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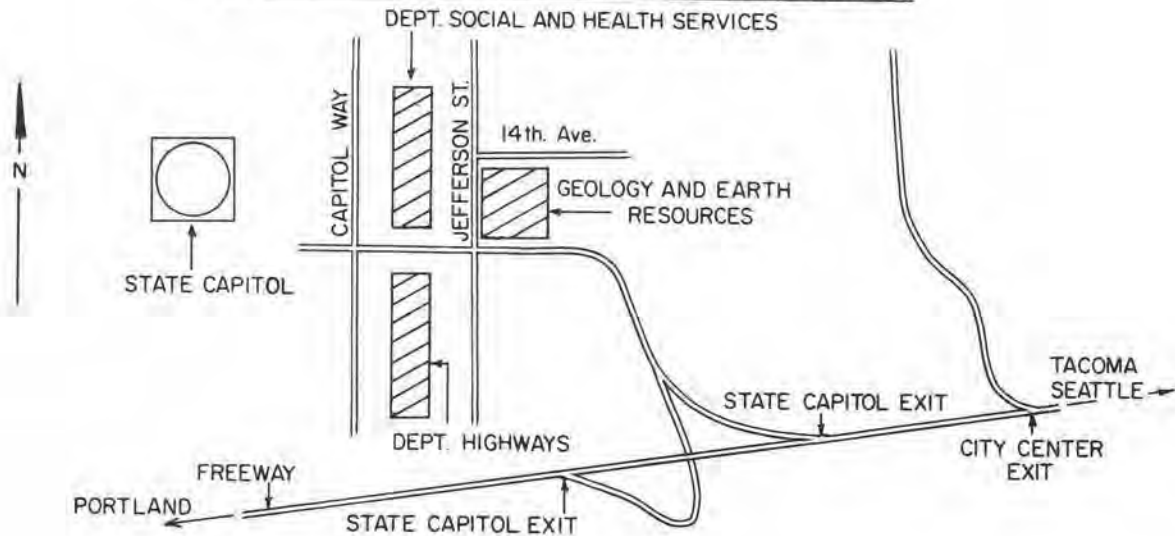


Exploration



Mineral exploration, development, and mining in Washington, 1977

LOCATION MAP DIVISION OF GEOLOGY AND EARTH RESOURCES



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## METALLIC MINERAL EXPLORATION IN WASHINGTON, 1977

By  
Clint Milne

In the fall of this year many metallic properties throughout the state were visited by me for the Division of Geology and Earth Resources to survey current developments in exploration, development, and production.

Almost 50 companies were active in exploration this past year. This is about a 25 percent decrease from 1976 and about equal to or slightly less than the activity in 1975 (fig. 1). Although the intensity of uranium exploration was nearly the same as 1976, base-metal activity dropped in 1977. This latter trend was due to very low base-metal market levels, which caused major companies to tighten up their exploration activities, bringing the total number of active companies in Washington down from 1976.

In 1977, metals explored for in order of decreasing abundance were as follows: copper-molybdenum, uranium, silver, gold, lead-zinc, and tungsten. Metallic mineral prospecting was carried out in many areas of the Cascade Mountains (western Washington) and Okanogan Highlands (north-

eastern Washington) physiographic provinces. The heaviest areas of mineral exploration were in the central Cascades for copper and molybdenum including some uranium, and in southwest Stevens County and the Pend Oreille Valley for uranium (fig. 2).

Lead-zinc exploration entertained a low level of activity in northeastern Washington, whereas gold, silver, and tungsten exploration was intense locally.

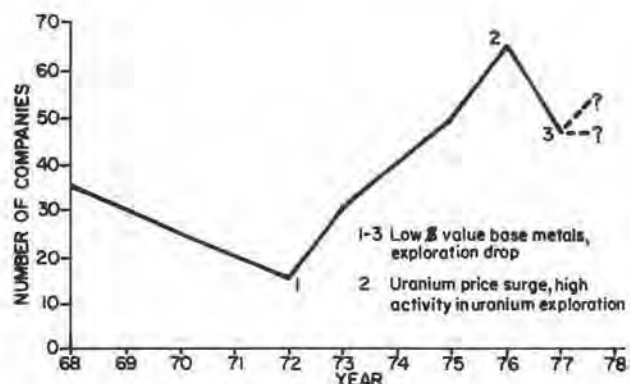


FIGURE 1.—Exploration activity in Washington State in the last decade.



FIGURE 2.—Areas of mineral exploration 1977.

## Uranium Exploration

The most intense exploration for a metal in Washington this year was uranium, as it was in 1976. There is no reason to believe this trend will slacken much due to the soaring demand and rising prices for uranium.

The greatest concentration of exploration occurred in the Pend Oreille Valley, in Pend Oreille County, and in southwest Stevens County, in the vicinity of the Midnite mine (fig. 3).

Approximately 10 major companies were investigating the Tertiary sequences and felsic intrusives of the Pend Oreille Valley. Companies involved in this area included BurWest, Minatone, Kerr-McGee, Dennison Mines, Continental Oil, Reserve Oil, Exxon, U.S. Steel, and others. West of this area, in eastern Ferry County, at least five companies were

known to be involved in uranium prospecting. This area includes the uraniumiferous pegmatites of the Kettle Range.

Dawn Mining Co., which operates the Midnite mine, the state's only producing uranium mine, is drilling 10 new holes and has apparently completed several. RexCon is drilling in northern Lincoln County about 12 miles southwest of the Midnite mine.

