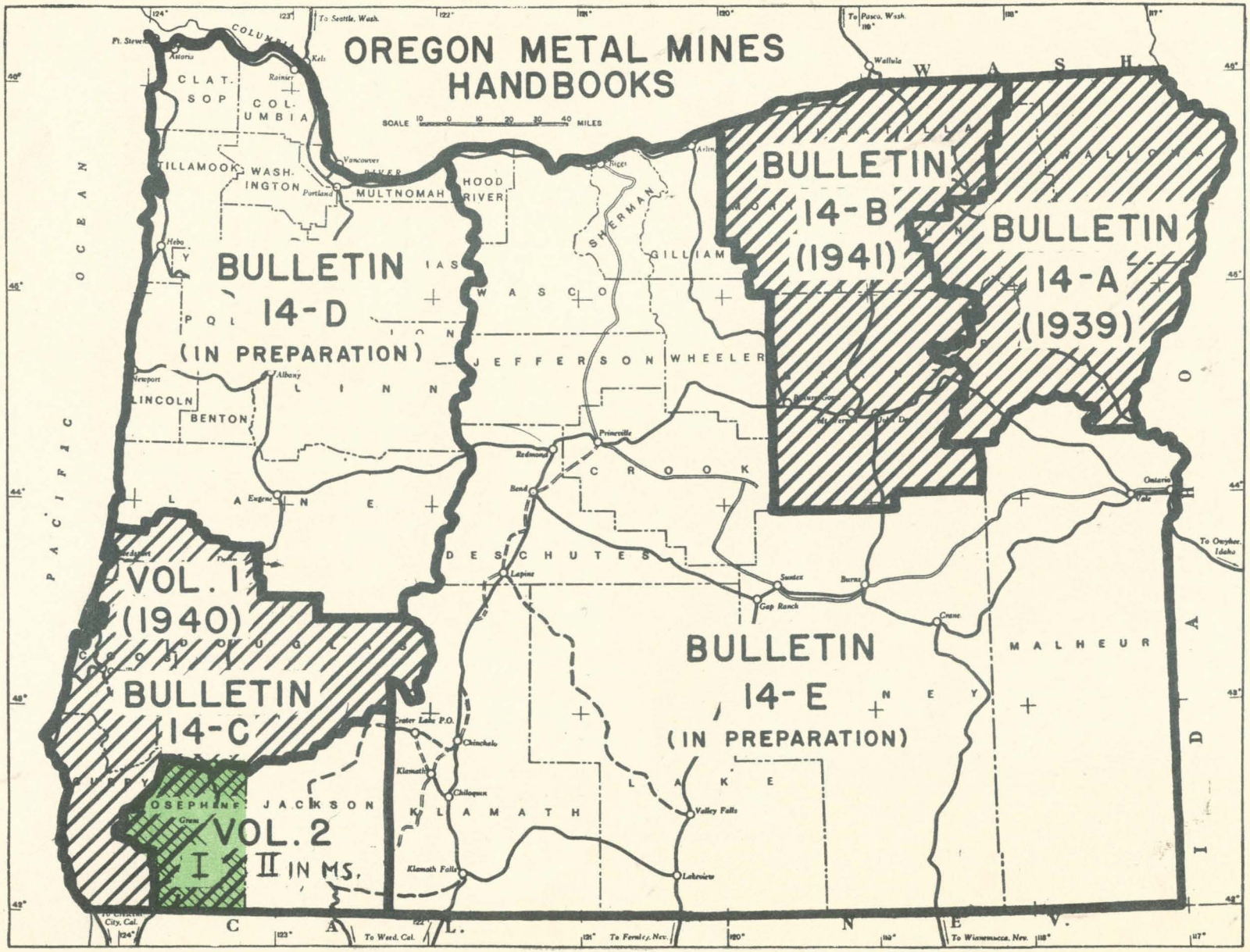

BULLETIN 14-C. Vol. 2, Sec. I, Josephine County, (1942).

FOREWORD

Bulletin No. 14, the handbook of Oregon metal mines, is being issued in the form of a series of separate bulletins. This is the fourth of the series and covers Josephine County in southwestern Oregon. As originally planned, Bulletin 14-C, Vol. 2 would have covered both Jackson and Josephine Counties. Such a volume, however, would have contained some 400 pages, so it seemed best to divide Vol. 2 into two sections to expedite the issue and to reduce the size.

Section 2 of Vol. 2, covering Jackson County, is now in manuscript form and will be issued as early as possible in 1943.

Much of Josephine County is commonly regarded as being mineralized. Consequently many mining claims have been staked and operations have been started in many parts of the county during the years since the 50's. Some claims were never developed; some, carrying well-known old mine names, were active for various lengths of time; and a considerable number are still active.

It has been a five-year task to compile this comprehensive record of Josephine County mining properties. Certainly inaccuracies will be found in the record since names of properties along with ownerships have been changed from time to time. The records of mining activity at some old properties has also been inadequately reported in the past.

Much of Josephine County has been covered by geological surveys, and a generalized geologic map is included in this bulletin. The Grants Pass quadrangle was mapped in detail by the U. S. Geological Survey, and a colored geologic map of the quadrangle was issued by this Department in 1940.

The map of the Kerby Quadrangle, lying west of the Grants Pass, has been all but completed by the U. S. Geological Survey, but it now appears that the map cannot be issued until after the war.

To those who use this bulletin or to engineers seeking information on mining properties in Josephine County, it may be pointed out that a field office-assay laboratory of this Department is located at Grants Pass, the county seat. In some cases, more recent or more detailed information than is included in this bulletin may be obtained by visiting or by addressing an inquiry to the field geologist at the State Assay Laboratory, Grants Pass.

EARL K. NIXON, Director.

Portland, Oregon,
October, 1942.

