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

Bulletin No. 21

Second Biennial Report

of the

State Department of Geology and Mineral Industries

of the

STATE OF OREGON

1939-1940

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

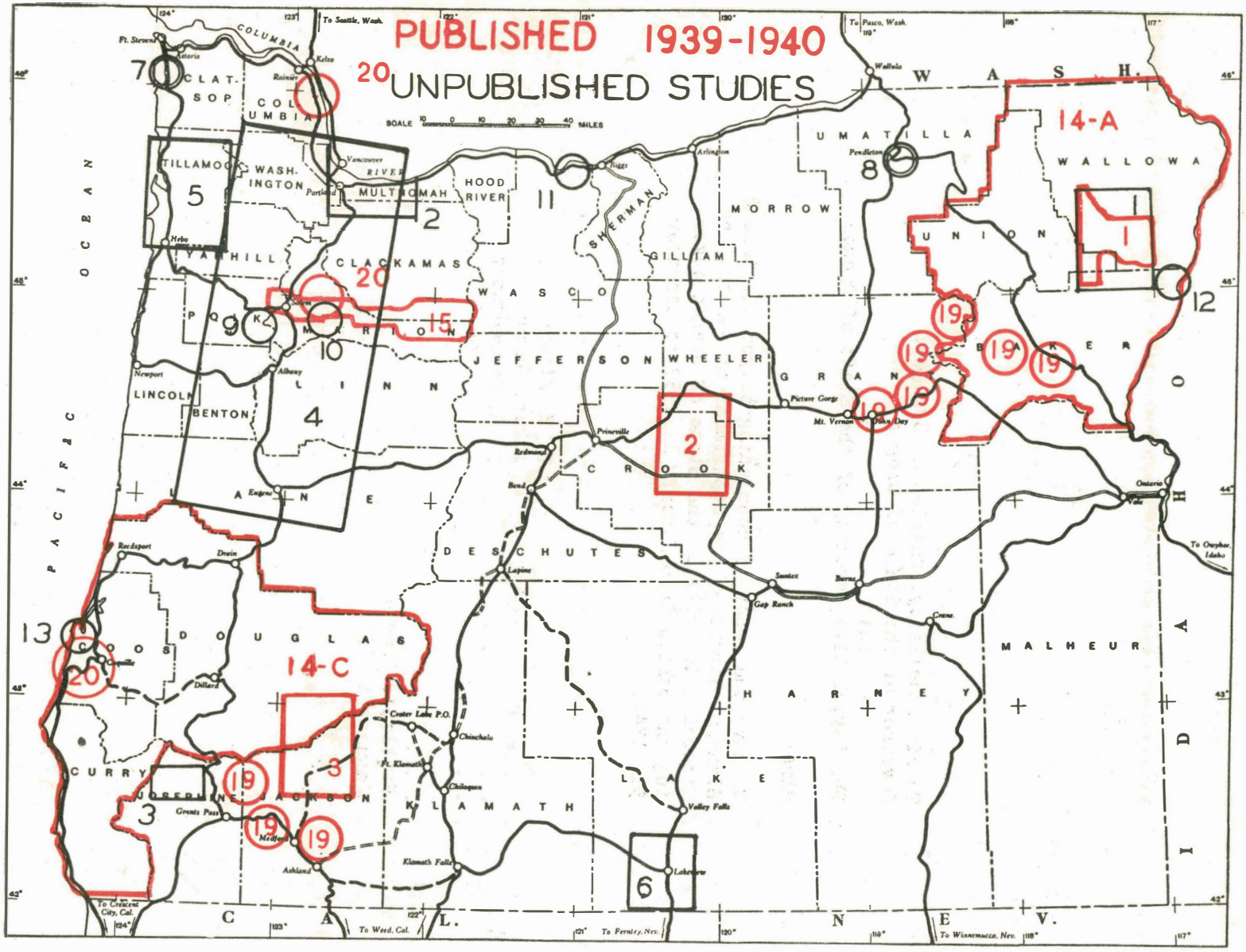
To His Excellency, Charles A. Sprague,
Governor of the State of Oregon.
and
The Legislative Assembly of the State of Oregon.

Sirs:

We have the honor of submitting to you the Second Biennial Report of the Department of Geology and Mineral Industries of the State of Oregon covering the period from January 1, 1939 to December 31, 1940.

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

Portland, Oregon
January 1, 1941


PUBLISHED 1939-1940
20 UNPUBLISHED STUDIES
SCALE 10 0 10 20 30 40 MILES
14-A
14-C
PACIFIC OCEAN
COLUMBIA
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MARION
LINN
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BENTON
WASCO
SHERMAN
GILLIAM
MORROW
UMATILLA
WALLOWA
UNION
BAKER
JEFFERSON
WHEELER
GRANT
CROOK
DESCHUTES
DOUGLAS
COOS
CURRY
JOSEPHINE
JACKSON
KLAMATH
LAKE
HARNEY
MALHEUR
IDAHO
WASH.
To Seattle, Wash.
To Pasco, Wash.
To Crescent City, Cal.
To Weed, Cal.
To Fernley, Nev.
To Winnemucca, Nev.
To Owyhee, Idaho

Index Map of

F I E L D S T U D I E S

of the
State Department of Geology and Mineral Industries
1939--1940

(Does not include several general studies and publications)

PUBLISHED (Red)

Geologic Map Series (red quadrangles)

- No. 1 Geological Reconnaissance in the Central Part of the Wallowa Mountain, Oregon.
- No. 2 Geology and Mineral Resources of the Round Mountain Quadrangle.
- No. 3 Geology and Mineral Resources of the Butte Falls Quadrangle.

Published Bulletins with areal applications (red overprint).

- No.14-A Oregon Metal Mines Handbook: Baker, Union, Wallowa Counties.
- No.14-C Oregon Metal Mines Handbook: Coos, Curry, Douglas Counties.
- No. 15 Geology of the Salem Hills and the North Santiam River Basin .
- No. 19 Dredging of Farmland in Oregon.
- No. 20 Analyses and other properties of Oregon Coals.

UNPUBLISHED (Black)

Unpublished Geologic Studies (black parallelograms)

1. Geology and Physiography of the Northern Wallowa Mountains (in press).
2. Geology of Portland Area, Oregon (unfinished).
3. Reconnaissance Geology of the Southeastern portion of the Galice Quadrangle (unfinished).
4. Lime Fertilizer Survey in the Willamette Valley (unfinished).
5. Reconnaissance of the Mineral Resources of Tillamook County, (unfinished).
6. Reconnaissance of the Mineral Resources around Lakeview.

Water Supply Problems (double black circles).

7. Water Supply Problem for the City of Gearhart.
8. Water Supply Problem for the City of Pendleton.

Special Short Problems (black circles).

9. Magnetometer Profile across a part of the Willamette Valley.
10. Investigation of Coal near Scio.
11. Study of Metallurgical Smelting Furnace near The Dalles.
12. Surface Geology of the Homestead Area.
13. Investigation of Black Sand Deposits near Marshfield.

CONTENTS

OREGON MINERAL PRODUCTION

The outstanding characteristic of the State's mineral industry is the exceptional rise in the value of its mineral production during this last biennium. Naturally, the Department takes considerable pride in reciting and publicizing this evidence of the healthy condition of one of the State's important basic industries.

No survey was made of non-metallics in 1939, but referring to the survey during 1938 of the 1937 output, and to the 1940 canvass which is not yet complete, it appears that the production has risen somewhat.

The picture of metallic production, however, is quite different. From official preliminary estimates, the 1940 production is 50% greater than that for 1939. Therefore, the total production in metallic and non-metallic for 1940 is up about 25% for the year.

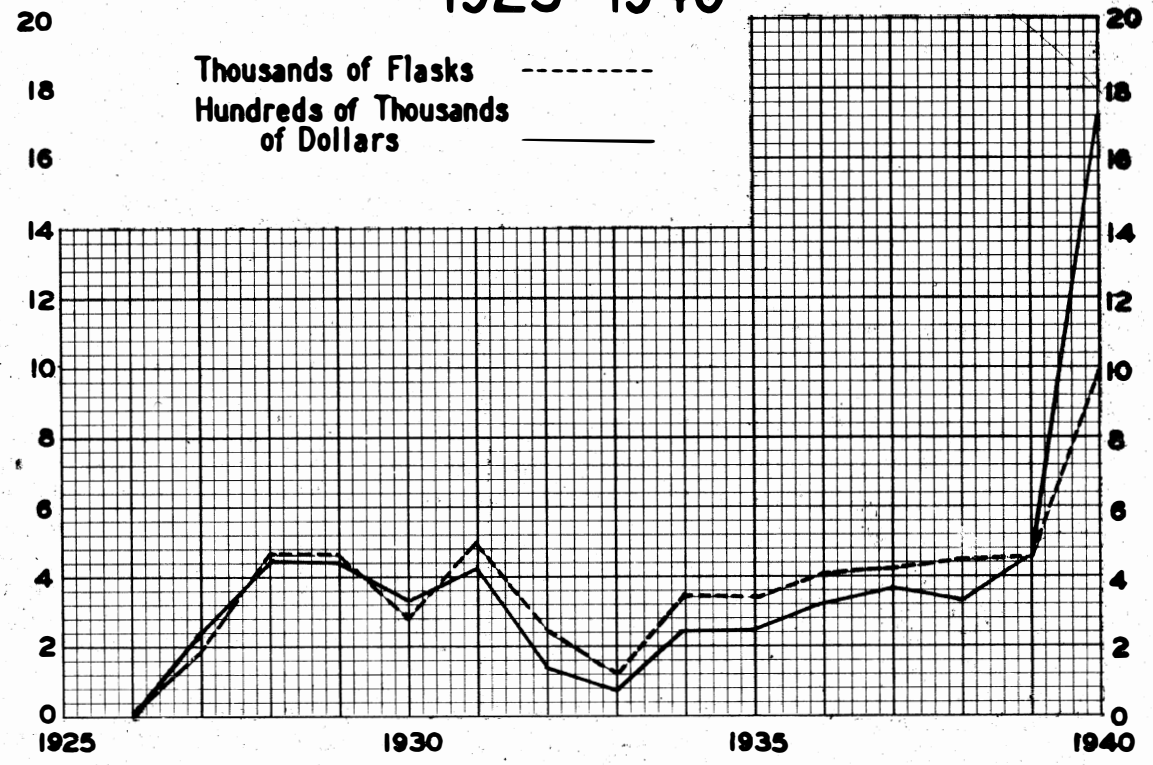
The Department is known to be directly responsible for the locating in Oregon of certain mining enterprises, and through its field work and technical assistance has been able to assist many other operations to an extent which may have some bearing on the increased mineral production in the State. However, it goes without saying that the bulk of the increase mentioned is due to natural causes, such as the increased price and use of quicksilver due to war conditions, and increased gold production due in part to the continued $35.00 per ounce gold price.

In the next biennium it is probable that non-metallic production will stage an upward surge such as the metallic production has within the last twelve months.

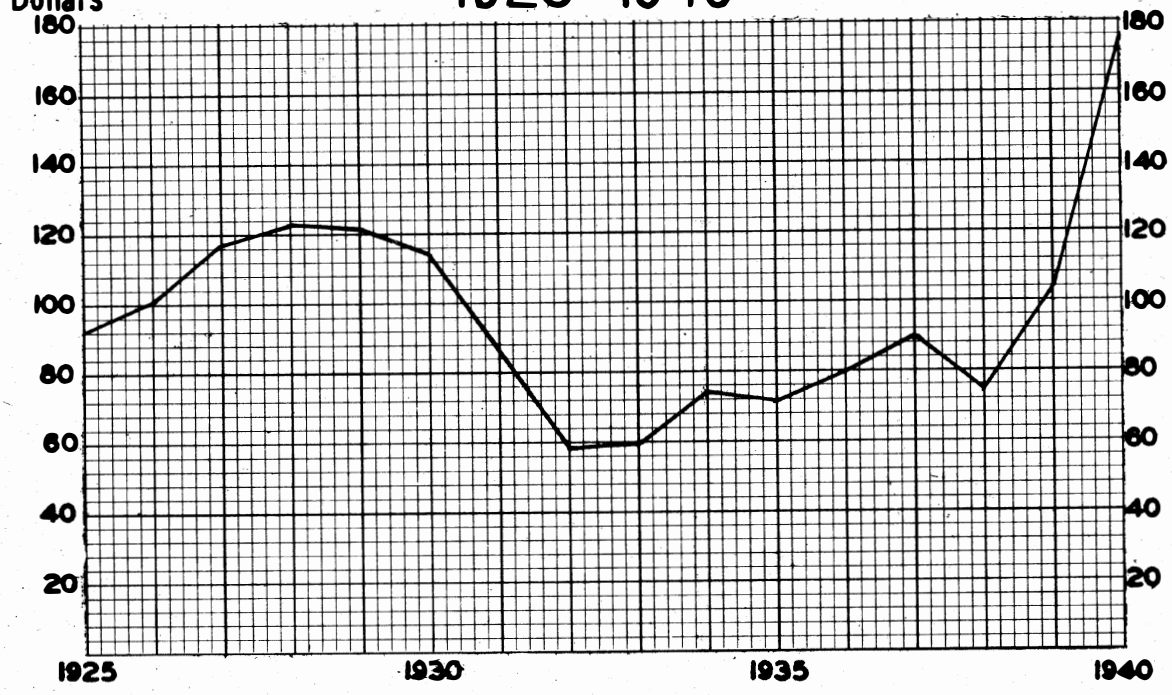
In any event, it appears that the mining and mineral industry in Oregon has increased much more rapidly during the last two years than any other basic industry in the State, and that it is now on a sounder and more substantial basis than at any time in the past.

