West Virginia Geological and Economic Survey

ANNUAL REPORT

Fiscal Year 2005

STATE OF WEST VIRGINIA
Joe Manchin III, Governor

BUREAU OF COMMERCE
L. Thomas Bulla, Secretary

GEOLOGICAL & ECONOMIC SURVEY
Carl J. Smith, Director & State Geologist

Publication AR-05
June 30, 2005

WEST VIRGINIA GEOLOGICAL AND ECONOMIC SURVEY

Principal Staff Directory for 2005

Director and State Geologist	*Carl J. Smith*
Associate State Geologist	*Michael Ed. Hohn*
Deputy Director Finance and Administration	*John D. May*
Chief Geologist	*Douglas G. Patchen*
Advanced Geoscience Research	*Michael Ed. Hohn* *Ronald R. McDowell*
Applied Coal Resources Investigations	*Nick Fedorko III*
Applied Oil and Gas Resources Investigations	*Katharine L. Avary*
Computing Services and Computer Upgrades	*Mary C. Behling*
Earth Science Information Center	*Paul R. Liston*
General Geoscience	*Jane S. McColloch*
Geoscience Education	*Thomas E. Repine, Jr.*
GIS Program and Statewide GIS Coordinator	*Craig A. Neidig*
Public Service	*Steven W. McClelland*
Publications and Graphics	*Charles H. Gover, Jr.*

Address: West Virginia Geological and Economic Survey
Mont Chateau Research Center
1 Mont Chateau Road
Morgantown, WV 26508

Phone: 1-800-WVGEOLOgy (1-800-985-3656)
(304) 594-2331
On Net: 557-3170

Fax: (304) 594-2575

Web Site: http://www.wvgs.wvnet.edu

E-mail: info@geosrv.wvnet.edu

Hours: 8:00 am to 5:00 pm Monday through Friday (closed holidays)

CONTENTS

West Virginia science teachers pause during a field trip conducted by the Geoscience Education Program's RockCamp teacher training workshop.

TRANSMITTAL LETTER

The Honorable Earl Ray Tomblin, President of the Senate
and
The Honorable Robert S. Kiss, Speaker of the House of Delegates
Legislature of West Virginia
The State Capitol
Charleston, West Virginia 25305

Gentlemen:

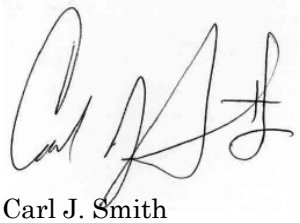
I am pleased to submit the Annual Report of the Geological and Economic Survey for fiscal year 2005. This report summarizes our accomplishments over the past year, and our current operational and financial status.

Again this year, the Survey's Annual Report has produced digitally and distributed on CD in PDF format. As such, it is representative of the highly technical nature of the agency, and our constant efforts to serve West Virginians in the most efficient and effective ways.

Through the highly dedicated efforts of our excellent staff, we have, to date, met the challenge of providing the citizens of our State the high level of professionalism in applied geoscience research, public service, information, and outreach that they have come to expect from us.

Even under our current fiscal constraints, we are working on a number of major projects that will have a significant impact on the State and region. This in turn provides a sound foundation of geological knowledge for economic growth, general prosperity, and a quality environment in West Virginia.

Respectfully submitted,



Carl J. Smith
Director and State Geologist

June 30, 2005

THE WEST VIRGINIA GEOLOGICAL AND ECONOMIC SURVEY

Mission

West Virginia has always been heavily dependent on its geology and natural resources for much of its way of life. Thus, the West Virginia Geological and Economic Survey was established by legislative act (chapter 29, article 2, sections 1-9, as amended) on February 26, 1897, and given the broad charge to carry out investigations of the geological formations and physical features of the State, with particular emphasis on their economic implications, and to prepare special reports and maps dealing with the State's geology and natural resources.

Survey geologists examining maps of mining in Kanawha County.

Today, the Survey is a dedicated, unique, compact agency characterized by a strong commitment to continuous improvement and service to the Mountain State. As West Virginia's principal agency concerned with applied geological science, the Survey continues to be responsible for systematic study and evaluation of the geology of the State. The Survey's greatest assets are over a century's accumulation of data and research findings, and the knowledge and skills of its professional geological staff. From these come sound scientific investigations and invaluable resource development data which are in the public domain through published reports and maps, computer media and database listings, files and records, and expert consultations. A wealth of knowledge has been learned about the State's geology and natural resources, but much work remains to be done in order to provide the detailed, publicly available geological information that is required for the future growth of West Virginia.

Organization

The West Virginia Geological and Economic Survey, a division of the West Virginia Bureau of Commerce, uses an innovative organizational structure which prorates and assigns all resources (human, financial, equipment, etc.) to appropriate projects. This resource allocation is dynamic, changing as required to meet the challenges and opportunities present in the environment in which the agency operates. A project as defined here represents the smallest component in the agency's structure. Each of these sub-organizational units has a distinct mission, either temporary or ongoing, is adaptive, and has been aggregated with similar projects into programs of a more permanent nature. The distinguishing characteristic of this design is that there are no barriers to reallocation of resources between projects or programs. Current projects and programs are presented on the page following the "Goals" portion of this report section.

Funding for personal services, employee benefits, and annual increment is allocated at the program level, with sign-off authority remaining at the executive level of the agency. Non-personal services-related, or unclassified, funding from all sources (general, federal, and special revenue) is allocated at the project level. The principal investigator for each project is delegated responsibility for expenditure decision-making for all funds allocated to that project, utilizing information provided through monthly fund activity reports. Expenditures and performance are monitored at the project level while agency funding requests and performance measures are prepared at the program level. Executive override

authority to direct or reverse expenditure decisions as required in the best interests of the agency rests with the Director.

Each approved project is financed through some combination of dedicated (restricted to specific, project-related expenditures under the terms and conditions of an enabling agreement, contract, or legislative intent) and non-dedicated (not restricted as to the nature of expenditure, such as unclassified general revenue appropriations or revenue-generating special revenue funds) funding sources. Unclassified general revenue funding not encumbered for agency operational expenses (utilities, telephone, etc.) is prorated among approved projects based on the number of general revenue positions assigned to each project. General revenue expenditure authority, as delegated, reverts to the executive level during the final two months of each fiscal year to ensure optimal and efficient utilization of expiring funds. Final responsibility for all funding allocation resides with the Director.

Functions

These major functions characterize the Survey's operations, programs, and projects:

1. Applied research;
2. Development of a geographic information system;
3. The archiving, interpretation, and public availability of basic data and information;
4. Public service;
5. Educational programs to develop better knowledge and understanding of geoscience;
6. Outreach to West Virginia's citizens and visitors.

Survey geologists taking samples from a roadcut in Boone County.

A critical balance among these functions is maintained as the Survey continues to effectively and efficiently carry out its broad charge, which is far more relevant today than it was in 1897.

The Survey operates in the knowledge that geology is a key factor to the State's economic prosperity, and that the exploitation of its geologic resources profoundly impacts the environment of all West Virginians. For informed decision-making, the Survey collects and archives vast amounts of geologic data; conducts detailed studies and research on the State's geology and mineral resources; and makes this information publicly available through numerous publications, and by making professional staff available to provide applied geological information, data, and interpretations. Areas of expertise include energy resources (coal, oil, natural gas), economic minerals (limestone, sandstone, sand and gravel, salt), geologic hazards (landfill siting, subsidence, landslides, floods), geographic information (topographic maps, remote-sensing imagery), general geology (stratigraphy, geologic mapping), hydrogeology (ground water and surface water), computer applications in geology (computer mapping and analysis, databases), geochemical information, and geologic publishing.

Goals

Although the Survey's scientific instruments, methods, techniques, and procedures are vastly superior to those available in the past, its long-range goals remain the same as they have been throughout its history. These are to acquire and make publicly available a detailed knowledge of the geology, mineral, energy, and water resources of the State, for the benefit of all West Virginians. Through competent geological science and dedicated public service, the West Virginia Geological and Economic Survey does its part to promote responsible development of the State's mineral resources to insure the best future—economic and environmental—for West Virginia.

Survey geologists prepare a core from a drill site in Monongalia County.

Geological & Economic Survey

Programs/Projects

GENERAL MANAGEMENT & ADMINISTRATION

Executive
Administrative
Facilities Maintenance

INFORMATION TRANSFER

Computing Services
Computer Upgrades
Publications & Graphics

PUBLIC SERVICE

Service
Outreach
ESIC

APPLIED COAL RESOURCES INVESTIGATIONS

National Coal Resources Data System (NCRDS)
Coal Availability Studies
Coal Recoverability Study
Coal Bed Mapping Maintenance
MTRM Mapping

APPLIED OIL & GAS RESOURCES INVESTIGATIONS

Oil & Gas Basic Data
Coal Mine Methane
PTTC
Reservoir Characterization
Secondary Natural Gas Recovery

GENERAL GEOSCIENCE

Advanced Geoscience Research
Economic Minerals Geoscience
Environmental Geoscience
Geologic Mapping

GEOSCIENCE EDUCATION

Earth Science Teachers' Workshops

GEOGRAPHIC INFORMATION SYSTEM

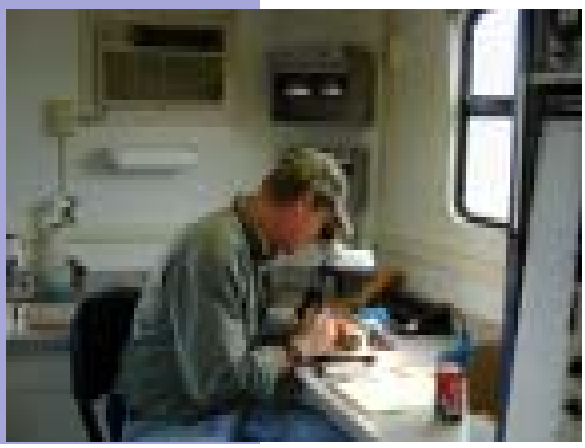
GIS Coordinator
Coal Bed Mapping Project
Mineral Parcel Mapping Project
Statewide GIS Technical Support Center
Digital Line Graph Development Project
Reserve Coal Valuation Model

EXECUTIVE SUMMARY

Research Activities

The Survey supports its research activities with outside funding while providing the research benefit to West Virginia.

Research Projects–Twenty research projects are in progress.



Analyzing core samples at a drill site in Preston County.

Mineral Lands Mapping Program—As part of the State's geographic information system (GIS) efforts, the Survey, along with the Department of Tax and Revenue and West Virginia University, is conducting the West Virginia Mineral Lands Mapping Program. The goal is to develop layers of digital GIS information related to coal resources, coal land ownership, and topographical and cultural base maps. With this program, West Virginia takes a lead technological role in applying GIS to natural resource assessment in the United States. The program is unique in concept and vision, and represents one of the most complex and comprehensive data development effort ever attempted within the public sector of state government to map geological and natural resource holdings. With procedures and methodologies established by completion of mapping and GIS coverages for Fayette County, this massive undertaking involving the geologic reevaluation of all of West Virginia's minable coal resources has completed maps and GIS coverages for Monongalia, Marion, Harrison, Wetzel, Marshall, Ohio, Brooke, and Hancock counties. Mapping is progressing in Raleigh, Kanawha, Putnam, Boone, Wyoming, Doddridge, and Jackson counties.

Publications/Presentations—Survey staff wrote and/or contributed to 20 geological articles, abstracts, or publications. Survey staff presented over 65 talks, exhibits, and classes for schools, colleges, civic groups, professional organizations, government agencies, and public events.

Examining coal geology in a Kanawha County mine.

Maps—The U.S. Geological Survey-funded STATEMAP geologic mapping program continued with bedrock mapping of the Osage, Rivesville, and Fort Seybert 7.5-minute quadrangles completed, and mapping underway for the Grant Town, Romney, and Springfield 7.5-minute quadrangles. Development of

digital geological maps is an ongoing effort at the Survey. Compilation and conversion to digital form is in progress for high-priority analog geological maps of several topographic quadrangles in the State's high-growth eastern panhandle.

Fiscal Operations/ Funding Activities

The Geological and Economic Survey encompasses seven major programs supported through a combination of State, federal, and other funding sources. In addition to funding for basic operations from general revenue appropriations, the Survey is supported by funds dedicated to specific areas of research from supplemental general revenue, federal cooperative agreements, contracts, and revenue-generating operations.

Approximately 57 percent of general revenue funding was dedicated to support agency operations this fiscal year, with the balance funding the Statewide Geographic Information System (GIS). Most of the non-GIS general revenue appropriations underwrite costs of personal services, annual increments, and employee benefits. This fiscal year, these expenditures accounted for 84 percent of all non-GIS general revenue expenditures, with the remaining funds utilized for current expenses, repairs, equipment, and insurance premiums.

Two programs, Geoscience Education and Coal-bed Mapping, have funding provided by the Legislature and accounted for approximately 26 percent of unclassified expenditures this fiscal year. What balance remains is used to meet basic operational costs.

Operational Improvements

Improving the agency's computer network is an ongoing effort. Upgrades of network software, including anti-virus and security software, were made. Recabling of the entire Survey office complex continues.

The Survey continues to develop its comprehensive centralized Oracle-based customer database along with an on-line log of service requests. These applications run on the agency's internal Intranet, and allow staff to far more efficiently and accurately record and have access to a wide variety of information on usage and demand of the Survey's services and products. Information such as that is invaluable in improving the level and types of services and products the agency provides.

With the agency now being totally computerized, all functions, including cartography, data processing and manipulation, publications production, and agency administrative and research operations, are fully digital. Product output quality, research capabilities, and operational efficiencies for the agency are, as a result, at an all-time high.

Service and Outreach

Service Requests—Through June 2005, the Survey responded to 2,306 requests for information, publications, and other services this fiscal year.

Earth Science Information Center (ESIC)—One of 64 such affiliates the U.S. Geological Survey operates or sponsors throughout the nation, the West Virginia Geological and Economic Survey's ESIC effectively works with the public, industry, government, and education communities as a convenient, single point-of-service to the agency's large volume of map, aerial photograph, and geodetic information. The West Virginia ESIC responded to 695 service requests this year, thus demonstrating a substantial public interest in this resource

A nature walk at Blackwater Falls State Park, part of the Survey's Visiting Geologist Project.

RockCamp—The Survey's Geoscience Education Program continues its successes in conducting the agency's educational outreach. Now in its second decade, the program reached 7,666 cumulative professional development teacher experiences. One "teacher experience" represents outreach and assistance in the form of a time-intensive workshop, field trip, professional presentation and/or publication to a single West Virginia teacher. These contacts have resulted in the indirect transfer of awareness of the Survey and an appreciation of the relevance of geological knowledge to more than 153,000 classroom students in all 55 counties.

Web Site—The Survey's Web site **(http://www.wvgs.wvnet.edu)** is constantly being developed and expanded. The site includes sections on West Virginia's geology; recreational and scenic geology; agency research, information services, and outreach programs; data and statistics; geoscience education; a "virtual" geology museum; frequently asked questions; downloadable county-based coal and oil and gas resource production data tables; feature articles; and links to other sites of interest. Recent additions include geochemical analyses data; downloadable page-size maps of West Virginia's geologic resources; and an interactive coal-bed mapping page allowing users to view GIS maps, turn on and off different map layers, pan and zoom, run queries, and print self-composed, page-size maps on their PCs.

This fiscal year, the site saw an eight-percent increase in visitor sessions, along with a 40-percent increase in downloaded files.

***"pipeline"* (Public Access to the Oil and Gas Data System)**–The Survey's menu-driven public-access on-line "*pipeline*" service gives users access to the agency's comprehensive 135,000-well oil and gas database of well completion, location, geology, production, plugging, log, sample, and core data. Customers will also find county-based mineral resource data summaries. Users pay a modest fee any staff-generated customized request.

Visiting Geologists—Once again, the Survey's Visiting Geologist Project operated during the 2004-2005 park season. Thirteen parks were visited this year

EXECUTIVE SUMMARY (CONTINUED)

and over 350 visitors participated. Survey geologists provide one or more presentations and nature walks to park visitors and discuss the unique geologic setting of each park and the importance of geologic resources to the State. These presentations provide park visitors a better appreciation of what underlies the landscape, and the importance of geology to the beauty and economy of the Mountain State.

West Virginia teachers examine rock formations during a RockCamp field trip.

Digital Publications Production—A major effort continues to convert existing Survey publications and produce new publications solely in digital formats. The goal is to enable publications to be distributed on CDs, by e-mail, as digital files, or as hard copy, depending on a user's wishes and capabilities. A significant result of this effort this fiscal year has been the reissuing of the complete 30-volume set of the Survey's "County Report Series." These report volumes and accompanying maps comprise the original geological survey of the State, and have been out-of-print for decades. Now each is available on CD from our Publication Sales Office.

Presentations—Survey staff continue to present numerous talks, exhibits, and classes for schools, colleges, civic groups, professional organizations, government agencies, and public events.

