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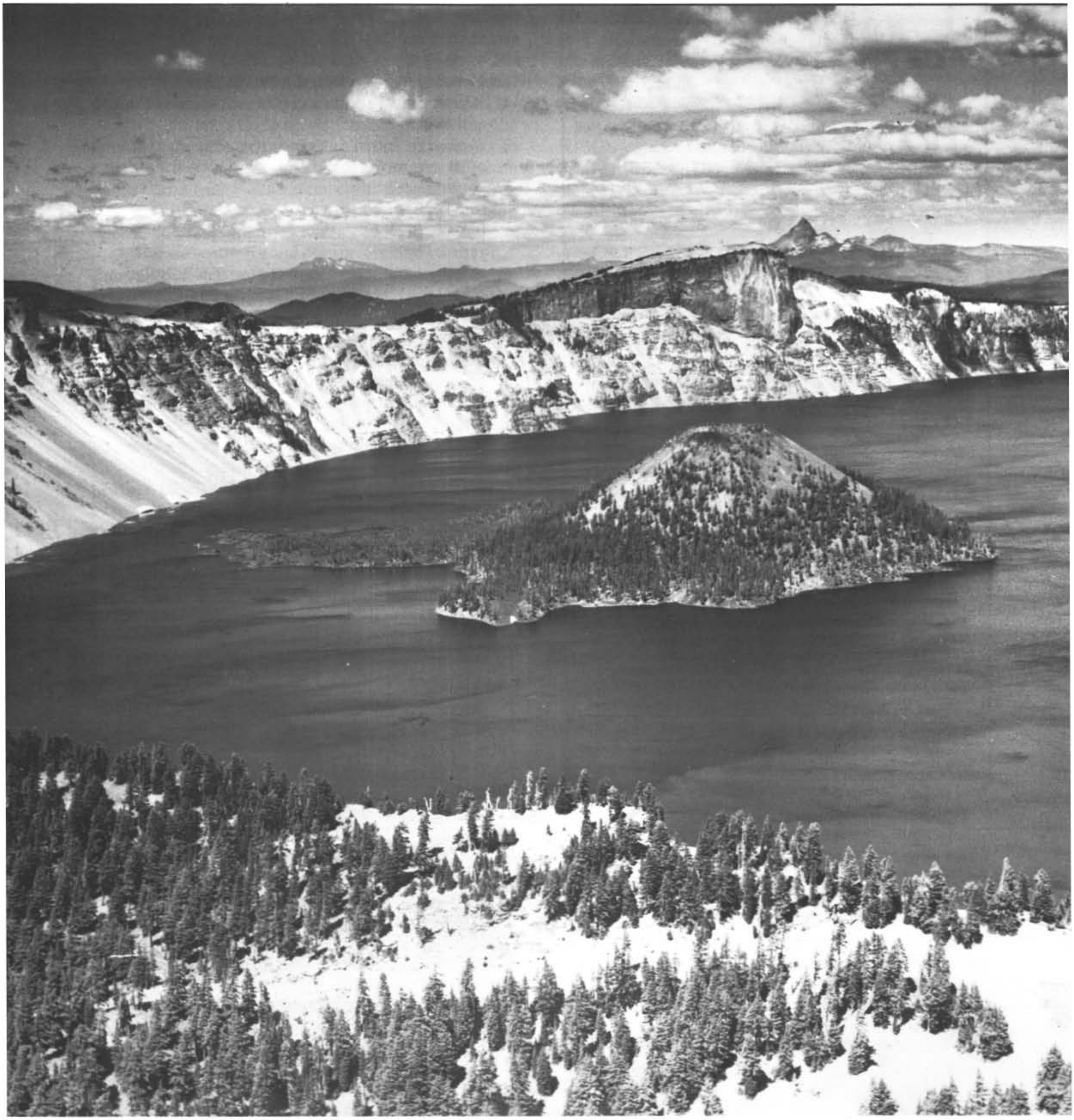

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Cover Photo

Crater Lake, one of the areas in Oregon being studied by the U.S. Geological Survey as part of its geothermal research program. The article beginning on page 103 lists USGS activities throughout the Cascade Range. (Oregon State Highway Division photo)

Old mines are dangerous

The tragic death in April of a miner near Quartzville should serve as a warning to all who work in—or visit—old mines in Oregon. Each year, the Oregon Department of Geology and Mineral Industries prints warnings about the dangers of mines in the hope that this type of accident may be prevented. We also have a free brochure that describes in detail some of the unexpected dangers that exist in abandoned mines, caves, and open pits.

Common dangers in old mines include:

1. Rotten timber (posts and timbers supporting roofs and walls).
2. Broken or rotten ladders, steps, stairways, or any other means for getting in and out.
3. Unsupported roofs and walls (danger of falling rocks).
4. Bad air (lack of oxygen or the presence of deadly gases).
5. Underground holes and shafts (covered or uncovered).
6. Water (unfit for drinking or the danger of drowning).
7. Underground fires (burning up oxygen or giving off poisonous gases).
8. Abandoned explosives (dynamite, powder, and detonators).
9. Snakes, spiders, scorpions, and poisonous insects.
10. Danger of becoming lost.
11. Caving ground (ledges, rims, and mine surfaces). □

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U.S. Geological Survey geothermal research program in the Cascade Range

INTRODUCTION

This list summarizes U.S. Geological Survey (USGS) activities that are already in progress or are about to begin in the Cascade Range of Oregon, Washington, and California. The list is divided into two parts: (1) projects associated with the geothermal research program, and (2) activities outside the geothermal research program. Work in progress by non-USGS groups under contracts, extramural grants, or Department of Energy funding is not included.

The Cascade Range comprises one of the major belts of active volcanoes of the world. Being located near several population centers, the Cascade volcanic chain would seem to be an attractive prospect for the development of geothermal energy. However, the geothermal potential of the Cascades cannot be accurately assessed until the geological history of the region, its structure, hydrology, and volcanic and hydrothermal processes are more thoroughly understood.

In combination with other research groups, the U.S. Geological Survey Geothermal Research Program has undertaken a number of long-term geologic, geophysical, geochemical, and hydrologic studies of the Cascade Range on both regional and local bases. A geologic map of the Cascade Range will be compiled and supplemented with detailed mapping in specific areas. Aeromagnetic, gravity, and heat flow maps are being prepared to complement the geologic maps. Additional geophysical investigations include both active and passive seismic, electrical, and remote sensing techniques. Petrologic and geochronological data are being acquired in conjunction with geologic mapping. Studies of the geochemistry of hydrothermal alteration and geothermal fluids have also been initiated. Reports and maps will be published by the USGS and in scientific journals as individual projects are completed.

