# EXPLANATION

## Introduction

The accompanying six maps of the Nuka-Etivluk region represent an attempt to give as complete and objective an interpretation as possible of the geology of the area. The work is based largely on field studies made in 1950, 1951, and 1953 in cooperation with the Office of Naval Petroleum and Oil Shale Reserves (ONPSR). Supplemental field checking in 1964 and 1965 was supported in part by ONPSR and in part by the Office of Naval Research through the Arctic Research Laboratory.

The physiographic subdivisions of the region are indicated on the illustration in the upper-right corner of this sheet. The Northern Foothills (1) extend along the northern edge of the area and are succeeded to the south by the Southern Foothills (2), which in turn are divided into a dissected plain (2a) and a belt of hills (2b). The Brooks Range Province (3) makes up the southern part of the area and is divided into a spur of the DeLong Mountains (3a) and the front of the Endicott Mountains (3b).

In general, the physiography reflects the underlying geology. The Northern Foothills are underlain by competent clastic rocks of Late Cretaceous age with Appalachian-type folds. The dissected plain and northern margin of the Southern Foothills consists of strongly folded fine-grained clastic rocks, also of Cretaceous age. Most of the Southern Foothills and the DeLong Mountains constitute a broad belt of highly disturbed rocks of various kinds and ages. The Endicott Mountains are made up of resistant rocks, both folded and faulted.

Mapping of the 2,000 square miles in the highly disturbed belt posed the greatest problem. The rocks had obviously been folded and faulted intensely, and different lithologic types and stratigraphic units were intermingled and juxtaposed. In order to interpret the structure, the rocks were mapped in great detail, carefully differentiating the units and facies. Three main stratigraphic sequences were recognized and designated informally as the Foothills (I), Ipnavik (II), and Nuka Ridge (III) -- sequences that must have been deposited in different basins, but during approximately the same time interval. These sequences extend over most of the disturbed belt, and can be readily distinguished. However, other rock units do not fit into these stratigraphic sequences; they occur only sporadically in the area, but all have been included on the map in order to aid in the structural interpretation.

The interpretation that seems to explain best the unlike but juxtaposed stratigraphic sequences involves large-scale flat thrusts by which the three different, but more or less contemporaneous, sequences were sheeted over one another. Subsequently the whole structure was folded, faulted, and eroded to give the present distribution of the rock units.

Evidence supporting this hypothesis includes: (a) indications that the three rock sequences once formed sheets extending over wide areas; (b) allochthonous remnants of Ipnavik rocks resting on Foothills rocks at widely separated localities; and (c) indications of major dislocations, such as Nuka Ridge rocks overriding contemporaneous, but lithologically contrasting rocks of the other two sequences.

Evidence against this hypothesis includes: (a) the almost incredible distance of 50 miles that the allochthonous rocks would have to be pulled to unstack the sheets; (b) an additional 50 miles of movement that would be required to restore reasonable facies gradients; and (c) the total movement of 100 miles would mean that the thrusts had come from south of the Brooks Range--that is, from the opposite flank of the orogen.

Despite the conflicting evidence, the thrust-sheet theory seems the most logical interpretation of the regional structures.

Corrections or additions to the map are earnestly solicited. Also, comments as to the value of this type of detailed mapping as opposed to a more generalized approach would be welcome.

## UNCONSOLIDATED ROCKS

(Limits determined entirely from aerial photographs)

QUATERNARY

**Cover**

Turf mat on frozen colluvial mantle of windblown silt, organic debris, and frost distributed lithic fragments. Boundaries generally placed at limit of outcrop, rubble, or relief reflecting consolidated rock

$Q_3$ / $Q_2$ / $Q_1$

**Alluvium**

Gravel and finer-grained deposits along present valley floors. Relationship to glacial sequence not known

$Q_3$, active deposits along stream channels; includes most of modern floodplain

$Q_2$, intermediate to younger gravels abandoned by stream; willow-covered, incompletely frozen, infrequently flooded in part

$Q_1$, low terrace remnants of oldest deposits left behind as streams, rejuvenated from a more mature stage at a higher level, cut valley flat up to 10 times width of modern stream channel; surface mantled with organic debris and silt and modified by frost

