STATE OF OREGON
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
Head Office: 1069 State Office Bldg., Portland 1, Oregon
Telephone: CApitol 6-2161, Ext. 488

Field Offices

2033 First Street
Baker

239 S.E. "H" Street
Grants Pass

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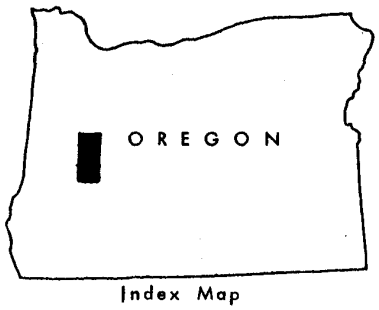
RECONNAISSANCE GEOLOGY OF THE MARCOLA, LEABURG, AND LOWELL QUADRANGLES, OREGON

By
Herbert G. Schlicker*
and
Hollis M. Dole**

Introduction

Mapping of the Cascade Range is part of the work undertaken jointly by the State of Oregon Department of Geology and Mineral Industries and the U.S. Geological Survey towards completion of the geological map of the State. The present mapping is of a reconnaissance nature, and detailed mapping in the future will undoubtedly show revision of units and formation boundaries.



Index Map

Although the geology of the Marcola, Leaburg, and Lowell quadrangles was mainly the responsibility of the State, definite boundaries were not drawn. State and Federal geologists worked together in an attempt to solve the many problems of the area. Most of the eastern third of the area was mapped by Dallas Peck of the U.S. Geological Survey. Dr. Roland W. Brown, paleobotanist with the Survey, gave age determinations for fossil leaf localities in the area. Responsibility for the statements contained herein are, however, to be borne entirely by the authors.

General geology

The mapped area is in the central portion of the western part of the Cascade Range in Oregon. It is bordered by the southern Willamette Valley on the west and by the peaks of the High Cascades on the east.

The rocks of the area are a series of lava flows, flow breccias, tuff breccias, and tuffs of Cenozoic age. The Eocene rocks of the Willamette Valley south of Cottage Grove can be traced eastward into the edge of the map area where they underlie or grade into the tuffs of the Oligocene Mehama volcanics. The rocks of the Mehama volcanics are predominantly pebbly tuffs, but interbedded welded tuffs and great thicknesses of basalt flows occur locally. The next younger rocks of the Western Cascades are volcanics of Miocene and Pliocene age. These are mainly lava flows, which vary in composition from basalt to andesite, and subordinate tuffs. The youngest rocks are the High Cascade lavas (olivine basalts) of upper Pliocene to Recent age. The most recent of these rocks are intracanyon flows.

