

December 2009

SURFACE COAL MINING

Characteristics of Mining in Mountainous Areas of Kentucky and West Virginia



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Highlights

Highlights of [GAO-10-21](#), a report to congressional requesters

Why GAO Did This Study

Surface coal mining in the mountainous areas of Appalachia—often called “mountaintop mining”—generates controversy, in part because of its scale and the post-mining appearance of the land. Yet there is limited public access to information on the size, location, and life span of these operations, or on how the land can be expected to look afterward. GAO was asked to report on the characteristics of (1) surface coal mining and (2) reclaimed lands that were disturbed by surface coal mining in the mountainous, eastern part of Kentucky and in West Virginia, where most such mining occurs.

Federal and state law requires mining operators to obtain permits before mining. Among other things, the permits identify the acres under open permit (the acres subject to mining associated with a permit that has not been closed) and how the land will be reclaimed—including the post-mining land use, whether the approximate original contour (AOC) of the land will be restored, and the extent to which excess earth, rock, and other materials (known as “spoil”) are placed in nearby valleys. For this study, GAO relied on electronic databases of mining permits maintained by Kentucky and West Virginia. This report makes no recommendations. In commenting on a draft of this report, the Department of the Interior and the two state mining agencies generally agreed with our findings.

[View GAO-10-21](#) or [key components](#).
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SURFACE COAL MINING

Characteristics of Mining in Mountainous Areas of Kentucky and West Virginia

What GAO Found

Surface coal mining in Kentucky and West Virginia had the following important characteristics, based on permits issued from January 1990 through July 2008:

- The number of acres under open permit increased by an average annual rate of 2.2 percent in Kentucky and 1.7 percent in West Virginia.
- The number of acres under open permit became more geographically concentrated.
- The length of time that permits were open varied from less than a year to more than 18 years.
- In West Virginia, 28 contiguously permitted areas contained nearly half of the permitted acres, as of July 2008.

Reclaimed lands had the following important characteristics, based on permits issued from January 2000 through July 2008:

- The most common type of post-mining land use in Kentucky was fish and wildlife habitat and, in West Virginia, it was forestland.
- Most permits required operators to reclaim the land to AOC, but there were some exceptions (called variances). Most of the variances were for lands where there was insufficient spoil to restore AOC because the land had been previously mined but not reclaimed.
- Kentucky and West Virginia collectively approved nearly 2,000 fills to store at least 4.9 billion cubic yards of excess spoil in nearby valleys.

A West Virginia site showing the bare soil of active mining and the greener land that is being reclaimed



Source: GAO.

Contents

Letter		1
	Background	4
	Characteristics of Surface Coal Mining in Mountainous Areas in Kentucky and West Virginia	8
	Characteristics of Reclaimed Lands That Were Disturbed by Surface Coal Mining in Mountainous Areas of Kentucky and West Virginia	29
	Agency Comments and Our Evaluation	62
Appendix I	Objectives, Scope, and Methodology	64
Appendix II	Comments from the Department of the Interior	69
Appendix III	Comments from the Kentucky Department for Natural Resources	74
Appendix IV	Comments from the West Virginia Department of Environmental Protection	81
Appendix V	GAO Contact and Staff Acknowledgments	82
Tables		
	Table 1: Coal Production from Surface Mines in Select States and Regions, 2008	6
	Table 2: The 10 Counties in Kentucky with the Largest Number of Open Acres in July 2008 and the Number of Open Acres in Those Counties in 1990	20
	Table 3: The 10 Counties in West Virginia with the Largest Number of Open Acres in July 2008 and the Number of Open Acres in Those Counties in 1990	22

Figures

Figure 1: Contour, Auger, and Highwall Mining	5
Figure 2: Area Mining on a Mountaintop	6
Figure 3: Acres in Kentucky Associated with Issued, Released, or Forfeited Permits, by Year the Permit Was Issued, Released, or Forfeited, 1970–July 2008	11
Figure 4: Cumulative Number of Acres in Kentucky Associated with Open, Released, and Forfeited Permits, 1970–July 2008	13
Figure 5: Acres in West Virginia Associated with Issued, Released, or Forfeited Permits, by Year the Permit Was Issued, Released, or Forfeited, 1961–July 2008	15
Figure 6: Cumulative Number of Acres in West Virginia Associated with Open, Released, and Forfeited Permits, 1961–July 2008	17
Figure 7: Acres in Kentucky under Open Permit as a Percentage of All Acres under Open Permit in the 10 Counties with the Largest Number of Open Acres in July 2008	19
Figure 8: Acres in West Virginia under Open Permit as a Percentage of all Acres under Open Permit in the 10 Counties with the Largest Number of Open Acres in July 2008	21
Figure 9: Average Length of Time Kentucky Permits Issued Since 1990 Were Open, by Size and Status, as of July 2008	23
Figure 10: Average Length of Time West Virginia Permits Issued Since 1990 Were Open by Size and Status, as of July 2008	24
Figure 11: The 559 Permitted Areas in West Virginia, as of July 2008	26
Figure 12: The 28 largest Permitted Areas in West Virginia	28
Figure 13: PMLU Types Approved in Kentucky, 1970–2008	32
Figure 14: PMLU Types Approved in West Virginia, 1970–2008	34
Figure 15: Pre-Mining Land Use Types Identified in Kentucky, 1970–2008	37
Figure 16: Pre-Mining Land Use Types Identified in West Virginia, 1970–2008	39
Figure 17: An Illustration of a Reclaimed Site Meeting the AOC Requirement, Compared with the Original, Pre-Mining Contour	42
Figure 18: Number of Permits in Kentucky Issued to Be Reclaimed to AOC, Compared with Permits Issued with AOC Variances, 1970–2008	43
Figure 19: Number of Permits in West Virginia Issued to Be Reclaimed to AOC, Compared with Permits Issued with AOC Variances, 1970–2008	45

Figure 20: A Reclaimed, Surface-Mined Site with an AOC Variance in West Virginia	47
Figure 21: Types of AOC Variances Approved in Kentucky, 1970–2008	50
Figure 22: Types of AOC Variances Approved in West Virginia, 1970–2008	52
Figure 23: A Terraced Fill on a Reclaimed Site in West Virginia	54
Figure 24: Fills Approved in Kentucky, 1970–2008	56
Figure 25: Storage Volume of Fills Approved in Kentucky, 1970–2008	57
Figure 26: Fills Approved in West Virginia, 1970–2008	59
Figure 27: Storage Volume of Fills Approved in West Virginia, 1970–2008	60
Figure 28: Length of Fills Approved in West Virginia, 1970–2008	61

Abbreviations

AOC	approximate original contour
EIA	Energy Information Administration
ERIS	Environmental Resources Information System
OSM	Office of Surface Mining Reclamation and Enforcement
PMLU	post-mining land use
SMCRA	Surface Mining Control and Reclamation Act of 1977
SMIS	Surface Mining Information System

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United States Government Accountability Office
Washington, DC 20548

December 9, 2009

The Honorable Norm D. Dicks
Chairman
The Honorable Michael K. Simpson
Ranking Member
Subcommittee on Interior, Environment
and Related Agencies
Committee on Appropriations
House of Representatives

The Honorable Jeff Bingaman
Chairman
Committee on Energy and Natural Resources
United States Senate

Surface mining for coal in the mountainous areas of Appalachia—often referred to as mountaintop mining—generates controversy due to the scale of mining operations and concern about the post-mining appearance of reclaimed lands, among other issues. Mountaintop mining operations can involve thousands of acres and take a decade or more to complete. During this time, the land is cleared of forests and other vegetation, and explosives or other techniques are used to break up the earth, rock, and other materials (known as “spoil”). The spoil is then removed to expose the underlying coal seams and allow for its extraction.¹ Once the coal has been extracted, some or most of the spoil is placed back on top of the mined-out area. Excess spoil is often placed in adjacent valleys. The area is then prepared for its post-mining land use.

Surface mining is an important source of coal production in Appalachia, accounting for about 40 percent of the coal produced in the region in 2008, the most recent data available.² In 2008, Kentucky and West Virginia accounted for about 76 percent of the coal produced from surface mines

¹Mining breaks up solid rock layers and produces smaller, irregularly shaped pieces that are separated by voids, or air pockets. This causes the overall volume of the excavated material to increase, or “swell,” so that it no longer fits together as compactly as it once did.

²The remaining 60 percent of coal produced in Appalachia comes from underground mining.

in Appalachia, producing about 120 million tons, making them the third- and second-largest surface coal-producing states in the nation.³ Almost all surface mining in Appalachia occurs on private land.

Surface mining of coal is regulated by the Surface Mining Control and Reclamation Act of 1977 (SMCRA), which created the Department of the Interior's Office of Surface Mining Reclamation and Enforcement (OSM) to implement and enforce the act. SMCRA allows an individual state to develop its own program to implement SMCRA if that program is in accordance with federal law and is approved by OSM. OSM is charged with enforcing states' adherence to their approved programs or implementing a federal program in accordance with SMCRA if the state fails to submit, implement, or enforce its own program. OSM has approved programs for 24 states, including Kentucky and West Virginia in 1982 and 1981, respectively.

Despite the public scrutiny that surface mining in mountainous areas has received, the public is limited in its ability to access information on the scope of these operations—their size, location, and how long they have been in operation—and on what the mountain can be expected to look like after mining operations have ceased and the land has been reclaimed. Although this information is available to the public, the public cannot readily aggregate these data over time to perform trend analyses, which is a key component to understanding the characteristics of surface mining in these states since mining operations can last a decade or more. In response to your request, this report provides information on the characteristics, over time, of (1) surface coal mining in mountainous areas in Kentucky and West Virginia and (2) reclaimed lands disturbed by surface coal mining in mountainous areas in Kentucky and West Virginia.

This report focuses on surface coal mining in the mountainous areas of Kentucky and West Virginia because these are the states in which the majority of mountaintop mining that is the source of controversy in Appalachia occurs. These areas accounted for about 73 percent of Appalachia's surface coal production in 2008. For Kentucky, we included in our analysis surface mining permits in the mountainous, eastern part of the state, which accounted for most of the state's surface coal production. We excluded permits in the flatter, western part of Kentucky, which accounted for about 9 percent of Kentucky's surface coal production in

³Wyoming produced about 464 million tons of coal from surface mines in 2008.

2008. We included surface mining permits from all of West Virginia in our analysis. To address our objectives, we relied extensively on the two states' electronic databases, which contain select information from the states' surface mining permit files. The permit files provide detail on mining operations that are not contained in these databases. The Kentucky database is called the Surface Mining Information System (SMIS). The West Virginia database is called the Environmental Resources Information System (ERIS). Through extensive discussion with state officials familiar with these electronic databases, and our analysis of the information from the databases, we determined that specific data elements are sufficiently reliable within certain time frames. Specifically, due to limits on data reliability and to be consistent between the states, we are reporting on the characteristics of surface mining in Kentucky and West Virginia from January 1990 through July 2008 and on the characteristics of reclaimed lands that were disturbed by surface mining from January 2000 through July 2008, except for Kentucky's data on variances, for which we are reporting from January 2002 through July 2008. However, SMIS and ERIS also contain data on these characteristics for prior years, in some cases dating to 1961. For some of these years, for some data elements, we determined that the data is reliable; in other instances, we identified specific data limitations. Although the general public has access to data from all years—the surface mining permit files in Kentucky and West Virginia are public documents—the data are readily accessible to the public by electronically accessing SMIS and ERIS. We include data from all years in many of the graphics in our report in order to provide a comprehensive overview of the data in SMIS and ERIS that clearly identifies the years for which there are data limitations and what those data limitations are. We believe that presenting data from the earlier years—and its limitations—decreases the likelihood of misuse or misinterpretation because the limitations on the data are not disclosed on the Web sites from which the public accesses SMIS and ERIS. Additionally, for West Virginia, we combined data from ERIS with electronic geospatial files of permit boundaries from the West Virginia Department of Environmental Protection to determine which permitted areas were adjacent to each other. From this information, we identified the largest, contiguously permitted areas in West Virginia. We had insufficient data to identify contiguously permitted areas in Kentucky. We also reviewed relevant federal and state laws, regulations, and policy guidance on surface coal mining and reclamation; visited several active mining operations and reclaimed sites in the two states; and met with officials from OSM, the West Virginia Department of Environmental Protection, and the Kentucky Department for Natural Resources. A more detailed description of our scope and methodology is presented in

appendix I. We conducted our work from March 2008 to December 2009 in accordance with all sections of GAO’s Quality Assurance Framework that are relevant to our objectives. The framework requires that we plan and perform the engagement to obtain sufficient and appropriate evidence to meet our stated objectives and to discuss any limitations in our work. We believe that the information and data obtained, and the analysis conducted, provide a reasonable basis for any findings and conclusions in this report.

Background

This section provides background on surface coal mining techniques used in Kentucky and West Virginia, coal production data, and SMCRA’s requirements for coal mining operations.

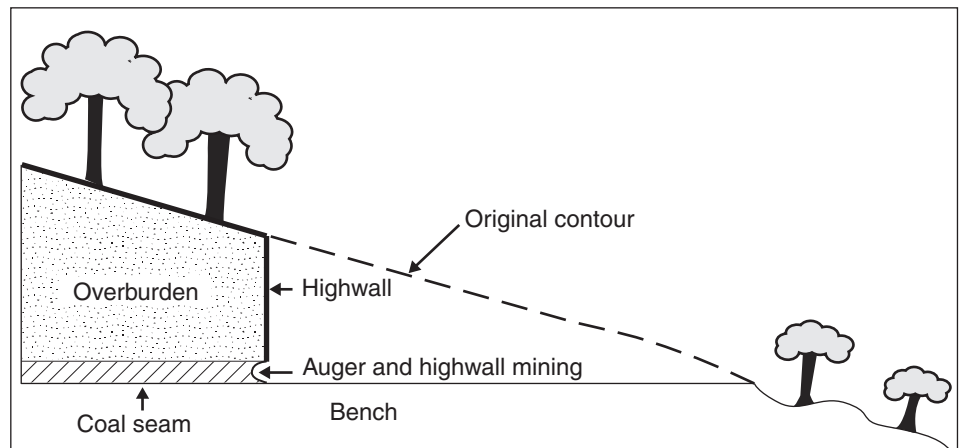
Surface Coal Mining Methods Used in Kentucky and West Virginia

A number of different surface mining methods are used to mine coal in Appalachia—including in Kentucky and West Virginia. The method used depends largely on the geology, terrain, and the accessibility of the underlying coal seam. Three of the most commonly used methods are contour mining, auger/highwall mining, and area mining. What is conventionally referred to as mountaintop mining is typically mining using one or more of these methods in mountainous areas.

Contour mining is typically used where coal seams are exposed in outcrops on hillsides and mountainsides. A cut is first made in the hillside above a coal seam to remove the overburden—the dirt and rock above a coal seam. This further exposes the coal seam and creates a flat area, called a bench, and a highwall—a cliff of exposed rock left after a surface mining operation has cut into the landscape. The mine is then enlarged by successive cuts that follow the coal seam around the side of the hill. The mining extends into the hill to the point where the overburden is too thick to make further exposure of the coal seam economic. The overburden—which is called spoil once it has been removed—can be placed back on top of the mined-out area. Any excess spoil that is not replaced because of stability or other reasons is placed in nearby valleys and hollows. Additionally, auger mining often is used at this stage to maximize the amount of coal recovered. Auger mining involves drilling into an exposed coal seam at the highwall, from the bench—much like a carpenter drills through wood. If coal seam characteristics permit, a “highwall miner” may be used in place of an auger. A highwall miner typically uses rotary cutting heads to extract the coal from the exposed coal seam. Both methods are secondary methods that permit the recovery of additional coal that would

not be economically recovered through surface or underground mining. Figure 1 depicts contour, auger, and highwall mining.

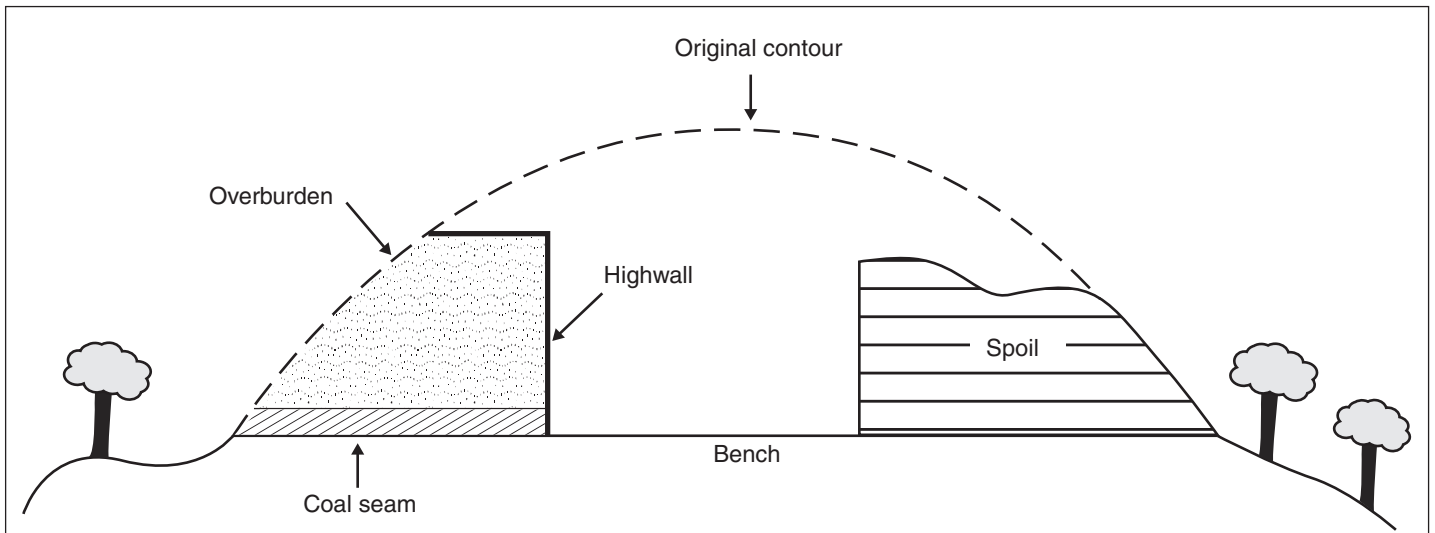
Figure 1: Contour, Auger, and Highwall Mining



Source: GAO depiction of an OSM figure.

To recover additional coal that cannot be recovered through contour and auger mining, some or all of a mountaintop can be area mined. To provide a flat surface for the operation of equipment, a first cut is made parallel to the top of the ridge after vegetation and topsoil have been removed. The overburden is loosened by blasting and removed. Once the coal seam is uncovered, the coal can be removed. As with contour mining, the overburden can be placed back on top of the mined-out area or in nearby valleys and hollows. Figure 2 depicts area mining on a mountaintop.

Figure 2: Area Mining on a Mountaintop



Source: GAO depiction of an OSM figure.

Surface Coal Production in Kentucky and West Virginia

In 2008, Kentucky and West Virginia accounted for about 76 percent of the coal produced from surface mines in Appalachia and are the states with the third- and second-largest surface coal production totals in the country, respectively. Wyoming is the largest. See table 1.

Table 1: Coal Production from Surface Mines in Select States and Regions, 2008

State/region	Production (thousands of short tons)	Percentage of production of total U.S. surface mines
All U.S. surface mines	813,322	100%
Appalachia (including eastern Kentucky and West Virginia)	157,705	19.4
Kentucky (east and west)	50,849	6.3
Kentucky (east only)	46,116	5.7
West Virginia	69,409	8.5
Wyoming	464,143	57.1%

Source: U.S. Department of Energy's Energy Information Administration (EIA).

Note: EIA defines Appalachia for purposes of compiling data on coal production to include Alabama, eastern Kentucky, Maryland, Ohio, Pennsylvania, Tennessee, Virginia, and West Virginia.

Surface Mining Control and Reclamation Act Requirements for Regulating Coal Mining Operations

SMCRA and its implementing rules set national standards for regulating the surface impact from both surface and underground mines. States with their own programs are to set standards in accordance with federal standards, and the requirements of Kentucky and West Virginia are generally similar to federal requirements.⁴ In some instances, the wording of Kentucky and West Virginia's state requirements is identical to the federal requirements. OSM oversight focuses on assuring that state regulating agencies comply with the requirements of the approved state program. SMCRA requires OSM to make such inspections as are necessary to evaluate how well state programs are administered.

Under approved state programs, state regulatory agencies review and approve surface mining permits. The permitting process requires operators to submit detailed plans that describe the extent of the proposed mining operations and how reclamation will be achieved.⁵ For example, operators must identify the area to be permitted, provide technical descriptions of how mining operations will be conducted, and describe how the land will be reclaimed. In reclaiming the land, operators generally must backfill, compact, and grade the mined-out area and eliminate all highwalls,⁶ spoil piles, and depressions. Operators are also required to comply with standards that govern, among other things, the post-mining use(s) for which the reclaimed land will be prepared, the final contour of the reclaimed land, and how spoil that is not deposited back onto the mined-out area will be handled.

To help ensure that operators comply with regulatory requirements and permit provisions, including a site's reclamation plan, SMCRA requires operators to post a bond (or bonds). States are also authorized to set up an

⁴GAO did not conduct a comprehensive analysis of differences between the regulatory schemes, but we note some differences that we have observed or which have been identified to us by the regulatory authorities in this report. OSM has determined that both Kentucky and West Virginia mining programs meet the legal requirement found in SMCRA that they are "no less effective" than federal regulations.

⁵For simplicity in this report, we refer to permittees and operators as operators. The permittee is the person or entity holding the permit and is legally responsible for the permit, whereas the operator is the person or entity who conducts coal removal operations. The permittee and the operator may or may not be the same person or entity.

