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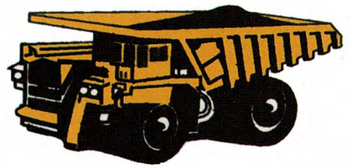
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Lighting The Nation

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

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.

Below is an abbreviated list of the cost per kilowatt-hour for the lowest, highest and surrounding states (list includes the District of Columbia).

Rank	State	Ave. Electricity Cost per Kilowatt-hour
1.	Idaho	3.9
2.	Kentucky	4.1
3.	Washington	4.1
4.	Wyoming	4.3
5.	Oregon	4.8
8.	**West Virginia**	**5.2**
23.	Virginia	6.1
27.	Ohio	6.3
34.	Maryland	7.1
40.	Pennsylvania	8.0
45.	Massachusetts	10.2
46.	Connecticut	10.5
47.	New Jersey	10.6
48.	Rhode Island	10.6
49.	New York	11.2
50.	New Hampshire	11.7
51.	Hawaii	12.0

Without Coal, We Would Be in The Dark

Every time you turn on a light, the television, or your computer, believe it or not, you are supporting the coal industry. We have come to live in a society where electricity is an everyday necessity. And, coal is the most common resource used in the production of electricity.

Not surprisingly, since 1950, the demand for electricity has steadily increased and with it, so has the need for coal.



In 1950, for example, 47% of the nation's electricity generated came from coal. In 1997, that number has increased to 56%.

Coal has always been the leading resource for the production of electricity while the majority of the other major resources have decreased in the production of electricity.

Since 1950, natural gas has dropped from 14% to 9%; petroleum from 10% to 2% and hydro from 29% to 11%.

Nuclear usage, on the other hand, has increased from 0% to 22%.

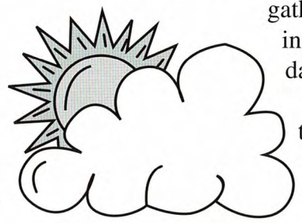
So remember, the next time you turn on the air conditioner, or the porch light, consider yourself a supporter of the coal industry.

Did You Know . . . . . .

. . . that 99% of electricity consumed in West Virginia, is produced from coal?

Researchers Once Again Debunk Global Warming

For 20 years, orbiting high above the Earth, a network of National Aeronautics and Space Administration (NASA) weather satellites has gathered temperature readings at a rate of 30,000 per day.



These readings show that the upper troposphere, which "global circulation models" (GCM) claim would heat up before any other part of the atmosphere, shows a slight cooling trend over the past 20 years.

This fact, along with other criticisms of the global warming enthusiasts' computer models, was presented recently at a Heritage Foundation conference by Dr. Roy Spencer of NASA's Marshall Space Flight Center in Huntsville, Alabama, and Dr. John Christy, associate professor of atmospheric science at the University of Alabama.

Christy and Spencer's work to develop the only precise global temperature record has earned them NASA's Medal for Exceptional Achievement.

Christy and Spencer attribute the discrepancies between the GCMs and their data to a lack of understanding of the world's climate system. They pointed to the GCM's failure to explain cloud physics, the uncertainty surrounding the cooling effects of clouds, and the lack of inclusion of the upper troposphere's ability to "let off steam."

The two also take issue with claims that land surface temperature records are more important because, as Katie McGinty of the Council on Environmental Quality argues, "people don't live in the troposphere." They pointed out that land-based records represent only 10 percent of the globe, and are corrupted by the "heat-island effect," or the trapping of heat near the surface by urbanization.

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Coal Calendar

August

4-6 **17th Conference on Ground Control in Mining,** Lakeview Resort and Conference Center, Morgantown, WV. Contact Karen Centofanti, (304) 293-7680.

6-9 **West Virginia Mining And Reclamation Association Annual Meeting,** The Greenbrier, White Sulphur Springs, WV. Contact Patty Bruce, WVMRA, (304) 346-5318.

9-13 **Coal In The Classroom Seminar,** MSHA Academy, Beaver, WV. Contact Sandi Davison, WVCA, (304) 342-4153.

12 **Third Health and Safety Seminar for Small Mines,** Ramada Inn, Somerset, PA. Contact Mary Ann Sherburne, Penn State University, (814) 865-7472.

15-22 **45th Annual Pennsylvania Bituminous Coal Show.** Carmichaels Fire Hall and High School, Carmichaels, PA.

19-21 **Overview of Coal Mining Industry Technical Fundamentals for Executives**, Penn State, State College, PA. Call (800) 778-8632.

20 **Tug Valley Mining Institute Meeting**, Brass Tree, Williamson, WV. Guest speaker, Wade Gilley, president of Marshall University and newly appointed chairman of the Governor's Task Force on Mining.

21 **NEW DATE**
11th Annual Kentucky Professional Engineers In Mining Seminar, Holiday Inn North, Lexington, KY. Contact Kim King, (606) 257-4634.

23-25 **CoalOps '98,** Griffin Gate Conference Center, Lexington, KY. Contact Art Sanda (304) 252-6801.

September

4-5 **West Virginia Coal Association Fall Membership Meeting,** Lakeview Resort and Country Club, Morgantown, WV. Contact Sandi Davison, (304) 342-4153.

21-25 **Review Course for the Professional Engineering Examination of Mining/ Mineral Engineers,** Penn State, State College, PA. Contact 1-800-PSU-TODAY.

28 **Coal Foundation Invitational Golf Tournament,** Pete Dye Club, Bridgeport, WV. Contact Patty Bruce, WVMRA, (304) 346-5318.

28-30 **Acid Mine Drainage Formation and Abatement Technology,** Penn State, State College, PA. Contract 1-800-PSU-TODAY.

29- Oct. 1
Kentucky Nonpoint Source Conference, The Center For Rural Development, Somerset, KY. Contact Geaunita Caylor (606) 257-2820.

October

8-10 **Kentucky Coal Association Annual Meeting**, Marriott Griffin Gate Resort, Lexington, KY. Contact Mike Musulin, (606) 233-4743.

11-14 **National Mining Association Convention '98,** Pointe Hilton Resort on South Mountain, Phoenix, AZ. Contact Portia Graham, (202) 463-2668.

November

20-21 **West Virginia Mining and Reclamation Association Fall Board Meeting**, Lakeview Resort and Country Club, Morgantown, WV. Contact Patty Bruce, (304) 346-5318.

