

# *Journal of The American Society of Mining and Reclamation (JASMR)*



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## **Journal of the American Society of Mining and Reclamation**

**The Journal of the American Society of Mining and Reclamation** (JASMR) promotes the exchange of basic and applied solutions for the reclamation, restoration, and revitalization of landscapes impacted by the extraction of natural resources—including, but not limited to coal, minerals, gas, and oil. Contributions reporting original research, case studies, field demonstrations, or policy dealing with some aspect of ecosystem reclamation are accepted from all disciplines for consideration by the editorial board.

### **Contributions to JASMR**

**The Journal of the American Society of Mining and Reclamation** publishes contributions under the headings Research Papers, Case Studies, Demonstrations, Policy Papers and Review articles. All papers are peer reviewed. Manuscripts may be volunteered, invited, or coordinated as a symposium.

**Research Papers:** Emphasis is given to the understanding of underlying processes rather than to monitoring. Applying these principals to specific, replicated laboratory, glasshouse, and field problems dealing with reclamation are encouraged. These reports are grouped into the following ASMR defined groups: ecology, forestry and wildlife, geotechnical engineering, land use planning and design, international tailings reclamation, soils and overburden, and water management.

**Case Studies:** Papers in this category report on reclamation activities over spatial or temporal scales. Monitoring of the response of ecosystem components (water, soil, and vegetation) to innovative practices are the basis for these case study reports.

**Demonstration Studies:** Papers in this category report on reclamation activities that do not necessarily include projects where significant amounts of data are collected. These may consist of largely photographic evidence of before and after some reclamation technique is applied. These may be observations that practicing reclamationists have observed that have changed how they continued to enhance the process of returning disturbed landscapes to a more desirable condition.

**Policy or Review Papers:** Submission of papers dealing with regulatory and procedural issues is welcomed. These papers emphasize changing approaches to the science and technology of landscape revitalization.

**Other:** Letters to the Editor are accepted, and Book Reviews may be invited by the Editor-in Chief.

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***ABSTRACTS OF PAPERS***  
***RESEARCH PAPERS***

**SUCCESS OF BRANDENBARK™, AN ARTIFICIAL ROOST  
STRUCTURE DESIGNED FOR USE BY INDIANA BATS (*MYOTIS  
SODALIS*)<sup>1</sup>**

Joshua Adams<sup>2</sup>, Piper Roby, Price Sewell, Jeffrey Schwierjohann, Mark Gumbert  
and Michael Brandenburg

**Abstract.** The federally endangered Indiana bat (*Myotis sodalis*) is a concern for development projects in nearly half of the United States. The species roosts and rears young under exfoliating bark of trees, which has put it at risk for incurring adverse impacts from most projects that require tree clearing throughout its summer range. Project proponents generally incorporate avoidance and minimization strategies into the planning process. These strategies, however, are not always compatible with project goals and objectives, and mitigation is often required to offset adverse impacts to the Indiana bat. BrandenBark™ is an artificial roost structure that mimics the natural roosting habitat of Indiana bats. To date, 69 BrandenBark™ structures have been installed in 7 states (IL, KY, LA, OH, PA, TN and WV). Of these, 59 (86%) structures have been used by 6 species of bats, including northern long-eared bats (proposed for federal listing) and little brown bats (under status review); however, the majority of use (85%) has been by maternity colonies of Indiana bats confirmed by radio telemetry, capture, or genetic analysis of guano. Of the structures used by Indiana bats at Fort Knox Military Installation (n=21) in north-central Kentucky, 120 emergence counts have been conducted with an average of 81.3±7.1 bats per roost. Although the roost area under BrandenBark™ is slightly warmer ( $\bar{X} = 24.6 \pm 7.2^\circ\text{C}$  [SD]) than that of natural bark ( $\bar{X} = 23.1 \pm 6.5^\circ\text{C}$ ), the temperature difference between BrandenBark™ and ambient ( $\bar{X} = 2.1 \pm 2.7^\circ\text{C}$ ) is less variable than the temperature difference between natural bark and ambient ( $\bar{X} = 3.9 \pm 4.0^\circ\text{C}$ ), possibly indicating a more stable thermal environment. However, both roost types are warmer than corresponding ambient temperatures. BrandenBark™ provides instant long-lasting habitat commensurate with natural roosts, is easy to install and monitor, and does not require the purchase of additional land for placement when used as a mitigation option.