Soon to be the second uranium-producing mine in the state is Western Nuclear's new Sherwood mine. Over the past year the company has been developing two open pits in pre-Eocene conglomerate and stockpiling ore. Production will start in March 1978, at 500 tons per day with low-grade ore (0.035 percent cutoff). The mill will be in full gear by July 1978, with a grade of approximately 0.08-0.10 percent uranium at 2000 tons per day. Western Nuclear reportedly has more than 14,000,000 pounds of

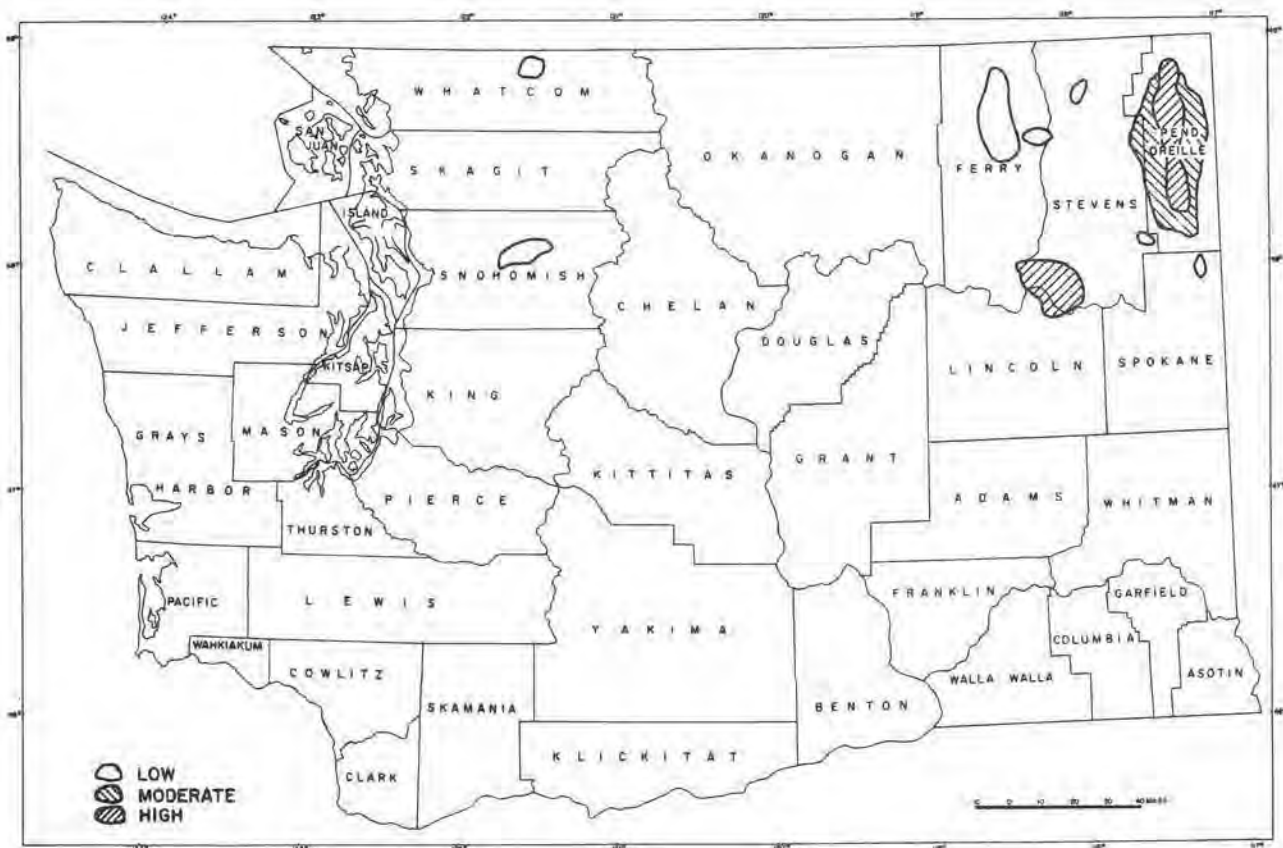


FIGURE 3.—Uranium exploration activity, 1977.