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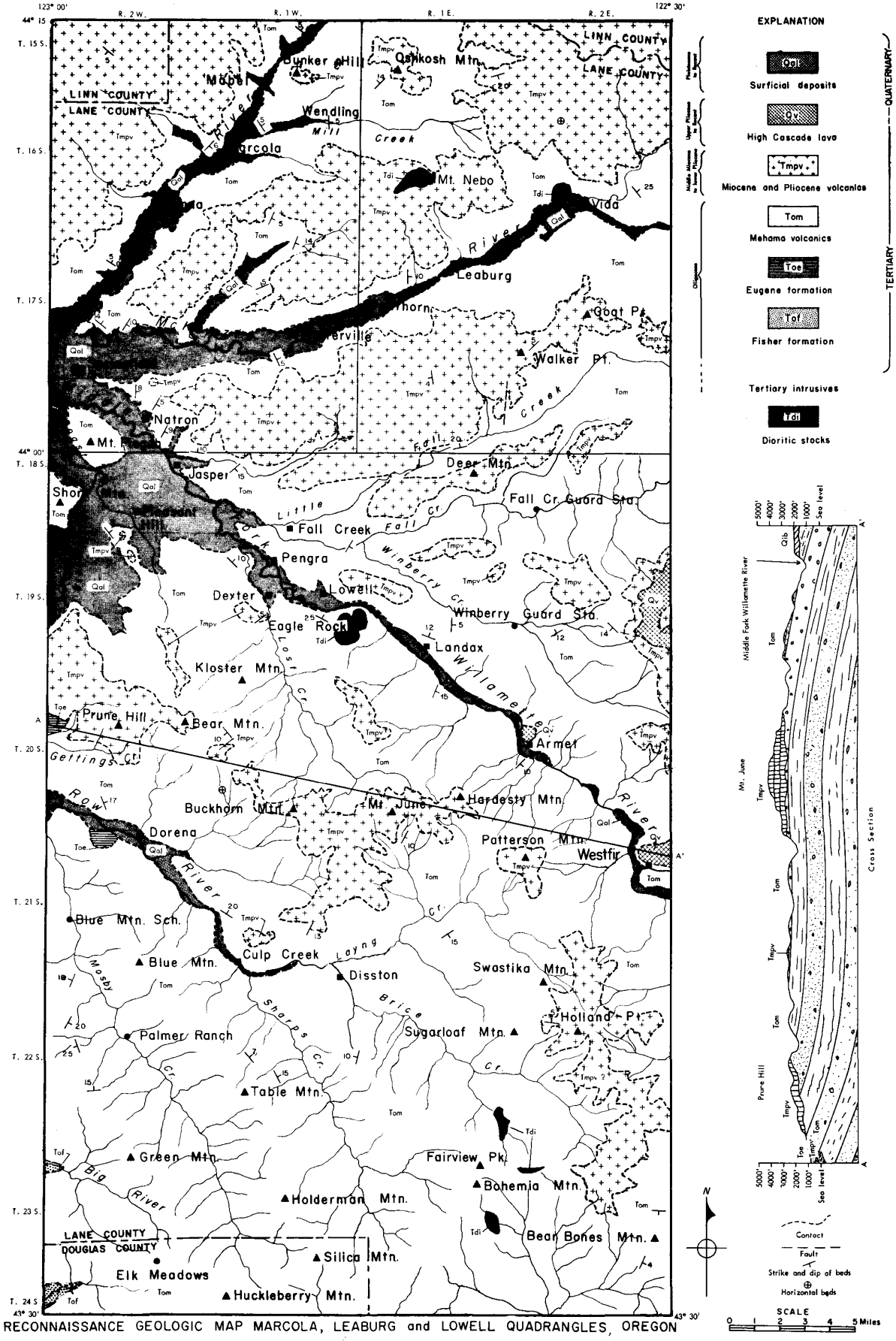
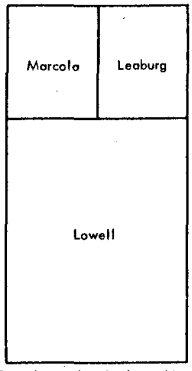
* Geologist, State of Oregon Department of Geology and Mineral Industries.
** Director, State of Oregon Department of Geology and Mineral Industries.



RECONNAISSANCE GEOLOGIC MAP MARCOLA, LEABURG and LOWELL QUADRANGLES, OREGON

The structure of the Cascade Range in this area can best be described as a pile of volcanics. The dips of the strata are generally to the northeast, averaging about 10°. Anticlinal folds are not apparent, and no evidence of mountain building due to folding could be determined. Reconnaissance mapping does not readily reveal faulting in interbedded volcanics since key beds, if present, are difficult to recognize. Indirect evidence indicates that faulting may be extensive. At the Dorena, Lookout Point, and Hills Creek dam sites, detailed studies by the U. S. Army Engineers* have revealed extensive faulting trending northwest to north. The major streams such as Mosby Creek, Sharps Creek, Row River, and the Middle Fork of the Willamette River, trend northwest and may be fault controlled.