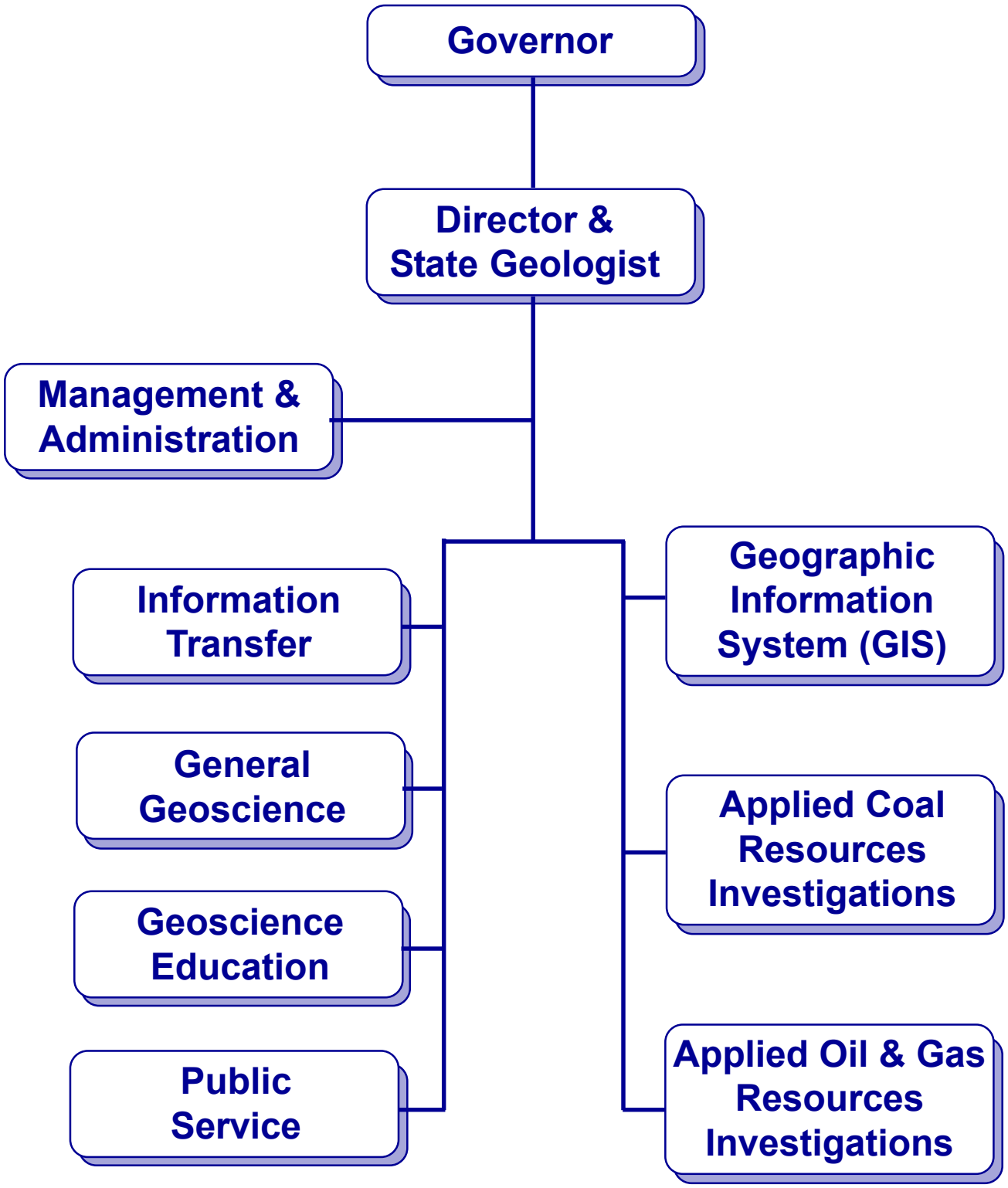
Staff Development

To keep them knowledgeable and current, all staff members are encouraged to enroll in advanced courses and participate in professional activities to improve scientific and professional skills.

Visitors to the Survey's display and sales booth at the West Virginia State Fair can inspect and purchase any of the thousands of maps and publications the agency produces. Displays are held at sports and outdoor shows around the State throughout the year.

West Virginia Geological & Economic Survey

Organization Chart



WEST VIRGINIA
GEOLOGICAL AND ECONOMIC SURVEY STAFF
Fiscal Year 2005

Carl J. Smith, A.M., C.P.G. ..... *Director and State Geologist*
Michael Ed Hohn, Ph.D. ..... *Associate State Geologist*
John D. May, M.B.A ..... *Deputy Director Finance and Adminstration*

ADMINISTRATIVE AND FACILITIES MAINTENANCE

Gloria J. Rowan, B.S. ..... *Administrative Service Manager*
Linda C. Carlier ..... *Administrative Clerk*
Judith A. Sparks ..... *Receptionist/Director's Secretary*
Gary C. Rowan ..... *Maintenance Man*
Louis W. Curkendall ..... *Maintenance Worker*

APPLIED COAL RESOURCES INVESTIGATIONS

Nick Fedorko III, M.S. ..... *Coal Geologist and Manager*
Bascombe M. Blake, Jr., M.S. ..... *Coal Geologist*
James Q. Britton, M.S. ..... *Geologist III*
William C. Grady, M.S. ..... *Microscopist*
Nathan T. Heilmann, B.S.* ..... *Geologist I*
Frank L. Hutchinson, B.S.** ..... *GIS Technical System Administrator*
Ronald D. Lane, M.S. ..... *GIS Technician*
Edward I. Loud, B.S. ..... *Coal Geologist*
Darren McConnell, B.S. ..... *Geologist I*
Barnes L. Nugent, M.S. ..... *Geologist III*
Charles D. Renton, B.A. ..... *Lab Assistant II*

GENERAL GEOSCIENCE

Jane S. McColloch, M.S., R.P.G. ..... *Hydrogeologist*

GEOSCIENCE EDUCATION

Thomas E. Repine, Jr., Ed.D., R.P.G. ..... *Education Specialist and Manager*

* Transferred within program during year.
** Left during year.

COMPUTING SERVICES AND COMPUTER UPGRADES

Mary C. Behling, M.S. ..... *Geologist and Manager*
Steven A. Munro, M.S. ..... *Network Administrator*
Susan C. Kite, B.S. ..... *Programmer Trainee*
John T. Saucer, B.S. ..... *Database Administrator*
Susan E. Pool, B.S. ..... *Programmer/Analyst*

GIS PROGRAM

Craig A. Neidig, M.S. ..... *Statewide Coordinator*
Nick Fedorko III, M.S. ..... *Coal Geologist and Coal-bed Mapping Project Manager*
Richard D. Binns, Jr. M.S. ..... *GIS Database Administrator II*
Todd Bowman, B.S. ..... *Information Systems Coordinator I*
Leigh A. Cielensky. ..... *Executive Secretary*
Sarah E. Gooding, B.S. ..... *Geologist I*
Kendra L. Hatcher, B.S. ..... *Geologist I*
Nathan T. Heilmann, B.S. ..... *Geologist I*
Kimberly J. Hutchinson, B.S.** ..... *GIS Database Administrator*
Robert J. Johnson, B.S. ..... *Geologist III*
David A. Jones, B.S. ..... *Geologist II*
J. Eric Lewis, B.S. ..... *Geologist I*
Annie J. Morris, M.S.* ..... *Geologist I*
Dennis R. Pierson, B.S.** ..... *Geologist I*
John T. Snider, B.S. ..... *Programmer Analyst II*
Jeanne M. Sutton, B.S. ..... *Geologist II*
Amanda G. Thomson, B.S.** ..... *Geologist I*
Christopher E. Volk, B.S.** ..... *Geologist I*
Brian J. Walker, M.A. ..... *Assistant Editor*

APPLIED OIL AND GAS RESOURCES INVESTIGATIONS

Katharine L. Avary, M.S. ..... *Petroleum Geologist and Manager*
Patricia J. Johns ..... *Records Manager*
Gayle H. McColloch, Jr., M.S., R.P.G. ..... *Geologist IV*
Annie J. Morris, M.S. ..... *Geologist III*
John M. Bocan, B.A.,B.S. ..... *Information Systems Coordinator II*
M. Patrick Kish, M.S.** ..... *Geologist II*

* Transferred within program during year.
** Left during year.

PUBLICATIONS AND GRAPHICS

Charles H. Gover, Jr., B.S. ..... *Editor*
J. Daniel Barker, A.A. ..... *GIS Cartographer*
Betty L. Schleger ..... *Editorial Assistant*
Charles P. Bowman ..... *Production Assistant*

ADVANCED GEOSCIENCE RESEARCH

Douglas G. Patchen, Ph.D. ..... *Chief Geologist*
Ronald R. McDowell, Ph.D. ..... *Senior Research Geologist*

PUBLIC SERVICE

Steven W. McClelland, M.S. ..... *Coal Geologist and Manager*
Kenneth C. Ashton, B.S. ..... *Coal Geologist*
Michael A. Kirk, B.S. ..... *Publication Sales Manager*
Paul R. Liston, A.A. ..... *Engineering Technician/Surveyor*

COOPERATING PERSONNEL

Robert E. Behling, Ph.D. ..... *Geologist*
E. Ray Garton, M.S. ..... *Geologist/Curator*
William H. Gillespie, M.S. ..... *Geologist*
Thomas W. Kammer, Ph.D. ..... *Paleontologist*
J. Steven Kite, Ph.D. ..... *Geologist*
Philip A. Martin, M.S. ..... *Geologist*
Ronald L. Martino, Ph.D. ..... *Geologist*

* Transferred within programs during year.
** Left during year.

PART-TIME EMPLOYEES

Edwin K. Berry ..... *Geoscience Education*
John D. Beuthin, Ph.D. ..... *Applied Coal Resources Investigations*
Mary Sue Burns ..... *Geoscience Education*
Harry E. Brown ..... *Applied Coal Resources Investigations*
Gary W. Daft, Jr. ..... *Applied Coal Resources Investigations*
Jacqulyn D. Davis ..... *Applied Coal Resources Investigations*
Stuart L. Dean, Ph.D. ..... *Applied Geoscience Research*
Richard J. Diecchio, Ph.D. ..... *Applied Oil and Gas Resources Investigations*
Debra A. Hemler, Ph.D. ..... *Geoscience Education*
Kelby E. Hicks* ..... *Applied Oil and Gas Resources Investigations*
James M. Horner ..... *Applied Coal Resources Investigations*
Byron R. Kulander, Ph.D. ..... *Applied Geoscience Research*
Jennifer S. Maloney** ..... *Applied Coal Resources Investigations*
Kevin T. Oldness** ..... *Applied Coal Resources Investigations*
Marie A. Patchen ..... *Applied Coal Resources Investigations*
John J. Renton, Ph.D. ..... *Applied Coal Resources Investigations*
Paula J. Waggy ..... *Geoscience Education*
Laura C. Walkup ..... *Geoscience Education*

* Transferred within programs during year.
** Left during year.

DIGITAL LINE GRAPH DEVELOPMENT PROJECT
West Virginia University Department of Geology and Geography

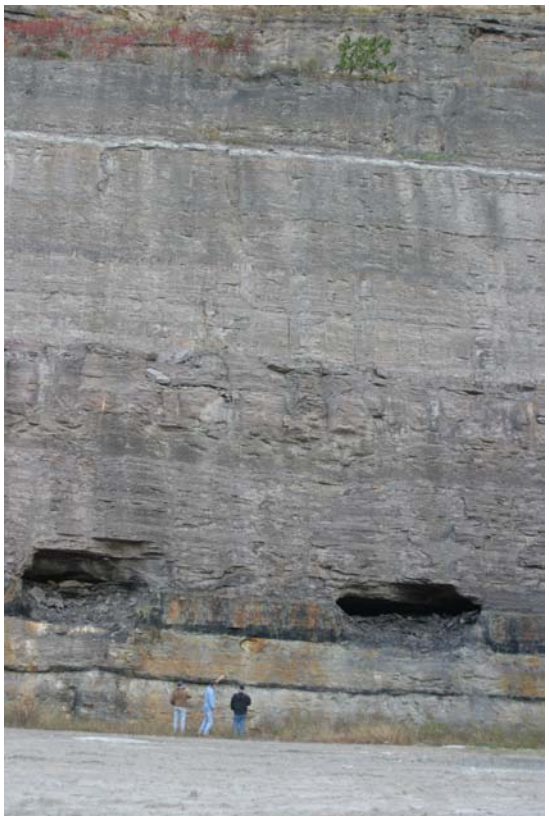
Dr. Trevor Harris ..... *Co-director*
Dr. Gregory Elmes ..... *Co-director*
Kurt Donaldson ..... *Senior Research Coordinator*
Eric Hopkins ..... *GIS Analyst*
Kevin R. Kuhn ..... *Geographic Information Technician*
Frank LaFone ..... *Senior Internet Coordinator*

MINERAL PARCEL MAPPING PROJECT
West Virginia Property Tax Division, GIS Development Unit

Dale Vanderlaan ..... *GIS Manager*
Robert Barker ..... *Tax Map Technician—Office*
Diane Leadmon ..... *GIS Unit Office Assistant*
Gary Farren ..... *Tax Map Technician—Field*
Wayne Hamlin ..... *Tax Map Technician—Field*
Randy Butler ..... *Tax Map Technician—Field*
Leo Muncy ..... *Tax Map Technician—Field*
Norbert Netzel ..... *Tax Map Technician—Field*
John Wright ..... *Tax Map Technician—Field*
Ron Oxley ..... *Tax Map Technician—Field*
Tom Stalnaker ..... *Tax Map Technician—Field*
Craig Wanless ..... *Tax Map Technician—Field*
Yi-Ning Chen ..... *GIS Programmer/Analyst*

* Transferred within programs during year.

** Left during year.



Survey geologists use a Logan County surface mine highwall to observe the local stratigraphy.

Examining coal seam stratigraphy in a Kanawha County mine.

FINANCIAL SUMMARY

Funding Overview

The West Virginia Geological and Economic Survey encompasses seven major programs (Figure 1) that are supported through a combination of State, Federal and other funding sources (Figure 2). In addition to funding for basic operations from General Revenue appropriations, the agency is supported by funds dedicated to specific areas of research from supplemental General Revenue, Federal cooperative agreements, contracts, and revenue-generating operations.

Figure 1

PROGRAM EXPENDITURES FY 2004-2005

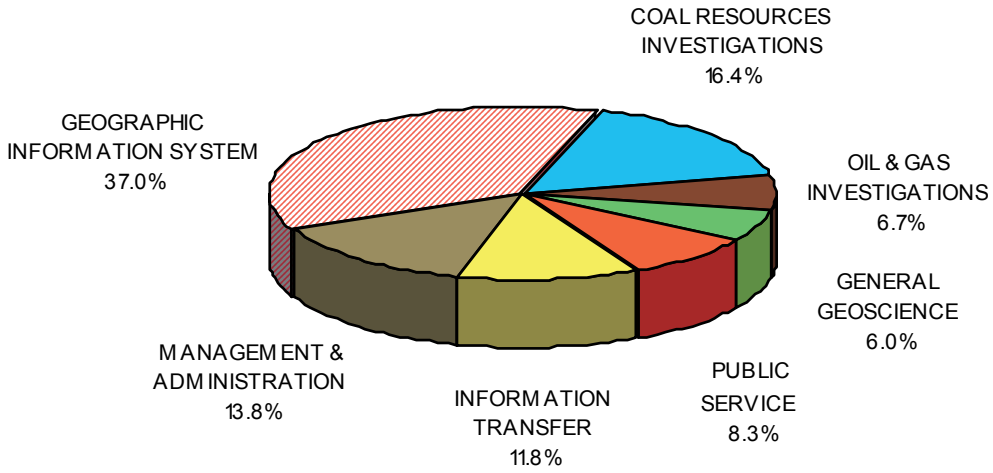
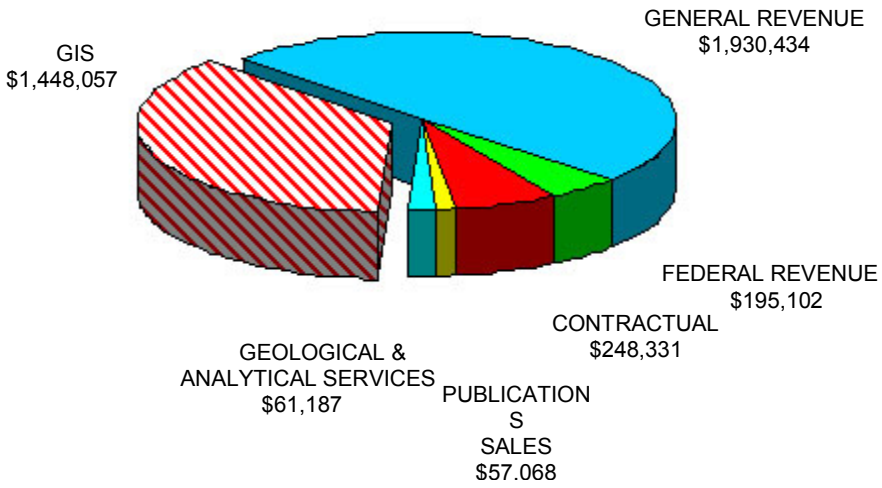


Figure 2

EXPENDITURES BY SOURCE OF FUNDING FY 2004-2005



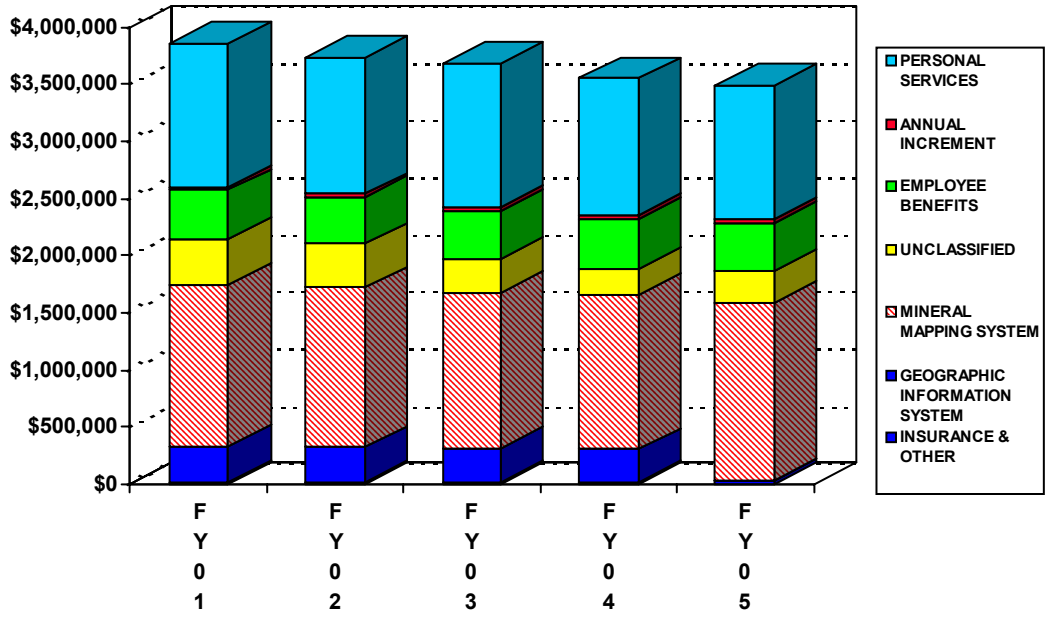
Agency Operational Funding

General Revenue

Most agency funding is provided through General Revenue appropriations. In fiscal year 2004-2005, approximately 57 percent of General Revenue was dedicated to support agency operations, with the balance funding the Statewide Geographic Information System (GIS). In comparison to the other funding sources, General Revenue has remained relatively stable, having decreased by only 9.2 percent in the past five years (Figure 3).

