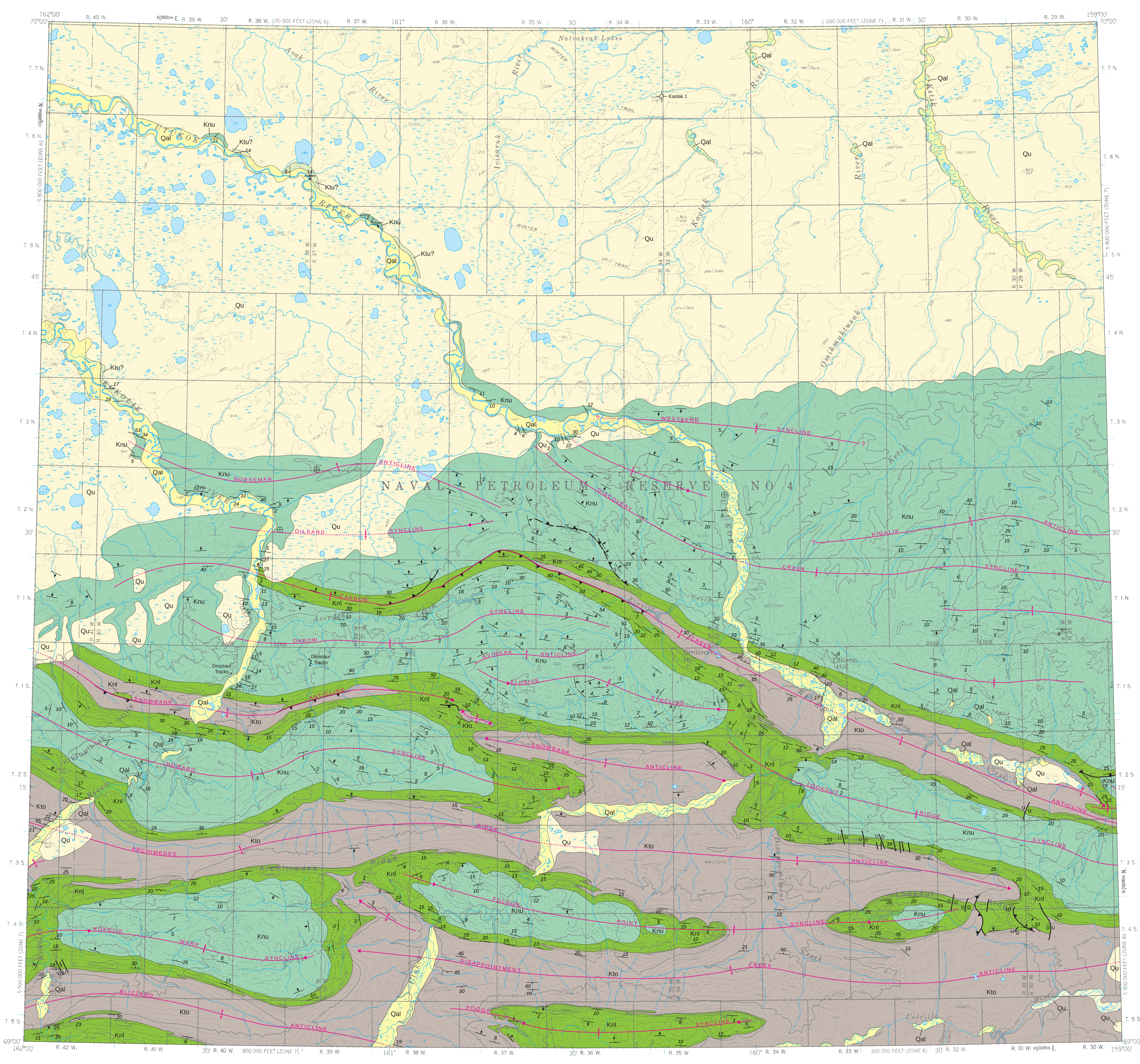
Prepared in cooperation with
ALASKA DEPARTMENT OF NATURAL RESOURCES,
DIVISION OF OIL AND GAS



Base from U.S. Geological Survey, 1956
Universal Transverse Mercator projection
1927 North American Datum
100,000-foot grid ticks based on Alaska coordinate system, zone 4

TRUE NORTH
MAGNETIC NORTH
18°
APPROXIMATE MEAN DECLINATION, 2005

SCALE 1:250 000

5 0 5 10 15 20 MILES

5 0 5 10 15 20 25 KILOMETERS

CONTOUR INTERVAL 100 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

ALASKA
QUADRANGLE LOCATION

Geology by Chapman and Sable, 1960, and Pessel and Mull, 1964;
aerial photographic revisions by C.G. Mull, 2002
Digital cartography and compilation by Christopher P. Garrity
Edited by Elizabeth D. Koozmin

