STATE OF OREGON
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
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Bulletin No. 14-D
NORTHWESTERN OREGON

Oregon Metal Mines Handbook

By the Staff

Bulletin 14-A — Northeastern Oregon — East Half
14-B — Northeastern Oregon — West Half
14-C — Southwestern Oregon
Vol. I — Coos, Curry, and Douglas Counties
Vol. II Section 1 — Josephine County
Section 2 — Jackson County
14-D — Northwestern Oregon
14-E — Central and Southeastern Oregon

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FOREWORD

Northwestern Oregon, with which this bulletin deals, contains by far the greatest concentration of the State's population. This area produces and markets the largest part of the State's nonmetallic minerals; but its value of output of metals is small by comparison, even though past production from the Western Cascades has included gold, silver, copper, lead, zinc, and mercury. There is reason to predict that the discovery of large reserves of high-iron bauxite in several counties, as described in this bulletin, may in the future make this part of the State of national as well as local importance in metallic ore production.

Cataloging Oregon's mines and mineral deposits is a continuing Departmental activity. The Department endeavors to inspect and record all reported new deposits and seeks also to keep its records up to date by making examinations of new development work in known deposits. It is impossible for the Department to examine all known mines and prospects. Therefore wherever a Federal Government report is available it is incorporated in Departmental records and used in the mines catalog with appropriate credit.

Bulletin 14-D, the sixth in a series of bulletins comprising the Oregon Metal Mines Handbook, has been in preparation since 1938. Active work in compilation was interrupted by the impact of World War II and the necessary concentration of Departmental activities on strategic mineral investigation. Organizing descriptive matter in Department records was resumed in 1947, but completion was slow because staff members could not give uninterrupted attention to the work.

Nearly all present and past members of the staff have contributed to the compilation and editorial work of this bulletin. Dr. John Eliot Allen, formerly geologist with the Department, compiled many of the reports of the deposits in the Western Cascades. Most of the assembling and final editing was done by Mr. David J. White and Miss Margaret Steere. Mr. Ralph S. Mason prepared most of the maps for reproduction. Mrs. Lillian F. Owen gave careful attention to proofreading and multigraphing.

F. W. Libbey
Director

April 18, 1951

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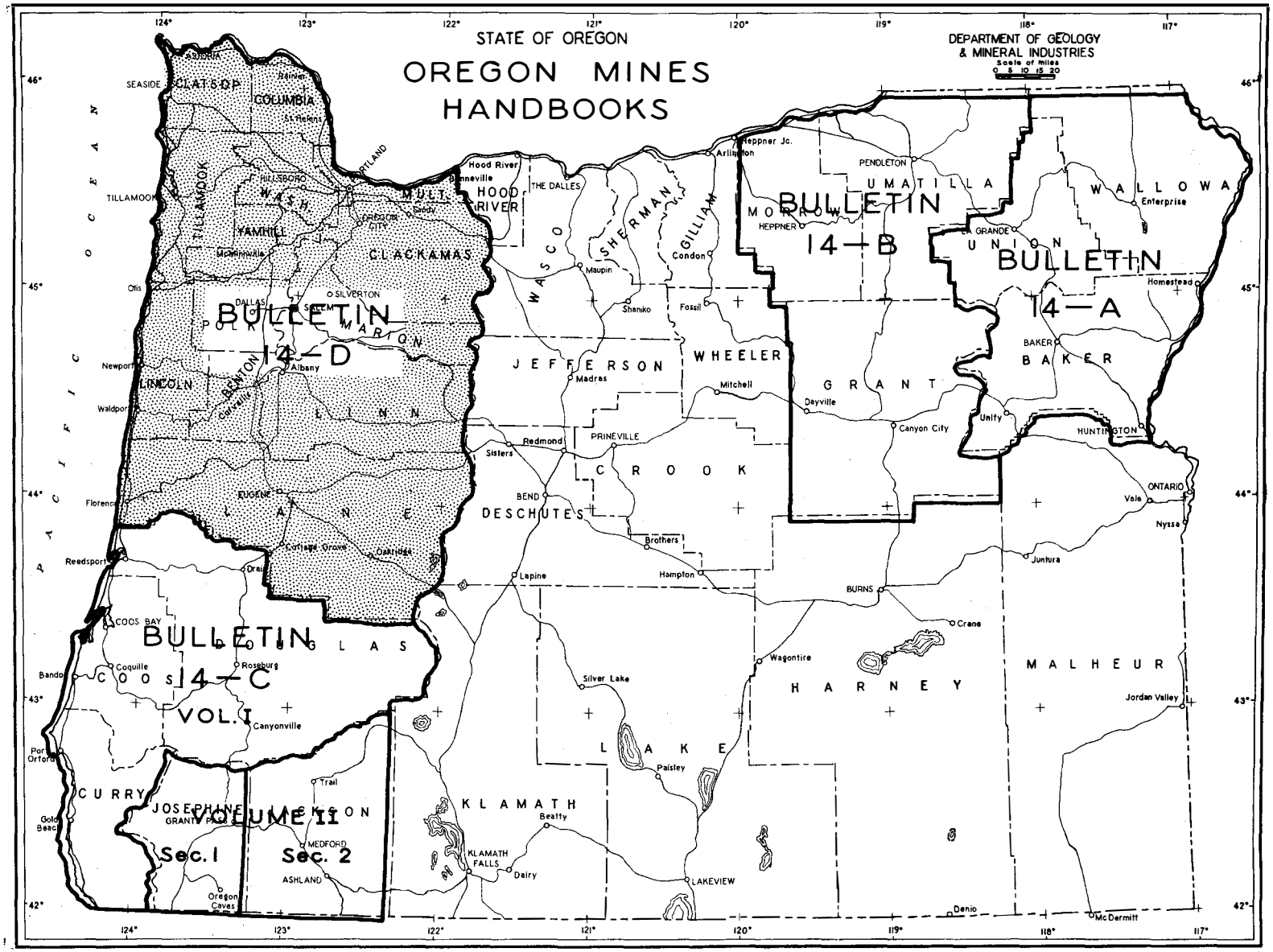


Fig. 1 Index map of Oregon showing areas covered by mines handbooks.

INTRODUCTION

The geographical unit covered by this volume is bounded on the north by the Columbia River, on the east by the High Cascades, on the south by the southern boundary of Lane County, and on the west by the Pacific Ocean. This unit includes 13 counties whose total area is 16,773 square miles - an area twice as large as the State of Massachusetts. The areas of individual counties are as follows:

County	Square Miles	County	Square Miles
Benton	647	Marion	1,173
Clackamas	1,890	Multnomah	424
Clatsop	820	Polk	739
Columbia	646	Tillamook	1,115
Lane	4,594	Washington	716
Lincoln	1,006	Yamhill	709
Linn	2,294		

Several counties of northwestern Oregon have extensive occurrences of commercial nonmetallic minerals; in addition, Clackamas, Columbia, Lane, Linn, Marion, Multnomah, Polk and Washington counties have known deposits of metallic minerals. These metallic deposits may be conveniently separated into four distinct groups geographically and, to a lesser degree, mineralogically. They are: (1) deposits of the western slope of the Cascades, consisting essentially of copper, iron, lead, and zinc sulphides usually containing some gold and silver; (2) the quicksilver deposits of Lane and Clackamas counties; (3) the limonite and ferruginous bauxite deposits of Columbia, Clackamas, Marion, Multnomah, and Washington counties, consisting of both hard and soft limonite in bog deposits, and those containing high-iron bauxite which has been derived from the laterization of basalt; (4) black sand minerals along the coast.

Besides these 4 groups, there are four types of nonmetallic deposits which are discussed in this bulletin, as they are closely related to metallurgical processes for production of metals; namely, (5) refractory and high-alumina clays, (6) coal, (7) limestone, and (8) silica sands. A few other miscellaneous minerals (9) in isolated localities and occurrences are also listed.

Total value of mineral production for this part of the State amounts to many millions of dollars, but by far the greatest proportion of value has been in nonmetallic minerals. The total recorded value of metallic minerals, exclusive of mercury, from 1880 through 1947 is about one and one third million dollars, $1,000,000 of which came from the Bohemia district. As northwestern Oregon was settled earlier than any other part of the State and has remained more populous, demand for construction materials such as sand, rock, cement, and brick has been relatively large in this area. The major part of this demand has been supplied from local sources.

History

Many of the important events of early Oregon history centered in this region. Lewis and Clark wintered in Clatsop County in 1804; the Astor expedition founded the town of Astoria in Clatsop County in 1811; Jason and Daniel Lee founded their mission at Champoeg in Yamhill County in 1834; and the northern Willamette Valley was the destination of all Oregon emigrant trains. So from earliest times northwestern Oregon has been the population center of the State.

The discovery of gold in California in 1848 and in Oregon on Jackson Creek in 1851 provided the incentive for prospecting on all streams and creeks of the State. In northwestern Oregon, production was meager. Small amounts of metallic gold were found in the valleys of the Molalla, Santiam, and McKenzie rivers. The following up of these discoveries of placer gold resulted in finding lode deposits. Gold was found at Bohemia in 1858, in

the Molalla and Santiam valleys in 1860, and at Blue River in 1863. The town of Quartzville in Linn County was established in 1864. Little in the way of production resulted from the early discoveries, and it was not until late in the past century and early in the present one that any important production came from the deposits in the Cascade Range. The Lawler mine at Quartzville was active in the 1890's, as were also the Musick, Champion, and Noonday mines of the Bohemia district. In the Blue River district the only producing mine, the Lucky Boy, was active in the early 1900's.

Mills were equipped with stamps and amalgamation plates and could recover economically only free gold, so when the generally superficial oxidized ores were mined out these mills were unsuited to recover the values locked up in the complex primary sulphides. Selective flotation had not been developed; mechanical concentration where tried was both inefficient and produced a complex concentrate, the metals of which could not be separated economically by smelting. These factors caused curtailment of many operations, and activity was intermittent from about 1910-1930.

After the increase in the price of gold in the early 1930's a small annual production from both Quartzville and Bohemia districts was maintained until terminated by war conditions. Operations at the Champion mine in the Bohemia district by the Higgins and Hinsdale mines from 1939 to 1942 resulted in the completion of some development work and the erection of a flotation mill and power plant. Operations were suspended in 1942 before production was attained. F. J. Bartells acquired the mill and property from the H and H mines in 1944. From 1945 to 1949 a small amount of gold was produced from the Champion and Evening Star mines by F. J. Bartells and from the Helena mine by K. O. Watkins.

Climate

Northwestern Oregon has a humid climate with a rather wide variation in annual precipitation. An average figure for the annual precipitation of the Western Cascades is about 70 inches; it is less than this in the Willamette Valley, and more along the northern part of the coast. Records of annual snowfall in the higher portions of the Cascades also indicate a wide variation. Recordings as high as 458 inches of snowfall have been noted at Cascade Summit on the Willamette Pass. Because of the great variations in altitude between the High Cascades and the coastal region, a wide range of temperature is to be expected. Along the coast the climate is mild and equable, snow is rare, and temperatures seldom reach freezing.

Transportation

Northwestern Oregon has the greatest concentration of population in the State, and also the most extensive road system. A network of paved highways and improved roads covers most of the Willamette Valley. There are several east and west connections from this network both with the Coast Highway to the west and The Dalles-California Highway east of the Cascades. The main line of the Southern Pacific Railway runs north and south in the Willamette Valley, with two branch lines to the coast. The Spokane, Portland, and Seattle Railroad has a line paralleling the Columbia River from Portland west to the coast at Seaside, and a branch electric line from Portland to Eugene. Ocean transportation facilities are available by way of the Columbia River and the lower part of the Willamette River. Transportation to the metal mining districts in the Cascade Range, however, is restricted to a few graveled and paved mountain roads tributary to the main highways.

Physiography

The principal physiographic provinces of northwestern Oregon consist of the Cascade Mountains on the east, the Coast Range on the west, and the Willamette Valley between. With the exception of the west slope of the Coast Range, which drains toward the Pacific Ocean, all of the area drains either into the Willamette Valley and thence northerly into the Columbia River, or directly into the Columbia.

The western section of the Cascades is a rugged, deeply dissected, heavily timbered area with summits as high as 6,000 feet. Glacial action has modified the topography near the heads of some of the larger valleys, steepening the canyons and depositing gravels. The eastern portion of the Cascades, designated as the High Cascades, is a relatively narrow belt extending from north to south and is characterized by shield-shaped lava plateaus capped by numerous majestic volcanic cones such as Mount Hood, Mount Jefferson, Three Sisters, and Diamond Peak, together with many smaller cones and lava flows.

The Coast Range is generally much lower in elevation than the Cascade Range, with a more mature topography and no large mountain masses such as those of the Cascades. The area is deeply dissected by streams, and generally covered by a thick forest growth characterized by very large conifers and dense underbrush. Large logging operations have been and are carried on in many localities in the Coast Range.

The Willamette Valley, a broad, level, or gently sloping alluviated plain, famous as an agricultural section, averages about 25 miles wide between the foothills of the two ranges and extends from Lane County north to the Columbia River, a distance of about 140 miles. The valley is constricted by intravalley hills, which rise to elevations as high as 1000 feet between Portland and Oregon City and in the area south and north of Salem.

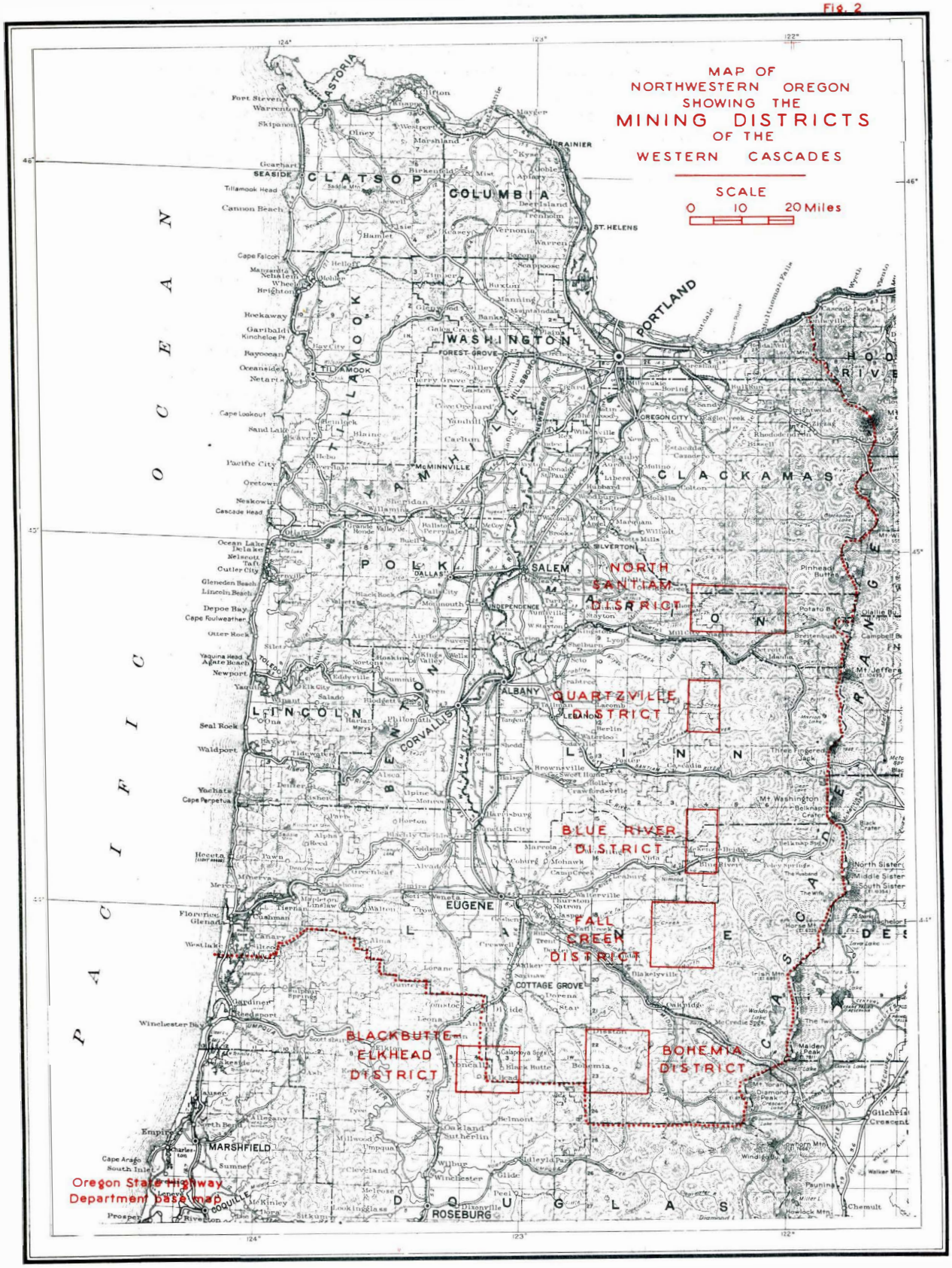
Geology

Callaghan and Buddington (1938: 7,8,21,22)* describe the geology of the Cascades as follows:

> "The Cascade Range in Oregon is composed mainly of volcanic rocks with a very minor proportion of small dioritic intrusive bodies. The proportion of flows to fragmental rocks varies from place to place. . . . Fluviatile and glacial deposits are of local significance only. These rocks range in age from Eocene to Recent (?), with probably every epoch of the Cenozoic represented. . . .
>
> "Most if not all of the volcanic rocks of the High Cascades are believed to be younger than those of the Western Cascades, where flows that antedate the last period of extensive glaciation partly fill valleys. Constructional volcanic surfaces are preserved in the High Cascades but are mostly if not completely lacking in the Western Cascades. The High Cascades contain flows that were deeply trenched during the late (Wisconsin?) period of extensive glaciation and flows that are later than this glaciation. They are thus definitely both Recent and Pleistocene and are believed to extend back into the Pliocene, though there is no direct evidence.
>
> * * * * * * *
>
> ". . .the principal events in the history of the range are as follows:
>
> "1. Accumulation of the lavas of the Western Cascades at various places and at various times from Eocene to Miocene. There were undoubtedly many erosional unconformities within the series although only a few were seen. There was undoubtedly some deformation at various times, for the gray andesite lavas overlie unconformably Eocene marine sediments in the Roseburg area, whereas the two formations appear to be conformable on the east slope of Bear Creek Valley.
>
> "2. Deformation, dioritic intrusion and contact metamorphism, further deformation, and deposition of minerals, probably near the end of the Miocene.
>
> "3. Extensive erosion, possibly accompanying regional uplift, and possibly further slight deformation.
>
> "4. Accumulation of the lavas of the High Cascades and the valley flows that extend down into the Western Cascades. The valley flows are known to have been modified by the latest extensive glaciation (Wisconsin?), but it is not definitely known whether most of the flows of the High Cascades antedate all the glacial periods.

*Bibliography in back of this bulletin.

Fig. 2


MAP OF
NORTHWESTERN OREGON
SHOWING THE
MINING DISTRICTS
OF THE
WESTERN CASCADES
SCALE
0 10 20 Miles
NORTH SANTIAM DISTRICT
QUARTZVILLE DISTRICT
BLUE RIVER DISTRICT
FALL CREEK DISTRICT
BLACKBUTTE-ELKHEAD DISTRICT
BOHEMIA DISTRICT
PACIFIC OCEAN
CLATSOP
COLUMBIA
TILLAMOOK
WASHINGTON
CLACKAMAS
HOOD RIVER
POLK
MARION
LINCOLN
BENTON
LINN
LANE
DOUGLAS
CASCADE RANGE
PORTLAND
SALEM
ALBANY
CORVALLIS
EUGENE
COTTAGE GROVE
ROSEBURG
MARSHFIELD
McMINNVILLE
FOREST GROVE
OREGON CITY
ST. HELENS
SILVERTON
Oregon State Highway Department base map

It is inferred that some may be as old as the Pliocene, but no definite proof has been evolved. Some flows in the High Cascades are definitely later than the latest extensive glaciation. During the Pleistocene the Western Cascades continued to be eroded and were somewhat modified by glaciation."

The Coast Range is made up of sandstones, shales, lavas, intrusives, and igneous fragmental rocks of Tertiary age. During the Tertiary, parts of Western Oregon were periodically covered by the ocean, and many thousands of feet of marine sandstones and shales were deposited.

Intrusions and outpourings of basaltic lavas occurred at least three times during the Tertiary, i.e., during the Eocene, middle Miocene, and late Pliocene or Pleistocene epochs. According to Baldwin (1947:29) gabbroic and dioritic sills of upper Oligocene age occur in the Coast Range in the Dallas and Valsetz areas. The oldest basalts frequently form the higher peaks in the center of the Coast Range. Miocene lavas cap the hills around Salem and south and west of Portland, and appear as flows and dikes in the western part of the Coast Range. The latest lavas form many of the small peaks around the Portland region. Subsequent uplifts caused the sedimentary beds and lavas to be folded along north-trending axes. The Tertiary beds under the Willamette Valley generally dip east beneath the lavas of the west slope of the Cascade Range; the sediments sometimes interfinger with the lavas.

Besides the great alluvial plains of the Willamette Valley and its larger tributaries, there are small areas of alluvium represented by the low-lying lands along the Columbia and limited areas of alluvium and sand dunes along some of the submerged coastal streams and on narrow coastal plains.

MINERAL DEPOSITS

Sulphide deposits of the Western Cascades

Mining properties and prospects in this bulletin are listed according to County. Those in the Cascade section of Clackamas, Marion, Linn, and Lane counties are grouped under districts designated as North Santiam, Quartzville, Blue River, Fall Creek, and Bohemia (see fig. 2 on opposite page). There is a general similarity of characteristics among these Cascade districts in history, mineralization, type of ore deposits, and operating problems. Total recorded production (to 1947) had a value of more than $1,400,000, chiefly in gold, with the bulk of production from enriched oxidized zones.

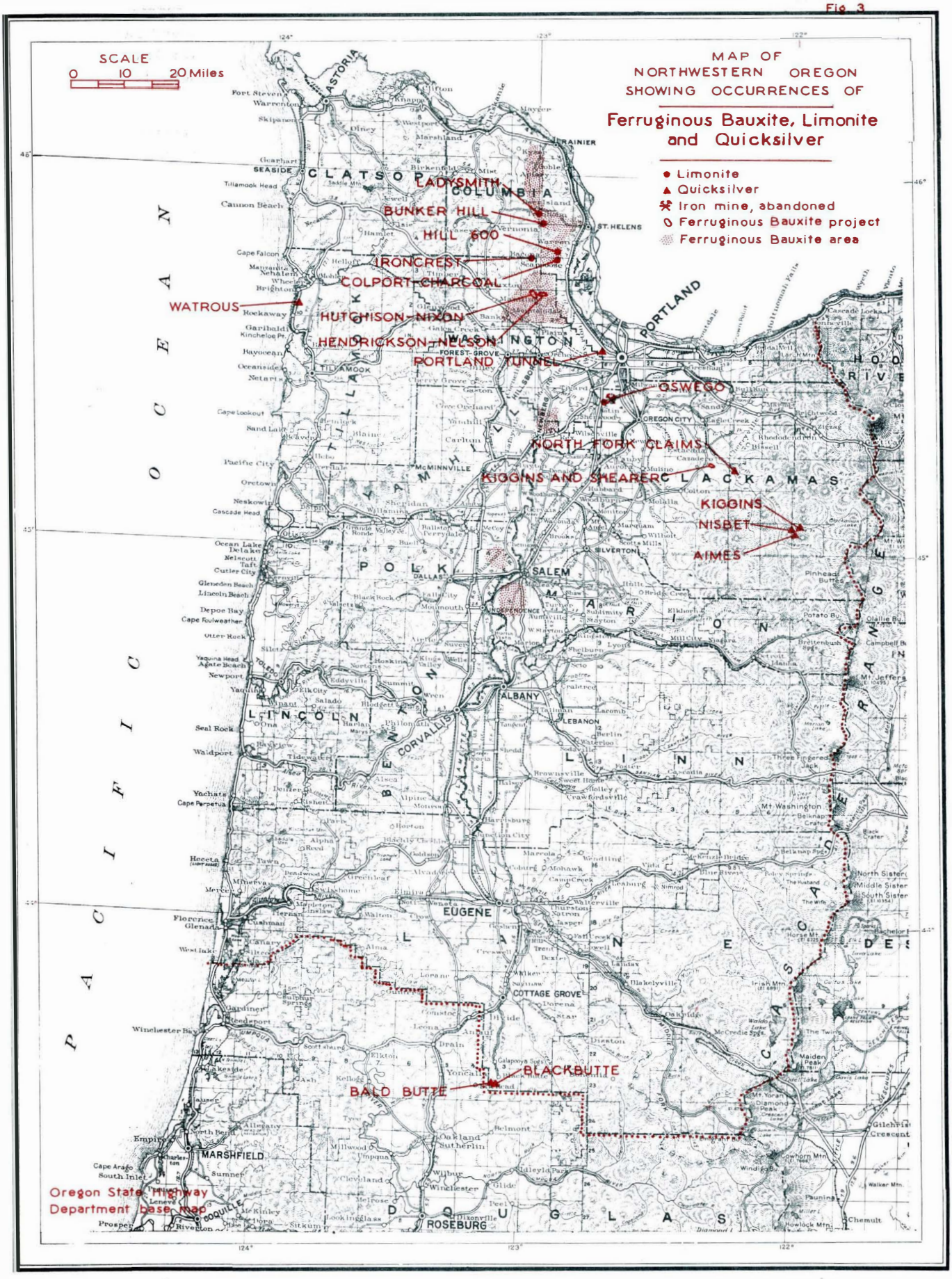
All of the districts are dependent upon smelting facilities for economical ore treatment. The nearest smelters are at Tacoma, Washington, and Selby, California, and as shipment of concentrates requires a truck haul in addition to a railroad freight charge, transportation is a major handicap.

The following table, in part from Callaghan and Buddington (1938:24), shows the recorded production (1880-1947 from the principal Western Cascades deposits.

(From reports of the United States Mint, data of V. C. Heikes, and U.S. Bureau of Mines Minerals Yearbooks)

Districts	Gold oz.	Silver approximate oz.	Copper lbs.	Lead lbs.	Zinc lbs.	Approximate total value
North Santiam	454	1,412	41,172	40,700	110,063	$ 25,257
Quartzville	8,550	2,920	---	---	---	181,255
Blue River	7,737	12,844	4,257	1,051	---	173,789
Bohemia	38,107	40,493	302,453	535,281	174,000	1,025,005
Total	54,848	57,669	347,882	577,032	284,063	$1,405,306

Fig. 3


SCALE
0 10 20 Miles
MAP OF
NORTHWESTERN OREGON
SHOWING OCCURRENCES OF
Ferruginous Bauxite, Limonite
and Quicksilver
● Limonite
▲ Quicksilver
Iron mine, abandoned
Ferruginous Bauxite project
Ferruginous Bauxite area
LADYSMITH
BUNKER HILL
HILL 600
IRONCREST
COLPORT-CHARCOAL
WATROUS
HUTCHISON-NIXON
HENDRICKSON-NELSON
PORTLAND TUNNEL
OSWEGO
NORTH FORK CLAIMS
KIGGINS AND SHEARER
KIGGINS
NISBET
AIMES
BLACKBUTTE
BALD BUTTE
Oregon State Highway
Department base map
PACIFIC OCEAN
COLUMBIA
CLATSOP
TILLAMOOK
WASHINGTON
YAMHILL
POLK
MARION
LINCOLN
BENTON
LINN
CLACKAMAS
HOOD RIVER
WASCO
JEFFERSON
DESCHUTES
LANE
DOUGLAS
CROOK
JACKSON
ASTORIA
PORTLAND
SALEM
ALBANY
CORVALLIS
EUGENE
COTTAGE GROVE
ROSEBURG
MARSHFIELD
COOUILLE
SEASIDE
TILLAMOOK
McMINNVILLE
OREGON CITY
SILVERTON
LEBANON
FOREST GROVE
ST. HELENS
RAINIER

The occurrence of the metallic ores is summarized by Callaghan and Buddington (1938:2,3) as follows:

> "The mineral deposits occur in fissure veins of probable upper Miocene age and are believed to be genetically related to the dioritic intrusive bodies. They are of the low-temperature and shallow-depth, or epithermal type, except those in the Bohemia district, which bear evidence of an initial high-temperature stage. Typical vein matter consists of altered brecciated country rock cemented with quartz that contains sphalerite, galena, chalcopyrite, and pyrite. Very minor amounts of tetrahedrite occur in some of the veins, bournonite was seen in one vein, arsenopyrite in two veins, and stibnite in several veins. Gold and silver occur in most of the sulphide ore, commonly in small amounts, but visible gold in dendrites and 'wires' is present in weathered vein matter. Quartz and altered rock are the principal materials accompanying the sulphides, but other minerals occur, including calcite, dolomite, mesitite, ankerite, adularia, johannsenite, epidote, sericite, chlorite, clay minerals, barite, and both specular and red hematite. The variation in the proportions of some of the minerals permits distinction of several types of veins. Complex sulphide veins in which sphalerite predominates are the most abundant. In a few veins chalcopyrite is the dominant sulphide. A few quartz veins contain free gold without appreciable sulphides. Another group is characterized by a gangue of carbonate, chiefly calcite. Veins with stibnite in cherty quartz occur in the southeastern part of the Bohemia district. Wall rocks of the veins are altered to an aggregate of quartz, carbonate, and chlorite, to quartz, carbonate, and sericite, or to quartz and clay minerals. Pyrite occurs in almost all the altered rock.
>
> "Veins exposed to weathering and readily permeated by water are characteristically leached and iron-stained, and secondary sulphides in them are negligible. In some of the veins gold remains as minute flakes, 'wires,' and dendrites. No secondary zinc minerals remain, and galena is represented by only very minor amounts of anglesite and cerussite, except in one vein. Secondary copper minerals include covellite, which forms films on chalcopyrite, chalcocite, which remains as a powder in some veins, a very little azurite, malachite, and chrysocolla. Pyrite is leached or changed to limonite."

Quicksilver

Some scattered occurrences of cinnabar, the common ore of quicksilver, are reported in the Western Cascades, but the two important known localities in northwestern Oregon are the Blackbutte-Elkhead district in southern Lane County extending into Douglas County, and the Oak Grove Fork locality in Clackamas County. From the standpoint of production, the Blackbutte-Elkhead is by far the more important, with past production greater than $1,000,000. These are two of a discontinuous chain of deposits which extend south from the State of Washington through Oregon and into California.

Other small deposits have been recorded from a few localities in northwestern Oregon.

The origin of these cinnabar deposits is believed to be intimately associated with comparatively recent volcanic activity; such deposits are classified as typically epithermal, that is, they were deposited from thermal waters relatively close to the surface and at moderate temperatures. Necessarily they could not have been subjected to extensive erosion.

Deposition has occurred along lines of fracturing caused by fault movements, with mineralizing solutions sometimes following incipient fractures to form a network of small seams, sometimes depositing the cinnabar in open fissures to form high-grade ore, and sometimes disseminating the finely divided cinnabar in gangue or rock. The lavas, breccias, and tuffs that usually enclose these mineralized fractures have been intensely altered and silicified by thermal waters.

Location of quicksilver mines and prospects of northwestern Oregon are shown in figure 3 opposite this page.

Limonite

Limonite iron ores have long been known to occur in Columbia, Washington, and Clackamas counties. One deposit was mined at Oswego and supplied a blast furnace there for nearly 30 years (see fig. 3 opposite p. 7).

The limonite occurs between weathered basalt flows in some places and between sandstone and altered basalt in others. It originated from the chemical weathering of Columbia River basalt and for the most part was deposited along sluggish stream channels and in swamps or lakes. Some of it is probably a chemical precipitate (bog iron); but the occurrence of petrified wood within the ore, the lenticular shape of the ore bodies, and the thin-bedded tuffaceous material overlying the ore indicate transportation and deposition of the ore in depressions on the surface.

Reserves of limonite in deposits west of Scappoose in Columbia County have been estimated by Miller (1940:30) to total 4,555,000 tons of ore containing 40 percent or more dry iron. About two-thirds of this tonnage is probably recoverable only by underground mining methods.

Ferruginous bauxite

Ferruginous bauxite deposits were discovered by the Department in northern Washington County in 1944. Continued investigations have shown the presence of many millions of tons of this ore in northern Washington and eastern Columbia counties. High-grade bauxite occurrences were found by the Department geologists in the area south and north of Salem in Marion County. In 1948, ferruginous bauxite containing a higher percentage of silica than the other known deposits was discovered near Estacada in Clackamas County; not enough exploration has been done to determine the extent and geology of this deposit. The areas containing deposits of ferruginous bauxite are shown in figure 3 opposite page 7.

The ferruginous bauxite occurs as nearly flat-lying deposits on the last flow or flows of Columbia River basalt (except the Clackamas County deposit) and was formed by laterization of the basalt. The deposits are overlain generally by silt ranging from 1 to 100 feet in thickness. Probably the average overburden is less than 25 feet. Variable thicknesses of clay, kaolinized basalt, usually 100 feet or more, often separate the bauxite from the underlying unweathered basalt. The deposits occur on flat-topped hills or ridges and gentle slopes, and their attitudes correspond with the regional slope. Elevations of the deposits have proved to be rather accurate indicators of regional structure. Erosion has dissected and removed a large part of the flows of basalt originally laterized, with complete removal more common on the crests of anticlines.

Thickness of the deposits is from 6 to 20 or more feet. In Washington and Columbia counties the texture of the ore is oölitic or pisolitic near the top of the section with lower sections ranging from earthy to nodular. With the exception of one place the oölitic section is lacking in the deposits near Salem, and apparently only a thin portion of the original lower section remains.

Exploration by the Department in Washington County has indicated more than 5,000,000 long tons of ferruginous bauxite in two localities. Alcoa Mining Company, the mining subsidiary of the Aluminum Company of America, has been engaged in the exploration of the ferruginous bauxite deposits in northwestern Oregon for more than five years. The ores in Washington and Columbia counties contain about 35 percent alumina, and 20 to 25 percent iron.

Coastal sands

Although the value of mineral products obtainable from the beaches in northwestern Oregon appears to be of relatively minor importance under present-day conditions, these deposits are substantial in size and contain minerals which may be eventually utilized. Besides quartz and feldspar, the common constituents of the sands at many places along the beaches are magnetite, ilmenite, zircon, and garnet.

The possible metallic products of these sands are iron, titanium, and zirconium. Glass and abrasives are possible nonmetallic products.

Refractory and high-alumina clays

Refractory clay deposits located at the following localities in northwestern Oregon were studied by Wilson and Treasher (1938) near Mayger in northwestern Columbia County, south and east of Molalla in Clackamas County, near Eugene in Lane County, and at Hobart Butte in southwestern Lane County. The Molalla and Hobart Butte deposits were investigated during 1942 and 1943 by the U.S. Geological Survey and U.S. Bureau of Mines with a view towards the utilization of the clay in the production of alumina. These deposits have reserves of probably more than 70,000,000 tons. A pilot plant to test northwest clays experimentally was constructed at Salem with Government funds, but the plant was not utilized for that purpose. The Government refused to advance money for testing the clays after World War II and the plant was leased to a private company for production of ammonium sulphate fertilizer.

Coal

Coal of lignitic or subbituminous grade has been reported from nine of the twelve northwestern Oregon counties. Department records include reports of coal mines or prospects from all but Benton, Lane, and Polk counties. The deposits are not at present of economic value, and many, on account of their low grade, thinness, distance to market, or other characteristics, may never be productive. Most of the prospecting for coal in northwestern Oregon was done many years ago, and information is very fragmental and unreliable for a large proportion of the deposits. With changing conditions of demand, resulting from the exhaustion of cheap wood products used for heating (cordwood, hog fuel) and reduction of oil reserves, it is entirely possible, if not probable that some of the coal deposits may be profitably mined in the future.

The coal occurs in formations that vary in age from Eocene to lower Miocene. The coal beds vary in thickness from a few inches to several feet, and usually contain numerous partings of clay and bone.

Limestone

High-grade limestone is not known to be present in deposits of economic size in northwestern Oregon, although large commercial deposits are being mined in both southwestern and northeastern Oregon. Deposits of lower grades ranging from 50 to 75 percent $CaCO_3$ are known to occur in Polk and Clackamas counties in moderate amounts, and have been utilized both for agricultural limestone in the Willamette Valley and for portland cement at Oswego. These deposits consist of beds of shell marl and foraminiferal limestone ranging from a few feet to more than 50 feet in thickness.

Foundry sands

Development of high-grade steel foundry sands near Eugene was started early in World War II, and steel foundry sand was produced there for the Portland market by Silica Products, Oregon, Ltd. Several other deposits are known to exist in adjacent localities. The sand was derived by weathering of sandstones of lower Tertiary age, and contains about 30 percent of kaolin. The natural sand requires washing to remove the clay which could have a commercial ceramic value.

Miscellaneous minerals

Antimony is present in a number of the Cascade deposits (especially at the President property, Bohemia district). Arsenic minerals occur at Hobart Butte, but not in economic amounts. Manganese occurs sparsely at a prospect west of Dallas, Polk County. Bismuth has been reported in an unidentified mineral from the North Santiam district, and barite occurs as a gangue mineral in the Bohemia district. Diatomite is found at a locality along the North Santiam Highway near Detroit in Linn County.

ACKNOWLEDGEMENTS

Much of the source material for this volume has come from other publications. Chief among these is U.S. Geological Survey Bulletin 893 titled Metalliferous Mineral Deposits of the Cascade Range, Oregon, by Eugene Callaghan and A. F. Buddington (1938). Additional records were obtained from other reports of the U.S. Geological Survey and from those of the U.S. Bureau of Mines. Publications of the State Department of Geology and Mineral Industries and reports of private geologists and engineers have also been drawn upon. The staff of the Department wishes to express appreciation of assistance rendered by many owners of mines and prospects who have given generously of their time in acting as guides and in supplying pertinent information.

MINERAL DEPOSITS OF NORTHWESTERN OREGON

In this bulletin the mineral deposits are segregated according to counties in alphabetical order. Thus the term mining "area" used in previous volumes of the Mines Handbook is herein equivalent to county area. The term mining "district" has been retained to segregate further the mining properties of some of the counties even though there are no definite district boundaries. Their names are retained because of their historical significance and also because of their usage by claim owners and prospectors. The mining district as a legal unit in formulating mining regulations has been pushed far into the background by state legislative enactments.

BENTON COUNTY

Geography

Benton County, comprising 647 square miles, is located in the central portion of the Willamette Valley. The Willamette River forms its eastern boundary and the summit of the Coast Range trends north and south along its western border. Polk County lies to the north of Benton County; Linn County is on the east; Lane County on the south; and Lincoln County on the west. Elevations range from a maximum of 4,097 feet at Marys Peak in the Coast Range to 175 feet along the Willamette River. The Coast Range is heavily dissected and contains numerous rounded peaks along its summit. These peaks protrude above the general mass of lower mountains and hills.

Except the western edge of the county, where the streams drain westward toward the Pacific Ocean, the drainage is eastward into the Willamette River. Corvallis, the county seat and most important city, is located on the Willamette River.

The climate is predominantly mild and equable. The average annual precipitation is about fifty inches with the mountainous areas receiving some snow.

Agriculture is the most important industry. Clay, sandstone, sand, and gravel are the only known mineral resources.

U.S. Highway 99W crosses the eastern part of the county from north to south, and U.S. Highway 20 extends westward from Corvallis to the coast. Besides these United States interstate highways, state and county roads traverse parts of the county. The main line of the Southern Pacific Railroad parallels the Willamette Valley, and a branch line serves the area from Corvallis to Newport on the Oregon coast in Lincoln County.

Geology

The rocks of Benton County consist of Eocene lava flows, marine Eocene sediments, Oligocene tuffaceous sediments, basaltic, gabbroic, and dioritic intrusives, probably ranging from Eocene to Miocene in age, and Pleistocene to Recent alluvium. Detailed geological maps in the county are almost completely lacking, and the geology as described in the following paragraphs is inferred from published reports concerning the geology of surrounding regions, particularly those in the Coast Range and Willamette River provinces.

The core of the Coast Range consists of basalt flows, most of which are of submarine origin, and interbedded tuffaceous sediments. These volcanic flows must have been erupted on the floor of the seas which covered the area during early Eocene and middle Eocene times. A portion of this series of lavas, as they occur in the Dallas and Valsetz quadrangles north of Benton County, has been called the Siletz River volcanic series by Baldwin (1947:6-14) and was assigned to the middle Eocene.

Overlying these basalt flows are large thicknesses of marine tuffaceous sandstones and shales with some mudstones and siltstones. The lower or basal sandstones are probably equivalent to the Tyee sandstone of the middle Eocene, exposed to the south in the vicinity of Roseburg, or the Burpee formation, which has been mapped by Vokes, Norbisrath, and Snavely (1949) as covering a large area of the Coast Range in Lincoln County to the west of Benton County. Also, upper Eocene sandstone and shales possibly occur in Benton County.

Oligocene sandstones, siltstones, and tuffs occur to the northeast of Benton County in the Salem area, east of Willamette River in the vicinity of Albany, and to the southeast near Eugene. Both marine and terrestrial types of Oligocene sediments are probably represented in Benton County.

Igneous intrusives, mainly basaltic and gabbroic sills and dikes, evidently occur in the Coast Range in Benton County. Baldwin (1947) mapped gabbroic and dioritic intrusives in the Dallas and Valsetz area and assigned them to the middle Oligocene. Basaltic and nepheline syenite intrusives occur in the Coast Range in Lincoln County where they are considered to be Oligocene or Miocene in age.

Pleistocene and Recent unconsolidated alluvial deposits make up the valley fill of the Willamette River. These deposits are mainly silts, sands, gravels, and clays. Many of the Pleistocene gravels have a glacial origin.

Mining Properties

BELLFOUNTAIN CLAY

Owner: A. Bystrom.

Location: About 1 mile west of Bellfountain and 5 miles northwest of Monroe, on the A. Bystrom ranch, $\frac{1}{2}$ mile north of the Dawson Mill road.

History: The owner states that in pioneer days people from the surrounding area obtained this clay for local use as a refractory material. Clay was dug from the base of the 70-foot terrace, and within 24 hours the pit would again be filled. Apparently the clay was forced up from the bottom, as Mr. Bystrom says that it was not a case of slump from the sides. The pit is now a quaking bog filled with soil and brush.

Description: Wilson and Treasher (1938:64) report that the clay is one of the second-grade buff-colored fire clays, and its quality is not uniform.

Reference: Wilson and Treasher, 1938:64.

MONROE SANDSTONE QUARRY

Location: On the east slope of a hill less than a quarter of a mile west of the town of Monroe in southeastern Benton County.

Description: Parks (1914:28-29) discusses the sandstone at this locality as follows:

"The rock is fine-grained sandstone. Only a very small amount of stone has been taken out and the quarry has not been operated for a number of years. The quarry consists of two small openings each about thirty feet in length, fifteen feet in depth and in either a thickness of not more than six feet of beds is exposed.

"The sandstone beds lie flat and no evidence of folding is to be seen in the exposures. The planes of bedding and of jointing are in such relation that blocks with a maximum dimension of three feet can be taken out. The extent to which the stone has been opened up is so limited that it is impossible to make any satisfactory estimate of the quantity available at this place.

"The rock is of even texture, grayish green in color and consists chiefly of quartz grains with occasional particles of feldspar, olivine, flakes of muscovite and films of secondary calcite. A few calcite veins also cut through the rock at varying angles. These mineral particles are cemented together largely by argillaceous matter and a small proportion of lime carbonate.

"On an average six to eight feet of soil and waste rock would have to be stripped off in order to expose beds of usable quality. This amount of stripping would not become appreciably deeper for some distance. The stone is said to be easily worked but such a small amount has been used that it is difficult to get any very definite information on this point. The only place in which, to the writer's knowledge, the Monroe sandstone has been used is in the steps, water table and trimmings of the County Court House in Corvallis. On the whole, the apparent quality of the stone is favorable and since it is convenient to transportation a quarry could, no doubt, be opened up in this location to furnish considerable stone locally in the Willamette Valley."

Reference: Parks, 1914, 28-29.

CLACKAMAS COUNTY

Geography

Clackamas County, located immediately south of Multnomah County and extending westward from the summit of the Cascade Range to the Willamette Valley, comprises an area of 1,890 square miles. Oregon City, situated on the Willamette River in the northwestern part of the county, is the county seat.

The topography varies from low, level floodplains and terraces of the Willamette River Valley, to the rolling foothills of the Western Cascades, becoming increasingly rugged eastward toward the upland surface of the High Cascade Range. Elevations range from 25 feet at the Willamette River to 11,245 feet at the peak of Mount Hood, situated in the northeast corner of the county.

The Willamette River and its tributaries, the Clackamas, Molalla, and Tualatin rivers and Butte Creek drain most of the county. The Willamette River has a winding course through the northwest corner of the county and flows generally in a northerly direction. The Clackamas River flows northwestward across the center of the county; the Molalla River and Butte Creek drain the southwestern part of the county; and the Sandy River, a tributary of the Columbia River, drains the northeastern part.

The major industries are lumbering, paper making, and agriculture. Mineral resources include sand, gravel, crushed rock (mainly basalt), mercury, high alumina clay, ferruginous bauxite, limestone, iron ore, coal, and gold.

Geology

The areal geology of Clackamas County, except for the small part of the western edge that is in the Willamette Valley, is the same as that of the Cascade Range which has been divided lengthwise into two belts: the Western Cascades and the High Cascades. The Western Cascades in Clackamas County are composed of great thicknesses of Eocene, Oligocene, and Miocene volcanic flows with associated pyroclastics and continental sediments, and some Pliocene lavas consisting of basic andesites and basalts. The High Cascades consist of volcanic flows of the Pliocene and younger epochs. The Columbia River basalt formation (middle Miocene), the Cascade andesites (Pliocene to Pleistocene), and Boring lavas (Pliocene) are the most widespread volcanic rocks of the county. The andesites which form the cone of Mount Hood are Pleistocene to Recent (?) in age.

Although most of the sediments exposed are of continental origin, there is some evidence of marine deposition along the eastern edge of the Willamette Valley during Eocene, Oligocene, and early Miocene epochs. Eocene marine fossils are found in sandstone associated with the basalt along Butte Creek. The Butte Creek beds mapped in the Molalla area by Harper (1946) contain marine sandstone and shell limestone and are considered to be Oligocene or early Miocene in age.

During the Pliocene epoch sand, gravel, clays, and boulders were deposited on the floodplains of the rivers. These deposits are known as the Troutdale formation. Pleistocene and Recent alluvial deposits of sand, silt, and gravel cover the Willamette Valley and terraces of the Willamette River. Also during the Pliocene epoch, volcanic mudflows containing coarse debris filled local basins and covered the lower slopes of mountains. These deposits are variable and difficult to correlate. Some such deposits occurring along the Zigzag, Sandy, and Clackamas rivers have been called the Rhododendron formation.

The mineral deposits of Clackamas County have not been extensively developed. Cinnabar occurs in calcite veins in Miocene basalt on the Oak Grove Fork of the Clackamas River. Only a minor amount of mercury has been produced from these deposits. Ferruginous bauxite occurs along the west bank of the Clackamas River a few miles southeast of Estacada and also in a road out just east of the town. Coal seams occur in the Butte Creek beds in the vicinity of Wilhoit. Impure limestone, which was produced for agricultural stone, is also found in the Butte Creek beds near Marquam and Scotts Mills. High alumina clay deposits in the vicinity of Molalla have been extensively explored. Limonite was mined near Oswego and used in the production of iron at a plant at Oswego from about 1867 to 1894. The limonite is a bog deposit between flows of Columbia River basalt. A very minor amount of gold has been produced from small quartz veins along Cheeney Creek and on Ogle Mountain.

Mining Properties

AIMES MINE (Quicksilver)

Location: Sec. 5, T. 6 S., R. 7 E., on the Oak Grove Fork of the Clackamas River, south of the Nisbet mine, about 27 miles southeast of Estacada via the new road along the Clackamas River and the Oak Grove Fork.

Area: The group consisted of 4 or 5 claims in 1943.

Production: A production of two or three flasks of mercury has been reported. In 1943 a retort was reported to be on the property.

Geology: Mineralization is similar to that in the more actively prospected Kiggins and Nisbet mines where cinnabar is in veinlets of calcite in basaltic lava flows.

Informant: Francis Frederick, 1943.

CHEENEY CREEK PROSPECTS (Gold)

Old names: Chena Creek district; Northern Light Mining and Milling Company.

Location: Sec. 20, T. 3 S., R. 7 E., about 14.5 miles west-southwest of Mount Hood, 3 miles south of Welches on Salmon River. Prospects reached from the end of the road at Tawneys by a trail following Cheeney Creek and a series of switchbacks up the steep slope of the ridge.

History and development: The records of the United States Mint for 1893 show a production of $1,000 or 48.38 ounces of gold ascribed to "Salmon Creek Chinese." According to Stafford (1904:57), in 1903 about 100 claims had been located, and 20 were being developed. The Northern Light Mining and Milling Company at that time reported having a shaft 87 feet deep and 400 feet of tunnel. E. Renfer of Portland was president.

Geology: The area was visited in 1931 by Callaghan and Buddington (1938:81-82) who reported as follows:

> "The only prospect found by the writers is in a ravine on the steep west slope of Cheeney Creek at an altitude of 2500 feet. . . .(it) was a crosscut that extends 85 feet west to a drift trending N. 2° E., but the drift was caved 20 feet from the crosscut. Only narrow gouge seams appear in the drift, and no definite vein was recognized. The rocks exposed at and below the prospect are light gray andesites, dark labradorite andesites, and volcanic breccias, with an apparent dominance of flow rocks. No dioritic intrusive bodies were found. The country rock at the prospect is a light gray andesite, only slightly altered. The open cut above the tunnel reveals two thin seams of vein matter on intersecting fractures that are neither large nor persistent. The more persistent fracture strikes N. 20° W. and dips 59° SW., and the other strikes N. 22° E. The vein matter consists of fragments of country rock altered to an aggregate of quartz and clay minerals on which are crusts of galena and sphalerite with quartz and dolomite. The remaining spaces are filled with dolomite and a little calcite. Galena equals or exceeds sphalerite, and both are more abundant than pyrite. No chalcopyrite was observed."

Reference: Stafford, O. F., 1904:57.
Callaghan and Buddington, 1938:81-82.

FERRUGINOUS BAUXITE DEPOSITS

Location: Occurrences of ferruginous bauxite extending over a lineal distance of about a mile along the southwest side of the Clackamas River from a point about 6 miles southeast of the town of Estacada were indicated by reconnaissance work of the Department. Outcrops are located on the Kiggins and Shearer farms in the NW¼ sec. 3 and NE¼ sec. 4, T. 4 S., R. 4 E., in Clackamas County. These farms are a short distance east of the community of Springwater south of Estacada. Oölitic, high-silica bauxite is exposed in a road cut just east of the Estacada high school building.

History and development: In 1948 a sample of ferruginous bauxite pisolites from this area was submitted to the Department for mineral determination. The Department immediately began an investigation of the area. In September 1948 the Department put down 6 auger holes on the Kiggins property and took several samples from outcrops.

Description of deposits: The Clackamas County bauxite contains a higher percentage of silica and alumina than the deposits in Washington and Columbia counties, and much lower percentage of iron oxide and titania. Gibbsite and kaolin are the aluminum minerals in the bauxite, with the amount of kaolin being less in proportion to that of gibbsite.

The ferruginous bauxite thus far observed in this area is the brown oölitic variety. The nodular and lower section fine-grained varieties commonly occurring in Washington and Columbia counties have not been found.

Average analysis, on a dry basis, obtained from about seven feet of section in two auger holes about 1,000 feet apart on the Kiggins farm is:

Alumina	43 %
Iron	10
Silica	21.5
Titania	1
Loss on ignition	20
Moisture	24

An average of five samples of oölitic material obtained from outcrops separated by a distance of about half a mile is as follows:

Alumina and titania	44 %
Iron	11
Silica	17.7

The geological relationship of the deposits has not been definitely ascertained. Recent evidence points to laterization of the Rhododendron formation beginning in early Pliocene time, thus indicating a shorter time of laterization than that in Washington and Columbia counties.

Reference: Ore.-Bin, 1948:63-65.

KIGGINS MINE (Quicksilver)

Owner: D. E. Kiggins, Estacada, Oregon.

Location: Secs. 4 and 5, T. 6 S., R. 7 E., along the south side of the Oak Grove Fork of the Clackamas River. The mine is northeast of the Aimes Mine and about half a mile east of the Nisbet mine.

Area: 5 lode claims.

History and development: Since the discovery of cinnabar on the property in 1924, the Kiggins mine has produced between 60 and 90 flasks of quicksilver from development work under the direction of various leasers and operators: (Kiggins, Nisbet, and Horse Heaven Mines, Inc.). George Nisbet produced 33 flasks from the mine before 1938. It is reported that about 30 to 50 flasks were produced from 1938 to August 1943 by Mr. Kiggins and others. In 1941 the Horse Heaven Mines company was reported to have an option on the property. George Nisbet was developing the mine in 1943 and stopped work there in August 1943 in order to resume work at the adjoining Nisbet mine.

The mine has been developed by 360 feet of adit drifts and crosscuts. No stoping has been done on the property.

A 7-8-ton per day shaft-type furnace was built directly into a natural rock cleft by Nisbet in 1924 or 1926. The condenser plant was improved in 1939 and again in 1942.

Geology: Four veins are exposed. The Falls vein is in the river bottom near the base of a small waterfall. The other three veins have been explored by open cuts or adits. All the veins strike northwestward. The Falls vein dips steeply to the east. The Vermillion vein, upon which most of the work has been done, dips 50° to 55° NE. and varies from 2 to 6 feet in width. The two other smaller veins are near the main workings on the Vermillion vein; one vein dips 85° NE. and the other dips 10° to 20° SW. All the veins are in a zone less than 200 feet wide.

The cinnabar mineralization exists as veinlets in calcite veins in fractured basalt. At one section on the Vermillion vein where it is about 5 feet wide 27 different bands of cinnabar in the calcite occur. The average cinnabar content of the calcite is low but in many places along the vein excellent ore has been found. Samples taken by the U.S. Bureau of Mines in 1943 ranged from half a pound to 12.4 pounds mercury over 4 or 5-foot widths.

Informants: F. W. L., 1941, and Francis Frederick, 1943.

MANDRONES COAL MINE
(Also known as Wilhoit Springs Coal Mine)

Owner: Mandrones Coal Mine Corporation, an Oregon corporation, has leased 240 acres in sec. 15, T. 6 S., R. 2 E., from the U.S. Government and 320 acres from J. J. Tobin in secs. 15 and 16, T. 6 S., R. 2 E.

Operator: Ted G. Mandrones, Portland, Oregon.

Location: Near center of the W½ sec. 15, T. 6 S., R. 2 E., north of Rock Creek about half a mile east of Wilhoit. The property is served by a partially paved county road from Wilhoit to Molalla which is 8 miles to the north. Molalla is roughly 30 miles south of Portland.

History: A small amount of coal has been mined since about 1942. Most of it has been produced as a result of development work done in driving two slopes. In 1948 some stoker coal was trucked to Portland.

Development: The development in 1948 consisted of two main slopes and a third slope 20 feet in length, 3 feet wide, and 3 feet high. In 1948 the No. 1 slope was deepened and a gangway located south of the face was extended. The No. 1 slope was about 500 feet in length and the No. 2 slope, said to be about 215 feet long, was largely filled with water.

A rebuilt hoist powered by a second-hand automobile motor was used to haul the cars up No. 1 slope to the portal from which point they were hand-trammed out on the trestle and dumped over a screen. A small gasoline-driven piston pump was used to dewater the mine. Buildings at the mine included a small house occupied by the operator and sheds covering the blacksmith shop and hammer mill.

Topography: The terrain of the immediate area surrounding the mine is fairly rugged. The most conspicuous topographic features are numerous landslides. Rock Creek, which flows in a northwestern direction, has a steep narrow channel in this area. The portal of No. 1 slope is situated at an approximate elevation of 975 feet and the portal of No. 2 slope, on the east bank of Rock Creek about 600 feet to the south of No. 1, is at an approximate elevation of 955 feet.

