

THE APPALACHIAN REGIONAL REFORESTATION INITIATIVE

A FIVE YEAR PROGRESS REPORT

**PRESENTED AT THE JOINT ASMR/ARRI/WPCAMR
CONFERENCE**

**PITTSBURGH, PA
JUNE 8, 2010**

SCOTT D. EGGERUD, FORESTER, OSMRE

25 YEAR OLD SURFACE MINE SLOWLY REVERTING BACK TO FOREST



THE APPALACHIAN REGIONAL REFORESTATION INITIATIVE



APPALACHIAN REGIONAL REFORESTATION INITIATIVE (ARRI)

ARRI is a broad-based group working to reestablish forest habitat on active and abandoned mine lands.

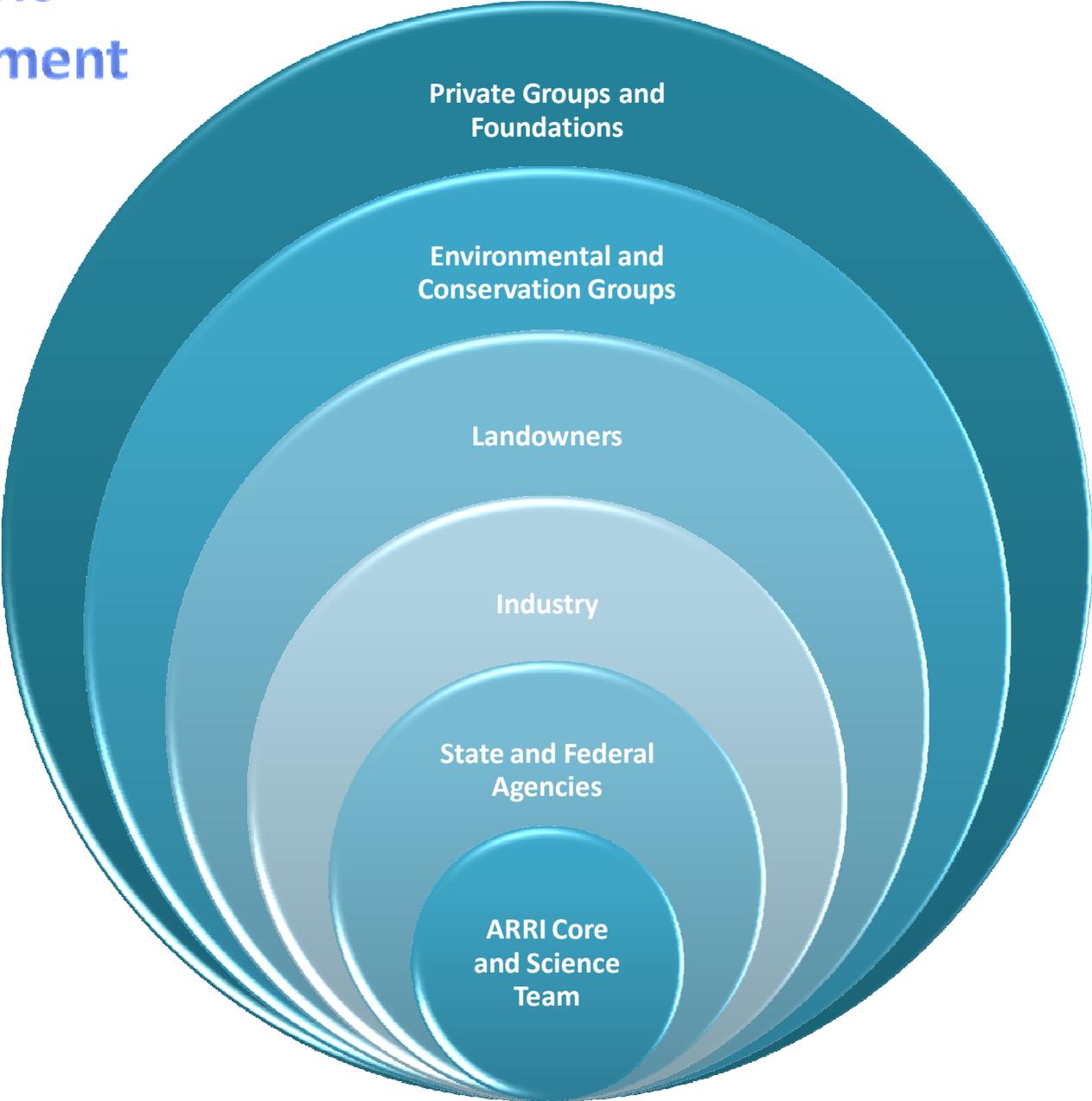
ARRI'S GOALS:

