RESTORING FORESTS ON MINE LAND IN APPALACHIA

Before During After?

Patrick Angel¹, Sarah Hall², Carl Zipper³, Christopher Barton⁴, Jeffrey Skousen⁵, Jennifer Franklin⁶, James Burger³
Pre-SMCRA
Reforestation Efforts

Loblolly Pine, West Kentucky

Mixed Hardwoods, East Tennessee
Pre-SMCRA Reforestation Efforts

White Oak, Southern Illinois

Black Walnut, Southern Indiana
Pre-SMCRA meets Post-SMCRA

What Happened?

• In an effort to achieve stability and prevent landslides, spoils were repeatedly graded which created a highly compacted surface.

• Compacted spoils inhibit root penetration, gas exchange and water infiltration which resulted in high seedling mortality, increased runoff and poor water quality.

• Mining firms and reclamationists became very skilled at creating grasslands: efficient, cheap, successful in achieving bond release.
Arrested Natural Succession

Reclaimed MTR sites - Pike Co. KY
UK’s StarFire Research Complex
(2,541 Trees per Cell)

Conventional Reclamation

- \( \approx 20\% \) survival
- Growth well below regenerating forest of same age

Low Compaction Reclamation

- \( \approx 75\% \) survival
- Growth similar to regenerating forest of same age
Appalachian Regional Reforestation Initiative
ARRI’s goals:

• Plant more high-value hardwood trees...

• Increase the survival rates and growth rates of planted trees...

• And expedite the establishment of forest habitat through natural succession
The Forestry Reclamation Approach

- Provide at least 4 feet of suitable material
- Avoid compaction
- Limit ground cover
- Plant a variety of hardwood tree species
- Use proper tree planting techniques
ARRI's Science Team

- Berea College
- Ohio University
- Ohio State University
- Pennsylvania State University
- Purdue University
- Southern Illinois University
- Stephen F. Austin State Univ.
- University of Kentucky
- University of Maryland
- University of Tennessee
- Virginia Polytechnic Institute
- West Virginia University
- WV State University
- Wilkes University
- Indiana University of PA
- US Forest Service
- US Geological Survey
- The American Chestnut Foundation
- OSM
ARRI's Science Team

THE APPALACHIAN REGIONAL REFORESTATION INITIATIVE (ARRI)

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THE APPALACHIAN REGIONAL REFORESTATION INITIATIVE

Jim Burger1, Don Graves2, Patrick Angell3, Vic Danks4, Carl Zipper5

The Forest Reclamation Approach (FRA) is a method for re-establishing sound and long-term sustainable forests under the Surface Mining Control and Reclamation Act (SMCRA). The FRA is based on knowledge gained from both scientific research and experience (Photo 1). The FRA can achieve cost-effective regulatory compliance for coal operators, while creating productive forests that generate value for their owners and provide watershed protection, wildlife habitat, and other environmental services.

The purpose of the Advisory is to describe the FRA, which is considered by state mining agencies and US Office of Surface Mining to be an appropriate and desirable method for reclaiming mined land to support forested lands used under SMCRA (Angell et al., 2005). The FRA is also supported by members of the ARRI's academic team, which is drawn from Universities in nine states, and by other groups and agencies.

The FRA's Five Steps

The FRA can be summarized in five steps:

1. Create a suitable rooting medium for good tree growth that is no less than 6 feet deep and composed of topsoil, weathered sandstone and/or the best available material.

2. Loosely grade the topsoil or topsoil substitute established in step one to create a non-compacted growth medium.

3. Use ground covers that are compatible with growing trees.

4. Plant two types of tree species: successional species for wildlife and carbon sequestration, and commercially valuable crop trees.

5. Use proper tree planting techniques.

Step 1. Create a suitable rooting medium.

Tree survival and growth can be hindered by highly saline or acidic soils. During mining and reclamation, all highly alkaline materials with excessive soluble salts and all highly acidic or toxic material should be covered with a suitable rooting medium that will support trees. The best available growth medium should be placed on the surface to a depth of at least four feet to accommodate the needs of deeply rooted trees.

Growth media with low to moderate levels of soluble salts, equilibrium pH of 5.6 to 7.0, low cation exchange capacity, and low levels of toxic materials are preferred. However, where such materials are not available, an equilibrium pH of 4.6 or as high as 7.5 is acceptable if tree species tolerant of those conditions are used.
Backfill placed in lifts and compacted to insure stability

4-6 feet of uncompacted soil medium
State UK's Starfire Research Complex
Since 2005...

about 85 million trees have been planted
on about 125,000 acres
Arrested Natural Succession

What about the 750,000+ acres reclaimed since SMCRA?
Mitigating mine soil compaction - Campbell Co. TN
2 year old American chestnut
A New Direction

(Backward Looking)

≈1 million acres of reclaimed grass/shrub lands in Appalachia

- CCC modeled program to stimulate economy and improve the environment
- Plant millions of trees on thousands of acres of barren mine land
- Create much needed “green” jobs in Appalachia
5 yrs of GFW’s work on legacy mines...

- Over 1.2 million trees
- 1,974 acres
- 9,619 volunteers
- 170 project in 8 states