West Virginia Geological and Economic Survey

ANNUAL REPORT

Fiscal Year 2004

STATE OF WEST VIRGINIA
Bob Wise, Governor

BUREAU OF COMMERCE
Betty Carver, Chief

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

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June 30, 2004

WEST VIRGINIA GEOLOGICAL AND ECONOMIC SURVEY

Principal Staff Directory for 2004

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*
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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:

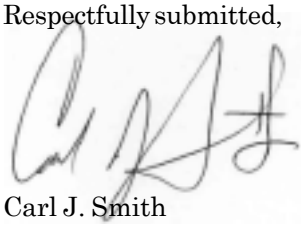
I am pleased to submit the Annual Report of the Geological and Economic Survey for fiscal year 2004. This report summarizes our accomplishments over the past year, and our current operational and financial status.

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, 2004

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

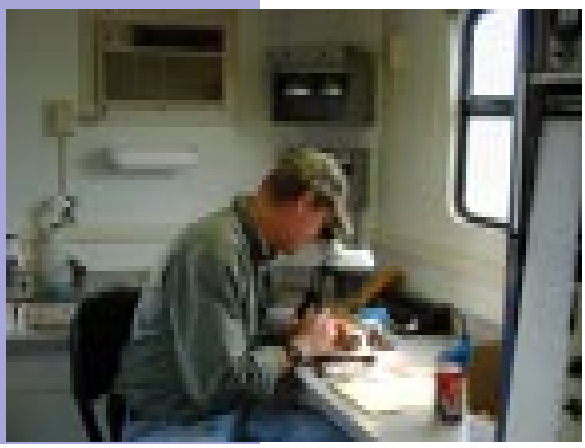
GIS Coordinator
Coal Bed Mapping Project
Mineral Parcel Mapping Project
Statewide GIS Technical Support Center
Digital Line Graph Development Project
Reserve Coal Valuation Model

EXECUTIVE SUMMARY

Research Activities

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

Research Projects–Seventeen 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; 20 Kanawha Formation coal beds in western Raleigh County; and all Pocahontas 2 and 3 coal beds in Raleigh County. Mapping is progressing in Kanawha, Putnam, Boone, Wyoming, and Jackson counties.

Publications/Presentations—Survey staff wrote and/or contributed to 22 geological articles, abstracts, or publications. Survey staff presented over 75 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 Ft. Seybert, Osage, Rivesville, Romney, and Springfield 7.5-minute quadrangles underway. Completed were the Morgantown North, Morgantown South, and Lake Lynn 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 eight 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.

Most of the Survey's non-GIS general revenue appropriations are used to pay for personal services, annual increments, and employee benefits. Funds for agency operations are provided through an unclassified general revenue appropriation. This fiscal year, expenditures for operational costs were 10.4 percent of non-GIS general revenue expenditures.

Two programs, Geoscience Education and Coal-bed Mapping, have funding provided by the Legislature and accounted for approximately 25 percent of unclassified expenditures this fiscal year. What balance remains is used to meet basic operational costs.

Due to a statewide budgetary deficit, agencies were directed to reduce fiscal year 2003-2004 expenditures by 2.9 percent. This was the fourth consecutive year that such action has had to be taken to ensure a balanced budget. This expenditure reserve required the elimination of discretionary outlays and restricted the activities of all agency programs.

Per the instructions of the Department of Administration, fiscal year 2004-2005 appropriation requests were submitted at 91 percent of fiscal year 2003-2004 general revenue funding. The approved fiscal year 2004-2005 Budget Bill appropriated general revenue funding to the Geological and Economic Survey reflecting a funding reduction of 1.9 percent from that of fiscal year 2003-2004.

General revenue funding has been requested by the Department of Administration for fiscal year 2005-2006 at 94.5 percent of the fiscal year 2004-2005 current level. If implemented, the budget contraction would result in funding inadequate to support operations and will adversely impact, to varying degrees, all agency programs and functions.

Operational Improvements

Improving the agency's computer network is an ongoing effort. Upgrades of network software, including anti-virus and security software, were made. Re-cabling 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 2004, the Survey responded to over 1,300 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 over 650 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 has surpassed 7,350 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 147,000 classroom students in 52 counties.

Web Site--The Survey's Web site **(http://www.wvgs.wvnet.edu)** is constantly being developed and expanded. Currently, the site includes section 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

EXECUTIVE SUMMARY (CONTINUED)

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.

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

This fiscal year, the site saw a 10-percent increase in page views over last year, along with a 20-percent increase in visitor sessions and a 98-percent increase in downloaded files.

***"Apipeline@"* (Public Access to the Oil and Gas Data System)--**Subscribers to the Survey's menu-driven public-access on-line "A*pipeline@*" service receive 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 to access the database at their convenience from their personal computer via the Internet.

Visiting Geologists--Once again, the Survey's Visiting Geologist Project operated during the 2003-2004 park season. Thirteen parks were visited this year and nearly 300 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.

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.

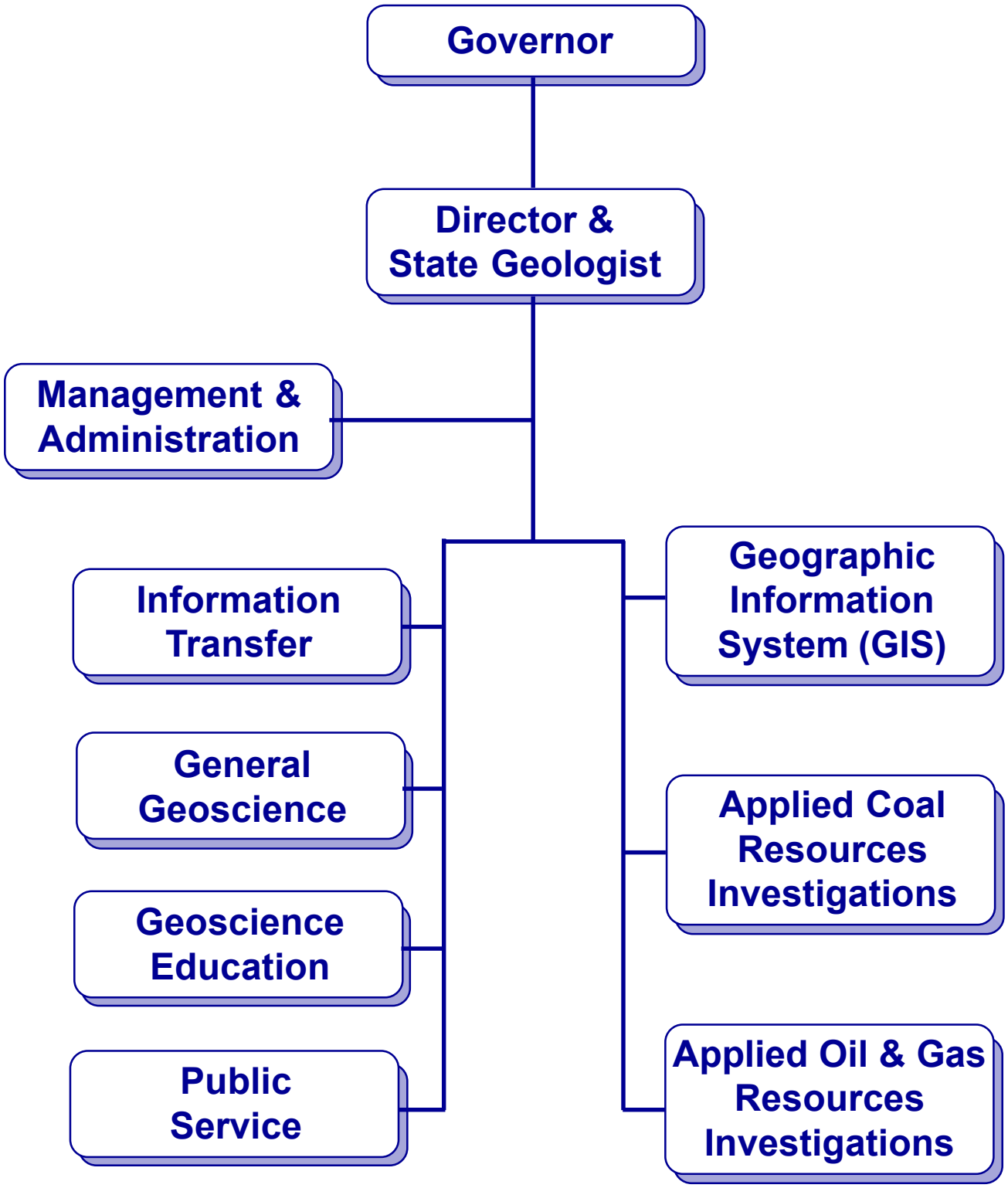
Staff Development

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 2004

Carl J. Smith, A.M., C.P.G. ..... *Director and State Geologist*
Michael Ed Hohn, Ph.D. ..... *Associatae 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*
Ronald D. Lane, M.S. ..... *Purchasing Manager*
Gary C. Rowan ..... *Maintenance Man*
Louis W. Curkendall ..... *Maintenance Worker*

APPLIED COAL RESOURCES INVESTIGATIONS

Nick Fedorko III, M.S. ..... *Coal Geologist and Manager*
Gayle H. McColloch, Jr., M.S., R.P.G. ..... *Coal Geologist, Statistician,and Assistant Manager*
Bascombe M. Blake, Jr., M.S. ..... *Coal Geologist*
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. ..... *Programmer/Analyst*
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*
James Q. Britton, M.S.* ..... *Geologist III*
Todd Bowman ..... *Computer Technician*
Leigh A. Cielensky. ..... *Executive Secretary*
Sarah E. Gooding, 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*
Dennis R. Pierson, B.S ..... *Geologist I*
Erin M. Sturgill, B.S.** ..... *Geologist I*
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*
David L. Matchen, M.S.** ..... *Geologist III*
Gayle H. McColloch, Jr., M.S., R.P.G. ..... *Geologist IV*
John M. Bocan, B.A.,B.S. ..... *Information Systems Coordinator*
M. Patrick Kish, M.S. ..... *Geologist II*

