UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

MINERAL RESOURCES OF THE LOST FOREST INSTANT WILDERNESS STUDY AREA, OREGON

By

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Studies Related to Wilderness

The Wilderness Act (Public Law 88-577, September 3, 1964) and related Acts, require the Geological Survey and the Bureau of Mines to survey certain areas on Federal lands to determine their mineral resource potential. Results must be made available to the public and be submitted to the Administration and the Congress. These maps and reports present the results of a geological and mineral survey of the Lost Forest Instant Wilderness Study area.

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SUMMARY

The results of a mineral resource survey of the Lost Forest Instant Wilderness study area, which covers about 86 mi^2 (223 km^2) in central Oregon, indicate that the area has low potential for metallic, nonmetallic, and energy minerals, and fossil fuels. Geothermal resource potential appears low; however, additional study will be necessary for a conclusive evaluation.

The Lost Forest Instant Wilderness study area encompasses three contiguous parcels of land that are centered on an isolated stand of western yellow pine surrounded by sage-and juniper-covered high desert in northeastern Lake County, Oreg. The three parcels, designated informally as the Lost Forest or "A" area, the Sand Dunes or "B" area, and the Juniper Island or "C" area, total about 55,000 acres (22,000 ha), and are bounded by poor quality desert roads.

Bedrock consists of Miocene and younger basalt and andesite flows, tuffs, tuffaceous and palagonitic sedimentary rocks, and mafic eruptive debris in cinder cones and tuff rings and ridges. The bedrock is partly overlain by Pleistocene lake sediments, and by a variety of Late Pleistocene and Holocene surficial deposits, the most prominent of which are active, and locally partly stablized, dune sands. The older rocks are cut by a series of small northwest-trending normal faults, along which the mafic eruptive complexes are located, and by a few interconnecting northeast-trending normal faults.

Claims for borates, nitrates, soda, and other minerals have been located in the Lost Forest Instant Wilderness study area. On the Sand Springs Niter claims, shoreline or deltaic sand and gravel deposits are overlain by windblown sand, and underlain at shallow depths by basalt flows. The Lost Forest claim, along the northern boundary of the Sand Dunes (B) roadless area is mostly covered by partially stabilized sand dunes. Although diatomite, crystalline salts, uranium, and cinnabar have been produced from partly similar geologic settings in the region, no production has been reported and no mineral deposits of economic interest are known within the study area.

The results of this investigation indicate no commercial deposits of minerals are at the surface. Evaluation of geology, geochemical samples, and data from an aeromagnetic survey further indicates there is little chance of their presence in the subsurface, except possibly at great depths.

Currently available data on the temperature of spring and well waters in and near the Lost Forest indicate they are too low for electric power generation; although some of these waters are slightly above ambient temperatures, they occur in insufficient quantity for space heating. Without

additional study, including detailed hydrologic and heat flow investigations, a final and comprehensive evaluation of the geothermal potential is not possible.

INTRODUCTION

Purpose and scope

This report describes briefly the geology and mineral and geothermal resource potential of the Lost Forest area of south-central Oregon. The area is being considered for inclusion in the National Wilderness Preservation System. The area centers on an isolated stand of western yellow pine growing on windblown sand, pluvial lake sediments, and altered basalt. The stand of pines is surrounded by extensive areas of high desert characterized by sage and rabbit brush, several varieties of desert grasses, and sparse juniper trees.

Evaluation of the area consists of geologic mapping of bedrock exposures, extensive sample collecting, and analysis of bedrock and surficial materials, supplemented by an interpretation of subsurface geology. The latter was based, in part, on a review of a regional aeromagnetic map.

The U.S. Geological Survey was responsible for collecting bedrock and sediment samples. During the course of the August 1978 sampling, a geologic map (scale 1:62,500) was prepared. It provided a framework for discussing the geology and for interpretating the analytical data and the aeromagnetic map. A number of samples were analyzed by six-step semiquantitative spectroanalysis (Grimes and Marranzino, 1968) for a group of 30 elements. Other more sensitive analytical techniques were used for several other elements thought to be possibly present in rocks of the area. Mineral identification was by thin section and X-ray diffraction methods.

The U.S. Bureau of Mines was responsible for examining mines, prospects, and associated mineral occurrences, and for relating mining and exploration activities in the region to the study area. Mining claim records from the Lake County courthouse in Lakeview, Oreg., were examined to determine names and locations of claims in the vicinity of the Lost Forest study area. Information on the geology and mineral production of the region is from published and unpublished reports by the U.S. Geological Survey, U.S. Bureau of Mines, U.S. Department of Energy, and Oregon Department of Geology and Mineral Industries.

During June 1978, Bureau of Mines personnel spent 18 man-days in field investigations of claim areas and mineral occurrences. Samples were taken where appropriate and analyzed to confirm the presence or absence of particular elements. In addition, each sample was analyzed spectographically to identify anomalous amounts of other elements. Each sample was also checked for radioactivity and fluorescence. Eleven samples were taken from the surface and from auger holes drilled by hand or with a truck-mounted power auger. In the field a portable seismograph was used to determine shallow subsurface conditions, and a scintillometer to test for radioactivity.

Location and geography

The Lost Forest Instant Wilderness study area consists of three separate but contiguous segments of ground in northeast Lake County, Oreg., about 70 mi (113 km) southeast of Bend and 15 mi (24 km) east of the small settlement of Christmas Lake. The three segments which total about 55,000 acres (22,000 ha), are bounded by poor quality desert roads; they are informally referred to as the Lost Forest or "A" area, on the north, the Sand Dunes or "B" area, on the west, and the Juniper Island or "C" area, on the east (fig. 1).

A graded dirt road leads north from Lost Forest to U.S. Highway 20, a distance of about 27 mi (43 km); U.S. Highway 395 can be reached by a graded gravel road 27 mi (43 km) east of Buffalo Well at the southeast corner of the Sand Dunes area. A poor quality powerline maintenance road follows the western and southwestern border of the Sand Dunes area and desert roads of poor quality follow the borders of the other two areas.