GEOLOGIC MAP OF THE UTUKOK RIVER QUADRANGLE

By
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Christopher P. Garrity

INTRODUCTION

The Utukok River quadrangle (1:250,000) is located on the western Arctic North Slope of Alaska. This geologic map of the quadrangle is a compilation of U.S. Geological Survey (USGS) mapping by Chapman and Sable (1960) and unpublished mapping by Pessel and Mull (1964) for Richfield Oil Corporation. In preparation of this map, previous stratigraphic and structural interpretations were revised with the aid of modern high-resolution color-infrared aerial photographs. Regional maps by Payne and others (1951), Lathram (1965), and unpublished mapping by Martin and others (1968) for British Petroleum Company were consulted for control on the location of structural axes in areas of poor exposure. The mapping from these primary sources was then modified to incorporate recent revisions in stratigraphic nomenclature by Mull and others (2003), to which the reader is referred for more detailed discussions of the age, thickness, regional distribution, and generalized interpretations of depositional environments of the stratigraphic units.

HISTORY OF EXPLORATION

The area of the Utukok River quadrangle is one of the more remote areas in the foothills belt north of the Brooks Range and has been mapped by most workers only at a regional scale in reconnaissance fashion. The quadrangle includes part of the National Petroleum Reserve in Alaska (NPRA), which was established in early 1923 as Naval Petroleum Reserve #4 (NPR-4). Almost immediately following its establishment, the Department of Navy made a request to the Department of the Interior for USGS scientists to begin topographic and geological investigations to determine the petroleum potential of the area. The first geological reconnaissance inland in the northwestern part of the NPRA was carried out in the summer of 1923 by W.T. Foran and Gerald Fitzgerald (Paige and others, 1925). They surveyed along the coastline of the northwestern Arctic Slope, from near Cape Beaufort to Wainwright, and traveled inland along some of the coastal rivers (including the Kokolik and Utukok Rivers) into the northwestern corner of the Utukok River quadrangle. In these traverses, they observed thick sections of interbedded sandstone, shale, and coal on the flanks of three anticlinal folds.

During the summer of 1924, more intensive exploration in the northern Brooks Range foothills was carried out by a field party led by Foran and topographer O.L. Wix in an expedition that developed into a saga of geographic exploration and survival in previously unmapped country (Smith and Mertie, 1930). The field party was extensively hindered by ice early in the season but finally reached Wainwright on the coast in early August. They ascended the Kuk and Kaolak Rivers, and in mid-August portaged their canoes and equipment over the tundra to the Utukok River. In late August, after traversing up the Utukok, they reached a point at which the water was too shallow for further canoe transportation. They then cached one of their canoes and some of the equipment and portaged the remaining canoe and equipment overland for over 15 miles (mi) southward up a small stream that they later named Disappointment Creek. From there they crossed a divide and encountered a stream to the south that they expected would lead into the Noatak River drainage on the south side of the western Brooks Range. Instead, this drainage, which was not reached until August 30, turned out to be the headwaters of the Colville River, which flows eastward to the Beaufort Sea, not southward. This necessitated yet another portage southward to a small lake that they named No Luck Lake, in the foothills of the central DeLong Mountains, just south of the Utukok River quadrangle. Several days were spent returning to the Utukok River to retrieve some of the supplies cached there, and in reconnaissance to find a route south through the mountains to the Noatak River drainage, which flows westward to the Chukchi Sea coast at Kotzebue. Yet another long portage was then undertaken to reach the head of the Niniuktuk River, a tributary of the Noatak. At this point late in the season, however, stream flow on the Niniuktuk River was very low and mostly frozen; therefore, it was still necessary to backpack the canoe and supplies, which included an outboard motor and fuel that had been carried through all the portages. Finally, after being on reduced rations and living off the land, deeper water was reached in mid-September and the party was finally able to use the canoe and motor on the Noatak River. They reached Kotzebue and safety on September 21, where they were then delayed by more than a week of storms before chartering a boat to Nome. There, they obtained passage on a steamship that reached Seattle in late October.

In the end, the field party had crossed the entire northern foothills belt, including over 60 mi of almost continuous portage across the tundra. During the traverses, the field party recognized the broad belt of folded, coal-bearing Cretaceous beds that are now known as the Nanushuk Formation, but, because of the difficulties they encountered, the party was not able to accomplish much geologic mapping. Instead, the major contribution of this expedition was increased knowledge of the geography of the previously unmapped upper Colville River region.