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*

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

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*
Robert F. Fonner, M.S., C.P.G. ..... *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*
Thomas H. Darby II** ..... *Applied Coal Resources Investigations*
Jacqulyn D. Davis ..... *Applied Coal Resources Investigations*
Stuart L. Dean, Ph.D. ..... *Applied Coal Resources Investigations*
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*
Christopher L. Howton** ..... *Applied Oil and Gas Resources Investigations*
Byron R. Kulander, Ph.D. ..... *Applied Coal Resources Investigations*
Charity L. Liston** ..... *Public Service*
Patrick S. McBride** ..... *Applied Oil and Gas Resources Investigations*
Jennifer S. Maloney ..... *Applied Coal Resources Investigations*
Kevin T. Oldness ..... *Applied Coal Resources Investigations*
Marie A. Patchen ..... *Applied Coal Resources Investigations*
Charles D. Renton* ..... *Applied Coal Resources Investigations*
John J. Renton, Ph.D. ..... *Applied Coal Resources Investigations*
Leslie A. Rhodes** ..... *General Geoscience*
Laura R. Sheehan** ..... *Applied Oil and Gas Resources Investigations*
Paula J. Waggy ..... *Geoscience Education*
Jennifer C. Walker** ..... *Applied Coal Resources Investigations*
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*
Nichole Edwards** ..... *GIS Analyst*
Kevin R. Kuhn ..... *Geographic Information Technician*
Scott Lamon** ..... *Geographic Information Technician*
Frank LaFone ..... *Senior Internet Coordinator*

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

Ed Maki** ..... *GIS Unit Suprvisor*
Dale Vanderlaan ..... *GIS Analyst*
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 Geological & Economic Survey encompasses eight major programs (Fig. 1) that are supported through a combination of State, Federal and other funding sources (Fig. 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

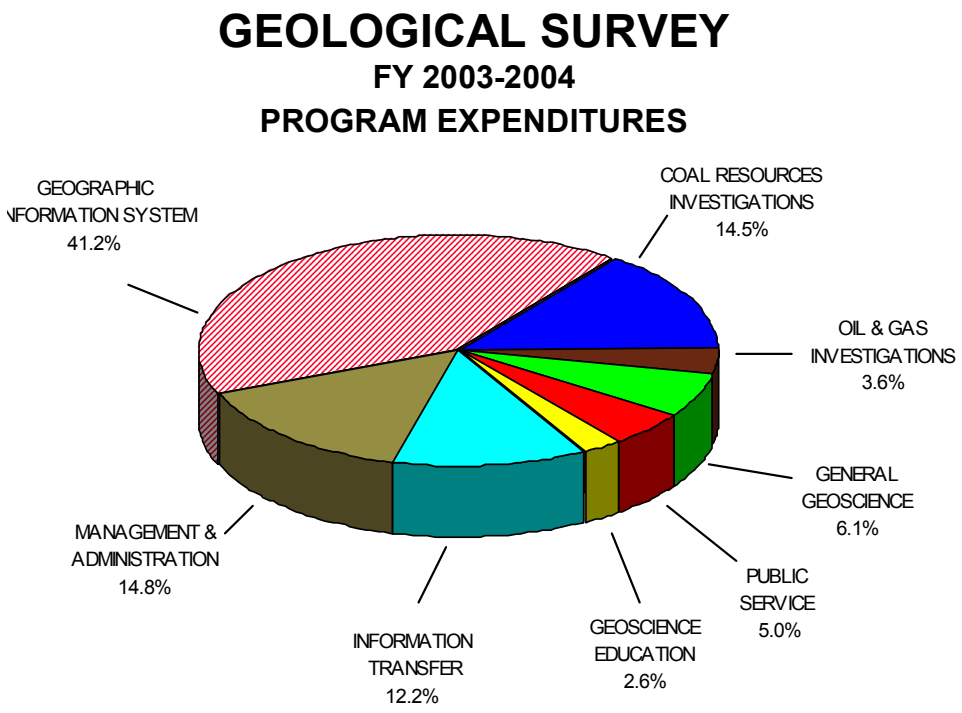
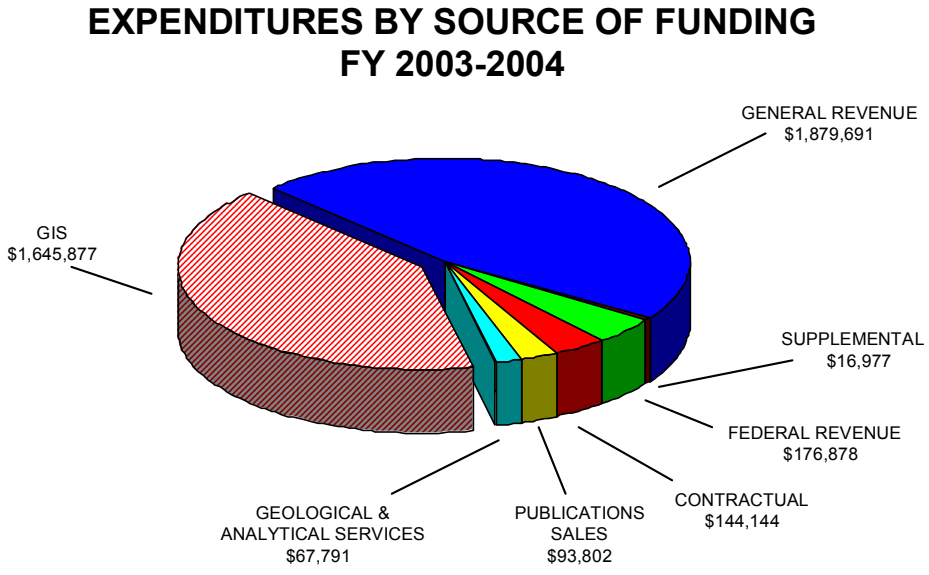


Figure 2

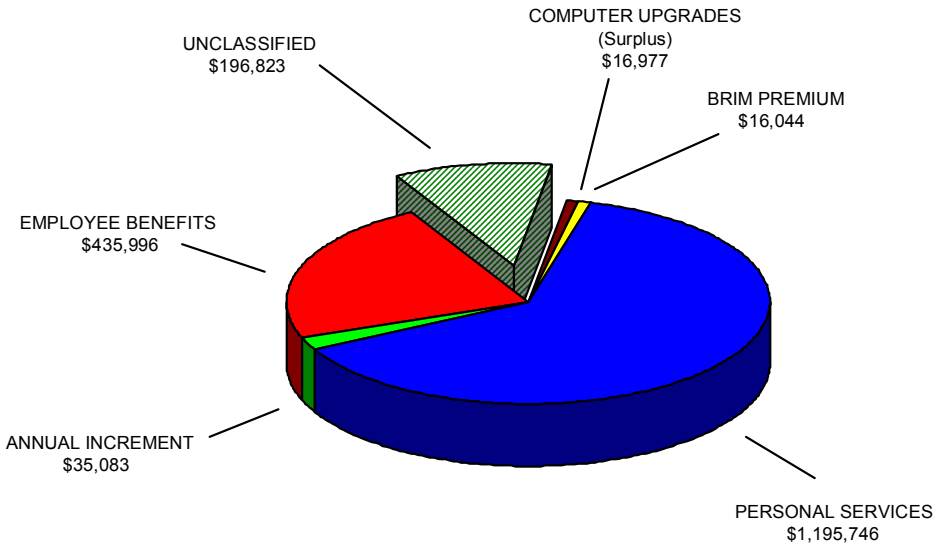


Agency Operational Funding

As the Geological Survey is a human resources-intensive agency, most of its non-Geographic Information System (GIS) General Revenue appropriations are employed to underwrite the costs of Personal Services, Annual Increments and Employee Benefits. Funds with which to sustain agency operations are provided through an Unclassified General Revenue appropriation. In FY 2003-2004, appropriations available for operational support decreased by 29.4% from preceding year. Expenditures for operational costs totaled $196,823, or 10.4% of non-GIS General Revenue expenditures (Fig. 3).

FY 2003-2004 GENERAL REVENUE EXPENDITURES (Exclusive of GIS Appropriations)

Figure 3



Two programs for which funding has been provided by the Legislature, Earth Geoscience Education and Coal Bed Mapping Maintenance, accounted for approximately 25% of Unclassified expenditures in FY 2003-2004 (Fig. 4). The remaining balance is used to meet non-discretionary, basic costs of operation (utilities, telecommunications, vehicle rental, maintenance, intra-state services, etc.). Funding constraints have necessitated support reduction of basic agency programs, resulting in a 38% decrease in these operational expenditures over the past five years (Fig. 5).

