

OFFICIAL PUBLICATION OF THE AMERICAN SOCIETY OF RECLAMATION SCIENCES

# reclamation *matters*

Fall 2025



**Highlights of the 42nd Annual ASRS Meeting in Butte**

**Working with Mother Nature at the University of Oklahoma  
Center for Restoration Ecosystems and Watersheds**

**2025 ASRS Professional Student Awards**

**Lifetime Member Spotlight: Bob Nairn**

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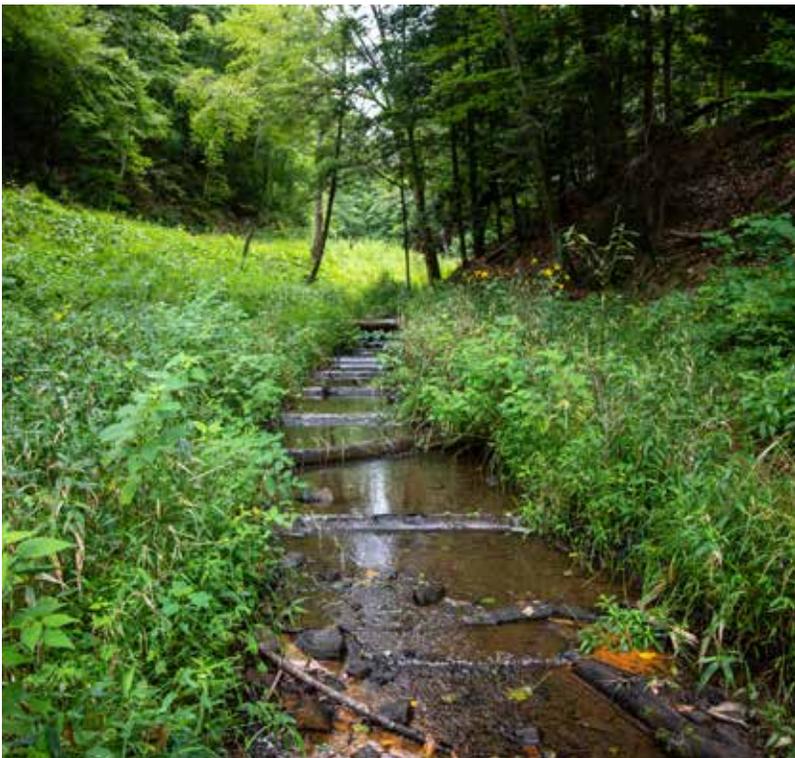


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## reclamation matters

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## KENNET BERTELSEN

There's a Luke Bryan song with the lyrics "I believe that days go slow, and years go fast." That song was playing on a Spotify playlist I "borrowed" from my daughter when I realized it was a decade ago that I joined the planning committee for the ASRS (then ASMR) Annual Meeting in Spokane. At the time, I knew of the organization vaguely, through friends and business colleagues. To be honest, I really didn't think much beyond it being a seemingly decent business development investment, made more attractive by the event being held locally to where I live.

A lot of slow days, quick years, and volunteer hours later, I'm writing this as President of the organization. Clearly ASRS made a much larger impression on me than a few new business cards. What I noticed in that first meeting I attended was that ASRS seemed to have a true sense of community. We have an outsized geographic and technical footprint for our membership number, but with members who feel personally connected to the organization. As I talked to people at our most recent meeting in Butte, I was happy to have that feeling reinforced repeatedly.

Now, a lot of changes can happen in 10 years, and our organization is no different. We've changed our name, seen meeting attendance vary, evolved

operationally, and had a pandemic thrown in there just for fun. We have also seen changes in the way industry and the public views "reclamation." Heck, even what we consider "industry" has changed. It's a lot to keep up with, and over the last couple of years, ASRS has continued to have conversations about the long-term health and vitality of the organization.

While folks continue to ask some form of "how is ASRS doing?," the short answer is ASRS is doing well! We had a very successful annual meeting in 2025 and have an excellent group of committed volunteers on the National Executive Council (NEC) and our various committees. Our finances are in strong order, and we continue to see new members and volunteers. Would we like to see more growth? Of course, but not just for growth's sake. We want to maintain value for membership, not least of which is that sense of community and belonging that keeps us all here. We want to share that with new members, not just count numbers.

In 2024, we held a series of roundtable events to gather feedback from our membership to help strengthen the value we bring. More frequent events to gather, in person or virtually, to foster communication and collaboration among members was a recurring theme. That led to the rollout of our fall and spring webinar

series, and we are continuing to secure sponsors to keep those events free to attendees. Attendance numbers exceeded our expectations, and we are excited to kick off the 2025/2026 series, detailed later in this issue of *Reclamation Matters*. Please join us for great content and discussions at those events!

We continue to grow our social media presence and encourage you to reach out on Facebook and LinkedIn. We welcome your feedback and would love to hear what makes ASRS so special to you! We will continue to use that feedback to better implement outreach to new members and existing members alike. Making those events between annual meetings better.

Planning for upcoming annual Meetings in Laramie, WY (2026) and Pittsburgh, PA (2027) is going strong. If you would like to get involved, please reach out to the planning chairs:

### **Laramie**

#### **Brenda Schladweiler**

bschladweiler@bksenvironmental.com

#### **Paul Griswold**

PGriswold@peabodyenergy.com

### **Pittsburgh**

#### **Kelsea Green**

kelsea@biomost.com

#### **Dan Guy**

dan@biomost.com

*We continue to grow our social media presence and encourage you to reach out on Facebook and LinkedIn. We welcome your feedback and would love to hear what makes ASRS so special to you!*

We have started to develop a different approach to annual meetings as well. In the past, ASRS would go between east and west locations in alternating years. As part of our Strategic Plan update, we are looking at the selection process being driven more by a “champion” of a particular location and are looking for someone to bring their own unique perspective and energy to 2028!

Shifting to our Strategic Plan update in general, the last overhaul happened around the time of our name change. As I mentioned before, a lot has happened since then, and we felt it was time to take stock of what has been accomplished and what may

need a refresh. This update is being spearheaded by former ASRS president Julie LeBar, with her and I meeting regularly to provide a draft update to the NEC in October 2025. Sustained success and growth of the organization is the primary driver of the document, intended to:

- Maintain and strengthen value to new and existing members;
- Identify new ways to engage industry, understanding that legacy mining is no longer the only industry involved in reclamation;
- Set intentional growth metrics that play to, and build off, our strengths –

not reinventing who we are; and

- Provide current and future ASRS leadership with tangible metrics to define and track success.

Our 2025 election is coming up, and we have a strong slate of candidates looking to increase their involvement in our organization! After 10 years volunteering in some capacity at ASRS, that reinforces the sense of community I have and strengthens my belief that the future of ASRS is bright.

I hope you enjoy this issue of *Reclamation Matters*, and please reach out with any questions, comments, or concerns at [president@asrs.us](mailto:president@asrs.us). 🌱



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# Looking ahead

BRANDON HOLZBAUER-SCHWEITZER  
STUDENT AND EARLY CAREER PROFESSIONALS REPRESENTATIVE

This past June, ASRS held the 42nd Annual Meeting in Butte, Montana. The meeting was a huge success for the society, so I'd like to thank the planning committee for putting together such an outstanding event, and all attendees for their engagement with all the activities and sessions.

