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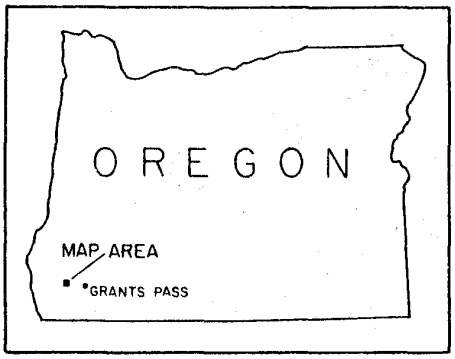
GEOLOGY OF THE LOWER ILLINOIS RIVER CHROMITE DISTRICT

By
Len Ramp*

Introduction

General. This is the second preliminary report on the work being done in connection with a study of chromite deposits in southwestern Oregon. Most of the State's chromite production has come from this area and predominantly from the Oregon Chrome mine (No. 31, see map on following page).

Geography. The area mapped lies mostly in the west ½ of T. 37 S., R. 9 W., along the Illinois River in the western part of Josephine County. A portion of the area overlaps into R. 10 W. and T. 38 S. It is reached by 12 miles of Forest Service road from Selma, on the Redwood Highway (US 199) about 22 miles southwest of Grants Pass.



Topography of the area is rugged. Relief from the highest point, Pearsoll Peak, a short distance southwest of the mapped area, to the narrow, often steep-walled canyon of the Illinois River is about 4100 feet. Landsliding is a common feature. There are more than ten fairly large active landslides in the area. The cirque-like landslide area just north of the Chrome King mine (No. 44) and the one west of the Crown mine (No. 5) are prominent topographic features. The hillside west of the Illinois River and north of Dailey Creek to the drainage area of Lightning Creek contains numerous slump blocks and sag ponds and in general displays the typical hummocky topography of a landslide area.

Field work. Basic geologic information is from the Kerby quadrangle geologic map (Wells and others, 1949). The large-scale mapping of the present studies by the Department was begun during the fall and winter of 1953 and has been carried on intermittently until the present. Several of the larger chromite deposits have been mapped in detail.

Geologic setting

Geology of the area is complex. The area is underlain predominantly by peridotite which is either partly or completely altered to serpentine. The most common variety of peridotite is saxonite which is composed primarily of olivine and enstatite in varying pro-

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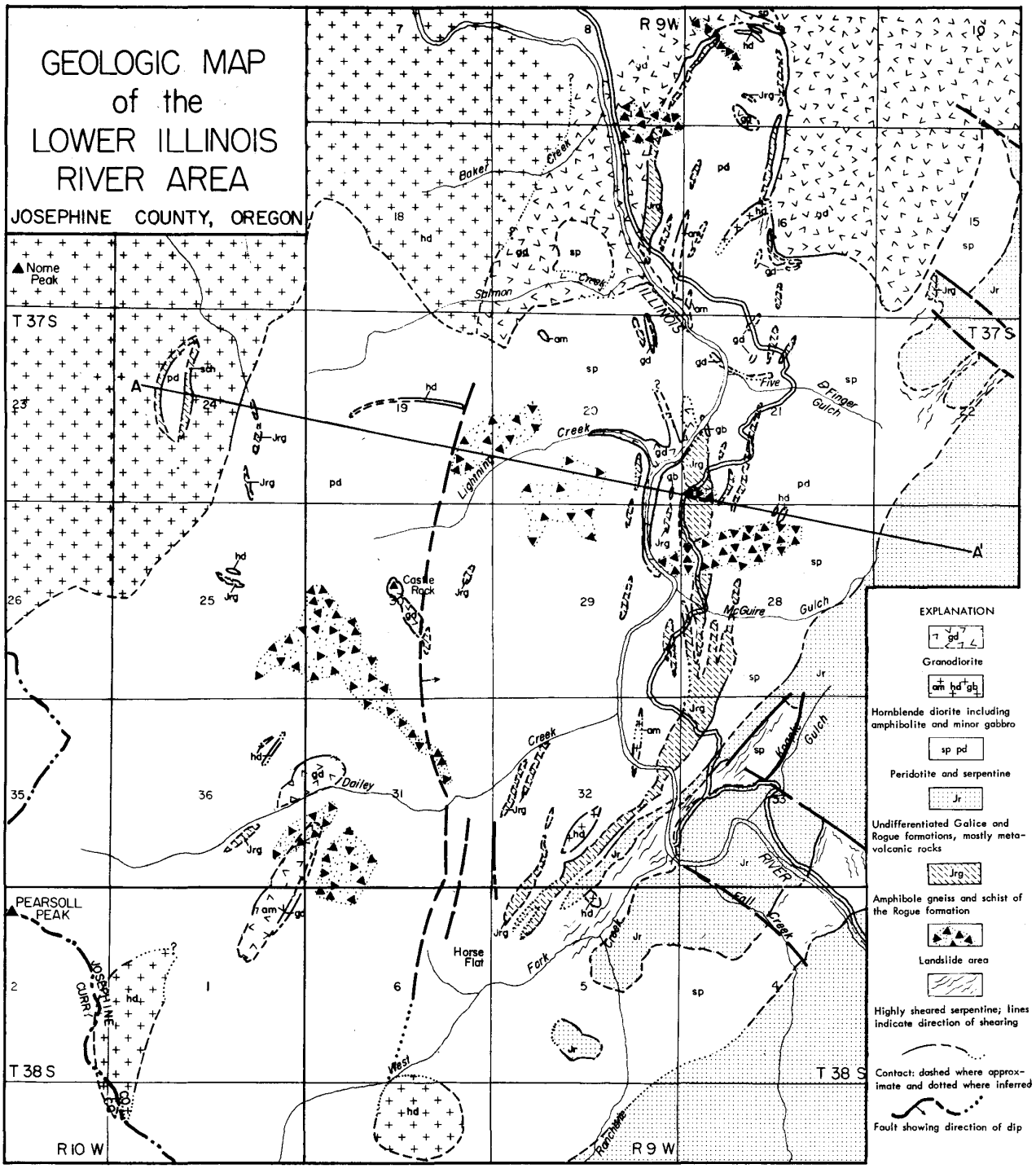
GEOLOGIC MAP of the LOWER ILLINOIS RIVER AREA