TERTIARY OR QUATERNARY

QTg

**Higher-level gravel**

Remnants of gravel within a few hundred feet of present stream levels; may include deposits on more than one graded surface; turf mat and frozen mantle of silt and organic debris up to 20 feet thick. Inferred to be alluvial deposits of ancestral drainage system consisting of subsequent trunk stream and superposed main tributaries in a mature stage, probably graded to a higher stand of sea level; unknown relationship to glacial history

CRETACEOUS AND TERTIARY

UNCONFORMITY

Hiatus that includes much of the Late Cretaceous and most if not all of the Tertiary. Folding of Appalachian style throughout; inferred orogeny, so-called Laramide, that produced upfolds and thrusts in the mountains and most of obvious folding and faulting in the foothills. Prolonged emergence and denudation; as much as a mile thickness of rock may have been stripped and deposited in sedimentary basin to north. A surface of low relief, cut at a later stage and from which present landscape is being etched, grades northward at an altitude about 750 feet above the present Colville River. This surface was probably deformed by no more than slight warping or tilting

## CONSOLIDATED ROCKS

(Underscored symbols - identified from aerial photographs; queried symbols - identification doubtful. Probable map units in areas in which rocks have not been differentiated shown by combined symbols: ₱s/Ps/Ml)

CRETACEOUS

Kn | Knc / Knk

**Nanushuk Group**

A few thousand feet of arenitic and lutitic rocks of the Nanushuk Group. Examined only north of the Nuka River (Sheet 2); consists of a nearshore marine phase, the Kukpowruk Formation (Knk), grading and intertonguing upwards with a paralic, nonmarine phase, the Corwin Formation (Knc); numerous traces of montmorillonitic(?) clay beds in middle part; greenish sandstone of Tuktu Formation, characteristic of the Group in regions to the east, is absent. Presumably of Albian and Cenomanian age as in the east. Extreme eastward shaling. Interpreted as molasse, formed near the end of geosynclinal deposition

Kf | Kfc, Kfsm, Kfe, Kfl / Kfw, Kfli, Kfm, Kfs, Kft

**Fortress Mountain Formation**

Indeterminate thickness, possibly more than 1½ miles total, of wacke, conglomerate, and lutite derived from a source to the south and deposited in an active trough. Varies from very thick bedded, nonstratified cobble conglomerate to flysch-like, very thinly interbedded siltstone and mudstone. The coarser-grained rocks generally limited to southern part of terrane where they underlie hills and ridges along north margin of complex hills; a zone of fine-grained, locally conglomeratic wacke probably within lower part of the formation persists almost to Colville River and may extend under the Torok Formation north of the Colville. The less competent finer-grained rocks have been reduced to the dissected plain extending north from the hills

Deposited in lenticular beds and sets of beds that show sharp gradations from coarse- to fine-grained rocks laterally and vertically; grossly lenticular concentrations of wacke and conglomerate along an easterly trend, presumably parallel to former shoreline, suggest point sources of deposition such as headlands, perhaps deltas; bedding slightly acute to trends of wacke and conglomerate sets may indicate clinoform deposition. Fine-grained wacke and lutite display abundant features of turbidites; sole marks indicate westerly, longshore, current directions. Poorly sorted detritus consists of chert, mafic rocks and minerals, feldspars, quartz, carbonate, etc. -- similar in large part to rocks included in the Ipnavik sequence to south -- and of chloritic, calcareous mud. Few ammonites and Inoceramus of Albian age in basal part; microfauna sparse

Basal beds deposited with apparent conformity upon argillaceous unit and Shublik Formation of Foothills sequence in the south and with possible gradation upon lutitic rocks containing Buchia of Valanginian age at Brady on the Kiligwa River (Sheet 3) to the north. Deformation accompanied deposition of most of Formation and youngest members lie unconformably upon older and upon the Ipnavik sequence in the south

Kt

**Torok Formation**

Distal geosynclinal facies of lutitic rocks; not examined. A basal more coarsely clastic zone possible; possibly intraformational unconformities or uneven deposition on growing folds. Apparently gradational with overlying Nanushuk Group and presumably correlative and intertonguing in part with the Fortress Mountain Formation. Arbitrarily excluded from the area south of the Colville River although lutite may have been prominent in younger parts of the Fortress Mountain (cutbanks throughout the Colville plain expose significant proportions of the fine facies of the Fortress Mountain)

