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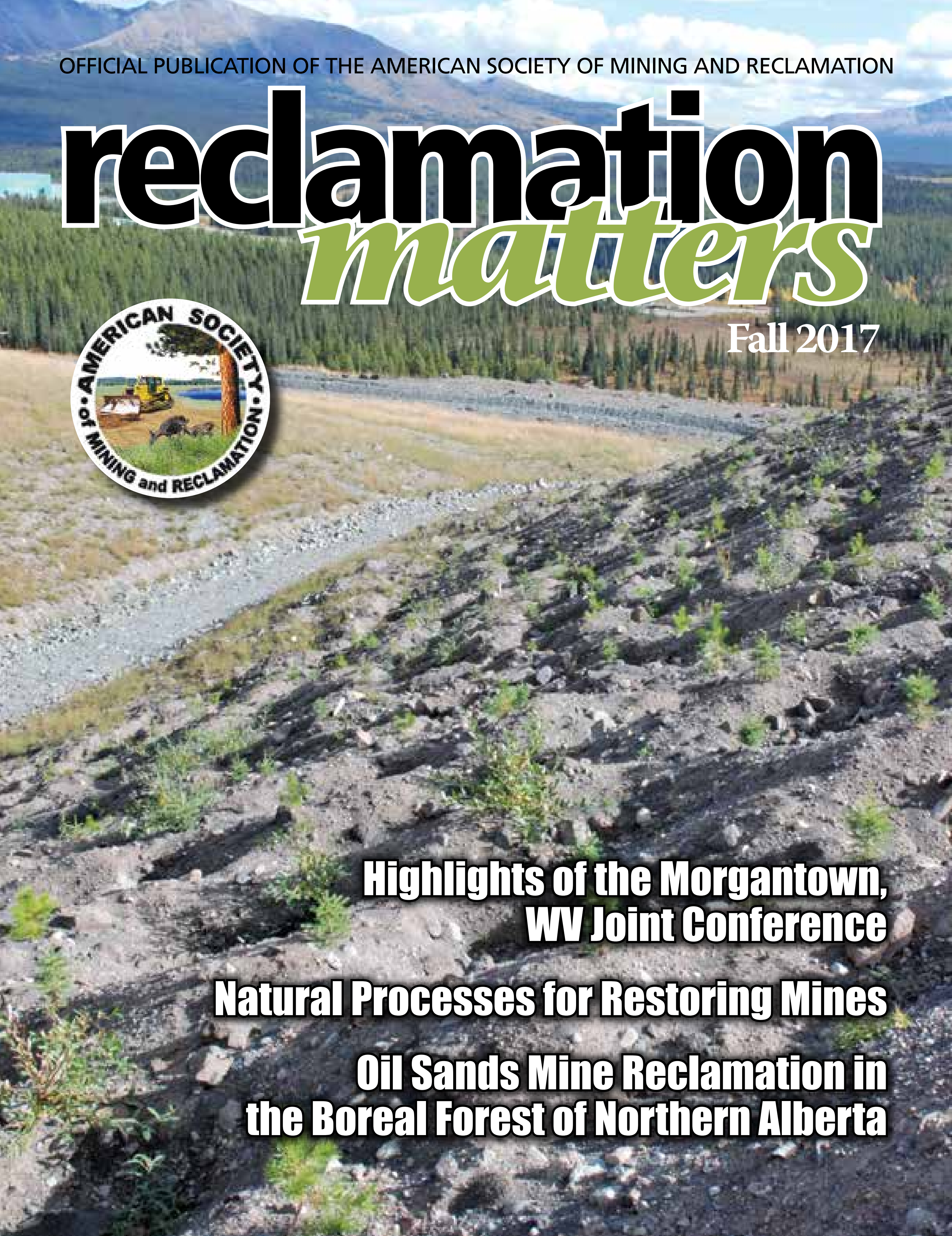
reclamation matters

Fall 2017



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reclamation matters

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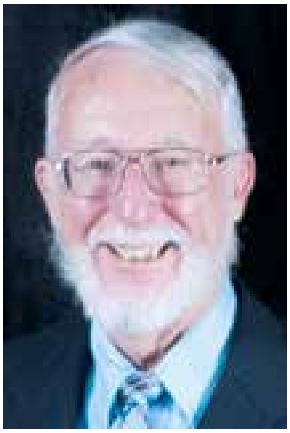


The Globalization of Mine Reclamation Science and Technology

By Kimery Vories, ASMR President

There is at least one positive thing that can be said about the current debate on the role of fossil fuels and increasing carbon dioxide levels in the atmosphere. The entire planet seems to have awakened to the importance of protecting the environment from at least some of the activities of human civilization. Closer to home, the field of coal mining and reclamation has been an intrinsic part of the American infrastructure over the last 40+ years. This is not the case for most of the developing world. Even in this country, however, this activity is currently threatened by the "Quixotic" tendency of some who prefer to "tilt at windmills" rather than roll up their sleeves and work on solutions to problems that also advance human civilization.

Rachel Carson wrote *Silent Spring* in 1962, emphasizing the negative impact of uncontrolled use of manmade chemicals in the environment, such as DDT and other pesticides. She poetically envisioned a "doomsday" scenario that awakened the world to take action by developing appropriate environmentally protective controls on the use of such chemicals. After half a century, pesticides are still used to control some detrimental outbreaks of insect species in a much more environmentally compatible manner. Today many people may have forgotten her contribution or have grown up in a world where such protections are taken for granted. The importance of her vision is not that the doomsday scenario came true but that professionals in USEPA, USDA, and the agricultural industry did the hard work necessary to develop the science, technology, and regulatory controls that have improved this human experience in an environmentally compatible way. The same case can be made for the passing of the Surface Mining Control and Reclamation Act of 1977 with the subsequent advance of science, technology, and appropriate regulatory controls on surface coal mining. The important lesson here is that doomsday visions and scenarios may reveal a danger that has been previously ignored and result in appropriate actions and regulations to minimize or eliminate dangers. These revelations have been a regular occurrence throughout human history and can be expected to continue in the foreseeable future. So far, however, we have been able to solve the problems without the doomsday event occurring.

Although I have spent most of my professional life working on problem-solving related to energy and environment in the USA, many of the young professionals of today will be increasingly challenged to not only make advances in the field but to also take mine reclamation science and technology into the rest of the developing world. In my experience, trying to share the best science and technology in places like Australia, South Africa, India, and now China, I have found that there are many in similar professions in the rest of the world who are very eager to share the benefits of what we've learned and take it home with them. The beauty of environmental science and technology is that it needs to be spread globally and can be made an integral part of any culture to improve the human experience.

Much of the future of ASMR and of our members may well focus on the abilities of young professionals in our midst to take the best mine land reclamation science and technology developed here and globalize it in the world of tomorrow. ■

You Can't Cheat When Liming

By Jeff Skousen
West Virginia University

This past August, I spent a day at the 2017 National Boy Scout Jamboree, which was held at the Summit Bechtel Reserve and the new National Boy Scout Camp. The reserve, formerly known as the Garden Ground Property in Fayette and Raleigh Counties, West Virginia, is adjacent to the New River Gorge National River and borders several West Virginia state parks. The camp includes about 14,000 acres with another 70,000 acres of state and national park lands surrounding it.

In November 2009, the Boy Scouts announced that the Bechtel Summit Reserve would be the new site for the National Boy Scout Jamboree and the National High Adventure Base. The first major scouting event at the reserve was scheduled for July 2013, the National Jamboree, which was only four growing seasons away. The original 10,000 acres in the acquisition included large areas of abandoned mined lands with scarred landscapes, dangerous high walls, surface mine pits, barren areas, acidic soils and water, and old mine buildings and deteriorating structures. To prepare for the 2013 event, much work had to be done quickly.

A massive reclamation project ensued, with the West Virginia Division of Abandoned Mine Land Reclamation designing and organizing much of the enormous earth moving operation to prepare the site for development. Several large construction companies and reclamation contractors were hired to do the work. Dozens of bulldozers, backhoes, trucks and shovels were brought in to reclaim the land in phases. Blasting, backfilling, and grading progressively repaired a landscape designed for the Boy Scout Camp. Not much topsoil was available on the area, so the best materials the landscape provided were placed on the surface as growing media. Revegetation contractors limed, fertilized and seeded selected vegetation species.