AUGUST

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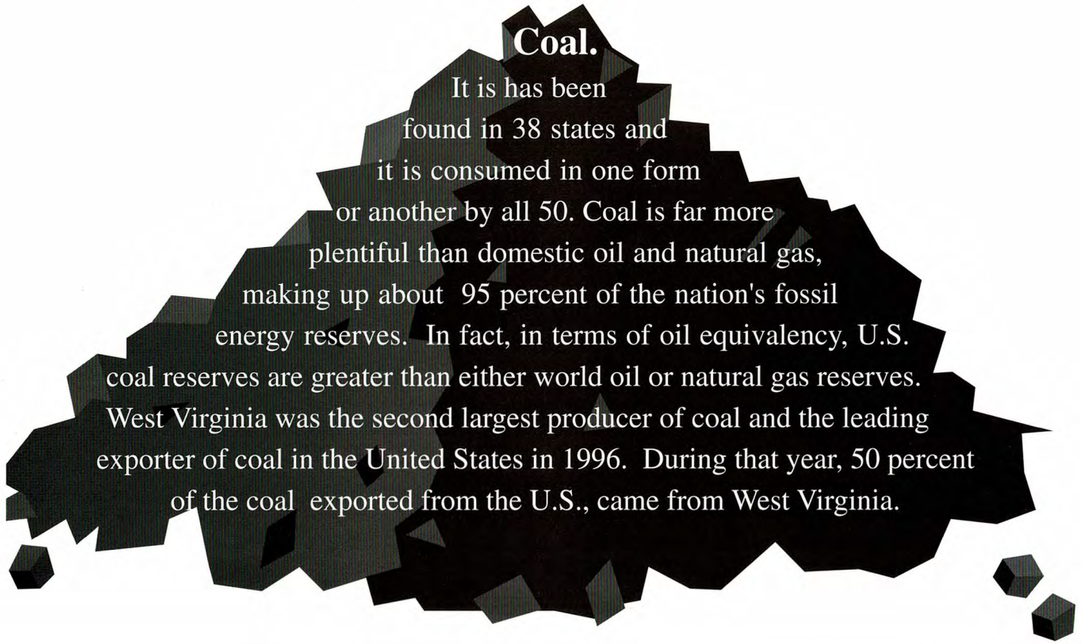
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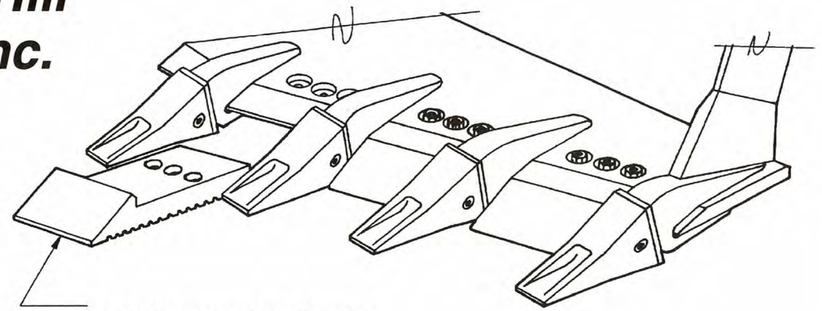
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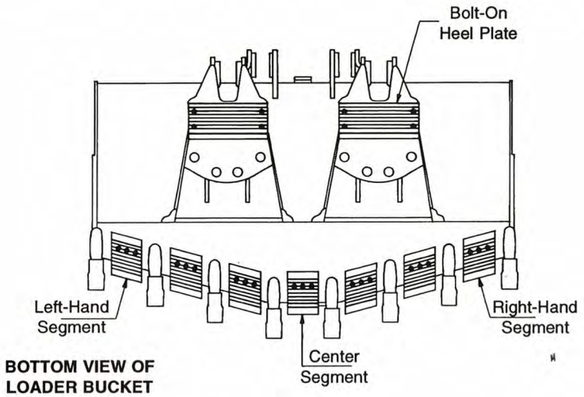
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Companies Open Reclamation Sites During State's DEP Annual Mining Tour

Three companies provided their sites to help interested participants gain a better understanding of mining reclamation practices during the West Virginia Division of Environmental Protection's (DEP) annual mining tour on June 8-10.

Unlike DEP tours in the past, this year's tour had a new twist by including state legislators, citizen critics, media, as well as members from the Governor's newly formed task force together in one group.

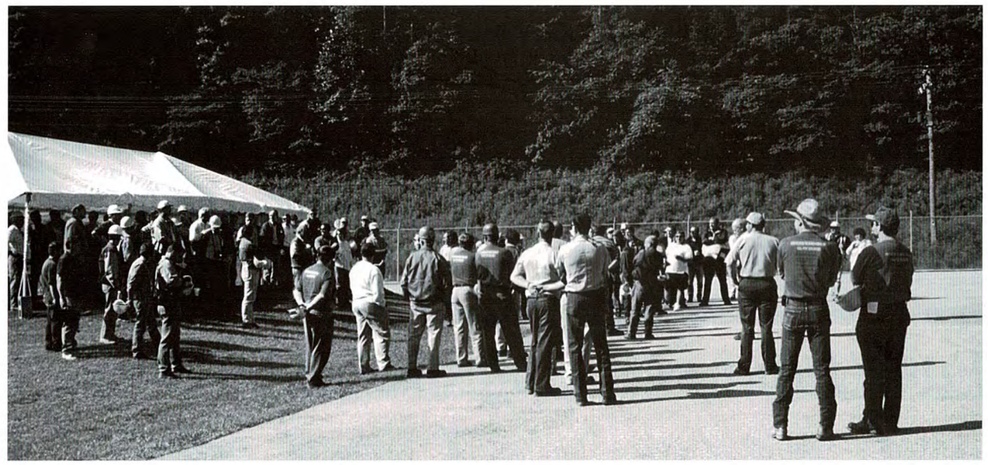
Sites visited were Cannelton Industries in Kanawha/Fayette counties; Hobet Mining, Inc., Dal-Tex Division in Logan County; and Catenary Coal Company - Samples Mine in Kanawha County.

All three locations demonstrated the positive aspects and benefits of reclaimed areas that included wildlife plots, active sites and the practices of re-planting hardwood seedlings.

At the Cannelton Industries site, reclaimed by Perry and Hylton, an unrecognizable mining operation that occurred 30 years ago, now is a serene pasture that at one time harbored cattle.

To the right were hardwood trees branching out just as if nothing had taken place. Off in the distance to the left, also on a reclaimed site, was the Mount Olive Maximum Security Complex.

