



## **WHAT'S NEXT FOR RECLAMATION?**

**April 9-13, 2017**

**Morgantown, WV**

**Waterfront Hotel**



# West Virginia Mine Drainage Task Force



**The Task Force has been  
around for a very long time...**



**Hand loading...**



# Deep Mining...



# Some of us started at a very young age!

seems to be quite some dust  
(visible neat the windows).

Coal sieving Pennsylvania – 1911



**Some of us took a heap of time  
before we learned the trade**





# Interactive Presentation

If you see yourself in a picture,  
Point and shout “That’s me!”



03/16/2012

# Test!



# Mining for a long time



# Trees Volunteered



# Reclamation Needed



# Partial Highwall Elimination



# Reclamation in West Virginia – 1970



# Water Quality was always a concern

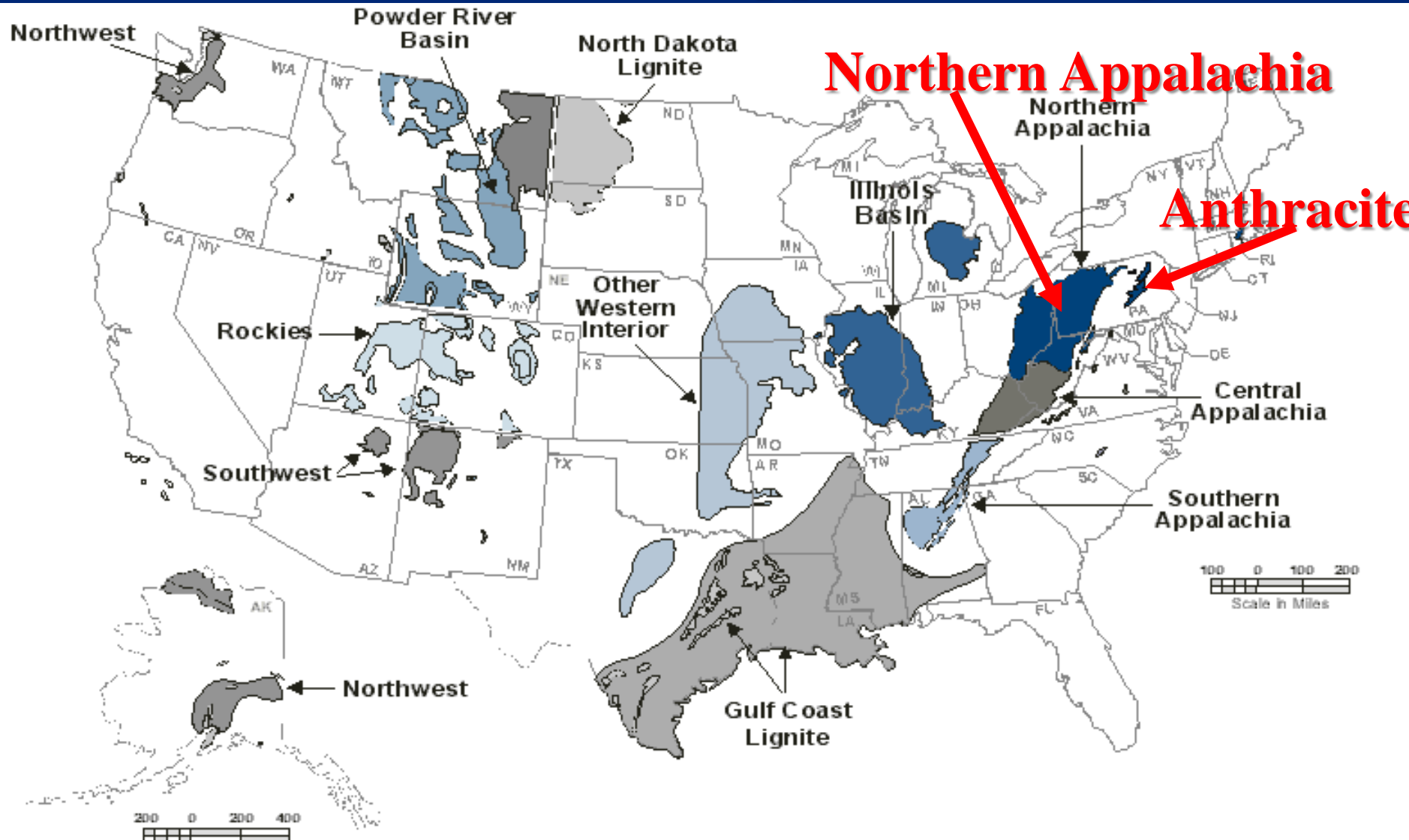




# Acid Mine Drainage Impacts



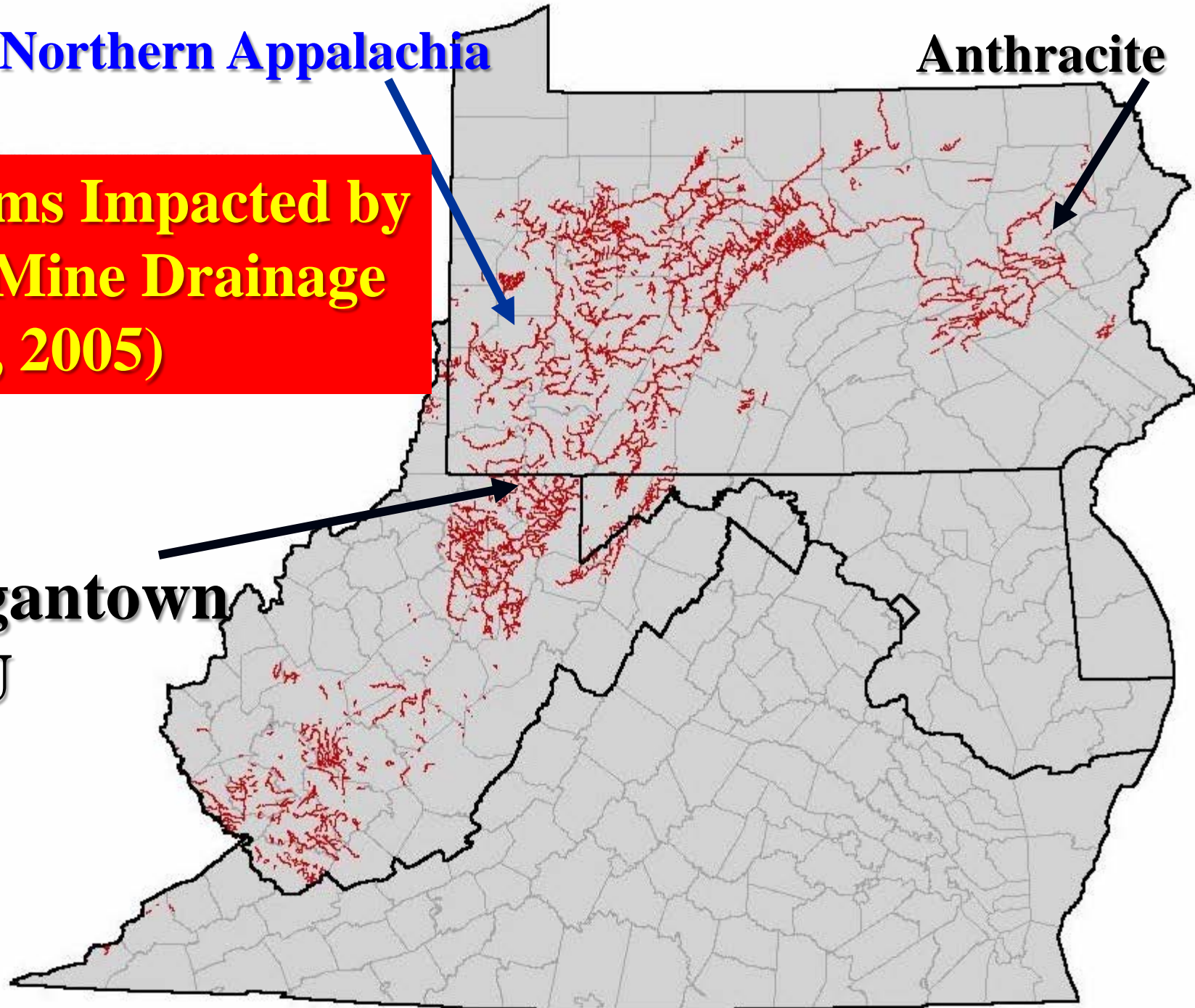
**While many areas in the USA have mine drainage, the most severe areas are in the...  
Anthracite and Northern Appalachian regions.**



