

THE GEOLOGICAL SURVEY OF WYOMING
Gary B. Glass, State Geologist

FIFTY-SIXTH ANNUAL REPORT
of the
GEOLOGICAL SURVEY OF WYOMING

For Fiscal Year 1989
July 1, 1988 to June 30, 1989

by

Gary B. Glass and Susanne G. Bruhnke



Laramie, Wyoming
October, 1989

THE GEOLOGICAL SURVEY OF WYOMING
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INTRODUCTION

STATUTORY AUTHORITY

The office of State Geologist was established in 1890 with the Wyoming State Constitution (Art. 9, Sec. 6) and modified by legislative enactment in 1969, 1975, 1977, 1979, and most recently Laws 1982, Ch. 62, §3 (Title 9, Ch. 2, Art. 8, W.S. 9-2-803).

The Geological Survey of Wyoming, which was created by the Legislature in 1933, has since been modified by legislative enactment in 1957, 1969, 1977, 1979, and most recently Laws 1982, Ch. 62, §3 (Title 9, Ch. 2, Art. 8, W.S. 9-2-803 through 9-2-809).

AGENCY MISSION

The mission of the Geological Survey is to provide timely information on the geology and mineral and

energy resources of the State as an aid to the management of these valuable natural resources.

AGENCY GOALS

The Geological Survey of Wyoming's goals, which are listed below, link the Survey's activities and programs to the State's needs:

INFORMATION DISSEMINATION — PROVIDE THE PUBLIC AND PRIVATE SECTORS WITH TIMELY, ACCURATE, AND ACCESSIBLE INFORMATION ABOUT THE STATE'S GEOLOGY AND MINERAL AND ENERGY RESOURCES.

This goal is achieved by publishing geologic maps and general interest, scientific, and technical reports on geology and mineral and energy resources; by making technical files available to the public; and by operating a public information service that provides answers to inquiries or enables inquirers to readily identify and obtain existing information.

GEOLOGIC FRAMEWORK — INCREASE KNOWLEDGE OF THE GEOLOGIC STRUCTURE AND GEOLOGIC FORMATIONS IN THE STATE TO PROVIDE THE SCIENTIFIC FRAMEWORK FOR INVESTIGATIONS OF MINERAL RESOURCES AND GEOLOGIC HAZARDS AND TO MEET UNFORESEEN FUTURE RESPONSIBILITIES.

This goal is achieved through geologic mapping; through stratigraphic and paleontologic field studies; through the testing of conceptual models; and through laboratory investigations of the petrologic, physical, and chemical properties of rocks and minerals.

MINERAL AND ENERGY RESOURCE ASSESSMENT — INCREASE KNOWLEDGE OF THE DISTRIBUTION AND QUALITY OF THE STATE'S MINERAL AND ENERGY RESOURCES SO THAT GOVERNMENT OFFICIALS AND THE PUBLIC NOT ONLY CAN FORMULATE AND EVALUATE POLICIES

WHICH AFFECT THE LONG-TERM AVAILABILITY OF THESE RESOURCES, BUT ALSO CAN MAKE INFORMED DECISIONS ABOUT THE USE OF THE STATE'S LAND, MINERAL, AND ENERGY RESOURCES.

This goal is achieved by using the techniques of resource evaluation including geologic mapping, reconnaissance exploration, and field and laboratory studies of rocks and minerals.

MINERAL AND ENERGY RESOURCE PROCESSES — ENHANCE THE ABILITY TO DISCOVER HIDDEN OR AS YET UNRECOGNIZED MINERAL AND ENERGY RESOURCES BY DEVELOPING INFORMATION ON THE NATURAL PROCESSES BY WHICH MATERIALS IN THE EARTH ARE FORMED, TRANSPORTED, AND CONCENTRATED.

This goal is achieved through field investigations, laboratory analysis, and the construction of conceptual models.

HAZARDS IDENTIFICATION AND PREDICTION — IDENTIFY POTENTIAL GEOLOGIC HAZARDS AND IMPROVE THE ABILITY TO PREDICT THE LOCATION, TIME, AND SEVERITY OF NATURAL AND MAN-MADE HAZARDS SO THAT LOSS OF LIFE AND PROPERTY IS MINIMIZED IF NOT ELIMINATED.

This goal is achieved through geologic mapping, field investigations, aerial photographic interpretation, and the application of geologic principles related to dynamic Earth processes.

TIMELY REPORTING OF EVENTS AND CONDITIONS — PROVIDE TIMELY REPORTING AND FORECASTS OF MINERAL PRODUCTION AND

VALUES AS WELL AS IMPORTANT HYDROLOGIC AND GEOLOGIC EVENTS AND CONDITIONS OF IMMEDIATE CONCERN TO THE PUBLIC AND TO GOVERNMENTAL BODIES.

This goal is accomplished by ongoing analysis of mineral- and energy-related activities, including man-related projects and the geologic conditions surrounding those projects, and the timely dissemination of relevant information to include warnings. Similarly, natural events are also monitored, particularly in regard to how they might affect the public.

COORDINATION — IMPROVE THE COORDINATION OF EARTH-SCIENCE DATA COLLECTION, RESEARCH, AND MAPPING TO MINIMIZE DUPLICATION OF EFFORT, INCREASE DATA ACCESSIBILITY, AND REDUCE COSTS.

Coordination is carried out by sharing and(or) exchanging plans, technologies, and data bases with appropriate entities and by striving to standardize information formats.

MISSION SUPPORT — IMPROVE PRODUCTIVITY OF THE SURVEY TO EFFECTIVELY CARRY OUT ITS MISSION.

This is accomplished by providing new training or continuing education opportunities for employees; by replacing and upgrading obsolete field, laboratory, and publication-related equipment when warranted; by acquiring computer software and(or) hardware to enhance the operations and management of the Agency; and by implementing innovative ideas that increase output from available resources.

AGENCY ACCOMPLISHMENTS

In FY89, the Geological Survey:

— provided data, advice, and assistance to both in-state and out-of-state inquiries, responding to more than 17,604 inquiries related to geology and mineral and energy resources (6,019); to the effective use of earth-science techniques, products, and information (221); and to requests for Survey publications and information on publications (11,364).

— prepared 68 new reports or maps that communicate information on the State's geologic and mineral and energy resources, and published those reports for dissemination through the Publications Sales Section.

— maintained and expanded public files and data bases on the State's geologic and mineral and energy resources.

— identified and evaluated geologic hazards in Wyoming associated with earthquakes, landslides, subsidence, shrinking-swelling clays, active faults, wind-blown sands, and the naturally-occurring toxic elements, selenium and radon.

— assessed mineral and energy resources, documented their occurrences, and determined their origins and manners of occurrence through more than 12 field and laboratory investigations.

— increased knowledge of the State's stratigraphic framework through four geologic mapping and(or) geologic investigations.

— facilitated the judicious use of Wyoming's geologic and mineral and energy resources through the review of 156 planning documents.

ORGANIZATION

To accomplish its mission and achieve its goals, the Geological Survey operates under two programs (Figure 1):

ADMINISTRATION PROGRAM (001) - Since 1969, when the Agency was reorganized and expanded, efforts of the Administration Program have been directed at geological factors that directly or indirectly affect the State's citizenry, State-owned lands, communities, new mineral discoveries, mineral development, items of scientific importance, and natural or man-induced geologic hazards.

The staff of the Administration Program currently consists of 13 full-time and 9 part-time employees. Seven full-time geologists and 7 part-time geologic assistants form the backbone of this program, which is tasked with the major objectives of the Agency. The Director and two other full-time employees (executive secretary and bookkeeper) in the Administration Program provide the truly administrative, budgetary, and fiscal support for the Agency. In addition, 3 full-time (Editor and two cartographers) and 2 part-time (cartographer and stockworker) members of this program provide editorial, cartographic, and other support to the