Quadrangle Index Map

Stratigraphy

Fisher formation: In the map area rocks assigned to the Fisher formation are poorly exposed. The outcrops are found in the North Fork of Calapooya Creek and 5 miles to the north in Big River. Better exposures of the formation occur just south of the map area in the main branch of Calapooya Creek. At this location the lowermost material is a coarse boulder conglomerate about 50 feet thick overlain by a welded tuff. The welded tuff grades upward into an indistinctly bedded pebbly feldspathic tuff which appears to grade westward into a well-bedded fluviatile tuff. Correlation of this material with the Fisher formation was based on the similarity of the conglomerate and pebbly feldspathic tuff to the rocks described in mapping to the northwest (Vokes, et al, 1951). The welded tuff is considered to be a part of the Mehama volcanics. The sequence of conglomerate-welded tuff- fluviatile tuff is interpreted as interfingering of Mehama volcanics with Fisher formation.

West of the mapped area, fossil leaves found at Comstock have been dated Eocene while those from the new Goshen locality are upper Oligocene age (Vokes, et al, 1951). The rocks of both areas are considered by the authors to be part of the Fisher formation; thus the Fisher formation extends from upper Eocene throughout the Oligocene epoch. Fossil leaves determined to be of Eocene age were found in the fluviatile tuff just west of the map area. On this basis rocks shown on the map as Fisher formation are most likely Eocene in age and represent the lower part of the formation. According to Vokes, et al (1951), the Fisher formation interfingers with the marine Eugene formation and hence they are partly contemporaneous in age.

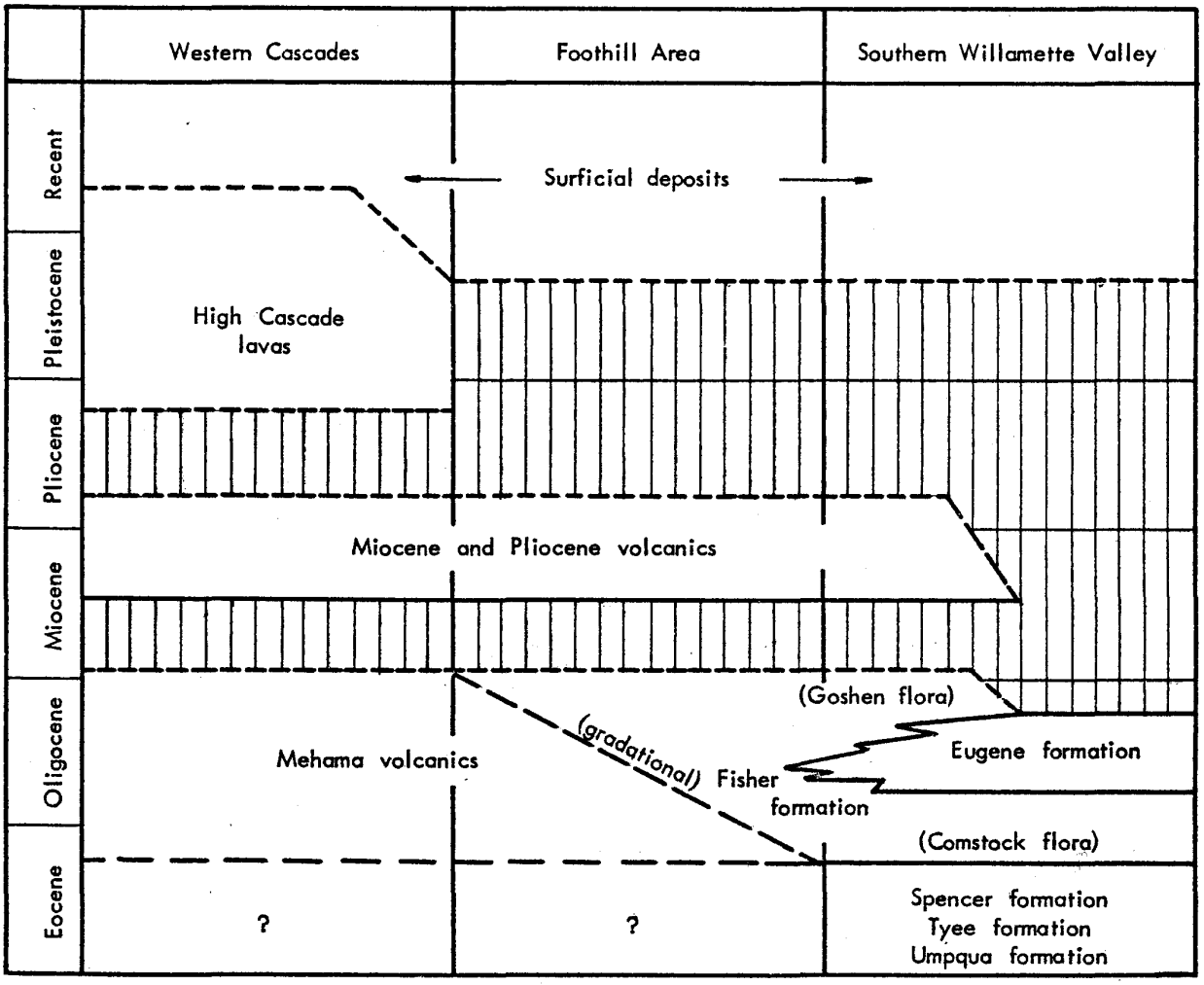
Mehama volcanics: The Mehama volcanics are typically a coarse, indurated tuff and pebbly tuff breccia with interbedded basalt, flow breccia, and welded rhyolitic and dacitic tuff flows. Occasionally the tuffs are well bedded indicating deposition in a fluviatile environment. Some basalts in the Mehama volcanics are locally thick and may represent intracanyon flows. Welded tuff occurs flanking Coburg Ridge about 3 miles north of Springfield, near Mohawk Post Office, along the Row River northwest of Dorena, in the Table Mountain area, in the Mosby Creek area southwest of Palmer Ranch, in the Layng Creek area near Junetta Creek, and in the canyon of Brice Creek. Smaller, less prominent exposures of welded tuffs occur in many other localities throughout the area mapped as Mehama volcanics. The welded tuffs frequently contain large rounded quartz grains, glassy feldspars, and large flattened glass shards in a matrix of finer-grained material. In several localities the tuff contains considerable biotite. The outcrops are generally steep, or smoothly rounded from weathering, and are pink to buff colored. The upper portion of the thicker flows grades into unwelded lapilli tuff.

