $59 Student Member]

____ Functional Fillers and Nanoscale Minerals II — FF $ _____
[$89 Member, $109 Nonmember/List, $79 Student Member]

First Name _____ Last Name _____

PROCEEDINGS CD-ROM

Available for pick-up at the meeting in the SME Bookstore.

*(Full registrations, one-day and students receive either a 2006 SME Annual Meeting Preprint CD-ROM **OR** the 7th ICARD proceedings on CD-ROM).*

Indicate your choice:

____ 2006 SME Annual Meeting CD-ROM ROM
____ 7th ICARD Proceedings on CD-ROM IROM

Additional copies may be purchased:

____ 2006 SME Annual Meeting CD-ROM ROM $ _____
[$49 Member, $59 Nonmember $39 Student Member]

____ 7th ICARD Proceedings on CD-ROM IROM $ _____
[$49 M,ember $59 Nonmember, $39 Student Member]

FIELD / INTEREST

(Check one)

____ Coal Mining (1B)
____ Coal Processing (6)
____ Construction Materials & Aggregates (CA)
____ Economics (4)
____ Environmental (7)
____ Geology/Exploration (8)
____ Government (2)
____ Industrial Minerals Mining (1C)
____ Industrial Minerals Processing (1D)
____ Manufacturing (5)
____ Metallurgy (9)
____ Metals Mining (1A)
____ Metals Processing (10)

JOB DESCRIPTION

(Check all that apply)

____ Consultant (C)
____ Educator (D)
____ Engineer (E)
____ General Manager/Vice President (G)
____ Geologist (H)
____ Marketing/Sales (M)
____ Mine/Plant Manager (N)
____ Owner (O)
____ President/CEO/COO (P)
____ Purchasing Agent (R)
____ Scientist/Researcher (S)
____ Student (T)
____ Supervisor/Foreman (U)

SHORT COURSES

(Fees are in addition to SME registration. All short courses are held at the America's Center).

March 25-26, 2006

New Belt Conveyor Design Methods

	ADVANCE	AFTER 2/24/06		
____ Member	$550	$625	NBM	$ _____
____ Nonmember	$650	$725	NBN	$ _____
____ Student Member	$450	$525	NBSM	$ _____

State of the Art Techniques for Mine Waste Closure Planning: Characterization, Monitoring and Modeling

	ADVANCE	AFTER 2/24/06		
____ Member	$450	$525	SAM	$ _____
____ Nonmember	$550	$625	SAN	$ _____
____ Student Member	$350	$425	SASM	$ _____

Treating Mine Drainage: A Detailed Review of Available Options and Their Advantages

	ADVANCE	AFTER 2/24/06		
____ Member	$450	$525	TMM	$ _____
____ Nonmember	$550	$625	TMN	$ _____
____ Student Member	$350	$425	TMSM	$ _____

March 26, 2006

Accelerated Development Program

	ADVANCE	AFTER 2/24/06		
____ Member	$300	$375	ADM	$ _____
____ Nonmember	$400	$475	ADN	$ _____
____ Student Member	$200	$275	ADSM	$ _____

Grinding and Classification Models for Making Plant Improvements

	ADVANCE	AFTER 2/24/06		
____ Member	$300	$375	GCM	$ _____
____ Nonmember	$400	$475	GCN	$ _____
____ Student Member	$200	$275	GCSM	$ _____

Optimization and Strategic Risk Management for Open Cut Mines

	ADVANCE	AFTER 2/24/06		
____ Member	$300	$375	OSM	$ _____
____ Nonmember	$400	$475	OSN	$ _____
____ Student Member	$200	$275	OSSM	$ _____

ADVANCE REGISTRATION DEADLINE: FEBRUARY 24, 2006

PAYMENT

Please Total both pages

Payment must be in US Dollars **GRAND TOTAL $ _____**

☐ Check or Money Order Payable to (SME) Society of Mining, Metallurgy, and Exploration, Inc.