⁶SMCRA requires that highwalls be eliminated, except in cases where they already existed due to mining operations conducted prior to the enactment of SMCRA, in which case they must be eliminated to the extent practical. Depressions must also be eliminated, except where they are small and are needed for moisture retention, erosion minimization, creation or enhancement of wildlife habitat, or revegetation.

alternative system if it will achieve the same objectives and purposes as the bonding requirements of SMCRA. For example, West Virginia imposes a tax on coal production, the proceeds of which are used to reclaim forfeited sites instead of requiring a bond reflecting the full projected cost of site reclamation. Once a state bond release specialist determines that all reclamation standards identified in the permit have been met, the bond is “released,” meaning the money put up for bond is returned to the operator. Once the bond has been released, state jurisdiction over the mining operation ceases. If an operator fails to comply with applicable provisions, it may forfeit the bond, in which case the state becomes responsible for reclaiming the land to the reclamation standards found in the operator’s permit.

When a permit is issued, it is considered an open permit until the bond associated with it is completely released or forfeited, at which time it is considered a closed permit. Permits are not actively mined during the entire period that the permit is open. For example, mining might not have begun, or the land could be in the process of being reclaimed prior to bond release. In this report, the acres associated with issued permits (whether open or closed) are sometimes referred to as “issued acres” for the purposes of brevity and readability. Similarly, the acres associated with open permits are sometimes referred to as “acres under open permit” or “open acres.” If a permit is closed because the bond associated with it was completely released, the permit is referred to as a “released permit,” and the acres associated with the released permit are sometimes referred to as “released acres.” If the permit is closed because the bond was forfeited, the permit is referred to as a “forfeited permit,” and the acres associated with the permit are sometimes referred to as “forfeited acres.”

Characteristics of Surface Coal Mining in Mountainous Areas in Kentucky and West Virginia

Based on data provided to us by Kentucky and West Virginia, we are reporting on three characteristics in surface mining in the mountainous areas of these two states. We identified a fourth characteristic in West Virginia using electronic geospatial files of permit boundaries provided to us by the state. These data were not available from Kentucky. In summary:

- First, the number of acres under open permit increased because the number of acres issued grew faster than the number of acres released or forfeited. The average annual growth rate from January 1990 through July 2008 was about 2.2 percent in Kentucky and 1.7 percent in West Virginia.
- Second, acres under open permit have become more concentrated in specific counties since 1990. About 44 percent of the acres under open

permit in Kentucky, as of July 2008, were located in three counties—Pike County, Perry County, and Knott County. In 1990, the three counties with the most acres under open permit accounted for only 28 percent of the total. Similarly, in West Virginia, as of July 2008, Boone County, Logan County, and Mingo County accounted for about 48 percent of all acres under open permit at that time, compared with 33 percent for the three counties with the most acres under open permit in 1990.

- Third, the length of time that permits were open varied. In Kentucky, for permits issued since 1990, the length of time a permit was open—from issuance to release—ranged from less than 1 year to more than 18 years and averaged about 7-1/2 years. In West Virginia, the length of time from issuance to release ranged from less than 1 year to almost 17 years and averaged about 8-1/2 years. Moreover, both states have a substantial number of permits that were issued since 1990 that were still open as of July 2008. The average length of time these permits were open was nearly 5 years in Kentucky and more than 8-1/2 years in West Virginia.
- Fourth, nearly half of the permitted acres in West Virginia are concentrated in 28 contiguously permitted areas. We identified these areas using available electronic geospatial files of West Virginia permit boundaries for permits that were open in July 2008 or that were released or forfeited since 1990. These 28 contiguously permitted areas account for 178,600 acres, or about 47 percent of all the acreage that is either currently open or that was released or forfeited since 1990. The largest of these contiguously permitted areas is 21,700 acres and is made up of 37 permits. About 89 percent of the acreage in the 28 contiguously permitted areas is under open permit as of July 2008.

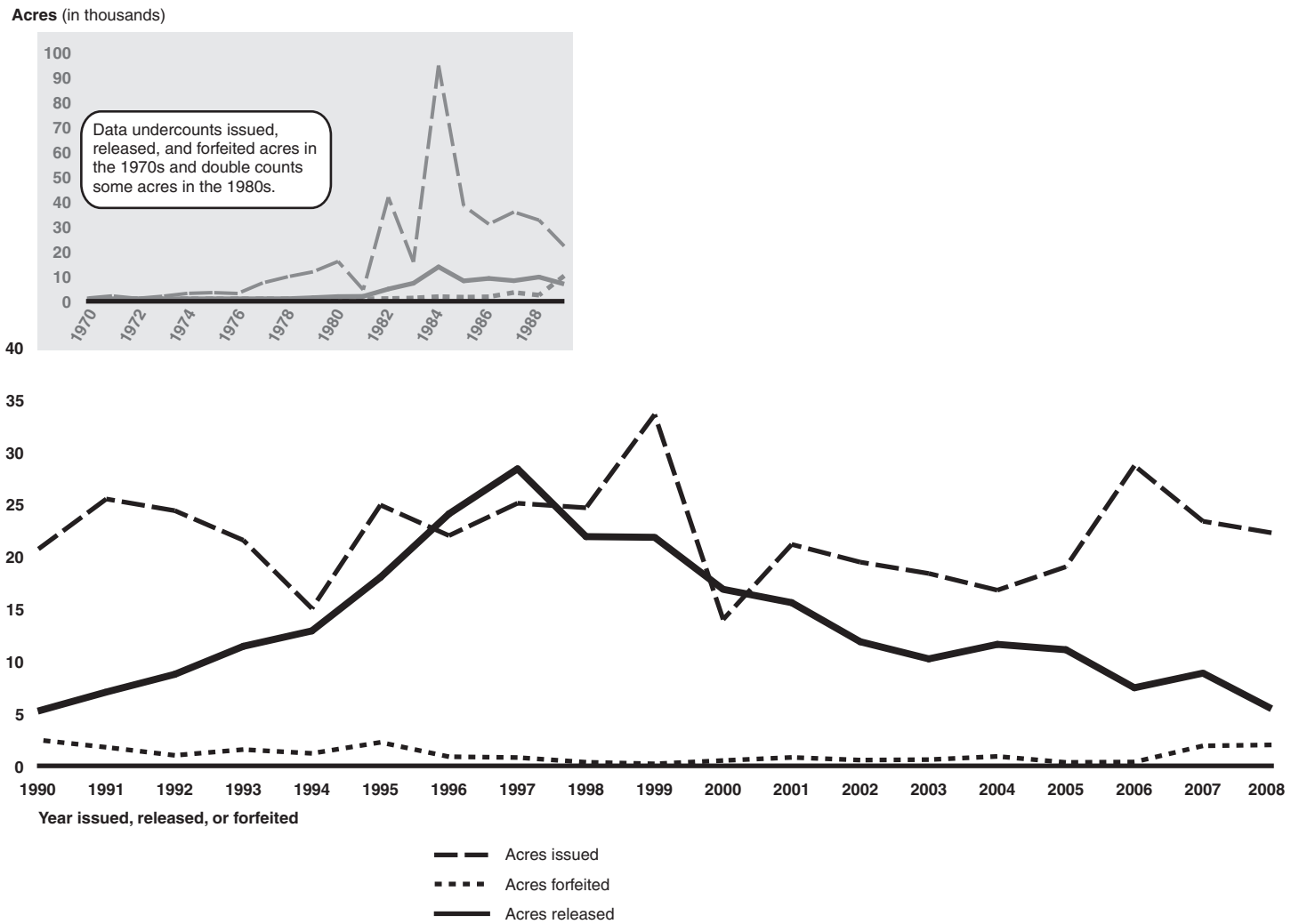
Both states' databases provide data on acres under open permit and related data for years prior to 1990. However, for some of these earlier years, the data understates or overstates mining activity. Because of these data limitations, and to be consistent between the states, we base our analysis on data from January 1990 through July 2008. We present the results of this analysis in the text of this section of the report. However, we include data from the earlier years in some of the figures in this section and identify the data limitations for these years in order to provide a comprehensive overview of the data in the states' databases that clearly identify the years for which there are data limitations and what those data limitations are. We believe that presenting data from the earlier years—and its limitations—decreases the likelihood for misuse or misinterpretation because the data is publicly available, but its limitations are not disclosed on the Web sites from which the public can access the

data. Data from the earlier years should not be relied upon to convey a representative picture of past mining characteristics or decisions.

Acres Under Open Permit Have Increased in Kentucky and West Virginia

The two states' databases show that the number of acres associated with open permits has increased from 1990 through 2008. Kentucky provided us with data on the number of permits and their associated acres that were issued, released, and forfeited from 1970 through July 2008. However, data from the 1980s double counts some issued and released permits (and associated acreage). A Kentucky state official told us that all permits open in the mid-1980s were reissued to comply with revisions to state regulations. However, the number of reissued permits and their associated acres cannot be distinguished from other permits that were issued during that time frame. A state official knowledgeable about the reissuing effort told us that it was completed by 1990 and that subsequent data should therefore generally be considered reliable. Additionally, data from the 1970s undercounts some permits (and associated acreage) because not all permits of that era are included in the SMIS database. Figure 3 shows the number of acres for which permits were issued, released, and forfeited by year, and includes the spike in permitted acres that resulted not from new mining but from the permit reissuing effort in the 1980s.

Figure 3: Acres in Kentucky Associated with Issued, Released, or Forfeited Permits, by Year the Permit Was Issued, Released, or Forfeited, 1970–July 2008



Source: GAO analysis of data from Kentucky's SMIS database.

Notes:

Data for 2008 is through July 30, 2008.

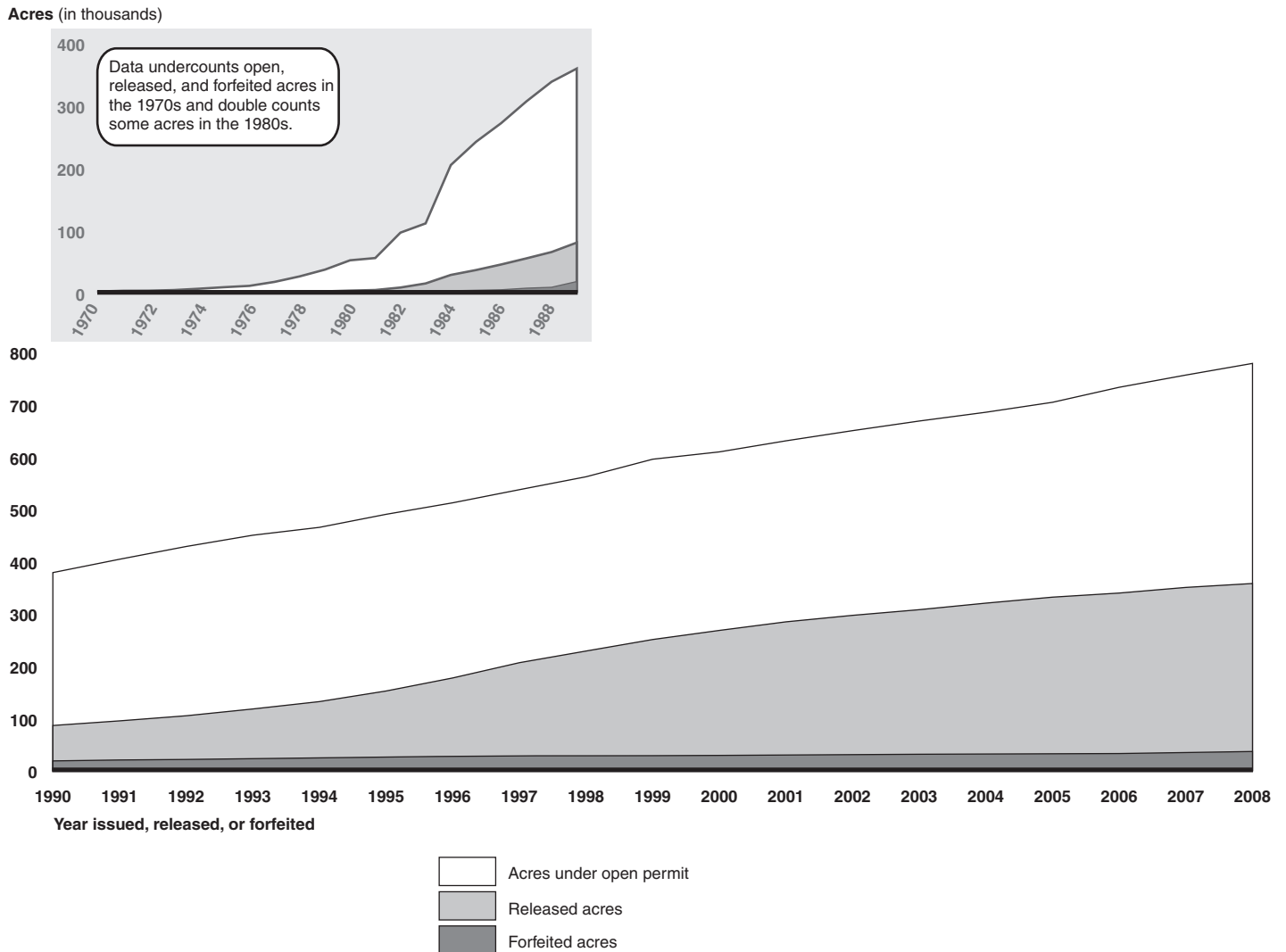
Data undercounts acres associated with permits issued, released, or forfeited in the 1970s because not all permits of that era are included in the SMIS database. Data double counts some acres associated with permits issued or released in the 1980s because of state administrative actions to reissue previously issued permits.

Acres issued also includes changes in the size of existing permits that occurred during the year.

From January 1990 through July 2008, the number of acres under open permit in Kentucky grew from 292,400 acres to 420,900 acres—an average annual increase of about 2.2 percent. The difference between the number of acres for which permits have been issued and the number of acres that have been released or forfeited is the number of acres under open permit. From 1990 through July 2008, the number of acres associated with issued permits grew from 378,800 acres to 778,800 acres, and the number of acres associated with released and forfeited permits grew from 86,400 acres to 357,900 acres.⁷ Figure 4 illustrates the growth in acres associated with issued permits relative to acres associated with released or forfeited permits.

⁷Due to rounding, the difference between the number of acres for which permits have been issued, and the number of acres that have been released or forfeited, may not equal the number of acres under open permit.

Figure 4: Cumulative Number of Acres in Kentucky Associated with Open, Released, and Forfeited Permits, 1970–July 2008



Source: GAO analysis of data from Kentucky's SMIS database.

Notes:

Data for 2008 is through July 30, 2008.

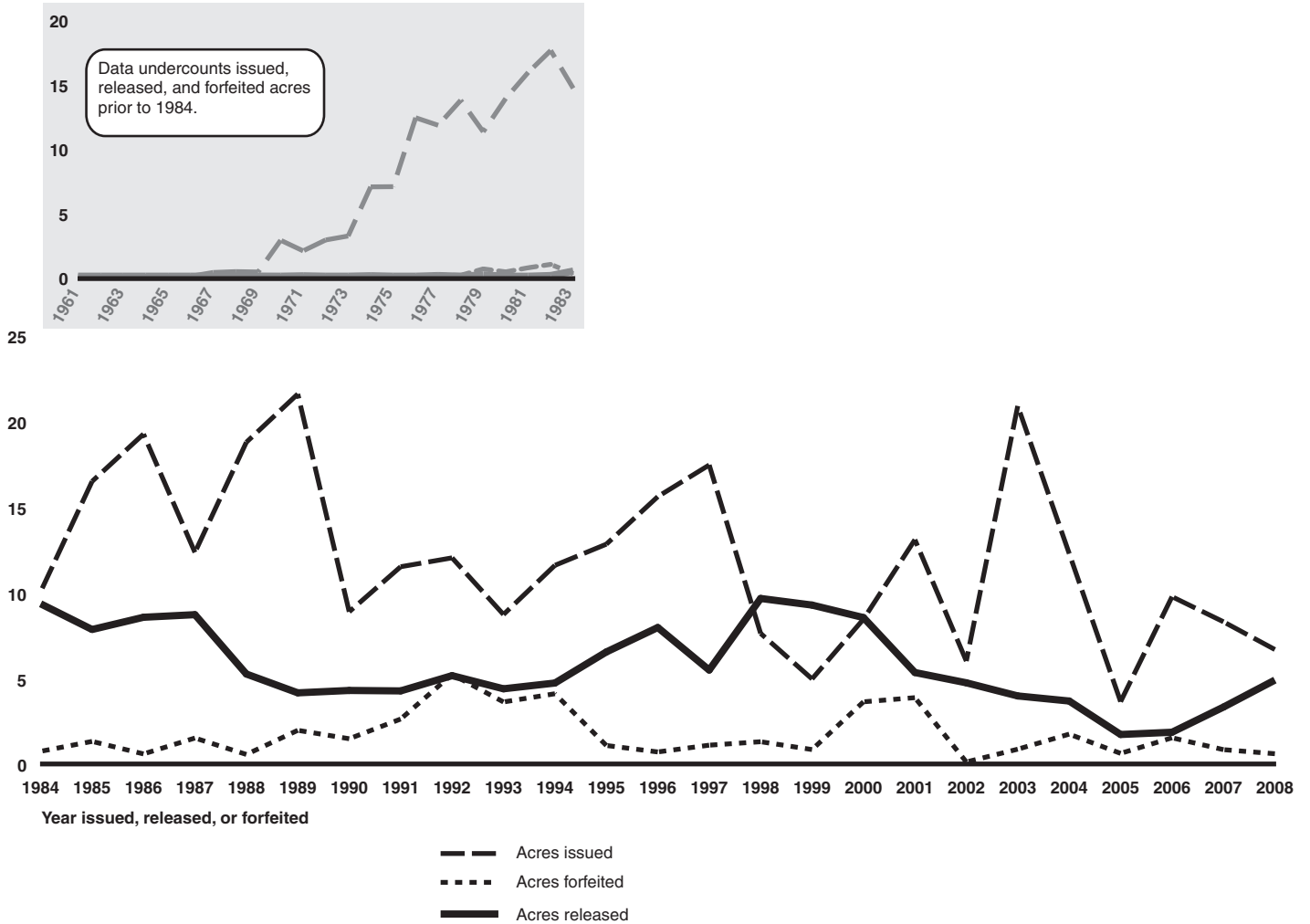
Data undercounts acres associated with permits issued, released, or forfeited in the 1970s because not all permits of that era are included in the SMIS database. Data double counts some acres associated with permits issued or released in the 1980s because of state administrative actions to reissue previously issued permits.

West Virginia provided us with data on the number and size of permits that were issued from January 1984 through July 2008 and on permits that were already open in 1984. These data are presented in figure 5. One official told us that, when the West Virginia Department of Environmental Protection upgraded its computer system, it didn't systematically update electronic permit files that were closed prior to 1984. As figure 5 shows, there is very little data on the number of acres released and forfeited prior to 1984.⁸

⁸Although we found this data to be sufficiently reliable starting in 1984, the text in this section of the report is based on our analysis of data from January 1990 through July 2008 to be consistent between the states.

Figure 5: Acres in West Virginia Associated with Issued, Released, or Forfeited Permits, by Year the Permit Was Issued, Released, or Forfeited, 1961–July 2008

Acres (in thousands)



Source: GAO analysis of data from West Virginia's ERIS database.

Notes:

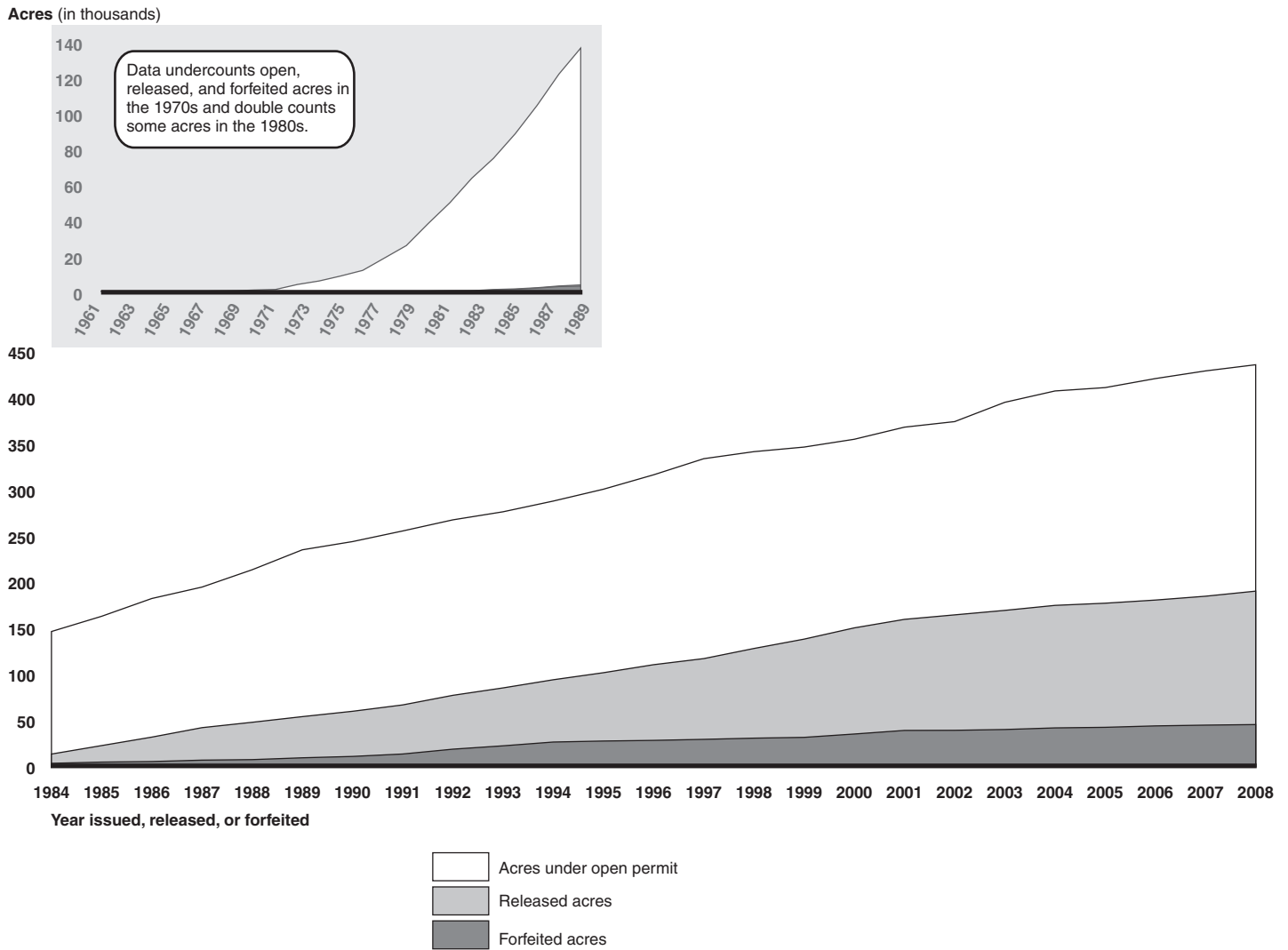
Data for 2008 is through July 30, 2008.

