STATE OF IDAHO
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IDAHO BUREAU OF MINES AND GEOLOGY
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THE METAL AND COAL MINING DISTRICTS OF IDAHO, WITH NOTES ON
THE NONMETALLIC MINERAL RESOURCES OF THE STATE

By
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Annotated Bibliography

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Prepared in cooperation with
the United States Geological Survey

University of Idaho
Moscow, Idaho
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PURPOSE AND SCOPE OF THE REPORT

The present report enlarges and, so far as possible, brings up to date that
part of J. M. Hill's "Mining districts of the western United States", Bulletin
507 of the U. S. Geological Survey, which pertains to Idaho. Available data on
the nonmetallic resources of the state are added, but the writer's information
on nonmetallic minerals is somewhat less comprehensive than that on the metallic
substances.

Brief descriptions are given of each of the mining districts, based on pub-
lished accounts supplemented by such unpublished data as are available. A large
number of the metal-mining districts have been visited at one time or another by
the writer. The descriptions are accompanied by a map that gives the location,
and, so far as possible, the boundaries of almost all the districts. The approx-
imate limits of the principal coal-mining districts are shown on the map, but it
has proved feasible to show only a few of the nonmetallic districts in this way.
Consequently, most of the data on nonmetallic minerals are summarized briefly in
sections of the report that follow the descriptions of the mining districts. Each
description of a district or resource is followed by numerical citations to the
pertinent publications in the bibliography at the end of the report. The purpose
is to aid anyone interested in the mineral resources of Idaho as a whole or in
part to ascertain readily the present state of knowledge regarding the area or re-
source with which he is concerned. Wherever it appears desirable, references are
included to papers which describe neighboring areas and to deposits similar to
those in the particular district under consideration. Those general papers that
do not pertain either to particular mining districts or to individual nonmetallic
resources are cited in a list headed "general" in that part of the bibliography
on miscellaneous subjects at the end of the report.

The bibliography is intended to include essentially all publications of
value regarding the geologic features of Idaho. No attempt is made to include
all papers in which incidental reference to Idaho is made. Of the many brief
news articles constantly appearing in technical press, only those are included
that contain geologic or historic data of relatively permanent value. Most per-
nant articles in the technical press that occupy two or more pages are cited
except for omission of some in which the geologic data given are mere summaries
of information available elsewhere. Papers dealing solely with metallurgical
matters are not cited, and only those papers dealing with methods of mining or
other engineering matters are included that contain descriptive data of interest
to a geologist or examining engineer desirous of learning the geologic features
of an area. Similarly historical accounts are listed only when they contain
sufficient data on production of mineral resources or similar matter of probable
interest in the present connection. It is intended to include reference to
essentially all of the older papers dealing with geology, but these publications,
especially those dealing solely with paleontology, have not been cited as exhaust-
ively as have the more recent reports, as recent reports commonly embody all of
the older data of interest from an economic standpoint. Publications of limited
circulation, not available in Washington have not been systematically searched.
However, references to several articles that have appeared in such publications
are included in the bibliography.
The bibliography is arranged alphabetically by authors. Each reference in it is followed by notes that are intended to indicate the scope, and, to some extent, the adequacy of the paper referred to. Some papers, especially those not generally accessible or whose essential features of interest to the economic geologist can be briefly stated, are abstracted at relative length. For the convenience of those interested in particular parts of the state, the bibliography is also arranged by counties with special subheadings for those papers that cannot be conveniently so grouped. In this list, the papers under each subheading are arranged chronologically. The annotations are not repeated.

In order to save space, the papers listed in the bibliography are numbered and these numbers are employed in the citations following each summary. Citations are made in numerical order, but those of outstanding importance are distinguished by an asterisk. In many instances, everything of general interest regarding a district will be found summarized in the few references to which attention is thus directed. The other papers cited need be consulted only if a more thorough study is contemplated. The annual reports of the State Inspector of Mines and the different volumes of the Mines Handbook are cited after a summary of a mining district or nonmetallic resource only if especially detailed data regarding the area in question are contained in some particular volume or if no other information on the district is available in published form. Both of these reports commonly include in each volume data in one form or another regarding production and development in each of the mining districts in which there is any current activity. Complete grasp of the data regarding a given district contained in the reports can only be obtained by systematic study of the whole series. A few of the more detailed descriptions included in Mineral Resources of the United States are included in the bibliographic citations. In addition, the groups of bibliographic citations at the end of many of the descriptions of mining districts, and descriptions of particular resources, are followed by references to notes on or statistics regarding the area or resource described that appear in the annual volumes of Mineral Resources of the United States or their successors, those of the Minerals Yearbook. A few such references have been omitted because the area concerned could not be identified. Volumes of the Mineral Resources of the United States were issued from 1883 to 1923 by the United States Geological Survey, and from 1924 to 1931 they were published by the United States Bureau of Mines. Since 1931, the Minerals Yearbook has taken the place of that publication. In some instances, references to districts in "Mineral Resources" do not apply exactly to the districts as defined in the present paper; furthermore, the data in "Mineral Resources", particularly in the earlier volumes, are subject to minor inaccuracies inherent in compilations made by correspondence. These are necessarily carried over into the references here made.

The descriptive summaries are intended to give the chief geologic features of the respective areas and nonmetallic resources that are of interest from the standpoint of economic development. Sufficient data to give an idea of the amount of past development and of recent activity are included. The information presented is for the most part abstracted from the publications cited at the end of each description, but unpublished recent data are utilized wherever available. Lack of reference to post-mineral faulting or to the effects of supergene processes in the description of a mining district omotes that these features are not of economic consequence in the district described.

In the consideration of metallic resources, both lode and placer, and of coal, the mining district constitutes a convenient, although not necessarily a precise, unit for description and is thus employed. In the descriptions that follow, the mining districts are arranged alphabetically by counties. If it is
desired to look up a mining district whose location with respect to county bound-
aries is unknown to the searcher, this information can be obtained from Plate 1,
or through use of the index. As several different districts have the same or sim-
ilar names, this fact must be remembered in seeking information on a district
whose location is imperfectly known. There is no repetition of district names
within the limits of a county. A district that lies in more than one county is
described under the county in which its principal mines are situated, with cross
references under the other counties. A few contiguous and closely related dis-
tricts are described together. Such districts are listed under the name of the
district of greatest economic importance, with appropriate cross references.

For convenience, the data on gold placers along the Snake River are all
summarized in one place (pp. 6 ). Reference is made to this general descrip-
tion under each of the counties in which these placers occur, which includes near-
ly all in the Snake River Plain.

Each of the coal districts that has as yet received serious attention is
listed with the other mining districts. In many places, impure lignitic layers,
and occasionally obsidian or other material that has no relation to coal, in
Tertiary strata, have been prospected. No attempt has been made to record all
such occurrences of supposed coal, but incidental mention of some is made in de-
scriptions of certain mining districts.

The oil possibilities of southwestern and southeastern Idaho are discussed
separately. Some prospecting for oil is reported by the State Inspector of Mines
in Kootenai County, but no description of it has been published and this occur-
cence is consequently not further discussed in the present report.

Data on nonmetallic resources, other than fuels, are listed alphabetically
under the material sought, without regard to areal distribution, and also, where
practicable, in the district descriptions. Most of these resources have, as yet,
received relatively little development, although phosphate and some others are of
large potential value. The present limits of the lands reserved for phosphate
are shown on the map.

Idaho includes nearly 200 recognized mining districts, a number of which
are locally divided into subdistricts. Originally the organized mining district
was a unit of administration and was supposed to have rather definite limits.
At present, no official record exists of the extent of many of the districts.
Both boundaries and names are established, mainly by current local usage, and
tend to change with changes in conditions. However, at any given time the name
and extent of a district are fairly definite and well known to the local people.
Many districts have remained essentially unchanged since originally established.
Plate 1 shows, as nearly as can be determined, the present name and extent of
each of the mining districts in Idaho. It is based on such published information
as is available on the usage followed in the annual reports of the State Inspector
of Mines and on such other data as could be obtained by consultation with local
mining men and others in a position to know. Most of the mining districts in the
south-central part of the state have been visited by the writer and the limits of
these districts are given on Plate 1 as accurately as present usage permits. The
available data regarding some of the districts in other parts of the state are
less definite. The location of a few districts listed in the State Inspector of
Mines' reports is unknown. These are listed under the appropriate counties, but
obviously can not be shown on Plate 1. Probably most of these are subdivisions
of better known districts. The map has had the benefit of critical examination
by Mr. Stewart Campbell, former State Inspector of Mines, and by C. N. Gerry of
the U. S. Bureau of Mines. The invaluable assistance thus afforded is gratefully
acknowledged.
To facilitate finding particular mining districts, each is assigned a number on Plate 1 in approximate geographic order from north to south, and lists of the district names in numerical and also in alphabetical order are appended to the map. The alphabetical list also shows the principal metallic or nonmetallic resources of each district. To save space, the chemical symbols, rather than the names of the metals, are used in this list, but an explanation of the symbols is added for the benefit of those not versed in chemistry.

The report, as originally compiled, was intended to be complete through 1936. An appendix to the annotated bibliography, prepared by Mrs. M. S. Carr, has been added and pertinent citations thereto appear throughout the report under the descriptions of mining districts and of nonmetallic resources. This appendix includes papers published from January 1, 1937, to April 15, 1941, so far as available, and essentially brings up to date the references to the literature.

Assistance in the compilation of references to publications accorded by Mrs. A. C. Paul, Miss N. L. Bowen, and Miss E. M. Thom is also gratefully acknowledged. In addition, Mrs. Paul searched the annual volumes of "Mineral Resources" and the "Minerals Yearbook" through 1936 for the numerous references listed below the bibliographic citations and contributed suggestions from her long experience in compilations of this kind. References to chapters of the "Minerals Yearbook" 1937-1940 are included in the appendix by Mrs. Carr.

The descriptions of mining districts where practicable have been modified to include information as to developments through 1940, but data on recent history are less comprehensive than information prior to 1937. For example, many new roads have been built in the state in 1937 and later, and it may be that some of these are not adequately taken account of in the descriptions in the present report.
The Black Hornet, Boise, and Shaw Mountain districts in northeastern Ada County and adjacent parts of Boise County, close to Boise, include most of the gold lode mines in Ada County, although some prospects exist in unorganized areas outside their limits. The total production probably does not exceed a few score thousand dollars and little has been done in any of these districts for many years.

The area is underlain by granitic rock of the Idaho batholith, with occasional dikes of granite porphyry and lamprophyre. The ore deposits are quartz veins in sericitized granitic rock, containing free gold, pyrite, arsenopyrite, sphalerite, and galena. The ore shoots range in thickness from 2 to rarely 10 feet, and in length up to about 120 feet. The ore mined in the early days contained 0.2 to 0.7% of an ounce of gold to the ton, occasionally materially more (especially in the Shaw Mountain district). Little attention has been paid to the sulphide ore in which the gold is not readily recovered by amalgamation.

In the Black Hornet district, the veins strike north to northwest and dip about 45° W.; in the other two districts, they strike east and dip 45° - 80° S.

Citations to bibliography
49, 186, 359, *360, 362, 652

Black Hornet district

Highland district
(See Twin Springs district, p. 21 of this pamphlet)

Boise district

Shaw Mountain district
Placer mining in the steep gulches of the above mentioned lode mining districts has been negligible, but it is reported that placer gold (as yet little developed) occurs along the Snake River (see p.100 of this pamphlet).

Rough Mountain district (see p. 80 of this pamphlet).

ADAMS COUNTY

Black Lake district (see Mountain View district below)

Cuddy Mountain district (see p. 98 of this pamphlet)

Hornet Creek district (copper, lead, gold, and silver).

This district, also called the Galena, is near the crest of the Cuddy Mountains, 22 miles from the Pacific, Idaho, Northern Railroad at Council and is accessible only by trail. Thus far, it has been only superficially prospected. At one place, there is an area of altered rhyolite with some chalcopyrite that may be similar in genesis to the Red Ledge (see Seven Devils district, p. 7 of this pamphlet), and elsewhere there are bunches of lead-silver ore in limestone. Apparently a little placer mining has been done in the general vicinity as mention of a Placer Basin mine near Council is made on Page 207 of the Minerals Yearbook, 1936, pt. 2.

Citations to bibliography

361, 362, *373, 652

Meadows placer district (gold).

The placer deposits on Goose Creek, about 4 miles east of Meadows, have yielded a little gold and are reported to contain sapphire, diamond, corundum, and other uncommon minerals.

Citations to bibliography

*65, 171, 172, 352, 565, *652
Mineral Resources 1906, p. 242; 1906, p. 267, 1230;
1910, pt. 1, p. 468; 1911, pt. 1, p. 566;
1912, pt. 1, p. 718; 1913, pt. 1, p. 767;
1914, pt. 1, p. 612; 1915, pt. 1, p. 538;
1924, pt. 1, p. 266; 1925, pt. 1, p. 529.

Mountain View district (gold).

This little known district (also termed the Black Lake and Rapid River) is now included in the Seven Devils district for the purpose of filing claims. It is near Rapid River, about 12 miles northeast of Landore, and contains some gold-bearing quartz veins. It is reported that $200,000 or more have been produced, but at costs in excess of the value of the ore.

Citations to bibliography

362, 373, *652
Seven Devils district (copper).

This district is the best known in western Idaho south of the "Panhandle", and its name is sometimes extended to include all the mountainous area in Idaho bordering the Snake River from Weiser to Lewiston. The district has been under development intermittently since about 1894, with some prior placer and lode mining, and has a total output roughly estimated at about $1,000,000 in copper with some gold and silver. This district is relatively inaccessible. Many of the prospects are reached only by trail and none has received extensive development.

About 1925, attention was attracted to the district by the activities of the Idaho Copper Company and Idaho Copper Corporation, controlled by George Graham Rice and associates, but it appears from press accounts and the reports of the State Inspector of Mines that most of the work accomplished on the ground was in road-building and the installation of a surface plant. On December 14, 1928, Rice and the corporation were convicted of using the mails to defraud in connection with this promotion.

The area is mostly underlain by altered andesitic and rhyolitic flows and pyroclastics with interbedded limestone, all largely or entirely of Permian age, cut by granitic rock that is probably either a projecting part of the Idaho batholith or a closely related stock. Extensive areas are over lain by the Columbia River basalt.

The lodes that have been most productive are copper deposits of contact-metamorphic origin that replace blocks of limestone enclosed in granitic rock and extend out into the latter as well. Lime silicates such as are usually associated with contact-metamorphic deposits are abundant and the granitic rock is sericitized. In some deposits, the principal hypogene (primary) metallic mineral is chalcopyrite; in others, bornite. Some molybdenite and other sulphides are locally present. The deepest workings have not reached ore unaffected by supergene (secondary) processes. Relatively complete oxidation is confined to a zone of variable depth, apparently nowhere more than 75 feet below the surface but secondary sulphides persist to the deepest workings of record, about 300 feet below the surface. It appears that much of the readily accessible high-grade ore (containing over 30 per cent copper and a little silver and gold) has been picked out and shipped, but that in several prospects considerable ore containing 5 to 7 per cent copper remains in sight. Like other deposits of this type, the contact-metamorphic deposits of the district are irregular in size, shape, and tenor, so that extensive development is required to determine their value.

A few of the mines of the district, particularly the Red Ledge, are in deposits of pyrite sparsely disseminated through rhyolitic and andesitic rocks, largely tuffaceous, that have undergone widespread hydrothermal metamorphism. The valuable parts of the deposits consist of slits and fracture zones along which chalcopyrite and smaller amounts of sphalerite, galena, and other sulphides have formed in a gangue of quartz, barite, calcite, hematite, and the hydrothermally altered rock. In the ore so far developed, there has been supergene (secondary) enrichment which has caused the formation of chalcocite, covellite, and rarely bornite. It appears from the incomplete data available that some of the zones of fracture and ore deposition are 80 to 150 feet wide and contain 1.5 to nearly 2.5 per cent copper and small amounts of silver and gold.

Several prospects have been opened on small and apparently nonpersistent fractures in andesite and andesitic tuff in which there has been irregular deposition of chalcocite and other sulphides in a sparse gangue of quartz and epidote. The brilliant colors of the oxidized copper minerals that stain the rocks...
around such fractures make them conspicuous, but the amount of ore in sight appears to be very small.

In addition there are some fissure veins containing quartz with gold and some sulphides, and others containing copper sulphides in which feldspar (mainly orthoclase) and muscovite are so abundant in the quartz that the vein material resembles pegmatite. So far as recorded development goes, all the ore shoots in the fissure veins are relatively small and of low to moderate grade. A little placer mining has been done.

Citations to bibliography


BANNOCK COUNTY

Cleveland district.

Near Cleveland (T. 12 N., R. 40 E.) there is an unorganized district (not shown on Plate 1) in which manganese deposits have been prospected since 1922 and from which some ore has been shipped. The manganese occurs as layers of wad, with local nodules of mixed pelomelane and pyrolusite, interbedded with fine sand forming a terrace of probable lacustrine origin, whose top is at an elevation of 5,500 feet, regarded as of early Pleistocene age. From January 28, 1926, to May 5, 1927, 1,200 tons, ranging from 36.5 to 48 per cent manganese (dry basis) were shipped. Later data on production are given in Mineral Resources. The deposits at Lava Hot Springs are probably similar.

Citations to bibliography
*226, 406, 565, 815


Fort Hall district (copper, gold).

This district (which includes what is sometimes termed the Fortneuf) is extensive but contains only two lode mines that have produced. Each of these, the Moonlight and the Fort Hall, have shipped a few tons of copper ore. The district
is crossed by the Union Pacific Railroad and by highways. The deposits are irregular replacements along fractures in Ordovician (?) sedimentary rocks containing chalcopyrite, pyrite, a little galena, and secondary sulphides in a gangue of quartz and calcite. In the Fort Hall district, gold placers have been worked to some extent along the flood plains of the Snake River. A little prospecting for lead is reported.

West of the district, in T. 7 S., R. 33 E., two prospects for coal have been opened by Indians; one is on carbonaceous plant-bearing shale (Tertiary) of no value as coal, and the other is on a small obsidian dike.

Citations to bibliography

3, 388, 596, 406, 410, 565, 652, 660, 664

Mineral Resources 1905, p. 225; 1906, p. 280; 1907, pt. 1, p. 289;
1906, pt. 1, p. 411; 1909, pt. 1, p. 341;
1910, pt. 1, p. 454; 1915, pt. 1, p. 536;

Lava Hot Springs district.

(See Cleveland district, p. 8 of this pamphlet)


Portneuf district.

(See Fort Hall district, p. 8 of this pamphlet)

Swan Lake district (lead).

This little developed district, whose boundaries have not been accurately ascertained, is near the town of Swan Lake in southeastern Bannock County. Swan Lake is on the Union Pacific Railroad. The Chatterton lead mine at Swan Lake is reported to have workings totaling about 212 feet. Sulphur also occurs near here.

Citations to bibliography

130 (1932), 406

BEAR LAKE COUNTY

Bear Lake district (lead, copper).

The principal prospects for lead and copper in the Bear River Range lie within the Bear Lake district, as indicated approximately on Plate 1, but it is reported that prospect pits are scattered all the way from Swan Lake, Idaho, to the vicinity of Soda Springs. A branch of the Union Pacific Railroad is nearby and roads reach most prospects. The lodes have long been known and several shipments of ore, chiefly lead, have been made, but most of the mines have long been abandoned and none has ever received much development. One mine, the Sunset, produced and stored a small tonnage of lead ore in 1932. Mansfield regards the deposits of both lead and copper as of small promise.

The area containing the prospects is underlain by a thick sequence of Palaeozoic and Mesozoic strata without known intrusive rocks. Most of the lead deposits are along the contact between the Blacksmith (?) and Ute (?) limestones of Cambrian age. The ore is in irregular replacements, consisting of galena and its
oxidation products in a gangue of calcite and dolomite.

The copper prospects lie along a belt about a mile west of that containing the lead deposits mainly along the line of contact between the Blacksmith limestone (†) and the Bloomington formation (†) of Cambrian age. The ore is mainly malachite and azurite in quartz veins and locally tennantite and tetrahedrite in brocaded quartz and jasper.

Citations to bibliography

#406, 417, #463, 565, 662


Bloomington district.

(See Bear Lake district, p. 9 of this pamphlet.)

Montpelier district (copper).

In an unorganized area east of Montpelier on the Union Pacific Railroad, here called for convenience the Montpelier district, a number of prospects for copper have been opened in Triassic red beds. A few small shipments have been made, but little work has been done since 1914 and the prospects appear to be of doubtful value.

Near the surface, copper carbonates line joints in sandstone and shale. At depths of 100 feet or more, chalcocite and covellite have been found replacing the woody matter of fossil plant fragments. Deposition is irregular, sporadic, and shows little relation either to stratigraphic horizons or to zones of shearing and fracture. Much of the material appears to be merely copper-stained rock, although some ore containing over 2 per cent copper is present in small masses.

Citations to bibliography

#211, #406, 615, 607, 662


Nouman district (copper).

Near Nouman, which is located close to the Union Pacific Railroad, copper carbonates and brochantite occur in little developed quartz-filled fissures cutting limestone.

Citations to bibliography

211, #406
Camae Cove district (gold, silver).

This placer district (also called Tyson Creek) is in the southeast corner of Benewah County. The report of the State Inspector of Mines for 1932 lists seven properties there, but no other information is available, expect the brief references in Mineral Resources and the Minerals Yearbook cited below.

Citations to bibliography

180 (1932), 565, 652


Minerals Yearbook 1932-33, Statis. App., p. 129

Grass Mountain district.

The State Inspector of Mines' report for 1932 lists one property in the district. No other data are available.

Round Top district.

(See below)

St. Joe district (lead, copper, gold).

This district (part of which is called Round Top by some) is in the northeast corner of Benewah County. It is crossed by the Chicago, Milwaukee and St. Paul Railroad, but some of the prospects are accessible only by trail. The district (not to be confused with the area of the same name in Shoshone County) is underlain by Belt (largely Priabon) sedimentary rocks cut out by granodiorite and micaschist dikes and locally also by lamprophyre and pegmatite. Locally, the old rocks are masked by Tertiary gravel and basalt much younger than the mineralization. Lodes have long been known and intermittently prospected in the St. Joe district, but there has been little, if any, production and none of the mines is extensively developed.

The lodes are replacement deposits in shattered zones in the Belt strata. Pyrrhotite, arsenopyrite, pyrite, sphalerite, galena, chalcopyrite, and possibly tetrahedrite (named in approximate order of decreasing abundance) occur in a gangue of quartz and calcite. The reference in Mineral Resources, listed below, show that some placer mining has been done.

Citations to bibliography

2, 4, 124, 169, 312, 414

Mineral Resources 1906, p. 259; 1931, pt. 1, p. 453

BINGHAM COUNTY

Placer deposits along the Snake River have been worked in Bingham County.
Camas district (gold).

The Camas district (Heiley gold belt), served by a highway and a branch of the Union Pacific Railroad, produced some gold in the early days and has had intermittent prospecting since. Small veins of variable strike associated with lamprophyre dikes occur in granitic rocks of the Idaho batholith. The veins contain gold, pyrrhotite, pyrite, sphalerite, galena, chalcopyrite, quartz, calcite, and siderite. So far, the base metal ores have received little attention and appear less promising than those of other districts.

Citations to bibliography
100, 186, 228 (1914), *362, 565


Minerals Yearbook 1954, Statis. App., pp. 107, 111

Galena district (lead, silver).

The Galena district, served by a highway and nearly 25 miles from the railroad at Ketchum, contains a few lead-bearing lodes formed by replacement in tabular shear zones in Paleozoic strata, probably similar to some of those in the well known Warm Springs district nearby. Although known in the early days, none of the lodes has yet been developed to any extent, and there has been almost no activity in the district for many years. The 30-ton smelter erected at Galena in the eighties operated for only a short time and probably received much of its ore from the East Fork district which lies immediately to the north.

Citations to bibliography
362, *641, 652

Mineral Resources 1886, p. 258; 1917, pt. 1, p. 471; 1918, pt. 1, p. 476

Hailey district.

(See Mineral Hill district, p. 13 of this pamphlet.)

Hailey gold belt.

(See Camas district above.)

Lava Creek district.

(See Lava Creek district under Butte County, p. 29 of this pamphlet.)

Little Wood River (Muldoon) district, (lead, silver, copper).

Although numerous deposits are known in the Little Wood River district, most of the production has come from the Muldoon mine, after which the district is named by some. Muldoon is about 26 miles by road from a station on the Union Pacific Railroad. The Muldoon mine probably produced about $200,000 in silver-lead ore, mostly in 1891 to 1896, with intermittent activity and production in later years. Little except desultory prospecting has been done in the district for many years.

The part of the district containing known lodes is underlain by Paleozoic
sedimentary rocks, cut by dikes of dioritic and granitic porphyry and aplite. In the Muldoon mine, the ore occurred as a replacement deposit along bedding in the Paleozoic strata with a porphyry hanging wall, locally mineralized. Argentiferous galena, pyrite, and some sphalerite and chalcopyrite are disseminated with quartz in altered rock of different kinds. In an area in the sedimentary rocks in which contact-metamorphic silicates are plentiful, there are deposits containing slightly oxidized galena and copper sulphides. Ore containing 6 per cent copper and small amounts of gold and silver are reported to have been found in these areas.

Citations to bibliography
197, 228 (1915), 362, 498, 501, 666, 644, 652


Mineral Hill (Hailey) district (silver, lead, gold, copper, zinc, arsenic, quicksilver, and barite).

The Mineral Hill district (output about $20,000,000) is one of the most productive districts in Idaho. This district (sometimes called the Hailey district) and the Warm Springs district immediately north of it include most of the famous Wood River region which in common usage includes also the Galena and Camas districts. The district, which is served by a highway and by a branch of the Union Pacific Railroad, is best known for its lead-silver ore, but gold, copper, and zinc have also been produced, and arsenic, quicksilver, barite, and other valuable substances are present. The first discovery is reported to have been made in 1864 and the principal development was in the period from 1879 to 1891 with several periods of revival since. Over 75 per cent of the total production was made prior to 1900. Many of the known shoots of lead-silver ore of good grade have been mined out, but, with few exceptions, development is confined to a depth of a few hundred feet. The future of the district lies in the discovery of new shoots at greater depth, although enough ore remains in sight in a number of the mines to permit profitable mining under favorable market conditions for years to come. A few new ore bodies have been found close to the surface in recent years.

The district is underlain mainly by the Wood River formation (Pennsylvanian) with the Milligen (Mississippian and Devonian (t) locally exposed. The sedimentary rocks have been folded, intruded by several stocks (probably outliers of the Idaho batholith) and broken by thrust and normal faults. Large areas are covered by the Challis volcanics (Oligocene or Miocene).

Most of the lodes of commercial importance occur in shear zones in the sedimentary beds which locally extend into the igneous rocks. They contain argentiferous galena with some sphalerite and tetrahedrite and small amounts of pyrite and other sulphides in a gangue that consists of altered and crushed country rock, carbonates (principally siderite) and a little quartz. A few lodes, such as the War Dance, contain abundant arsenopyrite and others (in the southern part of the district) contain ruby silver. There are also veins consisting of barite (of possible commercial value), and celestite or quartz with negligible amounts of metallic minerals. The Challis volcanics locally show the results of slight mineralization and in some of the lodes in the older rocks hysingerite, zeolites, and possibly some of the sulphides were deposited late, possibly in connection with Tertiary volcanism.

There is no reason to suppose that original ore deposition was confined to the shallow zone in which nearly all the mining has so far been done. The shear zones are much larger and more continuous than the valuable ore shoots within them. The
original fracturing appears, locally at least, to have been of the reverse type, and the ore shoots are thought to be in large part localized at places where buckling relieved the pressure and facilitated deposition. However, with present data, it is ordinarily impossible to predict much in advance of development where such shoots are to be found. As many of the known shoots are in steep segments of the shear zones, increase in dip is to be regarded as a favorable indication.

Repeated fracturing occurred during and subsequent to the mineralization. Much of the movement was approximately in the plane of the lodes, but locally, as in the Minnie Moore, complex transverse faulting made the problem of finding ore more difficult. In general, post-mineral movements have not been as widespread nor as potent in interfering with mining as is popularly supposed. No evidence exists to support the idea, held by some, that a great fault, the "Wood River Fault", underlies the region and cuts off the lodes at shallow depth.

Citations to bibliography


Mineral Resources
1863-64, pp. 424-425; 1886, p. 268; 1887, p. 107;
1904, pp. 145, 183, 186; 1905, pp. 115, 126, 392, 477;
1906, pp. 245, 261-262, 517;
1907, pt. 1, pp. 121, 291-292;
1908, pt. 1, pp. 169, 416-417; 1909, pt. 1, p. 343;
1910, pt. 1, pp. 463-486; 1911, pt. 1, p. 597, 905;
1912, pt. 1, p. 719; 1913, pt. 1, p. 768;
1914, pt. 1, pp. 614, 626;
1915, pt. 1, p. 537, 538, 906-909;
1918, pt. 1, p. 476; 1919, pt. 1, p. 464;
1920, pt. 1, p. 250; 1921, pt. 1, p. 406;
1924, pt. 1, pp. 266-267; 1925, pt. 1, p. 329, 530;
1928, pt. 1, pp. 649, 652;
1929, pt. 1, pp. 367, 373, 385-386;

Minerals Yearbook 1932-33, Statis. App., p. 129
1934, Statis. App., pp. 107, 109-110

Muldoon district.

(See Little Wood River district, p. 12 of this pamphlet.)

Vienna and Sawtooth districts (silver, lead).

The Vienna and Sawtooth districts adjoin each other near the southern end of Stanley Basin, about 40 miles by road from Ketchum at the end of a branch of the Union Pacific Railroad. The districts have been intermittently worked since the eighties. Each district produced roughly $1,000,000, mostly from silver ore, in the first few years after discovery. The lodes contain some lead and zinc which have only recently become of interest because of improved transportation facilities. Since 1925, there has been renewed activity in the two districts and some production has been reported.

These districts are mainly underlain by the Idaho batholith which is cut by a
few dikes of a pink silicic porphyritic rock, dioritic porphyry, and lamprophyre. Patches of sedimentary rocks and Challis volcanics in places overlie the batholith. All lodes are in the granite, in part associated with the dikes. They consist of quartz and altered granite with some siderite, with scattered galena and other sulphides, in part in shear zones, in part in minor fractures. The ore shoots are thus irregular and generally small.

Citations to bibliography
43, 49, 265, 362, 494, 565, 641, 652
(Sawtooth district)
Mineral Resources 1865, p. 258; 1925, pt. 1, p. 530;
1926, pt. 1, p. 434.
(Virginia district)
Mineral Resources 1912, pt. 1, p. 720; 1913, pt. 1, p. 769;
1915, pt. 1, p. 538; 1917, pt. 1, p. 472;
Minerals Yearbook 1932-33, Statis. App.,, p. 129
1934, Statis. App., pp. 107, 110

Warm Spring district (silver, lead, gold, copper, iron).

This district contains the principal modern producers of the Wood River region. It produced over $3,000,000 from 1880 to 1902, and has a recorded output of $6,162,747 from 1902 to 1931. In the latter period, nearly 50 per cent of the total was produced in 1917 to 1923, largely from the Independence, and about 37 per cent in 1927 to 1931, largely from the Triumph. In later years, the Triumph has continued to be one of the district's principal producers.

The rocks of the district include intricately folded and faulted sedimentary beds of pre-Cambrian (?), Ordovician, Silurian, Devonian (?), Mississippian, and Pennsylvanian age, cut by several granitic masses and dikes of different kinds.

Most of the ore deposits, including all with notable production, are roughly tabular replacements along shear zones, mainly in Carboniferous rocks, broadly similar to many of the lodes of the Mineral Hill district. They differ from the latter in having somewhat more calcite and distinctly less siderite in the gangue, relatively more abundant boulangerite and stilbitite, and in the fact that some of the ore is an exceedingly fine-grained, intricate mixture of sulphides of lead, zinc, antimony, and iron, requiring special treatment for successful separation.

Much of the production in the early days came from the Parker and other mines near Ketchum, whose ore was rich in silver because of the abundance of tetrahedrite and polybasite. There are also a number of irregular replacement deposits characterized by the presence of lime-silicate minerals. Some of these contain gold ore, others copper, and some were worked for ferruginous flux to supply local smelters, now long abandoned. Although some production was obtained from each of several varieties of lime-silicate ores, none of these deposits is large, and few have received any attention recently.

The problems pertaining to the discovery of ore shoots in the Warm Spring district, although similar to those in the Mineral Hill district, are less acute because of the fact that a number of the mines still have considerable known ore and because several are deeper than the average for the Wood River region. One of the essential factors in future development is the successful treatment of the complex ore referred to above. The refractory nature of this ore retarded development in the early days and its treatment by what is reported to be a special kind of oil
flotation is responsible for the recent production from the Triumph mine.

The district contains beds of impure graphitic anthracite of possible future value as a source of low-grade graphite for paints and other uses. Chalcedonic masses in the Challis volcanics have been sought to some extent to be cut and polished for ornaments.

Citations to bibliography
97, 132, 166, 226 (1914), 289, 362, 552, 564, 565, #549, 652


Minerals Yearbook 1932-33, Statis. App., p. 129
1934, Statis. App., pp. 107, 110

Wood River region.
(See Caves, Mineral Hill, and Warm Spring districts, pp. 12, 13, 15 of this pamphlet.)

BOISE COUNTY

Alpine district.

The State Inspector of Mines' report for 1932 lists two properties in this district. No other data are available.

Citations to bibliography
150 (1932), 186, 360, 362

Banner district (silver-gold).

This district is about 75 miles by highway from Boise through the Boise Basin and is included by some as part of the Gembrinus district. It is about 6 miles southeast of Lowman, but not readily accessible from there. In 1882 to 1894, it produced $1,500,000 to $2,000,000, but there has been little activity in the lode mines for many years. The deposits are large, well defined quartz veins in the rock of the Idaho batholith which carry pyrrargyrite, argentite, and other sulphides
with little or no gold. Placer mining has long been carried on here and the dis-

Citations to bibliography
*18, 21, 49, 80, 362, 565, 652

1915, pt. 1, p. 539; 1916, pt. 1, p. 581;
1917, pt. 1, p. 473; 1918, pt. 1, p. 477;
1921, pt. 1, p. 409; 1922, pt. 1, p. 231;
1924, pt. 1, p. 267; 1926, pt. 1, p. 531;
1928, pt. 1, p. 653; 1929, pt. 1, p. 385;

Minerals Yearbook 1932-33, Statis. App., p. 129
1934, Statis. App., pp. 107, 110

Centerville district (gold).

This district, regarded by some as part of the Placerville district, contains
some gold veins in granitic rock, but is principally known for its placer deposits, which were among the more productive deposits of the Boise Basin in the early
days. In recent years, there has been dredging here, which was temporarily halt-
ed by the destruction of the dredge by a forest fire in 1931. The district is
served by highways and by the Intermountain Railway, and is 44 miles from Boise.

Citations to bibliography
16, 42, 44, 49, 80, 87, 104, 172, 228 (1914), 244, 245,
287,357, 360,362,385,434, 435, 466, 501, 534, 542, 558,
566,652, 765.

Cold Springs district.

No data available except that the 1932 report of the State Inspector of Mines
lists a property here.

Citations to bibliography
180 (1932), 362

Dry Buck district.

No data available except that the 1932 report of the State Inspector of Mines
lists a property here.

Citations to bibliography
96 (1932), 279, 130 (1932), 362

Elkhorn district.

(See below.)

Gambrinus district (gold, silver, lead).

Most of the early lode mining in the Boise Basin was in this district, which
is sometimes called the Elkhorn district, (6 miles by road from Idaho City) but
there has been little recent activity. Most of the veins follow shear zones of

17.
northwest trend which cut aplite and lamprophyre dikes in the granitic rock of the Idaho batholith. The veins are mined mainly for gold, but some contain lead-silver ore.

Citations to bibliography
16, 21, 42, 44, 49, 60, 65, 87, 104, 186, 228 (1914), 244, 245, 296, 360, 362, 385, 446, 510, 534, 542, 595, 652, 785.

Gem district.
(See West View district, p. 22 of this pamphlet.)

Gold Hill district.
(See Quartzburg district, p. 20 of this pamphlet.)

Granite district.
(See Quartzburg district, p. 20 of this pamphlet.)

Grimes Pass district.
(See Pioneerville district, p. 19 of this pamphlet.)

Highland district.
(See p. 5 of this pamphlet.)
This district is reported to be 18 miles east of Boise and to contain gold veins in granitic rock.

Citations to bibliography
16, 85, 97, 172, 360, 362, 534, 652

Horseshoe Bend coal district (coal).

The Horseshoe Bend coal district, not to be confused with the Horseshoe coal district in Teton County, has long been known and a number of prospects therein have been intermittently operated. Only a small amount of coal has been produced for local use. The district is about 20 miles from Boise and 40 miles from Weiser and is served by a highway and the McCall branch of the Union Pacific Railroad.

Along the valley of the Payette River near Horseshoe Bend, and in Jerusalem Valley a short distance up-stream, there is a mass of poorly consolidated sediments with associated basalt flows about 15 miles long, 1 to 4 miles wide, and about 1,000 feet thick. These strata rest in a depression on the surface of granitic rock belonging to the Idaho batholith. The sediments, which are slightly deformed by flexure and faulting, contain a few thin beds of sub-bituminous coal and lignite, that in most exposures are less than 1/4 inches thick.

Citations to bibliography
103, 186, 369, 360, 362, 565

Idaho City district (gold).

This district contains some of the most productive placers of Boise Basin as well as a number of small gold lode mines, but few of either have been operated extensively in recent years. It is served by a little-used railroad and by a highway from Boise, 56 miles to the southwest.

The placer workings were not only in the gravel of the present streams, but also in several older gravel deposits higher on the slopes. Some gold was found in local remnants of Miocene (?) sediments under the gravel, but these nowhere proved of much value. The lodes are probably similar to those of the Gambrinus district.

Citations to bibliography

Moore Creek district (gold).

This district, a short distance south of Idaho City, contains placer deposits only and has not been as much developed as those farther north in Boise Basin. Some of the gold has come from the gravel of the present stream and some from gravel under Miocene (?) basalt flows.

Citations to bibliography
16, 42, 44, 49, 104, 244, 245, 360, 362, 446, 542, 652

Payette River placers.

Placer mining has been carried on intermittently along the Payette River, its south fork, and their tributaries, particularly in the vicinities of Banks, Garden Valley, and Lowman. This indefinitely bounded district is not shown on Plate 1.


Pearl district.

(See West View district, p. 22 of this pamphlet).

Pioneerville district (gold, silver, lead).

This district, about 50 miles from Boise, according to the usage which has been followed in the annual reports of the State Inspector of Mines, includes the areas termed by many the Summit Flat and Grimes Pass districts, which are shown
separately on Plate I. It includes a number of base metal lodes, some valuable largely for silver, and, especially close to Pioneersville, placer deposits that were productive in the early days and have recently been reopened. In the early days, a few hundred thousand dollars came from lodes in the bedrock. All this was obtained by amalgamating the free gold in the shallow oxidized parts of the deposits. The sulphide ore has not yet been adequately tested although a little intermittent work has been done on it.

The country rock is the Idaho batholith cut by numerous Miocene (?) porphyry dikes. The principal mines are on shear zones in which pyrite, galena, sphalerite, and possibly other sulphides are somewhat irregularly distributed in a gangue of sericitized granite rock with lenses of quartz and some calcite. In these lodes, the principal value is in the gold, although considerable amounts of lead and zinc exist and some recovery of these has been made. In some places, galena and other sulphides are irregularly and sparsely disseminated through somewhat altered and fractured granite rock. Both of the above kinds of deposits are of probable mid-Tertiary age. In addition, there are a few lodes of similar age, which, like those of the Banner district, contain rich silver in addition to base metal sulphides. Recently one of these, the Comeback, has yielded some good silver ore.

Citations to bibliography
16, 42, 44, 49, 80, 85, 87, 104, 186, 228 (1914), 244, 245,
286, 357, 360, 362, 385, 434, 435, 446, 492, 510, 516, 534, 542,
560, 668, 662, 785.

Placerville district. (See below.)

Quartzburg district (gold).

The Quartzburg district includes the Gold Hill, Granite, and Placerville districts. The latter two, centering around the towns so-named are placer districts formerly much more productive than at present. The gold lode mines around and west of Quartzburg have probably produced well over $8,000,000. Several of them, such as the Gold Hill, Belshazzar, Mountain Chief, and Mayflower, are, or recently have been, active. The area is about 60 miles by highway from Boise and is also served by the little-used railroad terminating at Centerville, about 7 miles away.

The country rock is quartz monzonite of the Idaho batholith, which is cut by numerous dikes, mainly porphyritic, of probable Miocene age. The dikes in general trend northeasterly and form part of the so-called "porphyry belt", which contains all of the principal lode mines of the Boise Basin. Most of the lodes are later than and genetically related to the dikes. The few, such as the Blue Rock, that appear to be related to the Idaho batholith are relatively undeveloped.

The Tertiary lodes include veins, mainly in the quartz monzonite, and stockworks, mainly in dikes, which comprise aggregates of small cracks subordinately to and at acute angles with the fractures and shear zones containing the veins. In most of the veins, ore shoots are individually small, but in places stoping has been carried over 1,000 feet down the dip, and as much as 3,000 feet horizontally. Ore shoots tend to be localized at the intersection of veins and dikes, but are not confined to such places. The stockworks in the Pioneer workings of the Gold Hill mine, the only place where this variety of deposits has yet been mined, have locally been stope continuously for as much as 100 feet in stope length, and are generally over 20 feet wide. Most of the ore in the stockworks is in thoroughly altered rhyolite porphyry, but it is by no means confined thereto.
Galenchismitite, tetradymite, arsenopyrite, pyrite, native gold, galena, and sphalerite are the principal hypogene (primary) metallic minerals in the Tertiary lodes of the district, although their proportions vary. Most of the sulphides are in quartz seams and veins although some, especially pyrite, are disseminated in the wall rocks, which, in and near the lodes, are intensely sericitized and somewhat carbonitized. Much of the ore contains somewhat more than half an ounce of gold to the ton with occasional pockets of high-grade material.

Both here and in other districts in and near Boise Basin Tertiary lodes such as those described above have only recently begun to receive development at depth. Early mining was confined to the shallow oxidized parts of the lodes, but modern milling methods enable good recoveries to be made in the sulphide ore, most of the gold therein being free and apparently hypogene (primary). As yet, little has been done with the bismuth and other metals in the ore, but these constitute possible by-products. The lodes, especially the stockworks are inconspicuous in outcrop and it is quite possible that well directed prospecting within the "porphyry belt" would result in new discoveries.

Citations to bibliography


Rock Creek district.

(See West View district, p. 22 of this pamphlet).

Shaffer Creek district.

(See West View district, p. 22 of this pamphlet).

Shaw Mountain district.

(See p. 5 of this pamphlet.)

South View district.

(See West View district, p. 22 of this pamphlet.)

Summit Flat district.

See Pioneerville district, p. 19 of this pamphlet.)

Twin Springs district (gold).

The Twin Springs or Highland district lies along the Boise River in the general vicinity of Arrowrock Dam, but its limits up and down stream are not accurately known. There has been intermittent placer activity here for a long time. The down-stream end of the district apparently also embraces some gold lodes similar to those in the Black Hornet and adjacent districts (p. 5).

Citations to bibliography

172, 360, 362, 662

Mineral Resources 1907, pt. 1, pp. 288, 289, 297, 298;
1908, pt. 1, pp. 414, 419, 421, 423, 424;
1909, pt. 1, pp. 341, 345, 547;
1910, pt. 1, pp. 454, 459;
1911, pt. 1, pp. 590, 592;
(Continued)

21.

1934, Statis., App., pp. 107, 109, 111, 112

Willow Creek district.
(See below.)

West View district (gold).

This district and parts of it have received an unusual number of different names such as Gem, Payette River, Pearl, Rock Creek, Shaffer Creek, South View, and Willow Creek. The part of the district from Pearl west is in Gem County.

Most of the lode mines are in Boise County, but much of the small amount of placer mining that has been done was in the western part of the district, especially along Willow Creek. The different parts of the area are within easy reach of railroad points and about 25 miles by highway from Boise. The production from 1870 to 1896 was estimated by Lindgren at about $80,000 in gold, and the amount mined since has been small.

Most of the district is underlain by granodiorite or a kindred rock. There are masses of augite diorite and dikes of several kinds. Lindgren regarded all of these as related to the Idaho batholith, but Kirkham believes that some masses are intrusive into the Payette formation. Patches of the latter and associated rhyolitic and basaltic necks and flows cover areas bordering the mineralized parts of the district. Lindgren stated that the Payette and related volcanic rocks were later than the lodes and that the Payette included placers derived from the lodes. The suggestion is made that some of the rocks intrusive into the granodiorite may represent a continuation of the "porphyry belt" of the Boise Basin with which they accord in position and trend, and that therefore some of the lodes here may have affinities to those of the Quartsburg district.

Most of the lodes are veins in the granodiorite, but some are in augite diorite and in dioritic porphyry dikes. The ore is in narrow seams in shear zones in altered rock, and contains pyrite, arsenopyrite, sphalerite, galena, and rarely chalcopyrite and ruby silver, and some quartz and calcite. Much of that mined in the nineties contained as much as 5 ounces to the ton in gold.

Citations to bibliography
16, 20, 23, 24, 49, 66, 87, 103, 172, 186, 228 (1914), 359, 360, 362, 565


(Continued)

Minerals Yearbook 1932-33, Statis., App., p. 129
1934, Statis., App., pp. 107, 113

BONNER COUNTY

Blacktail district.

(See Pend Oreille district, p. 24 of this pamphlet.)

Clark Fork district (silver, lead, copper).

The presence of copper, gold, and lead in this district has been known for a long time, but there was little production prior to 1913 and the principal development started with the discovery of some high-grade lead-silver veins in 1926. The mineralized area is bordered on the west by the Great Northern Railroad and on the south by the Northern Pacific Railroad, providing exceptionally convenient transportation facilities.

The district is underlain by the Belt series with intercalated quartz diorite sills, which, like the enclosing rocks, are regarded as pre-Cambrian. Both are cut by granodiorite of probable Mesozoic age accompanied by lamprophyre and pegmatite dikes. The Belt strata are folded and cut by faults, some of which have displacements of several thousand feet. Some of the faults are closely related to the intrusion of the granodiorite, whereas others are later. Mineralization is in part localized along certain of the faults.

Mineral deposits are widely distributed throughout the district, but are especially abundant in a zone several miles long bordering the Hope fault, which has a westerly strike, transverse to many other faults of the region, and, like the Casdorl fault in the Coeur d'Alene region, is supposed to have a large lateral shift. Most of the productive deposits are in a small area near the town of Clark Fork, south of the Hope fault. Most of the lead deposits on the south side of the fault resemble those of the Coeur d'Alene region. They are replacement veins in Belt strata, mainly Wallace, containing galena, tetrahedrite, and lesser amounts of sphalerite, pyrite, arsenopyrite, and chalcopyrite in a gangue of siderite with some quartz and calcite. Some of these veins are rich in silver, a fact which has aided in the successful development of small mines. On both sides of the area containing these lodes, and likewise south of the Hope fault, there are copper veins containing chalcopyrite in a gangue of quartz and siderite. North of the Hope fault there are veins in which replacement played a relatively subordinate part. Those consist largely of quartz and pyrrhotite with variable amounts of galena, sphalerite, pyrite, arsenopyrite, chalcopyrite, calcite, and locally siderite. Those in which galena is abundant are principally valuable for lead. They contain less silver than the veins farther south, probably because of the paucity of tetrahedrite. Some of the veins contain insufficient base metals for profitale mining, and their value lies mainly in their gold content.

Citations to bibliography
2, 6, 8, 9, 124, 129, 170, 206, 215, 382, 415, 531, 565, 587, 598, 611, 652, 687, 701

Hope district.
(See Lakeview district below).

Lakeview district (silver, lead, copper, zinc).

This district borders Pend Oreille Lake on the southeast and is regarded by some as part of the larger district named for the lake. The original discovery of ore in the vicinity was made in 1888 at what is now the Webber mine in the Lakeview district. The rush that followed did not result in any production, but led to intensive prospecting in the area around Pend Oreille Lake during which it is probable that all exposed lodes were noted. Mining has continued intermittently to the present time, but little has been done for several years. The ore is valuable principally for silver, although lead and lesser quantities of copper and zinc are recoverable.

The district is underlain by the Wallace and Striped Peak formations of the Belt series, covered locally by Cambrian quartzite, shale, and limestone, and intruded by granodiorite. There are a number of large faults, of which the Pack-saddle fault is the most persistent within the district.

The principal development is on three vein systems: the Webber, 8,000 feet long; the Conjecture—Keep Cool, apparently 12,000 feet long; and the Hewer, 8,000 feet long. The vein systems are great shear zones, locally as much as 120 feet thick, containing lenses and chimneys of vein quartz, which is itself much sheared. The sulphide ore is associated with the quartz masses, the sheared country rock, even where silicified, being barren. Lamprophyre dikes cut the sheared rock and ore intricately. The ore contains siderite (locally rhodochrosite), pyrite, arsenopyrite, quartz, sphalerite, galena, tetrahedrite, stibnite, chalcopyrite, boulangerite (?), kubanerite, and proustite, named in approximate order of deposition except that certain of the minerals crystallized at more than one point in the sequence.

Citations to bibliography


Minerals Yearbook 1956, pt. 2, pp. 206, 210

Pend Oreille district (silver, copper, gold, lead).

This district, served by the Great Northern and Spokane International railroads and by lake boats, has been known and intermittently operated since 1888.
From 1889 to 1917, numerous small shipments of high-grade silver ore from this district and the nearby Lakeview district are estimated to have aggregated about $500,000. In 1917 to 1926 the Talache (formerly Blacktail) mine is reported to have produced about $2,000,000 of which nearly 80 per cent was from silver and the rest about equally divided among copper, gold, and lead. Since then, there has been relatively little production in the district. Some term the part of the district on the west side of the lake the Blacktail and that on the northeast the Hope district.

The district is underlain by Belt strata, cut by granodiorite and locally overlain by patches of Cambrian sedimentary rocks.

The lodes are similar to those of the Lakeview district except that ore deposits are largely confined to the filling of clear-cut fissures, without the great shear zone characteristic of the Lakeview district. The minerals formed are about the same as in the Lakeview district, except that rhodochrosite is not recorded, polybasite (definitely hypogene) is more abundant than proustite, and in one mine hypogene metallic arsenic is present.

Citations to bibliography
2, 7, 124, 129, 165, 215, 232, 233, 234, 382, 414, 415, 531,
*632, 585, 587, 593, 611, 622, 684, 687, 810

Mineral Resources 1906, p. 234; 1907, pt. 1, pp. 294, 655;
1910, pt. 1, p. 468; 1911, pt. 1, p. 589;
1912, pt. 1, p. 722; 1913, pt. 1, p. 771;
1914, pt. 1, pp. 617-618; 1915, pt. 1, p. 540;
1916, pt. 1, p. 582; 1917, pt. 1, pp. 473-474;
1919, pt. 1, p. 466; 1920, pt. 1, p. 281;
1921, pt. 1, p. 409; 1922, pt. 1, p. 61-62, 232, 523;
1925, pt. 1, pp. 388-399; 1924, pt. 1, pp. 265-269;
1926, pt. 1, p. 532; 1928, pt. 1, p. 436;
1927, pt. 1, p. 582; 1929, pt. 1, pp. 664, 666;
1950, pt. 1, pp. 614, 621, 636; 1951, pt. 1, p. 455

Minerals Yearbook 1932-33, Statis. App., p. 129
1934, Statis. App., pp. 107, 111
1935, Statis. App., pt. 2, pp. 209, 211

Priest Lake district (lead, silver, copper).

This large district, which includes much of western Bonner County and parts of Boundary County, contains a number of prospects, but no mines with large production records. Some include in it the adjacent Porthill district in Boundary County, p. 28 of this pamphlet. The southern end of Priest Lake is 25 miles by road from Priest River on the Great Northern Railroad, and the prospects are reached by branch roads and trails from that point or from roads in Boundary County.

The district is largely underlain by granodiorite and kindred rocks with local areas of other rocks, presumably quartzite, limestone, and argillaceous Belt strata. In some areas, there are large amounts of gneiss and schist, presumably the result of injection and metamorphism of Belt strata in connection with batholithic intrusion, although other rocks may be included. Most of the prospects are along the shores of Priest Lake. The only descriptions of these known to the writer are the two very brief ones mentioned below. These show that some prospects are on veins containing galena (low in silver) and some chalcopy-

-25-
rite; others are in pyrite replacements in limestone or dolomite. It appears from the annual reports of the State Inspector of Mines and news notes in Mining Truth that in 1930 to 1932 some attempts were made to develop material in the so-called "Mystery Metal Belt" in this district. It is claimed among other things that the material mined contains aluminum and beryllium. Silicate minerals containing aluminum are, of course, present in the rocks of this as of nearly all regions, but this fact is in no way an indication that aluminum can be profitably recovered from them.

### Citations to bibliography

| BONNEVILLE COUNTY |

**Mount Pisgah district (gold).**

This little-known district, about 40 miles from Soda Springs on the Union Pacific Railroad, was discovered in the seventies and at first is reported to have yielded $225,000 annually from placers. There has been some lode mining and recently some dredging, but the dredge has been idle for several years. Since 1932, an increase in production from small placer operations has been reported.

Mesozoic sedimentary rocks are cut by intrusive rocks, apparently largely diorite and in the form of dikes and sills. The principal lodes are large tabular masses of quartz (whether veins or quartzite beds is not clear), which have been shattered and had calcite and auriferous pyrite deposited in them. In the material so far mined, the pyrite is oxidized and the gold is free.

### Citations to bibliography


**1934, *Statistics* App.*, pp. 107, 111**

26.
Pine Creek coal district (coal).

Several prospects have been opened in Cretaceous sedimentary rocks here, but they show mainly lenses of carbonaceous shale intercalated in sandstone with some impure and mashed coal.

Citations to bibliography
310, 323, 397, 400, 539, 540, 614

Willow Creek-Cardicou coal district (coal).

A number of prospects have been opened in Cretaceous beds here, but they show mainly lenses of carbonaceous shale in sandstone. Coal material that can be burned has been sorted from some of the lenses.

Citations to bibliography
154, 311, 323, 397, 406, 539, 540, 614

BOUNDARY COUNTY

Katcha district.

(See below)

Mayie Yaak district (gold, lead, silver, molybdenum, tungsten).

This large, but little developed, district includes most of Boundary County east of the Kootenai River. Its southeastern part is sometimes termed the Katcha or Katcha-Loncin district. Other parts of it have received local names, such as the Queen Mountain and Brush Lake districts. Branches of the Great Northern Railroad traverse the river valleys, but many of the prospects are accessible only by trails. Numerous lode and some placer prospects are intermittently operated, but the production as yet has been small. The principal metals sought are gold, lead, silver, molybdenum, and tungsten.

The district is underlain by Belt strata with intercalated large and closely spaced basic sills (pre-Cambrian), both cut by great masses of Triassic granitic rock.

