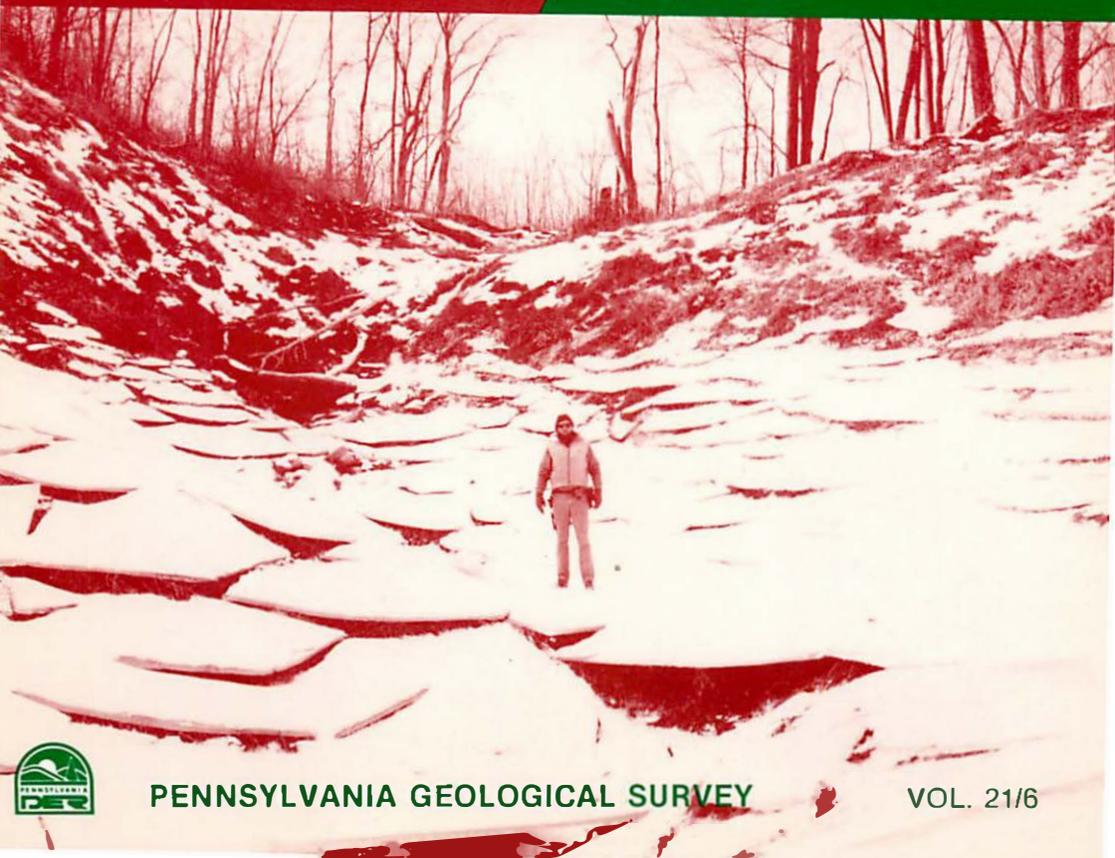
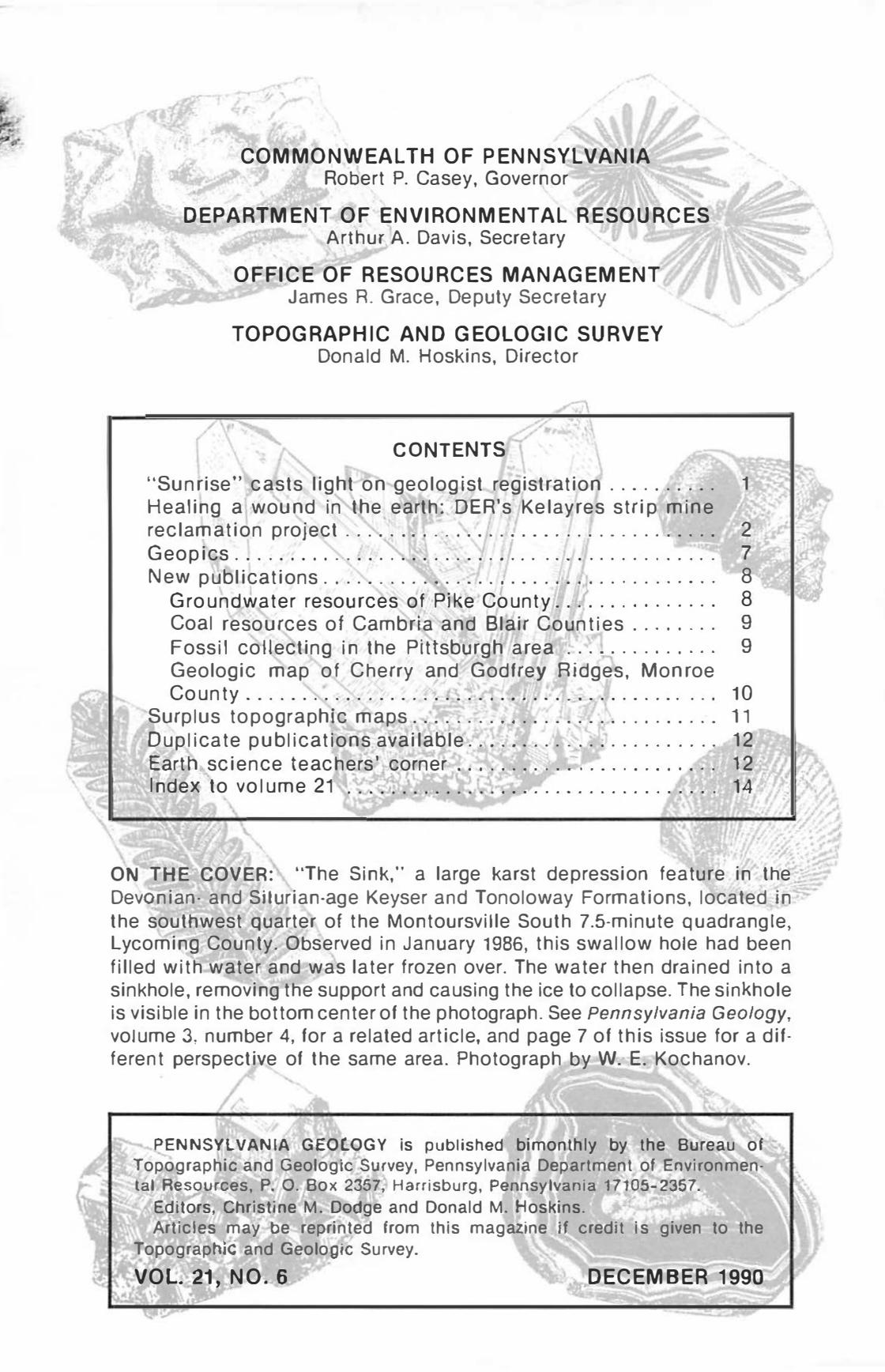


