FIELD REPORT ON TIN AND REE MINERAL INVESTIGATIONS IN THE CHITANATALA MOUNTAINS

by

Roger Burleigh

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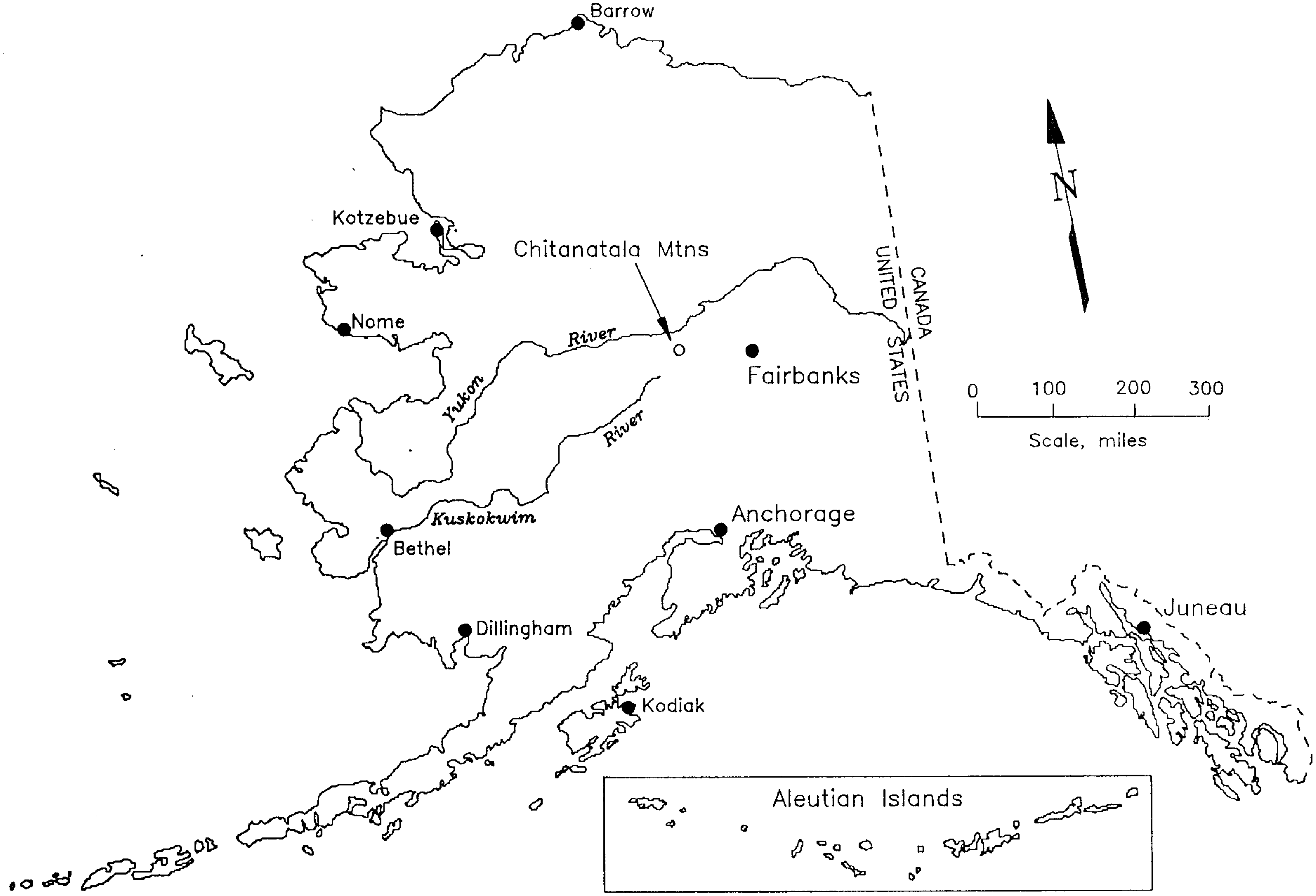
UNITED STATES DEPARTMENT OF THE INTERIOR

Manuel Lujan Jr., Secretary

BUREAU OF MINES

T S Ary, Director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INTRODUCTION

During the time period of May 22 through May 29, 1989 Patricia Moore and Roger Burleigh conducted a reconnaissance field examination of the intrusive complex which cores a portion of the Chitanatala Mountains. The Chitanatala Mountains forms a roundish set of hills approximately 40 miles due south of Tanana. Access to the project site was obtained by helicopter from Fairbanks, about 110 air miles to the east, figure 1.