Profiled on the next several pages are the three companies that hosted the DEP annual tour in June.



About 75 people gather on the first day at Dal-Tex during the Division of Environmental Protection's annual mining tour on June 8-10. During the three-day period, about 100 people, including legislators, citizen critics, media and members from the Governor's newly formed task force on mountaintop mining, participated in the tour.

Catenary Coal Company

County: Kanawha, Boone, and Raleigh.
Nearest Post Office: Eskdale.
Permit Acreage: 6,240.72.
Tons Mined: 4.5 million tons/year.
Employees: 249.
History of Operation: The mine started production in late 1992 and produces more than 4.5 million tons per year of low sulfur coal.
Special Conditions: Prior to Arch's ownership of the properties, the area of the Samples Mine was extensively mined by surface and underground methods.
Reclamation: To date, the mining operation has eliminated more than 20 miles of abandoned highwall, 3 million tons of coal refuse, and extinguished two mine fires in the 5-Block seam. Separately, Catenary has entered into agreements with the WV DEP to reclaim two abandoned refuse piles within the Cabin Creek watershed.
Post Mining Land Use: Wildlife habitat, forest land, and range land.
Mineral: Winifrede, Coalburg, Stockton, Lower 5-Block, 5-Block, 6-Block, and 7-Block.
Estimated Life of Operation: 10 years.
Receiving Stream: Left and Right Forks of White Oak Creek, Seng Creek and Rockhouse Creek of Clear Fork of the Big Coal River, Tenmile Fork, and Cabin Creek.
Major Drainage Basin: Kanawha River.



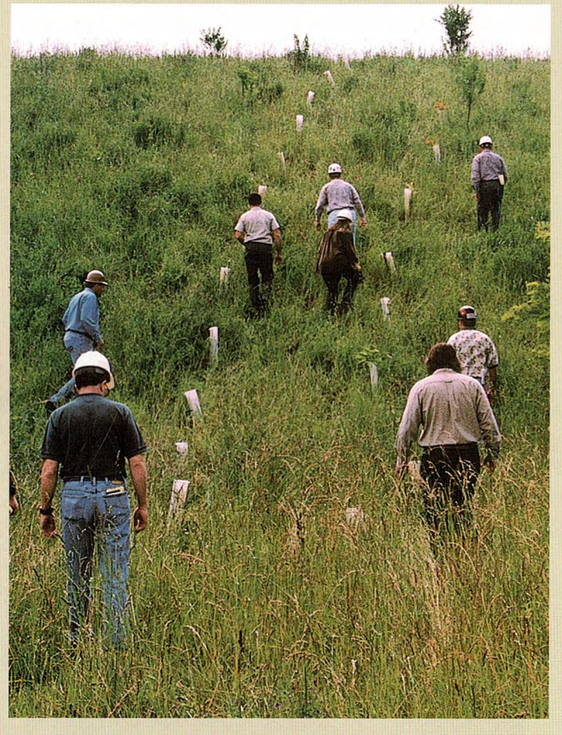
State Delegate Greg Butcher, D - Logan, discusses with Shelly Huffman about what they have seen during the tour at Catenary. Butcher and Huffman are newly appointed members of the Governor's Task Force to study mountaintop mining in West Virginia.

DEP Annual Mining Tour

Hobet Mining, Inc., Dal-Tex Division

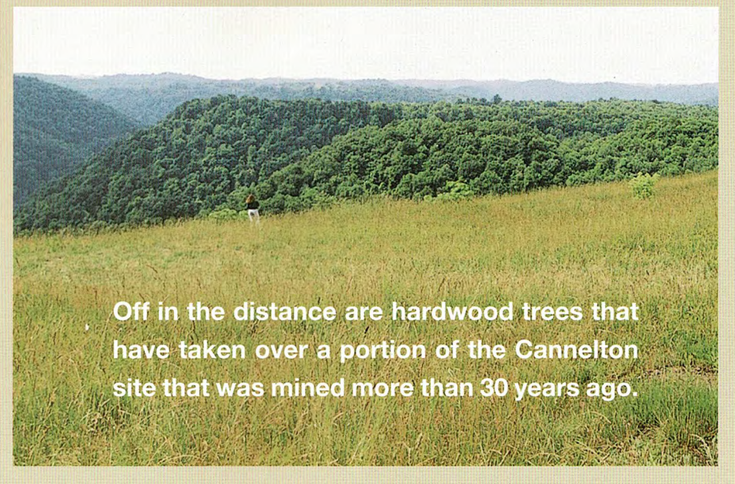
Nearest Post Office: Sharples.
Tons Mined: 4.9 million tons/year.
Employees: 209.
History of Operation: The Left Fork operation was started in 1990. This operation started on the northern most extent of the permit area and has gradually moved south.
Post Mining Land Use: Fish and wildlife.
Permit Acreage: 2,607.
Mineral: Buffalo, Coalburg, Stockton, Clarion, 5-Block.
Estimated Life of Operation: 10-12 years.
Receiving Stream: Left Fork and Briar Branch of Beech Creek of Spruce Fork of Little Creek.
Major Drainage Basin: Kanawha River.
Type of Sediment Structures Used: On-bench sediment ditches and sediment ponds.

Several tour participants look over the hardwood seedling planted in protective tubing. Dal-Tex has planted more than 27,000 hardwood seedlings on its site.



Cannelton Industries, Inc.

County: Kanawha, Fayette.
Nearest Post Office: Cannelton.
History of Operation: Started operation in the mid-1960s.
Tons Mined: Approximately 20 million.
Permit Acreage: 2,010.
Reclamation: After final regrading, the spoil piles were reshaped with dozers and were hydroseeded.
Post Mining Land Use: Originally designated and used as pasture land. Through natural processes, a variety of woody-stem plants are invading the area. Several small water depressional areas and potholes were created during final grading, which continue to provide waterfowl habitat.
Mineral: All splits, 6-Block, 5-Block.
Estimated Life of Operation: Approximately 25 years.
Receiving Stream: Tributaries to Hughes Fork; tributaries to Smithers Creek.
Major Drainage Basin: Gauley and Kanawha Rivers.
Structure used for fish and wildlife habitat: Depressional areas provide seasonal water and potholes provide permanent water.



Off in the distance are hardwood trees that have taken over a portion of the Cannelton site that was mined more than 30 years ago.

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Fortunately, when these sites were mined by mountaintop mining techniques, West Virginia had the vision to dream of what can be, and not be limited to what already is.