Planning for the 43rd Annual Meeting in Laramie, Wyoming is in full swing. We have lots of exciting events planned for 2026, including the second annual Early Career Professional (ECP) Trivia Night. I'm eager to see all the familiar faces in Wyoming and hope we can continue to grow our society, so be sure to spread the word. If you're looking to stay involved between now and June,



be sure to check the ASRS website (ASRS.us) for upcoming activities, including the virtual mid-year event. The continued commitment from our members, National Executive Council (NEC), Technical Division Representatives, and many other committees are what make the Society

great. So, please stay engaged!

It is crazy to think that 2025 is rapidly coming to a close, but I am honestly looking forward to some cooler weather – it has been hot in Denver. This summer has been quite busy, but I hope everyone has been

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<b>Required Bond Value</b>	<b>\$35,647,090</b>

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successful and completed the year's fieldwork season safely. Sadly, this will be my last summer as the ASRS ECP Representative, but I look to stay involved with the Society by sitting on the Financial Advisory Committee, and hopefully the NEC. As my term as the ECP comes to an end, I look forward to meeting new people, reinforcing relationships with old friends, and staying engaged with ASRS.

ASRS will hold elections for several positions (Student NEC Representative, President, ECP Representative, and the NEC) this fall. We have many promising nominees lined up for these positions, and I'm excited to see what

our new leaders have to offer with a fresh perspective on the Society. We are also working on expanding what ASRS can offer the students and ECPs through our Student Engagement Committee. This can't be done alone, so please consider this a call out to all those interested in becoming involved and learning more about the early years of your career and what opportunities are available as we grow together. Any questions, comments, or requests you may have are welcomed with open arms.

Thank you all for your continued support, engagement, and participation with ASRS. 🌱



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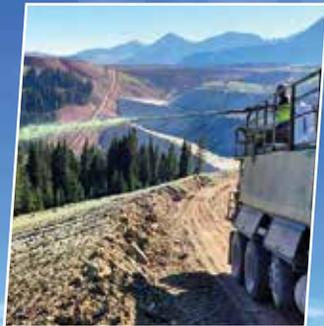
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# Thanks to MICHAEL CURRAN

*Reclamation Matters* wants to thank Mike Curran for his dedication to this magazine since 2023 when he took over the Editor position from Jeff Skousen. An additional year before that was spent mentoring under Jeff. *Reclamation Matters* wishes Mike well in all future endeavors.

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# 2025 Wild Women of Reclamation



*Front row (L to R): Natalie Kruse Daniels, Erin Richard, Sara Klopf, Samantha Treu, Brittany Trushel, Marie Shepherd, Heather Brighton, Michele Coleman, Kelsea Green. Second row (L to R): Brenda Schladweiler, Adrianna Dacres, Fadekemi Onipede, Dupe Oluwasesan, Paxton Hunter, Paige Ford, Sam Taylor, Adele Vickland. Third row: Anna Waitthus, Aimee Kelly, Meghan Blair, Audrey Hardgrave, Emily Fox, Erin Hurley, Krista Noyes, Laurel Vickland. Fourth row (L to R): Molly McDermott, Jasmine Allison, Faith Day, Kaela Walton-Sather, Jenise Bauman, Felicia Cassidy, Olivia Spilker, Annastasia Erdmann. Back row: Jennifer Franklin, Gwen Geidel, Kristina Minchow.*

BY SARA KLOPF AND GWEN GEIDEL

The 11th annual meeting of the Wild Women of Reclamation (WWR) was held on June 3, 2025 during the 42nd Annual American Society for Reclamation Sciences (ASRS) meeting in Butte, MT. This year, Michele Coleman has stepped down from the WWR leadership, and we want to thank her very much for her dedication and initiative in starting and shepherding this group over the last 10 years along with Brenda Schladweiler. During both Michele's and Brenda's terms as President of ASRS, each was able to further encourage and provide mentoring and camaraderie as the group continues to grow.

The goals of the WWR are to provide mentorship and professional support for women in reclamation. We facilitate networking by meeting in a smaller group, and we all enjoy learning from the life experiences of others at many different career stages. Every year, we host a presenter who shares "their story," which can mean different things to each presenter. Common topics are work/family balance, enthusiasm for learning from many different sources, and challenges in the workplace.



This year, our presenter was Marie Shepherd, P.E., who has worked for Peabody's Kayenta Mine in Arizona for most of her career. Marie is a Diné Navajo woman who credits much of her success to her grandparents, and who understood the importance of traditional teachings as well as western education. Marie attended the University of Arizona, which she selected for the climate and optimal distance from home. While she initially felt lonely there, she eventually found other Navajo students and built her community away from home.

Marie's first job out of college was with the Arizona Department of Transportation, where she worked on many projects including basic earthworks, rest area construction, and moving an entire bridge five miles

down the road. While with ADOT she made an effort to learn from all ranks and develop relationships with mentors, while not being afraid to contribute her own opinions.

She entered the world of reclamation with the McKinley coal mine in New Mexico and although she was initially unsure about working in mining, she realized that mining was essentially a large cut and fill project, which helped her build confidence. At McKinley, she learned a great deal about the mining and reclamation process, built her leadership skills, and tallied up several accolades. She took on the daunting task of updating the R2P2 coal mining permit, and was successful, even though her first calculations were "rubbish!" Marie and her team won an award in 2008 from the New Mexico

Mining and Minerals Division for their geomorphic reclamation work. She was also able to produce a video recorded in Navajo to explain exploration drilling to locals who were not able to understand previous outreach efforts. Although she had a very rewarding position at McKinley Mine, she saw a position with Peabody's Kayenta Mine in Arizona and was encouraged by her colleagues to apply to advance her career.

Ever humble, Marie was surprised to be hired at Kayenta, but excited to have the opportunity to grow and learn in this new position. At Kayenta, she has worked on reclamation, monitoring, permitting, building relationships with the local community, mine closure, and bond release. Her work has resulted in several reclamation awards, including from ASRS and OSMRE. More importantly, the lands she and her colleagues have reclaimed have been utilized by local tribal residents for grazing and other traditional uses, as they incorporated traditional plants into their reclamation plans. Marie has been able to apply the traditional knowledge imparted to her by her grandparents to her career in reclamation, which has truly enhanced the value of the reclamation done.

Marie also makes time for ranching, sewing, spending time with her two daughters and a granddaughter, mentoring Navajo youth, participating in tribal activities, running, hiking, biking, and relaxing.

Marie finished with some words of wisdom for the group.

- 1) Don't be afraid to get your hands dirty – you'll learn a lot working on a project at all levels.

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- 2) Learn from everyone and don't create borders/boundaries – you never know what you might learn from others.
- 3) Don't be afraid to make mistakes – you just might discover something.
- 4) Set goals, both short and long-term.
- 5) Adapt and embrace change – the world will change, don't be left behind!
- 6) Share your experience and learning to pass it on to the next generation of professionals.
- 7) Take a break and reflect – you just may solve a problem or gain new appreciation for something.

Hopefully you caught Marie's talk in Butte, and we look forward to seeing the Wild Women again in Laramie, WY in 2026! 🌱



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# Highlights of a Week Well Spent at the 42nd Annual ASRS Meeting



Thanks to everyone who planned for weeks and months ahead of this meeting. Dustin Wasley and Steve Dent, co-chairs, and their planning committee deserve a round of applause for a week filled with technical knowledge sessions, site tours, and networking with old and new friends in the industry, all the while encouraging the younger professionals in our Society to meet and engage with “older, more seasoned” individuals. There were 305 attendees, 33 sponsors, and 29 exhibitors.

