

STATE OF OREGON  
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES  
702 Woodlark Building  
Portland, Oregon

Bulletin No. 25

**Third Biennial Report**  
of the  
**State Department of Geology  
and Mineral Industries**  
of the  
**STATE OF OREGON**

Jan. 1, 1941 to July 1, 1942

TO HIS EXCELLENCY THE GOVERNOR  
and the  
FORTY-SECOND LEGISLATIVE ASSEMBLY



STATE GOVERNING BOARD

W. H. STRAYER, CHAIRMAN . . . . .	BAKER
ALBERT BURCH . . . . .	MEDFORD
E. B. MACNAUGHTON . . . . .	PORTLAND

EARL K. NIXON  
DIRECTOR

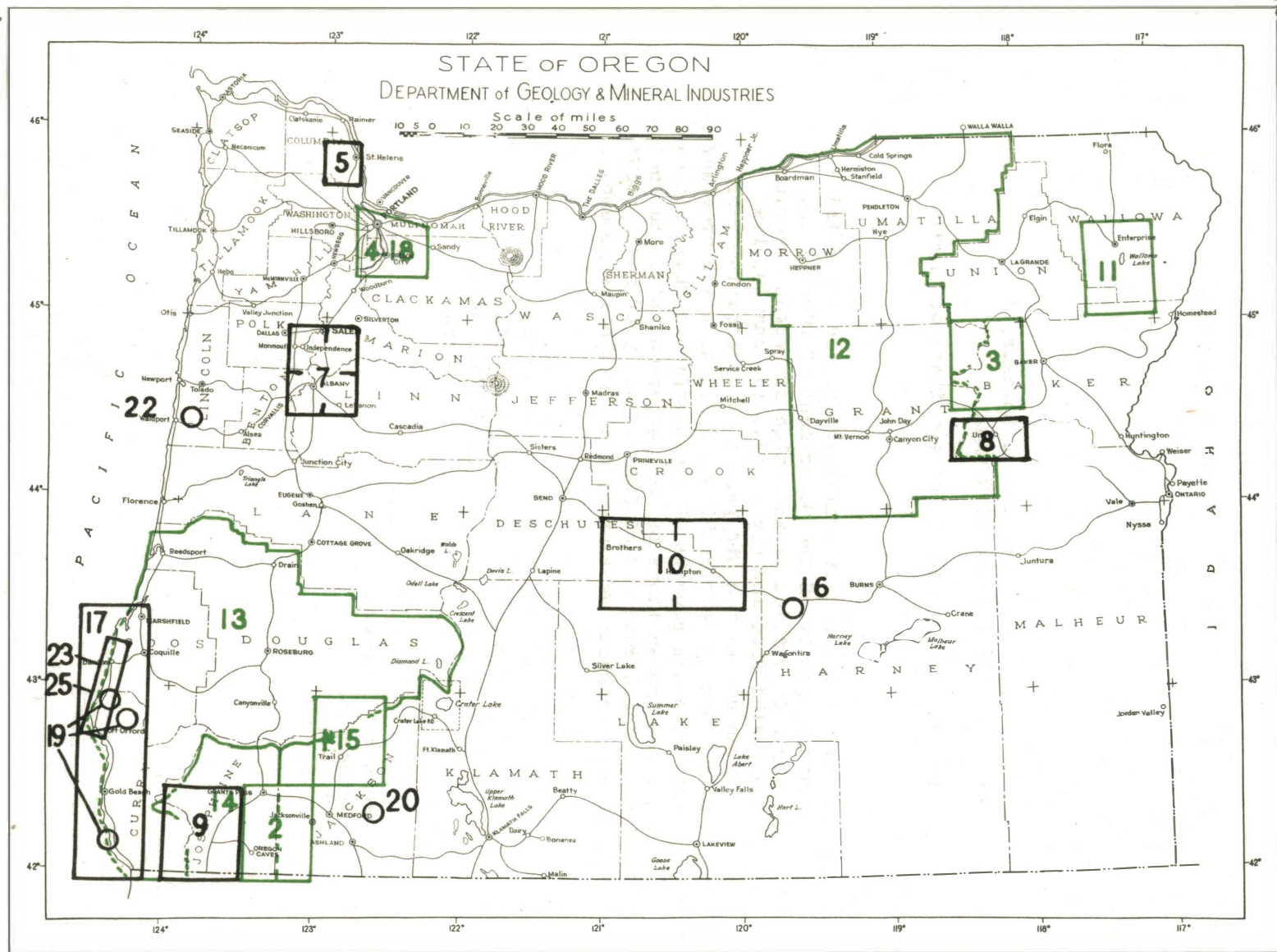
To His Excellency, Charles A. Sprague,  
Governor of the State of Oregon  
and  
The Legislative Assembly of the State of Oregon

Sirs:

We have the honor of submitting to you the Third Biennial Report of the Department of Geology and Mineral Industries of the State of Oregon covering the period from January 1, 1941 to June 30, 1942. Only an eighteen month period is covered in order to conform to Section 92-802 O.C.L.A. which provides that biennial reports of state officers shall include all the transactions of such departments to and inclusive of the 30th day of June of the year next preceding the regular session of the Legislative Assembly.

W. H. Strayer  
Albert Burch  
E. B. MacNaughton  
Board

Portland, Oregon  
January 1, 1943



Studies made by the  
State Department of Geology and Mineral Industries  
from

January 1, 1941 to June 30, 1942 (18 months)

FIELD STUDIES OF PARTICULAR AREAS (see opposite map)

Green: Results published prior to June 30, 1942.

Black: Not completed, June 30, 1942.

Geologic Map Series

- (1) No. 3 Geologic map of the Butte Falls quadrangle.
- (2) No. 4 Geologic map and geology of the Grants Pass quadrangle.
- (3) No. 5 Geologic map and geology of the Sumpter quadrangle.
- (4) No. 6 Geologic map and geology of the Portland area.
- (5) ----- Geologic map and geology of the St. Helens quadrangle.
- (6) ----- Geologic map and geology of the Molalla quadrangle.
- (7) ----- Geologic map and geology of the Lebanon, Salem, Corvallis and Albany quads.
- (8) ----- Geologic map and geology of the north half of the Ironside Mt. quadrangle.
- (9) ----- Geologic map and geology of the Kerby quadrangle.
- (10) ----- Geologic map and geology of the north half of the Hampton and Brothers quads.

Bulletins

- (11) No. 12 Geology and physiography of northern Willowa Mountains.
- (12) No. 14-B Oregon Metal Mines Handbook: Grant, Morrow, & Umatilla counties.
- (13) No. 14-C Vol. I Oregon Metal Mines Handbook: Curry, Coos, & Douglas counties.
- (14) No. 14-C Vol. II, Sec. 1 Oregon Metal Mines Handbook: Josephine county (with  
geologic map).
- (15) No. 22 Geology of the Butte Falls quadrangle.
- (16) No. 23 Investigation of the reported occurrence of tin at Juniper Ridge.
- (17) No. 24 Origin of the black sands of the southwest Oregon coast.

Short Papers

- (18) No. 7 Geology of the Portland area.
- (19) No. 9 Some manganese in the southern Oregon coastal region.
- (20) No. 10 Tyrrell manganese mine and associated properties.
- (21) ----- Gold-bearing bars along the Snake River in Oregon.

Unpublished Special Problems

- (22) ----- Geology of Table Mountain intrusive, Lincoln county.
- (23) ----- Chromite sand investigations on the southwest Oregon coast (drilling,  
sampling, mapping).
- (24) ----- Magnetometer survey of quicksilver deposits in central Oregon.
- (25) ----- Magnetometer survey of Oregon coastal black sand deposits.

PUBLISHED STUDIES WITH GENERAL APPLICATION

Bulletins

- No. 16 Field identification of minerals for Oregon prospectors and collectors.
- No. 17 Manganese in Oregon.

Short Papers

- No. 5 Survey of non-metallic mineral production for Oregon, 1940.
- No. 6 Pumice and pumicite.
- No. 8 Strategic and critical minerals.

Miscellaneous

- Landforms map of Oregon.
- The spectrographic laboratory.
- The Ore.-Bin (monthly).



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## OREGON MINERAL PRODUCTION

During the past two years the trends in mineral production throughout the west have been characterized by a sharp decrease in gold output together with increasing attention to production of war metals and minerals. Difficulties in obtaining supplies and equipment because of priorities regulations as well as rising mining costs, and loss of workmen to the armed forces and to war construction projects, have contributed to the throttling down of gold production. The demand for certain of the war metals is greatly in excess of domestic supply; consequently there is the pressing need of increasing as much as possible the production of these critical minerals.

As in other western states, the mineral production picture in Oregon during the current biennium represents a transition from peace-time to war-time type of production. Gold mining, which has been the backbone of Oregon's output of metals, started to decline in 1941. Gold operators even then had difficulty in obtaining critical operating materials. Strategic metals came into sudden demand. There was a scurry for chromite and manganese ore and increased developments in quicksilver; three antimony properties began to receive attention; exploration of a large nickel deposit in Douglas County was undertaken by an experienced, and financially strong, corporation.

The Director of the Department took the lead in bringing about establishment in 1942 by Metals Reserve Company, a Federal agency, of three ore-buying depots for the purchase of chromite ore in Oregon. This development made possible sale of ore by small producers and in small lots - direct to the Government - in three producing areas in the state, namely; at Coquille in the Coos Bay district, at Grants Pass in southwest Oregon, and at Seneca near the Canyon City-John Day district.

According to the U. S. Bureau of Mines the value of production of gold, silver, copper and lead in Oregon during 1941 was slightly in excess of \$3,600,000, of which amount gold accounted for 94%. In addition, mines in Oregon produced 9,000 flasks of quicksilver valued at approximately \$1,620,000, making a total of \$5,222,000 for Oregon's 1941 metallic mineral production. In addition, 69 ounces of platinum metals were produced and also some chromite, but the Department has no information on the value of the latter.

No canvass of non-metallic mineral production was made by the Department in 1941, but probably the value of the production was not materially different from that of 1940. For that year the departmental canvass showed a value of a little more than \$5,750,000.

In 1942 gold production continued to decrease. (In October gold mines were closed by order of the War Production Board.) There was a large increase in chromite production, which would offset in part the decrease in gold production.

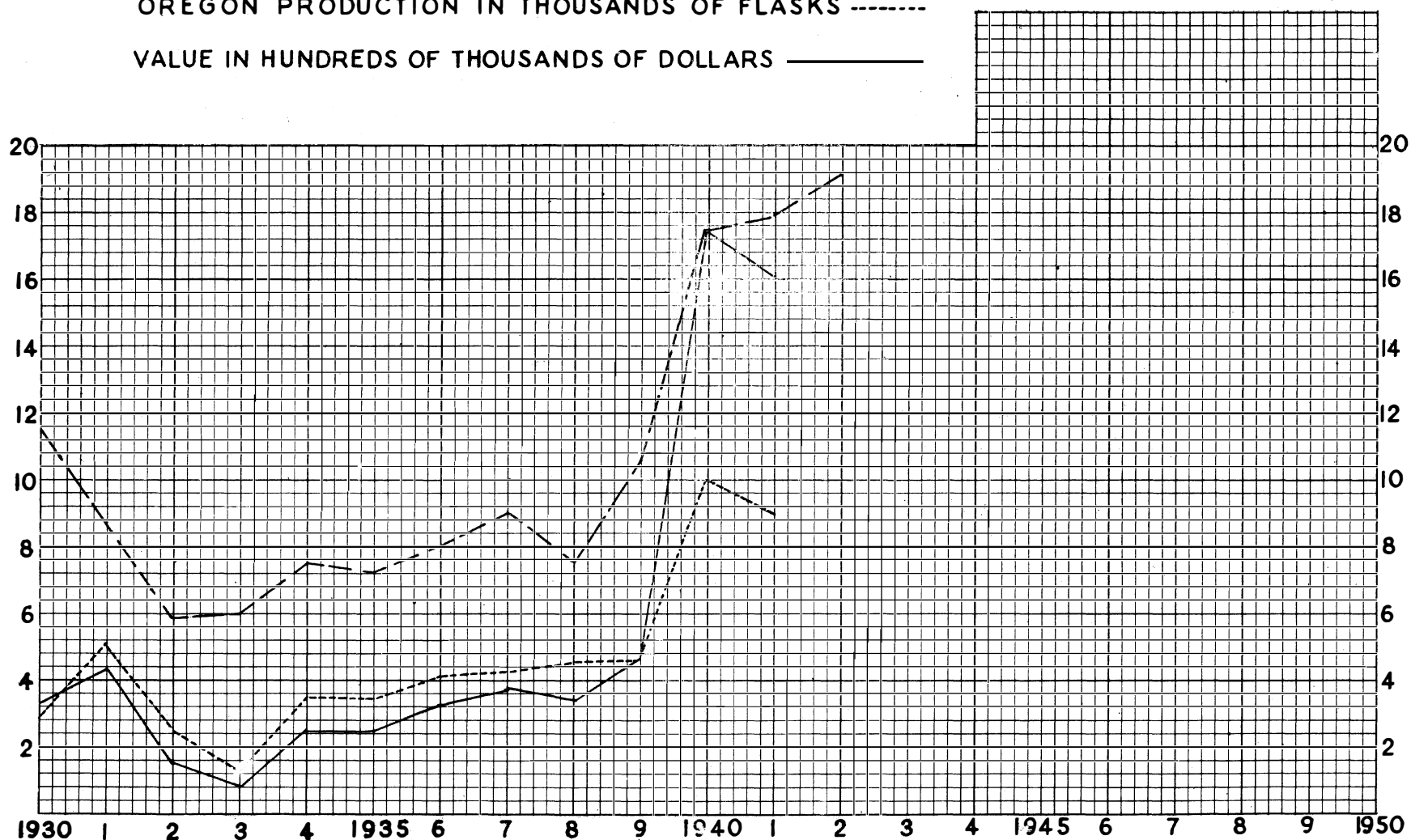
The 1942 production of non-metallic minerals in the state will probably be in excess of that of previous years, due to the large amount of war construction work.

