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SURVEY OF NON-METALLIC MINERAL PRODUCTION
OF OREGON FOR 1940

by

C. P. Holdredge
Consulting Geologist



1941

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Introduction

The field survey upon which this report is based was made during the month of December, 1940. During that time, the writer visited all producers that he was able to reach in every county of the state except Multnomah County which was covered by the Portland office of the Department. Production and value figures were collected on the spot wherever possible. If for any reason production data were not available at that time, a blank was left to be filled in and mailed to the Portland office. In most cases the response was satisfactory.

Supplemental data, confined largely to the Multnomah County producers, to public agencies, and to large producers with head offices in Portland or outside the state, were collected by mail at the Portland office of the Department.

Production problems of individual producers were discussed whenever such problems were stated, but lack of time prevented detailed examination of deposits.

While every effort was made to collect as complete production statistics as possible, care was taken to avoid duplication. It is certain that some production has been missed. Duplications are believed to be insignificant.

For the first time an effort was made to gather information on the production of semi-precious stones (agates, petrified wood, etc.) produced in the state. The results were enlightening but are far from complete. A surprisingly large number of people derive a livelihood from the semi-precious stone industry in the state.

Results:

The general results of the survey are given in Table 1 in which the state has been divided into geographic districts, each of which includes several counties. These districts, in addition to being geographic divisions, are also somewhat different geologically. As much as possible, they were designed to set off areas between which there is a minimum flow of industrial minerals; that is, materials produced in each district are largely used therein. This is not true of certain products like diatomite, clay products, limestone and limestone products and silica, which have restricted occurrence and yet are used in nearly every district.

It is with regret that a relatively large number of items of rather large value have been grouped in a lump figure under the heading "Miscellaneous". Some of these items, such as mineral water, pumice bricks, and monumental stone are

produced commercially at present in relatively small volume. Producers of certain other products did not wish production figures made public.

The production by certain federal agencies could not be segregated into districts, and is grouped separately as "Various". The six districts into which the state is divided are as follows:

1. The Coastal District, including all of the state west of the summit of the Coast Range, and also Coos and Curry Counties.
2. The Willamette Valley District, including the entire drainage of the Willamette and Sandy rivers and their tributaries.
3. The Southwestern District, including Jackson and Josephine Counties and all of Douglas County except the small western portion which lies in the Coastal District.
4. The Southeastern District, comprising Klamath, Lake, Harney and Malheur Counties.
5. The Northeastern District, comprising Grant, Baker, Union and Wallowa Counties.
6. The North Central District, including Hood River, Wasco, Sherman, Gilliam, Morrow, Umatilla, Wheeler, Jefferson, Crook and Deschutes Counties.
7. Unclassified production by such agencies as the War Department, U.S. Public Roads Agency, W.P.A., U.S. Forest Service.

Comparisons:

Basic construction materials, such as sand, gravel, crushed rock, quarry rock, building stone, etc., make up approximately 60% of the state's total production of non-metallic minerals. Cement, clay products, diatomite, limestone (other than for cement), semi-precious stones, coal and silica follow in the order named.

The prices given for the various products are f.o.b. the point of production and do not contain any transportation charges as far as is known. There is a variation of from 30 cents to 69 cents per yard for sand and gravel in the different districts which is probably somewhat misleading. In those districts showing a price of less than 50 cents per yard considerable quantities of pit-run material have probably been included. In such cases only the royalty and excavating charges are given with nothing for processing. In general the average price arrived at from the totals for the state are more nearly correct for processed sand and gravel, for crushed rock and for pit-run and quarry-run materials. Representative prices on building stone were difficult to obtain. Quarry conditions and the uses for which the stone was quarried cause wide fluctuations. Clay products are sold partly by piece and partly by weight, and unit prices could not be shown in a condensed table. No unit of measurement exists for semi-precious gem stones. Coal brought an average price of \$3.70 per ton at the mine. Silica was sold at various prices depending upon the amount of processing. The unit prices on limestone, cement and diatomite are confidential.

Most of Oregon's non-metallic mineral products are low-priced commodities and can stand only a limited amount of haulage charges. Since many deposits of these minerals are in outlying districts at some distance from the better markets in the more thickly populated centers, their production is prohibited by the freight rates now in effect.

The beneficiation of many such products is relatively complicated and may be different for each deposit. Technical studies and testing work are necessary to determine the necessary treatment.