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(Bulletin 14 C, Vol. II, Section 1)

INTRODUCTION

Deposits of many useful minerals are present in Oregon, but because of its large area of over 95,000 square miles - parts of which are not readily accessible - adequate knowledge of the location and extent of mineral deposits has, in the past, often been incomplete or lacking. Certain areas are very difficult to prospect. Both discovery and development have been handicapped by rugged mountains with dense timber growth in some sections, and great arid stretches of country in others. In spite of these difficulties, Oregon has produced in excess of $250,000,000 worth of mineral products since 1850.

Ores of the precious metals have been mined in the southwestern counties of the State since 1851 and in the various mountainous sections of eastern Oregon since 1861. From year to year many of the streams in these sections have furnished a consistent production of placer gold. Gold and a small amount of platinum metals has been recovered from beach sands along the coast since the early days of Oregon mining. Oregon is second among the States in quicksilver production. Many chromite deposits are known, and production of this strategic mineral is now becoming increasingly important.

Oregon has abundant resources of non-metallics such as building and monumental stone, common and refractory clays, as well as raw materials for making high calcium lime and Portland cement. In normal times the manufacture of clay products and Portland cement are among the important industries of the State. Oregon has inexhaustible supplies of sand and gravel suitable for construction purposes. Tremendous reserves of diatomite and pumice in eastern Oregon await industrial demand. Although coal has been mined for years in the vicinity of Coos Bay, Coos County, great reserves remain, and lignites and sub-bituminous coals are known to exist in various other parts of the State.

GEOGRAPHY

Cutting across Oregon from north to south are two main ranges of mountains, - the Cascades and the Coast Range, - both of which occur also in Washington on the north and California on the south. The Cascade Mountains form the "backbone" of the State, dividing it into two parts commonly referred to as Eastern (including Central) Oregon and Western Oregon. The portion east of the Cascades is about twice as large as that to the west. The Coast Range of mountains parallels the coast line very closely for the northern two-thirds of its length. The southwestern part of the State is occupied by the Siskiyou mountainous area of old mineralized rocks; while the northeastern quarter of the State is largely occupied by the Blue Mountain Ranges, also of old rocks.

The Columbia River runs along Oregon's northern border for 300 miles. Its scenery is world famous; it is a transportation artery of major importance; its economic possibilities from a power standpoint are just beginning to be realized; it is Oregon's greatest resource. Between the Cascades and the Coast Range and extending from the Columbia River southward for nearly 200 miles is the celebrated Willamette Valley. In places the floor of this valley is 25 miles wide and, with the contiguous foothills, comprises over three million acres of productive farm lands. The Willamette River drains northerly emptying into the Columbia northwest of Portland.

South of the Willamette Valley and separated from it by low mountain ranges is the valley of the Umpqua River. Still farther south and separated from the Umpqua Valley by higher mountains is the Rogue River, famous for its fertile valley as well as its fishing and placer mining. Both the Umpqua and the Rogue drain westerly into the Pacific Ocean.

Beyond the mountainous areas, much of northeastern Oregon consists of rolling uplands utilized for wheat growing and the raising of live stock. Thus it will be noted that Oregon possesses a great diversity of land surface, and a corresponding variation in climate.

TRANSPORTATION

Main trunk lines of railroads now reach practically all parts of the State except certain southeastern areas and a coastal strip in southwestern Oregon. The Southern Pacific Railroad, with its many feeders, traverses the western portion of the State from north to south, passing through the most productive portions of western Oregon and California, and connects with both water and rail lines at Portland on the northern border of the State. The Oregon Electric Railway operates a freight service from Portland to Eugene. Coastal points are reached by rail and highways through many passes in the Coast Range, and by means of coastwise boats between San Francisco, Portland, and Seattle. Throughout nearly all of its 300 mile course as the north boundary of the State, the Columbia River, besides supporting large barges and medium sized freighters as far east as Arlington, is paralleled by two transcontinental railway lines, the Spokane, Portland & Seattle Railway, or "North Bank", (on the Washington side) and the Union Pacific Railroad on the Oregon side of the river. The main Portland-Ogden line of the Union Pacific cuts across and taps the most important mining, farming, and stock-raising sections of eastern and northeastern Oregon, while branch lines from both of these roads reach far south into the interior and central districts of eastern Oregon. In addition, the Great Northern Railroad traverses the center of the State from north to south, part of the way over tracks of other roads, and enters California by way of Klamath Falls.

The Oregon State system of State highways in 1941 consisted of nearly 5000 miles of which over 4500 miles are surfaced. In addition to the State system a network of county and forest roads extends into mining districts, making most properties readily or reasonably accessible.

GEOLOGIC FEATURES

The Cascade Range is the dominating physiographic feature of the State. The mountain forms constituting the western half of the range are igneous in origin and represent vast ancient outpourings of volcanic material together with subordinate intrusive sheets, dikes and masses. The high peaks such as Hood, Jefferson, Thielsen, Three Sisters, and McLoughlin which surmount the east edge of the range in a line from north to south are relatively young although possibly extinct volcanoes. Lesser peaks and cinder cones dot the region of the high Cascades and represent outpourings of lava in still more recent times.

The west slopes of the Cascades are composed of a variety of rocks, including lavas, volcanic tuffs and conglomerates, shales and sandstones. These rocks have been intruded by masses of partly or wholly crystalline rocks in places. It is in association with the latter type that most of the ore deposits are found. The east slopes of the Cascades and the adjacent country are covered with more recent lava flows. Only here and there have streams cut sufficiently deep to expose earlier rocks.

