UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

MINERAL RESOURCE POTENTIAL OF THE HOMESTEAD, LAKE FORK, AND LICK CREEK ROADLESS AREAS, BAKER AND WALLOWA COUNTIES, OREGON

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STUDIES RELATED TO WILDERNESS

Under the provisions of the Wilderness Act (Public Law 88-577, September 3, 1964) and related acts, the U.S. Geological Survey and the U.S. Bureau of Mines have been conducting mineral surveys of wilderness and primitive areas. Areas officially designated as "wilderness," "wild," or "canoe" when the act was passed were incorporated into the National Wilderness Preservation System, and some of them are presently being studied. The act provided that areas under consideration for wilderness designation should be studied for suitability for incorporation into the Wilderness System. The mineral surveys constitute one aspect of the suitability studies. The act directs that the results of such surveys are to be made available to the public and be submitted to the President and the Congress. This report discusses the results of a mineral survey of the Homestead, Lake Fork, and Lick Creek Roadless Areas, Wallowa-Whitman National Forest, Baker and Wallowa Counties, Oregon. Homestead (06291), Lake Fork (06290), and Lick Creek (06285) Roadless Areas were classified as further planning areas during the Second Roadless Area Review and Evaluation (RARE II) by the U.S. Forest Service, January 1979.

SUMMARY

Study of gold placers on Duck Creek and analyses of gold-bearing stream-sediment samples indicate a very low potential for placer resources in glacial deposits in western and northern Lake Fork Roadless Area. The glacial deposits cover about 18 mi^2 of the area and are estimated to be 500 ft thick in places. They are mostly till, however, which is unsorted and not expected to contain appreciable amounts of gold. Some glacial outwash zones in these deposits may have greater concentrations, but such zones could not be differentiated in the field.

Low potential was determined for other commodities: copper, gold, and silver resources at the Williams mine, just outside the Lick Creek Roadless Area; limestone suitable for construction and possible chemical uses at the Black Cat prospect, in the southern part of the Lick Creek Roadless Area; and deposits of sand and gravel and highly fractured basalt for road metal throughout the study area.

INTRODUCTION

The Homestead, Lake Fork and Lick Creek Roadless Areas together encompass 32,695 acres of Wallowa-Whitman National Forest, in the southeastern Wallowa Mountains, Baker and Wallowa Counties, Oregon (fig. 1). The Homestead Roadless Area consists of 3 noncontiguous areas that are about two miles west of the Snake River on the Oregon-Idaho border. The Lake Fork and Lick Creek areas are separated by a 0.5 mi-wide corridor along U.S. Forest Service road 66 (fig. 2). The Lick Creek Roadless Area is the northernmost of the three and adjoins the southeast corner of the Eagle Cap Wilderness.

GEOLOGIC SETTING

The oldest rocks in the area comprise an assemblage, perhaps as much as 15,000 ft thick, of predominantly pyroclastic, volcanic and volcaniclastic rocks (Evans, 1983a) of Permian and Triassic age. The assemblage is overlain by the Triassic Wild Sheep Creek Formation above an angular unconformity with local relief to 500 ft. The formation consists of at least 1,000 ft of very