Data undercounts acres associated with permits issued, released, or forfeited prior to 1984 because permits closed prior to 1984 are not included in ERIS.

Acres issued also includes changes in the size of existing permits that occurred during the year.

According to ERIS data, from January 1990 through July 2008, the number of acres under open permit in West Virginia grew from 183,700 acres to 245,200 acres—an average annual increase of about 1.7 percent. The difference between the number of acres for which permits have been issued, and the number of acres that have been released or forfeited, is the number of acres under open permit. From 1990 through July 2008, the number of acres associated with issued permits grew from 243,700 acres to 435,200 acres, and the number of acres associated with released and forfeited permits grew from 60,000 acres to 190,000 acres. Figure 6 illustrates the growth in acres associated with issued permits relative to acres associated with released or forfeited permits.

Figure 6: Cumulative Number of Acres in West Virginia Associated with Open, Released, and Forfeited Permits, 1961–July 2008



Source: GAO analysis of data from West Virginia's ERIS database.

Notes:

Data for 2008 is through July 30, 2008.

Data undercounts acres associated with permits issued, released, or forfeited prior to 1984 because permits closed prior to 1984 are not included in ERIS.

Not all acres that are permitted are disturbed—that is, cleared of vegetation as part of the mining operation. Typically, areas are disturbed when they are mined for coal, used for roads, or to temporarily or permanently store spoil. Sometimes operators will leave relatively large portions of a permitted area undisturbed if, for example, market conditions do not support mining an area where it is relatively expensive to extract the coal. A Kentucky official said that SMIS does not contain data on disturbed acres and that he and other officials he spoke with do not believe they can provide a sufficiently accurate estimate. A West Virginia official said that data from ERIS on disturbed acres is not reliable. However, he estimated that about 25 percent of permitted acres are never disturbed.

Mining in Kentucky and West Virginia Has Become More Geographically Concentrated

According to the two states' databases, mining activity in the mountainous areas of Kentucky is concentrated in the southeastern part of the state, while mining in West Virginia is concentrated in the southwestern part of the state. In both states, mining has become more concentrated over the last 19 years, according to data provided by state agencies. In Kentucky, the 420,900 acres that were under open permit, as of July 2008, in the mountainous, eastern portion of the state constitute about 1.6 percent of the state's total land mass.⁹ However, as figure 7 indicates, about 44 percent (186,600 acres) of the 420,900 acres under open permit in mountainous areas are located in three counties: Pike, Perry, and Knott.¹⁰ Collectively, the open acres account for 20 percent of these counties' total land mass.

⁹There are 55,300 additional acres under open permit in the flatter, western portion of the state.

¹⁰Due to rounding, the percentage of acres under open permit in Pike County, Perry County, and Knott County total 45 percent in figure 7.

Figure 7: Acres in Kentucky under Open Permit as a Percentage of All Acres under Open Permit in the 10 Counties with the Largest Number of Open Acres in July 2008



Sources: GAO analysis of data from Kentucky's SMIS database; Map Resources (map).

In 1990, the acreage under open permit in Kentucky was less concentrated in individual counties than it was in 2008. As table 2 shows, the three counties with the greatest acreage under open permit in 1990—Pike, Martin, and Breathitt—accounted for about 28 percent (82,400 acres) of the 292,400 acres under open permit. Collectively, these open acres accounted for about 8 percent of the total area of the three counties. Table 2 also shows the 10 counties in Kentucky with the most acres under open

permit in 2008 and the number of acres under open permit in 1990 for those same counties.

Table 2: The 10 Counties in Kentucky with the Largest Number of Open Acres in July 2008 and the Number of Open Acres in Those Counties in 1990

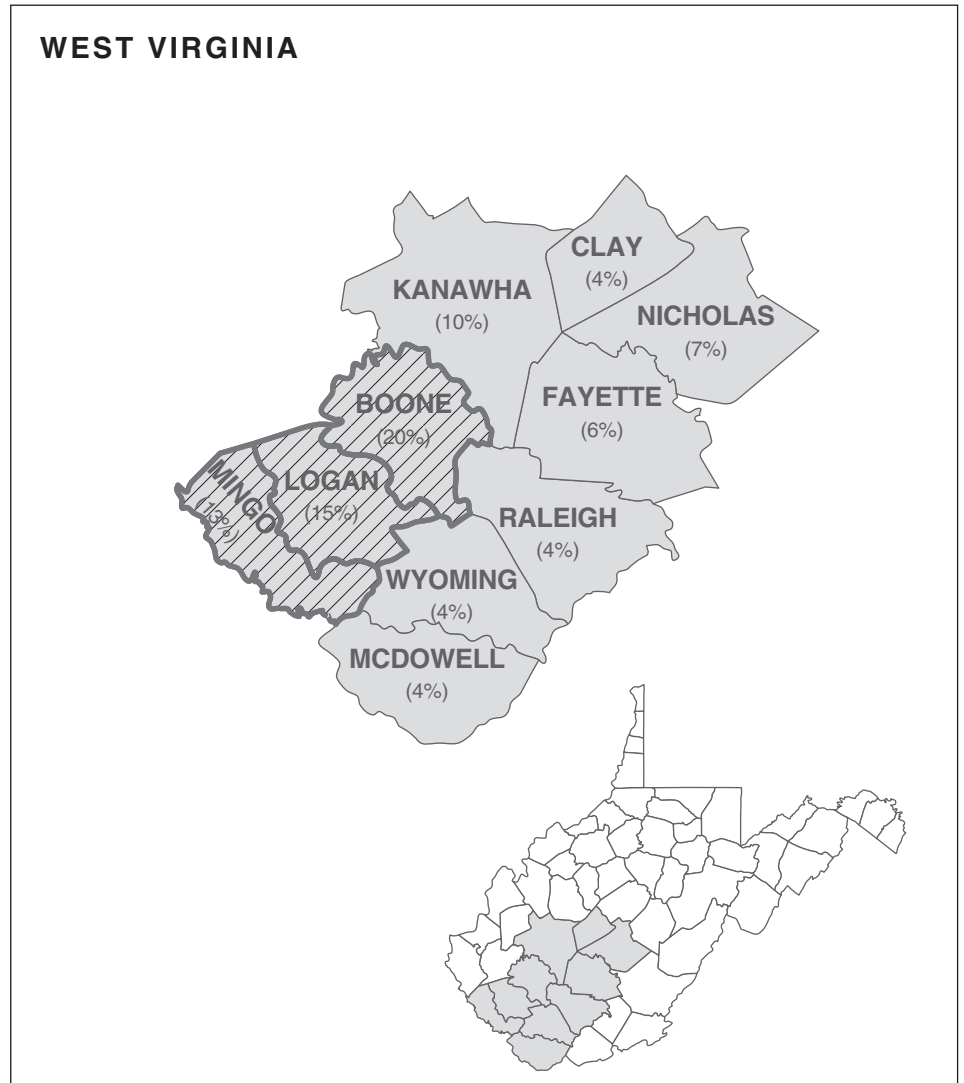
County	Size of county (acres)	Acres under open permit in July 2008		Acres under open permit in January 1990	
		Number of acres	County's share of open acres in Kentucky	Number of acres	County's share of open acres in Kentucky
Pike	504,858	96,300	23%	27,500	9%
Perry	219,290	50,100	12	25,000	9
Knott	225,926	40,200	10	17,300	6
Harlan	299,501	37,700	9	16,100	6
Martin	147,718	34,300	8	29,000	10
Letcher	217,037	28,100	7	11,800	4
Breathitt	316,986	26,000	6	25,900	9
Bell	231,264	25,800	6	20,600	7
Leslie	258,790	21,700	5	12,400	4
Floyd	253,094	15,600	4	16,500	6
All other counties	23,187,309	45,000	11%	90,300	31%
Total	25,861,773	420,900	100%	292,400	100%

Sources: GAO analysis of data from Kentucky's SMIS database and the U.S. Census Bureau.

Note: Columns may not add to the total because of rounding.

In West Virginia, the 245,200 acres that were under open permit, as of July 2008, constitute 1.6 percent of the state's total land mass, the same percentage as in Kentucky. As figure 8 indicates, about 48 percent (118,600 acres) of the 245,200 acres are located in three counties: Boone, Logan, and Mingo. Collectively, the open acres account for about 13 percent of these counties' total land mass.

Figure 8: Acres in West Virginia under Open Permit as a Percentage of all Acres under Open Permit in the 10 Counties with the Largest Number of Open Acres in July 2008



Sources: GAO analysis of data from West Virginia's ERIS database; Map Resources (map).

In 1990, the acreage under open permit was less concentrated in individual counties than it was in 2008. As table 3 shows, the three counties with the greatest amount of acreage under open permit in 1990—Logan, Boone, and Nicholas—accounted for 33 percent (61,000 acres) of the 183,700 acres under open permit in 1990. Collectively, these open acres accounted for about 6 percent of the total area of these counties. Similar to table 2, this

table shows the 10 counties in West Virginia with the most acres under open permit in 2008 and the number of acres under open permit in 1990 for those same counties.

Table 3: The 10 Counties in West Virginia with the Largest Number of Open Acres in July 2008 and the Number of Open Acres in Those Counties in 1990

County	Size of county (acres)	Acres under open permit in July 2008		Acres under open permit in January 1990	
		Number of acres	County's share of open acres in West Virginia	Number of acres	County's share of open acres in West Virginia
Boone	322,035	48,000	20%	20,400	11%
Logan	291,590	37,800	15	21,500	12
Mingo	271,130	32,900	13	16,900	9
Kanawha	583,034	25,000	10	18,900	10
Fayette	427,750	16,400	7	13,800	8
Nicholas	418,816	15,900	6	19,100	10
Raleigh	389,978	11,000	4	2,200	1
Wyoming	321,165	10,900	4	4,100	2
Clay	220,045	8,900	4	2,400	1
McDowell	342,336	8,600	4	6,200	3
All other counties	11,919,168	29,800	12%	58,200	32%
Total	15,507,046	245,200	100%	183,700	100%

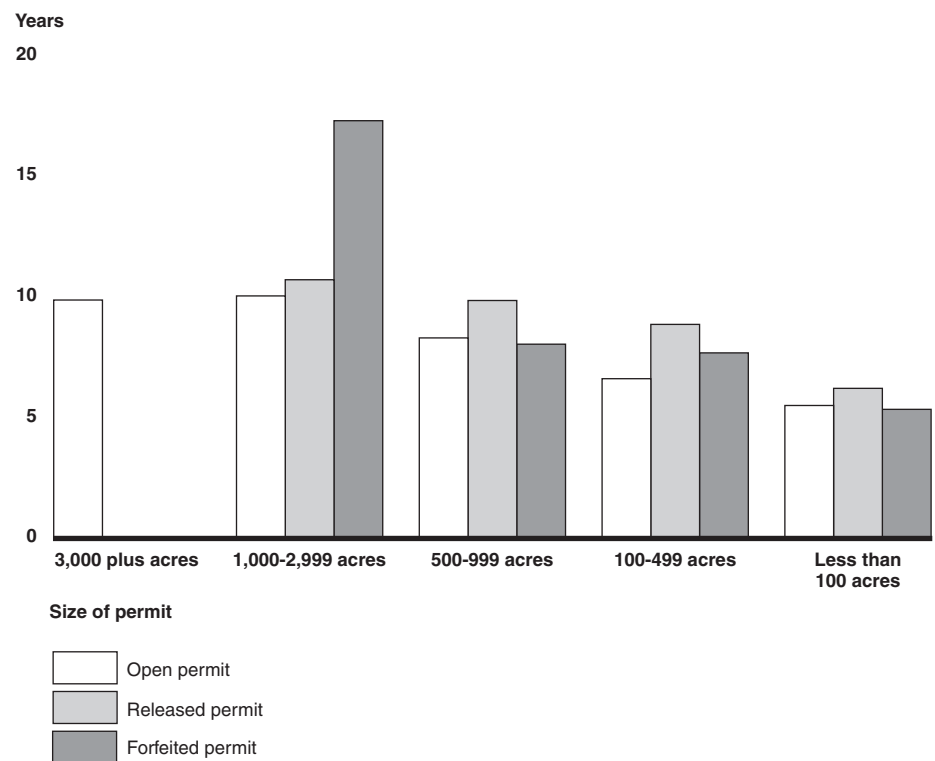
Sources: GAO analysis of data from West Virginia's ERS database and the U.S. Census Bureau.

Note: Columns may not add to the total because of rounding.

The Length of Time That Permits Were Open in Kentucky and West Virginia Varies

The two states' databases show that the length of time that permits were open varied. In Kentucky, of the 1,075 permits issued since 1990, 362 were subsequently released, as of July 2008. The length of time these permits were open ranged from less than 1 year to more than 18 years and averaged about 7-1/2 years. However, 680 of the permits issued since 1990 were still open, as of July 2008, and the average length of time these permits were open was about 7 years. Additionally, 33 of the permits issued since 1990 have been forfeited. As figure 9 shows, the length of time that permits were open did not vary substantially by their size or status—open, released, or forfeited—with one exception.¹¹

Figure 9: Average Length of Time Kentucky Permits Issued Since 1990 Were Open, by Size and Status, as of July 2008



Source: GAO analysis of data from Kentucky's SMIS database.

¹¹The exception is the category of forfeited permits between 1,000 and 2,999 acres in size. There is only one permit in this category.

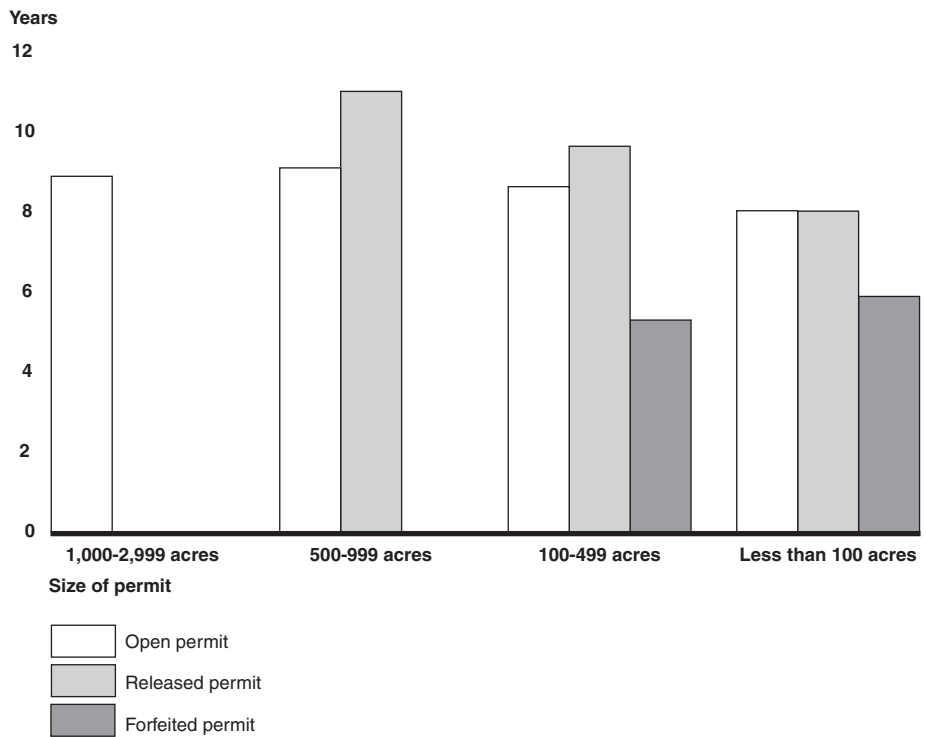
Notes:

For forfeited acres, the length of time the permit was open is from the issue date to the forfeiture date; additional reclamation work occurs after forfeiture.

There is only one forfeited permit between 1,000 and 2,999 acres in size.

The situation is similar in West Virginia. Of the 637 permits issued since 1990, 171 were subsequently released, as of July 2008. The length of time these permits were open ranged from less than a year to almost 17 years and averaged about 8-1/2 years. However, 397 of the permits issued since 1990 were still open, as of July 2008, and the average length of time these permits were open was about 8-1/2 years. Additionally, 69 of the permits issued since 1990 have been forfeited. As figure 10 shows, the length of time that permits were open did not vary substantially by their size. There is greater variation by status—open, released, or forfeited.

Figure 10: Average Length of Time West Virginia Permits Issued Since 1990 Were Open by Size and Status, as of July 2008



Source: GAO analysis of data from West Virginia's ERIS database.

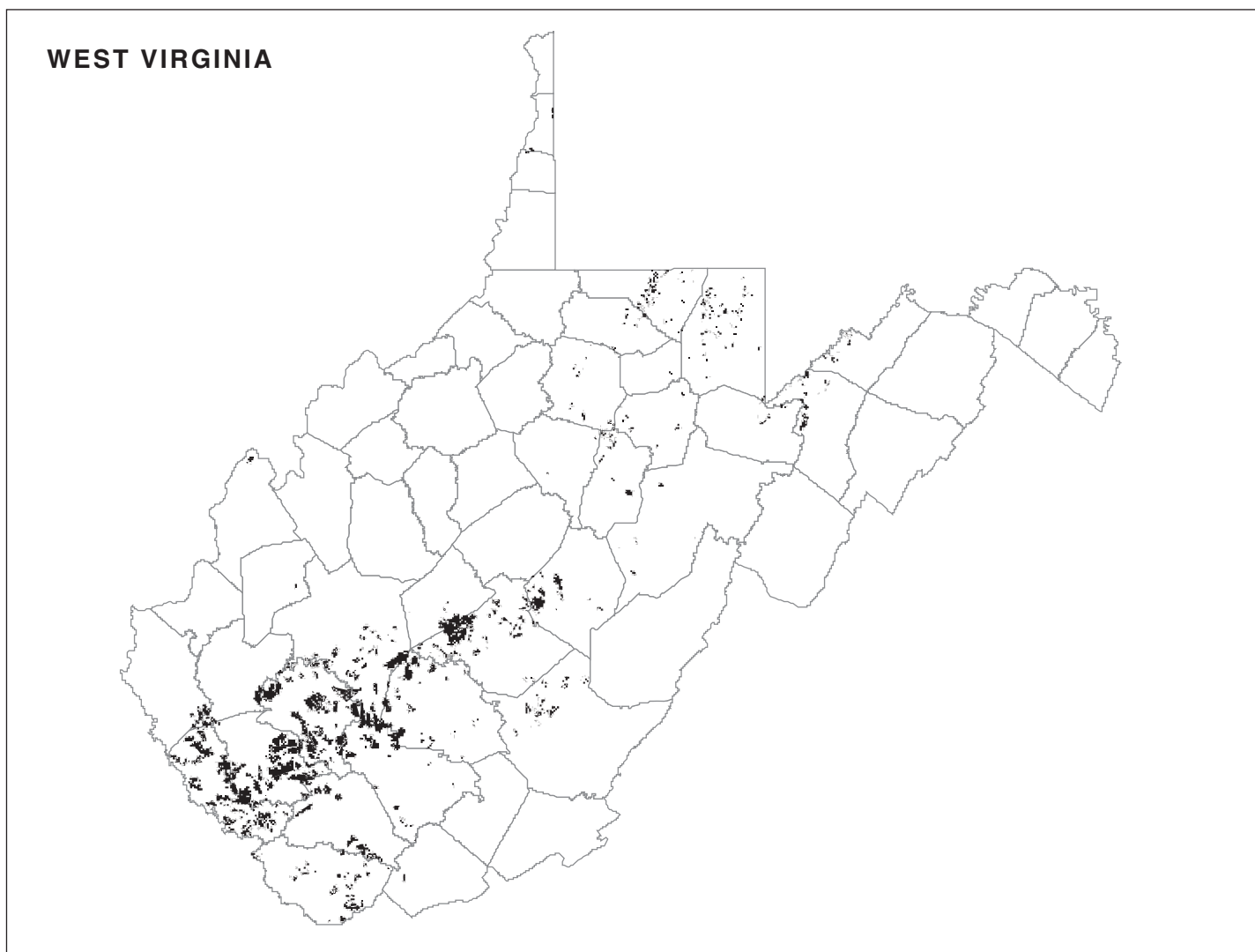
Note: For forfeited acres, the length of time the permit was open is from the issue date to the forfeiture date; additional reclamation work occurs after forfeiture.

Many Permitted Acres in West Virginia Are Concentrated in a Few Large, Contiguously Permitted Areas

We obtained from the West Virginia Department of Environmental Protection Web site all available electronic geospatial files of permit boundaries. For permits that were open, as of July 2008, or released or forfeited since 1990, the permits with permit boundary files are associated with 317,600 acres—or 83 percent of the 381,000 acres associated with all open permits and permits released or forfeited since 1990.¹² Using the permit boundary files, we determined that there were 559 separate, permitted areas. We defined these as areas that were covered by either (1) a single permit that was not contiguous with any other permit or (2) two or more contiguous permits. The larger areas tended to consist of contiguous permits. Figure 11 shows 559 permitted areas in West Virginia, as of July 2008.

¹²The West Virginia Department of Mines Web site had a geospatial permit boundary file for all but six open permits. In total, these permits are 1,000 acres in size.

