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PERLITE OCCURRENCES IN SOUTHEASTERN KLAMATH AND SOUTHWESTERN LAKE COUNTIES, OREGON

by
Norman V. Peterson*

A preliminary study of perlite occurrences in southeastern Klamath and southwestern Lake Counties was made by the writer during 1960 while extending the reconnaissance mapping of the Lakeview uranium area. Large bodies of glassy rhyolite-dacite rocks with associated perlite were found to be widely distributed in Klamath and Lake Counties. This distribution and the possibility of new and larger markets in the lightweight aggregate industry and increasing use of perlite as a filtering medium, made it desirable to delineate and sample the perlite occurrences and to indicate areas of possible commercial importance.

The mapping of the rhyolite-dacite rocks was limited generally to the Lakeview uranium area in Lake County and to accessible areas adjacent to Oregon Highway 66 and the railroad to the west near Bly and Beatty in Klamath County. Detailed work will surely show more outcrops of the glassy rhyolite-dacite rocks and associated perlite occurrences.

Definition of Perlite

Strictly defined, perlite is a volcanic glass having numerous concentric cooling cracks which give rise to a perlitic structure (concentric onion-like partings). Most perlites have a water content that is greater than normal obsidian and an overall composition that varies between rhyolitic and dacitic. Perlite ranges in color from light gray to almost black and has a waxy to pearly luster. Owing to its water content turning to vapor, perlite, when crushed, sized, and heated quickly to its softening temperature, expands into fluffy pellets that resemble pumice.

Commercially, the term perlite refers to any naturally occurring glass of igneous origin that will expand when heated quickly and yield a frothy, light-colored mass of glass bubbles. The expanded product is also called perlite.

Perlite Industry

Since perlite is a low-cost industrial mineral, economic production requires cheap mining and processing methods and low transportation cost to markets. Most deposits are quarry-type operations where bulldozer ripping, carryall or power-shovel loading methods are used. Crude perlite is usually crushed and screened at or near the quarry and then shipped to a processing plant for drying, pre-heating, and expansion. The expansible properties of different perlites are seldom the

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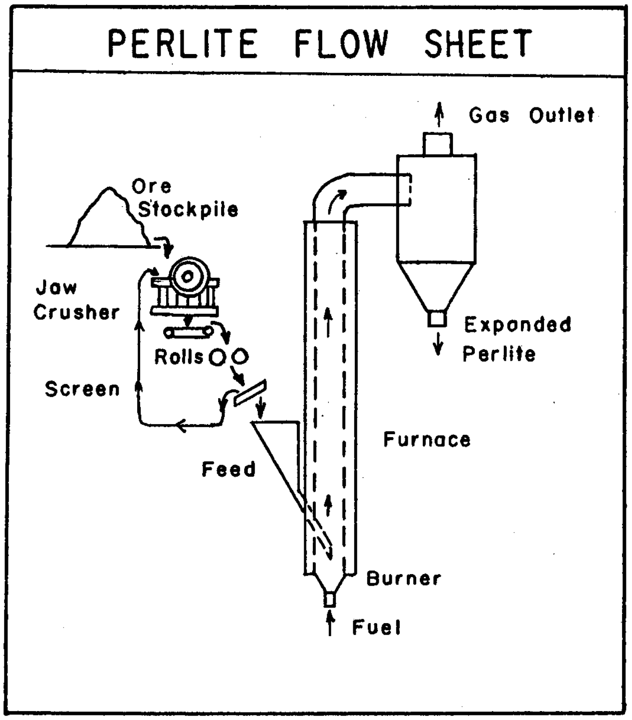
same so that the processing plant design is based on trial tests of the perlite for:

1. Physical characteristics, mainly fracture.
2. The temperature at which the perlite expands.
3. The extent to which water vapor has been driven out of the perlite particles before the softening temperature has been reached.
4. The particle size of the raw perlite fed to the furnace.

Vertical and horizontal oil or gas fired furnaces of several designs are used. A typical flow sheet of the operation is shown in the accompanying illustration. After expansion, the hot perlite is cooled and separated into various size fractions by a series of cyclones. The sized product is then bagged or sent to bulk storage.