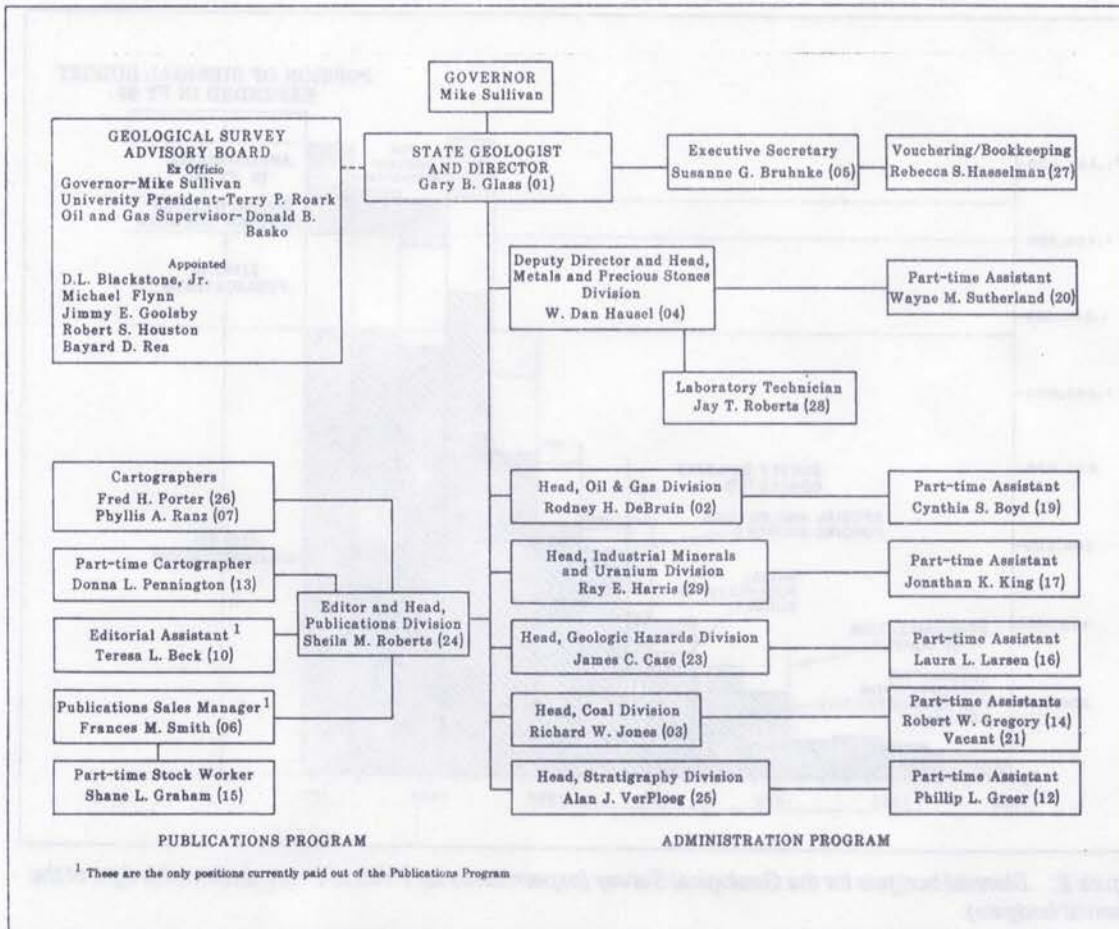


Figure 1. Organization chart for the Geological Survey in FY89.

Publications Program. Although these latter five positions are currently funded from the Administration Program, it has been recommended that they be transferred to the Publications Program. Their activities are discussed in the Publications Program.

In support of this program the Agency solicits and receives some funds from outside sources (State, local, or Federal grants) to augment General Fund appropriations. In FY89, these augmenting funds totaled \$74,718.51, of which \$46,055.98 were expended in that fiscal year. Although the projects funded by these grants become part of the Administration Program, their continuation into future years is speculative as they are only funded on an annual basis.

PUBLICATIONS PROGRAM (002) - This is the publishing arm of the Agency. The program is also charged with selling and distributing the Agency's publications. The Publications Program, which in-

cludes the salaries for two full-time employees (Publication Sales Manager and Editorial Assistant) as well as funds for supplies, equipment, commercial printing, and travel related to publication activities, is funded by General Fund appropriations.

The Publications Program consists of a Publications Division, which is headed by the Editor. This Division includes a Cartographic Section, an Editorial Section, and a Publications Sales Section. The Cartographic Section puts all illustrative materials (drawings, maps, charts, etc.) into publishable form and makes proof copies and printer-ready negatives. The Editorial Section edits and puts all manuscripts into printer-ready formats, writes printing specifications, and sees that reports are satisfactorily printed. The Publications Sales Section sells Survey publications over-the-counter, by mail, and by phone, keeps an inventory of publications, and mails exchange publications. Revenues from the sale of publications in FY 89 was \$68,756. It has been recommended that the five

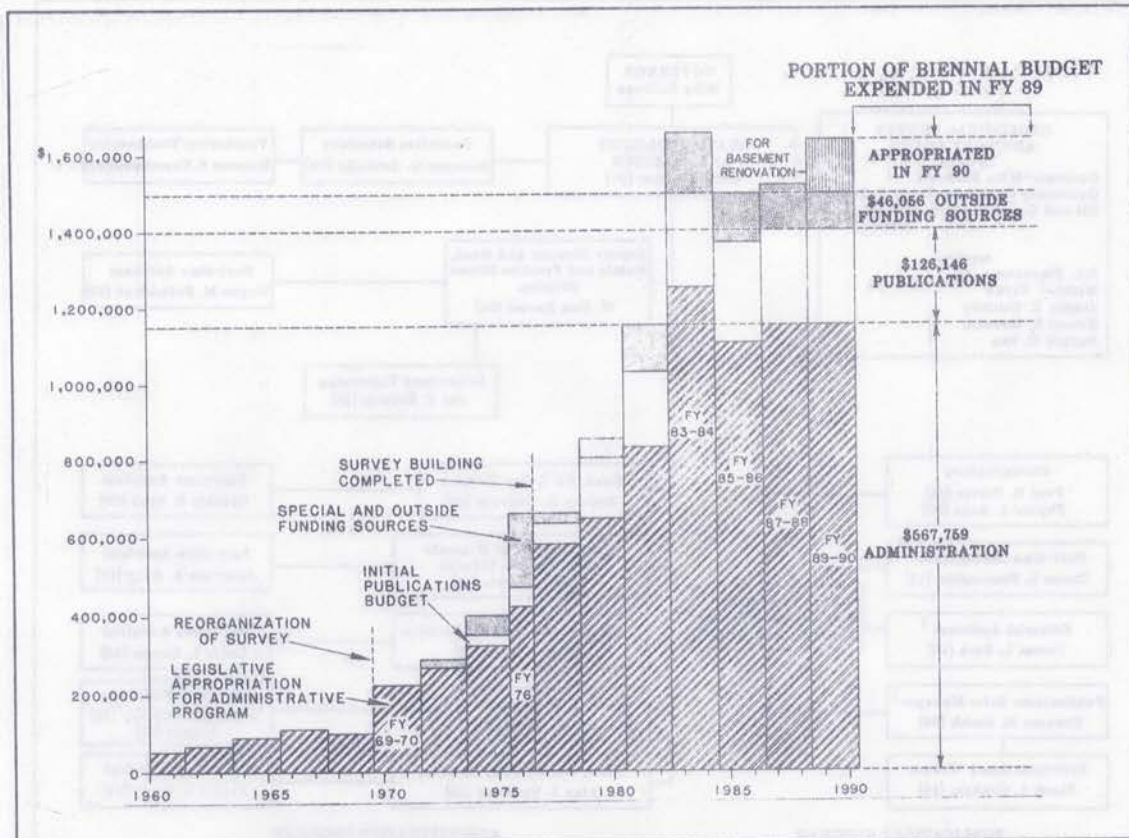


Figure 2. Biennial budgets for the Geological Survey (expenditures for FY89 are annotated to the right of the biennial budgets).

positions in this Division that are not currently funded by the Publications Program be transferred into and funded by this Program.

The biennial appropriations for these two programs are shown in Figure 2 along with FY 89 expenditures.

MAJOR ACCOMPLISHMENTS OF THE ADMINISTRATION PROGRAM

OBJECTIVES

The Administration Program is implemented by the State Geologist, six geologic Divisions (Coal, Geologic Hazards, Industrial Minerals and Uranium, Metals and Precious Stones, Oil and Gas, and Stratigraphy), and the Laboratory Section. To accomplish the Agency's mission and goals as listed earlier, this

program has three major objectives: (1) provide geologic information, advice, and assistance to inquiries, (2) conduct office, field, and laboratory investigations and prepare geologic reports and maps on those investigations, and (3) maintain records on geologic, mineral, and energy resources.

ACCOMPLISHMENTS

For each of these three major objectives, the activities and accomplishments of the Administration Program in FY 89 are described below:

SERVICES: Provide information, advice, and assistance for all inquiries on the State's geologic, mineral, and energy resources.