- 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**

ARRI STARTED AS A JOINT EFFORT BETWEEN OSM AND THE APPALACHIAN COAL STATES



Concentric Management Model





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 LEADERSHIP

- **CORE TEAM (25 MEMBERS) -**
 - **OSM**
 - **7 APPALACHIAN STATES**

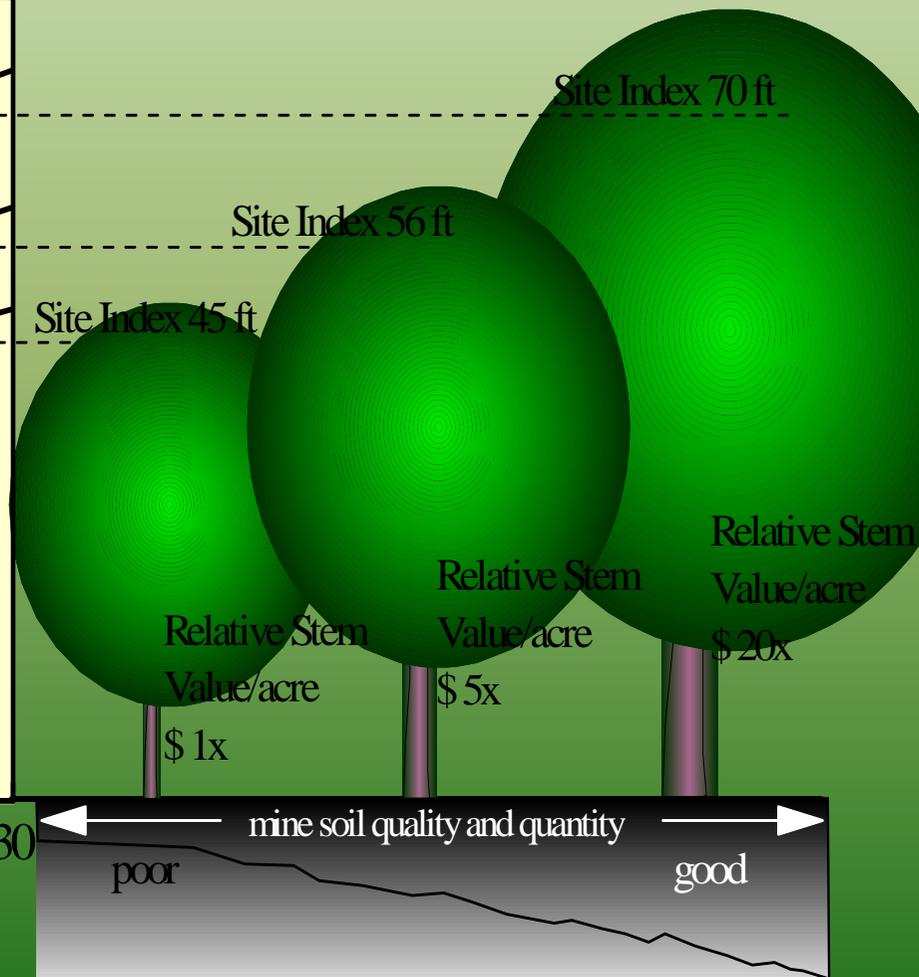
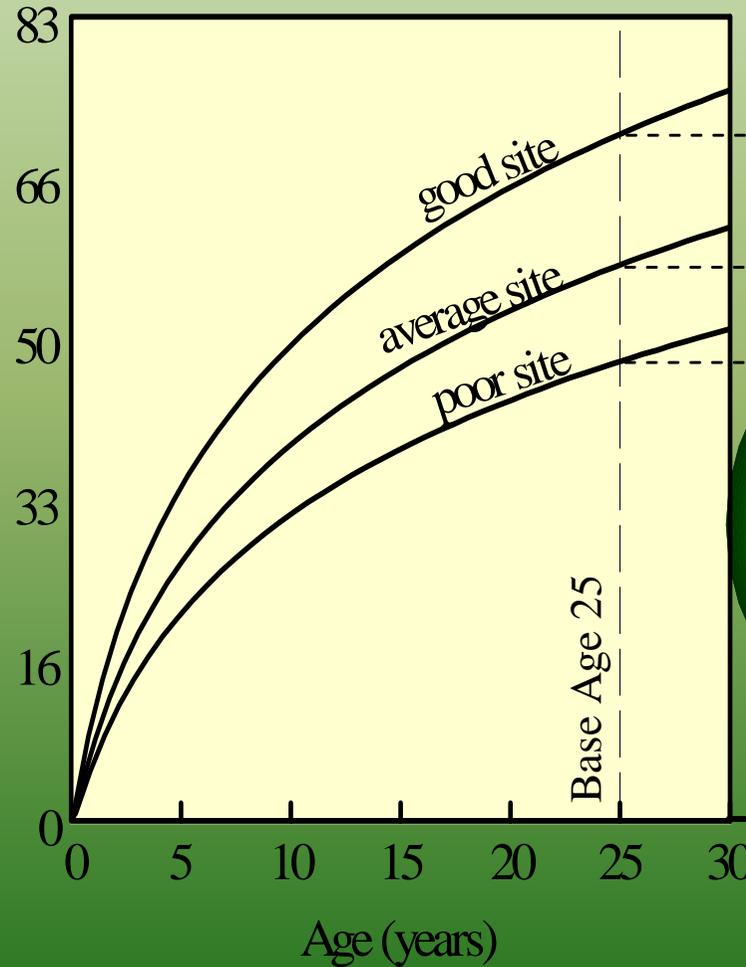
- **SCIENCE TEAM –**
 - **30 REFORESTATION SCIENTISTS AND EXPERTS**
 - **15 UNIVERSITIES, GOVERNMENTS, AND AN NGO**

FORESTRY RECLAMATION APPROACH (FRA)

- 1: CREATE BEST POSSIBLE GROWTH MEDIUM
WITH MATERIALS ON PERMIT AREA.**
- 2: LOOSELY PLACE TO AVOID COMPACTION**
- 3: USE A TREE COMPATIBLE GROUND COVER**
- 4: PLANT PROPER SPECIES OF TREES**
- 5: USE PROPER TREE PLANTING TECHNIQUES**

Site Index

Tree Height (ft)



