STUDIES RELATED TO WILDERNESS

LARAMIE PEAK AREA, WYOMING

GEOLOGICAL SURVEY BULLETIN 1397-B

Mineral Resources of the Laramie Peak Study Area, Albany and Converse Counties, Wyoming

By KENNETH SEGERSTROM, U.S. GEOLOGICAL SURVEY,
and ROBERT C. WEISNER, U.S. BUREAU OF MINES

With a section on AEROMAGNETIC INTERPRETATION
By M. DEAN KLEINKOPF, U.S. GEOLOGICAL SURVEY

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An evaluation of the mineral potential of the area

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STUDIES RELATED TO WILDERNESS

In accordance with the provisions of the Wilderness Act (Public Law 88-577, Sept. 3, 1964) and the Joint Conference Report on Senate Bill 4, 88th Congress, the U.S. Geological Survey and the U.S. Bureau of Mines have been conducting mineral surveys of wilderness and primitive areas. Studies and reports of all primitive areas have been completed. 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. This report discusses the results of a mineral survey of some national forest lands in the Laramie Peak study area, Wyoming, that is being considered for wilderness designation. The area studied is on the crest of the Laramie Mountains in southeastern Wyoming.

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STUDIES RELATED TO WILDERNESS

MINERAL RESOURCES OF THE LARAMIE PEAK STUDY AREA, ALBANY AND CONVERSE COUNTIES, WYOMING

By KENNETH SEGERSTROM, U.S. Geological Survey, and ROBERT C. WEISNER, U.S. Bureau of Mines

SUMMARY

The U.S. Geological Survey and the U.S. Bureau of Mines made a mineral survey of the Laramie Peak study area, Wyoming, in 1973. The U.S. Geological Survey also made an aeromagnetic survey in 1972. The area proposed for examination by the U.S. Forest Service comprises about 34,500 acres (13,760 hectares) in Albany and Converse Counties, Wyo., and is in the highest part of the Laramie Mountains. In order to cover all areas that were considered by the Forest Service for inclusion in the study area, approximately 57,000 acres (23,000 hectares) were surveyed.

The Laramie Peak study area is underlain for the most part by granite of Precambrian age, although several small roof pendants of Precambrian metamorphic rock exist, as do numerous Precambrian dikes of diabase and amphibolite. Most of the area is a northeast-striking horst bounded on the southeast side by a shear zone and on the northwest side by a fracture zone in which a swarm of mafic dikes is emplaced. Mineralized rock containing minor amounts of copper and nickel is locally associated with the shear zone and with a few of the mafic dikes which have been sheared.

The study included geologic and aeromagnetic mapping with emphasis on the search for evidence of mineral deposits and sampling of rocks and stream sediments. Spectrographic analysis of all samples, plus further analyses of selected samples by atomic absorption (arsenic, gold), fire assay (platinum, palladium) and beta-gamma scaler (equivalent uranium) were made. The geological, geophysical, and geochemical studies indicate that the mineral potential of the Laramie Peak study area is low. No patented mining claims and no oil and gas leases are within the area, and examination of numerous unpatented claims within and adjacent to the area revealed no indication of potential mineral resources. Only three samples (U.S. Bureau of Mines Nos. 1, 17, and 32) taken from within the study area yielded other than negligible mineral values. Sample 1 assayed 0.17 ounce of gold per ton(5.8 ppm (parts per million)), sample 17 contained 1,300 ppm copper (0.13 percent), and sample 32 assayed 5.6 ounces of silver per ton (192 ppm). Several samples from outside the study area in the vicinity of Esterbrook and along the east side of the study area contained anomalous metal values; these are listed in the text of the report. The geologic setting (Precambrian rocks) precludes the presence of fossil

fuels. Commercial-quality nonmetallic minerals such as building stone and sand and gravel are present, but abundant supplies of these materials are available closer to the markets. There is no evidence to indicate that geothermal energy could be developed within the Laramie Peak study area.

INTRODUCTION

This bulletin presents the results of a general geologic study and mineral survey of the Laramie Peak study area, Wyoming. The boundaries of the area have been changed from time to time, so that the area which was actually studied is larger than the 34,500 acres (13,760 hectares) designated by the Forest Service. The area actually studied is about 230 km^2 (90 mi^2 (square miles)), about 70 percent more than the area shown between the study area boundaries on the map. The study area (fig. 1) is in the Laramie Mountains, southeastern Wyoming. It is within the Medicine Bow National Forest, in Albany and Converse Counties.

CHARACTER AND ACCESS

Laramie Peak, in the southern part of the area (pl. 1), is the principal landmark of southeastern Wyoming and westernmost Nebraska. The summit of the peak, 3,133 m (metres) (10,272 ft) above sea level, is about 300 m (1,000 ft) higher than the next highest peaks in the Laramie Mountains. The northeast-trending Laramie Peak study area (fig. 1), about 25 km (kilometres) (16 mi (miles)) long, and 4–8 km (2.5–5 mi) wide, comprises about 138 km^2 (54 mi^2) of exceptionally rugged Precambrian terrain with total relief of 1,400 m (4,600 ft) (pl. 1). The east side of Laramie Peak rises 915 m (3,000 ft) in a distance of 1.6 km (1 mi). Narrow ridges and broad gullies with steep gradients strewn with exfoliated blocks and talus characterize Laramie Peak, South Mountain, and Bear Head Mountain, in the southern part of the area. The narrow gorge of Horseshoe Creek, with nearly vertical walls of granite as much as 150 m (about 500 ft) high, is the most spectacular topographic feature of the northern part.

Main streams are Horseshoe Creek, Cottonwood Creek, and Bear Creek, draining the northern, middle, and southern parts of the area, respectively. Water from these east-flowing, perennial streams is the principal resource of the area. Numerous beaver ponds are picturesque features of the upper reaches of the tributary creeks. There are no lakes in the area.

The Laramie Peak study area is accessible by fair roads from Glendo and Douglas, and by a relatively poor road from Wheatland (fig. 1). Forest Service roads skirt the east and west sides of the area. In general, all of these roads are difficult to travel in wet weather, because they are not surfaced except for short distances from the forementioned towns. Silt and clay derived from Tertiary deposits that fringe the Precambrian mountain mass make some stretches of road nearly impassable during heavy rains and for a few hours afterward.

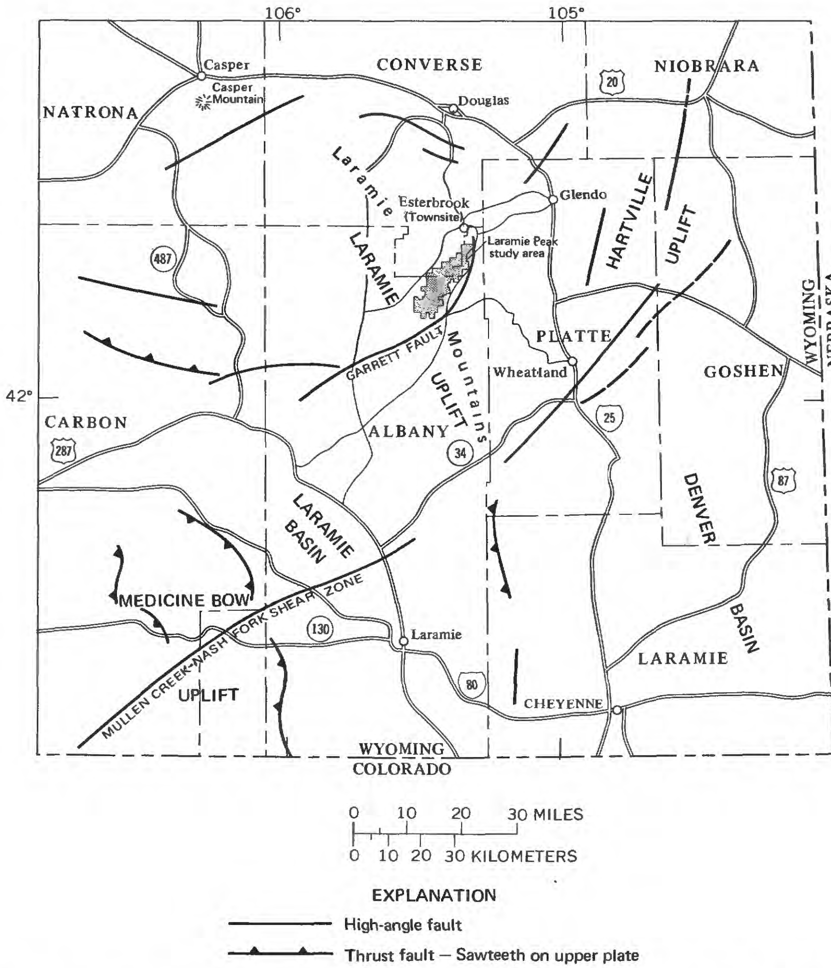

FIGURE 1.—Index map of southeastern Wyoming showing the location of the Laramie Peak study area, roads, and principal structural geologic features.

Three constructed trails penetrate parts of the area. One of them leads to a Forest Service lookout tower on top of Black Mountain. Another crosses the southern part of the area, along Arapaho Creek. A third trail leads up the west side of Laramie Peak to the summit (pl. 1). Access to remote parts of the area is by game trails, but such routes are generally too overgrown with vegetation to be traveled by horseback.

CLIMATE AND VEGETATION

In the summer the climate of the Laramie Peak study area is generally mild and pleasant. In the winter the climate is typically windy, cold, and dry. Heavy snowfall is common in the spring. Snowbanks linger on the upper slopes of Laramie Peak until early in July. The annual precipitation is 508–635 mm (millimetres) (20–25 in.).

The study area is heavily forested except for about 4 km^2 (1.1 mi^2) at the north end, around the Maggie Murphy mine, and a similar tract on the east side, north of White Ranch, where fires occurred 10–15 years ago.

PREVIOUS INVESTIGATIONS

Geologic literature of the Laramie Peak study area is meager. Previous geologic studies, including small-scale geologic mapping, were of a reconnaissance nature. Several short, unpublished reports on prospecting and development at and near Esterbrook, just north of the area, were written by Henry C. Beeler during the period 1902–6. The most extensive study of the region was by Darton (1916, p. 53–56, pl. 4). His publication includes a geologic map of the north Laramie mountains and adjacent region, at a scale of about 1:4,000,000, and descriptions of the sedimentary rocks. Spencer (1916, p. 47–53 and 56–81) described the Precambrian rocks and mineral deposits of the same region. Smith (1954) investigated areas of anomalous radioactivity in the vicinity of Esterbrook. Guilinger (1956) studied the possible relationship of uranium occurences to base-metal deposits, and the metamorphic and intrusive rocks. Greeley (1962) studied the geology of the Esterbrook area. Osterwald and others (1966)reported occurrences of copper, lead, uranium, lithium, beryl, iron, silver, gold, zinc, and bismuth near the northernmost part of the study area. The Laramie Peak study tract is included in a reconnaissance petrological and geochemical study of much of the Laramie Mountains by Condie (1969). Hills and Armstrong (1974) have reported on the geochronology of Precambrian rocks in the Laramie Mountains.

PRESENT INVESTIGATIONS

The Laramie Peak study area and vicinity were mapped geologically and sampled by the U.S. Geological Survey in the summer of 1973. Aerial photographs at an approximate scale of 1:20,000 taken for the U.S. Forest Service in 1957 were used in mapping. Geologic contacts, structures, and sample localities were transferred from the photographs to topographic maps of the following quadrangles: Esterbrook (1943), Cow Creek Mountain (1968), South Mountain (1968), and Windy Peak (1964). Plate 1 is compiled at 1:48,000 scale on the topographic maps from the geology that was plotted on the aerial photographs. The results of an aeromagnetic survey of the area which was made by the U.S. Geological Survey in 1972 also is shown on plate 1. Interpretation of this survey was made by M. D. Kleinkopf. The 433 stream-sediment samples, 205 rock outcrop samples, and 19 mine-tailings samples which were collected in the field were analyzed by the U.S. Geological Survey.