Figure 11: The 559 Permitted Areas in West Virginia, as of July 2008

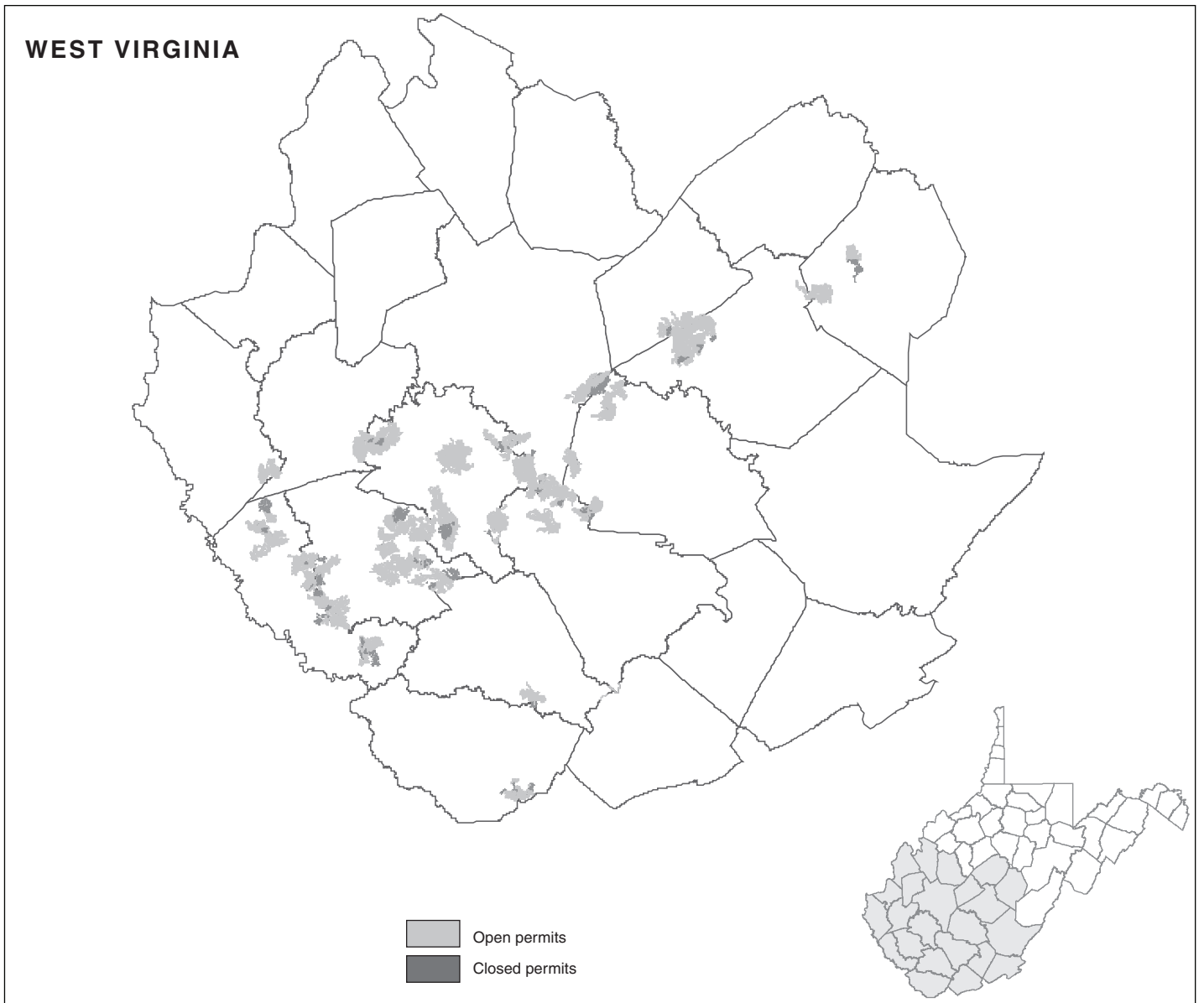


Sources: GAO analysis of data from West Virginia's ERIS database and West Virginia Department of Environmental Protection GIS data; Map Info (map).

A few of the contiguously permitted areas are much larger than most of the other permitted areas. The largest 5 percent of permitted areas—28 areas of the 559 we identified—are groups of contiguous permits and cover 178,600 acres, or 47 percent of the 381,000 acres associated with open permits or permits released or forfeited since 1990. Additionally, we found that about 89 percent (159,200 acres) of the 178,600 acres that constitute these 28 permitted areas were under open permit. This

contrasts with the 139,000 acres that make up the remaining 531 permitted areas, which have 85,000 acres (61 percent) under open permit. Figure 12 shows open and closed (released and forfeited) permits for these 28 permitted areas.

Figure 12: The 28 largest Permitted Areas in West Virginia



Sources: GAO analysis of data from West Virginia's ERIS database and West Virginia Department of Environmental Protection GIS data; Map Info (map).

Characteristics of Reclaimed Lands That Were Disturbed by Surface Coal Mining in Mountainous Areas of Kentucky and West Virginia

In summary, the states' data for permits issued from January 2000 through July 2008 provides information on three important characteristics of land reclaimed after being disturbed by surface mining: the approved post-mining land use (PMLU), the extent to which the land is restored to its original contour, and the number and size of fills created from excess spoil. First, fish and wildlife habitat and forestland were the most common types of PMLU approved in Kentucky and West Virginia, respectively. Forestland was the most common type of land use prior to mining in both states. Second, while most operations have been issued permits in recent years requiring them to reclaim the land to its approximate original contour (AOC), some were granted exceptions, referred to as AOC variances.¹³ Specifically, 76 percent (294 permits) of the 388 permits issued in Kentucky from January 2002 through July 2008 were required to reclaim the land to AOC. In West Virginia, 85 percent (181 permits) of the 212 permits issued from January 2000 through July 2008 were required to be reclaimed to AOC. Most of the AOC variances granted were "remining" variances, meaning that the variance was granted because the land had been previously mined but not reclaimed, leaving insufficient spoil to restore AOC. Finally, Kentucky and West Virginia collectively approved nearly 2,000 fills to be placed in nearby valleys and hollows, with a storage volume of at least 4.85 billion cubic yards of excess spoil, on permits issued from January 2000 through July 2008.

Both states' databases provide data on pre-mining land uses and PMLUs, AOC variances, and fills for permits issued in years prior to 2000. However, for many of these years, the data understates or overstates mining activity and, consequently, characteristics of reclaimed lands. Because of these data limitations, and to be consistent between the two states, we base our analysis on data from January 2000 through July 2008, with the exception of AOC variances in Kentucky, where the data is complete only for permits issued starting in 2002. We present the results of this analysis in the text of this section of the report. However, we include data from the earlier years in the figures of this section and identify the data limitations associated with these years in order to provide a comprehensive overview of the data in the states' databases, and we clearly identify the data limitations and the years to which they apply. We believe that presenting data from the earlier years—and its limitations—

¹³SMCRA authorizes both "exceptions" and "variances" to AOC requirements, but federal and state regulations use the term AOC variances to address both concepts, as we do for consistency in this report.

decreases the likelihood for misuse or misinterpretation because the data is publicly available, but its limitations are not disclosed on the Web sites from which the public can access the data. Data from the earlier years should not be relied upon to convey a representative picture of past mining characteristics or decisions.

Fish and Wildlife Habitat and Forestland Were the Most Common Post-Mining Land Uses Approved, While Forestland Was the Most Common Land Use Prior to Mining

During the permitting process, operators designate one or more types of PMLU, although the approved PMLU(s) may later be changed through a permit revision. If an operator does not plan to return an area to its pre-mining land use, the operator must propose an alternative PMLU for approval. State approval of an alternative PMLU requires consultation with the landowner.¹⁴ In general, the PMLU must be either a use the land could have supported before any mining, or a “higher or better” use.¹⁵ Under SMCRA, once mining has been completed, operators are required to reclaim all disturbed lands in a timely manner to a condition capable of supporting the approved PMLU(s).¹⁶ However, once the bond has been released, state jurisdiction over the mining operation ceases, and landowners can use the land at their own discretion following bond release. Additionally, even in cases where the PMLU(s) is fully implemented after bond release, some land use types, such as forestland, can take years—even decades—to achieve their intended appearance and productivity.

The two states’ data show that, for permits issued from January 2000 through July 2008, the most common PMLU type approved was fish and wildlife habitat in Kentucky and forestland in West Virginia. Our analysis of the data revealed that both states’ databases improved over time in the percentage of permits that captured information on PMLU types and, by 1995 and 1998, respectively, the data indicates that all new permits issued had at least one PMLU type approved in Kentucky and West Virginia.

¹⁴Kentucky officials commented that the selection of a PMLU is generally the landowner’s choice—although the choice must be consistent with applicable regulations.

¹⁵The federal regulations implementing SMCRA present specific criteria for higher or better uses, such as a reasonable likelihood for achieving the proposed use, and the use does not pose a hazard to public health. If the land was previously mined and left unreclaimed, the PMLU must be the highest and best achievable use that is compatible with surrounding areas and does not require the disturbance of areas previously unaffected by mining.

¹⁶According to the Department of Interior, prior to bond release by the regulatory authority, the operator must demonstrate that the PMLU identified in the approved permit has been established or the infrastructure is in place to ensure its development.

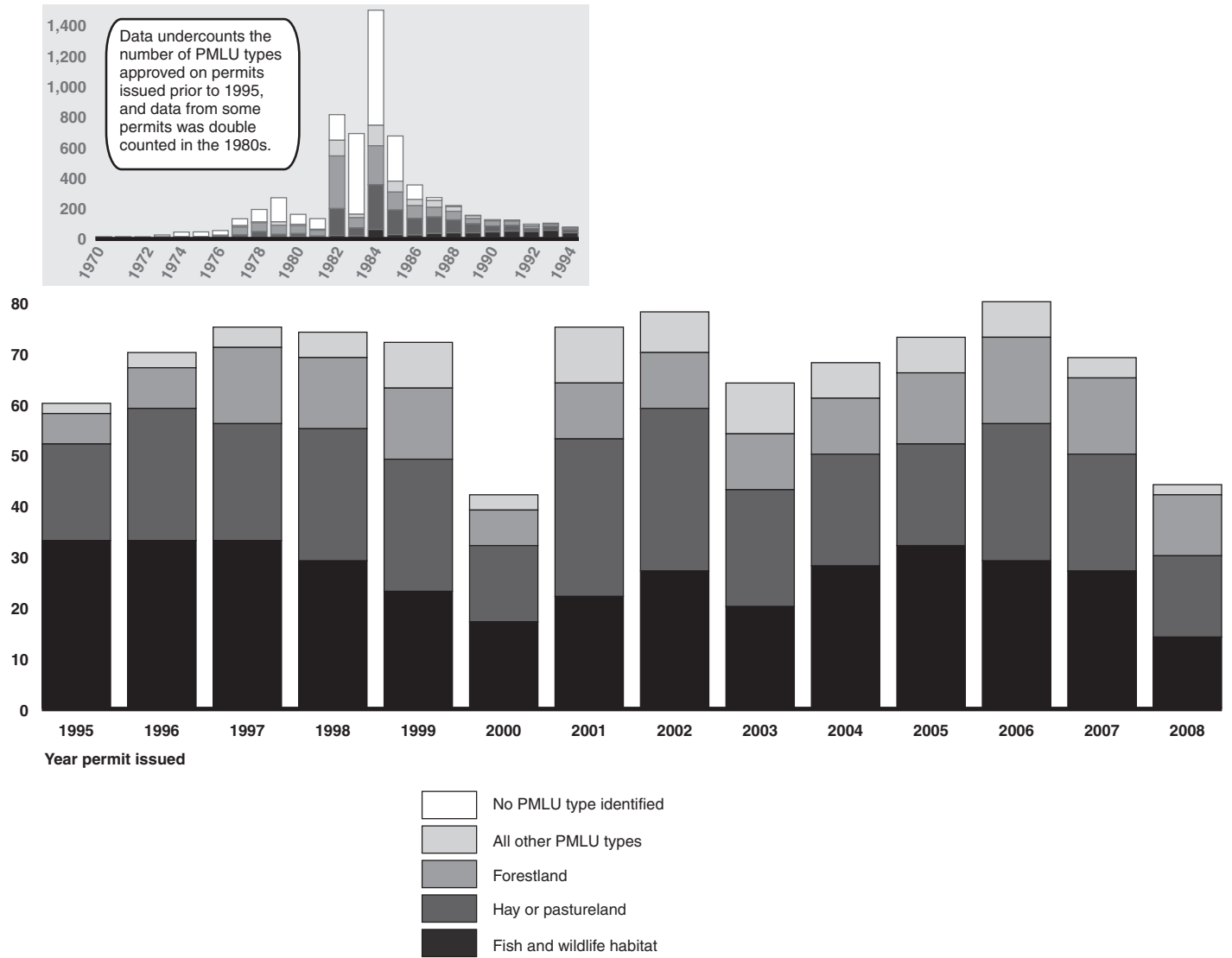
Specifically, in Kentucky, of the 481 permits issued from January 2000 through July 2008, 216 permits were approved for fish and wildlife habitat as a PMLU, followed by 209 permits approved for hay or pastureland, and 109 permits approved for forestland.¹⁷ Fifty-nine permits issued during that time were approved for other PMLU types, including 22 residential, 19 industrial, and 12 commercial.¹⁸ Figure 13 shows these data, including the number of permits that did not identify a PMLU type.

¹⁷Kentucky regulations define fish and wildlife land use as land dedicated wholly or partially to the production, protection, or management of fish or wildlife. Areas considered as having the fish and wildlife land use are typically characterized by a diversity of habitats in which use by wildlife is the dominant characteristic, whether actively managed or not. Kentucky regulations define pastureland as land used primarily for the long-term production of adapted, domesticated forage plants to be grazed by livestock or occasionally cut and cured for livestock feed. Kentucky regulations define forestland as land used or managed for the long-term production of wood, wood fiber, or wood derived products.

¹⁸The other permits in Kentucky included five approved for “other” PMLU types of an unspecified nature and one for recreation.

Figure 13: PMLU Types Approved in Kentucky, 1970–2008

Permits



Source: GAO analysis of data from Kentucky's SMIS database.

Notes:

Data for 2008 is through July 30, 2008.

Data undercounts the number of PMLU types approved prior to 1995 because this data element was not consistently recorded in the SMIS database for permits issued prior to that time, and because not all permits issued in the 1970s are included in SMIS. Data double counts the number of PMLU types approved for some permits issued in the 1980s because of state administrative actions to reissue previously issued permits.

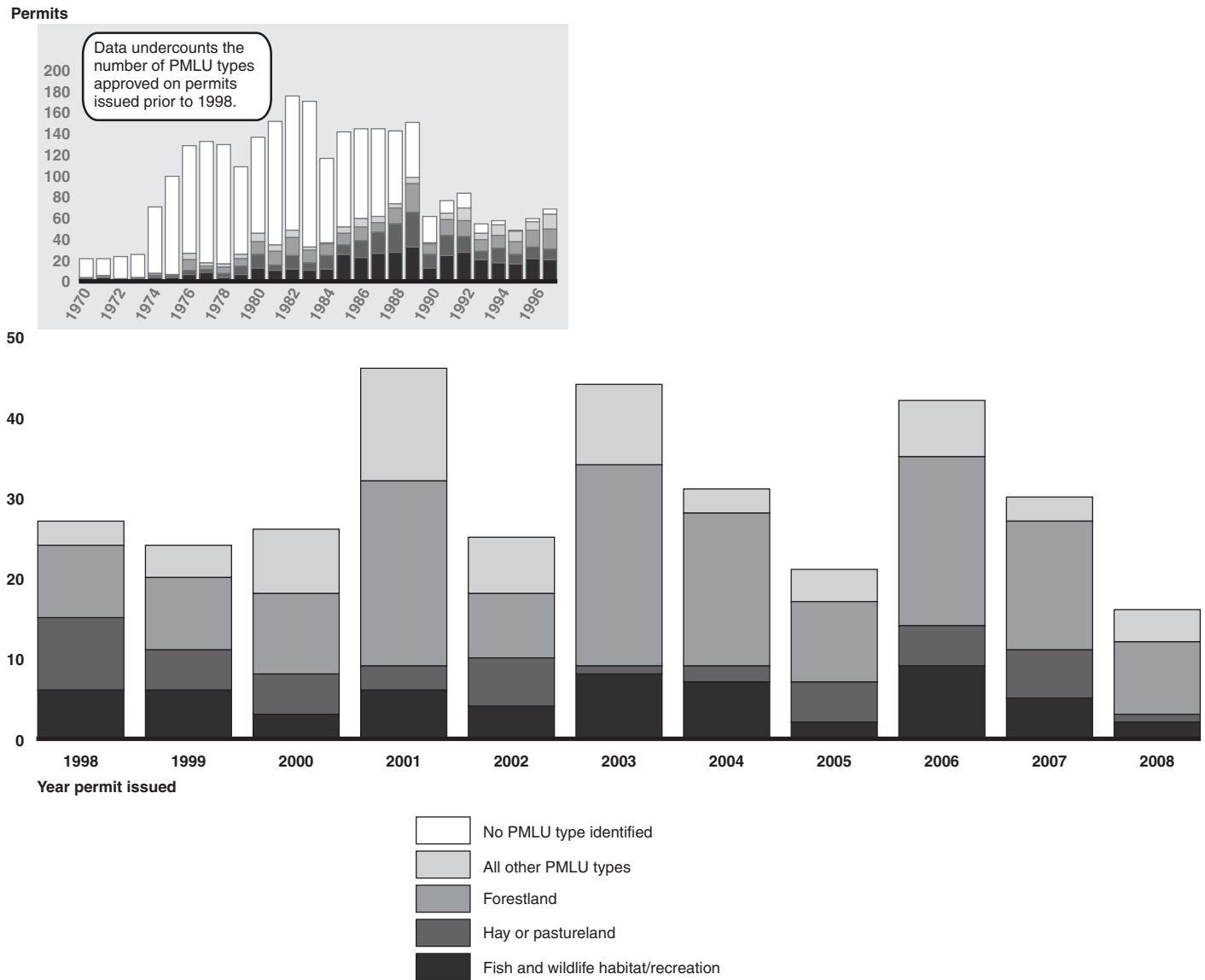
The total number of PMLUs approved might exceed the total number of permits issued because operators can designate more than one PMLU type. In addition, the data reflects the approved PMLU type and does not necessarily represent the actual land use after the permit has closed.

In West Virginia, of the 212 permits issued from January 2000 through July 2008, 141 permits were approved for forestland as a PMLU, followed by 46 permits approved for fish and wildlife habitat/recreation and 34 permits approved for hay or pastureland.¹⁹ Sixty permits issued during this time were approved for other PMLU types, including 23 for commercial forestry or woodland, and 12 for industrial/commercial.²⁰ Figure 14 shows these data, including the number of permits that did not identify a PMLU type.

¹⁹West Virginia regulations define forestland as having at least a 25 percent tree canopy or being at least 10 percent stocked by forest trees of any size, including land formerly having had such tree cover and that will be naturally or artificially reforested. Fish and wildlife habitat and recreation lands are wetlands, fish and wildlife habitat, and areas managed primarily for fish and wildlife or recreation. West Virginia regulations define hay or pastureland as being used primarily for the long-term production of adapted, domesticated forage plants to be grazed by livestock or cut and cured for livestock feed.

²⁰The other permits in West Virginia included 14 approved for “combined” PMLU types of an unspecified nature, 6 rangeland, 2 public service, 2 residential, and 1 water impoundment.

Figure 14: PMLU Types Approved in West Virginia, 1970–2008



Source: GAO analysis of data from West Virginia's ERIS database.

Notes:

Data for 2008 is through July 30, 2008.

Data undercounts the number of PMLU types approved prior to 1998 because this data element was not consistently recorded in the ERIS database for permits issued prior to that time, and because permits closed prior to 1984 are not included in ERIS.

The total number of PMLUs approved might exceed the total number of permits issued because operators can designate more than one PMLU type. In addition, the data reflects the approved PMLU type and does not necessarily represent the actual land use after the permit has closed.

While the state and federal agencies are not required to oversee a PMLU's implementation once a permit has been released, OSM and several Appalachian states have recognized that past practices have not always established healthy, productive forests on reclaimed lands. In June 2008, OSM issued a policy directive to promote reestablishment of forestland where existing forests had been removed by surface mining.²¹ The OSM directive's purpose is to encourage reforestation, rather than past reclamation practices that led many operators and landowners to choose agricultural PMLUs that did not include trees, such as hay or pastureland. According to the directive, past reclamation practices led to low rates of tree survival and growth, forest fragmentation, reduced carbon sequestration, loss of wildlife habitat and forest products, and increased flood potential. To reverse this trend, the directive encourages the widespread and routine planting of native, high-value trees that will restore the uses and ecosystems provided by forests prior to mining. The OSM directive is part of a broader effort known as the Appalachian Regional Reforestation Initiative—formed in 2004 by federal and state agencies, the coal industry, environmental organizations, and others in the Appalachian region—to promote improved reforestation techniques on surface-mined lands.

In addition to PMLU types, the states' databases contain information on the type of land use associated with the permitted area immediately prior to mining—the pre-mining land use. The most common types of pre-mining land use identified for permits issued from January 2000 through July 2008 were the same for both states: forestland and previously mined but unreclaimed lands. According to OSM, virtually all of the land that has been surface mined for coal over the past 30 years in Appalachia was forested before it was originally mined. The states' data indicate that other types of pre-mining land use—such as residential, commercial, or cropland—occurred infrequently or not at all. Our analysis of the data revealed that starting in 1989 in Kentucky, at least 97 percent of new permits issued identified at least one pre-mining land use type and starting in 1998 in West Virginia, all new permits issued identified at least one pre-mining land use type.