# **G PENNSYLVANIA O L O G Y**



**PENNSYLVANIA GEOLOGICAL SURVEY**

**VOL. 21/6**



**COMMONWEALTH OF PENNSYLVANIA**

Robert P. Casey, Governor

**DEPARTMENT OF ENVIRONMENTAL RESOURCES**

Arthur A. Davis, Secretary

**OFFICE OF RESOURCES MANAGEMENT**

James R. Grace, Deputy Secretary

**TOPOGRAPHIC AND GEOLOGIC SURVEY**

Donald M. Hoskins, Director

**CONTENTS**

|   |    |
|---|----|
| "Sunrise" casts light on geologist registration .....                             | 1  |
| Healing a wound in the earth: DER's Kelayres strip mine reclamation project ..... | 2  |
| Geopics .....   | 7  |
| New publications .....  | 8  |
| Groundwater resources of Pike County .....  | 8  |
| Coal resources of Cambria and Blair Counties .....                                | 9  |
| Fossil collecting in the Pittsburgh area .....                                    | 9  |
| Geologic map of Cherry and Godfrey Ridges, Monroe County .....                    | 10 |
| Surplus topographic maps .....  | 11 |
| Duplicate publications available .....  | 12 |
| Earth science teachers' corner .....  | 12 |
| Index to volume 21 .....  | 14 |

**ON THE COVER:** "The Sink," a large karst depression feature in the Devonian- and Silurian-age Keyser and Tonoloway Formations, located in the southwest quarter of the Montoursville South 7.5-minute quadrangle, Lycoming County. Observed in January 1986, this swallow hole had been filled with water and was later frozen over. The water then drained into a sinkhole, removing the support and causing the ice to collapse. The sinkhole is visible in the bottom center of the photograph. See *Pennsylvania Geology*, volume 3, number 4, for a related article, and page 7 of this issue for a different perspective of the same area. Photograph by W. E. Kochanov.

**PENNSYLVANIA GEOLOGY** is published bimonthly by the Bureau of Topographic and Geologic Survey, Pennsylvania Department of Environmental Resources, P. O. Box 2357, Harrisburg, Pennsylvania 17105-2357.

Editors, Christine M. Dodge and Donald M. Hoskins.

Articles may be reprinted from this magazine if credit is given to the Topographic and Geologic Survey.

**VOL. 21, NO. 6**

**DECEMBER 1990**



## “Sunrise” Casts Light on Geologist Registration

The location of buildings, transportation routes, and utilities on steep slopes subject to landslides, on karst terrain subject to collapse, and in unstable areas subject to earth shaking is an ever-increasing state and national problem. Planning to avoid these hazards and mitigate their adverse effects is frequently the responsibility of geologists. Thus, there is a need for ensuring competency of these geologists.

In the past 20 years, 15 states have established programs requiring the registration of geologists who offer their services in investigating, explaining, and mitigating geologic conditions and hazards. The states' registration objectives are to ensure that professionals, who present themselves as experts, can meet certifiable minimum standards. Organizations such as the American Institute of Professional Geologists have suggested that self-regulation is the most desirable form of certification and regulation of professional practice.

Many states use a process called “sunrise” to review requests for the creation of new administrative agencies to prove that they are clearly needed for public protection. “Sunrise” is a natural consequence of the “sunset” process, in which existing governmental agencies are reviewed in order to remove any that are no longer needed.

Considerable controversy over the certification and regulation of geologists is evident amongst practitioners of the many subdisciplines of our science. In an attempt to overcome some of the controversy and answer the inevitable questions that will be asked during any “sunrise” or other legislative hearing process, several geological organizations have cooperated in drafting a model geologists' practice act. That model was among the topics discussed at the recent annual meeting of the Association of Engineering Geologists (AEG) in Pittsburgh, which featured a day-long colloquium focused on issues of geologist registration.

Geologists, engineers, state officials, legislators, and others interested in the registration of geologists will benefit by consulting the published report of the AEG meeting. The included papers on the philosophy of registration, ethical issues, and the experiences of other states will be extremely useful in any discussion of this topic. Indeed, the discussions on the

*(continued on page 7)*



# **Healing a Wound in the Earth: DER's Kelayres Strip Mine Reclamation Project**

by Jon D. Inners (DER, Bureau of Topographic and Geologic Survey),  
and David C. Hogeman, John R. Magula, and Lawrence Dobash  
(DER, Bureau of Abandoned Mine Reclamation)

[Stripping] is extensively employed in the Hazleton district, where the visitor can see the hand of man, not leveling the rough places of earth, but rather, scooping out deep trenches . . . . A drive around Yorktown, Audenried, Honeybrook, and M'Adoo, shows to what extent these excavations have been and are still carried out. Everywhere deep cuttings [transform] a naturally rugged and barren mountain to a still more desolate region.  
Peter Roberts, *The Anthracite Coal Industry* (1901, p. 20)

**INTRODUCTION.** In late October 1989, at Kelayres in northeastern Schuylkill County, the Pennsylvania Department of Environmental Resources (DER) began the largest abandoned coal strip-mine reclamation job in its 16-year history. Before it is finished, nearly \$9 million will have been spent to move 10,582,000 cubic yards of earth into a hole nearly 400 feet deep and 1.25 miles long. As one watches the earth movers (big by any other standard, but dwarfed by the yawning Kelayres mine) creep about on the rock and dirt slopes, several questions immediately come to mind. How did it come to scar the face of the land? How long has it existed? What is the geologic setting of the Kelayres pit? Why is it being filled? And, finally, where is the money coming from to pay for this enormous project? Through joint authorship of this article by a geologist (Inners), a hydrogeologist (Hogeman), a project inspector (Magula), and a civil engineer (Dobash), we will attempt to answer these four questions and, at the same time, provide some insight into the program for reclamation of abandoned-mine lands in Pennsylvania.

**PHYSICAL SETTING AND GEOLOGY.** The Kelayres strip mine is located about 4 miles south-southwest of Hazleton (Luzerne County) in the Eastern Middle Anthracite field (Figure 1). It occupies a narrow strip (750 to 1,000 feet wide) (Figures 2 and 3) bounded approximately by Interstate 81 on the west and Pa. Route 309 on the east. The village of Kelayres is situated along its southeastern edge, and the borough of McAdoo lies a little farther to the east. The general elevation of the broad upland—locally called “the Mountain”—into which the stripping was cut is about 1,700 feet.