Uses of Perlite

Perlite can be made in a variety of densities, it is chemically inert, flame-proof, mildew-proof, does not disintegrate when wet and has excellent heat and sound insulating properties. The most important uses from a rapidly growing list are shown below.

Plaster aggregate: For making a plaster that is lightweight, easy to apply, has good acoustic and thermal insulating properties, is fireproof, resilient, nailable, sawable, and has good bonding properties.

Lightweight concrete aggregate: For roof decks, beams, building blocks, prefabricated units and floors, modern curtain-wall construction.

Loose-fill insulation: For insulating between wall studs, around steam pipes, in refrigeration cars, and deep freezers, and as a loose fill medium for imbedding hot steel ingots during shipping.

Fillers: Perlite fines are used in rubber goods, cleansers, paints, glazed tile, glazes, plastics, resins, and metal surface plaster. Also used as a porous support for catalysts and chemicals in gaseous reactions.

Industrial filtering: For filtering juices, dry cleaning compounds, alcoholic beverages, and other chemicals.

Cementing and grouting of oil well casing.

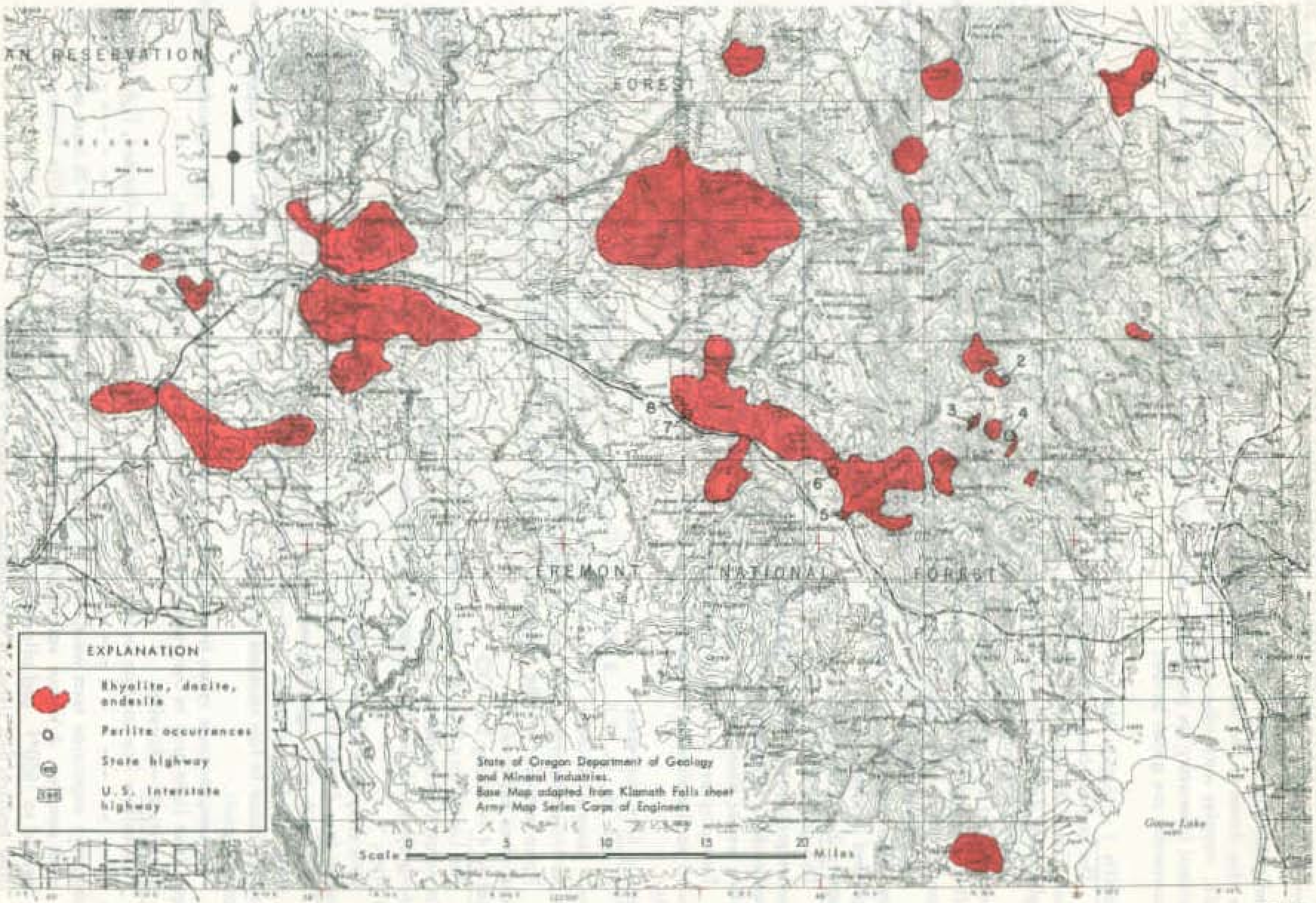
Refractory: For making medium temperature-range refractory brick.