A significant portion of the work included in the USGS program is being done by universities, state agencies, and private institutions under contracts and extramural grants. Throughout these investigations, a conscientious effort is being made to coordinate activities with others working in the Cascade Range under funding from different sources (for example, the Department of Energy). The Geothermal Research Program Coordinator has designated Charles R. Bacon, Menlo Park, California, as geologist responsible for coordination of USGS geothermal investigations in the Cascades.

Letters after researchers' names indicate USGS offices in the following cities: D = Denver, Colorado; MP = Menlo Park, California; R = Reston, Virginia; S = Seattle (LIA), Washington; and SLC = Salt Lake City, Utah.

USGS PROJECTS IN THE CASCADE RANGE ASSOCIATED WITH THE GEOTHERMAL RESEARCH PROGRAM

Geophysical studies

Geothermal geophysics—D. R. Mabey (SLC): Evaluation of KGRA's in Cascades using geophysical data including aeromagnetic, gravity, SP, MT, AMT, EM, and active seismic techniques.

Teleseismic and microearthquake geothermal studies—H. M. Iyer (MP): Delineation of magma systems and the deep structure under the Cascades, particularly in Oregon, through microearthquake surveys and teleseismic P-wave studies.

Geothermal/Tectonic seismic studies—C. S. Weaver (MP): Detailed seismicity studies to understand the tectonic environment of the Cascades in relation to possible geothermal systems, particularly in central and southern Washington.

Active seismic exploration of geothermal sources—D. P. Hill (MP): Detailed determination of the velocity structure of the crust and upper mantle beneath the Cascades. Use of this information in interpreting the pressure-temperature conditions in the crust in conjunction with laboratory measures of physical properties.

Geothermal processes, heat flow—A. H. Lachenbruch (MP): Measurement and theoretical studies of heat flow in the Cascades of northern California and southern Oregon.

Geoelectric studies—W. D. Stanley (D): Use of deep electrical sounding techniques to investigate crustal structure beneath the Cascades.

Geophysical characterization of young silicic volcanic fields—D. W. Williams (D): Characterization of volcanic geothermal areas using gravity, aeromagnetic, and other geophysical data.

Engineering geophysics—H. D. Ackermann (D): Determination of the relationships between the rock properties in areas of geothermal interest and their seismic-wave transmission properties from seismic measurements in the field.

Geothermal regional studies—R. Simpson (D): The use of deep-sounding magnetotelluric measurements to provide information on broad crustal-mantle structure and on areas of geothermal interest.

Electrical techniques applied to shallow- to medium-depth exploration for geothermal resources—D. B. Hoover (D): Development and application of AMT, SP, and telluric techniques for exploration and characterization of geothermal systems to a depth of about 1 km.

Transient geomagnetic and telluric investigations—J. N. Towle (D): Use of a geomagnetic-telluric array to study the conductivity of the crust and upper mantle under the Cascades.

Heat flow, Crater Lake—D. L. Williams (D): Measurement of heat flow in bottom sediments and photographic coverage of selected sites on the bottom of Crater Lake, Oregon.

Seismic stratigraphy and geologic history of the floor of Crater Lake—C. H. Nelson (MP): Detailed seismic reflection profiling of the floor of Crater Lake to study sedimentation processes and relations between submerged volcanic features.

Lineament analysis—D. Knepper (D): Preparation of maps of lineaments in the Cascade Range from LANDSAT imagery.

Geologic studies

Geology of Newberry and Three Sisters Volcanoes—N. S. MacLeod (MP): Geologic mapping and related studies of Newberry and Three Sisters volcanoes. Geologic map of the west half of the Crescent 2° Quadrangle, Oregon.

Hydrothermal alteration in the Cascades—M. H. Beeson (MP): Detailed field mapping and laboratory petrological and mineralogical studies of selected areas of hydrothermal alteration associated with active and fossil geothermal systems of Western and High Cascades.

Geology of young volcanic rocks and thermal areas in and around Lassen Volcanic National Park—L. J. P. Muffler (MP): A geologic study of the volcanic rocks and hydrothermally altered areas in the region of Lassen Peak to provide the geologic framework for understanding the geothermal resources of the southernmost Cascades.

Regional volcanology—R. L. Smith (R): Classification, characterization, and geothermal evaluation of volcanic systems in the Cascades.

Volcanology and petrology of Mt. Shasta—R. L. Christiansen (MP): A study of the volcanic evolution of Mt. Shasta and the Cascade Range in its vicinity.

Medicine Lake Volcano—J. M. Donnelly (MP): Geology of Medicine Lake Highland with emphasis on its volcanic evolution in time, space, and composition.

Volcanic evolution of the Crater Lake region—C. R. Bacon (MP): Geology and petrology of Mt. Mazama and vicinity, with emphasis on processes leading to the development of shallow silicic magma reservoirs.

Mt. St. Helens—W. Hildreth (MP): Geochemistry and petrology of Mt. St. Helens, in collaboration with the USGS volcano hazards studies and other non-Survey researchers.

Regional petrologic reconnaissance of the Cascades—W. Hildreth (MP): Geochemical and isotopic reconnaissance of the many lesser vents between the major stratocones to develop a better understanding of the characteristic scales and longevities of the Cascade volcanic foci.

Geologic map of the Cascades—R. G. Luedke (R): Compilation of a geologic map of the Cascade Range in California, Oregon, and Washington to be used in conjunction with regional geophysical maps for evaluation of the geothermal resource potential and tectonic regime of the modern Cascade Range.

Fluid geochemistry and hydrology

Rock-water interactions—R. O. Fournier (MP): Development of geochemical techniques for estimating conditions deep in hydrothermal systems from chemistry of geothermal fluids.

Geochemical indicators—A. H. Truesdell (MP): Application of chemical and isotopic methods to the study of geothermal systems to determine subsurface temperatures, flow directions, origins, and ages of geothermal waters.

Chemistry of thermal waters—R. H. Mariner (MP): Collection and analysis of liquid and gas samples from thermal springs and wells of the Western and High Cascades for chemical and isotopic data used to estimate reservoir temperatures, outline areas for further geothermal exploration, identify potential pollution problems, and estimate recharge-discharge relations.

Geothermal hydrologic reconnaissance of the southern Cascades—E. A. Sammel (MP): Description and evaluation of the hydrology of several geothermal areas in the southern Cascades, including the Klamath Falls, Newberry, Medicine Lake, Shasta, and Lassen areas.

Hydrologic studies at Mt. Hood—J. H. Robison (MP): Hydrologic reconnaissance of Mt. Hood with emphasis on the warm springs and drill holes on the

North and Middle Sister, part of the Three Sisters Wilderness Area now being studied by the USGS as part of its geothermal research program. (Oregon State Highway Division photo)

south flank.

