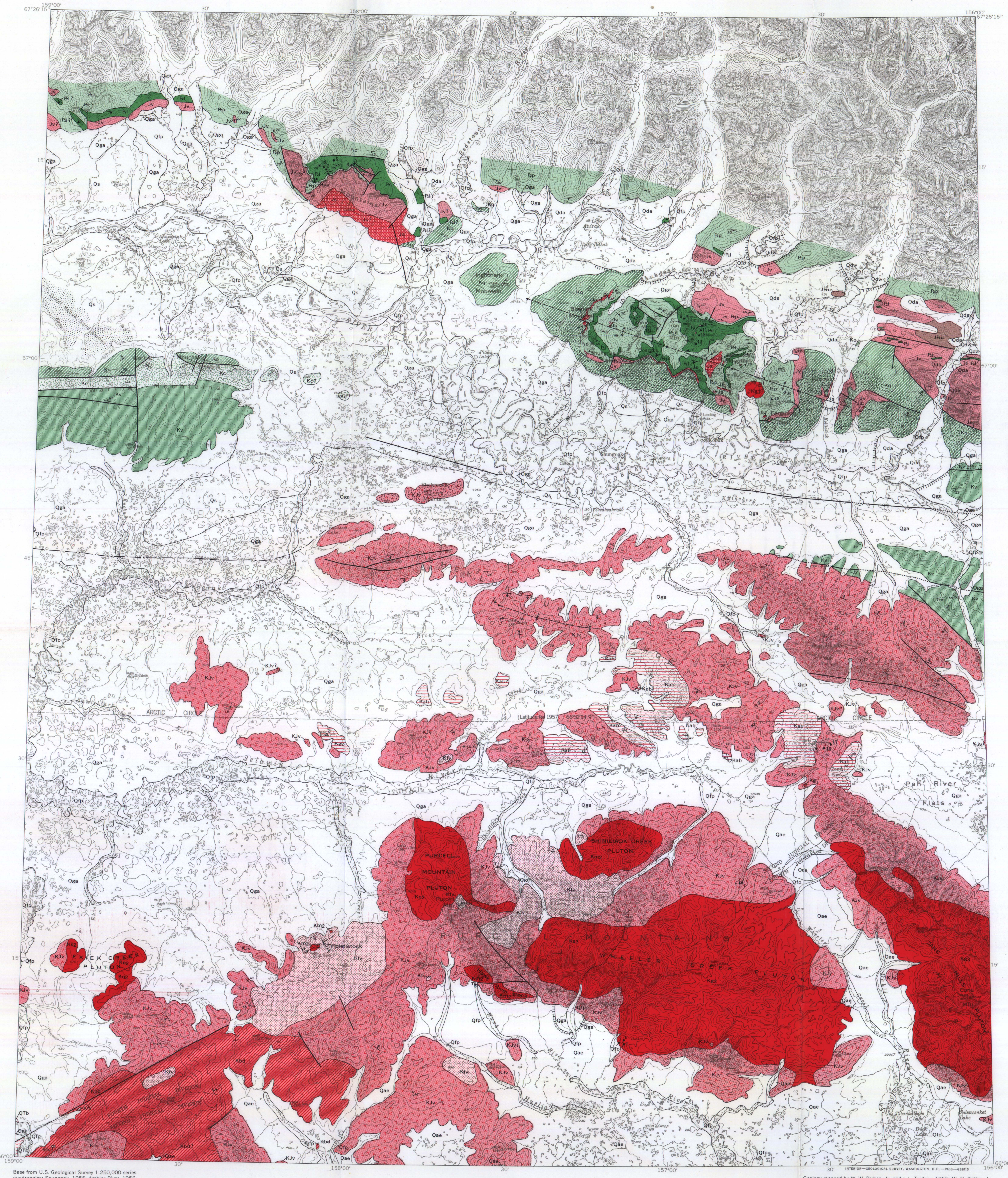
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

MISCELLANEOUS GEOLOGIC INVESTIGATIONS
MAP I-554



Base from U.S. Geological Survey 1:250,000 series quadrangles: Shungnak, 1955; Ambler River, 1956

