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OREGON'S MINERAL INDUSTRY IN 1964

By Ralph S. Mason*

Oregon mines and metallurgical plants continued to pump large quantities of primary wealth into the state's economy in 1964. Indications are that the value produced during the past year will probably equal that of the record-shattering total turned in for 1963. Soaring metal prices on world markets, particularly for mercury, saw the reopening of six cinnabar mines and activity at several antimony properties which have been idle for many years. Production of aggregate, which accounts for approximately two-thirds of the total value of all minerals produced in the state, was close to that of last year, in spite of a lessened demand by large federal construction projects. The disastrous Christmas-week floods across the state temporarily paralyzed nearly all of the sand and gravel producers, who suffered high losses to stocks and equipment. The need for aggregate and stone of all types for the coming year will probably set new records as the state rebuilds its highways, jetties, dikes, plants, homes, and bridges. Offshore oil and gas leases for federal and state lands lying off the Oregon coast were granted to major oil companies last fall. The action marks an important milestone in the state's long search for petroleum.

Metals

Mercury

A continuing imbalance in the international mercury supply and demand forced prices up to all-time highs in 1964. As a direct result, interest in several Oregon mercury properties developed and at year's end activity was reported at six mines. The Black Butte mine in southern Lane County, idle

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Some of Oregon's Minerals at a Glance
Preliminary Figures for 1964
(in thousands of dollars)

	1963	1964
Clays	$ 330	$ 275
Gold	63	22
Lime	1,835	2,115
Sand and Gravel	18,850	17,500
Stone	24,197	24,000
Misc.*	17,417	17,191
Estimated total	$62,692	$61,103

* Copper, diatomite, lead, mercury, nickel, pumice & volcanic cinder, silver, zinc, cement, iron ore.

for several years, was reactivated by the American Mercury Corp. early in December, with production scheduled for January. The Black Butte has had a history of intermittent production stretching back to 1890. The mine has produced 16,000 flasks of metal. Another important mercury producer, the Bretz mine in Malheur County, was reportedly being reopened late in the year. Production from the Bretz since it was discovered in 1917 has totalled about 14,000 flasks. The property has been idle recently.

At the Canyon Creek mercury prospect near Canyon City in Grant County, Lawrence Roba and Banday Sintay produced a small amount of quicksilver from development ore during the year. The property was scheduled for stepped-up exploration by a major mercury producer early in 1965. The War Eagle mine west of Shady Cove in northern Jackson County was leased by Dave Chase, who conducted an exploration and development program. The Red Cloud mine in the upper Cow Creek area of Douglas County was leased by W.F. Sexton of Grants Pass. Plans for stripping, concentrating, and retorting the ore to start about April 1 were announced.

Activity was also reported at the Bonita mine in the Meadows district of Jackson County and at the Palmer Creek prospect in the Upper Applegate district of the same county. A federal Office of Minerals Exploration contract with Pacific Minerals & Chemical Co. for exploration at the Mother Lode, Cobar, and Lookout Mountain groups in Crook County is in recess until June 1965. Total estimated cost of the cooperative project is $63,000.

Gold and silver

Production of gold from placer and hard rock operations declined appreciably from 1963 levels as did the recovery of silver, principally from underground operations. Active during the year were 18 seasonal placer mines and 10 hard-rock mines.

The Buffalo mine in eastern Grant County produced from the lower level driven several years ago. The ore was treated in a flotation mill at the

mine. Additional mill capacity was installed during the year. The mine is located in snow country and is virtually isolated during the winter months, but despite this handicap operations continue throughout the year.

At the Oregon King mine in the Ashwood district of Jefferson County, gold and silver were produced from development ore. Shipments to the smelter included both lump ore and flotation concentrates. Exploration was conducted under an O.M.E. loan with a total estimated cost of $55,150. Oregon King entered into an operating agreement with Ag. Boaz Inc. of Seattle, Washington. The new operators have installed additional mining equipment and have announced plans to drift east and west on the 400-foot level and to explore the side walls with long-hole drilling. Arthur J. Theis is president of Boaz and James P. Jackson, Jr. general superintendent.

Copper

Production of copper in Oregon came from two main sources, the Standard mine near Prairie City in Grant County and the Oregon King mine in Jefferson County. At the Standard, Jim Kinsella single-handedly mined, sorted, and shipped 60 tons of ore. Kinsella also saws wood and performs other work as time permits, which is pretty good for a man somewhat past 70 years of age. A small amount of by-product copper came from the Oregon King silver mine.

Nickel

The only nickel mine and smelter in the United States continued to produce at Riddle in Douglas County, where Hanna Mining Co. mined and its subsidiary, Hanna Nickel Smelting, refined slightly greater tonnages than in the previous year. With the installation of a natural gas line through the area, Hanna changed to the use of natural gas in its calciners and in the newly installed multiple-hearth roasters. The additional equipment will permit more efficient plant operation and will increase productive capacity. The Hanna operation has been in continuous production since July 1954, when the first garnierite ore was trammed down Nickel Mountain and smelted into pigs of ferro-nickel.

Antimony

Rising prices and increased demand for antimony encouraged activity at three Oregon mines. The Jay Bird mine in southern Jackson County was reopened by W.H. Holloway, who produced a small tonnage of development ore. The Coyote mine near Brogan, Malheur County, was scheduled for

some exploration work by George Wicklander of Pendleton after the first of the year. A.W. Brandenthaler of Baker reopened the Gray Eagle mine near Baker with a small crew. Both the Jay Bird and the Gray Eagle produced during World War II, when antimony was in critically short supply.

Exploration projects

The Bunker Hill Co. of Kellogg, Idaho, explored the black sands at the mouth of the Columbia River early in the year to determine whether iron ore of commercial size and grade could be mined and beneficiated. The company terminated its leases in May after considerable drilling and sampling revealed insufficient ore for its purposes. In the Bohemia district, Federal Resources Corp. of Salt Lake City leased a group of mining properties and inaugurated an exploration program of diamond drilling and tunnelling to develop reserves of the complex gold, silver, copper, lead, and zinc ore exposed in numerous shallow workings. In the Blue River district of Lane County, minor work was done at the Lucky Boy mine by a California mining group. A lead-zinc property in Linn County was drilled by an Idaho mining company.

Industrial Minerals

Lightweight aggregates and pozzolan

Production of natural lightweight aggregates in the state was concentrated, as it has been for many years, in the Bend area of central Oregon. Two operators, Boise-Cascade Pumice Co. and Central Oregon Pumice Co., quarried and processed volcanic cinders and pumice. The carefully blended aggregates are extensively used in concrete block manufacture and for a variety of loose-fill applications. A new industry for the state commenced operations near Shutler in Gilliam County, when Permanente Cement Co. began processing volcanic ash for use as a pozzolan in large, monolithic concrete dam construction. The bulk of the plant's production was being used in the John Day dam on the Columbia River and the Green Peter dam on Quartzville Creek in Linn County. When used to replace a part of the portland cement in concrete mixes, pozzolans reduce costs, decrease heat of hydration during the curing stage, and increase workability and resistance to aggressive waters.

