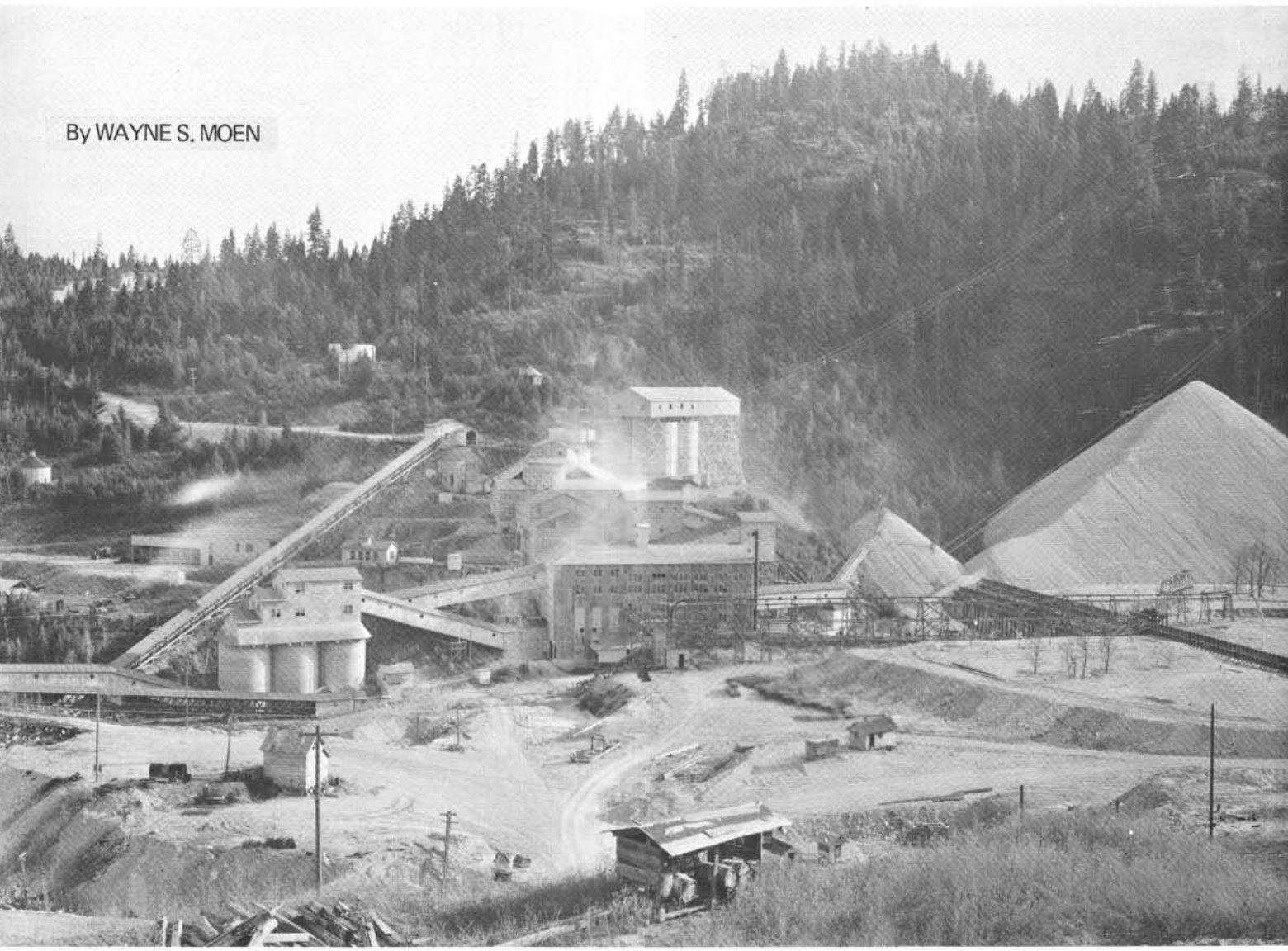
STATE OF WASHINGTON
DEPARTMENT OF NATURAL RESOURCES

BRIAN J. BOYLE, Commissioner of Public Lands
RUSSELL W. CAHILL, Supervisor

DIVISION OF GEOLOGY AND EARTH RESOURCES
RAYMOND LASMANIS, State Geologist

THE MINERAL INDUSTRY OF WASHINGTON - HIGHLIGHTS OF ITS DEVELOPMENT, 1853 - 1980

By WAYNE S. MOEN



INFORMATION CIRCULAR 74

Prepared through the cooperation of the U.S. Bureau of Mines

1982

WA
GS
15:74

COVER

Northwest Magnesite Co.'s concentrating plant at Browns Lake, Stevens County, in 1959. Crude magnesite from several quarries was treated at sink-float and flotation plants shown in photo and then transported by aerial tramway to reduction plant at Chewelah. At the reduction plant shown on page 16, magnesite was converted to "dead-burned magnesite" and shipped to steel mills of the East as basic refractory.

STATE OF WASHINGTON
DEPARTMENT OF NATURAL RESOURCES

BRIAN J. BOYLE, Commissioner of Public Lands
RUSSELL W. CAHILL, Supervisor

DIVISION OF GEOLOGY AND EARTH RESOURCES
RAYMOND LASMANIS, State Geologist

INFORMATION CIRCULAR 74

THE MINERAL INDUSTRY OF WASHINGTON - HIGHLIGHTS OF ITS DEVELOPMENT, 1853 - 1980

By

WAYNE S. MOEN

Prepared through the cooperation of the U. S. Bureau of Mines

1982

CONTENTS

	Page
Introduction	1
Earliest coal mining	1
Discovery of gold	4
Beginning of placer gold mining	4
Early lode mining	6
Peak years of metal-mining activity	11
Recent metal-mining activities (1970-1980)	14
Industrial mineral development	15
Oil and gas	19
Coal	21
Statistics of recent and current production	22
Future of Washington's mineral industry	22

ILLUSTRATIONS

Page

Figure 1. Mineral production in Washington, 1900-1980 2
2. Coal mining towns of Fairfax and Wilkeson, Pierce County, in 1927 3
3. Pacific Coal Co. tipple and washing plant at Carbonado, Pierce County, in 1918 . . . 3
4. Rocker shown in photo was to separate placer gold from sand and gravel 5
5. Kittitas Gold Co. dredge on Swauk Creek, Kittitas County, in 1926 6
6. Metal production of Washington, 1866-1900 6
7. Arrastre shown in photo was on Swauk Creek, Kittitas County, in 1924 7
8. Pick and wheelbarrow miners at the turn of the century 7
9. Last Chance gold mine, Republic district, Ferry County, in 1900 7
10. Eureka gold camp, Ferry County, in 1897 8
11. Blewett gold camp, Chelan County, in 1900 8
12. Sunset copper mine, Index district, Snohomish County, in 1935 9
13. Republic mill, Ferry County, in 1900 10
14. Northport smelter, Stevens County, in 1920 10
15. Knob Hill gold mill at Republic, Ferry County, in 1945 11
16. Placer gold washing plant in Liberty district, Kittitas County, in 1960 12
17. Holden mine concentrating mill, Railroad Creek district, Chelan County, in 1950 12
18. Pend Oreille Mines and Metals Co.'s concentrating mill at Metaline Falls, Pend Oreille County, in 1960 13
19. Production of Washington's major metal-producing counties, 1903-1970 13
20. Metal production of Washington, 1900-1980 14
21. U.S. Marble quarry at Valley, Stevens County, in 1900 15
22. Beehive kilns at Granger Clay Products Co., Yakima County, in 1945 15
23. Lehigh Portland Cement Co. plant at Metaline Falls, Pend Oreille County, in 1945 16
24. Northwest Magnesite Co. at Chewelah, Stevens County, in 1949 16
25. Northwest Alloys plant at Addy, Stevens County, in 1978 17
26. Sand and gravel, and stone production of Washington, 1900-1980 18
27. Silica mining operation in Wenatchee district, Chelan County, in 1977 18
28. Shell Oil Co.'s exploratory gas well in Kittitas County, in 1980 19
29. Physiographic provinces of Washington and wells drilled for oil and gas between 1900 and 1980 20
30. Aerial view of coal-fired steam-electric plant near Centralia, Lewis County, in 1980 20

ILLUSTRATIONS – Continued

Page

Figure 31. Coal production of Washington, 1900-1980 21
32. Cumulative coal production in Washington, by county 21
33. Active metallic properties of Washington, 1979 24
34. Active nonmetallic properties of Washington, 1979 25
35. Sand and gravel operations of Washington, 1979 26

TABLES

Table 1. Mineral production for Washington, 1979-1980 23
2. Washington mineral production, 1970-1980 23

THE MINERAL INDUSTRY OF WASHINGTON - HIGHLIGHTS OF ITS DEVELOPMENT, 1853 - 1980*

by

Wayne S. Moen

Introduction

In 1853, a shipment to San Francisco from a mine on Bellingham Bay of 150 tons of coal valued at $4,500 gave birth to Washington's mineral industry. In the years that followed, coal as well as 30 other mineral commodities were produced, resulting in a steady growth of the state's mineral industry that, in 1980, was valued at around $300 million. In the discussion that follows, highlights of the development of Washington's mineral industry are presented from 1853, when Washington Territory was formed, through 1980, a span of 128 years.

Mining was one of the first industries to become established when permanent settlements began to appear in Washington Territory. The region was well mineralized — a fact that was soon recognized by the early settlers, though many years were to elapse before the great diversity of its mineral resources was known. Then, too, the value and importance of many mineral substances became apparent only when population increases brought about local market demands. Just how important mining was to become to the state's economy is best indicated by the dollar value of new wealth contributed by the mines of the state during the past 128 years. From no production at the beginning of the period, this value has shown a nearly continuous yearly increase, except for the occasional times of depression and market stagnation, until it reached an amount of more than $305 million in 1980. The total value of mineral production for the 128-year period has been approximately $4 billion.

The progress of prospecting and mining here has not lacked the glamour commonly associated with the industry, but actually romance has played a relatively small part in the mineral development of the state. For some reason, when mining is mentioned one usually thinks of gold and silver and, to a lesser extent, of copper, lead, zinc, and a few other metallic ores. These have had, and do have, an important place in our mining industry, but a far more important place must be given to the nonglamorous minerals — coal and industrial minerals such as sand and gravel, stone, portland cement, and dolomite.

In considering our first 128 years of mining, it is of interest to review the accounts of early discovery and development. Some of these records are vague and contradictory, and some have been garbled and misquoted by later commentators, but the original accounts are available in libraries and include observations and findings by competent observers who were present during or near the times and events described.

Earliest Coal Mining

The earliest recorded discovery of mineral in what was later to be Washington Territory occurred in 1833, when Dr. Tolmie, an Englishman in the employ of the Hudson's Bay Co. at Fort Vancouver and later Factor of Fort Nisqually, found and described coal outcroppings on the

* A revision and updating of the following report: Glover, Sheldon L., 1954, One hundred years of mining in Washington: Washington Division of Mines and Geology Biennial Report No. 5, part 2, p. 9-20.