DISCONFORMITY

Time interval and type of depositional break relative to overlying Fortress Mountain Formation varies from north to south. Sedimentation possibly continued without interruption distally (to north). To the south, an insignificantly deformed--unless it had been emplaced as an allochthonous sheet--Foothills sequence was depressed into the trough in which the Fortress Mountain Formation accumulated; an undetermined section may have been stripped from the Foothills sequence. The hinge line of the trough need not have been south of the complex hills and the southern part of the region may have been or become emergent with the beginning of deposition of the Fortress Mountain. The Ipnavik sequence likely was thrust across the Foothills sequence after or during deposition of the older Fortress Mountain Formation. Along with older parts of the Formation, it was folded and then truncated across local unconformities within the younger parts

## Geologic Boundaries and Structures

Solid where determined with reasonable certainty, long-dashed where approximately located, short-dashed where inferred, and queried where doubtful; dots indicate observations or interpretations from aerial photographs. Concealed features discriminated only under alluvium

1. Geologic contact or mapped boundary between units
2. Fault, fault trace, or zone of fractures; sawteeth towards upper plate of flat thrust
3. 4. Traces of anticlinal (3) and synclinal (4) fold axes. Overturning shown by looped arrows, direction of plunge by barb
5. Feature on aerial photograph interpreted to trace stratification of bedrock

**Attitude of Strata**

1. Strike and dip of stratification, measured or estimated to nearest 5°
2. Approximate strike, direction of dip of stratification
3. Strike and dip of stratification interpreted from aerial photographs
4. Strike of vertical or near vertical stratification
5. Strike and dip of overturned stratification
6. Horizontal or flat-lying stratification
7. Generalized strike and dip of crenulated beds

**Approximate centers of Aerial Photographs**

○ U. S. Navy, BAR, 1949, vertical, scale about 1:20,000

△ U. S. Geological Survey, TAL, 1955 and 1956, twinplex, scale about 1:75,000

● Fossil collection locality

Base maps mosaicked from 1:63,360 scale compilation sheets for U. S. Geological Survey (1956) Utukok River, Lookout Ridge, Misheguk Mountain, and Howard Pass 1:250,000 scale topographic quadrangles. Altitude and contour data can be obtained from appropriate published quadrangles

Field Mapping

- M. D. Mangus and R. L. Detterman, 1949
- Kent and Tailleur, 1950
- Kent, Reiser, and Tailleur, 1951
- George Gryc, 1951
- C. L. Mohr, 1952
- E. G. Sable and Tailleur, 1953

Scale: 0, 10, 20, 30, 40, 50 miles

Physiographic Elements

1. Northern Foothills Section
2. Southern Foothills Section: a. Dissected plain; b. Complex hills
3. Brooks Range: a. DeLong Mountains; b. Endicott Mountains

Outline of Nuka-Etivluk region showing areas of field mapping and boundaries between physiographic elements

---

## Sequences at Mount Bupto
(Sheet 6)

Two incomplete sequences--both apparently autochthonous. Sequence I, in anomalous, strongly compressed anticline at Mount Bupto, seems to have been folded up through sequence II; outcrops of chert in sequence II reflect compound folding not displayed by chert units in other sequences. Correlation of sequence I to sequence II suggested only by lithology. Chert unit ($c_3$) in sequence II seems to cross divide to chert unit ($c_2$) in sequence on upper Cutaway Creek, but other features of the two sequences differ substantially

II

$wc_2$

**Wacke and conglomerate**

Fine- to coarse-grained wacke and mudstone in scattered and isolated outcrops. Distinguished by subordinate conglomerate containing clasts of granitic in addition to mafic rocks. May also be present east of Ipnavik River near 68°25' N (Sheet 7)

DISCONFORMITY(?)

$c_3$

**Chert**

Chert, prominent in terrane south and east of Mount Bupto. Medium- to dark-gray; weathers to medium and light tones, some bright iron-staining; section possibly a few hundred feet thick. Similar in many respects to other chert units but distinguished tentatively by stratigraphic associations, by apparently greater thickness, and by unique style of folding. Probably in tectonic contact with all rocks except the wacke and conglomerate ($wc_2$)

Ps

**Siksikpuk(?) Formation**

Red and green nodularly bedded chert overlying varicolored argillitic shale

$Ml_2$ / $Ml_1$

**Lisburne Group**

Apparently less than 250 feet of black shale, chert and limestone of the dark facies ($Ml_2$) over more than 750 feet of medium- to dark-gray limestone with abundant irregular layers and stringers of chert of the light facies ($Ml_1$). Fossils of Late Mississippian age collected in upper part of $Ml_1$. Thickest, most continuous and least intruded section of Lisburne Group preserved in foothills

FAULT(?)