Figure 4

GENERAL REVENUE UNCLASSIFIED EXPENDITURES FY 2003-2004

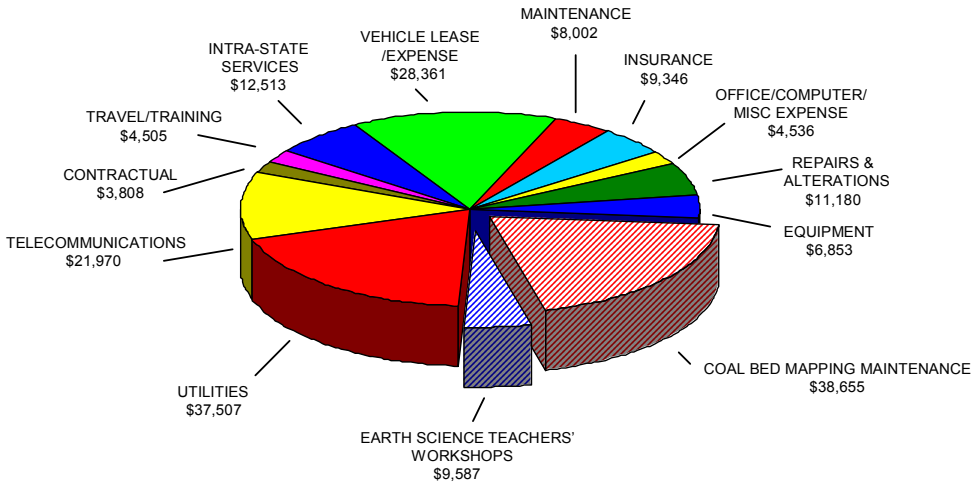
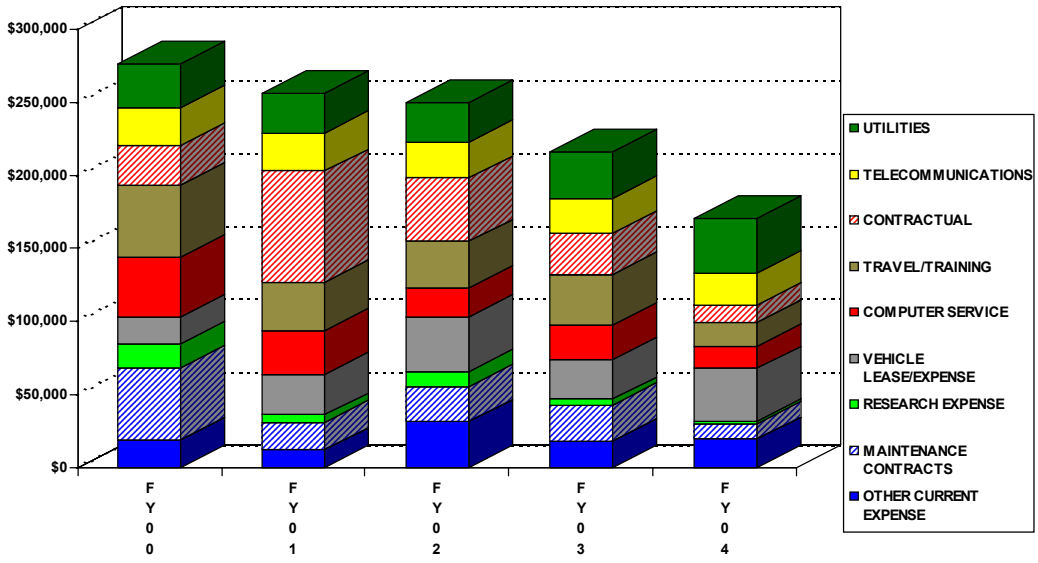


Figure 5

GENERAL REVENUE OPERATIONAL SUPPORT FUNDING FY 2000-2004



FINANCIAL SUMMARY (CONTINUED)

Geographic Information System

Expenditures for the Geographic Information System accounted for approximately 46% of total General Revenue outlays in FY 2003-2004. 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 Geological Survey to serve as lead and fiscal control agent in a joint program with the Department of Tax & Revenue and the West Virginia University (WVU) Department of Geology & Geography.

Approximately two thirds of GIS appropriations are passed through to the other cooperating State agencies. The remaining one third is allocated to the Geological 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 Geological Survey. Expenses incurred by the Mineral Parcel Mapping and Reserve Coal Valuation Projects (Tax & Revenue) and Digital Line Graph Development and Technical Center Projects (WVU) are paid by the participating agencies. Appropriate reimbursement mechanisms have been established through Memorandums of Agreement with Tax & Revenue (by expense line item reimbursements) and WVU (by contractual payments upon receipt of itemized expenditure statements).

General Revenue funding totaling $1,643,890 was appropriated for GIS operation in FY 2003-2004: the Mineral Mapping System ($1,349,859 Fund 0253-207) and the Geographic Information System ($294,031, Fund 0253-214). These appropriations were allocated among the participating agencies as shown in Figure 6.

Figure 6

ALLOCATION OF FY 2003-2004 GIS GENERAL REVENUE APPROPRIATION ($1,643,890)

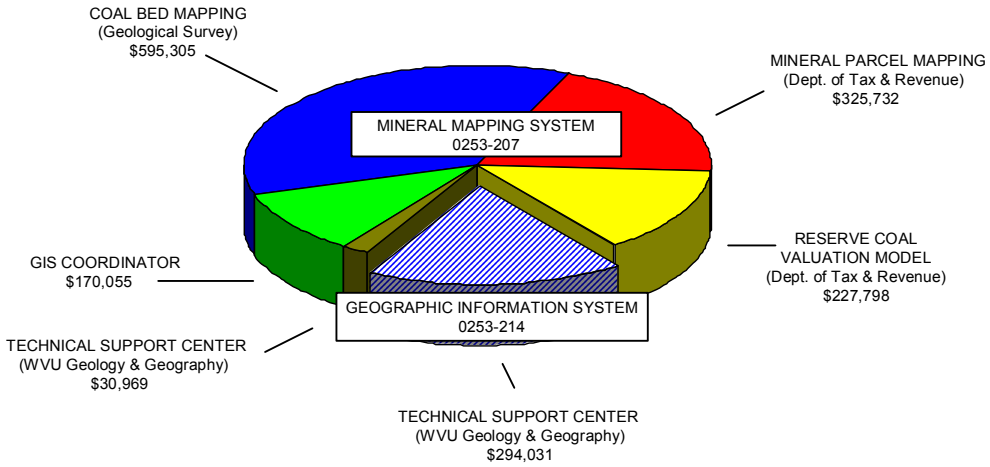
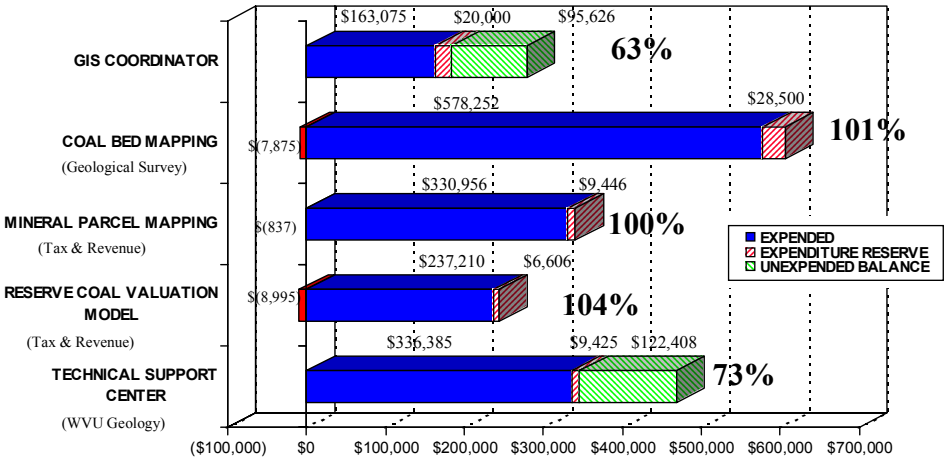


Figure 7 Total composite expenditures and remaining balances by project through the end of FY 2003-2004 are shown in Figure 7. Insufficient funding for 3 of the 5 GIS cooperators required intra-program allocation transfers with which to sustain the respective projects through the end of the year.

FY 2003-2004 GIS GENERAL REVENUE EXPENDITURES AND APPROPRIATION BALANCES
Through June 30, 2004
(Bold Figures Represent Percentage of Available Funding Expended)



Detailed summaries of GIS funding and expenditures are presented in Appendix B of this report.

Fiscal Year 2003-2004 Expenditure Reduction

Due to a Statewide budgetary deficit, agencies were directed to reduce FY 2003-2004 expenditures by 2.9%. This was the Forth consecutive year that such action has had to be taken to ensure a balanced budget. This expenditure reserve ($103,026 of the Geological Survey's FY 2003-2004 General Revenue appropriations) required the elimination of discretionary outlays and restricted the activities of all agency programs.

An insufficient appropriation for Employee Benefits necessitated funding transfers from Personal Services totaling $24,000 to meet benefit obligations during the fiscal year. An additional $24,500 was transferred to the Unclassified appropriation from Personal Services late in the year to fund operational expenses. These transfers were made possible through timely reimbursements received for staff time expended on sub-contracts with the WVU Research Corporation.

FINANCIAL SUMMARY (CONTINUED)

Fiscal Year 2004-2005 Budgeted Appropriations

Per the instructions of the Department of Administration, the agency's FY 2004-2005 Appropriation Request was submitted at 91% of FY 2003-2004 General Revenue funding. For the Geological Survey, this reduction equaled $319,737. Included in the request were six separate "Improvement Requests", or requests for restoration and additional funding of $332,956. The approved FY 2004-2005 Budget Bill appropriated General Revenue funding of $3,486,896 to the Geological Survey, reflecting a reduction of just $65,735, or 1.9%, from that of FY 2003-2004.

Fiscal Year 2005-2006 Current Level Appropriation Request Reduction

Per the instructions of the Department of Administration, General Revenue funding has been requested for FY 2005-2006 at 94.5% of the FY 2004-2005 current level. If implemented, the budget contraction would result in an appropriation of $191,779 less than that of the current year and would adversely impact, to varying degrees, all agency programs and functions.

Improvement Level Requests

A series of six improvement level proposals has been submitted with the agency's FY 2005-2006 Appropriation Request. These requests, totaling $184,240, would sustain those agency programs most seriously damaged by appropriation reductions.