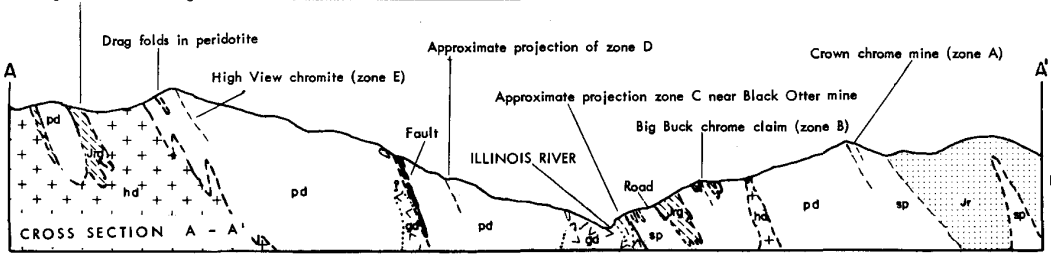
JOSEPHINE COUNTY, OREGON



EXPLANATION

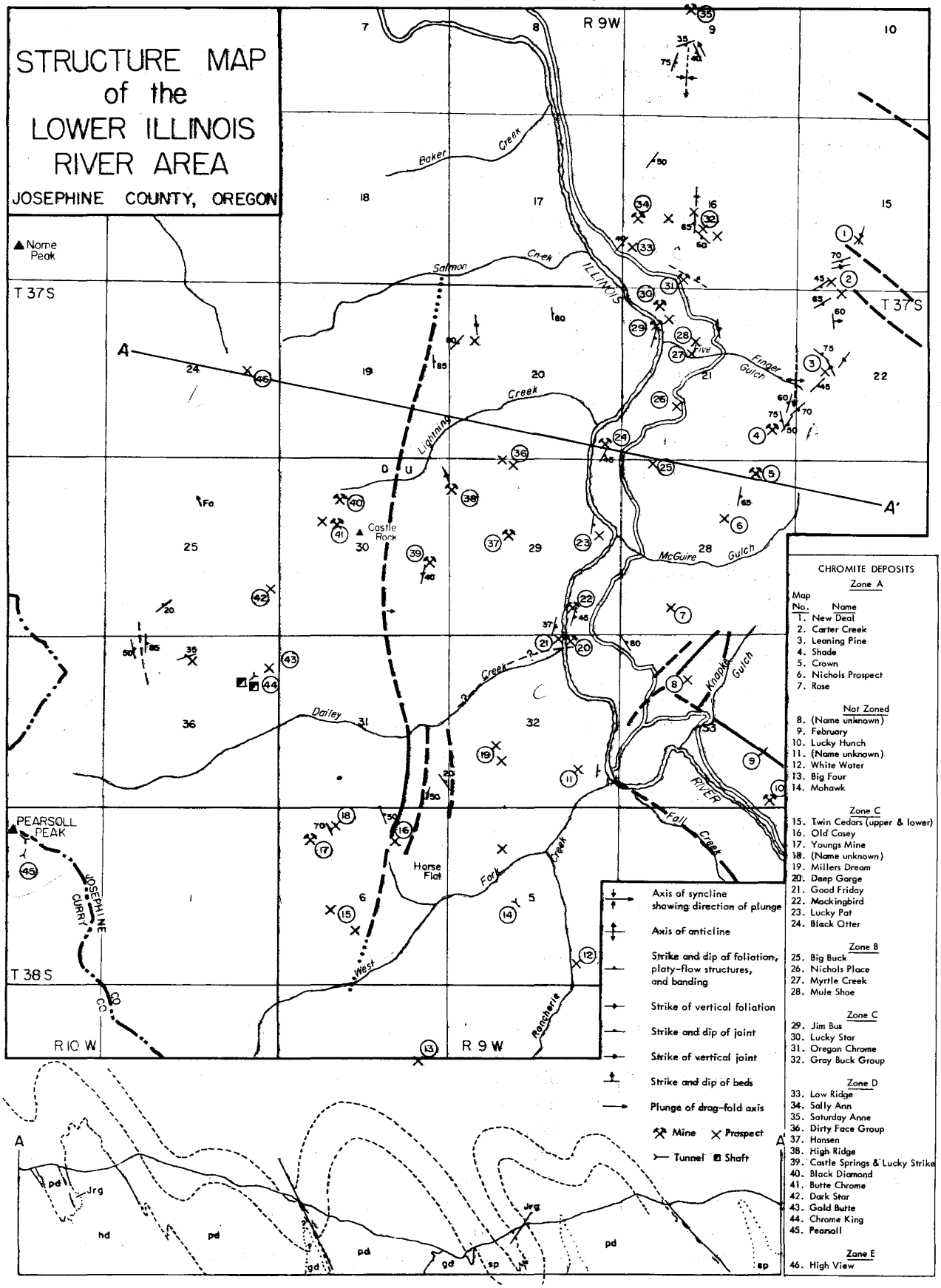
- gd — Granodiorite
- am hd gb — Hornblende diorite including amphibolite and minor gabbro
- sp pd — Peridotite and serpentine
- Jr — Undifferentiated Galice and Rogue formations, mostly metavolcanic rocks
- Jrg — Amphibole gneiss and schist of the Rogue formation
- Landslide area
- Highly sheared serpentine; lines indicate direction of shearing
- Contact: dashed where approximate and dotted where inferred
- Fault showing direction of dip

0 1/4 1/2 1 2 MILES



Geologic Map by
Len Ramp, Geologist

State of Oregon
DEPARTMENT OF GEOLOGY
and
MINERAL INDUSTRIES
April 1957



CHROMITE DEPOSITS

Zone A

Map No.	Name
1.	New Deal
2.	Carter Creek
3.	Leaning Pine
4.	Shade
5.	Crown
6.	Nichols Prospect
7.	Rose

Not Zoned

8.	(Name unknown)
9.	February
10.	Lucky Hunch
11.	(Name unknown)
12.	White Water
13.	Big Four
14.	Mohawk

Zone C

15.	Twin Cedars (upper & lower)
16.	Old Casey
17.	Youngs Mine
18.	(Name unknown)
19.	Millers Dream
20.	Deep Gorge
21.	Good Friday
22.	Mockingbird
23.	Lucky Pat
24.	Black Otter

Zone B

25.	Big Buck
26.	Nichols Place
27.	Myrtle Creek
28.	Mule Shoe

Zone C

29.	Jim Bus
30.	Lucky Star
31.	Oregon Chrome
32.	Gray Buck Group

Zone D

33.	Low Ridge
34.	Sally Ann
35.	Saturday Anne
36.	Dirty Face Group
37.	Hansen
38.	High Ridge
39.	Castle Springs & Lucky Strike
40.	Black Diamond
41.	Butte Chrome
42.	Dark Star
43.	Gold Butte
44.	Chrome King
45.	Pearsall

Zone E

46.	High View

portions together with minor amounts of magnetite and chromite. Serpentinization is more complete in shear zones, near contacts with the intruded rocks or inclusions, and in areas surrounding later intrusives. The ultramafic rocks (peridotite and serpentine) have intruded sedimentary and volcanic rocks belonging to the Galice and Rogue formations of Upper Jurassic age. These formations (undifferentiated on the accompanying geologic map) are composed mainly of volcanic rocks which have suffered low-grade regional metamorphism. Hornblende gneiss occurs near the serpentine contacts and as inclusions and roof pendants in the serpentine and peridotite. Similar gneiss has been mapped as Rogue formation in other areas (Wells and Walker, 1953).