SCALE 1:250 000

5 0 5 10 15 20 25 MILES

5 0 5 10 15 20 25 KILOMETERS

CONTOUR INTERVAL 200 FEET
DATUM IS MEAN SEA LEVEL
1965 MAGNETIC DECLINATION AT SOUTH EDGE OF SHEET VARIES FROM 17°00′ TO 18°00′ EAST

INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D.C.—1968—G68115

Geology mapped by W. W. Patton, Jr. and I. L. Tailleur, 1955; W. W. Patton, Jr., J. M. Hoare, Bond Taber, and I. L. Tailleur, 1958; W. W. Patton, Jr. and T. P. Miller, 1964; W. W. Patton, Jr., T. P. Miller, I. L. Tailleur, W. P. Brosge; H. N. Reiser, and P. H. Townsend, 1965; W. W. Patton, Jr., T. P. Miller, and I. L. Tailleur, 1966; T. P. Miller, 1967

EXPLANATION

SEDIMENTARY ROCKS

Surficial deposits

Qfp, *flood-plain deposits. Silt, sand, and gravel along flood plains of major drainages. Locally includes some fan and terrace deposits along narrow tributary valleys*

Qdw, *glacial drift. Chiefly till and outwash deposits of Walker Lake Glaciation (Fernald, 1964) on Shungnak, Kogoluktuk, and Mauneluk Rivers. Characterized by prominent morainal topography showing very little erosional modification. Assigned a probable Wisconsin age (Fernald, 1964)*

Qda, *glacial drift. Chiefly till and outwash gravel and sand deposits of Ambler Glaciation (Fernald, 1964) in Ambler Lowland and lower valleys of Redstone and Mauneluk Rivers. Locally includes outwash from Walker Lake Glaciation* (Qdw). *Modified morainal topography. Assigned a Wisconsin(?) age (Fernald, 1964)*

Qga, *undifferentiated older glacial drift, alluvium and eolian deposits. Chiefly highly modified till and outwash gravels mantled by wind-blown and water-laid silt and fine sand. Characterized by subdued morainal topography with many thaw lakes. Includes prominent dissected terrace deposits of quartz-rich gravel and sand surrounding Sheklukshuk and Kiliovilik Ranges and Lockwood Hills. Southern boundary of unit approximately coincides with southern limit of Brooks Range glaciation. Glacial erratics to an altitude of 2,000 feet in Lockwood Hills and 1,500 feet in Sheklukshuk and Kiliovilik Ranges. Includes small patch of morainal deposits on south side of Purcell Mountains derived locally from valley glaciers in Purcell Mountains. Glacial deposits assigned an Illinoian age (Patton and Miller, in press; McCulloch and others, 1965)*

Qs, *chiefly sand deposits. Modified and dissected deposits of wind-blown and water-laid sand with subordinate amounts of silt. Includes actively drifting and recently stabilized dunes of the Great Kobuk and Little Kobuk Sand Dunes; dot pattern indicates areas of active dunes*

Qae, *undifferentiated alluvial and eolian deposits, chiefly silt and fine sand. Includes glacial outwash and fan gravels along Wheeler Creek and Dakli River and along south side of Purcell Mountains*

QUATERNARY

CRETACEOUS — Upper Cretaceous

Kq

Quartz conglomerate, sandstone, and mudstone

Conglomerate composed chiefly of white quartz pebbles in a quartzose and micaceous matrix; pebbles of phyllite, schist, greenstone, and chert in subordinate amounts. Interbedded quartzose and micaceous sandstone and mudstone. Overprint pattern where unit sheared and dynamically metamorphosed; conglomerate clasts stretched and flattened and sandstone and mudstone altered to semischist and phyllite. In eastern part of Cosmos Hills unit includes as much as several hundred feet of undifferentiated igneous pebble-cobble conglomerate (Kc). *Assigned a Late Cretaceous age based upon correlation with similar rocks in adjoining Baird Mountains and Selawik quadrangles which have been dated by potassium-argon methods (Patton and Milller, in press)*

Lower Cretaceous

Kc

Igneous pebble-cobble conglomerate

Massive poorly stratified and poorly sorted conglomerate composed of pebble- to cobble-size clasts of mafic extrusive and intrusive rocks in a graywacke and mudstone matrix. Clasts of chert and limestone locally abundant. Assigned a probable late Early Cretaceous (Albian) age based upon correlation with similar conglomerate in adjoining Selawik quadrangle (Patton and Miller, in press)

