



# ICG Eastern, LLC

## Applying FRA at ICG Eastern Birch River Surface Mine

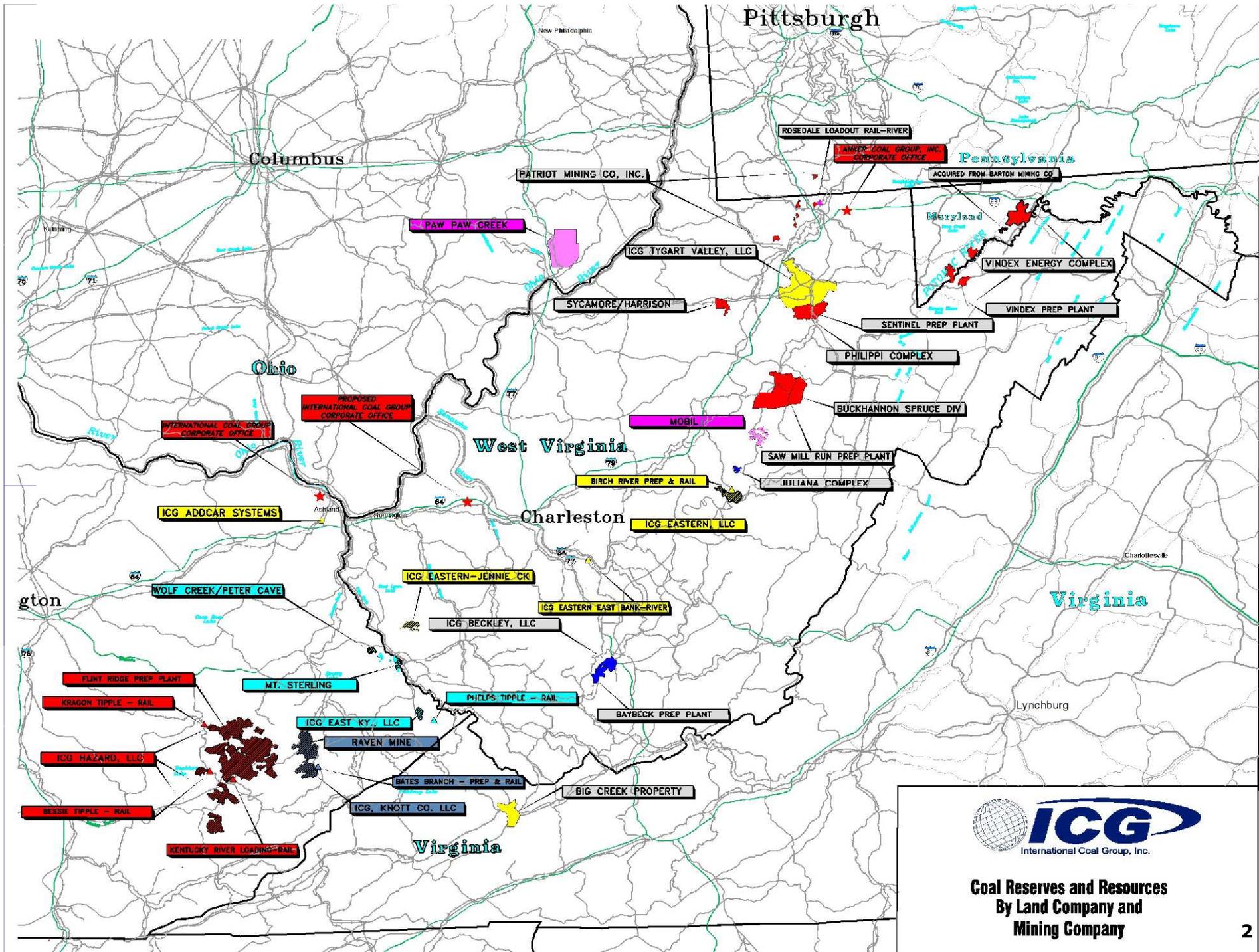


AMERICA'S  
**BEST**  
ENERGY VALUE



**Michael Duvall**

President and General Manager



**Coal Reserves and Resources  
By Land Company and  
Mining Company**



# ICG Eastern, LLC Complex Overview



- Located in central WV in Webster county near Cowen
- Surface mine, preparation plant & rail loadout
- Annual coal production approximately 3.0 MM tons
- Mining operations began in April 1992
- BE 1570W dragline began mining in November 1998
- Operation purchased by ICG in October 2004



