

BIENNIAL REPORT
OF THE
STATE GEOLOGIST
FOR THE PERIOD ENDING SEPTEMBER 30, 1920,

by

G. B. Morgan
State Geologist.

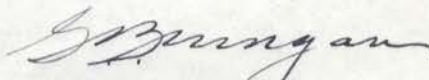
1918-1920

To His Excellency,
Robert D. Carey,
Governor of Wyoming.

Dear Sir:

Pursuant to the requirements of Section
262, Wyoming Compiled Statutes, 1910, I beg to
submit herewith the biennial report of the State
Geologist for the period ending September 30, 1920.

Very respectfully submitted,


State Geologist.

Cheyenne, Wyoming.
October 31, 1920.

DUTIES OF THE STATE GEOLOGIST

Since the passage of the Act of February 22, 1919, the general administration of this office embraces the following functions:

- A. General publicity work, which consists of collecting and distributing information on oil and gas fields and other mineral deposits in the State; the publication of geological bulletins and maps; and advertising the mineral wealth of the State to the people at large.
- B. Examinations and confidential reports on lands (mineral and oil) for the State Land Board.
- C. Investigations of alleged infractions of the oil and gas laws of the State.

In regard to function A, there appears to be nothing in the present law covering this phase of the activities of the State Geologist or requiring geologic research work for publicity purposes. However, such work is fundamental and inseparable from the other duties of the office. No State Geologist would be worthy of the name if he did not do his utmost to collect and dispense information on the mineral resources of the State and to assist in the proper development of the same.

Function B relates to such an important department of the office that the last Legislature considered it necessary to enact a law legalizing what was heretofore a voluntary service on the part of the State Geologist. This department embraces the following activities:

1. Examinations and reports on the geology and mineral character of State lands, both developed and undeveloped.
2. Examinations and reports on operations of various kinds on State lands, including mining, drilling, and prospecting.
3. Reports on the production of oil, gas, and minerals from the various State leases

and recommendations by which the production and consequently the revenues of the State may be increased.

4. The power to act in a consulting capacity to the State Land Board and advise it in all matters relating to oil and minerals, when called upon.

Although these latter duties do not at present occupy all the time of the State Geologist, they are rapidly becoming more numerous and more important. The State has immense holdings in the oil, gas, and coal fields within its boundaries and the royalties from them amount to great sums annually and are becoming larger each year. To protect the State's interests in the various fields often necessitates exhaustive investigations and requires expert knowledge of the technology of petroleum production as well as of mining and geology. Within the next few years this work will probably require the entire attention of one man, especially if conservation laws are passed.

The third function is one that is still in an early stage of development. The oil and gas laws of the State are so few and crude that very little enforcement is possible or necessary. The only conservation laws now on the statute books are the ones prohibiting the waste of natural gas and oil at the wells and requiring abandoned wells to be plugged. (See Wyoming Session Laws, 1913, Chapter 46, and Wyoming Session Laws, 1915, Chapter 22.) These laws are all right for a State in the beginning of the development of its oil fields, but do not at all meet the conditions now existing in Wyoming. It must be remembered that Wyoming is becoming one of the great oil states and will probably rank fifth this year in petroleum production in the United States. It must also be borne in mind that the State is interested in the conservation of oil and gas from two standpoints: first, from the standpoint of public welfare which comes within the police powers of the State; and, second, from the standpoint of ownership of

mineral lands, which directly affects the common school and other funds of the State. The State government is charged with the administration of the State lands so that the greatest ultimate benefit may be obtained for the common schools, University, and public buildings. This can be effected only if wise conservation measures are employed. There are, therefore, two very vital reasons why the State and public, as well as private, lands in our oil and gas fields should be protected by proper conservation laws.

