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2016

Conference Issue

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PRESIDENT'S MESSAGE

Moving Forward

By Brenda Schladweiler, ASMR President

Greetings as we enter a New Year. As always, the holidays seem like a blur...last thing I remember was Halloween.

Over these last months, your National Executive Council (NEC) has been busy, not only preparing for the upcoming national meeting, but also dealing with many administrative items. The ASMR National Meeting Guidebook has been finalized and was approved by the NEC on January 21, as was the ASMR Policy Hand-

book. Thanks to all who provided assistance through many weeks and months! Both documents were truly a team effort. The new web site is more than a wish at this point. We were hoping to have it up and running by now in anticipation of the Spokane meeting. We are somewhat behind the curve but moving forward. Dick Barnhisel continues to keep the old web site useable until this new version comes online. Lee Daniels and his financial investment subcommittee members contin-

ue to look out for the financial well-being of the society. Thanks to all!

The planning for the Spokane meeting is going well. Dustin Wasley and his planning committee have lined up an outstanding week of activities. I was in Spokane a few years back for another society's meeting, and that city offers an excellent venue. Please plan on attending. Thanks to Dustin and his group!

Robert Darmody agreed to another year functioning as your Executive Secretary. Having consistency in that position is very helpful. We saw that with Dick Barnhisel. Thanks to you, Robert!

As you can see, it takes a WHOLE LOT of people for this society to function. We are blessed that we have a dedicated and committed membership to see that reclamation science advances in this age when the extractive industries are under fire. Consider "tooting our horn" on any local and state opportunity to not only highlight the society but to also allow the general public to understand what reclamation is all about. It would be my goal that every household in Wyoming understands that word. It is part of the natural resource extraction cycle in which we all have a role. If any one person decides that they are for or against an activity, make that decision based on facts and knowledge. Too many times, emotion rules in policy making. Make it your goal in your community to educate someone about what you do – make it personal to them. One person at a time. We don't want to be the best kept secret out there.

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EDITOR'S MESSAGE

PROCRASTINATION – The Enemy of Productivity and Peace

By Jeff Skousen, West Virginia University

My oldest son is in the final stages of writing his dissertation for his graduate degree at the University of Illinois. His graduate program is in archaeology and anthropology, and he has been a very productive researcher and writer during the past four years. He has already published three journal articles and three book chapters, and has co-edited a book on this topic; very good for a person at this stage in his career. He has always been a driven person and tends not to dilly-dally over decisions or actions that need to be taken. I'm not sure where he gained these attitudes, but he seems to manage wisely his time and efforts. I am quite proud of him.

Most of us are pretty good at managing our time in productive and efficient ways. We all learned this through trial and error, because without time management, we found ourselves buried and suffocating. Some of us are busy doing field work, compiling data, and writing reports. Others are managing people and organizations, which is time-consuming and sometimes

thankless. Too many of us can be trapped in numerous meetings, which seizes our time and strips our output. I know of many people who primarily teach, which takes much time for preparation and delivery. A few people are involved in evaluating and regulating the efforts of others, and this requires candor, diplomacy and compassion. Clearly, our lives are full of job, family, church, hobbies, exercise, and other responsibilities and these things demand our best and indefatigable efforts. But some of us are so busy that we become overwhelmed with too many things to do, too many places to be, and too many deadlines to meet. We are pulled in so many directions, each with their own consequences, and we struggle to decide which path to take and when to take it. Busy, busy, busy. We've all experienced this.

Setting priorities and fulfilling commitments in a timely manner are the best ways to keep from falling behind and being unfocused and unproductive. I have learned by experience that procrastination is our #1 enemy to efficiency and output.



In my earlier days, I taught seminars on time management and gave five principles to minimize procrastination, indecisiveness and futility. To me, these are keys to happiness.

1. Daily planning the night before. I ask myself "What must I accomplish tomorrow?"
2. Work with a clean desk. Clutter is paralyzing.
3. Reduce large projects to task-sized pieces and complete one task at a time.
4. Plan on interruptions and work around obstacles, but don't get sidetracked and discouraged.
5. Assign firm deadlines.

I believe these five keys help us stay focused on the essential things we must accomplish. Our "To Do" lists should be prioritized and concise, and guide our plans and efforts. If you also use these keys and establish this pattern in your life, I am confident your anxiety will decline, and you will find greater personal happiness and peace. ■

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EARLY CAREER MESSAGE

Meet Cindy Adams

By Cally Driessen

Meet Cindy Adams, the incoming Early Career Representative to the NEC

Cindy Adams is the Business Development Manager at BKS Environmental Associates, Inc. She graduated in 2005 from the University of Denver with an MBA and a BS in Environmental Science. Cindy has been a member of ASMR since 2009 and becomes the Early Career Representative to the NEC in June. Cindy took the time to answer a few questions so we could get to know her better.

What inspired you to pursue a career in reclamation?

Truth be told, it was the first real job that hired me out of college and was willing to give me a chance. I wanted to find a job that I could combine my business and environmental science degree, and environmental consulting offered that. Reclamation is fulfilling, as it is a key component to striking a balance of energy extraction and environmental well-being. Spending more and more time in the energy extraction industries, I have gained a better appreciation and understanding of the challenges that we face.

Describe your work experience

Working for a small environmental consulting firm, my job offers a diverse set of tasks ranging from technical to business aspects – from fieldwork, data collection, and report writing to project management, business development, marketing, and business management. Every day brings new challenges and opportunities.

One of my favorite projects was conducting reclamation monitoring on the Glenrock Coal mine, as the mine is now a Wind Farm and harvests another type of energy.

The range of projects includes baseline surveys (prior to development), interim reclamation monitoring to determine reclamation success, threatened/endangered/sensitive plant habitat and species surveys, aquatic resource inventories including wetland delineations, bond release vegetation sampling, and many more.

What have you gained from your experience as an Early Career member of ASMR?

I enjoy the Early Career socials at ASMR. I have met many other young professionals and graduate students who are working in reclamation. It's interesting hearing their experiences and the new reclamation research.

At the Laramie conference in 2014, I met one of my mentors and now co-chair of the Wild Women of Reclamation. All of these have given me some good personal advice which I am grateful to have had.

Do you think there is more this society can do to inspire early career professionals to be active and eventually become lifelong members?

The challenge is that most early career professionals don't set out to have the same career for a lifetime. More important to them is to have opportunities to grow in the organization and be involved at a level that they feel comfortable with. Some early career

professionals may stay only for a couple of years as members of the society, while others may become lifelong members. Regardless, the society, right now, can inspire all of them in their reclamation aspirations.



What do you hope to accomplish as the new EC representative?

- Continue to have the early career social at the ASMR national conferences, which aids in networking and general enjoyment.
- Widen the membership base by encouraging all those involved in reclamation, regardless of the particular industry, to join ASMR and participate in meetings.
- Provide more visibility to the opportunities that are available to early career professionals in ASMR.

What are your hobbies and interests outside of work?

I enjoy gardening, but my friends call what I do larger than gardening. We typically plant 100+ tomato plants each year along with a variety of other vegetables. My family and I do a lot of canning,

and some of my favorites are spaghetti sauce, fruit salsa, and peach jam. Each year I have an experimental vegetable. In years past we've planted purple potatoes, heirloom tomatoes, butternut squash, sweet potatoes, and purple carrots. I haven't yet decided what this year's experiment will be.

My husband and I are currently building a house in Colorado on our family's ranch. It is the most beautiful place and a great spot to get away from it all.

Other interests include hiking, camping, traveling, and scrapbooking. I enjoy hanging out with my niece and nephews.

Cindy is helping plan the early career social at this year's meeting. We are very excited for this year's event and hope to see everyone in Spokane! ■



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Challenges and Opportunities: Reflections on a Life in Mined Land Reclamation

*By Dr. Stephan Schroeder, Soil Scientist (Retired State of North Dakota);
Dr. Terry Toy, Geomorphologist (Retired University of Denver);
Kimery Vories, Reclamation Ecologist
(Retired USDI Office of Surface Mining Reclamation & Enforcement)*

Introduction

In the last 50 years, those of us working to protect and enhance the environment associated with the production of energy have experienced a roller coaster ride that has been both exhilarating and exasperating. The unpredictable changes to the regulatory arena; the environmental mood of the nation; national, international and corporate politics; dramatic changes in mining, transportation, and fuel combustion technologies; and economic fluctuations that dramatically impact the viability of when and where mining and reclamation can be economically done have all profoundly impacted the lives of professionals involved in mined-land reclamation. Since we have lived on this roller coaster for the past few decades, we have some perspective and experience that can be shared with future professionals with the hope that our experience can help brace you for an equal or greater ride in the future.

Whether a person is employed in academia, government, industry, or consulting, personal and professional growth is contingent on many important variables some of which are beyond our control. Therefore, here we want to focus on positive elements that can be controlled and will facilitate personal and professional growth over a career course in this field. We have found that the

consistent and constant positives that have endured during this experience include dedication to the advancement of the sciences, professionalism, inspirational mentoring, and partnerships. The one organization that the authors have in common and that has nurtured the best of these positives over the years has been the American Society of Mining and Reclamation.

Record of Significant Events and Advances in the Science and Technology

The following table lists on the left column some Significant Events that have impacted the field of mined land reclamation that the authors have experienced over the last five decades. The right column lists advances in the science and technology for the same time period. Neither list is intended to be comprehensive but includes those events and advances with the greatest impact to the authors.