Kv

Volcanic graywacke and mudstone

Poorly sorted dark greenish-gray volcanic graywacke and mudstone. Lenticular masses of pebble-cobble conglomerate composed chiefly of clasts of mafic intrusives, chert, and limestone. Interbedded dark-orange weathering, gray, highly calcareous graywacke and mudstone in Waring Hills. Overprint pattern where unit locally sheared and dynamically metamorphosed to semischist and phyllite. Assigned a late Early Cretaceous (Albian) age based upon correlation with similar graywacke and mudstone in adjoining Hughes (Patton and Miller, 1966) and Selawik (Patton and Miller, in press) quadrangles

PALEOZOIC

Pzp / Pzl

Metasedimentary rocks

Pzp, *chiefly dark phyllite and fine-grained quartz-mica schist. Minor calcareous schist and thin limestone. Chlorite schist in lower(?) part of unit; garnetiferous and quartzo-feldspathic schists near granite* (Kg_1) *in Cosmos Hills. Locally small bodies of greenstone. Unit appears to overlie, underlie and interfinger with limestone and dolomite* (Pzl). *Bulk of unit believed to be of Devonian age based upon stratigraphic relationship with fossiliferous limestone and dolomite* (Pzl). *Part of unit overlying limestone and dolomite may be late Paleozoic or possibly early Mesozoic in age; part underlying limestone and dolomite may be pre-Devonian*

Pzl, *chiefly light-gray, partly recrystallized, reef-like, limestone and dolomite. Minor intercalated phyllite and schist. Corals and stromatoporoids of probable Devonian age locally abundant (table 1). Some isolated masses of dark-gray limestone and chert in Jade Mountains and Cosmos Hills lithologically resemble rocks of Lisburne Group in northern Brooks Range (Bowsher and Dutro, 1957); may be Mississippian in age. Deposits of chalcopyrite, bornite, and chalcocite in dolomite breccia on Ruby Creek in Cosmos Hills (Herreid, 1961)*

VOLCANIC ROCKS

QUATERNARY — Upper Cretaceous

QTb

Basalt

Dissected nearly horizontal flows of gray to dark-red vesicular olivine basalt along Tagagawik River valley in southwest corner of Shungnak quadrangle. Eastern edge of broad sheet of late Tertiary or Pleistocene flows that extends westward across Selawik (Patton and Miller, in press) and Candle (Patton, 1967) quadrangles

Kfv

Felsic volcanic rocks

Southwest of Purcell Mountains, *white, pale green, and grayish-purple porphyritic latite, quartz latite, and trachyte flows and crystal-lithic tuffs. Pale olive, felsic, ash-fall tuffs, tuffaceous graywacke, and volcanic conglomerate. Tuffaceous graywacke typically mottled due to partial zeolitization of volcanic material; possibly correlative with similar tuffaceous graywacke of mid-Cretaceous age in northwestern Kateel River quadrangle (Patton, 1966) (Hoare and others, 1964)*

Purcell Mountain, *welded tuffs and flows(?) of rhyolitic and rhyodacitic composition*

North-central Purcell Mountains and Kiliovilik Range, *flows and hypabyssal intrusives of pale green and grayish purple, quartz latite porphyry. Abundant dark reddish and dark greenish, latitic, crystal and lithic tuffs. Fragments of granitic and volcanic rocks are abundant locally in both flows and tuffs. Unit appears to overlie stratigraphically Early Cretaceous granitic rocks of the Purcell Mountain and Shiniliaok Creek plutons and to be intruded and thermally altered by Late Cretaceous granitic rocks of the Wheeler Creek pluton. Biotite from tuff yields potassium-argon age of 85.2±2.2 m. y. (65APa91, table 2)*

CRETACEOUS — Lower Cretaceous

Kab

Porphyritic andesite and basalt

Chiefly greenish-gray and dark-reddish porphyritic andesite and basalt flows and shallow intrusives. Pillows and columnar jointing common. Abundant partially devitrified, perlitic, volcanic glass of dacitic composition at head of Kiliovilik Creek. Includes several plug-like bodies of latite and trachyte(?) porphry. Appears to be younger than the bulk of the andesitic volcanic rocks (KJv). *Assigned an Early Cretaceous age based upon potassium-argon age of 125±3.3 m. y. from andesite porphyry in Kiliovilik Range (66APa7, table 2). Latite plug associated with basalt flows at VABM Sela yields potassium-argon age of 122±3.0 m. y. (65AMm143, table 2)*