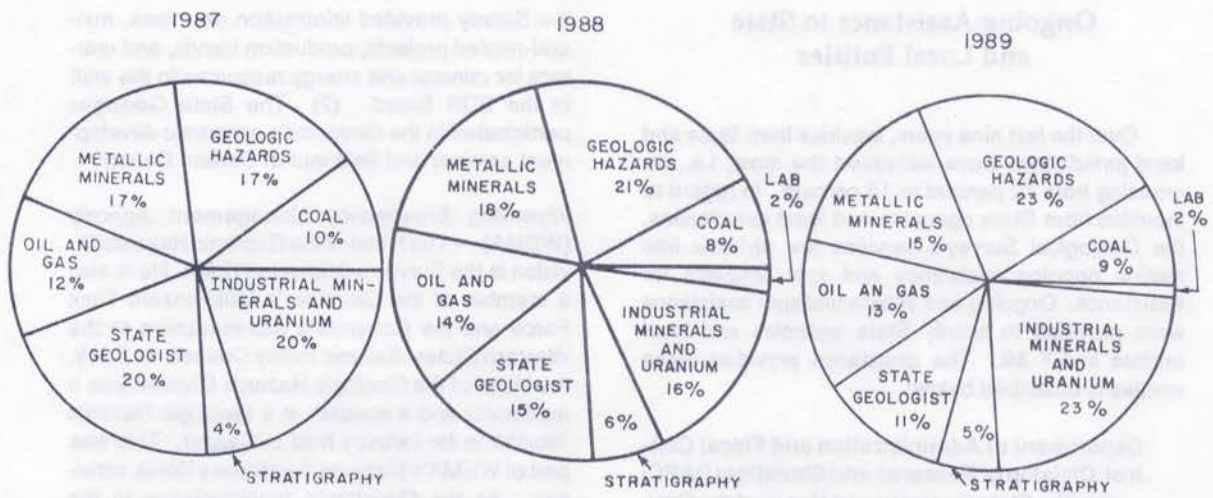


Figure 3. Percentage of inquiries directed to each of the Geologic Divisions, Fiscal Years 1987-1989.

General

Because the Geological Survey is primarily a service-oriented organization, its geologic staff responds to many thousands of requests for information and assistance each year. Figure 3 illustrates the percentages of these inquiries received by the various Geologic Divisions of the Survey over the last three fiscal years. Most significantly, the Industrial Minerals and Uranium, the Geologic Hazards, and the Metals and Precious Stones Divisions had the most inquiries in FY 89. This has been the case for the last three years.

Since at least 1981, inquiries directed to the geologic staff have increased every year. In FY89, inquiries increased about 6 percent (from 5,655 in FY 88 to 6,019 in FY 89); this level equates to 3.0 inquiries per geologist per work day (254 work days in a year). More importantly, this current level of inquiry is 221 percent greater than it was in FY 81 (Figure 4). Figure 4 also shows the categories of inquirers requesting information and assistance from the geologic staff.

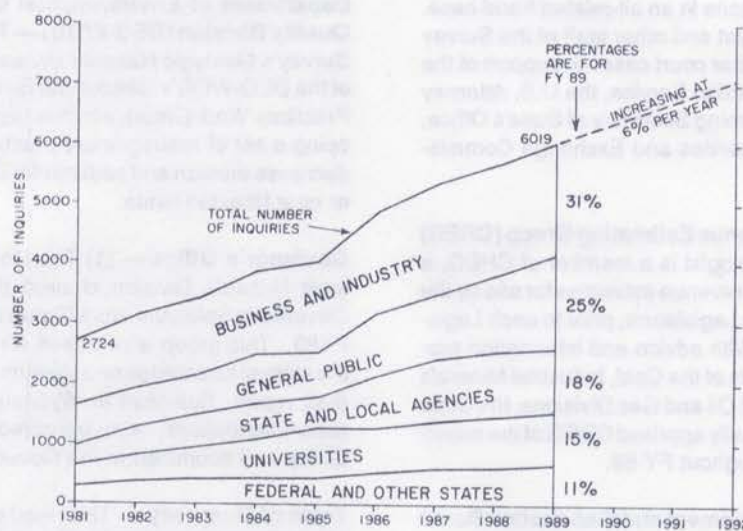


Figure 4. Number of inquiries directed to the Geologic Divisions by category and fiscal year.

Ongoing Assistance to State and Local Entities

Over the last nine years, inquiries from State and local jurisdictions have increased the most, i.e., increasing from 12 percent to 18 percent. In regard to inquiries from State agencies and local jurisdictions, the Geological Survey's services are divisible into routine ongoing assistance and spot requests for assistance. Ongoing and substantial spot assistance were provided to twenty State agencies and local entities in FY 89. The assistance provided these entities is described below:

Department of Administration and Fiscal Control, Division of Research and Statistics (DAFC)

— (1) The State Geologist and Heads of the Coal, Industrial Minerals and Uranium, Oil and Gas, and Metals and Precious Stones Divisions provided summaries of the historical prices for oil, coal, and metals; summaries of current prices; maps; production statistics; and forecasts related to mineral and energy resources throughout the year for use in economic forecasting or for use in the *Wyoming Data Handbook*. (2) The State Geologist reviewed and commented on the Wharton Economic Forecasting Model.

Archives, Museums, and Historical Department

— As the Associate Curator of Mineralogy for the Wyoming State Museum, the Survey's Deputy Director continued to provide materials and information for the museum on request.

Attorney General's Office — The State Geologist provided information and testimony that helped convict three persons in an oil-related fraud case. The State Geologist and other staff of the Survey are assisting in other court cases in support of the U.S. Postal Inspection Service, the U.S. Attorney General, the Wyoming Secretary of State's Office, and the U.S. Securities and Exchange Commission.

Consensus Revenue Estimating Group (CREG)

— The State Geologist is a member of CREG, a group that makes revenue estimates for use by the Governor and the Legislature, prior to each Legislative Session. With advice and information provided by the Heads of the Coal, Industrial Minerals and Uranium, and Oil and Gas Divisions, the State Geologist continually apprised CREG of the minerals situation throughout FY 89.

Economic Development and Stabilization Board (EDS Board) — (1) The State Geologist and Heads of the Coal, Industrial Minerals and Uranium, and Metals and Precious Stones Divisions of

the Survey provided information on mines, mineral-related projects, production trends, and markets for mineral and energy resources to the staff of the EDS Board. (2) The State Geologist participated in the Governor's economic development seminar and field tour of Carbon County.

Wyoming Emergency Management Agency (WEMA)

— The Head of the Geologic Hazards Division is the Survey's liaison to WEMA. He is also a member of the Governor's Multi-hazard Task Force and the Governor's representative to the Western States' Seismic Policy Council. In FY89, the Head of the Geologic Hazards Division was a moderator and a speaker at a *Geologic Hazards Workshop for Industry* held in Casper. This was part of WEMA's Hazards Awareness Week activities. As the Governor's representative to the Western States Seismic Policy Council, he attended the annual meeting, which was held in Hawaii, and a *Biennial Earthquake Program Workshop* held in Maryland.

Department of Environmental Quality, Land Quality Division (DEQ-LQD)

— (1) The Head of the Geologic Hazards Division assisted the DEQ-LQD in a jointly sponsored *Symposium on Abandoned Mine Land Reclamation Technologies* held in Rock Springs. (2) The Heads of the Coal, Industrial Minerals and Uranium, and Metals and Precious Stones Divisions continued to review Abandoned Mined Land Reclamation Projects (AML). (3) The Survey also has a Memorandum of Understanding with the DEQ-LQD in regard to reviewing paleontologic Surveys required for mining applications.

Department of Environmental Quality, Water Quality Division (DEQ-WQD)

— The Head of the Survey's Geologic Hazards Division is a member of the DEQ-WQD's Silvicultural Best Management Practices Work Group, which is tasked with developing a set of management practices that would decrease erosion and sedimentation in streams in or near forested lands.

Governor's Office

— (1) The Head of the Geologic Hazards Division chaired the 75-member Governor's Selenium Work Group through most of FY89. This group was tasked with summarizing the state of knowledge on selenium in Wyoming. A draft report, *Selenium in Wyoming: issues and recommendations*, was prepared by the Work Group and submitted to the Governor.

Town of Guernsey — The Head of the Industrial Minerals and Uranium Division assisted the Town of Guernsey in developing and implementing a project to evaluate a high-silica volcanic ash (Patten

Creek) deposit near Guernsey. Funds for the project came from a block grant from the Economic Development and Stabilization Board.

Department of Health and Social Services — The Geologic Hazards Division continued to participate in radon-related projects of the Department of Health and Social Services and the U.S. Environmental Protection Agency. In FY89, the Geological Survey placed radon detection canisters in 40 homes in the Laramie area, provided guidance for placement of canisters in schools in Campbell and Fremont Counties, and suggested where canisters should be placed in Saratoga.

Industrial Siting Administration (ISA) — The Survey reviewed one siting application in FY 89, and also reviewed the ISA's proposed regulations for commercial waste disposal sites.

International Trade Office — The Head of the Industrial Minerals and Uranium Division provided the Trade Office with samples of decorative stone and uranium. These samples were placed in the trade center office in Taiwan.

Legislative Service Office — (1) In October, the State Geologist and the Heads of the Coal, Industrial Minerals and Uranium, and Oil and Gas Divisions estimated the production and assessed value for minerals produced in the State. The Survey's estimates and those of several other State agencies were used to reach a consensus on future mineral production and assessed values. Later these consensus estimates were used by the Consensus Revenue Estimating Group (CREG) to provide a forecast of mineral revenue for use by both the Governor and the Legislature. (2) Definitions of oil and gas terms were provided in response to a Legislator's request for information.