The strip mine lies in the southwestern fork (Honey Brook syncline) of the Honey Brook-Jeansville basin, second largest of the numerous

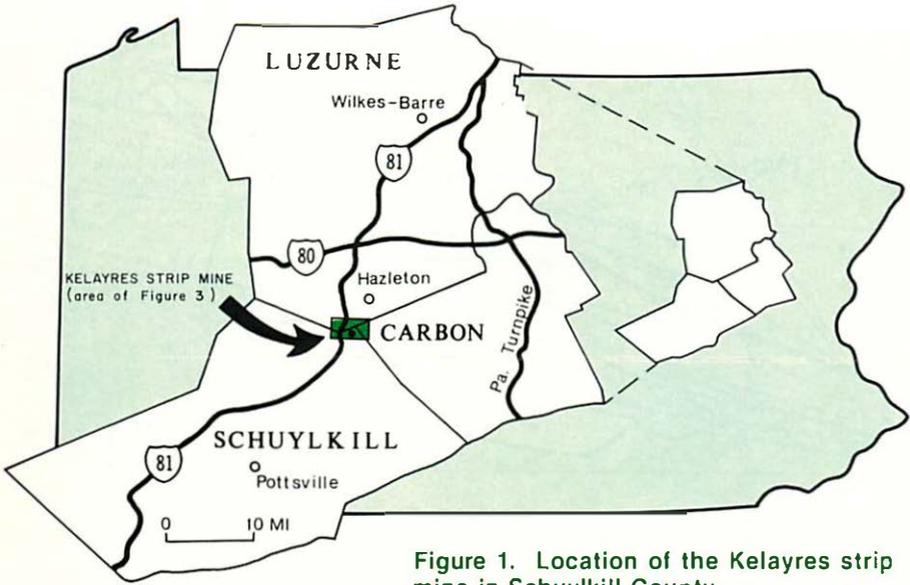


Figure 1. Location of the Kelayres strip mine in Schuylkill County.



Figure 2. View of the Kelayres strip mine from near its eastern end on March 21, 1990, showing the seatrock of the Mammoth-Wharton coal bed on the south footwall dipping 50 degrees to the north. Two trucks in the middle distance give the scale.



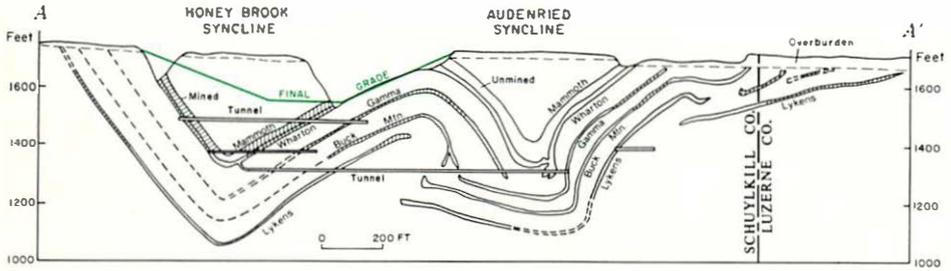


Figure 4. Mine-map cross section (modified from a section drawn in 1935 by the Glen Aiden Coal Company) of the Kelayres strip mine area near line A-A' on Figure 3. The colored line indicates the approximate final grade of the reclaimed slopes.

the century, when the mines were operated by the Lehigh and Wilkes-Barre Coal Company, both seams had been extensively worked. Although considerable stripping on the Mammoth-Wharton and other seams was done earlier (see quote from Roberts, 1901, above), the first major surface excavations at the Kelayres site took place in the late 1920's, when the Lehigh and Wilkes-Barre Coal Company dismantled the patch towns of Honey Brook No. 1 and Honey Brook No. 2 to get at the coal beneath (Druska and others, 1990). The gash that is now being backfilled, however, dates mainly from the stripping operations of Capparell Coal Company and Correale Mining Company during the period 1959-61 (Mike Druska, personal communication, 1990). These two companies removed all of the coal remaining in the Mammoth or Mammoth-Wharton seams down to the bottom of the synclinal basin for a distance of more than 6,000 feet in a northeast-southwest direction. In the slightly more than 100 years of deep and strip mining in the Mammoth-Wharton synclinal basin at Kelayres, a total of 2.5 to 3 million tons of anthracite was probably produced within the area that is now being reclaimed.

Subsequent to the stripping operations carried on in the early 1960's, the site remained in an unreclaimed state. In 1974, Beltrami Enterprises of Hazleton purchased the strip pit and a large tract of land to the north, but did no actual mining on the site. The huge, near-vertical highwall of the abandoned stripping, only a few tens of feet from homes in Kelayres, was "an accident waiting to happen." In November 1978, the accident happened. Twelve-year-old Gerald Pozza fell to his death while hanging over the highwall on a garden hose tied to a tree. As a result of this tragic fatality, the Kelayres strip mine soon became a high-priority reclamation site under the new federal Surface Mining Control and Reclamation Act.

**RECLAMATION FUNDS.** By the mid-twentieth century, 200 years of unregulated coal mining had left vast areas of Pennsylvania and more than 30 other states looking like veritable “moonscapes” of elongate craters and cone-shaped refuse piles. Pennsylvania took the lead in addressing the problem of these “abandoned mine lands” (AML) with the passage of the Land and Water Conservation Act of 1968. Nearly 10 years later, the U.S. Congress and President Jimmy Carter responded to the need for similar national legislation by passing and signing into law the Surface Mining Control and Reclamation Act of 1977. This act created the federal Office of Surface Mining (OSM) as an agency under the Department of the Interior. Title IV of the Act established a surcharge collection system to fund reclamation projects under the jurisdiction of OSM; the surcharges were established at 15 cents per ton on deep-mined coal and 35 cents per ton on surface-mined coal paid by active coal operators. Approximately \$3 billion will be generated from the AML program nationwide over the 15-year authorized life of the program. Due to the Commonwealth’s huge AML inventory—about one third of the national total—OSM funding in Pennsylvania has been directed to such health and safety priorities as the Kelayres project.

The Kelayres project is funded in Pennsylvania’s 1988 AML grant from OSM. The reclamation contract was awarded to Geupel Construction Company, Inc., of Columbus, Ohio, on June 22, 1989. The \$9 million funded for the project will not allow for backfilling to “original contour”; the north and south slopes as finally constructed will be about 2.5:1 (22 degrees) (see Figure 4). Completion of the Kelayres project, currently projected for Fall 1991, will eliminate one of the largest and most hazardous AML sites in the nation.

*The authors thank John Bogash, Mike Druska, George Lenyo, and Mike Petresky for generously supplying historical information used in writing this article.*

## REFERENCES

- Druska, Mike, Petresky, Mike, and Lenyo, George (1990), *Kelayres centennial: coal had major role in its establishment and growth*, Hazleton Standard-Speaker (July 19, 1990), p. 22.
- Inners, J. D. (1988), *The Eastern Middle Anthracite field*, in Inners, J. D., ed., *Bedrock and glacial geology of the North Branch Susquehanna lowland and the Eastern Middle Anthracite field, northeastern Pennsylvania*, Annual Field Conference of Pennsylvania Geologists, 53rd, Hazleton, Pa., 1988, Guidebook, p. 32-39.
- Roberts, Peter (1901), *The anthracite coal industry*, New York, MacMillan, 261 p.
- Schasse, H. W., Inners, J. D., and MacLachlan, D. B. (in preparation), *Geology and mineral resources of the Conyngham quadrangle, Luzerne and Schuylkill Counties, Pennsylvania*, Pennsylvania Geological Survey, 4th ser., Atlas 175b.