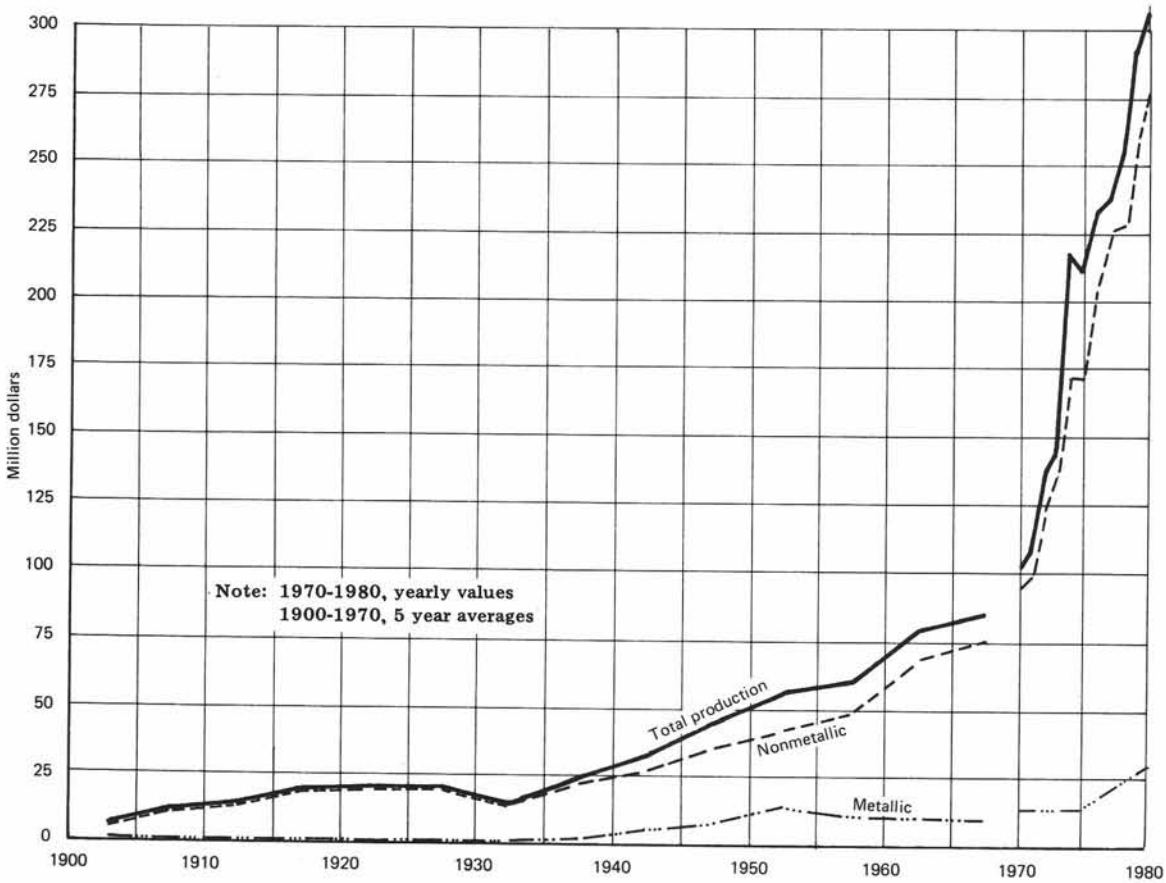


Figure 1. —Mineral production of Washington, 1900-1980.

Toutle River near its junction with the Cowlitz River in what is now Cowlitz County. Other coal in this same vicinity was found in 1848, but there is no record of any mining at those times, and certainly the coal was valueless at that early period, prior to the settlement of the region.

The next record of discovery was again of coal, this time in 1852 on the shore of Bellingham Bay. A Captain William Pattle was then engaged in furnishing the Hudson's Bay Co. with timber, which he was cutting on Lopez Island. He had crossed over to the mainland and was inspecting timber on Bellingham Bay when Indians called his attention to coal outcrops along the shore. He and Messrs. Morrison and Thomas, who were working with him, immediately located adjoining claims of 160 acres under the provisions of the donation law then in force in the Territory. Captain Pattle opened a "wheelbarrow" mine on his claim and took out a small amount of coal, an operation which, although soon abandoned, apparently initiated mining in the Territory. The next year, 1853, a more ambitious undertaking was started on Morrison's claim, where the "Ma-moosie mine" was developed; about 150 tons of coal was shipped from this property to San Francisco before operations were suspended for several years. In the meantime, the blowing down of a large tree had exposed a coal bed about 2 miles north of the Pattle claim. This was located in the fall of 1853 by Messrs. Brown and Hewitt, and resulted in the organization of the Bellingham Bay Co., and the eventual development of coal reserves which, under various managements and names and despite fires and other difficulties, supported large-scale operations to 1955.

Coal was something familiar to those early settlers, and they needed and valued it. Also, the phenomenal growth of population in California and its lack of coal provided an immediate export market and source of much-needed cash.The extensive coal beds of Skagit, King, Pierce, and Kittitas Counties were awaiting discovery, and the

Fairfax

Figure 2. —Coal mining towns of Fairfax and Wilkeson, Pierce County, in 1927, were typical of many coal-mining towns of Washington.

Figure 3. —Pacific Coal Co. at Carbonado, Pierce County, in 1918. Tipple and washing plant shown in photo was near portal of mine.

existence of the southwest Washington fields had been known since 1833. It is no wonder, therefore, that one occurrence after another was found and prospected in the years just subsequent to the Bellingham Bay discoveries. In 1853 coal was discovered on Black River, near the present site of Renton, and a mine was opened there in 1854. A few years later the coal fields of the Issaquah and Newcastle areas, King County, and the coking coal of Carbon River and the Wilkeson area, Pierce County, were found. In about 1871 the Kittitas field was discovered, with shipping commencing in 1886, by which time the industry was well established throughout the coal-producing areas of the state. In 1860, yearly coal production in Washington was only around 5,000 tons; by 1876, it reached 100,000 tons per year; and by 1888, it exceeded one million tons per year, with a total production from 1860 through 1899 of 18,866,000 tons.

Discovery of Gold

The discovery of gold and the beginnings of metal mining are not so well documented, but certain features are clear. In 1853 Major Isaac I. Stevens was appointed governor of the newly organized Washington Territory. He was to journey overland from St. Paul, Minnesota, to Olympia, and while so doing was charged with the duty of searching out a feasible route for a transcontinental railroad.

Governor Stevens had assigned to Captain (later, General) George B. McClellan the task of investigating passes over the Cascade Mountains; the work was underway while Stevens was journeying west. The two men met at Fort Colville in October, 1853. At that time McClellan reported that he had ascended the Yakima River on September 3, 1853, and mentioned finding the first traces of gold that he had encountered, saying "though not sufficiently abundant to pay for working, it caused considerable excitement in the camp. . . . Gold was found to exist, in the explorations of 1853, throughout the whole region between the Cascades and the main Columbia north to the boundary, and paying localities have since been found at several points, particularly on the southern tributary of the Wenatchapam [Wenatchee]. The gold quartz is also found on the Nachess [Naches] River. The gold bearing rock, crossing the Columbia and stretching eastward along Clark's Fork and the Koutenay [Kootenai] River, unquestionably extends to the Rocky Mountains." It would appear that these later mentions of gold were the result of information which came to the attention of Governor Stevens between October, 1853, and the time just prior to 1860 when he submitted his report to the War Department, and thus included a period when prospecting was becoming generally active.

Beginning of Placer Gold Mining

Placer mining in the vicinity of Fort Colville was underway and probably began there in 1855. It must be remembered, however, that Fort Colville was an outfitting station for a very large region; and placering north of the boundary, in Canada, known to have been profitable, may have accounted for most of the activity ascribed to the Colville area. It is doubtful that the placer-gold production from the bars and tributaries of the Columbia and Pend Oreille Rivers in Washington was ever particularly important.

Whether or not gold mining actually began in the Colville area, an event of greater import was the discovery of placer gold in the Similkameen River in 1859. George A. Bethune, the first State Geologist of Washington, in his report of 1890 credits this with being the earliest find and the first to be profitably developed. The International Boundary Commission was engaged at that time in surveying the line between the United States and Canada, and in 1859 had reached the Similkameen River, having already completed the section north of Fort Colville. One of the soldiers of the party panned some of the gravel of the river bank and found it to be gold bearing. This started a "rush," resulting in hundreds of miners stampeding to the area and causing Okanogan City to mushroom to nearly 3,000 population in the first month of its existence. However, a few months later news came of the gold strikes in the Cariboo, Frazier, and other districts of Canada, and the miners, always ready

to believe that faraway fields are greener, deserted the Similkameen for the new diggings to the north.

During the next 10 years or so, prospectors were drifting north from California fields and south from Canadian fields, and were finding gold on streams here and there, both east and west of the Cascades. Some of these strikes in the early sixties were important; others were soon proved to have little value or were quickly worked out.

Figure 4. — From 1855 to the early 1900's the rocker was often used in one- or two-man operations along gold-bearing bars of the Columbia River to separate placer gold from sand and gravel.

It was probably in 1860 that placer gold was discovered on Peshastin Creek in what is now Chelan County. This and Swauk Creek, where gold was first discovered in 1868 near the present town of Liberty, Kittitas County, were vigorously worked by individuals and later by mining companies for many years and are still producing some gold. The Peshastin-Swauk district has accounted for what has probably been the principal placer-gold production of the state. In this connection it is interesting to note that here, as in many other placer localities, Chinese were able to operate profitably after the earlier white miners had abandoned the diggings. Eventually the Chinese moved out, and again the whites resumed work in the better localities.

The early prospectors ranged far and wide. They needed little financing, they traveled chiefly on foot, and they carried their tools and supplies on their backs when not established in temporary base camps. They missed very little in the way of promising ground, and the remains of test pits, tailing piles, old sluices, and other signs of their activities may be found today on remote and relatively inaccessible creeks throughout the mountains. This is not to say that no future discoveries of placer gold will be found, but the search will be difficult and the places will be where, for one reason or another, the "old timers" were unable to operate advantageously. Even on the better prospected streams unworked ground is occasionally found, and the bars of the larger rivers are, to some extent, replenished during each period of high water.

Placering at the present time is unimportant in Washington. The total gold recovered by this means has doubtless been considerable, although the amount is unknown. The records of recovery prior to 1900 are fragmentary at best and are not broken down to a county basis, or, for that matter, to placer as distinct from lode operations. Nevertheless, it appears reasonable to assume that the recovery made before the turn of the century greatly exceeded the later production. Since 1900, however, the records are fairly complete. The statistics of the U.S. Geological Survey and U.S. Bureau of Mines show a placer-gold production of $935,252 from 1900 to 1957, inclusive. For comparison, the lode-gold production for this same period was $52,106,982. Again, the relative insignificance of placer mining in later years is indicated by production figures for the 10-year period from 1900 to 1909, inclusive, when $350,541 was produced, as compared with figures for the similar period from 1944 to 1953, when only $12,456 was produced, or 3½ percent of the earlier amount.

Figure 5. — Kittitas Gold Co. dredge on Swauk Creek, Kittitas County, in 1926, was largest gold dredge to operate in Washington. Over $35,000 in gold was recovered from 1926 to 1929.

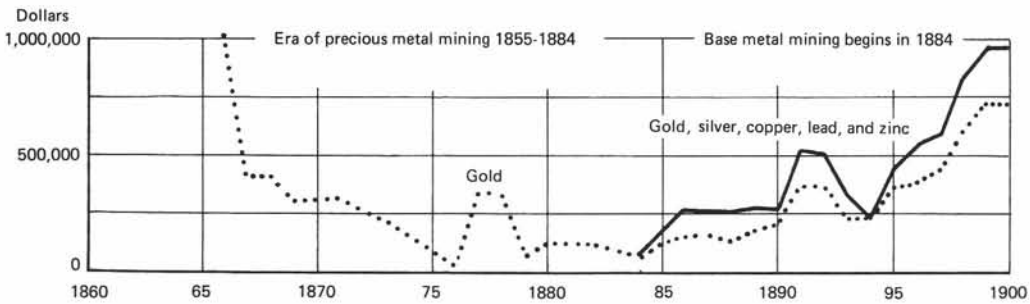


Figure 6. —Metal production of Washington, 1866-1900.

Early Lode Mining

The real metal-mining industry of the state probably dates from the discovery in 1871 of lode gold near the base of Mount Chopaka, Okanogan County. Considerable work was done here by Hiram F. Smith, later a member of the state legislature. A short time thereafter additional lode discoveries were made in the area, but as the land was in a reservation set aside for Chief Moses and his Indian tribe, the miners were moved off by soldiers and the work was discontinued until about 1887.

Following the Mount Chopaka finds, increasing attention was centered on the occurrence of lode ores throughout the Territory, with the result that hard-rock mining, as distinct from placering, began to assume the importance it deserved. Differing from the ephemeral placer operations conducted by individuals or small groups, lode mining, to be successful, involves considerable capital, heavy equipment, permanent camps, and competent management. Obviously, it was to mean far more to the industrial development of the state than had most of the earlier placer operations.

Gold-bearing veins in the Peshastin district were first worked at Culver Gulch in 1874, but many other discoveries were soon made in that area and on the Swauk. At first the gold was separated from the quartz gangue by grinding in arrastres. These were crude mills, powered by horizontal or overshot water wheels which were geared to a revolving center post. Heavy blocks of rock, usually four in number, were attached by arms to the post and were dragged around and around in a shallow basin cut in the rock or in a stone-lined pit, the ore being fed to the mill in egg-sized pieces. Many arrastres — the remains of some of which can be seen today — were constructed in the Peshastin-Swauk district, their use being followed by stamp mills in the several instances where continued mining proved profitable.