The lead-silver veins appear to be similar to those in the northern part of the Clark Fork district, but have been little developed. Gold-quartz veins are known in shear zones in quartzite of the Belt series and also in basic sills. The gold is free and appears to be associated with pyrite and pyrrhotite. It has been suggested that the veins in the sills derive their gold from the sills themselves, but the evidence is inconclusive. Molybdenite has been found in veins of quartz and mica, resembling pegmatite. The tungsten prospects are on quartz veins containing scheelite and specks of galena, pyrite, and pyrrhotite. Garnet, actinolite, and hypersthene are present in the rock nearby.

Citations to bibliography
124, 170, 168, 313, 328, 382, 536, 565, 567, 652, 681

Mineral Resources


Forthill district (lead and silver).

This district contains the Idaho-Continental lead-silver mine, which was productive from 1815 to 1928, and a number of prospects. The mine, which is 26 miles by road from Forthill on the Great Northern Railroad, is in quartzite, probably Silt, with large granitic masses nearby. The veins are replacement deposits in shears zones containing argentiferous galena, pyrite, siderite, and a little quartz. Molybdenum deposits are also reported.

Citations to bibliography


Minerals Yearbook 1932-33, pt. 2, p. 266
1935, pt. 2, p. 487

Priest Lake district.
(See p. 26 of this pamphlet).

BUTTE COUNTY

Antelope district.
(See Lava Creek district, p. 29 of this pamphlet).

Blackburn district.
(See Dome district below).

Clyde district.
(See Hamilton district, p. 29 of this pamphlet).

Dome district (lead, silver).

This district was formerly called the Blackburn and then became part of the Hamilton district. The latter name is now restricted to the area north of the Dome district. Lead ore was discovered in the district about 1880, and about $75,000 was produced at that time. In 1900 to 1928, a total production of $1,952,216 is recorded mainly from the Wilbert mine, about 30 miles by road from a branch of the Union Pacific Railroad at Arco, which has long been the only property under extensive development. This mine has an enviable record for continuity of production, but has been shut down since 1930.

The district is underlain by intricately folded and faulted quartzite and dolomite (Ordovician). The only known intrusive rocks in or near it are some small, highly altered dikes (Miocene (?) in the Wilbert mine. 26.
The known ore deposits are all replacements in or immediately adjacent to dolomitic strata, in part along faults, in part along bedding. In the upper workings of the Wilbert, there is much oxidation. The hypogene metallic minerals include galena, pyrite, sphalerite, and locally some copper minerals and the gangue is silicified dolomite with introduced calcite and dolomite. The deposits appear to be of the type formed by solutions of magmatic origin far from their source.

Citations to bibliography


Era district.
(See below.) Lava Creek district.

Hamilton district (lead, silver).

This district has been known since the middle eighties, but production has been small. Its northern part, containing many of the known lodes, is sometimes termed the Clyde district. The properties are about 30 miles from Mackay and about 40 miles by a better road from Arco. Both Mackay and Arco are on a branch of the Union Pacific Railroad. There are silver-lead ore bodies, possibly like those of the Dome district described above. At one place, oxidized copper ore in magnesian limestone has been prospected.

Citations to bibliography
317, 633, *644


Minerals Yearbook 1934, Statis. App., pp. 107, 111

Lava Creek district (silver, lead, zinc, tungsten).

According to present usage, this district, which is about 25 miles by highway from Arco on a branch of the Union Pacific Railroad, includes the old Antelope, Era, and Lava Creek districts. The total production is roughly $400,000, of which $250,000 was from oxidized silver ore from the Hornsilver mine in 1886 and 1887.
Except for brief revivals in 1913 and 1928, there has been little development since 1893 when the shallow oxidized ore was largely exhausted.

The district contains Carboniferous sedimentary rocks overlain by the Challis volcanics, both intruded by granite and related dikes of Miocene age. There are small amounts of younger basaltic lava. The granitic intrusion domed and fractured both the volcanic and sedimentary rocks and developed lime silicate minerals in them.

The ore deposits are mainly in the Challis volcanics, but in part in nearby sedimentary rocks. Some are valuable mainly for silver, others for lead or zinc and a few for either antimony, copper, or tungsten. The lodes are in fissure veins and breccia zones, and formed mainly by replacement, but in part by fissure filling. Ore shoots are irregular and small, and in most exposures of hypogene (primary) ore the sulphides are sparse.

**Citations to bibliography**

E, 90, 27, 116, 372, 565, 577, 596, 600, 601, 644, 652, 690

**Mineral Resources**

1904, pt. 1, p. 189; 1906, p. 251; 1907, pt. 1, p. 291;
1908, pt. 1, p. 416; 1911, pt. 1, p. 587;
1912, pt. 1, pp. 728, 993; 1913, pt. 1, p. 768;
1914, pt. 1, pp. 614; 1915, pt. 1, p. 737;
1916, pt. 1, p. 579; 1917, pt. 1, p. 474;
1918, pt. 1, p. 476; 1919, pt. 1, p. 467;
1922, pt. 1, p. 235; 1924, pt. 1, p. 269;
1925, pt. 1, p. 535; 1926, pt. 1, p. 436;
1928, pt. 1, p. 666; 1929, pt. 1, pp. 383, 388;

**Cana County**

**Big and Little Smoky and Rosetta districts** (gold, lead, silver).

These three districts adjoin each other and the boundaries between them are indefinite. Most of the mines are little over 25 miles by road from Fairfield on a branch of the Union Pacific Railroad. Placer and probably also lode mining were formerly carried on in the Rosetta and Big Smoky districts, but neither has ever been active and both have long been quiescent. Even in the Little Smoky district, which was most active between 1880 and 1890 and from which most of the production of over $1,000,000 came, little has been done since 1900. These districts are now relatively accessible and the lead and zinc ore characteristics of the principal lodes can be more easily handled than in the early days. Consequently, it is to be hoped that the renewed interest manifested in the area since 1929 may eventually result in production.

Large parts of the three districts are underlain by the Idaho batholith, but most of the lodes are in the impure quartzites and limestones that it intrudes. In places, there are dikes of granophyre and kindred porphyries and extensive remnants of the Challis volcanics, all later than the mineralization.

The ore deposits of the Little Smoky district are replacements along shear zones and are closely similar to many in the nearby Mineral Hill and Warm Spring districts that have been abundantly productive. The principal ore minerals are galena, sphalerite, pyrite, and tetrahedrite in a gangue of quartz, siderite, and altered country rock.
Little is known regarding the Big Smoky and Rosetta districts. There are probably lead deposits like those of the Little Smoky, and also gold-quartz veins.

Placer mining has been carried on near Worswick Hot Springs in the Rosetta district and in the open valley at the sharp, right-angle bend in Little Smoky Creek in the district of that name. The production from both areas appears to have been small.

Citations to bibliography
49, 186, 362, 462; 503, 665; 641, 652

(Little Smoky district)
Mineral Resources 1868, p. 258; 1909, pt. 1, p. 343;
1910, pt. 1, p. 455; 1915, pt. 1, p. 557;
1916, pt. 1, p. 579; 1918, pt. 1, p. 476;
1919, pt. 1, p. 467; 1921, pt. 1, p. 410;
1922, pt. 1, p. 235; 1923, pt. 1, p. 386;
1924, pt. 1, p. 270; 1924, pt. 1, p. 535;
1929, pt. 1, p. 388; 1930, pt. 1, p. 636;
1931, pt. 1, p. 455;
Minerals Yearbook 1932-33, Stat., App., p. 129
1934, Stat., App., pp. 107, 111

(Rosetta district)
Mineral Resources 1905, p. 227; 1906, p. 252; 1907, pt. 1, p. 292;
1912, pt. 1, p. 719; 1913, pt. 1, p. 769;
1914, pt. 1, p. 614; 1915, pt. 1, p. 909;
1917, pt. 1, p. 475; 1924, pt. 1, p. 270;
Skeleton district (gold).

This district, wholly within the Idaho batholith, is reported to contain gold lodes and placer deposits, but they have received little development and little is known about them. The area is reached by trail from Atlanta or Featherville on the west or by road and trail from Soldier to the south. Some extend the limits of the district to include mines in the Soldier district as the latter is delimited on Plate 1. In consequence of this and the scanty information available about either district, it is impossible to separate with certainty references to them in Mineral Resources. In the list of such references which follows, most of the references probably concern the Skeleton district as shown on Plate 1, but the first five, and possible others also, concern the Soldier district.

Citations to bibliography
186, 362, 462, 503, 641, 652

Mineral Resources 1908, pt. 1, p. 417; 1909, pt. 1, p. 343;
1910, pt. 1, p. 465; 1911, pt. 1, p. 567;
1918, pt. 1, pp. 478-479; 1924, pt. 1, p. 270;
1925, pt. 1, p. 653; 1926, pt. 1, p. 436;
1931, pt. 1, p. 455;
Minerals Yearbook 1932-33, Stat., App., p. 129
1934, Stat., App., pp. 107, 111

31.
Soldier district (lead, copper).

The Soldier district, wholly within the Snake batholith and 10 to 20 miles from points on the Hill City branch of the Union Pacific Railroad, is little known and has not been very productive. The Perseverance mine, one of the few in the district recently operated, is on a breccia zone in which crushed and chloritized granitic rock is impregnated with vein quartz which has itself been crushed and recemented. Galena, chalcopyrite, and pyrite are plentiful in irregular bands. Some include this district with the Skeleton district which adjoins it on the north.

Citations to bibliography
186, 362, 462, 503, 641

Mineral Resources
(See Skeleton district, p. 31 of this pamphlet.)

Volcano district.

(See Elmore County, p. 50 of this pamphlet.)

Willow Creek district (lead, silver).

Most of the production of this district, which is a little over 25 miles by road from Fairfield on a branch of the Union Pacific Railroad, came from the Gentle Riddle (Buttercup) and other lead mines in Paleozoic strata nearby in 1866 to 1868, and apparently did not much exceed $75,000. The recent exploration of galena-bearing veins in granitic rock at the Perseverance has not resulted in much production.

Citations to bibliography
186, 362, 462, 503, 641

CANYON COUNTY

The only metal-mining here is a little gold placer mining along Snake River.
(See p. 100 of this pamphlet.)

CARIBOU COUNTY

No metal-mining is recorded in Caribou County except that the Mount Flagah district touches its northern boundary. For sulphur, see p. 110 of this pamphlet; for phosphate, see p. 106. Magnesite and mineral water also are reported.

CASSIA COUNTY

Black Pine district (silver, gold, zinc, lead, quicksilver).

This district, accessible from several directions by roads, which are poor near the mines, has been known since 1860. Some ore was shipped from the Silver Hills mine about 1894, about 14 cars of unknown content from the Hazel Pine mine about 1914, and 6 cars of zinc carbonate ore from the Ruth mine during the World War. No other production is on record although intermittent development has continued until recently and other small shipments may have been made.

The ore deposits are irregular replacements in Eocene limestone, which have in part been guided by fractures. No igneous rocks crop out in the vicinity. The lodes may be epithermal deposits of middle Tertiary age. The hypogene minerals include quartz, pyrite, sphalerite, tetrahedrite, jasmonite, calcite, barite, chalcopyrite, and realgar. Oxidation is shallow. The zinc carbonate ore mined during
the war was bottomed within 12 feet of the surface. According to Anderson, the silver and gold content of the tetrahedrite offers the best hope for future development, with lead, zinc, and possibly copper as by-products.

Citations to bibliography


Cannon Creek district
(See Stokes district, below)

Dolomite district

No data available on the district except that one property is listed in the 1932 report of the State Inspector of Mines.

Citations to bibliography
130 (1932), 468

Goose Creek coal district

This district contains lignite in Tertiary beds, reported to be of poor quality.

Citations to bibliography
13, *102

Grape Creek district

The only available information is that one property is listed here in the 1932 report of the State Inspector of Mines.

Citations to bibliography
130 (1932)

Snake River placers
(See p. 100 of this pamphlet.)

Stokes district (lead, silver).

Ore deposits have long been known in this district, which is nearly 40 miles from Burley on a branch of the Union Pacific Railroad, and a number of small shipments have been made, but as yet mining has been confined to small-scale operations and there appears to have been no production for over 10 years.

The lodes are mainly fissure fillings with some replacement in pre-Cambrian (?) quartzite and Carboniferous strata overridden by the quartzite along a thrust fault. Mineralization is believed to be related to the nearby stock of granodiorite regarded by Anderson as intruded at about the end of the Cretaceous. The valuable metals are lead and silver with subordinate amounts of gold and copper. The principal hypogene metallic minerals are tetrahedrite, pyrite, and chalcopyrite in a quartz gangue. Arsenopyrite, specularite and sphalerite are rare.

CLARK COUNTY

Birch Creek district (copper, lead).

As mapped on Plate 1, this district, which is about 50 miles by road from points on the Butte branch of the Union Pacific Railroad, is the southern extension of the Nicholus district, sometimes included in it. Campbell extends the name to include the east flank of the Lemhi Range, bordering the Hamilton and Dome districts, but there appear to be few prospects and no mines of consequence in that area. Parts of the Birch Creek district are sometimes termed the Skull Canyon and Buck Creek districts. The Heart Mountain district, to which one property is credited in the 1932 report of the State Inspector of Mines, is probably also part of the Birch Creek district.

Ore deposits were first discovered here in 1885. The total production is somewhat over $150,000, of which nearly half is from the Weimer copper mine, and much of the rest from the Scott lead mine, both of which lodes were among the first discovered in the district. Operations have continued intermittently up to the present time, but recent production has been small.

The district is underlain by Paleozoic sedimentary rocks with basalt flows and gravel in the valley of Birch Creek. Except for a few Eocene (?) dikes, intrusive rocks appear to be absent.

Most or all of the lodes are replacements in limestone and quartzite, in part controlled by shearing or bedding planes. Many are pipe-like and irregular. The copper deposits contain chalcocite, chalcopyrite, and oxidized copper minerals in a gangue of altered gouge-like rock with calcite, barite, and jasper. In the lead deposits, galena and its oxidation products are plentiful, and pyrite, sphalerite, tetrahedrite, and covellite also occur.

Citations to bibliography

317, 565, 669, 644, 652

34.
Continental Divide coal district (coal).

There are several prospects for coal, as yet undeveloped, along the Continental Divide in northeastern Clark County. Those in T. 14, N., R. 38, 39, E., not far from points on the Butte branch of the Union Pacific Railroad, expose coal, some of which is of possible future commercial value, but no coal was found by Mansfield in the prospects in T. 14 N., R. 40 E. The coal-bearing rocks are Cretaceous sandstone, shale, and clay, locally exposed by erosion of the overlying Tertiary volcanic and sedimentary strata. The exposed coal beds vary from a few inches to nearly 3 feet in thickness, and analyses indicate that they are of sub-bituminous grade or somewhat better.

Citations to bibliography

CLEARWATER COUNTY

Blacklead district (copper, iron).

This little-known district, accessible only by pack trail up the St. Joe River from Avery on the Chicago, Milwaukee and St. Paul Railroad, was prospected for copper in the early days and for some time thereafter, but is now abandoned. It contains contact-metamorphic deposits scattered in irregular seams and replacement deposits without apparent system in blocks of the Blacklead limestone of Anderson (Paleozoic (?)), which are enclosed in the Idaho batholith. The deposits contain considerable magnetite, small amounts of partly oxidized chalcopyrite, and minor quantities of quartz, epidote, zoisite, and hornblende.

Other deposits containing magnetite are reported to have been found elsewhere in Clearwater County, notably one in the general vicinity of T. 38 N., R. 5 E. According to Anderson, these are all probably of similar type and some may contain enough iron to be of possible future value.

Citations to bibliography
*10, 77, 239, 240, 364, 366

Burnt Creek district (gold).

Both veins and placer deposits have long been known here, but the production has not been large. The district, which is 36 miles from Ahsahka on a branch of the Northern Pacific Railroad, and 10 to 35 miles from Elk River on a branch of the Chicago Milwaukee and St. Paul Railroad, is underlain by gneissic Belt rocks cut by numerous dykes. The lodes are irregular, discontinuous quartz veins with pyrite, arsenopyrite, and gold in local shoots.

Citations to bibliography
*10, 14, 77, 364, 366, 566, 565, 652

Mineral Resources
1905, p. 237; 1906, p. 261; 1907, pt. 1, p. 304;
1908, pt. 1, pp. 428-429; 1909, pt. 1, p. 351;
1910, pt. 1, p. 463; 1911, pt. 1, p. 590;
1912, pt. 1, p. 722; 1913, pt. 1, p. 771;
1914, pt. 1, p. 618; 1915, pt. 1, p. 541;

Minerals Yearbook
1932-33, Statis. App., p. 129
1934, Statis. App., pp. 107, 111
35.
Moose Creek district (gold).

This is one of the early placer camps at which operations have been continued intermittently up to the present time, although production appears never to have been great. It is in and near unsurveyed T. 39 N., R. 10 E., and is accessible only by pack trail, a fact which may in part account for the limited development. Apparently, no lodes have been mined.

Citations to bibliography
*10, 77, 364, 366, 829

1916, pt. 1, p. 585; 1919, pt. 1, p. 479;
1921, pt. 1, p. 467; 1921, pt. 1, p. 410;
1922, pt. 1, p. 233; 1923, pt. 1, p. 390;
1924, pt. 1, p. 70; 1925, pt. 1, p. 533;
1926, pt. 1, p. 437; 1928, pt. 1, p. 666;
1929, pt. 1, p. 589; 1930, pt. 1, p. 637;

Minerals Yearbook 1932-33, Statis. App., p. 129
1934, Statis. App., pp. 107, 111

Musselshell district (gold, monazite).

This is one of the early placer districts. It is in and near T. 36, N., R. 6 E. Monazite as well as zircon and garnet are sufficiently abundant in this and other placer districts in the region to be of possible value under suitable market conditions.

Citations to bibliography
*10, 77, 364, 366, 829

Neva district.

(See Ruby Creek district, p. 38 of this pamphlet.)

Orofino coal district (coal).

In the general vicinity of Orofino, there are several minor workings on lignitic beds in sediments intercalated in the Columbia River basalt, probably of little interest except for small-scale local use.

Citations to bibliography
*10, 14, 91, 319, 364, 366, 361

Oxford district (copper).

This little-known district is in and near T. 38 N., R. 7 E., is mainly underlain by quartz diorite related to the Idaho batholith. It contains a few lodes. The Oxford mine, which was largely saved when visited by Anderson in 1923, is on a quartz vein containing chalcopyrite which is oxidized to malachite, apparently to a considerable depth.

Citations to bibliography
*10, 77, 364, 366, 829
Pierce City district (gold).

Discovery of placer gold in this district in 1861 initiated mining in Idaho, although the presence of metals had previously been noted in a few other places. The district is now reached from Orofino on a branch of the Northern Pacific Railroad and by highway. Different estimates of the production of the Pierce City district range from $5,000,000 to $10,000,000, mostly mined prior to 1875, although intermittent production has continued to the present time and has increased somewhat in recent years as a result of dredging and lode mining. Anderson estimates the production from gold lodes at about $250,000, mostly before 1906.

The district is mainly underlain by the Idaho batholith, but there are considerable remnants of metamorphosed and injected Belt strata, now largely gneissic, and numerous pegmatitic and other dikes. On the west side of the district, Columbia River basalt laps up on the older rocks.

The lodes are mainly in or close to the gneissic masses and are irregular, discontinuous fissure fillings of quartz, 2 to 10 feet thick, with local shoots containing auriferous pyrite, native gold, and some arsenopyrite. The ore mined is said to contain from half an ounce to an ounce to the ton in gold.

Some of the placer gravel is in terraces on the sides of the valley, others on ridges, and some in the present stream channels. The high deposits, locally as much as 500 feet above modern streams, are thought by some to result from damming of the streamways by the Columbia River basalt. The principal placer operations in the district were on Orofino Creek, but a number of the stream valleys in the surrounding region have also been profitably worked. It appears that throughout this part of Idaho the richer and more accessible placer deposits are, in general, worked out. There may be some untouched deposits in localities unknown to the early miners and there are doubtless places where dredging or other large-scale methods can recover gold that could not be profitably handled in the early days. Even at present there are numerous adverse factors varying in different localities, such as transportation difficulties, narrow, steep canyons, abundant boulders, and scarcity of water during the short summers. Lode mining has not as yet progressed beyond small-scale operations, but, under market conditions favorable to gold mining, there is a possibility of expansion.

Citations to bibliography

Mineral Resources
1906, pp. 216, 219, 237; 1906, pp. 241, 261-262;
1907, pt. 1, pp. 281, 304; 1908, pt. 1, pp. 407, 410, 429;
1911, pt. 1, p. 590; 1912, pt. 1, pp. 722-723;
1913, pt. 1, p. 771; 1914, pt. 1, p. 618;
1915, pt. 1, p. 541; 1916, pt. 1, p. 583;
1917, pt. 1, p. 476; 1918, pt. 1, p. 479;
1919, pt. 1, p. 467; 1920, pt. 1, p. 261;
1921, pt. 1, p. 410; 1922, pt. 1, p. 254;
1923, pt. 1, p. 390; 1924, pt. 1, p. 270;
1925, pt. 1, p. 535; 1926, pt. 1, p. 437;
1928, pt. 1, p. 666; 1929, pt. 1, p. 389;

Minerals Yearbook
1932-33, pt. 2, pp. 28, 107; Statis. App., pp. 129, 130;
1936, pt. 2, pp. 207, 208.

37.
Ruby Creek district (gold, lead, silver).

This district, which includes what is sometimes termed the Newa district, is exceptional in this part of Idaho because, in addition to the gold veins first worked, lead-zinc deposits are being developed. This district is crossed by both a railroad and a highway. There has been intermittent production of gold on a small scale, but as yet little production of base metals.

The country rock is mainly quartzite and micaceous schist of Belt age cut by small granitic masses and dikes of different kinds.

The gold veins are presumably similar to those in other parts of the county. The veins containing sulphides mainly result from replacement along fissures, some of which trend slightly west of north and others nearly at right angles. They contain sphalerite with subordinate galena in a siderite gangue and minor quantities of other minerals such as chalcopyrite and ankerite or dolomite. The Ruby Creek mine is the only place where lodes of this sort have yet received much development.

Citations to bibliography

10, 77, 364, 366, 385, 386


Minerals Yearbook 1932-33, Statis. App., p. 129

CUSTER COUNTY

Alder Creek district (copper, zinc).

This district, sometimes called the White Knob or Mockay, was discovered about 1884, and produced somewhat over $2,000,000 prior to 1912, mainly in copper ore from the Empire mine, and about $15,000,000 since then. This mine appears to have been called the White Knob by some, but a much less extensively developed property now bears this name. Nearly 50 lodes are known, but nearly all the production has come from the Empire and Copper Basin copper mines and the White Knob and Horsehoe lead mines, all clustered close to Mockay, the terminus of a branch of the Union Pacific Railroad. The last two also contain bodies of copper and zinc ores. This district is notable because it contains one of the few really productive copper mines in Idaho. Little has been done for several years because of poor market conditions, but reserves of both oxidized and sulphide ore remain. The exhaustion of the principal developed bodies of oxidized copper ore and the lack of a suitable market for the zinc sulphide ore which is locally plentiful presented problems that hampered development here even before the general decline in the price of base metals caused operations to halt. In 1939, there was a revival of interest in this district.

The district is underlain largely by dolomitic limestone of the Ebraer and other Paleozoic sedimentary beds, emerging from a cover of Challenger volcanics. Near the Empire mine, granite and related porphyries of probable Mississippian age cut both Paleozoic and Tertiary strata.

The Empire and nearby deposits lie along the border of the main intrusive mass, the ore being in part in the limestone and in part in the igneous rock. In and close to the ore bodies the usual contact-metamorphic lime silicates are plentiful. Ore deposition was in part controlled by zones of shearing that are arranged radially with respect to the intrusive mass. In most deposits in this part of the district, the principal valuable hypogene (primary) mineral is chal-
copyrite, although much of the ore so far mined has been more or less thoroughly oxidized. In the Horseshoe mine, however, most shipments to date have been lead carbonate ore. Much of the ore remaining in the Horseshoe contains abundant marmatite (iron-rich sphalerite) and pyrite, chalcoprite, and galena.

The Reed and Davidson or Copper Basin and nearby properties in the western part of the district differ mainly in that the predominant country rock is quartzite. All ore so mined is oxidized and most of it is in replacements along the bedding of the quartzite or of intercalated limestone. Individual ore bodies are smaller and lime-silicates less abundant than in the Empire and neighboring mines.

Some lead veins are reported to be present in outlying parts of this district, but little is known about them.

Citations to bibliography

26, 57, 161, 301, 317, 375, 503, 604, 605, 507, 621, 869, 838, 839, 840, 842, 864, 652, 660, 741


Alto district (lead, zinc, copper).

Mining has been intermittently carried on in this district (about 15 miles by highway from Ketchum, the terminus of a branch of the Union Pacific Railroad) since 1896 or before, but the production so far is very small. Lead and copper are the principal metals sought.

The district is underlain by argillaceous and locally calcareous quartzites of Ordovician and Pennsylvanian age cut by granitic stocks and locally covered by the Challis volcanics. There are several large faults, both normal and reverse.

Some lead veins similar to those of the adjoining Warm Springs district are
reported, but most of the prospects are on lodes of contact metamorphic type. The
calcareous beds have been more or less thoroughly replaced by diopside,
grossularite, epidote, augite, prehnite, wollastonite, fluorite, quartz, calcite,
and similar minerals. In restricted and highly irregular parts of beds thus met-
amorphosed there has been sporadic and rarely abundant deposition of such minerals
as galena, sphalerite, pyrite,chalcopyrite, and arsenopyrite.

Citations to bibliography
186, 362, 568, 649, 652


Bayhorse district (silver, lead, copper).

This district (about 75 miles by highway from Mackay, the terminus of a branch
of the Union Pacific Railroad) was discovered about 1877 and by 1896, when its
most productive period closed, had reached a total production of roughly
$10,000,000, of which about $6,900,000 was from silver, $2,700,000 from lead, and
$650,000 from copper. The principal subsequent periods of revival were in 1912
and in 1920 to 1925. In recent years, the Clayton silver mine has been the prin-
cipal producer. The production since the boom days has probably totaled a little
over $2,500,000.

The district is underlain by a thick sequence of Paleozoic strata, which have
been deformed into a peculiar anticline with flat top and bulging sides. There
are normal and thrust faults, the largest of which parallel the axes of folding.
Ore deposition is in part controlled by fractures related to the bulging of the
flanks of the anticline. A small boss of granodiorite and sills of hydrothermally
altered gabbro of uncertain age out the Paleozoic beds and the Idaho batholith lies
just west of the district. The Challis volcanics mask the older rocks over large
areas.

Many of the lodes, such as the Beardsley, Excelsior, and Red Bird are local-
ised mainly because of the superior replaceability of dolomitic rocks. The Bay-
horse dolomite (Cambrian (?)) is so favorable to mineralisation of this character
that scarcely an exposure of it exists that does not somewhere show its effects,
although in many places the amount is insufficient to be of commercial interest.
Other dolomitic rocks were also locally affected by mineralisation. The known
hypogene metallic minerals include galena, sphalerite, pyrite, tetrahedrite, and
chalcopyrite, and the gangue minerals are quartz, barite, calcite, and fluorite.
Oxidation, while commonly incomplete, is more prevalent in these lodes than in
many of those in Idaho, and much of the early success in both mining and local
smelting is due to this fact. In the Bayhorse dolomite, the deposits are highly
irregular in shape. In the Red Bird and other properties in different dolomitic
rocks, the influence of shear zones in localising ore deposition is somewhat more
evident and in otherwise similar replacements in more argillaceous beds, shearing
locally was a dominant feature, although ore shoots are irregular and discontini-
uous. The last mentioned variety, typified by the Twin Apex and Dryden, has as yet
failed to yield large production.

A variety of ore deposit distinctly different from any of those above mention-
ed is typified by the Rasmhorn and Skylark mines. In this variety, ore deposition
took place largely by replacement along well defined shear zones in argillaceous
and quartzitic rock and siderite, largely absent in the replacements in dolomite,
is an essential constituent of the gangue. These lodes resemble the principal
lodes of the Wood River region except that silver-bearing tetrahedrite is locally
abundant. Much of the high-grade silver ore that has been mined in such lodes

40
comes from the tetrahedrite-rich portions, which, so far as present data show, are not systematically arranged. Some of the ore in narrow bands is reported to have contained as much as 1,000 ounces of silver to the ton. While the best ore in known shoots has been mined, some high-grade and considerable low-grade sulphide ore remains in present workings. Here, as in the Wood River region, the discovery of new ore shoots remains an attractive possibility.

Most of the siderite lodes tend to conform to regional structural trends, but there is much local variation. Some lodes approximately accord with the bedding; others parallel joint systems; still others appear to be transverse to local structures or to be irregular and discontinuous. In the principal mines, the lodes form linked systems. The shearing is commonly both wider and more continuous than the ore deposition. Stopes widths are rarely as much as 10 feet.

Citations to bibliography

26, 27, 49, 54, 55, 56, 57, 68, 186, 301, 335, 440, 501, 517, 523, 565, 637, 652, 696, 728, 816

Mineral Resources

1904, pp. 188, 189; 1905, p. 280; 1906, p. 256;
1907, pt. 1, p. 296; 1908, pt. 1, p. 422;
1911, pt. 1, p. 591; 1912, pt. 1, p. 723;
1913, pt. 1, p. 772; 1914, pt. 1, p. 619;
1917, pt. 1, p. 476; 1918, pt. 1, p. 480;
1920, pt. 1, p. 252; 1922, pt. 1, p. 41;
1922, pt. 1, p. 234; 1925, pt. 1, pp. 290-391;
1926, pt. 1, p. 458; 1926, pt. 1, p. 667;
1929, pt. 1, p. 390; 1930, pt. 1, pp. 637-638;

Minerals Yearbook

1932-33, Statis. App. p. 129
1934, Statis. App., pp. 107, 112
1936, pt. 2, pp. 206, 208, 211

Boulder Creek district (silver, lead, zinc).

This district (about 60 miles by road from Mackay, the terminus of a branch of the Union Pacific Railroad) has been known since about 1882, and some ore was shipped in the early days, but by far the greater part of the production of the district came from the Livingston mine after the discovery of a new lead-silver ore body there in 1925 until mining operations ceased in 1930. Some work has been done here at intervals since 1930.

Most of the known lodes are in the argillaceous Milligen formation close to its contact with the Idaho batholith and related stocks, but a few are in metamorphosed patches of the more quartzitic Wood River formation similarly situated and some mineralization apparently without economic value has also occurred in the Challis volcanics.

The Livingston and others in the Milligen formation are in shear zones and are characterized by jaspersite with sphalerite and other sulphides. Calcite is the principal introduced gangue mineral. Aplite dikes are associated with some of the lodes. At the Livingston mine, the best lead-silver ore, consisting mainly of nearly massive jaspersite, in a shoot with a pitch length of 1,550 feet, has been worked out leaving sulphides with relatively abundant sphalerite remaining in the walls.

41.
No other ore shoot of comparable grade or size is known in either this mine or the prospects on similar deposits, but it is to be expected that such shoots exist. Some of the ore in the limited prospect workings of Strawberry Basin and elsewhere contains massive jamesonite.

Citations to bibliography


Copper Basin district (lead, silver).

This district (over 50 miles by road from Mackay, the terminus of a branch of the Union Pacific Railroad) is of somewhat indefinite extent. Some include in it the western part of the Alder Creek district, as that area is mapped on Plate 1 which follows the usage of the State Inspector of Mines. The principal mine in the Copper Basin district, as that term is here used, is the Star Hope. It was discovered in 1880 and produced about $50,000 from rich silver-lead ore prior to 1890, since which date it has been mostly inactive.

The district is underlain by deformed and locally much metamorphosed Paleozoic sedimentary rocks cut out by a granitic stock probably related to the Idaho batholith and by dikes of several kinds. The Challis volcanics over extensive areas. The Star Hope lode appears to be a quartz vein containing partly oxidized galena and probably other sulphides in quartzite, but little information regarding this or other deposits in the district is available.

Citations to bibliography
*504, 644, 652

East Fork district (lead, silver).

This is a poorly defined area, which contains a number of prospects and some mines, mainly in and near Germania Basin. It is about 50 miles from Ketchum, the terminus of a branch of the Union Pacific Railroad, the last few miles being over a road scarcely passable for automobiles. The total production, largely from oxidized silver-lead ore, may exceed $500,000, mostly shipped prior to 1890. Recently gold prospects in the nearby Washington Basin have received some attention.

The district is underlain by highly deformed and metamorphosed Carboniferous strata, in which much of the original calcaeous material is replaced by silicates, intruded by granitic rocks related to the Idaho batholith and by dikes. These rocks are locally covered by the Challis volcanics.

The lead-silver deposits, such as the Tyrolean and Biblesack, are replacements, more or less closely related to shearing. Individual ore bodies appear to have been small and irregular. Most of the ore mined was oxidized and has a gangue of quartz and calcite. Certain prospects, such as those on Fourth of July Creek, are in part on deposits in which sulphides are disseminated through irregular bodies containing quartz and lime-silicates.

In Washington Basin, there are five quartz veins reported to contain 0.1 to 1 ounce a ton in gold. They are replacements on shear zones and contain sparsely disseminated pyrite, pyrrhotite, stibnite, arsenopyrite, and other sulphides, including a little tetradymite.
The placers of this district (125 miles by road from Maenay, the terminus of a branch of the Union Pacific Railroad) were discovered about 1869, and were actively worked during the following decade with brief revivals of interest since then. Their production is variously estimated from $500,000 to $2,000,000. The Lost Packer, the only lode that has yet received much development, was located in 1902. The production from lodes totals about $800,000, nearly all in copper and gold from the Lost Packer, although a number of copper and lead prospects are known.

Most of the lodes are in pre-Cambrian schist and Ordovician (?) calcsilicate and quartzitic rocks, which are in close proximity to the Idaho batholith. These rocks are cut by aplite and other dikes related to the batholith and by the more numerous Tertiary dikes that are younger than the main lodes but which are genetically related to the contact metamorphism of Permian (?) and Tertiary volcanics which drop out in the vicinity.

The Lost Packer lode consists of a series of shoots with step-like arrangement in contorted schist. The schist is cut by altered, pre-mineral dikes of aplite, lamprophyre, and pegmatite, and by fresher porphyritic dikes of Tertiary age that cut both ore and schist. The steps in the lode are supposed by local people to result from post-mineral faulting masked by later intrusion of the porphyry dikes, but a more probable explanation is that they result from original distribution of the fissures that guided the ore-forming solutions. Some post-mineral faulting has occurred, but there is no proof that it has anywhere materially altered the relations of the ore bodies. The principal hypogene minerals in the ore are chalcopyrite, quartz, and siderite, with minor amounts of tetrahedrite, pyrite, pyrrhotite, calcite, and barite. Some oxidation and secondary enrichment have taken place, but not enough to be of much commercial importance. Little ore such as that mined in the past, reported to contain $80 to $90 a ton, remains in known shoots, but considerable material of lower grade is said to have been left on the borders of the stopes.

The prospects in the vicinity are in part closely similar, but, in some, argentiferous galena, instead of chalcopyrite, is the principal sulphide. The ore in the contact metamorphic deposits has been utilized only as flux for the Lost Packer smelter, now abandoned. The gold content helped to pay the cost of handling.

The placer diggings are confined to an accumulation of gravel mainly of probable Pleistocene age in the valley of Loon Creek near the abandoned town of Casto, although placer gold is known in other parts of this valley and its tributaries. Although the deposits that have been worked include terraces fully 100 feet above the present channel, most of the production has come from a strip about 75 feet wide and a mile long, comprising part of an ancient channel not far above the modern stream. This strip may be worked out, but there is considerable gravel that has received little attention as yet. Some of this contains boulders, but
these, on the whole, are neither as large nor as numerous as in some other deposits in mountain valleys in this region.

Citations to bibliography


Mackay district.
(See Alder Creek district, p. 38 of this pamphlet.)

Parker Mountain district.
(See Lemhi County, p. 76 of this pamphlet.)

Robinson Bar placer district (gold).

Placer districts have been worked at several places on the Salmon River between Stanley and Challis. Robinson Bar is one of the best known of these. Except for recent small-scale operations, almost no placer mining has been done here for a long time.

Citations to bibliography
171, 172, 362, 637

Seafoam (Greyhound) and Sheep Mountain districts (gold, silver, lead).

Most of the properties in the Seafoam (Greyhound) district are within 10 miles of the Rapid River Ranger Station, 102 miles by road from Ketchum, the terminus of a branch of the Union Pacific Railroad. Some properties in the Seafoam and all in the Sheep Mountain district can be reached only by trail. Both districts were known in the eighties. The principal development at that time was in the placers, especially at the original settlement of Seafoam, where the narrow canyon of Rapid River locally widens, but small shipments of ore containing precious metals and lead were sent to Ketchum from the Mountain King in the Sheep Mountain district and other prospects in the general area. Since then, several of the lodes have been intermittently developed, the last period of activity being in 1927 and 1928. The production of the two districts is not known, but they were not among the larger placer camps, and, although the Greyhound and other lode mines have shipped, the aggregate obtained from lodes has been relatively small.

The districts are underlain by the Idaho batholith close to its eastern border. In this marginal part of the batholith, there is considerable variation in detail in the character of the rock. Engulfed blocks of the roof rocks, some partly resorbed, are present in places, and dikes of aplite, lamprophyre, and rare pegmatite are locally plentiful.

The Seafoam (Greyhound) and many of the other lodes consist of roughly lenticular masses of quartz and altered rock, generally arranged en echelon in shear zones. The products of silicification and sericitization of the granitic rocks
are characteristic in and near the lodes. In many places, the sulphides are so fine-grained and sparsely disseminated that little or no evidence of metallization is visible even where a good tenor in precious metals is reported to have been shown by assays. Pyrite is the most commonly visible metallic mineral, but chalcopyrite, galena, sphalerite, and arsenopyrite are also present. Locally, galena is sufficiently abundant to constitute a lead ore.

A different kind of lode is represented by the Mountain King where irregular replacement deposits in blocks of dolomitic limestone enclosed in granitic rock contain galena, sphalerite, pyrite, and chalcopyrite in quartz. Locally, the sulphides are so abundant as to constitute a high-grade lead ore. A variety, represented by the Mystery prospect, appears to have formed at higher temperatures for hudsonite and other contact-metamorphic silicates are present in the galena ore and there are irregular veins of glistening quartz and pyrrhotite.

Citations to bibliography
26, 362, *503, 518, 562, 566, 646, 662
(Seaford district)
Mineral Resources 1905, p. 230; 1908, pt. 1, p. 422;
1909, pt. 1, p. 346; 1910, pt. 1, p. 458;
1913, pt. 1, p. 772; 1919, pt. 1, p. 468;
1920, pt. 1, p. 252; 1921, pt. 1, p. 411;
1926, pt. 1, p. 526; 1926, pt. 1, p. 438;
1929, pt. 1, p. 536; 1932, pt. 1, p. 380;

Minerals Yearbook 1932-33, States, App., p. 150
1934, States, App., pp. 107, 112
(Sheep Mountain district)

Stanley district (gold).

This is a large area containing widely scattered, little-developed, gold lode prospects and placer deposits that have been intermittently worked on a small scale. Most properties are connected by short trains or roads with the Sawtooth highway. The distance by this highway from Stanley to Ketchum, on a branch of the Union Pacific Railroad, is about 65 miles. A dredge was installed in one valley, but appears never to have been operated to any extent.

The area is underlain by the Idaho batholith with masses of Carboniferous, argillaceous, and quartzitic rocks on its border and extensive covers of alluvial and glacial deposits in Stanley basins and tributary valleys. In the southern part of the area, there are patches of Challis volcanics.

Most of the lodes are narrow quartz veins and silicified shear zones in the granitic rock. Some, like the Astoo which has recently been reopened, are in the sedimentary beds. Locally, there are rhyolite dikes containing pyrite and free gold, mainly in cracks.

Citations to bibliography
57, 263, 279, 362, 375, *645

Mineral Resources 1905, pp. 218, 230; 1906, p. 256;
1907, pt. 1, p. 298; 1908, pt. 1, pp. 407,410,421-422;
1909, pt. 1, p. 346; 1910, pt. 1, p. 468;
1911, pt. 1, pp. 591, 595, 1912, pt. 1, p. 723;
45.
White Knob district.

(See Alder Creek district, p. 38 of this pamphlet.)

Yankee Fork district (gold, silver, lead, copper).

This district is about 85 miles from Ketchum and 115 miles from Hailey by highway, both being at the ends of branches of the Union Pacific Railroad. A number of branch roads in the district are now almost or quite impassable to vehicles.

Placers in this district are reported to have been discovered in 1862, but never attained much development. In recent years, the possibility of dredging in the alluvial flats has been considered and some preparatory work has been done. Lode mining started in 1876 and was actively carried on for over 20 years with several later revivals. The total production is probably over $12,000,000, nearly all in silver and gold. Most of this came from the General Custer mine which was the mainstay of the district until it closed in 1905. Less than $500,000 appears to have been produced since 1900 and a total of only about $60,000 is credited to placer mines.

The area containing the mines is underlain by gently flexed flows and tuffs of the Challis volcanic series. On the margins of the district, the Idaho batholith, Permian (?) volcanics and Carboniferous sedimentary rocks are exposed but show little mineralization.

Most of the lodes are fillings of shear zones and fractures with subordinate replacement of the wall rocks. Hydrothermal alteration of the wall rocks is widespread and near the veins is intense. In a few of the zones of brecciation, for example in the Montana and Sunbeam mines, some of the ore shoots have formed largely by replacement. Some of the lodes are long, individual veins with average thicknesses of about 4 feet, but many are aggregates of small gash veins. The hypogene metallic minerals include selenides, pyrite, galena, chalcopyrite, enargite, tetrahedrite, and probably others. In most of the ore now exposed, the sulfides are so sparse or fine-grained as to be discovered only on careful inspection, but some lead ore has been mined and some of those familiar to the district think valuable bodies of base metal sulfides remain. The predominant gangue is banding, cryptocrystalline quartz with minor amounts of opal, adularia, calcite, and albite in places. Some or most of the ore mined in the early days was oxidized and doubtless enriched by supergene agencies, but so much oxidized pyrite remains in surface exposures that it is obvious that oxidation was incomplete. This raises the question whether the high-grade pockets, some of which yielded $75,000 a ton in gold and silver, may not have been in part of hypogene origin. If so, other such pockets doubtless remain as yet undiscovered in the deeper parts of the lodes. Most of the ore, still unmined, however, contains $20 or less in gold and silver, much of which is not amenable to amalgamation. 46.
Citations to bibliography

28, 27, 49, 56, 362, 440, 495, 565, *637, 652

Mineral Resources
1904, p. 182; 1906, p. 231; 1906, p. 256;
1907, pt. 1, p. 236; 1908, pt. 1, pp. 409, 422-423;
1911, pt. 1, p. 692; 1912, pt. 1, pp. 723-724;
1913, pt. 1, p. 773; 1914, pt. 1, p. 619;
1915, pt. 1, p. 542; 1916, pt. 1, p. 584;
1917, pt. 1, p. 477; 1918, pt. 1, p. 480;
1920, pt. 1, p. 622; 1921, pt. 1, p. 411;
1922, pt. 1, p. 234; 1923, pt. 1, p. 391;
1924, pt. 1, p. 271; 1925, pt. 1, p. 535;
1926, pt. 1, p. 438; 1928, pt. 1, p. 668;
1929, pt. 1, p. 390; 1930, pt. 1, p. 638;

Minerals Yearbook
1922-53, Statis. App., p. 129
1954, Statis. App., pp. 107, 112

ELMORE COUNTY

Atlanta district

(See Yuba district, p. 51 of this pamphlet)

Bear Creek and Red Warrior districts (gold, silver)

Deposits in the vicinity of Rocky Bar, 65 miles by road from the Union Pacific Railroad at Mountain Home, around which these two districts center, were discovered about 1862, but were little developed until almost 10 years later. It has been estimated that the lode mines of the Bear Creek district produced about $2,000,000 in gold and silver and about an equal amount in gold from placers up to 1882. Operations continued into the nineties, but data as to the amount produced are not available. The lodes of the Red Warrior district are thought to have produced less than those of the Bear Creek district, but the placer production is locally reported to have been large. Revivals of interest have yielded little production in either district.

The area is underlain by the Idaho batholith, in places cut by related dikes and others of later age. Most of the veins strike nearly east and consist of quartz lenses along shear zones which contain auriferous pyrite and minor amounts of galena and sphalerite. Transverse faulting is said to introduce local complications. The lode system is reported to have been traced some distance beyond the area known to contain ore shoots.

Citations to bibliography

*45, 49, 172, 186, 362, 565, 624, 652

Blackstone district

Possibly the same as the Volcano district, p. 50 of this pamphlet. One property here listed in 1832 report of the State Inspector of Mines.

Citations to bibliography

130 (1932), 362

47.
Black Warrior district (gold).

This district is about 15 miles northwest of Atlanta and is connected with it by a road now impassable to vehicles. A little development on several veins in the Idaho batholith and a small amount of placer mining have been done here. The lodes are presumably like those of the Yuba and other districts in the vicinity.

Citations to bibliography

45, 186, 362, 655, 652

Mineral Resources 1906, p. 231; 1906, p. 286; 1907, pt. 1, p. 297;
1906, pt. 1, p. 423; 1910, pt. 1, p. 459;
1911, pt. 1, p. 661; 1912, pt. 1, p. 724;
1914, pt. 1, p. 620; 1915, pt. 1, p. 543;
1916, pt. 1, p. 584; 1922, pt. 1, p. 635;
1926, pt. 1, p. 459; 1928, pt. 1, p. 666;

Minerals Yearbook 1932-33, Statis. App., p. 129
1934, Statis. App., pp. 107, 112

Dixie district (gold).

In the early days, this district, which is 30 miles from the Union Pacific Railroad at Mountain Home, produced some gold from lodes presumably like those of the Neal district and others along the southern border of the Idaho batholith, but has had little activity recently. It is not to be confused with the district of the same name in Idaho County.

Citations to bibliography

362, 652, 790

Featherville district (gold).

This is a placer district, 56 miles by road from Mountain Home on the Union Pacific Railroad, and one of the areas in which dredging has been extensively practiced. In 1922 to 1927, when most of the dredging was done, Mineral Resources credits Elmore County with the production of 32,777 ounces of placer gold mainly from this dredge.

Citations to bibliography

45, 49, 362, 566

1908, pt. 1, p. 423; 1909, pt. 1, p. 347;
1912, pt. 1, p. 724; 1913, pt. 1, p. 773;
1914, pt. 1, p. 620; 1915, pt. 1, p. 543;
1916, pt. 1, p. 584; 1917, pt. 1, p. 477;
1918, pt. 1, p. 480; 1919, pt. 1, p. 468;
1921, pt. 1, p. 411; 1922, pt. 1, p. 234;
1923, pt. 1, p. 382; 1924, pt. 1, p. 271;
1925, pt. 1, p. 656; 1926, pt. 1, p. 458;
1927, pt. 1, p. 675; 1928, pt. 1, pp. 647, 668;
1929, pt. 1, pp. 365, 390-391; 1930, pt. 1, p. 658;
Hardcorable district.

(See Yuba district, p. 51 of this pamphlet)

Middle Boise district.

(See Yuba district, p. 51 of this pamphlet)

Neal district (gold).

This district, near the Arrowrock Dam and about 25 miles from Boise, was discovered in 1889 and produced about $2,000,000 in lode gold through 1892. Subsequent production has been small and, except for prospecting in the last few years, the district has long been almost inactive.

The district is within the Idaho batholith. Porphyritic and lamprophyre dikes are present, and the latter are associated with the lodes which are quartz lenses with pyrite, gold, galena, sphalerite, arsenopyrite, and locally garnet in sericitized and carbonatized granitic rock. There are small transverse faults.

Citations to bibliography

#360, 362, 565, 652


1934, Statis. App., pp. 107, 115

Fir Grove district (gold, silver).

This district, 43 miles by road from the Union Pacific Railroad at Mountain Home, contains a number of lode prospects and a few small placers. The principal development has been at the Franklin Mountain mine, which is reported to have produced slightly over $750,000 in gold and silver. This mine shut down in 1917 and only a little prospecting has since been done there in search of faulted or otherwise interrupted ore shoots.

The district is within the Idaho batholith. Near the Franklin Mountain mine there are numerous stringers and dikes of pegmatite that locally are pre-cose. Ballard reports that there are dikes of diorite, rhyolite, and diabase which are cut by the lodes, but the evidence for this is not clear as the workings appear to have been inaccessible since long before Ballard's visit and no dikes other than pegmatite were noted by the present writer during an examination of the surface near the mine in 1929.

The veins follow shear zones in sericitized and somewhat silicified granitic rock. The vein quartz contains pyrite, galena, sphalerite, and locally arsenopyrite and chalcopyrite. It is reported that most of the development in the Franklin Mountain mine was on two veins that strike about N. 20° W., dip steeply east, and belong to a series distributed through a zone about 1-1/4 miles wide. Cinnabar is reported to have been formed in stringers in the granitic rock, but these have not been productive.

49
Citations to bibliography
45, 171, 172, 186, 362, 565, 962


Minerals Yearbook 1932-33, Statis. App., p. 129
1934, Statis. App., pp. 107, 113

Red Warrior district.
(See Bear Creek and Red Warrior districts, p. 47 of this pamphlet.)

Roaring River district (molybdenum).

This district, reached by trails about 15 miles long from Featherville and Rocky Bar, is noted mainly for its molybdenite prospects. It is underlain by the Idaho batholith cut by dikes of aplite, diorite, and lamprophyre. Molybdenite is in places disseminated in the granitic rock, but most of it is associated with quartz veins, in part brecciated and locally containing feldspar and other pegmatic material. Other minerals in the deposits include pyrite, specularite, chalcopyrite, marmatite, fluorite, and calcite. The lodes, especially in the more pyritic portions, are reported to contain gold and silver.

Citations to bibliography
45, 362, 937

Snake River placers.

Placers along Snake River have been worked at King Hill and Glenns Ferry. See p. 100 of this pamphlet.

Twin Springs district.
(See Boise County, p. 21 of this pamphlet.)

Volcano district (silver, copper).

This is a little known and little developed district in the southern part of the Idaho batholith, close to Hill City, the terminus of a branch of the Union Pacific Railroad. Dikes of aplite and of several kinds of porphyry are reported to cut the granitic rock and basalt and rhyolite flows locally cover it. There are several quartz veins stained with copper, manganese, and iron, and locally containing chloropyrite, pyrite, galena, and sphalerite. A little mining has been done from time to time, some since 1930, and a little silver ore has been found. Some of the dikes, which are locally mineralized, may be Tertiary so the lodes may have a resemblance to the Tertiary lodes of the Boise Basin.

Citations to bibliography
83, 362, 462

Yuba district (gold, silver).

This district, 80 miles by road from the Union Pacific Railroad at Mountain Home, is also termed by some the Atlanta or Middle Boise district, and the area along its southern margin is sometimes called the Hardcoralb district. The area was discovered in 1864 and active mining continued at least into the eighties with intermittent activity since then. In 1923, the Boise-Rochester, one of the principal mines, was reopened. It soon became one of the most active gold producers in the state, but was again shut down in 1936. It has produced ore valued at not less than $6,000,000, of which at least $2,500,000 were produced in 1931 to 1936.

The district is underlain by the Idaho batholith, which here varies somewhat in composition. There are aplite and other dikes related to the batholith and some later porphyries also. The aplite dikes are altered, especially near the lodes, but the porphyry dikes are fresher and not known in the mineralized areas.

Apparently there is one nearly continuous vein known as the Atlanta lode, with probable breaks and branches, and along which the principal mines of the district extend for 2 miles with a trend of about N. 20° E. There are also a number of subsidiary lodes of northwest trend that are supposed to branch off the main lode. In addition, especially in the outlying parts of the district, there are veins apparently not connected with this lode system, which as yet have produced little. The Atlanta vein and its main branches correspond in trend to the principal sets of joints in the granitic rock. It is thought that circulation of mineralizing solutions along the joints softened the neighboring rock while concomitant and subsequent earth movements were concentrated along these zones of increased weakness, producing the shearing now so conspicuous.

The wall rocks, especially at some distance from the lodes, were sericitized. In and near the lodes, the rock was silicified and quartz veins deposited. The relatively rich ore formerly mined contained stephanite, pyrargyrite, and other silver minerals, but these are exceptional in the ore mined recently, in most of which pyrite is the only sulphide visible. The mill heads during the recent boom averaged slightly less than half an ounce of gold and from 1 to 2 ounces in silver to the ton.

Citations to bibliography
- 46, 49, 66, 71, 67, 159, 140, 151, 172, 173, 186, 217,

Mineral Resources
- 1906, p. 219; 1906, pp. 256, 257;
  1907, pt. 1, p. 297; 1908, pt. 1, pp. 165, 409, 423-424;
- 1911, pt. 1, p. 591; 1912, pt. 1, p. 724;
  1913, pt. 1, p. 775; 1914, pt. 1, p. 620;
  1917, pt. 1, p. 477; 1918, pt. 1, p. 480;
  1919, pt. 1, p. 468; 1920, pt. 1, p. 252;
  1921, pt. 1, p. 411; 1922, pt. 1, p. 235;
  1923, pt. 1, p. 391; 1924, pt. 1, p. 271;
  1928, pt. 1, p. 668; 1929, pt. 1, p. 391;

Minerals Yearbook
- 1932-33, pt. 2, pp. 22, 106, 107; Statis. App.,
  pp. 118, 129.
- 1934, pt. 2, pp. 40, 143-144, 145
  1934, Statis. App., pp. 95, 100, 107, 112-113
  1935, pt. 2, pp. 36, 141
  1936, pt. 2, pp. 206, 207, 208, 210
  51.
FREMONT COUNTY

This county contains no known metallic deposits. For oil, see p. 104 of this pamphlet; oil shale, p. 104; phosphate, p. 106.

GEM COUNTY

Bodie district.

(See Squaw Creek district below.)

Pearl district.

(See West View district, Boise County, p. 22 of this pamphlet.)

Squaw Creek district (copper, silver).

This district, also known as the Bodie, about 15 miles from Emmett on a branch of the Union Pacific Railroad, contains the old Liberty group, a past producer of copper-silver ore, with an 1100-foot tunnel and other workings, but no other information is available in regard to it. Presumably the deposits resemble those of the West View district (p. 22).

Citations to bibliography

130 (1932), 360


West Mountain district.

The 1932 report of the State Inspector of Mines lists two properties here. No other information is available.

Citations to bibliography

130 (1932), 362

West View district.

(See Boise county, p. 22 of this pamphlet.)

GOODING COUNTY

Snake River placers.

(See p. 100 of this pamphlet.)

IDAHO COUNTY

Big Creek district.

(See Valley County, p. 93 of this pamphlet.)

Buffalo Hump district (gold, silver, copper).

Most of the lode mines in this district, which was formerly called the Robbins, are in the vicinity of Buffalo Hump. The roads built here in the late nineties are now passable only to pack-animals, but the distances to highways are rarely more than a few miles. The lode mines around Buffalo Hump appear to have produced about $700,000, comparatively little having been done for over 15 years.

