STATE OF WASHINGTON

REPORT

OF THE

Supervisor of Geology

Department of Conservation and Development

From April 1, 1921, to September 30, 1922

D. A. SCOTT, Director

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REPORT OF THE SUPERVISOR OF GEOLOGY.

DR. SOLON SHEDD, Supervisor.

ADMINISTRATION.

Scope of Report. This report covers the administrative work of the Division of Geology from April 1, 1921, to September 30, 1922. The results of the work of the Division are issued in the form of bulletins, maps, and publications of various kinds, and are distributed quite generally among the people of Washington who may be interested in them, and to geologists, engineers, investigators, manufacturers, and public libraries generally, throughout the country. The reports consist of both the economic and scientific phases of various problems.

Organization. Prior to April 1, 1921, what is now the Division of Geology had been the Washington Geological Survey. This included the Geological Branch, the Topographical Branch, and the Hydrometric Branch. The work of this organization was under the supervision of a Board of Geological Survey, consisting of the Governor, Lieutenant Governor, Secretary of State, President of the University of Washington, and the President of the State College of Washington. This board appointed a State Geologist to direct the work of the survey and from time to time such assistants as it deemed necessary in order to carry on this work satisfactorily.

When the new code, which had been passed by the last legislature, became a law on April 1, 1921, the Washington Geological Survey became the Division of Geology in the Department of Conservation and Development, and the director of this division assumed the duties that had been performed by the Board of Geological Survey. On assuming office, Director D. A. Scott appointed Professor Solon Shedd, head of the Department of Geology at the State College of Washington, as Supervisor of Geology, and the headquarters of the Division of Geology were located at Pullman. In addition to the Supervisor, Professor Olaf P. Jenkins of the Department of Geology of the State College of Washington, Herschel H. Cooper and Charles A. Stewart, graduate students in the Department of Geology, have been employed part time in field work and the preparation of reports, while Miss Bernice M. McDermid has acted as secretary.

With the change in name of the Geological Survey to the Division of Geology, the Hydrometric Survey was transferred to the Division of Water Resources, leaving only the work in geology and topography under the direction of the Supervisor of Geology.

Office Work. The office work of the Division of Geology takes a considerable amount of time, as many requests for information along various lines are being constantly received. Requests for information in regard to the occurrence of gas and oil in various parts of the state have been very numerous. Letters are also being constantly received asking for information in regard to the mineral resources of different parts of the state. People who are considering coming to Washington to reside are anxious to know about

the climate, soil, and resources in general, and inquiries along these lines are being received constantly.

In addition to taking care of routine office work, I have read the manuscript and proof for the report on the Underground Water Supply of the Region About White Bluffs and Hanford, and the report on the Iron Ores, Fuels, and Fluxes of Washington. I have also prepared a chapter on the coke and limestone of Washington, which is being published as a part of the report on the iron ore deposits of Washington. I also made an examination of conditions along the Columbia River from Bridgeport to the Grand Coulee. This work was done with a view to determine the most feasible place to construct a dam across the river in connection with the Columbia Basin Irrigation Project. In addition to the above, I have done some work on a report dealing with the general geology and topography of Washington, which I hope eventually to publish as a bulletin of the Division of Geology.

For all of this work the Division of Geology has paid nothing except for stenographic work. I mention this simply to show that the work of the Division is carried on at a very small expense. This is due to the fact that a large part of the work has been done by men who do not receive pay from the funds of this Division. Expenses, in addition to a salary, have been paid to the men doing field work, while they were in the field, but nothing has been paid for the preparation of reports. No salary has been paid so far to the Supervisor from the funds of this Division.

Publications. Since April 1, 1921, the following publications have been issued and distributed:

Bulletin No. 21—The Mineral Resources of Washington.

Bulletin No. 23—The Metal Mines of Washington.

Bulletin No. 25—The Magnesite Deposits of Washington.

Bulletin No. 26—Underground Water Supply of the Region About White Bluffs and Hanford.