In 1925, Gerald Fitzgerald and W.R. Smith of the USGS revisited the Utukok River area in an expedition that left Kotzebue in mid-April. Equipment was ferried by dog team up the Noatak and Kugururok Rivers and across a divide to the head of the Utukok River (Smith and Mertie, 1930). Working by dog team, they carried out reconnaissance geologic mapping along the upper Utukok River, which was an area not previously explored. Downstream, they retrieved one of the canoes that had been cached by Foran late the previous summer. A divide between the Utukok River and the head of the Colville River was located, and, after ice broke at the end of May, the canoe was used for transportation down the Colville. Backpacking expeditions away from the river extended the area of the surveys.

The geology of the western part of the Utukok River quadrangle was first mapped in 1926 by a USGS field party that also began operations at Kotzebue in April. This party, led by P.S. Smith and Gerald Fitzgerald, moved by dog team up the Kivalina River and then to the head of the Kokolik River. After ice breakup in early June, the party moved down the Kokolik by canoe and again extended the surveys laterally with backpacking trips away from the river (Smith and Mertie, 1930).

The results of these reconnaissance expeditions demonstrated the lateral continuity of the folded coal-bearing Cretaceous section in the northern foothills of the western Brooks Range. A number of north- and south-verging, asymmetric anticlines were mapped and shown on a generalized geologic map by Smith and others (1926) that showed some of what was known of the geology of NPR-4. The report also included a generalized cross section northward from the Brooks Range mountain front (east of the Utukok River quadrangle), which provided the first description and illustration of the belt of regional anticlines and synclines of decreasing amplitude to the north that deformed the Cretaceous rocks of the foothills belt. The report by Smith and others (1926) also discussed the logistical constraints to oil exploration and development and pointed out that either a railroad or a 1,000-mi-long pipeline (both with associated defense issues and enormous capital expenditures) would be needed to develop oil resources on the North Slope. The report also recommended further study and the drilling of shallow stratigraphic test holes on the North Slope. A much more extensive summary of the geology of northwestern Alaska by Smith and Mertie (1930) discusses the results of these surveys in greater detail; in this report, the authors estimate the thickness of the entire Cretaceous sequence at over 15,000 feet (ft).

No further geologic investigations were carried out in the area of the Utukok River quadrangle until 1947 and again from 1949 to 1953 as part of a renewed USGS program of exploration of NPR-4 for the U.S. Navy. In the ensuing 20 years since the first field studies in NPR-4, fixed-wing aircraft, motorized all-terrain vehicles, and aerial photography had revolutionized the field of geologic mapping. These tools greatly facilitated more detailed geologic mapping as well as the stratigraphic and structural studies that were carried out by a large number of USGS geologists. Summaries of these individual projects and the resulting detailed maps were compiled by Chapman and Sable (1960).

As part of the Navy exploration program in NPR-4, seismic-reflection and gravimetric surveys were carried out on the area from 1950 to 1952, and one exploratory well (Kaolak #1) was drilled in 1951 near the northern edge of the Utukok River quadrangle. A summary of the results of the geophysical surveys and drilling is given by Chapman and Sable (1960, p. 145-151, 155). More detailed discussions of the geophysical surveys are presented by Woolson (1962), and data on the Kaolak test well are given by Collins (1958). Reed (1958) presented a comprehensive discussion about this phase of exploration of NPR-4.

The Navy exploration program resulted in the discovery of recoverable oil at Umiat, in the southeastern part of NPR-4, and of gas at Gubik, a short distance east of Umiat. This success served as the impetus for active oil industry exploration on the North Slope that began in 1958. Geophysical surveys and drilling of several wildcat wells east of NPR-4 led to the 1968 discovery of the supergiant Prudhoe Bay oil field 285 mi northeast of the Utukok River quadrangle by Atlantic Richfield Company and Humble Oil Company (now part of ExxonMobil Corp). Following the success of the industry exploration, the U.S. Navy and U.S. Department of the Interior carried out renewed exploration of the renamed National Petroleum Reserve in Alaska (NPRA) from 1974 to 1982, including additional geophysical surveys throughout NPRA and including the Utukok River quadrangle. The results of this second phase of government exploration in NPRA were published by Gryc (1988). A regional map of NPRA by Mayfield and others (1988) may be found in Gryc (1988).