Horticultural applications: Used as a soil conditioner, a plant propagating medium, packing material for shipping, and as a diluent in insecticides.

Klamath and Lake County Occurrences

In southeastern Klamath County and southwestern Lake County, the perlite occurrences are almost always found as a selvage zone around glassy flow-banded rhyolite-dacite rocks. Pumiceous tuffs and breccias are generally associated. The zones of perlitic rocks vary from a few feet thick to large dome-shaped masses that cover several acres.

On the accompanying map, rocks of predominantly rhyolitic to andesitic composition have



PERLITE OCCURRENCES IN KLAMATH AND LAKE COUNTIES, OREGON been generally outlined. Previously known perlite occurrences and others found during this study are also shown on the map. No detailed study of any occurrence was attempted, but, when feasible, samples were taken and submitted to L. L. Hoagland, assayer-chemist at the department's Portland laboratory, for preliminary expansion tests (see table). Data on eight individual perlite occurrences are given below:

Locality 1 -- Eagles Nest (Paisley Perlite)

The Eagles Nest or Paisley Perlite is located along the crest and east flank of Tucker Hill in secs. 25 and 36, T. 34 S., R. 19 E., about 10 miles southeast of Paisley in Lake County. The Eagles Nest deposit is being developed by A. M. Matlock of Eugene, Oregon.

A large amount of light-gray perlite has been explored along the east flank of the elongated dome-shaped mass of glassy flow-banded rhyolite that makes up Tucker Hill. Perlitic structure is well developed and the rocks break down into perlite sand with common to abundant obsidian cores (Apache tears). This deposit was studied in some detail by N. S. Wagner (1950).

Samples of perlite from the Eagles Nest submitted to the department for preliminary expansion tests* show the perlite to have good to excellent expansible properties and a very light-colored expanded product.

Locality 2 -- Glass Slipper

This occurrence, in sec. 14, T. 37 S., R. 18 E., was discovered adjacent to the Marty K uranium prospect in 1955. The perlite is light to dark gray and occurs at the contact of a large rhyolite dome and massive pumice tuffs. Where it has been exposed in several bulldozer cuts the perlite breaks down into a translucent sand. Obsidian is common as "Apache tears".

Two samples, one of the perlite sand with occasional obsidian and the other a dark-gray banded perlite showed volume increases of 350 percent and 200 percent when tested for expansibility.

Locality 3 -- No Name

In sec. 28, T. 37 S., R. 18 E., perlite occurs on both edges of a northeast trending rhyolite dike. Several bulldozer cuts made while exploring for uranium minerals expose perlitic rocks. The perlite varies from light gray to dark gray and grades into a pink and green glassy rhyolite.

Three samples from the west edge of the dike showed a 25 percent to 100 percent volume increase when expanded.

Locality 4 -- Lucky Day OO

The Lucky Day OO is a uranium prospect in sec. 35, T. 37 S., R. 18 E. Here again perlite is found at the contact of a small rounded mass of glassy flow-banded rhyolite and volcanic tuffs. Light-gray perlite has been exposed in a shallow bulldozer cut on the northwest edge of the rhyolite plug.

One sample of almost white perlite showed a volume increase of 50 percent when tested.