**Northern Appalachia**

**Anthracite**

**Streams Impacted by  
Acid Mine Drainage  
(EPA, 2005)**



**Morgantown  
WVU**

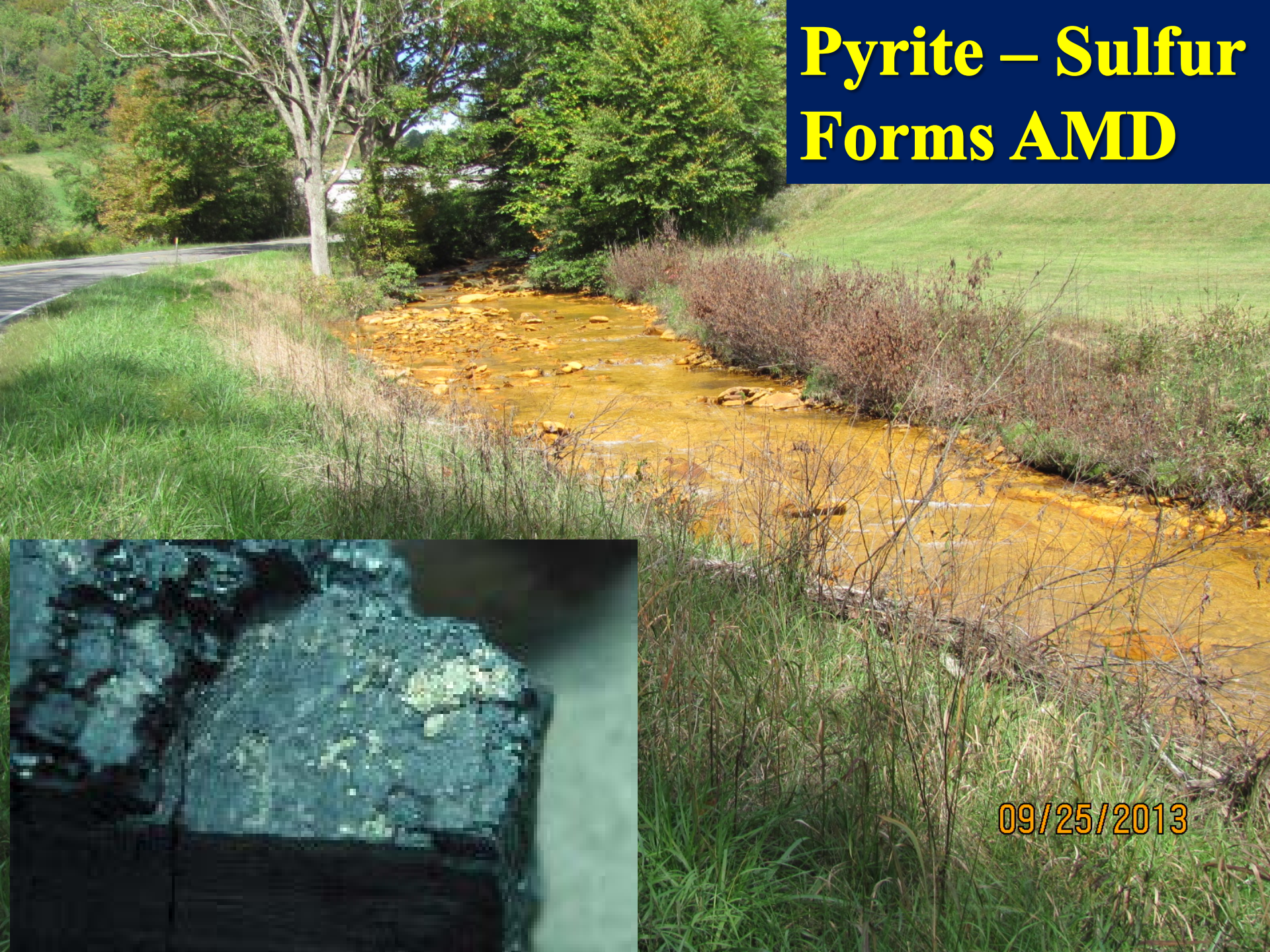
# Coal Mining in Northern West Virginia



# Acid Seep



# Pyrite – Sulfur Forms AMD



09/25/2013

**Many miles of streams with AMD!**



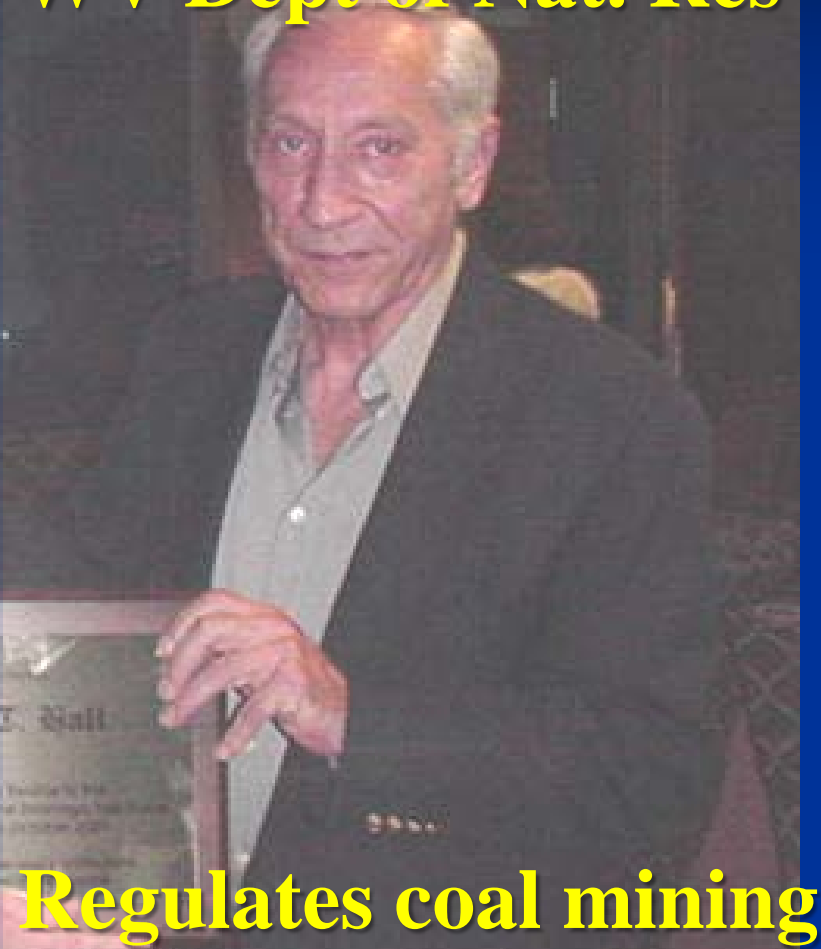
2007 5 11

**AMD – 1965**

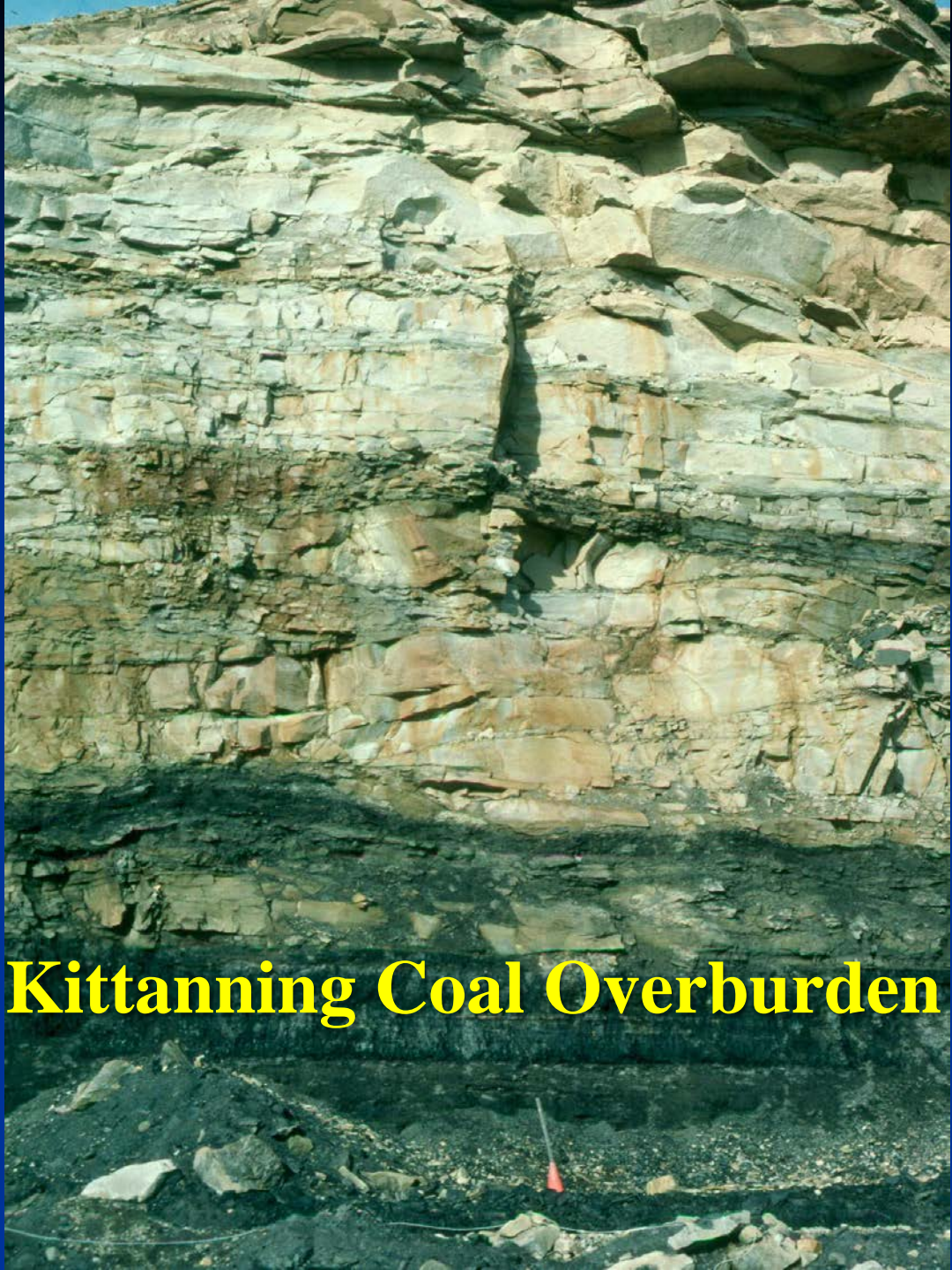




**Dave Callaghan**  
**1978 – Director**  
**WV Dept of Nat. Res**



**Regulates coal mining**



**Kittanning Coal Overburden**

# Mine Drainage Task Force Organized in 1978



# Define the AMD problem Procedures to reduce



**Spent much time looking at problems!**





# **Mining Methods Geology, Coal**

# Looked for Solutions



2005 10 5

**In 1979,  
West Virginia  
Mine Drainage  
Task Force**

**Put out a  
bulletin**

**Suggested Guidelines  
for Method of Operation  
in Surface Mining of Area  
with Potentially  
Acid-Producing Materials**

# 1979 Bulletin

## Outlined Procedures for:

- overburden analysis,
- material handling
- ground and surface water,
- mining equipment,
- economic feasibility.