Some of the highlights of this week include:

## Sunday

1. Montana Resources Mine Tour and the Headframe Spirits Distillery Tour. The view of the old surface pit north of town (which still has an

active mine) was phenomenal.

2. Welcome Exhibitor and Sponsor Reception on Sunday night. Two areas of exhibitors were located near the registration desk or in the main King Ballroom. This two-hour event allowed attendees to mingle with exhibitors and understand what services or products they provide.
3. NEC Meeting. The National Executive Committee met for an extended six hours to discuss overall planning for the Society and to focus on “where have we been” and “where do we want to go”.

## Monday

1. Haulin’ ASRS kicked off a week of running early in the morning.
2. The Plenary on Monday morning consisted of the following speakers:
  - a. Nick Tucci – Haley & Aldrich,

Inc. – A History of Butte, America  
Matt Vincent – Past President of MT Mining Association – There’s Gold in Them Thar Wastes! Sonja Nowakowski – Director of Montana DEQ – The Next 30 Years: The Future of Montana Reclamation

3. The Annual Awards and Business Luncheon was filled with numerous Society awards. A “wee bit” of business was squeezed in to this 1.5 hour time frame.
4. Afternoon technical sessions attracted attendees to a number of topics.
5. The Social Event at the Butte Depot was filled with live music, great catered heavy finger food and lively conversation in the old railroad depot which has been turned into an event center and bar.





## Tuesday

1. The Wild Women of Reclamation Breakfast had Marie Sheperd with Peabody share her life story. This event is a great way for mentors and mentees to meet and gather.
2. Morning and Afternoon Technical Sessions provided further insight.
3. Wyoming AML Seed Certification Class met in the King Ballroom and

then went outside to get some hands-on experience and testing.

4. Poster Session Social was in the King Ballroom at the end of the afternoon.
5. The Uptown Happy Hour was at the Sláinte Butte America Pub and was hosted by Trihydro and Pace Analytical. This gave attendees an opportunity to meet once again together to enjoy company and conversation – not to mention free food.

## Wednesday

1. Morning and Afternoon Technical Session provided further “brain food”.
2. Student Awards Luncheon was sponsored by Navajo Transitional Energy. This event allows the Society to highlight some of our outstanding young people and their achievements during the week.
3. The NEC met one more time to wrap





up discussions.

- 4. The Early Career Professionals and Student Social Event was at the Montana Tech Student Success Center. A Montana trivia contest provided fun for all even for those not from Montana.

### Thursday

- 1. The final day of the ASRS conference

had two tours, one being to the Warm Springs Wildlife Management Area and one to the Anaconda Smelter. Both sites were relatively close and provided unique perspectives on the area surrounding Butte, both its history and the place it is today.

If you weren't able to attend the 42nd annual meeting, you will have other

chances for other places but you really missed "getting to know the Butte area". It's a fascinating place of history steeped in mining and hard-working miners. Legacy sites provide challenges but those two are being met with ingenuity and hard work. Thanks again to the Planning Committee...good job! 🍀





# *Monday Night Social*





# ASRS 2025 Professional Awards

## **William T. Plass Award**

*This award is the highest honor the Society has and recognizes those in research, teaching, outreach, and administration. The award is given to a person who has distinguished themselves in the field of disturbed ecosystem reclamation at the local, regional, national, and international levels.*

## **Michele Coleman**

*Nominated by Richard Barnhisel*

Michele Coleman (P.Eng, P.Geo.) possessed a unique educational background for her career, which included degrees in geology (B.Sc. 1983; M.A. 1986) and chemical engineering (B.Sc. 1985) from the University at Buffalo (State University of New York). She is a registered professional engineer and a registered professional geoscientist in New Brunswick. Her love of nature and curiosity about a sustainable natural world sparked her devotion/drive to creating sustainable ecosystems on mined lands. Her career focused on collaborative research, knowledge transfer, and mentoring in the reclamation field in Canada and the US.

Michele Coleman retired in 2020 from her position of Environmental Engineer/Coordinator at the New Brunswick Power Corporation (NBPC). Her responsibilities included adherence to environmental standards for active mines and reclaiming 42 coal mines. Her work improved reclamation outcomes through research, innovation and collaboration with government, industry, academics, community representatives, landowners, and the general public to foster transparency and ensure that reclamation goals were aligned with local interests. She pioneered the concept of sustainable ecosystems on reclaimed mines in NB, including reestablishing two extirpated tree species, native forest cover and habitat, improving and increasing fish habitat and creation of hundreds of acres of fully functioning wetlands. Through scores of international to local presentations, she played a lead role in reclamation education and policy throughout the Atlantic Provinces. The research collaboration with the University of New Brunswick focused on tracking acid mine drainage and the impact of reintroducing treatment sludge back into the waste rock. This provided decades of university students with real-world experience and helped advance the management of acid rock drainage related issues.

Her contributions for outreach extended to ASRS through holding multiple positions, including President, among many other positions. She was passionate about the Atlantic Chapter of the Canadian Land Reclamation Association and the National Canadian Land Reclamation Association, where she was either chair or on the organizing committee of nine regional and three national conferences and recipient of both National CLRA Awards.



## **Richard I. & Lela M. Barnhisel Reclamation Researcher of the Year Award**

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

### **Michael Curran**

*Nominated by Richard Barnhisel*

Dr. Michael Curran owns and operates Abnova Ecological Solutions, where he serves as CEO and Principal Ecologist. Abnova is a small ecological consulting and research firm focused primarily on land reclamation and restoration, wildlife and insect research, and environmental data management. Mike has a PhD in Ecology and Graduate Minor in Statistics from University of Wyoming. During his time at UW, he won the MS and PhD Scholarships from ASRS and pioneered the use of spatially explicit dashboards to improve understanding of reclamation performance across Wyoming's oil and gas fields. He also developed techniques to improve vegetation monitoring efficacy with handheld imagery and drones. Between graduating from UW and starting Abnova, Curran held a post-doctoral research position at Mississippi State University studying wildlife populations with remote sensing technologies and then worked at a large plant nursery in New Jersey where he worked as both a grower and manager. More recently, he won the ASRS Early Career Award. He served as the Editor of *Reclamation Matters* and is an Associate Editor of both *Reclamation Sciences* and *Natural Areas Journal*.



## **Pioneer of Reclamation Award**

*This award is presented to an individual that has had significant impact and influence in the field of environmental science and reclamation relating to disturbed ecosystems over their entire career.*

### **Laurel Vicklund**

*Nominated by Brenda Shladweiler*

Laurel Vicklund is a respected leader and environmental scientist whose distinguished career spans over three decades in mining, environmental stewardship, and organizational leadership.

A Colorado State University graduate with a concentration in soils, Laurel is widely recognized for her work in land reclamation and sustainable resource development. Laurel's extensive experience in environmental engineering and reclamation began with technical roles at Kennecott's Cordero Mine and progressed through senior environmental leadership positions at Alpha Coal West and Peabody Energy. Currently serving as President of Peregrine Global Services, she has held several key roles within the company since co-founding it in 2003, including Vice President of International Operations and President of Peregrine Global Foundation.