Locality 5 -- Drews Valley Ranch

Just north of Oregon Highway 66 on Drews Valley Ranch in secs. 16 and 17, T. 38 S., R. 17 E., there is a large mass of light-gray perlitic rock. The perlite and glassy dacite with zones of obisidian occur in low rounded hills that are possibly remnants of a thick flow. This appears to be a large deposit.

Four samples were taken from widely separated points on the low hills. The expanded products ranged from light gray to very white with volume increases up to 550 percent.

Locality 6 -- Roselite

Quicksilver exploration in sec. 5, T. 38 S., R. 17 E., has exposed flow-banded, light gray to

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*Laboratory expansion tests were made by grinding and screening to obtain a +28 mesh and a -20 mesh sample. A known volume of the sample is placed in an electric muffle furnace preheated to 1850°F. and allowed to remain for 10 seconds. The expanded volume is measured after cooling and listed as a percentage increase in volume.

EXPANSION PROPERTIES OF PERLITE FROM
KLAMATH and LAKE COUNTIES, OREGON

Locality Number and Name	Sample No.	Fused Color	Expanded Volume	Temp.	Time	Minus	Plus	Sample Description
1. Eagles Nest Perlite	P-26137	Very light	200%	1600° F.		20	28 mesh	Perlite.
		" "	650%	1850° F.	30 sec.	20	28 mesh	
" " "	P-26138	Very light	700%	1850° F.	30 sec.	10	20 mesh	Perlite.
2. Glass Slipper	P-25602		350%	1900° F.	30 sec.	20	28 mesh	Perlite sand. Translucent, occasional obsidian fragments (this sample badly shattered).
" "	P-25603		200%	1900° F.	30 sec.	20	28 mesh	Dark gray banded perlite from upper cut.
3. No Name	P-25604		25.0%	1900° F.	30 sec.	20	28 mesh	Dark gray banded perlite.
" "	P-25605		25.0%	1900° F.	30 sec.	20	28 mesh	Dark gray-green vitreous perlite (?).
" "	P-25606		100%	1900° F.	30 sec.	20	28 mesh	Light gray banded perlite.
4. Lucky Day OO	P-25567		50%	1900° F.	30 sec.	20	28 mesh	White to light gray perlite.
5. Drews Valley Ranch	P-25488	Gray	125%	1850° F.	30 sec.	150% @ 1950° F.		Gray perlite w/common obsidian.
" " "	P-25489	Gray	25%	1850° F.	30 sec.			Gray perlitic flow banded glassy rhyolite.
" " "	P-25490	White	550%	1850° F.	30 sec.	400% @ 1700° F.		Gray glassy rhyolite.
" " "	P-25491	White	550%	1850° F.	30 sec.			Gray perlite sand.
6. Roselite			No data					Light gray-green perlitic rhyolite.
7. No Name	P-25653	White w/few blk. specks	500%	1850° F.	30 sec.			Pinkish-gray perlite common feldspar & biotite crystals.
8. No Name	P-25654	Very white	700%	1850° F.	30 sec.			Medium gray perlite, common feldspar.

green glassy rhyolite. Where opalization and clay alteration are not present the rocks have a perlitic structure. Drill holes are reported to have encountered perlite for considerable depth. No samples were submitted from this occurrence.

Locality 7 - No Name

Pinkish-gray glassy biotite dacite (?) with a perlitic structure occurs in prominent rounded outcrops just north of Oregon Highway 66 in NW$\frac{1}{4}$ sec. 30, T. 37 S., R. 16 E. This occurrence is very close to the western border of Lake County. Small crystals of feldspar and biotite mica are common to abundant in the sugary textured massive rock.

One sample expanded 500 percent and the product was white with a few black specks.

Locality 8 -- No Name

On the eastern edge of Klamath County in sec. 24, T. 37 S., R. 15 E. medium-gray perlitic rocks crop out over a wide area. The sugary-textured rocks weather easily into low-rounded outcrops. Feldspar and biotite are common to abundant. The widespread outcrops indicate a large quantity of perlitic material.

One sample chipped from several outcrops showed a very white expanded product with a volume increase of 700 percent.