Lost Forest occupies a part of the eastern end of Fort Rock Basin, a topographic depression with interior drainage. In earlier, wetter periods of the late Pleistocene, a large pluvial lake filled the basin to a depth of about 200 ft (60 m). The ancient high shorelines of the lake are evident in many places around the basin; some prominent ones are at 4,450 ft (1,356 m), and others at a maximum elevation of about 4,500 ft (1,370 m). Most of the basin floor is about 4,300 ft (1,310 m) above sea level, although the elevation at the Fossil Lake depression, which was the sump for pluvial Fort Rock Lake, is about 4,290 ft (1,308 m). The highest point within the study area apparently is in the northern end of the Juniper Island parcel at an elevation of slightly more than 4,800 ft (1,460 m). Several large crescent-shaped sand dunes east of Fossil Lake stand as much as 50 or 60 ft (15 or 18 m) above the surrounding lake beds.

Lost Forest is near the boundary of the Basin and Range physiographic province on the south and the High Lava Plains province on the north (Dicken, 1950). It includes geologic and physiographic features characteristic of both provinces.

Previous work

Although little systematic geologic mapping has been done in the Lost Forest roadless areas, numerous studies have been made of various aspects of the geology, paleontology, and hydrology of the region.

The first detailed geologic examination of south-central Oregon was by Waring (1908). He mentioned the discovery of soda and borax at Alkali Lake, and nitrates at Wagontire Mountain. Nonmetallic mineral resources in eastern Oregon were discussed by Moore (1937). Allison and Mason (1947) described the sodium salts of Lake County. Mercury deposits near the study area were described by Brooks (1963). Erikson and Curry (1977) did a preliminary study of uranium potential in the region.

Much of the early geologic reconnaissance (Russell, 1884, 1905; Waring, 1908) did not stress evaluation of the mineral and geothermal potential of these areas. The many studies that discuss the occurrence of fossils at Fossil Lake, less than a mile west of the Sand Dunes area, and at localities

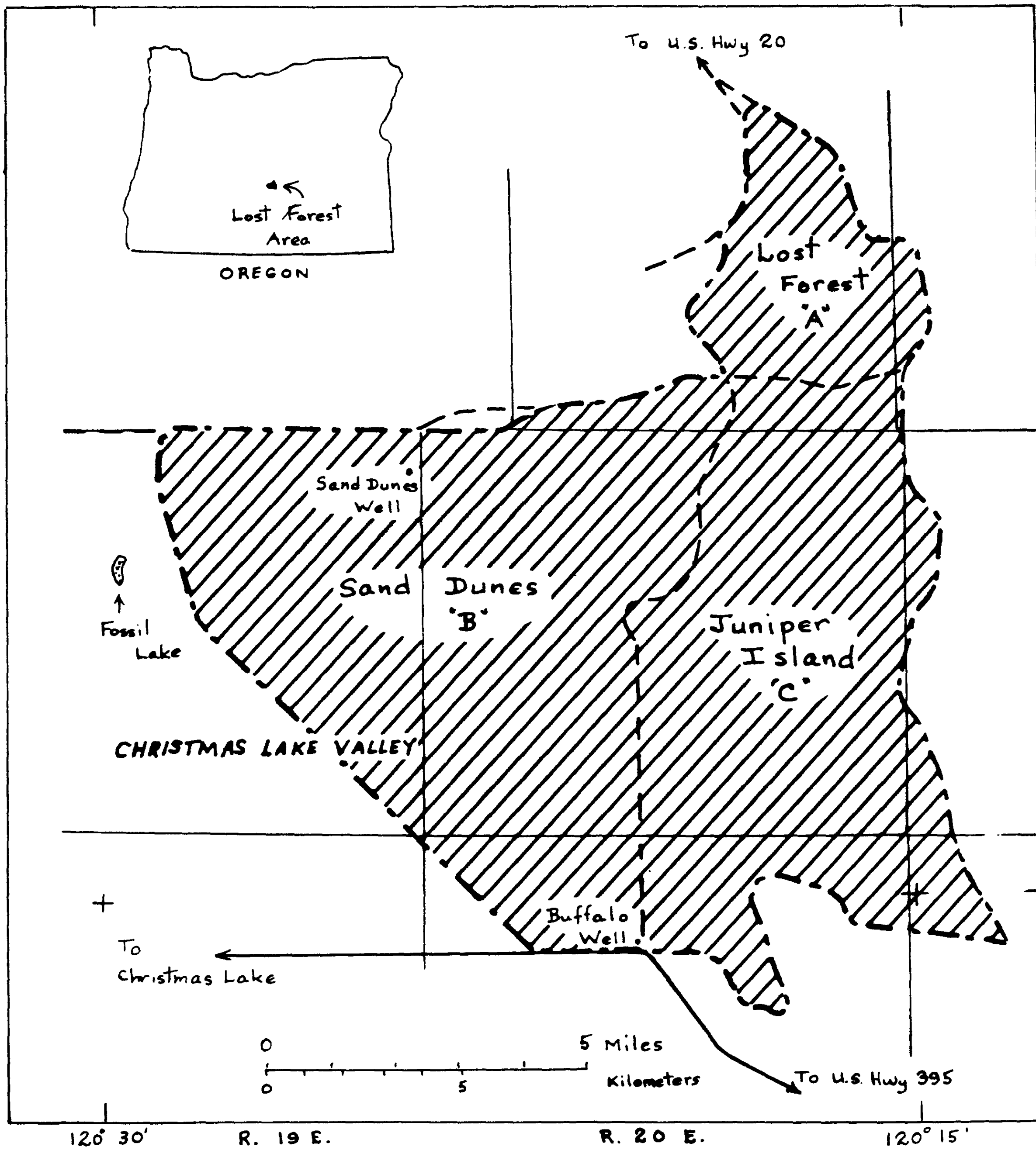

Figure 1.--Index map showing location of Lost Forest roadless areas, Oregon. Separate areas informally named Lost Forest, Sand Dunes, and Juniper Island.

south of Lost Forest, near Buffalo Well, also contribute little data that are of importance in our investigation. Elftman (1931) and Allison (1966) summarized most of the available information concerning the Fossil Lake fossil beds, and included comprehensive lists of published and unpublished papers dealing primarily with fossil identifications and descriptions, and secondarily with the underlying geology. Repenning (1967, p. 40; 1968, p. 63-67) referred to the fossil localities near Buffalo Well.