Geology: The coal bed occurs within fine-grained, cream- to buff-colored tuffs often containing small amounts of charred vegetable matter. These tuffs are considered to be a part of the Butte Creek beds of middle Oligocene to lower Miocene age (Harper 1946:8, 9). The hill rising behind (east of) the mine is capped with lava, as evidenced by the numerous boulders of black, fine-grained lava occurring as float in the vicinity of the mine.

In the immediate vicinity of the mine tunnels, the base of the sediments containing the coal is not exposed. However, to the northwest, down Rock Creek about two miles, there is a quarry in lava which is thought to represent the Pre-Butte Creek lavas (Harper 1946:4-6) that underlie the Butte Creek beds. The lava exposed in the lower part of the quarry is greenish-black and porphyritic.

The coal bed strikes N. 13° E. and dips 6° to the east. Thickness of the bed varies from 3 feet in No. 3 adit to about 10 feet in the No. 2 slope. The thickness of the bed exposed in No. 1 slope varies from 5 to 7 feet. Total amount of measureable coal is less than 3 feet, the remainder being a mixture of bone, minute seams of coal, and thin, clay partings. The section of coal as measured 468 feet from the portal of slope No. 1 by Libbey and Mason in April 1948 shows two beds of bright coal 1 foot 2½ inches and 1 foot thick, respectively, separated by a 4-inch clay parting. The entire section was measured as follows:

	Feet	Inches
Roof, sandstone		
Bone with coal seams	0	4
Coal, bright	0	2 1/2
Bone and coal	0	5
Coal, bright	0	3/4
Bone and coal	1	5
Clay parting	0	1
Bone and coal	0	8 1/2
Coal, bright	0	3
Bone and coal	0	3
Coal, bright	1	2 1/2
Clay parting	0	4
Coal, bright	1	0
Floor		
Total thickness of bright coal	2	8 3/4
Total thickness of bed	6	3 1/4

The coal is bright and slacks upon exposure, is poorly indurated, and breaks easily into fine particles. It is high-volatile, class C bituminous grade with a high ash content. Analyses of the coal by the Department in 1944 are as follows:

	As Rec'd	Dry
A. Sample bright coal only		
Moisture %	12.55	---
Ash %	1.95	2.23
B.t.u.	11,616	13,283
B. Sample of carbonaceous shale with coal seams		
Moisture %	5.65	---
Ash %	32.95	34.9
B.t.u.	7,799	8,266

Sink and float tests were made on the sample taken from slope No. 1 in 1948 by A. D. Centenero, Chemical Engineer at the University of Washington. The results of these tests showed that by crushing the coal to 1-inch size, about 32 percent of washed coal could be recovered having an ash content of 9-10 percent.

References: F. W. Libbey, R. S. Mason, H. M. Dole, 1948.
Harper, 1946: 4-6, 8, 9.

MARQUAM LIMESTONE DEPOSIT

Owner: T. T. Leonard, Silverton, Oregon.

Location: Sec. 2, T. 6 S., R. 1 E., Clackamas County, 1 mile northeast of Marquam. Two deposits were examined, one in the center of the NW¼ of sec. 2 and one in the center of the S½ of the same section. Hodge (1938:368) reports a deposit in the NW¼ sec. 2 and NE¼ sec. 3 covering 10.38 acres, and another in the SE¼ NW¼ sec. 2 covering 3.96 acres.

Topography: The deposits lie upon the gentle west slope of a main north-trending ridge, at elevations varying from 325 to nearly 400 feet. The country is open, with only a few clumps of oak and fir. Much of the area is cultivated.

Geology: The limestone occurs as lenses in sandy tuffs, grits, and conglomerates, both massive and well-bedded, which have low dips to the south and southeast. Conglomeratic phases overlie the lime lenses at two localities. Fossils, both foraminifera and megafossils, indicate Vaqueros age, correlative with the Illahe-Mehama formation of Thayer (1939:6-7) and

the Butte Creek beds of Harper (1946:6-9). The marine sediments are overlain by the continental Molalla formation to the east, but at the Marquam locality they are unconformably overlain by dense glassy to porphyritic and scoriaceous basalts. These lavas apparently flowed out over a more or less mature topography, as the elevations of the contact are variable and irregular. The porphyritic phase of the lava contains about 20 percent phenocrysts (as much as 6 mm diameter) of plagioclase in a dense black aphanitic groundmass.

The limestone is composed of broken shells, largely small oysters, and is more accurately described as a shell marl which has been leached at the surface (as well as in some interbedded horizons) and cemented below the water table by the dissolved lime. Well-rounded andesitic (?) cobbles are associated with the limestone, substantiating its near-shore origin. The secondarily enriched zone, usually less than 5 feet thick, is the "high-grade," and runs as high as 65 percent $CaCO_3$, while the "primary zone" below is only 25 percent $CaCO_3$. The leached zone near the surface is very low in lime content.

Economics and development: The northern deposit was tested, according to Hodge (1938: 268), by 14 drill holes averaging 14 feet in depth, and an average thickness of 9 feet was estimated to give reserves of 5 million tons assaying 70 percent $CaCO_3$. More recently the two deposits examined were again drilled by the present owner. Samples were taken in $5\frac{1}{2}$-foot lengths, in 13 holes averaging 11 feet in depth. The arithmetical average of thirteen of these samples was 42.2 percent $CaCO_3$.

Limestone was mined for several months in 1943 and ground on the property in a hammer mill. An area 300 feet long and nearly 100 feet wide was stripped of 2 to 5 feet of soil and leached rock overburden; the open cut is some 90 by 40 feet long and 8 feet deep. Mr. Leonard reports that by careful sorting the average grade was maintained as high as 60 percent $CaCO_3$, and that many assays from individual strata were higher than this, one running as high as 79.6 percent $CaCO_3$.

Report by: J.E.A., 1946.

References: Harper, 1946:6-9, 25.
Hodge, 1938:268.
Thayer, 1939:6-7.

MOLALLA HIGH-ALUMINA CLAY

Location: Tps. 5 and 6 S., Rs. 2 and 3 E., in southwestern Clackamas County, southeast and east of Molalla. A number of privately owned properties are located in this area, two of which are the Ellis deposit in the $NE\frac{1}{4}NE\frac{1}{4}$ sec. 27, T. 5 S., R. 2 E., and the Dibble deposit in the $SE\frac{1}{4}SE\frac{1}{4}$ sec. 1, T. 6 S., R. 2 E. The properties examined by the Department, the U.S. Bureau of Mines, and the U.S. Geological Survey (Nichols, 1944), from whose reports most of the following is abstracted, covers sections 15, 16, 21, 22, 27, and 28 of T. 5 S., R. 2 E.

History and development: Wilson and Treasher (1938:46-47) report that the Dibble deposit was the first to be discovered in the Molalla area. According to Nichols (1944:2-3) a company was organized in 1911 to utilize Molalla clay as a blend in a pottery plant near Astoria, Oregon, but was unsuccessful. Later the Cascade China Company acquired 40 acres near Molalla but this company also failed. The Willamina Clay Products Company and the Denny-Renton Coal Company used small amounts of Molalla clay for experimental purposes. Wilson and Treasher investigated the Molalla clays in 1937. They report that a road was built to the Ellis clay deposit where a 33-foot adit, with a wide chamber just inside the portal, had been excavated, and that extensive workings were once developed in the Dibble deposit where several adits had been driven and a shaft, now caved in, had reportedly been sunk.

Between July 1942 and May 1943, the U.S. Bureau of Mines sampled the deposits by drilling 77 holes; the deepest was 189 feet, the shallowest 37 feet. Total footage drilled was 7,964 feet. The cores were described by Nichols (1944) who made the geological report for the U.S. Geological Survey. This work by the federal bureaus was a part of the high-alumina clay

investigations in seeking new domestic sources of alumina. The Olin Corporation shipped several carloads of Molalla clay to Salt Lake for testing in the Government-owned plant originally built to treat alunite for recovery of alumina.

Geology: According to Nichols (1944) the clay is found in the Molalla formation beneath a thin veneer of terrace deposits which lie about 170 feet above the Molalla River. The Molalla River has cut a steep-walled canyon, and the terrace surface, beneath which the clay lies, forms a northwest-sloping slightly dissected, and youthful surface developed during the middle Pleistocene. Lithologically the formation consists mainly of plastic and semi-flint clay, breccia, and weathered silt, sand, and gravel. Interbedded with the clay are silt, sand, and gravel; shale, sandstone, and conglomerate; wood; and gritty low-grade clay. The clay deposit is composed of discontinuous lenses, varying lithologically and chemically in both horizontal and vertical directions. The greatest thickness measured was 139 feet, but it may thin out to nothing within a few hundred feet. North of the area the Molalla formation is overlain by the Boring lavas, which are vesicular, light colored, and characterized by the presence of olivine and by a porous texture. The Boring lavas are thought to be either late Pliocene or Pleistocene in age (Treasher, 1942). The Molalla formation is probably Pliocene according to Harper (1946:14).

The deposits consist of an upper clay series and a lower clay series of high alumina content usually separated by low-grade material and sandstone. The upper clay series varies from about 20 to 133 feet in thickness and the lower clay series probably averages about 55 feet in thickness.

Analyses were made of composite samples from both the upper and lower clay series and are recorded by Nichols (1944:11) as follows:

	Upper clay series	Lower clay series
SiO_2	45.5 %	43.6 %
Al_2O_3 (total)	27.8	30.2
Fe_2O_3 (total)	11.5	10.3
TiO_2	1.8	1.8
ZrO_2	0.0[x]	0.0
P_2O_5	0.13	0.19
V_2O_5	0.0	0.0
CaO	0.3	0.3
MgO	0.4	0.3
K_2O	0.0	0.0
Na_2O	0.4	0.1
SO_3	0.0	0.0
Ignition loss 950° C.	11.8	12.6
Total	99.63	99.39
Organic carbon, C	0.43	0.33
Carbon dioxide, CO_2	1.43	1.32

[x] Note: 0.0 indicates less than 0.05 percent.

The "available" alumina, an arbitrary term, is usually between 84 and 97 percent of the total Al_2O_3. It is the percentage by weight that is obtained in one hour by a 20 percent solution of H_2SO_4 acting on clay which has been calcined to 700° or 800° C.

The clays are predominantly gray, although combinations of gray, green, yellow, brown, and red are present. According to Nichols (1944:9-10) the clays consist of the following minerals:

Clay minerals	Other constituents
kaolinite	gibbsite
montmorillonite	siderite
beidellite-nontronite	limonite
celadonite	hematite
halloysite	ilmenite
illite (?)	pyrite
	quartz
	zircon
	feldspar

The deposit was divided into four ore bodies by Nichols (1944:21) who estimates reserves of approximately 49 million dry tons of measured and indicated clay, with an available Al_2O_3 content of 26.37 percent, and an available Fe_2O_3 of 8.01 percent. Of this amount approximately 26 million dry tons has an average grade of 29 percent available Al_2O_3 and an average ratio of overburden to ore of less than 2 to 1.

References: Nichols, 1944.
Harper, 1946:11-14.
Wilson and Treasher, 1938:46-47.

NISBET MINE (Quicksilver)

Owner: George Nisbet, Estacada, Oregon.

Location: E½ sec. 5, T. 6 S., R. 7 E., north of the Aimes Mine and west of the Kiggins Mine. Access to the mine area is via the new river road from Estacada to the Oak Grove Dam; the mine is about 1 mile downstream from the dam. A cable tram serves to transport equipment across the river from the road to the mine.

Area: 11 claims.

History and development: Cinnabar was first discovered in this area in 1924 by Mr. Nisbet on what is now the Kiggins property. Mr. Nisbet built a small plant on the Kiggins property in 1926, and one on his own property in 1939. In 1940 the property was leased to the Oregon Quicksilver, Inc., 69 West Broadway, Eugene, Oregon, of which George S. Barton was president. This company produced a total of 75 flasks, ending its production in 1942. Total production as of 1943 was about 300 flasks.

A small shaft-type furnace plant built by Mr. Nisbet in 1939 had a capacity of about 15 tons of coarse ore per day. The Oregon Quicksilver company reconditioned the furnace in 1941, but the condenser system was not serviceable in 1943. Electric power is available at the mine, and in August 1943 a small compressor was on the property.

Several veins have been developed by about 600 lineal feet of lateral workings and some open pits. In 1943 some of the workings were caved, but about half of the workings were accessible. Most of the production has come from stoping on three veins; the most productive was the Nisbet vein.

Geology: The mine is in the steep and heavily timbered canyon of the Oak Grove Fork of the Clackamas River at an elevation of 1750 feet. Some of the mine workings are almost at the edge of the river.

The country rock is basalt with major and minor fracturing, perhaps due to some nearby large fault to the west with block displacements in secondary faults, and smaller tertiary fractures having little or no displacement, the whole making a network of wide and narrow veins. The larger veins are from 3 to 6 feet wide and the smaller ones 1 or 2 feet wide. The large ones pinch and widen (lenticular), indicating displacement. Vein filling is mainly

calcite and partially replaced country rock; apparently silica came in later through the calcite and started replacing it, but ceased early, forming a honeycomb appearance at weathered exposures.

The cinnabar is chiefly in the calcite veins and seams in the basalt. Cinnabar is reported also to be in cracks in the basalt as pure cinnabar seams. The main veins strike west. There are cross veins which do not appear to be as important as the west-striking veins.

A sample, representing a 13.7-foot width, taken by the U.S. Bureau of Mines from a cut located west of the main workings assayed about 12 pounds of mercury to the ton. A narrow vein 6 inches in width is reported to have assayed 54 pounds of mercury to the ton.

Informants: A.M.S., May 29, 1938; F.W.L., March 21, 1941; and Francis Frederick, 1943.

NORTH FORK CLAIMS (Quicksilver)

Owner: Jacob Hauck, 1902 14th Street, Oregon City, Oregon.

Location: SW¼ sec. 7 and sec. 8, T. 4 S., R. 5 E., on the North Fork of the Clackamas River. Several open pits and a tunnel are located 1.7 miles north of the North Fork guard station on the south side of a road which is south of and approximately parallel to the North Fork. This road will be referred to as the North Fork guard station road.

History and development: Eleven unpatented lode claims were first located in 1934 by Mr. Hauck. Assessment work and some tunneling has been done intermittently since that time. There has been no production.

Geology: The sequence exposed in the Clackamas River canyon at this locality consists of Columbia River lavas, with interbedded sediments in minor amounts, overlain by agglomerates and tuffs which have been referred to as the "Rhododendron formation," probably of Pliocene age. The Rhododendron formation on the North Fork is at least 2,000 feet thick and is overlain by gray inflated Cascade lavas.

Faults cut through the Rhododendron agglomerates and tuffs in a direction N. 52° W. from a point near the center of the SW¼ sec. 6, T. 4 S., R. 5 E., to a point near the center of the NE¼ sec. 7, where they are exposed along the North Fork of the Clackamas River. These faults contain clay gouge of red ocherous and dark-gray soft material in which free mercury is said to occur. There are at least three probably parallel faults exposed in the road now extending up the North Fork. On the south bank of the North Fork above the road at an elevation of about 1500 feet a 30-foot adit has been driven in the agglomerate and tuff in an attempt to tap a reported quicksilver vein said to have been exposed by a shaft near the top of the hill beneath coarse water-worn gravels. Immediately to the east of the shaft and tunnel and just above, there is a rim rock of the Pleistocene (?) lavas.

Results from the analysis of seven samples of clay gouge and altered agglomerates from small fault zones in this area showed from a trace to 0.3 pound of mercury to the ton. Two samples submitted by Mr. Hauck in September 1948 returned 9.2 and 26.0 pounds of mercury to the ton.

Report by: J.E.A., July 19, 1941.

OGLE MOUNTAIN MINE

(see North Santiam District, Marion County)

OSWEGO IRON MINE

Old names:
Prosser Mine
Oregon Iron Company, 1865-1877
Oswego Iron Company, 1877-1894

Location: N½ secs. 8 and 9, T. 2 S., R. 1 E., 2 miles due west of Oswego, in the face of the high bluff north of the riding academy and below the golf course. The outcrop of the iron bed may be traced from a point a few hundred feet west of the section line between 8 and 9 at an elevation of 325 feet, for a distance of nearly 1,000 feet to the east and northeast around the face of the bluff to an elevation of 400 feet, due east of the highest point on the ridge.

History: The first iron blast furnace on the Pacific Coast was erected in 1865. The ore was mined from the Prosser Mine, and the first pig iron was cast in August 1867. This original furnace, located at Oswego, was used from 1867 to 1886. No production is recorded for 1886 or 1887. A new, more-modern blast furnace was constructed and started operation in 1888. The highest annual production for the old furnace was 6,250 long tons of pig iron in 1883; for the new furnace 10,987 long tons in 1890. No production is recorded after 1894.

Development: The mouths of three caved shafts on the ore may be seen along the outcrop; a large dump 50 feet down the hill suggests either a loading dump or a possible low-level crosscut. According to Diller (1896:511):

> "The mine consists in general of three slightly converging inclines, running down the slope of the bed for nearly a thousand feet, and some of the ore has been taken out on both sides. The capacity of the mine in 1880 was estimated at 20,000 tons a year. During that year it worked only three and two-thirds months, and yielded 6,225 tons."

Geology: The iron ore is limonite, which forms an interbed 2 to 8 feet in thickness in lava, striking N. 15° E. and dipping from the surface down the slope for 200-400 feet about 20 to 30 degrees, diminishing in the lower course to an average of 8 to 10 degrees. The limonite bed was about 1 mile long and half a mile wide. It was underlain by Columbia River lava of presumable middle Miocene age, and overlain by Boring lava, probably of Pliocene age. According to Diller (1896:509):

> "The underlying lava, on whose irregular surface the ore was deposited, is dark-gray basalt, and usually very vesicular, showing that at the time of its extrusion it flowed out upon the surface. It is considerably decomposed in places, and by the process of decomposition oxide of iron is liberated. This fact points to the adjacent lava slopes that surrounded the small lake or swamp in which the ore was deposited as the original source of the iron. By surface streams or chalybeate springs the iron was brought to the lake or swamp, where, under the influence of organic, chemical, or mechanical agents, it was precipitated and accumulated to form the bed of ore."

Locally overlying beds of sand were not uncommonly found, and in places contained logs, trees with their roots in place in the sand, and numerous fossil leaves. The trees were abundant and well preserved at 700 feet down the dip, varying from 5 or 6 inches to 6 feet in diameter. Some of them showed bark and very little decay. Leaves submitted by Diller (1896:510) to F. H. Knowlton of the National Museum were determined as oak: "This is almost the same as *Quercus elaenoides* Lx. but differs in having a rounded instead of an obscure acuminate apex."

Ore deposit: The ore mined varied in hardness, color, and composition, owing to the varying amounts of silica and organic matter. Diller states (1896:509):

"From the southwest part of the outcrop down the dip 800 feet, the ore averages 38 to 45 percent of metallic iron, contains more alumina, less silica, and is soft and friable. Going east on the outcrop about 1500 feet, a hard, blackish, flinty, highly siliceous ore is found. It continues down on the dip about 200 feet and is 200 to 300 feet in length. Although there is always more or less of it through the bed in streaks, in some places the whole becomes almost oölitic in appearance, and in these places it is richest. The ore ranges in thickness from 2 to 20 feet, averaging 5 or 6 feet, with the irregular depressions and elevations of the lava surface on which it was deposited."

The approximate range of analyses of ore from this area is indicated by the following table (Diller, 1896:508):

Composition of Iron Ore from near Oswego, Oregon

	Percent
Metallic iron	30-40
Silica	7-15
Magnesia	2- 3
Manganese	4- 8
Lime	2- 4
Phosphorus	0.37-0.67
Sulphur	0.3- 1

Report by: J.E.A., 1945.

References: Diller, 1896:508-511.
Treasher, 1941:184-186.
Libbey, 1940:194-197.
Allen, 1941:183-184.

SCOTTS MILLS CLAY

Location: NE¼ sec. 23, T. 6 S., R. 1 E., about 1 mile east of Scotts Mills on the upper (ridge) road.

Description: This clay was mentioned by Wilcox (1935:23) and was visited and analyzed by Wilson and Treasher (1938:62-63) who report that it has a P.C.E. of cone 29 and a high-silica content, which would make for small shrinkage.

References: Wilcox, 1935:23.
Wilson and Treasher, 1938:62-63.

TERRILL "SILICA" PROPERTY

Owner: Charles F. Terrill, estate, or Minnie B. Terrill et al.

Location: Sec. 32, T. 2 S., R. 2 E., in Oregon City, just south of Rebecca and west of Georgia streets. Part of Blocks 15 and 16, Nob Hill, situated in the Ezra Fisher D.L.C., Clackamas County, Oregon.

History: As related by Mr. Terrill, Sr., in 1916 Terrill "Silica" was used as a filler in asphalt pavements. The material was dried, screened, and shipped from the plant as a finely divided (200 mesh) powder. The entrance of rough-top or non-skid asphalt into the field stopped the operation.

During World War I, some sand from this property was used for molding sand. It is said to have been used also by a Portland soap company.

In 1924, the Zeno Laboratories, Inc., of Portland, Oregon, took one ton of the white clay for which they paid $100. This material was used by that company for the base of a tooth powder. It is reported that the finished product netted $14,000.

Development: A large open cut has been made in a steep bank. Maximum depth of the cut perpendicular to the original surface is 10 feet. The cut extends laterally about 40 feet. Material removed may be estimated at about 212 cubic yards. A drainage ditch about 12 feet deep runs through the edge of the pit.

Equipment: The small plant building and equipment are in ruins.

Geology: The exposure is in a curved escarpment forming one side of a gulch which is cut in the flat upland of Oregon City. Treasher (1942) mapped the area as the Troutdale formation. Several strata of varying color, each conformable upon the other, are exposed in the pit. The dip is 3 to 4 degrees to the north. Where weathered, the beds appear thinly banded, but on fresh surfaces they appear massive. The joints are at right angles, spaced 3 to 4 feet apart, and are normal to the bedding. The beds are indurated to the point where they stand without sloughing, but may be broken out easily with a pick. High-iron content is indicated by bands of limonite and light-colored iron oxides.

The finished product of the plant came from a white ash bed. Microscopic examination of a sample from this bed showed the following composition: 90 percent volcanic glass shards that are fresh, about 1 percent kaolin, less than 1 percent diatoms, and 8 to 10 percent unidentifiable fines. This ash bed is from 3.5 feet to 5 feet thick and is composed of particles of uniform size. The size of the average particle is .02 millimeter. The white ash is overlain by a blue ash containing 30 to 40 percent diatoms. Tan sand beds of varying grain size and containing some diatoms overlie the blue ash.

Informants: W.W.P. and J.A.A.

References: Treasher, 1942.

CLATSOP COUNTY

Geography

Clatsop County occupies the extreme northwestern corner of the state and is located entirely within the Coast Range physiographic province. It is bounded on the north by the Columbia River and on the west by the Pacific Ocean. The total area contained within the county is 820 square miles. Astoria, the county seat, is famous historically and for its fishing industry.

The Coast Range, with characteristically broken topography, extends from north to south across the county. Elevations range from sea level to 3,283 feet at Saddle Mountain.

The drainage is northward into the Columbia River, westward into the Pacific Ocean, and southeastward into the Nehalem River. The Nehalem River flows southwestward toward the Pacific Ocean across the southeastern corner of the county.

The major source of income is the salmon fishing industry. Lumbering is also important. Clatsop County has no active mines except minor sand, gravel, and crushed-rock operations. The mineral occurrences consist of residual clays, magnetite, and some chromite and monazite in the black sands along the beaches.

Geology

The formations exposed in Clatsop County are mainly Eocene, Oligocene, and Miocene marine sediments which have been intruded by Miocene basaltic lavas; minor amounts of sandstone probably of Pliocene age; and Pleistocene and Recent unconsolidated sediments. Warren,

Norbisrath, and Grivetti (1945) mapped the Eocene, Oligocene, and Miocene sediments in northwestern Oregon as one unit, the middle Tertiary sediments.

The oldest rocks are the Tillamook volcanic series (Eocene) and they form the core of the Coast Range in the north portion of northwestern Oregon. These volcanics consisting of basaltic lavas, tuffs, and breccias are exposed at Green Mountain in southeastern Clatsop County and also in the south-central part of the county. Exposures of sandstones, shales, and conglomerates of the Cowlitz formation (upper Eocene) unconformably overlie these volcanics.

The Oligocene and Miocene sandstones and shales cover a large portion of western and eastern Clatsop County. The Astoria formation (middle Miocene) occurs in the vicinity of Astoria and farther south along the coast. This formation has not been observed farther east than the eastern boundary of this county.

Intruding and in places overlying these middle Tertiary sediments are basaltic lavas called the Columbia River basalts (middle to upper Miocene). Nicolai Mountain, Wickiup Mountain, Tillamook Head, Saddle Mountain, Humbug Mountain, Sugarloaf Mountain, and Onion Peak are composed of these lavas.

Some Pliocene (?) sandstones occur along the Columbia River north of Nicolai Mountain. Pleistocene and Recent sands, silts, and gravels occur along the beaches of the Pacific Ocean, in the bars of the Columbia River, and along the valleys of smaller streams.

Mines and Prospects

HAMMOND BLACK SAND LOCALITY

Owners: Drilling in 1944 by the U.S. Bureau of Mines in the Hammond area was confined to property owned by Clatsop County, Bio-Products Laboratory, and the Point Adams Packing Company.

Location: The Hammond deposit is on the south bank of the Columbia River near the town of Hammond, approximately 10 miles west of Astoria, Oregon.

Exploration: The U.S. Bureau of Mines drilled 113 holes in the NW$\frac{1}{4}$ sec. 9, T. 8 N., R. 10 W., in the summer of 1944. In 1941 the Department tested a small area in the SW$\frac{1}{4}$ sec. 5, T. 8 N., R. 10 W., bounded on the north and west by the Fort Stevens military reservation. A post-hole auger was used for drilling and sampling. Thirteen holes spaced from 1 to 400 feet apart were drilled. This exploration indicated that black sand of fairly high concentration (about 40 percent magnetite) occurs to depths of at least 3 feet over an area at least 500 feet wide (east-west) and at least 800 feet long (north-south). The following is a record of holes drilled and samples taken. Samples 1, 2, and 9 were tested at Oregon State College by Professor George Gleason. The rest of the samples were inspected visually.

(1) 4 feet plus heavily banded black sand.
(2) 3 feet plus banded black sand oxidized near the surface.
(3) Gray sand to 3 feet, then trace of black sand.
(4) 3 feet of black sand.
(5) to (7) 2 feet plus banded black sand.
(8) 3 feet plus banded black sand.
(9) 4 feet plus banded black sand.
(10) 3 feet plus banded black sand.
(11) 3 feet gray sand (less than 10 percent magnetite).
(12) 2$\frac{1}{2}$ feet gray sand with black sand at bottom.
(13) Trench shows gray sand to 3-foot depth.

Analyses: percent of magnetite

	H-1	H-2	H-9
Concentrate:	62.6	30.1	58.4
Middlings:	22.7	41.6	27.4
Tails:	14.6	28.3	14.2

Geology: Kelly (1947:4) describes the geology of the Hammond deposit and the adjacent area as follows:

"The mountainous areas adjacent to the coast are composed of Tertiary bedded shales, volcanic tuffs, and basaltic lava flows. Uplifts and depressions have produced a series of wave-cut platforms, beaches, and sea cliffs, which stand at various altitudes to 1,000 feet above sea level. The most recent coastal depression probably was in the nature of a westward tilt, as the drowned valley of the Columbia River extends for a considerable distance out to sea. As a result, materials derived from the erosion of the Tertiary rocks lie mostly on the sea floor. The present river sands, including those explored, which contain relatively large quantities of magnetite, are apparently largely derived from erosion of rock formations from sources up the Columbia River. This material was transported downstream when the water was high and was deposited along the river and at or near the estuarial mouth. Successive floods, along with tidal action, effected a sorting whereby the black-sand deposits under consideration were deposited in their present form and position.

"The sands from many of the drill holes were angular and exhibit a freshness characteristic of recently eroded material. The sands are characteristic products of erosion from areas containing andesitic, rhyolitic, and granitic rocks. The rhyolitic and granitic rocks occurred only in the upper reaches of the Columbia River gorge.

"The Hammond deposit is an irregularly shaped body of magnetite-bearing sands approximately 1,130 feet long and 300 feet in average width. The long axis of the sand body is parallel to the south bank of the Columbia River, which flows in a northwesterly direction at this point. Surface elevations range from 7.3 to 29.5 feet above mean sea level, the average being 16.4 feet. The overburden, consisting of a light-gray dune sand, increases in thickness toward the southwestern parts of the deposit. It ranges from less than 1 inch to a maximum thickness of 24 feet, averaging 9 feet. The black or magnetite-bearing sands are 1 to 6 feet thick; the average thickness is 3.2 feet. The ratio of overburden to the magnetite-bearing sand stratum is approximately 3 to 1. The magnetite sands are comparatively flat-lying at altitudes of 5 to 10 feet above mean sea level. Stratification with gray sand and cross-bedding are characteristic of the deposit.

"A sample of comparatively high-grade black sand, representing a 3-foot sand thickness, was obtained near hole 72; microscopic determination by grain count revealed the following minerals:

	Percent
"Magnetite	40
Hornblende	16
Ilmenite	19
Quartz-feldspar	15
Garnet	7
Zircon, rutile, biotite, and olivine	3
	100 "

Reference: Kelly, 1947.

P. M. WEST CLAY

Clay is reported by Wilson and Treasher (1938:33) about 2 miles south of Seaside and half a mile west of the Seaside-Tillamook road. A sample was submitted by the owner, who reported that it had been used in pottery manufacture at Warrenton, Oregon. This light, cream-colored, soft material is buff-firing clay of low refractory value, giving light gray, vesicular, glassy fusions below cone 16. The analysis shows 23.4 percent alumina, 63.2 percent silica, and only 1.86 percent iron oxide, and also shows large quantities of alkalies (by difference) and alkaline earths. It is therefore more valuable for the light-colored pottery and structural wares than for refractories.

Reference: Wilson and Treasher, 1938:33.

COLUMBIA COUNTY

Geography

Columbia County, located east of Clatsop County and north of Washington County, is bounded on the north and east by the Columbia River. St. Helens, situated on the Columbia River in the southeastern part of the county, is the county seat. The county comprises an area of 646 square miles.

Columbia County lies on the east side of the Coast Range, which as a whole, is a heavily dissected mountainous region. However, eastern Columbia County is less dissected and contains many relatively flat, gently sloping areas. Extending westward from the Columbia River, along which some abrupt rises of elevation occur, the altitude usually increases gradually from a few feet above sea level to about 1,500 feet along a divide, known locally as the Clatskanie divide. This divide trends from southeast to northwest across the county. West of this divide the topography is more rugged with a maximum elevation of more than 2,000 feet. On the north and east sides of the Clatskanie divide the streams flow into the Columbia River; on the west side into the Nehalem River.

The principal industries are lumbering and fishing. The mineral resources consist of crushed rock, bauxite, limonite, clay, and coal.

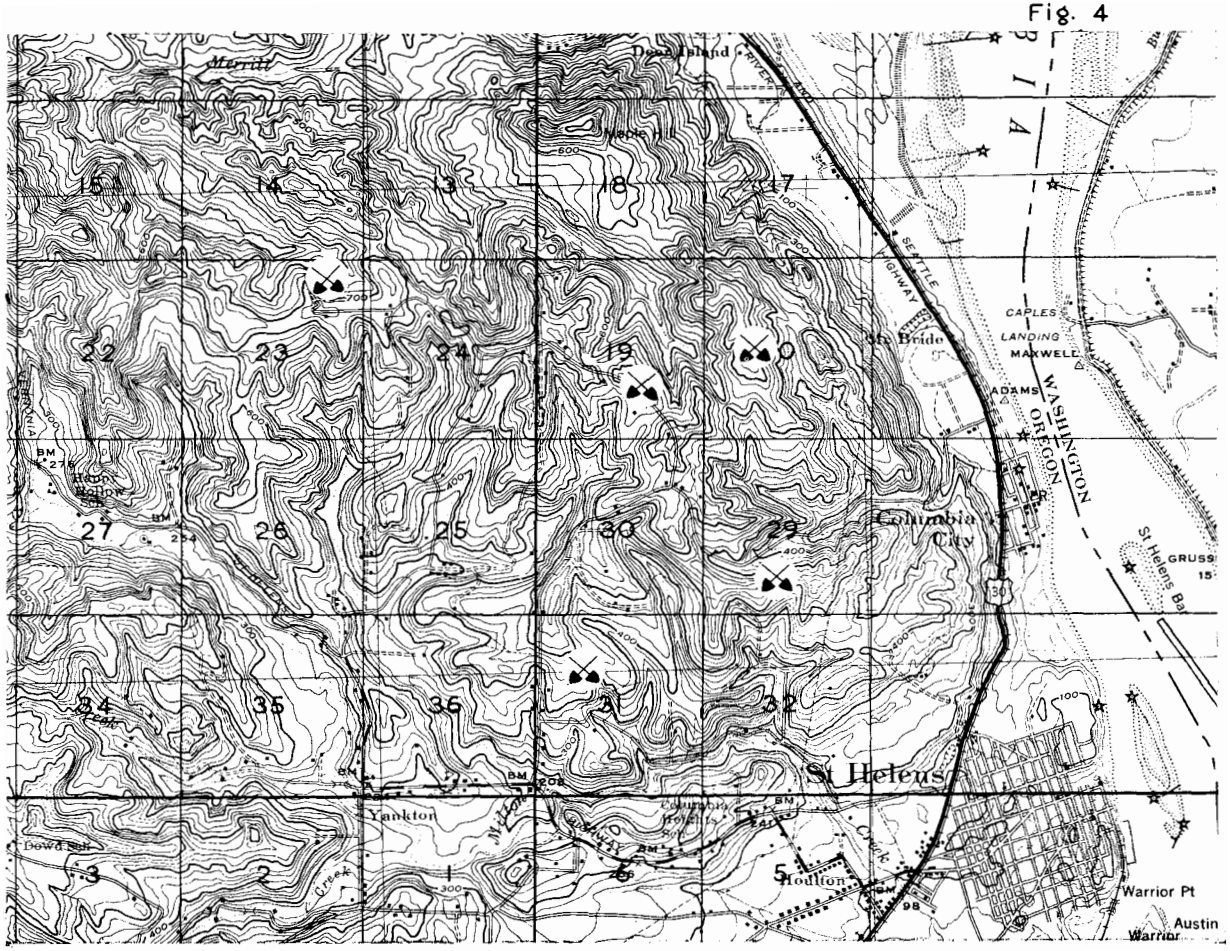
Geology

The oldest rocks known in Columbia County are the Tillamook volcanics probably of middle Eocene age and overlain in part by upper Eocene sediments. This volcanic series outcrops southwest of Vernonia near Rocky Point and along Rock Creek. The Goble volcanic series, upper Eocene in age, is exposed along the Columbia River from Deer Island northward beyond Rainier. Great thicknesses of sediments, mainly tuffaceous sand and shales, were deposited during the Oligocene epoch over most of the county area.

Overlying these sediments are numerous flows of Columbia River basalt, which were erupted from fissures during the middle Miocene epoch. The lava erupted intermittently, thus allowing some weathering and erosion between flows. As a result, iron oxide that formed from the weathering of the basalt was deposited in bogs and swamps and later covered with basalt flows thus forming bog iron ore or limonite. At the close of this period of eruption, ferruginous bauxite was formed from the basalt after a long period of lateritic weathering.

During Pliocene times sands and gravels, which make up the Troutdale formation, were deposited in depressions by the Columbia River. During the Pleistocene, due to a rise in sea level, sands and gravels, as well as ice-rafted erratics, were deposited along the Columbia River and its tributaries and occur as high as 400 feet in elevation.

Fig. 4



Ferruginous bauxite pits, Columbia County, Oregon, opened by Alcoa Mining Company to supply ore for metallurgical testing at East St. Louis.

Mines and Prospects

FERRUGINOUS BAUXITE DEPOSITS

Location: Ferruginous bauxite deposits are located in eastern Columbia County in an area paralleling the Columbia River and extending northward from Scappoose, Oregon, to several miles northwest of Rainier, Oregon. The most extensive deposits are situated from 2 to 9 miles west of the towns of St. Helens and Columbia City in Tps. 4 and 5 N., Rs. 1 and 2 W.

History and development: Libbey, Lowry, and Mason (1945:47-64) listed numerous localities in Columbia County where ferruginous bauxite occurs. Extensive sampling of outcrops in Columbia County was done by the Department.

Alcoa Mining Company has been engaged in exploratory drilling and sampling of the deposits since 1945. In 1948 Alcoa opened some pits and mined a small amount of ore from five properties in Columbia County (see fig. 4 on opposite page), namely, the Fay Olsen property in the NE¼ sec. 23, T. 5 N., R. 2 W; the L. Larsen property in the NW¼, SE¼ sec. 19, T. 5 N., R. 1 W; the W. C. Stumberg property in the S½, SW¼ sec. 29, T. 5 N., R. 1 W; the A. F. Smith property in the NW¼ sec. 20, T. 5 N., R. 1 W; and the Rose Urvilo property in the SE¼, NW¼ sec. 31, T. 5 N., R. 1 W. All the ore that was mined was shipped to East St. Louis for metallurgical testing work.

Topography: The ferruginous bauxite deposits of Columbia County lie within the eastern foothills or extensions of the Coast Range of mountains. Elevations range from a little above sea level along the Columbia River to nearly 2,000 feet. The region as a whole is considerably dissected by streams which have eroded deep canyons. The deposits occur usually in topographic highs where flat surfaces and smooth slopes persist.

Geology: Wilkinson, Lowry, and Baldwin (1946) show that Miocene basaltic lavas, known as the Columbia River basalts, unconformably overlie Oligocene marine sediments in Columbia County in the ferruginous bauxite localities. The basalts are more than 500 feet thick in some places. The Oligocene sediments are predominantly tuffaceous sandstones.

The ferruginous bauxite was formed by laterization of the upper flow or flows of the Columbia River basalt. The bauxite is overlain by fine-grained gray or tan to red silt which varies from a few feet to 100 feet in thickness. These silts are believed to be a part of the Troutdale formation assigned by Chaney (1944) to the lower Pliocene epoch.

The structure of the basalts in southern Columbia County is briefly discussed by Libbey, Lowry, and Mason (1945:12) as follows:

> "In southern Columbia County the structure of the basalts is even less well known than farther south in Washington County. The known dips in the basalts northwest of Scappoose are to the northeast and judging from the regional slopes, the basalts appear to form the southwest limb of a southeast-trending and plunging syncline whose axis runs through the Yankton area. From there, the basalts rise to the northeast."

The topographic distribution of the bauxite deposits ranges from 300 to 1,600 feet in elevation. The attitude of the deposits corresponds to the regional slope of the area.

A full section of ferruginous bauxite consists of brown or red pisolitic ore at the top, underlain successively by banded, nodular, and fine-grained varieties, which range in color from tan to various shades of red. A complete section of the laterite is not always found.

The arithmetical average composition of the ferruginous bauxite channel-sampled by the Department in Columbia County is 38.63 percent alumina, 20.70 percent iron, 9.36 percent silica, and 5.83 percent titania. As reported by The Oregonian, February 24, 1946, the laterite deposits investigated by Alcoa Mining Company in Washington and Columbia counties contain an average of 33 percent alumina, 33 percent ferric oxide, and about 6 to 6.5 percent each of silica and titanium.

The thickness of the deposits in Columbia County ranges from 5 to 30 feet. The ratio of the silt overburden to ore is probably less than 2 to 1.

Examinations of thin sections of oölitic or pisolitic varieties of the ore show that both the oölites and matrix may have a colloform structure. Some of the oölites have a dark-gray opaque core surrounded by a rim of reddish-brown translucent material with residual grains of magnetite. Limonite is also common in the concretions. Gibbsite fills cracks or cavities in some of the oölites, and the matrix often contains a large amount of gibbsite.

Petrographic studies of the porous granular type of ore show that much of the original texture of the basalt is retained. The numerous residual crystals of magnetite retain their original arrangement. The laths of plagioclase as well as other constituents have been largely replaced by gibbsite. Reddish-brown birefringent iron oxide, probably goethite, is a lesser constituent.

References: Libbey, Lowry, and Mason, 1945:12, 47-64.
Wilkinson, Lowry, and Baldwin, 1946.

KENUSKY CREEK COAL LOCALITY

Location: Sec. 27, T. 5 N., R. 3 W., in the headwaters of Kenusky Creek, half a mile south of the Pittsburg Bluff-Vernonia and St. Helens highway, just south of the summit.

Geology: The coal is probably within the Pittsburg Bluff formation of middle Oligocene age. It was examined by Diller (1896:493-494) who reported as follows:

> "The thickness of the beds (in the Pebble Creek Mine to the southwest) is sufficient to suggest considerable lateral extension, and for this reason the same coal might be expected to appear upon the East Fork of the Nehalem River. In fact, two coal beds have been discovered upon one of the forks of that stream. Mr. A. H. Powell has prospected them in sec. 27, T. 5 N., R. 3 W. At this point the general elevation of the peneplain is about 2,200 feet, and the canyon is over 400 feet deep. The coal is about 5 feet in thickness, and lies between horizontal beds of sandstone. It is shaly, and, judging from its looks alone, appears to be inferior in quality to that of the East Fork of Pebble Creek.
>
> "Mr. Powell reports a bed of coal farther down the ravine, about 80 feet below the one just noted, and smaller beds farther up, but on account of landslides, the luxuriant undergrowth, and a large amount of fallen timber we were unable to find them.
>
> "Mr. Anderson collected a number of fossil shells near the coal, and it was then thought probable that the same bed continues from sec. 34, T. 4 N., R. 4 W., to sec. 27, T. 5 N., R. 3 W., a distance of nearly 10 miles. According to Dr. Dall, the fossils do not support this view, for in section 37 the shells are apparently of Miocene age, while these of sections 34 and 23 are unquestionably Eocene. So far as the writer is aware, no coal has yet been found on the main stream of the East Fork of the Nehalem, where it ought to be exposed if continuous, as suggested above. In that locality it would be more conveniently located for shipment to the main valley of the Nehalem and the coast."

Reference: Diller, 1896:493-494.

SCAPPOOSE CREEK COAL PROSPECT

Location: A coal bed is exposed by two tunnels and several open cuts near the center of the W½ sec. 10, T. 3 N., R. 2 W., approximately half a mile northeast of Canyon School which is located on Dutch Canyon Road 2.5 miles west of the Columbia River Highway.

Description of deposit: The coal bed as exposed by the tunnels is about 4 feet thick and strikes N. 55° W. and dips 9° N.E. The southernmost tunnel runs in on the coal for more than 100 feet, sloping up about 4°. At the mouth of the tunnel the coal is 2½ feet thick; 75 feet in it is 4 feet thick; and at the face it is 2 feet thick.

The coal was sampled by W. K. Mann, c/o L. C. Mann, Gueda Springs, Kansas, and it appears to be good lignite with an average thickness of at least three feet. An analysis of the coal as reported by Mr. Mann is as follows:

	As Received
Moisture	24.12 %
Ash	7.66
Fixed carbon	35.55
Vol. comb.	29.86
Sulphur	2.57
B.t.u. per lb.	8,300

Report by: J.E.A., March 28, 1940.

SCAPPOOSE IRON PROPERTIES

Location: A number of deposits of limonite are located in Tps. 3, 4, and 5 N., Rs. 2 and 3 W., Columbia County. The largest deposit, the Colport-Charcoal Iron, is about 2 miles west of the town of Scappoose which is on the S.P.& S. Railway and U.S. Highway 30 about 25 miles north of Portland, and 7 miles southwest of the port of St. Helens, on the Columbia River. A logging railroad passes below the deposit less than 1 mile to the northeast. Deposits are located as follows:

Name	Location	Acres
Colport-Charcoal Iron	Secs. 3, 10, T. 3 N., R. 2 W., and sec. 34, T. 4 N., R. 2 W.	214.0
Ironcrest	Sec. 35, T. 4 N., R. 3 W.	15.0
Ladysmith	Secs. 25, 26, T. 5 N., R. 3 W.	13.4
Bunker Hill	Sec. 31, T. 5 N., R. 2 W., and sec. 6, T. 4 N., R. 2 W.	5.1
Hill 600	Sec. 27, T. 4 N., R. 2 W.	6.0

Most of the iron ore properties are privately owned with both surface and mineral rights included. The Colport-Charcoal Iron consists of 4 separate deposits, the Ladysmith of 2, and the Bunker Hill of 4.

History and development: Limonite iron ore, similar to that mined at Oswego from 1867 to 1895 (See Oswego Iron Mine, Clackamas County) was first discovered near Scappoose in 1890. Little work was done until the period 1918 to 1926, during which time the Oregon Charcoal Iron Company and its successor, the Oregon Iron Ore Development Corporation, drilled more than 24 churn drill holes and opened up many cuts on the Colport-Charcoal Iron deposits. Various operators drilled about 30 holes by hand on the Ironcrest, Ladysmith, and Bunker Hill properties, and dug 21 open cuts, short tunnels, and a shaft on the Ironcrest property. They also drilled the Bunker Hill by hand augers and drove a 144-foot tunnel. A few hundred tons of ore reportedly was mined from what was known as the Payne and Rafferty mine on the north fork of Scappoose Creek, many years ago (Williams and Parks, 1923:14); and iron was mined from Hill 600 for use as a pigment.

The U.S. Bureau of Mines carried out an extensive exploration of the Scappoose deposits in 1942, by churn drilling (7,000 feet), rotary bucket drilling (6,000 feet), hand auger drilling (several thousand feet), trenching, and test pitting.

The Williams Paint Company, Emeryville, California, in 1947, purchased and shipped more than 1,000 tons of limonite for pigment. The ore was mined from the Ironcrest property, owned by the A. A. Muck interests, located about 8 miles west of Scappoose. In 1948 and 1949 limonite was mined for this company from property owned by Columbia County.

The Orr Engineering and Chemical Company, of which James Orr, Portland, Oregon, is president, began activating limonite in 1949 in a plant at Scappoose, Oregon. The limonite is mined from the Oregon Charcoal Iron Company deposit located about 2 miles northwest of Scappoose. The activated limonite is sold for use as a sulphur absorber in purifying manufactured gas. Limonite is also prepared at this plant for use as paint pigment.

Reserves and grade: Reserves of limonite of the 5 major properties in Columbia County, according to various past reports, are about 4,000,000 tons. The Colport-Charcoal deposits contain more than 50 percent of the total of these reserves.

Average analyses obtained by the U.S. Bureau of Mines are given in the following chart. They were calculated from the analyses and thickness of ore in each hole, and weighted with the area allotted to each hole.

Dry basis, percent

Area	Moisture	Ignition loss	Fe	S	P	Mn	SiO_2	Al_2O_3	TiO_2
Colport Charcoal	---	13.04	48.4	0.0280	0.7739	0.62	5.05	4.53	--
Ironcrest	---	12.98	49.70	.0833	.4570	.33	6.89	2.27	--
Ladysmith	---	12.47	49.5	.1279	.6919	----	5.69	3.95	0.40
Bunker Hill	---	12.66	45.8	.1675	.7301	----	4.91	5.05	--
Hill 600	---	11.09	49.8	.034	.887	.65	5.77	7.81	--
			48.6	.046	.73	.58	5.33	4.26	

Geology: The limonite iron ores of Columbia County lie on the eastern edge of the Coast Range, which is here composed largely of marine and continental sandstones and shales of Oligocene age, unconformably overlain by Columbia River basaltic lavas of Miocene age. The Oligocene (Pittsburg Bluff) sediments were folded and eroded previous to the extrusion of the basalts, which piled up to a thickness of over 500 feet in this area during Miocene time. The basalts were uplifted and gently folded along a northwest-trending axis during the Pliocene. During the Quaternary the Columbia River cut terrace levels at elevations ranging from 500 feet downwards. Erosion has cut through the basalts and stripped them away in some of the drainage basins, exposing the underlying sediments. Remnants of the old surface of the basalt still remain as high, gently sloping uplands.

During and after extrusion of the basalts, climatic conditions were such that the basalts were subjected to strong chemical weathering and erosion. The leached and dissolved iron from the basalt was precipitated largely in bogs in depressions in the basalt surface; some deposits indicate transportation and deposition in channels. Most deposits were covered by a thin bed of tuffaceous material, followed by another series of basalt flows which buried and preserved them. The deposits lens out rapidly, and many of them have been partly eroded or have been divided by erosion into several portions.

The ore consists predominantly of soft yellow limonite with hard, dark-brown to nearly black bands of limonite. Soft yellow or tan granular limonite normally underlies the banded variety.

The deposits: The main deposits have been described in considerable detail by Williams and Parks (1923) and by the U.S. Bureau of Mines; their reports are summarized here.

The Colport-Charcoal Iron deposit lies at an altitude of from 450 to 900 feet, underlying the ridges northwest of Apple Valley 2 miles northwest of Scappoose. The deposit is overlain and underlain by weathered basalt, and has an average overburden from 60 to 90 feet thick. It has been divided by erosion (and possibly by faulting) into four separate deposits. The ore bodies dip from 2 to 10 degrees to the northeast and vary from 2 to 14 feet in thickness, with an average thickness of more than 5 feet.

The Ironcrest deposit lies on the northwest side of a ridge sloping gently to the southwest, at an elevation of about 2,000 feet, half a mile west of Pisgah Home and 7 miles airline west of Scappoose. The ore which is from 2 to 20 feet thick lies in a fairly narrow west-trending channel. The eastern portion rests upon basalt; the western portion rests upon a pebbly, tuffaceous sandstone.

The Ladysmith deposit is also apparently a stream-bed deposit, divided by erosion, one portion now lying 50 feet above the other. The larger body lies on a hillside which slopes 6° SE; the other lies on a wide flat ridge. It is located south of the road about 3 miles west of Trenholm, and 10 miles airline west of St. Helens. The ore body ranges in thickness from 2 to 17 feet, averaging nearly 10 feet. The overburden averages about 15 feet thick.

The Bunker Hill deposit, located on the divide between Alder Creek and the headwaters of the Clatskanie River 9 miles airline west of St. Helens, is similar to the Ladysmith in composition and origin, and has been separated into four small areas comprising about 5 acres. The ore bed averages 4 feet thick, with a thick overburden in most places.

The Hill 600 deposit, just south of North Scappoose Creek, 3½ miles northwest of Scappoose, consists of a relatively thin bed of ore underlying the crest of the hill. The ore is a little more than 3 feet thick, with an average overburden of 30 feet.

References: Williams and Parks, 1923.
Miller, 1938:29-33.

SIG FRANSEN CLAY PIT

Owner: Sig Fransen, Rainier, Oregon.

Location: NE¼ sec. 33, T. 8 N., R. 3 W., 6 miles northwest of Rainier and 3½ miles east of Mayger. The deposit lies on the west wall of the Columbia River, less than 100 feet below the crest of the canyon wall, and 500 feet above the river.

History: According to Wilson and Treasher (1938:27-28), the deposit was discovered many years ago when county engineers started a quarry for road metal in the underlying basalt. Small amounts of clay have been sold to the Pacific Stoneware Company, Portland, over a period of time. The Denny-Renton Clay and Coal Company contemplated development of this clay for their Portland plant in 1922, but plans were not carried out. The deposit has lain idle since that time, except for the removal of a few tens of tons since 1938 by the Pacific Stoneware Company.

Topography: The deposit underlies a westward-sloping plateaulike surface 400 to 550 feet in elevation. The surface breaks off abruptly on the east at the canyon wall of the Columbia River.

Development: The only development consists of a quarry with a 25- to 40-foot face, and a steep narrow road down to the quarry from the county road which runs along the crest above the quarry.

Geology: The clay is formed from gravel that has been so thoroughly altered that the pebbles of volcanic origin (largely andesitic in nature) are soft enough to be carved with a knife. According to Wilson and Treasher (1938:19), the pebbles, ranging in diameter from

1 to 8 inches, are chiefly felsite with a small percent derived from metamorphic rocks, usually quartzite, which are not altered. The matrix was originally coarse-grained arkose containing, in addition to feldspathic minerals, quantities of quartz grains and white mica. The igneous pebbles retain their original shape and can be separated from the mass. In some cases the mineral texture and color are preserved; in others, the pebbles are altered to a structureless cream-colored clay.

The age of the gravel is believed to be equivalent to the Troutdale formation, of upper Pliocene age, as it lies above the Columbia River basalt and contains quartzite pebbles, and has been deformed with the basalt.

Calculations by Wilson and Treasher (1938:30) on a basis of a 25-foot thickness for the clay seam, give a minimum of 430,000 and a possible maximum of 1,720,000 short tons of clay reserve on the Sig Fransen property. Refractory properties of the clay are given in the cited report.

References: Wilson and Treasher, 1938:27-33.
Allen and Nichols, 1946.

SOUTH PEBBLE CREEK COAL LOCALITY

Owner: Clark and Wilson Lumber Company, Linnton, Oregon.

Location: Sec. 34, T. 4 N., R. 4 W., on the main fork of Pebble Creek, about 6 miles south of Vernonia.

Geology: The coal lies in the Pittsburg Bluff formation of middle Oligocene age, which strikes about N. 30° E. and dips gently to the southeast. It lies between fairly hard sandstones. F. M. Anderson, who assisted Diller (1896:492) in making the survey in 1895, found a few fossil shells and fish scales in the gray sandstone above. According to Diller (1896:491-492,503):

> "The pit, which once exposed the whole thickness of the bed, has been filled up by the stream, but I was informed by Mr. N. C. Adams, who prospected much of the coal in that region, that the bed is 4 feet 10 inches thick, including a parting of soft yellowish sandstone which measured 4 to 6 inches. At the time of our visit only the upper 18 inches of the bed could be seen. On a fresh fracture the lustre of the coal is brilliant, but soon becomes dull. It has a fine-banded structure parallel to the bedding, and upon exposure to changes of temperature and moisture, fissures develop along these planes in the coal, but much of it does not slack. It contains a few nodules of pyrites, breaks readily into flattish pieces, and burns with a bright yellow flame. Analyses No. 2 and 3 are from this locality:

	Moisture	Volatile matter	Fixed carbon	Ash	Sulphur	Physical properties of coke
2	11.6	42.82	41.64	4.38	4.32	Sooty, incoherent
3	10.83	41.05	43.17	4.95	2.47	Partly brilliant and coherent

> "About 100 yards farther down Pebble Creek, upon the right bank above the stream, apparently the same coal crops out, showing that the strata dip gently eastward."

Reference: Diller, 1896:491-492, 503.

ST. HELENS COAL PROSPECT

Location: Sec. 18, T. 5 N., R. 1 W., an abandoned prospect drift located 4 miles north of St. Helens at an elevation of about 300 feet.

Geology: The coal bed strikes north, and dips 5 degrees west. It is of undetermined thickness, and the portion of the bed exposed in the drift was measured and sampled at a point 50 feet west of the portal by M. R. Geer and J. E. Morrison in 1939 (Yancey and Geer, 1940:17) as follows:

Roof, undetermined[b]:

	Feet	Inches
Clay, gray, soft		a 5
Coal		a 2½
Clay, gray, soft		a 3
Coal		a 4½
Clay, gray, soft		a 3
Coal		a 4
Clay, brown		a 4
Coal		a 1
Clay, gray, sandy		a10
Bone		a 5
Clay, gray, sandy		a 6½
Bone, coal streaks	a 1	
Coal	1	
Bone		a 2

Floor, undetermined[b]

Thickness in drift	7	½
Thickness in sample	1	

a Not included in sample.

b Neither the roof nor floor of the bed was exposed. The section measured is overlain by at least 12 feet of clay and coal.

Analyses of the coal (Yancy and Geer, 1940:19-20) show the following:

	As Received	Moisture Free	Moisture & Ash Free
Ash	16.0 %	22.7 %	----
B.t.u's.	6690	9470	12259
Moisture	29.4 %	---	----

Reference: Yancey and Geer, 1940:17,19-20.

VERNONIA COAL MINES

Owner: Mineral rights are owned by Clark and Wilson Lumber Company now reorganized into two companies, the Pittsburg Development Company and the Nehalem Assets Company, each holding an undivided one-half interest. The timber is owned by the Crown Zellerbach Company.

Operator: Vernonia Coal Mines, William Tyacke, Fred Ovesen, and Douglas Tyacke, Vernonia, Oregon. An application to incorporate has been made.