**Additional Key words:** bark roosting, bat

<sup>1</sup> Paper to be presented at the 2015 National Meeting of the American Society of Mining and Reclamation, Lexington, KY *Reclamation Opportunities for a Sustainable Future* June 7–11, 2014. R.I. Barnhisel (Ed.) Published by ASMR; 1305 Weathervane Dr., Champaign, IL 61821. pp 1 - 15

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## REPRODUCTION POTENTIAL AND NATURAL CANKER INFECTION ON BACKCROSSED CHESTNUT TREES<sup>1</sup>

J. M. Bauman<sup>2</sup>, C. Cochran, J. Chapman, and K.E. Gilland

**Abstract:** American chestnut (*Castanea dentata* Marsh. Borkh.) is a once-dominant hardwood species with the potential to be a valuable restoration tree for use on surface mined lands in the Appalachian region. Coupling soil-ripping and plowing and disking with plantings of American and backcrossed chestnuts have resulted in high seedling survival on a reclaimed surface mine site in southeast Ohio. The objective of this study was to evaluate flowering, chestnut bur production (seed), and natural cankers caused by chestnut blight fungus (*Cryphonectria parasitica*) on three chestnut breeding lines, in three soil tillage treatments after seven field seasons. Pure American (*Castanea dentata*), and two types of *C. dentata* × *C. mollissima* hybrids ( $BC_2F_1$  and  $BC_3F_1$ ) were documented. Reproduction potential was measured via flower production in June. Canker incidence was recorded as necrotic bark lesions with the presence of orange spore bearing structures. When reproduction potential was compared among seed types, there were no differences; all chestnuts trees were flowering and producing chestnut burs after 7 seasons. Soil treatment had no impact on flowering incidence; however, hybrid breeding lines had a mild effect. Canker incidence and presence of flowers were not related statistically. When natural canker incidence was compared, pure American chestnut exhibited the most infection ( $P < 0.0001$ ). There were also notable treatment effects, plots that applied the deep ripping had greater disease incidence on pure American chestnuts ( $P < 0.0001$ ). Long-term survival and stand stability will depend on chestnut's tolerance to the blight at an age of fruiting and flowering. Results after seven years suggest that hybrids were exhibiting a decrease in blight incidence and are flowering and producing burs. Employing deep ripping methods to backcrossed American chestnut plantings provide a viable method for hardwood seedling establishment in soils impacted by surface mining.

**Additional Key Words:** Arrested succession, directed plantings, backcross breeding program, soil subsurface methods, reclaimed mine lands, The American Chestnut Foundation.

<sup>1</sup> Oral paper was presented at the 2015 National Meeting of the American Society of Mining and Reclamation, Lexington, KY Reclamation Opportunities for a Sustainable Future June 6-11, 2015. R.I. Barnhisel (Ed.) ASMR; 1305 Weathervane Dr., Champaign, IL 61821. pp 16-32

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## **COST SAVING AND PERFORMANCE ENHANCING MODIFICATIONS AT A LIME-BASED TREATMENT SYSTEM: RUSHTON TREATMENT PLANT CASE STUDY<sup>1</sup>**

