Green Lands
WVMRA
1624 Kanawha Blvd. East
Charleston, WV 25311

Bulk Rate
U.S. Postage
PAID
Permit No. 1
Ravenswood, WV

BEN B. FAULKNER
RT 1 BOX 673
PRINCETON, WV 24740

"YOU CAN'T BEAT IT."

KOMATSU WA500-3 WHEEL LOADER

On coal jobs in the mountainous terrain of southwest Virginia and West Virginia, the WA500-3 Wheel Loader is making its mark. At Powell Valley Mining in Virginia, the WA500-3 loads material and faces up a new site while in West Virginia. Four-Way Trucking Co. uses a WA500-3 to load coal at Massey Coal Company's Marfork operations.

Komatsu's new WA500-3 adds up to more value and better return on your investment. It's what you've come to expect from Komatsu and Rish Equipment Co. Contact your nearest Rish branch today for details.

"You can't beat it," said Jessee Surber, construction foreman at Powell Valley. "It handles well, operator's like it, it's dependable, and its ease of servicing reduces maintenance time."

KOMATSU

Rish
EQUIPMENT COMPANY

COEBURN, VA • 540-395-6901 BECKLEY, WV • 304-255-4111 BLUEFIELD, WV • 304-327-5124 BRIDGEPORT, WV • 304-842-3511
LOGAN, WV • 304-752-9313 PARKERSBURG, WV • 304-422-8441 ST. ALBANS, WV • 304-755-3311 FROSTBURG, MD • 301-689-2211

Green Lands

Winter 1999

Productivity And Performance You'll Tip Your Hat To.

Performance. Productivity. Customer satisfaction. Plus a commitment to bring you a full line of the world's best equipment.

Louisville, KY (502) 456-4050	Corbin, KY (606) 528-9440	Allen, KY (606) 886-1276	Pittsburgh, PA (412) 741-1731	Clearfield, PA (814) 765-8500
Evansville, IN (812) 867-6661	Indianapolis, IN (317) 247-9125	Fort Wayne, IN (219) 482-3681	Nitro, WV (304) 755-7788	St. Louis, MO (314) 487-8925

Green Lands

Volume 29 Number 1

4 Coal Associations Sponsor First Ever "Winter Wonderland"

5 Coal Calendar

12 Three Top Twenty Teams Scheduled to Participate in Mountain State Coal Classic

16 Princess Beverly Coal Company

26 Reviewing Abandoned Mine Land Projects

43 Evaluation of Tree Growth on Surface Mined Lands in Southern West Virginia

Green Lands
is a quarterly publication of the West Virginia Mining & Reclamation Association, with offices at 1624 Kanawha Boulevard East Charleston, West Virginia 25311
(304) 346-5318, FAX 346-5310
E-Mail: wvmra@wvmra.com

On the Cover
On a sunny day in November, trees, still holding their brilliant fall colors, cover a mountaintop area mined just a few years ago by Princess Beverly Coal Company. This is just one of many sites that trees have become prevalent on reclaimed mine sites. See story on page 16.

WVMRA Staff & Board of Directors

STAFF
President
Benjamin C. Greene

Assistant to the President
Patty Bruce

Vice President
Daniel Miller

Editor
James LeFew

OFFICERS
Chairman
Wayne H. Stanley - Bridgeport

First Vice Chairman
William E. Broshears - St. Louis, MO

Second Vice Chairman
Phillip R. Cooper - Clothier

Secretary
Stephen G. Capelli - Kenova

Treasurer
John K. Skidmore - Charleston

Associate Division Chairman
David R. Hibbs - South Charleston

Directors
J. W. Anderson - Princeton
K. J. Bealko - Bridgeport
J. O. Bunn - Grundy, VA
R. D. Cussins - Bayard
B. H. Daud - Morgantown
B. E. Dearth, Jr. - Charleston
D. R. Donell - Weirton
T. L. Dotson - Prestonsburg, KY
R. E. Gallimore - Bluefield
J. H. Harless - Gilbert
T. W. Hylton - Beckley
J. C. Justice II - Beckley
R. L. McMillion - Charleston
P. K. Moran - Charleston
K. D. Nicewonder - Bristol, VA
D. T. Pochick - Bluefield
J. C. Smith - Charleston
D. B. Sult - Charlottesville, VA
J. C. Supcoe - Hansford
C. R. Sutton - Jane Lew
D. S. Walker - Charleston
J. H. Wellford - Charleston
K. G. Woodring - St. Louis, MO

Honorary Members
C. E. Compton - Bridgeport
L. W. Hamilton, Jr. - Hansford
J. C. Justice, Sr. - 1924-1993
F. B. Nutter, Sr. - Ft. Lauderdale, FL
L. A. Streets - 1926 - 1998
L. A. Vecellio, Sr. - 1915-1996

Our Reputation Is In Your Hands

That's why Carter Machinery is fully committed to total customer satisfaction. When you have the CAT equipment you need, the support you require, and the service you deserve, you've got all the tools you need for success. We back up all of our customers with the right equipment, 21 convenient locations and highly trained technicians. Service and parts are always available when you need it. That's our promise to you.

Carter CAT

(800) 768-4200

To most people, coal means affordable energy.
But for 43,000 West Virginians,
it means a way of life.

Wherever you live in West Virginia, whatever you do, the coal industry is an important part of your life.

- Coal mines employ 21,000 people at an average annual wage of $50,000.
- Coal creates 22,000 additional jobs for the companies and people who supply products and services to mines.
- Coal contributes over $200 million annually in state tax revenues.
- Coal and coal-reliant utilities pay 60% of all state business taxes.
- Coal supplies $3.6 billion to West Virginia's gross state product.

The working men and women of Arch Coal believe that responsible mountaintop mining protects the environment and beauty of our mountain heritage, and preserves a way of life for thousands of West Virginians. For a free brochure about how mountaintop mining works, call 1-800-686-1839. **Arch Coal, Inc.**

Photos shown clockwise: Jim Taylor, American Hydraulics; Larry Duff, Appalachian Electronics; Shane Lewis, M&P Distributors; Rush Sparks, Hobet 21 Mine; Cathy Gritt, Rish Equipment Company and Phillip Guthrie, Samples Mine.

Coal Associations Sponsor First Ever "Winter Wonderland"

For the first time ever, "Winter Wonderland" was created at Coonskin Park in Kanawha County sponsored by the West Virginia Mining and Reclamation Association and the West Virginia Coal Association.

More than 150,000 lights made a night at Coonskin Park a festive holiday while providing a subtle hint of the importance of coal to electricity and to West Virginia.

Deemed an overwhelming success, it was estimated that more than 5,000 people came to walk among the lights while listening to Christmas music during a three-weekend period in December.

Coal Calendar

January

13-15 26th Annual West Virginia Mining Symposium, Holiday Inn - Charleston House, Charleston, WV. Contact Patty Bruce (304) 356-5318.

17 Mountain State Coal Classic, Banquet, Raleigh County Armory, Beckley, WV. Contact Terry Miller, (304) 252-8528.

18-23 Mountain State Coal Classic Basketball Tournament, Raleigh County Armory, Beckley, WV. Contact Terry Miller, (304) 252-8528.

21-22 Threats to Coal: Consolidation Clean Air/Climate Change, Century 21 Technology, sponsored by *Energy Daily,* Ft. Lauderdale, FL. Contact Michael J. Marlow, (202) 662-8561.

26-31 WVMRA Semi-Annual Meeting, El Conquistador Resort, Puerto Rico. Contact Patty Bruce, (304) 346-5318.

February

7-10 25th Annual Conference of the International Society of Explosives Engineers, Nashville, TN. Call (440) 349-4004.

17-19 Environmental Permitting Symposium, sponsored by Air/Waste Mgmt. Assn./EPA, Research Triangle Park, NC. Call (412) 232-3444.

26 Kentucky Water Resources Annual Symposium, Wyndham Garden, Lexington KY. Contact Kim King (606) 257-4634.

March

27 Virginia Mining Association Annual Meeting & Awards, Holiday Inn, Norton, VA. Contact Debbie Rollins (540) 679-0456.

JANUARY

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

FEBRUARY

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28						

MARCH

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

Daniels Law Firm

P.L.L.C.