# ICG Eastern, LLC Complex Overview



## ■ Complex

- Situated on approximately 4,700 acres
- Fifteen Article 3 permits
- Primarily thermal coal production
- All coal shipped by rail



# ICG Eastern, LLC Complex Overview



## ■ Surface Mine

- Overburden handling equipment
  - BE 1570W dragline (idled in October 2009)
  - O&K RH120 excavator
  - Caterpillar 993K and 992G Front End Loaders
  - Caterpillar D11R Carry Dozers & D11R Dozers
- Mine Five Seams – Freeport, Kittanning (2) & Clarion (2)
- Coal is transported on internal haul roads to plant



**Preparation Plant**

**Active Surface Mine**

**Rail Loading**

**ICG Eastern's Birch River Facilities**





# ICG Eastern, LLC Reclamation



## ■ Reclamation Equipment

- Caterpillar D10R dozers
- Caterpillar D7 dozer
- Caterpillar 345 backhoe
- Caterpillar 330 backhoe
- John Deere 350 backhoe



# Previous Reclamation Methods “Old School”





# Very Compacted





# Heavy Grass Cover





# Results

## Meager Tree Growth and Inadequate Survival





# Results

## Meager Tree Growth and Inadequate Survival





# Reclamation Technique Changes



- **Adopted Forestry Reclamation Approach in 2007**
  - Most permits were forestland Post Mining Land Use
  - All others were modified to FRA in 2008 & 2009
- **Benefits**
  - More productive tree survival and growth
  - Decreased dozer operating time to regrade
  - Less grass seed
  - All adds up to reduced costs



# Reclamation Technique Changes



## ■ Challenges

- Dozer operator habits and attitudes
- Increased sedimentation and erosion?
- Bond release concerns
- Aesthetics (ugly reclamation)



# Forestry Reclamation Approach (FRA)



- **Suitable rooting medium**
- **Non-compacted rooting medium**
- **Tree compatible ground covers**
- **Plant commercially valuable hardwoods**
- **Use proper tree planting techniques**



# Suitable Growth Medium





# One Pass Only Regrading





# Loosely Compacted





# Ripping Compacted Regraded Areas





# Non-Competitive Grass Cover





# Proper Planting Techniques





# Creation of Experimental Tree Planting Study Area



- **Partnered with WVU Division of Plant and Soil Sciences**
  - Discussed with Dr. Jeff Skousen
  - Evaluation of FRA methods, tree growth, and soil characteristics
  
- **Site Prep began February 2007**
  - Dumped Rock and graded site
  - Added tree bark and hyroseeding
  - Tree planting in April 2007
  - Monitoring began summer 2007



# Experimental Study Area



- **Why create an experimental site?**
  - Last 10 to 15 years increased desire by landowners to restore forestland on their property
  - Future economic returns from commercially valuable trees
  - Past SMRCA reclamation practices have not generally been conducive to good tree growth and survival



# Study Area Objectives



- 
- Evaluate chemical and physical properties of brown versus gray sandstone with bark mulch and hydroseeding treatments
  
  - Evaluate tree growth on various combinations
    - Brown vs. gray sandstone
    - Bark mulch vs. no bark mulch
    - Hydroseeding vs. no hydroseeding



# Study Area Location





# Study Area Construction





# Study Area



**Brown weathered sandstone**



**Gray unweathered sandstone**



# Study Area

- **Bark mulch treatment**
- **6-inch layer of bark on brown and gray sandstone**



# Study Area

- 2.5m X 2.5m spacing
- 1680 trees per hectare





# Grasses Hydroseeded



- **Hydroseeding**



<u>Species</u>	<u>Seeding Rate</u>
Birdsfoot trefoil	11 kg/ha
Kobe lespedeza	6 kg/ha
Ladino clover	3 kg/ha
Orchard grass	6 kg/ha
Perennial ryegrass	6 kg/ha
Red top	2 kg/ha
Weeping lovegrass	2 kg/ha
<b>Total</b>	<b>36 kg/ha</b>