Her professional accomplishments have been widely recognized. She directed several projects which won awards including Office of Surface Mining Reclamation Director's Awards, Wyoming Game and Fish Wildlife Reclamation Award. In 2011, she earned the title of Sportswoman of the Year from the NW Wyoming Chapter of Sportsmen for Wildlife and Wyoming Business Report's Woman of Influence in Energy. She has served in leadership roles with the American Society of Reclamation Scientists and received the Society's award of Reclamationist of the Year in 2002. Her contributions include numerous publications on sagebrush establishment and mined land reclamation, including her editorial role in producing the Western Handbook of Reclamation Techniques.

Beyond her professional achievements, Laurel is deeply involved in community service. She serves on numerous boards and advisory groups, including the Edible Prairie Project, Energy Capital Economic Development, the Gillette College Foundation, the Thunder Basin Grasslands Prairie Ecosystem Association, and she is the Chair of the Northeast Wyoming sage-grouse Working Group. She is also President of the Peregrine Global Foundation and is active in her local faith community at Holy Trinity Episcopal Church.



## Early Career Award

*This award is intended to recognize an early career member of ASRS that is involved in reclamation research, teaching, and/or on-the-ground reclamation practices within academics, regulatory oversight or in an industry position.*

*The nominee must have been employed in their field for a minimum of three years but not more than 10 years.*

### **Kelsea Green**

*Nominated by Tim Daney*

Kelsea Green is an Environmental Engineer working in mine water reclamation for BioMost Inc. of Mars, Pennsylvania. Kelsea obtained her bachelor's degree in environmental engineering from Saint Francis University with a concentration in ecological engineering and minor in mathematics. During her Sophomore and Junior years, she completed international research in Bolivia, presented at the 2012 Tupelo Meeting and interned at BioMost. Kelsea began her professional career in consulting, where she worked on projects like Corridor H and environmental inspections with a sprinkle of passive system operation and maintenance until making the switch to academia and returning to Saint Francis University. As the SFU environmental engineering lab manager and instructor, she took students to AMD sites, taught field and lab measurement methods, and developed student networking, including bringing them to two ASRS annual meetings. Kelsea has volunteered with the Center for Watershed Research and Service, the Stoneycreek-Conemaugh River Improvement Project, and the Clearfield Creek Watershed Association. Following a few years off to raise her kids, Nora and Emmett, Kelsea returned to consulting with BioMost in 2022. Kelsea's projects include passive and active mine water treatment design in Pennsylvania and West Virginia as well as operation and maintenance of treatment trust sites. Through BioMost, she has obtained her E.I.T. certification and become more involved with ASRS as an NEC Delegate. Kelsea is excited to continue working toward her professional engineering license and continue her involvement in ASRS as she and her colleagues plan the 2027 Annual Meeting in Pittsburgh, PA.



## Reclamationist of the Year Award

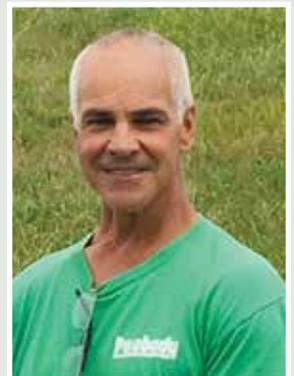
*The Reclamationist of the Year award recognizes individuals demonstrating outstanding accomplishments in the practical application or evaluation of reclamation technology. It also rewards individuals responsible for implementing innovative practices or designs for new reclamation strategies.*

### **Monty Parke**

*Nominated by Jen Schlotthauer*

Monty Parke holds the position of Senior Manager of Conservancy and Reclamation. He has 46 years of experience in mining, farming, and land reclamation. Including more than two decades of developing innovative solutions in coal mine reclamation in Indiana and Illinois. Contributions include safe and efficient methods for capping and reclaiming coal refuse slurry impoundments, backfilling underground slopes, exhaust, and intake shafts.

Monty developed and implemented passive systems for water treatment that require little active management, grass waterways, buffer strips, cover crops and fertility management for water quality. He is the current manager of reclamation at the Peabody Midwest Closed mine sites still under reclamation status and advises sites still in operation with reclamation issues. He is responsible for erosion control, maintenance and tree planting of tens of thousands of acres of reclaimed mined land. To date, he has had a hand in over 52,000 acres reaching or exceeding the requirements and obtaining final bond release, resulting in \$355 million dollars of bond released and over 20 mine permits released.



## Distinction in Reclamation Award

*This award recognizes a specific project in which a company has demonstrated excellence in reclamation design, implementation, and overall success, resulting in the conservation of natural resources and the ecosystem.*

### **Raccoon Creek Restoration and Recovery**

*Nominated by Natalie Kruse*

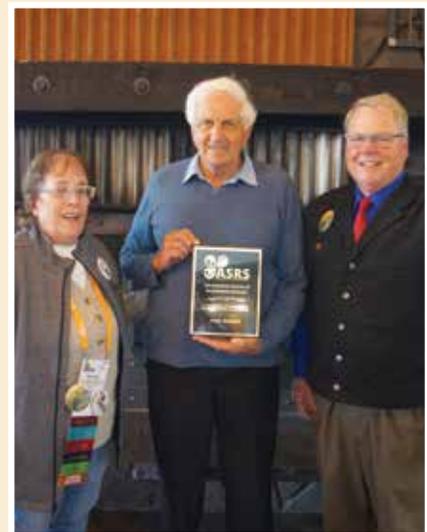
Unregulated coal mining through the 1970s resulted in acid mine drainage (AMD) and sedimentation throughout the Raccoon Creek watershed. For many years, Raccoon Creek was considered “unrecoverable” – too far gone to ever rebound from the impacts of pre-law coal mining. Fortunately, concerned citizens in the 1980s cared deeply about the watershed and succeeded in getting the support of agency partners. The grassroots Raccoon Creek Improvement Committee, becoming the Raccoon Creek Partnership (RCP) in 2007, has been an integral part of the recovery of Raccoon Creek.



RCP has worked with countless partners over the years, but those responsible for most of the funding, project construction, and monitoring are Ohio Department of Natural Resources Division of Mineral Resources Management (ODNR DMRM), Ohio Environmental Protection Agency (OEPA), Office of Surface Mining (OSM), and Ohio University Voinovich School. These partners have secured approximately \$17 million in funding for the completion of 22 restoration projects in the watershed. Projects include active and passive treatment, standard reclamation, and the removal of one low-head dam. These projects have greatly improved water quality in Raccoon Creek and restored this once unrecoverable watershed, devoid of aquatic life and choked with sediment and metals, back to a thriving, healthy biological community. In 2022, Ohio EPA officially approved upgraded Aquatic Life Uses for much of Raccoon Creek. The headwaters, previously designated Limited Resource Water (the lowest degree of biological integrity) are now meeting Warmwater Habitat and over 30 miles are now meeting Exceptional Warmwater Habitat (EWH). On November 12, 2024, Ohio Governor DeWine and ODNR Director Mertz officially designated Raccoon Creek the first Scenic River in Southeast Ohio. After many decades being one of the most impaired watersheds in the state, it's very exciting to share this story of recovery.

Designation showcases the partnerships that have resulted in recovery of Raccoon Creek over the past several decades – from “dead as a bag of hammers” to meeting Warmwater and Exceptional Warmwater Habitat.

