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THE ORE BIN

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State of Oregon
Department of Geology and Mineral Industries
PRELIMINARY NOTE ON THE LATE PLEISTOCENE
GEOMORPHOLOGY AND ARCHAEOLOGY OF
THE HARNEY BASIN, OREGON

Keith D. Gehr and Thomas M. Newman
Department of Anthropology, Portland State University
Portland, Oregon

The geology and water resources of the Harney Basin (Figure 1) in southeastern Oregon have been studied by Russell (1903, 1905), Waring (1909), Piper and others (1939), Walker and Swanson (1968), and others. The most detailed and definitive work is that of Piper and his team of investigators from the U.S. Geological Survey, who worked in the Basin from 1930 to 1932. They recognized a prominent abandoned beach ridge along Harney Lake at an elevation of 1,249.7 m (4,100 ft) and commented: "No higher shore features are known to exist in the central area of the Harney Basin, although most other desert basins in eastern Oregon have prominent shore features at least 100 ft higher than their playas" (Piper and others, 1939, p. 14).

These writers left unresolved the question as to whether pluvial Lake Malheur had ever reached and overflowed the basalt dam, estimated to be 1,254 m (4,114 ft) high, across Malheur Gap. On the basis of the native fish fauna in the Harney Basin, Hubbs and Miller (1948) concluded that there had been a direct connection with the Columbia via the South Fork of the Malheur River and the Snake River.

Probably because their primary concern was with other matters, all of the previous investigators apparently failed to notice two clear wave-cut terraces,
Figure 2. Wave-cut terrace on northwest side of butte adjacent to Malheur National Wildlife Refuge Headquarters. Elevation of terrace is 1,255 m (4,118 ft).
each at an elevation of about 1,255 m (4,118 ft), which corre-
sponds acceptably well with the elevation of the spillway across
the Voltage lava flow, which blocked Malheur Gap. One terrace is
on the northwest side of the low butte adjacent to the Malheur Na-
tional Wildlife Refuge headquarters (Figure 2); the other, located
mainly in sec. 24, T. 27 S., R. 29-1/2 E., contains a deposit of
fossil shoreline molluscs that, by augering, were found up to an
elevation of 1,255.1 m (4,111.7 ft). Ninety-eight percent or more
of this population is comprised of a snail tentatively identified
as _Lymnea utahensis_. Minority species include another snail tenta-
atively identified as _Parapapolyx effusa_.

In 1975, two artifacts were found in the wall of a drainage
ditch running roughly parallel to the terrace in sec. 34. The
ditch is nearly 1,600 m (5,250 ft) long and averages 2 to 3 m
(7 to 10 ft) in depth. The provenance of the artifacts was ques-
tionable, but for several reasons it seemed worthwhile to search
for a possible early site. Later finds, both on and below pluvial
lake gravels, have proved the presence of man in the Basin before
the end of the pluvial period.

Along with the artifacts, the gravels in the ditch wall have
preserved an excellent record of three pluvial lake stillstands.
Two of these have been dated, as has the terrace, from carbon-14
determinations on fossil snails. Because measurements on outer
fractions of samples indicated significant contamination with
younger carbon in even the younger samples, ages were determined
from the inner fractions of samples.

Figure 3 shows locations of the wave-cut terrace and various
beach ridges at the southern part of Harney Lake. The oldest beach
ridge (1), at 1,251.1 m (4,107.7 ft), has a preliminary date of
about 32,000 B.P. (USGS-459). The mollusc population there is
essentially reversed from that on the terrace, being 98 percent
or greater _Parapapolyx effusa_, with the _Lymmaeids_ being a minority
species. This ridge is covered with younger gravels culminating in
a shoreline (2) at 1,252.1 m (4,107.9 ft), now dated at approxi-
ately 9,600 B.P. (USGS-460). The lake bottom associated with
this shoreline is covered with a prominent deposit of fossil
_Lymnaeids_ snails similar to those on the terrace. This line of
tiny molluscs can be traced for almost 700 m (2,300 ft) in the
side of the ditch. Two new species, tentatively identified as
_Lymnea palustris_ and _Helicoma anceps_, are plentiful in the last
100 m (300 ft) before the beach ridge. Their presence suggests
a marshy ecozone that may have been seasonally dry.