Business Law
- Commercial Litigation and Arbitration
- Incorporation
- Contracts
- Partnership and Joint Venture Agreements
- Mechanics Liens
- Environmental Law

Construction Law
- Bid Disputes
- Contractor Licensing
- Construction Claims and Defense of Claims
  a) General Contractor
  b) Subcontractor
  c) Owner
- Bond Payment Claims

Mining Law
- DEP/Administrative
- Leases and Contracts

Tax Law
- IRS Audits
- WV Sales Tax Audits
- Tax Planning
- Business Planning
- Buy-Sell Agreements

12th Floor One Valley Square • Charleston, WV

INDEX
TO ADVERTISERS

Arch Coal, Inc 3
Akers Supply. 53
Anderson of West Virginia 15
Beckwith Machinery ..... inside back cover
Bell Farms Reclamation Service 9
Carter Machinery 2
Cobre Tire 25
Crown Hill Equipment 21
Daniels Law Firm 6
Eagle Carbon 11
Heavy Machines 40
Hotsy Equipment 8
Kimberly Industries 24
Logan Corporation 56
Long-Airdox Company 42
Massie Reclamation 53
Nell Jean Enterprises 10
Ohio Seed 9
Penn Line Service 36
Petroleum Products 8
Rish Equipment ..... back cover
RMI, Ltd 14
Robinson & McElwee, LLP 11
Rudd Equipment ..... inside front cover
Triangle Surety Agency 11
Cecil I. Walker Machinery 28

Correction

In the last issue of *Green Lands* we incorrectly identified John Hall. The caption should have read: (from left) John Hall, Ken Woodring and Fil Nutter during the WVMRA banquet. We apologize for any inconvenience.

"Oil is our Product — Service is our Business"

PETROLEUM PRODUCTS INC

Beckley (304) 256•3000
Bluefield, VA (540) 326•1503
Charleston (304) 926•3000
Logan (304) 752•3900
Pineville (304) 732•6808
Williamson (304) 235•2234

What makes Clean Burn your best choice in a used-oil heating system?

You decide. Turn your used oil into free heat and profits.

CLEAN BURN
Multi-Oil Heating Systems
www.cleanburn.com

Call HOTSY First

Hotsy Equipment Co.
1-800-369-4687
Charleston, WV, Beckley, WV,
Clarksburg, WVWinchester, KY

Let us add a farming dimension to your seeding needs

Bell Farms
Reclamation
Summersville, WV

Robert Gene Bell, Jr.
(304) 872-6183

Specializing in
- Land Reclamation
- Hydroseeding
- Erosion Control

Robert Gene Bell
Rt. 1 - Box 373A
Summersville, WV
26651
Phone (304) 872-3749
FAX (304) 872-6891

Depend upon
The Ohio Seed Company
for all reclamation seed
high quality and prompt delivery

Service Quality Experience

TOLL FREE
1-800-879-3556
The Ohio Seed Company
P.O. Box 87
West Jefferson, Ohio 43162
(614) 879-8366

NELL JEAN ENTERPRISES

NELL JEAN ENTERPRISES INC.
NJE
MINE SUPPLY
INDUSTRIAL SUPPLY
253-0200
NELL JEAN SQUARE
BECKLEY, W.VA.

CENTURY LUBRICANTS CO. FUCHS

WE DELIVER

SANDVIK Rock Tools

COMMONWEALTH BOLT
ROOF CONTROL PRODUCTS

AEROQUIP*DIXON*BOWMAN
HYDRAULIC, SUCTION, DISCHARGE HOSES AND FITTINGS

CENTURY*DA*VALVOLINE
LUBRICANTS, FLUIDS

MAKITA*INGERSOL RAND*CP
PNEUMATIC & POWER TOOLS, GENERATORS

GREEN MACHINE*MAKITA*HOMELITE
PUMPS, BLOWERS, STRING TRIMMERS, CHAINSAWS

AMES*COUNCIL*COOPER
TOOLS, YARD TOOLS, HAMMERS, SPECIALTY TOOLS

VAREL*BAKER HUGHES*BRUNNER LAY
ROCK BITS, DRILL STEEL, DRILL SUBS

COBRA*UNIDEN*TRUCK SPEC
CB'S AND ACCESSORIES

SANDVIK
ROCK TOOLS & RESINS

FRAM-BENDIX-AUTOLITE
FILTERS, BRAKES, SPARK PLUGS

PROTO*SK*RIGID
HAND, SPECIALTY, PIPE TOOLS

CARBRITE*UNIPRO*CAMPBELL
CLEANING PRODUCTS, ABSORBENTS, TIRE CHAINS

CM*DIXIE*WYTH SCOTT
HOISTS, PULLERS, CHAINS

INTERSTATE*FORNEY*PERMATEX
BATTERIES, WELDING SUPPLIES, SEALANTS

CARHART*IRON AGE* CAROLINA
WORK CLOTHES, STEEL TOE AND METATARSAL BOOTS

BROWNING*REMINGTON*SMITH & WESSON
HUNTING BOOTS, CLOTHES, GUNS

S·K
COOPER INDUSTRIES COOPERTOOLS
BAKER HUGHES Mining Tools
Iron Age SAFETY SHOES
STANLEY STANLEY-PROTO INDUSTRIAL TOOLS PROTO
PERMATEX INDUSTRIAL
Valvoline
DIXON
RIDGID
INGERSOLL-RAND PROFESSIONAL TOOLS
DRYDENE HEAVY DUTY LUBES
ALEMITE

MINING & INDUSTRIAL SUPPLY
304-253-0200

EAGLE CARBON, INC.

Caustic Soda • Anhydrous Ammonia • Soda Ash Briquettes
Environmental Consultants • Quicklime
Road Oyl (for dust control and road stabilization)

Todd A. Dean • Highway 41 • Box 1636 • Summersville, WV 26651 • 872-1646

Digging Deeper

Complex commercial transactions and mineral development ventures require a law firm with the experience, the resources, and the energy to dig deeper into the issues and discover solutions that may otherwise go unexplored.

ROBINSON & MCELWEE LLP

A Leading Advisor to the West Virginia Coal Industry in Legal, Regulatory, and Governmental Affairs.

Charleston 304/344-5800 \ **Clarksburg** 304/622-5022
Responsible Attorney: Christopher B. Power

TRIANGLE
SURETY AGENCY, INC.

Specializing in:

- ▲Coal Reclamation Bonds
- ▲Self Insurance Bonds for Workers Compensation
- ▲Financial Guarantee Bonds

Suite 970, One Valley Square • Charleston, West Virginia 25301

304-342-4989 or 1-800-551-4989

Three Nationally Ranked Teams Scheduled for Mountain State Coal Classic

Number one team in the nation to play in tournament

Woodrow Wilson prepares to defend its title

Last year's Mountain State Coal Classic was a barn burner by any definition. Tournament Chairman Jim Justice said that this year will be even better.

Well, if the basketball tournament plays the way it is expected, Mr. Justice will be able to say "I told you so!"

The Coal Classic, scheduled for January 18-23, 1999 at the Raleigh County Armory in Beckley, WV, will include three nationally ranked high school boys teams.

Mt. Zion Christian Academy, Durham, N.C. (last year's Coal Classic runner-up); Oak Hill Academy, Mouth of Wilson, Va.; and Simon Gratz, Philadelphia; were ranked nationally as 3rd, 4th and 12th, respectively, in the Associated Press preseason poll.

However, since the season has begun, *USA Today* ranks Oak Hill as the number one team in the nation, while Simon Gratz and Mount Zion are ranked 8th and 11th. All three teams are currently undefeated.

Mt. Zion, who plays a national schedule, only had two losses last year, (26-2). One of the losses was to Woodrow Wilson during the Coal Classic.

Woodrow Wilson, before a sold out crowd, stunned Mt. Zion 81-72 in double overtime to capture the tournament's title.

Perennial powerhouse, Oak Hill Academy, will be bringing three players over 6-foot 8 to the tournament. The team was ranked No. 1 in the AP preseason poll in 1991 and again in 1993 when they finished that year on top with a perfect record, (30-0).

In the AA Division, tournament champion Tucker County High School, will be returning to defend its crown against three other strong division schools.