Career Observations and Conclusions

Dr. Stephan Schroeder

Over the past 35 years, Dr. Stephan Schroeder has worked in the coal mining industry of North Dakota. He started his career as a Reclamation Research Scientist with North Dakota State University's Land Reclamation Research Center (LRRC) located on the USDA-ARS Northern Great Plains Research Laboratory facility in Mandan, ND. There he conducted numerous research studies on moisture movement within spoils; reclaimed land productivity as affected by factors such as fertility, depth of topsoil, and topography; and



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1960s

Significant Events Impacting Mine Reclamation	Advances in the Science and Technology
	Development of field and laboratory manuals, equipment, and computer programs by academia and government agencies (USGS, USFS, ARS and USDA) to accurately measure environmental variables and subsequent impacts
1969 - North Dakota mines required to regrade lands to be traversable by farm machinery	
1969 - National Environmental Policy Act -First major federal effort to regulate industries impacting the natural environment	

1970s

Significant Events Impacting Mine Reclamation	Advances in the Science and Technology
Many mining States pass laws that require minimal reclamation at coal mines like grading spoil ridges, sedimentation ponds, and revegetation. Requirements and enforcement varied from state to state.	1973 - The American Society of Mining and Reclamation (ASMR) evolved from a small West Virginia advisory council. Workshops and conferences established to communicate advances in mined land reclamation. Aerial seeding developed to revegetate remote minimally graded reclaimed land.
1973 - Oil Crisis initiated by OPEC	Federal research funds poured into studies related to the environmental impacts of mining and processing oil shale in Colorado and Utah. Studies focused on impacts to the geology, vegetation, wildlife and reclamation technology.
1975 - North Dakota requires up to two meters of soil to be removed, segregated, and respread; no vegetation standards defined. North Dakota requires lands back to approximate original contour (AOC), up to 75 cm of soil to be removed and replaced, reclamation to meet Public Service Commission satisfaction (nothing specified).	1977 - Colorado State University prepares the first computer-aided program, the Plant Information Network (PIN), which allowed land reclamation professionals to select the most suitable native species that could be grown in specific geographic locations.
Clean Water Act (1972) passed that created the Federal Environmental Protection Agency. Mining operations required to apply for NPDES permits for control of water quality from discharges. Off-site sediment discharges regulated, usually with installation of sediment ponds. Fly ash produced at some power plants is incorporated into the final reclamation of on some coal mines.	1976 - Workshop on Reclamation of Western Surface Mined Land sponsored by Ecology Consultants Inc. and proceedings edited by Kimery Vories
	Water quality monitoring expanded at mines. Active and passive treatment of acid mine drainage (possibly better in the 1960s).
Clean Air Act (1970) passed requiring fugitive dust control at mines from pits, tipples and haul roads.	Air quality monitoring expanded at mines
	Ivan Jansen at the University of Illinois conducts research on the restoration of prime farmland following coal mining.
1977 - Federal Surface Mining Reclamation and Control Act passed creating the USDI Office of Surface Mining and requiring all States to develop similar laws and regulatory programs. Coal mining operations required to apply for Federal Interim program permits until the States could develop programs and be granted regulatory primacy. Comprehensive regulatory program for conducting base line environmental studies, permitting, reclaiming and revegetating surface coal mines.	Federal and State programs, consultants and industry begin hiring technical staff that will be needed to implement SMCRA (often from other federal and state agencies).
	Erosion studies at mines comparing natural and reclaimed lands.
	Adaptation of Universal Soil Loss Equation to use on mine-lands. Vegetation and reference plots established.
	Mining companies often hired farmers to revegetate graded areas. Erosion control practices commonly included surface manipulations (grading), top-soiling, fertilizer application, seeding, mulching and sometimes irrigation in the West. Reclamation practice became progressively more elaborate.

1980s

Significant Events Impacting Mine Reclamation	Advances in the Science and Technology
1980 - Acid Deposition Act Passed	1981 - US Fish and Wildlife development of information and technologies that would allow for the commercial production and establishment of more native species in the West.
	Research funding into causes and effects of acid rain. Coal-fired power plants in the East and Midwest begin to install scrubbers and begin incorporating the sludge into mine reclamation.
1982 on Black Sunday - Exxon pulls out of Oil Shale effectively shutting down the industry in the U.S.	1981 - First biennial Billings Land Reclamation Symposium sponsored by Dr. Frank Munshower of Montana State University and Mr. Scott Fisher of OSMRE. There were 11 symposia that continued through 2009. Two symposia were held jointly with ASMR.
1982 - Permanent Regulatory program for Federal Surface Mining Control and Reclamation Act published and implemented in most States.	1982 - First Mine Land Reclamation Symposium in Mandan, ND sponsored by the North Dakota State University Land Reclamation Research Center and the USDA Northern Great Plains Research Laboratory
1985 - Rail monopoly on transportation of coal out of the Powder River Basin is broken which results in a dramatic reduction in the cost of coal and results in a dramatic decrease in mining operations in the Midwestern U.S.	1984 - First meeting of ASMR and continued dissemination of scientific and technical information through ASMR meetings.
	1987 - First book published on the geomorphology and reclamation of disturbed lands, included mined lands.
	Studies on use of biosolids in mined land reclamation. Development of equipment and expansion of seed sources for reclamation.

1990s

Significant Events Impacting Mine Reclamation	Advances in the Science and Technology
	OSMRE initiates a series of technical interactive forums to advance the science and technology of revegetation in the West.
States continue revision and expansion of requirements for reclamation and bond-release. Tightening regulation and raising expectations.	1996 - OSMRE co-hosts with Southern Illinois University its first national technical forum on Placement of Coal Combustion By-Products at coal mines.
	1998 - OSMRE conducts the first technical interactive forum on the Reclamation and Restoration of Prime Farmland on mined land.
	1998 - OSMRE signs MOU with Bat Conservation International to partner on efforts to protect bats at both abandoned and active coal mines.
	1999 - OSMRE conducts its first national technical forum on ways to improve reforestation at coal mines.

studies on runoff and erosion on spoil and reclaimed lands using a rainfall simulator. His experience with coal mine lands prior to that was limited to a soil classification field trip as a graduate student at Purdue University. While having the advantage of seeing a complete soil profile all at once, the biggest things he remembers from the trip was the professor pointing out a

reddish-brown surface water flow (later told was acid mine drainage), trees trying to establish in very thick introduced species of grasses and legumes, and finally the seemingly hundreds of ticks that were prevalent in the area. Was that "wildlife" re-establishment?

At his job site in North Dakota, he was fortunate to meet with Dr. Armand Bauer

who had done extensive field research on the mines in North Dakota for approximately five years. With his mentoring from and collaboration with Dr. Bauer, he was able to start his research and analyses of previously collected data almost immediately which led to several joint refereed papers. This mentoring (more on this below) was invaluable to his career.

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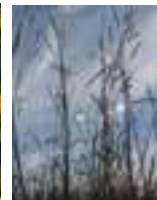
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2000s

Significant Events Impacting Mine Reclamation	Advances in the Science and Technology
2000 - First hectares of prime farmland released from final bond at the Glenharold Mine near Stanton, ND.	2000 - OSMRE conducts a technical interactive forum on bat conservation at coal mines.
	Development and refinement of landscape design software incorporating geomorphic principles. Likewise, increased use of computer mapping and GIS in reclamation.
	2002 - OSMRE publishes the first comprehensive bat gate design manual for protecting bats at caves and mines.
	2002 - OSMRE conducts a national technical forum on market based approaches to reforestation of mined lands.
	2004 - OSMRE conducts a national technical forum protecting endangered bats at coal mines.
	2005 - OSMRE begins annual funding for Applied Science projects to develop applicable new science and technology to improve reclamation.
2006 - Outbreak of White-Nose Syndrome in Bats that will result in the death of millions of bats as it spreads throughout the eastern US. USFWS, OSM, and Interstate Mining Compact Commission jointly develop guidance for protecting endangered bats at coal mines.	2006 - OSMRE conducts its first technical Geomorphic Reclamation forum for the Western US. Increasing recognition of the applicability of the earth science of geomorphology to mined land reclamation.
Global Warming science and debate evolves into actions that will decrease coal mining and use of coal as a fuel. 2008 Historical US annual coal production peaks and declines hereafter.	2009 - OSMRE conducts its second national technical forum on Geomorphic Reclamation.

2010s

Significant Events Impacting Mine Reclamation	Advances in the Science and Technology
2013 - US EPA effectively requires that many older coal-fired power plants be shut down and prohibits the construction of new coal fired power plants in the US.	2010 - OSMRE conducts a national technical forum on protecting endangered bats threatened by White-Nose Syndrome.
2015 - Global Oil Glut caused by OPEC that dramatically impacts the oil fracking business and thus the reclamation related to the same in the US.	2014 - OSMRE conducts its third national technical forum on Geomorphic Reclamation Growing application of Geographic Information Systems in mining and reclamation.
2015 - OSMRE publishes a Federal proposed rule that would completely revise all of the requirements for conducting coal mining and reclamation operations in the US.	
Nearly 175 hectares of prime farmland totally bond released in North Dakota to date.	

Dr. Schroeder has published over 75 refereed publications, symposium proceeding papers, and research reports from his mined land research work. In addition, he collaborated on the development of the Revised Universal Soil Loss Equation v. 1.06 used for disturbed lands along with others including a co-author of this paper, Dr. Terry Toy. To his amazement, the PowerPoint lectures on this program can still be found on the inter-

net by doing a search on the site called www.powershow.com. Another highlight of his research career was the increased use of direct re-spreading of SPGM and immediate cropping of croplands rather than seeding to grass and legumes for several years. He also served as a research adviser on grants provided by the OSMRE Western Regional Office in order to help present research results at several symposiums.

Following the closing of the LRRC in 1994 due to reduced funding, Dr. Schroeder began a new career as a mine land regulator when he was hired as an Environmental Scientist for the North Dakota Public Service's Reclamation Division. In this capacity, he was able to participate in not only the permitting process but also the compliance and bond release aspects for the entire mining process. He espe-



cially enjoyed being part of the process of reclaimed mine lands getting final bond release after 10 years by achieving all of the revegetation standards proscribed by North Dakota law (over 8,600 ha permitted after July 1, 1979 to date).

During his tenure with the PSC, he was amazed to find that a lot of mining personnel had not stayed current with previous research techniques but were promot-

ing failed procedures during that earlier research. This past experience and knowledge of what did and did not work proved to be very helpful over the years. Thus, Dr. Schroeder's mentoring skills were put into practice long after he had completed his final research projects. He also suggested that membership in organizations such as ASMR would be highly beneficial and well worth the expense involved to join and attend meetings.

Thus, Dr. Schroeder has remained a member of ASMR long after his retirement from the PSC in 2011 for several reasons. While he and his wife Nancy enjoy traveling to various cities around the states for the annual meetings and visiting with friends and colleagues, Dr. Schroeder is still very interested in current research and its progression over the last few years. He also enjoys the interaction, or mentoring, that occurs between the newer

members of the society and those who have been around for, say, a "few" years. In this manner, he feels he is giving back in a similar manner that Dr. Bauer did for him early in his career.

Dr. Terry Toy

The interest and experience in mined land reclamation for Dr. Terry Toy began in 1971 while working as a hydrologic technician with the Public Lands Hydrology Program of the US Geological Survey (USGS) in Denver, Colorado. He was assigned to work with the hydrologists and geomorphologists in that



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office to compare erosion and sediment yield from undisturbed and reclaimed mine lands using large-scale rainfall simulation. Participation in the rigorous research at the USGS strongly influenced his entire professional career.

From this beginning, Dr. Toy was awarded 8 grants from Government agencies and private industry, co-authored two books, edited two other books, published 13 book chapters, four extensive map series, 34 journal articles, 22 refereed conference proceedings, six workshop manuals, and a few other miscellaneous professional reports. These pertained to mined land reclamation, geomorphology and erosion. In recent years, he has focused on erosion prediction using the Revised Universal Soil Loss Equation for severely disturbed lands, including mined lands. He considers himself first a geomorphologist and second an erosion sci-

entist, both with applications to disturbed lands. While a professor at the University of Denver, Dr. Toy taught 18 different classes, ranging from the introductory level to doctoral level, including hydrology, process geomorphology, soil erosion, and disturbed land reclamation. Several students from these classes have taken their place in the reclamation profession, and he is proud of their accomplishments.

