MINERAL RESOURCE POTENTIAL OF THE LINCOLN CREEK ROADLESS AREA, DOUGLAS COUNTY, NEVADA

SUMMARY REPORT

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STUDIES RELATED TO WILDERNESS

Under the provisions of the Wilderness Act (Public Law 88-577, September 3, 1964) and related acts, the U.S. Geological Survey and the U.S. Bureau of Mines have been conducting mineral surveys of wilderness and primitive areas. Areas officially designated as "wilderness," "wild," or "canoe" when the act was passed were incorporated into the National Wilderness Preservation System, and some of them are presently being studied. The act provided that areas under consideration for wilderness designation should be studied for suitability for incorporation into the Wilderness System. The mineral surveys constitute one aspect of the suitability studies. The act directs that the results of such surveys are to be made available to the public and be submitted to the President and the Congress. This report discusses the results of a mineral survey of the Lincoln Creek Roadless Area (5983), Toiyabe National Forest, Douglas County, Nevada. Lincoln Creek Roadless Area was classified as a further planning area during the Second Roadless Area Review and Evaluation (RARE II) by the U.S. Forest Service, January 1979.

SUMMARY

The Lincoln Creek Roadless Area has low potential for skarn-type tungsten resources in area A (fig. 2), as indicated by the presence of geochemical anomalies; however, geologic evidence, the lack of claim activity, and the generally weak concentrations of the anomalous elements suggest that the potential for tungsten resources is low in this area. No other mineral resource potential and no oil, gas, coal, or geothermal resources exist within the study area.

INTRODUCTION

The Lincoln Creek Roadless Area comprises 10.3 mi^2 (26.7 km^2) on the generally heavily forested western slope of the Carson Range overlooking the southeast shore of Lake Tahoe in Douglas County, Nevada. The area is bounded by U.S. Highway 50 on the north and west, by Nevada Highway 19 (Kingsbury Grade) on the south, and by a U.S. Forest Service road on the east (fig. 1). Elevations range from 6,400 ft (1,950 m) at Cave Rock to 8,433 ft (2,570 m) near the east boundary.

The U.S. Geological Survey conducted geological and geochemical surveys of the area during the summer of 1982 to supplement previously completed studies south of latitude 39°00'N. (Armin and John, 1983; Chaffee and others, 1980). The U.S. Bureau of Mines examined prospects and mineralized areas and searched literature and county claim records in 1981. They collected five rock chip samples and 11 stream-sediment samples for geochemical analysis. Rock chip samples were analyzed by fire assay for gold and silver, and selected samples were analyzed by fluorometric methods for uranium and by semiquantitative spectrographic methods for 42 elements. Heavy-mineral concentrates of stream-sediment samples were analyzed spectrographically. All lode and placer samples were checked for radioactivity and fluorescence.

GEOLOGIC SETTING

Rocks exposed in the Lincoln Creek Roadless Area consist predominantly of Late Cretaceous granitic rocks of the Sierra Nevada batholith. More than three-quarters of the study area is underlain by the granodiorite of Daggett Pass, a medium- to coarse-grained hornblende-biotite granodiorite that is about 92 million years old (Armin and John, 1983). Small parts of four other plutons extend into the area near the southern and northern boundaries of the roadless area.

The granitic rocks intrude two pendants or septa of metavolcanic rocks of Triassic and Jurassic age. The northern pendant consists mainly of andesitic pyroclastic and volcaniclastic rocks that have been metamorphosed to biotite-hornblende amphibolite and biotite schist. Most of this pendant is exposed outside of the roadless area to the east and covers about 11.5 mi^2 (30 km^2). Moore (1969) assigned this pendant a Triassic and Jurassic age. The pendant underlying Castle Rock, near the southern boundary of the area, consists of metamorphosed rhyolitic rocks (Bonham and Burnett, 1976).

A dike of biotite-hornblende dacite intrudes the granodiorite of Daggett Pass at Cave Rock. This dike is the only evidence within the roadless area of the volcanic activity that pervaded much of the northern and central Sierra Nevada in the late Tertiary. More extensive exposures of Tertiary volcanic rocks occur about 1 mi (1.6 km) north of the area near Shakespeare Point and farther north across U.S. Highway 50.

Thin deposits of Quaternary alluvium form the valley floors of some of the major stream drainages within the study area.