Dikes and irregularly shaped intrusives of hornblende diorite and granodiorite and occasionally amphibolite and gabbro have intruded the ultramafic rocks. A stock of granodiorite underlies the northern part of the map area and extends north to the drainage of Red Dog Creek. The granodiorite exposed in the bed of the Illinois River at the mouth of Lightning Creek is apparently part of the same intrusive. A belt of hornblende diorite approximately 5 miles wide borders the map area to the northwest.

All of the intrusive rocks in the area are dated as late Jurassic to early Cretaceous and the more basic rocks are considered as having been intruded the earliest.

Structure

In general the formations strike north to northeast and dip steeply to the east. The granodiorite and its related dikes show the least amount of conformity in this respect. Inclusions, schlieren, and foliations in the ultramafic rocks, as well as in the chromite deposits, all seem to conform to this major structural trend.

Folding. The peridotite and older rocks have been subjected to considerable deformation. Jointing is a prominent feature wherever fresh outcrops of peridotite are seen. Further evidence of deformation is displayed in the drag folds and the present attitudes of the chromite and pyroxene-rich schlieren which represent primary platy-flow structures in the peridotite. Most of the evidence of folding in the peridotite was obtained in the northern portion of the mapped area. The present outcrop pattern of the granodiorite-serpentine contact appears to be controlled by folding. The series of folds in this area are plunging to the south. Their axes appear to plunge more steeply near the granodiorite contact and it is possible that intrusion of the granodiorite accentuated the plunge. Interpretation of the folding, as illustrated in cross-section A - A', is somewhat idealized and simplified; however, it seems to fit well the available structural data. The folds are inclined, apparently asymmetrical, and approach isoclinal development.

Faulting. As in other areas in southwestern Oregon (Ramp, 1956, and Wells and others, 1940, p. 470) there are apparently two major sets of faulting. One set is essentially parallel to the regional structure (longitudinal) and the other is almost normal to this direction (transverse). Most of the exposed contacts of serpentine with older rocks are highly sheared and undoubtedly represent zones of considerable movement. "Slickentite" along the road west of Rancherie Creek is the result of such shearing. Faults trending N. 40° to 80° W. are far more numerous than shown on the map, but the magnitude of their displacements is probably less than that of the longitudinal faults. Where direction of movement on the transverse faults could be determined, it was found to be oblique. With exception of the large north-trending fault cutting through the mapped area, the transverse faults are of later origin than the longitudinal faults.

Nature of the chromite deposits

General. Spotty outcroppings ranging from lens-shaped pods to almost tabular-shaped wisps of massive chromite and schlieren-banded disseminated chromite are found along definite zones in the serpentinized peridotite. These zones strike from N. to N. 40° E., and in most cases dip at high angles to the southeast.

Shape and size of orebodies. Most of the deposits of the area consist of narrow lenses or planar streaks of disseminated to massive chromite, seldom more than 2 or 3 feet in thickness, extending 20 to 50 feet along the strike, and measuring similar distances down dip. The chromite bodies have been subjected to considerable offset by faulting, which often occurs at small angles to the plane of the ore zone. The result is separation of the lens-shaped pods to a greater degree than that caused by magmatic flowage.

The largest bodies of chromite ore have been found in the Oregon Chrome mine (No.31). The bodies are lens-shaped and somewhat ellipsoidal in plan; they are approximately 20 feet in maximum thickness, about 150 feet in length, and 50 feet in width; some have been mined that contained as much as 5,000 tons of ore.

In areas of intense shearing and alteration of the ultramafic rocks to "slickentite," small lens-shaped pods of massive, relatively unsheared chromite are occasionally found. "Tails" of crushed chromite leading off the pods in the direction of shearing often lead to other chromite pods. Chromite bodies of this type containing as much as 75 tons of ore have been found in the area.