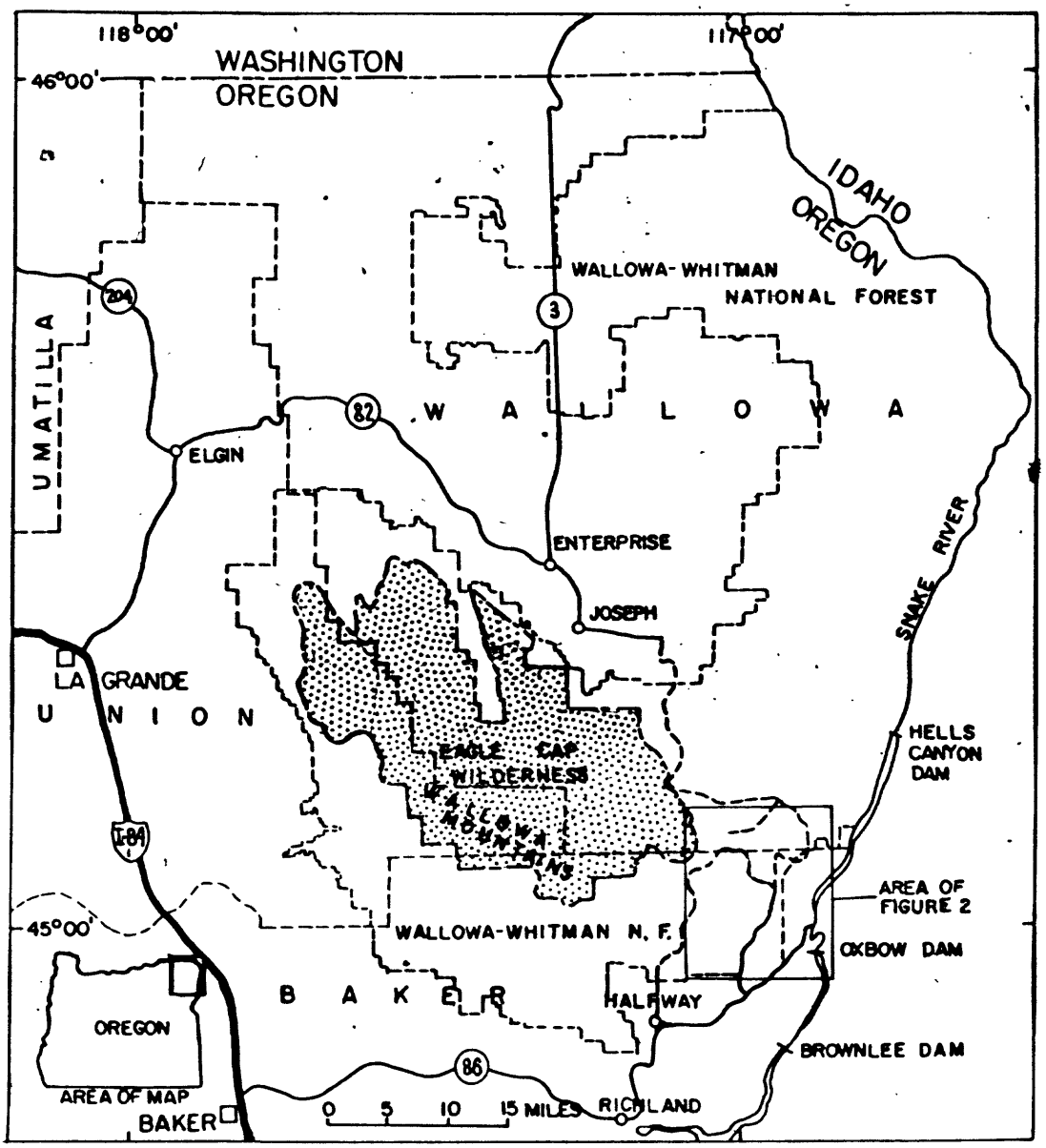

Figure 1. Index map showing location of figure 2 and nearby Eagle Cap Wilderness.

fine-grained basalts and andesites, and minor pyroclastic beds. A hypabyssal andesite porphyry stock intrudes the Wild Sheep Creek Formation on Russel Mountain. Pillow breccia and lapillistone 500 ft thick bordering the andesite porphyry on the east and south sides of Russel Mountain may represent a submarine extrusive apron originating from a vent now occupied by the porphyry. An unknown thickness of Upper Triassic fine-grained limestone was deposited, probably following the volcanic activity. The age of the limestone establishes that the porphyry and the related extrusive rocks are pre-Late Triassic in age. Diorite and gabbro plutons, tentatively assigned a Jurassic age on the basis of Late Triassic limestone xenoliths in one of them, intrude the andesite porphyry and older rocks. Serpentinite xenoliths in the diorite and gabbro pluton on Russel Mountain may be samples of peridotite underlying the Triassic volcanic and volcaniclastic assemblage.