GEOCHEMICAL STUDIES

A total of 21 rock, 27 minus-60-mesh (0.25-mm) stream-sediment, and 27 nonmagnetic heavy-mineral-concentrate samples were processed for the geochemical investigation of the Lincoln Creek Roadless

Area. The rock samples were collected to provide information on normal, or background, chemical abundances of the rock units in the overall study area. The sediment samples were collected to provide information about the chemical elements in the overall rock material eroded from the drainage basin upstream from each sample site.

The concentrate samples were taken from the same localities as the minus-60-mesh stream-sediment samples. Because of the processing procedures used, the analyses of the concentrate samples provide information about the chemistry of a limited number of minerals in the rock material eroded from the drainage basin upstream from each sample site.

All three types of samples were analyzed for 31 elements (silver, arsenic, gold, boron, barium, beryllium, bismuth, calcium, cadmium, cobalt, chromium, copper, iron, lanthanum, magnesium, manganese, molybdenum, niobium, nickel, lead, antimony, scandium, tin, strontium, thorium, titanium, vanadium, tungsten, yttrium, zinc, and zirconium) using a six-step semiquantitative emission spectrographic method (Grimes and Marranzino, 1968). Because of the limited amount of sample material, the nonmagnetic heavy-mineral concentrates were only analyzed spectrographically. The rock and stream-sediment samples were also analyzed for arsenic, bismuth, cadmium, antimony and zinc by atomic absorption spectrometry using a modification of the method of Viets (1978).

Two elements (copper and antimony) in the rock samples were selected as having anomalous concentrations that might be related to mineralization; in a similar manner, five elements (arsenic, cadmium, copper, antimony, and zinc) for the stream-sediment samples and five elements (boron, bismuth, molybdenum, tin, and tungsten) for the concentrate samples were selected as possibly being related to mineralization. Anomalous concentrations for the selected elements are shown by location on figure 3. On the basis of a technique called SCORESUM (Chaffee, 1983), anomalous concentrations for the individual selected elements in each sample were assigned anomaly scores (table 1), and these scores were then summed for each sample type at each site. The resulting Scoresums for the stream-sediment and concentrate samples were plotted by drainage basin on a geologic base map of the roadless area (fig. 4). Statistics used in preparing table 1 were derived using programs available in the U.S. Geological Survey RASS-STATPAC system (VanTrump and Miesch, 1977).

Geochemical anomalies

Scattered, generally weak geochemical anomalies are present in both stream-sediment and concentrate samples in several drainage basins (fig. 4). The most significant anomaly is in North Logan House Creek, in the northern part of the roadless area, where anomalous concentrations of antimony are present in the stream-sediment samples and anomalous concentrations of boron, bismuth, molybdenum, tin, and tungsten are present in one or both of the concentrate samples (fig. 3). This area is underlain by Mesozoic volcanic rocks that have been intruded and metamorphosed by the Cretaceous granodiorite of Daggett Pass. The anomalous element suite in the North Logan House Creek drainage is compatible with a contact-metasomatic (skarn) tungsten-deposit environment; however, the generally low element concentrations suggest only a very low potential for such a deposit. A similar statement can be made for the anomaly present in the upper part of the Logan House Creek drainage.

Sources of the other anomalies scattered throughout the roadless area are not known. All of the anomalies are associated predominantly with the granodiorite of Daggett Pass; none of the anomalies is thought to indicate any important mineral resource potential.

PROSPECTS AND MINERALIZED AREAS

Exploration and mining activity began in the Sierra Nevada as early as 1850, with the first recorded activity near the Lincoln Creek Roadless Area in 1901. The Genoa mining district, 3 mi (5 km) east of the roadless area, was organized in 1860. Results of prospecting for gold, silver, and copper in this district were discouraging (Smith and Vanderburg, 1932).

No claims have been located within the roadless area. Twelve claims were located in 1901 near Spooner Junction for gold, and several claims were located along Kingsbury Grade in the 1950's for uranium. No visible signs of mining activity were observed during field investigations, and no production has been recorded.

The U.S. Bureau of Mines examined the Kingsbury Queen prospect located about 1.25 mi (2 km) southeast of the roadless area on Kingsbury Grade (No. 1, fig. 1). The Kingsbury Queen prospect is located on a 15-ft (4.6-m) wide radioactive pegmatite dike that trends N. 15° E. and dips 25° SE. One sample of the dike contained $<$0.001 percent uranium oxide (U_3O_8). No radioactive pegmatite dikes were found in the roadless area.

