

WGS

The Geological Survey of Wyoming
HORACE D. THOMAS, *State Geologist*

Biennial Report of the
State Geologist



1951 - 1953

Laramie, Wyoming
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Biennial Report of the State Geologist
of the
State of Wyoming
for
1951 - 1953
by
HORACE D. THOMAS
STATE GEOLOGIST

INTRODUCTION

This report covers the activities and accomplishments of the Geological Survey of Wyoming during the two-year period, 1951-1953. The geological projects undertaken by the Survey are briefly described, the various activities of the Survey are discussed, and the resulting publications are listed.

ORGANIZATION OF THE GEOLOGICAL SURVEY

All but two states have geological surveys. Many are located at state universities or colleges and are commonly affiliated in some fashion with the department of geology. During 1952, the 46 State Geological Surveys employed 363 geologists (308 full-time; 55 part-time) and had a sum of \$5,399,253 available during the year (Fig. 1). It should be pointed out, however, that some of these surveys carry on programs similar to that of the Natural Resources Research Institute, at the University, and to that of the State Oil and Gas Supervisor.

The Geological Survey of Wyoming has been located at the University of Wyoming since 1933. Dr. S. H. Knight, Professor of Geology, served as State Geologist from 1933 to 1940. The incumbent, Dr. H. D. Thomas, Professor of Geology, has served since April, 1941.

The State Geologist, by virtue of action of the University administration, carries a half-time teaching load and devotes the other half of his time to the Geological Survey. For the first time, a full-time geologist was added to the staff in June, 1951. Mr. William H. Wilson, who received the B.S. degree in geology from the University of Utah and the M.A. degree from the University of Wyoming, was appointed as Assistant State Geologist. Mr. Wilson specialized in economic geology (mineral deposits) and ground water geology. He resigned from the U. S. Geological Survey to accept his present position. The addition of Mr. Wilson to the staff has aided immeasurably in broadening the program and the services of the State Geological Survey.

January 12, 1953

To His Excellency
The Honorable C. J. Rogers
Governor of the State of Wyoming
Cheyenne, Wyoming

Dear Sir:

Pursuant to the requirements of Article 12, Section 18-1204, Wyoming Compiled Statutes, 1945, the Biennial Report of the State Geologist for the years 1951-53 is herewith submitted.

Respectfully yours,
Horace D. Thomas
State Geologist

HDT:mlc

ACTIVITIES OF THE GEOLOGICAL SURVEY COOPERATION WITH THE U. S. GEOLOGICAL SURVEY

Informal cooperation is carried on with all branches of the U. S. Geological Survey. The State Geologist has brought to the attention of the U. S. Geological Survey certain geological problems needing attention and the Federal Survey has taken action on them. Conversely, the Federal Survey keeps us informed on the independent projects it is carrying on in Wyoming. This complete cooperation lends effectiveness and efficiency to the geological work carried on by both agencies in the State and prevents overlap or duplication of effort.

Formal cooperative agreements with the U. S. Geological Survey for the undertaking of geological investigations in Wyoming have been carried on since 1941. State and Federal funds are matched in equal amounts on specific projects. These agreements have enabled the State to obtain geological work for half the cost, and to take advantage of the highly skilled personnel of the U. S. Geological Survey. Projects have been carried on dealing with phosphate rock, titaniferous magnetite, anorthosite, cordierite, regional geology, ground water supply, and the examination of individual mineral deposits. The results of completed projects have been published either by the State Geological Survey or by the U. S. Geological Survey.

Fuels Branch.—Formal cooperation is maintained with the Fuels Branch of the U. S. Geological Survey, whose office is located in the same building with the State Geological Survey. The Fuels Branch is concerned solely with the petroleum geology and fuel resources of Wyoming. As a result of this program, 22 maps or charts pertaining to the geology of Wyoming have been published by the U. S. Geological Survey and two bulletins have been issued by the State Geological Survey.