Kbd

Spilitic pillow basalt and diabase

Dark greenish- to reddish-brown, fine-grained, amygdaloidal, spilitic pillow basalt flows and dark-greenish-gray, medium- to coarse-grained, spilitic diabase intrusives. Subordinate andesitic and basaltic tuffs. Unit characteristically weathers to pinnacles and spires. Believed to overlie andesitic volcanic rocks (KJv) *and underlie felsic volcanic rocks* (Kfv); *probably of Early Cretaceous age*

KJv

Andesitic volcanic rocks

Chiefly dark greenish-gray, andesitic, crystal-bearing lithic tuff, volcanic breccia, and volcanic conglomerate with intercalated trachyandesite and basalt flows in subordinate amounts. Minor volcanic graywacke and mudstone. Hornfelsic and propylitically altered in vicinity of granitic plutons. Overprint pattern where sheared and foliated at Shaleruckik Mountain. Abundant Buchia "sublaevis" of earliest Cretaceous (Neocomian) age near Zane Pass in east-central Shungnak quadrangle (table 1). Bulk of unit thought to be of earliest Cretaceous age and correlative with similar andesitic volcanic rocks dated by fossils and potassium-argon methods in adjoining Hughes (Patton and Miller, 1966) and Kateel River (Patton, 1966) quadrangles. Some volcanic graywacke in southwestern part of Shungnak quadrangle and in Lockwood Hills may be mid-Cretaceous in age and approximately correlative with volcanic graywacke and mudstone unit (Kv). *Some flows and tuffs may be as old as Jurassic and correlative with mafic volcanic rocks* (Jv). *Unit includes many small bodies of felsic intrusives which have not been mapped separately; one such body of quartz latite porphyry in eastern Sheklukshuk Range yields a potassium-argon age of 117±4.3 m. y. (65APa52a, table 2)*

JURASSIC(?)

Jv / Js

Mafic volcanic rocks and serpentinite

Chiefly dark-greenish-gray basalt flows and diabase intrusives; commonly altered or partially altered to an aggregate of chlorite, epidote, and sodic plagioclase. Subordinate chert and mudstone. Flows locally show well-developed pillows. Unit highly sheared and foliated in many places in Cosmos Hills

Js, *serpentinite. Includes: 1) numerous small highly sheared and tectonically emplaced(?) bodies of serpentinite mostly near or along the basal contact of the Cretaceous sedimentary rocks, 2) a large mass of serpentinite at Asbestos Mountain in the Cosmos Hills, and 3) a large mass of partially serpentinized peridotite and dunite along the south side of the Jade Mountains. Asbestos and jade deposits in Cosmos Hills and Jade Mountains (Anderson, 1945)*

Unit clearly younger than metasedimentary rocks of Paleozoic age, which it locally intrudes, and older than sedimentary rocks of mid-Cretaceous age, which it unconformably underlies. Tentatively assigned a Jurassic(?) age on the basis of potassium-argon age determinations of 155 and 168 m. y. on possibly correlative rocks in the Christian quadrangle in eastern Brooks Range (Reiser and others, 1965)

PALEOZOIC

JPzu

Undifferentiated mafic volcanic rocks and phyllite

Mafic volcanic rocks (Jv) *and dark phyllite* (Pzp), *undivided, in complex fault and intrusive relationships*

PLUTONIC ROCKS

TERTIARY AND (OR) QUATERNARY — CRETACEOUS — Upper Cretaceous

Kg3

Granodiorite and quartz monzonite

Chiefly leucocratic, medium-grained, hornblende-biotite granodiorite and quartz monzonite in Zane Hills and Wheeler Creek plutons. Locally intruded by thin aplite and fine-grained alaskite dikes. Assigned a Late Cretaceous age based on potassium-argon age determinations of 80.6± 2 m. y. for Wheeler Creek pluton and 81.9± 3 m. y. for Zane Hills pluton (Miller and others, 1966)

