

MAP OF BETTLES AND SOUTHERN WISEMAN QUADRANGLES SHOWING LOCATION OF FIELD OBSERVATION POINTS (dots) AND CONTINUOUS FOOT TRAVERSES (lines). Geology extended between field stations by aerial reconnaissance and by interpretation of aerial photographs. Geology along northern edge of map area taken in large part from Brosge and Reiser (1971).

TABLE 1. EARLY CRETACEOUS AND PERMIAN INVERTEBRATE FOSSIL COLLECTIONS
[Sample locations are shown on map as \bullet]

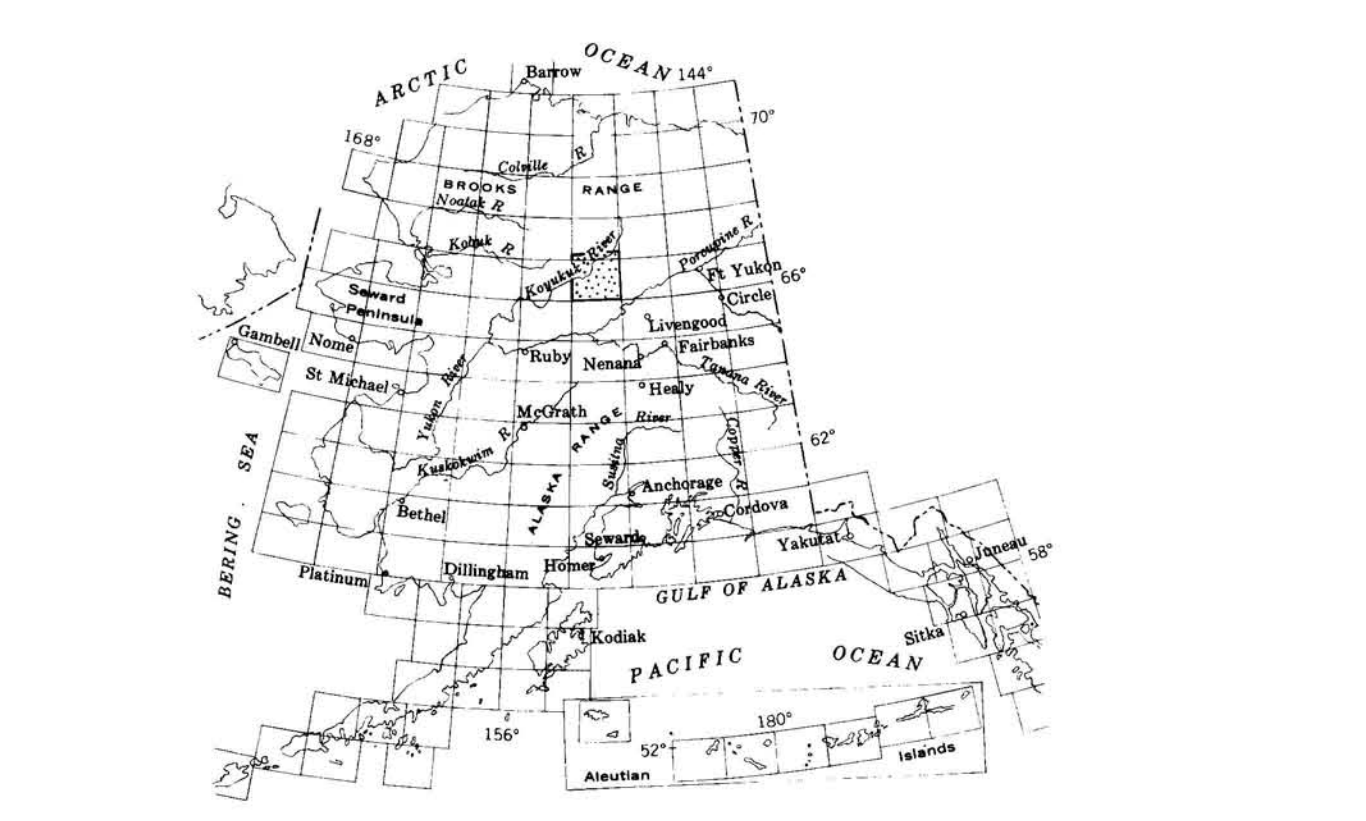
No.	Field Collection No.	USGS Locality No.	Fossils	Latitude and Longitude
Volcanic graywacke and mudstone (Kgm) ^{1/2}				
1	53APa32 67APa235	Mea. loc. 24638 Mea. loc. 40675	<i>Archibolites talkeetnensis</i> (Talay) <i>Archilina</i> sp.	67°04' N.; 150°51' W.
2	58AN110 67APa237	-----	<i>Podoceras</i> cf. <i>P. duplainum</i> (d'Orbigny) <i>Archilina</i> (?) sp.	67°02' N.; 151°09' W.
3	58AN109 67APa236	Mea. loc. 40676	Indet. pelicyoda	67°06' N.; 150°57' W.
4	53APa348 67APa238	Mea. loc. 24679	<i>Archilina</i> sp.	66°59' N.; 151°26' W.
5	53APa353	Mea. loc. 24680	Anticlerid ammonite, possibly <i>Protaniloceras</i> sp. <i>Archilina</i> sp.	66°55' N.; 151°41' W.
6	53APa354	Mea. loc. 24681	Indet. pelicyoda	66°43' N.; 151°42' W.
7	70APa262	Mea. loc. 40673	Fragment of smooth ammonite	66°17' N.; 152°30' W.
8	70ANa378	Mea. loc. 40674	Ammonite fragments, possibly <i>Archibolites</i> sp. Indet. pelicyoda	66°19' N.; 152°47' W.
Mafic volcanic and intrusive rocks (JVP) ^{1/2}				
9	70APa236	24455-PC	Foraminifera, bryozoa, crinoid debris, <i>Subconospira</i>	67°05' N.; 152°29' W.