A younger, undated shoreline (3) overlies the preceding one
at an elevation of 1,253.4 m (4,112.2 ft). Artifacts have been
found in almost unquestionable primary context both on the gravel
surface of this deposit and immediately underlying it. The
stratigraphically lower artifact appears to be a punch-struck
obsidian blade, a tool little known in Oregon but fairly common
in a surface site which overlies part of this beach ridge by
about 1 m (3 ft) (Dumond, 1962).
SCHEMATIC OF SOUTH HARNEY LAKE
STRATIGRAPHIC PROFILE & DATES

Figure 3. Cross section of southern part of Harney Lake showing elevations and ages of wave-cut terrace and beach ridges.
The previously discussed terrace (4) at 1,255 m (4,118 ft) is the youngest dated feature, with a shell radiocarbon age of 8,700 B.P. (USGS-461). It is unusual, if not unique in the Great Basin, for the highest shore feature to be among the youngest in the sequence.

Finally, the presently undated beach ridge (5), at 1,249.7 m (4,100 ft) seems to represent the final stillstand of pluvial Lake Malheur before drier conditions apparently rapidly reduced the huge Pleistocene lake to the present series of playas and marshes.

Two surface sites in the area, one on the terrace by the ditch and the other over the highest beach ridge, were clearly occupied when the lake level was at or just below the overflow point of the Basin. Dates approaching 8,700 B.P. can be inferred for these sites. Both sites have been heavily potted, but enough artifacts have been found to suggest a Cascade point-crescent-blade tool complex. Many of the Cascade points show basal grinding.

It is now apparent that the Voltage lava flow, which dammed the Basin, is not of the "very recent" age suggested by all earlier Basin investigators. Based on the shell dates, it must have occurred more than 32,000 years ago.

These observations should all be considered to be preliminary in nature and subject to later reinterpretation or change. They are presented now for any possible value they might have to other Great Basin investigators.

Particular thanks are given to Stephen Robinson and the U.S. Geological Survey for generous and speedy help on radiocarbon dating of the mollusc shells. Robert Herrmann of the Meyerhaeuser Company is also thanked for the tentative mollusc identification.

References

Walker, G.W., and Swanson, D.A., 1968, Summary report on the
geology and mineral resources of the Harney Lake and Malheur
Lake areas of the Malheur National Wildlife Refuge, north-
central Harney County, Oregon: U.S. Geological Survey
Waring, G.A., 1909, Geology and water resources of the Harney
Basin Region, Oregon: U.S. Geological Survey Water-Supply
Paper 231, 93 p.

* * * *

BLM TO OFFER GEOTHERMAL LEASES

The U.S. Bureau of Land Management is planning to offer geothermal
leases in four parts of Oregon this fall. The lands fall within
locations classified as Known Geothermal Resource Areas (KGRA's),
so leases must be bid for. Sites and tentative sale dates are:

Alvord KGRA - Tps. 32-37 S., Rs. 33-36 E., W.B. and M.,
    Harney County; October 19, 1978
Breitenbush KGRA - Tps. 8,9 S., R. 7 E., W.B. and M.,
    Clackamas and Marion Counties; October 19, 1978
Belknap-Foley Springs - T. 16 S., R. 6 E., W.B. and M.,
    Lane County; September 27, 1978 (new date to be set)
Carey Hot Springs - T. 16 S., Rs. 6,7 E., W.B. and M.,
    Clackamas County; February 13, 1978 (new date to be set)

For more specific information write to the Oregon State
Office of the U.S. Bureau of Land Management, 729 N.E. Oregon
Street, P.O. Box 2965, Portland, Oregon 97208.

* * * *

USGS TO REPRINT MINERAL RESTRICTIONS MAP

The U.S. Geological Survey is planning on reprinting a map, "Fed-
eral Lands Subject to Mineral Restrictions," which essentially
shows that all public lands in the West currently have mineral
entry restrictions. Because the map shows the Department of the
Interior's recognition that all public lands do have mineral re-
strictions, it is important that legislators see the map before
making decisions on public land minerals issues.