The development of markets for non-metallic minerals requires considerable research and expert analyses. During the past year, market conditions of some industrial minerals have changed much more rapidly than ever before. The war, with its political, economic and social upheavals, has seriously interrupted the normal flow of commodities. Certain things that formerly were low-priced and hard to sell have suddenly become scarce and expensive. Two excellent examples are pumice and grinding pebbles. The major portion of the nation's supplies of pumice formerly came from Italy while the grinding pebbles came from Denmark and France. Since these sources have been closed by the war, there is now a strong demand for domestic deposits of these commodities. These changing conditions afford opportunities for the development of several of the non-metallic mineral deposits of the state that formerly seemed to have slight economic importance.

The Coastal District is characterized by an abundance of sedimentary rocks and considerable quantities of basic lavas; in the southern counties, some igneous intrusives and metamorphic rocks occur. The sedimentary rocks are largely Tertiary shales and sandstones which include the Coos County coal beds, and younger gravels, sands and clays. The sandstones and shales are poorly consolidated and pebbles derived from them are soft. These soft pebbles are so common in most of the streams in the district that the value of the gravels for construction purposes is considerably reduced. However, some of the sandstones are hard and break in sufficiently large pieces to serve for jetty rock; yet they are softer than is desirable and only the proximity to the point of use as compared to better grades of jetty rock at a greater distance make them of any value for this purpose. The beach sands are mostly too fine for construction use, but some are used outside the district for foundry sand.

Many of the lavas have been considerably altered and are not suitable for road metal or other construction purposes. However, there are a number of quarries in unaltered rock that are suitable for these purposes. Some of it breaks sufficiently large for riprap and jetty rock and considerable quantities are used for various purposes. Care is necessary in the selection of quarry sites in this district. It will be noted that the quantity of crushed rock and quarry-run rock produced in this district is about three times the quantity of sand and gravel produced. The main reason is the presence of soft pebbles in most of the gravel deposits.

Many agates are found on the beaches, especially in Lincoln County, and a species of garnet known as "Oregon jade" is found on some of the beaches in the southern part of the district. The agates probably have been derived from the lavas and carried to the beaches by the streams, although appreciable quantities may have been freed from the mother rock by wave erosion and concentrated by the same agency. "Oregon jade" is derived from the metamorphic rocks.

Sands and gravels derived from the metamorphic rocks also contain some soft pebbles and are not particularly good for construction purposes. Nevertheless considerable quantities are used, and there are also quarries in the metamorphics or associated intrusives producing crushed rock, riprap, and rock for jetty construction.

A clay deposit near Tillamook is utilized for the manufacture of brick and tile. The market for such products is rather small in this district; otherwise similar clay deposits in the district probably would be utilized for the same purposes.

The coal production, although important in the past, is now small because of the distance from market and the keen competition in the local market of wood products and fuel oil.

The value of production of construction materials reflects the extent of markets and the quality of the products. The production of agates and other semiprecious stones reflects the quality and quantity of the occurrences but also indicates the favorable location with respect to a tourist market.

The well-known black sands of the Oregon coast have long been prospected for gold and platinum and more recently for their chrome content. There is some possibility that they might also yield ilmenite, olivine, garnet, zircon, and silica sands as commercial by-products. There is also a possibility of greater development of coal if any industrialization results from the chromite sand investigations undertaken by the State Department of Geology and Mineral Industries. Natural gas has been reported from wells drilled in Coos County and may yet be found in commercial quantities.

As indicated above, clays suitable for brick and tile no doubt occur at various places awaiting only a satisfactory market for their development. The beach sands have been but little studied for their non-metallic content, and possible uses for them at interior points may yet be found. Some of them might be satisfactory for plaster sand which is now scarce and brings a high price at some inland points.

The Willamette Valley District, while much smaller than at least two other districts, yielded approximately 40% of the state's non-metallic mineral production in 1940. The main reason is its greater population and the availability of a wider variety of construction minerals. A more densely populated district uses not only more of the same non-metallic mineral products, but also a wider variety of these products.