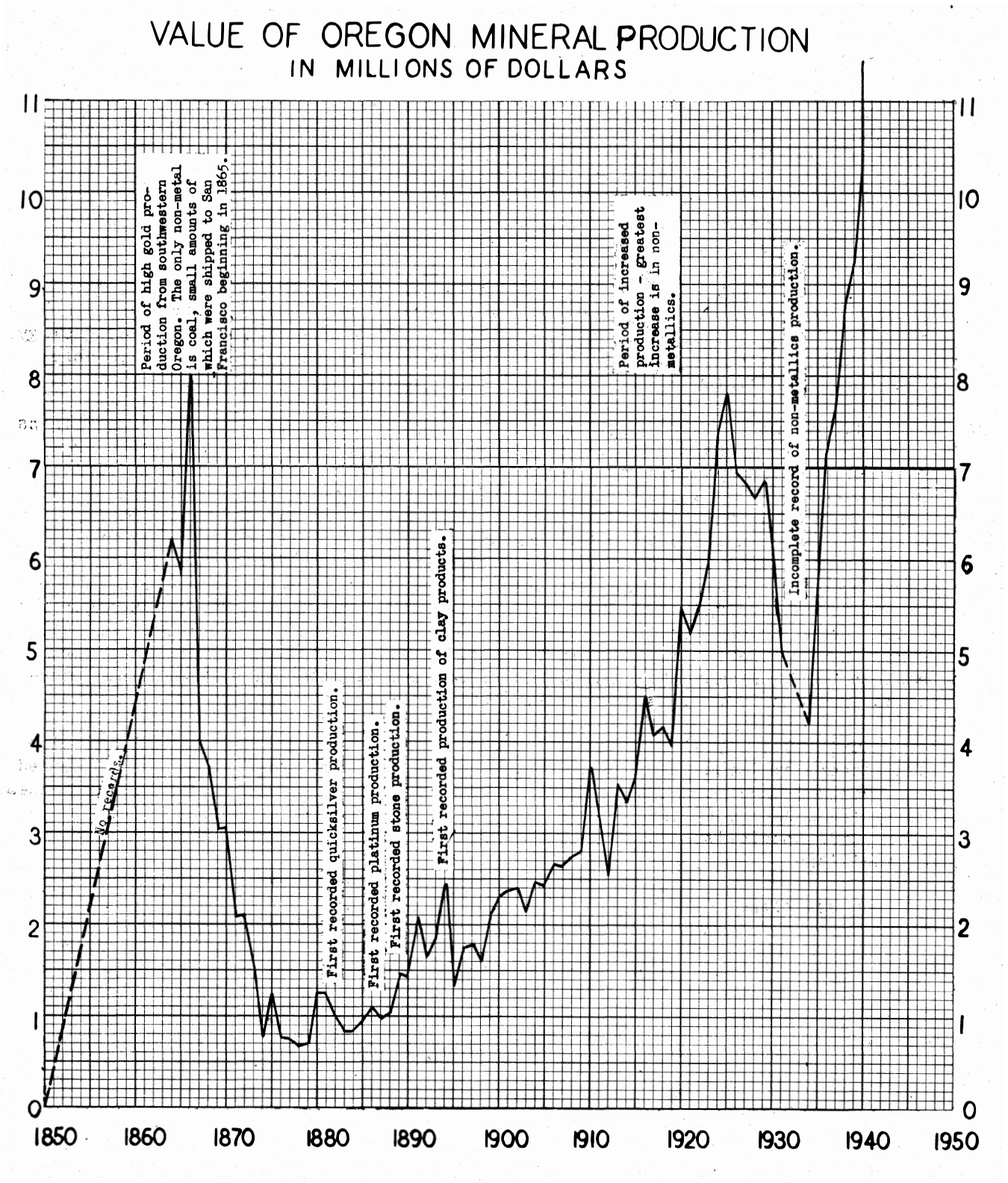
Mineral production curves, both metallic and non-metallic, are shown on the following two pages.

OREGON QUICKSILVER PRODUCTION
1925-1940



AVERAGE MARKET PRICE PER FLASK
1925-1940




VALUE OF OREGON MINERAL PRODUCTION
IN MILLIONS OF DOLLARS
Period of high gold production from southwestern Oregon. The only non-metal is coal, small amounts of which were shipped to San Francisco beginning in 1865.
No records.
First recorded quicksilver production.
First recorded platinum production.
First recorded stone production.
First recorded production of clay products.
Period of increased production - greatest increase is in non-metallics.
Incomplete record of non-metallics production.
0
1
2
3
4
5
6
7
8
9
10
11
1850
1860
1870
1880
1890
1900
1910
1920
1930
1940
1950

INTRODUCTORY STATEMENT

This report covers the activities of the State Department of Geology and Mineral Industries for the 1939-1940 biennium and is the second such report to be issued.

The old Oregon Bureau of Mines and Geology was discontinued in 1923, and there was no Oregon department devoted exclusively to geology, mining, and mineral industries until the present Department was established in 1937.

The Department has now gotten its feet firmly on the ground. Having made satisfactory progress with an inventory of the State's mineral resources during the first biennium, it is much better acquainted now with the problems of geology, mining and metallurgy in various parts of the State. Consequently, it is able to give better service to the State's mining community.

The services rendered by the Department are in increasing demand by citizens of the State, and so a problem has been presented, namely, that of meeting that extra demand without substantially increasing the Departmental personnel in direct proportion. As a matter of fact, since the Department was established three and one-half years ago, many measures have been taken and means devised for cutting corners and increasing the amount of effective work by the personnel. Much lost motion has been eliminated 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. There is very little division of responsibility.

During the 1937-1938 biennium, several projects were carried out by outside consultants employed for the purpose. Money was available for only very limited employment of such consultants during the second biennum. 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.

Future plans for the Department are outlined beginning page 47.

SET-UP OF THE DEPARTMENT

Under the law which created this Department (Oregon Laws of 1937, Chapter 179) certain duties were outlined 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.
11. Give a grubstake loan of $50 each to qualified prospectors, the loan to be repaid and also a royalty to the State of 10% of returns from claims staked. (No appropriation was made by the 1939 Legislature for grubstake loans, and therefore the grubstake statute was inoperative during the past biennium.

The Department is administered by a Governing Board of three citizens who serve for four-year periods. The Governor of Oregon selects the Governing Board, subject to the approval of the senate. The Board members serve without compensation but receive travelling 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.

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 and Mr. Burch in 1940.

The regular active personnel of the Department is as follows:

At Portland Office - Headquarters

Earl K. Nixon, Director, Mining Geologist.
F. W. Libbey, Mining Engineer.
John Eliot Allen, Geologist.
James A. Adams, Metallurgical Chemist.
Wessley W. Paulsen, Assistant Geologist.
Ruth Van Meter, Secretary
Helen Kluge, Bookkeeper.
F. A. Steeble, Multigraph Operator.
Agatha Cook, Stenographer.
Maurice Brady, Office Assistant.

At Baker State Assay Laboratory

Hugh K. Lancaster, Mining Geologist.
Leslie C. Richards, Assayer.

At Grants Pass State Assay Laboratory

Ray C. Treasher, Field Geologist.
Albert A. Lewis, Assayer.

In the canvass of value of non-metallic mineral production described on page 33, C. P. Holdredge, Consulting Geologist, is temporarily employed and on a contract basis.

Extra office and stenographic help has been employed at times both at the head office and at the laboratories when especially needed. During 1939 and 1940, arrangements were made with the National Youth Administration whereby the Department took advantage of its services for a number of months.

POLICIES

Policies adopted when the Department was organized have been followed quite closely during the 1939-1940 biennium. For example, projects that are outside of Department routine have been selected primarily for their practical and economic application. Strictly scientific and academic studies have thus usually been subordinated to those of practical and economic value.

As stated in the first biennial report, one of the State's most critical needs is scientific and technical research as applied to geological, mining, metallurgical, and various industrial mineral problems. The Department's policy has been, nevertheless, to respect particularly the element of timing in the selection of studies.

While continuing the inventory of Oregon's mineral resources, the Department has changed its policy to include certain metallurgical studies as short-range projects which formerly were classed as long-range studies and therefore deferred. Studies of certain strategic minerals of special interest due to war conditions come into this category.

On the theory that the prevention of waste in ill-advised mining ventures is a saving of money for legitimate mining investments, the Department has maintained an attitude of frankness in discussing mining problems with, or giving advice to, individuals whether or not they are experienced in mining. (Nor has there been any change in the Department's attitude toward the sale of securities in mining and oil in Oregon). As in the previous biennium, the Department is cooperating with the State Corporation Commissioner in an earnest effort to improve the attitude of the investing public toward mining commitments.

The amount of geologic field work and mapping by the Department has been considerably increased over that of the preceding biennium. Thus, more rapid progress is being made toward the completion of a geologic map of the State.

The Department has followed a policy of going out of its way to obtain and 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 and its advantages to electro-metallurgical 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 especially in carrying out the State geological survey is being continued and is bringing excellent results.

The Department cooperates from time to time with other Oregon commissions or agencies, such as the State Land Board, State Tax Commission, State Forestry Department, State Highway Commission, etc.

There is one policy that this Department has always followed, namely, reports of studies 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: 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.

Salaries and Wages account covers payment of all services rendered by persons regularly or temporarily employed by the Department.

General, Operating and Maintenance covers all current operating expenses of the Department, such as rents, travel and field expense, cost of printing and publication, and current supplies of expendable nature.

The Capital Outlay appropriation is for the purchase of all items of equipment, vehicles, or supplies other than expendable items.

The Special Requests appropriation covers the cost of projects or studies which should properly be segregated from other Departmental activities.

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.

Appropriations received for the past two years and funds requested for the new biennium are:

	Funds Received 1939-1940	Funds Requested Biennium 1941-42
Salaries and Wages	$ 59,960	$ 68,940
G.O.M. Expenses	17,760	24,160
Capital Outlays	1,780	3,725
Special Requests	10,000	(?)
	89,500	107,500

Increased appropriations for the new biennium are justified on the basis of: (1) substantially increased demands by citizens of the State for field work and service by the Department; (2) increased demands on the Department, due to growing importance of mineral and metallurgical industries in the lower Columbia River area as a consequence of low cost Bonneville power: (3) increased demands on the Department because of the importance of Oregon's strategic war minerals in the national defense program; and (4) a logical investment in the further encouragement of Oregon mineral production which, as indicated on pages 1 and 3, is now showing a more rapid rise in importance than any other basic Oregon industry.

MINING AND MINERAL INFORMATION SERVICE

Possibly the most important and certainly the most generally used and kindly received single service of the Department consists in the dissemination in various ways of mining and mineral information to the general public. Personal interviews consist of discussions of mining problems, mining regulations, mining industries, ore deposits, and of economic, geological, and metallurgical problems. Many inquirers desire identifications of rocks, minerals and ores.

A great many requests for information come to the head office and to the assay laboratories by letter, a few by telegram, many of the requests being referred to this Department for reply by other State departments, colleges, Chambers of Commerce, members of Congress, and other public office holders.

Tangible evidence 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 Second Biennium (1939-1940)

Visitors at the Portland Office	6,055
Pieces of mail received at the Portland Office	18,723
Pieces of mail sent out from "	35,996

(as of December 20, 1940)

Note that the above figures do not include the amount of mail handled and the number of visitors received at the State assay laboratories at Baker and Grants Pass. Those figures are given on page 10.

A larger share of the staff's time is consumed in attending to the public's requests, whether made in person or written, than by any other single phase of the Department's activities; yet the results and the good of this personal service are difficult to report or demonstrate in any tangible way. It all comes under the general heading of the dissemination of mining and mineral information and, since, as above stated, it takes the most time, it also costs the most money.

The Department disseminates mining and mineral information in still other ways; for example, the members of the technical staff, in cooperation with the State Board for Vocational Education, have given several series of talks on mining geology and mineralogy at Baker and Bend. The attendance at these so-called "mining schools" ranged from a few dozen up to 125 in the classes at Bend. Talks by members of the staff of the Department on pertinent subjects have been given at various times to Kiwanis, Rotary, Lions Clubs, Chambers of Commerce, and numerous other local groups throughout the State. In cooperation with the section on counseling and guidance of the Portland schools, student interviews have been arranged with members of the technical staff of the Department to assist in the orientation program.

A "clearing house" service, established for the purpose of getting buyer and seller together, is carried out gratis by the main office. A form is provided on which the property owner describes his mining property or problem, all the conditions affecting, together with terms of lease or sale. The data are then condensed and published in the "Ore.-Bin", with other similar offers, and sent out to a mailing list of around 450 addresses. Inquiries are referred directly to the property owners. The Department acts merely as a clearing house and takes no responsibility for the statements made.

STATE ASSAY LABORATORIES

The law creating the Department provided for quantitative, as well as qualitative, determinations of minerals and ores originating in Oregon, and in 1937 Assay Laboratories equipped to make such determinations were established at Grants Pass and at Baker. Most of the assayer's time is occupied in making quantitative determinations, but qualitative work is also done in testing for various minerals and in classifying rocks. In addition, during the past two years some metallurgical research has been carried on at the Baker laboratory, principally on the flotation of limestone, while at Grants Pass some testing was done on refractory properties of clay samples. The scope of quantitative analytical work at the laboratories has broadened continually. Quantitative determinations have been made for the following:- gold, silver, copper, lead, zinc, mercury, platinum, manganese, chromium, tungsten, molybdenum, lime, magnesia, silica, iron, nickel, antimony, tin, phosphorus, arsenic, cobalt and aluminum. The largest percentage of the analytical work is in assaying for gold and silver.

