UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

# Stratigraphy and Sedimentation of the Torok, Kukpowruk and Corwin Formations of Cretaceous age in the Kokolik-Utukok River Region, National Petroleum Reserve in Alaska

by

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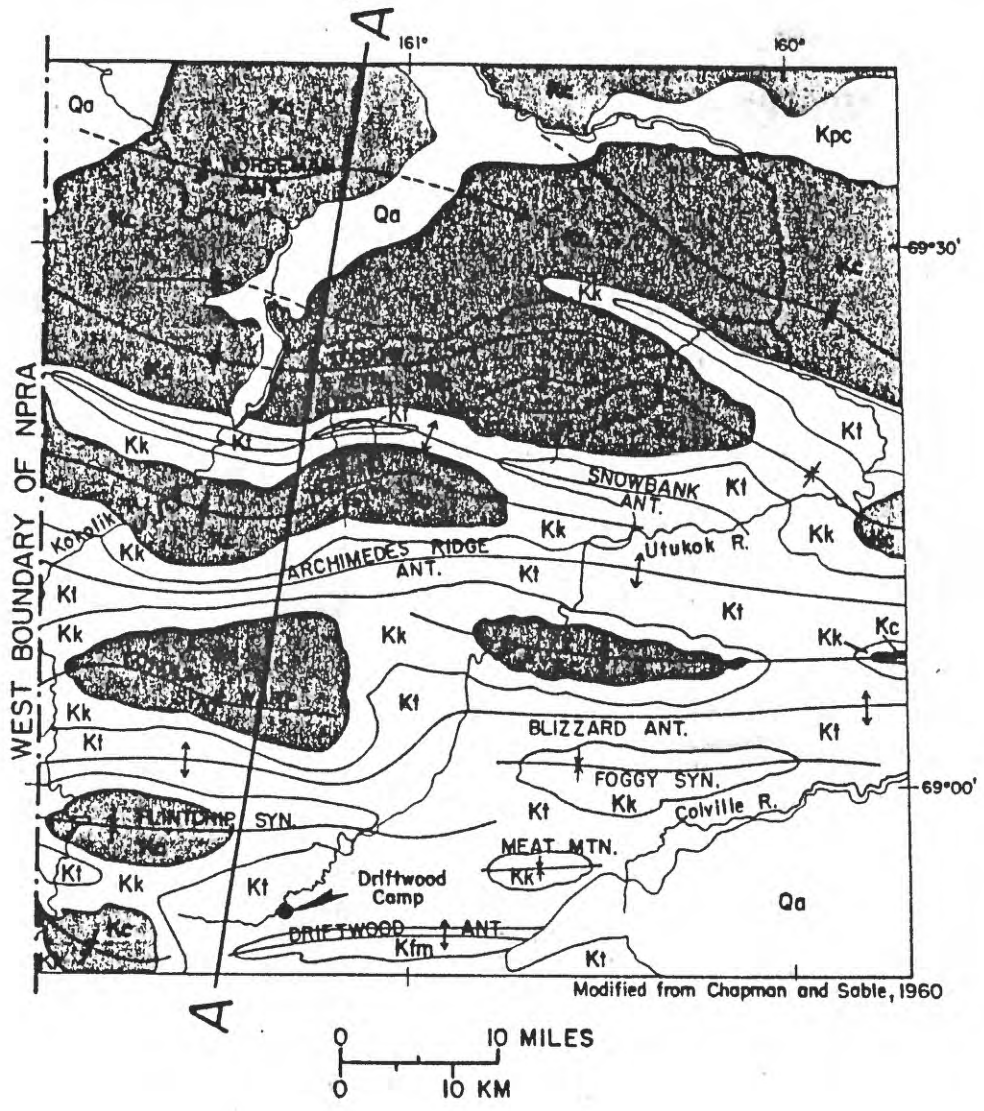
## INTRODUCTION

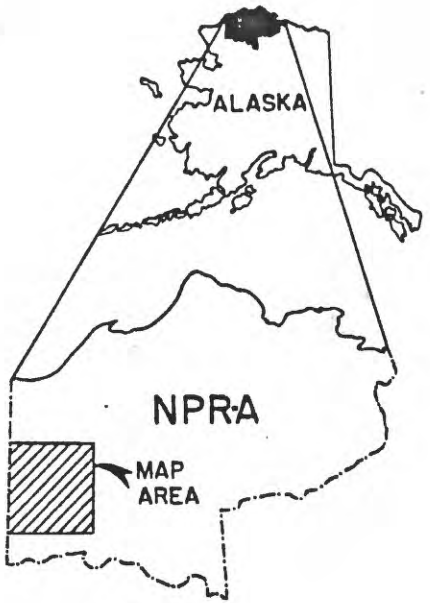
Investigations by the U.S. Geological Survey of the stratigraphy and sedimentation of the Torok, Kukpowruk, and Corwin Formations were undertaken as part of a land-use study of the National Petroleum Reserve in Alaska (NPR-A). The land-use study (Part 105-C) was authorized by the Secretary of Interior under the provisions of U.S. Public Law 99-258 (1976). A major objective of the land-use study was to assess mineral resources, including coal.

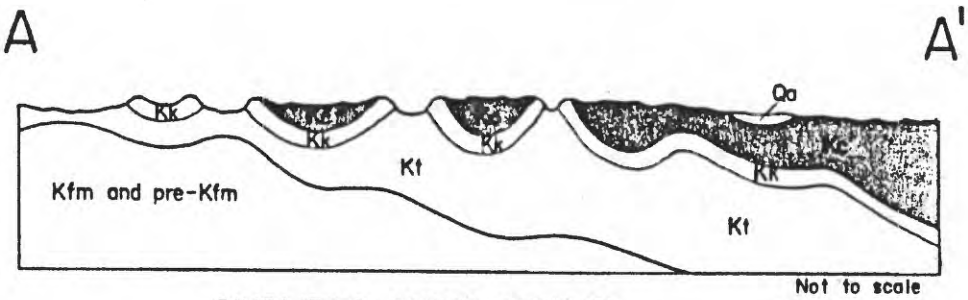
Coal-bearing rocks between the Kokolik and Utukok Rivers in the southwestern part of the NPR-A were investigated by the authors from August 8 to August 26, 1978. Field work was undertaken for two purposes: (1) to determine the quantity of coal present, and (2) to study depositional environments, which can be used as tools for predicting coal occurrence, quantity, and quality. During the course of these investigations, stratigraphic sections were measured by jacob staff and Abney level at the localities indicated on plate 1. Coal beds were mapped in outcrops along drainages; no attempt was made to map coal beds between drainages because of soil and vegetation cover.




# EXPLANATION

| | | |
|---|---|---|
| Qa | Surficial deposits | QUATERNARY |
| Kpc | Prince Creek Formation | CRETACEOUS |
| Kc | Corwin Formation | |
| Kk | Kukpowruk Formation | |
| Kt | Torok Formation | |
| Kfm | Fortress Mountain Formation | |




SIMPLIFIED CROSS-SECTION

Fig. 1--Geologic map of the Kokolik-Utukok River Region, National Petroleum Reserve in Alaska. Structural axes are indicated by lines and arrows. The shaded Corwin Formation is coal-bearing.

Field work was done from Driftwood Camp located on the Utukok River in sec. 28, T. 6 S., R. 39 W. The camp is temporary and has no roads, permanent buildings, or other structures, but it has a graded airstrip on river terrace gravels. Helicopters were used daily to fly 30 to 60 miles north of the camp to areas selected for study. During the summer of 1978, fuel, food, and other supplies were flown to the camp on a regular basis by chartered aircraft from Kotzebue, Alaska. Driftwood Camp was operated by the U.S. Bureau of Mines under the supervision of Donald P. Blasko. The authors wish to express their appreciation to the U.S. Bureau of Mines for the use of the camp facilities.