Figure 7. —In several gold districts around 1890, arrastres were used to grind vein quartz to liberate the native gold, but because of their low capacity and poor gold recovery they were soon replaced by the more efficient stamp mill. Arrastre shown in photo was on Swauk Creek, Kittitas County, in 1924, and was powered by an overshot water wheel.

Figure 8. — Pick and wheelbarrow miners at the turn of the century produced a portion of gold and silver from small mines in Washington.

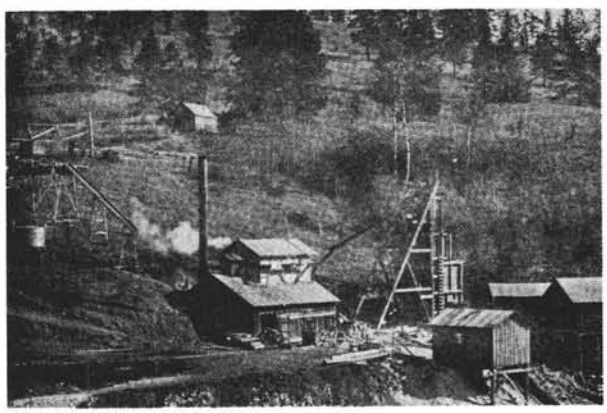


Figure 9. — Last Chance gold mine, Republic distric., Ferry County, in 1900, was typical of the many small gold mines in gold districts of northeastern Washington.

Following this earliest lode mining, mineral discoveries were made in many northern counties, the result of the tireless efforts of countless prospectors — efforts which through 1936 had led to the locating of approximately 125,000 mining claims. The ore deposit of the Old Dominion mine, Stevens County, was discovered in 1883. This mine produced more than $600,000 in lead-zinc ore prior to 1920. The Bonanza mine, Stevens County, produced nearly 100,000 tons of lead-silver ore between its discovery in 1885 and 1957. The Germania mine, discovered in 1894 in Stevens County, produced about 1,250 tons of high-grade tungsten ore between 1904 and 1941.

In the Deer Trail and Chewelah districts of Stevens County deposits rich in silver had been discovered in 1894, and by 1940, mines of these districts produced over 2 million ounces of the metal.

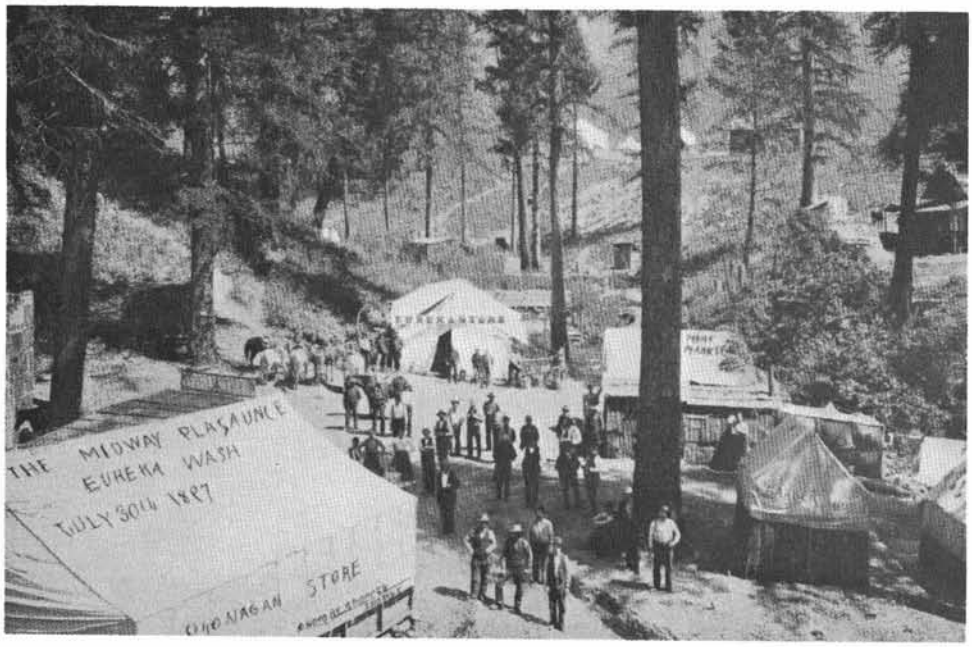


Figure 10. — Gold camp of Eureka, in 1897, was typical of the many mining camps that sprang up in areas where deposits of gold and silver were discovered. Eureka grew into the present town of Republic, county seat of Ferry County.

Figure 11. — Blewett gold camp, Chelan County, in 1900. Gold mill on right treated most of gold ore from mines in Culver Gulch. All that remains of the camp is the mill foundation as State Highway 97 passes directly through the old camp.

The many veins of the Ruby-Conconully district, Okanogan County, were discovered in about 1886 and produced some $200,000 in silver ore before 1907. Since that time the district has seen only intermittent activity, but at the turn of the century it was one of the most active camps in the state, with two or three thousand people in the area. Its old town of Ruby, complete with a brewery and the usual stores and saloons, is now represented only by the brush-covered foundations of former buildings.

The Sunset mine, Snohomish County, was discovered in 1897; from then to about 1932 development or production there was almost continuous. For several years, about the time of World War I, the property was one of the largest copper producers of the state, with an annual output valued between $100,000 and $200,000. The Monte Cristo mines of Snohomish County were located in 1889 and 1890, and from then until about 1903 were particularly active, producing some $7 million from gold ore which was treated at a smelter in Everett. In 1896 the Republic, Ferry County, ores were discovered. This camp has had a long, continuous history of activity and is still one of the state's most important gold producers, approximately $90 million in gold and $15 million in silver having been extracted since 1900. In 1914 the Electric Point mine of Stevens County was discovered, a property which produced more than a million dollars' worth of lead ore between 1916 and 1920. Similarly, many other ore bodies were discovered, prospected, and developed into paying properties during those earlier years of mining activity.

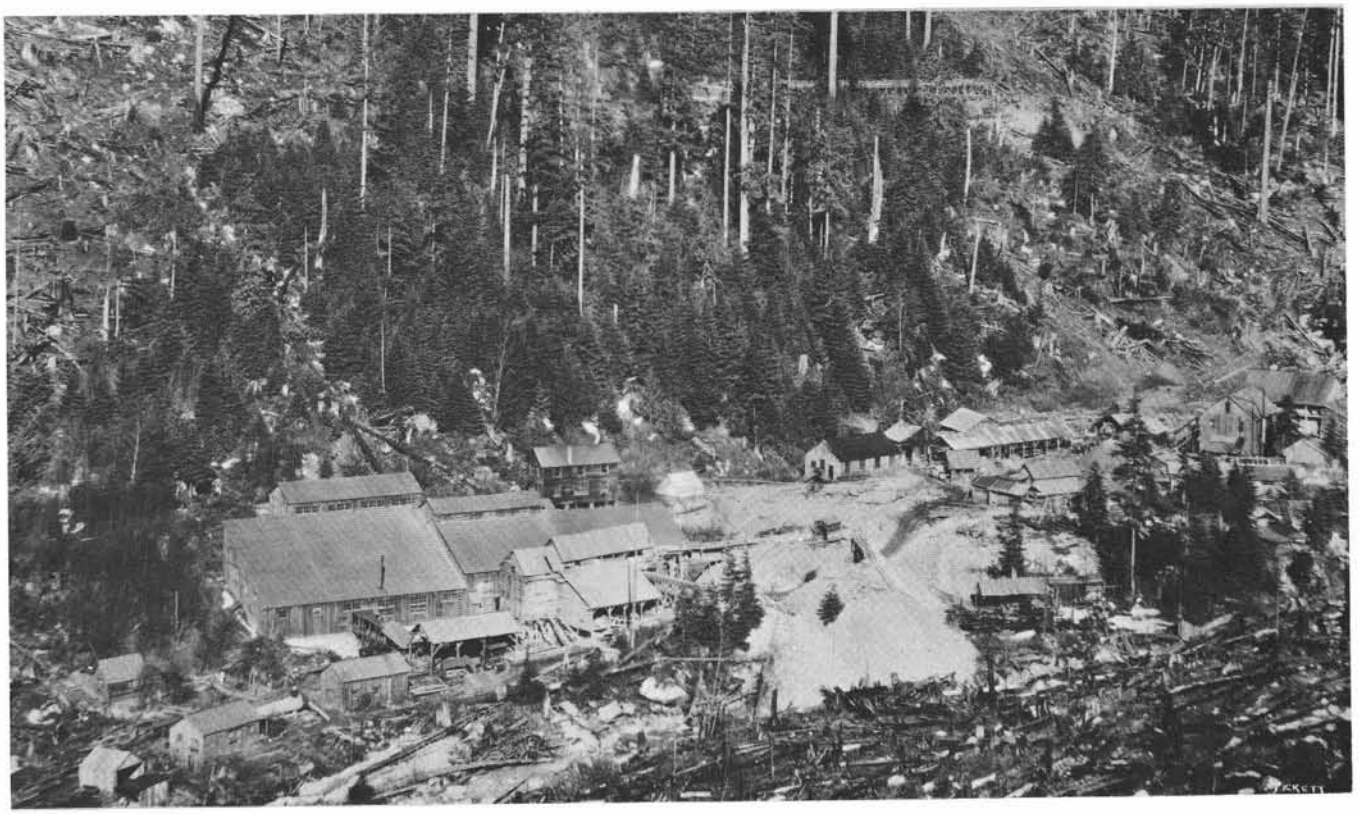


Figure 12. — Sunset copper mine, Index district, Snohomish County, as it was in 1935. The mine was the state's largest copper producer in the 1920's.

In the late 1800's, smelters were erected to treat concentrates and ores from the mines, as well as from out-of-state mines. The first smelter to appear on the scene was the Colville lead-silver smelter, which was built in 1887. This was followed by smelters in Tacoma, Everett, and Spokane in 1890, in Northport in 1897, and in Keller in 1905. As ore from the mines was depleted, smelters were forced to close. Of the six original smelters built in the state, only the Tacoma smelter survived. As one of the largest copper smelters in the United States, it currently is dependent upon out-of-state and foreign ores. Many concentrating mills were also built in the main mining districts. In 1911, around 30 mills were either active or under construction, but currently only five are operational.

Figure 13. — Republic mill at Republic, Ferry County, in 1900, was one of the largest gold mills in the state at the turn of the century. The 200-ton-per-day mill used roasting and cyaniding to recover gold and silver from siliceous ores of the Republic district.