Besides powerhouses like these appearing in the Coal Classic, there is an added attraction for the student-athletes.

Woodrow Wilson stunned Mt. Zion 81-72 in double overtime to capture the title in last year's Mountain State Coal Classic in Beckley.

During the tournament, one player and one cheerleader of every high school, will be awarded a $500 college scholarship totaling about $17,000.

Scholarships have been a tradition at the Mountain State Coal Classic since its inception in Charleston ten years ago.

Last year, more than 14,000 fans attended the week-long tournament. This year should be no different.

For more information contact Terry Miller at (304) 252-8528.

Mountain State Coal Classic Lineup

Raleigh County Armory, Beckley, WV January 18-23, 1999

AAA
Parkersburg South
Oak Hill Academy
Woodrow Wilson
Elkins
Mt. Zion Christian Academy
Burch
Princeton
Simon Gratz

AA
Richwood
Oceana
Wyoming East
Tucker County

A
Marsh Fork
Baileyville
Fayetteville
Charleston Catholic

Girls
Woodrow Wilson High School
George Washington
Nicholas County
Tucker County

Junior High Boys
Shady Spring
Park
Independence
Beckley-Stratton

Junior High Girls
Shady Spring
Park
Independence
Pikeview Junior High

Colleges
College of West Virginia
Southern Wesleyan
Pikeville College
Ohio Valley

RMI, ltd.

Serving the Coal Industry for all of the Bonding and Insurance Services you need.

From Insurance Professionals you know

Call one of us today to get the service rolling:

- Bonding Programs
- Property and Liability Insurance Programs
- Self-insured or Fully-insured Benefits Plans
- 401(k), Group Life, Key Man Life Products

RMI, ltd.

RMI Stands for Insurance

A Division of City National Bank

WINFIELD (main office) — (304)586-0045
1 Wall Street • Winfield, WV

CHARLESTON	BLUEFIELD	CLARKSBURG	STATEWIDE
(304) 346-3024	(304) 324-3957	(304) 623-0696	1-800-377-6210
(304) 345-1070			

KEEP BACK

BLASTHOLE DRILLING

After all, if your drills don't stay on schedule, none of your other equipment will either. That's why you should consider the Ingersoll-Rand DM-M3, the most productive rig in its class for 9 7/8" to 12 1/4" (251 to 311 mm) holes. It uses a patented closed-loop hydrostatic feed system which runs up to 18% more efficiently than conventional systems, and provides single-lever control of speed and direction for simplicity of operation. A unique double-acting cylinder feed system allows for greater feed length with smaller diameter feed cylinders that reduce weight and structural demands on the tower. And it's backed by the world's best 24-hour service and support. Call Anderson of West Virginia at 1 304-756-2800 for more info.

Anderson

CHARLESTON AREA
Route 119 South, Alum Creek, WV 25003
304-756-2800

CLARKSBURG AREA
Lewis County Ind. Park, Jane Lew, WV 26378
304-884-7821

© 1995 Ingersoll-Rand Company

INGERSOLL-RAND
CONSTRUCTION & MINING

Princess Beverly Coal Company

Making a Difference in a Small Corner of the Industry

Princess Beverly employees are active with surrounding communities promoting the state's coal industry. Here, employees have a booth at the EPA hearing last November. A few week prior, they were promoting the industry at "Bridge Day" near Fayetteville.

For just a few moments, Pete Moran, president of Princess Beverly Coal Company, puffs on his cigar as he studies the company's active mining operation through the office building window. An operation Moran help build from the beginning. An operation Moran is very proud of.

Suddenly, his eyes locked on a plush area of grass and trees.

"See that mountain over there? It was shifting and cracked from previous mining," he said as he continued to peer out the window. "Water was hitting the mine seams and causing acid mine drainage. After we mined it, we put it back and it has grass and trees on it, just like before."

Having been in the business for 25 years, Moran knows firsthand that there are much greater benefits to mountaintop mining and reclamation than what the public tends to read or hear.

"Now that property can actually have a productive life," he said. "You could put a farm here. You could also build a development here. The infrastructure certainly is here."

As a result, Moran questions why critics who say reclamation efforts are not providing a better use for the land, blame coal companies.

"We don't own the land," he said. "We can't control what they do with the property when we are finished."

Yet Moran understands the importance of putting land back to a productive state when mining is completed. It was just two years ago that Princess Beverly was recognized by the West Virginia Mining and Reclamation Association and the Division of Environmental Protection for "its reclamation efforts for the unique combination of mountaintop removal and contour mining technology."

Locust trees swarm a reclaimed area that was mined in the late 1980s at Princess Beverly.

It was three men, twins Peter and Paul Moran and Lawson Hamilton, Jr., incorporated Princess Beverly Coal, now one of the largest independent surface operators in the state, in Greenbrier County 20 years ago.

During that time, the company worked one shift with 12 employees and produced about 100,00 tons of coal per year.

Then in 1984, due to a change in the industry, Princess Beverly's operation moved to Kanawha County and has been there ever since.

"It was around that year the price of metallurgical coal dropped to below the price of steam coal," Moran said. "As a result the operation had to mine more coal to keep the operation going. We had to keep up with the times."

When the operation moved to Kanawha County, the company began with eight employees and mined 100,000 tons of coal per year.

The company increased its production and employees every year and in 1990, it was producing close to 194,000 with 33 employees. One year later, production tripled with 36 employees.

Three years later, Princess Beverly expanded and opened its Notomine operation.

In 1997, the production mark crossed the 2 million-ton mark with 90 employees.

"We produced 2.1 million tons of coal that year," said Vice President Mike Snelling. "That's 10.26 tons per man hour. We might produce less tonnage, than larger operations, but we produce it more efficiently."

Are smaller coal operations better than larger ones in southern West Virginia? Not at all, Moran said.

"We just have a new style of management. The secret to our growth is that we are thin on the management side," he said. "We encourage participation from employees working in the operations. They know what we need to do and what the company's goals are."

Princess Beverly was recognized by the West Virginia Mining and Reclamation Association and the Division of Environmental Protection for its reclamation efforts for the unique combination of mountaintop mining and contour mining technology.

And like any other coal company safety awareness is high on the priority list. "Safety is *the* most important thing around here," Moran said.

Like many operators, Moran gets frustrated with the way today's coal industry is treated in West Virginia.

He said that 20 years ago start-up costs would be around $1 million and the permit process used to cost $10,000 for a surface mine. Today, it costs about $10 million in start-up capital.

> *"We don't own the land. We can't control what they do with the property when we are finished."*
>
> Pete Moran, President,
> Princess Beverly Coal Company

In addition, Princess Beverly has about $330,000 in a 375-acre permit and another $550,000 in a 2,400-acre surface mine permit.

Yet, if it cost so much to mine coal, why stay in the business?

"I have too much invested here," he said.

Moran emphasized how the money generated from coal stays within the state. "We pay local mechanics to work on our equipment and our employees spend money in the surrounding communities. It all stays home. The money doesn't leave the state."

Including the taxes paid by the company.

"We pay 2.5 million in severance taxes alone," he said noting that is one of many taxes paid by coal operators. "Add this up and it means that the state of West Virginia gets more money per ton of coal mined than do the operators themselves."

Although Princess Beverly does not use a dragline, it is easy to see the large capital investment. Large bulldozers, which include eight Komatsu D575A-2 Super Dozers, that exceed 40 feet in length are the primary production tools. Along with nine rock trucks and 11 large class production bulldozers complete the main stay of the company's operation.

"Many small and medium size coal operators in the eastern U.S. rely heavily on large dozer production for a majority of their overburden removal," Snelling said.

Moran said this equipment allows the company to maximize bulldozer production while only hauling fill that cannot be moved by bulldozers. This is what keeps them competitive with draglines that move so much more earth at one time.

Princess Beverly's philosophy has three essential elements for profitability:

- Blast cast as much as possible;
- Push all you can push;
- Haul only what you have to.

By utilizing large bulldozers, Princess Beverly can consistently achieve its operating goals.

The cost of using a bulldozer is about 1/3 of a haul yard. So operator training is critical to keep lower overall costs. In other words, push all you can push with a bulldozer and haul only what you need to haul.