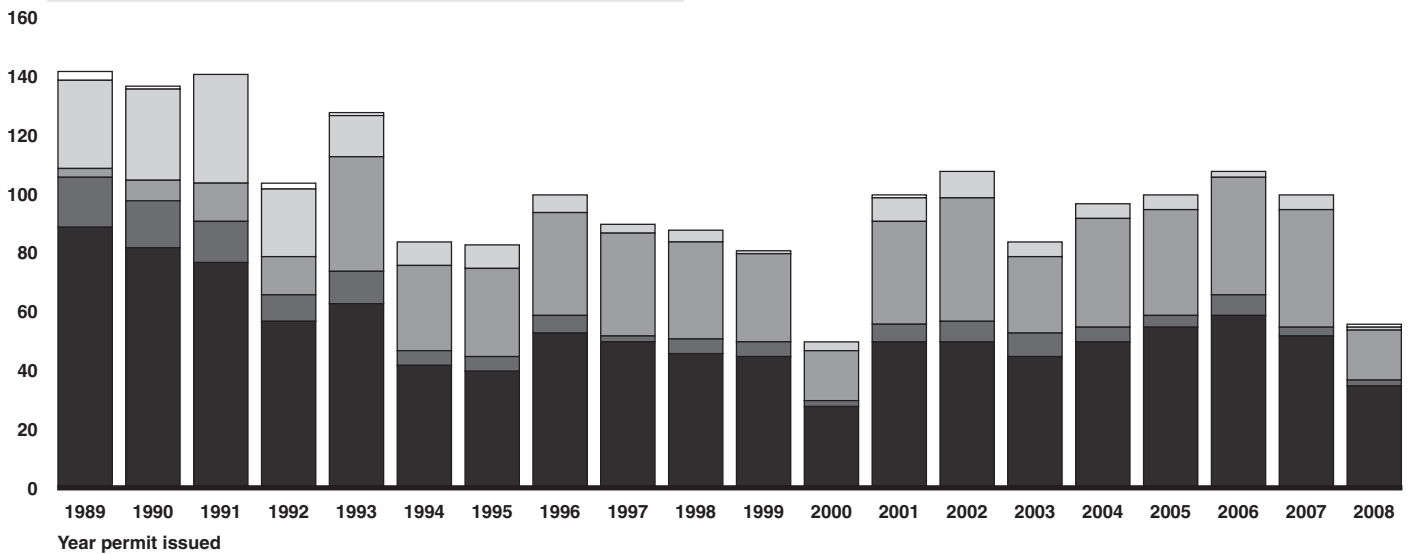
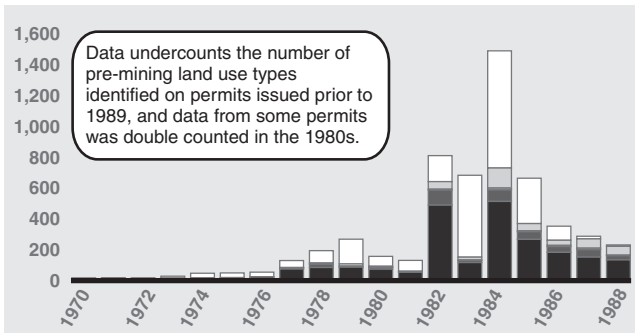
²¹OSM directive TSR-16, "Reforestation of Title IV and Title V Mined Lands," June 10, 2008, available at www.osmre.gov/guidance/directives/directive931.pdf.

Kentucky's data show that, of the 481 permits issued from 2000 through July 2008, 415 permits had a pre-mining land use of forestland, and 290 were previously mined. (As with PMLU, permits can identify more than one pre-mining land use type). In addition, 44 permits identified hay or pastureland, and 43 permits identified other types of pre-mining land use, including 24 permits with undeveloped land.²² Two permits did not identify any pre-mining land use type. Figure 15 shows these data, including the number of permits that did not identify a pre-mining land use type.

²²The other permits in Kentucky included five that identified a pre-mining land use type of heavy industrial, five residential, two each for commercial, cropland, and fish and wildlife habitat, and one each for impoundment of water, public services, and "other" of an unspecified nature.

Figure 15: Pre-Mining Land Use Types Identified in Kentucky, 1970–2008

Permits



- No pre-mining land use type identified
- All other pre-mining land use types
- Hay or pastureland
- Previously mined but not reclaimed
- Forestland

Source: GAO analysis of data from Kentucky's SMIS database.

Notes:

Data for 2008 is through July 30, 2008.

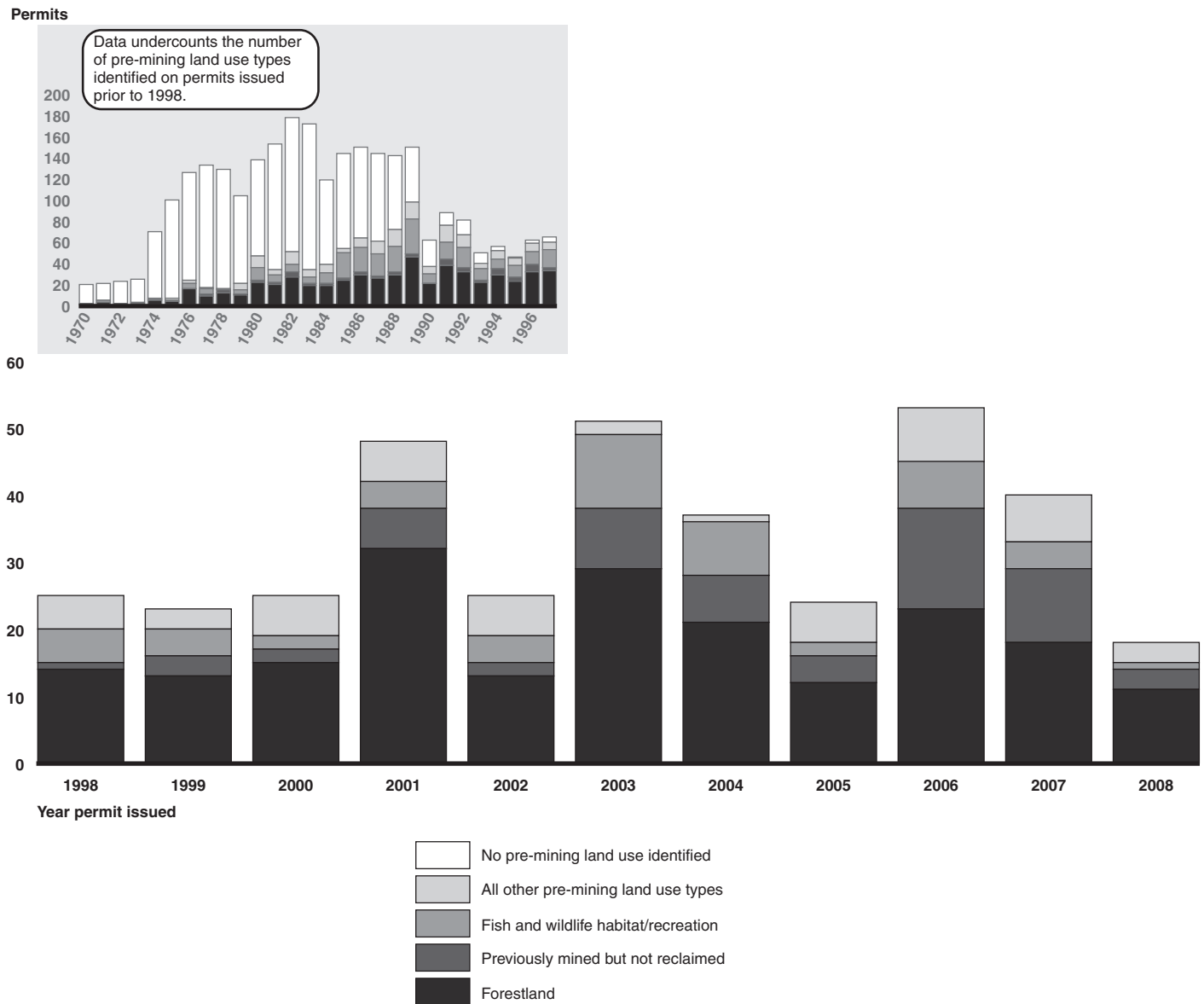
Data undercounts the number of pre-mining land use types identified prior to 1989 because this data element was not consistently recorded in the SMIS database for permits issued prior to that time, and because not all permits in the 1970s are included in SMIS. Data double counts the number of pre-mining land use types identified on some permits issued in the 1980s because of state administrative actions to reissue previously issued permits.

The total number of pre-mining land uses identified might exceed the number of permits issued because operators can identify more than one pre-mining land use type.

Over the same period, West Virginia's data show that of the 212 permits issued, 174 permits had a pre-mining land use of forestland, and 59 were previously mined. Additionally, 43 permits had a pre-mining land use type of fish and wildlife/recreation, while 45 permits identified other types of pre-mining land use, including 23 for hay or pastureland.²³ All permits issued since 2000 in West Virginia identified at least one pre-mining land use type. Figure 16 shows these data, including the number of permits that did not identify a pre-mining land use type.

²³The other permits in West Virginia included 12 that identified "combined" pre-mining land use types of an unspecified nature, 4 industrial/commercial, 3 rangeland, and 1 each for commercial woodland, public service, and water impoundment.

Figure 16: Pre-Mining Land Use Types Identified in West Virginia, 1970–2008



Source: GAO analysis of data from West Virginia's ERIS database.

Notes:

Data for 2008 is through July 30, 2008.

Data undercounts the number of pre-mining land use types identified prior to 1998 because this data element was not consistently recorded in the ERIS database for permits issued prior to that time, and because permits closed prior to 1984 are not included in ERIS.

The total number of pre-mining land uses identified might exceed the number of permits issued because operators can designate more than one pre-mining land use type.

Most Operations Are Required to Reclaim the Land to AOC, but There Are Exceptions

SMCRA generally requires surface-mined land to be reclaimed to AOC. The act defines AOC as closely resembling the general surface configuration of the land prior to mining and blending into and complementing the drainage pattern of the surrounding terrain. However, SMCRA does not require operators to duplicate the original contour or elevation of the mined area. Furthermore, according to OSM, it is often not physically possible to do so because of site-specific conditions and performance standards such as ensuring stability, controlling drainage, and preventing stream sedimentation. In addition, SMCRA allows exceptions to the AOC requirement—called AOC variances—under certain circumstances.

Kentucky and West Virginia issued AOC policy guidance in 2001 and 1999, respectively, to help implement SMCRA. The states issued this guidance following special oversight reviews that OSM conducted on how the states applied standards and approved permits in reference to AOC requirements.²⁴ In both states' permit applications, operators provide calculations, maps, and/or cross sections to illustrate and define the proposed post-mining contour of the permit area. This proposed contour becomes part of the reclamation plan for the site, fulfillment of which is a condition for release of the operator's bond. The OSM reports found, among other things, that some reclaimed sites where the operator was supposed to return the land to AOC differed little from sites that had been

²⁴U.S. Department of the Interior, Office of Surface Mining, *Final Report: An Evaluation of Approximate Original Contour and Post-Mining Land Use in West Virginia*, May 1999; and *An Evaluation of Approximate Original Contour and Post-Mining Land Use in Kentucky*, May 2000.

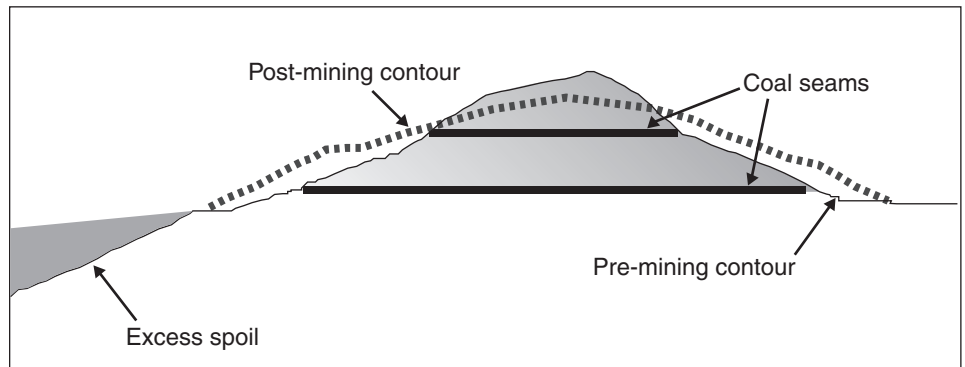
granted AOC variances.²⁵ Both states agreed to apply their AOC policies prospectively for all new permits issued, as well as review all pre-existing permits and correct deficiencies to the extent practicable. Kentucky's guidance states that, in general, approximately 80 percent of spoil volume should be returned to the mined-out area to achieve AOC, although site-specific flexibility is allowed.²⁶ Kentucky's guidance also states that the post-mining contour must closely resemble, but does not need to exactly match the pre-mining contour, and the post-mining slopes do not necessarily have to be long and uninterrupted, even if the pre-mining slopes were. West Virginia's AOC guidance provides a technical model designed to maximize the amount and height of spoil placed back on the mined-out area and therefore minimize the amount of excess spoil placed in fills that can impact streams and terrestrial and aquatic habitats.²⁷ In addition, the West Virginia model is designed to result in fills being placed as far upstream as possible. Like Kentucky's guidance, West Virginia's guidance allows site-specific flexibility for AOC determinations. Figure 17 illustrates what a reclaimed site could look like in meeting the AOC requirement, compared with the original, pre-mining contour.

²⁵Specifically, the OSM report on Kentucky found that state regulators had placed a greater emphasis on the amount of spoil material returned to the mined-out area and not enough emphasis on the post-mining land configuration, land use, slope stability, and drainage controls. Similarly, the OSM report on West Virginia concluded that the state's AOC determinations should give more attention to large, post-mining changes in elevation in relation to the pre-mining relief; the amount and location of spoil placed outside the mined area; and land configuration. In 2007 and 2008, OSM conducted follow-up reviews on the effectiveness of the two states' new AOC policies and procedures and how sites in steep slope areas had been reclaimed to AOC, compared with AOC variances. As of September 30, 2009, OSM had not published its findings. GAO did not analyze individual permits and post-mining site data to determine the extent to which the proposed reclamation plan is ultimately achieved or whether bond release is appropriately granted.

²⁶Memorandum from Larry D. Adams, Director, Division of Permits, Kentucky Department for Surface Mining Reclamation and Enforcement, "Approximate Original Contour Determination," Sept. 20, 2001.

²⁷West Virginia Department of Environmental Protection's Division of Mining and Reclamation, *Permit Handbook*, Section 29, "AOC/Excess Spoil Guidelines," June 24, 1999. These guidelines were later supplemented with a "Final AOC Guidance Document Policy" in the *Permit Handbook* on June 5, 2000.

Figure 17: An Illustration of a Reclaimed Site Meeting the AOC Requirement, Compared with the Original, Pre-Mining Contour



Source: OSM.

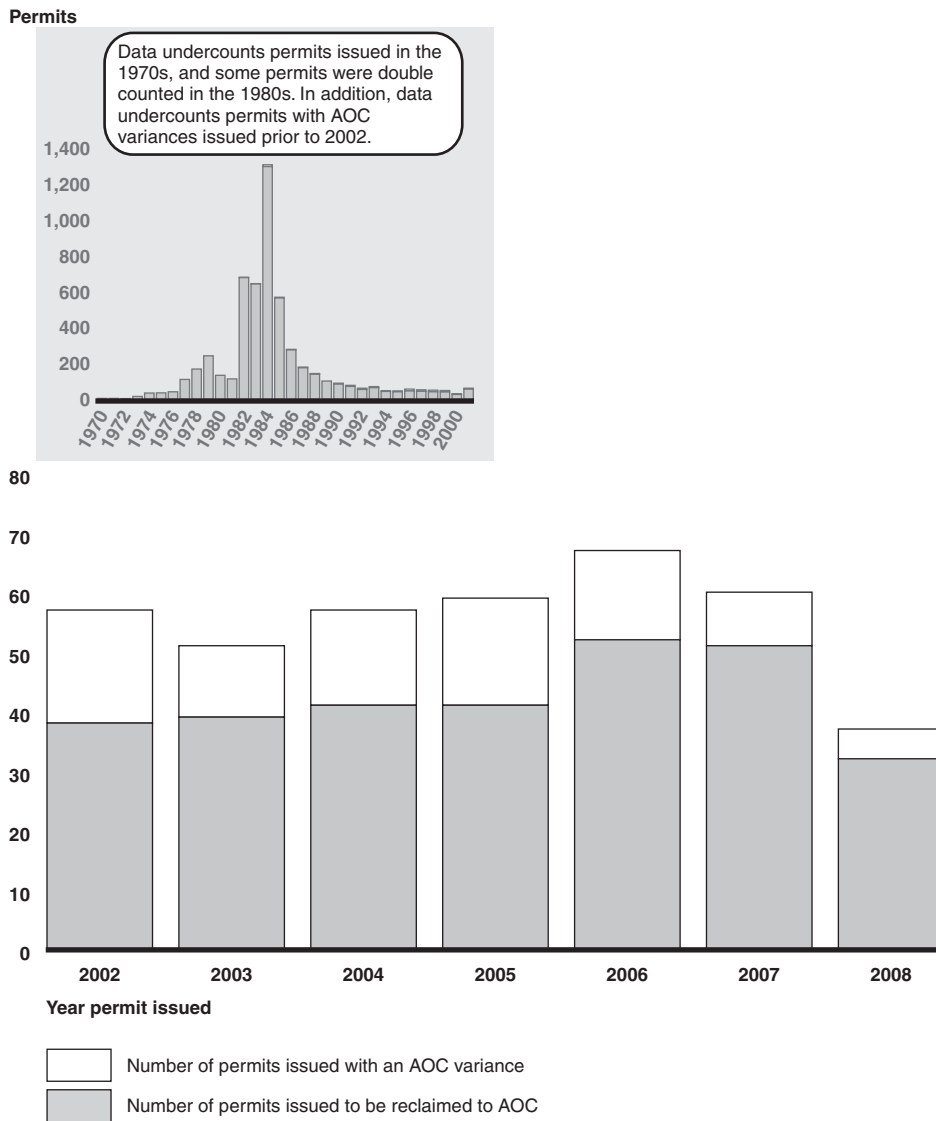
While the states' databases contain data on some permits issued with AOC variances as long ago as 1982 in Kentucky and 1976 in West Virginia, officials in both states stated that the reliability of data on AOC variances improved starting in 2002 and 2000, respectively.²⁸ In addition, state officials told us that operators do not always use the variances they are granted, resulting in some of those sites being reclaimed to AOC, a fact that may not be reflected in the data. State officials also told us that an AOC variance may apply to the entire permitted area, or only a portion, and that a permit may contain more than one AOC variance. Finally, Kentucky officials told us that they have not consistently recorded reliable information in their database on the acres or PMLU types associated specifically with AOC variances, and West Virginia officials told us they have not recorded this information to any extent in their database, thus we are unable to provide that information.

According to Kentucky's and West Virginia's data, most surface coal mining permits issued in recent years required the land to be reclaimed to AOC, although both states also granted some permits with AOC variances. Specifically, 76 percent (or 294 permits) of the 388 permits that Kentucky issued from January 2002 through July 2008 required the operator to reclaim the land to AOC. The remaining 24 percent (or 94 permits)

²⁸In the special oversight reviews that OSM published in 1999 and 2000, OSM found that the two states did not have reliable electronic inventories of AOC variances at that point, which made it difficult to identify exactly how many existed. In response, Kentucky and West Virginia revised their databases to clearly identify AOC variances on existing and future permits.

contained 99 AOC variances. Figure 18 shows the number of permits issued to reclaim the land to AOC, compared with permits issued with AOC variances.

Figure 18: Number of Permits in Kentucky Issued to Be Reclaimed to AOC, Compared with Permits Issued with AOC Variances, 1970–2008



Source: GAO analysis of data from Kentucky's SMIS database.

Notes:

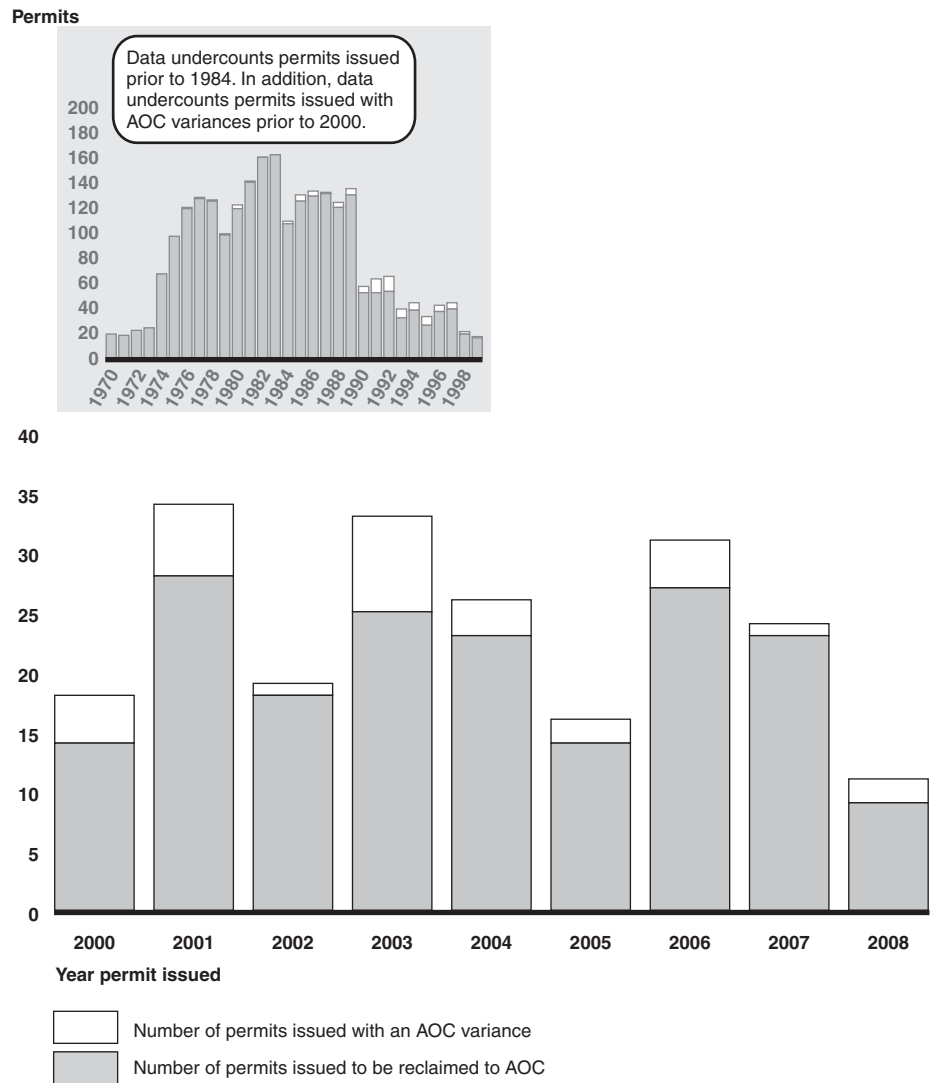
Data for 2008 is through July 30, 2008.