Ka3

Alaskite

Medium-grained alaskite at west end of Wheeler Creek pluton. Presumably Late Cretaceous in age

Lower Cretaceous

Kq2

Quartz monzonite

Chiefly leucocratic, medium-grained, porphyritic, biotite quartz monzonite in Purcell Mountain and Ekiek Creek plutons. In Ekiek Creek pluton quartz monzonite is finer grained and is cut by dikes of melanite nepheline syenite. Potassium-argon age determination of 98.6± 2.9 m. y. for Purcell Mountain pluton (Miller and others, 1966). Unit assigned an Early Cretaceous age

Km2

Monzonite

Chiefly leucocratic, medium-grained, biotite-pyroxene monzonite of Shiniliaok Creek pluton, Hawk River stock, and Triplet stock. Potassium-argon age determination of 99.4±2.4 m. y. for Shiniliaok Creek pluton (Miller and others, 1966). Unit assigned an Early Cretaceous age

Kn2

Nepheline syenite

Chiefly medium-grained nepheline syenite and related mafic alkaline rocks such as malignite, ijolite, and pyroxenite in Ekiek Creek pluton. Assigned an Early Cretaceous age based upon correlation with similar rocks in adjoining Selawik quadrangle which have been dated as 107±2.8 m. y. by potassium-argon methods (Patton and Miller, in press)

Ks2

Syenite

Chiefly leucocratic, medium-grained, gneissic hornblende syenite in Ekiek Creek pluton. Assigned an Early Cretaceous age based upon correlation with similar syenitic rocks in adjoining Selawik quadrangle which have been dated as 100±5 m. y. (Miller and others, 1966; Patton and Miller, in press)

Kg1

Granite

Chiefly leucocratic, medium-grained, gneissic, muscovite-biotite albite granite in Cosmos Hills. Crystalloblastic texture; irregular foliation due to orientation of the micas. Intrudes phyllite and schist unit (Pzp) *of Paleozoic age. Tentatively assigned an Early Cretaceous age based upon potassium-argon age determination of 121±3.8 m. y. for an associated soda aplite (65APa44, table 2)*

CRETACEOUS

Contact
Approximately located; inferred or indefinite

Fault
Approximately located or inferred; dotted where concealed

Trace of pronounced change in magnetic character of bedrock (see * note)

Anticline
Showing approximately located or inferred crestline and direction of plunge

Syncline
Showing approximately located or inferred troughline and direction of plunge

Morainal ridge

Vertical — Inclined (55) *May include overturned beds* — Horizontal
Strike and dip of beds

Inclined *May include overturned beds* — Vertical or near vertical
Strike and dip of beds based on photo interpretation

Inclined — Horizontal
Strike and dip of foliation

Strike and dip of prominent foliation or bedding based upon photo interpretation

△2
Location of potassium-argon age sample
Number refers to sample list in table 2

•6
Fossil locality
Number refers to fossil list in table 1

•T
Thermal spring

*NOTE: The broken line, which is shown on the map in the western part of the Shungnak quadrangle south of the Waring Mountains, indicates the approximate location of a pronounced change in magnetic character of the underlying bedrock. This change in character, which we believe represents the southern limit of Cretaceous sedimentary rocks, is indicated in several N-S and NW-SE trending aeromagnetic profiles (Dempsey and others, 1957; Andreasen, 1960). North of this line the profiles are generally smooth and free of large amplitude peaks. South of the line, however, they are characterized by large amplitude, steep gradient peaks which suggest the presence of igneous rocks at shallow depth. The igneous rocks are presumed to be andesitic volcanic rocks (KJv).

