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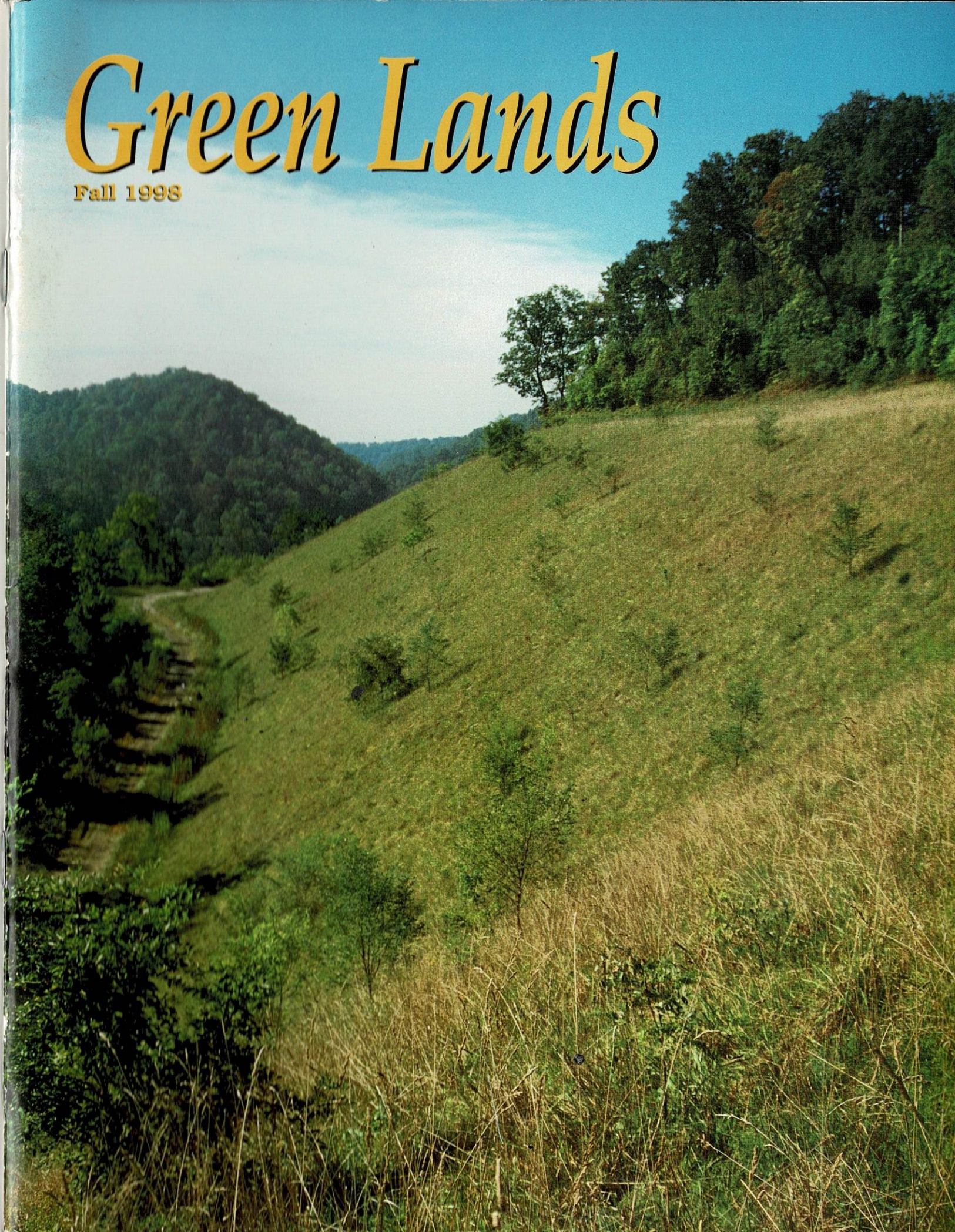
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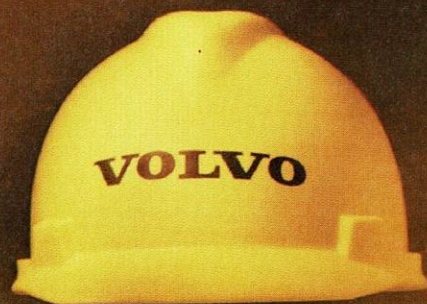
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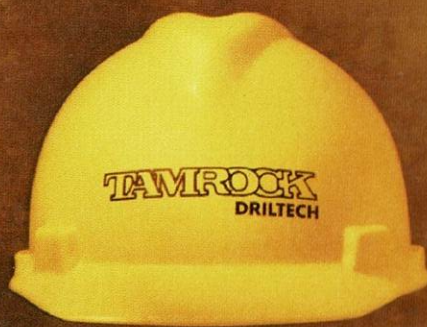
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*Green Lands*  
is a quarterly publication of the  
West Virginia Mining & Reclamation Association,  
with offices at 1624 Kanawha Boulevard East  
Charleston, West Virginia 25311  
(304) 346-5318, FAX 346-5310.  
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## On the Cover

Looking across 53 acres of the Len's Creek #1 Surface  
Mine operation of Pritchard Mining Company, Inc.  
which was completed in the fall of 1996. There  
were about 34,700 trees planted after the site was  
reclaimed.

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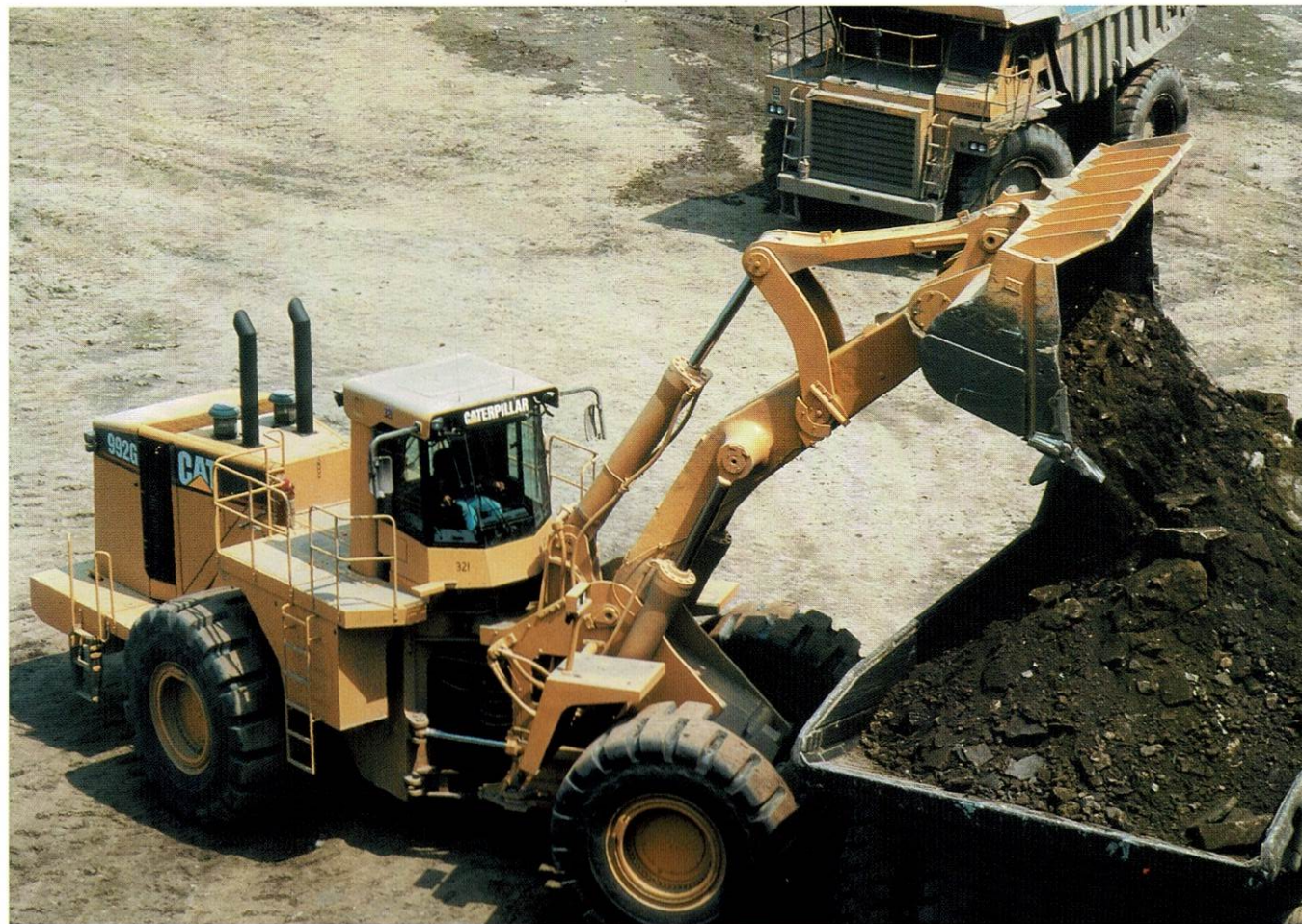
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# Shedding Some Light With West Virginia Coal

**Editor's Note:** In the last issue of *Green Lands*, we published an abbreviated list of states and the primary source for electricity. After numerous questions regarding this list, we are publishing the full list in this issue.

Coal continues to be the largest resource for the production of electricity in the United States.

It is more plentiful than oil or natural gas making up about 95% of the nation's fossil energy reserves.

Nationwide, 32 states use coal as the primary source for the production of electricity. This equates to about 57% of the energy used for electric generation comes from coal which is up from 46% in 1970.

According to the Energy Information Administration and the National Mining Association, in 1996 32 states depended on electricity generated mostly from coal, 9 states depended on nuclear, 5 states on hydro, 3 states on natural gas, and 2 states on oil.

Seven of the 10 states with the lowest electric costs used coal as the major source for generation. Of the six states with the highest electric costs, only one, Massachusetts, used electric mostly generated from coal.

**West Virginia, which has the sixth lowest electricity costs in the nation, generates more than 99% of its electricity by using coal.**

Rank	State	Ave. Electricity Cost per Kilowatt-hour	Largest Share of Net Generation	Rank	State	Ave. Electricity Cost per Kilowatt-hour	Largest Share of Net Generation
1.	Idaho	3.9	Hydro	29.	Georgia	6.5	Coal
2.	Kentucky	4.1	Coal	30.	North Carolina	6.5	Coal
3.	Washington	4.1	Hydro	31.	Kansas	6.6	Coal
4.	Wyoming	4.3	Coal	32.	New Mexico	6.8	Coal
5.	Oregon	4.8	Hydro	33.	Delaware	6.9	Coal
6.	Montana	5.0	Coal	34.	Maryland	7.1	Coal
7.	Tennessee	5.2	Coal	35.	Michigan	7.2	Coal
8.	<b>West Virginia</b>	<b>5.2</b>	<b>Coal</b>	36.	Florida	7.3	Coal
9.	Alabama	5.3	Coal	37.	District of Columbia	7.5	Oil
10.	Indiana	5.3	Coal	38.	Arizona	7.6	Coal
11.	Nebraska	5.3	Coal	39.	Illinois	7.8	Nuclear
12.	Utah	5.3	Coal	40.	Pennsylvania	8.0	Coal
13.	Wisconsin	5.3	Coal	41.	California	9.4	Hydro
14.	Minnesota	5.6	Coal	42.	Maine	9.4	Nuclear
15.	North Dakota	5.6	Coal	43.	Vermont	9.7	Nuclear
16.	Oklahoma	5.6	Coal	44.	Alaska	10.2	Natural Gas
17.	South Carolina	5.7	Nuclear	45.	Massachusetts	10.2	Coal
18.	Nevada	5.8	Coal	46.	Connecticut	10.5	Nuclear
19.	Iowa	6.0	Coal	47.	New Jersey	10.6	Nuclear
20.	Mississippi	6.0	Coal	48.	Rhode Island	10.6	Natural Gas
21.	Colorado	6.1	Coal	49.	New York	11.2	Nuclear
22.	Texas	6.1	Coal	50.	New Hampshire	11.7	Nuclear
23.	Virginia	6.1	Nuclear	51.	Hawaii	12.0	Oil
24.	Louisiana	6.2	Natural Gas				
25.	Missouri	6.2	Coal				
26.	Arkansas	6.3	Coal				
27.	Ohio	6.3	Coal				
28.	South Dakota	6.3	Hydro				



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# Ready Reclaim Recreate

West Virginia's coal industry cannot only co-exist with the state's tourism industry, but through reclamation and other post mining land uses, it has a tremendous potential to enhance recreation and tourism far into the next century.