The Chitanatala Mountains were briefly examined in 1975 by Patton et al. of the USGS (1). This brief reconnaissance (1) identified a variety of compositions in the complex ranging from syenites to diorites and both "wet" and "dry" phases as well. Analyses of rocks, stream sediments, or pan concentrate samples are not available from this reconnaissance mapping survey, therefore very little was known of the geology or economic potential of the area prior to this evaluation. Furthermore, no previously known metalliferous occurrences are known to occur in the region.

The purpose of the Bureau's examination was two-fold: one, to apply past Bureau findings of elevated concentrations of rare earth elements (REE) associated with syenite rock types (2) as a basis for exploring the Chitanatala Complex for REE, and two, to pursue the Bureau's Critical and Strategic Minerals (Tin) program in a province where tin deposits are known to be related to intrusive rocks.

Approximately 16 square miles were mapped from a central camp locality on a ridge located 1 mile east of VABM Cosna. Seventeen rock samples (Ci 27001-5 & Ci 27034-50), one soil sample (Ci 27041) and three pan concentrate samples (Ci 27036-37 & 27045) were obtained during the course of mapping. In late May, many of the creeks traversed still contained a heavy ice pack which precluded the opportunity to acquire a wider coverage of pan concentrate samples. The sample locations are plotted on figure 2.

GEOLOGY

A complex assemblage of rocks, which have been assigned to the Nixon Fork terrane by Patton et al.(3), underlies the Chitanatala Mountains . This terrane comprises "three stratigraphic packages separated by major unconformities: 1) a Precambrian metamorphic basement, 2) a thick lower Paleozoic platform carbonate sequence, and 3) a thin upper Paleozoic and Mesozoic terriginous terrane" (3). Patton et al. (3) did not specifically discuss the rocks in the Chitanatala Mountains, however, they made mention of the fact that the Kuskokwim Mountain igneous belt of volcanic and volcanoplutonic complexes have K-Ar ages between 72 and 60 Ma. The intrusive rocks of the Chitanatala Mountains are believed to be included in this belt. Based upon these criteria, the igneous rocks of the Chitanatala Mountains