Geochronology

Potassium-argon dating—M. A. Lanphere (MP): Determination of age and evolution rate of volcanic centers in the Cascades using K-Ar radiometric dating.

Thermoluminescence dating—R. J. May (MP): Development of the thermoluminescence (TL) dating technique for volcanic rocks in the age range of 10^3 to 10^5 years.

Carbon-14 dating—S. W. Robinson (MP): Use of radiocarbon dating to provide chronology of episodes of late Pleistocene volcanism and lacustrine episodes in areas of geothermal potential.

Paleomagnetic studies—C. S. Grommé (MP): Dating young volcanic rocks using the paleomagnetic record of Holocene secular variation and the application of other paleomagnetic and rock-magnetic techniques to the study of volcanic geothermal systems.

USGS ACTIVITIES OUTSIDE THE GEOTHERMAL RESEARCH PROGRAM

Geophysical studies

Pacific states geophysical studies—A. Griscom (MP): Synthesis and interpretation of gravity and aeromagnetic data over northern California to gain a better understanding of the regional tectonism and structure.

California gravity—H. W. Oliver (MP): Preparation of interpretive text to go with preliminary Bouguer gravity map of California (1:750,000).

Geomagnetic polarity time-scale and paleosecular variation—E. A. Mankinen (MP): Paleomagnetic data from volcanic areas in California, Nevada, Arizona, and New Mexico will be used to determine paleosecular variation in the western United States during the last five to six million years.

Geophysical studies in Medford 2° Quadrangle (CUSMAP)—R. J. Blakely (MP): Gravity and aeromagnetic studies in the Medford 2° Quadrangle.

Thermal infrared studies of Cascade volcanoes—J. D. Friedman (D): Repetitive thermal infrared surveys of Cascade volcanoes for the purpose of delineating and monitoring areas of anomalously high surface temperature.

Remote sensing geothermal—K. Watson (D): Preparations of master image set for Mt. Hood and Newberry Crater areas from repetitive thermal infrared and multispectral data and ground meteorological measurements.

Geologic studies

Volcanic hazards overview—D. R. Mullineaux (D): Preparation of overview maps of volcanic hazards for Oregon (1:1,000,000) and western U.S. (1:2,500,000).

Volcanic hazards—D. R. Crandell (D): Rocks and unconsolidated deposits of volcanic origin and of late Quaternary age are being studied at volcanoes in

Newberry Volcano, near Bend, Oregon. Note Big Obsidian Flow in center of photo. The USGS is studying Newberry Volcano and surrounding volcanic features with its geothermal research program. (Oregon State Highway Division photo)

Washington, Oregon, and California for the purpose of evaluating potential hazards from future eruptions. Includes recent eruptive histories of Glacier Peak (J. E. Beget, Univ. Washington), Mt. St. Helens (R. P. Hoblitt [D]), Mt. Hood (Crandell), Mt. Shasta (C. D. Miller [D]), and studies of Holocene pyroclastic flows (Crandell).

Tephra hazards, Cascade Range volcanoes—D. R. Mullineaux (D): Study of large single shower beds of tephra, mainly from Mt. St. Helens and Mt. Mazama, to evaluate potential tephra hazards downwind from Cascade Range volcanoes.

Tephrochronology of the western region—A. M. Sarna-Wojcicki (MP): Isotopic age determination, and correlation of late Cenozoic ashes and tuffs by means of instrumental neutron activation, X-ray fluorescence, and electron probe analyses of volcanic glass, and by petrography and paleomagnetism. Includes studies of tephra units and source areas in the south, central, and north Cascade Ranges.

Sacramento Valley—Northern Sierran Foothills—E. J. Helley (MP): Preparation of geologic maps of Quaternary alluvial deposits and late Cenozoic volcanic rocks of the Sacramento Valley and Northern Sierran Foothills, with special emphasis on the age of associated faulting.

Medford-Coos Bay Quadrangles (CUSMAP)—J. G. Smith (MP): Preparation of a multidisciplinary land-resource analysis folio of Medford 2° Quadrangle, with primary emphasis on the evaluation of potential mineral resources and their relation to regional structure, tectonostratigraphic units, and plate tectonic models.

Geochemical exploration of Medford 2° Quadrangle (CUSMAP)—D. J. Grimes (D): Collection and analysis of stream sediment samples for 32 elements; preparation of preliminary maps and identification of target areas for detailed studies.

Mineral resources of Spirit Lake Quadrangle—R. P. Ashley (MP): Preparation of a geologic map and reports on geology and mineral resources of Spirit Lake 15' Quadrangle, Washington.

Wenatchee 2° Quadrangle—R. W. Tabor (MP): Preparation of geologic maps of four 1:100,000 quads making up Wenatchee 2° Quadrangle, Washington, with emphasis on tectonics.

Port Townsend 1:100,000 Quadrangle, Washington—J. T. Whetten (S) and H. D. Gower (MP): Preparation of geologic map with emphasis on tectonics.

Geologic map of Columbia Plateau; Columbia River Basalt—D. A. Swanson (MP); **Genesis of basalt**—T. L. Wright (R): Continuing studies of Columbia River Basalt in southeastern Washington and northeastern Oregon.

Seismo-tectonic analysis of Puget Sound province—H. D. Gower (MP): Investigation of suspected Quaternary and bedrock faults by marine seismic profiling; aeromagnetic, gravity, and geologic investigation; geologic reconnaissance of arcuate topographic feature east of Seattle in Western Cascade Range.

Tectonic analysis—K. F. Fox, Jr. (MP): Compilation of tectonic map of Washington (1:500,000).

Mt. Baker monitoring—D. Frank (S): Photographic surveys of fumarolic emission and associated snowmelt patterns, and chemical analysis of stream draining Sherman Crater for the purpose of monitoring activity of Mt. Baker.

Wilderness studies

Caribou-Thousand Lakes—A. Till (University of Washington)

Baker Cypress-Lava Rock—J. A. Peterson (MP)

Sky Lakes—J. G. Smith (MP)

Salmo Priest—F. K. Miller (MP)

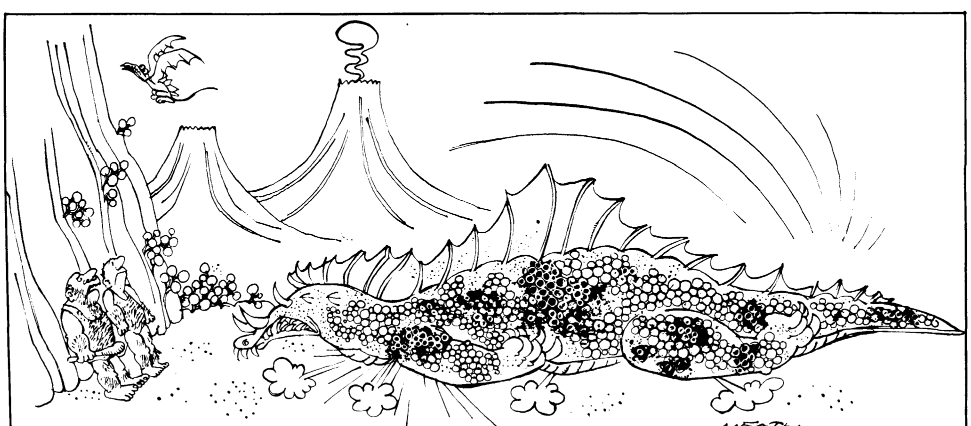
Three Sisters—N. S. MacLeod and G. W. Walker (MP)

