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The Ore Bin



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DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES

● The Ore Bin ●

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DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES

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OREGON'S MINERAL INDUSTRY IN 1962

By

Ralph S. Mason*

Despite severe economic stresses suffered by many segments of the national economy during the year, Oregon's mineral industry maintained its stabilizing role of nearly uniform monthly payrolls in sharp contrast to the largely seasonal agricultural, logging, and tourist industries. Total value of minerals mined in the state will not be known for several months, but preliminary estimates indicate activity during the past year at about the same level as in 1961. A growing awareness of the importance of mineral raw materials to the local economy has resulted in the instituting by several county planning commissions of surveys to identify existing and potential deposits, particularly of sand and gravel, and to take steps toward their protection from urbanization until they can be utilized to their fullest extent. A growing complex of exotic metals producers, fabricators, and research testing facilities further bolstered local and state economies with rock-solid payrolls. The recent discovery in Oregon of large quantities of a mineral which has possible use in absorbing atomic wastes aroused much interest, despite the lack of any markets at present or in the near future.

Metals

Copper

Survey of the state's copper resources was continued by the department, which started the long-term project 3 years ago. Ultra-sensitive geochemical techniques capable of detecting 2 parts of copper per million in surface soils are being employed as an aid in determining possible hidden deposits. Copper contained in base metal ores was the only red metal produced during the year.

Gold and silver

The Oregon King Consolidated Mines, Inc., reopened the Oregon

*Mining Engineer, State of Oregon Dept. Geology & Mineral Industries

King mine in Crook County following publication of a report by the department, marking the first time in many years that any ore has been mined in the state principally for its silver content. The company has been sampling and reconditioning the old workings. Emerald Empire Mines completed 1,450 feet of tunnel near the Musick mine under a contract with the Office of Minerals Exploration. Upon completion of this work, Emerald continued 212 feet farther before ceasing work. Exploration was also conducted underground on the 600 level of the Musick, the 700 of the Helena, and the 900 and 1,200 of the Champion. All of the mines are located in close proximity in the Bohemia Mining District of Lane County. The Buffalominer in Grant County continued development of its low-level tunnel started 4 years ago. Production of gold in the state reached an all-time low with most of the metal coming from numerous small seasonal placer operations. The accompanying graph shows Oregon gold production during the past 25 years.

Uranium

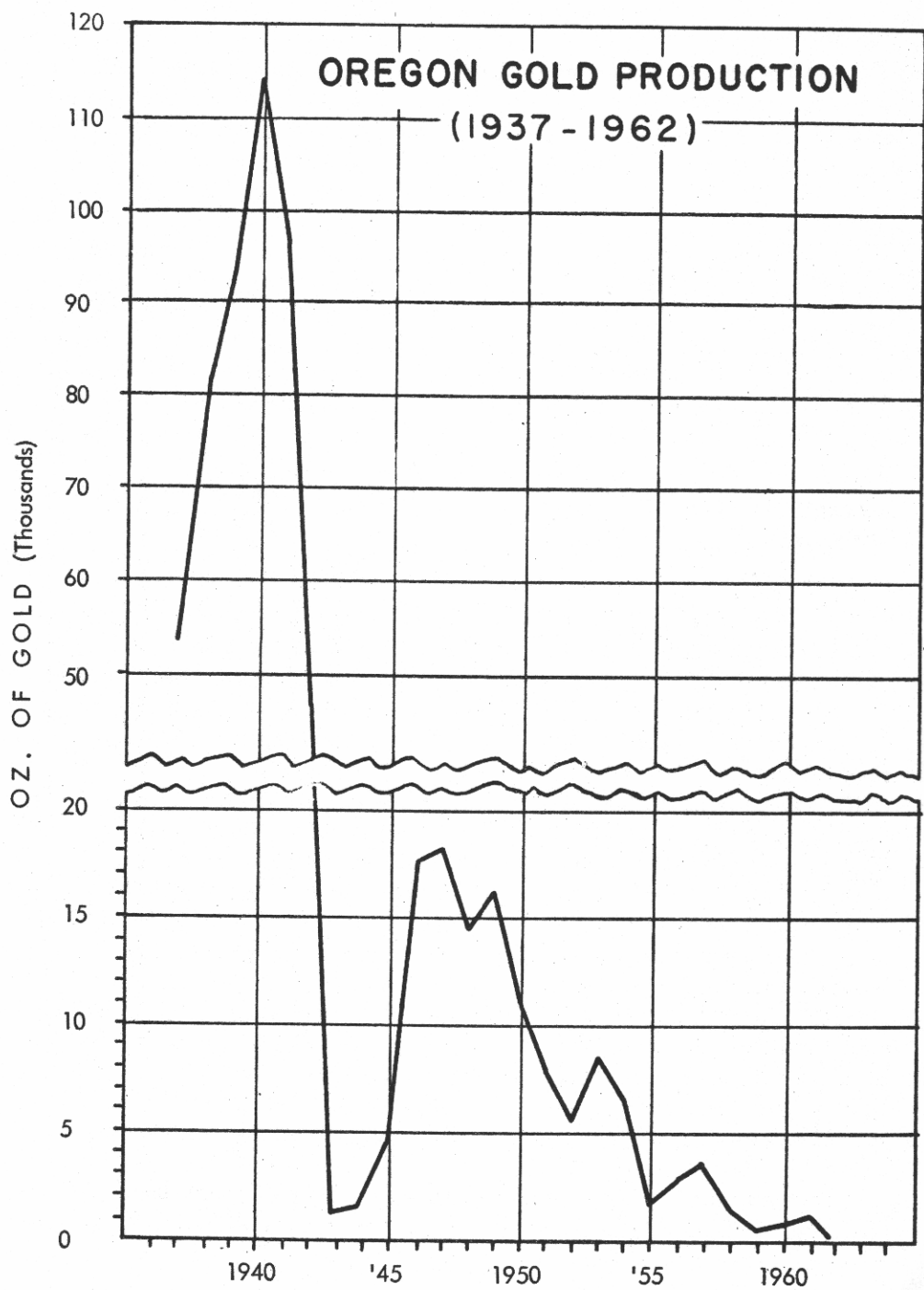
Eight carloads of uranium ore were shipped from the Lucky Lass mine in Lake County by Don Lindsey and associates. The ore came from a development pit being dug to reach some high-grade material located by drilling last year. Shipments went to Vitro Chemical in Salt Lake City. The White King mine, a short distance from the Lucky Lass, was operated by Vance Thornburg, who reopened the old No. 1 shaft and kept the large open pit pumped out. No shipments of ore were made during the year.