The greenish-colored pebbly tuff breccias are generally quite massive and frequently contain large pebbles and carbonized wood fragments. Usually the tuffs show coarse, indistinct

* Personal communication, Lloyd L. Ruff and Paul Howell.

CORRELATION TABLE

Western Cascade Mountains



bedding. They are best exposed northeast of Marcola near Wendling, along the railroad near Dexter, and in the Fall Creek area. They are also extensive both above and below the welded tuffs. Numerous basalt dikes and a few dioritic stocks and dikes intrude the Mehama volcanics.

In general, the Mehama volcanics have an easterly dip averaging about 10°. Where westerly dips have been observed they appear to be primary features or possibly the result of faulting. The prominent northwest trend of the major streams may be the result of a series of strike faults.

Allison and Felts (1956) believed that the Mehama volcanics could "most reasonably" be referred to the Oligocene but that the lower part of the formation may range downward into the Eocene. Numerous occurrences of Oligocene and Oligo-Miocene leaves have been found throughout the area of Mehama volcanics. According to Thayer (1939), the Mehama volcanics are believed to interfinger with the Oligocene marine sediments of the Eugene formation. Apparently the Fisher formation is the finer-grained, water-laid equivalent of the Mehama volcanics while the Eugene formation is the marine equivalent. All three formations (Mehama volcanics - Fisher formation - Eugene formation) are believed to be at least partly equivalent in age.

Eugene formation: The Eugene formation is exposed in a small area about 3 miles west of Prune Hill along the west edge of the Lowell quadrangle and also in a small area just west of Dorena Dam. It is a fossiliferous marine sandstone of Oligocene age and is not considered as part of the Western Cascades. References to literature describing the Eugene formation are given in the selected bibliography at the end of the text.