Location and area: A purchase contract has been secured by Vernonia Coal Mines for a total of 640 acres in the S½ sec. 23 and the N½ sec. 26, T. 4 N., R. 4 W. The property is located about 4 miles southeast of Vernonia on the southwest bank of Coal Creek which

flows in a northwesterly direction to join Pebble Creek 2½ miles away. The mine is reached over a logging road which was formerly a logging railroad grade from Vernonia. The roads leading out to the mine are numbered with a standard system and the main road is called "the 400" while the spur leading to the mine is number 410. At the time of the inspection there was no road leading all the way to the portal located in the SW¼ sec. 23, T. 4 N., R. 4 W. A short road is to be built to connect the mine with the log road and a 2½-mile road is expected to be built down Coal Creek to its mouth where it would join the main road.

History: In 1888 the coal was found by Douglas Tyacke's father and the land was patented in 1894. Diller (1896:492-493) discusses an exposure of coal in sec. 23, T. 4 N., R. 4 W., on the East Fork of Pebble Creek, which apparently is now known as Coal Creek. According to Diller's report the Great Northern Coal Company had done some coal exploration work in this area. About 1941 a sample was obtained from old workings for the Clark and Wilson Lumber Company. In 1948 underground development was done by Vernonia Coal Mines.

Topography: The coal outcrops on the southwest slope of the hill about 50 feet above the level of the valley floor. The terrain is characterized by fairly steep-sided hills which rise to an elevation of 1300 feet. Small gullies are common and the drainage pattern is fairly well developed.

Development: Underground development consists of a 200-foot slope which has been driven into the hill in a westerly direction. This tunnel is roughly parallel to, and about 25 feet north of, a slope driven many years ago but now caved near the portal. The new slope is expected to tap the old one near the face, but insufficient work had been done at the time of examination to effect this junction. The present slope is not over 4 feet wide and is being used merely to examine the coal section. Another slope forty feet in length has been driven on the same seam about 1,000 feet southeast of this tunnel.

In November 1948 the Department took a sample at the face 125 feet from the portal. A second incomplete section was measured 185 feet from the portal. The analysis of the sample is:

"as received" basis

Moisture	27.38 %
Ash	23.38
Volatile matter	26.30
Fixed carbon	23.14
B.t.u.	6,042

Section sampled at face on right hand, or north side, 125 feet from portal.

Section of Coal Bed, Tunnel No. 2

	Feet	Inches
Top of bed not exposed[1]		
Roof, parting, soft sand		
Coal with several thin clay partings	2	9½
Sandy clay		5*
Coal		9½
Peat, or bony coal	2	2½*
Coal	1	1
Floor not exposed		
Total thickness of bed	7	3½
Total thickness of coal sampled	4	8

Sampled November 10, 1948.

[1] According to Douglas Tyacke, about 2 feet of coal lies above the roof of the present tunnel.

* Not included in sample.

Section measured 185 feet from portal on left hand, or south, side of tunnel.

	Feet	Inches
Roof		
Coal	2	9½
Sandy clay		6
Coal		9½
Peat or bony coal	1	1
Sandy clay	1	5
Remainder of section hidden by water		
Total thickness of bed	6	7

Geology: The coal bed is a member of the Pittsburg Bluff formation of middle Oligocene age. This series of beds strikes northward and dips eastward in this region. The Pittsburg Bluff formation consists of massive gray, medium-grained, and somewhat-tuffaceous sandstone and some beds of shale and clay.

The approximate elevation of the exposure of the coal bed in the tunnel is 733 feet. The bed strikes northeastward and dips about 5 degrees to the southeast. It lies between beds of sandstone and contains two main partings, one of sandy clay and one of peat or bony coal. The seam is slightly more than 7 feet thick and contains nearly 5 feet of clean coal, exclusive of some coal remaining in the roof.

The luster of the coal is brilliant on a fresh surface, but rapidly becomes dull upon exposure. When hit with a pick it quickly becomes a brownish color. The coal is compact and splits readily parallel to the bedding.

Baldwin (1948) measured and sampled a section of coal exposed at the face of the 25-foot drift located on the north side of Coal Creek. The coal in this drift dips about 4 degrees eastward. The entire coal seam is not exposed but portions of the section visible both above and below timbers appear to be as follows:

	Feet	Inches	
Roof, yellow sandstone			
Bony coal	1	6	
Clay gouge		1½	
a Coal	2	5	
a Clay gouge		3	
a Coal		5	
a Carbonaceous shale		5	
a Coal, bony		9	
a Carbonaceous shale		8	
Bony coal or impure carbonaceous shale	1	8	
Carbonaceous shale and seams of fireclay	1	4	(1 ft. for former, 4 in. latter)
Carbonaceous shale	1	8	
Coal (bony?)		11	
Floor, carbonaceous shale, base unexposed			
Total thickness of bed	12	1½	
Total thickness of sample	4	11	

a Portion sampled.

The sample was analyzed by L. L. Hoagland of the Department staff with the following results:

"as received" basis

Moisture	24.49 %
Ash	19.95
B.t.u.	6,856

Report by: D.J.W. and R.S.M., December 10, 1948.

References: Baldwin, 1948.
Diller, 1896:492-493.

LANE COUNTY

Introduction

The published information on the geology and mineral resources of Lane County has been brought up to date by Smith (1938). The data presented are excerpts from this publication with a few additions.

Geography

Lane County forms the southern boundary of northwestern Oregon and is located about midway between the Columbia River and the California line. The county extends from the summit of the Cascade Range a distance of 120 miles westward to the Pacific Ocean. It is bounded on the north by Lincoln, Benton, and Linn counties, and on the south by Douglas County. Lane County lies between 43°17' and 44°18' N. latitude and 121°45' and 124°09' W. longitude.

Portions of three physiographic provinces are embraced within the boundaries of the county, namely, the Cascade plateau on the east, the upper end of the Willamette Valley in the center, and the Coast Range on the west. A great variety of topographic forms and variations in relief are outstanding features. From sea level along the narrow coastal belt, the surface rises gradually along sharply dissected terrain to elevations between two and three thousand feet at the crest of the Coast Range. In the central part of the county the relief is less, with abrupt rises in elevation at the head of the Willamette Valley. Eastward the elevations increase until they reach more than 10,000 feet in the peaks of the Cascade Range known as Three Sisters.

The principal river is the Willamette, the headwaters of which rise for the main part in south central Lane County. Of the several tributaries of this river, the principal one is the McKenzie. The chief stream of the western part of the county is the Siuslaw.

In general the climate is humid with rainy winters and dry summers. There is a fog belt along the coast, and in the upper regions of the Cascade Range low temperatures prevail during winter months.

Lumbering is the principal industry, with agriculture second in importance. The scenic resources of the county are a valuable asset.

Geology

From the western edge of the Cascades to the summit the rocks are practically all extrusive igneous rocks - basalts and andesites with minor amounts of intrusives. In the Willamette Valley the formations consist of sands, silts, clays, and gravels. The western part of the county is covered by extensive thicknesses of sandstones, shales, conglomerates, limestone lenses, and tuff, with basaltic and diabasic intrusives.

In general the older formations occupy the western portion and the younger rocks the eastern part. The oldest rocks known to be exposed in this county are Umpqua sandstones, shales, and basalts deposited in seas which covered most of western Oregon during the middle Eocene.

In the Black Butte area the Umpqua is unconformably overlain by the Calapooya formation, which consists predominantly of breccias and agglomerates with some andesitic and basaltic lava flows. The unconformity may correlate in time with the deposition of the Tyee sandstone to the southwest.

The Tyee sandstone (middle Eocene) covers a large part of western Lane County. At Tyee Mountain in Douglas County, the type section of the Tyee formation, this formation overlies the Umpqua. These Tyee sandstones are more thickly bedded than those of the Umpqua formation.

Agglomerates, breccias, tuffs, sands, and clays of the Fisher formation were deposited on the coastal plains bordering the late Eocene to early Oligocene seas. Probably contemporaneously the marine sandstones, shales, and conglomerates of the Eugene formation were being deposited in the seas west of the coastal plains.

Porphyritic basalt in the Willamette Valley near Coburg bridge and massive flows of basalt farther east in the Cascades probably correspond to the Columbia River basalts extruded during the middle Miocene. The Columbia River basalts are overlain by andesitic lavas which represent large volcanic outpourings during Pliocene time. Andesitic and basaltic lava flows that were erupted during Pleistocene and Recent epochs now occur on the summit of the Cascades.

Numerous bodies of dioritic intrusive rocks are found in the Cascade Range. The sulphide deposits of the western Cascades, according to Callaghan and Buddington (1938), are believed to be genetically related to these intrusives, which are younger than the Miocene basalts. Baldwin (1947:35-37), after reviewing the literature pertaining to the intrusives of the Cascade and Coast ranges and from his own observations in the Coast Range, states that the Cascade intrusives appear to be similar in composition and age to Coast Range intrusives, which he assigns to the upper or late Oligocene.

Quicksilver, gold, silver, copper, lead, zinc, and antimony are the metallic minerals found in Lane County. The nonmetallic mineral resources consist of clay, crushed rock, sand, gravel, and tuff. Quicksilver has been produced from the Blackbutte mine. Gold, silver, copper, lead, and zinc have been produced from three mining districts, namely, the Bohemia, Blue River, and Fall Creek. A minor amount of refractory clay has been produced from a deposit at Hobart Butte.

Blackbutte-Elkhead District

Location

The Blackbutte-Elkhead district lies in Douglas and Lane counties, 15 miles south of Cottage Grove. The Elkhead property is in the Umpqua River drainage and the Blackbutte mine properties are 5 miles east of the Elkhead mine near the headwaters of the Coast Fork of the Willamette River in T. 23 S., R. 3 W. Only the Blackbutte mine is included in this bulletin since the Elkhead mine is described by the Oregon Department of Geology and Mineral Industries (1940) and by Wells and Waters (1934:34-35).

Topography

This district lies in the region of the divide between the Willamette and Umpqua drainage known as the Calapooya Mountains, which may be considered as the link connecting the Coast and Cascade ranges. The topography is rugged with sharp ridges, steep slopes, and valleys which in some places are narrow and in others show signs of maturity with widening bottoms. Elevations range from 1,000 feet in the valleys to 3,000 feet or more on the ridges.

History and production

The history and production is largely that of the Blackbutte mine described on page 41.

Geology and ore deposits

The geology and structure of the area have been described by Wells and Waters (1934: 27-28) as follows:

"Formations: All the formations exposed in the Blackbutte-Elkhead area belong to the Tertiary system. The oldest and most extensive of these is the thick series of marine sandstones, shales, conglomerates, and intercalated basalt flows constituting the Umpqua formation. A thick series of amygdaloidal basalt flows lies at the base. Alternating beds of shale and sandstone typical of the Umpqua formation occur in the lower part. The higher sandstones become progressively arkosic and more sandy and thicker bedded, and the shale decreases until the formation consists in its upper part of massive beds of arkosic sandstone, some of which are 100 feet or more thick, separated only by thin partings of shale. Locally, the thick sandstone layers are interbedded well-assorted conglomerate, whose pebbles of quartz and siliceous volcanic rocks do not exceed 1 inch in diameter. Good exposures of the conglomerate occur in sec. 27, T. 23 S., R. 4 W.

"An angular unconformity separates the Umpqua formation from the volcanic conglomerate, pyroclastic rocks, and lavas of the Calapooya formation. Dikes, sills, and volcanic necks of basalt and diabase intrude both the Calapooya formation and the older rocks. A thin coat of volcanic ash or of river alluvium locally forms a surficial mantle.

"Structure - Red Hill Anticline: The rocks of the Blackbutte-Elkhead area have been only slightly deformed. The principal structural feature of the area is an elongated anticlinal dome developed in the Umpqua formation. Its longer axis trends northeast and is indicated by the course of Red Hill. It is about 12 miles wide, and its limbs for the most part dip at angles between 10° and 18°. Near the Elkhead mine, however, the east limb of the anticline dips 30° to 50°.

"The core of the anticline is made up of amygdaloidal lava, and the flanks and crest of shale and sandstone. Differential erosion of these rocks has caused the fold to be reflected in the topography. During the rise of the anticline differential movements occurred between the lavas and the sedimentary beds. Near the Elkhead mine, where the dips are relatively steep, these movements produced fractures in the tuffaceous member directly above the amygdaloidal lava, and these fractures served as paths for the ascending ore solutions. West of the junction of Adams and Elk creeks the north limb of the fold is cut by a fault of small displacement.

"The Red Hill anticline plunges to the northeast and disappears beneath the lavas and sedimentary beds of the Calapooya formation. These rocks are not involved in the folding but lie on a surface eroded across the anticline."

Mining Properties

BALD BUTTE PROSPECTS (Quicksilver) Blackbutte-Elkhead District
(Cinnabar Mountain, Sullivan Prospect)

Owners: J. F. Woodard and O. G. Gilbertson, Cottage Grove, Oregon, and others.

Location and development: Numerous prospects are located in secs. 17, 20, 21, and 28, T. 23 S., R. 3 W., mainly on Bald Butte and Cinnabar Mountain on the southwest side of Garoutte Creek. One claim in the SE¼ sec. 17 on Gold Butte is also held by Woodard and Gilbertson. A 200-foot tunnel in the SW¼, SW¼ sec. 21, on Cinnabar Mountain, is reported to show low-grade cinnabar in altered andesite. There are 4 tunnels on the north part of Bald Butte with a total of 635 feet of underground workings.

Geology: In the area comprising Bald Butte and Cinnabar Mountain a zone of altered andesitic lavas about 2 miles long and a quarter of a mile wide marks the outcrop of a fault zone that trends N. 15°-35° W. This altered fault zone is probably in the upper or lava facies of the Calapooya formation. Resistant iron ribs in the rocks of the zone formed a steep ridge locally crowned by jagged crags. These crags are similar to those found in the rocks of Blackbutte to the northeast.

Mr. J. F. Woodard reports that assays ranging from 7 pounds to 16 pounds of mercury per ton can be obtained from this area. Wells and Waters (1938:33-34) describe the mineralization in this area, but do not report any evidence of ore grade material.

Some claims are located on a mass of altered rock on the north side of East Garoutte Creek, which roughly parallels the zone of rocks containing the Blackbutte mine. The main claims in this area are the Sullivan prospects. Workings on these claims show altered andesite cut by a few silica-carbonate veinlets oxidized to iron ribs. Assay tests are reported to show small quantities of cinnabar.

Informant: Francis Frederick, 1943.

References: Wells and Waters, 1938:33-34.

BLACKBUTTE MINE (Quicksilver) Blackbutte-Elkhead District

Owners: Quicksilver Syndicate, with Robert Taylor and Fred Mills, Blackbutte, Oregon, president and manager, respectively.

Location: NW¼ sec. 16, T. 23 S., R. 3 W., on a steep butte lying between Garoutte Creek and east fork of Garoutte Creek, 17 miles south of Cottage Grove by way of a county road which parallels the Coast Fork of the Willamette River. The mine, office, and furnace are on the northwest slope of Blackbutte at an approximate elevation of 1,200 feet.

History and production: The principal vein was discovered in the early 1890's. The mine was acquired in 1898 by the late W. B. Dennis. Mr. Dennis developed the upper levels of the mine and designed a new furnace plant. Due to the low price of mercury and the banking panic the mine was closed in 1908. In 1916 operations were resumed, this time utilizing a Scott furnace.

In 1927 the mine was taken over by the Quicksilver Syndicate under the direction of R. S. Betts. A 4- by 60-foot Gould rotary furnace was installed and in 1929 another similar unit was added. Since the death of Betts in 1935, the mine has been worked sporadically, and in 1939 one of the Gould furnaces was sold. The Quicksilver Syndicate developed the lower levels, namely, the 600, 900, 1,100, and 1,650-foot or Dennis Creek level. In 1942 the mine was not in operation. The grade of ore mined by the Quicksilver Syndicate was said to average between 3 and 4 pounds of mercury per ton. Until 1942 the total production was about 14,000 flasks of mercury.

Development and equipment: The Blackbutte mine has been developed and mined on the 100, 200, 300, 400, 500, 900, 1,100, and 1,650-foot levels from adit tunnels. The various levels are connected by raises and open stopes. There are two ore passes: one which connects the 600-foot level with the 900-foot level, and the other which connects the Dennis Creek or 1,650-foot level with the 1,100-foot level.

Mining of the ore has been by a shrinkage system. The ground is suited to this type of mining as the walls on the open stopes have stood well after many years of exposure.

The mining equipment consists of two compressors, motors, switches, power lines, transformers, 15 mine cars, and 3 jackhammers with hose and drill steel. The furnace plant equipment consists of the following: one crusher with a capacity of 200 tons per day together with ore bins at Dennis Creek level; one crusher with a capacity of 100 tons per day at the 900-foot level; one Gould furnace with complete condensing system; and a blacksmith shop, forge, and miscellaneous tools.

Geology: Blackbutte is composed of andesitic lavas, breccias, and tuffs of the middle and upper Calapooya formation of Eocene age. The sandstones and shales of the Umpqua formation, upon which the Calapooya formation rests unconformably in this general area, is apparently absent in the vicinity of Blackbutte.

The rocks of the Calapooya formation have been extremely altered by hydrothermal solutions. Silica-carbonate veins, weathered at the surface to brown iron ribs, are common. The alteration of the lavas of Blackbutte are described by Wells and Waters (1934:30) as follows:

> "In spite of the thorough alteration of the lavas of Blackbutte, close examination generally reveals the outlines of altered phenocrysts of feldspar or hypersthene, and under the microscope the original texture of the lava and the outlines of some of the original minerals are generally well preserved. Thus rod-shaped aggregates of cryptocrystalline silica and siderite suggest original crystals of hypersthene, and mats of sericitic and siliceous alteration products suggest original tabular crystals of feldspar. In places, however, volume changes that accompanied the alteration have obliterated the original structure and texture.
>
> "Two different alteration products, distinguished by their relative amounts of silica, may be recognized -- the silica-carbonate veins and associated silicified rock and a softer material containing sericite and abundant carbonates, especially calcite, with minor amounts of silica."

In 1942 the U.S. Bureau of Mines examined and explored the Blackbutte mine as one of its war minerals investigations. Seven diamond drill holes were completed and extensive channel sampling was done. The resulting report on the geology of the deposits is quoted as follows:

> "The Blackbutte mine was developed from outcrops, downward along the strong fault zone, which strikes approximately N. 70° W. and dips 45° to 65° to the northeast. While its strike is approximately N. 70° W., it does not run exactly straight, but curves gently northward from west to east, and it is at and in the vicinity of the apex of the curve of the 'warp' that the fault shows its greatest horizontal displacement. The fault is fairly tight in the upper levels, but it widens considerably at depth. On the 1,100 level the fault has horizontal displacements up to almost 1 foot, whereas on the 1,650 or Dennis Creek level it has similar displacements up to as much as 5 or 6 feet.
>
> "From the 500 level upward the oreshoots lie along this fault zone for distances of several hundred feet on each side of the warp of the fault, but the region near the apex of the warp was too low-grade for mining. Lower down, on the 900 level, the ore bodies lie on the hanging wall of the fault zone along some 1,600 feet, and the apex of the warp was mined there. Below the 1,100 level

only the west side of the fault warp has been developed, and that not extensively. It was in the eastern area below the Smoky Stope, which has been mined above but not below the 900 level, that our core drilling has indicated a large block of ore. The ore below the 900 level does not seem to be controlled entirely by the faulting but is determined both by subordinate faulting near and in the hanging wall of the main fault and by the bedding contact between the light-colored tuff and a darker, reddish tuff and breccia.

"Judging from the mine workings, the oreshoots were large, ranging from 100 feet to over 500 feet in length, and extend from the top east portion of the mine down to below the 1,100 level. According to the management, the mercury content in these oreshoots is rather spotty. Assays ranged from a fraction of a pound to over 30 pounds of mercury per ton and averaged between 3 and 4 pounds of mercury per ton for the ore mined. The Smoky stope is a good example of this type of oreshoot. The Bureau of Mines sampled the Smoky Stope drift and obtained assays from a few tenths of a pound to over 30 pounds of mercury a ton over a distance of 490 feet along the drift. The average assay value for this distance was 2.91 pounds of mercury per ton. The four holes drilled in this area intersected the vein at distances of 140 to 350 feet below the drift and showed vein widths of 6 to 28 feet. The ore averaged 4.2 pounds of mercury a ton.

"Mercury occurs near the fault zones and at the bedded tuff contacts as cinnabar with subordinate amounts of metacinnabar and native quicksilver. Accessory minerals in the ore zones include calcite, siderite, pyrite, and silica. The cinnabar occurs as thin streaks and small specks throughout the altered andesite and tuff. The walls of the oreshoots are not definite and are determined by assays, the mercury values gradually diminishing as they get farther from the main fault zone with its subordinate hanging-wall faults were the channels of access for the mercury-bearing solutions. The mercury was deposited in the upper tight area of the main fault zone and just below the red tuff and breccia in the lower portion of the mine between the subordinate hanging-wall faults."

References: Schuette, 1938:138-146.
Wells and Waters, 1934:28-34.

Blue River District

Location

This district lies about 4 miles north of the town of Blue River on the McKenzie River, 45 miles east of Eugene. It is largely in Lane County but also extends into Linn County, and all but a few of the prospects are contained in Tps. 15 and 16 S., R. 4 E. A road 4½ miles long leads north from Blue River to the Lucky Boy mine, which is the important mine in the district. Other properties are reached by means of numerous trails. Figure 5a, page 44, shows the principal mines, prospects, veins, and diorite intrusive bodies in the district.

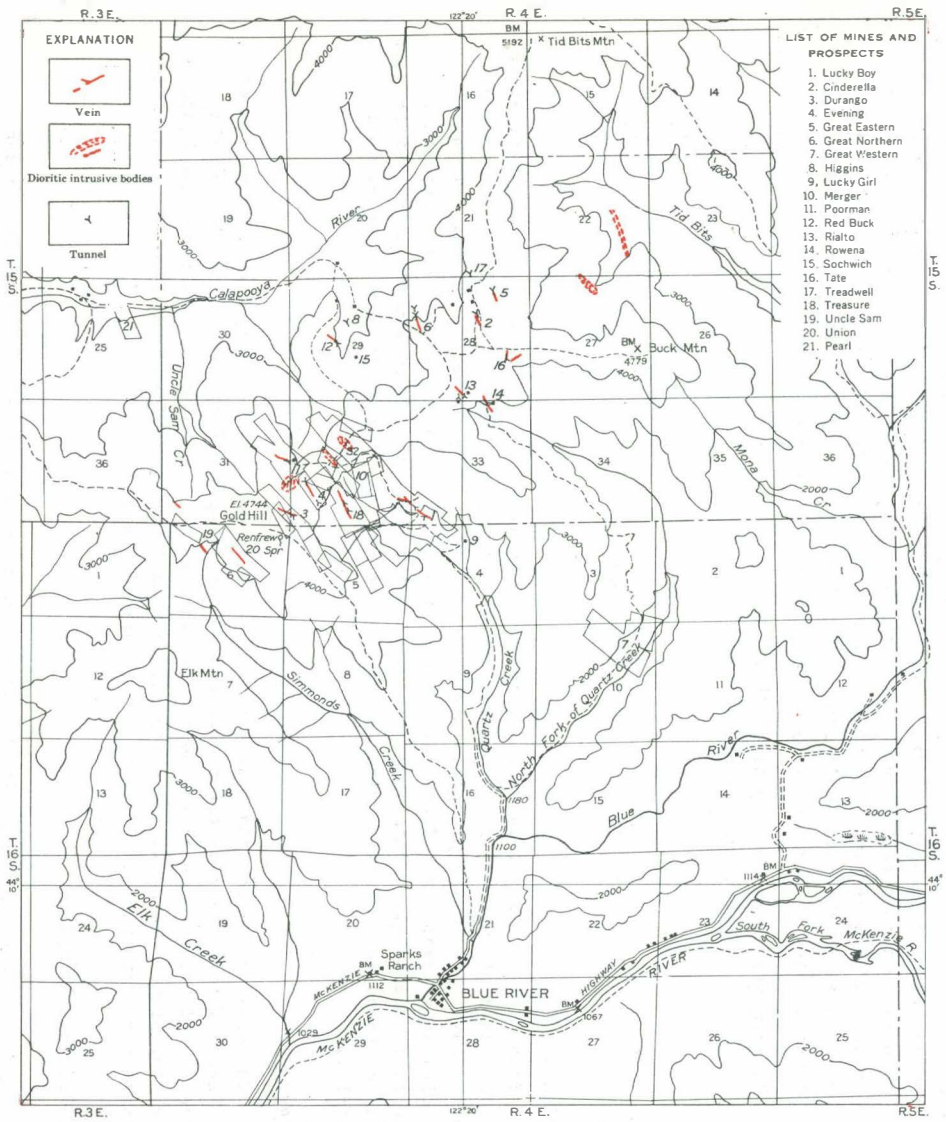
Topography

The area is characteristically rugged, with steep, timbered slopes on either side of the divide which separates the headwaters of the Calapooya River on the north from the McKenzie and Blue rivers on the south. Elevations along this divide are more than 4,000 feet; the highest point in the district, Gold Hill, is 4,744 feet. Most of the mines and prospects are within 1,500 feet of the summit of the divide.

History and production

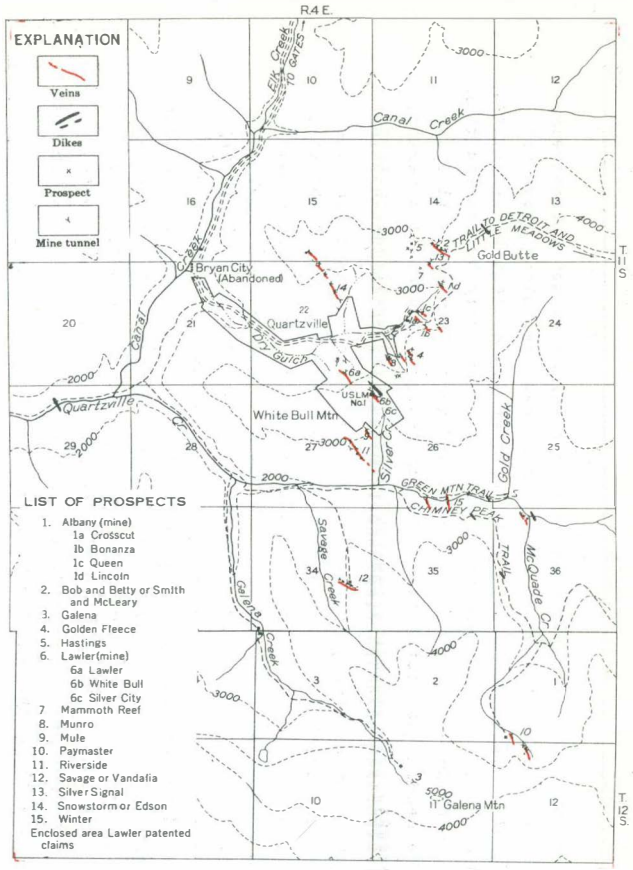
Both the history and production of the district are largely the same as for the Lucky Boy mine on page 48.

Fig. 5a



Blue River District, Lane and Linn Counties, Oregon.
Sketch map showing approximate location of prospects, mines, veins, and dioritic intrusive bodies.

Fig. 5b



Quartzville District, Linn County, Oregon.
Sketch map showing approximate location of prospects, veins, and dioritic intrusive bodies.

SCALE
0 1/2 1 2 Miles

Maps adapted from U.S.G.S. Bulletin 893

Geology and ore deposits

Rock and mineral associations are in general the same as in other Cascade deposits. The proportion of flows to fragmental rocks (tuffs and volcanic breccias) appears to be about equal. The nearly horizontal lavas are predominantly andesitic; some rhyolite, however, appears on the north side of the divide on the headwaters of Uncle Sam and Badger creeks. Two groups of dioritic dikes and plugs with narrow contact aureoles of hornfels occur, one northeast of Gold Hill and the other on the south fork of Tid Bits Creek.

Most of the past mining was from the oxidized portions of the veins, which are fewer and less developed than in the Bohemia district to the south. The Lucky Boy vein contains the usual Cascade assemblage of pyrite, sphalerite, galena, and chalcopyrite, with quartz the dominant gangue material. It also contains some small grains of tetrahedrite. Calcite is predominant in a few of the veins in the district, especially the Great Northern, Higgins, and Cinderella. Adularia is more common here than in other districts. The secondary minerals are largely leached out, but occur in small amounts.

Mining Properties

BLUE BIRD MINE Blue River District

see Rialto

CALAPOOYA & BLUE RIVER MILLING & MINING COMPANY Blue River District

see Poorman

CINDERELLA MINE (Gold, silver) Blue River District

Location: N½ sec. 28, T. 15 S., R. 4 E., Linn County, near Lane County line, on the north side of a drainage divide. It is reached by about 3 miles of trail from the Lucky Boy mine, which is 4½ miles by road north of Blue River, the latter being 43 miles east of Eugene on the McKenzie River Highway.

Area: 7 claims in 1916.

History: In 1902 this property had a 50-foot shaft and a tunnel 240 feet long.

Development: In 1930 there were two tunnel levels; the upper one, 40 feet above the lower, was caved. The lower had a 50-foot crosscut and a 90-foot drift in a southeasterly direction. A shaft connects the surface with the lower level. In addition there were remains of a small stamp mill.

Geology: As exposed in the lower of the two tunnels, the vein consists of altered rock containing a band 12 to 15 inches wide of brownish-black powder, largely manganese. The country rock is altered andesite. Parks and Swartley (1916:55) say the vein is 2 feet wide and is developed by tunnels and raises.

References: Callaghan and Buddington, 1938:117.
Parks and Swartley, 1916:55.
Stafford, 1904.

CONSOLIDATED LUCKY BOY MINING COMPANY Blue River District

see Lucky Boy

DURANGO GROUP (Gold, silver) Blue River District

Location: Sec. 5, T. 16 S., R. 4 E., and secs. 31 and 32, T. 15 S., R. 4 E., probably in Linn County near Lane County line. This property crosses Gold Hill near the summit. The area is about a mile west of the Lucky Boy mine, which is about 4½ miles north of Blue River on the McKenzie Highway.

Area: 3 patented claims.

Geology: As exposed in a tunnel on the southeast slope of Gold Hill, a vein 1 to 6 feet wide, consisting of brecciated, iron-stained labradorite andesite, with quartz stringers, is followed for 130 feet. It is a part of a wider zone of altered rock. Several cuts to the southeast in Durango Flat show quartz. An open cut more than 30 feet wide on the northwest slope of Gold Hill exposes stringers of quartz and brecciated country rock cemented by quartz. For the most part the material is weathered, but some silicified material contains disseminated pyrite.

Reference: Callaghan and Buddington, 1938:117.

EVENING GROUP (Gold, silver) Blue River District

Location: Sec. 32, T. 15 S., R. 4 E., probably in both Lane and Linn counties, crossing the east peak of Gold Hill, about a mile west of the Lucky Boy mine which is about 4½ miles by road north of Blue River on the McKenzie Highway.

Area: 2 patented claims.

Development: Two tunnels, 110 feet and 240 feet below the summit of Gold Hill respectively, together with a shaft 50 feet deep, were reported in 1902. Only the lower tunnel was found by the U.S. Geological Survey party in 1930.

Geology: The vein consists of iron-stained altered rock with quartz stringers and is thoroughly weathered and leached. As explored in a tunnel for 500 feet, vein matter varies from 6 feet wide near the portal to 6 inches wide 280 feet from the portal. At the face, 1 foot of altered rock shows. The country rock is labradorite andesite. The vein strikes N. 30° W. and dips 65° - 75° S.W. Callaghan and Buddington (1938:118) state that the tunnel follows the vein S. 30° E.

References: Callaghan and Buddington, 1938:117-118.
Stafford, 1904.

GREAT EASTERN MINE (Gold, silver) Blue River District

Location: Sec. 28, T. 15 S., R. 4 E., northeast of the Cinderella mine, probably in Linn County, but close to the county line between Linn and Lane counties. It is on the north slope of the drainage divide and connected with the Cinderella mine by a sled road. It is about 3 miles by trail north of the Lucky Boy mine, which is about 4½ miles by road north of Blue River on the McKenzie Highway.

Development: The only opening reported is an adit 330 feet long.

Geology: The vein consists of one or more seams of porous, iron-stained quartz 1 to 12 inches wide in blocky altered rock. Five feet of altered rock, with thin quartz seams, occurs at the face. The strike is S. 45° E., with a 70° - 85° dip.

Reference: Callaghan and Buddington, 1938:118.

GREAT NORTHERN MINE (Gold, silver) Blue River District

Location: W½ sec. 28, T. 15 S., R. 4 E., Linn County, about 2 miles by trail north of the Lucky Boy mine.

Area: 6 claims in 1916.

History and development: In 1916 the property was owned by L. B. Bartlett, Portland, Oregon. The mine was operated in 1917. The recorded production is small but second to that of the Lucky Boy mine. Several hundred lineal feet of tunnels and raises are said to have been driven. Callaghan and Buddington (1938:118) reported that the equipment consisted of a 4-stamp mill, an aerial tramway line, and small buildings in a fair state of repair.

Geology: The vein, as exposed in drifts from a crosscut tunnel, consists of brecciated andesite from a few inches to 3 feet or more wide containing lenses of massive white calcite. Pyrite occurs in the altered rock. Leached vein matter consists of altered rock, porous quartz, and a brown powder containing oxides of iron and manganese. Parks and Swartley (1916:112) state that the property was reported to have an oreshoot 75 feet long and 10 feet wide, averaging $10 to $12 a ton.

References: Callaghan and Buddington, 1938:118.
Parks and Swartley, 1916:112.

GREAT WESTERN MINE (Gold, silver) Blue River District

Location: Sec. 10, T. 16 S., R. 4 E., Lane County, in the valley of the East Fork of Quartz Creek, at the extreme southern margin of the district. The property is reached by a trail branching from the Lucky Boy mine road about 2 miles north of Blue River on the McKenzie Highway.

Area: 8 claims. (Either patented or surveyed for patent.)

Not visited; no further information.

References: Callaghan and Buddington, 1938:119.
Parks and Swartley, 1916:112.

HIGGINS MINE (Gold, silver) Blue River District

Location: Sec. 29, T. 15 S., R. 4 E., Linn County, northwest of the Great Northern mine. A cabin on the property is reached by a steep trail from the Great Northern mine, which is about 2 miles by trail from the Lucky Boy mine, the latter being about 4½ miles by road north of Blue River on the McKenzie Highway.

Development: The main tunnel was driven 326 feet. In addition, there are some open cuts and short tunnels. The 2-stamp mill is operated by water power.

Geology: A crosscut tunnel intercepts a fracture striking N. 65°-70° E. A vein of soft, altered rock with small lenses of calcite is exposed in the face. The country rock is tuff. An andesite dike 3 feet wide is cut by the tunnel 20 feet from the portal.

Reference: Callaghan and Buddington, 1938:119.

LANE COUNTY MINING COMPANY Blue River District

Owner: George F. Davis, Springfield, Oregon, (in 1916).

Location: Not known.

Area: 3 patented claims.

Reference: Parks and Swartley, 1916:139.

LUCKY BOY MINE (Gold, silver, copper, lead) Blue River District

Owner: Consolidated Lucky Boy Mines Company (1935), 213 American Bank Building, Portland, Oregon. Grant Phegley, president; J. E. Phegley, secretary, Morgan Building, Portland, Oregon.

Location: Secs. 32 and 33, T. 15 S., R. 4 E., and secs. 4 and 5, T. 16 S., R. 4 E., about 4½ miles by road north of the town of Blue River, on the northeast side of Quartz Creek, a tributary of Blue River.

Area: Property consists of 14 patented claims as follows:

Lucky Boy group	Lucky Queen group	Others
Lucky Boy	Lucky Queen	Sure Winner
Lucky Boy fraction no. 1	Imperial	F. G. S.
Lucky Boy fraction no. 4	Majestic	
Louise	S. P.	
Louis	Boodle	
Confidence		
Gold Dollar		

History and production: The Lucky Boy mine was discovered in 1887, and a 15-stamp mill was built in 1898. In 1903 a 40-stamp mill was erected, together with a power plant on the McKenzie River and a transmission line to the mine. The mine closed down in 1912 and the equipment either has been taken away or is now in ruins. This mine has furnished nearly all the production of the Blue River district. The recorded production since 1902, which does not include a possible $50,000 to $100,000 prior to 1902 and which has a total value of approximately $174,000, is as follows:

Gold	7,737 ounces
Silver	12,844 ounces
Copper	4,257 pounds
Lead	1,051 pounds

Development: Most of the mining was done in the 5 upper levels which total more than 4,000 lineal feet of drifts, crosscuts, raises, and winzes. Two lower levels have been driven in recent years. No. 6 level explored the vein for more than 400 feet. No. 7 level crosscut driven 216 feet below No. 6 did not reach the vein.

Geology and ore deposits: The country rock is tuff and volcanic breccia, together with some labradorite andesite dikes. The main oreshoot occurred at or near the intersection of the Daisy Creek vein, which strikes from N. 45° W. to west, and the Lucky Boy vein, which strikes N. 33° W. and dips 80° NE. The Confidence vein is parallel to and about 200 feet southwest of the Lucky Boy. The Gold Dollar is shown on old maps as lying northwest of the Confidence, striking nearly north and as being explored by open cuts and a short drift. The Imperial vein is probably the gouge zone near the portal of the lowest or No. 7 crosscut. Sulphides from the vein in the next to lowest or No. 6 crosscut consist of chalcopyrite, galena, pyrite, and sphalerite in quartz. According to Callaghan and Buddington (1938:120) the vein on this level is as much as 25 feet thick, including masses of country rock, with lenses as much as 3 feet thick of silicified material and streaks of sulphides a few inches wide. A grab sample taken in 1941 from the waste dump at the No. 5 crosscut assayed* 0.02 ounces of gold and 0.47 percent zinc. The oxidized zone extends to a depth of at least 150 feet.

Assays of picked samples supplied by the owners gave the following results (Callaghan and Buddington, 1938:120):

*Department sample.

Gold (ounces)	Silver (ounces)	Lead (percent)	Zinc (percent)
0.03	19.77	71.52	0.8
0.07	18.50	65.1	0.9

References: Callaghan and Buddington, 1938:119-121.
Parks and Swartley, 1916:69-70.
Stafford, 1904.

LUCKY GIRL GROUP — Blue River District

Location: Sec. 4, T. 16 S., R. 4 E., southeast of the Lucky Boy group on the east side of Quartz Creek.

Area: 7 claims.

Reference: Callaghan and Buddington, 1938:121.

MERGER GOLD MINING COMPANY (Gold, silver) — Blue River District

Location: Sec. 32, T. 15 S., R. 4 E., Lane County. It is reached by about 1 mile of trail leading northwest from the Lucky Boy mine.

Area: 6 claims (1916).

History and Development: S. M. Carter, Blue River, Oregon, was president of Merger Gold Mining Company in 1916. Development in 1916 consisted of several tunnels.

Geology: The country rock is andesite flow breccia. The Merger tunnel is said to be 1,600 feet long towards the Lucky Boy vein which it does not reach.

References: Callaghan and Buddington, 1938:121.
Parks and Swartley, 1916:153.

POOLER'S CLAIM (Gold, silver) — Blue River District

Location: Sec. 29, T. 15 S., R. 4 E. (This property may be the same as the Higgins.)

Geology: According to Parks and Swartley (1916:180-181):

"The country rock is andesite. The deposit is of the brecciated zone type with a NW-SE strike. The property is developed by short prospect tunnels and open pits. An 8-foot width is said to assay from $8.20 to $13.40 per ton. Some specimen ore has been taken from this prospect, showing wire gold imbedded in quartz crystals. The quartz has the appearance of being formed in small vugs.

"It is reported that during the present summer of 1916 more development work has been done, including the installation of a small stamp mill."

Reference: Parks and Swartley, 1916:180-181.

POORMAN GROUP (Gold, silver) — Blue River District

Location: Secs. 31 and 32, T. 15 S., R. 4 E., mainly on the ridge northwest of Gold Hill, about 2 miles by trail from the Lucky Boy mine.

Area: 5 patented claims.

History: In 1916 the property was called the Calapooya and Blue River Mill and Mining Company with office at Brownsville.

Development: The caved adit on the Poorman Claim is reported to be 600 feet long.

Geology: Vein material on the dump of a caved tunnel on the vein consists of silicified tuff and massive quartz. Assays of from $3 to $24 to the ton were reported in 1916.

References: Callaghan and Buddington, 1938:121.
Parks and Swartley, 1916:48.

RED BUCK (Gold) Blue River District

Location: Sec. 29, T. 15 S., R. 4 E., Linn County, near the Lane County line, and about 3 miles by trail northwest of the Lucky Boy mine.

Development: There are numerous cuts, and one 145-foot adit.

Geology: The vein, as exposed for 145 feet in an adit, is from 1 to 2½ feet wide, without definite walls, and consists of iron-stained and brecciated, altered tuff cemented by quartz.

Reference: Callaghan and Buddington, 1938:121.

RIALTO GROUP (Gold, silver) Blue River District
(formerly Blue Bird)

Owner: S. M. Carter, Blue River, Oregon (President, 1916).

Location: The ground crosses the line between secs. 28 and 33, T. 15 S., R. 4 E., and also the county line of Lane and Linn counties. It is at the head of the north fork of Quartz Creek and may be reached by trail from the Lucky Boy mine.

Area: 12 claims.

Development: There are 4 tunnels with a lineal footage of more than 800 feet. Equipment consists of a cabin, a mill building, water tank, and a prospector's mill.

Geology: The country rock is andesitic flow breccia. The vein is vertical and strikes northwest. Vein matter consists of soft, altered rock, with iron-stained gouge and quartz seams. Lenses of quartz as much as 6 feet thick have been reported.

References: Callaghan and Buddington, 1938:121.
Parks and Swartley, 1916:35.

ROWENA GROUP (Gold, silver, copper, zinc) Blue River District

Location: Secs. 28 and 33, T. 15 S., R. 4 E., Lane County, near the Linn County line, on the north fork of Quartz Creek, east of the Rialto. It is reached by a trail from the Lucky Boy mine.

Area: 8 claims.

History: This may be the present spelling of the Ravena Group mentioned by Stafford (1904).

Development: There are several tunnels with a total lineal footage of about 750 feet.

Geology: The country rock is tuff or volcanic breccia. Vein matter consists of brecciated altered rock containing stringers of quartz with partly leached sulphides, chiefly chalcopyrite. The vein is from 1 foot to 6 feet wide. A sample taken across a width of 6½ feet was reported by Callaghan and Buddington (1938:122) as assaying 0.03 ounce of gold and 9.6 ounces of silver to the ton, 7.6 percent copper, and 4.1 percent zinc. Another sample was reported as assaying 0.8 ounce of gold and 7 ounces of silver to the ton, 5.2 percent copper, and 3 percent zinc.

References: Callaghan and Buddington, 1938:122.
Stafford, 1904.

SOCHWICH PROPERTY Blue River District

Location: Near the center of sec. 29, T. 15 S., R. 4 E., Linn County, near the Lane County line. The property is reached by trail leading northeast of the Lucky Boy mine.

Development: There are several tunnels with undetermined lineal footage.

Geology: As exposed in tunnels on a ridge, vein matter consists of soft, white pyrite material containing thin seams of quartz, all in altered tuff. At a caved tunnel near the cabin, vein matter on the dump is brecciated andesite cemented with druzy quartz without sulphides.

Reference: Callaghan and Buddington, 1938:123.

TATE PROPERTY (Gold, silver, lead, copper, zinc) Blue River District

Location: Sec. 28, T. 15 S., R. 4 E., Lane County, near the Linn County line, on Tate Creek. The property is reached by a trail from the Lucky Boy mine.

Development: The main tunnel is 276 feet long and contains a short drift. The total lineal footage of all the tunnels reported is about 435 feet.

Geology: Veins from 1 foot to 5 feet wide of altered tuff and andesite breccia, with stringers of quartz, are exposed in three tunnels and an open cut. Vein material contains adularia, and where not leached the sulphides are mainly sphalerite, with minor amounts of pyrite, chalcopyrite, and galena. Manganese oxide occurs on some fracture faces.

Reference: Callaghan and Buddington, 1938:123.

TREADWELL PROSPECT Blue River District

Location: Near the line between secs. 21 and 28, T. 15 S., R. 4 E., in the ravine northwest of the Great Eastern mine.

Development: The tunnel is reported to be caved and was not examined by Callaghan and Buddington.

Reference: Callaghan and Buddington, 1938:123.

TREASURE MINE (Gold, silver) Blue River District

Location: Sec. 31, T. 15 S., R. 4 E., in Lane County close to the Linn County line, mainly on the south slope of the east peak of Gold Hill. It is a short distance west of the Lucky Boy group.

Area: 3 patented claims.

History: The property has had small production, although in 1902 it was the most extensively developed mine in the district.

Development: Parks and Swartley (1916:224) state that the lower tunnel was 1,800 feet long and the upper tunnel 500 feet. Stafford (1904) reports that in 1902 the mine was opened by a shaft 30 feet deep and by tunnels on 5 levels, the total amount of development, including raises and crosscuts, amounting to about 4,000 feet in all. Camp buildings were still standing in 1930. A 15-stamp mill was in ruins.

Geology: The main workings were inaccessible in 1930 when examined by the U.S. Geological Survey party. The country rock is tuff or volcanic breccia and andesite. Vein matter on the dump consists of iron-stained, altered country rock and drusy quartz.

Some blocks of massive quartz contain disseminated pyrite but little if any other sulphide. It has been reported that the oreshoot was 270 feet long and opened on four levels. The width of the vein varied from a minimum of 5 feet on level two to an average of 12 feet for 320 feet on level three. Assays following were taken from a report prepared by D. L. McDaniel and C. L. Marshall (1911).

Gold (ounces)	Silver (ounces)	Width of vein (feet)	Notes
0.06	0.48		Coarse ore bin
.08	.06	5.7	North stope level 2
.04	.84	2.2	Upper raise
.16	2.82	1.8	Upper raise
.09	.46	15.0	
.04	.36	8.5	
.06	.73	3.8	South stope level 2
.14	.82	10.0	

References: Buddington and Callaghan, 1938:123.
McDaniel and Marshall, 1911.
Parks and Swartley, 1916:224
Stafford, 1904.

UNCLE SAM GROUP Blue River District

Location: Sec. 6, T. 16 S., R. 4 E., Lane County, on the southern slope of the ridge west of Gold Hill. The property is about 2 miles west of the Lucky Boy mine.

Area: 2 claims (?).

History: Stafford (1904) reports that in 1902 this mine was equipped with a 10-stamp mill.

Development: Lineal footage of two tunnels on the south slope of the ridge is 378 feet. On the Old Uncle Sam prospect the main tunnel is 165 feet long.

Geology: As exposed in a tunnel east of the mill building and 130 feet higher on the hillside, the vein is about 3 feet wide and consists of iron-stained altered rock containing stringers of quartz. Most of the opening is in coarse volcanic breccia, but the face is in andesite. A prospect known as the Old Uncle Sam is located on the opposite slope of the ridge where the drainage is northward to the Calapooya River. Here a tunnel follows an altered zone in rhyolite S. 40° E. This zone has a maximum width of 9 feet and is characterized by well-defined walls, but the deposit shows only a few stringers of quartz.

References: Callaghan and Buddington, 1938:124-125.
Stafford, 1904.

UNION MINE (Gold, silver) Blue River District

Owner: Wendell Snow, Seneca, California.

Location: Sec. 6, T. 16 S., R. 4 E., Lane County, on the southern slope of the ridge west of Gold Hill, and lying about 1 3/4 miles west of the Lucky Boy mine.

History: There has been a small production, but the mine has been idle since 1915. In 1938 the *Mining Journal* reported that the owner was planning to resume operations.

Development: Workings consist of about 1200 feet of drifts and crosscuts, and there is a small mill on the ground.

Geology: The country rock is black, fine-grained andesite. As exposed in the workings,

there is a main vein from a few inches to 5 feet wide, striking about N. 43° W. and consisting of brecciated altered rock cemented by quartz. Some of the more massive quartz fragments contain disseminated sulphides, but generally the vein matter is thoroughly leached. Some small, more or less parallel quartz stringers and veins on both sides of the main vein have been cut by crosscuts.

Reference: Callaghan and Buddington, 1938:125-126.

Bohemia District

Location

The area (see fig. 6, map in pocket) is included chiefly in Tps. 22 and 23 S., Rs. 1 and 2 E., and is about 35 miles by road southeast of Cottage Grove. The principal productive area lies around Bohemia Mountain, occupying an area somewhat less than 9 square miles. Including outlying properties, the area is several times this figure. A logging railroad, connecting with the Southern Pacific at Cottage Grove, runs east to Disston, which is the nearest railroad connection for the district. Disston is 19 miles by road southeast of Cottage Grove.

The road from Cottage Grove to Bohemia forks at Sharps Creek, one branch going into the district by way of Sharps Creek and the other by way of Frank Brice and Champion creeks. There are numerous trails leading to outlying properties.

Topography

At the southern limits of the Willamette Valley, the divide separating the drainage of the Willamette and Umpqua rivers is known as the Calapooya Mountains, which form an east-west connecting link between the Cascade and Coast ranges. The Bohemia District lies on and around the eastern part of this divide in an area characterized generally by high, rugged summits and steep, heavily timbered slopes. The principal peaks have altitudes as follows: Bohemia Mountain, 5,987 feet; Fairview, 5,933 feet; Grouse, 5,570 feet; Grizzly, 5,450 feet; North Fairview, 5,550 feet; and Elephant, 5,522 feet. Many of the mines are at altitudes of 4,000-5,000 feet. Callaghan and Buddington (1938:39-40) state:

> "Glaciation has modified the upper parts of the valleys, particularly on northern and eastern slopes, and glacial debris extends down the valley of Champion Creek possibly as far as the mouth of Golden Curry Creek, or to an altitude of 3,100 feet. Glacial cirques, some of them with lakes and muskegs, are best represented by Crystal, Golden Curry, Champion, Horseheaven, and Musick Basins. Some of the veins, particularly the Musick, have been eroded by glaciers. Possibly others have been covered by glacial debris, as in the vicinity of the old Champion mill."

History

The Bohemia district surpasses all the other mining districts of the Oregon Cascades in area, number of producing properties, amount of development work, and total production. Gold was first discovered in this region in 1858, and the first stamp mill was built in 1875. The Musick vein, the first of importance to be discovered, was located in 1891, and a 5-stamp mill was built there. The Champion put in a 10-stamp mill in 1895 and the Noonday a 20-stamp mill in 1896 (Diller, 1900:7).

Between 1902 and 1912 the Champion, Noonday, and Musick mines were consolidated under the West Coast Mines Company, which operated a 30-stamp mill. The Noonday was productive between 1896 and 1908. Other producers at various times have been the Vesuvius (active previous to 1921) and Evening Star. Between 1932 and 1938 the Mahala mines, the Bartels Mining Company, and the Minerals Exploration Company produced ore valued at more than $400,000.

The main mines were again consolidated in 1939 under the H. & H. mines, who completed construction of a mill and power plant at the Champion mine in 1942, but suspended operations in August due to high cost of material and shortage of labor.

Since 1945 some ore has been produced from the Helena mine under the management of Kenneth Watkins, and from the Champion mine by Fred J. and William Bartels. The mill at the Champion mine was reconditioned in 1946, and some tailings from the Musick and ore from the Helena and Champion mines were concentrated by flotation in 1948 and 1949.

Geology and ore deposits

Speaking generally, rocks in the Bohemia district and their relationships are the same as in the other Cascade districts. The geology and ore deposits are described in detail by Callaghan and Buddington (1938:40-49). Bedded northeast-dipping volcanic flows of tuffs, breccias, rhyolite, and andesites make up the bulk of the rocks. There are dikes of andesite and several scattered intrusions, in the form of dikes, plugs, and a stock, of dioritic rocks to which the ore deposits are believed to be genetically related. These intrusives have altered surrounding volcanics forming contact metamorphic zones.

The veins have a dominant trend to the north and northwest. About half of them strike N. 50°-70° W., about a quarter N. 70°-90° W., and the remainder N. 30°-50° W. Dips are mainly 60°-80° S. Most of the veins with a northwesterly strike are in the southern half of the district; those with a westerly strike are in the northern part. They are younger than any of the rocks in the district, and consist, in most places, of brecciated, altered, and partly replaced country rock cemented by or containing fissure fillings of drusy or comb quartz that locally contain sulphides.

Gold, largely from the oxidized portions of the sulphide veins, has been the principal commercial metal mined. The dominant sulphide is sphalerite, which is associated with galena, chalcopyrite, and pyrite in varying amounts, and in some places with a small amount of tetrahedrite. Primary specularite is associated with the quartz in several of the veins. Galena is dominant in the Musick vein, chalcopyrite in the Oregon-Colorado, and stibnite in the Tall Timber and El Capitan veins. Although a few high-grade pockets have been found, the gold content of the unweathered sulphide ores is generally low. There is a rough areal zonal distribution of mineral deposits with respect to the intrusive rocks. The area of most intensive igneous intrusion contains base-metal quartz veins with variable amounts of gold and in places specularite and dolomite; in areas where there are fewer intrusive bodies the veins carry less sulphide, more carbonate, and occasionally stibnite. The properties are classified by Callaghan and Buddington (1938:47-48) as follows:

Base-metal veins with varying amounts of gold:

- Champion
- Helena
- Musick
- Noonday
- Vesuvius
- Crystal
- Grizzly
- Shotgun
- Utopian
- Vindicator
- War Eagle

Veins with specularite:

- Gold Cross (in War Eagle)
- Orofino
- Alpharetta
- Sultana
- Cape Horn

Veins of quartz and clay minerals (not productive):

- North Fairview
- Syndicate

Pyrite and cherty quartz veins:

- Sultana (in part)
- Cape Horn (in part)
- Orofino (in part)
- Golden Slipper
- Northern vein east of Helena No. 2 camp.

Chalcopyrite-quartz veins:

Oregon-Colorado

Gold-quartz and gold-calcite-quartz veins (western part of district):

Star
West part of Cripple Creek group
President

Stibnite-pyrite-quartz veins:

Tall Timber
President

Specularite and magnetite veinlets and disseminated specularite:

Fractures in hornfels adjacent to many of the intrusive bodies.

Disseminated pyrite:

In contact zones around the small intrusive bodies, and in the outer part of the large areas of contact-metamorphic rock.

In the early days mining was carried on mainly in oxidized parts of oreshoots. When the sulphides appeared in the ore and values could not be recovered by amalgamation, the properties shut down. In recent years small flotation plants have been built, but activity has been intermittent. The 100-ton flotation mill at the Champion mine is available for custom milling of ore from other properties in the district and may aid in increasing the recovery of base metals. Callaghan and Buddington (1938:47) state that:

> "The value per ton in terms of recovered metals for outputs of 100 tons or more for the various mines since 1902 has ranged from $1.20 to $16 (with gold figured at $20.67 an ounce). . . .The average value per ton for the largest operation, that of the combined Musick and Champion mines, was $6.90 for 14 years. Annual averages for years in which more than 1,000 tons was milled range from slightly less than $5 to slightly more than $9 a ton ($20.67 an ounce for gold)."

While these comments are pertinent to the matter of eccnomics of operation under discussion, it would not be fair to place a gross average value on the ore or to judge present-day possibilities from these figures. Undoubtedly much of the milling done was inefficient and poor recoveries were made. On the other hand a much greater proportion of enriched ore was treated than could be mined today. Present-day operations would be mainly from sulphide ores which have a lower gold content. As against this, there are the two factors of a higher dollar value for gold and the efficient flotation process for separating complex sulphide ore.

Taber (1949:12) made the following summary pertaining to the grade of the ore in the Bohemia district:

> "The metal content of the sulfide ores differs considerably from place to place. The gold content ranges from a trace to about 1 ounce. High-grade pockets have been found that contained as much as 10 ounces of gold per ton. The Helena mine has produced several such pockets. The silver averages about 2 ounces per ton, the lead 3 percent, the zinc 5 percent, and the copper about 1 percent. In many of the veins, zinc is the predominant sulfide metal. In a few, notably the Musick vein, lead is more abundant than zinc."