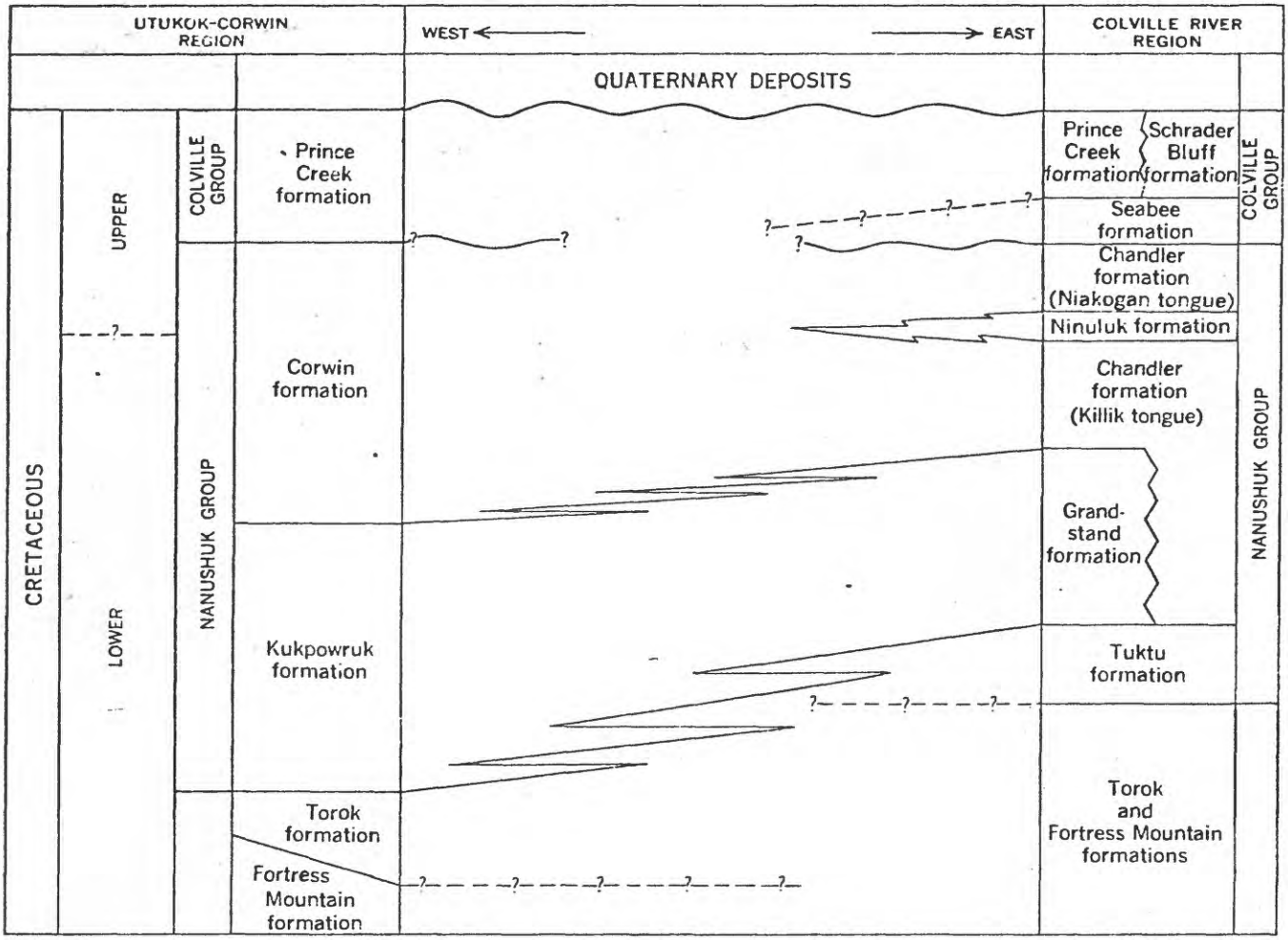
The presence of coal in northern Alaska has been known for more than 100 years. Coal was mined in the Corwin Bluffs area on the shores of the Chukchi Sea to fuel whaling ships as early as 1879 (Schrader, 1904, p. 112). The first comprehensive study of the geology of the Utukok-Corwin Region, which includes the area of this investigation, was made by Chapman and Sable from 1944 to 1953. The geographic location and stratigraphic position of more than 100 coal beds are shown by Chapman and Sable on a geologic map and in generalized stratigraphic sections (Chapman and Sable, 1960, pls 9-16). Their work revealed the presence of as many as 28 coal beds in the Corwin Formation, ranging in thickness from a few feet (1 m) to more than 20 feet (6 m) (Chapman and Sable, 1960, p. 155). Coal resources in the Cape Lisbourne-Colville River Region on the North Slope were estimated to be more than 220 billion tons by Barnes (1967, p. E1) and as much as 3.3 trillion tons in the NPR-A by Martin and Callahan (1978). The rank of the coal is high-volatile bituminous A, B, and C, much of which has coking qualities to subbituminous A, B, and C (Callahan and Sloan, 1978, p. 27-28).

## PHYSIOGRAPHY

The area of investigation is about 200 miles (320 km) north of the Arctic Circle, 50 miles (80 km) north of the Brooks Range, and 50 miles (80 km) inland of the Chukchi Sea. It is part of the Foothills Province of the North Slope of Alaska (the area north of the Brooks Range is called the North Slope). The Foothills Province has undulating topography consisting of linear east-west trending barren sandstone ridges and tundra valleys. The province is 50 to 90 miles (80 to 145 km) wide and is bounded on the north by the flat-lying Arctic Coastal Plain Province and on the south by high mountains comprising the Brooks Range Province.

Ground elevations in the area investigated range between 200 and 2,500 feet (60 and 760 km) above sea level. The climate, vegetation, and wildlife were described in detail by Chapman and Sable (1960, p. 61-64).

The area is drained by the northward flowing, broadly meandering, braided Kokolik and Utukok Rivers. These major rivers have numerous tributaries that exhibit dendritic and trellis drainage patterns. Permafrost is everywhere present to a depth of several hundred feet (hundreds of meters). The upper 1-2 feet (0.5 m) of permafrost thaws during summer months, which allows the excavation of the upper parts of coal beds and other lithologic units. The only extensive exposures of rocks in the area are along the cutbanks of major drainages; these exposures are commonly intermittent and separated by areas covered by vegetation, talus or slump material. Repeated freezing and thawing has caused most rock outcrops to slump perceptively.




From Chapman and Sable (1960)

Fig. 2--West-east correlation of Cretaceous rocks in the National Petroleum Reserve in Alaska.

## STRUCTURE

The most significant geologic structures in the Kokolik-Utukok River region are a series of large parallel, east-west trending symmetrical folds in sedimentary rocks that comprise the foothills north of the Brooks Range. The structures in this fold belt rise to successively higher topographic elevations and expose progressively older Cretaceous rocks in a southward direction. In the northern part of the fold belt, coal-bearing rocks in the Corwin Formation are commonly preserved in synclines, whereas soft shales of the Torok Formation are exposed in breached anticlines. Sandstones in the Kukpowruk Formation form resistant ridges on the flanks of folds between exposures of the Torok and Corwin Formations. Strata on the flanks of folds generally dip between 5 and 20 degrees. The plunge of fold axes is usually less than 5 degrees. The names and locations of anticlines and synclines are shown on figure 1.

High-angle normal faults with minor displacements were observed in a few places on barren sandstone ridges along the flanks of folds. Large-scale faults, if present, are obscured by tundra vegetation and slump material.

## STRATIGRAPHY

Five formations of Cretaceous age crop out in the Kokolik-Utukok River region. In descending order these are the Prince Creek, Corwin, Kukpowruk, Torok, and Fortress Mountain Formations. The Corwin and Kukpowruk Formations are part of the Nanushuk Group and the Prince Creek Formation is part of the Colville Group. Figure 2 is a west-east correlation of Cretaceous rocks in the National Petroleum Reserve in Alaska (NPR-A).

The Prince Creek and Fortress Mountain Formations are present in only small areas in the northeast and south-central parts of the map area (figure 1.) and were not studied by the authors. Chapman and Sable (1960, p. 126-127)

describe the Prince Creek Formation as a nonmarine unit, about 100 feet (30 m) thick, mostly composed of sandstone and conglomerate with some shale and claystone. The Fortress Mountain Formation (Chapman and Sable, 1960, p. 72) is mostly shale with interbedded siltstone, sandstone and some conglomerate, and it may be as much as 5,000 feet (1,525 m) thick.

The Torok Formation is composed of soft dark-gray shale and some thin interbeds of gray siltstone and gray, very fine grained sandstone. The formation is several thousand feet (hundreds of meters) thick, but in most places only the upper part is exposed. "Stray" gray, very fine grained lenticular sandstones a few hundred feet (hundreds of meters) long and 10 to 15 feet (3 to 6 m) thick are present locally in the shales and siltstones that compose the upper part of the formation. These sandstones are genetically related to the overlying Kukpowruk Formation.

The Kukpowruk Formation is 1,400 to 1,700 feet (425 to 520 m) thick and is composed of gray, very fine to very coarse grained, crossbedded sandstone and interbedded gray shale. Crustacean burrows and snail trails are present in a few of the sandstones. The formation weathers to barren, rounded sandstone ridges that are separated by vegetated depressions underlain by shale. The sandstone in many places appears as persistent benches in outcrops, but close scrutiny reveals that they are quite lenticular in cross section.

The Corwin Formation is composed of gray, very fine grained, silty, current ripple bedded sandstone interbedded with gray, very fine to very coarse grained, crossbedded sandstone, gray, carbonaceous shale; and gray nodular limestone. Poorly preserved fossil leaves and wood are common. Dinosaur tracks and skin impressions were found at two isolated localities in secs. 1, 2, 11 and 12, T. 1 S., R. 39 W. on Avingak Creek and in sec. 13, T. 1