A summary of several studies of the ground water resources of the region is presented in a report by Hampton (1964); the report includes a generalized geologic map (scale 1:62,500) that covers all but the eastern part of the Lost Forest area.

A small-scale reconnaissance geologic map of the eastern part of the Crescent 2° quadrangle (Walker and others, 1967) shows the generalized geology of the entire Lost Forest region, as well as areas far beyond the boundaries of the proposed wilderness.

Bedwell (1970) mentions some of the features of pluvial Fort Rock Lake and their relation to several archeological sites, which he describes in detail.

Chapter A

Geological and Geochemical Evaluation of Mineral Resources

by

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GEOLOGY

All rocks in and near the Lost Forest candidate areas are of Miocene or younger ages. Included are air-fall tuffs and tuffaceous sedimentary rocks, interstratified basalt and andesite flows, local accumulations of basaltic eruptive material, and broad expanses of several different kinds of Pleistocene and Holocene surficial sediments. These materials were deposited in a developing shallow physiographic and structural basin that started to evolve in late Miocene and early Pliocene times. The area is on or close to the southern margin of the broad, northwest-trending Brothers Fault Zone (Walker, 1969; 1974; Lawrence, 1976) which, in this vicinity, appears to be the northern limit of the Basin and Range province. Both northwest- and northeast-trending normal faults, with displacements mostly less than 100 ft (30 m), and commonly only a few tens of feet (meters), traverse parts of the area. Mafic volcanic vents are present locally; silicic domes and related flows crop out within a few miles of the Lost Forest.

The distribution of rock types exposed in the Lost Forest area are shown on the geologic map (pl. 1). The relative stratigraphic position, lithologic character, and geologic ages of rock units are indicated on the map explanation. In most places these different units can be readily separated. However, where there are few or no outcrops, and identification is based largely on float characteristics, it is difficult, if not impossible, to distinguish palagonite breccia from basalt, particularly where the basalt is altered. Also, active dunes are continually migrating and, in places, intermixing with stabilized dunes and other windblown deposits. Furthermore, in much of the Lost Forest study area, particularly in the southern part of the Sand Dunes parcel (fig. 1), an unmapped thin veneer of windblown silt obscures much of the poorly consolidated bedrock. Originally the western part of the area was covered by late Pleistocene (pluvial) Fort Rock Lake, which had a maximum depth of more than 200 ft (60 m), and with highest shorelines at an elevation of about 4,500 ft (1,370 m) (see pl. 1). In some places wave action on this ancient lake stripped the bedrock, whereas elsewhere a discontinuous veneer of lake sediments was deposited.

The entire sequence of rocks is nearly flat lying or only slightly inclined. Most inclined bedded sedimentary rocks and flows reflect initial dips around basaltic vents and are not the result of subsequent deformation.

Eruptive centers within the Lost Forest study area consist of basaltic cinder cones, tuff rings (maar), and tuff and breccia ridges which represent the vents for fissure eruptions. One cinder cone, in the northern end of the Juniper Island area, is composed of reddish scoriaceous cinders, blocks of more massive material, spindle bombs, and irregular layers of partly agglutinated eruptive spatter. The ejected material ranges from sand-sized particles to chunks and blocks at least 1 ft (0.3 m) in diameter. Tuff rings and tuff and breccia ridges are composed of chilled and altered granulated fragments of basalt and andesite that have undergone various degrees of alteration to palagonite and zeolites. Essentially all of this alteration is the result of basaltic and andesitic lava erupting or flowing into water or invading water-saturated sediments. Mineralized silicic domes and related flows, such as at Elk Mountain, about 3 mi (5 km) east of the southeast corner of the Juniper Island area, and at Glass Buttes, about 10 or more mi (16 or more km) northeast of the Lost Forest, are not exposed at the surface. They may be present at depth beneath the flows and sedimentary rocks that characterized the Lost Forest study area. None of the rocks of the Lost Forest study area show evidence of hydrothermal alteration, either along faults or fractures or adjacent to any of the centers of eruptive activity.

AEROMAGNETIC SURVEY

As part of a geothermal potential evaluation of southeast Oregon, a regional aeromagnetic survey was made of a major segment of the Crescent 2^{o} quadrangle (U.S. Geol. Survey, 1972). The survey, which covers the Lost Forest roadless areas as well as adjacent regions to the west, southwest, and south, was of a reconnaissance nature with east-west flight lines spaced at approximately 2 mi (3 km) intervals.

The generalized magnetic pattern (fig. 2) consists of (1) a smooth, equidimensional low that is centered a few miles northeast of the Lost Forest and extends part way into it and (2) a northwest-trending gradient that separates the equidimensional low from an area characterized by an irregular positive anomaly on the southeast with an amplitude of about 200 to 300 gammas over that in the low.

The smooth, equidimensional low may represent a prism of relatively nonmagnetic tuffaceous sedimentary rocks, or possibly rhyolitic rocks beneath a veneer of Pliocene and Pleistocene basalt and andesite flows. The size and shape of the low is also consistent with a buried caldera filled with relatively nonmagmetic rocks; however, except for the existence of the anomaly itself, there is little evidence to indicate a buried caldera.