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TABLE 1. INVERTEBRATE PALEOZOIC AND MESOZOIC FOSSIL COLLECTIONS

Fossil localities are shown on map as •6

No.	U.S.G.S. locality	Stromatoporoids			Tabulate corals											Rugose corals							Brachiopods		Gastropods		Pelecypods		Latitude and longitude
		Amphipora sp.	amphiporoids	massive stromatoporoids	*Alveolites* sp. 1	*Alveolites* sp.	*Aulocystis* sp.	*Aulopora* sp.	*Cladopora* sp.	*Favosites* sp	*Roemeria* sp.	*Syringopora* sp. 1	*Syringopora?* sp.	*Thamnopora* sp.	thamnoporoid	"*Billingsastraea*" sp. 1	"*Billingsastraea*" sp. 2	cyathophylloid	cystiphylloid	*phaceloid*	*Siphonophrentis?* sp. 1	*Tryplasma* or *Zelophyllum*	*Spinatrypa* sp.	Indeterminate	?*Euomphalopterus* sp.	Indeterminate	*Buchia* "*sublaevis*"	*Buchia* cf. *B. sublaevis*	
	Limestone-dolomite unit (Pzl)																												
1	7983-SD					×					?											?							67°14′ N.; 158°08′ W.
2	7982-SD													×				×	×										67°15′ N.; 158°06′ W.
3	7981-SD				×					×		×		×	×						?								67°15′ N.; 158°06′ W.
4	6667-SD														×														67°14′ N.; 158°06′ W.
5	6668-SD 7984-SD	×													×										×	×			67°16′ N.; 158°04′ W.
6	6669-SD	×													×														67°15′ N.; 158°01′ W.
7	7985-SD		×	×											×				×										67°15′ N.; 158°00′ W.
8	6462-SD														×														67°01′ N.; 157°03′ W.
9				×						×			×		×									×		×			67°04′ N.; 156°56′ W.
10									×																				67°03′ N.; 156°53′ W.
11															×														67°03′ N.; 156°53′ W.
12	6460-SD 7659-SD 7980-SD				×	×	×	×	×	×		×	×	×		×	×				×		×						67°03′ N.; 156°54′ W.
13	6461-SD																				×			×					67°02′ N.; 156°54′ W.
14	7996-SD	?																		×									67°01′ N.; 156°02′ W.
	Andesitic volcanic rocks (KJv)																												
15	M2959																										×		66°31′ N.; 156°32′ W.
16	M2960																											×	66°31′ N.; 156°30′ W.
17	M2961																										×		66°32′ N.; 156°29′ W.

Corals and stromatoporoids identified by W. A. Oliver, Jr., and C. W. Merriam; brachiopods by J. T. Dutro, Jr.; gastropods by E. L. Yochelson; and pelecypods by D. L. Jones