The Bureau of Mines of the United States Department of Interior has supervision under the Act of February 29, 1920, over oil and gas development in public lands. The Bureau has promulgated a set of regulations covering drilling operations and production on Government leases. It is proposed and recommended that the coming Legislature investigate this situation with a view of passing suitable conservation laws along the same lines. It is also desirable that the Government and State officials co-operate in these matters. To do this successfully will require the enlargement of this office and the employment of a petroleum engineer or technologist, acting under the direction of the State Geologist, who shall have general supervision over drilling and production operations and who shall pay particular attention to the operations on State lands. A detailed memorandum, covering the proposed legislation, will probably be drawn up and submitted to your office at the proper time.

Conservation laws to be effective and equitable should be moderate in tone and elastic in application and should be in broad and general terms rather than too specific. The powers of supervision, however, should be clearly defined and delegated to the official in charge, supervisor, inspector, or petroleum assistant to the State Geologist. Matters coming before this department would consist largely of field investigations, of drilling, cementing and casing

problems involving loss by water entering the oil and gas sands, loss by leakage of oil from wells improperly drilled, cased, or cemented, loss of oil or gas because of inadequate appliances to control and regulate, and loss due to inadequate and improper storage facilities. The scope of this department might even be made broad enough to include research work and co-operation with the Bureau of Mines to the end that old and practically abandoned wells might be rejuvenated and the largest ultimate extraction of oil be thereby obtained.

ACTIVITIES OF STATE GEOLOGIST
FROM OCTOBER 1, 1918, TO SEPTEMBER 30, 1920.

The present incumbent took over the office of State Geologist on August 1, 1919. From October 1, 1918, to August 1, 1919, the records of the office show the following reports submitted by former State Geologist L. W. Trumbull to the State Land Board:

1. Report, April 22, 1919, on Sec. 36, T. 33 N., R. 65 W.
Sec. 36, T. 32 N., R. 65 W.
Sec. 20, T. 33 N., R. 64 W.
Sec. 9, T. 33 N., R. 64 W.
Sec. 17, T. 33 N., R. 64 W.
2. Report, May 3, 1919, on Sec. 36, T. 40 N., R. 79 W.
(Salt Creek)
3. Report, May 6, 1919, on Sec. 36, T. 35 N., R. 84 W.
4. Report, June 9, 1919, on Sec. 16, T. 40 N., R. 79 W.
5. Report, June 17, 1919, on Sec. 19, T. 46 N., R. 98 W.
(Grass Creek)

From August 1, 1919, to October 1, 1920, this office under the present State Geologist rendered services to the State as follows:

A. General publicity work.

1. Examination of Lance Creek oil field and report on same, published August 10, 1919.
2. Examination of oil fields north of Rawlins and report, published November 1, 1919.
3. Examination of Rock Creek field and report, published October 21, 1919.
4. Examination of Laramie Basin field and report, published October 24, 1919.

5. Re-examination and revised bulletin on Lance Creek, published January 1, 1920.
6. Re-examination and bulletin on Rock Creek field, published April 1, 1920.
7. Examinations of areas in southeastern part of State and other places for supposed oil structures.
8. Publication of State Geological Map, Dec. 1, 1919.
9. Examination of the Osage-Newcastle oil field and report, published July 8, 1920.
10. Examination of Dry Piney field and report, published August 1, 1920.
11. Examination of existing conditions in fields near Casper, Thermopolis, Cody, Lander, and Rawlins and geological investigations in the northwestern and western part of the State.
12. Collecting specimens and acting as superintendent of the Mines and Mineral Exhibit at the State Fair, Douglas, Wyoming.
13. Publication of Mineral Resource bulletin, Oct., 1920.
14. Generally keeping in touch with the oil and mineral development, answering numerous inquiries and meeting and supplying visitors with data on the oil and minerals of the State.