The companies that mined those sites were allowed to reclaim them to a condition that supports a multitude of future uses. Like the Iowa farmer in the movie "Field of Dreams," if we build the sites, they will come. And when they come, they will bring with them better jobs, housing, schools, recreation facilities, and a better life for all West Virginians.

Dream West Virginia! Don't let a few local naysayers limit your dreams by overly stringent and unrealistic interpretations of the surface mining and reclamation laws.

All West Virginians benefit from coal everyday. If you believe in the coal industry, don't let people forget how important coal is to this state's economy.



Thousands Visit West Virginia Mining Sites Everyday

Surprisingly to many people, mountaintop mining has been around for 30 years and continues to benefit West Virginia in a variety of ways.

West Virginia is the home of the world's most valuable and abundant mineral deposit, coal. It is a resource we use as a part of our everyday lives.

However, a century of mining, coupled with the continuous decline of prices, western competition and a generation of federal environmental regulation, have forced the coal industry to undergo a tremendous streamlining process as well as a technological revolution.

Simply put, the easy coal has already been mined, the marketplace is even more competitive and mining operations must accommodate numerous environmental considerations. All of which has led to the practice of mountaintop mining, an innovative technique pioneered in West Virginia more than 30 years ago.

Mountaintop mining involves moving all of the overburden from atop the coal seams to recover 100 percent of the mineral. Many mountaintop operations are thriving on sites thought to be "mined out." These seams, once thought to be unminable, are now being recovered. As such, mountaintop mining represents the best mining technology and the most efficient method of recovery in the wise use of West Virginia's mineral wealth.

Surface mining is a short term, interim land disturbing industry. Unlike many other land disturbances, the reclamation process presents a second opportunity for utilization. Once mountaintop operations are completed, the land will never be mined again but through today's sophisticated reclamation techniques, the restored site can be adapted for almost any post mining land use.

The economic importance of mountaintop reclamation is the increased opportunity and potential for development after the mineral has been totally removed.

There is no doubt that many areas of West Virginia are in need of flat building space. In many cases, mountaintop reclamation offers a construction alternative by creating level land.

This concept is not new. Mountaintop mining has been practiced in West Virginia for more than 30 years.

In fact, when Congress passed the Federal *Surface Mining Act* in 1977, the House Interior Committee's report featured a section on mountaintop mining. Within that section, a full-page photograph of Cannelton Industries, Inc. surface operation (see cover photograph) near Montgomery, WV, was used to show the technique pioneered by Tracy Hylton. The report used the photograph as a positive example of mountaintop mining in West Virginia and noted the site was "suitable for various uses."

The federal report also explains that there is the possibility of "improved land uses through the creation of significantly expanded areas of flat land."

In West Virginia, state law provides regulations through the *West Virginia Surface Coal Mining and Reclamation Act* that specifies the development of mountaintop mining sites may include any of the following: Heavy industry (airports, manufacturing); Light industry (stores, parking facilities); Public Services (schools, hospitals); Residential (housing developments); Cropland; Rangeland; Hayland or pasture; Forestland; Commercial woodland; Impoundments of water; or Fish and wildlife habitat and recreation land.

The importance of reclaimed land as valuable real estate has been recognized in West Virginia for many years. In McDowell and Raleigh counties, for example, these lands have provided the locations for major school facilities constructed almost 20 years ago.

In Fayette County, the Mount Olive Maximum Security Correctional Complex was constructed to replace the outdated Moundsville prison and provides 350 direct jobs to the area.

And, as a result of mountaintop mining, an airport as well as the Southwestern Regional Jail and adjoining industrial park were constructed in Logan County.



After the mountaintop mining operation was completed, Geupel Construction Co., in conjunction with the Logan County Airport Authority, constructed this airport several years ago.

Farther north in Harrison County, a new F.B.I. center, the Eastpointe and Newpointe malls, Bridgeport City Hall, U.S. Postal Service, Robert C. Byrd High School and numerous other stores and businesses are located on reclaimed sites. At these locations alone there are more than 5,000 West Virginians employed!

The Morgantown Mall, in Monongalia County, has taken advantage of a reclaimed mining site as well.

The city of Weirton, in Hancock County, has used reclaimed sites for its 260-bed hospital, the Weirton Steel Office Complex, little league fields as well as developments and businesses for more than 20 years.

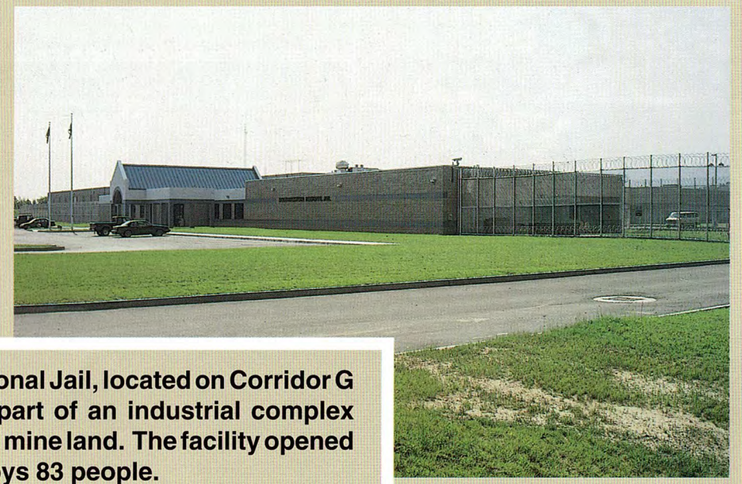
Coal is West Virginia's most recognizable product. The industry provides a valuable resource and jobs. Once reclaimed, mining sites can continue to contribute even more to the economic benefit for West Virginia.

West Virginia will continue to be the economic frontier for companies in all industries well into the next century. As they seek land to construct new facilities, mountaintop mining sites will provide prime building locations.

We have more than 40 years of history to prove it!

On the following pages are just a few examples of how, over the years, mountaintop mining sites have provided excellent locations for a multitude of opportunities and uses.

Southwestern Regional Jail
Logan County



The Southwestern Regional Jail, located on Corridor G in Logan County, is a part of an industrial complex developed on reclaimed mine land. The facility opened in April 1998 and employs 83 people.