**Peter Beckett** is a Lifetime Member of ASRS and has been active in the Society and specifically Student Awards for many years. This year, the NEC wanted to recognize Peter for his long devotion to the Society and encouragement to the upcoming student members. Thanks, Peter! 🌱





# ASRS 2025 Student Awards



***PhD Winner***  
**JESSIE HIATT**

Jessie is a 2nd year PhD candidate in Geological Engineering at Colorado School of Mines, co-advised by Dr. Wendy Zhou and Dr. Lesli Wood. She also holds a MS in GIS and Geoinformatics and a BS in Geological Engineering from Mines. Jessie's PhD research focuses on the integration of multi-temporal spaceborne and airborne remote sensing, terrestrial Light Detection and Ranging (LiDAR), ground observations, and geospatial analytics to track the spatiotemporal dynamics of underground coal fires. Her work aims to enhance monitoring and reclamation practices for these long-term geohazards, particularly those affecting abandoned mine lands in the western United States. Professionally, Jessie works as a geologist and GIS analyst at Tetra Tech, where she supports coal fire mitigation and reclamation projects through field investigations and geospatial modeling. In her free time, she enjoys kayaking and burro racing.



***Masters Winner***  
**TYLER KLEINSASSER**

Tyler is a graduate student at the SD School of Mines and Technology. He has excelled in the field of Civil and Environmental Engineering, maintaining a perfect 4.0 GPA. His academic foundation includes a bachelor's degree in engineering, where he honed crucial skills essential for tackling complex environmental challenges. After graduation, his objective is to secure a challenging and rewarding role that allows him to apply his engineering expertise to real-world challenges. His long-term goal is to start his own engineering consulting firm, drawing inspiration from his family's entrepreneurial spirit. In his spare time, Tyler enjoys sports, reading, and spending time outdoors.



***Undergraduate Winner***  
**AUDREY MATHEWS**

Audrey Mathews is a first-year student studying Natural Resources and Environmental Sciences at the University of Illinois Urbana-Champaign. She is a research technician for Erik J. Sacks, where she collaborates with researchers to prepare Miscanthus plants that are tolerant of environmental stresses like salinity, heat, and disease. During her time at UIUC Audrey has enjoyed engaging with the community through clubs like Students for Environmental Concerns and The Wildlife Society. In addition, she has participated in volunteer events like environmental teach-ins at middle schools and native plant restoration projects. In the future, she hopes to use her education to protect wildlife and their habitats. 🌿

## Special Thanks to Our Exhibitors





# Berkey Pit tour





The Canadian Land Reclamation Association donated two children's books to the ASRS's Silent Auction in Butte.

Pictured are Peter Beckett and Michele Coleman with copies of *From the Earth to Us: Discovering the Origins of Everyday Things* by Tanya Richens, P.Ag. 🌱

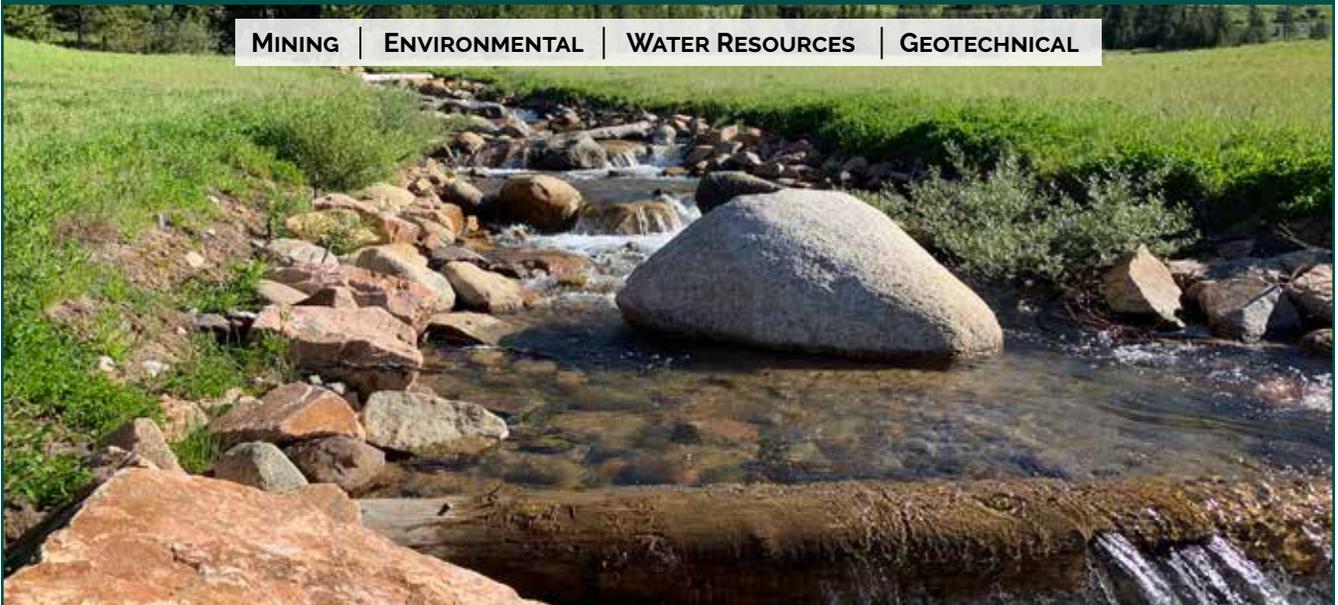


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# ASRS Webinar Schedule 2025–2026

## September 9

Amy Samples, Edelen Renewables, sharing about Edelen's Coal to Solar program.

## October 14

Sean Luis, Tacoma Power, "Characterizing juvenile salmonid behavior via acoustic telemetry in a downstream fish passage program within the Cowlitz Falls Hydroelectric Dam"

## November 11

"Reclamation and Ecological Restoration Needs Across Borders", featuring Peter Beckett and others.

## December 9

ASRS Mixer

## January 13

Caitlin Youngquist, Dirt Works, sharing about soil health

## February 10

Bin Xu, Centre for Boreal Research, sharing about peatland restoration

## March 10

Josh Oakleaf, Wyoming Department of Environmental Quality, "Sage-Grouse Reclamation and Restoration"

## April 14

Bob Nairn, University of Oklahoma, sharing on bioreactors

## May 12

Christopher Fields-Johnson, Davey, sharing about 15 years of forest reclamation on the Powell River Project

*Please refer to the ASRS website for the latest times and titles.* 🌿

# Welcome to the Cowboy State!



The 43rd Annual Meeting of the American Society of Reclamation Sciences will be held in Laramie Wyoming on June 7 through 11, 2026 at the beautiful Rochelle Center conference facility on the University of Wyoming campus. Hotels are generally within walking distance.

The Planning Committee has been working hard to make this a fun week of learning, social events, tours, and workshops. We are adding several new items this year that we hope are desirable for our members and their guests. S0000...invite your friends and colleagues to the Cowboy State next year. We promise you will have a great time! 🌿

# LIFETIME MEMBERS SPOTLIGHT BOB NAIRN



I have been an active American Society of Reclamation Sciences (ASRS) member since 1990 and a Life Member since 2003. I have watched the society go through two name changes (from American Society of Surface Mining and Reclamation [ASSMR] to American Society of Mining and Reclamation [ASMR] in 2001 and then from ASMR to ASRS in 2020). I joined our society 35 years ago and gave my first formal professional presentation at our seventh

annual meeting in Charleston, West Virginia that spring. My colleague and good friend Bob Hedin encouraged me to present “Sizing and Performance of Constructed Wetlands: Case Studies” at that meeting, and, as they say, the rest is history.