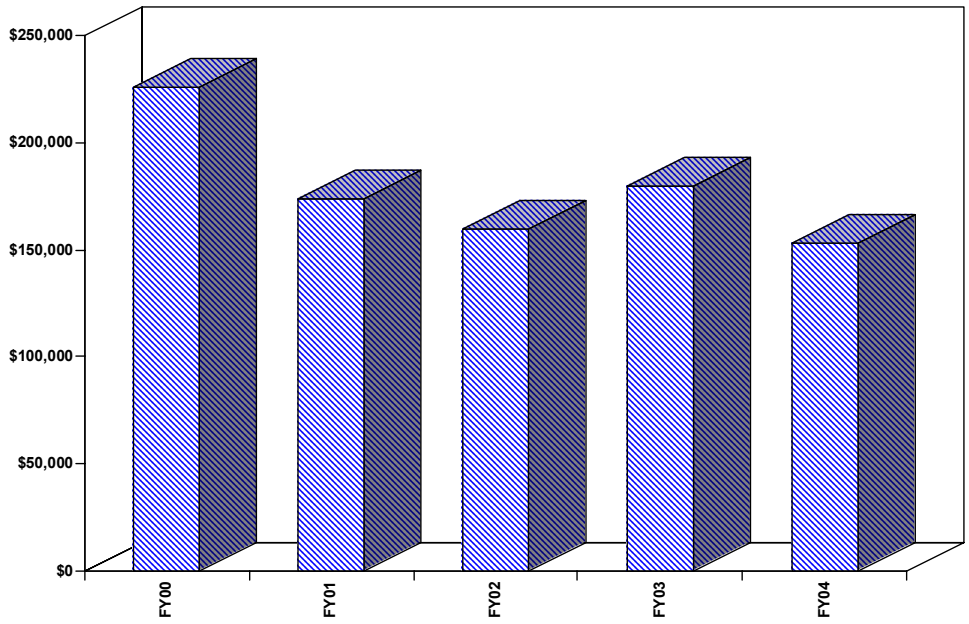
Current Cooperative Agreements

Federal Revenue continued to contribute a significant portion of the Geological Survey's operating support in FY 2003-2004 (Fig. 8) through cooperative agreements for coal research and mapping projects.

Federal Revenue

Figure 8

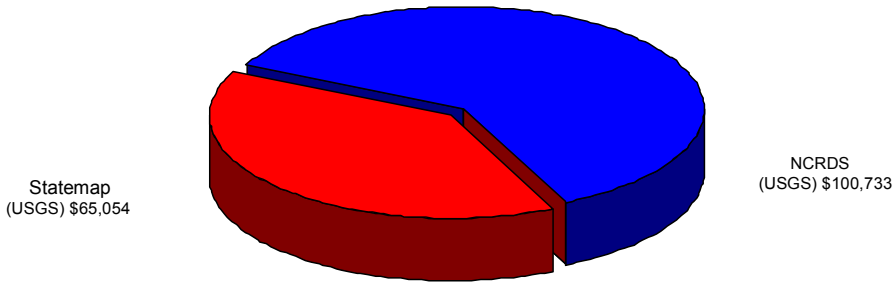
FEDERAL FUNDS RECEIPTS
FY 2000-2004



The U.S. Department of Interior's Geological Survey (USGS) is the West Virginia Geological Survey's principle Federal grantor. Disbursements for the National Coal Resources Data System (NCRDS) and Statemap projects accounted for all Federal program expenditures in FY 2003-2004 (Fig. 9).

Figure 9

FEDERAL FUNDS EXPENDITURES
FY 2003-2004



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 FY 2004-2005.

Future Federal funding variations would produce a ripple effect on the Geological Survey's total funding composition. Changes in the level of overall Federal funding would impact non-State funding as well. Several recent projects funded through WVU, for example, are in the form of sub-contracts from the US Department of Energy (DOE). Reimbursements to General Revenue from the recovery of indirect costs and deposits to Special Revenue for fees generated from in-house services for both Federal and sub-contractual-funded projects would decline correspondingly. Finally, uncertainty over Federal budgetary actions may further restrict funding opportunities by narrowing the number and scope of project solicitations by grantor agencies.

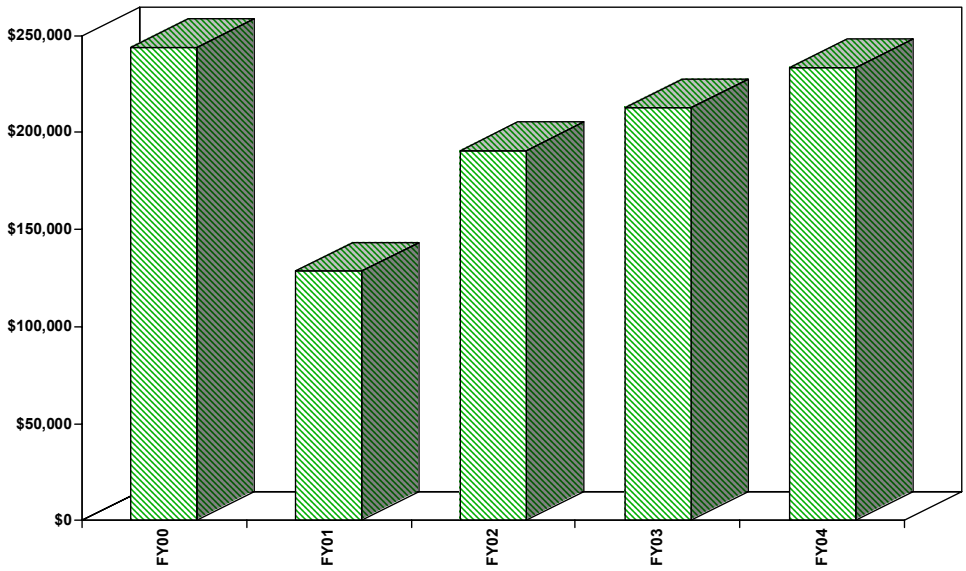
Contracts

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

Special Revenue

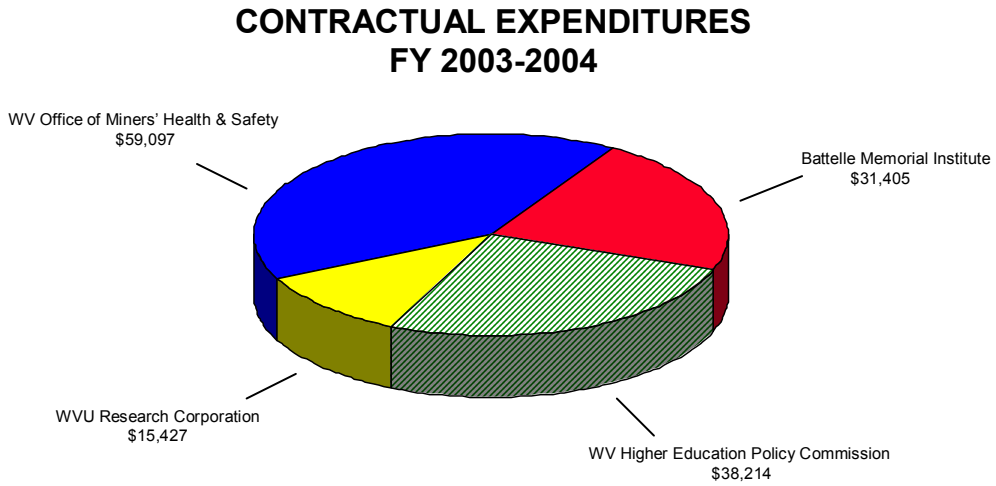
Figure 10

CONTRACTUAL FUNDS RECEIPTS
FY 2000-2004



Federally funded subcontracts through the WV Office of Miners' Health & Safety (Fund 3105), Battelle Memorial Institute (Fund 3107), WVU Research Corporation (Funds 3107 & 3109) and the WV Higher Education Policy Commission (Fund 3111) accounted for all contractual expenditures in FY 2003-2004. (Fig 11). It is anticipated that contractual funding to support agency research efforts will remain at current year levels in FY 2004-2005.

Figure 11



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

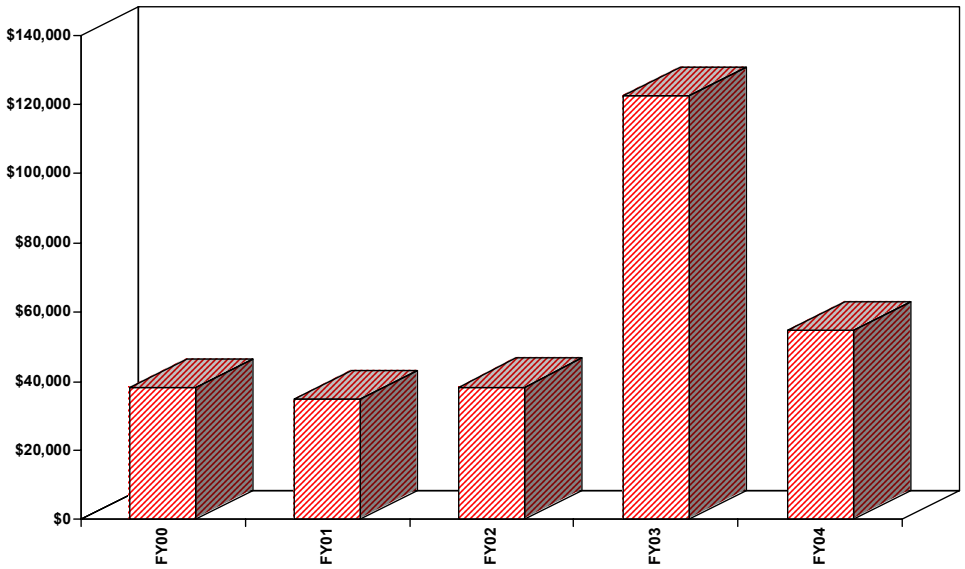
Funds have been generated through the sales of publications and geologic services. Sufficient balances of sales receipts are maintained to defray agency operational costs associated with these revenue-producing activities.

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 helped to produce generally consistent annual increases in service revenues. The receipt of a one-time $50,000 payment for data services accounted for a marked increase in FY 2002-2003 receipts (Fig. 12). Consequently, FY 2003-2004 deposits to the agency's Geological & Analytical Services Fund (3100) of $54,655 represented a decrease of 55% from the prior year.