**W**e work hard, we play hard. And how we spend our spare time is just as, if not more, important as how we make our livelihood.

Consequently, tourism in West Virginia has grown by about 30% according to Commerce Commissioner Robert Reintsema. However, in that same time period, so has the coal industry, more specifically mountaintop mining.

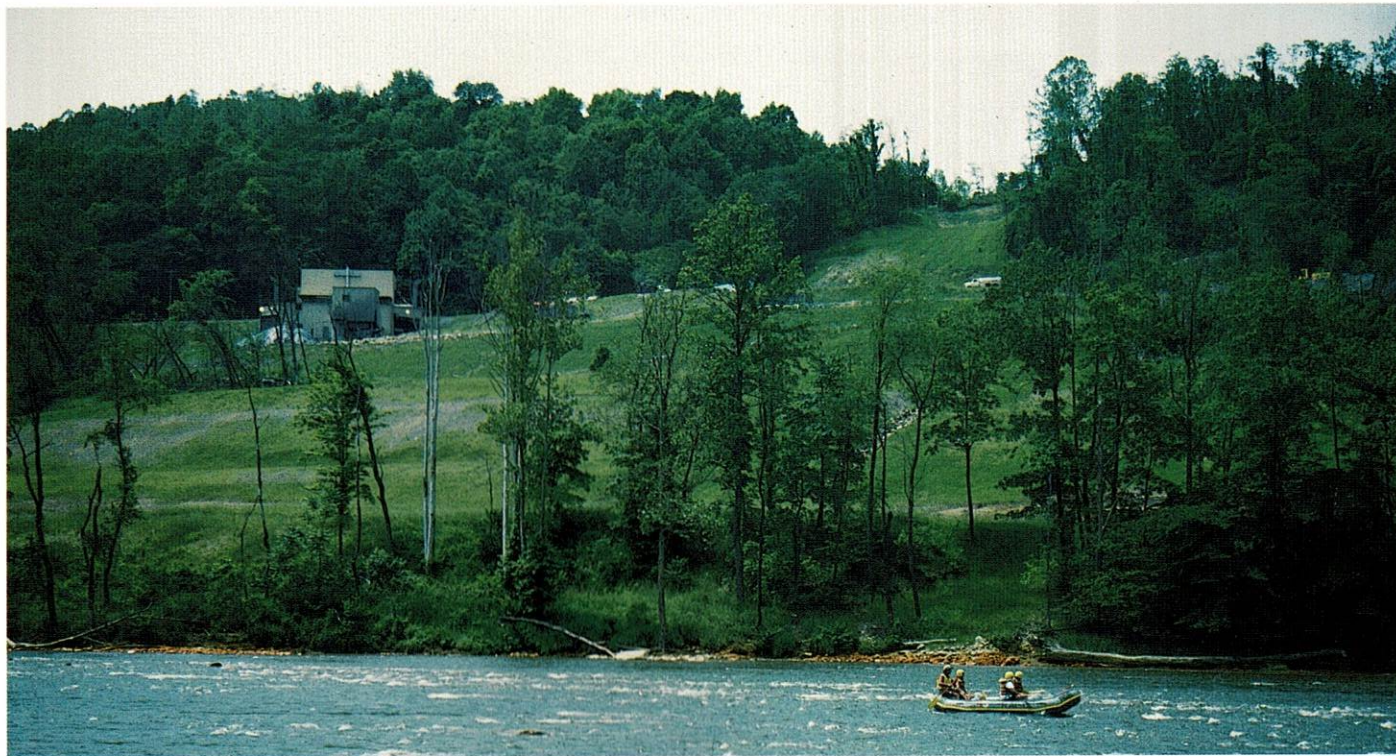
Mountaintop mining has been practiced in West Virginia for more than 30 years.

Coal prices have declined steadily over the last 18 consecutive years and the demand for low cost energy continues to increase not only within the state, but nationwide.

This demand, coupled with modern technology and more efficient equipment, has resulted in the development of several large mountaintop mines in the last 8-10 years.

Is coal mining, particularly mountaintop mining, inhibiting the growth of the state's booming tourism industry?





**Rafters paddle on the Cheat River in front of Patriot Mining Company's Albright Ash Reclamation Project. The project was a massive, historic environmental blight on the banks of the Cheat River in Preston County. Construction entailed curtailing the leaching of acid water into the Cheat, through building barriers of calcareous fly ash recycled from power plants.**

To answer this question, let's compare the geography of the state's prime tourist areas with that of the major coalfields. There is virtually no coal mining activity in the tourist-heavy counties of the eastern panhandle, and very little in the northern panhandle, where historic Wheeling is a main attraction.

However, Weirton where many previous mines existed, now have athletic fields for

all sports, built on reclaimed sites by Starvaggi Industries, Inc.

And closer to the eastern panhandle, the town of Thomas in Tucker County, has a little league baseball field via Buffalo Coal Company. After mining was completed, Buffalo reclaimed and built the field for many teams to enjoy for years to come.

In Pocahontas and Greenbrier counties, the national forest

takes up much of the land and there is little mining activity nearby.

It's in the Raleigh-Fayette County area, southeast of Charleston, that the two industries come together. This is where the state's booming whitewater rafting industry is centered, along with popular attractions like Pipestem, Tamarack, Glade Springs, Winterplace and hiking and mountain bike trails.

Raleigh-Fayette also represents the eastern border of the southern coalfields where mountaintop mining is now predominant. Mining and tourism seem to be peacefully co-existing in this area even as the town of Fayetteville quickly becomes the center of outdoor activity in the state.

For example, near Oak Hill in Fayette County, is the Ace Adventure Center, an outdoor sporting center. This campsite is located on an old mined area and still has high walls visible as a reminder of the activity years ago.

***"Coal is an integral part of the West Virginia economy. A good economy is crucial to tourism."***

West Virginia  
Commerce Commissioner  
Robert Reintsema

Ace, which has more than 400 campsites, has activities which include rock climbing, whitewater rafting, horseback riding and mountain biking.

"It's all here," said Lee Fuqua, one of three owners of the center. "U.S. 19 is going to be the Mecca of recreation."

Fuqua also said the goal of Ace is to be a first class outdoor

resort and notes that most of the people visiting come from out of state.

Moving north into Nicholas County, the Twin Streams Recreation camping area, which has been opened less than two

years, is constructed on an old mine site that had been mined by Sewell Coal Company.

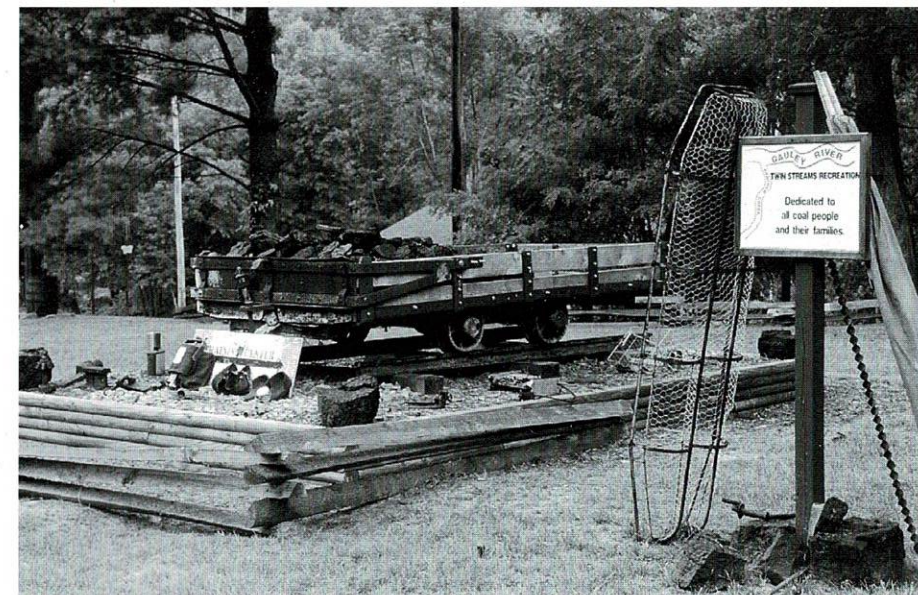
The camp ground located on the shores of the Gauley River and Panther Creek, has 140 camp sites over a 22 acre area.

James Fitzpatrick, president and owner of Twin Streams bought the property when Lady H Coal Company went bankrupt and sold partials during an auction.

Remnants of the coal companies are strategically placed throughout the area to remind all campers that coal is the reason why he is in business here today.

Easily accessible from U.S. 19, Twin Streams provides areas for basketball, horseshoes, volleyball, wagon rides, horseback riding, and walking trails.

Of all the different uses for the land, why build a campground? "It's an ideal site, right on the Gauley River. And, the state wants tourism," said Fitzpatrick,



**Although the mine no longer exists, Twin Streams Campground, located in Nicholas County, keeps reminders of what once was a mining operation, now is an outdoor recreation area.**



who also intends to have whitewater rafters as clientele.

With Ace and Twin Streams vying for a piece of whitewater industry, can a coal mine hurt the water sport?

"Sure it can," Reintsema said. "If a whitewater stream in northern West Virginia turns orange from acid mine drainage, then obviously that's going to have a negative impact."

But, by and large, when you whitewater down the New or Gauley rivers, when you ride the mountain bike trails, when you golf in West Virginia, you don't readily see any of these negative effects attributed to mining.

"I don't have the technical background to make any assessment of the environmental impacts of mining, but I do know that people who come to West Virginia for outdoor recreation tend to return. What I'm concerned about is what the controversy over mountaintop mining might do to our image. If we have people not coming here because of their concern over the effects of such mining, then that can have a negative effect."

In other words, what Reintsema doesn't want is for coal and tourism to be an obstacle to one another. "Every state has to use what it has. Two things we have here are coal and abundant recreational opportunities. We need both."

"For one thing," he explained, "coal is an integral part of the West Virginia economy. A good economy is crucial to tourism."

"People have more leisure time in the 1990s than ever before, but when the economy goes bad, leisure-type activities are usually the first to be cut."

"I think," Reintsema continued, "that the mining and tourism industries have some opportunities

to work together for the good of both their constituencies. One of tourism's growth areas is in cultural and historic sites, and certainly coal is a big part of West Virginia's heritage as evidenced by the recent designation of an 11-county region in southern West Virginia as a national coal heritage area.

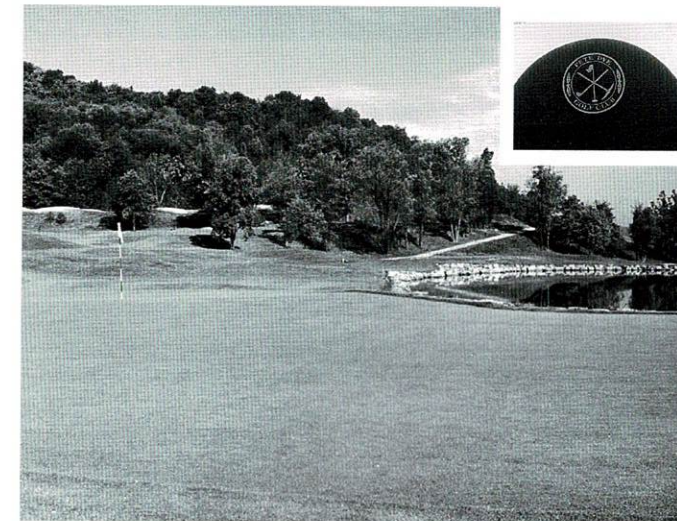
"Then too, we are in the planning stages of developing a 'Legends of Golf' trail across West Virginia similar to Alabama's Robert Trent Jones golf trail. We think that there are several reclaimed mine sites, including some mountaintop operations, that could fit in nicely with that concept if the infrastructure is there."