J.M. Dietz<sup>2</sup> and T.S. Gourley

**Abstract:** The Rushton deep mine is located near Phillipsburg, Pennsylvania. The Rushton treatment system, a lime-based chemical treatment system, treats pumped AMD from the closed deep mine at a rate between 15 and 30 MLD (million liters per day). The mine water has moderate “hot” acidity (200 to 400 mg/L as CaCO<sub>3</sub>), with elevated iron (100 mg/L), manganese (8 mg/L), and aluminum (10 mg/L). The mine water also contains elevated carbon dioxide acidity ranging between 100 and 150 mg/L as CaCO<sub>3</sub>, resulting in a total acidity between than 350 and 600 mg/L. In 2010, studies were initiated to evaluate the impacts of the mine water chemistry on the performance of the existing treatment system. Based on the results, a number of system improvements and modifications were made to the treatment system. The improvements included: 1) installation of a new pre-aeration system to remove CO<sub>2</sub> from the mine water and add dissolved oxygen (DO) to meet the iron oxidation requirements; and 2) elimination of aeration and replacement of mixer impellers in the existing reactor tank to improve lime dissolution and minimize secondary reactions (i.e., calcite precipitation). The pre-aeration system was installed in the summer of 2013 and the reactor modifications were completed in the spring of 2014 at a total cost of \$0.8 million. The improvements have resulted in a decrease in overall operating costs by \$0.25 million per year from the decrease in lime usage and electricity consumption. The volume of sludge produced per volume of AMD treated has also decreased by approximately 50% by eliminating the precipitation of calcite associated with the CO<sub>2</sub> contained in the mine water and the added CO<sub>2</sub> from aeration previously provided in the reactor tank. This decrease in sludge production will increase the duration that sludge can be stored in the deep mine injection locations. The presentation will provide a discussion of the various study components, installation/modifications, post-construction performance, and future cost-saving modifications to be implemented.

Additional Key Words: acid mine drainage, lime treatment, hydrated lime, carbonic acid

<sup>1</sup> Oral paper to be presented at the 2015 National Meeting of the American Society of Mining and Reclamation, Lexington, KY *Reclamation Opportunities for a Sustainable Future* June 6 - 11, 2015. R.I. Barnhisel (Ed.). Published by ASMR; 1305 Weathervane Dr., Champaign, IL 61821. Pp 33-56

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## METHODOLOGY FOR APPLYING GEOMORPHIC RECLAMATION TO EXCESS SPOIL FILLS IN WEST VIRGINIA<sup>1</sup>

Peter R. Michael<sup>2</sup>, Leslie C. Hopkinson, Nathan DePriest, and John D. Quaranta

**Abstract.** Researchers at West Virginia University developed and evaluated a method for applying geomorphic landform design principles to excess spoil fills in West Virginia. Although successful in the southwestern United States, challenges to applying geomorphic reclamation to steep-slope terrain in Central Appalachia were previously identified as (1) regulatory agencies' current intent to limit the down-gradient reach of excess spoil fills and (2) designing and constructing "natural" landforms that are stable in a youthful, erosional landscape. The methodological approach presented in this paper addresses those challenges. The researchers developed the Geomorphic Land Design method, used it to create an alternative design to an existing valley fill, and then evaluated the design based on the criteria of fill volume maintenance, channel stability, and landform stability. Potential ecological improvements over the conventional design resulted from preserved stream length and greater diversity in slope gradient and aspect. None of the geomorphic designs generated, however, satisfied all evaluation criteria simultaneously or complied with regulations governing the placement of excess spoil.

**Additional Key Words:** landforming, natural landscaping, stream restoration, excess spoil fills, valley fills, durable rock fills.

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<sup>1</sup> Oral paper to be presented at the 2015 National Meeting of the American Society of Mining and Reclamation, Lexington, KY *Reclamation Opportunities for a Sustainable Future* June 6 - 11, 2015. R.I. Barnhisel (Ed.). Published by ASMR; 1305 Weathervane Dr., Champaign, IL 61821. pp 57-72.