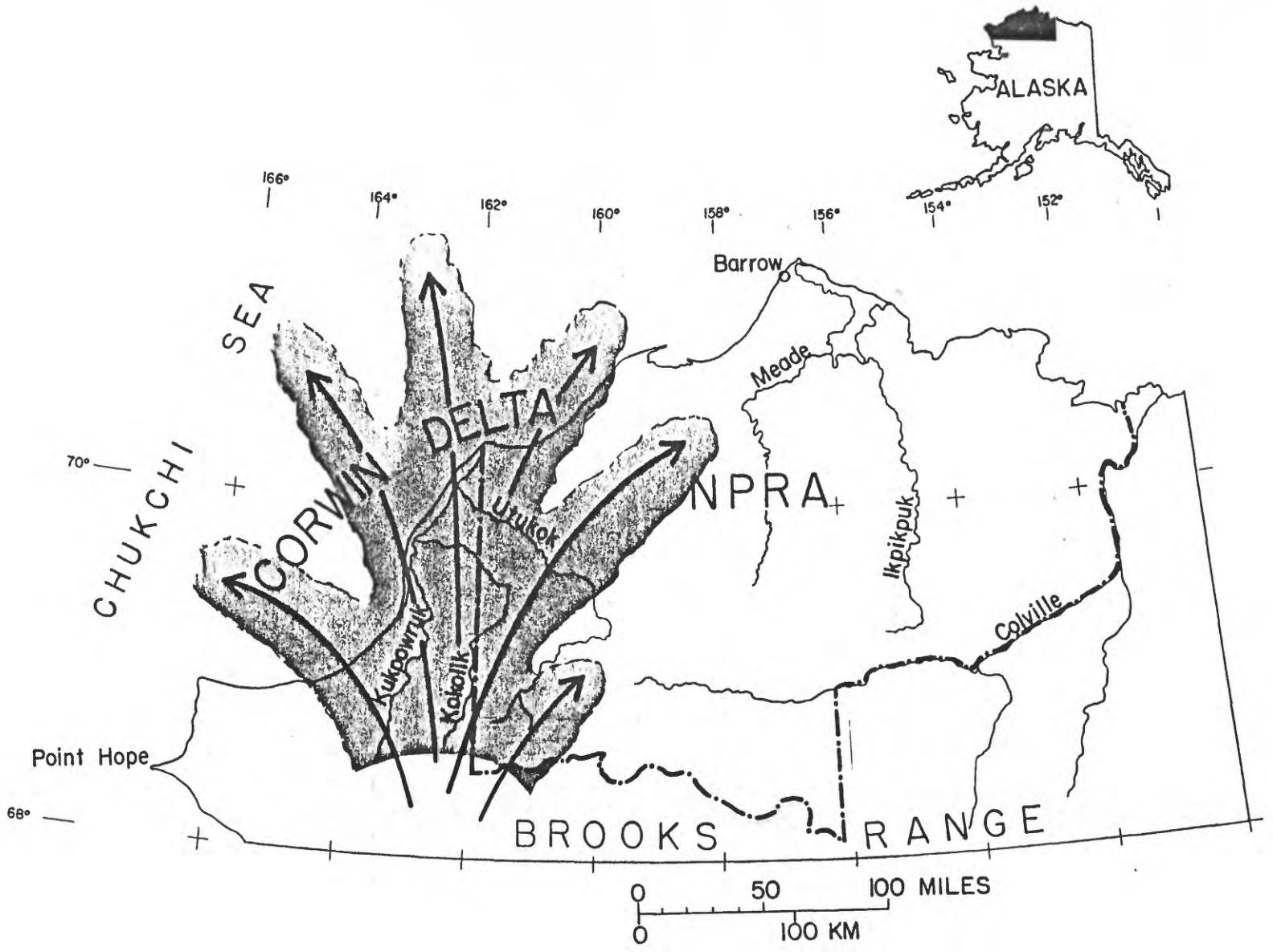



Fig. 3--Map showing a hypothetical configuration of the bird-foot Corwin Delta in the Torok, Kukpowruk and Corwin Formations in northwestern Alaska.

S., R. 40 W. on the Kokolik River. The formation is more than 5,000 (1,525 m) thick. It weathers to vegetated, rounded hills and valleys with moderately low relief that are occasionally interrupted by barren sandstone ledges and escarpments.

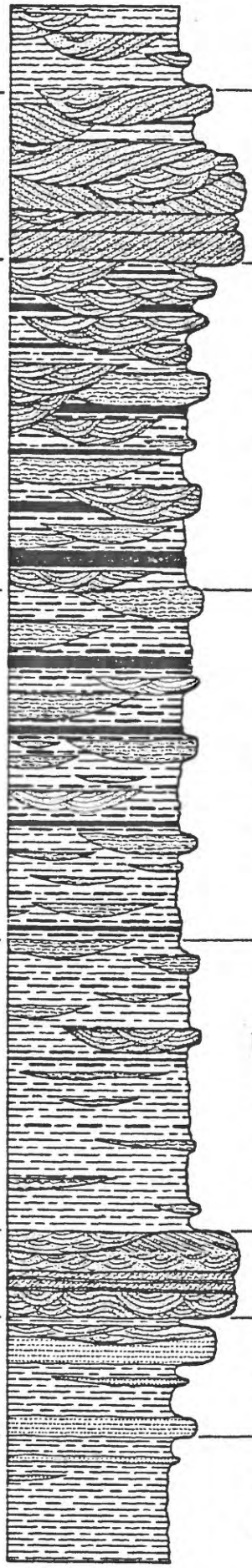
## DEPOSITIONAL ENVIRONMENTS

An east-west cross section of the Torok, Kukpowruk, and Corwin Formations was constructed using 10 measured sections (pl. 2). The lithologies, fossils, and primary sedimentary structures in the rocks of these formations clearly indicate that they were deposited as parts of a large bird-foot delta called the Corwin Delta (Ahlbrandt, 1979, in press).

The Corwin Delta developed northward from the south shore of a Cretaceous sea which was located along the north edge of what is now the Brooks Range. The precise temporal relations and geometric configurations of the delta are unknown. However, it appears that the delta was restricted to the Cretaceous Period, and that it covered most of the present-day North Slope and parts of the Chukchi Sea (fig. 3). As shown on plate 2, the Kukpowruk and Corwin Formations thin in an easterly direction, a fact that suggests that the area investigated is situated along the eastern part of the Corwin Delta.

The Corwin Delta was fluvially dominated. Delta-front sandstones are everywhere constructional and prograding. Nowhere were beach or bar deposits observed that would indicate that wave, current, tidal or other destructional processes were active.

The vertical and lateral successions of depositional environments and lithofacies in the Corwin Delta are similar to many modern deltas and deltas in the geologic record (Horne and others, 1978; Coleman, 1976). Normally, in landward and upward directions deltas are characterized by gray marine shale that is replaced by delta-front sandstones that in turn are replaced by



| | |
|---|---|
| FLOOD PLAIN | Red and gray mudstone (stream overbank deposits) and interbedded crossbedded lenticular sandstone (stream channel deposits) |
| ALLUVIAL PLAIN | Crossbedded superposed lenticular sandstone (meandering stream channel deposits); sparse shale, mudstone and coal (overbank and marsh deposits) |
| UPPER DELTA PLAIN | Numerous, thick, lenticular, crossbedded sandstone (distributary channel deposits); thick, lenticular, current ripple-bedded, silty sandstone (crevasse splay deposits); carbonaceous shale and thick, discontinuous coal (marsh deposits) |
| MIDDLE DELTA PLAIN | Some lenticular, crossbedded sandstone (distributary channel deposits); lenticular, current ripple-bedded silty sandstone (crevasse splay deposits); carbonaceous shale and thick to thin coal (marsh deposits); thin gray shale (interdistributary bay fill deposits) |
| LOWER DELTA PLAIN | Sparse, lenticular, crossbedded sandstone (distributary channel deposits); thin, lenticular, current ripple-bedded, silty sandstone and siltstone (crevasse splay deposits) sparse, thin, carbonaceous shale (marsh deposits); thick gray shale (interdistributary bay fill deposits) |
| DELTA FRONT | Variously bedded sandstone (peripheral delta deposits) |
| DISTAL DELTA FRONT | Low-angle crossbedded to flat-bedded sandstone and siltstone (marineward edge of delta front); gray shale (marine) |
| PRODELTA AND MARINE | Thin flat-bedded sandstone and siltstone and interbedded gray shale (shallow marine deposits marginal to delta) |

Fig. 4--Model of characteristic depositional environments and lithofacies of deltas and associated rocks in vertical succession.