In September 2011, the contractors responsible for revegetation became concerned that the herbaceous vegetative cover that was planted had not established and the small patches of grasses and legumes were surrounded by large bare areas. One of the seeding contractors, who was being held responsible for the inferior vegetation cover, contacted me and asked that I evaluate the physical and chemical properties of the soil and determine why vegetation was not establishing. Rainfall had been sufficient for seedling success that summer. The contractor's soil sample results showed that the pH of the soil was in the 5 to 6 range, which was not too low to prevent vegetation establishment. In many areas, we saw small amounts of dead vegetation on the ground and it looked like the grass seedlings had started to grow and then died. He and I were puzzled by the lack of living vegetation.

We took a lot of soil samples at two or three different depths in distinct areas with and without vegetation. After analysis, we found that most of the surface (upper one inch) of soil had a pH between 5.0 and 6.0, but the pH of the soil below one inch was 3.0 to 4.5. So while seeds germinated, the seedlings died as their roots penetrated deeper into the acid soil beneath the surface. The seeding contractor explained that lime had been applied by another company. So I wrote a small report showing my results and concluded that soil acidity was too high for vegetation to establish and grow, and recommended that additional lime needed to be applied to neutralize the acidity. This report was circulated and it started a firestorm.

I got calls from everyone (it seemed) asking about my report and recommendations. The contractors responsible for landscaping and soil preparation, including liming, were upset and wanted me to retract my report stating they had applied the recommended amount of lime. A meeting was called to discuss the situation and those invited were the contractors involved, Boy Scout Camp officials, financial advisors, and WVU soil scientists (me, but I invited two WVU colleagues for support).

After quizzing the contractors on their reclamation practices, the soil preparation contractors finally admitted that they had applied a special kind of lime that they were told was 100 times more effective than just regular lime. They had applied only 120 pounds of this special lime per acre, instead of the soil test recommendation of 10,000 pounds per acre (5 tons/ac). I asked what was so special about this lime that made it so much more potent. They said this special lime material was ground to extra small particles that made it much more active and effective. I asked whether this special lime had any other ingredients in it other than calcium carbonate. They said it was pure calcium carbonate. "Oh no," I thought, "This lime is not 100 times more effective. Someone made a very bad mistake that is going to cost a lot of money to fix." I looked at my colleagues, and they too had raised eyebrows and alarmed expressions like me.

"Well," I said, "you can't cheat when liming acid soils." I explained that liming acid soils is an ancient practice (known and practiced for centuries!), and the science of measuring soil acidity and recommending liming rates for neutralizing that acidity are well known and successfully applied throughout the world. Moreover, the calculations for determining proper liming rates, the properties of the lime material including particle size and purity, and the application methods are completely understood and effectively practiced by farmers, scientists, and reclamation people. This special lime was not so special and, when applied at only 120 pounds per acre, did not supply enough neutralization to amend these acid soils; hence, the vegetation would not grow. The room was pretty quiet.

Continuing, I said that the full rate of agricultural lime needed to be applied and that additional seeding would be necessary to establish an herbaceous ground cover. In fact, liming and seeding need to be done now, and it will probably need to be done again in the spring, and then possibly done on deficient areas again next fall. If they wanted a full stand of herbaceous cover on the site in time for the summer 2013 Boy Scout Jamboree where 60,000 scouts and leaders will be tromping over the grounds (only two growing seasons away!), they had better hurry. As I and my colleagues left the meeting, we could feel the tension. Somebody was liable for not applying enough lime on 1,000 acres of ground and getting the site adequately prepared for seeding.

As it turned out, I was not consulted further, nor was I asked about my additional recommendations. I did, however, attend the 2013 National Jamboree as a scout leader. Unfortunately, the grounds were a muddy mess and the scouts and their leaders mucked about in the mud for two weeks (Pictures 1 and 2). Fortunately, the 2017 Jamboree this past summer had much better vegetation cover and much less mud.

I have often thought about this situation and my comment, "You can't cheat when liming." This statement is not only true for liming, but for many other activities in reclamation (and life). Such cheating or short-cuts may be attempted when planting trees, seeding disturbed areas, treating acid water, building roads, etc. Most of us know the tried and true practices in reclamation; they are well known and effective when correctly applied. If a short-cut is taken or a cheaper alternative is tried, almost always a penalty is paid. Experts and scientists can help us determine which techniques are proven versus those that are untested or based on false notions. During talks to people actively engaged in reclamation, I repeat the old motto, "If you don't do it right the first time, when will you have the time and money to do it again?" So if you are tempted to take a short-cut and do less than the standard recommended procedure or to try an unproven technique or product, remember the risk involved and recall my experience that "you can't cheat when liming." ■

Picture 1. The heavy use areas around camps, cooking grounds, and sanitary facilities were very muddy.

Picture 2. Straw and hay was brought in by the truck loads and applied to the surface to cover the mud.

Choosing Your Path

By Cindy Adams
SGM, Inc.

This article explores why and how seven different young professionals with a variety of backgrounds and career experiences chose their paths. Special thanks to all those that contributed to the article: Buck Neely, Sara Klopf, Melissa Van Scoyoc, Craig Kerman, Mike Curran, Lindsay Wilson-Kokes, and Seth Cude.

What guided you to your current employer?

The interviewees chose their current employers by utilizing resources such as advice from graduate school advisors, networking at ASMR Early Career Professional socials, and talking with ASMR vendors. Other interviewees selected their employers by location (where they wanted to live) and by their values aligning with the employer. Melissa works with the Salmon River Restoration Council, and their focus is providing restoration-focused employment and community support to the entire watershed. She shares the same values and is very happy to be working there.

Why did you select the industry that you are working in?

There are many reasons to choose an occupation and area in which to work. Some people know what they want to do or be from an early age, others discover their interests in college, and still others after graduation. Buck chose to work in the area of acid mine drainage because he grew up in rural northwest Pennsylvania and saw the scarred landscapes and polluted streams that were left from past generations of coal mining. Sara has been interested in environmental science since middle school and is now a research associate at Virginia Tech studying mine reclamation and working on research projects for various professors. After graduating with her Masters, Lindsay wanted to work with a government agency such as USFS; however, after realizing how difficult it was/is to get a job with a government agency, she pursued environmental consulting.

How did you pick your current position?

Many interviewees picked their current positions based on subject matter, location, experience to gain, and positive past positions/internships. Seth attributes ASMR as a big help in his selection of his current position. He said, "I met with RESPEC staff at the 2015 ASMR booth, was excited about the types of projects they worked on, and everything fell into place from there." Craig wanted to explore and expand his knowledge and experiences in restoration/reclamation, and fortunately a job opened up closer to home for him. He is working with the Quapaw Tribe of Oklahoma as an Assistant Environmental Director/ Environmental Engineer to help manage and conduct remedial activities at the Tar Creek Superfund Site. Buck describes being an environmental engineer as "a mechanic for the environment to diagnose and apply solutions to the problem at hand."

What do you find most rewarding in your job?

The rewarding aspects of our careers are different for everyone to some degree, but some common themes include working with a team of hard-working and fun people, and being able to see the improvements to the world around us, whether it be stream and watershed improvements, restoration of fisheries habitat, or restoration of tribal land following remedial action activities of superfund sites. Others find happiness when working with industry and clients to aid in their compliance with state/ federal environmental regulations, while enjoy improving their social and their environmental management skills.

How have you navigated your personal relationship with your supervisor?

The interviewees had some good insights and have had good supervisors. Seth said, "A beer or two after work with the boss is sometimes more helpful than good performance evaluations because it builds a personal connection, and you and he can be more honest in your relationship." A few of the interviewees said their supervisors are a wealth of knowledge and have provided guidance to them over the years.

How do you manage your work load?