* * * *

SURFACE MINE REGS PUBLISHED

A draft of surface mining regulations required by Public Law
95-87, the Surface Mining Control and Reclamation Act of 1977,
has been published by the Office of Surface Mining, U.S. Department
of the Interior. The proposed regulations are considered to be
controversial by the mining industry.
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<td>[Descriptions, with many illus. and maps, of seven field trips covering central Oreg., western Oreg., the Columbia River, Columbia River Gorge, the Portland area, and the lava caves of Mt. St. Helens. 206 p., 3 figs. in pocket.]</td>
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<td>[Discusses geography, engineering geology, mineral resources, geologic hazards, and geology of estuaries. 148 p., 16 separate geology and geologic hazards maps in color.]</td>
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<td>[Descriptions of geologic units, geologic structure, geothermal resources, and nonmetallic minerals. 66 p., 60 figs., 4 geologic and mineral location maps.]</td>
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<td>[Covers geography, engineering geology, tectonic setting, mineral resources, geologic hazards, and geology of cities. 148 p., 45 illus., 12 geology and geologic hazards maps.]</td>
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91. GEOLOGIC HAZARDS OF PARTS OF NORTHERN HOOD RIVER, WASCO, AND SHERMAN COUNTIES, OREGON, 1977, Beaulieu.
[Discusses geography, geologic units, and geologic hazards. 95 p., 51 figs., 11 separate geology and geologic hazards maps.]

92. FOSSILS IN OREGON, 1977, Margaret L. Steere, ed. $4.00
[Collection of 22 articles reprinted from The ORE BIN. Categories comprise fossil plants, fossil animals, and fossil localities. Paleontological time chart included. 227 p., many figs.]

93. GEOLOGY, MINERAL RESOURCES, AND ROCK MATERIAL OF CURRY COUNTY, OREGON, 1977, Ramp, Schlicker, and Gray.
[Subtopics include geography, geology, rock material resources, metallic mineral resources, nonmetallic mineral resources, and mineral fuels. 79 p., 12 figs., 9 tables, 3 maps.] (Companion to Bull. 90.)

94. LAND USE GEOLOGY OF CENTRAL JACKSON COUNTY, OREGON, 1977, Beaulieu and Hughes.
[Covers geography, geologic units, engineering properties of geologic units, mineral resources, and geologic hazards. Glossary included. 87 p., 29 figs., 15 tables, 5 geologic maps, and 5 geologic hazards maps.]

95. NORTH AMERICAN OPHIOLITES, 1977, Coleman and Irwin, eds.
[13 papers from field excursions and seminars of 1977 sponsored by the International Geological Correlation Program. 183 p., index map of North America, and 5 geologic maps.]

96. MAGMA GENESIS, 1977, H.J.B. Dick, ed. $12.50
[Proceedings of the American Geophysical Union Chapman Conference on Partial Melting of the Earth's Upper Mantle. Aid to geologic mapping and to assessment of mineral wealth in magmatic terrain. 13 papers. 311 p., many illus.]

[Compiled by GeoRef, American Geological Institute computer data base service. Comprises 1,400 entries including titles from 150 serials and has subject, county, and rock-unit indexes. 74 p.]
Open-File Reports

0-76-4 STREAM SEDIMENT GEOCHEMISTRY, NORTHEASTERN OREGON, 1976. 
[Analyses of stream sediments in 33 quadrangles for copper, lead, zinc, nickel, and mercury. 48 p., 33 topog. maps.] $25.00

0-78-4 GEOTHERMAL GRADIENT DATA, 1978, Hull, Black-well, and Black. 
[Data collected between December 1976 and December 1977. Tables and graphs with measurements in metric and English units. 187 p., map of well locations.] $5.00

Other Publications

Misc. Paper No. 4 RULES, REGULATIONS AND LAWS RELATING TO EXPLORATION AND DEVELOPMENT OF OIL AND NATURAL GAS IN OREGON, 1977. 
[Pt. 1. Oil and gas. Text p. 1-18 plus copy of ORS Chap. 520.] $1.00
[Pt. 2. Geothermal. Text p. 19-34 plus copy of ORS Chap. 522.] $1.00