Oil and Gas Conservation Commission — (1) Wyoming Statute 30-5-103 makes the State Geologist one of the Commissioners of this regulatory agency. Monthly hearings were routinely 0.5-1.0 day long in FY 89 and involved 366 dockets. The State Geologist also served as the Acting Chairman of the Commission when the Governor was not present. Matters related to the Oil and Gas Conservation Commission, in addition to the hearings, routinely require another two or more days of effort by the State Geologist each month. (2) The Geologic Hazards Division continued to provide some geologic information to assist the Commission's field personnel in evaluating sites for disposal pits.

Secretary of State's Office — The State Geologist and Head of the Metals and Precious Stones

Division provided technical advice, information, and assistance to support the investigations of several suspected cases of mineral-related scams. These activities also supported the U.S. Postal Inspection Service, U.S. Attorney General, Wyoming Attorney General, and the U.S. Securities and Exchange Commission.

State Crime Laboratory — The Survey continued to provide technical and laboratory assistance to investigators from the State Crime Lab when requested.

Wyoming State Land and Farm Loan Office — (1) The Survey's Oil and Gas Division provided (a) weekly reports of oil and gas activities on or near State lands, (b) oil and gas tract evaluations to assist with selecting tracts for the lease auction every other month, and (c) an updated computerized listing of oil and gas potential and sale results on State lease tracts; (2) the State Geologist (a) reviewed and made recommendations on all commercial and scientific fossil-collecting permits (there were 8 applications in FY89), (b) made recommendations for some needed changes in the State's fossil-collecting rules and regulations, and (c) provided some information regarding proposed land exchanges involving State lands.

State Planning Coordinator and Governor's Clearing House — (1) The State Geologist and Heads of the six geologic and mineral divisions reviewed 156 documents for the Governor's Clearing House in FY89 and submitted written comments on 44. (2) The State Geologist provided mineral and energy resource information for use by Standard and Poors in regard to evaluating Wyoming's bond strength.

University of Wyoming — (1) The State Geologist and several of the Survey's Division Heads continued to provide quarterly minerals outlook articles for publication in the Institute for Policy Research's *Wyoming quarterly update*; (2) the State Geologist and Deputy Director remained members of the American Heritage Center's Advisory Board for the Anaconda Collection, which was opened for use in FY 88; (3) the State Geologist continued to serve on the College of Agriculture's Advisory Council; (4) the Metals and Precious Stones Division continued field and laboratory research into diamond-bearing kimberlite deposits in Wyoming, partially funded by a cooperative agreement with the University's Mining and Mineral Resources Research Institute; and (5) ongoing assistance and information was provided to faculty and students from several different departments of the University.

Spot Assistance to State and Local Entities

In addition, spot requests for assistance were received in FY 89 from 79 other State and local entities. The following is a list of these entities in FY89:

Agriculture Department
Air National Guard
Albany County Clerk's Office
Albany County Commissioners
Albany County Planning Office
Army National Guard
Big Horn County Library
Budget Division (DAFC)
Campbell County Economic Development Corporation
Casper Area Economic Development Alliance
Casper College
Casper County Extension Office
Casper School District
Chugwater City Council
Cody (Mayor)
Cody Area Development Council
Communications Division (DAFC)
Data Services Division (DAFC)
Education Department
Environmental Quality - Air Quality Division
Evanston Fire Department
Fremont County Planning Department
Game & Fish Department
Gillette City Council
Government Efficiency Study Committee
Green River High School
Highway Department
Horse Creek Water District
Kelly Walsh High School, Casper
Labor Department
Laramie City Council
Laramie County Community College
Laramie Economic Development Council
Laramie School District
Lincoln County Planning Department
Lovell City Council
Lusk City Council
Midvale Irrigation District
Natrona County Extension Agent
Natrona County Health Department
Natrona County Planning Commission
Northwest Community College
Personnel Division (DAFC)
Platte County Commissioners
Public Service Commission - Transportation Division
Public Service Commission - Utilities Division
Purchasing & Property Control (DAFC)
Recreation Commission
Representative Craig Thomas
Representative Jim Hageman
Representative Scott Ratliff
Research & Statistics Division (DAFC)
Revenue and Taxation Department
Riverton Economic Development Board
Senator Frank J. Dusi
Senator Jim Geringer
Senator John Vinich
Senator Tom Stroock
Sheridan County Economic Development Board

St. Stephens Indian School
State Archaeologist's Office
State Auditor's Office
State Engineer's Office
State Inspector of Mines
State Treasurer's Office
State Veterinary Laboratory
Surplus Property Division (DAFC)
Sweetwater County Planning Association
Thermopolis (Mayor)
Training & Development (DAFC)
Travel Commission
Tri-City Community Education
Washakie County Museum
Water Development Commission
Western Wyoming College
Wheatland City Council
Wyoming Community Development Authority
Wyoming Council on the Humanities
Wyoming Public Employees Association
Wyoming Small Business Development Commission

Assistance to Federal Entities, Foreign Entities, and Other States

Requests for information and assistance were also received and answered for 115 Federal, foreign, or other state entities as listed below:

Federal

Army Corps of Engineers
Army Corps of Engineers Waterways Experiment Station
Bicentennial Commission of the U.S. Constitution
Bighorn Canyon National Recreation Area
Bureau of Indian Affairs
Bureau of Land Management
Bureau of Mines
Bureau of Reclamation
Defense Nuclear Agency
Department of Agriculture - A.R.S.
Department of Energy
Energy Information Administration
Environmental Protection Agency
Federal Emergency Management Agency
Fish and Wildlife Service
Forest Service
Internal Revenue Service
Labor Department
Library of Congress
Mine Health & Safety Administration
Minerals Management Service
National Earthquake Information Center
National Park Service
National Research Council
Nuclear Regulatory Commission
Office of Surface Mining, Reclamation & Enforcement
Postal Service
Senator Malcolm Wallop's Office
Soil Conservation Service
Tennessee Valley Authority
U.S. Customs
U.S. Geological Survey
Wind River Tax Commission

Foreign

British Columbia Ministry of Energy, Mines, and Mineral Resources
British Geological Survey
Büro für angewandte Geologie
Geological Museum of China
Canada - Indian Affairs (Calgary)
Instituto de Geociencias - UNICAMP
International Tsunami Information Center
Queens University of Belfast
University of Cape Town, South Africa
USSR Academy of Science

Other States

Arizona Geological Survey
California Water Resources Board
Central Michigan University
City of Los Angeles, Office of Emergency Management
Colorado Department of Public Lands
Colorado Geological Survey
Colorado School of Mines
Colorado State University
George Mason University
Harveyville Grade School
Hawaii Civil Defense Agency
Idaho Geological Survey
Illinois Natural History Survey
Illinois State Geological Survey
Illinois State University
Indiana Geological Survey
Indiana University
Iowa State University
Kansas Geological Survey
Kentucky Department of Mines & Minerals
Kentucky Energy Cabinet
Los Angeles Department of Water & Power
Louisiana Geological Survey
MacKay School of Mines
Miami University
Michigan State University
Minnesota Geological Survey
Missouri Department of Natural Resources
Missouri River Management Project
Montana Bureau of Mines & Geology
Nebraska Highway Department
New Jersey Department of Corrections
New Jersey State Museum
New Mexico Energy, Minerals & Natural Resources Department
New Mexico Geological Survey
New Mexico State Land Office
North Carolina Geological Survey
North Dakota Geological Survey
North Platte Natural Resource District
Oklahoma Geological Survey
Oregon Dept. of Geology & Mineral Industries
Pennsylvania Bureau of Topographic & Geologic Survey
San Joaquin Valley Drainage Program
South Dakota Natural Resources Division
South Dakota School of Mines
South Dakota State University
State University of New York at Buffalo
Syracuse University
Texas A & M University
Texas Bureau of Economic Geology
Tuscaloosa Academy
University of Arizona
University of California - Santa Barbara

University of Colorado
University of Missouri
University of New Orleans
University of North Carolina
University of North Dakota
University of Texas at Austin
University of Utah
University of Wisconsin
Utah Energy Office
Utah Geological and Mineral Survey
Utah Geological Survey
Utah Museum of Natural History
Vermont Agency of Natural Resources
Virginia Division of Mineral Resources
Virginia State Geological Survey
Virginia Technical University
Virginia Western Community College
Washington Div. Mines & Mineral Resources
West Virginia Department of Mines
Western Michigan University
Wisconsin Geological & Natural History Survey

Talks and Briefings

As an extension of this service-related function, the State Geologist, Division Heads and staff, and the Editor collectively presented 43 talks or briefings on mineral resources, geology, or geologic hazards to the following groups:

American Association of Petroleum Geologists, San Antonio, Texas
American Institute of Professional Geologists, Casper
American Water Resources Association, Cheyenne
Architectural Institute of America, Annual Convention, Cheyenne
Biennial Earthquake Program Workshop, Emmitsburg, Maryland
Desk and Derrick Club, Casper
Evolution of Abandoned Mine Land Technologies: A Symposium, Riverton
Friends and Company, Laramie
Friends of Mineralogy (Colorado Chapter) and Department of Geology,
Colorado School of Mines, Golden, Colorado
Geologic Hazards Workshop for Industry, Casper (2 talks)
Geological Society of America, Denver, Colorado
Governor's Selenium Work Group, Laramie
Governor's Water Forum, Cheyenne
Inter-agency Soil Scientist Workshop, Casper
KGWN Town Talk Program, Cheyenne
KUWR radio talk show, Laramie
Laramie Children's Museum, Laramie (2 talks)
Laramie County Community College, Cheyenne (2 talks)
Lions Club, Cheyenne
Lions Club, Pine Bluffs
National Aeronautics and Space Administration, Second Basin Analysis
Workshop, Pittsburgh, Pennsylvania
Prospectors of Wyoming (POW), Cody
Rock Springs Rockhound Club, Rock Springs
Society of Mining Engineers, Symposium on *In Situ* Solution Mining,
Casper
St. Stephens Indian High School, Natural Resources Class, Riverton (2
talks)
Tri-Cities Community Education Field Trip, Hartville
U.S. Geological Survey, U.S. Bureau of Mines, and Western State
Geologists meeting, Sacramento, California
Uinta County School Bond Meeting, Mountain View
University of Wyoming, Department of Geology and Geophysics, Laramie
University of Wyoming Educational TV, Laramie
Western States Seismic Policy Council, Honolulu, Hawaii

Wyoming Geological Association, Casper (5 talks)
Wyoming Mining Association's Teacher Workshop, Cheyenne
Wyoming State Science and Math Teachers Association, Cheyenne
Wyoming Water Research Center, Laramie

INVESTIGATIONS: Conduct office, field, and laboratory investigations and prepare geologic reports and maps that (a) increase understanding of the geologic, mineral, and energy resources of the State and (b) have a practical bearing on Wyoming's communities and people.

Arranged by Geologic Division, the following 36 reports, studies, or investigations were ongoing or completed in FY89:

Coal Division

- **Summary report on coalbed methane potential in Wyoming** (completed and submitted for publication by the Wyoming Geological Association as a joint effort with the Oil and Gas Division).
- **Investigation of the stratigraphic framework of coal-bearing rocks in the Wind River Basin** (ongoing; preparing an interim report for publication; partially funded by a grant from the U.S. Geological Survey's Coal Branch).
- **Preparation of reports summarizing Federal coal drilling in Wyoming to include coal analyses** (ongoing; in FY89, prepared and published a report on the coal geology underlying the Rawhide Village subdivision near Gillette; partially funded by the U.S. Bureau of Land Management).
- **Preparation of a coal resources map of the Powder River Basin Coal Field** (ongoing; partially funded by a grant from the U.S. Geological Survey's Geologic Division).
- **Preparation of a coal resources map of Wyoming** (ongoing).

Geologic Hazards Division

- **Selenium investigations** (ongoing; in FY89, chaired and organized a 75-member work group for the Governor which (1) coordinated selenium researchers in Wyoming, (2) prepared a paper on selenium and livestock in Wyoming, (3) initiated work on a selenium bibliography, (4) initiated testing of fish in Laramie plains' lakes for selenium content, (5) initiated testing of rural water supplies in the Casper area for selenium, and (6) provided a draft report to the Governor titled, *Selenium in Wyoming: issues and recommendations*).

- **Landslide mapping and classification** (ongoing; in FY89, (1) prepared maps of landslides for 175 (1:24,000-scale) quadrangles, (2) prepared 50 (1:24,000- or 1:62,500-scale) maps which were published as Preliminary Landslide maps, and (3) prepared draft copies of six 1:250,000-scale regional maps of landslides; was at one time partially funded by a grant from the U.S. Geological Survey).

- **Radon investigations** (ongoing; in FY89, placed 40 radon detection canisters in homes in the Laramie area in support of the Wyoming Department of Health and Social Services radon program and initiated preparation of a map of alluvial deposits as an aid in assessing radon potential across the State).

- **Earthquake investigations** (ongoing; in FY89, (1) prepared a short report describing recent research on active faults in Wyoming and (2) acquired a computer, partially funded by the Wyoming Emergency Management Agency, to begin simulation studies of possible earthquakes).

- **Educational materials on geological hazards** (ongoing; in FY89, assisted in acquiring and distributing educational materials on earthquakes to schools as a joint effort with the Wyoming Emergency Management Agency).

Industrial Minerals and Uranium Division

- **Map of industrial minerals and construction materials in the Powder River Basin** (completed and published; partially funded with a grant from the U.S. Geological Survey's Geologic Division).

- **Map of uranium, other metals, and precious stones in the Powder River Basin** (completed and submitted for publication; a joint effort with the Metals and Precious Stones Division; partially funded with a grant from the U.S. Geological Survey's Geologic Division).

- **Evaluation of sites for a planned underground explosive test (DUGHEST)** (ongoing; in FY89, completed an unpublished report on one site and monitored water wells at the site; partially funded by the U.S. Defense Nuclear Agency).

- **Silica sand investigations** (ongoing; in FY89, (1) began a study of a high-silica volcanic ash deposit near Patten Creek, which was partially funded by a grant from the Town of Guernsey, (2) prepared and published a report on tripoli occurrences in Wyoming, and (3) worked with the Town of Lovell in an effort to get them funding to evaluate some high-silica sand deposits).

- **Field and laboratory studies of selected industrial minerals and construction materials** (ongoing; in FY89, (1) continued gathering information and samples of decorative stone and aggregate, (2) worked with the Town of Cody in an effort to get them funding to evaluate a magnetite-bearing sand, and (3) continued to map the industrial minerals in the Guernsey 7 1/2-minute Quadrangle).

- **Preparation of a report on uranium mines and radioactive mineral occurrences in Wyoming** (ongoing).

- **Investigations of unconformity-related uranium deposits in Wyoming** (ongoing).

- **Preparation of background gamma radiation maps of Wyoming** (ongoing; in FY89, prepared and published a map of the Newcastle 1° x 2° sheet).

Metals and Precious Stones Division

- **Field and laboratory investigations of precious metals** (ongoing; in FY89, prepared and published a comprehensive report on precious metal lode and placer deposits).

- **Economic geology study of the South Pass-Atlantic City mining district** (ongoing; in FY89, (1) prepared and published three 1:24,000-scale geologic maps from the district and (2) prepared and submitted a small-scale regional map for publication and (3) discovered several gold, tungsten, chromium, and nickel anomalies; was initially partially funded by a grant from the U.S. Geological Survey's COGEMAP Program).

- **Field and laboratory investigations of strategic and rare metals and minerals** (ongoing).

- **Field and laboratory investigations of potentially diamond-bearing kimberlites and other rocks** (ongoing; more than 100 possible kimberlite pipes have been recognized to date; partially funded through a cooperative agreement with the University of Wyoming's Mining and Mineral Resources Research Institute).

- **Preparation of a comprehensive report on Wyoming's lapidary and gemstone resources** (ongoing).

- **Map of uranium, other metals, and precious stones in the Powder River Basin** (completed and submitted for publication; a joint effort with the Industrial Minerals and Uranium Division; partially funded with a grant from the U.S. Geological Survey's Geologic Division).

Oil and Gas Division

- **Report on the Hawk Point oil field** (completed and published).

- **Report on the Cottonwood Creek oil and gas field area** (completed and submitted for publication by the Wyoming Geological Association).

- **Summary report on Wyoming's oil and gas industry in the 1980s** (completed and published).

- **Preparation of an oil and gas map of the Powder River Basin** (ongoing).

- **Preparation of an oil and gas map of Wyoming** (ongoing).

Stratigraphy Division

- **Geologic mapping in the southern Bighorn Mountains** (ongoing; in FY89, prepared and submitted two 1:24,000-scale geologic maps for publication; was initially partially funded by a grant from the U.S. Geological Survey's COGEMAP Program).

- **Preparation of index maps depicting geologic mapping in Wyoming** (ongoing; in FY89, prepared and submitted four index maps for publication).

- **Preparation of bibliographies of Wyoming geology** (ongoing).

- **Stratigraphic nomenclature chart for Wyoming** (ongoing; joint project with the U.S. Geological Survey).

Miscellaneous

- **Rock and mineral identifications and analyses** (ongoing; in FY89, (1) the Laboratory Section and the Metals and Precious Stones Division provided free rock and mineral identifications for at least 137 persons and (2) the Laboratory Section conducted 835 analyses and tests on 252 samples in support of the Geologic Divisions).

- **Educational Series of publications** (ongoing; in FY89, (1) the Head of the Publications Division completed and published *Wyoming geomaps*, which is the first report in this new series and (2) in support of this publication, a separate booklet of activities for the classroom was also prepared).