The Coast Range of mountains is composed largely of shales and sandstones, with small amounts of conglomerate. These beds are tipped up and folded; in many localities they have been intruded by dikes and sills of basaltic lava, and may be covered or interbedded with these more recent lava flows. Because of dense vegetation the Coast Range has not been thoroughly prospected, but coal, iron ore, stone, and an abundance of useful clays have been found. In addition there are the scattered gold and platinum-bearing sands located along the beaches and on some of the coast streams.

The Klamath Mountains in southwestern Oregon are composed of sedimentary, metamorphic, and igneous rocks principally of Mesozoic or earlier age; they are much older than the Cascade or Coast Ranges. In these mountains are located the chief placer and quartz mines of Jackson, Josephine, Curry, Coos, and Douglas Counties, from which has come a large produc-

tion of precious metals. Many of the mountain ranges of eastern Oregon are made up of ancient sedimentary beds that have been intruded by igneous granitoid rocks, folded and broken, and tilted at various angles, greatly modifying their original condition and altering them to argillites, slates, and marbles. Other ranges are composed of later lavas. There are evidences here of greater movement and alteration of the rocks than in most other sections of the State. Some entire ranges seem to have been produced by uplift and movement along vast breaks that, in places, extend for many miles. Such faulting has assisted in the upbuilding of the Blue Mountains proper, of the Wallowa Range, Steens Mountain, and others in eastern Oregon.

HISTORICAL GEOLOGY

While this publication is primarily devoted to the metallic minerals of Oregon it might be of interest to include a table showing the major divisions of geologic time together with events in the geologic history of the State.

There is also included a rough guess of the percentage of the total time that elapsed during each major division.

The earth is thought to be anywhere from 500,000,000 to 2,600,000,000 years old. If we take an estimate about midway between these extremes, we find that by applying the above percentages, which refer to the percent of the total lapse of time since the formation of the earth, we are able to give some rough actual ages to the different time divisions. These are very rough guesses. After all, what are a few million years to us now? On this basis the gold veins were formed a hundred million years ago; the old gold channels were laid down 50 million years ago; the basalt flooded Eastern Oregon 30 to 40 million years ago; the glaciers carved out the deep valleys of the Wallowas one-half to one million years ago (or even more recently).

TIME DIVISIONS OF THE GEOLOGIC PAST
(Read from bottom up)

Major Divisions		Minor Divisions	Some Events in Eastern Oregon	Some Events in Western Oregon
		Recent	Lowest gold placers	Lowest gold placers and gravels
			Volcanic ash and tuff	Cascade volcanoes
Quaternary	1%		Glaciers	Conglomerates and gravels around Portland
Man				
		Pleistocene	Diatomite	
			Later gold placers	Quicksilver deposits
		Pliocene	Later rimrock lavas	Cascade lavas & granodiorite with some copper, lead and zinc
Tertiary	3%	Miocene	Beginning of building of Cascade volcanoes	
Mammals				
			Columbia river basalt flood	Columbia river basalt floods
		Oligocene	Fossil beds of John Day river	Fossil beds of Willamette Valley
				Limestone as at Markham and Dallas
		Eocene	Old gold channels	Old gold channels of southern Oregon and commercial coals as of Coos Bay
	5%	Cretaceous		
			Intrusion of granites and formation of gold veins, molybdenum and tungsten	Fossil beds of the Rogue River area
Mesozoic	11%	3-3/4 Jurassic		Intrusion of granite and formation of gold & other metalliferous veins
Reptiles				
			Limestones and argillites of Wallowas and elsewhere	Chromite and serpentines
	2-1/4	Triassic		
			Greenstones of copper belt	
	3%	Permian		Limestones, argillites & greenstones
	6%	Carboniferous	Elkhorn Ridge argillites	Older schists and slates
Paleozoic	30%			
Amphibians	4%	Devonian		
			Burnt River schist?	
Fishes	3%	Silurian		
				Older schists?
Shellfish	7-1/2%	Ordovician		
	6%	Cambrian		
Pre-Cambrian	55%			
Almost no life				

- Formation of the Earth -

Mineral Production

Statistics of Oregon mineral production dating from the discovery of gold were not recorded for many years. Even now, a segregation of the production of some of the non-metallics is not reported by the United States Bureau of Mines. As compiled from available official sources, Oregon has produced 132 million dollars' worth of metals and 118 millions of non-metals, giving a total mineral production of 250 million dollars. These are minimum figures. How much greater the total production actually has been cannot be stated definitely.

Statistics of production are now compiled by the United States Bureau of Mines, but complete figures from all producers are difficult to get promptly. This is especially true for non-metallics, reports of some of which are never secured.

To give an idea of recent production the following table is given.

MINERAL PRODUCTION - 1934-1940, inclusive.

Year	Metals	Non-Metals	Total
1934	$1,476,049	$2,735,348	$4,211,397
1935	2,262,904	3,333,580	5,596,484
1936	2,590,261	(4,400,000 est.in part)	6,990,261
1937	2,392,133	5,234,000	7,626,000
1938	3,282,970	Estimated(5,500,000	8,784,000
1939	3,828,243	(5,500,000	9,331,000
1940	5,794,018	5,751,951	11,545,969

Metals are gold, quicksilver, silver, copper, lead, zinc, and platinum in order of value.

The most important non-metals are stone, sand and gravel, cement, and clay products in the order of their value. Coal, diatomite, lime, pumice, and mineral waters, etc., are included in the production figures.

The non-metallic properties of Oregon are to be described in a later publication, and are therefore, not described here.

During 1940 and 1941 prospecting for strategic minerals (especially chromite, quicksilver, manganese and antimony) was active, but except for quicksilver, actual production was small. Production of chromite began in 1942, with prospects for considerable increase. Gold production is affected both by priorities and higher costs, and will be considerably reduced during the war period.

mining districts of eastern Oregon were known. Supplies were brought in from The Dalles, 300 miles away.