32.
The area is underlain mainly by granitic, gneissic, and schistose rocks. Most of the lodes in the Buffalo Hump district are in a vein system occupying a zone 5 miles long with a maximum width of 1-3/4 miles, and containing over 20 veins. This zone occupied the crest of what appears to be a large anticline trending somewhat west of north. Most of the veins trend northeast, apparently without any such relation to regional stretching as exists in the Elk City district although otherwise the veins are similar.

A number of veins outside of the Buffalo Hump vein system have been mined in the Robbins district. One of the most extensively developed of these is in the War Eagle mine in the southern part of the district. Lenses of vein quartz, in part accentuated by post-mineral faulting, are enclosed in a hybrid granodiorite containing admixed sedimentary material. The usual simple sulphides, native gold, and possibly a telluride are present. Gold, silver, and copper are recovered. The principal ore shoot is reported to average $30 a ton.

Citations to bibliography

172,179, 206, 324, 356, 362, 364,366,376,377,383,385, 565
565,570, 573, 617, 619, 620, 621,652,676,699,746, 768, 790

1907, pt. 1, p. 300; 1908, pt. 1, p. 426;
1909, pt. 1, p. 349; 1910, pt. 1, p. 461;
1911, pt. 1, p. 585; 1912, pt. 1, p. 726;
1913, pt. 1, p. 776; 1914, pt. 1, p. 835;

Minerals Yearbook 1932-33, Statis. App., p. 130
1934, Statis. App., pp. 108, 114

Bungalow district (gold).

This is a placer district from which considerable production is reported. There has been hydraulic work in recent years. The district has not been described in print.

Camp Howard district (gold).

The Camp Howard district appears to correspond to the northern part of the Simpson district, as plotted on Plate 1 (see p. 80 of this pamphlet). The 1932 report of the State Inspector of Mines lists ten properties in the Camp Howard district. Apparently all are inactive, and presumably all placers. No other data are available.

Citations to bibliography

130 (1932)

Chamberlain Basin district (gold, copper).

This district, accessible only by trail and airplane, contains gold and copper lode and placer prospects, but none has yet received much development.

The district is underlain by the Idaho batholith and its border facies of gneissic quartz-diorite and injection gneiss. The lodes are in the marginal rocks. Some are quartz veins with tremolite and small amounts of pyrrhotite and galena.

55.
others have partly oxidized copper-silver-gold sulphides in quartz. The gravel of Chamberlain Basin has not yet been adequately tested, but its topographic situation is such as to appear favorable to the accumulation of placer gold, if the surrounding hills contain adequate source material. One reason for the scanty development here is the remoteness from existing routes of transportation.

Citations to bibliography
279, 576

Clearwater district (gold).

The 1932 report of the State Inspector of Mines lists two properties in the Clearwater district, Idaho County. These are actually in or close to the district of that name in the adjacent part of Nezperce County (p. 78 of this pamphlet).

Citations to bibliography
130 (1932), 364, 366

Cottonwood Buttes district (gold, silver, and copper).

This district, which is served by a branch of the Northern Pacific Railroad, contains quartz veins reported to carry gold, silver, and copper in an area of older rocks projecting through the Columbia River basalt. It is in and near T. 32 N., R. 2 E. Development appears to be very scanty. Apparently some prospecting for coal has been carried on in the Tertiary beds here. A little placer mining has been done in the Cottonwood Buttes district and also near Kenterville about 10 miles southwest.

Citations to bibliography
10, 91, 324, 364, 366, 381, 515

Mineral Resources 1913, pt. 1, pp. 774-775; 1914, pt. 1, p. 622;

Minerals Yearbook 1934, Statis., App., pp. 106, 114

Crooks Cerral district (copper).

This district is between the Snake and Salmon rivers near Lucile. The principal development is at the Blue Jacket mine (idle in recent years) where it is reported that schistose diorite or diabase, locally 50 feet wide, contains disseminated chalcopyrite and oxidized copper minerals.

Citations to bibliography
*62 (1911), 362, 364, 366, 373, 565, 652

1911, pt. 1, p. 582; 1912, pt. 1, p. 725.

Dewey district.
(See Harpster district, p. 57 of this pamphlet.)

Dixie district (gold).

This district until recently was reached only by trails from the Elk City highway. A few years ago, a road was built to the Dixie Ranger Station. Placer mining

54.
began here in 1861 and lode mining in 1891. The placers have a recorded production of $270,000, probably less than the real total, and the lodes have produced possibly $50,000. Little has been done in recent years. The geology and ore deposits resemble those of the Elk City district.

Citations to bibliography
10, 46; 79, 172, 223, 362, 364, 366, 369, 383, 442, 485, 619,
*620, 621, 662, 699, 722, 727, 769, 771, 814

Mineral Resources
1905, p. 232; 1906, p. 258; 1907, pt. 1, p. 299;
1908, pt. 1, p. 425; 1909, pt. 1, p. 546;
1910, pt. 1, p. 490; 1911, pt. 1, p. 592;
1912, pt. 1, p. 725; 1913, pt. 1, p. 778;
1914, pt. 1, p. 826; 1915, pt. 1, p. 546;
1916, pt. 1, p. 586; 1917, pt. 1, p. 476;
1919, pt. 1, p. 469; 1922, pt. 1, p. 235;
1923, pt. 1, p. 392; 1924, pt. 1, p. 272;
1925, pt. 1, p. 536; 1926, pt. 1, p. 439;
1929, pt. 1, p. 391; 1930, pt. 1, p. 639;

Minerals Yearbook
1922-23, Statics, App., p. 129
1924, Statics, App., 107, 113-114

(See Valley County, p. 94 of this pamphlet).

Edwardsburg district.

Elk City district (gold).

This district is now served by a highway from Grangeville on the Camas, Pacific
Railroad, about 80 miles away, which greatly decreases the transportation difficulty from which the area has long suffered. Placer deposits here were discovered in 1861. Published estimates of the placer production of the district range from
$10,000,000 to $18,500,000, and, since 1902, lode mines have produced over $725,000,
the prior production from lodes being small.

This district is mainly underlain by gneiss related to the Idaho batholith.
In its eastern portion the quartz monzonite of the batholith proper is capped by
small residual patches of quartzite. The valley around Elk City is floored by
Tertiary sediments.

Most of the lodes are made up of quartz lenses, maximum observed thickness
20 feet, and length 300 feet or more, grouped in a radiating system in the gneiss
close to the quartz monzonite or granodiorite contacts and commonly trending nearly
at right angles to the linear schistosity in the gneiss. Sulphides commonly make
up less than 5 per cent of the ore and include pyrite, tetrahedrite, sphalerite,
chalcopyrite, galena, with some native gold and minor amounts of other metallic
minerals. With local exceptions, oxidation is shallow. There is faulting, both
parallel and transverse to the veins.

Gold is widely distributed in small amounts in the Tertiary sediments, the so-
called "high level placer deposits" of the area. These have largely been left as
the gold content was too low for profit under primitive conditions of operation.
Richer placer deposits, now largely worked out, were formed by reorientation of
the old sediments in two stages along modern streams.

55.
This district (about 46 miles from Grangerville, the terminus of the Camas, Pacific Railroad, the last half of the road being nearly impassable to vehicles) was one of the richest of the early placer camps, its production of placer gold being roughly estimated at $2,500,000. In contrast, lode mining so far has been negligible although a number of small veins are known. Recently there has been some revival of placer mining. The geology resembles that of the Elk City district.

Citations to bibliography


Mineral Resources
1906, p. 232; 1907, pt. 1, p. 299;

Minerals Yearbook
1932-33, Stat. App., p. 129
1934, Stat. App., pp. 107, 114, 96
1935, pt. 2, pp. 37, 142
1936, pt. 2, p. 207

Green Mountain district (copper, silver).

The Bunker Hill and Sullivan Company operated a copper-silver prospect in this district in 1929 and 1930. It is now reached by a road from Elk City.

Citations to bibliography

10, 46, 77, 79, 107 (1930), 364, 366, 385

56.

Harpster district (gold, copper).

Near Harpster, which is within 15 miles of both Stites and Grangeville, the ends of two branch railroads, small amounts of quartz diorite and somewhat larger masses of Permian (?) volcanics lie west of a great mass of schist and gneiss overlying the Idaho batholith and east of the widespread Columbia River basalt. Close to the town there are gash quartz veins carrying some gold in both the quartz diorite and volcanics. About 5 miles away there are wide silicified breccia zones in the volcanics containing pyrite, some chalcopyrite, and small amounts of gold. The gold tenor of the ore mined is reported to be about 10th of an ounce a ton, with local, high-grade seams. A small production has been obtained, mainly from the veins of the Dewey mine (for which the district is sometimes named). Little active mining has been done in the district for years.

Citations to bibliography

Mineral Resources 1910, pt. 1, p. 460; 1911, pt. 1, p. 592;
1912, pt. 1, p. 726; 1913, pt. 1, pp. 774, 775;
pt. 2, p. 1376;
1914, pt. 1, pp. 622, 625; 1915, pt. 1, pp. 545, 546;
1918, pt. 1, p. 462; 1919, pt. 1, p. 470;
1921, pt. 1, p. 412; 1922, pt. 1, p. 235;
1923, pt. 1, p. 309; 1924, pt. 1, p. 272;
1930, pt. 1, p. 630.

1934, Statis. App., pp. 107, 108, 113

Lolo district (copper).

This district, which is served by the branch of the Northern Pacific Railroad which extends from Lewiston to Stites, contains a number of copper veins, some of which have received a little development. The district is mainly underlain by quartz diorite and gneiss of the border zone of the Idaho batholith. The veins are fissure fillings of irregular widths, varying from a few inches up to 6 feet. They contain quartz in which chalcopyrite and minor amounts of other sulphides are commonly sporadically and sparsely distributed.

Citations to bibliography
*10, 46, 172, 364, 366

Mineral Resources 1907, pt. 1, p. 300; 1924, pt. 1, p. 272

Minerals Yearbook 1932-33, Statis. App., p. 129

Lowell district (gold).

Near Lowell on the Middle Fork of the Clearwater River, some prospecting has been done. A little placer gold production has been reported from here and other places in this part of northern Idaho County.


87.
Maggie Creek district (asbestos).

This district, which is close to Kooskia on a branch of the Northern Pacific Railroad, contains the asbestos deposits of Kamiah Buttes. Small shipments were made in 1910, 1917, and probably other years. The deposits are lens-shaped masses, containing anthophyllite asbestos (mass fiber) aligned parallel to the trend of the enclosing炽石 and gneiss and probably formed by hydrothermal metamorphism from the nearby Idaho batholith. Similar deposits are known in several places in the vicinity and in Clearwater County, but have received little attention.

Citations to bibliography
10, 172, 364, 366, 713

Mineral Resources 1906, p. 258; 1913, pt. 1, p. 775; 1914, pt. 1, p. 622;
1915, pt. 1, p. 544; 1925, pt. 1, p. 392;

Minerals Yearbook 1932-33, Statis. App., p. 129
1934, Statis. App., p. 106

Marshall Lake district (gold, silver).

Placer mining was carried on in the southern part of this district, sometimes called the Resort district, which is 40 miles by highway from McCall (the terminus of a branch of the Union Pacific Railroad), in the sixties and seventies and has continued intermittently to the present. The record of the early production here is merged with that of the nearby Warren district, and hence cannot be ascertained. Lodes were discovered about 1876, but produced little until after 1900. The production from 1902 to 1928 totalled $289,222 in gold and silver, of which nearly 90 per cent was produced in 1916 to 1918 when the Hoite (now the Golden Anchor) was at the peak of its production. There has been considerable activity at this and the adjoining Sherman-Rowe mine in recent years and numerous prospects have also received attention.

Most of the known lodes are in the northern part of the district and a large part of this area is underlain by schistose Belt rocks, forming a roof pendent in the Idaho batholith. The schist has been more or less thoroughly injected by igneous material and locally by quartz and out by dikes and stringers of aplite, lamprophyre, and pegmatite.

Most of the lodes strike east and many dip south. They are narrow bodies of quartz with stringers of aplite and pegmatite intimately associated with them. Post-mineral faulting has locally occurred, but most of the abrupt terminations and en echelon arrangements of quartz masses result from original deposition. The lode matter commonly contains only a few per cent of metallic minerals, mainly metallic gold, argentiferous tetrahedrite, chalcopyrite, pyrite, sphalerite, and galena, and is valuable mainly for its moderate content of gold.

Citations to bibliography
46, 79, 172, 360, 362, 565, 617, 662, 769, 770, 771

1909, pt. 1, p. 345; 1910, pt. 1, p. 455;
1912, pt. 1, p. 726; 1913, pt. 1, p. 775;
1914, pt. 1, p. 622; 1915, pt. 1, p. 545;
1916, pt. 1, p. 587;

(Cont'd)
1920, pt. 1, p. 282; 1921, pt. 1, p. 412;
1922, pt. 1, p. 392; 1924, pt. 1, p. 272;
1926, pt. 1, p. 556; 1928, pt. 1, p. 460;
1928, pt. 1, p. 669; 1929, pt. 1, p. 392;
1930, pt. 1, pp. 615-614, 620, 639-640;

Minerals Yearbook 1932-33, pt. 2, p. 107; Statis., App., p. 129
1934, Statis., App., pp. 108, 114

Newsome district.

This is the northern part of the Termite district (p. 61 of this pamphlet) and
by many is regarded as a separate district.

Cerro Grande district (gold, copper).

This district is about 60 miles by highway from the railroad at Grangeville,
and most of the mines are accessible by recently constructed or improved roads.
The production, largely from gold lodes, in the past 30 years has been over
$100,000. Of this a considerable amount came from the Gnome mine in 1933 and 1934.
Some copper has been mined.

The district is underlain by the Idaho batholith and related gneiss with small
dacitic intrusions of probable Tertiary age.

Several of the lodes consist of sparsely disseminated auriferous pyrite in
large shear zones in schist more or less silicified and containing much pegmatitic
material, locally termed dike or reef deposits. In places, such shear zones attain
widths of half a mile. They are very low-grade, but are of possible interest for
large-scale operation. Lenticular gold quartz veins similar to those of the Elk
City district, but not in such a well defined vein system are being developed in
several properties.

The Ptsite lode differs from most in this part of Idaho in that it appears to
be of Tertiary age because part of the mineralization is in a dacite stock believed
to be of that age. Small, vuggy quartz veins and stringers in the dacite and near-
by granodiorite contain pyrite, chalcopyrite, galena, and minor amounts of tetra-
dymite, molybdenite, and probably wolframite, and scheelite.

Citations to bibliography
10, 46, 77, 79, 172, 293, 362, 364, 366, 383, 386,
565,570,573,617,618,620,621,699,769, 771.

1909, pt. 1, p. 549; 1910, pt. 1, p. 461;
1911, pt. 1, p. 693; 1912, pt. 1, p. 728;
1914, pt. 1, p. 622; 1915, pt. 1, p. 548;
1916, pt. 1, p. 587; 1917, pt. 1, p. 479;
1918, pt. 1, p. 481; 1919, pt. 1, p. 470;
1923, pt. 1, p. 392; 1924, pt. 1, p. 272;

Minerals Yearbook 1932-33, Statis., App., p. 130
1934, pt. 2, pp. 40, 143, 144, Statis., App., pp. 108-114;
59.
Ramey Ridge district.
(See Edwardsburg district, p. 6 of this pamphlet).

Rapid River district.
(See Mountain View district, p. 6 of this pamphlet).

Resort district.
(See Marshall Lake district, p. 66 of this pamphlet).

Robbins district.
(See Buffalo Hump district, p. 52 of this pamphlet).

Salmon River district.
(See Simpson district below).

Salmon River Canyon placers (gold).

At intervals along the Salmon River from the upper end of the Simpson district to the vicinity of Shoup there are small placer workings operated only when water conditions are favorable. Among these is a deposit near the mouth of Butts Creek, production from which is mentioned in Mineral Resources for 1926, pt. 1, p. 536, 1928; pt. 1, p. 669; 1929, pt. 1, p. 361. The production from most of the other operations along this part of the Salmon is doubtless merged with that of such districts as Pizie and Warren where the gold is marketed.

Citations to bibliography
103, 771

Simpson district (gold).

This is chiefly a placer district, most operations being along the Salmon between Freedom and Riggins. Many term it the Salmon River district. Placer gold appears to have been produced here at intervals for a long time. A number of the companies recently active here claim the presence of rare metals not substantiated by reliable independent assayers or of gold not detectable by ordinary assay methods.

Citations to bibliography

Mineral Resources
Minerals Yearbook 1932–33, Statis. App., pp. 129, 130

Tennile district (gold).

This district, which includes the Newsome, is crossed by a new highway from Grangeville at the end of a branch railroad. Its northern part is served by a road about 46 miles long from Stites, the terminus of another branch line. A new highway from Lewiston is almost completed into the district. Placers were found here in 1861 and the production from this source is about $2,000,000; the better deposits being largely worked out. The production from lodes in 1900–1931 has been about $170,000. In 1932, the Lone Pine mine built a new mill and since then has largely increased its production. Several other prospects are also being actively developed.

The geology and the character of the lodes and placers resemble those of the adjacent Elk City district (p. 55) except that the lodes do not appear to belong to such a complex vein system and have not been proved to have the consistent relation to regional stretching exhibited by the veins of Elk City.

Citations to bibliography
10, 46, 77, 79, 293, 364, 366, 363, 366, 475,
670, 672, 817, 819, 820, 621, 699, 732, 769, 771.

Mineral Resources 1910, pt. 1, p. 461; 1911, pt. 1, p. 593;
1912, pt. 1, p. 726; 1913, pt. 1, p. 775;
1914, pt. 1, p. 623; 1915, pt. 1, p. 546;
1916, pt. 1, p. 587; 1917, pt. 1, p. 473;
1918, pt. 1, p. 482; 1919, pt. 1, p. 470;
1920, pt. 1, p. 262; 1921, pt. 1, p. 422;
1922, pt. 1, p. 235; 1923, pt. 1, p. 392;

Minerals Yearbook 1932–33, Statis. App., p. 130

(Newsome district)

Mineral Resources 1905, p. 233; 1906, p. 258; 1907, pt. 1, p. 300;
1910, pt. 1, p. 461; 1911, pt. 1, p. 593;
1912, pt. 1, p. 726; 1913, pt. 1, p. 775;
1914, pt. 1, p. 622; 1915, pt. 1, p. 545;
1916, pt. 1, p. 587; 1917, pt. 1, p. 479;
1918, pt. 1, p. 481; 1919, pt. 1, p. 470;
1921, pt. 1, p. 422; 1922, pt. 1, p. 235;
1923, pt. 1, p. 356; 1924, pt. 1, p. 272;
1925, pt. 1, p. 536; 1926, pt. 1, p. 440;

Minerals Yearbook 1932–33, Statis. App., p. 130

Warren district (gold).

This district is about 50 miles by highway from McCall, the terminus of a branch of the Union Pacific Railroad. Placer deposits here were discovered in 1862.
and lode mining began in 1866. The total production of this and the neighboring Marshall Lake district was estimated by Lindgren in 1897 to be in excess of $15,000,000 of which about $2,000,000 was from lodes. Since then, about $500,000 has been produced, nearly half of which probably came from placers. Interest in the placers has recently been renewed by the installation of dredges in the Warren meadows.

Most of the district is underlain by the Idaho batholith. Although 250 veins had been recorded in the district as early as 1871, few have ever been much developed and much of the production has come from the Little Giant and Rescue mines.

The lodes are mostly narrow bodies of quartz within wider zones of shearing and alteration. In some places, such as the lower Little Giant workings, a number of parallel lodes are close together. Locally rich ore occurs on sets of complimentary joints called floors. The metallic minerals include gold, pyrite, tetrahedrite, sphalerite, galena, arsenopyrite, and locally scheelite, stibnite, and ruby silver, and in the aggregate rarely exceed 2-1/2 per cent of the vein matter. Much of the ore contains nearly an ounce and a half of gold to the ton and much of that mined in the early days ran over 8 ounces to the ton. Oxidation is everywhere slight. Locally post-mineral faulting is conspicuous but displacements are generally small.

Most of the placer deposits are in the Warren and Saccsh meadows; broad, flat expanses of gravel and sand surrounded by hills. Locally the width of the meadows exceeds 2 miles.

Citations to bibliography

560, 563, 617, 652, 723, 724, 759, 771, 707.

Mineral Resources 1906, p. 182; 1906, pp. 219, 234;
1906, pp. 246, 269, 312; 1907, pt. 1, pp. 300-301;
1909, pt. 1, p. 486; 1909, pt. 1, p. 349;
1910, pt. 1, pp. 461, 746; 1911, pt. 1, p. 593;
1912, pt. 1, p. 726; 1913, pt. 1, p. 775;
1914, pt. 1, p. 623; 1915, pt. 1, p. 546;
1916, pt. 1, p. 587; 1917, pt. 1, p. 479;
1918, pt. 1, p. 492; 1919, pt. 1, p. 470;
1920, pt. 1, p. 255; 1921, pt. 1, p. 421;
1922, pt. 1, p. 236; 1923, pt. 1, pp. 376, 392-393;
1924, pt. 1, pp. 266, 282, 272-273;
1925, pt. 1, pp. 318, 322, 536; 1926, pt. 1, p. 440;
1927, pt. 1, p. 647; 1928, pt. 1, p. 670;
1930, pt. 1, pp. 620, 639, 640;

Minerals Yearbook 1932-33, pt. 2, pp. 22-23, 106, 107
pp. 95, 108, 115
1935, pt. 2, pp. 37, 141-142
1936, pt. 2, pp. 207, 208

JEROME COUNTY

(Snake River placers, see p. 100 of this pamphlet.)
KOOTENAI COUNTY

Beauty Bay district (lead, silver).

This area, which is reached by road and boat from Coeur d'Alene on the Northern Pacific Railroad, is underlain by Belt strata with Tertiary basalt flows along Coeur d'Alene Lake. There are intrusive bodies that have been tentatively regarded as Tertiary. A few lead-silver, arsenic and bismuth lodes are known, but there has been little development.

Regarding platinum in Kootenai County, see Kootenai County, Bibliography.

Citations to bibliography

Burnt Cabin district.

(Probably part of the Hayden Lake district, described below.)

Hayden Lake district (lead, silver, copper).

Several lodes have been prospected for lead, silver, and copper ore in the Hayden Lake district. Exploration has continued up to the present time, but the results as yet are small. Belt strata and bodies of granodiorite lie east and south of Hayden Lake, which is a short distance north of Coeur d'Alene on the Northern Pacific Railroad. On the west and north there are patches of Tertiary basalt and areas of glacial deposits.

Citations to bibliography

Lake Front district.

This area, which is served on the north by a branch of the Union Pacific and on the south by the Chicago, Milwaukee and St. Paul Railroad, is underlain by Belt strata with Tertiary basalt flows along the shore of Coeur d'Alene Lake. Mining is apparently inactive as the district is not mentioned in the 1932 report of the State Inspector of Mines.

Citations to bibliography

Little North Fork district (copper, lead, silver).

This district is served on the south by a branch of the Union Pacific Railroad and on the north is not far from Bayview on the Spokane International Railroad. The district is underlain by Belt strata and contains a few prospects and mines for copper and lead-silver ores. The principal producer of copper in the district is the Empire mine, in Shoshone County, close to the county boundary. In this and other copper mines in the district, the veins are in quartzite, are a few inches up to 50 feet thick, and contain chalcopyrite and pyrite in a gangue of quartz and siderite. The results of oxidation extend to depths of about 100 feet, but secondary enrichment appears to have been slight. One shoot in the Empire contains 63.
about 50 per cent copper, but the average content of the lode is reported to be about 1-1/2 per cent copper.

Citations to bibliography

Medimont district (lead, copper).

The area near Medimont and Lane, stations on the branch of the Union Pacific Railroad, is underlain by Belt strata and contains a few prospects for lead and copper, some of which have been recently operated.

Citations to bibliography
2, 7, 8, 124, 129, 279, 382, 669.

Wolf Lodge district (lead, silver).

This district, close to Coeur d’Alene on a branch of the Northern Pacific Railroad, is underlain by Belt strata locally covered by basalt, and contains several lead-silver prospects, some of which have received more development than most others in the county.

In 1923, in this and other parts of Kootenai County, interest was aroused by the reported presence of platinum and related metals, but investigation by the Idaho Bureau of Mines and Geology and cooperating organizations failed to show the presence of any platinum in samples taken from the places where high returns had been reported. The supposed platinum occurrences are in slightly altered basic dikes and in quartz veins, both in quartzite of the Belt series. The properties visited and sampled are the Home Builder, Caribou, and Wilson Mutual or Green. At the second property mentioned a small quartz vein containing arsenopyrite, pyrite, galena, and sphalerite was noted.

Citations to bibliography


LATAH COUNTY

Blackbird district.
(See Hoodoo district, p. 86 of this pamphlet.)

Blackfoot district (gold, copper).

This district, also known as the Gold Hill, served by the Washington, Idaho and Montana Railroad, contains placers from which a little gold has been taken and some prospects on lodes containing copper and precious metals disseminated in quartzite.

Citations to bibliography
318, 364, 366, 414, 652, 736.
Gold Creek district.

(Possibly the same as the Blackfoot district above).

Hoodoo district (gold, copper).

This district, also called the Blackbird, is about 10 miles from Harvard on the Washington, Idaho, and Montana Railroad. It contains placer deposits, worked in the past, which have recently been examined with a view to possible dredging, and gold-quartz veins and disseminations of chalcopyrite and its oxidation products in schist. Some copper ore has been shipped from the Kispah mine.

Citations to bibliography
172, 364, 366, 565, 652

Mineral Resources 1905, p. 234; 1906, p. 259; 1907, pt. 1, p. 301;
1908, pt. 1, p. 428; 1909, pt. 1, p. 549;
1910, pt. 1, p. 461; 1911, pt. 1, p. 595;
1912, pt. 1, p. 778; 1914, pt. 1, pp. 623, 624;
1916, pt. 1, p. 567; 1918, pt. 1, p. 462;
1919, pt. 1, pp. 470-471; 1920, pt. 1, p. 253;
1921, pt. 1, p. 412; 1922, pt. 1, p. 236;
1923, pt. 1, p. 395; 1924, pt. 1, p. 273;
1925, pt. 1, p. 537; 1926, pt. 1, p. 440;
1929, pt. 1, p. 393; 1930, pt. 1, p. 640;

Minerals Yearbook 1932-33, Statis. App., p. 130
1934, Statis. App., pp. 106, 115

Mica Mountain district.

(See Robinson district below.)

Moscow Mountain district (gold).

This district, also known as the Thetuna Hills, is north of Moscow, which is served by branches of the Union Pacific and Northern Pacific railroads. This area contains gold-quartz veins in granitic rocks. The principal development is at the White Cross mine which at one time had a stamp mill.

Citations to bibliography
346, 364, 366, 414, 565, 721


Minerals Yearbook 1932-33, Statis. App., p. 130
1934, Statis. App., pp. 106, 115
Robinson district (mica).

Mica is mined from pegmatite in this area, which is also termed the Mica Mountain district and is about 4 miles north of Avon on the Washington, Idaho, and Montana Railroad.

Citations to bibliography
364, 366, #615, 652, 822

Ruby Creek district.
(See Clearwater County, p. 39 of this pamphlet.)

Troy district (copper, fire clay).

This area, which is served by a branch of the Northern Pacific Railroad, contains prospects showing bornite and chalcopyrite in gneiss, schist, and garnetiferous limestone. Fire clay is also quarried in the area.

Citations to bibliography
#652

LEMHI COUNTY

Aurora district (gold).

This name is sometimes applied to the part of the Mackinaw district opposite the settlement of North Fork. It contains formerly productive placer deposits.

Blackbird district (copper, gold, cobalt, nickel, silver).

The northern part of this area contains copper-gold and cobalt-nickel lodes, while the southern part, sometimes called the Musgrove district, contains selenium-bearing gold-silver ore. The district, which is about 35 miles from Salmon by a recently improved road, and is also conveniently approached from Challis, about 60 miles away, was discovered in 1893 and from then until about 1902 there was considerable activity at and near the Blackbird copper mine. During the World War, cobalt-nickel deposits, 3 or 4 miles southeast of this locality, were prospected and partly developed, but the results do not appear to have been encouraging as the property has long been deserted. The precious metal deposits of Musgrove Creek have been known for many years, but were principally developed in 1913, 1914, 1915, and 1921. About $35,000 has been produced, mainly from the Musgrove mine.

The predominant rock throughout the district is more or less argillaceous. Quartzite of the Belt series cut by a few gabbro and lamprophyre dikes presumably related to the granitic stock of variable composition that crops out to the northeast. This stock is thought to be an outlier of the Idaho batholith. A remnant of the Challis volcanics extends into the southwestern part of the district and this formation probably covered much of the area before being removed by erosion. Rhyolite dikes probably related to the lava are exposed along musgrove Creek.

The copper-gold and cobalt-nickel deposits are interrelated and differ only in proportions of the minerals and in structural details. They are irregular and discontinuous veins and lenticular masses of quartz and mineralized quartzite commonly localized in schistose parts of the quartzite, the schistosity being apparently related to and concomitant with the mineralization which probably took place under high temperature and pressure. The known hypogene metallic minerals are pyrite, chalcopyrite, nickeliferosus pyrrhotite, galena, cobaltite, amalite, molybdenite, and galena.
arsenopyrite, and magnetite, and the gangue minerals include quartz, biotite, calcite, siderite, garnet, and tourmaline. The shallow, oxidized parts of the copperiferous lodes contain enough gold to have been prospected for this metal.

The precious metal deposits along Musgrove Creek have yielded ore containing $10 to $20, and locally as much as $70 to the ton of gold and silver, at least in part as selenide. They are essentially like those of the Parker Mountain and similar districts except that the enclosing rock is quartzite instead of lava or tuff.

Citations to bibliography


Blue Wing district (tungsten).

Mineralization here has been known since 1861, but development of the tungsten deposits, which distinguish it, did not begin until 1911. Some tungsten ore was produced in 1911 to 1917 at the Patterson and Boise-Ima mines, and development was renewed in 1927 and 1929. Since 1934, there has been a marked increase in activity and the district has become one of the larger tungsten producers in the United States. The district is now generally approached from Mackay, the terminus of a branch of the Union Pacific Railroad, about 80 miles away.

The deposits are in fractures and shear zones, locally as much as 20 feet wide in argillitic quartzite of the Belt series close to the border of a buried granitic mass. Sharp bends and step-like offsets, not formed by post-mineral faulting, are characteristic. The ore consists of glistening white quartz interlayered with or containing fragments of partly replaced quartzite, with chlorite, pale yellow mica, molybdenite, molybdenite, pyrite, galena, argentiferous tetrahedrite, sphalerite, and chalcopyrite irregularly but rarely abundantly distributed through the quartz.

Citations to bibliography


Carmen Creek district.

(See "Districts east of Salmon", next page.)

Dahlonega district.

(See Gibbonsville district, p. 70 of this pamphlet.)
Districts east of Salmon (gold).

The Carmen Creek, Eldorado, Kirtley Creek, and Pratt Creek (including the Sandy Creek) districts are grouped along the west flank of the Beaverhead Range near Salmon. Short roads and trails connect them with the highway in Lemhi Valley. Together they may have produced roughly $1,000,000, in part from placers, in part from gold veins containing some base metals. Some of these districts, especially the Eldorado, are extended by some to include areas south of Lemhi Valley, but, as Plate 1 shows, this practice is not here adopted.

The country rock is mainly quartzite of the Belt series with locally dioritic dikes and larger granitic intrusions. Most of the lodes are quartz veins with pyrite, chalcopyrite, and lesser amounts of galena and sphalerite. Some are lens-shaped quartz masses in zones of intense schistosity into which mineralization has spread with the development of disseminated pyrite, chalcopyrite, magnetite, actinolite, and epidote. There has been some oxidation and copper sulphide enrichment.

Citations to bibliography

37, 186, 193, 276, 382, 565, *635, 652, 772.

(Eldorado district)

Mineral Resources 1898, p. 914; 1904, p. 465; 1906, pp. 236, 562;
(Eldorado reported in Gibbonsville district for
1909 and 1907.)
1909, pt. 1, p. 590; 1910, pt. 1, p. 462;
pt. 2, p. 115, 496;
1911, pt. 1, p. 596; pt. 2, p. 596;
1912, pt. 1, pp. 727-728; 1913, pt. 1, p. 776;
pt. 2, p. 1377;
1914, pt. 1, p. 624; 1915, pt. 1, p. 547;
1916, pt. 1, pp. 586, 689; 1917, pt. 1, p. 480;
1918, pt. 1, pp. 482-483; 1919, pt. 1, p. 471;
1921, pt. 1, p. 421; 1922, pt. 1, p. 236;
1923, pt. 1, pp. 340, 393;
1928, pt. 1, pp. 646, 654, 670-671;
1929, pt. 1, pp. 367, 393; 1930, pt. 1, pp. 621, 641;

Minerals Yearbook 1932-33, Statis. App. p. 130
1934, Statis. App., pp. 106, 115

(Kirtley Creek district)

Mineral Resources 1907, pt. 1, pp. 302-303; 1908, pt. 1, p. 428;
1911, pt. 1, p. 595; 1912, pt. 1, p. 728;
1913, pt. 1, p. 777; 1914, pt. 1, pp. 624-625;
1915, pt. 1, p. 547; 1916, pt. 1, p. 569;

(Pratt Creek district)

Mineral Resources 1907, pt. 1, p. 303; 1908, pt. 1, p. 428;
1912, pt. 1, p. 728; 1916, pt. 1, p. 589;
1917, pt. 1, p. 480; 1919, pt. 1, p. 472;
1920, pt. 1, p. 253; 1921, pt. 1, p. 413;
1923, pt. 1, p. 334; 1924, pt. 1, p. 274;
1925, pt. 1, p. 538; 1926, pt. 1, p. 481;
1928, pt. 1, p. 672; 1929, pt. 1, p. 364;

Minerals Yearbook 1932-33, Statis. App., p. 130
1934, Statis. App., pp. 106, 116

Eight Mile district.
(See Junction district, p. 71 of this pamphlet.)

Eldorado district.
(See “Districts east of Salmon, p. 68 of this pamphlet.”)

Eureka district (gold, copper).

This district is near Salmon and is crossed by the highway along Salmon River.
A number of the smaller properties are, however, only accessible by trail.

Cupferiferous gold lodes were mined in the early days and since about 1917
the copper lodes with little gold have been productive, with brief interruptions, on
a small to moderate scale, up to recent years when the sharp decline in the price
of copper compelled suspension of operations. A portion of the area northwest of
Salmon, which contains lodes with relatively plentiful galena is sometimes called
the Silverton district, after the principal prospect.

Much of the district is underlain by argillaceous quartzite of the Belt series,
locally schistose. In the northern and western parts of the area a granitic stock
presumably related to the Idaho batholith is exposed. The valleys of the Salmon
and Lemhi rivers are bordered by Tertiary tuff, sandstone, and some lave, with a
few lignite beds, some of which were mined for local use before the railroad made
it possible to ship in better fuel.

The gold lodes are mainly small quartz lenses in the granitic stock near its
contact with the quartzite and contain auriferous pyrite, chalcopyrite, and
a little galena. The copper deposits are replacements in shear zones with subordi-
nate quartz lenses. The hypogene minerals comprise quartz, micas, chlorite,
epidote, chalcopyrite, pyrite, magnetite, specularite, dolafossite, and locally
sphalerite and barite. The ore averages 2-1/2 to 6 per cent, rarely as much as
20 per cent, copper with negligible amounts of precious metals. The ore near the
surface is oxidized and some stope are reported to contain abundant supergene
chalocite, but much of the material mined is free from the effects of surface
processes.

Citations to bibliography

37, 64, 166, 193, 489, 491, 521, 565, 637, 652, 716, 772

Mineral Resources 1907, pt. 1, p. 302; 1908, pt. 1, p. 427;
1910, pt. 1, p. 462; 1911, pt. 1, p. 545;
1912, pt. 1, p. 728; 1913, pt. 1, p. 776;
1914, pt. 1, p. 624; 1916, pt. 1, p. 547;

(Cont'd)

69.


Gibbensville district (gold).

This district, sometimes called the Hughes Creek and Dahlanega, is traversed by a highway and is about 30 miles from Salmon on the Gilmore and Pittsburg Railroad.

The placers of this area were discovered in 1877, and gold lodes were actively worked from about 1880 to 1898, with intermittent development in both lodes and placers up to the present. The total production is roughly $2,000,000, mostly from placers.

The area is underlain by quartzite and slate of the Belt series, intruded by gneissic quartz diorite, probably Mesozoic but thought by some to be possibly pre-Cambrian. A small remnant of Tertiary lava remains.

The lodes are narrow, steep, quartz veins with auriferous pyrite, locally massive, and in places calcite and chalcopyrite. The primary ore averages half an ounce to 2 ounces a ton, of which 40 per cent is reported to yield to amalgamation. The veins are broken by a complicated system of faults which interfere with mining.

Citations to bibliography


Gravel Range district (gold, silver, opal).

This district, sometimes called the Singiser, was discovered in the early seventies. It is somewhat over 100 miles by road from Mackay, the terminus of a branch of the Union Pacific Railroad. A little placer mining was done at that time, but the principal development began in 1896 at the Monument Lode mine. There was intermittent lode mining in the area until about 1914. Since then, little but has been done except a little assessment work and placer mining. An estimate of less than $100,000 in gold and silver, as the total production of the district, has been made; apparently a very liberal figure.
The mineralized part of the area is underlain by the Tertiary Challis volcanics. The Casto volcanics (Permian?) crop out in the northwest part and the Belt series along Panther Creek.

In the Monument or Singiser mine, the ore follows fractures trending N. 20 to 40 degrees and dipping 40 to 66 degrees NW. It contains quartz, a clay mineral-like halcyosite, pyrite, adularia and a salemite-like naumanniite. The Rabbitfoot, the only other extensively developed property, shows widely silicified and kaolinized white rhyolite with here and there minor fractures lined with flakes of gold with or without quartz. The altered rhyolite contains sparse pyrite and is reported to carry gold. Much of the ore mined at the Monument is reported to have contained $11 a ton whereas that at the Rabbitfoot was lower grade. High-grade ore is reported to have been found at the Monument in the early days.

A prospect on silicified breccia zones in Tertiary tuff near Meyers Cove contains barite and stibnite in sufficient abundance to constitute antimony ore, providing a sufficient quantity is present.

Opals have been mined on Panther Creek. They occur in quartzite and in a porphyry dike or detached mass of the Challis volcanics, in Challis volcanics, and in placers elsewhere in the district. Although some stones of good quality have been found, they are so brittle as to be difficult to work and hence very little has been done on the deposits for a number of years.

In addition to gold and opals, some placer gravels contain cassiterite (tin oxide) in crystals, and as botryoidal masses, but the amount recovered has been too small to be of consequence.

Citations to bibliography

54, 56, 145, 362, 372, #495, #535, 652, 772


Hughes Creek district.

(See Gibbonsville district, p. 70 of this pamphlet.)

Indian Creek district.

(See Mineral Hill and Indian Creek districts, p. 74 of this pamphlet.)

Junction district (lead, gold, silver, manganese).

As mapped on Plate 1, this district includes areas regarded by some as separate districts known as Eight Mile and Little Eight Mile districts, after creeks that flow through them, and in addition the area close to the town of Junction on the former Gilmore and Pittsburgh Railroad. Little mining was done prior to 1904 when the Leadville mine, the principal producer, was located, and in recent years the district has not been active. The total production has been nearly $300,000 in lead and precious metals.

The part of the district in the Beaverhead Range is mainly underlain by Paleozoic strata, largely Carboniferous limestone, with small dioritic intrusions. The
part in the Lemhi Range contains both Belt and Paleozoic beds with similar intrusions. The intervening Lemhi Valley is underlain mainly by Tertiary tuffaceous sandstone and related beds, masked by later gravel. A large mass of similar Tertiary clastic beds, including some marl, occupies the pass through the Beaverhead Range in the eastern part of the district, utilized by the highway into Montana.

Most of the lodes are irregular replacements in limestone or less commonly slate, almost without introduced gangue minerals. The principal metallic minerals are argentiferous galena, pyrite, chalcopyrite, and sphalerite. Some manganese oxides are present. In the Leadville mine, which is in Carboniferous limestone, post-mineral faulting has brought recent alluvial deposits into contact with the lode.

**Citations to bibliography**

27, 37, 193, 500, 372, #636, 662


Kirtley Creek district. (See "Districts east of Salmon", p. 68 of this pamphlet.)

Leesburg district. (See Mackinaw district, p. 73 of this pamphlet.)

Little Eight Mile district. (See Junction district, p. 71 of this pamphlet.)

McDevitt district (copper).

This district lies on either side of Lemhi Valley, which is traversed by a highway. The part of the district north of the valley is included by some in the Eldorado district. It is reported that copper deposits in the district were prospected by Mormons who attempted a settlement in the Lemhi Valley in 1854 to 1857. The Copper Queen, the principal producer, was located in 1863 and has operated intermittently since 1898. Upland, in 1910, estimated the total production at $100,000, largely in gold. Since then, a somewhat larger amount has been produced, largely in copper from the Harmony.

The district is underlain by quartzite and schist of the Belt series with local remnants of Paleozoic beds. Tertiary clastic beds, interbedded with lava on the mountain slopes, underlie Lemhi Valley and extend up the spurs on either side.

The lodes are in quartzite and locally chlorite schist of the Belt series.
They follow shear zones, locally with marked brecciation, and contain quartz, a little calcite, pyrite, chalcopyrite, locally bornite, and in places limited amounts of free gold and oxidation products. In most of the better copper ore, the amount of precious metals is negligible. Specimens of bornite with visible gold have been found.

Much of the ore mined ranged from 2 to 7 per cent copper, although some was of higher grade.

Citations to bibliography
37, 153, 216, 267, 300, 469, #491, 521, 665, 656, 652

Mineral Resources
1909, pt. 1, p. 551; 1914, pt. 1, p. 625;
1917, pt. 1, p. 460; 1918, pt. 1, p. 463;
1920, pt. 1, p. 253; 1921, pt. 1, p. 413;
1924, pt. 1, p. 274; 1925, pt. 1, p. 537;
1926, pt. 1, p. 441; 1928, pt. 1, p. 671;
1929, pt. 1, p. 394; 1930, pt. 1, p. 641;
1931, pt. 1, p. 469.

Mackinaw district (gold).

This district is sometimes called the Leesburg district and the northeast part of it, mainly valuable for placer, is called by some the Moose Creek or Aurora district. The Mackinaw district centers around the old town of Leesburg, about 20 miles by road from Salmon. Leesburg once had a population of 7,000 people. Placers were discovered in this vicinity in 1866. The principal activity was in the following 14 years, although placer mining has since continued intermittently. There has been a revival of interest since 1926. The placers in the general vicinity of Leesburg may have a total production of somewhat over $5,000,000 and those in what is sometimes called the Aurora district may have produced another $1,000,000. The lode mines, mainly the Italian and Shoo Fly, have contributed about $250,000 in bullion.

Much of the district is underlain by granitic and gneissic rocks belonging to a stock believed to be related to the Idaho batholith. The Belt strata covering the central part of the stock still remain. On Moose and napas creeks, there are patches of Tertiary lava and sediments. A few rhyolite dikes, presumably Miocene, are present.

There are five intergradational types of lodes: (1) Narrow quartz veins accompanied by stockworks in granitic rock, which contain pyrite, sphalerite, specularite, and a little galena, represented by the Italian gold mine; (2) replacements along fault planes with quartz and pyrite, and abundant, somewhat mineralized gouge, as at the Gold Dust mine; (3) irregular replacement bodies of pyritiferous quartz, along shear zones in schist which contain garnet, epidote, and magnetite, represented by the Mayflower group; (4) small lenses in schist and probably also in granitic rock, that are supposed to be the source of much of the placer gold; (5) quartz veins in contact with biotite monzonite dikes, with comparatively abundant chalcopyrite and sphalerite, and some pyrite and galena. The last variety cuts deposits of the first named at the Italian mine. It may be of Miocene age. Lead ore is reported at the Bull of the Woods mine, but little is known about it. Nearly all the lodes are valued for their moderate to low-gold content, base metals being negligible.

Unpleby regards the earlier and more extensive placers as probably of both
Mioocene and Pliocene age. Proof of such antiquity is lacking. Much of the placer gravel is clearly later than Pleistocene (presumably Wisconsin) till on which it rests.

Citations to bibliography


Minerals Yearbook 1932-33, Statis. App., p. 130
1934, Statis. App., pp. 108, 116

Mineral Hill and Indian Creek districts. (gold, silver, copper, lead).

These districts are 30 to 40 miles by highway from Salmon, but a number of the properties in both are not now accessible to vehicles.

The Mineral Hill district, discovered in 1882, has produced about $800,000, and the adjoining Indian Creek district, located in 1896, has produced about $600,000. In both, gold and silver have been the principal metals recovered although base metals are locally abundant enough to be of economic interest. Placer mining has not been an important factor in these districts. Intermittent operation of the lode mines has continued, but none of the properties has been worked on a large scale for many years. Recently, the Ulysses has been reopened.

The area contains schist and quartzite of the Belt series cut by gneissic and granitic rocks with associated pegmatite and aplite, and later, post-mineral dikes of several kinds. The gneissic rocks were formerly supposed to be Archean, but D. M. Davidson and Anton Gray have shown in unpublished theses at the University of Minnesota that they are intrusive into the Belt rocks and both gneiss and granitic rock are probably related to the Idaho batholith.

Some of the lodes parallel bedding or schistosity in the sedimentary rocks, but many are controlled by joints in the igneous rocks. The lodes were formed in part by fissure filling, in part by replacement. They are from a few inches to 15 feet wide and rarely of great horizontal extent and contain quartz, pyrite, chalcopyrite, arsenopyrite, galena, sphalerite, and locally celestite, magnetite, and muscovite. The wall rocks are silicified and sericitized and contain some sulphides.

Citations to bibliography

56, 67, 193, 362, 364, 366, 385, 636, 652, 772

74.


(Indian Creek district)


Minerals Yearbook 1932–33, Statis., App., p. 130; 1934, Statis., App., p. 106

Muscrove district.

(See Blackbird district, p. 66 of this pamphlet.)

Nicholla district (lead silver).

This district, about 25 miles by road from Gilmore, is sometimes loosely included in the Birch Creek district. (p. 34) It was discovered about 1881 and was actively productive through 1889 with intermittent attempts to resume operation since then. Estimates of total production range from $2,500,000 to $6,000,000, mostly from the Viola mine.

The rocks of the district comprise folded and faulted Paleozoic limestone, quartzite, and shale, with a small granitic mass reported a short distance north of the area.

The Viola contained three large replacement bodies in magnesian limestone connected by stringers. The ore was lead carbonate intermixed with iron and manganese oxides and contained from 20 to 60 per cent lead and 4 to 16 ounces of silver to the ton. Near the margins of the lead ore bodies, now reported to be exhausted, there are deposits of smithsonite ore from which shipments were made in 1925 and 1926. Other properties in the district, mostly unproductive, contain similar, but, so far as developed, smaller and lower grade deposits.
This district was discovered in 1904, and is about 85 miles by road from Mackay, the terminus of a branch of the Union Pacific Railroad. The district was intermittently productive through 1915. Recently renewed prospecting has resulted in mining small, high-grade pockets and some development is reported on the larger lodes. The total production probably does not much exceed $10,000 obtained from carrying $10 to $20 a ton in silver and gold.

The deposits are veins and breccia zones in the Challis volcanics with banded chalcedonic quartz, selenides, native gold and very small amounts of chalcopyrite and other sulphides. A little fluorite is present locally.

Citations to bibliography
27, 37, 195, #669, #636, #652


Minerals Yearbook 1932-33, Statis. App., p. 130.

Parker Mountain district (silver, gold).

Pratt Creek district.
(See Districts east of Salmon, p. 68 of this pamphlet.)

Sandy Creek district.
(See Districts east of Salmon, p. 68 of this pamphlet.)

Silverton district.
(See Eureka district, p. 69 of this pamphlet.)

Spring Mountain district (lead, silver, copper).

This district is about 8 miles from Gilmore. Lodes were found here in the early eighties and several small mines have been developed, but the total production is not large.

The district is underlain mainly by Paleozoic strata cut out by quartz diorite dikes. Most lodes are replacements in limestone, containing lead ore similar to those in the Texas district, but one (the Bruce estate) is a copper deposit of probable contact metamorphic origin.

Citations to bibliography
37, 557, 555, 594, #636, #652

Minerals Yearbook 1932-33, Statis., App. p. 130
1934, Statis., App., p. 108

Texas district (lead, silver, copper, gold, zinc).

This small district, which centers around Gilmore, was discovered in the eighties, but produced little prior to 1902. From then through 1929 the production totaled $11,550,862 mainly in lead and silver, but including some gold, copper, and zinc. Most of the production came from the Pittsburg Ridge mine. Little was done for some time after 1929, but there has been a revival of activity recently, in part occasioned by discovery of a pocket of rich silver ore south of Gilmore.

The principal ore bodies are in fracture zones approximately parallel in strike, but opposite in dip to the stratification of the enclosing Devonian (?) dolomite. Some mineralization follows fissures at right angles to the main lodes. The hypogene ore consists largely of quartz and simple sulphides formed by a combination of replacement and filling, but much of that so far mined is more or less thoroughly oxidized.

Citations to bibliography
27, 37, 193, 443, 565, 656, 657, 658, 659.


Wilson Creek district (gold, silver).

There are a few prospects for gold and silver ore in this little known district near the Middle Fork of the Salmon and farther down that river, particularly on the west side near its mouth, there are other gold prospects, both lode and placer, which do not appear to have been included in any named district. All these prospect 77.
are far from roads and the trails to some are scarcely passable by horses.

Citations to bibliography

No description of this district has been published. The papers cited below give general data on the region:
186, 300, 501, 518, 636

Yellowjacket district (gold, copper, lead).

Until recently this district was commonly approached from Mackay, the terminus of a branch of the Union Pacific Railroad, about 125 miles away. The road to Salmon, only about 50 miles long, has recently been improved.

Prospecting began here in the sixties and extensive development in the eighties, with most of the production in 1893 to 1897. There has been intermittent activity at both lode and placer mines since then. The records show shipment of $121,761 in bullion from the Yellowjacket lode mine, but the total from that property, the only one with any considerable production, has been estimated by Umpleby at $450,000, largely from ore averaging about 0.1 ounce of gold to the ton. A number of other properties, both lode and placer, have produced gold and silver, but the aggregate amount is apparently not very large. Lead and copper ore is present and small shipments have been made. The placer production has been very small.

The district is underlain by argillaceous and locally calcareous Belt quartzites cut by dikes of altered diabase of probable pre-Cambrian age and by a variety of dikes and intrusive masses believed to be of Tertiary age. The Belt strata are broken by large faults, one of which is an overthrust that may be of early date as it does not appear to affect the Cato volcanics (Permian?) on the western border of the district.

The Yellowjacket lode is a shatter zone with numerous veins and stringers in more or less altered quartzite. Post-mineral faulting is present, but is apparently not of large displacement. Most of the production came from opencut workings on oxidized ore shoots containing altered pyrite and small amounts of lead and copper minerals in a gangue of quartz and ferruginous calcite. In underground workings, in part 400 feet below the open cut, sulphide ore containing massive galena with some chalcopyrite and pyrite in quartz is known, but as yet has been little developed.

In somewhat similar but smaller, and less oxidized deposits in the Columbia and other mines, chalcopyrite, tetrahedrite, and locally galena and sphalerite occur in quartz with some calcite in fractures and breccias in quartzite. The ore mined at the Columbia in the early days is reported to have contained an ounce and a half of gold per ton, locally more. The Copper Blance is distinguished by abundant chalcopyrite and supergene chalcoelite and by siderite in place of calcite. Some copper ore has been shipped from this prospect. At the Black Eagle, fractures in pre-Cambrian (?) diabase or gabbro ore filled with quartz containing siderite, pyrite, specularite, chalcopyrite, and some calcite and sphalerite.

Citations to bibliography

56, 186, 362, 538, 565, 566, 636, 657, 772

Mineral Resources 1905, p. 236; 1906, p. 261; 1907, pt. 1, p. 304;
1908, pt. 1, p. 428; 1909, pt. 1, p. 351;
1910, pt. 1, p. 443; 1912, pt. 1, p. 526;
1912, pt. 1, p. 729; 1913, pt. 1, p. 777;
(Con't)

Minerals Yearbook 1932-33, Statis., App., p. 130
1934, Statis. App., pp. 108, 116

LEWIS COUNTY

Deer Creek district (copper).

This little developed and inactive district is about 16 miles by wagon road or trail from Winchester at the end of a branch of the Camas Prairie Railroad. The lodes are in schistose greenstone, probably a part of the Permian volcanic strata of the region. Much of the area is covered by folded Columbia River basalt, through which granitic rock is locally exposed.

The lodes are fissure veins containing quartz, siderite, calcite, chalcopyrite, molybdenite, and possibly a telluride. Much of the ore in shallow workings is oxidized. In one prospect, the ore is reported to contain about 3 per cent copper and a little gold and silver. In another (the Deer Creek) there is a little copper and about 0.3 of an ounce of gold to the ton. This property has a mill and presumably has had some production.

Citations to bibliography
219, 246, 261, 283, 294, 362, 364, 366, 373, 455, 652

NEZ PERCE COUNTY

Cave Gulch, Clearwater, and Peck districts (copper, gold).

These are three small areas on the lower Clearwater River, reported to contain copper and gold lodes. Bear Peck the country rock in the river canyon is metamorphosed Silt strata. No further data are at hand. The following references give data on the general region, but not on this district in particular.

The Deer Creek district (above) extends into Nez Perce County.

Citations to bibliography
171, 172, 318, 364, 366, 414, 527, 820

Mineral Resources 1915, pt. 1, p. 648
Minerals Yearbook 1932-33, Statis. App., pp. 128-130

Oneida County

The Blue Jay mine in an unorganized district near Malad is reported to have ore containing lead, copper, gold, and silver. No other data available.

Citation to bibliography
460

Owyhee County

Bruneau district.

In an unorganized area on Little Valley Creek near Bruneau, volcanic glass 73.
sand at a depth of 250 feet supposed to contain platinum has been explored by drilling and a shaft has been begun. In 1932, a sample obtained from a churn drill hole sunk under the supervision of the State Inspector of Mines was reported by the U. S. Bureau of Mines to contain neither gold nor platinum.

Citation to bibliography
*130 (1932), 459

Carson district.

(See Silver City region, p. 81 of this pamphlet.)

Castle Creek district (lead, silver, copper).

A number of prospects showing lead, silver, and copper were reported in this district in the Inspector of Mines' annual report for 1906, but further details are lacking.

Citations to bibliography
*62 (1906), 166, 166, 362, 464, 652

1926, pt. 1, pp. 426, 442; 1928, pt. 1, p. 673;

Minerals Yearbook 1932-33, Statis. App., p. 150
1934, Statis. App., pp. 108, 117

De Lamar district.