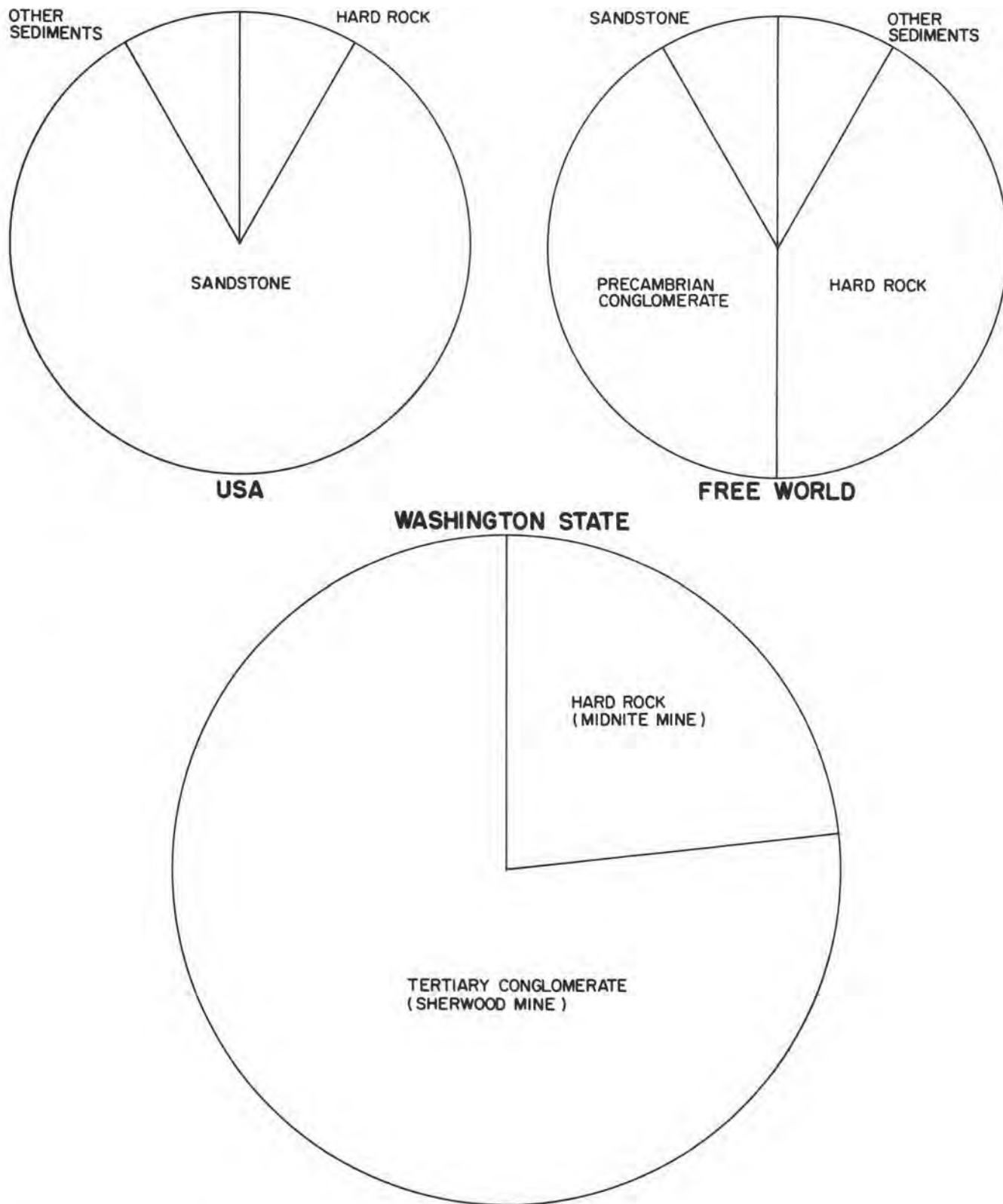


FIGURE 4.— A generalized comparison of source rocks for uranium in USA, Free World, and Washington State.



uranium in reserve.

Elsewhere in Washington this company continued intensive exploration on their properties around the Midnite mine and in Ferry County.

In addition to those companies mentioned above in and around the Midnite and Sherwood mines, 11 other companies leased acreage in the vicinity of these two mines for uranium prospecting.

In other parts of the state, Energy Resources of Denver is reported to be drilling at the old Daybreak mine on the western flanks of Mount Spokane, while Houston Oil and Minerals Corp. drilled for uranium in the Mount Leona area of east-central Ferry County. In the Sultan Basin, of Snohomish County, reconnaissance activity picked up; several companies were known to be investigating uranium possibilities. North of the Sultan Basin and northeast of Mount Baker, Lucky Mc Uranium was prospecting for potential uranium hosts.

### Copper-Molybdenum Exploration

Copper and molybdenum investigations were predominant in the Cascade Range, particularly in King and Snohomish Counties (fig. 5). In Snohomish County around Darrington, Duval drilled a copper property at Gold Hill, and Inspiration Development drilled in the vicinity of Helena Peak. The Sultan Basin, north of Sultan, was the center of much exploration activity. Two copper-molybdenum properties were drilled in southern-central Snohomish County by Occidental Minerals and Cities Service Minerals. To the west of this area, St. Joe drilled a tourmaline breccia pipe at Gold Bar, near Sultan.

In King County, northeast of the town of North Bend, Duval prospected for copper in the Mount Si area, while Houston Oil and Minerals drilled at the Middle Fork copper property.

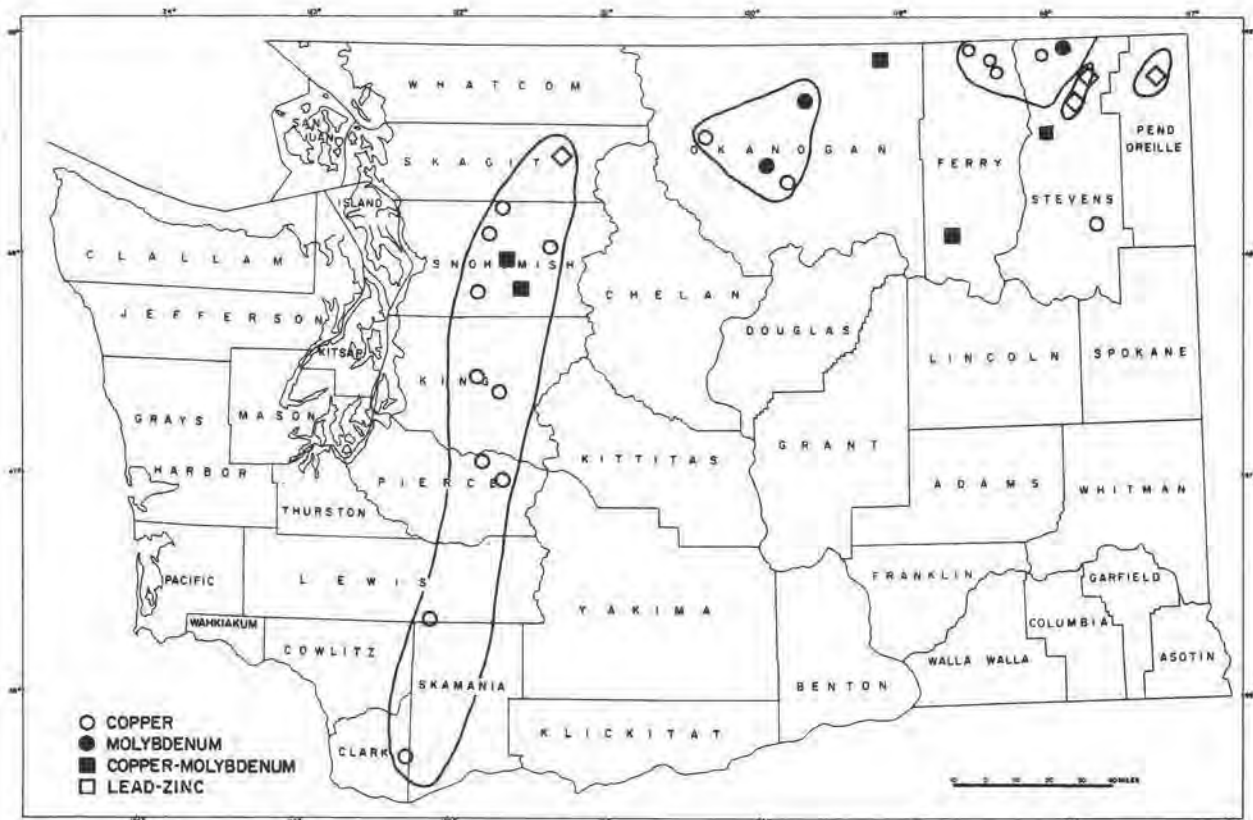


FIGURE 5. — Areas of base metal exploration in 1977.

Moving south, Cities Service Minerals investigated base metals in the Carbon River area northwest of Mount Rainier. Still farther south in northern Skamania County, Duval continued their development work on a low-grade copper property in the St. Helens District. In southern Skamania County, Amoco explored a copper breccia—the Miners Queen property in the silver Star Mountain area.