Ferruginous bauxite

Exploration of the ferruginous bauxite deposits in northwestern Oregon by a large aluminum company continued during the year. The scale of operations was small, however, and consisted largely of shallow drilling and sampling.

Quicksilver

The only mercury producer in the state was the Angel Peak mine in Lake County, operated by Vance Thornburg, who retorted a few flasks, the second lowest amount produced in the state since 1926. At year's end the department was compiling an extensive report on the state's quicksilver resources. Notice of publication of this bulletin will be announced in The ORE BIN. The Office of Minerals Exploration signed a contract during the year with Pacific Minerals & Chemical Co. to explore the Mother Lode, Cobar, and Lookout Mountain claim groups in Crook County.



Chromite

The department published an extensive and detailed report, "Chromite in Southwestern Oregon," early in the year. The bulletin contains reports on the numerous mines in this part of the state and discusses the formation of the various types of ore bodies.

Exotic metals

Although constantly changing technologies kept exotic metals producers and fabricators on the jump in 1962, the community of space-age metals specialists continued to develop. In the Albany area, facilities operated by the U.S. Bureau of Mines, Wah Chang Corp., Oregon Metallurgical Corp., and Northwest Industries, Inc., either produced or fabricated a wide range of metals and alloys. Included in the list are molybdenum, tungsten, columbium, tantalum, zirconium, hafnium, and vanadium. In the Beaverton area several research and testing laboratories designed to serve the "new" metals industry have become established recently. It is interesting to note that this entire industry uses not one pound of Oregon-produced ore.

Electroprocess industries

Hanna Nickel Smelting Co. operated its smelter at Riddle continuously throughout the year, treating slightly over one million tons of raw ore from the Hanna Mining Co. openpit mine nearby. The mine and smelter employ 440 men. Total payroll in 1962 was over \$3,000,000. In addition, the company purchased nearly \$1,300,000 of electrical energy and \$1,000,000 worth of local supplies. Hanna's Riddle smelter has the distinction of having the world's largest ferrosilicon furnace. The alloy is used as an intermediate product in the reduction of the nickel ore to ferronickel. The ferronickel contains 53 percent nickel and is sold to some 30 consuming steel companies. Several shipments were made to European customers.

National Metallurgical Corp. continued to produce elemental silicon at its plant at Springfield. High-purity quartz for the process was obtained from Nevada and the Bristol Silica Co. quarry in Jackson County, Oregon. National's parent company, Apex Smelting, merged with American Metals Climax and Kawneer late in the year. Two carbide manufacturers in the Portland area, Electrometallurgical Corp. and Pacific Carbide & Alloys, were in continuous operation during the year. One plant used burnt lime from the Chemical Lime plant near Baker and the other shipped in limestone from Texada Island, British Columbia.

Primary aluminum was produced continuously at the Reynolds Aluminum Co. plant at Troutdale and the Harvey Aluminum plant at The Dalles. Harvey installed automated equipment to handle metal and materials. The plant

Some of Oregon's Minerals at a Glance
Preliminary figures for 1962
(in thousands of dollars)

	<u>1961</u>	<u>1962</u>
Clays	\$ 357	\$ 315
Gold	37	11
Sand and gravel	13,680	12,318
Stone	21,202	21,000
Misc.*	15,557	16,795
Estimated total	51,730	49,091

*Asbestos, cement, copper, gem stones, lead (1961), iron ore, lime, mercury, nickel, pumice, uranium ore.

produced approximately 80,000 tons of metal during the year.