Figure 3

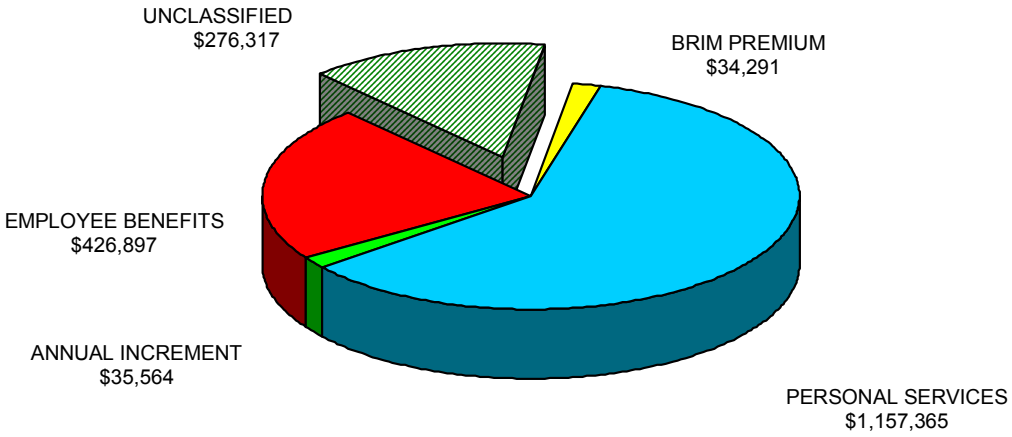
GENERAL REVENUE APPROPRIATIONS
FY 2001-2005



As the Survey is a human resources-intensive agency, most of its non-Geographic Information System (GIS) General Revenue appropriations underwrite the costs of Personal Services, Annual Increments, and Employee Benefits. In fiscal 2004-2005, Personal Services-related expenditures accounted for 84 percent of all non-GIS General Revenue expenditures, with the remaining funds utilized for current expenses, repairs and alterations, equipment (Unclassified), and insurance premiums.

Figure 4

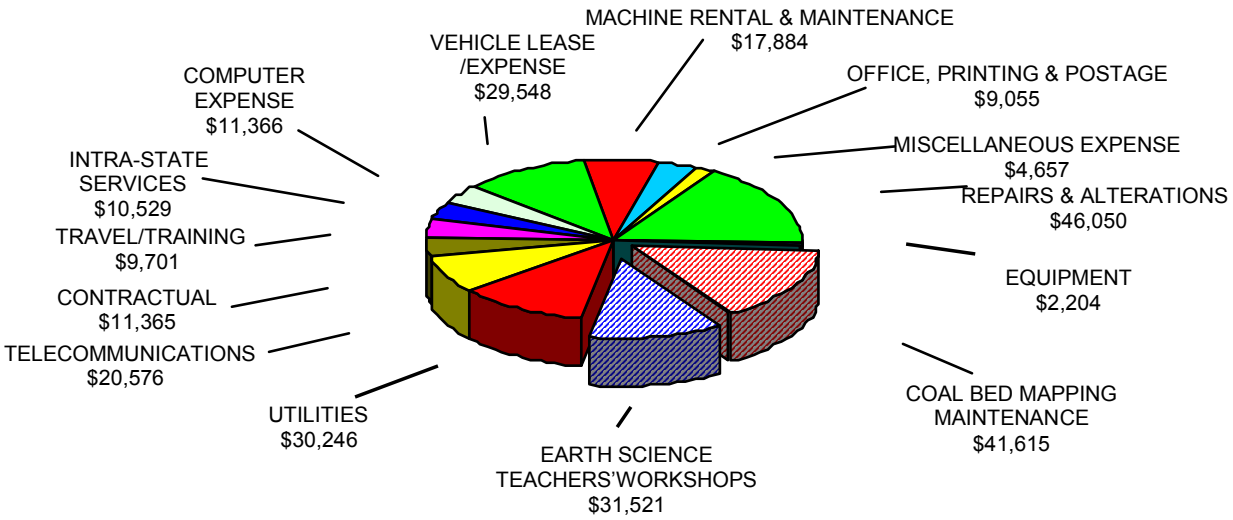
GENERAL REVENUE EXPENDITURES
(Exclusive of GIS Appropriations)



Two programs for which funding has been provided by the Legislature, Earth Geoscience Education and Coal-bed Mapping Maintenance, accounted for approximately 26 percent of Unclassified expenditures in fiscal 2004-2005 (Figure 5). The remainder of the Unclassified appropriation was employed to meet non-discretionary, basic costs of operation (utilities, telecommunications, vehicle rental, maintenance, intra-state services, etc.).

Figure 5

GENERAL REVENUE UNCLASSIFIED EXPENDITURES



FINANCIAL SUMMARY (CONTINUED)

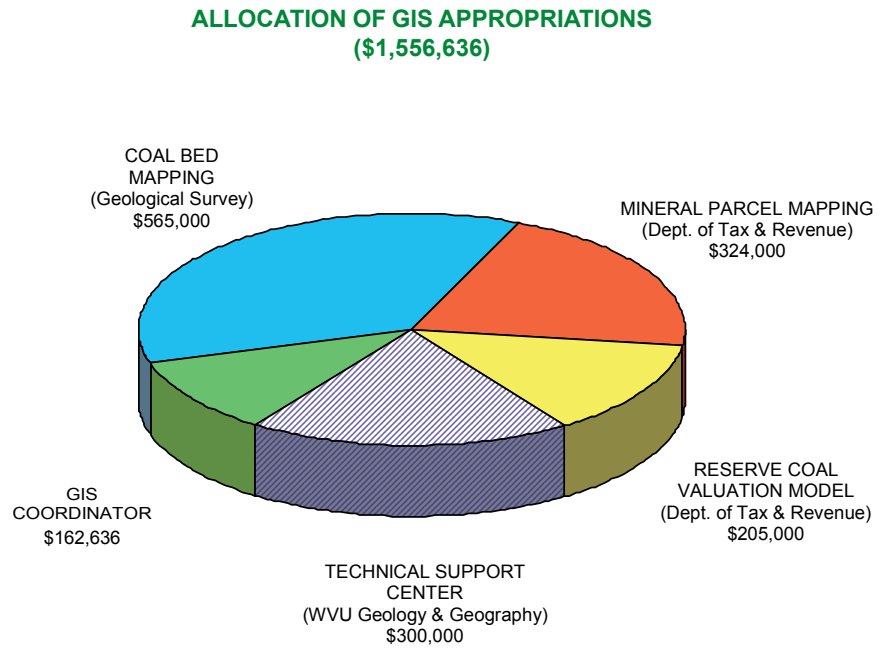
Geographic Information System

Expenditures for the Geographic Information System accounted for approximately 43 percent of total General Revenue outlays in fiscal 2004-2005. GIS is a unique collaborative effort of State agencies that was established by Executive Order 04-93 and House Bill 2222 during the 1995 Legislative session. The act authorized the Survey to serve as lead and fiscal control agent in a joint program with the Department of Tax and Revenue and the West Virginia University (WVU) Department of Geology and Geography.

Approximately two-thirds of GIS appropriations are passed through to the other cooperating State agencies. The remaining one-third is allocated to the Survey's participating GIS research group, the Coal-bed Mapping Project. Expenses incurred by the Coordinator's Office and the Coal-bed Mapping Project are paid directly by the Survey. Expenses incurred by the Mineral Parcel Mapping and Reserve Coal Valuation projects (Tax and Revenue) and Technical Support Center (WVU) are paid by the participating agencies. Appropriate reimbursement mechanisms have been established through memorandums of agreement with Tax and Revenue (by expense line item reimbursements) and WVU (by contractual payments upon receipt of itemized expenditure statements).

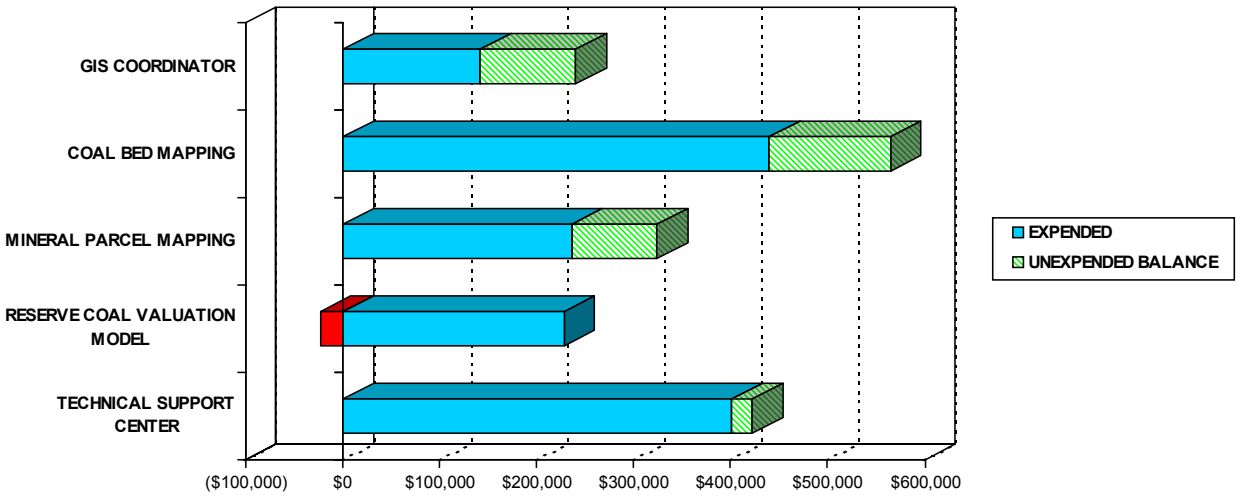
General Revenue funding (Mineral Mapping appropriation) totaling $1,556,636 was allocated for GIS participating agencies as shown in Figure 6.

Figure 6



Total composite expenditures and remaining balances by project through the end of fiscal 2004-2005 are shown in Figure 7.

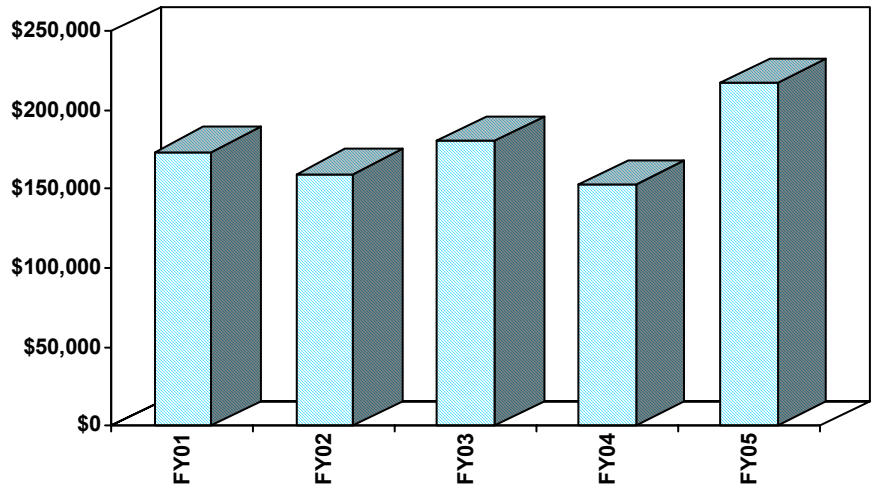
Figure 7 GIS EXPENDITURES & APPROPRIATION BALANCES THROUGH JUNE 30, 2005
(Bold Figures Represent Percentage of Allocated Funds Expended)



Current Cooperative Agreements

Federal Revenue continued to contribute a significant portion of the Survey's operating support in fiscal 2004-2005 (Figure 8) through cooperative agreements for coal research and mapping projects.

Figure 8 FEDERAL FUNDS RECEIPTS

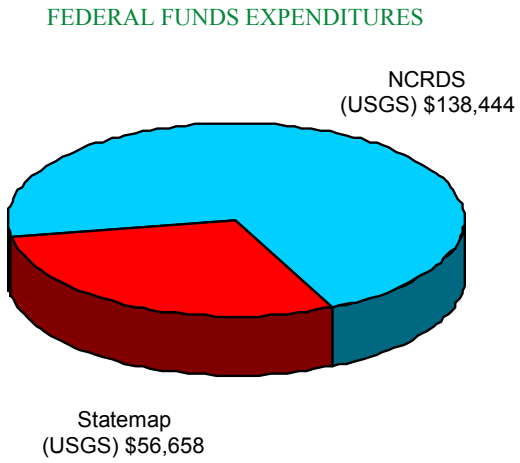


FINANCIAL SUMMARY (CONTINUED)

Federal Revenue

The U.S. Department of Interior's Geological Survey (USGS) is the West Virginia Geological and Economic Survey's principle Federal grantor. Disbursements for the National Coal Resources Data System (NCRDS) and STATEMAP projects accounted for all Federal program expenditures in fiscal 2004-2005 (Figure 9).

Figure 9



Federal Funding Outlook

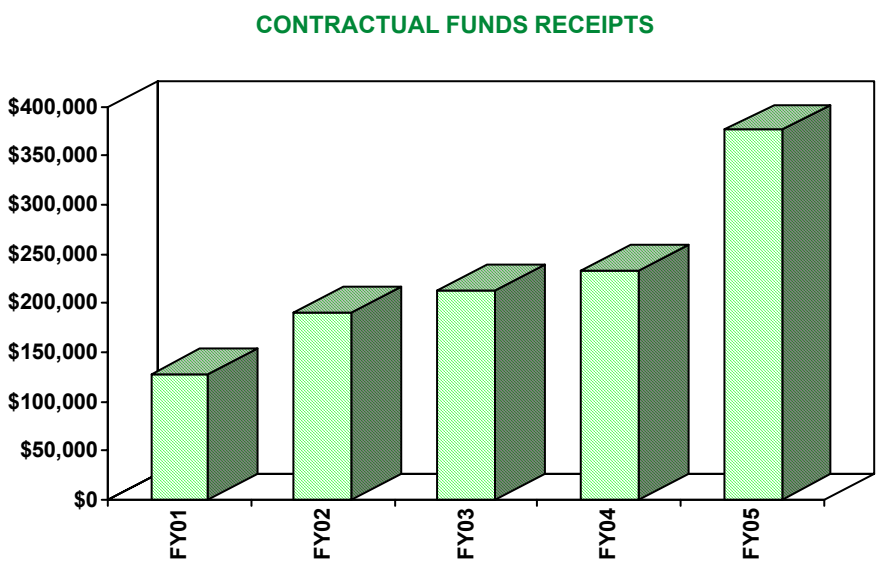
Most of the USGS-funded project agreements are of a continuing, long-term nature and are unlikely to be impacted by variations in Federal budget funding. It is difficult to assess the future impact on net USGS funding as a consequence of project completions (Coal Availability and Recoverability studies), increased project funding (NCRDS), and prospective new cooperative agreements. Pending new cooperative projects with the Mine Safety and Health Administration would provide a degree of diversification of Federal funding sources in fiscal 2005-2006.