In the northern Cascades of western Okanogan County, Quintana explored their Mazama copper property northwest of the town of Winthrop. In central Okanogan County, Gulf Minerals drilled for copper in the Omak area, and Azure Resources drilled at the Starr mine for molybdenum west of Tonasket. Near the Canadian border, in northeastern Okanogan County, Dresser Industries was drilling the Buckhorn Mountain holdings of Sunshine Valley Minerals for copper-molybdenum.

Bear Creek Mining Co. dropped its copper-molybdenum property at the old San Poil mine (Mount Tolman), south of Keller, in southern Ferry County. Apparently, negotiations failed to work out favorably with the Colville Tribal Council. Extensive exploration on this property over the past 10 years indicates a possibility of 500,000 tons of ore at a grade of about 0.16 percent  $\text{MoS}_2$  and 0.16 percent copper (minor gold and silver). Over 27,000 feet of (combined) drilling was carried out, one adit was driven, and numerous geochemical and geophysical surveys were completed.

In northern Ferry County near the Canadian border, Inspiration Development has prospected for copper on Togo and Marble Mountains.

In Stevens County, Noranda continued to drill for copper and molybdenum in quartz monzonite northeast of Kettle Falls in the Pingsten-Gold Creek area. In the northern part of the county, U.S. Steel "punched a few holes" on Flagstaff Mountain, seeking molybdenum ore.

### Lead-Zinc Exploration

Slumping metal prices and oversupplied markets left Washington State at a low level of exploration activity for lead and zinc in 1977.

In northeastern Stevens County, Brinex Ltd., a subsidiary of Union Holding, examined possible ore extensions at the Van Stone mine (inactive). The mine is currently owned by Callahan Mining Co., U.S. Borax, and Brinex Ltd. Brinex Ltd. explored the lead-zinc occurrence at the Iroquois property near the Canadian border (fig. 5). Near Northport, the Boggs Brothers Construction Co. engaged in limited development of the Phillips Ranch lead-zinc mine.

In the northern Cascades, Valumines reportedly has drilled a lead-zinc-silver-copper occurrence in Skagit County, southwest of Mount Logan.

### Precious Metals and Tungsten Exploration

In scattered areas of the central and eastern Cascade Range, several gold and silver occurrences were under investigation by U.S. and Canadian companies (fig. 6). In western Yakima County and east of Mount Rainier, Teck Corporation explored the potential of a low-grade gold-silver deposit in the Morse Creek area of the Summit mining district. Near Wenatchee, in southern Chelan County, Cyprus Mines Corp. continued development at the Gold King gold mine. North of here, in the western part of the county and east of Glacier Peak, Texasgulf examined the gold-silver-copper deposit of the old Royal-Red Mountain mine. In the Harts Pass region of the northern Cascades, Lions Mines, Ltd. did some exploratory trenching on the Newlite gold mine. Southeast of this area, near Twisp in Okanogan County, Continental Mining and Excavating Inc. undertook limited

exploration on the Alder gold mine where they foresee the potential of a massive sulfide deposit within an ore zone extension. Limited silver exploration continued in central Okanogan County in the Conconully and Oroville areas.

In the Republic area of Ferry County, exploration was carried out at the Flag Hill gold mine by Houston Oil and Minerals for the second year. Northwest of Republic near the Okanogan-Ferry County border, Occidental Minerals explored for silver in the Sheridan District. In this same region, Kittie Glide Mines Ltd. of Vancouver prospected heavily for tungsten, silver, and gold on its properties in the Horseshoe Mountain-Kelly Mountain area. Twenty holes were drilled and numerous geological, geochemical, and geophysical surveys undertaken.

The Melrose silver mine, located in north-eastern Stevens County near the Canadian border and operated by Norex American, intensified exploration

and development this year with open pit mining operations. In the Chewelah area of central Stevens County, silver exploration occurred on the Chewelah Silver Group.

### Producing Mines

The state's only producing uranium mine, owned by Midnite Mines, Inc., recently reported additional reserves of 700,000 pounds. When this is added to last year's figures, and uranium reserves depleted this year by production taken into account, the measured ore reserves should still be well over 2,000,000 pounds  $U_3O_8$ . The mill operation is currently milling uranium ore at about 470 tons per day.

The Knob Hill gold mine, which is located north of Republic in Ferry County, will close in several months after 40 years of production, due to