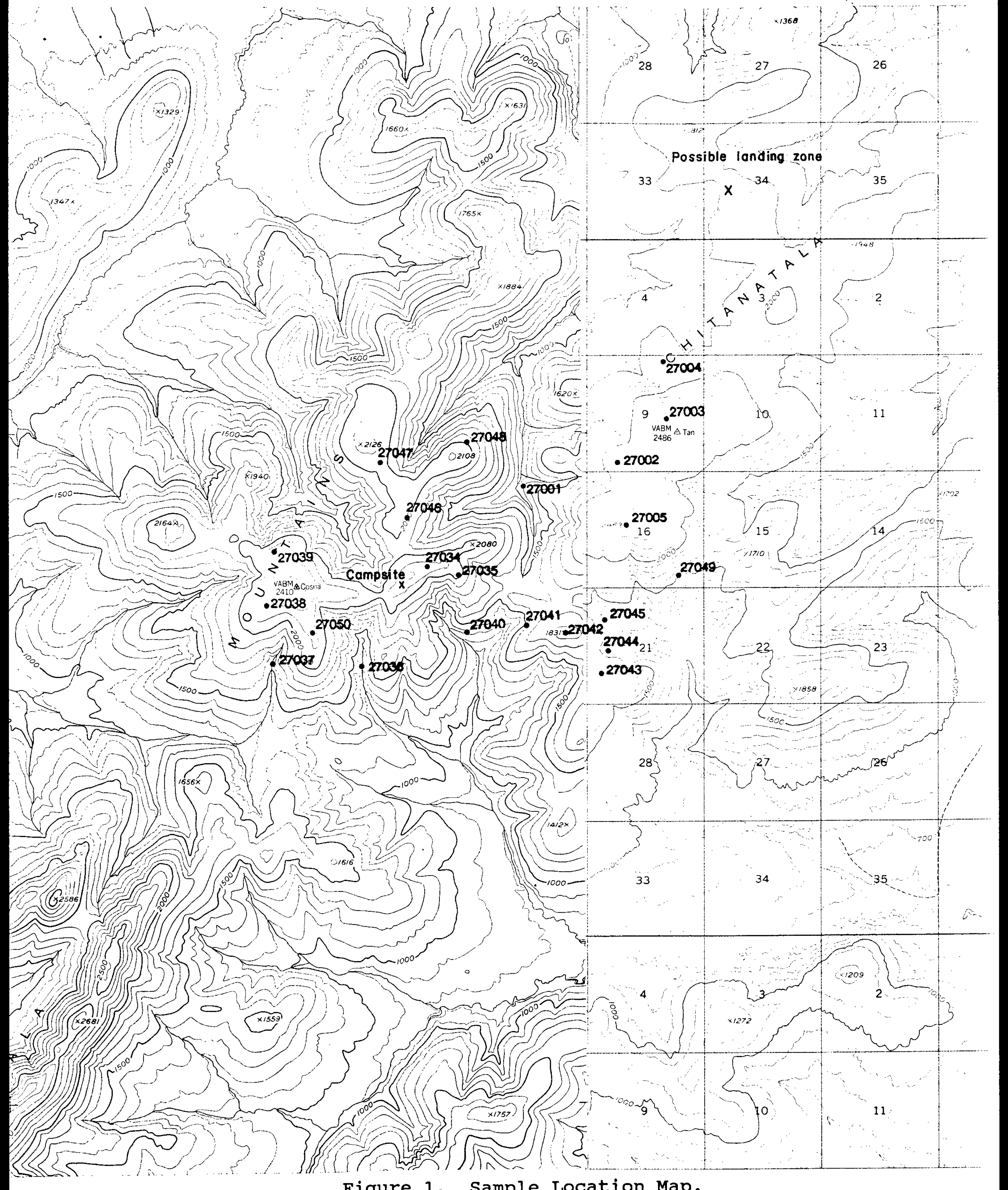

Figure 1. Sample Location Map.

USGS 1:63,360 scale topographic base map.
Kantishna River C-4 & C-5 quadrangles.