Industrial Minerals

Pyroprocess Industries

Production of Portland cement continued at the three plants located in the state, but preliminary estimates by the U.S. Bureau of Mines indicate that total volume produced in 1962 will be slightly less than that of the preceding year. First shipment of limestone from Texada Island, B. C., to the Oregon Portland Cement Co. plant at Oswego arrived in a 10,000-ton barge late in the year. Previously OPC used limestone quarried in a company-owned plant

located at Lime in Baker County. The new limestone movement will increase Port of Portland's annual tonnage figures by about 500,000 tons. The two barges that will be used are the world's largest deck cargo carriers.

Expanded shale was bloated at both the Smithwick Concrete Products Co. and the Empire Building Materials plants. Both are located in northern Washington County, where large deposits of Keasey shale are readily accessible. Empire supplied expanded shale to Oregon Portland Cement Co. for use as a pozzolan material in the cement for the John Day dam on the Columbia River.

Oregon's oldest manufacturing industry - brick and tile - continued at about the same pace that it has for many years. Twenty plants are operating, most of them in western Oregon.

At its plant in Portland, Supreme Perlite Co. expanded raw perlite imported from out of state. A. M. Matlock opened a perlite deposit 10 miles south of Paisley in Lake County and announced plans to erect a crushing and screening plant at the quarry. The perlite is said to expand to a product weighing less than 6 pounds per cubic foot. Vermiculite-Northwest continued to exfoliate raw material imported from Libby, Montana, at its

Portland plant.

Natural lightweight aggregates

Production of pumice, scoria, and volcanic cinders was at about the same pace as in previous years. Two companies in the Bend area of central Oregon produced carefully sized and blended pumice and cinder aggregate for concrete block and monolithic purposes. Large quantities of cinders and scoria were also used for county and state road construction.

Silica

Two silica producers, Bristol Silica Co. in Jackson County, active for over 25 years, and Silica Product Co. of Roseburg, less than a year old, supplied all of the silica produced in the state in 1962. In addition to metallurgical and petrochemical processing uses, Bristol developed markets for its pure white quartz in ornamental building block, built-up roofs, and similar applications. Silica Product shipped test lots of its Quartz Mountain rock to Hanna Nickel Smelting Co. at Riddle.

Limestone

Big news in limestone circles in Oregon in 1962 came from two sources. Large-scale shipments of stone from Texada Island, British Columbia, to the Oregon Portland Cement plant at Oswego in Clackamas County began in September, apparently ending a trans-state haul by rail from Lime in Baker County which has been going on for many years. Ash Grove Lime & Portland Cement Co. of Kansas City, Missouri, one of the oldest manufacturers of lime in the United States, announced plans to build a multimillion-dollar plant on the outskirts of Portland, construction to start in early 1963. Raw stone for the plant is also to come from Texada. Production of burnt lime by the Chemical Lime Co. of Baker increased over the previous year. Limestone is also burned by Pacific Carbide & Alloys Co. in Portland and by the Amalgamated Sugar Co. at Nyssa in Malheur County.

Building stone

Production of building stone continued in about the same volume and manner as last year. The industry is characterized by numerous small operations and no really large ones. The various volcanic tuffs which abound in many parts of the state form the basis for most of the stone produced.

Sand and gravel

Swings in the general business level of an area are accurately recorded by the cash registers of the state's many sand and gravel producers. No

major construction can be accomplished without these products, and the awareness of this fact has resulted in steps being taken by several county planning commissions to protect potentially valuable deposits against inroads of civilization which might render them unusable. In certain communities in the eastern part of the nation a complete program, including identification of deposits, adequate zoning to protect mutually the deposit and the public, programmed exploitation, and eventual conversion to other uses such as parks and housing developments is already in effect.

Asbestos

Coast Asbestos Co. operated a quarry and beneficiation plant a few miles north of Mount Vernon in Grant County. Chrysotile asbestos was rough-finished and shipped to southern California for further processing.

Bentonite

A gray clay from Crook County was mixed with a bright red dye and used to keep northwest forests green during the past year. Central Oregon Bentonite Co. produced bentonitic clay from a quarry in the Camp Creek area which, when mixed with rhodamine dye and added to large quantities of water, produced a slurry used by the Forest Service to "bomb" range and forest fires.

Plans to erect a bentonite processing plant at Bend were announced during the year by Anderson Mining & Development Co., with completion scheduled for the spring of 1963.

Clinoptilolite

A mineral new to industry appeared on the scene during the latter part of the year. Clinoptilolite, a member of the zeolite family occurring in a tuff member in the middle of the John Day Formation, has the ability to capture radioactive Cesium-137 from atomic wastes, but cannot be readily identified, and has no present value or market. A report on clinoptilolite appeared in the December 1962 ORE BIN.