This is achieved by hauling the upper and lowest interburden while bulldozers reduce middle seams. This minimizes haulage and maximizes bulldozer usage.

In fact, Moran estimates that about 80% of the total cut is moved by bulldozer while the remaining 20% is hauled.

This is in conjunction with the size of that particular cut.

"The longer the pit length the better," Snelling

said. "Longer pit lengths minimize operational delays and can create multiple working faces in the same mining cut."

By using bulldozers, Princess Beverly uses different techniques in removing the earth above the coal seams and still extracts 100% of the coal.

Outside of the operation, Princess Beverly knows how to be a good corporate citizen and stays active within the local community. Employees volunteer with local fire and rescue squads and of course, monetary donations to local little league teams and schools are frequent.

In fact, the company gave $5,000 to Cabin Creek Dawes Elementary School for Christmas that was matched by its neighbor, Catenary Coal. The money was used to buy much needed clothes as well as holiday presents for the school's students.

"Every kid should have a Christmas," Moran said.

It is easy to see why Princess Beverly employees are proud of the job they do, the industry they support and of the company they represent.

Bolt-On Segments & Heel Plates Available from Crown Hill Equipment,Inc.

Quality manufactured Bolt-On Segments & Heel Plates by GH Hensley for ***Caterpillar 980, 988, & 992 loaders.***

BOLT-ON SEGMENT WITH RIBBED BOTTOM IS EXTRA THICK

- *Durable heat-treated steel castings*
- *Half-arrow design: increases penetration and reduces wear to the leading edge*
- *Accepts O.E.M. bolt and nut or standard size plow bolts and nuts*
- *Ribbed-bottom design traps material to greatly reduce wear of our cast parts*
- *Thicker material on the bottom extends wear life beyond O.E.M. flat plate*

BOTTOM VIEW OF LOADER BUCKET

Hensley Cast Steel Bolt-On Heel Plates Replace Cat O.E.M. Flat Rolled Plate.		
Machine Model	**Cat O.E.M.**	**Hensley Part #**
980C 973	7V0910 or 9V6109	**7V0910HX**
988	6Y3609 or 9V5793	**6Y3609HX**
992	6Y3610 or 6W0276	**6Y3610HX**

Crown Hill Equipment, Inc.

Box 210, Hansford, WV 25103-0210

304/595-4111

inside WV **1-800-950-4445**

Princess Beverly Through The Years

1978 - Princess Beverly incorporated in Greenbrier County with 12 employees averaging 100,000 tons per year.

1984 - Company moves to Kanawha County and opens Kayford Operation with eight employees.

1990 - Princess Beverly produces 193,000 tons with 33 employees.

1993 - Notomine Operation starts production and surpasses 1 million tons. Princess Beverly has grown to 57 employees.

1996 - Company increases to 75 employees.

1997 - Princess Beverly produces more than 2.1 million tons of coal with 90 employees.

Princess Beverly Coal Company
At A Glance

Kayford Operation

Mining Methods	Mountaintop Mining
Permitted Acreage	809 Acres
Operating Schedule	2-10 hour shifts
Number of Employees	39 hourly
Major Customer	Utilities
1997 Tons produced:	1,011,794

Notomine Operation

Mining Methods	Mountaintop Mining
Permitted Acreage	1,000 Acres
Operating Schedule	2-10 hour shifts
Number of Employees	37 hourly
Major Customer	Utilities
1997 Tons produced:	1,099,552

Meet the team that's carefully constructing a better West Virginia.

You may not see us when we build an airport runway, prepare a site for commercial development, create a landfill, face up a new mine, or reclaim land after it's mined. But we're part of the team that helps you accomplish your goals. We have the staff, the expertise, and the equipment to promise a quick response, and a job done with the highest safety and quality standards.

We stake our reputation on it.

Call John Wellford or Gerald Ramsburg at 304 346-3775 and put Kimberly's team to work on getting the job done right for you.

Kimberly Industries®
The Get it done right Company

Kimberly Industries, Inc. NorthGate Business Park One Wellford Way Charleston, WV 25311 304 346-3775

The BIGGEST Name in BIG TIRE Service!

With over 25 years experience **SERVICING BIG TIRES**, no job is too **BIG** for the team at **COBRE TIRE**. We're proud of the **SERVICE** we provide our customers, so naturally, they're our best references...

How did we become the world's largest retailer and service provider to the construction and mining industry? Easy. By implementing our "Total Tire Management" system. Simply defined, it's our exclusive professional tire management program that extends tire performance and reduces our customers' operating costs.

To learn more about our **SERVICE** based company, our professional tire management program and the names of our well-**SERVICED** clients, **CALL 1-800-722-0007.**

BRIDGESTONE/FIRESTONE OTR

COBRE TIRE

A Division of BRIDGESTONE/FIRESTONE, INC.

Reviewing Abandoned Mine Land Projects

The following fourteen pages depict outstanding reclamation projects throughout West Virginia.

"Before" and "After" photographs are shown for comparison of how companies have returned old abandoned areas into modern-day reclamation projects with funding provided by the current West Virginia coal industry.

Whitman Flats

Randolph County

With a special emphasis on water quality, this project was completed in the fall of 1996 at a cost of $1.17 million. About 200 acres were reclaimed that was mined in the 50s, 60s and early 70s. With more than 11,000 linear feet of limestone surface ditches constructed, water quality continues to improve greatly enhancing the Middle Fork watershed.

Bellwood Tipple/Refuse

Fayette County

This leftover refuse pile, had not only burned prior to being reclaimed, but was unsightly to local residents. Carefully engineered water drains were constructed to eliminate water quality problems and direct water away from the public road.

reclamation

(rek′lə mā′shən)

It's a big word with an important meaning to West Virginians. And with reclamation, previously mined sites like the one transformed by Catenary Coal in Kanawha County are now more beautiful than ever.

Walker Machinery and Caterpillar equipment play a vital role in West Virginia's reclamation success. We'll continue that tradition in the future, for our state and for our children.

For the best equipment, parts, and service available to the industry, the spelling is a lot easier. W·A·L·K·E·R.

Charleston
Route 60 East
Belle, WV 25015
(304) 949-6400

Huntington
837 Adams Avenue
Huntington, WV 25704
(304) 526-4800

Logan
Route 10
Rita, WV 25619
(304) 752-0300

Jackson, Ohio
11069 Chillicothe Pike
Jackson, OH 45640
(740) 286-7566

Parkersburg
4010 Emerson Avenue
Parkersburg, WV 26101
(304) 424-0200

Beckley
Route 16
Crab Orchard, WV 25827
(304) 253-2706

Summersville
815 Main Street
Summersville, WV 26651
(304) 872-4303

Walker CAT

©1997 Cecil I. Walker Machinery Co.

Turner-Douglas Complex

Preston County

Located near the West Virginia/ Maryland border, this pleasing 58-acre site contained coal refuse piles, collapsed mine portals and red dog suspected to have burned around the time of World War II. Reclamation work greatly improved water quality to Laurel Run and the Youghiogheny River.

Upper Decker Creek #5

Preston County

This AML project was the culmination of the cooperation efforts between the DEP's Abandoned Mine Lands office and the USDA's Natural Resources Conservation Service that greatly improved water quality in Kanes Creek. Since its completion, the pH level is well within the 6 to 9 pH standard.

Indian Ridge

McDowell County

These two pages demonstrate the excellent reclamation work on several different sites within the project that cost approximately $1 million to complete. With extremely steep slopes causing severe erosion that directly impacted the community of Crumpler, a major hazard to local travel has been eliminated.

Site #4

PENN
LINE SERVICE INC.

Diverse Dimensions in Specialty Contracting

Scottdale, PA 15683 • 412/887-9110

Duo Refuse

Greenbrier County

Prior to completing this project, this area was an attraction for ATV riders while others dumped household garbage, junk cars and other trash. This area was an unsightly, unsafe mess near the community of Duo until completed this fall.

Piney Creek Refuse

Raleigh County

Left is an area with an extremely steep slope refuse pile located behind Beckley area residents until repaired with AML funds as seen above. Every rainstorm would cause excessive erosion into yards and blocked local travel.