<sup>2</sup> Peter R. Michael, PE is a Geologist, U.S. Office of Surface Mining Reclamation and Enforcement, Pittsburgh, PA 15220. Leslie C. Hopkinson, PhD, is an Assistant Professor, Nathan DePriest is a PhD Candidate, and John D. Quaranta, PhD, PE, is an Associate Professor, Department of Civil and Environmental Engineering, West Virginia University, Morgantown, WV 26506.

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## **SULFATE REMOVAL FROM COAL MINE WATER IN WESTERN PENNSYLVANIA: REGULATORY REQUIREMENTS, DESIGN, AND PERFORMANCE<sup>1</sup>**

William J Walker,<sup>2</sup> Jorge Montoy, and Tyler Chatriand

**Abstract:** The listing of the Monongahela River as an impaired waterway prompted the Pennsylvania Department of Environmental Protection (PADEP) to adjust aqueous discharge limits to the river to no more than 250 mg/L of sulfate. In response to this, an analysis of water treatment options for a coal mining company was conducted at several non-operating mines in western Pennsylvania that discharge directly or indirectly to the Monongahela River. Given the extremely high capital and operations costs for typical sulfate reduction methods such as reverse osmosis and ion exchange, novel passive and semi-passive treatment options were explored. An ethanol-fed bioreactor system was selected, designed, and constructed in 2014 to test whether sulfate reducing bacteria could be utilized to remove sulfate in alkaline mine water to meet discharge limits. The unique design elements consist of metals removal circuit, ethanol feed circuit, and twin bioreactors bedded with large cobbles and seeded with sulfate reducing bacteria, but containing no additional carbon source. Biochemical performance has shown that sulfate reduction approaches 1500 mmol SO<sub>4</sub> m<sup>-3</sup>/day during warmer weather, one of the highest rates recorded in the literature. Effluent sulfate ranged from 58 to 400 mg/L at 16°C and about 1400 mg/L at 2°C compared to influent sulfate concentrations that averaged 2800 mg/L. In addition, the bioreactor produced 500-1500 mg/L of total alkalinity due to microbial metabolism supported by the ethanol, typically corresponding with sulfate decreases. Effluent metal concentrations were decreased to 1 mg/L Fe and 0.2 mg/L Mn. The recirculation loop was found to remove 90% of iron in the original settling pond prior to entering the reactors to minimize sludge accumulation.

**Additional Keywords:** bioreactors, AMD, sulfate reduction, sulfate reducing bacteria, mine water

<sup>1</sup> Paper to be presented at the 2015 National Meeting of the American Society of Mining and Reclamation, Lexington, KY *Reclamation Opportunities for a Sustainable Future* June 7–11, 2015. R.I. Barnhisel (Ed.) Published by ASMR; 1305 Weathervane Dr., Champaign, IL 61821. pp 73-93.

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**OTHER PAPERS**

**OSMRE/VISTAS AT WORK: BUILDING CAPACITY TO MEET CHALLENGES IN PRE-REGULATORY MINING AREAS<sup>1</sup>**

Dr. T Allan Comp<sup>2</sup>, Sarah Meade, Amy Showalter, and Cody Zirkle

**Abstract:** The Office of Surface Mining Reclamation and Enforcement/VISTA Team was founded to address the socio-economic and environmental impacts of mining conducted prior to the Surface Mining Control and Reclamation Act of 1977. During its twelve year history, our Team's Volunteers in Service to America (VISTAs) have secured over \$13.5 million in grants for host communities and marshaled nearly 800,000 hours of volunteer time from community members (equivalent to 385 years of volunteer service).

In 2006, OSMRE estimated more than three million people in Appalachia lived within one mile of Abandoned Mine Lands (AML), defined by the Code of Federal Regulations as "un-reclaimed" coal-mined lands that existed before August 3, 1977, and for which there is no continuing reclamation responsibility. AML related environmental problems include surface and ground water pollution, and abandoned or sediment-clogged streams. These environmental conditions contribute to persistent poverty, high obesity rates and poor overall health. Incentives for business relocation and basic services have dwindled, while population and property values have plunged, leaving communities with limited capacity to provide solutions.