Mineral Deposits Branch.—In 1944, a long-range cooperative program was established to study the geology of the Laramie Range. Principal attention was paid to the alumina and titaniferous iron deposits, but during the course of the program a very large deposit of a rare mineral, cordierite, was discovered. Field work on the project was completed during the summer of 1952. Part of the results have been published — one State bulletin deals with the alumina rock, a second deals with the cordierite deposits. A preliminary report on the titaniferous iron deposits has been placed on open file where it is available for public inspection. Two state publications will be issued during 1953 — a final report on the titaniferous iron deposits and one on the general geology of the range. Two reports will be published in technical journals and reprints will be distributed as contributions of the State Geological Survey. One will be a theoretical paper on the gneisses, schists and related rocks; the second will deal with the theoretical aspects of the titaniferous iron deposits.

A similar program will be carried out in some other part of the State, with field work scheduled to begin in 1953. The particular area selected

will be one which offers economic possibilities and will be decided upon jointly by the State officers and representatives of the U. S. Geological Survey.

Engineering Geology Branch.—Prior to 1951, cooperative projects were carried on with the Engineering Geology Branch, and as a result the Federal Government has issued two maps of Wyoming showing metallic and nonmetallic mineral deposits, and the State has issued one map showing sand and gravel deposits. No cooperative projects were carried on during 1951-53.

Ground Water Division.—Prior to 1951, the State Geological Survey cooperated formally in two ground water projects on which reports were issued. No formal projects were undertaken during 1951-53, but this office enjoyed the full cooperation of the Ground Water Division on minor problems pertaining to Wyoming ground water occurrences.

COOPERATION WITH OTHER FEDERAL AGENCIES

U. S. Bureau of Mines.—Close, but informal, cooperation is carried on with the U. S. Bureau of Mines. Deposits of certain minerals which need core-drilling, or other subsurface development, in order to accurately determine potentialities, have been brought to the attention of the Bureau of Mines and, if warranted, that agency has carried on subsurface exploratory work. There has been a free interchange of information between the State Geological Survey and the Bureau of Mines.

Preliminary conferences with the Regional Director, Region IV, have been held on the matter of the State Geological Survey entering a formal agreement with the Bureau of Mines for the annual collection of mineral statistics. Such an agreement will likely be made fairly soon and, if so, will enable us to obtain production figures a year or two earlier than in the past.

U. S. Coast and Geodetic Survey.—The State Geological Survey supplies the Seismological Field Survey of the Coast and Geodetic Survey with data on the occurrence of earthquakes in Wyoming. Earthquake report cards are distributed to forest rangers, postmasters, and others over the State. These report cards are returned to the State Geologist with information regarding earthquake occurrences. The assembled data are then sent to the Seismological Field Survey.

Other Agencies.—The State Geological Survey is called upon to supply geological information to many other Federal agencies, such as the Soil Conservation Service, the Grazing Service, the Reclamation Bureau, the Department of Commerce, and others. Data have been supplied to Congressional Committees and other Federal groups or committees.

COOPERATION WITH UNIVERSITY AGENCIES

Department of Geology.—The intimate inter-relationship of the Geological Survey and the Department of Geology has been pointed out earlier

in this report. It should be pointed out further, however, that the field research undertaken by graduate students is of great value to the Geological Survey. These results are made available to us early. Many of the resulting theses have been published by the Geological Survey. In turn, the Geological Survey has assisted students in defraying field expenses on projects in which the Survey is interested, or by supplying thin sections or polished surfaces.

The graduate students constitute a valuable store of part-time assistance for the Survey. They have been employed to catalog oil well samples, plot oil well logs, draft geological maps and illustrations, and to undertake other assignments. The students, in turn, receive valuable experience in applied geology. If it were not for the high-quality part-time help available through the employment of graduate students, the full-time staff would have to be considerably larger.

Natural Resources Research Institute. — The Natural Resources Research Institute was established to carry on scientific research on the utilization of the mineral resources of the State. The Geological Survey and the Natural Resources Research Institute work in close cooperation and the State Geologist is a member of the executive committee of the Institute. The Geological Survey may bring to the attention of the Institute any mineral deposits whose quality or uses might be determined through laboratory investigations. In turn, the Institute supplies the State Geological Survey with needed analytical information on mineral specimens submitted as an aid in determining the potentialities of certain deposits.