Managing work load is a task that must be learned in any position. Making lists for a variety of time frames such as daily, weekly, monthly, and long term is a great way to keep track of multiple projects and deadlines. Melissa said, "To keep from being overwhelmed, I start each week with a list of my priorities. I make sure to focus on accomplishing those tasks, and remind myself that completing even little tasks help." Other suggestions include delegating tasks to other staff members, doing something fun outside of work each day, and being willing to put in the extra time to get the task done when needed.

How have you navigated gaining bigger responsibilities and being given additional roles as you have grown in your position?

Gaining more responsibility and roles can be both exciting and stressful. Greater responsibility often requires developing new or enhanced skills. Gaining additional roles generally requires learning leadership principles and increasing social contacts. Using tools to better manage your work load have aided many young professionals. Some have cross-trained to gain experience in other areas as a method to gain more responsibility and have career growth. As knowledge and experience expand, young professionals are in a better position to negotiate salary, benefits, and job desires.

Advice Offered From Early Career Professionals

- Don't be afraid to ask for help/ guidance.
- Network as much as you can.
- Next to competency and specific areas of expertise, personal relationships are what makes the world of consulting go. Make sure to build good relationships – with your coworkers, clients, bosses, regulators and everyone you meet in your professional career. You never know where the people you meet will be in a few years. Maintaining positive personal relationships throughout your professional career is one of the most valuable tools in the kit.
- Volunteer to help with everything! Say "yes" to opportunities as they come along. Even if you might not be paid for it, you may learn new skills that you can market later on, or at the very least, you will obtain good will from your colleagues for helping out. Saying yes to a variety of volunteer efforts is a good way to find out what you like to do and importantly what you don't like to do for work. Also, you don't know when unexpected opportunities may present themselves.
- Put yourself in some uncomfortable situations (including people contacts or intimidating settings) early on, so that those experiences can build over time. Down the road, you won't be caught off guard by anything that is thrown at you.
- Get a good education, get experience working in the field and gain technical skills. The field is still young, but growing very rapidly, so being able to use both technical skills and field experience to your advantage seems like a solid way to gain an edge.
- Stay in touch with your graduate advisor! He/she will most likely remain an asset and can still provide guidance.
- Business development is an important tool and can aid in job advancement. Utilize the knowledge of senior employees. Read a book or take an online class about how to sharpen your business development skills, particularly if you are an introvert like me.
- When asked a question, try to find an answer, *and then confirm it*, before responding.
- *Double check your work!* This is not school, and you often don't get a second chance. There are only two types of work: work that is right, and work that is not.
- Unless you already know the job and the employer, almost any job will not be what you thought it was going to be. It will require different skills, time commitments, personal relationships or work other than what you expected. Be flexible. ■

Haulin'ASMR 2017

By Michelle Coleman

Buck Neely (BioMost, Inc) and Michele Coleman (NB Power) at the Haulin' sign.

Front row: Ron Hamrick (Arch Coal), Michele Coleman (NB Power), "Buck" Cody Neely (BioMost, Inc) Back Row: Dan Guy (BioMost, Inc), Zenah Orndorff (Virgina Tech), Sara Klopf (Virgina Tech), Brad Pinno (Canadian Forest Service) Missing from photos from other days: Bryan Page (University of Oklahoma), Ryan Mahony (BioMost, Inc), Jim Gusek (Sovereign Consulting Inc)

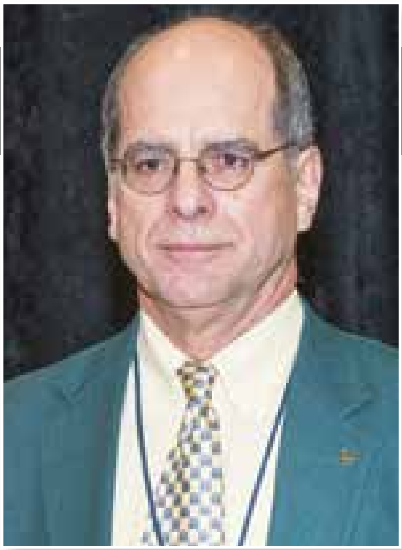
Wow! Haulin'ASMR is catching on as a great way to see the host city of our annual conferences, meet new people, network about ideas and get some exercise so that we have the stamina to make it through eight hours of stimulating presentations, followed by late nights with poster presentations and socials, dinners and organization meetings.

This year we had three levels of "speed" taking off each morning from the great sign that the organizers made. We had the "Strollin" ASMR participants who wanted to just get out along the Monongahela River, enjoy the cool mornings and meet new people but were not runners. We'd always had a group that participated at this level, so this year we formalized them with a name and invited other conference participants to join them. We still had the "Haulin" ASMR runners who plodded along the paved pathway chatting along with new friends and catching up on the news of old friends. We added the "Flyin" ASMR group for those members that were in training and really wanted a hard workout before the presentations started. Friendships and camaraderie formed through the competitiveness of that group.

Attendance ranged each morning, based on who had a presentation that day, or who had other distractions. Most mornings, between five and 10 participants arrived at the meeting sign. Every day there was at least one new face with 25 participants over the five days.

We hope to meet again in St. Louis, so please contact me at mcoleman@nbpower.com. We look forward to seeing many new faces with running or walking shoes in 2018! ■

Pioneer in Reclamation Award



Dr. Paul Ziemkiewicz

Dr. Paul Ziemkiewicz is Director of the National Mine Land Reclamation Center and the West Virginia Water Research Institute. He has worked in reclamation for over 40 years, and his accomplishments include many of the passive acid mine drainage treatment technologies in use today as well as watershed restoration planning methods. He has helped to initiate new policy and practice in mined land reclamation including acid mine drainage policies and initiatives, as well as innovative policies with fly ash and steel slag.

Dr. Ziemkiewicz received the E.M. Watkin Award for Outstanding Contribution to the Betterment of Land Reclamation from the Canadian Land Reclamation Association. He also received the Environmental Conservation Distinguished Service Award from the Society for Mining, Metallurgy and Exploration. Dr. Ziemkiewicz oversees programs in mine drainage, watershed management, biofuels, industrial site restoration and treatment of drilling brines.

ASMR is pleased and honored to present the Pioneer in Reclamation Award to Dr. Ziemkiewicz as the 2017 Pioneer in Reclamation by ASMR. He was nominated by Dr. Jeff Skousen.

Reclamationist of the Year Award

Timothy Danehy

Timothy Danehy is the 2017 recipient of the Reclamationist of the Year Award for demonstrating outstanding accomplishments in applications of reclamation technology. His professional career centers in innovative techniques to lower the cost of mine water treatment and enhance the sustainability of watershed restoration and protection efforts. His work and development in this field has led to the development of five patents. He has published numerous papers, journals, books and proceedings. Timothy has also received several honors and awards from regional and national organizations for the innovative approaches he has developed and recommended to the industry and governments for reclamation and water quality enhancement.

ASMR is happy to confer the 2017 Reclamationist of the Year Award to Timothy Danehy. He was nominated by William H.J. Strosnider.

Early Career Award in Reclamation

Dr. William H.J. Strosnider

Dr. William "Bill" Strosnider was awarded ASMR's Early Career Award in Reclamation for outstanding reclamation research, teaching, and application of reclamation technologies for a person working less than 10 years in reclamation. Bill works as an assistant professor at Saint Francis University in central Pennsylvania. He also serves as the Director of the Center for Watershed Research and Service at St. Francis.

Bill's focus has been identifying water-quality issues and advancing sustainable engineering solutions to improve human and ecosystem health. In his short professional career, Bill has journal publications and numerous conference proceedings and has worked in Bolivia, Peru, Guatemala, Nicaragua, and Haiti. One of his more productive research efforts has been in the passive co-treatment of acid mine drainage with wastewater and sewage. He also advises the Student Chapter of ASMR at St. Francis University.

ASMR is pleased to present the 2017 ASMR Early Career Award in Reclamation to Dr. Strosnider, who was nominated by Dr. Robert Nairn.