Similarly, in the Southwestern Rocky Mountains and High Desert, the boom-bust nature of mining towns in the hard-rock mining west created a legacy of rural communities struggling with similar challenges: high rates of poverty, unemployment, and economic distress, often overlooked in the shadow of the success experienced by nearby communities.

Though distance separates these two areas, the issues the communities face are similar.

These communities are unified by the OSMRE/VISTA Team, an innovative partnership between OSMRE and VISTA. OSMRE/VISTAs work in the field to bring fresh eyes, an injection of hope, and hard work to address existing environmental and socioeconomic challenges.

**Additional Key Words:** AML, mining impacts, environment, socio-economic, water pollution, poverty, boom-bust, coal, hard-rock, community solutions

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<sup>1</sup> Paper to be presented at the 2015 National Meeting of the American Society of Mining and Reclamation, Lexington, KY *Reclamation Opportunities for a Sustainable Future* June 7–11, 2014. R.I. Barnhisel (Ed.) Published by ASMR; 1305 Weathervane Dr., Champaign, IL 61821. pp 94-116.

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## THE CURRENT POLICY AND PROBLEMS ABOUT LAND RECLAMATION OF CHINESE MAINLAND<sup>1</sup>

Shuqin Zhao<sup>2</sup>, and Ling Zhang

**Abstract:** To evaluate the damage of land affected by disturbances in the course of construction. In 2011 our government abolished the regulations of land reclamation implemented in 1988 and introduced new *regulations for land reclamation*. The single-appropriate suitability evaluation of the new regulation has two influences: first, it offers the land oblige an opportunity that could legally pursue a high economic value but at the cost of sacrificing the environment. Therefore, this makes the scientifically based land reclamation plan confronted with the risk of multi-appropriate choices. Secondly, it provides an opportunity for reclamation obligor to diminish their reclamation responsibility easier and with less investment. Besides, there exists the possibility that choosing an unreasonable reclamation structure will lead to the need to re-reclaim these sites. As a result, land reclamation will face social, economic, and ecological risks. It is one of the choices of effectively avoiding the risk to do multi-appropriate evaluation. In this paper, we considered the ecological environment, economy, social characteristics of Mengziling Nangou Ultra-poor magnetite and screened evaluation factors. Finally, a comprehensive evaluation of multi-appropriate results was made, and the optimization results were generated through establishing an evaluation index system, which not only can avoid the risk we mentioned above but is beneficial to supervision and administration.

**Additional Key words:** Mainland China, damaged land, land reclamation, land suitability evaluation

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<sup>1</sup> Oral paper to be presented at the 2015 National Meeting of the American Society of Mining and Reclamation, Lexington, KY *Reclamation Opportunities for a Sustainable Future* June 6 - 11, 2015. R.I. Barnhisel (Ed.). Published by ASMR; 1305 Weathervane Dr., Champaign, IL 61821. pp 117-136

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## ***ABOUT THE AUTHORS***

**Mr. Josh Adams** is the Director of Energy Services and has served as Field Supervisor on several of Copperhead's large Oil & Gas projects. In the past 3 years he has supervised and coordinated field efforts on more than 35 proposed gas lines totaling over 500 miles of proposed line. These efforts included more than 400 mist-net survey sites, acoustic surveys, and on-the-ground habitat assessments. Mr. Adams has extensive experience in terrestrial ecology and has completed many surveys for various species over a wide geographic area, including snails, bats, aquatic macro invertebrates, and fish. He has six years of survey experience dealing with eastern bat species. He is proficient with various field techniques used to study terrestrial and aquatic organisms and their habitats, and has participated in the production of technical reports, including data entry, statistics, and detailed results analysis. He has worked on numerous surveys for threatened and endangered species and has extensive experience working with agency personnel to develop and implement field studies.



