

# WASHINGTON GEOLOGIC NEWSLETTER

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BERT L. COLE  
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## QUARTERLY PUBLICATION

For years the Division of Mines and Geology has considered the possibility of publishing a quarterly news report on geologic happenings in the state. Now, after much thought, the quarterly newsletter has become a reality. Through it, we hope to keep the people of Washington abreast of events that are of geologic significance in our state. We would like to hear from you about what you think of our efforts as we go along.

## THE DIVISION OF MINES AND GEOLOGY

### A New Function Under an Old Name

Since its inception in 1945, the State Division of Mines and Geology and its predecessor agencies, dating back to 1890, have been almost totally concerned with the development of the state's mineral resources. During the 1960's, however, the division began to recognize the wide application that geology has on the welfare of mankind. As a result of this recognition, the division began to diversify its activities.

One of the first fields of new activity was that of environmental geology. Because of the growing concern for the environment by the public, we felt it necessary to establish an environmental geology section within the division to handle environmental problems that were geologically oriented.

The first step in this program was to start developing data on landslides in the state with the hope that in time a landslide map would be produced showing those areas that would be hazardous to build on because of potential slide conditions. As the program began to develop, we recognized that the problems were of a far broader scope than we anticipated, and that they would require more time to solve than we had supposed. Typical of the problems we have run into, and where we hope to be of special assistance, is that of the local land use planner who is trying to develop a comprehensive plan with which to intelligently guide the development of the land. We very soon discovered that none of the plans that we reviewed had received any geologic input so that such things as seismic stability, landslide potential, etc. had not been considered. As a result of this, the division is beginning to gather basic geologic data and reduce it to a form usable by the land use planner or the land developer. Traditionally, geologists have produced maps and geologic reports primarily for the benefit

of other geologists. It is the hope of the division that we can circumvent that problem, and that we will be able to produce geologic information that will be usable by those with only a small amount of geologic knowledge.

Another area that was found wanting was in the amount of geologic information that was available to our state education system at the junior and senior high school levels. As a result of this, the division from time to time has published nontechnical popular geological reports that could be used by students or by anyone else who was interested. We have made an attempt to reprint articles that would be of interest to the student and these are made available free of charge on request. We are currently participating in the development of a geologic education program for the Cispus Environmental Education Center.

The main goal of the division is to be of service to the taxpayers of the State of Washington in whatever way we can. We feel an obligation to the people of our state. We recognize it is their dollars that support our activities, and we propose that they get full value for the moneys they expend.

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*Except for Alaska, Washington has more glaciers than any other state. In the Skagit Basin, 396 glaciers cover 64½ square miles of the northern Cascades.*

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## ENVIRONMENTAL GEOLOGY NEWS

We are preparing a bibliography of Washington landslides that will consist of, in its final form, published as well as unpublished data such as engineering reports and theses dealing with or showing the locations of landslides in the state. An annotated bibliography of published literature of Washington landslides has been completed in card form. The bibliography is a byproduct of a Keysort card file—more than 350 landslides have been inventoried and classified. Both the card file and the bibliography will be expanded to include additional unpublished material as it becomes available. The card file should serve as a useful data bank

for slope stability information and may be the basis for future publications in this field.

Don Tubbs, a University of Washington graduate student, recently completed a DNR-USGS sponsored study of landslides that occurred in Seattle during the winter of 1971-1972. Don was able to establish close correlations with landslides to both geology and rainfall. The results of his study will be made available this winter.

A geologic recon of the southern Cascades was conducted last summer by Dr. Paul Hammond of Portland State. Dr. Hammond had a "running start" on this project as a result of his graduate studies (University of Washington) and previous work for industry in the area. Paul's work was supported by the Department of Natural Resources, through the Division of Mines and Geology. The study is being conducted with special emphasis on factors of possible geothermal significance. An open-file preliminary map will be available this winter, with a final sheet planned for the following winter.

Mapping of the lowlands along the west side of Hood Canal began this last summer in another project jointly sponsored by the USGS and DNR. This project stresses Pleistocene and Recent geology with special emphasis on environmental factors. Dr. Robert Carson of Raleigh, North Carolina, is conducting this work. Bob is well versed in the Pleistocene history of the area, having done his Ph. D. studies (at the University of Washington) in the area between the Olympic Mountains and the Chehalis River. The first summer's work was concentrated on the area between the Skokomish and Hamma Hamma Rivers.

## SURFACE MINED LAND RECLAMATION

While it is true that hindsight is often clearer than foresight, a look back over the past two years that Washington's Surface Mining Land Reclamation Act has been in effect indicates some clear foresight in the past has contributed to the goals being met today.