Mining Properties

ANNIE TRAIL PROSPECTS Bohemia District

Description: Several prospects occur along the old Annie Trail, which runs along the west side of Noonday Ridge from Ridge Hotel/Spring south to the road in the saddle near U.S. bench mark 5176 near the center of the east edge of sec. 7, T. 23 S., R. 2 E. These are described in order, from south to north.

(1) In the northwest corner of sec. 8, T. 23 S., R. 2 E., at an elevation of about 5,100 feet, about 1,000 feet north along the trail, a 25-foot drift running S. 75° E. has been dug at trail level on a zone of limonite ribs in altered andesite.

(2) In the extreme northwest corner of sec. 8 at about 5,050 feet elevation a tunnel runs east 115 feet and forks; one branch runs 40 feet S. 60° E., the other 35 feet N. 10° E. The tunnel lies in a wide zone of altered and kaolinized andesite carrying no visible sulfides or quartz.

(3) The "Santa Monica" vein lies in a gulch in the southern part of the NE¼ sec. 6, T. 23 S., R. 2 E., at an elevation of about 4,100 feet. A caved tunnel of considerable length, judging from the size of the dump, lies a few feet below the trail. No ore was seen on the dump.

(4) A tunnel which runs S. 35° E. for 35 feet, thence east for 65 feet is located on the trail a little south of the north edge of sec. 6 at about 4,000 feet elevation. A zone of altered andesite contains large amounts of limonite, but no sulfides were seen.

(5) The Ellen or Sacramento claims lie below the trail just north of the line between Tps. 22 and 23 S., in the southeast corner of sec. 31, and the Parker Pen claim lies above the trail 500 feet farther north.

Report by: J.E.A., August 1945.

BEVERLY CLAIM (Gold, silver) Bohemia District
(formerly Four Monte)

Owner: Harold Whitlock, Cottage Grove.

Location: In the drainage basin of Fairview Creek, west of Utopian road, in S½NE¼ sec. 10, T. 23 S., R. 1 E.

Development: Consists of a short drift and two short crosscuts.

Topography: The outcrop of the vein most extensively prospected is from 4,100 to 4,300 feet in elevation.

Geology: The country rock is mainly rhyolite. The vein strikes N. 50°-55° W. and dips southwest. As exposed in a drift, the deposit shows a narrow band of altered rock containing drusy quartz veinlets and sparse sulphides.

Reference: Callaghan and Buddington, 1938:67.

BIG 4 CLAIM (Gold) Bohemia District

Owner: W. B. Patten, Culp Creek.

Location: NE¼ sec. 8, T. 23 S., R. 1 E., on Fairview Creek, about 1 mile from Mineral Station which is at the mouth of the creek on the Sharps Creek road.

Development and geology: Three caved tunnels are located on the south side of Fairview Creek. One tunnel, which apparently runs S. 30° E., is reported to be 50 feet long and have a 3-foot vein. A second tunnel, which runs S. 65° E., is located 200 feet due east of the cabin and 10 feet above the creek level. The vein developed by this tunnel crosses the creek, where it appears as a gouge zone 2 to 6 inches wide, striking N. 65° W. and dipping 80° NE. A third tunnel is located about 75 feet farther down the creek and due south of the cabin, 25 feet above the creek level. On the north side of the creek, a caved tunnel, which apparently runs due north, is located on the trail 200 yards down stream from the cabin. The bedrock, as exposed in the creek bed, is massive gray andesite.

Report by: J.E.A., 1945.

BOSTON TUNNEL Bohemia District

Location: N½ sec. 16, T. 23 S., R. 1 E., on the south side of Fairview Creek, below the mouth of Puddin Rock Creek, near a falls. It lies across from the Sharps Creek road between Glenwood and Mineral Station.

Development: A tunnel 300 feet long is reported to have been driven in the early 1900's (Stafford[1904]reports 60 feet) by the Bohemia Gold Mining Company. It was not visited.

Report by: J.E.A., 1945.

BURKHART PROPERTY Bohemia District
(also known as United States Consolidated)

Location: Sec. 30, T. 23 S., R. 1 E., on the east side of Martin Creek, above the Combination mine.

History: The old Burkhart cabin is located in the center of sec. 30, but the mine workings, reported to be a short distance up the hill to the east, could not be found when visited in 1945.

Report by: J.E.A., 1945.

CHAMPION MINE (Gold, silver, copper, lead, zinc) Bohemia District

Other names: Calapooya Mining and Tunnel Company
Hartford Mine
Evening Star Mine
Oregon Securities Company
West Coast Mines Company
Mahala Mines Company
Bartels Mining Company
Higgins and Hinsdale

Owner: Fred J. Bartels, Disston, Oregon.

Location: N½ sec. 13, T. 23 S., R. 1 E., on the narrow ridge between Champion Creek and City Creek basins, at Champion Saddle about 35 miles by road southeast of Cottage Grove and 12 miles from the railroad at Disston, which connects with the Southern Pacific Railroad at Cottage Grove.

Area: 10 patented claims. At various times there have been as many as 30 claims in the property.

History: Gold was discovered in the district in 1858, and in 1875 a 5-stamp mill was built on the Knott claim, now a part of the Champion property. This was the first mill in

the area, but it shut down in 1877 and interest in the district did not revive until 1891. The Champion vein was discovered in 1892, and in 1895 a 10-stamp mill was built on that property. In 1902 the Champion, Helena, and Musick mines were consolidated under the West Coast Mines Company. A 30-stamp mill was built at the Champion mine and it ran until 1908, partly on ore from the other properties. Only a small amount of development work was done between 1912 and 1916, and no mining was carried on between that time and 1930. During the period 1932 to 1938 approximately $100,000 was produced from the Champion by several operators, including the Mahala Mines and the Bartels Mining companies. In 1939 the property was taken over by Higgins and Hinsdale (H. & H. Mines) who built a mill and power plant and did several thousand feet of development work including most of the 1,200-foot level. Operations were suspended in August 1942, however, due to high cost of materials and shortage of labor, before production had been attained. The property and mill were turned over to F. J. Bartels in 1944. From 1945 through 1949 a few cars of concentrates were shipped as well as some cars of run-of-mine gold ore.

Development: Several adits are located on the north side of the ridge, between Champion Creek and City Creek, (chiefly on the 900-foot and 1,200-foot levels) and several on the south side (on the 300-foot, 400-foot, and 600-foot levels). Elevations vary from 4,400 feet at the 1,200 level to more than 5,500 where the veins cross Grouse Mountain.

The Champion or Evening Star vein has been developed for over 2,500 feet along the strike by means of 8 levels with approximately 30,000 lineal feet of workings, 20,000 feet of which has been done since 1931. The Mable vein is crossed in the 900-foot crosscut 175 feet from the portal, and the Excelsior vein is crossed 500 feet from the portal. Several hundred feet of drifting has explored this vein, but otherwise there has been little work on other than the Champion vein.

Equipment: The buildings on the property include a machine shop, blacksmith shop, an assay office, a haulage track shed, a tunnel house, a mine office, a diesel-electric plant, a cook house, a bunkhouse suitable for 75 men, a 100-ton selective flotation mill, and several other small buildings. A compressor, ore cars, air-driven mine locomotive, and other necessary tools are included in the mine equipment.

Geology: The ore is directly related to dioritic intrusion into volcanic rocks. Typical veins consist of brecciated altered country rock cemented by vuggy quartz, containing sulphides and other accessory minerals. The Champion vein is in rhyolite, labradorite andesite, tuff, hornfels, and granodiorite porphyry. The Evening Star vein is on what is considered as the southeasterly extension of the Champion vein. Veins generally have northwesterly strike and an average dip of 65° - 70° SW. Oreshoots are from 120 feet to 500 feet long. The vein matter consists of sphalerite, pyrite, chalcopyrite, galena, and a small amount of hematite in quartz and altered rock. Oxidation is nearly complete near the surface, with some oxidation throughout the workings. Engineers' reports have shown values of samples from pillars of 0.44 to 9.82 ounces of gold, 1 to 2 ounces of silver to the ton, a trace of lead, 0.25 to 1 percent copper and an average of about 5 percent zinc, for an average width of 2.7 feet. There are at least seven other veins, some of which offer a little encouragement. In the east oreshoot of the Evening Star, samples of pillars assayed 0.63 ounce of gold and 2 ounces of silver to the ton for an average width of 4 feet.

The Excelsior vein lies 420 feet north of the Champion vein and strikes east. The vein is essentially an altered zone in granodiorite porphyry.

The Vindicator vein is on a spur northwest of the Champion vein and strikes N. 50°-66° W. and dips 60°-65° S. It consists of quartz seams in greenish andesite.

The Columbia vein, an altered zone in granodiorite, is located southeast of the Champion mill.

The Bluebird claim is south of the intersection of Champion Creek and a trail to Grizzly Saddle. A vein on the claim strikes N. 80°-85° W. and dips from 80° S. to vertical.

The Birdie vein lies on the west slope of Grouse Mountain south of the Evening Star. The vein strikes N. 70°-80° E.

Miscellaneous: The 100-ton flotation mill was reconditioned in 1946 by the present owners, and has been operated intermittently from 1946 through 1949.

References: Diller, 1900:7
Stafford, 1904
MacDonald, D. F., 1909:80-84
Parks and Swartley, 1916:234-235
Smith, 1938:40-45
Callaghan and Buddington, 1938:51-54
Taber, 1949:22-25

CITY CREEK PLACERS Bohemia District
(Long Placers)

Owner: Carl Owen, Disston, Oregon.

Location: Secs. 17 and 20, T. 24 S., R. 2 E., on Steamboat Creek, 1 to 2 miles south of City Creek forest camp.

Development: These placers have reportedly been worked fairly extensively by sluicing from time to time, and have a total acreage amounting to 160 acres at one locality, with smaller areas elsewhere. Values are said to have run from 15 to 20 cents a yard, old price of gold ($20.67).

Report by: J.E.A., August 1945 (not visited).

COMBINATION GROUP (Gold, silver, lead, and placer) Bohemia District

Old name: Combination Mining and Milling Company.

Owner: H. E. Cully, Eugene, Oregon.

Location: West edge of sec. 19, T. 23 S., R. 1 E., and E½ sec. 24, T. 23 S., R. 1 W., on the Sharps Creek road, just west of the junction of Puddin, China, and Martin creeks, about 12 miles south of Disston.

Area: One quartz claim (Silver Queen) and one placer (Cindy) claim.

Development: According to Diller (1900:20), there are two tunnels about 100 feet long and short drifts along the vein on two levels. The main dump is on the west side of Martin Creek. The tunnel runs due west, but was caved 40 feet in from the portal. The owner reports that the tunnel is more than 700 feet long, with a winze 60 to 70 feet deep.

Geology: The vein strikes N. 86° E., and dips 65° SE. and has a width in places of nearly 10 feet but the pay streak is narrow. Vein material is kaolinized and contains quartz with some limonite. Values are apparently in the pyrite and galena, although these sulphides are not abundant. Sphalerite and chalcopyrite are present but not common. Ore from the upper level assayed 0.55 ounce of gold and 47.75 ounces of silver to the ton, and hard parts of the vein containing pyritiferous quartz from the lower level assayed no gold and 0.2 ounce of silver to the ton (Callaghan and Buddington, 1938:64).

References: Callaghan and Buddington, 1938:63-64
Diller, 1900:20
Parks and Swartley, 1916:65

COPPER KING CLAIM — Bohemia District

Owner: Floid Salah Day, Disston, Oregon.

Location: SW¼, NE¼ sec. 17, T. 23 S., R. 2 E. The Copper King claim is one of the Belcher group of claims.

Miscellaneous: On September, 5, 1949, F. S. Day sent to the Department a sample taken from this claim. The sample was described as a grab from an ore dump from a 12-inch ore-shoot in a vein three feet in width at a depth of fifty feet. The sample contained chalcopyrite, sphalerite, galena, pyrite, and quartz and it assayed as follows: .04 ounce of gold and 14.50 ounces of silver per ton; 7.70 percent of copper; and 15.42 percent of zinc.

Informant: F. S. Day.

Report by: D.J.W., May 1950.

CRIPPLE CREEK GROUP (Gold, silver) — Bohemia District

Owner: Max Kruse, Cottage Grove, Oregon.

Location: Secs. 13 and 24, T. 23 S., R. 1 E., in the valley of City Creek on the east slope of Jackass Ridge, and reached by a trail 4,000 feet from the Oregon-Colorado road.

Area: 11 claims.

Development: The Western vein has been prospected by six adits and several shallow cuts for a length of 3,000 feet. The Cripple Creek vein has an adit 275 feet long and two short crosscuts. The Lost vein has two drifts and several pits. One drift is 200 feet long, the other 20 feet.

Geology: Elevations at the outcrops of the veins range from 4,000 to 4,700 feet. The country rock is tuff and volcanic breccia. The Western vein strikes N. 30°-50° W., with dips varying between 60° N. to vertical, and 60°-80° SW. It consists of vuggy quartz, sparse sulphides, a thick band of clay, and included country rock. The northern and southern parts of the vein consist of fine-grained, smoky, brecciated quartz cemented by dolomite. Coarse leaf gold and wire gold occur in vugs in a few places.

The Cripple Creek vein is 1,000 feet southwest of the north end of the Western vein. It strikes N. 32° W. and dips 70°-80° NE. The vein ranges from 4 to 15 inches in width and consists of quartz and knots of kaolin, with small amounts of disseminated sphalerite, pyrite, and chalcopyrite.

The Lost vein is between the Western vein and south end of Cripple Creek vein. It strikes N. 30°-60° E. and dips 55°-70° NW. The vein, as exposed, is less than 2 feet wide and consists of clayey altered rock, with pyrite seams, a small quantity of disseminated sulphides, and drusy quartz stringers.

Miscellaneous: A small cabin is located on the property. It was reported in 1949 that an ore bin had been built.

References: Callaghan and Buddington, 1938:65-66
Stafford, 1904

CRYSTAL MINE (Gold, silver) — Bohemia District
(formerly Lizzie Bullock, Lead Crystal, El Calado)

Owner: Kenneth O. Watkins, Corvallis, Oregon

Location: N½ sec. 11, T. 23 S., R. 1 E., northwest of the Champion mine. The property is reached by a branch from the Champion road.

Area: 3 claims (Knickerbocker, El Calado, Mountain Lion).

History: In 1890 the mine was known as the Lizzie Bullock and is credited with production at that date. Diller (1900:25) stated that there was a 2-stamp mill on the property. By 1902 it had been renamed the Crystal. A 5-stamp mill was on the property in 1919.

Development: The Crystal vein has been explored for a length of 3,300 feet by drifts and prospect trenches. The lowest level is at an elevation of 4,580 feet in Crystal Basin and follows the vein a distance of about 400 feet. At 4,690 feet elevation there is an upper level that has more than 100 feet of drift. There are other short drifts on the property. Most of the underground workings are now inaccessible.

Geology: The country rock consists of labradorite-andesite flows, tuffs, and volcanic breccias. The Crystal vein extends from Crystal Basin northwestward across the ridge south of Elephant Mountain. Elevation of the outcrop of the vein ranges from 4,500 feet to 5,300 feet. It has an average strike of N. 65° W. and dips to the south. It consists of breccia cemented by quartz and contains pyrite, sphalerite, chalcopyrite, and galena.

Taber (1949:41) reported that 108 samples taken by K. O. Watkins in the lower workings averaged .03 ounce of gold, 2.0 ounces of silver, 1.1 percent copper, 2.0 percent lead, and 2.9 percent zinc.

References: Callaghan and Buddington, 1938:66-67
Diller, 1900:25
Taber, 1949:40-41

EL CAPITAN CLAIMS (Gold, stibnite) Bohemia District
(President, Churchill)

Owner: W. B. Patten, Culp Creek, Oregon.

Location: Center of the E½ sec. 23, T. 23 S., R. 1 E., in the canyon of St. Peter Creek, 1½ miles south of the Musick mine.

Area: Four unpatented claims and power site.

History: This property is said to have been located in about 1898 by A. P. Churchill. Since 1926 it has been owned by Patten who has done some work on the tunnels, mostly development. It is reported to have produced between four and five hundred dollars in gold.

Development: The vein has been exposed by open cuts at intervals of 200 feet for more than 1,000 feet. There are two tunnels; the upper one is 83 feet above the lower which is at an elevation of 3,900 feet. The upper tunnel was caved when the property was visited in 1941. It is reported to be 160 feet long. The lower tunnel extends N. 70° W. for a distance of 220 feet.

Geology: The country rock consists of volcanic breccia and andesitic lava flows which dip eastward. An intrusion of dioritic rock occurs just southwest of the property. The vein has a sinuous course, averaging N. 60°-70° W., and a dip ranging from 80° S. to vertical. The oxidized portions of the vein gave free gold concentrates of values reportedly as much as $1,500 a ton. The concentration ratio is not known. In the lower tunnel the vein is from 15 to 30 inches in width and consists of two portions: an oxidized gold-bearing portion which contains pyrite, chalcopyrite, galena, and sphalerite in a matrix of vuggy quartz breccia with calcite crystals lining secondary cavities, and a stibnite-bearing portion consisting of blades and clusters of stibnite crystals in white silicified breccia. The gold-bearing portion runs from 5 to 15 inches in width, and the stibnite-bearing portion from 10 to 30 inches. At no place was the stibnite-bearing footwall definitely cross cut. About 10 tons of stibnite ore, which should run at least 25 percent stibnite, lies on the dump.

Informant: W. B. Patten.

Report by: J.E.A., 1941.

References: Callaghan and Buddington, 1938:67
Parks and Swartley, 1916:55

ELKHORN PROSPECT Bohemia District

Location: Near the center of the N½ sec. 22, T. 23 S., R. 1 E., about half a mile west of the Tall Timber and Shane Saddle, at an elevation of about 3,700 feet.

History: This prospect is reported to have been discovered by Shane and McCabe, soon after the turn of the century, and more recently was owned by Andrew Brund and D. P. Burton. Stafford (1904) reports that 800 feet of work was done on the property, but local information indicates less than 200 feet. This property was not visited.

Informant: W. B. Patten, Culp Creek, Oregon.

Report by: J.E.A., 1945.

Reference: Stafford, 1904

GEM, RICO, AND SLIDE CLAIMS (Gold, silver) Bohemia District

Owner: George S. Barton, Eugene, Oregon.

Location: Center W½ sec. 11, T. 23 S., R. 1 E., on the west slope of Fairview Mountain, south and east of the Utopian road.

Area: 3 patented claims having a total area of approximately 45 acres. The Rico is a small fraction.

Development: A 100-foot adit is located on the Gem claim and prospect pits on the other claims.

Geology: The country rock is composed of tuffs and volcanic breccias. The vein on the Gem claim, as exposed in an adit in tuff, trends S. 62° E. and shows a narrow quartz stringer that contains disseminated pyrite. Prospect pits on altered rock and quartz stringers occur on the other claims.

Reference: Callaghan and Buddington, 1938:67

GLENWOOD CLAIM (Gold, silver) Bohemia District
(Also known as Shane Prospect)

Owner: Fred Williams, Cottage Grove, Oregon.

Location: Center E½ sec. 22, T. 23 S., R. 1 E., on Little Rock Creek, about a mile west of the El Capitan vein. The claim is reached by way of the Bohemia trail south from the Musick mill.

History and development: There are 3 short drifts, one of which is 30 feet long. The other two drifts were inaccessible in 1930 (Callaghan and Buddington, 1938:4,67). The prospect was located by E. H. Shane, and 300 feet of workings was reported in 1902.

Geology: The vein strikes N. 60° W. and is nearly vertical. There is a wide zone of altered tuff, andesite, and rhyolite, with lenticular veins of quartz, containing very little sulphide.

References: Callaghan and Buddington, 1938:4,67
Stafford, 1904

GOLD CROSS CLAIM (Gold) Bohemia District

Owner: George McQueen, Cottage Grove, Oregon.

Location: NE¼ sec. 19, T. 23 S., R. 2 E., on Grouse Mountain, near Annie Creek on the south extension of the Noonday road.

Area: 2 patented claims, Gold Cross and Bohemia Girl.

History: A total of 800 feet of tunnels was reported in 1902.

Development: There is an adit and numerous cuts, but all were caved at the time if the U.S. Geological Survey reconnaissance in 1930. K. O. Watkins reported in 1949 that the workings were open.

Geology: The country rock is labradorite andesite, and the vein strikes N. 60° W.

References: Callaghan and Buddington, 1938:67
Stafford, 1904

GOLDEN RULE GROUP Bohemia District

Owner: Kenneth O. Watkins, Corvallis, Oregon.

Location: NW¼ sec. 11, T. 23 S., R. 1 E., on the west side of North Fairview Peak, south of the Crystal and Elephant Mountain groups.

Area: 5 claims, the Damon, Pythias, Stone Easel, David, and Jonathan.

History and development: Stafford (1904) reports 100 feet of open cuts and tunnels aggregating 70 feet in 1902. The "Golden Rule" noted by Parks and Swartley (1916:107) is a separate property. The owner reports that there are several small veins on which a small amount of development work has been done.

Informant: K. O. Watkins, 1945 (not visited by the Department).

References: Parks and Swartley, 1916:107
Stafford, 1904

GOLDEN SLIPPER CLAIM (Gold) Bohemia District

Owner: Ed Jenks estate, Cottage Grove, Oregon.

Location: NE¼ sec. 20, T. 23 S., R. 2 E., on the trail to Riverside Tunnel near Horse Heaven Creek in the southeastern section of the district.

Development: An adit 420 feet long trends N. 65° W. to S. 70° W. In 1902, two tunnels were reported totaling 400 feet.

Geology: The country rock is labradorite andesite. The Golden Slipper vein strikes from S. 80° W. to N. 80° W., and dips 80° S. A 2-foot vein of cherty quartz, containing pyrite seams and disseminated pyrite, cementing brecciated andesite is exposed in the tunnel. Over a part of its course the vein is paralleled by a basalt dike.

Report by: J.E.A., August 1945.

References: Callaghan and Buddington, 1938:67-68
Stafford, 1904

GOLD KING PROSPECT Bohemia District

Location: W½ sec. 29, T. 23 S., R. 2 E., on the west side of Horse Heaven Creek, south of the Riverside and Oregon-Colorado properties.

History: The prospect was located by A. W. Ziniker, who, according to Stafford (1904) owned it in 1903, and had completed 300 feet of workings. The property was not visited by the Department.

Report by: J.E.A., 1945.

Reference: Stafford, 1904.

GOOD FRIDAY GROUP — Bohemia District

Owner: Glendelia (Mrs. J. W.) Nokes, Disston (?), Oregon.

Location: NE¼ sec. 16 and SE¼ sec. 9, T. 23 S., R. 1 E., on the Sharps Creek road, mostly on the east side of Judson Rock Creek.

Area: 4 unpatented claims, the Good Friday, St. Patrick, Bluejay, and Fairplay.

Development and geology: Eleven short tunnels, some of which may not be a part of the Good Friday Group, are located along the Sharps Creek road. They vary in length from 20 to 70 feet and average 40 feet long. They are driven in andesite breccia along joints, seams, and stringers which strike from N. 30° to 55° W., and dip from 60° to 80° SW. A few of the tunnels showed gouge zones from 6 inches to 1 foot wide, but nowhere were sulphides in evidence, and iron oxides were not commonly present.

Report by: J.E.A., August 1945.

GRAHAM PROPERTY (Gold, silver) — Bohemia District
(Hartley property)

Owner: Frank Graham, Cottage Grove, Oregon.

Location: SE¼ sec. 17, T. 23 S., R. 1 E., on the crest of Birdsnest Ridge, northeast of Sailor Gulch; elevation about 3,500 feet.

History and development: The property was originally located by Carl Maddox, who reported the occurrence of metacinnabar. Three tunnels were dug along the side of the ridge 500, 650, and 730 feet south of the ridgetop cabin. The first tunnel runs 55 feet S. 80° E. in massive andesite; the other two are caved, but appear to have run east and southeast for short distances, probably not over 30 feet.

Geology: The country rock is massive flow-banded andesite, with a few indistinct zones of silicified and iron-stained material, samples of which, taken from the dump of the tunnel 650 feet south of the cabin, were assayed in the Department laboratory and returned .02 ounce of gold and a trace of silver.

Report by: J.E.A., August 1945.

GRAY EAGLE AND ALICE CLAIMS (Gold) — Bohemia District

Owner: George McQueen, Cottage Grove, Oregon.

Location: S½ sec. 18, T. 23 S., R. 2 E., on Grouse Mountain and in Annie Gulch. Reached by way of the south extension of the Noonday road.

Area: 2 patented claims, which overlap about 50 percent.

Development: Three adits driven in the vein measure about 250 feet. In addition, there are several cuts.

Geology: The country rock is labradorite andesite. The vein strikes N. 50° W. across both claims toward the Knott shafts, and dips 65° SW. The vein is an altered zone in andesite containing a small amount of quartz and sulphide.

Reference: Callaghan and Buddington, 1938:68

GRIZZLY GROUP (Gold, silver) Bohemia District

Owner: Ed Jenks estate, Cottage Grove, Oregon.

Location: NE¼ sec. 12, T. 23 S., R. 1 E., on the west slope of Noonday Ridge. The property is reached by a trail leading east from the Champion road, at a point about 1½ miles north of the Champion camp.

Area: Three claims were reported by Callaghan and Buddington (1938:68). However, there are 5 claims, from southeast to northwest, on the Grizzly vein: the Sedan, Oversight, Rainbow, Oroplata, and Baltimore.

History: Stafford (1904) reported 800 feet of development work on the Grizzly vein. Parks and Swartley (1916:115) reported that 5 claims located in sec. 11, T. 23 S., R. 1 E., were owned by the Grizzly Mountain Mining and Reduction Company.

Development: The Grizzly vein has been prospected by 3 main adits, at elevations of 3,975, 4,125, and 4,475 feet, and several trenches for a horizontal distance of 2,000 feet and a vertical range of 600 feet.

Geology: The country rock is andesite intruded by diorite. The vein material is quartz with varying amounts of sphalerite, pyrite, chalcopyrite, and galena. The quartz contains some fragments of silicified andesite. The vein strikes N. 60° W., dips 55° - 65°S., and is from 1 to 6 feet in width.

References: Callaghan and Buddington, 1938:68
Parks and Swartley, 1916:115
Stafford, 1904
Taber, 1949:43-44

HELENA MINE (Gold, silver, copper, lead, zinc) Bohemia District

Old names: Oregon Securities Company
Helena Consolidated Mining and Milling Company
Mines Service, Inc.

Owners: Helena Mines, Inc., of Nevada.

Location: Sec. 12, T. 23 S., R. 1 E., and secs. 7 and 18, T. 23 S., R. 2 E. The vein extends from the east side of Champion Creek across Grizzly Mountain to the Noonday Mill on Horse Heaven Creek. The principal workings of the mine lie on the southeast slope of Grizzly Mountain and can be reached by the Noonday road.

Area: 3 patented and 7 unpatented claims. Some of the claims in the group are the Helena, Laurette, Mountain Chief, Verde, American Boy, White Wings, White Bear, and Fallen Leaf.

History and production: The Helena vein was discovered in 1896 by C. P. Bruneau. The Jennings brothers purchased the property in 1899 and operated the mine until 1902. Some sulphide ore and a small amount of high-grade oxidized ore were produced by them.

In 1902 the Helena mine was bought by Oregon Securities Company, which was succeeded by the West Coast Mines Company. The Helena mine was owned in conjunction with the Champion and Musick mines, but no work was done on the Helena. Production up to 1931 is estimated by Callaghan and Buddington (1938:55) at $150,000.

In the early 1930's L. M. Capps purchased the mine. In 1935, F. Dale Wyatt of Eugene, Oregon, leased the mine, organized the Helena Mining Company, and built a 35-ton flotation mill. This company produced ore worth $35,000. In 1937 W. G. Reaves produced ore worth $85,000. The property reverted to Capps. The Mines Service Company, of which George S. Barton of Eugene, Oregon, was president, leased the mine in 1938 and produced a small amount of ore. The property again reverted to Capps and remained idle until 1945.

Kenneth O. Watkins of Corvallis, Oregon, bought the property in 1945 and sold a three-fourths interest to Henry D. Moyle of Salt Lake City, Utah. The Helena Mines, Inc., a Nevada corporation, has since then obtained control of the property. Watkins, manager of the mine, reported in September 1949 that William E. Caldwell of Corvallis, Oregon, was president of this corporation. Watkins has operated the mine intermittently since 1945. Some shipping-grade ore has been produced and some ore has been concentrated at the Champion mill.

Development: The vein has been explored by drifts and trenches for a horizontal distance of 3,000 feet. There are three main levels, the lowest at an altitude of nearly 4,600 feet, all connected by raises. In 1949 all the drifts, except the entrance to one level, and raises were open and in good condition.

Equipment: In 1949 most of the principal drifts had track and air lines. A portable air compressor and other mine tools were available. The outside improvements consist of a small tunnel house, an ore bin, and a two-story bunk house.

Geology: In general the geology is the same as for the Champion Group. The vein strikes N. 47°-57° W., and dips 65°-75° N. The principal oreshoot, according to Callaghan and Buddington (1938:55), appears to have been 200 feet long and extended vertically for 200 feet from the surface. This shoot is in a large granodiorite porphyry dike; the remainder of the vein is in labradorite andesite. The oreshoots average about 5 feet in width. Several stages of vein filling are shown. Sulphide ore consists of sphalerite, pyrite, chalcopyrite, galena, and a small amount of tetrahedrite, with quartz, included rock fragments, kaolin, and barite.

Oxidized ore sampled by Diller (1900:30) assayed 0.9 ounce of gold and 1.15 ounces of silver. Taber (1949:27) reported the results of the assay of four grab samples taken by him from a high-grade pocket opened at the face of the lowest level drift in 1946. The arithmetical average of these four samples is as follows:

Gold	3.15 ounces
Silver . . .	2.8 ounces
Lead	5.8 percent
Zinc	5.8 percent
Copper . . .	1.2 percent

These samples are exceptional rather than the average. The gold content of the oreshoots usually ranges from a trace to 1 ounce.

References: Callaghan and Buddington, 1938:54-57
Diller, 1900:30
Parks and Swartley, 1916:234-235
Taber, 1949:25-28

HENRY CLAY PROSPECT — Bohemia District

Location: Near the south edge of sec. 23, T. 23 S., R. 1 E., on the east side of Monte Rico Ridge in the south part of the district.

History: According to Stafford (1904), the property was owned by Whale and Gilbert in 1902 who did a total of 1200 feet of development work including at least 2 tunnels. The property was not visited by the Department.

Report by: J.E.A.

Reference: Stafford, 1904.

HIAWATHA CLAIM Bohemia District

Location: Center SE¼ sec. 10, T. 23 S., R. 1 E., northwest of the forks of the Sharps Creek and Utopian roads, on the south fork of Fairview Creek.

History: According to Stafford (1904) the claim was owned in 1903 by Alfred Johnson, and about 360 feet of development work, consisting of 2 tunnels and a raise, had been completed. This may be the same as the Beverly, page 56.

Reference: Stafford, 1904.

INGHAM GROUP (Gold, silver) Bohemia District

Owner: E. C. Ingham, 308 Park Building, Portland, Oregon.

Location: N½ sec. 19 and SW¼ sec. 18, T. 23 S., R. 2 E., and sec. 13, T. 23 S., R. 1 E. The claims are reached by way of the south extension of the Noonday road.

Area: 10 patented claims (Alta, McCrum, Keep, Elsie, Acme, Petite, Lucky Grouse, Gold Dollar, Key, and Great Falls).

Development: There are several tunnels, cuts, and a shaft. Some of the openings are caved and the total footage of work is not known. Most of the development work was done on the McCrum, Key, Gold Dollar, and Lucky Grouse claims

Geology: The country rock is andesite and tuff. Both the Great Falls vein, prospected on the Great Falls claim, and the Sunset vein, on the Lucky Grouse, Key, and Elsie claims, strike N. 60° W. and dip steeply south. The Gold Dollar vein is in tuff and strikes N. 80°-90° W. On the McCrum claim to the northwest a vein strikes N. 70°-80° east and dips 80° N. The veins are altered andesite with some quartz.

Reference: Callaghan and Buddington, 1938:69.

JUDSON ROCK GROUP Bohemia District
(Judson Rock Mining and Milling Company)

Owner: Ray Nelson, Cottage Grove, Oregon.

Location: W½ secs. 10 and 15, T. 23 S., R. 1 E., above the Sharps Creek road and extending over the ridge to Fairview Creek. This group of claims is northwest of the Vesuvius claims and north of the Good Friday group.

Area: 9 claims in 1902.

History and development: The company was formed in 1901 by Col. W. H. Blair. Stafford (1904) reported 500 feet of development tunnels on the property which was not visited by the Department.

Reference: Stafford (1904).

LEROY GROUP (Gold, silver) Bohemia District

Old name: Elephant Mountain Mining and Milling Company.

Owner: K. O. Watkins, Corvallis, Oregon.

Location: NE¼ sec. 11 and W½ sec. 12, T. 23 S., R. 1 E., a short distance northwest of the Old Champion mill and west of Champion Creek.

Area: 6 patented claims: Leroy, Long Tom, Laura, Laura ext., War Eagle, Ora; and Maud G. (not patented).

History and development: Most of the development work was done on this property between 1900 and 1910. Stafford (1904) reported 800 feet of tunnel in 1902. There are numerous cuts and tunnels having a total length of 1,100 feet.

Geology: The vein, which strikes N. 60°-70° W. and dips 55°-70° SW., is in a southwesterly dipping dike of granodiorite porphyry. Vein matter consists of a breccia of porphyry cemented by reticulating veinlets of quartz, which form about one-fourth of the mass. Small to moderate amounts of sphalerite, chalcopyrite, and galena are contained in the quartz. Porphyry on the dump contains knots of black tourmaline. A large volume of material, with an average low percentage of base metals, is developed.

References: Callaghan and Buddington, 1938:69-70
Stafford, 1904
Taber, 1949:41

MAYFLOWER MINE (Gold, silver) Bohemia District

Old name: Kelso Gold Mining and Milling Company.

Owner: Wallace Huntington heirs.

Location: Near the junction of secs. 16, 17, 20, and 21, T. 23 S., R. 2 E., in the valley of Horse Heaven Creek and reached from the Mayflower trail, which branches from the Noonday road.

Area: 5 patented claims (Bonita, Yreka, Ely Pearson, Nightingale, Buckhorn). F. S. Day has a claim on the east extension of the Mayflower vein.

History: There appears to have been considerable ore mined, but no production records are available.

Development: There are 4 adits, two on each side of the creek, and several cuts and short tunnels. Records of lineal footage are not available. Some stopes from 2 to 4 feet wide are caved to the surface. There are tramways on both sides of the creek, and a mill, an assay office, and a cabin on the property.

The mill consists of an Aurora 12 by 14-inch crusher, rotary pan feeder, 5 stamps, vanner table, and cyanide tanks. The building had been crushed by snow, so additional equipment may have been covered when the property was visited in 1945. A 6-foot Chilean mill was brought part way down the hill but was never installed. Power was developed by a 4-foot double-cup Pelton wheel fed by 12-inch pipe with a head of over 100 feet supplied by a long ditch from the north.

Geology: Country rock is tuff. As exposed on the Yreka claim, the vein strikes N. 70°-78° W. and dips 75°-80° N. It crosses the valley of Horse Heaven Creek and outcrops between 3,000 and 3,400 feet. Vein matter is oxidized and consists of altered tuff, with reticulating veinlets of drusy quartz. According to Diller (1900:31) a shoot on this vein contained 4 feet of quartzose material with much pyrite, and a sample 8 to 12 inches wide of ore high in sulphides assayed no gold, 0.05 ounce of silver, 17.71 percent zinc, 11.88 percent lead, and 1.38 percent copper.

Report by: J.E.A., August 1945.

References: Callaghan and Buddington, 1938:70-71
Diller, 1900:31
Stafford, 1904

MINERAL KING PROSPECT Bohemia District

Location: SE¼ sec. 20, T. 23 S., R. 2 E., on Horse Heaven Creek. Workings are also reported on Windy Creek half a mile south either in sec. 28 or 29.

Development: A tunnel over 200 feet long runs S. 10°-60° E. into the steep hillside from a point on the east bank about 100 feet above the creek and 300 feet due south of the old cabin and camp. The tunnel is caved 125 feet in and contains water beyond this point, but extends S. 30° E. for at least 150 feet farther.

The Calapooya Mining and Tunnel Company was reported by Stafford (1904) to have development amounting to 100 feet of open cuts and 600 feet of tunnels on Windy Creek half a mile farther south.

Geology: The country rock is a massive, fine-grained dark gray andesite, cut by narrow, nearly vertical veins striking N. 30°-60° W. The veins are from a few inches to 3 feet in width and consist of altered rock and clay gouge with irregular areas containing calcite and sparsely disseminated pyrite.

Report by: J.E.A., 1945.

Reference: Stafford, 1904

MUSICK MINE (Gold, silver, copper, lead, zinc) Bohemia District

Owner: Tar Baby Mining Company, Salt Lake City, Utah, but leased by Helena Mines, Inc.

Location: Principal workings at the head of City Creek in Bohemia Saddle on north slope of Bohemia Mountain in N½ sec. 14, T. 23 S., R. 1 E., about 1 mile southwest of Champion mine.

Area: 14 unpatented claims according to Taber (1949:28).

History and production: The Musick vein, discovered by James C. Musick in 1891, is one of the earliest found in the district. He organized the Bohemia Gold Mining and Milling Company, built a 5-stamp mill, and operated the property until 1901. In 1902 the Musick, Helena, and Champion mines were acquired by the Oregon Securities Corporation. Ore was hauled from the Musick mine to the Champion mine by electric tram and by cable-bucket tram from the portal of the Champion mine to the mill in Champion Creek gulch.

West Coast Mines Company bought the Oregon Securities Corporation holdings in 1908. This company sold the Musick mine to L. M. Capps of Idaho in 1921. The Minerals Exploration Company leased the mine in 1935, built a 22-ton gravity concentrator mill, and produced $101,000 worth of concentrates in 1936 and 1937. About 1939, Higgins and Hinsdale Mines Company obtained a lease on the property but operations were stopped because of World War II. Kenneth O. Watkins bought the H. and H. Mines Company lease in 1944, and sold his contract in 1945 to the Tar Baby Mining Company of Salt Lake City, Utah. This company acquired the property from the L. M. Capps estate in 1946. In 1948 the mine was leased to the Helena Mines, Inc., who subleased the east end of the mine to Wyatt, Nordstrom, and Smith. This group did development work, using the main level of the Musick mine to reach their adjoining claims. In 1949 some Musick dump ore was hauled to the Champion mill for treatment.

Development and equipment: The Musick vein has been developed by more than 6,000 feet of drifts and crosscuts plus numerous stopes, raises, and winzes. Three main levels about 100 feet apart explore the vein for nearly 1,800 feet. The California vein, which is north of the Musick vein and merges with it to the west, has been explored on the surface by pits and outcrops for about 1,500 feet. The Mystery and Alpharetta veins have been prospected by shallow pits, trenches, and drifts. A short adit, known as the Cline, has been driven on a vein 600 feet east of the Alpharetta vein.

The bunkhouse at the camp was partially destroyed by snow in 1948. The mill house was also in poor condition. A steel snow shed partly covered the haulage track from the main tunnel.

Geology: In general, the geology is the same as for the Champion mine. The Musick vein differs from other veins in the district by having sharp bends in its course. The strike varies from N. 42° W. to west and where best exposed the dip varies from 65° S. to vertical.

The country rock is light-colored rhyolite except for a few exposures of andesite and tuff. The ore has the usual sulphides but contains a higher-than-usual proportion of galena. Several splits in the vein enclose lenses of country rock. Shoots as much as 375 feet long and 3 to 5 feet wide have been stoped. Samples vary in gold content. Weathered ore assayed as high as 1.4 ounces of gold and about 2 ounces of silver to the ton (Callaghan and Buddington, 1938:58). Taber (1949:30) reported that a sample taken by him in 1946 from broken rock in the stopes contained 0.38 ounce of gold, 1.7 ounces of silver, 1.2 percent copper, 5.6 percent lead, and 5.7 percent zinc.

References: Callaghan and Buddington, 1938:57-60
Parks and Swartley, 1916:234-235
Stafford, 1904
Taber, 1949:28-30

NOONDAY MINE (Gold, silver, copper, lead, zinc) Bohemia District

Owners: John C. Higgins of the H. and H. Mines Company, Portland, Oregon.

Location: W½ sec. 18, T. 23 S., R. 2 E., on the east slope of Grouse Mountain, and south rim of Horse Heaven Basin.

Area: 6 claims: 5 patented (Henry, Annie, Maggie, Fraction, Emma) and Mandy, unpatented.

History and production: The property was opened in 1891 or 1892 and operated intermittently a 20-stamp mill until 1908. A new mill in Horse Heaven Basin and an aerial tram were constructed, but the ore was not free milling and the mine shut down. Small shipments of sorted ore were made in 1917 and 1918. Recorded production was nearly $96,000 up to 1919; this may have included some Helena production. In 1934 the property was operated by the Grouse Mountain Mining Company, and produced $50,000. In 1936 and 1937 K. O. Watkins mined a small amount of ore. The U.S. Bureau of Mines Minerals Yearbook reported a production of 380 tons of ore in 1937. In 1939 the property was purchased by the H. and H. Mines Company, who did some development work. In 1945 the Silver Shield Mining and Milling Company of Salt Lake City, Utah, obtained a lease and option to purchase the property. It has since that time reverted to John C. Higgins of H. and H. Mines Company.

Development: The mine has been developed on 3 principal levels and various sublevels. Diller (1900:28) reported 2,000 feet of workings; Stafford (1904) reported 4,300 feet of tunnels and 500 feet of raises. The workings were largely inaccessible in 1931 at the time of the U.S. Geological Survey reconnaissance.

In 1945 most of the workings on levels No. 2 and No. 3 were open. Level No. 2 is reached by a crosscut running southwest 130 feet to drifts running N. 55°-60° W. on the Annie vein. The No. 3 level, 168 feet below level No. 2, is reached by a crosscut running S. 27° W. for 430 feet to the Annie vein. There are three sublevels between the No. 2 and No. 3 levels at 39 feet, 57 feet, and 110 feet respectively below the No. 2 level. The No. 3 level intersects the Henry vein 80 feet from the portal. The drift on the Annie vein runs north 600 feet, mostly paralleling the vein a little to the north, with several short crosscuts to it. About 350 feet west of the main crosscut an exploratory crosscut has been driven 400 feet S. 25°-35° W. to intersect the Maggie vein.

Geology: The mineralization is similar to other base-metal veins in the Bohemia District. Three veins, the Henry, Maggie, and Annie, are known. The mine is located on the Annie vein. Country rock is labradorite andesite, with a small plug of dacite just north of the west end of the Annie vein.

The Annie vein trends N. 45°-70° W. and dips from 75° N. to 80° S. It is prospected over a lineal distance of about 1,300 feet. There appear to be several splits, which in some places result in two well-developed veins separated by a zone of altered rock. One high-grade oreshoot was 90 feet long and was stoped an inclined distance of 140 feet over a width of 5 feet of which 1½ to 2 feet was high-grade ore. In 1917 and 1918 smelter shipments of 13.09 tons of sorted sulphide ore containing some leached material yielded 20.92 ounces of gold and 34.37 ounces of silver (Callaghan and Buddington, 1938:62).

Report by: J. E. A., 1945.

References: Callaghan and Buddington, 1938:60-62
Diller, 1900:28-29
Stafford, 1904
Taber, 1949:31-33

NORTH FAIRVIEW GROUP (Gold, silver) Bohemia District

Owners: Art Carlyle and brother, Cottage Grove, Oregon.

Location: Sec. 11, T. 23 S., R. 1 E., east of Utopian Road and between Fairview Peak and North Fairview Mountain. This group of claims is reached by a trail leading from Utopian Road at a point about a mile north of its junction with Sharps Creek Road.

Area: 12 patented claims.

Development: The North Fairview vein has been explored by one tunnel, extending 850 feet through the top of the ridge between Fairview Peak and North Fairview Mountain, and other short drifts and cuts. Three other veins on the North Fairview claims have been prospected by short tunnels. One tunnel, at an altitude of 4,960 feet follows a vein, dipping 45° S. for a short distance S. 70° W. Another vein, striking 84° E. and dipping 60° SW., has been prospected by a 50-foot tunnel situated below and to the west of the main tunnel. A third vein located south of the North Fairview vein strikes approximately west and dips 75°-85° S. This vein has been prospected by pits and short adits.

Geology: Country rock is a coarse, andesite agglomerate. The North Fairview vein, which strikes N. 75° E. to N. 70° W. and dips 60° to 75° S., is as much as 12 feet thick and consists of clayey, altered rock, with quartz stringers. Weathering in the vein shows to a depth of 200 feet below the crest of the ridge. Very little sulphide appears on the dumps.

References: Callaghan and Buddington, 1938:71-72
Parks and Swartley, 1916:163

OPHIR CLAIM (Gold, silver) Bohemia District

Owner: Fred Williams, Cottage Grove, Oregon.

Location: Center sec. 14, T. 23 S., R. 1 E., on the east slope of Bohemia Mountain, just southeast of the Musick mine. The outcrop of the vein is at a little more than 5,000 feet elevation.

Development: The vein has been prospected for more than 1,500 feet horizontally by 3 adits and several cuts. The adits aggregate 415 feet in length.

Geology: The northern part of the vein is in andesite, the southern part in tuff. The strike is N. 10°-30° W., and the dip is 70° W. Vein material is altered andesite with quartz. Pyrite is the principal sulphide, but there are a few seams of galena, sphalerite, and a small amount of chalcopyrite. Diller (1900:19) reports an assay from the vein of no gold and 5.65 ounces of silver to the ton.

References: Callaghan and Buddington, 1938:72
Diller, 1900:19

OREGON-COLORADO GROUP (Gold, silver, copper) Bohemia District

Owner: Helena Mines, Incorporated, Disston, Oregon

Location: Secs. 19, 29, and 30, T. 23 S., R. 2 E., on the Oregon-Colorado road and the west slope of Annie Gulch. This is the southernmost of the developed veins in the district and is about 4 miles by road southeast of the old Vesuvius mill.

Area: 7 patented claims (Confidence, Dora, Marie, Dewey, Sampson, Holy Smoke, and Watson).

History: According to Taber (1949:37), most of the exploration on the deposit was done by the Vesuvius Mining Company prior to 1920. K. O. Watkins obtained control of the property about 1945, and in 1949 the property was owned by Helena Mines, Inc.

Development: The Oregon-Colorado vein is developed by two long drifts and several cuts through a horizontal distance of about 2,000 feet. The lower adit, at an altitude of 3,300 feet, is reported to be 1,800 feet long, and the upper adit, at an altitude of 3,600 feet, 450 feet long. Four oreshoots 50 feet, 137 feet, 50 feet, and 140 feet in length respectively were revealed in the first 1,100 feet of the lower adit. Stafford (1904) reported that the orebody is 7 to 8 feet wide, with a pay streak 2 to 5 feet wide.

Geology: Country rock consists of tuff, volcanic breccia, and coarse agglomerate. A dike of fine-grained andesite is exposed at the portal of the lower tunnel. The vein strikes northwest and dips 60°-65° S. Vein matter consists of a breccia of country rock cemented by comb quartz and chlorite, containing sulphides, chiefly chalcopyrite and pyrite, and shows relatively high values in copper. Diller (1900:28) lists an assay result of 1.0 ounce of gold and 3.4 ounces of silver to the ton from a sample taken in the upper tunnel 60 feet from the portal. Samples from the large ore dump taken by K. O. Watkins are reported to have assayed 4.4 ounces of silver and 4.9 percent copper.

References: Callaghan and Buddington, 1938:72-73
Diller, 1900:28
Stafford, 1904
Parks and Swartley, 1916:228
Taber, 1949:36-37

OROFINO CLAIMS (Gold, silver) Bohemia District

Owner: Carl Owens, Disston, Oregon.

Location: Center $N\frac{1}{2}$ sec. 36, T. 22 S., R. 1 E., south and west of the Noonday road in the northern part of the district. The property is south of the Cosmos and Sunset groups.

Development: An adit 50 feet long at 3,620 feet in elevation and several open cuts comprise the development work.

Geology: Country rock is thin-bedded metamorphosed tuff or hornfels. The adit follows a vein striking S. 30° E. Vein matter on the dump shows cherty quartz with crusts of pyrite and a few seams of quartz with sphalerite, chalcopyrite, and pyrite. Southeast of this vein at an altitude of 3,430 feet prospecting has been done on veinlets of specularite associated with intrusive porphyry masses. On the Golden Rod claim at 3,900 feet elevation, a cut shows a small vein striking N. 50° W., with comb quartz, specularite, and a small amount of chalcopyrite.

Reference: Callaghan and Buddington, 1938:73

PEEKABOO GROUP (Gold, silver) Bohemia District

Owner: William Edwards' heirs.

Location: $SE\frac{1}{4}$ sec. 14 and $NE\frac{1}{4}$ sec. 23, T. 23 S., R. 1 E., on Jackass Butte. The property is reached by a trail leading south from the road at the Musick mine.

Development: The Peekaboo vein has been prospected for 1,200 feet by cuts and an adit 175 feet long; most of the work was done before 1902. Three other veins have been prospected by cuts and at least one drift. There is a mill and cabin on the property.

Geology: Country rock is tuff and volcanic breccia. The Peekaboo is a cross vein in tuff for most of its length. It strikes from N. 20° E. at the south end to N. 45° E. at the north end. The dip is 60°-70° NW. Vein matter is from a few inches to 2 feet wide and consists of vuggy quartz, with dolomite, pyrite, sphalerite, and galena. Other veins show similar narrow quartz seams with associated sulphides. The Tipperary vein on the east slope of Jackass Butte shows 14 to 18 inches of quartz containing the usual sulphides. It strikes S. 48° W. and intersects the Ophir vein.

Reference: Callaghan and Buddington, 1938:73-74.

RATTLESNAKE VEIN (Gold, silver, lead) Bohemia District

Owner: W. B. Patten, Culp Creek, Oregon.

Location: NE¼ sec. 22, T. 23 S., R. 1 E., on the west slope of Monte Rico Ridge, one mile southwest of Bohemia Mountain at elevation 4,825 feet.

Area: One claim, the Demon, which also includes the Tall Timber vein described separately.

Development: A drift extends S. 20° E. for 100 feet, with three crosscuts running N. 80° E. at 35 feet, 85 feet, and 100 feet from the portal. Two zones of disseminated pyrite were explored for 50 feet by drifts south from the second crosscut 25 feet and 50 feet respectively east of the main tunnel.

Geology: Country rock is altered andesite in which disseminated pyrite in crystals as much as 7 mm in diameter appear in shear zones from 2 to 10 feet wide. Stringers of pyritic quartz and a small amount of chalcopyrite and sphalerite occur. A sample of sulphide ore from the face of the first crosscut assayed 0.22 ounce of gold, 0.9 ounce of silver, 0.7 percent zinc, and a trace of lead.

Informant: W. B. Patten.

Report by: J.E.A., 1945.

Reference: Callaghan and Buddington, 1938:74.

REDSIDES CLAIM (Gold) Bohemia District

Owner: Corbett Smith, Cottage Grove, Oregon.

Locality: NW¼ sec. 26, T. 23 S., R. 1 E., on the west side of Monte Rico Ridge at an elevation of about 4,200 feet.

Area: 1 claim.

History: Located in 1905 or 1906 by E. H. Shane and McCabe.

Development and geology: There are three tunnels. The uppermost, near the cabin, is a crosscut trending due north 40 feet in fine-grained bedded green tuff (which dips 15° northeast) to a thin east-west shear zone. Another caved tunnel lies 100 feet to the west. The main tunnel lies about 200 feet below on the north side of a narrow gulch just above creek level. This tunnel runs N. 35° W. for 155 feet to the face along a vein which dips 50° SW. The country rock is altered tuff, and the vein at the face consists of 3 feet of brecciated rock and clay gouge with spotty sulphides and some gray quartz, together with 2 feet of massive barren blue quartz.

Informant: W. B. Patten.

Report by: J. E. A., 1945.

REED AND FLETCHER GROUP Bohemia District

(Also known as Montana)

Owner: Forest and William J. James, Route 2, Box 121, Eugene, Oregon.

Location: SE¼ sec. 12, T. 23 S., R. 1 E., and NW¼ sec. 18, T. 23 S., R. 2 E. The property extends from Helena or Grizzly Saddle westward toward Champion Creek. It is reached by means of a trail from the Champion road.

Area: 6 patented claims.

Development: Stafford (1904) reported 1,500 feet of development work. Besides several adits of undetermined length, there are cuts and prospect pits.

Geology: The country rock is labradorite andesite. A vein on the west slope of Grizzly Saddle at 5,000 feet strikes S. 40°-68° E. Two adits on the vein are inaccessible. Some quartz shows on the dump to the northwest at an altitude of 4,350 feet. Another inaccessible drift trends S. 65° E. Vuggy quartz on the dump surrounds fragments of country rock and shows moderate amounts of sphalerite and a small amount of chalcopyrite.

References: Callaghan and Buddington, 1938:74
Stafford, 1904

RISSEU PROSPECT (Gold, antimony) Bohemia District

Owner and history: Located many years ago by Henry Risseu. Owned by John R. Smith in 1927. Present owner not known.

Location: NE¼ sec. 22, T. 23 S., R. 1 E., at an elevation of about 4,500 feet, about 300 feet below the Glenwood Trail and 1,000 feet southwest of the Tall Timber group.

Area: One claim named the Stibnite.

Development and geology: A tunnel in silicified andesite-tuff runs S. 40° E. for 85 feet on a vein from 2 to 6 inches wide which dips 60° NE. It contains stringers of chalcopyrite, sphalerite, stibnite, and arsenopyrite (?) with secondary limonite and manganese oxides. Near the face a side drift follows a cross-vein 2 to 8 inches wide for 30 feet in a direction S. 50° W.

Report by: J.E.A., August 1945.

RIVERSIDE GROUP (Gold, silver, copper, zinc) Bohemia District

Owner: Kenneth O. Watkins, Corvallis, Oregon.

Location: Center sec. 20, T. 23 S., R. 2 E., west of Horse Heaven Creek and reached by way of the Mayflower trail down Horse Heaven Creek from the Noonday road.

Area: 3 patented claims (Pasadena, Hobart, and McKinley).

Development: A main adit, now caved, at 2,900 feet elevation is said to be about 1,800 feet long; short tunnels and cuts comprise the development work.

Geology: The vein, which is in tuff, strikes northwest and dips southwest. Ore on the dump consists of comb quartz and brecciated and silicified tuff containing veinlets and blebs of chalcopyrite, with some sphalerite, pyrite, galena, and secondary botryoidal manganese oxides. It is reported that the width of the vein is greater than that of the tunnel. Callaghan and Buddington (1938:75) discuss the exposure of the vein in the main workings and present assays of samples as follows:

"In an engineer's report W. W. Elmer states that old mine survey notes show that the main adit is 1,780 feet long, that it follows the vein for several hundred feet, and that after the drift left the vein numerous crosscuts were driven that cut the vein and showed continuity of vein matter from the portal to the face. Two assays reported by Elmer averaged 0.1 ounce of gold and 2.9 ounces of silver to the ton, 1.86 percent of copper, 0.7 percent of lead, and 6.8 percent of zinc. Another assay yielded 0.54 ounce of gold and 4.33 ounces of silver to the ton."

Report by: J.E.A., August 1945.

References: Callaghan and Buddington, 1938:74-75
Taber, 1949:39

SAILOR GULCH PLACER — Bohemia District

Owner: George H. Conley, Cottage Grove, Oregon.

Location: E½ NW¼ NE¼ sec. 18, T. 23 S., R. 1 E., at the mouth of Sailor Gulch and on Sharps Creek. It is reached by the Sharps Creek road to a cabin half a mile west of Mineral Station.

Area: 1 placer claim, the Slide.

Development and geology: Some gulch placering has been done 400 feet from the mouth of Sailor Gulch, by means of a 300-foot flume which gives a 15-foot head to a 3-inch hose. The boulders are large and must be moved by hand. The deposit along the creek is about 40 feet wide and not much over 10 feet deep. Below, on Sharps Creek, a flat of several acres lies 20 feet above creek level. Boulders in these gravels are as much as 3 feet in diameter. Bedrock is massive andesite.