Dr

**Rudite and arenite**

Section probably less than 250 feet in exposed thickness, seen in outcrop only on Safari Creek and Ipnavik River. Distinguished by quartz conglomerate with red-weathering quartz arenite matrix and by moderately indurated, light-colored arenite with carbonized clasts. Includes zone of soft clay shale bearing large baritic(?) ironstone concretions. Probably in fault contact with chert ($c_3$) in cutbank on Ipnavik River. Pollen suite of Late Devonian, possibly Early Mississippian, age. Similar conglomerate but without associated arenite occurs near upstream limit of mapping on Jubilee Creek (Sheet 5)

## Sequence on upper Cutaway Creek

Rocks lying between Ipnavik sequence and Foothills sequence around window along Cutaway Creek. May occur in a thin plate below plate of Ipnavik sequence

$w_4$

**Wacke and mudstone**

Fine-grained wacke and mudstone in rubble and scattered small outcrops above chert unit ($c_2$) in vicinity of Rim Butte. Apparent gradation into Buchia-bearing wacke and conglomerate (mapped as Okpikruak Formation) overlying chert on north side of window not resolved

$c_2$

**Chert**

Chert a few hundred feet in exposed thickness. Thin- to medium-bedded; very dark colored; weathers to black rubble with distinctive orange-colored scars. Nonfossiliferous but resembles other upper Paleozoic cherts in region. Zone of varicolored chert may overlie dark chert. Section might be correlative with chert ($c_3$) in sequence at Mount Bupto that adjoins across divide of Cutaway Creek. Similar black and orange weathering chert present between Recon and Jubilee Creeks to west (Sheet 5)

## Sequence north of Memorial Creek
(Sheet 6)

Possibly continuous with Ipnavik sequence lying to north but the proportion of mafic rocks is sufficiently great to distinguish the sequence until relationships are better understood

Ko?

**Okpikruak(?) Formation**

Thick section of wacke and subordinate mudstone that may represent the Okpikruak Formation although the characteristic coarse-ribbed clam shells apparently are absent. Differentiated in mapping chiefly because the sequence in which it is included is distinctly different from the Ipnavik sequence

m

**Mafic igneous rock**

Diabase in closely spaced sheets and/or in a layered mass. Contact with Lisburne Group near base of exposed section is intrusive but elsewhere most contacts seem to be extrusive

$Ml_1$

**Light-colored facies of Lisburne Group**

Fossiliferous calcarenite; baked at contact with overlying igneous rocks. Early Mississippian

## Sequence at head of Kiligwa River
(Sheet 5)

Terrane at and east of head of Kiligwa River and extending northwestward across the river; wraps allochthonously around Foothills sequence in window across Drenchwater Creek. Whether in fault or gradational contact with Ipnavik sequence on either side of Jubilee Creek not determined. Distinguished from the Ipnavik sequence by the lack of mafic sills and the chiefly dark facies of the Lisburne Group. Not determined whether the contrasts reflect dislocations between the sequences, whether the lack of sills results from a locally different section of Lisburne, or whether there was juxtaposition before disposition of the wacke

Ko?

**Okpikruak(?) Formation**

Thick section of wacke and subordinate mudstone that may represent the Okpikruak Formation although the characteristic coarse-ribbed clam shells are apparently absent. Differentiated in mapping chiefly because the sequence in which it is included is distinctly different from the Ipnavik sequence. Irregular occurrence of conglomerate in basal part; a zone of red and green chert may occur above lowermost clastic beds. Cobble to boulder granitic conglomerate near mouth of Drenchwater Creek contains shell clasts in matrix. Wacke at the mouth of Recon Creek contains the only occurrence of the finely ribbed Buchia of Valanginian age

$c_4$

**Chert**

Red and green and dark-gray, iron-stained chert similar to chert unit $c_1$. Mafic sills and oil shale common in $c_1$ not observed

$Ml_2$

**Dark-colored facies of Lisburne Group**

More than 150 feet of thick-bedded black chert underlain by several hundred feet of black mudstone and calcilutite. Older Late Mississippian fossils in mudstone