However, golf courses on reclaimed sites are already gaining a foothold in West Virginia. Pete Dye Golf Course near Clarksburg is one of the top courses in the nation and Scarlet Oaks in Poca, is considered to be one of the premier golf courses in the state, both of which are built on old mining sites.

Don Nicewonder, president of Premium Energy, Inc. is currently mining a site in the southern part of West Virginia and intends to make it a golf course



Twin Streams, with 120 campsites, located on the shore of the Gauley River, can help boost tourism on land that was once mined by Sewell Coal Company.



With golf becoming more and more popular, this would be an excellent way to turn reclaimed sites into recreation and boost tourism as well. Above is the Pete Dye Golf Course near Clarksburg, one the nation's premier golf courses. Courses such as this and the Scarlet Oaks Golf Course in Poca, are two prime examples of post mining land use for recreation.

when mining is completed.

Reintsema is very optimistic about the future of West Virginia's tourism industry. "There may be those who conclude that coal mining is a problem for tourism. I would prefer to view mining in West Virginia as an industry critical to the economic well-being of our state and one that provides many state residents with the means to take full advantage of the many tourism opportunities that are ours."

Finally, with hunting and fishing as important components of West Virginia's recreational opportunities, we're very much in favor of wildlife enhancement on reclaimed mine sites."

Coal, with its economic major impact and use for electricity, is essential to West Virginia's existence. Although tourism is a booming industry, it cannot support the state in such a way that coal has, however, it is an important part of West Virginia.

Thus with the intense need for these two industries, working together is the only way to go mountain biking after all of the e-mails are sent for the day.

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# Wayne Stanley Elected New

Wayne H. Stanley of Bridgeport, was elected Chairman of the Board of the West Virginia Mining and Reclamation Association during its 32<sup>nd</sup> annual meeting in White Sulphur Springs, August 6-9.

He succeeds James C. Justice II, of Beckley, who served as the WVMRA chairman for the past year.

Touting himself as a third generation coal miner, Wayne grew up in Harrison County and is now the general manager of Stanley Industries, Inc., a business started by his father. He is also president of Shiloh Mining, Inc.

Stanley Industries is truly a family operated business with his parents, three brothers, sister, sister-in-law, and brother-in-law all involved with the business.

"It's definitely a team effort," Wayne said about the company. "We all work together. Without their help I wouldn't be able to serve as the chairman of the WVMRA."



**Wayne Stanley (left) of Bridgeport, takes a moment to express his thoughts about becoming chairman of the West Virginia Mining and Reclamation Association. Jim Justice's (right) term expired after serving last year as the WVMRA chairman.**

Stanley Industries, Inc. has a surface mine in Upshur County, one in Marion County, as well as three rock quarries in Tucker County.

Also, Shiloh Mining Company, Inc. operates a deep mine in Upshur County.

Upon graduating from West

Virginia University in 1972 with a bachelor's degree in business administration, he accepted a position with the accounting firm, Ernst & Ernst (now Ernst & Young), in Charleston and became a certified public accountant. In 1975, he returned to the family business and has been

# Chairman of WVMRA

there ever since.

Stanley Industries, Inc. has been a member of WVMRA for more than 20 years with Wayne being a member of its board since 1993 and an officer for the past four years.

Wayne has also been the treasurer of the West Virginia

Surface Mine Drainage Task Force since 1977.

As WVMRA Chairman, Wayne looks ahead into the upcoming year and feels that "it is a challenging time for the coal industry. However, the truth will prevail."

Outside of Stanley Industries,

Wayne is an active member of the Gideons International where he has been a member of the state cabinet for 12 years. He is also a member of the Trinity Assembly of God Church in Fairmont.

He and his wife, Gloria, have one son Kenneth, who resides in Bridgeport with his wife Becky.

## WVMRA Officers Elected During Annual Meeting

Other WVMRA officers elected during the annual meeting were: First Vice Chairman - William E. Broshears, Eastern Associated Coal Corporation, St. Louis, MO; Second Vice Chairman - Phillip R. Cooper, Wind River Resources Corporation, Clothier; Secretary - Stephen G. Capelli, Pen Coal Corporation, Kenova; Treasurer - John K. Skidmore, New Allegheny, Inc., Charleston; and Associate Division Chairman - David R. Hibbs, Cummins Cumberland, South Charleston.

The Board approved Donald B. Sult, AMVEST Minerals Corporation, Charlottesville, VA, who replaced Markus Ladd and Ben H. Daud, Anker Energy Corporation, Morgantown,

who replaced Richard Bolen.

John P. McHale, Lodestar Energy, Inc., Pax, was the newly elected board member.

Other WVMRA Board members that were reelected by the membership were: R. Donald Cussins, Buffalo Coal, Bayard; Bernie E. Dearth, Jr. Bridgeport Trucking Company, Charleston; Donald R. Donell, Starvaggi Industries, Inc., Weirton; James H. "Buck" Harless, Chafin Branch Coal Company, Gilbert; K. Donald Nicewonder, Premium Energy, Inc., Bristol, VA; Daniel T. Pochick, Rish Equipment Company, Bluefield; and John H. Wellford, Kimberly Industries, Charleston.



## WVMRA Board Approves New Members

New WVMRA members were approved by the Association's Board during the annual meeting in early August. Browning Fork Coal Services, Inc., Gilbert, WV. (Sidney R. Young III) is the Association's new General member.

New Associate members are: Atlantic Process Mining Chemicals, Charleston, WV (John A. Singleton); EICO, Inc., Paintsville, KY (Edadeane Bussey); Jefferson Corporation, South Charleston, (Dean E. Lewis); LaRoche Industries, Inc., Atlanta, GA, (J. Wade Bowman); and Smith Helms Mulliss & Moore, L.L.P., Raleigh, NC, (George J. "Jerry" Oliver).

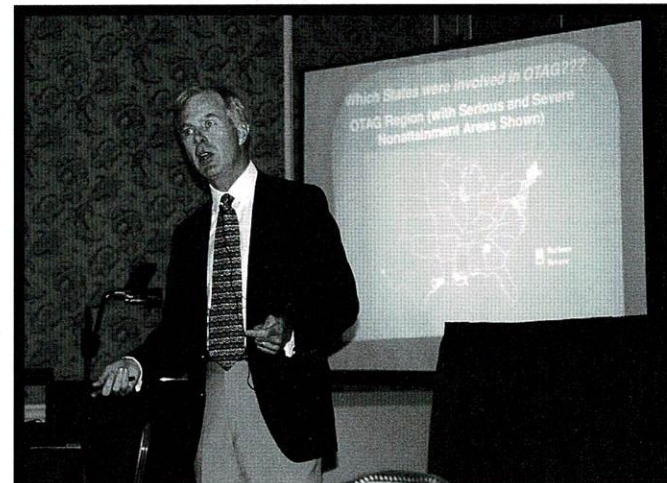
### Pete Pitsenbarger Retires After Three Decades With DEP

Pete Pitsenbarger officially retired from the Division of Environmental Protection's Abandoned Mine Lands and Reclamation Office on August 31, 1998.

He began his long industrious career in resource management with the Department of Natural Resources (DNR) as the Assistant Chief of the Reclamation Division in 1968. In 1977, he was promoted to Chief of that Division.

In 1989, Pete became Chief of the Abandoned Mine Lands and Reclamation Office and has been there until April of this year.

He recalled the many memories accumulated and said "I met a lot of nice people."



### WVMRA Annual Meeting Speakers

Dave Flannery, attorney for Charleston based law firm Jackson and Kelly, speaks on "Air Quality Issues and Their Threat to West Virginia" during the technical session of the WVMRA annual meeting.

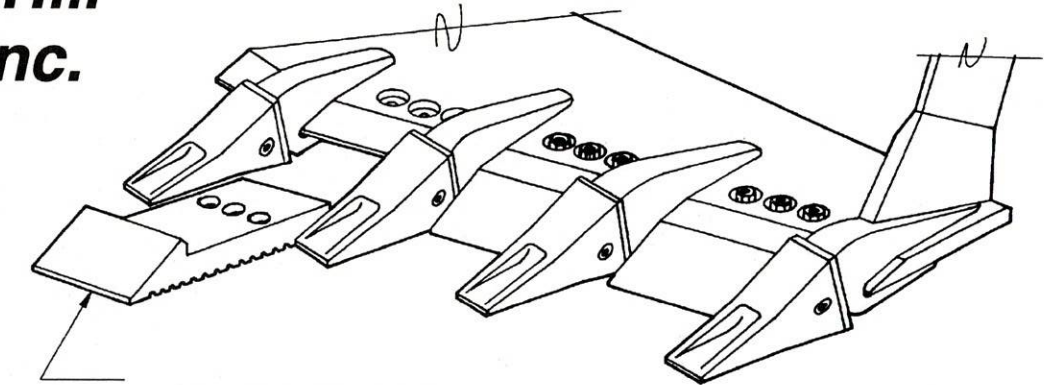
Other speakers were West Virginia Division of Environmental Protection Director Michael Miano on "A New Look at the Division of Environmental Protection" and James Griffith, Managing Director for Rothschild, Inc. who spoke on the "Investment and Financing Opportunities for the Coal Industry."

## Did You Know . . .

**. . . the coal industry and electric utilities account for about 60% of West Virginia's business taxes?**

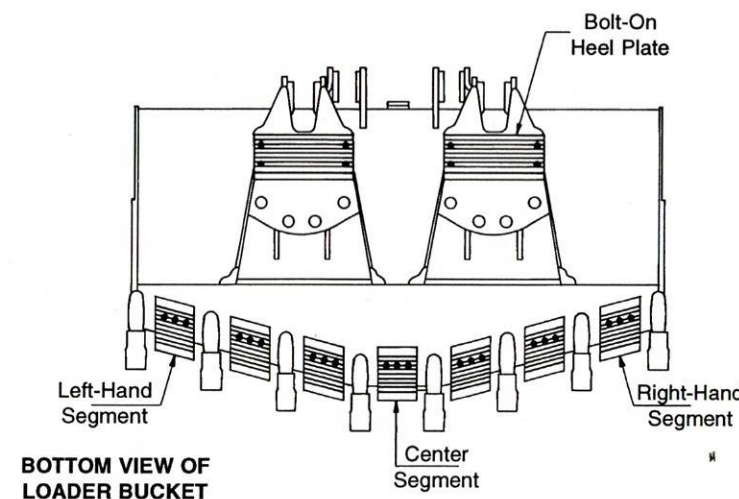
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## Coal In The Classroom Graduates 10 Teachers

Ten teachers from around the state graduated in the 1998 *Coal In The Classroom* program that was conducted on Aug. 10-14. Close to 100 teachers have graduated from the program since its inception six years ago.

*Coal In The Classroom* is a hands-on program that enables teachers, of any level, to gain a better understanding of the impact and benefit of the state's coal industry and how to create lessons for their classrooms.

Time was spent in the field visiting sites that included AEP's John Amos Plant in Nitro; Catenary Coal's Samples Operation in Kanawha County; Eastern Associated Coal's Wells operation in Boone County; and Phillips' manufacturing plant in Beckley. The program concluded with discussion on how to present lessons in their classroom.

Sandy Turley, of Hurricane Middle School in Putnam County, gained a new appreciation about the state's coal industry. "There is just no way the average person can realize what it takes to process coal. There are so many jobs that I didn't realize existed."