Eastpointe/Newpointe Mall Area
Harrison County

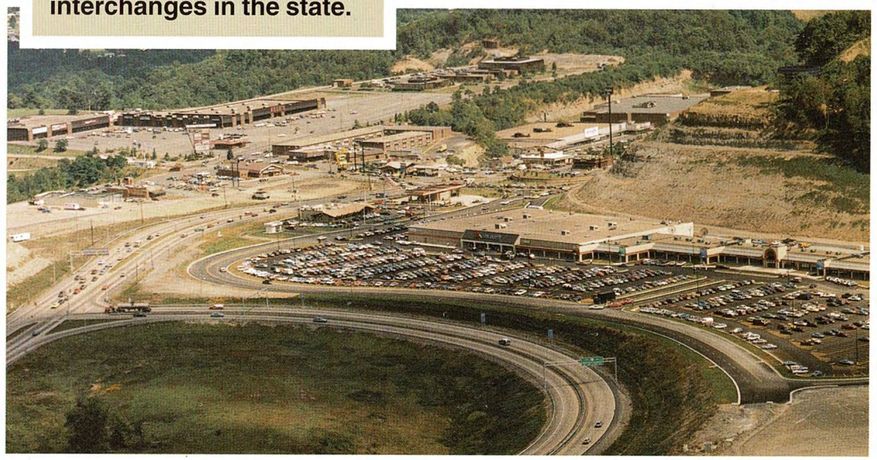
At the Interstate 79 and U.S. 50 interchange, LaRosa Fuels, Inc. and Thompson Coal and Construction Company, using mountaintop mining, created the real estate that has been heavily developed. Today, it has become one of the busiest interchanges in the state with an estimated 100,000 plus vehicles traveling on the interchange every day. Employing about 2,000 people in just this one area, the mining site is approximately 2 miles long and has numerous businesses retail stores, city buildings, hotels, and malls.

Commercial Impact

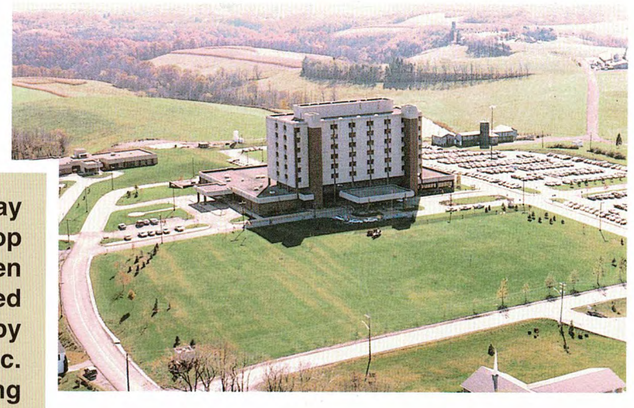
Thompson Plaza - 20 acres;
Hills Plaza - 15 acres;
Eastpointe (I, II, III) - 80 acres;
Newpointe - 45 acres;
Unfinished Newpointe planned for development - 35;
Location of Bridgeport City Hall;
U.S. Postal Service;

More than 2,000 employed;
More than $100 million gross business;
More than 500 hotels rooms.

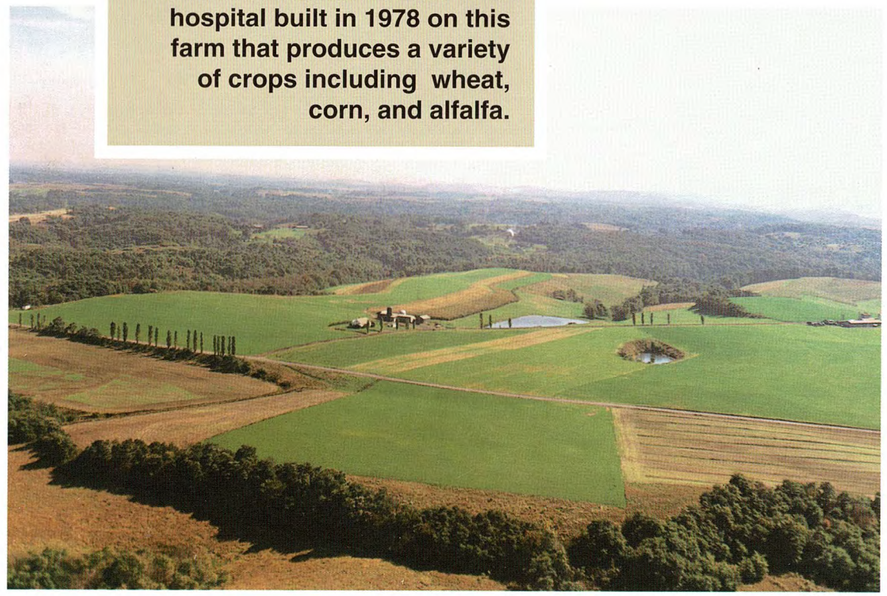
Eastpointe Mall is located on one of the busiest interchanges in the state.



Weirton
Hancock County



About 85% of modern-day Weirton is built on mountaintop mining sites that have been reclaimed and developed in the late 70s, mostly by Starvaggi Industries, Inc. Weirton's post mining land use includes housing developments, shopping centers as well as this 260-bed hospital built in 1978 on this farm that produces a variety of crops including wheat, corn, and alfalfa.





Although many companies reclaim sites that could provide the opportunity for economic development, creating wildlife habitat is also an important part of reclamation. Coyotes and many other wildlife species inhabit mining sites after they have been reclaimed. This coyote happened to be on a Catenary Coal Co. site in Kanawha County.

Mount View High School
McDowell County



Mount View High School was built in 1980 on an area that was once a mountaintop mining site. With McDowell County more than 90 percent hillside, land that can be used for economic development is at a premium. Mountaintop mining allows for maximum efficiency in mineral recovery and creates developable, level land, which is in short supply in West Virginia.

F.B.I. Complex
Harrison County

The F.B.I. Complex in Clarksburg has become a very important part of the city's growth. Completed in July 1995, this F.B.I. facility has grown to more than 3,000 employees and is located on 986 acres of reclaimed land.



Mount Olive Correctional Complex
Fayette County

Due to the limited supply of accessible, sufficient, large, level, tracts of undeveloped land in West Virginia, planners considered building two correctional facilities to replace the civil war-era Moundsville Penitentiary.

This solution would have been more costly and less efficient by duplicating programs and services causing operating expenses to be higher than acceptable for West Virginia taxpayers.

However, it was later discovered that numerous reclaimed surface mine sites in the Upper Kanawha Valley had the potential for redevelopment and could provide more than 300 acres in area.

Ultimately, the site decided upon for Mount Olive was in Fayette County, originally owned and mined by Cannelton Industries, Inc.