## Geopics

A view from the west end of "The Sink," showing the stream that drains into the sinkhole. The sinkhole is visible just below the center of the photograph. Note the high-water mark along the upper right and the concentric polygons of broken ice resulting from the collapse. (See also the cover photograph and accompanying caption in this issue.) Photograph by W. E. Kochanov.



---

*"Sunrise" (continued from page 1)*

philosophy of registration could be used in evaluating the need for any type of professional registration.

The AEG report and draft model act are valuable resources and possible guides for those who advocate registration of geologists. The proof of public need and the public benefits of registration will be illuminated through the "sunrise" of an official review process.

*Donald M. Hoskins*

Donald M. Hoskins  
State Geologist

## NEW PUBLICATIONS

### GROUNDWATER RESOURCES OF PIKE COUNTY

This recently released report, the latest in a series of reports dealing with the groundwater of Pennsylvania on a county basis, offers a detailed, yet easily understandable, description of groundwater in Pike County. Using data obtained from observations on hundreds of wells drilled in both bedrock and unconsolidated surficial material, the author effectively defines the quantity and quality of groundwater in the county. The report is replete with technical information such as depth of wells, depth to water, water-level fluctuations, well yields, transmissivity and storage-capacity test results of aquifers, and water-quality indicators such as specific conductance, hardness, pH, and concentrations of dissolved constituents. Methods of obtaining this information and its significance are clearly explained.

Two large colored maps of the county (1:50,000 scale, or 1 inch = 4,167 feet) show the distribution of bedrock units, elevation of the groundwater table, distribution of unconsolidated surficial deposits, and locations of wells. The water-bearing and water-quality characteristics of each rock unit are discussed in the text.

All of this information will be useful to the technical experts working with groundwater projects in Pike County, such as the engineers and hydrogeologists involved in developing new water supplies and the government officials and planners concerned with protecting future supplies. Furthermore, the clearly written introductory explanation of basic concepts such as geologic setting, hydrologic cycle, and groundwater occurrence makes the information presented in this publication understandable to the interested reader who is not a specialist.

**Groundwater Resources of Pike County, Pennsylvania** was written by Drew K. Davis of the U.S. Geological Survey. W. D. Sevon (Pennsylvania Geological Survey), Thomas M. Berg (Ohio Geological Survey), Lane D. Schultz (Allan A. Meyers, Inc.), and George H. Crowl (deceased; formerly with Ohio Wesleyan University) prepared the map of surficial geology, and Sevon, Berg, and Schultz prepared the map of bedrock geology. Published by the Pennsylvania Geological Survey, the report may be purchased from the State Book Store, P. O. Box 1365, Harrisburg, PA 17105-1365. The price is \$17.75 plus \$1.07 state sales tax for Pennsylvania residents. Prepayment is required; please make checks payable to *Commonwealth of Pennsylvania*.

—V. W. Skema

# COAL RESOURCES OF CAMBRIA AND BLAIR COUNTIES

The Pennsylvania Geological Survey has recently published Mineral Resource Report 96, **Coal Resources of Cambria and Blair Counties—Part 1, Coal Crop Lines, Mined-Out Areas, and Structure Contours**. This compilation by Albert D. Glover consists of a series of topographic quadrangle maps reduced to a scale of approximately 1:62,500 and printed loose-leaf to fit conveniently into a three-ring binder. For each principal coal seam within a quadrangle, a separate map showing coal crop lines and the extent of strip and deep mining is included. A composite map containing crop lines of all principal coal seams, structure contours, and fold axes is also included for each quadrangle.

The coal resource information found in this report is needed not only for exploration and mining programs, but also for land use planning, land acquisition, and environmental planning. This report may help an investigator determine whether an area in Cambria or Blair County has been mined or whether it is underlain by coal that can be mined. Moreover, it will be of assistance in investigations of problems such as mine drainage and subsidence. The basic geologic framework of the parts of Cambria and Blair Counties underlain by coal is also presented in this report. By using coals as marker beds, the location and structure of other geologic units may be determined.

This report is available for \$15.25, plus \$0.92 sales tax for Pennsylvania residents, from the State Book Store, P. O. Box 1365, Harrisburg, PA 17105-1365. Orders must be prepaid; please make checks payable to *Commonwealth of Pennsylvania*.

—D. Yannacci

## FOSSIL COLLECTING IN THE PITTSBURGH AREA

Students of earth science, professional geologists, and weekend fossil collectors take note. If you would like to go on a self-guided fossil-collecting trip around the Pittsburgh area and learn some geology at the same time, you are in luck! John Harper, a geologist with the Pennsylvania Geological Survey, recently led a field trip for

the Pittsburgh Geological Society for which he prepared a 50-page guidebook entitled **Fossil Collecting in the Pittsburgh Area**. The field trip includes stops at three fossil-rich collecting sites in the Pittsburgh area as well as an outcrop-by-outcrop description of the geology along the route. The sites are (1) a quarry in the Connellsville sandstone containing fossil plant remains; (2) a roadcut exposure in the Ames Limestone in which an assemblage of offshore marine invertebrate fossils can be found; and (3) a mine spoil pile of Brush Creek shale that contains invertebrate fossils from a nearshore marine environment. All of these exposures are in Pennsylvanian-age lower to middle Conemaugh rocks. In addition to the geologic road guide and collecting-site descriptions, the guidebook contains a generously illustrated text in which the author details the geology of the Pittsburgh area, and a series of five plates in which over 100 line drawings of fossil life forms found in the Pennsylvanian-age rocks of western Pennsylvania are shown. So if you are looking for an educational activity that you can do alone or with friends or family in and around the Pittsburgh area, or if you just need a reference guide to help you identify some of the more common Pennsylvanian-age fauna and flora found in that part of the state, do not overlook this publication. The price of the guidebook is \$5.00 plus \$1.00 postage and handling. To obtain a copy, send a check (payable to *Pittsburgh Geological Society*) to the Pittsburgh Geological Society, P. O. Box 3432, Pittsburgh, PA 15230.

—J. R. Shaulis

## GEOLOGIC MAP OF CHERRY AND GODFREY RIDGES, MONROE COUNTY

Map lovers and teachers of structural geology will greatly appreciate the new maps published by the U.S. Geological Survey on the geology of Cherry and Godfrey Ridges, Monroe County, Pennsylvania. The report includes two maps, which, when put together, measure 9 feet long, a challenge for mounting and display. The maps are published at a scale of 1:8,000. This large scale was chosen in order to adequately portray the extreme complexity of folding in an area largely covered by surficial and glacial deposits of Holocene and Wisconsinan age.