Five rock samples and 11 placer samples were analyzed by the U.S. Bureau of Mines. The rock samples contained no anomalous quantities of gold, silver, or copper. One placer sample from an unnamed stream near Zephyr Cove contained 11 cents gold per yd^3, and another sample from North Logan House Creek contained 4 cents gold per yd^3 (at \$400 per troy oz gold). Because of the low concentrations of gold and small volumes of gravel, these areas are not considered to constitute a resource. The nine other placer samples contained no detectable gold.

ASSESSMENT OF MINERAL RESOURCE POTENTIAL

The Lincoln Creek Roadless Area has low potential for tungsten resources in area A (fig. 2), at the north end of the roadless area. Geochemical anomalies suggest that skarn-type tungsten mineralization may occur in the metamorphic septum between the granodiorites of Daggett Pass and North Logan House Creek in area A. However, the absence of observed tungsten mineralization, the lack of known host rocks (marble) for skarn mineralization in the metamorphic rocks, the lack of claim activity, and the generally weak geochemical anomalies suggest that only a low potential exists for tungsten resources in this area. No other mineral resources were identified by this study, and no oil, gas, coal, or geothermal resources exist within the study area.

REFERENCES CITED

Armin, R. A., and John, D. A., 1983, Geologic map of the Freel Peak 15-minute quadrangle, California and Nevada, with Quaternary geology by J. C. Dohrenwend: U.S. Geological Survey Miscellaneous Field Investigations Map I-1424, scale 1:62,500 in press .

Bonham, H. F., Jr., and Burnett, J. L., 1976, South Lake Tahoe folio geologic map: Nevada Bureau of Mines and Geology, scale 1:24,000.

Chaffee, M. A., 1983, SCORESUM—A technique for displaying and evaluating multielement geochemical information, with examples of its use in regional mineral assessment programs: Journal of Geochemical Exploration in press .

Chaffee, M. A., Hill, R. H., Speckman, W. S., and Sutley, S. J., 1980, Preliminary data set containing geochemical analyses of samples of rock, stream sediment, and nonmagnetic heavy-mineral concentrate, Walker Lake 2° quadrangle, California and Nevada: U.S. Geological Survey Open-File Report 80-881, 235 p., 1 plate.

Grimes, D. J., and Marranzino, A. P., 1968, Direct-current arc and alternating-current spark emission spectrographic field methods for the semi-quantitative analysis of geologic materials: U.S. Geological Survey Circular 591, 6 p.

Moore, J. G., 1969, Geology and mineral deposits of Lyon, Douglas, and Ormsby Counties, Nevada: Nevada Bureau of Mines Bulletin 75, 45 p.

Smith, A. M., and Vanderburg, W. O., 1932, Placer mining in Nevada: Nevada Bureau of Mines Bulletin 18.

Streckeisen, A. L., 1976, To each plutonic rock its proper name: Earth Science Reviews, v. 12, p. 1-33.

VanTrump, George, Jr., and Miesch, A. T., 1977, The U.S. Geological Survey RASS-STATPAC System for management and statistical reduction of geochemical data: Computers and Geosciences, v. 3, p. 475-488.

Viets, J. G., 1978, Determination of silver, bismuth, cadmium, copper, lead, and zinc in geologic materials by atomic absorption spectometry with tricaprylylmethylammonium chloride: Analytical Chemistry, v. 50, no. 8, p. 1097-1101.

Table 1.--Summary of background and anomaly ranges for 21 rock samples and of background ranges and anomaly scores for selected anomalous elements in 27 -60-mesh stream sediment, and 27 nonmagnetic heavy-mineral-concentrate samples, Lincoln Creek roadless Area, Nevada.

[All concentrations are in parts per million. aa, atomic-absorption analysis; all other analyses are spectrographic. N, not detected at the lower limit of determination shown in parentheses; --, no samples in that category]. See figure 4 for location of anomalies].