Study conducted by Jim Burger, Virginia Tech

Mineland Reforestation- Starfire Mine, KY



1 yr



3 yr



7 yr



Non-compacted Site



Compacted Site

UK's Bent Mountain Research Complex





Surface Mine Reforestation Test Plots

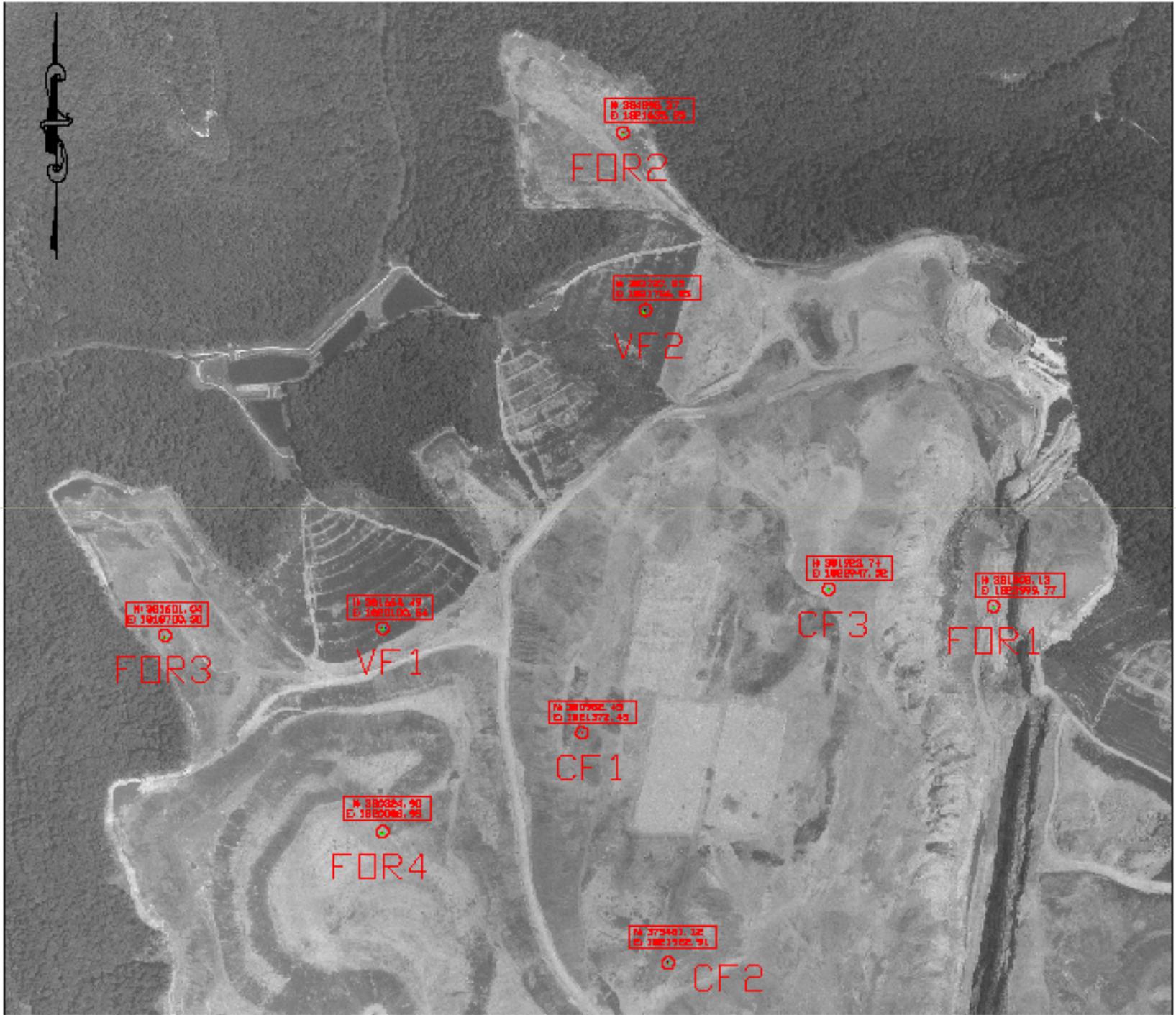
Permit S-3004-95



Test Plot Descriptions

- Unweathered Gray Sandstone
 - 14) No Top Soil
 - 15) Top Soil
 - 16) Top Soil
 - 17) No Top Soil
- Weathered Brown Sandstone
 - 5) No Top Soil
 - 6) Top Soil
 - 7) No Top Soil
 - 9) Top Soil





ARRI's OUTREACH:

- The ARRI website at:
<http://arri.osmre.gov>
- Statement of Mutual Intent
- ARRI's Newsletter
- Brochures
- Forest Reclamation Advisories
- Videos
- Television, newspapers, and radio

ARRI'S STATEMENT OF MUTUAL INTENT



STATEMENT OF MUTUAL INTENT for the APPALACHIAN REGIONAL REFORESTATION INITIATIVE

The States of Appalachia including the Regulatory Authorities in Kentucky, Maryland, Ohio, Pennsylvania, Virginia, and West Virginia; the Office of Surface Mining, including the Tennessee Federal Program; and all other parties of this Statement of Mutual Intent desire to work together to promote and encourage planting more trees on active and abandoned coal mined lands. We will increase efforts, cooperate and partner among ourselves to plant economically viable trees, while using current Forestry Reclamation Approach (FRA) technology. This technology will increase survival rates and growth rates of crop trees, increase overall productivity, and promote natural invasion and succession of plant and animal communities.

FRA technology is a five-step reclamation process that has been proven by forestry research to increase tree survival and tree productivity. The five steps in the FRA are:

1. Create a suitable rooting medium for good tree growth that is no less than four feet deep and comprised of topsoil, weathered sandstone and/or the best available material.
2. Loosely grade the topsoil or topsoil substitutes 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 trees, early succession species for wildlife and soil stability, and commercially valuable crop trees.
5. Use proper tree planting techniques.

Reforestation of coal mined land using the FRA will provide multiple environmental and economic benefits:

Environmental Benefits of Reforestation

- Increased diversity of plant succession
- Natural succession of native forest plants
- Reduced potential for establishment of invasive species



STATEMENT OF MUTUAL INTENT APPALACHIAN REGIONAL REFORESTATION INITIATIVE

_____ Signature _____

_____ Date _____

Mr. Ms. Mr. Dr. Other _____

Print Name of First Last _____

Title _____

Company/Organization _____

Address Line 1 _____

Address Line 2 _____

City, State, Zip _____

Phone _____

E-mail (Use the ARRI Mailing List) _____

INITIAL SMI SIGNING CEREMONY DECEMBER 15, 2004



ARRI'S STATEMENT OF MUTUAL INTENT

968 signatories represent **207** different organizations:

- 52 Government Agencies
- 59 Industry Organizations
- 17 Watershed/Citizens Groups
- 10 Environmental Groups
- 17 Academic Institutions
- 17 Conservation Groups
- 8 Faith-Based Groups
- 7 International Groups
- 5 Schools
- 15 Other
- 382 individuals



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Kingdom Come Elementary School
ARRI Arbor Day Event

ARRI'S STATEMENT OF MUTUAL INTENT



ARRI NEWS- LETTERS

APPALACHIAN REGIONAL REFORESTATION INITIATIVE

INSIDE THIS ISSUE:

Conference 2

Pennsylvania
Shares Reforest-
ation Efforts 2

Pennsylvania
Shares Efforts
Cont. 3

Ohio Representa-
tives Meet
Booths 3

Ohio An-
nounces Excel-
lence in Reforest-
ation
Awards 4

Reforestation
Effort is Break-
ing New
Ground 5

Booths Cont. 5

Graves Receives
Secretary's
Environmental
Leadership
Award 6

News Clips
from the Appa-
lachian Region 6

ARRI News



VOLUME 1, ISSUE 7

JANUARY 2008

Conference Imparts Reforestation Knowledge

By Linda Keene
Photos by Gail Smith

The 2007 Mined Land Reforestation Conference was held August 7-8 at the Southwest Virginia Higher Education Center in Abingdon, Virginia. The conference had over 200 attendees.

The conference began with Dr. Carl Zipper from Virginia Tech moderating the morning session and opening it with "Why Better Mine Reforestation?"

Next, Brent Wahlquist, Director of the Office of Surface Mining Reclamation and Enforcement (OSMRE), discussed "OSMRE's Commitment to Better Mine Reforestation."

Bob Zic, TECO Coal, Corbin, KY, followed with "A Coal Miner's Perspective on Mine Reforestation."

Les Vincent, Virginia Division of Mined Land Reclamation, spoke on "The Appalachian Regional Reforestation Initiative and the Forestry Reclamation Approach: A State-Federal Reforestation Initiative."

"Advances in Scientific Knowledge and the Forestry Reclamation Approach," was the topic of Dr. James Burger's, Department of Forestry, Virginia Tech, talk and slide presentation.



Conference participants enjoyed mingling amongst the vendors.

Mary Beth Adams, US Forest Service was the moderator of the mid-morning presentations.

Becky Hatmaker, OSMRE, continued the morning presentations with "Federal and State Regulations, Bond Release and the Forestry Reclamation Approach."