COOPERATION WITH STATE DEPARTMENTS

Natural Resource Board. — The State Geological Survey stands ready to cooperate with the Natural Resource Board in any possible manner on the mineral resources of the State. The Board has made available to the State Survey a research model petrographic microscope — an instrument necessary for the study of thin-sections and polished surfaces of Wyoming rocks, minerals and ores.

Oil and Gas Conservation Commission. — The State Geologist, by law, is a member of the Oil and Gas Conservation Commission. The Geological Survey is now receiving from the State Mineral Supervisor copies of electric logs of wells drilled in the State. Such logs have been difficult to obtain in the past and the arrangement facilitates keeping the electric log file complete.

Commissioner of Public Lands. — Prior to the issuance of permits for the collection of fossils in Wyoming, which are obtained from the State Commissioner of Public Lands, the endorsement of the State Geologist is necessary. During 1951-1952, permits were endorsed for issuance to the following collectors: Dr. A. S. Romer, Harvard University; Dr. Glen L. Jepsen, Princeton University; Frick Laboratory, American Museum of Natural History; and Dr. Harold Cook, Agate, Nebraska.

State Highway Department. — The Geological Survey cooperated with the Highway Department in the preparation of geological descriptions for roadside markers of geological features visible from the highways (see Public Education).

State Game and Fish Commission. — Over the years, the Geological Survey has assisted the Game and Fish Department on matters of water supply for hatchery use (see Ground Water).

TECHNICAL INVESTIGATIONS

MINING GEOLOGY

Kirwin district, Park County. — The old Kirwin mining district, which was active in early days, has never been subjected to modern geological investigation. A long-range project has been undertaken by Mr. Wilson on the geology of the area and the nature of the ore deposits. Field studies were begun in 1951 but it will be necessary to extend the work over several summers to adequately complete the study.

Hecla district, Laramie County. — The regional geology and the nature of mineralization in the old Hecla mining district are being studied by Robert McGraw, a graduate student at the University, and the Geological Survey is assisting in the project by obtaining thin-sections of rocks and ores for petrographic study by Mr. McGraw.

MINERAL INVENTORY

As a long range project, the Geological Survey has been compiling factual and reliable data on the known mineral deposits of the State. As a result of this program, Bulletin 45, "Wyoming Mineral Resources" was published during 1952. Although this is a valuable contribution, a great deal more study is necessary in order to obtain still more complete and reliable data. As a means toward this end, the following mineral deposits were examined by Mr. Wilson during 1951-1952:

| | |
|-------------------------|--------------------------|
| Allanite—Johnson County | Manganese—Crook County |
| Beryl—Goshen County | Manganese—Johnson County |
| Copper—Albany County | Monazite—Big Horn County |
| Copper—Carbon County | Monazite—Sheridan County |
| Copper—Laramie County | Rare earths—Crook County |
| Gold—Fremont County | Sulfur—Lincoln County |
| Iron—Park County | Tungsten—Fremont County |
| Iron—Platte County | Tungsten—Washakie County |
| Lead—Park County | Uranium—Campbell County |
| | Uranium—Carbon County |

GROUND WATER

Kemmerer Area. — During part of July, 1951, the State Geologist and the Assistant State Geologist investigated the availability of ground water

for possible industrial use in the Hilliard Flat area, southwest of Kemmerer.

Como Bluff. — Studies were made during 1952 on the problem of augmenting the water supply for the Como Bluff Fish Hatchery.

Harmony School District. — After drilling a well to 300 feet without encountering water, the School Board solicited the assistance of the Geological Survey. At the suggestion of Mr. Wilson, a new well was drilled a short distance away which encountered an adequate supply of water at 27 feet.

Others. — Advice was given to individuals—mainly ranchmen and others in the Laramie area—on the possibility of obtaining ground water on their lands.

ENGINEERING GEOLOGY

Converse County High School. — In 1952, the Converse County high school administrators solicited the assistance of the Geological Survey to examine several proposed building sites for a new high school building. Severe cracks had developed in the old building because of the unstable condition of the rocks on which it had been built. Geological advice was given on locations which would be more stable building sites.