## Ipnavik sequence

Succession of stratigraphic units, widely distributed across the disturbed belt, that seems distinctly different from the juxtaposed Foothills and Nuka Ridge sequences. Allochthonous relationship to Foothills sequence preserved along Picnic Creek (Sheet 5) and Cutaway Creek (Sheet 6); relationship to Nuka Ridge sequence is ambiguous. Interpreted to have been thrust as a sheet at least 25 miles northward; may be the northern part of an allochthonous sheet extending over much of the western Brooks Range orogen

Ko

**Okpikruak Formation**

Rhythmically interbedded wacke and mudstone; number of conglomerate beds increases to southwest; contains layers of carbonaceous detritus and oil shale clasts. Section at least 1000 feet thick; probably overlain by an additional section of finer-grained rocks that is prominent only west of Ekakevik Mountain where discontinuous breccia-like conglomerate is notable. Blanket-like persistence across region. Contains textures characteristic of turbidite deposition. Distinctive preservation of Buchia on bottom of wacke beds. Composed of poorly sorted clasts of volcanic rocks and minerals, quartz, chert, plagioclase and K-feldspar, and shells in chloritic matrix. Coarse-ribbed Buchia of Berriasian age throughout most of coarse-grained section. Strongly deformed in detail but section as a whole only moderately fragmented

UNCONFORMITY
Slight and (or) local

Basal contact of the Okpikruak Formation appears to be slightly discordant with the chert unit and Lisburne Group near latitude 68°31' N. west of the Ipnavik River (Sheet 6). However, the Okpikruak Formation is generally conformable with the chert unit; the more intricate folding of the chert seems to be the result of the relative incompetency of the chert

m

**Mafic igneous rock**

Diabase, mostly as sills in Lisburne Group and in cherty unit. Individual bodies are a few tens to more than 250 feet thick and extend a few hundred yards to a few miles laterally. Fine- to coarse-grained, dark-greenish-gray, weathers distinctive dark reddish brown, resistant and competent; pervasive deuteric alteration; contact effects limited; forcibly intruded in part

$c_1$

**Cherty unit**

Persistent section several hundred feet thick composed, from the top down, of: 1. varicolored, red and green weathering, dull-lustered, radiolarian(?) chert; thin zones of grayish-red weathering shale; zones 5 to 10 feet thick of thin- to medium-bedded intercalated black, papery oil shale and dark chert. Scarce Foraminifera in clay shale; 2. sheared mudstone with boudins or thin layers of tasmanite (algal-like spores of Tasmanites); 3. thin- to medium-bedded, medium- to dark-gray, dull-weathering chert; 4. black, ferruginous, iron-stained, thin- to medium-bedded, flinty chert and medium-grayish-brown mudstone or shale. Thin layers of crinoidal limestone contain brachiopods of upper Paleozoic aspect

$Ml_3$ | $Ml_1$ / $Ml_2$ / $Ml_4$

**Intermediate and lutitic facies of Lisburne Group**

Persistent section less than one-quarter mile thick. The upper two-thirds consists chiefly of medium- to dark-gray carbonate and chert of a facies intermediate between, or a mixture of, the light and dark facies and subordinately of beds and zones of both the light and dark facies; the lower part consists of dark-gray silty limestone and calcareous shale of the lutitic facies. Abundance of the light facies decreases, and the proportion of the lutitic facies increases, southwestward. Early Mississippian in lower part and Late Mississippian in upper part

Ds

**Skajit Limestone**

Light- to very light-colored, fine- to medium-grained, thick-bedded limestone and dolomite with minor chert. On Buccaneer Creek (Sheet 5) includes medium-bedded intercalated shale and limestone. Nearly 1000 feet exposed thickness in DeLong Mountains; small blocks of recrystallized(?) carbonate along trace of thrust near north edge of sequence. Can be traced westward into the Kugururok Formation. Middle and Late Devonian; lutitic phase is Late Devonian

## Foothills sequence

Standard stratigraphic succession in the Brooks Range and the Southern Foothills from the west coast to the Sagavinirktok River 450 miles to the east. Autochthonous with respect to the Ipnavik sequence but ambiguous with respect to the Nuka Ridge sequence