Special Revenue

Contracts

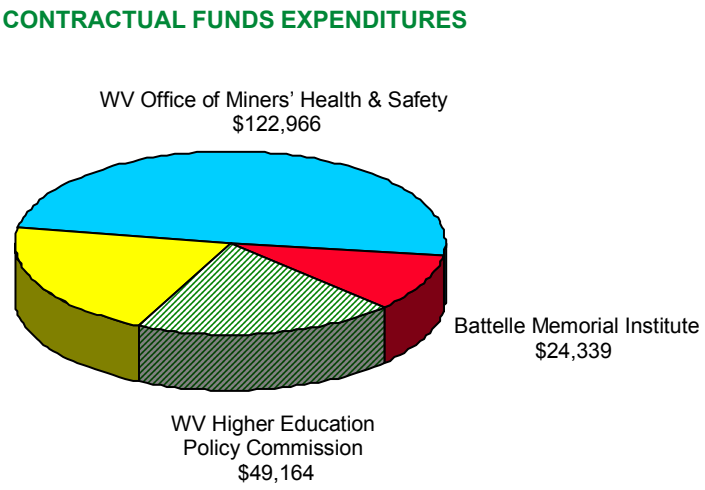
Increased cooperative project activity has resulted in a significant growth of contractual research funding in recent years (Figure 10).

Figure 10



Federally funded subcontracts through the West Virginia Office of Miners' Health and Safety (Fund 3105), Battelle Memorial Institute (Fund 3107), WVU Research Corporation (Funds 3107 & 3109), and the West Virginia Higher Education Policy Commission (Fund 3111) accounted for all contractual expenditures in fiscal 2004-2005. (Figure 11). It is anticipated that contractual funding to support agency research efforts will remain at current year levels in fiscal 2005-2006.

Figure 11



FINANCIAL SUMMARY (CONTINUED)

In recognition of the value of non-State funding to the continued viability of the Geological Survey, potential grant and contract opportunities have been continually investigated and aggressively pursued.

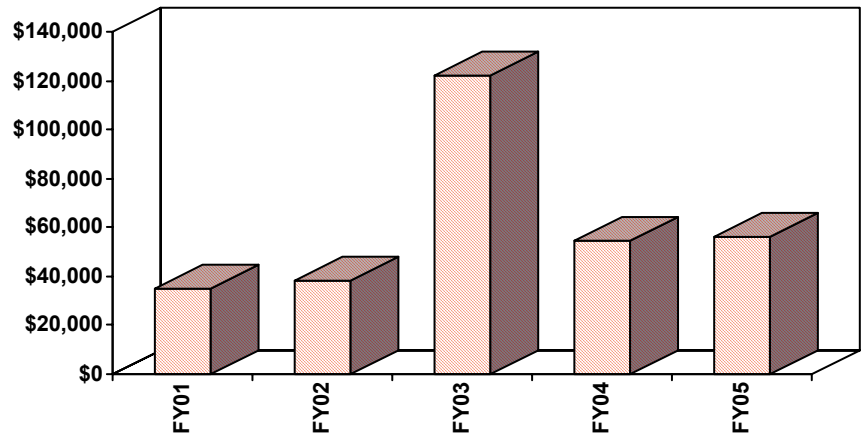
Revenue-Generating Operations

Funds have been generated through the sales of publications and geologic services. Sufficient balances of sales receipts are maintained to defray agency operational costs associated with these revenue-producing activities.

The establishment of equitable fees to be charged to users for geological services has facilitated recovery of incremental costs associated with the performance of services. Optimal pricing, coupled with the introduction of proactive outreach efforts, has produced consistent annual increases in service revenues (Figure 12). (A one-time $50,000 payment for data services accounted for the marked increase in fiscal year 2002-2003 receipts). Fiscal 2004-2005 deposits to the agency's Geological and Analytical Services Fund (3100) of $56,251 represented increases of three percent over that of the prior year and 61 percent over the five-year period.

SERVICE REVENUES

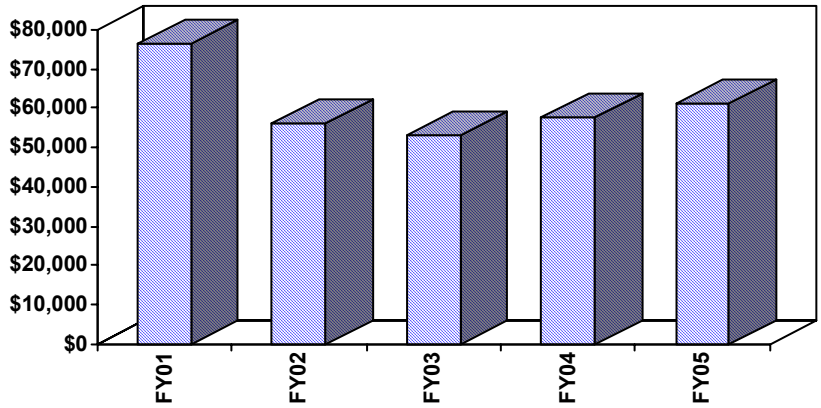
Figure 12



Publication sales products include maps, books, reports, and other agency documents reproduced on a variety of media (photostatic, black line and well-log copies, microfilm, CDs, pre-formatted diskettes, etc.). Fiscal 2004-2005 net sales receipts deposited in the agency's Publications Sales Fund (3101) totaled $61,197; an increase of 6 percent from the prior year (Figure 13).

Figure 13

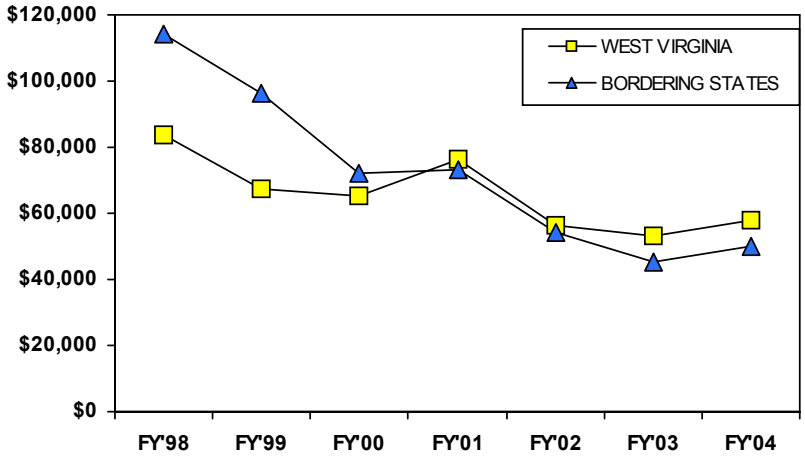
PUBLICATIONS SALES REVENUES



An evaluation of publications sales of the geological surveys of West Virginia and those of the bordering states of Maryland, Ohio, and Virginia (Figure 14) reveals a decline in revenues from fiscal 1998 through fiscal 2004 (the most recent year for which comparison figures are available) for all states. West Virginia's receipts decreased by just 30.9 percent over this period, however, compared to 56.1 percent for the composite sales figure. Revenues are expected to remain at current levels, assuming continued or increased demand for agency information products and services by industry, government, and the public.

Figure 14

PUBLICATIONS SALES REVENUES
WEST VIRGINIA vs. BORDERING STATES[1]



[1] Association of American State Geologists Statistician's Annual Reports, 1998-2004.

FINANCIAL SUMMARY (CONTINUED)

Advance Funding

All current contractual projects are expenditure-driven, requiring that expenses be incurred prior to reimbursement from funding sources. Authority granted in prior years to employ residual State appropriations as start-up funds has greatly enhanced the agency's capability to attract and maintain non-State support from agreements that stipulate an expense reimbursement mode of funding. Under this arrangement, reimbursements are ultimately returned to the General Revenue fund and, consequently, no expense is incurred by the State. This funding mechanism has enabled the agency to utilize grantor-reimbursed funds in excess of $195,000 in fiscal 2004-2005.

RESEARCH

- **Carbon Dioxide Sequestration**—The Survey is part of the Midwest Carbon Sequestration Regional Partnership (MRSCP), one of seven regional partnerships funded by the U.S. Department of Energy. Each partnership is tasked with examining the region's options for carbon dioxide sequestration. The prime contract for the MRCSP is Battelle Memorial Laboratories in Columbus, OH. The Survey is part of the team examining options for potential geologic sinks which can be used to sequester carbon dioxide. The agency's coal and oil and gas databases will be used extensively in this effort. The Ohio Geological Survey is leading the geological sequestration part of the program and is developing an interactive Web site using information supplied by the Survey and other state geological surveys. The initial contract is for two years, which began October 1, 2003.

Data for all West Virginia oil and gas reservoirs including outline polygons and specific reservoir attribute data were compiled by the Survey team which included Geologist M.P. Kish and Programer/Analyst S.E. Pool. In addition, data for various regional geologic maps were compiled and submitted to various members of the partnership research team. Geologist and Program Manager K.L. Avary assisted in writing parts of the final geologic summary for Phase 1. In March 2005, the USDOE announced Phase 2 funding awards which included the Battelle team and which includes the Survey. Phase 2 will examine specific sites in more detail throughout the seven-state partnership area.

Chief Geologist D.G. Patchen is part of a team organized by the Interstate Oil and Gas Compact Commission which was selected by the USDOE to examine existing state regulations for underground injection, and determine how carbon dioxide sequestration would fit into the existing state regulatory framework. A final report was released by this group.

In a cooperative effort with the West Virginia Development Office, the Survey evaluated eight West Virginia sites for their potential carbon dioxide sequestration potential. These site evaluations will position the State to be ready to participate in the USDOE FutureGen Program. The site reports were prepared by K.L. Avary and Geologist and Program Head N. Fedorko, and include evaluation of coal seams as well as deeper oil and gas reservoirs and saline aquifers.

- **Coal-bed Mapping Project**—The geographic information system (GIS)-based Mineral Lands Mapping Program is a cooperative effort between the Survey, the West Virginia Department of Tax and Revenue, and the West Virginia University (WVU) Department of Geology and Geography. The Department of Tax and Revenue is responsible for creating GIS layers of mineral parcel ownership. WVU is charged with creating various GIS base map layers, or digital line graphs (DLGs).

The Survey is conducting the Coal-bed Mapping Project wherein a GIS-based inventory of coal in the State is being created. Coal-bed maps or layers being created include: structural contour maps; outcrop maps; surface, auger, and underground mined area maps; coal thickness maps; percent parting maps; and coal quality maps. Coal-bed coverages for Fayette County were completed in 1998 while maps and GIS coverages for 12 beds in Monongalia, Marion, and

Harrison counties were completed in 1999. GIS coverages for all important coal beds in Wetzel, Marshall, Ohio, Brooke, and Hancock counties were completed in 2000. All coverages for 20 coal beds of the Kanawha Formation in western Raleigh County were completed in 2001.

This fiscal year, in Raleigh County, mapping was completed for the Sewell coal, No. 6 Pocahontas, and Pocahontas No. 6 upper split. Mapping continued for the Pocahontas No. 7, Pocahontas No. 9, Fire Creek, and Beckley lower split coal beds. The active underground mining was updated for all beds.

All mapping was completed of the Pittsburgh coal bed in Kanawha and neighboring parts of Putnam and Jackson counties. Also completed was all mapping of the Little Eagle, Eagle, Eagle A, Lower Powellton, Powellton, No. 2 Gas, Peerless, and Williamson coal beds in Kanawha County. These were merged with previously mapped areas in Fayette and Raleigh counties. Mapping was initiated on the Cedar Grove, Fire Clay, and Chilton coal beds. Stratigraphic correlation of the Winifrede through No. 6 Block coal interval is being done as is updating the active underground mining for all beds.

In Boone and northern Wyoming counties, all mapping was completed of the Little Eagle, Eagle, Eagle A, Lower Powellton, Powellton, No. 2 Gas, Peerless, and Williamson coal beds. This mapping was merged with Kanawha County and other previously mapped counties (see above). Initiated and continued was mapping of the Cedar Grove, Fire Clay, Little Chilton, Chilton, Chilton A, Lower Winifrede, Winifrede, Upper Winifrede, Upper Winifrede, Little Coalburg, Coalburg, Stockton, Stockton Rider, Little No. 5 Block, No. 5 Block, Upper No. 5 Block, No. 6 Block, and No. 7 Block coal beds. Stratigraphic correlations were completed of considerable new data acquired during the year and updating the active underground mining for all beds was done.

In Wyoming County, compilation of underground mining was completed for the Pocahontas No. 6, Pocahontas No. 6 upper split, Pocahontas No. 7, Pocahontas No. 9, Fire Creek, Beckley lower split, and Beckley coal beds. Initiated and continued was compilation of underground mining in the Sewell and Pocahontas No. 3 coal bed in Wyoming County.

In Doddridge County, mapping was initiated by reconciling existing data with newly received data and beginning work on stratigraphic correlations.

Annual deliverables for this fiscal year were prepared for the Department of Tax and Revenue for delivery early in fiscal 2006. These included all underground mining compilations, the products listed above for each county, updated mining for previously mapped nine and one-half counties, and numerous stratigraphic databases. Considerable stratigraphic database work was accomplished throughout the State with addition of records from Tax and Revenue files. All workers were upgraded to ArcGIS 9 and all of the mapping made accessible in a multi-user environment through implementation of Spatial Database Engine. Simultaneously, all mapping was re-projected from North American Datum (NAD) 1927 to NAD 1983. Numerous custom tools were developed to streamline the mapping process. Work proceeded on migration of the stratigraphic database into a more robust network-capable hardware and software environment. Con-

tinued effort went into project design, improvement in procedures, acquisition of computer equipment and software, and training.

- **Coal-bed Methane**—Another potential source of energy and revenue from West Virginia coal is the methane-rich natural gas held within the deeply buried beds. The Survey has actively promoted exploration, assessment, and utilization of coal-bed methane.

Geologist and Program Manager K.L. Avary continued to update a summary of data on coal-bed methane wells for the Survey's Web site, and presented talks summarizing West Virginia activity at the Eastern Section American Association of Petroleum Geologists meeting, Columbus, OH. Avary also attended the North American Coal-bed Methane forum.

- **Coal-bed Methane Potential**—Applied Coal Resources Investigations Program geologists worked cooperatively with EG&G Corporation, the West Virginia High Tech Consortium, the U.S. Environmental Protection Agency, and the U.S. Geological Survey to drill a core hole at the Meadowfill Landfill in Harrison County to explore for coal-bed methane. The long range purpose of the research is to explore the feasibility of capturing the gas stream (largely methane and carbon dioxide) being liberated from closed refuse disposal cells at the landfill, and to pump it into the underlying coal beds. In this way, the methane volumes would be increased for future production and the carbon dioxide would be sequestered in the coal, thereby preventing release of this greenhouse gas into the atmosphere. Coal geologists also worked with other industry explorationists in gathering valuable information for Survey archives.

- **Coal Quality**—The Applied Coal Resources Investigations Program maintains and regularly enhances a computerized database of the chemical and physical characteristics of West Virginia coals. It is one of the largest public databases of coal quality information in the nation.

Since coal is an incredibly variable substance, an understanding of its quality and makeup is highly important to many applications. This database is critical in helping potential customers find the specific West Virginia coal to meet their needs. It is also used to help equipment designers understand the nature and variability of coal for use in heat generation and as chemical feedstock. Policy makers often call on the program's coal quality expertise to gauge the potential effects of legislation on the State's coal industry.

This year, additional samples were collected and analyzed, analyses were completed on stored samples, and values in the computer database were verified and/or corrected. A large number of analyses from records at the West Virginia Department of Tax and Revenue were added to the database.

- **Comparison of Mid-Carboniferous Floras**—Geologist B.M. Blake, Jr. is participating in a National Science Foundation (NSF)-funded research project to compare mid-Carboniferous fossil plant collections available from eastern Europe and North America to address questions relevant to vegetation responses during onset of a major glacial interval. Findings will be compared with vegetative patterns of change during the Pleistocene.

RESEARCH (CONTINUED)

Besides the benefits of increased understanding of vegetative evolution and distribution patterns during the Carboniferous, the work provides the opportunity to heighten public awareness of the severity of climatic oscillations recorded during an earlier period of earth's geologic history and the implications for the present day. W.H. Gillespie, paleobotanist, is also a cooperating scientist on the project. Lead investigators are Dr. H.W. Pfefferkorn of the University of Pennsylvania and Dr. R. Gestaldo, Colby College.

- **Derivative Map Project**—This is a pilot study using geologic data and other information to develop derivative maps to aid in the visualization of geologic hazards and other environmentally-related aspects in the areas of Jefferson and Berkeley counties east of 78 degrees west longitude, in West Virginia's eastern panhandle. Further work is planned as more digital geologic map data becomes available from the Digital Map Compilation Project.

- **Digital Map Compilation Project**—This project will produce geographic information system (GIS) data sets and digital maps of legacy geologic information. Currently, source material is limited to recent 1:24,000-scale published and open-file report maps deemed acceptable for inclusion in the data set. Line work for all maps is initially digitized at a scale of 1:24,000 and then generalized to a scale of 1:100,000 for inclusion in the National Geologic Map Database. Once this work is completed, attributes are assigned to geologic contacts, faults, and bedding orientations, thus completing the process of providing detailed data for inclusion in West Virginia's growing 1:24,000-scale GIS database.

To date, 1:100,000-scale digital data are available for 48 7.5-minute quadrangles located in the eastern panhandle. The more detailed 1:24,000-scale work is in progress, supported by matching funds provided by the U.S. Geological Survey's STATEMAP Program. Other work planned in this project includes digital compilation of any remaining acceptable 1:24,000-scale published or open-file report maps, a "maps-on-demand" printing and plotting system, compilation of the 1:250,000-scale West Virginia State Geologic Map, preservation of the 1:62,500-scale county report series geologic maps, and other early agency-published maps.