Concrete aggregates. — In connection with a research program on the durability of certain Wyoming rock aggregates used in concrete being carried on by Dr. H. S. Sweet, of the Civil Engineering Department, the Geological Survey employed Mr. Marvin Millgate, a geology student, to make petrographic studies of the rocks and minerals in the aggregates. The presence of certain minerals causes disintegration of concrete structures, and the use of aggregates containing such minerals should be avoided.

PALEONTOLOGY

Fossil fish. — While investigating manganese deposits in the Big Horn Mountains in 1952, Mr. Wilson discovered the fossilized bones of one of the first known vertebrates. These were fish-like animals, known as Ostracoderms, which lived about 480 million years ago. The unusual specimens were placed with Dr. P. O. McGrew, vertebrate paleontologist at the University, for study and for inclusion in the geological museum.

MINERAL IDENTIFICATION SERVICE

The Geological Survey maintains a free mineral identification service designed to be of value to prospectors, amateur rock collectors, and the general public. If the submitted specimens appear to have possible economic importance, they are turned to the Natural Resources Research Institute for assay or analysis. Several potentially important mineral deposits in the State have been brought to light through this service in the past. During 1951-52, approximately 250 specimens of rocks and minerals from all counties in the State were examined and identified.

OIL WELL SAMPLE LIBRARY

The Geological Survey has in its oil well sample library the most important representative collections of Wyoming oil well samples in the Rocky Mountain region. The collection has been accumulated through the cooperation of oil companies operating in Wyoming, who have donated samples and cores with the belief that they will be properly cataloged, cared for, and preserved for the future at the University. The collection now represents samples from 531 wells, principally exploratory wells, scattered over the Rocky Mountain region. These represent about 2,400,000 feet, or about 460 miles, of drilled hole. Many geologists come to the University to examine these samples.

ELECTRIC LOGS OF DRILLED WELLS

During the biennium, the Riley Reproduction Company of Denver donated a set of several thousand electric logs of wells drilled in Wyoming for use by the State and Federal Geological Surveys and by the Department of Geology. Essentially all wells in the State which have been logged electrically are represented in the set and the total logged footage aggregates over 17 million feet. The file is being kept complete through cooperation of the State Oil and Gas Supervisor who sends to the Geological Survey one copy of all electric logs filed with him. In addition, the General Petroleum Corporation has donated hundreds of copies of electric logs of wells drilled through the Rocky Mountain Region and these are added to the file.

A complete file of electric logs is invaluable in geologic research and is used not only by staff and students at the University but by many other geologists.

EARTHQUAKE REPORTS

Reports on earthquakes in Wyoming are made to the Seismological Field Survey of the U. S. Coast and Geodetic Survey by the State Geologist, who serves as Collaborator in Seismology. Data on earthquake frequencies are valuable in the determination of equitable insurance rates and in connection with the erection of large structures, such as dams, and the excavation of underground workings, such as tunnels and mines. Wyoming is quite stable seismically and in the 10 years of reporting, there have been no earthquakes of any but minor intensity. Most earthquake reports have come from Yellowstone National Park and adjacent areas.

PUBLIC EDUCATION

Grade and high school students. — The Geological Survey receives many requests from students over the country asking for specimens of Wyoming minerals or for information on the mineral resources of the State. Usually a single specimen of a typical mineral is sent to fill such requests. In addition, a non-technical pamphlet is being prepared which describes

the principal minerals that are important in the economy of the State, and their properties, uses and occurrences.

Tourist information. — Many tourists planning to visit Wyoming are amateur mineralogists and prior to their visits ask for information on the occurrence of mineral specimens in the State. A pamphlet on rock and mineral localities has been prepared to fill such requests. In addition, an information circular on jade has been revised.

Industrial rock and mineral sets for schools. — Sets of 16 important Wyoming rocks and minerals have been prepared in special compartmented boxes. Composition, properties, uses and occurrences are given on an accompanying sheet. These mineral sets are to be distributed to Wyoming schools and to other agencies upon request.

Geological roadside markers. — Cooperating with the State Highway Department, the Geological Survey has prepared 100-word descriptions of geological phenomena visible along Wyoming highways. These are being incorporated on attractive roadside markers erected by the Highway Department, and a number are already in place. Wyoming has a diversity of well-displayed geological features and this is an excellent way to familiarize the public with glacial, erosional, structural, mineralogic, and paleontologic examples.