I am a western Pennsylvania native and a first-generation college graduate from a family of coal miners and steel workers. After emigrating from Cape Breton, Nova Scotia, my paternal great-

grandfather and his brothers mined the Big Vein in the Georges Creek Valley of Allegany County, Maryland. One of those brothers moved to Ohio and lost his life underground to “a fall of slate” in the Congo #2 Mine, Perry County, Ohio. I like to think that their blood in my veins influenced my career.

My grandfather moved to Aliquippa, Pennsylvania to work in a steel mill. Aliquippa was a “company town” and everyone – even up until the mid-1980s



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– either worked in steel or in a support industry. As a teenager, I once expressed a desire to follow in my Dad’s footsteps into the mill. He told me I was going to college. End of story.

With generous scholarship support and the maximum amount of what were then called Guaranteed Student Loans, I completed a BS in Environmental

Science from Juniata College in Huntingdon, Pennsylvania in 1989. I was then fortunate enough to begin my career as a Research Biologist with the U.S. Bureau of Mines, where I served on one of the first research teams to examine the passive treatment of mine drainage. My mentors Bob Kleinmann and Bob Hedin, and the rest of the Bureau Environmental

Technology group, changed my life. I learned that I enjoyed research and technology transfer (aka teaching), and despite loving my job and the people with whom I worked, a career in academia appeared promising. I left the Bureau in 1992 and earned a PhD in Environmental Science at The Ohio State University in 1996, completing one of the first dissertations at the Olentangy River Wetland Research Park, a well-known ecological engineering research and education site (that had nothing to do with mining reclamation but had a lot to do with ecological restoration).

During the final year of my doctoral program, I interviewed for a faculty position at the University of Oklahoma (OU). I had been west of the Mississippi only once (to attend summer classes at the University of Montana Biological Station) before my job interview at OU. It seemed like a good place to start, and I became a faculty member in the School of Civil Engineering and Environmental Science in January 1997. It was my first (and, as it turns out, so many years later, only) job post-PhD. I became the founding director of the Center for Restoration of Ecosystems and Watersheds (CREW), a director of the Water Technologies for Emerging Regions (WaTER) Center, an adjunct professor of Biological Sciences, and filled several other positions.

I currently serve as the Robert W. Hughes Centennial Professor of Engineering, David L. Boren Professor, and Viersen Family Presidential Professor. My CREW research team emphasizes the understanding of naturally occurring biogeochemical and ecological processes in natural infrastructure applications addressing water challenges. Our work at the Tar



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Creek Superfund Site led to recognition with the American Academy of Environmental Engineers and Scientists Excellence in Environmental Engineering and Science (E3S) Honor Award, the ASRS William T. Plass and Reclamation Researcher of the Year Awards, and the Juniata College Alumni Achievement Award. However, in Norman, Oklahoma, I am known as “the other Nairn”, basking in the light of my wonderful wife Amanda’s many community accomplishments and my daughter Maria’s burgeoning photography and journalism career.

During my career, I have witnessed many and varied changes in the field of reclamation science. Although our nation’s dependence on coal for electricity generation decreased from more than 50 percent in 1990 to less than 15 percent more recently, the need for reclamation did not decrease in a like manner. Thousands of acres of derelict mine lands and thousands of miles of impaired waters still exist. We still have work to do. In addition, our collective ASRS knowledge is needed to address other land and water disturbances, from oil and gas development to highway construction to hydroelectric installations and everything in between. ASRS recognizes “the multidisciplinary nature of land reclamation and provide(s) opportunities” to our members and by doing so, ASRS will continue to make a difference.

*I was asked to share a few lessons that I have learned throughout my career. Having recently undergone a significant personal health scare, please allow me to wax philosophical about the big picture. As well as being relevant for our profession, I think these points are universally applicable, especially in today’s fractured and contentious world.*

1. **Be kind.** We need to take care of one another as we take care of the environment.
2. **Listen.** It is amazing what we learn if we truly listen to others.
3. **Have fun.** Life is too short for us to not enjoy ourselves, in everything we do.

Be kind, listen, and have a good time doing it. Over the past few decades, I have found ASRS to be a unique organization that promotes kindness, listening, and fun, along with the best in reclamation science. I look forward to bringing students to ASRS annual meetings for years to come. 🌱

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# GETTING TECHNICAL

## *Updates from Technical Division Representative Kenton Sena*

ASRS has had technical divisions (TDs) at least as long as I have been around. I remember making my way timidly to the Forestry TD meeting (or was it Forestry and Wildlife?) in Laramie in 2013. I wasn't really sure what the TD was or what it did, but hoping it was fine for me to attend even though I was new and wasn't an official member of the division.

Since then, much has changed, but some has stayed the same. In Laramie 2013, I was pleased to learn that TD meetings are open to anyone interested in the given focus area. That has not changed. If you are interested in plants in reclamation, please come to the Vegetation TD meeting. If soils are more your thing, we've got a Soils TD for you, too!

In Laramie 2013, a primary focus of the TDs was to provide reviewers for the Society's journal at the time – the Journal of the American Society of Mining and Reclamation (JASMR). Before that, articles were reviewed for conference proceedings. After the Journal was reborn as Reclamation Sciences, the focus of the TDs became obsolete, as reviewer assignments became streamlined through the new journal editorial manager system.

And, since Laramie 2013, the TD focus

areas have also changed. Some of our TDs were experiencing declining membership and interest, reflecting shifts in the industry, while others continued to grow due to increasing interest and demand. With leadership from the NEC, TD focus areas were reset to better reflect the interests and needs of the Society's current membership.

Some of these changes to TDs may have left you feeling a bit detached and unsure how to re-engage. But now, as we look ahead to Laramie 2026, allow me to formally invite you to consider how the technical divisions might serve as an entry point for you to become more involved in the Society.

The technical divisions present an opportunity for you to connect with others in your general area of interest and expertise in the Society. If your interests lie in reclamation design and construction, the Engineering and Construction TD might be a good fit for you. Or maybe you're more interested in the role of remote sensing to prioritize reclamation sites and better monitor reclamation success – find your people in the Technology TD! TDs can help make a big group feel smaller, facilitating focus, collaboration, and community building.

Technical divisions can also serve as think tanks – small groups for generating ideas, identifying needs, and planning projects. This year, a focus for the technical divisions has been identifying topics for the ASRS webinar series, as well as potential special session topics for Laramie 2026. This has created an opportunity for more bottom-up rather than top-down planning – members develop programming that meets their needs and interests. The current webinar series reflects this – webinar speakers and topics were identified by members in conversations that started during the annual meeting in Butte.

If you're looking for an opportunity to get more involved in the society, getting more involved in a technical division is a great place to start. Our current Technical Divisions (and their chairpersons) are listed below. Contact a TD chair or me (Kenton.sena@uky.edu) for more information about how to participate:

- Vegetation: Allen Wellborn;
- Soils: Seth Cude;
- Engineering and Construction: Rich Sivils;
- Water: Buck Neely;
- Wildlife: Jenise Bauman;
- Technology: Chair position open. 🌱



# ASRS MEMBER NEWS

## Two Laurentian Faculty Honored with King Charles III Coronation Medal for Outstanding Contributions

DR. PETER BECKETT, DR. NADIA MYKYTCZUK RECOGNIZED FOR THEIR IMPACT IN ENVIRONMENTAL RESTORATION AND MINING RESEARCH

Laurentian University proudly celebrates the remarkable achievements of two esteemed faculty members – Dr. Peter Beckett and Dr. Nadia Myktyczuk – who have been honored with the prestigious King Charles III Coronation Medal, it was announced in March. They join Dr. John Gunn, Professor Emeritus and renowned environmental scientist, who was announced as a recipient in February. This accolade recognizes Canadians who have demonstrated exceptional dedication to their communities and service to the country.

