The Appalachian Regional Reforestation Initiative -

Restoring Forests on Mined Land

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- Unweathered Shale
- Weathered Sandstone
- Unweathered Sandstone
- Forest Topsoil

15-year response of trees and forages
University of Kentucky
Bent Mountain Research Complex
What do trees want?

- **Physical properties**
  - At least 4 feet deep
  - Non-compacted
  - Rocks easily weathered
  - A sandy loam texture

- **Chemical properties**
  - Low to moderate levels of soluble salts
  - An equilibrium pH of 5.5 to 6.5
  - Low pyritic sulfur

- **Fertility**
  - Adequate levels of N, P, K and other essential nutrients
STEP 1:
Create a suitable rooting medium for good tree growth that is no less than 4 feet deep and comprised of topsoil, weathered sandstone and/or the best available material.
The Forestry Reclamation Approach

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

Suitable Growth Medium

4-6 ft.

Backfill

Backfill placed in lifts and compacted to insure stability

Coal Seam

4-6 feet of uncompacted soil medium

Coal Seam
The Forestry Reclamation Approach

STEP 3:
Use ground covers that are compatible with growing trees
The Forestry Reclamation Approach

STEP 4:

Plant two types of trees – early successional species for wildlife and soil stability, and commercially valuable crop trees.
The Forestry Reclamation Approach

STEP 5: Use proper tree planting techniques
Mined land reforestation productivity potential

Study conducted by Jim Burger, Virginia Tech
The FRA as EPA’s BMP for HFs and MTRs?

- Carbon sequestration rates of 3 Mg/ha/yr (Maharaj et al., 2007)
- Reduced runoff and erosion (Taylor et al., 2009)
- Improved water quality (Angel et al., 2008)
- Accelerated natural succession (Hall et al., 2009; Angel et al., 2007; Cook, 2007)
- American Chestnut restoration (French et al., 2008)
- Cost savings and economic returns (Michels, 2008)
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Restoring healthy productive forests on mined land
ARRI is a joint effort between... OSM and the Appalachian coal states
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
Appalachian Regional Reforestation Initiative
ARRI’s Science Team

- Ohio University
- Ohio State University
- Pennsylvania State University
- Purdue University
- Southern Illinois University
- University of Kentucky
- University of Maryland
- University of Tennessee
- Virginia Polytechnic Institute
- West Virginia University
- West Virginia State University
- US Forest Service
- US Geological Survey
- TACF
- OSM
ARRI's Science Team

The Forestry Reclamation Approach (FRA) is a method for reclaiming mined land to forest under the Surface Mining Control and Reclamation Act (SMCRA). The FRA is based on knowledge gained from both scientific research and experience. The FRA provides a cost-effective, regulatory-compliant, and environmentally sound approach that generates value for their clients and provides economic, wildlife habitat, and other environmental benefits.

The purpose of this Advisory is to describe the FRA, which is considered by state mining agencies and US Office of Surface Mining to be an appropriate and cost-effective method for reclaiming mined land to support forested land uses under SMCRA (Angell and others, 2008). The FRA is also supported by members of the ARRI’s scientific team, which is drawn from universities in nine states, and by other groups and agencies.

The FRA’s Five Steps

1. Create a suitable rooting medium for good tree growth that is no less than 1 foot deep and composed of topsoil, weathered cinders, 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 live trees of three early successional tree species for wildlife and soil stability, and commercially valuable crop trees.
5. Use proper tree planting techniques.

Step 1. Create a suitable rooting medium.

The survival and growth of trees can be threatened by highly alkaline or acidic soils. During mining and reclamation, a highly alkaline material with excessive calcium and/or 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 deep-rooted trees.

Growth media with low to moderate levels of soluble salts, equilibrium pH of 5.0 to 7.0, low pH buffer content, and textures conducive to proper drainage are preferred. However, where such materials are not available, an equivalent pH of as low as 4.5 or as high as 7.5 is acceptable if tree species tolerant of those conditions are used.
Since 2004...

about 70 million trees have been planted on about 103,000 acres
ARRI’s work on legacy mines...

- 177,500 trees
- over 2,500 volunteers
- 250 acres
- 22 sites in 6 states
MISSION: To restore ecosystem services on disturbed lands through reforestation to enhance the quality of life for American citizens.
green forests work.....

....to mitigate climate change,

....to improve water quality,

....to restore habitat,

....to create economic opportunities.
Green Forest Works for Appalachia

- CCC modeled program to stimulate economy, create jobs and improve the environment
- Plant millions of trees on several hundred thousand acres of barren mine land
- Create much needed jobs in Appalachia

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

Prepared by the Science Team of the Appalachian Regional Reforestation Initiative
planting for the future

...one tree at a time

coming soon: www.greenforestswork.org