FINANCIAL SUMMARY (CONTINUED)

SERVICE REVENUES
FY 2000-2004

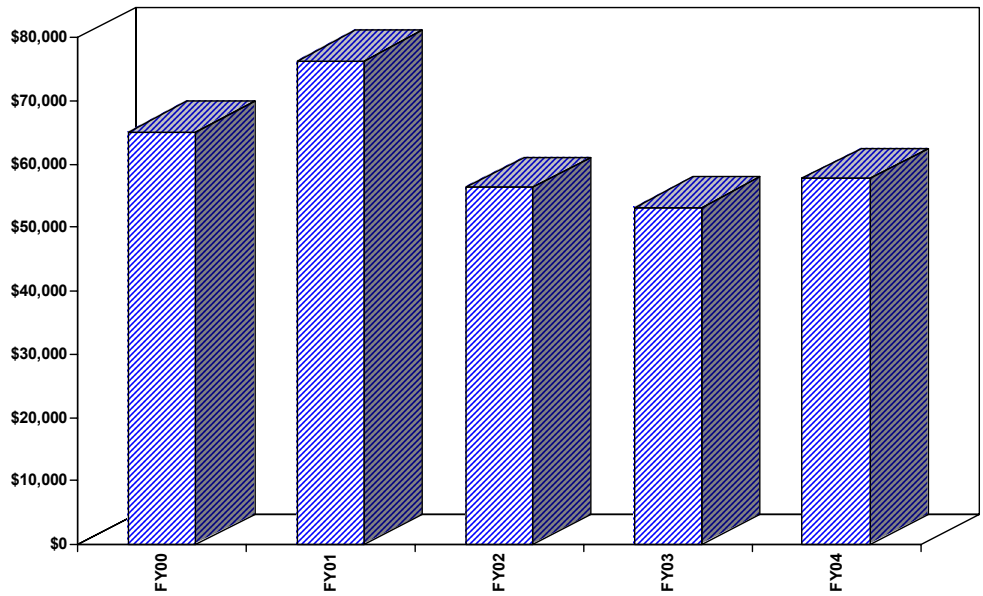
Figure 12



Publication sales products include maps, books, reports and other agency documents reproduced on a variety of media (photo static, black line & well-log copies, microfilm, pre-formatted diskettes, etc.). FY 2003-2004 net sales receipts deposited in the agency's Publications Sales Fund (3101) totaled $57,735; an increase of 8% from the prior year (Fig. 13).

PUBLICATIONS SALES REVENUES
FY 2000-2004

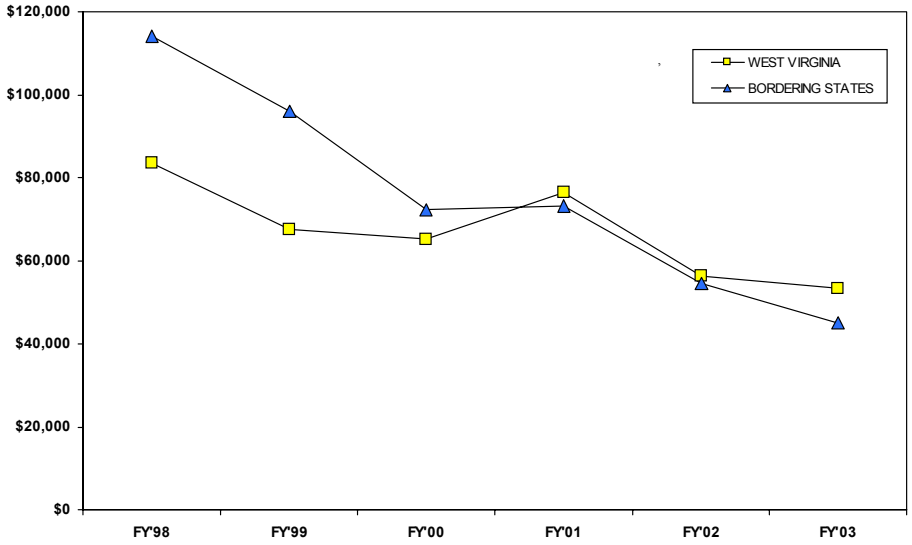
Figure 13



An evaluation of publications sales of the Geological Surveys of West Virginia and those of the bordering states of Maryland, Ohio and Virginia (Fig 14) reveals a decline in revenues from FY 1998 through FY 2003 (the most recent year for which comparison figures are available) for all states. West Virginia's receipts decreased by just 36.2% over this period, however, compared to a loss of 60.4% for the composite sales figure. Revenues can be expected to remain at current levels, assuming continued strong demand for agency information products and services by industry, government and the public.

Figure 14

PUBLICATIONS SALES REVENUE
West Virginia vs. Bordering States[1]
FY 1998-2003



[1]Association of American State Geologists Statistician's Annual Reports, 1998-2003

Insurance Reimbursements

Two episodes of storm activity (July, 2003 and May, 2004) resulted in over $27,000 of electrical damages during the fiscal year. Insurance proceeds in excess of $10,000 were received from the Board of Risk & Insurance Management (BRIM) in recompense for the first occurrence. Currently pending is an insurance claim of over $11,000 for the second incident.

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 $105,000 in FY 2003-2004.

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.

Chief Geologist D.G. Patchen is part of a team organized by the Interstate Oil and Gas Compact Commission which was selected by the U.S. Department of Energy to examine existing State regulations for underground injection, and determine how carbon dioxide sequestration would fit into the existing State regulatory framework.

- **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, most of the mapping for the Sewell coal was completed along with structural contour maps and preliminary outcrops for the No 6 Pocahontas, No. 6 Pocahontas upper split, No. 7 Pocahontas, No. 9 Pocahontas, and Fire Creek coal beds. Work began on the structural contour maps for the Beckley lower split and Beckley coal beds. Active underground mining was updated for all beds.

Nearly all mapping of the Pittsburgh coal bed in Kanawha and neighboring parts of Putnam and Jackson counties was completed as well as structural contour and outcrop maps for the Little Eagle, Eagle, Eagle A, Powellton, No. 2 Gas, Peerless, and Williamson coal beds. Also completed were the combined underground, surface, auger, and highwall mined areas with the outcrop to create the "mined and remaining coal" map for the Eagle bed. This was combined with previous mapping in Fayette and Raleigh counties. Work began on stratigraphic correlation of the

Cedar Grove to Chilton Rider coal interval. Active underground mining for all beds was updated.

In Boone and northern Wyoming counties, stratigraphic correlations for the entire study area were completed as well as structural contour and outcrop maps for the Eagle, Powellton, No. 2 Gas, and Williamson coals. Active underground mining for all beds was completed.

Annual deliverables were made to the Department of Tax and Revenue for the year and these included all underground mining compilations, the products listed above for each county, updated mining for previously mapped counties, and numerous stratigraphic databases. Considerable stratigraphic database work was accomplished throughout the State with the addition of records from Department of Tax and Revenue files. Work proceeded on migration of the stratigraphic database into a more robust network-capable hardware and software environment. Continued 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 Coal Bed Natural Gas Workshop, part of the Governor's Energy Task Force Roadmap Workshop series, for a meeting of the Ohio Geological Society, and at the Northeast/Southeast Sections Geological Society of America meeting. Chief Geologist D.G. Patchen is on the steering committee for a workshop on coal-bed natural gas which is part of the Governor's Energy Task Force Energy Road Map Workshop series.

- **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. Program geologists also worked with other industry explorationists in gathering valuable information for the 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.

RESEARCH (CONTINUED)

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.

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 is 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. The previous study, completed in 1991, evaluated up to 11 years of production data for more than 17,000 wells drilled since 1979. This study evaluated production histories for the past 24 years (and for as many as 70 years for a small subset of data) for more than 70,500 wells.

The current study evaluated data for 22 natural gas plays and 10 oil plays delineated by the stratigraphic and geological controls in their formation. The gas plays followed those described in **The Atlas of Major Appalachian Gas Plays** (publication V-25) and the oil plays included both primary and enhanced production. Calendar years of monthly production were converted to true "production years" based on when the wells went on-line. Production and pay data in the database were edited, analyzed, and organized by play. Play assignments were made according to the deepest pay zone in a well and, for some plays, also by the field in which the well occurred. Gas and oil production decline ratios were calculated for each play as Flush-1 (year 1 to year 2), Flush-2 (year 2 to year 3), Settled-1 (year 3 to year 20), and Settled-2 (year 20 and beyond). Maps by play were generated. The results were presented to the WVDTR for their review and assessment.

- **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.

- **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 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. Additional funds were also 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 core drilling and for mineralogical, elemental, and more recently, trace element analyses from laboratories at West Virginia University.

Other funds supported updated compilation of mined areas in the No. 3 Pocahontas coal 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.

- **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 nine workshops during the year, including one 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 carbonate reservoirs, basin modeling, and horizontal drilling. The workshop on data management was of interest to oil producers. This workshop was held in conjunction with the Preferred Upstream Management Practices Project. 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.

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 John Bocan. New issues of the quarterly, on-line newsletter were posted.

- **Preferred Upstream Management Practices Project**—This five year, U.S. Department of Energy-funded effort had three objectives: 1) Identify preferred management practices currently in use in the Appalachian region, or that can be transferred from other regions; 2) Create an Appalachian Region Council for future identification of preferred management practices 3) Create and maintain an interactive Web site listing preferred management practices for the region, as well as supporting data and relevant information on the oil reservoirs in the Appalachian region.

A Web site that includes case histories was completed. At the completion of the project, a workshop was held to summarize the most significant findings.

- **STATEMAP Geologic Mapping—**The purpose of this U.S. Geological Survey annually-funded, competitive grant program is to produce high-quality geologic maps. Two mapping project proposals were approved for funding this year and

work commenced on the mapping of Ft. Seybert, Osage, Rivesville, Romney, and Springfield quadrangles. Mapping projects slated for completion in 2004 were completed on time.

Geologists G.H. McColloch, Jr. and J.S. McColloch were principal investigators in bedrock mapping of the Morgantown North, Morgantown South, and the Pennsylvania part of the Lake Lynn 7.5-minute quadrangles, Monongalia and Preston counties, West Virginia, and Fayette and Greene counties, Pennsylvania.