The northwest-trending gradient that cuts the northern part of the Lost Forest probably reflects one or more fractures in the Brothers Fault zone; conceivably it could be partly filled with intrusive basalt or rhyolite.

CHEMICAL ANALYSES OF BEDROCK AND SURFICIAL DEPOSITS

Semiquantitative (spectrographic) chemical analyses of bedrock and a variety of surficial materials from localities shown on figure 3 are in accord with an evaluation of a low mineral potential for the Lost Forest study area. Analyses of samples collected within the proposed wilderness (table 1) show no significant anomalies, although several elements (B, Ba, Cr, Cu, Sr, and possibly Y, Zr, and Hg) are apparently locally present in quantities somewhat greater than their average abundances, as indicated by Turekian and Wedepohl (1961). Boron is slightly concentrated in a sample of saline efflorescence from the surface of a playa in the northwestern part of the area (sec. 3, T. 26 S., R. 19 E.; sample LF-16-78). X-ray analysis of this sample indicates that no boron mineral is present, but does show the presence of opal, feldspar, trona ($NaCO_3 \cdot HNaCO_3 \cdot 2H_2O$), halite(?), and clay minerals. Presumably the boron is adsorbed on the clay. Also present in slightly anomalous amounts are barium, in two samples, and chromium, copper, zirconium, possibly yttrium and strontium, and mercury in one sample each. Although the analytical data indicate slightly greater than normal amounts of these few elements in one or more samples, none of these data indicate that economic concentrations are present in the proposed wilderness.

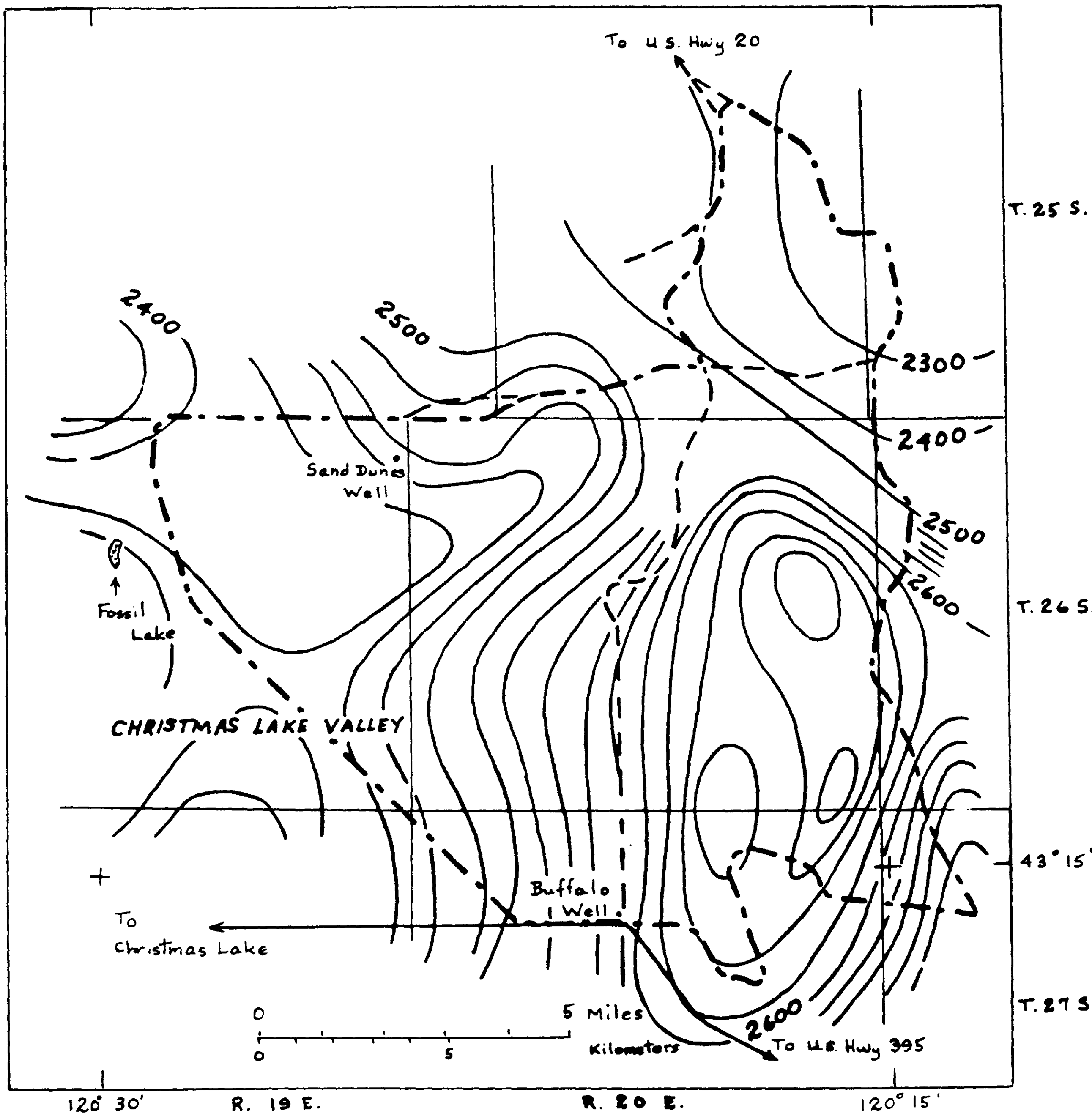

Figure 2.--Aeromagnetic map of Lost Forest area (From U.S. Geol. Survey . 1972).

