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

An Official Online Publication of the American Society of Mining and Reclamation

ISSN Number 2328-8744

Volume 9, Number 1, 2020

The Journal of the Society of Mining and Reclamation will be published quarterly online on the Society's website: www.asmr.us

Page charges are $10 US/page for non-members, payable prior to placement in the web Journal.

All manuscripts are peer reviewed. Authors will be kept anonymous from the reviewers.

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 are welcome. These papers emphasize changing approaches to the science and technology of landscape revitalization. We strive to have them reviewed within 6 weeks.

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

Printed copies: Although this Journal is an online Journal, copies are available at the cost of printing with an ink-jet or color laser printer.

Contact asmr@twc.com for cost of current and back issues.

Cover photo are curtesy of Dr. Mike Strager, West Virginia University

Manuscripts are submitted electronically to Dr. Richard Barnhisel at asmrjournal@twc.com or asmr@twc.com

Style Guide for Authors: Manuscript preparation guide is available at: http://www.asmr.us/Publications/Journal/Manuscript%20Guidelines%20Journal.pdf Which is preferred or https://www.soils.org/files/publications/style/chapter-01.pdf

Table of Contents

Research Papers

Demonstration Paper

ABSTRACTS OF PAPERS
Research Papers

IDENTIFICATION OF TROPICAL NATIVE HIGH-ACCUMULATING PLANT SPECIES FOR PHYTOREMEDIATION [1]

A. A. Adesipo, D. Freese, O. O. Awotoye, A. T. Salami, and D. J. Oyedele [2],

Abstract. Heavy metal contaminants from gold mine sites in southwest Nigeria are posing a high tendency of entry to the food chain. To avert the risk, phytoremediation of the sites is paramount. However, despite recent research advancements in phytoremediation and identification of over 400 hyperaccumulators plant species for Cd, As, Ni, Zn, and Mn, elements such as Pb, Cu, Cr, Hg are largely limited, moreover, less is known of tropical species. This study aims to identify native high-accumulating plants with a high level of heavy metals tolerance growing on three sites an abandoned gold mining site (Site 1); an active gold mining site (Site 2), and an undisturbed vegetation site (Control site) in southwestern Nigeria. Soil properties; pH, textural class, electrical conductivity, available P, percentage Total Nitrogen (TN), Organic Carbon (OC) and Organic Matter (OM), as well as total Pb, Cd, Fe, and Cu concentration, were analyzed at two sampling depths (0-20 and 20-40 cm). The accumulation and enrichment potential of Pb, Cd, Fe, and Cu in *Acanthus montanus*, *Chromolaena odorata*, *Crinum jagus*, *Melanthera scandens*, *Melochia corchorifolia*, *Palisota ambigua*, *Pteris togoensis*, *Musa sapientum*, and *Theobroma cacao*, were determined. High clay content, low nutrients, and elevated metal contamination characterized the mine sites soils, with significant differences indicated by PERMANOVA results and confirmed by nDMS analysis. All plants showed elevated metal content and high accumulating potential of Pb with high Fe. None of the plants meet the threshold criteria for hyperaccumulators, but they show high-accumulating potential for phytoremediation. *Crinum jagus* has the highest accumulation factor of 8.71, 37.47, 1.08, and 29.38 for Pb, Cd, Fe, and Cu, respectively. It is a novel recommendable plant species for phytoremediation and can be employed both in the tropical regions and in other climatic adaptable regions around the globe.

Additional Key Words: Hyperaccumulators, Phytoremediation, *Crinum jagus*, tropical regions, gold mining, Artisanal miners.

---

[1] Paper presented at the 2019 National Meeting of the American Society of Mining and Reclamation, Big Sky, MT. Welcome Back to Montana: **The Land of Reclamation Pioneers**, June 3-7, 2019. Published by ASMR, 1305 Weathervane Dr., Champaign, IL 61821.