Artificial lightweight aggregates were made from expansible shale calcined at two plants in northwestern Oregon. Empire Building Materials quarried and furnaced a deposit of Keasey shale at Sunset Tunnel in Washington County. Empire began construction of a pozzolan processing mill at

the plant site late in the year, with completion scheduled for May 1965. Finely ground, expanded shale has been used locally as a pozzolan for several years. Originally pozzolan was only substituted for a part of the cement in concrete mixes when large, monolithic masses of concrete were placed. The recent development of pumping techniques for placing smaller quantities of pre-mixed concrete has increased the demand for pozzolans, because they impart a greater workability to the mix. Thin-shell concrete forms, roof decks, and concretes for acid plants also use pozzolan in their mixes. Empire fabricated all of the concrete piling, caps, and beams for the Astoria bridge across the mouth of the Columbia River. The piles were four feet in diameter and from 90 to 112 feet in length. Although of hollow construction, they were jetted and then driven into place with a pile driver. Empire developed a novel technique of slip-forming the upper half of the piling, which was cast in a horizontal position. One of the most claustrophobic jobs in the state was held by the workman at the plant who had to crawl into each finished piling and remove the metal core. The 70,000- to 80,000-pound piles were trucked and barged from Portland to the bridge site.

A few miles south of Vernonia, Cloverleaf Mines, Inc., operated the old Smithwick expansible shale quarry and kiln under a lease-purchase agreement with the Vernonia Industrial Development Corp., a community development group which is seeking to firm up the area's economy by encouraging year-around mineral production.

Pacific Diatomite Corp. increased production of diatomite from its property near Silver Lake in Lake County, and trucked the raw material to Eugene for processing and packaging. Principal uses of the product are for kitten litter and for lining portable barbecues. The company also sold perlite from its quarry near Paisley in Lake County, and announced plans for erecting a plant at Eugene for the manufacture of sponge rock and insulation fill. At Riddle the Mining-Minerals Manufacturing Co. dried and screened material from the nearby Hanna Nickel Smelting Co. slag pile and marketed it as an abrasive for sandblasting. Most of their product was being used in shipyards in the San Francisco Bay area. Minor quantities of the slag were also used by the State Highway Department for sanding ice-covered roads. Test shipments of perlite from a property on Dooley Mountain in southern Baker County were made by Del Harmon to Supreme Perlite Co. in Portland.

The Department of Geology conducted expansibility tests on pumice samples from Deschutes County in central Oregon. The results indicated that some pumice has a capacity to develop a cellularity over and above that with which it was endowed by nature. Volume increase was greatest for fresh, commercial-grade pumice, with expansion ranging from 90 to 110 percent. A report on the project appeared in the April, 1964 ORE BIN.

A similar departmental project conducted during the year involved testing the expansibility of the volcanic ash near Arlington. It was found that volume increases of the order of 120 to 140 percent were possible when the ash was heated in a muffle furnace.

An occurrence of vermiculitized biotite near North Powder in northern Baker County was sampled and tested by the department. Although the vermiculite expanded sufficiently to make it economically interesting, the mineral was too thinly disseminated through a batholithic intrusive. Commercial crude vermiculite is currently imported into the state from Montana for expansion in Portland. A report on the department's study of the Baker County occurrence appeared in the October 1964 ORE BIN.

Silica

Bristol Silica Co. was the principal producer of metallurgical and other grades of quartz in the state. The plant, which was moved to its present location west of Gold Hill in Jackson County a year or so ago, suffered extensive damage to stockpiles and equipment during the Christmas flooding of the Rogue River. Small tonnages of silica were mined at Quartz Mountain east of Roseburg in Douglas County. Oregon dune sands were the subject of a study made by the U.S. Bureau of Mines at Albany. Tests indicated that the sands could be beneficiated sufficiently to make them suitable for clear container and amber grades of glass. Test results were published in the Bureau's Report of Investigations No. 6484.

Bentonite

Central Oregon Bentonite Co. produced crude bentonite from deposits on Camp Creek in eastern Crook County. The bentonite was sold for use in sealing stock ponds and irrigation ditches, in well-drilling muds, as a stock-feed binder, and as a carrier for insecticides in crop dusts.

Limestone

High-grade limestone was quarried at widely scattered points in the state. Chemical Lime Co. operated a quarry high up in the Elkhorns of Baker County and calcined the stone at its kilns near Baker. Oregon Portland Cement Co. quarried limestone near its kilns at Lime in Baker County and at a quarry near Dallas in Polk County. Ideal Cement Co. produced rock from Marble Mountain south of Wilderville in Josephine County. Harmony Limestone, Inc., a newcomer to the state, erected a mill in Illinois Valley, Josephine County, and opened up a quarry on a marble deposit near

ACTIVE MINES IN OREGON, 1964

Gold Placer

Mine	County
DeJanvier	Jackson
Cowie	Jackson
Sunset	Josephine
Joe Joe	Josephine
Leland	Josephine
Speaker	Josephine
Wolf Creek	Josephine
Bear	Josephine
Gold Nugget	Josephine
Aphir	Josephine
Brown	Josephine
Gold Bar	Josephine
Leopold	Josephine
Maloney	Josephine
Upper Hogum	Douglas
Tennessee Gulch	Douglas
Suksdorf and Anderson	Malheur
Winterville	Baker

Gold Load

Mine	County
Oregon King	Jefferson
Buffalo	Grant
Dark Canyon	Josephine
Snow Bird	Josephine
Greenback	Josephine
Fleming	Jackson
Little Arctic	Jackson
Warner	Jackson
Ashland	Jackson
Lucky Bart	Jackson

Nickel

Mine	County
Hanna Nickel Co.	Douglas

Antimony

Mine	County
Jay Bird Mine	Jackson
Gray Eagle Mine	Baker
Coyote Mine	Malheur

Copper

Mine	County
Standard	Grant
Oregon King	Jefferson

Mercury

Mine	County
Bonita	Jackson
Palmer Creek	Jackson
War Eagle	Jackson
Canyon Creek	Grant
Bretz	Malheur
Black Butte	Lane

Limestone and Lime

Mine	County
Chemical Lime Co.	Baker
Ideal Cement Co.	Josephine
Oregon Portland Cement Co.	Baker, Polk
Harmony Limestone, Inc.	Josephine

Silica

Mine	County
Big Quartz	Douglas
Bristol Silica Co.	Jackson

Bentonite

Mine	County
Central Oregon Bentonite	Crook

Building Stone

Mine	County
Moon Mesa	Baker
Rainbow Rock	Wasco
Willowdale	Jefferson
Red Rock	Deschutes
Cinder Hill	Deschutes
Kahneeta Stone	Wasco