In the upper right portion of the photograph, is the Warden's residence that overlooks the complex.

Mount Olive At A Glance

Completed in December 1994;
120 Acre-site;
386 Employees;
More than 500 indirect (private) jobs;
$60 Million Capital Investment;
$17.7 Million Annual Expenditures.



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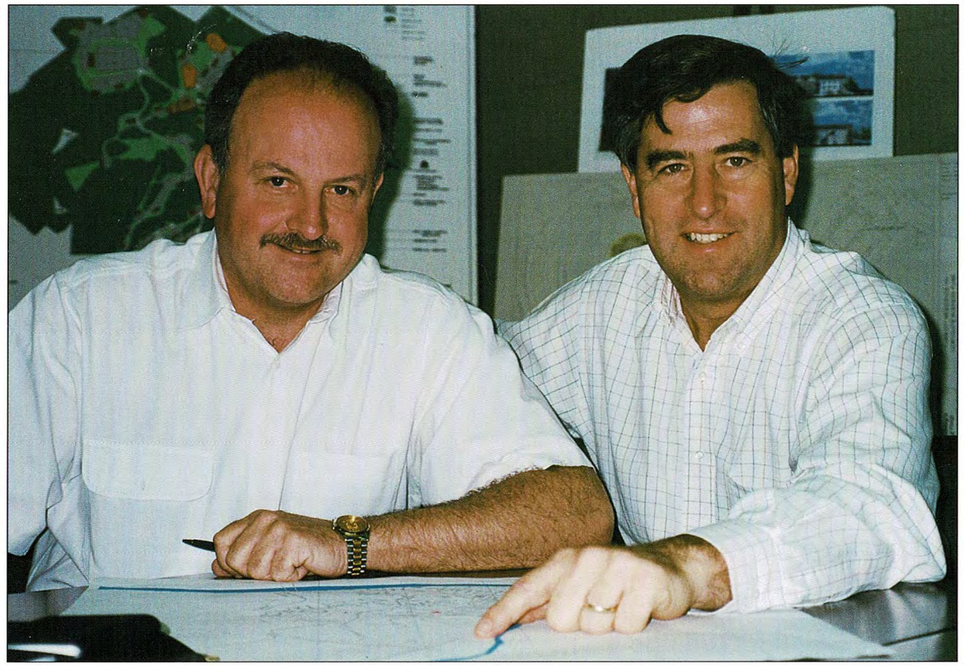


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Standard	17 yd^3 (13.00 m^3)	22 yd^3 (16.82 m^3)	28 yd^3 (21.4 m^3)
High Lift	16 yd^3 (12.00 m^3)	20 yd^3 (15.29 m^3)	26 yd^3 (19.9 m^3)
Dump Heights			
Standard	18'-5" (5.61 m)	18'-10" (5.74 m)	21'-6" (6.55 m)
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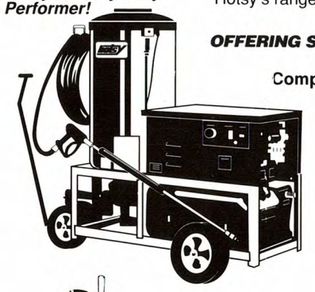
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AMERICAN WOODCOCK USE OF RECLAIMED SURFACE MINES IN WEST VIRGINIA

Ian D. Gregg, **Jeffrey G. Skousen** and
David E. Samuel - West Virginia University

"What's a woodcock ?" Some people hear the name and picture a wood duck or woodchuck, but just one look at this little bird's unique appearance will tell you that the woodcock is something different. Indeed, "different" is a good way to describe the American woodcock, because it is one of West Virginia's most unique and interesting birds.

Just ask someone who's come to know this feathered bundle of energy. A birdwatcher might tell you about the woodcock's musical, acrobatic courtship display on warm spring evenings. A hunter might tell you how the woodcock is a prized game bird, requiring a good shooting eye or a little luck to bring down as it zigzags through the trees. (Although he definitely won't tell you the locations of the old surface mines where his setter points the birds every fall.)

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However, a biologist will tell you that the woodcock is a species in trouble. Populations throughout its range in eastern North America (including West Virginia) are low and have been steadily decreasing for 30 years (Bruggink 1996).

The trends are of such concern that the U. S. Fish and Wildlife Service had to cut the 1997 hunting season in half. Why these declines in population? The main problem is habitat loss. Woodcock require areas that provide three key components. First, there must be thick shrub and tree cover (typical of the young stages of forest growth) to provide protection from predators while feeding or resting during the day. Second, there must be moist, rich soils that support abundant populations of earthworms (the species' primary food). Finally, there must be scattered grassy openings, which are used at twilight in the spring for the male's vocal display on the ground and in flight to attract mates, and as resting areas under the cover of darkness during the summer. Alder swamps, overgrown fields, and young hardwood stands are typical examples of areas that provide these three components. Such areas simply are not as abundant as they once were - they have become housing developments, golf courses, or mature forests, and are no longer suitable for woodcock.

Thus, it is important to find ways to create new

woodcock habitat (U. S. Fish and Wildlife Service 1990). Past studies of reclaimed mines have demonstrated that they can provide habitat for a variety of wildlife species including wild turkeys (Anderson 1980) and white-tailed deer (Knotts 1975). And, as mentioned before, hunters traditionally have sought woodcock on old surface mines during the autumn migration. Might West Virginia's reclaimed mines also provide courtship and feeding habitat during the spring and summer? If so, what habitat features on reclaimed mines are most important in determining woodcock use ? And, how could future reclamation and management of surface mines be designed to benefit this species ? A recent study by researchers at West Virginia University addressed these questions.

STUDY AREAS AND INFORMATION COLLECTED

Patriot Mining Company, Buffalo Coal Company, and New Allegheny, Inc., along with other landowners, provided access to reclaimed sites of a variety of ages and reclamation types for the study. We selected a total of 29 reclaimed study sites in Monongalia, Preston, Tucker, Grant, Randolph, and Greenbrier Counties (Fig. 1). Sites ranged from 4 to 45 years in average age of reclamation and from 23 to 370 acres in size.

At each site, we measured two types of woodcock use: feeding use during the summer months (determined by flush counts with a pointing dog) and singing use by males during April and May (determined by conducting surveys on foot in twilight periods). We also collected data on each site's vegetation (amounts, types, and heights of shrub, tree, and herbaceous cover), soils (moisture retention, organic matter content, pH, and compaction), and earthworm abundance.