[2] Adegbite A. Adesipo, PhD student, Department of Soil Protection and Recultivation, Brandenburgishe Technische Universität (BTU), Platz der Deutschen Einheit 1, 03046, Cottbus-Senftenberg Germany; Dirk Freese, Professor, Department of Soil Protection and Recultivation, BTU Cottbus-Senftenberg Germany; Olusegun O. Awotoye, Professor, Institute of Ecology and Environmental Studies, Obafemi Awolowo University (OAU), Ile-Ife Nigeria: Ayobami T. Salami, Professor, The Technical University (Tech-U), Ibadan, and Durodoluwa J. Oyedele, Professor, Department of Soil Science and Land Resources Management, OAU, Ile-Ife Nigeria.

Click below for full paper.

https://www.asmr.us/Portals/0/Documents/Journal/Volume-9-Issue-1/Adesipo-GR.pdf

DOI: http://dx.doi.org/10.21000/JASMR20010001

ARTHROPOD RESPONSE TO PRAIRIE MANAGEMENT ON RECLAIMED MINE LAND IN APPALACHIA[1]

Alexys K. Nolan[2], Keiron Young, and Rebecca M. Swab

Abstract. Prescribed burning and mowing are common management techniques in prairie ecosystems; however, more information is needed to understand the full effects of these practices on resident arthropods. To study these impacts and understand how they relate to arthropod assemblages on reclaimed coalmine land, an arthropod trapping project was conducted in the summer of 2017 at The Wilds in southeast Ohio. Pitfall trapping was used on four prairies which had undergone different management techniques in recent years: 1) burned in the spring a few months before the study, 2) burned in the spring a year prior to the study, 3) mowed late summer the year before the study, and 4) no recent management. Results showed that all prairies that received management treatments had a family richness of 41-44, while the unmanaged prairie had a family richness of 33. The mowed prairie had the highest arthropod abundance and the lowest family diversity; contrarily, the recent 2017 burned prairie had the lowest abundance and the highest family diversity. The two dominant guilds in all treatments were detritivore-carrion feeding arthropods and predator-parasite arthropods; these guilds were proportioned similarly in all treatments except for the 2017 burned prairie, which was the only treatment to have a significantly higher proportion of predator-parasites than detritivore-carrion feeders. This evidence indicates that detritivore-carrion feeding arthropods are more negatively impacted by recent fire than predator-parasites, though within these groups the response of individual taxonomic families differed. Overall findings indicate that while mowing prairies may result in higher abundances of arthropods and relatively high levels of family richness, it may not increase family diversity. Prescribed fire appears to have a negative impact on arthropod abundance initially; however, the higher abundance of arthropods in the 2016 burned prairie indicates that burned grasslands can be recolonized relatively quickly. It is recommended that periodic burning is done to maintain the grassland ecosystem and sustain arthropod richness and diversity. In areas where burning is not practical, rotational mowing can be used to sustain richness and increase arthropod abundance.

Additional Key Words: Insect; Burning; Prescribed Fire; Mowing; Mechanical; Entomobryidae; Coleoptera; Porcellionidae; Lycosidae; Orbatid Mite; Formicidae

---

[1.] This paper was submitted to JASMR for consideration in one of their issues and was not presented at our conferences that were held in the past.

[2.] Alexys K. Nolan, Restoration Ecology Program Associate, The Wilds, Cumberland, OH 43732; Keiron Young, Restoration Ecology Apprentice, The Wilds; Rebecca Swab, Director of Restoration Ecology, The Wilds.

Click below for full paper.
https://www.asmr.us/Portals/0/Documents/Journal/Volume-9-Issue-1/Nolan-OH.pdf

DOI: http://dx.doi.org/10.21000/JASMR20010029

Demonstration Study

USING UNMANNED AERIAL VEHICLES TO MODEL SURFACE RUNOFF DURING WELL PAD DEVELOPMENT[1]

Michael P. Strager[2], Angela Maria Klein Hentz, Paul Kinder, and Shawn Grushecky