Miocene and Pliocene volcanics: The Miocene and Pliocene rocks of the Western Cascades are mainly andesite and basalt flows. Pebbly tuffs and lapilli tuffs occur locally. The lavas and tuffs are interbedded and the sequence varies considerably from area to area. The basaltic lavas are mainly dark and fine grained; however, deviations from this texture are not rare. At Bear Mountain about 5 miles north of Dorena the dominant lava is a gray basalt having numerous black phenocrysts of augite averaging about a quarter of an inch across. Feeder dikes of this material can be seen cutting the Mehama volcanics in the valley of Gettings Creek near the west edge of the Lowell quadrangle.

In the Marcola and Leaburg quadrangles the Miocene and Pliocene volcanics are widespread. In the Lowell quadrangle they cap only a few of the higher ridges such as Prune Hill, Bear Mountain, Buckhorn Mountain, Mount June, Swastika Mountain, and Holland Point. These volcanics can be distinguished from the Mehama volcanics by the greater percentage of lava, by the lack of greenish tuff breccia and welded tuff interbeds, and by stratigraphic position. Furthermore, the lavas are more dense and are less weathered and the tuffs are not so firmly cemented as those found in the Mehama volcanics.

The Miocene and Pliocene volcanics are probably partly correlative with the Columbia River basalt, Boring agglomerate, Rhododendron formation, and Fern Ridge tuffs observed farther north along the western flank of the Cascade Range. They unconformably overlie the Mehama volcanics and are, in turn, capped by the High Cascade lavas to the east. They have variable dips which probably represent the initial dip from local volcanic sources. Although some folding may have occurred in these rocks it has not been of sufficient magnitude to greatly modify the primary structure.

High Cascade lavas: The High Cascade lavas are distinctive light-gray olivine-bearing basalts ranging in age from upper Pliocene to Recent. They occur extensively at higher elevations in the Cascade Range and are also found as intracanyon flows at lower elevations.

In the map area, High Cascade lavas occur in three small patches as follows: on Saddleblanket Mountain in the northeast part of the Lowell quadrangle, just north of Armet along the Middle Fork of the Willamette River, and as an intracanyon flow in the vicinity of Westfir where lava flowed down the valley of the Middle Fork of the Willamette River and came to rest on relatively young gravels. Dips in the High Cascade lavas are primary and not the result of folding.

Dioritic intrusives: Coarse-grained intrusives occur throughout the Cascade Range, but are mostly restricted to the mineralized areas (Callaghan and Buddington, 1938). Minerals in the intrusives, identified with the hand lens, are intermediate plagioclase, augite, and hornblende, and occasional biotite. In the map area, the largest intrusion is the diorite stock at Mount Nebo which is about 2 miles long and 1 mile wide with the longest dimension running east and west. Two smaller diorite stocks about three-fourths to a mile wide occur at Vida on the McKenzie River and at Eagle Rock on the Middle Fork of the Willamette River. In the Bohemia mining district about a dozen diorite bodies are exposed which range in size from several hundred feet to a mile across. Only a few of the larger intrusives are shown on the map.

The diorites of the Cascade Range intrude the Mehama volcanics and the Miocene and Pliocene volcanics. It is difficult to establish a definite age for them as a group and it is quite likely there was more than one period of intrusion. The intrusives may be as late as middle Pliocene and as early as Oligocene.

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SURVEY GEOLOGISTS IN OREGON

The U. S. Geological Survey again has several field parties in Oregon this summer making geological investigations for the State Geologic Map, a cooperative project with the State of Oregon Department of Geology and Mineral Industries.

Mr. Dallas Peck is doing reconnaissance mapping in the Antelope quadrangle of central Oregon. During August and September, Mr. Peck will continue his work of the past two summers in the western Cascade Mountains.

Dr. Thomas P. Thayer, with assistant Irving Brown, is continuing his geologic mapping in the John Day area. This summer Dr. Thayer will be working in the Izee quadrangle.

Mr. Richard Lewis will work with Dr. Thayer in central Oregon in order to familiarize himself with the geology of northeastern Oregon. Mr. Lewis will be largely responsible for compilation of the geologic map of northeastern Oregon.

Dr. Ralph Imlay, Survey authority on Mesozoic formations, is doing field work north of Burns in central Oregon. Later in the summer Dr. Imlay will do collecting in southwestern Oregon.

