

# Using Native Shrub and Small Tree Species to Enhance Forest Reclamation on Surface Mines



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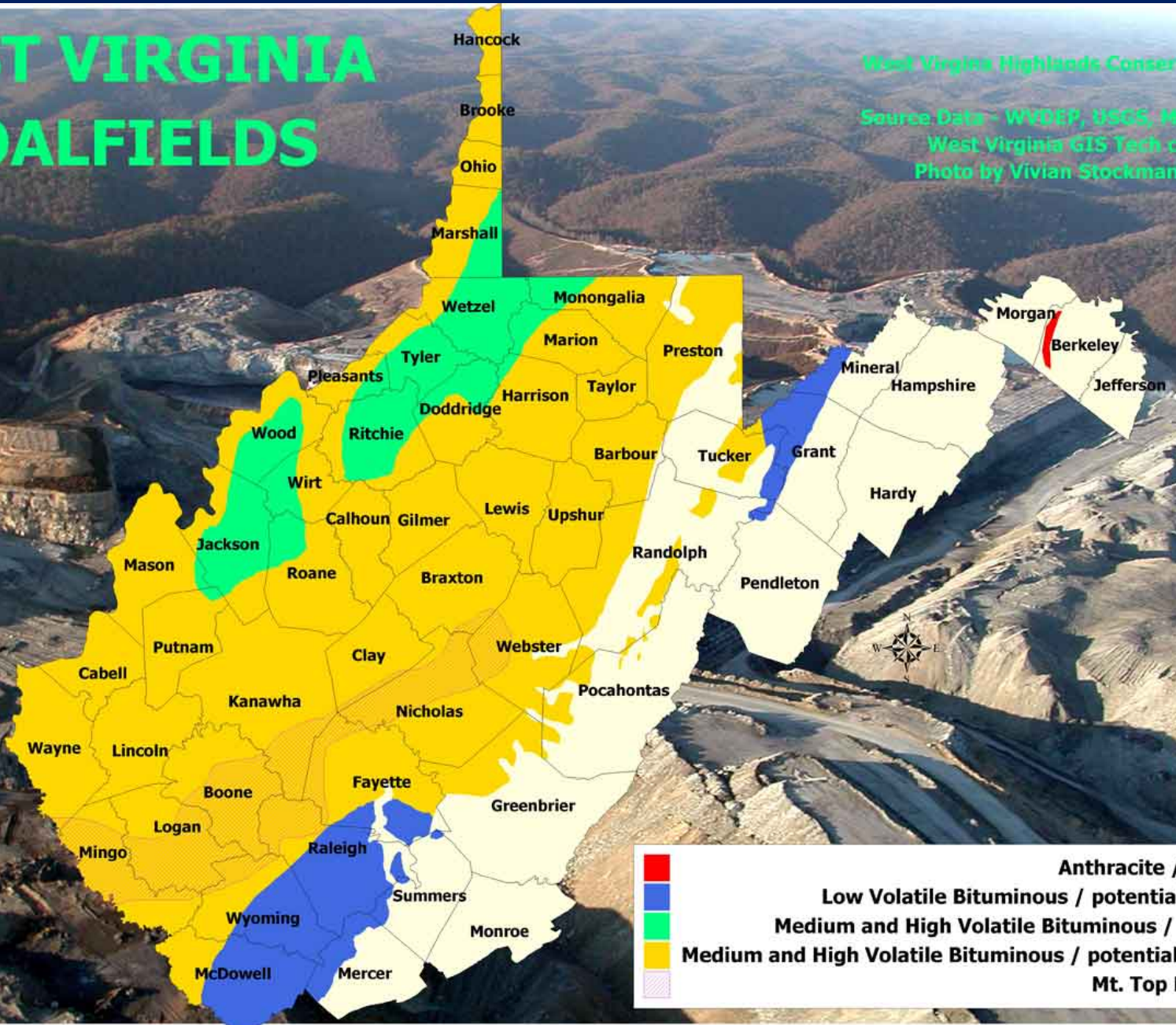
# WEST VIRGINIA COALFIELDS

West Virginia Highlands Conservancy 2004

Source Data - WVDEP, USGS, Manifold.net

West Virginia GIS Tech center

Photo by Vivian Stockman-OVEC



# History of Surface Mining Reclamation

A progression from rehabilitation  restoration



# Surface Mining Reclamation Between 1930-1977

- Millions of acres
- Eastern USA
- No reclamation requirement



- Intended only to reshape the land
- Little emphasis on revegetation
- Natural encroachment



