



CHAPTER 1

THE APPALACHIAN REGIONAL REFORESTATION INITIATIVE

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INTRODUCTION

The Appalachian Regional Reforestation Initiative (ARRI) is a cooperative effort by the States of the Appalachian region with the U.S. Department of the Interior's Office of Surface Mining Reclamation and Enforcement (OSMRE) to encourage restoration of high-quality forests on reclaimed coal mines in the eastern United States. The goals of ARRI are to communicate and encourage mine reforestation practices that 1) plant more high-value hardwood trees on reclaimed coal-mined lands in the Appalachian region, 2) increase the survival rates and growth rates of planted trees, and 3) expedite the establishment of forest habitat through natural succession. These goals can be achieved when mines are reclaimed by using the Forestry Reclamation Approach (FRA).

The FRA is a method for reclaiming coal-mined land to forest under the federal Surface Mining Control and Reclamation Act of 1977 (SMCRA), and is based on knowledge gained from both scientific research and experience (Chapter 2, this volume). State mining agencies and OSMRE consider the FRA to be an appropriate and desirable method for reclaiming coal-mined land to support forested land uses (Kentucky Department for Surface Mining Reclamation and Enforcement 1997; Ohio Department of Natural Resources 2001; U.S. Office of Surface Mining Reclamation and Enforcement 1999; Virginia Department of Mines, Minerals, and Energy 2001a, 2001b). Seven states (California, Kentucky, Maryland, Ohio, Pennsylvania, Tennessee, and West Virginia) have codified the FRA in their official policy or a memorandum of understanding to signal their adoption of the FRA as a means of reforesting mined sites.

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When mining and reclamation operations are conducted using the FRA, results can include both cost-effective regulatory compliance by the coal mine operator and productive postmining forests. Productive forests generate value for their owners and provide watershed protection, wildlife habitat, and other environmental services (Fig. 1).

WHY IS THE APPALACHIAN REGIONAL REFORESTATION INITIATIVE NEEDED?

The roles of ARRI are to coordinate and improve the sharing of information about mined land reforestation, and to promote further research on reclamation and restoration of mine lands across all the Appalachian states. Even though application of SMCRA methods improved the landforms of surface mines compared to pre-SMCRA conditions, the mined land was generally not restored as forest. In contrast with the aftermath of pre-SMCRA mining, the SMCRA approach increased land-surface stability, improved water quality, and enhanced human safety in the Appalachian region. However, implementation of SMCRA has not been accompanied by widespread replacement of forests disturbed by mining. Many mined lands were restored as grasslands, but the owners do not currently use them for hay or pasture. Natural succession will eventually restore native forests on such areas, but this process is slow—centuries may be required.

After passage of SMCRA, regulators focused on stability of landforms created by mining at the expense of restoring forest land capability. They adopted this approach in an attempt to solve the problems caused by pre-SMCRA surface mining, such as severe erosion, sedimentation, landslides, and mass instability. As a result, excessive soil compaction was common on surface mines, and aggressive groundcover species were generally planted. Furthermore, the technical complexities of implementing SMCRA were a challenge to both regulators and mine operators. Consequently, reforestation took a backseat. Last, some of the mine operators' early efforts



Figure 1.—Thinning and pruning a 17-year-old white pine stand established by an active coal mining operation in Virginia using procedures similar to the Forestry Reclamation Approach. Scientific studies demonstrated that this site's productivity is comparable to that of the area's native forests (Rodrigue and Burger 2004), and that the stand's response to management has created additional economic value for the timber landowner (Burger and others 2003). Photo by J. Burger, Virginia Tech, used with permission.

to reforest under SMCRA proved problematic, in part because they were conducted without the benefit of the scientific knowledge available today. Mine operators and regulators came to believe that postmining land uses such as hayland and pasture were easier and cheaper to achieve than forests. These factors and others contributed to a significant loss of forests due to mining across the Appalachian region. Efforts by the ARRI Science and Core Teams (Preface, this volume) are intended to increase knowledge and change attitudes about planting trees on surface mines.