B. State Land Board work.

1. Report on Sec. 8, T. 33 N., R. 75 W., Glenrock field, Sept. 19, 1919.
2. Report on State and University lands, Big Muddy field, Nov. 19, 1919.
3. Report on Sec. 36, T. 36 N., R. 65 W., Lance Creek field, Jan. 2, 1920.
4. Report on State and University lands, Rock Creek field, April 20, 1920.
5. Report on Secs. 10 and 16, T. 57 N., R. 84 W., Sheridan coal field, May 12, 1920.
6. Report on Sec. 36, T. 58 N., R. 100 W., Elk Basin field, June 1, 1920.
7. Report on Sec. 16, T. 23 N., R. 102 W., Leucite Hills (potash), Aug. 26, 1920.
8. Investigation of Sec. 36, T. 40 N., R. 79 W., and Sec. 16, T. 39 N., R. 78 W., Salt Creek field. (3% field deduction in oil produced at wells)

C. Law enforcement work.

1. Investigation of alleged waste of natural gas in the Mahoney and Byron fields.
2. Publication Dec. 5, 1919, of Press Bulletin No. 5 for general distribution. (Wyoming Statutes Relating to Oil and Gas)
3. Investigation and report to Attorney General on the waste of natural gas in carbon plant at Cowley, Wyoming, under Act of February 24, 1919.
4. Investigation of the waste of oil and the plugging of wells in the Dry Piney field.

Work of this nature will become part of the duties of the oil and gas supervisor in case that office is created.

EXPENDITURES OF STATE GEOLOGIST.

The last Legislature appropriated \$8,500.00 as a contingent fund for the operation of this office, which was available April 1, 1919. Departmental expenses, including traveling expenses, office expenses, transportation expenses, clerical hire, general office and field equipment outlays, amount to \$6,522.19, from April 1, 1919, to and including September 30, 1920, leaving a balance on hand at that time of \$1977.81.

IMPORTANCE OF THE MINERAL DEPOSITS OF THE STATE.

In Wyoming the live stock industry has long been considered the most important. At the present time this great industry does not stand alone and is no longer predominant. At least two other industries are as great -- agriculture and mining. The mineral industry embraces the production of oil, coal, gas, and all other minerals and is by no means the least important of the three.

The total production of crude petroleum in Wyoming this year will exceed 15,000,000 barrels, worth more than \$45,000,000.00 at the wells. The annual coal production amounts to about 8,000,000 tons, valued at \$20,000,000.00 at the mines. The annual gas produced and consumed in the State amounts to about 21,000,000,000 cubic feet, worth one million dollars. The average output of iron ore is about 500,000 tons, worth \$1,500,000.00 at the mines. The copper production aggregates at least \$200,000.00 and the combined production of other ores and minerals, such as gold, silver, uranium, and platinum, will increase this figure to \$250,000.00. The gross receipts of the annual production of the less valuable minerals may

be set out as follows:

Clay, brick and fire	\$105,000.00
Bentonite	10,000.00
Gypsum	200,000.00
Soda and magnesia.....	10,000.00
Phosphate	5,000.00
Mineral waters	<u>5,000.00</u>
Total	\$345,000.00

Adding to this total the value of our quarry output, our limestone for flux and sugar beet use, our building stone, and our Sherman Hill gravel for railroad ballast, we have a new total of approximately \$500,000.00 for the less valuable minerals. These totals may be reassembled for convenience as follows:

Annual Gross Value of Our Mineral Products
at Places of Production.

Petroleum	\$45,000,000.00
Coal	20,000,000.00
Gas	1,000,000.00
Iron	1,500,000.00
Precious metals	250,000.00
Less valuable minerals	<u>500,000.00</u>
Grand total	\$68,250,000.00

This is a very considerable sum compared with similar statistics on other states and places the mineral industry at the very top of the list in Wyoming. This fact should engage the attention of economists and those interested in the welfare and development of our State's resources.

In addition to the money paid for the raw mineral products of the State, it is well to consider the comparatively large number of men working in the oil fields, in the coal, iron, and other mines, and in the refineries, and also the men engaged in transporting these mineral products and the materials and equipment used in the industry. Millions of dollars in wages are paid to these men yearly.