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

Dr. Jennifer Franklin

The Richard I. and Lela M. Barnhisel Reclamation Researcher of the Year Award is given to a scientist who has contributed to the advancement of reclamation science and/or technology through scientific research. Dr. Jennifer Franklin is an Associate Professor in the Department of Forestry, Wildlife, and Fisheries at the University of Tennessee-Knoxville, TN. Her current research includes tree-compatible ground covers for mine reclamation, health and effectiveness of trees in storm water retention basins, and American chestnut establishment on reclaimed mine sites. Dr. Franklin has published in journals and conference proceedings, and she teaches three undergraduate courses, two graduate-level courses, and advises several graduate students.

ASMR is happy to present the 2017 Richard I. and Lela M. Barnhisel Reclamation Researcher of the Year Award to Dr. Jennifer Franklin. Dr. Franklin was nominated by Richard Barnisel.

William T. Plass Lifetime Achievement Award

Dr. Robert W. Nairn

Dr. Robert W. Nairn was selected to receive the Plass Award, ASMR's most prestigious award. It is given to a person who has made significant contributions over his lifetime to the development of reclamation science and who has distinguished himself at the local, regional, national, and international levels.

Dr. Nairn is the Sam K. Viersen Family Presidential Professor in the School of Civil Engineering and Environmental Science at the University of Oklahoma, Norman, OK. He is Director of the Center for Restoration of Ecosystems and Watersheds, Associate Director of the Water Technologies for Emerging Regions Center, and Adjunct Professor of Biology at the University of Oklahoma. He teaches both undergraduate and graduate courses in environmental science and engineering. His general research areas include watershed biogeochemistry, ecological engineering, ecosystem restoration, and wetland science. His research involves reclamation of coal mined areas in Oklahoma and Arkansas, and the Tri-State Lead-Zinc Mining District of Oklahoma, Missouri, and Kansas. He also has significant research in the Bolivian Andes near Cerro Rico de Potosi. He has served as President of ASMR and received the Richard I. and Lela M. Barnhisel Reclamation Researcher of the Year Award, as well as the University of Oklahoma Vice President's Outstanding Research Impact Award.

ASMR is honored to present Dr. Nairn with the William T. Plass Award. Dr. Nairn was nominated by Margaret Dunn.

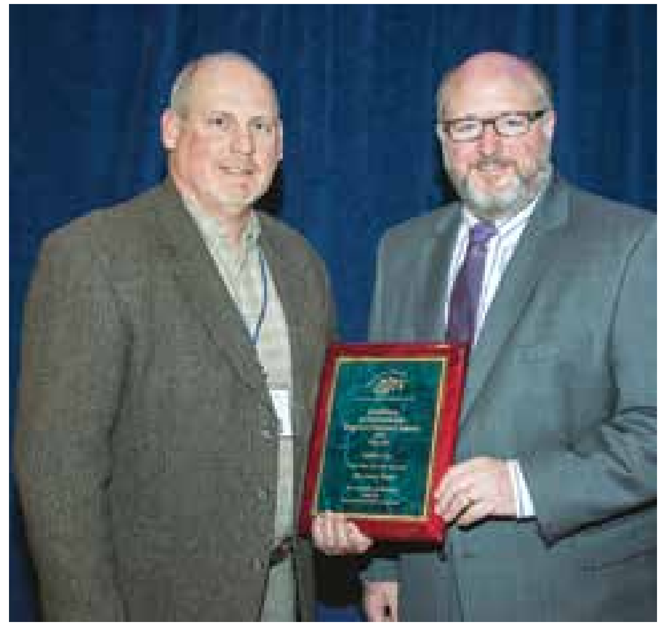
Appalachian Regional Reforestation Initiative Awards

Title V Award

COAL-MAC, INC

Terry Potter (Coal-Mac) receiving the Award from Tom Shope (OSM)

The Phoenix No. 1 Surface Mine is a mountaintop removal operation with four (4) valley fills operated by COAL-MAC, Inc. Phoenix No. 1 has an AOC variance and a post mining land use of forestland. Over 350,000 trees have been planted on this permit and this job exemplifies the intent of SMCRA in regard to contemporaneous reclamation, resource recovery, and overall compliance with the governing mining laws and regulations. This permit combines the best of mountain top removal with returning the area to a post mining land use of forestland while integrating the development of wildlife habitat. The reclamation process provides benefits for deer, turkey and a variety of other wildlife and will enhance this area in the years to come for the landowners and the environment.



Title IV Award

GOBCO, LLC

Lawrence Tankersley (VA DMME) accepting the Award for Gobco from Tom Shope (OSM)

GOBCO completely removed a coal refuse pile and established a new stream channel. The contractor seeded the area with a FRA mixture of low growing, non-competitive species of grass and legumes. The Virginia Department of Mines and Minerals contracted with Drennen Forestry, a professional tree-planting contractor, to plant 3,600 native hardwood seedlings over the site. After six complete growing seasons, red and white oaks are well established above the herbaceous layer.

MS Scholarship
Hannah Angel - Stephen F. Austin University

Ph.D. Scholarship
Stephanie Fulton - University of Georgia

1st Place Oral Presentation
Ellen Fielding - University of Oklahoma

1st Place Poster
Amy Sikora - University of Oklahoma

2nd Place Oral Presentation
Carolyn King - University of Alberta

2nd Place Poster
Amanda Pinnino - University of Wyoming

3rd Place Oral Presentation
Alexis Monteleone - West Virginia University

3rd Place Poster
Jennifer Buss - University of Alberta

Exhibitors at the Morgantown, WV Joint Conference

Allstar Ecology

ArborGen Inc. - Geoff Hill

Foam Concepts - Marcus Anderson

Appalachian Regional Reforestation Initiative - Kylie Schmidt & Pat Angel

TriHydro Amy Blyth

Triton Environmental - Daniel Hoover

Full Circle Mushroom - Lisa Van Houten

ASMR & ARRI - Nick Schaer and Scott Eggerud

Aridea Solutions - BJ Evans

RESPEC - Seth Cude

Baker Corp. - Tremel Guiillory

SNF Mining - Tim Kane & Jeff Volek


Office of Surface Mining


Marshall Miller & Assoc. - Jeff Almond

Carus Corp. - Pam Dugan

Navigator Environmental - Rachel Vass

Exhibitors at the Morgantown, WV Joint Conference

Civil & Environmental Cons. - Lindsay Wilson-Kokes


JRW Bioremediation - Mike Sieczkowski


Enviromine - James Sala

REIC Labs - Ed Kirk


NALCO - Danny Bess

Pacific InterMountain Dist. - Erik Krippaehne


WK Merriman - Matt Morosetti


Veolia - Pat Kanis

St. Cloud Mining - Dan Eyde


Truax Company - Michael Hall

Somerset Env. Solutions - Jeff Hayden

Gateway to ASMR

By Olivia Lewis
Frostburg State University

I am a first year ASMR student member and a senior in the process of obtaining my bachelors degree in Geography at Frostburg State University. My gateway to land reclamation was engraved in my university's surrounding landscape. Frostburg State University is located in the Ridge and Valley Region of the Appalachian Mountains in Frostburg, Allegany County, Maryland, which has a rich heritage of mining in the historic Georges Creek. The Georges Creek watershed is one of the larger tributaries flowing into the North Branch of the Potomac River and covers 74 square miles. Georges Creek, or as the locals would say, the "Crick", lies between the mountains of Big Savage and Dans. My geographic perspective and academic pursuit is expanding because of my focused interest in land reclamation. As a first year member of ASMR, I would like to share my exciting journey to land reclamation interests to my new ASMR community.