**Dr. Jenise Bauman** is a professor at Western Washington University in Huxley College of the Environment. She earned her Ph.D. from Miami University, M.S. from West Virginia University, and B.S. at Eastern Kentucky University. Dr. Bauman is initiating projects that are focused on the restoration of coal mine landscapes in the Appalachian forests, the recovery of riparian forests in the Pacific Northwest, and the reconstruction of estuaries in urban areas of the Western Washington peninsulas. Her research couples field methods with molecular techniques to better understand vegetation establishment, plant interactions, and system recovery in disturbed soils. Research foci include belowground interactions of beneficial fungi during restoration, impact of invasive species on plant-fungal mutualisms, and plant pathology within forest restoration.



**Ms. Julia Chapman** is currently a doctoral student at The University of Dayton in Dr. Ryan McEwan's laboratory of environmental ecology. Her research interests include plant community assembly, the relationship between biodiversity and ecosystem function, and floristic surveys. She received her M.S. Biology degree from The University of Dayton in 2012 with a thesis focused on seedling, sapling, and herbaceous layer dynamics in an Appalachian old-growth forest stand at Lilley Cornett Woods in eastern Kentucky. Currently, her dissertation work focuses on spatial and temporal forest dynamics in both temperate (LCW) and tropical (Taiwan) systems, with an emphasis on patterns of functional and phylogenetic diversity in relation to environmental variation. She is also currently mentoring two undergraduate student projects on herbaceous layer dynamics in two small forest fragments in western Ohio: Drew Woods State Nature Preserve in Ansonia, OH and Armbruster Nature Preserve in Middletown, OH.



**Dr. T Allan Comp** founded and serves as the Program Officer for the DOI/VISTA Team, and the two OSMRE/VISTA Teams, the Appalachian Coal Country Team (ACCT) and the Western Hardrock Watershed Team (WHWT). Building on a base created out of a dozen years of leading two OSMRE/VISTA Teams and at the request of the Secretary of the Interior, Sally Jewell, Dr. Comp began DOI/VISTA in partnership with Americorps VISTA and Conservation Legacy in 2013. He has received national awards for his work with the people of the Appalachian coal country, for his successful effort to engage the arts and humanities in environmental recovery and for his remarkable choreography of multiple federal agency partnerships, particularly with VISTA. In September 2009 he was awarded the Service to America Medal in the Environment category by the Partnership for Public Service, the highest award a federal employee can receive. Allan is a historian of technology with a long engagement in cultural resources, community re-development, and environmental reclamation.



**Mr. Nathan DePriest** is a doctoral candidate in Civil and Environmental Engineering at West Virginia University. His dissertation focuses on the analysis of alternative surface mine reclamation practices, specifically the application of geomorphic landform design principles to valley fill reclamation in central Appalachia. Prior to his position as a graduate research assistant, he worked for the West Virginia Water Research Institute and the West Virginia Department of Environmental Protection.

**Dr. Keith Gilland** is currently a Visiting Assistant Professor in the statistics department at Miami University's Middletown campus. He received his PhD in plant and environmental biology from Ohio University in 2013. His work thus far has centered on the reintroduction of American chestnut on surface-mines reclaimed using Forestry Reclamation Approach Methods. Specifically, identifying suitable microsite conditions for early chestnut establishment and the differences in morphology between chestnut hybrid lines and their influences on establishment and survival. In addition to work with chestnut, he has explored the processes governing spontaneous plant community assembly on FRA-reclaimed mines. In addition to work on surface mines, he is pursuing research locally in the forests of Southwest Ohio. Undergraduate research projects are examining the effects on plant herbaceous community recovery following invasive removal in isolated, potentially dispersal-disadvantaged urban forests.