Approximately **60%** of mine land reclaimed in some fashion by industry between **1940-1971**

# Surface Mining Control and Reclamation Act (SMCRA)



- 1977
- Federal-to-state oversight
- Active mines, AMLS
- Permit required
- Designated post mine land use

# Surface Mining Control and Reclamation Act (SMCRA)



**1980s-1990's:**

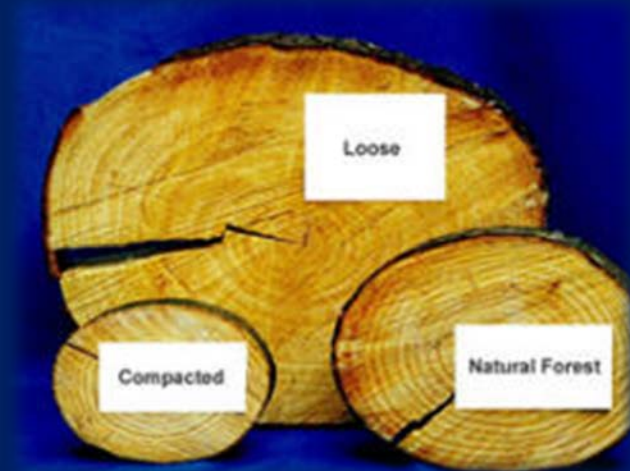
- **Excessive grading**
- **Aggressive herbaceous cover**
- **80-90% land reclaimed into hayland/pasture**

# The Forestry Reclamation Approach (FRA)



Composed of 5 Steps:

1. Establish 4 ft deep topsoil rooting medium
2. Loosely grade medium
3. Plant compatible groundcovers
4. Plant two tree types
5. Proper planting techniques





# Comparing a Mined vs Native Forests

**MINED FOREST**

**NATIVE FOREST**



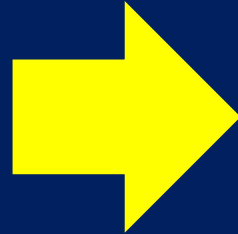
# Native Shrubs and Early Successional Tree Species

- Species richness
- Biodiversity
- Organic matter
- Habitat
- Food source
- Enhance productivity



# Tree and Shrub Species for Surface Mine Reclamation Plantings in Appalachia

## Objective



Examine 20 native tree and shrub species overall growth and health over time on reclaimed surface mines in West Virginia