Dr. Matthew Ramspott is my advisor in the Geography Department at Frostburg State University and teaches the intermediate and advanced remote sensing classes. In the Spring of 2016, I was introduced to land reclamation when two remote sensing students and I collaborated on an undergraduate research project entitled, "Using Geospatial Imagery to Assess Impacts of Mountain Top Removal (MTR) Mining, a Central Appalachian Case Study." The project looked at two different locations, one in West Virginia and the other in Maryland. The larger of the two areas is located in West Virginia just east of Charleston, occupying parts of the two neighboring counties of Clay and Kanawha, near the unincorporated coal community of Bickmore. The second area is near Frostburg, Maryland, and includes numerous smaller mine sites that run along the Georges Creek Valley area, and some that are close to the Frostburg State University campus. We used imagery from both Land Sat 5 and 8 to create multi-temporal composites of surface mined site locations. Each composite consists of three processed Normalized Difference Vegetation Index (NDVI) dating from 1987, 1995 to 2015. The final product displays the land use changes from active mine sites to reclaimed lands. The data from the aerial imagery observation paired with cultural information about the coal communities was my first introduction to remote land reclamation.

In the Spring of 2017, I was lucky enough to get an internship with the Western Maryland Geospatial Information System Center (WMGISC) at Frostburg State University. The Center's most recent priority is to facilitate the utilization of Coal Combustion by Products (CCP's) as a helpful soil neutralizing tool in land reclamation projects. I spent four days a week at the WMGISC office learning about new land reclamation research and delineating coal crop subsidence areas and other mine related features along the contours within the Georges Creek Watershed using LiDAR imagery. My semester's work with the Center included developing a presentation to share with my friends at the FSU's undergraduate research symposium and was entitled, "Down in the Valley, Subsidence in Historic Georges Creek." The imagery showed pockets of soft spots along the coal outcrops which allow ground water to enter mine workings and increases saturation levels and chances of land mobility.

In the middle of the Spring semester, Dr. Flood, a professor of Environmental Analysis and Planning at Frostburg State University, announced to the geography students that the 2017 American Society of Mining and Reclamation Conference would be held at West Virginia University. Students that were interested were asked to write an essay about why they wanted to attend the AMSR conference. Four students including myself earned the opportunity to attend the ASMR conference.
It was my first time attending the conference, and I felt welcomed by the conference coordinators. We sat through presentations by people with different roles within the mining industry, such as scientists, private consultants and regulators. The international presentations peaked my interest.
Prior to hearing the international

presentations, I hadn't thought about minable coal environments outside of the United States and the different environments that require similar but different land reclamation incentives/aids. I was inspired by watching young ASMR members present, and I hope to present at the ASMR conference in 2018.

Another area that has been an exciting continuation of my journey was being hired for a summer internship at the Maryland Department of the Environment with the Mining Program, Abandoned Mine Lands Division in Frostburg, Maryland. AML consists of a team of engineers, geologists, biologists and program mangers to aid the effects of energy extraction prior to the Surface Mining Control and Reclamation Act of 1977. The process begins with the AML problem that has been identified and approved from an Office of Surface Mining grant. No further action can be taken without a right of entry from the land owner. After evaluating the landscape, a design for the project is drawn by one of the agency's engineers. The project manager will then obtain all permits, then invite bids from contractors for the work, and then select the contractor. While the projects are being constructed, periodical inspections are made at the construction site to insure the project is being developed sufficiently. The summer internship with the Maryland Abandoned Mine Lands Division gave me the opportunity to actively use the skills I learned at Frostburg State University in the work force.

Spending my college years in an historic mining town in Appalachia has helped fuel my understanding of the cyclical nature of energy extraction. My past, present and future academic goals have been directed toward land reclamation. The skills I have obtained through academics and in the work place will be of value in my future pursuits. I am looking forward to this coming school year to build upon my GIS-based research to ultimately become an active member in the American Society of Mining and Reclamation. ■

CALL FOR ABSTRACTS

CONFERENCE ABSTACTS AND PAPERS due by January 8, 2018

We invite researchers, practitioners, regulators, industry, consulting firms, and others to present research findings, case studies, demonstration projects, and regulatory/policy studies on any of the following subjects:

Forestry and Wildlife
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Geomorphic Landform Reclamation/Land Use and Design
Soils and Overburden/Cover Systems
Water Management/ARD
Abandoned Mine Lands (AML)
Refuse, Waste Rock, and Tailings Management

If you are interested in moderating a session contact Chris Johnston, cjohnston@imlinc.com or organizing a session, please contact Kim Vories, kimery.vories7@gmail.com

Please submit an abstract **electronically** for an oral or poster presentation by **January 8, 2018** to Robert Darmody (rdarmody@illinois.edu). Abstracts will be reviewed and placed in a technical session. An abstract submission form is available at www.asmr.us. All PowerPoint presentations will be loaded on a conference web site.

CONFERENCE SITE

The conference center and hotel is the RENAISSANCE St. Louis Airport Hotel at 9801 Natural Bridge Road, St. Louis, MO 63134. A block of rooms has been reserved at the rate of $139 per night including hotel parking. A special government rate is available with appropriate ID at $129 per night. The room block is under ASMR. Room reservations can also be made at www.asmr.us. The hotel phone number is (314) 429-1100.

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Thursday June 7, 2018

#1 Tour Guide: **Dan Barkley**, Illinois Office of Mines and Minerals, Begins at 7:30 am and lasts approximately 9 hours.
Illinois Underground Longwall Mining Mitigation on Farmland

##2 Tour Guide: **Paul Griswold**, Peabody Energy, Begins at 8:30 am and lasts approximately 5 hours.
Prairie State Energy Campus tour featuring one of the most modern and efficient coal power plants in the country.

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Challenges and Opportunities: Oil Sands Mine Reclamation in the Boreal Forest of Northern Alberta, Canada

By Brad Pinno, Research Scientist, Forest ecology and reclamation, Natural Resources Canada, Canadian Forest Service

The mineable oil sands are a major resource in northern Alberta, Canada, near the city of Fort McMurray with an estimated 32 billion barrels of recoverable oil from the total mineable area of 4,800 km^2 (1,850 sq miles) where the oil sands are within 75 m (250 ft) of the surface and are suitable for extraction by open pit mining (Figure 1). The total oil sands reserve is much larger with deeper deposits across northern Alberta being developed using a variety of different techniques where steam is injected into the ground to essentially "melt" the heavy oil thereby allowing it to be pumped to the surface. Within the mineable oil sands, there are currently seven active mines with more proposals in varying stages of applications and approvals. The current total disturbed area is 904 km^2 (350 square miles) and there is daily production of over 1 million barrels which is processed by upgraders on site or processed further south around Edmonton. One of the unique aspects of these mines is that they are located adjacent to each other within a relatively small geographic area.

The oil sands mines are all on provincially owned public land which is leased to the mining companies by the Government of Alberta for resource extraction with the land eventually being returned to the province once all reclamation and closure activities are complete. One of the fundamental requirements for all industrial activity on public lands in Alberta is to reclaim the land to an "equivalent land capability" to what

Figure 1: Oil sands deposits in northern Alberta, Canada. The yellow area is the total oil sands deposits while the black is the mineable oil sands. IMAGE FROM ROGER BRETT.

Figure 2: Common boreal forest types of northern Alberta. A) Boreal mixed wood forest composed of trembling aspen and white spruce are the most common stand type in upland areas. B) Fens and bogs with tamarack and black spruce are common wetland forests. C) Newly regenerated aspen forest after the 2016 McMurray fire.

was present before the development. This means that the land will be able to support a variety of post-disturbance land uses but not necessarily just those that were present before disturbance. For oil sands mines in the boreal forest, these reclamation requirements have been expanded to include the goal of creating "self-sustaining, locally common boreal forest ecosystems." This is a high standard and puts more of an emphasis on creating functioning forest ecosystems and producing multiple values rather than creating simpler timber plantations or agricultural fields.