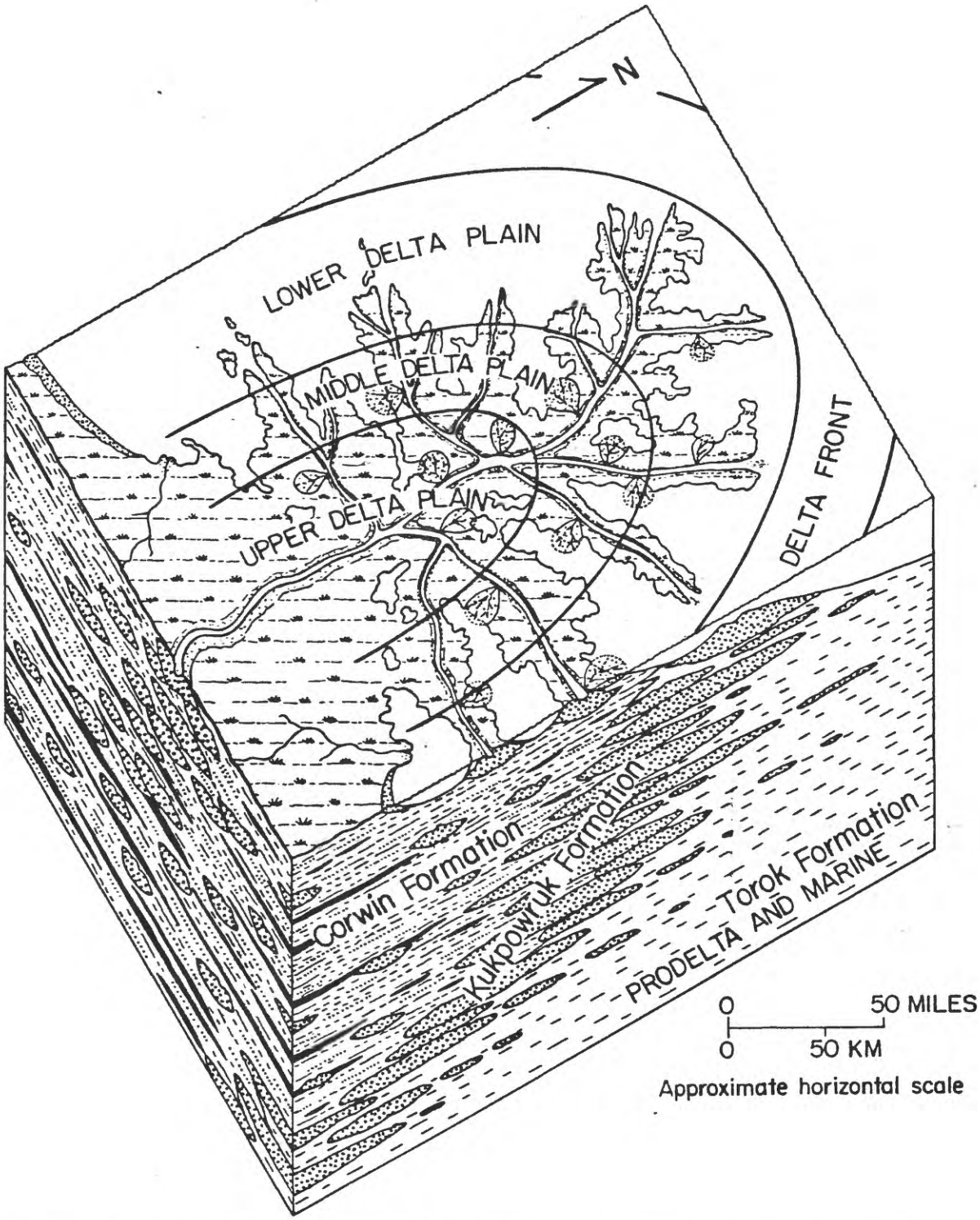



Fig. 5--Depositional environments of the Torok, Kukpowruk and Corwin Formations in northwestern Alaska. Lithologic symbols are identified on plate 2.

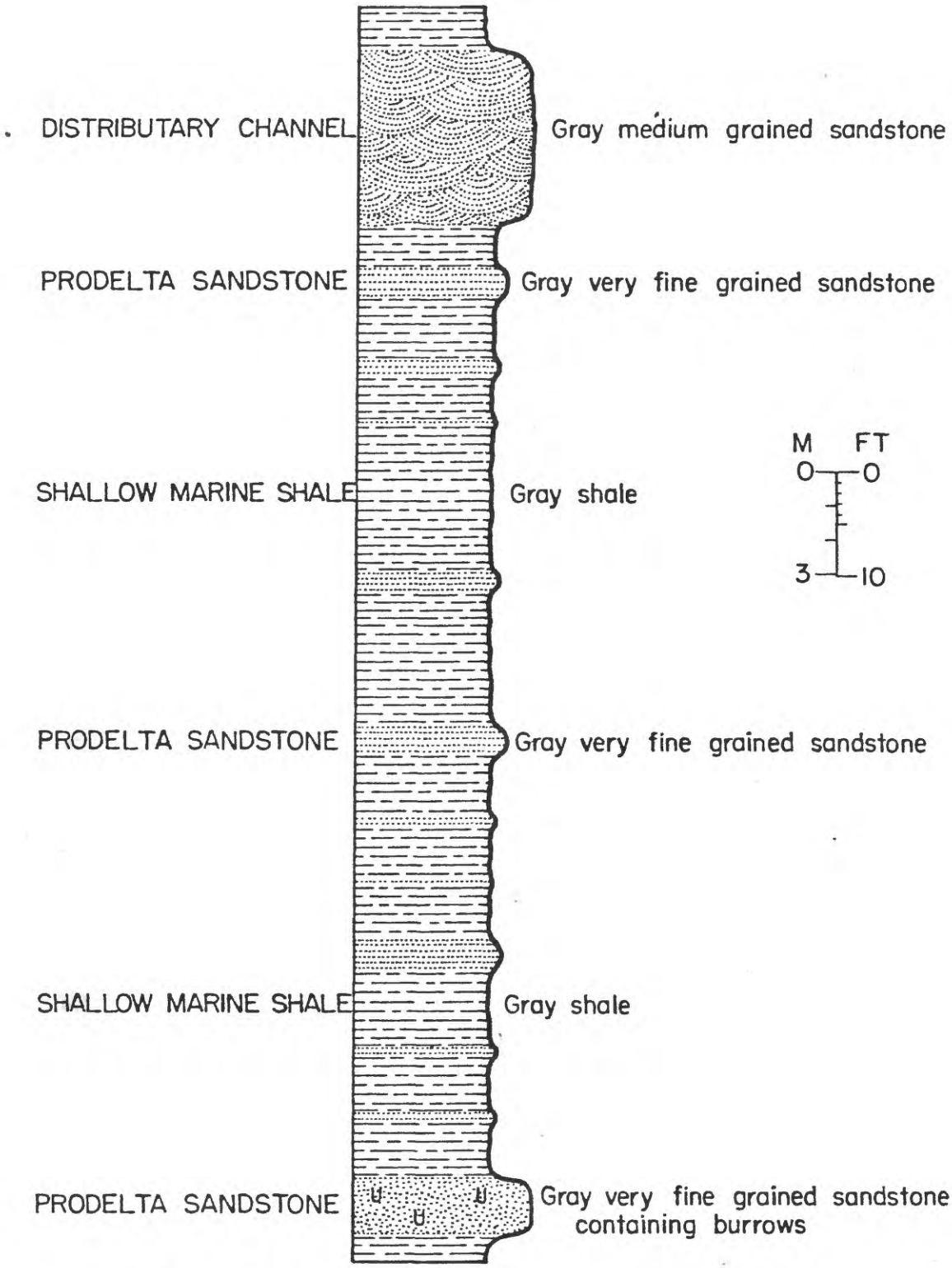



Fig. 6--Delta front deposits in the Kukpowruk Formation in NE$\frac{1}{4}$ sec. 23, T. 1 S., R. 39 W. (Section A378, beds 10-13).

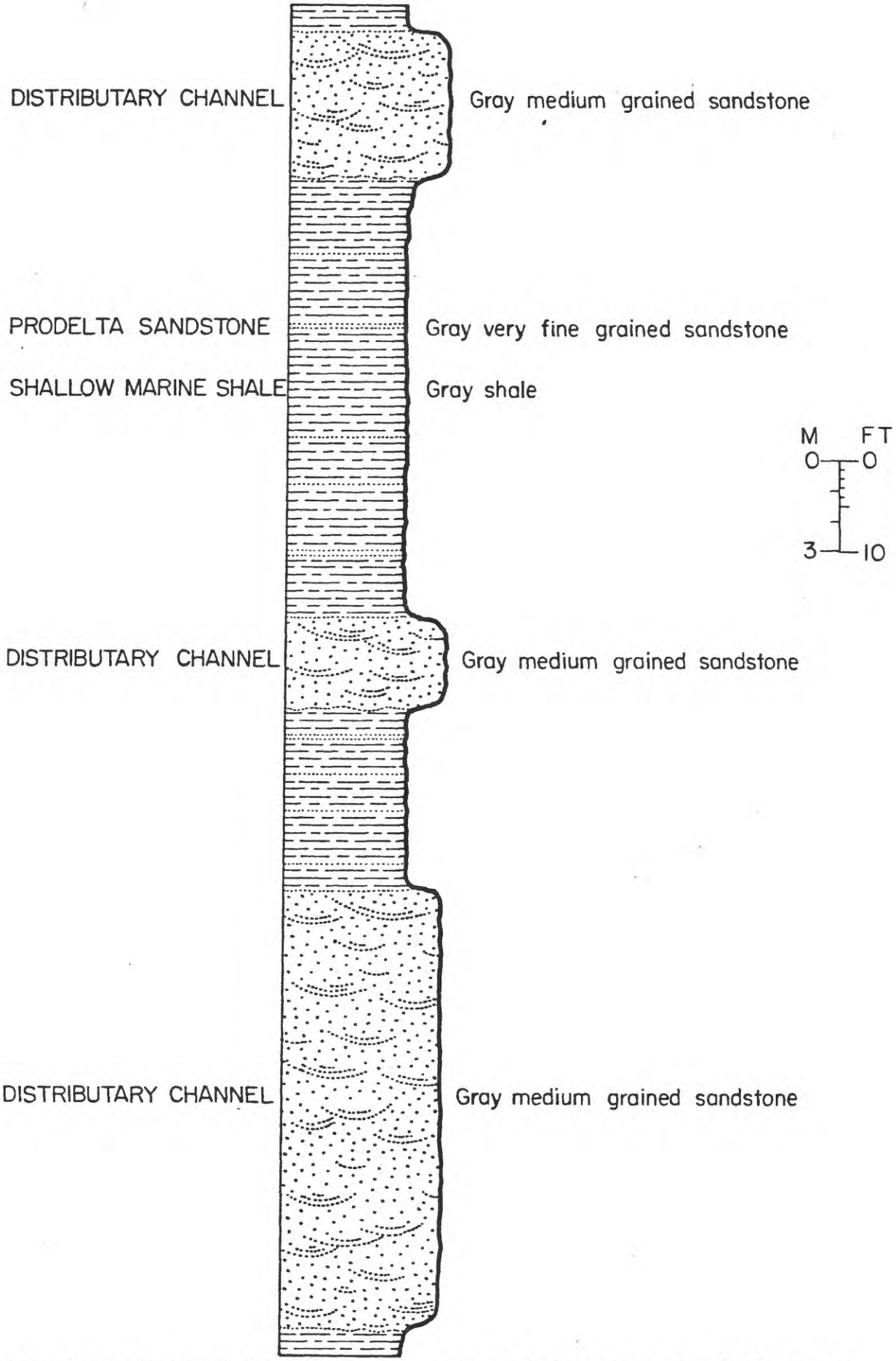



Fig. 7--Delta front deposits in the Kukpowruk Formation in $W\frac{1}{2}NW\frac{1}{4}$ sec. 1 T. 2 S., R. 36 W. (Section AL478, beds 18-23).

sandstone, siltstone, shale, carbonaceous shale, and coal that are deposited in a delta-plain environment. Alluvial-plain and flood-plain deposits may overlie delta sequences. Figure 4 is a model that illustrates the normal vertical succession of these rocks. In figure 4 the delta-plan environment is arbitrarily divided into lower, middle, and upper parts. The distal delta front environment shown on figure 4 is usually included in the delta-front environment by most authors.