The western part of the Willamette Valley District is characterized by about the same types of sedimentary rocks and lavas as are found in the Coastal District. The eastern part is characterized by a wide variety of lavas and volcanic sediments. Stream gravels and sands are abundant and there are various types of clays. The sedimentary rocks of the western part of the district include some beds of impure limestone that have been quarried mainly for cement rock but also for agricultural stone. All these sediments contribute soft pebbles to the streams entering the Willamette from the Coast Range, thus rendering them inferior for construction purposes. The gravels found in the Willamette River north of Eugene are the best found in the district because they have traveled far enough for the weaker and

softer materials to be destroyed or reduced to fine sand and clay. The streams flowing from the Cascades accumulate vast deposits of gravel but the quality of these gravels is not quite as good as those in the bed of the Willamette River itself because some of the lavas from which the Cascade sands are derived are porous, and others are more or less altered. However, Cascade gravels are only slightly less used commercially than those of the Willamette.

A large percentage of the lavas of the Cascades are still unaltered and make excellent crushing rock and riprap. If they were not so far from the coast, they might also be used for jetty rock, since many of them are highly suitable. Some of them have been quarried to a limited extent for building stone and for special purposes such as flagstones and for rock gardens. Considerable quantities of agates and petrified wood are found in and along the borders of the western part of the Cascades.

Clays are abundant in the Willamette Valley District which contributes approximately 90% of the state's production of this material. Probably the largest and highest grade of refractory clay on the Pacific Coast is located at Hobart Butte near Cottage Grove. This deposit is owned by the Willamina Clay Products Company which is planning to build a large refractories plant at Eugene. Much of the land of the Willamette Valley needs drainage and large quantities of clay are used for the manufacture of drain tile. Considerable quantities of clay products are shipped out of the district.

Limestone produced in the district is used both for the manufacture of cement and for agricultural limestone. Most of the output is from near Dallas in Polk County. The potential demand for agricultural stone is very large, and the present consumption for that purpose is susceptible of considerable expansion since a large proportion of the farmland of the Valley requires limestone to neutralize acidity and to maintain fertility. A report to be issued in the near future by the Department of Geology and Mineral Industries will discuss sources of limestone in the district and also the problem of supplying stone to the farms of the Willamette Valley.

Some of the volcanic sediments (tuffs, tuff breccias and pumicites) may become of value. The tuffs and breccias have in the past been used for building stone with considerable success because of the ease with which they can be cut when freshly quarried; hardness develops after drying out. They are especially adaptable to interior stone work for such purposes as fireplaces. Pumicite has a potential value as an abrasive, but probably deposits of suitable material are not extensive. Some weathered sandstones of the western part of the district appear to have a sufficiently high silica content to warrant beneficiation to produce silica sand, for which there is an excellent local market. Some of the stream gravels contain appreciable quantities of quartzite pebbles and these pebbles are a possible source of silica. Most of our paper mills use a peculiar type of lava for the manufacture of fly-bars and bed-plates for their beaters. Originally this lava was largely imported from Germany. That source is now closed and an opportunity is presented to the state to develop its own rock for this purpose. Some of the lavas of the Cascades might be adapted to this use.

Non-metallic mineral products in various categories are brought into the Willamette Valley District from other districts, from other states, and from abroad. Among those brought in in largest quantities are coal, petroleum products, and cement products.

Some small deposits of sub-bituminous coal are known either in the district or close to its borders. While these coals are of lower grade than those brought in from Wyoming and Utah, these Oregon coals are equal in heating value to some of the Washington coals now sold in the Portland area. Willamette Valley coal should have a competitive price advantage per unit of heating value.

Evidence which could assist in determining the possibility of production of petroleum in or near the district is far from definite. The Coast Range may offer possibilities, but little in the way of detailed mapping has been done.

The Willamette Valley market for cement is a large one. The cement business is quite competitive, and California cement has been able to compete with the local plant in the district because of low water rate.

The Southwestern District comprises an area that for the most part is underlain by metamorphic rocks and associated intrusives. However, in the northern part of Douglas County, Tertiary sandstones and shales and both intrusive and extrusive lavas occur. The same is true of the eastern part of Jackson County. This district contains a wider variety of rocks than either of the two districts already discussed. Sand and gravel, crushed rock, limestone and limestone products are its principal non-metallic mineral products. It also yielded all of the state's production of silica for the year; likewise all of the production of bottled mineral water. The district's production of semi-precious stones was probably relatively small but a considerable quantity was processed and marketed within the district.

Monumental stone from the Ashland granite quarry was processed during the year from stone quarried the previous year. The amount sold was not credited to 1940 production. Because of its high quality, there is a consistent demand for this stone, but lack of capital and organization have precluded proper merchandizing methods. It is probable that an experienced organization could not only build up the monumental stone business, but also could compete in the market for natural building stone. The quality and reserves of stone appear to be adequate. It is believed that there is an opportunity at this property to build up a substantial industry.