**Mr. Mark Gumbert** is the principal biologist, and founder of Copperhead Environmental Consulting, Inc. He is an accomplished naturalist and focused project coordinator with 20 years of experience. As Copperhead's lead pilot, he has logged over 400 hours tracking bats in Copperhead's plane. As a MS student at Eastern Kentucky University he conducted research on the endangered Indiana bat, resulting in a peer reviewed publication regarding the roosting behavior of male bats near a hibernaculum. Since his thesis work Mr. Gumbert has been interested in the ecology of bats and has extensive experience with all of the techniques used for the study of bats, including radio telemetry, mist netting, harp trapping, light tagging, pit tagging, night vision counts, and the use of bat detector equipment (AnaBat II) for recording and identifying ultrasonic bat calls. In addition, he has conducted winter and summer habitat assessments, hibernacula surveys, and emergence surveys on caves and mines in Kentucky, Virginia, West Virginia, Tennessee, North Carolina, and Ohio; many requiring technical expertise and the use of vertical climbing gear. To help protect sensitive bat habitat Mr. Gumbert has assisted in the construction and maintenance of cave gates throughout the east. As a new pilot he has begun conducting radio telemetry tracking with an aircraft. Using this technique he has helped track the migration paths of endangered Indiana bats that have resulted in the discovery of new maternity colonies.



**Dr. Leslie Hopkinson** is an Assistant Professor of Civil and Environmental Engineering at West Virginia University. She earned Ph.D. degree in Biological Systems Engineering at Virginia Tech, specializing in natural resources management and ecological restoration. Her research focus is in hydrology, streambank stability, reclamation, and stream restoration.

**Ms. Zhang Ling** is currently a Ph.D student at China University of Geosciences. Ling has her B.S in Land resources management from Shijiazhuang University of Economics and an M.S in Land resources management from China University of Geosciences. Her interest areas are hydrology, soil quality, soil and water erosion, restoration ecology, reclamation in mine area. She will visit TAMU as a visiting student for one year beginning in the fall of 2015.



**Ms. Sarah Meade** serves as the OSMRE/WHWT VISTA Leader. She joined the OSMRE/VISTA support office in September 2014, and serves in Albuquerque, NM. Sarah holds a Bachelors of Arts in Environmental Studies from Goucher College. At Goucher, she worked as a research assistant on an interview-based project investigating the history and development of the Latino immigrant farming community in the Mid-Atlantic United States. Before her volunteer term of service as the OSMRE/VISTA team leader, Sarah served as an OSMRE/VISTA with the New Mexico based non-profit, Rio Puerco Alliance, as the Community Watershed Outreach Coordinator, collaborating with community members on watershed restoration and community food projects. Sarah is a native of Santa Fe, NM.



Peter Michael, PG, is a Geologist in the Appalachian Regional Office of the U.S. Department of the Interior, Office of Surface Mining Reclamation and Enforcement (OSMRE). He has performed numerous geotechnical investigations and programmatic services pertaining to coal mining impacts on human health and safety, property, and the environment in such areas as: stability of coal-mine-waste slurry impoundments, coal combustion residue mine placement, excess spoil fill stability, landslides, mine blasting, and mine subsidence. Prior to working with OSMRE, Mr. Michael served as a Peace Corps Volunteer in Thailand, mapping landforms for the Royal Thai Department of Land Development.



Mr. Michael has a BS in Geology from Rider University and MA in Geology from Binghamton University. He is currently serving as Director at Large on the Board of Directors of the Pittsburgh Geological Society and is an Associate to the University of Pittsburgh Center for Philosophy of Science.

**Dr. John D. Quaranta, P.E.** is an Associate Professor with the Department of Civil and Environmental Engineering at West Virginia University with a specialization in geotechnical and geoenvironmental engineering. His research encompasses: slope stability and seepage analysis for landform design, and dam safety and groundwater impacts resulting from mineral, and oil and gas life-cycle phases.