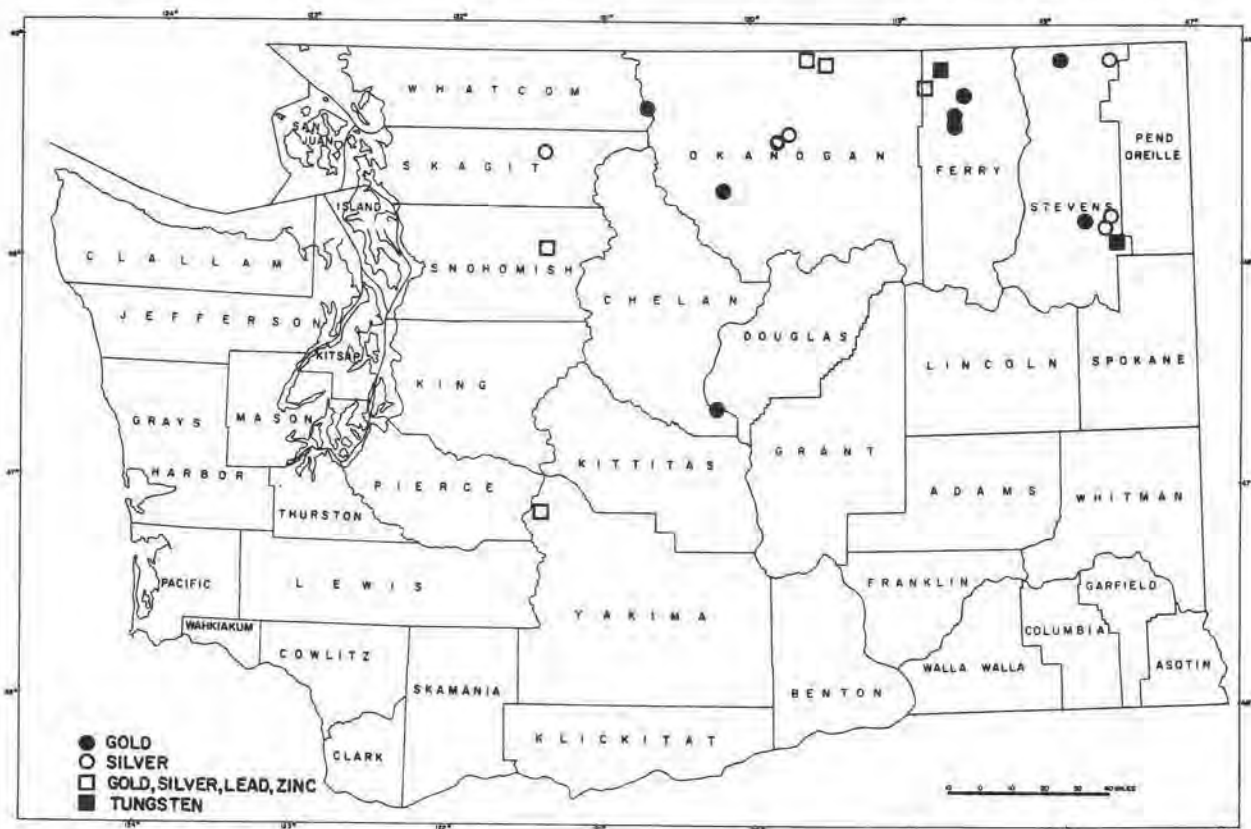


FIGURE 6. — Areas of precious metals and tungsten exploration in 1977.



exhausted ore supplies. Only a few miles away, however, Ruby Mines, Inc. has mined ore from the Valley gold mine on the west side of Curlew Lake and shipped the ore to its mill in Omak.

North of the Valley mine in Ferry County and near Danville, Lone Star Mining Company, in conjunction with Granby Mining Corp. of Greenwood, B.C. (both subsidiaries of Capata Corp. of Houston), has been developing the Lone Star pit. This ore is running about 1.0 percent copper with over 610,000 tons of minable reserves. Molybdenum occurs sporadically in the altered quartz monzonite host rock as blebs and stringers.

The Pend Oreille mine in Pend Oreille County was the only producing lead-zinc mine this year. However, the mine closed indefinitely in the early fall due to declining zinc prices.

The Melrose mine in northeastern Stevens County, although a small mine, produced high-grade silver ore with a silica content high enough for free smelter fees at the Trail and Tacoma Smelters.

In central Stevens County, south of Chewelah, the Blue Grouse tungsten mine, owned by local operators, continued limited production at this small but high-grade tungsten mine.

#### MINING COMPANIES ACTIVE IN WASHINGTON, 1977

Amoco Minerals Co.	Duval Corp.	Noranda Exploration, Inc.
Azure Resources, Ltd.	Energy Fuels	Norex American
Bear Creek Mining Co.	Energy Resources (of Denver)	Occidental Minerals Corp.
Brinex Ltd.	Exxon Corp.	Quintana Minerals Corp.
Blue Grouse Tungsten	Gulf Minerals Corp.	Reserve Oil and Minerals Co.
Boggs Brothers Construction Co.	Houston Oil and Minerals Corp.	RexCon, Inc.
Bunker Hill Co.	Inspiration Development Corp.	Ruby Mines, Inc.
BurWest	Kerr-McGee Corp.	Silver Consolidated Mining Co.
Chevron Oil Co.	Kittie Glide Mining Co.	Spent Hansen
Cities Service Minerals Corp.	Lone Star Mining Co.	St. Joe American Corp.
Continental Oil Co.	Lucky Mc Uranium Co.	Teck Corp., Ltd.
Cyprus Mines Corp.	Lions Mines, Ltd.	Texasgulf, Inc.
Dawn Mining Co.	Midnite Mines, Inc.	Totom Mining, Ltd.
Dennison Mines, Ltd.	Minatone Co.	U.S. Steel Corp.
Dresser Industries	Mineral Hill Mines, Inc.	Valumines, Inc.
Dusty Mack Mines, Ltd.	Morse Brothers	Western Nuclear, Inc.

#### COMPANIES WITH LEASED ACREAGE FOR URANIUM PROSPECTING IN THE MIDNITE MINE AREA, 1977

Century "21" Mining, Inc.	Grandview	Painted Desert
Daybreak	John Stanley Mines	Quad Metals Corp.
Empire Explorations	Metaline Mining & Leasing	Western Gold
Evergreen	North Star Uranium, Inc.	

#### INDUSTRIAL MINERALS IN WASHINGTON, 1977

By  
Charles W. Walker

The year 1977 was a fairly good year for the nonmetallic mineral industries as a whole, and for most of them individually. According to preliminary figures

of the U.S. Bureau of Mines, Washington's mineral production value in 1976 was about \$176,560,000 and is expected to exceed \$181 million in 1977. Industrial

minerals, mostly portland cement (\$53.5 million), sand and gravel (\$31 million), and stone (\$18.5 million), accounted for 58 percent of the total mineral value, followed by mineral fuels and metals.

Nonmetallic minerals are produced in every county of the state, but are concentrated primarily near the larger urban areas. The most common of these minerals thus far produced in Washington includes stone, sand and gravel, limestone, dolomite, coal, clay and shale, diatomite, olivine, peat, pumice, quartz, and silica sand. The distribution of these commodities is shown in figure 1.

The stone industry this year has shown some growth over last year. Over 100 quarries produce stone, consisting mainly of basalt, limestone, sandstone, quartz, quartzite, and granite. The top stone-producing counties include Snohomish, Whatcom,

King, Clallam, and Stevens. Crushed stone is used primarily as road base and surface material, riprap rock, agriculture rock, concrete and asphalt aggregate, railroad ballast, cement, and terrazzo chips. Pend Oreille, Whatcom, and King are the only counties in the state that manufacture portland cement. Approximately 35 percent of this cement is derived from locally produced material. The building stone industry in Washington is small relative to the crushed stone industry. Demand for crushed stone is expected to increase substantially in the next few years, but the demand for dimension stone is not expected to grow much.