Northern Alberta is in the heart of the boreal forest with major forest types of trembling aspen (*Populus tremuloides*) and white spruce (*Picea glauca*) on mesic uplands, jack pine (*Pinus banksiana*) on sandy uplands, and black spruce (*Picea mariana*) and tamarack (*Larix laricina*) on wetland bogs and fens (Figure 2). These are also the same types of forests that will be created during reclamation and that will form the final closure landscape. There are many limitations for forests growing in these northern areas, regardless of whether they are natural or reclaimed forests, with long, cold winters (average January temperature of –17°C or 1°F), short cool summers (average July temp of 17°C or 63°F) and little precipitation (annual average of 420 mm or 16.5 inches) which mostly falls during the growing season. Besides mining and other industrial disturbances such as timber harvesting, natural disturbances such as wildfire are also common in the region with major fires north of the

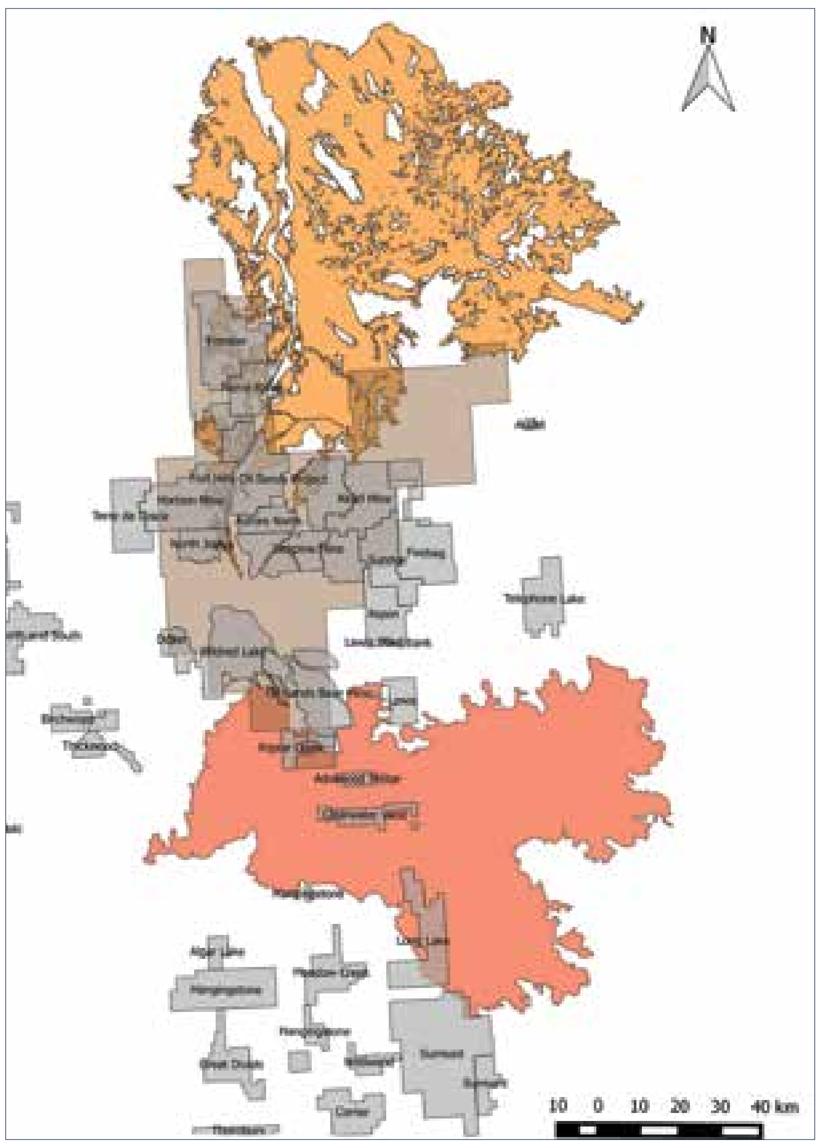

Figure 3: The mineable oil sands (brown) surrounded by the Richardson Fire of 2011 (orange) to the north and McMurray Fire of 2016 (red) to the south. Both mining and other oil sands extraction leases are shown (gray). FIGURE FROM EDITH LI.

oil sands in 2011 (Richardson Fire – 700,000 ha or 1.7M acres) and south of the oil sands in 2016 (McMurray Fire – 590,000 ha or 1.4M acres) (Figure 3).

Even though there are harsh climatic conditions in northern Alberta, there are some advantages to working in the boreal forest. For example, there is an abundance of quality reclamation soils rich in organic matter salvaged from either upland forests or wetlands. The soils in the region are geologically young and relatively unweathered so they are generally high in available nutrients, base cations, and organic carbon. The freezing temperatures can also be advantageous by allowing the salvage and placement of soil while it is frozen in the winter thereby reducing the potential for compaction. The harsh climate also limits the number of problematic weed species present in the area and although there are abundant agricultural weeds on many young reclamation sites, most of these are eliminated from the site once the native vegetation becomes established. A common misconception is that oil sands reclamation sites are contaminated with oil and have acid mine drainage problems but this is not true. In fact, high pH and salinity are more common issues to deal with by ensuring that the reclamation cover soils are deep enough and have suitable chemical properties (pH<8, EC<4) to support the future forest.

Figure 4: Reclamation soils being placed. Moving right to left in the photo are the overburden, suitable subsoil, and then cover soils rich in organic matter. PHOTO BY EDITH LI.

Figure 5: Forest floor based reclamation soils showing the high diversity of understory plants. The small white flowers are wild strawberry. PHOTO BY BRAD PINNO.

The two major reclamation cover soils, upland forest based (referred to as forest floor mineral mix or FFM) and wetland based (referred to as peat mineral mix or PMM), have different properties that are beneficial for use in reclamation (Figure 4, Table 1). The FFM soils are a mixture of the forest floor (O horizon) mixed with the underlying A and B horizons salvaged to a depth of approximately 50 centimetres (20 inches). This mixture is rich in plant seeds, roots, and rhizomes so when it is placed on reclamation areas a high native plant diversity similar to that of the previous forest establishes (Figure 5, Errington and Pinno 2015). These FFM soils are also the most "natural," given that they have only been salvaged and transported from an existing forest to a newly reclaimed forest (without stockpiling) resulting in a nutrient regime (Howell et al. 2017) and microbial community that are similar to natural forests. However, these high levels of plant propagules, nutrients and active microbial communities result in a flush of herbaceous vegetation which can compete with trees thereby reducing natural establishment and growth.

The other type of reclamation cover soil, PMM, is rich in peat and has a very high water holding capacity. This high water holding capacity is beneficial to the establishment of tree seedlings, particularly trembling aspen and balsam poplar (*Populus balsamifera*), which have very small, wind-blown seeds requiring a continuous water supply in order to germinate and establish (Pinno and Errington 2015). In many cases we have seen up to 20,000 seedlings per ha (8,000 per acre) naturally establishing on these soils (Figure 6). However, the plant community is noticeably less diverse on these soils (Errington and Pinno 2015) likely because the wetland plants that were previously growing in the soil are not suited for growing in reclamation areas.

Table 1: Soil and site properties from six-year-old reclamation sites and natural forest. Soil properties are from 0-15 cm. FFM is forest floor mineral mix reclamation soil. PMM is peat mineral mix reclamation soil. Natural is a fire origin trembling aspen forest. Forb diversity refers to native forbs only. Tree regeneration refers to natural aspen regeneration. In reclaimed stands this regeneration is from natural seeding while in the natural forest it is from root suckers.

	pH (in H_2O)	Carbon (%)	Bulk density (g cm^{-3})	Water content (%)	Vegetation biomass (g 0.25 m^{-2})	Forb diversity (# species 200 m^{-2})	Tree regeneration (stems ha^{-1})
FFM	7.6	2.6	1.01	18	32	18	3,500
PMM	6.0	8.1	0.58	31	6	13	9,500
Natural	5.4	1.1	1.13	7	81	20	30,000

Figure 6: Reclamation researchers in a stand of 6-yr-old trembling aspen trees which naturally established from seed on peat-mineral mix reclamation soil. PHOTO BY BRAD PINNO.