Those graduating in the *Coal In The Classroom* program were: Pamela Atha, Van Middle School, Boone County; Patsy Dillon, Mullens Middle School, Wyoming County; Nancy Dinkins, Huntington High School, Cabell County; June Eldreth, Mullens Middle School, Wyoming County; Lethea Denise Gibson, Princeton Junior High School, Mercer County; Mary Hale, Burch Middle School, Mingo County; Hope Painter, Clear Fork Elementary School, Raleigh County; Robyn Simpson, Burch Middle School, Mingo County; Sandra Turley, Hurricane Middle School, Putnam County; and Deborah Young, Burch Middle School, Mingo County.

The West Virginia Mining and Reclamation Association, West Virginia Coal Association, Peter's Creek Coal Association and Tug Valley Mining Institute are sponsors of *Coal In The Classroom*.

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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.

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  - Stringent quality standards
- Expanded, responsive customer service
- Improved organizational and production efficiencies
- Modernized worldwide company communications

And that's just the beginning.

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# Responsible mountaintop mining. It's good for West Virginia, and it's the right thing to do.

Arch Coal and its subsidiaries have been practicing underground and mountaintop mining in West Virginia for the past two decades. Our goal is to operate the industry's safest, most environmentally responsible mines. Pursuing that standard is the right thing to do. It respects our heritage, and we think it's also good business. 



Arch miners take great pride in the reclamation efforts at all our mine sites.



Seed mixtures used on reclaimed Arch mines include a large percentage of legumes, including alfalfa, red clover, yellow-sweet clover and Birdsfoot trefoil. Trees, shrubs, grasses and groundcovers, create highly productive habitats for many native species of wildlife.

## Respecting West Virginia's heritage.

Protecting the land for future generations is clearly the right thing to do. Even after mining, a very substantial mountain remains in a condition that will serve West Virginians well.

Mountaintop mining balances respect for the land with the livelihoods of West Virginians. We think it makes good business sense too, because in the long run, responsible mines are successful, productive mines.

## Restoring topsoil is the first step.

An important part of Arch's reclamation success is its use of substitute topsoils that have many positive characteristics which original topsoils lack. The native soils in much of southern West Virginia are acidic, low in fertility, and thin due to the steep slopes. After reclamation, the resulting soils are nearly neutral, which permits greater growth of grasses and clovers vital to erosion control and wildlife diversity.

## Careful plantings for food and cover.

The trees, shrubs and grasses planted on reclaimed mountaintop mines are excellent sources of food and cover for many native species of wildlife, including deer and wild turkey. In time, this land will return to mature woodlands and support the same hardwood species that typify the mature forests of West Virginia.

In the fall, autumn olive, annual small grains, black alder and bicolor lespedeza provide food for grouse, morning dove, songbirds and bobwhite quail. And every year we plant thousands of trees including several species of acorn-producing oaks.

Arch plants tens of thousands of bare root deciduous and evergreen trees annually at our mountaintop sites, including several native species of oaks, poplars, locust, cherry, dogwood, crab apple and maple.



# and it's the right thing to do.



Grouse, turkey, bobwhite quail and other game birds thrive on reclaimed sites.

## Water quality and wetland habitat.

Arch builds water basins, ponds and depressions to retain water throughout its reclaimed mountaintop mine sites. These wetlands collect runoff, prevent siltation downstream, and control flooding.

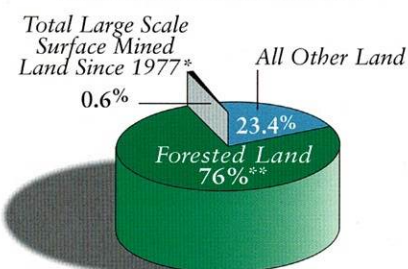
At Hobet 21 alone, Arch has created over 42 acres of wetlands on its reclaimed lands. They not only provide a water source, they also increase species diversity.

Wood ducks, herons, mallards and Canada geese are frequent visitors to our sites as they migrate along the Eastern flyway. And we routinely stock our sediment control ponds with Largemouth Bass, Hybrid Bluegill and Channel Catfish, which thrive in these new water sources.



Low-sulfur coal from Arch mines is primarily used to generate electricity. Whenever you switch on the air conditioning or boot up a computer, you are using power from West Virginia coal. Coal is the source for more than one-half of the electricity generated in the United States. In West Virginia, 99% of all electricity comes from coal, which is the primary reason our energy costs are lower than many other states.

## West Virginia: A Land Where Forest Predominates



The actual acreage of West Virginia affected by large scale surface coal mining, including mountaintop mining, is very small. West Virginia remains the third most heavily forested state in the nation.

\*West Virginia Division of Environmental Protection

\*\*West Virginia Forestry Association

## Nature's way: the beauty in diversity.

In a 1996 visit to Arch's Hobet 21 complex, a mountaintop site in Boone County, the U.S. Secretary of the Interior noted: "In some ways [the reclaimed land] is better than it was before. It is a more diverse landscape — a savanna of forests coming back, of fields, of open spaces. It is probably closer to the landscape that existed here a thousand years ago...with all its diversity and richness and water fowl and deer and big game and wildlife."

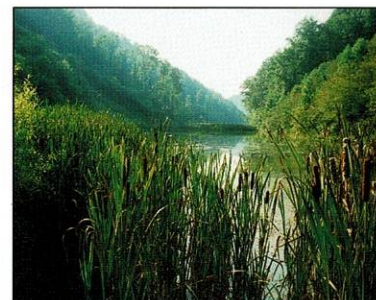
August 4, 1996 Sunday Gazette-Mail.

## Arch's record of excellence.

Arch and its subsidiaries are widely recognized for excellence in safety and environmental stewardship. In the last three years alone we've won nearly 50 awards, including several prestigious awards from wildlife preservation groups.

Arch integrates the reclamation process into every phase of its mining operations. We take great care to ensure that the land is restored to a natural and productive state once mining is complete.

Wetlands created on mountaintop mine sites provide homes for waterfowl and water sources for wildlife. Our Samples Mine in Kanawha County was honored by Ducks Unlimited recently for excellence in the creation and preservation of wetlands habitat.



## Animals thrive on reclaimed mines.

With abundant food, cover and water, wildlife prosper on reclaimed mountaintop mines. Significant populations of whitetail deer, wild turkey, red and gray fox, groundhogs, rabbits and other small rodents inhabit all of our reclaimed mine sites. Predators, including bobcats, coyotes, owls and several species of hawks are also common. In addition, the West Virginia Department of Natural Resources has released Canada Geese and Black Bear on our sites.

Wildlife such as deer and wild turkey abound where forests meet the new growth on reclaimed land. In 1997, our Dal-Tex complex in Logan County received the National Wild Turkey Federation's first ever national award, the Land Stewardship Award, for creating turkey habitat.



 **Arch Coal, Inc.**

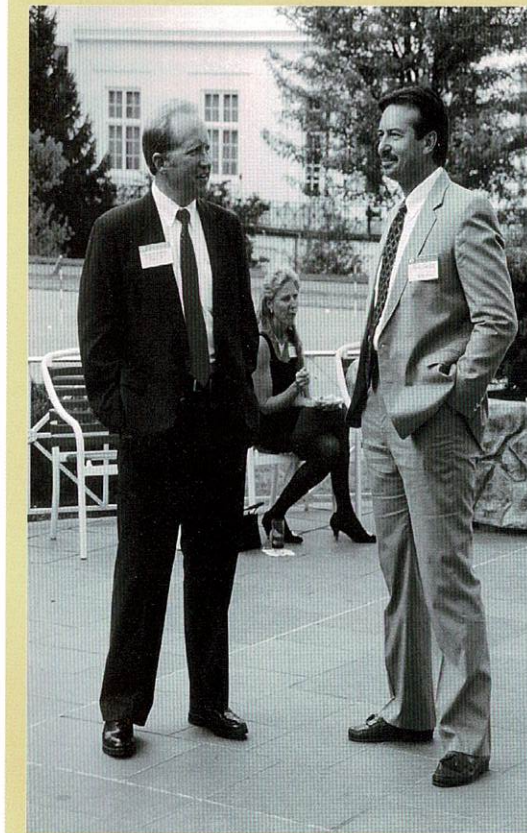
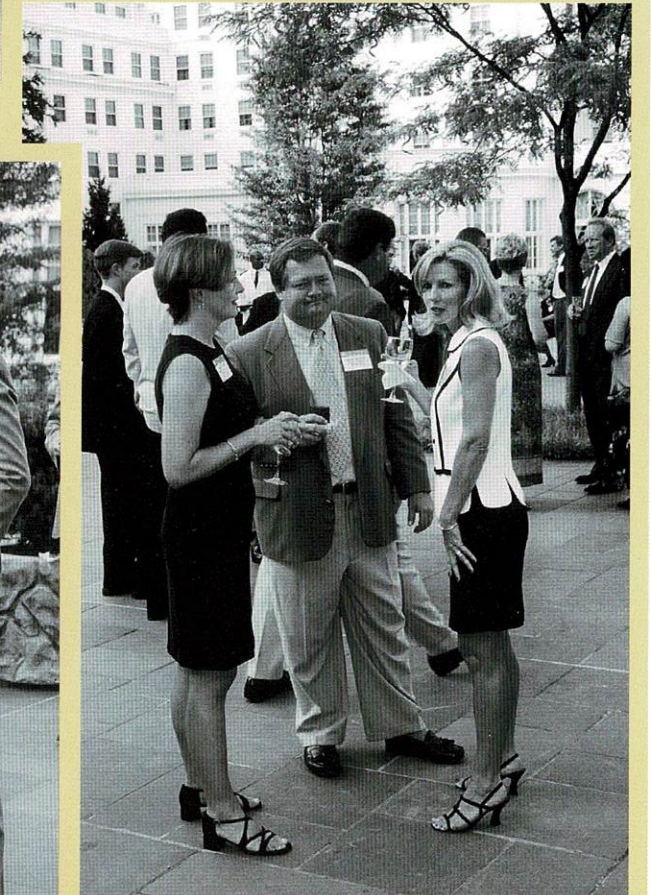
For a free information packet about how mountaintop mining works call 1-800-686-1839. Responsible mountaintop mining. It's good for West Virginia, and it's the right thing to do.



## Thanks to the Sponsors of the Associate Members' Welcoming Reception During the WVMRA Annual Meeting

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(right photo) Charlie and Rebecca Carter speak with Charlie Gage (right); (lower right photo) Susan Smith (left) chats with Norm and Beth Daniels; (bottom photo) New WVMRA Chairman, Wayne Stanley (left) takes a moment with Mark Trimble.





# Company Pride Always Evident During Annual Night Out On Kate's Mountain

## 1998 General Member Winners

1st Place



Arch Coal (left) slid by frequent company pride winners "Buck's Bunch" and Ford Coal to grab top honors this year. However, Ford Coal (below) still made their presence known as Runner Up.

Runner Up



## 1998 Associate Member Winners

1st Place

In the associate division for company pride, RMI, Ltd. (right) captured top honors for the first time, while Rish Equipment Company (below) had a strong showing as Runner Up.