- **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. Three staff members were hired and equipped for the work and they began on compiling mining in the Williamson and Chilton coals in Mingo and Logan counties, and the No. 4 Pocahontas coal in McDowell County.

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

- **Avary, K.L.**, 2004, Recent coal-bed methane activity in West Virginia: **Geological Society of America, Northeastern and Southeastern Sections Joint Meeting, Abstracts with Programs**, vol. 36, no. 2, p. 53.

- Beuthin, J.D. and **B. M. Blake, Jr.**, 2004, Revised stratigraphy and nomenclature of the Upper Hinton Formation (Upper Mississippian) based on recognition of regional marine zones, southern West Virginia: **Southeastern Geology**, vol.42, p.165-178.

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- Cecil, C.B., **N.Fedorko**, F. Dulong, and C.F. Eble, 2004, Stop 3: Late middle Pennsylvanian Lower Freeport coal bed(?) And associated strata on Interstate 68 at milepost 11.4: *in* **Geology of the National Capital Region Field Trip Guidebook**, S. Southworth and W. Burton (eds.), U. S. Geological Survey Circular C-1264, p. 91-93.

- Dulong, F.T., **N. Fedorko**, J.J. Renton, and C.B. Cecil, 2004, **Chemical and Mineralogical Analyses of Coal-Bearing Strata in the Appalachian Basin**: U.S. Geological Survey Open-File Report 02-489 (online only, http://pubs.usgs.gov/of/2002/of02-489/).

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- **Fedorko, N.**, C.B. Cecil, and R. Stamm, 2004, Stop 2: Paleosols in the Pittsburgh red shale, Conemaugh Group on Interstate 79 at exit 146: *in* **Geology of the National Capital Region Field Trip Guidebook**, S. Southworth and W. Burton (eds.), U. S. Geological Survey Circular C-1264, p. 88-91.

- **Fedorko, N.**, **W.C. Grady**, C.F. Eble, and C. B. Cecil, 2004, Stop 1: Upper Conemaugh and lower Monongahela Group strata on the north side of the Morgantown Mall complex on Interstate 79 at Exit 152, Morgantown, W.Va.: *in* **Geology of the National Capital Region Field Trip Guidebook**, S. Southworth and W. Burton (eds.), U. S. Geological Survey Circular C-1264, p. 84-88.

- **Matchen, D.L.**, **R.R. McDowell**, **K.L. Avary**, and **M.E. Hohn**, 2003, Reservoir characterization of the Devonian Gordon Sandstone in two West Virginia oil fields: Using modern techniques to understand an old reservoir (abstract): American Association of Petroleum Geologists Eastern Section Annual Meeting, September 2003.

- **McColloch, G.H., Jr.** and **J.S. McColloch**, 2004, **Bedrock Geology of Morgantown North Quadrangle, Monongalia County, West Virginia**: West Virginia Geological and Economic Survey, Publication OF-0403, 1:24,000 scale.

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RESEARCH (CONTINUED)

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- **McColloch, G.H., Jr.** and **J.S. McColloch**, 2003, Mapping the West Virginia portion of the Lake Lynn 7.5-minute quadrangle: A pilot project for utilizing pre-existing geologic GIS data to produce geologic maps (abstract): **Geological Society of America Abstracts with Programs**, vol. 35, no. 6.

- **McDowell, R.R.**, **D.L. Matchen**, and **K.L. Avary**, 2004, Opportunistic geology--staying one step ahead of the hydroseeder (abstract): **Geological Society of America Abstracts with Programs**, vol. 36, no. 2, p. 115.

- **McDowell, R.R.**, **K.L. Avary**, **D.L. Matchen**, **R.J. Diecchio**, **K.E. Hicks**, and **C.L. Howton**, 2003, **Preliminary Bedrock Geologic Map of the Franklin Quadrangle**: West Virginia Geological and Economic Survey, Publication OF-0303, 1:2400 scale.

- **Newall, D.** and D. Chambers, 2002, **Potential Effects of Mountaintop Removal Coal Mining on Fluvial Geomorphology and Aquatic Habitat, West Virginia–Review of Literature 1929-2000**: West Virginia Geological and Economic Survey, Publication C-47, 95 p.

- **Patchen**, **D.G.** and **K.L. Avary**, 2003, Evolution of exploration, drilling and completion concepts for Appalachian Basin's Trenton-Black River play: 2003 American Association of Petroleum Geologists Mid-continent Section Annual Convention.

- Tso, J., **R.R. McDowell**, **K.L. Avary**, **D.L. Matchen**, and G. Wilkes, 2004, Middle Eocene igneous rocks in the Valley and Ridge of Virginia and West Virginia: *in* **Geology of the National Capital Region Field Trip Guidebook**, S. Southworth and W. Burton (eds.), U. S. Geological Survey Circular C-1264, p. 137-161.

- West Virginia Geological and Economic Survey, 2004, **Burnsville Lake**: Publication OF-0401, 1:24,000 scale.

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 190 general revenue, 13 federal revenue, and 26 special revenue projects. A total fiscal 2003-2004 agency budget, with amendments and reappropriations, of $4,958,155 was allocated to these projects and a $5,232,502 budget was developed for fiscal 2004-2005.

West Virginia Financial Information Management System (WVFIMS)—Receipt and disbursement processing on WVFIMS continued in fiscal 2003-2004 with a total of 1,369 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 2003-2004. 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, 2004 consisted of 51 full-time and 6 part-time staff.

Purchasing

The purchasing function includes procurement processing, travel coordination, and fixed asset accounting. Over 750 requisitions and purchase authorizations were processed for the procurement of services, commodities, and operating expenditures in fiscal 2003-2004. In addition, over 175 travel expense accounts were prepared and 10 items were added to the fixed asset inventory.

Purchasing Card Program—Procurements via the State Purchasing Card Program accounted for 86 percent of the number of all purchases in fiscal 2003-2004. This program enables 12 authorized employees to make agency purchases on assigned VISA cards, as opposed to through the existing requisition/purchase order procedure. Agency Purchasing Card Program procurements totaled $119,528.

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 1,350 transactions were submitted for payment on WVFIMS in fiscal 2003-2004. Of these, 16 (1.2 percent) were returned by the State Auditor's Office for clarification or correction, compared to 1.8 percent for all State agencies.

Accounts Receivable

A total of 129 invoices were generated in fiscal 2003-2004 for publication sales, geological services, facilities rentals, and contractual agreements. Collections from these sources for the year ended June 30, 2004 totaled $406,835. VISA and MasterCard sales accounted for $44,140 of collections. Accounts receivable on June 30, 2004 totaled $3,775.

Administrative Services

Administrative services continued to provide support for routine agency operations in fiscal 2003-2004.

Reception/Telecommunications/Correspondence Processing—As the agency's initial point of contact, this activity received and transferred approximately 22,000 telephone inquiries and opened and routed to appropriate staff over 8,800 pieces of mail in fiscal 2003-2004. In addition, over 1,475 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 2003-2004.

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. No additions were made to the library during the year.

ADMINISTRATIVE AND FACILITIES MAINTENANCE PROJECTS (CONTINUED)

Facilities Maintenance

Several building and grounds maintenance program improvements were initiated during the year. Surplus funds of $24,000 realized from contractual reimbursements were partially utilized for building and grounds upgrades. In addition, a lightning-damaged transformer was replaced and work commenced to bring agency facilities into compliance with electrical standards. Installation of an electric generator purchased from the West Virginia Public Broadcasting Authority in response to frequent power outages is pending funding. Essential site preparation and hookup should be completed by the end of the calendar year.

Preparation began for the relocation of Computing Services and Computer Upgrades projects staff form the Education Center to the agency's office building. Work involved rehabilitation of office space and transfer of equipment and office furnishings.

All major safety and fire issues identified in an annual loss engineering inspection for the Board of Risk and Insurance Management were satisfactorily resolved during the 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. Used polarized-light microscopy to analyze an unknown "mineral" submitted to the Survey; wrote and returned a brief report of results to the owner of the specimen.

Manuscript Review—Reviewed abstracts and manuscripts generated by Survey staff and wrote a book review for the journal, *Natural Resources Research*.

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

Professional Activities/ Outreach

Educational Outreach—Taught Historical and Environmental Geology at Fairmont State University for the 2003-2004 school year. Served as a committee member for Simon Cole, a master's degree candidate in the West Virginia University Department of Geology and Geography.

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 for the joint Northeast-Southeast Sections, Geological Society of America Convention, Tyson's Corners, VA, and co-authored a field trip guidebook on the Eocene igneous rocks of West Virginia for the same meeting. Led the West Virginia portion of the 33rd Annual Virginia Field Conference to examine Eocene igneous rocks in eastern West Virginia and western Virginia.

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 served on the steering committee for an Underground Mine Mapping workshop, directed by the Interstate Mining Compact Commission and commissioned by the U.S. Department of Labor, Mine Safety and Health Administration. He continues to serve on the steering committee for a follow-up workshop tentatively planned for early 2005 in Morgantown.
- Geologist, Statistician, and Assistant Program Manager G.H. McColloch, Jr. is one of five state representatives serving on the North American Geologic Map Data Model Steering Committee, and continues to serve as Survey representative on the West Virginia GIS (Geographic Information System) Steering Committee. McColloch also serves as the agency's liaison to the U.S. Geological Survey (USGS) National Geologic Map Database Project, and as a member of the USGS/American Association of State Geologists Data Capture Working Group.

- **Coal Reports**--G.H. McColloch, Jr. updated the West Virginia section of the **Keystone Coal Industry Manual**, a bi-annual publication, and completed the annual article on 2003 West Virginia mineral production for the Society of Mining Engineers' **Mining Engineering** magazine.

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, and Geologist S.E. Gooding attended the 2003 ESRI User Conference, San Diego, CA.
- Geologists A.J. Morris and S.E. Gooding along with K.J. Hutchinson, and F.L. Hutchinson attended the West Virginia GIS Forum and Exhibition, Morgantown.

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.