Abstract. Unmanned Aerial Vehicles (UAVs) can be applied to collect valuable information during the construction of oil and gas well pads. The aerial photos from a UAV provide high spatial and temporal information and when built as orthomosaics and digital surface models, can map the sources and paths of runoff for better sediment management. The objective of this work was to use UAV imagery to predict total suspended solid runoff resulting from the construction of an oil and gas well pad. We collected true-color images with a Phantom 4 Pro and processed the imagery to create an orthomosaic and a digital surface model (DSM). The orthomosaic was classified using a maximum likelihood classifier to determine cover types and the DSM was processed to create a runoff grid. Annual total suspended solid (TSS) loading rates were assigned to the cover type classes and modeled with an annual runoff grid. We were able to identify three locations with elevated TSS loading values that could be detrimental to downstream aquatic systems and suggest the use of mitigation activities at these sites to prevent potential impacts. The use of UAVs in the oil and gas industry proved to be a viable option for better sediment management during pad construction.

Additional Key Words: Site planning, Site design, Runoff model, Watershed management, Aquatic system, Drones.

---

[1] Oral paper presented at the 2019 National Meeting of the American Society of Mining and Reclamation, Big Sky, MT. Welcome Back to Montana: The Land of Reclamation Pioneers, June 3 - 7, 2019. Published by ASMR; 1305 Weathervane Dr., Champaign, IL61821.

[2] Michael P. Strager is Professor, School of Natural Resources, Davis College of Agriculture, Natural Resources and Design, West Virginia University, Morgantown, WV 26506; Angela Maria Klein Hentz is Research Project Coordinator of the Natural Resource Analysis Center, School of Natural Resources, Davis College of Agriculture, Natural Resources and Design, West Virginia University, Morgantown, WV 26506; Paul Kinder is the Director of the Natural Resource Analysis Center, School of Natural Resources, Davis College of Agriculture, Natural Resources and Design, West Virginia University, Morgantown, WV 26506; and Shawn Grushecky is Assistant Professor, Energy Land Management Program, School of Natural Resources, Davis College of Agriculture, Natural Resources and Design, West Virginia University, Morgantown, WV 26506.**Click below for full paper.**

https://www.asmr.us/Portals/0/Documents/Journal/Volume-9-Issue-1/Stranger-WV.pdf

DOI: http://dx.doi.org/10.21000/JASMR20010051

ABOUT THE AUTHORS

Mr. Adegbite Adeleke Adesipo is a PhD student at the chair of Soil Protection and Recultivation in Brandenburg University of Technology Cottbus, Germany. His research interest focusses on soil reclamation, land use system, and soil science especially soil physics and chemistry. He collaborates with several international researchers and growing an international initiative towards soil reclamation.

Dr. Olusegun Olufemi Awotoye is a Professor of ecology and environmental management at the Institute of Ecology and Environmental Management (IEES), Obafemi Awolowo University Ile-Ife. His research focus includes pollution monitoring and bioremediation of contaminated soil, role of microbes for improved plant nutrition and establishment, assessment and restoration of degraded environment, as well as evaluation of floral biodiversity in the moist savanna zone of Africa. He is the former director of IEES and teaches post-graduate students.

Dr. Dirk Freese is a research faculty member in the Institute for Environmental Science and a Professor at the Chair of Soil Protection & Recultivation at Brandenburg University of Technology in Cottbus, Germany. He completed his Ph.D. at Humboldt-University in Berlin. His research interests lie in the area of soil science, especially in soil chemistry, soil reclamation and land use systems (agroforestry). He has collaborated actively with researchers in several national and international research projects. He has extensive international experience in soil and land reclamation focusing on the dynamics of plant nutrients and contaminants. He also teaches courses for post-graduates and PhD students.

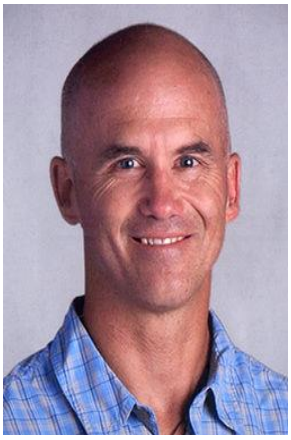
Dr. Shawn Grushecky is currently an Assistant Professor and Program Coordinator for Energy Land Management in the Davis College of Agriculture, Natural Resources and Design at West Virginia University. He has led the development of the curriculum and degree program in Energy Land Management, which is one of only twelve programs accredited by the American Association of Professional Landmen. He maintains an active research program in the area of natural resource and related energy development. Currently, his research and outreach are mainly in the areas of energy development and land management as well as natural resource enterprises.