In 1863 the Auburn canal was completed; the next year the Rye Valley ditch was constructed; and nine years later Sparta ditch was built. The Eldorado ditch, with its total length of over 100 miles, built by Chinese labor, to supply water to the Malheur diggings, was also completed in this period. But by this time the principal hydraulic placer deposits were largely exhausted and a gradual decline in production began. In recent years the introduction of standard and dragline gold dredges has caused an increase in placer gold production.

The Virtue quartz mine was discovered soon after the discovery of placer gold. Quartz mines were worked at Susanville and at Mormon Basin as early as 1865 and 1868. One of the first mills was built at Susanville in 1869. Connor Creek and Cable Cove mines were worked, but the necessity of shipping ore on horseback for several hundred miles hindered their development. Real activity in quartz mining followed the construction of a transcontinental railroad in 1885, and the development of the many camps was thereafter placed on a more permanent and productive basis.

Production previous to 1904 was for some years above the million-dollar mark, but, beginning with that year, there was a decreasing annual production to 1911, the low-water mark, when $463,439 was produced. Since 1911 there has been a marked increase; in 1940, the last year for which complete figures are available, the production from Baker and Grant Counties, for all metals, was $2,964,455.

In addition to the productive Blue Mountain region, there are several widely scattered mining districts, namely Pueblo Mountain district in southern Harney County; the Harney or Idle City district in the northern part of the same country; the High Grade district in southern Lake County, south of Lakeview near the California line; the Ochoco Creek area in north-eastern Crook County; the Ashwood district in Jefferson County; and the Spanish Gulch district in south-eastern Wheeler County. The above scattered districts have had only a small production except in the Ashwood district where quicksilver valued at several hundred thousand dollars has been produced by the Horse Heaven mine.

Copper

In Oregon copper production has usually been incidental to gold production. Copper-gold ores are found in the Homestead district on the Snake River, occurring as chalcocite and chalcopyrite along shear zones in greenstones. They are also found along the "copper belt" of the lower Powder River Valley where chalcopyrite, chalcocite, and cuprite are found in bunches and disseminated through shattered and sheared greenstone. Some copper prospects are found in the Wallowa area, where mineralization consists mainly of chalcopyrite with other sulphides in contact deposits between granodiorite and limestone.

Another important district is near Takilma and the old town of Waldo, some 40 miles southwest of Grants Pass. Here copper occurs as chalcopyrite in serpentine. The production from this district to date has amounted to about three million pounds, in spite of the long haul to market.

Other districts where copper ores are found are the Imnaha and Quartzburg in eastern Oregon, the North and South Umpqua in Douglas County, and the Siskiyou Range in Curry and Josephine Counties.

The total production of copper in Oregon to December 31, 1939, as given by the United States Bureau of Mines, is 24,104,000 pounds. The mine production for 1940 is reported to be 176,000 pounds.

Lead

At the present time no mines in Oregon are operated primarily for the production of lead. It is a common constituent of the base ores of gold and silver, and occurs in greater or lesser quantities in several districts in both western and eastern Oregon, especially in Lane and Baker Counties.

The production of lead in 1940 was 70,000 pounds. This production came from three counties of the State with Baker County producing the greatest amount.

Zinc

Because of high transportation and smelting charges value of zinc production in Oregon has been practically nil. Sphalerite is a relatively common mineral in the sulphide deposits of the western Cascades. It occurs in notable concentrations in the North Santiam and Bohemia districts.

Platinum

The streams and beaches of southwestern Oregon and northern California have long been known as a source of platinum metals in the United States. Although the output of platinum from Oregon is small (119 ounces in 1940) the scarcity of the metal in the United States makes the occurrence important.

Basic rocks such as peridotite and serpentine derived from it are generally considered to be the source rocks of platinum; and the abundance of serpentine in southwestern Oregon may account for the occurrence of platinum, although it has not been found in place.

The production comes chiefly from small beach placers which are worked primarily for gold, although a small quantity of platinum metals is recovered from gold dredging and hydraulic operations. Both gold and platinum are associated with the so-called "black sands".

Quicksilver

Since 1882 Oregon has produced about 60,000 flasks of quicksilver, with a total value of about $6,000,000. It was second in production in the United States in 1940, with an output of 9,040 flasks, valued at $1,599,436.

Deposits occur in the western, central and southeastern parts of the State. Many sections have not been adequately prospected, however, and with intelligent development several partially developed properties should be added to the twenty-three now producing. See Department Bulletin No. 4 (172 pages) for details.

Chromium

Chromite is ordinarily found in serpentine rocks, and there are extensive areas of this rock in the southwestern counties, and in Grant and Baker Counties. The localities of greatest importance where chromite was mined during the World War are those near Canyon City, in Grant County, and in the Waldo and Illinois River areas in Josephine County. There are over 100 properties in Oregon with a total past production of 36,500 long tons, and known reserves of upwards of a quarter million long tons. In 1918, 18,000 long tons were shipped,

two-thirds from Eastern Oregon and one-third from the western part of the State. See Department Bulletin no. 9 (70 pages) for details.

Nickel

A deposit of garnierite, nickel silicate, occurs on Nickel Mountain about five miles northwest of Riddle, Douglas County. The nickel mineral is supposed to have been derived from the olivine in the surrounding peridotite. According to a report by the U. S. Geological Survey (Pecora & Hobbs, '42) about 162 acres are underlain by a blanket containing over 6,000,000 tons of from 1 to 2 percent grade. About 80,000 tons have been proved to contain 2 to 3 percent nickel.

There are some other unexplored deposits in southwestern Oregon.

Molybdenum

Molybdenite has been found in a few localities in northeastern and southwestern Oregon. Perhaps the most important of these are in the Wallowa area, occurring as contact deposits, previously referred to under copper. The metal occurs associated with pyrite, magnetite, quartz, calcite, garnet, epidote, and scheelite.