Report by: J.E.A., 1945.

SCORPION PROSPECT — Bohemia District

Location: Sec. 26, T. 23 S., R. 1 E., on Monte Rico Ridge, near Scorpion Butte.

History: Stafford (1904) reported 110 lineal feet of tunnel workings on claims owned by Jack Morgan. Local information indicates that this property was at one time owned by Alec Lundenberg.

Reference: Stafford, 1904.

SEARS PROPERTY — Bohemia District

Owner: James W. Sears.

Location: Just north of the center of sec. 13, T. 23 S., R. 1 E., and south of the Evening Star claim.

History: Stafford (1904) reported 600 feet of development work in 1903. This property was not visited by the Department.

Reference: Stafford, 1904.

SHOTGUN VEIN (Gold, silver, copper, lead, zinc) — Bohemia District

Location: E½ sec. 11, T. 23 S., R. 1 E., southeast of Crystal Basin, crossing the ridge extending northeast from Fairview Peak.

Development: The vein outcropping between 4,500 and 5,200 feet in altitude has been proved through a horizontal distance of 1,000 feet by four drifts and numerous cuts and pits.

The drifts are on the south slope of the ridge. The lowest drift, at an elevation of 4,750 feet, is inaccessible. Another drift, about 75 feet higher and 30 feet long, has four feet of quartz exposed at the face. A third drift, about 125 feet above the lowest one, is more than 100 feet long. The fourth drift, at an altitude of about 4,950 feet, is nearly 200 feet long.

Geology: Country rock is labradorite andesite except for a narrow dike of dacite porphyry. The vein strikes N. 40°-60° W. and dips from 65° N. to vertical. Vein matter is brecciated country rock cemented with an equal amount of vuggy quartz. Oreshoots contain moderate to large proportions of sphalerite, galena, and chalcopyrite, and a small amount of pyrite. Shoots are 4 feet or more in width.

References: Callaghan and Buddington, 1938:75, 47
Taber, 1949:46

STAR GROUP (Gold, silver) Bohemia District
(Known as Day mine)

Owner: F. S. Day, Disston, Oregon; in September 1948 leased to Martin Robinson and Leroy Berrey who formed the Day Basin Mining Company.

Location: SE¼ sec. 11, T. 23 S., R. 1 E., on the east slope of Fairview Mountain just north of Sear's cabin, at an elevation ranging from 4,650 to 4,900 feet.

History: The original Star claim was located late in the last century by Peterson and Klucky, and according to Stafford (1904) there was 500 feet of development work in 1903. It was reported in 1949 that Robinson and Berrey were doing development work.

Development: Two veins north of Sear's cabin are prospected by short drifts. The drift on the southern vein is 120 feet long; the length of the other is not recorded.

Geology: Country rock is andesite breccia. The southern vein strikes N. 40°-65° W., and consists of a 5-foot band of partly leached vein matter, with some pyrite, sphalerite, and chalcopyrite. A porphyry dike lies just south of the vein. A narrow vein which strikes N. 73°-80° E., and dips 60° S. is prospected by an upper tunnel. It contains a small amount of sulphides.

References: Callaghan and Buddington, 1938:75
Stafford, 1904

STAR MINE (Gold, silver) Bohemia District

Old names: Golden Star, Gold Leaf, Consolidated Mining Company.

Owner: H. E. Cully, Eugene, Oregon.

Location: NE¼ sec. 20, T. 23 S., R. 1 E., south of Puddin Rock, at elevations between 3,200 to 3,600 feet. The mine is about 2 miles by trail from the Martin Creek branch of the Sharps Creek road, 12 miles south of Disston, on the railroad.

Area: 4 claims and a mill site.

History: The "Bughole" vein was discovered some time previous to 1910 by Pat Jennings. According to Cully, about $30,000 was taken from a shoot in the west tunnel, and the mine was then sold to the Consolidated Mining Company for $60,000. In the early 1920's F. J. Bartels and Bert Kline built a small mill on the creek below the mine and did considerable development work, including crosscutting, and exploration on the "Porphyry Dike" half a mile west of the main workings. The property was owned between 1924 and 1935 by Fred Coulter and Carl Maddox; between 1935 and 1940 by Dave von Needa; and between 1940 and 1942 by Frank B. Cooper.

Development and geology: Most of the development is fairly shallow in the oxidized and enriched portions of three veins, which lie more or less parallel to each other only 15 to 20 feet apart. These veins strike from N. 40° W. to N. 75° W. and dip from 50°-80° S. paralleling the steep hillside. They have been developed over a lateral distance of about 500 feet by means of three drifts at about 3,500 feet in elevation, with additional drifts a few feet above and below this elevation. The easternmost workings consist of 3 drifts from 100 to 150 feet long and one drift 50 feet long. Two of these, at elevations of 3,505 and 3,525 feet, are on the same vein, and narrow oreshoots have been stoped for the 25-foot distance between them. A second oreshoot in the upper drift has been stoped to the surface. The lower drift at 3,460 feet elevation lies on a parallel vein directly beneath, and an oreshoot on this vein has also been stoped to the surface, the stope passing a few feet to the north of the upper drifts but not connecting with them. Two samples taken from the middle drift (at 3,505 feet) and a sample from the lower drift (at 3,460 feet) showed very low values in gold and silver. The 50-foot drift lies on a vein a few feet above and to the south of the others. About 100 feet to the northwest of the portals of these drifts a 40-foot drift at an elevation of 3,500 feet exposes a vein in hard quartz. Two hundred feet farther to the northwest at an elevation of 3,505 feet, a drift at least 120 feet long (caved on its east end) is reached by a short crosscut from the south. A narrow shoot on this vein, the "Bughole," is stoped to an upper caved level.

Vein matter consists of brecciated altered andesite which contains disseminated pyrite and white to iron-stained quartz, frequently vuggy with comb structure. This material varies from a few inches to nearly 5 feet in thickness, and is paralleled and penetrated by stringers consisting of loose granular quartz in a matrix of limonitic material and some manganese oxides. These oxidized zones are from less than an inch to more than a foot thick, and contain most of the free gold. The oreshoots appear to be about 10 feet long, have been stoped for about 3 to 5 feet in width, and run directly up the dip. There is a suggestion that the ore in most cases occurs where the N. 45°-55° W.-trending fractures intersect a set which trends N. 65°-80° W.

Half a mile northwest of the main workings and at about the same elevation, four large open cuts, two crosscuts, and one 50-foot tunnel have been dug on the so-called "Porphyry Dike," a wide altered zone in porphyritic andesite. The zone appears to trend east and west, and dips 40° to 70° south. A sample across 1 foot of silicified material in the tunnel assayed .03 ounce of gold and a trace of silver.

The upper crosscut, 125 feet long in green andesite breccia, cuts the western extension of the vein 45 feet below and a little to the west of the "Bughole" drift. At this depth the vein appears only as a fracture in the rock, with a small amount of disseminated pyrite present. The lower crosscut lies from 150 to 200 feet in elevation below the main workings. It runs N. 25° E. for 350 feet in porphyritic andesite, and cuts a vein at 275 feet which strikes N. 75° W. and dips 65° S. The vein consists of 2 to 3 feet of clay gouge, containing a 1-inch stringer of quartz and limonite. An assay of a sample across 30 inches gave .02 ounce of gold and a trace of silver.

Informant: R. E. Cully.

Report by: J.E.A., August 1945.

STONEWALL GROUP (Gold, silver, copper, lead, zinc) Bohemia District

Owner: T. G. Donaca, American Bank Building, Portland, Oregon.

Location: Secs. 8 and 9, T. 23 S., R. 2 E., at elevations between 4,000 and 4,500 feet, in the eastern part of the district, north of the divide between Frank Brice and Horse Heaven creeks, on a branch of Grassy Creek. It is reached by a branch of the Johnson Meadows trail, a little over half a mile from the Noonday Ridge forest road.

Area: 5 claims.

Development: There are three adits, one 50 feet and two 75 feet long, on separate veins, and several open cuts.

Geology: The veins strike N. 40°-50° W., and dip steeply to the northeast. The northeastern vein which is located a few hundred feet above the falls on Grassy Creek at an elevation of 4,100 feet, has at least 6 feet of vein matter containing a small amount of chalcopyrite, sphalerite, and galena. According to K. O. Watkins, this vein assays $4.20 gold and 6 ounces of silver. The next vein to the west consists of an altered zone 140 feet wide, with smooth walls along which oreshoots in places show seams of massive sulphides as much as 20 inches thick. According to Watkins, a shoot exposed by an adit along the northeast wall, 3 to 14 inches wide, assayed 27.4 percent zinc, 10 percent lead, and 1.2 percent copper; an east-west trending shoot in the middle of the zone as much as 20 inches wide assayed 20 percent zinc, 11 percent lead, and 5 percent copper; and a shoot along the southwest wall, 8 to 14 inches wide, contained about 15 percent total sulphides.

Informant: K. O. Watkins.

Reference: Callaghan and Buddington, 1938:76

SULTANA MINE (Gold, silver, lead) Bohemia District
(Formerly Cosmos, Green Rook mine, Bohemian mine)

Owners: Bohemian Gold Mines, Inc., James C. and Ferdinand Miller, 6703-6th Avenue, Seattle 7, Washington.

Location: S½ sec. 25, T. 22 S., R. 1 E., and reached by a branch of the Noonday road. It is farthest north of any property in the district, except the Sunrise to the west.

Area: 12 claims, mostly on the Sultana vein.

History: In 1916, 6 to 7 men operated a small compressor and Chilian mill. Since 1931, production has been approximately $10,000.

Development: The Sultana vein is developed by two crosscut tunnels and drifts with a lineal footage said to be in excess of 2,000 feet. Also, there are cuts and a shallow shaft. Other veins on the property are undeveloped. The surface plant includes a house and mill. Much of the underground development was inaccessible to the U.S. Geological Survey party in 1930.

Geology: Country rock is andesite. The Sultana vein outcrops between 3,900 and 4,000 feet in altitude. It strikes N. 66°-80° W., dips 80° S., and is proved for 2,500 feet. Vein material consists of altered rock with small shoots containing quartz and sulphides. Drifts from the east crosscut tunnel show the vein to be generally 3 to 4 feet wide with individual shoots ranging in width from several inches up to 5 feet. As exposed in the west crosscut tunnel the vein consists of brecciated quartz with some pyrite, chalcopyrite, sphalerite, galena, and a small amount of tetrahedrite.

References: Callaghan and Buddington, 1938:64-65
Parks and Swartley, 1916:114

SUNRISE GROUP Bohemia District

Location: NW¼ sec. 34, T. 22 S., R. 1 E., at about 3,700 feet elevation, approximately 2 miles due east of Adams Mountain Lookout on the west side of Cat Creek, and reached by 2½ miles of trail from Lund Park.

History: According to Stafford (1904) a large amount of work was done on this property, totaling at least 1,200 feet of development.

Reference: Stafford, 1904.

SUNSET GROUP (Gold, silver, copper, zinc) Bohemia District

Owner: Kenneth O. Watkins, Corvallis, Oregon.

Location: Along the north edge of sec. 36, T. 22 S., R. 1 E., extending from the west side of Champion Creek eastward a short distance beyond the summit of Noonday Ridge. The property is reached via the Noonday road.

Area: 20 claims.

Development: The principal vein, known as the Cape Horn, has been traced by 3 drifts and several prospect pits for a horizontal distance of 4,000 feet and through a vertical range of 1,000 feet. The drifts were sealed at the portal by slide material in 1936. According to Callaghan and Buddington (1938:77) the upper drift is 175 feet long and is east of Noonday road at an elevation of 4,300 feet; the second drift is 300 feet long, about 1,000 feet farther west and 400 feet lower; and the third drift is 700 feet long and 150 feet lower.

Geology: Country rock is labradorite andesite at the top of Noonday Ridge, but metamorphosed tuff is predominant in the area of the outcrop of the Cape Horn vein. Outcrop of the vein ranges from 3,000 to 4,500 feet in altitude. The strike is east and the dip is 75°-80° S. Typical vein matter consists of alternating bands of drusy comb quartz and cherty quartz, some kaolin, and sulphides, both disseminated and in veinlets. Sphalerite is the most abundant sulphide, but small amounts of galena, pyrite, and chalcopyrite occur in some oreshoots.

A sample from the face of the second drift yielded a trace of gold and silver and 10 percent zinc, and a sample 4.5 feet wide at the face of the third drift is reported to have yielded a trace of gold and silver, 7 percent zinc, and very small amounts of lead and copper (Callaghan and Buddington, 1938:77).

Reference: Callaghan and Buddington, 1938:76-77

SWEEPSTAKES GROUP (Gold, silver) Bohemia District
Also known as Radio)

Owners: Ray E., Robert L., and Gena Nelson, Cottage Grove, Oregon.

Location: SE¼ sec. 3, T. 23 S., R. 1 E., near the trail from the Sharps Creek road to Adams Mountain and just south and west of Kitten Rock, a butte north of the trail.

Area: 3 claims.

History: In 1902, 1,000 feet of tunnel work was reported. The property is credited with a small production in 1909 and 1910. Some development work was done in 1943.

Geology: The country rock is tuff and volcanic breccia. Veins strike N. 55°-70° W., and, as shown by material on the dump, contains some iron-stained drusy quartz, with vugs lined with dolomite crystals. Of 7 samples sent from the Philco claim to the State Assay Laboratory at Grants Pass, the highest ran $4.90.

References: Callaghan and Buddington, 1938:78
Stafford, 1904

SYNDICATE GROUP (Gold, silver) Bohemia District

Owner: Ed Jenks estate, Cottage Grove, Oregon.

Location: W½ sec. 17, and E½ sec. 18, T. 23 S., R. 2 E., on the west slope of the valley of Horse Heaven Creek. The property is reached by the Mayflower Trail.

Area: 12 claims.

Development: There are several cuts, adits, and crosscut tunnels, some of which are inaccessible. Lineal footage of the tunnels is unknown but is in excess of 400 feet. In 1902 it was reported to be 250 feet.

Geology: The country rock is labradorite andesite, with intercalated tuffs. As exposed in an adit, the Paymaster vein, which strikes east across the Mayflower trail, shows a narrow band of altered rock with some seams of solid sulphide. South and west of the Paymaster vein are openings that prospect the Myrtle vein, which strikes N. 85°-90° W. and dips 75°-80° N., showing a wide band of white, altered, claylike or silicified rock cutting across both tuffs and andesite. This vein contains lenses and seams of characteristically gray quartz which is moderately drusy and includes fragments of pyritized country rock. The Owl vein lies midway between the Paymaster and the Myrtle.

References: Callaghan and Buddington, 1938:77-78
Stafford, 1904.

TALL TIMBER VEINS (Gold, silver, antimony) Bohemia District

Owner: W. B. Patten, Culp Creek, Oregon.

Location: NE¼ sec. 22, T. 23 S., R. 1 E., west of the Rattlesnake claim on the west slope of Calapooya Ridge near the trail from Shane Saddle and Glenwood station.

Area: 1 claim, the Demon, which also includes the Rattlesnake (page 73).

Development: There are 3 short adits and pits but definite footage is not available. The workings range in altitude from 4,500 to 4,620 feet.

Geology: The country rock is labradorite andesite and tuff. A vein striking N. 70° W. on the trail, and exposed by a 25-foot drift at 4,620 feet, shows quartz containing pyrite and large crystals of stibnite. On the trail at an altitude of 4,570 feet on the north side of a small gulch, 2 veins are exposed consisting of brecciated andesite with veinlets of quartz and moderate amounts of sphalerite, chalcopyrite, galena, and pyrite. One of these veins strikes N. 10° W. and is vertical; the other strikes N. 30° W. and dips 60° SW. Below the trail 50 feet south, a tunnel runs N. 80° E. for 175 feet, intersecting a vein which dips 80° W. It contains altered and silicified andesite with disseminated pyrite. Another vein which strikes N. 60° E. and dips 60° S. is exposed near the face of this tunnel.

Report by: J.E.A., August 1945.

Reference: Callaghan and Buddington, 1938:78.

UTOPIAN GROUP (Gold, silver, copper, lead, zinc) Bohemia District

Owners: Ray E., Robert L., and Gena Nelson, Cottage Grove, Oregon.

Location: On the north boundary of sec. 3, T. 23 S., R. 1 E., crossing into sec. 34, T. 22 S., R. 1 E. A cabin on the property is reached by a trail which branches from the Adams Mountain trail just beyond Cat Mountain.

Area: 2 claims.

History: At one time the property was owned by Vesuvius Mines Company. It is reported that ore was packed from these claims on horses and treated at the Vesuvius mill. In 1902 300 feet of tunnels was reported.

Development: Tunnels and drifts amounting to about 450 feet have been driven. The Arizona Mining Journal reported in June and July, 1943, that "development has been carried to a depth of 900 feet, and an 1800-foot tunnel has been driven."

Geology: Most of the prospecting has been done on the Plato vein, which is in a dacite porphyry dike. The vein outcrops between 4,300 and 4,500 feet in elevation and strikes N. 40°-45° W. Vein matter on the dump consists of coarse, granular, vuggy quartz, with the usual sulphides disseminated.

Reference: Callaghan and Buddington, 1938:78-79
Stafford, 1904.

VESUVIUS MINE (Gold, silver) Bohemia District

Owners: Vesuvius Mines Company, Miss Frances Lucille Hard, President, 410 St. Claire St., San Jose, California. In 1949 it was under lease to Hi-Potential Mining Company, Ray Nelson, Cottage Grove, Oregon.

Location: S½ sec. 11 and N½ sec. 14, T. 23 S., R. 1 E., on the south and southwest slopes of Fairview Mountain.

Area: 11 patented claims, Vesuvius, Jasper, Newton, Fawn, Storey, German, Charles, Wild Hog, Stocks-Harlow, William Tell, and Dixie Queen (?).

History and production: The veins in the Vesuvius area were discovered about 1895 and were operated by the Graber brothers of Cottage Grove, Oregon, until 1902. Stocks and Harlow were working a vein near the Vesuvius at the same time. In 1902 F. J. Hard bought both the Vesuvius mine and the Stocks-Harlow property and organized the Vesuvius Mines Company. He built a new camp and drove a new adit, called the Wild Hog adit, below the old Vesuvius workings. Development work was attempted on this adit intermittently until 1923. In 1949 the Hi-Potential Mining Company was working on the Stocks-Harlow vein. Production from the mine has been small.

Development: Total length of mine workings is about 6,000 feet. The Vesuvius workings consist of a main level, at an elevation of 5,400 feet, and three levels above the main one. These workings have about 2,700 feet of drifts and crosscuts. The main level on the Vesuvius vein intersects the Jasper vein. Workings on the Jasper vein consist of about 400 feet of drifts and crosscuts. The Wild Hog adit, with its portal located 665 feet below the main Vesuvius adit, contains more than 2,500 feet of drifts and crosscuts. About 1,200 feet of the drifts are on the Vesuvius vein. The Stocks-Harlow vein is developed by approximately 400 feet of drifts and crosscuts on two levels. The Storey vein is prospected by two short drifts, two shafts, and several cuts. The workings are mostly caved; the Wild Hog adit, however, was reported to be open in 1945.

Geology: The country rock is labradorite andesite, with intercalated tuff and volcanic breccias. Four veins have been explored. The Vesuvius vein has an average strike of N. 85° E. and the dip is 60° S. It intersects the Jasper vein, which has a strike of N. 67° W. An ore-shoot, located at the intersection of the Vesuvius and Jasper veins, was 120 feet long on the main level and 70 feet long on the level above, with stoping width from 3 to 5 feet. The Stocks-Harlow vein strikes N. 80° E. and dips south. The Storey vein on the southeast spur of Fairview Mountain strikes N. 56° W. and dips 70°-75° S. The usual sulphides encountered in the veins of this district occur in the Vesuvius vein.

References: Callaghan and Buddington, 1938:62-63
Parks and Swartley, 1916:227-228
Stafford, 1904
Taber, 1949:34-36.

WALTON CREEK PROSPECT (Gold) Bohemia District
(Jo Jo claim)

Location: NW¼ sec. 8, T. 23 S., R. 1 E., about half a mile from the mouth of Walton Creek, at an elevation of 2,500 feet. It is reached by an old trail up the creek.

History: The prospect was located by Joe Walton many years ago. A 3-stamp Tremaine mill, largely home-made, was operated by water power.

Development and geology: A large open cut and shallow shaft have been dug 50 feet above the mill on the east side of the creek. The vein is 4 to 6 inches wide, strikes N. 30° W., and dips 70° NE. A sample from the vein returned no values. Another open cut lies 50 feet east. It is reported that more extensive workings are located on the west side of the creek a quarter of a mile above the mill and cabin. Country rock is gray andesitic porphyry, and the vein matter is a siliceous gouge with large amounts of limonite and manganese oxides.

Report by: J.E.A., August 1945.

WAR EAGLE GROUP (Gold, silver) Bohemia District

Owner: O. G. Gilbertson, Cottage Grove, Oregon.

Location: N½ sec. 13 and 14, T. 23 S., R. 1 E., for the most part below the Oregon-Colorado road and Bohemia trail.

Area: 6 claims and a fraction. The property includes what was formerly known as the Wall Street claim.

Development: There are many cuts, pits, and tunnels. The tunnel on the War Eagle No. 1 is 600 feet long. War Eagle No. 2 has been prospected for more than 2,000 feet by cuts and short tunnels. The total lineal footage of development is not recorded.

Geology: Outcrops of the several veins range in altitude from 4,100 to 5,200 feet. Country rock is andesite, with associated tuffs and breccias. Four veins have been prospected - the War Eagle No. 1, War Eagle No. 2, Morning Glory, and a cross vein. The War Eagle No. 1 strikes N. 60°-85° W. and dips 80° S. From 3 to 4 feet of vein is exposed consisting of brecciated andesite, quartz, and disseminated sulphides (sphalerite, pyrite, galena, and chalcopyrite). Diller (1900:24) reported an assay of 0.15 ounce of gold and 2.20 ounces of silver to the ton from a sample of iron-stained quartz at the surface above the tunnel. He also gave assay results of 2.75 ounces of gold and 16.65 ounces of silver to the ton, 3.95 percent zinc, and 53.80 percent lead from a sample of a small spur vein containing galena with some sphalerite and red hematite. The War Eagle No. 2 vein has an average strike of N. 75° W., with a nearly vertical dip. As exposed, the vein matter ranges from 2½ to 8 feet in width of iron-stained, brecciated tuff, cemented by quartz veinlets. The Morning Glory vein, north of the road near the Vesuvius mine, strikes N. 85° W. The cross vein strikes N. 15° E. It occurs in a porphyry dike and, as exposed, consists of a breccia of porphyry cemented by a network of quartz veinlets and thin layers of specularite.

Reference: Callaghan and Buddington, 1938:79-80
Diller, 1900:24.

WARRENER VEIN Bohemia District

Owner: K. O. Watkins, Corvallis, Oregon.

Location: SW¼ sec. 1, T. 23 S., R. 1 E., at an elevation of from 4,300 to 4,500 feet on the west slope of Noonday Ridge.

Area: 2 unpatented claims.

Miscellaneous: The vein, in andesite, strikes N. 75° W., for at least 1,000 feet, and is developed by a 75-foot drift and two open cuts.

Informant: K. O. Watkins.

WINCHESTER GROUP Bohemia District

Location: E½ sec. 15, T. 23 S., R. 2 E., at Johnson Meadows.

History: Stafford (1904) reported 400 feet of work in 1903 on claims owned by J. I. Jones now deceased. It is reported that there are several large open cuts.

Report by: J.E.A., 1945.

Reference: Stafford, 1904.

YELLOWJACKET CLAIM (Gold, silver) Bohemia District

Owner: Carl Owen, Cottage Grove, Oregon.

Location: South of the center of sec. 13, T. 23 S., R. 1 E., in the valley of City Creek. It is reached by way of the Oregon-Colorado road.

Development: The vein has been prospected by two tunnels and several pits for 1,500 feet.

Geology: Country rock is tuff or volcanic breccia and some intercalated andesite. The vein strikes N. 60°-80° W. and dips 60°-70° S. Average width is about 14 inches. A small amount of galena, with some sphalerite and pyrite may be seen in some places.

Reference: Callaghan and Buddington, 1938:80-81.

Fall Creek District

Location

This district is in southeastern Lane County, roughly 35 miles east-southeast of Eugene. It is located on the divide between Christy and Fall creeks about 20 miles by road and 5 miles by trail north of Oakridge, on the Middle Fork of the Willamette River. Oakridge is 43 miles from Eugene via State Highway 58 or by the Southern Pacific Railroad. A road also extends 20 miles east from Lowell along Big Fall Creek to the western edge of the district. The district lies in Tps. 18 and 19 S., Rs. 3 and 4 E., although most of the properties are in an area of 3 square miles in secs. 18 and 19, T. 19 S., R. 4 E., and sec. 13, T. 19 S., R. 3 E. The so-called "Winberry mining district" is about 10 miles west, between the north and south forks of Winberry Creek, in T. 19 S., R. 2 E.

History and production

The Fall Creek district was discovered in 1901, and was actively prospected in 1903, according to Stafford (1904:61). A minor amount of development work has been done on some of the prospects in the district. The Ironsides property was operated for several years and prospecting was done on the Blanket property as late as 1931. No production has been recorded.

Topography

The surface is rugged, with steep, timbered slopes and high ridges. South of Christy Creek the ridges are flat-topped, representing a great intracanyon lava flow which filled the North Fork valley to an elevation of about 3,000 feet in Pleistocene time; north of Christy Creek, Alpine Ridge runs northeast through the district and rises to elevations from 4,000 to 4,752 feet on Sinker Mountain.

Geology and ore deposits

Fragmental rocks are predominant in the district, although flow rocks consisting of normal andesites and labradorite andesites occur at many places. A remnant of an olivine basalt flow lies between Christy and Perdue creeks and an intracanyon flow of olivine basalt masks other rocks south of Christy Creek. The tuffs and volcanic breccias are particularly prominent in the Portland Creek basin. Augite diorite and dacite porphyry plugs or dikes occur at a few places, with adjacent contact hornfels. There has been little tilting or deformation. According to Callaghan and Buddington (1938:128):

> "There are two large areas of altered rock and many smaller ones in the district. One extends from a point a short distance below the confluence of Logan and Portland creeks 1½ miles up Logan, 2½ miles up Portland Creek, and an undetermined distance up Nevergo Creek. The other large area includes most of the prospects and occupies the ridge between Perdue Creek and the creek to the south. There are smaller areas on Sinker Mountain, along the Alpine trail to the southwest, and a zone 15 feet wide trending N. 40° W. at the junction of Tiller and Fall creeks. Most of the material in this zone is bleached or iron-stained and contains disseminated pyrite in the unweathered parts.
>
> "The mineral deposits in this district are of low grade and consist (1) of zones without definite veinlike appearance in weathered altered rock which, according to prospectors, yields a little gold on panning; (2) of silicified zones in altered rock that apparently do not yield any appreciable gold; and (3) of veins in altered rock with stringers of quartz in comb or cockade structure. Only leached vein matter was found on the dumps of caved workings, and pyrite was the only sulphide seen. No appreciable production is expected in this area."

Another wide altered zone occurs between Coffee and Tumble creeks in sec. 32, T. 19 S., R. 4 E., south of the North Fork. It is crossed by the logging road from Oakridge, and landsliding in the clay zone has made road maintainance difficult.

The "Winberry district," located 10 miles west of the Fall Creek district, was the scene of considerable promotion and prospecting during the early 1930's. A comprehensive report by Ruff (see Smith, 1938:45-46) accompanied by numerous assays of material from the various prospects showed that earlier reports of high-grade values were unjustified. Only one sample showed values as high as 70 cents per ton; most assays showed only traces. Similar activities in the "Nooncheste district" near McKenzie Pass appeared to be based on misinformation of geological conditions.

Mining Properties

BLANKET CLAIM (Gold) Fall Creek District

Location: E½ sec. 18, T. 19 S., R. 4 E., about half a mile east of Perdue Creek. The property lies between 2,500 and 3,000 feet in altitude.

History and development: The claim was being prospected in 1931. There are numerous trenches and pits.

Geology: A weathered zone of iron-stained,coarse volcanic breccia has been exposed which shows a low gold content. No definite vein was reported.

Reference: Callaghan and Buddington, 1938:128.

CHRISTY PROSPECT Fall Creek District

Location: NW¼ sec. 19, T. 19 S., R. 4 E., on the south side of the point of the ridge, between Perdue Creek and the creek to the west, overlooking the steep canyon of Christy Creek.

Development: Underground workings were inaccessible in 1931. The amount of work was not reported.

Geology: Vein matter on the dump of the main tunnel consists of altered and silicified tuff or volcanic breccia, in places cemented by vuggy comb quartz and containing finely disseminated pyrite.

Reference: Callaghan and Buddington, 1938:128-129.

FLETCHER CLAIM Fall Creek District

Location: NW¼ sec. 13, T. 19 S., R. 3 E., on the creek west of Perdue Creek and 1¼ miles in a straight line northwest of the Christy Prospect.

Development: Workings are caved. Amount of development not reported.

Geology: The vein matter on the dump consists of light-gray altered rock with cherty quartz and pyrite, both disseminated and in veinlets.

Reference: Callaghan and Buddington, 1938:129.

GOLDEN EAGLE GROUP (Gold) Fall Creek District

(Formerly known as Jumbo or Hyland mine)

Owners: George W. Thompson and R. K. Bushnell, Eugene, Oregon.

Location: About three quarters of a mile northwest of the Christy prospect mostly in NW¼ sec. 13, T. 19 S., R. 3 E., between Billy and Perdue creeks, at an elevation of 2,800 feet.

Area: 11 lode claims.

Development: Three tunnels cut a vein on the west side of a small creek. The middle tunnel is said to be 105 feet long, the last 30 feet of which was caved (1940). Two crosscuts in this tunnel (inaccessible), reportedly extending 70 feet to the left and 80 feet to the right, are located 40 feet from the portal of the tunnel. The lower tunnel is 150 feet S. 30° W. of the middle tunnel and about 35 feet lower in elevation. Mr. Thompson, one of the owners, said that the lower tunnel runs N. 20° S. for 75 feet, then N. 30° E. for 330 feet. The upper tunnel is approximately 40 feet N. 18° W. of the portal of the middle tunnel.

According to Callaghan and Buddington (1938:129), "The middle tunnel . . . runs 50 feet N. 14° E. to what appears to be the intersection of two veins, one trending N. 50° W., the other N. 10° W., and both dipping south . . . . The vein in the upper tunnel trends N. 33° W. and dips 27°-40° N.E."

Geology: The rocks of the area are mostly volcanic breccias, agglomerates, and tuffs, with necks and flows of porphyritic andesite. The valley of the North Fork was at one time filled with a thick flow of olivine basalt, which has been in part eroded leaving a flat-topped ridge between this stream and Christy Creek and a small remnant north of Christy Creek in the Perdue Creek area. The top of this flow lies at an elevation of 2,700 to 3,000 feet. Callaghan and Buddington (1938:127) mention that "A dike of augite diorite occurs at the Jumbo. . . ." This diorite was seen 200 feet northeast of the middle tunnel, and is said to appear near the ends of both the middle and lower tunnels. Rock at the mouth of the middle tunnel is andesite porphyry.

Assays made by the Department on ore samples taken by the owners from this property range from nil to 1.37 ounces to the ton in gold. A sample of panned concentrates gave a return of 77.14 ounces to the ton in gold. Panning done on the ground showed definite values in fine gold. Pyrite could be panned from almost any place in the middle tunnel (except the quartz veins) and usually showed a few colors as well. Pyrite is concentrated in a few places along fractures, but usually is found evenly disseminated or as irregular bands, patches, or blebs in the andesite. The mineralized zone apparently runs about north-south, judging from the slump topography, and float showing fine pyrite can be picked up over a width of about 200 feet. The altered zone is at least as wide.

Informant: George W. Thompson.

Report by: J.E.A., 1940.

Reference: Callaghan and Buddington, 1938:127, 129.

HIGH PRAIRIE GROUP (Gold) Fall Creek District

Location: SW¼ sec. 32, E½ sec. 31, S½ sec. 30, T. 19 S., R. 4 E., at elevations ranging from 1,600 feet to 2,800 feet. The property is 20 miles from Oakridge by good forest road. Claims more or less parallel Tumble Creek.

Area: 6 unpatented lode claims, five of them in a north-south line, and the sixth parallel to the west of the northernmost.

History: These claims were discovered when the railroad and logging roadcuts were made in 1938. This altered zone was not known when the area was covered by Buddington and Callaghan in 1930 and 1931, and is not mapped.

Development: Roadcuts have opened up a mineralized zone near the southwest corner of sec. 32. A short tunnel south into the hill for 20 feet exposed mineralized material. This tunnel lies directly below the logging road, near where it crosses Tumble Creek. The railroad cut along the North Fork of the Willamette River near the southern line of sec. 30 is said to expose altered rock for nearly 1,000 feet.

Geology: The rocks of this area are mostly volcanic breccias, agglomerates, and tuffs, with some andesite and dacite. At the location point under the road near Tumble Creek, the mineralized zone is exposed for at least 30 feet and possibly more. It appears to be bounded on the east by a bed of lapilli-tuff. The material is completely weathered altered rock, without any definite veins, but with pyrite both disseminated and concentrated in a few places along fractures, in irregular bands, patches, or blebs. About half a mile to the south in the roadcut an outcrop of more or less altered dacitic material contains disseminated pyrite.

The topography adjacent to Tumble Creek along most of its length suggests landslide and slumping which may be due to the altered and soft nature of the mineralized zone. This slump area is about 1,000 feet wide, but exposures within it are very poor.

Report by: J.E.A., 1940.

IRONSIDE PROPERTY

Fall Creek District

Owners: Mrs. Nellie Chapman, Portland, Oregon, and Mr. L. Howe, Eugene, Oregon.

Location: E½ sec. 18, T. 19 S., R. 4 E., about half a mile east of Perdue Creek and 25 miles north of Oakridge.

Area: 4 claims.

History and development: The property has been worked in a small way for several years. There are three tunnels with total length of 210 feet. Equipment includes a small 5-stamp mill and a cabin.

Geology: Irregular streaks and masses have been mined from an area of altered and deeply weathered volcanic breccia containing fragments as much as 3 feet long. No coarse-grained quartz or sulphides were observed.

Reference: Callaghan and Buddington, 1938:129.

Miscellaneous Mining Properties in Lane County

COTTAGE GROVE NATIVE COPPER DEPOSIT

Owner: B. C. Myers, Disston Route, Cottage Grove, Oregon, purchased the property in 1942 from John and Ray Walden, E. 12th Street, Eugene, Oregon.

Location: SW¼, NE¼ sec. 19, T. 21 S., R. 2 W., Lane County, about 7½ miles south of Cottage Grove on Mosby Creek.

Area: Deeded land, total acreage unknown.

History: W. L. Cobb, Oakland, Oregon, traced the copper to the Myers farm in August 1940. Kernan, of Roseburg, drilled two holes here in the spring and summer of 1941, but work was discontinued because the "copper balled on the bits" and stopped work. Two shafts and a number of open cuts have been dug to prospect for the "ore-bearing zone."

Development: Development work in July 1942 consisted of the following: one 47-foot well, one 37-foot well, two churn drill holes to depths of 75 feet and 85 feet, one 35-foot shaft, another shaft 18 feet deep, and two or three open pits.

Geology: The country rock consists of well-bedded, fine-grained altered red tuff, now claylike, overlain by coarse tuff breccia with occasional included water-worn boulders. This volcanic series is nearly horizontal and probably belongs to the Calapooya formation (Eocene?).

Cracks in the tuff frequently contain thin sheets of native copper. Since the shafts were inaccessible at the time the property was visited, the copper seams were visible only in the bed of the creek where they had a general north-south strike and stood almost vertical. The sheets of copper are rarely more than a millimeter in thickness and one or two centimeters in diameter. Commonly they are partly altered to malachite.

Two samples of the red tuff were taken, one from an open pit and the other from the shaft near the outcrop. The State Assay Laboratory obtained values of copper from these samples of 0.06 and 0.11 percent, respectively.

The extent of the deposit was not determined because, in most of the open cuts, no copper seams were visible and the shafts, which were filled with water, could not be inspected. However, it was reported that the native copper had been found over a wide area.

Report by: R.C.T. and J.E.A., July 1942.

EUGENE SILICA SAND

Owner: Larry Bufton, 435 N.E. 83rd Avenue, Portland, Oregon.

Location: S½ NE¼ sec. 34, and the SW¼ NW¼ sec. 35, T. 17 S., R. 4 W., and extends onto adjacent ground in sec. 36. The property is at Wallace Butte, about 2 miles west of Eugene, on the extension of 11th Street.

History: The deposit was first mined sometime previous to and during 1923 by the Eugene Fire Clay Products Company, and about 12,000 tons was used for making No. 2 refractory brick. Some of the sand was reported to have been used directly as molding sand in foundries at Eugene and Portland. The first account of the deposit was given by Paul W. Cook (1923:40-47). It was visited by R. C. Treasher in 1938 in the course of an investigation of refractory clay deposits of western Oregon for the State Department of Geology and Mineral Industries. Treasher reported (Wilson and Treasher, 1938:66) that:

> ". . . it is possible that a greater commercial value could be obtained from this material by washing the sand free of clay and using it for the purer forms of silica sand, which are not abundant in this part of Oregon. More permeable

foundry sands for larger castings could be made with smaller clay contents, and it is possible that the washed quartz will have sufficient purity for steel foundry service. Tests for particle size, particle shape, and resistance to abrasion and thermal shock should be continued."

More detailed physical and chemical tests made by Treasher and Bassett (1943) led to actual foundry tests which proved very satisfactory. The results of these tests were described by Lowry and Mason (1943). This last report was made with the cooperation of K. E. Hamblen and Larry Bufton, who had obtained an option on the property. In August and September 1943 the U.S. Bureau of Mines drilled a number of auger holes on this and other nearby silica sand deposits. Silica Products, Oreg., Ltd., was formed, a washing and drying plant was constructed in 1944 with financial assistance from the Reconstruction Finance Corporation, and shipments to the Portland market began early in 1945. Although the sand proved to be a superior steel foundry sand and metallurgically successful in those foundries which used it, inability to sell to the large steel foundries forced closing and sale of the plant in 1947.

Topography: Wallace Butte is a low round hill which rises about 50 feet above the wide level valley floor and covers an area of about 80 acres. Its maximum elevation is about 450 feet.

Geology: As first pointed out by Cook in 1923, it is believed that the Eugene sand is a residual deposit formed by the weathering of indurated feldspathic sandstone, which makes up a lower member of the Eugene formation of Oligocene age. The feldspars in the sandstone, originally about 35 percent, have been largely altered to clay, which may be washed out to produce a nearly pure quartz sand. Muscovite mica is present in small amounts, but much is removed with the clay in the washing operation. The quartz is subangular to angular and remarkably even grained, over 50 percent being retained on a 70-mesh screen, with about 18 percent on each of the adjacent 50- and 100-mesh screens. Extensive laboratory and foundry tests of the fineness, bonding strength, permeability, sintering point, and durability (Lowry, 1947) show that it is comparable to the best Ottawa foundry sand and in several respects superior to it.

Drilling by the U.S. Bureau of Mines in the Wallace Butte area gives reserves of clay-free sand in the order of 100,000 dry tons measured and 300,000 dry tons indicated.

References: Cook, 1923:40-47
Lowry, 1947
Lowry and Mason, 1943
Treasher and Bassett, 1943
Wilson and Treasher, 1938:65-66

FALL CREEK RANCH CLAY

Location: SW¼ SE¼ sec. 31, T. 18 S., R. 1 E., on Fall Creek road, 3¼ miles NE. of Lowell, at Henry Page place, "Fall Creek Ranch." The clay is across the creek from the road, and the nearest bridge is half a mile west.

Description: The clay is a number 2 white fireclay with cone fusion from 23 to 30. It lies along the side of a 75-foot stream terrace, covered with soil and rock overburden.

Reference: Wilson and Treasher, 1938:67-68

HAWKINS CLAY AND SILICA SAND

Location: NW¼ NW¼ sec. 2, T. 18 S., R. 4 W., half a mile south of the Eugene silica sand locality. Wilson and Treasher (1938:66) report that it is similar to the Eugene deposit.

Reference: Wilson and Treasher, 1938:66

HOBART BUTTE HIGH-ALUMINA CLAY

Owners: Mineral claims held by O. K. Edwards, et al, c/o Willamina Clay Products Company, Willamina, Oregon.

Location: In the four sections at the junction of Tps. 22 and 23 S., Rs. 3 and 4 W. The portion of the property which has undergone development, and which includes the largest amount of the clay, lies in sec. 31, T. 22 S., R. 3 W. The quarry is within 150 feet of the top of the butte, at an elevation of 2,350 feet. It is 16 miles by road south of Cottage Grove by way of London.

History: According to Wilson and Treasher (1938:69-71), the deposit was discovered in 1930 by Robert Phillips while prospecting for cinnabar. It was leased in 1933 by the Willamina Clay Products Company, who later purchased the land in sec. 31. A road was completed to the mine, and 12,000 to 15,000 tons was mined and shipped to the brick plant at Willamina where firebrick were made using about 5 percent Willamina clay for a bond. In September 1942 the Columbia Metals Corporation secured a lease on the property, with the object of using this clay as a source of alumina. The lease expired and the property reverted to Willamina Clay Products Company.

Topography: Hobart Butte rises more than 1,500 feet from the valley of the Coast Fork of the Willamette River to an elevation of 2,459 feet. It is elongated in a northeast-southwest direction, the ridge crest being about half a mile long. The sides are steep with 30° slopes. The quarry lies near the northeast end of the crest, on the southeast slope.

Development: In the fall of 1933 a road was built part way to the quarry and clay was dropped 825 feet by chute. In 1936 the road was completed to the quarry and by 1942 nearly 15,000 tons had been mined. During 1943 the U.S. Bureau of Mines drilled 24 diamond drill holes totaling 6,896 feet.

Geology: The regional geology was described by Wells and Waters (1934:26-28,34) who mapped the extent of the Eocene Umpqua marine sandstones and conglomerates with the underlying Eocene basalts as well as the unconformably overlying Calapooya formation, consisting of a lower dominantly sedimentary facies and an upper, dominantly igneous facies. They also outlined the areas of altered rocks, which include Hobart Butte as well as the mineralized areas at the Elkhead and Blackbutte quicksilver mines. They report that Hobart Butte belongs to the lower sedimentary facies of the Calapooya formation. According to Loofbourow (1943:5), from whom a large portion of the present report is abstracted, these sedimentary rocks attain a thickness of at least 3,500 feet in Hobart Butte, with the top not exposed. The sedimentary rocks are composed primarily of volcanic breccias, tuffs, conglomerates, lava flows, and mud flows, which do not vary greatly in composition but are strikingly dissimilar in appearance. East of the butte lavas predominate; to the west tuffs predominate. Wood and charcoal are common in the tuffs and conglomerate, and leaves date the formation as upper Eocene.

Ore deposits: The clays have been described in detail by Wilson and Treasher (1938: 71-72) and Loofbourow (1943:6-11), and their account will only be summarized here.

The high alumina clay at Hobart Butte is nonplastic and homogeneous. It occupies fairly well-defined horizons in the continental sedimentary series of volcanic origin, generally parallel with the bedding. Hobart Butte appears to be a gentle syncline pitching at a low angle to the northeast, broken by a northwest-trending fault. The altered rocks are mainly gray, in some places leached white. Red and reddish purple beds are common. Surface alteration has changed the gray beds to a yellowish tint but has not affected the red beds. High-grade material is characterized by a smooth conchoidal fracture; low-grade material breaks with an irregular rough surface. The lustre is porcelaneous, and although there are some areas of hard material, most of the clay can be easily scratched with a knife, often by the fingernail. The principal clay mineral is kaolinite, but there are several associated minerals in small amount, which may be listed as follows:

realgar	pyrite	limonite
orpiment	arsenopyrite	scorodite
stibnite	siderite	mansfieldite
	calcite	

The ore reserves of two orebodies outlined by the drilling program of the U.S. Bureau of Mines were determined by Loofbourow (1943:12-13) to total 11,900,000 tons of dry ore, with a grade of 29 percent available Al_2O_3 and 3 percent available Fe_2O_3. The maximum ratio of overburden to ore is 1 to 1, and there is 6,500,000 tons of ore with no overburden. The moisture content is 3 percent.

References: Allen and Fahey, 1948:122
Loofbourow, 1943:5,11-13
Wells and Waters, 1934:26-28, 34
Wilson and Treasher, 1938:69-72

JUNCTION CITY CLAY

Location: SW¼ NW¼ sec. 31, T. 15 S., R. 5 W., about 8 miles due west of Junction City, in a roadcut just west of the junction of the Bear Creek road with the Ferguson Creek road.

History: Wilcox (1935:26) reported that the Eugene Brick and Tile Company had obtained a white firing clay from about 6 miles west of Junction City on the Triangle Lake (old High Pass) road.

Geology: Clay was found in roadcuts and in an excavation north of the Bear Creek road. It was fine-grained, plastic, and slightly gritty. A few inches below the surface it became more gritty, and probably represented an unaltered arkose in which the feldspathic material had weathered to clay.

References: Wilcox, 1935:26
Wilson and Treasher, 1938:64-65

MABEL CLAY

Location: The deposit is located 27 miles by road northeast of Eugene on the Marcola-Crawfordsville road, about 5½ miles north of Mabel on the Carl Marks property.

Description: A hard white clay tested by Wilcox (1935:23) was "the whitest clay encountered in Oregon," and gave a cone test of 32. The clay was covered with soil when visited by Treasher (1938:66).

References: Wilcox, 1935:23
Wilson and Treasher, 1938:66-67.

LINCOLN COUNTY

Geography

Lincoln County, comprising an area of 1,006 square miles, is situated in the north central coastal area. It is bounded on the south by Lane County, on the east by Benton and Polk counties, and on the north by Tillamook County. Toledo, the county seat, is an important lumbering center on the Newport-to-Corvallis highway about 8 miles east of Newport.

Lincoln County topography shows youthful to maturely dissected hills that form a part of the crest and western flank of the Coast Range. Eastward from the Pacific Ocean, elevations increase to more than 3,000 feet along the summits of the Range.

The coast line is relatively straight with embayments at the mouths of the principal streams and with beach areas situated between basaltic headlands, as between Yaquina Head and Cape Perpetua. The main drainage channels are the Salmon, Siletz, Yaquina, Alsea, and Yachats rivers all of which flow westward to the Pacific Ocean.

Lumbering, dairying, and commercial fishing are the chief industries. There are no active mining operations in the county other than sand, gravel, and crushed rock. Coal was mined at one locality on a small scale in the late 1800's and early 1900's. Chromite, ilmenite, and magnetite occur in some of the sands along the beaches.

Geology

Baldwin (1947), Vokes, Norbisrath, and Snavely (1949), and Snavely and Vokes (1949) have mapped and described the areal geology of Lincoln County. These publications should be consulted if more detailed information than is recorded in the following brief summary is desired.

Marine and brackish-water sediments along with interbedded igneous rocks ranging in age from lower Eocene to middle Miocene are widely exposed. These formations are overlain along the coast by Pleistocene and Recent terrace and estuarine deposits. Intrusive igneous rocks, such as dikes, sills, and stocks of basalt, gabbro, camptonite, diorite, and syenite, cut the pre-Pleistocene rocks.

The oldest rocks are the basalt flows, pillow lavas, breccias, pyroclastic material, and interbedded tuffaceous sedimentary rocks composing the Siletz River volcanic series. This series of rocks constitutes the heavily dissected highlands in the northern part of the county between the Salmon and Siletz rivers. The upper part of the series has been determined to be of middle Eocene age, but the stratigraphic range of the series is probably from lower to middle Eocene.

The Burpee formation (middle Eocene), consisting of rhythmically bedded sandstones and siltstones, conformably overlies the Siletz River volcanic series. This formation is exposed between the Salmon and Siletz rivers along the eastern and southern border of the Siletz volcanics and extends southward, probably covering most of central and eastern Lincoln County.

Tuffaceous siltstones, sandstones, and volcanic material comprising the Nestucca formation and the Moody shale member of the Toledo formation are of upper Eocene age. The Toledo formation also has a sandstone member considered to be middle Oligocene in age. The Nestucca and Toledo formations outcrop in western Lincoln County in a narrow strip extending north and south along the western border of the exposures of the Siletz River volcanics and the Burpee formation.

The Yaquina formation (upper Oligocene), consisting mainly of micaceous and tuffaceous sandstone, lies unconformably upon the Nestucca formation and disconformably on the Toledo formation. The Yaquina formation extends from Siletz Bay southward almost to Yachats.

The Nye mudstone (lower Miocene) disconformably overlies the Yaquina formation in the vicinity of Newport Bay. The Astoria formation (middle Miocene), consisting of sandstone, shale, and volcanic rock, outcrops in places along the sea cliffs between Lincoln Beach and Cape Foulweather, from Otter Rock to Yaquina Head, and in the vicinity of Newport.

Mining Properties

YAQUINA COAL LOCALITIES

Coal was mined in Lincoln County in the late 1800's and early 1900's, in T. 11 S., R. 11 W., and in T. 10 S., R. 10 W. No coal has been mined in later years and outcrops and old workings are covered by heavy underbrush.

Diller (1896:495-496) reported on the Yaquina coal field as follows:

"This field is in Lincoln County, north of the Yaquina River, and 6 miles from the coast. It borders Depot Slough upon the west, and has its greatest extent north and south.

"A few miles west of Toledo, in sec. 13, T. 11 S., R. 11 W., coal has been found in a number of gulches. At one place the coal is exposed in a tunnel nearly 200 feet in length. It is greatly fissured, and the cracks contain a yellowish coating that makes the coal look muddy. The bed at the end of the tunnel is about 20 inches in thickness. It becomes thinner to the northwest, as the bottom rises in that direction, and it lies between soft sandstones, the top one of which contains marine shells. The inclination of the strata was not accurately measured, but it has been estimated at 20 degrees. Analysis No. 14 is of coal from this locality.

"Dr. J. H. Bryant, who systematically prospected this field with a diamond drill, bored a hole a short distance southeast of the tunnel, but I have not yet been informed what he found. In this same neighborhood there are other exposures of coal, but so far as yet known they are small and of no value. In places the sandstones contain many small films or lenses of coal, and there are all grades in size from this to beds 20 inches in thickness and a mile or more in lateral extent. The character of the deposits everywhere not only in this field, but in others, is such as to indicate that they are very local and in most cases not of commercial importance.

"In sections 36 and 30 of the next two townships to the north several outcrops of coal have recently been prospected with the diamond drill by Dr. J. H. Bryant. One bed having a thin parting of sand is reported to average 3 feet of coal. A sample from this bed was given me by Mr. P. T. Johnson. Its composition is numbered 15 in the list of analyses. The extent of this coal is not yet known, but it is not believed to be great."

Diller gives the following analyses for Nos. 14 and 15 referred to above:

No.	Moisture	Volatile matter	Fixed carbon	Ash	Sulphur	Physical properties of coke
14	8.11	41.15	33.59	17.15	0.95	Sooty, noncoherent
15	8.53	39.95	45.79	5.73	2.00	Partly brilliant and coherent

Diller further states:

"Farther northward traces of coal have been found near the head of Depot Slough, and also on the Siletz River, but the outcrops are less promising than those already noted.

"The Yaquina coal field has a length from north to south of about 5 miles and a breadth of not over a mile. It contains, apparently, several beds of coal which belong to nearly the same horizon. Although not very far from marine transportation, it does not promise to be of great commercial importance."

According to Stafford (1904:13):

"Mr. B. F. Jones, of Toledo, writes that the Toledo Coal Company did considerable prospecting several years ago with the result that a surface ledge three feet thick was opened up, and an eight foot ledge was discovered by drilling to a depth of 100 feet. After building 400 feet of tunnel to crosscut the big vein, the company became financially involved, and ceased operations before reaching its objective point. . . .There are extensive coal beds lying north of Toledo for a distance of ten miles, and coal cropping of from one to two and one half feet thickness have been found within a radius of four miles. . . ."

Properties: C. K. Crosno, real estate broker, Toledo, described (to R.C.T.) a mine in NE¼ NW¼ sec. 31, T. 10 S., R. 10 W. A 50-ft. slope produced 100 tons of coal which was partly used locally and partly shipped to San Francisco by boat. The mine, active between 1906 and 1914, was on the old Romtvedt property, now owned by E. L. Dean.

Pete Rasmussen owns a coal property in the NE¼ SW¼ sec. 27, T. 11 S., R. 11 W., 1.7 miles southeast of Yaquina on the old railroad grade, and 200 feet east of channel light No. 9. A 125-foot tunnel was driven in hard sandstone which dips N.W. The coal vein is reported to be 6 inches thick and getting thicker toward the face.

References: Diller, 1896:495-496
Stafford, 1904:13

Report by: R.C.T., 1943

LINN COUNTY

Geography

Linn County with an area of 1,467,160 acres (2,294 square miles) is the second largest county in northwestern Oregon. It lies south of Marion County and north of Lane County, extending from the Willamette River on the west to the crest of the Cascade Range. Albany, on the Willamette River in the northwestern corner of the county, is the county seat.

The greater part of Linn County lies on the western slope of the Cascade Range. The Willamette valley plain is constricted between Salem and Albany but broadens south of Albany to about 20 miles. Elevations in the Willamette Valley lowland range from approximately 160 to 400 feet with several hills or buttes, such as Knox Butte, Hardscrabble Hill, and Peterson Butte, rising above the general level of the plains and terraces. The physiography of the Cascades is generally similar to that of the Cascades in Marion County, except that the altitude (10,495 feet) of the main peak, Mount Jefferson, is greater than any of the peaks in Marion County. The principal streams are the North and South Santiam and Calapooya rivers which flow westward or northwestward into the Willamette River.

Agriculture and lumbering are the principal industries. The mineral resources consist of sand, gravel, crushed rock, and the metalliferous deposits of the Quartzville district located forty miles east of Albany. Although the veins in this district contain some copper, lead, and zinc minerals, gold and silver have comprised the recorded production.

Geology

Much of the information pertaining to the geology of Linn County has been taken from unpublished maps of the Albany and Lebanon quadrangles prepared by Allison (1941) and Allison and Felts (1941), respectively. Maps by Callaghan and Buddington (1938) and Thayer (1939) have also been used as references.

The geology of Linn County is similar to that of Marion County. Rocks which form the Cascade Range are nearly all of volcanic origin from Eocene to Recent in age. In the Willamette Valley, Eocene and Oligocene marine sediments are exposed; basaltic and gabbroic intrusives form the cores of some of the hills; and Pleistocene and Recent alluvial deposits cover the valley lowlands.

Marine tuffaceous sandstones of Eocene age are found in the hills northeast of Albany. These sediments apparently dip eastward under the Oligocene tuffaceous sandstones of the Eugene (Illahee) formation. Sandstones of the Eugene formation are exposed near Knox Butte, along the Santiam River a few miles south of Jefferson, at Peterson Butte, and in Golden Valley. Fragmental volcanic rocks of Oligocene age occur east of the exposures of the Eugene formation. They are known as the Mehama volcanics and occur east of Ridgeway Butte, on the southeast side of Hungry Hill, on the lower slopes of Prospect Mountain, and at Franklin Butte. Fossil flora collected from outcroppings of sandstones and water-lain tuffs and breccias on the west and south sides of Franklin Butte have been studied by Sanborn (1947), who considers the flora to be an Oligocene to Miocene transition type.

Younger basaltic lavas, named the Stayton lavas, which are probably the same age as the Columbia River basalts of middle Miocene age, overlie the Mehama volcanics and the Eugene formation. The Stayton lavas cap Ridgeway Butte, Hungry Hill, Franklin Butte, and Prospect Mountain in the Lebanon area. Peterson Butte is a volcanic neck or plug of this lava.

In the Cascade Mountains proper, the Oligocene and Miocene volcanics are overlain by Pliocene and Pleistocene lava. Some of the higher peaks of the Cascades were glaciated during the Pleistocene. Some olivine basalt flows of Recent age also occur in the Cascades. Clear Lake in the upper McKenzie Valley was formed by the damming of the drainage channel by Recent basalt flows.