The Torok, Kukpowruk, and Corwin Formations were mostly deposited in prodelta and marine, delta-front and delta-plain environments, respectively as shown on figure 5. However, the Kukpowruk Formation intertongues with the overlying Corwin Formation and with the underlying Torok Formation, which results in the intertonguing of depositional environments along arbitrary formation boundaries.

## Delta Front

Figure 6 illustrates depositional environments and lithofacies of part of the Kukpowruk Formation in measured section A378 (pl. 2). The rocks are gray shale and thin interbedded gray very fine grained flat-bedded sandstone. Near the top of the section is a 17 foot- (5 m) thick gray very fine to medium-grained crossbedded bench-forming distributary channel sandstone.

Figure 7 is a stratigraphic interval at the top of the Kukpowruk Formation in Section A478 (pl. 2). The rocks here are composed about equally of gray, medium-grained crossbedded sandstone and gray shale with minor thin beds of gray, very fine grained flat-bedded sandstone. The distributary channel at the base of figure 7 is 48 feet (15 m) thick. The distributary channel or delta-front sandstones in the Kukpowruk Formation seldom exceed 60 feet (18 m) in thickness. They exhibit scoured bases and large-scale low-angle trough crossbedding. Lag gravels and fossil wood and plant fragments

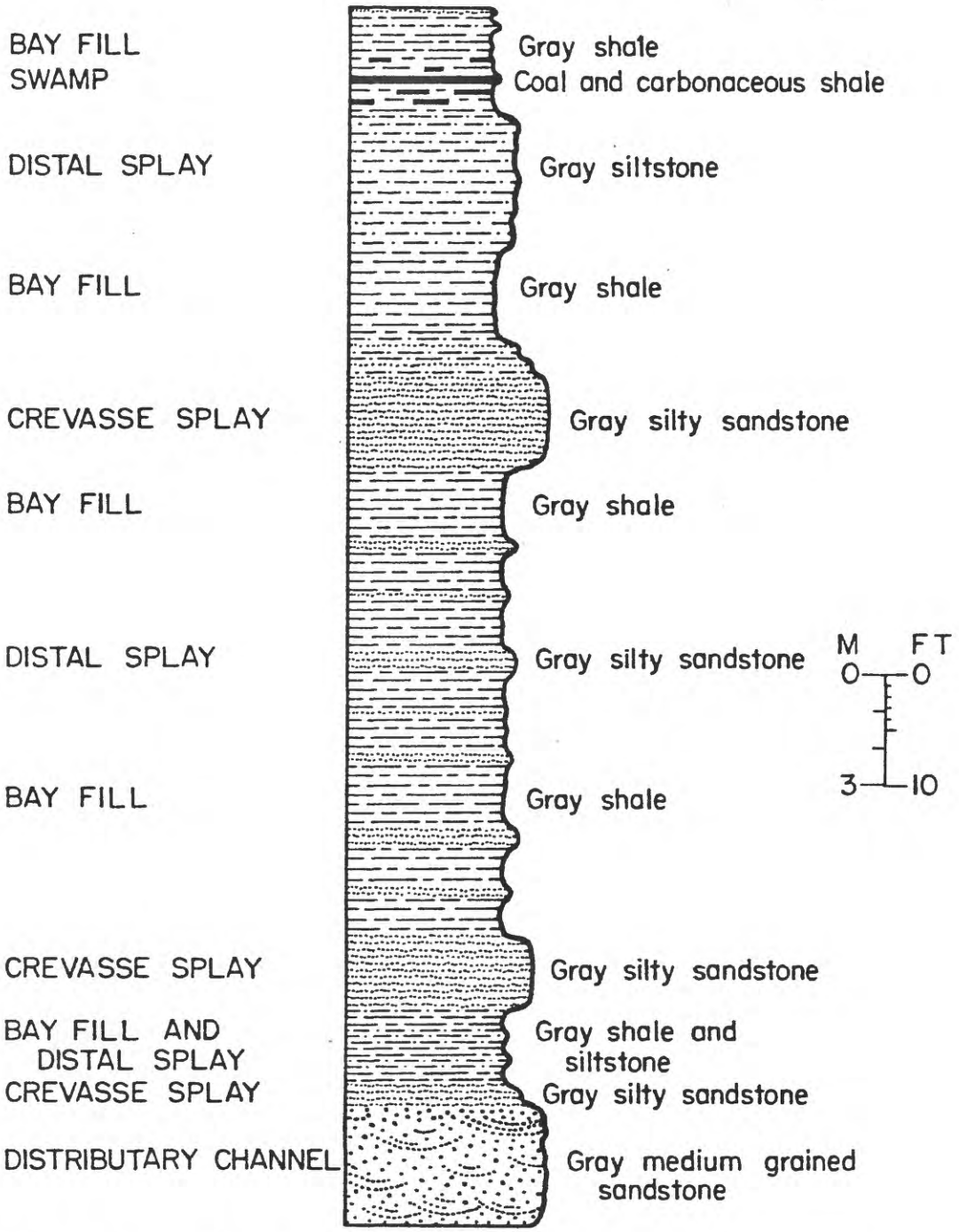



Fig. 8--Lower delta plain deposits in the Corwin Formation in SW¼ sec. 33, T. 1 S., R. 40 W. (Section A1078, beds 1-12).

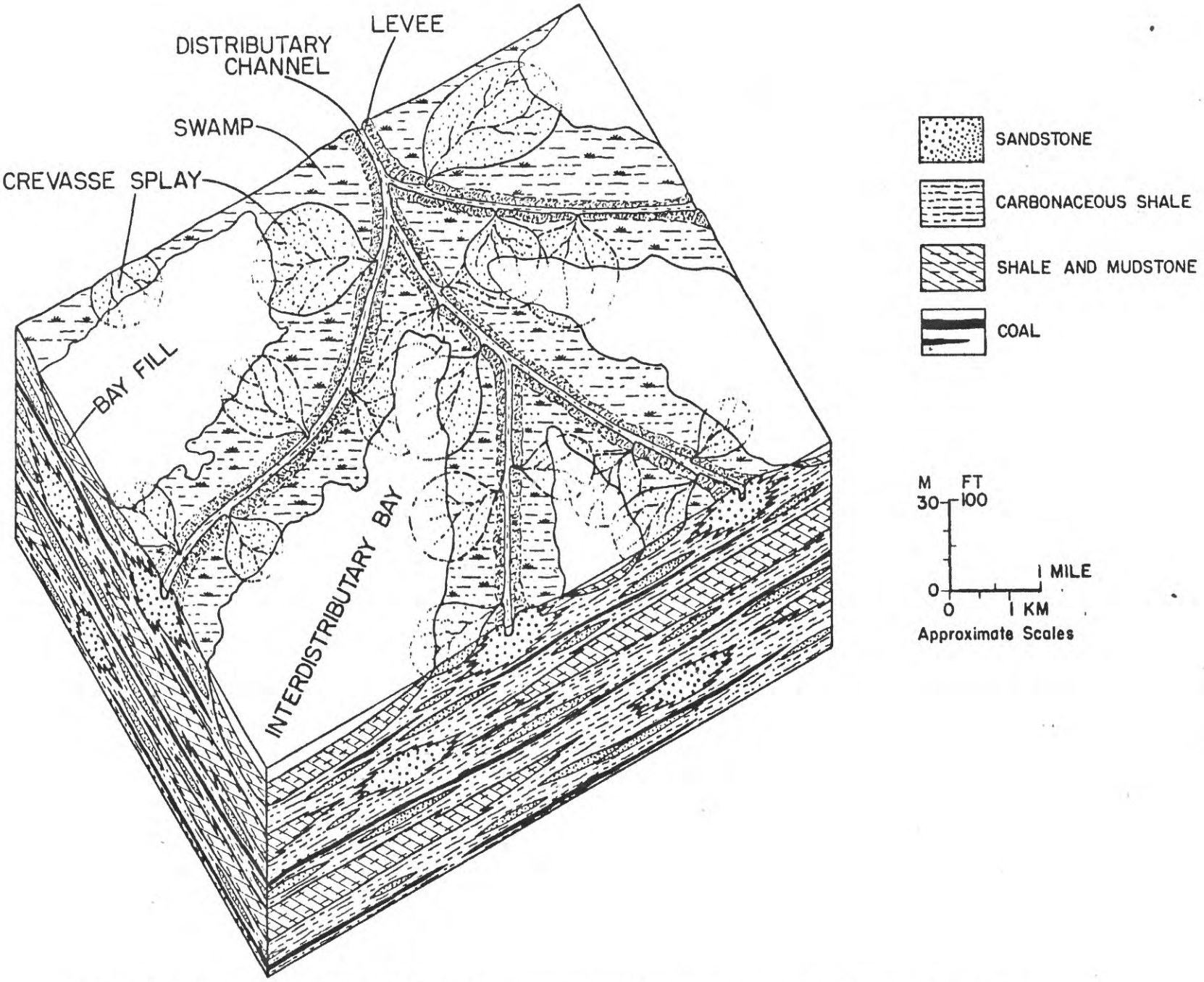



Fig. 9--Model of a middle delta plain depositional environment. Most coal beds in the Corwin Formation were deposited in this environment.