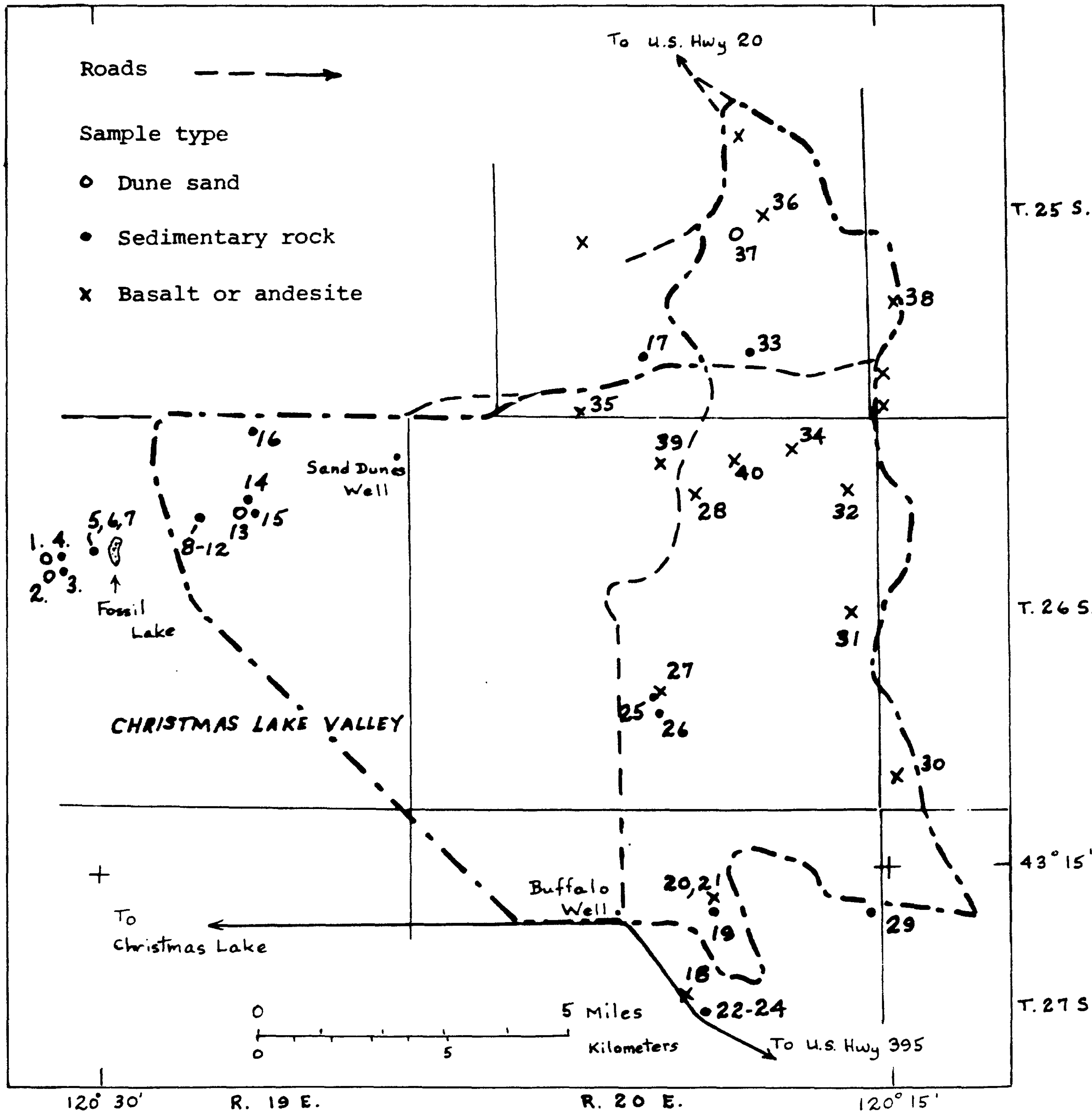

Figure 3.--Map showing sample localities, Lost Forest area, Oregon. Analyzed samples are identified in Table 1 by the letters LF preceding and the year (78) following sample numbers.

Table 1. Analyses of sample from the Lost Forest area, Oregon[1].

[Inst., instrumentation; AA, atomic absorption; F, fluorometric; ppm, parts per million; numbers in parentheses indicate sensitivity limit of method used; N, not detected at limit of detection; L, indicates detected, but below limit of determination. Analysts: D. A. Risoli, A. L. Gurzensky, E. P. Welsch, J. D. Sharkey, and D. M. Hopkins]