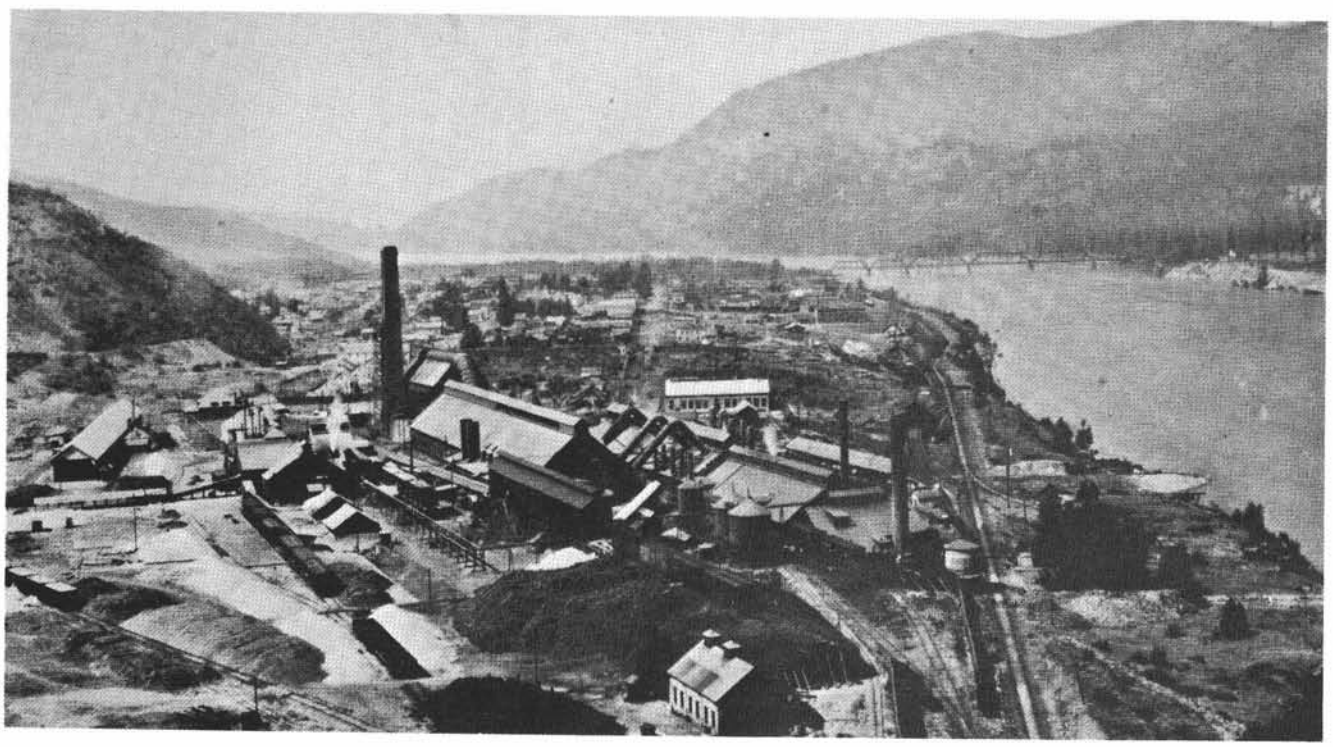


Figure 14. — Northport smelter, Stevens County, in 1920, smelted copper, lead, and silver ores from mines in northeastern Washington, as well as copper ore from British Columbia. In 1922, after 24 years of sporadic operations, the smelter closed and was dismantled.

Peak Years of Metal-Mining Activity

From 1940 to 1970, some of the older mines and many more which were newly developed or discovered were particularly active, causing the metal output of the state to reach all-time highs. One of the later outstanding developments was the beginning of mining at the Holden property of the Howe Sound Co., Chelan Division, in 1938. This Chelan County operation was one of the largest in the state, producing a total of 10.6 million tons of copper-gold silver-zinc ore from 1938 thru 1957 valued at $66.5 million. Outstanding, too, is the phenomenal development of the Metaline district of Pend Oreille County. The large zinc-lead deposits of this district not only placed it in a favored position among the mining areas of the state but gave it importance among the producing regions of the nation. The principal mines were the Pend Oreille, Grandview, and Bella May. Total production from these and other lead-zinc mines amounted to around $146 million between 1902 and 1969. The peak year for lead-zinc production in Pend Oreille County was 1957; 18 million pounds of lead and 22 million pounds of zinc, with a combined value of $7.5 million, was produced from mines of the Metaline district.

Among the other important metal mines of the state during the peak metal-mining years was the Gold King, Chelan County, which produced $16 million in gold and silver from 1949 to 1967. In Okanogan County, between 1939 and 1953, gold--silver-copper-zinc ore valued at around $1 million came from the Alder mine; and from 1943 to 1951, the Kaaba Texas was the leading producer of silver-copper-lead-zinc ore in the county. In Stevens County, lead-zinc mining reached its peak in 1955, when the Van Stone produced 35 million pounds of zinc and 4 million pounds of lead, with a combined value of $5 million. In the years following 1955, mining of metals in the state declined, and by 1970, most mining operations had ceased. Of the major mines, only the Pend Oreille lead-zinc mine in Pend Oreille County and the Knob Hill gold mine in Ferry County continued to operate. Since 1955, uranium had been mined at several properties, the largest of which was the Midnite in Stevens County, but in 1966, a collapse of the uranium market resulted in the closure of the state's uranium mines. Total yearly metallic mineral production in Washington in 1970, stood at around $11 million, whereas in 1955, it had reached its peak of $14 million.

Figure 15. — Knob Hill gold mill at Republic, Ferry County, in 1945. Since 1935 the mill has been used to recover gold and silver from ore of the Knob Hill mine, and currently the mine is Washington's only major gold producer.

Figure 16. — Placer gold washing plant in Liberty district, Kittitas County, in 1960. Plant is typical of those being used currently to recover placer gold from the sands and gravels of gold-bearing streams.

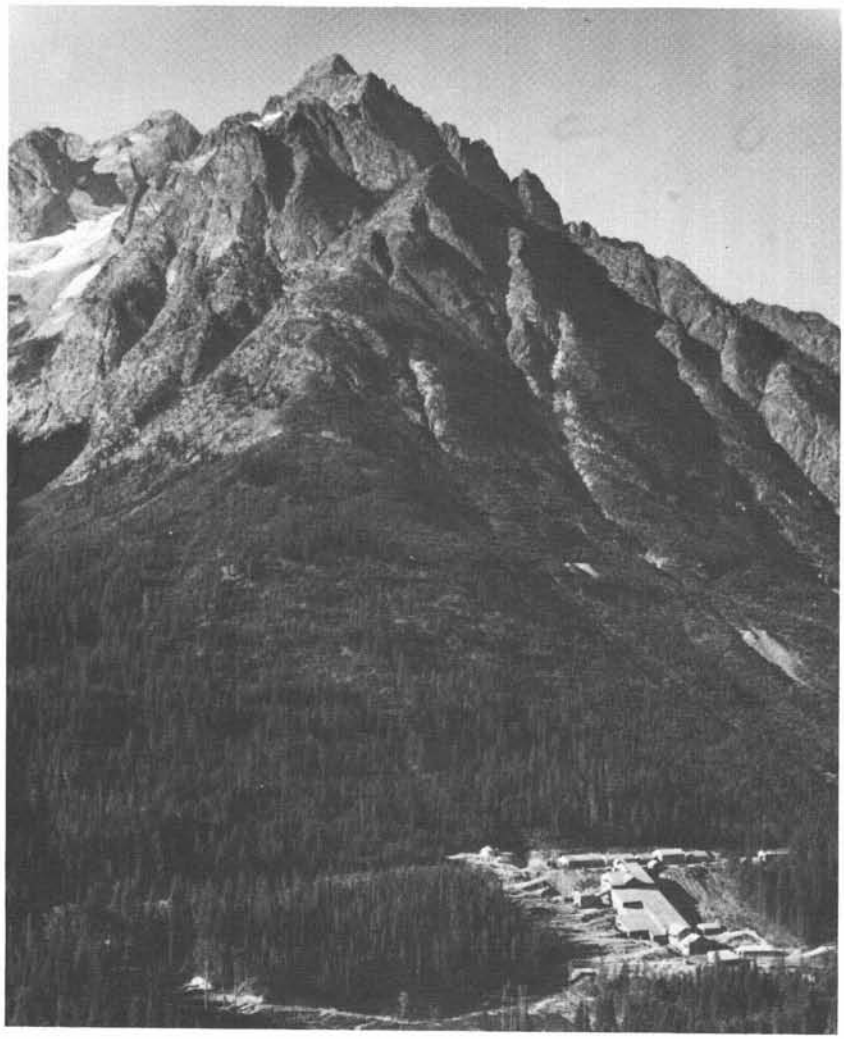


Figure 17. —Holden mine concentrating mill, Railroad Creek district, Chelan County, in 1950. This mine produced the bulk of copper, zinc, silver, and gold mined in Washington from 1938 to 1958.

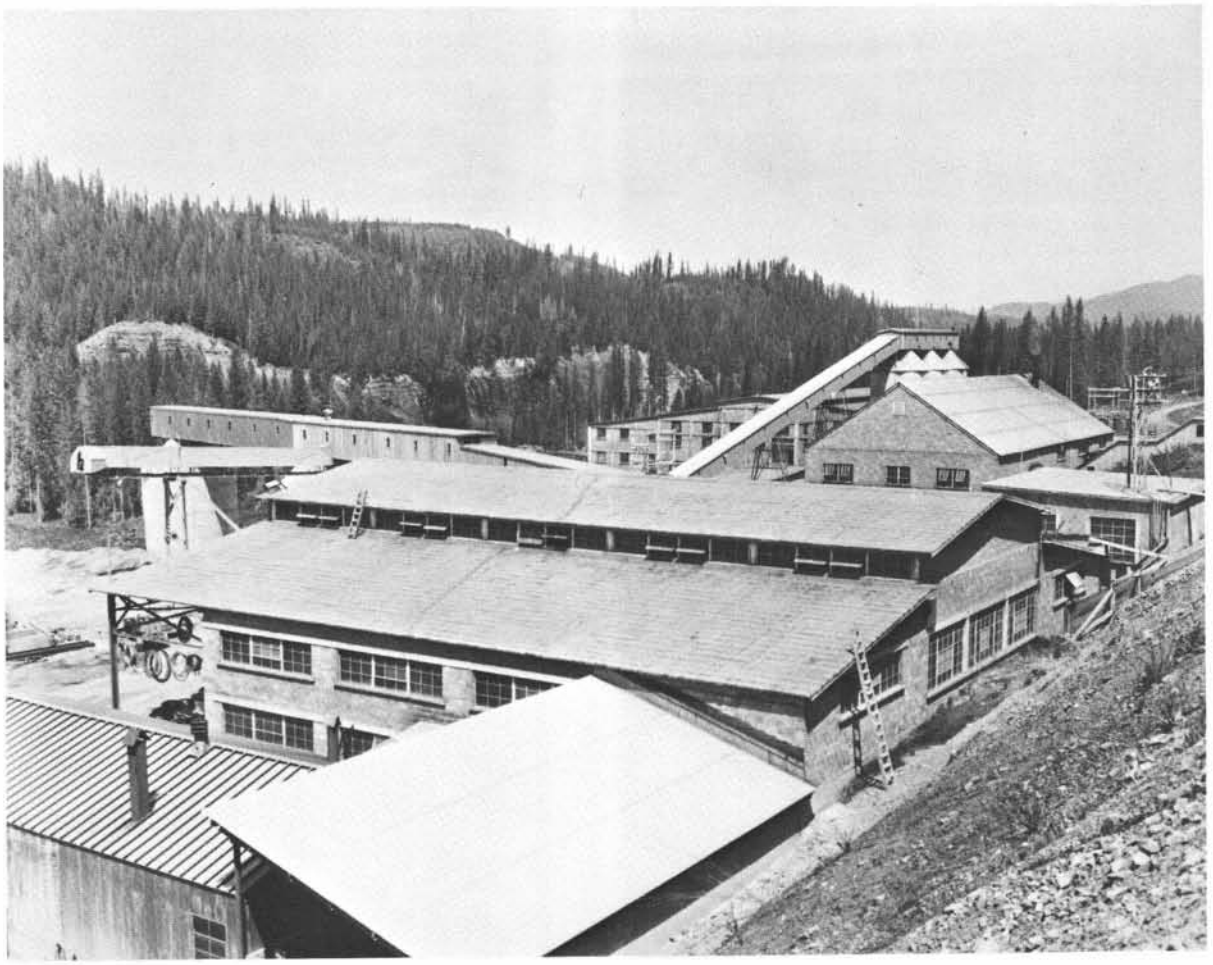


Figure 18. —Pend Oreille Mines and Metals Co.'s concentrating mill at Metaline Falls, Pend Oreille County, in 1960, was the county's major producer of lead and zinc concentrates from 1929 to 1970.

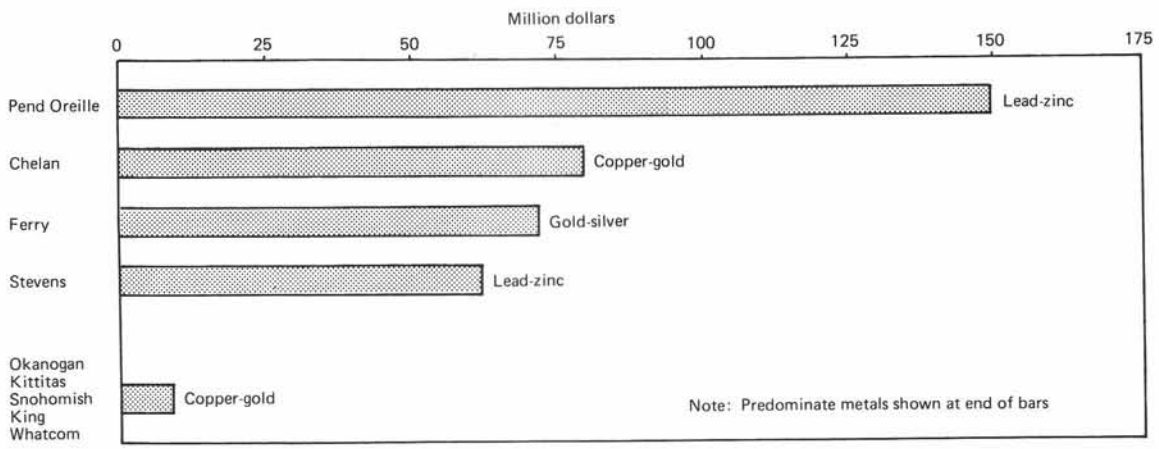


Figure 19. —Production of Washington's major metal-producing counties, 1903-1970 (includes gold, silver, copper, lead, and zinc).