(See Silver City region, p. 81 of this pamphlet.)

Flint district.

(See Silver City region, p. 81 of this pamphlet.)

Florida Mountain district.

(See Silver City region, p. 81 of this pamphlet.)

French district.

(See Silver City region, p. 81 of this pamphlet.)

Mammoth district.

(See Silver City region, p. 81 of this pamphlet.)

Rough Mountain district (silver).

One idle silver mine is reported in the 1932 report of the State Inspector of Mines in this small district near Grandview on the Snake River.

Citations to bibliography
*130 (1932), 416

1931, pt. 1, pp. 443, 444.
Silver City region (gold, silver).

The area of Tertiary precious metal deposits centering around Silver City about 25 miles by unimproved road from Murphy, the terminus of a branch railroad that leaves the main line of the Union Pacific at Rampa, is most conveniently described as a unit, although composed of four mining districts. The Carson district, which includes Silver City, is also termed the Florida Mountain, Silver City, and War Eagle district, and part of it is often called the De Lamar district. The French district adjoins it on the southeast and includes the Oro Fino and other mines. The Flint district lies to the southwest and the Skoelo district to the south. The latter apparently includes the Mammoth district.

Placer deposits were found in the vicinity of De Lamar in 1863, and the first lode locations followed promptly. In 1865, the interest in placers had largely subsided, but the discovery of very rich ore at the Poorman and Oro Fino led to active lode mining attended by much excitement. In 1876, a combination of exhaustion of some of the known ore bodies and of the failure of the Bank of California terminated the first period of activity after nearly $12,000,000 in precious metals had been produced. The second and greater period began in 1889 with discovery of the Black Jack and De Lamar ore bodies, followed in later years by others. Decline in production with exhaustion of known ore bodies began about 1910 and since 1914 much of the development has ceased, although desultory mining has continued to the present time with several attempts at revival. The Silver City region has produced a total of over 1,000,000 ounces of gold and well over 20,000,000 ounces of silver, and has a record of more sustained active production than any other region in the state except the Coeur d’Alene. Apparently much of the recent work has been in the placers.

The region contains a stock of granodiorite, petrographically somewhat similar to and presumably of about the same age as the Idaho batholith. Small blocks of biotite gneiss and schistose sedimentary rocks remain locally on the margin of the stock. There are pneumatolytic dikes related to the granodiorite and also dikes of diorite and dacite porphyry that are supposed likewise to be so related. Their resemblance in petrography and structural relations to certain of the dikes in the "porphyry belt" of the Boise Basin suggests, however, the possibility that they are of similar age and hence much later than the granodiorite. All the rocks above mentioned are regarded by those who have studied the region as older than the Tertiary basin and rhyolite flows, with associated dikes that at one time appear to have completely covered them.

Pronounced shearing or closely spaced jointing, earlier than the extrusion of the lava, is conspicuous in the granodiorite, and is locally followed by certain of the veins, particularly in the Flint district. Subsequent to the volcanism, a complicated fault system was developed and other veins were deposited above certain of the fractures thus formed. Still later another set of fractures broke and offset the veins. Sericite and pyrite developed in the crushed rock of the last set, but precious metals were not deposited.

Four varieties of lodes are recognized in the region; (1) those with abundant white quartz such as those of the Flint district; (2) those with lamellar, pseudomorphic quartz in the vicinity De Lamar; (3) silicified and mineralized shear zones such as the Poorman; and (4) cemented breccias such as the Oro Fino. The veins tend to be exceptionally persistent along both strike and dip. Some are several thousand feet long and the Oro Fino-Golden Chariot is still strong at a depth of 2,500 feet below the outcrop.

The principal hypogene metallic minerals of the region include argentite, electrum, jamesonite, ruby silver, and related minerals; marmatite, myrmekite, stibnite and tetrahedrite, arsenopyrite, galena, pyrite, marcasite, and other occur...
in minor amount. The gangue minerals include barite, calcite (in mineralized
gouge), quartz (by far the most abundant gangue mineral), chalcedony, sericite,
siderite, and valencianite. Argentite, naumannite, cerargyrite, silver and ruby
silver minerals are believed also to have been formed by supergene processes. It
appears that the very rich ore mined close to the surface resulted from secondary
supergene enrichment, but that a large part of the ore that has been mined was of
hypogene origin. The latter ranged in value from 0.7 to perhaps 2.5 ounces per
ton. It appears from the data available that conditions governing the localization
and continuity of ore shoots were complex and not entirely understood by the miners.
It is entirely possible that ore of good grade remains in this old and once pros-
perous region.

Citations to bibliography
49, 68, 67, 75, 86, 112, 172, 186, 228 (1914), 252, 270, 336, 339,
355, 362, 367, 421, 433, 436, 471, 528, 529, 530, 550, 551, 554, 560,
585, 682.

(Carson district)
Mineral Resources 1883-84, p. 614; 1904, pp. 145, 189; 1906, p. 238;
1906, pp. 262-265; 1907, pt. 1, pp. 121, 306;
1909, pt. 1, pp. 134, 334, 352;
1912, pt. 1, pp. 730; 1913, pt. 1, p. 778;
1914, pt. 1, pp. 524, 527;
1916, pt. 1, pp. 590-591; 1917, pt. 1, pp. 482-482;
1918, pt. 1, p. 484; 1919, pt. 1, p. 457, 473;
1920, pt. 1, p. 254; 1921, pt. 1, p. 414;
1922, pt. 1, pp. 217-218, 221, 237;
1923, pt. 1, p. 396; 1924, pt. 1, pp. 257, 275;
1925, pt. 1, pp. 128, 191, 539;
1926, pt. 1, p. 442; 1927, pt. 1, p. 581;

Minerals Yearbook 1932-33, Statis. App., p. 130
1934, Statis. App., p. 106, 116-117
1935, pt. 2, pp. 36, 142
1936, pt. 2, pp. 207, 208.

(Flint district)
Mineral Resources 1904, p. 189; 1905, p. 238; 1906, pt. 1, p. 352;
1921, pt. 1, p. 414; 1922, pt. 1, p. 237;
1923, pt. 1, p. 396; 1924, pt. 1, p. 275;
1926, pt. 1, p. 442.

Minerals Yearbook 1934, Statis. App., p. 108

(French district)
Mineral Resources 1906, p. 236

(Steele district)
Mineral Resources 1911, pt. 1, p. 536; 1913, pt. 1, p. 711;
1916, pt. 1, p. 581; 1917, pt. 1, p. 482;
1921, pt. 1, p. 414; 1922, pt. 1, p. 436;

82.
Snake River placers.

(See p. 100 of this pamphlet.)

South Mountain district (lead, silver).

This lead-silver district, about 20 miles southwest of Silver City and 82 miles by road from Honeida, Oregon, its most convenient railroad shipping point, was discovered about 1868 and its principal activity was from 1871 to 1875 when the failure of the Bank of California forced a shut-down. A smelter, built in 1874, is reported to have produced $150,000 in bullion. Since then there have been brief attempts to revive the mines.

The district is at the southern tip of a small mountain range composed of close-jointed granodiorite (Mesozoic?) and a roof pendent of steeply folded and overthrust metamorphosed sedimentary rocks (possibly Carboniferous) surrounded and in part covered by basalt flows. There are dikes of pegmatite, aplite, and dacite, all regarded as related to the granodiorite. Dikes and replacement veins in part accord with vertical fractures complimentary to overthrusts in the sedimentary rocks and many of the dikes follow the joint shearing in the granodiorite.

Most of the past exploration has been on replacement veins, in which the ore is largely confined to segments with calcareous wall rocks. These veins, commonly 3 to 8 feet wide, contain abundant galena and sphalerite and lesser amounts of chalcopyrite, pyrite, arsenopyrite, pyrrhotite, and tetrahedrite in a gangue of quartz and calcite. As early operations were largely directed at recovery of the silver in the oxidized ore, which gave way to sulphides at slight depth, it would appear that considerable amounts of hypogene ore remain. Early accounts indicate that in places massive sulphide fairly rich in silver was exposed in the workings.

The limestone which makes up a large part of the sedimentary sequence is locally intensely contact metamorphosed with the development of abundant hedenbergite, ilvaite, and other silicates. In such rock there are in places deposits containing abundant chalcopyrite and sphalerite, and lesser amounts of galena, pyrite, and arsenopyrite. Such ore could evidently not be profitably handled in the early days and received little attention.

In addition, quartz veins without visible metallic minerals but containing a little gold are locally present in the sedimentary rocks. These have not yet proved valuable.

Citations to bibliography

49, 64, *362, 547, 565, 588, 652


Steele district.

(See Silver City region, p. 81 of this pamphlet.)

FAYETTE COUNTY

No known metallic resources. For oil and gas, see p. 105 of this pamphlet.
Rockland district (lead, silver).

In an unorganized district near Rockland (not shown on Plate 1) a shaft 250 feet deep has been sunk at a lead-silver prospect.

Citations to bibliography
#130 (1932), 460

Snake River placers.
(See p. 100 of this pamphlet.)

SHOSHONE COUNTY

Bald Mountain district.
(See Saint Regis district, p. 92 of this pamphlet.)

Beaver district.
(See Coeur d'Alene region, below.)

Black Prince district (copper).

This district (also known as the East Coeur d'Alene) is served by the Chicago, Milwaukee and St. Paul Railroad along the St. Joe River. It is underlain by the Belt series intruded by monzonite and by aplite and diabase dikes. Several prospects exist, but, so far as known, none has received much development. They show quartz veins with some chalcopyrite in contact metamorphosed rocks.

Citations to bibliography
8, 125, 153, #647

Burke district.
(See Coeur d'Alene region below.)

Chamberlain Meadows district (copper).

This name is sometimes applied to the area in the northern part of the Moose Creek district (p. 91) that contains copper deposits similar to those of the St. Joe district (p. 91).

Coeur d'Alene district.
(See Coeur d'Alene region below.)

Coeur d'Alene region (lead, silver, zinc, gold, tungsten).

This rather small area (roughly 500 square miles) in the upper drainage basin of the Coeur d'Alene River contains eight mining districts and has the longest sustained and by far the largest production of any part of the state. It is served by the Northern Pacific and Union Pacific railroads and by good highways.

The region includes the Coeur d'Alene or Shoshone district (a relatively little developed area north of Murray), the Eagle district that contains the gold placer and lode mines at which activity in the region began, the Evolution district in the southern part of the region which has only recently come into prominence because of
the large silver production of the Shoshone mine; the Hunter or Mullan district with its famous old copper mines in the southeast part of the region; the Leland or Burke district, immediately north of the Hunter, which contains some of the best known lead-silver mines of the region, such as the Hecla, Hercules, and others; the Placer Center or Wallace district in the south-central part of the region (containing such famous mines as the Tamarrack and Interstate-Callahan with complex lead-zinc ores); the Summit district, southeast of but not clearly separated from the Eagle (a relatively unproductive area) and the Yreka or Kellogg-Wardner district in the southwestern part of the region which includes the Bunker Hill and Sullivan mine, the most productive in the region, as well as several other properties. The part of the Yreka district that is drained by Pine Creek contains lodes with relatively abundant zinc and is sometimes designated the Pine Creek district.

Prospecting began in the region in 1878, and active development of the gold placers near Murray in 1884 and continued for 10 years, with a recent short revival due to dredging. The beginning of development of the lead-silver lodes soon followed and by 1889 was in full swing. Copper came into prominence with the opening of the Snowstorm mine in 1904, attained maximum production in 1908, and has gradually declined since. Production of zinc began in 1906, and, with some fluctuations, has increased since. Tungsten and antimony have been produced, especially during the World War, but neither has attained much importance.

In recent years, the number of producers in the region has ranged from 30 to over 60. From 1884 to 1931 the aggregate production (according to Mineral Resources) has been $7,180,161 in gold; 262,277,378 fine ounces of silver; 82,676,976 pounds of copper; 4,406,687 short tons of lead; 853,130,752 pounds of zinc (spelter), and the total value is $731,574,415. Except for the temporary marked increase during the World War and decrease in the early thirties caused by the widespread business depression, the production of the region has from the beginning mounted at a fairly steady rate. There seems no reason to doubt that it will continue, in general, to do so for some time to come.

Most of the region is underlain by slate, quartzite, calcarceous shale and strata of intermediate composition, all belonging to the Belt series and aggregating many thousand feet in thickness. The Burke and Revett formations, which include the purest quartzites in the region, contain the principal productive lodes, but mineral deposits are known in most of the different kinds of rock in the region. A number of the valuable ore bodies are in the upper part of the quartzitic slate of the Frichard. Masses of monzonite and syenite crop out at intervals in a north-easterly direction across the central part of the region and there are also dikes of diabase and lamprophyre, some of which follow major faults. No large ore shoots are known in the granite rocks, but sulphide minerals are present in such rock in several places. Locally, the lamprophyre is later than the mineral deposits, showing that ore deposition and igneous intrusion are closely related in age.

The strata are folded and are broken by numerous large faults, both normal and reverse. The Osborne fault along the valley of the South Fork of Coeur d'Alene River, with a supposed horizontal component of about 12 miles is an outstanding feature of the structure. The mineralization tends to be most pronounced in the areas of greatest structural complexity, but the lodes follow minor fractures rather than major faults.

Most of the ore deposits, including nearly all with large production, are roughly tabular masses formed dominantly by replacement and only to a relatively minor extent by fissure filling in shear zones, commonly in quartzite and locally in argillaceous and other rocks. In many the ore shoots are continuous for long distances, both horizontally and down the dip; in others there is a succession of closely spaced, irregular, ore shoots. They contain galena, sphalerite, siderite,
and quartz in varying proportions; in some lodes the galena and siderite, in others the sphalerite and quartz, being dominant. Pyrite is commonly and pyrrhotite and chalcopyrite locally present in minor amount and barite is conspicuous in a few lodes. Numerous other minerals are known in small amounts. Zinc is relatively abundant in the lodes in the vicinity of Pine Creek and in the corresponding position on the north side of the Osborne fault north and northeast of Wallace. It also tends to increase with depth in some mines. There is reason to think that sphalerite and much of the quartz were deposited early and have been in part replaced by the somewhat later siderite and galena that form the outstanding constituents of most of the ore so far mined. Much of the ore is fine-grained, and the galena commonly shows the results of crushing.

Some of the lead-silver lodes of the type above described contain sufficient copper in chalcopyrite and tetrahedrite to be a valuable by-product. In addition, there are certain siderite veins, largely in the southern part of the region, that are mined mainly for their chalcopyrite content. These also contain considerable pyrite magnetite and locally barite, but relatively little galena or sphalerite. Fissure filling was a greater factor in these cupriferous lodes than in those rich in lead. Several commercially productive copper ore bodies have been developed, but a number of the prospects on deposits of this sort appear from available descriptions not to be very promising.

Contact metamorpho phenomena are locally conspicuous in the quartzitic and argillaceous rocks near monzonitic masses, but in only a few places, such as the Success, Rex, and Helena-Frisco lead-zinc mines, have sulphides been deposited in connection with such phenomena in sufficient amount to have yielded much ore.

The Snowstorm, near Mullan, is the only copper mine in the region that has been very productive. Development here began in 1903 and production ceased in 1915. This deposit is a zone of dissemination of minute particles of bornite, chalocite, chalcopyrite, and tetrahedrite, and their oxidation products through a certain stratum of Rettv quartzite. Oxidized ore constituted a large part of that mined. It was stoped to the 600-foot level and locally persisted to the 1600-foot level. The ore shipped in 1904 contained 4 per cent copper, 6 ounces of silver, 0.1 ounce of gold to the ton. That concentrated in 1912 contained 2.75 per cent copper. Mining ceased after unsuccessful attempts to find the ore body beyond a reverse fault against which it terminated. Other similar lodes are known in the vicinity, but are mostly of lower grade and so far none has attained comparable production.

The principal gold lodes, now largely exhausted, are near Murray. They are fissure veins with quartz, pyrite, chalcopyrite, galena, sphalerite, and free gold, the sulphides being in relatively small amount. Certain of the veins of this sort contain enough scheelite to constitute tungsten ore under favorable market conditions such as existed during the World War. This area also contains placer deposits, the richest of which has already been mined.

For a long time most of the ore mined in the region has been essentially free from the effects of oxidation and in many of the lead lodes sulphide was plentiful at or close to the surface. On the other hand, a few lodes show abundant oxidation to depths of well over 900 feet. Secondary enrichment does not appear to be of much commercial importance in this region. Even in the Snowstorm copper mine most of the chalocite is regarded as primary.
Citations to bibliography

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150, 171, 184, 187, 207, 228 (1914), 228 (1915), 241, 242, 247,
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299, 335, 346, 366, 372, 418, 419, 420, 423, 438, 441, 445, 467, 469,
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669, 671, 675, 685, 693, 694, 696, 704, 720, 732, 739, 741, 746,
760, 767, 768, 791, 797, 803, 812, 825, 826, 827, 840.

(Coeur d'Alene region.) The following list includes references to the
region as a whole. Lists below give references to the districts within the region.)

Mineral Resources 1863-84, p. 614; 1866, p. 146; 1867, pp. 107-109;
1888, p. 88; 1892, p. 72; 1895-96, p. 162;
1896-97, pp. 252-253; 1896-99, pp. 225-224;
1899, pp. 227-301; 1900, p. 193; 1901, p. 202;
1904, pp. 145, 154, 182, 189, 190, 200, 266-266;
1905, pp. 115, 124, 146, 217, 216, 236-240, 336-337,
379, 392;
1906, pp. 121, 127, 131, 135, 134, 243, 244, 245,
283, 285, 396, 446-446, 446-447, 477, 512;
1907, pt. 1, pp. 121, 232, 283, 284, 306-306,
602-603, 712;
1908, pt. 1, pp. 169, 179, 207-208, 406, 407-409,
709, 723;
1909, pt. 1, pp. 134-135, 236, 335, 336, 338;
1910, pt. 1, pp. 156, 190-197, 236, 274, 446, 450;
1911, pt. 1, pp. 28, 229, 240, 241, 261, 291, 330,
366, 585, 597;
1912, pt. 1, pp. 36, 240, 267, 289, 311, 352, 389,
708, 709, 713;
1913, pt. 1, pp. 587-558, 635, 641-642, 725, 761,
770-780, 859, 877, 879;
1914, pt. 1, pp. 574, 600, 606-606, 609, 627, 641;
1915, pt. 1, pp. 650, 532, 536, 549-561, 693, 908,907;
1916, pt. 1, pp. 569, 572, 577, 591-592, 595;
1917, pt. 1, pp. 465, 482-483, 486, 561;
1918, pt. 1, pp. 464, 469, 470, 472, 485, 486, 488,
773, 912;
1919, pt. 1, pp. 454, 460, 460, 475-475, 476-477,574;
1920, pt. 1, pp. 424, 247, 254-255, 483;
1921, pt. 1, pp. 401, 416, 458;
1922, pt. 1, pp. 132 (platinum), 225, 235-236, 238,
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1923, pt. 1, pp. 380, 536, 397;
1924, pt. 1, pp. 163, 260-261, 262, 275-276, 277,
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1928, pt. 1, pp. 648, 648, 649, 654, 657, 674, 675;
1930, pt. 1, pp. 612, 615, 621, 628, 640, 643-644;
1935, pt. 2, pp. 42, 79, 141, 142, 143, 495
1936, pt. 2, pp. 104, 206, 209, 210, 211

(Beaver district)
Mineral Resources 1906, p. 240; 1906, p. 264; 1907, pt. 1, p. 308;
1908, pt. 1, p. 431; 1909, pt. 1, pp. 355-354;
1910, pt. 1, p. 485; 1911, pt. 1, p. 598;
1912, pt. 1, pp. 714, 731; 1913, pt. 1, pp. 763, 760-781;
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1918, pt. 1, pp. 471, 496-488;
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1923, pt. 1, pp. 396-397; 1924, pt. 1, pp. 276-277;
1925, pt. 1, p. 540; 1926, pt. 1, pp. 443-444;
1926, pt. 1, p. 675; 1929, pt. 1, p. 397;

Minerals Yearbook 1932-33, Statis. App., p. 130,
1934, Statis. App., p. 108

(Coeur d'Alene district)
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1913, pt. 1, p. 781; 1914, pt. 1, p. 629;
1915, pt. 1, p. 552.

(Evolution district)
Mineral Resources 1906, p. 240; 1906, p. 264; 1908, pt. 1, p. 432;
1909, pt. 1, p. 354; 1911, pt. 1, p. 598;
1912, pt. 1, p. 731; 1913, pt. 1, p. 781;
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1916, pt. 1, p. 594; 1917, pt. 1, p. 456;
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1920, pt. 1, p. 256; 1921, pt. 1, pp. 415-416;
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1924, pt. 1, p. 277; 1925, pt. 1, p. 444;
1926, pt. 1, pp. 675-676; 1929, pt. 1, pp. 396-399;

Minerals Yearbook 1932-33, pt. 2, pp. 108; Statis. App., p. 130
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(Hunter district)
Mineral Resources 1889, p. 307; 1905, pp. 219, 240; 1906, p. 264;
1907, pt. 1, pp. 307-308, 308-309;
1912, pt. 1, pp. 734-738; 1913, pt. 1, pp. 783, 789-794;
1914, pt. 1, pp. 630-632, 641;
1919, pt. 1, p. 460; 1920, pt. 1, pp. 256-258;
1921, pt. 1, p. 418; 1922, pt. 1, pp. 239-240;
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(Hunter district, Cont'd)

| Minerals Yearbook | 1932-33, pt. 2, p. 109; Statis. App., p. 130 |
| 1936, pt. 2, p. 211. |

(Leland district)

| Minerals Yearbook | 1932-33, Statis. App., p. 130 |
| 1936, pt. 2, p. 211. |

(Placer Center district)

| Minerals Yearbook | 1932-33, Statis. App., p. 130. |

(Yreka district)

| 89. |

(Cont'd)
(Yreka district, Cont’d)

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1938, pt. 1, pp. 41, 471, 493-496;
1921, pt. 1, pp. 401, 418-419; 1922, pt. 1, pp. 242-244;
1923, pt. 1, pp. 360, 401-403;
1924, pt. 1, pp. 258, 250, 282-284;
1925, pt. 1, pp. 519, 523, 547-550;
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1928, pt. 1, pp. 664, 683-686;
1929, pt. 1, pp. 366, 367, 372-373, 405-410;
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Statist. App., pp. 116, 130
1935, pt. 2, pp. 42, 141, 142, 143
1936, pt. 2, pp. 104, 208, 209, 210, 211.

(Summit district)

Mineral Resources
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1906, pp. 226, 264, 525-526;
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1908, pt. 1, pp. 409, 431, 439;
1909, pt. 1, pp. 327, 354, 356, 578;
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1913, pt. 1, pp. 356-766, 761, 785-786;
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1922, pt. 1, pp. 223, 239, 242;
1923, pt. 1, pp. 397, 401;
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1929, pt. 1, pp. 397-398, 408;
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Minerals Yearbook 1932-33, Statist. App. p. 130
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Eagle district.
(See Coeur d’Alene region, p. 84 of this pamphlet.)

Evolution district.
(See Coeur d’Alene region, p. 84 of this pamphlet.)

Hunter district.
(See Coeur d’Alene region, p. 84 of this pamphlet.)
Kellogg-Wardner district.
(See Cœur d'Alene region, p. 84 of this pamphlet.)

Lelande district.
(See Cœur d'Alene region, p. 84 of this pamphlet.)

Little North Fork district.
(See Kootenai County, p. 63 of this pamphlet.)

Monitor district.
(See St. Regis district, p. 92 of this pamphlet.)

Moose Creek district.
(See Clearwater County, p. 35 of this pamphlet.)

Mullen district.
(See Cœur d'Alene region, p. 84 of this pamphlet.)

Murray district.
(See Cœur d'Alene region, p. 84 of this pamphlet.)

Pine Creek district.
(See Yaak district in Cœur d'Alene region, p. 89 of this pamphlet.)

Placer Center district.
(See Cœur d'Alene region, p. 84 of this pamphlet.)

St. Joe district (copper, gold).

This ill-defined district embraces the upper drainage basin of the St. Joe River. The prospects are reached by trail from Avery on the Chicago, Milwaukee and St. Paul Railroad. Those near the state boundary are most readily accessible from towns in Montana. Numerous copper lodes have been prospected on a small scale and a little placer mining has been done.

The area is underlain by metamorphosed Belt strata, folded, much faulted, and cut by the large Wishards diabase sill (probably pre-Cambrian) and by related small sills and dikes. The Idaho batholith and its outliers crop out to the south and west. Most of the lodes are veins and disseminations containing pyrite, chalcopyrite, and siderite. Many are in or near the Wishards sill. So far as present data go, the deposits appear to be of low-grade. The Ward mine, on the state boundary, is one of the few productive properties in the district and much of its production is credited to the workings on the Montana side of the boundary. It is a shear zone with numerous veinlets of quartz, calcite, siderite, with small amounts of chalcopyrite, pyrite, and chalcocite in the veinlets and disseminated through the sheared rock.

Citations to bibliography
8, 10, 125, 155, 239, 240, #461, 565, #647, 652

Mineral Resources:
1911, pt. 1, p. 600; 1912, pt. 1, p. 733;
1913, pt. 1, p. 785; 1914, pt. 1, p. 635;
1915, pt. 1, p. 557; 1916, pt. 1, p. 536;
1917, pt. 1, p. 489; 1918, pt. 1, p. 435;
1921, pt. 1, p. 417; 1922, pt. 1, pp. 222,242;
1925, pt. 1, p. 546; 1926, pt. 1, p. 449;
Minerals Yearbook 1932-33, Statis. App., p. 130
1934, Statis. App., pp. 108, 119

St. Regis district (copper, gold).

This district centers around Adair on the Chicago, Milwaukee and St. Paul Railroad. The principal mines are the Monitor, Richmond, and others between the state boundary and the loop in the railroad east of Adair. Production is small.

The district is underlain by Belt strata, cut by the Wishards diabase sill along the state boundary. The lodes are veins and disseminations in shear zones containing quartz, siderite, calcite, chalcopyrite, pyrite, and, in the upper levels, the oxidation products of the sulphides. The ore locally contains 0.2 to 0.5 ounce of gold to the ton.

Citations to bibliography
8, 125, 153, 239, 240, 647, 652

Mineral Resources 1906, p. 266; 1907, pt. 1, p. 310

Slate Creek district (copper, lead).

This ill-defined district lies north and northwest of Averv on the Chicago, Milwaukee and St. Paul Railroad, but most of its prospects are accessible only by trail, either from Averv or from Wallace.

The lodes are groups of veinlets and disseminations in shear zones in the Belt strata, containing quartz, siderite, and calcite and small amounts of chalcopyrite, pyrite, galena, sphalerite, and specularite.

Citations to bibliography
8, 125, 651, 561, 565, 647, 652

Sliderock Mountain district (copper).

This area is south of the Chicago, Milwaukee and St. Paul Railroad and its prospects are reached by trails. Production so far is negligible.

The country rock is Belt strata, injection gneiss, and, in the south, monzonite. Most of the lodes are small quartz veins and ill-defined groups of quartz veinlets containing a little chalcopyrite and locally small amounts of gold, silver, and lead. In the southern part of the area, there are conspicuous outcrops of vein quartz, as much as 20 feet wide, with locally a little pyrite. Apparently these outcrops belong to lenticular veins, which, on the surface, can not be traced far.

Citations to bibliography
8, 651, 652

Summit district.
(See Coeur d'Alene region, p. 84 of this pamphlet.)

Union district.
(See Coeur d'Alene region, p. 84 of this pamphlet.)

Yreka district.
(See Coeur d'Alene region, p. 84 of this pamphlet.)

32.
Horseshoe Basin coal district (coal).

This district (called the St. Anthony district) includes all known coal deposits of apparent value in the Teton coal field, a large area underlain by formations which elsewhere are known to contain coal. It is served by a branch line of the Union Pacific Railroad. The principal property is the Brown Bear, which shipped about 30,000 tons of coal prior to 1924.

The rocks of the district comprise Paleozoic limestone, shale, and quartzite, Mesozoic sandstone and shale with coal beds, and Tertiary lava. There is much folding and folding, both normal and reverse.

The coal is in beds varying from 1 to 6 feet or more in thickness, commonly steeply inclined and rendered more or less friable as a result of folding. Much of the coal is of good sub-bituminous grade. Evans estimates that the district contains about 11,000,000 tons of coal. The principal drawback, aside from competition with coal districts in Utah and other neighboring states, is in the large amount of deformation which the coal has suffered, making it relatively expensive to mine, and producing an unavoidably large proportion of fine sizes.

Citations to bibliography

VALLEY COUNTY

Big Creek district (gold, copper).

This district is reached only by trails leading east from the end of the Forest highway near Edwardsburg, its remoteness from present and past routes of travel has hampered development, but there are a number of scattered prospects and two, the Jensen and Iron Clad, have produced some gold.

The district is on the margin of the Idaho batholith and is largely underlain by the dioritic and gneissic rocks related thereto. There are also areas of relatively unmetamorphosed quartzite of the Belt series, of Casto volcanics (Permian?), and of Challis volcanics (Tertiary), as well as porphyritic dikes and small granitic masses of probable Miocene age.

At the Jensen, there are lenses of quartz with chalcopyrite, pyrite, and pyrrhotite, and pockets of coarse gold in a shear zone in gneissic biotite diorite.

The Iron Clad property includes a breccia zone in quartzite containing auriferous iron-stained quartz, and in another place a number of small quartz lenses in quartzite with disseminated chalcopyrite and pyrite.

Citations to bibliography

Deadwood district (lead, zinc, gold, silver).

This district, comprising the drainage basin of Deadwood River, is served by...
a highway leading to Cascade, 52 miles to the northwest, on a branch of the Union Pacific Railroad. There has been intermittent work here since the nineties, the principal development being in 1924 to 1932 by the Bunker Hill and Sullivan M. S. & C. Company at the Hall-Interstate and Lost Pilgrim groups. This company milled considerable lead-zinc ore, but in 1932 ceased operations here. In addition there are several small mines on gold-quartz veins and in the past a little placer mining was done. A dam across Deadwood River for power purposes has been built.

The district is in the south-central part of the Idaho batholith. There are small dikes of lamprophyre, pegmatite, and felsitic porphyry, and here and there small schist inclusions. The lodes worked by the Bunker Hill and Sullivan are quartz lenses with a little siderite and irregularly distributed sulphides in and close to schist inclusions. The irregular character of the ore shoots and extensively crushed and kaolinized rock introduced difficulty in operation. In much of the ore, sphalerite is more abundant than galena, and pyrite is fairly plentiful.

Citations to bibliography
28, 76, 135, 362, 652

Mineral Resources 1907, pt. 1, p. 293; 1908, pt. 1, p. 419;
1909, pt. 1, p. 345; part 2, p. 769;
1910, pt. 1, p. 467; 1911, pt. 1, p. 569;
1912, pt. 1, p. 732; 1913, pt. 1, p. 770;
1914, pt. 1, p. 617; 1916, pt. 1, p. 561;
1921, pt. 1, p. 420; 1922, pt. 1, p. 244;
1923, pt. 1, p. 403; 1924, pt. 1, p. 284;
1928, pt. 1, p. 867; 1929, pt. 1, p. 411;

Minerals Yearbook 1932-33, Stat. App., p. 130
1934, Stat. App., pp. 109, 119

Edwardsburg district (gold, copper, lead).

The Edwardsburg district, which includes in its northern part what is often termed the Ramsey Ridge district in Idaho County, and in its southern part the area commonly called the Profile district, is in the upper drainage basin of Big Creek. It is at the end of a road, 94 miles long, through Warren to a branch of the Union Pacific Railroad at Ogall, open only in the summer. A few of the mines are reached by branch roads, but most are accessible only by trail. A recently completed road from Yellow Pine into this district passes over lower divides and, therefore, much improves transportation conditions. This road passes through Profile Gap in the center of the Profile district. Deposits have long been known here, but most of the activity dates from about 1903. Since then, a number of prospects and small mines have been opened, but the total production has been small.

The district is mainly underlain by quartzitic Belt strata with intercalated, highly metamorphosed limestone, intruded by the Idaho batholith and by Tertiary porphyritic dikes. In the part known as the Profile district, a block of Paleozoic limestone and quartzite is included in the Idaho batholith. Volcanic strata correlated with the Cenozoic volcanics (Eocene) occupy part of the Ramsey Ridge area, but are not known to contain lodes. Farther south and east there is a cap of Challis volcanics. Alluvial deposits border the principal streams.

Most of the ore deposits are low-grade, gold lodes in zones of shearing and fracture scores to hundreds of feet wide and persistent for long distances on the strike. They are composed of breccia, sericitized, and silicified country rock interspersed with numerous, relatively small quartz veins along joints and in shear.
zones. Both the altered rock and the vein quartz are auriferous, much of the gold being associated with the sparsely disseminated pyrite. The scanty available information indicates that the ore is only partially free-milling and ranges in tenor a trace up to about a quarter of an ounce of gold to the ton, with occasional pockets of higher grade material. Fluorite, tetrahedrite, stibnite, galena, sphalerite, molybdenite, and chalcopyrite are present in places. Some of the lodes contain enough of one or more of these minerals to be of economic interest. In most places oxidation is far from complete, even near the surface. The Paleozoic strata contain little developed copper and lead deposits of contact metamorphic type.

On Ramey Ridge, most of the lodes are lenticular bodies of quartz, containing pyrite and chalcopyrite, locally with siderite, in sheared and altered diorite rock. They are much smaller and apparently less persistent than the lodes mentioned above, but some contain shoots which probably average an ounce or more of gold to the ton. Under present conditions, the principal interest is in the gold and silver, but copper has been found wherever development has progressed to the shallow depth necessary to encounter sulphides. Veins in the Belt strata near the southern end of the ridge are associated with contact metamorphic silicates and locally contain copper ore of good grade.

Gold placers have been worked on a small scale in several places and interest in them has recently been revived. It is reported that much of the gravel is of good grade, but that the abundant boulders are troublesome.

Citations to bibliography

| 25, 69, 79, 362, 566, #676, #645, 652, 769, 771 |

Mineral Resources 1905, p. 219; 1907, pt. 1, p. 299;
1908, pt. 1, p. 425; 1909, pt. 1, p. 348;
1910, pt. 1, p. 480; 1911, pt. 1, p. 592;
1912, pt. 1, p. 725; 1913, pt. 1, p. 774;
1914, pt. 1, p. 622; 1917, pt. 1, p. 492;
1918, pt. 1, p. 496; 1928, pt. 1, p. 687;
1929, pt. 1, p. 411.

Minerals Yearbook 1932-33, pt. 2, pp. 23, 108; Statis. App., p. 130

Hurdy Creek district (gold).

The 1932 report of the State Inspector of Mines lists two properties in this district which is near Carburton and contains gold mines. The location of the district is not sufficiently well known to be plotted on Plate 1.

Citations to bibliography

#130 (1932)

Mineral Resources 1926, pt. 1, p. 687; 1929, pt. 1, p. 411
Minerals Yearbook 1932-33, Statis. App., p. 130

Lake City district (gold).

The 1932 report of the State Inspector of Mines lists two properties in this area, which apparently is a placer district near McCall. It is not shown on Plate 1.

Citations to bibliography

#130 (1932), 362.

Profile district.

The southwestern part of the Edwardsburg district (pp. 94-95) is sometimes called the Profile district.

Thunder Mountain district (gold).

This area is about 15 miles by an old road impassable to automobiles from the end of the recently constructed road in the Yellow Pine district and the distance by the new road to the railroad at Cascade is about 80 miles. The inaccessibility of the Thunder Mountain district has long been one of its outstanding disadvantages, but the new road has greatly decreased this. The district was discovered in 1895 and most actively developed in 1901 to 1907, in the early part of which period many people rushed there under the mistaken impression that the gold lodes were rich, whereas with minor exceptions they are large deposits of low tenor. The total production is probably a little less than $400,000, largely from the Dewey and Sunny-side, and mostly prior to 1909, when a landslide which destroyed the town of Roosevelt completed the discouragement of most who had lingered after the Dewey shut down in 1907.

The district is underlain by the Challis volcanics and the lodes result from local concentration under favorable structural conditions of tenuous solutions which appear to have suffused the light-colored rhyolitic tuff and flows in the upper part of the Challis volcanics over a wide area. The principal hypogene minerals are native gold, pyrite, quartz, and clay minerals. Much of the better ore averages 0.4 of an ounce of gold to the ton or less, and there are large mineralized areas of much lower tenor. Some, at least, of the high-grade stringers that have occasionally been found are of supergene origin. Although placer methods were successfully applied to mining weathered material in the outcrops of the lodes, particularly the Dewey, prospecting for placer deposits in the streams of the district has as yet yielded little.

Citations to bibliography


Minerals Yearbook 1932-33, Statis. App., p. 130
Warm Lake district (gold).

This little-developed area, nearly 40 miles by highway from the railroad at Cascade, contains prospects on auriferous quartz veins in the Idaho batholith. No description of it has been published.

Citations to bibliography

The papers cited below pertain to neighboring areas or give general data regarding this part of Idaho:
77, 362, 490, 496, 497, 498

Yellow Pine district (gold, antimony, quicksilver).

The settlement of Yellow Pine is about 65 miles by highway from the railroad at Cascade, and the Yellow Pine Company's camp is reached by a recently constructed road about 15 miles farther up the South Fork of the Salmon. Some of the deposits were known as early as 1875, but little was done prior to 1900 and the only extensive development, that of the Yellow Pine Company at Meadow Creek, began in 1928. This company started milling gold-antimony ore in 1932. Previous to this, only a few small shipments of antimony and gold ore, and a few flakes of quicksilver had been derived from the district.

The district is underlain by the Idaho batholith, here mainly granodiorite, with dikes of several kinds and numerous schistose inclusions. There is a large included block of calcareous and quartzitic strata, mainly Paleozoic. The Challis volcanics extend into the eastern part of the district.

Some of the antimony-gold lodes are individual quartz lenses a few feet in maximum width. High-grade streaks in these furnished most of the antimony ore formerly mined. Other lodes comprise quartz stringers and lenses in large shear zones, mainly in granodiorite. Dikes of pegmatite, aplite, and lamprophyre are commonly associated with the lodes. Post-mineral faulting is common, but the displacements are not large. Stibnite, pyrite, and locally a copper mineral, probably tetrahedrite, are disseminated both in the vein quartz and in the altered and silicified rock of the shear zones. The Yellow Pine Company is mining ore of this character primarily for its content of precious metals (average perhaps a quarter of an ounce of gold to the ton). The antimony was regarded originally as a by-product, but is likely to have greater relative importance in the near future. It has recently been found that scheelite is plentiful in some of the ore.

The quicksilver lodes are in a small part of the included block of sedimentary rock, mainly in more or less altered limestone which in and close to the ore is largely converted to jasperoid in which pyrite and cinnabar are disseminated, the latter in part filling cracks. The quartzite beds were impervious to the mineralization and in places bound it sharply. Elsewhere the ore is an irregular pipe in the limestone. In most places, in existing workings, the grade of the ore is low, but the amount of mineralized rock appears to be large.

Citations to bibliography

#41, 75, 76, 87, 154, 156, 158, #165, 173, 350, 362, 372, #538, 566, 646, 647, 706, 708, 802, #859.

Mineral Resources

1911, pt. 1, p. 906; 1914, pt. 1, p. 623;
1915, pt. 1, p. 545; 1918, pt. 1, p. 677;
1917, pt. l, pp. 414-415, 667; 1928, pt. l, pp. 41, 163;
1919, pt. 1, p. 178; 1920, pt. 1, p. 432;
1921, pt. 1, p. 116; 1922, pt. 1, p. 119;

(Cont'd)
Mineral Resources (Cont'd) 1926, pt. 1, p. 46;
1930, pt. 1, pp. 42, 601; 1931, pt. 1, pp. 54, 466a

Minerals Yearbook 1932-33, pt. 2, pp. 22, 107, 313; Statis., App., pp. 128, 130
1934, pt. 2, pp. 40, 143, 144, 145, 480; Statis., App.,
pp. 86, 99-100, 108, 119-120
1935, pt. 2, pp. 36, 142, 145, 626
1936, pt. 2, pp. 207, 208, 210, 490

WASHINGTON COUNTY

Cuddy Mountain district (gold, silver, copper, lead).

This district is also known as the Heath district, after the town of Heath which is its principal settlement. This town is about 20 miles by road from Cambridge on the Pacific and Idaho Northern Railroad, and several of the prospects are even closer to the railroad. Desultory mining has been carried on here for the last 30 or 40 years and a number of lodes containing gold, silver, copper, and lead have been prospected, but the production so far is small.

The district is underlain by sedimentary and volcanic strata of probable Triassic and Permian age overlain by extensive areas of Tertiary basalt flows and cut by monzonite, granodiorite, quartz porphyry, and basalt. According to Livingston's tentative interpretation, the monzonite and granodiorite, which are interrelated, are of pre-Triassic age, the quartz porphyry Tertiary or Cretaceous, and the basalt Miocene.

The deposit at the I.X.L. mine consists of pyrite, chalcopyrite, and pyrrhotite irregularly disseminated through fractured and altered monzonite over an oval area approximately 8,000 feet long and 4,000 feet wide, covered by a shallow gossan. Apparently the sulphide ore in the principal tunnel contains little more than 1 per cent copper, but parts of the deposit may be of higher grade. Livingston suggests that the quartz porphyry may be the source of mineralization and may itself contain undiscovered ore bodies.

At the Climax and Railroad mines and others, the deposits are limestone lenses in the Permian strata that have been replaced by garnet and other silicates with chalcopyrite and other sulphides. Some high-grade, silver-copper ore is reported to have been mined.

There are also several silver-lead veins and replacements in Triassic (?) rhyolite and Permian andesite, most of which were inaccessible at the time of Livingston's visit, although some had formerly been productive.

Citations to bibliography
74, 76, 277, 361, 382, 363, 373, *374, 377, 656, 652, 706

Mineral Resources 1885, p. 229; 1906, p. 267; 1911, pt. 1, p. 622;
1917, pt. 1, p. 492; 1918, pt. 1, p. 498;
1919, pt. 1, p. 483; 1921, pt. 1, p. 420;
1925, pt. 1, p. 500; 1928, pt. 1, p. 687;
1929, pt. 1, p. 412; 1930, pt. 1, p. 666;

Heath district.
(See Cuddy Mountain district above.)
Mineral district (silver, copper).

The mines of this district (which is also termed the Washington) are reached by short roads from the Mineral ferry across the Snake River to the branch railroad on the Oregon side. At one time, there were two small smelting furnaces in the district. Prior to 1900, about 600,000 ounces of silver had been produced, but comparatively little has been done since.

The area is underlain by Permian andesite and Triassic rhyolite, schist, slate, and limestone, cut by small pre-Triassic (?) granitic masses and Miocene basalt dikes. There is much faulting.

Some of the veins are replacements striking northwest and commonly associated with basalt dikes. They contain quartz, calcite, pyrite, chalcopyrite, galena, sphalerite, and tennantite (or tetrahedrite). These veins are locally 20 feet or more wide. They include all the deposits which have yielded silver ore.

A second set strikes northeast and consists largely of chalcopyrite and pyrite in quartz, with little silver. They are reported to range in width from 4 to 68 feet. These veins are associated with granodiorite, but do not appear to cut the Triassic strata, a fact which led Livingston to the suggestion that the granodiorite of this part of Idaho may be comparatively old.

Citations to bibliography

74, 277, 358, 362, 363, 377, 373, 376, 565, 630, 652, 706


Minerals Yearbook 1934, Statia. App., pp. 109, 120
1936, pt. 2, p. 208

Monroe district (gold).

This district (also termed the Weiser), about 10 miles north of Weiser, contains the Modoc gold lode, which is a network of quartz seams in a volcanic breccia. Fuller's earth also occurs here. No further data are available.

Citations to bibliography

322, 362, 652, 706, 729

Mineral Resources 1930, pt. 1, 660; 1931, pt. 1, p. 466

Washington district.

(See Mineral district above).

Weiser district.

(See Monroe district above.)

Weiser quicksilver district.

The Idaho-Almaden mine, 11 miles east of Weiser, was first developed in 1937. By August, 1939, it had produced a total of 469 flasks and since then has continued to be actively productive. The ore is in parts of sandy and shaly beds supposed to belong to the Payette Formation (Miocene) that has been replaced by chaledony and cpal.
Citations to bibliography
327, 328, 330, 351, 352, 700, 706, 734, 787, *809

Placers along Snake River (gold).

The bars and terraces along the Snake River contain gold in many places and
have been worked intermittently since the seventies or earlier. In Idaho, the prin-
cipal operations have been along the stretch of river between Blackfoot and Minidoka,
but some work has been done near Twin Falls, between King Hill and Hammett, near the
mouth of the Bruneau River, and farther west. Dredges and numerous other devices
have been tried, but small scale operations appear to have been most successful.
Recent laboratory studies show that the gold can be recovered by flotation.

It appears that gold is present so generally that the total quantity must be
large, but ground containing as much as 40 cents to the cubic yard is exceptionally
rich, much of that worked containing less than half this amount, and the gold is so
irregularly distributed and so exceedingly fine as to be difficult to recover.
Much of the gold is so fine that it takes approximately 5,000 grains to equal one
cent in value (old price), and a great deal is far finer. Exceedingly fine flakes of
platinum and allied metals are present, apparently in the proportion of about
one grain of platinum to 2,000 or 3,000 gold particles.

Citations to bibliography

The papers listed numerically below are divided into two groups. The first contains those specifically describing the placer deposits. The second in-
cludes several pertaining to power, groundwater, and general descriptions of the
geology along the Snake River. Papers regarding the paleontology of the Tertiary
beds in and near the Snake River Plains are also included. Many data regarding the
measurement of the water flowing in the Snake and its tributaries are contained
in annual Water Supply Papers of the U. S. Geological Survey entitled "Surface water
supply of the United States for the upper Columbia River and neighboring drainage
basins", not listed individually below.

Papers relative to placer gold -
34, 58, 59, 63, 162, 171, 172, 175, *269, *273, *274, 275,
284, 384, 466, 558, 565, 579, 662, 658, 735.

Other papers relative to the Snake River Plains -
49, 90, 101, 119, 122, 142, 143, 147, 152, 155, 156, 157,
158, 165, 166, 174, 177, 178, 180, 189, 210, 215, 218, 219,
220, 221, 222, 223, 224, 225, 226, 229, 235, 276, 328, 330,
331, 334, 351, 352, 359, 362, 365, 416, 428, 429, 430, 431,
449, 463, 478, 524, 528, 529, 530, 541, 603, 604, 605, 606,
656, 670, 673, 679.

Mineral Resources
1904, pp. 146, 161-162;
1905, pp. 216, 219, 224, 225, 229-230, 236, 237, 242;
1906, pp. 242, 250, 252, 256, 261, 262;
1907, pt. 1, pp. 281, 292, 290, 292, 296, 304,
306, 311;
1908, pt. 1, pp. 414, 415, 424, 428, 429, 430, 434;
1910, pt. 1, pp. 454, 458, 459, 463, 464, 468;
1911, pt. 1, pp. 580, 586, 590, 596, 602;
1912, pt. 1, pp. 716, 722, 789, 790, 737;

100.

(Cont'd)
Mineral Resources (Cont'd)
1913, pt. 1, pp. 761, 773, 774, 778, 781;
1914, pt. 1, pp. 604, 612, 620, 621, 627;
1915, pt. 1, pp. 536-537, 541, 543, 545, 546, 549, 560;
1916, pt. 1, pp. 576, 586, 591, 607;
1917, pt. 1, pp. 447, 482, 492;
1918, pt. 1, pp. 475, 480, 484, 495;
1919, pt. 1, p. 469; 1921, pt. 1, pp. 412, 414, 420;
1922, pt. 1, pp. 237, 244;
1923, pt. 1, pp. 366, 369, 403, 404;
1924, pt. 1, pp. 266, 273, 275, 284;
1925, pt. 1, pp. 529, 533, 535, 537, 539, 550;
1928, pt. 1, pp. 668, 687; 1929, pt. 1, p. 411;
1930, pt. 1, p. 659;

Minerals Yearbook 1932-33, Statist. App., pp. 129, 130
1934, Statist., pp. 107, 108, 109, 111, 113, 115,
116, 117, 119, 120.

NONMETALLIC RESOURCES

Asbestos

Amphibole asbestos is reported to be abundant in several localities in Idaho, Clearwater, and other counties in Idaho. Chrysotile asbestos has also been reported from several localities, but little is known about them. Since 1900 there has been intermittent production on a small scale of mass fiber amphibole asbestos from deposits in T. 33 N., R. 5 E., Idaho County (see Plate 1). These deposits, the only ones in Idaho that have yet become productive, are lenticular masses in schist and gneiss, and appear to represent hydrothermally altered bodies of dunite. Deposits of probably similar origin, but in which the asbestos is in small seams instead of masses, are described in T. 37 N., R. 1 E., and T. 30 N., R. 4 E. (see Plate 1) and also occur in other localities.

Citations to bibliography

The publications referred to numerically below include only those in which asbestos is considered from a commercial standpoint. Those interested in searching for new sources of asbestos will find data of value in all papers describing the general geology of the Seven Devils region and Clearwater and Idaho counties.

*10, 11, *176, 565, 628, 713

(Kamiah district)

1922, pt. 2, p. 139; 1923, pt. 2, p. 343;

Barite

Large barite veins cut Carboniferous strata near Hailey, Blaine County, and are also reported near Muldoon, Blaine County. Barite is present in Paleozoic and other strata in Custer County and elsewhere, but is not known in such large and pure deposits as those of Blaine County. Like so many of Idaho's nonmetallic resources, the barite awaits improvement in market and transportation conditions before it can be developed.

101.
Citations to bibliography
270, 343, 625, #649


Beryl.

Beryl is locally present in the mica-pegmatites of Latah County, and presumably other localities in Idaho. A little has been mined at one property in Latah County.

Citations to bibliography
15, 33, 666

Mineral Resources 1907, pt. 2, p. 799

Building stones of Tertiary age.

Stratified rocks of Tertiary age have furnished most of the building stone so far quarried in Idaho. Tuff and feldspathic and tuffaceous sandstone are most used. Such rocks are easily quarried and shaped, have light, pleasing colors, and ample strength for the structures in which they are used (mainly small houses, rarely more than two stories high), Their crushing strength is much less when wet than it is when dry. In foundations there is a tendency to spill immediately above the ground surface unless the stone is protected from moisture by a cement coating. Basalt and other kinds of lava are also used to some extent. They are better adapted to foundations and other structures subject to the attack of moisture, but are less easily worked and generally of less pleasing appearance than the tuffaceous rocks. Some of the basalt weathers into blocks of convenient size and is used in rough walls without further treatment.

Rocks of the kinds above referred to are found in many parts of Idaho. The feldspathic or arkosic and tuffaceous varieties are used in buildings in Boise and vicinity, at Albion, at and near Pocatello, Idaho Falls, American Falls, and other places in southeastern Idaho, and at Challis and Salmon in south-central Idaho. Feldspathic sandstone quarried near Boise is used in the State Capitol and other large buildings there, and has been shipped to several other states for use in large buildings. Lava is used at the above mentioned localities and others, but on a comparatively small scale. Among the larger structures in which basalt has been used may be mentioned a business building in Idaho Falls and a church in Lewiston. At present, none of these rocks is shipped far from the quarries, but, with increase in population and improvement in transportation, it may eventually be profitable to expand the industry.

The pink Tertiary granite along the Middle Fork of the Salmon and elsewhere is of striking appearance, but is remote from transportation and large blocks would be difficult to obtain.

Citations to bibliography

The papers listed numerically below mention most localities in which Tertiary rocks have been quarried for building stone and give all available data as to the quality of the stone for such purposes. The geologic reports on many areas in Idaho describe Tertiary rocks more or less suitable for use in building.

#64, 131, 298, #380, 406, 625

Building stones of pre-Tertiary age.

The generally gray, granitic rocks of the Idaho batholith and of stocks on both sides of it are suitable in strength, and, in many localities, in appearance for use as building stone. Much of it is too irregularly and closely jointed for good dimension stone and all of it is subject to high transportation costs. It has been quarried on a small scale near Lewiston and elsewhere.

Limestone and marble are present in numerous localities in the state and some, such as the tremolite-limestone in southern Cassia County, is suitable for use as building and ornamental stones. The great deformation to which the rocks have been subjected make it difficult to get satisfactory dimension stone. Transportation costs at present are high. For other uses of limestone, see p. 106 of this pamphlet. Quartzite and other old rocks are locally used in rough masonry.

Citations to bibliography

Pre-Tertiary rocks have been as yet so little used in building that specific data are scanty. In addition to the papers cited below, those interested should consult geologic reports on the locality where building stone is desired.

*360 and #406

References to Mineral Resources. The kind of stone and the county in which it is found are given for each reference.

1886, p. 546, marble, Cassia County
1889-90, p. 388, marble, Cassia County
1891, p. 469, marble, Shoshone County
1896, p. 967, marble, Bear Lake County
1906, p. 1039, granite, Kootenai County, Nez Perce County
1907, pt. 2, p. 585, granite, Cassia County
1912, pt. 2, p. 496, marble, Clearwater County
1922, pt. 2, p. 226, granite, Idaho County

Clay

Clay of both transported and residual character derived from alteration (by weathering and hydrothermal action) of granitic, pegmatitic and metamorphic rocks is worked to some extent in Latasah County and similar material exists in neighboring regions. It is reported to be suitable for use in refractories and pottery. Impure clays suitable for making common brick are widely distributed, especially in Bonewah, Cassia, Kootenai, Latah, Lewis, Idaho, Power, and Washington counties.

Citations to bibliography


Coal

Three kinds of coal are known in Idaho. One of these is the graphitic anthra-

Cites to bibliography


Cites to bibliography

Three kinds of coal are known in Idaho. One of these is the graphitic anthra-

Cites to bibliography

Citations to bibliography
66, 102, 103, 128, 129, 190, 317, 323, 396, 397, 406, 540,
549, 652, 682, 685.

Mineral Resources 1886, pp. 252, 256.

Diatomaceous earth

Beds of diatomaceous earth are reported among the Tertiary strata in Idaho,
Washington, Fayette, Camas, Owyhee, Gooding, and Elmore counties. Small amounts
have been produced recently in Elmore, Gooding, and Idaho counties for use in sugar
refining and for other purposes.

Data on diatomaceous earth are to be found in recent annual reports of
the State Inspector of Mines as well as in the volumes of Mineral Resources noted
below.


Feldspar

The pegmatite dikes widely distributed in north-central Idaho contain feldspar
of the sort used in porcelain manufacture. Most of these dikes are small and irreg-
ular, and at present they can not compete with better and more accessible deposits
elsewhere. If greater use is made of the clay deposits of this region, a local
market for feldspar may be created.

Citations to bibliography
10, 565, 625, #677

Gas and oil possibilities in southeastern Idaho

Interest has long been displayed in the possibility of finding oil and gas in
southeastern Idaho and in recent years drilling has been undertaken at two local-
ities in Bannock County and one each in Benewah, Caribou, and Teton counties.
According to reports of the State Inspector of Mines there are several wells in
the Horsehoe Creek area, Teton County, one of which is over 3,000 feet deep.