Sand and gravel is mined commercially from well over 320 pits throughout the state, with the counties of King, Pierce, Snohomish, and Spokane leading production. Of the total sand and gravel produced,

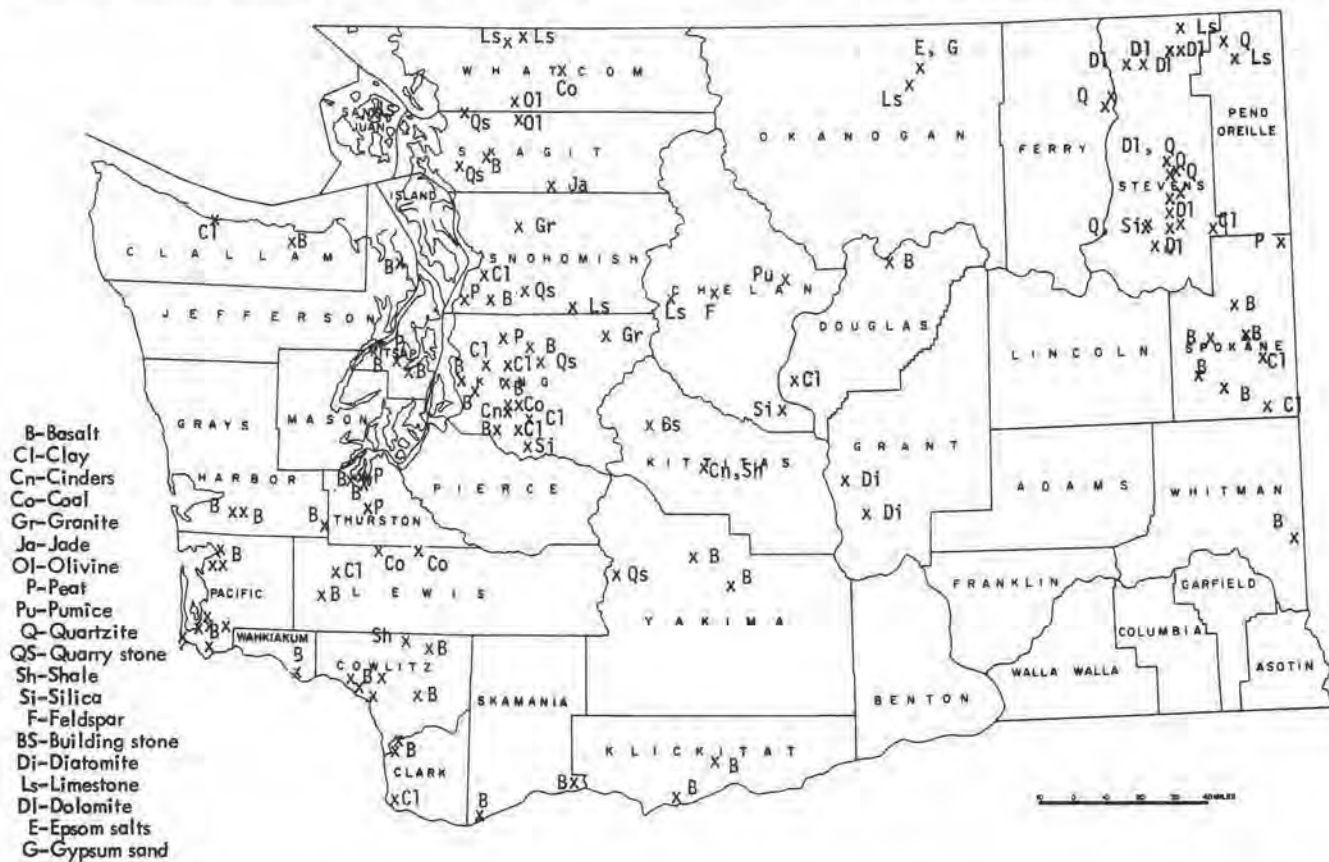


FIGURE 1.—Active nonmetallic properties in Washington, 1977 (excluding sand and gravel).

by far the major portion was used as construction aggregate; a minor amount was used as industrial sand and gravel, such as in abrasive products, glass sand, molding sand, and other uses. The sand and gravel industry can expect a growth rate comparable to the construction industries' dollar volume growth rate in any given area of the state. Production this year is above normal for a 10-year period.

Dolomite is mined from over 10 quarries, all located in the northeastern part of the state. The mineral is used as a soil conditioner and is sold in 40 or 100 pound bags or in bulk form. A source of magnesium metal is another primary use of dolomite. Production of magnesium ingot at the Northwest Alloys plant at Addy commonly exceeds 600,000 pounds per week. Dolomite can also be calcined for use as a refractory and in the paper mill industry. The demand for magnesium metal and magnesium compounds, principally as refractories, is expected to increase at a moderate rate.

The WIDCO mine, northeast of Centralia, continues to produce over 99 percent of the coal in the state. All of the coal is used for electrical power generation at the Centralia steam plant. Small-scale surface mining operations at the Black Prince mine, just east of the WIDCO mine and on Palmer Coking Coal property near Ravensdale, produce less than 50,000 tons per year in the aggregate. Limited strip-ping operations on the Discovery seam in the Glacier anthracite field near Bellingham produced approximately 2,000 tons for experimental purposes and to fill small local contracts. Major energy companies from the Midwest and Rocky Mountain states show continued interest in Washington's coal reserves.

The clay and shale industries are located primarily in Spokane, Clallam, Snohomish, and King Counties. Both clay and shale are used primarily in the manufacture of common and refractory bricks and portland cement. The demand for these products is expected to maintain the present annual rate of in-

crease through 1980. However, the continued growth of this energy-intensive-based industry could be severely impeded by persistent energy problems.

Diatomite is derived from several open-pit operations in Grant County. This commodity is used mainly as a filter aid and as insulation, with minor uses as industrial fillers. Almost all of the diatomite produced is exported out of the state. Demand for diatomite is expected to increase at a moderate rate through 1985.

Whatcom and Skagit are the only two counties in the state that produce olivine. The mineral is processed locally and sold throughout the country as foundry sand and as a refractory material. The present demand for these products is greater than production. Extended outlook for olivine appears very good.