# OREGON QUICKSILVER PRODUCTION SINCE 1930

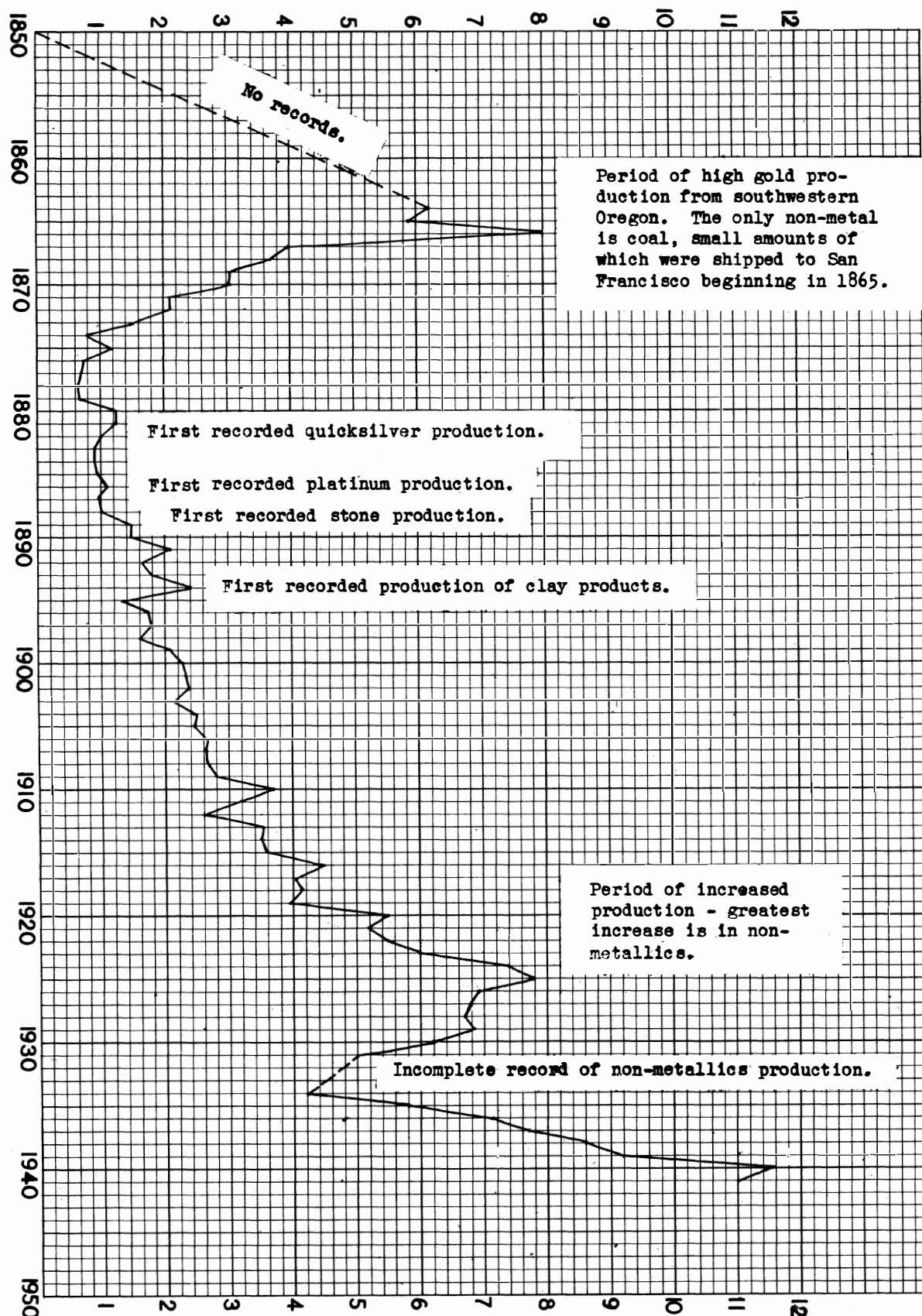
AVERAGE PRICE PER FLASK IN TENS OF DOLLARS — — —

OREGON PRODUCTION IN THOUSANDS OF FLASKS - - - - -

VALUE IN HUNDREDS OF THOUSANDS OF DOLLARS ———



# VALUE OF OREGON MINERAL PRODUCTION IN MILLIONS OF DOLLARS



## INTRODUCTORY STATEMENT

This report covers the activities of the State Department of Geology and Mineral Industries for the 18-month period from January 1, 1941, to June 30, 1942. The first two biennial reports covered two calendar years each. The Oregon legislature of 1939 appropriated funds for the calendar years 1939 and 1940 and for an extra 6-month period - the first half of 1941. The 1941 legislature then appropriated funds for the current biennium from June 30, 1941 to June 30, 1943. In order to get in step, this report was prepared to cover the 18-month period. Hereafter the biennial reports will cover the 24-month period ending June 30, the end of the fiscal year preceding a regular legislative period.

The old Oregon Bureau of Mines and Geology was discontinued in 1923 and there was no State geological survey or Oregon Department devoted exclusively to the State's mineral industry until 1937. Since establishment of this Department in that year, the services rendered have been in increasing demand by citizens of the State, so that it has been a problem to meet that extra demand without substantially increasing the Department personnel in direct proportion.

As a matter of fact, since the Department was established five years ago, many measures have been taken and means devised for cutting corners and increasing the amount of effective work by the personnel. Efficiency has been raised by the selection and training of staff members and assistants who have special aptitude or experience in their respective lines. Problems and projects now are undertaken and completed with much more speed, accuracy, and efficiency than was possible immediately after the Department was organized. The technical staff is believed to be well-balanced for best application among the various technical problems that the Department undertakes, although losses of technical personnel to the Military Service, and to higher-pay jobs in private industry make the maintenance of a staff difficult.

During the first two biennia, several projects were carried out by outside specialists or consultants employed for the purpose. Money was available for only very limited employment of such consultants during the current biennium. Under the circumstances, some work was done by the regular staff which could have been done more simply by outside specialists, and some projects had to be abandoned for lack of funds or facilities.

On Monday, December 8, 1942, a memorandum was directed to all members of the Department, advising them that henceforth all activities of the Department would be directed 100% toward war work, i.e., encouragement of strategic mineral production, the interpretation for mineral producers of directives and requirements of the Federal Government along mineral lines, etc. Thus, departmental activities and policies have been changed since Pearl Harbor to dovetail with activities of other agencies, private, State, and Federal, particularly those of the War Production Board and Metals Reserve Company. Such close cooperation came about in part as a result of the director's serving part time as Consultant, both to the War Production Board and Metals Reserve Company at the request of those agencies.

Certain departmental activities of longer range application in Oregon have been deferred until after the war. Departmental attention to gold and silver production has been subduced or virtually ended for the duration. Instead, encouragement is being given to the production of such ores as those of chromium, manganese, quicksilver, tungsten, antimony, etc.

Future plans for the Department are outlined on a later page.

## SET-UP OF THE DEPARTMENT

Under the laws that govern this Department (Oregon Laws of 1937, Chapter 179), certain duties are outlined. The Department is expected to:-

1. Conduct geological and mineral resource studies.
2. Carry out scientific and economic studies pertaining to utilization of raw materials.
3. Co-operate with Federal and other agencies in such studies.
4. Serve as a bureau of mineral information, to conduct a mineral survey of the State, to bring up-to-date the mines catalog, to publish reports of studies, statistics, etc.
5. Conduct a State Geological Survey.
6. Collect specimens and develop a museum containing said specimens, samples, maps, models, etc.
7. Start a mining and geological library.
8. Make qualitative and quantitative mineral assays.
9. Study minerals and ores and processes for their improved treatment.
10. Establish state assay laboratories for free assaying of ores for citizens of the State.

The Department is administered by a Governing Board of three citizens who serve for four-year periods. The Governor of the State selects the Governing Board, subject to the approval of the senate. The Board members serve without compensation but receive traveling expenses. They meet at least four times each year. The Board may make contracts with other Federal and State agencies, may receive gifts and legacies and make use of same for the best interests of Oregon.

The Board causes to be published a Biennial Report of Departmental activities. It selects the Director of the Department who has charge of its work and who subscribes to the same oath of office as other State officers. The Director employs assistants and fixes their remuneration with the approval of the Governing Board. Money received from sale of maps and bulletins and from other sources goes to the State Treasurer for the account of a "departmental fund". The accounts of the Department must be audited annually.

An organization chart showing the major divisions of Departmental activity and personnel responsibility is given on the following page.

Organization within the  
State Department of Geology and Mineral Industries

Director (Nixon)	Analytical Division (Harrison)	Assay Laboratories { Baker (Richards) Grants Pass (Bassett)
		Information and correspondence on minerals, rocks and ores (staff)
	Qualitative Laboratory	Spectrographic laboratory (Harrison)
		Spectrographic examinations (Harrison)
		Petrographic examinations (Allen, Paulsen, Brown)
		Mineralogic examinations (Allen, Paulsen, Richards)
	Mines Division (Libbey)	Blowpipe examinations (Allen, Bassett, Richards)
		Chemical examinations (Allen, Bassett, Richards)
		Information and correspondence on mines (Libbey, Nixon, Allen, Treascher, Lancaster)
		Metallurgy and economics (Libbey, Nixon)
	Mine examinations	Portland (Libbey, Allen)
		Baker (Lancaster)
		Grants Pass (Treascher)
		"Ore.-Bin" (Nixon, Libbey)
	Geological Division (Allen)	Annual production data (Libbey)
		Editorial (Nixon, Libbey, Allen)
		Information and corresp. on geology, etc. (Allen, Paulsen, Brown)
		Geological surveys (Allen)
	Stratigraphy (Allen, Treasher)	Paleontology (Bowman, Allen)
		Map making and drafting (Allen, Paulsen, Brown)
		Editorial (Allen, Libbey, Nixon)
		Library and catalogue
Reference Division (Bowman)	Collections of rocks, minerals, and ores with index	Map collection and index
		Mine reports and card files
		Display cases, cards, maps, etc.
		Thin section file
Photograph collection	Mine priorities (Libbey, Nixon)	Corporation commission recommendations (Nixon)
		Negotiations and cooperation with USGS, USBM, etc. (Nixon)
		War Production Board, Metals Reserve Company (Nixon)
		Stenography (Cook)
Cooperation Division (Nixon)	Filing (Cook)	Multigraphing reports and bulletins (Hanton)
		Inventory { Capital outlays Field equipment Loan collections Storage lists
		Payrolls
		Bookkeeping
Clerical Division (Cook)	Purchasing	Automobile servicing
Accounting & Property (Steeble)	Automobile servicing	

## PERSONNEL

The Governing Board of the Department is composed of the following members:

W. H. Strayer, Baker, Chairman  
Albert Burch, Medford  
E. B. MacNaughton, Portland

Mr. MacNaughton was reappointed in 1939; Mr. Burch was reappointed in 1940; and Senator Strayer was reappointed in 1941.

The regular personnel of the Department as of June 30, 1942 is as follows:

### At Portland Office - Headquarters

Earl K. Nixon, Director, Mining Geologist.  
F. W. Libbey, Mining Engineer.  
John Eliot Allen, Chief Geologist.  
H. C. Harrison, Spectroscopist - Chief Chemist.  
Randall Brown, Junior Geologist.  
Wesley Paulsen, Junior Geologist.  
Paul Fitzsimmons, Junior Geologist.  
Jean Bowman, Junior Geologist - Paleontologist.  
Agatha Cook, Secretary.  
F. A. Steeble, Accountant.  
Phyllis Hanton, Multigraph Operator.  
June Roberts, Stenographer.

### At Baker State Assay Laboratory

Hugh K. Lancaster, Field Engineer  
L. C. Richards, Assayer

### At Grants Pass State Assay Laboratory

Ray C. Treasher, Field Geologist  
Robert Bassett, Assayer.

Extra office and stenographic help when especially needed has been employed at times both at the head office and at the laboratories.