WOODCOCK USE OF RECLAIMED SITES

Of the 29 sites, 15 were used by woodcock. Five were used as feeding habitat only, four by singing males only, and six as both feeding and singing habitat.

Feeding Use

We found that woodcock feeding use was highest on older sites (more than 25 years old) and sites with a mix of old and new reclamation (Fig. 2). These areas provided good cover; they had four times as many shrub and tree stems as other sites (Fig. 3) and averaged about 50% canopy cover of shrubs and trees as compared to less than 20% cover found on areas not used for feeding. Woodcock selected feeding areas on these older sites where the soil had more organic matter, lower compaction, and more earthworms. However, in comparison to newer reclamation, the soil conditions on these older sites were not very good. The older sites averaged less than 2 g / m^2 of earthworms (Fig. 3); past research has suggested that at least 8 g / m^2 are needed to provide ideal woodcock habitat (Straw et al. 1994), so food may be inadequate on these older sites. Sites reclaimed more recently had many more earthworms, but they did not provide sufficient cover to allow woodcock to safely use them for feeding. The fact that woodcock were using older sites, even with low levels of earthworms, suggests that mines may be the best available habitat in some areas. However, to provide better-quality feeding habitat in reclaimed areas, it will be necessary to provide suitable cover on newer reclamation with its better soil and earthworm condi-

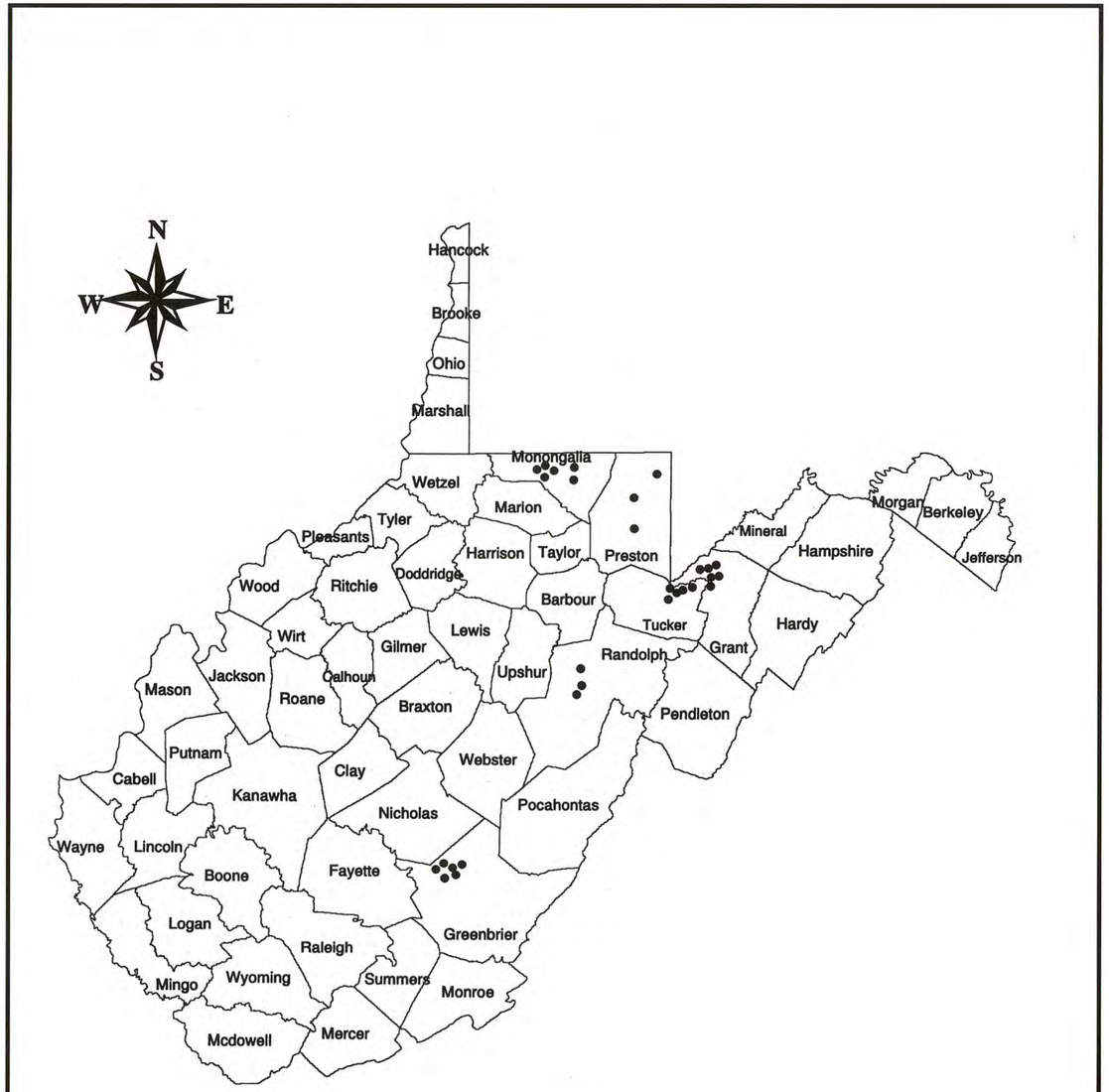


Figure 1: Study area locations

tions.

Singing Use

As with feeding use, singing use was high on sites with mixed old and new reclamation. In contrast to feeding use, however, single-age sites used were of the younger, more open variety (Fig. 2). For the actual singing grounds, woodcock selected areas of about 0.25 acre which had less litter cover and shorter herbaceous plants than the rest of the site. Although these singing ground areas did not have a lot of woody vegetation, there typically were some scattered shrubs around them, which probably provided some cover without interfering with the flight portion of the display. Areas chosen for singing grounds included overgrown haul roads and wet or rocky areas with sparse herbaceous cover. These types of areas arise virtually incidentally to reclamation and probably do not have to be actively created as long as some openings are present.

RECLAMATION FOR WOODCOCK

It is clear that reclaimed surface mines are used by woodcock. However, existing reclaimed areas tend not to be ideal woodcock habitat. Older sites generally provide good cover, but less favorable soil and earthworm conditions for feeding habitat and inadequate openings for singing grounds. Newer sites have abundant singing ground areas, with better soil and earthworm conditions, but often lack sufficient woody cover to provide feeding habitat. The best existing sites appear to be those with mixed old and new reclamation; both feeding and singing use were highest on such sites. Thus, reclamation should be aimed at providing sites with good soil and a mix of woody cover and open grassy areas. There are several strategies which could help accomplish this. First, plantings of shrubs and trees should be emphasized in current reclamation. Hawthorn and black alder are two species that have been used successfully in reclamation plantings (Skousen 1988) and will provide appropriate habitat for woodcock. Rather than scattering individual shrubs and trees across the entire site, they should be planted in clumps one to several acres in size, leaving grassy openings in between.