Mt. Washington—N. S. MacLeod (MP)

Mt. Hood-Zigzag—T. E. C. Keith (MP)

Goat Rocks—D. A. Swanson (MP)

Glacier Peak—J. G. Evans and R. W. Tabor (MP) □

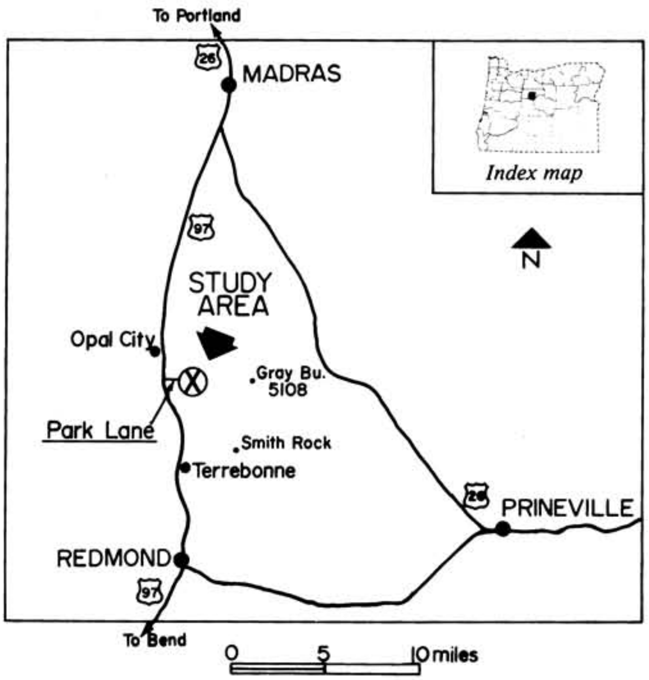


"Thank goodness! Extinct just in the nick of time!" (C) Punch-ROTHCO

An exposure of limestone at Gray Butte, Jefferson County, Oregon

by Melvin Ashwill, retired public school teacher, Route 1, Box 393, Madras, Oregon 97741

Geology is a field-oriented science and, as such, is founded on observations by many persons. No agency has staff to study personally all the geology the field has to offer, and new discoveries are continually being made. In this article, Melvin Ashwill reports on a recent discovery in the Gray Butte area that may be of considerable interest to many of our readers.



Gray Butte is a 5,108-ft promontory in southern Jefferson County, Oregon (Figure 1). The area, mapped as Oligocene-Miocene John Day Formation (Waters, 1968), has been considered to be made up of continental deposits.

On the lower west flank of the butte, I recently located a small exposure of light-gray, unfossiliferous, recrystallized limestone in association with some arenites. This exposure appears to be a window into a formation that is older than the surrounding rocks.

Previous studies of the area include those by Russell (1905), Stearns (1931), Hodge (1942), Williams (1957), Wells and Peck (1961), Waters (1968), and Stensland (1970).

Several of these investigators noted that the basalt immediately to the southwest of the study area appeared to be among the oldest rocks nearby, and some estimated an Eocene age for them. Likewise, some

← *Figure 1. Maps showing location of Gray Butte limestone, Jefferson County, Oregon.* ↓

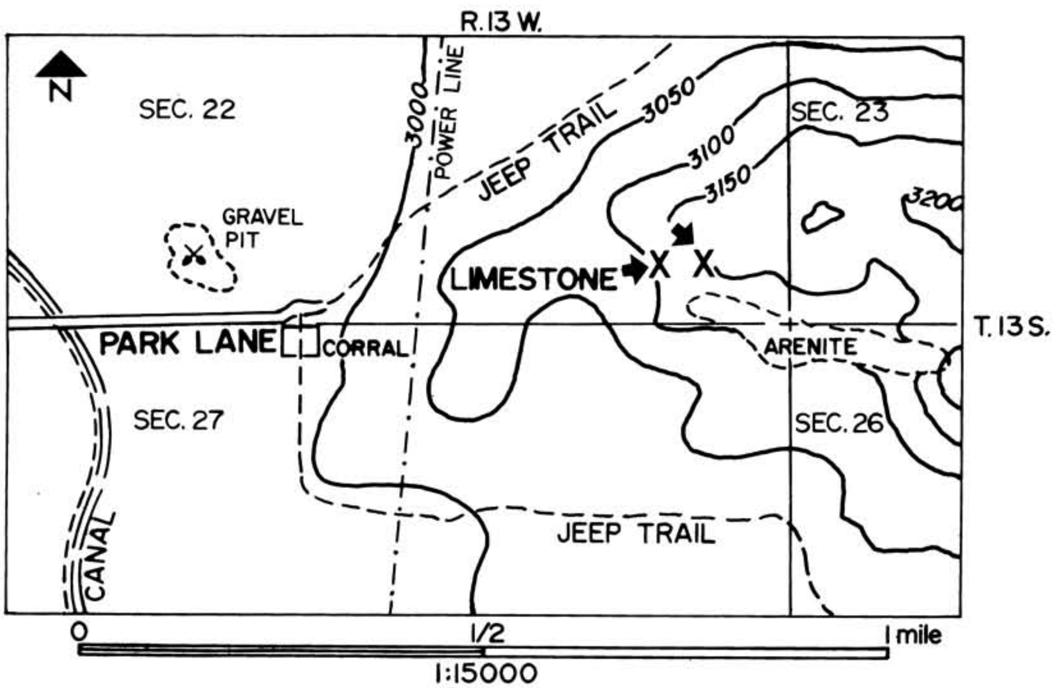


Figure 2. Limestone cropping out at Gray Butte. Beds are dipping steeply.

workers suggested the presence of an anticline whose northeast trending axis extends roughly through the study area.

The scant exposures of limestone (Figures 2 and 3) occur in strata ranging from 4 to 14 in. in thickness. By scraping away the thin topsoil, an observer can follow the limestone for about 150 ft. The sequence is more than 45 ft thick and includes tuffaceous layers varying from less than 2 ft to more than 6 ft in thickness. The strata strike east-northeast and dip 75° to the north-northwest. Other dips recorded by Williams (1957) within 5 mi of the study area are between 10° and 30°.