# Emphasis on Material Handling of Acid-Producing Materials

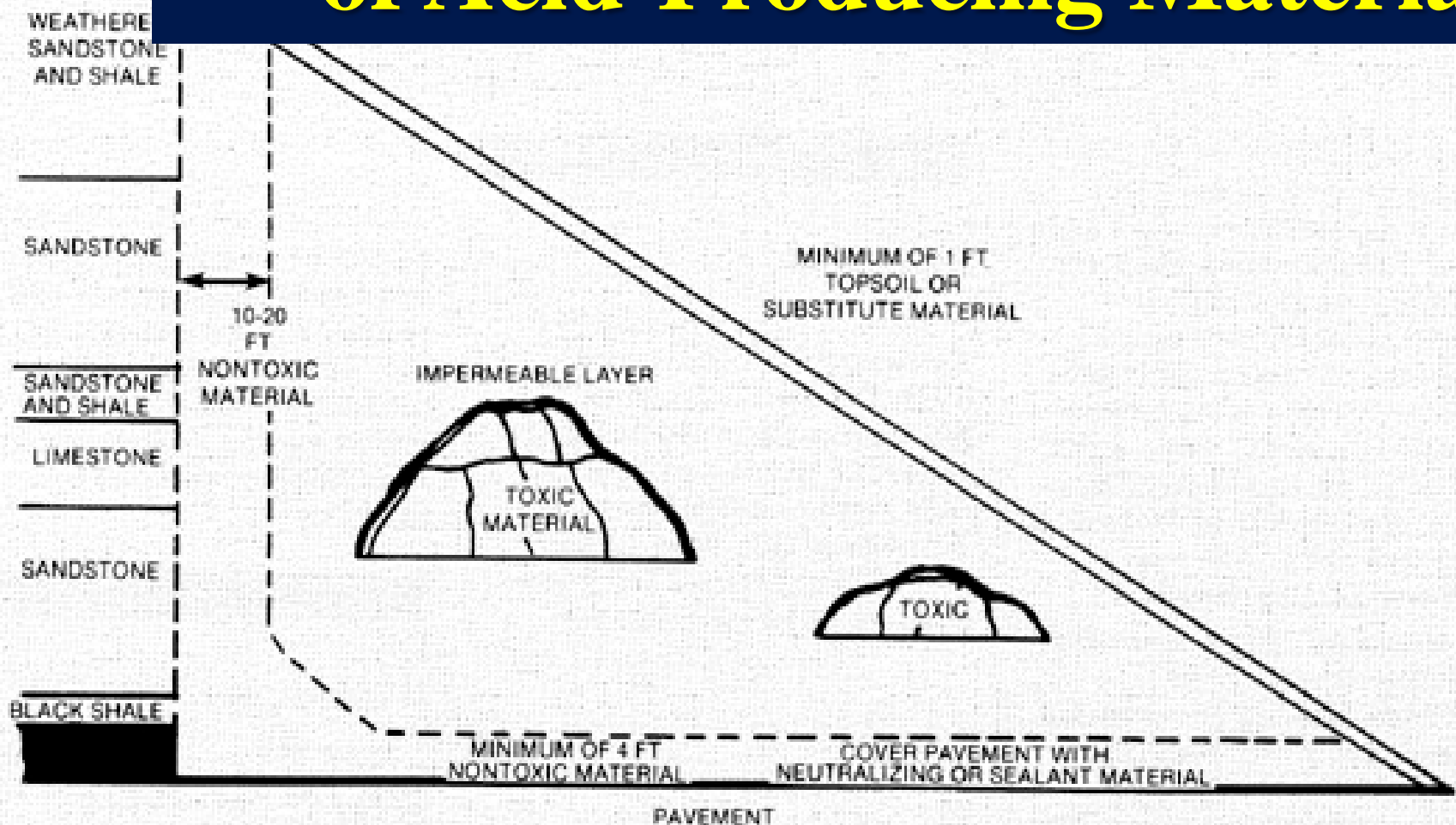


Figure 11: During construction of the backfill, toxic material should be placed off the pit floor, compacted, treated with neutralizing material, and capped with an impermeable layer to reduce air and water contact.