PUBLIC SERVICES

Office callers. — Almost every day representatives of oil and mining companies or other individuals interested in mineral resources call at the Geological Survey offices. One of the most effective points in handling such callers is that here in one building such persons may take advantage of advice and information available from the staffs of the State Geological Survey, the U. S. Geological Survey and the Department of Geology of the University. In addition, it is possible for such persons to confer also with other agencies located on the campus, such as the Bureau of Mines, the Natural Resources Research Institute, the Engineering College, or other departments.

Correspondence. — A large volume of inquiries seeking information on Wyoming mineral resources, petroleum geology, and geology in general is received daily by the office. Properly answering this mail constitutes a rather imposing chore.

Topographic sheets. — The Geological Survey carries a supply of the topographic maps covering Wyoming. These are useful to hunters, fishermen, campers, prospectors, ranchmen and others, and many copies are distributed each year.

Air photos. — The entire State has aerial photographic coverage, but because of the cost of such photos, it has been impossible to purchase more than a fraction of all the available ones. It is hoped that by adding to the air-photo library from time to time, it will eventually be possible to obtain

complete coverage. These photographs are very useful to anyone seeking information on surface features, or the geology, of specific areas. Many persons consult the collection.

PUBLICATIONS, MAPS AND REPORTS

Geological examinations have little value unless the accumulated information is made available to the public. Every effort has been made to publish printed reports on the results of projects of any magnitude. About 400 copies of each publication are deposited in libraries in the United States and foreign countries. Other copies are distributed to individuals, corporations, agencies, and others on request.

Along with the increased activity in petroleum exploration in Wyoming, there has been an increased demand for our publications. Many of the earlier ones are now out of print and not available for distribution.

Bulletins and Reports of Investigations of the Geological Survey of Wyoming. — The following State Geological Survey publications were issued during the period 1951-53:

Bulletin 43 — "Anorthosite of the Laramie Range, Albany County, Wyoming, as a possible source of alumina", by A. F. Hagner

Bulletin 44 — "Stratigraphy of the Newcastle formation, Black Hills Region, Wyoming", by Robert Grace

Bulletin 45 — "Wyoming mineral resources", by F. W. Osterwald and Doris Osterwald

Report of Investigations No. 3 — "Stratigraphy of the Sussex sandstone, Powder River Basin, Wyoming," by Jacqueline Wilson

U. S. Geological Survey cooperative publications. — Since the beginning of cooperative work with the Fuels Branch of the U. S. Geological Survey, 18 maps and charts have been published. Those issued during the period 1951-52 are as follows:

"Geologic map of the Spread Creek — Gros Ventre area, Teton County, Wyoming", U.S.G.S. Oil and Gas Invest. Map 118

"Geologic map of the Powder River Basin, Wyoming", U.S.G.S. Oil and Gas Investigations Map 122

"Stratigraphic sections of Cretaceous rocks in northeastern Teton County, Wyoming", U.S.G.S. Oil and Gas Invest. Chart 43

"Geological map of Wyoming". This map, published late in 1952, fills a vital need. A geological map of the State was issued in 1925, but went out of print some years ago. The need for a new revised map was great. Preparation started in 1946 and a black and white map has been issued early to satisfy the demand. A colored map will be printed later.

Other maps and charts which have been completed and are now in the printer's hands deal with (1) the Paleozoic rocks of the Hartville area, (2) the geology of the Riverton area, (3) the post-Frontier rocks of central Wyoming, and (4) the geology of the Crazy Woman area, Johnson County.