- **Articles written for publication by outside publishers** (ongoing; in FY89, the State Geologist, Division geologists, or the Head of the Publications Division prepared the following 40 papers or articles for publication):

Coal Division

Jones, R.W., 1988, Wyoming coal developments, markets, and future opportunities [abstract]: *The Contact*, Volume XXXIV, no. 10, p. 5.

Jones, R.W., 1988, Coal update *in* Summer minerals update: *Wyoming Quarterly Update*, University of Wyoming, Volume 7, no. 4, p. 4-7.

Jones, R.W., 1988, Coal update *in* Fall minerals update: *Wyoming Quarterly Update*, University of Wyoming, Volume 8, no. 1, p. 5-9.

Hogle, D.G., and Jones, R.W., 1989, Stratigraphic framework and regional subsurface geology of Upper Cretaceous through lower Eocene rocks in the Wind River Basin, Wyoming [abstract]: *American Association of Petroleum Geologists Bulletin*, Volume 73, no. 3, p. 363-364.

Jones, R.W., 1989, Coal update *in* Winter minerals update: *Wyoming Quarterly Update*, University of Wyoming, Volume 8, no. 2, p. 5-8.

Hogle, D.G., and Jones, R.W., 1989, Stratigraphic framework and regional subsurface geology of Upper Cretaceous through lower Eocene rocks in the Wind River Basin, Wyoming [abstract]: *The Contact*, Volume XXXV, no. 5, p. 1.

Jones, R.W., Harris, R.E., and Hausel, W.D., 1989, Wyoming [exploration in 1988]: *Mining Engineering*, Volume 41, no. 5, p. 319-322.

Jones, R.W., 1989, Coal update *in* Spring minerals update: *Wyoming Quarterly Update*, University of Wyoming, Volume 8, no. 3, p. 8-11.

DeBruin, R.H., and Jones, R.W., in press, Coalbed methane in Wyoming: *Wyoming Geological Association 40th Annual Field Conference Guidebook*.

Geologic Hazards Division

Case, J.C., 1988, Recent active fault research in Wyoming: *Proceedings of the 1988 Annual Conference, Western States Seismic Policy Council, Honolulu, Hawaii, November 14 - 18, 1988*, 4 p.

Case, J.C., 1988, Wyoming State report: *Proceedings of the 1988 Annual Conference, Western States Seismic Policy Council, Honolulu, Hawaii, November 14 - 18, 1988*, 2 p.

Industrial Minerals and Uranium Division

Harris, R.E., 1988, Industrial minerals in northeastern Wyoming: *Wyoming Geological Association 39th Annual Field Conference Guidebook*, p. 315-321.

Harris, R.E., 1988, Industrial minerals and uranium update *in* Summer minerals update: *Wyoming Quarterly Update*, University of Wyoming, Volume 7, no. 4, p. 7-9.

Harris, R.E., 1989, Industrial minerals update *in* Fall minerals update: *Wyoming Quarterly Update*, University of Wyoming, Volume 8, no. 1, p. 9-11.

Harris, R.E., 1989, Industrial minerals update and Uranium update *in* Winter minerals update: *Wyoming Quarterly Update*, University of Wyoming, Volume 8, no. 2, p. 8-10.

Harris, R.E., 1989, Industrial minerals update and Uranium update *in* Spring minerals update: *Wyoming Quarterly Update*, University of Wyoming, Volume 8, no. 3, p. 11-12.

Jones, R.W., Harris, R.E., and Hausel, W.D., 1989, Wyoming [exploration in 1988]: *Mining Engineering*, Volume 41, no. 5, p. 319-322.

Metals and Precious Stones Division

Hausel, W.D., 1988, Metals and precious stones update *in* Summer minerals outlook: *Wyoming Quarterly Update*, University of Wyoming, Volume 7, no. 4, p. 9-10.

Hausel, W.D., 1988, Metals and precious stones update *in* Fall minerals update: *Wyoming Quarterly Update*, University of Wyoming, Volume 8, no. 1, p. 11-12.

Hausel, W.D., 1988, Gold in Wyoming, *in* Modreski, P.J., editor, *Mineralogy of precious metal deposits - a symposium on the mineralogy of gold and silver deposits in Colorado and other areas: Colorado Chapter, Friends of Mineralogy and Department of Geology, Colorado School of Mines*, p. 122-124.

Hausel, W.D., 1989, Metals and precious stones update *in* Winter minerals update: *Wyoming Quarterly Update*, University of Wyoming, Volume 8, no. 2, p. 10-12.

Hausel, W.D., 1989, Metals and precious stones update *in* Spring minerals update: *Wyoming Quarterly Update*, University of Wyoming, Volume 8, no. 3, p. 12-13.

Hausel, W.D., Harris, R.E., and Jones, R.W., 1989, Wyoming [exploration in 1988]: *Mining Engineering*, Volume 41, no. 5, p. 319-322.

Erlich, E.I., Hausel, W.D., and Sutherland, W.M., in press, Timing of alkaline and ultramafic-alkaline volcanism within the Russian, Siberian, and North American ancient platforms [abstract]: *International Conference on Volcanology, Santa Fe, New Mexico*.

Hausel, W.D., in press, Precious metals in Wyoming - an untapped frontier [abstract], Society of Mining Engineers of AIME, National Meeting, Salt Lake City, Utah, Program with Abstracts.

Oil and Gas Division

DeBruin, R.H., 1988, Oil and gas update: Wyoming Quarterly Update, University of Wyoming, Volume 7, no. 4, p. 3-4.

DeBruin, R.H., 1988, Oil and gas update: Wyoming Quarterly Update, University of Wyoming, Volume 8, no. 1, p. 3-5.

DeBruin, R.H., 1989, Oil and gas update: Wyoming Quarterly Update, University of Wyoming, Volume 8, no. 2, p. 3-5.

DeBruin, R.H., 1989, Oil and gas update: Wyoming Quarterly Update, University of Wyoming, Volume 8, no. 3, p. 5-8.

DeBruin, R.H., and Jones, R.W., in press, Coalbed methane in Wyoming: Wyoming Geological Association 40th Annual Field Conference Guidebook.

DeBruin, R.H., in press, Banjo Flats Field: Wyoming Geological Association Bighorn Basin and Wind River Basin Oil and Gas Fields Symposium.

DeBruin, R.H., in press, Marshall Field: Wyoming Geological Association Bighorn Basin and Wind River Basin Oil and Gas Fields Symposium.

DeBruin, R.H., in press, Rattlesnake Field: Wyoming Geological Association Bighorn Basin and Wind River Basin Oil and Gas Fields Symposium.

DeBruin, R.H., in press, South Fork Field: Wyoming Geological Association Bighorn Basin and Wind River Basin Oil and Gas Fields Symposium.

DeBruin, R.H., in press, Slick Creek Field: Wyoming Geological Association Bighorn Basin and Wind River Basin Oil and Gas Fields Symposium.

DeBruin, R.H., in press, Cottonwood Creek Field: Wyoming Geological Association Bighorn Basin and Wind River Basin Oil and Gas Fields Symposium.

Publications Division

Roberts, S.M., 1988, Wyoming geomaps: a multipurpose geological education tool [abstract]: Geological Society of America Abstracts with Programs, v. 20, no. 7, p. A67 (no. 19181).

State Geologist

Glass, G.B., 1988, Overview in Summer minerals update: Wyoming Quarterly Update, University of Wyoming, Volume 7, no. 4, p. 2-3.

Glass, G.B., 1988, Overview in Fall minerals update: Wyoming Quarterly Update, University of Wyoming, Volume 8, no. 1, p. 2-3.

Glass, G.B., 1989, Overview in Winter minerals update: Wyoming Quarterly Update, University of Wyoming, Volume 8, no. 2, p. 2-3.

Glass, G.B., 1989, Overview in Spring minerals update: Wyoming Quarterly Update, University of Wyoming, Volume 8, no. 3, p. 4-5.

Glass, G.B., in press, Wyoming [Geological Survey activities]: The State Geologist's Journal, Volume XLI.

Glass, G.B., in press, Wyoming [coal]: Keystone Coal Industry Manual, McGraw-Hill, Inc., New York, New York.

PUBLIC FILES: Gather and continuously update and maintain files and libraries on all available reports, records, maps, and other data relating to the surface and subsurface geology and mineral resources of the State.

In FY 89, the Agency (1) enlarged its geologic hazards files, particularly in regard to landslides and selenium-related documents, (2) expanded its geologic and mineral and energy resource files, and (3) added several thousand entries to its computerized data bases. The Survey also maintains a "Confidential" file of drilling records from holes drilled on State mineral leases, pursuant to Wyoming Statute 36-6-102.

With the exception of the "Confidential" drilling records mentioned above, files and libraries of the Survey are available to the public. A public-use area is provided on the second floor of the Wyoming Geological Survey Building. This area hosts microfiche, microfilm, and paper copies of many oil and gas well logs; aerial photographs; unpublished geologic and mineral reports; open file reports of the U.S. Geological Survey and the U.S. Bureau of Mines; and U.S. Department of Energy uranium reports for Wyoming. The Survey's extensive collection of Environmental Impact Statements, Industrial Siting Applications, and numerous other government documents are now kept in the Survey's first floor reference library.