Arenites and other clastic rocks crop out about 150 ft south-southeast of the limestone. They strike north-northwest, extend for several hundred yards, and also dip steeply. The clastic sediments vary laterally from sand-sized grains to cobble-sized quartz conglomerate. Although the clastic rocks are lower on the slope than the limestone, their true stratigraphic relationship remains obscure. The arenite sequence is over 50 ft thick and is overlain by more than 20 ft of mudstone containing as yet unidentified fossil wood.

The lithological differences in these rocks from others at Gray Butte, their anamalously steep dips, the indications of metamorphism in the recrystallization of the limestone, and the quartzic arenites all suggest an older age for these rocks than was previously believed. They appear to lie in the axis of an anticline (Figure 4).

Three miles to the south, the tuffs at Smith Rock contain inclusions of limestone country rock (Bruce Nolf, personal communication, 1978), lie stratigraphically above the rocks of the study area, and are John Day (mid-Tertiary) in age. A mile east of the limestone and stratigraphically between it and the Smith Rock tuff, a relatively unstudied assemblage of fossil plants suggests that the rocks there may be older than John Day age.

Further study will be necessary to determine if the fossils are intermediate in age between the limestone and the Smith Rock tuff. Should subsequent study prove that such is the case, an unusual geologic column indeed is exposed at the surface in this area: the Piocene deposits just west of Prineville, the Miocene Columbia River Basalt Group east of Lone Pine Flats, the John Day Formation at Smith Rock and the north wall of Sherwood Canyon, and the successively older rocks of the study site.

Directions for finding the limestone exposure, which lies in the SE¼SE¼ sec. 22, T. 13 S., R. 13 E., are as follows: 15 mi south of Madras, Oregon, on U.S. Highway 97, turn east on Park Lane. While driving the 2 mi east to the end of Park Lane (Figure 5), notice the small power line along the road. In the distance ahead, the line continues straight ahead along a section line past the end of Park Lane. This power line is important to orientation and is not to be confused with the two larger high-voltage lines on steel towers crossing the area in a different direction.

Two miles beyond the highway, Park Lane ends with a private road that turns 90° to the right and a National Grasslands road continuing in a northeasterly direction. At this junction stands a wooden corral, with a gate at each end, allowing access to a jeep trail. Be sure to close the gates behind you, both as you enter and as you leave. After going through the corral, follow the jeep trail three-quarters of a mile, park your vehicle, and walk due north a quarter of a mile. At this point, you will reach the small power line described above, and within 4 ft of the base of one of the poles (#229001), you will find a section corner marker in plain view.

The limestone described in this article lies approximately 730 ft west and 320 ft north of this point. A second small exposure of limestone lies about 100 yds west of the first.

Figure 3. Linear blocks of limestone along ledge at Gray Butte. Between exposed blocks, ledge is covered by thin topsoil.

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Waters, A. C., 1968, Reconnaissance geologic map of the Madras Quadrangle, Jefferson and Wasco Counties, Oregon: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-555.

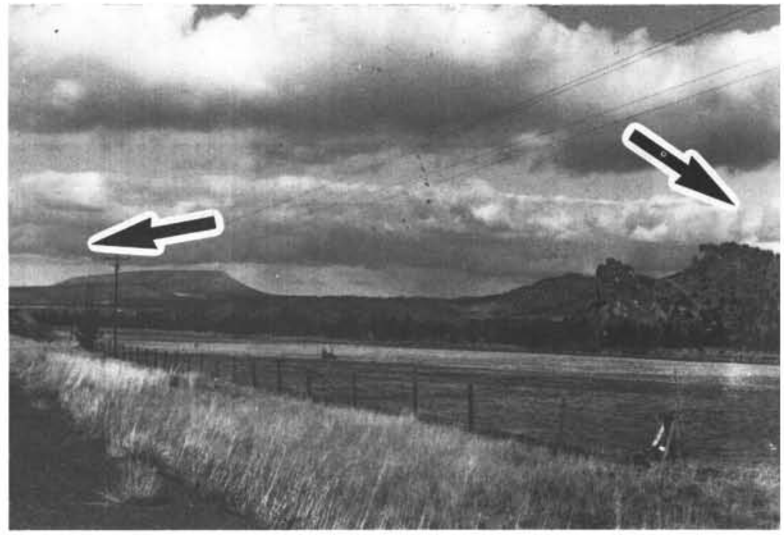

Figure 4. Looking northeast toward study area from near Terrebonne. Arrows indicate dips of anticline.

Wells, F. G., and Peck, D. L., 1961, Geologic map of Oregon west of the 121st Meridian: U.S. Geological Survey Miscellaneous Geological Investigations Map I-325, in cooperation with the Oregon Department of Geology and Mineral Industries.