Antimony

Antimony sulphide (stibnite) is found in several sections of the State. Promising deposits occur in the Upper Applegate area, Jackson County, near Watkins, and on Forest Creek, in the same area. These ores are said to contain good values in gold and silver. A wide vein is reported to exist in Jackson County, 12 miles west of the Pacific Highway, at the Siskiyou Mountain summit. Stibnite is also found in the Bohemia district, Lane County, and on Big Boulder Creek four miles east of Susanville in Grant County. The Koehler Mine, near Baker, shipped several carloads of stibnite during the First World War. Value of shipments is reported as about $15,000.

COAL

There are several regions in Oregon which contain coal. The most important of these is the Coos Bay field, which surrounds Coos Bay in Coos County. This field has had a continuous production since its discovery, producing more or less actively for the past 73 years. It has a recorded production of about two and one-half million tons, reaching a maximum in 1904, when 111,540 tons were produced.

The coal in this section is of sub-bituminous grade with analysis about as follows:

Moisture	11-20 percent
Volatile matter	30-40 "
Fixed carbon	35-45 "
Ash	8-12 "
Sulphur	1.3-1.6 "
B.t.u.	9,000-10,000

The production in this region has been materially reduced in the past several years because of the competition of other fuels, particularly fuel oil from California. In 1937, 9,300 tons were sold.

Another locality which gives promise is the Eden Ridge field in the southeastern part of Coos County. This field has been sufficiently prospected to demonstrate the existence of

two veins of coal, one 7 feet and one 10 feet thick, having perhaps the highest grade yet found in the State. Washing would be necessary to obtain a commercial grade. A railroad is constructed to a point 10 miles from the deposits.

Other coal fields have been prospected in different parts of the State. The chief localities are the Upper Nehalem in Columbia County, the Lower Nehalem in Clatsop and Tillamook Counties, the Yaquina field in Lincoln County, the Eckley and Shasta fields in Curry County, the Rogue River Valley field in Jackson County, and the John Day field in Wheeler, Gilliam, Morrow, and Grant Counties.

ACKNOWLEDGEMENTS

Field work on this section of the catalogue of mines was done principally by J. E. Morrison and Ray C. Treasher. Assistance was received from a large number of people who offered valuable information concerning various mining properties. Especial mention should be made of the following:

Alden, R. M., Galice, Ore.
Bristol, F. I., Rogue River
Burner, W. R., Grants Pass
Camerson, Don, U.S.F.S., Grants Pass
Davis, W. G., Box 54, Phoenix, Ore.
Fixley, W. C., Williams
Foster, George C., Kerby, Independence Placer
Gilliam, F. W., Wolf Creek
Gray, C. E. Wolf Creek
Hammer, R. L., Selma
Harvey, J. R., Grants Pass
Hunter, Glenn, C., Grants Pass
Messenger, Harry, Takilma
Moore, R. H., Central Point
Pool, M. E., Rogue River, (Wimer)
Ross, Dr. Rex, Placer
Thrasher, G. W., Holland
Walker, A. A., Gold Hill
Ward, H. W., 628 Dakota, Medford
Whittrock, J. H., Kerby
Williams, Percy, Wolf Creek
Wickham, P. B., Greenback Mine, Placer

MINING AREAS IN SOUTHWESTERN OREGON

It has been the custom to refer any mining property to a so-called mining "district" for its legal location. No absolute boundaries have ever been outlined for these districts, with the result that any miner who had a property located somewhere between two more or less adjacent districts could not determine with assurance in which one his property lay.

In order to provide definite limits to the various regions in which mining and prospecting are conducted, while at the same time retaining as many of the old terms as possible by which the districts have been known, the term "area" is used in this volume to define and include various known "districts". These "areas" adjoin and are laid out so that no unclassified land lies between them. The term "district" is thus restricted to certain portions of the area where custom has established usage. Each area is named after the most familiar district included within it.

PART C VOLUME II
(JOSEPHINE COUNTY MINES CATALOG)

GEOLOGY OF JOSEPHINE COUNTY

By
Ray C. Treasher

Geologic maps of most of Josephine County have been published, and field work is now going on. The Riddle quadrangle covering the northeast quarter was published in 1924 (Diller 24); the Grants Pass quadrangle covering the southeast quarter was published in 1940 (Wells 40); the Kerby quadrangle covering the southwest quarter is in preparation. The northwest quarter, including most of the Galice area, has never been covered except by a reconnaissance survey by Diller (14).

A summary of the characteristics of the geologic formations which have so far been distinguished and mapped is given in the following discussion. Some corrections of the early work have been made so as to present an up-to-date picture of the geology of Josephine County.

Older Greenstone (Triassic)

The oldest rocks of the County are known as "greenstone" which covers the east side of the County except where intruded by granitic rocks. They have been eroded into mature mountains with steep slopes. The zone of weathering is deep and a brick-red soil frequently develops. Vegetation in the greenstone areas is heavy; brush forms almost impenetrable "jungles" of manzanita, "goat brush", and poison oak; timber includes hardwoods such as scrub and live oak and madrona, and conifers such as pine, fir, and hemlock.

Greenstone is a term used to designate a group of rocks that are fine-grained, hard, dense, and silicified to varying degrees. The predominating color is light green but they may be brownish from iron and manganese stain. Occasionally the rocks are banded, giving a clue to the sedimentary origin of a part of them. Quartzite, argillite, and limestone are common phases in certain areas. Shearing and faulting may produce a material superficially resembling serpentine, which it is not, as serpentine results from the alteration of ultra basic intrusives such as peridotite. The term "slickentite" has been applied to these slick, serpentine-appearing rocks.