These two scenic areas of the Piney Creek project cost more than $750,000 of AML money to complete. It was highly visible as well as an everyday eyesore to Beckley residents and visitors. This page represents a portion of the project that is located around the Eisenhower Bridge, an exit off of I-64 that travels directly into Beckley.

Tradition Proud. Technology Wise. Leading The Way Into The Future.

Today's LeTourneau.

In surface mines and heavy construction sites around the world, the complete line of LeTourneau loaders has established a tradition of engineering and manufacturing excellence unparalleled in the industry. From the exacting blend of special alloy steel used in frames, lift arms and buckets to micro-machined gearing and hand-assembled solid-state circuit boards, quality and durability are priority one.

Utilizing proven diesel-electric power with the lowest center of gravity, LeTourneau loaders operate at a constant engine speed for superior fuel savings and longer engine life. Computerized, no-spin torque is individually controlled to each traction motor, so if traction is lost at one wheel, power is instantly redistributed to the other drive wheels.

LeTourneau loaders offer the most complete range of efficient and productive buckets precisely sized for any material, with solid-state controls providing faster cycle times and greater productivity than any comparably-sized loader.

Superior safety features include an acoustically advanced operator's cabin design with non-obstructive integral ROPs and sloped rear cowling for unequalled visibility. The primary regenerative dynamic-retarding brake system brings the loader to a complete stop, with secondary air-operated disc brakes mounted on each motor.

And when it comes to state-of-the-art technology, LeTourneau continues to lead the pack. The generators, traction motors and solid-state electronic controls are the most advanced in the industry, with interchangeable modular components for easy service and maintenance access.

So when only the best-built, finest quality, most productive loader will do, look to today's LeTourneau. Tradition proud and technology wise.

HEAVY MACHINES INC.

100 SMILEY DR.
P.O. BOX 430
ST. ALBANS, WV 25177
(304) 755-7000
FAX: (304) 755-1045 PARTS
FAX: (304) 755-1047 OFFICE
(800) 362-3761

Loaders From Today's LeTourneau

	L-1000	L-1100	L-1400
Operating Payload			
Standard	51,000 lbs. (23,133 kgs.)	66,000 lbs. (29,937 kgs.)	84,000 lbs. (38,102 kgs.)
High Lift	48,000 lbs. (21,773 kgs.)	60,000 lbs. (27,216 kgs.)	78,000 lbs. (35,381 kgs.)
SAE-Rated Bucket Capacity			
Standard	17 yd^3 (13.00 m^3)	22 yd^3 (16.82 m^3)	28 yd^3 (21.4 m^3)
High Lift	16 yd^3 (12.00 m^3)	20 yd^3 (15.29 m^3)	26 yd^3 (19.9 m^3)
Dump Heights			
Standard	18'-5" (5.61 m)	18'-10" (5.74 m)	21'-6" (6.55 m)
High Lift	19'-10" (6.04 m)	20'-0" (6.10 m)	23'-6" (7.16 m)

LONG-AIRDOX.

CUTTING COSTS...NOT CORNERS.

BECAUSE THESE LUMPS OF COAL ARE WORTH CONSIDERABLY LESS THAN THEY WERE JUST THREE YEARS AGO.

With coal prices at mine level dropping 15 to 20 percent during the past three years, improving profitability is tough. Knowing this, we at Long-Airdox have streamlined company operations and quickly strengthened our professional capabilities to support the global coal mining industry effectively and efficiently.

- Consolidated operations
- Broad-based product technological advances
- Stringent quality standards
- Expanded, responsive customer service
- Improved organizational and production efficiencies
- Modernized worldwide company communications

And that's just the beginning.

Cutting your operation costs without cutting corners ... without compromising the quality of our products ... is our objective.

We have renewed our focus on sustaining strong long-term customer relationships to meet the challenging demands of today's ... and tomorrow's ... worldwide marketplace.

Long-Airdox ... committed to reducing your mining costs and boosting your profitability with dependable, high-performance products and systems.

LONG-AIRDOX

Virginia Tech Corporate Research Center
1750 Kraft Drive, Blacksburg, VA 24206
(540) 552-5555 Fax: (540) 552-5525
e-mail: sales@long-airdox.com

A member of The Marmon Group of companies

EVALUATION OF TREE GROWTH ON SURFACE MINED LANDS IN SOUTHERN WEST VIRGINIA

By
Jeff Skousen, Paul Ziemkiewicz, and Christina Venable
West Virginia University

INTRODUCTION

Coal mining has disturbed approximately 6 million acres since 1930 in the United States. In Appalachia, the vast majority of land mined for coal was originally forest land. Laws were passed in Ohio, Pennsylvania, and West Virginia during the late 1930s and 1940s requiring mine operators to register with the state and pay bonds to ensure some reclamation would take place after mining.

Reclamation prescribed in these early laws directed soil, subsoil, and overburden (the geologic material overlying the coal) be used to refill the excavated area. Backfilling and leveling the land was specified, and then trees and shrubs were to be planted in the regraded areas.

Studies of surface mine revegetation with trees began in the 1940s. Black locust (*Robinia pseudoacacia* L.) was the most extensively studied and successful species (Brown and Tryon 1960). Other species such as autumn olive (*Elaeagnus umbellata* Thumb.), Virginia pine (*Pinus virginiana* Mill.), red pine (*P. resinosa* Ait.), and white pine (*Pinus strobus* L.) grew well in many of those early studies (Brown 1962, Chapman 1947, Potter et al. 1955, Tryon 1952). Hardwoods like oaks (*Quercus spp.*) and cherry (*Prunus spp.*) failed to grow usually because the trees sustained rodent damage.

During ensuing decades, laws and regulations governing surface mine reclamation in the eastern U.S. evolved into seeding grasses and legumes rather than establishing trees. The rationale for this change was that forage species controlled erosion, provided a quick economic return to land owners through haying or grazing of livestock, and was aesthetically pleasing. These laws have generally hindered tree planting because they permit partial release of reclamation bonds as soon as the ground cover requirement is met. The cover requirement is achieved by herbaceous plants, and planting of woody plants is an added reclamation expense to mining companies. In addition, the herbaceous cover competed with planted tree seedlings resulting in high mortality.

Under management, most mined areas in the eastern U.S. are capable of highly productive, sustained forage crops. However without management, hayland and pasture in West Virginia, either by design or under declining management, ultimately returns to forest. Woody species will become established by natural secondary succession if given the opportunity and sufficient time, especially where the reclaimed site is surrounded by native forest. However, establishment of a forest of commercially valuable trees by natural succession is extremely slow.

Most large-scale surface coal operators in southern West Virginia have revegetated their mined areas with grasses and legumes. Fewer operations established tree plantings or wildlife habitat plantings. Given the current emphasis on large-scale surface mining in West Virginia's low-sulfur coal fields, coal operators, regulators, the public and scientists are interested in the development of sustainable forests on reclaimed mines.

OBJECTIVE OF THE STUDY

The objective was to evaluate the process of forest invasion on reclaimed surface mines in southern West Virginia and to compare the process to endpoints represented by forests on adjacent, unmined soils.

MATERIALS AND METHODS

This study evaluated tree establishment and growth on three reclaimed mountaintop removal surface mines in southern West Virginia. All of these sites had been revegetated with grasses and legumes, and sometimes black locust seed was added into the seed mix. The sites were:

- Mynu Mine: 23 years since initial revegetation,
- Zapata Mine: 22 years since initial revegetation,
- Amherst Mine: 19 years since initial revegetation.

Site Descriptions

Three sites were selected in southern West Virginia: 1) the Mynu mine, 2) the Zapata mine, and 3) the Amherst mine (Table 1). These old mined sites currently have large-scale mining taking place on adjacent areas. The three surface mines removed coal from the Kanawha and Allegheny Formations of the Pennsylvanian System. These formations are dominated by the Homewood and Upper Connoquenessing sandstones, and Winifrede shales. Overburden composition can generally be described as 60% sandstone and 40% shale. A detailed stratigraphic description of the overbur-

Table 1. Location and description of mountaintop removal surface mines sampled for vegetation characteristics in southern West Virginia.