Lightweight Aggregates, Pozzolan

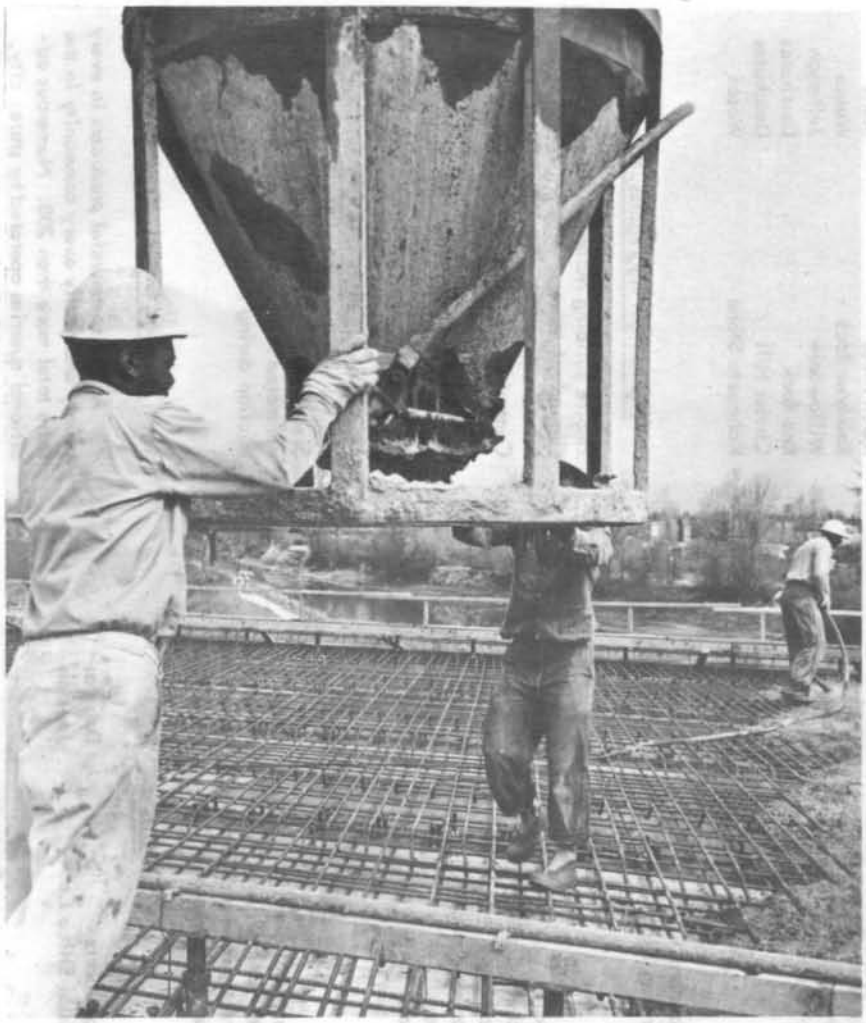
Mine	County
Empire Building Materials	Washington
Cloverleaf Mines	Washington
Permanente	Gilliam
Central Oregon Pumice	Deschutes
A. M. Matlock	Lake
Boise-Cascade Pumice	Deschutes

Brick and Tile

Sixteen brick and tile plants, largely concentrated in western Oregon, were in production during the year.

Sand and Gravel, Crushed Stone

Active commercial producers in every county and nearly every community in the state total more than 200. Numerous additional quarries operated by state, city, county, and federal agencies, and by logging companies using aggregate for private use.



Community growth is measured in buckets of concrete. Sand and gravel or crushed rock form the bulk of the concrete mix. They are rapidly becoming of critical importance in populous areas where demand is heavy and reserves are dwindling through depletion and spreading urbanization. (Photograph courtesy of Oregon Highway Department.)

the Oregon Caves National Monument. Products sold included agricultural stone and roofing granules. The plant suffered considerable flood damage in December. E. W. Morris is owner and operator of the quarry and mill.

Sand and gravel and stone

Slightly more than two-thirds of the total value of mineral and metallurgical products produced in Oregon in 1964 was represented by sand,

gravel, and stone. These basic mineral commodities were dredged or quarried at numerous points throughout the state and for the most part were used close to the point of origin. Some gravel, however, was barged 100 miles to riverside communities having no sources less than 20 miles distant by road. Steadily improving techniques in mining, beneficiation, and re-use of wash water were apparent at many of the operations. Greater over-all efficiencies enabled operators to resist inflationary price increases in their product, and at year's end the unit price for sand, gravel, and stone was fractionally lower than for the previous year. A century ago the symbol for the colonization of the northwest was the woodsman's axe. A little later it was the plow. Today in every growing community in the state progress in the form of new roads, dams, bridges, plants, and homes is symbolized by the gravel truck and the bucket of concrete.

Metallurgical Plants

Exotic metals

Oregon continued to maintain its position as an important space-age metals center during 1964. In the Albany area, the complex of research and production facilities included the U.S. Bureau of Mines Electrodevelopment Laboratory, Wah Chang Corp., Oregon Metallurgical Corp., and Northwest Industries, Inc. Wah Chang reported development and fabrication of tungsten-rhenium and tungsten-rhenium alloys, fabrication of titanium and titanium alloys, and the commercial production of high-strength columbium alloys. The company also processes several exotic metal ores into finished products. Oregon Metallurgical continued its production of titanium and zirconium castings. The firm reported increased demand for its various titanium products. Northwest Industries machined various reactive metals for use in high-temperature and severe-corrosion applications. Many of the metals are difficult to mill and dimensional tolerances, particularly for missile components, are of a high order.

Pyroprocess industries

What is probably the most modern lime plant in the world was fired up in the Rivergate district in Portland in April. Ashgrove Lime & Portland Cement Co. of Kansas City, Missouri, built the fully automated, gas-fired, twin-kiln facility at a cost of $3 million. Raw limestone is barged to the plant from Texada Island, British Columbia. Also operating in the Portland

Metallurgical Plants in Oregon

Pyroprocess Plants	Product	County
Ashgrove Lime & Portland Cement Co.	Lime	Multnomah
Chemical Lime Co.	Lime	Baker
Oregon Portland Cement Co.	Cement	Baker, Clackamas
Ideal Cement Co.	Cement	Jackson
Empire Building Materials Co.	Expanded shale	Washington
Cloverleaf Mines, Inc.	Expanded shale	Washington
Pacific Diatomite Corp.	Perlite	Lake
Supreme Perlite	Perlite	Multnomah
Vermiculite-Northwest	Vermiculite	Multnomah
Owens-Illinois	Glass	Multnomah

Electrometallurgical Plants	Product	County
Harvey Aluminum Co.	Aluminum	Wasco
Reynolds Metals Co.	Aluminum	Multnomah
Oregon Steel Mills	Steel	Multnomah
Hanna Nickel Smelting	Ferronickel	Douglas
National Metallurgical Corp.	Silicon	Lane
Pacific Carbide & Allows Co.	Carbide	Multnomah
The Electrometallurgical Co.	Ferroalloys, Carbide	Multnomah

area was the Oswego plant of Oregon Portland Cement Co., which similarly uses high-grade limestone imported from Canada. Oregon Portland also operated its cement plant at Lime, Baker County, using local stone. Ideal Cement at Gold Hill, Jackson County, used stone from Wilderville in Josephine County. Extensive damage to the company power plant located on the Rogue River occurred during the December flooding. Supreme Perlite and Vermiculite-Northwest, both located in Portland, imported raw perlite and vermiculite from out of state and expanded them. Approximately 20 brick and tile plants were active in the state during the year, as they have been for long periods extending back, in some instances, to the mid-1800's.