# Treatment Plots Evaluated



**Plot 1: brown sandstone**

**Plot 2: brown sandstone – bark mulch**

**Plot 3: brown sandstone – hydroseeded**

**Plot 4: brown sandstone – hydroseeded, bark mulch**

**Plot 5: gray sandstone**

**Plot 6: gray sandstone – bark mulch**

**Plot 7: gray sandstone – hydroseeded**

**Plot 8: gray sandstone – hydroseeded, bark mulch**



# Trees Planted



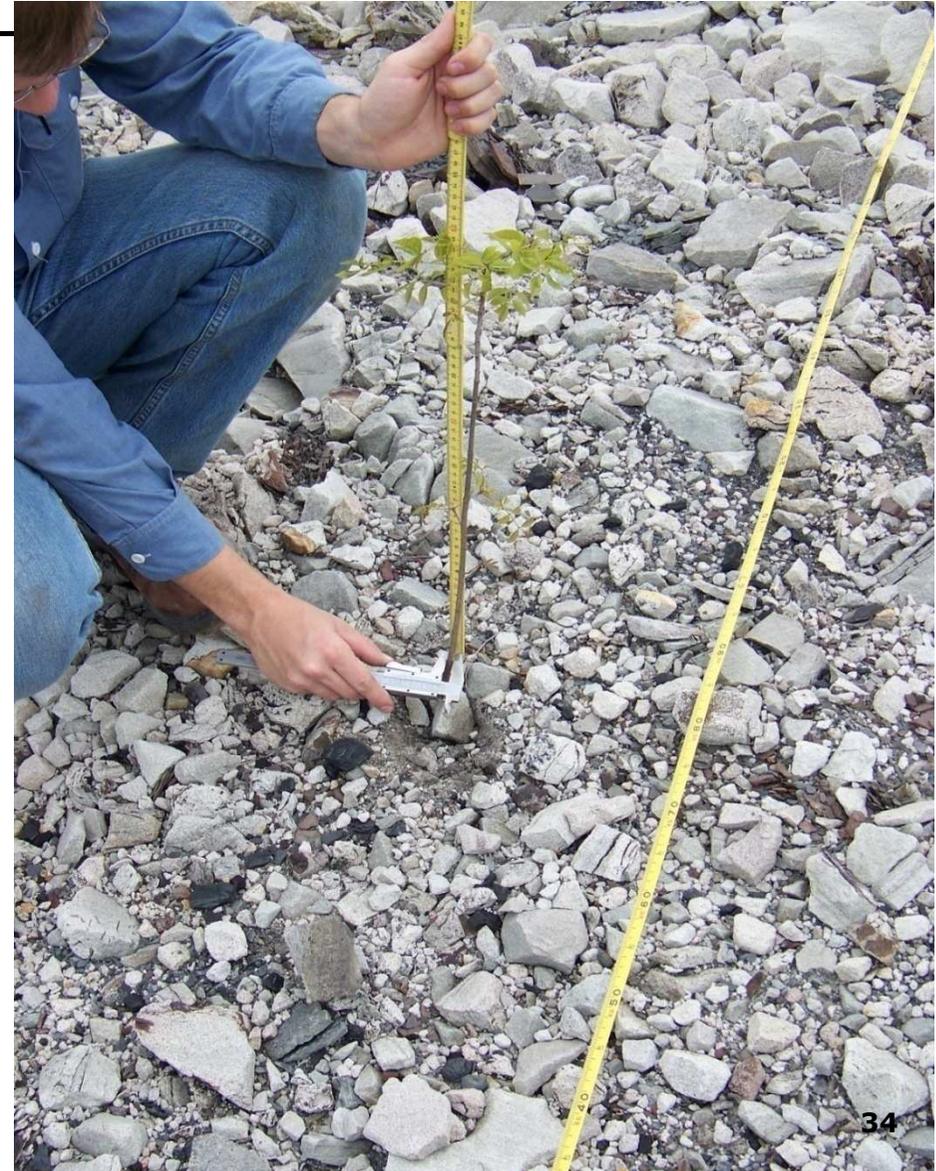
<b>Species</b>	<b>Planted</b>	<b>% of Total</b>
<b>Black Cherry</b>	<b>850</b>	<b>11%</b>
<b>Black Locust</b>	<b>800</b>	<b>10%</b>
<b>Dogwood</b>	<b>350</b>	<b>4%</b>
<b>Eastern Redbud</b>	<b>350</b>	<b>4%</b>
<b>Northern Red Oak</b>	<b>850</b>	<b>11%</b>
<b>Pitch X loblolly Pine</b>	<b>800</b>	<b>10%</b>
<b>Sugar Maple</b>	<b>850</b>	<b>11%</b>
<b>Sycamore</b>	<b>450</b>	<b>6%</b>
<b>White Ash</b>	<b>850</b>	<b>11%</b>
<b>White Oak</b>	<b>850</b>	<b>11%</b>
<b>White Pine</b>	<b>400</b>	<b>5%</b>
<b>Yellow Poplar</b>	<b>600</b>	<b>8%</b>
<b>Total</b>	<b>8000</b>	<b>100%</b>