Conclusions

During this preliminary study the individual occurrences were not mapped in detail or completely sampled, nor were tonnages calculated. The study does indicate, however, that large amounts of perlite with good to excellent expansible properties are available. If the problem of cost of transportation to market can be worked out there certuinly is a good possibility of finding a suitable, adequate source of perlite in this area.

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RARE MINERAL COLLECTION DISPLAYED

Albert and Stella Keen of Portland, members of the Oregon Agate and Mineral Society, have placed a supremely fine mineral display in the department's loan-exhibit case. The Keen's minerals, which have come from many parts of the world, show a perfection in color and crystalline form rarely seen in such collections. The specimens will be shown until the middle of August.

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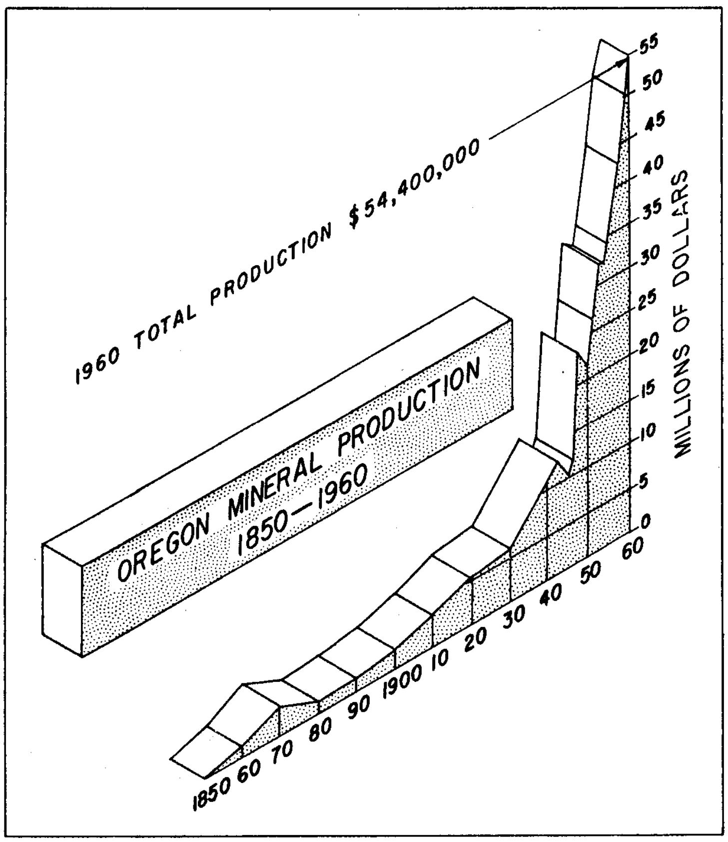
OREGON MINERAL PRODUCTION SETS PACE FOR STATE'S INDUSTRIES

by

Ralph S. Mason*

With the posting of a 9 percent gain over 1959, Oregon's mineral industries last year climbed to another record-breaking production total valued by the U. S. Bureau of Mines at $54,419,000. This achievement is all the more remarkable because practically every other segment of the state's economy suffered declines during the same period and the new record resulted almost entirely from increases in production and not from price advances. The growing importance of two basic industrial mineral commodities, sand and gravel and crushed stone, to the economy of the state is shown in their 13 percent increase during 1960.

Taken as a whole the value of mineral production in Oregon has increased 153 percent in the past 10 years. (See accompanying graph.) Of considerable surprise is the fact that Oregon mineral production has now reached to within a pick handle length of Idaho, long famous as a heavy mineral producer. In 1960 Idaho produced only 5.5 percent more mineral wealth than did Oregon. It must also be borne in mind that values assigned to mineral commodities by the U. S. Bureau of Mines are usually based on the raw rather than the processed material. (See Table 1.) If mineral wealth produced in Oregon was reported on the same basis that lumber is, the value would be far in excess of $100 million for 1960.



Despite the large increase in production during the year, some minerals suffered declines. Diatomite was off 6 percent, pumice and volcanic cinders were down 4 percent, sand and gravel 3 percent, and mercury 58 percent. Sharp increases over the previous year were registered by cement, up 18 percent; clays and shale, up 8 percent; stone, up 26 percent; and limestone, up 10 percent. Production of building stone increased markedly in 1960. Gold, silver, copper and nickel were produced in slightly greater quantity than in 1959.