## POLICIES

Although the law under which the Department was created outlines in general the activities to be carried out, certain policies are determined by the Governing Board and Director. The selection of projects for study, manner of approach, and especially the emphasis to be placed on various activities are matters of policy which are given consideration. When the Department was first established in 1937, a policy was adopted of giving more emphasis to projects and studies of practical and economic value, such as mineral inventories, and of subduing somewhat the longer range investigations of strictly scientific and academic application. In 1941 the Department was in a position to give more attention to strictly scientific and longer range projects, but definite plans were interrupted by the war emergency.

Immediately upon our entrance into the war, it became the policy of the Department to concentrate wholly on encouragement of production of war minerals. Especial attention has been given to exploration and production problems of quicksilver, chromite, manganese, copper, zinc, nickel, and vanadium. In addition, the Department has worked closely with the War Production Board on mineral industry problems. The director was appointed Oregon Emergency Coordinator for Mines to work with the Mining Branch of the WPB on mining priority matters connected with the State's mineral industry. He was also appointed as a consultant for the Materials Division of WPB and for the Metals Reserve Company, serving on a part time basis.

The element of timing in selection of projects for study has been considered of prime importance, and therefore certain strategic mineral studies were given precedence long before this country entered the war. An excellent example of such timing is the Department's pioneer studies of chromite sands of the Oregon coastal region.

Summer field work of the Oregon geological survey, customarily carried out in cooperation with Oregon State College and the University of Oregon, was continued in 1941.

The Department has continued to follow a policy of making special effort to furnish data to, or cooperate with, individuals or groups interested in locating new industries in the lower Columbia River area. In this connection, the Department continually stresses the attraction of low-cost Bonneville electrical power in conjunction with deep water transportation and these advantages to electrometallurgical and chemical industries. Cooperation with the Bonneville Administration has been mutually helpful. The policy of full cooperation with the University of Oregon and Oregon State College in various ways but particularly in geologic mapping and in metallurgical work has given excellent results.

There is one policy that this Department has always followed, namely, reports of investigations made shall always be compiled and published at the earliest possible time after completion of the work so that the greatest practical use can be made of the data obtained. Publication of reports must not, and will not, be held up months or years and thus become stale or obsolete.

## APPROPRIATIONS

The Department's administrative and field activities are carried out with money appropriated by the Legislature out of the General Fund in the State Treasury. Appropriations received by the Department for expenditure during the past biennium were divided among the following classifications which are self explanatory: Salaries and Wages; General, Operating and Maintenance Expenses; Capital Outlays; and Special Requests. Funds appropriated for use under one classification can not be used under any circumstances to cover expenditures under a different classification. All Departmental expenditures are covered by warrants drawn on the State Treasurer and are audited by the Secretary of State's office before payments are made.

In addition to the receipt of appropriative funds, the Department maintains a small separate account with the State Treasurer, into which go monies received from sale of Departmental publications, gifts, or match money from cooperating agencies. Warrants are then drawn on this account to cover payment of expenses incurred by the Department, but the fund is used primarily to augment amounts allotted for printing, since the fund comes mainly from sale of publications.

The following headings give appropriations made in the past as well as funds requested for the biennium, 1943 - 1945.

	1939 - 1940	1941(1st half)	1941 - 1943	Funds re- quested 1943 - 1945
	Jan.1-Dec.31	Jan.1-Jun.30	Jul.1-June 30	Jul.1-Jun.30
<u>Department of Geology and Mineral Industries</u>				
Salaries and Wages	\$ 59,960	\$ 15,005	\$ 68,070	\$ 94,160*
General Operation & Maintenance	17,760	5,057	24,160	30,285*
Capital Outlays	1,780	445	3,725	5,725*
Special Requests	<u>10,000</u>	<u>1,250</u>	<u>11,400</u>	<u>11,400*</u>
	\$ 89,500	\$ 21,757	\$107,355	
<u>Spectrographic Laboratory</u>				
Salaries and Wages			\$ 6,350	
General Operation & Maintenance			1,300	
Capital Outlays			<u>6,600</u>	
			<u>14,250</u>	
			\$121,605	\$141,570*

\*Joint request of Department of Geology and Mineral Industries and Spectrographic Laboratory for 1943 - 45.

Note that the figures given above for funds appropriated for the 1941-43 biennium - taken from the printed budget - are for a period of 24 months, rather than the 18 months covered by this report. The figures are shown thus in order to indicate the appropriations over comparable periods.

Increased appropriations requested for the new biennium are justified on the basis of:

- (1) The appropriation of funds to carry on the work of the spectrographic laboratory has now been incorporated in the regular department budget. It was carried as a separate appropriation in the 1941-43 biennium.
- (2) The cost of operating the Department has increased substantially as the costs of transportation, supplies, and equipment have increased. The increased cost of living due to war conditions has made necessary requests for substantial salary adjustments. The Department has experienced much difficulty in maintaining a technical staff in the face of offers of higher-pay salaries from private corporations.
- (3) War conditions have made unusual and sometimes unpredictable demands on the technical facilities of this Department. As the strategic position of various ores changes from time to time, plans and activities of the Department are made to conform. Maintenance of an elastic program is more costly than carrying on one of routine.

## MINING AND MINERAL INFORMATION SERVICE

Possibly the most important, certainly the most generally used and kindly received, single service of the Department consists in the dissemination in various ways of mineral industry information. A considerable part of this service consists of personal interviews. There is a constant demand for information concerning ore deposits, mining operations, markets, mineral economics, prospecting, and treatment of ores; in short a wide range of mining, geological, and metallurgical problems. Many inquirers desire identification of rocks, minerals and ores.

A great many requests for information come to the head office and to the assay laboratories by letter, by telephone, and by telegram. Many of these requests are referred to this Department for reply by other State departments, colleges, chambers of commerce, members of Congress, and other public officials.

Since a major portion of the staff's time is consumed in this service, it follows that this service costs proportionally more than any other single activity of the Department. Because of its nature it is difficult to evaluate this activity in a tangible way. However, the information desired may not be available from any other public agency, and minerals have assumed such an important place in the world's economy that it is essential that authoritative information concerning the State's mineral industry should be readily available to the general public.

Tangible evidence of some of the work of the Department in the dissemination of mining and mineral information and the giving of service may be obtained from the following:

During the Third Biennium (1/1/41 to 6/30/42) - 18 months.

Visitors at Portland Office. . . . .	3,727
Pieces of mail received at Portland Office . . . .	16,659
Pieces of mail sent out from the Portland Office,	
including publications	30,230
Number of mineral identifications, Portland Office	800

(Figures for similar items at the State Assay Laboratories at Baker and Grants Pass are given on page 12).

"A clearing house" service, established for the purpose of getting buyer and seller together, is carried out gratis by the Portland office. A form is provided on which the property owner describes his mining property or problem, together with all the pertinent conditions, as well as terms of lease or sale. The data are then condensed and published in the "Ore.-Bin" - a monthly publication of the Department, with other similar offers, and sent out to a mailing list of around 500 people. Inquiries are referred directly to the property owners. The Department acts merely as a clearing house and takes no responsibility for the statements made.

## SPECTROGRAPHIC LABORATORY

The Department was authorized by a law passed by the 1941 legislature to establish, equip, and operate a spectrographic laboratory the function of which would be to make spectrographic determinations at cost for any department, institution or other agency of the State of Oregon; and to make other spectrographic determinations at a reasonable charge therefor in excess of cost, i.e. - to function also as a custom laboratory.

As the act establishing the laboratory provides, the Governing Board of the Department has set up rules covering the operation of the laboratory. These rules and regulations together with a description of the laboratory and its equipment were published in pamphlet form.

The spectrographic laboratory is located in the Portland office of the department. Dr. H. C. Harrison assumed the duties of spectroscopist and chief chemist on July 6, 1941. During the period between July 6, 1941 and Jan. 3, 1942, he was in charge of the design and construction of the room to be used as the spectrographic laboratory; the selection and ordering of spectrographic equipment; the designing and supervision of construction of certain laboratory equipment which could not be purchased; and the design and supervision of construction of equipment to be used in the chemical laboratory of the Portland office. In addition to the above duties he was charged with the responsibility of carrying out a thorough investigation of the reported occurrence of tin at Juniper Ridge near Burns, Oregon, the results of which have been published as Bulletin No. 23.

The spectrographic laboratory was sufficiently equipped by the end of 1941 so that analytical work was started on Jan. 3, 1942. From the period between Jan. 3, 1942 and July 1, 1942, the spectrograph was calibrated, a number of analytical standards were prepared and tested, and quantitative methods and working curves were "set up" for quantitative spectrochemical determinations of several metals. Spectrograms of 349 different samples were taken and interpreted during the period, and about 300 other samples were analyzed by the examination of their visual spectra by means of a small spectroscope.

The spectrographic laboratory is equipped with the following: a 3-meter grating spectrograph manufactured by Baird Associates, Boston, Mass.; a positive-pressure air conditioning unit; an analytical balance; a button balance, a motor-generator set and starter; a microdensitometer and lamp; dual projection enlarger; arc-stand unit; sector motor with disks; exhaust hood and exhaust fan; electric control panel containing voltmeter, ammeter, variable resistors; developing machine for photographic manipulations; ball mill and ball-mill rack; refrigerator for photographic plate storage; two compartment sink; and various other smaller items.

Ever since installation of the laboratory its facilities have been in constant demand for routine analyses for individuals and companies both in and out of the state as well as for the solution of special problems directly connected with war work. Among the latter have been analyses for the State crime detection laboratory and the Army, the development of a method for the detection of extremely minute amounts of silver in mercury - a problem involving a serious hazard in the munitions industry, and development of methods for quantitative determinations of other critical war metals, such as chromium, zirconium, and nickel, each of which occurs in important amounts in the state. Many analyses have been made for the purpose of investigating samples suspected of containing critical metals. Upon the results of such analyses decisions may often be reached as to whether or not further exploration is justified.

Groups of college students, members of college faculties and other scientists, as well as many other interested persons have visited the laboratory in order to have the spectrographic technique explained and illustrated.

At the request of federal and state agricultural agencies, the Department entered into a co-operative research program comprising a study of the reason for the decline of productivity of filbert and walnut orchards. The Department's part of the study will be spectrographic analyses of soil and vegetation samples with especial attention to minute quantities of certain relatively rare elements.

## STATE ASSAY LABORATORIES

### Analytical Work

The law creating the Department provided for both quantitative and qualitative determinations of rocks, minerals, and ores originating in Oregon, and in 1937 laboratories equipped to make such determinations were established at Grants Pass and at Baker. Assayers are mainly occupied in making quantitative determinations, but qualitative work is also done in testing for various minerals and in classifying rocks. The scope of analytical work at the laboratories has broadened continually. Quantitative determinations have been made for the following elements: gold, silver, copper, lead, zinc, mercury, platinum, manganese, chromium, tungsten, molybdenum, calcium, magnesium, silicon, iron, nickel, antimony, tin, phosphorus, arsenic, cobalt, and aluminum. In normal times, by far the largest percentage of analytical work is in assaying for gold and silver. All through the period covered by this report, strategic minerals have become more and more important, consequently analytical work in our laboratories has been increasing on strategic and critical metals and decreasing on gold and silver. During the past year, analytical work on chromite, manganese ore, quick-silver ore, copper, lead, and zinc ores, has been greater relatively than ever before.

In 1942, the State Assay Laboratory at Baker was appointed sampling and assaying representative of the Metals Reserve Company to handle shipments of chromite consigned to Metals Reserve Company at Baker.

The number of samples which any citizen of Oregon or group of citizens may submit is limited to two in any thirty day period. No samples are accepted from engineers engaged in evaluation work or from mine operators who are milling or shipping ore, or are employers of labor. In these respects, the State Laboratories are not in competition with custom laboratories.

During the 18 month period covered by this report the laboratories made 6,692 quantitative determinations, and 1,550 qualitative determinations. In addition they gave information to 7,197 callers, and wrote 4,879 letters in reply to inquiries.

### Field Geologists

At each laboratory, headquarters are maintained for a mining or field geologist. These men spend most of their time in the field. They visit mining properties in order to give advice on basic geological and engineering problems, to obtain data on production and other information for the Department's mining catalog, to take ore samples in connection with special mining studies and to make geologic surveys for the Department. No surveys for the purpose of evaluation are made by departmental personnel, nor are investigations undertaken which compete with private consultants.

The services of the field geologists are in constant demand. During this biennial period they made 326 inspections of mining properties, including some repeat visits made in the study of special problems or in checking on production.

## OREGON GEOLOGICAL SURVEY (1941)

Field mapping of the Oregon Geological Survey in 1941 included two main areas, namely, the Mollala quadrangle in Clackamas County and the St. Helens quadrangle in Columbia County. Dr. W. D. Wilkinson of Oregon State College was in charge of the field parties and mapping; John Eliot Allen, chief geologist of the Department, acted as advisor and investigated some of the economic phases of both areas. He also mapped a corner of the St. Helens quadrangle.