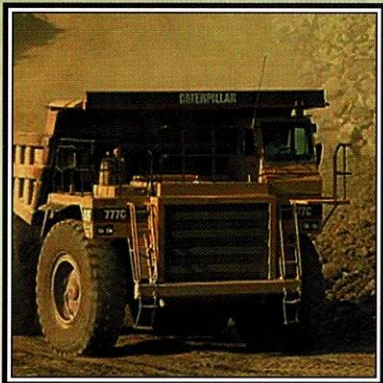


Runner Up





# 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.

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(304) 526-4800

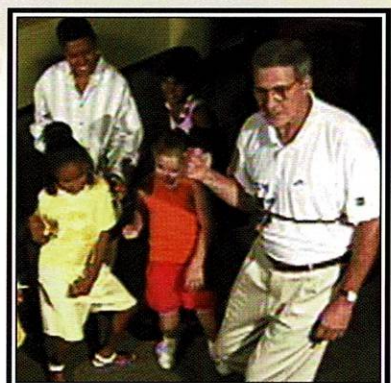
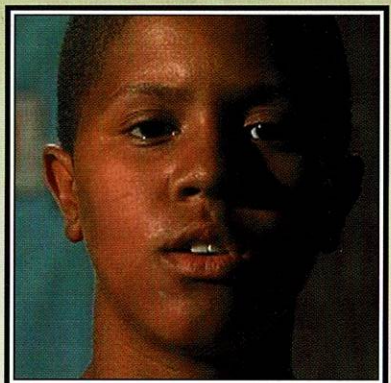
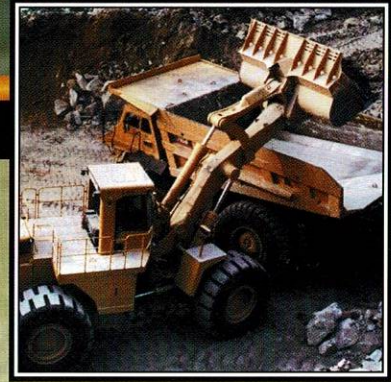
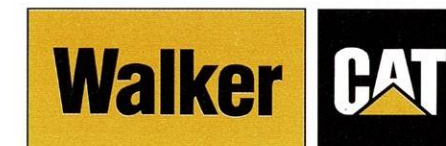
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(304) 253-2706

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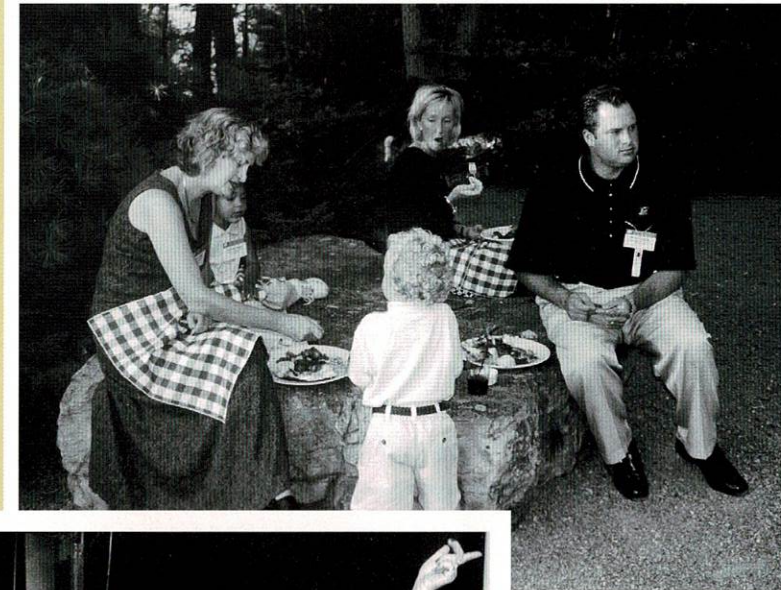




# More On Kate's Mountain . . . . .

## 1997 Company Pride Winners

WVMRA Chairman Wayne Stanley presents plaques for the first place winners of the 1997 company pride award. Gary White (right) accepts the general member award for Chafin Branch Coal Company or "Buck's Bunch" and Stephanie Laskody (bottom) accepts the associate member award for Mt. State Bit Service.



(left) Gail and Isabella Hunt enjoy their meal Kate's Mountain style with Pam, Reed and Brook Smith; Brian and Michelle Johnson (bottom right) display the WVMRA mugs given to all members for the evening festivities; and Bunny Fitch was one of the several members to show off their singing talents with the band, "The Production Company."





# Thanks To All WVMRA Annual Meeting Prize Donors

## **GOLF TOURNAMENTS**

Anderson of West Virginia (Dave Gettman) -  
\$10,000 Hole in One (18<sup>th</sup> Hole)  
Appalachian Mining Services (Charlie Miller) - \$100  
Beckwith Machinery Company (Dave Trueman) - \$100  
Cecil I. Walker Machinery Company (Steve Walker) - \$100  
Corporate Identity (Jeff Burgess) - Deluxe Caddy Pouches  
Crown Hill Equipment, Inc. (Chris Supcoe) - \$50  
Cummins Cumberland, Inc. (Dave Hibbs) - \$100  
EICO, Inc. (Eda Bussey) - \$50  
Fairchild International (Gary Fairchild) - \$100  
Fielding Hydroseeding (Ed Brown) - \$100  
Hitachi Construction Machinery Corp. (Braxton Griffin) - Golf Bag  
John Rader - Golf Trophy  
Logan Corporation (Cal Nelson) - \$100  
Kimberly Industries, Inc. (John Wellford) - \$100  
Mt. State Bit Service, Inc. (Stephanie Laskody) - Golfer's Kits  
Nelson Brothers, Inc. (Tab Hudson) - \$100  
Pace Carbon Fuels, LLC (Jim Treptow) - Golf Balls,  
Golf Bag & Putter  
Penn Line Service (Larry Roberts) - \$50  
Petroleum Products (Tom Taylor) - \$100  
Rish Equipment Company (Dan Pochick) - \$100  
RMI, Ltd. (Charlie Morton) - \$250  
Rudd Equipment Co. (John Smith) -  
Refreshment Carts & Cigars (men and ladies)  
Smith-Manus Agency, Inc. (Brook Smith) - \$100

## **KATE'S MOUNTAIN**

WV Coal Association (Bill Raney) - Mountaineer Statue

## **LADIES' PROGRAM**

Black Diamond Construction, Inc. (Bill Casto) - \$50

## **CHILDREN'S BOWLING TOURNAMENT**

Austin Powder Company (Tim Warden) - Trophies  
Cascades Coal Sales, Inc. (Flick Goldsmith) - \$50  
Triangle Surety Agency, Inc. (John Jacobs) - 2 - \$50 bonds

## **MONTE CARLO**

Beckwith Machinery Company (Dave Trueman) - \$100  
Black Diamond Construction, Inc. (Bill Casto) - \$50  
Cascades Coal Sales, Inc. (Flick Goldsmith) - \$50  
Cecil I. Walker Machinery Company (Steve Walker) - \$100  
Corporate Identity (Phil Manker) - \$150  
Crown Hill Equipment, Inc. (Chris Supcoe) - \$100  
Cummins Cumberland, Inc. (Dave Hibbs) - \$100  
Dyno Nobel Appalachia (Grant Shrader) - VCR  
EICO, Inc. (Eda Bussey) - \$100  
The Ensign-Bickford Company (Richard Gotcher) - \$100  
Employers Service Corporation (Paul Ayers) - \$100  
Fielding Hydroseeding (Ed Brown) - \$100  
Hitachi Construction Machinery Corp. (Braxton Griffin) - Putter  
Ingersoll-Rand Company (Tim Larson) - \$100  
K & P Mining, Inc. (Mike Perilli) - \$50  
Kimberly Industries, Inc. (John Wellford) - \$100  
Nelson Brothers (Gary Self) - \$100  
Pace Carbon Fuels, LLC (Jim Treptow) - \$100  
Republic Industries (John Krebs) - Gold Coin  
Rish Equipment Co. (Dan Pochick) - Greenbrier Wreath

## **CHILDREN'S PUTTING TOURNAMENT**

Austin Powder Company (Tim Warden) - Trophies  
Cascades Coal Sales, Inc. (Flick Goldsmith) - \$50  
Triangle Surety Agency, Inc. (John Jacobs) - 2 - \$50 bonds

## **BOWLING TOURNAMENT**

Cummins Cumberland, Inc. (Dave Hibbs) - \$50  
Employers Service Corporation (Tom Cloer) - \$50  
Logan Corporation (Cal Nelson) - \$100

## **TENNIS TOURNAMENTS**

Cummins Cumberland, Inc. (Dave Hibbs) - \$50  
Ingersoll-Rand Company (Tim Larson) - \$50  
Kimberly Industries, Inc. (Gerald Ramsburg) - \$100  
Penn Line Service (Larry Roberts) - \$50  
Rish Equipment Company (Dan Pochick) - \$100  
Skelly and Loy, Inc. (John Gunnett) - \$100  
Cecil I. Walker Machinery Company (Steve Walker) - \$50

## **TRAP TOURNAMENT**

EICO, Inc. (Eda Bussey) - \$50  
Employers Service Corporation (Paul Ayers) - \$50  
Cecil I. Walker Machinery Company (Steve Walker) - \$50

## **NEW CHAIRMAN'S BREAKFAST**

Black Diamond Construction, Inc. (Bill Casto) - \$100  
Cascades Coal Sales, Inc. (Flick Goldsmith) - \$50  
Cummins Cumberland, Inc. (Dave Hibbs) - \$75  
The Ensign-Bickford Company (Richard Gotcher) - \$100  
Employers Service Corporation (Tom Cloer) - \$100  
Fielding Hydroseeding (Ed Brown) - \$100  
Ingersoll-Rand Company (Tim Larson) - \$100  
Jackson & Kelly (Louis Southworth) - \$100  
Kimberly Industries, Inc. (Gerald Ramsburg) - \$100  
Nelson Brothers, Inc. (Tim Zeli) - \$50  
Pace Carbon Fuels, LLC (Jim Treptow) - \$100  
Rudd Equipment Company (John Smith) - \$100  
Cecil I. Walker Machinery Company (Steve Walker) - \$100

## **NAME TAG DRAWING**

Continental Conveyor & Equipment Co. (Calvin Kidd) -  
Golf for 4 at White Oak Country Club  
Crown Hill Equipment, Inc. (Chris Supcoe) - \$100  
Cummins Cumberland, Inc. (Dave Hibbs) - \$75  
EICO, Inc. (Eda Bussey) - \$50  
Fielding Hydroseeding (Ed Brown) - \$100  
Ingersoll-Rand Company (Tim Larson) - \$100  
K & P Mining, Inc. (Mike Perilli) - \$50  
Kimberly Industries, Inc. (John Wellford) - \$100  
Long-Airdox Company (Mike Hastings) - 13" Color TV  
The Greenbrier (Lee Doggett) - Weekend at The  
Greenbrier  
Nelson Brothers, Inc. (Tony Nelson) - 13" Color TV  
Pace Carbon Fuels, LLC (Jim Treptow) - \$100  
Rudd Equipment Company (John Smith) - \$100  
Cecil I. Walker Machinery Company (Steve Walker) -  
\$100

## **FUN RUN**

Appalachian Mining Services (Charlie Miller) - \$100  
Cummins Cumberland, Inc. (Dave Hibbs) - \$50

## **FISHING TOURNAMENT**

Appalachian Mining Services (Charlie Miller) - \$100  
EICO, Inc. (Eda Bussey) - \$50  
Ingersoll-Rand Company (Tim Larson) - \$50  
Logan Corporation (Cal Nelson) - \$100  
Nelson Brothers, Inc. (Tony Nelson) - \$50  
Potesta & Associates (Dana Burns) - \$50



# 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.



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## 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 <sup>3</sup> (13.00 m <sup>3</sup> )	22 yd <sup>3</sup> (16.82 m <sup>3</sup> )	28 yd <sup>3</sup> (21.4 m <sup>3</sup> )
High Lift .....	16 yd <sup>3</sup> (12.00 m <sup>3</sup> )	20 yd <sup>3</sup> (15.29 m <sup>3</sup> )	26 yd <sup>3</sup> (19.9 m <sup>3</sup> )
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)



# Restore Natural Beauty



We're a proven leader in land and mine surface reclamation. And we make it easy. For over 35 years, we've been giving nature a hand with seeding, mulching, and landscaping.

We're committed to customer satisfaction. Our long term customers stand as proof. And if that's not enough, just ask to see one of our completed sites. We bring beauty to places you would never dream possible.

We're reliable, yet innovative. We're Penn Line Service.

So for your next reclamation project, call 800-448-9110 and ask for Ron Hill. Let us help you restore natural beauty.