The number of samples which any single person or group of persons may submit is limited to two in any 30-day period, but no samples are accepted from engineers in their work of evaluating mines or prospects, or from mine operators who are milling or shipping ore or hiring labor. In these respects, the State Laboratories are not in competition with custom laboratories.

At each laboratory, headquarters have been established 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 the 1939-1940 biennium, the laboratories made 13,504 quantitative determinations, gave information to 4551 callers, and replied to 6184 letters. In addition 1267 qualitative determinations were made.

During the same period, the field geologists, in addition to making several areal geologic studies, visited and reported upon 243 properties. This number does not include repeated visits to a given property in connection with the original or other problem, nor does it include certain trips made on special studies.

OREGON GEOLOGICAL SURVEY (1939 and 1940)

Field work of the Oregon Geologic Survey was done both in 1939 and 1940 in cooperation with the Geology Departments of the University of Oregon and Oregon State College. Areas were chosen in which it was believed detailed economic studies were warranted and of especial present importance.

Work in 1939 was on two projects. During the first half of the summer of 1939, Department geologists mapped the Round Mountain quadrangle which includes the Ochoco area in Crook County. This district contains quicksilver deposits of economic importance. Dr. W. D.Wilkinson of Oregon State College, who, assisted by student geologists, had done preliminary survey work in the quadrangle, was in direct charge of the mapping. Early in 1940, results of the survey were published in the form of a geologic map with the title "Geologic Map and Geology of the Round Mountain Quadrangle".

Late in the summer, the survey of the Wallowa quadrangle, which was begun in 1938, was completed under the supervision of Dr. Warren D. Smith of the University of Oregon. Results of this survey will be published early in 1941 as bulletin no.12. A geologic map of the quadrangle, which will be a revised form of the preliminary map published in 1938, is now being completed.

During the summer of 1940, the Butte Falls quadrangle in southwestern Oregon was mapped. This is the general area extending from the locality near Trail north to Tiller. The work was in cooperation with Oregon State College and was under the supervision of Dr. W. D. Wilkinson. Both Departmental geologists and student geologists were engaged in the survey. Special studies were made of quicksilver occurrences.

In the fall following completion of the field work, a preliminary report of these studies was published by the Department in order to make available as soon as possible certain information of economic nature obtained in the field. This report was in the form of a G.M.I.Short Paper under the title "Advance Report of Some Quicksilver Prospects in the Butte Falls Quadrangle, Oregon". Complete results of the Butte Falls quadrangle survey will be published in bulletin form. The geologic map which the bulletin will supplement is now being prepared and will be published in January, 1941.

MINES INSPECTION SERVICE

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 very substantially. By far the largest number of such requests comes from small operators or prospectors who have staked claims and 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 geologic 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 geologize mining districts at the request of a group of operators having somewhat similar problems. An example of this is a survey of the Galice Mining District in southwest Oregon, which is being undertaken.

The Department also visits and inspects the larger mining properties in the State in order to become conversant with and discuss the mining and geological problems with the operators themselves. An example of this is a series of visits to some well-known producing mines in the Granite District that has led to the Department's enlisting the assistance of the U.S. Bureau of Mines on a metallurgical problem common to several properties, the solution of which, if favorable, would be a tremendous benefit to the area in question.

Next to the dissemination of mining and mineral information by the Department its most important duty is this inspection of mines about the State. By making great numbers of such inspections, members of the staff have an opportunity to make comparisons of geology and mining conditions and to offer suggestions based on the experience, and sometimes the mistakes, of others.

The Departmental field men also compare notes with, and sometimes make suggestions to, mine 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 publishing the mines catalog of the State. The catalog 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.

The Department found that it had not requested enough money for general operating expenses for the second biennium to take care of the increased demand for field work and the mine inspection service. Many requests for mine inspections were necessarily declined the past year for lack of funds. An additional amount to cover this situation has been requested in the new budget.

TECHNICAL STUDIES AND PUBLICATIONS OF THE DEPARTMENT

In most cases the results of technical studies of various kinds that are made by the Department are bulletins or geologic maps published and issued for the use and benefit of citizens of the State and others.

During the first biennium, eleven bulletins and one map were issued. These are listed immediately below.

Bull. No. 1 Mining Laws of Oregon.
Bull. No. 2 Progress Report on Coos Bay Coal Field: F. W. Libbey.
Bull. No. 3 Geology of Part of the Wallowa Mountains: C. P. Ross.
Bull. No. 4 Quicksilver in Oregon: C. N. Schuette.
Bull. No. 5 Geological Report on Part of the Clarno Basin: Donald K. Mackay
Bull. No. 6 Preliminary Report on Some of the Refractory Clays of Western Oregon: Hewitt Wilson and Ray C. Treasher.
Bull. No. 7 Gem Minerals of Oregon: H. C. Dake.
Bull. No. 8 Feasibility of a Steel Plant in the Lower Columbia River Area near Portland, Oregon: Raymond M. Miller.
Bull. No. 9 Chromite Deposits in Oregon: John Eliot Allen.
Bull. No. 10 Placer Mining on the Rogue River, Oregon, in Relation to Fish and Fishing in that Stream: Henry Baldwin Ward.
Bull. No. 13 First Biennial Report of State Department of Geology and Mineral Industries.
Geologic Map of the Wallowas.

During the biennium just passed, nine bulletins, two maps, and four G.M.I. Short Papers were issued and published as well as the monthly Ore.-Bin. In the following pages these various publications of the second biennium are described in some detail.

Bulletin No. 8 (Revised Edition)

"An Investigation of the Feasibility of a Steel Plant in the Lower Columbia River Area" by Raymond M. Miller, 1940. 55 pp., 25 tables, 2 figs.

Purpose: The purpose of this study was to determine, on the basis of available market, cost and availability of coke, limestone, ore, etc., whether an integrated steel industry for the Portland area should deserve serious consideration. The imminence of Bonneville power and the expectation of electrometallurgical industries, in any event, gave point to the making of the original study.

Nature of the Study and Report. The study was made by the Department in cooperation with Columbia County, which contains the only known commercial deposits of iron ore in the State. Raymond M. Miller, consulting metallurgist, who had previously made a report along somewhat similar lines for the War Department engineers, was retained to make this report.

The present study is not a duplication of the report mentioned above, for it goes thoroughly into the market situation; it is confined to the proposition of an integrated steel industry, practically omitting reference to electric furnaces, and it takes into account the situation and costs under the present Bonneville rate structure.

Results: The study indicates that installation of a modern integrated steel plant on the lower Columbia River deserves serious consideration. The present exigencies of national defense probably give greater weight to this conclusion.

The first edition was exhausted in 1939. Because of the number of requests for this bulletin, a revised edition in which statistical data were brought up-to-date was published in 1940.

Cost. The revised edition cost $336.09. Sales price per copy is 40¢.

Bulletin No. 11

"The Geology and Mineral Resources of Lane County", by Warren D. Smith, 1938.

Purpose. It is planned that eventually each county in the State will have a bulletin describing its physiography, geography, geology, and mineral deposits, both metallic and non-metallic. This is the first of the series, and is designed to give the residents of this particular area, as well as others interested in the county, a well-rounded perspective of the various economic and geologic factors that make up the scenic and mineral resources of the region. Eventually, bulletins on each county will complete the detailed survey of the ore-deposits and geology of the State.

Nature of the Study and Report. Dr. Warren D. Smith, head of the Department of Geology, University of Oregon, had a manuscript partially prepared incorporating the major features covered in bulletin No. 11. A small amount of additional field work was necessary to complete information on certain mining areas. The report gives details of topography, climate, hydrology, geologic formations and underground resources. It is amply illustrated.

Results. This bulletin has been in demand by individuals and groups interested in securing authoritative data concerning the geology, geography and mineral resources of Lane County. Its educational value has been recognized by schools and study groups, as well as by prospectors and engineers.

Cost. The cost of publication was $602.57. Sales price per copy is 50 cents.

Bulletin No. 12 (to go to press early in 1941).

"The Geology and Physiography of the Northern Wallowa Mountains", by Warren D. Smith, John Eliot Allen, Wayne Russell Lowell, and others. 1941, about 75 pp., numerous figs., 4 plates, map.

Purpose. This report will contain a study of the stratigraphy, petrology, structure, paleontology and physiography of the Wallowa Mountains in the Wallowa Lake quadrangle. Ore deposits are listed. Fossil lists, cross sections of structures, and stratigraphic charts will accompany the report. An entirely new map will include additional data gained since the publication of the reconnaissance map of the area in 1939. This report is mainly a geological study in a critical portion of the State, and is a definite contribution to the geologic history of Oregon.

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 the report and the new map is estimated to be about $400.

Bulletin No. 14.

"Oregon Metal Mines Catalog" by the Department Staff.

14-A - Baker, Union, Wallowa Counties. 1939. 125 pp., index, areal map.
14-C, vol.1 - Coos, Curry, Douglas Counties . 1940 133 pp., index, areal map.
14-C, vol.2 -- Jackson, Josephine Counties. (In preparation)
14-B - Grant, Morrow, Umatilla Counties (In preparation).

Purpose. This bulletin is designed to supply the need for up-to-date information concerning mining properties of the State. The last Oregon Mines catalog was issued in 1916. Since then much exploration work has been done and many mining properties opened up. The preparation of a mines catalog is one of the requirements of the act creating the Department.

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 catalog is being issued in 6 volumes corresponding to as many arbitrary divisions within the State.

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

Results. There is a constant demand for the bulletin.

Cost. Bulletin 14-A cost $701.64.
Bulletin 14-C, vol.1, cost $481.08.
Sale price for each is 50 cents.

Bulletin No. 15.

"Geology of Salem Hills and North Santiam Basin", by T. P. Thayer, 1939. 40 pp., 8 figs., map in 4 colors.

Purpose. This bulletin makes available desired geologic information, together with a geologic map, which has not previously been published. Its publication is in line with an objective of this Department that accurate and pertinent data on Oregon geology and mineral resources should be made available for general use.

Nature of the Study and Report. The original field study was made by Dr.Thayer as one of the requirements for a Doctor of Philosophy degree at California Institute of Technology. The author has revised this thesis, selecting such portions as will explain the excellent geologic map which accompanies the report. The map covers an area reaching from Salem to Mount Jefferson and 12 to 30 miles wide.

The original manuscript and map were supplied to the Department without cost. In order properly to make geologic formations distinguishable, the map is lithostated in four colors.

Results. The bulletin is a valuable addition to the geologic knowledge of Oregon. The map and text provide a cross-section of the western slope of the Cascade Mountains, and will enable other investigators to correlate these data northward and southward.

Cost. The cost of publication of the bulletin and four-color map was $445.99. Sale price is 65 cents.

Bulletin No. 16.

"Field Identification of Minerals for the Oregon Prospector", compiled by Ray C. Treasher and staff, 1940. 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, released in August, 1940, is now (December 1940) exhausted. It is planned to issue the second edition early in 1941. The Department's belief that the result of this publication would be helpful to Oregon prospectors and other interested persons seems to be well justified.

Cost. The cost of the bulletin was $498.25. The sale price is 50 cents.

Bulletin No. 17.
(in preparation)

"Primer of Geology and Guide to Prospecting in Oregon", by Earl K. Nixon.

Purpose. The bulletin is intended to give Oregon prospectors practical ideas on proper methods of each kind of prospecting in this State. It is written by one who has had much practical and technical experience. The language, style, and ideas are to be presented in a manner easily understood by the untrained prospector.

Nature of the Study and Report. The report will start with several chapters on simple geology. From these a prospector may learn to reason from cause to effect in interpreting the various mineral and geological conditions he finds in his travels. The report will give details of just how to proceed with prospecting for placer, lode deposits, coal, and so forth. Certain fundamental information, such as rock identification and the causes of various types of mineralization, is given. There follow chapters on exploration, evaluation of prospects, and financing. Each mineral of commercial importance known in the State is treated in such a fashion as to make clear to the prospector its commercial importance, its market situation, and its uses.

The bulletin is one of a short series being prepared by the Department to encourage and assist prospectors in intelligent search for and development of ore deposits in this State.

Results. It is hoped that this Bulletin will give the prospector who is untrained technically, and at a cost which he can afford, a handbook which will help him understand what he is doing and prevent him from following wills-of-the-wisp.

Cost. Estimated cost of preparing this bulletin is $225.

Bulletin No. 18

"First Aid to Fossils, or What to do Before the Paleontologist Comes", by John Eliot Allen, 1939. 28 pp., 3 plates, 5 tables.

Purpose. Lack of general public knowledge of the simpler procedures used in the collection and care of fossil material has frequently led to the destruction of valuable specimens. This paper attempts to fill the need for an inexpensive non-technical handbook which furnishes the casual finder or the amateur collector of fossils with information on the proper methods for the collection and preservation of this specimen.

Nature of the Study and Report. This report attempts to answer the numerous questions that might occur to the collector when he starts to collect fossils. Chapters discuss the problems of "What are fossils?", "How to go about collecting", "How to collect shells", "How to collect vertebrates", "How to collect plants", "How to collect microfossils", and "How to prepare a home laboratory and museum". A list of authorities on fossils in the west and a selected bibliography is included for reference purposes. A map and list of some of the fossil localities in Oregon may help the collector to find fossils.