Diatomite

A. M. Matlock of Eugene opened up a large pit of diatomite in Christmas Valley in northern Lake County and will install a processing plant at Silver Lake. Previously the crude ore was trucked to the Willamette Valley for treatment before being sold for poultry litter, sweeping compound, and other uses.

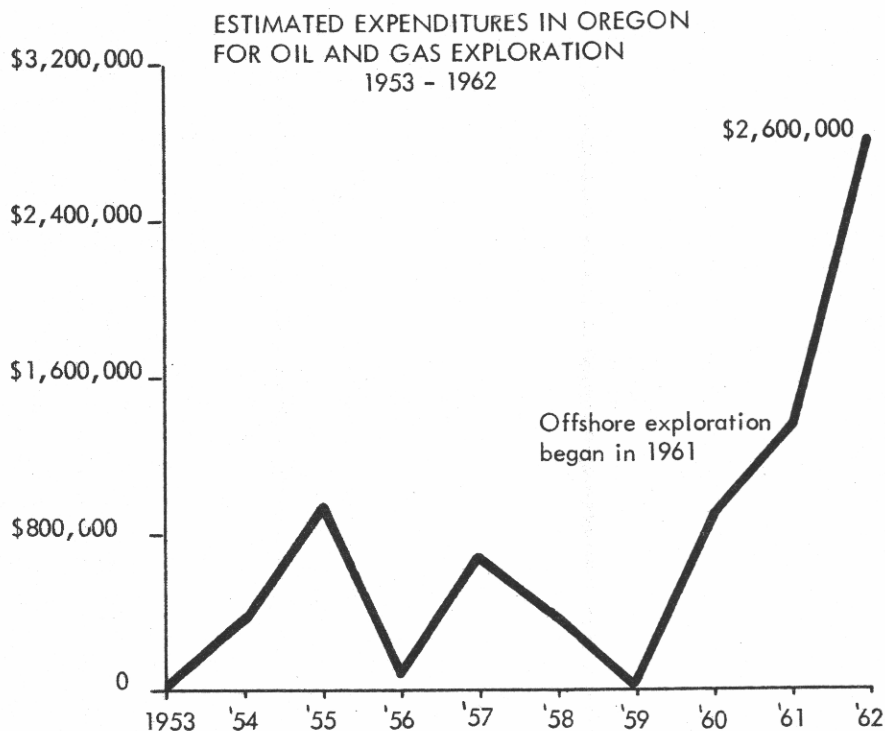
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OIL AND GAS EXPLORATION IN 1962

By

Vernon C. Newton, Jr.*

Offshore seismic work and drilling in the Willamette Valley of western Oregon pushed exploration expenditures to nearly \$3 million in 1962 (see graph). The department issued six drilling permits for oil and gas tests this year, three to large firms and three to independent "wildcatters." Footage drilled in the 12-month period totalled 23,335 feet.



*Petroleum Engineer, Oregon Dept. Geology & Mineral Industries

The year completed the 60th anniversary of oil exploration in the state. According to the department's records, 168 oil and gas tests have been drilled in Oregon to date, but unfortunately no commercial deposits of petroleum have been found in that time. Small amounts of natural gas, however, were utilized for domestic purposes in various areas of the state in the past, and a few farms still use locally produced gas for heating. Besides the 168 oil and gas drillings made thus far, exploration companies have drilled 46 core holes and several hundred stratigraphic holes for near-surface geologic information.

Willamette Valley

Drilling activity was concentrated in the Willamette Valley during 1962, following 8 months of competitive leasing. The Humble and Gulf Oil companies began leasing in the valley in October 1961. In 1962 several other firms joined the leasing when they realized the play was of some magnitude. Gulf appeared to be concentrating efforts at the southern end of the valley, while Humble assembled leases in the Salem and Silverton areas.

Reserve Oil & Gas Co. of San Francisco was the first organization to drill in the Willamette Valley last year. The company operated on leases held by the Linn County Oil Development Co. under a farmout arrangement. In May, when Reserve began its drilling, an estimated one million acres were under lease by various companies. Operations were halted on the Reserve well in September pending a decision by management to drill ahead or abandon.

In midsummer Humble moved in a massive rig to drill a deep test about 6 miles east of Silverton. After abandoning this hole, the equipment was moved to a location 6 miles north of Albany and a second hole drilled. This also proved to be a dry test. The company was reported to be dropping leases in the area as renewal dates were reached. Gulf did not drill on its acreage in 1962, but apparently was still interested in the valley prospects.

Local interest continued in the vicinity of Ash Creek south of Dallas in Polk County. John Miller & Associates drilled two shallow test holes but failed to find production. Sixteen shallow wells have been drilled in this area in search of oil and gas during the past 40 or 50 years. Gas shows encountered in salt-water sands and films of oil seen on water bailed from a few of the drillings have stirred hope of finding commercial deposits.