- Geologist A.J. Morris served as a judge at the Rowlesburg School Science Fair.
- J.M. Sutton and A.J. Morris participated in Career Day at North Elementary School, Morgantown.
- 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.
- B.M. Blake, Jr. traveled to Poland with other U.S.-based researchers in July 2003 to meet and participate in an eight-day workshop with their European counterparts to discuss evidence of Carboniferous climate change. Blake made a presentation at the workshop on Carboniferous geology of the Appalachian region. In May 2004, the Survey hosted the European and American researchers for the second workshop. Blake again made a presentation at the workshop and lead a three-day field trip in the region.
- N. Fedorko made a presentation about the Coal-bed Mapping Project at the annual conference of the National Association of State Land Reclamationists, Charleston, and at the combined Northeast/Southeast Section Meeting of the Geological Society of America, Washington, DC. He also presented an update on Survey coal activities at the 31st Annual West Virginia Mining Symposium, sponsored by the West Virginia Coal Association, Charleston. In addition, Fedorko gave a talk about the compilation of mining underway as part of the Coal-bed Mapping Project and facilitated one of the discussion sessions at the Underground Mine Mapping Workshop, Louisville, KY.
- K.J. Hutchinson made a presentation on the Coal-bed Mapping Project at the West Virginia GIS Forum and Exhibition, Morgantown.
- B.M. Blake, Jr., and N. Fedorko made a dual presentation to a retreat meeting of the West Virginia-based employees of U.S. Department of Interior, Office of Surface Mining, at Stonewall Resort. Blake talked about the stratigraphy of West Virginia coal, and Fedorko talked about the coal program at the Survey.

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—The Sand Hill well core was laid out for Trenton Consortium Project geologists to examine and sample. Industry geologists visited the library to examine Trenton cores and Weir cores and samples, as interest in these reservoirs continued.

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 geologists R.R. McDowell and D.L. Matchen served as mentors for two WVU undergraduate students as part of a Mentored Field Experience Program, sponsored by the National Science Foundation and the American Association of State Geologists. They also worked with two K-12 teachers while doing STATEMAP program field work. The teachers, veterans of the RockCamp and Geoteach programs, were an integral part of the STATEMAP mapping team.
- 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 safety workshops for well tenders was as great as it had been the year before. A core workshop held at the International Oil and Gas Association-New York summer meeting featured Beekmantown and Queenston cores. A workshop in Lexington, KY, provided a hands-on introduction to Petra software, a specialized application for

the oil and gas industry. A carbonate reservoir workshop in Columbus, OH, was well-received. A workshop on Subsurface Fluid Pressures was held in conjunction with the Eastern Section AAPG meeting, Pittsburgh, PA. A workshop on Coal-bed Natural Gas was held at Stonewall Jackson Resort; a workshop on data management was of particular interest to oil producers. D.G. Patchen, as PTTC Program Manager, is responsible for coordinating all of these workshops, which totaled nine 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. She also chaired an Ad Hoc AAPG Committee on Domestic Sections.
- 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 is the Eastern Section Councillor for the AAPG Energy Minerals Division. He is also a member of the AAPG Committee on Preservation of Cores and Samples, and the Membership Enhancement Development Committee. Patchen was the General Chair for the 2003 meeting of the Eastern Section AAPG and the Eastern Region of the Society of Petroleum Engineers. This meeting was the first time these two groups met together. The meeting was very successful in terms of numbers of attendees, papers presented, and vendors exhibiting. K.L. Avary has agreed to act as general chair for a similar meeting of both groups, to be held in Morgantown in September 2005.
- D.G. Patchen was a candidate for AAPG Vice-President, and represents West Virginia on the Potential Gas Committee, a group funded by the American Gas Association and company donations. He also serves as the Appalachian Basin Chairman for the Potential Gas Committee.
- D.G. Patchen and K.L. Avary attended the annual AAPG meeting in Dallas, TX to participate in committee and section business meetings, and attended AAPG Leadership Days, Tulsa, OK.

Continuing Education—D.L. Matchen completed the requirements for his doctoral degree in geology at WVU.

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

APPLIED OIL AND GAS RESOURCES INVESTIGATIONS PROGRAM (CONTINUED)

program. These meetings included the Eastern Section AAPG, Pittsburgh, PA.; PTTC Regional Lead Organization Directors meeting, Washington, DC; Independent Oil and Gas Association of New York, Buffalo, NY and Niagara Falls, Ontario; and the North American Coal-bed Methane Forum, Morgantown.

- K.L. Avary and D.L. Matchen assisted R.R. McDowell in leading the Virginia Field Conference to Pendleton County to examine the Eocene intrusive rocks. This was the first time that the Virginia Field Conference had visited West Virginia, and was also very well attended. Avary and Matchen also assisted McDowell in preparing a guidebook for the annual meeting of the Southeastern and Northeastern sections of the Geological Society of America, Tysons Corner, VA. The guidebook covered the Eocene intrusive rocks of Pendleton County.
- K.L. Avary presented a talk on recent coal-bed methane permitting and drilling activity in West Virginia at the annual meeting of the Southeastern and Northeastern sections of the Geological Society of America, Tysons Corner, VA; to the Ohio Geological Society, Columbus, OH; and at the Coal-bed Natural Gas Workshop, part of the Governor's Energy Task Force Workshop series, at Stonewall Jackson Resort. In addition, Avary presented a talk on coal-bed methane and Trenton/Black River activity at a public forum on the future of natural gas at the University of Charleston.
- D.L. Matchen gave an invited talk in the Salvage Geology session at the annual meeting of the Southeastern and Northeastern sections of the Geological Society of America, Tysons Corner, VA. K.L. Avary and R.R. McDowell were co-authors.
- D.G. Patchen gave a talk on current activity in the Trenton/Black River at the annual meeting of the AAPG Mid-continent Section, Tulsa, OK, and at the annual meeting of the Geological Association of Canada/Mineralogical Association of Canada, Brock University, St. Catherines, Ontario. K.L. Avary was a co-author.

COMPUTING SERVICES AND COMPUTER UPGRADES PROJECTS

Data Activities & Computing Operations

Oil and Gas Data System—

- Development of the new Oil and Gas Data System continued. Data fields were modified to optimize queries. Lookup tables were updated, forms were updated, and data-in/data-out tools were developed.
- Well-specific production data for 2002 were received, evaluated, edited, checked, and analyzed prior to being written into the database. Monthly production data records for 47,128 wells were added to the database.

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.

Survey Computing Operations—

- The agency's local area network provides connectivity for all platforms (VAX, UNIX servers and workstations, Windows-based servers and PCs, and several networked devices such as plotters and scanners), intra-agency communication, and Internet access through a T1 wide area network telecommunications link to the West Virginia Network for Educational Telecomputing (WVNET).
- Numerous PC installations,,repairs, upgrades, problem troubleshooting, and operational issues occupied mush staff time. These tasks involved installing new hardware and software, software updates, transferring files, network settings, viruses, printer problems and printer drivers, Alost@ files and configurations, dead components, network adapter problems, BIOS issues, and problems caused by power outages. Fourteen uninterrupted power sources were destroyed as a result of a major power failure.
- Network-based full and incremental backups of systems were run. Maintenance agreements were initiated or renewed, as necessary. Regular vigilance was required to stay one step ahead of system hackers and viruses. Security patches on servers were regularly updated. New database, application, Internet map server, and e-mail servers were purchased, along with a new router, VPN, and RAM for various machines. Additional ArcGIS software licenses were purchased. An Internet and e-mail usage policy was developed for the agency.

Network—

- Considerable effort was concentrated into the management of the agency-wide computer network of servers, workstations, and PCs. Firmware updates were made to various network components. Re-cabling of the Survey's Mont Chateau headquarters continued with the installation of several new cable runs, construction of patch cables, and installation of rails, boxes, and faceplates in offices.
- Updates to the enterprise edition of anti-virus software were regularly uploaded to PCs. Domain name servers were modified and updated. Network backups were performed regularly. The firewall was monitored regularly. A database of network configurations containing the specifications of all devices on the network was being maintained.

State Information Technology Plan—A revision of the agency's Information Technology (IT) plan and a summary of the agency's IT projects were prepared and submitted to the Governor's Office of Technology as requested.

Service

Service Requests—

- Project staff responded to more than 150 external requests for data or queries about basic data during this fiscal year. The *Apipeline@* public-access 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 224 requests for information coming in via those methods. The INFO-line e-mail address is **info@geosrv.wvnet.edu**. These and other requests received via the agency's Web site were forwarded to appropriate agency staff for response. Vigilance is required for these publicly-advertised e-mail accounts because of the huge amount of "spam" and computer viruses (not included in these counts) they receive despite e-mail filters.

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 interactive coal bed mapping facility; geoscience education; an Avirtual@ mini-museum; 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 feature introduced this year was an interactive topographic map index. 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. Updates were made to several sections and pages on the Web site.
- 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 a 10 percent increase in page views over the previous fiscal year, along with a 20 percent increase in visitor sessions, and a 98 percent increase in downloaded files. This Acyber-service@ is free to Internet users at the Survey's Web address, **http://www.wvgs.wvnet.edu**.

Public Access *"pipeline"* to the Oil and Gas Data System—The agency's public-access *Apipeline@* cyber-service has seen continued growth in subscription. 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 four decades. Included in the geological data are unit tops and thicknesses, and zones and formations of pays and shows of hydrocarbons. Other data available include well farm names and numbers and company numbers, and depths and types of water encountered in the drilling

COMPUTING SERVICES AND COMPUTER UPGRADES PROJECTS (CONTINUED)

operation. By directly accessing the Survey's Oil and Gas Data System, the information contained in the database 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 through the menu-driven formatted screens 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). User-originated queries for wells meeting specific user-defined criteria or for the downloading of ASCII files aren't available in this version of *"pipeline"*. These types of operations, however, can be completed in the interim by agency staff and results are forwarded to the user as ASCII or Excel files. Modest fees are charged for customized data searches. Registered users can access the *"pipeline"* database at their convenience from their Internet-connected PC. On-line registration for the *Apipeline@* service is available through the agency's Web site. There were 193 registered user accounts this fiscal year.