Silts and gravels deposited during the Pleistocene occupy the valley lowlands. Silts, sands, and gravels along the banks of the rivers are alluvium of Recent age.

According to Callaghan and Buddington (1938:102) the veins of the Quartzville district are less extensive and contain less sulphides than those in the Bohemia district. Recorded production from the Quartzville district is very small.

Quartzville District

Location

This district is 40 miles nearly due east of Albany, and is included in T. 11 S., R. 4 E., and the northern part of T. 12 S., R. 4 E., in Linn County. Quartzville, now extinct, was located approximately in the center of the district. The district reached from Foster by 30 miles of U.S. Forest Service road up Quartzville Creek. Foster is on U.S. Highway 20, 31 miles southeast of Albany. Most of the production in the district has been from the ridge of Dry Gulch in secs. 22 and 23, T. 11 S., R. 4 E.

Topography

The region has steep, heavily timbered, mountainous slopes, with elevations ranging from 1,500 feet on Quartzville Creek to about 3,500 feet on the ridges. Gold Peak in the eastern part of the district rises to about 4,000 feet and Galena Mountain in the southern part to 5,000 feet. The entire district is drained by Quartzville Creek and its tributaries, which join the Middle Santiam River about half way between the middle of the district and the town of Foster.

Geology and mineral deposits

As in other Cascade mining districts, rocks of the area are made up of andesite and rhyolite flows and interbedded tuffs and breccias in about equal amounts. There are scattered dikes and plugs of dacite porphyry with narrow contact aureoles of hornfels. Vein systems are markedly uniform in strike, averaging N. 40° W., with steep dips in either direction. Although individual ore shoots are of rather small dimensions, the shear zones of the system to which they belong usually have considerable lateral extent, several of them being traceable for several thousand feet, with widths of 50 feet or more.

Much of the underground workings are now inaccessible, and those that are open are usually in the upper weathered portion of the veins, so that knowledge of the sulphide zones is scanty. Depth of oxidation varies greatly and in places unaltered rock containing sulphides crops out at the surface. Most of the veins contain mixed sulphides with sphalerite and pyrite common. Bournonite and tetrahedrite have been recognized. Pyritization is widespread, and pyrite is found streaking some vein walls. Concentrations of metallic gold in the oxidized zone at or near the surface have been the incentive for much of the prospecting, so that development work, except in a few cases, has been principally in following small ore shoots. Almost no systematic crosscutting which would show the potentialities of the large shear zones has been done. Many exceptional specimens of wire gold have been found in pockets.

The district was first discovered in 1863 and organized as a mining district in 1864. The Lawler and Albany mines were operated during the 1890's. The district has been largely idle since that time, and a production of less than 200 ounces of gold has been recorded since 1896 out of a total production of 8,557 ounces. The total value of recorded production is $181,255; divided as follows:

Gold	8,557 ounces
Silver	2,920 ounces

Several of the properties, mainly relocations of claims which were worked many years ago, have been active in a small way in recent years. A few operators have built small mills, some homemade, to amalgamate a part of the gold present, and during the 1930's made a living from a partial recovery of the gold present. A little placering by "snipers" has also been done along Quartzville Creek.

Figure 5b, opposite page 45, shows the prospects, veins, and intrusive bodies of the Quartzville District.

Mining Properties

ALBANY MINE (Gold, silver) Quartzville District
(formerly Lincoln Mines Company)

Owners: J. McChesney and A. M. Hammer, Route 1, Turner, Oregon.

Location: Mainly in sec. 23, T. 11 S., R. 4 E. The claims, not all contiguous, are located for the most part in Dry Gulch.

Area: 3 unpatented and 3 patented claims.

History: The property was prospected as early as 1888. In 1892 a Tremaine two-stamp mill was built, and oxide ore said to assay $25.00 to $27.00 was milled from two small shoots, giving a very poor mill recovery. Later the Lincoln Mines Company operated the property and built a 10-stamp mill. Records of the United States mint give the property a production of 653 ounces of gold for the years 1890, 1892, and 1893. In 1925 a Lane mill was installed and ore was brought down to it by cable tramway.

Development: In 1931 a total of 1,090 feet of tunnel was accessible. In addition there are several cuts and shallow shafts. Equipment includes a Lane mill in good condition, a cable tramway, a 10-stamp mill in ruins, and two cabins. The workings on the property are at an elevation ranging from 2,570 feet to 3,070 feet.

Geology: Country rock includes andesites, rhyolite, and volcanic breccias. The lowest tunnel, the Crosscut, was driven in rhyolite about S. 52° E. for 444 feet along a silicified shear zone showing some sulphides. It then turns east for 237 feet in pyritic rhyolite, said to assay $1.20 in gold. The Bonanza tunnel, 400 feet above, was driven on a vein striking about S. 26° E., containing quartz and altered, brecciated country rock with some sulphides. Samples of the vein were reported to show no ore of milling grade. Some of the vein has been stoped. The Queen tunnel in altered andesite and volcanic breccia at 2,670 feet in elevation and northeast of the Crosscut tunnel, has a drift on a steeply dipping vein striking N. 37° W. A stope 60 feet long was carried 30 feet to the surface. A sample across 2 feet at the back of the stope was reported to assay 0.10 ounce of gold and 0.4 ounce of silver to the ton. The Lincoln and Goodman tunnels, driven in a shear zone, are about 1,800 feet northeast of the camp at an altitude of 3,035 feet. The former follows a vein containing a small amount of quartz and some sulphides in altered volcanic breccia. The Goodman tunnel shows gouge and silicified pyritic tuff. Outcrops of the Queen vein are much altered and iron stained, and produced some rich pockets.

Report by: F.W.L., 1938

References: Callaghan and Buddington, 1938:103-105
Parks and Swartley, 1916:141
Stowell, 1921

BOB AND BETTY (Gold, silver, lead, zinc) Quartzville District
(formerly Smith and McCleary)

Owner: Estate of W. S. Risley, Albany, Oregon.

Location: Near the south line of sec. 14, T. 11 S., R. 4 E., on the north side of the divide between Dry Gulch and Canal Creek. It is reached by about 1 mile of the Detroit trail from the Albany mine.

Area: 2 claims.

History: The property was located by T. J. McCleary in 1881. McCleary admitted Don Smith and five others into partnership to form the Portland group. A company was formed and a 10-stamp mill was brought in, together with a boiler and steam engine. No milling was done by this company, but later, in about 1885, Smith leased the property and with four other men, milled about 100 tons of ore from which a very poor recovery by amalgamation was made. The ground was relocated just prior to 1930 as the Bob and Betty.

Development: Tunnels aggregate about 1,650 lineal feet, with about 900 feet open. In addition, there is a large open cut and a caved shaft reported to be 100 feet deep. Elevation of tunnels ranges from about 2,950 to 3,100 feet.

Geology: The country rock is altered andesite, and development tunnels show a wide zone of shearing. Vein filling in the shear zone consists of gray and white quartz, gouge seams, and quartz veinlets in silicified country rock. The strike is N. 55°-80° W., with an average dip of 70° S. A sample of sorted sulphide ore from a pile of a few tons at the portal of the lowest crosscut tunnel gave the following results, according to Stowell (1921): gold, 0.20 ounce; silver, 1.0 ounce; copper, trace; lead, 2.8 percent; zinc, 2.95 percent. Later work, including a winze about 8 feet deep on the ore shoot, shows about 12 inches of nearly solid galena with an additional 30 inches of iron-stained rock containing soft seams and a few bunches of soft sulphides, principally galena.

Report by: F.W.L., 1938.

Reference: Callaghan and Buddington, 1938:105-106
Stowell, 1921

DOODLEBUG CLAIM (Gold ?) Quartzville District

Owner: Deb Devine.

Location: NW¼ sec. 23, T. 11 S., R. 4 E., on Quartzville road.

Development: A 10-foot cut and a 4-foot tunnel.

Geology: There is a northwest-trending shear zone in altered andesite, with disseminated pyrite in silicified rock stained with manganese and iron. No assays are available.

Report by: F.W.L., 1938.

GALENA MINE (Gold, silver, copper, lead, zinc) Quartzville District

Owner: Northern Pacific Company or Weyerhaeuser Timber Company (patented timberland). Formerly owned by Seattle Mining Company.

Location: NW¼ sec. 11, T. 12 S., R. 4 E., at the head of Galena Creek in the southern part of the district, and several miles by trail south of Quartzville.

Area: In 1921 consisted of 10 unpatented claims.

History: In 1921, the property was being developed by the Seattle Mining Company. Since that time the ground has been acquired by the Northern Pacific Company with timber rights belonging to the Weyerhaeuser Timber Company.

Development: Elevations of the workings range between 3,360 feet and 3,700 feet. Lineal footage in the two crosscut tunnels (one at 3,640 feet and another at 3,360 feet) totals about 725 feet. There is a small open cut above the upper tunnel and a second open cut between the upper and lower tunnels.

Geology: Country rock is andesite with interbedded volcanic breccia. The ore deposit consists of enrichments in poorly defined brecciated shear zones, trending northwestward, in which seams of quartz together with disseminated sulphides have been deposited. Two crosscut tunnels, having a difference in elevation of 280 feet, cut this shear zone, and some drifting has been done. Oxidation is superficial with sulphides showing close to the surface. In the upper tunnel drifting followed a quartz vein, containing sulphides, from 2 or 3 inches wide on the south to 18 inches wide on the north.

The following assays were reported by Stowell (1921:34-36):

A sample across 18 inches of vein in the north drift returned gold, 0.56 ounce and silver, 2.44 ounces to the ton; copper, 0.65 percent; lead, 0.20 percent; zinc, 4.25 percent. Farther in the tunnel a 6-foot south drift showed 12 inches of vein which assayed gold, 0.02 ounce and silver, 3.68 ounces to the ton; copper, 0.15 percent; lead, 8.85 percent; zinc, 2.4 percent. In an open cut at an elevation of 3,500 feet, a sample across 4 feet of vein material returned: gold, 0.10 ounce and silver, 0.4 ounce to the ton; copper 0.35 percent; lead, 4.65 percent; zinc, 1.6 percent.

In the lower tunnel a sample in the face of the south drift of 16 inches of quartz and gouge gave: gold, 0.03 ounce and silver, 0.31 ounce to the ton; copper, 0.45 percent; lead, 0.20 percent; zinc, 2.0 percent.

About 650 feet north of the upper cut at an elevation of 3,750 feet, there is an outcrop of breccia or agglomerate showing disseminated sulphides over an area 100 feet by 50 feet. A 4-foot section assayed gold, 0.10 ounce and silver, 0.4 ounce to the ton; copper, 0.05 percent; lead, 2.6 percent; zinc, 3.7 percent.

References: Callaghan and Buddington, 1938:106
Stowell, 1921

HASTINGS (Gold, silver) Quartzville District
(Hammell Group)

Owner: Gaylord Ingham, Albany, Oregon.

Location: SW¼ sec. 14, T. 11 S., R. 4 E., on the steep north slope of the ridge north of Dry Gulch and west of the Bob and Betty claims.

Area: 3 claims (in 1921).

Development: It is reported that the tunnels, now caved, total 150 feet. Besides these, there are several open cuts. The workings are about 3,000 feet in elevation.

Geology: Country rock is andesite and volcanic breccia. Vein matter consists of brecciated country rock, with reticulating veinlets of quartz. Most of the workings are inaccessible. The vein strikes NW and, as exposed in an open cut, is 6 to 8 feet wide.

References: Callaghan and Buddington, 1938:106
Stowell, 1921

HIGHLAND CHIEF (Gold, silver) Quartzville District
(formerly Mule Claim)

Owner: Rex Keefover, Foster, Oregon.

Location: Near the east line of sec. 27, T. 11 S., R. 4 E., just south of the Lawler group on the west side of Silver Creek. The claim is reached by a trail about 2 miles long from the Lawler mine.

Geology: The average trend of the vein, which outcrops at a little more than 3,000 feet in elevation, is about N. 50° W., with a vertical dip. It is prospected by a short tunnel in silicified andesite, containing disseminated sulphides. The tunnel follows a wall in which there are small bunches of sphalerite, galena, and pyrite. The face is all in whitish silicified rock, containing sulphides and having seams of iron-stained soft gangue. Assay values are not available.

Reference: Callaghan and Buddington, 1938:109.

HOOT-EN-ANNE (Gold, silver, copper) Quartzville District

Owner: Philip R. Peterson, 1620 N. Liberty Street, Salem, Oregon.

Location: Sec. 13, T. 11 S., R. 4 E., 3 miles northeast of Quartzville about half a mile east of Red Heifer Butte on the trail to Detroit.

Area: Two full claims known as Crow and Hoot-em-Anne.

History: Discovered and located in fall of 1937.

Development: Development work consists of two discovery cuts and four shallow cuts at an elevation of 4,000 feet.

Geology: Cherty quartz and breccia form the vein material. The country rock is rhyolite. Outcroppings are leached and iron-stained. The ore minerals are gold with a small amount of pyrite, chalcopyrite, and a small amount of galena. Ore shoots are short, usually only a few feet long. General trend of the veins is N. 50° W.

The following samples were taken and assayed in the Department laboratory: 18 inches of vein material from the location cut of the Hoot-en-Anne claim did not contain any gold and silver; 2 inches of vein material from the discovery cut of the Crow claim assayed 0.06 ounce of gold and 4.6 ounces of silver.

Report by: J.E.M., 1938.

HOUF PROPERTY (Gold) Quartzville District

Owner: James Houf.

Location: SW¼ sec. 19, T. 11 S., R. 4 E., on the Quartzville road at Yellowbottom Creek.

Area: 40 acres patented timber land.

History and development: Acquired in 1937. There are no improvements except a small cabin, and no development work has been done.

Geology: A wide zone of pyritized andesite is exposed in the bed of Yellowbottom Creek, along one side of a rhyolite dike. Specimens of andesite were said to assay 0.07 ounce of gold.

Report by: F. W. L., 1938.

LAWLER MINE (Gold, silver) Quartzville District

Owner: G. C. Howard, 107 Old Broad Street, London, England.

Location: Secs. 21, 22, 23, 26, and 27, T. 11 S., R. 4 E. The claims extend from the bed of Dry Gulch southeastward over White Bull Mountain into the basin of Silver Creek.

Area: 2 large placer claims in the bed of Dry Gulch and 11 lode claims extending southeast from the gulch, all patented. Placer acreage is 238.8; lode acreage is 164.8.

History: The original discovery of lode gold of the district is said to have been made by Dr. E. O. Smith on Lawler ground in 1861. A company was organized and it optioned the property to W. B. Lawler, who interested English capital. Considerable development work was done and a 20-stamp mill built. Production was in the neighborhood of $100,000.

It is reported that the mill closed down in 1898, and that 2,000 feet of tunnels and raises had been driven.

Development: There were four main adit levels with a difference in elevation of 500 feet between the upper and lower levels. These are now largely inaccessible. Stopes extend from the 155 or bottom level to the surface on a vein 8 feet wide in places. Shoots are said to rake to the southeast. Elevations of the claims range from 2,000 feet in Dry Gulch to 3,755 feet at the top of White Bull Mountain.

Geology: Country rock is rhyolite, andesite, and volcanic breccia. The vein strikes approximately S. 50° E., crossing a spur extending northwest from White Bull Mountain. Vein matter consists of brecciated country rock cemented by quartz. On the dump of one tunnel, fragments of sphalerite, galena, chalcopyrite, and pyrite with quartz were reported. The bottom tunnel is reported to have been driven the last 200 feet in a dark-colored dike rock, and that there was about 8 inches of ore in the shoot before this rock was struck. There is no record of any crosscutting to the walls of the dike. A small pile of tailings, probably less than 2,000 tons, is located below the new ruined Lawler mill. A sample of this material panned a small concentrate of an oxidized lead mineral, probably cerrusite, and a few small colors of free gold.

The placer area consists of rubble of unproved depth, character, and value. It extends for about 2 miles down Dry Gulch in which water flows only during periods of heavy runoff.

Informant: Frank Bevier ? (or Bert)

Report by: F. W. L., 1938

Reference: Callaghan and Buddington, 1938:107-108

LUCILLE CLAIM (Gold, silver) Quartzville District

Owner: C. F. McCallister, Foster, Oregon.

Location: NE¼ sec. 22, T. 11 S., R. 4 E., on the Quartzville road, which goes up the north side of Dry Gulch.

History: Values on this claim were reportedly discovered by McCallister. A pocket said to have returned about $2,000.

Development: There is a large open cut about 40 feet long, about 12 feet wide at the widest part, and 15 to 20 feet deep near the face.

Geology: The country rock is altered andesite. As exposed in an open cut, a northwest-trending shear zone contains silicified and iron-stained rock with crushed material in irregular fissures. Some manganese stain and considerable gouge are present. This is thought to be in the same sheeted zone as the Snowstrom (Edson) deposit.

Report by: F.W.L., 1938.

MARION CLAIM (Gold, silver) Quartzville District

Owner: In 1921 held by Harry Dunlap, Gates, Oregon.

Location: Sec. 23, T. 11 S., R. 4 E., on the east side of Gassy Gulch near Dry Gulch. The claim is on a steep slope between elevations of about 2,500 and 3,000 feet.

Area: A fraction.

Development: The crosscut tunnel measured 45 feet.

Geology: There are two mineralized zones cut by a short crosscut tunnel. About 30 feet from the portal a lens is intersected which shows a small quantity of base-metal sulphides. At the face of the tunnel a narrow stringer pans free gold. The first vein is further explored by a surface shaft 10 feet deep, located just south of the portal of the tunnel. A sample of 10 inches of vein matter consisting of rusty quartz and altered country rock returned 0.22 ounce of gold and 0.34 ounce of silver to the ton.

Reference: Stowell, 1921.

MUNRO GROUP Quartzville District
(formerly Mayflower Group)

Owner: Glen Peck, Foster, Oregon.

Location: Sec. 23, T. 11 S., R. 4 E., on the west side of a ravine south of Dry Gulch, between the Lawler Group of claims on the west, and the Trillium (Golden Fleece or Makelim) Group on the east.

Area: Three claims and a fraction.

History: The deposit was discovered about 1890. The owner reports a production of about $1,500 (72.56 ounces) in gold, but there are no official records. A prospector's mill was operated by the owner in 1931; an old arrastre on the ground is largely dismantled.

Development: The total length of tunnel is about 480 feet, of which 263 feet is crosscut and 217 feet is drift.

Geology: Callaghan and Buddington (1938:109) describe the geology as follows:

> "A caved drift and a drift running S. 30° E. on a vein dipping 77° NE are on the east side of the ravine. A crosscut on the west side of the ravine

runs S. 41° W. under a group of tunnels 60 feet higher. The main tunnel of this group is a crosscut 40 feet long running S. 45° W. and a drift 96 feet long running S. 40° E., with two winzes about 20 feet deep. A short drift on a parallel seam lies 15 feet to the east. An inclined drift lies 100 feet northwest of these tunnels. An open cut on a vein trending N. 20° W. and a tunnel 15 feet long on a similar seam trending S. 36° E. are 40 feet apart and 800 feet southeast of the main workings. The country rock is largely altered and iron-stained andesite, but rhyolite occurs in the main crosscut. The vein matter is all iron-stained and leached and consists of brecciated, partly silicified country rock and sheeted zones of altered rock. Very little comb quartz and no sulphides other than pyrite were seen in place."

Reference: Callaghan and Buddington, 1938:109.

PAYMASTER CLAIM (Gold, silver, copper, lead, zinc) Quartzville District

Owner: Dave Maelkey, Foster, Oregon.

Location: SW¼ sec. 1, T. 12 S., R. 4 E., near the head of the west fork of McQuade Creek in the southeastern part of the district. It is reached by a trail branching south from the Chimney Peak Trail near the junction of the west fork with McQuade Creek. Outcrops on the property range in altitude from 3,650 feet to about 3,800 feet.

Development: The lineal footage is not known. In 1916 it was reported that there was a drift 130 feet long on a vein 14 inches wide showing heavy sulphides.

Geology: Mineralized zones in tuff and andesite strike northwest. These zones are characterized by altered and silicified country rock containing small quartz veins, with sulphides, a few inches wide. Five hundred feet S. 25° W. from the cabin is a zone of altered country rock with 4 to 8 inches of quartz, with sulphides. A sample by Stowell (1921) returned: gold, 0.04 ounce and silver, 0.86 ounce to the ton; copper, 0.5 percent; lead, 3.2 percent; and zinc, 4.0 percent. About 1,000 to 1,500 feet west of the cabin is the so-called main tunnel. Stowell reports a vein which may be a westerly extension of the vein just described. A 1-foot sample of quartz in the vein returned: gold, 0.76 ounce and silver, 1.94 ounces to the ton; copper, 0.10 percent; lead, 10.1 percent; zinc, 8.4 percent.

References: Callaghan and Buddington, 1938:109-110
Stowell, 1921
Parks and Swartley, 1916:178

PEAK AND DWARF CLAIMS (Gold) Quartzville District

Owner: John H. Peterson, Turner, Oregon.

Location: Half a mile northeast of Silver Signal mine, 3 miles north of Quartzville by trail.

History: Discovered and located in fall of 1937.

Development: Location work and four other shallow cuts. The claim is located at an elevation of 4,000 feet. Plenty of timber is available, but water will have to be developed.

Geology: A quartz vein in altered tuff strikes N. 45° W.

Report by: J.E.M., 1938.

RED HEIFER CLAIM (Gold, silver) Quartzville District
(formerly Silver Signal)

Owner: Eugene Wheeler, Foster, Oregon.

Location: Close to the line between secs. 14 and 23, T. 11 S., R. 4 E. The workings are on the north side of the ridge at Red Heifer Butte and 300 feet west of the Quartzville-Detroit trail. The workings are at an elevation of about 3,300 feet.

History: In 1921 the vein was reported to contain a high-grade ore pocket. The present owner has installed a small mill and is working the property in a small way (1938).

Development: There are two tunnels, one of which is caved, and several cuts. The upper or working tunnel, is a crosscut in about 60 feet. At about 50 feet there is a short drift to the southeast and a raise 30 feet high showing a vein about 3 feet wide.

Geology: The country rock is andesite. Vein material consists of comb quartz, stained with iron and manganese. As exposed in a cut above the mill, the outcrop shows crushed material, together with hard ribs of a silicified breccia in a shear zone. Specimens of vein matter on the dump of a caved tunnel were sampled by the U.S. Geological Survey party. Sulphides assayed 0.32 ounce of gold and 4.9 ounces of silver to the ton. Thoroughly leached material assayed 0.92 ounce of gold and 6.2 ounces of silver to the ton. In the present working tunnel a small stope about 10 feet long is being worked on a vein of iron-stained soft material and crushed quartz containing a seam of manganese oxide gouge.

Report by: F.W.L., 1938

Reference: Callaghan and Buddington, 1938:110-111

RELIEF PROPERTY (Gold, silver) Quartzville District

Owners: Aho Brothers, Foster, Oregon.

Location: W½ sec. 26, T. 11 S., R. 4 E., just south of and adjoining the Lawler ground. The Relief Camp is reached via the Green Mountain Forest Service trail at Canal Creek on the Quartzville road.

Area: 3 claims.

Development: Development work consists of about 140 lineal feet of tunneling on a steep slope at around 3,000 feet in altitude. The camp has a cabin and a small building in which a mill is to be placed.

Geology: Country rock is altered andesite. The vein is in a fracture zone and is explored by a tunnel 115 feet long. When driving the tunnel at a distance of 85 feet from the portal, the face, then about 8 feet wide, was said to assay 0.6 ounce of gold and 1.0 ounce of silver to the ton. Here a raise was started. The vein strikes N. 35° W. and dips 60° to 70° NE. At about 100 feet from the portal, a short crosscut about 15 feet long was driven to the southeast. The face of the tunnel is said to contain low-grade ore. Vein material consists of iron-stained and silicified altered rock with gouge seams and some disseminated sulphides, principally sphalerite.

Report by: F.W.L., 1938

RIVERSIDE GROUP (Gold, silver) Quartzville District
(formerly Spotted Fawn)

Owner: George Oakley, Foster, Oregon.

Location: Mainly in the E½ sec. 27, T. 11 S., R. 4 E., on the south slope of White Bull Mountain, and reached by about 2 miles of trail from the Lawler mine. Elevations of the workings range from about 2,500 to more than 3,000 feet.

Area: 4 claims.

History: The first location was made in 1912, and the property has been active in a small way continually since that time.

Development and equipment: There is a Gibson prospectors mill and an inclined plane about 700 feet long on about a 30° angle, upon which two homemade sleds are lowered in order to get ore to the mill. Besides several cuts there are 9 tunnels having a lineal footage of about 500 feet.

Geology: The vein consists of brecciated, altered andesite, with considerable iron-stained soft material and bunches of quartz containing sphalerite, pyrite, and galena. As exposed in the present working tunnel at about 3,000 feet elevation, the full width of the face of the tunnel is being mined. The tunnel trends N. 30° W. and follows a nearly vertical wall upon which there is a gouge seam 6 to 12 inches thick. The wall has vertical striations indicating post-mineral movement. The face of ore is said to assay from $8 to $50. A sample taken by Stowell (1921) in a lower tunnel, representing 4 feet of vein matter, assayed 1.32 ounces of gold and 0.98 ounce of silver to the ton.

Report by: F.W.L., 1938

References: Callaghan and Buddington, 1938:110
Stowell, 1921.

SAVAGE GROUP (Vandalia) (Gold, silver) Quartzville District

Owner: W. S. Risley, Albany, Oregon.

Location: Sec. 34, T. 11 S., R. 4 E., on the steep mountain side east of Savage Creek. The workings are reached by trail from the mouth of Savage Creek. Workings range from about 2,750 to 3,100 feet in elevation.

History: The property was discovered in 1900. Various owners have worked the ground according to Stowell (1921). In 1921 the Vandalia (2 claims) and the Golden West group of 5 claims made up the Montana Mining Company, an association of individuals, not a corporation. Their combined production was about $7,000. The present owner has built a small mill and worked the property in a small way since 1931.

Development: Six tunnels and various open cuts explore ore deposits on both groups. Lineal footage of tunnels totals about 600 feet. There is a caved shaft 80 feet deep besides several open cuts.

Geology: The country rock consists of andesites and tuffs. Vein matter occurs in shear zones 50 feet or more in width containing small, branching, siliceous veins of varying strike and dip, oxidized close to the surface only. On the Vandalia group, in the upper crosscut tunnel, a sample taken across 2½ feet of vein in the east drift returned: 0.16 ounce of gold and 0.74 ounce of silver to the ton, with traces of lead, zinc, and copper. Samples taken in other tunnels returned very low values in gold and silver. Pyrite occurs consistently but other metallic sulphides are distributed in small bunches. A tunnel on

the Golden West claim showed a 5-inch streak of rusty quartz, which returned 0.68 ounce of gold and 0.62 ounce of silver to the ton, and 3½ feet of mixed quartz and altered country rock, lying next to the rusty streak, assayed 0.36 ounce of gold and 0.34 ounce of silver to the ton. The drifts are close to the surface so that they develop little or no backs. A second short tunnel, a little lower in elevation, is on the same vein. A sample across 3 feet returned: gold, 0.14 ounce and silver, 0.36 ounce to the ton; copper, 0.25 percent; lead, 0.8 percent; zinc, 3.9 percent.

References: Callaghan and Buddington, 1938:110
Stowell, 1921

SKOOKUM CLAIM (Gold, silver) Quartzville District
(formerly Mammoth Reef)

Owner: Percy Calkins, Foster, Oregon.

Location: Near the line between sec. 14 and sec. 23, T. 11 S., R. 4 E., about 30 miles northeast of Foster, plus one mile of trail up Red Heifer Butte. The outcrop is at the top and on the north side of Red Heifer Butte, 600 feet west of the Quartzville-Detroit trail.

History: A valuable pocket of native gold was said to have been removed from this claim.

Development: Probably there are more than 600 lineal feet of tunneling besides several cuts at elevations ranging from 2,600 to more than 3,000 feet in altitude.

Geology: There is a northwestward-trending fractured zone in altered andesite and tuff; and, forming part of it, is a large quartz vein, or composite of smaller veins, which outcrops for a considerable distance on Red Heifer Butte and is said to be traceable across several claims. This vein has a regular and persistent hanging wall, dipping steeply to the northeast. At least four tunnels (three are now caved) were run on the north side of the zone. They explore the fracture zone, but the only evidence of ore is in a small caved stope near the face of the longest tunnel. Near the top of the Butte, a shaft (now caved), said to be 80 feet deep, was sunk in quartz on or near the hanging wall of the large quartz vein. In this shaft the rich pocket was supposed to have been found. The quartz is iron-stained, with some vugs. At the top of the mountain a shallow open cut has exposed a section of a white, iron-stained quartz vein about 10-15 feet wide containing a small amount of pyrite. A sample of this section returned 0.02 ounce of gold and a trace of silver.

Report by: F.W.L., 1938

Reference: Callaghan and Buddington, 1938:108

SNOWSTORM AND BELL CLAIMS (Gold, silver) Quartzville District
(formerly Edson Group)

Owners: Graves and Bush, Gates, Oregon.

Location: Sec. 22, T. 11 S., R. 4 E. The ground is crossed by the Quartzville road, and lies on the slope northwest of Edson (or Cannon) Gulch, tributary to Dry Gulch, the junction lying opposite the Lawler Mill. The property is between 2,400 and 3,000 feet in elevation.

Area: 2 unpatented claims.

History: The first discovery was made by Mr. R. Edson in 1897, and development work was done by him for several years. At one time the group consisted of five claims known as the Carbonate Group. Two claims have been relocated by the present owners and development work is being done in a small way.

Development: Lineal footage of tunnels is about 650 feet.

Geology: Country rocks are rhyolite, tuff, and andesite. The lowest tunnel, the Bell, was sampled by Stowell (1921). He found negligible gold values except in a 4-inch seam of quartz containing chalcopyrite. From this seam a sample assayed 1.72 ounces of gold and 33.3 ounces of silver to the ton. The tunnel is in a pyritic rhyolite breccia, cemented by quartz, and the zone of shearing appears to be about 70 feet wide, trending northwest. Other tunnels show a similar sheeted zone with sparsely disseminated pyrite and quartz stringers. Present work is in a short upper tunnel where the face shows a much-altered, brecciated zone with fractures containing soft, iron-stained gouge, showing considerable manganese stain and some crushed quartz. This face pans a small amount of free gold.

Report by: F.W.L., 1938

References: Callaghan and Buddington, 1938:111-112
Stowell, 1921

TILLICUM and CUMTILLIE CLAIMS (Gold, silver) Quartzville District
(formerly Makelim Group; Golden Fleece and Free Gold;
Advance Mining and Milling Company)

Owner: Frank Bevier, Foster, Oregon.

Location: SW¼ sec. 23, T. 11 S., R. 4 E., on the steep hillside between the Lawler and Albany groups, east of Monroe Mill, upper Dry Gulch; and reached by trail about 2 miles long from Frank Bevier's house in Dry Gulch.

Area: 2 claims.

History: The advance Mining and Milling Company owned 5 claims of the Makelim Group in 1916. The present owner has made his living from these claims since 1931, with a small 2-stamp water-powered mill.

Geology: The workings are mainly in iron-stained, altered rhyolite and andesite somewhat more than 3,000 feet in elevation. Considerable development work was done in the oxidized zone in early days, but much of this is now inaccessible. The present workings lie 100 feet below the old workings and total 300 feet. The working tunnel trends about N. 40° W., starting in altered andesite on the northeast wall of a dike of dark-colored rock, probably diorite. The tunnel has been driven over 125 feet on this wall, but at about 75 feet from the portal a branch of the tunnel crosscuts the dike and follows a soft seam paralleling the dike on the southwest side. The present face shows that this seam contains 8 to 10 inches of white gouge with black streaks of finely divided pyrite. Next to this seam is a soft brecciated mass, from 6 to 12 inches wide, made up of crushed rock and quartz in iron-stained gouge. This mass is wedge-shaped, came in from the bottom, and does not yet reach to the back. It pans a fair amount of free gold. Mr. Bevier believes this is the so-called Becket ledge, which was mined in the workings above.

Informants: Frank Bevier and J.E.M., 1938

Report by: F.W.L., 1938

References: Callaghan and Buddington, 1938:106
Parks and Swartley, 1916:7

WAKEFIELD - FRIES GROUP (Gold, silver) Quartzville District

Location: Sec. 15, T. 11 S., R. 4 E., at the head of Cedar Creek, a tributary of Canal Creek, and north of Quartzville. This group adjoins the Graves-Bush or Snowstorm group on the northwest.

Area: 2 full-sized patented claims (Mother Lode and Wakefield).

Development: There are several short tunnels and open cuts. Near the north end of the Wakefield claim, a crosscut tunnel bearing N. 35° E. is 125 feet long. Apparently no work has been done since patenting.

Geology: The country rock consists of rhyolite and andesite. There are considerable widths of brecciated country rock cemented by quartz veinlets, showing comb structure. Sulphide minerals are scanty. Structure and mineralization are similar to that of the Snowstorm (or Edson) group adjoining on the southeast.

Reference: Stowell, 1921

WHALE CLAIM (Gold, silver) Quartzville District

Owner: Edward Austin, Foster, Oregon.

Location: NW¼ sec. 23, T. 11 S., R. 4 E., on the south slope of Red Heifer Butte and west of the Red Heifer and south of the Skookum claims. The property is reached by a trail leading up the slope from a point near the end of the Quartzville road.

Development: Two small open cuts on a steep slope about 3,000 feet in altitude.

Geology: A silicified fractured zone is exposed in two open cuts about 400 feet apart. In the first open cut near the trail from the Quartzville road, there is a silicified rhyolite breccia containing quartz and iron-stained soft material about 18 inches wide said to contain free gold. The outcrop of this vein has in places resisted erosion to a greater extent than the surrounding rock so that it is a prominent feature of part of the slope. The second open cut shows bunches of quartz containing sulphides, mainly sphalerite, and said to assay well in gold and silver.

Report by: F.W.L., 1938

WINTER CLAIM Quartzville District
(formerly Newport)

Location: Near the south edge of sec. 26, T. 11 S., R. 4 E., on the south bank of Gold Creek, half a mile from the mouth, across from Winter's cabin.

Development: An open cut 27 feet wide and a tunnel 54 feet long with a crosscut 27 feet to the east have been made in andesite on the south bank, across from the cabin.

Geology: The vein trends S. 35° E., and the various gouge seams dip steeply both to the northeast and the southwest. Some of the lenses of sulphides are 6 inches wide but seem to be confined to the bank of the stream, for the crosscut reveals gouge seams and breccia but no sulphides. Altered rock and some sulphides occur on the north bank. Sphalerite is the principal sulphide, but there is considerable galena, pyrite, and a few small lumps of chalcopyrite. The gangue consists of coarse quartz, angular lumps of sericite, ankerite veinlets later than the sulphides, and a few tabular crystals of barite in vugs in ankerite.

Reference: Callaghan and Buddington, 1938:112 (Not visited by Department.)

WORLD'S FAIR CLAIM (Gold, silver) Quartzville District
(Wire Gold Claim)

Owner: Lance Stewart, Gates, Oregon.

Location: Near the line between secs. 23 and 26, T. 11 S., R. 4 E., in the gulch south of the Tillicum claim.

History: Several thousand dollars in gold is reported to have been taken from an open cut in the gulch south of the Golden Fleece (Tillicum) claim.

Geology: Presumably the same as for the other properties in the district.

Reference: Callaghan and Buddington, 1938:112

Miscellaneous

JORDAN COAL LOCALITIES

Owners: James and Emma Vasek, St. Benedict Abbey of Mt. Angel, Jos. Folts, Jungwuth Estate, Charles H. Salzl, Charles H. Fulz, Annie Thomas, and Alice C. Burton.

Location: Secs. 2, 4, 8, 9, 10, 12, and 16, T. 10 S., R. 1 E., on Thomas, Bilyeu, and Neal creeks.

History: Throughout the seven sections listed above, coal seams of varying thickness have been found at various depths in wells dug for water. About thirty years ago, a seam, which is said to have been exposed in the bluff north of the Jungwuth place about half a mile due east of Jordan on the south side of Thomas Creek, was mined for use in a blacksmith shop. In 1939 considerable work was done to develop the seams on the Vasek property and a ton or two was mined and used at the ranch.

Development: So far as determined, there has been no development work beyond the various wells mentioned above (most of them drilled, so that no accurate data could be obtained), the old workings which could not be found on the south side of Thomas Creek, and various open cuts on the Vasek property.

Geology: The entire area is underlain by coarse to medium-grained yellow tuffaceous sandstones, either well-bedded or massive. These are correlated with the Mehama volcanics (Thayer, 1939), lying a mile to the north. The sandy tuffs at the Vasek place show gentle dips, mostly to the west. The Mehama anticline probably lies just east of the four sections covered.

The Mehama volcanics are intruded by basalts, in two localities ($NE\frac{1}{4}$ sec. 10 and $SW\frac{1}{4}$ sec. 4). The intrusives may be either interbedded or subjacent flows. In the $NE\frac{1}{4}$ sec. 8, vesicular lava also appears on the west side of an open cut near its mouth. Capping the flat-topped ridges, which lie about 250 feet above the streams, are weathered gravels from a few feet to fifty feet in thickness. Recent alluvium forms the lowland valleys. The profiles are composite, with youthful uplands and mature stream-valleys.

Description of localities: Three open cuts which expose coal are located in the bed of a small northwest-flowing tributary which enters Thomas Creek near the center of sec. 8, T. 10 S., R. 1 E. Using Greens Bridge, near the junction of Neal and Thomas creeks, as a base level, these cuts lie at elevations of 150 to 175 feet. The main cut runs N. 70° E. from the creek bed for 90 feet into the hillside, with a face which if cleaned would be about

18 feet high. This cut ran in along the top of the coal, exposing it to a maximum observed thickness of 3 feet. The coal is now covered due to caving, but is said to have a maximum thickness of 6 feet near the face. Sample A was taken from the west side of the cut, across 18 inches, at a point 30 feet from the mouth of the cut. Two other cuts lie about 100 feet upstream from the main cut and expose from 6 inches to more than 2 feet of coal (Sample B was taken from across this 2 feet).

In the bed of the creek another 100 feet upstream an outcrop of coal at least one foot thick lies under water. Sample C was taken from coal in a shed on the James Vasek place. This coal was said to have come from this outcrop.

Samples A, B, and C were taken from the James Vasek place, NE¼ sec. 8, T. 10 S., R. 1 E., February 4, 1940, by John Eliot Allen; and analyzed by the U.S. Bureau of Mines, Seattle, Washington, March 4, 1940. Analyses of these samples of coal are as follows:

Sample A

	Moisture	Volatiles	Fixed Carbon	Ash	Sulfur	B.t.u.
As received	40.5	13.4	8.9	37.2	0.4	
Air dried	19.3	18.1	12.1	50.5	0.6	
Moisture free		22.4	15.0	62.6	0.7	
Moisture and ash free		59.9	40.1		2.0	

Sample B

	Moisture	Volatiles	Fixed Carbon	Ash	Sulfur	B.t.u.
As received	37.9	15.8	10.5	35.8	1.6	
Air dried	15.3	21.6	14.3	48.8	2.3	
Moisture free		25.5	16.9	57.6	2.6	
Moisture and ash free		60.2	39.8		6.1	

Sample C

	Moisture	Volatiles	Fixed Carbon	Ash	Sulfur	B.t.u.
As received	24.0	34.9	30.2	10.9	3.3	8,210
Air dried	9.0	41.8	36.1	13.1	4.0	9,830
Moisture free		45.9	39.7	14.4	4.4	10,800
Moisture and ash free		53.7	46.3		5.1	12,620

The ash content of A and B was so high that the calorific value was not determined.

Other localities in T. 10 S., R. 1 E., where evidences of the occurrence of coal were observed or reported are: near the center of SE¼ sec. 9 in the bed of Bilyeu Creek (less than 3-inch, nearly horizontal seam of coal in north bank); in the southwest corner of SE¼ sec. 10 in the bed of Neal Creek (seam of coal, which was under water when visited, reported to be 6 inches thick); SE¼ sec. 4 in face of bluff on south side of Thomas Creek (the old workings on a good seam reported to have produced coal 30 years ago could not be located); near the center of NE¼ sec. 9 200 feet north of the road a 3-inch seam of coal in massive tuffaceous sandstone; log of well behind the Parish house north of the center of sec. 9 showed 1 foot of coal at a depth of 117 feet; near section corner between secs. 1, 2, 11, 12 (coal reported to be exposed in bed of Thomas Creek); and center of N½SE¼ sec. 16 on Burton Ranch (coal said to have been struck in well at a depth of 28 feet).

Well logs in T. 9 S., R. 1 E., had showing of coal as follows: Mike Fink property, sec. 34, in well located 50 feet above Thomas Creek (well 14 feet deep, 2 feet of coal in the bottom) and the Daugherty property, sec. 33, in well 10 feet deep with coal for the last 3 feet.

The coal is lignite with interbeds of clayey carbonaceous material. Maximum thickness of coal is about 3 feet. The elevation of the various coal horizons vary greatly and no ocrrelation was attempted. Apparently the deposits consist of small lenses, rather than one continuous horizon.

Report by: J.E.A., 1940

Reference: Thayer, 1939

MARION COUNTY

Geography

Marion County, located largely within the Willamette River Valley with a narrow extension eastward to the summit of the Cascade Range, comprises an area of 1,173 square miles. The Willamette River forms the western boundary of the county; the North Santiam River its southern boundary; and the Pudding River and one of its tributaries, Butte Creek, a part of its eastern boundary. Salem, situated on the Willamette River, is the county seat and the state capital.

The northern portion of Marion County lies on the broad valley plain and terraces of the Willamette River. The valley plain near Salem is about 200 feet above sea level. South of Salem the valley is constricted by the Salem and Waldo hills, which can be considered as a part of the foothills of the Western Cascade Range. The maximum elevation of the Salem Hills is slightly above 1,100 feet and that of the Waldo Hills is about 900 feet. According to Thayer (1939:3) elevations in the Western Cascade Range average between 4,500 feet and 5,000 feet. The Western Cascades are quite rugged with narrow ridges and valleys. To the east in the High Cascades elevations average between 5,000 and 7,000 feet with isolated higher peaks. The topography of the High Cascades is characterized by steeply sloping volcanic peaks projecting above a generally plateaulike divide with glaciated dip slopes and U-shaped valleys.

The main drainage channels are the North Santiam River and the Pudding River, together with their tributaries, which flow in an easterly and northerly direction, respectively, into the Willamette River. A minor portion of northeastern Marion County is drained by the Clackamas and Collawash rivers.

The principal industries are agriculture, dairying, and forestry. The mineral resources consist of gold, silver, copper, lead, zinc, coal, clay, ferruginous bauxite, tuff, sand, gravel, and crushed rock.

Geology

The known formations exposed in Marion County range in age from Eocene to Recent. The Eocene rocks are mainly lavas with some minor occurrences of marine sediments. Oligocene to Miocene lavas and pyroclastics comprise most of the Western Cascade Range, and Oligocene marine sediments and associated terrestrial volcanics and pyroclastics underlie middle Miocene basaltic lavas in the western part of the Western Cascade Range. The middle Miocene lavas are in places overlain by Pliocene pyroclastics. Pliocene to Pleistocene lavas constitute the High Cascade Range. Pleistocene glacial and alluvial deposits and Recent alluvial deposits lie within the Willamette Valley and the valleys of other main streams.

The Pre-Butte Creek lavas mapped by Harper (1946) and the marine sandstone associated with these lavas along Butte Creek have been assigned to the Eocene. Rhyolites outcropping along the North Santiam River and near Fox Creek in the Breitenbush River were considered as being Clarno age (Eocene) by Thayer (1939).

Oligocene marine tuffaceous sandstone outcrops along the western edge of the Salem Hills and in places in the Waldo Hills. These sandstones were named the Illahee formation by Thayer (1933). The Butte Creek beds of Harper (1946) consisting of marine tuffaceous sandstones interfingering with terrestrial tuff, breccias, and lavas occurring in the vicinity of Scotts Mills are probably equivalent to the Illahee. The Illahee appears to be equivalent in composition and age to Eugene or Pittsburg Bluff formation. Thayer (1939) states that the Illahee grades eastward into the terrestrial Mehama volcanics. Lowry (1947:5) indicates that the Mehama volcanics may prove to be older than the Illahee.

Unconformably overlying the Illahee formation are the Stayton lava flows which are equivalent to the Columbia River lava of the middle Miocene. These flows are mainly medium to dark gray basalts. The Stayton lavas in the eastern part of the Waldo Hills according to O'Neill (1939) are overlain by the Fern Ridge tuffs, which were tentatively assigned to the Pliocene.

Along the North Santiam River from Mill City to Detroit, the Oligocene to Miocene Sardine series consisting of rhyolitic and andesitic tuffs and the Breitenbush tuffs are exposed. Farther eastward in the High Cascade Range, Thayer (1939) has mapped three Pliocene to Pleistocene volcanic series separated by erosional unconformities. They are in ascending order: the Outerson volcanics consisting of agglomerates, breccias, and tuffs; the Minto lavas; and the Olallie lavas and Santiam basalts consisting of basaltic and andesitic flows and olivine basalt flows, respectively.

Several areas of dioritic intrusives occur in the Cascades in Marion County, particularly those in the North Santiam district. According to Callaghan and Buddington (1938:2) the age of the mineralization in the Cascade Range is probably upper Miocene and is genetically related to these intrusives. Baldwin (1947:35-37) presents evidence that indicates the dioritic intrusives of the Cascade Range are possibly of upper or late Oligocene age. The exact age of the intrusives is uncertain.

Chalcopyrite, sphalerite, pyrite, galena, and gold are the principal metallic minerals occurring in the fissure veins in the North Santiam district. Coal occurs west of Scotts Mills and in the Waldo Hills. Ferruginous bauxite occurs mainly as float in the Salem and Eola hills and in sec. 1, T. 9 S., R. 2 E., northeast of Mehama. A deposit of tuff near Mount Angel was quarried in the early 1900's and was used on a small scale as a building stone. In 1949 building blocks were being produced by the Tuff Stone Company from a tuff deposit in sec. 29, T. 8 S., R. 1 E., about six miles northeast of Sublimity.

North Santiam District

Location

The center of the district is about 50 miles southeast of Salem, and 23 miles by road east of Mehama, on the Little North Santiam River. Most of the mines are in T. 8 S., Rs. 4 and 5 E., in Marion County; the Ogle Mountain group lies over the divide in the Molalla River drainage in Clackamas County to the north. A few properties lie outside this area in T. 7 S., R. 4 E., and T. 9 S., Rs. 3 and 6 E. The road up the Little North Santiam River goes through the center of the district, formerly called the Lester Mining district, and the eastern part of the district, formerly called the Mineral Harbor mining district. Other properties are reached only by trail.

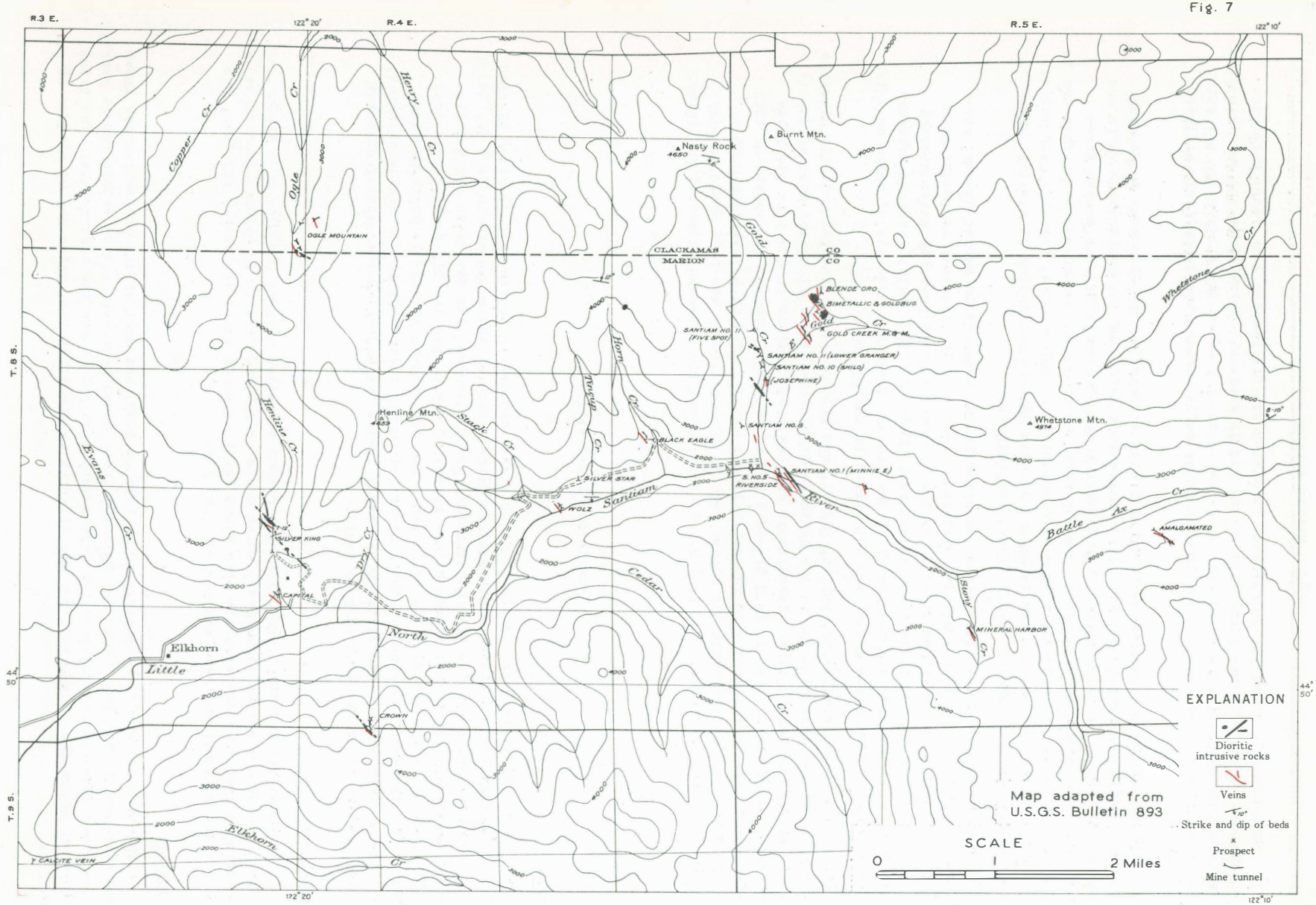
Topography

The district is very rough, with high relief and steep slopes. Summits rise 2,000 feet from the Little North Santiam River, which drops over 1,400 feet in 12 miles. Elevations of the ridges and peaks are commonly over 4,000 feet. Several peaks are over 4,600 feet, and Battle Axe Mountain has an elevation of 5,547 feet.

History

The district was first discovered in 1896 or 1897, and most of the properties now known had been located by 1903. Only the Ruth and Crown mines have been active within recent years, and future development will probably depend upon high prices for the base metals. The total recorded production (1896-1947) for the district is about $25,000, which may be divided as follows:

Fig. 7



NORTH SANTIAM DISTRICT, MARION AND CLACKAMAS COUNTIES, OREGON.

Sketch map showing location of mines and prospects, veins, and dioritic intrusive bodies.

Gold	454 ounces
Silver	1,412 "
Copper	41,172 pounds
Lead	40,700 "
Zinc	110,063 "

Geology and mineral deposits

Unlike other Cascade areas, lavas, particularly light-colored andesites and rhyolites, predominate over fragmental rocks. The lavas probably belong to the Oligocene-Miocene Sardine series of Thayer (1939:8-9) and are intruded by small dacite-porphyry dikes and plugs. One quartz-diorite body occurs at the Crown mine, and larger unexposed intrusions are indicated both by the large areas of contact metamorphic hornfels and by the zoning of the mineralization. This areal zoning is better developed in the North Santiam district than elsewhere in the Cascade Range. The chalcopyrite veins along the river from the Crown mine to the Santiam form the central group. This is succeeded in the section up Gold Creek by the pyrite veins; and that in turn by the complex sulphide veins in the Blende Oro and, farther east, in the Ruth mines. The complex sulphide veins carry sphalerite, with variable amounts of galena and chalcopyrite. Outer limits of mineralization are represented by the calcite vein on Elkhorn Creek and the Ogle Mountain mine.

Figure 7 on opposite page shows the principal mines, prospects, veins, and dioritic intrusive bodies in the North Santiam District.

Mining Properties

BIMETALLIC AND GOLDBUG CLAIMS (zinc, copper) North Santiam District

Owner: John Hart heirs.

Location: In unsurveyed sec. 18, T. 8 S., R. 5 E., Marion County. These claims are reached by a trail about 2 miles long from the Little North Santiam road at Gold Creek.

Area: 2 claims.

Development: The Bimetallic tunnel is 290 feet long, and the Gold Bug tunnel 170 feet.

Geology: On the west side of the north branch of the east fork of Gold Creek the Bimetallic tunnel follows the vein which trends N. 30° W. and dips 80° SW. The country rock is diorite, with considerable sericite near the vein. Vein material consists of brecciated country rock, vuggy quartz, and the usual sulphides, especially chalcopyrite, with pyrite predominating.

The Gold Bug tunnel on the east side of the creek is presumably on the same vein which has a strike of S. 40° E. and is nearly vertical. The vein matter consists of brecciated andesite, in places 2½ feet wide, with lenticular streaks of quartz 1 to 10 inches thick, containing some sulphide, principally sphalerite and pyrite.

Reference: Callaghan and Buddington, 1938:89

BLACK EAGLE MINE (Gold, lead, copper) North Santiam District

Owner: John Hart heirs.

Location: Sec. 24, T. 8 S., R. 4 E., on the west side of Horn Creek, on the Little North Santiam road.

Area: 11 claims (in 1916).

History: In 1916 the property was owned by the Black Eagle Mining and Milling Company.

Development: About 1,000 lineal feet has been driven in the main tunnel, 400 feet of which is on the principal vein. In addition there are several short tunnels and open cuts. In 1916 a saw mill, power plant, bunk houses, and concentrating mill were on the property. The portal, which is now caved, is in gravels.

Geology: Country rock is andesite. The main vein strikes N. 45° W., with varying steep dips. Vein matter exposed in a shoot 85 feet long consists of silicified greenish andesite breccia cemented by quartz which contains chalcopyrite with very little galena. There has been oxidation to form limonite, malachite, azurite, and chrysocolla, the last showing in openings 3 or 4 inches in diameter. A stope 20 feet square and 20 feet high shows several parallel veins, the principal one of which is 2½ feet wide with an additional 7 feet of low-grade material.

References: Callaghan and Buddington, 1938:89-90
Parks and Swartley, 1916:33-34

BLENDE ORO CLAIMS (Gold, silver, zinc, lead, copper) North Santiam District

Owner: J. P. Dobell, 405 N. 4th Avenue, Corvallis, Oregon.

Location: NE¼ sec. 8, T. 8 S., R. 5 E., at an elevation of about 2,700 feet on the north branch of the east fork of Gold Creek. The claims are 2 miles by trail from the Little North Santiam road at the mouth of Gold Creek, which is 25 miles east of Mehama. The main tunnel is about 300 feet north of the Bimetallic.

History: The Blende Oro claims were located about 40 years ago by John Hart who, with his brother, did most of the development work.

Development: The main tunnel follows the vein N. 10° E. for about 215 feet. Seven hundred feet up the hill north of the main tunnel a 40-foot drift has been driven due north along a 3- to 5-foot vein of sericite gouge containing disseminated sulphides.

Geology: According to Callaghan and Buddington (1938:90):

> "The country rock, probably originally a tuff, has been altered to a mass of sericite and cherty quartz with disseminated pyrite. The vertical vein consists of this altered country rock with sulphides either irregularly disseminated, in bunches, or in bands. The material with considerable sulphides ranges from 12 to 65 inches in width and forms an ore shoot over 100 feet long. Sphalerite, pyrite, galena, and chalcopyrite are present, with sphalerite - a light resinous variety - predominating. All the sulphides occur as well-defined crystals lining vugs; some of the sphalerite crystals are over an inch in diameter. In places there are lumps of nearly solid sphalerite over 6 inches thick. Galena is scattered through the more massive parts of the vein. Chalcopyrite is disseminated in the massive parts of the vein or occurs in bunches or in well-formed sphenoids on the surfaces of quartz and sphalerite crystals. A very little calcite and pyrite occur on the surfaces of the other crystals."