		Percent				Semiquantitative spectrographic analyses (6-step) (ppm)																Inst.	AA (ppm)		F
Sample number	Material	Fe (.05)	Mg (.02)	Ca (.05)	Ti (.0002)	Mn (10)	B (10)	Ba (20)	Bo (1)	Co (5)	Cr (10)	Cu (5)	La (20)	Mo (5)	Ni (5)	Pb (10)	Sc (5)	Sr (100)	V (10)	Y (10)	Zr (10)	Hg	Mo	Li	U
LF-1-78	Sand from dune	3.	3.	7.	0.3	700	10	500	L	30	70	30	L	N	30	30	15	700	150	30	70	0.02	L(1)	21	0.3
LF-2-78	do.	3.	1.5	3.	.3	700	15	700	1.5	30	30	30	L	N	30	30	10	500	100	30	150	L(.02)	L(1)	21	.7
LF-3-78	Pleistocene sedimentary rock	3.	1.5	3.	.3	700	20	300	1	20	30	30	L	N	30	L	10	500	150	20	100	.02	L(1)	24	1.1
LF-4-78	do.	3.	1.5	7.	.3	300	15	300	L	15	30	50	20	N	30	L	10	300	300	20	70	.35	L(1)	20	.7
LF-5-78	do.	3.	.7	.7	.3	200	20	150	L	15	30	30	20	N	20	L	10	150	200	10	70	.08	L(1)	24	.3
LF-6-78	do.	1.5	.7	.7	.3	150	15	200	L	10	30	30	20	N	20	L	7	200	300	15	70	.02	L(1)	23	.5
LF-7-78	do.	3.	1.	1.5	.3	300	10	300	1	20	70	15	20	N	20	L	10	500	150	15	70	L(.02)	L(1)	26	.5
LF-8-78	do.	3.	1.5	3.	.3	1000	30	500	1	30	70	70	20	N	50	10	15	500	150	30	150	.02	L(1)	26	.8
LF-9-78	do.	3.	1.5	5.	.3	700	10	300	L	30	70	30	L	N	30	10	10	700	150	20	100	.02	L(1)	13	.8
LF-10-78	do.	7.	3.	5.	.5	1000	L	500	L	30	50	30	L	N	30	L	15	1000	200	15	150	.02	L(1)	10	.5
LF-11-78	do.	5.	2.	3.	.7	1000	L	500	L	30	100	30	L	N	50	L	15	700	150	30	150	.02	1	17	.5
LF-12-78	do.	5.	1.5	3.	.3	700	30	300	L	30	70	50	20	L	70	L	15	300	150	20	100	.04	3	28	.7
LF-13-78	Pumice from dune	3.	1.5	2.	.3	700	15	300	L	15	30	30	L	N	30	L	15	300	150	30	100	.04	L(1)	21	.7
LF-14-78	Pleistocene sedimentary rock	5.	3.	1.5	.5	700	30	300	L	30	70	50	L	N	70	10	15	300	200	30	150	L(.02)	2	21	.8
LF-15-78	do.	2.	.3	.7	.3	700	10	1000	1.5	L	N	5	20	5	L	L	L	150	20	20	300	.02	L(1)	26	.6
LF-16-78	Efflorescence on playa	2.	1.5	1.5	.3	700	200	300	L	10	30	15	L	N	20	L	10	200	300	15	70	.20	2	20	1.0
LF-17-78	Palagonite tuff	7.	5.	7.	1.	1500	L	150	L	70	700	150	L	N	150	L	30	300	200	30	150	.04	L(1)	7	1.1
LF-19-78	do.	7.	1.5	1.5	.5	1500	15	1500	1.5	L	N	15	20	N	7	10	20	200	15	50	150	.04	L(1)	16	.3
LF-22-78	Pliocene sedimentary rock	3.	3.	3.	.5	700	15	300	1.5	15	30	30	20	N	15	L	15	500	150	30	100	.10	L(1)	38	.3
LF-23-78	do.	3.	1.5	1.5	.5	700	15	700	1.5	10	30	30	30	N	15	15	15	200	70	30	150	.02	L(1)	21	.4
LF-24-78	do.	3.	1.5	1.5	.3	700	15	700	1.5	15	70	20	L	N	20	10	10	300	200	20	100	.18	L(1)	26	.8
LF-26-78	Palagonitic sedimentary rock	7.	3.	7.	1.	1500	L	300	L	30	100	100	L	N	70	L	20	300	200	50	150	L(.02)	L(1)	15	1.0
LF-37-78	Send from dune	3.	3.	5.	.7	700	L	300	L	30	100	30	L	N	30	L	15	700	150	15	100	.02	L(1)	18	.07

[1]Looked for but not detected: Ag, As, Au, Bi, Cd, Nb, Sb, Sn, Th, W, Zn.

MINERAL POTENTIAL

Undiscovered minerals or mineral products of commercial interest are not indicated either in surficial deposits or in the bedrock beneath them. Rhyolitic domes and related flows at Glass Buttes, about 15 mi (24 km) northeast of the Lost Forest, and at Elk Mountain, 3 mi (5 km) southeast, have been explored for mercury and possibly precious metals. No indication was found that rhyolitic rocks of this type are present in the subsurface of the Lost Forest areas.

Although diatomite and some zeolites have been recognized in the sedimentary rocks of the area, neither of these commodities are present in sufficient quantity to constitute commercial deposits; there is no indication that they might be more abundant in the subsurface.

The saltpan crusts on several playas is not suitable for economic exploitation because of the small volume of saline minerals. Also the trona and halite(?) identified in these evaporites are both abundantly available at low cost in high-grade deposits elsewhere. There is no evidence that thicker or higher grade deposits of evaporites are present beneath the surface.

Dune sands are composed of a variety of rock-forming minerals, mostly feldspar, pyroxene, olivine, hypersthene, and magnetite, fossil fragments and pumice; they have no value as a source of quartz sand or refractory minerals.

Normally, late Cenozoic volcanic rock with the structure and physical characteristics of that found in the Lost Forest area is not present in mineralized areas. This fact, coupled with analyses of selected samples, indicates the region is devoid of important metals concentration.

POTENTIAL FOR GEOTHERMAL RESOURCES

Spring and well waters in the Lost Forest areas are only slightly above ambient temperature, generally about 17°C (62°F). Higher temperatures have been measured in well waters at the east end of Glass Buttes, about 15 to 20 mi (24 to 32 km) northeast of Lost Forest, and in several springs and wells to the south near Summer Lake (Bowen and Peterson, 1970). These slightly elevated temperatures may relate only to fairly deep circulation of meteoric water along permeable zones into areas of warm rocks. According to Hull and others (1977) the Lost Forest is in a region of higher than normal heat flow, perhaps as much as 2.5 Heat Flow Units. However, no systems with temperatures suitable for electric power generation have been identified and there is no evidence to suggest sufficiently large volumes of hot water suitable for space heating. Without additional study, including detailed hydrologic and heat flow investigations, a final and comprehensive evaluation of the geothermal potential of the area is not possible.

CHAPTER B

Economic Appraisal of Mineral Resources

by

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SETTING

Prospecting in northern Lake County, Oreg., and the surrounding region has been mainly for nonmetallic mineral commodities. Three categories of deposits have been important: crystalline saline deposits in closed-drainage basins; diatomaceous lake sediments deposited sporadically in the region since mid-Tertiary time; and volcanic flows, cinders, and pumice. Silicic vent rocks in the region contain local concentrations of mercury and uranium.

For several years around the turn of the century, sodium borate was scraped from surficial marsh deposits south of Alvord Lake in Harney County, about 100 mi (160 km) southeast of the study area. The process proved economically unfeasible and no production is reported after 1902 (Struthers, 1904, p. 894).