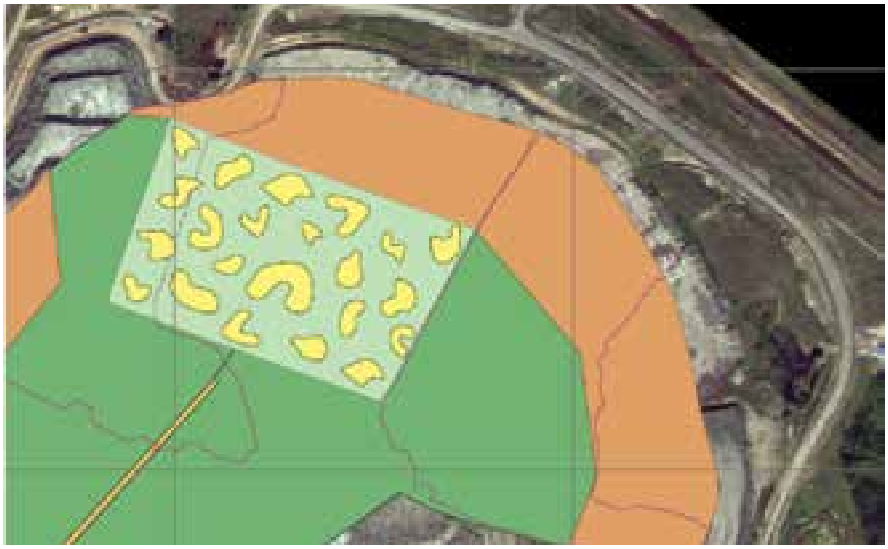

Figure 7: Islands reclamation area showing the high diversity patches of forest floor based soil (yellow) within a matrix of peat based soil (light green). Surrounding areas of FFM (dark green) and PMM (orange) show the typical scale and arrangement of cover soil placement. IMAGE FROM KRISTA SHEA.

Given the importance of both trees and understory plant communities, the question is now being asked about how to combine these soils across the landscape to maximize their overall benefit. One approach that is being tested now is referred to as the "Islands" where patches of the higher diversity forest floor based soil are placed within a matrix of peat based soil either in mixtures or layers (Figure 7). These islands may then act as colonization centers for plants to establish and then spread across the entire reclamation site, similar to what is seen in nature with unburnt patches after wildfires or in timber harvesting with reserve patches left within cutblocks (Pinno et al. 2016).

Most of the existing reclamation in the mineable oil sands has been done on overburden dumps but approximately half of the final reclamation landscape will

Author Brad Pinno is a Research Scientist with Natural Resources Canada, Canadian Forest Service based in Edmonton, Alberta. Here he is on a newly reclaimed area immediately after soil placement. PHOTO BY RUTH ERRINGTON.

be on tailings landforms which may be more difficult to reclaim. Oil sands tailings can have elevated salts from both natural and oil extraction processes, texture extremes with both sands and clays produced depending on the extraction process used, and potential nutrient limitations for plant growth. However, there are research projects that are developing effective techniques for reclaiming these tailings deposits. One of these is the Sandhill Fen Watershed project which is a world class operational research project demonstrating how both upland forests and wetlands can be created on tailings deposits (Wytrykush et al. 2012). This project brings together a diverse group of researchers from across North America, from plant and insect biologists to geochemists and hydrologists, to study new tailings reclamation techniques. The results and best practices from the study are now being applied to new tailings reclamation areas.

Another potential reclamation challenge is the use of stockpiled soil. Direct placement of soils is preferred, both operationally to reduce handling costs and ecologically to preserve plant diversity and ecosystem function. However, direct soil placement is not always possible so soil is stockpiled for future use. In fact, a large proportion of the final reclamation landscape will be created using stockpiled cover soils. The main issue with stockpiled soil is a loss of viability of buried plant propagules, particularly in FFM, and extra handling which can result in higher risks of compaction. Alternative reclamation techniques are being tested that might decrease the risks of using stockpiled soils. For example, on some stockpiles, trees are being planted and native vegetation is being encouraged to maintain a healthy plant and soil community with the anticipation that these stockpile soil materials will be used in final reclamation in the future. If the trees and desirable plants can become established this may provide the surface layers of the stockpiled soils with the same biological legacy of plants as in the FFM when it is used in reclamation.

Like all reclamation, there are both challenges and opportunities associated with reclaiming oil sands mines in the boreal forest of northern Alberta. It is still early in the development cycle for this resource so there is an emphasis on reclamation research now with the expectation that this work and investment will pay back great dividends in the future when reclamation activities ramp up in the future around 2030. ■

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The Center for Watershed Research and Service at Saint Francis University

By Hannah Patton, William Strosnider, Kelsea Green

The Center for Watershed Research and Service (CWRS) helps to match nonprofit partners in need of assistance with faculty and students that can help them to achieve their desired restoration result. The Center was founded in 2012 and is associated with the Environmental Engineering program at Saint Francis University. The overall mission of CWRS is to provide expert assistance and manpower in order to magnify the watershed restoration efforts of both domestic and international nonprofit organizations. In providing local and international projects with expert assistance, time, and extra manpower, CWRS hopes that their efforts to support watershed restoration will help to advance restoration science, foster community involvement, and develop the next generation of environmental professionals (Figure 1).

Figure 1: CWRS Undergraduate students testing alkalinity in water samples in Potosí, Bolivia.

The work completed by CWRS is centered on abandoned mine drainage (AMD) restoration. Partnerships have been established between CWRS and an assortment of nonprofit organizations, including Stream Restoration Inc., Engineers in Action, Clearfield Creek Watershed Association, Kiski-Conemaugh Stream-Team, Blair County Conservation District, Stonycreek-Conemaugh River Improvement Project, Sandyvale Memorial Gardens, and many more (Figure 2). William Strosnider is the CWRS director. Environmental engineering professors Kelsea Green and Joel Bandstra are associate directors, along with Denise Damico, an environmental historian.

Figure 2: CWRS Faculty Member Professor Kelsea Green performing community outreach at a Pittsburgh Pirates game.

Incorporating undergraduate students into restoration projects is integral to the success of CWRS. Undergraduate student involvement allows students to improve their ability to complete research and work in the field and laboratory, and alternately provides nonprofit organizations with more manpower to efficiently complete projects (Figure 3). Integrating students into CWRS projects is completed in a variety of ways: class projects are given to students involving real world problems with the goal of providing service to nonprofit partners, student-professor research teams are formed to investigate fundamental and applied science questions that are of interest to nonprofit partners, and the Saint Francis University student body is mobilized for large volunteer events supporting nonprofit partners. The CWRS is an organization that is uniquely modeled to blend education with technical service. This model can be modified and applied in a variety of circumstances in order to benefit both students and the environment.

Figure 3: CWRS Undergraduate Students sampling Lambert's Run in Western Pennsylvania.

CWRS hopes that by connecting with members of ASMR, they can further accomplish their mission and become more involved with various organizations and projects. Please feel free to contact CWRS with any questions, comments, or potential project ideas. Contact information for CWRS, as well as information on projects, can be found in the recent newsletter on their webpage: https://www.francis.edu/center-for-watershed-research-and-service/, as well as on their Facebook "Center for Watershed Research & Service." ■

Natural Processes for Restoring Mines

By David Polster
Polster Environmental Services



Picture 1. Compaction (left), steep slopes (center) and a lack of micro-sites (right) are common filters at many mine sites.

Natural processes have been restoring natural disturbances for millions of years, from volcanic eruptions to landslides, glaciation and riverbank erosion. Understanding how these processes have operated and functioned on natural disturbances allows us to apply these natural processes to disturbances humans create. The first step in applying these natural processes is to identify the filters or constraints that are preventing natural recovery. At most mines, issues such as compaction, steep slopes and a lack of suitable micro-sites prevent the collection, germination, and establishment of pioneering vegetation (Pictures 1 and 2).

How do natural processes deal with these filters? For example, tree windfalls in a forest bring up clumps of soil in their roots (Picture 3). A mound of loose soil is left beside the hole and root decomposition releases a flush of nutrients. The loose soil eliminates compaction and addresses the issue of micro-sites as the mound and the hole create a diversity of conditions. In addition, the natural process of making the forest floor rough and loose brings up nutrients such as phosphorus that can stimulate growth in nutrient-limited ecosystems.