^{1/2} Fossils in colls. 1-8 identified by R. W. Talay and D. L. Jones, U. S. Geol. Survey.
^{2/2} Foraminifera in coll. 9 identified by B. L. Mose, Univ. of Montreal, Canada; other fossils in coll. 9 identified by J. T. Dutton, Jr., U. S. Geol. Survey.

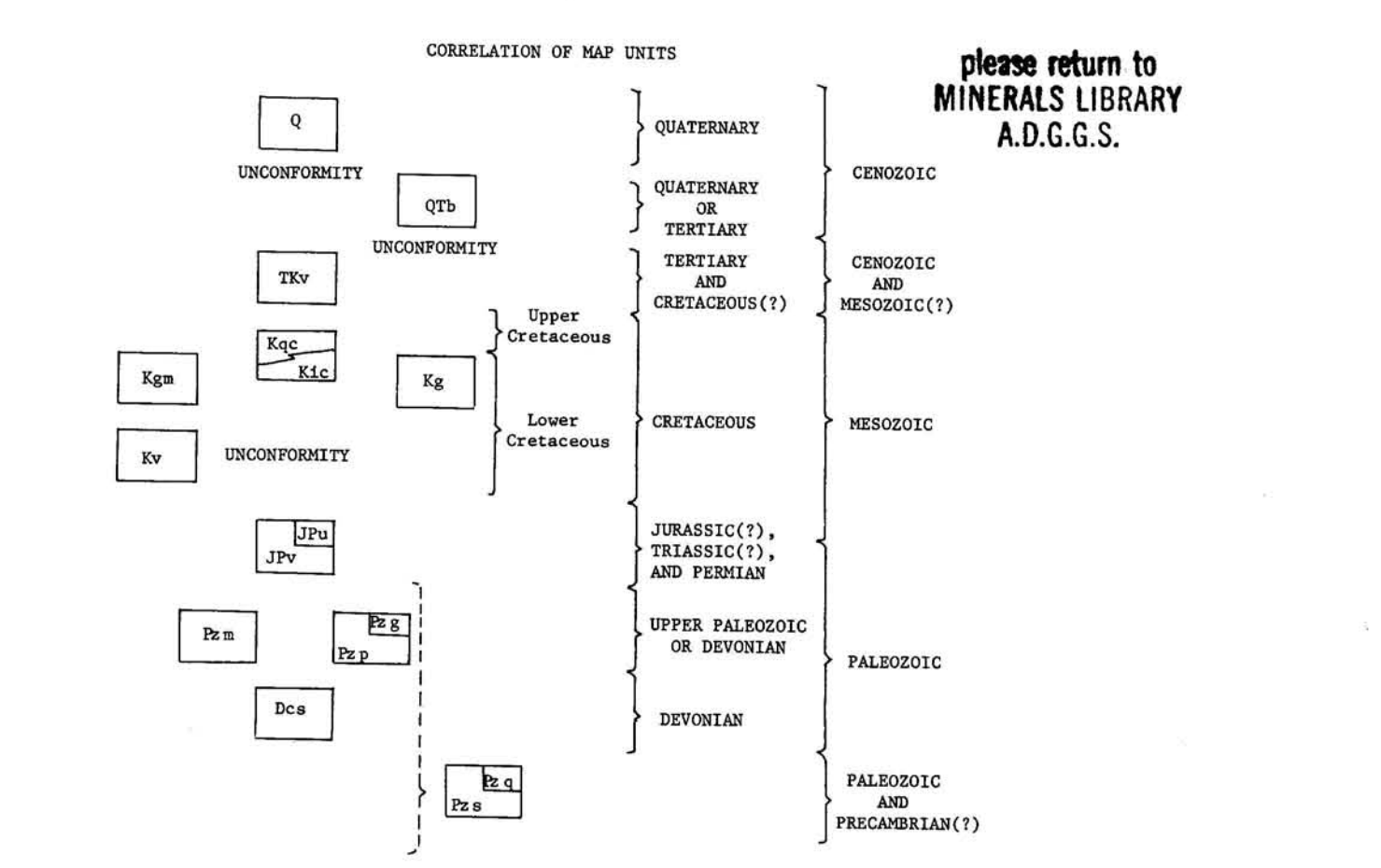
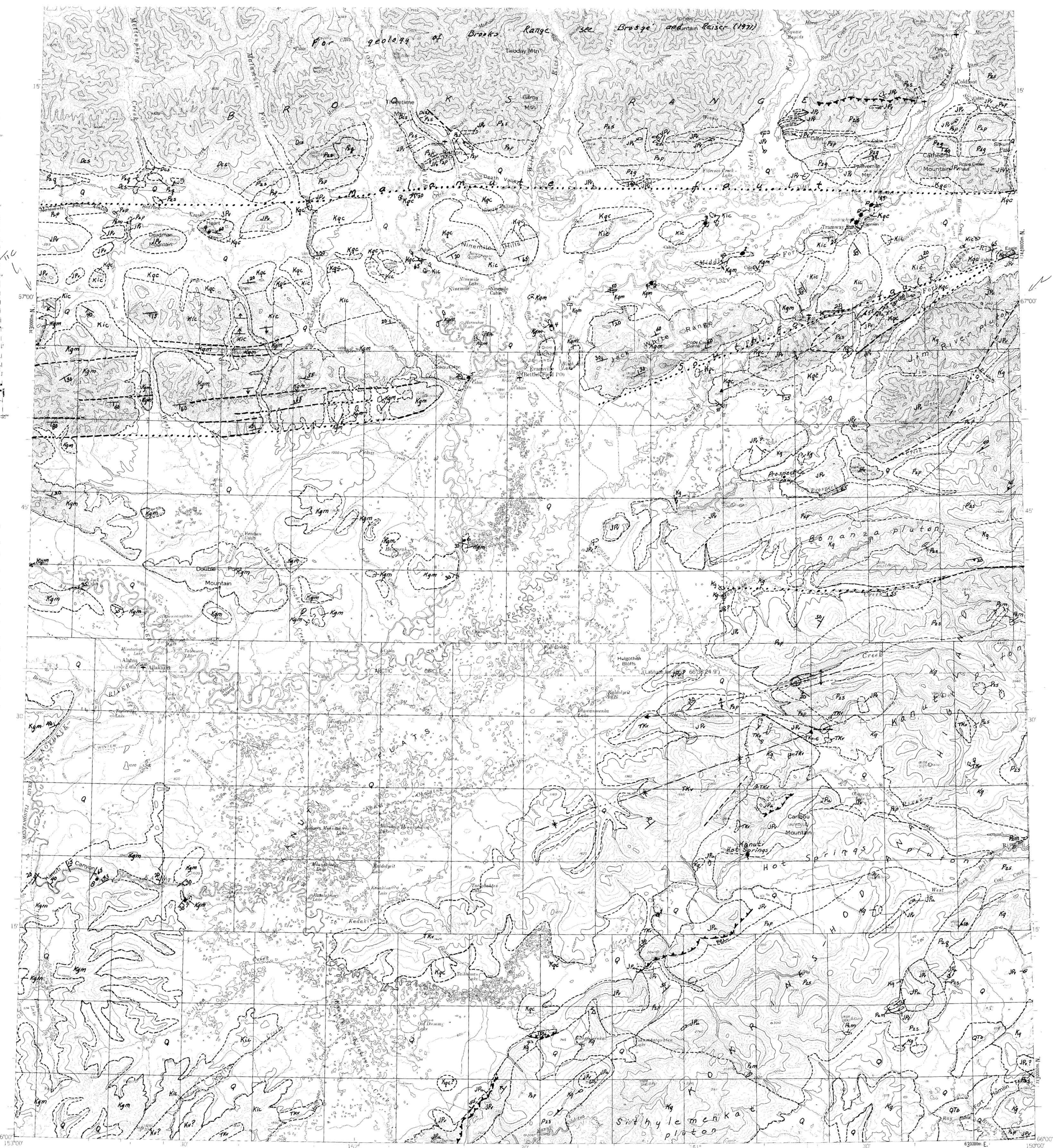
TABLE 2. POTASSIUM-ARGON AGE DETERMINATIONS
[Sample locations are shown on map as \bullet]