Element	Background data		Anomaly data		
	Range of values (ppm)	Percent of samples with background values	Anomaly score=1 (ppm)	Anomaly score=2 (ppm)	Anomaly score=3 (ppm)
		Rock samples			
Copper (Cu)	<5-50	96	70-100	--	--
Antimony (Sb)-aa	N(1)-1	96	8	--	--
		Stream-sediment samples			
Copper (Cu)	15-50	85	70	100	--
Arsenic (As)-aa	N(10)-10	93	20	30	--
Zinc (Zn)-aa	15-75	86	80-95	--	--
Cadmium (Cd)-aa	N(0.10)	86	0.3	0.4	--
Antimony (Sb)-aa	N(1)-2	71	3-4	5-6	8
		Heavy-mineral-concentrate samples			
Boron (B)	20-70	82	100	150-200	--
Bismuth (Bi)	N(20)	89	--	--	50-1,500
Molybdenum (Mo)	N(10)-20	96	70	--	--
Tin (Sn)	<20-70	93	100	--	--
Tungsten (W)	N(100)-100	93	200	300	--

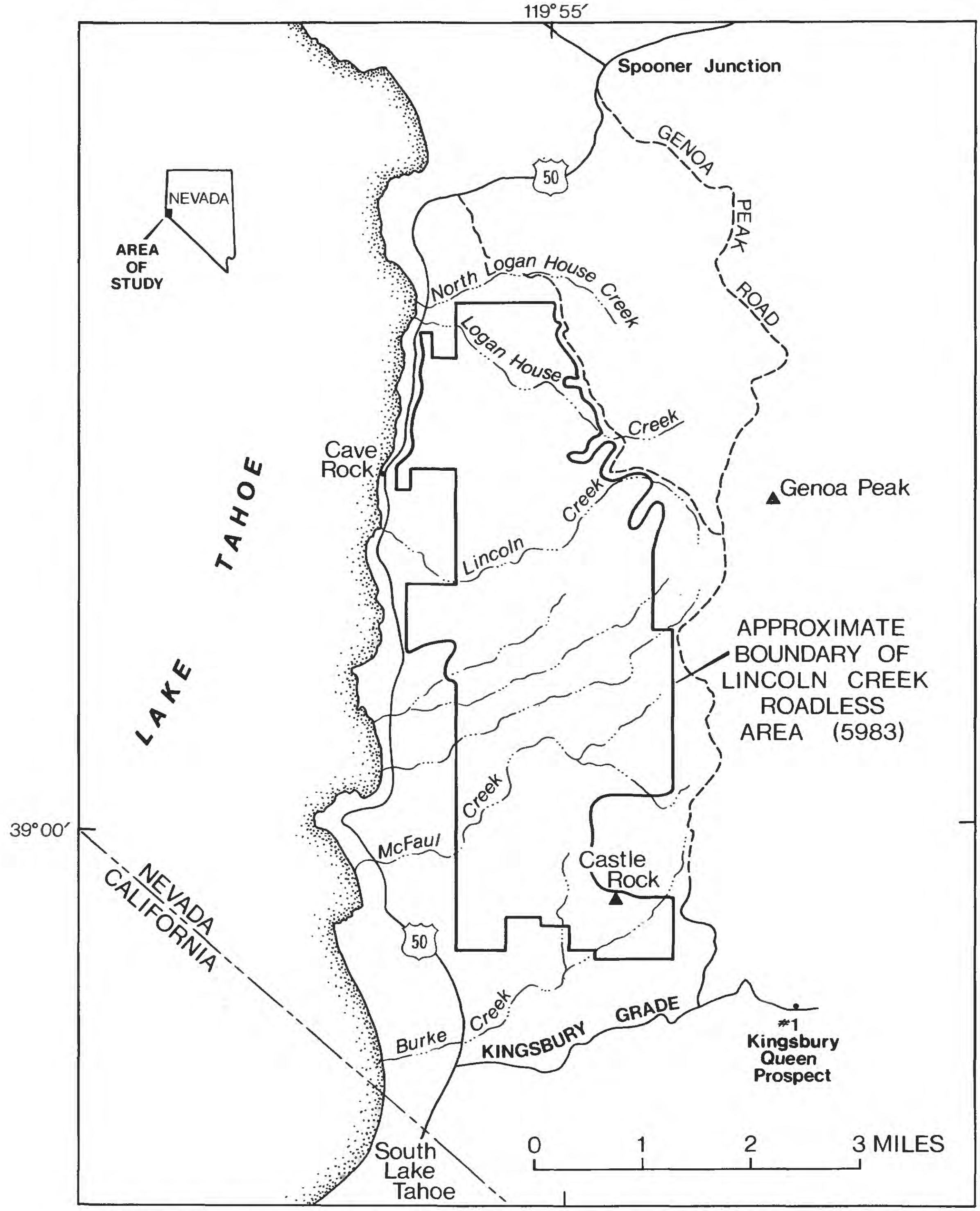

Figure 1.--Index map of the Lincoln Creek Roadless Area (5983) and vicinity, Douglas County, Nevada