Over the years, Dr. Toy has worked as a consultant for both coal and hard-rock mining companies in developing and evaluating mine site plans in general and the erosion potential of reclamation surfaces in particular. This consulting experience proved invaluable in bringing reality to his research and to the classroom.

Since 1971 there has been a notable evolution in mined land reclamation. Originally, much of the concern about the damage to the environment caused

by mining focused on mass-movement, erosion, and degradation of water quality due to sediment and chemical discharges. These were major issues wherever mining was taking place and especially in Appalachia. Through time, the focus changed. Erosion control and water quality issues declined and now the emphasis seems to be on revegetation. Maximizing species variety and production seems to be the goal. Interestingly, some recent studies have found that, although a large number of plant species may have been planted, natural processes and selection tend to reduce the total number to a subset of species particularly adapted to the site conditions. Efficiency in reclamation may be an important objective in the future. It is extremely important for those engaged in mined land reclamation and especially those entering the profession to become thoroughly familiar with the existing literature in American Society for Mining and Reclamation proceedings and in various professional journals. Otherwise, they are doomed to "reinventing the wheel" with some regularity. Limited funding demands efficiency in reclamation.

Most professionals belong to various societies and organizations. Dr. Toy considered the most important of those to be the American Society of Mining and Reclamation (ASMR). It is the mix of academics, regulators, and reclamation specialists that makes this organization so special. A respectful atmosphere of different perspectives and experiences maximizes the opportunity of "real-world" solutions to "real-world" reclamation issues. His association with ASMR has been valuable, highly rewarding and enjoyable.

Prognostication of the future for reclamation will include increased use of Geographic Information Systems and computer modeling to design and monitor mining and reclamation lands. Perhaps, monitoring by the companies and regulators will include the use of drones.

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Kimery Vories

Over the past 50 years, Kimery Vories has tried to carve out a career in protecting the environment related to energy extraction through mining. His career in science began as a research assistant for the USDA Agricultural Research Service in 1964. Thanks to his mentor, Dr. Hugo Ferchau at Western State College in Colorado, he conducted an extensive vegetation analysis of the Piceance Basin of Western Colorado during the first oil-shale boom in the mid-70s. He was one of the developers of the Plant Information Network (an early attempt to use computers to integrate vegetation characteristics with suitability for mine land reclamation) at Colorado State University. At CSU, he also developed a system for accessing seeding and vegetation establishment information, which focused on the use of native plant species for reclamation and published the first of a series of guidebooks on the subject. He holds a BA & MA in Biology/Geology from Western State College of Colorado with an additional three years Post MA Graduate work in Ecology and Reclamation at the University of Massachusetts and Colorado State University. He has been professionally employed in coal mining and reclamation since 1979 with 80 related publications. He served in the US Coast Guard from 1968 to 1974, where he became the first oil pollution investigator for the coast of Washington State in 1971.

He was the manager of environmental services for seven years for a large (2

million ton/year) Midwestern coal mine. There he pioneered the use of landscape design to maximize the post mining value of the reclaimed land, the use of quality overburden materials as soils, the restoration of prime farmland, beneficial placement of CCBs in reclamation to support the post-mining land use, and reforestation on minimally compacted soils with noncompetitive herbaceous species during the early '80s. Thanks to William Marbaker, his mentor with the Missouri Mining Industry Council, he came to understand how essential it was to integrate environmental protection into the mining industry in a way that produced a net positive result for modern civilization.

He joined the USDI Office of Surface Mining (OSM) in 1987. He chaired several multi-agency, multi-interest group steering committees that held technical forums, published proceedings, and managed Internet Websites on mining and

reclamation issues related to the technical aspects of: Reclamation with Coal Combustion By-Products; Prime Farmland Reclamation; Bat Conservation and Mining; Geomorphic Reclamation; and Reforestation. He has served on: (1) the Editorial Board for Coal Combustion and Gasification Products, a peer reviewed scientific publication of the University of Kentucky; (2) the National Steering Committee and Technical Steering Committee for the World of Coal Ash Symposium; (3) was the team leader for the OSM National Technology Transfer Team and its Applied Science Funding Program; and (4) was an instructor in OSM's National Technical Training Program for courses in Acid Forming Materials Fundamentals and Soils and Revegetation. He retired from OSM in 2014.

He is a lifetime member of the ASMR. He has served on the National Executive Committee, nominations committee,



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U.S. Department of Interior, Office of Surface Mining
Rock Springs Subsidence Mitigation Project

"People's Choice" National AML Reclamation Award
U.S. Department of Interior, Office of Surface Mining
Snake River Gravel Pit Project

"Western Regional Award" Exemplary Reclamation Project
U.S. Department of Interior, Office of Surface Mining
Kleenburn Coal Mine Project



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served as president, and organized two technical sessions on Geomorphic Reclamation at ASMR 2013 in Laramie. He will co-host the ASMR annual meeting in St. Louis in 2018. He was elected president for the second time beginning June 2016.

The challenges and opportunities he has experienced over this career has emphasized the importance of organizations like ASMR in order to keep pace with the dramatic changes taking place in the sciences and regulatory programs related to energy development, environmental protection, and land reclamation technologies. ASMR provides an invaluable service in promoting the professionalism necessary for maintaining effective credibility in a highly controversial and rapidly evolving field. Also, you can't do it alone. You need active relationships with other professionals that can provide valuable mentoring and role models that keep you on track over the years. ■

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JUNE 4 - 9, 2016
THE DAVENPORT GRAND HOTEL
SPOKANE, WASHINGTON

EVENT SCHEDULE



ASMR 2016 Program Committee

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Devin Clary, Montana DEQ
Amy Blyth, Trihydro Corporation
Kennet Bertelsen, PE, Morrison-Maierle
John Haney, PE, GeoEngineers
Stuart Jennings, KC Harvey
Len Ballek, Herrera Environmental Consultants
Dave Enos, Teck American
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Meeting Financial Sponsors/Exhibitors (to date)

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Opportunities still exist! See attached information.

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Sunday, June 5, 2016

7:30 a.m. – 5:00 p.m. Workshop 1 – Natural Process for the Restoration of Drastically Disturbed Sites

10:00 a.m. – 4:00 p.m. NEC Meeting – Meeting Room 1

10:00 a.m. – 4:00 p.m. Exhibitor Setup – Grand Ballroom B

10:00 a.m. – 4:00 p.m. Registration

1:00 p.m. – 5:00 p.m. Wine Tour – Downtown Spokane (on your own)

6:30 p.m. – 9:00 p.m. Exhibitor and Sponsor Welcome Reception - Grand Ballroom B

Monday, June 6, 2016

6:30 a.m. – 8:00 a.m. Breakfast – Grand Ballroom A

6:30 a.m. – 7:30 a.m. Haulin’ ASMR – Meet in lobby

7:30 a.m. – 5:00 p.m. Registration – Grand Ballroom Hallway

9:00 a.m. – 11:30 a.m. Plenary Session – Grand Ballroom C

9:00 a.m. – 9:15 a.m. Welcome – ASMR President Brenda Schladweiler

9:15 a.m. – 9:30 a.m. Welcome – ASMR Executive Secretary Robert Darmody

9:30 a.m. – 9:45 a.m. Washington Department of Ecology

9:45 a.m. – 10:15 a.m. Break – Exhibit Hall – Grand Ballroom B

10:15 a.m. – 10:45 a.m. Keynote Speaker

10:45 a.m. – 11:15 a.m. Office of Surface Mining - TBD

11:15 a.m. – 11:30 a.m. Announcements – Robert Darmody

12:00 p.m. – 2:00 p.m. ASMR Awards Luncheon – Grand Ballroom A

Monday, June 6, Technical Sessions			
	WATER QUALITY SESSION 1A	LONG TERM RECLAMATION EVALUATION SESSION 1B	RECLAMATION TECHNOLOGIES SESSION 1 C
2:00 p.m. - 2:30 p.m.	Rock Disposal Area Seep Water Treatment At The Jerritt Canyon Mine by Debbie Johnston	Reclamation Of The McLaren Tailings Restoring Previously Unusable Area Back To Its Historical Landscape by Marty Bennett	A Comparative Analysis Of Selenium Geochemistry Using A Sequential Extraction Procedure And X-Ray Absorption Spectroscopy by Jessica Favorito (Student)
2:30 p.m. - 3:00 p.m.	A Paired Comparison Study To Evaluate The Effect Of Ionic Strength On Trace Metal Removal Products In A Vertical Flow Bioreactor Substrate by Julie LaBar (Student)	Survival And Growth Of Chestnut Backcross Seeds And Seedlings After 8 Years On Surface Mines by Jeff Skousen	Bench Scale Hexavalent Chromium Removal With A Biochemical Reactor by James Gusek

3:00 p.m. - 3:30 p.m.	Got Aluminum? - Removing Suspended Metals With Peat Based Sorption Media by Paul Eger	Effects Of Topsoil Substitute Materials, Depth Of Material, And Compaction On The Average Growth Rates Of Hardwood Trees Eleven Years After Reclamation by Kara Dallaire (Student)	The Use Of Soil Sampling And Investigations To Improve Reclamation Costs by James Hartsig
3:30 p.m. - 4:00 p.m. - BREAK			
	WATER QUALITY SESSION 2A	LONG TERM RECLAMATION EVALUATION SESSION 2B	RECLAMATION TECHNOLOGIES SESSION 2 C
4:00 p.m. - 4:30 p.m.	Acid Mine Drainage Treatment With Dispersed Alkaline Substrate And Limestone Beds by Kristen Dieterman	Design Approaches And Lessons Learned For The Durant Canyon Reclamation Project by Pierre LeMieux	The Potential Of Biosolids And Other Amendments For Revegetation Of Lead/Zinc Mine Tailings With Three Biomass Crops: Greenhouse Study by Mariam Al-Lami (Student)
4:30 p.m. - 5:00 p.m.	Determination Of Hydraulic Retention Time For Passive Treatment System Oxidative Unit Using Rhodamine by Leah Oxenford (Student)	Environmental Control Of Shrub Density Development At The Seneca li Mine, 1987-2014, Routt Co. Co by Vern Pfannenstiel	Looking At Reclamation In Terms Of Ecological Restoration by Michael Vice
5:00 p.m. - 5:30 p.m.	Green Remediation Of Acid Mine Drainage Impacted Water: A Field-Scale Filter Development Using An Industrial Byproduct by Abhishek RoyChowdhury	Evaluation Of Small Tree And Shrub Plantings On Reclaimed Surface Mines In West Virginia by Alexis Monteleone (Student)	The Holistic Approach To The Design, Monitoring, And Future Performance Assessment Of A Surface Barrier by Zhuanfang (Fred) Zhang