TABLE 2. POTASSIUM-ARGON AGE DETERMINATIONS

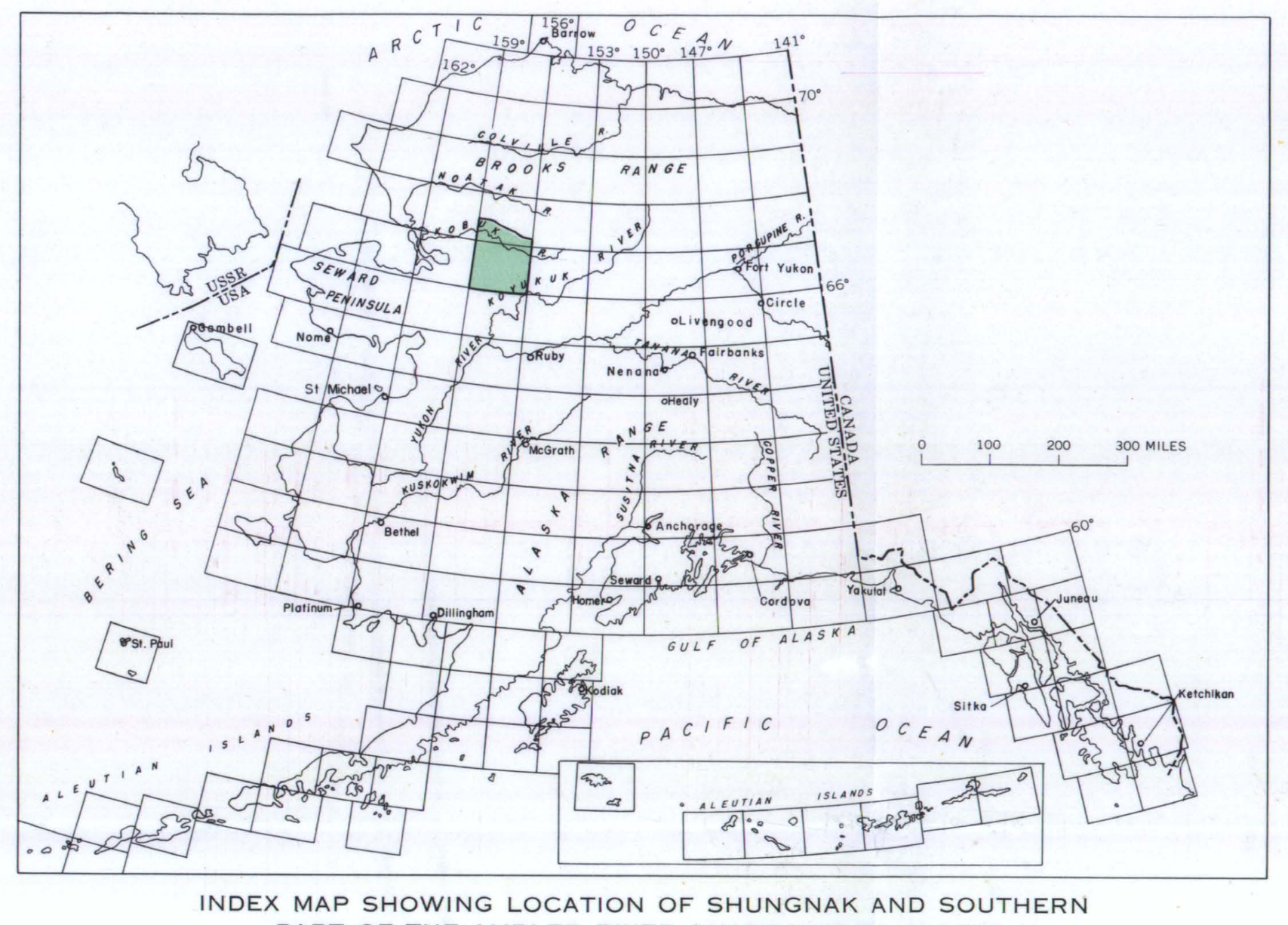
Sample locations are shown on map as △2

No.	Field No.	Latitude and Longitude	Mineral	Unit	K_2O percent	Ar^{40}_{rad} (moles/gm)	$Ar^{40}_{rad}/Ar^{40}_{total}$	Apparent Age (millions of years)
1	65APa44	66°59′ N. 156°42′ W.	Hornblende	Kg_1	0.743 0.758 avg. 0.751	1.390×10^{-10}	0.93	121±3.8
2	65APa91	66°24′ N. 157°21′ W.	Biotite	Kfv	7.37 7.40 avg. 7.38	9.511×10^{-10}	0.91	85.2±2.2
3	65AMm143	66°32′ N. 158°06′ W.	Hornblende	Kab	0.485 0.488 avg. 0.486	0.9036×10^{-10}	0.76	122±3.0
4	65APa52a	66°35′ N. 156°43′ W.	Hornblende	KJv	0.267 0.278 avg. 0.272	0.4847×10^{-10}	0.67	117±4.3
5	66APa7	66°31′ N. 157°15′ W.	Hornblende	Kab	1.00 1.01 avg. 1.00	1.919×10^{-10}	0.90	125±3.3