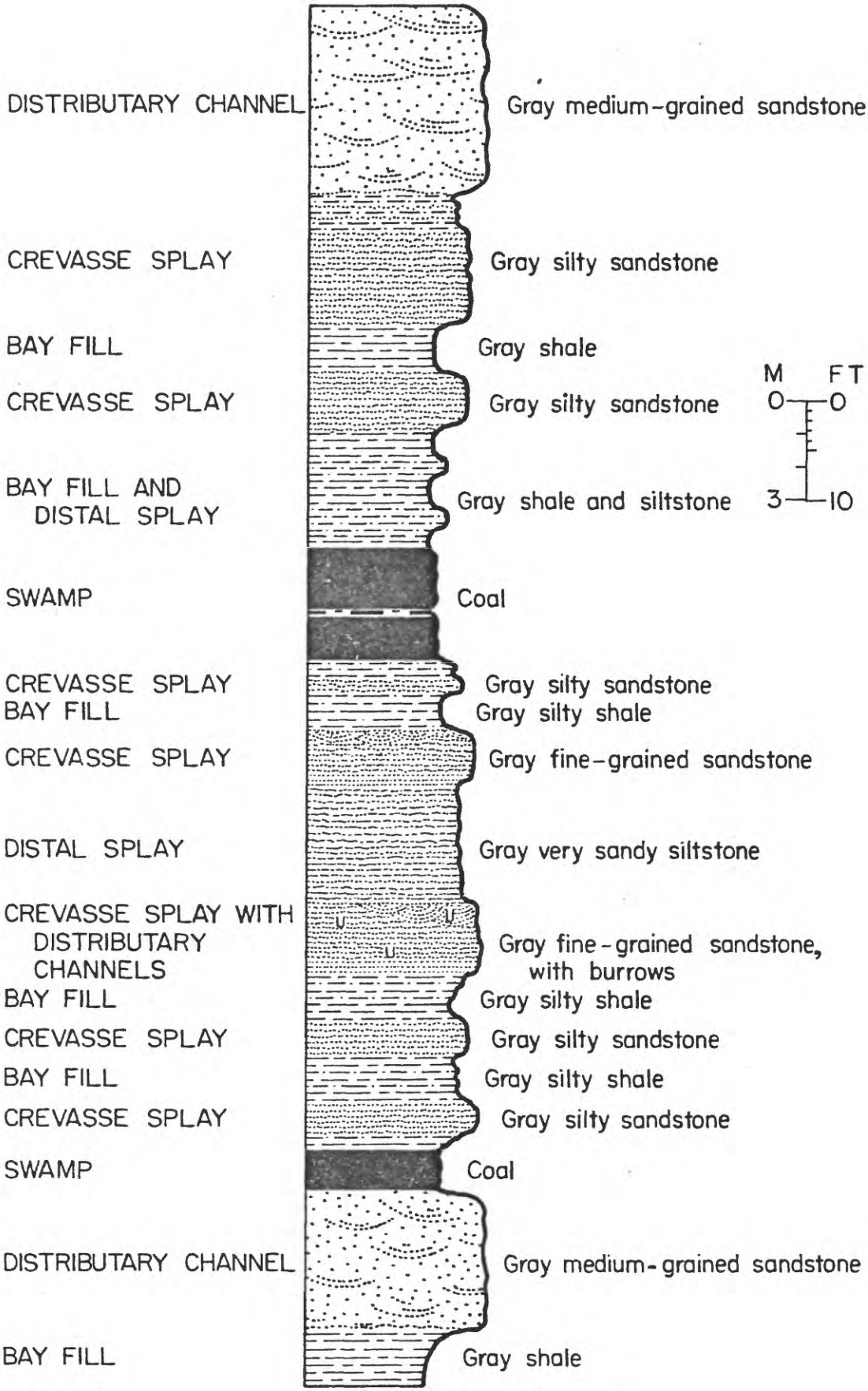



Fig. 10--Middle delta plain deposits in the Corwin Formation in NW¼SW¼ sec. 36, T. 2 N., R. 39 W. (Section A1378, beds 6-23).

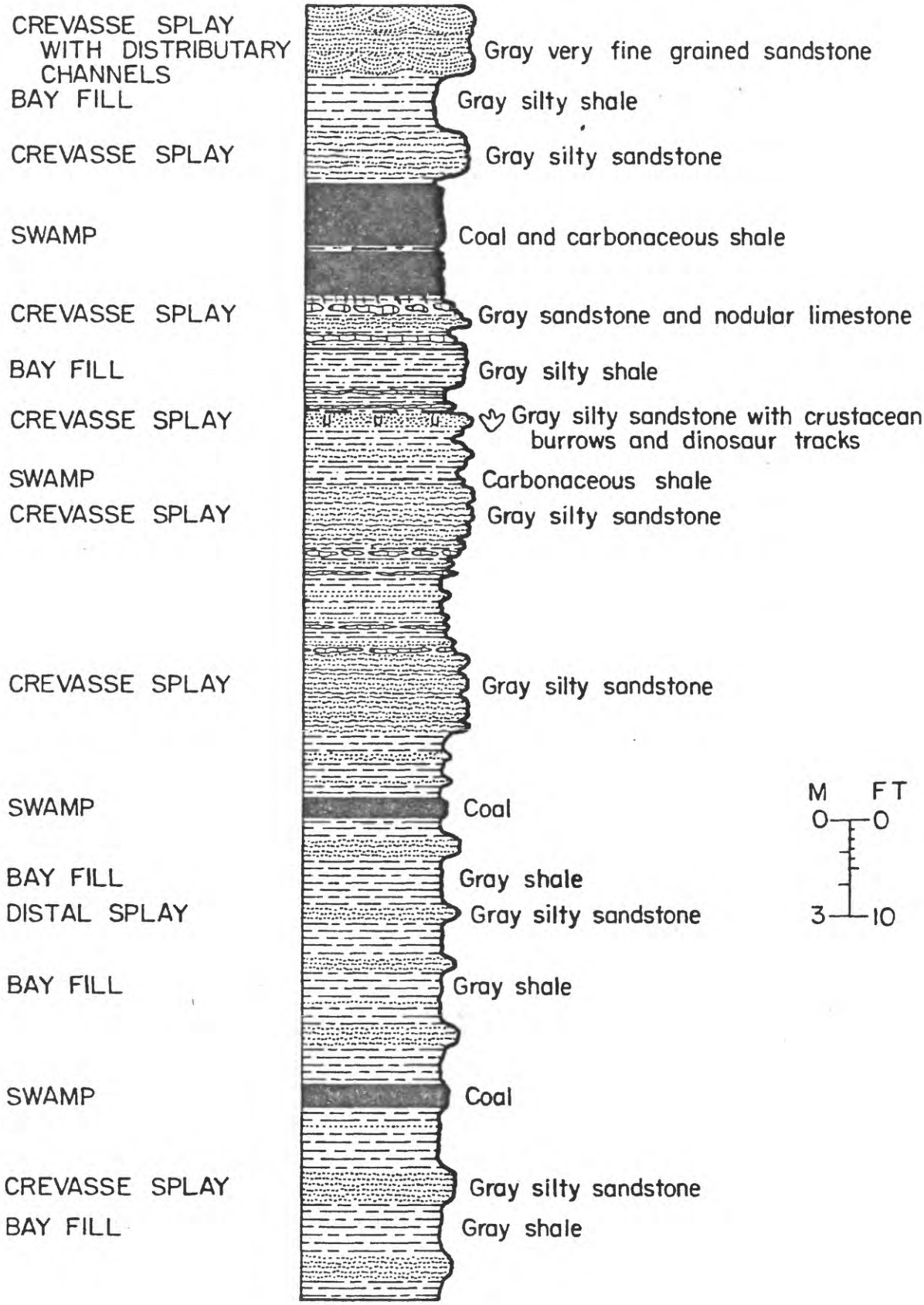



Fig. 11--Middle delta plain deposits in the Corwin Formation in NE¼NW¼ sec. 13, T. 1 S., R. 40 W. (Section A278, beds 16-45).