Characteristic	Mynu	Zapata	Amherst
County Location	Kanawha/Boone	Boone/Logan	Logan
Nearest Town	Eskdale, WV	Sharples, WV	Yolyn, WV
Coal Seams Mined	No. 5 Block No. 6 Block	Stockton No. 5 Block	Coalburg Stockton No. 5 Block
Mining Method	Mountaintop Rem.	Mountaintop Rem.	Mountaintop Rem.
Mining Dates	1971 - 1975	1973 - 1976	1974 - 1979
Postmining Topography	Flattened top and outslope.	Flattened top, valley fill, and outslope.	Flattened top, gently rolling top, valley fill, and outslope.
Years since Reclaimed	23	22	19
Revegetation Species	Grasses, legumes, and Black Locust	Grasses and legumes.	Grasses, legumes, and Black Locust.

Figure 1. Site location in southern West Virginia where we studied tree growth on surface mines.

den and soil information for each site is available from the authors.

The **Mynu Mine** is located approximately 30 miles southeast of Charleston, WV, near the town of Eskdale, on the Kanawha and Boone County line (Figure 1). Mining activities of various companies have been ongoing at this site since the early 1960s. Coal seams mined at the site are the No. 5 Block and No. 6 Block (Lower and Middle Kittanning). Much of this area had been previously mined, leaving old highwalls and unreclaimed areas. The current mining operation near this site is owned by Catenary Coal Company, and the company has been mining (and remining) by mountaintop removal.

The specific site studied as a part of this project was mined by Mynu Coal Company between 1971 and 1975. The mountain ridge had been removed to mine the coal and a flat bench was left. According to mining personnel, mining equipment at the time included front-end loaders, bulldozers, and trucks. Reclamation practices at the time included seeding the area with grasses and legumes, with a small amount of black locust in the seed mix. Our vegetation sampling transects traversed the flattened top, the outslope, and undisturbed areas.

The **Zapata Mine** is located approximately 40 miles south of Charleston, WV, near the town of Sharples, on the Boone and Logan County line. Mining activities began here in 1965. The coal seams mined at the site are the Stockton and No. 5 Block. The current operation is owned by Arch Coal, and mountaintop removal is the mining technique.

The site studied for this project was mined by Zapata Coal Company (Beebait Branch site) between 1973 and 1976. A flattened top was left and some material had been pushed over the side. A valley fill was constructed on the site to contain excess spoil from the operation. Our transects traversed the flattened top, valley fill, and outslope. An adjacent undisturbed area was also sampled for vegetation cover. Mining equipment was assumed to be front-end loaders, bulldozers, and trucks. Reclamation at the site included seeding with a mixture of grasses and legumes.

The **Amherst Mine** is located approximately 15 miles southeast of Logan, WV, near the town of Yolyn, in Logan County. Mining activities began in 1970. The coal seams mined at the site are the Coalburg, Stockton, and No. 5 Block. The current operation is owned by Arch Coal, and the area is being mined by mountaintop removal surface mining methods.

The site studied for this project was mined by Amherst Coal Company (Jordan Fork site) between 1974 and 1979. A gently rolling terrain was left on the top of some of the area, while another portion had a flattened top. A valley fill was constructed for excess spoil material. Our transects traversed the flattened area and valley fill, the outslope, and undisturbed areas. Mining equipment was a BE 295 Shovel, front-end loaders (Cat 988), and trucks (Cat 777). Reclamation on the site included seeding with a mixture of grasses and legumes, and black locust and smooth alder (*Alnus serrulata* (Ait.) Willd.).

Sampling Methods

At each of the three sites, a point was randomly located at the edge of the reclaimed, flattened top and the outslope. At that point, a major compass direction was chosen (North, South, East, or West) that was most perpendicular to the direction of the edge between the top and outslope. A transect was then established along that compass direction. The transect extended 150 feet onto the flattened top (the reclaimed area), 150 feet into the outslope area, and 150 feet into undisturbed woodland (each of these areas are denoted "sections"). This process was repeated twice more on each site, for a total of three transects (each being 450 feet in length) and three sections (150 feet each on flat, outslope, and undisturbed areas) on each transect.

Along the transect, systematic sampling of vegetation occurred. Total canopy cover was estimated (as a percentage) by taking a vertical sighting with a 1-inch diameter tube at a height of 7 feet every 5 feet along the transect line. Tree species in the canopy were identified.

Tree density and diameter at breast height (dbh) were determined in a plot measuring 7.5 feet wide and 150 feet long along the transect in each section. All trees rooted in the plot were identified by species and their dbh determined. Basal area was calculated by multiplying stem densities by dbh and converting this area to ft^2 per acre. Herbaceous cover was determined in 1/4 m^2 quadrats placed on the right side of the transect at 20-foot intervals. Total herbaceous cover was estimated and plant species (grasses, legumes, vines, and shrubs) contributing to the total herbaceous cover were also identified.

Average vegetation values (canopy cover, herbaceous cover, and stem density) were determined for each section along each transect and these values were compared statistically within each site. Comparisons were also made for vegetation parameters among sections for a site and among sites.

RESULTS AND DISCUSSION

Canopy Cover: Total tree canopy cover for all undisturbed sites was between 84 and 88% and these values were not significantly different among sites (Table 2). The outslope areas of the surface mines varied in cover from about 70% at Mynu and Zapata to 28% at Amherst. The outslope area on Amherst had been seeded with grasses, legumes, and trees, while the outslope areas on Mynu and Zapata had not been seeded. Therefore, the outslope area at Amherst had much less tree cover compared to these same areas on Mynu and Zapata, and the seeding of herbaceous plants on Amherst greatly hindered the re-establishment of trees in that area. Spoil material had been apparently pushed over the side during mining on Mynu and Zapata, and trees were growing well in this spoil

Table 2. Total tree canopy cover, herbaceous cover, stem density, and basal area at three different positions (undisturbed, outslope, or flat top) for three mountaintop surface mines in southern West Virginia.

	Mynu			Zapata			Amherst		
Parameter	Und[a]	Outs	Flat	Und	Outs	Flat	Und	Outs	Flat
Tree Canopy Cover (%)	85	70	24	88	72	15	84	28	14
Herbaceous Cover (%)	22	14	67	27	25	68	17	95	78
Total Stem Density (Stems/ac)	1483	1838	1182	1240	2745	669	712	496	322
Total Basal Area (Ft^2/ac)	48	79	45	74	72	9	60	15	7

[a]Und = Undisturbed section; Outs = Outslope section; Flat = Flat top section.

material. The flattened tops on all sites had low amounts of tree canopy cover (varying between 14 and 24%). The flat tops were seeded with grasses and legumes, and trees had a much more difficult time establishing, much like the outslope area at Amherst.

Herbaceous Cover: Herbaceous cover was almost opposite of tree cover. On undisturbed areas on all three sites and outslope areas of the Mynu and Zapata sites, herbaceous cover varied between 14 and 25%. On the reclaimed flat tops and the Amherst outslope, herbaceous cover was greater than 65%.

Tree Density: The stem density of all trees (all sizes) on undisturbed areas varied between 712 stems/acre at Amherst to 1,483 stems/acre at Mynu. Fewer trees were found on flat areas than on other areas at all sites, while the highest stem densities were found on outslope areas at Mynu and Zapata. The Zapata outslope was heavily wooded and covered by numerous small trees. Basal area of all trees on each site is also provided.

Tree Size: A better understanding of the size of trees on these sites can be discerned by dividing the trees into two size categories (Table 3). The undisturbed areas at Mynu and Zapata had around the same number of trees >1 inch dbh. The average dbh of trees in this size category was 3.5 inches for Mynu and 4.2 inches for Zapata. The undisturbed site at Amherst had fewer trees, but the average dbh of these trees was 5.1 inches. The Mynu and Zapata outslope areas had more trees with slightly smaller average stem diameters, while the flat areas on Zapata and Amherst were occupied by fewer and smaller trees.

The density of trees with stem diameters <1 dbh are also shown in Table 3. The undisturbed areas had many small trees in this size category and, in two out of three cases, had more than corresponding outslope and flat areas. The average stem diameter of understory trees in undisturbed areas was 0.15 inches at Mynu, and about 0.27 inches at Zapata and Amherst. It is likely that the greater competition for water and light in the better developed forest hindered the growth of understory trees and kept those that had established relatively small. The outslope areas at Mynu and Zapata, as mentioned, had many trees, while the flat areas at Zapata and Amherst had relatively few trees.