There is a very thick sequence of Paleozoic and Mesozoic sedimentary rocks in
this part of Idaho. The Paleozoic beds, although largely marine, do not appear
favorable as sources of oil or gas as they are too thoroughly indurated and meta-
morphosed. Even the carbonaceous rocks of the Phosphoria formation (Permian) which
have a fetid odor when struck are so metamorphosed that they yield very little oil
on distillation.

Some of the Mesozoic beds, especially those of Cretaceous age, are no more
metamorphosed than strata of similar age in Wyoming that have yielded oil on a
commercial scale. Certain of the Cretaceous and even some of the older Mesozoic
strata in Idaho appear lithologically suitable as reservoir rocks and there is
evidence that both gas and oil, especially the former, are locally present, at
least in Teton County, although not as yet found in commercial quantity.

Much of the rock in southeastern Idaho, especially close to the great over-
thrusts and overturned folds that are plentiful in many localities south of 43°
latitude, has been too intensely compressed and shattered to appear favorable to the
occurrence of oil or gas. As the major deformation in this region took place at
about the beginning of the Tertiary, all the Mesozoic and earlier rocks were affect-
ed by it, but in some localities the Mesozoic rocks are not so greatly deformed as
to exclude the possibility that oil and gas may remain in them.
Citations to bibliography

In addition to the reports listed numerically below, which refer specifically to oil and gas, those interested should consult the general geologic papers listed under "Phosphate".


Gas and oil possibilities in southwestern Idaho.

For over 30 years there has been interest in the possibility that gas and oil may be present in the Tertiary beds of the Snake River Plains and tributary valleys. A number of wells have been drilled and several of those in Payette County have encountered considerable gas (mainly methane), but, as yet, no oil except traces. The wells here are somewhat over 1,000 feet deep, and at Ontario, Oregon, one well is approximately 4,300 feet deep. The companies formed to search for gas and oil have operated mainly in the area between Payette and Boise in Payette, Canyon, and Ada counties, but local interest has been aroused in Goose Creek and Raft River valleys, Cassia County; near Buhl, Twin Falls County; in Jerusalem Valley, Boise County, and to a less extent in other localities.

The Tertiary clastic beds in this part of Idaho comprise tuff, sandstone, shale, conglomerate, and locally dist noceous earth and silty lenses, interbedded with lava flows. Most of the clastic beds include tuffaceous material in varying amount.

There seems no question that all the exposed beds are of continental origin laid down in streamways, fans, swamps, and local, largely ephemeral lakes, and composed in part of rock waste from the surrounding mountains, in part of the products of volcanic eruptions. A large part of the accumulation in many localities is made up of ash and coarser eruptions and only slightly resorted and modified subsequently.

The thickness of the Tertiary beds has not been accurately determined, but where most extensively developed it is surely several thousand feet. The beds lie in areas of subsidence and downwarp, and have locally been flexed into gentle anticlines. Faults are present in numerous places and locally are closely spaced and intricate.

In the surrounding mountains there are sedimentary and volcanic beds ranging in age up to the Jurassic, granite intrusions of somewhat later age, and some Tertiary lavas. All of the pre-Tertiary rocks are so thoroughly cemented and metamorphosed as to be unfavorable as sources of petroleum even though some of them were originally rich in organic matter.

It is probable that conditions favorable to the accumulation and storage of gas and oil, if present, exist in several places although apparently the favorable anticlines are not large and in many places the numerous faults would be likely to permit the escape of gas or oil. The character and mode of origin of the Tertiary beds is such that it is improbable they ever contained organic matter of a character and quantity adequate to produce commercial supplies of oil. On the other hand, the vegetable remains locally plentiful in the Tertiary beds constitute a source of methane gas.

Trivial quantities of light oil are reported to have been obtained from gas from wells in the general vicinity of Payette and some of the gas may have been dominantly ethane. Much of that so far found, however, is largely methane and doubtless originated from the decay of the vegetable matter scattered through the Tertiary sediments.

106.
While many of the Tertiary beds would serve as satisfactory reservoir rocks for oil or gas migrating from outside sources, no rocks suitable as source material are known. Inasmuch as the Tertiary strata are known to persist in the vicinity of Payette to depths well below sea level, it is conceivable that beds of early Tertiary or Cretaceous age suitable as sources of petroleum may underlie them. In view of what is known regarding the geology of Oregon and Idaho, this possibility is remote.

Citations to bibliography

The papers listed numerically below include, in addition to those referring specifically to oil and gas, all describing the geology and paleontology of the Tertiary strata of southwestern Idaho. Paleontologic papers on the Lateh and similar floras further north are also cited:


Gem-stones of minor importance in Idaho.

In addition to such semi-precious stones as opal and beryl, listed separately, a number of minor gem-stones have been reported to have been found in Idaho, mostly in placer sand. These include diamonds, sapphires, topaz, garnets, and zircon. The production of all these so far has been trivial and for some of the rarer stones reported the identification is in doubt. Garnet and zircon are of wide occurrence in the state, but in most places are not of commercial quality.

Citations to bibliography

144, 196, 196, 607, 710, 794, 815

References to Mineral Resources. The following list gives the gem-stone reported and the locality following each reference:

1898-1897, p. 1203, topaz, Roseberry, Valley County
1913, pt. 2, p. 668, diamonds, sapphires, garnets, zircon, Rock Flat mine, Adams County
1918, pt. 2, p. 851, garnet, near Orofino, B sparce County
1919, pt. 2, p. 179, topaz, Moulton, Cassia County

Gypsum.

There are beds of gypsum in the Wells formation in Bear Lake County and in Miocene strata in Washington County, and small amounts elsewhere. So far, there is little commercial development.

Citations to bibliography

*606, 565, *618, 625


Limestone.

In addition to the use in Portland cement, noted on p. 103, relatively pure Carboniferous limestone has been burned for lime at Montpelier, Bear Lake County; Bayview, Bonner County; and similar material is intermittently quarried for use in best sugar refining at Arco, Butte County, and elsewhere. Most of the purer Paleozoic, Mesozoic, and Tertiary limestones, plentiful in many parts of the state, especially in the southeast, contain beds suitable for either purpose. Limestone of probable pre-Cambrian age is being quarried for lime near Orofino and Triassic
limestone of a good quality is exposed near Harpster. In the past, limestone of different kinds, including much that is too high in magnesia, iron, and other impurities for the above mentioned purposes, has been used as flux in small local smelters, especially in Blaine and Custer counties. Limestone, travertine, and marble suitable for use as building and ornamental stones doubtless exist, but, under present market and transportation conditions, have received little attention.

Citations to bibliography
10, 380, 406, 715, 717


Mica.

Pegmatite dikes in several localities contain muscovite mica of sufficiently good quality to be of commercial interest. The dikes are commonly small and rarely are abundant so that in localities remote from transportation they are of no immediate value. In Lathe County, districts within convenient hauling distance of the railroads produced mica to a total value of about $100,000 up to 1928. Similar mica-bearing dikes exist in Clearwater and other counties.

Citations to bibliography
1, 10, 15, 566, 608, 609

(Adams County)

(Latah County)

(Coeur d'Alene region, Shoshone County)
Mineral Resources 1885-86, p. 911; 1914, pt. 2, pp. 72-73

Monazite.

Monazite, principally valuable for its content of thorium and cerium, which have a variety of uses in incandescent gas mantles, electric filaments, sparkers for cigarette lighters, mordants, ceramics, and other things, is one of the heavy minerals present in many of the placer deposits derived by erosion of the Idaho batholith. It is known especially in Boise Basin, Boise County; along Musselshell Creek and near Pierce, Clearwater County; and in northern Idaho County.

Monazite is not at present being produced, but it and other heavy minerals, such as zircon and rutile, might be of value as by-products of placer operations under suitable market conditions. Most of the references to monazite in Mineral Resources concern the deposits in Boise Basin.

Citations to bibliography
10, 357, 360, 556


Nitrate.

Deposits of nitrate, most or all of which are of the cave type and too small
in quantity to be of commercial interest, are known in Bannock, Bingham, Blaine, Bonneville, Caribou, Clark, Custer, Elmore, Fremont, and Owyhee counties. Most of the occurrences are either in limestone or basalt, both of which rocks in different ways tend to form caves where nitrate of organic origin can accumulate. The only place in Idaho where an attempt to work such a deposit has been made is along the state boundary southwest of Homedale, Owyhee County (Plate 1). Work in 1916 and 1917 here, and in neighboring parts of Oregon, showed that the deposits were not of commercial value.

Citations to bibliography

213, 369, 412, 565, and 596


Opals.

Opals have been found in Tertiary igneous rocks of several kinds and in several localities in Idaho. Many show fire, but they are so brittle as to be difficult to work, and stones of gem quality are nowhere known to be abundant. Prospecting has been carried on in Owyhee, 22, and Lemhi counties, and elsewhere, but no opal mining has been carried on in Idaho for a number of years past.

Citations to bibliography

66, 194, 336, 496, 565, 636, 775, 794, 815

Mineral Resources 1892, p. 777; 1893, p. 698; 1896, p. 1299;
1904, p. 966.

Phosphate rock in southeastern Idaho.

In southeastern Idaho there are 669,821 acres belonging to the western phosphate reserve, of which 268,989 have been formally classified as phosphate land (see Plate 1) and released from any form of phosphate withdrawal. There is in addition some privately owned phosphate-bearing land. In 1922 it was estimated that Idaho had a reserve of about 4,997,800,000 long tons of high-grade phosphate rock, nearly all occurring as bedded sedimentary deposits within the Phosphoria formation (Permian). Phosphate is also locally present in Mississippian beds. Some mining has recently been done in Bear Lake and Caribou counties, and a number of properties formerly active in these two counties have suspended operations. Thus, at the present time, very large reserves of readily available rock are known in southeastern Idaho, but its development is almost at a standstill pending improvement in market conditions.

Citations to bibliography

Papers relating to phosphate in Idaho are listed numerically below in two groups; the first containing papers pertaining to phosphate, the second containing papers regarding paleontologic and other geologic matters in the region containing the phosphate beds.


Group 2. 30, 103, 106, 109, 110, 116, 118, 214, 236, 237, 238, 249, 303, 390, 391, 393, 394, 395, 398, 399, 401, 405, 417, 424, 436, 437, 444, 453, 464, 465, 484, 486, 585, 614, 626, 672, 674,

108.
1912, pt. 2, pp. 660, 681, 684;
1914, pt. 2, pp. 45, 21; 1917, pt. 2, p. 11;
1922, pt. 2, p. 115; 1923, pt. 2, p. 249;
1929, pt. 2, p. 351; 1930, pt. 2, p. 325;

Minerals Yearbook 1932–33, pt. 3, pp. 703–704
1934, pt. 3, p. 966
1935, pt. 3, p. 1064
1936, pt. 3, p. 998

Portland cement materials.

The only plant now manufacturing Portland cement in Idaho is that near Inkom, Bannock County, which started in 1928 and has since been intermittently productive. Sufficiently pure limestone and suitable argillaceous rocks for use in cement-making are probably common in those parts of Idaho underlain by Paleozoic and Mesozoic strata. They are known to be present in several parts of southeastern Idaho, ready to be utilized when transportation and market conditions are favorable. In Bannock County, the Cambrian formations appear most suitable, but elsewhere are the Twin Creek (Jurassic) and Brazer (Mississippian) limestones, and Tertiary travertine area of suitable composition for use as the limestone component, and there are doubtless others. Argillaceous rocks are abundant in most localities, containing limestone, and beds of suitable composition to mix with the limestone could probably be found.

Citations to bibliography

There is a possibility that materials such as are used in the manufacture of Portland cement may be found in most areas in Idaho containing Paleozoic or Mesozoic strata so that geologic descriptions of all such areas are of possible interest to one contemplating starting a plant, but only papers in which the suitability of the rocks for this purpose are here listed.

30, 10, 165, 714

Pumice

At and near American Falls and in Cassia County, pumice deposits were developed on a small scale some years ago. Pumice, the main use of which is as an abrasive, can probably be found in many places in and near the Snake River Plains and the basalt plains in Latah and adjacent counties. So far, the market for it has not been such as to encourage development.


Salt

Saline springs in southern Caribou County were in the past utilized rather extensively as sources of salt, but in recent years competition with salt more favorably situated with respect to transportation has caused the industry to decline. Beds of rock salt, doubtless the source of the salt in the springs (which issue along the line of the Bannock overthrust), are present in the rocks of this area, especially in the Preuss sandstone (Upper Jurassic) and have been mined to a limited extent. The rock salt of this area is above the average of the commercial salts of the United States in purity. Too little development has been undertaken to
warrant estimates of quantity, but it appears that, if market and transportation conditions should improve, the salt here is worthy of consideration.

Citations to bibliography
110, 406, 487, 666, 625, 726


Sulphur.

Many of the numerous warm springs throughout Idaho contain hydrogen sulphide and at some of them native sulphur deposits have accumulated. The best known are near Soda Springs, Caribou County, in T. 9 S., R. 43 E. Development began here in the late nineties and considerable sulphur was produced in 1901 and 1902, but operations ceased about 1910. The sulphur, with a little gypsum, forms the cement of a fault breccia composed of tuff, limestone, and quartzite. Deposition doubtless took place from water like that which, in the vicinity, forms springs discharging hydrogen sulphide and carbon dioxide. In view of the relatively high-grade deposits of Wyoming and Utah, the outlook for profitable mining of the sulphur here is not regarded as good. Sulphur deposits, doubtless similar to those above mentioned, were reported in 1884 at Swan Lake, Bannock County. They have not been worked recently.

Citations to bibliography
406, 453, 481, 662

Mineral Resources 1883-84, p. 664; 1911, pt. 2, pp. 945-946; 1916, pt. 2, pp. 407-408
STATE OF IDAHO
Chase A. Clark, Governor

IDAHO BUREAU OF MINES AND GEOLOGY
A. W. Fahrenwald, Director

THE METAL AND COAL MINING DISTRICTS OF IDAHO, WITH NOTES ON
THE NONMETALLIC MINERAL RESOURCES OF THE STATE

By
Clyde P. Ross

Annotated Bibliography
By
Clyde P. Ross and Martha S. Carr

Prepared in cooperation with
the United States Geological Survey

University of Idaho
Moscow, Idaho
BIBLIOGRAPHY

Below is an annotated list of papers on subjects that relate to the geology of Idaho. References Nos. 1 to 686, arranged alphabetically by authors, were annotated by C. P. Ross and include papers published prior to 1937. These are followed by a second list which has been annotated by Martha S. Carr. This list contains references Nos. 687 to 842 and includes papers available from the beginning of 1937 through April 15, 1941.

Annotated List, arranged alphabetically by authors.
References Nos. 1 to 686, from 1872 through 1936
Compiled and annotated by C. P. Ross

1. Anderson, A. L.,
Mioa deposits of Latah County, Idaho;
Idaho Bureau of Mines and Geology, Pamphlet 14, 1925. Topographic map.
A general description of the deposits. Concludes that the outlook is promising for a small industry.

2. Anderson, A. L.,
Some Mioocene and Pleistocene drainage changes in northern Idaho;
Idaho Bureau of Mines and Geology Pamphlet 18, 1927. Two drainage maps.
Discusses drainage changes produced by Miocene basalt and Pleistocene ice (mainly latter).

3. Anderson, A. L.,
Portland cement materials near Pocatello, Idaho;
Shows that material suitable for Portland cement manufacture is situated convenient to transportation near Pocatello and can be utilized if market conditions justify; gives brief data on geology. Revises Paleozoic stratigraphy in the area.

4. Anderson, A. L.,
A geological reconnaissance in the St. Maries region, Idaho;
Brief data on mineral possibilities, mainly lead-zinc prospects.

5. Anderson, A. L.,
Lava Creek vents, Butte County, Idaho;
Describes lava (Pleistocene ?) as having issued from fissure vents and filled valleys in hills northwest of the Craters of the Moon National Monument.

6. Anderson, A. L.,
Geology and ore deposits of the Lava Creek district, Idaho;
The district contains deposits of lead, silver, tungsten, etc., in and associated with Tertiary lava and a Tertiary granitic mass. Formerly a silver producer, but little mining in recent years.
7. Anderson, A. L.,
Cretaceous and Tertiary planation in northern Idaho:
Postulates a summit peneplain (late Cretaceous), a subsummit
peneplain (early Tertiary) and a third surface represented
by remnants of old age valleys which are older than the Snake
formation (Miocene).

8. Anderson, A. L.,
Sequence of ore deposition in north Idaho:
Econ. Geol., vol. 25, No. 2, pp. 160-175, 1930.
Discusses paragenesis of the minerals in the copper lodes
of the Clark Fork district and St. Joe and Clearwater
basins and relations of these veins to the lead deposits
of the Coeur d'Alenes.

9. Anderson, A. L.,
Geology and ore deposits of the Clark Fork district, Idaho:
Idaho Bureau of Mines and Geology Bull. 12, 1930. Reconnaissance
geologic map.
General description of the geology and ore deposits of the
district, which somewhat resemble those of the Coeur d'Alene
region to the south. Production began about 1913 and a num-
ber of lead-silver and copper deposits have been developed,
mostly on a limited scale.

10. Anderson, A. L.,
Geology and mineral resources of the region about Crofino, Idaho:
Idaho Bureau of Mines and Geology Pamphlet 34, 1940. Geologic map.
Report on a geologic reconnaissance of over 6,400 square
miles. A valuable contribution to data on the geology
and mineral resources of a little-known region. Mainly
Belt rocks and the Idaho batholith, some Paleozoic and
Mesozoic strata, and Tertiary lava.

11. Anderson, A. L.,
Genesis of the anthophyllite deposits near Kamiah, Idaho:
Regards the anthophyllite as a hydrothermal replacement of
ultrabasic intrusives, particularly dunite. There has been
a small production from the area since 1908.

Alkaline rocks of the Highwood type in southeastern Idaho:
A petrographic description of sills and dikes at Mount
Caribou, Bonneville County.

13. Anderson, A. L.,
Geology and mineral resources of eastern Cassia County, Idaho:
Idaho Bureau of Mines and Geology Bull. 14, 1931. Reconnaissance
geologic map.
A general description of the geology and ore deposits of
the region.
14. Anderson, A. L.,
   Description of a hornblendite with pegmatite characteristics near Ahsahta, Clearwater County, Idaho.

15. Anderson, A. L.,
   Genesis of the mica pegmatite deposits of Latah County, Idaho:
   Econ. Geol., vol. 28, No. 1, pp. 41-68, 1933.
   Advances the concept that the mica, beryl, and other minerals formed in the pegmatite by replacement.

   Composition of the Idaho batholith in Boise County, Idaho:
   Says that the part of the Idaho batholith studied consists of two facies, the older with the composition of calcic granodiorite to quartz diorite, the other ranges between granodiorite and quartz monzonite.

17. Anderson, A. L.,
   Contact phenomena associated with the Cassia batholith, Idaho:
   Geologic map.
   Postulates that the Cassia batholith is bordered by a zone in which igneous material has so impregnated the quartzite as to make it resemble granitic rock.

18. Anderson, A. L.,
   A preliminary report on recent block faulting in Idaho:
   Map.
   Outlines theory that some mountain masses were formed by faulting of "basin range" type. Cites supposed faults in Boise Basin, Long Valley, Deadwood Basin, Thousand Springs Valley, etc.

19. Anderson, A. L., and Rarson, A. C.,
   Silver mineralization in the Banner district, Boise County, Idaho:
   Econ. Geol., vol. 29, No. 4, pp. 371-387, June-July, 1934.
   First description in any detail of a silver camp which produced about $3,000,000 in the early days. The veins are characterized by sulphantimonide minerals and are associated with Tertiary porphyritic dikes.

20. Anderson, A. L.,
   Geology of the Pearl-Horseshoe Bend gold belt, Idaho:
   Idaho Bureau of Mines and Geology Pamphlet No. 41, 1934.
   Geologic sketch map.
   Describes gold lodes related to Tertiary dikes. The mines are inactive, but possibility of further development is regarded optimistically.

21. Anderson, A. L.,
   Some pseudo-eutectic ore textures:
   Econ. Geol., vol. 29, No. 6, pp. 577-589, Sept.-October, 1934.
   Describes intergrowths of sulphides in ore from Boise Basin and vicinity mainly resulting from replacement.
22. Anderson, A. L.,
The valley of Grimes Creek in Fayette Canyon, Idaho;
Jour. Geol., vol. 43, No. 6, pp. 618-629, Aug.-Sept., 1935,
Postulates that the part of Grimes Creek now in a valley perched high on the south side of the Fayette Canyon was formerly a tributary of the Fayette, captured by a tributary of Boise River, working headward toward the axis of uplift of a high-level peneplain, with the deepening of Fayette Canyon resulting from other tilting of this surface.

23. Anderson, A. L.,
Petroleum of the Pearl-Horseshoe Bend porphyry belt (abst.);
Pan-American Geologist, vol. 65, No. 1, p. 78, Feb., 1936,
Describes one of several complex belts of Miocene dikes in this part of Idaho. Assumes that partly crystalline magma was squeezed out intermittently through fractures and, hence, that the dike rocks illustrate changes that magma undergoes at different depths.

24. Anonymous,
The Pearl district;
Min. and Met. Press., vol. 107, No. 2, pp. 66-67, 1913,
Gives brief data on character of ore in Cheekmate, Lincoln, Black Pearl, and Whitman mines. Cites errors in milling.

25. Anonymous,
Big Creek mining district;
Min. and Met. Press., vol. 108, pp. 110-111, July 18, 1914,
Gives brief data on the Moscow, Red Metal, and other mines near Edwardsburg.

26. Anonymous,
Mineral resources and opportunities of Custer County, Idaho;
Salt Lake Min. Rev., vol. 28, No. 8, pp. 12-15, June 20, 1923,
Gives brief data on mines in the Alder Creek, Lava Creek, Rayhorse, Yankee Fork, and Sanfoam districts. The paper is a resume of one by R. N. Bell in the Mackay Miner.

27. Anonymous,
Ford Motor and General Motors companies help revive Idaho mining;
Gives historical data on the Red Bird and mentions a number of other mines in Custer and Lemhi counties, such as the Livingston, the Whynot (Yanke Fork district), the Wilbert (Butte County), the Gilmore district, the Leadore district, and the Micholina district.

28. Anonymous,
Bunker Hill opens good ore in Deadwood Basin;
Eng. & Min. Jour. Press., vol. 119, No. 21, p. 856, May 23, 1925,
Reports that silver-lead ore has been struck at depth of 500 feet. Says company has spent about $185,000 since Nov. 15, 1924. The All-Interstate and Pilgrim groups are under bond for $450,000.
Anonymous.
Sulphur ore strike made in Kelly Gulch near Hailey, Idaho.
Reports discoveries of lead ore made by the Mathews family in 1926 and 1927.

Anonymous.
Openings of mineral land by Interior Department.
There are old workings and active prospecting for lead on 17,882 acres of land near St. Charles and Fish Haven, Bear Lake County, Idaho, opened to entry August 20 at the Blackfoot land office.

Anonymous.
Burroughs' faith rewarded; important ore discovery on 700 level of Talacta's property.
Records discovery of ore on the 700 level and summarizes history and production.

Anonymous.
Idaho gold will improve its mill.
Tells of rich pockets uncovered in Balsamazar mine.

Anonymous.
Idaho beryl deposits found important.
Ceramic Age, vol. 21, No. 5, p. 141, May, 1933.
A summary of No. 15.

Anonymous.
"The (gold) mills of the Gods grind slow," Snake River "flour" gold.
A summary of No. 274.

Anonymous.
Gold rush of fifty years ago - Story of Eagle City and the Coeur d'Alene gold stampede - Led to foundations for a great industry.
Mining Truth, pp. 3 and 4, December 7, 1933.
Gives brief information on early history of the Coeur d'Alene region.

Ashlee, Thomas E.
A contribution to the Latah Flora of Idaho.
Describes plant fossils from twelve localities in northern Idaho, including data on new species.

Atwood, W. W.
The physiographic conditions at Butte, Montana, and Bingham Canyon, Utah, when the copper ores in these districts were enriched.
Econ. Geol., vol. 21, pp. 627-749, 1926.
Summarizes his interpretation of the geomorphic history of western Montana and neighboring parts of Idaho. Postulates complications caused by ice and non-ice-land and Pahsimel-valleys because of piracy. Supports Uspallata's interpretation of the physiography of Idaho.
38. Auerbach, H. S.,
Tungsten ore deposits of the Coeur d'Alénes:
Describes undeveloped deposits near Murray, reported to contain 25% tungsten oxide.

39. Auerbach, H. S.,
The north side of the Coeur d'Alénes:
The north side includes the Delta, Eagle City, Murray, Littlefield, and Raven, all once gold producers. Gives summary of the writer’s ideas on the geology of the area.

40. Bacorn, H. C.,
A complicated fault system:
Describes Huron vein at Gibbonsville, Parallel veins in slate cut by numerous faults which, with one exception, are reverse.

41. Bailey, H. D.,
Ore genesis at Meadow Creek mine:
Summarizes history and geology of the Meadow Creek mine. Concludes that the pyritic gold ore is related to the Idaho batholith and the stibnite was added as a result of Tertiary intrusion.

42. Ballard, S. M.,
The Boise basin district in Idaho:
A summary of the bulletin of the Idaho Bureau of Mines and Geology by the same author. Emphasizes Ballard's concept that the only ore bodies of value are found in connection with rhyolitic porphyry dikes.

43. Ballard, S. M.,
Geology and ore deposits of the Alturas quadrangle:
Idaho Bureau of Mines and Geology Bull. 5, 1922.
A general description of the silver deposits of the Vienna district. General geology is based on Umpleby's U. S. G. S. Bull. 880.

44. Ballard, S. M.,
Geology and gold resources of Boise Basin, Boise County, Idaho:
Idaho Bureau of Mines and Geology Bull. 9, 1924. Geologic sketch map.
Geologic descriptions of the mines in the Basin by an engineer who has had a long operating experience there. The general geologic data are more sketchy.

45. Ballard, S. M.,
Geology and ore deposits of the Rocky Bar quadrangle:
Maps and describes hypothetical dike zones; Gives data on Yuba, Rocky Bar, Pine Grove, and other mining districts in this part of Elmore County.
46. Bancroft, C. J.,
Central Idaho, A rugged mining region;
Gives general description of topography, emphasizes eroded plateau character. Notes that unaccessibility hampers mining in numerous districts which are listed but not described.

47. Baumgarten, Karl
Thunder Mountain landslide (Idaho);
A detailed description of the landslide that flooded Roosevelt, Valley County, the principal town in the Thunder Mountain district.

The Seven Devils mining district, Idaho;
Summarizes the geology of the area and briefly describes the principal properties.

49. Becker, G. F.,
Geologic sketch of the Pacific division;
A general summary of then current ideas of the geology of Idaho and summarizes by counties (mainly in tabular form) of the character and mineral content of the ore deposits.

50. Beckwith, Radcliffe H.,
Geological setting of Idaho batholith;
Pan-Am. Geol., vol. 45, No. 6, pp. 359-376 (incl. geol. map), June, 1922.
Describes and maps the general geology of the Buffalo Hump (Robbins) mining district.

51. Beckwith, Radcliffe H.,
Quartz veins of the Buffalo Hump, Idaho;
Gives detailed data on vein system and character of mineralization.

52. Beckwith, Radcliffe H.,
Ore deposition at Buffalo Hump, Idaho;
Discusses succession of mineral deposition in the ore of the Sam Lewis property on the basis of microscopic study.

53. Beckwith, Radcliffe H.,
The geology and ore deposits of the Buffalo Hump district;
This paper combines the data and maps in Nos. 50, 51, 52.
Tertiary volcanic tuffs and sandstones used as building stones in the upper Salmon River Valley, Idaho:
U. S. Geol. Surv. Bull. 511, Pt. 1, pp. 237-248, 1930. Contains small outline map (Fig. 1) of Custer and Lemhi counties, showing quarries and prospects at which stone was examined.
Gives petrographic description and Sur. of Standards tests of tuff and sandstone used locally as building stones.

55. Bell, R. N.
The Ramshorn mine at Bayhorse, Idaho:
Brief data on production, etc., of Ramshorn and other mines in the Bayhorse district.

56. Bell, R. N.
An outline of Idaho geology and of the principal ore deposits of Lemhi and Custer counties, Idaho:
A very sketchy account, mainly historical with geologic data on some of the mines in the Bayhorse district, near Salmon, and in the Yankee Fork district.

57. Bell, R. N.
Thunder Mountain and Mackey, Idaho:
Gives brief data on the mines of the Thunder Mountain district, routes to the district and certain of the mines near these routes.

58. Bell, R. N.
The origin of the fine gold of Snake River:
Eng. & Min. Jour., vol. 73, pp. 143-144, 1902.
Cites theory of Capt. N. L. Turner that the gold comes from solution in a pre-existing lake. Gives details of the appearance of the gold under the microscope.

59. Bell, R. N.
Dredging for fine gold in Idaho:
News note describing operation of Sweetser Burroughs dredge with data on value of gravels.

60. Bell, R. N.
Geology of Thunder Mountain and central Idaho:
Eng. & Min. Jour., vol. 73, pp. 791-793, June 7, 1902.
A description of the ore deposits of the Thunder Mountain district and brief data on the general geology of central Idaho and on means of access to Thunder Mountain. Principal value is in description of ore occurrence in the Dewey mine, now inaccessible.

61. Bell, R. N.
Facts about Thunder Mountain:
This is the most complete of Bell's several articles on the Thunder Mountain district and is based on a personal visit.
62. Bell, R. N.,
Report of the mining districts of Idaho for the year (annually for 1903 to 1920 inclusive). Some issues have maps, including a diagrammatic geologic map of the state.
Consists of running comments on geology, history, and current activities of the mines of the state.

63. Bell, R. N.,
The gold of the Snake River:
Describes operations of the Sweetser-Burns Women Dredging Co. of Minidoka, an early operator which had the pick of the locations. Its operations started 13 years previously. Results in best ground at a depth of 6 ft., averaged less than 10% a cu. yd. Paid one $10,000 dividend in 10 yrs. operation, the only one paid by any company in this district. Describes methods successfully used by small operators to recover 90% of visible gold. Bell is skeptical about so-called invisible gold. Small amounts of platinum present.

64. Bell, R. N.,
South Mountain, Idaho:
A sketchy geologic description of the district.

65. Bell, R. N.,
Sapphires in Idaho:
Reports sapphires in placer gravel near Meadows, thought to come from a nearby basalt dike.

66. Bell, R. N.,
Geology and mines of Idaho:
A condensation of data in Bell's official report for 1907 with descriptions of coal in Clark County, and Pearl, Quartzburg, Silver City, Coeur d'Alene mining districts.

67. Bell, R. N.,
Association of igneous intrusions with Idaho ore bodies:
Advances concept that dikes in the Coeur d'Alene district are related to ore deposition, rich ore shoots being near the dikes. Mentions faults in the Delamar, Owyhee County; Minnie Moore, Blaine County; and a greenstone dike in the Kentuck, Lemhi County, which slightly displaced the vein. Best stopes in the Kentuck are on the two sides of this dike.

68. Bell, R. N.,
Atlanta gold district:
Describes operation of the Pettit mine on the Atlanta lode and mentions the Monarch mine. Bullion record of the district is $6,000,000.

119,
69. Bell, R. N.,
Big Creek gold district, Idaho:
Describes what is now called the Edwardsburg district. Ore bodies are large, but low-grade. Chances of development look favorable. There was much wildcatting here at the time of the Thunder Mountain boom.

70. Bell, R. N.,
Mining in Idaho:
Gives summary of mining in 1915. Mentions Interstate-Callahan and others in the Coeur d'Alenes, Texas, Dome, Last Packer, etc.

71. Bell, R. N.,
Rich gold ore found in Idaho:
Gives a brief description of the Boise Rochester ore body at Atlanta. The lode comprises lined fissures in granite with quartz seams containing ruby silver, and sulphides of iron, lead, zinc, copper, antimony, arsenic, silver, and native gold and silver. Diabase dike on both sides of the Boise Rochester vein. Reports discovery of high-grade ore and improvement in metallurgy.

72. Bell, R. N.,
Phosphate deposits in Idaho:
Calls attention to the advantages of the phosphate for fertilizer.

73. Bell, R. N.,
Quicksilver and antimony discoveries in central Idaho:
Idaho Min. Dept., Bull. 1, 1918.
Gives brief description of the Yellow Pine mining district prior to most of the development.

74. Bell, R. N.,
The Ixaxa copper prospect:
The prospect is in the Heath district, Adams County. Ore is chalcopyrite on seams and joints in altered monzonite.

75. Bell, R. N.,
Reopening of old Delamar mine under way:
A news note, with brief geologic data on the Delamar and neighboring properties.

76. Bell, R. N.,
Northwestern porphyry copper deposits (Oregon-Idaho):
Gives data on the copper deposits and general geology of the area on both sides of the Snake River from Huntington to the mouth of the Grand Ronde River, mostly in Oregon. Mostly a description of the Oregon Copper Co.
77. Bell, R. N.,
Geology of Idaho—1. The Central Batholith:
A rambling summary of data regarding the Idaho batholith and ore de-
position in Idaho. Bell thinks the concept that the central granitic
areas are unfavorable to prospecting is unfounded because ore deposition
has continued intermittently until relatively recent times.

78. Bell, R. N.,
Bunker Hill in the Deadwood Basin:
Describes the Lost Pilgrim and adjacent properties and more briefly
the United Mercury property in the Yellow Pine district.

79. Bell, R. N.,
Mines in the Idaho granite batholith:
Gives geologic data on mines in the Profile, Edwardsburg, Warren,
and Marshall Lake districts.

80. Bell, R. N.,
Boise Basin continues making history:
Mentions placers at Placerville and Idaho City; lodes at Quartzburg,
Belshazzar, Mountain Chief, Mineral Hill, Coon Dog, Independent,
Disseminated Lead Mineral, Washington, Banner, etc.

81. Bell, R. N.,
Ore formations of Coeur d'Alenes:
Summarizes the writer's views as to the geology and ore deposits
of the region.

82. Bell, R. N.,
Western Agricultural Minerals:
Min. Truth, vol. 15, No. 1, pp. 5-6, 20, 22, 26, 28, Feb. 20, 1930.
Cites advantages and quality of Idaho phosphate and argues
for wider use.

83. Bell, R. N.,
Another Butte in southern Idaho?
Brief description of geology and recent prospecting in Volcano
district, Elmore County.

84. Bell, R. N.,
Search for oil and gas in Idaho:
Min. Truth, vol. 16, No. 8, 1931, pp. 5-6, 12.
Gives drilling data near Fayette and thinks terrestrial origin of
the beds not necessarily proof of absence of oil.

85. Bell, R. N.,
Gold chances in the pre-Cambrian; conditions in the Idaho batholith show
Canadian possibilities; may be another Cripple Creek volcano:
Min Truth, pp. 5-6, 8, August 4, 1932.
Cites Boise Basin and other Idaho areas as evidence in favor of
his concept that large granitic masses may contain valuable lodes.

121.
86. Bell, R., N.,
New development of historic Idaho gold veins:
Brief data, mainly historical, on Golden Chariot and War Eagle Mines, Silver City region.

87. Bell, R., N.,
The gold resources of Idaho:
Min. and Contracting Review, vol. 37, No. 32, pp. 7-8, Aug. 13, 1935; No. 33, pp. 6-7, Aug. 20, 1935; No. 34, pp. 6-6, Aug. 27, 1935; No. 35, pp. 5-6, Sept. 3, 1935; No. 36, pp. 6-7, Sept. 10, 1935; No. 37, pp. 5-6, Sept. 17, 1935; No. 38, pp. 7-8, Sept. 24, 1935.
Gives summary descriptions of Bell's ideas as to the geology and history of the Boise Basin, Atlanta, Pearl, and Yellow Pine areas.

88. Bell, R., N.,
Idaho rare metals:
Min. and Contracting Review, vol. 37, No. 47, pp. 5-6, Nov. 26, 1935.
Refers to tungsten at Warren, Idaho County; near Murray, Shoshone County; and in the Blue Wing district, Lemhi County; and to molybdenum in the Shoshone region, Custer County, and elsewhere in Idaho.

89. Berg, J. E.,
Some Coeur d'Alene geology:
Profitable ore mainly in Revitt and Burke and north of Casmum fault. Says that valuable ore bodies in the Pichita have essential differences from the typical lead ore of the district. Silver ratio in the ore in the "dry belt" south of the Casmum fault is raised by tetrahe- drite content. Describes the Morning mine here.

90. Berry, E. W.,
Gardonia from the Miocene of Idaho and Washington:
Paleontologic description of specimens from Payette of Idaho and Latah of eastern Washington.

91. Berry, E. W.,
A revision of the flora of the Latah formation:
Records 152 species from the Spokane area and concludes the age is upper rather than middle Miocene. Discusses some of the general problems regarding the Tertiary floras of the region.

92. Berry, E. W.,
Miocene plants from Idaho:
Gives data on 76 plant species from 30 localities, mostly in Nezperce and Idaho counties. The beds are correlated with the Latah formation (upper Miocene).

93. Berry, R. W.,
Relief map, State of Idaho, and Press Bulletin:
U. S. Geol. Surv. Scale of map = 1 inch = 12 miles, 1928.
Gives a general impression of the topography of the state.
96. Blackwelder, Eliot
One of the early phosphate reports which extends into Bonneville and Teton counties, Idaho.

97. Blackwelder, Eliot
Reasons for the writer's belief that the surface is post-middle Miocene instead of Eocene as postulated by Upleby.

98. Blackwelder, Eliot
Mentions finding early Ordovician graptolites on Trail Creek, Hailey quadrangle.

99. Blackwelder, Eliot
Postulates that phosphates originated in marine beds, apparently through wholesale deaths of animals over a wide area.

100. Blake, W. F.,
Descriptive article regarding the Bellevue, Bullion, Hailey, Gold Belt, and Smoky areas.

101. Boss, Norman H.,
Explorations for fossil horses in Idaho; Smithsonian Inst., Explorations and Field Work of 1931, pp. 41-44, 1932.
Description of the season's field work at the fossil locality near Hagerman.

102. Bowen, C. F.,
Describes poor lignite beds. Some data on general geology.

103. Bowen, C. F.,
Data on small Tertiary coal beds of little value.

104. Bowron, W. L.,
Brief description of dredging and of lodes in the dike system extending from Canyon Creek to Rock Creek.

123.
105. Bradley, F. H.,
Note on "Quebe group" on the east side of Malade Valley.

106. Bradley, F. H.,
Describes trip from Ogden to Fort Hall and then through headwater region of the Snake River.

107. Brainard F. L.,
Describes properties in the Pine Creek area then coming into production for the first time in 15 years.

108. Branson, C. C.,
Paleontology and stratigraphy of the Phosphoria formation; Missouri Univ. Studies, Vol. 8, No. 2, 1930. With a map.
A general description of the formation and detailed faunal descriptions.

109. Branson, C. C.,
A general description of the formation and detailed faunal descriptions.

110. Breger, C. L.,
Describes salt deposits in Pleistocene alkali flats which are of good quality and of, at least, local value.

111. Brooks, Betty Watt
Describes plant remains from 13 miles southwest of Homedale, Idaho, regarded as not older than middle Miocene and probably of upper Miocene age.

112. Brown, H. S., and Madgett, F. G.,
The Delamar mine of southwestern Idaho; Cal. Jour. Geol., vol. 12, pp. 35-41, 1908.
Gives brief data on equipment and history of this gold mine. Notes that the north slope of Delamar Mountain is composed of basalt and basaltic andesite by pyroclastic lava. The country rock of the veins is said to be a distorted quartz porphyry laccolith bounded on the south and east by an "iron dike" and on the north and west by basalt. The veins have horses of green porphyry like a mass which crops out farther southwest.

113. Brown, R. W.,
Describes, among others, fossil plants from White Bird, Idaho County; Potlatch Creek, Latah County; and Salmon, Lemhi County, Idaho.
114. Buckley, E. R.,
Review of Ransome and Calkins' "Geology and ore deposits of the Corr d'Alene district";
Summarizes the report. Doubts the slaty cleavage, major faulting and brecciation were simultaneous. Thinks the gold-quartz veins belong to later period than the siderite veins. Says igneous origin not proved; thinks vein matter may have originated from sediments now removed.

115. Burbank, W. S.,
Epithermal base-metal deposits;
On pp. 650-651 cites the Lava Creek district, Butte and Blaine counties, and the Black Pine district, Cassia County, as examples of epithermal base-metal deposits.

116. Burling, L. D.,
Early Cambrian stratigraphy in the North American Cordillera with discussion of Albertella and related faunas;
Gives general data and brief locality descriptions including some in the Bear River Range and near Malad in Idaho.

117. Burroughs, A. H., Jr.
Talache Mines, Inc., Operations at Gold Hill mine, Quartzburg, Idaho;
Gives brief data on history and geology, and describes the mill (since burned) in which an unusually satisfactory recovery of free gold from sulphide ore was obtained.

118. Butler, B. S.,
Ore deposits related to stratigraphic, structural, and igneous geology in the Western United States;
Reference is made to features of the geology of Idaho in drawing a picture of the relations of general geologic features to ore deposits.

119. Buwalda, J. P.,
Tertiary history of the lower Snake River Valley, southwestern Idaho (abst.);
Payette formation is Middle or Upper Miocene, a Pliocene formation is also present, and the Idaho formation is Pleistocene instead of Pliocene. The rhyolite flows are mainly late Miocene or Lower Pliocene and the oldest basalt is Middle or Upper Miocene and doubtless correspond to the Columbia basalt. Pleistocene basalt also present. Idaho penplain is Miocene, possibly Pliocene.

120. Buwalda, J. P.,
Oil and gas possibilities of eastern Oregon;
Oregon Div. of Mines and Geol. vol. 3, No. 2, 1921.
Gives geologic data on areas adjacent to Idaho and concludes that discovery of commercial oil deposits is improbable.
121. Buwalda, J. F.,
A preliminary reconnaissance of the gas and oil possibilities of southwestern and south-central Idaho;
Idaho Bureau of Mines and Geology Pamphlet 5, 1925.
Discusses oil possibilities in the western part of the Snake River Plains and considers conditions unfavorable.

122. Buwalda, J. F.,
The age of the Payette formation and the old erosion surface in Idaho;
Says the Payette is upper Miocene or Pliocene on mammal evidence. Hence, using Umpleby's reasoning the peneplain be called Eocene would be younger.

123. Calkins, F. C.,
Discussion of Review by E. R. Buckley of "The geology and ore deposits of the Coeur d'Alene district";
Econ. Geol., vol. 4, pp. 268-281, April, 1909.
Shows that there is ample evidence that the monzonite is intrusive and produced contact metamorphism; which Buckley questioned in his contention that insufficient consideration had been given to the hypothesis of ore deposition by descending waters.

124. Calkins, F. C., (and MacDonald, D. F.)
A geological reconnaissance in northern Idaho and northwestern Montana; with notes on the economic geology;
Reconnaissance covers part of Boundary, Bonner, Kootenai, Shoshone, and Benewah counties, as well as part of Montana. Gives definitions and descriptions of topographic features. Describes the Belt rocks, an area of possible Archean rock, basalt, monzonite, etc. The data on mines are a slight expansion of U. S. Geol. Surv. Bull. 285, pp. 2111-52.

125. Calkins, F. C., and Jones, E. L., Jr.
Geology of the St. Joe-Clearwater region, Idaho;
Work done in classification of the public lands. Belt strata vary somewhat from Coeur d'Alene section and are more metamorphosed.

Economic geology of the region around Mallan, Idaho, and Saltese, Montana;
Belt rocks generally same as in the Coeur d'Alene district, but have some variations. They are cut by diabase. Lead-silver deposits in the north and copper in the south. Includes the Snowstorm copper mine in the north, however. Siderite is characteristic except in Snowstorm which has bornite, chalocite, and chalcopyrite disseminated in quartzite.

127. Campbell, Arthur
Annual Report of the Mining Industry of Idaho for the year 1935.
Gives same kind of data as No. 130.

128. Campbell, W. R.,
Miscellaneous analyses of coal samples from various fields of the United States;
Gives brief data on methods of sampling and ranks of coal and lists two analyses from Fremont County, Idaho.
130. Campbell, Stewart
Annual Report of the Mining Industry of Idaho for the year (annually for 1921 to 1932 inclusive). Maps showing distribution of resources, etc. Gives articles on current activities and mine safety work, production data, and lists by counties each mining company of record with data as to officers, amount of development, etc. Properties for which other information is lacking are listed by name and owner at the end of each county list.

131. Campbell, Stewart
Idaho building stone:
Describes operations of the Boise Stone Co., using Tertiary sandstone.

132. Campbell, Stewart
A geologic error regarding the Wood River district (Minnie Moore mine);
Gives his own ideas on the geology of the district. Shows that the concept of a flat fault cutting off ore bodies throughout the district is without foundation.

133. Campbell, Stewart
Mining Industry of Idaho:
A general outline of the subject.

134. Campbell, Stewart
Yellow Pine enterprise - Bradley operation one of the country's largest;
2600 tons daily to be mined and milled:
Mining Truth, December 1 - pp. 18-17; December 17, p. 9, 1931.
Summarises the history of the Meadow Creek mine, Valley County, Idaho, and gives brief geologic data.

135. Campbell, Stewart
Bunker Hill and Sullivan M. and C. Co., Hall-Interstate, Lost Pilgrim mines, Bernhard, Deadwood Basin, Valley County;
Brief data on history, geology, and milling, mining and transportation methods at the Lost Pilgrim mine.

136. Campbell, Stewart
Progress of the Yellow Pine enterprise;
Min. Jour., vol. 15, No. 15, pp. 3-4, December 30, 1931.
Summarises the history of the Meadow Creek mine, with some geologic data.

137. Campbell, Stewart
Idaho Mining Laws:
A publication of the State Mine Inspector, Boise, Idaho, Jan., 1932.
The title indicates the contents.

127.
138. Campbell, Stewart
The Yellow Pine enterprise of the Yellow Pine Co., Stibnite, Valley County;
Outline of the history, geology, and development of the Meadow
Creek mine.

139. Campbell, Stewart
St. Joseph Lead Co., Boise-Rochester mine and mill, Atlanta, Idaho;
Outline of history, ore beds, and recent development at the
Boise-Rochester mine.

140. Campbell, Stewart
Amalgamation-flotation of gold ores;
Mainly consists of data on the Boise-Rochester mill, Atlanta,
Idaho, but includes some geologic data.

141. Campbell, William
The microstructure of a complex ore from the Frisco mine, Gem, Idaho;
Describes a mixture of galena, blende, magnetite, calcite,
quartz, barite (?) in the Frisco mine in the Coeur d'Alene region.

142. Carpenter, J. T.
Tentative correlation of Tertiary strata in Idaho, Wyoming, Utah, Oregon,
Nevada, and Washington (abstract);
Brief abstract (See No. 143).

143. Carpenter, J. T.
A tentative correlation of northwestern Tertiary strata:
Northwest Science, vol. 6, No. 2, pp. 84-86, 1932.
A compilation from the literature with table and bibliography.

144. Carpenter, J. T.
Idaho, the gem state;
A summary of data of interest to amateur mineral collectors.
Mentions minerals in Ada, Owyhee, Gem, Washington, Adams and
Custer counties.

145. Carr, H. C.
Vein structure in the Monument mine;
Gives history and geologic character of the lode in the principal
mine in the Singiser district, Lemhi County. Reports that the lode
in Tertiary volcanic rocks is banded quartz with tellurides.

146. Carr, W. E.
Big silver-lead producer in Idaho (Hecla mine);
Description of equipment installed after the fire of 1923.
147. Chaney, R. W.,
Notes on the flora of the Payette formation:
Describes flora from near the southwest border of Idaho, also 7 miles south of Horseshoe Bend. Refers the Payette to the Miocene with a suggestion it may be Lower Miocene. Says it indicates a climate like northern California and southwestern Oregon of today.

148. Clapp, C. H.,
Idaho's batholith and Montana's mountains (abstract):
Says Idaho batholith was intruded during mountain-building after the profound thrust faulting, but before and during the shallow overthrust faulting and appears to have mushroom shape. The batholith affected or produced pressures that aided in squeezing up Montana's mountains in wedge-shaped blocks.

149. Clarke, W. C.,
Coeur d'Alene mining region:
Sketch map showing zones of the different metals mined; little geology. The paper is mainly a description of the region, not primarily geologic.

150. Clayton, J. C.,
The Coeur d'Alene silver-lead mines:
An early descriptive article with some geology. Gives data on the Bunker Hill and Sullivan, etc.

151. Clayton, J. D.,
The Atlanta district:
Gives a geologic map of the district without any scale, apparently about 40 square miles.

A group of small lodes, N. 80° W. (mag.) 60-80 S., is traversed by a large lode N. 70° E. 60-70 S. Ore is quartz with native gold and silver, ruby silver, brittle (antimonial) silver and silver sulphide, (argentite) pyrite. Much of the quartz is comparatively barren. Silver appears to have been leached out above water level.

152. Clearman, M. M.,
A geological situation in the lava flow, with reference to the vegetation:
A brief and inadequate description of the geology and vegetation of the Snake River Plain.

153. Collier, A. J.,
Ore deposits of the St. Joe River Basin, Idaho:
Geologic map. Reconnaissance relating to classification of lands claimed by Northern Pacific Railroad, Belt rocks intruded by small masses of diabase and granitic rocks. A number of prospects for lead-silver and copper ore, but little development.

129.
154. Condit, D. D.,
Oil shale in western Montana, southeastern Idaho, and adjacent parts of Wyoming and Utah:
Map shows outcrops of the Phosphoria formation, but no other geology.
Report records data then available on oil shale in the region from an economic standpoint.

155. Cope, E. D.,
On the fishes of a fresh-water Tertiary in Idaho:
Describes fossil fish collected by Clarence King from Catherine's Creek, Idaho.

156. Cope, E. D.,
On the occurrence of fossil Cobitidae in Idaho:
A note on collections by Clarence King at Catherine's Creek.

157. Cope, E. D.,
On three extinct Astaci from the fresh-water Tertiary of Idaho:
Describes fossils from Catherine's Creek, Idaho.

158. Cope, E. D.,
On the fishes of the recent and Pliocene lakes of the western part of the Great Basin and of the Idaho Pliocene Lake:
Proposes the name Idaho formation and lists a fauna from these beds, mostly without giving definite localities.

159. Courtis, W. M.,
Priest Lake mining district, Idaho:
Gives geologic and other data on copper and lead prospects.

160. Crandall, Lynn and Stearns, H. T.,
Groundwater in Little Lost River, Idaho:
Notes that a manuscript report is available for public inspection at the U. S. Geol. Survey offices in Washington, D. C., and Idaho Falls, Idaho, and at the offices of the Commissioner of Reclamation, Boise, and the Bureau of Mines and Geology, Moscow, Idaho.

161. Crandall, Lynn and Stearns, H. T.,
Groundwater in Big Lost River Valley, Idaho:
Dept. of Interior Memo for the Press, June 23, 1930.
Notes that a manuscript report is available for public inspection at the U. S. Geol. Survey offices in Washington, D. C., Idaho Falls, Idaho, at the offices of the Commissioner of Reclamation, Boise, and of the Bureau of Mines and Geology, Moscow, Idaho.

162. Cress, C. W.,
Gold sand from Snake River, Idaho:
Gives a list of heavy minerals in a sample of placer sand from Snake River.
163. Currier, L. W.,
A preliminary report on the geology and ore deposits of the eastern part of the Yellow Pine district, Idaho:
Describes gold and antimony deposits at the Meadow Creek mine and adjacent properties. Postulates that alteration of the rocks of the Idaho batholith began with deuteritic changes and continued through hydrothermal deposition of gold and quartz. The antimony deposits are later.

164. Czizik, Jay A.,
Brief report on current activities without much of present interest.

165. Dall, Wm. H.,
Notes on the discovery of Cycloceras in the Idaho Tertiaries:
Description of fossils from Castle Creek, Owyhee County.

166. Dall, W. H.,
Discovery of a Balkan fresh-water fauna in the Idaho formation of Snake River Valley, Idaho:
Description of invertebrates from the Idaho formation, especially from Castle Creek, Owyhee County.

167. Daly, R. A.,
Geology of the region adjoining the western part of the international boundary:
Gives geology (with maps) of a strip along the northern border of Idaho.

168. Daly, R. A.,
The differentiation of a secondary magma through gravitative adjustment (Moyie Sill in the Purcell Range, Idaho-Montana):
The concept is that differentiation took place by assimilation of quartzite and subsequent gravity settling of minerals. The area is on the Canadian boundary.

169. Davenport, R. W.,
Coeur d'Alene Lake, Idaho, and the overflow lands:
Discusses the results of using Coeur d'Alene Lake as a storage reservoir for power purposes and possible improvements.

170. Davis, W. M.,
Features of glacial origin in Montana and Idaho:
Describes observations along the railroads crossing the Panhandle. Mainly concerns extent and source of a glacier along the Clark Fork Valley.

171. Day, D. T., and Richards, R. H.,
Investigation of black sands from placer mines:
Lists content of 21 samples from Idaho.


175. DeQuille, Dan
Millions in gold beneath the lava flows;
Suggests that gold placers may exist under the basalt of the Snake River Plains.


177. Dorf, Erling
Flora from the Idaho beds (abst.);
Geol. Soc. Amer. Proceedings, p. 382, June, 1936. Mentions over 56 species from four localities in southwestern Idaho. Age is Upper Miocene or possibly lower Pliocene.

178. Dorf, Erling
Contribution to Paleontology, 2, A late Tertiary flora from southwestern Idaho;
Carnegie Inst., Washington, Pub. 476, pp. 73-124, preprint, November 20, 1936. Geologic map. Describes a flora from beds variably assigned to upper Fayette, Poison Creek or lower Idaho formations near Weiser, and says they are upper Miocene or lower Pliocene.

179. Doubleday, D. G., Buffalo Hump, Idaho;

180. Douglass, Earl
A geological reconnaissance in North Dakota, Montana, and Idaho; with notes on Mesozoic and Cenozoic geology;
181. Douglas, E. M.,
Boundaries, areas, geographic centers and altitudes of the United States
and the several states:
Gives brief data as to the boundaries of Idaho.

182. Duffield, W. S.,
Western phosphate mines:
An early summary of geologic and other data on phosphate in Idaho,
with a discussion as to conservation policies.

183. Eby, J. H.,
Botton in ore deposits of Coeur d'Alenes:
Pan-Amer. Geol., vol. 47, No. 3, pp. 179-182, April, 1926.
Gives stratigraphic tables of the Belt series and suggests a
correlation between different kinds of ore deposits and the
different Belt units.

184. Eby, J. H.,
The importance of outcrops to the prospector and miner:
This is a general discussion of the geologic features of the outcrops
of ore bodies, illustrated mainly by hypothetical sections
of ore deposits in and near Idaho.

185. Eakins, E. C., and others
Portland cement materials and industry in the United States:
Gives data on limestone at Lime Point on Snake River near the
mouth of the Grande Ronde, which indicate it may be valuable
for cement manufacturers.