Prof. Aaron Waters of Johns Hopkins University, on temporary duty with the Survey, is doing reconnaissance mapping in the area east of the Deschutes River and north of Latitude 45°.

For the first time in approximately 25 years Dr. Francis G. Wells, who is in charge of the Survey's program on the State Geologic Map, will not be in the field in Oregon. Dr. Wells reports that the compilation of the geologic map of western Oregon has been completed and that black and white preliminary copies should be available some time in mid-1958. Approximately a year later the map will be published in color.

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GOVERNOR MAKES NEW APPOINTMENT

Lester R. Child of Grants Pass, long active in State oil exploration work and a one-time leasing and geology representative for Phillips Petroleum Company, was appointed by Governor Robert D. Holmes to the governing board of the State Department of Geology and Mineral Industries.

Child, a resident of Oregon since World War I, is a native of Ogden, Utah, where he was born November 2, 1886. He is a graduate of Ogden High School and has been in the geology and sales business since.

Child was appointed to the unexpired term of Niel R. Allen, also of Grants Pass, who resigned. Allen's term would have expired March 16, 1960.

The new board member was on the staff of Oil Exploration Company and Union Oil Company during the three test drills of 1950 in Coos and Douglas counties. He was with the Phillips firm for two years and was in charge of mapping the Oakland-Sutherlin area of Douglas County for Community Gas and Oil Company and Yoncalla Oil Company.

A Democrat, Child has been a resident of Grants Pass since 1940.

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DEPARTMENT FIELD ACTIVITIES

Mr. Herbert G. Schlicker is doing reconnaissance work in the Coast Range on magmatic differentiation in the sills and dikes. He is also collecting material in northwestern Oregon for testing at the U.S. Bureau of Mines laboratories in Seattle, Washington, to determine suitability for lightweight aggregate.

Mr. R. E. Stewart is continuing his studies of Oregon micropaleontology. His present major project is a revision of three Ore.-Bin papers on stratigraphic implications of some Cenozoic foraminifera from western Oregon to be issued as Department Bulletin 36, Part IX.

Miss Margaret L. Steere is completing the investigations for her bulletin of western Oregon fossil localities.

Mr. N. S. Wagner is doing mapping in the Imnaha River area and in the Dale and Desolation Butte quadrangles of northeastern Oregon for the State Geologic Map.

Mr. Howard Brooks is mapping in the Huntington quadrangle for the State Geologic Map. Brooks has also begun work on the quicksilver deposits of the State to revise and bring up to date Department Bulletin 4, "Quicksilver in Oregon."

Mr. Len Ramp is completing his studies on the occurrence of chrome in southwestern Oregon. This project was delayed the first of the year in order to furnish prospector service to callers at the Grants Pass office.

Mr. Norman V. Peterson has taken over the work of Max Schafer, resigned, on the uranium deposits of the State. Peterson has just begun work with the Department at the Grants Pass office and is spending some time in general reconnaissance to acquaint himself with the area.

Dr. George Koch, professor of economic geology at Oregon State College, has been retained by the Department to make a study of the mines and surface geology of a part of the Granite mining district, Grant and Baker counties. Dr. Koch is assisted by Mr. Stephen Pilcher, graduate student at Oregon State College.

Mr. H. J. Buddenhagen has been engaged by the Department on a while-actually-employed basis to make a geologic interpretation of the pre-Tertiary rocks of central Oregon. It is anticipated that this will be a long-term project.

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D. FORD McCORMICK

D. Ford McCormick died at Medford, July 14. His death ended a career devoted whole heartedly to the mining profession. Born 70 years ago in Texas, he attended the University of Texas where he received a degree in civil engineering. In 1910 he obtained a mining engineering degree from the Colorado School of Mines and during the ensuing 11 years practiced in Costa Rica, Mexico, and Cuba. Returning to the United States in 1921 he settled in New Jersey where he was a consulting mining engineer associated with the Georgia Kaolin Company. He moved to Medford in 1933 to manage the Sterling Placer mine and since that time Medford has been his permanent home. Governor Hall appointed Ford McCormick to fill out the unexpired term of John Butler on the State Board of Engineering Examiners in January 1948, and reappointed him for a 6-year term a month later. He was serving his second term on the board when he passed away. McCormick was a member of the American Institute of Mining, Metallurgical, and Petroleum Engineers and was active on numerous mining committees in the Pacific northwest.