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OIL AND GAS EXPLORATION IN 1964

By V. C. Newton, Jr.*

Offshore Developments

Twelve companies, representing the bulk of the United States oil industry, spent nearly $41 million for offshore exploration in Oregon and Washington during 1964. Federal offshore leases amounted to $37.3 million, while seismic operations and geologic studies last summer totalled an estimated $3.4 million. Results of the bidding by 11 companies on shelf lands adjacent to Oregon and Washington indicate that this region is one of the industry's main hopes for uncovering a new oil province in the United States. Chances for finding production offshore appear to be great enough to overcome the difficult environmental features of deep water and inclement weather.

Returns from federal offshore leases are deposited in the U.S. Treasury, and no benefits accrue to the bordering state from these payments. Nevertheless, if oil is found on the outer continental shelf lands the adjacent state will gain from ancillary businesses generated onshore. It can be hoped, too, that once oil is found on federal shelf lands development will move shoreward to probe for oil entrapped by facies changes in the marine sediments.

The lease sale held by the State Land Board in December showed that interest in the near-shore prospects is very low at present. Of 18 tracts offered for lease by the Land Board, only two brought bids. The geology farther out apparently offers a greater thickness of Tertiary marine beds and less intercalated volcanic rocks than can be found along the coast.

Summary of State Offshore Leases

Tract No.	Company	Acreage	Bonus	Rent	Total Paid	Location
37	Shell Oil Co.	6,900	$15,663	$6,900	$22,563	5 mi. S. of Winchester Bay
38	Standard Oil Co.	6,700	†3,333	6,700	20,033	2 mi. S. of Winchester Bay

* Petroleum Engineer, Oregon Dept. Geology and Mineral Industries.

Offshore Exploration Permits, 1964

Permit No.	Company	Geophysical	Geological
SL-2	Shell Oil Co.	Sparker Gas exploder Conventional seismic	Drill ship - M.V. Eureka
SL-3	Union-Standard	Gas exploder	Drill ship - Caldrill
SL-4	Standard, operator Standard of California Humble Oil & Refining Co. Pan American Petroleum Co. Superior Oil Co. Phillips Petroleum Co. Texaco, Inc.	Conventional seismic	
SL-5	Superior Oil Co.	Conventional seismic	Drill ship - Submarex
SL-6	Richfield-Mobil		Drill ship - Exploit
SL-7	Mobil-Richfield	Gas exploder	
SL-8	Humble Oil & Refining Co.	Conventional seismic	Drill ship - Submarex
SL-9	Atlantic Refining Co.	Sparker	
SL-10	Texaco-Mobil	Sparker	Drill ship - Western Explorer

Last summer 12 oil firms conducted geological and geophysical studies off the Oregon coast, these companies being primarily interested in the outer continental shelf region. Samples and cores were obtained from the ocean floor by drilling ships. Drilling was done as far as 40 miles from shore on several occasions and in water as deep as 2,000 feet. In 1964, five drilling ships, three conventional seismic fleets, two sparker ships, and two gas exploder ships were utilized in studies on the shelf lands bordering Oregon.

Onshore Developments

The Department issued one new drilling permit in 1964. This was for a shallow test well near Dallas in Polk County. Total footage drilled in 1964 was 1,718 feet, the lowest in 16 years. Footage includes that drilled by Gulf on its 8,470-foot test at Halsey in Linn County. Gulf abandoned the well in January 1964.

Permits Issued in 1964

Permit No.	Company	Well Name	Location	Depth	Status
54	John T. Miller	Adams 2	SE¼ sec. 11 T. 8 S., R. 5 W. Polk County	622'	Suspended

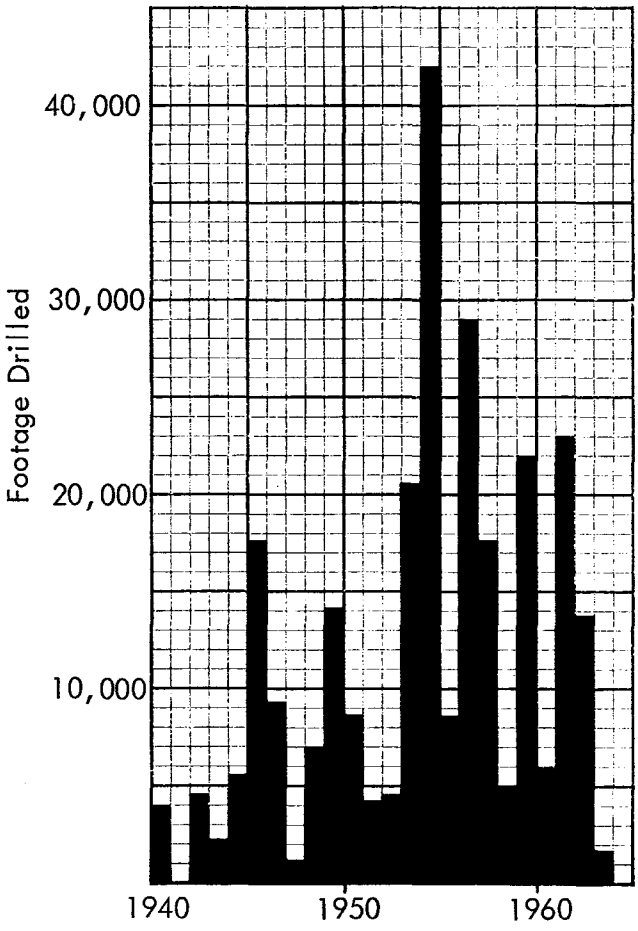
Records Released in 1964

Permit No.	Company	Well Name	Location	Depth	Records Available
45	Two State Oil & Gas Co.	Vale City 1	SW¼ sec. 21, T. 18 S., R. 45 E. Malheur County	1,185'	History Driller's log
46	Reserve Oil & Gas Co.	Bruer 1	NE¼ sec. 31, T. 6 S., R. 4 W. Polk County	5,549'	History Core descriptions Mud log Electric log Dipmeter Sonic log Samples
47	Humble Oil & Refining Co.	Wicks 1	NE¼ sec. 11, T. 7 S., R. 1 E. Marion County	7,797'	History Driller's log Mud log Electric log Samples
48	Humble Oil & Refining Co.	Miller 1	SE¼ sec. 10, T. 10 S., R. 3 W. Linn County	4,951'	History Driller's log Mud log Sonic log Electric log Samples
49	John T. Miller	Adams 1	SW¼ sec. 11, T. 8 S., R. 5 W. Polk County	410'	Driller's log Samples
50	J. Miller- R. Mitchell	Bliven 1	SW¼ sec. 11, T. 8 S., R. 5 W. Polk County	389'	Driller's log Samples
52*	Gulf Oil Corp.	Porter 1	NE¼ sec. 27, T. 13 S., R. 4 W. Linn County	8,470'	(See footnote)

* Gulf released records on this well to Salem Printing & Blueprint Co., 475 Ferry Street S.E., Salem, Oregon. Records in Department's files are confidential until January 1966.