The Southeastern District comprises the largest area but is more sparsely populated and has a smaller non-metallic mineral production than any of the others. The district is characterized by a great abundance of Tertiary lavas and volcanic sediments with a limited area in the northern part underlain by pre-Tertiary marine sediments. The lavas yield excellent crushing rock and some building stone. The volcanic sediments yield "cinders" (scoria), great quantities of which are used to surface county roads and to ballast logging railroads.

Associated with the volcanic sediments near Harper and in the Otis Basin are deposits of freshwater diatomite, from which a small production was obtained during the year. In general, however, the diatomite deposits of this area are poorly located with respect to markets, and prohibitive freight rates prevent profitable production, except to supply a possible small local demand. There are also extensive deposits in the Klamath Basin but generally the deposits are impure, and so far as is known do not meet specifications for acceptable diatomite. Although freight rates to outside markets are high, if a satisfactory deposit were found near Klamath Falls, shipping facilities over two transcontinental railroads

would be available. Possibilities of using these impure diatomites in the manufacture of clay bonded insulating bricks and as an admixture in concrete are suggested by Moore. ^{1/}

Vast deposits of pumice occur in the northwestern part of the district. In large part, the material is not of a grade suitable for specialized abrasive purposes. Shipments have been made, however, which were reported satisfactory. There was a small production during 1940, which included pumice used in Portland cement manufacture. Considerable interest has been aroused in Oregon pumice because of cessation of shipments of Italian pumice. Further investigation of the deposits is necessary, but there is considerable promise of successful development.

Bentonite has been reported from the volcanic sedimentary beds and should be further investigated. The market is limited and transportation would be an important factor, but the price is relatively high.

Since this area is semi-arid, the streams are few and small. Therefore the deposits of sand and gravel are correspondingly limited and mostly occur on old lake terraces. The gravel is usually of good quality, but there is a scarcity of sand. Considerable quantities of sand are shipped into Klamath Falls from northern California deposits.

The only clay brick and tile plant in Oregon east of the Cascades is located in Klamath Falls.

The manufacture of pumice bricks, blocks, pipe and special shapes in this area is a relatively recent activity. One company, the Klamath Concrete Pipe Company, has a plant in Klamath Falls and uses pumice from Glass Mountain, California. The Silica Brick and Tile Company has a pit and plant near Chemult where common brick, face brick, and building tile are manufactured. A special process is employed to make the material water-proof. Advantages of pumice bricks and shapes are light weight and high insulation qualities. Nails can be driven easily into the finished material. Probably these shapes have an especial advantage for use in interior partitions.

In Lake County are large deposits of salines in lake beds. Because of high transportation charges, these deposits appear to be uneconomic under present conditions. Should some means be afforded for reducing such charges, these lake beds could be a valuable source of salts for chemical industries in the Lower Columbia River Area.

The Northeastern District is characterized by a wide variety of metamorphic rocks with their associated intrusives, small areas of pre-Tertiary marine sediments, and Tertiary lavas and volcanic sediments. Both the lavas and the metamorphics yield good crushing rock and one deposit of granite, the Northwest Granite Quarry near Haines, yielded a small production of good monumental stone. Being of relatively high relief, the region receives more rainfall than the Southeastern District. Consequently there are more streams and more stream deposits of sand and gravel. In general, these are of good quality, but they have not been extensively developed. In many places there appears to be a scarcity of sand. Like

^{1/} Moore, B.N., U.S.G.S.Bull.875, Nonmetallic Mineral Resources of Eastern Oregon, 1937

the Southwestern District, this district has large deposits of limestone and these have been quarried extensively for cement manufacture, for sugar mill rock, and for agricultural limestone.

Clay products used in this district are mostly brought in from the adjacent portions of Idaho, but probably suitable deposits of clay exist within the district.

Bentonite has been reported from the Tertiary volcanic sediments and some diatomite occurs near Austin and Mount Vernon in Grant, and near Keating in Baker, counties.

Feldspar occurs in a railroad cut near Lime in a deposit which warrants further investigation. Some effort is being made to develop deposits of asbestos and talc in the southern part of Baker County.