Coos County

E. W. McDowell of San Antonio, Texas, assembled a 20,000-acre block of oil and gas leases near Coquille in Coos County during the summer

months. McDowell was reported to be representing an independent Texas group. No drilling had been done on the lease block by the end of December 1962.

Some leasing was done in northern Coos County but nothing significant developed. An application by Willard Farnham of Portland for oil leases on 80,000 acres of Elliott State Forest land was approved by the State Land Board in June. The application had been held in abeyance pending revision of the state lease form. Farnham did not complete negotiations for the Elliott Forest lands after the application was approved.

Northwest counties

Superior Oil Co. leased an estimated 60,000 acres in Columbia, Washington, and Yamhill Counties of northwestern Oregon during the year. The company was probably attracted to the area by the recent publishing of the state geologic map of western Oregon and by studies made by Texaco and Richfield Oil Corp. just after World War II. Wells drilled by these two firms encountered porous sands in upper Eocene marine sediments. Tests proved the sands to be wet in the early drillings.

Central and eastern Oregon

No activity occurred in central Oregon this past year. Northwestern Oils, Inc., was reported to be maintaining interest in the vicinity of Hay Creek, southeast of Madras. A well was drilled 20 miles southeast of Prineville in 1958 by Standard and Sunray in a joint venture. The latest drilling in central Oregon was done in 1960 by Humble near Lakeview, where two deep tests were made.

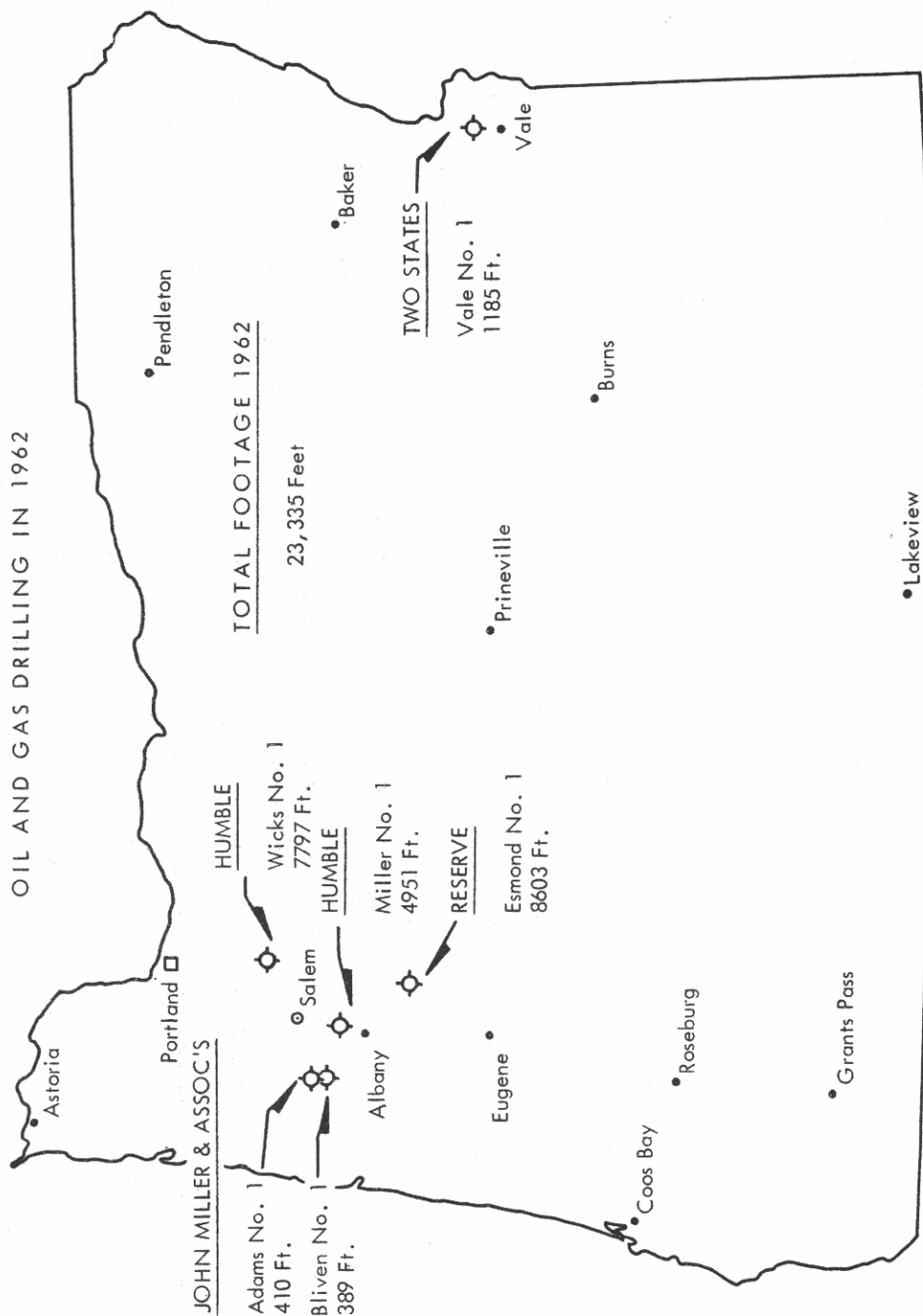
Two-State Oil & Gas Co. of Boise, Idaho, commenced operations in April on a shallow gas test at Vale in Malheur County. The company was reported to hold 50,000 acres of leases around the well site. The hole stopped short of the objective depth because of the company's commitments in Canada.