Data undercounts permits issued in the 1970s because not all permits of that era are included in the SMIS database, and some permits were double counted in the 1980s because of state administrative actions to reissue previously issued permits. In addition, data undercounts permits issued with AOC variances prior to 2002 because this data element was not consistently recorded in SMIS for permits issued prior to that time.

A permit may contain more than one AOC variance. In addition, the data reflects the AOC variances that are approved, not necessarily the variances implemented.

In West Virginia, 85 percent (or 181 permits) of the 212 permits issued from January 2000 through July 2008 required the operator to reclaim the land to AOC. The remaining 15 percent (or 31 permits) contained 33 AOC variances. Figure 19 shows the number of permits issued to reclaim the land to AOC, compared with permits issued with AOC variances.

Figure 19: Number of Permits in West Virginia Issued to Be Reclaimed to AOC, Compared with Permits Issued with AOC Variances, 1970–2008



Source: GAO analysis of data from West Virginia's ERIS database.

Notes:

Data for 2008 is through July 30, 2008.

Data undercounts permits issued prior to 1984 because permits closed prior to 1984 are not included in the ERIS database. In addition, data undercounts permits issued with AOC variances prior to 2000 because this data element was not consistently recorded in ERIS for permits issued prior to that time.

A permit may contain more than one AOC variance. In addition, the data reflects the AOC variances that are approved, not necessarily the variances implemented.

According to the two states' databases, Kentucky and West Virginia have approved three different types of AOC variances—remining, mountaintop removal, and steep slope. Remining AOC variances are used for certain lands that have been previously mined, but not reclaimed, and for which the regulatory agency deems there is insufficient spoil to return the remined land to the shape of the original mountain. A remining AOC variance simply requires the operator to return as much spoil as possible to the site. This type of AOC variance also allows the operator to keep a preexisting highwall intact, so long as it is stable.

By contrast, the other two types of AOC variances—mountaintop removal and steep slope—may be approved for specific types of operations on land in mountainous areas, even though the land could physically be reclaimed to AOC.²⁹ In these cases, federal and state regulations allow the operator to reclaim the land without regard to the AOC requirement if the land will be suitable for certain PMLUs. According to an OSM policy document on AOC variances issued in June 2000,³⁰ these types of AOC variances present an opportunity to create relatively flat, flood-free land capable of supporting residential and industrial development or other valuable land uses in mountainous Appalachia. However, the OSM policy advises that mountaintop removal and steep slope AOC variances should be granted “only in situations where beneficial land uses could compensate for the adverse effects of not returning the land to AOC.” These adverse effects include increased excess spoil that can result in more and larger fills placed in adjacent valleys and hollows,³¹ compared with operations that

²⁹A “mountaintop removal” operation is one that, by definition, will not restore the area to AOC, but will instead reclaim the land to a level plateau or a gently rolling contour, with no highwalls remaining. However, the term “steep slope” is used to describe mining operations in mountainous terrain that may, or may not, include an AOC variance. Steep slope operations that do not have an AOC variance follow the same requirements as other permits that comply with AOC requirements.

³⁰OSM, *Postmining Land Use: Exceptions to Approximate Original Contour Requirements for Mountaintop Removal Operations and Steep Slope Operations*, June 2000, available at <http://www.osmre.gov/guidance/docs/mtpmlureport.pdf>.

³¹A “hollow” is a depressed or low part of a surface, especially a small valley or basin. Throughout this report, we use the term “fills” to encompass both hollow and valley fills, unless otherwise noted.

comply with the AOC requirement.³² The OSM policy also directs state regulatory agencies to approve mountaintop removal and steep slope AOC variances only in cases where the PMLU offers a net benefit to the public or the economy. An example of a reclaimed site with an AOC variance, used to build the Mount Olive Correctional Complex in Fayette County, West Virginia, appears in figure 20.

Figure 20: A Reclaimed, Surface-Mined Site with an AOC Variance in West Virginia



Source: GAO.

³²Even when land is returned to AOC, some excess spoil must be disposed of in fills. When a site is not returned to AOC, a substantially greater amount of excess spoil can be generated, which must be placed outside the mined-out area.

The types of mining operations and PMLU restrictions to which mountaintop removal and steep slope AOC variances apply are as follows:³³

- A mountaintop removal operation involves the extraction of an entire coal seam or seams in the upper part of a mountain, ridge, or hill. Additionally, the land must be reclaimed to a condition suitable for agricultural, industrial, commercial, residential, or public facility (including recreational facilities) uses.
- A steep slope operation is one conducted in an area with a slope exceeding 20 degrees (or less, if deemed appropriate by the state after considering soil, climate, and other site characteristics) that does not involve the removal of the entire mountaintop. Operators of steep slope AOC variances are restricted to the same PMLUs as for mountaintop removal variances, except that agricultural land use is not allowed.

To help ensure the land is reclaimed to a condition capable of supporting the PMLU proposed by the operator, SMCRA and its implementing regulations also provide specific criteria for granting mountaintop removal and steep slope AOC variances. For example, for mountaintop removal AOC variances, the operator must provide assurance in the permit application that the PMLU will be

- compatible with adjacent land uses;
- obtainable according to data regarding expected need and market;
- assured of investment in necessary public facilities;
- supported by commitments from public agencies, where appropriate;
- practicable with respect to private financial capability for completion of the proposed use;

³³By contrast, AOC variances granted for remaining operations are not restricted to specific PMLUs. However, if an alternative PMLU is planned for such an operation, it is subject to the general requirement that it must be deemed equal to, or better than, the land's original, pre-mining use.

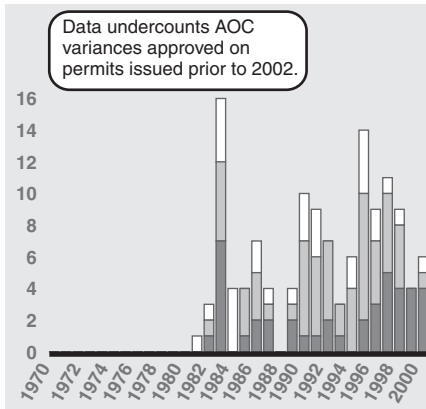
-
- planned pursuant to a schedule attached to the reclamation plan so as to integrate the mining operation and reclamation with the PMLU; and
 - designed by a registered engineer in conformance with professional standards established to ensure the stability, drainage, and configuration necessary for the intended use of the site.

Kentucky's data indicate that, of the 99 AOC variances contained in 94 permits issued from January 2002 through July 2008, 79 were for remining, while 5 were for mountaintop removal, and 15 were for steep slope AOC variances.³⁴ Figure 21 shows the types of AOC variances approved in Kentucky, by year.

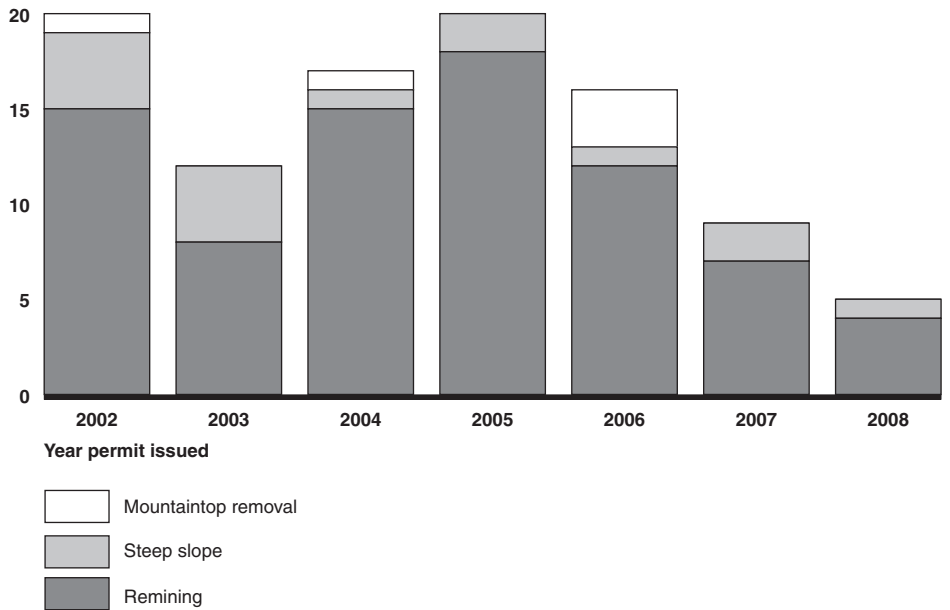
³⁴Ninety-four permits in Kentucky issued from January 2002 through July 2008 each contained one AOC variance, while five permits issued in that time frame each contained two AOC variances.

Figure 21: Types of AOC Variances Approved in Kentucky, 1970–2008

AOC variances



25



Source: GAO analysis of data from Kentucky's SMIS database.

Notes:

Data for 2008 is through July 30, 2008.

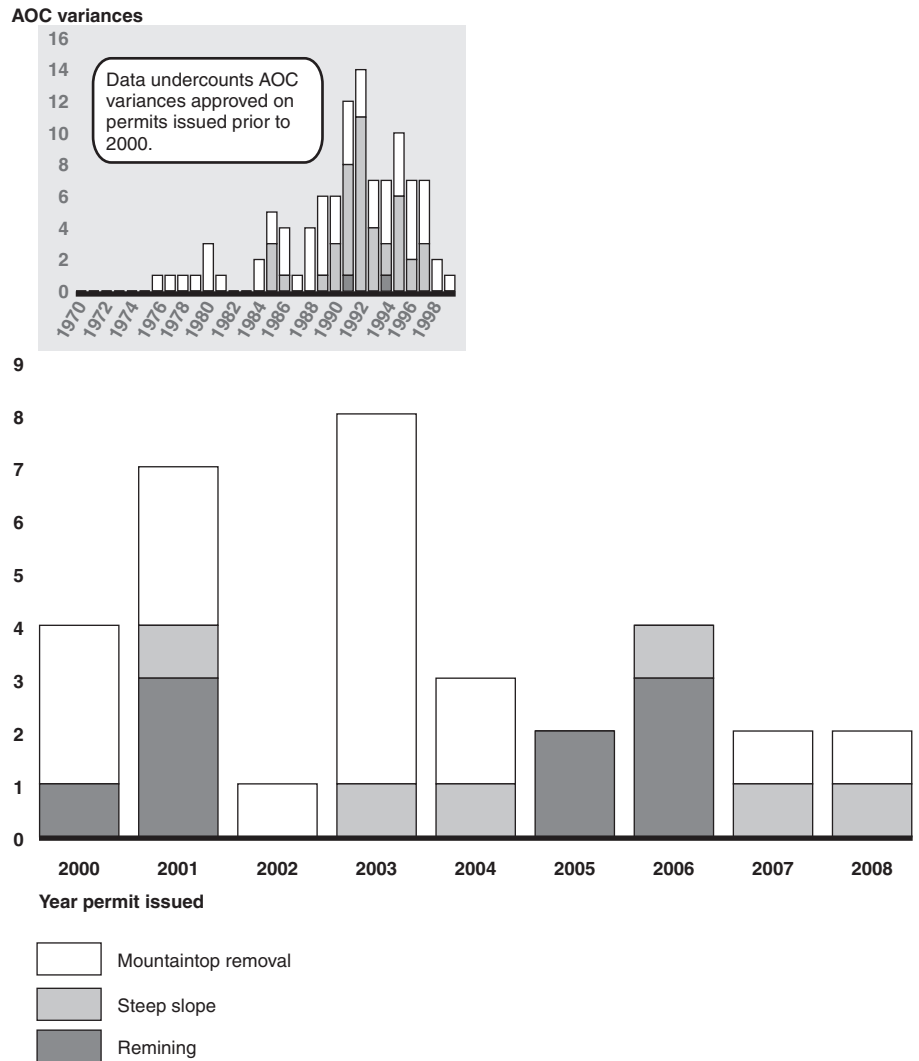
Data undercounts the number of AOC variances approved on permits issued prior to 2002 because this data element was not consistently recorded in the SMIS database for permits issued prior to that time.

The data reflects the AOC variances that are approved, not necessarily the variances implemented.

In West Virginia, of the 33 AOC variances contained in 31 permits issued from January 2000 through July 2008, 9 were for re-mining, 18 were for mountaintop removal, and 6 were for steep slope AOC variances.³⁵ Figure 22 shows the types of AOC variances approved in West Virginia, by year.

³⁵Thirty-one permits in West Virginia issued from January 2002 through July 2008 each contained one AOC variance, while two permits issued in that time frame each contained two AOC variances.

Figure 22: Types of AOC Variances Approved in West Virginia, 1970–2008



Source: GAO analysis of data from West Virginia's ERIS database.

Notes:

Data for 2008 is through July 30, 2008.

Data undercounts the number of AOC variances approved on permits issued prior to 2000 because this data element was not consistently recorded in the ERIS database for permits issued prior to that time, and because permits closed prior to 1984 are not included in ERIS.

The data reflects the number of AOC variances that are approved, not necessarily the number of variances implemented.

Operators Were Approved to Construct Nearly 2,000 Valley and Hollow Fills from 2000 to 2008

As part of the permitting process, operators may be authorized to place excess spoil in fills in nearby valleys and hollows. OSM, Kentucky, and West Virginia regulations define these fills as structures consisting of any material, other than organic material, placed in a valley or the uppermost reaches of a hollow where either (1) the side slopes, measured at the steepest point, are greater than 20 degrees or (2) the average slope of the profile of the valley or hollow, from the bottom to the top of the fill, is greater than 10 degrees. In the permit application, operators justify the estimated number and size of these fills based on the amount of excess spoil they calculate will not be needed to achieve AOC or, in the case of an AOC variance, to support the proposed PMLU. The regulations further distinguish between valley fills and hollow fills, and Kentucky makes use of this distinction in its database. One official told us that in Kentucky, the difference between valley fills and hollow fills is that hollow fills tend to be smaller in size and located higher up in the valley than valley fills. West Virginia does not make use of this distinction in its database.

According to OSM, the amount of excess spoil generated varies considerably depending on the nature of the rock and the mining method used, but the industry average is about 25 percent of material removed.³⁶ Although fills are not subject to AOC requirements, the operator must ensure fills are safe and stable,³⁷ compatible with the surrounding landscape, and suitable for the approved PMLU. In addition, among other requirements, operators must dispose of the excess spoil in designated areas within the permit boundaries; minimize the adverse effects of leaching and surface water runoff from the fill; and minimize adverse impacts on fish and wildlife to the extent possible, using the best technology currently available. Excess spoil that is acid- or toxic-forming must be adequately covered or treated to control the impacts on surface and groundwater, plant growth, and the approved PMLU.³⁸ Terraces may be constructed if needed for stability, for control of erosion, to conserve

³⁶While there is no specific numerical requirement in regulations relating to what amount of excess spoil may be deposited in fills, OSM states that permit applications should contain strata-by-strata, volume-weighted information regarding spoil calculations to help the states determine the amount of excess spoil to be placed in fills and the degree to which AOC may be achieved.

³⁷The fill must be designed and constructed to attain a minimum long-term static safety factor of 1.5. The foundation and abutments of the fill must be stable under all conditions of construction.

³⁸West Virginia officials noted that they do not allow acid-forming materials to be included in fills. Kentucky regulations allow for acid-forming materials to be included in fills under certain circumstances.

soil moisture, or to facilitate the approved PMLU. Figure 23 shows a terraced fill on a reclaimed site in West Virginia.

Figure 23: A Terraced Fill on a Reclaimed Site in West Virginia



Source: GAO.

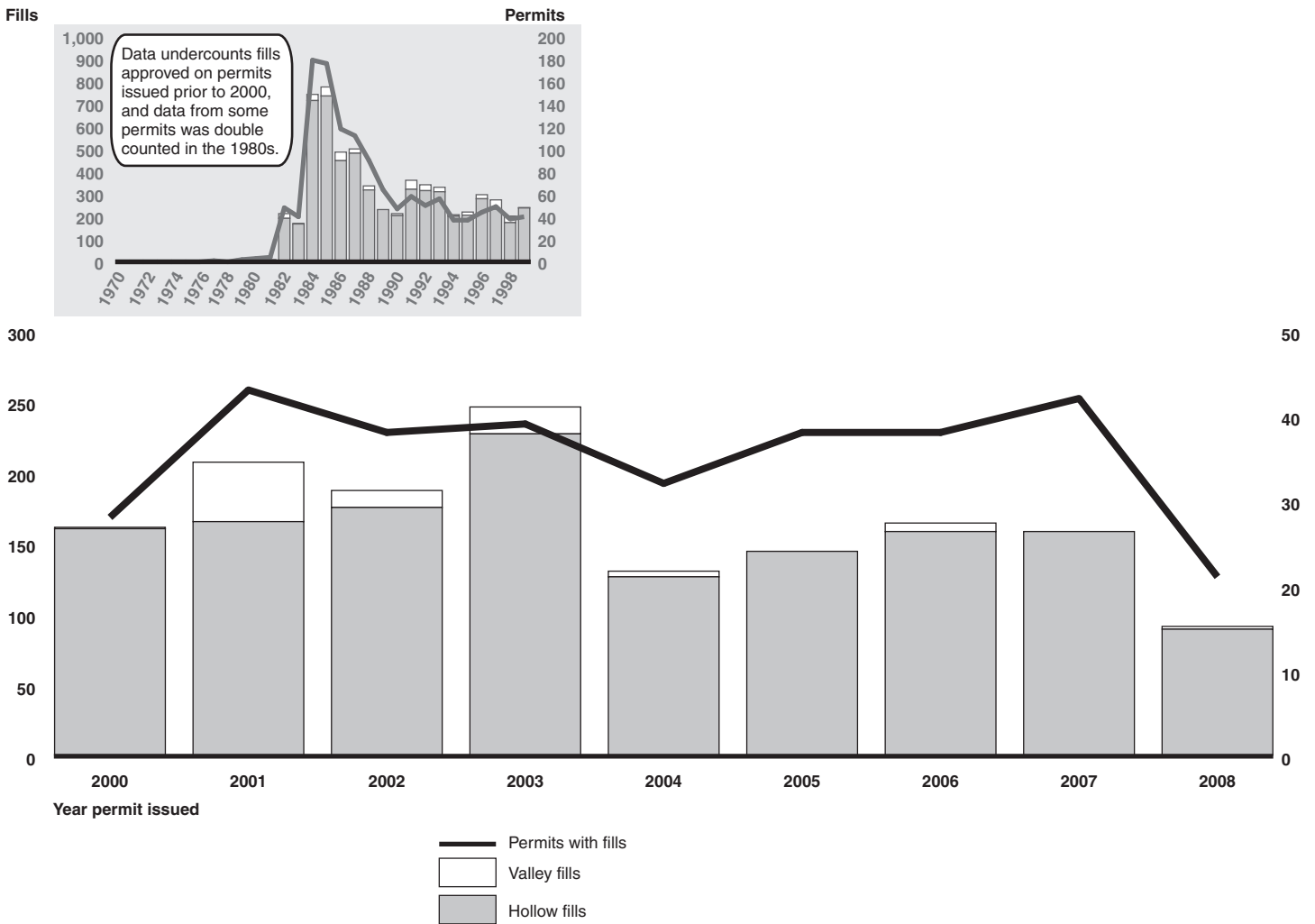
The two states' databases indicate operators were collectively approved to construct nearly 2,000 fills from January 2000 through July 2008 to store at least 4.85 billion cubic yards of excess spoil. The data reflects the number and size of fills approved; the states do not keep electronic data on the number and size of fills that were actually constructed.³⁹ According to state officials, operators may forgo constructing an approved fill, or they may construct a smaller fill than approved, without revising the permit. A permit can contain one or more fills, but an operator may only be authorized to increase the number or size of fills through a permit revision.

³⁹For example, OSM found in its 2000 special oversight report on Kentucky that only 21 fills, or 64 percent, of the 33 authorized fills it reviewed were actually constructed. OSM stated that, in a number of instances, operators had overestimated the anticipated volume of excess spoil.

Additionally, while both states have collected some information on fills in their databases since the late 1970s, Kentucky officials told us their fill data is less reliable prior to 2000. West Virginia officials also told us they did not consistently record information on fills in their database until the late 1990s.

Kentucky approved 1,488 fills on permits issued from January 2000 through July 2008, of which 94 percent of the fills were classified as hollow fills, and 6 percent were valley fills. Sixty-six percent (319 permits) of the 481 permits issued during that time approved the construction of one or more fills. Figure 24 shows the total number of fills approved, and permits issued with fills, by year.

Figure 24: Fills Approved in Kentucky, 1970–2008



Source: GAO analysis of data from Kentucky's SMIS database.

Notes:

Data for 2008 is through July 30, 2008.