No.	Field No.	Latitude and Longitude	Mineral	Age Unit	K ₂ O percent	A ₄₀ / A _{total} ⁴⁰ (noles/ga)	A ₄₀ / A _{total} ⁴⁰	Apparent Age (millions of years)
1	67APa23	66°16' N. 151°07' W.	Biorblande	TKV	0.770 0.778 avg. 0.774	6.736x10 ⁻¹¹	0.75	58±7
2	66ANa25A	66°09' N. 151°18' W.	Biotite	Kg	7.99 7.97 avg. 7.98	1.287x10 ⁻⁹	0.86	106±3.0

Potassium analyses: Lois Schlocher.
Argon analysis and age calculation: J. C. Von Eszen
K⁴⁰ decay constants: $\lambda_1 = 0.585 \times 10^{-10} \text{ year}^{-1}$; $\lambda_2 = 4.72 \times 10^{-10} \text{ year}^{-1}$. Abundance ratio: K⁴⁰/K³⁹ = 1.191 × 10⁻⁴ atom percent



INDEX MAP SHOWING LOCATION OF BETTLES AND SOUTHERN WISEMAN QUADRANGLES, ALASKA



- DESCRIPTION OF MAP UNITS
- Q SURFICIAL DEPOSITS—Undifferentiated glacial drift, eolian, and alluvial deposits.
 - TKV BASALT—Flat-lying flows of dark vesicular to massive olivine basalt in Bay River drainage basin. Subordinate volcanic conglomerate and breccia composed of locally derived epiclastic debris in a brown glass matrix. Age uncertain but probably late Tertiary or Quaternary.
 - TKV PELTIC VOLCANIC ROCKS—Brown, gray, and light-tan porphyritic flows, breccia, conglomerate, and tuff of acidic and intermediate composition. Potassium-argon age of 58±7 m.y. (early Tertiary) from flow on Kamui River (table 2). Unit appears to grade downward into quartz-pebble conglomerate (Kqc) and probably includes rocks as old as Late Cretaceous.
 - Kgc QUARTZ-PEBBLE CONGLOMERATE—Well-sorted clasts of white quartz, gray quartzite, graywacke, chert, schist, and mafic volcanic and intrusive rocks. Minor sandstone, shale, and thin ash-fall tuff. Occurs along south edge of Brooks Range and west edge of Kohnen-Hodman Highlands. Gradational contact with igneous pebble-cobble conglomerate (Kic). Abundant plant fossils of Late Cretaceous age (R. W. Brown, written commun., 1953) in outcrops along Middle Fork of Koyukuk River near Tramway Bar.
 - Kic TOROUS PEBBLE-COBBLE CONGLOMERATE—Poorly sorted clasts of mafic volcanic and intrusive rocks, chert, and graywacke. Occurs along south edge of Brooks Range and west edge of Kohnen-Hodman Highlands. Appears to grade southward and westward into graywacke and mudstone (Kgm). Bulk of unit believed to be late Early Cretaceous (Alaskan), but may include beds as young as Late Cretaceous.
 - Kgm VOLCANIC GRAYWACKE AND MUDSTONE—Dark-greenish-gray, fine- to coarse-grained, poorly sorted graywacke interbedded with dark-gray mudstone. Graywacke composed largely of first- and second-cycle volcanic debris of mafic and intermediate composition. Locally includes lenticular masses of mafic igneous pebble-cobble conglomerate. Contains ammonites and pelicyoda of late Early Cretaceous (Alaskan) age (table 1).
 - Kq GRANITIC ROCKS—Coarsely porphyritic biotite quartz monzonite. Subordinate granodiorite, monzonite, and fine-grained quartz porphyry. Potassium-argon age of 106±3.0 m.y. (Early Cretaceous) from Sthylmenak pluton (table 2).
 - Kv ANDESITIC VOLCANIC ROCKS—Chiefly dark-reddish and greenish andesitic crystal-bearing lithic tuff and tuff breccia. Subordinate andesitic flows. Probably correlative with andesitic volcanic rocks of earliest Cretaceous (Neocomian) age in adjacent Hughes quadrangle (Patton and Miller, 1966). Found only in southwestern part of Bettles quadrangle.