Erosion is another issue at many mines (Picture 4). The common solution to soil erosion is to seed the site with grasses and legumes to hold soil particles. While effective, seeding with agronomic grasses and legumes has been shown to prevent recruitment and establishment of woody species. Making sites rough and loose can prevent erosion and create conditions that foster recovery without the use of heavy forage seeding. A reasonably sized excavator can make rough and loose configurations by opening holes on the site, dumping the material that is generated from the holes in mounds between the holes. The excavator, using a digging bucket (not a clean-up bucket), takes a large bucket full of material and places it to the left of the hole that was just opened with half of the material in the bucket outside the hole and the other half spilling into the hole. Rocks are welcome to include as these tend to create additional heterogeneity. A second hole is then excavated half a bucket width to the right of the first hole. Material from this hole is then placed between the first and second holes. A third hole is now opened half a bucket width to the right of the second hole, with the excavated soil placed between the second and third holes. Care should be taken when excavating the holes to shatter the material between the holes as the hole is dug. The process of making holes and dumping soil is continued until the reasonable operating swing of the excavator is reached. The excavator then backs up the width of a hole and repeats this process, being sure to line up the holes in an alternating fashion with the space between the holes (mounds) on the previous row. Rough and loose surface configurations can be used on re-contoured

Picture 2. Rough and loose ground on this re-sloped waste rock dump prevents erosion, eliminates compaction and provides a diversity of micro-sites for seeds to land in and where plants can grow. Willow cuttings that can be seen growing here were easily installed in the rough and loose ground.

Picture 3. Trees turning over in a forest create a natural pattern of mounds and holes that provide a diversity of micro-sites where the seeds of pioneer species can land and grow.

Picture 4. Erosion is a common problem at many mines (left). However, treating erosion by seeding with agronomic grasses and legumes (center) such as on this exploration trench seeded in 1977, creates a barrier to recovery as can be seen in this picture taken in 2009 (right), 32 years after the seeding.

Picture 5. This former hydroelectric dam site was made rough and loose with equipment, and woody debris was scattered on the surface (left). Alder and conifers (Douglas-fir) seeded in naturally (center and right) and were found in all but one of the 50 plots that were established to monitor recovery.

dump slopes to control erosion and provide suitable sites for vegetation establishment. Between 1 and 1.5 m of elevation difference should occur between the tops of the mounds and the bottoms of the holes. The cost of making mine sites rough and loose was found to be about $715/ha while the cost of traditional hydroseeding is about $3,500/ha, so the rough and loose ground is much better as well as being cheaper.

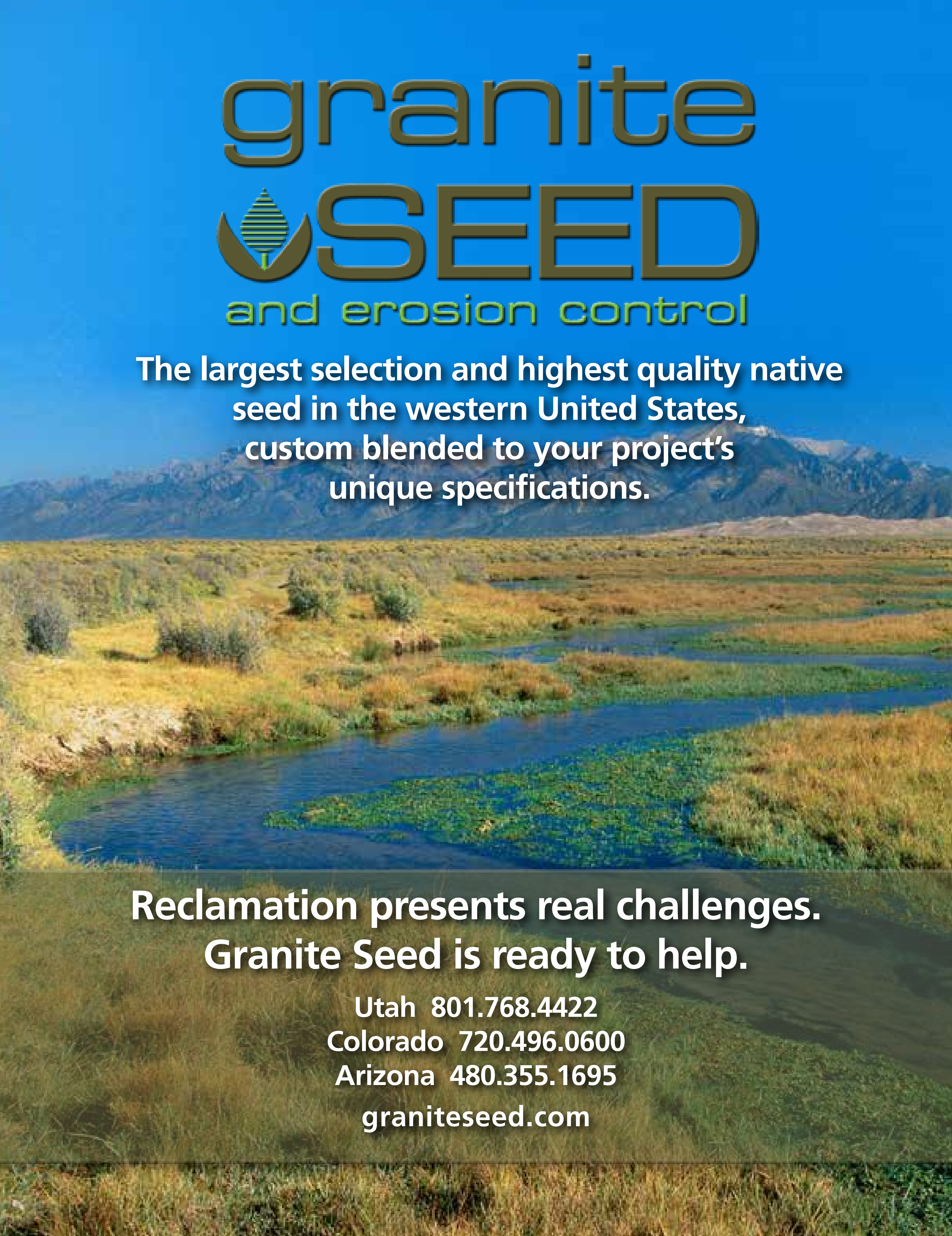
Pioneer species such as alder, poplar and willows will quickly establish on suitably prepared sites. So creating conditions that allow pioneer species to establish and thrive will foster conditions for the growth of later successional species. In addition, the diversity of micro-sites creates habitat for a diversity of species including more pioneer, mid- and late-successional species. The former dam site shown in the following photographs was made rough and loose and woody debris was scattered (Picture 5). By the fourth growing season after the dam was removed, the site was covered with pioneer species such as red alder and conifers were growing in all but one of the 50 plots used to monitor the recovery. A total of 84 species had established thereby creasing a diverse ecosystem that will be resilient to changes in the environment. By using the natural recovery processes, the cost of restoration was limited to the cost of making the sites rough and loose and scattering the woody debris. In terms of machine time, it should be noted that the cost of making sites rough and loose is less than the cost of making it smooth.

Natural recovery processes can significantly reduce the cost of mine reclamation. By creating situations that foster the establishment of pioneer species and ameliorate the filters

Picture 6. *A waste rock area in Timmins, Ontario has been colonized by a diversity of pioneer species as well as local conifers. If this area had been made rough and loose rather than leaving it smooth, with woody debris scattered on the surface, the restoration of this area would be complete. Note that no topsoil or other growth media was applied to this site and the vegetation establishment was totally unanticipated.*

Picture 7. In contrast to Picture 6, this site, also in Canada, was made rough and loose with woody debris scattered on the surface. Recruitment of native species was much faster and growth is better than the site/soil conditions shown in Picture 6.

(compaction, steep slopes, lack of micro-sites, etc.) that are preventing recovery, mine sites can naturally recover with all the right species in all the right places (Pictures 6 and 7). In forest areas, care must be taken to avoid seeding the site with competitive grasses and legumes. This historic treatment for mine reclamation has slowed the process of recovery and in some cases actually reversed the recovery of the site. By paying attention to the conditions that are preventing recovery (filters), the reclamation of mining disturbances can be simple, effective and cheap. ■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