[Identifies seven areas of anomalously high heat flow. 50 p., 17 figs., 10 tables, and well location map.] $3.00

Oil and Gas Invest. 5 PROSPECTS FOR NATURAL GAS PRODUCTION AND UNDERGROUND STORAGE OF PIPELINE GAS IN THE UPPER NEHALEM RIVER BASIN, COLUMBIA-CLAT-SOP COUNTIES, OREGON, 1976, Newton and Van Atta. 
[56 p. with geologic map in pocket.] $5.00

[Concise data to aid planners and contractors. 45 p., 16 figs., 10 tables, and rock material location and geology map.] $4.00

[Color map with geologic time chart and stratigraphic cross sections. Scale 1:250,000.] $3.00

[2 sheets, each 42 by 44 in; scale 1:500,000 (1 in = about 8 mi).] $3.75

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BENTON COUNTY ROCK MATERIAL RESOURCES STUDY PUBLISHED

The Department has just released Short Paper 27, entitled "Rock Material Resources of Benton County, Oregon." The 47-page study discusses future demand, planning, mining, reclamation, and geology of the rock material resources of Benton County. Included are 16 figures, 10 tables, and a geology and quarry site map for the County. By linking rock resources with a geologic map, the report becomes a useful predictive tool for planning purposes, enabling the planner to address the complex issues surrounding the rock resources industry.

This publication, which is available at Department offices, sells for $4.00.

Purpose of This Study

Benton County's population is expected to continue to expand in the future as a result of increased light industrial development brought about by available manpower; availability of land and electric power; and favorable aesthetic, cultural, and climatic conditions. While creating an increasing need for construction aggregate, this growth may simultaneously restrict the use of existing sources of aggregate by zoning, encroachment of incompatible development, and loss of rock material deposits when structures are built over them. With proper planning, however, a continued supply of these important rock material resources will be available in a manner most compatible with the environment and long-range land use plans.

The purpose of the study was to develop concise data on the rock material of Benton County in a form which could be submitted to potential users or developers of these resources and which could be used as a data base for land use ordinances in compliance with ORS 215.055. Oregon law ORS 215.055 and Land Conservation and Development Commission (LCDC) Goal 5, Topic B, formally direct the County to take the processing of mineral aggregates into consideration in the adoption of any land use ordinance. Data on the locations of sand and gravel...
pits, clay pits, and rock quarries; past production; the quantity and quality of material available; and the future requirements for these products are needed before land use ordinances are passed. This study, financed by the Oregon Department of Geology and Mineral Industries and Benton County through a grant from the Land Conservation and Development Commission, provides the above data along with broad parameters for secondary and tertiary land uses after mining. The data presented in this report will be used by planners and public officials for making land use plans and decisions and also by contractors looking for rock materials for construction projects.

Recommendations from Short Paper 27

The study provides a strong mineral resource data base and a geologic map for use of the County Planning and Public Works Departments, County and State road and highway departments, private contractors, and private citizens.

Included in the text are an inventory of current mineral resource availability and a forecast of future demands, which will help to focus the County's needs. The report also stresses the necessity of planning for secondary usage and reclamation of surface mining sites in order to eliminate adverse environmental effects often associated with surface mining.

The study recommends that the land status of all active and potential mining sites, particularly those near urban areas, should be determined in terms of present use and zoning classification and that all future changes in status should consider the mineral resource potential of each parcel. County zoning of land which excludes mineral resource development has the effect of preventing any future production and reduces the available natural resource, thus affecting resource availability projections.

It is also recommended that the County encourage mined land reclamation on all surface mining sites within its boundaries. By working closely with State agencies and by reviewing all reclamation plans, the County also may have significant input into the State program.

* * * * *

WHAT'S IN IT FOR YOU?

The Department receives with grateful appreciation the letters and telephone calls from ORE BIN readers who remark about articles they found especially interesting or enjoyable.

Everyone is welcome to share personal opinions with us. Why not go a step further and include a note with your order (see centerfold) telling us what you'd like to read about in the ORE BIN?
MOBIL OIL DRILLING AT OAKLAND

Mobil Oil Corporation began drilling on a deep test hole near the town of Oakland in Douglas County on July 10, 1978. If drilled to the proposed depth of 14,000 ft, the exploration hole, called "Sutherlin Unit No. 1," will be the deepest hole put down in the State.