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NEW DRILLING PERMIT ISSUED

Drilling Permit No. 28 was issued July 24 to Oregon Petroleum Corporation, 1344 N.E. Sandy Blvd., Portland, Oregon. The test is to be in the SW$\frac{1}{4}$ sec. 27, T. 7 S., R. 19 E., Wheeler County and is to be known as the Clarno No. 1. Surveyed location is not available but will be filed with the Department within 60 days. The test is to be drilled on U.S. Government land that is under the administration of the Bureau of Land Management. Officers of the Oregon Petroleum Corporation are: Claude B. Brown, 3546 Las Flores Blvd., Lynwood, California, President; O. H. Maryatt, 26 E. Sola Street, Santa Barbara, California, Vice President; and Robert J. Lewis, 150 Alamos Road, Menlo Park, California, Secretary.

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LIME PLANT AND QUARRY TO OPERATE IN BAKER COUNTY

According to the Baker Record-Courier of July 4, the Chemical Lime Company quarry on Marble Creek, Baker County, will get into production the week of July 20 and the big burning plant at Wing Siding will begin operation 60 days later. General Manager Robert Vervaeke reports that three 360-ton steel bins have been installed at the quarry where a total of 5600 feet of new conveyors, jaw and gyratory crushers, feeders, and quarry machinery is on the site. The hauling contractor will use 25-ton truck-trailer units for the 12-mile haul to the 30,000-ton stockpile facility at Wing. The Company will install two kilns, both 150-foot by 7-foot rotary gas-oil burning types. Additional air purification equipment is being installed. The plant will produce burned chemical-grade lime, hydrated lime, and pulverized quicklime, in addition to quarry waste, agricultural rock, etc. It will employ 25 to 30 men.

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LAKEVIEW MINING COMPANY ADDS BIG DRILL

The Lake County Examiner reports that the Lakeview Mining Company has purchased a new drill rig for deep exploration. The drill is a Mayhew 2000 and is capable of sinking a 12-inch hole from 2000 to 3000 feet deep. It will be used for making deep test holes for the Company's uranium exploration program in the Lakeview area.

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PROPOSED LAND WITHDRAWALS

Date of Notice	Location: County	Location: Area	Acres	Purpose
May 7, 1957	Morrow and Umatilla	T. 5 N., R. 27 E. T. 4 N., R. 27 E.	1,560	Expansion of Umatilla Ordnance Depot
May 29, 1957	Harney	T. 33 S., R. 32 3/4 E.	116	Administrative site
June 5, 1957	Klamath	T. 39 S., R. 9 E.	40	Public housing, Klamath Falls airport
June 11, 1957	Wasco	T. 2 N., R. 14 E.	5	The Dalles Dam project (flooded land)
June 12, 1957	Benton and Lane	T. 15 S., R. 7 W.	111	Air navigation facilities site
June 14, 1957	Klamath	T. 40 S., R. 10 E.	160	Air navigation facilities site
July 16, 1957	Sherman and Wasco	T. 3 S., R. 14 E. T. 2,3 S.,R. 15 E. T. 1,2 S.,R. 16 E.	5,018	To provide access for fishing
		Total	7,010	

The U.S. Bureau of Land Management has notified the Department that the above withdrawals of public land in Oregon have been proposed. These are in addition to the six proposals listed in the April 1957 Ore.-Bin. So far this year, proposed withdrawal of public land for special purpose usage totals 14,668 acres.

The total amount of land withdrawn in Oregon since the withdrawal practice was begun many decades ago is unknown - even the Bureau of Land Management could not supply the figure when asked. The U.S. Forest Service tells us that approximately 1 million acres out of their total of 24 million acres in the Pacific Northwest Region is reserved for special purpose use.