5:30 p.m. – 7:00 p.m. Happy Hour - Exhibit Hall - Grand Ballroom B

6:30 p.m. – 9:00 p.m. Early Careers Event – Meet in Lobby beginning at 6:15 pm,
..... will walk to Post Street Ale House

Tuesday, June 7, 2016

6:30 a.m. – 7:30 a.m. Haulin' ASMR - Meet in lobby

6:30 a.m. – 8:00 a.m. Breakfast - Grand Ballroom A

7:30 a.m. – 9:00 a.m. Registration - Grand Ballroom Hallway

7:30 a.m. – 4:00 p.m. Technical Tour #1 - Upper Coeur d'Alene Basin Mining Tour
..... (Hosted by CDM Smith)

7:30 a.m. – 4:30 p.m. Technical Tour #2 - Land Reclamation in the Inland Empire
..... (Hosted by Rainier Seeds)

5:30 p.m. – 10:00 p.m. Social Evening at Chateau Rive

Wednesday, June 8, 2016

6:30 a.m. – 7:30 a.m. Haulin' ASMR - Meet in lobby

6:30 a.m. – 7:30 a.m. Living Legends

7:30 a.m. – 8:30 a.m. Wild Women of Reclamation - Meeting Room 1

6:30 a.m. – 8:00 a.m. Breakfast - Grand Ballroom A

7:30 a.m. – 5:00 p.m. Registration - Grand Ballroom Hallway

Wednesday, June 8, Technical Sessions			
	WATER QUALITY SESSION 3A	LONG TERM RECLAMATION EVALUATION SESSION 3B	RECLAMATION TECHNOLOGIES WITH BOMAG SESSION 3C
8:30 a.m. - 9:00 a.m.	An Appalachian Regional Study To Predict TDS Release From Coal Mine Spoils by Lee Daniels	Revegetation Trends And Seeding Lessons At Two Montana Coal Mines Based On 20 Years Of Monitoring by Richard Producers	Deep Till Method In-Situ Soil Reclamation With A Bomag Recycler by R. Anderson (Student)
9:00 a.m. - 9:30 a.m.	Proof Of Concept Bio-Terrace Aluminum Removal At An Abandoned Metal Mine, Idaho by James Gusek	Reclamation Practice Influences On The Post-Mining Plant Community At A Virginia Mine Site After Six Years by Carl E. Zipper	Composite Sampling - Pre In-Situ Soil Reclamation With A Bomag Recycler by M. Meadows (Student)
9:30 a.m. - 10:00 a.m.	Removal Action At The Monte Cristo Mining Area by Ryan Tobias	Long-Term Study Identifies Avenues For Improving Re-vegetation Efforts by Matthew Rinella	Post In-Situ Soil Reclamation With A Bomag Recycler by G. Gardner & M. Williams (Students)
10:00 a.m. - 10:30 a.m. - BREAK			
	WATER QUALITY SESSION 4A	LONG TERM RECLAMATION EVALUATION SESSION 4B	MAPPING/GIS SESSION 4C
11:00 a.m. - 11:30 a.m.	Treatment System Restoration And Power Generation In The Slippery Rock Creek Watershed by Ryan Mahony	Mineral Sands Mine Soils In Southeastern Virginia: Comparison Of Physical And Chemical Properties After Eight Years by Zenah Orndorff	Using 3D Photogrammetric Methods To Determine Stockpile Volumes by Jeff Igelman
11:00 a.m. - 11:30 a.m.	Implementation Of Two Passive Treatment Systems In Northern West Virginia by Cody Neely	Switchgrass Bioenergy as Silvopasture on Reclaimed Mine Soil by David Lang	Ecological Problems In Kazreti, Georgia, Caused By Copper And Gold Mine And Its Reclamation Using Gis System by Marika Avkopashvili
11:30 a.m.- 12:00 noon	Validating A Method For Determining Specific Conductivity In Mining Wastewater by Jeffrey Parks	Natural Processes For The Restoration Of Drastically Disturbed Sites by David F. Polster	Blending Historic Mapping With Lidar At Abandoned Mine Sites by Curt Coover
Lunch with Guest Speaker			

	WATER QUALITY SESSION 5A	RECLAIMED SOILS SESSION 5B	DRONES AND UAVS SESSION 5C
1:30 p.m. - 2:00 p.m.	TDS Accumulation In An Ohio Creek As It Travels Through A Coal Mining Site by Jonathan Peterson	Evaluating The Suitability Of A Reforestation Growth-Medium Prepared By Tractor Pulled Scraper Pans At An East Texas Lignite Surface Mine by Hannah Angel (Student)	UAs (Drones) De-Mystified, And How They Can Help Your Mining Reclamation Project by Josh Schane
2:00 p.m. - 2:30 p.m.	Comprehensive Watershed Restoration Via Ecological Engineering: The Role Of Passive Treatment by Robert W. Nairn	Montana Moonscapes: Mitigating Large-Scale Erosion On Steep Slope Uplands In Roadless Areas Of The Anaconda Superfund Site by Pedro Marques	Trihydro Talk - Placeholder
2:30 p.m. - 3:00 p.m.	A Review Of The Literature Pertaining To Passive And Hybrid Treatment Systems For Removal Of Tds From Mining Impacted Waters by Gregory Boardman	Underground Mine Subsidence Evaluation, Closure, And Risk Management by Tyrel Wilson	Geotechnical TD Business Meeting
3:00 p.m. - 3:30 p.m. - BREAK			

	WATER QUALITY SESSION 6A	RECLAMATION IN CHALLENGING ENVIRONMENTS SESSION 6B	INTERNATIONAL RECLAMATION SESSION 6C
3:30 p.m. - 4:00 p.m.	Long-Term Effectiveness Of Three Passive Systems Treating Acidic, High-Metal, Abandoned Coal Mine Discharges Near De Sale, Pennsylvania by Cliff Denholm	Rethinking Arsenic Reclamation Of A "Hellafund" Site, Montana by Scott Robison (Student)	Patches: Optimizing The Ecological Benefits Of Different Reclamation Soils Across The Landscape In The Alberta Mineable Oil Sands Region by Brad Pinno
4:00 p.m.- 4:30 p.m.	Trompe Design, Construction And Performance by Timothy P. Danehy	The Spenceville Copper Mine Reclamation by William J. Walker	Succession Of Algae, Moss, And Herbaceous Flora During 29 Years In Prairie Opencast Coal Mine, Inner Mongolia, China by Xiang Fan (Student)
4:30 p.m.- 5:00 p.m.	Biochemical Reactors For Hard Rock Mining-Influenced Water: Overview Of Treatability Studies And Lessons Learned For Implementation by Nicholas Anton	Restoration In Challenging Northern Climates by Alex Zimmerman	The Quality Assessment Of Long Term Topsoil Stockpiles Of Sandy Soil In Gobi Desert, Mongolia by Buyantogtokh Uuganbayar (Student)

Thursday, June 8, 2016

6:30 a.m. – 7:30 a.m.Haulin' ASMR - Meet in lobby

6:30 a.m. – 8:00 a.m.Breakfast - On Your Own

7:30 a.m. – 12:00 noonRegistration - Grand Ballroom Hallway

THURSDAY, JUNE 9, TECHNICAL SESSIONS			
	ECOLOGICAL IMPLICATIONS OF RECLAMATION SESSION 7A	RECLAMATION IN CHALLENGING ENVIRONMENTS SESSION 7B	INTERNATIONAL RECLAMATION SESSION 7C
8:30 a.m. - 9:00 a.m.	Compaction Impacting Hydrology And Tree Growth On A Demonstration Mine In The Western Gulf by Cassidy Comer (Student)	East Fork Ninemile Waste Consolidation Area Site Selection, Design And Initial Construction by Cody J. Lechleitner	Effects Of Landscape Transitions Due To Underground Coal Mining On Ecosystem Services In High Groundwater Table And Underground Coal Mining Area: A Case Study Of Yanzhou Coalfield by Wu Xiao
9:00 a.m. - 9:30 a.m.	Surface Mine To Biomass Farm: Growing Shrub Willows (Salix Spp.) In Northeastern West Virginia - First Year Results by Bart Caterino (Student)	Revegetation Of The Forest Rose Mine In Western Montana by Leonard Ballek	Integrated Approaches Of Water And Solid Waste Management In Mining Reclamation Of Coimolache Mining Company-Peru by Alfredo Sagástegui
9:30 a.m.- 10:00 a.m.	The Effectiveness Of Native Seed Dispersal Islands In Reclaimed Mine Lands Dominated By Eurasian Grasses by Robert W. Pal	Reducing Fresh Water Consumption In Hydraulic Fracturing By Using Acid Mine Drainage As A Make-Up Fluid by Eric Cavazza	Revegetation Of Jharia Coalfield Using Remote Sensing, Based On Thermal Infra-Red Data: A Case Study by Pradeep Kumar
10:00 a.m. - 10:30 a.m. - BREAK			

	ECOLOGICAL IMPLICATIONS OF RECLAMATION SESSION 8A	RECLAMATION IN CHALLENGING ENVIRONMENTS SESSION 8B	INTERNATIONAL RECLAMATION SESSION 8C
10:30 a.m. - 11:00 a.m.	Improved Methods Of Assessing Plant Species Diversity On Mine Reclamation Sites: A 10-Year Update by David L. Buckner	Acid Soil Remediation And Revegetation Of Metal Contaminated Pastures, Deer Lodge, Mt by Stuart Jennings	Mining Reclamation Through Service-Learning: Case Studies From Wisconsin by Yari Johnson
11:00 a.m. - 11:30 a.m.	What'S So Great About Beavers? by Susan Firor	Update To Tribal-Led Remedial Action At The Tar Creek Superfund Site by Craig Kreman	The Relationship Between Student Service Learning And Technical Assistance In Mine Water Reclamation by Kelsea Palmer
11:30 a.m. - 12:00 noon	Ripping And Native Seeding Treatments Influence On Vegetation Composition Of Compacted Tailings by Jennifer Franklin	Heavy Metal Characterization And Source Identification For Grove Gulch In Butte, Mt by Raja Nagisetty	Cost Effective Plans for Successful Mine Closure – Recent Case Studies by Marc S. Theisen

	ECOLOGICAL IMPLICATIONS OF RECLAMATION SESSION 9A	RECLAMATION IN CHALLENGING ENVIRONMENTS SESSION 9B	INTERNATIONAL RECLAMATION SESSION 9C
1:30 p.m. - 2:00	Ecology and Wildlife TD Business Meeting	Developing A Conceptual Site Model In A Watershed With Multiple Mine Waste Dumps, Bunker Hill Superfund Site, East Fork Ninemile Basin by Tom Mullen	Land Use TD Business Meeting
2:00 p.m. - 2:30	Determination Of Plant Cover In Field Sampling: A Point-Intercept Method For All Strata by David L. Buckner	Coal Mine Reclamation Costs And Local Economic Impacts In The Powder River Basin In Wyoming by Roger Coupal	Advanced Planning And Measurable Outcomes: Restoration Success In Southern Colorado by Joe Schneider
2:30 p.m. - 3:00 p.m.			
3:00 p.m. - 3:30 p.m. - BREAK			
	SESSION 10A	SESSION 10B	SESSION 10C
3:30 p.m. - 4:00 p.m.			
4:00 p.m. - 4:30 p.m.			
4:30 p.m. - 5:00 p.m.			
NEC WRAP UP MEETING			

POSTER SESSION AND MIXER

Wednesday June 8th, 5:30 to 7:00 PM

The Poster Session will be held in the Grand Ballroom on Wednesday evening June 8th, along with a Social Mixer including refreshments. Posters will be displayed on easels provided. Below is a list of the abstracts that have been accepted for the Poster Session.