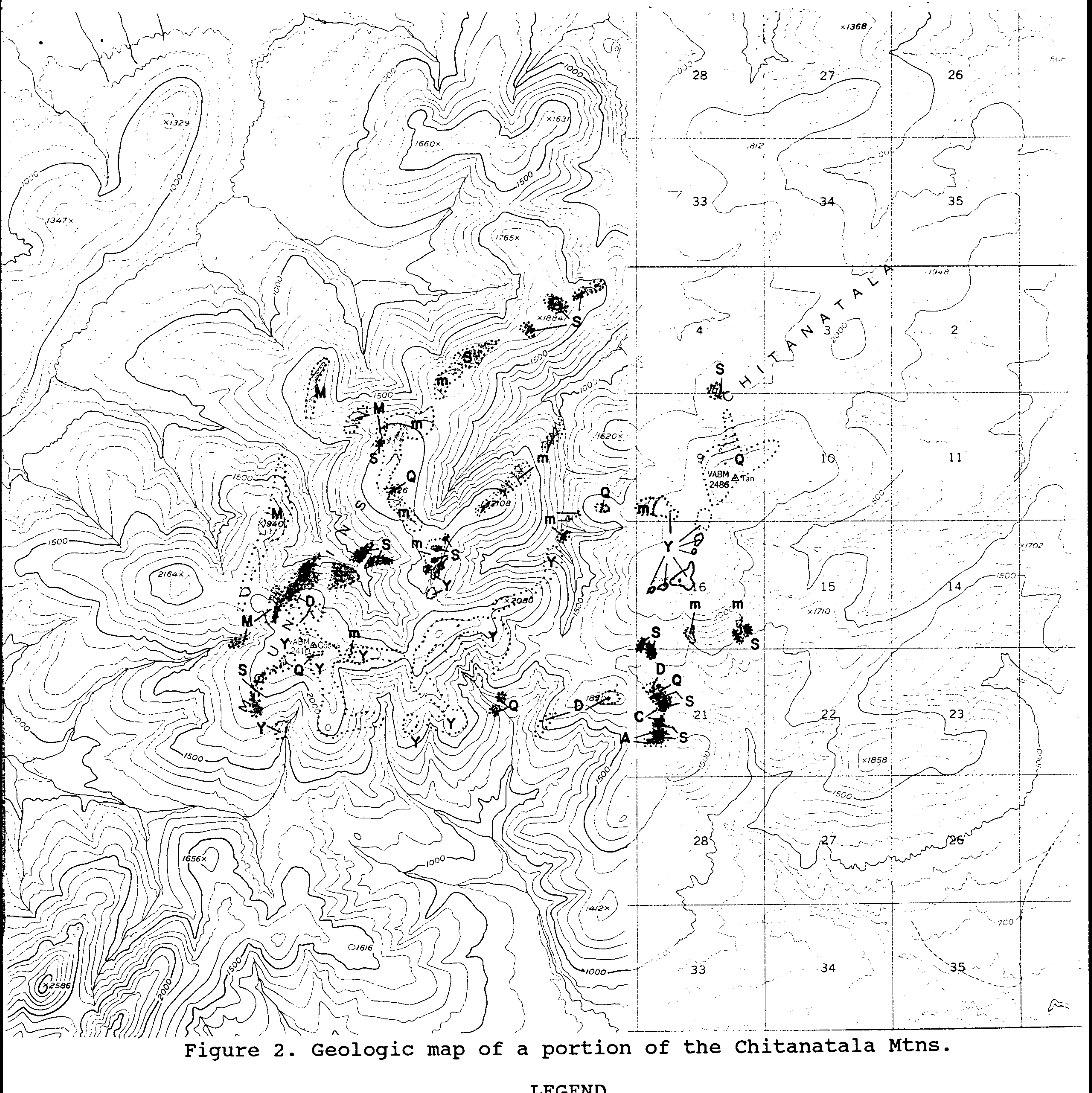

Figure 2. Geologic map of a portion of the Chitanatala Mtns.

LEGEND

A Meta-andesite	Meta-Sedimentary Rocks
M Marble	Y Syenite
Q Porphyritc Quartz Monzonite	m Monzonite
D Equigranular Bio-Hnbl Diorite	C Carbonate-altered quartz-eye porphyry dike

USGS 1:63 360 scale topographic base map.
Kantishna River C-4 & C-5 quadrangles.

appear to intrude the Paleozoic platform rocks and possibly portions of the terriginous terrane.

The various igneous rocks observed clearly have intrusive contacts with the local limestone, shale, graywacke and basalt country rocks as mapped previously by Chapman (1). Wherever these rocks outcropped near an exposure of intrusive rock they were either altered to marble or hornfels (nearly migmatite in places) and were strongly deformed. The deformation observed in the country rock appeared to be largely plastic as opposed to brittle.

It became clear that previous workers (1) had inferred the extent of intrusive rocks from air photo interpretation. Hence the areal extent of intrusive rock types found to occur is more limited than determined by earlier examinations.

Five igneous rock types have been defined in the map area. These include:

1. Syenite; Includes alkali syenite, mafic mineral rich (various concentrations of biotite and amphibole) syenites, and biotite or amphibole syenite.

2. Diorite; Generally fine to medium grained and includes some ragged K-spar phenocrysts

3. Monzonite; Medium grained and has a noticably larger proportion of K-spar phenocrysts compared to the diorite.

4. Quartz monzonite; medium grained and is similar to the monzonite except that it contains abundant quartz.

5. Altered quartz-eye porphyry dike rock.

Syenite

The syenite is the most widely exposed igneous rock type in the map area (fig 2). The compositional variety and the petrogenesis of the syenite pluton appears to be quite complex. The lack of continuity between outcrops of the syenite permitted only a cursory understanding of it. The earliest apparant syenitic phase appears to be a mafic variety of foliated biotite- and amphibole-rich syenite containing variable amounts of fine to coarse-grained tabular potassium feldspar phenocrysts. A perception of gradational relations to a more holocrystalline hypidio- to allotriomorphic and leucocratic rock type is found in some outcrops of the syenite complex. The more mafic and foliate varieties are clearly crosscut by sub- to leucocratic coarse grained syenite and alkali syenite dike swarms (particularly south of VABM Cosna). Coarse grained nepheline was possibly identified in these dikes which would make these rocks even more undersaturated with respect quartz. Small amounts of less than millimeter sized grains of euhedral zircon are also present in the leucocratic phases. The foliated fabric of the syenite trends approximately north-south with moderate to steep dips defined by the orientation of tabular potassium feldspar, biotite or amphibole grain alignments. The structural character of the syenite was, however, not routinely evaluated in this study.

As figure 3 shows, the syenite complex is generally surrounded by nonfoliated intrusive rocks of diorite, monzonite and quartz monzonite compositions which occupy the region between the syenite complex and the altered country rocks. Further detailed mapping, particularly on the south border of the complex, may conclusively clarify the distribution of less potassic compositions about the syenite rocks.

The syenite is crosscut by quartz monzonite dikes, a foot or less in width, at VABM Cosna and at an outcrop a mile south of VABM Tan. On this basis, the quartz monzonite, and probably the monzonite and diorite as well, intrude(s) the syenite complex.

Diorite

The diorite as mapped is fine to medium-grained and contains biotite and an approximately equal amount of a dull green-gray mafic mineral which is probably an altered amphibole. In some diorite outcrops, the amphiboles appear to predominate and tend to be unaltered. The diorite contains a small amount of red-brown zircon as well.