**Ms. Piper Roby** conducted her Master's research on amphibians, but has been involved in many projects centering on herpetofauna, terrestrial snails, fish, bats, and mammals, as well as projects requiring all taxa surveys. She has been on rope in various caves for several years and is comfortable in underground situations. She has also surveyed for and worked with Threatened and Endangered species, including the Indiana bat (*Myotis sodalis*), Gray bat (*Myotis grisescens*) and Cheat Threetooth snail (*Triodopsis platysayoides*) and several species of bats in the eastern U.S. She has conducted many tracking projects on bats (to roost trees and foraging), coyotes, bobcats, mountain lions and snakes. She has worked for the National Park Service as a Wildlife Biotech trapping and tracking bobcats, coyotes and mountain lions. She also conducted small mammal and stream surveys, and constructed and monitored pit-fall trap arrays aimed at surveying reptiles. Ms. Roby has extensive experience in several versions of ArcGIS and she is familiar with many aspects of the program, including digitizing, manipulation and data analysis, and map creation.





**Mr. Price Sewell** is a biologist with over 16 years of experience of ecological project management. Among his expertise are Section 7 Endangered Species surveys, general wildlife surveys, and cave surveys. His field expertise includes work with bats, fish, terrestrial and aquatic mollusks, reptiles, amphibians, and rare plants. In addition to field work. Mr. Sewell has extensive experience with Indiana bats and has conducted sampling for this species in Ohio, Indiana, Kentucky, Pennsylvania, New York, Illinois, Missouri, Maryland Georgia and Tennessee. He has performed radio telemetry studies on Indiana bats, gray bats, eastern small-footed bats, evening bats, silver-haired bats, red bats, and big brown bats and has participated in fixed station night foraging, day roost location, and aerial radio telemetric studies. In addition, Mr. Sewell has extensive caving experience and is well versed in vertical caving techniques. He has conducted bat hibernacula counts in KY, TN, IN, and WV.



**Ms. Amy Showalter** serves as the OSMRE/VISTA Team Coordinator. She joined the OSMRE/VISTA support office in December 2014 and brings energy for effective communication and administration, holistic approaches, and service learning. Her previous experience includes managing home repair projects as an AmeriCorps member in Tucson, AZ and providing support for adults with intellectual disabilities in Harrisonburg, VA. She also taught hiking-based environmental education in New Hampshire's White Mountains with the Appalachian Mountain Club. A native of Virginia, Amy graduated from Goshen College with a degree in Bible, Religion & Philosophy, and a minor in International Studies.



**Dr. Zhao Shuqin** (born in 1965), has her PhD from China University of Mining and Technology (Beijing). Currently, Shuqin is working in Land and Urban Planning College, Shijiazhuang University of Economics, as a professor. She is branch secretary of China Communist Party of her college. She is also the member of the Academic Committee of China Land Science Society and China Mining Cities Economic Work on Behalf of the Committee. She is one of the two levels of talent of "Three Three Three Talents Project" of Hebei Province, China. Shuqin mainly engage in land resources economic management system, real estate valuation research.



**Dr. William Walker** is a Senior Geochemist with Sovereign Consulting Inc. in Seattle, WA. He completed a BS and MS in Chemistry and a PhD in Geochemistry/Water Chemistry from the University of California-Davis. Over the past 25 years he has completed numerous water quality studies and mining/smelter related projects as part of environmental forensic and remediation projects. He specializes in analysis of reactions pertinent to water quality and acid mine drainage and on methods of water quality improvement to mine related effluents.



**Mr. Cody Zirkle** serves as the OSMRE/ACCT Leader. He joined the OSMRE/VISTA support office in September 2014, and serves in Beckley, WV. Cody graduated with a B.S. in Biology from Emory & Henry College. He previously served an AmeriCorps VISTA term with the Boys & Girls Clubs of the Mountain Empire in Bristol, VA as their Social Media Director, and an AmeriCorps term with New Orleans Area Habitat for Humanity as a Project Manager and Volunteer Leader. Cody is a native of Big Stone Gap, VA.