# Tree and Shrub Species for Surface Mine Reclamation Plantings in Appalachia

Williams Forestry  
established research blocks  
in 2008 and 2010

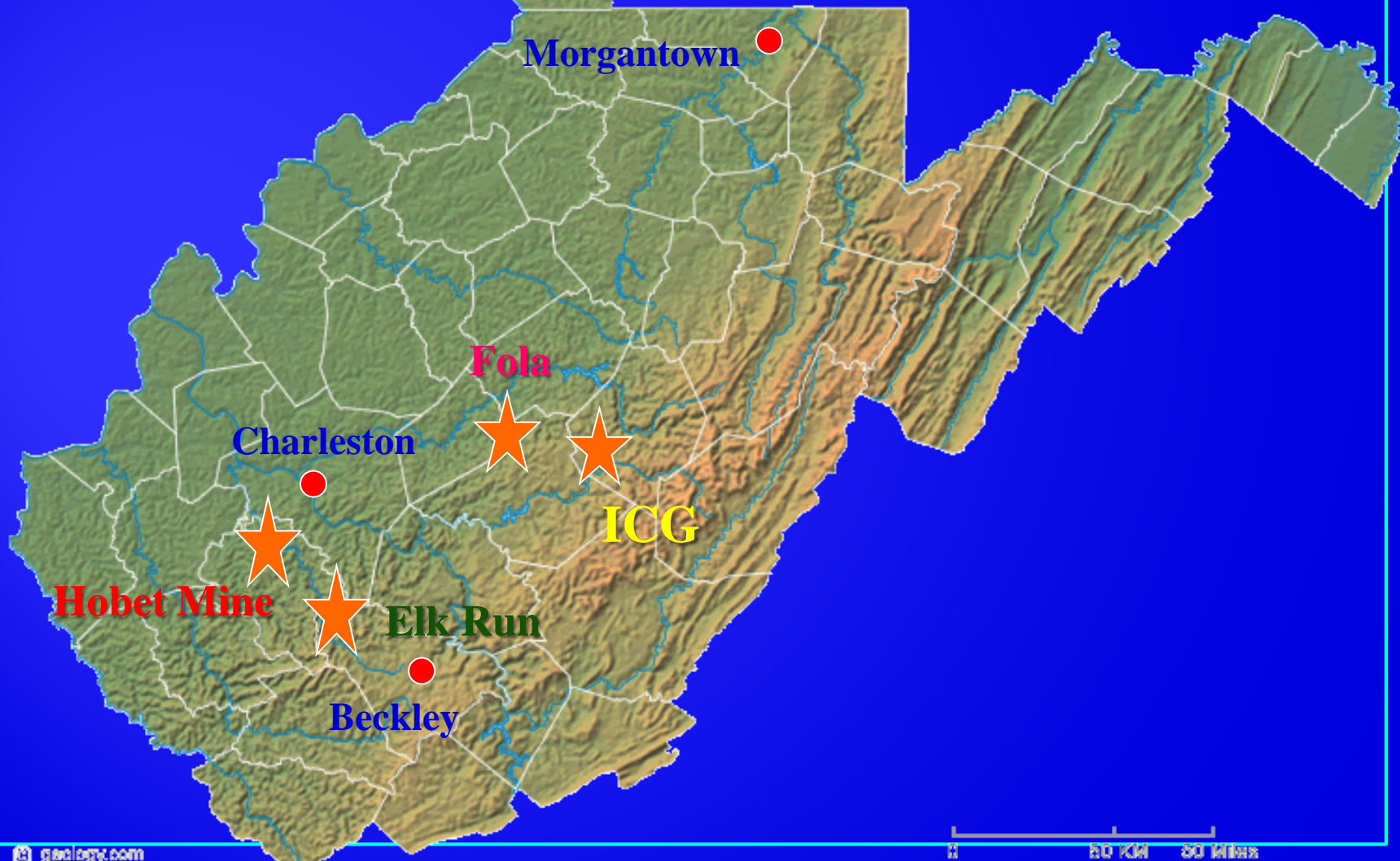


4 Mines in West Virginia:

- 1) Elk Run
- 2) Hobet
- 3) Fola
- 4) ICG-Birch River

# Study Site

## Birch River Mine



# Tree and Shrub Species for Surface Mine Reclamation Plantings in Appalachia



E2

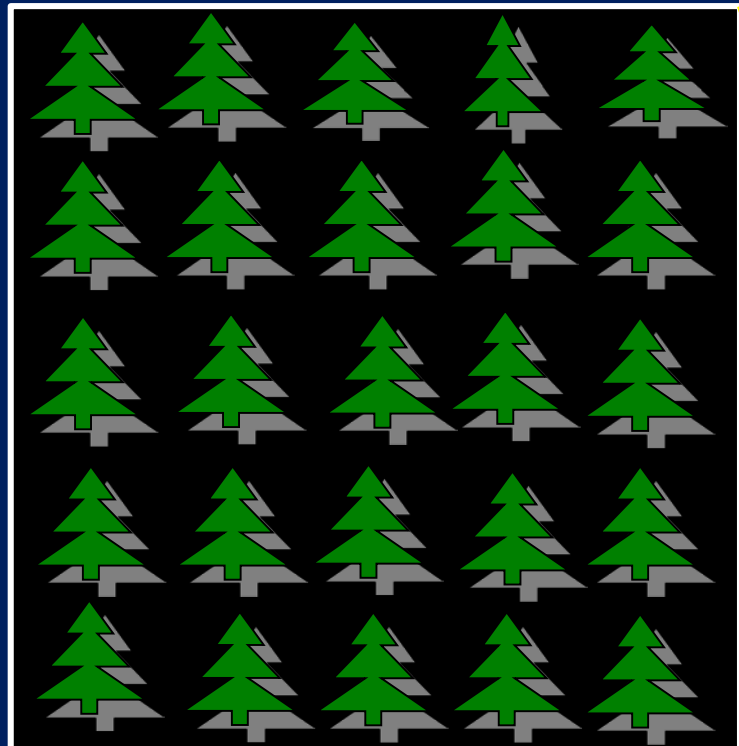
E1

W2

W1

# Tree and Shrub Species for Surface Mine Reclamation Plantings in Appalachia

8 ft.



40 ft.