The Mesozoic rocks are progressively metamorphosed in the greenschist facies, the older rocks generally showing a greater degree of metamorphism. Contact metamorphic effects of the intrusions have been superposed on the regional metamorphism, but the effects of the two kinds of thermal events are not easily distinguishable. Metagraywacke with hornblende in apparent equilibrium with calcic plagioclase suggests local attainment of hornblende-hornfels facies, possibly due to a concealed intrusion. Contact metamorphism and alteration of the Wild Sheep Creek Formation by the andesite porphyry include silicification, quartz veining, enrichment in magnetite and hematite, alteration of mafic minerals to iron oxides resulting in maroon coloration, and extensive epidote replacement resulting in green coloration.

The Mesozoic rocks exposed in the southeast Wallowa Mountains have been referred to as part of the Wallowa Mountains-Seven Devils Mountains volcanic arc terrane of Brooks and Vallier (1978), which was accreted to North America between Late Triassic and middle Cretaceous.

The Mesozoic rocks are overlain by the Columbia River Basalt Group. The lowest formation of the group, the Imnaha Basalt, is about 1,800 ft thick in the southern Homestead area and wedges out against the Triassic rocks to the north. The Imnaha Basalt is characterized by coarse plagioclase phenocrysts to 1.6 in. in length. The very fine-grained Grande Ronde Basalt, 770 to 1,440 ft thick, overlies the Imnaha Basalt and older rocks. The basalts are early to middle Miocene in age.

Quaternary landslide and glacial deposits, and alluvium cover much of the roadless areas. The glacial deposits, the most widespread of the three, consist mostly of till, attain a thickness to 500 ft in the Lake Fork area and appear to have been carried into that area from the Mesozoic terrain to the west.

MINING ACTIVITY

There has been little mining activity in the roadless areas, although several placer and lode prospects occur in and adjoining the areas. Placers along Duck Creek, at the north boundary of the Lake Fork Roadless Area, have been worked intermittently since the 1930's.

Mining in the region has been more extensive outside the roadless areas than within. The inactive Williams mine (fig. 2), located just north of the Lick Creek Roadless Area, contains copper, gold, and silver. The roadless areas lie between the Cornucopia mining district, centered 6 mi west of the Lick Creek and Lake Fork Roadless Areas, and the Homestead mining district, centered 3 mi east of the Lake Fork area. Gold was discovered in the Cornucopia district in the 1870's and has been the major commodity along with

associated silver, copper and lead. Copper accompanied by substantial gold and silver was discovered in 1897 in the Homestead district at the present Iron Dyke mine (fig. 2). Several copper prospects in the Homestead district are about 2 mi east of the Lake Fork area, in volcanic rocks exposed below the Imnaha Basalt in the Snake River Canyon. One additional prospect occurs west of the intersection of Forest Service roads 3925 and 3960 and north of the Imnaha River (fig. 2).

GEOCHEMISTRY

Geochemical samples were collected from streams (fine silt and pan concentrates) and from outcrops that contained sulfide minerals, quartz veins, and abundant iron oxides. The samples were analyzed for 31 elements by spectrographic methods and for gold by atomic absorption. Few geochemical anomalies were found, even in areas underlain by Mesozoic rocks, which, judging from mines and mineral occurrences in the region, are the most likely hosts for mineral deposits (Evans, 1983b, c). Silver (3 parts per million (ppm)) and copper (to 1.35 percent) were found in quartz samples from the Williams mine. Silver (2 ppm) was found in a quartz vein in the Black Cat prospect. An unpanned sample of fine sediment from an unnamed tributary to the Imnaha River contained 0.5 ppm silver, indicating a probable small source of silver minerals in Mesozoic rocks in the south wall of Imnaha Canyon.

Most of the heavy-mineral fraction in local stream sediments is magnetite. Samples of nonmagnetic heavy minerals that were sufficiently large enough for atomic-absorption analyses for gold were obtained in only 8 of the 81 pan concentrates. Five of the samples, from sites in the southwestern and north-central parts of the Lake Fork Roadless Area, contained gold ranging from 0.10 to 27 ppm. The drainage basins from which these samples were taken are underlain largely by glacial deposits. These deposits are part of the same glacial mantle found in the Duck Creek placer area. An unpanned sample of silt from a stream draining the western Lake Fork Roadless Area contained 0.15 ppm gold.