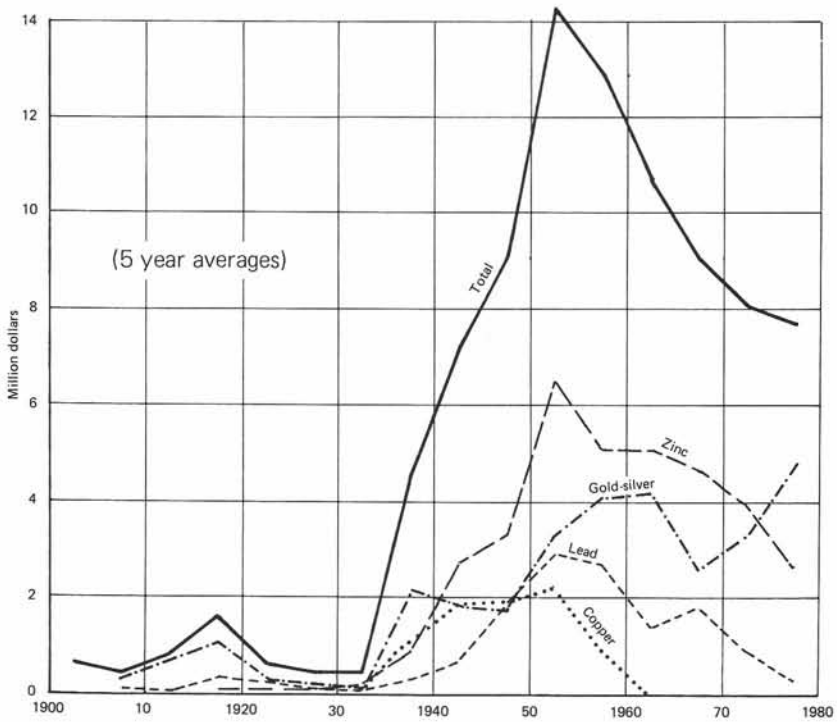


Figure 20. —Metal production of Washington, 1900-1980.

Recent Metal-Mining Activities (1970-1980)

Although metal mining had declined significantly by 1970, exploration and development of metallic mineral deposits by major mining companies increased considerably in the northern counties of the state and the Cascade Mountains. Known deposits of low-grade ore were being reexamined, and new mineral occurrences were being sought after. Extensive exploration and development work delineated several large copper-molybdenum mineral deposits. Work by Bear Creek Mining Company since the early 1950's established a very large deposit of copper in the Glacier Peak area of Snohomish County, in the north Cascades, and work by Duval International Corp. in the Spirit Lake district in the early 1970's disclosed an extensive low-grade copper deposit. In northeast Washington, Bear Creek Mining Company undertook exploratory work from 1964 to 1976 for copper and molybdenum in southwest Ferry County. This resulted in the discovery of the Mount Tolman deposit, which has been under development by Amax since 1978. Markets for uranium materialized in 1970, and the Midnite mine resumed production. In 1977, with the opening of Western Nuclear's Sherwood mine in Stevens County, the production of uranium in Washington reached an all-time high, with the current production being around $25 million per year.

It is not feasible in this summary account to list all the many proved or promising properties. Most of them contain the more usual ores of gold, silver, copper, lead, and zinc. However, to indicate the variety of available metals other resources deserve mention: these include ores of antimony, chromium, iron, manganese, mercury, and tungsten.

Industrial Mineral Development

As the state's metallic mineral resources were being developed, so were nonmetallic minerals. At the turn of the century clay from numerous pits throughout western Washington was mined for the manufacture of common building bricks used in the construction of buildings in rapidly growing towns. From sandstone quarries came building stone used in the construction of buildings as far south as San Francisco. And from limestone deposits on the San Juan Islands and the foothills of the Cascades came raw material used in the manufacture of lime and cement. In northeastern Washington, quarries in Stevens, Pend Oreille, and Spokane Counties produced marble and serpentine for monumental and architectural stone, as well as granite for paving blocks and curbing for the cities and towns of the region. In Pend Oreille County, limestone mined and processed in 1904, from a deposit near Metaline Falls, gave birth to the cement industry of Washington. In 1916, mining of magnesite began in Stevens County and "dead-burned magnesite" was shipped to steel mills of the East as a basic refractory. In 1916, about 700 tons of magnesite was mined, and by 1950, over 380,000 tons valued at almost $3 million was shipped yearly, which made Washington the foremost producer of magnesite in the country. In 1968, after 51 years of operation, mining of magnesite ceased. In Grant County of central Washington, mining of diatomite began in 1918, with a production of less than 1,000 tons. By 1980, many thousand tons were being mined primarily for use in filtration and as fillers in paint, rubber, and plastic products.

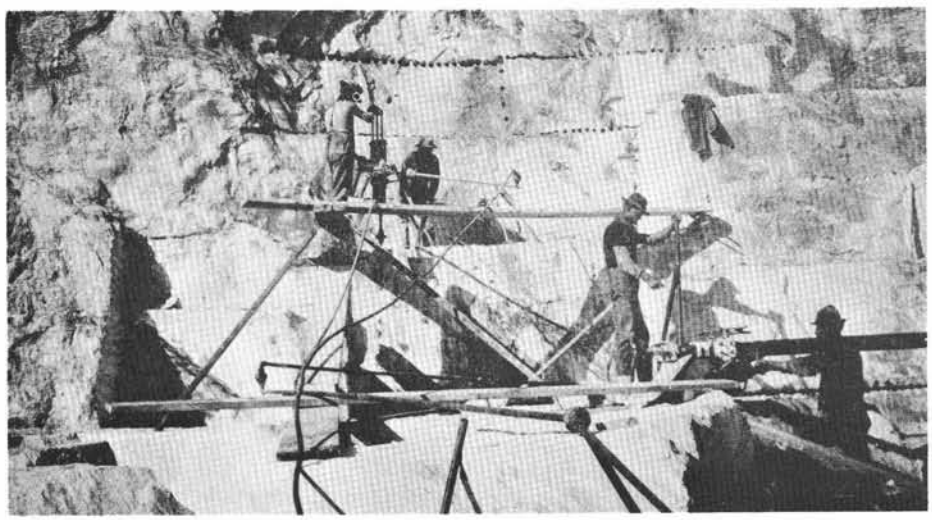


Figure 21. — U.S. Marble quarry at Valley, Stevens County, in 1900, was the largest stone quarry in Washington at that time. Workers shown drilling out large blocks of serpentine for use as monumental and building stone, utilizing steam-driven drills.

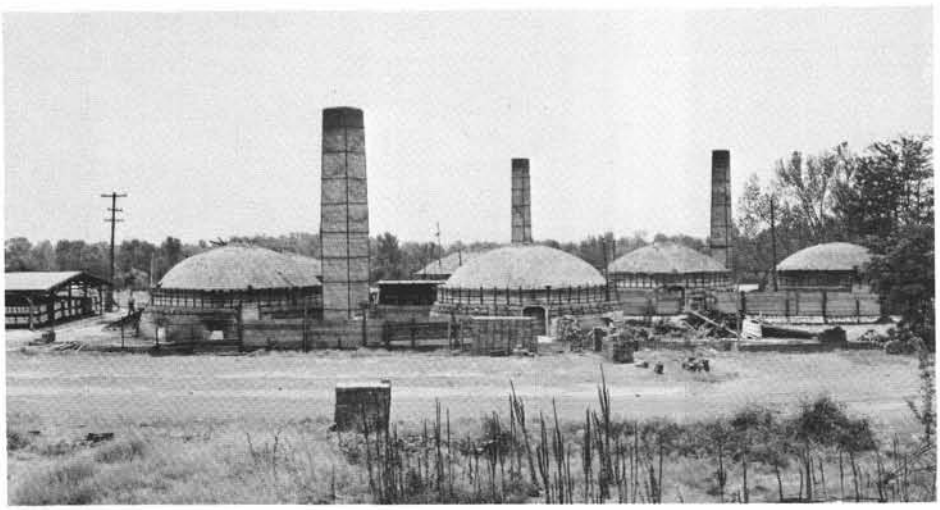


Figure 22. — Granger Clay Products Co. at Granger, Yakima County, in 1945. Beehive kilns were used to fire common brick and tile.

Figure 23. — Lehigh Portland Cement Co. plant at Metaline Falls, Pend Oreille County, in 1945 — site of the first cement plant in Washington (1904).

Figure 24. — Northwest Magnesite Co. at Chewelah, Stevens County, in 1949, was the leading producer of magnesite in the country. Crude magnesite from several outlying quarries was converted to "dead-burned magnesite" at reduction plant shown in photo.

In more recent years, the production of olivine began in Whatcom and Skagit Counties around 1946; barite mining began in Stevens County in 1940; and from 1933 to 1939, talc was produced from several mines in Skagit County. Although dolomite had been mined in Stevens County since the early 1900's for minor uses such as soil conditioners, refractory and building stone, and in 1943 and 1944 for the production of magnesium, it was not until 1976, that it became a major industrial mineral of eastern Washington. In 1976, Northwest Alloys placed into production a magnesium metal plant that utilizes around 450,000 tons of dolomite annually in the production of 25,000 tons of magnesium.

Adequate supplies of limestone, clay, and shale remain available for the production of Portland cement in areas where construction is at a maximum. Four large cement plants satisfy all market requirements; the dollar value of their output, which in 1980 was $83 million, led all other mineral substances. Sand, gravel, and common stone, all used in construction work, are in abundant supply in most areas where the need is greatest, and contribute many millions to the value of the state's mineral output.

Since 1930, when only around $2 million in sand and gravel was produced, production increased steadily to a maximum of $86 million in 1970. However, since 1970, due to slumps in the building industry, and completion of large projects such as freeway construction, production of sand and gravel has declined slightly. Because of near-future industrial and population growth in the Northwest, increased production of sand and gravel can be expected. Production of stone has also increased steadily since 1930, to an average of around $25 million since 1960.

Industrial minerals produced in 1980 include clay, diatomite, gypsum, olivine, peat, sand and gravel, stone, barite, limestone, dolomite, serpentine, silica sand, marble, talc, and granite. Ratios change from one year to another, but in recent years the various nonmetallic minerals and aggregates have accounted for about 90 percent of total mineral production. In 1980, the production of nonmetallic minerals had a value of about $275 million. Compared with our neighboring states, Washington's mineral production for 1980 was greater than Oregon's, but less than Idaho's. In 1979, Washington was 29th in rank in dollar value with 0.93 percent of the total mineral output of the United States. For comparison, Idaho was 18th in rank with 1.82 percent, and Oregon was 35th in rank with 0.68 percent.

Figure 25. — Northwest Alloys plant at Addy, Stevens County, in 1978, is one of the most modern metal-producing plants in Washington. As much as 400,000 tons of dolomite and 100,000 tons of quartzite are mined annually to produce magnesium and silicon metals.