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**LINE SERVICE INC.**

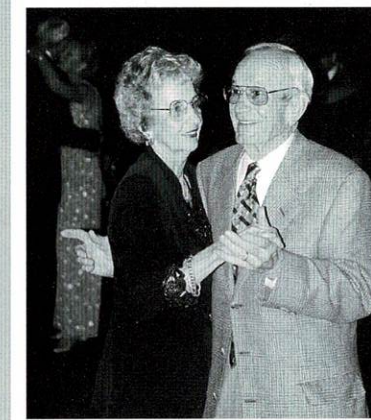
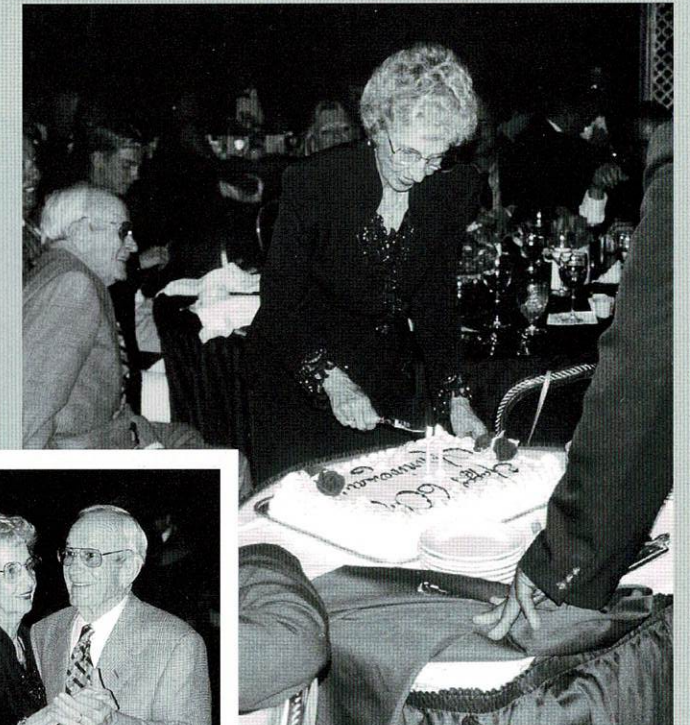
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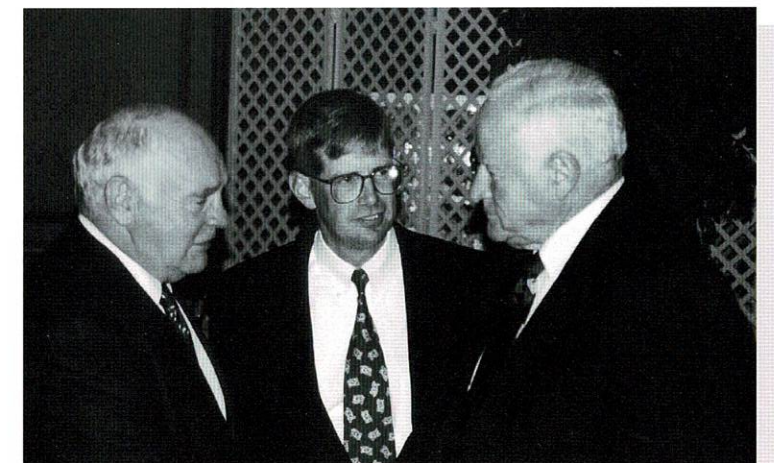


Monte Carlo night brought out the big spenders and eventually created big winners. Above are Jennie Digon, Penn Line Services; and Jim Ashby, Metikki Coal, trying their luck on craps. And, as luck would have it Jennie and Jim were the first and second big winners, respectively. Right is (from left) Buck Weaver, Ken Woodring and Fil Nutter during the WVMRA banquet.

## Celebrating 60 Years Together

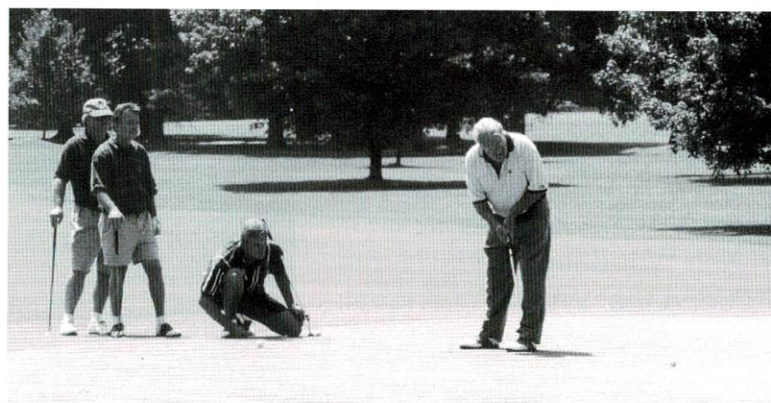
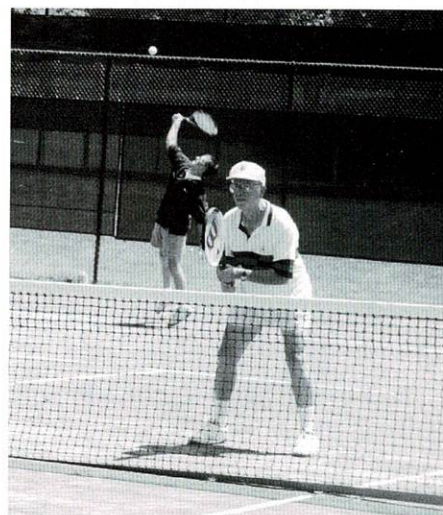
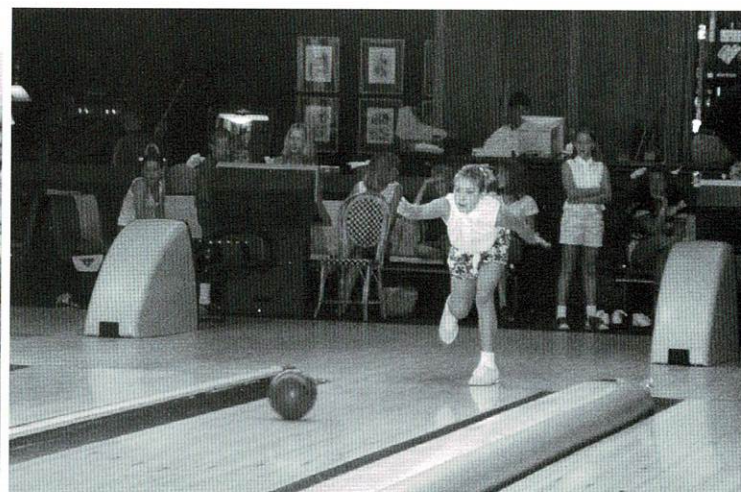


The banquet was extra special for Fred and Chris Shewey who celebrated their 60th wedding anniversary.





## More Scenes From The WVMRA Annual Meeting



(Starting in upper left going clockwise: Ike Goldsmith and Andrew White captured first and second place in the children's putting contest; Angela Lowe rolls a strike during the children's bowling contest; Jared Ramsburg serves one up while teammate Ken Moffitt waits for the return; Bill Broshears, Norm Duncan and Chris Supcoe watch as Dave Hibbs shows off his putting skill; and Anne Moran finishes off the hole during the women's tournament.

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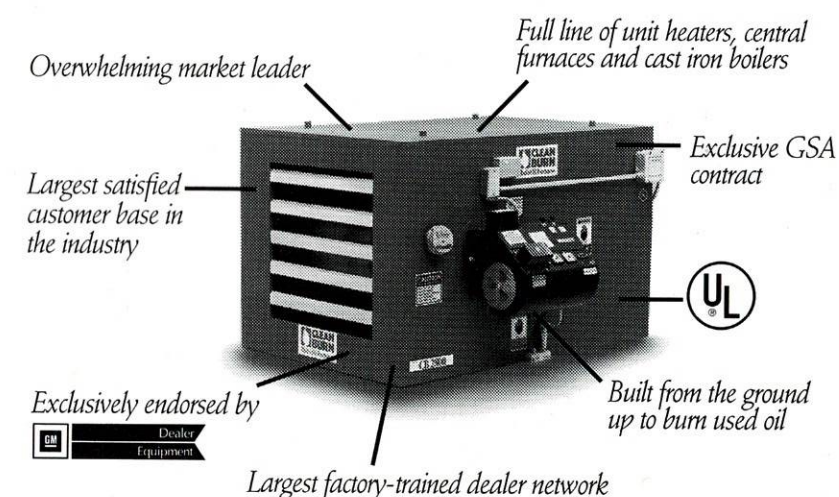


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# Coal Calendar

## November 1998

- 1-2 Virginia Self-Insurers Association Annual Meeting**, Fort Magruder Inn, Williamsburg, VA. Call (804) 643-6697.
- 2 Toxic Release Inventory Reporting: A workshop for the coal industry**, Days Inn, Flatwoods, WV. Contact Patty Bruce (304) 346-5318.
- 12-13 Kentucky Mining Institute 59th Annual Meeting**, Lexington Center at Heritage Hall, Lexington, KY. Contact Geaunita Caylor (606) 257-2820.
- 20-21 WVMRA Fall Board Meeting**, Lakeview Resort and Country Club, Morgantown, WV. Contact Patty Bruce, (304) 346-5318.

NOVEMBER						
S	M	T	W	T	F	S
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8	9	10	11	12	13	14
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29	30					

## January 1999

- 13-15 West Virginia Mining Symposium**, Holiday Inn-Charleston House, Charleston, West Virginia. Contact Patty Bruce, WVMRA, (304) 346-5318.
- 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.
- 26-31 WVMRA Semi-Annual Meeting**, El Conquistador Resort, Puerto Rico. Contact Patty Bruce, (304) 346-5318.

JANUARY						
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# ACID MINE DRAINAGE INVENTORY IN WEST VIRGINIA

Ben Faulkner and Jeff Skousen

## INTRODUCTION

### Location and Extent

Two references document acid mine drainage in West Virginia (WV). The WV Division of Environmental Protection, Office of Water Resources (WVDEP-OWR) annually compiles a 303(d) list of streams affected by acid mine drainage. A priority stream list and a non-priority stream list are generated on the basis of analytical and benthic investigations (Bennett 1997). This study found that 17 of 51 priority streams in the state were affected by acid mine drainage in 1996. On the non-priority list in 1996, 469 streams in West Virginia were affected by acid mine drainage.

The United States Environmental Protection Agency (EPA) Region III Office in Wheeling, WV compiled a Geographic Information System (GIS) database of streams with impacted fisheries by acid mine drainage in 1995 (Figure 1, USEPA 1995). This EPA database defined two levels of impact. Streams with severe impacts were characterized as "no fish" by state fisheries biologists. Streams with less severe impacts were denoted "some fish," where acid mine drainage had reduced the number of species or reduced productivity. The WVDEP- OWR list indicates all mine drainage impacts (including alkaline mine drainage), while the USEPA figure is limited to acid mine drainage only.

As seen from these references, acid mine drainage in WV is a serious and widespread problem. Despite chronic problems in several watersheds, the state of West Virginia does not export acidity beyond its borders. All major rivers leaving the state, including those impacted by acid mine drainage, are now net alkaline when they cross the border (STORET, 1997). Further,

they are generally improving in quality for a number of reasons.

### Origin

Mining operations in WV are classified into four legal categories. First, "abandoned mine lands" (AML) are identified as those sites that finished mining activities prior to the Surface Mining Control and Reclamation Act (SMCRA) in 1977, and where no or poor reclamation was done. Second, "active" sites are those that are currently under permit (but could be at various phases of mining and reclamation, or inactive) and have not been awarded bond release. Third, "released" sites are those that were permitted after 1977, mined, reclaimed, and released from reclamation liability. Fourth, "forfeited" sites are those where the permit was revoked (due to poor mining practices or problem water quality) and reclamation bonds were forfeited to the state after 1977.