Investigations by the U.S. Bureau of Mines, also in the summer of 1973, were by R. C. Weisner, who first obtained mining claim records in the courthouses at Douglas, Wyo. (Converse County), and Laramie, Wyo. (Albany County), and then searched for these claims in the field. U.S. Bureau of Land Management land-status records in Cheyenne, Wyo., were also checked. Detailed sampling was made of all mining-claim sites and prospect workings which were found. Analyses of 80 samples were made by the Bureau of Mines.

ACKNOWLEDGMENTS

Local ranchers Arthur Fawcett, Thomas Pickerall, Lawrence Prager, and Bert Shoemaker permitted access through their land and provided friendly cooperation in many ways. Jack Saunders, Assistant District Ranger at Douglas, Wyo., shared with us his extensive knowledge of the area. Discussion of the geology of the region with F. A. Hills of the University of New York at Buffalo was very helpful.

GEOLOGY

GEOLOGIC SETTING

The Laramie Peak study area occupies part of the northern Laramie Mountains (fig. 1), carved chiefly in the Precambrian crystalline rocks of a structural block called the Laramie uplift. The uplift is flanked by upwarped Paleozoic and Mesozoic sedimentary rocks. The study area is underlain by granite for the most part, but diabase and amphibolite are exposed in numerous dikes, and hornblende schist and other metamorphic rocks are exposed in several roof pendants (or xenoliths?). The uplifted block is bounded on the southeast side by a shear zone which contains minor copper and nickel minerals, and on the northwest side by a broad fracture zone into which a swarm of mafic dikes has been emplaced.

PRECAMBRIAN ROCKS

All the rocks of the Laramie Peak study area are of Precambrian age. The oldest of these rocks are hornblende gneiss and schist, mica schist, quartzite, and pegmatite. Jaspilite occurs locally in the gneiss and quartzite. The next oldest and most abundant rock is granite, which intrudes the metamorphic-pegmatitic complex. The youngest rocks are numerous dikes of diabase and amphibolite, which intrude the older rocks.

METAMORPHIC ROCKS AND EARLY PEGMATITE

Gray to greenish-gray hornblende gneiss and schist are the most abundant metamorphic rocks of the area. The gneiss and schist are composed mostly of hornblende, quartz, and feldspar. Hematite, epidote, pyrrhotite, garnet, calcite, chlorite, kaolin(?), and sphene also occur in these rocks. Locally in NE¼ sec. 34, T. 28 N., R. 71 W., the hornblende gneiss contains abundant porphyroblasts of garnet as much as 1.5 cm (centimetres) (0.6 in.) across.

Massive, fine-grained quartzite, the next most abundant metamorphic rock, is light-gray to pinkish-gray, and occurs as lenses in the hornblende gneiss. Muscovite biotite quartz schist, the third most abundant metamorphic rock, is interbedded locally with the hornblende rocks and quartzite. Banded iron-formation or jaspilite occurs in sec. 21, T. 28 N., R. 71 W., but its outcrops are small—less than 1 m (3 ft) across—and few.

The gneiss, schist, and quartzite are injected with white to light-gray pegmatite. The pegmatite bodies are tabular, as much as 10 m(32 ft) thick in sec. 21, T. 28 N., R. 71 W., and are generally conformable with bedding and foliation in the enclosing metamorphic rocks. Because of their greater resistance to chemical decomposition and erosion, the pegmatite outcrops stand as much as 2 m (more than 6 ft) above adjacent gneiss and schist. The rock is composed largely of quartz, microcline, albite, and muscovite. Grain size is highly irregular; feldspar crystals are as much as 13 mm (0.5 in.) long.

GRANITE

The metamorphic-pegmatitic complex is intruded by granitic rocks of the Laramie batholith, which was first defined by Condie (1969, p. 61). The roof of the batholith has been largely removed by erosion, so that intrusive rocks are exposed in more than 95 percent of the Laramie Peak study area. The granitic rocks are characteristically light pinkish gray to reddish brown, massive, holocrystalline, and medium grained. They tend to weather by exfoliation. The rocks of the Laramie batholith are largely composed of approximately equal parts of quartz, potassium feldspar, and plagioclase, but modal analyses show that they range in composition from quartz monzonite to granodiorite to granite. Biotite, the chief ferromagnesian mineral, constitutes 2–5 percent of the rock. Sericite, hornblende, chlorite, limonite, hematite, and epidote, where present, are believed to be secondary. "Magnetite and apatite are the only abundant primary accessory minerals" (Condie, 1969, p. 62).

Small veins and stringers of aplite and pegmatite occur in the granite. These are believed to be unrelated to and younger than the much larger pegmatite bodies that are emplaced in the metamorphic rocks.

Metamorphic and granitic rocks at the northern end of the Laramie Mountains and, by inference, the rocks of the Laramie batholith were assumed to be part of a 2.5- to 2.7-b.y. (billion-year) Wyoming crust (Condie, 1969, p. 58). The assumption was based on a single strontium-rubidium age determination of 2.45 b.y. on biotite from gneiss on Casper Mountain, about 90 km (56 mi) west-northwest of Esterbrook (Giletti and Gast, 1961, p. 455). This assumption was strengthened by analyses of nine samples of granitic rocks from a belt extending from 40 km (25 mi) south of Esterbrook to about 30 km (19 mi) west of Esterbrook; a minimum age of 2.54±0.4 b.y. (Rb/Sr whole-rock isochron) was determined from those samples (Hills and Armstrong, 1974).

Age determinations of samples from two localities on the road from Esterbrook to Friend Park, just west of the Laramie Peak study area, gave 1.235±0.025 and 1.336±0.027 b.y. (K/Ar biotite from granite gneiss), according to Hills and Armstrong (1974, table 2). They believe, however, that the relatively young dates obtained there have been reset by subsequent metamorphism of granite which was emplaced about 2.5 b.y. ago. A map of the northern Laramie Mountains with contours on biotite K/Ar dates indicates that rocks of the Laramie Peak study area and vicinity have been affected by metamorphism more recently than other rocks of the range, and that the latest metamorphic event is progressively older northwestward (Hills and Armstrong, 1974, fig. 2).

MAFIC DIKES

Numerous greenish-gray to black dikes of metadolerite, metagabbro, and amphibolite intrude the granitic and metamorphic rocks of the Laramie Peak study area and vicinity. All the dikes which were observed in the field are shown on plate 1, but it is probable that a few more, concealed by soil and vegetation, exist. The dikes are as much as about 8 km (5 mi) long and are about 1–25 m (3–80 ft) wide; on plate 1 the dikes are shown by symbol, as they are too narrow to be plottable at true scale.

The dike rocks are composed of hornblende and clouded plagioclase for the most part and have textures that range from aphanitic to coarsely holocrystalline and from massive to closely foliated. The hornblende appears to be a uralite, according to Greeley (1962, p. 30), but thin sections of the samples collected by Segerstrom in 1973 do not seem to contain hornblendes with uralitic characteristics, such as pseudomorphism after pyroxenes. As much as a few percent of quartz and magnetite also occur; where the quartz is less than 1 percent the rock can be called an amphibolite. Plagioclase crystals in the amphibolite seem less clouded than those in the other dike rocks; their composition is in the andesine-labradorite range. Hematite, epidote, chlorite, and sericite are common secondary minerals.

Despite our failure to recognize uralitization in thin section, we believe that the dikes were pyroxene-rich when emplaced, but that they have been subsequently altered either by deuteric processes or by regional metamorphism. In the Cloud Peak Primitive Area, north central Wyoming, where similar dikes cut granitic rocks of similar age to that of the Laramie batholith, a continuum from pyroxene to hornblende may be seen in the dike rocks (T. J. Armbrustmacher, oral commun., 1973). The metamorphic event or events that reset the dating of granite in the Laramie Mountains (Hills and Armstrong, 1974, fig. 2) may well have caused the virtually complete transformation of pyroxene to amphibole in the dikes of the present study area.

Closely spaced foliation in the dikes, where present, is believed to be evidence of shearing stresses along faults, rather than schistosity resulting from recrystallization during a regional metamorphic event. Such foliation is restricted to one or both margins of many of the dikes and in places the foliation extends into the enclosing granite.

PROMINENT QUARTZ VEIN

A vertical quartz vein 1–2 m (3–6 ft) wide and traceable at the surface for about 230 m (750 ft) cuts a small roof pendant and extends into granite on either side, in sec. 29, T. 27 N., R. 72 W. The vein appears to be barren of sulfides and other minerals, with the possible exception of feldspar. Many quartz veins, too small to be shown on the map at 1:62,500 scale, occur elsewhere in the granite and metamorphic rocks.

PALEOZOIC SEDIMENTARY ROCKS

CASPER FORMATION

Pale-red and light-gray sandstone is exposed along Three Cripples Creek (pl. 1) about 4 km (2.5 mi) east of Esterbrook and a little north of the study area (pl. 1). Light-gray limestone underlies the sandstone in several exposures north of the creek. These sedimentary rocks form part of the Casper Formation, of Middle and Late Pennsylvanian and Early Permian age; a stratigraphic section of this formation, 366 m (1,200 ft) thick, was measured at Macfarlane Ranch, 3.2 km (2 mi) to the east of the exposures north of the Three Cripples Creek (Agatston, 1954, p. 536, 550, 581).

TERTIARY SEDIMENTARY ROCKS

WHITE RIVER AND OGALLALA FORMATIONS

Unconsolidated sedimentary deposits underlie the northeastern edge of the mapped area of plate 1 and extend for many kilometres to the east. White silt-sized material, much of it volcanic ash, is exposed below an altitude of about 1,700 m (about 5,500 ft) in cuts along the road in E½ sec. 12, T. 28 N., R. 71 W. (pl. 1). This material, largely silt-sized and almost completely devoid of heavy minerals, is characteristic of the White River Formation of Oligocene age (N. M. Denson, oral commun., 1973).

Overlying the White River Formation is a sequence of gray silt, sand, and gravel containing abundant heavy minerals. These sediments are assigned to the Ogallala Formation of Miocene and Pliocene age. The contact between the White River and Ogallala Formations is concealed by colluvium in the northeastern part of the study area, where all the Cenozoic rocks are shown as a single unit.

A poorly sorted gravel deposit underlies a large area that extends from near Esterbrook westward for several kilometres. This deposit, which is typical of the fanglomerate facies of the Ogallala Formation, rests directly on Precambrian rocks on the west side of the study area, as opposed to its superposition on the White River Formation to the east of the mountains.

QUATERNARY TALUS DEPOSITS

Talus composed of angular blocks of granite, as much as 5–6 m (about 16–20 ft) across, covers steep slopes and partly fills broad gullies on Laramie Peak and adjacent high ridges. The talus, which probably attains thicknesses of 10–20 m (about 32–65 ft), is an important collector of water; with little or no surface runoff the downward-percolating raindrops and snowmelt give rise to springs at the headwaters of Friend, Cottonwood, Ashenfelder, and Lost Creeks (pl. 1).

QUATERNARY ALLUVIUM

Alluvial deposits exist along all watercourses, but in the rugged terrain enclosed by the boundary lines of the Laramie Peak study area these deposits are generally small. The alluvial deposits consist mostly of well-sorted sand and gravel. Where the deposits are too small to be shown on the plate, their widths are not more than about 6 m (20 ft). The unmapped alluvium is generally course, ill sorted, and composed of poorly rounded clasts of rocks and rock-forming minerals.