In a concerted effort, the Coal and Oil and Gas Divisions continued to enter mineral resource data into the Survey's IBM PC/XT computers for easier man-

agement and manipulation of data. The initial goals of this computerization effort are the input of mineral

production, reserves, and contract and price information.

MAJOR ACCOMPLISHMENTS OF THE PUBLICATIONS PROGRAM

OBJECTIVES

Publications are an essential part of the Survey's overall service function as mandated by law (W.S. 9-2-805, part a, subsections iv and v). The Publications Program, which is actually synonymous with the Publications Division, is both the publishing and sales arm of the Survey and performs an essential role in the sale and distribution of information to the public. This Program contains the funds for preparing and printing geological information collected and interpreted by Survey personnel or outside authors. Although the Program currently only has two full-time employees,

five other positions in the Administration Program work in this Program.

The major objectives of this Program are three-fold: (1) to publish reports and maps so that information about Wyoming's geology and mineral and energy resources is available to both the public and private sectors, (2) to sell and distribute Survey publications, and (3) to provide technical support to the Director, Division Heads, other Survey staff, and occasionally to outside entities.

ACCOMPLISHMENTS

For each of these major objectives, the activities and accomplishments of the Publications Program in FY 89 are described below:

PUBLISHING: Make information about Wyoming's geology and mineral and energy resources available to both public and private sectors in standard publication format.

The Editor and the State Geologist establish publishing priorities. The two graphs in Figure 5 summarize the general subject matter of Survey publications and the number of new publications completed

each decade. In FY89, the Editorial Section prepared bid specifications for 17 printing jobs, and the Editor attended 16 press runs to assure the printed quality of these publications met Survey standards.

The 72 new titles published by the Survey in FY 89 set a new record for publications completed in one year (Figure 6). This dramatic increase and other increases since 1982 are the result of a concerted effort to increase the number of new publications each year.

Level funding and small cuts in the appropriations for the Publications Program over the last four years, however, has necessitated some adjustments. Antiquated photographic and drafting equipment has been kept rather than replaced. Several prepared manuscripts are deferred from publication until each following year and an increasing number of publications are prepared as open file reports or preliminary maps rather than sent out for commercial printing. An open file report or preliminary map is one that is prepared in a reproducible format and is reproduced only as requested. The advantage to this procedure is the timeliness of release (it does not have to wait for available printing monies). The disadvantages are the often inferior reproduction; the inability to adequately illustrate the reports with photographs, color, and other special methods; and the sometimes high cost of reproduction on an individual basis, particularly if there are a number of large illustrations.

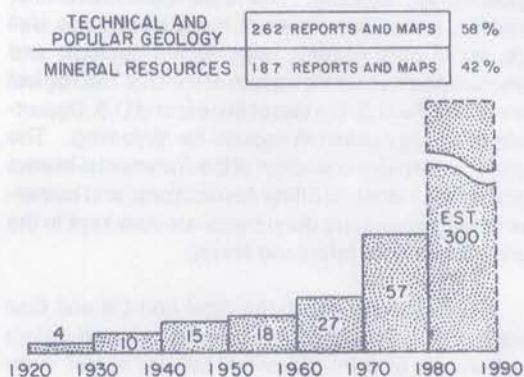


Figure 5. General content of Survey publications since Fiscal Year 1920 (upper) and number of new titles by decade (lower).

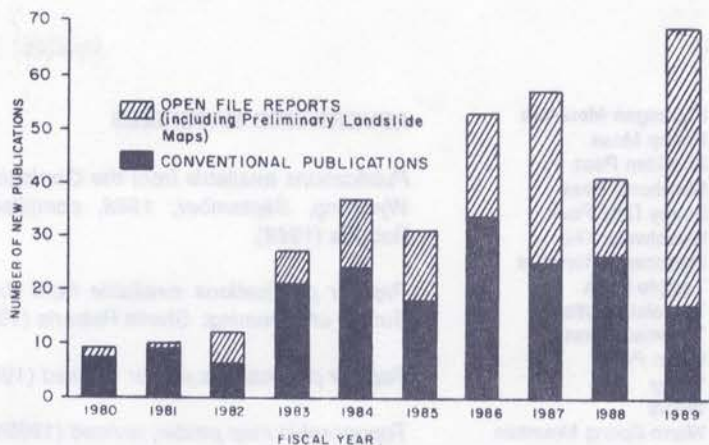


Figure 6. Number of new titles published each fiscal year (1980 through 1989).

New Publications

The 72 publications listed below represent the combined efforts of the Publications Division and other Survey divisions toward meeting the primary objective of the Publications Program:

ANNUAL REPORT

Fifty-fifth annual report of the Geological Survey of Wyoming, July 1, 1987, to June 30, 1988, by G.B. Glass (1988).

BULLETIN

The geology of Wyoming's precious metal lode and placer deposits: Bulletin 68, W.D. Hausel (1989).

EDUCATION SERIES

Wyoming geomaps, Educational Series 1, Sheila Roberts (1989).

MAP SERIES

Geologic map of the Radium Springs Quadrangle, including the Lewiston gold district, Fremont County, Wyoming: MS-26, W.D. Hausel (1988).

Precambrian basement map of Wyoming: Outcrop and structural configuration: MS-27, D.L. Blackstone, Jr. (1989).

Revised geologic map of the Atlantic City Quadrangle, Fremont County, Wyoming: MS-28, W.D. Hausel (1989).

MISCELLANEOUS

Index to U.S. Geological Survey topographic maps

available from the Geological Survey of Wyoming (1989).

OPEN FILE REPORTS

Revised geologic map of the Louis Lake Quadrangle, Fremont County, Wyoming: OFR 88-12, W.D. Hausel (1988).

The geology and reserves of Hawk Point oil field, Campbell County, Wyoming: OFR 89-1, R.H. DeBruin (1989).

Coal geology, geophysical logs, and lithologic descriptions from a drilling program at the Rawhide Village Subdivision, Campbell County, Wyoming: OFR 89-2, R.W. Jones and P.J. Taucher (1989).

Background gamma radiation of the Newcastle 1° x 2° Quadrangle, Wyoming, South Dakota, and Nebraska: OFR 89-3, R.E. Harris (1989).

Tripoli (tripolite) in Wyoming: OFR 89-4, R.E. Harris (1989).

POSTCARD

Wyoming State Geologists.

PRELIMINARY LANDSLIDE MAPS

The following 50 quadrangles were completed in 1989 (authors of individual maps are not shown here):

Alpine Lake
Bob Lakes
Castle Rock
Chimney Rock
Christina Lake
Clayton Mountain
Clouds Home Peak

Cony Mountain
Dick Creek Lakes
Dickinson Park
Dundee Meadows
East Fork Basin
Esmond Park
Fish Creek Park

Flag Peak
Fossil Hill
Francs Peak
Fremont Peak North
Fremont Peak South
Gannett Peak
Green River Lakes
Halls Mountain
Hardluck Mountain
Hays Park
Lake Creek
Lizard Head Peak
Mount Arter
Mount Arter SE
Mount Burwell
Needle Mountain
Noon Point
Pinnacle Mountain

Ptarmigan Mountain
Sheep Mesa
Sheridan Pass
Shoshone Pass
Soapy Dale Peak
Sweetwater Gap
Sweetwater Needles
Temple Peak
Thorofare Buttes
Togwotee Pass
Union Peak
Valley
Wapiti
Warm Spring Mountain
Wiggins Peak
Wolf Point
Yellow Mountain
Younts Peak

ADVERTISING MATERIALS

Publications available from the Geological Survey of Wyoming, September, 1988, compiled by Sheila Roberts (1988).

Popular publications available from the Geological Survey of Wyoming: Sheila Roberts (1988).

Popular publications poster, revised (1989).

Topographic map poster, revised (1989).

SALES AND DISTRIBUTION: Sell and distribute Survey publications.

In FY 89, the Publications Sales Manager and Editorial Assistant responded to 802 written inquiries about publications, answered an average of 25 telephone inquiries per work day, and received 4,194 publications sales.

PUBLIC INFORMATION CIRCULAR

Wyoming's oil and gas industry in the 1980s: a time of change: PIC-28, R.H. DeBruin (1989).

WYOMING GEO-NOTES

No. 19: by G.B. Glass, R.H. DeBruin, R.W. Jones, W.D. Hausel, R.E., Harris, J.C. Case, and A.J. VerPloeg, (July, 1988).

No. 20: by G.B. Glass, R.H. DeBruin, R.W. Jones, W.D. Hausel, R.E. Harris, and A.J. VerPloeg, (November, 1988).

No. 21: by G.B. Glass, R.H. DeBruin, R.W. Jones, W.D. Hausel, R.E. Harris, A.J. VerPloeg, and J.C. Case, (January, 1989).