The Mollala work was done in large part because of the presence in the district of high alumina clays, coal, and limestone; the work in Columbia County was done on account of the presence of deposits of iron ore (limonite). In both cases the work of the Oregon Survey was of considerable value to the U. S. Bureau of Mines and U. S. Geological Survey. These agencies have had parties in both of these areas for several months in 1942 and substantial programs of drilling and exploration were carried out in each of the two localities by the U. S. Bureau of Mines.

Other field work of the state survey included the Ironside Mountain quadrangle, located in eastern Oregon, southwest of Baker. This was selected for mapping because it contains some mineral deposits about which little was known, and also because the work would supply desired stratigraphic evidence. Mapping of the north half of this thirty minute quadrangle was carried out by Wallace Lowry, junior geologist of the Department, as a doctorate thesis problem under supervision of the Departmental staff. A geologic map and report on the geology will be published during the coming biennium.

A study of the paragenesis of the southwestern Oregon gold ores was carried out by Wayne A. Lowell, formerly junior geologist with the Department. This study was made the subject of a doctorate thesis by Mr. Lowell. By furnishing advice, some funds, and a substantial amount of spectrographic laboratory assistance, the Department cooperated in this study, which is a contribution to the geology of southwestern Oregon.

During the spring of 1942 the Governing Board decided that the formal state geological survey work which consists of field mapping of quadrangle areas should be discontinued for the period of the war emergency. In its place individual mapping projects or investigations of war mineral occurrences were substituted. Colored geologic quadrangle maps, the field work for which was completed in the current biennium, will be published during the new biennium so far as funds will permit.

## MINES INSPECTION SERVICE

Next to the dissemination of mining and mineral information by the Department, its most important duty is the inspection of mining properties throughout the State.

During the biennium just passed the number of requests by mine operators and claim owners for inspection of their properties by members of the technical staff of the Department has increased. By far the largest number of such requests comes from small operators or prospectors who desire advice on geology and methods of prospecting. Not infrequently mine operators with considerable experience but who have come into Oregon from other states, seek the advice of staff members who may be familiar with the general geological conditions of mineralization, or past history of mining in the district in question.

The Department declines to carry out geological or engineering studies of substantial size on individual properties, feeling that that is the province of the private consulting engineer. However, it does undertake to map or investigate mining districts at the request of a group of operators having somewhat similar problems.

The Department also visits and inspects the larger mining properties in the State in order to become conversant with particular mining and geological problems and to discuss them with the operators themselves.

Departmental field men also compare notes with, and sometimes make suggestions to, operators whom they visit on the occasion of these mine inspections. The field men also make reports on the properties for use by the Department in compiling the mines catalogue of the State. The catalogue is of very wide use not only to mine operators but also to engineers and other mining people seeking information on individual properties or mining districts.

Following the declaration of war and the uptrend in demand for strategic minerals, the inspection of such properties as those containing chrome, manganese, quicksilver, and tungsten took precedence, and the inspection of gold properties both quartz and placer was virtually discontinued.

An important result of the mines inspection service is the intimate knowledge of the mineral resources of the State gained by members of the Department staff. This knowledge has been especially effective in cooperation with both Federal and private agencies engaged in procurement and mining of war minerals.

During the biennial period covered by this report, staff members from the Portland office made over 150 inspections. The number made by field men stationed at Baker and Grants Pass is given under the heading of State Assay Laboratories.

## TECHNICAL STUDIES AND PUBLICATIONS

The results of departmental technical studies and investigations are usually published in the form of bulletins, maps, or G.M.I. Short Papers. These reports are in demand not only by Oregon citizens and institutions, but also by various individuals, groups and agencies outside the State.

During the first two biennia, twenty bulletins, three maps, and four G.M.I. Short Papers were issued as listed below:

### Bulletins

1. Mining Laws of Oregon, 1937. (Three printings and revision, 1941)
2. Progress Report on Coos Bay Coal Field, 1938: F. W. Libbey. (Two printings)
3. Geology of Part of the Wallowa Mountains, 1938: C. P. Ross.
4. Quicksilver in Oregon, 1938: H. C. Schuette.
5. Geological Report on Part of the Clarno Basin, 1938: Donald K. Mackay (Two printings, now out of print).
6. Preliminary Report on Some of the Refractory Clays of Western Oregon, 1938: Hewitt Wilson and Ray C. Treasurer.
7. The Gem Minerals of Oregon, 1938: H. C. Dake.
8. The Feasibility of a Steel Plant in the Lower Columbia River Area near Portland, Oregon, 1938: R. A. Miller. (Two printings and revision, 1940)
9. Chromite Deposits in Oregon, 1938: John Eliot Allen. (Three printings)
10. Placer Mining on the Rogue River, Oregon, in Relation to Fish and Fishing in that Stream, 1938: Henry Baldwin Ward.
11. Geology and Mineral Resources of Lane County, Oregon, 1938: Warren D. Smith.
13. First Biennial Report of the Department, 1937-1938 (out of print).
14. Oregon Metal Mines Handbook: by the staff
  - A: Baker, Union & Wallowa Counties, 1939.
  - C: Vol. I, Coos, Curry, Douglas Counties, 1940.
15. Geology of Salem Hills and North Santiam River Basin, Oregon, 1939: Thomas P. Thayer.
16. Field Identification of Minerals for Oregon Prospectors and Collectors, 1940: compiled by Ray C. Treasurer. (Two printings and revised edition, 1941)
18. First Aid to Fossils, or What to Do Before the Paleontologist Comes, 1939: J. E. Allen (Three printings).
19. Breeding of Farmland in Oregon, 1939: F. W. Libbey.
20. Analyses & Other Properties of Oregon Coals, 1940: H. F. Yancey and M. R. Geer.
21. 2nd Biennial Report of the Department, 1939-1940.

### G.M.I. Short Papers

1. Preliminary Report upon Oregon Saline Lakes, 1939: O. F. Stafford.
2. Industrial Aluminum: A Brief Survey, 1940: Leslie L. Motz.
3. Advance Report on Some Quicksilver Prospects in Butte Falls quadrangle, Oregon, 1940: W. D. Wilkinson.
4. Plotation of Oregon Limestone, 1940: J. B. Clemmer and B. H. Clemmons.

### Geologic Map Series

- Lake
- Geologic Map of the Wallowa/quadrangle, 1938: W. D. Smith & others (also in Bull. 12).
- Geologic Map of Medford quadrangle, 1939: F. G. Wells & others.
- Geologic Map and Geology of Round Mountain quadrangle, 1940: W. D. Wilkinson & others.

During the biennial period Jan. 1, 1941, to June 30, 1942, five bulletins (including revised editions of Nos. 1, 8 & 16) four maps and four G.M.I. Short Papers were published, as well as the monthly "Cre.-Bin". These publications are described in detail in the following pages.



Bulletin No. 1  
(Revised 1942)

"Mining Laws of the State of Oregon", compiled and arranged by the State Department of Geology and Mineral Industries, together with reprint of Federal placer mining laws and regulations from U. S. Bureau of Mines Technical Paper No. 591, 1942. 28 pages.

Purpose: This bulletin was compiled in order to provide the general public with Oregon mining laws brought up-to-date, as well as to give information on placer mining regulations most of which are not specifically covered by State laws.

Nature of the Report: Chapter 179, Oregon Laws, 1937, which created the State Department of Geology and Mineral Industries, is given. Chapter on laws pertaining to location of mining claims, regulation of mining, gas and oil wells, liens on mines, regulations concerning minerals on State lands, and various miscellaneous provisions are included. Because of the many inquiries made of the Department for information concerning placer mining regulations and because the State laws governing procedure for locating and recording of mining claims are specific only for lode claims, a chapter was added to include Federal placer mining regulations as given in U. S. Bureau of Mines Technical Paper 591.

Result: Copies of the laws applying to Oregon mines are now available in a form that is convenient and the prospector or small operator is able to get a reasonable idea of the statutes which govern his activities. Sale of this bulletin is regular and consistent. The revised edition of this bulletin, numbering 1500 copies, was prepared by the State Printer. The total cost of issuing of revised edition was \$186.65. The bulletins sell at 20¢ each (postpaid).

Bulletin No. 12

"The Geology and Physiography of the Northern Wallowa Mountains", by Warren D. Smith, John Eliot Allen, and others. 64 pp., 12 pl., 5 figs., 1 map, 1941.

Purpose: This report is a geological study of a part of the state that is of considerable importance in the stratigraphy of Oregon. The area covered includes a number of occurrences of strategic minerals, and some of the largest limestone deposits in the west. It is also one of the most scenic spots in Oregon.

Nature of Study and Report: The report contains results of studies of the stratigraphy, areal geology, petrology, structure, paleontology, and physiography of the Wallowa Mountains in the Wallowa Lake quadrangle. Ore deposits are listed and the more important occurrences are described and mapped. Fossil check lists, structural cross-sections, and stratigraphic charts accompany the bulletin.

Results: It was found that unlike the southern portion of the Wallowa Range, the northern portion contains large areas of granodiorite that are practically barren of mineralization and that only in certain contact zones between the granite and limestone are there possible ore localities. At least 90% of the entire mountain area is eliminated from immediate consideration as prospecting ground. One of the most complete Oregon Mesozoic fossil collections ever obtained has been classified, giving a list of types.

Cost: The cost of publication of 775 copies of the report and the new map was \$540.67.

Bulletin No. 14

"Oregon Metal Mines Handbook" by Departmental staff.

14-B Grant, Morrow, and Umatilla Counties. 157 pp., index, areal map, 1941.

Purpose: This bulletin is designed to supply the need for up-to-date information concerning mining properties of the State. The last Oregon Mines catalogue was published in 1916. Since then much exploration work has been done and many mining properties opened up. The preparation of the mines catalogue is one of the requirements of the act creating the Department. Bulletin No. 14-A, Baker, Union, and Wallowa Counties, was published in 1939. Bulletin 14-C, Vol. I, Coos, Curry and Douglas Counties was issued in 1940. Bulletin No. 14-C, Vol. II, Sec. 1, Josephine County, was prepared during the third biennium but was not published until November, 1942. Bulletin No. 14-C, Vol. II, Sec. 2, Jackson County, is complete in manuscript and will be published early in 1943.

Nature of the Study and Report: The gathering and compiling of information contained in this bulletin is a continuing project and one that occupies a large part of the field man's time. Field reports are submitted to the Portland office for checking and compilation. In cases of properties about which information is lacking, such descriptions as are available in published reports are used.

The catalogue is being issued in several volumes corresponding to arbitrary divisions within the State.

In respect to individual mines, their location, area, ownership, general geology, and miscellaneous information are given as fully as possible. An index of mining properties is included.

Results: There is a constant demand for the bulletin.

Cost: Bulletin 14-B cost \$509.30 for 763 copies. Sale price for each is 50 cents.

Bulletin No. 16

"Field Identification of Minerals for the Oregon Prospector", compiled by Ray C. Treasher and staff, Revised edition, 1941. 128 pp., 17 figs., tables.

Purpose: This bulletin is intended to provide Oregon prospectors with information on the identification of minerals using only tests that can be applied in the field. It is primarily for the man who is untrained technically.

Nature of the Study and Report: Information is given explaining the various mineral tests and suggestions are made concerning selection of field equipment. Included are discussions of the need and use of such tools as the hand lens, hammer, streak plate, magnet, etc. The various minerals that the prospector is likely to find are described in non-technical language. Summary tables are given to aid the prospector in rapidly determining his mineral. A glossary of all necessary technical terms is added.

The bulletin does not pretend to be an original study. The data have been taken from various textbooks and condensed and clarified for the use of the layman.

Results: The demand for this bulletin was so great that the first edition of 800 copies was soon exhausted, and a second revised edition of 1000 copies was published early in 1941. This second edition was edited by Dr. Lloyd W. Staples, and various revisions in the text were made. The Department's belief that this publication would be helpful to Oregon prospectors and other interested persons seems to be well justified.

Cost: The cost of the first edition was \$498.25, of the second edition \$371.23. The sale price is 50 cents.

Bulletin No. 17

"Manganese in Oregon", by F. W. Libbey, J. E. Allen, R. C. Treasher, and H. K. Lancaster. 76 pp., 3 plates, 1942.

Purpose: The bulletin was prepared in order to make available up-to-date information concerning Oregon manganese deposits. Long before the United States entered the war it was plainly evident that a complete inventory of domestic sources of manganese was a necessity. The Department timed the study so that its records would be as complete and up-to-date as possible when the need for them arose.

Nature of the Study and Report: More than eighty manganese occurrences in the state were investigated. Relatively little in the way of development has been done on these deposits, both because, for the most part, they are low grade, and also because in normal times, the price offers no incentive to prospect for and explore manganese deposits. Therefore it was not possible to make estimates of tonnage. However, from geologic and petrologic evidence it was possible to determine to a large degree, those deposits which have little or no chance of being commercial.

Sampling and assay results are given as fully as possible. The bulletin contains index maps showing location of deposits.

Results: There has been a consistent demand for this report both from within and outside the state.

Cost: Seven hundred fifty copies of the bulletin were multigraphed at a cost of \$272.71.