186. Eldridge, G. H.,
a geological reconnaissance across Idaho:
Gives sketch maps of Idaho and of the Atlanta, Silver City, and Wood River
districts, but no geologic maps.
An account of a trip from Salmon through Harley, Atlanta, and
Boise to Silver City. One of the earliest geological studies
in the region, but many of the conclusions still hold good.
Gives sketch maps of Idaho and of the principal mining districts
visited, without geology.

187. Ellis, H. I.,
New developments in the Coeur d'Alenes:
Review of activity at the time.

188. Emons, S. F., Wright, A. A., and others
The Nampa image:
A discussion as to the origin of a human figure in clay reported
to have come from a depth of 320 feet in a well at Nampa in beds
regarded by Emons as late Tertiary or early Quaternary.
189. Emmons, S. F.,
Geological guidebook of the Rocky Mountain excursion:
Route was essentially along the Butte Branch of the Oregon Short Line with a side trip to Shoshone Falls, Snake River Plains, described by Emmons, pp. 371-374.

190. Evans, G. W.,
The Horseshoe Basin area of the Teton coal field in southeastern Idaho:
Data on economic possibilities of this area, which is not to be confused with Horseshoe Bend. Conclusion is that 11,000,000 tons of sub-bituminous coal may be present. It is friable, and the beds are inclined at high angles.

191. Evans, H. M.,
A new ostracod spine from the lower Triassic of Idaho:
Description of fossil fish spine from near Paris, Bear Lake County.

192. Fairbanks, Ernest E.,
Zoophyllum from Idaho, with notes on the determination of Mallard's constant:
Am. Mineralogist, vol. 11, No. 9, pp. 244-262, Sept., 1926.
Description of material in dolomite near Riggins.

193. Feltham, L. L.,
Salmon River's gold opportunities:
A sketchy summary of data on mines from Nicholla to Shoup with special reference to their gold possibilities.

194. Fernquist, C. C., and Dake, H. C.,
Opal from the Columbia Plateau basalt flows of Washington, Idaho, and Oregon:
Mentions opal in Tertiary rocks in Washington, Oregon, and in Latah, Lemhi, Owyhee, and other counties in Idaho.

195. Fernquist, C. C.,
Gem minerals of Idaho:
Summary data on diamonds in Adams County; quartz in Custer, Benewah, Idaho, Shoshone, and Owyhee counties; amethyst in Blaine, Custer, and Owyhee counties; chalcedony and agate in Blaine, Custer, Idaho, Owyhee, Lemhi, and Valley counties; jasper in Custer, Bear Lake, Blaine, Fremont, and Washington counties; opal in Boise, Kootenai, Latah, Lemhi, Lincoln, Nezpero, and Owyhee counties; cordierite in Clearwater, Adams, and Washington counties; hematite in Idaho County; malachite in Bear Lake County; orthoclase in Owyhee County; beryl in Latah and Nezpero counties; garnet in Clearwater County; zircon in Idaho County; peridot, topaz in Idaho County; andalusite in Shoshone and Valley counties; syenite in Shoshone County, scissite in Adams County; epidote in Adams and Washington counties; tourmaline, staurolite in Shoshone County; ilvaite in Owyhee County, chrysoberyll in Adams, Washington, and Custer counties.
196. Ferquist, C. G.,
Coeur d'Alene minerals described by a museum curator:
Oregon Mineralogist, vol. 2, No. 11, pp. 3-4, 30-31, November, 1934;
No. 12, pp. 7-8, 28-29, December, 1934; vol. 15, No. 1, pp. 26, 52-54,
January, 1935.
A summary in popular language of data on the geology and mineralogy
of the Coeur d'Alene region.

197. Finch, E. E.,
Muldoon district, Idaho:
sketch map.
The district contains lead-silver and some copper ore in sedimentary rocks,
probably mainly Carboniferous, with various dikes.

198. Finch, J. W.,
Geology and water supply of Hayden Lake and Rathdrum Prairie:
Describes an area in northern Kootenai County.

199. Finch, J. W.,
Prospecting for gold ores:
Mainly an outline of the geology of gold lodes in general, with
data on methods of search and development, and a brief discussion of
the occurrence of gold in Idaho with map showing location of
gold veins.

200. Finch, J. W.,
Biennial report on the activities of the Bureau:
Idaho Bureau of Mines and Geology Pamphlet No. 36, January, 1933.
Lists current activities and plans for the future.

201. Finlay, J. R.,
Mining and milling in the Coeur d'Alene district, Idaho:
An abstract of the paper published by the American Institute of
Mining and Metallurgical Engineers (No. 202).

202. Finlay, J. R.,
Mining industry of the Coeur d'Alene by Lakes:
American Institute of Mining and Metallurgical Engineers paper). Claim map
Gives general data on geology, history, etc., of the area.

203. Finlay, J. R.,
The mining industry of the Coeur d'Alene district, Idaho:
An abstract of a paper by J. R. Finlay (No. 202) with comments by
Arthur Lakes.

204. Flagg, A. L.,
The Elk City mining district, Idaho County, Idaho:
Topographic sketch map.
Gives miscellaneous notes on the district.
205. Flagg, A. L.,
Lawrence mine and mill in Kootenai County (Bonner), Idaho:
Brief data on geology and milling methods.

206. Flagg, A. L.,
Buffalo Hump mining district:
Notes on the history of the district.

207. Foreman, C. H.,
Mining methods of the Hecla mine:
A description of methods of stoping, etc., with incidental geologic data.

208. Foreman, C. H.,
Mining methods and costs at the Hecla and Star mines, Burke, Idaho:
Mainly of engineering interest, but gives some data on history and geology.

209. Freeman, O. W.,
Geologic climates of the Inland Empire:
A brief summary of published data.

210. Furlong, E. L.,
A new otter from later Cenozoic beds, southwestern Idaho (abstract):
Mentions an otter jaw found in the Idaho formation along Snake River northwest of Grand View, Owyhee County.

211. Gale, H. S.,
Geology of the copper deposits near Montpelier, Bear Lake County, Idaho:
Describes prospects on deposits containing partly oxidized copper sulphides disseminated in Triassic "red beds".

212. Gale, H. S., and Richards, R. W.,
Preliminary report on the phosphate deposits in southeastern Idaho and adjacent parts of Wyoming and Utah:
Gives maps showing the phosphate reserve and geologic sketch maps of parts of the reserve. Describes the phosphate deposits and the general geology in a preliminary way.

213. Gale, H. S.,
Nitrate deposits:
Nitrate salts have been reported from several localities in Idaho, notably in Bannock County, near Soda Springs and Potamolla; in Elko County; in the southwestern part of the state near the Utah-Nevada line. These are believed to be deposits of the cave type and are reported as of very small extent and probably of little economic value.

136.
214. Gannett, Henry
Report on the geographical work of the Green River division,
Contains miscellaneous geographic and historical data on south-
eastern Idaho.

215. Gannett, Henry
Profiles of rivers in the United States,
Gives maps of the Snake River and Clark Fork.

216. Gardner, E. D.,
Mining practice at Harmony Mines Company, Baker, Idaho;
Describes mining methods at a copper mine in the McDevitt district
and incidentally gives the most recent published data on the ore
occurrence there.

217. Gardner, E. D.,
Milling methods and costs at the concentrator of the St. Joseph Lead
Company, Atlanta, Idaho;
A metallurgical paper, but gives data on mineralogy, history,
transportation.

218. Gazin, C. L.,
A new Shrew from the Upper Pliocene of Idaho;
Description of one of the fossil forms from the Tertiary sediments
near Hagerman.

219. Gazin, C. L.,
New fields from the Upper Pliocene of Idaho;
Descriptions of fossils from the Tertiary beds near Hagerman.

220. Gazin, C. L.,
Fossil hares from the late Pliocene of southern Idaho,
One of the numerous papers regarding the Hagerman fossil locality.

221. Gazin, C. L.,
Upper Pliocene musistles from the Snake River Basin of Idaho;
One of the papers resulting from study of the fossils from near
Hagerman.

222. Gazin, C. L.,
Fossil-hunting in southern Idaho,
Smithsonian Inst., Expl. and Field Work 1934, Pub. 3300, pp. 9-12, 1935.
Description of the season's field work at the fossil locality
near Hagerman.

223. Gazin, C. L.,
Graviv-ade sloth remains from the late Pliocene and Pleistocene of Idaho;
One of the papers describing fossils from the Hagerman locality.
224. Gazin, C. L.,
A new antilocaprid from the upper Pliocene of Idaho:
One of the reports on fossils from near Hagerman.

225. Gazin, C. L.,
Annotated list of Pleistocene mammalia from American Falls, Idaho:
The title indicates the contents.

226. Gazin, C. L.,
A study of the fossil horse remains from the upper Pliocene of Idaho:
One of the papers regarding the Hagerman locality.

227. Gerry, C. N.,
Precious and semi-precious metals, Idaho:
Gives production and descriptive data for the state as a whole and by counties.

228. Gerry, C. N.,
Gold, silver, lead, and zinc in Idaho:
Gives production and descriptive data for the state as a whole and by counties.

229. Gidley, J. W.,
A new Pliocene horse from Idaho:
One of the papers resulting from study of the fossils from near Hagerman.

230. Gilbert G. K.,
Contributions to the history of Lake Bonneville:
A summary of the available data on extinct Lake Bonneville, the original limits of which extended into southern Idaho.

231. Gilbert G. K.,
Lake Bonneville:
Detailed discussion of ancient Lake Bonneville, the northern part of which extended into Idaho.

232. Gillson, J. L.,
Zircon, a contact metamorphic mineral in the Pend Oreille district, Idaho:
Discusses reasons for regarding the zircon of this area as of contact metamorphic origin.

233. Gillson, J. L.,
Granodiorites in the Pend Oreille district of northern Idaho:
A petrographic description, with analysis of several granodiorite masses.
234. Gilson, J., L.
Contact metamorphism of the rocks in the Pond Oreille district, Idaho:
Small outline map and sketch of the area.
A petrographic paper. Granodiorite metamorphosed the Belt strata in
three stages: (1) recrystallization, (2) deposition of high temper-
ature silicates, (3) sericite, chlorite, magnetite, serpentine, sul-
phides, formed by replacement.

235. Gilmore, C. W.
A new species of extinct turtle from the Upper Pliocene of Idaho:
Description of one of the species of fossils found near Hagerman,
Twin Falls County.

236. Girly, G. H.
On some new and old species of Carboniferous fossils:
Includes descriptions of a few fossils from near Montpelier, Idaho.

237. Girly, G. H.
The fauna of the phosphate beds of the Park City formation in Idaho,
Wyoming, and Utah:
Mainly detailed description of species, but gives resume of strat-
igraphic relations of the formation. This includes the present
Phosphoria formation.

238. Goddard, Malcolm
Fish remains from the marine lower Triassic of Aspen Ridge, Idaho:
Description of fish remains from 10 miles east of Soda Springs.

239. Goode, R. U.
Bitterroot Forest Reserve (Idaho-Montana):
Nat. Geographic Mag., vol. 9, pp. 387-400, 1898.
Topographic sketch map.
A geographic description with special reference to forest conserva-
tion of the area, from the Bitterroot River to 116° 46' W., and from
the Salmon River to the North Fork of the Clearwater.

240. Goode, R. U.
Survey of the boundary line between Idaho and Montana:
U. S. Geol. Survey Bull. 170, 1890.
Gives a contour map along the part of the Idaho boundary which
coincides with the 39th meridian and data regarding the work of
surveying it.

241. Goodrich, R. H., and Holdren, N. E.
Experiments in the recovery of tungsten and gold in the Murray district,
Idaho:
Mainly a discussion of ore dressing at the Golden Chest mine, with
incidental data on ore occurrence and mineralogy.

129.


Henderson, E. P., and Glass, Jewell J.,
Pyroxmangite from Idaho (abstract);
Crem Abs., vol. 25, No. 9, 286, Sept. 1936.
Pyroxmangite, new locality; identity of sobralite and pyroxmangite;
Records data on a specimen from Homedale which confirms the composi-
tion of the original material from South Carolina and adds new in-
formation as to the properties of the mineral.

Hersch, W. E.,
Water resources of the Fort Hall Reservation, Idaho;
A chapter regarding water included in G. R. Wansfield's report:
Geology, geography, and mineral resources of the Fort Hall
Indian Reservation.

Herron, W. H., (in charge)
Profile surveys along Henrys Fork, Idaho, and Logan River and Blacksmith
Fork, Utah;
Gives strip maps of the streams mentioned in the title.

Hershey, D. H.,
Some Tertiary and Quaternary geology of western Montana, northern Idaho, and
eastern Washington;
Discusses terraces along South Fork of the Coeur d'Alene River, of
which he thinks the 1180-foot terrace is probably early Miocene;
in the middle Miocene the Columbia River basalt dammed the river,
produced a lake and caused shift in the river course; a later glacial
lake also formed in this valley; there is evidence of two glaciations.
Also discusses physiography of Clearwater County.

Hershey, O. H.,
Genesis of the silver-lead ores in the Wardner district, Idaho;
Min. & Sci. Press, vol. 104, June 1, pp. 750-753; June 8, pp. 766-790;
June 15, pp. 826-827, 1912; Published later as a pamphlet by Min. and
Sci. Press.
Thinks that the lead, silver, and zinc minerals were originally
disseminated through certain bands in the Belt rocks, were first
concentrated into the lodes by heat and water from the monzonite
intrusion and then into commercial shoots by hot water related to
thrust faults. Says there are 12 periods of mineralization related
to nine systems of faulting.

Hershey, O. H.,
Origin of lead, zinc, and silver in the Coeur d'Alene district;
Min. & Sci. Press, vol. 107, Sept. 27, pp. 489-493; October 4, pp. 529-533,
1913.
Thinks metals get into Pritchard slate by erosion from Archean igneous
rock. Discusses differences between lodes in the Pritchard and other
formations. Valuable deposits confined to zones of faulting.

141.
Hershey, O. H.,
Origin and distribution of ore in the Coeur d'Alene district:
Published for the author as a pamphlet by the Min. & Sci. Press, 1916.
Geologic map.
Gives detailed description of the results of the author's field work in the Kellogg-Cauburn area, and argues that the metals of the Coeur d'Alene lodes are derived by leaching from the Belt rocks rather than from a magmatic source.

Hershey, O. H.,
Genesis of the Success zinc-lead deposit:
Econ. Geol., vol. 12, pp. 548-568, 1917.
A criticism of Umpleby's article on the same subject (No. 643).
Thinks monzonite is post-ore.

Hershey, O. H.,
Geology of the Success mine:
Discusses S. R. Moore's article under same title (No. 458). Says Moore's specimens show replacement of monzonite by ore minerals.

Hershey, O. H.,
Mining geology in the Coeur d'Alene district, Idaho:
An historical summary of the geologic work done and geologic methods used in the region.

Hess, F. L.,
Describes the Huagrove district.

Hess, F. L., and Wells, R. C.,
Brammerite, a new uranium mineral:
Reports identification of brammerite from a sample of placer material from Stanley Basin, sent in by S. M. Ballard.

Hess, F. L.,
Haynes Steelite Company (In chapter on cobalt):
Gives brief data on the geology of the principal cobalt prospect in the Blackbird district, Lemhi County.

Howett, D. P., and Schaller, W. T.:
Hisingerite from Elaine County, Idaho:
Describes occurrence and origin of hisingerite in the Minnie Moore.

Howett, D. P.,
A manganese deposit of Pleistocene age in Cammack County, Idaho:
Data on a small deposit of wad in Pleistocene beds.

Hidden, W. E.,
The Hayden Creek, Idaho, meteoric iron:
Describes a specimen of meteoric iron.
268. Hill, J. M., (and Lindgren)

The mining districts of the western United States (with introduction by
W. Lindgren);
Brief data on location, geology, and literature on mining districts
in Idaho as well as other states.

269. Hill, J. M.,

Notes on the fine gold of Snake River, Idaho;

This is a summary of data available at the date of publication,
coupled with Hill's own observations, and is the most comprehensive
report on the subject that has been published.

270. Hill, J. M.,

Barite and strontium — Idaho;
Reports the presence of barite in the gangue of ore in the
Coeur d'Alene region, at Silver City, etc., and in lenses near Hailey.

271. Hill, W. H.,

The Deadwood placer claims, Idaho;
Camp is 5 miles south of Elk City. Gives favorable opinion
of ground which was being profitably worked when Hill visited it.

272. Hill, Walter Hoey

The Little Giant Mine, Warren, Idaho;

One of the most complete descriptions of the Little Giant mine
available. It has been expensive to mine because of extensive
faulting down to depth of 127 feet (the bottom at date of the
article). Since 1853, 1870 tons of ore valued at over $190,000
have been mined.

273. Hite, Thos. E.,

Fine gold and platinum of Snake River, Idaho;
Econ. Geol., vol. 28, No. 3, pp. 265-266, 1933.
A summary, with bibliography, of present data on the placers of
Snake River and a description of the character of the metallic
particles under the microscope.

274. Hite, Thos. E.,

Special features of fine gold from the Snake River, Idaho;
Econ. Geol., vol. 28, No. 7, pp. 686-691, 1933.
Gives data as to size and shape of the finer particles of gold
in Snake River placer deposits.

275. Hite, Thos. H., and Waring, G. A.,

Gold placer mining on the Snake River in Idaho (discussion);
Mainly an optimistic summary of recent activity in the area.

276. Hornbrook, Julius

Idaho placer operations;
Gives current data on placers in Lemhi County, especially Bohannon,
Moose, and Kirtley creeks.

143.
277. Hoyt, W. G.,
Power resources of the Snake River between Huntington, Oregon, and Lewiston, Idaho:
Mainly notes on possible dam sites.

278. Hoyt, W. G.,
Water utilization in the Snake River Basin, with a preface by Herman Stabler:
A complete summary of available essential information as to the potential value and utility of the Snake River and its tributaries.
This paper includes a summary up to the date of publication of data on surface water supplies contained in numerous Geological Survey papers not separately referred to.

279. Humphrey, Harry B.,
The phytogeography of the Coeur d'Alene flood plain of northern Idaho:
Discusses the geomorphology of Coeur d'Alene Lake and nearby streams in the light of plant evidence. Among the points made are the conclusions that distortions show that centuries rather than years were required for cutting the outlet of the lake through a glacial barrier.

280. Huston, George
Notes on the geology of the Snowstorm mine, Idaho:
Says belt rocks of district were laid down on a granite floor. The Snowstorm is in the Revett. Faulting is post-ore and cuts off mineralized strata. The whole of the Revett over an area 6 miles long is impregnated with chalcopyrite and supergene copper minerals. Suggests that the copper was introduced when sand accumulated to form the Revett quartzite. The fault dam influenced copper enrichment.

281. Huston, George
The copper beds of the Coeur d'Alene district:
"Copper" beds are known in the Wallace, St. Regis, and Revett, but have proved profitable only in the latter. The beds lie in a faulted syncline and chalocite enrichment is controlled by structure. Gives a small geologic sketch map of vicinity of the Snowstorm mine.

282. Huttlin, J. B.,
Sunshine output grows:
Gives brief, up-to-date data on mine and plant.

283. Ingalsbe, F. B.,
The Coeur d'Alene mining district:
Gives an outline of history and geology of the district.

284. Irvine, C. D.,
Fine gold of the Snake River, Idaho:
Summarizes different people's ideas as to the origin of the gold.
285. Jacob, E. D., and others
   The composition and distribution of phosphate rock with special reference
to the United States:
   Report mainly devoted to technologic and other general data. Brief
   statement regarding deposits in Idaho on Page 6.

286. Jacobs, M. E.,
   Report of mining districts of Idaho for the year 1902;
   Brief report without much of present interest.

287. Janin, Charles
   Gold dredging in the United States:
   Summary statement, including data on Idaho.

288. Jellum, S. P.,
   Geology of the Wild Rose vein:
   Description of a gold vein in the Pierce City district.

289. Jellum, S. P.,
   Central Idaho gold district:
   vol. 4, pp. 2-5, 31-37, 66-73, 1908.
   This is essentially one article continued through several numbers
   of the magazine. Describes Elk City, Dixie, Pierce City, Buffalo
   Bench, Newsome, Oro Grande, Fourmile.

290. Jennings, E. F.,
   The Lost Packer copper-gold lode:
   Gives history and geologic description. Regards lode as replace-
   ment on shearing related to the granitic rock.

291. Jennings, E. F.,
   The Lost Packer:
   Gives history and geologic description.

292. Jennings, E. F.,
   The Lost Packer copper-gold lode:
   Gives history and geologic description. Regards lode as replace-
   ment on shearing related to the granitic rock. Says quartz present
   was a constituent of the original granite.

293. Jenny, W. F.,
   Graphitic anthracite in the Parker mine, Wood River, Idaho:
   Columbia School of Mines Quart., vol. 10, pp. 313-316, 1889.
   Concludes that the deposit in the Parker mine, Warm Springs
   district, Boise County, is formed by sublimation.

294. Jones, C. G.,
   Phosphate rock in Utah, Idaho, and Wyoming:
   A description of early phosphate mining near Montpelier, Idaho,
   with notes on phosphate in Utah and Wyoming, and other parts of
   Idaho.
286. Jones, C. C.,
The discovery and opening of a new phosphate field in the United States:
A summary of Jones' investigations and the early history of
search for phosphate in Idaho and adjacent states.

287. Jones, E. L.,
Lode mining in the Quartzburg and Grimes Pass porphyry belt, Boise Basin,
Idaho:
map, based on Lindgren's.
Gives brief account of geology and ore deposits of Boise Basin
and details as to Quartzburg and Grimes Pass area.

297. Jones, E. L., Jr.,
A reconnaissance of the Pine Creek district, Idaho:
This area includes complex zine-lead and antimony ores. Belt
rocks intruded by small black dikes, mainly on faults, and caved
by tertiary gravel.

298. Julian, A. A.,
The volcanic tuffs of Challis, Idaho, and other western localities:
Gives microscopic description of three specimens of tuff from
Challis, Idaho, and others from Nevada, Arizona, and Texas.

299. Julian, C. E., and Norton, F. W.,
Mineral industries survey of the United States: Idaho, Shoshone County,
Coeur d'Alene district. The Silver Belt and the Sunshine mine of the
Coeur d'Alene district:
Gives brief general data on the Coeur d'Alene region and its
mines, including a summary of the geology; several mine maps and
sections.

300. Kemp, J. F.,
Notes on the geology of the trail from Red Rock to and beyond Leesburg,
Idaho (abstract):
Science, New Ser., vol. 5, p. 891, 1897.
Brief abstract of a paper given before the N. Y. Academy of Sciences,
Section of Geology, May 17, 1897, giving geologic notes on 100 miles
of the trail mentioned in the title.

301. Kemp, J. F., and Gunther, G. G.,
The White Knob copper deposits - Mackay, Idaho:
Considers, on the basis of office study after a visit by
Gunther, that the "contact metamorphic" minerals are confined
to the igneous rock.

302. Kennedy, F. A.,
Diamond drilling in the Seven Devils Mountains:
Describes drilling on Red Ledge property. Gives data on
operation methods in this rugged district and a little in-
formation as to geology.
303. Kindle, E. M.,
The fauna and stratigraphy of the Jefferson limestone in the northern Rocky Mountain region;
Pages 14-16 describe Devonian fossils from east of Mannen Station, Idaho.

304. Kirby, E. B.,
The gold deposits of Mount Caribou, Idaho;
Summarizes the geology. Says the only mining done up to that time was in a bed called the Nellie Quartzite, 25 feet thick, which has been mined for a length of 275 feet and a depth of 264 feet. Outlines his concept of the mode of origin.

306. Kirchoff, Charles
Seven Devils District;
Gives brief description of the geology of the district and mentions Peacock and Iron Dyke as largest mines.

306. Kirkham, V. R. D.,
Petroleum possibilities of certain anticlines in southeastern Idaho;
Discusses the relative possibilities of finding oil in parts of Teton and Caribou counties.

307. Kirkham, V. R. D.,
Notes on the geology of eastern Bear Lake County, Idaho, with reference to oil possibilities;
An office compilation of available data.

308. Kirkham, V. R. D.,
Oil possibilities and drilling activities in south Idaho;
Idaho Eng., vol. 2, No. 1, December, 1924.
Summarizes data in the author's official reports.

309. Kirkham, V. R. D.,
Geology and oil possibilities of Bingham, Bonneville, and Caribou counties, Idaho;
Gives discussion of the geology. Says it is possible oil country.

310. Kirkham, V. R. D.,
Oil possibilities of southeastern Idaho;
Min. and Met., vol. 6, No. 218, pp. 71-74, February, 1925.
Resume of his official publications.

311. Kirkham, V. R. D.,
Phosphate deposits of Idaho and their relation to the world supply;
Summarizes data on geology, origin, reserves, methods of mining, and uses of Idaho phosphate and tabulates data on other sources of phosphate in the world.

147.
312. Kirkham, V. R. D.,

Ground water for municipal supply at St. Maries, Idaho;
Concludes that there is artesian water suitable for municipal
supply in the flat basalt flows.

313. Kirkham, V. R. D., and Ellis, E. W.,

Geology and ore deposits of Boundary County, Idaho;
Describes Belt strata, basic sills, and granitic stocks, much
faulted. There are ten types of lodes; principal metals are
lead and silver; little development.

314. Kirkham, V. R. D.,

The general geology of eastern Washington and northern Idaho;
Outlines geologic data regarding the area from latitude 46° 30' to
48° 30' N., and from longitude 116° 30' to 117° 30' W., with a geologic
sketch map.

315. Kirkham, V. R. D.,

Geologic conditions, oil possibilities, and drilling progress in Teton
County, Idaho;
map.
Gives data on the only deep well in this part of Idaho. This well
obtained gas. Also outlines geologic structure and gives recon-
naissance geologic maps.

316. Kirkham, V. R. D.,

Oil possibilities of Melon Valley near Buhl, Idaho;
Area is underlain by tuffaceous beds and conclusion is that
drilling would be unjustifiable.

318. Kirkham, V. R. D.,

Ground water for municipal supply at Potlatch, Idaho;
Concludes that water can be obtained from sediments intercalated
in basalt, but not under artesian pressure.

319. Kirkham, V. R. D.,

Underground water resources in the vicinity of Orofino, Idaho, and Lapwai,
Idaho;
Gives geologic descriptions from the standpoint of hydrology.
Concludes that basalt near Orofino will yield sufficient water
to pump wells and that water under artesian head may be present
in sediments associated with the lava near Lapwai.

320. Kirkham, V. R. D.,

Abstracts of important papers dealing with the geology of the Inland
Empire and adjacent country (Idaho-Washington);
Abstracts of eleven of the papers listed in No. 321.

321. Kirkham, V. R. D.,

Bibliography of chief publications on the geology and geography of the
Inland Empire (Idaho-Washington);
Lists 212 papers, many of which deal with Idaho.
322. Kirkham, V. R. D.,
Press bulletin concerning land slips near Whitebird, Idaho:
Says fissures result from slipping of basalt on clay beds.

323. Kirkham, V. R. D.,
Brief papers on geologic field work in Idaho during 1927:
Includes brief preliminary report of the possibilities of an
underground water supply for the city of Weiser, Idaho. Favorable
conditions for artesian water. Coal and oil possibilities in Clark
County, Idaho. Chances for coal poor. There is an anticline which
might be favorable for oil. The rock tentatively called oroscoseous
in Pamphlet 19 is Triassic. Subsurface water supply in Big Lost
River Valley. Undulating water table results from buried reefs of
rock. Strong. An examination of coal prospects in Willow and Fall
craters, Bonneville County, Idaho. Not much commercial value.

324. Kirkham, V. R. D., and Johnson, M. M.,
The Latah formation in Idaho:
Descriptions of 40 localities in Idaho where strata resembling the
Latah are interstratified with basalt flows.

325. Kirkham, V. R. D., and Johnson, M. M.,
Active faults near Whitebird, Idaho:
Further observation of the slips mentioned in No. 322 indicated
they are probably gravity faults rather than landslides.

326. Kirkham, V. R. D.,
The Moy grain overthrust fault:
Jour. Geol., vol. 36, No. 4, pp. 364-374, 1930.
Description of an overthrust reported to extend from Montana through
Boundary County, Idaho, into Canada.

327. Kirkham, V. R. D.,
Old erosion surfaces in southwestern Idaho:
Conjectured that there is in southwest Idaho a pre-Columbian
River baselevel, a partial baselevel after the basalt and
two Pleistocene erosion surfaces, all warped.

328. Kirkham, V. R. D.,
Revision of the Payette and Idaho formations:
Gap, Payette, and parts of Ada, Adams, Owyhee, and Washington counties.
Reviews the literature regarding the two formations and on the
basis of his own mapping restricts the Payette to the clastic beds
within the Columbia River basalt and groups similar beds above as
the Idaho formation. Discusses the structure of the Tertiary beds
in southwest Idaho.

329. Kirkham, V. R. D., Johnson, M. M., and Holm, Donald
Origin of Palouse Hills topography:
In Palouse Hills in Latah County, Idaho, and adjacent parts of
Washington dissection is dominantly by formation and growth of
amphitheaters, mainly by nivation.

149
330. Kirkham, V. R. D.,
The Snake River downwarp:
Jour. Geol., vol. 39, No. 6, pp. 455-462, 1931. Geologic map of Canyon, Gem, Fayette, and parts of Ada, Adams, Owyhee, and Washington counties. Reviews history of idea of subsidence and warping and geosynclines and downwarps. Reviews concepts as to origin of Snake River Plains and concludes it is a downwarp formed by gentle subsidence almost normal to the axis of deformation in the Rocky Mountain system.

331. Kirkham, V. R. D.,
Igneous geology of southwestern Idaho:

332. Kirkham, V. R. D.,
Natural gas in Washington, Idaho, eastern Oregon, and northern Utah:
Am. Assoc. Pet. Engrs., Geology of Natural Gas, pp. 231-238, 1935. Says that most of the gas so far discovered in Idaho is in the western part of the Snake River Plains in rocks of Miocene and later age, and is thought to be derived from algal and sapropelic deposits in lake beds. Some gas of more usual character has been found in the marine Frontier formation (Upper Cretaceous) near Driggs, Teton County. There has been little production from either locality.

333. Kirkpatrick, O. E.,
History of Leesburg pioneers:
Pyramid Press, Salt Lake City, Utah, 1934. Describes discovery of gold at Leesburg in Lemhi County and also claims in region between Salmon and Leesburg. Gives total production of gold from Leesburg district as $16,000,000. Notice in Eng. and Min. Jour., October, 1934.

334. Knowlton, F. H.,
A fossil nut pine from Idaho:

335. Koch, L. H.,
A new occurrence of phiolite:
Amer. Mineralogist, vol. 2, pp. 143-144, 1917. Gives analysis (partial) and optical data on a large specimen of a mineral he calls phiolite (a zeolite) sent to National Museum, said to be from Challis, Idaho.

336. Kunz, Geo. F.,
Precious stones; opal:

337. Lakes, Arthur
Mount Caribou gold deposits:

150.
Lakes, Arthur

Coeur d'Alene mining region:
An abstract of Finlay's paper published by the American Institute of Min. and Met. Engineers, with comments by Lakes.

Lakes, Arthur

Some Idaho mining districts:
Gives brief data on the general geology of Idaho and on the Wood River and Delamar mining districts.

Lakes, Arthur

The Bellevue mining district:
Brief data on mines near Bellevue in the Mineral Hill mining district, Blaine County.

Lakes, Arthur

Some of the veins and ore deposits of the Wood River district:
Discusses structural relations of the deposits of the Mineral Hill district, Blaine County.

Lakes, Arthur

The Bullmacker mine near Hailey, Idaho:
Gives brief geologic description of a mine on Deer Creek which has lead-silver ore in a shear zone in limestone.

Lakes, Arthur

A new and large deposit of barite in Idaho:
Brief data on the lenses of barite near Hailey. This is the first published report on these deposits.

Lakes, Arthur

The Dollarhide mine, Idaho:
Brief description of the geology at and near a mine near the head of Warm Spring Creek, Little Smoky district.

Lakes, Arthur

Wood River mining district of Idaho:
One of his numerous brief descriptive articles.

Lammers, T. L.

The Murray gold belt, Idaho:
Murray is the oldest camp in the Coeur d'Alene district, formerly devoted to gold mining. Author thinks there are "sheets" of gold-bearing quartz underlying a large area, perhaps sedimentary.

Lancaster, Joseph

The Priest Lake district, Idaho:
Briefly describes the Idaho Continental Fern Cliff, Mountain Chief, Gem, Idaho Copper Company, Panhandle M. & M. Company, all of which are essentially prospects.
348. Laney, F. B., Kirkham, V. R., D., and Piper, A., M.,
Groundwater supply at Moscow, Idaho:
Shows that artesian water is available for municipal supply. Columbia
River basin fills an embayment in old rocks, mainly granitic.

349. Langton, Claude M.,
Geology of the northeastern part of the Idaho batholith and adjacent
region in Montana:
Cites evidence of two periods of folding and faulting near the Idaho
batholith, the latter period approximately of the same date as the
emplacement of the batholith. Regards the thrusts parallel to the
northeast part of the batholith as produced by outward push during
emplacement.

350. Larsen, E. S., and Livingston, D. C.,
Geology of the Yellow Pine cinnaiber mining district, Idaho:
U. S. Geol. Survey Bull. 715, pp. 73-88, 1920. Small reconnaissance geol-
logic map.
Describes the geology of the Hermes, Fern, and adjoining quick-
silver deposits.

351. Lee, W. T., and others
Guidebook of the Western United States; Part B, The Overland Route:
Gives geologic and topographic maps along the Union Pacific railroad
from Ogden, Utah, through Idaho to Yellowstone Park and a running
description of what is to be seen on this route.

352. Leidy, Joseph
On vertebrate remains from Idaho, Utah, and Oregon:
Mentions horse and mastodon remains of Pliocene age from Sinker
Creek, Owyhee County.

353. L'Hame, W. E.,
Thunder Mountain, Idaho:
Author thinks the same rhyolite which is productive at the Dewey
is exposed and mineralized a mile to the southeast and also at
the head of Holy Terror Gulch. He says at the Dewey it is cut
by "phonolite intrusions".

354. L'Hame, W. E.,
Thunder Mountain district:
Briefly describes geology and lodes of the Thunder Mountain district
and gives some data on Edwardsburg, Profile, and Marshall Lake districts.

355. Lincoln, F. C.,
Some gold deposits of the Northwest:
Eng. and Min. Jour., vol. 92, p. 408, August 26, 1911.
Gives brief historical and geological data on Delamar mine and on
some properties in Montana.
356. Lincoln, F. C.,
Gold deposits at Gibbonsville, Idaho;
Gives historical resume and descriptions of the general geology
and of the placer and lode mines of the district.

357. Lindgren, Waldemar
Monazite from Idaho;
Amer. Jour. Sci., 4th ser., vol. 4, pp. 63-64, 1897;
Records presence of monazite in placer sand at Idaho City and Placerville.

358. Lindgren, Waldemar
The canyons of the Salmon and Snake rivers, Idaho (abstract);
Science, new series, vol. 7, pp. 71-72, 1898;
Abstract of a paper giving data published more fully in official
reports. Says Columbia River basalt made lake in lower Snake River
Plain.

359. Lindgren, Waldemar
Description of the Boise quadrangle;
Describes the geology of the Boise quadrangle.

360. Lindgren, Waldemar
Mining districts of the Idaho Basin and the Boise Ridge, Idaho;
Geologic maps
Give general geologic and geographic data on the part of the Snake
River Valley around and north of Boise and describe lodes and
placers in Boise Basin (which he calls Idaho Basin) and the Neal,
Black Hornet, Boise, Shaw Mountain, and Pearl districts.

361. Lindgren, Waldemar
The copper deposits of the Seven Devils, Idaho;
Gives data on the Peacock and other mines based on a visit in October,
1897. Practically no development had been done in the district then
except surface cuts, although the deposits had long been known. Notes
that the limestone associated with the old volcanics contains crinoids
and is probably Carboniferous. The Peacock ore body as exposed in an
open cut is 35 feet wide and is bonite in a contact metamorphic gneiss,
perhaps 10% copper.

362. Lindgren, Waldemar
The gold belt of the Blue Mountains of Oregon;
1901. Reconnaissance geologic map.
A reconnaissance in southeast Oregon which includes some data on
adjoining parts of Idaho.

364. Lindgren, Waldemar
Mineral deposits of the Bitterroot Range and Clearwater Mountains, Montana;
A brief preliminary report of the work reported in detail in Prof. Paper
27.

365. Lindgren, Waldemar and Drake, W. F.,
The Nampa Folio;
Describes the general geology of the Nampa quadrangle.
Lindgren, Waldemar

A geological reconnaissance across the Bitterroot Range and Clearwater Mountains in Montana and Idaho:

Lindgren, Waldemar and Drake, N. F.,
The Silver City Folio:

Lindgren, Waldemar
The Idaho penplain (discussion):
Econ. Geol., vol. 13, pp. 466-488, 1918. Favors Eocene age for the penplain, largely on the basis of the relation of the Columbia River basalt to the mountains.

Livingston, D. C., and Stewart, C. A.,
Geology and ore deposits of the Dixie mining district, Idaho:

Livingston, D. C.,
Geology of Idaho:

Livingston, D. C.,
The Idaho penplain (discussion):
Econ. Geol., vol. 13, pp. 488-492, 1918. Relief map. Supports concept of Eocene age of the penplain mainly on basis of relation to Columbia River basalt.

Livingston, D. C.,
Tungsten, cinnabar, manganese, molybdenum, and tin deposits of Idaho:

Livingston, D. C., and Lacey, F. B.,
The copper deposits of the Seven Devils and adjacent districts:

Livingston, D. C.,
A geologic reconnaissance of the Mineral and Cuddy Mountain mining districts, Washington and Adams counties, Idaho:
Idaho Bureau of Mines and Geology Pamphlet 13, 1925. Geologic maps of a narrow strip bordering Snake River below Huntington and of the Heath and Mineral mining districts. Discusses and maps the geology of the districts named and of a strip along the Snake River below Huntington. Postulates that some of the lodes may be pre-Triassic and some, including the disseminated copper deposits, may be Tertiary. 154.
375. Livingston, D. C.,
Geology and underground water resources of Big Lost River Valley: Idaho Bureau of Mines and Geology Press Bull., 1931
Summarizes results of a brief study.

377. Livingston, D. C.,
Advances a theory that a thrust fault extends from Burnt River, Oregon, northeast across the Snake and Salmon rivers in Idaho.

378. Livingston, D. C.,
Overthrusting in central and western Idaho (abstract):
Brief statement of his concept that one long thrust extends from southeast Oregon through Mineral, Idaho, towards Grangeville and another, further east, extends towards and perhaps connects with the fault east of the Bitterroot Mountains. Neither thrust has yet been proved.

379. Livingston, D. C.,
Opportunities in Thunder Mountain district, Idaho:
Min. and Met., vol. 14, No. 316, p. 271, June, 1933.
A criticism of No. 512, postulating that the material Ross calls a mud flow in the Challis volcanics is gouge on a thrust fault.

380. Loughlin, G. F., and Burchard, E. F.,
The stone industry in the United States in 1913:
Contains a location map. Gives analyses and crushing tests of some of the rocks quarried. Granite, limestone, sandstone, lava are quarried, but industry is small. This paper is a summary of the whole subject.

381. Lupton, C. T.,
The Winiata coal field, Clearwater, Lewis, and Idaho counties, Idaho:

382. MacDonald, D. F.,
Economic features of northern Idaho and northwestern Montana:
This is a resume of the economic results of the reconnaissance by Calkins and MacDonald. The districts described are Pine Creek, Priest Oreille Lake, Troy, Sylvania, Snowshoe, Cabinet, and Prospect Creeks. Most of the deposits are mined for lead and silver; some gold.

383. Maguire, Don
Central Idaho gold field:
Notes on parts of Lemhi, Custer, Valley, Idaho, and Clearwater counties, especially a gold prospect west of Shoup.

384. Maguire, Don
Snake River gold fields:
A general descriptive article.
386. Malott, Conner, 
Gold rushes of the Northwest: 
Mining Truth, vol. 15, No. 18, pp. 5-6, 14, 1930. 
Mentions the early history of the Clearwater County, Elk City, 
Florencce, Boise Basin districts.

386A. Mann, R. L., 
Ruby Creek mining district: 
Brief description of lead-silver prospects in schist on Peteatch River.

387. Mansfield, G. R., 
An unusual type of lateral hanging valley: 
Description of a remnant of a valley belonging to a previous 
erosion cycle about 6 miles east of Soda Springs.

388. Mansfield, G. R., and Larsen, E. S., 
Nepheline basalt in the Fort Hall Indian Reservation, Idaho: 
A petrographic description of an unusual rock belonging to the 
Snake River basalt.

389. Mansfield, G. R., 
Nitrate deposits in southern Idaho and eastern Oregon: 
Describes a deposit of cave nitrate near Homedale, Owyhee County, 
and at Soldier, Cassia County, and others in Oregon.

390. Mansfield, G. R., 
Subdivisions of the Thaynes limestone and Nugget sandstone, Mesozoic, 
in the Fort Hall Indian Reservation, Idaho: 
A stratigraphic paper.

391. Mansfield, G. R., and Roundy, P. V., 
Revision of the Bannock and Bear River formations of southeastern Idaho: 
A stratigraphic paper.

392. Origin of western phosphates of the United States: 
Believes they are bedded deposits, not the result of supergene con-
centration. Reviews the literature. Summarizes available data on 
physiographic conditions affecting phosphate deposition.

393. Mansfield, G. R., 
Types of Rocky Mountain structure in southeastern Idaho (abstract with 
discussion by G. W. Stose): 
Same as the writer's Journal of Geology paper (No. 398).

394. Mansfield, G. R., 
The Wasatch and Salt Lake formations of southeastern Idaho: 
Assembles available stratigraphic data and gives index map 
of mapped areas.
396. Mansfield, G. R.,
Triassic and Jurassic formations in southeastern Idaho and neighboring regions;
Assembles stratigraphic data.

397. Mansfield, G. R.,
Coal in Eastern Idaho;
Gives geologic data related to the occurrence of coal.

398. Mansfield, G. R.,
Types of Rocky Mountain structure in southeastern Idaho;
Jour. Geol., vol. 29, No. 5, pp. 444-469, July-August, 1921.
Describes (1) unconformities, (2) swallowtail folds, (3) the Sannock thrust, (4) the Blackfoot fault, (5) drag folds, (6) fan folds, (7) the Meadow Creek graben.

399. Mansfield, G. R.,
Igneous geology of southeastern Idaho;
The rocks comprise rhyolitic ash, hornblende, andesite, porphyry, the age of which has not been fixed closer than that it is Tertiary, and rhyolite and olivine basalt regarded as of Quaternary and possibly Pleistocene age.

400. Mansfield, G. R.,
The geography of part of southeastern Idaho (abstract);
See No. 320 and No. 408.

401. Mansfield, G. R.,
Structure of the Rocky Mountains in Idaho and Montana;
Describes the thrust faulting and the folding. Estimates the amount of crustal shortening and gives concepts as to causes of deformation.

402. Mansfield, G. R.,
Tertiary planation in Idaho; (Abstract)
See No. 403.

403. Mansfield, G. R.,
Tertiary planation in Idaho;
Discusses the Idaho penplain in the light of his work in southeast Idaho. Reviews the literature. For southeast Idaho, evidence favors pre-middle Miocene planation.
404. Mansfield, G. R.,
Physiography of southeastern Idaho (abstract);
Essentially same as his paper before Assoc. Amer. Geographers.
(No. 405)

405. Mansfield, G. R.,
Geography of southeastern Idaho;
Assoc. Amer. Geographers, Annals, vol. 15, No. 2, pp. 51-64, June, 1925.
Outlines the complex physiographic history of the region. The
early peneplain, recorded by fragments at high levels, was dis-
turbed by Mid-Miocene deformation and later has been dissected
in about six partial erosion cycles.

406. Mansfield, G. R.,
The geography, geology, and mineral resources of part of southeastern Idaho;
An exhaustive treatise with geologic maps, etc.

407. Mansfield, G. R.,
The Idaho phosphate field;
Min. and Met., vol. 9, pp. 19-20, January, 1928.
A general summary of available data.

408. Mansfield, G. R.,
Phosphate in the United States;
Les réserves mondiales en phosphates (prepared for the XIV Congrès
Includes summary of data on Idaho phosphate field.

409. Mansfield, G. R.,
Structure of the Blackfoot Mountains, Idaho (abstract);
The older strata (Upper Mississippian to Lower Cretaceous)
are largely overlapped by Tertiary beds. There is much folding
and thrust and normal faulting. Holds that reduction in the
earth's volume by gravity and other causes is the probable source
of the great horizontal stresses which have produced the overthrusts.

410. Mansfield, G. R.,
Geography, geology, and mineral resources of the Fortneuf quadrangle,
Idaho;
All the Paleozoic and later systems, except the Jurassic, Cretaceous,
and early and middle Tertiary, are represented. Bannock overthrust
goes through the area. Old rocks largely covered by Tertiary beds.
Phosphate is present.

411. Mansfield, G. R.,
Some problems of the Rocky Mountain phosphate field;
Econ. Geol., vol. 26, No. 4, pp. 353-374, June-July, 1931.
Gives a summary of data and theories regarding the Phosphoria
formation (Perman) which comprises phosphatic shale below and the
Bex chert above. Postulates that both the phosphate and chert
originated largely through chemical precipitation.

412. Mansfield, G. R., and Boardman, Leona
Nitrate deposits of the United States;
Describes nitrate deposits, none of which is of economic value, in
Bannock, Bingham, Blaine, Bonneville, Caribou, Clark, Custer, Elmore,
Fremont, and Owyhee counties. Most are of the lake type.
413. Mansfield, G. R., and Ross, C. S.,
Welded pyroclitic tuffs in southeastern Idaho:
Nat. Research Council, August, 1935.
Describes tuff formed of glass shards so hot when they fell that
they welded together.

414. Marshall, R. B.,
Retraction of the Boundary line between Idaho and Washington from the
junction of the Snake and Clearwater rivers northward to the International
Boundary:
U. S. Geol. Survey Bull. 466, 1911.
Gives contour strip map of boundary and description of methods
of surveying used.

Profile surveys in the basin of Clark Fork of the Columbia River, Montana-
Idaho-Washington:
Strip maps and profiles of streams in the area indicated.

416. Marshall, R. B.,
Profile surveys in Snake River Basin, Idaho:
Contains strip maps of Snake River from Enterprise to Minidoka, Salmon
River from Salmon to its mouth, and of the Little Salmon River.

Profile surveys in the Bear River Basin, Idaho:
Strip maps and profiles of the streams in the area indicated.

418. McCarthy, J. F.,
History of the Hecla mine, Burke, Idaho:
Min. and Met., vol. 5, p. 277, June, 1923.
Summarizes history and production record.

419. McCarthy, J. F., and Foreman, C. H.,
Mining methods of the Hecla Mining Company:
Min. and Met., vol. 4, No. 196, March, 1923;
Data on underground mining methods. No geology.

History of the Hecla mine:
Part 1, Compressed Air Magazine, vol. 35, pp. 2447-2449, June, 1928;
Part 1 summarizes early history and gives a table of production
and dividends through 1927 (McCarthy).
Part 2 summarizes reconstruction of the plant after 1923 (Wood).
Part 3 summarizes the operations of unwatering the mine and re-
installing electrical equipment after the fire (Stevenson).

421. McClellan, R. S.,
Rejuvenating the Gold Charlot property in Idaho:
Mainly a description of a new mill at the Golden Charlot mine,
Silver City, with a little geologic information.
422. McDermid, A. J.,
An informative description of the geology of the Gold Hill and Pioneer workings by the company's engineer.

423. McElroy, G. E.,
Mine ventilation in the Coeur d'Alene mining district, Idaho; U. S. Bureau of Mines Inf. Circ. 6862, 1931.
Mainly concerns ventilation, but gives some general data and vertical sections of several mines.

424. Meek, F. B.,
Description of fossils found by Bradley on the divide between Ross Fork and Lincoln Valley.

425. Meiner, O. E.,
Ground water in Pahsimerdi Valley, Idaho; Idaho Bureau of Mines and Geology Pamphlet 9, 1924, Geologic sketch map.
Discusses the geology with reference to hydrology. Valley floored by coarse alluvium, terraced. Prospects for artesian flow are poor. Suggests conserving surface water by reservoir.

426. Meiner, O. E.,
The origin of the thermal springs of Nevada, Utah, and southern Idaho; Jour. Geol., vol. 32, No. 4, pp. 295-303, May-June, 1924.
Includes map by streams showing relation of thermal springs and large cold springs to Snake River basalt plain. The thermal springs are largely related to faults which originated before the end of the Tertiary. Many are not closely related to volcanic rocks and do not derive heat from them. May be related to juvenile water.

427. Melville, W. H.,
Description of specimen collected by R. L. Packard in the Seven Devils mining district.

428. Mearns, J. G.,
Among others, reviews data on mammals of the Idaho formation. Says the Idaho is later than any other described Pliocene faunal zone of the Great Basin province. Not satisfactorily separated from the Fayette or from a possible intermediate formation.

429. Mearns, J. G.,
Describes three species from the Idaho formation, but gives no other data.
430. Merriam, J. C.,
Fauna of the Idaho formation (abstract).
Says fauna of the Idaho represents a Pliocene stage later than any
other of the Pacific Coast and Great Basin regions with possible
exception of the Tulare, on the western side of the San Joaquin Valley.

431. Merrill, G. F.,
Notes on the composition of certain "Pliocene sandstones" from Montana and
Idaho.
He found that a number of specimens collected by Peale and labeled
"Pliocene sandstone" were tuff. The Idaho localities are "Marsh
Creek Valley" and Port Neuf Canon. These are near Pocatello.

432. Merril, Geo. F.,
New meteorites (Oakley, Idaho; Forksville, Va.):
Describes meteoric iron specimen from Oakley.

433. Metzenbaum, Walter
Famous Silver City vein rediscovered:
Mining Truth, vol. 14, No. 3, pp. 5-6, 1929.
Note regarding new development on Golden Chariot vein, Silver City.

434. Miles, J. H.,
Gold dredging in the Boise Basin of Idaho:
Gives historical sketch of dredging in the basin with photos
and brief description of equipment.

435. Miles, J. H.,
Winter dredging in Idaho:
Gives difficulties resulting from operation in weather as cold
as 240 below zero.

436. Miller, A. E.,
Cephalopods of the Phosphoria formation of northwestern United States
(abstract):
Cites cephalopods indicative of middle Permian age.

437. Miller, A. E., and Cline, L. M.,
The cephalopods of the Phosphoria formation of northwestern United States:
Concludes that the cephalopods, which occur only in the middle and
upper parts of the formation, show these parts are Middle Permian.
Representatives of several genera are described.

438. Moore, S. R.,
Geology of the Success mine, Coeur d'Alene district, Idaho:
A note describing a specimen regarded as supporting the view that
the granite in the Success mine is pre-mineral.

439. Neale, W. G.,
One of the successors of the Copper Handbook. Gives (among others)
brief descriptions of many Idaho mines.
Newberry, J. S.,
Geological facts recently observed in Montana, Idaho, Utah, and Colorado;
N. Y. Acad. Sci., Trans., vol. 1, pp. 4-8, 1861;
Brief notes on Snake River gold and on a few lodes in Custer and
and Blaine counties, also on flora and fishes of Idaho.

Newhouse, W. H., and Flaherty, G. F.,
The texture of some banded or schistose sulphide ores;
Mentions gneissic galena of the Coeur d'Alenes.

Nicholas, Francis C.,
Reconnaissance of the Dixie Royal mining district;
Briefly outlines author's concept of the geology of the Dixie
gold district, Idaho County.

Nichols, Ralph
Lead-silver mines of Gilmore, Idaho;
Gives history, geology, and production of the principal mines of
the Texas district, Lemhi County. They are replacements of lead
ore (mainly oxidized) along fissures in limestone.

Nighman, C. E.,
Phosphate mine of the Anaconda Copper Mining Company;
A description of the principal producer in the Idaho phosphate field.

North and Eberhardt (mining brokers):
Coeur d'Alene facts and figures;
Northwest Mining News, vol. 1, No. 1, pp. 7-8, 1907.
Gives historical data and a table of production from 1883 to 1906, incl.

Nye, Robert
The Boise Basin mining district;
Min. and Sci. Press, vol. 81, p. 400, October 6, 1900.
A summary of the history and geology of the area.

Packard, R. L.,
An occurrence of copper in western Idaho;
Briefly describes the Peacock mine and the Victoria mine in the
vicinity of the Seven Devils district. Ore is bornite in an
epidote garnet rock in limestone.

Palache, Charles
Note on epidote and garnet from Idaho;
Describes specimens from the Seven Devils district.

Palmer, Jesse T.
The Shoshone Ice cave of Idaho;
Describes a cave in basalt near Shoshone which contains ice the
year around.

162.
450. Palmer, Jesse T.,
Outline of the geology of Idaho;
Geog. Soc. of Philadelpia Bull., vol. 29, No. 4, pp. 55-61 (299-306),
October, 1931.
Brief summary of published data.

451. Pardee, J. T.,
Geology and mineralization of the upper St. Joe River Basin, Idaho;
One of the reports resulting from mineral classification of the lands involved in the Northern Pacific claims.

452. Pardee, J. T., and Bryan, Kirk
Geology of the Latas formation in relation to the lavas of the Columbia plateau near Spokane, Washington;
The original definition of the Latas formation which lies at the base of the Columbia River basalt near Spokane and near Coeur d'Alene, Idaho. Notes that there are valley flows filling canyons in the Columbia River basalt.

453. Peale, A. C.,
Report on minerals, rock thermal springs, etc.;
Describes a visit to Soda Springs.

454. Peale, A. C.,
Report on the geology of the Green River district;
Includes all of the region described in Prof. Paper 152, except the Cranes Flat quadrangle.

455. Peale, A. C.,
Jurassic section of southeastern Idaho and western Wyoming;
Title records character of paper.

456. Peterson, F. R.,
Rate and mode of soil deposition in the Palouse area of Washington and Idaho;
Science, New Ser., vol. 55, pp. 102-103, 1922.
Concludes soil is deposited by wind at rate of about 7,500 pounds per acre per year.

457. Phalen, W. C.,
Salt resources of the United States;
Salt has been produced in Bannock and Bear Lake counties from saline springs and in pre-Pleistocene alkali flats. Of local use only unless railroad becomes available.

458. Piper, A. M.,
Geology and water resources of the Goose Creek Basin, Cassia County, Idaho;
A geologic study made with a view to possible development of ground water. Includes a reconnaissance geologic map, mainly showing Tertiary and later rocks.
459. Piper, A. M.,
Geology and water resources of the Bruneau River Basin, Owyhee County, Idaho;
Concludes that there is a possibility of further development of artesian water from aquifers in the Eocene strata. The reconnaissance map shows Tertiary and later rocks only, but Paleozoic strata and granitic rocks are present.

460. Piper, A. M.,
Possibilities of petroleum in Power and Oneida counties, Idaho;
Idaho Bur. Mines and Geology Pamphlet 12, 1924. Reconnaissance geologic map of parts of the two counties;
Concludes that the geology is unfavorable for oil. Area contains Eocene and Pleistocene lava and sediments, including the Salt Lake formation, Wapiti, Nampa, Madison, Three Forks, Jefferson, Laketown, Fish Haven, Swan Peak, Garden City, and Cambrian strata, are present.