In the southern part of Grant County and the northern part of Harney County, is an area warranting study for oil possibilities. It lies partly in this district and partly in the southeastern district, and contains highly folded but only slightly metamorphosed Mesozoic and Paleozoic marine sediments, partly in the drainage basins of the John Day River, Crooked River, and Silvies River. Detailed exploration of the structural features of this area are necessary before it can either be recommended or condemned. Farther east in the Vale-Ontario region, some gas has been found in drill holes, and there may be possibilities of finding a commercial supply if testing is done under experienced geological supervision.

The North Central District is large, but it is thinly populated and only slightly less arid than the Southeastern District. Wide areas are underlain by Tertiary lavas and volcanic sediments. Pre-Tertiary marine sediments are exposed over a very limited area. The lavas furnish a great abundance of excellent stone for road metal, but good deposits of sand and gravel are rather limited. "Cinders" are used in large quantities for surfacing secondary roads and for ballast on logging railroads. The state's only large-scale production of diatomite comes from the deposit west of Terrebonne. This deposit contains diatoms which are especially suitable for use as a filter aid. The material is processed and packaged at Lower Bridge on the Deschutes River.

There are extensive deposits of pumice in the southern part of this district. Some of these may be of excellent quality and additional exploration work seems justified.

In 1940 there was a large production of semi-precious stones, including several types of agate and petrified wood. Favorable agate and wood localities are widespread and range from the central part of this district north to the John Day River valley. This valley is world-famous as a fossil locality, and has also been prolific in "thunder eggs".

SUMMARY OF OREGON MINERAL PRODUCTION 1940

Value production non-metallics	\$ 5,751,951
Value production quicksilver - U.S.Bureau of Mines	1,599,436
Value production gold, silver, copper, lead, U.S.Bureau Mines	4,094,018
Value production platinum (estimated)	2,000

\$11,447,405

OREGON 1940 NON-METALLIC MINERALS PRODUCTION BY DISTRICTS

District	Sand and gravel	Crushed rock	Pitrun : shale, gravel, scorial, sandstone, loam	Quarry run : rock and riprap	Building stone	Clay Products	Miscellaneous (1)	Totals
#1-Coastal	Quantity : 111,964 yds.	344,501 yds.	20,500 yds.	16,183 yds.				
	Value : \$ 67,578	\$339,604	\$ 5,625	\$ 8,543		\$1.153	(1)	\$ 422,503
#2-Willamette Valley	Quantity : 930,623 yds.	888,418 yds.	*17,000 yds.	1,843 yds.	11,080 cu.ft.		(1)	
	Value : \$556,709	\$890,928	\$ 3,538	\$ 491	\$9,320	\$402,116		\$1,863,102
#3-S.W. Part	Quantity : 222,331 yds.	126,600 yds.	6,199 yds.				(1)	
	Value : \$154,985	\$147,499	\$ 3,719					\$ 306,203
#4-S.E. Part	Quantity : 288,535 yds.	138,965 yds.	75,984 yds.	935 yds.	5,120 cu.ft.		(1)	
	Value : \$ 88,481	\$185,149	\$ 23,738	\$ 701	\$ 1,360	\$ 31,306		\$ 330,735
#5-N.E. Part	Quantity : 129,268 yds.	197,031 yds.	*				(1)	
	Value : \$ 55,671	\$183,015	\$ 525					\$ 239,211
#6-No. Centr.	Quantity : 259,565 yds.	291,395 yds.		1,251 yds.	1,400 cu.ft.		(1)	
	Value : \$153,616	\$301,719		\$ 625	\$ 375			\$ 456,335
#7-Various	Quantity : 282,670 yds.	566,657 yds.		76,631 yds.	2,518 cu.ft.		(1)	
	Value : \$ 95,801	\$598,025		\$ 38,315	\$33,993			\$ 766,134
Miscellaneous (1)							\$1,367,728	\$1,367,728
Totals:	Quantity : 2,224,956 yds.	2,553,567 yds.	*119,683 yds.	96,843 yds.	20,118 cu.ft.			
	Value : \$1,172,841	\$2,645,939	\$ 37,145	\$48,675	\$45,048	\$434,575	\$1,367,728	\$5,751,951

*Yardage figures incomplete.

(1) Miscellaneous includes Portland cement, limestone for uses other than cement, diatomite, silica, semi-precious stones, and coal. Figures for certain of these were released as confidential. Totals for separate districts would not include "Miscellaneous". 6726 tons of coal valued at \$21,317 was all produced from Coos Bay field, District No.1.