Oregon was still without oil or gas production at the close of its 62nd year of exploration. Since 1902, 171 holes have been drilled without making a commercial discovery of oil or gas. The number of wells is not too significant, however, as only 33 were drilled to a depth greater than 4,000 feet.

Gulf Oil Corp. quitclaimed an estimated 200,000 acres in the Willamette Valley following abandonment of "T. J. Porter 1" near the town of Halsey. Reserve Oil & Gas Co. dropped approximately 50,000 acres of leases near Lebanon when it was evident Gulf's well was a dry hole. Others who held smaller acreages in the same general area gave up interests in their leases also.



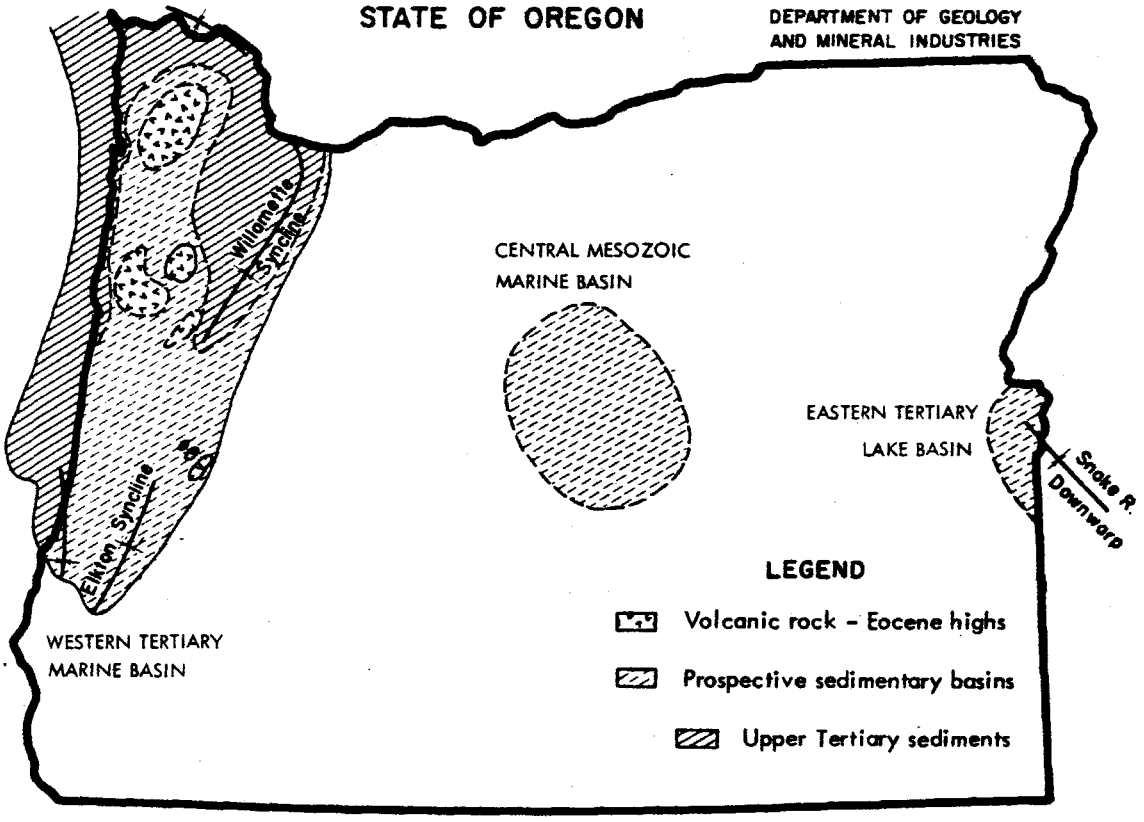
Oil test drilling in Oregon since 1940.

Superior, Texaco, and Richfield still have several thousand acres leased in northwestern Oregon. Wesley Bruer is believed to have retained his lease block near Salem in the Willamette Valley this past year. E. M. McDowell was reported to have a small lease block in Coos County, and D. F. McDonald holds leases bordering the shore north of Winchester Bay in southwestern Oregon. Pacific States Oil & Gas Co. of Portland leased approximately 2,000 acres in the Tualatin Valley, Washington County, in June and July 1964.

Sedimentary Basins Defined

Geologic data obtained by deep drilling in Oregon over the past 15 years indicates that certain areas of the state may still yield commercial quantities of oil and gas. The prospects have been limited to a much smaller

portion of the state than was under consideration prior to 1950. Outlines of favorable basin areas are shown on the accompanying map. Synclinal axes are shown to express the idea that their locations are the deep portions of the sedimentary basins.



Map showing location of sedimentary basins in Oregon.

Western Tertiary marine basin

Eocene rocks comprise the major part of the western marine basin. Tuffaceous marine sediments are commonly intercalated with volcanic rocks in this region. The lower Eocene section in the northern part of the basin is predominantly volcanic, while the contemporaneous section in the southern part of the basin consists of several thousand feet of marine sediments overlying a great thickness of volcanic rock.

Middle Eocene to late Oligocene sediments in the northern part of the basin probably offer the best hope for oil production onshore, but lower Eocene sediments in the southern half of the basin should not be entirely discounted, since several interesting oil shows have been found in wells drilled in these rocks.

A thick section of marine sediments, ranging in age from Eocene through Pliocene, is believed to exist offshore. At present this submerged region appears to be the most promising for oil exploration.

Eastern Tertiary lake basin

The Snake River Basin in eastern Oregon may contain as much as 10,000 feet of intermixed lake sediments, continental detritus, and intercalated volcanic rocks. Numerous gas occurrences in the region have encouraged wildcat ventures for 50 years or more. Except for a few instances of domestic use, the gas has not been found in large enough quantity to be commercially valuable. Small percentages of petroleum condensate were noted in the gas at several locations.

Porous zones have been scarce in most of the wells drilled in the western part of the Snake River Basin, and sands encountered have often contained gassy water. Formation water is fresh to a depth of about 1,000 feet, but becomes brackish below that level. Salt springs issue at the surface, however, at a locality $6\frac{1}{2}$ miles north of Vale, Oregon (The ORE BIN, September 1964). Faulting in the basin is probably associated with downwarp, and this, plus other structural elements, may provide suitable traps for accumulation of gas.

Central Mesozoic marine basin

Mesozoic marine sediments show through the younger cover of volcanic rocks over a fairly wide area in central Oregon and are possibly 30,000 feet in thickness in the Suplee-Izee region. Minor shows of asphalt, oil, and gas have been reported in this section of rocks. North and east of the basin, the Mesozoic sedimentary rocks are considerably folded and metamorphosed.

A covering of Tertiary volcanics has deterred extensive work in the central Mesozoic basin, but more drilling is expected to be done in this province. The sections explored to date have not been entirely discouraging. The Sunray-Mid Continent-Standard Oil Co. well drilled east of Prineville in 1958 found encouraging signs of gas in a Cretaceous section more than 3,500 feet thick.