☐ American Express _____ Expiration Date _____

☐ MasterCard _____ Expiration Date _____

☐ Visa _____ Expiration Date _____

☐ Discover _____ Expiration Date _____

Signature _____

I agree to pay the total according to card issuers agreement.

If paying by credit card the number and expiration date must be included for processing.

If you are a nonmember please review the cost savings and become an SME Member today and start saving… see pages 24-26 for details.

New Membership Application Form 2006

❑ Dr. ❑ Prof. ❑ Mr. ❑ Miss ❑ Ms ❑ Mrs.

Name: _____

Job Title: _____

Company, University, Agency, etc.: _____

Preferred Address:

_____

_____

Second Address (optional):

_____

_____

E-mail address: _____

Business Phone: (_____) _____ Home Phone (optional): (_____) _____

Business Fax: (_____) _____ Mobile Phone (optional): (_____) _____

Technical Div. 1st choice[1] _____ Technical Div. 2st choice _____

Technical Div. 3st choice _____

Professional Certification[2] 1st _____

Professional Certification[3] 2nd _____

Professional Certification[4] 3rd _____

Were you referred[5] by a current ASMR Member? If yes, enter their name here. _____

Footnotes

[1] Choices include Ecology, Forestry and Wildlife, Geotechnical Engineering, International Tailings Reclamation, Land Use Planning and Design, Soil and Overburden and Water Management.

[2] Include states certified if appropriate.

[3] Include states certified if appropriate.

[4] Include states certified if appropriate.

[5] This person will receive credit for the membership contest.

2005 Subscriptions Available to Members at No Charge in Addition to our Magazine – Reclamation Matters Also one copy of the CD of Proceedings from the past meetings is complementary, choose one of the following:

❑ 1990 ❑ 1994 ❑ 1996 ❑ 1997 ❑ 2002 ❑ 2003 ❑ 2004 ❑ 2005

You must check the appropriate boxes to keep receiving these publications:
❑ Inside Coal (Quarterly, So. Illinois University) ❑ FIPR newsletter (Florida Inst. Phosphate Res.)

Membership Class:	Advanced Payment Annual Dues	Advanced Payment Per Year	Lifetime[6] Membership	No. Years	Total Amount
Regular	$50	$50	$500	_____	_____
Sustaining Member	$100	$100	$1,000	_____	_____
Corporate Member	$100	$100	$1,000	_____	_____
Full-time Student	$10	$10	N/A	_____	_____
Part-time Student	$25	$25	N/A	_____	_____

Memorial Scholarship Donation (Tax deductible receipt will be mailed to you) _____
With a donation > $25, a CD of Stu Bengson slides will be sent in appreciation of your gift.

Membership Dues _____

Other Publications		Rate	Amount
Ecological Restoration –	Individual (Includes online access)	$43	_____
	Foreign Individual (Surface) (Includes online access)	$53	_____
	(Air Mail) (Includes online access)	$78	_____
Intern. J. of Surface Mining & Reclamation (16 more pages in 2004)		$123	_____
Land and Water –	USA	$15	_____
	Foreign	$27	_____
Northwest Mining Association Bulletin		$10	_____
Mine Water & the Environment *(4 issues/year + Membership in IMWA) Subscriptions end March 31*		$40	_____
		Subscription Total	_____
ASMR hats with logo white mesh $15, solid tan		$16	_____
ASMR shirts M, L, and XL $25 & XXL and XXXL		$30	_____

Add $5.00 if payment by credit card _____
Grand Total (Dues, Subscriptions, etc.) _____

❑ MasterCard ❑ Visa Card Number (- - -) Expiration Date (/)

Name as appears on card (Please print)_____ Signature _____

Make checks payable to: **American Society of Mining and Reclamation or ASMR in U.S. Dollars.**

Send to

American Society of Mining & Reclamation
3134 Montavesta Road, Lexington, KY 40502-3548

For questions, call (859) 351-9032 or email asmr@insightbb.com

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