Results. The demand for this publication was so great that the first edition of 500 copies, released in September, 1939, was exhausted before the end of the year; a second edition of 750 was printed in January, 1940. Requests for the bulletin were received from all over the country from libraries, universities, and high schools -- far in excess of the regular mailing list.

Cost. The cost of the bulletin was $96.45 for the first, and $74.64 for the second, edition. Sale price is 20 cents.

Bulletin No. 19

"Dredging of Farmland in Oregon", F. W. Libbey, 1939. 40 pp., 10 pl.

Purpose. Because of adverse criticism of gold dredging operations in certain farm areas, Governor Sprague requested the Department to study and report upon certain economic phases of dredging in Oregon in relation to the removal of cropland from production, particularly in the John Day Valley.

Nature of the Study and Report. This report presents results of a factual survey of gold dredging in Oregon in relation to reported damage to croplands. It includes studies of land values, economics of dredge operations, including the effects on local communities as well as the State at large, and the possibilities of reclaiming land after dredging operations. Special attention is given to conditions in the John Day Valley.

Results. A number of facts are given as a result of this impartial study. The most important of these are:

1. By far the largest dredge areas in the State are in lands of little or no value as cropland. Most of these dredge areas are in very low-value grazing lands.

2. Even in areas containing croplands such as the John Day Valley, the proportion of high-value land taken out of production is quite small. Views of dredge tailings near the John Day highway give an exaggerated idea of the amount of land removed from production. Large parts of these tailings were excavated from swamp land or river-bed land which could not be used for crops.

3. It is shown that economic benefits to local communities and the State at large in the production of new wealth by dredging operations is substantially in excess of those benefits derived from the same land used as farm land.

4. Results of the study indicate that should dredging operations be removed from farm localities such as the John Day Valley, the loss of payroll and other benefits to the community would undoubtedly be serious economically.

5. Resoiling of low-value agricultural land is economically impractical.

6. Resoiling of high-value land, that is land valued at around $100 an acre, is feasible provided stripping of overburden needs to be done in any event in order to make the most economic operation.

7. Any legislation designed to regulate or restrict dredge practice would affect the industry adversely and prospective dredging enterprises would look to other states for profitable investment.

Cost. Publication of this bulletin cost $246.21. Sales price, which includes mailing and postage, is 40¢.

Bulletin No. 20

"Analyses and Other Properties of Oregon Coals as Related to their Utilization", by H. F. Yancey and M. R. Geer, 1940. 38 pp., 9 tables, 2 pl.

Purpose. Large reserves of coal, situated for the most part convenient to tidewater transportation, constitute one of Oregon's important mineral resources. Because of the competitive position of Oregon coal, this potentially valuable industry stands essentially undeveloped. The investigation was undertaken in order to make available to producers, consumers, and the general public, detailed information on the physical and chemical properties of the coals currently mined in Oregon.

Nature of Study and Report. The bulletin is the result of a cooperative agreement between the Department and the U.S. Bureau of Mines. M. R. Geer, junior author, and mining engineer from the Bureau Station in Seattle, assisted by J. E. Morrison formerly a Department field engineer, sampled seven operating properties and two prospects. In Bureau of Mines laboratories, samples were subjected to standardized laboratory tests including chemical analyses both proximate and ultimate, and determination of heating value; friability tests to determine resistance to breakage or degradation in size on handling; slacking or weathering tests to measure the tendency to slack or disintegrate on exposure to the weather after mining; and determination of yields of products obtained by low-temperature "carbonization". In addition, one coal was selected for a laboratory hydrogenation test to determine its suitability for liquefaction by this process, and one coal was subjected to float-and-sink tests to estimate the feasibility of cleaning it mechanically. Burning tests were made of two coals, using an over-feed type domestic stoker.

Dr. H. F. Yancey, senior author and supervising engineer, Northwest Experiment Station, Bureau of Mines, Seattle, Washington, supervised the work.

Results. Valuable results from careful investigations are given in this report. The laboratory tests recorded showed that the Oregon coals, particularly those of the Coos Bay field, are suited both to low-temperature carbonization and hydrogenation processes; however, these methods of utilization, although technically sound, probably are not economically feasible at the present.

The actual use of similar coals in other parts of the country bears out the conclusion based upon the results of laboratory tests that the Coos Bay coals are suitable for both domestic heating and industrial uses.

Cost. The cost of publication was $167.04.
Sale price is 35 cents per copy.

Bulletin No. 21

"Second Biennial Report of the State Department of Geology and Mineral Industries, 1939-1940".

This report was prepared as a requirement of the law which created the Department.

The cost for 1000 copies is about $200.00.

REPRINTS OF BULLETINS

Demand has exceeded the supply in the case of seven of the twenty bulletins published by this Department. Bulletins reprinted are listed below:

Bulletin No.	Title	Original No.	Second Printing No.	Third Printing No.
1	Mining Laws of Oregon	1000	689	949
2	Coos Bay Coal Field	200	250	
5	Clarno Basin	200	200	
8	Feasibility of Steel Plant	500	752	
9	Chromite in Oregon	500	242	495
16	Identification of Minerals	800	(in press)	
18	First Aid to Fossils	500	600	

Reprints of bulletins published by this Department are made at a minimum cost, due to the method of duplication used, in which the original plates are retained and can be used over and over again with only slight deterioration. Plates first used in 1938 for Bulletin No.9 have been twice used since that time, and the latest impressions are substantially as clear as the first.

STATE GEOLOGIC MAP

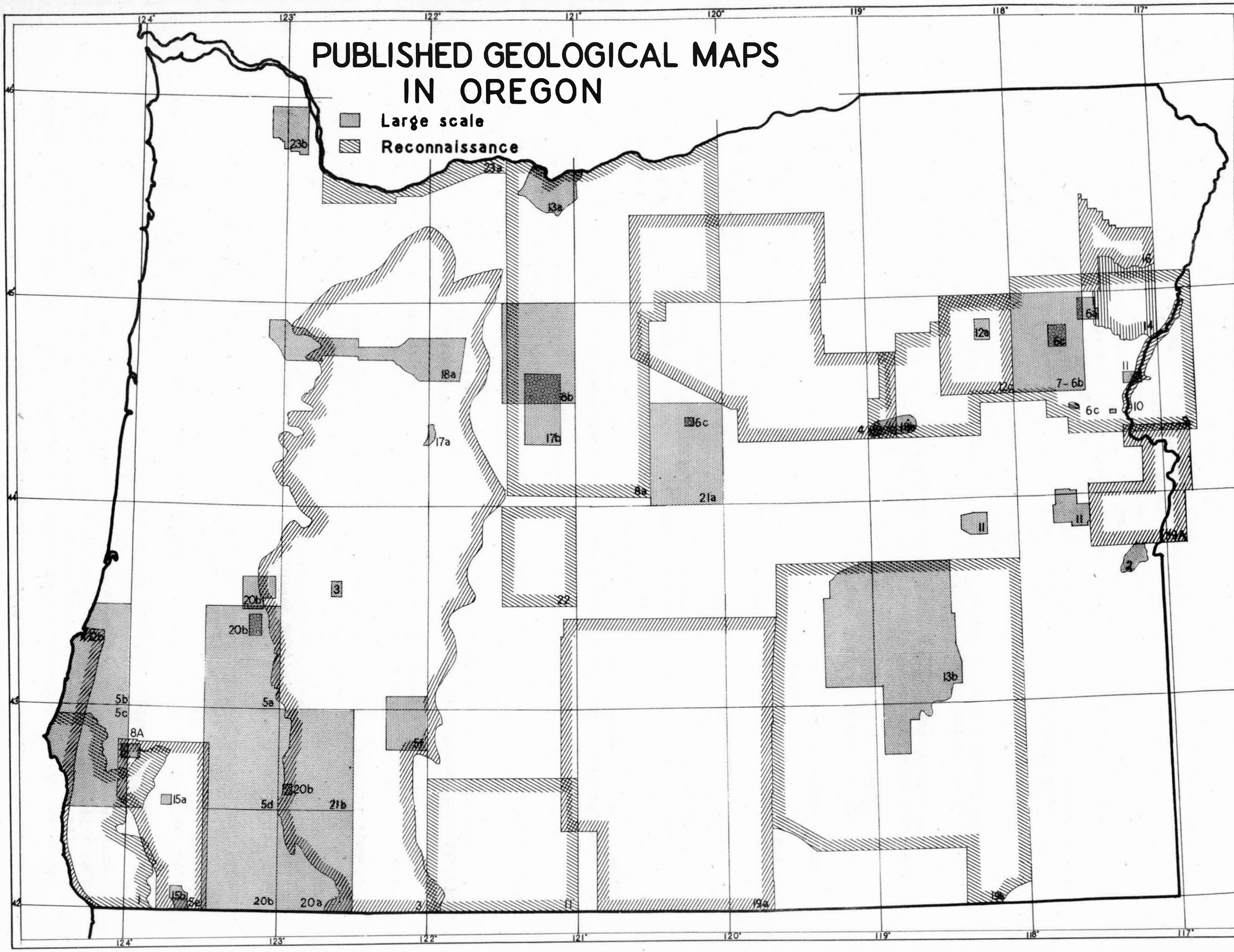
No complete geologic map of the State of Oregon has ever been published. Generalized geologic maps of the whole State have been prepared in the past, but because of lack of detail they are of small use to geologists and engineers.

During the past biennium, the Department made two specific contributions toward such a State map. Two 30-minute quadrangles, each containing about 875 square miles, were covered and geologic maps prepared. During 1939 a map of the geology of a quadrangle located in the Ochoco quicksilver district was finished and a geologic map issued. During the field season of 1940 a quadrangle in the quicksilver area south of Roseburg was mapped, and the geologic map covering the work has now gone to press. A geologic map of a quadrangle embracing most of the Wallowa Mountains is being completed and will be ready for the printer within a month. Geologic surveys of two additional quadrangles were completed by the U. S. Geological Survey during the last two years. These are the Grants Pass and Kerby quadrangles. The map for the former has gone to the printer; that for the latter must await completion of details. The various quadrangle maps mentioned above, although they do not make up a formal series, nevertheless have the same scale, namely 1 to 96,000, and are designed to help complete the geological map of the State.

The U.S.Geological Survey, the Oregon Bureau of Mines and Geology, members of the department of geology of the University of Oregon and Oregon State College as well as individual geologists working with private capital or under various sponsorships (such as the Carnegie Foundation) have surveyed and mapped geologically various areas within the State. The Department is compiling all map information that is available and reliable, and adding data as it is completed.

It will be many years before the State geologic map 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, for, generally speaking, geologic surveys are seriously handicapped in areas not covered by topographic maps.

Page 27 is an index map of Oregon, showing areas covered by published geologic maps. As is indicated, most of the area shown as mapped has, as a matter of fact, been covered only in reconnaissance fashion. It will be noted that the area with by far the largest population, namely, Portland and vicinity, as well as the entire Willamette Valley, is not covered by published geologic maps. The list of publications containing these maps is given on the back of the map.


PUBLISHED GEOLOGICAL MAPS
IN OREGON
Large scale
Reconnaissance
124°
123°
122°
121°
120°
119°
118°
117°
46°
45°
44°
43°
42°
23b
23a
13a
18a
18b
17a
17b
8a
16c
21a
4
12a
12c
7-6b
6a
6c
6c
16
14
11
10
11
11
22
2
19A
3
20b
20b
13b
12b
5b
5c
8A
5a
5f
15a
5d
20b
21b
1
15b
5e
20b
20a
3
11
19a
19b

PUBLISHED MAPS OF OREGON GEOLOGY

1. Butler, G.M., and Mitchell, G.J., Preliminary survey of the geology & mineral resources of Curry County, Oreg.: Min.Res.of Oreg.,Oreg.Bur.Mines & Geol.vol.2 no.2, 1916.
2. Bryan, K., Geology of the Owyhee irrigation dam project:U.S.Geol.Survey W.S.P.597-A,1928.
3. Callaghan, E., and Buddington,A.F.; Metalliferous mineral deposits of the Cascade Range in Oregon: U.S.Geol.Survey Bull.893, 1938.
4. Collier, A.J., The geology and mineral resources of the John Day region: Min.Res.of Oreg., Oreg.Bur.Mines & Geol.vol.1 no.3, 1914.
5. Diller, J.S., U.S.Geol.Survey Geol.Atlas (a) Roseburg folio #49, 1898; (b) Coos Bay folio #73, 1901; (c) Port Orford folio #89, 1903; (d) Riddle folio #218, 1924; (e) Mineral resources of southwestern Oregon, U.S.Geol.Survey Bull.546, 1914; (f)(and Patton,H.B.) The geology and petrography of Crater Lake National Park: U.S.Geol.Survey Professional Paper no.3, 1902.
6. Gilluly, J., (a) Copper deposits near Keating: U.S.Geol.Survey Bull.830-A, 1933; (b) Geol. and min.res.of the Baker quad.,Oreg.: U.S.Geol.Survey Bull.879,1937; (c)(and Reed, J.C., and Park, C.F.Jr.), Some mining districts of eastern Oregon: U.S.Geol.Survey Bull.846-A, 1933.
7. Grant, U.S., and Cady, G.H.,Preliminary report on the general and economic geology of the Baker district of eastern Oreg.: Min.Res.of Oreg.,Oreg.Bur.Mines & Geol.vol.1,no.6, 1914.
8. Hodge, E.T., (a) Geologic map of north-central Oreg.: U.of Oreg.Pub.Geol.Ser.vol. 1, no.5, 1932; (b) Geologic map Madras quad., Oreg.: Oreg.State Monographs, Studies in Geology no.1, 1940.