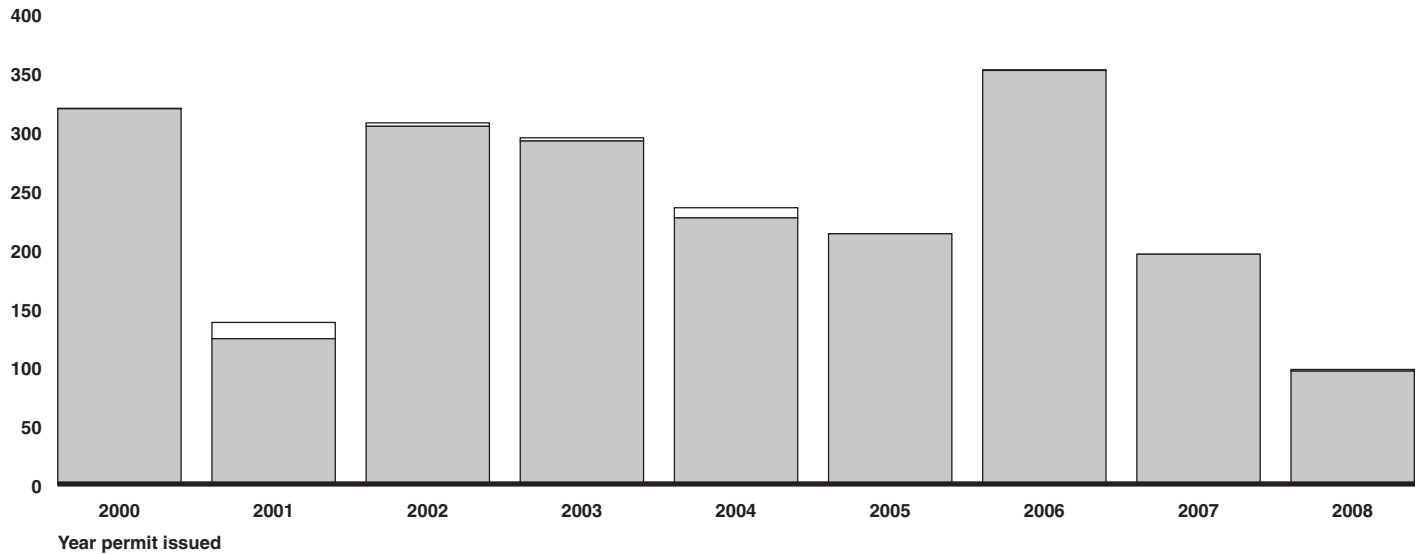
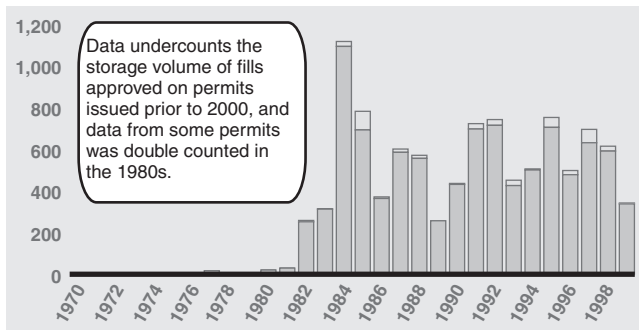
Data undercounts the number of fills approved prior to 2000 because this data element was not consistently recorded in the SMIS database for permits issued prior to that time, and because not all permits issued in the 1970s are included in SMIS. Data double counts the number of fills approved for some permits issued in the 1980s because of state administrative actions to reissue previously issued permits.

The data reflects the number of fills approved, not the actual number of fills constructed.

Of the 1,488 fills approved on permits issued from 2000 through July 2008, Kentucky's database contains storage volume information on 1,485 fills. In total, these 1,485 fills were approved to store up to 2.15 billion cubic yards of excess spoil, averaging 1.4 million cubic yards and ranging from 564 cubic yards to 23.1 million cubic yards per fill. See figure 25 for the total storage volume approved, by year.

Figure 25: Storage Volume of Fills Approved in Kentucky, 1970–2008

Cubic yards (in millions)



Valley fills
 Hollow fills

Source: GAO analysis of data from Kentucky's SMIS database.

Notes:

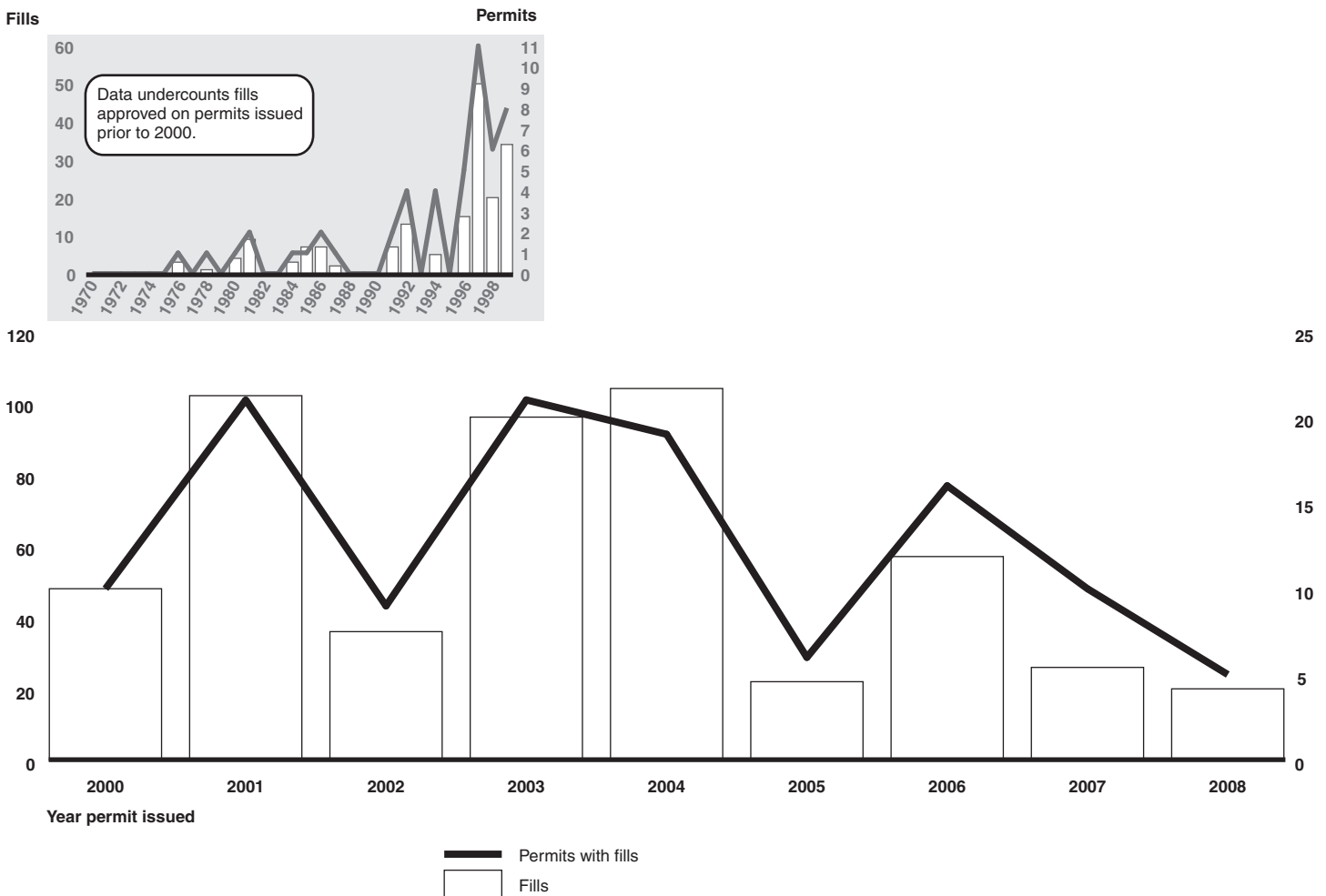
Data for 2008 is through July 30, 2008.

Data undercounts the storage volume of fills approved prior to 2000 because this data element was not consistently recorded in the SMIS database for permits issued prior to that time, and because not all permits issued in the 1970s are included in SMIS. Data double counts the storage volume of fills approved for some permits issued in the 1980s because of state administrative actions to reissue previously issued permits.

The data reflects the size of fills approved, not the actual size of fills constructed.

West Virginia approved the construction of 511 fills on permits issued from January 2000 through July 2008. Unlike Kentucky, West Virginia does not make a distinction between valley and hollow fills in its database. Fifty-five percent (117 permits) of the 212 permits issued during this time approved the construction of one or more fills. Figure 26 shows the total number of fills approved, and permits issued with fills, by year.

Figure 26: Fills Approved in West Virginia, 1970–2008



Source: GAO analysis of data from West Virginia's ERIS database.

Notes:

Data for 2008 is through July 30, 2008.

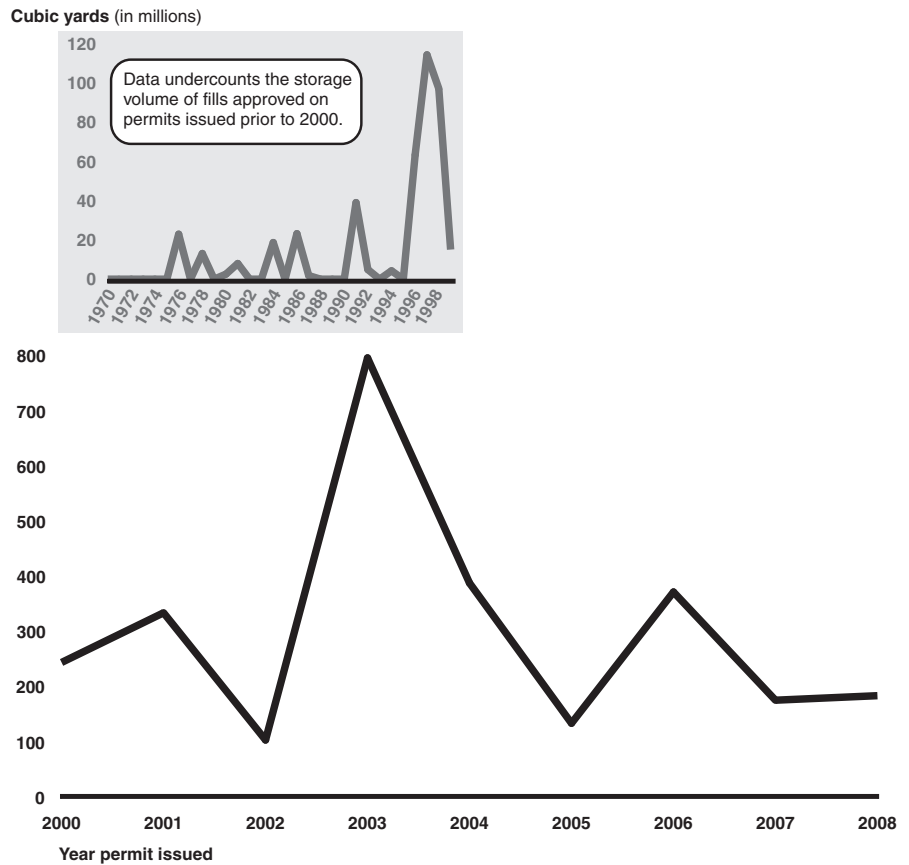
Data undercounts the number of fills approved prior to 2000 because this data element was not consistently recorded in the ERIS database for permits issued prior to that time, and because permits closed prior to 1984 are not included in ERIS.

The data reflects the number of fills approved, not the actual number of fills constructed.

Of the 511 fills approved on permits issued from 2000 to 2008, West Virginia's database contains storage volume information on 506 fills. In total, these 506 fills were approved to store up to 2.7 billion cubic yards of excess spoil, averaging 5.4 million cubic yards and ranging from 6,932

cubic yards to 123.6 million cubic yards per fill. See figure 27 for the total storage volume approved, by year.

Figure 27: Storage Volume of Fills Approved in West Virginia, 1970–2008



Source: GAO analysis of data from West Virginia's ERIS database.

Notes:

Data for 2008 is through July 30, 2008.

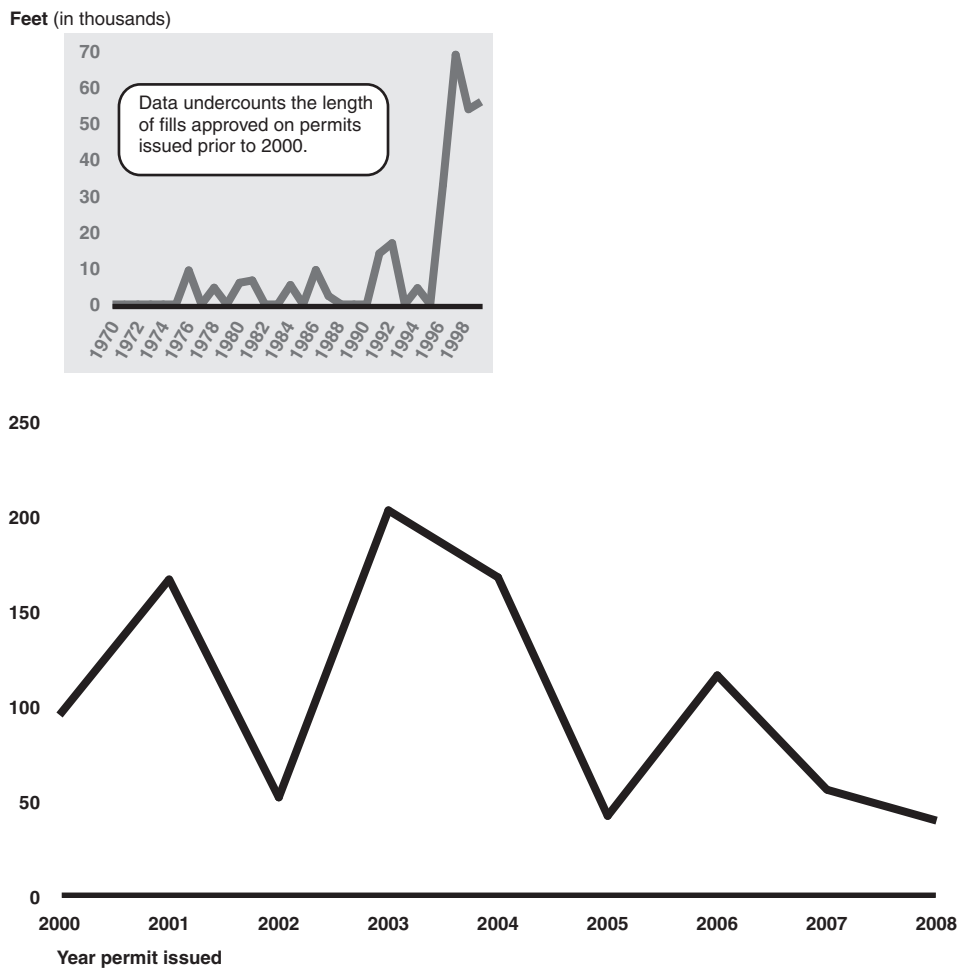
Data undercounts the storage volume of fills approved prior to 2000 because this data element was not consistently recorded in the ERIS database for permits issued prior to that time, and because permits closed prior to 1984 are not included in ERIS.

The data reflects the size of fills approved, not the actual size of fills.

While both states collect data on the approved storage volume of fills, West Virginia also collects data on their approved length. Of the 511 fills approved on permits issued from 2000 through July 2008, West Virginia's

database contains length information on 496 fills. In total, these fills were approved to measure 933,487 feet (nearly 177 miles) in length. On average, these fills were approved to measure 1,882 feet (over one-third of a mile) in length and varied from 150 feet to 8,400 feet (up to 1.6 miles) per fill. Figure 28 shows the total fill length approved, by year.

Figure 28: Length of Fills Approved in West Virginia, 1970–2008



Source: GAO analysis of data from West Virginia's ERIS database.

Notes:

Data for 2008 is through July 30, 2008.

Data undercount the length of fills approved prior to 2000 because this data element was not consistently recorded in the ERIS database for permits issued prior to this time and because permits closed prior to 1984 are not included in ERIS.

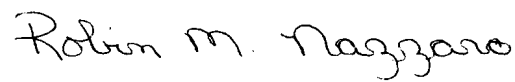
The data reflect the size of fills approved, not the actual size of fills.

Agency Comments and Our Evaluation

We provided a draft of this report to the U.S. Department of the Interior, the Kentucky Department for Natural Resources, and the West Virginia Department of Environmental Protection for review and comment. The agencies generally agreed with our findings. However, all three agencies raised concerns about including the older data from SMIS and ERIS in our report, data for which there are known limitations. We share the agencies' concerns that these data could be misinterpreted or misused. However, we are including these data in our report, along with the appropriate caveats, in order to provide a comprehensive overview of the data in SMIS and ERIS that clearly identifies the years for which there are data limitations and the nature of those limitations. We believe that the extensive discussions we had with Kentucky and West Virginia officials brought to light for the first time, at least in a comprehensive fashion, the full extent of the data limitations, and that documenting the results of these discussions is an important aspect of this study. We believe that presenting the data from the earlier years—and their limitations—decreases the likelihood of misuse or misinterpretation because the limitations on the data are not disclosed on the Web sites from which the public accesses SMIS and ERIS. Further, we clearly identify the data for which there are limitations and state that they do not convey a representative picture of past mining characteristics or decisions. We present comments from the Department of the Interior, the Kentucky Department for Natural Resources, and the West Virginia Department of Environmental Protection in appendixes II, III and IV, respectively. Our responses to the Department of the Interior and the Kentucky Department for Natural Resources are included in appendixes II and III, respectively. No response is warranted for the West Virginia Department of Environmental Protection's comments. The Department of the Interior and the West Virginia Department of Environmental Protection also provided technical comments that we incorporated into the report, as appropriate.

We are sending copies of this report to interested congressional committees; the Secretary of the Interior; the Director of the Office of Surface Mining, Enforcement and Reclamation; the Commissioner of the Kentucky Department for Natural Resources; and the Secretary for the West Virginia Department of Environmental Protection. The report also is available at no charge on the GAO Web site at <http://www.gao.gov>.

If you or your staffs have any questions about this report, please contact me at (202) 512-3841 or nazzaror@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made major contributions to this report are listed in appendix V.



Robin M. Nazzaro
Director, Natural Resources
and Environment

Appendix I: Objectives, Scope, and Methodology

This appendix details the methods we used to examine the characteristics, over time, of (1) surface coal mining in mountainous areas in Kentucky and West Virginia and (2) reclaimed lands that were disturbed by surface coal mining in mountainous areas in Kentucky and West Virginia. This report focuses on surface coal mining in the mountainous areas of Appalachia—often referred to as mountaintop mining—because of the controversy that mountaintop mining generates. We focused specifically on surface mining in the mountainous, eastern part of Kentucky and all of West Virginia because the majority of mountaintop mining in the Appalachian region occurs in these areas.¹ According to the U.S. Department of Energy’s Energy Information Administration (EIA), nearly 73 percent of the surface coal produced in Appalachia in 2008 came from these areas.

To respond to both objectives, we relied extensively on surface coal mining data provided by the Kentucky Department for Natural Resources and the West Virginia Department of Environmental Protection. Both of these departments maintain extensive electronic databases that contain select information from the states’ surface mining permit files. The permit files provide details on mining operations that are not contained in these databases. Kentucky describes its database, called the Surface Mining Information System (SMIS), as an extensive computer database that is used for tracking all permitting and enforcement actions on coal mining activity in the commonwealth of Kentucky. West Virginia describes its database, called the Environmental Resources Information System (ERIS), as a comprehensive information management system designed to track information about a variety of environmental regulatory activities.

We worked with state officials to identify available data elements useful to our analysis and requested extracts containing those elements from the states’ databases. Kentucky provided us with data from surface mining permits issued from 1970 through July 2008, and West Virginia provided us with data from surface mining permits that were open, as of 1984, or were issued from 1984 through July 2008.

¹A small amount of surface mining takes place in the northern half of West Virginia. According to officials from West Virginia and Office of Surface Mining Reclamation and Enforcement, permits in the northern half of West Virginia—north of Sutton, West Virginia—are generally not found on the steeper-sloped areas of that region. According to the ERIS database, as of July 2008, about 6 percent of open acres were in the northern half of West Virginia.

Based on discussions with Kentucky officials, we excluded from our analysis the following surface mining permits from the SMIS database extracts:

- surface mining permits for the western portion of the state because this region is generally not considered mountainous;
- combination permits (permits for both surface and underground mining) because SMIS does not provide data on the number of acres associated with each type of mining; and
- a type of permit that is designed for homeowners and issued for sites that are 2 acres or smaller because these permits are not industrial in nature.

Based on discussion with West Virginia officials, we excluded from our analysis those permits that were closed by the state before the operator ever utilized the permit.

For both states, we used the following data elements to address our objectives:

- issued permits, including the permit identification number, the issue date, the original size of the permit (in acres) and any adjustments to its size, and the county in which the permitted area lies;
- information on bonds associated with permits, as well as the status of the bonds and associated dates;
- the pre- and post-mining land uses associated with permits;
- information on approximate original contour variances, if any, associated with permits; and
- information on the number and size of fills, if any, associated with permits.

We performed the following analysis of data from Kentucky's SMIS database. We linked certain permits together under a unified identification number to more accurately reflect actual mining activity. Specifically, we linked renumbered permits, which are older permits that received a new identification number to conform to a new numbering system. We also linked transferred permits, which are permits that received a new identification number when they changed ownership. Despite the different identification numbers, the permits are essentially the same. Linking these permits prevents overcounting of the mining and reclamation activities

associated with a specific geographic area. This issue did not arise with West Virginia's ERIS database.

We also took the following steps as part of our analysis of data from West Virginia's ERIS database. First, because ERIS does not identify the date that a permit's status changed from open to either released or forfeited, we used the most recent date that a corresponding bond was released or forfeited. This issue did not arise with Kentucky's SMIS database. Second, to identify the largest permitted areas in West Virginia, we combined ERIS data with electronic geospatial files of permit boundaries from the West Virginia Department of Environmental Protection. We used ERIS data to identify when permits were issued and whether the permits were open, released, or forfeited, as of July 2008. We only included permits released or forfeited since January 1990, or permits that were still open as of July 2008, in this analysis. We excluded permits that were closed prior to 1990 because few of these older permits had associated geospatial files, and because the older permits were less likely to be associated with current mining activity. We used the electronic geospatial files to identify permitted areas, which we defined as either single, non-contiguous permits; or groups of contiguous permits. We then identified the size of the permitted areas and ranked them to identify the largest 5 percent. We did not perform this analysis with Kentucky permits because we did not have electronic geospatial files of their permit boundaries.