# Evaluation Methods - Trees



- **11 Belt transects of 3m were established across the soil treatments**
- **Trees measured for height to the highest point of live growth**
- **Measured for diameter 2.5cm from the soil surface**





# Results

## Growth and Survival



Comparison	Survival (%)	Growth (cm <sup>3</sup> )
<b>Substrate</b>		
Brown SS	69%	267
Gray SS	64%	91
<b>Bark Added</b>		
Yes	68%	210
No	68%	212
<b>Hydroseeding</b>		
Yes	64%	273
No	72%	154



# Treatment Results Growth & Survival



<u>Treatment</u>	<u>Survival (%)</u>	<u>Growth (cm<sup>3</sup>)</u>
Bss	74%	175
BssB	80%	271
BssH	67%	340
BssHB	61%	206
Gss	68%	33
GssB	70%	262
GssH	48%	43
GssBH	64%	67



# Species Results Growth & Survival

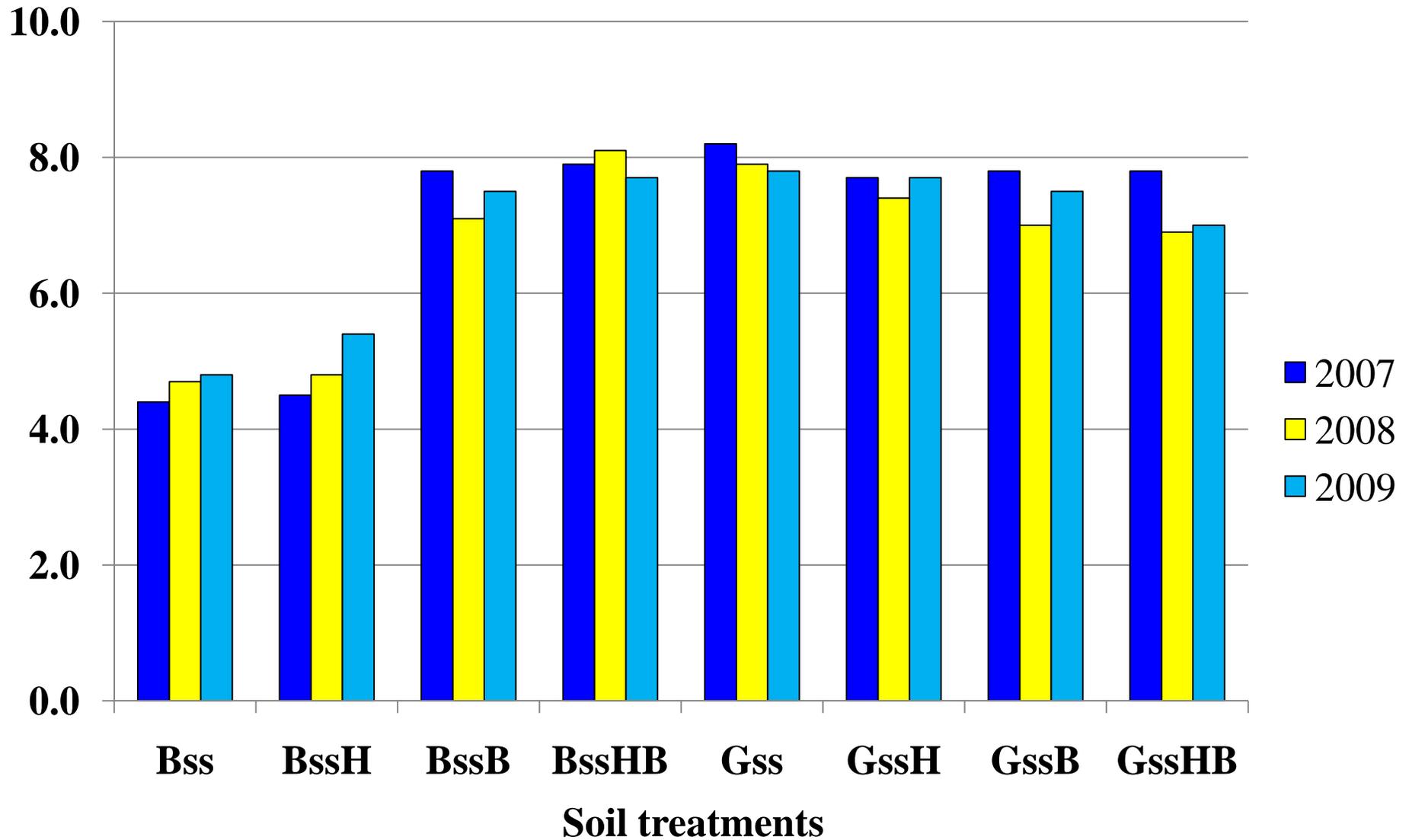


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<b>Species</b>	<b>Survival (%)</b>	<b>Growth (cm<sup>3</sup>)</b>
Black Cherry	79%	176
Black Locust	73%	951
Dogwood	13%	3
Eastern Redbud	45%	28
Northern Red Oak	69%	94
Sugar Maple	65%	14
Sycamore	47%	83
White Ash	72%	125
White Oak	75%	62
White Pine	82%	101
Yellow Poplar	68%	254



# Results - pH





**Brown sandstone**



**With bark**



**Gray sandstone**

**Black locust**



**Brown sandstone**



**With bark**



**Gray sandstone**

**Black cherry**







# Conclusion - Soil Properties

- **Brown sandstone and brown sandstone with hydroseeding had significantly lower pH (4.5-5.0)**