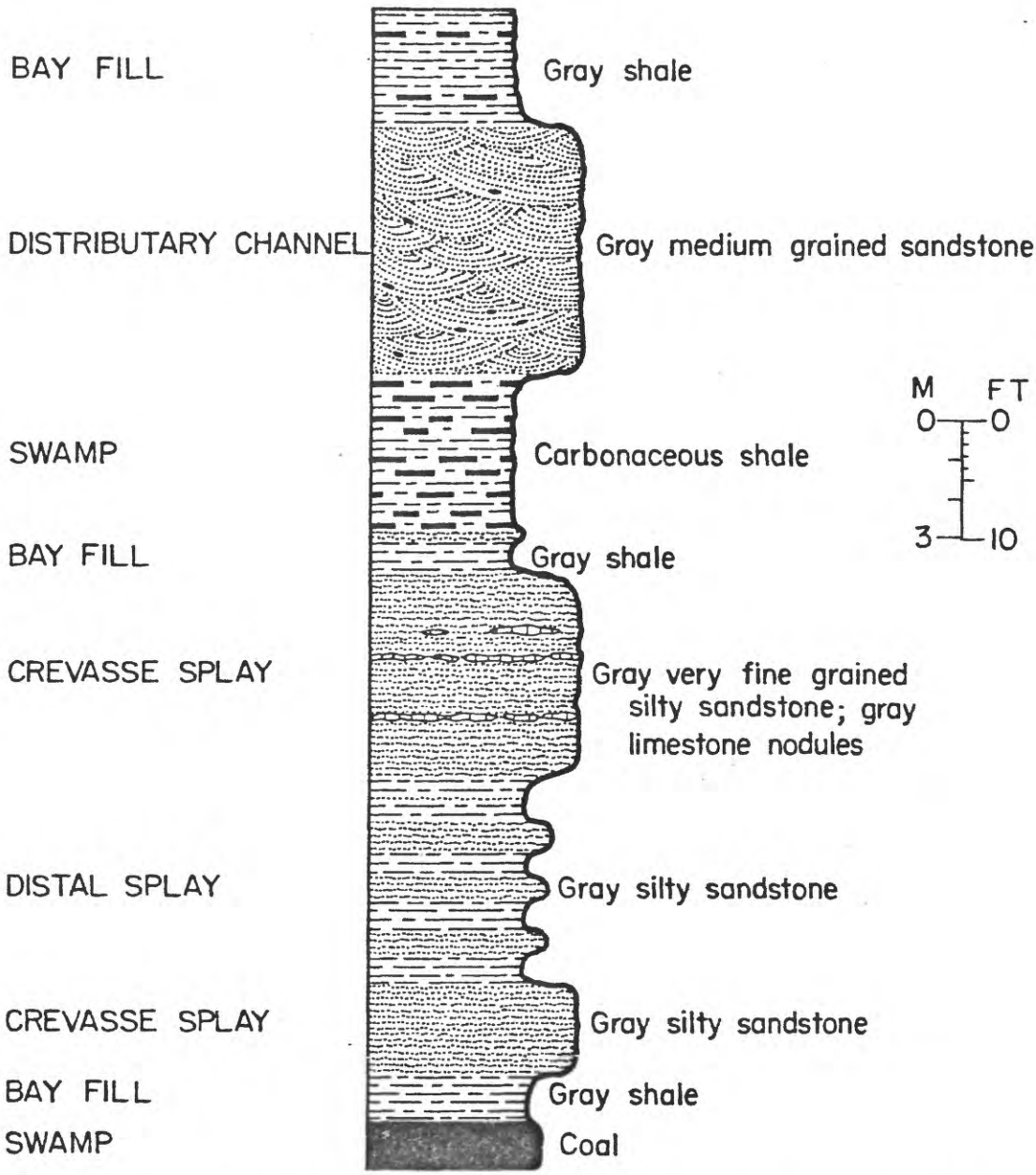



Fig. 12--Middle delta plain deposits in the Corwin Formation in WC sec. 24, T. 1 S., R. 36 W. (Section A478, beds 63-72).

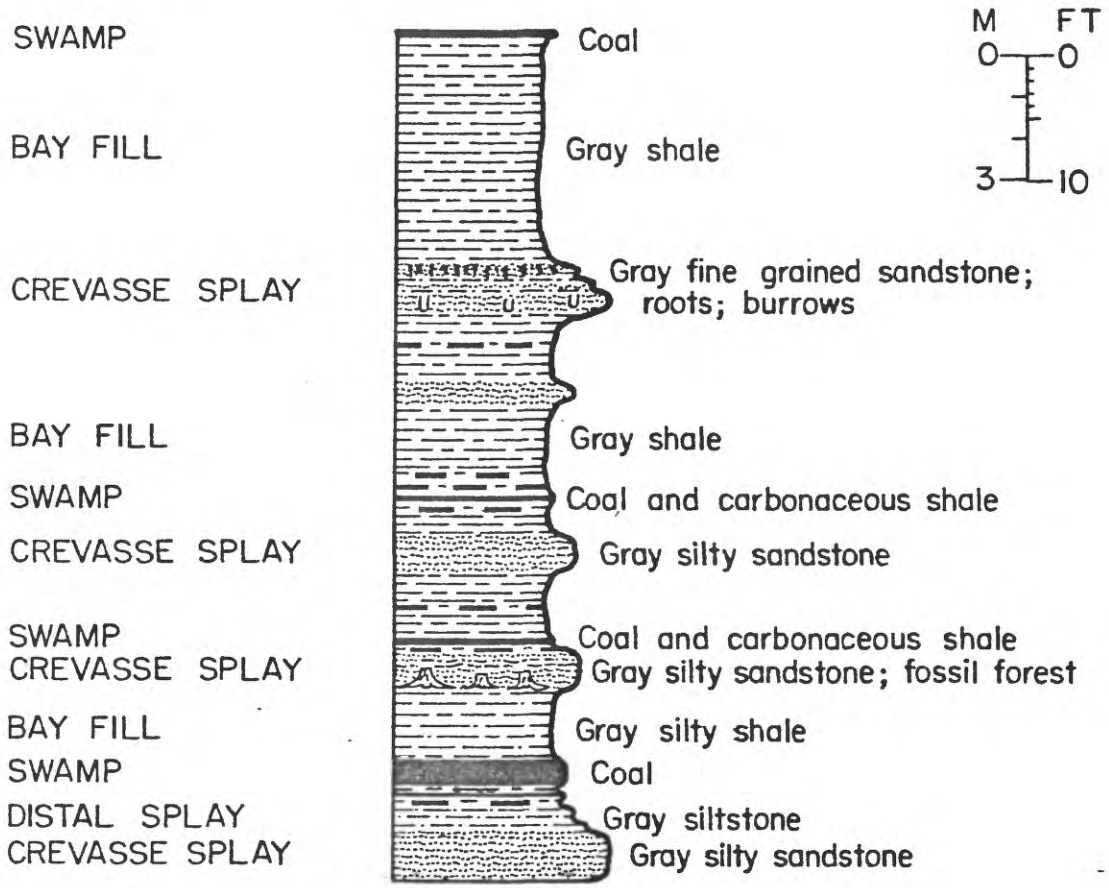



Fig. 13--Middle delta plain deposits in the Corwin Formation in $SE\frac{1}{4}NE\frac{1}{4}$ sec. 2, T. 1 S., R. 39 W. (Section A378, beds 111-124).

are common. These sandstones are graywackes that may or may not be analogous to the bar-finger sandstones observed by Fisk (1961, p. 29-52) in the Mississippi River Delta.

## Lower Delta Plain

Rocks deposited in a typical lower delta plain environment are shown in figure 8. The dominant lithology is gray shale deposited as bay fill mud. Interbedded with the shale are thick to thin current ripple bedded silty sandstones deposited as crevasse splays. Carbonaceous shales and coal are sparse and thin (see fig. 4). The upper 10 feet (3 m) of a distributary channel sandstone is shown at the base of figure 8.

## Middle Delta Plain

Coal beds in the Kokolik-Utukok River region are occur in the Corwin Formation. The Corwin Formation was deposited in a delta-plain environment, and the bulk of the formation, at least 4,000 feet (1,220 m) was deposited in a middle delta plain environment as defined by the authors (fig. 9). The midddle delta plain environment is characterized by carbonaceous shale and coal swamp deposits, sandstone and siltstone crevasse splay deposits, some shale bay fill deposits, and a few distributary channel sandstone deposits (figs. 10-13). The repetitious interbedding of these lithologies is the result of the periodical lateral shifting of crevasse splays, interdistributary bays, and swamps that takes place between major distributary streams during the aggradation of delta sediments.

The middle delta plain environment is especially favorable for the deposition and preservation of good quality coal. The environment includes the area where thick peat beds accumulated in swamps during the filling-in of the upper (landward) parts of interdistributary bays, and where large distributary streams were not closely spaced and actively eroding the peat

accumulations. Coals deposited in the upper (landward) parts of interdistributary bays generally have low sulfur content because the waters there are moderately brackish and of fluvial or meteoric origin (the coal in the Corwin Formation is consistently less than one percent sulfur). The influence of salt water on peat accumulations in the lower (seaward) parts of interdistributary bays is generally believed to result in larger concentrations of sulfur in coal.

### Upper Delta Plain

Rocks deposited in an upper delta plain environment were not positively identified in the area of investigation. The uppermost exposed rocks of the Corwin Formation in synclines, such as the Oxbow Syncline along the Kokolik River, are largely sandstones of fluvial origin. Exposures are poor, but the abundance, thickness, and persistence of the sandstones suggests deposition in an upper delta plain environment. The stratigraphic position and composition of the Prince Creek Formation is likewise possibly an upper delta plain environment.