MINING DISTRICTS AND MINERALIZATION

Recorded mining claims in and adjoining the Homestead Roadless Area include one placer claim located in 1934 along North Pine Creek, approximately 0.5 mi northeast of Fall Creek, and 16 lode claims located for copper in the mid-1960's (Hyndman, 1983). The lode claims are in the vicinity of North Pine and Fox Creeks and extend into the Homestead and Lake Fork areas. Lode claims are located on outcrops of basalt containing celadonite, a green ferric mica. Some of these outcrops are mentioned below in the discussion of the Lake Fork area.

Five claims are described within the Lake Fork area (Conyac, 1981). Four were located in basalt in the southern end of the area. Three of these claimed a 1-ft-thick layer of celadonite between basalt flows. Thirty-two other claims, mostly placers, were found near or adjoining the area: 11 claims along Duck Creek, 9 along North Pine Creek, and 12 in the vicinity of the Homestead Roadless Area near the mouth of Fall Creek. Although most claims were recorded in the mid-1930's and mid-1960's, two were recorded in the 1890's, and one vaguely described claim (not found) was recorded in 1885.

At least 46 claims were located within or adjacent to the Lick Creek area since the 1880's (Mayerle, 1982). They include lode locations on quartz veins in or adjacent to the northern portion of the area, gold placer claims along

the Imnaha River and limestone placer claims in the southern portion of the area. Two current claims, the Williams mine and the Thunder Mountain prospect, are close to the north boundary of the Lick Creek Roadless Area. Nine reconnaissance pan samples of gravel from the Imnaha River contained no detectable placer gold. However, two samples taken near Indian Crossing, about 0.5 mi east of the roadless area, contained a trace of gold.

Gold was reportedly taken from Duck Creek placers (Oregon Department of Geology and Mineral Industries, 1939, p. 60).

Outside the roadless areas, the Cornucopia mining district has a recorded gold production in excess of $10 million, and mining has resumed. In the Homestead mining district production from the Iron Dyke mine, the principal mine of the district and the largest copper producer in the state, was 14,417,920 lbs of copper, 256,489 oz of silver and 34,967 oz of gold from 1910-1934. From 1979 to 1982 the mine produced about 2 million lbs of copper, 27,000 oz of silver and 14,000 oz of gold (Hyndman, 1983). At the Williams mine north of Lick Creek, less than one ton of silver ore was produced in the 1880's. In 1929, 12 tons of gold-silver-copper ore yielded 1.98 oz of gold and 9 oz of silver.

No resources were determined for mining claims in the Homestead, Lake Fork, and Lick Creek Roadless Areas.

ASSESSMENT OF MINERAL POTENTIAL

The gold placers on Duck Creek and the gold-bearing pan concentrates taken in this study point to a very low potential for the occurrence of placer gold deposits in the terrane underlain by the glacial deposits in northern and western Lake Fork Roadless Area (fig. 2). The 20-square-mile area shown on figure 2 as covered by glacial deposits includes scattered exposures of Mesozoic and Tertiary bedrock totalling no more than two square miles (Evans, 1983a), and limited areas with glacial outwash in which gold is concentrated by water transport. The glacial deposits are estimated to be 500 ft thick in some places, but are principally till that is unsorted and not expected to contain an appreciable amount of gold. Most of the analyses indicate very low gold content, and suggest that the average concentration of gold in the glacial deposits is very low. Some glacial outwash zones may have greater concentrations. Because the material was brought into the area from the west, the glacial deposits do not reflect bedrock gold values in the roadless area. One effect of the glacial transportation would be dispersal of the gold, diluting the concentrations that occurred at the western bedrock sources.

The Williams mine, just outside the Lick Creek Roadless Area, has low potential for the occurrence of copper, gold and silver resources. Limestone pods (Black Cat prospect) suitable for construction and possible chemical uses, and deposits of sand and gravel and highly fractured basalt suitable for road metal are present in the study area, but other more accessible deposits are available outside the roadless areas. No deposits of high quality ornamental or building stone were identified. A potential for fossil fuels, geothermal resources, or other energy-related commodities was not identified in the Homestead, Lake Fork, and Lick Creek Roadless Areas.