Poster Session - Grand Ballroom A
Hydraulically Isolating An Existing Repository And Potentially Increasing Capacity by Kara M. Beaudoin
Metal Recovery Using Biogenic Sulfide From Acid Mine Drainage by Sangwoo Ji
Effect Of Different Forest Age On Soil Enzyme Activities And Microbial Diversity On Surface Mine Reclamation In Antaibao by Jinchuan Li
The Physiological Characteristics To Estimate Species Potential As Mine Reclamation Ground Covers by Eddy Nurtjahya
Interim Reclamation: The Benefits Of Temporary Reforestation For Meeting Final Reclamation Goals by Brad Pinno et al.
Interactive Effects Between Lime, Organic Matter, And Bacteria In The Establishment Of <i>Leymus Cinereus</i> In Mine Tailings by Deicy Sánchez
Passive Biological Treatment Approaches To Reduce Conductivity In Waters Affected By Mine Drainage: Key Challenges & Research Needs by William Strosnider
Recovery Rate And Purity Of Some Dissolved Metals In Mine Drainage From Abandoned Coal Mine by Gil-Jae
Fluorescent Dye Tracing In Abandoned Mines For Adit Discharge Source Control by Chapin Storrar
<i>Salix</i> Spp. As A Biomass Crop: Investigating Its Potential On Mined Lands And The Use Of Biochar As A Soil Amendment by Heather Nobert (Student)
Design And Construction Challenges For The Southeast Commerce Passive Treatment System by Bryan J. Page (Student)
Open Limestone Channel Performance For Aluminum-Rich Acid Mine Drainage by Charles Spellman (Student)
Contaminant And Treatment Dynamics In The Greater Rio Juckucha Watershed by Hannah Patton (Student)
Open Limestone Channels For Acid Mine Drainage Treatment: Effects Of Agitation On Ph Increase by Swayer Rensel (Student)
Hydraulic And Biological Maintenance Challenges And Solutions In An Aging Passive Treatment System by Nicholas Shepherd (Student)
Geochemistry And Biota Of Bolivian Hypersaline Lakes by Rachel Wagner (Student)
Evaluating The Suitability Of A Reforestation Growth-Medium Prepared By Tractor Pulled Scraper Pans At An East Texas Lignite Surface Mine by Hannah Angel (Student)
Lab Scale Batch Weathered Limestone Testing To Determine System Sizing by Andrew Hollern (Student)
A Gis Model To Guide Revegetation Efforts On Reclaimed Mine Lands by Mark Mariano (Student)
Soil Conditions Promoting Long-Term Reforestation Of Appalachian Forests by Jenise Bauman (Student)
The Institutional Context of Reclamation: Changing Landscapes of Energy by Kathryn Bills-Walsh

TOUR INFORMATION

Tour #1 - CDA Mining Basin Tour

Tuesday June 7th, 2016 (Hosted by CDM Smith)

8:00 – Depart Spokane for Upper CDA Mining Basin. The tour will focus on reviewing the remedial activities at each site and history of the sites. Box lunches will be provided.

9:30 – Arrive at Star Mine and Mill Complex

10:30– Arrive at Tamarack Mine Portal

11:30 - Lower Burke Canyon Repository

12:30– Success Mine Remedial Action

1:30 – East Fork Ninemile Waste Consolidation Area overlook

2:00 – Depart for Spokane

4:00 – Arrive in Spokane



Tour #2 - Rainier Seeding Tour

Tuesday June 7th, 2016 (Hosted by Rainiers Seeds)

7:30 - Board bus and travel to the Cleveland Mine near Lake Roosevelt about 30 mins east of Hunter WA

9:00 - Arrive at Cleveland Mine. BLM took control and voluntary reclamation in 2000. Review reclamation success and challenges (recently impacted by a fire)

10:00 - Depart for Rainier Seeds production/processing facility

11:45 - Arrive at Rainier Seeds, lunch provided.

12:30 - Tour the native seed processing facilities (one of the largest in the Western US)

- Plants of the Wild, a native seed nursery, will display native plants and discuss the process of native plant production used in many reclamation projects
- Wildlands, a reclamation company, will display reclamation equipment and discuss the challenges of reclamation on various projects

12:30 - Tour the native seed processing facilities (one of the largest in the Western US)

1:00 - Depart for Swanson Lake Wildlife Area

1:30 - Arrive - Swanson Lakes is a Bonneville Power Administration wildlife mitigation project, primarily for Columbian sharp-tailed grouse. It also supports a mix of species, including mule deer, upland game birds, raptors, songbirds, and several reptiles and amphibians. Various reclamation projects have taken place and are still on going.

3:00 - Depart for Spokane



WORKSHOP INFORMATION

NATURAL PROCESS FOR THE RESTORATION OF DRASTICALLY DISTURBED SITES

Presented by: David Polster, M.Sc., R.P. Bio. Polster Environmental Services, Ltd.
When: Sunday, June 5, 2016
Where: The Davenport Grand Hotel
Cost: \$150/person

TECHNICAL BACKGROUND

Natural processes have been “restoring” natural disturbances since the advent of terrestrial vegetation over 400 million years ago. This workshop will explore how these natural processes, systems and functions can be used to restore sites that humans have disturbed such as large mines, industrial disturbances, landslides, shorelines and other disturbed sites. We will look at how natural systems address filters to recovery such as erosion and steep, unstable slopes and how we can design restoration treatments that address these filters. We will explore the natural processes that provide nutrients and nutrient cycling capacity to ecosystems and how these can be re-established on drastically disturbed sites. In many cases restoration treatments based on these natural processes can be used to restore anthropogenic disturbances more easily and at a lower cost than traditional reclamation treatments. Examples will be drawn from the experience (over 37 years) of the instructor in the mining and heavy construction industry.

PARTICIPANTS

This course will be of interest to those engaged in the restoration of disturbed sites. Managers or other personnel from large mines or other sites where disturbances must be reclaimed will be interested in this course. Regulators and others looking for effective restoration strategies will find this course useful.

LEARNING OUTCOMES

The course provides a methodology for the restoration of drastically disturbed sites (mines, industrial sites, landslides, etc.) based on the natural recovery processes that operate in ecosystems throughout the world. Natural process based restoration is often less expensive than traditional treatments and provides for the long-term recovery of the site, including soil and vegetation development.

SPECIFIC OUTCOMES

Participants will learn a variety of treatments to control erosion, re-establish vegetation and build soil-forming processes. Specific details are provided to address issues that are commonly found at mines and industrial sites (e.g. compaction, steep slopes, adverse soil texture, toxic materials and lack of organic).

CONTENT AND PROGRAM

The workshop will be a full day (08:30 to 17:15 with breaks) and will follow the schedule outlined below.

07:30-08:30	Registration
08:30-10:30	Session 1. A brief review of ecosystem formation processes (assembly rules); The use of a successional model to inform restoration design.
10:30-11:00	Coffee break
11:00-12:30	Session 2. The role of nitrogen fixing pioneering species in restoration systems; Erosion processes and solutions.

12:30-13:30	Lunch
13:30-15:00	Session 3. Strategies to address climatic and seasonality constraints; Restoration of difficult sites (introduction to Soil Bioengineering).
15:00-15:30	Coffee break
15:30-17:15	Session 4. Implementation, maintenance and monitoring of restored sites; Incorporation of social values in the restoration of drastically disturbed sites.

METHODOLOGY

The course is presented as a series of PowerPoint presentations (approximately 1,250 slides) based on the experience of the instructor. These show photographs of a variety of restoration sites over many years so that participants can see how the restoration treatments performed (good and bad) and how the principles that are being taught have been used in a variety of different situations.

COURSE MATERIALS

Participants will receive a course manual (123 pp) that provides referenced details of the materials presented in the course. In addition, the instructor will bring his library of restoration related books for viewing by the participants during breaks.

EQUIPMENT

A room that can be darkened and a PowerPoint projector and screen are the only equipment needed (in a large room with many participants, a microphone may be needed). Participants may want to bring a writing implement to make notes.

INSTRUCTOR'S BIO NOTES

David F. Polster, R.P. Bio. is a plant ecologist with over 37 years of experience in vegetation studies, reclamation and invasive species management. He graduated from the University of Victoria with an Honours Bachelor of Science degree in 1975 and a Master of Science degree in 1977. He has developed a wide variety of reclamation techniques for mines, industrial developments and steep/unstable slopes as well as techniques for the re-establishment of riparian and aquatic habitats. He is the past- president (third term) of the Canadian Land Reclamation Association. He is the treasurer for the Western Canada Chapter of the Society for Ecological Restoration and is the NW Regional Representative on the board of the international Society for Ecological Restoration (SER). He was recently awarded the prestigious John Rieger Award from SER. He serves as the alternate mining representative on the board of the Invasive Species Council of B.C.

Dave has provided on-site design and direction in the development of reclamation and bioengineering systems for restoration of severely damaged ecosystems. He served as the environmental supervisor for CP Rail's massive Roger's Pass Project. He was responsible for developing the bioengineering systems that have successfully revegetated a portion of the Point Grey cliffs at UBC. Dave has prepared reclamation plans for numerous mines, quarries and gravel pits in Canada. He pioneered the concept of successional reclamation where the aim of the reclamation program is the re-integration of the disturbed site into the natural processes of vegetation succession. He has applied his knowledge in ecology to solving problems of unwanted and invasive vegetation. He has authored numerous papers and teaches graduate level courses on these topics.

TUESDAY NIGHT SOCIAL

**Tuesday June 7
6:00 PM to 10:00 PM**

An evening social for attendees and accompanying persons is scheduled for Tuesday, June 7th at the Chateau Rive (<http://bozzimedia.com/chateau-rive/>). The Chateau is located a short walking distance from the Davenport Grand. The evening begins at 6:00 PM will include musical entertainment, heavy appetizers, and a full bar. The cost for the evening event is \$60 each (in addition to conference registration). Tickets can be purchased during online conference registration. This will be a fun night, please join in and enjoy a wonderful evening with colleagues and friends.