In easternmost Pennsylvania, the rocks that hold up Godfrey and Cherry Ridges have been deformed into upright to nearly recumbent folds with wavelengths averaging about 700 feet (213 m). Thirty-two

stratigraphic units were mapped, aggregating 1,200 feet (365 m) in the northeastern part of the area and thinning to about 750 feet (230 m) in the west. Because the en echelon folds die out within short distances and plunge in different directions, and because the stratigraphic units are relatively thin, ranging from 5 to 180 feet (1.5 to 55 m) thick, the outcrop pattern on the two maps is complex and, in many respects, mimics larger structures in the Central Appalachians. These ridges contain a wide variety of easily distinguishable stratigraphic units, and, because of the complex folding, they have been used as a mapping area for geologic field courses.

Thirty-eight cross sections are included in this impressive publication. Teachers and students alike will treasure the map as a resource for teaching and learning about the folded structures of the Appalachians.

Map I-1422 by J. B. Epstein, entitled **Geologic Map of Cherry and Godfrey Ridges in the Saylorburg, Stroudsburg, and East Stroudsburg Quadrangles, Monroe County, Pennsylvania**, is available from the U.S. Geological Survey, Map Distribution, Federal Center, P.O. Box 25286, Denver, CO 80225, for \$6.20—a real bargain for a beautiful and useful map. For orders of less than \$10.00, please include \$1.00 for handling. Payment must accompany the order; please make checks payable to *Department of the Interior—USGS*.

—D. M. Hoskins

## Surplus Topographic Maps

As a result of the ongoing program to revise and update Pennsylvania's topographic maps, we have received updated versions of 17 quadrangles. The outdated maps are being offered to anyone who has a use for them. We also have a number of orthophotomaps that are surplus. These surplus maps will be provided, at no charge, while they last. If you are interested in receiving some of these maps, please advise us how many different quadrangles and the number of each that you would like. Personal selection of quadrangles will not be possible. Address requests to:

Library  
Department of Environmental Resources  
Bureau of Topographic and Geologic Survey  
P. O. Box 2357  
Harrisburg, PA 17105-2357

## Duplicate Publications Available

The Pennsylvania Geological Survey library has duplicate copies of the publications listed below. If you would like to receive copies of these publications, please write to us. Identify the publication that you want by the series and number, and send your request to Library, Department of Environmental Resources, Bureau of Topographic and Geologic Survey, P. O. Box 2357, Harrisburg, PA 17105-2357.

### Geologic Quadrangle Maps

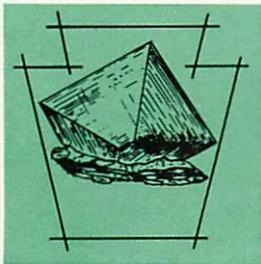
- GQ-1003 *Geologic map of the Prosperity quadrangle, southwestern Pennsylvania*, B. H. Kent. 1972. 1 sheet, scale 1:24,000.  
GQ-1054 *Geologic map of the Delano quadrangle, Schuylkill County, Pennsylvania*, G. H. Wood, Jr., and H. H. Arndt. 1973. 1 sheet, scale 1:24,000.  
GQ-1067 *Geologic map of the Midway quadrangle, Washington County, southwestern Pennsylvania*, J. B. Roen. 1973. 1 sheet, scale 1:24,000.

### Miscellaneous Investigations Series

- I-699 *Geologic map of the Oak Forest quadrangle and part of the Blacksville quadrangle, southwestern Pennsylvania*, J. B. Roen. 1972. 1 sheet, scale 1:24,000.  
I-715 *Geologic and coal-bed map of Clarion County, Pennsylvania*, E. D. Patterson and J. A. Van Lieu. 1972. 1 sheet, scale 1:62,500.  
I-801 *Geologic map of the Beans Cove and Hyndman quadrangles and part of the Fairhope quadrangle, Bedford County, Pennsylvania*, Wallace de Witt, Jr. 1974. 1 sheet, scale 1:24,000, with explanatory pamphlet.  
I-908 *Geologic map of the Avella quadrangle and part of the Steubenville East quadrangle, Washington County, Pennsylvania*, S. P. Schweinfurth. 1976. 1 sheet, scale 1:24,000.

### Professional Paper

- 602 *Geology of the west-central part of the Southern Anthracite field and adjoining areas, Pennsylvania*, G. H. Wood, Jr., and others. 1969. 150 p.



## EARTH SCIENCE TEACHERS' CORNER

by Tracey Gates

### “Where Have All the Flowers Gone?”

“Where have all the flowers gone?” So goes the line from a familiar song. If you have thought about it, you are probably asking yourself, “What flowers?” Every spring our yards are ablaze with the colors of many flowers. Unfortunately, for as many flowers as you see bloom-

ing in your yard, there are upwards of two or three times as many endangered or threatened species of native wild plants being lost.

Pennsylvania has 3,340 known types of higher plants. Five hundred of these are either gone or in jeopardy. This means that more than 15 percent of ALL species in the state are listed as either extinct or on the brink of extinction, a disheartening loss.

Pennsylvania does not stand alone with this problem. In Hawaii, 97 percent of all native plants are threatened. Central America, which holds approximately 40 percent of all species on the earth, is in an especially critical position in the tropical areas.

So what do these statistics mean to you as science teachers? Hopefully, by seeing this very brief overview of a critical problem, I have piqued your curiosity. Geology and the other fields of natural and earth science that you teach are essential elements in preparing our young people to be responsible adults. Included in these essential elements are teaching about plant and animal extinction, long recognized in geologic history. To aid in this teaching, we offer the assistance of the Wild Resource Conservation Fund (WRCF). This fund is an independent agency in the state that was developed especially to help tackle problems of threatened species, and has been a supportive sponsor of many projects to study the "hows," "whys," "wheres," and "whens" of these problems and to recommend solutions. The WRCF has a variety of information on native wild plants and wildlife of Pennsylvania that can be made available to you. One of particular interest may be the program on "Rare and Endangered Wildflowers of Pennsylvania," which is available in slides or a video cassette format. The program will provide you with some sobering facts and statistics about the situation of our state's plant community.

Isn't it time that we worry about the condition of our own surroundings and how the loss of these plants will affect us as human beings? What better place to start than with information from the WRCF? The WRCF is here to help and inform. As teachers, I am sure you are always looking for issues to excite your students. What better way than to inform them of important issues here in their own state?

We suggest that you can be a leader in your school by informing your students about this sensitive yet crucial segment of the life cycle. Who knows, perhaps one of the students sitting in your class will become a scientist and develop answers to preserving endangered species.