Since January 1, 1971, when the law became effective, approximately 900 applications for surface mining permits were received, and more than 800 permits, many with special conditions,

were issued. Data compiled between January 1, 1971 and September 1972 show that approximately 1,820 acres of land were newly disturbed during this period, primarily by sand and gravel operations. Of this total, some 475 acres or approximately 26 percent have been partly or totally reclaimed. The remainder of these acres will be reclaimed as the material is depleted and mining activity at the site ceases. It is significant that some of the reclaimed acres were disturbed prior to 1971 and not subject to the law. Often, mining and reclamation plans received from surface mining operators include reclamation plans for acreage disturbed prior to 1971, which reflects a changing attitude on the part of many companies to comply with the intent of the law rather than just the letter of the law, with regard to such items as revegetation, erosion control, water impoundment, screening, etc.

As far as the future of surface mining regulation is concerned, there are indications of possible further regulation in a number of bills to come before the federal legislature. The majority of these bills are directed toward setting federal minimums for reclamation, which generally are more restrictive than present state regulations. Some of these bills, if passed, could require revision of state regulations or even be federally administered. Of particular note in this regard were House Bill 6482 and Senate Bill 630, which were considered during the 1972 Federal Congress.

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*"Nay if I understand anything,  
greater wealth now lies hidden  
beneath the ground in the mountainous  
parts of your territory than  
is visible and apparent above  
ground."*

*Agricola De Re Metallica, 1556*

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## WASHINGTON METAL MINES

Whereas nonmetallic mineral deposits of some type or other may be found in each of the state's 39 counties, metal deposits occur mainly in the northern half of the state where Tertiary and Mesozoic intrusive granitic rocks predominate. Since the beginning of mining in Washington in 1855, the bulk of the state's metal production has come from only 10 counties.

Incomplete records indicate that from 1855, when gold was first mined in Washington, through 1971, \$418 million in metals was produced. The principal metals, in decreasing order of production value, are zinc, gold, lead, copper, silver, and uranium. Smaller amounts of tungsten, mercury, iron, antimony, manganese, molybdenum, tin, and chromite have also been mined.

Currently the production of metals in Washington is limited to gold, silver, lead, zinc, and uranium. From the Knob Hill mine, at Republic in Ferry County, come gold and silver. From the Pend Oreille mine, at Metaline Falls in Pend Oreille County, come lead and zinc. From the Midnite mine, on the Spokane Indian Reservation in Stevens County, comes uranium. The combined 1971 production of these mines was in the neighborhood of \$8.5 million.

About half of the state's gold production has come as a coproduct or byproduct of base metal mining. Early production included large amounts of placer gold from deposits along the Columbia River as well as from deposits along the banks of the Similkameen River, Ruby Creek, Sultan River, Swauk Creek, and Peshastin Creek.

An estimate of gold produced in Washington from 1855 through 1971 would be around \$90 million. Currently, Washington produces in excess of \$1 million yearly in gold, almost all of which comes from the Knob Hill mine.

## Silver

Silver has been the principal metal from 40 mines, but most of the production has been a byproduct from gold and base metal mines. The total silver production of Washington from 1866 through 1971 has been roughly 22 million ounces, worth about \$17.5 million. Although the dollar value of silver does not exceed that of gold, the total ounces of silver produced exceeds gold.

## Gold

Approximately 100 mines have at one time or other produced gold in Washington. Major producing mines have been the Knob Hill, Gold King, and Holden mines in the Republic, Wenatchee, and Railroad Creek mining districts of Ferry and Chelan Counties. Significant amounts of gold have also been produced from the Blewitt, Monte Cristo, Mount Baker, and Slate Creek mining districts of the northern Cascades, from the Oroville-Nighthawk district of north-central Washington, and from the Orient district of northeastern Washington.

The leading silver-producing counties are Ferry, Stevens, Chelan, and Pend Oreille. At the turn of the century, about half of the silver produced in Washington came from gold and silver lode mines, whereas the other half came from lead, zinc, and copper mines. Since 1957, nearly three-fourths of the silver has been a byproduct of gold mining operations. Currently silver is produced as a coproduct at the Knob Hill gold mine and as a byproduct at the Pend Oreille lead-zinc mine. Knob Hill mine produces over \$150,000 in silver annually, while Pend Oreille mine produces about \$30,000.