STRUCTURE

The Laramie Mountains and the Laramie uplift are two names for the same topographic and structural feature. The north-to-northwest-striking Laramie uplift (fig. 1) is a product of the Laramide Orogeny or Revolution, which resulted in deformation of the Rocky Mountains in the United States and Canada and of the Sierra Madre Oriental in Mexico. Today the Laramie uplift has an exposed Precambrian core flanked by outward-dipping Paleozoic and Mesozoic sedimentary rocks.

The small part of the Laramie uplift that is included in the Laramie Peak study area covers the greater part of a northeast-striking horst about 30 km long and 5–10 km wide (roughly 20 by 3–6 mi). The horst is bounded on the southeast side by an arcuate fault or shear zone, an extension of the Garrett fault (Condie, 1969, pl. 1), with an average width of about 300 m (1,000 ft). Uplift of the northwest side with respect to the southeast side of the shear zone is indicated by the outcrops of Paleozoic rock near Three Cripples Creek at the foot of an escarpment of Precambrian granite about 150 m (500 ft) high; this height represents a minimum displacement by faulting. The fault zone is fairly well exposed along roads in secs. 23 and 26, T. 28 N., R. 71 W., sec. 19, T. 26 N., R. 71 W., and sec. 24, T. 26 N., R. 72 W. (pl. 1); at these locations the shear planes are vertical and are spaced a few millimetres to a few centimetres apart.

The horst is bounded on the northwest side by a swarm of northeast-striking mafic dikes indicating a Precambrian ancestry to this structural trend. These dikes and the crystalline rock they intrude are deformed by closely spaced vertical shear planes of probable Laramide age along and near the dike edges. The shearing extends for a metre or so (3 or 4 ft) into the country rock on either side of the dikes, particularly in sec. 36, T. 27 N., R. 73 W., and in sec. 36, T. 28 N. R. 72 W., (pl. 1). A few of the dikes appear to be sheared throughout their entire width, although it is possible that this appearance may be due to schistosity, and hence a result of regional (dynamic) metamorphism rather than faulting.

The horst is sliced diagonally by two north-striking, en echelon faults whose combined length is a little more than 11 km (7 mi). The faults are followed in part by Horsehoe Creek, Roaring Fork, and Saltlick Creek, and are almost entirely concealed by valley-fill deposits, too narrow to be shown on plate 1, and by rock debris. Development of an obvious shear zone is not noted along the faults, except in T. 27 N., R. 71 W., sec. 8, at the Ashenfelder mine and vicinity, where vertical fracture planes occur as much as 140 m (about 450 ft) east of and parallel to the main fault trend. Dikes are not obviously displaced, yet they seem to be terminated by the faults at a few places. Vertical displacement along the faults is not evident.

A prominent fault in the southern part of the study area can be traced on aerial photographs for 5 km (about 3 mi). The strike is approximately N. 80° W. Along the fault right-lateral displacement of a prominent dike is about 350 m (nearly 1,200 ft), in NW¼ sec. 12, T. 26 N., R. 72 W. (pl. 1). The broad, low saddle between Laramie Peak and South Mountain and a segment of the upper valley of Cottonwood Creek are topographic expressions of the fault.

Northeast-striking, nearly vertical joints are so common throughout the granite outcrop area that they form a strong grain in the topography. Where the joints are filled with the ubiquitous mafic dikes they are shown on the map (pl. 1), thus highlighting the strong, northeast structural grain of the granite terrain.

INTERPRETATION OF AEROMAGNETIC DATA

By M. DEAN KLEINKOPF, U.S. Geological Survey

In August 1972 the U.S. Geological Survey flew an aeromagnetic survey of part of the Laramie Mountains between lats 42°10′ and 42°25′ N. and longs 105°15′ and 105°35′ W., which includes the Laramie Peak study area, Wyoming. The survey was flown at flight-line spacing of 1.6

km (1 mile) and barometric elevation of 3,050 m (10,000 feet). Compiling was done at scale 1:62,500, and contouring at 20-gamma interval. No measurements of rock magnetic properties were made.

The magnetic map can be divided into two areas on the basis of different magnetic patterns. The northern part of the map, in contrast to the southern part, shows lower intensity values and broad low relief features. Many of the magnetic features can be related in part to the distribution of high and low topography. The exceptions will be discussed below in more detail.

The most conspicuous feature on the map is a high-gradient zone that trends eastward across the central part of the area. Some topographic influence is present, but the nature of the gradient zone suggests that a localized magnetic source such as a system of eastward-trending dikes is present in the near subsurface. Mafic dikes crop out to the west but not to the east. In an area 3 km (2 mi) south of Laramie Peak, magnetic trends are in part coextensive with outcropping mafic dikes. The Garrett fault or shear zone along the east side of the area shows in the magnetic data as a series of negative magnetic features. These can be readily traced from the elongated closed low at Harris Park south along a low nose, through a low saddle, and finally along a steep magnetic gradient zone shown at the south edge of the map (pl. 1).

Other magnetic features in the south part of the area appear to be caused mainly by topography. There may be some influence from magnetite-enriched phases of the Precambrian granite that are topographically high. A notable exception appears to be the large magnetic closure of greater than 100 gammas located southeast of the Garret shear zone and beyond the boundary of the study area. This high suggests the presence in the subsurface of an equidimensional, somewhat vertical-sided stock which may be the source for nearby mineralization. No surface evidence of the postulated mass was detected in the field, although there is a subtle topographic expression that would provide an insignificant contribution to the total magnetic anomaly. From geophysical indications the postulated intrusive appears to be the only potential source of mineralization in or adjacent to the study area.

The most prominent magnetic feature in the north part is a northeast-trending low of 50–60 gammas. The configuration of the magnetic anomaly suggests a graben-like feature although the only surface expressions observed were parallel mafic dikes. Along the northwest side, the strike of the magnetic contours correlates with a well-defined system of exposed dikes.

GEOLOGIC HISTORY

During Precambrian time existing rocks were metamorphosed, granite and dike rocks were emplaced, and all were deformed and, to a minor degree, mineralized. The mafic dikes, youngest of the Precambrian rocks, were intruded along fractures. Scanty sulfide mineralization took place along some of the dikes and fractures.

In the area now occupied by the Laramie Mountains, the Paleozoic and Mesozoic Eras were characterized by occasional episodes of submergence and marine deposition, until finally, toward the end of the Cretaceous Period, major uplift commenced and locally continued well into Tertiary time. The Laramie Mountains are the classic area for the Laramide Orogeny, or Revolution, which affected the entire Rocky Mountain chain.

Erosion of the Laramie uplift proceeded throughout the Paleocene and Eocene Epochs, stripping the arched sedimentary cover and forming mountain valleys, such as that of Horseshoe Creek (secs. 29, 28, 21, 22, and 23 T. 28 N., R. 71 W.), in the crystalline core. Horseshoe Creek and other major streams were able to maintain their courses through the mountains during the Oligocene Epoch despite the thick accumulation of White River deposits in their valleys on the plains to the east.

In Miocene time the Laramie Peak horst formed. The Precambrian faults that bound the horst on the northwest side were reactivated and the Precambrian dikes that occupy these faults were sheared and again weakly mineralized. During development of the shear zone on the southeast side of the horst, further mineralization occurred.

The streams deepened their old valleys during slow uplift of the horst. The valley-in-valley, transverse profile of Horseshoe Creek, at the northern end of the study area, is evidence of antecedence as opposed to superposition of the stream. It has been previously held that major streams in the region have been superposed over major structures on a Tertiary cover (Blackstone, 1946, p. 254).

MINERAL RESOURCES

The geology of the Laramie Peak study area was mapped and studied with one major objective in mind: appraisal of the economic mineral potential of the tract. Since much of the terrain is blanketed with colluvium, soil, and vegetation, a great deal of the exploration effort was spent on sampling stream sediments. Rock outcrops were also sampled, even where mineralization was not evident. Courthouse records in Douglas (Converse County) and Laramie (Albany County) were examined for mining claims, and the few existing claims of the area were visited and sampled. The aeromagnetic survey and interpretation were made to appraise concealed features that might have an economic implication.

MINERAL SETTING

In and around the Laramie Peak study area, unlike most mountainous regions of the western United States, few traces of the early prospector are found. However, around the edges of the mapped area of plate 1 there are about 25 small mines and prospects. Some of those which are near the northeast end of the study area have been described by Spencer (1916) and Greeley (1962). The only known production was from a mine at Esterbrook (now abandoned, caved in, and covered by a hunting lodge), from which at least 17 tons of lead ore was shipped prior to 1904; this ore, whose mineral was galena, assayed 34.6 percent lead (Spencer, 1916, p. 64). Oddly, in other mines of the district galena seems to be absent, or virtually so, and pyrrhotite is by far the most abundant sulfide. The presence of chalcopyrite in massive pyrrhotite bodies and of malachite and chrysocolla derived from oxidation of sulfides prompted the exploration, by mine shaft, of several lodes in T. 28 N., R. 71 W., including the Maggie Murphy (secs. 21 and 22), the Three Cripples (sec. 15), and the Big Five (sec. 10). No production of copper resulted from these efforts, which were made in the early part of the 20th century.

Pyrite is the principal sulfide that was found in shafts, adits, and prospects of the shear zone along the east and southeast borders of the study area. Traces of chalcopyrite also occur in the shear zone in sec. 26, T. 28 N., R. 71 W.; sec. 22, T. 27 N., R. 71 W.; and sec. 19, T. 26 N., R. 71 W. No production has resulted, nor has any physical exploration been conducted along the shear zone since World War II.

The southwestern part of the mapped area, locally known as the Eagle Peak district, has about seven shallow (less than 6 m (19.5 ft) deep) prospect pits, most of which are on mafic dikes but a few are along the trend of the dike swarm that borders the Laramie Peak horst on the northwest. Hematite (specularite), magnetite (in octahedrons), and pyrite are seen in some of the workings. According to local rancher Lawrence Prager (oral commun., 1973), lead was the principal metal that had been sought in this district but we found no galena or other lead minerals in our investigation. No mining claims were filed in this southwestern part of the area.

SAMPLING AND ANALYTICAL TECHNIQUES

Stream sediments were sampled in an effort to identify heavy minerals and chemical elements that may have come from rocks weathered in the drainage area. At each locality enough material was collected to fill a 9- by 15 ½-cm (13 ½- by 6-in.) bag about two-thirds full. Silt- and clay-sized material, easy to obtain in the beds of major streams, was collected where possible. Sand-sized and coarser sediment was the only material available from many steeply descending tributary streams. These samples were dried and sieved, and the minus 80-mesh portions were analyzed. A few of the coarser grained samples had to be ground in order to provide minus 80-mesh material of sufficient volume required for analytical work. All 398 stream-sediment localities are shown on plate 1.

The U.S. Geological Survey took 198 samples directly from rock outcrops, each about 10-15 cm (4-6 in.) in size, and 11 samples from mine dumps (USGS localities shown on pl. 1). Most of these are granite or mafic-dike rocks; a few are mineralized rock. The U.S. Bureau of Mines collected other rock samples, chiefly from mine dumps and the walls of mine workings. All rock samples were ground, and the minus 80-mesh fractions were analyzed. The following analytical work was done on U.S. Geological Survey samples.

Semiquantitative spectrographic analyses by the six-step method were made of all samples for the following 30 elements: iron, magnesium, calcium, titanium, manganese, silver, arsenic, gold, boron, barium, beryllium, bismuth, cadmium, cobalt, chromium, copper, lanthanum, molybdenum, niobium, nickel, lead, antimony, scandium, tin, strontium, vanadium, tungsten, yttrium, zinc, and zirconium. Atomic absorption analyses were determined for gold on 37 samples and for silver, copper, lead, and zinc on 14 samples. Colorimetric analyses on arsenic were determined for 43 samples. Fire assay-spectrographic analyses for platinum, palladium, rhodium, ruthenium, and iridium were done on 29 samples of rock.

A separate, complete listing of the analytical results of U.S. Geological Survey samples is available in a report by Segerstrom and others (1975). Only analytical results showing significant amounts of selected elements are published in the present report.