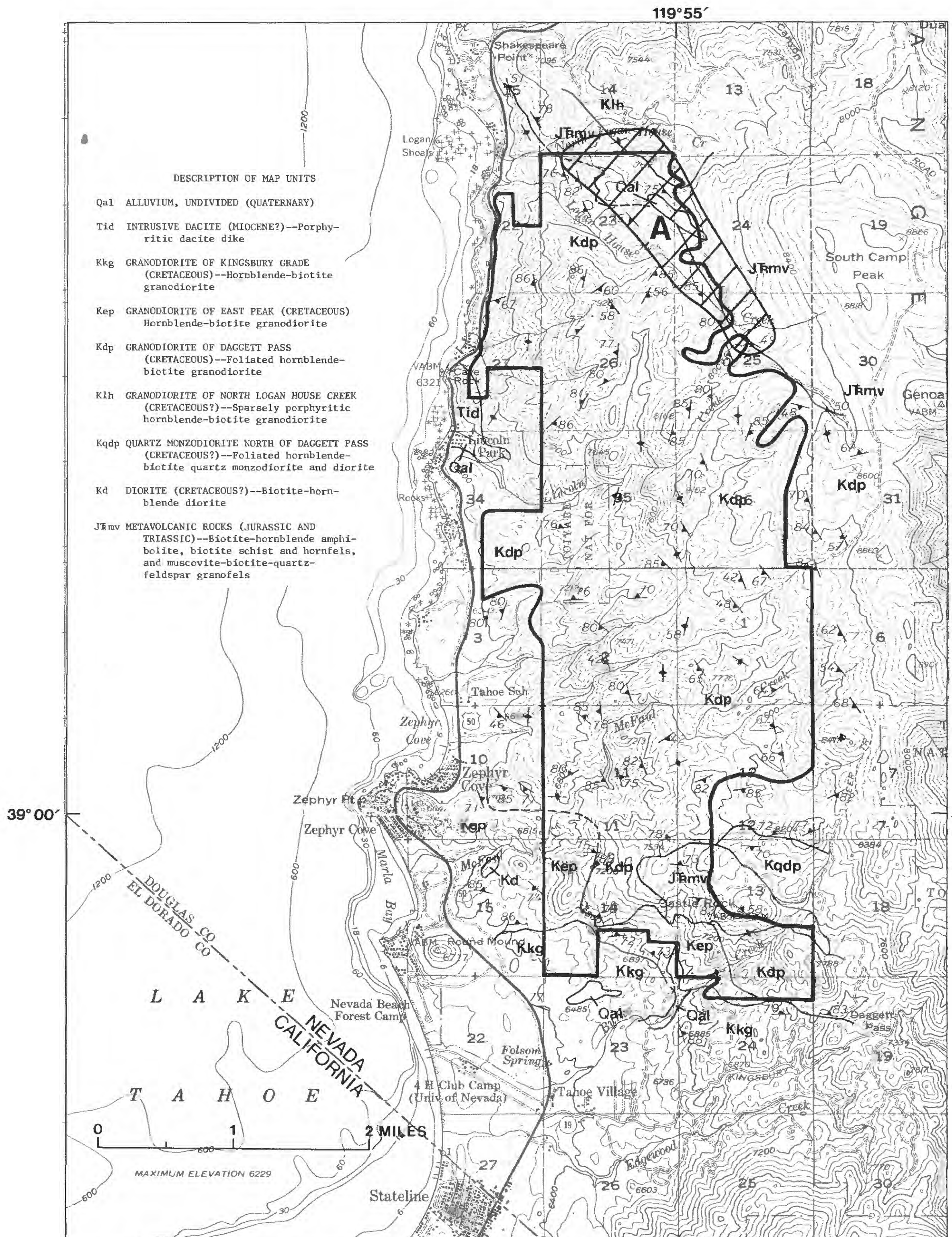

Figure 2.--Map showing geology and mineral resource potential of the Lincoln Creek Roadless Area, Douglas County, Nevada.