"Overburden, Topsoil Substitutes, Topsoil Handling: Influence on Tree Growth," was Patrick Angel's, University of Kentucky and OSMRE, talk.

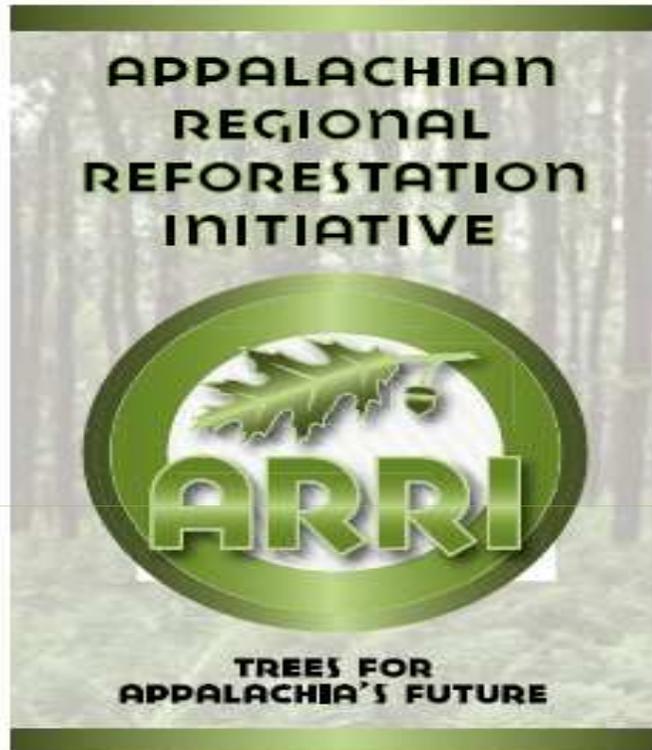
Dr. Jeff Skousen, Plant and Soil Sciences, West Virginia University, spoke on "Influence of Herbaceous Groundcover Vegetation on Reforestation Success."

Dr. Christopher Barton, Department of Forestry at the University of Kentucky, ended the morning session with a discussion on
(Conference continued on page 2)



OSMRE Director, Brent Wahlquist presents Jimmy Adkins with the 2006 ARRI Regional Award.

BROCHURES



A COOPERATIVE EFFORT AMONG:

The States of:
Kentucky, Maryland, Ohio,
Pennsylvania, Tennessee, Virginia,
and West Virginia;
the Office of Surface Mining
Reclamation and Enforcement;
their partners in industry;
environmental organizations;
academia; local, State and Federal
government agencies;
and local citizenry.

mine reclamation

**REFORESTATION FOR
APPALACHIA'S WILDLIFE**

resources for landowners



A COOPERATIVE INITIATIVE

FRA RECLAMATION ADVISORIES



APPALACHIAN REGIONAL REFORESTATION INITIATIVE (ARRI) FOREST RECLAMATION ADVISORY

FRA Number 2

December 2005

THE APPALACHIAN REGIONAL REFORESTATION INITIATIVE Jim Burger¹, Don Graves², Patrick Angel³, Vic Davis⁴, Carl Zipper⁵

The Forestry Reclamation Approach (FRA) is a method for reclaiming coal-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 (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 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 desirable method for reclaiming coal-mined land to support forested land uses under SMCRA (Angel and others, 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 4 feet deep and comprised 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 trees—early successional species for wildlife and soil stability, 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 alkaline 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

Photo 1. A white oak stand that grew on a pre-SMCRA surface mine in Southern Illinois. Observations by reclamation scientists and practitioners of soil and site conditions on reclaimed mines such as this, where reforestation was successful, have contributed to development of the Forestry Reclamation Approach.



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 5.0 to 7.0, low pyritic sulfur content, and textures conducive to proper drainage are preferred. However, where such materials are not available, an equilibrium pH as low as 4.5 or as high as 7.5 is acceptable if tree species tolerant of those conditions are used.