# Overburden Analysis

## Material Handling



# Even with Procedures...



**...some areas still developed AMD**



2006 9 26

# Complex Problem



OCT 20 2004

# 3 aspects of AMD Prediction

1. overburden geochemistry
2. overburden placement
3. hydrology

# Needed to start sharing information



2006 10 4

# First Task Force Meeting - 1980





# Hold Symposiums



2007 4 10



# Geologic Map of West Virginia

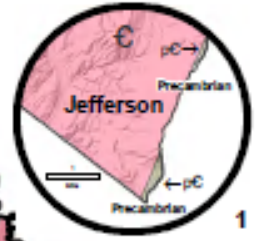
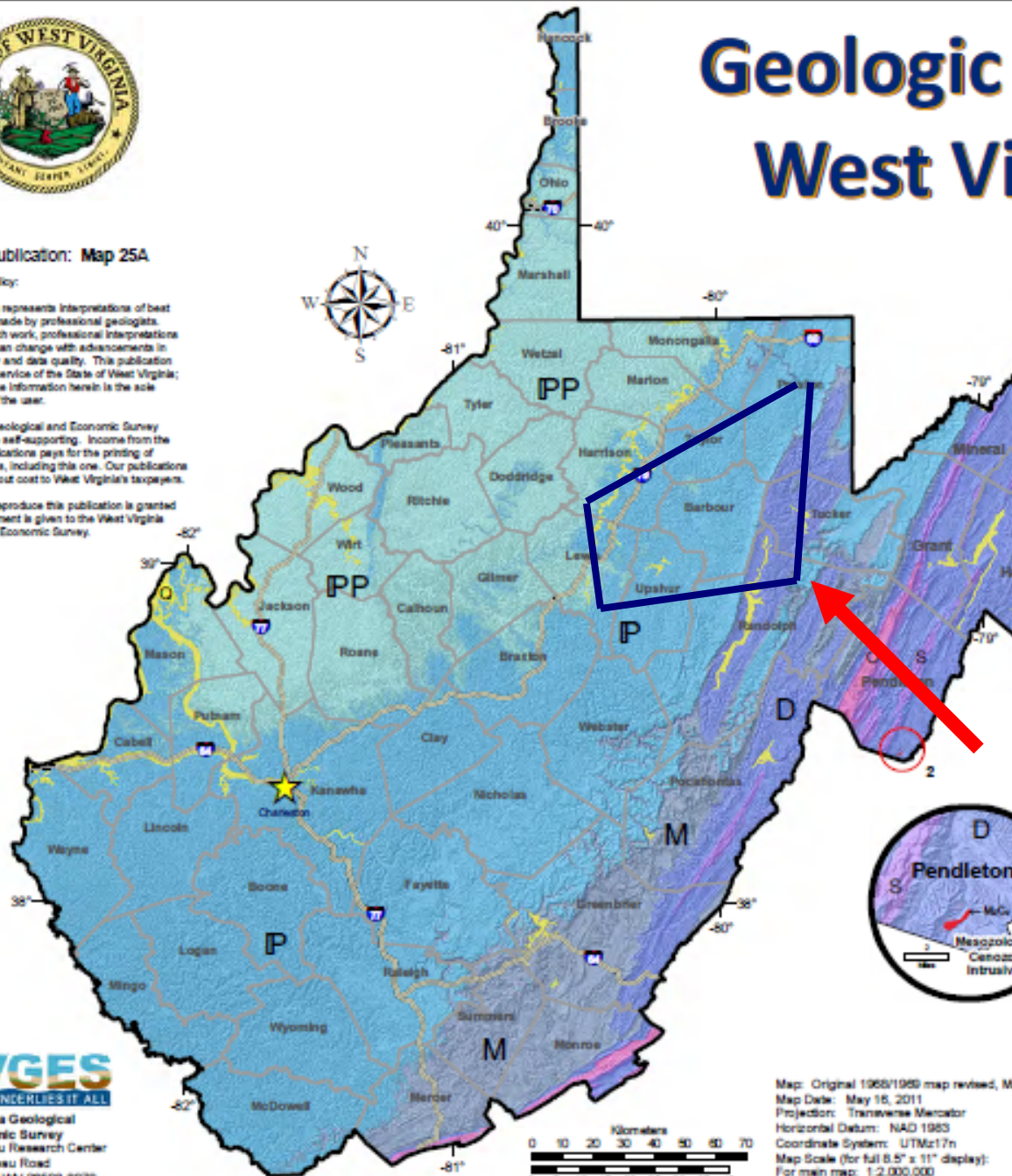
WVGES Publication: Map 25A

### Publications Policy:

This publication represents interpretations of best available data made by professional geologists. As in all research work, professional interpretations may vary, and can change with advancements in both technology and data quality. This publication is offered as a service of the State of West Virginia; proper use of the information herein is the sole responsibility of the user.

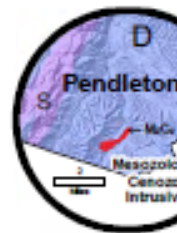
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### Legend: Era-Period USGS Geologic Coloring Scheme

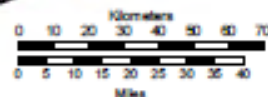
|   |  |
|---|--|
|   |  |
| <b>Q</b><br>Cenozoic - Quaternary<br>(0-2 mil. yrs. ago)<br>Alluvial deposits of sand, gravel, silt and clay along major streams. | <b>D</b><br>Paleozoic - Devonian<br>(359-416 mil. yrs. ago)<br>Redbeds, shale, sandstone, limestone, and chert.<br>Gas, silica sand, limestone |
|   |  |
| <b>MzCz</b><br>Mesozoic and Cenozoic Intrusives   | <b>S</b><br>Paleozoic - Silurian   |



**A large area was proposed to be excluded from mining in 1981.**

**WVGES**  
GEOLOGY UNDERLIES IT ALL  
West Virginia Geological and Economic Survey  
Mont Chateau Research Center  
1 Mont Chateau Road  
Morgantown, WV 26508-8079  
Phone: (304) 594-2331  
Web: www.wvges.wvnet.edu

Map: Original 1968/1969 map revised, May 16, 2011  
Map Date: May 16, 2011  
Projection: Transverse Mercator  
Horizontal Datum: NAD 1983  
Coordinate System: UTMz17n  
Map Scale (for full 8.5" x 11" display):  
For main map: 1:2,000,000  
For inset maps: Jefferson Co. 1:200,000  
Pendleton Co. 1:500,000



**Dave Callaghan**  
**1978 – Director**  
**WV Dept of Nat. Res**



**We Needed...**

**New Ideas and Technologies**

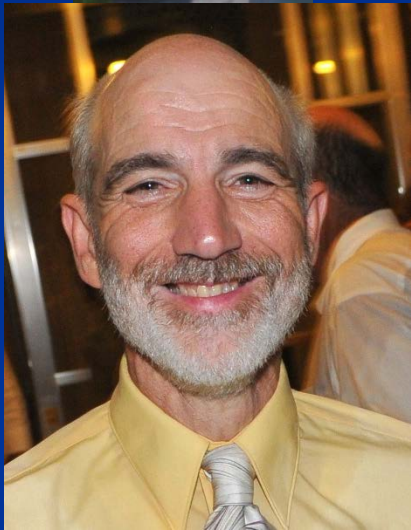
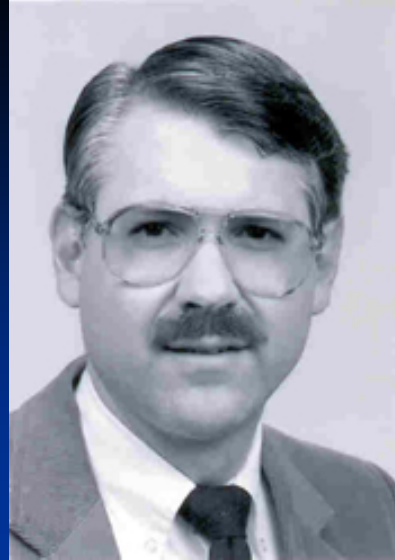
**Broaden Task Force Objectives**

- AMD Control Practices**
- AMD Treatment**
- Annual Symposia**

# Organize AMD Technical Advisory Committee

A group of approximately 15 people, mostly men, are standing in a line around a large, dark, rectangular object in an open field. They are wearing hard hats and safety vests, suggesting they are workers or experts in a technical field. The background shows a flat, open landscape under a clear sky.