There are three large refineries and a number of small ones in the State, having a total capacity of 78,000 barrels of crude oil

per day. By the process of refining, the value of a barrel of oil is increased from \$2.85 to approximately \$7.50 at wholesale prices. Thus, the value of our crude production is increased almost 300 % by the refineries in the State.

Our undeveloped natural resources are scarcely exceeded by those of any other State of the Union and of these the mineral resources are by far the most striking. Estimates of the intrinsic value of our great mineral resources would indeed be very crude and probably misleading, for in the present state of undevelopment there is no market for a great portion of our mineral deposits. The coal measures of the State contain roughly 1,078,620,100,000 short tons of workable coal. The royalty value of this incomprehensible amount of coal at 10 cents per ton is \$107,862,010,000.00. It will be hundreds of years, however, before the bulk of this coal is mined. With petroleum and gas it is somewhat different. The oil will be largely exhausted in the United States inside of 20 years and that is also probably true of the oil fields of Wyoming. In that time Wyoming may produce 400 million and possibly 500 million barrels of crude oil. The gas fields of this State appear to be practically inexhaustible, but of course they are not. They are capable of producing about 700 billion cubic feet of gas annually, while actual consumption is only 3% of that amount. Much of this gas contains a high gasoline content. Ten million gallons of casing-head gasoline are produced yearly, and this can be multiplied many times if industrial utilization of the resultant dry gas can be obtained. Another vast, undeveloped source of crude oil, gas, and by-products is the oil shale. The formation in which our oil shale is found covers approximately 3,500 square miles of territory in southwestern Wyoming. Some of the deposits are rich in oil and assay one barrel or more of oil and considerable gas and some ammonium sulphate to the ton of shale. It was estimated by the

United States Geological Survey that the shale beds of northwestern Colorado, which are similar to those of Wyoming, are capable of producing 20 billion barrels of crude oil. If that is the case, undoubtedly Wyoming shales are capable of producing at least one half that amount, when we consider that the shale area in Colorado is only 1900 square miles as compared to 3,800 square miles in Wyoming, although Colorado shales may be somewhat richer in oil.

The State has also many other rich and undeveloped mineral deposits which include those of iron, copper, gold, silver and other precious metals, asbestos, asphalt, bentonite, clay, cement materials, epsomite, Fuller's earth, glass sand, granite and other building stones, graphite, gypsum, manganese, mica, mineral waters, phosphate, potash, salt, soda, and sulphur, all of which are described in Press Bulletin Number 10, published October 1, 1920, by this office.

The above matter is brought to your attention for the purpose of showing the importance of the mineral industry and the mineral resources to the public welfare and the very great part the industry will play in the future affairs of the State. It is meet, therefore, that the Department of State Geologist or Geological Survey should receive consideration from the legislative bodies commensurate with its important relationship to the development and conservation of the State's mineral resources. It has already been recommended in the budget that the office of Assistant State Geologist be created and additional funds appropriated for research work in the field. More recent study of the problems leads the writer to believe that if possible another office should be created in this department as suggested in the early part of this report, that of Oil and Gas Supervisor, or Petroleum Assistant. This officer, as before suggested, would have jurisdiction over the oil and gas development and enforcement of the laws relating thereto. However, this office is not essential unless conservation laws are enacted.

If this plan is not feasible, then the Assistant Geologist should be a geologist who is familiar with petroleum engineering and has had some experience in the oil fields. In order to obtain such a man, the State would have to pay as much, if not more, salary than is now being paid to the State Geologist. Competent geologists and petroleum engineers are receiving from \$5,000.00 to \$8,000.00 per year from the large operating companies.

The above matters are respectfully submitted for your consideration and that of the Legislature with the hope that the Office of State Geologist will receive more consideration than it has in the past, in view of the importance of the work now being done and of the needful work that might be done if the Department were enlarged.