Offshore exploration

The search for oil structures continued off the Oregon coast in 1962 at a slightly increased pace over the previous year. Seismic, gravity, and magnetic studies were carried on in the coastal region of the state by at least 10 major companies. Expenditures are estimated to have exceeded \$1½ million.

No leases have been given on offshore state lands since passage of the Oregon submerged lands acts of 1961. Prior to that time one small lease was granted off the coast in Clatsop County in 1957. Donald F. McDonald

OIL AND GAS DRILLING IN 1962



applied for an offshore lease in Coos County in November 1962, but no action had been taken, at the time of this writing. Studies are currently being made by the department to determine leasing procedures used in other shoreline states. Oregon's 1961 law requires that leases on submerged lands be placed for competitive bid with a bonus being the biddable factor.

In October the U.S. Department of Interior sent preliminary lease maps of the Oregon coast to the Land Board and the Department of Geology and Mineral Industries for their inspection. The Federal government uses a 3-by-3-mile map grid on all its outer continental shelf lands for oil and gas leasing. The area covered in the Federal parceling system extends an average of 40 miles seaward from the Oregon coast line. Water depth ranges from 180 feet at the state boundary to 3,000 feet at the edge of the shelf lands.

EXPLORATION OFF THE OREGON COAST

<u>Company</u>	<u>Type survey</u>	<u>Exploration permit No.</u>	<u>Effective date</u>
Shell Oil Co.	Conventional seismic Sparker survey Bottom sampling	SL-2	12-31-62
Union Oil Co.	Gas exploder survey Bottom sampling	SL-3	7- 9-63
*Standard Oil Co.	Gas exploder survey	SL-4	8-31-63
Superior Oil Co.	Gravity survey	SL-5	10-15-63

*Standard Oil Co. was operator for Humble, Pan America, Ohio, Superior, Phillips, and Texaco oil companies under its permit from the State Land Board.

The State of Washington held three lease auctions in 1962 offering submerged state land. Texaco, Union, and Humble took leases on several thousand acres of submerged land in Washington, but the bulk of offshore leases went to the Superior Oil Co. for no more than minimum rental. Union drilled on its leases offshore at Grays Harbor in July and August but failed to reach any of its objectives, due to difficult operating conditions. The drilling was done from a floating barge, and large ground swells

prevented the company from finishing any of the 3 holes planned. The third attempt was abandoned when a severe storm threatened loss of the barge. Union will probably resume offshore operations next season, wiser from experience with the not-so-calm Pacific.

Exploration prospects for the Northwest

After drilling 6 holes in Oregon and 10 holes in Washington during the past year, oil prospectors did not discover a single barrel of oil or enough gas to warm a cooling interest. Cost of this year's probing is about \$5 million, perhaps more. Further exploration will be done in the Northwest only if an attractive economic climate exists and is accompanied by a valid hope for recovery of losses through discovery of new deposits.

Competition with other countries is forcing rigid economic practices within the domestic oil industry. Ability to obtain vast acreages of prospective land in foreign countries with merely the promise to spend specified sums in exploration is an attraction not found in this country. The risks of dealing with unstable governments are apparently considered worth taking. Oil produced overseas can be piped several hundred miles and then shipped to American ports for less than the cost of developing domestic oil.

During 1961 a total of 300,000 barrels of crude oil per day was imported into the five Far Western States of California, Arizona, Oregon, Washington, and Nevada. Exporters were: Middle East, 53 percent; Canada, 18 percent; South America, 16 percent; and the Far East, 13 percent ^{1/}. Declining production in California, main supplier for the Far Western States, is the reason for the unbalance in supply-demand. California's production dropped 2½ percent in 1962 despite an increase in number of wells drilled ^{2/}. Although there is presently an oversupply of oil on the world market, growth in the Far Eastern markets shows promise of partially relieving the current situation.

The Oregon legislature has attempted to create incentive for exploration by passage of oil and gas laws relieving industry of some burdens. The drilling of expensive, unnecessary wells because of stringent lease contracts is avoided. A race to "outdrill" competitors in order to "capture" oil from beneath adjoining leases is no longer necessary under new laws.