Bulletin No. 27—Iron Ores, Fuels, and Fluxes of Washington.

Of the above bulletins, Nos. 21, 23, and 25 were in the hands of the State Printer on April 1, 1921, at the time the transfer was made, the work having been done and the manuscript having been prepared under the direction of Professor Henry Landes, former State Geologist. In addition to the bulletins mentioned above, the manuscript for Bulletin No. 24, The Clays and Shales of Washington, was completed and has been received from Professor Landes; but up to the present time it has not been published on account of lack of funds.

TOPOGRAPHIC SURVEYS.

Topographic Maps. A topographic map is intended to represent the surface features of a given land area, and the elevation of all points above some common level, usually sea level. It also indicates the location of streams, lakes, ponds, roads, both private and public, towns, etc., in their correct relative positions. In the making of surveys for such maps, permanent marks, known as "bench marks," are established at various places over the area, and the exact elevation above sea level of these points given. These

serve as datum points for surveys of various kinds that may be carried on later.

The topographic map is made with such accuracy and in great enough detail so that it is of value for many purposes, such as in the laying out of roads, in the construction of irrigation ditches, and in the location of water-power sites, etc. The areas covered by these maps are bounded by parallels and meridians, and the completed maps are called "quadrangles." Each quadrangle is designated by the name of the most prominent place or topographic feature included within that quadrangle. The scale most commonly used in constructing these maps is approximately two miles to the inch. In special cases, however, other scales are used.

During the period covered by this report (April 1, 1921, to September 30, 1922), the topographic work in Washington has all been done in cooperation with the U. S. Geological Survey, the State paying one-half of the expense of the field work, and the Federal Survey paying the other half. Under this arrangement, work has been carried on during the summers of 1921 and 1922.

During the summer of 1921 the field work on the Sultan quadrangle. (western Washington) was finished and work was begun on the Othello quadrangle (eastern Washington). The area mapped on the Sultan quadrangle is about 200 square miles. This map is to be published on a scale of about two miles to the inch, with contour intervals of fifty and one hundred feet.

In addition to the Sultan quadrangle, the field work on the northwest quarter of the Othello quadrangle, which has been designated as the Corfu quadrangle, was completed, and it will be published on a scale of approximately one mile to the inch, with a twenty-five foot contour interval.

During the summer of 1922 the work in topographic mapping has been done on the Othello quadrangle, and it is expected that the field work on this quadrangle will be completed this fall. The south half of this quadrangle will be published on a scale of about one mile to the inch, with a twenty-five foot contour interval, while the northeast quarter will be published on the same horizontal scale, but with a fifty foot contour interval.

GEOLOGICAL INVESTIGATIONS.

Professor Olaf P. Jenkins and Herschel H. Cooper spent the field season of 1921 (June 15 to September 15) in a study of road materials, of the geology of the Grand Coulee, and of the iron ore deposits of Washington. Later, Professor Jenkins also made a study of the water resources of the White Bluffs-Hanford area.

Road Materials. At the request of Mr. James Allen, State Highway Commissioner, an examination of the country along the Inland Empire Highway from Rosalia to Dixie was made with a view to locating, if possible, deposits of sand and gravel, near the line of the highway, that would be suitable for concrete paving work. Professor Jenkins and Mr. Cooper spent about two weeks on this work, and the results are embodied in a report with maps, sections, and illustrations, submitted about July 1, 1921.

Grand Coulee. At your request, an examination was made of the Grand Coulee to determine, in so far as possible, whether the Coulee would hold water if used as a storage reservoir in connection with the Columbia Basin Irrigation Project. Professor Jenkins and Mr. Cooper spent about two weeks on the work, and their conclusions were submitted to you in a report with maps and sections about July 15, 1921.