Water quality problems associated with mining operations are not so easily classified. The origin of water discharges is not always clear. Attempts to define the mine drainage problem in WV have generally involved assessing flow and acid concentration (acid load) of affected streams. Another approach, certainly the most valuable and difficult, is to inventory individual discharge points identified as water quality concerns.

Such an individual discharge point inventory commenced in 1981 when WVDEP's Office of Abandoned Mine Lands began collecting water quality information on **abandoned mine lands**. Earlier efforts to identify problem mine drainage were noted in this evaluation (WV Division of Natural Resources 1973,

## Streams with Fisheries Impacted by Acid Mine Drainage in MD, OH, PA, VA, WV

(Based on EPA Fisheries Survey - 1995)

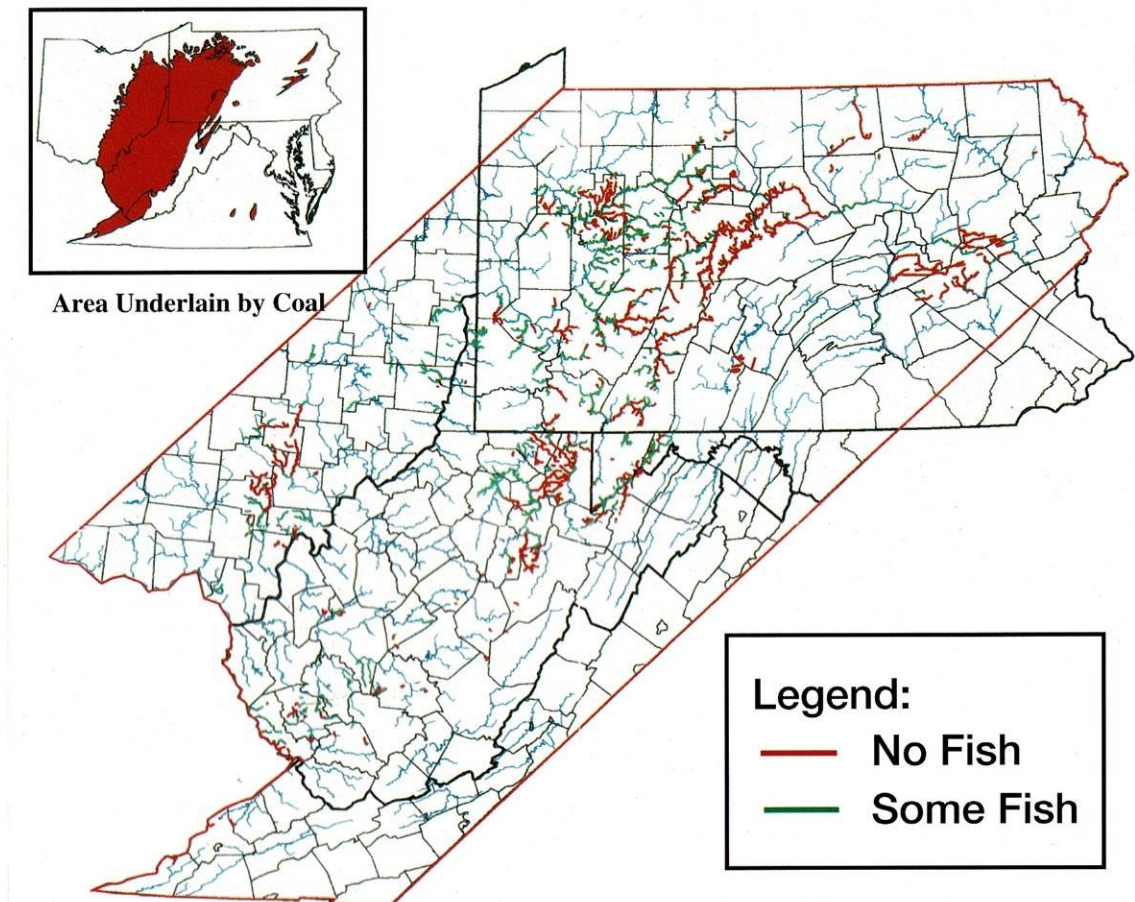


Figure 1

Stream Miles Impacted			
State	No Fish	Some Fish	Total
OH	258	349	607
PA	1714	1525	3239
WV	488	612	1100
VA	17	0	17
MD	42	110	152
<b>TOTAL</b>	<b>2519</b>	<b>2596</b>	<b>5115</b>



1979, 1981 - 1985). In 1988, the Special Reclamation Program under the Office of Abandoned Mine Lands began collecting water quality information at all sites where bonds were **forfeited** since SMCRA. This Bond Forfeiture inventory is updated regularly and prioritized yearly to implement treatment strategies (Faulkner 1996). In 1994, the first inventory of water quality problems at **active** mine sites was prepared by WVDEP (WVDEP 1995). This inventory was updated and refined in late 1996 (Faulkner 1997).

## STATUS OF INVENTORY

### AML Sites

The inventory of abandoned mine sites is fairly complete. Water quality data at AML sites was routinely collected by WVDEP during planning and design of the AML project, but the water data was generally not used to incorporate control or treatment techniques. Until recent changes in SMCRA, AML reclamation concentrated on correcting dangerous land configurations and human health and safety hazards rather than treating water quality problems. Recently, WVDEP has revisited many of these AML reclaimed sites with the goal of improving water quality at the site.

Further backfilling and regrading has been done on some AML sites, while passive treatments like in-stream limestone sand, limestone rotary drums, open limestone channels, anoxic limestone drains, wetlands, and alkaline producing systems of various designs have been installed or implemented (Faulkner and Skousen 1994; Skousen and Ziemkiewicz 1996). Continued monitoring of these mitigation efforts and other projects will be input to WVDEP's Geographic Information System.

### Bond Forfeitures

The responsibility of meeting effluent limits and minimizing impact to receiving streams rests completely with the permit holder. Should the permit be revoked, WVDEP implements water quality mitigation at the site on a watershed and priority approach. Water quality improvement efforts at selected sites are also

considered on a cost-benefit and watershed approach.

WVDEP's Special Reclamation Program has inventoried all bond forfeiture sites to determine water quality impacts. Less than 100 of these forfeited sites have a detectable impact to their receiving stream. Since 1985, the Special Reclamation Program, funded through forfeited securities, civil penalties and coal taxes, expended over \$6.9 million in chemical treatment of acid mine drainage at four bond forfeiture sites (Alton, F&M, T&T, and Omega).

Since 1988, over \$2.2 million has been spent on water quality investigation of over 900 sites and design of AMD abatement at bond forfeiture sites. An additional \$2.3 million construction work has been spent to mitigate water quality problems at 75 of these sites. Careful monitoring indicates backfilling and regrading often improve water quality at acid drainage sites by reducing acidity or flow or both (Faulkner and Skousen 1994). Developing passive technologies similar to those mentioned previously as well as diversion wells and alkaline additions have been employed with measurable success.

### Active Mines

Coal has been mined in WV since the late 1700's. Active mining of high sulfur coal seams and associated strata has the potential to produce acid mine drainage by exposing the pyrite to water and oxygen. Coal operators employ chemical and physical treatments to reduce acidity at active and reclaimed mines, and reclaim hundreds of acres of old mines each year by remining (Hedin et al. 1997). To meet NPDES effluent limits (pH >6 and no to low metal concentrations), operators often introduce strong chemical bases that neutralize the acidity in their drainage and precipitate metals, but the excess alkalinity in the treated water also neutralizes the acid mine drainage that may be present in the receiving stream from adjacent AML sites.

### METHODS

In 1994, WVDEP inspectors collected raw (untreated) mine drainage samples at active sites where

water quality was a concern and performed field analyses. Inspectors reviewed all sites at the final discharge point to ensure compliance with the effluent limits established under the NPDES program. This exercise was repeated in 1996, except water samples were also collected for laboratory analysis. Flow was estimated using the best available means. Samples for field analysis were collected at the source or at a collection point prior to chemical, biological, or physical treatment.

## RESULTS OF SAMPLING

### Problem Sources

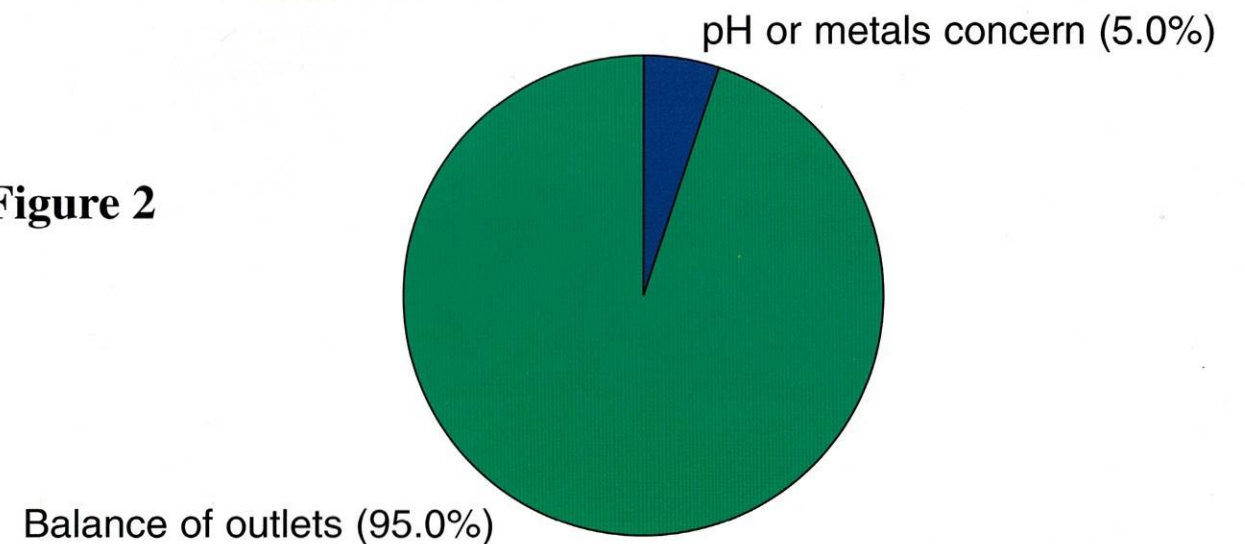
Based on the inventory in 1994, over 16,800 outlets were permitted at coal mine operations by the NPDES program in WV. WVDEP inspectors identified 890 of these outlets (5%) to be a water quality concern (Figure 2). Between 1994 and 1996, inspectors added 107 new

sources to the inventory, while another 133 sources were removed from the list due to improvement, duplication, elimination, or reclassification. In 1996, the number of outlets of concern changed to 864. In 1996, only 563 of the 864 sources exhibited a measurable flow (>1 gpm). The 563 sources represent the total number of sources now being considered. In all cases where a permit is applicable, operators must treat this water before discharge to receiving streams to meet the relevant discharge limits.

While specific sources could be presented, the distribution of sources can be described when sources and flows are listed by county. It is not surprising that two counties with large underground mine complexes (Grant and Monongalia) comprised over one-third of the total flow of acid mine drainage in the state. Adding Tucker and Harrison Counties increased the percentage to one-half of the state total. While Preston County

## NPDES OUTLETS WITH PROBLEMS BY NUMBER OF OUTLETS

Figure 2



Only 5% of all coal permit outlets have effluent problems



reported a sizable number of sources (10% of the total), these sources represented only a small portion of the total flow (2%). This may be due to the large number of surface mines with poor water quality, but most of them having low flows. A similar trend is seen in Nicholas County in southern WV. Conversely, McDowell County had only 1% of the sources, but the large deep mines in this county contained about 10% of the total flow for the state.

The 1996 data indicated that 37% of all sources (208 of 563) representing 50% of the total flow of concern is alkaline (pH >6 and net acidity <1 mg/L). Further, 265 sources (47%) representing over 55% of the total flow are not strongly acid (pH >5.0).