^{1/} Crude petroleum and petroleum products: U. S. Bur. Mines Annual Petroleum Statement, November 19, 1962.

^{2/} Preliminary Annual, The Mineral Industry in California in 1962: U.S. Bur. of Mines Area Rept. II-54, December 1962.

DRILLING PERMITS ISSUED IN 1962

Permit No.	Company	Well name	Location	Total Depth	Spud Date	Abandon Date
45	Two-State Oil & Gas Co., Inc.	Vale City No. 1	SW $\frac{1}{4}$ sec. 21, T. 18 S., R. 45 E. Malheur County	1185'	4-13-62	10-24-62
46	Reserve Oil & Gas Co.	Esmond No. 1	SW $\frac{1}{4}$ sec. 7, T. 12 S., R. 1 W. Linn County	8603'	5-25-62	9- 6-62 (suspended)
47	Humble Oil & Refining Co.	Wicks No. 1	NE $\frac{1}{4}$ sec. 11, T. 7 S., R. 1 E. Marion County	7797'	6-18-62	7-31-62
48	Humble Oil & Refining Co.	Miller No. 1	SE $\frac{1}{4}$ sec. 10, T. 10 S., R. 3 W. Linn County	4951'	8- 2-62	8-30-62
49	John T. Miller	Adams No. 1	SW $\frac{1}{4}$ sec. 11 T. 8 S., R. 5 W. Polk County	410'	9-14-62	9-24-62
50	John T. Miller, Ross Mitchell & Associates	Bliven No. 1	SW $\frac{1}{4}$ sec. 11 T. 8 S., R. 5 W. Polk County	389'	9-25-62	10- 2-62

Unit development of oil and gas fields is encouraged by the state so that unnecessary drilling will be eliminated and costs of production equipment shared among participating groups. Larger profits should result from application of these principles for all concerned. Low capital investment per barrel recovered will be the gain for the operator, while royalty holders receive returns over longer periods because fields will be produced longer.

Geologic conditions in several areas of Oregon are favorable for oil and gas accumulation, and if economic incentive remains more drilling will be done. In western Oregon there are at least 14,000 square miles of Tertiary sedimentary basin area, including accessible portions of the continental shelf. In central Oregon, the 6,000 square miles of prospective Mesozoic-Paleozoic marine sediments have been tested at only a few locations. The large, late Tertiary non-marine basins of southeastern Oregon have been tested by only a few deep holes, but several gas shows from relatively shallow horizons indicate that a commercial field may yet be found. Only 40 holes have been drilled deeper than 3,000 feet within the sedimentary basins of the state. Recent drilling has shed some light on geologic conditions of the basin areas, but it has also posed as many more. Further evaluation must be done by the drill.

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LAND WITHDRAWALS IN UMATILLA NATIONAL FOREST

According to a January notice from the Bureau of Land Management, the Department of Agriculture has filed application for the withdrawal of lands in the Umatilla National Forest. The total combined area of 828.25 acres, to be withdrawn from location and entry under the mining laws, is desired by the applicant for public outdoor recreation and fish habitat improvement.

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DEPARTMENT RELEASES NEW OIL PUBLICATION

A new oil publication entitled "Petroleum Exploration in Oregon" was released by the department this month. Reprints of recent articles from trade magazines and from The ORE BIN have been collected in Miscellaneous Paper 9, describing prospects in the onshore and offshore areas of the state. Price of the new publication was set at \$1.00.

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GEOLOGY OF THE MITCHELL BUTTE QUADRANGLE PUBLISHED

The second of the department's new Geological Map Series (G.M.S.-2) is now available. It is "Geology of the Mitchell Butte Quadrangle, Oregon" by R. E. Corcoran, R. A. Doak, P. W. Porter, F. I. Pritchett, and N.C. Privrasky. Work was begun in this area in the summer of 1952, when the authors were graduate students at the University of Oregon. Field mapping was completed by the senior author during succeeding seasons from 1953 through 1956 while a member of the State of Oregon Department of Geology and Mineral Industries staff.

The Mitchell Butte quadrangle is named after one of the prominent hills in the east-central portion of the area, which is underlain by massive, cemented sandstones and siltstones of the upper Miocene Deer Butte Formation. The quadrangle encompasses approximately 980 square miles along the northwestern edge of the Snake River Plain in southeastern Oregon. The multicolored map, accompanied by descriptive text, delimits 18 geologic units ranging in age from Miocene to Recent and includes igneous and non-marine sedimentary rocks. It may be purchased from the department's offices in Portland, Grants Pass, and Baker. The price is \$1.50.

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OREGON ACADEMY OF SCIENCE TO MEET

The 21st annual meeting of the Oregon Academy of Science will be held in Corvallis at Oregon State University on Saturday, February 23, 1963. The Geology-Geography Section, with Raymond Corcoran as chairman, will hold morning and afternoon sessions at 10:15 a.m. and 2:30 p.m. respectively. Twenty-two papers covering a broad range of subjects concerning onshore and offshore geology of Oregon as well as progress reports on geophysical investigations in the state will be presented.