ARRI PARTNERSHIPS





High Elevation Conservation Working Group, August 2008



COAL INDUSTRY





Restoring the King of the Forest

Bob Paris

Research Geneticist

The American Chestnut Foundation

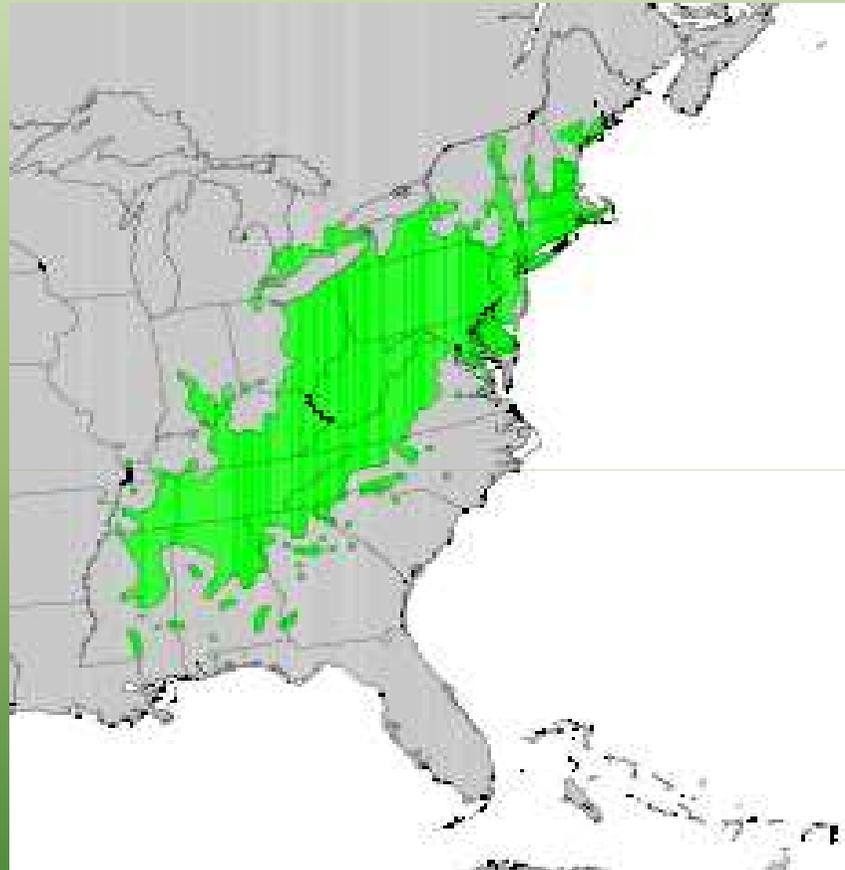
February 19, 2010

Wyoming County, WV



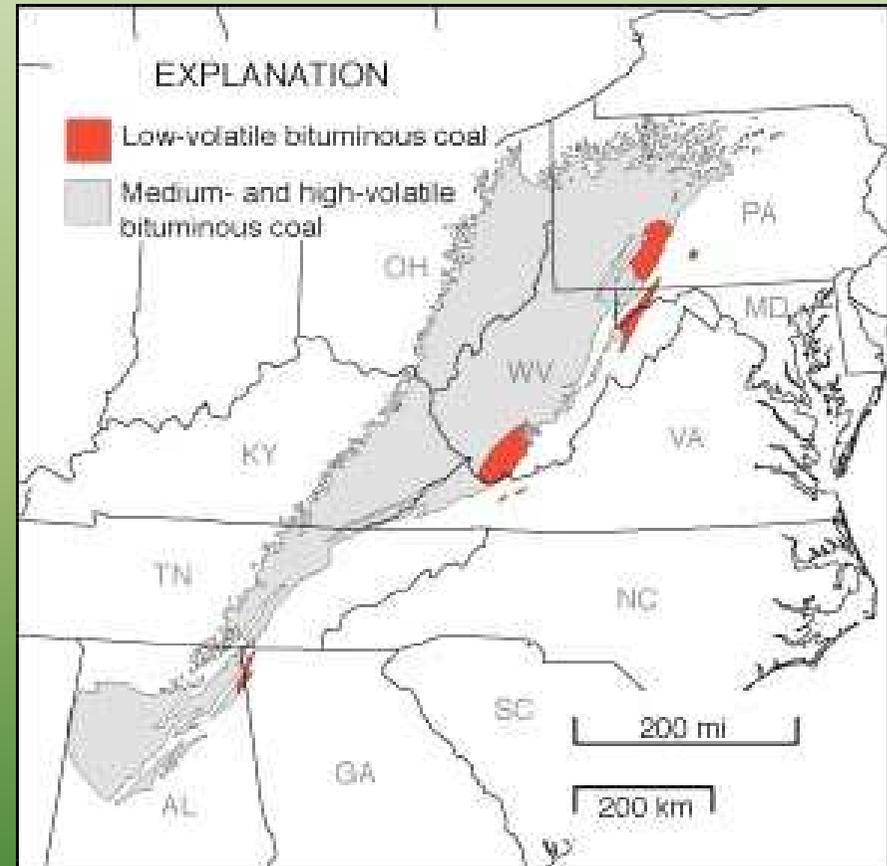
THE
AMERICAN
CHESTNUT
FOUNDATION

Natural range of the American chestnut



Native range of American chestnut. From Little, E.L., Jr., 1977, Atlas of United States trees, volume 4, Minor Eastern Hardwoods: U.S. Department of Agriculture Miscellaneous Publication 1342, 17 p., 230 maps.