8-A Lesher, C.E., The Eden Ridge coal field, Coos County, Oregon: U.S.Geol.Survey Bull.541,1914.

9. Lindgren, W., The gold belt of the Blue Mountains of Oreg.: U.S.Geol.Survey 22nd Ann. Report, pt.2, pp.561-776, 1901.
10. Livingston, D.C., A geologic recon.of the Mineral and Cuddy Mt.Dist.,Washington and Adams Counties, Idaho (incl.Oregon side of the Snake River): Idaho Bur. of Mines and Geol. pamphlet no.13, 1924.
11. Moore, Bernard N., Non-metallic mineral resources of eastern Oreg.: U.S.Geol.Survey Bull.875, 1937.
12. Pardee, J.T., (a) Faulting and vein structure in the Cracker Creek gold district, Baker County, Oreg.: U.S.Geol.Survey Bull.380,pp.87, 1909; (b) Beach Placers of the Oregon Coast: U.S.Geol.Survey Circ.3, 1934; (c)(and Hewett, D.F.) Geology and min.res. of the Sumpter quad.: Min.Res.of Oreg., Oreg.Bur.Mines & Geol.,vol.1 no.6, 1914;
13. Piper, Arthur M., (a) Geology and ground water resources of The Dalles region, Oreg.: U.S. Geol.Survey W.S.P.659-B; (b)(and Robinson, T.W., Park, C.F.Jr.) Geology and ground water resources of the Harney basin, Oreg.:U.S.Geol.Survey W.S.P.841, 1939.
14. Ross, C.P., Geology of a part of the Wallowa Mountains, Oreg.: Oreg.State Dept.Geol.& Min.Industries, Bull.3, 1938.
15. Shenon, P.J., (a) Geology of the Robertson, Humdinger, and Robert E.gold mines, southwestern Oregon; U.S.Geol.Survey Bull.830-B, 1933; (b) Geology and ore-deposits of the Takilma-Waldo district, Oreg.: U.S.Geol.Survey Bull.846-B, 1933.
16. Smith, W.D. et al, Geologic recon.of the central portion of the Wallowa Mountains, Oreg.: Oreg.State Dept. Geol. & Min.Industries Map ser.1, 1938.
17. Stearns, H.T., (a) Geology and water resources of the Upper McKenzie River valley: U.S. Geol.Survey W.S.P.597-D, 1929; (b) Geology and Water Resources of the middle Deschutes River basin, Oreg.: U.S.Geol.Survey W.S.P. 637-D, 1931.
18. Thayer, T.P., (a) Geology of the Salem Hills and the North Santiam basin: Oreg.State Dept. Geol.& Min.Industries Bull.15, 1939; (b) Chromite deposits of Grant County, Oreg.: U.S.Geol.Survey Bull.922-D, 1940.
19. Waring, G.A., (a) Geology and water resources of a portion of south-central Oreg.: U.S. Geol.Survey W.S.P.220, 1908; (b) Geology and water resources of the Harney basin region, Oreg.: U.S.Geol.Survey W.S.P.231, 1909.

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20 Wells, F.G., (a) Preliminary geological map of the Medford quad.: Oreg.State Dept. of Geol.and Min.Industries Map Ser.no.2, 1939; (b)(and Waters, A.C.) Quicksilver deposits of southwestern Oreg.: U.S.Geol.Survey Bull.850, 1934.

21. Wilkinson, W.C., (a) Geologic map of the Round Mountain quadrangle: Oreg.State Dept. of Geol.and Min.Industries Map Ser.no 3; (b) Geol.map of the Butte Falls quad., Oreg.: Oreg.State Dept. of Geol. and Min.Industries Map Ser. no.4.
22. Williams, H., Newberry Volcano of central Oregon: G.S.A.Bull.vol.46, pp.253-304, 1935.
23. Williams, I.A., (a) The Columbia River Gorge; its geologic history; interpreted from the Columbia River Highway: Min.Res.of Oreg., Oreg.Bur.Mines & Geol.vol.2 no.3, 1916; (b)(and Parks, H.M.) The limonite iron ores of Columbia County: Min.Res.of Oreg., Oreg.Bur.Mines and Geol. vol.3 no.3, 1923.

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. 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 136 paid subscribers and about 300 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 our exchange list.

Each month items of 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 Department information, but as an excellent vehicle for modest Department publicity.

LIST OF MINES

In March 1939, the Department compiled and multigraphed a list of mines of the State. It was recognized that the list as published was incomplete but was assembled from records then available because of the many requests received for such a compilation.

The type of property was indicated, that is, gold, quicksilver, chromite, placer, etc. Locations by county and district were given as well as ownership, insofar as such information was available. Total number of properties listed was 1621. Of these, some 200 were reported as active.

150 copies were multigraphed. The supply was exhausted during 1939.

Cost of publication was $91.10. The sale price was 25 cents each.

G.M.I. SHORT PAPERS

This is a new series of Departmental publications designed to supplement the series of regular bulletins. The G.M.I. (Geology and Mineral Industries) Short Papers cover miscellaneous subjects that come up from time to time and which, while too short or hardly of sufficient wide-spread interest to rate the dignity of a formal bulletin, are nevertheless justified as to issue.

So far, four of these papers have been issued:-

The first, "Preliminary Report upon Oregon Saline Lakes";
The second, "Industrial Aluminum: A Brief Survey";
The third, "Advance Report on Some Quicksilver Prospects in the Butte Falls Quadrangle, Oregon"; and
The fourth, "Beneficiation by Flotation of Willamette Valley Limestones of Oregon".

G.M.I.Short Paper No.1 was the result of a study of the feasibility of the commercial production of salt products from the salt lakes of Lake, Harney, and Klamath Counties, Oregon. The amount of $1000 was appropriated by the Legislature. Dr. Stafford's preliminary report on the subject indicated that commercial salt production is probably not yet feasible. The balance of the unused funds allotted for the study --$925.00-- was returned to the State's General Fund.

In the case of G.M.I.Short Paper No. 2, the event of the building of an aluminum plant at Vancouver, Washington, resulted in a flood of inquiries of the Department for information on aluminum--its method of reduction, its ores, et cetera. The Short Paper was issued in response to the demand for such information.

The purpose of Short Paper No. 3 was to publicize, soon after completion of field work, some of the principal economic results of the summer geologic survey.

The purpose of Short Paper No. 4 is to give prompt information on results of metallurgical tests on limestone fertilizer, which information may be of especial interest to the farmers of the Willamette Valley.

The price of this series of Short Papers is 10 cents each postpaid.

PRELIMINARY GEOLOGIC MAP OF THE MEDFORD QUADRANGLE

The field work that led to the publication of this map was financed by funds allotted to the U.S. Geological Survey by the Public Works Administration for the purpose of studying deposits of manganese and chromite ores in southwestern Oregon. A preliminary survey of the entire 30-minute quadrangle was made between July and the middle of November, 1938. Francis G. Wells, geologist of the United States Geological Survey, was in charge of the work. In order to make the result of the work available to the public as promptly as possible, the Department arranged to publish the map by color lithostating. It was issued in May, 1939.

The map has a scale of 1:96000, is about 17x23 inches in size, and contains the usual explanation of the geologic column, together with a list of mines and prospects. On the back a condensed description of the various rock types and mineral deposits is given. 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.

The cost of the publication was $334.60. Sales price is 40 cents each.

THE ROUND MOUNTAIN QUADRANGLE MAP

During six weeks of the summer of 1939, Department geologists under the supervision of Dr. W. D. Wilkinson of Oregon State College mapped the 30-minute Round Mountain Quadrangle in central Oregon lying roughly 20 miles east of Prineville. This work was in cooperation with Oregon State College. The geologic map was issued by the Department in March, 1940.

The map is in black and white, has a scale of 1:96,000, and is about 17x23 inches in size. In deference to the economic interest in the quadrangle area, its coverage by geologic survey was undertaken without the benefit of a topographic base. Condensed descriptions of the stratigraphy and ore deposits, as well as an outline of the economic geology, are given on the back.

The Ochoco district covered by the map contains many quicksilver prospects and has had a greatly increased interest manifested in it since the rise in the market price of quicksilver. Hence, the map has been in large demand by prospectors, mine operators, and examining engineers.

The cost of publication was $190.58. Sales price is 25 cents each.

ADDITIONAL TECHNICAL STUDIES MADE

Rarely a month passes during which the Department fails to receive one or more requests for special technical studies or surveys of a mining or geologic or economic nature in some part of the State. It may be a municipal water problem or a county mineral resource survey or geologic reconnaissance of a mining area.

In addition to these requests which come to the Department from citizens or groups within the State, members of the staff, alert to rends in mining and metallurgy and marketing of mineral products, recognize the urgency of carrying out some technical problem or other pertaining to mineral industries in Oregon. Unfortunately, the Department is unable to provide finances to carry out a majority of the requests made for such technical studies, because at the time of preparing the budget for consideration by the Legislature, it is impossible to anticipate the specific requests that will come up during the biennium. Thus, the Department is frequently handicapped, and must turn down a goodly number of such requests for surveys or technical studies because there is no contingent fund to cover their cost. During the past biennium, two such projects, which otherwise could not have been attempted, were made possible by Governor Sprague, who alloted certain amounts from his research fund.

In the following pages are descriptions of ten of the projects or studies carried out by the Department during the past biennium.

AGRICULTURAL LIMESTONE SURVEY IN THE WILLAMETTE VALLEY

This study was made to determine, if possible, the existence of limestone deposits that may be utilized to supply the need for lime fertilizer to correct soil acidity in the Willamette Valley. The problem involved (a) finding commercial deposits of limestone that would run, say, 75% or higher in calcium carbonate, (b) investigating large deposits of lower grade limestone, which might be amenable to concentration, and (c) determining by an engineering study what the price to the farmer should be for such lime fertilizer.

Twenty-five localities were visited in tracing down leads to reported deposits and in visiting known properties. As a result of this necessarily brief survey and in the absence of exploratory work on many of the deposits, it is believed that only three deposits in the valley have reasonable chances of commercial operation within the economic cost range, and that even these operations may experience competition from producers of the much higher grade stone of southern and eastern Oregon.

Flotation tests both by the Department and by the United States Bureau of Mines indicated that the well-known, but relatively low-carbonate limestone of the Willamette Valley, may be concentrated to produce a commercial grade product - running well above 80% $CaCO_3$. However, in considering the feasibility of a plant to produce a product of high lime content, a number of factors are involved, such as the loss of carbonate in the tailings, cost of plant installation in view of uncertain market demands, etc.

The Department is carrying out an engineering study of this problem at the present time, and the result of the study will be issued as a Department publication as soon as it is completed.

NON-METALLICS SURVEY

A canvass of the State's non-metallic mineral production was made in December, 1940. Both by means of correspondence and by field work, an earnest effort was made to contact every non-metallic mineral producer in the State.

The United States Bureau of Mines gathers statistics of annual mineral production for each of the States, and results are published each year in the Minerals Yearbook. Figures for metallic mineral production are complete and are made available to the public with reasonable promptness. Non-metallic mineral statistics are, however, quite incomplete for Oregon and reports of total production are sometimes delayed two years after the canvass is completed.

Production of non-metallics in Oregon includes that of limestone, clay, silica, diatomite, pumice, dimensional stone, sand, gravel and crushed rock, and some precious gems. While the value of production of agates and other semi-precious gem stones is material and may reach well over $100,000 annually, it is difficult to arrive at a definite figure. Oregon is famous for its agate localities and a considerable amount of specimen material is carried away each year by out-of-state collectors and dealers. Moreover, the boundary between the activities of the private collector and commercial dealer is not sharply defined, and dealers are sometimes loathe to state the value of material they produce in the State.

In the case of production of road surfacing material and track ballast by logging companies for their own use, the total amount produced is very large. However, records of this production are not generally kept and therefore, the total value can not be determined accurately. Only authenticated records are used in this canvass.

The Department receives many inquiries about the State's mineral production. Some of these are from individuals, others are from industrial and mining corporations, both from within and from outside the State. In order to keep an up-to-date record of the growth of the mineral industry and its value to the State and to be in a position to recognize or predict trends, an accurate statistical survey of mineral production, both metallic and non-metallic, should be obtained at regular intervals.

Returns from the non-metallics survey are not 100% complete, but it is probable that a minor amount only of the production is unreported. The value of non-metallics production in Oregon for 1940 is estimated to be in excess of $5,200,000.

OREGON COAST CHROMITE SANDS

The intent of this study was to determine, if possible, (a) whether the Oregon beach and back-beach black sand deposits seem to contain enough chromite to warrant a study of possibilities of commercial operation, and if so (b) how can the chromite and perhaps other valuable products be separated commercially.

It has been known for many years that a number of deposits up and down the Oregon Coast carry varying percentages of chromic oxide. In 1938 and 1939, the Department first made a reconnaissance survey and assayed samples from various localities from Astoria to the California line. From the result of this work and the concurrent geologic study, it was determined that there is enough tonnage of chromite-bearing sand indicated to justify a program of metallurgical work on minerals separation.