Saturday evening Dr. V. C. McMath, Assistant Professor of Geology at the University of Oregon, will give an illustrated talk on the geology of the Alps. Dr. McMath was a member of the A.G.I. International Field Institute excursion to the Alps during the summer of 1962.

Those interested in obtaining a copy of the titles and abstracts of these papers may do so by writing to Dr. F. A. Gilfillan, Oregon Academy of Science, Oregon State University, Corvallis, Oregon.

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AVAILABLE PUBLICATIONS

(Please include remittance with order. Postage free. A complete list of publications will be mailed upon request.)

BULLETINS

8. Feasibility of steel plant in lower Columbia River area, rev., 1940: R.M. Miller	0.40
14. Oregon metal mines handbooks: by the staff	
C. Vol. II, Section 1, Josephine County, 1952 (2d ed.)	1.25
D. Northwestern Oregon, 1951	1.25
26. Soil: Its origin, destruction, preservation, 1944: W.H. Twenhofel	0.45
27. Geology and coal resources of Coos Bay quadrangle, 1944: Allen & Baldwin	1.00
33. Bibliography (1st supplement) of geology and mineral resources of Oregon,	
1947: J. E. Allen	1.00
36. (1st vol.) Five papers on Western Oregon Tertiary foraminifera, 1947:	
Cushman, Stewart, and Stewart	1.00
(2nd vol.) Two papers on Western Oregon and Washington Tertiary foraminifera, 1949: Cushman, Stewart, and Stewart; and one paper on mollusca and microfauna, Wildcat coast section, Humboldt County, Calif., 1949: Stewart and Stewart	1.25
37. Geology of the Albany quadrangle, Oregon, 1953: Ira S. Allison	0.75
40. Preliminary description, geology of the Kerby quadrangle, Oregon, 1949: Wells, Hotz, and Cater	0.85
41. Ground-water studies, Umatilla and Morrow Counties, 1949: Norman S. Wagner	1.25
44. Bibliography (2nd supplement) of geology and mineral resources of Oregon, 1953: M. L. Steere	1.00
45. Ninth biennial report of the Department, 1952-54	Free
46. Ferruginous bauxite deposits, Salem Hills, Marion County, Oregon, 1956: R. E. Corcoran and F. W. Libbey	1.25
49. Lode mines, central Granite Mining District, Grant County, Oregon, 1959: Geo. S. Koch, Jr.	1.00
51. Twelfth biennial report of the Department, 1958-60	Free
52. Chromite in southwestern Oregon, 1961: Len Ramp	3.50
53. Bibliography (3rd supplement) of the geology and mineral resources of Oregon, 1962: M. L. Steere and L. F. Owen	1.50

GEOLOGIC MAPS

Prelim. geologic map of Sumpter quadrangle, 1941: J.T. Pardee and others	0.40
Geologic map of the Portland area, 1942: Ray C. Treasher	0.25
Geologic map of the St. Helens quadrangle, 1945: Wilkinson, Lowry, & Baldwin	0.35
Geologic map of the Dallas quadrangle, Oregon, 1947: E. M. Baldwin	0.25
Geologic map of the Valsetz quadrangle, Oregon, 1947: E. M. Baldwin	0.25
Geologic map of Kerby quadrangle, Oregon, 1948: Wells, Hotz, and Cater	0.80
Geologic map of Albany quadrangle, Oregon, 1953: Ira S. Allison (also in Bull. 37)	0.50
Geologic map of Galice quadrangle, Oregon, 1953: F.G. Wells & G.W. Walker	1.00
Geologic map of Lebanon quadrangle, Oregon, 1956: Allison and Felts	0.75
Geologic map of Bend quadrangle, and reconnaissance geologic map of central portion, High Cascade Mountains, Oregon, 1957: Howel Williams	1.00
Geologic map of the Sparta quadrangle, Oregon, 1962: Harold J. Prostka	1.50
Geologic map, Mitchell Butte quadrangle, Oregon, 1962: R.E. Corcoran and others (In press)	
Geologic map of Oregon west of 121st meridian (over the counter)	2.00
folded in envelope, \$2.15; rolled in map tube \$2.50	

(Continued on back cover)

**Department of Oceanography
Oregon State University
Corvallis, Oregon**

State of Oregon
Department of Geology & Mineral Industries
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POSTMASTER: Return Requested

The Ore Bin

Available Publications, Continued:

SHORT PAPERS

2. Industrial aluminum, a brief survey, 1940: Leslie L. Motz	0.10
4. Flotation of Oregon limestone, 1940: J.B. Clemmer & B.H. Clemmons.	0.10
7. Geologic history of the Portland area, 1942: Ray C. Treasher	0.25
13. Antimony in Oregon, 1944: Norman S. Wagner	0.25
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