Composition. The chromite deposits vary considerably in size, shape, and degree of concentration, that is, degree of segregation from the rock. Variation is seen also in the chromic oxide content of chromite crystals from the various deposits. Analyses of chromite samples from the area, with very few exceptions, indicate quite similar compositions. The amount of Cr_2O_3 generally varies between 40 and 50 percent. The average Cr to Fe ratio is 2.45 to 1, and the average Cr_2O_3 content is about 45 percent. A few of the deposits, however, have considerably lower chromic oxide content. The High Ridge claim (No. 38) for example, contains about 37 percent Cr_2O_3 and about 13 percent Fe in milled concentrates. The Twin Cedars prospect (No. 15), the Black Otter (No. 24), and the Rose claim (No. 7) also show off-grade ores which when concentrated fall below the minimum grade requirements* at the Government Stockpile.

The reasons for the variation in composition are not known with certainty, but are believed to be controlled partly by the high alumina content in some, and in other instances to hydrothermal alteration which may have resulted in a replacement of chromic oxide by iron oxide released during serpentinization of olivine. Secondary chrome-bearing minerals, such as kammererite and uvarovite which formed as a result of hydrothermal action, are believed to be evidence of chromite alteration. The presence of abundant talc, occasional aragonite, and minor sulphides in and around the chromite is further evidence of the hydrothermal action.

The chromite-bearing horizon. Five chromite-bearing zones have been distinguished in the broader portion of the ultramafic intrusion. They are designated from east to west as: Zones A, B, C, D, and E. Three of them, zones A, C, and D, are more easily observed than the other two. In the early stages of mapping these three zones were the only ones recognized. They were thought to be entirely separate from one another. After further

* 42 percent Cr_2O_3 and 2 to 1 Cr to Fe.

structural data were gathered, the possibility of the zones belonging to a single chromite-bearing horizon, which was exposed repeatedly in a tightly folded section, became apparent. Drawing of cross section A - A' helped explain why deposits such as those on the Mule Shoe, Myrtle Creek, and High View claims (Nos. 28, 27, and 46) did not seem to fit into the three zones first recognized. Later, with the discovery of the chromite at C. E. Nichols' place (No. 26) and knowledge of the location of the Big Buck claim (No. 25) farther south on Zone B, it was found that these two deposits fitted very nicely on the cross section.

In places the chromite-bearing horizon consists of two parallel chromite zones about 200 feet apart. Two separate chromite zones have been recognized at the Crown mine (No. 5), Deep Gorge (No. 20), and the Mockingbird (No. 22). The two zones could possibly be found in other parts of the area if additional detailed mapping were done.

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URANIUM MILL PROJECTED FOR LAKEVIEW

The Lakeview Mining Company submitted a formal proposal April 12 to the Atomic Energy Commission at Grand Junction, Colorado, for construction of a uranium mill at Lakeview, according to an announcement made by Dr. Garth Thornburg, president of the Company. It is estimated that it will take about 90 days for the AEC to process the proposal. If the proposal is accepted and permission to build received, it will take about 10 months to construct the mill. Cost of the proposed mill is estimated at $2,750,000. The mill will be rated at 210 tons of ore per day capacity, dry weight, and will employ about 62 persons. It will operate 24 hours per day seven days a week and will accommodate custom ore from other uranium mines provided that the ore is amenable to the process used at the Lakeview mill.

During the coming summer the Lakeview Mining Company expects to employ 54 men in exploration and development at the White King mine and to accelerate underground development. Negotiations are underway with the California-Oregon Power Company for installation of a power line to the mine site.

(Information from Lake County Examiner, April 18, 1957.)

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BINGHAM REAPPOINTED TO BOARD

Reappointment of Mason L. Bingham of Portland to the governing board of the State Department of Geology and Mineral Industries was announced Tuesday by Governor Robert D. Holmes.

Bingham, official of the Lewis Investment Company of Portland for more than 20 years, has been chairman of the three-man board which directs the State's activities for geological and mineral resources.

A native of Walla Walla, Washington, Bingham is a graduate of Harvard College and is an associate in the American Institute of Mining and Metallurgical Engineers.

Bingham's new term will run until 1961. Other members of the board are Austin Dunn, Baker, and Niel R. Allen, Grants Pass.

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TUNGSTEN PROSPECT LEASED

Mr. Guy O. Woolf, Gold Hill, recently leased his tungsten prospect located on Foots Creek, sec. 14, T. 37 S., R. 4 W., Jackson County, to the Calnevore Developing Corporation from Los Angeles represented by Messrs. Frank D. Robins, M. Goldman, and L. F. Darrell. Calnevore reportedly has tungsten and uranium holdings in California and Nevada. Mr. Woolf said that exploration work will start within three months.