From the Department's knowledge of the progress made in recent years in electrostatic separation, it was decided to have some of the representative deposits first tested by this method. Samples were sent east and the results were quite satisfactory. The Department then borrowed some laboratory type electrostatic apparatus, set it up in Portland, and carried the work on until it was necessary to terminate it because of the press of other urgent work. Interest in the possible value of these sands had nevertheless been aroused by the work of the Department and the publicity that attended the results.

At the present time, both magnetic and electrostatic minerals separation equipment is being installed at Oregon State College for carrying on this work, and for the solution of other problems of minerals separation in Oregon. After investigation and sampling of various beach and back-beach deposits, the Department decided that a potential industry for the production of chromite concentrates is indicated. Possibilities for a home market for such concentrates are believed to be good since a ferro-chrome plant is now proposed by a well-known ferro alloys manufacturing company.

Work on the chromite sands also indicated that in addition to such by-products as magnetite, gold, platinum, and locally zircon, a product of considerable value, namely ilmenite or titanium oxide, may also be produced from certain of the future chromite operations. This last product is a mineral composed of iron and titanium oxide. It is becoming increasingly popular as a substitute for lead oxide in paint manufacture.

MAGNETOMETER SURVEY OF THE SALEM AREA

Early in 1940, the Department was asked to verify an alleged oil structure in the Willamette Valley, west of Salem, which had been covered by some kind of a geophysical survey by private interests. As the map presented to us did not agree with our ideas of the structure, the Department made a brief geophysical check survey, using a magnetometer kindly loaned by one of the larger oil companies. The result of our work did not at all check with the private survey.

In order to settle the matter and to obtain a geophysical cross-section of a portion of the Willamette Valley for future use, the Department made an arrangement with the Geophysical Division of the United States Geological Survey whereby one of their technicians, assisted by a junior geologist of our Department, carried out a reconnaissance geophysical survey with a magnetometer in the area in question southwest of Salem. The result of this was to check closely the work done by the Department with the magnetometer and to indicate the absence at the point in question of oil structure. The cost was $325 out of cooperative funds already allotted to the U. S. Geological Survey, plus $100 from the operating fund of the Department. The net result of this geophysical work, was to save investors in the State many thousand dollars which probably would have been spent in drilling a well for oil in the area in question.

The longer geophysical cross-section run by the United States Geological Survey gave additional basic geologic information about the subsurface structure of the Willamette Valley that is of present and future value in interpreting possible oil or gas and ground water conditions.

GEOLOGICAL SURVEY OF THE PORTLAND AREA

Some three months' field work has been done by the staff geologist of the Department in a detailed geologic study embracing the western half of Multnomah and the northwestern portion of Clackamas Counties. The geology of all but a small portion of the area to be covered by the geologic map which will accompany the report has been plotted. Since the work has been done in detail rather than in reconnaissance fashion, and since there remains some petrographic work as well as the final preparation of the manuscript, the report and map cannot be completed and issued until late in 1941.

This is the first detailed geologic study to be made of the Portland area. The working out of the geologic history is expected to be of value to the sand and gravel industry which is important in the area, as well as to the development of the ground water resources of the region. On the academic side, the Portland locality is an area of highly controversial nature, and the study will be a valuable contribution towards solving problems of far-reaching interest.

PENDLETON WATER SUPPLY STUDY

At the request of the Water Board of the city of Pendleton, the Department made a two weeks' survey of the region near that city in order to determine whether geologic conditions were favorable to the development of additional municipal water supply.

The area was mapped in reconnaissance fashion so that conclusions could be drawn as to the probabilities of success if it were found necessary to drill for artesian water. In addition, the municipal water supply facilities and their relation to former sources of water supply were examined in some detail.

A report of the study by a geologist of the Department was made to the Water Board of Pendleton. This carried a number of recommendations as to what procedure to follow and suggestions as to the best means of enlarging the water supply substantially in the future to take care of the city's anticipated growth of population.

The city of Pendleton took care of the hotel and traveling expenses of the Department's geologist. It was understood that the city saved some $4,000 by the arrangement carried out with the Department.

GEARHART WATER SUPPLY STUDY

At the request of the City Council of Gearhart, Oregon, a short reconnaissance of the area around that city was made, in order to determine if possible whether geologic conditions were favorable for the development of domestic water supply by means of a deep well.

From evidence made available through this reconnaissance, it appears that the chances for developing a water supply adequate for domestic uses of the City of Gearhart by means of a deep well, within or immediately adjacent to the city, are very slight even by a well drilled to a minimum depth of 1000 feet. Water derived from this depth in this region would be very questionable both as to quantity and to quality.

PARTIAL RECONNAISSANCE OF THE MINERAL RESOURCES OF TILLAMOOK COUNTY

At the request of the Tillamook Chamber of Commerce, the Department made a brief field survey of some of the possible mineral resources of the county. Some twelve localities were visited and several hundred pounds of samples of coal and clay were taken. The Department lacked facilities for completing this work and expects to finish the job in 1941.

Certain conclusions based on the limited amount of field work done, nevertheless, were drawn. It appears that the county's mineral resources are principally of non-metallic nature - that is to say, they are composed mainly of road material, building stone and jetty rock, clay of various types, and coal.

GEOLOGIC RECONNAISSANCE NEAR LAKEVIEW, OREGON

At the request of the Lakeview Chamber of Commerce, a geologist of the Department made a ten-day survey of mineral deposits in the south-central portion of Lake County. Twelve properties were visited in rather widely separated areas. Samples were taken and assayed, and reports on each property were made for the use of the Department.

On the whole, the result of this study does not indicate very favorable conditions of mineralization for the areas in question. The Department cannot recommend very strongly that prospectors enter these areas with hope of finding very attractive mines. Under the circumstances, only prospectors or engineers of substantial experience should undertake to work in the area.

RECONNAISSANCE OF COAL PROSPECTS IN THE SCIO AREA

At the request of a committee of landowners in the district around St.Benedict's Abbey of Mount Angel, a geologist of the Department made a short reconnaissance study and map of the coal prospects in the area. Three samples were taken and analyzed by the United States Bureau of Mines Non-metallic Laboratory at Seattle.

Evidence was found that indicates a discontinuous condition of the coal vein present. The coal thus seems to be in lenses so that it would be rather difficult to develop an area large enough to justify a substantial operation at any one point, although the lenticular condition of the coal might not preclude its mining in a small way by individuals for local domestic use. The coal is lignite and three feet was the maximum thickness of vein observed.

Recommendations were made by the Department that caution be exercised in any development of the coal in the light of the various conditions which were explained.

RECONNAISSANCE OF GALICE DISTRICT

The Department was requested by a group of mining people and the local mining association to carry out a geological survey in the Galice District of southwestern Oregon. This was started by the field geologist stationed at the Grants Pass laboratory of the Department, and a considerable amount of field work was done. However, it could not be finished properly due to the press of other matters, so completion of the job was deferred until 1941.

ACTIVITIES DIRECTED TOWARD OBTAINING NEW INDUSTRIES

No record has been kept--nor would one be easy to keep-- of the amount of time spent in personal or written communications, bearing on the possible starting of new industries in the lower Columbia River area. Suffice it to say that, especially in the last two years since the use of Bonneville power has been so widely advertised and national defense become so important, the number of inquiries of this nature reaching the Department has been tremendous. Facts, figures, data and personal impressions in regard to the feasibility of starting divers types of mineral industries have been sought. Following are noted a few cases in which the Department has given sponsorship or assistance.

Electrolytic Zinc.

Since the Department started functioning, it has recognized not only the value to mining in this State of an electrolytic zinc plant, but also the benefit of such a plant to the lower Columbia area in payrolls and in business to established industries.

Recently--during the summer of 1940--the Department learned of special studies being made by an experienced smelter operator and metallurgist relating to the feasibility of an electrolytic zinc plant for a West Coast location. It developed that this investigator and the group in question had tentatively selected a plant location in another state. The Director of the Department, on expense money furnished by Governor Sprague, spent some time in California demonstrating to the parties interested why the lower Columbia location would be preferable.

Negotiations then moved to Portland and are still in progress.

Because of the presence of several paper mills in the lower Columbia River area which use quantities of sulphur dioxide, an important by-product of an electrolytic zinc smelter, because there is substantial production of zinc concentrates available in the Pacific Northwest at the present time, and for other reasons, it appears that a site in the Portland area is more favorable than any other on the coast for this type of smelter.

Chromite.

Since the term "strategic mineral" came to be almost a by-word because of publicity given it by the newspapers, the Department has received inquiries from time to time from groups or corporations interested in the possible location of a chromium reduction plant in the lower Columbia River area. Some of the inquirers have been bona fide commercial producers of chromium salts or ferro alloys, but a considerable number have been groups or individuals having few definite ideas in regard to the economics of such an enterprise.

In one case, the Department has been able to give certain help to a chemical firm interested in the production of chromium salts. In another the Department has, for nearly three years, been in communication with a large ferro-alloys corporation and has made various searches at their request. The Department understands that the group in question may begin erection of a chromium reduction plant in the lower Columbia area in the next few months.

Quicksilver

Since the precipitate rise in the price of quicksilver, the Department has been besieged by inquiries from various parts of the country for information on Oregon quicksilver properties. Engineers from groups or corporations have come to Oregon in search of suitable properties. In numerous cases, the Department has been instrumental in arranging visits to, and examinations of, quicksilver properties in the State, and in some cases has, on request, conferred with buyer and seller and suggested contract terms which were mutally acceptable.

Gold Properties

In addition to acting as clearing house for buyers and sellers of mining properties in the State, the Department goes out of its way to advertise mining areas or districts it believes have possibilities or have been neglected. The Department is given credit for being entirely responsible for the location in southwest Oregon of two or three of the several dredges that have come into that area in the last two years. Usually the Department never knows whether or not it has been instrumental directly in the consummation of a mining deal or in assisting in starting a new industry.

STRATEGIC MINERAL INVESTIGATIONS

The Department has either requested, or sponsored, or been directly responsible for, the carrying out of certain strategic mineral investigations by the Federal Agencies, in addition to cooperative projects in which the Department has participated. Departmental requests for such studies accompanied by evidence of justification have been made both by letter and in person. The latter case has been on the occasion of the Director's visits in Washington, D.C., to confer with the United States Geological Survey and the United States Bureau of Mines and to attend the annual meeting of the American Association of State Geologists.

Four such strategic mineral activities by the Federal Agencies are noted below:

1. A geologic survey of a large serpentine area in Grant County was made by the United States Geological Survey for the purpose of outlining favorable-looking chromite bodies. As a necessary part of this geologic work, a large party of topographic surveyors of the United States Geological Survey were first placed in the area in order to provide the geologists with a topographic base on which to work.

2. Following the work of the geologic survey in Grant County chromite areas, the United States Bureau of Mines carried out a substantial program of diamond drill exploration with the result that the presence of some 125,000 to 150,000 tons of medium grade chromite ore is stated to have been demonstrated.

3. During the early summer of 1940, the United States Geological Survey had an area of about 1,000 square miles in the Steens Mountain country of southeastern Oregon mapped by airplane photography. This aerial survey served as a basis for a reconnaissance geological survey by C. P. Ross of the United States Geological Survey and is pointed at the finding of new quicksilver reserves.

4. Two geologists of the United States Geological Survey spent a month in the late summer of 1940 making a new survey of the known nickel-bearing rocks of Nickel Mountain in the Riddle quadrangle, southwest of Roseburg, Oregon.

The Department has made a number of specific requests of the United States Geological Survey and the United States Bureau of Mines covering investigations of Oregon strategic minerals, manganese and antimony, but no favorable action on these particular requests has been taken by either of these agencies to date.

COOPERATION WITH FEDERAL AGENCIES

United States Bureau of Mines

1. In 1939, the Department arranged with the Bureau of Mines Station in Seattle to cooperate in an investigation of Oregon coal deposits. The Bureau furnished an experienced coal engineer, who, with a Department field engineer, visited and sampled coal deposits in various parts of the State. Most of the work was in the Coos Bay field since it has most properties opened up and has greatest commercial possibilities. Samples were taken according to Bureau of Mines standards. Results of the investigation are given in Department bulletin #20.

2. Arrangements were made with the metallurgical division of the United States Bureau of Mines whereby research work was done and is being continued on the following mineral projects: (a) Flotation tests on Willamette Valley Limestones referred to under Agricultural Limestone Survey in the Willamette Valley, page 33; (b) Investigation of various methods of concentrating the valuable constituents, but particularly chromite, of Oregon beach sands by metallurgists of the United States Bureau of Mines at College Park, Maryland. This work is being done on samples of black sand furnished by the Department; (c) Testing work on methods of separation of pure silica sand on samples of Oregon coast dune sands furnished by the Department. This work is also being done by Bureau metallurgists at College Park.

3. Roasting and cyaniding tests on Independence Cougar concentrates.

United States Geological Survey

1. In 1938, in the course of their regular work, the United States Geological Survey mapped the Medford quadrangle. Under a cooperative arrangement between the United States Geological Survey and this Department, wherein the Federal agency furnished the base and this Department the funds for printing, a colored geologic map of the quadrangle was issued early in 1939.

2. During the summers of 1939 and 1940, under a cooperative arrangement between the Department and the United States Geological Survey, geologic mapping was carried out by Survey geologists in the Grants Pass and Kerby quadrangles. The geologic map of the Grants Pass quadrangle is now ready for lithostating, and field work is practically completed on the Kerby quadrangle. This work by the Federal Survey was brought about through the matching of its funds with those of the Department. In 1939, the Oregon legislature appropriated $4000.00 for this cooperative work. As a matter of fact, the Department believes that Oregon is getting considerably the best of the deal.