461. Piper, A. M.,
Gold deposit near Freedom, Idaho;
Describes recently found low-grade gold lodes in schist about 35 miles south of Grangeville and 2 miles southeast of Freedom. Notes presence of a chromium mineral.

462. Piper, A. M.,
Ground water for irrigation on Camas Prairie, Camas and Elmore counties, Idaho;
Idaho Bureau of Mines and Geology Pamphlet 16, 1926. Reconnaissance geologic map;
Shows that Camas Prairie is an artesian basin in which the water is derived from gravel and sand in the younger alluvium. Suggests deep test drilling. Summarizes general geology of the area; Paleozoic strata, Idaho batholith, three kinds of Tertiary lava.

463. Piper, A. M., and Kirkham, V. R. D.,
Ground water for municipal supply at Idaho Falls, Idaho;
Idaho Bureau of Mines and Geology Pamphlet No. 16, 1926.
Recommends drilling 500-600 feet or more to bed of porous basalt and sand and gravel.

464. Piper, A. M., and Lanev, F. B.,
Geology and metalliferous resources of the region about Silver City, Idaho;
Idaho Bureau of Mines and Geology Bull. 11, 1926. Geologic maps;
A detailed account. Shows that there is a complex fault system. This is the best known of the districts showing Tertiary mineralization. The more accessible ore is worked out, but there is hope at depth.

465. Pointen, B. J.,
Warren mining district;
Northwest Mining Truth, pp. 3-4, August 19, 1921.
A summary of production and other data for the Warren, Marshall Lake, and Edwardsburg districts, written by the Secretary of the Warren Commercial Club.

466. Powell, F.,
Gold dredging on Snake River in Idaho;
Mainly a description of different dredges, but gives some data on history of development and character of gravel.
467. Price, G. S.,
Milling methods and costs at the Page concentrator of the Federal Mining & Smelting Company, Kellogg, Idaho;
A metallurgical paper, but gives a description of ore treated.

468. Rand, L. E., and Sturgis, E. B.,
The Mines Handbook, Vol. 18 (Two parts), 1931:
Mines Information Bureau, Suffern, N.Y.
The current successor to the Copper Handbook. Among others, has brief descriptions of many Idaho mines.

469. Ransome, F. L.,
Coeur d'Alene district:
Mainly historical, with brief geologic data and written in popular language.

470. Ransome, F. L.,
Ore deposits of the Coeur d'Alene district, Idaho;
An advance paper covering the same ground as Ransome's part of the Coeur d'Alene professional paper.

471. Ransome, F. L.,
The relation between certain ore-bearing veins and gangue fissures:
Refers to gangue-filled, pre-ore fissures. One example is Lindgren's description of Delamar mine. Describes a case in the Standard-Mammoth in the Coeur d'Alene from his own data.

472. Ransome, F. L., and Calkins, F. G.,
The geology and ore deposits of the Coeur d'Alene district, Idaho;
The most complete and detailed description of the geology of the Coeur d'Alene district available. Describes and correlates the Belt rocks. The lead-silver ore is from metasomatic-fissure veins in the siliceous rocks, mainly in the Ravett and Burke. There are gold quartz veins, formerly more productive than at present, those so far known being in the Fichardt slate. The only copper deposit of importance is the Snowstorm, an impregnated zone following bedding in the Ravett.

473. Ransome, F. L.,
Reply to Hershey's paper on Wardner district, Idaho;
Shows that Hershey's complicated theories are in part improbable and are not supported by much evidence.

474. Ray, F. A.,
The copper beds of the Coeur d'Alene district:
Critiques Huston's article (vol. 110, pp. 145-147) and argues for hypogene origin of the copper minerals.
475. Reed, John C., Jr.
Gold-bearing gravels of the Naches National Forest, Idaho County, Idaho:
Describes placer gold in Elk City, Ten Mile, and Castle Creek districts.
Postulated to belong to two varieties; (1) along and related to
present streams, (2) in higher level remnants of sediments deposited
on an old distorted erosion surface.

476. Reed, John C., Jr.
Early and recent mining activity in north-central Idaho:
Cites salient facts as to the mining history of the Clearwater
country and the northern Salmon River Mountains.

477. Reid, G. D.
The Seven Devils and the Snake River district:
Eng. and Min. Jour., vol. 84, p. 401, August 31, 1907.
Gives very brief descriptions of the two districts and expects
them to develop when railroad from Huntington to Lewiston is
completed.

478. Rice, Howard E.
The Hagerman, Idaho, fossil locality:
A popular summary of data on the locality.

479. Rich, J. L.
An old erosion surface in Idaho; is it Eocene?
Econ. Geol., vol. 13, pp. 120-136, 1918.
Challenges geomorphic concepts advanced by Umpleby (634) and by
Atwood (37), Thinks basins in Idaho and Montana, in part filled
by volcanic materials, have not been proved to be and are probably
not younger than the summit peneplain. Shows that the course of
the Salmon River is better accounted for by superposition than by
 piracy.

480. Rich, J. L.
Dating of peneplains; an old erosion surface in Idaho, Montana, and
Washington; is it Eocene?
(Report with discussions by Clark, B. L., and Blackwelder, Eliot:
Says the intermontane troughs with Tertiary sediments in them
may be older than peneplanation.

481. Richards, R. H., and Bridges, J. H.
Sulphur deposits near Soda Springs, Idaho:
Describes a group of sulphur springs with associated deposits of
native sulphur. The H2S may be of volcanic origin. Commercial
value doubtful.

482. Richards, R. H., and Hansfield, G. R.
Preliminary report on a portion of the Idaho phosphate reserve:
One of the early phosphate reports covering much of Bear Lake
County and a little of Caribou County (then Bonneville).

186.
483. Richards, R. W.,
Notes on lead and copper deposits in the Bear River Range, Idaho and Utah:
Lead ore is galena, etc., in calcite and dolomite gangue, tabular
replacements of limestone. Copper ore is oxidized copper minerals
in quartz veins with tennantite and tetrahedrite in a siliceous breccia.

484. Richards, R. W.,
The Bannock overthrust, a major fault in southeastern Idaho and northeastern
Utah:
The original description of the Bannock fault.

485. Richards, R. W.,
Methods of field work in the phosphate districts of Idaho, Montana,
Wyoming, and Utah (discussion):
Econ. Geol., vol. 8, pp. 181-186, 1913.
Mainly a description of plane table methods.

486. Richards, R. W., and Mansfield, G. R.,
Structural features of a portion of southeast Idaho (abstract):
Mentions Bannock thrust, etc.

487. Richards, R. W., and Mansfield, G. R.,
Geology of the phosphate deposits northeast of Georgetown, Idaho:
Contains detailed data as to the phosphate deposits of the region,
covered with much other geologic information including a description
of the Bannock overthrust, first recognized along this investiga-
tion.

488. Richard, T. A.,
The Bunker Hill enterprise:
Min. and Sci. Press, vol. 120, Jan 3, pp. 5-13; Jan. 10, pp. 41-46;
Mar. 6, pp. 337-346; Apr. 3, pp. 481-493; Apr. 10, pp. 521-530;
May 15, pp. 703-708; May 29, pp. 731-762, 1920; vol. 121, Aug. 14,
Also issued in pamphlet form. Maps.
Largely an historical account, but gives data on mining, milling,
and geology with mine maps and sections.

489. Ross, C. F.,
A new copper district near Salmon, Idaho:
Advance article covering district described in U. S. Geol. Survey
Bull. 774.

490. Ross, C. F.,
Tertiary planation in eastern Oregon and central Idaho (abstract):
Pan-Amer. Geologist, vol. 43, No. 6, p. 367, June, 1925.
Greatest erosion probably preceded Tertiary eruptions. The
"lake beds" in Lemhi Valley fill depressions in the planed
surface. Opinions here outlined revised later.

491. Ross, C. F.,
The copper deposits near Salmon, Idaho:
Describes copper deposits of moderately high temperature in
shear zones in Belt strata.
492. Ross, C. P.,
A disseminated lead prospect in northern Boise County, Idaho;
Idaho Bureau Mines and Geology Pamphlet No. 20, 1928.
Describes lead ore disseminated in granite in an extension
of the "porphyry belt" of Boise Basin. Mineralization is pre-
sumably Tertiary.

493. Ross, C. P.,
Some features of the Paleozoic stratigraphy of Idaho (abstract);
Outlines probable distribution of Paleozoic seas in Idaho.

494. Ross, C. P.,
The Vienna district, Blaine County, Idaho;
Small ruby silver deposits in granitic rock which can probably
be worked satisfactorily under favorable conditions.

495. Ross, C. P.,
Ore deposits in Tertiary lava in the Salmon River Mountains, Idaho;
Idaho Bureau of Mines and Geology Pamphlet No. 25, 1927.
Summarizes briefly available data on the Yankee Fork, Parker
Mountain, Singis, Musgrove, and Thunder Mountain districts.

496. Ross, C. P.,
Salient features of the geology of south-central Idaho (abstract);
Widespread marine, Belt strata appear to have been deformed and
overthrust in the Pre-Cambrian. Apparently since about the end of
the Pre-Cambrian the area in which the Idaho batholith is now ex-
posed has been above the sea although in east-central Idaho seas
persisted through most of the Paleozoic. Uplift in the area of
the batholith is related to intrusion rather than to deformation of geo-
synclinal deposits. The Idaho batholith all came to place in one
period of intrusion and is at least as old as Cretaceous and younger
than Triassic. Granite again came in during the mid-Tertiary. Partial
peneplanation preceded and followed extensive Tertiary volcanism.

497. Ross, C. P.,
Mesozoic and Tertiary granitic rocks in Idaho;
Jour. Geol., vol. 36, No. 8, pp. 673-693, 1928. Map showing principal
granitic masses in Idaho.
Outlines the then available data as to character and age of the
granitic rocks of Idaho. Shows that granite intrusion took place
at least twice, once near the end of the Jurassic or early in the
Cretaceous and again in the mid-Tertiary.

498. Ross, C. P.,
Early Pleistocene glaciation in Idaho (abstract);
An abstract of the data in No. 501.

499. Ross, C. P.,
History of mining in Idaho (abstract);
Outlines the conclusions based on data presented in No. 506.

500. Ross, C. P.,
Classification of the ore deposits of south-central Idaho (abstract);
An abstract of the data presented in No. 508.
501. Ross, C. F., Early Pleistocene glaciation in Idaho:
Shows that at least two periods of glaciation during the Pleistocene are recorded in Idaho. Describes glacial deposits in the Custer quar- drangle that were deeply cut into by erosion prior to Wisconsin glaciation.

502. Ross, C. F., The Seafoam mining district, Custer County. In Geology and ore deposits of the Seafoam, Alder Creek, Little Smoky, and Willow Creek mining districts, Custer and Camas counties, Idaho:
The area is underlain by the Idaho batholith with roof pendants. Ore deposits are sideritic lodes and irregular replacements in limestone.

503. Ross, C. F., The Alder Creek mining district, Custer County, Idaho. In Geology and ore deposits of the Seafoam, Alder Creek, Little Smoky, and Willow Creek mining districts, Custer and Camas counties, Idaho:
The Empire copper mine near Mackey is the only deposit with much of a production record. The principal contribution of this paper is that the mineralizing granitic rock is Tertiary.

504. Ross, C. F., The Little Smoky and Willow Creek mining districts, Camas County, Idaho. In Geology and ore deposits of the Seafoam, Alder Creek, Little Smoky and Willow Creek mining districts, Camas and Camas counties, Idaho:
Districts contain the Idaho batholith. Carboniferous strata and Tertiary volcanics. Principal deposits are of the sideritic type. Little activity for a long time.

A brief presentation of the views of Ross, Mansfield, and Anderson regarding the geomorphic history of Idaho. Ross, who finds that high level peneplain remnants in south-central Idaho are of late Tertiary age, makes tentative suggestions to reconcile his data with those of Anderson, who reports that in northern Idaho high level remnants of Cretaceous age are recognizable.

506. Ross, C. F., A graphic history of metal mining in Idaho:
Gives resume of production history mainly by graphs and concludes (1) that, except in Shoshone County, production has been governed primarily by discovery of ore and only secondarily by such economic factors as price and demand; (2) that in most counties the quantity of workable ore found in any one period has been small; (3) that the production of lead-silver ore is the only branch of the industry likely to be of much importance in the near future.
Ross, C. F.,
The physiography of south-central Idaho (abstract);
Most of the region was exposed to erosion from the close of the Paleozoic to the Cenozoic or later. The peneplain existing early in the Tertiary was dissected before being covered by Challis volcanic. The summit peneplain now recognizable is in part cut across these volcanics. Subsequently there was superposition, differentiation, lifting, and piracy resulting in a complex drainage pattern. Erosion in northern Idaho since the eruption of the Columbia River basalt has been interpreted as mainly confined to valley cutting. This difference with the history of neighboring regions may result from retardation of erosion through subsidence related to the basaltic eruption.

Ross, C. F.,
A classification of the lode deposits of south-central Idaho;
*Econ. Geol.*, vol. 26, No. 2, pp. 169-185, 1931.
Presents in tabular form a classification of the lode deposits of the region with brief discussion of the different kinds.

Ross, C. F.,
Some features of the Idaho batholith (abstract);
*Northwest Sci.*, vol. 7, No. 2, pp. 33-34, 1933.
A brief summary of concepts as to age and structural relations. See No. 522 for more extended account.

Ross, C. F.,
The lode deposits in the Boise Basin, Idaho;
*Econ. Geol.*, vol. 28, No. 4, pp. 329-343, 1933.
Outlines existing data as to lodes of the Basin. They have not been extensively developed in the past, but are promising. Five kinds of lodes are recognized, in part related to the Idaho batholith, in part to Tertiary dikes.

Ross, C. F.,
The Thunder Mountain mining district, Valley County, Idaho;
Outline map of the district. Essentially the same article as was later printed in *Econ. Geol.* (No. 512)

Ross, C. F.,
The Thunder Mountain mining district, Valley County, Idaho;
*Econ. Geol.*, vol. 28, No. 6, pp. 587-601, 1933.
Outline map of the district. Describes the geology of the Thunder Mountain district. Deposits of low-grade gold ore, of promise for large scale development, are found in effusive rocks (Oligocene or Mioocene).

Ross, C. F.,
The ore deposits of Idaho in relation to structural and historical geology: Ore Deposits of the Western States (Lindgren Volume);
Map. Summarizes the geology of Idaho and shows most of its ore deposits are related either to Idaho batholith or to mid-Tertiary intrusions. Many of the Tertiary lodes are related to certain zones of deformation which affected early Tertiary volcanic rocks.

Ross, C. F.,
Idaho, in Mesothermal gold deposits, by J. F. Connelly: Ore Deposits of the Western States (Lindgren Volume);
Briefly describes mesothermal deposits in Boise Basin, 170.
516. Ross, C. F.,
The Poke mining district, Butte County, Idaho:
Describes mainly the Wilbert mine which has a long record of production of lead ore formed by replacement in Ordovician dolomite associated with a thrust fault.

516. Ross, C. F.,
Some lode deposits in the western part of the Boise Basin, Idaho:
Describes lodes in the northwestern part of the Boise Basin that were under development at time of visit in 1930. Country rock is mainly granitic rock of the Idaho batholith cut by dikes of Miocene (?) age. Some lodes are related to the batholith, but most are related to the dikes. The principal value is in precious metals although some base metals are present. The area has promise.

517. Ross, C. F., and Milton, Charles
Stratigraphic correlation by heavy minerals in Paleozoic beds in Idaho (abstract):
Study of material from the Beyhorse region shows that even in highly indurated and somewhat metamorphosed sedimentary rocks heavy minerals may assist in stratigraphic correlation.

518. Ross, C. F.,
Geology and ore deposits of the Casto quadrangle, Idaho:
The quadrangle contains Belt strata, small amounts of beds of probable early Paleozoic age, effusive rocks of Permian (?) and Tertiary age, granitic rocks related to the Idaho batholith and granite and other intrusive rocks of mid-Tertiary age. Ore deposits related to both periods of intrusion are present, but have had little recent activity.

519. Ross, C. F.,
Correlation and interpretation of Paleozoic stratigraphy in south-central Idaho:
A compendium of available data with lists of all fossils recorded in published reports or in papers then in process of publication by the U. S. Geol. Survey. Among the principal points made is the concept that a positive area has occupied the site of the present Idaho batholith since about the end of the pre-Cambrian with a Paleozoic geosyncline east of it.

520. Ross, C. F.,
Geomorphology of south-central Idaho (abstract):
Gives brief summary of author's concepts, among which are that an early Tertiary partial peneplain was dissected prior to eruption of Challis volcanics (late Eocene or early Miozene). This volcanism was followed by another partial peneplanation with numerous short-lived subsequent events.

171.
521. Ross, C. P.,
Copper in Idaho: Copper Resources of the World.
Gives general data for the state and summary descriptions of the
Alder Creek district, the copper belt of the Coeur d'Alene region
and copper districts in the Lemhi Range.

522. Ross, C. P.
Some features of the Idaho batholith;
1936.
Shows that the batholith, mainly quartz monzonite, came to place mainly
as a unit, with relatively intense deformation on the margins, in part
directly associated with the intrusion.

523. Ross, C. S., and Shannon, E. V.
Mordenite and related minerals from near Challis, Custer County, Idaho:
States that the mineral supposed by Kock to be ptilolite is mordenite
and probably came from a vesicular andesite.

524. Rowe, J. F.
Pseudomorphs and crystal cavities:
Describes cavities and limonite pseudomorphs after pyrite in quartzite
near Shoshone.

526. Rowe, J. F.
Coeur d'Alene mining district:
Mining World, vol. 28, pp. 739-740, November 14, 1908;
Mining World, vol. 28, pp. 777-778, November 21, 1908;
Mining World, vol. 29, pp. 843-845, December 6, 1908.
Summary data on history, geology, mining methods, etc.

527. Russell, I. C.
Geology and water resources of Nez Perce County, Idaho;
Considers that the Columbia River lava is laid down on the deeply
weathered surface of old rocks eroded to moderate relief. The deep
soil of the region results from decay of the lava. There has been
subsidence of the lava plateau of at least 1,000 feet, and gentle
folding of the lava with faulting in places. He believes the Snake
and Salmon rivers, etc., were established prior to the movements.

528. Russell, I. C.
Geology and water resources of the Snake River Plains of Idaho;
Gives a comprehensive word-picture of the Snake River Plains.

529. Russell, I. C.
Preliminary report on artesian basins in southwestern Idaho and southeastern
Oregon;
Gives a sketch map of artesian basins along the Snake River as far
east as Glen's Ferry. The report summarizes the data then available
on artesian water in southeastern Oregon and southwestern Idaho.

172.
530. Russell, I. C.,
Notes on the geology of southwestern Idaho and southeastern Oregon:
U. S. Geol. Survey Bull. 217, 1903. Gives the same artesian basin map as
in Water Supply Paper No. 78.
The work on which the report is based was largely a search for artesian
areas and the data, hence, pertain to the lavas and sediments in the
Snake River Plains, etc.

531. Salisbury, R. D.,
Glacial work in the Western mountains in 1901:
Jour. Geol., vol. 9, pp. 716-731, 1901.
Gives data on ice lobes in the Pend Oreille and Kootenai valleys.

532. Sampson, Edward
Geology and silver ore deposits of the Pend Oreille district, Idaho:
A preliminary report summarizing the result of detailed work.
More complete report intend to come later.

533. Sayre, R. H.,
Arsenical ore deposits in the United States:
Gives general data on arsenic and lists occurrences in various
states, Mentions the War Dance (without naming it) and the Masoot,
Blaine County, Idaho.

534. Schick, Murray
Boise Basin turns to lodes:
A summary of recent activity.

535. Schofield, S. J.,
The origin of granite (micropegmatite) in the Purcell sills:
Concludes that sills came from a single reservoir, stratified
according to density.

536. Schrader, F. C.,
An occurrence of monazite in northern Idaho:
Describes monazite in placer deposits on Musselshell Creek,
Clearwater County.

537. Schrader, F. C.,
Molybdenite in the Rocky Bar district, Idaho:
U. S. Geol. Survey Bull. 760, pp. 87-99, 1924. Gives map showing location
of deposits, but no geology.
Molybdenite is in pegmatitic phase of granite and in related quartz
veins, also in the granite itself. There are numerous dikes in the
granite; also a mass of dark gray, flint-like, fine-grained, igneous
rock locally called "lime dike".

538. Schrader, F. C., and Ross, C. F.,
Antimony and quicksilver deposits in the Yellow Pine district, Idaho:
map of the region and a more detailed one of the vicinity of the quick-
silver deposits.
Describes all deposits accessible at the time.

173.
539. Schultz, A. R., and Richards, E. W.,
A geological reconnaissance in southeastern Idaho:
Geologic sketch map.
One of the early phosphate studies dealing mainly with the area be-
tween the Wyoming border and Longitude 115°, and between parallels
42°, 45°, and 48° 30'.

540. Schultz, A. E.,
A geological reconnaissance for phosphate and coal in southeastern Idaho
and western Wyoming:
A geologic sketch map which differ-
entiates only largest units.
Describes the general geology briefly and summarizes economic resources,
mainly phosphate, and rather poor coal in Idaho, some gold, etc.

541. Schuster, Julius
über ein pliozanes Eichenhölz aus Idaho:
Neu Jahrbuch, Pt. II, pp. 48-54, 1908.
A description of Querciniun (oak) Pliocene from Pliocene de-
posits near Lincoln City.

542. Shannon, E. V.,
On a supposed new occurrence of plattnerite in the Coeur d'Alene district:
A mineralogic note on specimens from the Morning mine at Mullan.

543. Shannon, E. V.,
Secondary enrichment in the Caledonia mine, Coeur d'Alene district, Idaho:
Econ. Geol., vol. 8, pp. 565-570, September, 1915.
Describes the relation of the supergene minerals, indicating enrich-
ment in silver and copper.

544. Shannon, E. V.,
Notes on unusual masses of plattnerite:
Amer. Mineralogist, vol. 2, pp. 15-17, 1917.
A mineralogic note on specimens from the Morning mine at Mullan.

545. Shannon, E. V.,
Some minerals from the Stanley antimony mine, Idaho:
A description of oxidized minerals from a mine near Burke, Shoshone County.

546. Shannon, E. V.,
On the occurrence of ilvaite in the South Mountain district, Owyhee County,
Idaho:
Gives mineralogic description of specimens and points out the interest
in ilvaite as indicative of contact metamorphic origin for the lead-
silver deposits here.

547. Shannon, E. V.,
Linaraite and leadhillite from Idaho:
Describes specimens from the Caledonia mines.

548. Shannon, E. V.,
Petrography of some lamprophyric dike rocks of the Coeur d'Alene mining
district, Idaho:
Detailed petrographic data on dikes that are abundant in the region.
Hornblende and biotite rocks form two fairly distinct classes. Specc-
artites are more abundant than ménzites and pernsntites and vogesites
are rare.
550. Shannon, E. V.,
An occurrence of naumannite in Idaho;
Naumannite (silver selenide) identified in specimen from the
silver stops of the Delamar mine. Collected as argentite by
Elbridge.

551. Shannon, E. V.,
Owyheeite;
Amer. Mineralogist, vol. 6, No. 4, pp. 88-93, April, 1921.
Describes a new mineral with formula Ag₂Pb₂(Se₂S₉) from the
Poorman mine, Silver City region. He had previously described
this as "silver- jamesonite". See reference No. 554.

552. Shannon, E. V.,
Additional notes on crystallography and composition of boulangerite;
Describes a specimen from the Wood River region, probably
from the Independence mine.

553. Shannon, E. V.,
On galenobismutite from a gold quartz vein in Boise County, Idaho;
Describes a specimen from the Helshazer mine.

554. Shannon, E. V.,
Boulangerite, bismutoplagionite, naumannite, and a silver-bearse variety
of jamesonite;
to Idaho).
Description of a mineral which he calls silver-jamesonite from the
Poorman mine, Silver City.

555. Shannon, E. V.,
Description of ferroanthophyllite, an orthorhombic iron amphibole from
Idaho, with a note on the nomenclature of the anthophyllite group;
A mineralogic note on a specimen from the Tamarack-Custer mine,
Shoshone County.

556. Shannon, E. V.,
Description of vivianite encrusting a fossil tusk from gold placers of
Clearwater County, Idaho;
Describes a specimen from a placer near Dent.

557. Shannon, E. V.,
Ludwigite from Idaho and Korea;
Describes Ludwigite, ferro magnesium borate, from Bruce Estate
mine, Lemhi County, Idaho, and gives an analysis. He also describes
a specimen from Korea.

558. Shannon, E. V.,
Mineralogy of some black sands from Idaho with a description of the methods
used for their study;
Gives a table of visible properties of minerals in "black sands". Lists
minerals found in about 60 samples in the Nat. Mus. mostly from three
localities (1) the Snake River bars; (2) Boise Basin, (3) Pierce City.
Among the minerals are ilmenite, garnet, zircon, platinum, monazite,
samarosite, titanite, columbite, polycrase, allunite, augite, olivine,
corundum, clinabre.
Shannon, E. V.,
Note on a garnet from a pegmatite in Idaho:
He thinks rose-colored garnet high in the pyrope molecule is the
common garnet of the pegmatite of the Idaho batholith. Gives an
analysis of one from the Laulla mine near Avon, Latah County.

Shannon, E. C.,
Notes on the mineralogy of three gouge clays from precious metal veins:
U. S. Nat. Museum Proc., vol. 82, art. 15, p. 11, 1922.
Describes (1) gouge from Black Jack mine, Carson district, Owyhee
County, Idaho, which consists of leuverrite; (2) sericitic-
muscovite gouge from Carroll-Driscoil mine, Boise Basin, Idaho;
(3) clay gouge from Garfield tunnel, Dalamar district, Idaho, which
resembles leuverrite. He concludes that muscovite, or at least
sericite, varies in potassium content, and that presence of sericite
is not proof of presence of potassium. Leuverrite can only be dis-
tinguished from sericite except on the basis of its low-temperature
water.

Shannon, E. V.,
An occurrence of iron-bearing gersdorffite in Idaho:
Describes (nickel, iron, cobalt) sulpharsenite from Slate Creek,
7 miles from Avery.

Shannon, E. V.,
An iron amphibole similar to hudsonite from Custer County, Idaho:
Description of a specimen from Rasche's prospect, Seacoa district.

Shannon, E. V.,
Jaspemnite from Slate Creek, Custer County, Idaho:
Amer. Mineralogist, vol. 10, No. 8, pp. 194-197, August, 1925.
Mineralogic description of specimen from the Crater mine.

Shannon, E. V.,
Tetradymite from the Bailey quadrangle, Idaho:
Amer. Mineralogist, vol. 10, No. 8, pp. 198-199, August, 1925.
Mineralogic description of specimen from prospect on upper Trail Creek.

Shannon, E. V.,
The minerals of Idaho:
Lists and describes all known mineral occurrences in Idaho. Reprints,
with additions to the bibliography. Hills list of Idaho mining dis-
tricts (U. S. Geol. Survey Bull. 507), Mineral descriptions are
subdivided by counties. The book is an excellent summary of present
knowledge of the mineralogy of Idaho.

Shannon, E. V.,
A lead ore consisting of native lead, leadhillite, and lothargite:
Mineralogic note on specimen from the Arizona mine, Wood River region.

Sheldon, G. L.,
The Yellow Jacket mine, Idaho:
Gives history of the mine from discovery in 1860 to date of article,
with some figures on production and costs.
Shenon, F. J.,
Geology and ore deposits of the Birch Creek district, Idaho:
Much the same data as in his previous article (No. 568) with some new details.

Shenon, F. J.,
Largely Carboniferous limestone, with Devonian limestone and Cambrian (?) quartzite. Follows Unbleby in believing the southward flowing stream once extended into Lemhi Valley. Says Birch Creek Valley is product of down-faulting. Ore deposits are replacements valuable for lead-silver and copper.

Shenon, F. J., and Reed, J. C., Jr.
Auriferous gravels of Elk and Newsome Creek basins, Idaho County, Idaho (abstract);
Basins essentially structural, formed in Tertiary, probably Miocene time by deformation blocking drainage. Most of the placer gold of central Idaho has come from such basins.

Shenon, F. J., and Reed, J. C., Jr.
The relationship of the quartz veins to the regional structure in the Elk City district, Idaho (abstract);
Points out that the veins are in general at right angles to the "mineral elongation" in the granite rock.

Shenon, F. J., and Reed, J. C., Jr.
Geology of the Elk City mining district, Idaho, with special reference to the structural setting of the veins;
Summarizes the geology of the district with emphasis on the fact that the veins tend to be at right angles to the "mineral elongation" in the granite rock.

Shenon, F. J., and Reed, J. C., Jr.
Geology of the Elk City, Crogrande, Buffalo Hump, and Ternmile districts, Idaho County, Idaho:
A preliminary report which summarizes available data on the gold lodes mainly in the Idaho batholith and Belt strata intruded thereby.

Shenon, F. J., and Reed, J. C., Jr.
Topographic and geologic map of the Elk City mining district, Idaho.
Includes the geologic map with brief description thereof.

Shenon, F. J., and Reed, J. C., Jr.
Down Idaho's "River of no return";
Mainly an account of experiences on a flat boat trip down Salmon River; includes some geology.
576. Shannon, F. J., and Ross, C. F.,
Geology and ore deposits near Edwardsburg and Thunder Mountain, Idaho.
This report gives the salient data on the gold lodes in Tertiary
volcanic strata in the Thunder Mountain district and on the gold-
quartz lodes and other ore deposits in large part related to Tertiary
dikes in the area around Edwardsburg. Reconnaissance geologic data
for the Eastern Division, Idaho National Forest, are included.

577. Shepherd, G. Frederick
Rifting and volcanic activity in the Craters of the Moon, Idaho (abstract).
Shows that evidence from the Craters of the Moon shows that the
Snake River lavas come from numerous individual vents and did not
extend lake-like over wide areas. Attributes the Great Rift to
regional, tectonic forces.

578. Shimmin, J. T.,
Sunshine mine increases silver output by improving products.
Mainly deals with recent mill and mine practice at the Sunshine
mine, Shoshone County, Idaho, but includes a summary description
of its geology.

579. Shockley, J. H.,
The origin of the fine gold in the Snake River, Idaho.
Eng. and Min. Jour., vol. 73, pp. 280-281, 1902.
From studies in Jackson Hole, he decides gold came mostly from
auriferous pyrite similar to that in andesite boulders. Says
that all gravels carry gold, but that bars with most sand carry
largest amount.

580. Stillman, Benjamin, Jr.
On an association of gold with scheelite in Idaho.
Describes a scheelite specimen from the Charity mine, Warren.

581. Simons, W. H.,
Annual Report for the Mining Industry of Idaho (Annually for 1933, 1934);
Report for 1934 contains map of Idaho showing mining districts.
Scope is same as previous issues of same series.

582. Simons, W. H.,
Early history of gold in Idaho;
A brief historical outline.

583. Simons, W. H.,
New prosperity at Warren;
Mining Truth, p. 7, December 7, 1933.
News note mainly as to dredging.

584. Skala, F. H.,
Preliminary report on the clays of Idaho;
This is in large a discussion of clays in general with Part II
of the report (pp. 24-71) describing samples of clay from various
places in Idaho. The results of the tests are considered encouraging.
585. Smith, J. F.
   The comparative stratigraphy of the marine Trias of Western America;
   Includes data on Triassic formations of southeastern Idaho.

586. Soper, E. K.
   Fire clays in northern Idaho;
   Describes fire clay of residual origin in Latah County.

587. Soper, E. K.
   The mining districts of northern Idaho;
   Sketch map.
   A brief resume of geology and mines of the region.

588. Sorenson, R. E.
   The geology and ore deposits of the South Mountain mining district, Owyhee County; Idaho;
   Idaho Bureau Mines and Geology Pamphlet 22, 1927.
   A reconnaissance map of the vicinity of the district and detailed geologic map of the district itself.
   Metamorphosed sedimentary rocks of unknown age are intruded by granodiorite and surrounded by basalt. There are contact metamorphic deposits, replacement veins and gold-quartz veins.

589. Spurr, J. E.
   Ore zones of Idaho;
   Comments on Thomasen and McGenigle's article on zonal distribution of ore in Idaho (No. 621). Shows that their tabulation of average distance of deposits of different metals from granite outcrops leads to an inference that gold was deposited at highest temperature followed in order by silver, lead, and copper, a sequence different from that required by the zonal theory. Seeks to bring data in line with theory by grouping deposits of different metals by areas.

590. Staley, W. W.
   Elementary methods of placer mining;
   Mainly a description of methods, but contains map of Idaho showing location of placer areas with list of placer mining districts.

591. Starmont, Leon
   Central Idaho has a new rush;
   Gives data on development near Lucille, based on unsubstantiated claims of rare metals.

592. Starmont, Leon
   Salmon River deal still a mystery;
   Notes that samples taken at the "rare metal" prospect near Lucille yield nothing on assay by U. S. Bureau of Mines and others.

593. Starmont, Leon
   Clark Fork and Lake Pend Oreille;
   Mining Truth, vol. 14, No. 8, pp. 7-8, 16, 1929.
   Gives descriptions of several mines in these two districts, especially the Boyer on Kootenai Point.
594. Stearns, H. T.,
Note on the first discovery of vanadinite in Idaho:
Describes discovery of vanadinite in the Iron Maid mine, Spring
Mountain district, Lemhi County, Idaho.

595. Stearns, H. T.,
The origin of a niter deposit near Dubois, Idaho:
Amer. Mineralogist, vol. 9, No. 6, pp. 135-137, June, 1924.
Shows that the deposit probably formed by leaching of sage-hen guano.
Analysis of a sample from the deposit is quoted.

596. Stearns, H. T.,
Craters of the Moon National Monument:
One of several summary descriptions by Stearns. Good photographs.

597. Stearns, H. T.,
Igneous geology of the Mud Lake Basin, Idaho (abstract):
Abstract of same data as in No. 599.

598. Stearns, H. T., and Bryan, L. L.,
Preliminary report on the geology and water resources of the Mud Lake
Basin, Idaho:
W. S. Geol. Survey Water Supply Paper No. 560, pp. 87-134, 1925. Map show-
ing position of the water table, etc.
This is a preliminary report on an extensive investigation of
ground water conditions around Mud Lake.

599. Stearns, Harold T.,
Volcanism in the Mud Lake area, Idaho:
Geologic map with location of craters.
Describes the volcanic rocks and gives his idea of the geologic
history. He says a nearly continuous belt of acid lava extends from
western to eastern Idaho, the centers of eruption apparently shifting
eastward since Miocene, or else an eastward progressive different-
iation has taken place. The Snake River basalt was erupted through
numerous narrow fissures or aligned tabular vents marked by small
craters, related to widespread faulting.

600. Stearns, H. T.,
Craters of the Moon National Monument, Idaho:
Of Stearns' several papers on this subject, the bulletin of the
Idaho Bureau is the most complete account. Discusses the origin,
etc., of the lava, which came up along fissures.

601. Stearns, H. T.,
The "Craters of the Moon" in Idaho:
One of several summary descriptions by Stearns.

602. Stearns, H. T.,
The "Craters of the Moon" in Idaho:
A brief description of the recent volcanic phenomena exhibited by
the rocks of this national monument.

179,
603. Stearns, H. T.,
Success and failure of reservoirs in basalt:
An abstract of a paper which is to describe six reservoirs in Idaho and two in Oregon. Failure of such reservoirs results generally from water table being far below floor or from proximity of an ancient stream channel filled with porous basalt. Points out that under some circumstances marked leakage does not destroy value of reservoir.

604. Stearns, H. T., and Bryan, L. L., and Crandall, Lynn
Water resources of the Mud Lake region, Idaho:
Gives data on water supply to and use from Mud Lake and suggestions for decreasing losses.

605. Stearns, H. T.,
Origin of the large springs and their alcoves along the Snake River in southern Idaho:
Postulates that a group of springs along the north side of the Snake River west of Twin Falls which discharge 5,000 cu ft. a second, issue mostly from pillow lava forming part of basalt fills in ancestral canyons of the Snake. Some are said to issue from box canyons made by solution of the basalt by the spring water.

606. Stearns, H. T., and Crandall, Lynn, and Steward, G.,
Records of wells on the Snake River Plain, southeastern Idaho:
Gives data as to depth to water, etc., for numerous wells in the Snake River Plain.

607. Sterrett, D. B.,
Gems and precious stones:
Describes a copper-bearing rock from near Montpelier that takes a polish and might be used as a semi-precious stone.

608. Sterrett, D. B.,
Mica in Idaho, New Mexico, and Colorado:
Mica in pegmatite in an area of gneiss and schist. Not much production.

609. Sterrett, D. B.,
Mica deposits of the United States:

610. Stevens, H. J.,
The extent of the Cordilleran Ice Sheet:
(1) The marginal lobe of the Cordilleran glacier occupying the Pend Oreille valley passed over the divide on the east and filled Priest Lake Valley. (2) If the Kootenai and Pend Oreille lobes come from same ice sheet, their junction is in Canada. (3) The points of these lobes united. (4) Glacial deposits have been largely reworked by streams so that the Cordilleran glacier may have extended farther south than then supposed.

A comparison of the Coeur d'Alene monzonite with other plutonic rocks of Idaho:
Concludes that the Coeur d'Alene intrusion is distinctly different in character from the rock of the Idaho batholith.

The Livingston mine, Custer County, Idaho:
Min. and Met., vol. 7, No. 233, pp. 223-224, May, 1926.
Describes discovery of the main Livingston shoot by crosscutting under his direction.

Report on the geological field work of the Teton division:
Describes reconnaissance studies in an area bounded by 112° 15' W. longitude, 44° 15' N. latitude, 109° W. longitude and 43° N. latitude. Includes notes on Mount Caribou mining district.

Silver strike:
Describes the discovery of ore in the Coeur d'Alene region in the eighties and the labor troubles of the early nineties.

An extinct glacier of the Salmon River Range:
Gives a rather detailed description of the effects of mountain glaciation on Nepius Creek and near Leesburg. He thinks the mountain glaciers united near Leesburg and spread over considerable country.

Note on the glaciation of central Idaho:
A general account of glaciation throughout central Idaho in which it is stated that Lindgren's Payette, at least at Placerville, is of glacial age and origin and that the placers near Elk City are remnants of deposits of a river that flowed through ice walls without regard to topography.

Gypsum deposits of the United States:
Gypsum in notable quantities present in Bear Lake County near Montpelier and in Washington County, 10 miles northeast of Huntington, Oregon, in the Miocene (?) strata, probably valueless.
619. Thomson, F. A.,
Gold veins of sandy areas in the Idaho batholith:
Geologic map and section copied from bulletin.
Says the deposits of Idaho, even those of Silver City (1), are genet-
ically related to the Idaho batholith. The paper is a summary of the
bulletin by Thomson and Ballard.

620. Thomson, F. A., and Ballard, S. M.,
Geology and gold resources of north-central Idaho:
Geologic map.
Mainly of value for mine descriptions.

Zonal distribution of gold, silver, lead, and copper ores in Idaho:
Eng. and Min. Jour., vol. 120, pp. 216-218, August 8, 1925.
Map of Idaho showing distribution of mining districts with reference to the Idaho bath-
olith.
It is shown statistically that, for the region studied, gold deposits are an average of 3.3 miles from intrusives; silver deposits are an average of 7.3 miles from intrusives; lead deposits are an average of 9.7 miles from intrusives; copper deposits are an average of 14.7 miles from intrusives.

622. Thomson, F. A.,
The future of Idaho as a mineral producer:
Brief enumeration of state's resources.

A preliminary study of certain reported platinum occurrences near
Coeur d'Alene, Idaho:
Idaho Bureau of Mines and Geology Pamphlet 6, 1925.
Shows that misleading assay returns are the cause of the platinum
boom. Gives list of reputable assayers and offers to check their
returns if platinum is reported.

624. Thomson, James
The geology of the Territory of Idaho, United States, and the silver lode
of Atlanta (abstract):
Geol. Soc. Glasgow Trans., vol. 8, pp. 175-177, 1866.
Gives brief notes on the geology of the Snake River Plains and of
lodes and placers near Atlanta.

625. Tullis, E. L.,
The development of Idaho's nonmetallic resources:
Discusses phosphate, clay, cement materials, limestone, marble,
sandstone, mica, granite, basalt, salt, barite, diatomaceous earth,
asbestos, sulphur, and montana bentonite, gypsum, bauxite, feldspar,
marlomite, talc, calcite, sand and gravel.

626. Tullis, E. L., and Loney, F. B.,
The clay of Tertiary age in northern Idaho and eastern Washington (abstract):
Deposits in Latah, Benewah, and Kootenai counties, Idaho, and
nearby counties in Washington, are of both residual and trans-
ported origin.
627. Tullis, E. L., and Loney, F. B.,
Tertiary clays, age in northern Idaho and eastern Washington (abstract);
Econ. Geol., vol. 28, No. 2, pp. 152-153, September, 1933.
Gives brief information on clays in Benewah and Kootenai counties,
Idaho, and in Washington. Deposits are said to be numerous and to
be used for fire brick and similar purposes, and are thought to be
products of Tertiary weathering.

628. Tullis, E. L., and Loney, F. B.,
The composition and origin of certain commercial clays of northern Idaho;
Econ. Geol., vol. 28, No. 5, pp. 480-495, 1933.
Cites deposits in Idaho and adjacent parts of Washington, but paper
is based on petrographic study of deposits in Latah County, Idaho,
regarded as derived by weathering of granitic and metamorphic rocks.

629. Turner, H. W.,
Faulting in the Red Cloud mine;
Describes faults in main shaft, with sectional sketch.

630. Turner, H. W.,
The ore deposits at Mineral, Idaho;
Geologic sketch map.
The lodes are mainly valuable for copper and silver. Some are re-
placements in porphyritic rock with a calcareous gangue; others
quartz-tourmaline veins in quartz diorite; others contact metamor-
phic-deposits with lime silicates and hematite in limestone.

631. Turner, J. B.,
The Jack Waite mine;
Briefly describes the geology and other features of the Jack Waite mine.

632. Umpleby, J. B.,
A preliminary account of the ore deposits of the Leon Creek district, Idaho;
The substance of this paper is repeated in Bull. 539.

633. Umpleby, J. B.,
The lead-silver deposits of the Dome district, Idaho;
The substance of this paper is repeated in Prof. Paper 97.

634. Umpleby, J. B.,
An old erosion surface in Idaho, its age and value as a datum plane;
Jour. Geol., vol. 20, pp. 139-147, 1912.
Gives same data on the Idaho peneplain as in U. S. Geol. Survey

635. Umpleby, J. B.,
The old erosion surface of Idaho;
Jour. Geol., vol. 21, pp. 224-231, 1913.
Reply to Blackwelder's criticism.

636. Umpleby, J. B.,
Geology and ore deposits of Lemhi County, Idaho;
Reconnaissance geologic map.
Discusses his supposed Eocene peneplain. Gives account of general
geology on which future work in this section must be based. Describes
most of the mines and prospects accessible at the time.
637. Umpleby, J. B.,
Some ore deposits in northwestern Custer County, Idaho:
Mainly of value for the description of ore deposits then accessible.

638. Umpleby, J. B., and Schaller, W. T., and Larsen, E. S.,
Custerite, a new contact metamorphic mineral;
Describes a mineral from the Empire mine, Mackay, Idaho.

639. Umpleby, J. B.,
Crystallized chrysocolla from Mackay, Idaho:
Mineralogic note.

640. Umpleby, J. B.,
The genesis of the Mackay copper deposits;
Econ. Geol., vol. 9, pp. 307-356, June, 1914.
Shows that they are contact metamorphic deposits and deposition took place in the limestone and in the chilled border phase of the granite.

641. Umpleby, J. B.,
Ore deposits in the Sawtooth quadrangle, Blaine and Custer counties, Idaho:
The report gives data obtained in a 12-day reconnaissance of the mines in the quadrangle.

642. Umpleby, J. B.,
The occurrence of ore on the limestone side of garnet zones;
Describes relation of ore to garnet zones in seven places, one of which is in the Seven Devils, another in the Alder Creek district, Idaho. Shows that the ore tends to deposit on the limestone side of contact metamorphic garnet zones (away from the intrusive).

643. Umpleby, J. B.,
Genesis of the Success zinc-lead deposit, Coeur d'Alene district, Idaho;
The mine is in a tongue of Fitchard strata in monzonite. Contains sphalerite, pyrite, and galena in genetic association with garnet and other contact metamorphic silicates.

644. Umpleby, J. B.,
Geology and ore deposits of the Mackay region, Idaho;
U. S. Geol. Survey Prof. Paper 97, 1917. Reconnaissance geologic map and more detailed maps of some areas.
Gives a report on a general reconnaissance. The sedimentary rocks range from Ordovician to Pennsylvanian, are overlain by lava and cut out by Mesozoic and later intrusives. Descriptions are given of the Alder Creek (Mackay) and Copper Basin copper districts, several districts containing lead-silver and copper ore in the southern part of the Bousehorn Mountains and Lemhi Range, the Maloon area with its copper and silver-lead deposits, and the Lem Creek and Bree districts with base-metal lodes rich in silver associated with Tertiary rocks.
646. Umpleby, J. E., and Livingston, D. C.,
A reconnaissance in south-central Idaho, embracing the Thunder Mountain,
Big Creek, Stanley Basin, Sheep Mountain, and Seafoam districts, Idaho;
Idaho Bureau of Mines and Geology Bull. 3, 1920. Almost illegible topo-
graphic and geologic sketch map.
Paper written by Livingston from Umpleby’s field notes. Briefly
describes the geology of the districts listed in the title.

647. Umpleby, J. E.,
Some structural features of northern Idaho (abstract);
Same as his Jour. of Geol. paper.

648. Umpleby, J. E., and Jones, E. L., Jr.,
Geology and ore deposits of Shoshone County, Idaho;
This report compiles and brings up to date available data.

649. Umpleby, J. E., Westgate, L. G., Ross, C. F., and Hewitt, D. F.,
Geology and ore deposits of the Wood River region, Idaho, with a description
of the Minnie Moore and nearby mines;
The first detailed work in this part of Idaho. Shows that there
is a very thick Paleozoic section cut out by several stocks of Mesozoic
granitic rock as well as by Tertiary intrusives. There are Tertiary
flows and tuffs. Ore deposits are of Mesozoic age, with consider-
able variety in type.

650. Van Brocklin, J. F.,
Prospector claims source of coarse gold along Salmon is in ancient gravel
deposits;
Idaho County Free Press).
Says placer gold of the lower Salmon River is largely derived from re-
working of gravel in channels buried under basalt. Citations particularly
such a channel on Rattlesnake Creek, Idaho County, two miles above Riggins.

651. Van Diet, F. H.,
Address of the retiring president;
Gives notes on gold deposits at Caribou Mt. and Waganton, Idaho.
Most of the paper refers to matters of concern only to the Society.

652. Varley, Thomas, et al
A preliminary report on the mining districts of Idaho;
A study made primarily to gather data relative to metallurgical
processes in use and problems encountered. Gives brief descrip-
tions of the geology and metallurgy of the mining camps of the state
with county bibliographies.
Waggoner, W. H.,
A review of the phosphate fields of Idaho, Utah, and Wyoming, with special reference to the thickness and quality of the deposits;
A summary of data then available.

Waldschmitt, W. A.,
Deformation in ores, Coeur d'Alene district, Idaho;
Econ. Geol., vol. 20, pp. 573-586, September-October, 1926.
Describes microscopic study of "gneissic galena." Two generations of galena indicated. The pressure producing the gneissic texture is believed related to faulting. Boulangerite formed during the deformation.

Walker, R. T.,
A glacially transported mine;
Describes a block of limestone with a fragment of a vein in it which was transported some distance by a glacier. It is in Texas Gulch, 2 miles north of Gilmore.

Waring, Gerald A.,
Two thermal springs in Idaho and Oregon (abstract);
The spring in Idaho is on the West Fork of the Bruneau River, issues from rhyolite, is scalding hot and rich in silicon and fluorides.

Warren, H. V.,
Silver-tetrahedrite relationship in the Coeur d'Alene district, Idaho;
Econ. Geol., vol. 29, No. 7, pp. 691-696, November, 1934.
Shows by assays that the galena in the Coeur d'Alene region does not carry more than 0.50 oz. of silver to the ton, most of the silver in the ore being in tetrahedrite.

Washburn, W. H.,
Gold in Snake River gravel bars;
Notes that gold is most abundant at head ends of bars deposited along inner sides of curves and that these are enriched at each flood; that the top layers are richest. Notes that gold above Boise River runs 1200 ounces to the cent, and is worth $17 to $19 per oz., while below it runs 900 ounces to the cent and is worth $14 to $16 per oz. (old price of gold).

Washburne, C. W.,
Gas and oil prospects near Vale, Oregon, and Fayette, Idaho;
Concludes that there are good chances for developing a gas field in the Fayette and Idaho formations, but not much chance for oil. Oil may be of fossiliferous origin. Gives deep well records.

Wood, W. H.,
The copper mines of the United States in 1906;
Gives current statistics and brief descriptions of copper deposits in Idaho, including the Lost Facker, White Knob, the Seven Devils district, etc.

Wood, W. H.,
The Copper Handbook;
Vol. 11, 1912-1913, printed in 1914 at Houghton, Michigan.
Much the same as previous volumes by Stevens.
Weed, W. H.,
The Mines Handbook:
Vols. 12 (1916), 13 (1918), 14 (1920), 15 (1922), 16 (1925).
Stevens Copper Handbook Co., N. Y. Dates in parentheses are dates published.
Vol. 12 and following volumes list data on metal mines of all kinds,
and give a little more geology than previous volumes of the Copper Handbook.

Weeks, F. E., and Ferrier, W. F.,
Phosphate deposits in western United States:
This is a compilation of data on phosphate available at the time.

Weeks, F. E., and Heikes, V. C.,
Notes on the Fort Hall mining district, Idaho:
In the section on general geology records the presence of Pahoehoe lava.
Ores are valuable for copper, silver, gold, with a little lead
and some manganese and iron. The copper may have come from the old
lava. Deposits are irregular and of doubtful value.

Weeks, F. E.,
Phosphate deposits in the western United States:
Brief mention of Idaho occurrences.

Welch, R. L.,
Development of the Elk City district, Idaho:
Summarizes author's concepts of the geology and ore deposition. Veins
strike N. 40° - 49° E. District is included in the "low grade gold
zone" of Idaho, but he thinks conditions favor operation by a poor man.
Values range from $1.50 to $85 per ton. Average value about $7.66.
Some assays $2,000 to $8,000 per ton. Briefly describes some of the
properties. (All values in terms of old price of gold)

Welch, R. K.,
Mining and milling in the Elk City district:
A descriptive article with brief reference to geology.

Wells, R. C.,
Note on brannerite:
Reports presence of helium in the brannerite from Stanley
Basin (see No. 285).

Wethered, C. E., and Coady, Leo, Jr.,
Mining methods at the Morning mine of the Federal Mining and Smelting
Company, Mullan, Idaho:
Mainly of engineering interest, but gives summary data on history
and geology.

Wetmore, Alexander
Pliocene bird remains from Idaho:
Describes fossil birds from the locality near Hagerman.
671. Wheeler, H. A.,
Plattmore from Idaho:
Brief description of a specimen from a lead mine (not named) in the
Oeur d'Alene region.

672. White, C. A.,
Remarks on the Jura-Trias of western North America:
Brief data on early collections of Jurassic and Triassic fossils in
western North America, including some from Idaho, especially from a
locality 65 miles N. and 18 miles E. of the S. E. corner of the state.

673. White, C. A.,
The molluscan fauna of the Truckee group, including a new form:
Description of fossils from Tertiary beds along the Snake River, 60
miles below Salmon Falls.

674. White, C. A.,
Triassic fossils of southeastern Idaho:
A paleontologic paper.

675. White, W. F.,
New plant and equipment at the Constitution mine (Yreka):
Gives very brief summary of geology. Mainly a description of plant
with mine cross-sections.

676. Whittle, C. H.,
The Buffalo Hump mining camp, Idaho:
Rock is metamorphic intruded by granite and dikes. Places of glacial
origin and probably of little value. Gold veins in granite contain
pyrite, galena, chalcopyrite, tobermorite, sphalerite, free gold,
quartz gangue. Veins are wide in places, but thin out rapidly.

677. Wilson, Hewitt, Bennett, A. L., and Heath, F. T.,
Preliminary report on the residual kaolin and feldspar in the Pacific
Northwest:
Gives favorable results of tests of three clays, two of which are from
Latah County, Idaho, for use in white ware and porcelain.

678. Wilson, Hewitt, and Goodspeed, G. E.,
Kaolin and china clay in the Pacific Northwest:
Report on a study to determine the mode of occurrence and commercial
value of the china clays in Washington and Idaho. It is concluded
that selected material from those areas is worthy of commercial in-
vestigation for use in china, etc. Describes clay deposits in Latah
County, Idaho.

679. Wilson, R. W.,
A rodent fauna from later Cenozoic beds of southwestern Idaho:
May, 1934; abstract, Pan-Amer. Geol., vol. 59, No. 5, p. 377, June, 1934;
One of the numerous papers about the fossil locality near Hagerman.

188.
Oil shale of the Rocky Mountain region.
Tests show that the black shale of the Phosphoria is not oil shale.
Gives section of Phosphoria in Georgetown Canyon, and results of
24 samples of shales and other carbonaceous material from southeast
Idaho. Samples of Cretaceous coal, sec. 36, T. 5 N., R. 43 E., and
Quaternary (?) black shale, sec. 29 T. 9 S., R. 42 E., yielded 39
and 20 gallons of oil to the ton, respectively.

The Cabinet anticlinal
Brief geologic data on the Cabinet range along the Idaho-Montana
boundary.

The Horseshoe Creek district of the Teton Basin coal field;
U. S. Geol. Survey Bull. 541, pp. 379-386, 1912. Map divides coal-
bearing and non-coal-bearing rocks.
Coal is Cretaceous and would be of economic value except that
beds are steeply inclined.

Coal in cone structure in coal from St. Anthony, Idaho (abstract);
Describes specimens exhibited at a meeting of the Geological
Society of Washington, D. C., supposed to be genetically related
to slickensiding.

Silver mining and milling at Talache, Idaho.
The silver ore of this mine comes from one of several parallel,
narrow veins in Belt strata. Tetrahedrite is one of the principal
ore minerals. Descriptions of the mine and mill are given.

Plattnerite and its occurrence near Mallan, Idaho.
Detailed mineralogic and crystallographic data regarding plattnerite
specimens from "You Like" prospect.

Milling methods and costs at the lead concentrator of the Hoela Mining
Company, Gem Co., Idaho.
A metallurgical paper, but describes the ore at the Hoela mine
at Burke and gives some general information.
Anderson, Alfred L.,
Geology of the Clark Fork-Sandpoint porphyry belt (abstract); Northwest Sci., vol.11, No. 5, p. 76, August, 1937.
Calls attention to a major zone of crustal weakness near Pend Oreille Lake, along which intrusive masses and mineral deposits have been localized.