The scheelite occurs in a quartz vein rather than the usual tactite formation. Portions of the vein contain pyrite and minor galena. A sample of the better-grade ore (quartz containing large crystals of scheelite) assayed 15.49 percent WO_3. Values in silver and gold are present in the sulphide-bearing portion of the vein.

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GEOLOGIC MAP OF THE LEBANON QUADRANGLE PUBLISHED

"Reconnaissance geologic map of the Lebanon quadrangle, Oregon," has just been published by the State of Oregon Department of Geology and Mineral Industries as one of its geologic map series. Authors are Ira S. Allison, Chairman of the Department of Geology, Oregon State College, and Wayne M. Felts, Senior Geologist with The Texas Company.

The Lebanon quadrangle lies chiefly in Linn County at the eastern edge of the Willamette Valley near the confluence of the North and South Santiam rivers just a few miles east of Albany. The oldest geologic formation, the Mehama volcanics, occurs in the eastern half of the quadrangle and interfingers westward with the Oligocene marine sediments of the Eugene formation. Both formations are intruded locally by basic volcanic dikes and pipes. Stayton lava flows of Miocene age overlie large areas of the Oligocene formations. Pleistocene gravels and silts representing several stages of alluviation are widespread on terraces and valley floors. In general the rocks in the Lebanon quadrangle have undergone only minor deformation. No metallic ores are known in the area, but there is an abundant supply of basalt rock of excellent quality, sand and gravel, and clays.

The various geologic formations are designated on the map by color and pattern and are superimposed on the Lebanon quadrangle topographic map. Fossil localities are shown and the dip and strike of rocks at outcrops are indicated. A text describing the geology of the quadrangle is printed on the back of the map. The map may be obtained from the office of the State Department of Geology and Mineral Industries, 1069 State Office Building, Portland 1, Oregon, and the field offices at Grants Pass and Baker. Price is 75 cents.

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PROPOSED LAND WITHDRAWALS

Date of Notice	County	Location Area	Acres	Purpose
March 21, 1957	Curry	T. 32 S., R. 14 W.	90	Development and management of fishing resources of the Sixes River
March 21, 1957	Lane	Tps. 21, 22, 23, S., R. 3 E.	3,780	For use in connection with Hills Creek reservoir project
April 3, 1957	Morrow	T. 4 N., R. 26 E.	1,672	Expansion of Umatilla Ordnance Depot
April 3, 1957	Marion, Linn	T. 10 S., Rs. 5, 6 E.	36	Construction and operation of the Detroit reservoir project
April 24, 1957	Wasco	T. 5 S., R. 11 E.	880	For wildlife purposes in connection with the White River Big Game Range
April 24, 1957	Wallowa	Tps. 5, 6 N., R. 42 E. Tps. 5, 6 N., R. 43 E.	1,200	For wildlife purposes in connection with the Wenaha Game Management Area

During the past month the Department has received from the U.S. Bureau of Land Management notices of six applications to withdraw public land for special purpose use (see chart). The merits and needs for these withdrawals are not known nor are they questioned, as the small acreage listed on the chart is not likely to work much of a hardship on the many other users of public land. Nevertheless it should be noted that withdrawal of land for special purpose use is continuing year after year and that the amount of public land in the State is not unlimited.

Withdrawal of land in the western states, especially in Nevada, has reached proportions sufficient to cause alarm to many people and certain industries. Among the concerned industries are forestry and mining.

Existence of a mining industry depends, among other things, on continual discovery of new deposits. This means that prospecting can never cease. New ore search techniques are being perfected to explore areas for hidden or covered deposits and, encouragingly, important new discoveries have been made. The more land open to prospecting the greater the chance of finding new ore deposits. In this day of accelerating demands for metals and industrial minerals it is important that as much land as possible be left open to prospecting.

Persons desiring to obtain information on withdrawals in Oregon can do so by writing the U.S. Bureau of Land Management, Department of Interior, 1001 N.E. Lloyd Blvd., P.O.Box 3861, Portland 8, Oregon.

H.M.D.

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DREDGING BILL

House Bill 655, which is concerned with the control of dredging operations for materials other than industrial minerals and sand and gravel, was passed by the Oregon House of Representatives April 23. The bill is now in the Natural Resources Committee of the Oregon State Senate.

House Bill 655 has been amended twice since being presented at a hearing held on the evening of April 1 before the House Committee on State and Federal Affairs. Objections to the bill were presented by the mining industry. Some of these objections were resolved by revisions, but the general intent of the bill still remains.

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