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 2004 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.

Other Projects—A student group from West Virginia University's College of Business and Economics worked with agency staff to prepare a needs assessment for the implementation of "e-commerce" on the agency Web site.

Professional Activities/ Outreach

Committees—

- Geologist and Project Manager M.C. Behling represents the Bureau of Commerce on the State Information Technology Council and serves on its Internet Committee, and serves on the Information Services and Communication's IPUG Committee. She is an adjunct faculty member in the West Virginia University Department of Geology and Geography.
- Geologist and Data Analyst S.C. Kite chairs the agency's Policy Committee.

Continuing Education—

- M.C. Behling, S.C. Kite, Programmer/Analyst S.E. Pool, and Programmer/ Analyst J.T. Saucer attended a software training course, "Introduction to ArcGIS," Morgantown.

- S.C. Kite attended the Geological Society of America Annual Meeting, Seattle, WA, and represented the agency at an Undergraduate Geology Symposium at James Madison University, Harrisonburg, VA.

- S.E. Pool attended a Carbon Sequestration Project regional meeting, Columbus, OH.

- J.T. Saucer attended the ESRI GIS User Conference, San Diego, CA.

Presentations/Exhibits–

- M.C. Behling, S.C. Kite, and S.E. Pool attended the State GIS Conference, Morgantown, where Behling presented an update on agency activities in oil and gas.

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, 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 300 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 is a member of the Natural Stream Work Group for the Canaan Valley Institute and the Appalachian States Coalition for Geological Hazards in Transportation Committee. She is Chair of the American Association of Petroleum Geologists (AAPG) Membership Committee, a member of the AAPG Mentoring Committee, and an AAPG Division of Environmental Geosciences Advisory Board member. McColloch attended AAPG Leadership Days, Tulsa, OK, and the annual AAPG meeting, Dallas, TX, to participate in division and committee business meetings.

Continuing Education—J.S. McColloch attended the Geological Society of America annual meeting, Seattle, WA; the AAPG annual meeting, Dallas, TX; the Geological Hazards in Transportation in the Appalachian Region Technical Forum, Lexington, KY; and the Digital Mapping Techniques Conference, Portland, OR.

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

Presentations/Exhibits—

- Geologist M.E. Hohn and J.S. McColloch presented a talk on the West Virginia Geological and Economic Survey and its past involvement in water-use issues at an interim meeting of the Select Committee A--Water Issues, Charleston.
- Coal Geologist and Statistician G.H. McColloch, Jr. and J.S. McColloch presented "Mapping the West Virginia Portion of the Lake Lynn 7.5-minute Quadrangle: A Pilot project for Utilizing Pre-existing Geologic GIS Data to Produce Geologic Maps," at the Geological Society of America annual meeting, Seattle, WA.

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 2004 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.

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 2004, 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 will completed in July 2004. 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 staff on mapping and GIS issues related to critical infrastructure data requirements and digital tax parcel mapping standards.

West Virginia Department of Tax and Revenue—C.A. Neidig assisted department staff in the development of guidelines related to digital tax parcel mapping standards.

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. 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 2005 budget request. He assisted with budget preparations and presentations at the fiscal 2005 Executive and Legislative budget hearings for the Survey, and prepared several PowerPoint presentations for various meetings.

Professional Activities/ Outreach

Committees and Advisory Groups—C.A Neidig serves as Co-Chair of the National States Geographic Information Council (NSGIC) Communications Committee and is the NSGIC representative on the National Digital Elevation Program Steering Committee. 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 the alternate Bureau of Commerce representative on 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. Neidig served on the West Virginia Flood Management Task Force, attended meetings, and assisted in the preparation of the GIS and mapping sections of the report, to be released in 2004. He also has served as a judge at the annual West Virginia Geography Bee since 2001.

GEOGRAPHIC INFORMATION SYSTEM PROGRAM (CONTINUED)

Continuing Education—C.A. Neidig participated in GIS sessions and presentations at the NSGIC 2003 Annual Conference, Nashville, TN; NSGIC 2004 Midyear Conference, Reston, VA; West Virginia GIS Conference and Workshops, Morgantown; and Water Resources GIS Datasets for West Virginia, Nitro.

Presentations/Exhibits—

- C.A. Neidig presented "WVSAMB Update" at the West Virginia Association of County Commissioners Annual Training Conference, Snowshoe Resort, and at the Wayne County Commission meeting, February 17 2004, Wayne.
- Executive Secretary L.A. Cielensky and C.A. Neidig, staffed the WVSAMB exhibit booth at the West Virginia Association of Counties annual meeting, Charleston.
- Engineering Technician/Surveyor P.R. Liston and C.A. Neidig staffed the Survey's exhibit booth at West Virginia Association of Land Surveyors annual meeting, Charleston.
- 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

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) fell to 838. This is an average of 70 per month, or three per working day. This drop can be attributed to program cutbacks required by reduced budget allocations.

Outreach—The cumulative number of provided "teacher experiences" since 1992 now stands at 7,367. (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 147,000 classroom students in 52 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 a No Child Left Behind grant (Grant # ITQ-04-MSTC-1). Called MSTC GLOBE, the $48,000 grant we awarded after competitive review. T.E. Repine, Jr. served as Project Director. The grant will conclude in fiscal 2005.

Professional Activities/ Outreach

Committees—As a member of the Project CATS Advisory Council, T.E. Repine, Jr. helps assess the success of this multi-million dollar National Science Foundation-funded program. Repine is 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—

- T.E. Repine, Jr. and Dr. D.A. Hemler , Fairmont State University, conducted several sessions on "Geologic Education and West Virginia Geology" at the statewide meeting of the West Virginia Science Teachers Association, Monongalia County.
- T.E. Repine, Jr. awarded Elise Adkins, Logan County High School, the 2004 I.C. White Earth Science Teacher of The Year award.
- D.A. Hemler awarded the 2003 National Association of Geoscience Teachers Eastern Section Award to Michele Adams, Berkeley County. In addition, she awarded Mary Sue Burns, Pocahontas County, the National Association of Geoscience Teachers Eastern Section Outstanding Earth Science Teacher Award. This award proclaims Burns as the best in a 12- state region.
- Teacher M.S. Burns, Geologist D.L. Matchen, T.E. Repine, Jr., and D.A. Hemler presented "Geoteach Field Program for Teachers: Perceptions and Benefits" at the Geological Society of America meeting, McClean, VA.
- Teacher M. Adams and T. E. Repine, Jr. presented "Teachers Experiencing Antarctica and the Arctic" at the Geological Society of America, McClean, VA.

- Dr. R.E. Behling, West Virginia University, D.A. Hemler, and T. E. Repine, Jr. presented the poster session "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.
- M.S. Burns, T.E. Repine, Jr., and D.A. Hemler presented "Summer Field Intern Program for a Teacher/Student Pair" 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 over 1,300 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 over 650 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 visiotrs. This year, the project provided Survey staff as guest speakers and walk leaders for 13 parks where over 300 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 took a 16-hour course, "Introduction to ArcGIS1 by ESRI," at the West Virginia GIS Conference, Morgantown.

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 2004 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 gave a presentation on ESIC's efforts with geospatial data at the West Virginia GIS Conference, Morgantown, and 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, 2003: publication AR-03, 99 pages.

Potential Effects of Mountaintop Removal Coal Mining on Fluvial Geomorphology and Aquatic Habitat, West Virginia–Review of Literature 1929-2000: D. Newell and D. Chambers, 2002, publication C-47, 95 pages.

Bedrock Geology of the West Virginia Portion of the Lake Lynn Quadrangle, Monongalia County, West Virginia: G.H. McColloch, Jr. and J.S. McColloch, 2003, publication OF0405, 1:24,000 scale.

Bedrock Geology of the West Virginia Portion of the Morgantown South Quadrangle, Monongalia and Preston Counties, West Virginia: G.H. McColloch, Jr. and J.S. McColloch, 2004, publication OF0404, 1:24,000 scale

Bedrock Geology of the West Virginia Portion of the Morgantown North Quadrangle, Monongalia County, West Virginia: G.H. McColloch, Jr. and J.S. McColloch, 2004, publication OF0403, 1:24,000 scale.

Burnsville Lake: 2004, publication OF0401, 1:24,000 scale.

Preliminary Bedrock Geologic Map of the Franklin Quadrangle: R.R. McDowell, K.L. Avary, D.L. Matchen, R. Diecchio, K. Hicks, and C. Howton, 2003, publication OF0303, 1:24,000 scale.

Revisions—

Publications, Maps, and Services of the West Virginia Geological and Economic Survey: 2003, publication ED-A, 56 pages.

Miscellaneous Publications—

- To accommodate the agency's change of address, mailouts, flyers, and posters were produced as well as revisions to existing periodicals and promotional material.
- Booklets outlining the agency's program and fiscal information, activities, and finances during fiscal 2003 and 2004 were produced and distributed to legislators.
- A budget impact report was produced.
- New publication review and approval forms were devised and produced.
- Business cards were produced for many staff members.
- Telephone number contact cards were produced.
- Purchase order forms were periodically produced.
- Media releases and 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. Extensive 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 produced.

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

PUBLICATIONS AND GRAPHICS PROJECT (CONTINUED)

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.

- As work continues on a digital revision of the State's transportation map, the software and procedures derived from that project are being applied to map products from the STATEMAP project. From this, standardized format and content guidelines and production procedures have been established, not only for STATEMAP products, but all future digital Survey maps.
- Work was completed on reissuing the agency's famed County Geologic Report series volumes and maps on CDs. All of the large-format maps have been scanned and archived as well as the report volumes. County Geologic Reports on CD are available form the Publication Sales Office. Work now focuses on digitally reissuing the Survey's "Volume" series 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.

Professional Activities/ Outreach

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, bookmarks, 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:

- Materials and handouts for a Petroleum Technology Transfer Council presentation.
- New labels and placards for the Survey's museum displays.
- 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.