- **Generation of Oil and Gas Production Declines**—A study was undertaken for the Department of Tax and Revenue, Property Tax Division (WVDTR), to reevaluate the oil and natural gas production declines for producing wells in the State was completed. This study evaluated production histories for the past 24 years (and as many as 70 years for a small subset of data) for more than 70,500 wells. Data for 22 natural gas plays and 10 oil plays were delineated by the stratigraphic and geological controls in their formation. The results were presented to WVDTR for review and assessment. Survey staff prepared a Web-based application for presenting the decline ratios and graphs and associated maps of the plays.

- **Geographic Information System (GIS) Technical Support Center at West Virginia University (WVU)**—As part of the overall State GIS program, legislative funding was approved for the establishment of a GIS Technical Support Center at WVU, with general administrative oversight provided by the Office of State GIS Coordinator and direct management by WVU. The center

is responsible for the archiving, organization, and accessibility to public domain GIS databases created by the Mineral Lands Mapping Program (MLMP) and other State and federal agencies. It serves first in the capacity of a GIS clearinghouse, with training facilities and other services to be added in the future. Metadata, geospatial statistics, socioeconomic modeling, environmental monitoring, and public policy in the information age are among the GIS issues already being addressed by the facility.

- **Improving the Availability and Delivery of Critical Information for Tight Gas Resource Development in the Appalachian Basin**—Survey staff prepared and submitted a proposal to the U.S. Department of Energy for a three-year project to digitally scan geophysical logs for more than 13,000 wells in five selected tight gas plays. Selected regional cross sections and maps will also be scanned and georeferenced, and staff will create a Web portal application combining both well data and images including maps, cross sections, log traces, and core and thin section photos.

- **Mine Index**—The Mine Index is comprised of 7.5-minute topographic quadrangle maps tracking the State's surface and underground mine permits. This open-file database is very useful to coal operators, land owners, equipment salespeople, and many others.

- **Mineral Lands Mapping Program**—The Mineral Lands Mapping Program was initiated in 1995 as a pilot project to demonstrate the capabilities of geographic information system (GIS) technology within State government. The program is to redefine the process by which mineral resources in West Virginia, especially coal property, are evaluated and assessed for taxation purposes. The program uses the emerging computer technology of GIS in order to accomplish its goals and serves as the "GIS pilot project" for the State as proposed in the 1993 Plangraphics GIS Development Plan. The program's legislative mandate also states that progress be reported to county tax assessors.

With this program, West Virginia takes a lead role in applying GIS to natural resource assessment in the U.S. The program is unique in concept and vision and represents the most complex and comprehensive data development effort ever attempted within the public sector of state government to map geological and natural resource holdings.

The program is a collaborative partnership between the West Virginia Department of Tax and Revenue, Property Tax Division (DTR); the West Virginia University GIS Technical Support Center (WVU); and the West Virginia Geological and Economic Survey. The Survey has overall fiscal and managerial oversight of the program. Each partner agency is responsible for data development and project management corresponding to its particular jurisdiction and expertise. The Survey manages the Coal-bed Mapping Project. DTR administers the cadastral mapping and creation of the parcel database and will create the linkages to existing DTR assessment systems. WVU is responsible for creation of the GIS data layers to which the parcel and coal-bed maps will be geographically referenced. In addition to general program oversight, the Office of Statewide GIS Coordinator is responsible for coordinating data development activities with other local, State, and federal entities which will feedback into the work of the program. Auxiliary

RESEARCH (CONTINUED)

input from numerous other parties (including coal companies, county tax assessors, and other government agencies) will strengthen and promote the program as it matures over the course of the next several years.

The maps, GIS coverages, and databases generated will contribute significant added value to a wide range of information useful to others outside of the program.

- **National Coal Resources Data System (NCRDS)**—For nearly 20 years, the Survey has received grants from the U.S. Geological Survey's NCRDS program to build the West Virginia portion of a national computerized database dedicated to coal information. This database is used for a variety of investigations including the Coal Availability Study, but its use is not limited to cooperative federal projects.

Data acquisition, entry into Survey computer databases, and verification by Applied Coal Resources Investigations Program personnel are ongoing processes. Non-confidential data are uploaded to the NCRDS periodically. Stratigraphic database work accomplished under this effort directly benefits the Coal-bed Mapping Project.

This year, geologists took the opportunity to log 25 cores drilled by the private sector to gain insight into the geology and stratigraphy of areas not well known or understood. Additional funds were added to the Survey's cooperative agreement in support of the U.S. Geological Survey's Overburden Characterization for Prediction of Acid Mine Drainage Program. Funds were designated for continued mineralogical, elemental, and trace element analyses on cores drilled in previous years from laboratories at West Virginia University. Other funds supported compilation of mined areas in the Allegheny Formation coal beds in northern West Virginia and retrieval of oil and gas e-logs from Survey files that document deep coal beds that may have potential for coal-bed methane production.

- **Paleomegafloral Survey**–Geologist B.M. Blake, Jr. completed a report, **Preliminary Paleomegafloral Survey of the New River Gorge National River with Remarks on the Paleoflora of the Associated nearby Gauley River National Recreation Area and the Bluestone National Scenic River**, under contract to the U.S. National Park Service. He documented the historical collections of plant fossils that have been taken from the area, catalogued the fossil plant species found in the area, and targeted potential collecting sites. He also included information on the fossil vertebrates and invertebrates found in the area.

- **Petroleum Technology Transfer Council Project in the Appalachian Basin**—The result of a cost-shared effort by the U.S. Department of Energy (USDOE) and the petroleum industry to identify technical problems and their solutions in the production of oil and natural gas, the Petroleum Technology Transfer Council (PTTC) selected the National Research Center for Coal and Energy (NRCCE) at West Virginia University (WVU) to assist producers in the Appalachian basin region with production-related problems. The original five-year program was extended for another five years until 2008.

Goals for this fiscal year were to continue to develop and host focused technology workshops; continue a program of active outreach to build name recognition; and expand and add value to the regional Web site, including and on-line newsletter and an interactive geographic information system containing information on wells of particular interest (coal-bed methane, directional, historic, and new Trenton). The Survey participates in this program with the expertise and resources of its geologists and staff, and staff members played important roles in each of these areas.

The PTTC hosted or co-hosted eight workshops during the year, including two on the Ordovician Trenton and Black River exploration targets. Other workshops held during the year and relevant to the Trenton-Black River play included those on carbonates and fractured reservoirs. The coal-bed methane and Upper Devonian reservoir workshops focused on two very active plays currently being developed in the Appalachian Basin. Two safety workshops for well tenders were very well-attended. Geologist and Program Head K. L. Avary assisted with most of these workshops, and maintained the database of all attendees at PTTC-sponsored functions to be used for future mailings. Avary and Information Systems Coordinator J.M. Bocan hosted a webcast using Macromedia Breeze software and a conference call to demonstrate the interactive GIS Internet Map Service (IMS) on the PTTC Web site for members of the Producer Advisory Group. Compilation of a file of data for all cores available at the Appalachian Oil and Natural Gas Research Consortium member surveys began with the goal of adding a layer to the IMS.

Outreach consisted of setting up a PTTC exhibit at various meetings and giving talks at numerous oil and gas meetings. Exhibits were set up at the Eastern Section American Association of Petroleum Geologists annual meeting, and the Independent Oil and Gas Association of New York summer and fall meetings. The regional PTTC Web site was further expanded by Geologists R.R. McDowell and M.E. Hohn, and Information Systems Coordinator J.M. Bocan. New issues of the quarterly, on-line newsletter were posted.

D.G. Patchen was elected to the PTTC Board of Directors as the RLO representative.

- **STATEMAP Geologic Mapping**—The purpose of this U.S. Geological Survey annually-funded, competitive grant program is to produce high-quality, 7.5-minute quadrangle maps of West Virginia's geology. Mapping projects slated for completion in May 2005 were completed on time. Successfully submitted were proposals for two mapping projects for 2005-2006, and work commenced on the mapping three quadrangles.

Senior Research Geologist R.R. McDowell, Geologist and Program Head K.L. Avary, and Geologists J.Q. Britton and D.L. Matchen the completed open-file geologic map of the Fort Seybert (Pendleton County) 7.5-minute quadrangle.

Geologist G.H. McColloch, Jr. and Geologist/Hydrogeologist J.S. McColloch completed open-file geologic maps of the Osage and Rivesville (Monongalia County) 7.5-minute quadrangles and began mapping the Grant Town (Marion County) 7.5-minute quadrangle. This project is significantly different than most geologic

RESEARCH (CONTINUED)

field mapping in that the strategy to accomplish it is to use procedures based on these geologists' geologic field mapping and (GIS) experience.

Mapping begins with new, publicly available Coal Bed Mapping Program (CBMP) data. Coverages include boundaries of individual coals, gridded and contoured structure of individual coals, gridded and contoured thickness of individual coals, polygons of known coal seam discontinuities, and polygons of all known mining. Data-point locations are included in distributed CBMP data, but no descriptive attributes are included to address confidentiality issues. This project will have access to all coal-point data but must also adhere to the confidentiality law concerning coal data

Regionally important coal beds provide a framework for mapping. In some cases the major coals are mapping unit boundaries. Other coal beds are important marker beds. Also used are available oil and gas well data where appropriate.

Field mapping consists of both collecting new data utilizing standard field mapping techniques and field checking of existing coal data. New data include adding new exposures not included in CBMP databases and filling in gaps in CBMP data, typically where no coal is present, beds are less than 12-inches thick, or the area is out of state. Up-to-date National Aerial Photography Program (NAPP) photography and remote sensing software are used for mapping and 3-D editing.

The completed digital map and accompanying text and cross section(s) are initially available as an open-file report. Maps of the bedrock geology and other relevant themes are then produced for the final publication. The open-file reports are the first step in becoming formal publications in the Survey's newly developed digital production facility.

This project will also result in digital GIS data sets and maps conforming to newly adopted American Association of State Geologists guidelines.

- **Trenton-Black River Research Consortium**—In response to the interest in new, deep drilling to the Trenton and Black River carbonates in West Virginia as well as New York, the Survey worked with the other members of the Appalachian Oil and Natural Gas Research Consortium on the basin-wide study of these rocks. The study, which will result in the creation of a regional play book, was funded by the U..S. Department of Energy, and the two-year contract period began in September, 2003. The Survey's responsibility for this project is to create the database and GIS products as well as provide data on the West Virginia wells which penetrate this interval. Information Systems Coordinator J.M. Bocan has primary responsibility for the project Web site and database development.

- **Underground Mine Mapping Project**—Recognition of the value of underground mine compilations to mine safety issues, as highlighted by the Quecreek mine accident in Pennsylvania, resulted in closer cooperation and communication between the Survey and the West Virginia Office of Miners' Health, Safety, and Training (MHST). The two agencies formed a partnership and were successful in receiving funding from the U.S. Department of Labor, Mine Safety and Health Administration, to enhance mapping efforts. Funding was awarded

in 2003 and received in 2004. MHST is focusing on collecting and archiving maps of underground mines, while the Survey is accelerating compilation of mined areas in a geographic information system format. Mining compilation directly benefits mapping conducted under the Coal-bed Mapping Project.

This year, compilation of mining was completed in the Chilton coal bed in Logan County, and the Squire Jim, Pocahontas No. 2, No. 4, and No. 5 coal beds in McDowell and Wyoming counties. Also completed was compilation of mining in the Pocahontas No. 6, No. 6 upper split, and No. 7 in all counties of occurrence as well as compilation of mining in the Pocahontas No. 9 and Fire Creek coal beds in Wyoming County and the Powellton coal bed in Logan and Mingo counties. Initiated and continued was compilation of mining in the No. 2 Gas and Peerless coal beds in Mingo and Logan counties.

- **Water Use**—The Survey's past experience in collecting and compiling statewide water-use statistics as a cooperator in the U.S. Geological Survey's Cooperative Water-Use Program has been beneficial to the State. The 2004 passage of Senate Bill 163, the West Virginia Water Resources Preservation Act, directed the Secretary of Department of Environmental Protection (WVDEP) to conduct a water resources survey of consumptive and non-consumptive surface water and groundwater withdrawals in the State. Under article 22-25-3 (e), *all state agencies that have a regulatory, research, or other function relating to water resources, including, but not limited to, the state Geological and Economic Survey, the Division of Natural Resources, the Public Service Commission, the Bureau for Public Health, the Commissioner of the Department of Agriculture, the Office of Emergency Services, Marshall University, and West Virginia University may enter into interagency agreements with the secretary and shall cooperate by: (i) Providing information relating to the water resources of the state; and (ii) providing any necessary assistance to the secretary in effectuating the purposes of this article. The secretary shall determine the form and format of the information submitted by these agencies.*

Geologist/Hydrogeologist J.S. McColloch has been assisting WVDEP by serving in an advisory capacity to provide guidance and technical assistance in designing and developing water-use questionnaires to be used in the water-use survey, and in the interpretation of survey results.

Publications (**bold** names denote Survey staff)—

- **Avary, K.L.**, 2004, Recent coal-bed methane activity in West Virginia: Eastern Section American Association of Petroleum Geologists Annual Meeting, Abstracts, AAPG Search and Discovery Article 90031.

- Grote, T., **R.R. McDowell**, and **B.M. Blake, Jr.**, 2005, Preliminary observations of an Upper Devonian Hampshire paleosol sequence in the Catskill Clastic Wedge of West Virginia (abstract): **Geological Society of America Abstracts with Programs**, vol. 37, no.1, p. 71.

- **McColloch, G.H., Jr.**, West Virginia, 2005: *in* **Annual Review 2004: Mining, Exploration and Coal Overviews: State Summaries**, Society for Min-

RESEARCH (CONTINUED)

ing, Metallurgy, and Exploration, Littleton, CO, United States, Mining Engineering, vol. 57, no. 5, p. 124-127.

- **McColloch, G.H., Jr.** and **J.S. McColloch**, 2005, **Bedrock Geology of the Osage Quadrangle, Monongalia County, West Virginia, and Greene County, Pennsylvania**: West Virginia Geological and Economic Survey, Publication OF-0502, 1:24,000 scale.

- **McColloch, G.H., Jr.** and **J.S. McColloch**, 2005, **Bedrock Geology of the Rivesville Quadrangle, Monongalia and Marion Counties, West Virginia**: West Virginia Geological and Economic Survey, Publication OF-0503, 1:24,000 scale.

- **McColloch, J.S.** and **G.H. McColloch, Jr.**, 2004, Mapping the Morgantown North and South 7.5-minute quadrangles in preparation for growth (abstract): **Geological Society of America Abstracts with Programs**, vol. 36, no. 5.

- **McDowell, R.R.**, **K.L. Avary**, **B.M. Blake, Jr.**, T. Grote, and **D.L. Matchen**, 2005, Late Devonian marine-nonmarine transition in the Catskill Clastic Wedge: Curiouser and curiouser (abstract): **Geological Society of America Abstracts with Programs**, vol. 37, no.1, p. 71.

- **McDowell, R.R.**, **K.L. Avary**, **J.Q. Britton**, **D.L. Matchen**, **R.J. Diecchio**, **K.E. Hicks**, **L.C. Walkup**, **M.S. Burns**, and **P.J. Waggy**, 2004, **Bedrock Geology of the Fort Seybert Quadrangle, Pendleton County, West Virginia**: West Virginia Geological and Economic Survey, Publication OF-0408, 1:24,000 scale.

- **McDowell, R.R.**, **K.L. Avary**, and **D.L. Matchen**, 2004, A trace fossil useful for bedrock mapping—a unique concept? (abstract): **Geological Society of America Abstracts with Programs**, vol. 36, no. 5, p. 374.

- Repetski, J.E., R.T. Ryder, **K.L. Avary**, and M.H. Trippi, 2005, **Thermal maturity patterns (CAI and %R_o) in the Ordovician and Devonian rocks of the Appalachian Basin in West Virginia**: U.S. Geological Survey Open-File Report 2005-1078, 69 p.

- Rome Trough Consortium, Refined lithostratigraphy, eastern Kentucky and West Virginia: Eastern Section American Association of Petroleum Geologists Annual Meeting, AAPG Search and Discovery Article 90031.

- Seppi, J., J. Gianato, M. Levesque, and **C.A. Neidig**, 2004, Safety in numbers: the West Virginia Statewide Addressing and Mapping Project: **Proceedings of the URISA 2004 GIS in Addressing Conference**.

- Venteris, E., **K.L. Avary**, J. Bartley, D.A. Barnes, K. Carter, C. Garcia, P. Radhakrishan, and M.P. Solis, 2005, A Web-based decision support system for geologic carbon sequestration: American Association of Petroleum Geologists Annual Meeting, Abstracts, AAPG Search and Discovery Article 90039.

Administrative and Facilities Maintenance Projects

Administrative and Facilities Maintenance projects provide financial planning and management, personnel and employee benefits, purchasing, accounts payable, accounts receivable, and facilities maintenance services.

Financial Planning and Management

Financial planning and management provide direction and coordination for all administrative activities.

Program-based Budgeting—The agency's internal accounting system was modified as required to provide financial reporting summaries for the use of project managers. Monthly expenditure statements were generated for 15 general revenue, 11 federal revenue, and 18 special revenue projects. A total fiscal 2004-2005 agency budget, with amendments and reappropriations, of $5,232,502 was allocated to these projects and a $5,202,301 budget was developed for fiscal 2005-2006.