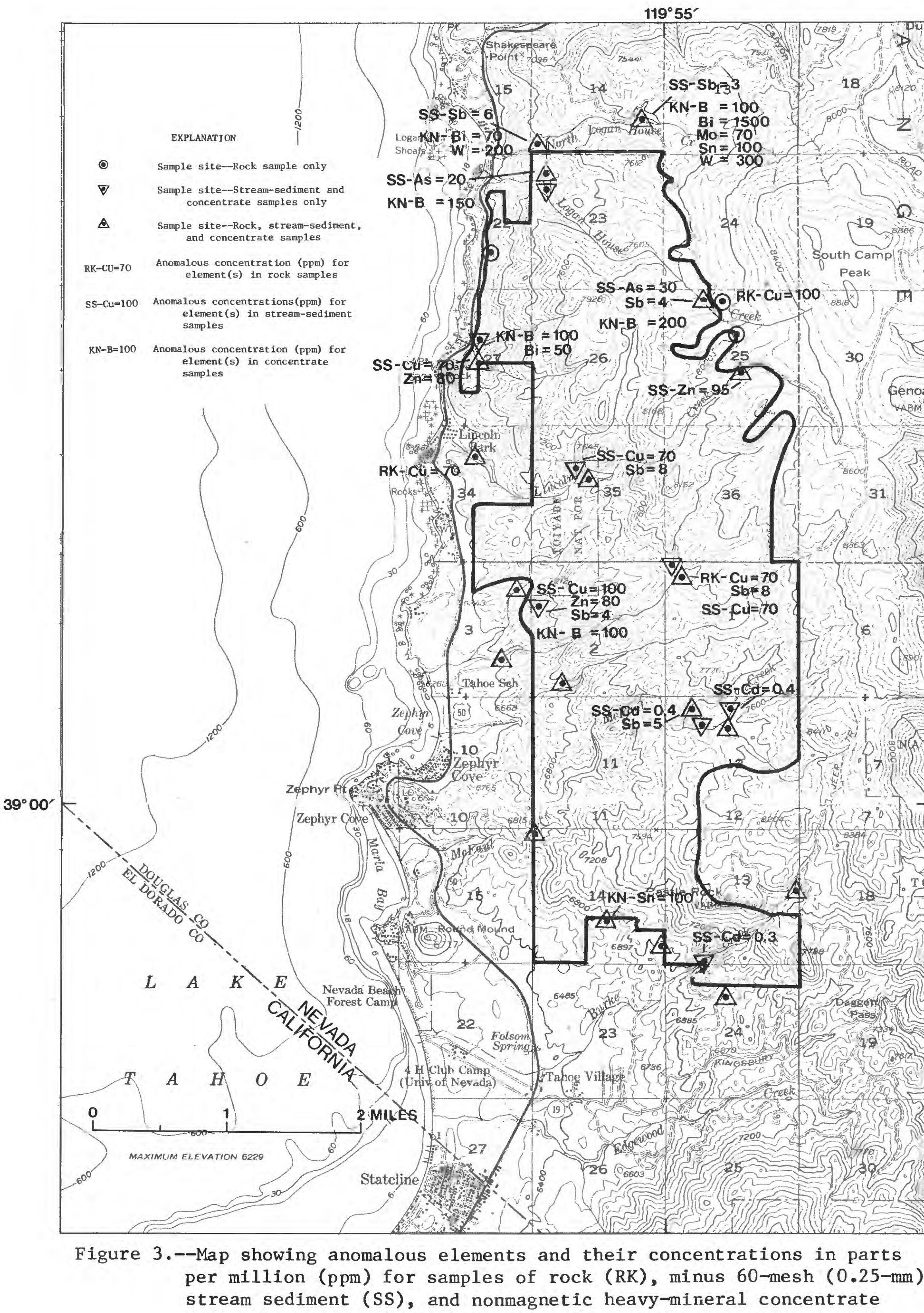

Figure 3.--Map showing anomalous elements and their concentrations in parts per million (ppm) for samples of rock (RK), minus 60-mesh (0.25-mm) stream sediment (SS), and nonmagnetic heavy-mineral concentrate (KN), Lincoln Creek Roadless Area, Douglas County, Nevada. See table 1 for element names and symbols.

