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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 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 is the Longview Power Plant in WV, one of the cleanest coal burning power plants in the US. Taken by R.I. Barnhisel on the field trip at the ASMR meeting in Morgantown WV.

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

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**SURFACE MINE TO BIOMASS FARM: GROWING SHRUB
WILLOW (*SALIX* SPP.) IN NORTHEASTERN WEST
VIRGINIA - FIRST YEAR RESULTS¹**

Bart Caterino², Jamie Schuler, Shawn Grushecky, and Jeff Skousen

Abstract: Shrub willow (*Salix* spp.) has been a focus of international efforts to develop renewable alternatives for fossil fuels and to sequester carbon from earth's atmosphere. One area of interest has been to plant and cultivate willow on reclaimed mine lands. West Virginia's coalfields provide significant land area for incorporating willow cultivation into reclamation. The objective of this study was to develop silvicultural treatments to overcome the most common properties of mine soils in Appalachia: high rock fragment content that often causes difficult planting, reduced nutrient availability, and low water-holding capacity. Cuttings of three shrub willow clones were planted with six planting/fertilizer treatments. The planting treatments compared a horizontal planting method that was more efficient than digging full depth holes into compacted and rocky mine soils to traditional vertical planting of cuttings. Fertilizer treatments compared no fertilization to controlled release and traditional fertilizer applied at 140 kg N ha⁻¹. Following the first growing season, clones clearly differed in survival and production but the influence of fertilizer treatments was inconsistent. Horizontal planting impeded cutting survival in rocky planting conditions. Survival and growth were lower for horizontally-planted cuttings relative to vertically-planted cuttings. Response to fertilizer varied by clone. Results of this study will be used to direct future establishment practices for willow on reclaimed mine soils in West Virginia.

Additional Key Words: reclamation, revegetation, short rotation coppice, planting methods

¹ Oral paper presented at the 2016 National Meeting of the American Society of Mining and Reclamation, Spokane, WA: Reclaiming the West, June 4 - 9, 2016. Published by ASMR; 1305 Weathervane Dr., Champaign, IL 61821.

² Bart Caterino, MS Candidate; Jamie Schuler, Professor; and Shawn Grushecky, Professor, respectively, Forestry and Natural Resources, West Virginia University, Morgantown, WV 26506; and Jeff Skousen, Professor, Plant and Soil Sciences, West Virginia University, Morgantown, WV 26506

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<http://www.asmr.us/Publications/Journal/Vol 6 Issue 1/Caterino-WV.pdf>

USE OF CAMERA TRAPPING TO DETERMINE SPATIAL DISTRIBUTION, HABITAT USE, AND ENVIRONMENTAL FACTORS AFFECTING MESOPREDATORS ON RECLAIMED MINE LANDS AT THE WILDS¹

Katherine Driscoll², Matt Lacey, and Joe Greathouse

Abstract. There have been few studies conducted on mammalian mesopredators on reclaimed mine sites. The Wilds, a 9,154-acre conservation center located in Eastern Ohio, was surface mined for coal from the 1940s-1980s and reclamation began in 1971 (History, 2015). Coyotes (*Canis latrans*) and bobcats (*Lynx rufus*) are the main mesopredators located at the Wilds and were the primary focus of this study. Camera trapping was used to assess how ecological factors impacted the habitat use and distribution of bobcats and coyotes on reclaimed mine land. Ten remote cameras were randomly deployed across the property to monitor the biological community at the Wilds from late January to early July. Statistical analyses were used to determine the impact of variable conditions on the number of bobcat and coyote observations at all camera traps. These conditions included the seasons, time period, baiting, edge versus interior habitat, mining effects, snow cover, and the level of human activity. It was determined that coyotes did not closely associate with any habitat types, while they did closely associate with several scavenging species. Bobcats were most closely associated with large prey items, such as the white-tailed deer, wild turkey, and eastern cottontail and were also closely associated with open or sparsely covered habitats. The results of Pearson's chi-squared tests determined that photographs of bobcats during this study were captured significantly more often when the camera trap was located on an unmined site, when the trap was baited, when snow cover was present, during nocturnal periods, and during winter. This study reaffirmed the ability of remote camera traps to effectively survey elusive species that may occur at low densities such as the bobcat and the coyote. The data collected from this study has demonstrated that although the effects of mining were extensive at the Wilds, the mesopredator populations of bobcats and coyotes have returned to this recovering landscape.

¹ Paper submitted to JASMR for consideration from work done at the Wilds.