**Group of experts!**



**More  
Work!**



# Acid Mine Drainage Technical Advisory Committee

| <u>Member</u>             | <u>Organization</u>  | <u>Background</u>       |
|---------------------------|----------------------|-------------------------|
| <b>David C. Callaghan</b> | WVDNR                | Director                |
| <b>Frank T. Caruccio</b>  | Univ. South Carolina | Geochemistry of AMD     |
| <b>Gwendelyn Geidel</b>   | Univ. South Carolina | Applied Geochemistry    |
| <b>Roger Hall</b>         | WVDNR                | Permitting              |
| <b>Bob Kleinmann</b>      | US Bureau of Mines   | Geochemistry of AMD     |
| <b>Charles Miller</b>     | Grafton Coal         | Industry Representative |
| <b>Hans Naumann</b>       | Island Creek Coal    | Industry Representative |
| <b>Pete Pitsenbarger</b>  | WVDNR                | Chief, Div. of Recl.on  |
| <b>Jack Renton</b>        | WVU                  | Geology of Coal         |
| <b>John Sencindiver</b>   | WVU                  | Overburden and Soils    |
| <b>Alfred Stiller</b>     | WVU                  | AMD Kinetics            |



**USING SURFACTANT  
TO CONTROL  
ACID MINE DRAINAGE**



**Soap Foam in the Creeks!**



**Controlled Release  
BF Goodrich - ProMac**



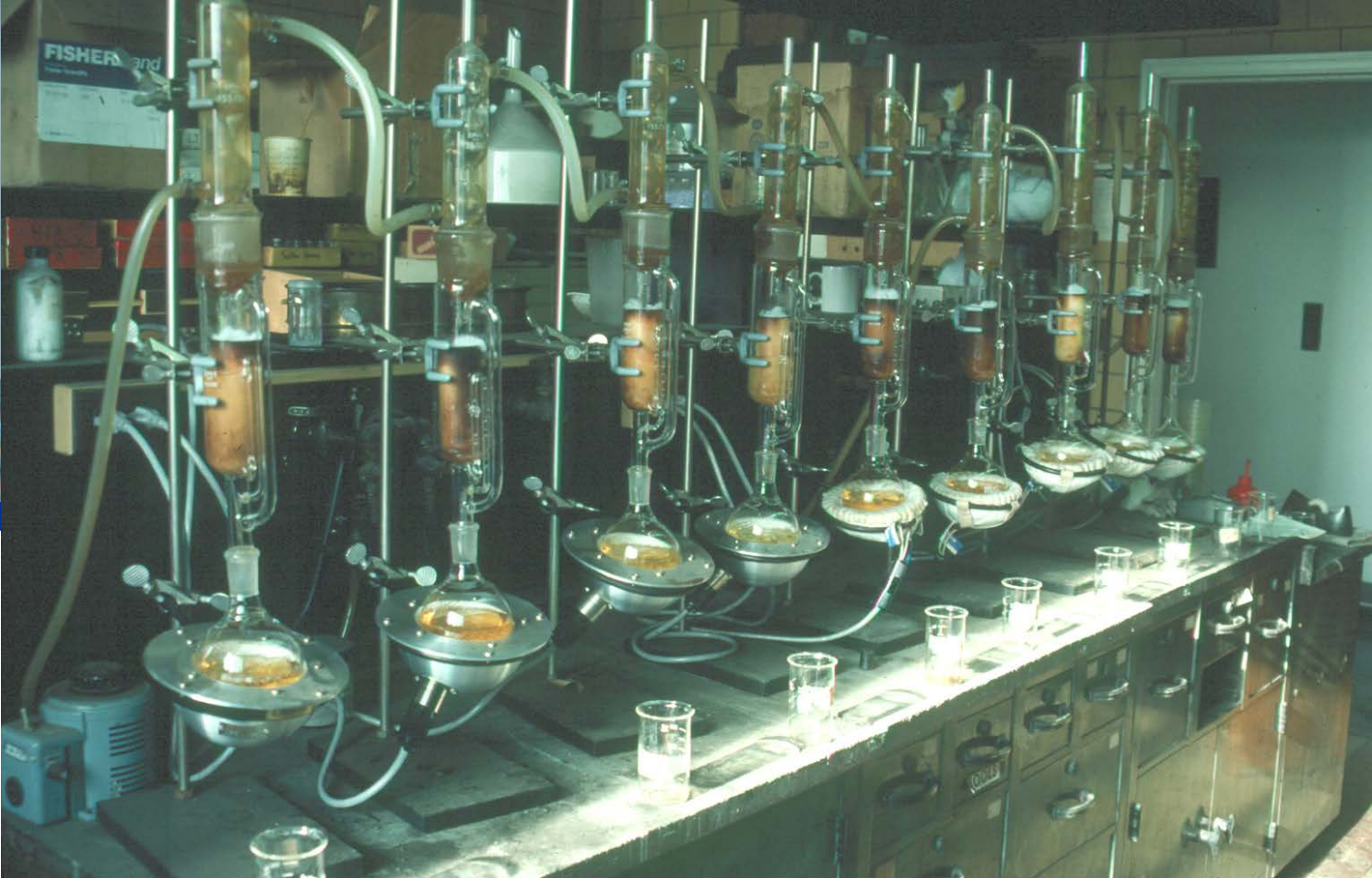
MERCER SITE

# Pseudo-karst Hydrology



## Alkaline Trenches





# Leaching Tests – Soxhlet Pyrite Reaction and Release Phosphate Application



# Overburden Analysis Acid Base Accounting Soil Development



# Continued to hold annual Symposia



03/26/2012



# Registration Table Lunch



**More happens in  
the halls and  
during the breaks**



|  |     |
|--|-----|
|  | 8.5 |
|  | 8.0 |
| A Review of Procedures for Surface Mining and Reclamation in Areas with Acid-Producing Materials | 7.0 |
|  | 6.5 |
|  | 6.0 |
|  | 5.5 |
|  | 5.0 |
|  | 4.5 |
|  | 4.0 |