Forests have been the traditional land use throughout the eastern coalfields and support an established industry; in recent years, resurgence in the hardwood timber and wood-using industries has occurred throughout the region. Furniture, flooring, and paneling are made from many fine hardwood species. Softer woods are used for plywood, oriented strandboard, and wood

pulp. Industrial wood-users are seeking “soft hardwoods” such as yellow-poplar (tuliptree), red maple, American sycamore, green ash, and bigtooth aspen—all of which have good potential as reclamation species—along with the traditionally valuable species such as the oaks. (Please see the Appendix starting on p. A-1 for scientific names of species mentioned in this chapter.) Furthermore, forests provide many benefits such as wildlife habitat, watershed control, carbon sequestration, and recreation. Owners of mined lands, who were once content to have their land reclaimed to grassland and shrubland, are becoming more interested in reforestation with commercially valuable hardwoods.

A goal of mined land reclamation under SMCRA is to create land with equal or better postmining land use potential than before mining. Scientific research has demonstrated that reforestation using the FRA is capable of achieving this goal. On many grassland areas created after passage of SMCRA, soil properties are actually less favorable to forests than they were before mining.

WHAT IS A FOREST RECLAMATION ADVISORY?

Reforestation researchers and experts from universities and agencies throughout the region have joined forces with federal and State regulators to form ARRI. One goal of ARRI’s Science Team is to generate a series of guidance documents called Forest Reclamation Advisories which describe state-of-the-science procedures for coal mine operators and other mine reforestation practitioners, agency personnel, and owners of mined land. For Web-based access to the Forest Reclamation Advisories, or additional information about the ARRI Science and Core Team members, see the ARRI Web site at <http://arri.osmre.gov/>.

LITERATURE CITED

- Burger, J.A.; Auch, W.; Oderwald, R.; Eisenbies, M. 2003. **White pine growth and yield on a mined site in Virginia: response to thinning and pruning.** In: Proceedings, 20th national meeting of the American Society for Mining and Reclamation and 9th Billings land reclamation symposium; 2003 June 3-6; Billings, MT. Lexington, KY: American Society for Mining and Reclamation: 96-102.
- Kentucky Department for Surface Mining Reclamation and Enforcement. 1997. **Reforestation initiative.** Reclamation Advisory Memorandum 124. March 10. [Frankfort, KY]. 11 p. Available at http://arri.osmre.gov/PDFs/SRA_GDs/KY.RAM.124.pdf (accessed August 31, 2016).
- Ohio Department of Natural Resources. 2001. **Mined land technical reforestation guidance & recommendations.** July 24. [Columbus, OH]: Ohio Department of Natural Resources, Division of Mineral Resources Management. 6 p. Available at arri.osmre.gov/PDFs/SRA_GDs/Oh.MLTRGnR.pdf (accessed August 31, 2016).
- Rodrigue, J.A.; Burger, J.A. 2004. **Forest soil productivity of mined land in the midwestern and eastern coalfield regions.** Soil Science Society of America Journal. 68(3): 833-844. <https://doi.org/10.2136/sssaj2004.8330>.
- U.S. Office of Surface Mining Reclamation and Enforcement. 1999. **Biology/Revegetation procedure 10.4, reforestation and wildlife habitat enhancement initiative.** Knoxville, TN: U.S. Department of the Interior, U.S. Office of Surface Mining Reclamation and Enforcement. 5 p. Available at http://arri.osmre.gov/PDFs/SRA_GDs/TN.Reforestation.Wildlife.Enhancement.Guidelines.pdf (accessed August 31, 2016).

Virginia Department of Mines, Minerals, and Energy. 2001a. **Guidelines for husbandry and reclamation practices.** Memorandum to Operators 3-96. Issued July 9, 1996. Updated October 1, 2001. [N.p.]: Virginia Department of Mines, Minerals, and Energy, Division of Mined Land Reclamation. 2 p. Available at http://arri.osmre.gov/PDFs/SRA_GDs/VA.GfHnRP.pdf (accessed August 31, 2016).

Virginia Department of Mines, Minerals, and Energy. 2001b. **Reforestation reclamation practices.** Guidance Memorandum No. 2-01. May 29. [N.p.]: Virginia Department of Mines, Minerals, and Energy, Division of Mined Land Reclamation. 2 p. Available at http://arri.osmre.gov/PDFs/SRA_GDs/VA_RefReclPr.pdf (accessed August 31, 2016).