### Dr. Peter Beckett: A Pioneer in Environmental Restoration

A professor at Laurentian University for nearly five decades, has been instrumental in transforming Sudbury's landscape. His pioneering efforts in environmental restoration have played a crucial role in combating years of ecological damage, leading to the region's renowned greening initiatives.

Dr. Beckett's dedication to environmental education and restoration has not only revitalized local ecosystems but has also positioned Sudbury as a global example of successful environmental rehabilitation.

### Dr. Nadia Myktyczuk: Innovator in Mining Research and Community Leadership

Serving as the President and CEO of MIRARCO (Mining Innovation, Rehabilitation, and Applied Research Corporation) and the Executive Director of the Goodman School of Mines at Laurentian University. She also holds an NOHFC Industrial Research Chair in Biomining and Bioremediation. Dr. Nadia Myktyczuk is a leading figure in biomining research and



KING CHARLES III  
CORONATION  
MEDAL

innovation. Her leadership extends beyond academia into community service, where she has been recognized for her commitment to advancing the mining sector, promoting women in mining, and fostering community engagement. Dr. Myktyczuk's work exemplifies the integration of scientific research with practical applications, benefiting both the industry and the broader community.

The King Charles III Coronation Medal, produced by the Royal Canadian Mint, is bestowed upon individuals who have made outstanding contributions to Canada in various fields. The recognition of Drs. Beckett and Myktyczuk not only honors their individual achievements but also highlights Laurentian University's dedication to excellence in research, innovation, and community service.

The accomplishments of Drs. Beckett, Myktyczuk, and Gunn serve as an inspiration to colleagues, students, and the broader community, reinforcing Laurentian University's commitment to fostering leadership and addressing pressing environmental and societal challenges.

— *Courtesy of Laurentian University* 🌱

# Reclamation and Ecological Restoration Needs in Selected Global Regions

BY YOGINDER P. CHUGH & BRENDA K. SCHLADWEILER, CO-CHAIRS, ASRS INTERNATIONAL INITIATIVE

## Overview

The American Society for Reclamation Sciences International Initiative (ASRS-II), launched in late 2023, engages global stakeholders in sustainable minerals facility operations, closure, and rehabilitation. With the growing demand for all minerals for energy security and sustainability, ASRS-II supports capacity building, technical exchange, and workforce development. Since January 2025, an International Oversight Committee (IOC) of members from Canada, China, Greece, India, Poland, South Africa, and South Korea, plus five U.S. experts, guides the initiative. Key focus areas are Information Synthesis and Transfer; Technical Support; and Future Workforce Development.

Major achievements to date include: a China–U.S. research program at the University of Tennessee, Knoxville; collaboration in the triennial International Land Reclamation and Ecological Restoration Conference in China; U.S. team focused presentations on the “Ecosystem Assessment and Valuation” topic at the conference; virtual technical support for South Africa and India and support needs assessments from selected IOC regions.

## Regional Needs and Challenges

**1. Canada:** Engage communities in



mine planning/closure; address reclamation bond defaults; reclaim oil sands tailings; define water release criteria; enhance biodiversity; adapt to climate change in restoration activities; expand Indigenous community roles; improve acid mine drainage and peatland restoration.

- 2. China:** Manage subsidence from underground coal mining; develop concurrent mining/reclamation (CMR); establish mine closure protocols; restore aquifers in surface mining; research acid mine drainage from abandoned mines.
- 3. India:** Develop sound mine closure practices integrating ecological restoration; aim for sustainable post-mining communities; move toward net-zero mines; expand underground

mining to reduce surface impacts.

- 4. South Korea:** Integrate water quality into mine closure planning; develop ecological assessment indicators.
- 5. European Union (EU):** Address large mining waste streams; standardize reclamation quality assessments; conserve agricultural lands; protect water resources; reduce CO<sub>2</sub> emissions in agriculture.
- 6. South Africa:** Tackle water scarcity affecting mining, agriculture, and communities; protect biodiversity from habitat loss and invasive species; integrate mine closure with strategic partnerships.

## Synthesized High-Priority Needs

1. Plan and implement mine/infrastructure closure from project

Since January 2025, an International Oversight Committee (IOC) of members from Canada, China, Greece, India, Poland, South Africa, and South Korea, plus five U.S. experts, guides the initiative.

- inception, involving stakeholders;
2. Include ecosystem function and service valuation in closure planning.
  3. Advance CMR technologies for subsided lands to protect agriculture and water.
  4. Research acid mine drainage solutions, mine waste management, and standardize reclamation practices.
  5. Develop ecosystem assessment and valuation methods for mined lands.
  6. Build human resource capacity via education and training.

### Planned Applications

- Understand and develop mine closure templates aligned with international principles.
- Collaborate with China on reclamation of subsided areas.
- Apply ecosystem assessment/valuation methods at project levels with knowledge sharing among IOC members.

### Conclusion

Identifying these global reclamation and ecological restoration needs for participating countries has given ASRS-

II a strong foundation for targeted action. Continued collaboration, capacity building, and discussion of best practices will advance sustainable development, ecological balance, and community benefits in mining regions worldwide.

### Acknowledgements

The authors sincerely acknowledge the contributions from Peter Beckett (Canada), Z. Hu (China), C. Jayadev (India), Duk-Min Kim (South Korea); Marcin Pietrzykowski (Poland), Lerato Ratsoenyane (South Africa), and Christo Tsidlas (Greece). 🌱

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# Working with Mother Nature at The University of Oklahoma Center for Restoration Ecosystems and Watersheds

BY ROBERT W. NAIRN AND DAYTON M'KENZIE DORMAN



From upper left: Mayer Ranch lead-zinc mine water passive treatment system at the Tar Creek Superfund Site, Ottawa County, Oklahoma; Red Oak coal mine passive treatment system in the Arkoma Basin, Latimer County, Oklahoma; oxidation pond at Mayer Ranch passive treatment system; CREW small unoccupied aerial system pilot; Norman Water Reclamation Facility treatment wetland mesocosm compound, Cleveland County, Oklahoma; former Lake Frances lakebed on the Illinois River, Adair County, Oklahoma.



The Center for Restoration of Ecosystems and Watersheds (CREW) was founded at the University of Oklahoma (OU) in 2004. It was initially an outgrowth of the combined efforts of the Ecosystem Biogeochemistry and Ecology Laboratory (EBEL) and

the BioEnvironmental Engineering and Science Laboratory (BEESL). Most CREW research team members are affiliated with the School of Civil Engineering and Environmental Science (CEES) in the OU Gallogly College of Engineering. CEES is a diverse academic unit and offers undergraduate and graduate degrees in civil engineering, architectural engineering, environmental engineering, and environmental science. CREW research is conducted

in conjunction with various academic and research units at OU and other universities, as well as multiple local, state, federal, tribal, and non-profit partners, in addition to private landowners.

CREW conducts research focusing on natural infrastructure, either through conservation of natural systems or creation and restoration of human-made systems. The CREW research philosophy takes a holistic

approach, using our understanding of ecosystem biogeochemistry to develop sustainable solutions to complex environmental problems. CREW works on the watershed- and ecosystem-scale, examining environmental impact and developing environmental remediation and restoration technologies based on ecological engineering techniques. Ecological engineering uses a systems perspective based on the premise that sustainable solutions require working with natural ecological and biogeochemical processes and not against them. Most projects focus on two general areas:

- Watershed biogeochemistry, which includes drainage-basin scale evaluations of pollution sources and mass loadings to and in streams and other receiving water bodies, leading to remediation and restoration planning that summarizes and prioritizes impacts

for clean-up.