- **EC decreased since plot construction**
- **Ca greater in bark mulch treatments**
- **P greater in Gray sandstone, lower in bark mulch treatments**

2007 4 19

# Conclusion - Trees

- **Brown sandstone had significantly greater growth**
- **Bark and hydroseeding has no significant effect on growth or survival after three years**

# Conclusion - Trees

- **Black Locust had significantly higher growth than any other species**

2008 6 10



# Creation of Second Experimental Tree Planting Area



- **Created 16 acre second site in 2009**
  - Brown and grey sandstone
  - 2,500 trees planted in 2009
  - 5,500 trees planted in 2010
  
- **Chestnut trees included in plantings**
  - Chinese variety
  - 15/16 back-cross hybrid variety
  - Native American variety

# Study Site 2





# Loosely Compacted





# American Chestnut Seedling





# **ICG Eastern, LLC Birch River Surface Mine Reclamation Awards**



- **Received three awards in 2008**
  - **Greenlands Award from WVDEP**
  - **IMCC Kenes C. Bowling National Award**
  - **USDO I OSM National Excellence in Reclamation Award**
- **Received WV Society of American Foresters Woodlands Award in 2009**
- **Received ARRI Award in 2009**
- **Received “Exemplary Reclamation of Refuse Facilities” in 2010 from WVDEP**





# Questions ?