3. During 1940, a brief geophysical (magnetometer) survey was carried out in a locality west of Salem. The point of this was, first, to check some

reported oil structures and, second, to get basic geologic information on this part of the Willamette Valley. Results are given on another page of this report under the heading Magnetometer Survey of the Salem Area. The work was carried out on a cooperative basis, the Department working jointly with the Geophysical Division of the United States Geological Survey.

4. Under an arrangement made with the United States Geological Survey early in 1940, a geologist of that agency spent some time investigating chromite sand possibilities in the Marshfield district near the Oregon coast. The work is cooperative between the Survey and this Department and will be continued in the spring of 1941.

5. During 1939, the Department made a bargain with the United States Geological Survey whereby the latter would complete the geologic base of the Sumpter quadrangle of eastern Oregon and prepare it for publication if the Oregon Department would stand the cost of issuing the colored map. The Survey recently completed its part of the arrangement, but the Oregon Department is obliged to withhold publication at least until funds may be available from new appropriations after the first of July, 1941.

COOPERATION WITH VARIOUS STATE AGENCIES

With the University of Oregon

During the field season of 1938, Dr. Warren D. Smith, head of the Department of Geology at the University of Oregon, was in charge of Departmental field parties in the Wallowa Mountains area and again for a short period in the same area during the summer of 1939. At the same time, a number of geology students at the University were employed on the State Geological Survey. Following this work, a report has been prepared jointly by members of the Department of Geology at the University and members of the staff of this Department, and the manuscript is ready for the printer.

The Department is pleased to acknowledge the excellent cooperation with Dr. Smith's department and staff at the University. Petrographic problems of the Department are sometimes referred to Dr. Staples.

With Oregon State College

The Department has maintained close cooperation with the Department of Geology of Oregon State College in respect to Oregon Geological Survey work during the field seasons of 1939 and 1940. Dr. Wilkinson has been in charge of parties in the field most of the time and is the principal author of two maps, both completed, and one bulletin now in preparation.

The Department, on several occasions, has called on the Department of Chemistry and the Department of Chemical Engineering of Oregon State College in connection with problems of metallurgy and has received excellent cooperation.

An informal, joint, three-way arrangement is in progress among the Department of Chemical Engineering, Oregon State College, the Department of Chemistry, University of Oregon, and this Department. The matter is a study of various geological, metallurgical and chemical phases of the chrome-bearing black sand concentrates of the Oregon coastal area.

The Department, by supplying a small amount of funds, is cooperating with an Oregon State College geological student who has a thesis problem of special economic interest. Dr. Hodge is the student's advisor and the sponsor of the arrangement.

With 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 and 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 practically all cases, the Department demands that acceptable technical reports by accredited engineers or geologists be submitted by the group requesting stock permits. The Department commonly suggests that these reports be by professional engineers registered in Oregon where the mining or oil properties involved are Oregon properties. In rare cases only has the Department made a decision based on its own information. In this way, 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.

For many years past, investors have looked askance at mining issues in Oregon, because, as in many other states, there have been a large number of illegitimate, unsound, ill-advised mining and oil promotions. This need not be the case, and it is believed that the situation is changing under the present arrangement.

This Department leans just as far backward to facilitate the operations of mining and oil people who give evidence of being sound and "right" with their plans, as it leans forward to be hardboiled with those it believes to be unsound, inexperienced, or not properly prepared to start a mining enterprise.

With State Tax Commission

On the occasion of inquiries by certain outside corporations as to the feasibility of plant site locations in the Portland area, the Department has been pleased to work with the Oregon Tax Commission in outlining the attractive features of a location on the Oregon side of the Columbia River.

SUMMARY AND FUTURE PLANS OF THE DEPARTMENT

There appeared in the First Biennial Report of the Department, issued January 1, 1939, an itemized schedule of future plans, problems, and contemplated studies. To indicate the way in which the Department has followed its schedule in the second biennium, that first outline of departmental plans is reproduced herewith below, and after each numbered paragraph a brief statement is made to show what action was taken by the Department on the matter in question during the 1939-1940 biennium.

It will be the plan of the Department during the 1941-1942 biennium to continue to carry out work on unfinished studies and, in selection of activities, to be guided by the original outline of plans, with the reservation that changes must be made from time to time due to unusual developments, such as need for strategic minerals investigations that fit into the national defense program.

Economic Studies

1. "A study of the feasibility of a lead and zinc reduction plant in the Willamette Valley. . . . ."
   1939-1940: No formal study was made, but the Department has actively sponsored an electrolytic zinc smelter for the Portland area and negotiations are under way toward its realization. (see page 40).

2. "Tests on recovery and separation of chromite, zircon, etc., from the coastal back-beach alluvial deposits. . . ."
   1939-1940: This work is already well under way, being carried out at no expense to the Department through a cooperative arrangement with the U. S. Bureau of Mines. (see page 43).

3. "Investigation of the possibility of beneficiating Willamette Valley limestone. . . ."
   1939-1940: The Department carried out a series of flotation tests on this problem and then arranged with the U.S. Bureau of Mines to complete the work. A recent publication (G.M.I.Short Paper No.4 - see page 30) carries the results of the U. S. Bureau of Mines' work. The Department is now making an engineering study of the economics of beneficiating the stone for fertilizer". (see page 33).

4. "Certain studies pertaining to Oregon dredge practice".
   1939-1940: A thorough study was made of Oregon dredge practice as related to resoiling, and a bulletin (no. 19) was issued by the Department. (see page 22).

5, 6, and 7. "Investigation of various Oregon coals, their utilization and by-product possibilities".
   1939-1940: A coal investigation was carried out in cooperation with the U. S. Bureau of Mines and all Oregon coals that were accessible for examination were sampled and studied. The result of the investigation was published as Bulletin no. 20. (See page 23).

8. "Further studies of deposits of pottery . . ."
   1939-1940: No further study of these clays has been made as yet. Facilities for clay testing have been installed at the Grants Pass Assay Laboratory but, so far, time has been lacking both for making the field studies and for carrying out any large number of burning tests.

9. "Examination of the Harney County borax deposits".
1939-1940: No opportunity presented itself to carry out this investigation. The item was put on the new budget for 1941-1942 but was eliminated, among others, in deference to the Budget Director's request that the total budget figure of the Department be lowered.

10. "Pumice and pumicite utilization".
1939-1940: Nothing was done on this study.

11. "A study and report on utilization of a large silica deposit recently uncovered".
1939-1940: This deposit of the Bristol Silica Company near Grants Pass was sampled, opened up, and placed in production by the company mentioned. The Department deemed it unnecessary as yet to make a special study of utilization partly in the light of the fact that the phosphorus content of the quartz is near the top tolerance for metallurgical silica.
Instead, the Department has in progress a cooperative arrangement with the U.S. Bureau of Mines whereby the latter is making mineral separation tests on dune sand of the Oregon coastal area to try and produce a high-grade silica sand product.

12. "Tests to determine the possibility of using Oregon diatomite in the manufacture of glass brick".
1939-1940: No work has been done on this.

13. "Electrostatic separation studies for beneficiation of various minerals".
1939-1940: The Department carried out a series of tests and prepared a brief paper on the electrostatic separation studies. Following this, it made an arrangement for further minerals separation tests by the U.S. Bureau of Mines. The Department is also cooperating with Oregon State College where electrostatic and magnetic separation apparatus is being installed for the purpose of working on this and other similar problems.

Studies of Geologic Nature

1. "A geologic survey and report on the Portland area".
1939-1940: This study is about 75% complete.

2. "Detailed geologic work in mineralized areas in the Wallowa Mountains in connection with tungsten and molybdenum deposits".
1939-1940: Field and petrographic work completed, and the manuscript is ready for the printer.

3. "Structural and stratigraphic studies in the Coos Bay area in which some gas production has been found recently."
1939-1940: No time has been given this study as yet.

4. "Investigation of known occurrences of nickel at Nickel Mountain, near Riddle".
1939-1940: A survey was carried out this summer by two geologists of the U.S. Geological Survey. The report presumably will be issued in 1941.

5. "Detailed mapping of lime on Connor Creek".
1939-1940: No attention was given to this.

6. "Topography and geology of the Canyon City chrome belt".

1939-1940: Topography was done by a group of 20-odd topographic engineers of the U.S. Geological Survey, and the geology mapped by Dr. T. P. Thayer of the U.S. Geological Survey. This was carried out the summer of 1940 and U.S.G.S. Bulletin No.922-D issued.

7. "Survey of quicksilver deposits of Tiller area".

1939-1940: This job was completed by the Department as its Oregon Geological Survey work. It covered a 30-minute quadrangle, called the Butte Falls. The geological map is in the hands of the printer for color reproduction. An advance report on the quicksilver prospects visited was published in September, 1940, as G.M.I. Short Paper No. 3.

8. "A study of Oregon's mineral springs".

1939-1940: No attention was given this project. It was included in the budget for 1941-1942 but deleted with others to reduce total budgeted expenditures.

9. "Preparation of bulletin of instructions and 'don'ts' to collectors of paleontologic material".

1939-1940: Study completed and issued as Bulletin No.18, entitled "First Aid to Fossils, or What to Do Before the Paleontologist Comes".

Other Plans and Needs

1. "Increasing the amount of geologic surveying to be done each field season".

1939-1940: The amount of geologic surveying was increased during the past biennium and will be further increased in the new biennium unless requested appropriations are reduced.

2. "Carrying out the plan already started of making geologic and resource reports by counties".

1939-1940: The Department issued a report on Lane County (Bulletin No.11) and started a resource survey of Tillamook County. Personnel and facilities did not permit undertaking additional county reports as such during the biennium, although work of some kind was done by the Department in practically every county of the State.

3. "Carrying out further cooperative projects with the U.S. Geological Survey in completing a geologic survey of the State".

1939-1940: Additional cooperative projects were carried out during the 1939-1940 biennium, such as sampling of chromite sands (see page 44) and completion of the Sumpter Valley quadrangle map (see page 44). The continuing cooperative arrangement covering geologic surveying is being carried on.

4. "Consolidation of the assay offices . . . ."

1939-1940: It was decided that this plan was not feasible as a regular arrangement.

5. "Assisting Oregon mine operators with metallurgical problems by making further cooperative arrangements with the U.S. Bureau of Mines' research laboratory".

1939-1940: Such arrangements are made as frequently as problems come up, and the U.S. Bureau of Mines has been glad to cooperate. One covering roasting and cyaniding of arsenical ores of Granite District is now under way.

6. "Publicizing and encouraging the use of Oregon black marble to the end that it may be developed and used widely".
1939-1940: The Department has put in a good word for Oregon black marble at every opportunity but so far without conspicuous success.

7. "Planning for a future study of the salt deposits in Lake County . . ."
1939-1940: A preliminary study of the feasibility and economics of utilizing the Abert and Summer Lakes salt deposits was carried out for the Department by Dr. O. F. Stafford of the University of Oregon. This was issued as G.M.I. Short Paper No. 1. The conclusion reached was that for economic reasons the time is not yet ripe for exploiting these salines. The balance of money appropriated for the study was returned to the General Fund. A new study will be made in the future when conditions have changed sufficiently to suggest more favorable results.

8. "An investigation and full report on the placer mining industry in the State".
1939-1940: No attention has been given to this matter yet.

9. "Preparation of a state-wide safety code for mining and mineral industries, as requested by the State Industrial Accident Commission".
1939-1940: A code was prepared by the Department and submitted.

10. "Encouragement of intelligent prospecting in Oregon by publishing a bulletin prepared by the Department outlining practical methods and procedure, and giving an outline of simple mining geology".
1939-1940: The director did considerable further work on preparation of this bulletin, but it is still incomplete; it will be issued during 1941.

11. "Continued collection and acquisition of Oregon mineral and paleontological specimens to be used in the Department museum".
1939-1940: Collection of museum material is going ahead slowly but is hampered by lack of facilities for exhibiting the material.

12. "Survey of non-metallic mineral occurrences, and a bulletin listing them".
1939-1940: Non-metallic survey of Oregon was carried out during December 1940, and total figures are shown in this report on page 34. A brief paper may be issued on the subject a little later.

13. "A brief study of mineral products brought into Oregon from outside to determine possibility of using Oregon minerals instead".
1939-1940: No time has been given to this study.

FUTURE PLANS

Specifically....the Department is bringing to completion as rapidly as possible several studies that have immediate importance, such as the Willamette Valley lime fertilizer survey and the chromite sand studies. Final geological maps and reports of the Wallowa Mountain area and the Butte Falls quadrangle are being "wound up" or printed and issued very soon.

Other studies or matters of unfinished business receive attention as consistently and frequently as time permits. Since it is essentially a service agency, the Department must recognize the rights of citizens of the State and others to a considerable amount of the staff's time in the routine furnishing of information and in the making of mine inspections.

No notable departure in plans or policies is contemplated by the Department during the next biennium. Budget estimates submitted would permit no material change in plan anyway. Should an emergency arise pertaining to mineral raw material sources in the National defense program, then the Department's program would be modified as far as possible to conform.

OREGON STATE DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES

Summary of Finances--Jan. 1, 1939 to Dec. 31, 1940.