ASMR

Registration Form

2016 ASMR Conference

33rd Annual Meeting of the American Society of Mining & Reclamation

June 4th to 9th, 2016 Spokane, Washington

Theme – Reclaiming the West

REGISTRANT(S)/CONTACT NAME(S): _____

COMPANY NAME: _____

ADDRESS: _____

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TELEPHONE: _____ FAX: _____

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Registration Selections and Costs

Full Meeting Early Registration (Prior to April 1, 2016)

Member	\$300	_____
Member (Speaker - if abstract submitted before 1/8/16)	\$250	_____
Non-Member ¹	\$350	_____
Non-Member (Speaker - if abstract submitted before 1/8/16)	\$300	_____
Student	\$125	_____

Payment information continued on back...

Full Meeting Late Registration (After April 1, 2016)

Member	\$350	_____
Non-Member ¹	\$400	_____
Student	\$150	_____
Guest accompanying full registrant	\$100	_____
Name of Guest _____		

Individual One Day Registration²

____ One Day - Monday - \$150.00 ____ One Day - Wednesday - \$150.00 ____ One Day - Thursday - \$150.00

Other Functions

The Awards Luncheon is included in the full member, non-member, student, and accompanying person registration. If you would like to purchase an additional ticket or if you have chosen the one-day registration and wish to attend the luncheon please check that option below. Tickets for the Evening Social Event and Early Career Professionals' Event and the tours must be purchased separately for all registrants.

ASMR Awards Luncheon	\$35/person	_____
Tuesday Night Social Event	\$60/person	_____
Early Careers Professional Event	\$20/person	_____
Workshop - Natural Process for the Restoration of	\$150/person	_____
Drastically Disturbed Sites		
Tour #1 - CDA Basin Mining Tour	\$80/person	_____
Tour #2 - Rainier Seeding Tour	\$80/person	_____

TOTAL: _____

¹ Go to <http://www.asmr.us/Forms/Forms.htm> under Forms to obtain an ASMR Membership Application Form.

² There are no technical sessions on Tuesday, only tours and one workshop.

No Refunds after May 1, 2016. Registrer online at: <http://www.asmr.us/Meetings/UpcomingMeetings.htm> or send a copy of registration materials and credit card info or check to address listed below.

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[Book your hotel group rate for American Society of Mining and Reclamation Annual Meeting](#)

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*Acid Sulfate Soils:
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Acid Sulfate Soil Working Group
International Union of Soil Sciences

Using Geophysical Imaging to Track Water Movement through Surface Coal Mine Valley Fills

*Erich T. Hester, Breeyn M. Greer, Carl E. Zipper, and Thomas J. Burbey
Department of Civil and Environmental Engineering, Department of Crop and Soil
Environmental Sciences, and Department of Geosciences, Virginia Tech*

Introduction

Surface coal mining (Figure 1) breaks up overburden bedrock into fragments, exposes fresh rock faces to weathering, and leads to elevated concentrations of dissolved minerals in downstream waterways. A key result is increased total dissolved solids (TDS) that can affect aquatic organisms. Rock fragments can range in size from fine powder up to boulders the size of automobiles. After mining is completed, this material is placed back into the original mined area and in excess-spoil disposal fills near the mined area, some of which may be placed in headwater valleys to construct valley fills. Mine spoils may be loose-dumped into the valley fill or placed in compacted lifts, but loose-dumping of durable rock is a common technique for constructing valley fills in Appalachia today. Surface coal mining regulations require that valley fills be constructed to ensure water drainage. Within loose-dump fills, drainage typically occurs within a layer of large-sized rock along the valley floor, at the fill bottom, so that water entering the fill from rainfall and adjacent terrain drains through the channels formed between the rocks. Because of concern with water-resource effects of mining discharge, researchers and industry are investigating alternative valley-fill designs that will reduce TDS concentrations of mine water outflows.

All of these fill construction and reclamation techniques, together with natural settling and weathering processes, combine to create the geologic structure of the fill that is exposed to hydrologic processes. Groundwater from adjacent areas may enter the fill material, and water from precipitation infiltrates the fill surface and moves through the fill material before being discharged to downstream waterways. The hydrologic effects of mining and valley fill construction varies among mine sites, but documented effects include more rapid (“flashier”) stormwater runoff, increased volume and duration of baseflow (Miller and Zegre 2014), decreased evapotranspiration, and increased water storage (Zegre et al. 2014) relative to the unmined Appalachian terrain (Evans et al. 2015). Infiltration can be rapid in some locations due to preferential flow paths and minimal in others due to surface compaction, and may change with time due to soil development and growth of plants (Caruccio and Geidel 1984, Hawkins and Aljoe 1992, Guebert and Gardner 2001). These prior studies have generally viewed filled areas as “black boxes” by measuring rainfall and consequent discharge into effluent streams, with little regard to the hydrologic processes occurring within a single mine site or to differences caused by differing fill construction procedures at different mine sites. Such studies rarely have investigated the fill subsurface to determine locations of flow paths, or to understand when or how subsurface flow paths are activated by precipitation.

It is the interaction of these complex and thus far poorly understood subsurface water flows with the rocks that comprise fills which elevates TDS in mine discharge and downstream waterways. Improved knowledge of where and when flow paths within fills are activated, and how water is stored and released by fills, will improve understanding of where and when rainwater acquires minerals that form TDS, and of surface mining’s hydrologic consequences. This knowledge in turn will aid development



Figure 1. Surface coal mining in Appalachia USA. Active mine areas are in the background, while reclaimed and revegetated mined areas are in the foreground (PHOTO CREDIT: ERICH HESTER).

of mining and fill construction methods that can reduce impacts to water quality and restore a more natural hydrology.

Methods

In summer 2014, we conducted a study of valley-fill hydrology in southwestern Virginia. Geophysical techniques were used to provide spatially continuous information about the subsurface in an effort to increase knowledge beyond that gained from point measurements and other techniques used previously. Electrical resistivity imaging (ERI), also known as electrical resistivity tomography (ERT), was applied to a single six-year-old valley fill (Figure 2). The fill was constructed of gray and brown sandstone spoil rock using a tiered approach with alternating slopes and benches. A loose-dump approach had been used by the mining firm to construct the fill. Our study was intended to determine the feasibility of using ERI to indirectly visualize and understand the subsurface hydrologic processes occurring in valley fills and on other mined lands.

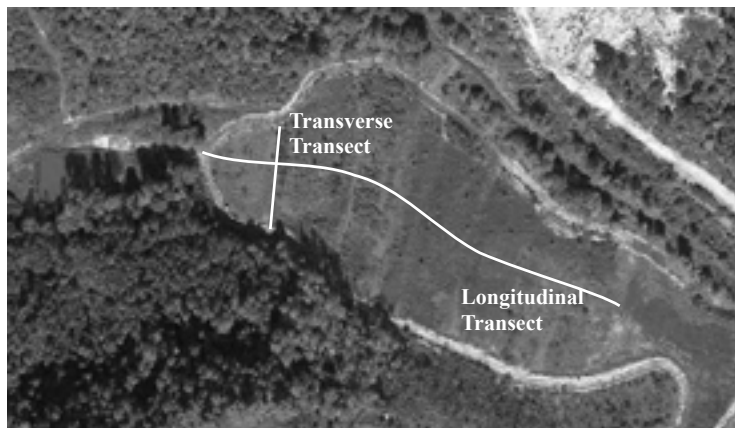


Figure 2. Aerial photo of valley fill used for project showing locations of longitudinal and transverse ERI transects. (PHOTO FROM GOOGLE MAPS).

ERI investigations were conducted by driving foot-long metal electrodes into the ground at a predetermined fixed interval along lines known as transects (Figures 2, 3). The electrodes were connected by cables to an electronic system (SuperSting R8 by Advanced Geosciences Inc. (AGI)) that injected electrical current sequentially into each electrode and simultaneously measured the resistivity of the ground using a different sequence of electrodes. The resulting raw resistivity data were processed using AGI Earth Imager inversion software. The result is an image that maps the spatial distribution of electrical resistivity along a vertical cross section of the subsurface beneath the transect known as a tomogram. Tomograms can be interpreted to yield information regarding the geology and hydrology of the subsurface. ERI was used during dry conditions to image the subsurface geologic structure of the fill and also during artificial rainfall application to image

water movement into and through the fill. Artificial rainfall was applied by pumping water from the effluent pond and distributing it with garden sprinklers over a 10-meter by 30-meter area of a flat bench between fill tiers. Artificial rainfall varied from 1.2 cm/hr to 2.5 cm/hr for two to four hours.



Figure 3. ERI equipment: AGI Earth Imager unit (above) and transect of electrodes connected by electrical cables (below). (PHOTO CREDIT: BREEYN GREER).



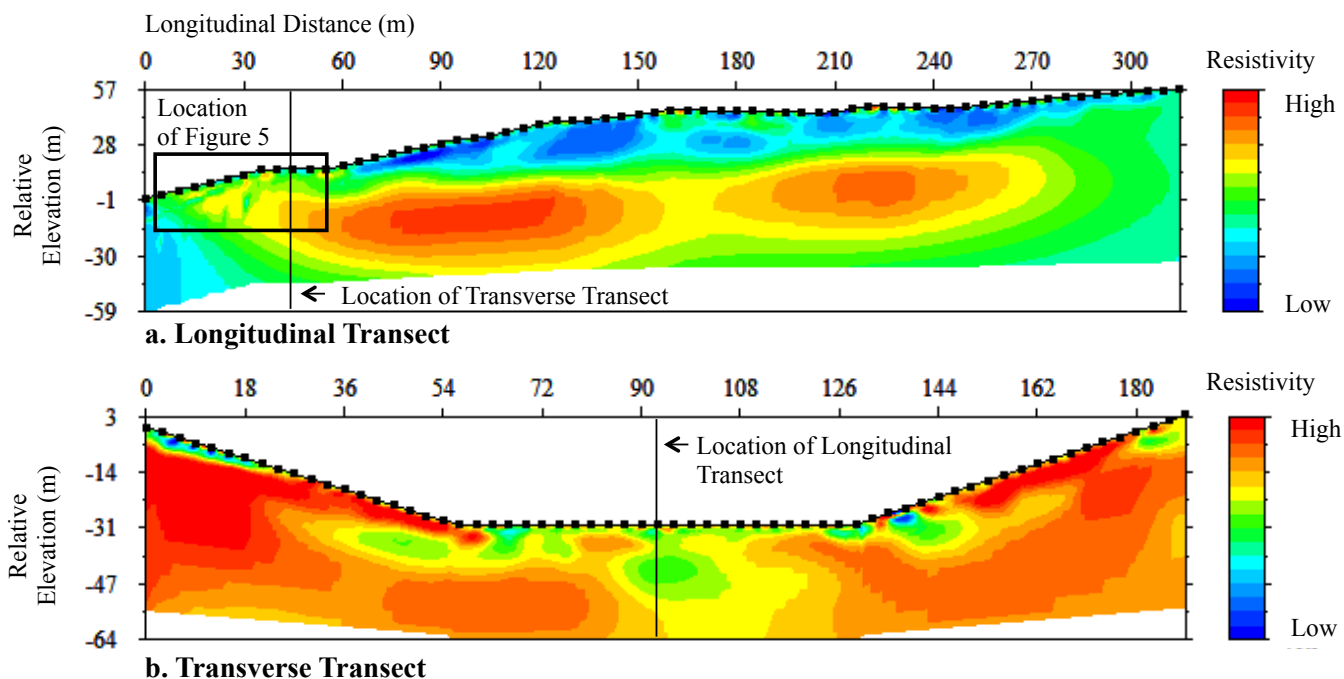


Figure 4. ERI tomograms taken under natural (no artificial rainfall) conditions showing subsurface geologic structure of the valley fill as cross-sectional images. Longitudinal (a) and transverse (b) transects are shown (Figure 2). Blue areas are zones of fine-textured rock materials, with pores that retain moisture easily; while red areas represent rock materials with larger pores that do not retain moisture.