Papers published in technical journals. — The following papers were published in technical journals during the period 1951-53:

- "Wyoming oil possibilities enhanced by variety of traps", by H. D. Thomas, *World Oil*, Vol. 132, No. 6, May, 1951, pp. 80-85.
- "Summary of Paleozoic stratigraphy of the region about Rawlins, Wyoming", by H. D. Thomas, *Guidebook*, 6th Ann. Field Conf. Wyo. Geol. Soc., Aug., 1951, pp. 32-36.
- "Changing concepts in Wyoming petroleum exploration", by H. D. Thomas, *Mines Magazine*, Vol. XLI, No. 10, Oct., 1951, pp. 57-60.
- "Cambrian and Ordovician stratigraphy around the southern Big Horn Basin, Wyoming", by H. D. Thomas, *Guidebook* 7th Ann. Field Conf. Wyo. Geol. Soc., Aug., 1952, pp. 32-36.
- "New geologic factors in Wyoming petroleum exploration", by H. D. Thomas, *Mines Magazine*, Vol. XLII, No. 11, Nov., 1952, pp. 107-108.

Unpublished maps. — Unpublished maps and charts from 114 theses prepared by graduate students at the University of Wyoming, and unpublished geological maps of 16 Wyoming counties prepared by the State Geological Survey are made available to the public through the sale of prints at cost. These maps have been in great demand, especially by oil companies, and it is estimated that about 4,000 copies have been distributed during the past two years.

During 1951-52, thirty graduate students completed theses and the resulting maps and charts are being distributed to the public on demand.

The county maps are greatly in need of revision. This, obviously, is a long-range project, but a geological map of Carbon County was completed in 1952 and work has begun on a revised map of Albany County.

Unpublished mineral reports. — When warranted, formal reports based on field examinations of individual mineral deposits are prepared and placed on open file for public inspection. Most of these are not of sufficient scope to warrant printing, but the information contained in them is of great value. Reports on the following were prepared by William H. Wilson during 1951-52:

| | |
|------------------------------|--------------------------|
| Allanite—Johnson County | Manganese—Johnson County |
| Beryl and mica—Goshen County | Monazite—Big Horn County |
| Copper—Albany County | Monazite—Sheridan County |
| Gold—Fremont County | Sulfur—Lincoln County |
| Iron—Park County | Tungsten—Fremont County |
| Lead—Park County | Tungsten—Albany County |

U. S. Geological Survey open file reports. — In order to make geological information available as early as possible without the delay in printing reports, the U. S. Geological Survey has made the Geological Survey of Wyoming a repository for unpublished reports pertinent to Wyoming. These may be consulted at the Survey offices. During the period 1951-53, the following 11 reports were placed on open file:

- "Preliminary report on the titaniferous iron deposits of the Laramie Range, Wyoming".
- "Geology of the Conant Creek-Muskrat Creek area, Fremont County, Wyoming".
- "Stratigraphic sections of the Phosphoria formation in Wyoming".
- "Stratigraphic sections of the Phosphoria formation in Montana".
- "Stratigraphic sections of the Phosphoria formation in Utah".
- "Stratigraphic sections of the Phosphoria formation in Idaho".
(First, second and third reports)
- "Stratigraphic sections of the Phosphoria formation measured and sampled in 1949", *Ibid.*, 1950, *Ibid.*, 1951.

TECHNICAL MEETINGS

In order to keep abreast of new geological and technological developments, the staff has participated in, or attended, numerous technical meetings. The State Geologist, during the biennium served as president of the Rocky Mountain Section of the Geological Society of America, on the membership committee of the Geological Society of America, and on the nominating committee of the American Association of Petroleum Geologists. The following regional or national meetings were attended by either the State Geologist or the Assistant State Geologist:

- Wyoming Geological Association Field Conference, 1951
- Rocky Mountain Section American Association Petroleum Geologists, 1951
- Rocky Mountain Section Geological Society of America, 1951
- Wyoming Geological Association Field Conference, 1952
- Rocky Mountain Section American Association Petroleum Geologists, 1952
- Cordilleran Section Geological Society of America, 1952
- Rocky Mountain Section Geological Society of America, 1952
- American Association Petroleum Geologists, 1952
- American Mining Congress, 1952
- Colorado Mining Association, 1952

PAPERS PRESENTED

The following talks were presented at meetings during the period 1951-53 by the State Geologist:

"Wyoming petroleum developments", Missouri Basin Inter-Agency Meeting, Worland, August, 1951

"New petroleum developments in Wyoming", 32nd Annual Convention Wyoming Engineering Society, Casper, February, 1952

Several talks were given in the field at different points at both field conferences of the Wyoming Geological Association.