Dr. Angela Maria Klein Hentz is a research scientist with a focus in remote sensing and geo-technologies applied in natural resources, especially in forestry. She has a Forest Engineering degree followed by a master and Ph.D. in Forest Resources. Currently she works as Research Coordinator for the Natural Resource Analysis Center at West Virginia University. She has experience with image processing, drones and LiDAR.

Dr. Paul Kinder is the director of the Natural Resource Analysis Center at West Virginia University. He received degrees from both West Virginia University and Ohio State University and has over 20 years' experience working in the private and public sectors. His research interests are in the geosciences (GIS & Remote Sensing), environmental and ecological restoration, natural resources planning and management, and social network analysis. He enjoys fostering a transdisciplinary approach to research, teaching, and service.

Ms. Alexys Nolan is the Restoration Ecology Associate at The Wilds, a conservation center in Southeast Ohio. She obtained her BSc in Biology at Western Michigan University in 2015. She enjoys hands on restoration and is currently working on projects such as: restoring pre-SMCRA reclaimed forest, studying reclaimed grassland reforestation techniques, and improving prairie habitat quality on site.

Dr. Durodoluwa Joseph Oyedele is a Soil Physicist and Soil Conservation and Management Scientist. He has been working on soil erosion, soil aggregation and soil and environmental health. He has over 30 years of research and teaching experience at the Obafemi Awolowo University, Nigeria. He was a former head of Department of Soil Science and a former Dean of the Faculty of Agriculture in the University.



Dr. Mike Strager is a professor in the Davis College of Agriculture, Natural Resources and Design at West Virginia University. He specializes in using appropriate spatial and decision analysis techniques to aid in the analysis and management of natural resources. He has applied Geographic Information Systems, spatial analysis, and remote sensing for forestry, water quality, wildlife, recreation and conservation planning. Much of his work has resulted in the development of spatial decision support to aid in prioritizing areas, evaluating alternatives and examining trade-offs when managing natural resources.

Dr. Ayobami Salami specializes in environmental applications of Remote Sensing and Geographic Information System (GIS). He is currently the Pioneer Vice Chancellor of Nigeria's premier Technical University, **First Technical University, Ibadan, Nigeria.** He was the Pioneer Head of Environmental Science, University of the Gambia, The Gambia (2000-2001); the Director, Institute of Ecology and Environmental Studies, Obafemi Awolowo University (OAU), Nigeria (2006-2010); Senior Research Advisor, Health,

Safety and Environment, Corporate Environment Department, Shell Petroleum Development Company (SPDC), Port Harcourt (2010-2011); and Deputy Vice-Chancellor (Academic), OAU (2011-2016).

Dr. Rebecca Swab Rebecca has been Director of Restoration Ecology at The Wilds since 2015. An Ohio native, Rebecca attended The Ohio State University where she received combined B.S and M.S degrees. She went on to complete her Ph.D. at the University of California Riverside, where she studied how plants respond to stressors such as changing fire intervals and climate change. As director of restoration ecology, Rebecca's goal is to serve as a bridge between conservation managers and researchers. She couples restoration projects on reclaimed mine lands with research to determine which restoration methods work best. Information about which methods and projects are the most successful at reaching goals such as increasing native species diversity and ecosystem function are then shared with the larger conservation community to improve the field of restoration ecology.

Mr. Keiron Young is a freelance Entomologist from Edinburgh, Scotland, who obtained his BSc and MSc from Edinburgh Napier University in Wildlife Biology and Conservation in 2015. He has worked with wildlife conservation groups on forestry and river habitat restoration throughout Scotland and was a Restoration Ecology Apprentice at the Wilds, Ohio. He is Currently looking at starting a Ph.D. in Freshwater Biology in 2021.