If metals are considered, about 20% of the pH >6 sources of concern have the potential, if untreated, to discharge high manganese concentrations (>2 mg/L). About 15% of the raw water sources with pH >6 have iron concentrations >3 mg/L. This represents 30% of the total flow. Large deep mines with neutral pH and iron concentrations >3 mg/L constitute a large portion of the water quality problem in the state. More sites have high iron concentrations at pH >5.9 than those sites with a pH between 4.9 to 5.9. A surprisingly small number of sites have only a low pH problem (pH <6 and <3 mg/L iron and <2 mg/L manganese).

#### Acid Mine Drainage Treatment

Mine operators employ a host of treatment strategies for managing water quality. The most primitive and expensive treatment method, soda ash briquettes in a hopper or ditchline, was employed in about 25% of the sites where water quality was a concern in 1994. These sources constituted less than 10% of the total flow. This is no surprise, since operators have historically used this treatment method on low volume and mildly acidic waters (Skousen et al. 1990). The use of soda ash for treatment was reduced substantially in 1996.

Caustic soda was used at many chemical treatment sites in 1994. While 36% of the sources received caustic soda in 1994, this represented only 26% of the

flow. Lime was used at 18% of the sites to treat 48% of the total flow in 1994. Obviously, the large deep mine and refuse complexes with very large flows used hydrated lime at central treatment plants. Anhydrous ammonia was used at a large number of sites and was responsible for 16% of the water receiving chemical treatment in 1994. Calcium oxide is being dispensed at a growing number of sites, and is replacing lime and ammonia at many sites due to its economic advantage and low toxicity. Many hydrated lime plants have converted to calcium oxide. A few sites meet effluent limits by employing passive technologies such as anoxic limestone drains or wetlands, but many more stay in compliance by the effects of dilution or physical retention in ponds.

A more meaningful examination of treatment strategies is possible when chemical analyses are available as they were in 1996. Calcium oxide appears to be the chemical of choice for high iron concentrations, while caustic is used frequently at sites with high manganese concentrations. Of the 864 sources in 1996, 632 received chemical treatment at least occasionally (73%).

About 85% of the acid sources received chemical treatment in 1994. Several sites were forfeited between 1994 to 1996, but the untreated discharge of only two sites (T&T and Omega) represented significant threats to the environment such that the State continued treatment. Others have been addressed with mechanical and passive efforts including backfilling, regrading, constructed wetlands, alkaline addition, and limestone drains. Similarly, many active sites achieved effluent limits by passive technologies.

Using historic state expenditures as a standard, industry spends at least \$30 million per year treating acid mine drainage in WV. Sites treating large alkaline flows high in iron with hydrated lime treatment plants and sites treating high pH water with manganese drives the total bill for treating mine drainage to \$60 million. In 1996, inspectors estimated 269 sources (31% of 864) representing 66,000 gpm (73% of 89,325) would significantly impact the receiving stream if untreated. These estimates are actually less than 1994 figures (308

sources with approximately the same total flow).

If treatment is not effective, violations are issued by WVDEP and efficacy is achieved or the permit is forfeited. Many sites in the state where land reclamation is complete are not eligible for bond release because of poor water quality. In 1994, inspectors estimated that about 70% of the 500+ sites with water quality concerns would not be "released." In 1996, inspectors estimated 66% of the permits would not be released because of poor water quality.

If a pie chart were to be constructed assigning portions of the total acid load of the state to each of these three categories (Figure 3), it would look like this:

1. Active Mine sites ..... 60,000 tons/year (22%)
2. Bond Forfeiture Sites ..... 14,000 tons/year (5%)
3. Abandoned Mine Lands .. 200,000 tons/year (73%)

Coal operators neutralize the acidity of their problem discharges to zero and, in fact, usually add more alkalinity to water to ensure compliance. The most serious water quality problems at bond forfeitures are

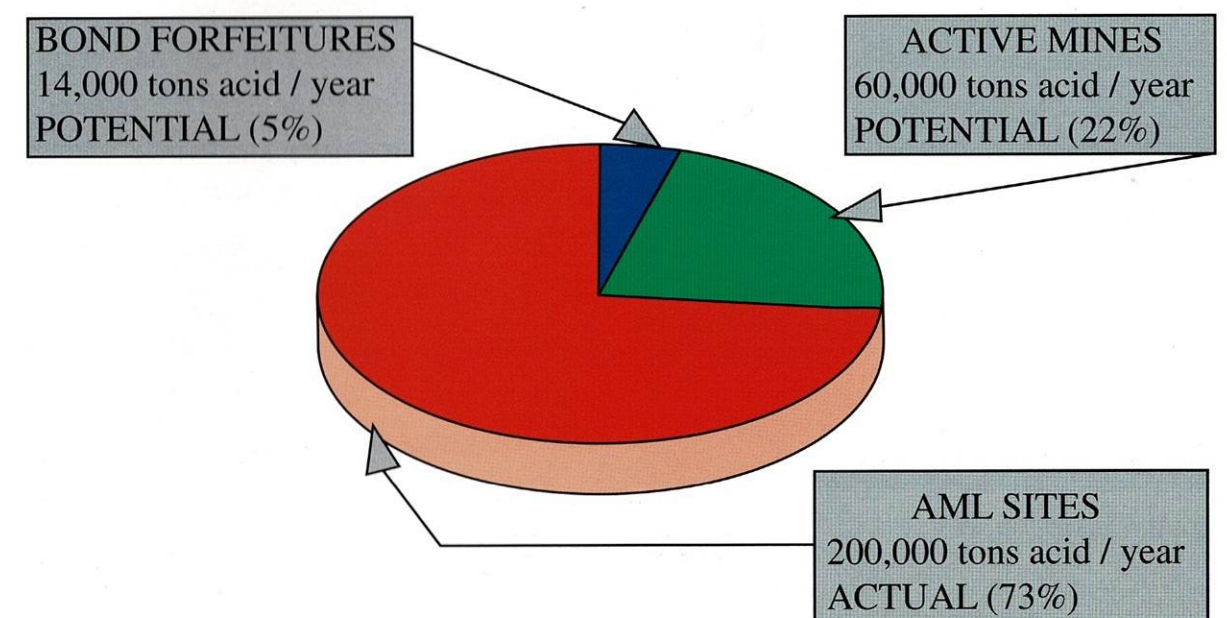
being neutralized by chemical treatment or by passive means. Additionally, direct and indirect water quality benefits from AML reclamation efforts have been realized in most acid mine drainage affected watersheds. Over \$12 million has been spent directly on acid mine drainage at AML projects in West Virginia to date. Projects totalling another \$6 million have been designed, and another \$12 million are being planned.

#### CONCLUSIONS

Recent sampling and aquatic habitat evaluation indicates that despite a long history of negative influence by acid mine drainage, many streams and rivers in West Virginia are improving in quality. Sampling and analysis of water from mined areas by WVDEP show: 1) most mines have alkaline drainage, 2) much of the problem drainage in the state is alkaline water (pH >6) with metals, 3) most of the problem drainage is from deep mines, and 4) excess alkalinity in discharge water due to treatment at active mines tends to neutralize acid in streams receiving acid mine drainage from nearby AMLs. Acid mine drainage continues to negatively

Figure 3

#### AMD SOURCES IN WV





impact streams in many areas of the state, but a combined effort by industry, state, federal, and public entities to control acid mine drainage at active mine sites, bond forfeitures, and abandoned mine lands has resulted in improved fisheries and restored water uses. Effective chemical treatment and watershed improvement efforts due to remining, AML reclamation, and stream restoration groups is improving stream and river water quality.

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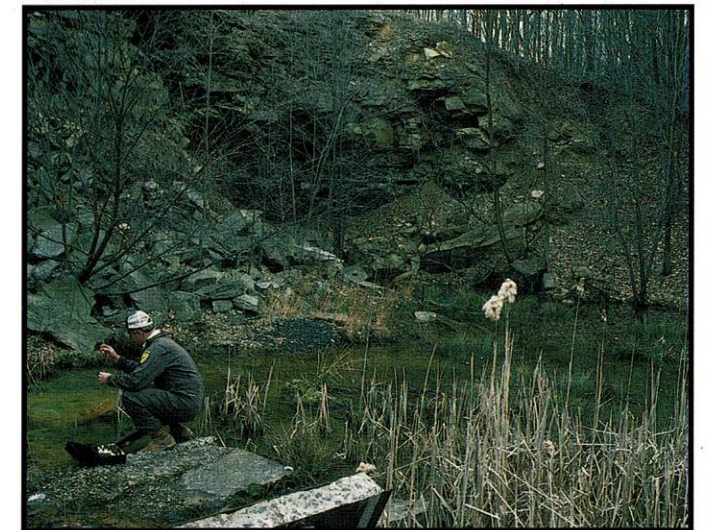
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Impact of acid mine drainage from Sovern Run into Big Sandy Creek in Preston County, WV.



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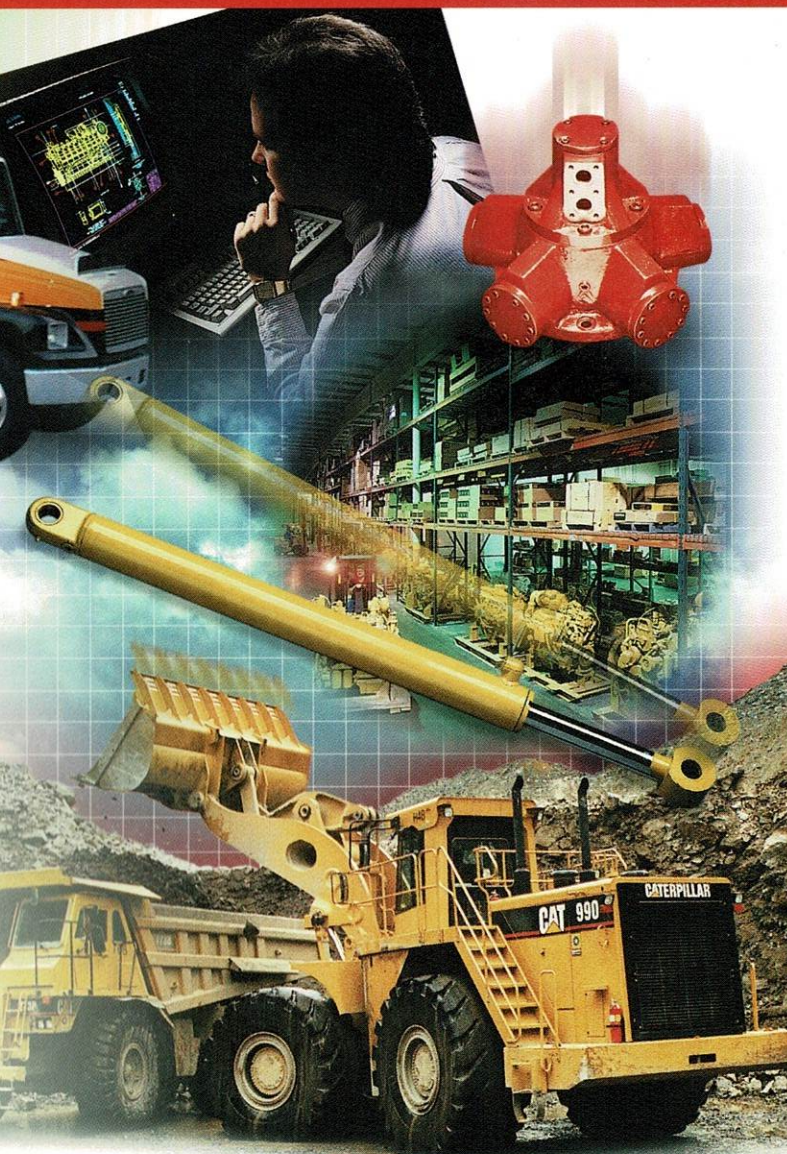
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