EVALUATION OF ANALYTICAL DATA

Because of the generally uniform composition of the felsitic rocks in the batholith and of the mafic rocks in dikes that cut the batholith the median values of elements in the two types of rock serve as background values for evaluating geochemical anomalies. Median values for elements in stream-sediment samples also serve the same purpose. Maximum, minimum, and median values for 21 elements, determined from the spectrographic analyses of 553 samples, are shown in table 1.

The greater abundance of boron, lanthanum, yttrium, and zirconium in stream sediments relative to rock samples indicates higher contents of minerals such as tourmaline, monazite, and zircon. These minerals become enriched in stream sediments relative to more common minerals owing to their higher specific gravities and resistance to chemical and abrasive action.

All localities where samples were taken by the U.S. Geological Survey are shown on plate 1, but only partial results of analyses of individual samples are given in tables 2, 3, and 4. Of 30 elements determined, only the 9 which are most relevant to mineralization in the area are tabulated, and results are given only for those samples of stream sediment, granitic rock, or dike rock, which contain anomalous concentrations of one or more of the 9 elements.

Only one of the stream-sediment samples (S4, table 2) was strongly anomalous. This sample, containing 300 ppm copper, was taken from a gulch which drains part of a roof pendant composed partly of pyrrhotite-mineralized rock.

Only one of the granitic-rock samples (S62, table 3) was highly anomalous. This sample, containing 300 ppm copper, was taken in fractured rock where there probably had been minor circulation of mineralizing solutions.

None of the dike-rock samples (table 4) was highly anomalous. One of the samples, K45, contained 300 ppm copper, but that concentration is not surprising insasmuch as the median value for copper in all dikes that were sampled is 100 ppm.

On the other hand, many samples of roof pendants, veins, and mine dumps were strongly anomalous (table 5). The results for copper, molybdenum, lanthanum, silver, nickel, lead, and chromium were determined by semiquantitative spectrographic analysis. Those for arsenic were determined by colorimetry, for gold by atomic absoprtion, for platinum and palladium by fire assay, and for eU (equivalent uranium) by beta-gamma scaler.

Of the high copper values shown in table 5, two (samples D1 and D18) are from natural exposures of rock in the same roof pendant as that of the Maggie Murphy and Many Hopes mines; the other high copper values are from mine dumps. We do not believe the anomalous copper values represent significant exploration targets for large-tonnage copper deposits.

MINING CLAIMS AND MINERAL LEASES

Land-status records of the U.S. Bureau of Land Management in Cheyenne, Wyo., show no patented mining claims or mineral surveys for patents in the study area, and there are no oil and gas leases. There are, however, four patented claims and one unpatented claim that have been surveyed near Esterbrook townsite north of the study area, and there are numerous unpatented claims recorded in the courthouse at Laramie, Wyo. (fig. 2). The claims are recorded in the Albany County courthouse, although many are now in Converse County (county boundaries were changed July 22, 1955, transferring parts of Albany County into Converse County). No claims located in the area have been recorded at the courthouse in Douglas since 1955. Recorded claims have been plotted in figure 2 as accurately as possible from the descriptions in the location notices. A field search was made for all claims, but no evidence of many of them could be found because some claims are very old—the earliest one was recorded in 1894—and descriptions of many of the claim locations are so vague that they could be plotted only approximately.

A state mineral lease that is no longer valid was issued for the E½ sec. 16, T. 28 N., R. 71 W. (fig. 3). The land covered by the lease adjoins the northwest corner of the study area.

TABLE 1.—*Summary of semiquantitative spectrographic analyses of unmineralized samples from the Laramie Peak study area*

[Iron, magnesium, calcium, and titanium values are in percent, all other values are in parts per million. The limit of determination is given in parentheses following the element symbol. L, detected, but below the limit of determination; N, not detected]

Element	Stream sediment (398 samples)			Granitic rock (72 samples)			Dike rock (83 samples)		
	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median
Fe (.05)	15	0.3	3	15	0.07	3	20	1	15
Mg (.02)	2	.1	1	5	.03	.3	10	.3	5
Ca (.05)	15	.2	.7	20	.1	1	20	1	15
Ti (.002)	1	.02	.3	1	.005	.1	1	.3	1
Mn (10)	2,000	50	500	3,000	10	150	2,000	100	1,000
B (10)	50	10	30	20	10	10	20	10	15
Ba (20)	1,500	70	500	2,000	30	1,000	1,000	20	200
Be (1)	2	N	1	3	N	1.5	1.5	N	1
Co (5)	50	5	7	50	5	5	70	7	50

Cr (10)	300	10	50	150	10	30	1,000	30	150
Cu (5)	300	5	15	300	5	15	300	10	100
La (20)	700	20	50	300	20	20	70	20	20
Mo (5)	15	N	N	L	N	N	N	N	N
Ni (5)	100	5	20	150	5	5	2,000	7	70
Pb (10)	100	10	20	500	10	20	L	L	L
Sc (5)	30	5	10	30	5	5	70	15	30
Sn (10)	30	N	N	N	N	N	N	N	N
Sr (100)	200	L	L	500	100	150	500	L	150
V (10)	200	70	100	200	10	30	300	70	200
Y (10)	500	10	70	70	10	30	70	10	30
Zr (10)	1,000	10	200	150	10	30	100	10	30

TABLE 2.—*Locations and semiquantitative spectrographic analyses of selected stream-sediment samples from the Laramie Peak study area*

[Samples were selected because they contained anomalous concentrations of one or more of the following elements: Be(3), Cr(200), Cu(50), La(150), Ni(500), Pb(50), Sc(20), V(150), and Y(50). Anomalous values are defined here as equal to or greater than the values (in parts per million) shown in parentheses after each element. The values shown in parentheses are two or more times as large as the median values shown under "Stream sediment" in Table 1, except for Y, which has a median for stream sediment that is higher than the maxima for granitic and dike rocks. L, detected, but below the limit of determination; N, not detected. Semiquantitative spectrographic analyses were made by J. M. Motooka and R. N. Babcock]

Sample	Latitude	Longitude	S-Be	S-Cr	S-Cu	S-La	S-Ni	S-Pb	S-Sc	S-V	S-Y
S2	42 22 30	105 22 30	1.0 L	70	5	50	20	10	15	100	50
S4	42 22 40	105 21 59	2.0	50	300	100	100	30	10	70	150
S6	42 22 49	105 21 19	1.5	30	20	150	20	20	10	70	30
S9	42 22 49	105 20 30	1.0	50	5	150	20	20	15	100	50
S10	42 18 29	105 26 59	1.0	50	10	70	15	20	7	70	50
S11	42 22 59	105 19 59	1.0 L	150	7	50	30	20	20	150	70
S13	42 22 30	105 22 59	1.0 L	70	10	30	20	15	15	150	100
S14	42 22 30	105 22 59	1.0	50	15	70	20	20	10	70	50
S15	42 22 30	105 22 49	1.0 L	70	10	50	20	15	20	150	50
S18	42 22 30	105 22 40	1.0 L	70	10	30	20	10 L	15	100	70
S21	42 22 19	105 23 9	1.0	70	5	30	20	10 L	15	100	150
S22	42 22 19	105 23 9	1.0	50	20	150	20	20	10	70	70
S23	42 22 19	105 23 19	1.0	100	15	50	30	10	15	150	50
S26	42 19 0	105 26 49	1.0 L	70	5	100	20	10	15	150	70
S29	42 19 29	105 26 9	1.0	70	5	50	30	10 L	15	150	50
S30	42 19 29	105 26 9	1.0 L	300	7	100	30	10 L	15	150	50
S35	42 19 40	105 25 29	1.0 L	100	7	100	50	10 L	20	150	50
S36	42 19 49	105 25 29	1.0	70	15	200	30	20	10	100	50
S38	42 20 9	105 25 0	1.0 L	100	5	200	30	10	20	150	100
S40	42 20 20	105 24 39	1.0 L	100	7	100	30	10	15	150	50
S41	42 18 29	105 27 19	1.0 L	70	10	50	15	20	10	100	50
S42	42 20 20	105 24 29	1.0	70	15	20	15	15	15	70	50
S45	42 20 9	105 24 19	1.0	70	30	70	30	20	15	150	50
S46	42 20 9	105 24 19	1.0 L	70	10	50	20	20	15	150	30
S53	42 19 40	105 21 50	1.5	50	20	150	20	30	7	70	50
S57	42 19 49	105 21 29	1.0	50	15	50	20	30	15	100	50
S58	42 19 49	105 21 19	1.5	50	30	100	30	30	10	70	50
S60	42 19 40	105 21 10	1.5	50	10	100	30	20	10	70	50
S61	42 19 49	105 20 59	1.5	30	20	100	15	20	10	70	50
S67	42 17 9	105 28 19	1.0 L	150	15	50	50	20	15	100	50
S68	42 17 9	105 28 29	1.5	50	15	150	30	20	7	50	70

S69	42 17 9	105 28 19	1.0 N	150	7	150	30	20	10	100	70
S73	42 17 30	105 28 19	1.0 L	100	5	300	30	20	10	100	70
S78	42 18 10	105 27 39	1.5	50	15	150	20	20	10	70	70
S79	42 18 19	105 27 39	1.0 L	100	5	30	20	20	15	100	50
S85	42 15 49	105 32 20	1.0 L	70	15	50	30	10	20	150	30
S86	42 15 39	105 32 30	1.0 L	70	15	50	30	10	15	150	30
S89	42 15 39	105 32 20	1.0	50	15	100	15	30	7	70	50
S90	42 15 39	105 32 20	1.0	30	7	50	15	15	7	70	50
S113	42 17 59	105 26 19	1.0	70	15	200	30	15	15	70	50
S119	42 14 9	105 32 39	1.0	30	10	150	15	15	15	70	50
S121	42 14 49	105 32 20	1.0	50	15	200	20	20	10	70	50
S134	42 12 39	105 31 29	1.0 L	100	7	150	20	15	15	100	50
S140	42 12 29	105 28 40	1.0 L	100	5	700	20	20	20	150	100
S151	42 13 19	105 27 39	1.0	70	20	150	30	10	10	100	30
S161	42 14 39	105 25 29	1.0	70	5	50	15	10 L	20	100	50
S162	42 14 39	105 25 29	1.0	50	15	100	15	15	15	70	50
S163	42 14 39	105 25 9	1.0 L	70	5	100	15	10	15	100	70
D17	42 17 30	105 28 59	1.0 L	70	15	50	20	20	15	150	30
D20	42 17 39	105 28 59	1.0	50	7	50	20	10	15	100	70
D21	42 17 49	105 28 49	1.0	70	10	50	20	15	15	100	50
D23	42 17 59	105 28 49	1.0	70	10	50	20	15	15	100	50
D28	42 21 19	105 21 50	1.5	50	50	100	15	20	7	50	70
D32	42 20 30	105 22 49	1.5	70	15	70	30	20	10	100	50
D34	42 20 59	105 22 59	1.0	100	15	30	30	20	15	150	30
D35	42 20 49	105 22 59	1.0	100	15	50	30	10	15	150	50
D37	42 20 59	105 23 19	1.0	100	10	50	30	15	15	150	30
D44	42 19 19	105 21 39	1.5	50	20	100	20	30	15	100	50
D46	42 19 29	105 21 39	1.5	20	15	20	5	10	5	20	70
D48	42 19 40	105 21 29	1.5	50	15	150	15	30	7	70	50
D61	42 17 30	105 23 30	1.5	30	15	150	15	30	7	50	30
D63	42 17 39	105 22 49	1.5	70	15	50	15	20	15	100	70
D70	42 15 29	105 32 30	1.0	70	15	100	20	20	15	100	50
D71	42 15 29	105 32 30	1.0	50	15	150	20	20	10	70	30
D73	42 15 19	105 31 59	1.5	70	15	200	15	30	7	70	50
D74	42 15 19	105 31 49	1.5	50	15	200	15	30	7	70	50
D75	42 15 19	105 31 49	1.5	50	15	100	15	20	7	70	50
D80	42 14 39	105 31 9	1.5	30	15	100	10	20	10	70	50
D82	42 14 20	105 31 9	1.5	50	15	50	10	15	15	70	50
D88	42 14 39	105 30 49	2.0	30	15	150	20	20	7	70	30
D97	42 21 19	105 20 39	1.5	100	15	100	30	20	15	100	50