Alkali Lake, about 21 mi (34 km) southeast of the study area, had been claimed for borates by 1908 (Waring, 1908, p. 20). By 1916, small amounts of sodium salts, chiefly carbonates, were being produced from potholes around the margin of the lake (Oregon Bur. Mines and Geology, 1916, p. 292; Phalen, 1917, p. 107). Hydrated sodium carbonate is present in the playa in relatively pure crystalline lenses within potholes.

Between 1904 and 1916, 97 placer claims were located on Wagontire Mountain, 12 mi (19 km) east of the study area, for niter, sodium nitrates, and other salts. Waring (1908, p. 20) reported a small quantity of high quality potassium nitrate on the northwestern side of Wagontire Mountain; the deposits were being developed during 1916 (Oregon Bur. Mines and Geology, 1916, p. 292). No production has been reported from the occurrence, but placer claims were located in the area as late as 1952.

Between 1907 and 1916, most of the playa at Christmas Lake (then called Borax Lake), 6 mi (10 km) west of the study area, was claimed for soda and borax. No production is recorded from the area.

Diatomite is being mined west of Christmas Valley, Oreg., about 20 mi (32 km) west of the study area. The American Fossil, Inc. mine is in the N1/2 sec. 23, T. 27 S., R. 16 E. A modern processing plant produces cat litter, floor sweeping compound, and insecticide carrier from diatomite mined by open pit. The flat-lying ore body is generally 8 to 30 ft (2.4 to 9.1 m) thick; overburden is 2 to 4 ft (0.5 to 1.2 m) thick. American Fossil, Inc., using backhoe trenching, has done some exploration for additional diatomite bodies in the eastern part of Christmas Lake Valley. No significant diatomite beds were found in or near the roadless areas.

Stone, volcanic cinders, and pumice occur in large volumes at several localities in central Oregon. Deposits have been mined near both Burns and Bend, Oreg., but production has come only from small pits in northern Lake County. Volcanic rocks suitable for crushed stone are abundant in the study area; other deposits of comparable quality are closer to markets.

Silicic vent rocks occur in a domal mass at Elk Mountain about 3 mi (5 km) east of the study area. In 1933, cinnabar was discovered in opalized, silicic, volcanic rocks near Glass Buttes, 14 mi (23 km) north of the study area. A total of 93 flasks of mercury were produced from the deposit between 1957 and 1961 (Brooks, 1963, p. 173). Small occurrences of cinnabar in opalized tuff were also discovered 25 mi (40 km) east of the Lost Forest study area on the north side of Horse Head Mountain (Brooks, 1963, p. 204). Late Tertiary tuffs, breccias, and agglomerates near flow-banded rhyolite intrusions, about 70 mi (113 km) south of the study area, contain uranium minerals. About 386,000 pounds (175,000 kg) of U_3O_8 were produced from the White King and Lucky Lass mines from 1955 to 1965 (Peterson and McIntyre, 1970, p. 47).

MINING CLAIMS

Sand Springs Niter claims

Five placer claims were located partially within the Lost Forest (A) and Sand Dunes (B) roadless areas (fig. 4,) in April 1918. They are about 9 mi (14 km) northeast of Fossil Lake in the S1/2 sec. 28 and N1/2 sec. 33, T. 25 S., R. 20 E. Elevation is 4,500 ft (1,370 m). Access is by 26 mi (42 km) of gravel and dirt road northeast from Christmas Valley, Oreg., or by about 20 mi (32 km) of dirt road south from U.S. Highway 20 at a point about 65 mi (105 km) west of Burns, Oreg.

The claims were located for borates, nitrates, and other minerals. The Perry claim, comprising the NW1/4 sec. 33, was located by J. O. Perry and others. The remaining four, Tree Top (covering the same ground as Perry), Sandy, Windy, and Boot Heel claims were located by the Sand Springs Niter Company formed by W. C. Snyder and others.

Unconsolidated gravel, sand, and silt in the claimed area are overlain by windblown sand accumulations of differing thickness. The older sediments probably are beach or deltaic deposits formed when the Pleistocene lake which occupied Christmas Lake Valley was near its highest level. A Quaternary subaqueous basaltic cone in the NW1/4 sec. 33, T. 25 N., R. 20 E., provides the greatest topographic relief in the area, and acts as a trap for windblown sand. Thin, vesicular, gray-to-black, Tertiary basalt flows crops out and probably underlie the entire claimed area at a shallow depth.

The mainly basaltic gravels are generally subrounded and poorly sorted; mollusk fossils are common. Sand particles consist of common rock-forming minerals with pumice and basalt fragments. No crystalline nitrates, borates, or other salts are exposed in the claimed area, nor does diatomite appear at the surface. No prospect workings were found.

Eight samples were taken from auger holes in the claimed area. Three holes were drilled 100 ft (30.5 m) apart along a line running N. 32° E. from the high point of the breccia cone. Two were drilled with a truck-mounted power drill using a 4-in. (10-cm) diameter auger. Four samples came from the first hole, between the surface and a depth of 10 ft (3.0 m); the hole bottomed at 10.8 ft (3.3 m). Three samples were from the second hole, in the interval from 5 to 22 ft (1.5 to 6.7 m) of depth; the hole bottomed at 26 ft (7.9 m). The third hole was drilled with a 6-in. (15-cm) diameter hand auger to a depth of 6 ft (1.8 m); one sample was taken in the interval from the surface to 3.3 ft (1.0 m) of depth. All samples consisted of silty, gravelly sand or sandy gravel, in part fossiliferous, and contained less than 6 percent calcium, less than 1 percent sodium, and no detectable borates or nitrates.