G. M. I. SHORT PAPERS

The G. M. I. (Geology and Mineral Industries) Short Papers make up a series of short, informational reports that warrant publication but are of insufficient scope to justify issuance as a bulletin.

So far eight of these papers have been issued, the last four of which came out in the current biennium. Their titles are as follows:

- No. 5, "Survey of Non-Metallic Mineral Production of Oregon for 1940"
- No. 6, "Pumice and Pumicite"
- No. 7, "Geologic History of the Portland Area"
- No. 8, "Strategic and Critical Minerals, A Guide for Oregon Prospectors"

G.M.I. Short Paper No. 5 reported the results of the Department's canvass of non-metallic mineral production carried out by an outside consultant. Mr. C. F. Holdredge was employed to make the survey and visited almost every part of the State. He made general observations and also obtained facts and figures on non-metallic production trends. It had been found that such a statistical survey cannot be made satisfactorily by correspondence alone. Evidence of this is that figures on production gathered by the national agencies were found to be incomplete. According to the Department survey, the total Oregon production of non-metallic minerals for 1940 amounted to \$5,752,000.

G.M.I. Short Paper No. 6 was written as a result of increasing interest in the production of pumice and pumicite. Demand for a high grade domestic product stepped up sharply as a result of stoppage of supplies from Italy. The paper was intended to satisfy numerous demands for information on these two products.

G.M.I. Short paper No. 7 is a nontechnical description and explanation of the geology of the Portland area written to accompany the colored geologic map of that area. Mr. Ray C. Treasher, field geologist, prepared both the map and report.

G.M.I. Short Paper No. 8 was prepared to supply useful information on minerals and metals especially needed in the war program. The author, Dr. Lloyd M. Staples, assistant professor of geology at the University of Oregon, has had a wide experience in examining Oregon mineral deposits. The paper describes localities, typical characteristics, occurrences, uses and markets of all the so-called strategic minerals.

#### ORE.-BIN

This small periodical by the staff is multigraphed in the office of the Department and issued monthly. It is designed to give in condensed form up-to-date information on mineral industry matters, and Departmental notes including notices of publication. During the last year it has served also to keep the mining industry informed as to new governmental regulations of the Metals Reserve, the W.P.B., and other Federal agencies. Also a "clearing house" column is included which lists buyers and sellers of mining property, mineral products, and mining equipment. It is understood that this column is maintained as a service to buyers and sellers by giving publicity to the applications which come to the Department, and that this publicity carries no Department guarantee of accuracy of statements submitted by the applicants.

The Ore.-Bin replaced the Press Bulletin which was issued monthly in 1938. The first issue of the Ore.-Bin was January 1939. No charge was made, and early in 1940 the circulation reached over 600 copies monthly, so that the expense of multigraphing and mailing became burdensome. It was then decided that a charge of 25 cents yearly would have to be made to the public beginning July 1, 1940.

At present, there are 125 paid subscribers, and about 340 free copies are sent to State legislators, members of Congress from Oregon, State libraries, certain Oregon newspapers, State schools of higher education, besides those on the exchange list.

Each month, items or entire articles originating in the Ore.-Bin appear in newspapers and mining journals, some with national circulation. Thus, the Ore.-Bin serves not only for dissemination of Departmental information, but as an excellent vehicle for modest Departmental publicity.

#### STATE GEOLOGIC MAP SERIES

The Oregon Geological Survey in mapping various areas of the State with a view toward eventual completion of the State Geological Map, has adopted the policy of publishing the results of field mapping in the form of 30-minute quadrangles covering about 875 square miles each, on the scale of 1:96,000 or about 3/4 of an inch to the mile. Usually a text descriptive of the geology of the quadrangle is printed on the back of the sheet. During the first two biennial periods, field work was completed on a number of these areas and the first two of the series were issued as the Wallowa Lake preliminary and the Round Mountain quadrangles. During the third biennial period, field work has progressed and has been completed on ten areas, and five quadrangles have been published.

Summarized below are geologic maps published during the third biennial period by the Department, and those unpublished but on which field work has been completed:

<u>Quadrangles published</u>	<u>Not published, field work done</u>	<u>(Approx. area)</u>
No. 1 Wallowa Lake (new issue)	St. Helens	219 sq. miles
No. 4 Butte Falls	Molalla	219 sq. miles
No. 5 Grants Pass	Lebanon, Salem, Corvallis, Albany	875 sq. miles
No. 6 Sumpter quadrangle	Ironside Mountain	438 sq. miles
No. 7 Portland area	Kerby	875 sq. miles
	Hampton and Brothers	875 sq. miles

## STATE GEOLOGIC MAP SERIES (continued)

The maps listed on the previous page have been or are to be published by the Department; the actual field work has been done by members of the Department, by members of the staff of geology of Oregon State College and the University of Oregon, by the U. S. Geological Survey, or by students working for advanced degrees in the graduate schools of various universities. The Department is encouraging geologic mapping in Oregon by any qualified organization or individual. Such encouragement has consisted of some financial assistance for the field work and an agreement to publish. The Department is publishing the maps as quickly as possible after completion of field work.

It will be years before the geological map of the entire State is completed. The work must be delayed necessarily because only about half of the State has been covered by topographic surveys. The latter must precede and serve as a base for geologic mapping. Generally speaking, geologic surveying is seriously handicapped in areas not covered by topographic maps. The quadrangles published in the present biennial period are described as follows:

### No. 4 Butte Falls Quadrangle

During the field season of 1940, department geologists under the supervision of Dr. W. D. Wilkinson of Oregon State College, mapped the 30-minute Butte Falls quadrangle which lies just north of the Medford quadrangle in southwestern Oregon. This work was done in cooperation with the Summer Geology Field Camp of Oregon State College. The geologic map was issued by the Department in 1941 and a complete bulletin covering the geology of the area will be published early in 1943.

In deference to the deposits of economic interest in the area, its coverage by the Geological Survey was undertaken without the benefit of a topographic map base. The area includes the Evans Creek or Meadows, and the Tiller-Trail quicksilver districts, with some twenty mines and prospects.

### No. 5 Grants Pass Quadrangle

This is the second of a group of geologic maps published by the Department in cooperation with the U. S. Geological Survey, the field work being done by geologists of the Survey under the direction of Francis G. Wells. The Medford quadrangle was the first, published in 1939, and the Kerby quadrangle will be the third, as yet to be published. Field work was done in 1938 and 1939 and the map was issued in 1940.

The map is in full color, about 17 by 23 inches in size, and together with the explanation of rock types in the geologic column, gives a list of some 134 mines or prospects with their location. On the back of the map is printed a condensed description of the geologic formations in the area. This method of presenting a geologic map with a digest of descriptive technical facts on the back is of much practical advantage to the prospector and engineer.

### No. 6 Sumpter Quadrangle

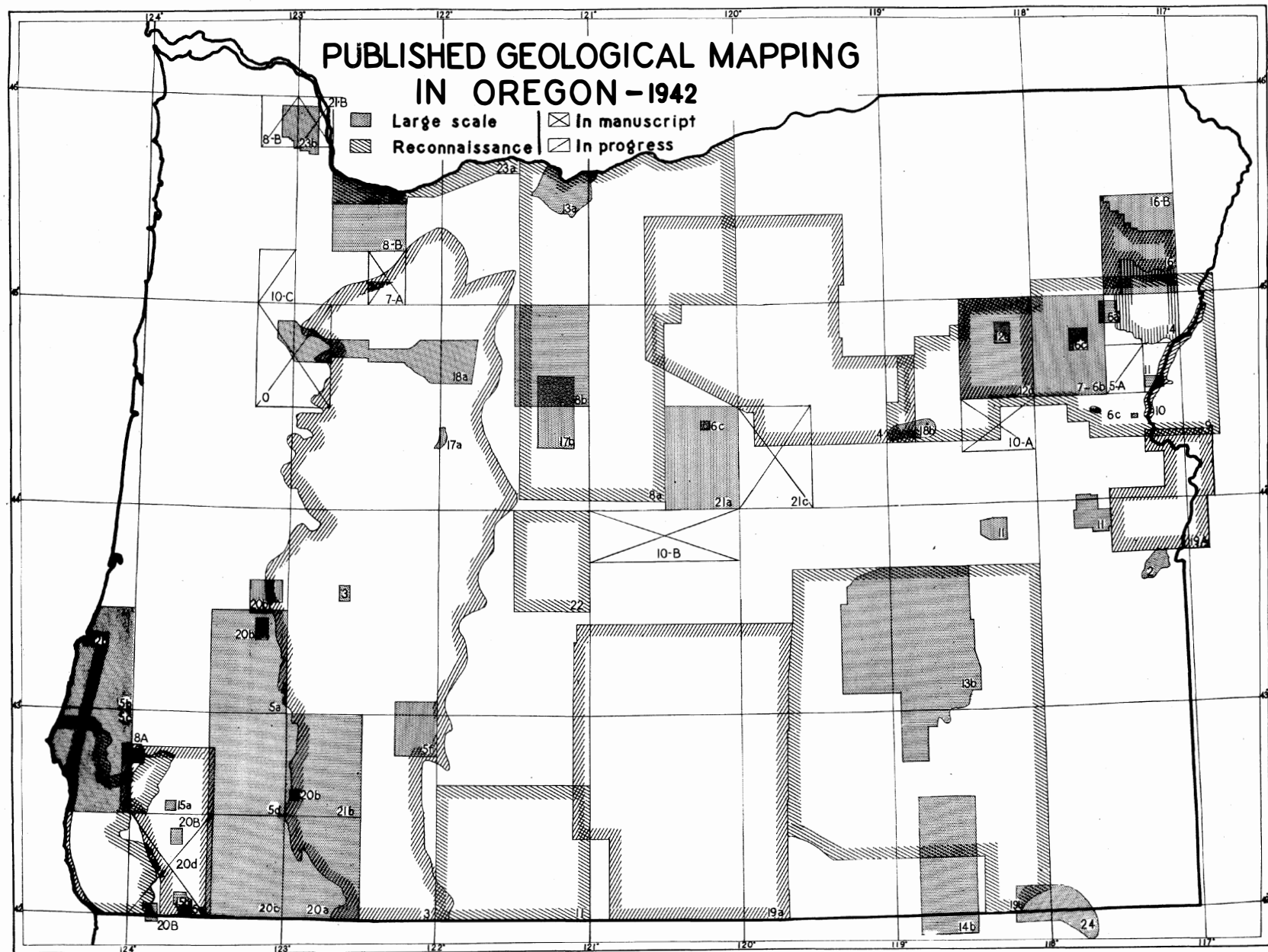
The field work for the Sumpter geologic map was done by J. T. Pardee and D. F. Hewett of the U. S. Geological Survey. Due to the importance of this area as a mining district which has contributed a large portion of the State's mineral production in the past, the Department asked the survey to release this work for publication. This was done in 1941. The map is about 17 by 23 inches in size and is printed in full color. The various major mineralized veins of the district are plotted and a condensed description of the geologic formations is given on the back. Some 33 mines are listed in the area.

### No. 7 Portland area

The Portland area includes all of two 30-minute quadrangles (Oregon City and Boring), and the portions lying south of the Columbia River of two others (Portland and Troutdale). Due to the unusual geologic features lying within this area and the large number of people living in it who might be interested in these features, Mr. Ray C. Treasher, Department geologist, began a survey in 1937 which was continued at intervals up to the time the map was published in 1942. Scale is 1:96,000; size about 17 to 23 inches.

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Page 21 contains an index map of Oregon showing areas mapped geologically by all agencies, as well as those where mapping is in progress. An explanatory bibliography is given on page 22.



# GEOLOGIC MAPPING IN OREGON

1942

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Compiled by John Eliot Allen, Chief Geologist,  
Oregon State Department of Geology and  
Mineral Industries

## ADDITIONAL TECHNICAL STUDIES MADE

### Summary Report on Iron Ores of Columbia County, Oregon

In order that the U.S. Bureau of Mines and private agencies interested in the development of the Scappoose Iron Ores of Columbia County might have all possible information concerning these deposits, Department engineers made a summary of some fifteen different reports that had been made in the past. These were analyzed, tabulated, and an index map made of the area. Visits were made by Departmental engineers to nearly all the localities listed in order to check exact locations. Tonnages, amount of development, overburden, thickness of the ore bed, and grade of ore with analyses, were listed for some nineteen properties. The demand for this typescript was considerable and nearly 30 copies were distributed to interested persons.

### Zinc Reserves in Oregon

A reconnaissance of a possible reserve of zinc ores in Oregon was made with the object in view of determining whether sufficient amounts existed to justify establishing an electrolytic zinc smelter in the Portland area.

Eleven mines in the Bohemia District, seven mines in the north Santiam District, and the Silver Peak Mines near Riddle were examined, many of them being mapped for the first time. Although the amount of development in most of these mines and prospects was small, a total of over 300,000 tons of zinc ore of commercial grade, and the possibilities of many times this amount appeared to be present. This information was compiled in typescript and supplied to interested persons.