TABLE 2.—*Locations and semiquantitative spectrographic analyses of selected stream-sediment samples from the Laramie Peak study area*—Continued

Sample	Latitude	Longitude	S-Be	S-Cr	S-Cu	S-La	S-Ni	S-Pb	S-Sc	S-V	S-Y
D102	42 19 9	105 20 9	1.0	150	15	20	50	20	15	150	30
D103	42 20 39	105 20 49	1.0	150	15	50	30	20	15	100	70
D104	42 22 19	105 19 49	1.0	70	15	50	30	15	15	100	50
D105	42 22 9	105 19 49	1.0	70	15	50	30	15	10	70	50
D109	42 16 59	105 26 29	1.5	50	15	150	10	20	7	50	30
D112	42 17 39	105 25 59	2.0	30	15	70	10	30	10	50	50
D113	42 17 59	105 25 49	1.0	70	10	70	20	20	10	70	50
D114	42 18 19	105 25 40	1.0	100	5	50	20	10	15	100	70
D115	42 18 29	105 25 49	1.0	100	50	150	50	20	15	100	70
D117	42 18 39	105 25 40	1.0 L	150	5	200	50	10	15	150	100
D120	42 20 49	105 21 29	1.5	30	15	150	10	30	7	50	70
D123	42 20 20	105 21 50	1.5	30	15	150	15	30	7	50	30
D125	42 20 20	105 21 39	1.5	100	30	70	30	30	15	100	50
D127	42 20 39	105 21 19	2.0	50	15	100	20	30	10	50	50
D128	42 20 39	105 21 10	1.0	100	15	50	50	15	15	100	50
K9	42 15 49	105 28 9	1.0	30	15	150	20	30	10	100	50
K12	42 18 39	105 23 9	1.5	30	30	200	20	30	10	70	100
K14	42 18 19	105 23 30	1.5	50	20	150	20	30	10	70	30
K18	42 18 19	105 23 30	1.5	50	20	70	20	30	10	100	50
K21	42 18 39	105 23 39	1.0	50	15	70	20	20	15	100	100
K22	42 19 0	105 23 30	1.5	70	15	70	20	15	15	150	70
K23	42 19 19	105 23 30	1.5	70	15	70	30	20	15	150	70
K25	42 19 40	105 23 30	1.0	70	15	50	20	100	15	100	70
K26	42 19 59	105 23 39	1.0 L	70	15	50	50	20	15	150	50
K27	42 19 49	105 23 59	1.0 L	70	10	50	30	10	15	150	30
K29	42 20 20	105 23 49	1.0 L	100	7	50	30	10 L	15	150	50
K31	42 20 49	105 23 39	1.0	50	10	50	20	15	10	100	50
K32	42 20 49	105 23 30	1.5	70	15	30	50	15	15	150	70
K33	42 20 49	105 23 59	1.5	50	7	150	30	15	15	150	30
K35	42 21 19	105 23 49	1.5	50	10	30	20	15	15	100	50
K36	42 21 29	105 23 59	1.5	100	70	30	50	15	15	150	50
K50	42 18 49	105 21 59	1.5	30	15	100	15	20	10	70	50
K51	42 18 49	105 21 59	1.5	30	15	150	15	20	10	50	50
K53	42 18 49	105 21 39	1.5	30	20	100	20	20	10	70	50
K58	42 18 49	105 20 59	1.5	50	15	70	20	50	15	100	50

K59	42 19 0	105 20 39	1.0	50	30	150	20	20	10	100	30
K62	42 16 9	105 24 10	1.0	50	5	50	20	20	10	100	70
K63	42 16 9	105 24 39	1.0	50	5	100	10	20	10	150	70
K66	42 16 0	105 25 9	1.0	50	15	150	20	20	7	70	30
K70	42 15 10	105 24 10	1.0	70	20	100	30	20	10	70	50
K79	42 17 59	105 24 39	1.0	50	5	30	20	10	10	100	50
K82	42 18 39	105 24 10	1.5	50	5	30	10	20	15	100	70
K83	42 18 39	105 24 19	1.5	50	30	100	30	30	15	100	70
K84	42 19 0	105 23 59	1.0	50	5	50	20	15	15	150	30
K85	42 19 9	105 23 59	1.0	70	5	30	30	10	15	150	50
K100	42 20 59	105 22 49	1.5	50	15	100	20	30	10	70	50
K103	42 21 10	105 22 49	1.5	100	20	70	50	30	15	100	50
K104	42 21 19	105 22 30	1.0 L	150	20	50	70	20	30	200	500
K105	42 21 29	105 21 59	1.5	70	30	150	50	20	15	100	70
K108	42 21 50	105 21 29	1.5	70	100	150	50	20	10	70	70
K109	42 21 59	105 21 19	1.5	70	10	50	20	15	10	70	50
K111	42 22 30	105 20 49	1.0	70	20	150	30	20	15	100	50
K113	42 22 19	105 20 30	1.0	70	20	150	30	20	15	100	50
K114	42 22 19	105 20 20	1.5	70	15	100	50	20	15	100	70
K115	42 19 0	105 25 9	1.5	50	15	100	30	20	10	70	50
K116	42 19 9	105 25 9	1.0 L	100	5	50	50	10 L	20	150	50
K117	42 19 19	105 25 0	1.0 L	100	5 L	30	50	10 N	30	200	70
K118	42 19 29	105 24 39	1.0 L	70	7	100	30	10 L	15	150	50
K119	42 19 19	105 24 19	1.0 L	70	15	100	20	10	15	150	70
K120	42 19 29	105 24 19	1.0 L	100	5	50	30	10 L	15	150	50
K131	42 15 19	105 29 49	1.0	70	5	100	30	10	15	150	70
K138	42 20 39	105 25 19	1.5	70	50	200	30	30	15	100	70
K139	42 20 49	105 25 29	1.5	70	20	150	30	30	10	100	50
K140	42 20 49	105 25 40	1.0	70	20	70	30	20	10	150	30
K141	42 20 30	105 25 49	1.5	70	20	200	20	30	10	100	50
K142	42 20 30	105 25 59	1.0	100	20	50	50	20	15	200	50
K143	42 20 20	105 25 59	1.5	70	30	150	30	30	10	70	50
K146	42 19 0	105 26 29	1.5	70	15	100	20	20	10	100	50
K147	42 18 49	105 26 29	1.5	70	20	150	20	50	10	70	70
K148	42 18 49	105 26 39	1.5	30	15	200	15	20	7	50	70
K149	42 16 29	105 26 39	1.5	50	20	150	20	20	7	70	70
K152	42 17 59	105 27 10	1.5	70	15	70	20	30	15	100	70
K159	42 14 49	105 28 9	1.5	50	15	70	20	30	10	70	50
K161	42 14 49	105 27 29	1.5	50	15	100	15	20	10	70	100

TABLE 2.—*Locations and semiquantitative spectrographic analyses of selected stream-sediment samples from the Laramie Peak study area*—Continued

Sample	Latitude	Longitude	S-Be	S-Cr	S-Cu	S-La	S-Ni	S-Pb	S-Sc	S-V	S-Y
K163	42 15 10	105 27 10	1.0	50	10	30	15	30	10	70	50
K166	42 14 39	105 26 39	1.0	50	15	70	15	20	15	100	50
K183	42 14 49	105 33 10	1.0	50	15	70	30	30	10	100	50
K205	42 14 20	105 27 10	1.0	30	20	150	20	15	10	70	30
K207	42 13 59	105 26 39	1.5	50	15	150	15	15	10	70	30
D141	42 13 40	105 32 20	2.0	70	30	200	30	30	7	70	50
D142	42 13 29	105 32 30	1.5	30	15	150	15	20	7	70	30
D143	42 13 29	105 32 30	1.5	50	10	50	15	15	10	100	50
D144	42 13 19	105 32 30	1.5	50	5	30	10	10	15	100	70
D146	42 13 9	105 32 30	1.0	50	5	50	10	10	15	100	50
D149	42 13 0	105 32 20	1.5	50	20	150	15	20	10	70	30
D154	42 13 9	105 34 29	1.5	50	15	100	20	20	10	70	50
D166	42 13 0	105 28 49	1.5	50	30	150	20	20	10	70	30
D168	42 12 39	105 28 0	1.5	70	15	70	20	20	15	150	30
D170	42 12 19	105 28 59	1.0	70	5	50	30	10	20	200	50
D031	42 20 20	105 22 49	1.5	70	15	50	30	20	15	150	30
S176	42 23 59	105 20 49	1.0	50	10	50	20	15	15	150	30
S177	42 24 19	105 20 20	1.0	50	20	70	30	30	10	100	70
S178	42 24 19	105 20 20	1.0	30	10	100	15	30	10	100	50
S180	42 24 19	105 19 19	1.0	50	15	30	20	30	10	100	200
S183	42 17 9	105 22 40	1.0	50	15	50	20	20	10	150	30
S188	42 16 59	105 21 59	1.0 L	50	15	50	20	20	10	150	30
S202	42 13 19	105 30 0	1.0 L	50	7	50	15	15	15	150	20
S206	42 12 29	105 29 29	1.0 L	50	5	50	15	15	15	150	70
S210	42 12 10	105 28 19	1.0 L	50	7	50	15	15	10	150	20
S212	42 11 59	105 27 50	1.0 L	70	5	50	15	15	10	150	50
D180	42 15 10	105 29 20	1.0 N	70	5	30	15	15	20	150	50
D185	42 14 29	105 29 49	1.0 L	70	5	50	20	15	15	150	30
D187	42 13 59	105 29 49	1.0 N	70	5 L	30	15	15	15	150	50
K215	42 21 39	105 23 49	1.0	70	5	200	20	20	15	150	70
K216	42 21 50	105 23 59	1.0 L	30	5	70	10	10	15	100	50

TABLE 3.—*Locations and semiquantitative spectrographic analyses of selected granitic rocks from the Laramie Peak study area*

[Samples were selected because they contained anomalous concentrations of one or more of the following elements: Be(3), Cr(200), Cu(50), La(150), Ni(500), Pb(50), Sc(20), V(150), and Y(50). Anomalous values are defined here as equal to or greater than the values (in parts per million) shown in parentheses after each element. The values shown in parentheses are one-and-a-half to three times as large as the median values shown under "Granitic rock" in Table 1. L, detected, but below the limit of determination; N, not detected. Semiquantitative spectrographic analyses were made by J. M. Motooka and R. N. Babcock]