Iron Ores of Washington. The legislature of the State of Washington at its seventeenth regular session passed a resolution known as Senate Joint Resolution No. 9, requiring the State Geologist to make an investigation and report on the iron ore deposits in the State of Washington. In accordance with this resolution the field work for this report was begun about the middle of July, 1921, and continued for the balance of the summer. Professor Jenkins and Mr. Herschel H. Cooper were assigned to this work, and one or both of them examined each iron deposit of importance, so far as known, in Washington. A study of the geology, origin, and extent of the ore bodies was made and samples of the ores were collected for chemical analyses.

From September 15, 1921, to June 15, 1922, Professor Jenkins and Mr. Cooper spent much time in the preparation of a report on the iron ores of Washington.

White Bluffs-Hanford Area. From October 19 to October 26, 1921, Professor Jenkins made an examination to determine the underground water supply in the region about White Bluffs and Hanford. This examination was made in connection with the Soldier Land Settlement Project. The results of this examination have been published as Bulletin No. 26 (Geological Series) of the Division of Geology.

The field season of 1922 was spent by Professor Jenkins and Mr. Charles A. Stewart in a study of the coal fields of Whatcom County. An advance report will be issued on this work some time this fall, and the final report will follow later.

RECOMMENDATIONS.

Geological Work. For the coming biennium we should finish the work already begun on the coal fields of Whatcom and Skagit Counties. This work is of real economic importance as it will be of much help in determining the extent and value of the coal beds in this part of Washington.

The question of the underground water supply is a very important one in many parts of this state and I believe some work should be done along this line. Requests are coming in constantly for information in regard to the water resources of various parts of the state, especially as regards artesian water, and often we have so little data that it is not possible to give very much help to the person making the inquiry because no study of the locality has been made.

We are having a large number of requests for a geological map of Washington, and we should publish such a map just as soon as possible. A large number of the states have prepared and published such maps, but so far only small areas in Washington have been mapped geologically. We now have a good base map of the state, and the various geological formations should be worked out and placed on this map as soon as possible.

Information in regard to the mineral resources of the various parts of the state is constantly being requested, and in order to furnish this, we should have on file in this office much more complete data than we have at the present time. In order to obtain this information it will be necessary to have someone go into the field and collect it. These data should be kept in such a form that they may be readily accessible and revised from time to time so as to be at all times up to date. At stated times, say once in every two years, reports on mineral statistics should be published showing accurately the locality, output, and producer of each mineral concerned. This information is of very great value to manufacturers, especially those who have occasion to use, in any way, minerals that are of value economically.

Soil surveys have been carried on in the past by the Geological Survey in cooperation with the U. S. Bureau of Soils, and the work done has proved to be of very great value to the state. Requests are coming in constantly for these reports, and the demand has been so great that the edition of some of the reports has been completely exhausted. There are still large areas in Washington that have not had soil surveys, and some work should be done along this line.

Topographic Surveys. Topographic maps are absolutely essential before an accurate detailed geological study of any locality can be satisfactorily begun. For a number of years past, topographic work has been carried on in various parts of Washington in cooperation with the U. S. Geological Survey. In this work the Federal Survey spends the same amount of money as the state appropriates for this work.

The topographic mapping for the past two years has been largely of areas within the Columbia Basin Irrigation Project, so that the larger part of the land within this project has been mapped.

I am very anxious to have some detailed geological work done in the near future in connection with the mining districts north of Spokane, but before starting on this geological work, some topographic mapping should be done in that region. In my opinion this is the most important metal mining district in the state and we should do all we can to help develop this industry.

Appropriations Requested. For topographic and hydrometric surveys, each succeeding legislature since 1909 has made an appropriation of from $30,000.00 to $35,000.00 (conditioned upon a similar sum being expended in the state by the United States Geological Survey).

Of the above amount, about $20,000.00 has been used for topographic mapping, and I therefore recommend that $20,000.00 be requested to continue this work for the coming biennium, conditioned on the U. S. Geological Survey expending the same amount in this state for the work.