### Reconnaissance Geology of the Table Mountain Intrusive, Lincoln County, Oregon

The ore of aluminum, bauxite, is usually derived by weathering from the rock, nepheline syenite. Nepheline is also used in glass manufacture and in general ceramic use. Table Mountain was reported to be composed of this rock and a short reconnaissance survey of the area was made by two Departmental geologists. It was found that weathering had been insufficient to form bauxite and that the nepheline was in insufficient amounts to be of value.

### Oil Surveys in Oregon

From time to time parties or concerns apply to the State Corporation Commissioner for permission to sell oil stock to finance drilling programs in the State. As a cooperative agreement between the Commissioner and this Department, engineers from the Department visited the areas in which the drilling was to be done and reported upon possibility of finding oil. Three surveys were made during this biennial period in the Lebanon, Hillsboro and Grand Ronde areas of the Willamette Valley.

### Snake River Canyon Survey

Engineers of the Department visited very inaccessible copper prospects within the Snake River Canyon near the mouth of the Imnaha River, spending over a week on the examination of possible reserves of copper ore on the Oregon side of the Snake. This examination involved one visit by way of the Snake River Mail-boat from Lewiston and another visit by trail on horseback from Enterprise, Oregon.

### Snake River Gold Bars

A reconnaissance survey and map of the high gold-bearing gravel terraces along the Snake River between Connor Creek and Robinette was completed during this biennial period. The extent of the gravels, elevations, thickness, and degree of past mining were outlined and discussed. The report will not be issued until after the war emergency.



### Titaniferous Black Sand Near the Mouth of the Columbia River

Two geologists of the Department mapped and prospected by means of auger holes, the extent and thickness of a lens of black sand containing magnetite and ilmenite which lies just north of the town of Hammond and east of the Fort Stevens Military Reservation. This lens was sampled and a number of analyses made with a view toward its possible utilization as a source of iron and titanium.

### Progress of Oregon Chromite Mining

During the biennial period, engineers and geologists of the Department repeatedly visited and reported upon chromite mines in the State which were being developed or were in active operation. Assistance was given the miners in helping them solve their problems of financing, access roads, priorities, and general operation.

### Pigments for Camouflage

With a view toward a possible increased need for cheap granular pigment materials to be used for camouflage, the Department made a survey of possible sources of these materials within the State and submitted typescript reports to the proper Federal Agencies.

### Fauna of the Ironside Mountain Quadrangle

The discovery of a number of large fossil types during the mapping of the Ironside Mountain quadrangle led to the study of these types by Departmental paleontologists. Some of the fossil bones found represented a camel, rhinoceros, mastodon, ground sloth and a very large elephant type. Careful study and descriptions of the fossils permitted the enclosing rocks to be assigned their proper position in the stratigraphic column.

### Ultraviolet Lamp Technique

The Department built two inexpensive ultraviolet lamps and with them has been developing the new technique for mineral determination whereby uranium, zircon, mercury, tungsten, molybdenum in tungsten and other qualitative and quantitative determinations of minerals and mineral content may be made.

## ACTIVITIES DIRECTED TOWARDS OBTAINING NEW OREGON INDUSTRIES

One effect of the war has been on the location of new essential industries in the Pacific Northwest. For five years the Department has been encouraging the establishment of metallurgical and chemical industries on the Lower Columbia, where the economic advantages of deep water transportation, low-cost electric power, and center of population are obvious. However, the Federal authorities for military reasons, have encouraged the location of essential new industrial plants well inland and the question of basic economics involved has necessarily been subdued. Where the raw materials themselves are near the coast, as in the case of the coal and chromite in the Coos Bay area, this trend is not effective. This trend, then, has had some bearing on the Department's efforts of encouraging new industries on the Lower Columbia. Practically all the Department's efforts to promote the State's new non-metallic industries have been deferred until after the war.

A few of the efforts of the Department to obtain new industries nevertheless are noted below:

Electrolytic Zinc Smelter: Figures on tonnage reserves were assembled and an attempt was made without success to secure government permission and financial assistance in the location and construction of an electrolytic zinc plant in the Pacific Northwest, preferably in the lower Columbia River area. Although it is believed that good evidence was presented to the War Production Board showing adequate zinc ore reserves in Oregon and Washington, the zinc branch would not admit the validity of statements. These were presented as cooperative efforts of owners of active zinc mines, the Bonneville Administration, and the Department.

Chromite Sand Concentration Plants: The Department has assisted actively in encouraging establishment of plants for the separation of chromite from the coastal "black sands". Such assistance has included furnishing information, and taking part in conferences concerned with feasibility and methods of procedure in dealing with Federal agencies. It is probable that at least two and possible four plants will soon be producing primary chromite concentrates, to be further refined to a commercial grade by a plant now under construction with Defense Plant Corporation funds. Both plants now under construction are in the Coquille-Marshfield area.

Stainless Steel Plant: A Columbia River location for a stainless steel plant has been under consideration by a large eastern corporation for a number of years. The Department has, at various times, supplied this corporation with information on availability of raw materials required by such a plant. In so far as the Department is informed no definite decision has yet been reached by the subject corporation.

Sponge Iron Plant: The Department has cooperated in attempts to establish a sponge iron furnace plant in the Lower Columbia River area. A pilot plant has been erected at Cascade Locks where experimental work is now being done, using both Oregon and Washington iron ores.

#### STRATEGIC MINERAL INVESTIGATIONS

Since Dec. 7, 1941, all efforts of the Department have been devoted to encouraging the production of war minerals. Oregon has important deposits of certain of these minerals, notably chromite, quicksilver, and nickel; and these have been given particular attention. Deposits of other strategic minerals including those of tungsten, antimony, tin, manganese, and zinc have been investigated and the Department has endeavored to inventory all known occurrences of strategic minerals in the State.

A brief description of departmental activities in relation to the more important of the State's war mineral resources follows:

Chromite: The so-called "black sands" of the Oregon coastal region sometimes contain interesting amounts of chromite. The Department pioneered in studying the commercial possibilities of these deposits. A very brief chronological summary of these studies is given below:

- 1938 - Sampling of beach deposits of "black sand" along the entire Oregon coast, and analysis of samples.
- 1939 - Further sampling of old marine terrace deposits; samples sent to eastern laboratories for concentration tests with electrostatic machines; testing work in State assay laboratories using electrostatic methods of concentration.
- 1940 - Cooperative work with U. S. Geological Survey in sampling elevated marine terrace deposits and analytical work on samples.
- 1941 - The Department obtained a modest WPA grant for the purpose of exploring chromite sands, and, in cooperation with the U. S. Geological Survey and Oregon State College, did a considerable amount of drilling and testpitting in deposits north of Bandon in Coos County. Computations based on sampling results showed probable reserves of commercial sands which would produce nearly 100,000 tons of 40%  $\text{Cr}_2\text{O}_3$  concentrates.

In cooperation with the Geophysical Division of the U. S. Geological Survey the Department sponsored a magnetometer survey of the ancient marine terraces where chromite sands were known to occur. Results showed that the magnetometer in many cases could be a useful tool in outlining boundaries of deposits.

- 1942 - Results of the drilling program of 1941 have been in continual demand by governmental agencies and private groups.

The Department secured the services of Dr. W. H. Twenhofel, head of the Department of Geology of the University of Wisconsin and well-known

authority on sedimentation, to make a field study and report on the origin of the "black sands". The report will be published very early in 1943.

Assistance was given engineers of the Kaiser Company and other prominent operators in furnishing records and acting as guide in their investigation of Oregon chromite resources. This service, of course, included deposits of hard rock chromite.

As with chromite in "black sands" the Department anticipated the demand for a complete inventory of hard rock chromite resources, and, in 1938, published Bulletin No. 9, Chromite in Oregon. The Director and staff have kept in close touch with the developments relating to prospecting, mining and marketing of chrome in the State. The Director was instrumental in securing establishment of Metals Reserve Company purchasing depots where small lots of chromite could be sold to the Government.

Nickel: Early in 1941 engineers of the Freeport Sulphur Company were advised by the Department to investigate the nickel deposit on Nickel Mountain near Riddle. Resulting examination led to a large scale exploration program, which may result in commercial production of this important war metal.

Quicksilver: During the summer of 1941 the Department, in cooperation with the Geophysical Division of the U. S. Geological Survey, made magnetometer surveys of three quicksilver deposits in central Oregon. These studies resulted in proving that the main fractures and faults in which the minable deposits lie can be outlined in advance of mining by these methods. The discovery of this useful application of geophysics in prospecting for quicksilver deposits may be of wide application and could probably be used to advantage in other quicksilver areas in the state.

In addition to the cooperative work described, members of the staff have investigated many quicksilver prospects brought to the department's attention.

The Director has given assistance in interpretation of production policies of the War Production Board to various quicksilver producers and at the suggestion of WPB has given new operators some help with problems of government financing.

Manganese: A report on manganese deposits of the State was published by the Department in 1942 and surveys and detailed reports of two local areas were made. There has been a small commercial production, but, in general, Oregon manganese deposits are not commercial without beneficiation. But few deposits are known that have tonnage to warrant beneficiation plants.

Antimony: Although known deposits of antimony in the State appear to be small, all reported occurrences have been examined by the Department. Ore in small amounts has been shipped from two of these deposits in recent months.

Zinc: The Department made a preliminary study including some field work of zinc reserves in Oregon. Additional figures were gathered on zinc reserves in other northwest states which might be available to an electrolytic zinc smelter proposed for a Columbia River location.

Tin: An exhaustive investigation of the reported occurrence of tin at Juniper Ridge, near Burns, Harney County, was made during parts of 1941 and 1942. Field studies were carried out, but the principal work of the investigation was in making analyses, both chemical and spectrographic, of samples of Juniper Ridge rock. Only microscopic amounts of tin were found in the rock. A bulletin describing in detail all of the testing work was issued by the Department late in 1942.

High Alumina Clays: Light metals are among the most critical of the war metals, and potential sources of supply of aluminum in high alumina clays in Oregon are being intensively investigated by the U. S. Bureau of Mines and U. S. Geological Survey. Previous work in clay investigations by the Department has been of considerable assistance to these Federal agencies. The Department's report on refractory clays of western Oregon made in 1938 and investigations connected with the State geological survey of the Molalla quadrangle in 1941 saved the Federal

technicians a large amount of work particularly in their preliminary investigations.

Iron: Steel supplies are critical because of the huge war demands. Iron ore supplies are not critical except in so far as their location might be strategic with relation to new iron and steel plant capacity. The Department has at various times investigated the iron ore deposits of Columbia County and in 1941 the State geological survey mapped the St. Helens quadrangle which contains most of the Columbia County deposits. The Department was instrumental in getting an investigation of these deposits made by the U. S. Bureau of Mines. During 1941-1942 this survey included an extensive drilling program. Results of the Bureau's work have not yet been made available.

Coal: Shortage of fuel supplies in the northwest make it essential that all available sources be put to use. The Department has been concerned, over a long period, with getting new operations started in the Coos Bay coal field so that this important resource would be a source of income to Coos County. To this end Bulletins Nos. 2 and 20 were published. More recently the Department was more concerned in obtaining production from the field because of the need for fuel at Oregon Army cantonments. On several occasions in the past the Department has urged the Bureau of Mines to make an economic survey of the Coos Bay Field. This was done during the summer of 1942 by Mr. Geo. Watkin Evans, a private consultant, engaged by the Bureau for the purpose of making the survey. He collaborated with Dr. H. F. Yancey and Mr. M. R. Geer, U. S. Bureau of Mines engineers, and authors of Department Bulletin No. 20. Stimulated by the survey and by the need for fuel supplies, a substantial new coal mining operation has been started near Marshfield.

#### COOPERATION WITH STATE AND FEDERAL AGENCIES

##### With the United States Geological Survey

A colored geologic map of the Grants Pass quadrangle was published by the Department under a cooperative arrangement with the Survey whose geologists did the field work during the summer of 1940 and 1941.

Field work in the Kerby quadrangle, west of Grants Pass, was done under the same cooperative arrangement, and publication of the map in the future by the Department awaits only some final details of work in the field.

The Department published a colored geologic map of the Sumpter quadrangle under its standing arrangement with the Federal Survey. Field work was done by the Survey geologists over a period of years and map data was compiled and assembled by the Survey.

Magnetometer surveys of certain quicksilver properties in central Oregon and of some of the black sand chromite lenses along the southern Oregon coast were made by the Geophysical Division of the U. S. Geological Survey under a formal cooperative arrangement with the Department. The work was definitely constructive and results in both cases showed the justification for additional exploration and mining development.

##### With the United States Bureau of Mines

Although there has been no recent formal cooperative arrangement between the Bureau and the Department, engineers of the two groups have made field trips together and exchanged information regularly on a mutually cooperative basis. The work of the Department has been of considerable use to the Bureau in some of its exploration jobs. For example, the Department's geologic mapping of the St. Helens quadrangle and the Department's loan of certain facilities were of some advantage to the Bureau; also work formerly done by the Department on clays in western Oregon supplied important advance information for the Bureau's investigations that led to the recent drilling in the Molalla district.