Species Composition: Individual tree species found along the transect and their stem density are shown in Table 4. The Mynu undisturbed area was dominated by red maple (*Acer rubrum* L.) and tuliptree (*Liriodendron tulipifera* L.), but also had 10 other tree species contributing to the tree community. The Zapata undisturbed area was dominated by tuliptree, with smaller amounts of sugar maple (*Acer saccharum* Marsh.), pawpaw (*Asimina triloba* (L) Dunae), sourwood (*Oxydendrum arboreum* (L) DC), black gum (*Nyssa sylvatica* Marsh.), sassafras (*Sassafras variifolium* (Nutt.) Nees), and seven other species of less importance. The Amherst undisturbed area was dominated by red maple and hickory, with small amounts of 10 other tree species.

The outslope area at Mynu was the most diverse tree community of all sites and all sections, having a total of 16 tree species. The dominant species were sourwood, red maple, black birch (*Betula lenta* L.), black locust, and autumn olive. The outslope of Zapata was dominated by red maple, sourwood, and black locust. Many of the red maple trees on this site had stem diameters from 0.1 to 2 inches (average dbh of red maple was 1.7 inches, Table 5). The outslope of Amherst was mostly occupied by red maple, black locust, autumn olive, and tuliptree.

On reclaimed flat areas on these mountaintop removal surface mines, red maple and black locust were the most prominent tree species. The Mynu flat area also had many stems of black birch and sourwood, both of which were fairly small trees (average dbh were less than 1.3 inches, Table 5), and pines. The Amherst flat area simply did not have many trees. This could have been due to competition from the herbaceous cover or soil compaction (Table 2).

Forest succession: There were substantial differences in species composition among the three sites and sections. The undisturbed sites were dominated by tuliptree, sugar maple and red maple, with minor contributions from red oak, hickory, black gum, black birch and ash (Tables 4-5). Outslope areas were dominated by red maple, black birch, tuliptree, sourwood, and black locust. On flat areas, red maple and black locust were the dominant trees.

Reforestation on outslope areas is progressing much more quickly than on flat top areas. It is also clear that the Mynu and Zapata mines are progressing successionally more quickly than the Amherst mine. The following gradient of forest community development is apparent among the reclaimed sites from least to most developed:

Amherst flat ≤ Zapata flat < Mynu flat ≤ Amherst outslope < Zapata outslope ≤ Mynu outslope.

Early succession.....Later succession
Least developed.....Most developed
black locust < pines < red maple < sourwood < black birch< tuliptree

Early succession is marked by a predominance of

Table 3. Stem density of trees >1 dbh and <1 dbh with corresponding basal areas at three different positions (undisturbed, outslope, or flat top) for three mountaintop surface mines in southern West Virginia.

Parameter	Mynu			Zapata			Amherst		
	Und[a]	Outs	Flat	Und	Outs	Flat	Und	Outs	Flat
Stem Density >1 dbh (Stems/ac)	716	1408	706	756	2129	448	422	310	182
Average dbh of Stems >1 dbh (inches)	3.5	3.2	3.4	4.2	2.5	1.9	5.1	3.0	2.6
Basal Area of Stems >1 dbh (Ft^2/ac)	48	80	45	74	71	9	60	15	7
Stem Density <1 dbh (Stems/ac)	767	430	476	484	616	221	290	186	140
Average dbh of Stems <1 dbh (inches)	.15	.44	.50	.29	.39	.50	.26	.34	.24
Basal Area of Stems <1 dbh (Ft^2/ac)	.09	.45	.65	.22	.51	.30	.11	.12	.04

[a]Und = Undisturbed section; Outs = Outslope section; Flat = Flat top section.

Table 4. Stem density (stems/ac) by species over three positions (undisturbed, outslope, or flat top) for three mountaintop surface mines in southern West Virginia.

Parameter	Mynu			Zapata			Amherst		
	Und[a]	Outs	Flat	Und	Outs	Flat	Und	Outs	Flat
Box elder								12	
Striped maple	20								12
Red maple	567	396	250	38	1490	361	203	191	64
Sugar maple	81	17	37	98		12			
Pawpaw				95			12		
Yellow birch				39					
Black birch	68	279	150		25	13		24	
Lespedeza		8							
Hickory							191		
Redbud				215				13	
Dogwood				13	24				
Autumn olive		181						52	42
Hazelnut							13		
Grape	45			13			39		
Tuliptree	320	104		407	26	12	40	64	24
Magnolia	9								
Laurel									13
Black gum	46	32		64			12		
Sourwood	118	438	250	96	680	13	42		40
Paulownia		9						12	
Red pine			25						
Pitch pine		52	202						
Aspen			13						
Black cherry		8	12				24	13	25
White oak			13	12					
Chinq. oak	77	17							
Black oak			25						
Chestnut oak				51					
Red oak				50					
Black locust	18	221	183		462	258		103	102
Sassafras	123	8		62	25		43	12	
Spicebush							69		
Sumac		8							
Basswood							24		
Hemlock			12						
Elm		8							
TOTALS	**1483**	**1838**	**1182**	**1240**	**2745**	**669**	**712**	**496**	**322**
Total number of Species	12	16	12	13	8	6	12	9	9

[a]Und = Undisturbed section; Outs = Outslope section; Flat = Flat top section.

Table 5. Average dbh of trees species (inches) over three positions (undisturbed, outslope, or flat top) for three mountaintop surface mines in southern West Virginia.

Parameter	Mynu			Zapata			Amherst		
	Und[a]	Outs	Flat	Und	Outs	Flat	Und	Outs	Flat
Box elder								2.0	
Striped maple	0.5								2.5
Red maple	0.3	1.7	0.9	2.1	1.7	1.6	3.6	0.9	0.5
Sugar maple	2.6	1.5	0.5	3.1		4.0			
Pawpaw				2.9			0.1		
Yellow birch				1.0					
Black birch	5.3	2.9	1.0		0.1	1.5		4.7	
Lespedeza		0.5							
Hickory							2.0		
Redbud				0.2				4.0	
Dogwood				0.5	0.7				
Autumn olive		1.5						0.4	0.4
Hazelnut							2.5		
Grape	2.0			1.0			2.0		
Tuliptree	4.0	3.1		2.9	5.2	2.0	7.8	1.0	1.5
Magnolia	11.0								
Laurel									0.1
Black gum	2.7	3.5		4.7			4.5		
Sourwood	1.5	1.8	1.3	1.7	1.0	1.0	0.8		0.7
Paulownia		1.0						7.0	
Red pine			10.0						
Pitch pine		6.3	3.4						
Aspen			1.0						
Black cherry		5.0	0.5				3.5	2.5	0.5
White oak			0.1	14.0					
Chinq. oak	0.1	0.3							
Black oak			1.2						
Chestnut oak				4.0					
Red oak				7.3					
Black locust	7.0	4.2	3.2		2.9	1.7		2.9	4.0
Sassafras	0.7	0.1		0.4	2.2		0.1	2.0	
Spicebush							0.6		
Sumac		0.5							
Basswood							5.3		
Hemlock			2.5						
Elm		0.5							

[a]Und = Undisturbed section; Outs = Outslope section; Flat = Flat top section.

black locust and red maple, which are adapted to loose, rocky soils (disturbed sites). They are succeeded by sourwood, black birch and tuliptree. It is also evident that black locust prepares disturbed areas for the invasion of later successional tree species. This observation has been documented by others and, as such, black locust is known as a "nurse" tree.

The flat areas are still in an early successional stage. The reasons for these areas remaining in an early-succession plant community is due to herbaceous species reseeding themselves annually and providing competition to tree establishment, but also to soil compaction, and shallow soil depth. How quickly the trees are able to overcome site factors such as soil compaction, herbaceous competition and rodent damage remains to be seen. It is clear, however, that on uncompacted outslope areas without seeded herbaceous cover, plant succession is rapid and is, within 20 years, approximating species diversity and growth rates similar to trees on undisturbed soils.