II

a | ac | aw

**Argillaceous unit**

Persistent argillaceous rocks between mid-Cretaceous and Early Jurassic rocks

a, clay shale, incompetent, dusky red weathering in part. Possibly younger mudstone and very fine grained wacke and unusual accessory rock types such as pyritic concretions, exotic pebbles, and organic-rich beds, preserved locally

ac, with coquinoid limestone of finely ribbed Buchia (Valanginian) along northern part of pre-Albian rocks

aw, with or grading upwards to fine-grained wacke near mountain fronts

m

**Mafic igneous rock**

Diabasic rocks. Thin, aphanitic to fine-grained mafic tabular bodies; most are shallow intrusives, some may be extrusive. Middle Jurassic or younger. Limited to northern edge of disturbed belt. At Lisburne Ridge, resembles diabase in Ipnavik sequence

TRIASSIC AND JURASSIC

Trs

**Shublik Formation
And associated rocks**

Distinctive map unit less than 300 feet thick. Upper part: fossiliferous, thin- to medium-bedded, light-colored calcilutite; contains Monotis of Norian age. Middle part: thinly interbedded dark chert and shelly bituminous paper shale; contains Halobia of Karnian age. Lower part: shale, organic shale, and organic claystone; sparsely fossiliferous, Middle Triassic. Includes up to 60 feet of black chert, organic calcilutite, shale, and oil shale with Otapiria and Inoceramus of Early and Middle Jurassic age. Siksikpuk Formation probably included in many mapped occurrences

Ps

**Siksikpuk Formation**

Red and green, or medium- to light-gray, locally brilliantly iron-stained nodularly bedded chert 100 feet or less thick; underlain by dusky red, green and gray argillitic or cherty mudstone or shale with barite concretions; approximately 200 feet thick. Nonfossiliferous. Early(?) Permian to east

ANGULAR UNCONFORMITY ?

I

Mlk

**Kogruk Formation of Lisburne Group**

Two occurrences of thick-bedded crinoidal limestone of light facies in southwest. No diagnostic fossils; Late Mississippian to west

Mlu

**Utokok Formation of Lisburne Group**

Thin fault fragments of medium-bedded shale, silty limestone, and calcareous quartzose siltstone in upper reaches of Rampart Creek (Sheet 5). Early Mississippian

$Ml_2$ / $Ml_1$

**Dark and light-colored facies of Lisburne Group**

Dark facies ($Ml_2$): in thin sections at the base of the sequence throughout most of the foothills; consists of about 300 feet of thick-bedded black chert overlain and underlain by black shale in the window around Drenchwater Creek (Sheet 5) and south of Lisburne Ridge (Sheet 7). Late Mississippian; possibly Early Mississippian as well on Twistem Creek (Sheet 5). Significant thickness of light facies ($Ml_1$) only at Lisburne Ridge: several hundred feet of calcarenite, dolomite, and cherty limestone; Early(?) Mississippian; overlain by black mudstone, phosphatic beds, and black chert

III

$Ml_2$ / $Ml_1$ / $Ml_2$

**Dark and light-colored facies of the Lisburne Group**

Less than 1000 feet exposed along Safari Creek (Sheet 6) and Friendly Creek (Sheet 7): a few hundred feet of limestone, shale, and subordinate chert of the dark facies ($Ml_2$) at the base; overlain by a few hundred feet of limestone of the light facies ($Ml_1$); overlain by black mudstone or shale, limestone, and chert of the dark facies ($Ml_2$); Early Mississippian in basal zone

Mk

**Kayak Shale**

Approximately 800 feet of medium-dark-gray hardened shale and slate with thin beds of very fine grained quartzite. Limestone beds in uppermost part. Apparently gradational upward into Lisburne Group. Early Mississippian fossils indicate that beds are somewhat older than equivalent lithic zones in type section to east

Dk

**Kanayut Conglomerate**

More than a half mile of orthoquartzitic arenite and conglomerate. Underlies front of Endicott Mountains. Assigned to the Late Devonian to east

## Nuka Ridge sequence

Third of three main sequences in region. Contrasts with Foothills and Ipnavik sequences indicate strong dislocations from original depositional sites but relative displacements are ambiguous. Sequence synthesized from rocks overlying and infaulted with the Nuka Formation at Nuka Ridge (Sheet 5) and from rocks closely but chaotically associated with the Nuka elsewhere

$w_1$

**Wacke with cannonball concretions**

Wacke with spherical calcareous concretions and mudstone similar to that on Kiligwa River. Overlying and infaulted with Nuka Formation at Nuka Ridge and closely associated with outcrops of Nuka elsewhere