To assess the reliability of SMIS and ERIS data, we (1) worked with state officials familiar with these systems to understand each data element and determine the time frames for the reliability of each element, (2) conducted extensive electronic and logic testing of the SMIS and ERIS data extracts we received, and (3) reviewed the SQL code for the states' system extracts. We determined these data elements to be sufficiently reliable within certain time frames. Specifically, data related to characteristics in surface coal mining (for example, permits issued, released, and forfeited) is sufficiently reliable starting in 1990 for Kentucky and in 1984 for West Virginia. For Kentucky, the extract provided to us double counts some issued and released permits (and associated acreage) in the 1980s because of administrative actions to reissue previously issued permits to comply with revisions to state regulations. The extract also undercounts some permits (and associated acreage) issued in the 1970s because not all permits of that era are included in the SMIS database. In West Virginia, the extract provided to us does not contain data from permits closed prior to 1984 and thus undercounts the number of issued and closed permits (and associated acreage) for prior years. Due to these data limitations, and to be consistent between the states, we are reporting

on the characteristics of surface mining in Kentucky and West Virginia from January 1990 through July 2008. With respect to characteristics of reclaimed lands—pre- and post-mining land uses, approximate original contour (AOC) variances, and fill data—the data are sufficiently reliable by 2000 in both states, with the exception of AOC variances in Kentucky, which are sufficiently reliable starting in 2002. Prior to these times, the states did not always consistently record these data elements in their databases—they began to consistently record different data elements at different times. Consequently, both states’ data undercount these data elements prior to certain years. Due to these data limitations, and to be consistent between the states, we are reporting on the characteristics of reclaimed lands that were disturbed by surface mining from January 2000 through July 2008, except for Kentucky’s data on variances, for which we are reporting from January 2002 through July 2008.

However, in many of the graphics in this report, we include data on characteristics from all the years for which SMIS and ERIS contain data, in some cases dating back to 1961. We do this for two reasons. First, it allows us to include in our report the additional data that are sufficiently reliable, but that fall outside of our reporting time frames. Second, although the general public has access to data from all years—surface mining permit files in Kentucky and West Virginia are public documents—the data are readily accessible to the public by electronically accessing SMIS and ERIS. Thus, including the additional data in the graphics of our report allows us to provide a comprehensive overview of the data in SMIS and ERIS that clearly identifies the years for which there are data limitations and what those data limitations are. We believe that presenting data from the earlier years—and their limitations—decreases the likelihood of misuse or misinterpretation because the limitations on the data are not disclosed on the Web sites from which the public accesses SMIS and ERIS.

In addition to our analysis of Kentucky’s SMIS database and West Virginia’s ERIS database, we took a number of other steps to gain an understanding of surface coal mining in Appalachia. Specifically, we reviewed relevant federal and state laws, regulations, and policy guidance on surface coal mining and reclamation and visited mining sites—both active and reclaimed—in Kentucky and West Virginia. We also met with officials from the Department of the Interior’s Office of Surface Mining Reclamation and Enforcement (OSM), including regional officials from their Charleston, West Virginia, and Lexington, Kentucky, field offices, as well as officials from the West Virginia Department of Environmental Protection, the Kentucky Department for Natural Resources, and others knowledgeable about coal mining in Appalachia.

We conducted our work from March 2008 to December 2009 in accordance with all sections of GAO's Quality Assurance Framework that are relevant to our objectives. The framework requires that we plan and perform the engagement to obtain sufficient and appropriate evidence to meet our stated objectives and to discuss any limitations in our work. We believe that the information and data obtained, and the analysis conducted, provide a reasonable basis for any findings and conclusions in this report.

Appendix II: Comments from the Department of the Interior

Note: GAO comments supplementing those in the report text appear at the end of this appendix.



United States Department of the Interior

OFFICE OF THE SECRETARY
Washington, DC 20240

NOV 10 2009



Ms. Robin M. Nazzaro
Director, Natural Resources and Environment
U.S. Government Accountability Office
441 G Street, N.W.
Washington, D.C. 20548

Dear Ms. Nazzaro:

Thank you for providing the Department of the Interior the opportunity to review and comment on the draft Government Accountability Office Report entitled, "*SURFACE COAL MINING – Characteristics of Mining in Mountainous Areas of Kentucky and West Virginia*" (GAO-10-21).

We appreciate the diligent work of the team that prepared the report and the large amount of data collected, synthesized, and analyzed. In general, we believe that this report is an informative and fair characterization of surface coal mining in eastern Kentucky and West Virginia. We do have several general and specific comments that, if addressed, will enhance the quality, clarity, and consistency of data in the report. Our comments are contained in the enclosure.

If you have any questions, or need additional information, please contact Michael Robinson, Chief of the Office of Surface Mining Reclamation and Enforcement's Appalachian Region Technical Support Division, at (412) 937-2882.

Sincerely,

Wilma A. Lewis
Assistant Secretary
Land and Minerals Management

Enclosure

Enclosure

Department of the Interior
Comments on Draft Report
SURFACE COAL MINING: Characteristics of Mining in Mountainous Areas of
Kentucky and West Virginia (GAO-10-21)

General Comments

See comment 1.

1. GAO discusses and displays data in the draft final report that was collected during earlier years of the SMCRA state programs. Kentucky and West Virginia regulatory program personnel and OSM staff advised GAO that the collected data should not be relied upon to convey a representative picture of past mining characteristics or decisions. DOI is concerned that the data from the earlier years (pre-1990) could affect the credibility of the more recent, reliable data presented in GAO graphs and figures, and, that following publication, the information may be presented elsewhere as factual, without proper context or qualification.

See comment 2.

- a. In the draft report, GAO gathered the West Virginia information from the pre-1990 ERIS data. GAO may consider examining paper permitting records for the years prior to 1990 for its accurate tabulation. Should GAO conclude that the pre-1990 data should remain in the report, we suggest that the scale used on report charts be consistent for pre- and post-1990 time periods. The current draft uses a smaller y-axis scale for the earlier time frame and a larger y-axis scale for the more recent data. When using the y-axis scale, DOI recommends consistent presentation of the data.

See comment 3.

- b. Prior to 2002, the Kentucky state database (SMIS) includes inconsistently recorded information on AOC variances. DOI suggests excluding this data from the GAO charts and narrative. Rather, GAO may consider reviewing the individual permit files to compile its statistics, using the data for the period 1983 through 1998 which were compiled by the Office of Surface Mining Reclamation and Enforcement staff from permit files as part of oversight activities in Kentucky in 1999. This data is provided on pages 4 and 5 of this enclosure for consideration.

See comment 4.

2. The scope of the draft report is intended to characterize surface coal mining in the mountainous areas of Kentucky and West Virginia. However, data from all of West Virginia coalfield counties are included. Most of the northern coal field of West Virginia is located outside of mountainous or steep slope terrain. While explanatory language is included in a footnote in Appendix I, the report's inclusion of the northern coal field inaccurately portrays the extent of "Mining in Mountainous Areas." GAO excluded data from the non-mountainous areas of western Kentucky, and DOI suggests the data from northern West Virginia be extracted from the report as well.

The following are GAO's comments on the letter dated November 10, 2009, from the Assistant Secretary, Land and Minerals Management.

GAO Comments

1. We share the department's concern that, following publication of our report, some of the data we present could be presented elsewhere without proper context or qualification. We include in our report—and clearly identify—data which we know do not convey a representative picture of past mining characteristics or decisions. (Some, but not all of these data were collected prior to 1990.) These data, along with most of the other data presented in our report, come from Kentucky's and West Virginia's publicly accessible databases. We believe that the extensive discussions that we had with Kentucky and West Virginia officials brought to light for the first time—at least in a comprehensive fashion—the full extent of the limitations associated with these data. Documenting the results of these discussions is an important aspect of this study. We believe that it is important to include in our report the data with known limitations, along with the appropriate caveats, in order to provide a comprehensive overview of the data that are in the states' databases. Furthermore, because these data are publicly available, another party could present some or all of the problematic data without proper context or qualifications, regardless of what we present in our report. For this reason, we believe it is particularly important that the information on data limitations is made public.

The department commented that including data in our report “from the earlier years”—that is, data with known limitations—could affect the credibility of the more recent, reliable data that we present. We believe that we have provided the appropriate caveats to ensure that the reader clearly understands which data have limitations and which do not. Nevertheless, the issue of including or excluding data with known limitations—even with appropriate caveats—has been discussed at length within GAO, with officials from the Department's Office of Surface Mining Reclamation and Enforcement (OSM), and with officials from Kentucky and West Virginia. While we believe it is important to include these data, we are aware that they could be taken out of context and misused. While we believe that the caveats included in our report provide a reasonable basis to believe that the data will not be misused unintentionally, we are adding additional language to our report suggested by the department's comments: that certain data should not be relied upon to convey a representative picture of past mining characteristics or decisions.

2. We determined that examining paper permitting records was prohibitively resource-intensive. The files are very large and require detailed knowledge to correctly interpret them. Additionally, we generally agree with the department that, in presenting data graphically, the same scale on the y-axis should be used when presenting similar data. However, in a number of instances in our report, using the same y-axis scale would have resulted in either graphs that did not fit on the page or graphs that had detail that was too small to easily see. In these cases, we used a different y-axis scale.
3. We include information collected prior to 2002 on approximate original contour (AOC) variances from Kentucky's Surface Mining Information System (SMIS) database for the reasons identified above—to provide a comprehensive overview of the data that are in the states' databases and to clearly identify the years for which there are data limitations and the nature of those limitations. We did not review individual permit files because we determined that it was prohibitively resource-intensive to do so. Additionally, we are aware that there are other sources of information about Kentucky's permitting activity. However, we designed the scope of this engagement to limit the information we present in our report to what is contained in SMIS.
4. We included permits from all of West Virginia in our report, including permits from the northern half of the state. According to West Virginia's Environmental Resource Information System (ERIS) database, as of July 2008, about 6 percent of the open acres in West Virginia were in the northern half of the state. Although OSM and West Virginia officials told us that most of the permits in this area are generally not found on the steeper-sloped areas of that region, they were referring to steep slope mining, which, according to the Surface Mining Control and Reclamation Act of 1977 (SMCRA) is mining that occurs on a slope with an average of 20 percent grade or steeper. The scope of our report is surface mining in the mountainous areas of Kentucky and West Virginia, not specifically steep slope mining. Northern West Virginia is a mountainous area—it is within the Appalachian Mountain chain.

Additionally, the relationship between surface coal mining in the northern and southern portions of West Virginia is not analogous to the relationship between surface coal mining in the eastern and western portions of Kentucky. Although we identified a specific "line" in West Virginia, north of which we stated permits are generally not found on steeper-sloped areas, this line was identified in consultation with OSM

and West Virginia officials for the purposes of this report. This contrasts with the situation in Kentucky. The U.S. Department of Energy's Energy Information Administration has identified a number of coal-producing regions throughout the country. It places all of West Virginia and the eastern part of Kentucky in the Appalachian region. It places western Kentucky in the Illinois basin region. Additionally, while eastern Kentucky is within the Appalachian mountain chain, western Kentucky is not.

Appendix III: Comments from the Kentucky Department for Natural Resources

Note: GAO comments supplementing those in the report text appear at the end of this appendix.



ENERGY AND ENVIRONMENT CABINET
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Leonard K. Peters
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Carl E. Campbell
Commissioner

November 9, 2009

Ms. Robin M. Nazzaro, Director
Natural Resources and Environment
U.S. Government Accountability Office
441 G Street, NW
Washington, DC 20548

Dear Ms. Nazzaro;

Reference is made to your correspondence of October 9, 2009 where in you conveyed a draft copy of your proposed report entitled "Surface Coal Mining: Characteristics of Mining in Mountainous Areas of Kentucky and West Virginia, (GAO-10-21)" for our review and comment. We have reviewed the draft document and our comments and suggestions are as follows:

General Comments

1. We sincerely appreciate GAO's intent to craft an informational document designed to provide credible information and reliable data. However, as we have previously stated on to your staff, the accuracy of our Surface Mining Information System data prior to the year 2000 was subject to repeated duplication of the information. The rationale that because the general public has access to data from all years GAO is going to include data from all years in many of your graphics so as to provide a comprehensive overview should be reconsidered. If GAO is not willing to do that, your statements should be carefully reworded to reflect that transitions in recording protocols (paper to electronic) and changes in the format of our electronic information storage prior to 2000 could provide for general misinterpretation and invalid assumptions. It should also be understood the public generally does not have the same access capability that was afforded GAO. The public's access is through a web-based system that provides access to the data one permit at a time. The extensive data download provided to GAO was an infrequent event. However, should the public ask for and receive a data dump of this magnitude, DNR would inform the requestor, as with GAO, the limitations of the data.

See comment 1.

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Ms. Robin M. Nazzaro, Director
Page 2
November 9, 2009

See comment 2.

2. As was previously discussed with GAO staff, we have some concern with the generally broad terms crafted to represent the status of a mining facility. The term "open" permit is one GAO created for this report and one that can easily be misinterpreted. We have noted the footnote on page 9 used to describe the term "open" permit. This term, as presented, encompasses wide-ranging mining scenarios, from no disturbance to active mining to complete reclamation awaiting bond release. We believe that the explanation should more thoroughly describe and, given the significance of this term, be included in the body of the text, rather than reduced to a footnote, so readers don't misinterpret its significance. We believe the current approach yields a misunderstanding by the general public that all "open" permits are disturbed, un-reclaimed mine sites.

See comment 3.

3. A significant aspect of the permitting process that isn't clearly conveyed in the report is that the selection of a post mining land use is mostly a landowner's choice. The only exception would be when a landowner's request conflicts with regulations.

See comment 4.

4. The data on Kentucky AOC variances does not exist prior to 2002. We understand that OSM has been compiling this information for some time and we recommend that you consult with them to acquire a more reliable source of information. We are aware that they have an inventory of permits with mountaintop removal and steep slope variances contained in a document they prepared called "An Evaluation of Approximate Original Contour and Post-Mining Land Use in Kentucky dated September 1999." There is also a tabulation of this data in the Stream Buffer Zone EIS.

Specific Comments

See comment 5.

1. Beginning on page 7, and repeated elsewhere, is the statement that "Kentucky and West Virginia accounted for about 76% of the coal produced from surface mines in Appalachia and are the states with the second and third largest coal production totals in the country". The statement is written such that one can incorrectly assume that Kentucky is the second largest producer rather than third. Further, GAO should clarify that Kentucky's western coal fields are not part of Appalachian Mountain system, but rather the Central coal basin. If GAO feels that the western Kentucky the coal production levels need to be included in Table 1, we suggest that the other coal producing states in the central coal basin also be included in this table.

Appendix III: Comments from the Kentucky
Department for Natural Resources

Ms. Robin M. Nazzaro, Director
Page 3
November 9, 2009

See comment 6.

2. Page #8, paragraph #1, reads that “the requirements of Kentucky and West Virginia are generally similar to the federal requirements.” This should read “the requirements of Kentucky and West Virginia are no less effective than the federal requirements.” The federal Office of Surface Mining has evaluated both the Kentucky and West Virginia surface programs and determined that our programs are no less effective than the federal regulations.

See comment 7.

3. Page #8, paragraph #2, should include a statement that the operator must demonstrate that the reclaimed site will meet environmental protection standards such as water quality and restore the ecological function of the land. Additionally, if it is the purpose of this document to educate the reader on the components of coal mining (regulatory requirements, effects of mining on the environment, overview of mining in the Appalachian states), then the narrative on permit application review is too brief and incomplete. The coal applicant (permittee/operator) will propose, in the application, strategies that will avoid, minimize or protect: the quality and quantity of surface water and ground water systems; adverse effects on fish, wildlife, and cultural and historic resources; and the effects of the operation on the public, including property, roads and infrastructure. It is the responsibility of the permit application reviewer to gauge the effectiveness and enforceability of these strategies. Absent from the stated process is the opportunity for public participation, supplied by consulting federal and state agencies and citizen input.

See comment 8.

4. Page #33, paragraph #2, should be revised to recognize that our Appalachian forests have been repeatedly harvested and, at best, we encounter second growth forest. This would more accurately describe the condition of the forests in both Kentucky and West Virginia.

See comment 9.

5. Page #13, paragraph #1, line #9 should be modified to convey that “permitted acres” does not mean acreage disturbed. While included in a footnote, we believe this information is important and should be included in the body of the text to ensure clarity.

See comment 10.

6. Page #27, paragraph #1, it should be noted in this paragraph that the number of approved (permitted) fills does not reflect the number of constructed fills. This discrepancy is mentioned later in the document on page 49, footnote 38. Though it can easily be tracked, the number of approved fills is an irrelevant statistic as it only details *proposed* fills. No permitting action is required to delete a fill from a mining plan. It would be much more meaningful to compare annual number of constructed fills that would reveal direct/indirect effects on the mountain environment.

See comment 11.

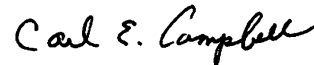
See comment 12.

Ms. Robin M. Nazzaro, Director
Page 4
November 9, 2009

7. Page #38, paragraph #1 should be modified to read "SMCRA requires surface-mined land to be reclaimed to AOC, unless a variance is approved or it is a remaining operation."
8. On Page # 48, paragraph #1, indicates that a "completed fill is at approximately the same elevation as the adjacent ridge line". This should be modified to convey that the crest of the fill is generally at approximately the same elevation as the lowest coal seam being mined.

Again, we sincerely appreciate the opportunity for review and comment. Please let us know if you have any questions or if we can be of further assistance.

Respectfully,



Carl E. Campbell, Commissioner
Department for Natural Resources

The following are GAO's comments on the letter dated November 9, 2009, from the Commissioner, Department for Natural Resources.

GAO Comments

1. We share Kentucky's concern that data from the Surface Mining Information System (SMIS) for the years prior to 2000 could be misinterpreted, but we believe we have made the limitations of the data clear in our report. We have discussed this concern within GAO; with Kentucky; with the Office of Surface Mining Reclamation and Enforcement (OSM); and with West Virginia, which has expressed a similar concern regarding its permit data. Given the level of concern, we have added additional language to our report stating that certain data should not be relied upon to convey a representative picture of past mining characteristics or decisions. Nevertheless, we believe that it is important to include the data, along with the appropriate caveats, in order to provide a comprehensive overview of the data in SMIS that clearly identifies the years for which there are data limitations and the nature of those limitations. When Kentucky originally provided the data from SMIS to us, the limitations on the older data were not acknowledged. We believe that the extensive discussions that we had with Kentucky officials brought to light for the first time—at least in a comprehensive fashion—the full extent of the data limitations and that documenting the results of these discussions is an important aspect of this study. This information about data limitations is useful to the public, even though public access to SMIS data through its Web-based system is limited to one permit at a time. Furthermore, if another party were to obtain the same access to SMIS data that Kentucky provided to us, it would be even more important for this information to be public. While we believe that Kentucky would include information on data limitations were it to provide this access to another party, we are less certain that this other party would fairly and accurately describe the limitations.
2. We note Kentucky's concern that the term "open permit" could lead readers to believe that the land consists entirely of disturbed, unreclaimed mine sites. (Disturbed land is land that has been cleared of vegetation as part of the mining process.) In response to earlier comments from Kentucky officials, we included a footnote to clarify this term when we first introduce it. Given the continued concern, we have now put this language into the text of the report. In addition, elsewhere in our report, we explain that not all acres that are permitted end up being disturbed.

3. We have modified the text of the report to make it clearer that landowners play a large role in choosing post-mining land uses.
4. We are aware that there are other sources of information about Kentucky's permitting activity. However, we designed the scope of this engagement to limit the information we present in our report to what is contained in SMIS.
5. Although table 1 makes clear that Kentucky is the third-largest producer of coal from surface mines in 2008, we modified the text of our report to ensure there is no ambiguity. However, we do not believe it is necessary to add additional information about coal production in other states to table 1. Although the scope of our report does not include surface coal mines in western Kentucky, we include the production total for all of Kentucky (east and west), along with the production total for Kentucky (east only) to be comprehensive. We do not believe that information about coal production from other states outside the scope of our report would be useful.
6. We are aware that OSM has determined that both Kentucky and West Virginia mining programs meet the legal requirements found in the Surface Mining Control and Reclamation Act of 1977 (SMCRA) and that they are "no less effective" than federal regulations. However, the point of the paragraph is to explain that Kentucky's and West Virginia's regulations are, in fact, similar to federal regulations. We make this point to avoid the repetition of describing each entity's regulations when there are not substantive differences. When we discuss regulations for which there are substantive differences, we note this in the report.
7. As noted in the text, there are statutory and regulatory requirements regarding surface coal mining that are not included in this report. We provide an overview of those requirements as background, but describing the regulatory framework for surface mining was not an objective of this report.
8. We do not dispute Kentucky's assertion that much of the forestland in Kentucky and West Virginia that has been mined was previously harvested, i.e., is second growth forest. However, in our report, we are discussing the use of the land immediately prior to mining, not how the land was used historically.

9. We agree that it is important to note that not all permitted acres are disturbed—that is, cleared of vegetation as part of the mining process—and we address this point specifically in our report. See also our comment 2 above.
10. We agree it would be better to report on the number of fills constructed instead of the number of fills approved. However, SMIS only contains data from permits and, as Kentucky notes, no permitting action is required to delete a fill from a mining plan. Thus, we were unable to provide data on the number of fills constructed.
11. We do not believe this change is necessary because the exceptions to the approximate original contour (AOC) requirement are made clear in later paragraphs. The paragraph that Kentucky references serves to introduce the concept of AOC and AOC variances. The next several pages of our report explain in greater detail the policy and requirements regarding AOC and variances.
12. We have modified the text in this paragraph to better make the distinction between “valley fills” and “hollow fills.”

Appendix IV: Comments from the West Virginia Department of Environmental Protection



west virginia department of environmental protection

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November 13, 2009

Robin Nazzaro
Director, Natural Resources and Environment
Government Accountability Office
441 G Street, NW
Washington, DC 20548

Dear Ms. Nazzaro:

Thank you for the opportunity to review and comment on the draft Government Accountability Office report GAO-10-21, "Characteristics of Mining in Mountainous areas of Kentucky and West Virginia." Although we have no major concerns about the report, we have included technical comments that clarify or provide more in-depth explanation for certain items.

Please feel free to contact our office with any additional questions you might have.

Sincerely,

Lewis A. Halstead
Deputy Director

Promoting a healthy environment.

Appendix V: GAO Contact and Staff Acknowledgments

GAO Contact

Robin M. Nazzaro, (202) 512-3841, nazzaror@gao.gov

Staff Acknowledgments

In addition to the individual named above, Andrea W. Brown, Assistant Director; Josey Ballenger; Antoinette Capaccio; Charles Egan; John Mingus, Jr.; Rebecca Shea; and Benjamin Shouse made key contributions to this report. Carol Kolarik, Janice Poling, and Jena Sinkfield also contributed to this report.

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