To obtain a slide set or video cassette, or for more information, contact Wild Resources Conservation Fund, P. O. Box 1467, Room 101, Third and Reilly Streets, Harrisburg, PA 17105-1467, telephone 717-787-1639.

**INDEX TO VOLUME 21**  
**SUBJECT INDEX**

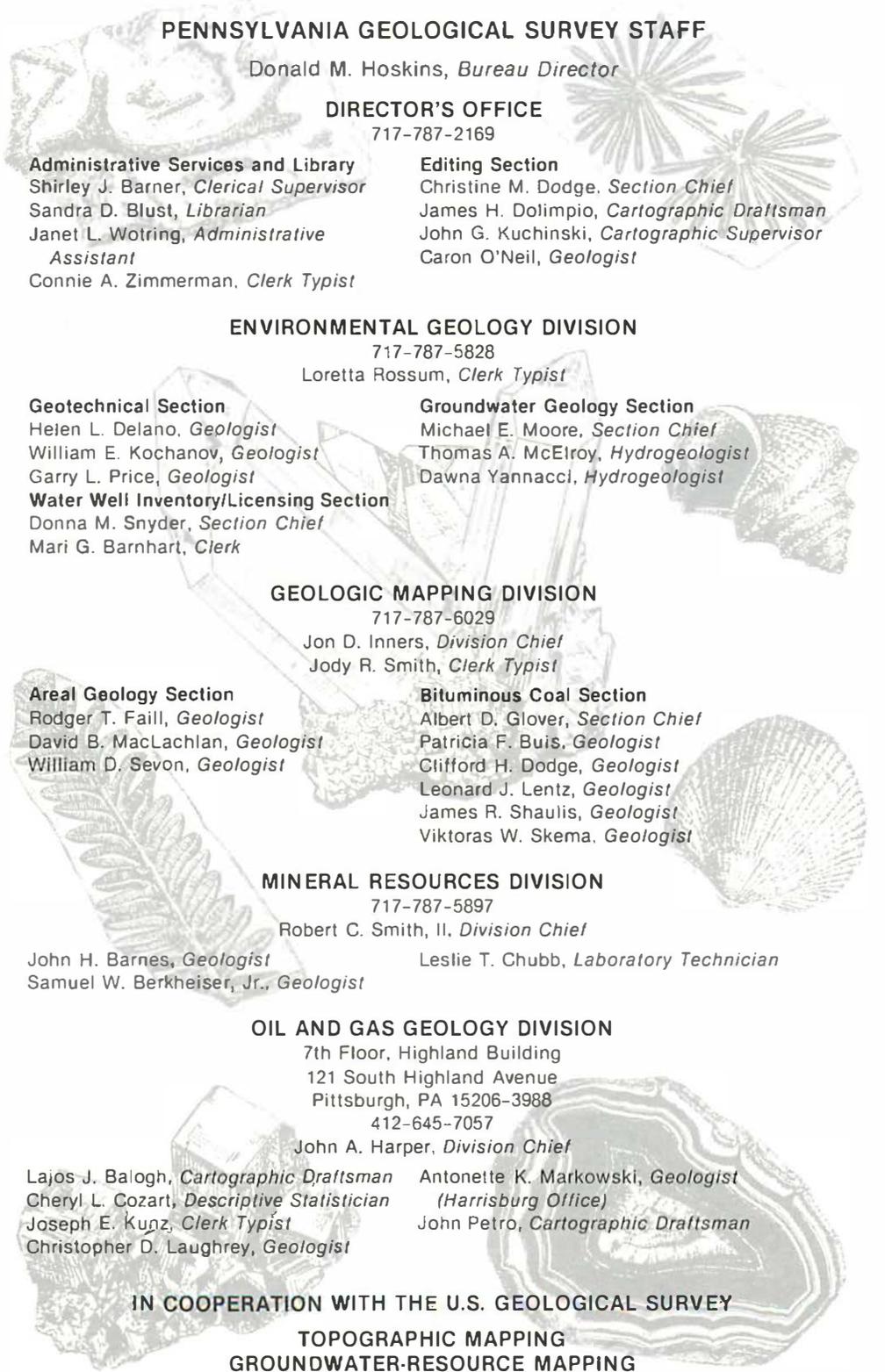
| <i>Subject</i>   | <i>Volume<br/>and<br/>number</i> | <i>Page(s)</i> |
|--|----------------------------------|----------------|
| <b>Abandoned mine reclamation</b> —Kelayres strip mine reclamation project, Schuylkill County  | 21/6                             | 2-6            |
| <b>Adams County</b> —Roofing granules, Catoctin Formation                                      | 21/3                             | 2-6            |
| <b>Allegheny County</b> —New publication, fossil localities, Pittsburgh area (Pbg. Geol. Soc.) | 21/6                             | 9-10           |
| <b>Allegheny Group</b> —Freshwater limestones  | 21/1                             | 9-16           |
| <b>Armstrong County</b> —Storage space created from mining, Vanport Limestone                  | 21/5                             | 4-7            |
| <b>Blair County</b> —New publication, coal resources (M 96)                                    | 21/6                             | 9              |
| <b>Cambria County</b> —New publication, coal resources (M 96)                                  | 21/6                             | 9              |
| <b>Catoctin Formation</b> —Roofing granules, Adams County                                      | 21/3                             | 2-6            |
| <b>Clinton County</b> —Dorcie Calhoun and the Leidy gas field                                  | 21/1                             | 3-7            |
| <b>Coal resources</b> —New publication, Cambria and Blair Counties (M 96)                      | 21/6                             | 9              |
| <b>Earth science education</b>   |                                  |                |
| Endangered wild plants in Pennsylvania   | 21/6                             | 12-13          |
| Physiographic and surficial geology maps published   | 21/1                             | 8              |
| <b>Fossil localities</b> —New publication, Pittsburgh area (Pbg. Geol. Soc.)                   | 21/6                             | 9-10           |
| <b>Franklin County</b> —Open-file report, sinkholes and karst-related features                 | 21/3                             | 15-16          |
| <b>Geochips</b> —Fishy field work (J. P. Wilshusen)  | 21/5                             | 16             |
| <b>Geological reports published, 1990</b>  | 21/4                             | 18-32          |
| <b>Geological research in Pennsylvania, 1990</b>   | 21/4                             | 2-17           |
| <b>Geopics</b> —Sinkholes, "The Sink," Lycoming County   | 21/6                             | 7              |
| <b>Groundwater</b> —New publication, Pike County (W 65)  | 21/6                             | 8              |
| <b>History</b>   |                                  |                |
| Dorcie Calhoun and the Leidy gas field   | 21/1                             | 3-7            |
| J. P. Lesley and the great anticline debate  | 21/2                             | 10-15          |
| John F. Caril—Pennsylvania's prophet of the oil fields   | 21/5                             | 8-12           |
| <b>Lancaster County</b> —Linear segment of Martic Line, an example of dextral transposition    | 21/2                             | 3-9            |
| <b>Limestone</b>   |                                  |                |
| Freshwater limestones, Allegheny Group   | 21/1                             | 9-16           |
| Storage space created from mining, Vanport Limestone   | 21/5                             | 4-7            |
| <b>Lycoming County</b> —Sinkholes, Geopics, "The Sink"   | 21/6                             | 7              |
| <b>Memorials</b>   |                                  |                |
| Buckwalter, Tracy V.   | 21/1                             | 2              |
| Ferguson, Harry F.   | 21/2                             | 2              |
| Shaffner, Marchant Nissley   | 21/5                             | 2-3            |
| <b>Metamorphic petrology</b> —Geologic structures and metamorphism, Piedmont                   | 21/3                             | 6-14           |
| <b>Monroe County</b> —New publication, geologic map of Cherry and Godfrey Ridges (USGS I-1422) | 21/6                             | 10-11          |