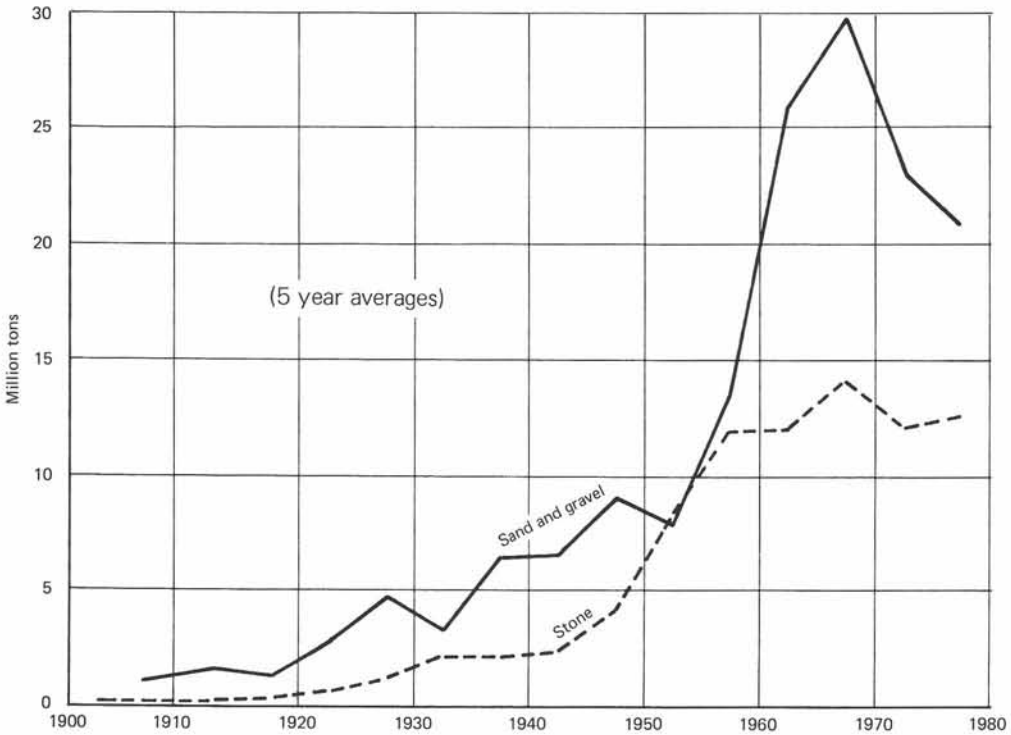


Figure 26. — Sand and gravel, and stone production of Washington, 1900-1980.

Figure 27. — Silica mining in Wenatchee district, Chelan County, in 1977, is typical of many nonmetallic mining operations in the state.

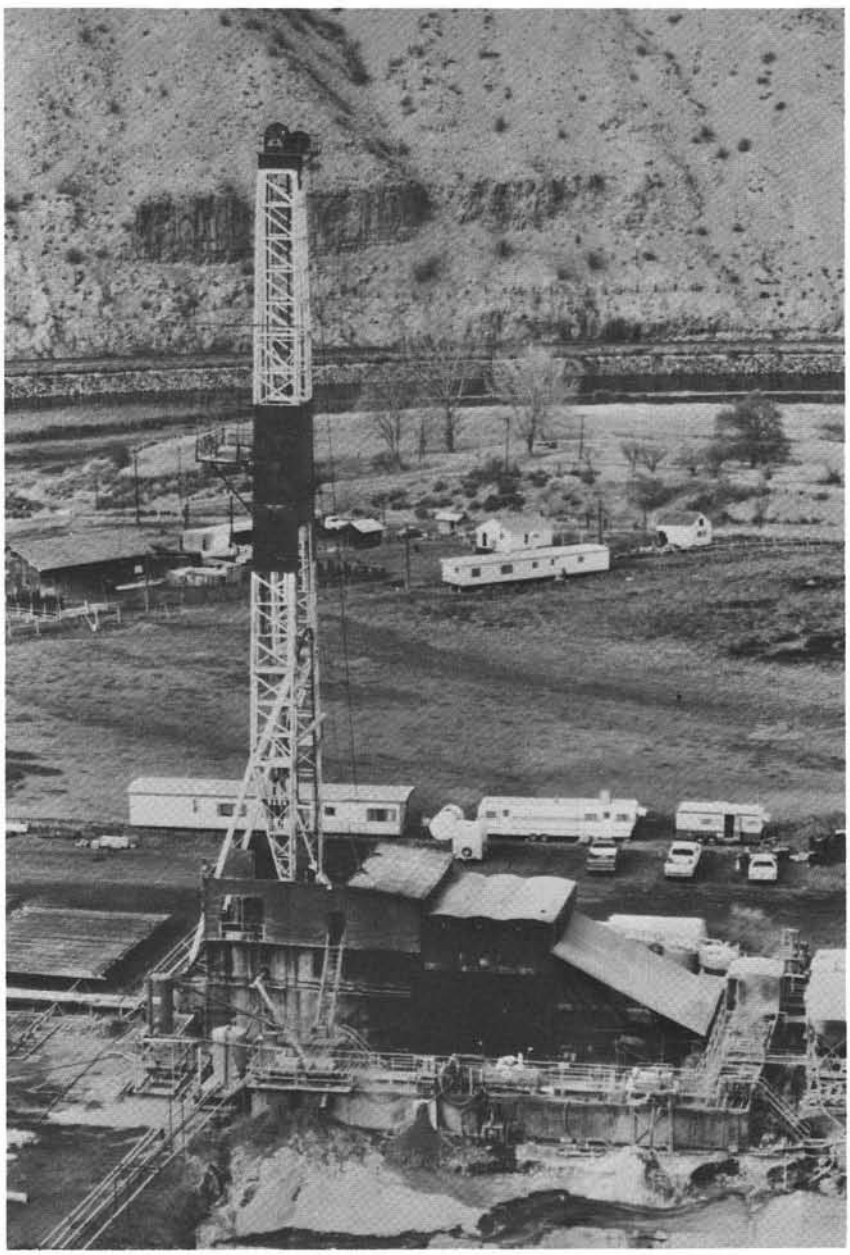


Figure 28. — Shell Oil Co.'s exploratory gas well in Kittitas County, in 1980.

Oil and Gas

Oil seeps were first reported in Washington along the sea cliffs on the west side of the Olympic Peninsula, but it was not until around the turn of the century that the first well was drilled for oil near Stanwood in Snohomish County; the well was unsuccessful. From 1900 to 1980, approximately 400 oil and gas wells were drilled in the state. The only successful well, which was drilled near Ocean City, Grays Harbor County in 1957, produced 12,000 barrels of oil before it was abandoned. Around 90 percent of the exploratory oil and gas wells drilled in the state are in western Washington counties; currently, exploration and extensive leasing is centered in central Washington, site of Shell Oil Company's reported gas discovery.

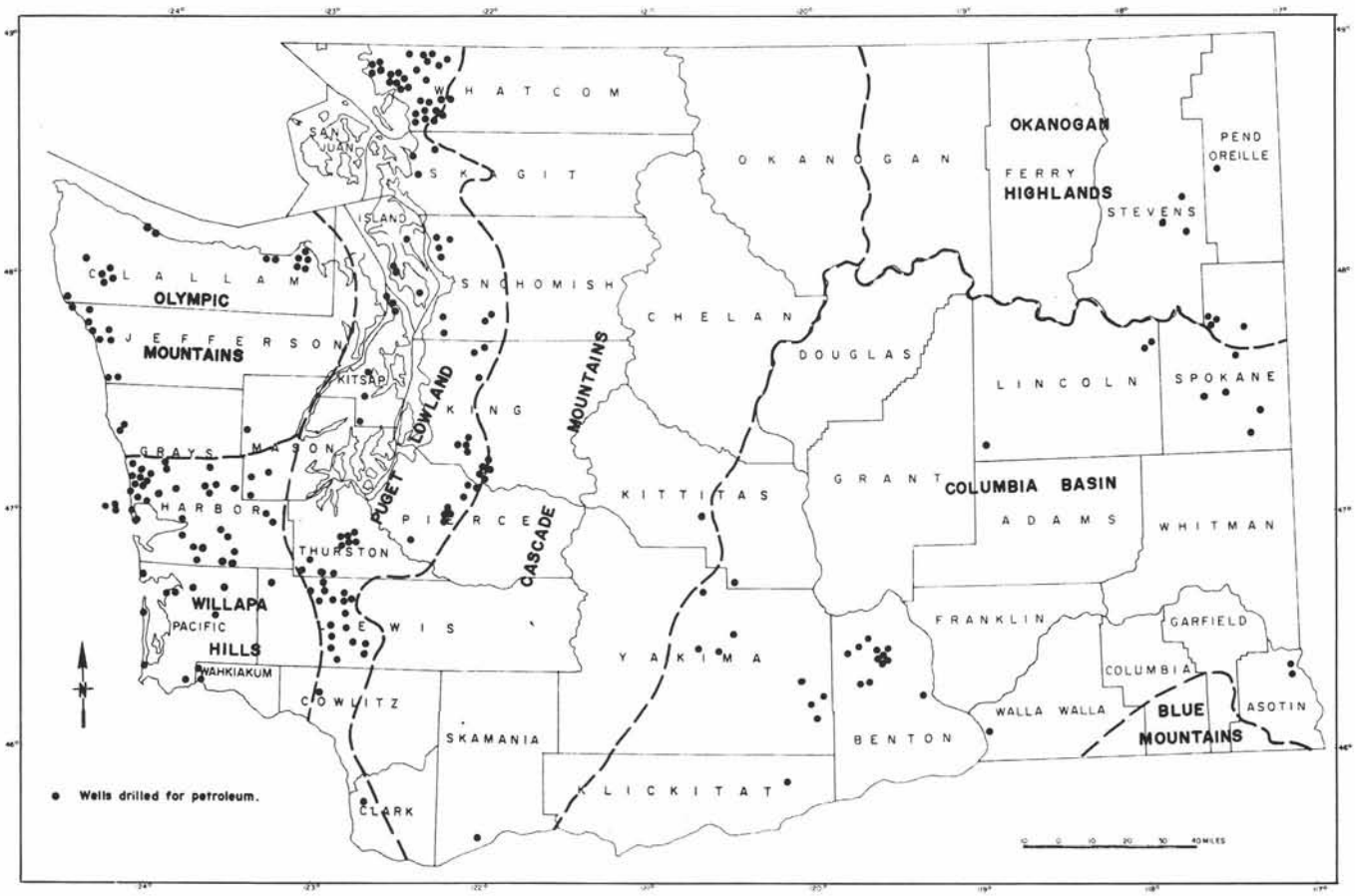


Figure 29. —Physiographic provinces of Washington and wells drilled for oil and gas between 1900 and 1980.

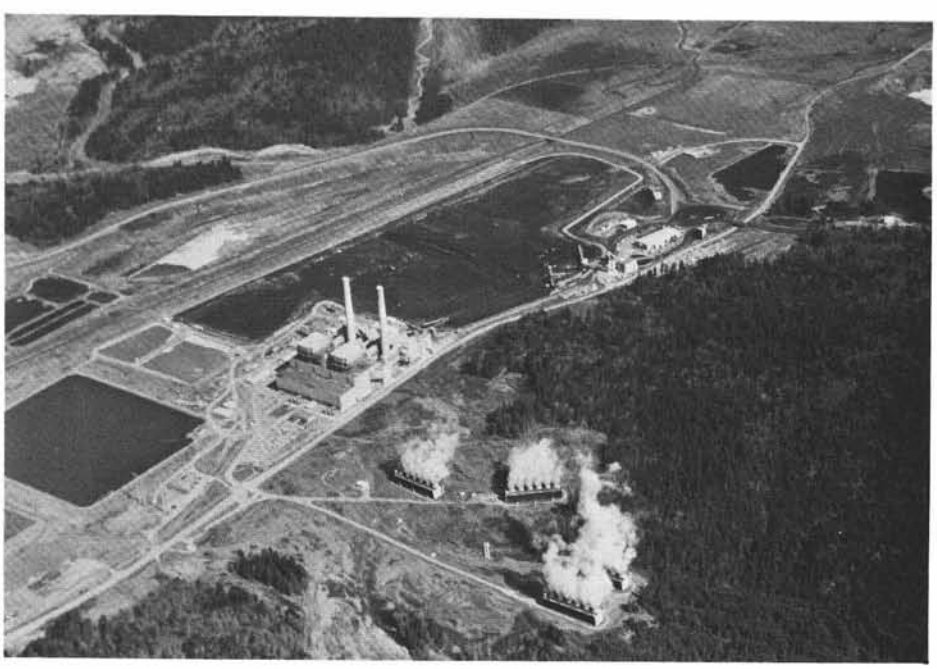


Figure 30. — Aerial view of coal-fired steam-electric plant near Centralia, Lewis County, in 1980. Almost 5 million tons of coal are consumed annually. Steam plant and coal stockpiles at center of photo; cooling towers at lower left.