Another helpful step would be creation of wetlands during regrading. This adds valuable habitat diversity to reclaimed sites (Ohlsson et al. 1982) and will help maintain areas of moist soil (and thus earthworms for woodcock) throughout the year. West Virginia Division of Natural Resources biologists can assist operators in inte-

Figure 2: Woodcock singing and feeding use by age class on 29 West Virginia surface mines, 1995-96.

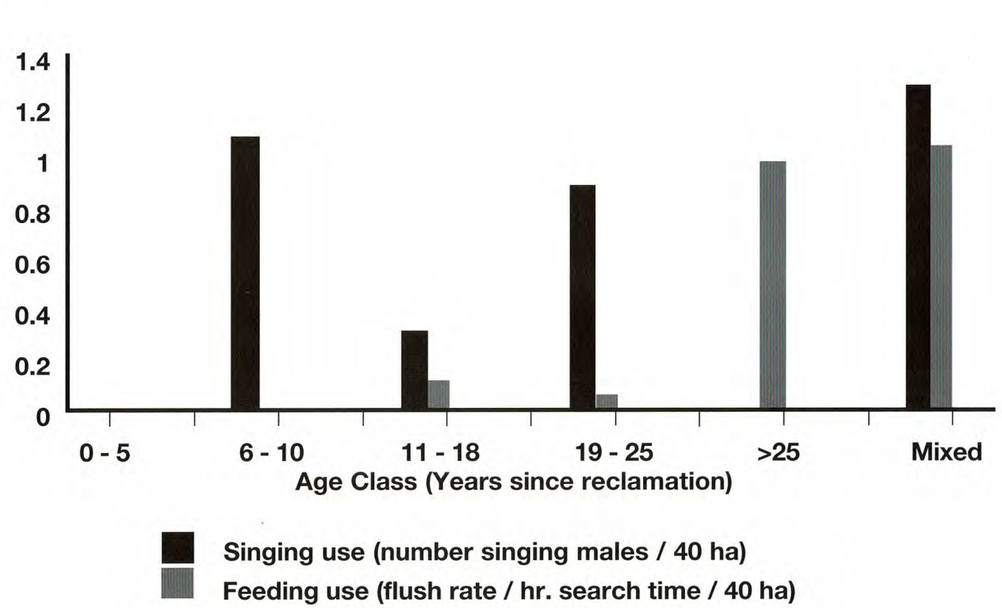
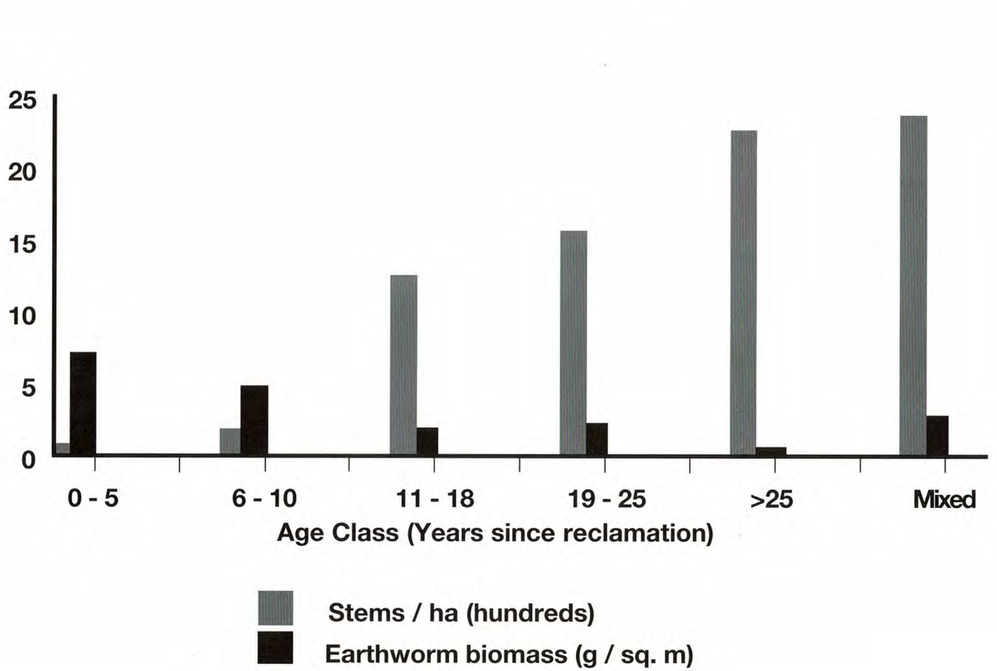


Figure 3: Stems/ha and earthworms biomass by age class on 29 West Virginia surface mines, 1995-96.



grating these guidelines into site-specific wildlife habitat reclamation plans for woodcock and other species.

Existing reclaimed and AML sites also can be managed to benefit woodcock. On older sites where succession has proceeded far enough to produce mature forests that are less suitable for woodcock, management techniques such as periodically cutting strips or patches of trees will provide temporary openings for singing grounds that will develop into excellent feeding cover as they grow back into brushy stages (Sepik et al. 1981). Partial remining on some sites might be a way to provide the interspersed old and new reclamation which woodcock seem to prefer while also providing economic and AMD abatement benefits.

In conclusion, woodcock do use reclaimed mine sites in West Virginia, even though reclamation has not been designed specifically for them. However, the reclaimed sites they are using often do not provide ideal habitat because they lack one or more key habitat components (good shrub and tree cover, good soil with many earthworms, and some openings). By consciously designing reclamation plans to provide all of these components on the same sites, it should be possible to further enhance the value of reclaimed areas for this species. This, in turn, could help counteract some of the losses of woodcock habitat that have occurred in the state and thus ensure that future generations of West Virginians can continue to enjoy this fascinating bird.

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(Above) Woodcock singing ground in a 20 year-old reclamation site in Randolph County.

(Below) Woodcock singing ground in a 7 year-old reclamation site in Tucker County.





American Woodcock



(Above) Woodcock feeding habitat in a 10 year-old reclamation site in Tucker County.

(Below) Woodcock feeding habitat in a 10 year-old reclamation site in Greenbrier County.



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