Monzonite-Quartz Monzonite

The monzonite is generally fine to medium grained and contains amphibole as the major mafic mineral. Biotite is a constituent in many samples, however, it may be an alteration product after amphibole as minor amounts of chlorite appear to be associated. Quartz is generally a visible constituent of the monzonite and the apparant difference between the quartz monzonite and the monzonite is nil except for the amount of quartz. Hence these compositions may only describe local compositional variations and not distinguish between separate phases.

The quartz monzonite as mapped occurs in two textural varieties. One variety is largely equigranular and contains biotite and amphibole as mafic mineral constituents and the other variety contains coarse euhedral phenocrysts of potassium feldspar in a finer grained matrix of plagioclase, quartz, biotite and accessory minerals.

Metasedimentary and Metavolcanic Rocks

Marbles, metamorphosed clastic sedimentary rocks, and meta-andesites which are believed to belong to the Paleozoic platform carbonate sequence described by Patton et al. (3), were mapped in the project area. The marble units, mapped on the northwest side of the plutonic complex, do not show evidence of deuteric alteration. They have been thermally upgraded to coarse-grained marble and substantially deformed. The slates and graywackes are noticably altered to hornfels as one approaches the vicinity of the intrusive contacts. The basalts and andesites which crop out on the southeast side of the plutonic complex may have undergone potassium metasomatism from the emplacement of the syenite phases of the complex. The biotite- amphibole-rich schistose units described above suggest that these rocks may indeed be an expression of contact alteration of the mafic to intermediate volcanic rocks.

Mineralization

The plutonic and surrounding altered country rocks were nearly devoid of any indication of hydrothermal activity or metallic mineralization. Only one quartz vein, with a maximum width of 1 foot was observed. This vein is exposed intermittently along the ridge a mile to 1.5 miles east of VABM Cosna. There are signs of past prospecting, and no indication metallic mineralization, associated with the quartz vein, was evident.

A trace amount of chalcopyrite and pyrrhotite was observed as an apparent alteration product of amphibole in quartz monzonite at one location (Ci-27049, fig. 3).

A greisen-like altered rock was found near the northern limits of the map area (sample no. Ci 27004). This occurrence is located in the vicinity of a prominent air photo lineament that has a ground expression as a linear depression. This sample also is in the vicinity of the contact of the quartz monzonite and hornfels. The rock is composed of mostly medium to coarse grained muscovite that has a pronounced greenish gray tint and quartz. No metallic mineralization appeared to be present in this boulder of about 9 inches in diameter, and no other rocks in this heavily vegetated area could be found. This rock is to be analyzed for tin and tungsten.

The rocks collected during this field examination were not analyzed due to the lack of any indication of significant mineralization in the area traversed. Three pan concentrate samples were analyzed for tin and they contained between 7 and 14 ppm tin.

Radioactivity

A Mt. Sorpis scintillometer was routinely carried in the field and all of the mapped units were scanned for signs of anomalous radioactivity. All of the rock types had approximately the same level of radioactivity, ranging between 40 to 80 counts per second. No anomalous readings were found at any of the outcrops and there was only a subtle inclination for the syenite rocks to have a slightly higher radioactive expression than the other rocks in the area.

RECOMMENDATIONS

From the camp site it was only possible to map one half of the intrusive complex. Chapman (1) had broken the plutonic complex down into a "wet" and a "dry" section. This field report describes rocks that were mapped in the "dry" half of the complex where it was hoped concentrations of REE would be found. The "wet" half is herein suggested to be a target area for potential tin-greisen type deposits or Bolivian-style tin-sulfide deposits as found elswhere in the Kuskokwim region. It was not possible to evaluate this area to any degree given the maximum possible radius of 4 miles for any given traverse. A reconnaissance flight over the "wet" area has shown that there is only one possible landing site for a helicopter. It is located on a ridge in section 34, T3S R22W. Six field days by a party of two geologists would be adequate to perform a similar level of evaluation of this "wet" section.

References

1. Chapman, R. M., W. E. Yeend, and W. W. Patton, Jr. Preliminary Reconnaissance Geologic Map of the Western Half of the Kantishna Quadrangle, Alaska. U.S. Geol. Surv. Open File Map 75-351, 1975.

2. Barker, J.C., and C. Mardock. REE- and Yttrium Bearing Pegmatites at Dora Bay, Southern Prince of Wales Island, Alaska. US Bureau of Mines OFR - in progress.

3. Patton, W.W. Jr., S.E. Box, E.J. Moll-Stalcup, and T.P. Miller. Geology of West-Central Alaska. USGS OFR 89-554, 1989.