Employment in the mining and metallurgical industries of the state increased 4 percent in 1960. Primary metals, with an average annual 7 percent increase in payrolls from 1955 to 1960, are among the fastest growing manufacturing sectors in the state. A summary of employment and payrolls is given in Table 2. Typical of the rapid changes that have occurred in the metallurgical industry in the past few years is the growing list of "new" metals refined either in electric arc,

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vacuum-arc, or the new electron-beam furnaces. Metals refined by these methods include nickel, aluminum, silicon, hafnium, zirconium, tantalum, columbium, and titanium. Although the employment statistics reported in Table 2 include the primary metallurgical industry, the value of the production from them is not included in the state totals (Table 1).

Viewed from the standpoint of their economic impact on the state, the mining and metallurgical industries contribute far more than the dollar totals would indicate. Characteristically these industries operate the entire year, use no migrant workers, create no shortages of boxcars and are not subject to the host of maladies and the vagaries of weather which beset agriculture, lumbering, and cattle raising. The accompanying map shows the mineral commodities produced in each county of the state and their total values.

Table 1

Mineral Production in Oregon, 1959 - 1960 1/

Mineral	1959 Short tons (unless otherwise stated)	1959 Value (thousands)	1960 Short tons (unless otherwise stated)	1960 Value (thousands)
Clays - thousand short tons	294	$308	318	$370
Copper (recoverable content of ores, etc.)			6	4
Gold (recoverable content of ores, etc.) . . . troy ounces	686	24	835	29
Mercury . . . 76-pound flasks	1,224	278	513	108
Nickel (content of ore and concentrate)	12,374	2/	13,115	5,246
Sand and gravel . . . thousand short tons	18,087	15,506	17,539	16,170
Silver (recoverable content of ores, etc.) . . . troy ounces	242	3/	284	3/
Stone . . . thousand short tons	13,341	16,126	16,864	19,620
Value of items that cannot be disclosed: Asbestos, carbon dioxide, cement, diatomite, gem stones, iron ore (pigment material) 1959, lime, pumice, uranium, and values indicated by footnote 2		18,607		14,125
Total 4/		49,843		54,419

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/ Figure withheld to avoid disclosing individual company confidential data.
3/ Less than $500.
4/ Total adjusted to eliminate duplicating value of raw materials used in manufacturing cement and lime; 1959 total revised.

Table 2
Oregon Mineral Industry Employment and Payrolls*

	1959 Employment	1959 Payrolls	1960 Employment	1960 Payrolls
Mining	1,227	$6,955,000	1,181	$6,662,000
Mineral manufacturing	2,552	14,341,000	2,860	16,740,000
Primary metals	5,650	35,586,000	5,751	37,128,000
Miscellaneous	762	4,549,000	796	4,786,000
Totals	10,191	$61,431,000	10,588	$65,316,000

* Oregon State Employment Department figures.