Results

The ERI surveys conducted under natural conditions (without artificial rainfall) were used to interpret the geologic structure of the valley fill's interior (Figure 4). These are maps of resistivity for a single point in time. Figure 4a shows a tomogram representing a vertical cross section beneath the ERI transect of electrodes placed down the centerline of the valley fill (Figure 2). This tomogram revealed that electrical resistivity is less (shown in blue) in the upper portion of the fill, closer to the land surface, than in the lower (deeper) portion (shown in orange). This lower resistivity layer is up to 30 meters thick in the center of the fill, probably due to the presence of smaller/finer rock fragments in shallower areas of the fill. These finer rock fragments make better contact with one another and retain water better after rainfall infiltration events, compared to the larger rocks that occur deeper in the fill. Water retained in the fill's upper section causes an increase in electrical conductivity and therefore a decrease in the electrical resistivity of that portion of the subsurface, as indicated by the blue color. Figure 4b shows a tomogram representing a cross section beneath the ERI transect of electrodes that were positioned (in a transverse direction) at the downslope-most flat bench of the fill (Figure 2). This area is not as deep, but highlights the side drains as areas of high spatial heterogeneity of resistivity at the

two locations where the natural side slopes meet the flat fill area between. This high heterogeneity is due to larger boulders and occasional air-filled voids that are more common there.

The ERI surveys conducted during artificial rainfall were used to determine the locations of subsurface hydrologic flow paths, the locations of temporary water storage zones, and how quickly the applied water moved through the fill. Figure 5 shows an example tomogram from a longitudinal transect shorter than that in Figure 4a in the vicinity of the downslope-most bench. The shorter transect had more closely spaced electrodes which yielded a more detailed image of the fill subsurface. Figure 5 is a "difference" tomogram, where the resistivity map from a later time is subtracted from the resistivity map for an earlier time. The earlier time (time 0) was just before artificial rainfall began, and the later time was after artificial rainfall had occurred for two hours. As artificial rainfall was applied, the spatial distribution of water within the fill changed; hence the "difference" tomogram shows how water moved within the fill over the two-hour time interval.

Figure 5 indicates that rainwater did not move from the surface into the fill uniformly. Rather, water accumulated at the surface and also moved into deeper fill zones preferentially in localized areas of the fill. The tomogram shows considerable volumes of water being held by spoil materials near the surface, indicated by

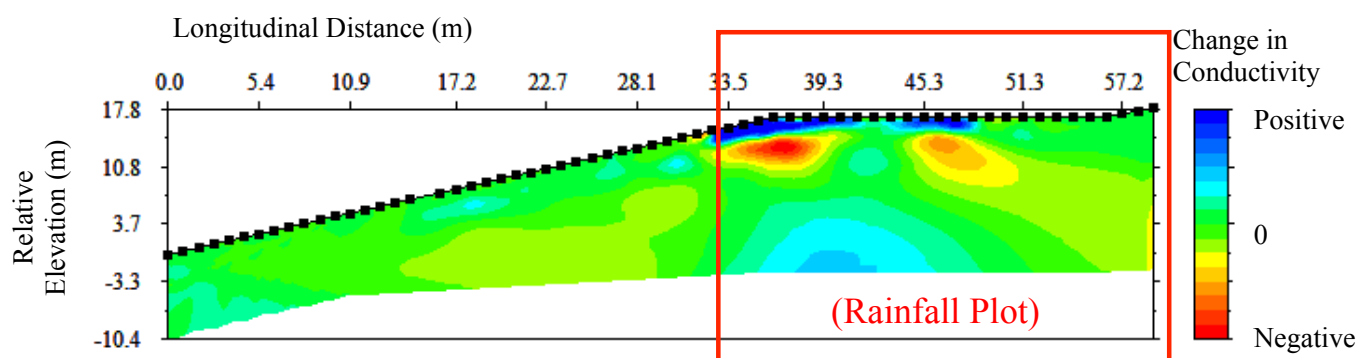


Figure 5. ERI “difference” tomogram shows the difference between just before artificial rainfall began (time 0) and approximately two hours after rainfall started. Difference tomograms show locations where electrical conductivity increased during the intervening time period (blue areas) due to increases in water content. Geologic structure is no longer visible, and red areas are artifacts of the inversion algorithm that occur near areas of strong conductivity increases (i.e. they do not represent actual conductivity declines). Artificial rainfall was applied along the horizontal bench within the red box.

a nearly contiguous area of dark blue color between 30 and 48 metres longitudinal distance. This water accumulation at and near the surface was visible during field work and was expected due to a hard surface of compacted fine rock fragments and dust. Water also accumulated at several locations in the subsurface, indicating zones where water was able to flow easily from the near-surface into the subsurface. The most obvious deeper water-accumulation zone is visible at about a 20-meter depth and 33-45 meters horizontally. Figure 5 shows infiltrating rainwater reaching depths of approximately 25 meters after two hours of rainfall, and other ERI surveys (Greer et al. 2016) showed water reaching a 10-meter depth within only 45 minutes of rainfall. Together, these difference tomograms indicate that preferential flow paths in some cases were rapid and deep. The lack of significant change outside of the rainfall plot (green in color) confirms that the changes in subsurface water content discussed above are caused by the applied rainfall.

Summary

Previous studies have surmised but not demonstrated that water moves through the subsurface of valley fills via preferential flow paths (Caruccio and Geidel 1984, Hawkins and Aljoe 1992). Our study was conducted to test the ability of ERI to determine the location of such preferential flow paths, to estimate how long rainwater takes to infiltrate those flow paths, and to determine the locations of temporary storage areas of infiltrated rainwater within the fill material. Our results indicate that ERI can indeed provide all three types of information, confirming earlier conceptions of preferential flow, and adding spatial and temporal quantification. Continued application of this technique to additional mined landscapes holds promise to improve understanding of how water flows through mine-spoil fill materials. Results will

enable insight about where, when, and how TDS are transported through mined landscapes and delivered to effluent streams. This will enable comparison of fill construction or reclamation approaches; will aid efforts to develop fill construction and reclamation methods to reduce TDS impact and hydrologic change; and will aid in monitoring and managing existing mined sites.

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Streambank Stabilization in the Slippery Rock Creek Watershed

D. Guy, R. Mahony, S. Busler, T. Danehy, C. Denholm, C. Neely, M. Dunn



Streambank erosion along the property of the Slippery Rock Campground Association.



Streambank after construction and prior to tree planting. Grass can be seen emerging through the coconut coir erosion control blanket. One of the four access paths is visible in the foreground.

Since 1985, the not-for-profit, member-owned Slippery Rock Campground has been the summer home for about 1,000 families. Located only 50 miles north of Pittsburgh, members of the 146-acre campground association have enjoyed fishing, kayaking, and other recreational opportunities due to the direct access to about one mile of Slippery Rock Creek (Ohio River Basin). Within the last decade, however, Slippery Rock Creek was becoming more of a problem than an asset during the spring months. As springtime in western Pennsylvania brings the wettest weather of the year, as well as rapidly melting snow, streams and creeks can overflow their banks and cause extensive erosion. Although this is a very natural process that has shaped the landscape through the ages, land development activities upstream appear to have contributed to an increased rate of streambank erosion resulting in increased sediment in the stream and negative impacts to aquatic habitat. In 2015, the creek was eroding campground property at the rate of nearly five horizontal feet per year along a 500-foot section of the streambank. As part of a partnership effort, the Slippery Rock Watershed Coalition (SRWC) and the non-profit Stream Restoration Incorporated (SRI) applied for a grant in order to help stabilize the streambank and improve the water quality and aquatic habitat in Slippery Rock Creek. A Growing Greener Grant from the Pennsylvania Department of Environmental Protection (PADEP) was awarded and other cash donations as well as in-kind contributions in the form of materials and services from project partners Allegheny Mineral Corporation; Slippery Rock Campground Association; Slippery

Rock University Geography, Geology, and the Environment Club; and BioMost, Inc.

A plan was developed to restore the streambank to a more natural state using both traditional and bioengineering techniques. This approach included re-grading the cut-bank (about eight feet in height), placing 30" x 12" riprap (NCSA, R-7) at the toe of the bank to prevent undercutting, adding root-wads and brush layers to provide additional erosion control as well as fish habitat along the edge of the creek, and subsequent planting of a portion of the riparian area.

Upon obtaining the necessary permits and approvals, construction began on September 30, 2014. The first step was laying-back the steep cut-bank to an approximate four horizontal to one vertical (4H:1V) slope extending from a grassy field area to the edge of the stream. During this process, over 350 tons of R-7 riprap was placed along the toe of the bank. In addition to contributing to the stabilization of the soil material, the riprap also supported the 40 root-wads that were partially buried in the streambank to provide fish habitat. Four footpaths, stabilized with 2" x 200-mesh, limestone aggregate (PADOT, 2A), were also created in the streambank stabilization area in order to facilitate access for fishermen and other individuals looking to enjoy the creek while limiting damage to the riparian zone.

Temporary erosion control was established by seeding the prepared slope with a native perennial grass mix and annual ryegrass in October 2014. Once seeded, the slope was covered using a coconut coir erosion control blanket to stabilize the re-vegetated riparian zone. Interesting to note, a flooding event occurred shortly before the final tree planting the following year that did not create any signs of erosion. Furthermore, silt had actually been deposited due, at least in part, to the more gentle grade of the re-established streambank.