 - JVP MAFIC VOLCANIC AND INTRUSIVE ROCKS—Foliated basalt, diabase, and gabbro. Subordinate basaltic and andesitic volcaniclastic rocks, chert, and cherty mudstone. Mafic rocks largely altered to "greenstone" and locally foliated. Foraminifera and brachiopods of Permian age in carbonate lens in pillow basalt at Mount Mountain (table 1). Unit may include rocks of Triassic and Jurassic age correlative with potassium-argon dated mafic assemblages in nearby parts of the Brooks Range (Reiser and others, 1965) (Tallier, 1970) and Yukon River valley (Brosge and others, 1969).
 - JPU ULTRAMAFIC ROCKS—Serpentinized peridotite and dunite. The close spatial relationship of these rocks with the mafic volcanic and intrusive rocks (JVP) suggests that the two units are approximately the same age.
 - Jm MARBLE—Small masses of white to light-gray coarsely crystalline marble. Altered to calc-silicate hornfels along contacts with Cretaceous granitic rocks. Age uncertain but probably Devonian or late Paleozoic.
 - Jp PHYLLITE—Dark-gray to black phyllite and subordinate fine-grained graywacke. Abundant white vein quartz. Age uncertain but probably Devonian or late Paleozoic. Unit includes many small bodies of mafic intrusive rock (JVP) not differentiated on map.
 - Jb GRAYWACKE—Dark-greenish-gray fine-grained impure quartzitic sandstone. Age uncertain but probably Devonian or late Paleozoic.
 - Jc CALCAREOUS SCHIST—Light-brown weathering calcareous schist interbedded with gray quartz-mica schist and marble. Occurs in southern Brooks Range where it has been assigned a Devonian age by Brosge and Reiser (1971).
 - Jd PELTIC SCHIST—Quartz-mica schist, chlorite schist, quartz-feldspathic schist, and subordinate quartzite. Metamorphic grade ranges from lower greenschist facies to almandine-amphibolite facies. Thermally altered to andalusite-cordierite hornfels and contact schist in broad bands surrounding Cretaceous granitic bodies (Kq). At least in part Paleozoic in age, but may include rocks as old as Precambrian. Unit includes many small bodies of mafic intrusive rock (JVP) not differentiated on map.
 - Jf QUARTZITE—Gray massive quartzite with subordinate quartz-mica schist. Probably Paleozoic.

- EXPLANATION OF SYMBOLS
- Contact, approximate contact, inferred contact, or indefinite contact
 - - - Fault, approximately located or inferred. Dotted where concealed
 - Thrust fault, approximately located or inferred. Barbs on upper plate
 - Anticline showing direction of plunge. Approximately located or inferred; dotted where concealed
 - Syncline showing direction of plunge. Approximately located or inferred; dotted where concealed
 - Strike and dip of beds. May include overturned beds
 - Strike of vertical beds
 - Strike and dip of beds based on photointerpretation or distant observation
 - Strike and dip of foliation
 - Invertebrate fossil locality. Number refers to fossil list in table 1
 - Plant fossil locality
 - Location of potassium-argon age sample. Number refers to sample list in table 2

REFERENCES

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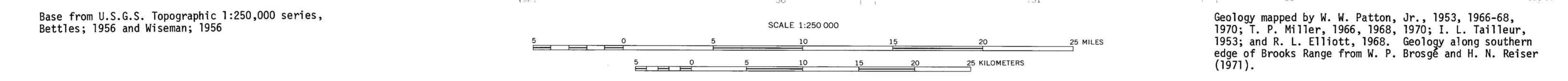
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Base from U.S.G.S. Topographic 1:250,000 series, Bettles; 1956 and Wiseman; 1956

SCALE 1:250,000

Geology mapped by W. W. Patton, Jr., 1953, 1966-68, 1970; T. P. Miller, 1966, 1968, 1970; I. L. Tallier, 1953; and R. L. Elliott, 1968. Geology along southern edge of Brooks Range from W. P. Brosge and H. N. Reiser (1971).