It was hoped that after passage of the Multiple-Use Mining Law, withdrawals prohibiting claim staking would be reduced, for the new law allows management of the surface rights of unpatented mining claims by the federal bureaus even to the point of game management and recreation. Because the withdrawals continue unabated, it would appear that the mining industry alone must live up to the principle of multiple-use of public land and that the search for minerals is to be restricted to an ever-decreasing area.

H.M.D.

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HEARINGS SCHEDULED FOR CHROME

Senate Committee hearings on the administration's long-range minerals program recommendations to Congress (see Ore.-Bin, June 1957) have been scheduled to open July 29, it was announced July 15 by Chairman James E. Murray of the Senate Interior and Insular Affairs Committee. The hearings will start at 10 o'clock in the morning July 29 in Room 224, Senate Office Building, Washington, D.C. Two days of hearings, July 29 and July 31, have been scheduled, with industry witnesses testifying the first day and government witnesses being heard on the second. Persons unable to appear are urged to submit written statements to Senator Murray or congressional delegates.

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NEW MILL ON DIXIE CREEK

The Standard Milling Company is erecting a 50-ton flotation-table concentrating mill on Dixie Creek, about 2 miles above Prairie City, Grant County, Oregon. Officers of the company are Ray E. Summers, D. L. Olling, and Vernon Jacobsen. The mill is scheduled for completion by August 1st and is designed to handle ore from the Standard and other mines in the Dixie Creek area.

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GEOLOGY OF UMATILLA BASIN DESCRIBED

Geology and ground-water resources of the Umatilla River basin area, Oregon, by G. M. Hogenson, has been released as an open-file report by the U.S. Geological Survey and the Oregon State Engineer. At the present time the report is in mimeograph form and subject to revision, but will ultimately be published as a Water-Supply Paper. It contains 310 pages, geologic maps, and numerous tables and graphs giving hydrologic information on streams, wells, and springs. Copies may be seen at the offices of the Survey and the Oregon Department of Geology and Mineral Industries in Portland, at the office of the State Engineer in Salem, in local public libraries, and in offices of county agricultural agents in Umatilla and Morrow counties.

The area covered by the report is the region drained by the Umatilla River. It includes most of Umatilla County and adjoining parts of Morrow and Union counties. The area extends southward into the Blue Mountains where pre-Tertiary metamorphic and intrusive rocks are exposed. The pre-Tertiary rocks are overlain unconformably by Eocene volcanics and sediments of the Clarno formation. A thick series of flows of Columbia River basalt of Miocene age overlies the older rocks. The basalt flows have been warped into broad gentle folds and somewhat faulted and fractured. The basalt is overlain by Pliocene to Recent alluvium.

Large quantities of water are available in the Columbia River basalt where structural conditions are favorable, and moderate quantities are present in the overlying fluviatile deposits. With few exceptions, the quality of the ground water is considered excellent.

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FIELD TEST FOR SELENIUM

Two simple and reliable tests for field detection of selenium in rocks and soils have been devised by the U.S. Bureau of Mines and printed in Report of Investigations 5328, "A field test for selenium." The 7-page pamphlet is available free of charge from: Bureau of Mines, Publications Distribution Section, 4800 Forbes Street, Pittsburgh 13, Pa.

Both methods involve fusion of the sample in a test tube to form elemental selenium that will volatilize and condense as a red deposit on the cooler upper portion of the test tube. The methods are sensitive to 10 parts per million, or 0.001 percent. Chemicals and equipment for making the tests are common items carried by most laboratory supply houses. Any type of gas burner such as a blow torch or camp stove can be used as long as it produces a flame temperature of at least 800 degrees.

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GEOLOGY STUDENTS HOLD SUMMER CAMP

The Department of Geology of the University of Oregon held its third annual summer camp at the Sunday Hill mine in the Mormon Basin, Baker-Malheur counties. Twenty students under the direction of Dr. Lloyd W. Staples attended the camp between June 19 and July 4 to study ore deposits of the area and make geologic maps.