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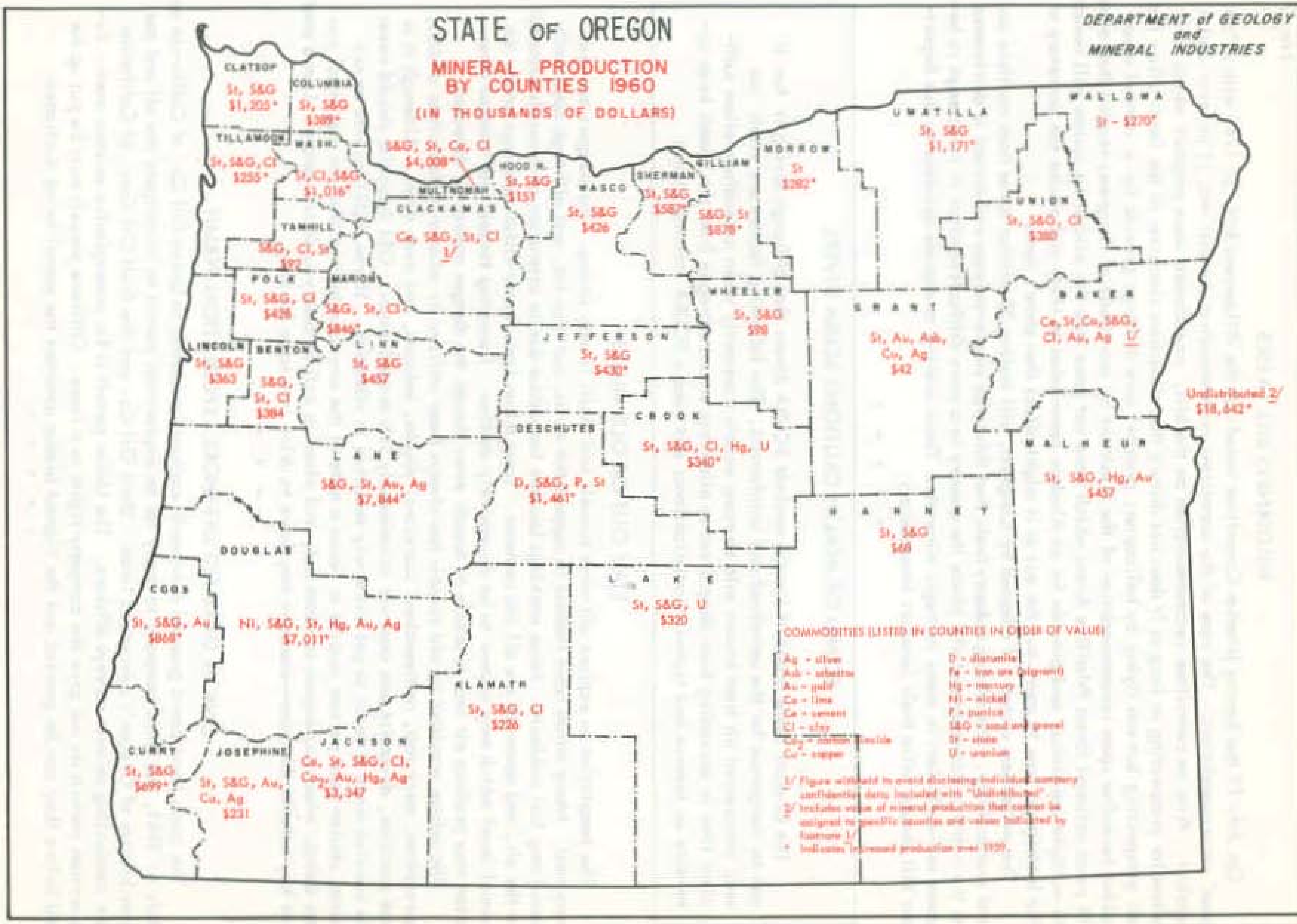

STATE OF OREGON
MINERAL PRODUCTION BY COUNTIES 1960
(IN THOUSANDS OF DOLLARS)
DEPARTMENT of GEOLOGY and MINERAL INDUSTRIES
CLATSOP
St, S&G $1,205*
COLUMBIA
St, S&G $389*
TILLAMOOK
St, S&G, Cl $255*
WASH.
St, Cl, S&G $1,016*
S&G, St, Ca, Cl $4,008*
MULTNOMAH
HOOD R.
St, S&G $151
WASCO
St, S&G $426
SHERMAN
St, S&G $587*
GILLIAM
S&G, St $878*
MORROW
St $282*
UMATILLA
St, S&G $1,171*
WALLOWA
St - $270*
UNION
St, S&G, Cl $380
CLACKAMAS
Ce, S&G, St, Cl 1/
YAMHILL
S&G, Cl, St $92
POLK
St, S&G, Cl $428
MARION
S&G, St, Cl $846*
LINCOLN
St, S&G $363
BENTON
S&G, St, Cl $384
LINN
St, S&G $457
JEFFERSON
St, S&G $430*
WHEELER
St, S&G $98
GRANT
St, Au, Asb, Cu, Ag $42
BAKER
Ce, St, Ca, S&G, Cl, Au, Ag 1/
Undistributed 2/ $18,642*
DESCHUTES
D, S&G, P, St $1,461*
CROOK
St, S&G, Cl, Hg, U $340*
LANE
S&G, St, Au, Ag $7,844*
MALHEUR
St, S&G, Hg, Au $457
HARNEY
St, S&G $68
DOUGLAS
Ni, S&G, St, Hg, Au, Ag $7,011*
COOS
St, S&G, Au $868*
LAKE
St, S&G, U $320
KLAMATH
St, S&G, Cl $226
CURRY
St, S&G $699*
JOSEPHINE
St, S&G, Au, Cu, Ag $231
JACKSON
Ce, St, S&G, Cl, CO2, Au, Hg, Ag $3,347
COMMODITIES (LISTED IN COUNTIES IN ORDER OF VALUE)
Ag - silver
Asb - asbestos
Au - gold
Ca - lime
Ce - cement
Cl - clay
CO2 - carbon dioxide
Cu - copper
D - diatomite
Fe - iron ore (pigment)
Hg - mercury
Ni - nickel
P - pumice
S&G - sand and gravel
St - stone
U - uranium
* Indicates increased production over 1959.