The term greenstone has been used in the past as a sort of catch-all term to be applied when the rock could not be more definitely classified. Diller (14, 24) included many altered rocks in this group. Wells (40) divides the greenstone into two classes; (1) metavolcanics, such as altered lava flows, flow breccias, and pyroclastics, with some intrusive rocks, and (2) metasediments, such as altered tuffaceous sediments, argillite, quartzite, chert, and limestone. The prefix "meta" means altered or changed. "Metamorphism" means changed in form. Efforts to trace this series northward from the Grants Pass quadrangle to the Riddle quadrangle has led to the suggestion that Diller's May Creek schist is merely a more highly metamorphosed phase of the metavolcanics and metasediments.

The greenstone has been invaded by certain ore solutions and quartz veins are common. The quartz veins may occupy fracture zones and may be mineralized with iron, copper and zinc sulfides, and free gold. Most of the famous "gold pockets" were found in the quartz veins of greenstone areas. Massive sulfides may carry gold but as a rule the "cube-iron" is poor in precious metals. Ores of chrome, nickel, and platinum are practically unknown in the greenstone.

Brief mention should be made here of the younger greenstones that are associated with the Galice and Dothan formations and according to Wells (personal communication) should be assigned to that sedimentary group instead of to the older greenstones. This is particularly true of the northwestern part of the County.

The older greenstones have a general north-northeasterly strike. Diller (14) proposed that the series was part of the east dipping limb of a major overturned fold. Wells (40) however, indicates that the series represents close folding of a series of folds. According to Wells and Hotz (41), re-examination of Diller's fossil collections coupled with the study of recent collections by the U. S. Geological Survey indicates that a Devonian age for the greenstones must be abandoned, and that more properly they are to be classed as Triassic.

Galice, Dothan, and Younger Greenstone formations (Jurassic)

The Jurassic sedimentary series and their associated volcanic rocks are well exposed in the western part of Josephine County. They are eroded into steep sided mountains and covered with heavy vegetation, particularly along the boundary between Josephine and Curry Counties. The zone of weathering is deep and where underlain by slate, the soil is clayey. The series originally was divided into the Galice and Dothan sedimentary series, separated for the most part by intervening greenstone (younger greenstone).

The Galice formation is predominately black slate that breaks into thin plates about 3 inches in diameter. It also contains some light colored conglomerates, grit, and tuffaceous sandstone, and shale. The Dothan formation is not as well known; in general it is similar to the Galice formation but has less slate and more sandstone and conglomerate. Volcanic rocks, particularly altered andesite flows interlayered with flow breccias, grit and shale, predominate in some places.

Quartz veins, mineralized with various sulfides and some free gold, occupy fractures along the contact of the sediments and the altered volcanics and other dissimilar rocks as well as occurring within the sediments themselves.

The structural trend of the Jurassic sedimentary series is north-northeast and roughly parallel to that of the older greenstones; dips are usually at high angles to the southeast or northwest. Minor faulting is common, being parallel to the structural trend. Major faulting is also recognized, as along the west side of the Illinois Valley. (Wells, personal communication).

Diller (14) identified the Galice formation as Jurassic on the basis of fossil collections made at various points. The type locality is at the Almeda Mine below Galice. He interpreted the Dothan formation as being younger than the Galice, either being faulted up, or representing the west limb of an east dipping overturned fold. More recent studies suggest that if the Dothan is a separate formation, it is older than the Galice (Taliaferro 41) and the structure is that of a series of north-northeasterly trending close folds. The greenstone that is interbedded with and lies between the two formations, as in the northwest portion of the Riddle quadrangle, is not to be associated with the older greenstone of Triassic(?) age but more properly should be classed as Jurassic greenstone or even included with the sedimentary series.

The Jurassic sedimentary situation is further complicated by the recognition of a Dillard formation, which is upper Jurassic and younger than Galice formation. Diller may have confused Dothan and Dillard in a number of instances. More academic work is necessary to solve these problems.

Peridotite and Serpentine (Jurassic)

Peridotite is an ultra-basic rock that lies in relatively narrow bands across Josephine County from the southwest corner toward the middle of the north boundary. The largest mass is at the southwest. Small discrete patches are found throughout the county. The rock is resistant to erosion and steep walled canyons are the rule. On some of the intervening plateau-like areas deep weathering has produced a peculiar shade of mahogany-red soil. Vegetation is less luxuriant than in other areas, and timber is more scrubby and is usually restricted to pine. Serpentine is an alteration product of peridotite; vegetation on these areas is so sparse that one can map true serpentine areas from a hilltop with a fair degree of accuracy.

Peridotites form a group of ultra-basic rocks that range from pyroxenite, through saxonite (or hartzburgite), wehrlite and lherzolite to dunite. Peridotite is dark colored on fresh fractures and frequently contains phenocrysts of enstatite or diallage. Olivine is an essential mineral component, and occasionally may be abundant enough to cause the rock to be classified as a dunite, as on lower Rough and Ready Creek. The ultra-basic rocks weather to a tan or buff color and are locally called "Buckskin Rocks". The enstatite phenocrysts weather more slowly than the olivine groundmass and stand out as knots on the rock surfaces. Many of the ultra-basic rocks are altered or "serpentinized". During this change they took on water and increased in volume. Pressures thus set up caused intense movements within the rock and minor faulting, thus giving the "slick" surfaces. Serpentine is very dark green to black on fresh fracture and at first glance may resemble black marble. Further alteration produces a rock with a yellowish green color and a waxy luster, very similar to the "slickentite" described under the discussion of the older greenstones.

Chromite is an accessory mineral of economic importance; it may be found as disseminated grains throughout some of the rock or it may be concentrated as "high grade" in pods or kidneys. For a more detailed description of this mineral occurrence, see Allen (38). Nickel is recognized as occurring in very small amount and may be concentrated as the greenish silicate garnierite in the overlying red soil.