Future Development

Union Oil Co. and Standard Oil Co. announced at a December meeting in Portland their plans to drill off the Oregon coast in the spring of 1965. The two firms have jointly contracted Western Offshore Drilling &

Exploration Co.'s drill-ship "Western Offshore III" for the work. The ship was used by Standard last summer to test federal leases 13 miles seaward of Santa Maria off the California coast. Water depth was 550 feet where drilling was done. An underwater television camera aided in the installation of well-head equipment.

Pan American Petroleum Corp. contracted Global Marine Exploration Co.'s "Submarex" for making ocean bottom stability tests off the mouth of Grays Harbor in Washington during December. Pan American is reportedly making plans to drill 15 miles west from Grays Harbor on the federal leases it acquired in October 1964. The company will use a bottom-supported jack-leg platform. The equipment will be floated to the site and the legs "jacked-down" to the ocean floor 250 feet below the water surface. A rig of this type, which is now operating in California, will probably be used

Caldrill I. (Caldrill Offshore, Inc.) A center-well core-drilling ship used by Standard Oil Co. and Union Oil Co. to drill shallow core holes off the Oregon coast in 1964. Large outboard motors position the vessel, so that no anchors are needed during the drilling operation..

for the work.

Early in 1965 the Shell Oil Co. made public its plans to drill off the Oregon coast. Shell probably will test its federal leases 20 miles off Newport. Water depth at this location is 300 feet. The company will move "Blue Water II" from San Francisco north to Oregon some time in the spring of 1965. The "Blue Water II" is a huge floating platform which was used by Shell to drill 12 miles off the California coast at San Francisco last winter.

The large platform proved itself during the drilling in northern California and should work as well in Oregon waters. The equipment floats half submerged when drilling is under way. For moves, the ballast water is pumped out of the lower structure so that the platform has a 15-foot draft while being towed.

This summer season will prove extremely interesting for those watching oil developments in the Northwest. If the preliminary deep drilling in 1965 finds encouraging signs of oil, a variety of development techniques are sure to be tried. Bottom-supported structures for operations in 400 feet of water are on the drawing boards and, perhaps more intriguing, numerous innovations are expected for sub-sea work.

Selected Bibliography

Baldwin, E. M., 1964, The geology of Oregon: Eugene, Oregon, Univ. Oregon Coop. Book Store, 2nd Ed., 1964.

Dickinson, W. R., and Vigrass, L. W., [in press] Geology of the Suplee-Izee area, Oregon: Oregon Dept. Geology and Mineral Ind. Bulletin series.

Newton, V. C., and Corcoran, R. E., 1963, Petroleum geology of the western Snake River Basin: Oregon Dept. Geology and Mineral Ind. Oil and Gas Investigations No. 1.

Oil and Gas Journal, 1964, Oil makes deepwater plans: Vol. 62, no. 52, p. 81, Dec. 28, 1964.

Snavely, P.D., and Wagner, H.C., 1963, Tertiary geologic history of western Oregon and Washington: Washington State Div. of Mines and Geology Rept. Inv. No. 22.

Wells, F.G., and Peck, D. L., 1961, Geologic map of Oregon west of the 121st meridian: U.S. Geol. Survey, prepared in cooperation with Oregon Dept. Geology and Mineral Ind.

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FIELD WORK IN OREGON, 1964

By R. E. Corcoran*

Field work in Oregon during 1964 increased again over that of the previous year, in the number both of graduate students doing thesis studies and of professional geologists involved in specific problems. Geologic mapping or field investigations of various types were carried out all over the state. Because of the increasing number of people who are presently undertaking geological studies in Oregon, we feel that a progress report will be of general interest to the public and may also encourage new studies that would contribute to the development of our mineral resources. The number of field parties in the state totaled at least 41, including 26 graduate students and 15 other geological investigators.

State Geologic Map Project

Probably the most important field study in Oregon concerns the State Geologic Map Project. The geologic map of the western half of Oregon was published in 1961; since that time most of the field work has been concentrated in the eastern part. The Department, in cooperation with the U.S. Geological Survey and aided by university professors and graduate students, is continuing this project. Preliminary geologic maps covering 1° by 2° areas at a scale of 1:250,000 (Army Map Series sheets) are being published soon after the field work is completed. More than 60 percent of the eastern half of the state has now been finished on a scale of 1:250,000 or larger (see figure 1). In eastern Oregon, Department geologists, professors and graduate students from Oregon State University and the University of Oregon, and graduate students from Princeton, Stanford, and Johns Hopkins Universities are conducting geologic studies in critical areas. The information developed from this research will be used in the final state map.

Geochemical and Geophysical Surveys

Perhaps the most significant new phase of geological exploration being carried on in Oregon is the geochemical and geophysical work by personnel

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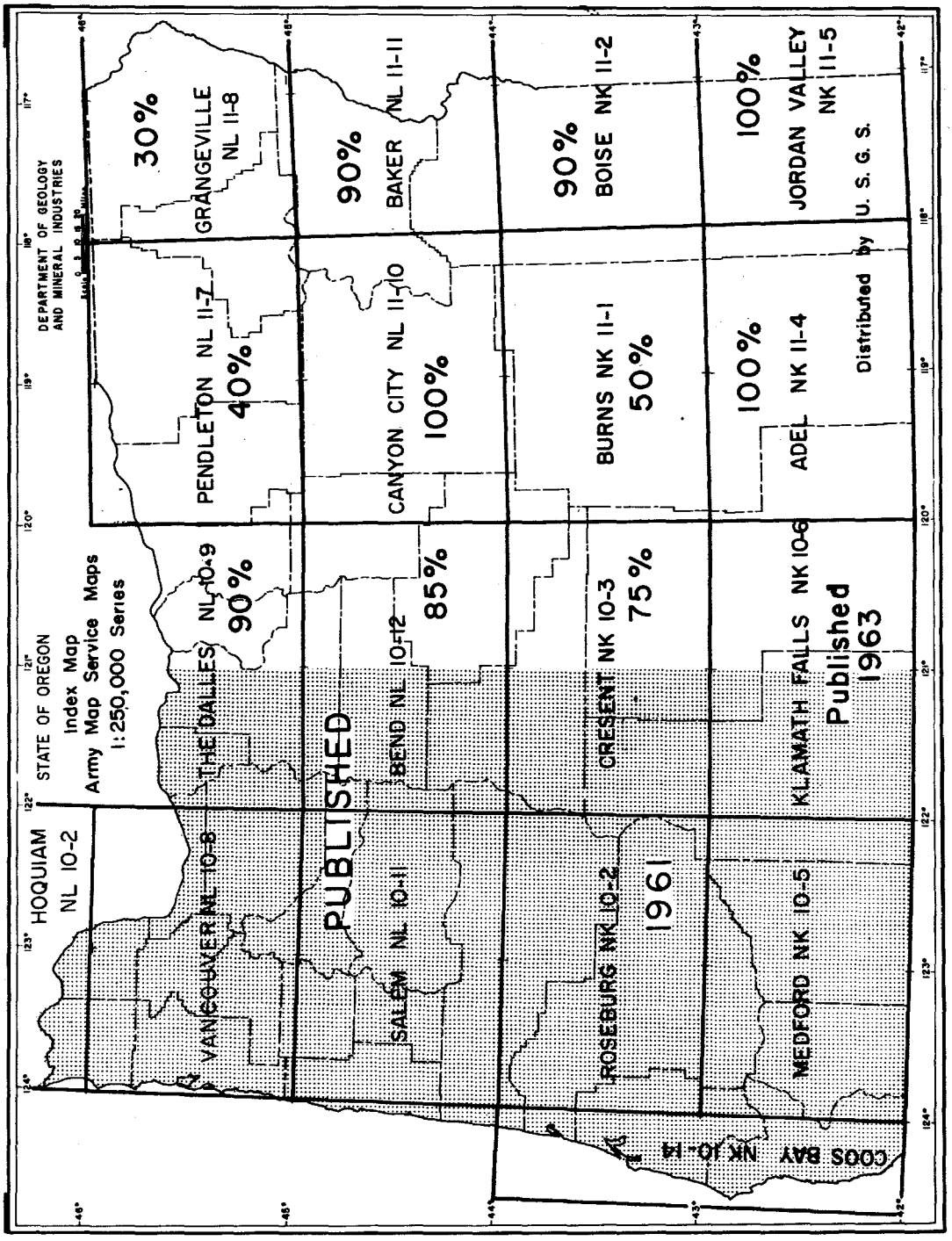