$w_5$

**Micaceous wacke**

Distinctive dark-gray, fine- to medium-grained sandstone (wacke?) with abundant plates of muscovite. Occurs in rubble patches near Nuka Formation east of Sorepaw Creek and east of Hardway Creek. Stratigraphic position unknown; possibly part of orogenic sediments

me

**Mafic extrusive(?) rock**

Poorly exposed igneous rocks tectonically associated with Nuka Formation (Sheets 5 and 6); aphanitic to fine-grained, apparent pillow structures in one outcrop; highly chloritic and calcareous. Presumably of extrusive or epiclastic origin

ll

**Laminated limestone**

Dark-brownish-gray, organic, very finely laminated calcilutite; only a few tens of feet exposed; affinities unknown: apparently juxtaposed with Nuka Formation and with cannonball wacke at the two occurrences on Mechanic Creek and the Kiligwa River

PMn: PMnq, PMnp, PMno, PMnn, PMnm, PMnl, PMnk, PMnj, PMna, PMnc, PMni, PMnh, PMng, PMnf, PMne; Pn

**Nuka Formation**

Characterized by marine arkose and calcarenite. At Nuka Ridge, possibly more than a mile and a half of apparently cyclically repeated members or units of lutite (PMn f, h, l, o), arenite (PMn e, i, m, p, q), and chert (PMn g, j, k, n, a, c). Late Mississippian fossils in lower part (f and h); Late Permian fossils in upper half (l through p). Tongue of dark facies of Lisburne Group in member f. Member j lithologically similar to Siksikpuk Formation. Elsewhere (Pn), fault-fragmented thin sections generally of arkose and calcarenite with Late Permian fossils, often part of tectonic chaos

## Sequence on upper Kiligwa River
(Sheets 5 and 6)

Chert and oil shale similar to Ipnavik sequence but distinguished by the lack of sills and by contrast in types of wacke. Stratigraphic as well as tectonic correlation with the Nuka Ridge sequence may be indicated by the similarity between wacke units and by the close areal association

$w_1$

**Wacke with cannonball concretions**

Thin sections of irregularly interbedded wacke and mudstone. Wacke distinctively medium greenish-gray, very fine- to fine-grained, very calcareous, slightly friable; spherical concretions of more calcareous rock a few inches to more than a foot in diameter are identifying feature. Microscopic volcanic and shell clasts characteristic of the Okpikruak Formation are not prominent and a similar wacke in an eastern region contains Buchia of Valanginian age. However, unit is tentatively correlated with the Okpikruak Formation

$w_3$

**Brownish wacke and mudstone**

Irregularly interbedded fine-grained wacke and mudstone. Probably lithogenetically the same as the wacke unit with cannonball concretions but $w_3$ sandstone is generally brownish gray color, less calcareous, more porous, and contains no concretions. Nonfossiliferous. Oil cut from two samples on Kiligwa River

$c_5$

**Chert**

One hundred feet or more of medium-gray, semi-glassy, light-toned, iron-stained chert and about 100 feet of darker chert. Zones of black papery oil shale up to 5 feet thick occur in lighter chert; mudstone with tasmanite associated with darker chert. Possibly includes about 100 feet of varicolored, cherty or argillitic mudstone

$Ml_5$

**Lisburne Group?**

Conglomerate of limestone clasts in carbonate matrix; associated with dark mudstone, black platy shale, black chert, and subordinate crinoidal limestone. Lithologically correlative for the most part with the Lisburne Group but fossils may indicate correlation with the Nuka Formation. A black conglomeratic limestone on Mechanic Creek (Sheet 2) may be related to this unit

## Assemblage on Drenchwater Creek

Rocks unlike any other in the region.

f

**Felsic igneous rock**

Light- to medium-hued aphanite and porphyry of rhyolitic composition. Observed only in sliver east of Drenchwater Creek. Only known occurrence of non-mafic volcanic rocks on Arctic Slope

## Rock-stratigraphic units not in a sequence and rock units not assignable to stratigraphic units

?