Sample	Latitude	Longitude	S-Be	S-Cr	S-Cu	S-La	S-Ni	S-Pb	S-Sc	S-V	S-Y
S62	42 19 49	105 20 49	1.0 N	150	300	20 N	150	15	30	150	20
S103	42 15 49	105 30 39	1.5	10	5 N	70	5	15	5 N	200	20
S129	42 13 40	105 31 40	1.5	10 N	5 N	150	5	10	5	20	10
S155	42 13 49	105 27 10	1.0 N	10 N	5 N	150	5 L	30	5 N	10 N	10
D25	42 18 19	105 28 29	2.0	10	5 N	200	5	30	5	50	30
D36	42 20 59	105 23 19	2.0	10 N	5 N	20 L	15	10 L	5 N	50	50
D47	42 19 40	105 21 29	1.5	10 N	5 N	20	5	15	7	200	20
D51	42 22 59	105 21 59	1.5	10 N	5 N	20	5 L	20	5 N	10 N	50
D81	42 14 29	105 31 9	1.0 N	10 N	5 N	300	5 L	10	5 N	10 N	20
D122	42 20 30	105 21 50	3.0	10 N	5 N	20 N	5 L	20	5	10 N	10 L
S170A	42 21 59	100 25 0	3.0	10 N	5 N	50	5 L	20	5 N	10 N	20
S174B	42 24 10	105 21 10	3.0	10 N	5 N	50	5 L	10	5	30	50
S187B	42 17 20	105 22 9	1.0	10 N	7	150	5	10 L	15	100	70
S195	42 14 20	105 28 19	1.5	10 N	5 L	150	5	10	5 L	20	10
K3	42 16 9	105 26 29	1.5	10	150	100	5 L	30	5	20	20
K7	42 16 9	105 27 39	2.0	10 N	15	150	5 L	30	5	10	20
K37	42 18 29	105 28 29	1.5	10	50	20	5 L	10	5 N	10 N	10
K56	42 19 0	105 21 29	1.5	10	50	20 N	5 L	20	5	30	10
K74	42 18 19	105 24 10	1.5	10 N	50	50	5	20	7	30	20
K94C	42 15 49	105 34 29	1.0 L	10 N	10	20 N	5 L	100	5 N	10 N	10 L
K97B	42 15 39	105 32 59	1.5	100	15	200	30	10 N	30	150	30

TABLE 4.—*Locations and semiquantitative spectrographic analyses of selected dike rocks from the Laramie Peak study area*

[Samples were selected because they contained anomalous concentrations of one or more of the following elements: Be(3), Cr(300), Cu(200), La(150), Ni(200), Pb(50), Sc(50), V(300), and Y(50). Anomalous values are defined here as equal to or greater than the values (in parts per million) shown in parentheses after each element. The values shown in parentheses are at least one-and-a-half times as large (even more for Pb) as the median values shown under "Dike rock" in Table 1. L, detected, but below the limit of determination; N, not detected. Semiquantitative spectrographic analyses were made by J. M. Motooka and R. N. Babcock]

Sample	Latitude	Longitude	S-Be	S-Cr	S-Cu	S-La	S-Ni	S-Pb	S-Sc	S-V	S-Y
S49B	42 19 29	105 26 49	1 N	100	100	20 N	70	10 N	70	300	30
S52	42 19 40	105 21 59	1 N	150	200	20 N	100	10 N	70	300	30
S59B	42 19 59	105 21 19	1 N	70	70	20 L	50	10 N	30	300	50
S63	42 16 9	105 24 10	1 N	150	70	20 N	70	10 L	30	300	30
S81	42 23 9	105 21 19	1 N	150	100	20 N	70	10 L	50	300	30
S97	42 16 29	105 31 29	1 N	70	100	20	70	10 N	30	300	50
S124	42 14 29	105 31 40	1 N	100	200	20 N	70	10 N	50	200	30
S146	42 13 9	105 27 50	1 N	150	70	20	70	10 N	50	300	30
S148A	42 13 9	105 27 39	1 N	150	70	20	100	10 N	50	300	30
S154	42 13 40	105 27 19	1 N	150	50	20 N	100	10 N	50	300	30
D9	42 16 40	105 29 39	1 N	150	20	20 N	100	10 N	50	300	30
D29	42 20 20	105 22 40	1 N	150	200	20 N	100	10 N	50	200	30
D39	42 19 9	105 22 30	1 N	300	70	20 N	70	10 N	30	300	30
D119	42 20 39	105 21 19	1 N	300	70	20 N	150	10 N	70	200	30
D147	42 13 9	105 32 30	1 N	70	70	20	50	10 N	30	300	30
D152A	42 12 39	105 31 49	1 N	150	50	30	200	10 L	30	200	30
S171	42 19 19	105 27 50	1 N	200	10	20	300	10 N	30	200	20
S173	42 23 49	105 21 19	1 L	100	30	20	50	10 N	30	300	30
K2	42 16 0	105 26 29	1 N	150	100	20 N	70	10 N	30	300	30
K5	42 16 9	105 27 19	1 N	300	100	20 N	200	10 N	30	150	20
K6	42 16 0	105 27 39	1 N	150	150	20	150	10 N	30	300	30
K19	42 18 10	105 23 59	1 N	100	150	20	70	10 L	50	300	30
K45	42 19 0	105 26 59	1 N	150	300	20	100	10 N	30	300	30
K65B	42 16 9	105 25 0	1 N	150	20	20	50	10 N	30	200	50
K76	42 17 39	105 25 9	1 N	150	70	20	70	10 N	30	300	30
K87	42 19 29	105 23 30	1 N	200	150	20 N	100	10 N	50	300	30
K130	42 16 0	105 30 10	1 N	100	100	20 L	50	10 N	30	300	30
K168	42 14 29	105 26 9	1 N	200	100	20 L	70	10 N	50	300	30
K186	42 17 30	105 30 29	1 N	150	70	20 N	70	10 N	50	300	20
K189	42 18 29	105 28 19	1 N	50	70	20	50	10 N	30	300	30
K202	42 13 49	105 27 29	1 N	150	100	20 N	50	10 N	50	300	30
K220	42 20 39	105 23 59	1 L	30	200	30	30	10 L	20	200	30
D188	42 14 29	105 29 49	1 N	100	50	20	50	10 N	30	300	30

TABLE 5.—*Analytical results from selected samples of roof-pendant rock, veins, and mine-dump material*

[Lower limits of determination (in parts per million) are as follows: Cu(5), Mo(5), As(10), Au (0.05), Pt (0.005), Pd (0.002), and eU (30). L, detected, but below the limit of determination; N, not detected; ---, indicates that no determination was made. Analysts: Copper and molybdenum (semiquantitative spectrographic analyses), J. M. Motooka and R. N. Babcock; arsenic (colorimetric analyses), D. G. Murrey; gold (atomic absorption analyses), J. G. Frisken and D. G. Murrey; platinum and palladium (fire-assay analyses), R. R. Carlson and E. F. Cooley; and equivalent uranium (eU) (beta-gamma scaler analyses), V. D. James]

Sample No.	Latitude	Longitude	Cu	Mo	As	Au	Pt	Pd	eU	Nature of sample
1/D1	42°23'20"	105°21'30"	500	15	N	N	N	0.002	50	Hornblende gneiss.
D2	42°23'00"	105°21'40"	700	N	100	L	.015	.020	30	Mine-dump material.
D4	42°23"00'	105°21'50"	15	N	N	N	N	N	60	Hornblende schist.
D18	42°23'00"	105°22'00"	700	N	N	N	N	N	L	Quartzite.
2/D52A	42°17'40"	105°21'00"	1,500	7	N	N	.010	.030	---	Mine-dump material.
D52B	42°17'40"	105°21'00"	1,500	N	80	L	.015	.007	---	Do.
3/D52D	42°17'40"	105°21'00"	3,000	N	N	N	N	.002	---	Do.
K61A	42°22'20"	105°19'50"	70	15	N	N	.010	.070	L	Oxidized mine-dump material.
K61B	42°22'20"	105°19'50"	50	N	N	N	.015	.030	L	Unoxidized mine-dump material.
2/K125	42°24'00"	105°21'50"	300	10	N	N	N	.015	L	Oxidized vein material.
4/K126	42°24'00"	105°21'40"	2,000	N	---	---	N	N	L	Do.
K132B	42°24'00"	105°21'40"	7,000	10	---	---	N	N	L	Mine-dump material.
K192	42°21'30"	105°20'40"	100	15	10	N	N	.005	70	Do.
5/K222	42°13'00"	105°24'30"	10	N	---	---	---	---	L	Do.
6/S168	42°21'30"	105°25'30"	N	N	10	N	N	N	60	Mica schist.
4/S189	42°18'50"	105°20'00"	1,000	N	200	L	N	N	30	Mine-dump material.

1/Lanthanum, 300 parts per million.
2/Silver, 0.5 parts per million.
3/Nickel, 1,000 parts per million.
4/Silver, 0.7 parts per million.
5/Chromium, 1,000 parts per million and nickel, 5,000 parts per million.
6/Chromium, 500 parts per million, and nickel, 3,000 parts per million.

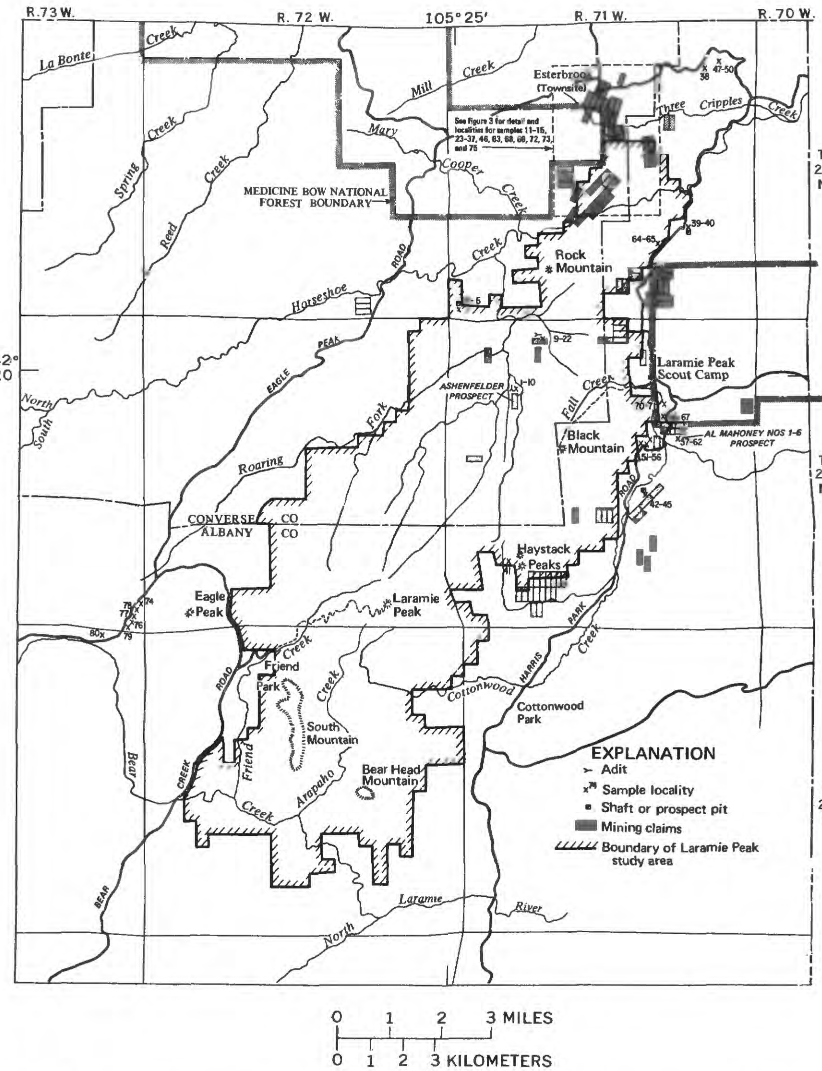

FIGURE 2.—Approximate locations of claims and U.S. Bureau of Mines sample localities in and near the Laramie Peak study area.

MINES, PROSPECTS, AND MINERALIZED AREAS

Eighty samples were taken by the U.S. Bureau of Mines from 11 areas within and near the study area (fig. 2). Analyses of these samples are shown in table 6. The boundary as established shows that only 29 of the samples are from within the study area.

With the exception of the Esterbrook workings, which are north of the study area, prospect workings have been confined to shallow pits and short adits on fault zones and dikes showing iron mineralization.