Figure 1. Index map showing progress of field studies in eastern Oregon. Percentage figu indicates amount of work completed in each quadrangle.

from the Federal Survey, the geophysics group in the Department of Oceanography of Oregon State University, the Department of Geology at the University of Oregon, and the Oregon Department of Geology and Mineral Industries. These studies include gravity surveys of various types, seismicity of the Pacific Northwest, electrical resistivity of laterites, geochemical sampling of stream sediments, geothermal studies of Recent volcanic rocks, and paleomagnetism of Cenozoic lavas in eastern Oregon.

Field Studies

Listed below are the various field projects being furthered in the state. For convenience in showing where these studies are located, the state is divided on the accompanying index map (figure 2) into six districts. For each district, the letter opposite the name of the project on the list is keyed to the map.

1. Northwest Oregon

a. Geology of Astoria Submarine Canyon. P.R. Carlson, PhD candidate, OSU.
b. Sediments of Astoria Fan and adjacent abyssal plain. C.H. Nelson, PhD candidate, OSU.
c. Season studies of foraminifera of Yaquina Bay, Ore. D.C. Manske, PhD candidate, OSU.
d. Distribution of foraminifera in Netarts Bay, Ore. A.A. Hunger, MS candidate, OSU.
e. Origin and development of shoreline processes, Clatsop Spit to Tillamook Head. J.Livingston, PhD candidate, OSU.
f. Stratigraphy and petrology of a portion of the upper Nehalem River basin. R. Van Atta, PhD candidate, OSU.
g. Geology of the Newport Embayment. P.D. Snavely, Head, Pacific Coast Branch, U.S.G.S.
h. Electrical resistivity of ferruginous bauxites, Columbia County, Ore. R.G. Bowen and R.E. Corcoran, Oregon Dept. Geol. & Mineral Ind.
i. Engineering geology studies, northern Willamette Valley and Tualatin Valley, Ore. H. G. Schlicker, Oregon Dept. Geol. & Mineral Ind.
j. Foraminiferal study of the Miocene Astoria Fm. R. Gonsalves, PhD candidate, Univ. Calif.
k. Geology of the southern third of the Marcola quad. T. Maddox, MS candidate, U of O.

2. Southwest Oregon

a. Mesozoic stratigraphy of Curry County, Ore. R. H. Dott, Jr., Prof. of Geology, Univ. Wisc.
b. Foraminiferal study of the Eocene-Oligocene rocks near Coos Bay, Ore. G. Rooth, PhD candidate, OSU.
c. Foraminiferal study of upper Eocene sediments: Sacchi Beach, Elkton, Lorane. K. Bird, PhD dandidate, Univ. Wisc.
d. Geology of the southeast quarter of the Roseburg quad. W. Johnson, MS candidate, U of O.
e. Geology of the southwest quarter of the Dixonville quad. H. Hixon, MS candidate, U of O.
f. Geology and petrology of the Rogue Volcanic Series. R. Helming, MS candidate, U of O.
g. Geology and gravity survey of the Glendale quad. C. Forbes, PhD candidate, U of O.
h. Reconnaissance gravity survey of southwest Oregon. H.R. Blank, Jr., U.S.G.S.
i. Geochemistry of stream sediments in western Josephine County. R.G., Bowen, assisted by R. Newell and J. Blanchard, Oregon Dept. Geol. & Mineral Ind. and U of O.
j. Stratigraphy and sedimentology of some Cretaceous and Eocene rocks in the Medford-Ashland region, B. McKnight, PhD candidate, OSU.