West Virginia Financial Information Management System (WVFIMS)—Receipt and disbursement processing on WVFIMS continued in fiscal 2004-2005 with a total of 1,342 transactions approved for entry. WVFIMS reports are reconciled with the agency's internal accounting system on a monthly basis.

Program and Project Support—Development continued on procurement and financial reporting procedures to adequately monitor and account for individual procurements made on the State Purchasing Card Program. In addition, the GIS financial reporting system was modified to meet fiscal reporting and monitoring needs of the program in fiscal 2004-2005. Budget planning support and assistance were given to numerous grant and contract proposals and limited-term special projects.

Personnel and Employee Benefits

In addition to payroll processing and employment record maintenance, this activity also provides explanation of benefits and assistance with such programs as insurance, health care management, and participatory retirement plans. The agency payroll as of June 30, 2005 consisted of 53 full-time and six part-time staff.

Purchasing

The purchasing function includes procurement processing, travel coordination, and fixed asset accounting. Over 625 requisitions and purchase authorizations were processed for the procurement of services, commodities, and operating expenditures in fiscal 2004-2005. In addition, over 175 travel expense accounts were prepared and 23 items were added to the fixed asset inventory.

Purchasing Card Program—Procurements via the State Purchasing Card Program accounted for 90 percent of the number of all purchases in fiscal 2004-2005. This program enables 12 authorized employees to make agency purchases on assigned VISA cards, as opposed to through the existing requisition/purchase

order procedure. Where applicable, the Purchasing Card Program has replaced all existing paper-based purchase and payment processing procedures for agency-level purchases of $2,500 or less.

Accounts Payable

Accounts payable is responsible for vendor payment processing and requisition and payment file maintenance. Over 1,340 transactions were submitted for payment on WVFIMS in fiscal 2004-2005. Of these, 22 (1.6 percent) were returned by the State Auditor's Office for clarification or correction, compared to 1.9 percent for all State agencies.

Accounts Receivable

A total of 157 invoices were generated in fiscal 2004-2005 for publication sales, geological services, facilities rentals, and contractual agreements. Collections from these sources for the year ended June 30, 2005 totaled $823,676, an increase of over 100 percent from collections of the prior fiscal year. VISA and MasterCard sales accounted for $43,841 of collections. Accounts receivable on June 30, 2005 totaled $2,612.

Administrative Services

Administrative services continued to provide support for routine agency operations in fiscal 2004-2005.

Reception/Telecommunications/Correspondence Processing—As the agency's initial point of contact, this activity received and transferred approximately 22,300 telephone inquiries and opened and routed to appropriate staff over 8,000 pieces of mail in fiscal 2004-2005. In addition, over 1,785 pieces of correspondence, forms, and documents were typed and prepared for further processing.

Facilities/Vehicle Scheduling—Conference areas were reserved for both staff and external use, subject to availability. No major upgrades of conference facilities were undertaken during the year. Vehicles leased from the State Travel Management Office are routinely scheduled for use by staff for travel purposes or are assigned for long-term usage to project field work. No additions or retirements were made to the fleet in fiscal 2004-2005.

Security and Custodial—Routine household cleaning and maintenance schedules have been maintained. No significant security issues arose during the year.

Library—The library is maintained as an in-house repository of earth science reference texts and technical journals. Services include receiving, cataloging, and storing publications, as well as maintaining staff loan records. In preparation of downsizing and relocating the library, a review of holdings was initiated in fiscal 2003-2004 and continued in fiscal 2004-2005. No additions were made to the library during the year.

Facilities Maintenance

Several building and grounds maintenance program improvements were initiated during the year. Surplus funds of $75,000 realized from contractual reimbursements were partially utilized for building and grounds upgrades. Work was completed to bring agency facilities into compliance with electrical standards. Site preparation for hookup of an electric generator purchased from the West Virginia Public Broadcasting Authority was completed. The generator was installed to prevent further extended downtime periods caused by frequent power outages.

The relocation of Computing Services and Computer Upgrades projects staff from the Education Center to the agency's office building was completed during the year. Work involved rehabilitation of office space and transfer of equipment and office furnishings.

No significant safety and fire issues were identified in an annual loss engineering inspection for the Board of Risk and Insurance Management. All previous deficiency findings were corrected during the preceding year.

ADVANCED GEOSCIENCE RESEARCH PROJECT

Michael Edward Hohn

Professional Activities/ Outreach

International Association for Mathematical Geology—Served Deputy Editor of the journal, *Mathematical Geology*, and book review editor for *Natural Resources Research*. Continue to serve as Chair of the Publications Committee.

American Association of Petroleum Geologists (AAPG)—Maintained the Web site for the Eastern Section, and served as the AAPG representative to the American Association for the Advancement of Science Section on Geology and Geography.

Ronald R. McDowell

Service

Public Service Requests—Examined and identified several rock and fossil specimens brought to the Survey by the public; valued a collection of rocks and fossils destined for donation to Fairmont State University; conducted a field trip on the geology along Corridor H near Baker for a freelance journalist writing an article for the Moorefield newspaper; and conducted two informational interviews with a reporter for a Morgantown radio station regarding the earthquake and tsunami in Indonesia in December 2004.

Manuscript Review—Reviewed abstracts and manuscripts generated by Survey staff.

Survey Web Site—Created and maintained pages on the Survey's Web site presenting the results of past and present STATEMAP project investigations, and maintained an alternative, emergency Web site for the Survey.

Professional Activities/ Outreach

Educational Outreach—Taught Historical and Environmental Geology at Fairmont State University in Fairmont, West Virginia for the 2004-2005 school year; served as an adjunct faculty member to the West Virginia University Department of Geology and Geography; and was a committee member for a master's thesis in Geology successfully presented and defended in May 2005.

Continuing Education—Attended a week-long short course on environmental geochemistry sponsored by the Extension Service of the University of Wisconsin.

Presentations/Exhibits—Co-authored a poster presentation the annual Geological Society of America Convention, Denver, CO; and co-authored two poster presentations for the Northeast Section Geological Society of America Convention, Saratoga Springs, NY.

Applied Coal Resources Investigations Program

Data Collection

Activities associated with the program's research projects result in the addition of abundant geologic data to the files. These include core logs; coal analyses; measured sections of outcrops, highwalls, and roadcuts; maps of underground coal mines; and a host of other important information. Most data collection throughout the year were associated with the Coal-bed Mapping Project.

Service

Service Requests—During the year, the program responded to numerous service requests from the general public, industry, academia, and government. The majority of requests were for information on mine subsidence and coal resources data, but requests for coal quality, mine index, and general geology information were also numerous.

Professional Activities/ Outreach

Committees—

- Geologist and Program Manager N. Fedorko continues serving on the steering committee for Underground Mine Mapping directed by the Interstate Mining Compact Commission. He helped plan and conduct a second workshop held in Pittsburgh, PA in June 2005.
- Geologist D.A. Jones served on a committee headed by the Office of Surface Mining to develop a curriculum for a technical training class in underground mine mapping with GIS.

Continuing Education—

- Geologist B.M. Blake, Jr. continued academic work in the doctoral program at West Virginia University (WVU).
- GIS Database Administrator K.J. Hutchinson, GIS Technical System Administrator F.L. Hutchinson, D.A. Jones, and Geologist A.J. Morris attended the 2004 ESRI User Conference, San Diego, CA.
- N. Fedorko, Geologists J.Q. Britton, K.L. Hatcher, N.T. Heilmann, D.A. Jones, J.E. Lewis, D. McConnell, B.L. Nugent, J.M. Sutton, GIS Database Administrator R.D. Binns, Jr., Programmer Analyst J.T. Snider, GIS Technician R.D. Lane, and State Geologist C.J. Smith attended the second Underground Mine Mapping Benchmarking Workshop, hosted by the Interstate Mining Compact Commission and the U.S. Department of Interior, Office of Surface Mining, Pittsburgh, PA.

Presentations/Exhibits—

- Participating in the Visiting Geologist Program at various State Parks were Geologists J.Q. Britton, B.L. Nugent, R.J. Johnson, J.M. Sutton, and S.E. Gooding.
- J.Q. Britton lead field trips to Coopers Rock State Park for four different high school junior class groups from Brooke and Marshall counties, and taught a mineral identification class to 138 eighth graders at Edison Junior High School, Parkersburg.
- B.L. Nugent led a Marshall County High School science class through the Sinks of Gandy cave system. He also led an ecology class from Montgomery County (PA) Community College through the Sinks of Gandy and lectured on the geology of the Spruce Knob and Seneca Rocks areas.

- N. Fedorko made a presentations about the Coal-bed Mapping Project and the Underground Mine Mapping Project at various locales including the West Virginia Mine Safety Innovation Conference, the West Virginia University Geology Department, the West Virginia Coal Associations Annual Mining Symposium, the West Virginia Assessors Association, and the Underground Mine Mapping Workshop.

Applied Oil and Gas Resources Investigations Program

Data Collection

Oil and Gas Database—For over 35 years, the Survey has been proud of the fact that it has developed and maintained the most comprehensive, dynamic, public-domain oil and gas database in the Appalachian basin. This year, data for newly permitted and newly drilled wells, and monthly and annual production, were added, and existing data were continually used and enhanced in the course of routine work, research and service requests. In addition, Geologist and Program Manager K.L. Avary continued to add data to the tables and files that are available on the Survey's Web site for new activity in coal-bed methane and the Trenton.

Core and Sample Library—Industry geologists visited the warehouse to examine Devonian shale cores and cuttings, as interest in these reservoirs continued. A student from East Carolina University examined Berea cores for part of her thesis research.

Well Log Library—Some logs were donated by companies. Many well logs were scanned and .tiff files of the scanned images made available to customers on CDs.

Service

Service Requests—During the year, the Applied Oil and Gas Resources Investigations Program responded to more than 100 requests per month received through phone calls, e-mail, letters, and personal visits for completion, stratigraphic, production, well location, and other data.

Academia—

- Chief Geologist D.G. Patchen and K.L. Avary continued to serve as Adjunct Professors of Geology in the Department of Geology and Geography at West Virginia University (WVU).
- K.L. Avary, and Geologist R.R. McDowell, worked with two K-12 teachers while doing STATEMAP project field work. The teachers, veterans of the RockCamp and Geoteach programs, were an integral part of the STATEMAP mapping team. In addition, an undergraduate geology major at WVU also worked with the STATEMAP team, gaining valuable field geology experience.
- K.L. Avary served as faculty advisor for the WVU American Association of Petroleum Geologists (AAPG) Student Chapter.
- D.G. Patchen continued to participate in the Visiting Geologist Program of the AAPG.

Oil and Gas Reports—Reports and data were submitted or presented to the Independent Petroleum Association of America, and the Energy Information Administration of the U.S. Department of Energy.

Sponsored Symposia—Survey geologists participated in several of the Petroleum Technology Transfer Council (PTTC)-sponsored workshops. The response to the well safety workshops for well tenders was again as great as it had been the year before. In addition to the well safety workshops held in Meadville, PA and Zanesville, OH, a coal-bed methane workshop was held in Morgantown; a workshop on fractured reservoirs was held in Columbus, OH; "Carbonates 101" took place in Washington, PA; Upper Devonian gas reservoirs was the subject of a workshop in Morgantown; the Trenton/Black River carbonates were the subject of two workshops: one to examine a core taken near the "lightbulb" hydrothermal dolomite body exposed in a road cut near Lexington, KY, and the second workshop

in Albany, NY allowed an opportunity to examine Trenton/Black River cores in the morning and an outcrop analog of a hydrothermal dolomite body in the afternoon. D.G. Patchen, as PTTC Program Manager, is responsible for coordinating all of these workshops, which totaled eight this year. Several hundred geologists, petroleum engineers, and other petroleum industry professionals attended these workshops, designed to increase awareness of new technology which can be used in the oil and gas industry.

Professional Activities/ Outreach

Committees—

- K.L. Avary served on the Honors and Awards Committee of the Eastern Section AAPG and as the Exhibits and Outreach Chair for the AAPG Energy Minerals Division. She is a member of the AAPG Student Job Quest and Youth Education Activities committees and the AAPG Committee on Committees.
- K.L. Avary is the delegate elected to represent the Appalachian Geological Society, and D.G. Patchen is the delegate elected to represent the Pittsburgh Association of Petroleum Geologists in the AAPG House of Delegates. K.L. Avary served as the Eastern Section representative on the House of Delegates Resolutions Committee. D.G. Patchen served as the Eastern Section representative on the House of Delegates Nominations Committee.
- D.G. Patchen is the Eastern Section Councillor for the AAPG Energy Minerals Division, and a member of the AAPG Membership Enhancement Development Committee. He also was a candidate for AAPG Vice-President. Patchen represents West Virginia on the Potential Gas Committee, a group funded by the American Gas Association and company donations. He serves as the Appalachian Basin Chairman for the Potential Gas Committee. During the year, the Potential Gas Committee released a new report which contains estimates of the nation's remaining gas resources and reserves.
- K.L. Avary is the General Chair for the 2005 meeting of the Eastern Section AAPG, Morgantown. Also serving on the organizing committee for the meeting are Deputy Director M.E. Hohn, technical program chair; Senior Research Geologist R.R. McDowell, field-trip chair; Programmer Trainee S.C. Kite, registration chair; Geologist/Hydrogeologist J.S. McColloch, judging chair; Geologist G.H. McColloch, Jr., assistant judging chair; and D.G. Patchen, workshop chair and hotel liaison. The Survey is co-hosting the meeting with the Appalachian Geological Society.
- D.G. Patchen and K.L. Avary attended the annual AAPG meeting in Dallas, TX to participate in committee and section business meetings. Patchen also attended AAPG Leadership Days, Tulsa, OK.
- G.H. McColloch, Jr. served as Chairman of the AAPG Energy Minerals Division Honors and Awards Committee. He served as a member of the joint U.S. Geological Survey (USGS)/American Association of State Geologists Data Capture Working Group. This committee organizes the annual Digital Mapping Techniques Conference and other projects relevant to geologic data capture, display, and dissemination. McColloch also is the Survey's contact for the USGS-hosted National Geologic Map Database project. In addition, McColloch served as one of six state survey members of the North American Geologic Map Data Model Steering Committee. This committee is made up of representatives from state surveys, the U.S. Geological Survey, the Geological Survey of Canada, and Canadian provincial surveys. The committee's charge is to develop a uniform geologic map data model for North America and shepherd it

through relevant processes to become an international standard. In the U.S., this will involve the data model becoming a Federal Geographic Data Committee standard.

Presentations/Exhibits—

- The Appalachian Oil and Natural Gas Research Consortium has a contract to implement the PTTC project in the Appalachian basin. As a full consortium member, the Survey has an obligation to participate actively in outreach efforts to make producers more aware of PTTC and the workshops. Consequently, D.G. Patchen attended various meetings to make presentations, promote upcoming workshops, put up displays, or distribute information packets about the PTTC program. These meetings included the Eastern Section AAPG, Columbus, OH.; PTTC Regional Lead Organization Directors meeting, Houston, TX and Washington, DC; and the Independent Oil and Gas Association of New York, Clymer, NY and Niagara Falls, Ontario.
- K.L. Avary presented a talk on recent coal-bed methane permitting and drilling activity in West Virginia at the annual meeting of the Eastern Section AAPG, Columbus, OH, and a talk at the PTTC workshop on Upper Devonian drilling and production activity. Programmer/Analyst S.E. Pool and Database Administrator J.T. Saucer were co-authors.

Computing Services and Computer Upgrades Projects

Data Activities & Computing Operations

Oil and Gas Data System—

- Development of the Oil and Gas Data System continued. Work began on the integration of the database with ArcSDE to create a spatial component to the data. Data fields were modified as necessary to optimize queries. Lookup tables and formatted screen programs were updated, forms were updated, and data-in/data-out tools were developed
- Well-specific production data for 2003 were received, evaluated, edited, error-checked, and analyzed prior to being written into the database. Monthly production data records for more than 48,300 wells were added to the database this fiscal year.

Oil and Gas Data System Applications—

- ESRI shapefile maps showing the locations of coal-bed methane wells and recently-permitted Trenton and deeper wells were updated for the Web site to reflect current permitting and drilling activity in the State.
- Work continued on the development of an oil and gas IMS application.

Survey Computing Operations—

- The agency's local area network provides connectivity for all platforms, intra-agency communication, and Internet access through a wide area network telecommunications link. Considerable effort was concentrated into the management of the agency-wide computer network of servers, workstations, and PCs. In order to improve operations, the data circuit was moved, two new switches were purchased and installed, and several new servers were purchased and installed. Firmware updates were made to various network components.
- Network-based full and incremental backups of systems were run. Back-up processes were modified and improved. Maintenance agreements were initiated or renewed, as necessary. Security patches on servers were regularly updated. Updates to the enterprise edition of anti-virus software were regularly uploaded to PCs. Re-cabling of the Mont Chateau complex continued, with the installation of several new cable runs; construction of patch cables; and installation of rails, boxes, and faceplates in offices. Project staff handled numerous PC installations, repairs, upgrades, troubleshooting efforts, and operational issues.

Service

Service Requests—

*Project staff responded to more than 200 external requests for data or queries about basic data during this fiscal year. The public-access ***"pipeline"*** system has continued to off-load many common and simple requests for basic oil and gas well data to the users themselves, leaving staff with time for other jobs and projects.