Four Federal lease sales were held in NPRA in the 1980s, but only two exploration wells were drilled by industry and neither discovered any oil or gas. Following a 10-year hiatus in exploration activity, NPRA again became a focus of interest with the 1996 announcement of the discovery of the Alpine oil field, located northeast of the Utukok River quadrangle just outside NPRA. Federal lease sales were held in 1999, 2002, and 2004 in northern NPRA but no lands in the Utukok River quadrangle were included. Exploration wells were drilled by industry during subsequent winter drilling seasons and several of those wells were announced as oil and gas discoveries.

REGIONAL SETTING

The northern part of Utukok River quadrangle is within the Arctic coastal plain, which is characterized by extensive areas of tundra cover, shallow tundra lakes (thermokarst lakes), and a few meandering streams that offer few bedrock exposures. The southern half of the quadrangle consists of upland areas that are underlain mainly by resistant rocks of the Nanushuk Formation. The southern area is incised by the Utukok and Kokolik Rivers and their tributaries. Excellent exposures can be traced long distances along the flanks of regional anticlines and synclines.

The area of the Utukok River quadrangle spans the transition from the deformed rocks of the foothills of the northern Brooks Range into the undeformed rocks of the Arctic coastal plain. Rocks exposed in the quadrangle are part of the gently south-dipping northern flank of the Colville basin, which is a deep, asymmetrical foreland basin of Cretaceous and Tertiary age that lies north of the Brooks Range orogenic belt. The Colville basin is underlain by a Devonian and older, deformed and weakly metamorphosed basement complex (Dumoulin, 2001) assigned to the Franklinian sequence (Bird and Molenaar, 1992). A relatively thin section of Carboniferous to lowest Cretaceous (lower Neocomian) strata representing platform deposits of the Ellesmerian and Beaufortian sequences (Bird and Molenaar, 1992) overlies the basement.

The rocks of the Colville basin are assigned to the Brookian sequence, a thick section of Lower Cretaceous to Miocene foreland basin deposits (see regional map in Mull and others, 1987, or Moore and others, 1994). Brookian sediments were eroded and transported northward from orogenic belts in the Brooks Range and eastward from the Chukchi platform, an ancestral highland that now lies beneath the Chukchi Sea west of northern Alaska (Mull, 1979). The basin fill comprises a thick (more than 12,000 ft), eastward-prograding clastic wedge consisting of deep-marine-basin and slope deposits (Torok Formation) and overlying shallow-marine shelf, deltaic, and nonmarine deposits (Nanushuk Formation) (Molenaar, 1985). The Nanushuk Formation forms most of the surface exposures in the foothills fold belt and underlies most of the coastal plain of northern Alaska. Following the eastward progradation of the Torok-Nanushuk clastic wedge to an ultimate shelf margin located nearly 200 mi east of the Utukok River quadrangle, the top of the Nanushuk was flooded by a regional marine transgression, which led to deposition of the Upper Cretaceous (Cenomanian to Coniacian) Seabee Formation (fig. 1). Renewed progradation of clastic depositional systems subsequently resulted in deposition of shallow-marine through nonmarine strata of the Upper Cretaceous (Turonian through Maastrichtian) Tuluvak, Schrader Bluff, Prince Creek Formations, and the lower Tertiary Sagavanirktok Formation east of the Utukok River quadrangle. Deposition of these shallow-marine to nonmarine sediments to the east completed the filling of the Colville basin.

STRATIGRAPHY

The stratigraphic units delineated in the Utukok River quadrangle are similar to those mapped by Chapman and Sable (1960). The upper and lower units of the Nanushuk Formation are approximately equivalent to the Corwin and Kukpowruk Formations of Chapman and Sable (1960). However, the upper and lower units of the Nanushuk interfinger; thus, the mapped contact between the two units is arbitrary and may not coincide with the position of the contact between the Corwin and Kukpowruk Formations mapped by Chapman and Sable (1960).

Rocks mapped as the Upper Cretaceous Prince Creek Formation of the Colville Group by Chapman and Sable (1960) along the lower parts of the Kokolik and Utukok Rivers are here reassigned to the Turonian(?) Tuluvak(?) Formation. This designation is based on the presence medium- to dark-gray, fine to very coarse grained, poorly consolidated sandstone that contrasts with the darker gray and much more firmly indurated sandstones of the upper unit of the Albian to Cenomanian Nanushuk Formation. Additionally, conglomerate lenses up to 3 ft thick within the sandstone beds contain an abundance of white quartz pebbles that contrast with the more chert-rich conglomerates in the Nanushuk Formation.