Peat, used for agricultural and horticultural purposes, is produced in Snohomish, King, Kitsap, Thurston, and Spokane Counties. The demand for peat is expected to be similar to that of the last few years. Some help to the industry is the use of peat as an ingredient in potting soils with the increased markets of the household plant industry.

Other industrial minerals produced in Washington during 1977 include cinders, epsom salts, gypsum, jade, pumice, and feldspar. Most of these materials are utilized within the state, with a lesser amount exported out. Production did not exceed 100,000 tons of all these commodities combined.

In summary, industrial mineral production in Washington has been increasing over the last few years, but the number of operators has only increased slightly. Expanded facilities and better production methods, along with the higher demand for the products, account for the favorable overall increases. Commodity prices will continue to increase as a result of local zoning regulations, antipollution and restoration requirements, higher production costs, and rising land values.

## FLASH FLOOD CAUSED DAMAGE IN CHELAN COUNTY

By  
Jerry Thorsen

Chelan County had a rash of flash floods this past summer, with some areas showing repeated damage. Particularly hard hit were some canyons between the Entiat and Columbia Rivers to the north and northeast of Entiat. The upper reaches of Crum, Ringstead, and McKinstry Canyons suffered from

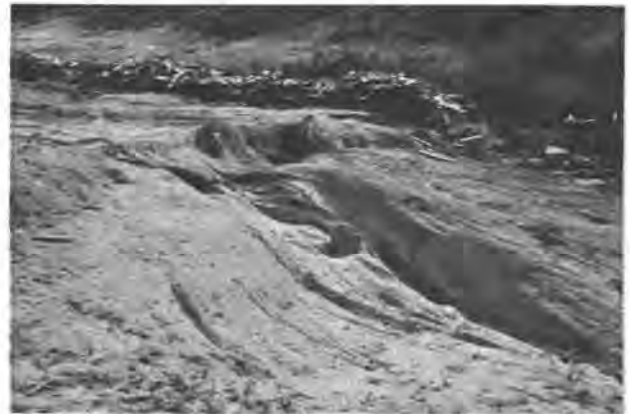


Bob Hughes provides scale to illustrate depth of erosion near mouth of small side canyon, tributary to Crum Canyon. Many such "mini torrents" contributed to the main flows.

violent but very localized thunderstorms. These storms probably dumped several inches of rain and hail within this area of a few square miles, while some nearby areas got little or no precipitation. The effects of this sudden downpour were made much more serious because the area had been burned the previous year. Thus, soil erosion was more severe than it otherwise might have been and the resultant flash floods were much like mudflows. The accompanying photos show some of the effects.

Webster defines a flash flood as "a local flood of relatively great volume and short duration that generally results from heavy rainfall in the immediate vicinity." Actually, a flash flood may originate so far from a particular site that the potential

victims may not even be aware of the cloudburst. A factor sometimes adding to the element of surprise is that the flood path may be a dry gulch with no obvious signs of previous flooding, or even an intermittent stream. Flash floods are not only erratic in their area of occurrence but also in their distribution through



Scour in Canyon floor. Soil picked up by the flash floods changed the runoff into mudflows in places; greatly increasing their destructive power.

time. Some of the canyons near Entiat had no history of flooding within the memory of long-term residents, yet some canyons had two floods last summer.

As with most other violent geologic processes, flash floods generally leave signs that can be detected and interpreted by the alert observer. The kinds of signs depend on how recent and severe the last flood episode was. Signs, such as debris and mud in the limbs of tall brush, may be gone in a few months or years. Other signs, such as a scoured dry channel, stranded "logjams," or trees barked on the upstream side may persist for decades. In arid country the deposits of the flood may be very persistent, often with large boulders in unexpected locations. In eastern Washington, many canyons open onto a river or lake,





Photograph shows erosion of valley floor and deposition of debris against cars in farm yard.



Swimming pool near mouth of Ringstead Canyon filled with mud. Note diving board on left.

so deposits may be dispersed by erosion or partially hidden under the water.



View looking in through front door of home. Mud filled lower story to a depth of several feet, collapsing floors in places.

The common drainage basin configuration is a network of steep-sided and relatively high gradient canyons that open onto an alluvial cone or fan. The stream that exists during flooding may occupy all of the canyon floor, and the channel may wander upon reaching the fan areas. Thus, none of the "flat" land is totally safe from flood hazard. In contrast, the lower flanks of canyon walls, the nose of ridges, or the mountain slopes above the alluvial fan, all may be safe from such hazard. In many cases, 20 feet or so in elevation could make the difference. The homebuilder in canyon areas of flash flood potential would be wise to consider such a sloping site and leave the flatter lands to agricultural, recreational, or timber uses.

#### DIVISION GEOLOGIC INVESTIGATIONS DURING 1977

Biostratigraphic studies, west coast Tertiary province. Weldon W. Rau. Continuing research is largely of a support nature or in cooperation with geologists of other agencies whose mapping projects are in the west coast Tertiary province.

Environmental geology maps in progress for Tacoma. Mackey Smith.

Geologic and slope stability maps are being compiled for a coastal zone atlas contract with the Washington Dept. of Ecology. The Whatcom County atlas is completed and published. Work has been completed and the maps are in preparation for eastern Clallam, eastern Jefferson, Island,



Skagit, Kitsap, and Snohomish Counties. King, Pierce, Thurston, and Mason County maps are in progress. Division geologists on this project are Jerry Thorsen, Kurt Othberg, Allen Fiksdal, and Mackey Smith. Private geologic consultants also mapped some of the areas involved.

Geologic studies in Grays Harbor basin. Weldon W. Rau. Reactivated studies in the Grays Harbor basin began with recon studies in parts of the Humpfulips quadrangle. Base maps were prepared and detailed mapping and related studies will begin in 1978.

Geology of the south one-half of the Colville 30-minute quadrangle, Stevens County, Washington. J. Eric Schuster. Field mapping in area partly completed. Preliminary map of Gillette Mountain 7½-minute quadrangle in preparation.

Geothermal research in the southern Cascades of Washington. J. Eric Schuster, and others. Field work completed; report in preparation.

Investigation of tectonic deformation in the Puget Lowland, Washington. Pamela Palmer. Conducted study of marine terraces in western Whatcom County as possible indicator of tectonic deformation.