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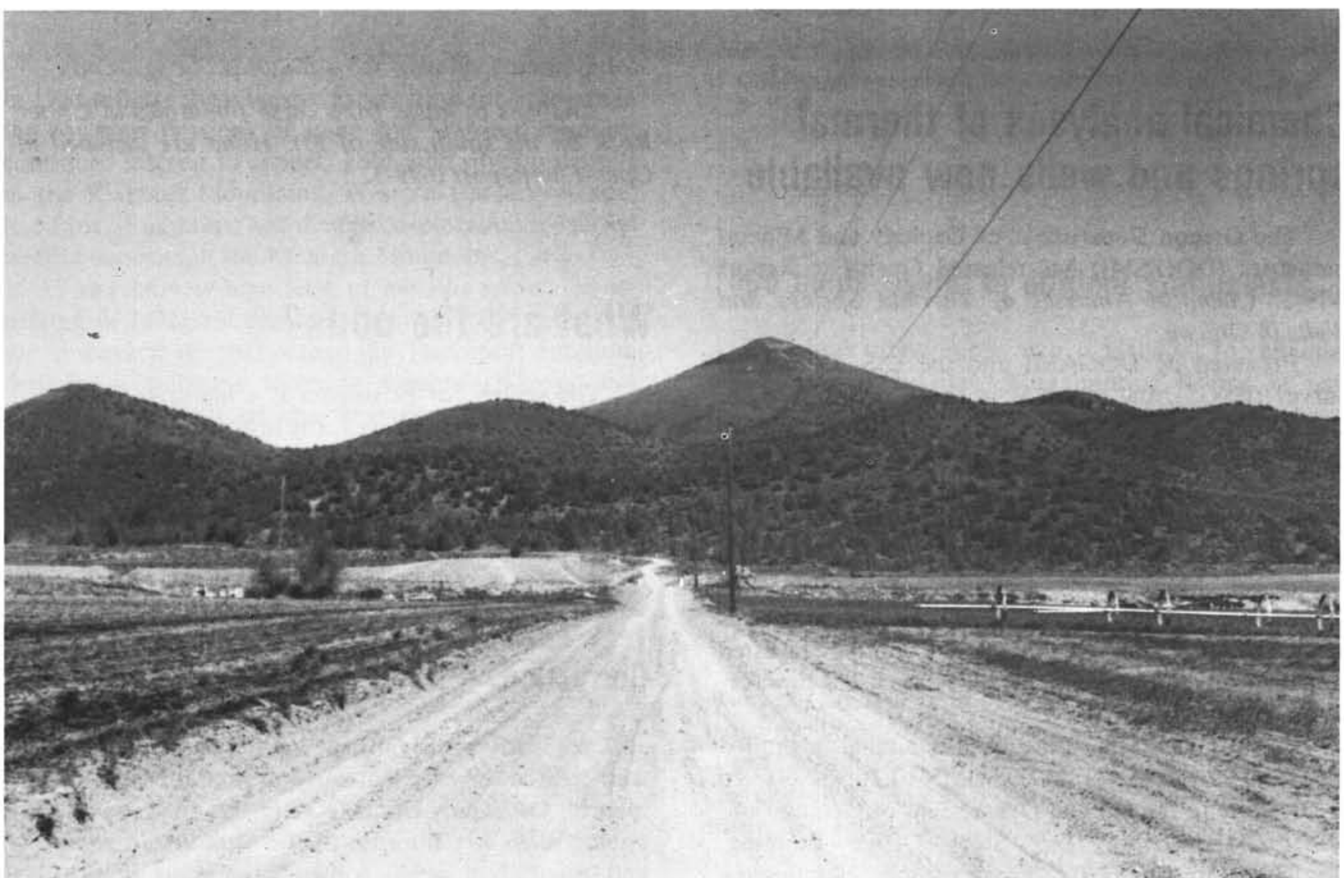
Figure 5. Looking east along Park Lane. Highest peak is summit of Gray Butte. Limestone is reached by following jeep trail through corral. Power line that parallels road and continues straight east is important in locating small limestone exposures.



Analyses of gases from these fumaroles at Crater Rock on the south side of Mt. Hood are included in Open-File Report 0-79-3.

Chemical analyses of thermal springs and wells now available

The Oregon Department of Geology and Mineral Industries (DOGAMI) has released Open-File Report 0-79-3, *Chemical Analyses of Thermal Springs and Wells in Oregon.*

Prepared by DOGAMI and the U.S. Geological Survey (USGS), the report is in the USGS data base, GEOTHERM, in Reston, Virginia. The information includes chemical analyses of waters, condensates, and gases from thermal springs, wells, and fumaroles in Oregon.

Most of the thermal springs shown in DOGAMI's Geological Map Series GMS-10 Map, *Low- to Intermediate-Temperature Thermal Springs and Wells in Oregon,* are analyzed in 0-79-3. Counties are listed alphabetically, and specific localities are listed similarly within the counties.

0-79-3 and GMS-10 are both available in limited supply. 0-79-3 sells for $3.00, GMS-10 for $2.50. To order, write to the Oregon Department of Geology and Mineral Industries, 1069 State Office Building, Portland, Oregon 97201. Payment must accompany orders of less than $20.00. □

What are the odds?

The search for petroleum is a high-risk business. For a new field wildcat well, the historic odds are better than nine to one that the well will prove to be a dry hole, and about fifty to one against finding oil or gas in commercially significant quantities.

Correction

We inadvertently misspelled the name of the artist who created the excellent cartoon that appeared in last month's OREGON GEOLOGY (v. 41, no. 6, p. 90). We apologize to Art Bimrose of the *Sunday Oregonian*—and thank him again for permission to reprint his most appropriate cartoon.

Mineral exploration activity increases

Oregon is experiencing a steady increase in exploration for minerals and mineral fuels as the nation increasingly turns toward domestic sources of metals and fossil fuels and as geologic studies outline new areas of potential resource occurrence.

A survey of expenditures made by private companies in searching for metals, petroleum and natural gas, and geothermal energy provides a direct measure of this prospecting activity. The following table shows a dramatic increase in each category in calendar year 1978, as compared to 1977.

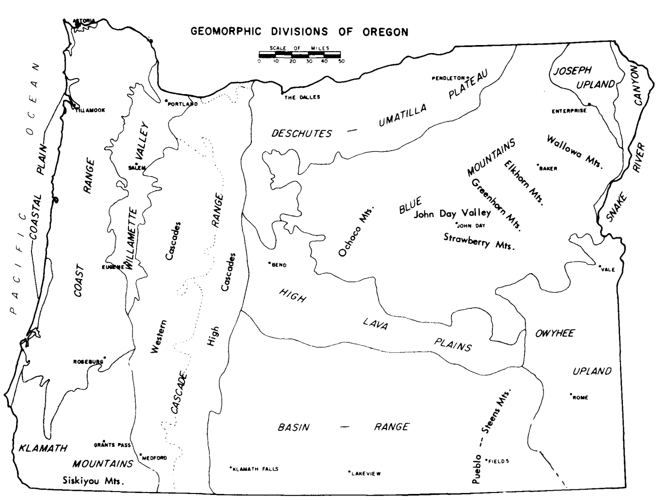
EXPLORATION EXPENDITURES

	Metals (incl. uranium)	Oil and gas	Geothermal (private)
1978	$4,435,402	$4,608,000	$1,298,000
1977	3,600,000	2,000,000	600,000
1976	2,300,000	2,000,000	1,400,000

METALS

The surge in exploration for metallic commodities in 1978 reflects the intensive exploration for uranium in the southern portions of Lake and Malheur counties; continued interest in copper, gold, and silver prospects in the Klamath Mountains, Western Cascade Range, and Blue Mountains; and detailed exploration for nickel laterite deposits in the Klamath Mountains.

The relatively high level of metallic mineral prospecting in 1978 will continue through 1979, reflecting the discovery of the potentially important uranium deposit in southern Malheur County (Brooks and others, 1979). All of the Basin-Range, High Lava



Plains, and Owyhee Upland provinces are currently being re-evaluated for uranium.

OIL AND GAS

The search for natural gas and petroleum accelerated in 1978 as drilling by Mobil Oil Corporation, John Rex, and Reichhold Energy Corporation tested a variety of geologic environments in western Oregon. The increase in activity will continue in 1979 due to the announcement of the discovery of natural gas in Columbia County by Reichhold and its partners, Northwest Natural Gas Company and Diamond Shamrock Corporation.

GEOTHERMAL ENERGY

Drilling and related exploration activities by private industry increased in 1978 compared to the previous years, but the only deep test was drilled by Northwest Natural Gas to a depth of 4,003 ft at a site west of Mt. Hood in Clackamas County, under a contract with the U.S. Department of Energy. In 1979, the level of spending for geothermal exploration will likely be approximately the same as in 1978.