The country rock is broken by three sets of fractures: a nearly vertical, main vein set which strikes about N. 10° E.; a second set striking N. 30° W.; and a third minor set of small and only slightly altered (sericitic) fractures striking N. 30° E. From the spacing of the fractures, it appears probable that the vein makes another jog to the N. 30° W. within a few feet of the face of the present tunnel.

Pyrite is widely disseminated along the main fractures in zones as much as 6 feet wide. Sphalerite seems to be more or less restricted to irregular lenses, which appear widest near the bends in the main vein. Some of these high-grade ore lenses are tens of feet in length and 2 or 3 feet in width but the average is less. Visual inspection of the high grade suggests a grade of perhaps 20 percent ZnS, 10 percent FeS, 3 percent $CuFeS_2$, with a gangue of quartz (often vuggy), silicified and brecciated country rock (altered tuff), and sericite gouge. Only traces of galena were noted. About 5 tons of high-grade ore from the 200 odd feet of development lie on the dump.

A vein exposed in the 40-foot drift north of the main tunnel has well-defined walls dipping 70° W. A large lens of quartz containing a high percentage of sphalerite was encountered a few feet from the mouth of the tunnel. Ore from this lens is said to have been mined from a winze (now filled). This vein is probably separate from that on the lower level and more or less parallels it on the west.

Report by: J.E.A., 1941

Reference: Callaghan and Buddington, 1938:90

BUECHE GROUP (Gold, silver, lead, zinc) North Santiam District

Owners: J. P. and B. E. Hewitt, Mehama, Oregon.

Location: NE¼ sec. 28, T. 8 S., R. 5 E., west of the Ruth Group, on Battle Axe Creek, half a mile above its mouth.

Area and history: The Bueche group of 40 claims was located in 1929 by Fred and Herman Bueche, and later purchased by the Hewitts.

Development and geology: The main workings consist of two drifts located on the Goodhope claim on both sides of Battle Axe Creek, only a few feet above creek level. The tunnel on the north side of the creek runs N. 30° W. for 90 feet, and N. 65° W. for 55 feet, on a vertical vein from 1 to 5 feet wide, containing numerous stringers of quartz and some sulphides. There are two short tunnels across the creek, their mouths being about 20 feet apart. A third caved tunnel lies 80 feet downstream to the southwest. The easternmost tunnel runs S. 50° E. for 50 feet on a vein which is 8 inches to a foot thick and dips 80° S. The center tunnel is 10 feet higher than the eastern one and runs S. 30° E. for 30 feet, then S. 85° E. for 25 feet to a vein 4 feet wide which strikes N. 42° W. and dips 75° W. A sample taken across this vein assayed 3.4 percent Zn. Still another vein on the Bueche group outcrops 700 feet west of the above on the road to the No. 5 level of the Ruth, about 300 feet east of the road forks. A sample from this vein, which consists of 3 feet of pyritized gouge striking N. 30° W. and dipping 70° SW. gave 0.4 percent Zn.

Report by: J.E.A., 1941

CAPITAL CLAIMS (Gold, silver, lead, copper, zinc) North Santiam District

Location: Across the section line between SW¼ sec. 28 and NW¼ sec. 33, T. 8 S., R. 4 E. The main tunnel is on the west side of Henline Creek, just above water level, at a point 100 feet below the bridge on the Little North Santiam River.

Area: Township plats of 1893 show one claim patented as the Capital Consolidated; maps in the Cadastral Engineers office at Portland show two claims, the Governor Chadwick and the King Lode.

History: These claims are reported to have been among the first patented claims in this part of Oregon, located by Governor Chadwick, whose term of office was 1877-78. A shipment of ore from this claim is said to have been made to Swansea, Wales.

Development: The tunnel at creek level runs N. 55° W. for 200 feet, to a winze at least 25 feet deep, then N. 75° W. for 125 feet to the face. There is a short 20-foot stope 55 feet from the portal and a 30-foot raise 20 feet from the face. A shaft is reported to have been dug elsewhere on the property.

Geology: The andesite country rock is cut by branching veins which are followed by the tunnel, and dip steeply to the south. In the stope 50 feet from the portal one vein 30 inches wide is separated by 5 feet of altered country rock from another vein from 15 to 24 inches thick. Both veins converge farther in the tunnel. The vein matter consists of a breccia of silicified andesite, charged with sericite and mesitite, an iron magnesium carbonate, and cemented with stringers and reticulating veinlets of quartz with sulphides, chiefly sphalerite. One streak of almost solid sphalerite 3 inches wide appears. There is a small amount of galena and chalcopyrite. Between about 150 and 175 feet from the portal the tunnel passes through coarse gravels, representing a deep narrow pre-glacial channel of Henline Creek.

Report by: J.E.A., 1941.

Reference: Callaghan and Buddington, 1938:91

CLACKAMAS MINING & MILLING COMPANY North Santiam District

Owner: E. H. Carleton, Canby, Oregon, president (1916).

Location: Sec. 10, T. 8 S., R. 4 E., near the Ogle Mountain mine on the north side of Henline Mountain.

Development and geology: Developed by a few short tunnels and open cuts. Country rock and ore reported to be similar to that at Ogle Mountain mine.

Reference: Parks and Swartley, 1916:56.

CROWN MINE (Gold, silver, copper) North Santiam District

Owner: Crown Mining and Milling Company. David Schrock, Tangent, Oregon, president (1941).

Location: SE¼ sec. 33, T. 8 S., R. 4 E., and extending into T. 9 S., R. 4 E., on the steep northern slope of the ridge between the Little North Santiam River and Elkhorn Creek, and about 21 miles by road east of Mehama. A trail extends to the workings from a branch of the main road at the river.

Area: Ten claims.

Development: There are about 1,000 feet of crosscut and drift on the main level and some short tunnels and cuts on the surface. Most of the development work was done in the four years prior to 1927.

Geology: Country rock is andesite. The main crosscut tunnel cuts several veins and fractures of altered andesite, tuff, volcanic breccia, and rhyolite near the contact of an intrusive mass of quartz diorite. There are also dikes of porphyritic diorite and hornblende biotite andesite. The veins are lenticular masses of brecciated altered country rock, with chalcopyrite lining vugs and in veinlets. Fracturing is generally northwesterly. In places malachite and chrysocolla have been deposited.

From north to south the veins cut by the main crosscut and explored by short drifts are described by Callaghan and Buddington (1938:91-92) as follows: No. 1 vein, 35 feet from the portal of the crosscut, strikes N. 80° W. and dips 70° NE. and, as exposed in a drift, consists of seams from 2 inches to 1 foot in width with almost no sulphides; the Blind vein, 85 feet from the portal of the crosscut, consists of an altered zone 6 inches to more than 1 foot in width; the Salem vein consists of a seamy brecciated zone with a little chalcopyrite and pyrite; another altered zone (thirteen-foot vein) consists of gouge seams in altered rock through a width of ten feet and strikes N. 60° W; the Blackwall vein is a seam of brecciated altered rock; and a broad altered and sheared zone (Winze vein), which is explored in the main drift near the end of the crosscut, contains a short lens of silicified country rock with seams of vuggy quartz, chalcopyrite, and a little sphalerite.

The following assay results were reported by Callaghan and Buddington (1938:93):

Assays of Samples from the Crown Mine

	1	2	3	4	5	6
Width - inches	Stringers	Selected	18.	6.	----	12.
Gold - ounces to the ton . .	0.10	0.06	0.03	0.22	0.08	0.08
Silver do	2.76	.90	.68	1.80	.90	1.60
Copper do	1.11	1.93	1.93	4.24	2.31	6.26

Note: Samples 1 and 2 are from Blind vein, 3 from Blackwall vein, 4 from Thirteen-foot vein, and 5 and 6 from Winze vein.

References: Callaghan and Buddington, 1938:91-93
Parks and Swartley, 1916:83-84

DUNLAP MINE (Gold, silver) North Santiam District

Owners: Harry Dunlap, Medford, Oregon, and W. F. White.

Location: Near the center of the N½ sec. 9, T. 9 S., R. 6 E., just north of the saddle immediately north of Gold Butte, and above the road to the lookout at Gold Butte at an elevation of from 4,000 to 4,200 feet.

History: A claim, the Greenback, was first located in 1904, and apparently had a small production from the stamp mill some time within the last ten or fifteen years.

Development and geology: A 40-foot crosscut tunnel runs due east, at a point on the south side of the ridge, only 1,000 feet north of the Gold Butte Lookout. A drift 10 feet from the face runs 25 feet north and 10 feet south on a vertical red cherty quartz zone from 6 to 18 inches wide, which contains sparse, partially oxidized sulphides and some comb quartz. The country rock is a gray andesitic tuff. About 300 feet farther north the location cut is in silicified andesite tuff; and over the ridge 500 feet farther north there is a 30-foot slope running down 35° in a S. 30° W. direction; and a tunnel 70 feet west of the slope extends about 30 feet in the same direction. Both lie about 100 feet in elevation above

a 1-stamp mill, run by a small gas engine and supplied by water from springs above the mill. A sample of ore from the storage bin, assayed in the Department's laboratory, ran 0.19 oz. gold and 0.62 oz. silver.

Report by: J.E.A., 1945

ELKHORN CREEK PROPERTY

North Santiam District

Location: SE¼ sec. 1, T. 9 S., R. 3 E., on the south side of Elkhorn Creek and reached by trail from the Elkhorn School over a series of terraces on the south side of the Little North Santiam River. The Elkhorn School is about 15 miles east of Mehama.

Geology: Country rock is andesite. The vein striking S. 65° W. consists of fragments of altered andesite cemented to calcite in places over 1 foot wide. Veinlets of cherty quartz occur in the calcite. Tetrahedrite has been reported but no metallic minerals were observed by the U.S. Geological Survey examining party.

Reference: Callaghan and Buddington, 1938:93

GOLD CREEK MINING AND MILLING COMPANY (Gold, silver, copper, lead, zinc)

North Santiam District

Owner: Gold Creek Mining and Milling Company, Otto Hansen, Salem, President (1916).

Location: On the east fork of Gold Creek about half a mile northeast of the forks and nearly 1½ miles by trail from the road at the mouth of Gold Creek. It is reported to be in sec. 18, T. 8 S., R. 5 E.

Area: In 1916 consisted of 17 claims.

Development: A crosscut tunnel has been driven in northerly direction about 1,500 feet and was intended to reach the downward extension of the Wall Street vein exposed 600 feet higher, but this would require 500 feet more of crosscutting.

Geology: The country rock exposed in the long crosscut is altered andesite containing disseminated pyrite. Several small veins 6 to 18 inches thick containing quartz, calcite, brecciated andesite with pyrite and chalcopyrite are exposed. A higher tunnel, the Wall Street, follows a vein one foot to several feet wide containing pyrite, chalcopyrite, galena, and sphalerite.

References: Callaghan and Buddington, 1938:93-94
Parks and Swartley, 1916:104

GREENHORN PROSPECT

North Santiam District

Location: Sec. 6, T. 10 S., R. 6 E., near the top of the ridge in the headwaters of McKay Creek about 2 miles east of Detroit. Reached by 1 mile of trail from the highway a mile east of Detroit.

History and development: The property was located prior to 1902 by W. J. Smith. Stafford (1904) reported that it was a "large free-milling deposit," with "120 feet of working tunnel and many open outs." Local information records an inclined shaft 20 feet deep in talc, as well as tunnels.

Miscellaneous: This property was not visited by the Department. According to Thayer (1939), it lies in Breitenbush tuffs.

Informant: C. C. Giebler, Breitenbush.
References: Stafford (1904)
Thayer (1939)

HUMBUG MINING AND MILLING COMPANY — North Santiam District

Old name: Breitenbush Mining Company.

Location: Near the center of sec. 8, T. 9 S., R. 6 E., about 3 miles by road north of Breitenbush River, on the north side of Humbug Creek, just west of the junction of the Dunlap Lake branch of the creek.

Miscellaneous: This property was not visited by the Department. It is reported to have several tunnels and open cuts. Stafford (1904) reported that it had "base ore carrying copper." According to Thayer (1939) it lies in the Breitenbush tuffs.

Informant: C. C. Giebler, Breitenbush.

References: Stafford, 1904
Thayer, 1939

MINERAL CUT PROSPECT — North Santiam District

Location: SE¼ sec. 7, T. 10 S., R. 5 E., below the railroad grade, just above the North Santiam River level, and reportedly about 1/3 mile south of Whitman Creek bridge, below the first large railroad cut, and just south of a siding.

History and development: Stafford (1904) reported that this property was opened by surface cuts and one 100-foot tunnel.

Geology: This property was not visited by the Department. According to Thayer, the locality is in diorite porphyry. Stafford says, "The ore is base."

Informant: C. C. Giebler, Breitenbush.

References: Stafford, 1904
Thayer, 1939

MINERAL HARBOUR GROUP (Gold, silver, copper, zinc) — North Santiam District

Owner: Amool Mining and Milling Company.

Location: Mostly in secs. 29 and 32, T. 8 S., R. 5 E., but extending into secs. 30 and 31, on the south side of the Little North Santiam River, around the drainage basin of Stony Creek. The trail to the cabin leaves the Little North Santiam road 1½ miles east of the Mouth of Gold Creek.

Area: 30 claims.

Development: A caved tunnel on the Black Prince claim is located on a small creek west of Stony Creek, about 550 feet above the river. It runs S. 40° E. about 30 feet to the cave. A tunnel on the King No. 4 claim is located ¼ mile to the southeast on the east side of Stony Creek, about 200 feet higher in elevation, and runs S. 40-70° E. for about 45 feet.

Geology: The country rock is spotted hornfels, or andesite modified by contact metamorphism. The Black Prince tunnel exposes a band of cherty quartz and sericite 10 feet wide, with quartz veinlets containing specularite, chalcopyrite, sphalerite, and a little galena. A 7-foot sample on the west side of the tunnel (No. 1) and a 5-foot sample on the east side of the tunnel (No. 2) assayed by the Department as follows:

	Au (oz.)	Ag (oz.)	Zn (percent)	Cu (percent)
No. 1	.01	Trace	0.8	0.0
No. 2	Trace	0.0	0.8	0.2

A massive quartz vein containing chalcopyrite and pyrite exposed in the tunnel on the King No. 4 claim strikes N. 80° W. and dips 80° S. A channel sample across a width of 10 inches assayed by the Department gave 6.5 percent Zn and 0.2 percent Cu.

Report by: J.E.A., 1941

Reference: Callaghan and Buddington, 1938:94

MOLALLA RIVER GROUP — North Santiam District

Location: NW¼ sec. 12, T. 7 S., R. 4 E., Clackamas County, on a branch of the Table Rock Fork of the Molalla River, mostly on the west side of the creek. The claims are best reached from the trail which crosses the Table Rock Fork at the mouth of Camp Creek, by going south up the ridge to the section line marked between secs. 1 and 12, and following the line east down the hill. A Pope and Talbot Lumber Company road now goes up the river beyond the mouth of Camp Creek.

Area: Two claims, surveyed in 1924 (?) the Alis Volat Propriis and the Second Chance, trend N. 30° E. along the west side of the north-running creek, and a third claim, the Rock Lode, adjoins the northern claim on the east, and trends N. 75° W. covering a creek branching off to the southeast.

History: According to local information, the trail to the claims was built in 1887.

Development: No openings could be found when the property was visited in 1945. Maps indicate a discovery tunnel located 300 feet west of the creek, in the NW¼ SE¼ NW¼ sec. 12.

Geology: The rocks in the district are typical western Cascade porphyritic andesites, tuffs, and breccias. They have been altered along a northwest-trending zone 75 to 500 feet wide which crosses the Table Rock Fork half a mile east of the mouth of Camp Creek and cuts through sec. 12. Within the zone, the volcanic rocks have been hydrothermally altered and vary from a bleached rock which still shows residual structures to a soft clay with minor amounts of disseminated sulphides. Numerous irony ribs cut the altered zone, and limonite stain is abundant along the joints of the less-altered rock. In a few places angular fragments of rock are cemented in a hard limonite matrix. A 3-foot vertical sample of the pyritiferous gouge from the south bank of the Table Rock Fork half a mile east of the mouth of Camp Creek was assayed in the Department's laboratory as follows: .005 ounce gold, a trace of copper, with no lead, zinc, or silver present.

Report by: J.E.A., 1945

MOTHER LODE GROUP (Gold, silver, copper, lead) — North Santiam District

Location: SE¼ NW¼ sec. 21, T. 8 S., R. 6 E., on the west side of Mother Lode or Gold Creek, about 2 miles north of its junction with Battle Creek, at an elevation of 3,700 feet. Reached by a trail about 5 miles from the road at Dunlap Lake.

Area: Three claims, surveyed in 1890 for the Cascade Gold and Silver Mining Company consisting of the Mother Lode, Mother Lode extension, and a mill site on the main creek 1,000 feet to the east.

Development: A crosscut tunnel runs S. 35° W. for about 50 feet beneath the bed of a small creek, then turns and runs S. 20° E. for at least 30 feet more, as far as the tunnel was accessible. Up the creek to the southwest the vein is exposed on both sides by shallow open cuts. A cabin, now caved in, is about 500 feet south of these openings up the hill on the trail. There are remnants of what appear to be some type of homemade steam boiler and a large number of firebrick below the end of the lower dump.

Geology: The country rock is spotted hornfels, a fine-grained gray andesitic rock with greenish spotted areas developed by contact metamorphism. It has an irregular blocky fracture and considerable variation in texture. The vein, which strikes N. 20° W. and dips about 75° to the southwest, is composed of about 2 feet of iron-stained broken quartz, some of it hard boulders and some banded comb quartz. From 1 to 3 feet of sericitic gouge and broken wall rock is on the hanging side of the vein. Chalcopyrite, malachite, and a reddish metallic sulphide are present. A sample across 3½ feet was assayed in the Department's laboratory and returned 0.1 to 1.0 percent copper, 0.1 to 1.0 percent lead, 0.30 ounce silver, trace of gold, and no zinc.

Report by: J.E.A., 1945

OGLE MOUNTAIN MINE (Gold) North Santiam District

Owners: J. B. Fairclough heirs, 1003 Main Street, Oregon City.

Location: Sec. 9, T. 8 S., R. 4 E., Clackamas County, on the upper course of Ogle Creek, a tributary of the Molalla River. The mine may be reached by one of four routes: 4 miles of trail from the mouth of Henline Creek and the Little North Santiam River road; by trail 2 miles up Ogle Creek from a lumber road at its mouth; by trail (formerly a road) from Scotts Mills, 20 miles to the northwest; or by trail from the forest road to Lookout Mountain, 7 miles to the southwest. The main mine workings are on the east side of Ogle Creek; there are several short tunnels over the ridge half a mile to the northeast.

Area: Eight claims, 2 fractions, and a mill site, surveyed for patent, mostly in the south half of sec. 9.

History: It is reported that work was started on the property in 1903 and machinery was brought to the mine in 1905. Operations were carried on until 1914, and the property was operated under lease in 1918-1919. The owner reports total production as about $10,000.

Development: Most of the mining was from the upper tunnels, about 560 feet above the mill and lower crosscut. On a map surveyed in 1910 one upper tunnel is shown as running N. 63° E. for 400 feet, where it branches, one branch running N. 73° E. for 200 feet, and another running N. 44° E. for 100 feet. About 260 feet in from the portal there are a 45-foot winze, a 168-foot raise, and drifts running 150 feet north and 100 feet south. In 1945 this tunnel was partially caved at a point 200 feet from the portal, with 2 feet of water beyond this point. A draft of air indicated passageways to the surface. Another short crosscut to the vein is reported to be 186 feet higher up the hill.

The lower crosscut, about 50 feet above the creek, was reported by Swartley (1916:166) to be 1,460 feet long. It strikes S. 85° E., and cuts veins at 390 feet, at 715 feet, and at 805 feet, where the wide gouge vein is caved. Water is about 3 feet deep beyond this point, but otherwise the tunnel is in good shape. Caved drifts extend S. 20° and 40° E. on the two inner veins. Swartley reports several hundred feet of drifting.

On the Jumbo claim, one-half mile northeast of the above described workings, a map surveyed in 1929 shows two tunnels on the east side of the ridge, lying about 250 feet apart and running N. 60° W. The northern tunnel is 130 feet long, with a drift 50 feet in, running 50 feet due north. The southern tunnel is 160 feet long, with short drifts to the north and west. There are also four open cuts and two pits or shafts.

Several workings were examined which lie south of the group of claims. One tunnel lies on the trail just above the creek level about 400 feet south of the old mill. It runs S. 45° E. in glacial till for 50 feet and in andesite for another 50 feet. Water is beyond this point, and the length of the tunnel is not known. There is some calcite and ankerite vein material with sulphides on the dump. A tunnel lies 700 or 800 feet farther south in the bend of the first switchback of the trail. It runs S. 70° E. for at least 75 feet,

commencing in glacial till and soil. As indicated by material on the dump, the tunnel is in a dark gray, porphyritic andesite on the inner part of its course. No ore or vein material appears on the dump. A tunnel on the trail 200 yards south of the upper switchback of the trail and 100 yards south of the forks of the trail to the main upper workings strikes S. 50° E. for 100 feet, then S. 20° E. for 85 feet. The only vein material is in narrow gouge seams from 1 to 6 inches thick dipping steeply to the northeast. The rock is gray andesite.

Equipment: The mine was originally equipped with a mill building and a sawmill, both of which are now completely caved in. Power was supplied by three large wood-fired boilers. Other machinery in the mill consisted of two steam engines, a 10-stamp mill, a tube mill 5 by 20 feet, concentrating table, two jaw crushers with 12- and 18-inch openings, two mine cars, and three wood tanks 15 by 20 feet high. Other equipment may be hidden beneath the caved timbers of the building.

At the time of the 1945 visit, all the liners to the mill had been removed and piled, and the stamps were set up, suggesting that an attempt had been made to return to stamp milling. The pebbles for the tube mill were of quartzite, taken from the Portland area gravels. The mine cars are in fair condition. The mine track is strap iron, not rail. Ore was carried from the upper workings by a tram with 1-inch cable, still in good condition.

Geology: The country rock consists of porphyritic andesite, volcanic breccia, and, in the lower part of the canyon, glacial gravels. Some labradorite andesite occurs in the lower tunnel. Vein matter from the lower level consists of cherty quartz veins, cut by carbonate veins, which are in turn cut by vuggy calcite veins. Some of the vein matter consists of gray ankerite with sphalerite and a little pyrite in silicified country rock. One specimen contains a vein of coarse calcite with abundant galena, a little sphalerite, pyrite and chalcopyrite, and quartz and adularia along the walls. The ore bodies have extremely well-defined walls, and appear to strike north to N. 40° W., and dip 45° to 60° E. Some cuts on altered rock near the swamps in sec. 16 may be on a continuation of the main vein. Judging from the stopes in the upper workings as reported by Parks and Swartley (1916:166) the main vein averaged about 5 feet in width. Near the surface the stopes are 6 feet wide. This upper stope is reported to have been largely in oxidized material having numerous particles of free gold and wire gold scattered through it, with an average recovery of 0.24 ounce gold to the ton. The owner states that gold specimens from this stope were exhibited at the Lewis and Clark Exposition in 1905. In the lower tunnel the vein at 715 feet from the portal strikes N. 20° W., dips 60° E., and consists of 1 to 4 feet of clay gouge with well-defined smooth walls. The vein at 805 feet from the portal strikes N. 45° W., dips 45° E., and consists of similar gouge material from 1 to 3 feet wide. A sample across this width was assayed in the Department's laboratory and returned only 0.005 ounce of gold to the ton.

Report by: J.E.A., 1945

References: Callaghan and Buddington, 1938:94-95
Parks and Swartley, 1916:166

PANSY GROUP — North Santiam District

Location: N½ sec. 18, T. 8 S., R. 6 E., on the east slope of the ridge north of Pansy Mountain west of Pansy Lake, at an elevation of from 4,200 to 4,800 feet, and about 1¼ miles due west of Bull-of-the-Woods Lookout.

Area: Three surveyed claims: Lily, Pansy Blossom, and Pansy Blossom extension, which trend N. 55° to 75° W.

History: The claims were surveyed in 1890 for the Cascade Gold and Silver Mining Company and the Consolidated Pansy Blossom and Lily Mining Company.

Development: Maps indicate one tunnel, running northwest for 100 feet, located 1,500 feet S. 60° W. of an old cabin on the north side of Pansy Lake. Four other open cuts are also shown on various parts of the claims.

Geology: These claims were not visited by the writer. The veins apparently trend northwestward and are located in the Breitenbush tuff or Sardine series of volcanics of Thayer (1939).

Report by: J.E.A., 1945

Reference: Thayer, 1939

RED ROCK GROUP — North Santiam District

Location: S½ sec. 12 and N½ sec. 13, T. 8 S., R. 3 E., in the headwaters of Copper Creek, 3 miles northwest of Elkhorn at an elevation of 3,000 to 4,000 feet. These claims may be reached by the road to Lookout Mountain, about 2 miles to the south.

Area: Ten claims were surveyed for the Consolidated Red Rock Mining Company in 1895.

Miscellaneous: These claims were not visited by the Department. A tunnel is shown on the maps as lying just north of the middle fork of Copper Creek, about 60 feet east of the trail, and 150 feet southwest of the quarter corner between secs. 12 and 13.

RIVERSIDE CLAIM — North Santiam District

Location: T. 8 S., R. 4 E., on the Little North Santiam River near the township line, probably in sec. 24.

Development: The drift in the north bank is 30 feet long. The tunnel on the south bank is 75 feet long.

Geology: The drift on the north bank of the river follows a breccia zone 28 inches wide, striking N. 23° W. and dipping 62° N.E. The zone contains silicified material with a little copper stain and some pyrite. The tunnel on the south bank runs S. 26° E. along a vertical breccia seam that is mainly less than 2 inches in width.

Reference: Callaghan and Buddington, 1938:95

RUSSELL-RITTER MINE (Gold, silver, manganese) — North Santiam District

Old name: Humbug.

Owners: Edward Russel and Carl Ritter.

Location: Sec. 4, T. 9 S., R. 6 E., about 13 miles northeast of Detroit and 1 mile northeast of Dunlap Lake. Reached via Breitenbush Springs road, Elk Lake road, and 100 yards on Gold Butte Lookout road to sign, "Ritter Trail," and 1 mile on Ritter Trail road. The Elk Lake road climbs from 1,800 feet to 5,000 feet in 6 miles.

Area: 6 claims (unpatented).

History: Outcrops were located 50 years ago by members of the Russell family. Not until about 1932, when Elk Lake road was built, making property accessible, was any development undertaken. A milling plant rated at 20-ton daily capacity was built in 1937. The property was known as the Humbug in 1903 (Stafford, 1904).

Development: The work done consists of a tunnel 70 feet long on the first vein where ore was being taken out in drifting, and sent to the mill. A small amount of ore has been removed from an open cut on the vein above the tunnel. On the second vein, a crosscut tunnel about 86 feet long intersects the vein in about 40 feet, and a short drift has been run about 20 feet to the southeast at this point.

Geology: The immediate area shows andesitic lavas and a rhyolite dike or dikes. There are at least two veins. The one upon which work is being done is a rhyolite breccia, striking S. 20°-25° E. and dipping 60°-65° SW. It has a well-defined footwall, with the hanging wall more indefinite. The vein material consists of both angular and rounded pieces of quartz and rhyolite cemented by soft siliceous material. As exposed in a tunnel, started on the outcrop, the vein is more than 6 feet wide. The values are in free gold, rather finely divided, with a very small amount of residual pyrite showing occasionally. There is some manganese stain which, in places, becomes a sooty deposit. A sample from the vein in this tunnel was submitted to the Department for assay and returned 0.16 ounce of gold and 0.18 percent manganese.

About 500 feet to the east of the first vein is a second vein with a similar strike and probably somewhat flatter dip. The outcrop shows very little oxidation and considerable pyrite. As exposed in a crosscut tunnel about 60 feet below the outcrop, there appear to be more oxidation, less sulphides, and some free gold. Country rock is a hard andesite. Vein filling is a siliceous breccia. The footwall on the surface is well defined; in the tunnel, where cut, the walls are somewhat broken and more indefinite.

Report by: F.W.L., 1938.

Reference: Stafford, 1904.

RUTH MINE (Gold, silver, zinc, lead) North Santiam District

Old names: Lewis and Clark Mining and Milling Company
Amalgamated

Owner: Pacific Smelting and Refining Company, J. P. Hewitt, president.

Location: Secs. 27 and 28, T. 8 S., R. 5 E., extending on both sides of Battle Axe Creek road about 1 mile from the mouth of the creek. No. 4 level is 40 feet above road level, and No. 5 level is just above creek level 200 feet below. The Blue Jay vein lies 1,800 feet farther east, the main tunnel being about 200 feet above the road. The Bueche group (page 117) openings lie near creek level several hundred feet west of the Ruth.

Area: The holdings now include about 30 claims in the Blue Jay group, and 18 claims in the Ruth group.

History: The Lewis and Clark Mining and Milling Company located five claims sometime previous to 1902, and by that time had opened up, according to Stafford (1904), several hundred feet of tunnel on two levels. In 1920 The Amalgamated Mining and Milling Company took over these claims and located 18 additional claims. In 1929 the Blue Jay vein was located by the Columbia Mines Development Company and during the period 1929-1934 the two concerns constructed a road 4 miles long to the mine, numerous buildings, and a mill, and in 1931-1932 shipped 9 carloads of crude ore and concentrates from the mill. In 1934 the Columbia took over the Amalgamated holdings, and in 1939 both groups were purchased by the Pacific Smelting and Refining Company. In 1931 the workings consisted of about 1,350 feet of drift and crosscuts, of which about 1,020 feet were workings on the main (No. 4) tunnel, on the Ruth vein.

Development: By 1945 the Ruth (formerly called the "Blue") vein had been developed by 1,575 feet of drift on the No. 4 level, with four raises of 110, 110, 45, and 40 feet

respectively, and about 100 feet of crosscuts. On the No. 5 level 212 feet below there is about 1,700 feet of drift with two raises to the No. 4 level. On the Blue Jay vein there is a 300-foot drift and a stope 40 feet high. There are numerous open cuts and short tunnels on several other veins, both between the Ruth and the Blue Jay, and west of the Ruth. Some development activity was reportedly conducted by Pacific Smelting and Refining Company at the Ruth mine in 1948.

Geology: The country rock is principally oligoclase andesite, but a dike of porphyritic rhyolite crosses the No. 4 tunnel near the portal and, according to Callaghan and Buddington (1938:87-88), parallels it throughout on the northeast side. The main fracture zone varies in width from less than 1 foot to more than 60 feet, with an average trend of N. 55° W. and a dip of 55°-70° NE. Within this pinching and swelling zone, bounded by well-defined walls along which much movement has taken place, the vein material is an altered mass consisting of comminuted rock, gouge clays (chiefly chlorite and some clay minerals), soft greenish chlorite with some sericite, with calcite locally cementing the other constituents and lining vugs. Quartz is very subordinate. Sulphides are present disseminated irregularly throughout the zone, in large lumps of almost solid sulphide, and fairly well-defined but irregular lenses. Sulphide minerals are sphalerite, galena, chalcopyrite, and a very little pyrite, with sphalerite predominating. According to Fred Draper, a consultant for the Pacific Smelting and Refining Company, these lenses of high-grade ore dip more steeply than the zone which includes them, averaging 80°, and pinch out against both the foot and hanging walls within fairly short distances.

The thicknesses in 15 blocks of ore, as given in a report by Rosenberg (1941) range from 5.2 to 15.4 feet; in 8 blocks the average thickness was more than 10 feet.

Estimates of ore reserves as high as 800,000 tons have been made by engineers, but an estimate made for the Reconstruction Finance Corporation placed the reserve at 200,000 tons, with an average of 4.33 percent zinc. Some of the shoots have a much higher percentage of zinc. On the fifth level, 280 feet southeast of the second raise, an ore shoot averages 6.62 feet in width and assays 6.04 percent zinc; above, on the fourth level, the same shoot is 30 feet wide and averages less than 4 percent zinc. In the Rosenberg report the average zinc content of the 15 blocks totaling about 200,000 tons of ore, is given as ranging from 6 to 11 percent.

Metallurgical tests made by the U.S. Bureau of Mines and the Denver Equipment Company indicate that simple selective flotation will recover, from 1 ton of ore, 0.0877 tons of zinc (54.4 percent metal); and .011 tons of lead (of similar grade). Gold, silver, and copper are usually low; a few assays gave as high as 0.66 ounce of gold and 4 ounces of silver, but usually they are present only as traces.

The upper workings are on the south side of the ravine, above and to the west of the No. 4 portal. The No. 2 level is a drift 80 feet long on a vein trending S. 30° E. in greenish pyritic andesite. The vein is 12 to 20 inches wide and consists of vuggy quartz with sulphides, almost entirely pyrite and sphalerite in about equal proportions. The No. 1 level runs 90 feet S. 40° E. to a vein 12 feet wide that consists of brecciated altered andesite with streaks of quartz, pyrite, and sphalerite, and a small amount of galena and chalcopyrite. The hanging wall strikes N. 45° W., and dips 65° NE.

Informants: J. P. Hewitt, Fred Draper.

Report by: J.E.A., 1945.

References: Callaghan and Buddington, 1938:87-89
Parks and Swartley, 1916:140
Rosenberg, F. J., 1941 (unpublished report)

SANTIAM COPPER MINE (Gold, silver, copper) North Santiam District

Known at various times as:

Freeland Consolidated (dissolved 1914)
Electric Mining and Smelting Company (dissolved 1914)
Consolidated Copper Mining and Power Company (1914-1925?)
Lotz and Larsen Mine (1916-1925)
Northwest Copper Company (1926-1930)
Rainbow Mine (lessees 1941)

Owner: J. P. Hewitt, Mehama, Oregon.

Location: Sec. 19, T. 8 S., R. 5 E., on both sides of the Little North Santiam River.

Area: 12 claims, now called Santiam numbers 1 to 12. Old names include Minnie E. or Northwestern (now Santiam No. 2), May Day (now No. 8), Shilo (now No. 10), Lower Granger (now No. 11), Five Spot (now No. 12), as well as the Josephine, Chief Justice, Go Devil.

History: Stafford (1904) reported that the Freeland Consolidated had 300 feet of tunnel, crosscuts, and drifts, with a shaft 84 feet deep. Parks and Swartley (1916:69) reported that the Electric Mining and Smelting Company's claims and the Freeland Consolidated Company's ground, about 25 claims in all, had been combined in 1914 under the Consolidated Copper Mining and Power Company, and leased to Lotz and Larsen in 1916. At this time 210 feet of drifting had been done on the Minne E. or Northwestern vein at the river's edge. Much of the mining and development was done in 1915-17, and two carloads (138 tons) of ore and some concentrates from a small mill were shipped in 1923, 1924, and 1925. By 1926 the property was in the hands of the Northwest Copper Company. A detailed sampling job was done by the U.S. Bureau of Mines, and a report was written by W. J. Elmendorf. Under his direction the 96-foot winze in the north tunnel was sunk in 1927, and 3 tons of sorted ore was shipped in 1928.

In 1930 the mine was taken over by the Santiam Copper Mines Company, and lessees shipped 14 tons of bulk ore in 1940. A small mill was built, and between May and September 1941, lots totaling 73 tons of concentrate were shipped. Since that time the property has been idle. Smelter returns representing shipments dating from 1923 to and including 1941 are as follows:

Shipments of Ore and Concentrate to the Tacoma Smelter

Tons (dry)	Copper (%)	Silver (oz.)	Gold (oz.)	
20.666	10.16	2.6		) sorted ore, No. 1 stope
29.629	11.36	3.49	.01	)
31.655	3.97	1.29		) crude ore, No. 2 stope
39.934	4.68	1.60		)
4.698	20.05	5.17		concentrates
11.479	6.52	2.10		crude ore, north tunnel
3.283	14.54	4.66	.01	sorted ore
14.547	7.39	2.34	.01	bulk ore
3.926	12.68	3.12	.04	)
4.760	21.62	6.37	.05	)
5.325	23.18	5.43	.05	)
5.289	22.88	6.03	.06	)
5.491	25.40	6.04	.04	) concentrates
5.416	23.41	6.60	.04	) (average returns from
5.885	17.34	5.10	.04	) smelter $28.76 per ton)
5.795	16.39	4.45	.04	)
5.603	18.28	5.16	.04	)
5.144	19.62	4.63	.03	)
5.785	16.02	3.46	.02	)
8.400	11.33	2.99	.04	)

Development: Most of the work has been done on the Minnie E., or Northwestern vein, on both sides of the Little North Santiam River. Nearly all the production has been from the main drift which follows the vein on the south side of the river approximately S. 43° E. for 1,000 feet, the last 100 feet of which was driven in 1941. There are 6 raises in three stopes, the first of which breaks through to the surface. Nowhere except at the extreme end of the tunnel is there more than 160 feet of backs, and the average is closer to 100 feet.

The north tunnel has about 300 feet of drift; 100 feet of it is on a vein branching off to the northwest. Near the face of this branch there is a winze 96 feet deep.

Geology: The Minnie E., or Northwestern vein, strikes N. 43° W., except for 350 feet adjacent to the river. Dips range from 50° E. to vertical, averaging about 70° E. Callaghan and Buddington (1938:96-97) describe the geology as follows:

> "The country rock on the north side of the river is agglomeratic oligoclase andesite, and that on the south side is mainly porphyritic oligoclase andesite. Chalcopyrite is the principal ore mineral, but there are also subordinate pyrite, sphalerite, and an unknown white metallic mineral, visible only under the microscope, that contains copper, silver, bismuth, and sulphur.
>
> "Though ore minerals are sporadically distributed throughout the vein, there are four fairly distinct narrow ore shoots, as shown in plate 17. That in the north drift is 100 feet long and in some places 18 inches wide. A winze, now full of water, is reported to have exposed 14 inches of chalcopyrite 96 feet below the tunnel. In places the shoot contains three seams of almost solid chalcopyrite, each 3 inches wide, associated with quartz stringers and altered rock. The vein pinches down to 1 inch at the end of the drift. An assay map by W. J. Elmendorf shows an average metal content for this shoot of 4.47 percent of copper, 1.22 ounces of silver to the ton, and no gold for a width of 6 feet. A shoot at the portal of the drift on the south side contains only a small amount of chalcopyrite. The first 180 feet of drift has an average metal content of 1.25 percent of copper, 0.1 ounce of silver to the ton, and no gold, according to the assay map. A shoot nearly 200 feet long extending southeastward from a point 280 feet from the portal has been partly stoped. This shoot averages, for a width of 5 feet, 2.41 percent of copper, 0.75 ounce of silver to the ton, and a trace of gold. Another shoot about 80 feet long, extending southeastward from a point about 760 feet from the portal, has been partly stoped. The vein at the face of the tunnel consists of 4 to 5 inches of nearly solid chalcopyrite, 1½ inches of quartz with a little calcite, and 7 inches of gouge.
>
> "An open cut about 500 feet east of the main tunnel reveals a seam of chalcopyrite half an inch wide. Some open cuts and a short drift west of the mouth of Gold Creek show gouge seams and some pyrite but no appreciable chalcopyrite.
>
> "Several of the tunnels along Gold Creek are believed locally to be on the same vein. The Mayday or Santiam No. 8 tunnel, on the west side of Gold Creek about 1,700 feet north of the camp, follows a soft pyritic altered zone 6 inches wide N. 40° W. for 100 feet. The Josephine crosscut, about 100 feet south of the footbridge near the forks of Gold Creek, extends 65 feet to a vein that strikes N. 10° W. and dips 70° E. The vein consists of gouge seams in andesite with no appreciable sulphides. The Shilo or Santiam No. 10 drift, 300 feet up the west fork of Gold Creek from the forks, follows a seam of pyritic altered rock with quartz and calcite stringers for 215 feet, mainly N. 15° W. The Lower Granger or Santiam No. 11 is a short distance north of the Shilo. A crosscut extends 155 feet S. 65° W. to the vein, which is followed by drifts of 110 feet N. 10° W. to a cave-in and S. 5° E. to a face that reveals silicified rock with a few quartz stringers. Vein matter on the dump contains scattered pyrite, a few streaks of

chalcopyrite, and a very little sphalerite. The Five Spot tunnel or Santiam No. 11, about 1,200 feet upstream from the Lower Granger, consists of a crosscut 275 feet long running S. 80° W. and a drift on the vein for 50 feet N. 3° E. The vein dips 60°-70° W. and consists of a breccia of country rock with vuggy quartz veinlets and disseminated pyrite."

On the Little North Santiam River road, half a mile east of the Gold Creek bridge, and about 65 feet above the river level, in the SE¼ sec. 19, there is a tunnel running 270 feet N. 35° W., with four crosscuts, two of them 120 and 140 feet to the east and northeast, and two of them running 30 and 80 feet to the west. The country rock is gray andesite, with a narrow vertical vein showing very little quartz and containing arsenopyrite, chalcopyrite, and malachite. A sample (P-3819) from the dump gave only a trace of gold and copper, and no lead, zinc, or silver.

Report by: J.E.A., 1945

References: Callaghan and Buddington, 1938:95-97
Parks and Swartley, 1916:69
Stafford, 1904

SILVER KING GROUP (Gold, silver, zinc) North Santiam District

Owners: John Langmack, president, and W. S. Risley (deceased), secretary-treasurer(1924).

Location: W½ sec. 28, T. 8 S., R. 4 E., on Henline Creek half a mile north of the crossing of the creek by the Little North Santiam River road. A branch road east of the bridge goes one mile to the mouth of the lower crosscut; the upper workings are reached by a trail which branches off near the end of the road.

Area: 12 claims.

Geology and development: The lower crosscut is about 1,700 feet long, running N. 20° E. from a point below the falls on Henline Creek, half a mile above the bridge. At 500, 550, 600, 750 feet from the portal it cuts narrow veins of sericite and quartz minerals with small amounts of sulphides. The veins strike N. 20°-30° W. and dip 75° W., with the exception of one which is vertical and another which dips 40°. Two other shear zones which strike N. 50° W. and dip 50° SW. are cut at 1,150 and 1,300 feet in; and a vein at the face strikes N. 70° W. and dips 60° S. All but one are less than 2 feet thick, and none contains more than a trace of sulphide minerals. Analyses of samples are as follows:

Location in tunnel (feet)	Thickness	Gold (oz.)	Silver (oz.)	Zinc (%)
600	10-18 (in.)	0.01	Trace	1.9
1,300	24 "	0.00	0.00	1.1
1,700	20 "	Trace	0.00	0.5

The principal vein is the Queen of the West, which is prospected by drifts on each bank of Henline Creek several hundred feet above the crosscut. The eastern tunnel on the El Capitan claim follows the vein, which strikes S. 45° E. for 50 feet and dips 40°-45° SW. According to Callaghan and Buddington (1938:97-98):

"A dike of dacite porphyry forms the hanging wall, but the footwall is altered andesite. The vein matter averages 18 to 24 inches in width and consists of fragments of altered andesite cemented by vuggy quartz in veins that contain sulphides, chiefly sphalerite, ranging from nearly black to light green, but also some galena, a little chalcopyrite, and pyrite. Some veinlets containing quartz and sphalerite are offset along other quartz veinlets. A little ankerite occurs on the surfaces of

other minerals in vugs. The drift on the west side of the creek reveals as much as 6 feet of vein matter, but the strike is N. 85° W. and the dip 40°-50° S. Dacite porphyry forms both walls of the vein in this drift.

"Another vein near the south boundary of the property, on a rock terrace southeast of the portal of the crosscut, has been prospected by a shaft reported to be 80 feet deep but now filled with water and debris to a point within a few feet of the surface. The vein matter is very similar to that of the Queen of the West.

"The assays given below are taken from a prospectus supplied by the owners. Samples 1 and 2 were taken from the shaft. Samples 3, 4, and 5 were taken progressively inward along the drift on the Queen of the West vein on the east side of the creek, sample 5 being at the face. The remainder were taken progressively inward along the drift on the west side of the creek, sample 12 being near the face. Zinc was not determined in those samples where its quantity is not given."

Assays of Samples from Silver King Property

	1	2	3	4	5	6	7	8	9	10	11	12
Width (inches)	---	---	20	10	18	---	75	---	---	18	60	---
Gold (oz. to the ton)	0.05	0.06	0.045	0.02	0.04	0.07	Trace	Trace	0.06	0.02	Trace	0.02
Silver (oz. to the ton)	1.6	2.1	3.1	9.8	4.4	5.2	7.4	14.6	39.1	40.8	4.2	5.2
Lead (percent)	.53	.1	2.1	3.2	2.92	3.8	3.2	3.7	2.93	1.73	3.9	4.7
Zinc (percent)	3.74	4.2	---	1.44	---	---	---	---	---	3.38	3.7	---

Report by: J.E.A., 1941

References: Callaghan and Buddington, 1938:97-98
Parks and Swartley, 1916:202-203

SILVER STAR AND HELVETIA CLAIMS

North Santiam District

Owner: G. Waldisberg, 225 N.W. Couch Street, Portland, Oregon.

Location: SE¼ sec. 23, T. 8 S., R. 4 E., on the road west of Tincup Creek.

History: Prospected actively in 1931 and 1941.

Development: The main tunnel was reported to be 65 feet long in 1931.

Geology: As exposed in the main tunnel the vein, ranging in width from a few inches to 18 inches, strikes first N. 25° W. then N. 37° E., and is approximately vertical. The country rock is altered oligoclase andesite. The vein matter consists of quartz and epidote with associated sphalerite and chalcopyrite. Near the vein is a dioritic intrusive body.

Reference: Callaghan and Buddington, 1938:98

WOLZ PROPERTY (Gold, copper, zinc) North Santiam District
(Also known as German mine)

Location: N½ sec. 26, T. 8 S., R. 4 E., below the road, and just north of the Little North Santiam River, between Tincup and Stack creeks. The property is reached by trail from the road.

Development: There is an open cut in the bank of the river, a 20-foot drift above this, and a drift 80 feet long above the short drift.

Geology: The country rock is greenish porphyrite andesite as exposed in an open cut. The vein consists of 18 inches of altered rock cemented by quartz. Sphalerite and chalcopyrite are disseminated in nearly equal proportions with a small amount of pyrite.

Reference: Callaghan and Buddington, 1938:98-99.

Miscellaneous Mining Properties in Marion County

BLACK DIAMOND COAL COMPANY

Location: SE¼ sec. 15, T. 6 S., R. 1 E. A caved shaft, inclined at about 45° eastward, lies about 100 yards west of the bridge across Butte Creek at Scotts Mills.

History: According to W. N. Mazingo of Woodburn, who lived in Scotts Mills at the time the work was done (between 1900 and 1910), a coal seam outcropping above the bridge was prospected with a churn drill to a depth of 400 feet. Mazingo said that in this hole a 9-foot seam of coal was encountered, followed by 40 feet of "sandstone and shale," and then 16 feet of coal was penetrated. On the basis of this prospecting hole, the incline was begun and run down for 500 to 600 feet before the company ran out of funds - at a point supposed to be only a few tens of feet from the coal.

Geology: Coal is known to exist in small seams in this general area. Coal streaks as much as 8 inches thick have been found in a 150-foot drift three-fourths of a mile above Wilhoit Springs on Rock Creek (see Mandrones Mine, Clackamas County). Coal is also known to exist in small seams to the south, at several points east of Scio. The formation is predominantly tuffaceous, varying from fine sandy tuff to coarse tuff-breccia and agglomerate. Limestone layers occur within the tuff to the north at Marquam, and up Butte Creek in secs. 29 and 30, T. 6 S., R. 2 E. The formation is upper Oligocene or lower Miocene in age.

One sample of coal was found on the dump of the shaft and appeared to be similar to the other local lignite, in that it has slaked badly and crumbles easily. The shaft itself appeared to be in medium- to fine-grained, obscurely bedded tuff.

Report by: J.E.A., 1940.

CONTINENTAL CHEMICAL COMPANY

Former names: Chemical Construction Company
Columbia Metals Corporation

History: A pilot plant near Salem, Oregon, designed for the production of alumina from clay using the Chemica or ammonium bisulphate process was completed in 1945 by the Chemical Construction Company. The plant was built with funds supplied by the Defense Plant Corporation,

a War Production Board subsidiary, and was leased from the government by the Columbia Metals Corporation of Seattle. C. K. White was Columbia Metals' Chief Engineer, and J. O. Gallagher was president of the corporation. W. R. Seyfried of the Chemical Construction Company was plant manager. Plans were made to test clay from Castle Rock, Washington; Molalla and Hobart Butte, Oregon; and Moscow, Idaho. Clay from Castle Rock was stockpiled and experimental operations were started. Before testing work was completed government funds for the clay work were cut off, and the plant was then used by Columbia Metals Corporation for making ammonium sulphate fertilizer under a contract with the Reconstruction Finance Corporation. The contract was terminated when it came up for renewal in 1948. In 1949 the government leased the plant to a group of local people for the manufacture of chemical fertilizer and other chemicals. The group is incorporated as the Continental Chemical Company.

FERRUGINOUS BAUXITE DEPOSITS

Location: Ferruginous bauxite deposits occur in the Eola Hills and Salem Hills north and south respectively of the city of Salem. The Eola Hills are situated in Polk County and the Salem Hills in Marion County. Bauxite also occurs in sec. 1, T. 9 S., R. 2 E., in the western foothills of the Cascade Range northeast of Mehama.

History: The occurrence of the ferruginous bauxite in the Salem area was first noted in 1945 by the Department. Libbey, Lowry, and Mason (1945:75-81) list numerous localities in this area where bauxite float and thin deposits of ferruginous bauxite occur. In 1946 Alcoa Mining Company drilled a few test holes and made some open cuts while prospecting for a short time in this area. In 1949 and 1950 some exploration was done by James W. McMahon, Portland, Oregon, on the bauxite occurrence northeast of Mehama.

Topography: The Salem and Eola Hills are a cuestalike group of hills within the Willamette Valley. The maximum elevation of the hills is nearly 1,100 feet with steep slopes on the west and gentle slopes on the east. The east slopes are essentially dip slopes. The bauxite northeast of Mehama occurs at approximately 1,800 feet on a narrow northeast-trending hill divided into two rounded hillocks by a narrow saddle.

The ferruginous bauxite deposits in the county occur on the flat-topped hills and ridges, and the outlines of the deposits are determined by the topography.

Geology: The laterite deposits in the Salem area were formed by the weathering of the Stayton lavas, which have been correlated with the Columbia River basalt of Miocene age. The Stayton lavas are fine-grained, even-textured to slightly porphyritic, dense rocks with a gray to nearly black color, as described by Mundorff (1939). In the Salem and Eola Hills the lavas overlie tuffaceous marine sandstones of the Illahe formation (Oligocene).

Dips of 3° in the Stayton lavas in the Salem area were noted by Thayer (1939). He states:

> "The Salem Hills are essentially a slightly warped lava-capped mass whose eastward dip is best shown west of Marion. The Salem, Eola, and Amity hills are all part of a single eastward dipping homoclinal block which is transected by the Willamette River west of Salem. . . .Along the foothills of the Cascades proper, north of Thomas Creek, the lavas slope gently northwestward toward the Willamette Valley."

The laterite in the Salem area is different from that in Washington and Columbia counties. For the most part the oölitic and pisolitic horizon apparently has been removed by erosion in the Salem area. The upper phase consists mostly of bauxite nodules that range in size from about 2 inches to 2 or 3 feet in diameter and are found mostly as float. The lower section is the fine-grained earthy variety similar to the soft earthy sections in Washington County. Below this earthy section, the laterite increases in silica content and grades into weathered basalt.

High-grade bauxite which is common as float, apparently occurs in place in only a few localities. These bauxite nodules are white, green, pink, light brown, or reddish-brown on a fresh surface. Many of them contain a large percentage of gibbsite, and analysis shows the alumina content to be 50 to 60 percent; silica, from 1 to 6 percent; and iron, from 1 to 14 percent.

In the NE¼, SW¼ sec. 28, T. 8 S., R. 3 W., at an elevation of 775 feet, about two-thirds of a mile south of the Rosedale School, a layer of brown, porous granular, gibbsitic nodules in the shallow soil overlying laterized basalt is exposed in a road cut. The laterized basalt shows a spheroidal weathering pattern and the upper five feet is brown with limonitic and gibbsitic streaks. A channel sample of this five-foot section analyzed in the Department laboratory gave percentage results as follows: Al_2O_3, 37.46; Fe, 21.20; SiO_2, 10.55; TiO_2, 2.78; ignition loss, 19.80.

Other localities described by Libbey, Lowry, and Mason (1945) present evidence showing that only a thin section of the lower laterite horizon remains in place in the Salem area.

Insufficient development has been done on the bauxite occurring northeast of Mehama to determine the possible quantity of reserves. The area thus far noted as containing bauxite is very small and preliminary investigation indicates that the bauxite occurs as float. Float samples analyzed in the Department laboratory gave percentage results on two different types as follows: low-iron type, Al_2O_3, 49.19; Fe_2O_3, 11.83; SiO_2, 6.64; high-iron type, Al_2O_3, 31.44; Fe_2O_3, 37.36; SiO_2, 6.42.

Report by: D.J.W., 1950

Reference: Libbey, Lowry, and Mason, 1945:66-81

KINGS CLAY

(Sublimity locality)

Owner: R. E. King, Sublimity, Oregon.

Location: SW¼ SE¼ sec. 18, T. 8 S., R. 1 E., about 6 miles northeast of Sublimity in road cuts along State Highway 214.

History: This locality was first reported by Wilcox (1935), and in 1937 Willamina Clay Products Company removed several truckloads of clay from the highway right-of-way for experimental purposes. It was sampled, along with a number of nearby localities, by Wilson and Treasher in 1938, from whose report the following is abstracted (pp. 49-60).

Geology: The clay rests upon gently west-dipping Stayton lavas of Thayer (1939) and is overlain by tuff which contains pumice fragments of an inch maximum in diameter, and small amounts of petrified wood. The tuff may belong to the Fern Ridge tuff formation; both this and the Stayton lavas are Miocene in age, according to Thayer. The clay is usually chalky white, fine-grained, and contains small clear grains of quartz. Near the surface it is limonite-stained along joint planes; deeper, the amount of limonite is less. Refractory and chemical characteristics of five samples from drill holes are given by Wilson and Treasher (1938:51-52).

Several other localities are described by Wilson and Treasher and are briefly listed as follows:

Loc. No. 12 — In road cut 0.8 mile NNW. of King locality. Clay composed of altered tuff.

Loc. No. 13 — In road cut 1,200 feet SW. of King locality. Clay composed of weathered conglomerate.

Loc. No. 14 In side-road cut 650 feet south of No. 13.
Clay similar to that at King locality.

Loc. No. 15 In road cut 0.5 mile west of No. 13.
Clay more iron-stained than at King locality, and is overlain and underlain by tuff and also grades laterally into tuff.

Loc. No. 16 In road cut 1.1 miles east of King locality.
Clay is irregularly overlain by tuff.

Loc. No. 17 In road cut 1.9 miles east of King locality.
Clay 9 feet thick overlain by 25 feet of tuff similar to that at King locality.

Loc. No. 18 In road cut on Ridge Road between Silver and Drift creeks, about 2 miles NW. of Silver Creek Falls. Three samples were taken by Wilson and Treasher (1938:59) from the clay bed underlying tuff and from "clay dikes."

References: Thayer, 1939
Wilson and Treasher, 1938:49-60
Wilcox, 1935

MACLEAY CLAY

Location: SE¼ NE¼ sec. 3, T. 8 S., R. 2 W., on State Highway 222, 7.1 miles east of State Street railroad crossing in Salem, and 1.1 miles west of Macleay.

Description: According to Wilson and Treasher (1938:62), clay overlain by typical purplish soil is exposed in several road cuts. It is light greenish to brown, and contains small amounts of grit. The parent rock of the lower samples taken is basalt, probably Stayton lava, and occasionally the weathered product retains the original vesicular voids. The refractory clay is of limited extent. This deposit is mentioned by Wilcox (1935:23) as being of importance, but Treasher did not so consider it.