Extent of coal fields in Appalachian region



www.pubs.usgs.gov/fs/fs115-99/

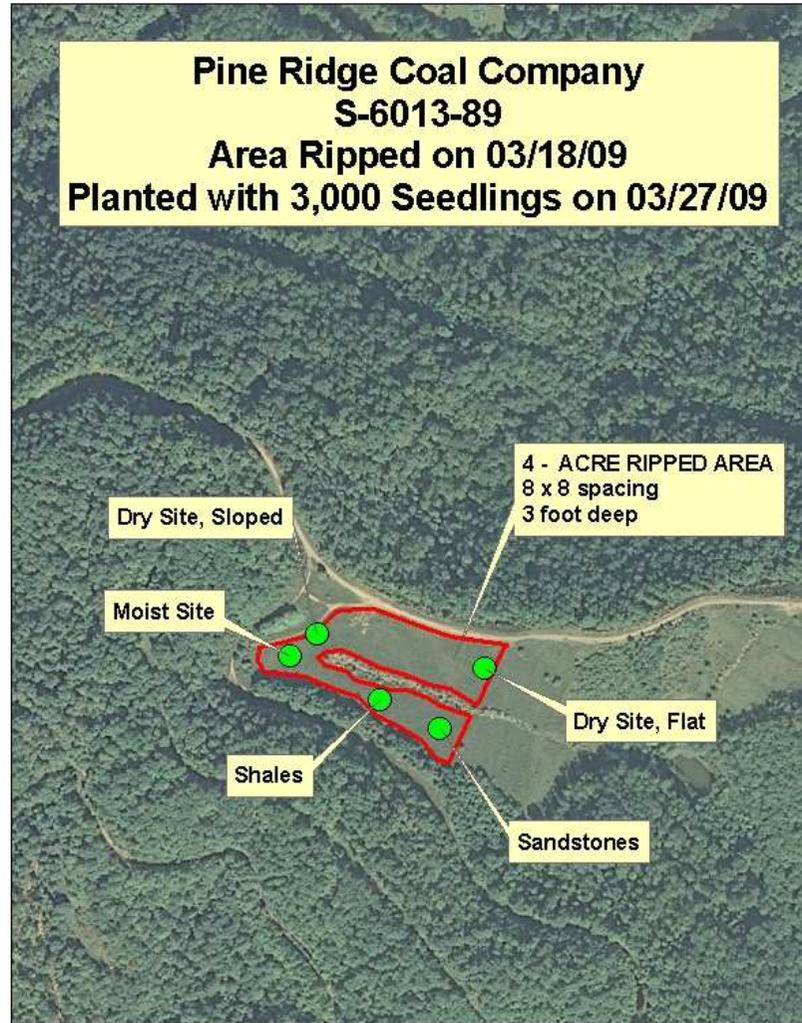




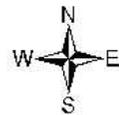




**Pine Ridge Coal Company
S-6013-89
Area Ripped on 03/18/09
Planted with 3,000 Seedlings on 03/27/09**

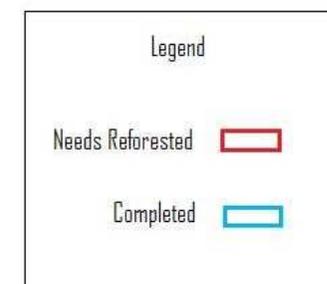
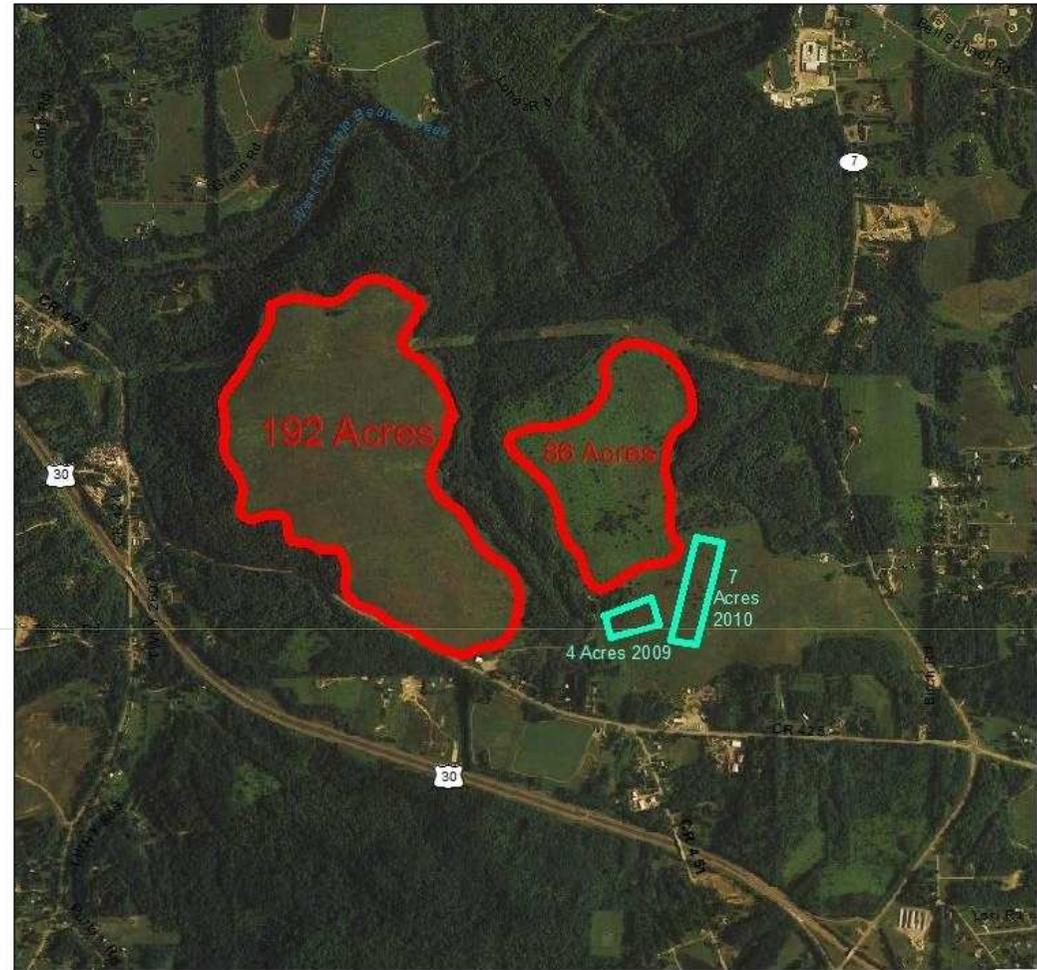


● American Chestnut Plots
10 seedlings/plot



1 inch = approx 3,000 feet
Lat 38 4 6
Lon -81 36 34

HELLBENDER BLUFF Columbiana County, OH



FRA PROVISIONS IN STATE AND FEDERAL PERMITS:

**ARRI HAS WORKED CLOSELY
WITH STATE AND FEDERAL
REGULATORY AGENCIES TO
INCORPORATE THE FRA
(FORESTRY RECLAMATION
APPROACH) INTO POLICIES AND
REGULATIONS.**



Kentucky
Department for Surface Mining
Reclamation and Enforcement

Reclamation Advisory Memorandum

From: Carl Campbell, Commissioner C.C.
Date: March 10, 1997
Subject: Reforestation Initiative

RAM # 124

Introduction

In the spring of 1996, after conducting both field visits and public meetings, the Kentucky Environmental Quality Commission issued a resolution to Governor Paul E. Patton and the Natural Resources and Environmental Protection Cabinet (NREPC) concerning the establishment of trees and shrubs on mine sites. The specific concern was that certain regrading and reclamation techniques currently being used or promoted seemed to inhibit the proper growth and development of deep rooted woody species.

In response the NREPC, through the Department for Surface Mining Reclamation and Enforcement (DSMRE), established a very diverse working group of professionals from industry, environmental groups, the U.S. Office of Surface Mining, the University of Kentucky Extension Service, the Department of Fish and Wildlife Resources, the Department for Natural Resources and its Division of Forestry, DSMRE, and others. The purpose of the group was to review current reclamation policy and practices that impact tree survival and growth on mined lands, and develop reclamation advisory guidance that, when utilized, would promote woody species use and development on mined lands.

The working group approached this task in a most professional manner and with a cooperative, progressive spirit. On behalf of DSMRE, I want to express my sincere appreciation to the members of the working group for their hard work and for the excellent result. The individual members are identified at the end of this document.

The following information represents the suggestions conveyed by the working group, and is henceforth accepted by the DSMRE as appropriate reclamation practice for those mined areas reclaimed to a postmining land use which requires the establishment of deep rooted woody species.

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Reclamation
Advisory
Memorandum

From: Carl E. Campbell, Commissioner

C.E.C.

Date: November 4, 2009

Subject: Reforestation Initiative Expanded for
Commercial Forestland
(RAM # 124 Addendum)

RAM # 144

Foreword

This RAM supplements RAM # 124, issued March 10, 1997. This RAM retains the provisions of RAM # 124 and expands them to include an additional option on commercial forest land. Language about the new option is presented in boldface italic type, as used in this paragraph.

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(502) 564-6940 FAX (502) 564-5698 e-mail: Carl.Campbell@ky.gov

TTY (502) 564-0183 (text telephone for the deaf, hard of hearing, or speech-impaired)

KY RAM 144:

allows for no
strike off

need landowner
approval

need
commercial
woodland
planting plan

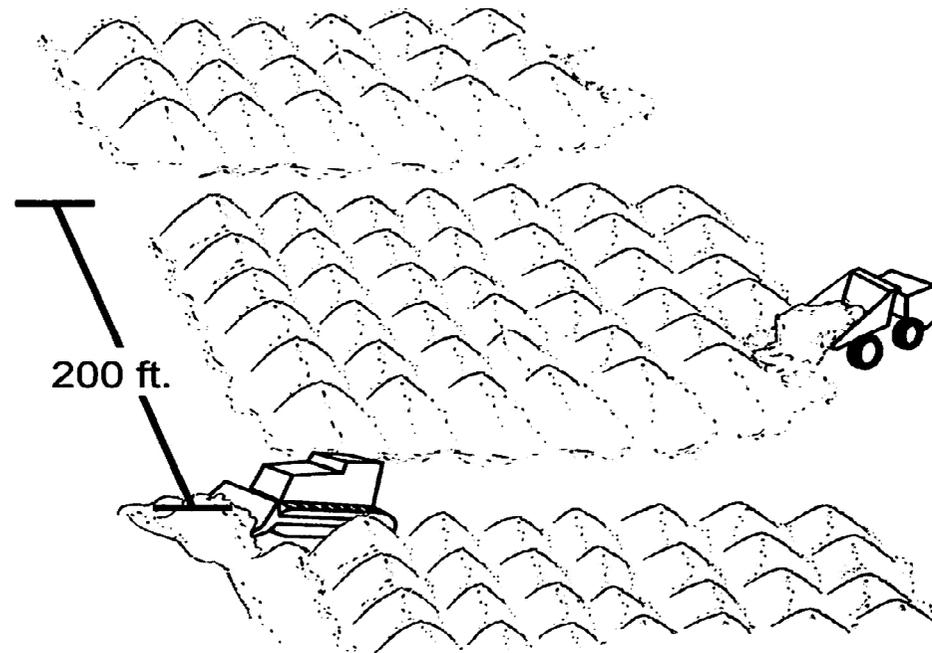
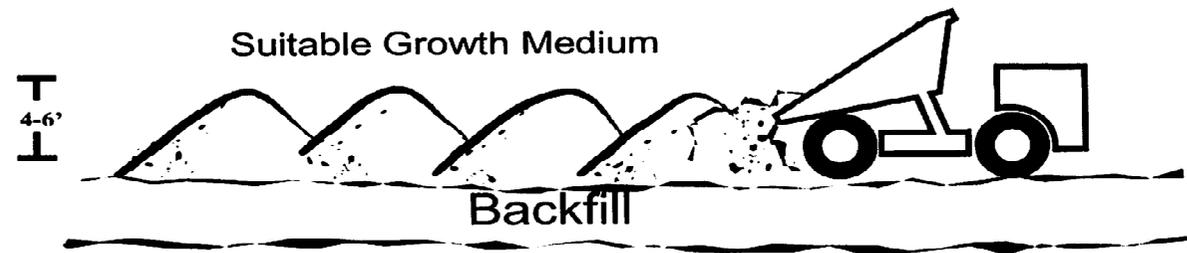


Diagram 4.

*Area Mining or Mountaintop Removal Reforestation Option
for Commercial Forestland*



WV FORESTLAND POST MINE LAND USE REGULATIONS (38CSR2-7.6)

- **APPROVED MAY 8, 2005**
- **AOC COMPLIANT SITES ONLY**
- **PLANS PREPARED BY RPF AND REVIEWED
BY A FORESTER EMPLOYED BY THE WV-
DEP**
- **INCORPORATES FRA**

TN & VA

- **Changed ground cover requirements on forestry post mine land use**
- **Eliminated numerical standard**
- **Only to that necessary to control erosion but allow for tree growth**
- **Permit by permit basis**

OSM'S REFORESTATION DIRECTIVE: TSR-16

	U.S. DEPARTMENT OF THE INTERIOR OFFICE OF SURFACE MINING RECLAMATION AND ENFORCEMENT DIRECTIVES SYSTEM	Subject Code: TSR - 16
		Transmittal Number: 931
		Date: JUN 10 2008
	Subject: Reforestation of Title IV and Title V mined lands	
Approval: 		Title: Director

1. **Purpose.** Much of the land being surface mined for coal, particularly in the eastern United States, was woodland or forestland prior to being mined. However, past regulatory emphasis under SMCRA has been on achieving land stability which has resulted in smoothly graded, compacted mine soils and the establishment of aggressive vegetative ground covers to control erosion. This type of reclamation has lead many mine operators and landowners to choose agricultural land uses dominated by grasses and forbs, despite the lack of agricultural infrastructure in many areas, over those that include trees. Trees that are planted in smoothly graded areas with heavy vegetative ground cover are unlikely to survive or thrive. The few that do survive are often stunted. Such areas have little potential for supporting healthy productive forests. The significant forest fragmentation resulting from these conventional reclamation practices has led to reduced carbon sequestration, loss of wildlife habitat, increased flood potential, loss of forest products, etc. The purpose of this Directive is to lay out OSM's role in reversing this trend. OSM will promote reforestation where existing forests were removed by mining and, when practical, encourage forest establishment after reclamation wherever coal is mined.

2. **Summary of Changes.** This is a new Directive.

3. **Definitions.**

a. **Forestry Reclamation Approach.** A scientifically based method of reclaiming surface coal mines to increase tree survival and growth and to expedite the establishment of forest habitat through natural succession. The five steps of the Forestry Reclamation Approach (FRA) are:

- (1) Create a suitable rooting medium for good tree growth at least four feet deep and comprised of topsoil and/or the best available material.



















**JAMES RIVER COAL COMPANY
MINE FOREMEN AND
EQUIPMENT OPERATORS
REFORESTATION TRAINING**

02/12&13/10

**PAUL ROTHMAN, KY DNR
PATRICK ANGEL, OSM
SCOTT EGGERUD, OSM**

















Red Spruce at
Kempton
Refuse AML
Project

2008 Arbor Day at Black Castle



2009 TENNESSEE ARRI MEASURABLES

of acres permitted with FRA (calendar year 2009): 767

estimated % of acreage permitted (calendar year 2009): 94%

of acres planted with FRA (calendar year 2009): 470

estimated % of acreage (calendar year 2009): 73%

of trees planted with FRA (calendar year 2009): 321,000

estimated % of acreage (calendar year 2009): 73%

of AML projects incorporating FRA (last 5 years): 6

of acres incorporating FRA (last 5 years): 412

of trees planted with FRA (last 5 years): 412,000

2009 TENNESSEE ARRI MEASURABLES, CONT.

of FRA training sessions conducted in 2009 (regulatory, academic, industry, landowner, etc): 8

of attendees (calendar year 2009): 192

of FRA presentations conducted in 2009 (regulatory, academic, industry, landowner, etc): 5

of attendees (calendar year 2009): 685

of volunteer tree planting events (2010): 0

of attendees (2010): 0

of Arbor Day events (2010): 2

of attendees (2010): 125

2009 TENNESSEE ARRI MEASURABLES, CONT.

of FRA/ARRI publications (calendar year 2009): 2

of FRA/ARRI news articles (calendar year 2009): 1

Programmatic changes to FRA (last 5 years): 1 (Reduced FRA ground cover Standard for Success)