No. 22: by G.B. Glass, R.H. DeBruin, R.W. Jones, R.E. Harris, W.D. Hausel, A.J. VerPloeg, and J.C. Case, (April, 1989).

Figure 7 shows a percentage breakdown of revenues derived from the sale of publications over the last three fiscal years, arranged by customer category. The revenues from sales to the general public have exceeded 50 percent of the total since FY 86. Most of the increase in revenues from sales to the general public since FY 85 are attributed to increasing sales of topographic maps used for recreation as well as other purposes.

Table 1 points out that the volume of receipted sales in each customer category and the revenues derived from that customer category are not always directly proportional, i.e., although the business and industry category represents fewer purchases than the general public, the sales are for greater dollar amounts.

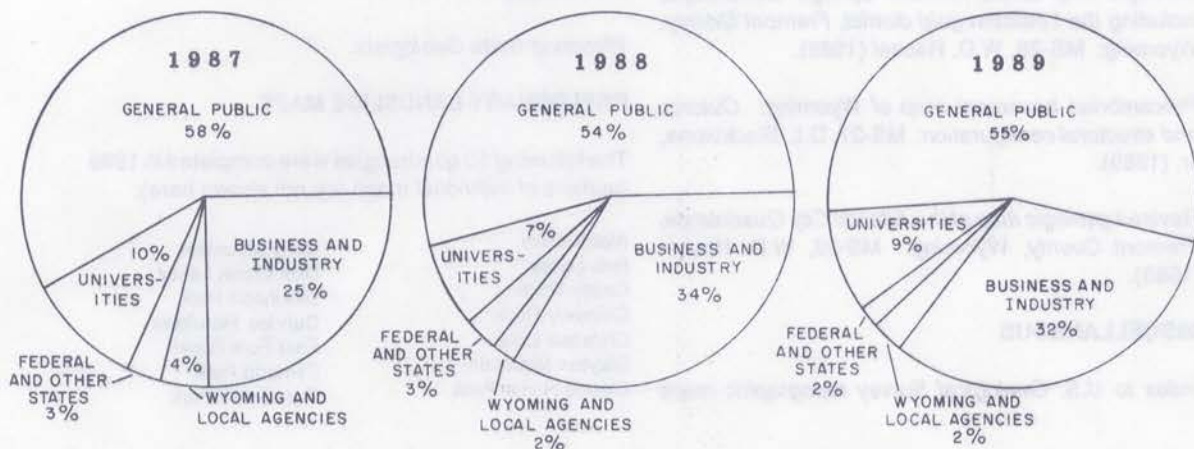


Figure 7. Percentage of publication revenue arranged by customer category (Fiscal Years 1987-1989).

Table 1. Percentage breakdown of FY89 publication sales by customer category and by sales revenue.

Category	Percent of Customers	Percent of Sales Revenue
General Public	74%	55%
Business and Industry	16%	32%
Universities	6%	9%
Wyoming and Local Agencies	2%	2%
Federal, Other States and Foreign	2%	2%

Revenues generated from the sale of publications are deposited in the General Fund. Table 2 summarizes the percentage breakdown of revenue from publication sales by publication type for FY 89.

As a general rule, sales income had been increasing until the peak year of FY 81 (Figure 8). With the subsequent recession, sales declined substantially, dropping to \$48,878 in FY 84. Slumping sales turned around in FY 85 and have held around \$70,000 for the last three fiscal years, in spite of the continuing economic recession in Wyoming.

Responding to a request from the Geological Survey's Advisory Board, the Publications Program has continued to look for new ways to make the public aware of valuable earth-science publications available from the Geological Survey of Wyoming. In addition to the regular mailings of press releases describing new items, Survey publications were displayed and sold at ten meetings of professional geological associations and rock and mineral clubs in the region in FY 89. Copies of *Wyoming Geo-notes* were mailed to government, business, and private concerns in a successful effort to interest them in subscribing to this quarterly publication on Wyoming's mineral resources. Continuing an effort begun in FY 86, posters describing the Survey's topographic map sales and some of the more popularly oriented publications on geology were distributed in the region. Topographic map sales remained high in FY89 because of increased public awareness of that service and because the Survey is now selling maps by mail and phone orders as well as over-the-counter.

Publications of the Geological Survey are distributed free-of-charge to libraries and archives throughout

Table 2. Percentage breakdown of revenue from publication sales by publication type for Fiscal Year 1989.

27%	Topographic maps (all scales)	\$18,791.00
27%	Bulletins	18,330.50
11%	Map Series	7,817.25
6%	Open File Reports	3,850.75
5%	Reports of Investigations	3,760.00
4%	Public Information Circulars	2,585.50
3%	Geologic Highway Map	2,004.00
3%	Geologic Map of Wyoming	1,905.30
3%	Reprints	1,895.50
1%	Preliminary Reports	730.00
.8%	Educational Series	575.00
.6%	Memoirs	390.00
.5%	County Resource Series	365.00
91.9%	Subtotal	\$62,999.80
8.1%	Miscellaneous publications and price difference for mailed publications	5,756.11
100.0%	Grand Total	\$68,755.91

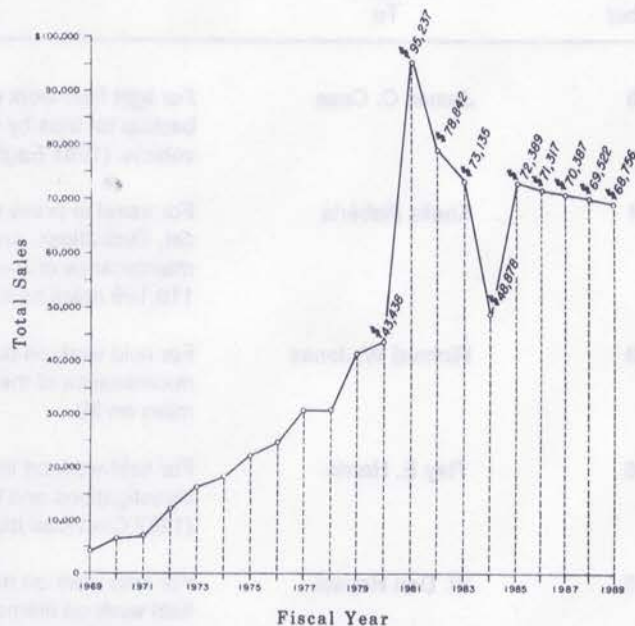


Figure 8. Fiscal year income to the General Fund from the sale of publications.

the State. Limited numbers of each publication are also provided to other State agencies and branches of government and to elected officials on request. In addition, the Survey participates in publication exchange programs with nearly all other state geological surveys, numerous foreign geological surveys, the U.S. Geological Survey, the U.S. Department of Energy, the U.S. Bureau of Mines, and other entities. These distributions do not add directly to sales revenue, but they provide an important service to the State and allow acquisition of publications from out-of-state agencies without direct charge. The publications acquired through the Survey's exchange agreements are subsequently donated to the University of Wyoming's Geology Library. In FY 89, an estimated 1,500 publications were received in exchange for Survey publications.

TECHNICAL SUPPORT: Provide technical advice and support to the Director, Division Heads, other Survey staff and occasionally to outside entities.

The Publications Division provides editing and drafting for maps and reports published by the Survey, creates illustrations for talks and displays, and generally assists in publication-related activities. The Editor also answers requests for information about Survey editing techniques, policies, and procedures from agencies, organizations, and consultants.

The cartographers frequently advise University of Wyoming faculty, staff, and students on drafting techniques. They also occasionally advise consultants and members of the general public as well as other State and Federal agencies.

SUMMARY OF PERMANENTLY ASSIGNED VEHICLES

The following list of motor vehicles is provided in accordance with Section 9-2-1014 revised:

License Number	Assigned To	Reason For Assignments
S-799	James C. Case	For light field work on geologic hazards investigations, a backup for trips by others, and for the maintenance of the vehicle. (1981 Eagle with 87,753 miles on it).
S-131	Sheila Roberts	For travel to press runs; for pickup and delivery of type set, illustrations, and photographic materials; and for the maintenance of the vehicle. (1978 Pontiac sedan with 110,129 miles on it).
S-168	Richard W. Jones	For field work on coal-related investigations and for the maintenance of the vehicle. (1972 Blazer with 131,340 miles on it).
S-126	Ray E. Harris	For field work on industrial minerals and uranium investigations and for the maintenance of the vehicle. (1987 Chevrolet pickup with 50,090 miles on it).
S-656	W. Dan Hausel	For field work on metallic minerals; for reconnaissance field work on diamond-bearing kimberlites in the Laramie Range; for a backup vehicle for field investigations by others, and for the maintenance of the vehicle. (1987 Chevrolet pickup with 28,574 miles on it).
S-132	Jay T. Roberts	For pickup and deliveries in town and for other short trips (1969 Ford pickup with 144,000 miles on it).