References: Wilson and Treasher, 1938:62
Wilcox, 1935:23

MT. ANGEL TUFF QUARRY

Owner: Members of the Abbey at Mt. Angel.

Location: Sec. 30, T. 7 S., R. 2 E., near the headwaters of Little Abiqua Creek.

History: The quarry was opened up before 1900. Blocks mined from the quarry were used as building stone in the construction of several buildings in Marion County, and in one Portland church.

Development: Development and exploration consist of a quarry and a number of 6-inch auger holes which were drilled in sec. 30 in 1946. These drill holes proved the overburden above the tuff to be rather thin, varying from 2 to 6 feet. Tuff was found over a distance of 1,000 feet along a line running northeast, parallel to the quarry face, and for a distance of 2,200 feet along a line at right angles to the quarry face. It is possible that the entire top of the hill in sec. 30, an area of 400 acres is made up of the tuff. Estimated reserves of the area drilled in sec. 30 were in excess of two million cubic yards.

The deposit is reported to have been diamond drilled extensively about the year 1910, but the records of this exploration were lost in a fire at the Abbey. Father Sebastian, Professor of Physics at the College and graduate in geology, examined the cores and reports the drill holes penetrated more than 60 feet of tuff.

Geology: Fern Ridge, about 5 miles northeast of Stayton and several miles to the south of the Mount Angel tuff deposits is the type locality of the Fern Ridge tuffs formation. It consists of conglomerates, tuffs, and breccias. The tuffs near Mount Angel may be of the same origin as the Fern Ridge tuffs.

The Fern Ridge tuffs, according to Thayer (1939:8), are conformable on the Stayton lavas and are probably of the same volcanic sequence believed to have been extruded in the Miocene period of volcanism. Later evidence indicates the Fern Ridge tuffs unconformably overlie the Stayton lavas and are of Pliocene age. The abundance of pumice fragments interspersed with volcanic ash with no evidence of bedding, indicate explosive activity during the deposition of the tuffs near Mount Angel.

References: Hamblen, 1946 (private report)
Thayer, 1939:8

SILVER CREEK TUFF QUARRY

Location: NW¼ SW¼ sec. 3, T. 8 S., R. 1 E., west of Silver Creek Falls on the road southeast of Silverton between Silver Creek and Drift Creek. The quarry is 300 feet west of the road and almost a quarter mile north of clay locality No. 18 of Wilson and Treasher (1938:59).

Development: Quarry face is about 75 feet long, 10 feet high, and 30 feet wide. An access road surfaced with dense black basalt leads to the quarry. Broken and imperfect stone is stacked around the quarry.

Geology: The rock is a tuff agglomerate. The matrix is very fine grained and slightly clayey. Pumice pebbles as much as 2 inches in diameter are common, and some carbonized wood is present. There is no structure to the stone and it breaks down easily into flat spalls.

Apparently, the rock is part of the tuff member in this area. Nearby localities prove the tuff is underlain by dense basalt and in spots, overlain by a vesicular lava. The tuff is similar to that at Union Hill School, and to Thayer's (1939:8) Fern Ridge tuff.

The stone was used in construction at Silver Creek Falls State Park.

Report by: R.C.T., 1943.

WALDO HILLS COAL MINE

Owner: J. B. Miner, 5903 N. E. Hassalo Street, Portland, Oregon, was reported as owner in May 1948.

Location: Sec. 28 and partly in sec. 33, T. 7 S., R. 1 W., in Marion County. The mine is reached via Garden Home Road from Salem east to Pratum, and 3.7 miles east of Pratum on the road to Silverton to intersection with Cemetery Road. At 0.9 mile from intersection turn left into Ferris property a short distance southwest of the mine. The mine is at an elevation of 475 feet in the headwaters of Beaver Creek.

Area: 120 acres of deeded land.

History: The Waldo Hills mine was operated in 1939 by the Waldo Hills Coal Company. In 1942 the property was under lease to Frank Ferris of Pratum, Oregon. Ferris, who has mined coal in Colorado, was operating a newly developed tunnel and drift. This development was then known as the Ferris and Krehbeil mine.

In May 1948 the mine was reportedly owned by J. B. Miner of Portland, Oregon, and the name had been changed to Waldo Hills Coal mine. The watchman at the mine said the mine had not been worked for the past six months, but plans were being made to open up the mine on a large scale.

Development and production: According to Yancey and Geer (1940:14) the property was under development by the Waldo Hills Coal Company May 15, 1939, and a slope 150 feet long and a short drift had been completed. Provisions were being made to screen the coal at 1½-inch round-hole and 1/8-inch square-hole sizes.

In 1942 an incline shaft had been sunk at about 40° for a distance of about 100 feet by Frank Ferris presumably on the same bed as the above development. From the bottom of the shaft where it penetrates the coal an entry or drift had been run in the bed for about 80 feet. A sump had been dug at the side of the drift about half way from the shaft to the present face at which a small electric rotary pump had been placed. It was necessary to run the pump only a short time each day. Shaft and drift are small in cross section and would permit only a small operation.

A small wooden car with the capacity of 500 pounds of coal was used in the shaft and drift. Sixteen-pound rails were set on stringers in the shaft, and timber stringers with scrap iron were used for track in the drift. An automobile engine and chassis had been converted to a hoist using a hoisting drum and half-inch steel cable.

A small amount of coal was being mined by Ferris. After hoisting, it was dumped over a punch screen with 2-inch round holes. Oversize was raked off as lump. Undersize was put over a 1-inch screen for nut and stoker coal separation. Equipment was available so that crude washing could be practised. The coal was sacked and sold for 35 cents a hundred at the mine.

In November 1948, J. B. Miner stated that some coal had been produced since he began operating the mine, but none was being produced at that time. He was having a briquet machine installed.

Geology: The mine is in sandstone, probably of the Illahe formation, overlain by Stayton lavas. The coal seams are separated by seams of clay, shale, and bone with shale in the roof and floor.

The coal bed strikes east and dips from 0° to 25° S. The bed was measured and sampled on the left rib of the slope, 125 feet south of the portal, by M. R. Geer and J. E. Morrison May 15, 1939, and reported as follows by Yancey and Geer (1940:14):

Section of Unnamed Bed in Waldo Hills Mine
(Laboratory No. B-40250)

		Feet		Inches
Roof, firm sandy shale				
	Shale, soft, brown		a	5½
	Coal, friable			2½
	Bone and shale		a	2
	Coal, friable			1½
	Clay, gray, plastic		a	1
	Coal, bright, friable			3½
	Clay		a	½
	Coal, shale streaks			2½
	Shale, firm		a	3
	Coal			¼
	Shale, soft, gray		a	6
	Coal, bone streaks	1		
	Shale		a	½
	Coal, bright			3
	Bone		a	2
	Coal, bony			9½
	Bone, soft		a	7½
Floor, smooth firm shale				
	Thickness of bed	5		6-3/4
	Thickness in sample	3		2-3/4

a Not included in sample.

The analyses of the coal sample, No. B-40250, described in the section on page 137 is shown in the following table:

	Proximate percent				Ultimate percent									
Condition of sample[1/]	Moisture	Volatile matter	Fixed carbon	Ash	Sulfur	Hydrogen	Carbon	Nitrogen	Oxygen	Air-dry loss, percent	B.t.u	Ash softening temperature, °F.	Agglomerating index	Subbituminous rank or lignite
1	22.0	25.1	39.0	13.9	.8	5.9	48.0	.6	30.8	11.3	8280	2710	NAa	B
2	----	32.1	50.1	17.8	1.0	4.4	61.5	.7	14.6	----	10610	----		
3	----	39.1	60.9	----	1.2	5.3	74.8	.9	17.8	----	12900	----		

[1/] 1, sample as received; 2, dried at a temperature of 105° C.; 3, moisture and ash free.

The section of the coal bed at the face of the drift of the Ferris and Krehbeil mine was measured and sampled by F. W. Libbey of the Department in 1942, as described below:

Section of Coal Bed in Ferris and Krehbeil Mine

	Feet	Inches
Roof, coal (4 inches)		
Coal		10
Dirt		3
Coal		3
Dirt		6
Coal		11
Shale		1
Coal	1	3
Floor, coal (2 inches)		
Thickness of bed	4	1
Thickness of sample	3	3

The sample of clean coal representing seams totaling 39 inches was sent to the U.S. Bureau of Mines at Seattle on May 2, 1942, for proximate analysis. Results were as follows:

	Moisture	Volatiles	Fixed Carbon	Ash	Sulfur	B.t.u.
As received	20.7	24.7	33.7	20.9	.7	7,470
Air dried	6.1	29.3	39.9	24.7	.8	8,850
Moisture free		31.2	42.5	26.3	.9	9,420
Moisture and ash free		42.3	57.7		1.2	12,790

Report by: F.W.L., March 1942

References: Yancey and Geer, 1940:14-15, 21

MULTNOMAH COUNTY

Geography

Multnomah County extends from the Portland hills eastward to the crest of the Cascade Range and is bounded on the south by Clackamas County and on the north by the Columbia River. It is the smallest county in northwestern Oregon, comprising an area of 424 square miles. Portland, an important port, manufacturing center, and largest city of Oregon, is the county seat.

The most important physiographic features are the Portland hills on the west, the floodplains and terraces of the Willamette and Columbia rivers, and the gorge the Columbia River formed in the lavas of the Cascade Range. Altitude ranges from about 25 feet along the Willamette and Columbia rivers to 4,768 feet at Buck Point in the Cascade Range. The Portland hills attain a maximum elevation of approximately 1,550 feet at Dixie Mountain in the northwestern corner of the county.

The Columbia River flows westward across the northern edge of the county but turns northward near the confluence of the Willamette River with the Columbia in northwestern Multnomah County. The Willamette River flows generally northward across the western portion of the county. The Sandy River, which enters the Columbia River at Troutdale, and its tributary, the Bull Run River, drain the eastern part of the county.

The major source of income in the county is from basic industries such as manufacturing, shipping, and construction; but agriculture, wholesale and retail trades, and service industries are important. Mineral resources consist of sand, gravel, and crushed rock. Ferruginous bauxite occurs along the western boundary, but the largest nearby deposits are in Washington County. The brick and tile industry is expanding rapidly.

Geology

In the Cascades in eastern Multnomah County, Oligocene pyroclastics are overlain by Miocene lavas, which are overlain by Pliocene terrestrial sediments and Pliocene to Pleistocene basaltic and andesitic lavas. In the Willamette Valley the Miocene lavas and the Pliocene terrestrial sediments are overlain in places by Pliocene basaltic lavas; and the terraces of the Willamette and Columbia rivers are covered by Pleistocene alluvial deposits and their present floodplains by Recent alluvium. The Portland hills to the west of the Willamette River consist of the Miocene lavas, in places covered by Pliocene terrestrial sediments and lava flows.

The oldest known rocks in Multnomah County are the agglomerates, breccias, conglomerates, sandstones, and tuffaceous sediments comprising the Eagle Creek formation, considered to be Oligocene to possible lower Miocene in age. This formation outcrops in the Columbia River gorge in Multnomah County from Eagle Creek to the vicinity of Warrendale. Lowry (1947) thought that upper Eocene basalts of the Goble volcanic series possibly occur in the gorge, but this fact has not been proved.

Overlying the Eagle Creek formation are the basaltic lava flows of the middle Miocene Columbia River formation. The dark gray basalts of this formation are found in the Columbia River gorge and cover most of the Portland hills. Ferruginous bauxite occurs in extremely weathered upper flows of the formation along the western edge of the county and in the vicinity of Rooster Rock.

In the Columbia River gorge and in some parts of the Portland hills, the Troutdale gravels, silts, and sands overlie the Columbia River basalt. This relationship is shown quite clearly along the bluff above Rooster Rock. These sediments apparently covered most of Multnomah County, but have since been partly eroded and partly covered by younger lava flows, known as the Boring lavas, and the Pleistocene and Recent alluvial deposits. The Troutdale formation is middle Pliocene in age and the Boring lavas are upper Pliocene to Pleistocene in age.

Boring lavas either flank or cap Grant Butte near Gresham, Hill 585 south of Foster Road, Kelly Butte, and Chamberlain Hill on the east side of the Sandy River east of Troutdale. Boring lavas also overlie the Columbia River basalts on the western slope of the Portland hills in southwestern Multnomah County.

Silts, sands, and gravels of the Pleistocene epoch cover the terraces of the Willamette and Columbia rivers, mainly in the area from the Sandy River westward to the Willamette River. Glacial outwash has been mapped by Treasher (1942) along the east and west side of the Sandy River southeast of Troutdale. Recent alluvium occurs along the channels and on the present floodplains of the main streams.

Mining Properties of Multnomah County

FERRUGINOUS BAUXITE DEPOSITS

See "Ferruginous Bauxite Deposits," Washington County.

GORDON CREEK COAL MINE

Owner: Miss Madeline Crump, Corbett, Oregon. About 1934 a lease, which has reportedly lapsed, was made to J. H. Semitsmier and Frank A. Maedke.

Location: SW¼ NE¼, N½ SE¼, and SW¼ SE¼ sec. 9, T. 1 S., R. 5 E., at the outcrop in the channel of Gordon Creek, about 3 miles east of the Sandy River.

Development and production: The mine is full of water but apparently had a slope sunk about 100 feet at an angle of 20°. The coal was hoisted up the slope to a tipple on the north side of the creek. According to Miss Crump, about 10 tons of coal has been produced.

Geology: Coal crops out near the creek level in a very steep wall made up of Troutdale sandstone. The contact of the coal bed and the overlying material was not found, but sandstone lies a few feet above the coal bed.

No information is available on the coal bed itself. The slope is filled with water so that relations inside the tunnel could not be seen. It reportedly is several feet thick and of a rather good quality. Samples on the dump indicate that it is a low-grade lignite, the woody structure being quite prominent. The coal contains considerable clay, silt, and chunks of petrified wood.

There is a small outcrop of coal just upstream from the tunnel opening, in what may be slump material. In and about this point the Troutdale sandstone appears to dip 10° to 15° S. However, it is also reported that similar coal crops out on Little Gordon Creek to the south, which, if true, would indicate that this dip is a local variation. The Troutdale formation is overlain by Boring volcanics at an elevation of 175 feet above the creek or an elevation of about 1,275 feet above sea level. Andesite apparently continues to the top of the ridge at an elevation of about 1,500 feet.

Report by: R.C.T., 1939

PORTLAND TUNNEL (Quicksilver)

Owner: Not known. Reported to be private land in the name of McKensey.

Location: Center of S½ sec. 30, T. 1 N., R. 1 E., about half a mile west of Montgomery Ward's store, Portland, Oregon.

Development and production: A tunnel located on the northeast side of the Portland hills at an elevation of 650 feet extends due west for 960 feet. There has been no production.

Geology: The tunnel is in nearly horizontal flows of vesicular lavas of the Columbia River basalt. The vesicles are frequently as large as one inch in diameter. Agglomeratic and bouldery interbeds are common and make up a large portion of the tunnel wall. These materials have been more or less altered to clay and hematite, and siliceous gel has been deposited in some of the openings. Limonite stalactites are not uncommon. Several areas 30 to 40 feet long appear to be largely hematite.

In the basalt, thin seams usually containing red hematite are common and are spaced an average of 40 feet apart. These seams strike a little east of north. The other main trend of fractures appears to be north 60° to 70° east, dipping steeply to the north.

Eleven samples were taken from the seams and the agglomeratic areas. These samples gave traces of quicksilver, in two cases as high as one pound per ton.

Report by: J.E.A., 1940

POLK COUNTY

Geography

Polk County borders Yamhill County on the south and extends westward from the Willamette River to the summits of the Coast Range. The area of the county is 739 square miles. Dallas, the county seat, is located on Rickreall Creek in the eastern foothills of the Coast Range.

The broad Willamette Valley contains numerous rounded hills, the most prominent of which are the Eola Hills in the eastern part of the valley. Higher and steeper hills lie to the west of the valley, and merge into the rugged mountainous area of the Coast Range in the western portion of the county. Elevations range from about 90 feet along the Willamette River to above 3,000 feet along summits of the Coast Range. Except for the western edge of the county, which is drained by the Salmon and Siletz rivers, the drainage is directly or indirectly into the Willamette River on the east by way of the South Yamhill and Luckiamute rivers, and Rickreall, Salt, and Mill creeks.

Agriculture, lumbering, and dairying are the principal industries. Fruit, nuts, and hops are the most important crops. The mineral resources consist of sand, gravel, crushed rock, and limestone. A deposit of manganese has been noted, but has not been explored and apparently is small.

Geology

Baldwin (1947) prepared reconnaissance geologic maps of the Dallas and Valsetz quadrangles located mainly in Polk County. The area covered by these maps consists of a section of the summit and eastern slope of the Coast Range and a portion of the western part of the Willamette Valley. This report was the main source of information for the following description of the general geology of Polk County.

The formations exposed in the Coast Range in Polk County consist of Eocene igneous and sedimentary rocks. Igneous dikes and sills probably of upper Oligocene age intrude these Eocene formations. Oligocene sediments occur in the Willamette Valley in the northeastern part of the county. Miocene basalts cap the Eola Hills. Pleistocene and Recent alluvium and terrace deposits mask many of the older formations in the valley of the Willamette River and along the lower valleys of the other major streams.

The Siletz River volcanic series (lower to middle Eocene) composed of basalt flows, breccia, pillow lavas, and interbedded tuffaceous sediments, is exposed in the highlands west of Dallas and extends southwestward across Polk County into Lincoln County. The series was officially named by Snavely and Baldwin (1948) from exposures along the Siletz River and its tributaries.

Middle Eocene sediments, consisting of sandstones in the basal part and largely shales in the upper part, overlie the Siletz River volcanic series. These sediments were tentatively correlated by Baldwin (1947) with the Umpqua-Tyee sediments of southwestern Oregon, and in part may be correlative to the Burpee formation which occurs farther west in the Coast Range. The limestone deposits in Polk County occur as lenses in the basal part of this series. These sediments extend north, south, and west of Dallas and surround the exposures of Siletz River volcanics.

In the eastern part of the area covered by the Dallas quadrangle, upper Eocene sediments and some basalt flows are exposed. These sediments consist of marine tuffaceous sandstone, siltstone, and shale probably equivalent in age to the Cowlitz, Coaledo, and Spencer formations. The best exposure is along the highway that crosses Cooper Hollow. These sediments are also exposed at Helmick Hill in southeastern Polk County.

East of the Dallas and Valsetz area on the western side of the Willamette Valley, sandstones, shales, and siltstones of the Keasey formation (upper Eocene to lower Oligocene) and younger Oligocene formations occur. At Holmes Gap these younger Oligocene sediments are in contact with the underlying Keasey formation. Oligocene sediments are also exposed in places along the west side near the base of the Eola Hills. These sediments are mainly light-colored tuffaceous sandstones probably correlative with the Pittsburg Bluff formation of Columbia County and the Eugene formation of Lane County.

Stayton lavas (middle Oligocene), correlative with the Columbia River basalts, cap Oligocene sediments in the Eola Hills. Gibbsite and ferruginous bauxite float are found at several localities in these hills.

Sills and dikes of gabbro and diorite have intruded the Eocene rocks in the southwestern part of the Dallas quadrangle and in many places in the Valsetz quadrangle. Sills cap Laurel Mountain, Fanno Peak, Bald Mountain, and some of the other highest peaks and plateaus. A long dike extends from Diamond Peak to Fanno Peak. These intrusives are considered to be upper Oligocene in age.

Pleistocene formations include terrace deposits of weathered gravels, particularly those east and northeast of Dallas along Rickreall and Salt creeks, and silt which covers much of the Willamette Valley plain and lower slopes of adjacent hills. Some glacial erratics of granitic rocks are associated with the silt. Recent floodplain deposits of gravel and sand cover the channels of the present streams.

Mining Properties of Polk County

BUELL LIMESTONE

Lessee: Buell Lime Products Company, A. N. Duncan, president, 12 Ladd and Bush Building, Salem, Oregon.

Owner: H. W. Schmidt, Route 1, Sheridan, Oregon.

Location and area: Secs. 19, 20, 29, and 30, T. 6 S., R. 6 W. The deposit is about 2 miles west of Buell and 3½ miles southeast of Willamina a short distance south of State Highway 22. The property contains 750 acres.

History and development: The deposit was noted by Hodge (1938:267) who stated that the Oregon Portland Cement Company investigated the occurrence in 1932. The Buell Lime Products Company obtained a 40-year lease with an option to purchase from H. W. Schmidt about February 1946. This company drilled 13 diamond-drill holes along the strike of the limestone bed. Quarrying operations were begun in March 1946 and have been continuous through 1950. Agricultural limestone has been marketed.

Geology: Limestone crops out in many places on the property on a dip slope south of an intermittent northwest-flowing creek. The limestone bed strikes N. 60° W. and dips 8° N. under a belt of tuffaceous shale which is exposed in the highway cuts and which forms the heavy overburden east of the quarry. On the west the limestone abuts against a basaltic hill. Basalt appears to underlie the limestone disconformably, but no angular relationship could be determined from the available exposures.

Drilling completed by the Buell Lime Products Company indicated that the limestone bed has an average thickness of about 20 feet and is underlain by greenish sandstone.

The Buell deposit is somewhat similar in appearance and composition to the Dallas limestone deposits 10½ miles to the southwest. Although fossils occur in the Buell limestone, no

attempt has been made to identify them. If the Buell deposit occupies a stratigraphic position equivalent to the Dallas limestone, it would be of upper Eocene age.

The limestone is massive and slightly jointed. It is a dense gray rock with both carbonaceous and clastic fragments. The rock weathers brown near the surface and any samples taken from outcrops may have a lower lime content as a result of leaching.

Results of the chemical analysis by L. L. Hoagland, Department chemist, of samples obtained at the quarry are given in the table below.

Sample No.	Description	CaO	MgO	SiO_2	Neutralizing value
P-4525	6½-ft. channel sample from face of quarry	27.72%	2.16%	29.06%	53.91%
P-4526	Specimen taken near middle of above channel	27.42	1.41	37.40	52.14
P-4527	Grab sample taken near hole 1	42.77	1.25	14.10	78.91
P-4528	Grab sample taken near hole 3	28.73	2.84	24.94	57.04
P-4529	Grab sample taken near hole 5	35.93	2.00	18.58	68.17

The Buell Lime Products Company submitted two composite samples of the diamond drill cores from holes 1 to 10 inclusive to Charlton Laboratories of Portland for analysis. The results are listed as follows:

Sample Description	CaO	MgO	Neutralizing value
1. Average material, holes 1 to 10 inclusive	32.0 %	1.47%	61.6 %
2. "High grade" material, holes 1 to 10 inclusive	34.3	1.21	63.6
3. Core from hole 13	43.8	0.95	80.2

Drill cores and outcrops in the vicinity of the drill holes indicate an average thickness of 20 feet of limestone extending over an area of 300 feet by 1,500 feet. Total indicated reserves over this area would be 9,000,000 cubic feet. Measured specific gravity of the limestone from the quarry is 2.3. Thus a total of approximately 646,000 tons of limestone is indicated. By further extension of the area from outcrop indications an inferred tonnage of 1,550,000 tons is obtained.

References: Hodge, 1938:267
Mason and Lowry, 1946

DALLAS MANGANESE

Owner: A. E. Ullman, Salem, Oregon.

Location: NW¼ sec. 36, T. 7 S., R. 6 W. Exposed only in the bank and the bed of Rickreall Creek.

Geology: Rickreall Creek flows over fine- to coarse-grained yellow, gray, and green tuffs, which at the locality are well bedded, but to the west are quite massive and even grained. Near the deposit the coarse-grained (2-5 mm) bands, from 6 to 18 inches thick, form ridges which stand out from the medium grained (½ to 1 mm) bands, from 1 to 2 feet thick. The coarse-grained beds are reddish in color; nearly all the medium and fine-grained tuffs are greenish or gray. The tuffs strike N. 80° E., and dip 15° W. at the locality; 100 yards upstream to the west they strike nearly due north and dip 5° east; 50 yards farther upstream they are nearly horizontal. The major jointing systems in the tuff strike N. 25° W. and generally dip 30° E., but some are vertical.

The tuffs are intruded, at the locality, by dense fine-grained black basalt. The contact is quite irregular, and the basalt is highly brecciated in places along the contact. Downstream from the locality the creek flows over basalt.

The north side of the creek consists of a steep 20-foot bluff of gravels which forms a relatively level terrace 50 to 200 feet wide and more than half a mile long. A similar less well-developed terrace appears on the south side of the stream, but the bluff is lacking on this side. Beyond the terrace on the hillsides both upstream and downstream from the locality basalt was the only rock seen.

Near the contact of the basalt and breccia with the tuff, the tuff is cut by thin veinlets (less than half an inch thick) of a manganese mineral (probably hausmannite), which, when it penetrates to the coarse-grained beds of tuff, spreads out and disseminates into the interstices between the tuff grains to form the matrix between the angular fragment The coarse beds contain from 10 to 14 percent manganese. Samples were taken as follows:

Sample number	Description of sample	Thickness of sample	Percent Mn
PA 7	Coarse red tuff	14 inches	10.57
PA 11	Coarse red tuff	6 "	10.69
PA 12	Grab sample of high-grade from coarse red tuff	----	14.97

The exposed outcrop of ore is about 20 feet long and not more than one foot thick. The manganese dissemination is irregular, and in the absence of exploration work the extent may not be predicted.

Report by: J.E.A., 1941

FERRUGINOUS BAUXITE DEPOSITS

See "Ferruginous Bauxite Deposits,"(page 133) Marion County.

LIME PRODUCTS COMPANY QUARRY (Limestone)

Owner: Lime Products Company, Dallas, Oregon, owned by T. T. Leonard, Silverton, Oregon.

Location and area: SE¼ sec. 11, T. 8 S., R. 6 W., about 6½ miles by road southwest of the county courthouse at Dallas, Oregon, and about half a mile south of the Oregon Portland Cement Company quarry. The quarry is at an elevation of about 500 feet. The property consists of about 186 acres of land.

History and development: The quarry was opened up several years prior to 1932 and limestone for agricultural purposes has been produced intermittently since that time. Agricultural stone was produced in 1949 and 1950 according to the Department's records. No figures as to the total output are available. According to Allen (1946:2) the quarry covered about two acres and the maximum height of the face was 30 feet. A short spur track joins with 3 miles of track which connects with the Southern Pacific Railway line near Bridgeport. This 3 miles of track is used jointly with the Oregon Portland Cement Company. Most of the production is delivered by truck. The stone is crushed in a mill near the quarry.

Geology: The limestone beds mined at this quarry are an extension of the "Dallas limestone member," the general geology of which was discussed under the Oregon Portland Cement Company quarry.

Allison (1933), from analyses of several groups of samples from this property and on the basis if exposures in the quarry and the results of test drilling, estimated that 20 to 30 feet of limestone would have an average of 70 to 75 percent $CaCO_3$. He estimated the tonnage readily accessible near the quarry to be about 300,000 to 400,000 tons, with additional tonnage becoming available as development proceeded. The overburden varies from less than 10 feet to more than 25 feet.

Report by: D.J.W., 1951

References: Allen, 1946:2
Allison, 1933 (unpublished report)

OREGON PORTLAND CEMENT COMPANY QUARRY (Limestone)

Owner: Oregon Portland Cement Company, 111 S.E. Madison Street, Portland, Oregon.

Location and area: NW¼ sec. 12, T. 8 S., R. 6 W., (quarry site) about 3 miles southwest of Dallas. About 925 acres in parts of secs. 1, 2, 11, and 12, T. 8 S., R. 6 W., are contained in this property.

History and development: Some limestone was quarried prior to 1911 and extensive drilling over an area which now has been largely quarried was completed in the early 1920's. Drilling during 1946 and 1947 indicated additional tonnage to the north and east of the quarry site at that time. The quarry in 1946 covered an area of more than 5 acres and its face is about 50 feet in height. The quarry is served by a 3-mile railroad spur from a branch of the Southern Pacific Railway near Bridgeport and has about half a mile of narrow-gauge track from quarry to the crushers and bunkers.

Topography: The limestone deposit lies on the eastern slope of a ridge situated south of Rickreall Creek, north of the Little Luckiamute River and northwest of Kings Valley. Drainage is mainly in two directions, north into Rickreall Creek and south into the Little Luckiamute River. Locally the relief is about 300 feet and the slopes are gentle. The quarry is at an approximate elevation of 600 feet.

Geology: According to Baldwin (1947:53) the limestone in the vicinity of Dallas occurs as a lens which appears to be a basal member of the Umpqua-Tyee sedimentary series consisting largely of tuffaceous sandstones and shales. He refers to this lens as the "Dallas limestone member." He also states that most of the known limestone deposits in this area, with a few exceptions, rest upon the Siletz River volcanic series. Basalt, probably of this series, is exposed in the floor of the quarry.

The limestone deposit extends from the divide between the quarry and the North Fork of Ash Creek (northeast of the quarry) southwestward beyond Waymire Creek and approximately as far eastward as Liberty Road. The beds strike N. 10° E. in this quarry and nearly due east in the Lime Products Company quarry about half a mile to the south, which indicates a structure plunging to the southeast. The limestone member is limited by an erosion surface up the dip and to the northeast and apparently dips beneath the overlying sediments to the east and south. It is more than 50 feet thick at the quarry.

The rock is an impure, dark gray, tuffaceous, sandy limestone that weathers to a porous, brown sandy material, due to the leaching of the calcium carbonate and alteration of the tuff grains. It consists of many foraminifera tests, fragments of large shells, and calcareous algae intermixed with tuffaceous material. The surface is uneven due to weathering along certain joints.

The limestone varies in composition from less than 50 percent to nearly 90 percent $CaCO_3$. According to J. D. Bywaters, superintendent of the Oregon Portland Cement Company quarry, stone from the quarry averages as shipped about 55 percent $CaCO_3$.

The Oregon Portland Cement Company produces about 400 tons of limestone a day. The ore is crushed and shipped to the company's cement plant at Oswego.

Report by: D.J.W., 1951

References: Allen, 1946:2-5
Allison, 1933 (unpublished report)
Baldwin, 1947.53
Hodge, 1938:266-267

TILLAMOOK COUNTY

Geography

Tillamook County, located along the Oregon coast between Lincoln and Clatsop counties, comprises an area of 1,115 square miles. Tillamook, an important coastal town situated on Tillamook Bay, is the county seat.

The topography is that of moderately rugged mountain country and similar to the other counties of northwestern Oregon situated in the Coast Range province. Maximum elevation is about 3,500 feet. The coast line is straight with several bold cliffs or headlands of igneous rock between which are located beaches and inlets. The main streams, the Nehalem, Wilson, Trask, and Nestucca rivers flow westward to the Pacific Ocean.

Lumbering, dairying, and fishing are the main industries. The mining industry of the county consists of sand, gravel, and crushed rock production. Small coal seams have been found on and near Neahkahnie Mountain.

Geology

Geological maps by Warren, Norbisrath, and Grivetti (1945) and Snavely and Vokes (1949) cover most of Tillamook County. These maps and the geological descriptions accompanying them were used in compiling the following account of the geology of this county.

Tillamook County is largely covered by a thick series of Eocene basaltic lavas and pyroclastics. Middle Eocene to middle Miocene marine and brackish water sediments with interbedded volcanic material are exposed to the west and south of this series. Upper Oligocene to lower Miocene intrusive igneous rocks occupy a portion of southwestern Tillamook County. Middle Miocene and younger basaltic flows and feeder dikes form most of the headlands along the coast, such as Cape Meares and Cape Lookout. Pleistocene and Recent alluvial deposits occur at the mouths of the major streams and on the beaches along the coast.

The Tillamook volcanic series (Eocene), consisting predominantly of basaltic lavas and tuffs, are the oldest rocks exposed in the county. They occupy most of the county north of the Nestucca River except along the coast. Along the western edge this series is overlain by marine and brackish water sedimentary beds of Cowlitz age (upper Eocene) to Astoria age (middle Miocene). Included in this group of sediments are the Oligocene formations (Keasey, Gries Ranch, Pittsburg Bluff, and Blakely) described in detail by Warren and Norbisrath (1946) from exposures in the Upper Nehalem River basin in Clatsop and Columbia counties.

Bordering the exposure of the Tillamook volcanic series on the southwest, Snavely and Vokes (1949) mapped shaly siltstones, claystones, and basaltic sandstones with intercalated volcanic material, for which the name Nestucca formation (upper Eocene) was proposed. These strata extend southward into Lincoln County and eastward into Yamhill and Polk counties. The Nestucca is equivalent to the upper part of the Tillamook volcanic series and the Cowlitz formation.

Burpee sandstone (middle Eocene) is exposed over a small area in southeastern Tillamook County. Intruding the Burpee and Nestucca formations are rather large bodies of gabbro, diorite, and basalt considered as upper Oligocene to lower Miocene in age.

Mining Properties of Tillamook County

LARREW PROPERTY (Gold?)

Owner: Frank L. Larrew, Blaine, Oregon.

Location: NE¼ NW¼ sec. 1, T. 4 S., R. 8 W. The workings were located under the falls of a creek, tributary to Slick Rock Creek, six miles east of Blaine.

Area: 500 acres of deeded land.

History: Gold was reportedly discovered on this property in 1930. A mill was built in the fall of 1939.

Equipment: Mill equipment includes a 4 by 6-foot rod mill and an amalgamation trap.

Geology: Medium-grained rather soft dark gray grit and sandstone with 2 to 3 percent of fine-grained pyrite in octahedra, some of which were quite yellow, especially on a weathered surface. Some chalcopyrite (?) in bunches and streaks and small grains of red cherty material were noted.

Report by: J.E.A., 1940

NEAHKAHNIE MOUNTAIN COAL LOCALITIES

Location and owners: Secs. 2, 10, and 16, T. 3 N., R. 10 W., and sec. 36, T. 4 N., R. 10 W., in Clatsop County. The ownership in these sections was reported as follows:

Sec. 16 - Markham and Callow, Inc., Nehalem, Oregon.

Sec. 10 - Markham and Callow, Inc., Nehalem, Oregon.

Sec. 2 - NW¼ Markham and Callow, Inc.; N½ and SW¼ Tillamook County.

Sec. 36 - NE¼ Josephine E. Walker, c/o U.S. National Bank, Portland, Oregon.

SE¼ Josephine E. Walker Dulley, c/o Wells Fargo Bank & Union Trust Company, Market and Montgomery Streets, San Francisco, California.

S½ SW¼ Alice Leslie Walker, address same as above.

N½ SW¼ Clatsop County.

SE¼ NW¼ Markham and Callow, Inc.

N½ NW¼ and SW¼ NW¼ Mary Smith, c/o John H. Smith, Jr., c/o Hawley Pulp and Paper Company, Oregon City, Oregon.

Description of deposits:

Locality No. 1 is about three-quarters of a mile northeast of the Coast highway, and 1 mile northeast of Neahkahnie beach, on the upper forks of what is locally known as Hodge Creek, at about 500 feet elevation. All exposures were caved at the time of the visit in 1941, but a report made by Diller (1896:494) is as follows:

"In sec. 16, T. 3 N., R. 10 W., occurs an 18-inch bed of coal lying between beds of clay. It is near the south foot of Neahkahnie Mountain, and is inclined at an angle of 30° southwestward. A short distance farther down the slope is another exposure of coal. It can be traced for 50 feet along the strike and ranges

from 5 inches to 14 inches in thickness. It dips at an angle of 30° to the northwest, nearly at right angles to that in the other exposure. There may be two beds of coal here, but considering the softness of the associated strata and the difference in position of the coal outcrops, it is not improbable that the lower exposure is only a slide from the upper. The analysis of coal from this locality is No. 11 in the list.

"On another branch of Hodge Creek, about 250 yards to the eastward from the locality just noted, two tunnels have been driven by Mr. J. G. Gerritze for Mr. S. F. Pearson. In one of them a 2-foot pocket of brilliant, homogeneous, fine-looking coal was found, which yielded the analysis No. 12 in the table."

The analyses mentioned by Diller (1896:503) are No. 11 and 12 below. No. 12-ABC was taken by the Department in 1941 from the dump of the tunnel mentioned by Diller.

Sample No.	Moisture	Volatile matter	Fixed carbon	Ash	Sulphur	Physical properties of coal
11	8.08	41.26	46.81	3.85	1.30	Partly brilliant and coherent
12	8.86	40.06	46.79	4.29	1.31	Partly brilliant and coherent
12 A	11.8	38.5	45.2	4.5	0.7	10,680 B.t.u. (air dried)
B		43.7	51.2	5.1	0.8	12,110 B.t.u. (moisture free)
C		46.0	54.0			12,760 B.t.u. (moisture and ash free)

Locality No. 2 - A coal of the same character, 22 inches in thickness, was reported from sec. 10, according to Diller (1896:494-495) by Mr. Frank Steinhauer.

Locality No. 3 - On Coal Creek in sec. 2, an 18-inch bed of coal lies between shales and strikes northeast, dipping to the northwest at an angle of 50°, according to Diller (1896:494).

Locality No. 4 - A lustrous black, 10-inch bed of coal occurs on Coal Creek in sec. 36 of the next township to the north in Clatsop County. It lies between sandstone (above) and shale. This locality was visited in 1942, but the only coal found was a large lump, 1 foot by 2 feet in size, which showed little checking or weathering, lying loose on a gravel bar in the bed of Coal Creek. Analysis of a sample 13-ABC from this lump and sample No. 13 taken by Diller (1896:503) is as follows:

Sample No.	Moisture	Volatile matter	Fixed Carbon	Ash	Sulphur	B.t.u.	
13 A	10.7	38.0	48.3	3.0	0.7	11,290	(air dried)
B		42.5	54.1	3.4	0.8	12,640	(moisture free)
C		44.0	56.0		0.8	13,080	(moisture and ash free)
13	8.91	41.54	47.23	2.31	0.38		

Diller's (1896:495) conclusions as to the possible value of the coal in this area are as follows:

"Sections 16, 10, 2, and 36 are all in a line extending northeast and southwest, and the coal exposed in them may all belong to the same bed. The coal field, so far as known, has a length of about 5 miles. The quality of the coal is good, but its thickness, so far as yet known, nowhere exceeds 22 inches. It occurs in strata so soft as to render timbering generally necessary, and is inclined at a considerable angle. In view of these facts, notwithstanding its good quality and nearness to tide water, above which it rises only a few hundred feet, it cannot be regarded as promising commercial importance."

Report by: J.E.A., 1942

Reference: Diller, 1896:494-495, 503

WASHINGTON COUNTY

Geography

Washington County comprises an area of 716 square miles located west of Multnomah and Clackamas counties. Hillsboro, situated approximately in the center of the Tualatin River Valley, is the county seat.

The most prominent physiographic features are the broad valley of the Tualatin River, the Chehalem Mountains on the south, the Portland hills on the north, and a rugged mountainous area of the Coast Range on the west. Elevations range approximately from 100 feet in the Tualatin Valley to more than 3,000 feet in the Coast Range along the western edge of the county. Drainage is largely eastward into the Willamette River by the Tualatin River and its tributaries, such as Dairy, McKay, and Gales creeks. However, a small part of the northwest corner is drained by the Nehalem River; and the headwaters of the Salmonberry, Wilson, and Trask rivers, which flow westward to the Pacific Ocean, are partly in western Washington County.

Washington County is noted for its dairy products, grain, fruits, nuts, and vegetables. The main industries are canning and lumbering. The mineral resources consist of ferruginous bauxite which occurs on the gently sloping hills north and south of the Tualatin Valley, sand, gravel, crushed rock, silt and clay from which brick and tile are made, and shale which is expanded to form a lightweight aggregate.

Geology

The Tillamook volcanic series (Eocene) consisting of basaltic lavas with interbedded tuffs and breccia is exposed in western Washington County from the Salmonberry River southward. Unconformably overlying these lavas are conglomerates, shales, and sandstones of the Cowlitz formation (upper Eocene) that are exposed along the eastern border of the exposure of these older lavas. Overlying the Cowlitz is the Keasey formation (upper Eocene to lower Oligocene) which consists of shales and sandstones lithologically similar to those of the Cowlitz formation. These sediments are exposed at Sunset Tunnel on the Wolf Creek Highway and along Gales Creek northwest of Forest Grove.

Tuffaceous and micaceous sandstones, siltstones, and shales make up the Gries Ranch, Pittsburg Bluff, and Scappoose formations of Oligocene age. They unconformably underlie the Columbia River basalts (middle Miocene) in northern and southern Washington County. These sediments are best exposed in the upper reaches of the East Fork and West Fork of Dairy Creek.

Thick flows of Columbia River basalt cap the Portland hills, the Chehalem Mountains, and Cooper and Bull mountains. Lateritic weathering of the Columbia River basalts has formed the ferruginous bauxite deposits of this county. The silts overlying the laterite deposits have been assigned to the Troutdale (Pliocene) formation (Libbey, Lowry, and Mason, 1945:10).

Boring lava (Pliocene) covers a portion of the west slope of the Portland hills east and northeast of Beaverton. These lavas are generally lighter in color than the characteristically dense, black flows of Columbia River basalts.

The valley fill of the Tualatin River consists of Pleistocene and Recent alluvial deposits, sands, gravels, and clays.

Mining Properties of Washington County

CLEAR CREEK DEPOSIT (Limestone)

Owner: Not known.

Location: Near the section corner common to secs. 10, 11, 14, and 15, T. 1 N., R. 5 W., on the north fork of Clear Creek, 200 yards west of forks at at an elevation about 900 feet. The deposit is about 4 miles southwest of Gales Creek; it is reached by a dead-end road to the saddle north of Clear Creek, a distance of 3.1 miles, thence 1.5 miles up the creek to the forks. The deposit has had no work done on it (1946).

Geology: According to Warren, Norbisrath, and Grivetti (1945), the area lies within the Tillamook volcanic series of probable middle Eocene age. The deposit consists of coarse-grained fossiliferous tuff and fine conglomerate, cemented and possibly replaced in part by lime. It outcrops in the bed of the creek, underlying and forming the basal 10 to 25 feet of a bed of basaltic conglomerate, also cemented by lime, which stands up in cliffs at least 30 feet high.

The strike is about N. 25° W. and the dip about 20°-25° E., but the structure is very obscure, even in the good outcrops afforded by the walls of the creek. The limestone overlies basaltic breccia which consists of both angular and rounded basaltic grains averaging about half a centimeter in diameter. The total section of overlying basaltic conglomerate is at least 500 feet thick, having an outcrop width of at least half a mile. East of this band of conglomerate, and either intruding or overlying it, is a dense, fine-grained, blocky basalt.

It is reported that low-grade limestone also appears along the strike on the south fork of Clear Creek, but it has not been traced farther in either direction. Sample No. P-4541 from the bed on the north side of the creek; sample No. P-4542 from the limy portion of the overlying conglomerate; sample No. P-4543 from the limy bed on the south side of the creek as analyzed in the Department's laboratory contained 57.08, 55.14, and 42.11 percent $CaCO_3$, respectively.

Informant: Fred Chain, 20 Park Street, Forest Grove, Oregon

Report by: J.E.A., 1946

FERRUGINOUS BAUXITE DEPOSITS

Location: T. 1 N., R. 2 W., and Tps. 2 and 3 N., Rs. 2 and 3 W. A part of the area in the E½, T. 2 N., R. 2 W., is situated in Multnomah County. This area is approximately twenty-five to thirty-five miles northwest of Portland and from six to fifteen miles north of Hillsboro, Oregon. Skyline Boulevard, which extends along the crest of the Portland hills northwestward from Portland, lies along the eastern edge of the laterite deposits.

History: In April 1944 the Department began investigation of deposits of ferruginous bauxite which occur in northern Washington County. A preliminary report by Libbey, Lowry, and Mason (1944) and the bulletin by Libbey, Lowry, and Mason (1945:28-47) list numerous float localities, outcrops, and deposits of ferruginous bauxite in this area.

Topography: A gently sloping upland surface, having an elevation of more than 1,600 feet, drops gradually southward in a distance of 7 miles to an elevation of about 400 feet where it approaches the Tualatin Plain. The crest of the surface forms the drainage divide between northern Washington County and southern Columbia County. The surface is dissected by many gulches and canyons with steep slopes, which separate numerous flat-topped hills and spurs.

Development and exploration: In 1944 and 1945 the Department explored a number of the deposits. An area totaling slightly more than 500 acres was mapped topographically. During the investigation 69 auger holes, totaling 1,614 feet, were drilled. More than 5,000,000 tons of ferruginous bauxite was indicated in two localities (see figure 3 opposite page 7). The Hendrickson, Zimmerman, Nelson, Hutchison, and Nixon properties contain the bulk of the reserves indicated by this exploration. Deposits were indicated at other properties, but considerably more exploration would be necessary to make accurate tonnage estimates.

Alcoa Mining Company explored the laterite deposits of Washington County from early in 1945 to late in 1947. The quantity of reserves developed by this company has not been made public. In 1946 the company made several shipments of ore from properties on Dixie Mountain to East St. Louis for testing purposes.

Geology: The ferruginous bauxite deposits of Washington County, like those of Columbia County, were formed by the laterization of Columbia River basalt of Miocene age following extrusion and before the deposition of the overlying silts. Probably the laterization occurred before the gentle folding and uplift of the region took place sometime in the Pliocene.

The Miocene basalts are underlain by shales and sandstones of Oligocene age. Exposures of these sediments occur along the northwestern border of the basalts in the bauxite locality of Washington County. Some of the exposures of these sediments are steptoes in the bauxite localities of Washington and Columbia counties representing ridge areas, which stood above the generally mature surface over which the basalts were extruded.

Basalt exposed in McKay Creek west of the Hendrickson laterite deposit strikes N. 65° W. and dips several degrees to the south. The attitude of this basalt is very similar to that of the laterite deposits on the Hendrickson and Hutchison-Nixon properties.

The basalt in the area of the ferruginous bauxite deposits in Washington County is thought to form the southwest limb of an anticline which trends northwestward, and the crest of which approximately coincides with the drainage divide in northern Washington County. This basalt dips to the south and apparently extends southward under the fill of the Tualatin Valley to reappear in the Chehalem Mountains.

The arithmetical average analysis of the ore on properties drilled by the Department in Washington County is 34.68 percent alumina, 23.12 percent iron, 9.48 percent silica, and 4.85 percent titania. The character of the ore in Washington County, which is similar to that in Columbia County, is further discussed in the description of the properties on which reserves of ores were estimated as a result of the Department's exploration program.

Hendrickson Property

The Hendrickson farm is located on Dixie Mountain Road in the N½ sec. 6, T. 2 N., R. 2 W., at an elevation of about 1,300 feet. Several outcrops and cuts were channel sampled. Twenty-nine holes were drilled on the property. The arithmetical average analysis of samples of ore from these drill holes is:

Alumina	(Al_2O_3)	31.85 %
Iron	(Fe)	25.95
Silica	(SiO_2)	8.95
Phosphorus	(P)	0.140
Titania	(TiO_2)	4.5
Ignition loss		18.0
Moisture		19.0

Approximately 64 acres are underlain by ore on this farm. The volume-weight factor for the ore is 17 cubic feet per long ton. Using this volume-weight factor and an average thickness of ore of 11 feet, 1,760,000 long tons of ore is indicated by the drilling.

A typical section (in descending order) of ore on the Hendrickson property consists of red to reddish-brown oölitic or pisolitic, reddish-brown nodular, firm red fine-grained, and brown to yellow brown, soft, fine-grained varieties of ferruginous bauxite. The overburden consists of top soil and buff to brown to red silt. Red clayey silt or clay, some of which contains oölites, immediately overlies the ore.

The strike of the ore body is approximately N. 75° W. and the dip 1°-2° S. The attitude was determined from the elevations of the bottom contact of the hard ore.

Geo. B. Zimmerman Estate

This property is northwest of the Hendrickson deposit and is separated from it by a narrow saddle. A drill hole penetrated 13 feet of oölitic ore which analyzed as follows:

Al_2O_3	36.60%
Fe	23.49
SiO_2	6.94

Insufficient exploration makes a tonnage estimate difficult. There are possibly 50 acres underlain by ore.

Nelson Property

The Nelson farm is located in the SW¼ sec. 32, T. 3 N., R. 2 W., a quarter of a mile northeast of the Hendrickson property. Average analysis of ore from three of the six drill holes on the Nelson property is:

Al_2O_3	32.52%
Fe	21.66
SiO_2	12.97

An estimated 175,000 long tons of reserves, based on a 10-foot average thickness of ore, lies between the holes drilled in ore.

Hutchison-Nixon Properties

The Hutchison and Nixon properties are 14 miles north of Hillsboro, and 8 miles north of North Plains by way of Pumpkin Ridge Road. Elevation in the area ranges from 1,100 to 1,300 feet. The legal description is secs. 1 and 2, T. 2 N., R. 3 W., and secs. 34, 35, and 36, T. 3 N., R. 3 W.

More than 230 samples were taken from 23 drill holes totaling 692 feet. The over-all weighted average analysis of the ore indicated is:

Al_2O_3	34.33%
Fe	24.46
SiO_2	8.64

The weighted average thickness of the ore was 13 feet. A total reserve of 3,600,000 long tons of ore is indicated.

The thickness of overburden ranges from 2 to 30 feet and averages 18 feet. The stripping ratio of the overburden to ore is 1.4 to 1.

The ore body is similar in thickness, attitude, and composition to that at the Hendrickson farm 1½ miles to the east. The ore is oölitic and pisolitic for the most part, with the lower portion of the bed somewhat less gritty and of a porous granular texture. The ore body strikes about N. 85° W. and dips approximately 10°-3° S.

References: Libbey, Lowry, and Mason, 1944
Libbey, Lowry, and Mason, 1945

YAMHILL COUNTY

Geography

The Willamette River forms most of the eastern boundary of Yamhill County which lies south of Washington County and north of Polk County.

The county comprises an area of 709 square miles. McMinnville, the county seat, is located near the junction of the North and South Yamhill rivers.

The most important physiographic features of Yamhill County are the broad plain of the Willamette Valley on the east, the Chehalem Mountains in the northeastern corner, and the Coast Range on the west. The Dundee, Amity, and Eola hills are minor structural features which stand above the low level plain of the Willamette Valley. Elevations in the county range from a low of about 75 feet along the Willamette River to slightly above 3,000 feet in the Coast Range. The drainage is principally southeastward along the North Yamhill River and northeastward along the South Yamhill River into the Willamette River. The Willamette River flows northward along the eastern edge of the county as far as Newberg where it turns abruptly eastward. Some of the area along the westward edge drains westward to the Pacific Ocean.

Agriculture is the main source of income. Fruits and nuts are the principal crops. Sand, gravel, crushed rock, and clay constitute the known mineral resources.

Geology

Published geological data pertaining to Yamhill County are rather limited. Reconnaissance and preliminary geology of parts of the county have been described by Washburne (1914), Piper (1942), Snavely and Vokes (1949), and Warren, Norbisrath, and Grivetti (1945). The geological map of a part of northwestern Oregon prepared by the last authors mentioned above covers more than the northern one-third of the county.

In general, the oldest rocks are exposed to the west in the Coast Range, and consist mainly of Eocene lavas and sediments (sandstone, siltstone, and shales). Intrusive igneous rocks of probable upper Oligocene age cut these Eocene formations. In the Willamette Valley, Oligocene sediments which overlie the Eocene sediments and underlie Miocene lava flows crop out at the base of Chehalem Mountains and the Dundee, Amity, and Eola hills. Pleistocene and Recent terrace and alluvial deposits form the fill of the Willamette Valley, and these deposits extend up the valleys of the North and South Yamhill rivers.

According to the map by Warren, Norbisrath, and Grivetti (1945), the Tillamook volcanic series (Eocene) occurs in the Coast Range in northwestern Yamhill County. East of this series north of Yamhill, middle Eocene shales are mapped as a separate unit. The authors state, however, that the lavas and shales interfinger. Farther east in the valley of Chehalem Creek, middle Tertiary sediments, mainly sandstones and shales, are exposed. These sediments as mapped include the upper Eocene Cowlitz formation and Oligocene formations. In the Chehalem Mountains and the Dundee Hills, flows of Columbia River basalt (middle Miocene) overlie the Oligocene sediments.

A small portion of the extreme southwestern corner of Yamhill County was included on the map prepared by Snavely and Vokes (1949). In this area sandstones of the Burpee formation (middle Eocene) are unconformably overlain by interbedded sediments and volcanic material of the Nestucca formation (upper Eocene). Thick sills of gabbro and diorite have intruded these Eocene formations and are exposed on Mt. Hebo and Little Hebo Mountain. The intrusives are considered as being of upper Oligocene age.

Mining Properties of Yamhill County

GRANDE RONDE CLAY

Location: SE¼ sec. 5, T. 6 S., R. 7 W., about 3 miles east of Grande Ronde Agency at an elevation of 575 feet, below and west of an old road.

History: Several pits were worked here around 1913 and clay was shipped to Portland and used in the manufacture of firebrick. The property was visited in 1934 by Wilcox (1935) and by Wilson and Treasher (1938:38), but the pits were full of water and slumped clay so that no samples were obtainable.

References: Wilcox, 1935
Wilson and Treasher, 1938:38

YAMHILL COAL MINE

Owner: Chris Payola, Yamhill Route, Oregon.

Location: Near the north edge of sec. 36, T. 2 S., R. 4 W., 4 miles northeast of Yamhill. The mine is located about 100 yards east of the road, 0.3 mile north of Woodland School junction. It is on the north side of a small creek and the portal is only a few feet above creek level at an elevation of 420 feet.

History and development: In 1903 Stafford (1904) reported that the Portland Coal and Development Company was opening a bed near North Yamhill. "The mine, which has been worked for a year, has a tunnel system 1,500 feet in extent, giving 700 feet horizontal depth and 400 feet vertical depth." According to local information this mine was worked until 1907 before closing down. The property at that time was on land owned by Peter Gosier.

The tunnel system reported by Stafford was apparently not extended further. The tunnel mouth is now completely caved for a distance of 20 or 30 feet. It apparently extended in a northeasterly direction into the hill.

Geology: The rock exposed at the tunnel mouth is a coarse-grained, angular yellow tuff. No structure could be determined. Slacked rock on the dump was platy and bony. No large lumps were seen. The thickness of the coal is unknown, but must have been several feet; it is probably of too poor grade to justify the reported large amount of development, although it might be worth while to open up the tunnel and determine its actual thickness, grade, and attitude.

Report by: J.E.A., 1945

Reference: Stafford, 1904:14

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INDEX OF MINES AND PROSPECTS

Symbols Used In Index

Ag . . . . . silver	Mn . . . . . manganese
Au . . . . . gold	Pb . . . . . lead
Cu . . . . . copper	Sb . . . . . antimony
Fe . . . . . iron	Zn . . . . . zinc
Hg . . . . . mercury	

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STATE OF OREGON
Department of Geology and Mineral Industries
EARL K. NIXON, Director

Map of Mining Districts

East Half--Northeastern Oregon

(Baker, Union and Wallowa Counties)

to accompany

Bulletin 14-A Oregon Metal Mines Handbook

Scale — ½-inch = 1 mile Issued March, 1939

Map base courtesy U. S. Forest Service

For convenience, areas with their contained mining districts (see index map) are outlined below:

AREAS	DISTRICTS
1—BAKER	Auburn, Baker, Minersville, Pocohontas
2—CABLE COVE	Cable Cove
3—CONNOR CREEK	Connor Creek, Snake River
4—CORNUCOPIA	Cornucopia, Pine Creek
5—CRACKER CREEK	Cracker Creek
6—EAGLE CREEK	Eagle Creek, Keating, Sanger
7—GREENHORN	Baker County in part
8—HOMESTEAD	Homestead, Lower Pine Creek
9—LOWER BURNT RIVER	Weatherby, Durkee, Chicken Creek, Pleasant Valley
10—MORMON BASIN	Dixie Creek, Malheur, Mormon Basin, Rye Valley
11—ROCK CREEK	Elkhorn, Rock Creek
12—SPARTA - SHEEP MTN.	Lower Powder River, Sparta
13—SUMPTER	Sumpter
14—UPPER BURNT RIVER	Bridgeport, Bull Run, Hereford, Unity
15—VIRTUE	Virtue
16—UNION COUNTY	Camp Carson, Medical Springs, Upper Eagle Creek
17—WALLOWA COUNTY	Imnaha, Wallowa Range, Snake River

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