#### Lead and Zinc

Although the Pend Oreille mine is presently the only lead and zinc producer in the state, at one time or other 20 mines produced zinc and 35 produced lead. Because of its silver content, lead was mined as early as 1885 in Stevens County, but it was not until 1939 that major amounts of zinc were produced. Since 1939, the Metaline mining district of Pend Oreille County has been the state's leading lead-zinc producer. Significant amounts of lead and zinc have also been produced at the Van Stone mine in Stevens County, and large amounts of zinc ore were mined at the Holden mine in Chelan County.

Total cumulative production of zinc in Washington through 1971 is about \$65 million, and lead \$155 million. Currently, the Pend Oreille mine produces around \$3.3 million of combined lead and zinc.

#### Copper

Although copper is not presently mined in Washington, 25 mines have produced copper as their principal product. From 1860 through 1961 a total 122,000 tons of copper valued at around \$4.5 million came from Washington mines. The bulk of the production came from the Holden mine in Chelan County, which over a 20-year period produced 107,911 tons of copper. Since the closure of the mine in 1957, the production of copper in Washington has been insignificant; however, copper remains the most sought-after metal in the state by major mining companies engaged in exploration work.

#### Uranium

Although minable deposits of uranium were not discovered in Washington until 1954, the

production of uranium has exceeded several other metals that were discovered 50 years earlier. In the ten-year period between 1955 and 1965, 4.7 million pounds of  $U_3O_8$  valued at around \$30 million was extracted from 1.2 million tons of ore. The bulk of the production came from the Midnite mine on the Spokane Indian Reservation in southern Stevens County. Mining at the Midnite mine resumed in 1969, and in 1971 the mine produced around 47,000 tons of ore that contained 300,000 pounds of uranium oxide valued at \$3.25 million.

Exploration for metallic minerals by major mining companies continued throughout 1972 but declined somewhat from that of previous years. For the most part, exploration activities were directed toward large low-grade deposits of copper. Bear Creek Mining Company continued to explore their copper prospect on Tolman Mountain in southern Ferry County while Cyprus Mines Corporation, Humble Oil Company, and Inspiration Development Company diamond drilled low-grade copper deposits in northern Okanogan County. In northwestern Washington, Natural Resources Development Corporation continued development work at the Clipper copper property on the South Fork of the Snoqualmie River in King County. In Snohomish County, rehabilitation of Sunset mine was undertaken by Joe Cashman of Skykomish; and, at the Wayside mine near Granite Falls, parts of the mine have been rehabilitated by Ram Mines, Inc. and diamond drilling for new veins was carried out. In the 1930's, the Sunset mine was a major producer of copper.

Rising silver prices encouraged several mining companies to investigate several silver mines that have produced in the past. In the Conconully mining district of Okanogan County, work was underway at the Fourth of July, Peacock, and Mohawk mines. In the Loomis district, sampling of the silver-bearing veins at the Ivanhoe mine was undertaken by Old Channel Placers, Inc.

At least three lead-zinc properties were under investigation during 1972. On the Colville Indian Reservation, Cordero Mining Corporation diamond drilled for zinc at the Iron Dike prospect. At the Schumaker mine in Stevens County, Coronado Development Corporation made preparations to mine lead-zinc that will be milled at Goldfield Consolidated mill near Aladdin. At the Pend Oreille mine at Metaline Falls, exploration and devel-

opment work was undertaken on a new lead-zinc ore body that lies 125 feet below the presently producing ore zone.

Exploration for uranium was confined to the Spokane Indian Reservation in southern Stevens County. Exploratory drilling at the Midnite mine exceeded 3,000 feet. Three miles north-east of the Midnite mine, Midnite Mining Company carried out radiometric surveys and exploratory drilling on mineral leases held by Evergreen Minerals, Inc.

Wayne S. Moen

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*Some people think of aluminum as being a light metal. However, a cubic foot of aluminum weighs about the same as a cubic foot of marble (166 pounds per cubic foot).*

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## THE OLYMPIC PENINSULA REPORT

Geologists have always been intrigued with the Olympic Peninsula and, over the years, various individuals and teams have contributed large amounts of data on the geology of this area. Presently, a concerted effort is being made to bring together all available geologic mapping and information on the rocks of this structurally complex area. This work is being coordinated and assembled for publication by Roland Tabor and Wallace Cady of the U.S. Geological Survey. In addition, they have completed much new mapping, particularly in the Olympic Mountains. In this connection, two detailed geologic maps were recently published by the U.S. Geological Survey: Geologic Map of The Brothers Quadrangle, by W. M. Cady, M. L. Sorensen, and N. S. MacLeod; and Geologic Map of the Tyler Peak Quadrangle, by W. M. Cady, R. W. Tabor, N. S. MacLeod, and M. L. Sorensen. As an outgrowth of his work in this area, Roland Tabor is currently assembling a popular report on the geology of the Olympic National Park.