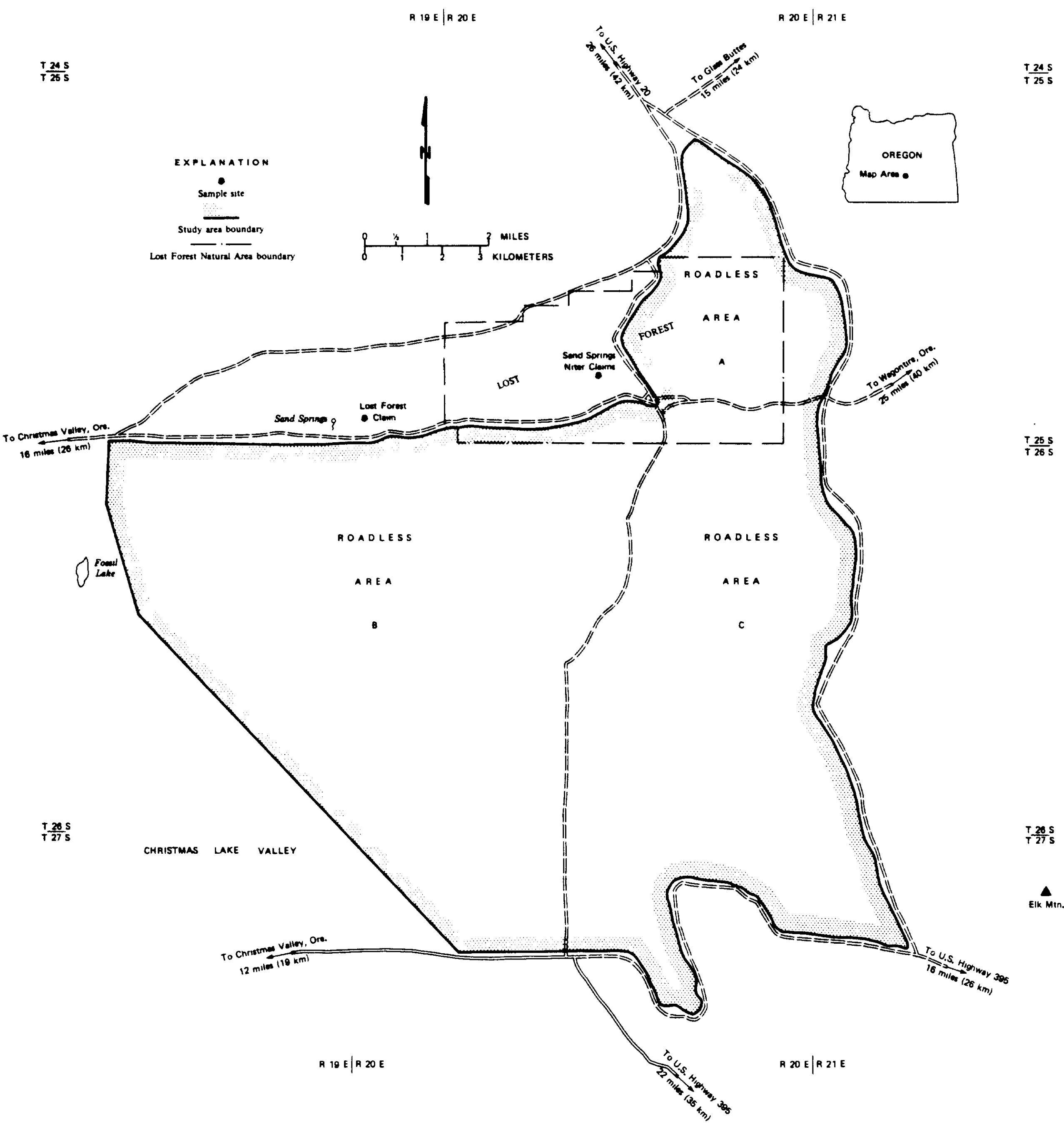

Figure 4.--Mining claims in the Lost Forest Instant Wilderness Study Area.

A 300-ft-long (91 m) seismic survey line was run N. 32° E. perpendicular to the supposed former beach line from a point 750 ft (229 m) northeast of the breccia cone. Results indicated no significant stratification in the sediments, which are about 25 ft (7.6 m) thick.

No evidence of concentrations of economically significant minerals was found in the claimed area. Saline and diatomite deposits commonly are found near the center of a closed-drainage basin. The claimed area is near the margin of Christmas Lake Valley, indicating little potential for the discovery of these resources.

Lost Forest claim

The Lost Forest claim along the northern margin of the Sand Dunes (B) roadless area, was located by H. P. Landon in April 1969. It is about 22 mi (35 km) by gravel and dirt roads northeast of Christmas Valley, Oreg., in sec. 35, T. 25 S., R. 19 E., at an elevation of 4,300 ft (1,310 m). The claim area consists mainly of windblown sand. Low dunes are partially stabilized by grasses and shrubs; interdune areas are generally flat bottomed and seasonally wet. Basalt and obsidian fragments, as much as 6 in. (15 cm) in diameter, are common in low areas. No outcrops or economically significant mineral accumulations were found. Sand Springs, mentioned by Waring in 1908 (p. 66), is near the claim. It is considered a low temperature (62°F (17°C)) geothermal spring (Bowen and Peterson, 1970, map).

Sand in the claim area consists of common rock-forming minerals and rock fragments. Potential for the discovery of mineral deposits on the claim is low. The sand does not constitute a resource because equal or better quality material outside the area is closer to markets.

Other claims

In 1939, 68 lode claims (Elk Butte 1-68) were located near Elk Mountain (sec. 3, T. 27 S., R. 21 E.), about 3 mi (5 km) east of the southeast corner of the study area. In 1949, three more claims (Desert Hawk 1-3) were located in the same area. Small prospect pits were excavated, but no mercury or other mineral deposits were found in the rhyolitic vent rocks. A brief survey using a scintillometer with a sodium iodide crystal 1.5X1.5 in. (3.8X3.8 cm) failed to detect any anomolous radioactivity.

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