**Unknown rocks**

Bedrock, generally observed on aerial photographs, which cannot be identified

JURASSIC AND CRETACEOUS

$wc_1$ | $wc_3$

**Wacke and conglomerate**

$wc_1$, unique, granitic boulder conglomerate with medium-colored, moderately sorted sandstone and wacke. Limited to narrow band between Mechanic and Jubilee Creeks. Nonfossiliferous. Coarsest clastic rock in region yet is exposed along north limit of rocks older than Fortress Mountain Formation. Granitic aspect resembles that of conglomerate in Okpikruak(?) Formation on Kiligwa River

$wc_3$, moderately thick section of wacke and conglomerate at Puvakrat Mountain. Resembles Okpikruak Formation in general but is much coarser than any nearby

w | wc | l

**Wacke, conglomerate, and lutite**

Outcrops of wacke and mudstone (w), wacke and conglomerate (wc), and lutite (l) unidentified with other units. Mostly Mesozoic in age. Includes section of fine-grained wacke and shale apparently under Nuka Formation on upper Sorepaw Creek

v

**Volcaniclastic(?) rock**

Fine- to medium-grained, greenish gray, tuffaceous carbonate or carbonatized clastic rock with abundant chloritic minerals in spherulitic grains. Examined only on Picnic Creek. May be correlative with calcareous igneous rocks associated with Nuka Formation

PERMIAN AND JURASSIC

c

**Chert**

Varicolored chert or chert rubble unidentified with other units

$c_6$

**Chert**

Chert forming prominent rubble traces between Mechanic and Sorepaw Creeks. Dark-colored, Paleozoic aspect; unlikely to be Lisburne Group

s

**Calcareous siltstone**

A few hundred feet of rhythmically, medium bedded calcareous siltstone in cutbanks southwest side of Safari Creek. Overlain by about 20 feet of bluish-gray glassy chert on opposite side of stream. Concretionary mass of dark, fine-grained limestone in rubble bank about one mile upstream contains fossil fragments that resemble Triassic Monotis

MISSISSIPPIAN

$Ml_2$ | $Ml_3$ / $Ml_1$ / $Ml_4$ | Ml

**Lisburne Group**

Widespread stratigraphic marker, 1000 to 2000 feet thick. Mapped largely as intertonguing or gradational facies. Light-colored (shelf) facies ($Ml_1$) of medium- to light-gray, medium- to thick-bedded limestone, dolomite, or calcarenite with variably subordinate chert in irregular stringers and layers; dark-colored (euxinic) ($Ml_2$) facies of thick-bedded black chert, interlayered chert and very fine-grained carbonate, dark-colored very fine-grained carbonate, and black mudstone to platy shale; lutitic facies ($Ml_4$) of current-deposited silty to muddy limestone, shale, and subordinate calcareous siltstone; and intermediate or mixed light and dark facies ($Ml_3$). In places mapped as undifferentiated (Ml). Age is Early and Late Mississippian

Ms

**Sandstone**

Fine- to medium-grained, light-colored, fossiliferous arenite in rubble patches near Cutaway Creek. Early Mississippian

DEVONIAN

---


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

OPEN FILE REPORT
SHEET 1 OF 7

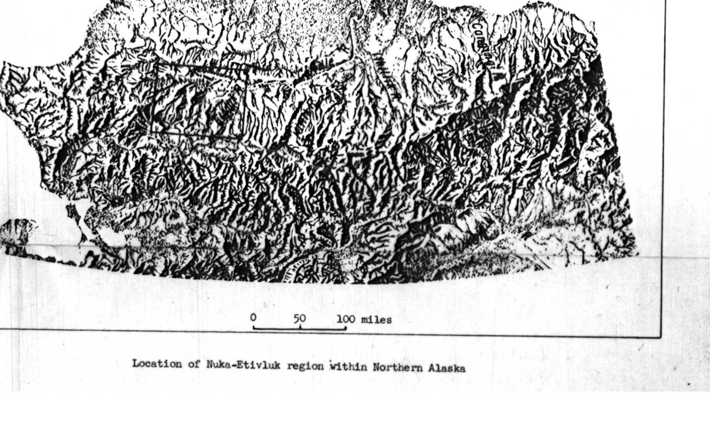
THIS MAP IS PRELIMINARY AND HAS NOT BEEN EDITED OR REVIEWED FOR CONFORMITY WITH U.S. GEOLOGICAL SURVEY STANDARDS AND NOMENCLATURE


# OUTCROP/GEOLOGIC MAPS OF THE NUKA-ETIVLUK REGION, NORTHERN ALASKA


By

I. L. TAILLEUR, B.H. KENT, JR. AND H.N. REISER


1966




Location of Nuka-Etivluk region within Northern Alaska