To complete the streambank stabilization and to create wildlife habitat in the

Table 1. Riparian Buffer Zone Tree and Scrub Planting

Common Name	Scientific Name	Size (ft.)	Quantity
Pin Oak	<i>Quercus palustris</i>	5-8	25
Choke Cherry	<i>Prunus virginiana</i>	5-6	50
Hemlock	<i>Tsuga canadensis</i>	3-4	50
Swamp White Oak	<i>Quercus bicolor</i>	1½-2	100
Serviceberry	<i>Amelanchier arborea</i>	2-4	37
Witchhazel	<i>Hamamelis virginiana</i>	2-3	25
Red Bud	<i>Cercis canadensis</i>	3-4	25
Ninebark	<i>Physocarpus opulifolius</i>	3-4	25
Sycamore	<i>Plantanus occidentalis</i>	3-4	25
Black Willow	<i>Salix nigra</i>	2-2½	2000
Silky Willow	<i>Salix sericea</i>	2-2½	700

Note: All trees and scrubs planted were bare-root seedlings, except Black and Silky Willows which were live stakes.

riparian buffer zone that included not only the re-graded area (500 feet long and 50 feet wide) but also an adjoining area (300 feet long and 50 feet wide), a variety of native trees were selected to be planted (Table 1). There were about 3,000 tree seedlings, shrubs, and live stakes planted in the riparian buffer zone, at varying spacing intervals. The willow live stakes were chosen due to their ability to easily root and form a dense root mat to reinforce the bank. The Geography, Geology, and the Environment Club from nearby Slippery Rock University volunteered to help with planting. The students were very energetic and eager to help restore the health of the watershed they call home. Over 30 students, community members, and campers participated in the planting event.

Within a month after the May 11, 2015 planting, growth had already started to take hold, and by the summer of 2015 greater than 95 percent of the trees had survived and the grasses were well established.

This project has been a positive investment for everyone involved and has met all of the goals of the partners. With continued site maintenance by the campground staff, this project is an example of a partnership effort with long-term positive results relating to both recreation and the environment. Not only has the property loss from flooding been essentially eliminated but Slippery Rock Creek has also been significantly improved by decreasing the sediment entering the stream by an estimated 5,000 cubic feet per year. ■



Summer 2015 - Grasses and trees are well established with no major erosion observed over the winter months or during the spring flooding events.

Bats and Mining

Craig Walker, Ecologist, DOI - Office of Surface Mining Reclamation & Enforcement

Bats play a vital role in nature. Many people are familiar with their ability to consume large numbers of mosquitos, but bats also eat agricultural pests as well. One study in southern Illinois estimated that bats saved the global corn industry \$1.1 billion by their consumption of the corn earworm. Not only are they important natural pest controllers, bats also pollinate many flowering plants here and in the tropics. They are important seed dispersers in the tropics and their droppings (guano) are used as an important natural fertilizer in many parts of the world. In North America, they pollinate cacti and agave. So, no bats, no tequila!

Worldwide there are over 1,300 bat species. They account for about 25 percent of all mammal species. In the U.S., there are over 40 species of bats, several of which are listed as threatened or endangered under the Endangered Species Act, including the Indiana bat and the northern long-eared bat (Figures 1 and 2).

Most bats are insectivores, although some eat nectar and fruit (as well as frogs and fish!). Insect-eating bats find their prey through echolocation, which involves sending out sound waves and analyzing the returning sound to determine the location of a prey. These calls are at a frequency that is too high for humans to hear. Many species emit unique frequency ranges. This is the basis for the identification of bats using acoustic detectors.

Protecting bat habitat is an important part of bat conservation. Many bats in the U.S. use caves and abandoned mines for hibernation and sometimes summer roosting. Forests are also used in the summer when bats are giving birth and raising



Figure 1. Northern long-eared bat (PHOTO: CRAIG WALKER, OSMRE)



Figure 2. Indiana bat (PHOTO: SANDERS ENVIRONMENTAL).



Figure 3. Bat tree (PHOTO: CRAIG WALKER, OSMRE).

young. It is important to know where bats are on the landscape in order that mining activities can be planned to avoid impacts.

Identifying suitable bat habitat means looking for both suitable roosting and foraging habitat and suitable hibernation sites. For bats that roost in forests in the summer, this means trees that have characteristics bats like. A tree should be of a suitable diameter – typically 3-5" or greater – and have exfoliating (peeling) bark (Figure 3). It should be located where it can get enough sunlight to warm the bats up during the day when they are roosting. Caves and mines must have a particular set of airflow and temperature characteristics to be suitable as hibernacula (Figure 4).

It is important to survey an area of suitable habitat to see if bats are present. Surveys of suitable summer and winter habitat may be conducted. Summer surveys may be conducted with mist nets, acoustic devices, or both. Surveys of potentially suitable hibernacula may be conducted by harp trapping or acoustic surveying.

Once it has been determined that bats are present, or their presence has been assumed, it is necessary to implement a protection and enhancement plan. There are a couple of different ways to protect and enhance bat habitat: (1) avoidance and (2) minimization. Avoidance involves things like restrictions on clearing trees during the maternity season, placing buffer zones around caves and underground mines, protecting riparian areas, and minimizing the amount of area disturbed. Minimization measures can be either short- or long-term. Short-term measures can include things like providing roosting habitat by girdling trees and staging tree removal to reduce the amount of forest cleared at one time. Long-term measures can include things like creating watering areas, re-planting suitable tree species, using native herbaceous ground cover, creating travel corridors, and restoring stream buffer zones. Occasionally, bat boxes designed to attract roosting bats may be installed.

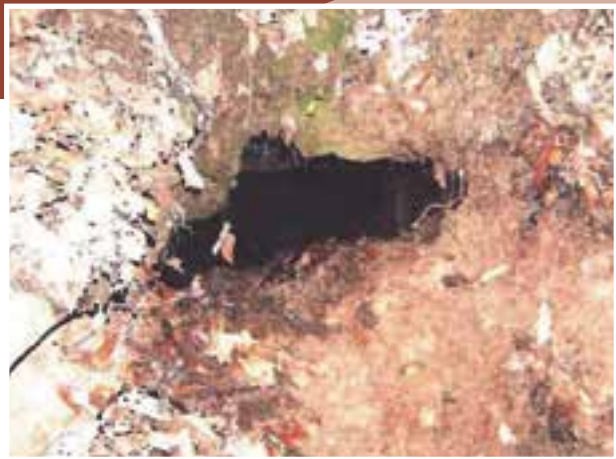


Figure 4. Abandoned mine portals prior to bat friendly gate installation (PHOTO: WVDEP).



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Figure 5. Standard bat gate with harp trap setup
(PHOTO: SANDERS ENVIRONMENTAL).



Figure 6. Bat gate attached to culvert with harp trap setup
(PHOTO: SANDERS ENVIRONMENTAL).

If there are abandoned underground mines present that may provide suitable habitat, it may be necessary to install bat friendly gates at the openings (Figure 5). Gates keep people out but allow bats to enter and exit unimpeded. Proper construction of these gates is essential so they don't prevent bats from using the portals. Sometimes traditional gates can't be installed due to safety concerns. In these cases culverts may be inserted into the abandoned portal with a gate attached to the end (Figure 6). There are a number of resources available that describe how to properly construct a bat friendly gate. A good place to start is at www.batcon.org/resources/for-specific-issues/caves-mines. OSMRE sponsored a conference on bat gates in 2002, and the publication from that meeting can be found at <http://www.osmre.gov/resources/library/proceedings/2002BatGateDesignForum.pdf>.

Many bat species are in decline and bats face many threats to their survival. Overall, habitat loss is a major cause of the decline. Forest habitat is being lost due to logging, development, agriculture, and mining. Disturbance and vandalism when bats are hibernating is another significant cause of bat mortality. If bats are aroused when they are hibernating in the winter, they may use valuable fat reserves necessary to survive the winter.



Figure 7. Bat house (PHOTO: CRAIG WALKER, OSMRE).

Recently, a very serious threat to the survival of bats in the U.S. has emerged: white-nose syndrome (WNS). WNS has devastated bat populations in the northeastern U.S. and continues to impact bats as it moves westward. Over 5 million hibernating bats have been killed. It has been found in 26 states and five Canadian provinces. Despite an intensive research program, this deadly disease continues to pose a serious threat to the survival of bats in the U.S. For more information on this devastating disease, visit www.whitenosesyndrome.org. ■



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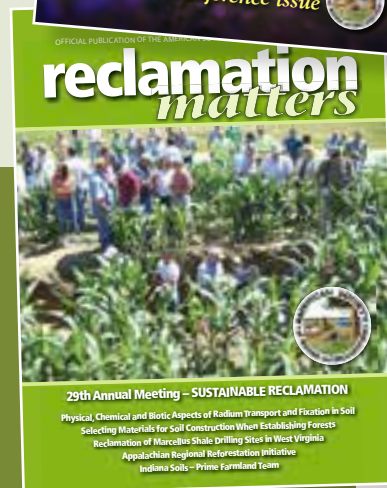
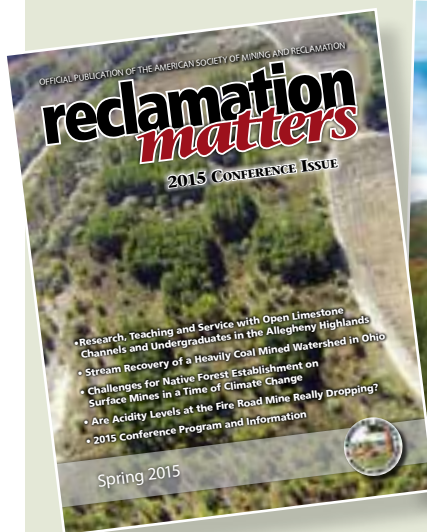


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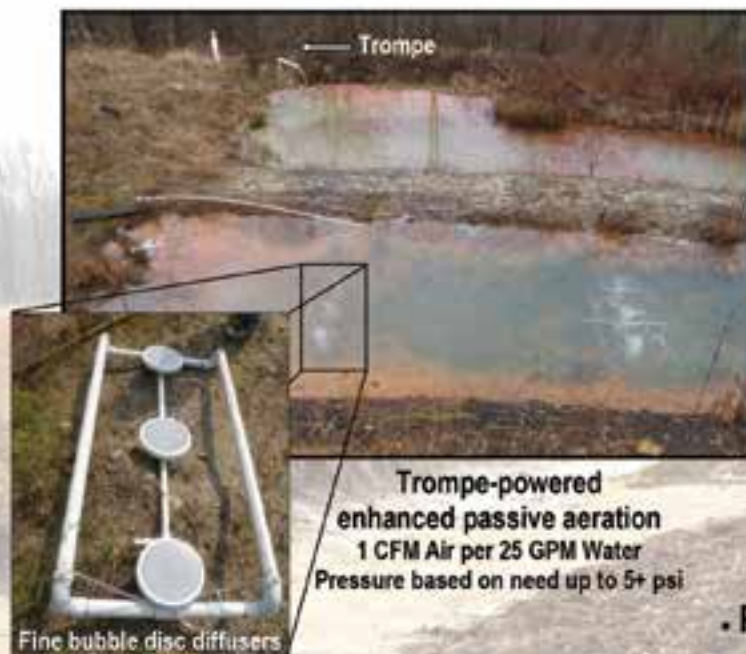
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