<b>20</b>	<b>18</b>	<b>10</b>	<b>13</b>	<b>9</b>
<b>15</b>	<b>16</b>	<b>11</b>	<b>17</b>	<b>3</b>
<b>1</b>	<b>4</b>	<b>14</b>	<b>6</b>	<b>12</b>
<b>19</b>	<b>5</b>	<b>2</b>	<b>7</b>	<b>8</b>

## Species Included:

1. American crabapple (*Malus coronaria*)
2. Black Cherry (*Prunus serotina*)
3. Black Chokeberry (*Aronia melanocarpa*)
4. Chokecherry (*Prunus virginiana*)
5. Common apple (*Malus pumila*)
6. Common pear (*Pyrus communis*)
7. Elderberry (*Sambucus canadensis*)
8. Eastern redbud (*Cercis canadensis*)
9. Flowering Dogwood (*Cornus florida*)
10. Gray Dogwood (*Cornus racemosa*)





11. Highbush Blueberry (*Vaccinium corymbosum*)
12. Highbush cranberry (*Viburnum trilobum*)
13. Nannyberry (*Viburnum lentago*)
14. Pawpaw (*Asimina triloba*)
15. Persimmon (*Diospyros virginiana*)
16. Red Mulberry (*Morus rubra*)
17. Serviceberry (*Amelanchier arborea*)
18. Washington hawthorn (*Crataegus phaenopyrum*)
19. Wild plum (*Prunus americana*)
20. Hazelnut (*Corylus avellana*)



# Soil Data

	<b>Hobet</b>	<b>Fola</b>	<b>Elk Run</b>	<b>ICG</b>
<b>pH</b>	4.5	3.4	6.4	7.5
<b>EC</b>	73	261	85	84
<b>% Fines</b>	82	66	74	58

# Hobet Mine - Groundcover



# Fola Mine - Groundcover



# Elk Run Mine - Groundcover



# ICG Mine - Groundcover



# In general...



# 2015 Best/Worst Performers

Best Performers	Worst Performers
Washington Hawthorn	Choke Cherry
Black Chokeberry	Persimmon
Nannyberry	Flowering Dogwood
Black Cherry	Pawpaw
Gray Dogwood	
Red Mulberry	
Hazelnut	



# 2015 Best Performers Survival (%)

	Hobet	Fola	Elk Run	ICG
W. Hawthorn	35	98	44	70
Black Cherry	50	66	53	49
Nannyberry	27	74	81	41
B. Chokeberry	41	82	45	69

# Hobet Mine - Washington Hawthorn



# Hobet Mine – Black Chokeberries



# 2015 Best Performers Survival (%)

	Hobet	Fola	Elk Run	ICG
W. Hawthorn	35	98	44	70
Black Cherry	50	66	53	49
Nannyberry	27	74	81	41
B. Chokeberry	41	82	45	69

# Fola Mine – Black Cherry



# Fola Mine - Nannyberry



# 2015 Worst Performers Survival (%)

	Hobet	Fola	Elk Run	ICG
Choke Cherry	26	26	73	41
Flowering Dogwood	5	6	6	24
Pawpaw	0	4	0	31

# Fola Mine – Pawpaw





# Hobet Mine – Choke Cherry



# 2015 Best Performers Height (m)

	<b>Hobet</b>	<b>Fola</b>	<b>Elk Run</b>	<b>ICG</b>
<b>W. Hawthorn</b>	0.4	1.8	0.8	0.9
<b>Black Cherry</b>	0.8	1.2	1.1	1.3
<b>Nannyberry</b>	0.4	1.1	1.3	0.5
<b>B. Chokeberry</b>	0.2	0.9	1	0.6

# ICG Mine – Black Chokeberries



# Elk Run Mine – W. Hawthorn



# 2015 Worst Performers Height (m)

	<b>Hobet</b>	<b>Fola</b>	<b>Elk Run</b>	<b>ICG</b>
<b>Choke Cherry</b>	0.3	0.4	1.2	0.7
<b>Flowering Dogwood</b>	0.1	0.1	0.1	0.2
<b>Pawpaw</b>	0	0.1	0	0.2

# ICG Mine – Pawpaw



# 2015 Survival (%) by Aspect

	Hobet	Fola	Elk Run	ICG
East	17	49	47	20
West	36	44	56	22



# 2015 Height (m) by Aspect

	Hobet	Fola	Elk Run	ICG
East	0.3	0.7	1.0	1.3
West	0.3	0.7	0.9	0.8





# Questions?