- Ecological engineering, especially passive treatment systems (design, construction, and evaluation of sustainable ecological systems for treatment of contaminated waters), land reclamation (native plant establishment and phytoremediation of degraded soils and wastes), applied fluvial geomorphology (natural channel design for stream restoration), and waste recycling (beneficial reuse of treatment residuals and wastes).

CREW is a field-oriented research team, because only at the systems-scale is the true complexity and interconnectedness of environmental processes apparent, making sustainable solutions possible. However, we couple these field evaluations with replicable laboratory and greenhouse microcosm/mesocosm experimentation and/or modelling. In

many cases, our ecosystems of choice are passive treatment systems for improving water quality, with a focus on drastically disturbed watersheds impacted by mining activities. These systems consist of various ecologically engineered process units, often alternating oxidative and reductive biogeochemical mechanisms, with an overall objective to address ecotoxic metal contamination in a cost-effective and sustainable manner. We use the watershed approach to prioritize impacts and implement solutions.

The CREW research portfolio includes almost 80 collaborative research projects funded over two decades. These projects range from educational research to laboratory-scale investigations to full-scale field installations. A few specific noteworthy long-term research efforts are detailed below.

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- Coal mine drainage characterization and passive treatment. This topic has been the research focus of CREW director Robert W. Nairn for over 35 years. Coal has been mined in 19 eastern Oklahoma counties since the 1870s (pre-dating 1907 statehood). Based on previous experience in the northern Appalachians, CREW has been involved in the design, construction, and/or monitoring of four full-scale passive treatment systems in the historic Arkoma Basin. These systems include a suite of process units, including anoxic limestone drains, oxidation ponds, aerobic wetlands, and vertical flow bioreactors. Research has been funded by the Oklahoma Conservation Commission, Office of Surface Mining Reclamation and Enforcement, Environmental Protection Agency, Department of Energy, and others.
- Comprehensive watershed assessments. Holistic evaluations are necessary for sustainable watershed management. Therefore, evaluations of the chemistry, biology, geology, hydrology, pedology, edaphology, sedimentology, ecology, epidemiology, human factors, and other forcing functions for a given drainage basin are needed. CREW has been conducting noteworthy research in this subject in conjunction with the Grand River Dam Authority (GRDA), an Oklahoma state agency and public power provider. In addition to other project-specific funding, GRDA and CREW entered a unique 10-year graduate student support agreement in 2009, which was renewed for another 10 years through 2029, providing an unprecedented 20 years of continuous student support, as well as access to gratis field site housing and state-of-the-art laboratory facilities at the GRDA Ecosystems and Education Center.
- Hard rock mining reclamation. Our research in the Tri-State Mining District (TSMD) pre-dates the establishment of CREW by seven years. A century of underground lead-zinc mining in the TSMD ended by 1970 and later resulted in the formation of four US Environmental Protection Agency Superfund sites, including Tar Creek in Oklahoma. A mid-1980s Record of Decision called for redesignation of the beneficial use classification of Tar Creek due to “irreversible man-made damages resulting from past mining operations at the site”. We began data collection efforts here in 1997, and this site has become the “bread and butter” of CREW research. Funding has been provided by the US Environmental Protection Agency, US Geological Survey, US Army Corps of Engineers, and Oklahoma Department of Environmental Quality, with additional support from GRDA, the Quapaw Nation of Oklahoma, and local non-profit entities. In addition to ongoing environmental transport and fate studies, in 2008 CREW began operation of the first full-scale mine water treatment system of any kind in the TSMD, the Mayer Ranch passive treatment system. In 2017, a second passive treatment system, Southeast Commerce, began operation. Combined, the two systems retain more than 71,000 kg of iron, 3,100 kg of zinc, 84 kg of lead, and 8 kg of cadmium every year. They have resulted in the return of diverse fish communities and populations of North American beaver (*Castor canadensis*) and river otter (*Lontra canadensis*) in the receiving stream. Conceptual designs for additional passive treatment systems have been completed. If additional funding can be obtained, CREW ecological engineering technologies have shown that the irreversible damage can finally be reversed.
- Engineering With Nature®. HT Odum first defined “ecological engineering” more than 60 years ago, but related terms like natural infrastructure, nature-based solutions, and Engineering with Nature® (EWN) have only recently entered the everyday lexicon of those of us designing, building, and evaluating human-made ecosystems. Researchers at the US Army Corps of Engineers Engineer Research and Development Center (ERDC) trademarked this term as “the intentional alignment of natural and engineering processes to efficiently and effectively deliver economic, ecological, and social benefits through collaboration”. CREW began formal EWN collaborations with ERDC in 2021, examining ecosystem, water resource, and geotechnical engineering research opportunities in the inland central United States (much of the EWN work up until this point focused on coastal applications). More recently, CREW has expanded EWN work to include novel methods to advance and accelerate implementation. As part of much broader collaborative efforts, the Network for Engineering with Nature (NEWN) includes dozens of university, government, non-profit, and private partners. The next NEWN Partners Symposium will be co-hosted by CREW.
- Innovative stormwater and wastewater treatment technologies. In addition to the CREW focus on mine waters, several projects have evaluated ecological engineering approaches to urban stormwater and municipal wastewater challenges. These projects have been cooperatively conducted with the City of Norman (Oklahoma) and have been funded by the National Science Foundation (NSF), US Bureau of Reclamation (BOR), US Environmental Protection Agency,

Oklahoma Conservation Commission, Central Oklahoma Master Conservancy District, and others. A paired watershed project which compared traditional stormwater management to “green infrastructure” approaches (e.g., rain gardens, pervious pavements, rainwater capture) demonstrated the critical role of climate, hydrology, and engineering design in environmental monitoring and data generation. More recently, with financial support from NSF and BOR, CREW developed a treatment wetland mesocosm compound at the Norman Water Reclamation Facility. Consisting of 50 individual treatment units, the robust experimental design incorporates multiple source waters, hydrologic designs, and vegetation planting schemes. In addition to conventional pollutants like nutrients and solids, approximately 90 emerging constituents, including pharmaceuticals, personal care products, pesticides, per- and polyfluoroalkyl substances, and perfluorooctanoic sulfonic acid substances are being evaluated. Experimental manipulations include hydraulic retention time, aeration, photosynthetically active radiation, and biological productivity.

- Other research initiatives. CREW continues to explore advanced environmental monitoring and management technologies. A fleet of three small, unoccupied aerial systems supports CREW research. These vehicles include multispectral, light detection and ranging, thermal, and conventional color photography and video sensors, and allow near real-time data generation. “Closing the loop” of passive treatment through examination of beneficial reuse of mine drainage derived treatment residuals

has also been explored. Iron-rich solids have been shown to be demonstrable phosphorus sorbents, solving one pollution problem (nutrient over-enrichment) by use of passive treatment residuals from another (mine waters).

CREW research seeks to identify

sustainable solutions to environmental challenges. By working with Mother Nature (through a fundamental understanding of natural ecosystem processes, which we can promote in proper design) rather than fighting against her (as traditional approaches typically do), we can ecologically engineer a sustainable future. 🌱

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