Coal

Coal reached its initial peak production in 1918, when 4 million tons were mined, valued at more than $14 million. After 1918, production decreased steadily owing to competition with oil and natural gas, until a low of 55,000 tons was reached in 1965. With the opening of the Centralia coal-fired steam-electric plant in 1970, production of coal has climbed to around 5 million tons yearly since 1975. Whereas in 1918, around 50 underground mines produced 4 million tons of coal, currently this single open-pit mine produces almost 5 million tons. The 6.2 billion tons of coal reserves of the state have over the past 10 years been under investigation by major coal companies, with the possibility of several fields being placed into production in the future.

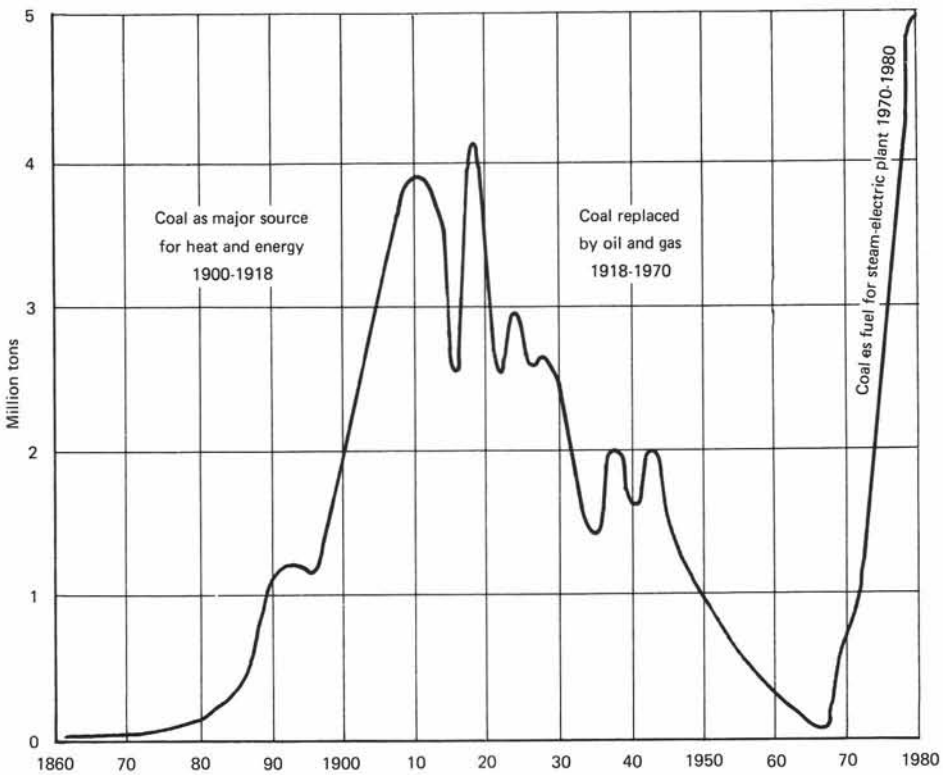


Figure 31. — Coal production of Washington, 1900-1980.

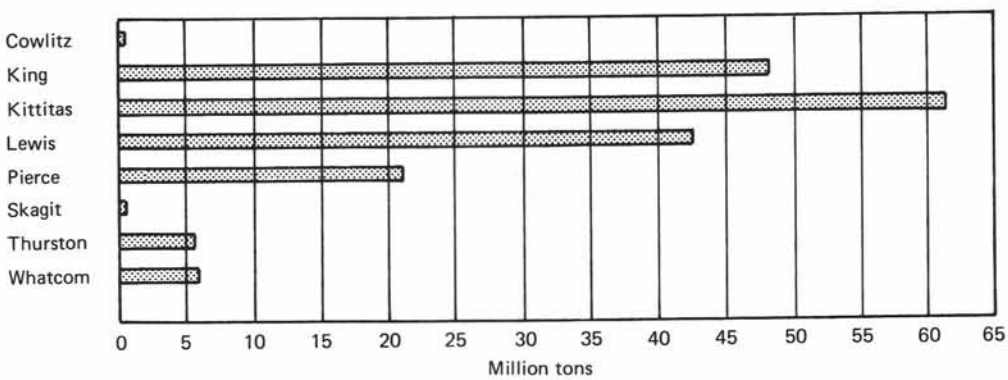


Figure 32. — Cumulative coal production in Washington, by county.

Statistics of Recent and Current Production

During 1979, 445 companies produced nonmetallic and metallic minerals in Washington. Sand and gravel was produced by 308 companies; stone was produced by 112 companies; 16 companies produced nonmetallic minerals, other than sand and gravel and stone. Metallic minerals were produced by 9 companies or individuals, and at least 50 mining companies actively searched for metal deposits in Washington in 1979.

In the nonmetallic minerals field, over 100 quarries produced basalt, olivine, limestone, dolomite, clay, diatomite, sandstone, granite, quartz, and quartzite. Only minor amounts of barite, pumice, talc, gypsum, serpentine, and jade were produced. Most major stone producers are in western Washington, with the leading counties being King, Pacific, Snohomish, and Pierce. In eastern Washington, Stevens and Pend Oreille Counties led in the production of stone. Chief uses of stone are for bituminous aggregate, roadbeds, riprap and jetty rock, cement manufacture, and magnesium metal production.

Only two companies produced coal in Washington during 1979. About 99 percent of the coal was produced by Washington Irrigation and Development Corp. at their Centralia mine as fuel for their steam-electric plant. Although only two mines produced coal, no fewer than eight coal exploration companies were investigating Washington's coal possibilities.

The increase in the production of sand and gravel in 1979 was due mainly to a boom in residential and commercial construction in the Pacific Northwest. As in the past 10 years, western Washington counties of King, Kitsap, Pierce, San Juan, and Snohomish led in production. In eastern Washington, Spokane and Yakima Counties led in the production of sand and gravel. Sand and gravel produced in the state is classed as construction sand and gravel and is used chiefly as concrete aggregate, in concrete products, asphaltic concrete aggregate, road bases, and fill.

Future of Washington's Mineral Industry

Washington is a state rich in mineral resources. The future of mining in Washington is secure, and the industry will continue to be a major factor in the state's economy. The actual dollar value of production is of decided importance in itself, but this is only a small part of mining's total contribution. Mining should be credited also with the value to the state from the payrolls and capital investments of the supply houses, powder manufacturers, equipment and machinery dealers, and others who are dependent on the mineral industry for their markets. Credit is due to mining for the operation of the growing number of processing, fabricating, and manufacturing industries whose activities depend on the products of the mines, pits, and quarries. Fortunately, the reserves of both metallic and industrial minerals are sufficient to maintain the industry on a profitable and useful basis for a long time to come, and their diversity is such as to minimize the effect of depressed market conditions which might adversely affect an economy based on only a few mineral products. It is reasonable to predict, therefore, that the importance of mining to the state in future years will at least equal and probably exceed the value and importance reached in the past 128 years. However, each year the industry is faced with increasing obstacles that hinder development and production of the state's mineral resources. County zoning ordinances, over taxation of mineral production, increasing land withdrawals, excessive environmental regulations, and the general opposition to mining by the public makes it more difficult to operate. Coupled with increasing foreign competition the mineral industry has many obstacles to overcome — obstacles that never existed when mining began in Washington.

TABLE 1. — *Mineral production for Washington, 1979-1980 (a)*

	1979		1980	
	Quantity	Value	Quantity	Value
Cement.....short tons	1,771,000	$ 99,400,000	1,546,000	$ 89,208,000
Clay (common).....do....	339,000	1,549,000	301,000	1,571,000
Gem stones.....		170,000		150,000
Peat.....short tons	11,000	48,000	5,000	103,000
Sand and gravel.....do....	24,258,000	59,382,000	19,019,000	46,731,000
Stone .....do....	15,196,000	35,783,000	11,068,000	29,272,000
Coal.....do....	5,050,000	(b)	5,137,000	(b)
Undistributed (c).....		93,586,000		138,157,000
Total.....		$289,918,000		$305,192,000

(a) U.S. Bureau of Mines production figures modified by Washington Division of Geology.
(b) Value included in "Undistributed value" figure.
(c) Includes coal, diatomite, clay (fire), olivine, gold, gypsum, barite, copper, lead, silver, sand (industrial), tungsten, and uranium. Values for coal and uranium estimated.

TABLE 2. — *Washington mineral production, 1970-1980*

Year	Nonmetallic minerals	Metallic minerals[1/]	Total production
1970	$ 91,381,000	$11,000,000	$102,381,000
1971	101,279,000	8,000,000	109,279,000
1972	127,221,000	9,000,000	136,221,000
1973	135,761,000	8,000,000	143,761,000
1974	173,401,000	15,000,000	188,401,000
1975	172,571,000	13,000,000	185,571,000
1976	212,173,000	20,000,000	232,173,000
1977	225,876,000	20,000,000	245,876,000
1978	229,488,000	25,000,000	254,488,000
1979	259,918,000	30,000,000	289,918,000
1980	275,192,000	30,000,000	305,192,000

1/ Estimated values.

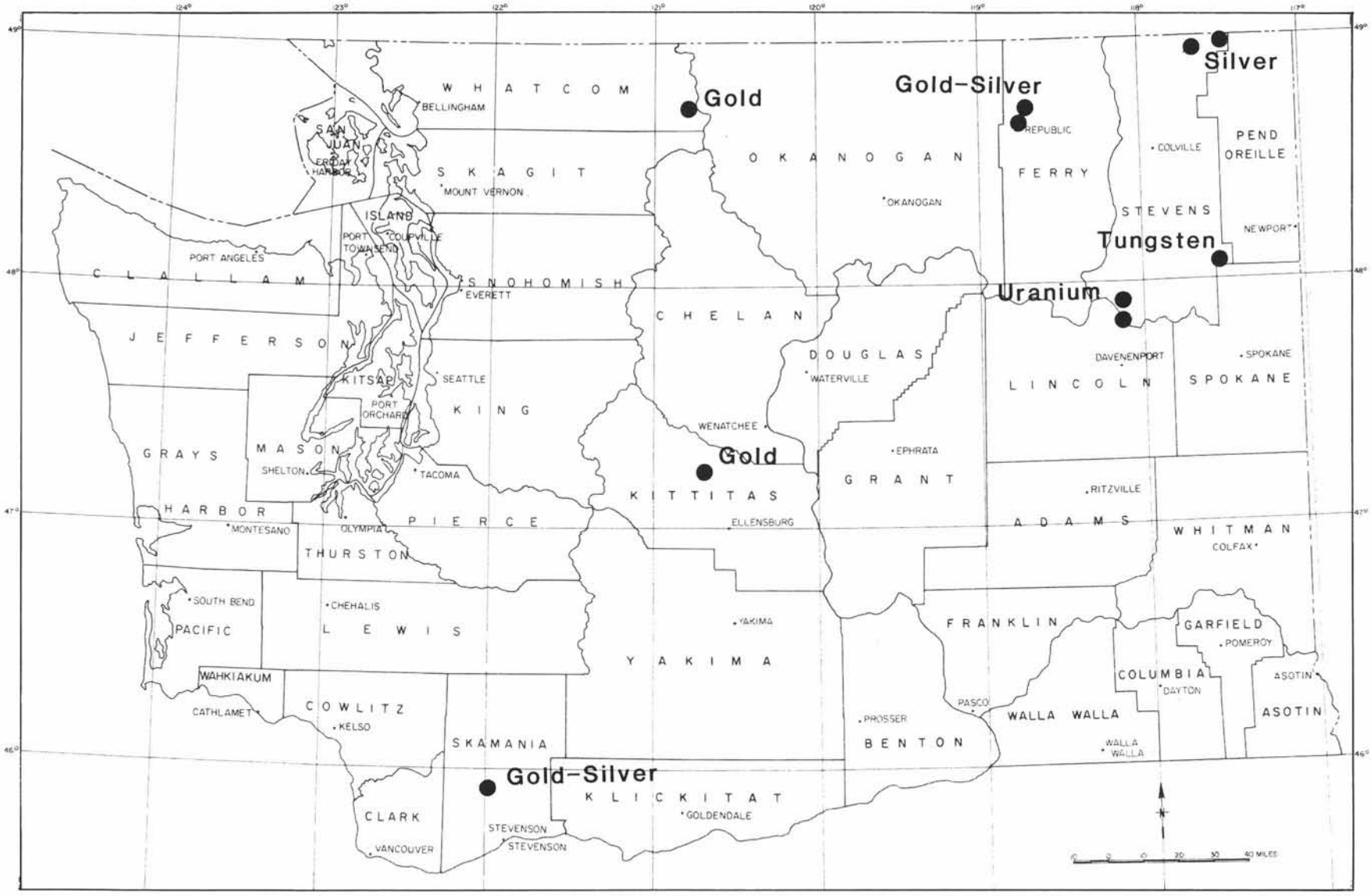


Figure 33. —Active metallic properties of Washington, 1979.