Anderson, Alfred L.,
Geology and ore deposits of the Atlanta district, Elmore County, Idaho; Idaho Bur. Min. and Geol., Pamphlet 49, September,1939. Geologic and topographic map.
Detailed report on a famous old district that has recently had a revival. Won early fame for its rich silver ores, and from 1932 to 1935, inclusive, was the largest producer of gold in the state. The Atlanta lode, the largest and most productive in the district, and other veins are shown on geologic map. Ore appears to have been deposited relatively near the surface, and geologic conditions do not encourage the idea that commercial ore is likely to recur at greatest depth.

Anderson, Alfred L.,
Geology and metalliferous deposits of Kootenai County, Idaho; Idaho Bur. Min. and Geol., Pamphlet 53, May; 1940. Reconnaissance geologic map.
Comprehensive reconnaissance report on a part of Idaho that contains many prospects, but few large mines. Describes the metalliferous deposits which include fissure veins, largely filled with quartz, and replacement deposits, somewhat younger in age, having very minor amounts of quartz. Exploration for lead-zinc-siderite replacement deposits appears to offer the greatest promise, although copper, silver, and bismuth lodes are also known.

Anderson, Alfred L.,
Aikinite and silver enrichment at the St. Louis mine, Butte County, Idaho; Econ. Geol., vol. 35, No. 4, pp. 520-533, June-July, 1940.
Aikinite (a rare bismuth mineral) is found at the St. Louis mine, where it has been hand-sorted and shipped to smelters for its silver content. The latter results from selective replacement of the aikinite by supergene argentite and native silver. The geologic setting and mode of occurrence of the aikinite are described.

Anderson, Alfred L.,
Many changes have been produced in the already solid rock of the Idaho batholith by hydrothermal solutions enriched particularly in silica, but also carrying variable quantities of potash and minor amounts of other materials.

Anderson, Alfred L., and Hammerund, Voral
Contact and endomorphic phenomena associated with a part of the Idaho batholith; Jour. Geol., vol. 48, No. 6, pp. 661-689, August-September, 1940. Geologic sketch map of part of Paradise Ridge, Utah County. Describes the contact-endomorphic phenomena in a group of rocks on Paradise Ridge in Utah County. Part studied is 3 miles S.E. of Moscow. 190.
693. Anderson, Richard J.
Microscopic features of ore from the Sunshine mine.
Econ. Geol., vol. 36, No. 5, pp. 666-667, August, 1940.
The ore in the Sunshine mine, Coeur d'Alene region, is in fissure veins,
associated with minor faults south of the Osburn fault. The country rock
is the pre-Cambrian St. Regis formation. The ore is generally massive,
with small cavities lined with crystals of siderite, quartz, and tetra-
hedrite with a variable but commonly high silver content.

694. Anonymous
Deep development under way in Coeur d'Alene silver belt.
Mining Journal, pp. 36-37, March 15, 1937.
Brief resume of data on Idaho's principal silver mines. Much pro-
duction comes from Yankee Roy mine of the Sunshine Mining Company.

695. Anonymous
Clayton silver mines.
The property of the Clayton silver-lead mines is located about 2 miles
north of Clayton on Kinnikinick Creek. Most of the article is devoted
to a discussion of the steady growth of this comparatively young mine.

696. Anonymous
Activities of the United States Geological Survey relating to metal mining.
Summarizes recent geological studies in Idaho being carried on in co-
operation with the Idaho Bureau of Mines and Geology, including the
Coeur d'Alene region, placers of the central part of the state and
Kootenai County.

697. Anonymous
Hearings before the Joint Committee to investigate the adequacy and use of
phosphate resources of the United States.
76th Congress of the United States, Third Session, Pursuant to Public Reso-
Inution No. 112; A joint resolution to create a joint congressional com-
mittee to investigate the adequacy and use of the phosphate resources of
the United States, 1939. Map, prepared by the National Fertilizer Asso.,
showing location of the fertilizer industry in the United States, 1939,
which includes distribution of phosphate rock deposits and dry mixing
plants in Idaho.
States by Committee members and others relative to phosphate resources
of the United States, including those in Idaho, and concerning other
phases of the phosphate industry.

698. Anonymous
Report on the feasibility of iron and steel production in the Northwest,
using Columbia River hydroelectric power.
Market Development Section, Bonneville Project, U. S. Dept. of Interior, 1939.
Mentions (p. 28) occurrence of a magnitite deposit approximately opposite
the confluence of the Imnaha and Snake rivers in Idaho County and of a
hematite deposit near St. Joseph in the Big Creek area in Bonneville County.

699. Anonymous
Clearwater Concentrating Company builds custom mill of 60-ton capacity in
Elk City district.
Northwest Mining, vol. 5, No. 6, pp. 8-10, March 16, 1939. Sketch map
of central Idaho showing locations of properties within 24-mile radius of mile.
Calls attention to a custom mill located 7 miles west of Elk City and
accessible to numerous properties in the surrounding area supplying a
variety of ore.
700. Anonymous
Idaho Almaden - Gem state's first quicksilver mine:
Min. World, pp. 9-11, October, 1939.
Describes the geology of the Idaho Almaden property, situated about 17
miles east of Weiser. Says predominating rocks are lake beds of the
Fayette formation (Miocene). Cinnabar, both amorphous and crystalline,
is the ore mineral, and its most abundant gangue is banded opaline silica.

701. Anonymous
Hope Silver-Lead mines, Inc.,
States that the work tunnel of the Hope mine, located about 3/4 mile west
of Clark Fork, is in the Wallace formation (Belt series, pre-Cambrian),
approximately 800 feet above the contact between the Wallace and the St.
Regis (also Belt series). Plans being made to sink 600 feet.

702. Anonymous
The mining empire:
Map of the mining empire of the Northwest, showing mining districts and
smelters. Gives brief information on mines in Montana, Idaho, Oregon,
and Washington, and a large part of British Columbia. Article contains
tables, giving the total production of the above states by metals in 1938.

703. Anonymous
Miners Register (Successor to the Miners Handbook and Copper Handbook), vol.19;
Summaries data on the nonferrous metal mines and mining companies in
the western hemisphere (including Idaho). Vol. 19 contains a glossary
of mining terms and brief information concerning the mineralogy of the
ore minerals.

704. Anonymous
"Mineralization" of Silver Belt "shear zone" recognized:
Northwest Mining News, vol. 6, No. 3, pp. 7-9, February 14, 1940.
Quotes in full the decision of the U. S. Dept. of the Interior that the
"shear zone" of the Coeur d'Alene Silver Belt is mineralized within the
meaning of the law.

705. Anonymous
Yellow Pine:
Mining World, pp. 2-7, May, 1940.
A description of the gold mine of the Yellow Pine Company, with brief
data on its geology.

706. Anonymous
The Snake River Park proposal - In abeyance, but not yet dead:
Mining World, pp. 23-24, June, 1940.
Discusses the effects of a national park and the construction of a canyon
road on the mining industry of the Seven Devils region. Although no high-
ly valuable mines exist, it is a region of known mineral deposits which
has scarcely been prospected.

707. Anonymous
Idaho in 1940:
Reviews Idaho's mining during 1940 and states that it ranked fifth
in value of mineral production.
Anonymous
Tungsten ore deposit discovered in the Yellow Pine district, Valley County, Idaho.

A high-grade deposit of tungsten ore was discovered jointly by engineers of the Bureau of Mines and geologists of the Geological Survey in the Yellow Pine district, which is well known for its antimonial gold ores. Although no estimate has been made of tonnages, it is believed that the discovery may be of great importance. Exploratory work in central Idaho has also determined an important reserve of antimony.

Appleton, John B., (compiled by)
The Pacific Northwest: A selected bibliography, 1830-39:
Northwest Regional Council, Portland, Oregon, 1939.
Covers completed as well as in-progress and contemplated research in natural resource (including mineral) and socio-economic fields with pertinent comments on many of the references. Papers, as well as maps, relating to Idaho are listed.

Ball, S. H.,
Gem stones:
Contains brief mention of garnet production from Emerald Creek, 12 miles southwest of Fernwood (Bonneville County), Idaho.

Barton, W. F., and Aronitz, Samuel S., Jr.
Mining and milling tungsten at the Ima mine:
Mining Congress Journal, vol. 28, No. 8, pp. 16-19, August, 1939.
Describes briefly the geology of the Ima mine area, which is in the Blue Wing mining district on Patterson Creek, Lemhi County. This mine was reopened a few years ago after being inactive since the First World War.

Baxter, W. T.
Shoshone ice caverns of Idaho:
Located in the northwestern part of Lincoln County, 14 miles north of Shoshone, these caves are tube-like openings in volcanic rock. No explanation for the occurrence of the ice is offered. The editor's note at the conclusion of the article states that there is another ice cave in the eastern part of Clark County, 7 miles northeast of Jacoby.

Bowles, Oliver
Asbestos:
Describes briefly an asbestos deposit about 14 miles southeast of Kamiah, Idaho, in Idaho County; the only one that has been developed commercially in the state. The deposit consists of anthophyllite in lenticular masses, some of which are 200 feet long and 35 feet thick.

Bowles, Oliver, and Bagley, B. W.
Comont:
Contains portland cement statistics of production, shipments, and stocks in Idaho.

Bowles, Oliver, and Coons, A. T.
Lime:
Contains statistics of lime production and supplies available in Idaho.
716. **Brown, R. W.**

**Additions to some fossil floras of the western United States:**

Summarizes a study of fossil plants from western United States, including the following localities in Idaho: White Bird, Idaho City, Salmon, and Thunder Mountain; and describes both the floras and the rocks from which they are derived.

717. **Bowles, Oliver, et al**

*Stone;*

Statistics on miscellaneous varieties of stone produced in Idaho.

718. **Callaghan, Eugene, and Lampson, Dwight W.**

*Tungsten resources of the Blue Wing district, Lemhi County, Idaho;*
U. S. Geol. Survey Bull. No. 931-A; Topographic and geologic map of the district has been issued separately.

The Blue Wing district is the largest producer of tungsten concentrates in Idaho. Quartz veins contain narrow ore shoots adjacent to buried granite intrusive into pre-Cambrian quartzite. Ilmenite and argentiferous tetrahedrite are the commercially important minerals.

719. **Campbell, Arthur**

**Annual Report of the Mining Industry of Idaho for the years 1937 to 1940, inclusive.** Maps showing general geology of Idaho, natural resources, mining districts, etc., in some of the issues.

Contains current articles related to the mining industry of Idaho, statistical data, and bibliographies, and lists by counties mining companies with succinct information regarding each.

720. **Campbell, Arthur**

*Idaho's mineral resources and production;*
Northwest Mining News, vol. 6, No. 5, pp. 3-5, 10, March 15, 1940.

Gives brief survey of individual mineral resources, States that in 1939 the Coeur d'Alene region produced 75% of Idaho's mineral production.

721. **Campbell, Charles D.**

*Phosphate minerals in pegmatite north of Deary, Idaho;*

This paper calls attention to the finding in a single exposure of pegmatite of the minerals, strainite, vivianite, and ankerite, an unusual association.

722. **Capps, Stephen R.**

*The Dixie placer district, Idaho, with notes on the lode mines by Ralph J. Roberts;*

Describes placer deposits and lode mines and prospects and discusses the physiographic history of the district.

723. **Capps, Stephen R.**

*Gold placers of the Sooesch Basin, Idaho County, Idaho;*
Idaho Bureau Mines and Geology Pamphlet No. 52, February, 1940.

Although there is a large amount of gold-bearing gravel in the district, most of it is of such a grade that competent management is necessary to make exploitation profitable. The placer mines described are the Lake Creek Basin, Sooesch-Ruby Creek are, Ruby Creek, Grouse Creek, and Sooesch Valley.
Observations of the rate of creep in Idaho:
Rough calculations made from excellent exposures in the area of the Idaho peneplain in west-central Idaho indicate that creep may have lowered by many hundreds of feet the summit level erosion surface of the region (of pre-Middle Miocene age). It demonstrates the importance of creep in interpreting old erosion surfaces as well as present land forms.

Statistical summary of mineral production (General U. S. summary and detailed production by states);
Include tables giving principal mineral products of Idaho in order of value, and quantity and value of mineral production in state.

Salt, bromine, calcium chloride, and iodine;
Contains statistics of shipments of salt in Idaho.

The American gold mine, Dixie, Idaho:
(From the Pacific Northwest: A selected bibliography, compiled by John B. Appleton, published by Northwest Regional Council, Portland, Oregon, p. 176, 1939)

Idaho mordenite - best in world;
Mineralogist, pp. 11, 18-21, February, 1938.
Describes the discovery and occurrence of mordenite, a rather rare zeolite, about 15 miles south of Challis. This mineral occurs in the central part of vugs 2 and 3 feet in diameter with calcite adjacent to the cavity walls.

Manna Creek petrified forest - some Idaho localities;
Mineralogist, pp. 9-10, November, 1938.
Describes the petrified forest north of Weiser, Washington County. Its logs occur principally at one horizon in the Miocene and field evidence suggests that the fossil wood can be correlated with that of Roosevelt, Washington. Author also mentions other Idaho localities where petrified wood has been found.

Nickel and cobalt;
Mentions a deposit near Salmon City, Lemhi County, which is said to contain cobalt, gold, copper, and nickel is being developed.

Bunker Hill's achievement;
Eng. and Min. Jour., p. 36, August, 1939.
Brief foreword to more detailed articles on this group of mining properties, the workings of which aggregate 70 miles in extent and reach a depth of 5,800 feet. Has produced lead-zinc-silver ore continuously for over 50 years, which period has been financed by the parent mine.
732. Emigh, G. D., Mineralogical and metallurgical investigation of ore from the Centor Star mine, Idaho:
Master's Thesis, 1933, Library, University of Idaho, Moscow. (From the Pacific Northwest: A selected bibliography, compiled by John B. Appleton, published by Northwest Regional Council, Portland, Oregon, p. 177, 1939.)

U. S. Bureau of Mines, Report Invest., No. 3484, January, 1940. (prepared in cooperation with the Missouri School of Mines and Metallurgy)
Describes briefly silicoflume from Idaho and states that preliminary tests demonstrate impossibility of concentrating the manganese minerals.

734. Erbring, Dorf
A late Tertiary flora from southwestern Idaho; Contributions to Paleontology, Miocene and Pliocene floras of western North America;
Carnegie Inst., Washington, Pub. 476, pp. 73-124, November, 1936;
Describes fossil plants collected near Weiser, Washington County, from indurated shales and tuffs overlying unconformably the upper part of the Columbia River basalt. The flora is referred to the uppermost Miocene or lowermost Pliocene.

735. Fahrenwald, A. W., Newton, Joseph, Staley, W. W., and Shaffer, R. E., A metallurgical study of Idaho placer sand;
A metallurgical study of recovery of flour gold from placers in Idaho, mainly along the Snake River. Includes a bibliography.

736. Faidt, J. N.
The geology and ore deposits of the Gold Hill district, Latah County, Idaho:

737. Federal Writers' Projects of the Works Progress Administration: Idaho; A guide in word and picture:
The Caxton Printers, Ltd., Caldwell, Idaho, 1937. Maps showing by counties distribution of mineral resources and products of metallic and nonmetallic mines.
Among other chapters on subjects of popular interest is one on resources and products in which the minerals of the state are discussed, giving Idaho's place among other states in the production of the various minerals. Lays emphasis on the potential value of the large deposits of phosphate rock in the eastern and southeastern parts of the state.

738. Federal Writers' Projects of the Works Progress Administration: The Idaho Encyclopedia: The Caxton Printers, Ltd., Caldwell, Idaho, 1938. Among the many illustrations is a map of the mining districts. A comprehensive reference book covering physical, historical, industrial, and cultural subjects and giving information relative to the state government and descriptions of counties, cities, towns, and villages. Gives a general picture of the geology of the state and lists the various minerals found there with their principal localities, also mining districts. Contains a bibliography.

196.
Arsenic and bismuth:
Mentions briefly that a new plant for the production of bismuth and antimony began operating in March, 1940, at Kellogg, Shoshone County, Idaho.

Copper:
Contains production and other statistical data regarding copper mining in Idaho.

Copper mining in North America:
Summarizes very briefly copper mining in the Coeur d'Alene, Loon Creek, Alder Creek, and Seven Devils districts in Idaho.

Copper, silver, copper, lead, and zinc in Idaho (mine report):
Reviews the mining industry by counties and districts.

Stratigraphy of the Belt series in Libby and Trout Creek quadrangles, northwestern Montana and northern Idaho:
Summarizes new data on the Pritchard, Wallace, and Striped Peak formations and the Ravalli group of the Belt series (pre-Cambrian) and correlates the principal sections of this series in northwestern Montana and northern Idaho.

Some Miocene plants from north-central Idaho:
Lists plants from Coeur d'Alene and Stanley Hill, 2 miles northeast, both in Kitsap County. These fossils, the author states, indicate Miocene age and probably Latih.

"Dry ore belt" geology in relation to the Silver Dollar mine:
Northwest Mining, vol. 5, No. 4, pp. 3-6, February 16, 1939.
Briefly outlines geology and vein structure of "Dry ore belt" of the Coeur d'Alene mining region, with particular reference to the Silver Dollar mine.

Orbicular rock from Buffalo Hump, Idaho (abstract):
Postulates that the gradation from schist with orbicules to a rock composed principally of orbicules indicates a metasomatic rather than a magmatic origin.
Surface water supply of the United States, Snake River Basin;
(Prepared in cooperation with the states of Idaho, Oregon, Washington, Wyoming, and other agencies)
Annual summary that includes records of gaging-stations on the Snake River and many other streams in the Snake River Basin in Idaho.

Surface water supply of the United States - The Great Basin;
(Prepared in cooperation with the states of Idaho, Oregon, Washington, and Wyoming.)
Annual summary that includes records of gaging-stations on bodies of water in the Bear River Basin, Idaho.

Surface water supply of the United States, Pacific slope basins in Washington and Upper Columbia River Basin;
U. S. Geol. Survey Water Supply Paper 792, 1937; 612, 1937; 832, 1938; and 862, 1940.
(Prepared in cooperation with the states of Idaho, Montana, and Washington.)
Annual summary that includes records of gaging-stations on bodies of water in the Upper Columbia River Basin in Idaho.

The history of the enterprise - Over fifty years of uninterrupted mining;
Outlines the history of the Banker Hill and Sullivan Mining and Concentrating Company. Although some of the first gold discoveries in the northern part of the state were made in 1860, there were no profitable ones in the northern section, or Coeur d'Alene Region, until 1882 when gold was found in Eagle Creek. The mining operations during the succeeding years are briefly described. In 1917 and 1926, respectively, erection of a lead smelter and an electrolytic zinc plant to treat ores with high content of these metals brought still further expansion of the region.

751. Hamerand, Vera.
Geology and petrology of a part of Paradise Ridge in northwestern Idaho;

752. Henderson, C. W., (and Dunlop, J. F., for 1937, 1938, and 1939)
Gold and silver;
Contains production and other statistical data regarding gold and silver mining in Idaho.

753. Hite, Thos. H.,
The origin of certain clay deposits in Latah County, Idaho;
Master's Thesis, 1930, Library, University of Idaho, Moscow (from The Pacific Northwest; A selected bibliography, compiled by John B. Appleton, published by the Northwest Regional Council, Portland, Oregon, p. 14, 1939.)
754. Hodge, E. T.,
Report on available raw materials for a Pacific Coast iron industry, (Appendix E-1, Unavailable iron ore deposits of western states):
War Dept., Corps of Engineers, U. S. Army, Office of Division Engineer,
Describes briefly deposits of iron ore (mostly magnetite) in Idaho,
which occur in eight or nine localities in areas of metamorphic and
igneous rock between Pend Oreille Lake and the Snake River.

755. Hodge, E. T.,
Report on available raw materials for a Pacific Coast iron industry,
Part 1, Information on additional iron ores of the Northwest:
War Dept., Corps of Engineers, U. S. Army, Office of Division Engineer,
North Pacific Div., vol. 5, Portland, Oregon, 1938. Map showing some
iron deposits in west-central Idaho; also geologic map of Iron Mountain
and vicinity.
Describes iron ore occurrences in Benewah, Washington, Idaho, and
Clearwater counties and includes analyses of the ores.

756. Hodge, Edwin T.,
Mineral resources of the Northwest (abstract):
The power plants such as Grand Coulee and Bonneville have stimulated
studies of possible hydroelectric industries, and among the mineral
resources which are discussed in this connection are the refractory
and ceramic clays in Iron County, Idaho. The suggestion is also made
that the great phosphate deposits occurring in the southeastern part
of the state might be treated by a plant on the Snake or Upper Columbia
rivers.

757. Holmes, W. Church
Metallurgy of the Coeur d'Alene silver ores:
The argentiferous tetrahedrite ores of the Sunshine, Polaris, and
Crescent mines are described and differences indicated.

758. Hughes, H. H., and others
Sand and gravel:
Contains statistics on sand and gravel production in Idaho.

759. Huttl, J. B.,
Boise Basin gold:
Gives brief summary of data on the Gold Hill mine at Quartsburg in
the Boise Basin. This mine, 1265 feet deep, contains free gold and
lead-bismuth minerals in fractures transverse to dioritic and rhyo-
litic dikes in granitic rock.

760. Water resources of Idaho, Vol. 1, Drainage basins in Idaho; Vol. II, Hydro-
electric power in Idaho (prepared in cooperation with the National Resources' Committee and assisted by the Engineering Experiment Station, University of
Idaho;
Idaho State Planning Board, November, 1936, revised December, 1937. Maps
showing drainage basins and developed water power.
Factual information on the water resources of the state arranged by the
drainage basins of the Kootenai, Clark Fork, Spokane, Snake (including
tributaries), and Bear rivers; also on the developed and undeveloped elec-
tric power in Idaho. A brief outline of the geology of each drainage basin
is included under the general descriptions of the basins.

195
761. Ingraham, H. W.,
Evolution of a mining district.
Compressed Air Magazine, vol. 46, No. 4, pp. 6410-6412, April, 1941.
Describes the growth of the Coeur d'Alene mining region, one of the
largest lead-silver producing districts of the world.

762. Johnson, S. L., and Warner, E. G.,
Phosphate rock:
U. S. Bureau of Mines Minerals Yearbooks, pp. 1315-1328, 1937; pp. 1167-1186,
Contains statistics of phosphate rock industry in Idaho. Volumes for
1938, 1939, and 1940 include reserves.

763. Johnson, Fred W., and Jackson, Chas. F.,
Federal placer mining laws and regulations, by Johnson, and Small-scale
placer mining methods, by Jackson;
The latter paper in this publication brings up to date material con-
tained in Bureau of Mines information circulars issued in previous
years, with the addition of the federal laws and regulations; includes
small maps of Idaho and other states, showing locations from which
appreciable quantities of placer gold have been won in the past; lists
the states to which United States mining laws are applicable, Idaho be-
ing among them. Bibliography.

764. Kennedy, Frank A.,
Recent developments in Idaho dredging;
Noticeable trend toward greater use of jigs and improvements in methods
of saving gold. Detailed descriptions of jigging operation given.

765. Motschewar, D. D.,
Geology and ore treatment of the Keep Cool mine, Lakview, Idaho;
Master's Thesis, 1938, Library, College of Mines, University of Washington,
Seattle, (from the Pacific Northwest, A selected bibliography, compiled by
John E. Appleton, published by the Northwest Regional Council, Portland,
Oregon, p. 176, 1939).

766. Lee, Charles A.,
Recent landslides in Salmon Creek Canyon;
The author describes and illustrates by photographs and diagrams the
factors leading to the landslide in the Buhl area (Buhl sinking area,
Robertson's sinking farm), about 7 miles west of Buhl on the east
margin of the Salmon Creek canyon, and states that seepage water may
have acted as a lubricant along friction planes after movement began,
but it does not seem to have been contributory in starting the slide.

767. Lilly, Frank
1939 in retrospect - 1940 in prospect;
Northwest Mining News, vol. 6, No. 1, pp. 3-7, 10-11, January 15, 1940.
Brief survey of recent mining and outlook for the future. Article
contains tables giving production of gold, silver, copper, lead, and
zinc in Montana, Idaho, Washington, Oregon, and British Columbia in
1937, 1938, and 1939. In 1939, Idaho led in the value of its silver
production, the Coeur d'Alene region in Shoshone County producing 88%
of the state's output. This district also produced a high percentage
of the state's copper, lead, and zinc output.
668. Lilly, Frank
Eastern part of the Coeur d'Alene mining district:
Northwest Mining News, vol. 8, No. 6, pp. 4-6, 10, March 31, 1940. Schematic chart showing principal properties of eastern part of the Coeur d'Alene mining district in order NW-SE and altitude levels of main tunnels and shafts. Gives brief survey of mining activity in the Coeur d'Alene region.

669. Lorain, S. H.
Gold mining and milling in Idaho County, Idaho;
This paper, which is one of a series on western mining districts, describes briefly lode-gold mining of the Elk City, Golden and Newsome, Orogrande, Buffalo Hump, Florence, Dixie, Burgdorf, Warren, and Ramey Ridge districts. Includes a brief outline of the geology of the county with bibliography. Most of the veins and disseminated lode deposits, as well as the placers associated with them, are in a belt about 35 miles wide by about 60 miles long that strikes northeast. With increased knowledge concerning the geology of the region and improved transportation, lode mining here is likely to increase.

770. Lorain, S. H., and Davis, W. Buford
Mining and milling methods and costs of the Golden Anchor Mining Company, Burgdorf, Idaho;
Describes operations at a successful small-tonnage mine in the Marshall Lake mining district in the mountains of central Idaho. The Golden Anchor ore is in a much faulted quartz vein, in granitic rock of the Idaho batholith. Near the mine are several small areas of pre-Cambrian schists and gneiss, into which the batholith was apparently intruded. The ratio of silver to gold in the mine increases with depth from 2:1 to 20:1, possibly because of solution and subsequent precipitation of the silver by downward percolating surface waters.

771. Lorain, S. H., and Mettiger, O. H.
Reconnaissance of placer mining districts in Idaho County, Idaho;
U. S. Bureau of Mines Inf. Circulur 7025, June, 1936. Map of gold belt of Idaho County, showing roads, trails, and mining districts; maps of specific districts showing gravel deposits. Includes brief summary of the geology of north-central Idaho, abstracted from other authors, and concise descriptions of the deposits of the Elk City, Red River, Newsome, Golden, Castle Creek, Orogrande, South Fork of the Clearwater River, Florence, Dixie, Burgdorf, Warren, Salmon River, Ramey Ridge, and other districts. Mining operations have been benefited by higher prices, development of new equipment, and improved transportation, but to work the remaining deposits under present economic conditions, cheaper, more compact, and more portable equipment is needed. The ancient high gravels covering large areas in several of the mining districts probably now contain the largest reserves of placer gold in Idaho County.

772. Lorain, S. H., and Mettiger, O. H.
Reconnaissance of placer mining districts in Lemhi County, Idaho;
U. S. Bur., Mines Inf. Circ. 7082, June, 1939. Map of placer mining districts of Lemhi County and maps showing gravel deposits in specific districts. One of a series of reports on western mining districts. Describes briefly placer deposits in Eureka, Kirtley, Eidorado, Gibbonville, Mackinaw, (Lesseburg) Shoup or Mineral Hill, Blackbird, Yellowjacket, Gravel Range districts. Refers to an earlier report on the geology of Lemhi County. Distribution of the ore deposits in the county suggests a broad zonal arrangement, with the gold deposits in the northern part, the lead-silver deposits in the southeastern part, and a band of copper mineralization running east and west through the center. The Mackinaw district is the only large area of high-grade placer gravels in the county.
773. Luff, Paul
Gold, silver, copper, lead, and molybdenum in Idaho (mine report);
Reviews the mining industry by counties and districts.

774. Lund, B. T.
Wolframite, tungsten, and vanadium:
Mention briefly tungsten mining at the Amite mine on Patterson Creek,
about 11 miles east of Pay.

775. Lundstrum, Mrs. W. D.
The Lost Opal mine, Clearwater Valley opal:
Mineralogist, pp. 49-50, February, 1939.
Recent unsuccessful efforts to locate the Lost Opal mine near
Leavenworth, Wasco County. Other opal localities in Idaho reviewed.

776. Lupher, Ralph L.
Origin of alluvial dikes in the Lewiston Basin, Washington and Idaho (abstract);
Author thinks that the evidence shows that the fissures into which
the clay, silt, sand, gravel, and basalt rubble were deposited, form-
ing the dikes, were the result of a gentle opening process and may
have been caused most commonly from the melting of buried ice although
some, which reach into the bedrock, are related to slumping.

777. Lupher, Ralph L.
Pliocene history of the Lewiston Basin of Washington and Idaho (abstract);
Cites the sequence of Pliocene events supposed to account for the
geologic and topographic features of the Lewiston Basin.

778. Mansfield, George R.
Blackfoot Valley, a typical valley system in southeastern Idaho (abstract);
The Blackfoot serves to link several intermontane valleys. Disorder
of the drainage in this region by two successive blankets of sediment-
ary and volcanic materials has resulted in preservation of records of
stages in the erosional history obliterated elsewhere.

779. Mansfield, George R.
Role of physical chemistry in stratigraphic problems;
Econ. Geol., vol. 32, No. 5, pp. 535-549, August, 1937.
There are many stratigraphic problems to be solved by geologists
familiar with physical chemistry. Among the examples cited are the
phosphate beds and bedded cherts of the Phosphoria formation in Idaho.

800. Mansfield, George R.
Erosional history of the Paradise Valley quadrangle, Idaho (abstract);
The author states that a succession of eleven rather distinct erosion
surfaces have been identified and he postulates that the temporary
base level established by basalt flows and now partly dissected has
served to protect records in erosional history which in the higher ad-
joining county have been destroyed.
781. Mansfield, George R.,
Phosphate deposits of the United States.
Brief description of the character and distribution of phosphate deposits in the United States. Previous estimates of reserves have been greatly increased, amounting at present to more than ten billion tons, not counting possible reserves or the Florida and Tennessee phosphatic limestones. More than half of the reserves are attributed to Idaho, and are contained in the phosphate shale member of the Phosphoria formation (Permian).

782. Mansfield, George R.,
Recent studies of reserves of domestic phosphate.
Interest in the proper conservation of reserves of phosphate rock in the United States has been aroused by hearings held by the "Joint Committee to investigate the adequacy and use of phosphate resources of the United States". Information formerly withheld and now made available makes it possible for the author to present a restatement of reserves of the eastern states and some modification of figures for the western states. All grades of phosphate being considered, the reserves for the western states approximate nearly eight billion tons and those for the entire country more than thirteen billion tons.
Relative to Idaho, the original figures are maintained with the suggestion that more detailed work would probably justify their expansion. Contains a longitudinal section, showing phosphate contents of strata penetrated by a crosscut at Conda, Caribou County.

783. Mansfield, George R.,
Geology of phosphate deposits in the United States (abstract).
Describes the processes by which phosphate deposits are produced from apatite, a mineral found in the crystalline rocks, and illustrates these processes by outlining the geologic histories of the principal types of phosphates in the southeastern and western fields, including those in Idaho.

784. Mootsor, C. H.,
Ground water in the United States, a summary.
A brief account of the ground water conditions throughout the United States, including Idaho in the western mountain region, with maps showing the principal areas in the United States underlain by various types of rocks yielding ground water supplies.

785. Motzger, C. H.,
Reconnaissance of placer mining in Boise County, Idaho.
U. S. Bur. Minos Inf. Circ. 7028, August, 1938. Map of Boise Basin and surrounding country; maps showing gravel deposits at various localities. Describes briefly the placer resources of Nocos Creek and tributaries, Elk Creek, Grimes Creek, Granite Creek, and tributaries in Boise Basin, and along the South Fork River outside of Boise Basin. The country rock of Boise Basin, the most productive placer mining area of Idaho, consists of granitic rock intruded by a belt of dikes. Many of the lodes are in and near the dikes. Beds of sandstone and silt, probably remains of fresh-water lake deposits, occur in the vicinity of Idaho City and form the bedrock of many of the creeks as well as the beach gravels. The Boise Basin remains the most favorable placer mining area in the country. Its future depends on development of better hydraulic mining methods and more extended use of small dredges and dragline plants.
786. Meyer, H. M.,
    Copper:
    Contains production and other statistical data regarding copper
    mining in Idaho.

787. Meyer, H. M., (and Mitchell, A. W., for 1940)
    Mercury:
    1940.
    The 1939 chapter mentions briefly that press reports indicate recent
    discovery of a large deposit of cinnabar ore near Weiser, Washington
    County, which has been leased for a 20-year period to L. K. Regua.
    The 1940 chapter states that during the period June-December, 1939,
    this deposit (the Idaho Almaden mine) ranked seventh largest in pro-
    duction in the United States.

788. Miller, T. H., and Luff, Paul
    Gold, silver, copper, lead, and zinc in Idaho (mine report):
    1940.
    Review the mining industry by counties and districts.

789. Minerals Yearbooks for 1937, 1938, 1939, and 1940;
    U. S. Bureau of Mines.
    Brief references to Idaho in general chapters in the Minerals Yearbooks
    have listed only for recent years.

790. McCloskey, J. F.,
    Central Idaho geology:
    Northwest Mining, vol. 5, No. 6, pp. 5, 6-10, March 16, 1939. Sketch map
    of central Idaho showing general layout of various districts.
    Outlines data on structural and economic geology of Idaho County.
    With conservative methods of exploitation, outlook for future de-
    velopment is promising.

791. McConnel, R. H.,
    Bunker Hill ore deposits in complex fractures:
    Summarizes the surface and underground geology of the Bunker Hill
    and Sullivan properties in the Coeur d'Alene district. The exposed
    rocks belong to the pre-Cambrian Belt series, folded and faulted by
    east-trending faults of major displacement, the Odell fault being
    the most profound break. Rock alteration, generally from sericiti-
    zation or bleaching, forms halos around the ore bodies and has aided
    their exploration and development. The primary ores consist of
    galena, sphalerite, tetrahedrite, pyrite, siderite, and quartz.

792. Newell, Norman D., and Krumel, Bernhard
    From a preliminary study of their fauna, the Woodside formation of
    southeastern Idaho and western Montana, and the Dinwoody formation
    of western Wyoming, are believed to belong to the Otoceras zone of
    early Triassic age.
Nichols, Robert L., and Stearns, Charles E.:
Grooved lava in the cross-section of Big Craters, Idaho:
The grooved, striated, and poikilomorphous lava and that covered with shark's-tooth projections indicate in most cases that these markings were caused by the falling or rolling of blocks, bombs, and lapilli on molten flow, and, therefore, that there was simultaneous extrusion of lava and pyroclastic material.

Olson, Boyd E.:
Gem minerals of the region around Orofino, Idaho:
Notes presence of corundum (sapphire), tourmaline, quartz (rock crystal), quartz (maclolite-stained), agate, jasper, chalcedony (white), garnets, epidote, siren, and opal and opalized wood in the vicinity of Orofino.

Olson, Boyd E.:
Idaho locality:
Mineralogist, p. 18, July, 1938.
Brief article on a number of localities in Clearwater County where anthophyllite, a comparatively rare amphibole mineral, occurs.

Olson, Boyd E.:
Idaho Miocene fossils:
Mineralogist, vol. 6, No. 9, pp. 19-22, September, 1936.
Describes outcrops of plant and other fossils from the Latah formation (middle Miocene) in Idaho, Clearwater, Nez Perce, and Latah counties.

Pate, M. L.:
Four Square gold mine, Murray, Idaho:

Paulsen, C. G.,
Canfield, G. H., Crandall, Lynn, Pollansbee, Robert, Newell, T. R., Parker, G. L., and Burton, A. E.:

Paulsen, C. G., Newell, T. R., Parker, G. L., and Turtle, A. H.:
800. Pebson, E. W.,
Zinc:
pp. 147-170, 1939; pp. 127-146, 1940.
Contains production data on zinc mining in Idaho.

801. Pebson, E. W., and Meyer, E. W.,
Lead:
Contains production data on lead mining in Idaho.

802. Pebson, E. W., and Unhau, J. B.,
Antimony and cadmium:
Discusses briefly production of antimony in Idaho. Before exhaustion of the ore at depth the Meadow Creek mine was the chief source, but in 1938 operations were shifted to shallow deposits at the Yellow Pine mine, Valley County.

803. Platts, John B.,
Influence of structure on ore deposits in the Coeur d'Alene district (abstract),
 Asserts that a recurring lateral thrust from the northwest toward the northeast, folding the pre-Cambrian Belt sediments into a series of northeast striking folds, and igneous intrusion which followed the planes of weakness in the axial shears of the anticlines (one of which is the Coeur d'Alene anticline), with accompanying high temperatures followed by long periods of cooling, have governed the deposit of a series of ores.

804. Read, C. H., and Brown, R. W.,
American Cretaceous forms of the genus Tempyskia,
U. S. Geol. Survey Prof. Paper 186-F, pp. 106-151, 1937. Map showing localities in the United States, including two in eastern Idaho where the fossil fern Tempyskia has been found.
Tabulations of stratigraphic sections of the localities where the specimens were collected or nearby areas indicate a rather close correlation in age (lowermost Lower Cretaceous to Sononian - late Upper Cretaceous) throughout the United States. Tempyskia from the Teton Basin, Idaho, are from the Aspen shale, and those from southeastern Idaho are from the Wauy formation, both Upper Cretaceous.

805. Reed, John C.,
Significance of amygdales in Columbia River lava (abstract),
Amygdales in the Columbia River lava in north-central Idaho are described with respect to their past geologic history. The minerals (as determined by their optical properties) in the amygdales that were examined are, from their outside concentric layers toward their interior ones, nontronite, greenalite, melanophlogite, erionite, chalcedony, and mixed chalcedony and opal.

806. Reed, John C.,
Amygdales in Columbia River lavas near Freedom, Idaho,
Incomplete study of seven amygdales from lava flows (Lower Middle Miocene) along Slate Creek, a tributary of Salmon River; shows them to be of unusual geological and mineralogical interest. This paper describes these unusual objects, giving tentative conclusions as to their origin, and summarizes the geology and structure of the region in north-central Idaho where they have been found.

206.
807. Reed, John C.,
A comprehensive report on an old lode and placer district which has recently had a revival by means of dredging. Describes briefly all the active, and many old lode and placer deposits and mines. This district has produced about $17,000,000 worth of precious metals, most of it placer gold.

808. Reed, John C.,
Describes all the active, and many of the inactive, placer and lode deposits. The placer deposits comprise those in weathered bedrock, in older gravels, and in younger sediments, those in the latter being the most productive. The lodes consist of small quartz veinslets in altered quartz diorite and may warrant exploitation.

809. Requa, L. K.,
The geology and operation of the Idaho Almaden mine; Northwest Mining News, vol. 6, No. 23, pp. 7-9, December 15, 1940; vol. 6, No. 24, pp. 7-9, December 31, 1940.
The deposit, discovered in 1889 by Harry Brown, is in much faulted Tertiary lake beds, which have been silicified and locally kaolinized in several stages. Most of the cimbar formed late. The ore body is 500 feet long, 350 feet wide, and 15 to 25 feet thick with low-grade material below. Methods of exploration, mining and milling are discussed.

810. Resser, Charles Elmer
Discusses Middle Cambrian formations and underlying Beltian strata in this district, which is the site of the first Cambrian outcrop discovered in northwestern United States. Identifiable fossils are described and illustrated.

811. Resser, Charles Elmer
Data are given on localities in northeastern Utah and adjacent portion of Idaho where the Spence shale members of the Ute limestone (Middle Cambrian) has been recognized. Descriptions, with plates, of its fauna are added. The type locality is in Spence Gulch on the eastern slopes of Bear River Range about 5 miles southwest of Liberty and 15 miles west of Montpeller, Idaho.

812. Ridgway, R. H., and Davis, H. W.,
Volumes for 1938 and 1939 mention briefly molybdenum deposit near Porthill, Boundary County; 1938, 1939, and 1940 describe operations at the Imi tungsten mine, Lemhi County; 1938 mentions a tungsten property 2 miles west of Murray, Shoshone County.

814. Roberts, R. J., The petrography and ore deposits of the Dixie district, Idaho: Master's Thesis, 1936, Library, University of Washington, Seattle (from the Pacific Northwest). A selected bibliography, compiled by John B. Appleton, published by the Northwest Regional Council, Portland, Oregon, p. 160, 1939. The Dixie mining district, about 40 miles southeast of Grangeville, Idaho County, is situated within the area capped by the Idaho penepalein, which is locally broken by broad basins and narrow canyons. The basins may be the result of opening out of wide valleys in the upland before the canyon cycle, but may in part be due to deformation in late Tertiary time. The rocks of the district are pre-Cambrian (?) sediments with some Cretaceous (?) granitic rocks and some later dike. The ore deposits occur along northwest-trending shear zones in granitic and met- amorphic rocks, and comprise gold-quartz veins of hydrothermal origin and disseminated low-grade, gold-pyrite deposits related to the veins. Oxidation of the deposits does not generally extend more than 50 feet below the surface.


816. Ross, Clyde F., Geology and ore deposits of the Boyhorse region, Custer County, Idaho: U. S. Geol. Survey Bull. 877, 1939. Geologic map and structure sections of the Boyhorse region. This report covers the Boyhorse quadrangle, much of the Custer quadrangle, and the area surrounding Round Valley, all in Custer County, and a small part of the Sawtooth quadrangle in Blaine and Custer counties. The Boyhorse, Boulder Creek, and East Fork mining districts are included in this region, which is underlain by a thick sequence of Paleozoic sedimentary rocks intruded on the west by the Idaho batholith and largely overlain by Tertiary volcanic strata and associated sedimentary rocks. The principal past production has been from the oxidized parts of silver-lead lodes, but the comparatively unaltered parts of the lodes of these and other metals give hope for the future.


Scheid, Vernon E.,
Fish in the Latah formation of Idaho:
Science, new ser., vol. 85, No. 2196, p. 120, January 29, 1937.
Although fragmentary remains of fish belonging to the genus Louisius have previously been found in the Latah formation, so far as the author has been able to determine, the first discovery of complete and articulated skeletons is in the Latah beds outcropping in a road cut 11-1/2 miles east of Lowiston. These beds are composed of yellow and porcelaneous white shale, enclosing a bed of gray volcanic ash. The writer's belief is that with further exploration other complete skeletons will be found in this formation in Idaho and Washington.

Scheid, Vernon E.,
Geologic excursions around Moscow, Idaho: Pt. 1, Rocks.
Furnishes necessary itineraries and descriptive data relative to short trips in the vicinity of Moscow to localities which will acquaint students and amateurs with some of the many geologic features of the region.

Scheid, Vernon E.,
Significance of a fossil horse tooth found at Moscow, Idaho.
Believed to be from the "Pullove formation" (middle or lower middle Pleistocene). Finding of this fossil is of particular importance in furnishing a clue to the age of the sediments.

Scheid, Vernon E., and Allen, J. N.,
A phosphate pegmatite from eastern Latah County, Idaho (abstract).
Northwest Science, vol. 14, No. 3, p. 72, August, 1940.
Describes briefly the occurrence of a pegmatite dike in rocks of the Belt series (pre-Cambrian) in the Mica Mountain district of eastern Latah County.

Schultz, John R.,
Early Pleistocene mammal fauna from the vicinity of Grand View, Ada and Owyhee counties, Idaho (abstract).
Lists species of mammals known from the Grand View locality and postulates that a comparison of these with the fauna from Egerman indicates that those from the locality are apparently of a somewhat younger stage.

Shea, W. P.,
Zinc ore reserves of the world.
Contains tables compiled from authentic sources showing estimates of probable reserves of ore, metallic content, and milling capacity, covering the more important mines in the United States (including those in Idaho) and outside the United States - also a table summarizing world reserves.

Shannon, P. J.,
Geology and ore deposits near Murray, Idaho.
Idaho Bureau Mines and Geology Pamphlet 47, October, 1938. Geologic and topographic map and index map of mines near Murray.
A brief but comprehensive report on a relatively little known part of the Coeur d'Alene region. Describes gold, silver, lead, and zinc lodes and placers. Some scheelite is found with the gold in bedding plane deposits in the Pritchard formation.
826. Shannon, F. J., and McConnel, R. H.,
The silver belt of the Coeur d'Alene district, Idaho;
A preliminary report on an exceptionally detailed study. Describes
briefly the geology and ore deposits of the district, the larger and
richer ore bodies being at considerable distances below the surface.
It is thought possible that additional ore bodies will be found in
the bleached zones in which the veins occur, particularly at great
depths and along the steep north limb of the Big Creek anticline.

827. Shannon, F. J., and McConnel, R. H.,
Use of sedimentation features and cleavage in the recognition of overturned
strata;
Econ. Geol., vol. 26, No. 3, pp. 430-444, May, 1940.
A brief account depicting the various sedimentation features and types
of cleavage which in many cases can be used in recognizing overturned
strata in the closely folded pre-Cambrian Belt series of the Coeur
d’Alene region, Idaho.

828. Skidmore, Jos. H.,
Gold mining and milling methods and costs at the Gold Hill mine at Talache
Mines, Inc., Quartzburg, Idaho;
Describes briefly the geology of this mine, which is in the Boise Basin in
the central part of Boise County, and refers to earlier papers on the
subject. Gold occurring in the free state is the principal economic
metal recovered. It is found commonly in white quartz veinalts associ-
ated with bismuth and iron sulphides. In 1937, milling capacity averag-
ed between 115 and 125 tons daily, and the ore bodies in the Pioneer
and Gold Hill rhyolite dikes had been mined to the 1100-ft. level.

829. Staley, W. W.,
Mining activity in the North Fork of the Clearwater River area;
Idaho Bureau of Mines and Geology Pamphlet 84, September, 1940. Map showing
mining districts;
A brief report on one of the oldest mining areas in the state, which,
with the development of modern mining methods and metallurgical pro-
cesses, is regarded as having possibilities for the future. Areas
discussed are the North Fork of the Clearwater River, Moose City,
Oregande Creek, Pierce, and Musselshell and Elderado.

830. Staley, W. W.,
An abridged bibliography of the mineral industry of the State of Idaho;
Idaho Bureau of Mines and Geology Press Bull. 19, October, 1940. Map of
Idaho showing minerals known to occur in each county.
Lists Idaho minerals with counties in which each is known to occur,
and counties with minerals found in each.

831. Stearns, H. T., Bryan, L. L., and Crandall, Lynn
Geology and water resources of the Mud Lake region, Idaho, including the
Island Park area;
with the U. S. Dept. of Interior General Land Office, Idaho Dept. of Reclama-
The study of the geology and water supply conditions of the area con-
tributing water to Mud Lake showed that the phenomenal increase in the
water supply was the result of porocamation of water used in irrigation
on the Elgin Bench about 30 miles away. The stability of this increas-
ed supply of water and methods for conserving and utilizing it were also
objectives of the investigation.
210.
832. Stearns, H. T., Crandall, Lynn, and Steward, W. G.,
Geology and groundwater resources of the Snake River Plain in southeastern Idaho:
U. S. Geol. Survey Water-Supply Paper 774, 1939, (prepared in cooperation
with the Idaho Bureau of Mines and Geology and the Idaho Dept. of Reclama-
tion). Geologic maps of various portions of the Snake River Plain and maps
of that region showing groundwater observations.
Summarizes geologic and hydrologic data on the part of the Snake River
Plain above King Hill. Estimates that the total annual groundwater
supply is 4,000,000 acre feet of which only a little is now used for
irrigation. The exceptionally large springs along the canyon of the
Snake River are interpreted as the result of interception by the
modern canyon of nearby former canyons now filled with highly permeable
water-charged material. Inventories of available water supplies of
the plain and its tributary valleys are given.

833. Tullis, E. L.,
The composition and origin of certain commercial clays in northern Idaho:
Master's Thesis, 1932, Library, University of Idaho, Moscow (from The
Pacific Northwest; A selected bibliography, compiled by John B. Appleton,
published by Northwest Regional Council,Portland, Oregon, p. 17, 1939a).

834. Tyler, Paul M., and Johnson, Bertrand L.,
The phosphate situation:
Summarizes the present status of the world's phosphate industry
and reserves of which Idaho is credited with almost six billion tons.

835. University of Idaho Phosphate Committee,
The University of Idaho and the development of Idaho phosphates:
showing extent of Idaho's phosphate-bearing beds.
A review of the phosphate industry and Idaho's position with respect to
the world situation. The geology of the Idaho deposits is briefly de-
scribed.

836. Upson, R. E.,
Correlation of some "Latah" beds of Nezperce County, Idaho (abstract):
Northwest Sci., vol. 16, No. 3, P. 72, August, 1940.
The similarity of a fossil flora found in "Latah" beds near Julia-
ette, Arrow Junction, and Fir Bluff Station, Nezperce County, to that
found in type Latah beds (upper or middle Miocene) near Spokanes and
Republic, Washington, strengthen earlier correlations.

837. Wales, Priscilla J.,
The Craters of the Moon, Idaho:
A portion of the Snake River plateau in south-central Idaho, which
was made a national monument in 1924, represents, according to the
author, the most recent fissure eruption in the United States, vol-
ocanic activity having ceased probably less than 500 years ago. The
article describes the spectacular formations which resemble the sur-
face of the moon as observed through a telescope.

838. Wells, R. C.,
Analysis of rocks and minerals from the Laboratory of the United States
Geological Survey, 1914-36:
A supplement to U. S. Geol. Survey Bull. 591, which is complete from
1860-1914. Analyses of Idaho rocks and minerals included.
211.
839. White, D. E. Antimony deposits of a part of the Yellow Pine district, Valley County, Idaho, a preliminary report. U. S. Geol. Survey Bull. 922-I, pp. 247-279, 1940. Geologic map. A large gold producing area, but at present of particular interest because it probably contains the largest reserve of antimony in the United States. Stibnite, the only antimony mineral present, occurs in veins and veinlets and in disseminated deposits.


One of the country's principal lead-zinc-silver mining camps is distinguished from the surrounding country by its complex folding and folding. The country rocks, mainly quartzites and argillites of the pre-Cambrian Jot Series, and the mineral deposits of the area are described, and the paper postulates that, from recent mining development and geologic study, more ore bodies may be found to take the place of those being exhausted.


Includes tables of records of flood discharges of streams in the Snake River Basin. These data form basis of comparison for possible future floods.


This dictionary is a comprehensive compilation of information showing the status and validity of all geologic names used in the United States and Alaska prior to 1936. The definitions of the formations set forth briefly the lithologic character, thickness, geologic age, stratigraphic relations to underlying and overlying formations, and type locality.
LIST OF PAPERS ON METALLIFEROUS DISTRICTS BY COUNTIES

Ada County


Adams County


46. Bells, Wm., Jr., The Seven Devils mining district, Idaho; Eng. and Min. Jour., vol. 69, pp. 345-346, 1900.


Bannock County


Bear Lake County


Benewah County


Bingham County


Blaire County


217,


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Boise County


Anonymous, Burroughs' faith rewarded; important ore discovery on 700-level of Talache's property: Min. Truth, vol. 15, No. 16, p. 4, 1928.


Bell, R. W., Boise Basin continues making history: Min. Truth, vol. 14, No. 17, pp. 6, 6, 14-16, October 17, 1929.

Malett, Conner, Gold rushes of the Northwest: Min. Truth, vol. 16, No. 19, pp. 5-6, 14, 1930.


Baill, R. H., The gold resources of Idaho: Min. and Contracting Review, vol. 37, No. 32, pp. 7-9, August 13, 1935; No. 33, pp. 6-7, August 20, 1935; No. 34, pp. 6-8, August 27, 1935; No. 35, pp. 5-6, September 3, 1935; No. 36, pp. 6-7, September 10, 1935; No. 37, pp. 5-6, September 17, 1935; No. 38, pp. 7-8, September 24, 1935.


Bonner County

Salisbury, R. D., Glacial work in the western mountains in 1901: Jour. Geol., vol. 9, pp. 718-731, 1901.


Bonneville County


Butte County


Camas County


Canyon County


Caribou County


Kirkham, W. E. D., Geology and oil possibilities of Bingham, Bonneville, and Caribou counties, Idaho: Idaho Bureau Mines and Geology Bull. 8, 1924.


Cassia County


Clark County


Elmore County


83. Bell, R. N., Another butte in southern Idaho: Min. Truth, 15th year, No. 19, pp. 5, 6, 14, November 20, 1930.


173. Dean, Robert L., Airplane service to Idaho mining camps: Min. and Met., vol. 6, pp. 79-81, February, 1935.


87. Bell, R. N., The gold resources of Idaho: Min. and Contracting Review, vol. 37, No. 35, pp. 7-8, August 27, 1935; No. 34, pp. 6-8, August 27, 1935; No. 35, pp. 4-6, August 13, 1935; No. 36, pp. 6-8, September 3, 1935; No. 37, pp. 5-6, September 17, 1935; No. 38, pp. 7-8, September 24, 1935.

790. McCloskey, J. E., Central Idaho geology: Northwest Min., vol. 5, No. 6, pp. 5, 6-10, March 16, 1939. Sketch map of central Idaho showing general layout of various districts.


Franklin County


Fremont County


Gem County


87. Bell, R. N., The gold resources of Idaho: Min. and Contracting Review, vol. 37, No. 32, pp. 7-8, August 13, 1935; No. 33, pp. 6-7, August 20, 1935; No. 34, pp. 6-8, August 27, 1935; No. 35, pp. 5-6, September 3, 1935; No. 36, pp. 6-7, September 10, 1935; No. 37, pp. 6-8, September 17, 1935; No. 38, pp. 7-8, September 24, 1935.


Gooding County


Idaho County


250.


231.


173. Dean, Robert L., Airplane service to Idaho mining camps: Min. and Met., vol. 6, pp. 79-81, February, 1935.


650. Van Broeklin, J. E., Prospector claims source of course gold along Salmon is in ancient gravel deposits: Northwest Min., vol. 13, No. 2, p. 4, February 4, 1937. (Reprinted from Idaho County Free Press.)


Anonymous. Clearwater Concentrating Company builds custom mill of 60-ton capacity in Elk City district: Northwest Min., vol. 5, No. 6, pp. 4, 8-10, March 16, 1939. Sketch map of central Idaho showing locations of properties within 24-mile radius of the mill.

McClellan, J. E., Central Idaho geology: Northwest Min., vol. 5, No. 6, pp. 5, 8-10, March 16, 1939. Sketch map of central Idaho showing general layout of various districts.


Jefferson County


Jerome County


Kootenai County


169. Davenport, C. W., Geology of the Coeur d'Alene Lake, Idaho, 1921.


Lathe County


**Lehni County**


56. Bell, R. N.; An outline of Idaho geology and of the principal ore deposits of Lehni and Buster counties, Idaho; Int. Mining Congress Proc., 4th sess., pp. 64-80, 1901.


37. Atwood, W. L.; The physiographic conditions at Butte, Montana, and Bingham Canyon, Utah, when the copper ores in these districts were enriched; Econ. Geol., vol. 11, pp. 697-740, 1916.


General map of placer mining districts of Lemhi County and maps showing gravel deposits in specific districts.  
Topographic and geologic map of the district has been issued separately.  

Lewis County  
236.
Lincoln County


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**Sulphur**