The inferred presence of the Tuluvak(?) Formation implies that the Turonian Seabee Formation, which lies between the Tuluvak Formation and the underlying Nanushuk Formation in the Colville River area to the east, also is present in the Utukok River quadrangle. Although no outcrops of the Seabee Formation have been observed, hillsides downslope from outcrops of the Tuluvak(?) Formation are commonly characterized by numerous white-weathering patches of bare soil and mudflows that suggest the presence of abundant bentonite. This distinctive weathering character is typical of the Seabee Formation. However, no paleontological data are available to confirm the presence of Turonian strata in the Utukok River quadrangle. The interpretation that rocks of Turonian age are preserved in the area conflicts with interpretations of the regional stratigraphy that are based on detailed analysis of seismic data north and east of the Utukok River quadrangle (P.L. Decker, ConocoPhillips, written commun., 2005). Those seismic interpretations suggest that Turonian strata have been eroded and that the youngest strata preserved are within the upper part of the Nanushuk Formation.

Dinosaur tracks and skin impressions are present in two locations in the Utukok River quadrangle. Roehler and Stricker (1984) reported a short trackway with three footprints, each about 1.25 inches in diameter, in a crevasse-splay deposit in the upper part of the Nanushuk Formation on the northwest side of the Kokolik River in sec. 13, T. 1 S., R. 40 W. They also reported dinosaur tracks and a skin impression in a crevasse-splay deposit in the upper part of the Nanushuk on the east side of a southern tributary of Avingak Creek in the northwest corner of sec. 12, T. 1 S., R. 39 E. Similar fossils were also found in loose boulders in the same creek in sec. 2, T. 1 S., R. 39 E. The skin impressions were identified by G.S. Lewis (USGS, written commun., 1983) as belonging to an ornithopodus or ornithischian dinosaur of the Family Hadrosauridae, genus and species indeterminate (Roehler and Stricker, 1984). This report of dinosaur tracks was one of the first reported indications of dinosaurs at a high latitude in the United States. The localities are noted on the map.

REGIONAL STRUCTURE

The relatively resistant clastic rocks of the Nanushuk Formation in the Utukok River quadrangle and adjacent areas are regionally deformed into a series of broad, open synclines and generally tighter and commonly faulted anticlines. The folds trend east to west across the southern part of the quadrangle. These structures are well defined by resistant sandstone horizons in the Nanushuk Formation, many of which can be traced for long distances on aerial photographs. The fold amplitudes generally decrease to the north so that the northernmost structures have markedly lower amplitudes than those to the south. The folds were developed in a passive roof complex of the Nanushuk Formation above a décollement in relatively incompetent shales and mudstones of the underlying Kingak Shale (Jurassic to Lower Cretaceous) and the Torok Formation (Lower Cretaceous, Aptian to Albian), the latter of which is exposed in the cores of many of the anticlines.

The anticlinal axes, which are better exposed in the southern part of the quadrangle, are characterized by north-vergent thrust faults in the Nanushuk Formation. This apparent structural style contrasts with that observed in the Lookout Ridge quadrangle to the east, in which both north- and south-vergent structures are evident. The Carbon Creek, Archimedes Ridge, and Blizzard anticlines are particularly prominent features, with shale of the Torok Formation exposed in the axial areas of all three. The anticlines are separated by a number of shorter, relatively simple synclines that are well expressed in the Nanushuk Formation.

The structural axes mapped here coincide mostly with the axes mapped by Chapman and Sable (1960), although some minor revisions in axial trends have been made as a result of examining modern color-infrared aerial photographs. Changes in the names of a few of the axes have been made in order to indicate continuity with axes in the Lookout Ridge quadrangle to the east, which was not mapped by Chapman and Sable.

Regional structural and stratigraphic analysis and apatite fission-track data suggest that the deformation in the western and central parts of the Brooks Range foothills foldbelt probably occurred during early Tertiary time in response to a late stage of uplift of the Brooks Range orogenic belt to the south (Mull and others, 1997; O'Sullivan and others, 1997).