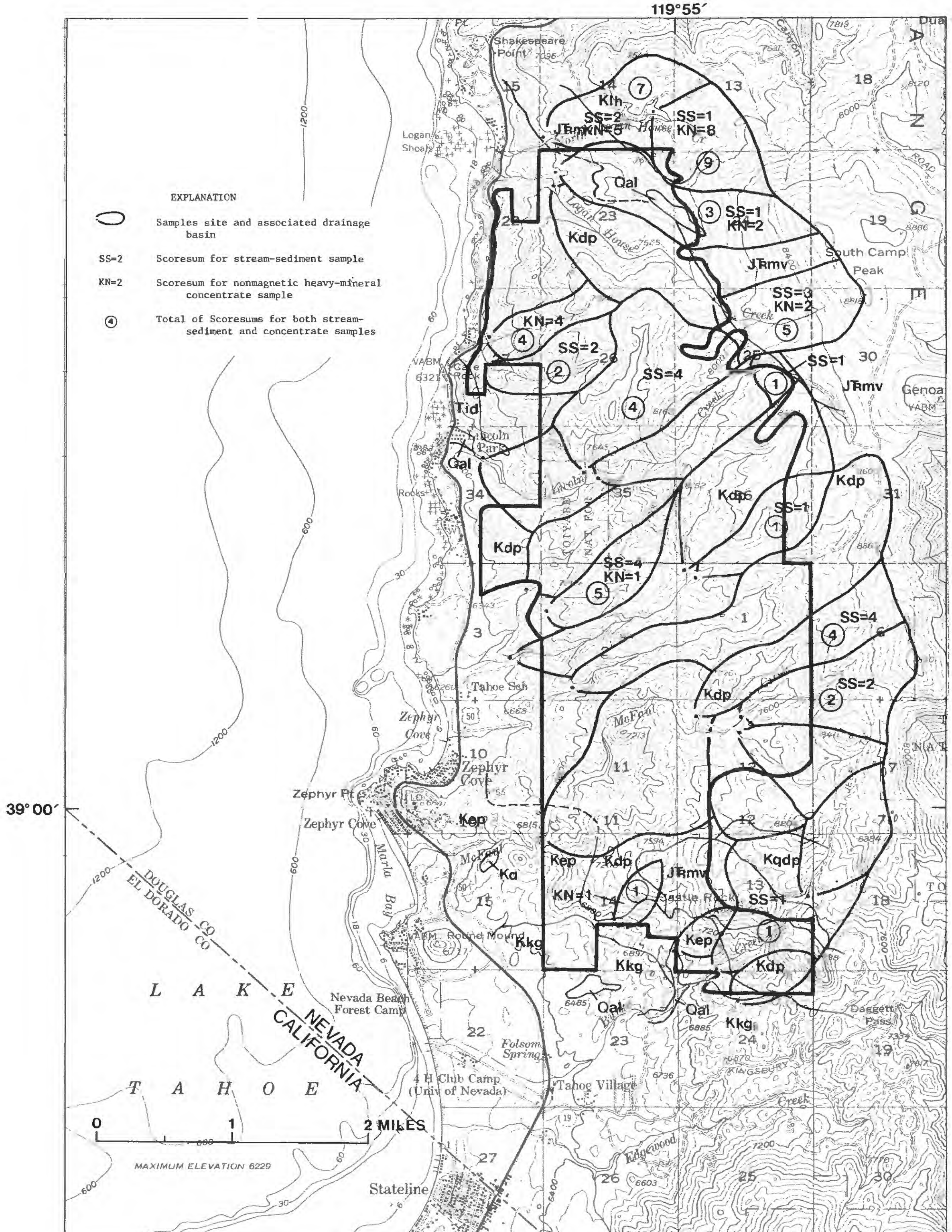

Figure 4.--Map showing Scoresums by drainage basins for samples of minus 60-mesh (0.25-mm) stream sediment (SS) and nonmagnetic heavy-mineral concentrate (KN), Lincoln Creek Roadless Area, Douglas County, Nevada. See figure 2 for explanation of geologic map symbols.