Structural relationships suggest that the ultra-basic rocks were intruded into the Jurassic sedimentary series and the older greenstones as sills or laccoliths (Wells 40). Minor faulting is common. The contacts of the ultra-basic rocks and associated rocks frequently are faulted and sheared and many mineral discoveries have been made in these zones. Wherever found, they should be prospected with care.

Field relationships suggest that the ultra-basic rocks are late Jurassic in age; - later than the Jurassic sedimentary series and before the diorite intrusion.

Diorite and Related Granitic Rocks (Jurassic?)

Several large, irregular masses of granitoid intrusive rocks are exposed in Josephine County. One large mass lies east of the Oregon Caves; a second is in the Grants Pass area; and a third is found near the middle of the west boundary line. Smaller bodies from a fraction of a mile square to several miles square are found scattered throughout the southeastern portion of the County. The rock weathers readily and it is not uncommon to find road cuts over 30 feet deep exposing "rotten granite". Hills are lower and more smoothly rounded than those underlain by other rocks. Vegetation is scrubby; brush is dense and trees are stunted. The soil is light colored and is full of rock granules. Enough clay is present so that the soil tends to pack under pressure and become almost impervious.

This group of granitoid intrusives includes diorite, quartz diorite, granodiorite, and granite. For the most part they are light gray fairly coarse and even grained holocrystalline rocks. Small aplite dikes are common but the pegmatite dikes found in the Ashland

granite mass seem to be absent. Porphyritic varieties are rare.

Little can be said of the structure of these rocks. Study of the various geologic maps of southwestern Oregon plainly shows the north-northeasterly trend of the pre-diorite rocks. There is a slight suggestion of a more northerly alignment of dioritic rock bodies as if these intrusives cut across the earlier trend of the rocks. Wells (40) has mapped contact aureoles around a number of the intrusives.

The diorite masses themselves have not been productive of mineral deposits. Some of the aplite dikes may carry some free gold. However, areas immediately surrounding these dioritic masses have been productive and this fact suggests that they should be carefully prospected for additional discoveries.

The granitic rocks intrude all the Jurassic formations and are overlain in other areas by Cretaceous sediments. They are thus either late Jurassic or early Cretaceous in age.

Horsetown (?) formation (Cretaceous)

The only exposures of Cretaceous sediments in Josephine County are in the Takilma area. They are described by Shenon (33b) as being either upper Horsetown or lower Chico. The lower beds are largely coarse conglomerate with some interbedded sandstone, and the upper beds are almost totally sandstone. Conglomerate beds somewhat resembling those of the gold-bearing Tertiary conglomerate are exposed along the West Fork of Illinois River. The sandstone is grayish green when fresh and has a tendency toward spheroidal weathering.

Tertiary Deposits

The known Tertiary rocks include the Eocene gold-bearing conglomerate of the Waldo-Takilma area, and the so-called "old channel" gold-bearing conglomerates.

Old gold-bearing Tertiary channels that have little relation to present drainage are a well known feature of northern California and southwestern Oregon. The old channel in the Waldo-Takilma area is described by Shenon (33b) who says that the conglomerate is composed of large boulders in a sandy matrix and that it was indurated at an early date and is not cut by minor faulting. The boulders are thoroughly altered or "rotted". He concludes that the precious metals were derived from the decomposition of the boulders and that the formation is Eocene in age instead of Cretaceous as suggested by Diller (14).

An old channel is recognized on Josephine Creek at the Golden Princess and Independence placers. The boulders are well "rotted" and the formation is sufficiently indurated to permit bedrock drifting. Coarse gold slugs the size of pumpkin seeds are common on bedrock. The Big Four placer on Pickett Creek seems to be part of an old channel. Here, the formation is indurated, the boulders are "rotted" but no unusual concentration of gold on bedrock is reported. The Old Channel placer at Galice is another in this series. Conditions are similar to those at the Big Four placer. Whether these old channel placer mines are on the same old Eocene channel has never been determined satisfactorily.

High level placer mines on Grave Creek, Butte Creek, The Benson, Three L's, Vindicator, and other places may be part of an old channel. The conglomerate is indurated and the boulders are rather well "rotted". In fact, they are called "wooden boulders" because they give a sound similar to a piece of wood when dropped.

These old channels have contributed materially to the gold deposits in many of the

later stream deposits, especially where modern drainage has cut through the old channel and distributed its precious metals throughout the younger gravels. A notable example of this is at the Sterling placer in Jackson County.

High Level Channels (Pleistocene ?)

The Rogue River canyon is characterized by high terraces along its walls, many of which are productive. They are most conspicuous downstream from Hell Gate canyon. The conglomerate is moderately indurated, most of the boulders are fairly fresh although some of them are "rotted". The gold is fine in size.

Shenon (33b) describes a gravel formation in the Waldo-Takilma area that gave rise to the most productive placers in the County. He suggests that these gravel deposits are of Pleistocene (Wisconsin) age and that the gold was largely derived from the erosion of the Eocene conglomerates.

Stream Placers (Recent)

The bars and channels of practically all the streams in southwestern Oregon show some trace of gold. The gold may have been derived partly from the erosion of gold bearing stringers cut by the streams, and partly as a re-concentration of gold that has escaped from placer operations upstream. This latter process is in operation at the present time.

Many of the small streams and gulches have been richly productive. The gold has resulted from the erosion of gold bearing stringers and pockets in the immediate drainage basin.

MINERAL PRODUCTION

Since the earliest days of mining in the State, Josephine County has been important in production of gold. For nearly ninety years gold placers have been worked, and were it not for war conditions which always affect gold mining adversely placer mining would be as important as ever.