## AMD CONTROL

- Overburden Analysis
- Handling and Placement
- Postmining Hydrology

**Update in 1987**

**New Ideas:**

**Alkaline Injection**

**Ammonia Treatment**

**In-Line Aeration**

**Wetlands**





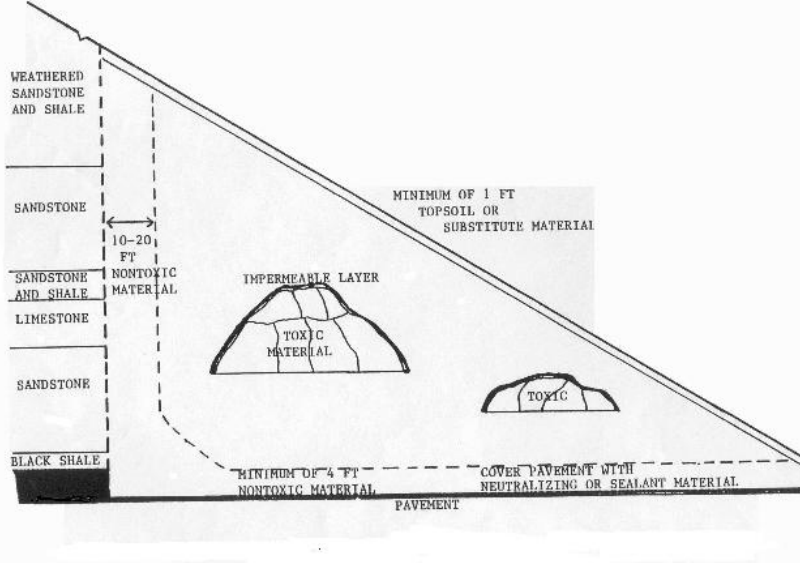
# Drilling and Blasting



10/13/2010

# Overburden Handling





# Lime the Pit floor



# Materials Handling

# High & Dry Placement





**Hurry Up!  
Mine Fast!**

**Don't leave pit  
open long**



**Alkaline Addition**

# Importance of Regrading Topsoiling Revegetation





# West Virginia Mine Drainage Task Force

[Home](#)

[2015 Symposium](#)

[Symposium Papers](#)

[Members](#)

[History](#)

[Links](#)

1106 Agric. Sci. Bldg.  
West Virginia University  
Morgantown, WV  
26506-6108  
304-293-2667

The West Virginia Mine Drainage Task Force was formed in 1978 and assigned to investigate the acid mine drainage (AMD) problem associated with surface mining in central West Virginia. Since then, the Task Force has broadened its scope to include areas outside of West Virginia with AMD problems.

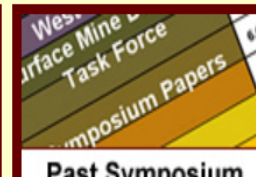
Task Force members represent the coal mining industry, regulators, private consultants, and scientists. The objectives of the Task Force are to keep current on new developments in AMD research, AMD treatment and control practices, and to present this information at annual symposia. Task Force Symposia have been held every year since 1980.

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Search x



2015 Symposium



Past Symposium Papers



Members



Links

<http://wvmdtaskforce.com>

# PROCEEDINGS

500+ papers

2008 3 29



## 28<sup>th</sup> West Virginia Mine Drainage Task Force Symposium

*April 10-11, 2007  
Morgantown, WV*

CO-SPONSORED BY  
WEST VIRGINIA MINE DRAINAGE TASK FORCE  
AND  
WEST VIRGINIA COAL ASSOCIATION

|   |     |
|---|-----|
|   | 8.5 |
| <b>West Virginia<br/>Surface Mine Drainage<br/>Task Force</b> | 8.0 |
|   | 7.0 |
|   | 6.5 |
| <b>Symposium Papers<br/>1980 - 1999</b>                       | 6.0 |
|   | 5.5 |
|   | 5.0 |
|   | 4.5 |
|   | 4.0 |

# Innovations Since 1987

## Examples of Papers

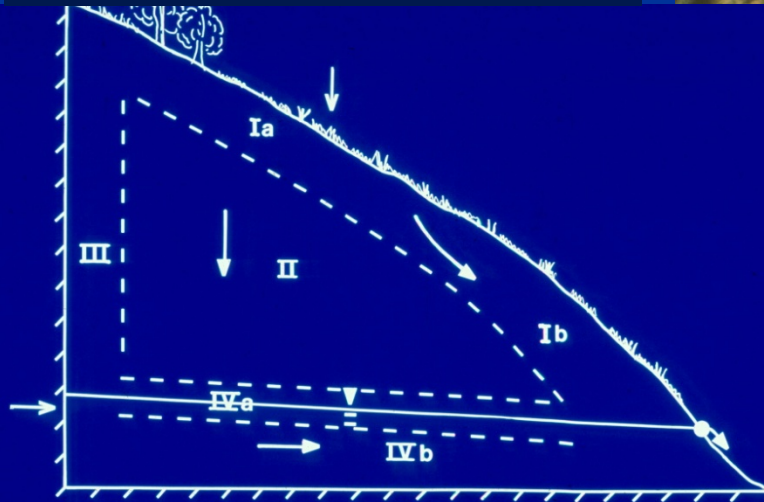


# DLM Site

Liner over refuse



## Oxygen Content



# Topsoiling Clay Caps Tracers



Prong Site



# Limestone in Underground Mines



# Refuse Piles – Alkaline Addition



2006 10 4

# Wetlands - 1990



# Anoxic Limestone Drains



# Water Wheel



# AMD Treatment Plant



2006 10 4



# New Passive Flushers





# West Virginia Mine Drainage Task Force

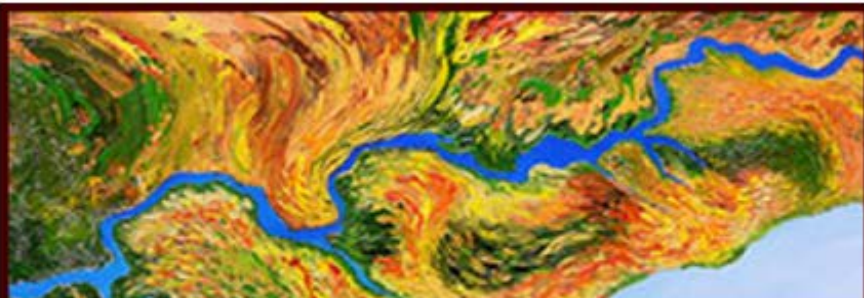
[Click Here!](#)



[Past Symposium Papers](#)



[Members](#)



[Links](#)



[History](#)



## West Virginia Mine Drainage Task Force

### Past Symposium Papers

Here you will find the papers presented at Task Force Symposia over the last 34 years 1980 - 2013.