*The Survey's e-mail-based INFO-line and the webmaster e-mail account on the agency's Web site continued to field a wide variety of requests for information, with more than 160 requests for information coming in via those methods. The INFO-line e-mail address is **info@geosrv.wvnet.edu**. These requests were forwarded to appropriate agency staff for response.

Web Site Development—

- Development and maintenance of the agency's Web site are ongoing efforts. The Web site contains sections on West Virginia geology; data and maps; the Survey's research, information services, and outreach programs; an interac-

tive coal bed mapping facility; geoscience education; a "virtual" mini-museum; an interactive topographic map index; extensive frequently asked questions (FAQs); the publications catalog; articles of general interest to the public and geologists; and the visiting geologists schedule at State Parks. Also included are feature articles and links to related sites of interest. A new Web service this year contains scanned images of West Virginia mine maps and geophysical logs for some oil and gas wells. A Web development team guides the operations of the site.

- The Internet Map Server (IMS) software displays map products (especially coal-bed coverages) developed in the Survey's Geographic Information System (GIS) Program and the locations of coal-bed methane wells and Trenton deep gas wells. A searchable database of the summary oil and gas and coal production data by county and by year is updated annually.
- Site content is tested on various versions of different Web browsers to ensure a consistent appearance, and is checked for accessibility. Servers are backed-up regularly. System logs are monitored to ensure proper operation of the site. Links are checked regularly and the site is edited periodically to keep the information current. Usage summary statistics are run monthly. This fiscal year, the agency saw an eight-percent increase in visitor sessions and a 40-percent increase in downloaded files. This "cyber-service" is free to Internet users at the Survey's Web address, http://www.wvgs.wvnet.edu. To increase awareness, several topical links to the Survey Web site were posted on the State Web portal.

Public Access *"pipeline"* to the Oil and Gas Data System—The agency's popular ***"pipeline"*** service for access to oil and gas well data was rebuilt and redeveloped this year from a limited account-based format to a Web-based application, greatly increasing its accessibility, availability, and ease of use. This service provides public access to the Survey's 135,000-well database of oil and gas well completion, location, geological, production, plugging, and log, sample, and core data, developed over the past nearly four decades. Accessing the Survey's Oil and Gas Data System, the information contained in ***"pipeline"*** can be used as a tool to support industry, government, and public needs for geologic, geographic, production, and other relevant data on these wells.

Currently, access is provided only to well-specific data. Users can search for information in any of the data types/domains based on the API number (county code and permit number). Queries for wells meeting specific user-defined criteria or for the downloading of files can be completed by agency staff, with results being forwarded to the user as ASCII or Excel files. Modest fees are charged for customized data searches.

WVGES Oil and Gas Well Data for West Virginia–The Survey's oil and gas well data are being made available for purchase as a digital publication on CD to be a tool to aid in the exploration and development of the Mountain State's oil and gas resources, and in the understanding of the State's subsurface geology. Data on more than 135,000 completed and permitted oil and gas wells are contained on the CD, in both Microsoft Access® format and eight ASCII tables. The data can be used to support industry, government, and public needs for geologic, geographic, and production data for oil and gas wells in the State.

COMPUTING SERVICES AND COMPUTER UPGRADES PROJECTS (CONTINUED)

Released as Digital Data Series-5 (publication DDS-5, **WVGES Oil and Gas Well Data for West Virginia**), these files are designed to be used in a relational database system. The files, however, can be adapted for use in other types of systems or used individually. Updates are planned for release semi-annually.

Agency Intranet—Development and expansion of the Survey's Intranet continued this fiscal year, with a team of agency staff guiding the application. Among the applications operational on the Intranet are administrative forms, employee information, agency policies, price lists, the agency calendar, Web site usage statistics, job vacancies, program-specific information, and downloadable software.

Administrative Data Systems—

- Financial Accounting System: Modifications were made to customize this system for the 2005 fiscal year budget and accounting procedures, the statewide Financial Information Management System, and new accounts. Databases were updated as necessary.
- Leave Accounting System: Individual staff summary reports were generated periodically. Databases were updated as necessary.

Professional Activities/ Outreach

Committees—

- Geologist and Project Manager M.C. Behling serves as the Bureau of Commerce Chief Information Officer in coordinating information technology among the Bureau's agencies. She represents the Bureau on the State Information Technology Council (ITC), serves on the ITC's Internet Committee, and is on the Information Services and Communication's IPUG Committee. Behling is also an adjunct faculty member in the West Virginia University Department of Geology and Geography.

Continuing Education—

- M.C. Behling attended a Gartner Group information technology presentation on PCs; several vendor presentations on information technologies and products; and several Information Services and Communication presentations on State information technology contracts, Charleston. Behling also attended the Intermediate PowerPoint, Intermediate Excel, and Advanced Excel software short courses at West Virginia University.
- M.C. Behling and Database Administrator J.T. Saucer attended an ESRI User's Group meeting, Morgantown.

Presentations/Exhibits–

- M.C. Behling and Associate State Geologist M.E. Hohn presented "West Virginia Oil and Gas Production Declines—Overview of the 2004 Study" at the 2004 State Property Tax Seminar, Flatwoods.

General Geoscience Program

Data Collection

Activities associated with the General Geoscience Program's service and research require continuous collection and analysis of significant amounts and types of data. Computerized databases for limestone, springs, maps, and geographic information are maintained. Additional information and materials are available for nonfuel minerals, geologic hazards, map information, and a host of other topics that fall within the expertise of the program.

West Virginia Mineral Industries Directory—Information was collected in preparation for the next edition of this biennial directory which lists the name, address, phone number, commodity produced, county of operation, permit number, and other key information for approximately 1,200 companies that obtained or maintained mining or drilling permits during the most recent two-year period in West Virginia. The directory also contains maps and graphs depicting geographical and historical trends in the State for the following commodities: coal, oil, natural gas, natural gas liquids, limestone, sandstone, sand and gravel, clay and shale, peat, and salt.

Service

Service Requests—The General Geoscience Program responds to service requests from industry, government, the general public, and academia. As the responsibilities of the program are to address all geologic and geographic matters not directly related to West Virginia's fossil-fuel resources, the scope of service activities is quite diverse. These areas of expertise fall into these general categories:

- Economic Minerals (limestone, dolomite, sandstone, sand and gravel, clay and shale, salt, peat, etc.).
- Environmental Geology (flood hazards, landslides, karst geology, radon, seismicity, etc.).
- Water (ground- and surface-water hydrology, water resources, water supply, water quality, water use, springs, etc.).

Economic Minerals Geoscience Project—The Survey receives frequent requests for geological information related to the potential development and uses of the State's limestone, dolomite, sandstone, salt, clay, shale, and sand and gravel, and other resources. The project maintains an expertise on these topics, constantly updates information files, and gives consultations when requested.

Environmental Geoscience Project—Each year, floods, landslides, subsidence, radon, and various other geologic hazards cause problems or concerns for many West Virginia citizens and businesses. Project staff provide information about what causes these problems and how they might be avoided or mitigated. Information about possible geologic hazards associated with a particular location for a building or development site is also provided by the project.

Water Project—Citizens, educational groups, industry, and government agencies frequently request information about various aspects of surface- and ground-water hydrology. Project staff provide information and assistance on such topics as springs, water quality and quantity, water availability, and water supplies and supply systems.

Earthquake Monitoring Station—In cooperation with the U.S. Geological Survey (USGS), a state-of-the-art earthquake monitoring station is maintained at the Survey's Mont Chateau headquarters. The station, linked by satellite to the National Earthquake Information Center in Colorado, monitors earthquake activity in West Virginia and throughout the world.

Visiting Geologist Project—In cooperation with the State Division of Tourism and Parks, the Survey conducts the popular Visiting Geologist Project at State Parks and other facilities throughout West Virginia. A Survey geologist or staff member presents a geologic talk and interpretive walk to park guests and local residents. This year, the project provided Survey staff as guest speakers and walk leaders for 13 parks where over 350 visitors participated.

Service Highlights—

- Geological Reports: Geological reports were prepared for proposed housing development sites. A service fee recovered costs.
- Facility Siting Information Packets: These packets are prepared to provide geological information in advance of development. Packets include information on mining activity and mineral resources, oil and gas drilling, flood-prone areas, hydrogeology, and environmental geology. A service fee recovers costs.
- Industrial Minerals: Numerous companies and consultants were assisted with information on the State's industrial minerals ranging from limestone deep-mining potential, to information on resources for cement and aggregate production, to data on producers and production quantities.
- Limestone for Air Quality Control at Coal-Fired Power Plants: Numerous companies were assisted with requests for information on the chemical composition, geographic location, and stratigraphic position of West Virginia limestones and dolomites which would meet specifications as sorbents in fluidized bed combustion or emission clean-up.
- Geoscience Education: Activity-oriented geology presentations and field trips were conducted for several school visits; some RockCamp graduates were given assistance in conducting their own field trips.
- Document Review: Staff members reviewed and provided comments on a variety of documents including research proposals, design memoranda, environmental assessments, reports, environmental impact statements, plans, and draft publications for federal and State agencies, intergovernmental committees, and other groups.
- Water-well Siting: Staff members assisted other State agencies in siting water wells at State facilities.

Professional Activities/ Outreach

Committees and Advisory Groups—

- Geologist/Hydrogeologist J.S. McColloch and Engineering Technician/Surveyor P.R. Liston serve as agency coordinators to the West Virginia Office of Emergency Services. They respond to situations requiring geological and geographic expertise, and assist the office in emergency preparedness and mitigation programs.
- J.S. McColloch represented the Survey on the Natural Stream Work Group for the Canaan Valley Institute, the Appalachian States Coalition for Geological Hazards in Transportation Committee, and the West Virginia Source Water Assessment/Wellhead Protection Program Review and Liaison Committee. She served as a member of the American Association of Petroleum Geologists (AAPG) 100th Anniversary Committee, the AAPG Division of Environmental Geosciences (AAPG/DEG) Advisory Board, and served as an associate editor for the AAPG/DEG's peer-reviewed journal *Environmental Geosciences*. She was elected AAPG/DEG President-Elect (2005-2006) and attended the annual AAPG meeting, Calgary, Alberta.

Continuing Education—J.S. McColloch attended the Geological Society of America annual meeting, Denver; the AAPG annual meeting, Calgary, Alberta; the Geological Hazards in Transportation in the Appalachian Region Technical Forum, Columbus, OH; and the Digital Mapping Techniques Conference, Baton Rouge, LA. She also attended the Third Annual West Virginia Water Conference, Roanoke, WV.

Awards—J.S. McColloch received the AAPG Eastern Section Honorary Membership Award, Pittsburgh, PA.

Presentations/Exhibits—J.S. McColloch and Coal Geologist and Statistician G.H. McColloch, Jr. presented "Mapping the Morgantown North and South 7.5-Minute Quadrangles in Preparation for Growth," at the Geological Society of America annual meeting, Denver, CO.

GEOGRAPHIC INFORMATION SYSTEM PROGRAM

A state-level Geographic Information System (GIS) program in West Virginia was first proposed in 1992. Governor's Executive Order 04-93 authorized the program. A funding proposal for GIS implementation was presented to the Legislature and approved under House Bill 2222 in February 1995, with a recommended annual operating budget of $2 million. This funding provided for the establishment of a State GIS Coordinator, the GIS Technical Support Center, and a GIS pilot demonstration project. The program's fiscal, administrative, and managerial responsibilities reside with the West Virginia Geological and Economic Survey. The fiscal 2005 funding level for the GIS program was about $1.6 million.

A research agenda is incorporated into the overall scope of the Office of State GIS Coordinator. The objective is to implement a statewide GIS program that will develop a comprehensive, standardized, public domain computerized digital cartographic database to be shared and used by government agencies, the general public, and the business community in order to modernize and improve decision-making processes at all levels for the benefit of West Virginia society. This implementation is being done in partnership with all State, federal, county, and municipal governments, and in cooperation with private industry. More specific tasks include:

- Coordinate various GIS initiatives and projects between State agencies and other government entities.
- Monitor ongoing initiatives such as consultant activities and agency projects.
- Answer general inquiries about the GIS program in West Virginia.
- Develop databases that support GIS applications with the greatest utility for multiple organizations.
- Facilitate access to data and GIS functionality by multiple users.
- Pool financial, staff, and technical resources to build the State GIS.
- Establish and enforce data standards to facilitate use of information that may be used by different organizations.
- Improve the quality, availability, and equitability for access and dissemination of geographic information to support decision-making and management
- Minimize duplication of effort of State agency funding and labor.
- Demonstrate the use of GIS to increase the productivity of State agency management and staff regarding their daily operations and standard procedures.
- Promote and publicize West Virginia GIS activities within and outside the State.
- Foster geographic education and professional career development in geospatial technologies.

The State GIS Steering Committee organizationally represents this mission at the agency level. The State GIS Coordinator, C.A. Neidig, reports directly to the Deputy Director and Associate State Geologist of the Survey. In July 2002, the Survey hired an Executive Assistant, L.A. Cielensky, to assist the State GIS Coordinator with office duties.

Data Collection

The Office of State GIS Coordinator is not directly responsible for the development or collection of digital data for incorporation into any specific GIS project. However, the Coordinator is responsible for the promotion and implementation of GIS activities that integrate all levels of data development and varying types of GIS applications within the State. There are several ongoing GIS database initiatives in which the Coordinator plays a principal role, primarily through the purchase of existing data sources or allocating funds for contractual and consulting activities:

Mineral Lands Mapping Program (MLMP)—The State GIS Coordinator provides general administrative oversight of the program, which is providing data development and advanced computer mapping capabilities in support of tax reassessment and valuation of the State's coal-bearing properties and other natural resource ownership. Four major data development projects are subsumed under the program: the Coal-bed Mapping Project (CBMP) at the West Virginia Geological and Economic Survey, the Digital Line Graph (DLG) Development Project at the GIS Technical Support Center at West Virginia University (WVU), the Mineral Parcel Mapping Project (MPMP) at West Virginia Department of Tax and Revenue (WVDTR) and the Reserve Coal Valuation Model (RCVM) at WVDTR. The goal of the program is the creation of a consistent and standardized GIS database at 1:24000 scale covering the entire State. The data development activities of the program serve as the foundation for other GIS activities in other State departments and agencies, and also at the federal, county, and local level. During fiscal 2005, the DLG coverages for the State were completed by WVU. Creation of digital parcel map layers and the coal-bed geometry continued in the southern coal field counties of the State ths year.

West Virginia Statewide Addressing and Mapping Board—In October 2001, C.A. Neidig was appointed to the West Virginia Statewide Addressing and Mapping Board (WVSAMB) by the Governor. He was selected as Board Chair in November 2001 and continues to serve in that capacity, chairing 10 meetings of the WVSAMB in fiscal 2004. The WVSAMB received a $15 million grant from Verizon Corporation to complete the mapping and addressing work needed to improve Enhanced 9-1-1 (E9-1-1) services for the State's emergency response providers. Duties include annual budget preparation and fiscal oversight, chairing board meetings, providing presentations, preparation of requests for proposals and evaluation of bidders' responses, preparation of legislative rules, correspondence and other documents, oversight of contractors, and other duties as required. The WVSAMB selected a Project Manager, Michael Baker Jr., Inc., in September 2002 and a mapping contractor, BAE Systems, Inc., in January 2003. An addressing contractor, microDATA GIS, Inc., was selected in December 2003. Delivery of digital orthoimagery and planimetric files was completed in July 2004. The addressing deliverables are due January 1, 2007. The WVSAMB is scheduled to sunset in April 2007. For further information, the WVSAMB Web site is **www.addressingwv.org**.

West Virginia GIS Technical Support Center—C.A. Neidig worked with staff of the GIS Technical Support Center on the development of cooperative projects and cost-share agreements with Federal agencies such as the U.S. Geological Survey and Department of Homeland Security. He also worked with

GEOGRAPHIC INFORMATION SYSTEM PROGRAM (CONTINUED)

staff on mapping and GIS issues related to critical infrastructure data requirements and digital tax parcel mapping standards, Federal Emergency Management Agency flood mapping, and others.

Service

Service Requests—During the year, the State GIS Coordinator responded to dozens of requests for information regarding the GIS program from the general public, industry, academia, and government. Most were for general information, such as availability of aerial photography and digital orthophoto quadrangles, status of MLMP data development, status of the WVSAMB, agency GIS activities, and State GIS program history. C.A. Neidig provided general information and assistance for computer system design specifications; request-for-proposal/ quotation development; and GIS data requirements for the WVSAMB, several State agencies, and counties. He also met with various county and local officials, Federal agencies, representatives from utilities and industry, and GIS vendors and consulting firms, to discuss potential data development and cost-sharing opportunities with the State.

Publications—C.A. Neidig prepared updates to the GIS Coordinator section of the **2001-2005 West Virginia Information Technology Plan**, published by the Governor's Office of Technology. Neidig also assisted in preparation of budget descriptions and performance measures for the GIS program section of the Survey's fiscal 2006 budget request. He assisted with budget preparations and presentations at the fiscal 2006 Executive and Legislative budget hearings for the Survey, and prepared several presentations for various meetings. His paper, "West Virginia Statewide Addressing and Mapping Project (2004 Update)," was included in the **Proceedings of the URISA 2004 GIS in Addressing Conference**.