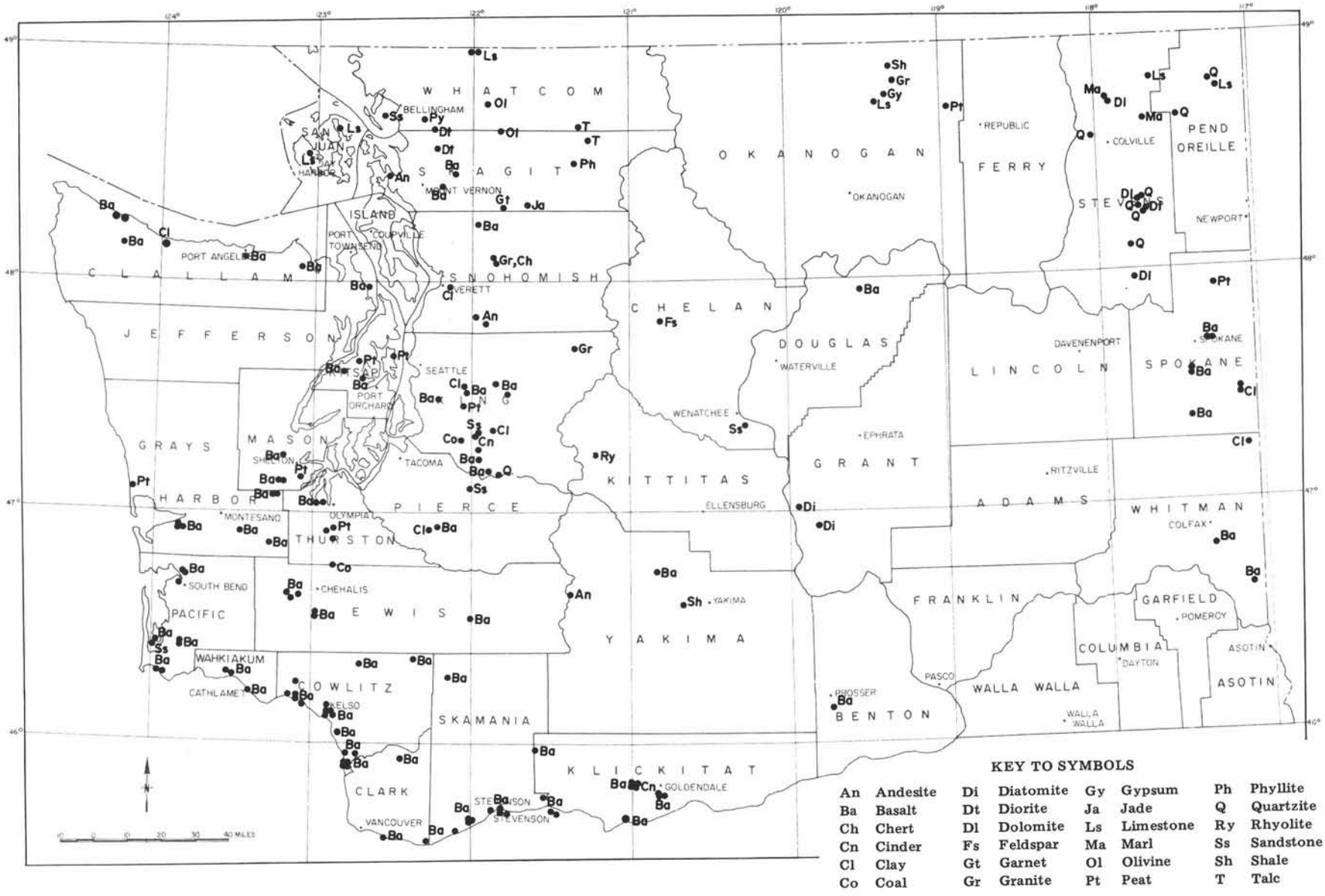


Figure 34. —Active nonmetallic properties of Washington, 1979.

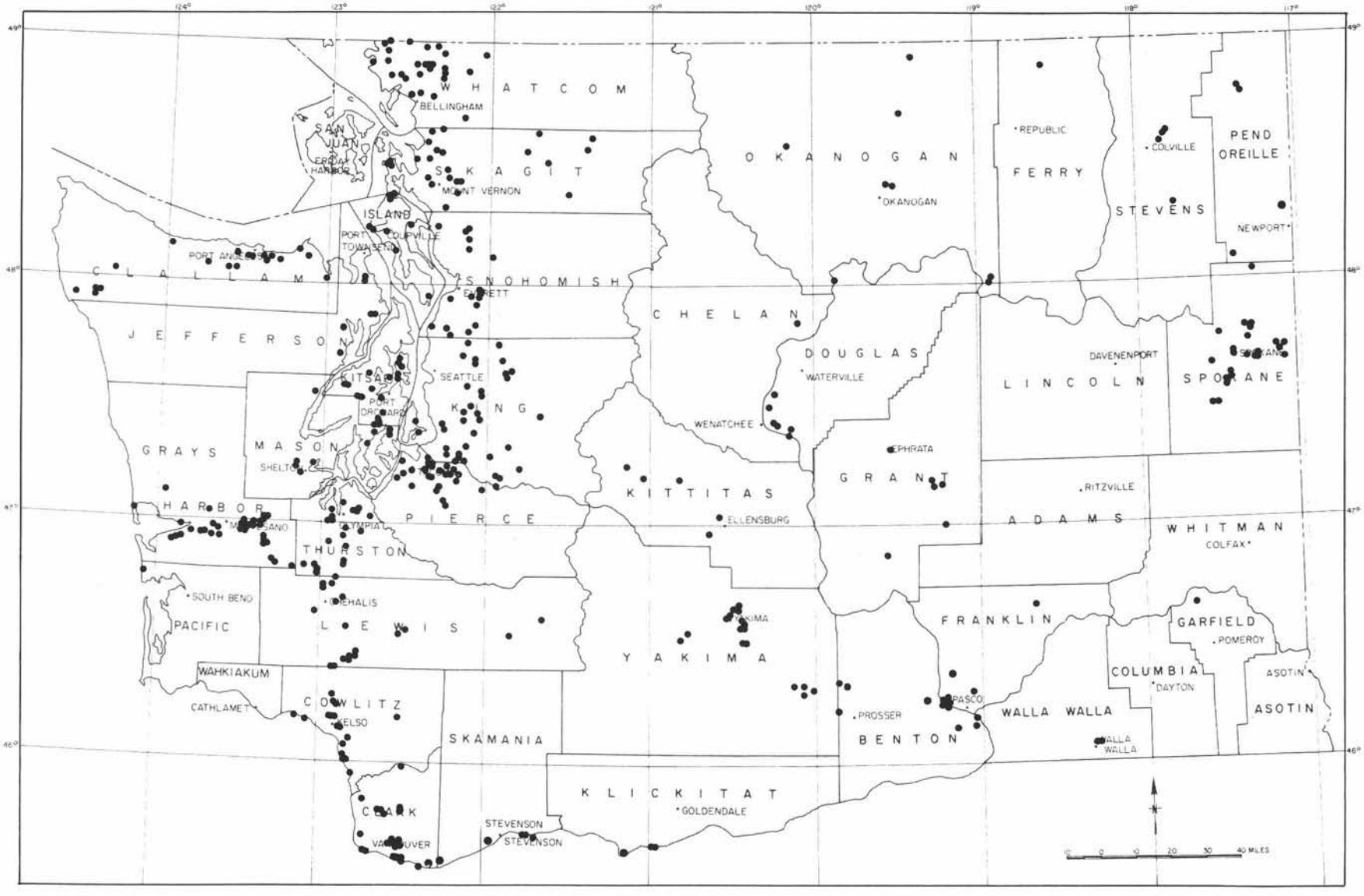
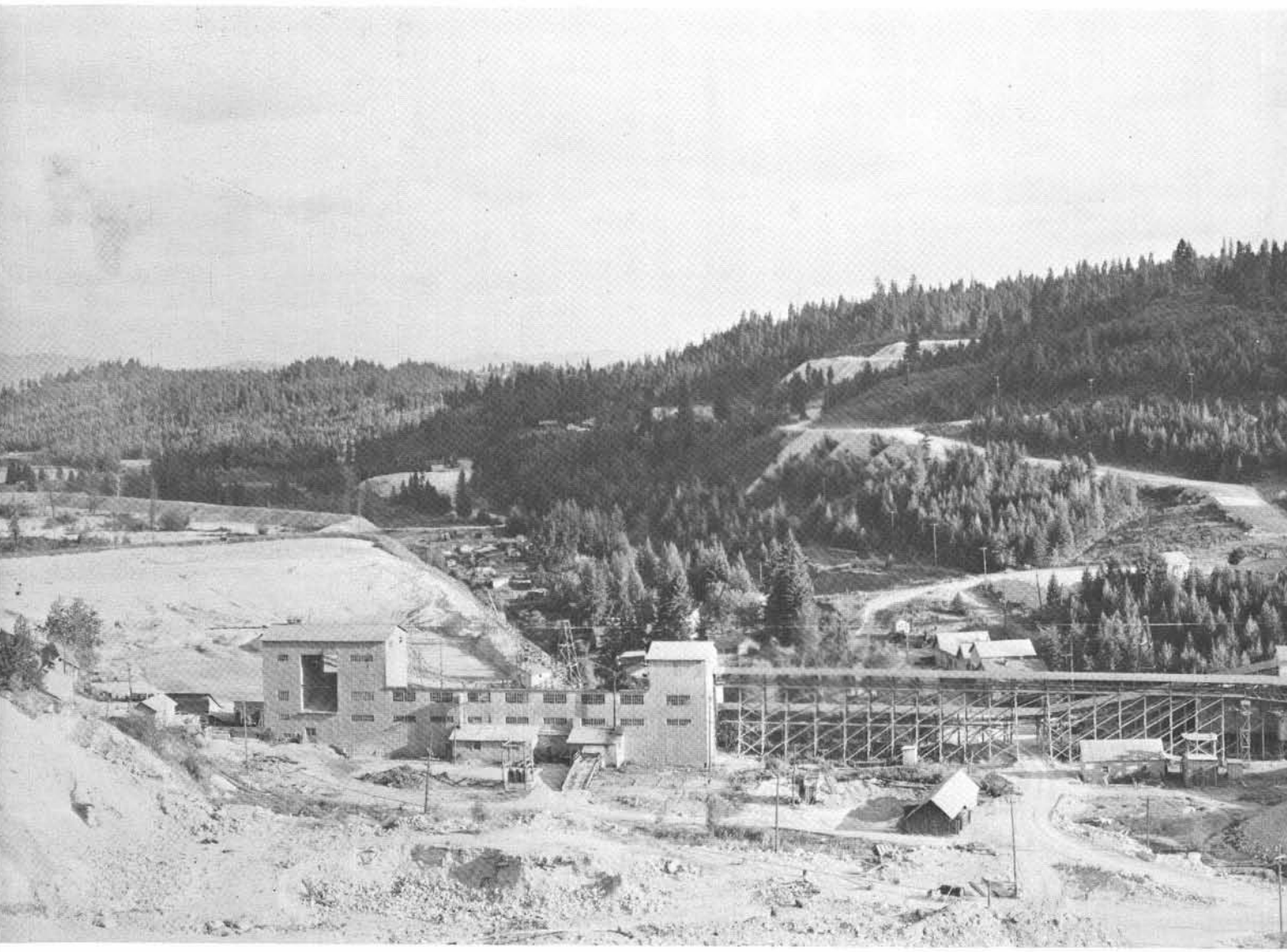



Figure 35. — Sand and gravel operations of Washington, 1979.