² Katherine Driscoll is Wildlife Ecology Apprentice, the Wilds, Cumberland, OH 43732; Matt Lacey is Wildlife Ecology Intern, the Wilds, Cumberland, OH 43732. Dr. Joe Greathouse is Assistant Professor of Biology, West Liberty University, West Liberty, WV 26074

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EVALUATION OF SMALL TREE AND SHRUB PLANTINGS ON RECLAIMED SURFACE MINES IN WEST VIRGINIA¹

A. Monteleone², J. Skousen, L. McDonald, J. Shuler, J. Pomp, M. French, and R. Williams

Abstract: Hundreds of hectares of mined land are reclaimed annually in Appalachia and planted with commercially-valuable hardwood tree species for forestry post-mining land uses. Establishment and growth of fruit and nut-producing tree and shrub species for wildlife habitat post-mining land uses have not been extensively studied on surface mines. Though these species are not planted as part of forestry reclamation, they are commonly found in forest ecosystems of WV and provide a food source for a variety of wildlife, insects, and microorganisms, all of which are important for maintaining a sustainable and functioning forest ecosystem. The objective of this study was to determine survival and growth of 20 species of nut and fruit-producing shrubs and small trees to evaluate their suitability for reclamation plantings. Seedlings were planted in graded overburden material in 2008 and 2010 on four reclaimed surface coal mines in WV. The selected sites were reclaimed using conventional methods. The experiment was a completely randomized block design with four replications per site. At each site, four blocks measuring 4,160 m², two east-aspect and two west-aspect, were established. Each block was comprised of 20 monoculture species plots, and within each plot 25 individuals of the selected species were planted on 2.4 m x 2.4 m spacing. Survival and growth of these species were measured in one growing season after planting and again in 2015 to determine individual species survival and growth. The best performing species overall were Washington hawthorn (*Crataegus phaenopyrum*), black chokeberry (*Aronia melanocarpa*), nannyberry (*Viburnum lentago*), black cherry (*Prunus serotina*), gray dogwood (*Cornus racemosa*), and red mulberry (*Morus rubra*) in that order with survival ranging from 62 to 43% after five to seven growing seasons. These species survived and appeared healthy on most blocks. The poorest performing species ($\leq 27\%$ survival) in descending order were blueberry (*Vaccinium corymbosum* L.), flowering dogwood (*Cornus florida*), and the worst performer being pawpaw (*Asimina triloba*) at only 9% survival.

¹ Oral paper presented at the 2016 National Meeting of the American Society of Mining and Reclamation, Spokane, WA *Reclaiming the West* June 4-9, 2016.

² Alexis Monteleone (Graduate Student), Jeff Skousen (Professor), Louis McDonald (Professor), Jamie Schuler (Asst. Professor), West Virginia University, Morgantown, WV 26505; Jonathan Pomp (Senior Forester), Forestry, Carbon, and GHG Services Division, Morgantown, WV 26501; Michael French (Director of Operations), Green Forests Work, Lexington, KY 40546; and Rick Williams (Reclamation Contractor), Williams Forestry and Associates, Calhoun, GA 30701.

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<http://www.asmr.us/Publications/Journal/Vol 6 Issue 1/Monteleone-WV.pdf>

ABOUT THE AUTHORS

Mr. Bart Caterino is a graduate research assistant at West Virginia University pursuing an M.S. in forestry. He earned his B.S. in civil engineering at Syracuse University and was previously a geotechnical specialist at the PA Department of Transportation. His professional interests include reclamation of disturbed lands, reforestation, forest management, and riparian restoration.



Ms. Katherine Driscoll received her B.S. in Zoology with a minor in Non-Profit Studies from North Carolina University in Raleigh, North Carolina. Ms. Driscoll is currently employed as a zookeeper in the Africa department of the El Paso Zoo in El Paso, Texas. Her research interests include citizen science, endangered species conservation and factors affecting population dynamics of threatened species.



Mr. Michael French has been working in the field of surface mine reforestation for more than a decade. He received a B.S. in Biology from the University of Kentucky and his M.S. work in Forestry at the UK focused on linking American chestnut restoration to surface mine reforestation. Michael currently serves as a forester for The American Chestnut Foundation and he is the Director of Operations for Green Forests Work, a non-profit organization whose mission is to restore healthy, productive forests on surface mined lands across Appalachia. He is also a member of the ARRI Science Team.



Joe Greathouse - Bio and photo are not available.

Dr. Shawn T. Grushecky is the Coordinator for the West Virginia University Professional Land Management Program. He received his B.S. in Wildlife Resources, M.S. in Forest Resources Science, and Ph.D. in Forest Resources Science with an emphasis on Wood Science all from West Virginia University.