REFERENCE

Brooks, H. C., Gray, J. J., Ramp, L., and Peterson, N.V., 1978, Oregon's mineral industry in 1978: Oregon Geology, v. 41, no. 4, p. 55-62. □

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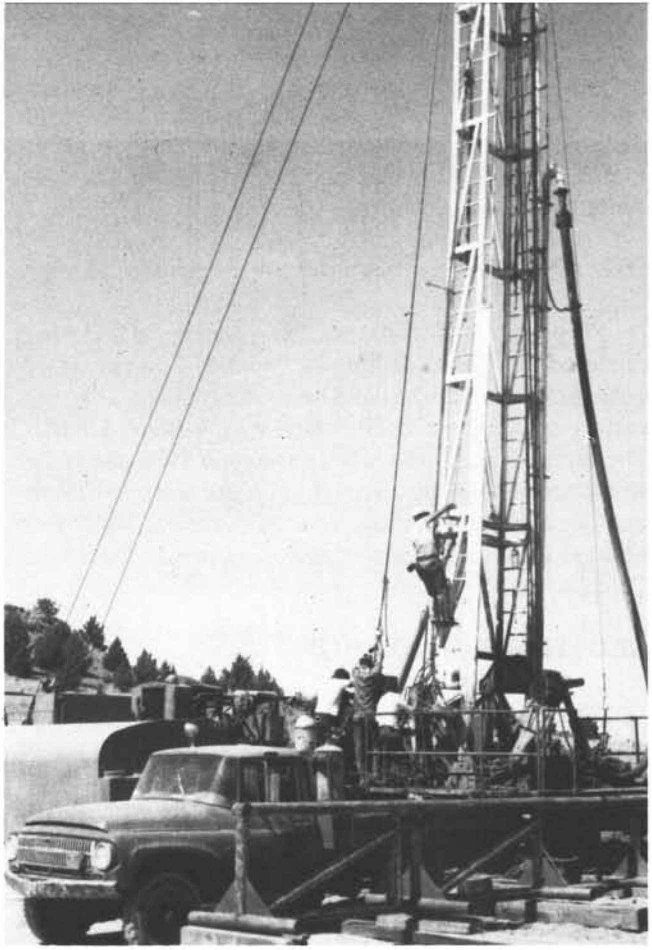
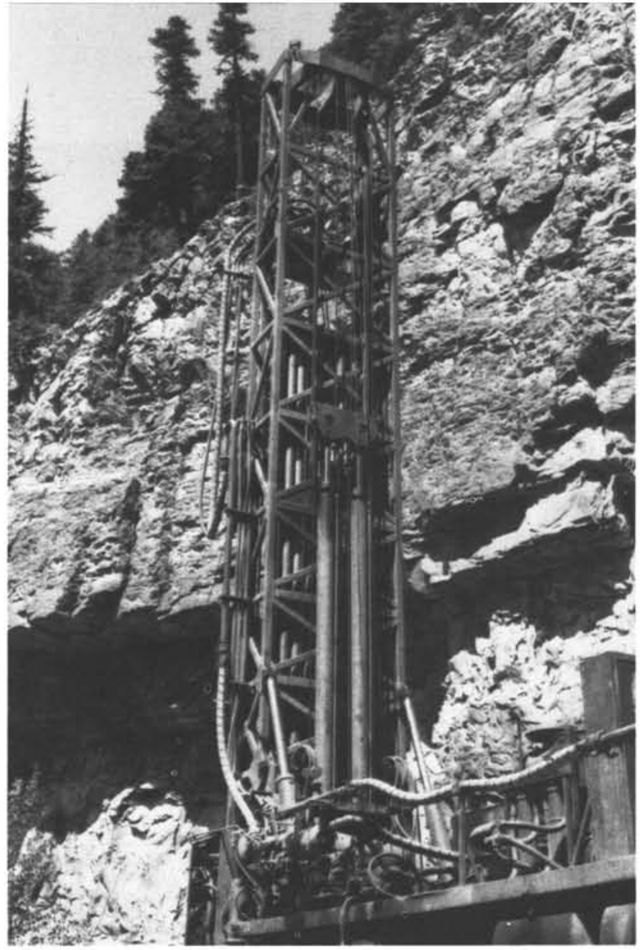


Drilling began June 5, 1979, on Agoil's "Hay Creek Ranch No. 2." The wildcat is located 8 mi east of the town of Madras in central Oregon. Agoil plans to test pre-Tertiary marine rocks with this 5,500-ft hole.



Northwest Natural Gas started drilling this 2,000 ft thermal gradient hole on the southwest flank of Mt. Hood during June. This is the third geothermal test hole they have drilled in the area.

Current oil, gas, and geothermal exploratory drilling

Mobil reached a depth of 7,000 ft in June with its "Ira Baker No. 1," located approximately 14 mi north of Eugene. The company plans to test Tertiary marine formations to a depth of 11,000 ft at this location. ↓ →

ABSTRACTS

The Department maintains a collection of theses and dissertations on Oregon geology. From time to time we will print abstracts of new acquisitions that we feel are of general interest to our readers.

ENVIRONMENTAL GEOLOGY OF THE KELLOGG CREEK-MT. SCOTT CREEK AND LOWER CLACKAMAS RIVER DRAINAGE AREAS, NORTHWESTERN CLACKAMAS COUNTY, OREGON,* by Matthew John Brunengo (M.S. in Geology, Stanford University, 1978)

The study area (approximately 31 mi^2) is located in an "urban fringe" zone southeast of Portland, Oregon, and includes all or parts of the incorporated cities of Milwaukie, Gladstone, Happy Valley, and Johnson City, and the towns of Clackamas, Sunnyside, and Park Place. This region has undergone explosive growth in the last decade and will continue to be developed in the coming years. Such growth will require careful evaluation of the physical limitations imposed on development by the topography, geology, climate, and hydrology of the area.

The geologic units of the area are the Yakima Basalt (Miocene), Sandy River Mudstone (Pliocene), Troutdale Formation (Pliocene), Boring Lava (Pliocene-Pleistocene), and Quaternary fluvial sands and gravels. The fluvial deposits have been cut into multiple terrace levels, which are here called the Gresham, Portland, Estacada, and Lower Clackamas terraces (in order of decreasing elevation and age). The geologic structure is dominated by the Portland Hills Fault: southwest of the fault is the uplifted Oatfield Ridge block, and northeast of it is the sediment-filled Portland basin. Sand and gravel are mined from most of the Quaternary fluvial units, and basalt is quarried from the Yakima Basalt.