**Other significant contributions to promote FRA/ARRI (last 5 years):
(See attached list)**

2009 VIRGINIA ARRI MEASURABLES

of acres permitted with FRA (calendar year 2009): 1,272.42 acres
estimated % of acreage permitted (calendar year 2009): 100%

of acres planted with FRA (calendar year 2009): 1,539 acres
estimated % of acreage (calendar year 2009): 92.8%

of trees planted with FRA (calendar year 2009): 912,556 seedlings
plus 15,000 on AML sites
estimated % of acreage (calendar year 2009): 92.8%

of AML projects incorporating FRA (last 5 years): 19

of acres incorporating FRA (last 5 years): 67

of trees planted with FRA (last 5 years): 35,000

2009 VIRGINIA ARRI MEASURABLES, CONT.

of FRA training sessions conducted in 2009 (regulatory, academic, industry, landowner, etc): 1

of attendees (calendar year 2009): 40

of FRA presentations conducted in 2009 (regulatory, academic, industry, landowner, etc): 1

of attendees (calendar year 2009): 65

of volunteer tree planting events (2010): 2 (AML sites)

of attendees (2010): 10, 10 (20 total)

of Arbor Day events (2010): 2

of attendees (2010): 150, 75 (225 total)

2009 VIRGINIA ARRI MEASURABLES, CONT.

of FRA/ARRI publications (calendar year 2009): 4

of FRA/ARRI news articles (calendar year 2009): 2

Programmatic changes to FRA (last 5 years): 1 (reg change to incorporate FRA language, especially ground cover)

Other significant contributions to promote FRA/ARRI (last 5 years): strong support of the American Chestnut Foundation, Developing GIS layer of Post-Mining Land Use and FRA sites.

2009 WV ARRI MEASURABLES

of acres permitted with FRA (calendar year 2009): 8,634.3
estimated % of acreage permitted (calendar year 2009): 96%

of acres planted with FRA (calendar year 2009): 4200
estimated % of acreage (calendar year 2009): 86%

of trees planted with FRA (calendar year 2009): 2.1 million
estimated % of acreage (calendar year 2009): 86%



**Between 2004 and 2009...
approx 60 million trees have been planted
on about 87,000 acres**

WE NEED TO DO A BETTER JOB OF TRAINING:

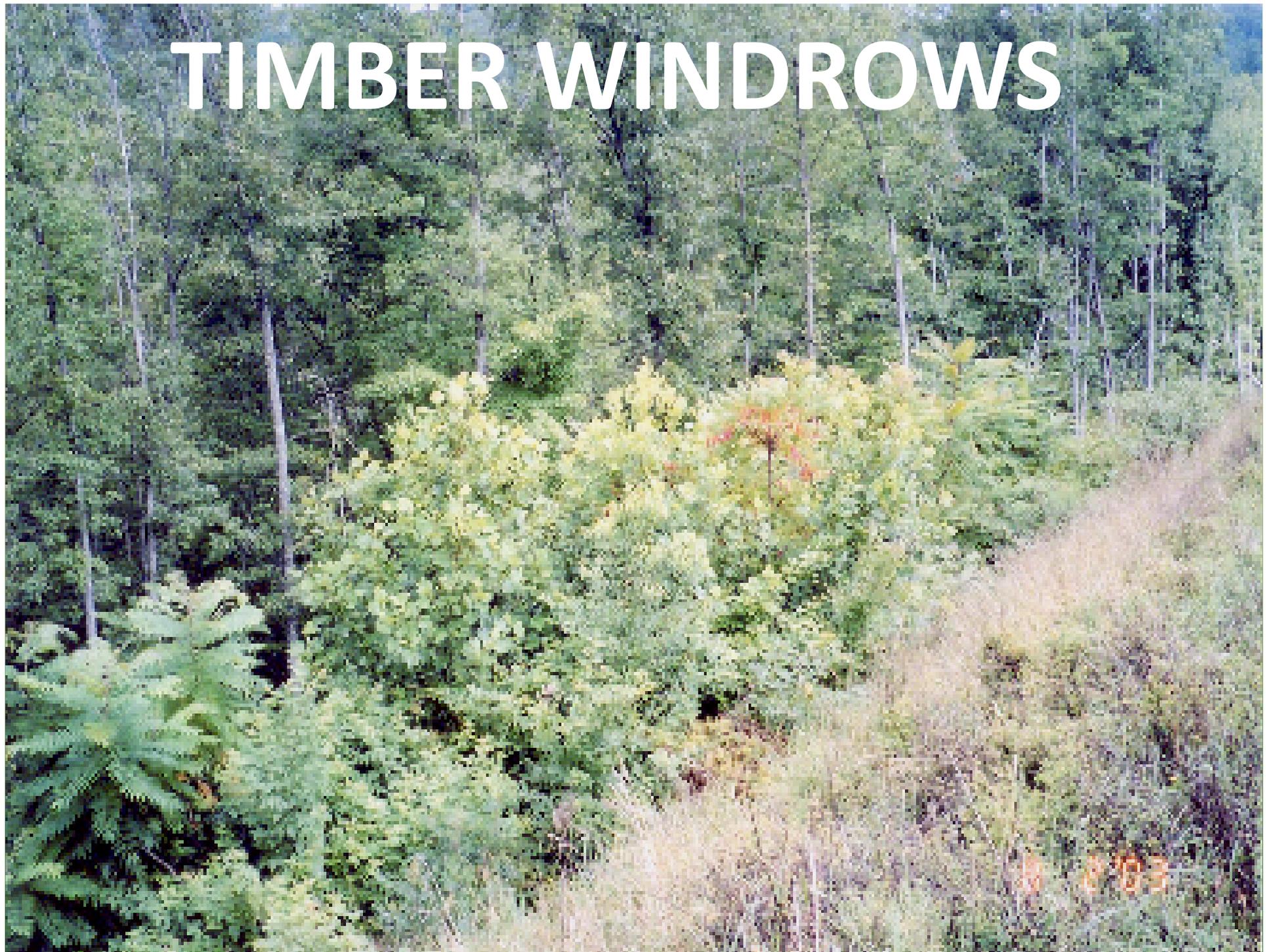
- LANDOWNERS**
- EQUIPMENT OPERATORS**
- INSPECTORS**







TIMBER WINDROWS





Ohio



Kentucky



West Virginia



Tennessee



Headwater Stream Recovery

(A New Direction)



Restored Hollow Fill
(UK Laurel Fork Mine – Guy Cove)



Un-mined Headwater Stream
(UK Robinson Forest – L. Millseat)

ARRI is working in two directions:

Forward... to get coal operators and landowners to adopt the FRA

- Regulations & Policy
- Training, Research & Demonstrations
- On site visits to offer Technical Assistance

Backward... to enhance past reclamation efforts through site prep and supplemental tree planting

Green Forest Works for Appalachia



*Prepared by the Science Team of the Appalachian
Regional Reforestation Initiative*



ARRI'S GREEN JOBS

PROPOSAL:

- 1 MILLION ACRES
- 2000 GREEN JOBS
- 125 MILLION TREES
- 175,000 ACRES