Professional Activities/ Outreach

Committees and Advisory Groups—C.A Neidig serves as Chair of the National States Geographic Information Council (NSGIC) Communications Committee and is the NSGIC representative on the National Digital Elevation Program Steering Committee, and lead on the NSGIC Census/Title 13 Work Group. He is a member of the Urban and Regional Information Systems Association (URISA) and the American Society for Photogrammetry and Remote Sensing. He represents West Virginia on the Federal Geographic Data Steering Committee and is an associate or affiliate member of Miss Utility of West Virginia (One Call), the West Virginia Association of Land Surveyors, the West Virginia E-911 Council, and the West Virginia Association of Counties. Neidig is a member of the West Virginia Information Technology Council (ITC) and serves on the ITC Personnel Subcommittee. He also serves on the Bureau of Commerce Information Technology Committee, is Chair of the State GIS Steering Committee, and serves on the State Mapping Advisory Committee. He also has served as a judge at the annual West Virginia Geography Bee since 2001.

Continuing Education—C.A. Neidig participated in sessions at the following conferences and meetings of GIS professionals: URISA GIS in Addressing Conference, St. Louis, MO; NSGIC 2004 Annual Conference, Austin, TX; and NSGIC Leadership Retreat, Shepherdstown.

Presentations/Exhibits—

- C.A. Neidig presented "WVSAMB Update" at the Miss Utility of West Virginia Annual Meeting, Davis, and at the ACECWV Luncheon, Charleston.
- Executive Secretary L.A. Cielensky and C.A. Neidig staffed the WVSAMB exhibit booth at the West Virginia Association of Counties Annual Meeting, Charleston.
- C.A. Neidig and J. Seppi presented "WVSAMB Update" at West Virginia GIS Day, Charleston, and a briefing, "WVSAMB Overview," to the West Virginnia Department of Transportation, Charleston.
- C.A. Neidig, J. Seppi, J Gianato, and M. Levesque presented "Safety in Numbers: The West Virginia Statewide Addressing and Mapping Project" at the URISA GIS in Addressing Conference, St. Louis, MO.
- C.A. Neidig and K. Dondalson of WVU presented "West Virginia Hi-Res Elevation Project" at the U.S. Geological Survey National Elevation Program Summit, Denver, CO.
- P.R. Liston, L.A. Cielensky, and C.A. Neidig staffed the Survey's exhibit booth at the West Virginia Expo, Charleston.
- C.A. Neidig served as a judge at the West Virginia Geography Bee, Charleston.

GEOSCIENCE EDUCATION PROGRAM

The Geoscience Education Program is now in its second decade of providing professional development "teacher experiences" to West Virginia's kindergarten through 12th-grade (K-12) science teachers. Unique education initiatives in geology continue to be developed and presented. These include a variety of cooperative programs, meetings, presentations, field trips, and workshops. The main goals of the Geoscience Education Program are to increase general citizenry awareness of earth science in general, and of the Geological and Economic Survey in particular. These are accomplished by encouraging and helping the program's primary audience—teachers and students—to formally and informally share their new-found understanding of how earth science is relevant to daily economic, social, political, environmental, and educational activities and issues, and to encourage the use of the Survey as a resource for geologic data, expertise, and outreach services. To facilitate these accomplishments, classroom-useful activities and lessons are developed. In addition, improved and updated information on a broad spectrum of West Virginia geology is distilled and modified for actual classroom implementation. Development and evaluation of these materials and activities are carried on through a network of contractual and volunteer work involving private, government, business, and educational facilities.

Service Requests—

- The Geoscience Education Program responds to numerous requests to visit classrooms, lead field trips, conduct tours of the Geological and Economic Survey, provide referral for educational equipment and publications, discuss classroom teaching strategies, and arrange professional outreach opportunities. Education Specialist T.E. Repine, Jr. works closely with faculty from West Virginia University and Fairmont State University to ensure Survey materials and training are appropriate to current educational pedagogy.
- This fiscal year, the total number of service requests (teacher experiences, mail, telephone, fax, and e-mail) rose to 958. This is an average of 79 per month, or four per working day. This increase can be attributed to restoration of the program's budget by the State Legislature.

Outreach—The cumulative number of provided "teacher experiences" since 1992 now stands at 7,666. (One professional development "teacher experience" represents outreach and assistance in the form of a time-intensive workshop, field trip, professional presentation and/or publication opportunity to a single teacher.) These contacts have resulted in the indirect transfer of awareness of the Survey and an appreciation of the relevance of geological knowledge to more than 153,000 classroom students in all 55 counties.

RockCamp—

- Under the direction of T.E. Repine, Jr., the Survey's RockCamp project has become the keystone to the agency's efforts to increase public appreciation for the earth sciences. Changes in educational pedagogy, improvements to facilities, and consolidation of personnel and paperwork have made the project one against which others are compared. The Survey's' full-time Education Specialist position has been copied and implemented by other state geological surveys. RockCamp addresses a critical need of West Virginia teachers by providing a on-going and permanent program which presents them with ideas allowing

and encouraging development of classroom-useful lessons. In response to changing educational philosophy, RockCamp also provides participants with educational sessions lead by award-winning educators addressing current ideas in teaching and evaluation, and utilizes the many areas of expertise found among Survey staff.

- Continuation of the program has been made possible through sound fiscal management of the original grant and by competitive grants awarded by the West Virginia Higher Education Policy Commission. The West Virginia University (WVU) Department of Geology and Geography and Science Education faculty from Fairmont State University have played an important role in the project's success. Several RockCamp participants have obtained sufficient knowledge and experience that they now work as summer interns with Survey field mapping crews.

Funded Projects—This fiscal year, the Geoscience Education Program received three grants. The first was a No Child Left Behind grant (Grant # ITQ-05-GEOCATS). The amount awarded was $47,139. The second awarded grant was also a No Child Left Behind grant (Grant #ITQ-05-MSTC GLOBE) for $50,000. The third grant was provided by the GEAR-UP Program and was for $3,880. All three grants were awarded after competitive review. T.E. Repine, Jr. served as Project Director for all three. The grants will conclude in fiscal 2006. These grants were a direct result of increased general revenue funding that made matching funds available.

Professional Activities/ Outreach

Committees—T.E. Repine, Jr. is serving his final year as National Councilor-at-Large for the National Association of Geology Teachers and was elected to serve on that organization's National Executive Council. He is also President of the 12-county North-central West Virginia Mathematics, Science, and Technology Consortium.

Presentation/Exhibits—

- Teacher M.S. Burns, T.E. Repine, Jr., D.A. Hemler of Fairmont State University, and L. Walkup of West Virginia University presented "Summer Field Intern Program for a Teacher/Student Pair" at the Geological Society of America meeting, Denver, CO.
- Dr. R.E. Behling of West Virginia University, D.A. Hemler, and T. E. Repine, Jr. presented "Generating Geology Majors Through K-12 Professional Development" at the Geological Society of America meeting, Denver, CO.
- D.A. Hemler, T.E. Repine, Jr., and teachers A. Baur, G. Hansen, and P. Mason presented "Using a Relevant Geology Theme to Develop Integrated Science Liberal Studies" at the Geological Society of America meeting, Denver, CO.

PUBLIC SERVICE PROGRAM

Service

Requests for Information—During the year the Public Service Program responded to 2,306 requests for information from the general public, industry, other branches of government, and academia. Questions ranged from hobbyists interested in the Mountain State's geology and where to collect fossils and minerals, to property owners concerned about geological hazards and what is located under their property, and business people with questions about the State's mineral resources. Most questions come by telephone or fax, but many people e-mail, write letters, search the Survey's Web site, or visit the Survey's offices.

Earth Science Information Center—The Survey's Earth Science Information Center (ESIC) is part of a national network providing public access to geographical and geological information. ESIC maintains extensive collections of aerial photographs, topographic maps, flood-prone area maps, geodetic control information, and other materials. These collections are frequently used by government, academia, the military, industry, and individuals for a wide variety of purposes. To maintain ESIC's efficiency and effectiveness, all of the information collections are being converted to digital formats. As a result of continued high levels of exposure and expanded services, the Survey's ESIC office received 695 requests for service this year.

- ESIC's aerial photography acquisition service assists companies, government agencies, and individuals in obtaining aerial photography of specific areas. The availability of existing photography is researched and the photos are obtained for the requestor. A service fee recovers costs.
- Historic map and aerial photograph reproductions are available through ESIC. This service provides duplicate copies of materials in the Survey's collection. Material is reproduced with enlargement, reduction, cropping, etc., as requested on a high-resolution color printer/copier. A service fee recovers costs. ESIC's aerial photography collection continued to increase this year through acquisition of over 1,000 historic aerial photographs from the period 1938 to 1939.
- ESIC's flood-prone area information service assists companies, government agencies, and individuals in determining the flood potential for specific parcels of real estate. The requestor is assisted in selecting the appropriate map, locating the property, and obtaining map copies. A service fee recovers costs.

Publication Sales—Survey publications are sold to the public through the Publication Sales Office, the best source for maps of West Virginia in the State. The office makes printed reports and maps and paper or electronic copies of open-file reports and maps available by mail order, telephone order, or in person. Also available are the popular 7.5-minute topographic quadrangle maps produced by the U.S. Geological Survey (USGS) in cooperation with the West Virginia Geological and Economic Survey.

Visiting Geologist Project—In cooperation with the State Division of Tourism and Parks, the Survey conducts the popular Visiting Geologist Project at State Parks and other facilities throughout West Virginia. A Survey geologist or staff member presents a geologic talk and interpretive walk to park guests and local visitors. This year, the project provided Survey staff as guest speakers and walk leaders for 13 parks where over 350 visitors participated.

Professional Activities/ Outreach

Committees—

- Geologist K.C. Ashton is a member of the National Highway Geology Symposium Steering Committee and is also a member of the American Geological Institute's Earth Science Outreach Committee.
- Engineering Technician/Surveyor P.R. Liston and Geologist/Hydrogeologist J.S. McColloch serve as agency coordinators to the West Virginia Office of Emergency Services. They respond to situations requiring geological and geographic expertise, and assist the office in emergency preparedness and mitigation programs.
- P.R. Liston is a Board Member of the West Virginia High Accuracy Reference Network. Installed by the National Geodetic Survey, this is a network of reference stations that serve as control points for global positioning systems. Liston also serves as the West Virginia's advisor and representative on all matters related to official State and county boundaries, and geodetic and geographic information. He is the West Virginia representative on the Council of Geographic Names Authorities in the U.S., a member of the Preston County Addressing Board, and an affiliate member of the West Virginia Association of Land Surveyors.

Continuing Education—

- P.R. Liston attended the West Virginia Association of Land Surveyor's Convention, Charleston, where he took short courses on basic math, safety preparation, adjoiner relations for surveyors, and using COORS. He also attended the Appalachian Remote Sensing Conference.

Presentations/Exhibits—

- The Public Service Program represented the Survey throughout the year with exhibits at various events and meetings ranging from professional societies to civic organizations. In addition, speakers are provided to a variety of schools and civic groups.
- Along with members of the Survey's Administrative and Publications projects, the Public Service Program annually staffs an information and sales display at several sports and outdoors show venues around the State, and most notably at the West Virginia State Fair. This excellent and successful outreach effort provides visitors direct access to geologic information and services available for the Survey, as well as maps and publications sold on site. Daily traffic at the fair display normally exceeds 1,000 people and represents a broad cross section of West Virginians.
- Geologist and Program Manager S.W. McClelland was a judge at the 2005 West Virginia North Central Regional Science Fair, Fairmont State University.
- P.R. Liston conducted an ESIC display and exhibit at the West Virginia Association of Land Surveyors Convention, Charleston, and at the West Virginia Industrial Expo, Charleston. He also conducted a tour and presentation for Glenville State College surveying students.

PUBLICATIONS AND GRAPHICS PROJECT

Publications

New Publications—

Annual Report of the West Virginia Geological and Economic Survey, 2004: publication AR-04, 99 pages.

Bedrock Geology of the Osage Quadrangle, Monongalia County, West Virginia, and Greene County, Pennsylvania: G.H. McColloch, Jr. and J.S. McColloch, 2005, publication OF0502, 1:24,000 scale.

Bedrock Geology of the Rivesville Quadrangle, Monongalia and Marion Counties, West Virginia: G.H. McColloch, Jr. and J.S. McColloch, 2005, publication OF0503, 1:24,000 scale

Bedrock Geology of the Fort Seybert Quadrangle, Pendleton County, West Virginia: R.R. McDowell, K.L. Avary, J.Q. Britton, D.L. Matchen, R.J. Diecchio, K.E. Hicks, L.C. Walkup, M.S. Burns, and P.J. Waggy, 2004, publication OF0408, 1:24,000 scale.

Revisions—

Publications, Maps, and Services of the West Virginia Geological and Economic Survey: 2004, publication ED-A, 56 pages.

Miscellaneous Publications—

- Booklets outlining the agency's program and fiscal information, activities, and finances during fiscal 2004 and 2005 were produced and distributed to legislators.
- A mission and goals booklet and a transition briefing booklet was produced for the Governor's Office.
- New digital letterhead was produced
- Business cards were produced for staff members.
- Telephone number contact cards were produced.
- Purchase order forms and fax forms were produced to include a new mailing address.
- Publication announcements were produced for publications released to the public during the period, and media releases were produced for events sponsored and conducted by the Survey.

Service

The Publications and Graphics Project provides editorial, composition, design, drafting, cartographic, photographic, xerographic, and digital and print production services for Survey research, service, and outreach efforts, and Survey-affiliated programs. In addition, the project provides publications production support and materials to professional societies and other organizations. In a year's time, this constitutes numerous publications, from reports, maps, CDs, and journal articles to forms, cards, and flyers. Extensive work is done producing posters, and other visual and printed material for presentations and exhibits. Also, editorial, cartographic, and production guidance and advice is given to Survey staff on a continuing basis.

Service Requests—Although the vast majority of service the Publications and Graphics Project provides is in support of Survey operations, the project does provide assistance to the public, other government entities, academia, and industry on requests for information concerning Survey publications, and editorial, cartographic, and digital and print production techniques. In addition, project personnel devote significant time in assisting other Survey staff in locating and reproducing archive and open-file material in response to service requests.

Mineral Parcel Mapping Project—Editorial, graphic, and production support was given to this project to produce quarterly reports, contract and agreement documents, manuals, booklets, spreadsheets, and other explanatory and promotional materials. Cartographic support was given in digital editing of mined areas.

STATEMAP Geologic Mapping—Production assistance was given for open-file publications and proposals. Preliminary versions of the Moorefield and Palo Alto geologic quadrangle maps were technically reviewed and changes addressed.

Geographic Information System Program—The project gives extensive support to this program through production of reports, promotional materials and other publications, Web site assistance, and graphic and event support. The project also assists with activities of the Statewide GIS Coordinator's office, again this year including production and distribution of the **West Virginia 9-1-1 Addressing Handbook** and CD.

Geoscience Education Program—A wide variety of items were produced for various earth science teachers' workshops and RockCamp activities including presentation and training booklets, proposals, handouts, schedules, flyers, posters, certificates, and reports. Significant resources were devoted to the revision of a teacher-authored, interactive CD on the geologic history of West Virginia as well as producing materials for a teacher education seminar and field trips. In addition, project staff assist in administrative and other support activities for the Geoscience Education Program.

Web Site—The Publications and Graphics Project is responsible for editorial and graphic development for, and content management of the agency's Web site.

PUBLICATIONS AND GRAPHICS PROJECT (CONTINUED)

Additions and revisions of site content occur continuously, and this year saw the site converted to a new verison of HTML.

Digital Product Development—A major effort continues this fiscal year to convert existing Survey publications and produce new publications solely in digital formats. The goal of the effort is to enable publications to be distributed on CDs, by e-mail, as digital files, or as hard copy, depending on a user's wishes and capabilities. Customized products are also be capable of being produced. A working group continues to develop and oversee standardized methodologies and procedures to produce digital maps and publications.

- A working group composed of project staff and geology staff established standardized format and content guidelines, and review and production procedures for STATEMAP products and all future digital Survey maps.
- Work continues on digitally reissuing the Survey's "Volume" series publications as well as variety of other publications.

Other Activities—A number of abstracts, professional papers, and funding proposals were edited and given production assistance; booklets were produced for the West Virginia University Credit Union; and project staff participated in meetings and activities of the Survey's Pricing Committee and Information Technology group.

Informational and Promotional Material—In a continuing effort to keep the public informed and aware of the Survey's activities and services, information flyers, handouts, publications catalogs, posters, and brochures were produced and distributed at the numerous conferences, displays, meetings, and other events attended by Survey personnel.

Publication Sales Displays—Catalogs, flyers, display materials and other items were produced to support sales efforts at sports shows, the West Virginia State Fair, and other events. Project staff participate in many of these events.

Gem and Mineral Show—Catalogs, handouts, and flyers were produced for this annual event.

Presentations/Exhibits—The project produces a variety of materials for talks, displays, exhibits, presentations, and journal articles. These materials involve varying combinations of drafting, cartographic, editorial, compositing, digital design, and xerographic work. Among them this year were:

- Editorial and production support for regional and national meetings of the American Association of Petroleum Geologists.
- Editorial and production support for Geological Society of America meetings.
- Editorial and production support for presentations on the Geoscience Education Program at meetings of the West Virginia Science Teachers Association, the National Science Teachers Association, and the Geological Society of America.
- Handouts for several presentations to school students.
- Catalogs and flyers for presentations on the Survey's Earth Science Information Center.