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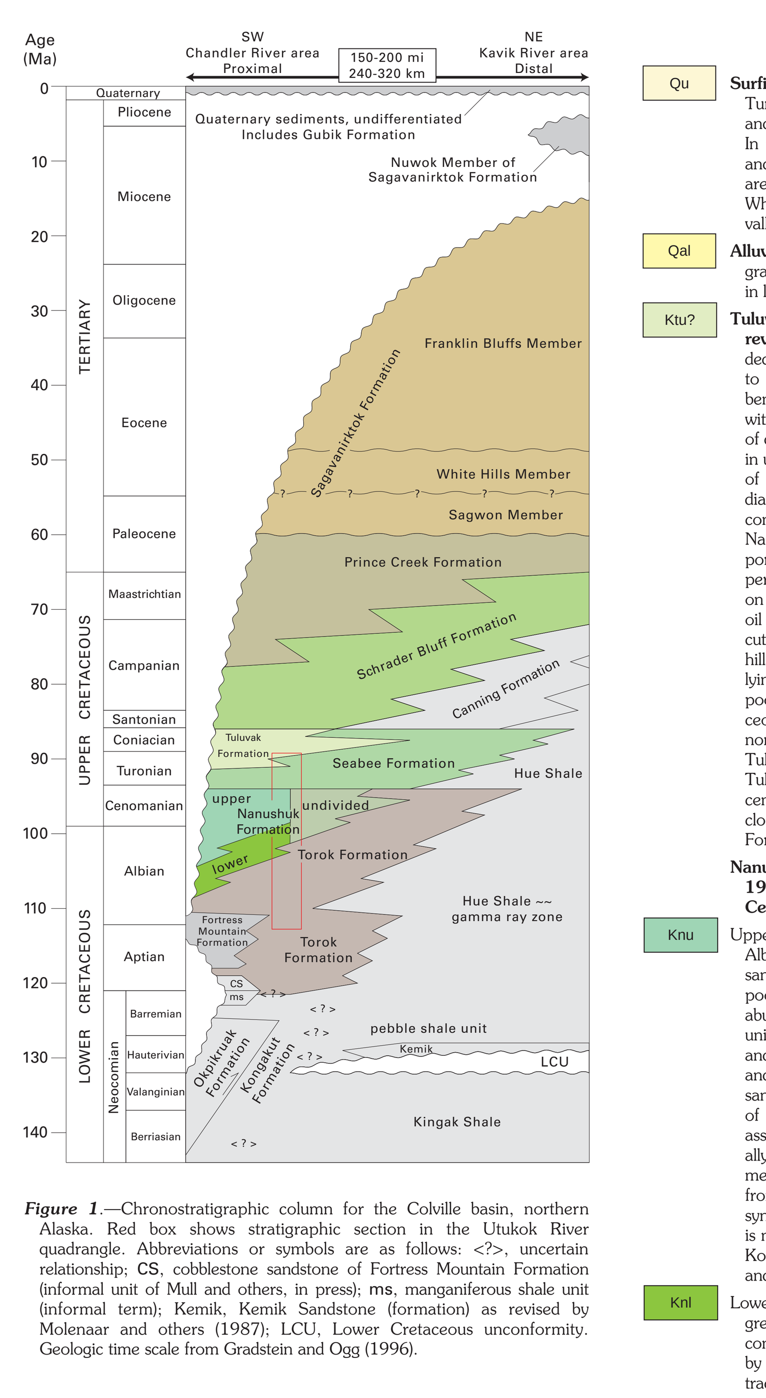

Figure 1.—Chronostratigraphic column for the Colville basin, northern Alaska. Red box shows stratigraphic section in the Utukok River quadrangle. Abbreviations or symbols are as follows: <?>, uncertain relationship; CS, cobblestone sandstone of Fortress Mountain Formation (informal unit of Mull and others, in press); ms, manganiferous shale unit (informal term); Kemik, Kemik Sandstone (formation) as revised by Molenaar and others (1987); LCU, Lower Cretaceous unconformity. Geologic time scale from Gradstein and Ogg (1996).

DESCRIPTION OF MAP UNITS

Qu — **Surficial deposits, undifferentiated (Holocene and Pleistocene)**—Tundra-covered, fine-grained, organic-rich silt, loess, and local colluvium and fine-grained alluvial sand and silt in areas adjacent to upland slopes. In northern part of quadrangle includes unstratified marine sand, silt, and local gravel of Gubik Formation (Black, 1964), which coincides with area of abundant shallow lakes in Arctic coastal plain (Brosgé and Whittington, 1966) and the topographically lower reaches of stream valleys in the northern part of the foothills fold belt

Qal — **Alluvial deposits, undivided (Holocene and Pleistocene)**—Alluvial sand, gravel, and silt in active braided and meandering stream flood plains, and in lightly vegetated, abandoned low terraces and flood plains