Parke D. Snavely and Norman S. MacLeod, also of the USGS, have been conducting geologic studies for the past several years along the north flank of the Peninsula to Cape Flattery. Their work will result in a detailed geologic

map of that area, as well as add substantially to overall geologic knowledge of the Olympic Peninsula.

Last summer an extensive geophysical survey was made in the Straits of Juan de Fuca and off the northwest tip of Washington. This research was carried out jointly aboard a Canadian research vessel by the U.S. Geological Survey and the Canadian Geological Survey. The project was co-headed by Parke D. Snavely of the Office of Marine Geology and Don L. Tiffin of the Canadian Survey.

For the past several years Richard J. Stewart of the University of Washington has been engaged in geologic studies, largely in the west-central part of the Olympic Mountains. His particular contributions have dealt with metamorphism as related to the geologic history of these rocks.

For the past 5 years my geologic studies have been directed largely toward the coastal area of the Olympic Peninsula. A report on the biostratigraphy of the Quinault Formation, published by the Division of Mines and Geology in 1970 as Bulletin 62, was the first research to be made available from the project. I am now engaged in overall geologic investigations, primarily of the Taholah and Destruction Island quadrangles. This study will culminate in a geologic report and map of the area. The report will serve as a base for solutions to geologic problems such as landslides and those dealing with road construction as well as for evaluating the mineral potential of this and surrounding areas. In addition, a report on the geology of the immediate coastal area is nearly ready for publication. It is designed to appeal to the beginning geology student as well as those generally interested in the natural sciences. The report is also intended as a guide for geologic field trips.

Weldon W. Rau

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*"Civilization exists by geological consent—subject to change without notice." Will Durant*

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## ENGINEERING AND URBAN GEOLOGY

The division is in the process of completing a report and table for use by city and county planners, land developers, and hopefully for use also by the average single home developer. The report and table have been prepared for the Puget Lowland area.

A report "Urban Geology, Western Washington; A State-of-the-Art Review" is tentatively to be presented at the annual meeting of the Cordilleran Section of The Geological Society of America, March 22, 23, and 24, at Portland State University in Portland.

An environmental geologic mapping program of the Puget Lowland was initiated with a trial project in the Olympia-Lacey area. The mapping will be done on the 7½-minute USGS topographic quadrangle sheets. The division is also cooperating with the USGS on a trial mapping

program in conjunction with the Resource and Land Inventory (RALI) Project.

## DIRECTORY OF WASHINGTON MINING OPERATIONS 1971-1972

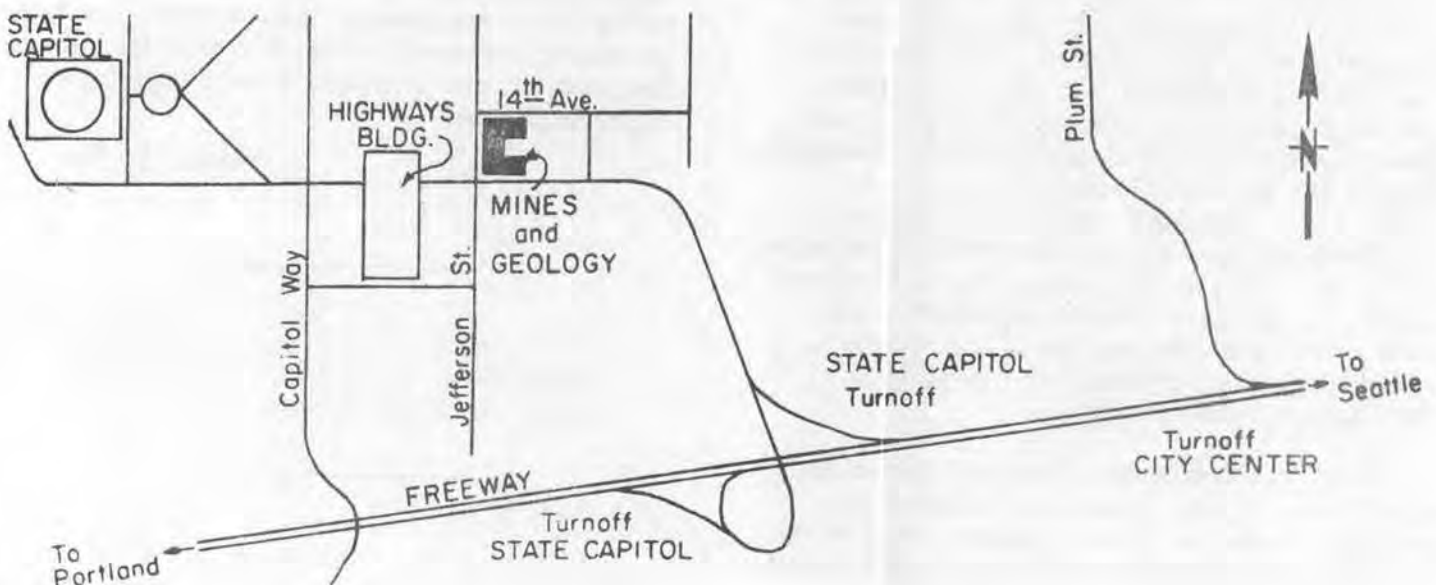
This free publication will be available in the spring of 1973 to anyone who requests it. The Directory is a biennial listing of all known metallic, nonmetallic, and sand and gravel operations in Washington. Company name, address, product, and location of mine(s) are included for each operation. The 1971-1972 Directory will contain in excess of 300 listings. If you would like a copy, write to the Division of Mines and Geology, Department of Natural Resources, Olympia, WA, 98504, and request Information Circular No. 47.