| <i>Subject</i>   | <i>Volume<br/>and<br/>number</i> | <i>Page(s)</i> |
|--|----------------------------------|----------------|
| <b>New publications</b>  |                                  |                |
| Mountain Press—Roadside geology of Pennsylvania<br>Pennsylvania Geological Survey                | 21/5                             | 15             |
| Coal resources of Cambria and Blair Counties (M 96)  | 21/6                             | 9              |
| Groundwater resources of Pike County (W 65)  | 21/6                             | 8              |
| Oil and gas developments in Pennsylvania in 1988 (PR<br>202)                                     | 21/3                             | 14–15          |
| Physiographic provinces of Pennsylvania (Map 13)   | 21/1                             | 8              |
| Surficial materials of Pennsylvania (Map 64)   | 21/1                             | 8              |
| Pittsburgh Geological Society—Fossil collecting in the<br>Pittsburgh area                        | 21/6                             | 9–10           |
| U.S. Bureau of Mines— <i>Minerals Today</i> (magazine)   | 21/5                             | 13–15          |
| U.S. Geological Survey—Geologic map of Cherry and God-<br>frey Ridges, Monroe County (I-1422)    | 21/6                             | 10–11          |
| <b>Oil and gas</b>   |                                  |                |
| Dorcie Calhoun and the Leidy gas field   | 21/1                             | 3–7            |
| J. P. Lesley and the great anticline debate  | 21/2                             | 10–15          |
| John F. Carli—Pennsylvania's prophet of the oil fields   | 21/5                             | 8–12           |
| New publication, developments in 1988 (PR 202)   | 21/3                             | 14–15          |
| <b>Open-file report—Pennsylvania Geological Survey</b>   |                                  |                |
| Franklin County, sinkholes and karst-related features  | 21/3                             | 15–16          |
| <b>Physiography—New publication, Pennsylvania (Map 13)</b>                                       | 21/1                             | 8              |
| <b>Piedmont</b>  |                                  |                |
| Geologic structures and metamorphism   | 21/3                             | 6–14           |
| Linear segment of Martic Line, an example of dextral trans-<br>position                          | 21/2                             | 3–9            |
| <b>Pike County—New publication, groundwater resources (W 65)</b>                                 | 21/6                             | 8              |
| <b>Potter County—Dorcie Calhoun and the Leidy gas field</b>                                      | 21/1                             | 3–7            |
| <b>Roofing granules—Adams County, Catoctin Formation</b>   | 21/3                             | 2–6            |
| <b>Schuylkill County—Abandoned mine reclamation, Kelayres<br/>strip mine reclamation project</b> | 21/6                             | 2–6            |
| <b>Sedimentology—Freshwater limestones, Allegheny Group</b>                                      | 21/1                             | 9–16           |
| <b>Sinkholes</b>   |                                  |                |
| Geopics, "The Sink," Lycoming County   | 21/6                             | 7              |
| Open-file report, Franklin County  | 21/3                             | 15–16          |
| <b>State geologist's page</b>  |                                  |                |
| Earth Day certainties  | 21/2                             | 1              |
| Peat to cleanse toxic waste  | 21/4                             | 1              |
| Pete Wilshusen retires   | 21/5                             | 1              |
| "Sunrise" casts light on geologist registration  | 21/6                             | 1, 7           |
| The beneficial effects of natural disasters  | 21/3                             | 1              |
| The unfortunate rewards of success—fossil collecting at<br>Swatara Gap site to end               | 21/1                             | 1              |
| <b>Structural geology—Linear segment of Martic Line, an example<br/>of dextral transposition</b> | 21/2                             | 3–9            |
| <b>Surficial geology—New publication, Pennsylvania (Map 64)</b>                                  | 21/1                             | 8              |
| <b>Topographic maps—Metric series (1:100,000) now complete</b>                                   | 21/5                             | 7              |

| <i>Subject</i>  | <i>Volume<br/>and<br/>number</i> | <i>Page(s)</i> |
|---|----------------------------------|----------------|
| <b>Vanport Limestone</b> —Storage space created from mining, Armstrong County                     | 21/5                             | 4-7            |
| <b>Westmoreland County</b> —New publication, fossil localities, Pittsburgh area (Pbg. Geol. Soc.) | 21/6                             | 9-10           |