Ktu? — **Tuluvak(?) Formation (Gryc and others, 1951; Whittington, 1956; revised by Mull and others, 2003) (Turonian?)**—Sandstone interbedded with conglomerate lenses and beds. Sandstone is medium gray, fine to coarse grained, friable to moderately indurated, with interbedded bentonitic shale, siltstone, claystone, and coal in beds up to 10 ft thick, with high-angle crossbedding in some places. Sandstone consists mainly of quartz and chert grains with apparent lower percentage of chert than in underlying units. Conglomerate lenses are up to 3 ft thick and consist of up to 50 percent white quartz clasts that are up to 3 inches in diameter. Outcrops have distinctive light-gray-weathering character that contrasts with the dark-gray-weathering sandstones of the older Nanushuk Formation. Some sandstone samples have fair to excellent porosity; measured porosity ranges from 20 to 29 percent. Measured permeability ranges from 2,000 to 7,000 millidarcies (mD). One locality on Kokolik River contains contains sandstone with conspicuous brown oil stain. Unit is generally poorly exposed, crops out only in a few stream cutbank localities along lower Kokolik and Utukok Rivers. Adjacent hillsides contain abundant white, bentonitic soils characteristic of underlying Seabee Formation, which is not exposed. A few collections of poorly preserved plant fossils were dated as ranging from Lower Cretaceous to Tertiary (Chapman and Sable, 1960), but are considered to be nondiagnostic. Unit is tentatively assigned to the lower part of the Tuluvak Formation, based upon lithologic similarity to rocks of the Tuluvak Formation in Umiat and Ikpikpuk River quadrangles of east-central Colville basin (Mull and others, 2004, 2005) and its apparent close association with abundant bentonitic beds similar to Seabee Formation which underlies the Tuluvak in east-central Colville basin

Nanushuk Formation, undivided (Gryc and others, 1951; Detterman, 1956; revised by Mull and others, 2003) (Upper Cretaceous, Cenomanian, to Lower Cretaceous, Albian)

Knu — Upper part (Upper Cretaceous, Cenomanian, to Lower Cretaceous, Albian)—Dominantly nonmarine to marginal-marine, gray to light-gray sandstone and quartz- and chert-pebble conglomerate interbedded with poorly exposed siltstone; dark-gray, silty, carbonaceous shale; and abundant coal; interbedded with marine rocks in upper and lower part of unit. Includes rocks formerly mapped as Corwin Formation (Chapman and Sable, 1960). Contact with lower part of Nanushuk is approximate, and was determined using aerial photography; traces of resistant sandstone beds with less lateral continuity are assigned to the upper part of the Nanushuk; resistant beds with greater lateral continuity are assigned to the lower part of the Nanushuk. Sandstone beds are generally tight; analyses of a number of samples yielded porosity measurements between 10 and 19 percent, but permeability generally ranged from less than 3 mD to 30 mD. Unit is exposed in axes of regional synclines and forms mesa-like areas in southern part of quadrangle. Unit is more than 4,500 ft thick with no top exposed in Oxbow syncline on Kokolik River in western part of quadrangle (Chapman and Sable, 1960) and appears to thin markedly from west to east across quadrangle

Knl — Lower part (Lower Cretaceous, Albian)—Dominantly gray to greenish-gray, very fine to fine-grained marine sandstone and minor conglomerate. Includes rocks formerly mapped as Kukpowruk Formation by Chapman and Sable (1960). Contains resistant beds that form rubble traces which display long, lateral continuity on aerial photographs. In southern part of quadrangle, basal part of unit intertongues conspicuously with upper part of underlying Torok Formation where some resistant sandstone intervals prograde and pinch out eastward into nonresistant shales. Unit is widely exposed on the flanks of regional anticlines in southern part of quadrangle and thins from as much as 4,000 ft in the western part of the quadrangle to about 2,000 ft toward the east (Chapman and Sable, 1960)

Kto — **Torok Formation (Gryc and others, 1951; Patton, 1956) (Lower Cretaceous, Albian to Albian)**—Dark-gray mudstone and silty mudstone, with lesser amounts of greenish-gray, thin-bedded siltstone. Widespread but generally poorly exposed in axes of Carbon Creek, Archimedes Ridge, and Blizzard anticlines in southern part of quadrangle

CORRELATION OF MAP UNITS

UNCONSOLIDATED DEPOSITS			
Qu, Qal	Holocene, Pleistocene		QUATERNARY
BEDROCK			
Ktu?	Turonian	Upper Cretaceous	CRETACEOUS
Knu	Cenomanian	Upper Cretaceous	CRETACEOUS
Knl	Albian	Lower Cretaceous	CRETACEOUS
Kto	Aptian	Lower Cretaceous	CRETACEOUS