ESTERBROOK DISTRICT

Public records show 4 patented and 29 unpatented claims in the Esterbrook district (fig. 3). Four general claim locations in and near the study area were examined: Esterbrook mine, area east of Esterbrook, Three Cripples prospect, and the Maggie Murphy group.

ESTERBROOK MINE

The Esterbrook mine is on the Douglas claim just south of Esterbrook townsite; it is about 1.6 km (1 mi) north of the study area. Workings here are the most extensive in the region. Henry C. Beeler, the State Geologist of Wyoming in 1902, examined the workings and prepared a report for the Esterbrook Mining Company. He reported that about 50 tons of ore had been mined with an average value of $15 per ton at metal prices in 1902. He further stated that shipments amounting to 35,588 pounds of hand-sorted carbonate ore containing 1.3 ounces of silver per ton (44.6 ppm), 0.035 ounce of gold per ton (1.2 ppm), 34.65 percent lead, 34 percent silica, and 7 percent iron had been made. The average price of lead in 1902 was about $0.04 per pound and the analysis of the shipment would indicate a concentration factor of 2 by hand sorting. At that time, a shaft had been sunk to 30 m (98 ft) on a siliceous vein containing lead carbonates, galena, and copper carbonates. The main shaft, now caved and filled, is reported to have been 107 m (350 ft) deep with a 92-m (300 ft) drift south and a 30-m (100-ft) drift north at the 102-m (335-ft) level. Prospecting was on a nearly vertical tabular body of quartz and calcite carrying lead carbonate at the outcrop and galena below (Spencer, 1916). This is the only mine in the general area that is reported to have contained lead.

Four samples (11–14, table 6) that were analyzed at Skyline Laboratories, Denver, Colo., for platinum and palladium contained less than 0.01 ppm of those metals. Five samples from dumps were anomalously high in copper, lead, and zinc (11–15, table 6). The property is one of the several northeast-trending belts of minor sulfide mineralization in this area described by Spencer (1916). Greeley (1962) described the deposit as "shallow-depth epithermal."

AREA EAST OF ESTERBROOK

Eight samples (23–29 and 46, table 6) were taken from prospect pits within 0.8 km (½ mi) east of Esterbrook townsite. The workings are about 1.6 km (1 mi) north of the study area. Five of these samples showed anomalous copper values (25–29, table 6).

THREE CRIPPLES PROSPECT

The Three Cripples shaft, now caved and filled, was reported by Spencer (1916) to have been sunk to 29 m (95 ft) in 1905. There is no record of any production from the property. This prospect and other pits in the vicinity are located on one of the zones of limonite-stained

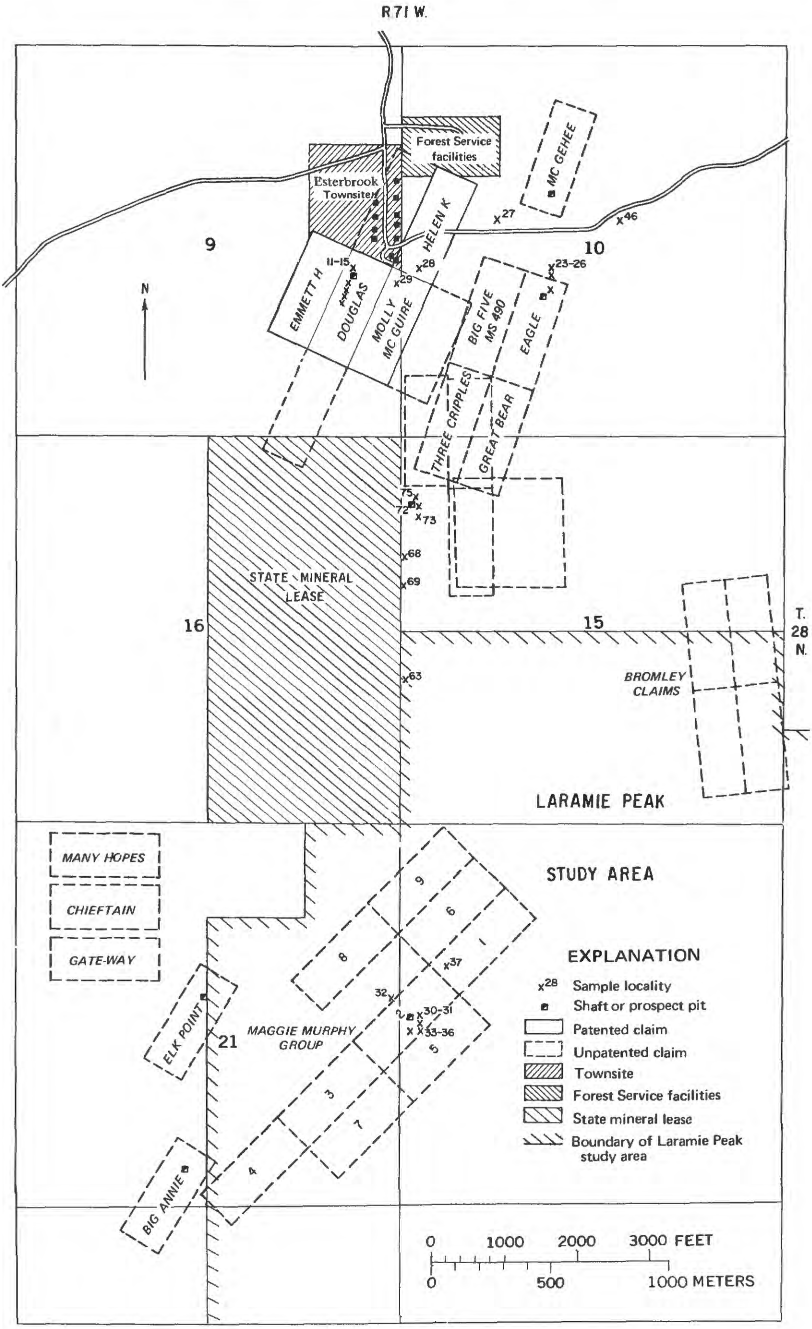

FIGURE 3.—Claims and sample localities in the Esterbrook district.

exposures that trend northeast in the area. The workings are south of the Three Cripples claim and are just north of the study area (fig. 3).

Five samples (68, 69, 72, 73, and 75, table 6) of selected rock and dump material at the shaft and prospect pits in the vicinity were relatively high in iron, but other metal contents were near background levels for rocks of the area. Sample 72 contained 3,000 ppm (0.3 percent) copper.

MAGGIE MURPHY GROUP

The Maggie Murphy claims, staked in 1903, are within the study area (fig. 3) about 3.2 km (2 mi) south of Esterbrook. The prospectors apparently were attracted to several outcrops of limonite-stained schist containing small amounts of oxidized copper minerals. Numerous pits were dug on a northeast-trending belt of schist mineralized with pyrrhotite; the belt is several hundred feet long and 3–6 m (10–20 ft) wide. Henry C. Beeler (written commun. to the State Geologist of Wyoming, 1902) examined the workings in the early exploration stage and recommended an exploration program. A shaft, now caved, was sunk to a depth of 33 m (107 ft). The material encountered was principally schist with some pyrrhotite-bearing quartz (Spencer, 1916). It is assumed that the shaft bottomed in waste material. Eight samples (30–37, table 6) were taken from dumps at the caved shaft and from prospect pits in the vicinity. One sample (32) assayed 5.6 ounces of silver per ton (192 ppm); and five (30–34) contained anomalous copper values.

In spite of anomalous concentrations of metals in selected mine-dump samples, the mineral potential of the Maggie Murphy area is considered to be low.

ASHENFELDER PROSPECT

The Ashenfelder prospect is in sec. 8, T. 27 N., R. 71 W. (fig. 2). "Ashenpelter," the name on the location notice, is believed to be a misspelling, as the claim is near "Ashenfelder Creek," which is the designation on all published maps known to the authors. According to local residents, the prospect was first worked in the latter part of the 19th century and then in 1932.

An adit about 21 m (70 ft) long was driven north on a limonite-stained shear zone. At the face, a winze was sunk and a drift was driven north from the winze; the back of the drift is about 2.8 m (9 ft) below the floor of the adit. Neither the winze nor the drift could be examined because of water, but the drift must be short as indicated by the small size of the waste dump at the portal. Ten samples (1–10, table 6) were taken—five (samples 4–8) in the adit, the others from the dump and small prospect pits near the adit. Assay values were negligible except for two samples. Sample 1, 61 cm (2 ft) of hematite-stained granite, assayed 0.17 ounce of gold (5.8 ppm) and 0.2 ounce of silver (6.9 ppm) per ton, and sample 5 contained 2,000 ppm (0.2 percent) lead. Samples 2–9 contained 0.1–0.4 ounce silver.

TABLE 6.—*Analyses of U.S. Bureau of Mines samples from the Laramie Peak study area*

[Samples were analyzed by semiquantitative spectrographic and fire assay methods in the U.S. Bureau of Mines laboratories in Reno, Nev. Spectrographic analyses were made using a 3.4-metre Wadsworth spectrograph with 30-inch plateholder. Estimates of concentrations were made by comparing intensity of lines in sample spectra with intensity of lines in spectra of a graded series of standards. The numbers in parentheses beneath the element symbols represent the estimated lower limit of detection for that element. A possible error of plus 100 percent to minus 50 percent of the reported concentration is assumed. Symbols used are: M, more than 10 percent; >, more than the amount shown: <, less than the amount shown; Tr, trace; – – –, looked for but not found and hence may occur only in amounts below the lower detection limit. Sample localities are given below by township, range, and section (T.R. Sec.); thus T. 53 N., R. 84 W., sec. 16, is recorded as 53-84-16. The following elements were looked for spectrographically but were not detected or were found only in amounts normal for rocks of the area except as shown under remarks; Ag, Al, As, Au, B, Ba, Be, Bi, Ca, Cd, Ga, Hf, In, La, Li, Mg, Mo, Na, Nb, P, Pt, Re, Sb, Si, Sn, Sr, Ta, Te, Tl, V, W, Y, Zn, and Zr]

		Assay (oz/ton)		Semiquantitative spectrographic analyses (ppm)							(percent)		
Sample	Location T. R. S.	Au	Ag	Co (40)	Cr (30)	Cu (20)	Mn (30)	Ni (20)	Pb (100)	Sc (10)	Fe (0.004)	Ti (0.001)	Remarks
1	27-71- 8	0.17	0.2	--	<30	160	100	--	100	--	M	0.05	Hematite stain.
2	27-71- 8	--	.1	--	<30	160	200	--	100	--	6	.1	Dump at small pit.
3	27-71- 8	--	.1	--	<30	160	300	--	100	--	M	.1	Dump at caved adit.
4	27-71- 8	Tr	.3	--	<30	80	60	--	--	--	6	.1	Gouge in drift.
5	27-71- 8	Tr	.1	--	100	160	500	--	2,000	--	M	.05	Specimen sample.
6	27-71- 8	Tr	.1	--	30	160	200	--	--	--	4	.05	Gouge in drift.
7	27-71- 8	Tr	.4	--	100	160	200	--	700	--	M	.05	Gouge in shaft.
8	27-71- 8	--	.1	--	100	160	2,000	--	100	10	7	.4	Gouge in drift.
9	27-71- 8	--	.3	--	60	160	200	--	--	--	7	.02	Dump at pit.
10	27-71- 8	--	--	--	30	160	100	--	--	30	M	.006	Specimen sample.
[1]11	28-71- 9	Tr	.4	40	60	3,000	1,000	40	100,000	<10	7	.2	Dump at caved shaft.
[1]12	28-71- 9	.03	.4	40	60	3,000	1,000	40	60,000	<10	M	.4	Do.
[1]13	28-71- 9	.02	.1	40	60	3,000	2,000	40	50,000	10	6	.4	Do.
[1]14	28-71- 9	Tr	.1	40	300	600	1,000	40	6,000	30	7	.2	Specimen sample.
[2]15	28-71- 9	--	.2	--	100	1,300	2,000	40	30,000	<10	5	.2	Dump at pit.
16	28-71-31	--	.2	--	60	1,300	200	40	700	--	7	.2	Gouge in winze.
17	28-71-31	--	--	--	30	1,300	500	40	200	--	4	.1	Dump at winze.
18	28-71-31	Tr	.2	40	100	600	100	--	2,000	--	6	.02	Specimen sample.
19	27-71- 5	--	.1	40	60	600	2,000	80	400	10	M	.8	Dike at caved adit.
20	27-71- 5	--	.2	40	60	600	2,000	80	--	10	7	.8	Dump at adit.
21	27-71- 5	--	--	40	300	160	2,000	80	200	10	M	.8	Do.
22	27-71- 5	Tr	.1	40	100	160	2,000	40	--	50	M	1.5	Specimen sample.