## AUTHOR INDEX

| <i>Author and subject</i>  | <i>Volume<br/>and<br/>number</i> | <i>Page(s)</i> |
|--|----------------------------------|----------------|
| <b>Berkheiser, S. W., Jr.</b>  |                                  |                |
| Roofing granules, Adams County, Catoclin Formation   | 21/3                             | 2-6            |
| Storage space created from mining, Armstrong County, Vanport Limestone   | 21/5                             | 4-7            |
| <b>Dobash, Lawrence</b> —Abandoned mine reclamation, Kelayres strip mine reclamation project, Schuylkill County  | 21/6                             | 2-6            |
| <b>Fail, Rodger T.</b> —Geologic structures and metamorphism, Piedmont   | 21/3                             | 6-14           |
| <b>Gates, Tracey</b> —Earth science education, endangered wild plants in Pennsylvania                            | 21/6                             | 12-13          |
| <b>Harper, John A.</b>   |                                  |                |
| Dorcie Calhoun and the Leidy gas field   | 21/1                             | 3-7            |
| J. P. Lesley and the great anticline debate  | 21/2                             | 10-15          |
| John F. Carll—Pennsylvania's prophet of the oil fields   | 21/5                             | 8-12           |
| <b>Hogeman, David C.</b> —Abandoned mine reclamation, Kelayres strip mine reclamation project, Schuylkill County | 21/6                             | 2-6            |
| <b>Hoskins, Donald M.</b>  |                                  |                |
| Earth Day certainties  | 21/2                             | 1              |
| Peat to cleanse toxic waste  | 21/4                             | 1              |
| Pete Wilshusen retires   | 21/5                             | 1              |
| "Sunrise" casts light on geologist registration  | 21/6                             | 1, 7           |
| The beneficial effects of natural disasters  | 21/3                             | 1              |
| The unfortunate rewards of success—fossil collecting at Swatara Gap site to end                                  | 21/1                             | 1              |
| <b>Inners, Jon D.</b> —Abandoned mine reclamation, Kelayres strip mine reclamation project, Schuylkill County    | 21/6                             | 2-6            |
| <b>Magula, John R.</b> —Abandoned mine reclamation, Kelayres strip mine reclamation project, Schuylkill County   | 21/6                             | 2-6            |
| <b>O'Neil, Caron</b> (compiler)—Geologic reports published, 1990   | 21/4                             | 18-32          |
| <b>Shaulis, James R.</b> —Earth science education, physiographic and surficial geology maps published            | 21/1                             | 8              |
| <b>Smith, R. C., II</b>  |                                  |                |
| Roofing granules, Adams County, Catoclin Formation   | 21/3                             | 2-6            |
| Storage space created from mining, Armstrong County, Vanport Limestone   | 21/5                             | 4-7            |
| <b>Valentino, David W.</b>   |                                  |                |
| Geologic structures and metamorphism, Piedmont   | 21/3                             | 6-14           |
| Linear segment of Martic Line, an example of dextral transposition   | 21/2                             | 3-9            |
| <b>Weedman, Suzanne D.</b> —Freshwater limestones, Allegheny Group   | 21/1                             | 9-16           |



## PENNSYLVANIA GEOLOGICAL SURVEY STAFF

Donald M. Hoskins, *Bureau Director*

### DIRECTOR'S OFFICE

717-787-2169

#### Administrative Services and Library

Shirley J. Barner, *Clerical Supervisor*

Sandra D. Blust, *Librarian*

Janet L. Wotring, *Administrative*

*Assistant*

Connie A. Zimmerman, *Clerk Typist*

#### Editing Section

Christine M. Dodge, *Section Chief*

James H. Dolimpo, *Cartographic Draftsman*

John G. Kuchinski, *Cartographic Supervisor*

Caron O'Neil, *Geologist*

### ENVIRONMENTAL GEOLOGY DIVISION

717-787-5828

Loretta Rossum, *Clerk Typist*

#### Geotechnical Section

Helen L. Delano, *Geologist*

William E. Kochanov, *Geologist*

Garry L. Price, *Geologist*

#### Water Well Inventory/Licensing Section

Donna M. Snyder, *Section Chief*

Mari G. Barnhart, *Clerk*

#### Groundwater Geology Section

Michael E. Moore, *Section Chief*

Thomas A. McElroy, *Hydrogeologist*

Dawna Yannacci, *Hydrogeologist*

### GEOLOGIC MAPPING DIVISION

717-787-6029

Jon D. Inners, *Division Chief*

Jody R. Smith, *Clerk Typist*

#### Areal Geology Section

Rodger T. Faill, *Geologist*

David B. MacLachlan, *Geologist*

William D. Sevon, *Geologist*

#### Bituminous Coal Section

Albert D. Glover, *Section Chief*

Patricia F. Buis, *Geologist*

Clifford H. Dodge, *Geologist*

Leonard J. Lentz, *Geologist*

James R. Shaulis, *Geologist*

Viktoras W. Skema, *Geologist*

### MINERAL RESOURCES DIVISION

717-787-5897

Robert C. Smith, II, *Division Chief*

John H. Barnes, *Geologist*

Samuel W. Berkheiser, Jr., *Geologist*

Leslie T. Chubb, *Laboratory Technician*

### OIL AND GAS GEOLOGY DIVISION

7th Floor, Highland Building

121 South Highland Avenue

Pittsburgh, PA 15206-3988

412-645-7057

John A. Harper, *Division Chief*

Lajos J. Balogh, *Cartographic Draftsman*

Cheryl L. Cozart, *Descriptive Statistician*

Joseph E. Kunz, *Clerk Typist*

Christopher D. Laughrey, *Geologist*

Antonette K. Markowski, *Geologist*

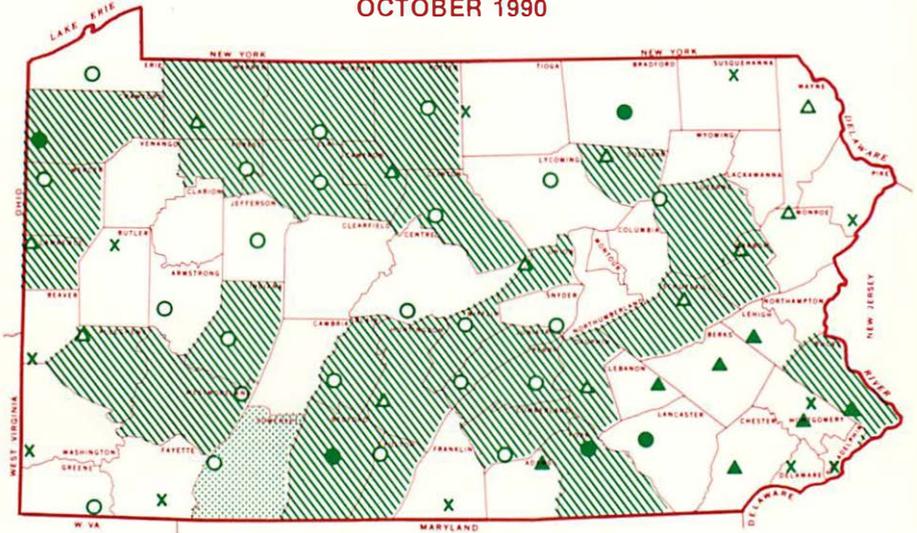
*(Harrisburg Office)*

John Petro, *Cartographic Draftsman*

IN COOPERATION WITH THE U.S. GEOLOGICAL SURVEY

TOPOGRAPHIC MAPPING  
GROUNDWATER-RESOURCE MAPPING

# GROUNDWATER LEVELS FOR OCTOBER 1990



### EXPLANATION

- |                    |                    |   |                    |         |      |                 |     |
|--------------------|--------------------|---|--------------------|---------|------|-----------------|-----|
| ○                  | ●                  | △   | ▲                  | X       |      |                 |     |
| Above<br>last year | Below<br>last year | Above<br>last year  | Below<br>last year | No data | High | Normal<br>range | Low |
| Observation well   |                    | Observation well<br>equipped with<br>data-collection platform |                    |         |      |                 |     |

Bureau of Topographic and Geologic Survey  
Department of Environmental Resources  
P. O. Box 2357  
Harrisburg, PA 17105-2357

Bulk Rate  
U.S. Postage  
PAID  
Harrisburg, PA  
Permit No. 747

*Address Corrections Requested*