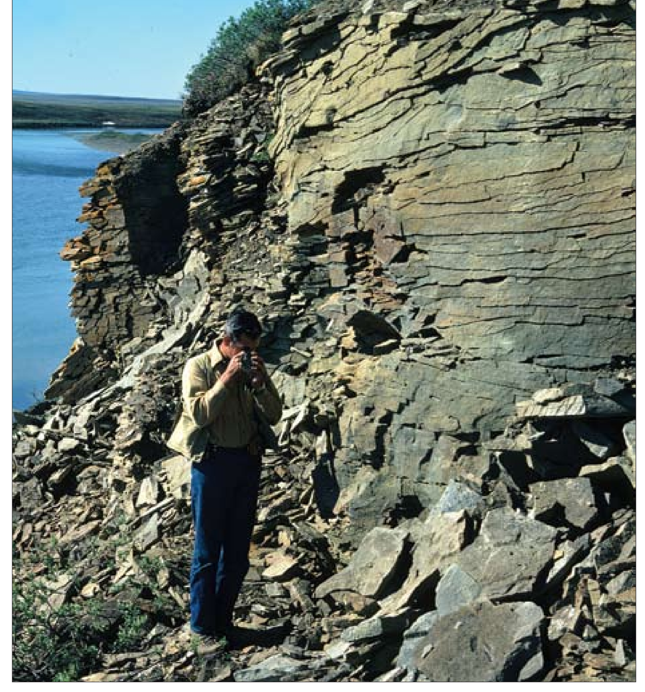

Figure 2.—Exposure of oil-stained sandstone in the Tuluvak(?) Formation along the Kokolik River, T. 3 N., R. 40 W.

EXPLANATION OF MAP SYMBOLS

Contact—Approximately located

Faults—Dashed where approximately located; dotted where concealed; queried where uncertain

U / D — Normal fault—Relative motion shown where known; U, upthrown side; D, downthrown side

Thrust fault—Teeth on upper plate

Folds—Approximately located; dotted where concealed; queried where uncertain

Anticline—Showing direction of plunge

Syncline—Showing direction of plunge

Traceable beds

Strike and dip of beds

40 — Inclined

Horizontal

Estimated

Oil exploration well—Dry hole in this quadrangle

Dinosaur tracks—Several locations in upper unit of the Cretaceous Nanushuk Formation

GEOLOGIC MAPS OF NORTHERN ALASKA

Edited by
David W. Houseknecht

Arctic Alaska hosts a spectrum of geology and a wealth of natural resources matched by few areas on Earth. Prior to the 1940s, geologic investigations in the region mostly were limited to coastal surveys and inland reconnaissance studies. Nevertheless, the potential for petroleum accumulations beneath Alaska's North Slope and for mineral deposits in the Brooks Range was recognized through the observations of the early expeditions. World War II demonstrated an urgent need for domestic energy and mineral resources and stimulated the initial systematic geologic mapping in northern Alaska as a basis for energy and mineral exploration. The geologic maps generated by those initial efforts also served as the foundation for additional petroleum exploration in the wake of the oil embargo of the 1970s. A few years into the 21st century, the natural resources of northern Alaska again are a focus of national attention. The need for detailed geologic maps is greater than ever, not only as a basis for petroleum and mineral exploration, but also for land-use planning and mitigating the environmental impacts of developing those resources.

The U.S. Geological Survey (USGS) performed the initial systematic mapping of the geology of Alaska's North Slope, including the northern front and foothills of the Brooks Range, between 1944 and 1953. Maps resulting from that work were published between 1960 and 1966 as USGS Professional Paper 303. Since that time, numerous geologic maps of individual quadrangles, or parts of quadrangles, have been published by the USGS and by the Alaska Division of Geological and Geophysical Surveys (ADGGS). Until now, no attempt was made to produce an integrated set of geologic maps using a uniform scale and cartographic standards, and consistently applied stratigraphic nomenclature. SIM–2817 is a set of digital geologic maps comprising individual 1:250,000 quadrangles, each assigned a unique letter (for example, this map of the Utukok River quadrangle is SIM–2817–D). The objective of these reports is to provide a new unified set of geologic maps of the northern flank and foothills of the Brooks Range using a uniform scale and cartographic style, as well as consistent stratigraphic nomenclature.

Although this collection of geologic maps incorporates significant contributions by many geologists who have mapped in northern Alaska during the past six decades, it would not be possible except for one geologist. This compilation is a testament to the career contributions of Charles G. (Gil) Mull, who has spent nearly forty years mapping the geology of the region for the petroleum industry, the USGS, the ADGGS, and the Alaska Division of Oil and Gas.

GEOLOGIC MAP OF THE UTUKOK RIVER QUADRANGLE, ALASKA

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2006
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