	Legislative Appropriation	1939-1940 Expenditures	Balance (Est.) Dec. 31, 1940
Salaries and Wages	$ 59,960.00	$ 56,041.86	$ 3,918.14
G. O. M. Expenses	17,760.00	17,759.43	.57
Capital Outlays	1,780.00	1,746.68	33.32
Special Requests			
State Geological Survey	5,000.00	5,000.00	---
Cooperation with U.S.G.S.	4,000.00	4,000.00	---
Investigation of Salt Deposits	1,000.00	75.00	925.00
	10,000.00	9,075.00	925.00
	89,500.00	84,622.97	4,877.03

OREGON STATE DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES

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

Balance, January 1, 1939			$ 44.13
Receipts			
Sale of Department Publications		$ 1,502.17	
From A.I.M.E. for Notices sent out by Dept.		24.23	
Reimbursement for engineer's field expenses out of State		48.75	
Refund Check, San Francisco-World's Fair Com.		300.00	
Funds from Baker people for expenses of attendant at mineral exhibit at San Francisco Fair	$550.00		
Less amounts returned	24.19	525.81	
From Governor's Research Fund toward reimbursement of Dept. for somewhat greater amount expended out of Salaries and Wages and G.O.M. on sand and concentrate work near Marshfield		300.00	
From D. Ford McCormick, reimbursement for thin section work of outside party arranged for and paid for by Department		10.00	
From W. J. Seufert toward expenses of Department Metallurgist		25.00	
From City of Pendleton toward gasoline expenses on geologic work done for municipality		9.41	
			2,745.37
			2.789.50
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			2,720.04
Estimated Balance, December 31, 1940			69.46

OREGON STATE DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES

Expenditures, Jan. 1, 1939 to Dec. 31, 1940 (Dec. 1940 estimated)

	1939		
Salaries and Wages	$ 28,489.41		$ 28,489.41
G.O.M. Expenses		G.M.I.*	
Office Rent	2,320.50	-	2,320.50
Office Sup. and Main.of Off.Equip.	546.53	34.57	581.10
Telephone and Telegraph	262.79	13.35	276.14
Postage and Express	442.99	-	442.99
Printing of Publications	1,240.69	180.58	1,421.27
Bonds and Insurance Premiums	45.00	-	45.00
Workmen's Compensation Payments	--	-	-
Restoration Fund Assessment	21.56	-	21.56
Auditing Service	--	-	-
Private Car Mileage	202.36	25.00	227.36
Fares, Railroad and Stage	90.36	-	90.36
Meals and Lodging	913.80	-	913.80
Gasoline and Oil	737.77	-	737.77
Auto Expense, Repairs, Storage	596.56	-	596.56
Auto Insurance	83.10	-	83.10
Fuel,Light,Power,Water,Laundry,Elec.Supp.	343.45	33.71	377.16
Laboratory Supplies and Ore Analysis	659.35	-	659.35
Maintenance of Laboratory Equipment	75.97	-	75.97
Laboratory Equipment	78.67	-	78.67
Newspapers, Periodicals, Maps, Blueprints	156.65	50.00	206.65
Laboratory Building Repairs and Fixtures	108.70	-	108.70
Photographic Supplies	191.39	-	191.39
Office Equipment Rentals	44.00	10.00	54.00
San Francisco Fair Mineral Exhibit	-	-	-
Moving of Portland Office	-	-	-
	9,162.19	347.21	9,509.40
Capital Outlays			
Office Furniture and Equipment	309.24	51.16	360.40
Laboratory and Field Equipment	322.46	-	322.46
Vehicles and Equipment	401.37	-	401.37
Photographic Equipment	10.00	-	10.00
Books	5.00	5.25	10.25
	1,048.07	56.41	1,104.48
Special Requests			
State Geological Survey			
Salaries and Wages	1,137.09		1,137.09
Travel Expenses	180.27		180.27
Other Expenses	1,458.76		1,458.76
	2,776.12		2,776.12
U. S. Geological Survey	792.11		792.11
Investigation of Salt Deposits	75.00		75.00
	3,643.23		3,643.23
TOTAL EXPENDITURES	$ 42,342.90	$ 403.62	$ 42,746.52

* These items were paid out of Geology and Mineral Industries Account (see preceding page)

1940			Biennium		
27,552.45		27,552.45	56,041.86		56,041.86
	G.M.I.			G.M.I.	
1,520.00	850.00	2,370.00	3,840.50	850.00	4,690.50
505.01	16.07	521.08	1,051.54	50.64	1,102.18
258.37	23.38	281.75	521.16	36.73	557.89
679.82	.83	680.65	1,122.81	.83	1,123.64
1,128.40	334.70	1,463.10	2.369.09	515.28	2,884.37
-	30.00	30.00	45.00	30.00	75.00
137.55	15.81	153.36	137.55	15.81	153.36
18.29	-	18.29	39.85	-	39.85
125.56	-	125.56	125.56	-	125.56
70.76	-	70.76	273.12	25.00	298.12
152.70	233.91	386.61	243.06	233.91	476.97
768.75	151.00	919.75	1,682.55	151.00	1,833.55
730.39	9.41	739.80	1,468.16	9.41	1,477.57
565.81	16.02	581.83	1,162.37	16.02	1,178.39
48.32	-	48.32	131.42	-	131.42
445.06	19.89	464.95	788.51	53.60	842.11
862.30	13.68	875.98	1,521.65	13.68	1,535.33
20.00	-	20.00	95.97	-	95.97
-	-	-	78.67	-	78.67
130.40	13.08	143.48	287.05	63.08	350.13
161.84	-	161.84	270.54	-	270.54
61.26	10.00	71.26	252.65	10.00	262.65
52.50	15.00	67.50	96.50	25.00	121.50
95.97	563.64	659.61	95.97	563.64	659.61
58.18	-	58.18	58.18	-	58.18
8,597.24	2,316.42	10,913.66	17,759.43	2,663.63	20,423.06
296.75		296.75	605.99	51.16	657.15
378.37		378.37	700.83		700.83
11.84		11.84	413.21		413.21
-		-	10.00		10.00
11.65		11.65	16.65	5.25	21.90
698.61		698.61	1,746.68	56.41	1,803.09
1,249.03		1,249.03	2,386.12		2,386.12
105.64		105.64	285.91		285.91
869.21		869.21	2,327.97		2,327.97
2,223.88		2,223.88	5,000.00		5,000.00
3,207.89		3,207.89	4,000.00		4,000.00
-		-	75.00		75.00
5,431.77		5,431.77	9,075.00		9,075.00
42,280.07	2,316.42	44,596.49	84,622.97	2,720.04	87,343.01

OREGON STATE DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES

Statement of Compensation and Expenses of Employees
January 1, 1939 to December 31, 1940.

		Compensation	Travel Expenses
Present Staff and Employees (13)			
Earl K. Nixon	Director	$ 7,382.11	$ 867.24
F. W. Libbey	Mining Engineer	6,003.56	151.30
John Eliot Allen	Geologist	5,152.69	485.17
James A. Adams	Metallurgical Chemist	285.00	26.00
Ray C. Treasher	Field Geologist	6,090.00	270.76
Hugh K. Lancaster	Field Engineer	2,470.83	102.46
Albert A. Lewis	Assayer	4,590.00	
Leslie C. Richards	Assayer	891.94	
Wessley Paulsen	Geologist	250.00	2.25
Ruth Van Meter	Secretary	2,910.00	
Helen Kluge	Bookkeeper	2,095.00	
Agatha Cook	Stenographer	796.61	
F. A. Steeble	Multigraph Operator	2,880.00	
*Leslie L. Motz	Metallurgical Chemist	4,322.42	162.34
*Maurice Brady	Office Assistant	400.81	
*A. M. Swartley	Mining Engineer	2,385.00	
*H. E. Crain	Bookkeeper	540.00	
*J. E. Morrison	Field Geologist	2,362.50	175.90
*H. B. Wood	Geologist	393.55	21.24
*Wayne R. Lowell	Geologist	1,627.10	217.98
J. B. Chamberlain	Assayer	56.99	
*Wm. T. Burns	Assayer	647.50	
Helen Patton	Stenographer	307.35	
Bertha B. Howe	Stenographer	25.20	
Mrs. J. E. Morrison	Stenographer	48.00	
Mary McAdam	Stenographer	14.40	
Donna Jenkins	Stenographer	69.00	
Virginia Norgren	Stenographer	29.00	
Margaret Fretwell	Stenographer	18.63	
Nellie Anderson	Stenographer	12.13	
Lillian Graham	Stenographer	3.60	
Francis Gillespie	Stenographer	7.75	
Jeanne Ramsey	Stenographer	16.80	
Evelyn Brund	Stenographer	45.20	
Nora Kluge	Stenographer	3.50	
June Roberts	Stenographer	45.00	
K. N. deBrauwere	Draftsman	17.80	
Al Mortenson	Draftsman	2.00	
Horace Burritt	Draftsman	4.25	
A. L. Morris	Draftsman	10.00	
Victor Nelson	Draftsman	25.25	
F. J. Beers	Draftsman	20.80	

		Compensation	Travel Expenses
Retlaw Haynes	Draftsman	$ 75.00	$
J. W. Deemy	Marshfield Survey	300.50	
Esther Holmes	Research Worker	149.19	
Wm. Leever	Geologist	90.00	
Claire Holdredge	Non-metallic Survey	500.00	
**Ford Young	Geologist	260.00	
**Herbert Harper	Geologist	429.08	
**W. D. Wilkinson	Geologist	705.63	
**Murl Hutchinson	Geologist	129.52	
**Wallace Lowry	Geologist	249.20	
**Eldon Gilbert	Geologist	65.81	
**W. D. Smith	Geologist	80.91	
**Robert Littleton	Geologist	33.87	
**Richard Meade	Geologist	50.00	
**Stewart Jones	Geologist	50.00	
	Salaries & Wages	$ 56,041.86	
	G.O.M.		1,850.77
	G.& M.I.		345.96
	State Geol.Survey	2,386.12	285.91
		$ 58,427.98	2,482.64

* Persons who were on staff or were regular employees, for some portion of the biennium.

** State Geological Survey Employees.

STATE DEPARTMENT OF GEOLOGY & MINERAL INDUSTRIES
Head Office: 702 Woodlark Bldg., Portland, Oregon.

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State Governing Board:
W. H. Strayer, Chairman, Baker
Albert Burch, Medford
E. B. MacNaughton, Portland

Earl K. Nixon — Director
F. W. Libbey — Mining Engineer
John Eliot Allen — Geologist
James A. Adams — Metallurgical Chemist

****

State Assay Laboratories

400 E. I Street, Grants Pass
Ray C. Treasher, Field Geologist
Albert A. Lewis, Assayer

2102 Court Street, Baker
Hugh K. Lancaster, Field Engineer
Leslie C. Richards, Assayer

****

Publications

BULLETIN		Price
1	Mining Laws of Oregon, 1937, with 1939 Addenda	$0.10
2	Progress Report on Coos Bay Coal Field: F. W. Libbey	0.10
3	The Geology of Part of the Wallowa Mountains: C. P. Ross	0.50
4	Quicksilver in Oregon: C. N. Schuette	1.15
5	Geological Report on Part of the Clarno Basin: Donald K. Mackay	0.25
6	Preliminary Report on Some of the Refractory Clays of Western Oregon: Hewitt Wilson and Ray C. Treasher	0.45
7	The Gem Minerals of Oregon: 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: John Eliot Allen	0.50
10	Placer Mining on the Rogue River, Oregon, in Relation to Fish and Fishing in that Stream: Henry Baldwin Ward	0.35
11	Geology & Mineral Resources of Lane County, Oregon: Warren D. Smith	0.50
12	Geological Reconnaissance of the Central Part of the Wallowa Mountains, Oregon: W. D. Smith and staff (in preparation)	
	Geological Map in 4 colors to accompany Bulletin 12	0.20
13	First Biennial Report of State Department of Geology & Mineral Industries, 1937-1938	(out of print)
14-A	Oregon Metal Mines Handbook: Northeastern Oregon, East Half: by the staff	0.50
14-C	Oregon Metal Mines Handbook: Southwestern Oregon, Coos, Curry and Douglas Counties: by the staff	0.50
	(Bulletins nos. 14-B, D, and E in preparation)	
15	Geology of the Salem Hills and North Santiam River Basin, Oregon: Thomas P. Thayer	0.65
16	Field Identification of Minerals for Oregon Prospectors and Collectors: compiled by Ray C. Treasher	0.50
17	Primer of Geology and Guide to Prospecting: Earl K. Nixon (in preparation)	
18	First Aid to Fossils, or What to Do Before the Paleontologist Comes: John Eliot Allen	0.20
19	Dredging of Farmland in Oregon: F. W. Libbey	0.40
20	Analyses and Other Properties of Oregon Coals: H.F.Yancey & M.R.Geer	0.35
G.M.I. SHORT PAPERS		
1	Preliminary Report upon Oregon Saline Lakes: O. F. Stafford	$0.10
2	Industrial Aluminum: A Brief Survey: Leslie L. Motz	0.10
3	Advance Report on Some Quicksilver Prospects in Butte Falls Quadrangle, Oregon: W. D. Wilkinson	0.10
4	Flotation of Oregon Limestone: J. B. Clemmer and B. H. Clemmons	0.10
MISCELLANEOUS PUBLICATIONS		
	The Ore.-Bin: staff, issued monthly, as a medium for news items about the Department, mines and minerals — Subscription price per year	$0.25
	Sampling of Small Prospects and New Discoveries	Free
	Geologic Map of Medford Quadrangle	0.40
	Geologic Map & Geology of Round Mountain Quadrangle: W. D. Wilkinson	0.25
	Oregon Mineral Localities Map	0.05
	List of Mines in Oregon	(out of print)