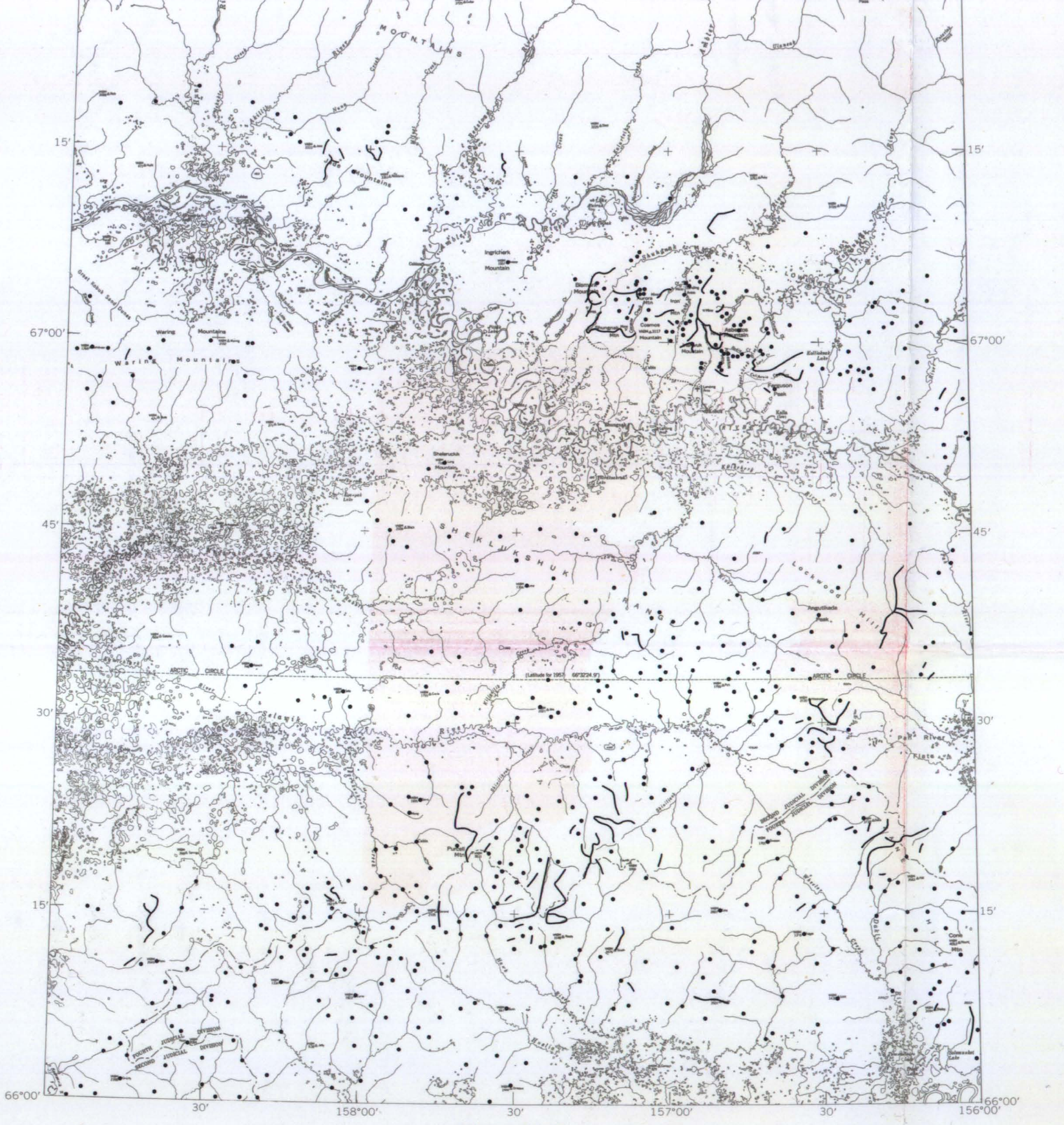
Potassium analysis: 1, 2, L. B. Schlocker and H. C. Whitehead; 3, 4, 5, L. B. Schlocker

Argon analysis and age calculation: 1, 2, M. A. Lanphere, J. D. Leutscher and E. H. McKee; 3, M. A. Lanphere; 4, 5, M. A. Lanphere and J. C. Von Essen

[K^{40} decay constants: $\lambda_\epsilon = 0.585\times10^{-10}$ year^{-1}; $\lambda_\beta = 4.72\times10^{-10}$ year^{-1}. Abundance ratio: $K^{40}/K = 1.19\times10^{-4}$ atom percent]



INDEX MAP SHOWING LOCATION OF SHUNGNAK AND SOUTHERN PART OF THE AMBLER RIVER QUADRANGLES, ALASKA



MAP OF SHUNGNAK AND SOUTHERN AMBLER RIVER QUADRANGLES SHOWING LOCATION OF FIELD OBSERVATION POINTS AND CONTINUOUS FOOT TRAVERSES

Geology extended between field stations by aerial reconnaissance and by interpretation of aerial photographs. Surficial deposits mapped almost entirely from aerial photographs

REGIONAL GEOLOGIC MAP OF THE SHUNGNAK AND SOUTHERN PART OF THE AMBLER RIVER QUADRANGLES, ALASKA

By
William W. Patton, Jr., Thomas P. Miller,
and Irvin L. Tailleur

1968

For sale by U.S. Geological Survey, price $1.00