At present (1942) chromite production is being stimulated because of the need for chromium in war materials. Josephine County contains important copper deposits, and these may be placed in production during the period of great demand for copper for war purposes.

Data on the mineral production of Josephine County (from the U.S. Bureau of Mines Minerals Yearbook, Review of 1940, p. 430) is given as follows:

Districts:	Mines Producing		Ore & old tailings	Gold (fine oz.)		Total	Silver.	Copper	Total
	Lode	Placer	(short tons)	Lode	Placer	Gold	(l&p)	(lbs)	value
Galice	4	10	18,143	4,992	740	5,732.	423		$200,921
Grants Pass	1	8	525	35	555	590.	84		20,710
Greenback	8	10	1,417	164	657	821.	389		29,012
Ill.River	1	8	28	7	285	292.	34		10,244
L. Applegate	1	1	24	16	18	34.	6		1,194
Waldo	4	14	486	42	3,558	3,600.	505	26,000	129,297
Total	19	51	20,623	5,256	5,813	11,069	1,441	26,000	$391,378

Value of nonmetallic mineral production is principally in sand, gravel, crushed rock and limestone converted to Portland cement in Jackson County. Exclusive of limestone, which may not be segregated from Jackson County production, value of nonmetallics produced in 1940 amounted to $84,143.

Total value of mineral production in the County in 1940 was $475,521.

GALICE AREA (21)

The Galice mining area is in northwestern Josephine County, west of R. 6 W., and north of T. 36 S., with the boundary cutting diagonally through T. 35 S., R. 7 W. Its area is about 300 square miles.

Geography:

The area is mountainous, with elevations ranging from 600 feet at the Rogue River to 4000 feet on some of the higher peaks. Maximum relief is, therefore, of the order of 3500 feet. The Rogue River is the master stream, flowing northward through the eastern part and westward through the northern part. It cuts across resistent rocks and its valley is gorge-like in certain sections. The main tributary streams are Grave Creek on the northeast, and Galice Creek on the west. Other tributaries have steep, short gradients.

The district is well forested with conifers on the more exposed slopes, and hardwoods in the gulches. The hillsides are covered with a dense growth of brush containing manzanita, buckthorn, and poison oak, so that the dense vegetation coupled with steep slopes and deep soil cover makes prospecting difficult. The district lies within the Siskiyou National Forest.

Transportation is limited to secondary roads and Forest Service truck trails. Poor transportation has been a decided handicap to mining activities.

Rainfall, occurring mainly in the winter and spring months, is about 40 inches a year. Maximum and minimum temperatures range from 0° to 90°.

Geology:

Little geologic mapping has been done in the Galice area. There are no topographic maps and the area is relatively inaccessible. Most of the areal geologic information available is the result of reconnaissance work of Diller (14) during the early part of the present century together with inferences drawn from work in adjoining areas. A small amount of detail mapping was done by Shenon (33c) in the vicinity of the Robertson Mine.

The rocks consist of the Jurassic sedimentary series, which includes the Galice and Dothan formations and the Jurassic metavolcanics. These were intruded by ultra-basics (peridotite & serpentine) and diorite. The most prominent structural feature is the fault zone, locally known as the Big Yank Ledge, that trends north-northeast through the Almeda Mine. Remnants of the old placer channels are found at the Old Channel placer and along Grave Creek. High terrace placers are found along the Rogue River. These formations and their relationships are discussed in the section on the general geology of Josephine County.

Mining:

About 1854 placer mining began on Galice Creek, with the work during the '50's being prosecuted on the most accessible and richest deposits. Activity diminished during the '60's and by the '80's the small placers were being worked by Chinese. In 1883 the Galice Creek district had an output estimated at $8000. Quartz mining was started about 1886 and in the '90's the quartz mines of the Mt. Reuben area became prominent; in 1897 the principal quartz mining in southern Oregon was in this district. In 1898 the Gold Bug Mine had a 5-stamp mill which yielded good returns; and the Golden Wedge was crushing its ore in an arrastre. Activity continued for the next five years. In 1905 the Almeda mine was developing ore and in 1908 a 100-ton matting furnace was built at the mine. In 1907

the Oriole was active, an activity that has continued sporadically to the present. In 1908, 3000 feet of underground workings were driven at the Almeda and three quartz mines of the district produced $23,580 worth of metals. In 1910 the producing mines were the Oriole, Gold Road, Nesbit, and Sugar Pine, the Sugar Pine using a 10-stamp mill. In 1912 the Almeda smelter was operated for 30 days and for about the same length of time during the next year. The Almeda mine was worked in a small way during 1915-1916.

During 1940 and 1941 the Benton mine was the largest underground mine in southern Oregon, and the development of new ore bodies is continuing. Interest in the Almeda has been revived by diamond drilling and by installation of a mill. The Bunker Hill or Robertson was also active during 1940 and 1941. In March 1941, the Robertson Brothers took out in just a few days a bunch of ore worth $20,480. The Black Bear, and some other lode mines are producing small amounts of ore (1942).

There were 18 placer properties and 7 underground mines in operation during 1941.

Favorable Areas for Prospecting:

The gold-bearing gravels of the old high channels have been fairly well located although it is possible that as the courses of these channels are plotted, "breaks" between the known areas may indicate additional gold-bearing gravels.

According to those who are familiar with the district, there are three "lodes" along which mineralization seems to have occurred. The most easterly is the Almeda, or as it is better known, the Big Yank ledge, having a trend slightly east of north. Next, to the west is the Chieftain "lode", cutting through the California claims. The most westerly is the General Grant "lode" that cuts through the Benton Mine. Whether these "lodes" exist as units with metallization throughout their lineal extent is not known, but the alignment of ore deposits and other evidence warrant a detailed study of the area.