Mr. Matthew Lacey is working towards his B.S. in Wildlife conservation and pursuing a minor in Environmental Policy and Planning at Virginia Polytechnic Institute and State University. Mr. Lacey will spend this summer working on the Virginia Appalachian Carnivore Study in Bath County, Virginia. His goals include studying and conserving endangered wildlife while also bridging the gap between science and policymaking.



Dr. Louis M. McDonald is a Professor of Soil Science in the Division of Plant and Soil Sciences at West Virginia University. He has degrees from the California Polytechnic State University, San Luis Obispo (B.S.), Louisiana State University (M.S.) and the University of Kentucky (Ph.D.). Since 1997, he has had teaching and research responsibilities in environmental soil chemistry and soil fertility. Louis teaches an undergraduate course in soil fertility, a graduate course in soil chemistry and coordinates graduate seminar. His research interests are the reclamation and remediation of disturbed and metal contaminated soils, especially the role of organic carbon in the mechanisms governing biological availability, and acid mine drainage geochemistry.



Ms. Alexis Monteleone received her B.S. degree in Environmental Protection from West Virginia University. She is currently perusing a M.S. in Agronomy from West Virginia University under Dr. Jeff Skousen working on a reforestation reclamation project in West Virginia. This research experience helped her to realize her interest in field science and reclamation research. In the future she hopes to continue to work on reclamation projects in Appalachia and beyond.



Mr. Jonathan Pomp is a Senior Forester for the Forestry, Carbon, and Greenhouse Gas (GHG) Services Division of Environmental Services, Inc. He received his B.S. in Forest Resources Management (2006) and M.S. in Forestry (2008) both from West Virginia University. He has a very diverse forestry-related background with over eight years of professional experience. Mr. Pomp's specialties include forest/fire ecology, forest inventory, growth/yield modeling and associated biological and financial analyses, forest carbon offsets, forestry reclamation/reforestation of disturbed sites, and Right-of-Way (ROW) vegetation management. At ESI, Mr. Pomp is responsible for GHG forestry offset project validations/verifications, forest biometrics, project scoping analyses, and field assessments for projects around the world. Mr. Pomp is a professional member of The Society of American Foresters (SAF), and is currently a Certified Forester (CF) with the organization; he also serves on the Executive Committee for the WV Division. He is a Registered Professional Forester in West Virginia, Michigan, South Carolina, North Carolina, and Mississippi, and a Certified Arborist with the International Society of Arboriculture. Mr. Pomp is also a Certified Commercial Pesticide Applicator in WV with authorization to apply herbicides for vegetation management in forests and ROWs.



Dr. Jamie Schuler is Assistant Professor of Silviculture at West Virginia University. He received his B.S. in Forestry and Forest Biology and M.S. in Forest Management both from SUNY ESF and his Ph.D. in Silviculture from North Carolina State University. His research interests include forest regeneration, forest restoration, plantation establishment, and stand dynamics.



Dr. Jeff Skousen is a Professor of Soil Science and is the Land Reclamation Specialist at West Virginia University. He received his Ph.D. from Texas A&M University, and M.S. and B.S. degrees from Brigham Young University. Jeff has more than 35 years of experience in reclamation of disturbed lands and agriculture. He teaches courses in soil science, environmental science, and reclamation of disturbed soils.



His research program includes acid mine drainage control and treatment and improvement of water quality, overburden and soil analyses, oil and gas site reclamation, revegetation of disturbed lands, reforestation, native plant restoration, biomass for bioenergy, and post-mining land use development.

Mr. Rick Williams of Williams Forestry & Associates has been providing quality services in the reforestation industry for over 35 years. We have offices in three states – Georgia, Ohio, and Pennsylvania, as well as a 275-acre nursery in North Georgia. We plant approximately 8 million tree seedlings each season for reforestation, reclamation, mitigation and environmental projects including State & USDA Conservation Programs. Our entire operation is managed and supervised by reforestation professionals. Our supervisory staff has extensive labor management experience and all field employees are trained to perform in a safe and professional manner. We can provide crews ranging from a man force of 3 to 35 employees.



Williams Forestry & Associates purchased Native Forestry Nursery in 2008 for the purpose of growing hardwood seedlings for our planting needs as well as for wholesale/retail purposes. Each year we plant millions of high value native hardwoods, shrubs and conifers.

Our company has an excellent reputation in the reforestation and mitigation industry. We are well equipped with the right technical expertise, a strict quality control program, and the work force to get the job done correctly and on time. These resources and our honest approach have made Williams Forestry & Associates a logical choice for landowners looking for a qualified tree planting contractor.