SUMMARY AND CONCLUSIONS

This study compared tree canopy cover and tree species composition, density, and stem diameter between mined sites and adjacent undisturbed areas on three surface mines in southern West Virginia. It is apparent from this data that trees do establish on mountaintop removal surface mines. The soil medium on outslope areas at the Mynu and Zapata site were composed of overburden pushed over the side from the flattened top. These areas had around 70% tree cover, and numerous stems of a variety of species occupied these sites. The areas that had been revegetated with grasses and legumes generally had less tree cover and fewer stems than sites where no herbaceous plants had been seeded. Obviously, the competition from forage species like orchardgrass, tall fescue, and sericea lespedeza was sufficient to hinder the establishment of trees on these sites, and the lower number of trees was not simply due to flattened tops and soil compaction.

Red maple and black locust were the dominant plant species on outslope and flat areas at all three mines. This is a common finding of foresters on surface mine sites. Black locust is one of the first species to colonize disturbed sites (sometimes because a small amount of seed was included in the seed mix), and it has shown its capacity to establish on these sites either naturally or by direct seedings through many years of research and observation. Many of the black locust trees we saw on outslope and flat areas on our sites were large trees (>5 dbh) being decimated by locust borer. We observed that most of the large black locust trees were already dead. The shade, protection, and soil building capabilities of black locust was noticeable because many small trees of other species were establishing under the locust canopy. As the large black locust trees die back, the saplings under the canopy will be released. More commercially valuable trees will become established on these disturbed areas if the tree species is present in adjacent undisturbed areas and given sufficient time.

The three sites selected for this study had all been mined and reclaimed in the mid to late 1970s. So approximately 20 to 25 years have passed since these sites were seeded or left with minimal plant cover (such as the outslope areas). Areas seeded with herbaceous plants showed low numbers of trees, while areas not seeded with herbaceous plants were almost as heavily covered by trees as undisturbed areas. It is clear that, even on seeded areas, trees will eventually invade and establish in the grass and legume cover on surface mines in southern West Virginia, but the time frame for tree invasion and establishment is less clear.

New policies have recently been adopted by the West Virginia Division of Environmental Protection to encourage and increase the number of disturbed acres planted to trees. The West Virginia Division of Forestry has established guidelines for rough grading of the surface, selecting spoil materials most conducive to tree growth that can be placed on the surface, and planting of compatible, less competitive, herbaceous ground covers for tree establishment.

REFERENCES

Brown, J.H. 1962. Success of tree planting on strip-mined areas in West Virginia. West Virginia Agriculture and Forestry Experiment Station Bulletin 473. West Virginia University, Morgantown.

Brown, J.H., and E.H. Tryon. 1960. Establishment of seeded black locust on spoil banks. West Virginia University Agriculture and Forestry Experiment Station Bulletin 440. West Virginia University, Morgantown.

Chapman, A.G. 1947. Rehabilitation of areas stripped for coal. USDA Forest Service Central States Forest Experiment Station Technical Paper 108. USDA Forest Service, Columbus, OH.

Potter, H.S., S. Weitzman, and G.R. Trimble. 1955. Reforestation of stripped-mined lands. West Virginia Agriculture and Forestry Experiment Station Mimeograph Circular 55. West Virginia University, Morgantown.

Tryon, E.H. 1952. Forest cover for spoil banks. West Virginia Agriculture and Forest Experiment Station Bulletin 357. West Virginia University, Morgantown.

MAGNETITE For Your PREP PLANT

SERVICE IS THE HEART OF OUR BUSINESS

Akers Supply, Inc.
Matewan, W. Va.
304/426-4422

Akers Magnetite, Inc.
Ceredo, W. Va.
304/453-2222

Massie
Reclamation, Inc.

STAND BACK
AND WATCH
US
GROW!

We specialize in
- hydroseeding
- dust control
- straw blowing

Charles Massie, President
P.O. Box 349 • Bradley, WV 25818
(304) 877-6460 • FAX 877-6462

A flat top section on the Mynu site showing vigorous herbaceous cover and some trees in the background.

Part of the outslope are near our transect on the Mynu site.

The flat to section on the Zapata mined site covered with grasses, legumes, goldenrod, blackberries and trees.

An undisturbed area adjacent to the Zapata mined site.

A flat top section on the Amherst site with diverse herbaceous cover.

An outslope are on Amherst with large trees and some seeded herbaceous cover.

The undisturbed area adjacent to the Amherst mined area.

LOGAN CORPORATION

KANAWHA STEEL & EQUIPMENT CO.
VALLEY AIR, INC.

NON-COMPLEX RENEWAL PARTS

PARTS FOR FRONT END LOADERS • DOZERS • TRUCKS AND GRADERS

Logan Corporation offers an innovative, expanding line of reverse engineered non-complex expendable parts for a wide range of OEM Mining and Construction Equipment. Each part is guaranteed to fit the original equipment. Parts for front end loaders, dozers, trucks and graders are our specialty.

- STEPS
- HANDRAILS
- CATWALKS
- GRILLS
- BUMPERS
- HOODS
- FENDERS
- LADDERS
- GUSSETS
- TOP RAILS
- GRAB IRON
- CAB GUARD
- TANK COVERS

"WE SUPPORT RESPONSIBLE MOUNTAINTOP MINING"

What exactly are non-complex renewal parts?

Items such as steps, handrails, catwalks, grills, bumpers, hoods, fenders and ladders, which frequently get damaged or destroyed during the normal course of operation and must be replaced. High quality parts, in many cases, have been enhanced to be better than the original. Parts that look good when installed as replacements on your equipment.

How does Logan's price compare?

Our selling price is far below the OEM's recommended selling price. Since the OEM probably did not manufacture this part in the first place and since the quality is as good, or better, the value is exceptional.

How can I get more information?

Your nearest Logan Dealer will send a representative to your site with samples for your inspection and to quote the best possible price and availability. Dealer inquiries welcome.

1-800-442-0134

OUR SELLING PRICE IS FAR BELOW THE ORIGINAL OEM'S!

PARTS FOR FRONT END LOADERS, DOZERS, TRUCKS AND GRADERS ARE OUR SPECIALTY.

HIGH QUALITY PARTS - ENHANCED TO BE BETTER THAN ORIGINAL!

GUARANTEED TO FIT THE ORIGINAL MANUFACTURER'S EQUIPMENT

TO PLACE AN ORDER, OR FOR ADDITIONAL INFORMATION CONTACT:

CHARLESTON BRANCH
3000 Sissonville, Drive
P.O. Box 3203
Charleston, WVA 25332
Phone: (304) 343-8801
1-800-340-8801
Fax: (304) 343-8817

PRESTONSBURG BRANCH
Rt. U.S. 321 North
P.O. Box 126
Prestonsburg, KY 41653
Phone: (606) 886-8123
1-800-844-8123
Fax: (606) 886-8627

HUNTINGTON BRANCH
555 West 7th Ave.
P.O. Box 58,
Huntington, WVA 25706
Phone: (304) 526-4750
1-800-669-1967
Fax: (304) 526-4777

CLARKSBURG BRANCH
212 N. Ohio Avenue
Box 1700
Clarksburg, WVA 26302
Phone (304) 623-5670
1-800-473-0110
Fax: (304) 623-5676

MIDDLESBORO BRANCH
200 U.S. Hwy. 25-E
P.O. Box 8
Middlesboro, KY 40965
Phone: (606) 248-2054
1-800-442-0134
Fax: (606) 248-2082

FIVE REASONS TO CHOOSE

BECKWITH

AS YOUR BUSINESS PARTNER

1. Widest selection of new and used equipment to give you more choice.
2. Fastest and most advanced product support capabilities to keep your machines out of the shop and on the job.
3. Most diverse selection of remanufactured components, used parts, and maintenance programs to lower your operating costs.
4. Most efficient parts distribution network to make sure you have the part you need when you need it.
5. 725 dedicated employees with the knowledge and experience to better serve you.

TRANSLATION:
We work for you!

http://www.beckwith-machinery.com

BECKWITH
Machinery Company

Rte. 76 E & Rte. 50 Bridgeport, WV 26330 • Phone: 304-842-2222
Sales • Rentals • Parts • Service • Financing • Consulting

M 963-97