Not only is Mobil's wildcat the deepest in Oregon, its collection of oil and gas leases is the largest ever assembled in the State. The firm reportedly has under lease or option approximately 1 million acres. Superlatives extend also to the equipment being used to drill the hole; Brinkerhoff's (the drilling contractor) Rig No. 53 is the largest to drill in Oregon and has a capability of 20,000 ft.

The Sutherlin Unit No. 1 will explore lower Eocene sedimentary and volcanic rock units as well as older rocks underlying the Eocene units. The nature of the rocks at 14,000 ft is a subject of controversy among geologists. Will they consist of Mesozoic marine sediments or will they be oceanic basalts? Mobil geologists hope that their Sutherlin Unit No. 1 will find natural gas in large quantities at depth on the Oakland anticline.

Photo courtesy Black Star, Doug Wilson, photographer

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The Old Maid Flat geothermal test hole was deepened from 564 m (1,850 ft) to 1,220 m (4,003 ft) during July and August 1978. The preliminary bottom hole temperature of about 175°F may be high enough to make Northwest Natural Gas Company's proposed heating project feasible if a large enough supply of ground water of that temperature can be found. Results of the Old Maid Flat drilling are still being evaluated to guide future exploration.

A second geothermal test hole was started near Timberline Lodge in August. Plans are to drill to a depth of 600 m (2,000 ft) to see if rocks on the flanks of Mount Hood Volcano have been heated enough to produce hot water that can be used for heating the lodge. Present depth of the hole is 270 m (870 ft).
Bill Covert (left), Northwest Natural Gas, and Joe Riccio, Oregon Department of Geology and Mineral Industries, conferring about drilling at Timberline Lodge.

Drilling below parking lot at Timberline Lodge.
OREGON 1977 MINERAL DATA SUMMARIZED

"Minerals in the Economy of Oregon," prepared under a cooperative agreement between the Bureau of Mines and the Oregon Department of Geology and Mineral Industries and published as SMP-21, may be obtained free upon request from the Publications Distribution Branch, Bureau of Mines, 4800 Forbes Avenue, Pittsburgh, Pennsylvania 15213.

The 14-page report contains tables summarizing Oregon's 1977 mineral production statistics; role in U.S. mineral supply; income from mineral bonuses, royalties, and rentals; and land ownership and mineral production. The report discusses the general mineral situation in Oregon, noting the construction of a new cement plant at Durkee, planned expansion of chlorine production in the Portland Rivergate district, and the reopening of small gold mines near Granite and Prairie City in eastern Oregon. The effects of regional energy problems and the implications of large withdrawals of land from mineral exploration and development are also considered in this report.

SMP-21 also contains a bibliography and 2-page map showing general locations of mineral deposits, geothermal wells, and mineral processing plants.

* * * * *

$IGN OF THE TIME$

Some 45 years ago a popular song advised, "Potatoes are cheaper; tomatoes are cheaper; now's the time to fall in love." Today's ditty, less lilting, has many variations. The DOGAMI version is, "Well, paper costs more now; and postage costs more now; ORE BIN prices must go up."

Beginning January 1, 1979, we will charge $4.00 for annual subscriptions and $10.00 for 3-year subscriptions. Each year the Department has had to spend more for supplies and printing to produce the ORE BIN without sacrificing quality. And that's not all. Changes in second-class rates are not timed or patterned to correspond with the raises in first-class postage. Between May and August 1978 alone, the cost of mailing the ORE BIN rose 29.9 percent!

Looking on the bright side, those who order before January 1 will enjoy the current rates. Use the coupons in the centerfold of this ORE BIN. Your order may be new, a renewal, or an extension of a current subscription, as long as DOGAMI has received it by January 1.

Another bright thought: On the drawing boards right now are plans for renovating the ORE BIN format. Readers may look forward to refreshing and welcome changes in '79. Be sure you and your friends will receive the hallmark January 1979 issue.
AVAILABLE PUBLICATIONS
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