Nuclear waste storage project in the Columbia Basin, Washington (U.S. Dept. of Energy cooperative effort). Glenda Tucker and Jim Rigby.

Olympic coast studies. Weldon W. Rau. Field work completed on an area bounded by the Hoh River, Bogachiel River, Highway 101, and the Pacific Ocean. Map and text in preparation. Prepared field guide for GSA Olympic coastal field trip in November.

Private Forest Land Grading project:  
 Geologic maps for soil surveys in Clallam and Skagit Counties, Kurt Othberg. Geologic maps for soil surveys in Okanogan, Ferry, Pend Oreille, King, Pierce, and Lewis Counties, Allen Fiksdal.

Slope stability of the Centralia-Chehalis area. Allen Fiksdal.

Strippable coal on state lands. Ellis Vonheeder.  
 Washington State mining directory. Clint Milne and Charles Walker.  
 Washington State mineral resource maps. Wayne Maen.

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U.S. GEOLOGICAL SURVEY OPEN-FILE REPORT  
 RELEASED

The following open-file report by the USGS is now available for inspection in our division library in Olympia:

Guidebook to Quaternary geology of the Columbia, Wenatchee, Peshastin, and upper Yakima valley, west-central Washington, by Richard B. Waitt, Jr., 1 fig., 25 p.

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COAL RESERVE MAPS RELEASED

By  
 Ellis R. Vonheeder

The first two of a series of open-file maps dealing with strippable and underground coal reserves on State-administered lands have been released by the Division of Geology and Earth Resources. The maps present data for those counties in the state that have known coal reserves. The map sheets are drawn to a ½ inch = 1 mile scale and supplement our Bulletin 47, "Coal Reserves of Washington." Each map presents reserve and analytical data in tabular form. A short bibliography lists sources of data.

Map priorities are determined both by the amount of State-administered land coincidental with coal-bearing formations and past interest shown by coal exploration companies. Maps for Whatcom, Lewis, Thurston, Cowlitz, and Kittitas Counties are completed.

Copies of maps are available for inspection at the Division of Geology and Earth Resources office,

1404 Jefferson, Olympia, WA 98504, and at the U.S. Bureau of Mines office, E. 315 Montgomery Ave., Spokane, WA 99207.

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## YOUR STATE GEOLOGIST REPORTS

I want to congratulate the Northwest Mining Association for a splendid annual convention this last December 2 and 3. It was reflective of the increased activity and progressive outlook of the Association. The mining industry is fortunate to have such a viable organization representing their interests. Of course, the thing that makes it go is the willingness of the members to take an active part in its affairs and to stand up and be counted. However, in light of recent developments that relate to geology and mining on the national scene, it is apparent that individuals must be more willing than in the past to pick up the cudgel in defense of the industry. I can think of no better way to do it than through active participation in the Association programs.

By the way, I have just proven quite conclusively, at least I'm satisfied I did, that conservation will not solve the energy problem. This great piece of research that proved the point took place, of all places, in my bath tub.

We recently sold our home; unfortunately, before our new home was built. This meant we had

to camp out in a duplex for a few weeks, waiting for our new home to be finished. As one might expect, practically all the necessities of life got put in the back of the duplex garage and were temporarily not available for use. Among those things that got put away was my bath tub bubbly. I had a little left in a bottle that I had opened at the old house, but it obviously was not enough to last. I told my wife my problem; she assured me that if I just didn't use as much bubbly with each bath, I certainly would have enough to last for the time we were in the duplex. Then, when we moved into the new house, we would find all that bubbly packed in the garage, and I could go back to my old habits. I grumbled a lot and averred she was wrong, but having no choice, I began my conservation program.

Well, to make a long story short, even though I cut my consumption of bath tub bubbly in half, I still ran out. The real solution to the problem was just like the real solution to the energy problem, I had to get more bubbly. I am convinced that if we run into severe energy shortages it will be because we did not develop more energy resources when we had the chance. We have had warning after warning by knowledgeable people that a crisis is coming if we do not find new energy reserves and more fully develop the existing ones.

Ted Livingston

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## GSA MEETING IN SEATTLE ATTRACTS 4,000

By  
Kurt Othberg

During the second week of November the 1977 Annual Meeting of the Geological Society of America was held in Seattle. Headquarters for the meeting was at the Olympic Hotel in Seattle, and

the technical sessions were held at the Seattle Center. Much of the planning and execution of the meeting functions was accomplished by the 1977 annual meeting local committee, which was headed



Geologic interpretations being offered by Weldon Rau during a beach stop on the GSA Olympic coast field trip.



The enthusiasm expressed by participants on the GSA Olympic coast field trip is shown by their attentiveness under obviously adverse weather conditions.

by Professor Donald J. Easterbrook. The local committee was made up of GSA members from Western Washington University, the University of Washington, Central Washington University, North Seattle Community College, University of Puget Sound, and the Washington Division of Geology and Earth Resources.

The meeting consisted of various technical and social activities. Many attendees enjoyed the Salmon Bake Cruise at Blake Island, the welcoming party, the annual dinner, and especially the GSA president Charles L. Drake's address, "Geology in the People's Republic of China." An excellent guest program for nongeologists included Seattle area tours and two nontechnical slide shows and lectures. All were attended by the many guests of GSA members.

Technical activities consisted of field trips, the presentation of papers, and a variety of films in the Science Theater. The fourteen field trips dealt largely with geologic phenomena of the Olympic Peninsula, the Cascades, and the San Juan Islands. Fifty-five separate technical paper sessions filled

three full days for attendees. The technical papers were both invited and volunteered, and were presented at either symposia, regular sessions, or poster sessions. As an example of the breadth of subjects covered, the sessions included the following topics in geology: uranium, capable faulting, geologic education, archeological geology, geomorphology, Quaternary geology, mineralogy, hydrology, paleontology, stratigraphy, history of geology, coal, geophysics and tectonics, minorities in geology, marine geology, petrology, environmental geology, mathematical geology, and others.

There were many GSA division meetings, affiliated society meetings, and associated informal group get-togethers that occurred during the GSA Annual Meeting. The titles of many of these exemplify the levity that most geologists enjoy when they congregate: Friends of the Algae, Friends of the Ordovician, PS Plankton People, Pals of the Precambrian, etc.

Come to GSA 1978 in Toronto!

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