An understanding of surficial processes is important in the prediction of environmental limitations on development. The magnitudes and effects of storm precipitation, evapotranspiration, soil infiltration, ground-water occurrence and quality, runoff production, stream behavior and erosion, flooding, soil erosion, and mass movement are discussed, with emphasis on their relevance to the study area, and on the effects of urbanization on the processes. Flooding is the most important geologic hazard in the area, but landslides, soil erosion, and streambank erosion also take place, and much of the area suffers from poor infiltration and ponding.

As a framework for discussion of the environmental geology of specific areas, the study region is divided into environmental systems and units on the basis of common materials, landforms, and processes. These are the Oatfield Ridge system (basaltic and gravel units), the Mt. Scott-Clackamas Heights Uplands system (upper slopes and lower slopes units), the Portland Terrace system, the Lowlands system (Estacada surface, terrace depressions, well-drained surfaces, depressions and drainageways, organic soils, and river gravels units), and the Terrace Scarps system. For each of these units, the soils, land use limitations, and geologic hazards are discussed and tabulated.

The study area is within a region of moderate to severe earthquake potential. The Portland Hills Fault may be active, and structures in the entire area are subject to damage caused by seismic shaking. Volcanic hazard is minimal.

LITHOFACIES AND DEPOSITIONAL ENVIRONMENTS OF THE COALEDO FORMATION, COOS COUNTY, OREGON, by Paul Thomas Ryberg (M.S. in Geology, University of Oregon, 1978)

The late Eocene Coaledo Formation, which is well exposed along the coast in western Coos County, has been subdivided into several stratigraphic units within each member. Seven types of lithofacies are defined, based on dominant lithology, bedding characterstics, and sedimentary structures.

Petrographic examination of composition and texture in Coaledo sandstones indicates a dominant andesitic volcanic source with minor plutonic, metamorphic, and sedimentary sources. Paleocurrent analysis suggests that this source area was located to the southeast. Sedimentary structures, fossils, and paleocurrents strongly suggest that Coaledo sediments were deposited on a coastline open to the west, i.e. with no restricted embayments.

At least 10 coarsening upward sequences are recognized in the lower Coaledo member, and at least eight are recognized for the upper member. These sequences probably represent prograding deltaic topset deposits, including distributary channel sands, interdistributary tidal flat and lagoonal sediments, and barrier bar sands. Deltaic foreset deposits are probably represented by the upper Elkton (?) interval immediately below the base of the Coaledo, and by the upper part of the middle Coaledo member. Deeper marine conditions are represented by the lower part of the middle Coaledo and the overlying late Eocene Bastendorff Formation.

GEOLOGY OF THE BLUE RIVER MINING DISTRICT, LINN AND LANE COUNTIES, OREGON, by Sara Glen Power Storch (M.S. in Geology, Oregon State University, 1978)

The Blue River Mining District is located in Linn and Lane Counties, Oregon, in the Western Cascades physiographic province. A few small veins in the district have been mined intermittently for gold since 1887, although most activity in the district ceased in 1913.

The volcanic rocks of the district are Miocene in age and belong to the Sardine Formation. Common volcanic lithologies include laharic breccias, lapilli tuffs, water-laid tuffs, basaltic andesites, and a dacite. The basaltic andesites are chemically similar to basalts of the Sardine Formation studied by White (personal communication, 1977) in the North Santiam area.

Intruding the volcanic sequence are small epizonal plutons. These dacite and andesite porphyries are similar to granodioritic and quartz dioritic plutons of island arc environments on the basis of their deficiencies in potassium feldspar and K_2O. The igneous rocks of the Blue River District show similarities with the calc-alkaline rock suite in their increasing K_2O, and decreasing FeO, MgO, CaO, and Al_2O_3 with increasing SiO_2 content, and in their systematic distribution on AFM and NKC diagrams.

Northwest-trending fractures and shear zones formed before and during the intrusive episode and subsequent mineralization. The area was later uplifted and folded to form the broad Breitenbush anticline.

Small U-shaped troughs, cirque-like features, and spines above 4,400 ft indicate that small valley glaciers were active in the district in recent geologic time. Since glaciation, streams have carved steep V-shaped valleys. Landslides and artificially induced subsidence (related to mining activity) have altered the present topography.

Hydrothermal alteration in the district has resulted in large areas of propylitically altered rocks, as well as some restricted areas of phyllic alteration in highly fractured rocks and near veins. Typical propylitic assemblages include chlorite, calcite, epidote, albite, and pyrite. Locally the phyllic assemblage of quartz, sericite, and kaolinite is present in shear zones and wall rock adjacent to veins.

Metallization in the district is restricted to a few small veins and areas of disseminated pyrite. A trace element geochemical survey indicated slightly anomalous metal values in veins and in the more intensely altered areas.

Association of the calc-alkaline magmatism with widespread propylitic alteration, fracture-controlled phyllic alteration, and disseminated pyrite indicates that the Blue River District may overlie a porphyry system at depth which has not been exposed by erosion.

GEOLOGY OF THE AREA NEAR THE NORTH END OF SUMMER LAKE, LAKE COUNTY, OREGON, by Paul Leonard Travis, Jr. (M.S. in Geology, University of Oregon, 1977)

The purpose of the study was to determine the nature and causes of the fault patterns north and east of Summer Lake. Secondarily a gravity survey was conducted to determine the general shape and depth of the valley floor below the alluvium. The Picture Rock Basalt covers most of the surface above the level of the valley floor. It was probably erupted about 10 million years ago. Normal faulting was initiated (or recommenced) shortly thereafter, and both faulting and volcanic activity have continued into the late Quaternary. The pattern of parallel, curved, and locally intersecting faults is primarily the result of inhomogeneous east-west extension, with about 1,500 m of extension having occurred across Summer Lake Valley. Combined with this, there have been lesser amounts of extension in other directions and also some right-lateral shear. The gravity survey shows that the valley fill has a maximum depth of about 2 km and a volume of about 240 km^3. □

Portland DOGAMI offices temporarily moved

The Portland offices of the Oregon Department of Geology and Mineral Industries have been moved temporarily to new quarters in the State Office Building while the old offices are being remodeled. The mailing address is still the same: 1069 State Office Building, Portland, Oregon 97201. The phone number is unchanged: (503) 229-5580.

The State Geologist, Deputy State Geologist, all professional and office staff, cartographer, and editor are now located in Room 408. Turn right after entering Room 408 and look for the receptionist behind the curved desk.

The Business Office, Sales, Shipping and Receiving, and Library are now in Room 555, through the Board of Nursing offices.

People wanting assays or assay information should come to Room 408 or call 229-5580 for further instructions.

Remodeling is expected to take about four months. Be sure to check the Building Directory, first floor of the State Office Building, north wall by the elevators, for our current office numbers. □

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