#### With the Federal Grazing Service

During 1942 the Grazing Service was asked by the Department of the Interior authorities to compile a list of mineral deposits in eastern Oregon. The Department assisted in the compilation, visited a number of properties, made available its reports, and made a number of analyses of samples in connection with this survey.

#### With the War Production Board

Principally because of frequent calls for mineral information from the Department by members of the various sections of the War Production Board, the Director of the Department was requested in February, 1942, to become a Technical Consultant for the Materials Division of the War Production Board and to devote up to half-time on various W.P.B. activities. As a result, the Department naturally has been in very close touch with War Production Board efforts to increase production of various strategic ores. Much time has been allotted to the investigation of access road projects to strategic mineral properties on behalf of W.P.B.

Even more time has been contributed by the Department to the job of assisting Oregon mine operators and sand and gravel producers with their priorities problems. This came about as a result of the Director of the Department being appointed State Emergency Coordinator of Mines.

#### With Metals Reserve Company

The Director of the Department fathered the idea of the Federal Government buying chromite in small lots at purchasing depots located in the producing areas. The result was the establishment by the Metals Reserve Company of three such purchase depots in Oregon and one at Yreka, California, in the first half of 1942. Since that time, other depots have been established in various parts of the United States. The Director became a Consultant also of the Metals Reserve Company at the request of that agency principally in connection with the operation of these purchasing depots for chromite and other strategic ores.

#### With the United States Forest Service

The Department has had occasion frequently to work with engineers of the Forest Service in connection with the planning for access roads to strategic mineral deposits. This cooperation has been very helpful mutually.

#### With the United States Department of Agriculture

A three-way arrangement among Oregon Agricultural Experiment Station, the U. S. Department of Agriculture and this Department was worked out in connection with a scientific investigation of filbert and walnut culture. The work to be supplied by this Department involves study in the spectrographic laboratory of samples of the minor constituents of soils and plant material for the purpose of determining what elements may be harmful or beneficial.

#### With the State Department of Agriculture

The Department cooperates with the Division of Animal Industries in investigation by spectrographic methods of samples suspected of containing poisons.

#### With Oregon State Police, Crime Detection Laboratory

The Department offers the service of its spectrographic laboratory from time to time to the State Crime Detection authorities. Samples of various materials are analyzed spectrochemically for elements and such other evidence as they may contain.

#### With Oregon State College

Close cooperation has been maintained with some departments of Oregon State College. Dr. W. D. Wilkinson of the Department of Geology was in charge of summer field parties of the State Geological Survey for the field season of 1941, and will be principal author of two quadrangle maps together with bulletin reports to accompany them.

In connection with the investigations of utilizing the black sand chromite deposits, cooperation between Professor George W. Gleeson, of the Department of Chemical Engineering, and this Department has been close and of mutual benefit.

The Department, along with the Oregon Mining Association and the Oregon Section of the American Institute of Mining and Metallurgical Engineers, gave active support to the re-establishment of the course in mining engineering at Oregon State College, effective with the fall term of 1942. The Department is pleased to have cooperated with the College authorities in this activity and in the selection of a professor to take charge of the mining courses.

The laboratories of the Department of Chemistry were made available by Dr. E. D. Gilbert to this Department during the summer of 1941 for research in connection with reported tin occurrences in central Oregon.

Some of the equipment for the spectrographic laboratory of the Department was made in the machine shops of the College. In return, the Department has made numerous mineral and other identifications by both petrographic and spectrographic methods for members of the teaching staff of the College.

#### With University of Oregon

Dr. Warren D. Smith, head of the Department of Geology and Geography, University of Oregon, with students from the University and also from Oregon State College, worked with this Department in mapping the geology of the Wallowa Mountains. This work made up the summer field work of the Oregon Geological Survey in 1938 and 1939. In 1941 Bulletin No. 12, "Geology and Physiography of Northern Wallowa Mountains", together with color geologic map, was published by the Department. Dr. Smith was senior author of both bulletin and map.

In 1942, the Department was pleased to publish a short paper entitled "Strategic and Critical Minerals" by Lloyd W. Staples, assistant professor of geology at the University of Oregon.

#### With the State Land Board

The Department has been pleased to give advice to the State Land Board, at its request, in connection with its negotiations with private parties for the exploration and development of mineral-bearing State lands. In several cases, the Department has prepared and submitted preliminary drafts of mining contracts or has made recommendations as to terms and operating conditions to be incorporated in such contracts.

#### With State Corporation Commissioner

The State Corporation Commissioner refers to this Department those persons who make application to him for sale of securities in mining and oil in this State.

This Department, then, gives consideration to the proposals in question as to their soundness as mining or oil enterprises. In all cases, the Department demands that acceptable technical reports by accredited engineers or geologists be submitted by the group requesting stock permits. The Department encourages the employment of Oregon professional engineers and discourages the acceptance by investors of reports and data that are frequently inadequate. After forming an opinion of the soundness of the mining or oil enterprise, the Department makes a recommendation to the State Corporation Commissioner. After weighing all evidence, he decides, and either approves or denies the application.

Thus, the Commissioner has the benefit of unbiased technical advice submitted by men familiar with mining and oil matters who are also interested in guaranteeing that Oregon mining and oil enterprises shall be on a sound and business-like basis, and that investors in such stocks sold in Oregon shall have confidence in the properties under consideration.

It is believed that the Corporation Commissioner's willingness to carry out the present cooperation with this Department is an evidence of his sincere desire for sound industries in Oregon.

#### SUMMARY AND FUTURE PLANS OF THE DEPARTMENT

It is a source of satisfaction to the Department that so many of its major studies, the results of most of which were published as bulletins, were timed so that they have been available for use directly in war work. The most important of these reports are on quicksilver, chromite, refractory clays, coal, manganese, and the Metal Mines Handbook describing mines in the counties of both northeastern and southwestern Oregon. Nearly all of these studies have been used by Federal agencies as well as private operators engaged in producing war minerals. Possibly the most timely of these studies, begun soon after the Department was established, was that of the chromite sands of the southwestern Oregon coastal region. The most important war mineral in these sands is chromite, but they also contain other minerals such as zircon and platinum metals, which are needed in war work, and which may serve to provide the stimulus necessary to keep the chromite sand industry alive after the war.

The greater part of the studies outlined in previous biennial reports, as planned for the future, has been completed. As stated on earlier pages of this report the formal State Geological Survey has been postponed until after the war and has been replaced by war mineral project investigations of particular properties or districts. Certain studies of non-metallic mineral deposits have been postponed also, but, because of the demand for salines, it may be desirable and necessary in the near future, to make a study of the saline lake beds of the southcentral part of the State.

An inventory of the copper deposits of the State is overdue and should be completed as soon as possible. If thoroughly done such an investigation involves a considerable amount of work, but, because of war needs, a reconnaissance survey which would take much less time is perhaps justified.

Further work in high alumina clay studies is planned, both in reconnaissance work in the field and in laboratory studies. With the rapid growth of air transportation, both military and civil, and the probable need for northwest sources of raw material for production of metallic aluminum, certain high alumina clay deposits of large size and convenient location in relation to transportation facilities may be in especial demand.

The spectrographic laboratory, authorized by the last legislature, has been set up and equipped to do analytical work covering a wide field, and, as stated on page 11, there is a large demand for its services, both for routine analyses, and for research work on new problems. It is possible that the latter work will be the more prolific of results which will benefit the State's mineral industry, and in so far as is possible, practical problems of general benefit will be selected.

The Department has long recognized that detailed geologic mapping of certain areas in the State is necessary in order to appraise the possibilities of finding oil in Oregon. While certain reconnaissance studies made in the past do not offer much encouragement to oil exploration in the State, the Department feels that the State's prospects for finding oil should not be condemned categorically on the evidence now available. Further work along the lines of detailed mapping is planned when practicable.

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In general, then, the Department intends, for the duration of the war, to plan its activities entirely in close relation to the requirements for strategic ores and war minerals.

These requirements change somewhat as has been noted. For example the demand for chrome and manganese has lessened somewhat, and the need for copper, tungsten, and zinc has increased. It is the intention of the Department to maintain a sufficiently elastic position to be able to meet promptly any necessary changes in program.

# OREGON STATE DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES

## GEOLOGY AND MINERAL INDUSTRIES ACCOUNT (Section 7, Chapter 179, Oregon Laws, 1937)

for period January 1, 1941, to June 30, 1942.

Balance, January 1, 1941 \$ 92.98

### Receipts

Sale of departmental bulletins	\$1181.50	
State Land Board refund	24.32	
Wm. J. Becker for tin survey	100.00	
Rental of alidade	10.00	
Coos County contribution for chromite study	208.94	
J. A. Maller, refund expenses of chemist	12.85	
Refund, Board of Control, fleet contract	42.93	
State Land Board, refund expenses of Agness trip	13.17	
Sale of sundry maps, etc.,	6.40	
J. Schulein, contribution for chromite study, black sands	45.25	
" " refund for drafting paper used	.50	
Oregon Economic Council, refund for telephone and telegrams		
for Priorities Board	39.35	
U. S. Smelting Co., refund for blueprints of black sands	3.54	
Judge E. L. Peterson, Coquille "	3.32	
Mack C. Lake "	3.32	
Refunds for telephone calls	14.10	1,709.49
		1,802.47

### Expenditures

These unappropriated funds were used for departmental expenses where estimates were under or where budgeted funds were insufficient to cover G.O.M. items and Capital Outlay	1,390.74
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Balance, June 30th, 1942 \$ 411.73



OREGON STATE DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES

Expenditures, Jan. 1, 1941 to June 30th, 1942 (eighteen months)

	Jan. 1, 1941 to June 30, 1941		
<u>Salaries and Wages</u>	\$ 14,983.82		\$ 14,983.82
<u>G.O.M. Expenses</u>		G.M.I.*	
Office Rent	\$ 1,075.00	\$ 195.00	\$ 1,270.00
Office Supplies	186.80	37.54	224.34
Telephone and Telegraph	164.57	55.54	220.11
Postage and Express	349.70		349.70
Printing and Publications	802.45	177.71	980.16
Bonds and Insurance Premiums			
Workmen's Compensation Payments	65.01		65.01
Restoration Fund Assessments			
Auditing Service			
Private Car Mileage	50.72	21.28	72.00
Fares, R.R., Stage, etc.	29.00		29.00
Meals and Lodging	428.61	14.87	443.48
Gasoline and Oil	296.97	9.54	306.51
Auto Expense, Repairs, Storage	357.10	23.15	380.25
Insurance			
Fuel, Light, Power, Water	187.22		187.22
Laboratory Supplies and Ore Analysis	304.37		304.37
Maintenance of Laboratory Equipment	3.50		3.50
Laundry			
Newspapers, Periodicals, Maps, Blueprints	81.56	5.00	86.56
Laboratory, Bldg. Reprs. & Fixtures	38.09		38.09
Photographic Supplies	14.68		14.68
Scavenger Service			
Office Equipment Rentals	4,435.35	539.63	4,974.98
<u>Capital Outlays</u>			
Office Furniture and Equipment	156.95		156.95
Laboratory and Field Equipment	158.82	26.63	185.45
Vehicles and Equipment	71.43		71.43
Books	28.19		28.19
Miscellaneous	415.39	26.63	442.02
<u>Special Requests</u>			
State Geological Survey:			
Salaries and Wages	320.24		320.24
Travel Expense			
Other Expenses	929.02		929.02
San Francisco Fair		47.95	47.95
Quicksilver Resurvey:			
Salaries			
Telephone and Telegraph			
Beach Sands:			
Salaries			
Travel Expense			
Other Expense			
	1,249.26	47.95	1,297.21
TOTAL EXPENDITURES	\$ 21,083.82	\$ 614.21	\$ 21,698.03

\* Items paid out of Geology and Mineral Industries Account (see preceding page).