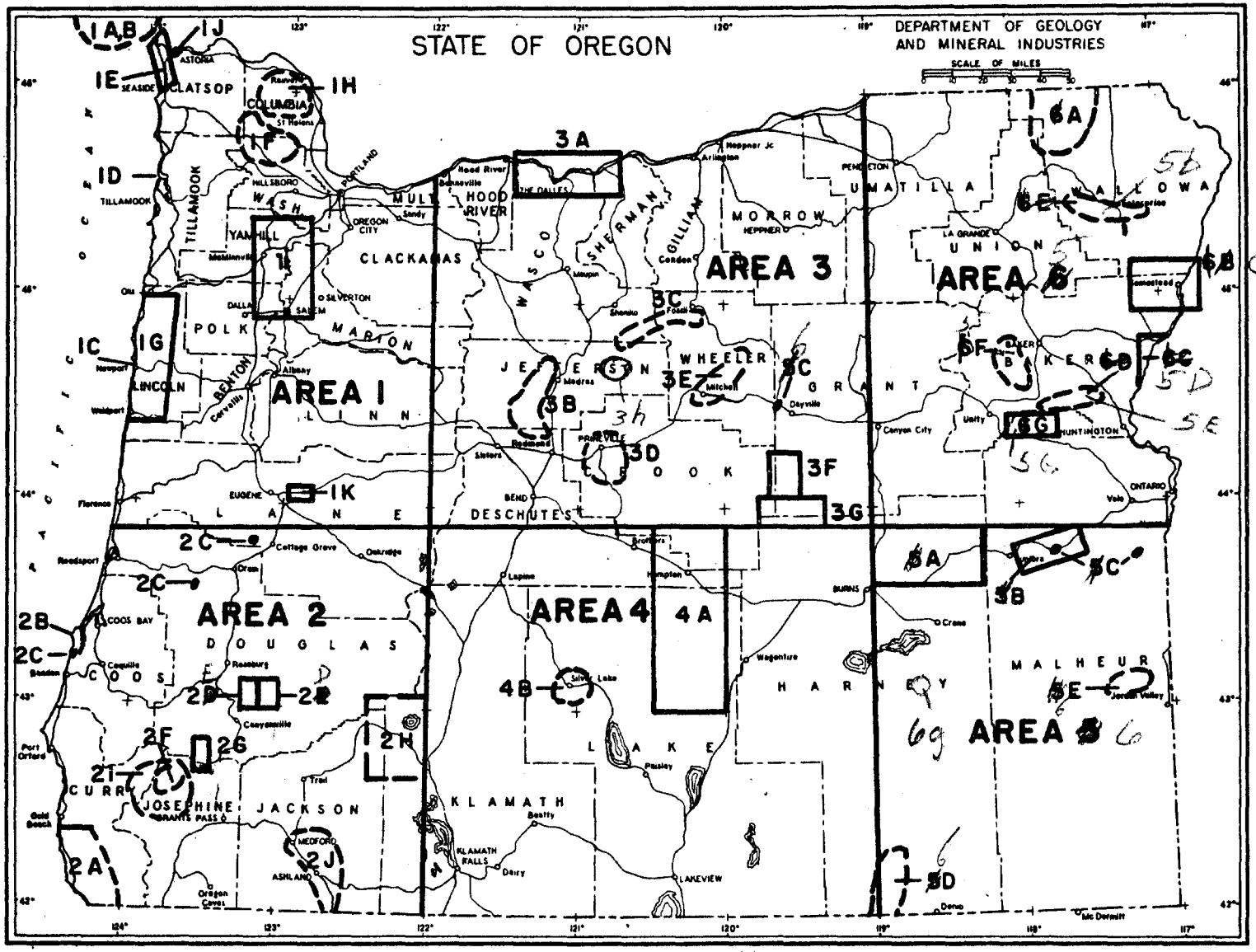

Figure 2. Index map showing location of field studies in Oregon.

3. North-central Oregon

a. Geology of the Wishram, White Salmon, The Dalles quads. R.C. Newcomb, U.S.G.S.
b. Petrology and stratigraphy of the Deschutes Fm., Madras area. D. Stensland, PhD candidate, OSU.
c. Petrology and stratigraphy of the John Day Fm., northern Wheeler County. P.T. Robinson, Prof. of Geology, OSU.
d. Petrology of the rhyolitic intrusives, John Day Fm., Prineville area. R.G. Fisher, Prof. of Geology, Univ. of Calif. at Santa Barbara.
e. Stratigraphy and petrology of the Cretaceous rocks in the Mitchell area. W.D. Wilkinson, Head, and K. Oles, Prof. of Geology , OSU.
f. Tertiary geology of the southwest quarter of the Dayville quad. M. Forth, MS candidate,OSU.
g. Geology of the Suplee-Izee area. H.J. Buddenhagen, consulting geologist.

4. South-central Oregon

a. Geology of the east half of the Crescent A.M.S. sheet. G.W. Walker, U.S.G.S., and N.V. Peterson, Oregon Dept. Geol. & Mineral Ind.
b. Geology of the Silver Lake area. F. Ikeagwuani, MS candidate, U of O.

5. Southeast Oregon

a. Geology of the northeast quarter of the Burns A.M.S. sheet. R.E.Corcoran, Oregon Dept. Geol. & Mineral Ind.
b. Geology of the Malheur River gorge between Harper and Juntura; emphasis on the petrology and areal extent of the Dinner Creek Tuff. G. Haddock, PhD candidate, U of O.
c. Paleomagnetism of Miocene basalts: Owyhee Gorge, Malheur River gorge, Picture Gorge. A.F.Frederickson, Head, Dept. of Earth and Planetary Sciences, Univ. of Pittsburgh.
d. Geology of the Pueblo Mountains region with emphasis on Cenozoic stratigraphy of the Pueblo Mts. and Thousand Creek valley. J.Avent, MS candidate, Univ. Washington.
e. Geology and petrology of the Cow Lakes lava field. G. Millhollen, MS candidate, U of O.
f. Tertiary mammalia from southeast Oregon. C.A. Repenning, PhD candidate, Univ. of Calif.

6. Northeast Oregon

a. The Grande Ronde dike swarm and its relation to the Columbia River Basalt. I.Gibson, Prof. of Geology, Univ. of Calif. at Santa Barbara.
b. Geology of the southeastern Wallowa Mountains, Oregon, and the southwestern Seven Devils Mountains, Idaho. T. Vallier, PhD candidate, OSU.
c. Geology of the Oregon portion of the Mineral quad. H. Brooks, Oregon Dept. Geol. & Mineral Ind.
d. Petrology and stratigraphy of the Burnt River Schist. R. Ashley, PhD candidate, Stanford U.
e. Geology of the pre-Tertiary rocks around the northern border of the Wallowa Batholith. B. Nolf, PhD candidate, OSU.
f. Stratigraphy and structure of the Elkhorn Ridge Argillite. M. Switek, PhD candidate, U of O.
g. Geology of the northern half of the Caviness quad. E. Wolff, PhD candidate, U of O.

Theses Completed in 1964

Doctoral Theses

Quaternary geology of the Willamette Valley; emphasis on the petrology and origin of the Willamette Silt. Jerry Glenn, OSU.
Subaqueous movement of sediment in the vicinity of the Oregon coastline. L.D.Kulm, OSU.
Petrography of the volcanic rocks in the Three Sisters area. Edward Taylor, Wash. State U.
Biostratigraphy of the Umpqua Formation, southwest Oregon. Richard Thoms, Univ. of Cal.

Master's Theses

Geology of a portion of the Picture Gorge quad. Willis White, OSU.
A stratigraphic study of the marine Cretaceous rocks near Mitchell, Ore. B. McKnight, OSU.
Continental shelf sediments in the vicinity of Newport, Ore. David C. Bushnell, OSU.
Coastal landslides of northern Oregon. William B. North, OSU.
Sedimentary petrology of the Umpqua Formation in the axial part of the southern Coast Range. Lawrence Burns, U of O.
Gravity studies over northeast-trending faults in the Klamath Mountains. Gerald Bruemmer, U of O.
Geology of the southwest quarter of Roseburg 15-minute quad. Donald Hicks, U of O.
Zeolites from Kings Valley and Coffin Butte, Benton County, Ore. Terry Clark, U of O.
Petrographic study of the rocks underlying Spencer's Butte. John Shaw, U of O.
Gravity profiles across the central Coast Range. Robert Witt, U of O.

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LAND WITHDRAWALS INCREASE 400 PERCENT

Withdrawals of public lands from mineral entry increased from 9,304 acres in 1963 to 46,658 acres in 1964, a growth of 400 percent. During the past year withdrawals by federal agencies were made in 16 counties in the state, all but three of them in western Oregon. Largest of the 12 withdrawals totalled 33,112 acres in Deschutes and Lane Counties, where a recreational area surrounding Waldo Lake was requested by the U.S. Forest Service. Recreation accounted for seven of the proposed withdrawals.

One withdrawal was requested by the U.S. Bureau of Land Management for the "protection of gravel deposits" needed for surfacing the Bureau's resource management roads in Douglas County. Another Bureau withdrawal was for protecting quarry sites for aggregate to be used on Bureau and private roads and for jetty rock. The quarries are located in Coos and Douglas Counties. Two withdrawals were proposed for the construction of reservoirs in Lane and Baker Counties, and one administration site covering 320 acres in Clackamas County was also listed. Since 1954 the total area involved in withdrawals is 424,961 acres, which is almost exactly equal to all the land in Benton County.

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