- Home
- 2015 Symposium
- Symposium Papers
- Members
- History
- Links

| Proceeding year |      |      |      |      |      |
|-----------------|------|------|------|------|------|
| 1st             | 1980 | 14th | 1993 | 27th | 2006 |
| 2nd             | 1981 | 15th | 1994 | 28th | 2007 |
| 3rd             | 1982 | 16th | 1995 | 29th | 2008 |
| 4th             | 1983 | 17th | 1996 | 30th | 2009 |
| 5th             | 1984 | 18th | 1997 | 31st | 2010 |
| 6th             | 1985 | 19th | 1998 | 32nd | 2011 |
| 7th             | 1986 | 20th | 1999 | 33rd | 2012 |
| 8th             | 1987 | 21st | 2000 | 34th | 2013 |
| 9th             | 1988 | 22nd | 2001 | 35th | 2014 |
| 10th            | 1989 | 23rd | 2002 |      |      |
| 11th            | 1990 | 24th | 2003 |      |      |
| 12th            | 1991 | 25th | 2004 |      |      |
| 13th            | 1992 | 26th | 2005 |      |      |

# Continue to Search 1988 Task Force Tour

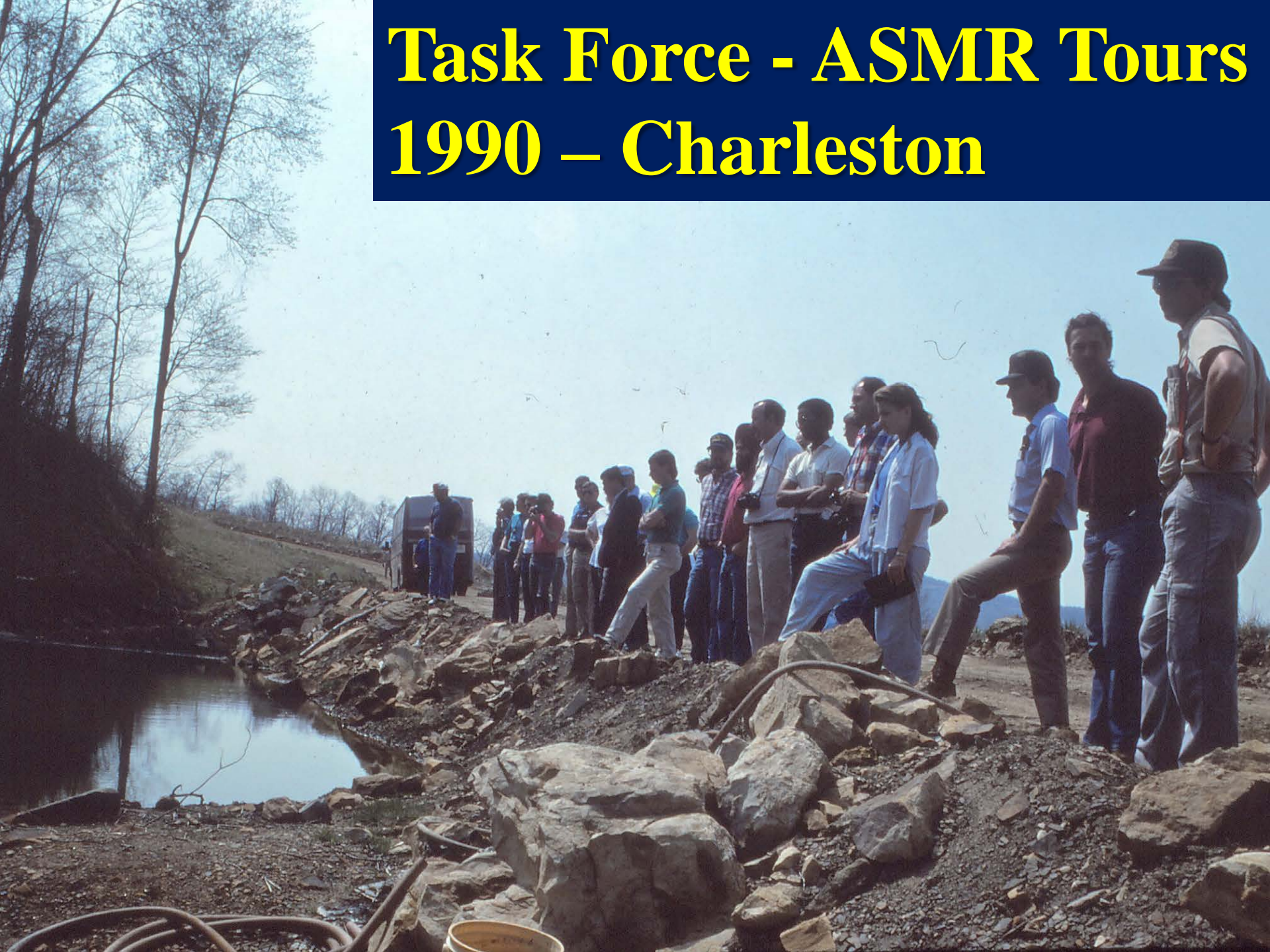


# Task Force - ASMR Tours 1990 – Charleston



Hobet Tour

# Task Force - ASMR Tours 1990 – Charleston



**Poof, Run for your life!**



# Task Force - ASMR Tours 1990 – Charleston

**Bus stuck!**



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# 1992 Task Force Members

25 yrs ago!



Beards were cool, apparently!

# Task Force - ASMR Tours 1994 – Pittsburgh



# 1997 Task Force Tour



20 yrs ago!

# Task Force – ASMR Tours 2004 – Morgantown



# 2004 Fall Tour



**Many of us still have lots to learn!**

**OCT 21 2004**

# 2005 - Jeddo Tunnel in Anthracite Region



# 2005 Task Force



2005 4 20

**Some fun along the way...**



09/17/2011



# 2009 Fall Tour Tennessee



# 2014 Fall Tour



# Keep Looking...



10/16/2009

**Willing to try anything!**



# Rootin' Tootin' Shootin' Time



**TA DA... All Solved!**



# Welcome to the Meeting!



# AMD Problems persist



2006 8 10



# Muddy Creek



# Importance of Surface Material Seeding