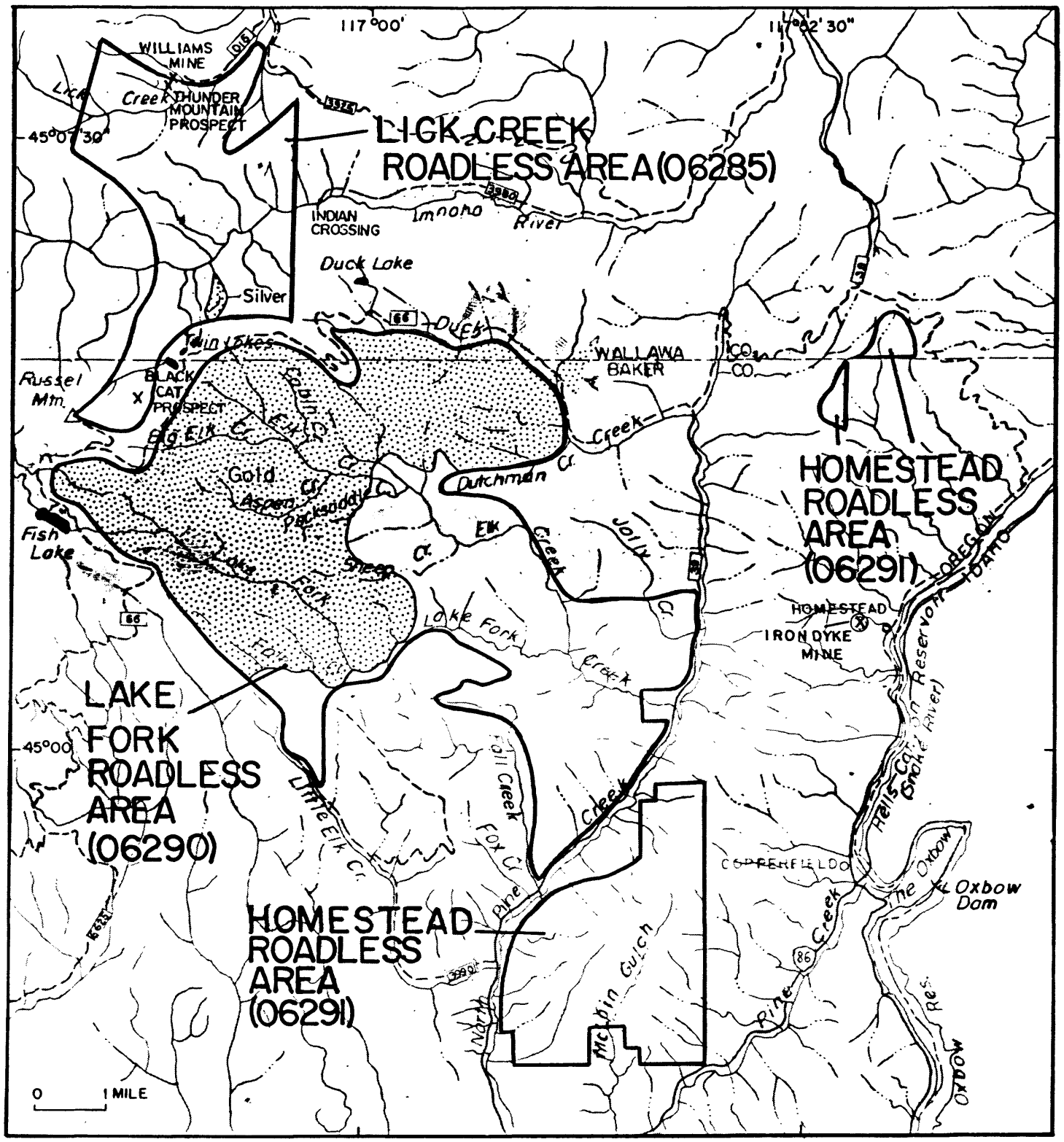

Figure 2. Map of the Homestead, Lake Fork and Lick Creek Roadless Areas, Oregon. Stippled areas contain limited glacial outwash deposits (Quaternary) which have low placer potential and low silver values in Mesozoic rocks.

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