## DIVISION MOVES TO NEW BUILDING

On November 8, Mines and Geology moved into new offices at 14th and Jefferson on the east campus of the Capitol grounds. Although the offices are temporary, they offer an improvement over the space occupied by the staff for the past 17 years. Ample parking is provided for visitors who should experience no trouble in finding our building as it is the first state office building after taking the State Capitol exit from Interstate 5.

Library as well as laboratory space has been expanded, and the mailing room has been designed for greater efficiency. Considering everything, Mines and Geology should be able to serve the public and perform duties more efficiently in the new offices. Stop by and visit us.

See diagram below.



## GEOLOGY—AN EXPANDING ROLE

Geologists do more than search for oil, gas, and minerals from the ground. Creeping urbanization has placed the geologist in a position of major responsibility for environmental study and evaluation. The natural environment exists on a geologic foundation and is modified and controlled by active geologic processes. Thus, the geologist, in dealing with his environment, automatically finds himself "the expert" in untraditional ways. The "environmental geologist" must work with other natural scientists, evaluating geologic factors, inventorying resources, and assessing other environmental variables. These data must be weighed to decide realistic priorities in long-range land use planning and resource development. Ultimately, these priorities must be communicated to law makers and administrators in order to be effective.

## YOUR STATE GEOLOGIST REPORTS

One of the unfortunate situations of our times is the apparent communication gap that has developed between the mineral producer and the environmentalist. At a time when the expertise of all segments of our population should be brought to bear on the problems of pollution abatement and control, we have a situation that to someone sitting in the middle like myself looks like a bull fight. Instead of attacking issues and problems, the environmentalists are by and large attacking industries. Industry on the other hand, still has the lingering attitude in many instances that the environmentalists are bent on destroying the vitality of the nation. It becomes very obvious with a minimum amount of observation and thought

that both attitudes are wrong and need to be revised.

It has been surprising to me how much industry and the environmentalist have in common if they would just sit down together and talk. As I read the various reports that come across my desk, I am impressed at the amount of money and effort that industry is pouring into lowering the amount of harmful emissions being released into the environment. Occasionally, I see articles that describe the findings of committees that were formed when industry people and environmentalists sat down and talked rationally and calmly together, and I find these to be very rewarding. When this happens, it seems that environmentalists are finding that industry is made up of people who are responsible and concerned about what is happening, and industry people are finding that environmentalists are responsible, intelligent people who are also concerned about what is happening. Unfortunately, there was too much antagonism and mistrust generated when environment-awareness first crashed onto the scene. How much better it would have been if the environmentalist had been wise enough to say, "Hey, what you are doing isn't right, let us help you straighten out the mess," and if industry had been wise enough to say, "You are right, we do have problems and we will be glad to accept your help in getting them straightened out."

I'm convinced that if the environmentalist and industrialist will work together in harmony toward a common goal there is no problem they cannot solve. If, however, they stubbornly refuse to see or even consider the other fellow's side, the solutions to our problems will be slow in coming and the enmity that already exists will be increased to the point that it could jeopardize our national well-being.

Ted Livingston

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*If you would like to subscribe to the Geologic Newsletter, please write to the Department of Natural Resources, Division of Mines and Geology, Olympia, Washington, 98504.*

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