WILDERNESS BILL PASSES

On July 13 the Senate Interior Committee voted out the Wilderness Bill, S. 174, with a "do pass" recommendation. The vote of the committee recommending the bill was 11 in favor and 4 against. Prior to committee recommendation on the bill, amendments were adopted which will allow for prospecting so long as it does not disturb the wilderness character of the land; allow for air prospecting but not flying by helicopter; prohibit core drilling; provide for a veto of areas added hereafter upon recommendation of the President by one House of Congress; require that after 14 years national forest Primitive Areas which have not gone into the wilderness system will revert to multiple use status; and provide for an Alaskan commission to study and advise the Secretary of the Interior on how to carry out the act as it might affect that state's lands.

The wilderness system, if adopted by Congress, will isolate 35 million acres from multiple use and productivity. The mining industry feels that this large single-purpose withdrawal is detrimental to the nation's economy and will place the country in a more difficult position in its attempt to become self-sufficient in many strategic minerals. Those wishing to express opinions on this important bill should write their Senators immediately.

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BOARD OF HEALTH CAUTIONS SCUBA DIVERS

The Oregon State Board of Health reminds SCUBA divers that although diving is fun it can be dangerous for the untrained and uninformed. The following factors are vital: use only compressed air from known safe sources; exhale constantly when ascending; allow sufficient time in ascending from deep dives to eliminate excess nitrogen from the blood; keep up-to-date on tetanus and typhoid immunizations; and take a SCUBA training course.

STAY OUT OF OLD MINES!

The temptation to explore old mine tunnels and shafts is very strong. The dangers are also very real. Many mines have timbers to support the walls, but they rot, and although apparently sound may fail suddenly. Mine workings become hazardous due to alteration of minerals exposed to the air, and cave-ins are all too common. Some mines have water-filled openings below the tunnel level which may appear to be deceptively shallow. Decaying timbers and mineral alteration may produce air that is unsafe to breath even though the danger cannot be detected.

The refuge provided by old tunnels has always been utilized by wild animals such as spiders, porcupines, pack rats, rattlesnakes, scorpions, skunks, bobcats, and even bears. Although it is bad practice, dynamite and caps are occasionally left around mines. Old dynamite should never be handled since it tends to get extremely sensitive to vibration. If you MUST go into an old mine, station your partner outside or leave a note at the entrance telling who you are, what you are doing, when you expect to come out, and whom to call in case you do not return. Leave your car key outside the mine--someone may have to drive into town for help.

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UNION GRANTED OFFSHORE EXPLORATION PERMIT

The State Land Board granted a 4-month exploration permit to Union Oil Co. of California on July 6, 1961, the third company to apply for an exploration permit to investigate the oil and gas possibilities of Oregon's submerged lands. Shell Oil Co. and the Gulf Oil Corp. of California are conducting seismic surveys offshore. The Union permit is for nonexplosive seismic work. Exploration permits do not give the company rights to a lease. Offshore parcels must be put up for bid before they can be granted and the highest bidder awarded the parcel being auctioned.

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