

# RESTORING FORESTS ON MINED LAND IN THE APPALACHIANS: RESULTS AND OUTCOMES OF A 20-YEAR RESEARCH PROGRAM<sup>1</sup>

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**Abstract:** The mixed hardwood forest of the central Appalachian coal field region is one of the most diverse, productive, and valuable temperate forests in the world. Strip mining for coal removes the forest ecosystem including the soil and surface geologic strata. Since the implementation of the Surface Mining Control and Reclamation Act in 1978, over 500,000 ha of native forest land have been converted to mine spoils covered with abandoned, unproductive grass and shrub land; less than 10% of these mined lands were reforested due to inadequate technology, economic disincentives, or regulatory constraints. A long-term forestland reclamation program was established in 1980 to develop mined land reclamation techniques specific for reforestation and forestry land uses. Our studies show that forest site quality was routinely degraded in the process of mining, but, if properly reclaimed, forest growth and yield of post mining forests can be as productive as native forests. High site quality is achieved by creating mine soils made from rock strata with properties similar to those of native soils. Soil compaction on mined sites was common; soil building and tillage techniques were devised that greatly increased forest site quality. Tree-compatible ground covers were developed for erosion control, and silvicultural practices were modified for mined land applications. Economic analyses showed that our revised reclamation techniques for forestry were cost effective, while meeting all federal and state regulatory requirements. Our studies also show that productive, reforested mined sites can sequester carbon at a rate of 4 Mt ha<sup>-1</sup> yr<sup>-1</sup>, which is important for sequestering and storing carbon released to the atmosphere in the process of burning coal for power production. Based on our research outputs, several states in the Appalachian region have revised their reclamation regulations and guidelines to produce high quality mined sites for restoring native forest ecosystems. With coordination among landowners, miners, and regulators, mined land can be restored for multiple forest values.

Key Words: Reclamation, mined land, forest management, soil quality

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