23	28-71-10	--	--	--	<30	160	100	--	--	--	2	.003	Gouge at pit.
24	28-71-10	--	--	--	<30	160	100	--	--	--	5	.01	Dump at pit.
25	28-71-10	--	.1	40	<30	3,000	500	--	--	--	5	.05	Do.
26	28-71-10	--	.1	--	<30	3,000	200	--	--	--	M	.05	Do.
27	28-71-10	--	.1	--	100	3,000	2,000	--	100	--	7	.2	Do.
28	28-71-10	--	Tr	--	100	1,300	500	--	200	--	2	.01	Do.
29	28-71- 9	--	.1	40	300	1,300	4,000	80	100	10	M	.8	Do.
30	28-71-22	--	.1	<40	100	600	200	40	100	--	7	.05	Do.
31	28-71-22	--	.1	--	100	600	2,000	40	--	--	M	.05	Gouge in pit.
[3]32	28-71-21	--	5.6	--	100	600	500	40	--	--	7	.05	Dump at pit.
33	28-71-22	--	--	--	100	600	500	40	--	--	M	.02	Stringer of dark gouge.
34	28-71-22	--	--	80	60	600	2,000	200	200	--	M	.006	Specimen sample.
35	28-71-22	--	.1	40	30	300	500	--	--	--	>7	.006	Vein in caved shaft.
36	28-71-22	--	--	--	60	160	4,000	--	100	--	>7	.2	Dump at shaft.
37	28-71-22	--	.3	--	30	160	200	--	--	--	>7	.01	Dump at pit.
38	28-71-11	--	Tr	40	60	300	500	80	--	30	6	.2	Do.
39	28-71-26	--	.1	300	30	80	200	--	--	30	M	.2	Gouge in caved shaft.
40	28-71-26	--	--	300	60	60	500	80	--	30	M	.8	Specimen sample.
[4]41	27-71-30	--	.2	--	30	40	500	--	200	--	3	.2	Granite.
42	27-71-22	--	.1	--	100	160	200	--	400	--	7	.2	Dump at caved shaft.
43	27-71-22	Tr	.2	--	60	160	200	--	200	--	6	.2	Do.
44	27-71-22	Tr	.2	--	100	5,000	500	80	1,000	--	5	.2	Do.
45	27-71-22	--	--	150	100	600	500	300	700	--	M	.1	Specimen sample.
46	28-71-10	--	--	--	30	60	500	--	--	--	3	.05	Dump at pit.
47	28-71- 1	--	.1	--	60	160	500	--	--	--	5	.05	Gouge in pit.
48	28-71- 1	--	--	--	30	160	200	--	--	--	4	.02	Dump at pit.
49	28-71- 1	--	--	--	60	160	500	--	--	--	7	.02	Do.
50	28-71- 1	--	.2	--	60	300	500	--	100	--	5	.02	Gouge in pit.
51	27-71-15	--	.1	--	100	60	500	80	100	30	4	.4	Dump at caved adit.
52	27-71-15	--	--	150	100	600	500	300	700	--	M	.1	Dike at road cut.
53	27-71-15	--	.2	--	60	60	500	--	--	--	4	.2	Do.
54	27-71-15	--	.2	--	30	40	500	--	--	--	3	.2	Do.
55	27-71-15	--	.1	--	60	60	500	--	100	--	4	.2	Dump at caved adit.

TABLE 6.—*Analyses of U.S. Bureau of Mines samples from the Laramie Peak study area*—Continued

		Assay (oz/ton)		Semiquantitative spectrographic analyses (ppm)							(percent)		
Sample	Location T. R. S.	Au	Ag	Co (40)	Cr (30)	Cu (20)	Mn (30)	Ni (20)	Pb (100)	Sc (10)	Fe (0.004)	Ti (0.001)	Remarks
56	27-71-15	--	.1	--	100	60	1,000	80	100	--	6	.2	Do.
57	27-71-14	Tr	.1	40	100	1,300	3,000	200	700	30	M	.4	Gouge in adit.
58	27-71-14	--	.2	--	60	300	1,000	--	--	--	6	.02	Do.
59	27-71-14	Tr	.1	--	30	300	1,000	--	--	--	6	.02	Do.
60	27-71-14	--	--	--	100	300	1,000	--	--	--	7	.02	Do.
61	27-71-14	Tr	.1	--	60	300	1,000	--	--	--	M	.05	Dump at adit.
62	27-71-14	--	--	<40	100	300	4,000	200	--	--	M	.006	Specimen sample.
63	28-71-15	--	.1	--	30	160	200	--	--	--	3	.05	Dump at pit.
64	28-71-26	--	--	--	100	600	4,000	--	--	--	M	.05	Gouge in pit.
65	28-71-26	Tr	.1	--	100	600	4,000	--	--	--	M	.05	Dump at pit.
66	27-71-11	--	.1	--	100	300	200	--	--	--	5	.05	Do.
67	27-71-11	--	.1	--	300	300	300	--	--	--	M	.05	Do.
68	28-71-15	--	.1	--	30	300	200	--	--	--	M	.02	Do.
69	28-71-15	--	.1	--	60	300	300	--	--	--	M	.02	Do.
70	27-71-10	--	.1	--	300	300	300	--	--	--	5	.05	Dump at caved adit.
71	27-71-10	--	--	--	300	300	500	--	--	30	M	.1	Do.
72	28-71-15	--	--	--	60	3,000	300	--	--	--	M	.02	Dump at shaft.
73	28-71-15	--	--	--	60	300	300	--	--	--	M	.05	Specimen sample.
74	27-73-36	--	.2	80	100	300	500	40	--	30	M	.1	Dump at pit.
75	28-71-15	--	--	--	100	80	500	40	400	--	4	.4	Dump at shaft.
76	27-73-36	--	.1	--	60	60	500	--	2,000	--	2	.1	Dump at pit.
77	27-73-36	--	.1	--	30	60	300	20	--	--	4	.1	Do.
78	27-73-36	--	Tr	--	30	60	500	--	4,000	--	3	.1	Do.
79	27-73-36	--	Tr	--	60	60	500	--	7,000	--	5	.3	Do.
80	26-73- 1	--	--	--	100	40	1,000	--	--	30	7	.8	Do.

[1]Samples 11, 12, 13, and 14 each contained <0.01 ppm platinum, <0.01 ppm palladium, and 2 percent zinc.
[2]Sample 15 contained 0.5 percent zinc.
[3]Sample 32 contained 0.01 ounce silver per ton on check assay.
[4]Sample 41 contained 100 ppm lanthanum.

PROSPECT NORTHWEST OF ASHENFELDER PROSPECT

Three selected dump samples (16–18, table 6) were taken at a prospect pit that is just within the study area about 3.2 km (2 mi) northwest of the Ashenfelder prospect. Although assay values were of no economic significance, anomalous concentrations of silver, copper, and lead were found.

PROSPECT NORTHEAST OF ASHENFELDER PROSPECT

Four samples (19–22, table 6) were taken at a caved adit that is about 1.6 km (1 mi) northeast of the Ashenfelder prospect. Aside from 600 ppm (0.06 percent) copper in samples 19 and 20, metal contents were low or negligible.

HARRIS PARK ROAD AREA NORTH OF LARAMIE PEAK SCOUT CAMP

Nine samples (38, 39, 40, 47–50, 64, and 65, table 6) were taken from four prospect workings along the Harris Park road in E½ T. 28 N., R. 71 W. (fig. 2). Only one of the workings, a pit at sample site 64–65, is within the study area. Metal values were low, although samples 64 and 65 contained 600 ppm (0.06 percent) copper.

HARRIS PARK ROAD AREA SOUTH OF LARAMIE PEAK SCOUT CAMP

Twenty samples (42–45, 51–56, 57–62, 66, 67, 70, and 71, table 6) were taken from seven prospect areas along the Harris Park road south of the Laramie Peak Scout Camp in T. 27 N., R. 71 W. All the workings are just east of the study area boundary (fig. 2). Six of the samples (42–45, 66, and 67) were from dumps near caved prospect pits or shafts; five (51, 55, 56, 70, and 71) were from dumps near short caved adits; three (52–54) were cut across a mafic dike in a roadcut; and six (57–62) were from the Al Mahoney Nos. 1–6 prospect. Except for anomalous copper values in selected dump samples, metal values were low.

The Al Mahoney Nos. 1–6 prospect was the only uncaved working that could be examined. Four chip samples (57–60) and two grab samples (61 and 62) were taken. The prospect, in sec. 14, T. 27 N., R. 71 W., about 1.6 km (1 mi) outside the study area, consists of a 18.3-m (60-ft) adit and a small stoped area about 7.6 m (25 ft) from the portal. Limonite stained granite is exposed on the surface at the portal, and the adit follows a nearly flat fault-gouge zone that is approximately 1.5 m (5 ft) thick. Cross faulting is indicated in the adit. Sample 57 was the only sample containing anomalous values, it contained 1,300 ppm copper.

HAYSTACK PEAKS

East of Haystack Peaks (sec. 29, T. 27 N., R. 71 W.) and just within the study area, a sample (41, table 6) of granite was taken from a claim. Analytical results were negligible.

AREA WEST OF EAGLE PEAK

Six samples (74 and 76–80, table 6) were taken from dumps at six prospect pits along the Eagle Peak road west of Eagle Peak, just outside the study area in sec. 36, T. 27 N., R. 73 W., and in sec. 1, T. 26. N., R. 73. W. Anomalous lead values were obtained on samples 76, 78, and 79.

MINERAL POTENTIAL

According to sample results, gold and silver either are not detectable or they occur in very low concentrations in the area. Copper, lead, and zinc were detected in anomalously high concentrations in a number of samples taken from prospect workings. These prospects, however, have been explored, and the potential for economic deposits of these metals is low. Occurrences of iron-bearing minerals such as pyrrhotite, pyrite, and limonite are numerous, but there is little possibility for the development of a commercial deposit in the area because of the small and discontinuous nature of the bodies involved.

Osterwald and others (1966) have reported occurrences of tantalum, lithium, beryl, and bismuth in and near the study area. However, the normal economic occurrence of tantalum, lithium, and beryllium is in granitic pegmatities where detailed sampling is necessary to document their grade. No pegmatites were sampled by the Bureau of Mines because no host pegmatite targets of sufficient tonnage are present in the study area.

No significant radiometric readings with a scintillometer were obtained at any prospects visited or from any of the samples. Furthermore, no uranium shipments have been recorded from the area. Smith (1954) and Guilinger (1956) discussed uranium mineral occurrences in the Laramie Peak region, and concluded that commercial uranium deposits probably do not exist in the region.

Building stone and sand and gravel of commercial quality are present, but abundant reserves of these materials are located closer to the markets in the area.

No oil and gas production has been reported from the study area, and no oil and gas leases have been issued. Furthermore, the geologic setting precludes the presence of fossil fuel resources in the study area.

There are no surface indications that geothermal energy could be developed within or near the study area.

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