July 1, 1941 to June 30, 1942			Period Jan. 1, 1941 to June 30, 1942		
\$ 31,657.03		\$ 31,657.03	\$ 46,640.85		\$ 46,640.85
	G.M.I.*			G.M.I.*	
2,896.20		2,896.20	3,971.20	195.00	4,166.20
608.21	15.74	623.95	795.01	53.28	848.29
424.14	108.58	532.72	588.71	164.12	752.83
701.39	11.52	712.91	1,051.09	11.52	1,062.61
1,817.57	66.50	1,884.07	2,620.02	244.21	2,864.23
71.25		71.25	71.25		71.25
134.79		134.79	199.80		199.80
24.29		24.29	24.29		24.29
109.05		109.05	109.05		109.05
191.04	175.00	241.76	241.76	196.28	438.04
398.21		398.21	427.21		427.21
1,324.36		1,324.36	1,752.97	14.87	1,767.84
526.11	169.25	695.36	823.08	178.79	1,001.87
584.16	15.44	599.60	941.26	38.59	979.85
44.04		44.04	44.04	44.04	44.04
439.58	4.11	443.69	626.80	4.11	630.91
713.14	16.26	729.40	1,017.51	16.26	1,033.77
80.59		80.59	84.09		84.09
20.56		20.56	20.56		20.56
266.03		266.03	347.59	5.00	352.59
757.01		757.01	795.10		795.10
24.94	1.29	26.23	39.62	1.29	40.91
10.00		10.00	10.00		10.00
20.00	30.00	50.00	20.00	30.00	50.00
12,186.66	613.69	12,800.35	16,622.01	1,153.32	17,775.33
302.69		302.69	459.64		459.64
472.90		472.90	631.72	26.63	658.35
1,543.75		1,543.75	1,615.18		1,615.18
41.55		41.55	69.74		69.74
2.00		2.00	2.00		2.00
2,362.89		2,362.89	2,778.28	26.63	2,804.91
1,673.46		1,673.46	1,993.70		1,993.70
898.38		898.38	898.38		898.38
408.43		408.43	1,337.45		1,337.45
				47.95	47.95
150.00		150.00	150.00		150.00
13.75		13.75	13.75		13.75
151.00	120.68	271.68	151.00	120.68	271.68
286.18	42.16	328.34	286.18	42.16	328.34
62.82		62.82	62.82		62.82
3,644.02	162.84	3,806.86	4,893.28	210.79	5,104.07
\$ 49,850.60	\$ 776.53	\$ 50,627.13	\$ 70,934.42	\$ 1,390.74	\$ 72,325.16

OREGON STATE DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES

Statement of Compensation and Expenses of Employees  
January 1, 1941 to June 30, 1942 (eighteen months)

		<u>Compensation</u>			<u>Travel Expense</u>		
		1/1/41- 6/30/41	7/1/41- 6/30/42	Total 18 months	1/1/41- 6/30/41	7/1/41- 6/30/42	Total 18 months
<u>Present Staff and Employees (16)</u>							
Earl K. Nixon	Director	\$2100.00	4246.67	6346.67	{ 159.56	363.75 (1) 407.89	931.20
*Helen Kluge Johnson	Bookkeeper	690.00	512.00	1202.00			
*Maurice Brady	Office Assistant	60.00		60.00			
*Ruth Van Meter	Secretary	455.00	540.00	995.00			
F. A. Steeble	Bookkeeper	750.00	1520.00	2270.00			
Agatha Cook	Secretary	580.73	1320.00	1900.73			
F. W. Libbey	Mining Engineer	1560.00	3713.33	5273.33	{ 40.15	135.60 (1) 7.35	183.10
John Eliot Allen	Chief Geologist	{ 1190.06 (1) 105.24	2940.00	4235.30	84.69	155.38	240.07
Ray C. Treasher	Assoc. Geologist	1470.00	3000.00	4470.00	132.50	233.41	365.91
Hugh K. Lancaster	Assayer	1230.00	2700.00	3930.00	55.65	240.39	296.04
Wessley Paulsen	Geologist	{ (1) 215.00 625.00	(1) 415.00 1188.84	2443.84	{ 29.55	(1) 39.20 175.76 (3) 187.59	432.10
*James A. Adams	Chief Chemist	1350.00	900.00	2250.00	39.17	160.65	199.82
*Albert A. Lewis	Assayer	1140.00	258.06	1398.06			
Leslie C. Richards	Assayer	1101.45	2330.00	3431.45			
June Roberts	Stenographer	228.75	652.32	881.07			
*Retlaw W. Haynes	Draftsman	9.00		9.00			
Phyllis Hanton	Multigraph Operator	28.40	793.33	821.73			
*W. H. Strayer	Technical	7.00		7.00			
*Howard E. Newell	Clerical Assistant	3.80		3.80			
*Thomas Imper	Multigraph Operator	33.75		33.75			
*Henry Shade	Carpenter	30.00		30.00			
*Margaret Stranahan	Clerical Assistant	19.88		19.88			
*Winifred Hiatt	Stenographer	16.80	98.00	114.80			
Fern Johnson	Stenographer	19.20	403.70	422.90			
*Herbert Harper	Geologist	125.00		125.00			
*Ira S. Allison	Geologist	160.00	(1) 125.00	285.00			
*E. C. Karlne	Painter		10.00	10.00			
*Henry Shade	Carpenter		2.25	2.25			

Robert G. Bassett	Assayer	1928.55	1928.55		
H. C. Harrison	Chief Chemist	250.00	250.00	62.83	62.83
*Ida Tschida	Clerical Assistant	19.75	19.75		
*Marjorie Estlund	Clerical Assistant	33.48	33.48		
*Betty Myers	Clerical Assistant	19.77	19.77		
*Clifford Williams	Clerical Assistant	8.00	8.00		
*Martella Murphy	Multigraph Operator	13.12	13.12		
Randall E. Brown	Geologist	{(1) 40.64			
		1012.50	1053.14	135.14	135.14
*Helen Clasper	Stenographer	12.38	12.38		
*Beverly Nordean	Stenographer	7.00	7.00		
Jean Bowman	Geologist	568.39	568.39	9.00	9.00
Thomas A. Roy	Geologist	13.33	13.33		
*Gordon Bath	Geologist	642.26	642.26	61.83	61.83
*Preston E. Hotz	Geologist	(2) 150.00	150.00		
Wallace D. Lowry	Geologist	(1) 275.00	275.00		
*Harold Wolfe	Geologist	(1) 100.00	100.00	(1) 75.60	75.60
*Jack Martin	Geologist	(1) 100.00	100.00	(1) 75.60	75.60
*R. K. Meade	Geologist	(1) 158.06	158.06	(1) 58.05	58.05
*W. D. Wilkinson	Geologist	(1) 500.00	500.00	(1) 79.91	79.91
*Wayne R. Lowell	Geologist	(1) 150.00	150.00		
*Dan Phillips	Office Assistant	(1) 93.90	93.90		
*Homer Nichols	Driller	(3) 16.00	16.00		
*Laborers		(1) 190.00	190.00		
*J. H. Thomas	Geologist	(3) 89.79	89.79		
*Albert Duke	Geologist	(3) 13.25	13.25		
*Wm. Birkholtz	Geologist	(3) 17.64	17.64		
*Allan B. Griggs	Engineer			(3) 5.06	5.06
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TOTALS					
Departmental		14983.82	31657.03	541.27	1733.74
State Geological Survey		320.24	2147.60		743.60
Quicksilver Resurvey			150.00		
Beach Sands			136.68		192.65
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		\$15304.06	\$34091.31	\$541.27	\$2669.99
					\$3211.26

\*Persons who were on staff or were regular employees for some portion of period.

(1) State Geological Survey

(2) Quicksilver Resurvey

(3) Beach Sands

# SPECTROGRAPHIC LABORATORY

July 1, 1941 to June 30, 1942, one year

Salaries and Wages \$ 3,283.55

## G.O.M. Expense

Office Supplies	21.39
Telephone and Telegraph	1.20
Freight and Express	12.41
Employer's contribution	11.25
Private Car Mileage	95.16
Meals and Lodging	35.75
Motor Vehicle Supplies	5.71
Power	1.07
Laboratory Supplies	175.29
Buildings and Fixtures	598.85
Photographic Supplies	126.27
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	1,084.35

## Capital Outlays

Buildings and Building Fixtures	17.80
Laboratory Equipment	5,998.83
Educational and Recreational	42.63
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	6,059.26

TOTAL EXPENDITURES \$ 10,427.16

## RECEIPTS:

Laboratory Fees, Feb. 5, 1942 to June 30, 1942	\$ 98.10
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# PUBLICATIONS

State Department of Geology and Mineral Industries, 702 Woodlark Building, Portland, Oregon.

## BULLETINS

	Price
1. Mining Laws of Oregon, 1942, rev. ed., contains Federal placer mining regulations . . .	\$0.20
2. Progress Report on Coos Bay Coal Field, 1938: F.W. Libbey. . . . .	0.10
3. Geology of Part of the Willowa Mountains, 1938: C.P. Ross . . . . .	0.50
4. Quicksilver in Oregon, 1938: H.C. Schuette . . . . .	1.15
5. Geological Report on Part of the Clarno Basin, 1938: Donald K. Mackay (out of print). .	
6. Preliminary Report on Some of the Refractory Clays of Western Oregon, 1938, Hewitt Wilson and Ray C. Treasher. . . . .	0.45
7. The Gem Minerals of Oregon, 1938: H. C. Dake . . . . .	0.10
8. The Feasibility of a Steel Plant in the Lower Columbia Area near Portland, Oregon: Revised edition 1940: R.M. Miller. . . . .	0.40
9. Chromite Deposits in Oregon, 1938: John Eliot Allen. . . . .	0.50
10. Placer Mining on the Rogue River, Oregon, in Relation to Fish and Fishing in that Stream, 1938: Henry Baldwin Ward . . . . . (out of print). .	
11. Geology and Mineral Resources of Lane County, Oregon, 1938: Warren D. Smith . . . . .	0.50
12. Geology and Physiography of Northern Willowa Mtns., 1941: W.D. Smith, J.E. Allen & others	0.65
13. First Biennial Report of the Department, 1937-1938. . . . . (out of print). .	
14. Oregon Metal Mines Handbook; by the staff A: Baker, Union & Willowa counties, 1939. . . . . 0.50 B: Grant, Morrow, Umatilla counties, 1941. . . . . 0.50 C: Vol. 1, Coos, Curry Douglas counties, 1941. . . . . 0.50 Vol. II, Section 1, Josephine county, 1942. . . . . 0.75 Section 2, Jackson county (mss.). . . . .	
15. Geology of Salem Hills & North Santiam River Basin, Ore., 1939: Thos. P. Thayer (out of print)	
16. Field Identification of Minerals for Oregon Prospectors and Collectors, 2nd edition 1941; compiled by Ray C. Treasher. . . . .	0.50
17. Manganese in Oregon, 1942: by the staff. . . . .	0.45
18. First Aid to Fossils, or What to Do Before the Paleontologist Comes, 1939: J.E. Allen .	0.20
19. Dredging of Farmland in Oregon, 1939: F.W. Libbey. . . . . (out of print). .	
20. Analyses & Other Properties of Oregon Coals, 1940: H.F. Yancey and M.R. Geer. . . . .	0.35
21. 2nd Biennial Report of the Department, 1939-1940. . . . .	Free
22. Geology of the Butte Falls Quadrangle, 1943: W.D. Wilkinson, et al. . . . .	
23. An Investigation of the Reported Occurrence of Tin at Juniper Ridge, Oregon, 1942: H.C. Harrison . . . . .	0.40
24. Origin of the Black Sands of the Coast of S.W. Oregon, 1943: W.H. Twenhofel. . . . .	0.30
25. 3rd Biennial Report of the Department, 1941-1942. . . . .	Free

## G.M.I. SHORT PAPERS

1. Preliminary Report upon Oregon Saline Lakes, 1939: O.F. Stafford . . . . .	0.10
2. Industrial Aluminum: A Brief Survey, 1940: Leslie L. Motz . . . . .	0.10
3. Advance Report on Some Quicksilver Prospects in Butte Falls Quad., Ore., 1940: W.D. Wilkinson	0.10
4. Flotation of Oregon Limestone, 1940: J.B. Clemmer & B.H. Clemmons . . . . .	0.10
5. Survey of Non-Metallic Mineral Production of Oregon for 1940: 1941: C. R. Holdredge . . . . .	0.10
6. Pumice and Pumicite, 1941: James A. Adams. . . . .	0.10
7. Geologic History of the Portland Area, 1942: Ray C. Treasher . . . . .	0.15
8. Strategic & Critical Minerals, A Guide for Oregon Prospectors, 1942: Lloyd W. Staples.	0.15
9. Some Manganese Deposits in the Southern Oregon Coastal Region, 1942: Randall E. Brown. .	0.10

## GEOLOGIC MAP SERIES

1. Geologic Map of the Willowa Lake Quad., 1938: W.D. Smith & others (also in Bull. 12). . .	0.45
2. Geologic Map of Medford Quad., 1939: F.G. Wells & others . . . . .	0.40
3. Geologic Map and Geology of Round Mountain Quad., 1940: W.D. Wilkinson & others . . .	0.25
4. Geologic Map of the Butte Falls Quad., 1941: W.D. Wilkinson & others (also in Bull. 22) . .	0.45
5. Geologic Map & Geology of the Grants Pass Quad., 1941: F.G. Wells & others . . . . .	0.30
6. Preliminary Geologic Map of the Sumpter Quad., 1941: J.T. Pardee & others . . . . .	0.40
7. Geologic Map of the Portland Area, 1942: Ray C. Treasher (see also Short Paper No. 7) .	0.25

## MISCELLANEOUS PUBLICATIONS

The Ore.-Bin: staff, issued monthly, as medium for news items about the Department, mines and minerals. Subscription price per year . . . . .	0.25
Sampling of small Prospects and New Discoveries . . . . .	Free
The Spectrographic Laboratory of the State Dept. of Geology & Mineral Industries, 1942.	Free
Oregon Mineral Localities Map . . . . .	0.05
Landforms of Oregon; a physiographic sketch--(17 by 22 inches) 1941 . . . . .	0.10