From 1909 until 1921, each succeeding legislature has appropriated $20,000.00 for geological surveys; and I would recommend that the same amount be appropriated for the coming biennium.

I am enclosing a chart that shows the various lines of activity of the Division of Geology.

Respectfully submitted,

S. SHEDD,
Supervisor of Geology.

APPROPRIATIONS FOR STATE SURVEYS, 1921-1923.

Alabama receives $15,000 yearly for Geological Survey, $2,400 of which is salary for State Geologist and $1,200 for Director of Museum, or $7,200 for full time salaries of employees.

Arizona receives $38,000, of which $25,000 is full time salaries of employees and $5,000 for State Geologist who is Dean of College of Mines and Engineering.

California receives $74,400 for their Mining Department.

Colorado receives $15,000 yearly for Geological Survey.

Florida receives $7,500, of which $4,600 is full time salaries, with $2,500 for State Geologist.

Georgia receives $16,500 for Geological Survey, of which $5,500 is for full time salaries and $3,500 for salary of State Geologist.

Illinois receives $137,000 biennially for Geological Survey.

Indiana receives $105,000 for Department of Conservation, consisting of several departments.

Iowa receives $8,000 yearly for Geological Survey, of which $3,600 is yearly salaries plus $1,750 for topographic work and $750 for stream gaging. Salary of State Geologist $900, plus University salary.

Kansas receives $25,000 yearly for Geological Survey, including investigations of road materials, of which $7,500 is paid in full time salaries. Salary of State Geologist $2,000 per year for half time.

Kentucky receives $35,500, of which $3,000 is salary of Director, and $12,500 for topographic mapping.

Maine receives no specific survey appropriation but some geological work done under Water Power Commission. No salaries paid.

Maryland receives $18,000 for Geological Survey. State Geologist and clerical help on per diem basis.

Michigan receives $47,000 under Department of Conservation which includes several departments.

Minnesota receives $8,250 per year for 1921 period.

Mississippi receives $34,500 per year, of which $3,000 is salary of Director.

Missouri receives $34,150 per year, of which $5,000 is salary for State Geologist.

New Jersey receives $32,605, of which $4,500 is salary for State Geologist.

New York receives $60,000 for all activities of Geological Survey.

North Carolina receives $35,000 for geological activities, of which $5,000 is salary for State Geologist.

North Dakota receives $3,000; State Geologist paid on per diem basis for actual work done.

Ohio receives $9,685 covering personal service and maintenance. Printing is done under another fund.

Oklahoma receives $39,000 per year.

Oregon receives $25,000 covering Mining and Geological work.

Pennsylvania receives $75,000, of which $7,000 is salary of State Geologist.

South Dakota receives $15,000 per year including biological, archeological and topographic work. Geologist receives only part pay from Survey and Assistant Geologist receives $3,000 per year.

Tennessee receives $36,000 per year, $4,500 of which is salary for State Geologist.

Texas receives $41,500, of which $7,000 is paid for full time salaries.

Vermont receives $3,000 plus $3,000 for topographic work. Salary of officials paid on per diem basis.

Virginia receives $18,000 yearly.

Washington receives $12,500 per year to cover geological, hydrographic and topographic work, $5,000 being used for geological.

West Virginia receives $23,400 for geological and paleontologic work. No salary for State Geologist.

Wisconsin receives $55,000 including all activities.

Wyoming receives $35,700 for all activities, $3,500 of which is salary for State Geologist.

Financial Statement Geological Division.

(Appropriation $10,000.00)

Salaries and wages	$2,951 78
Expenses of geologist and assistants	1,448 89
Miscellaneous expense	219 33
Field equipment	118 10
Office supplies	132 01
Telephone and telegraph	31 50
Postage	38 85
Automobile expense	633 04
Printing reports	912 06
Total	$6,485 56

NOTE—

Amount expended as per State Auditor's books	$6,743 43	
Credited to Geological Division item of printing to be charged to Land Settlement after report	257 87	
Total		$6,485 56