## MEASURED SECTIONS

Sedimentary rocks in the Torok, Kukpowruk, and Corwin Formations have a cumulative thickness of more than 6,000 feet (1,830 m). The rocks were measured and described in 13 sections, A178-A1378. Lithologic units were measured in feet (one foot equals 0.3048 meters). The depositional environments are indicated in the decriptions of measured sections and are identified by the following abbreviations:

SP - Crevasse splay

BF - Bay fill

DC - Distributary channel

DS - Distal part of crevasse splay

SW - Swamp

PD - Prodelta

## Section A178

Measured on the east slope of the Kokolik River in a northeast direction from NE NW SW sec. 24, T. 1 S., R. 40 E. to CS NE NW sec. 5, T. 1 S., R. 39 E.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part): Units 225-205 not shown on plate 2. | |
| 225 | Sandstone, gray, very fine grained, current ripple bedding. SP-- | 4.5 |
| 224 | Covered---------- | 61.0 |
| 223 | Coal. SW---------- | 1.8+ |
| 222 | Covered---------- | 48.0 |
| 221 | Sandstone, gray, very fine grained, calcareous, current ripple bedded.---------- | 3.3 |
| 220 | Covered---------- | 17.0 |
| 219 | Shale, dark gray, partly carbonaceous. SW---------- | 3.0 |
| 218 | Sandstone, gray, very fine grained, current ripple bedded. SP-- | 1.5 |
| 217 | Shale, dark gray, soft. BF---------- | 2.5 |
| 216 | Slope covered with carbonaceous shale and coal rubble. SW------ | 5.0 |
| 215 | Sandstone, gray, very fine grained, current ripple bedded, rooted. SP---------- | 4.5 |
| 214 | Mostly covered. Exposures in the upper 10.0 ft are mostly shale, dark gray and interbedded sandstone, gray, very fine grained.---------- | 36.0 |
| 213 | Shale, gray, soft. BF---------- | 5.0 |
| 212 | Shale, dark gray, and interbedded sandstone, gray, very fine grained; a small east-west trending channel develops laterally. BF-SP---------- | 5.5 |
| 211 | Sandstone, gray, very fine grained silty. SP---------- | 7.0 |
| 210 | Coal. SW---------- | 4.1 |
| 209 | Sandstone, gray, very fine grained, current ripple bedding, rooted. SP---------- | 2.7 |
| 208 | Shale, gray, soft. BF---------- | 0.6 |

Section A178

Measured on the east slope of the Kokolik River in a northeast direction from NE NW SW sec. 24, T. 1 S., R. 40 E. to CS NE NW sec. 5, T. 1 S., R. 39 E.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part)--continued | |
| 207 | Sandstone, gray, very fine grained. SP---------- | 1.6 |
| 206 | Shale, gray, soft. BF---------- | 3.0 |
| 205 | Covered. Shale rubble is mostly shale, gray, and thin interbedded sandstone, gray, very fine grained; one thin splay sandstone 160.0 ft above the base.---------- | 285.0 |
| 204 | Sandstone, gray, very fine to medium grained, poorly sorted, subangular, abundant dark grains, scattered pebbles and small cobbles of dark chert, scattered plant debris and carbonaceous material on bedding planes, large scale low angle crossbedding. DC---------- | 40.0 |
| 203 | Covered---------- | 48.0 |
| 202 | Slope covered with carbonaceous shale and coal rubble. SW----- | 5.0 |
| 201 | Covered---------- | 137.0 |
| 200 | Sandstone, gray, fine to medium grained, poorly sorted, subangular, crossbedded. DC---------- | 29.0 |
| 199 | Shale, dark gray, and thin interbedded sandstone, gray, very fine grained. BF-DS---------- | 6.0 |
| 198 | Sandstone, gray, very fine grained, current ripple bedded; abundant carbonaceous debris. SP---------- | 1.6 |
| 197 | Shale, gray, soft. BF---------- | 2.5 |
| 196 | Sandstone, gray, very fine grained, calcareous, current ripple bedded. SP---------- | 1.7 |
| 195 | Shale, gray, soft. BF---------- | 5.5 |
| 194 | Coal. SW---------- | 0.3 |
| 193 | Shale, dark gray, soft. BF---------- | 2.0 |
| 192 | Sandstone, gray, very fine grained, current ripple bedding. SP | 1.2 |
| 191 | Covered---------- | 60.0 |

## Section A178

Measured on the east slope of the Kokolik River in a northeast direction from NE NW SW sec. 24, T. 1 S., R. 40 E. to CS NE NW sec. 5, T. 1 S., R. 39 E.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (Part)--continued | |
| 190 | Sandstone, gray, very fine grained, silty, current ripple bedding. SP---------- | 2.2 |
| 189 | Covered---------- | 35.0 |
| 188 | Sandstone, gray, very fine grained, current ripple bedded, and interbedded shale, gray, soft, one layer carbonaceous in the lower part. BF-SP---------- | 24.0 |
| 187 | Mostly covered. The upper part is shale, dark gray.---------- | 34.0 |
| 186 | Shale, dark gray to black, and very thin interbedded and interlaminated coal. SW---------- | 5.0 |
| 185 | Shale, gray, soft. BF---------- | 14.0 |
| 184 | Sandstone, gray, very fine grained, current ripple bedded. SP- | 2.5 |
| 183 | Covered---------- | 47.0 |
| 182 | Slope covered with carbonaceous shale and coal rubble. SW----- | 5.0 |
| 181 | Mostly covered. The upper 6.0 ft are shale, gray. BF---------- | 34.0 |
| 180 | Sandstone, gray, very fine grained, silty, current ripple bedded. SP---------- | 8.5 |
| 179 | Covered---------- | 72.5 |
| 178 | Sandstone, gray, very fine grained, current ripple bedded; abundant plant impressions. SP---------- | 5.5 |
| 177 | Shale, dark gray, soft. BF---------- | 0.6 |
| 176 | Coal. SW---------- | 3.0 |
| 175 | Shale, gray, soft, and thin interbedded sandstone, gray, very fine grained. BF-DS---------- | 16.5 |
| 174 | Sandstone, gray, very fine grained, silty, current ripple bedded. SP---------- | 5.0 |
| 173 | Covered---------- | 46.0 |

## Section A178

Measured on the east slope of the Kokolik River in a northeast direction from NE NW SW sec. 24, T. 1 S., R. 40 E. to CS NE NW sec. 5, T. 1 S., R. 39 E.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part)--continued | |
| 172 | Shale, dark gray, soft, and a few 1.5 to 3.0 ft thick interbedded sandstone, gray, very fine grained, current ripple bedded. BF-SP---------- | 42.5 |
| 171 | Sandstone, gray, very fine grained, current ripple bedded. SP- | 1.4 |
| 170 | Shale, gray, soft. BF---------- | 9.1 |
| 169 | Sandstone, gray, very fine grained, current ripple bedded. SP- | 2.2 |
| 168 | Covered---------- | 6.5 |
| 167 | Sandstone, gray, very fine grained, current ripple bedded. SP- | 2.0 |
| 166 | Covered in the lower part. The upper part is shale, gray, soft, and a few very thin interbedded sandstone, gray very fine grained, current ripple bedded. BF-DS---------- | 81.5 |
| 165 | Sandstone, gray, very fine grained. SP?---------- | 5.0 |
| 164 | Coal. SW---------- | 10.8 |
| 163 | Sandstone, gray, very fine grained. SP---------- | 4.5 |
| 162 | Shale, dark gray, soft, and a few 2.0 to 3.0 ft thick interbedded sandstone, gray, very fine grained, current ripple bedded. BF-SP---------- | 42.0 |
| 161 | Covered---------- | 35.0 |
| 160 | Shale, gray, soft. BF---------- | 2.0 |
| 159 | Sandstone, gray, very fine grained, silty, current ripple bedded. SP---------- | 3.0 |
| 158 | Covered---------- | 22.0 |
| 157 | Sandstone, gray, very fine grained, top and bottom; shale, gray soft, in the middle. SP-BF---------- | 5.5 |
| 156 | Shale, dark gray, soft. BF---------- | 11.0 |
| 155 | Slope covered with coal rubble. SW---------- | 5.0 |

Section A178

Measured on the east slope of the Kokolik River in a northeast direction from NE NW SW sec. 24, T. 1 S., R. 40 E. to CS NE NW sec. 5, T. 1 S., R. 39 E.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part)--continued | |
| 154 | Shale, dark gray, carbonaceous. SW---------- | 6.0 |
| 153 | Shale, gray, carbonaceous. SW---------- | 0.5 |
| 152 | Sandstone, gray, very fine grained, current ripple bedded. SP- | 4.0 |
| 151 | Covered; a coal may be present in the upper part.---------- | 45.0 |
| 150 | Slope covered with coal rubble.---------- | 8.0 |
| 149 | Sandstone, gray, very fine grained, silty, calcareous, current ripple bedded. SP---------- | 2.6 |
| 148 | Covered---------- | 30.0 |
| 147 | Shale, dark gray, carbonaceous; contains a few thin lamine of coal. SW---------- | 5.0 |
| 146 | Covered---------- | 40.0 |
| 145 | Sandstone, gray, very fine grained, silty, current ripple bedded. SP---------- | 3.2 |
| 144 | Coal---------- | 1.8 |
| 143 | Covered. Slope rubble is mostly gray shale and very fine grained sandstone.---------- | 25.5 |
| 142 | Sandstone, gray, very fine grained, calcareous, current ripple bedded. SP---------- | 2.0 |
| 141 | Shale, dark gray, and very thin interbedded sandstone, gray, fine grained. SP---------- | 27.0 |
| 140 | Covered---------- | 40.0 |
| 139 | Sandstone, gray, very fine grained, calcareous. SP---------- | 1.5 |
| 138 | Covered---------- | 14.0 |
| 137 | Sandstone, gray, very fine grained, silty, calcareous, current ripple bedded. SP---------- | 2.5 |
| 136 | Shale, dark gray, soft. BF---------- | 6.5 |

Section A178

Measured on the east slope of the Kokolik River in a northeast direction from NE NW SW sec. 24, T. 1 S., R. 40 E. to CS NE NW sec. 5, T. 1 S., R. 39 E.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part)--continued | |
| 135 | Shale, dark gray, carbonaceous. SW---------- | 0.5 |
| 134 | Sandstone, gray, very fine grained, current ripple bedded; abundant plant impressions. SP---------- | 4.0 |
| 133 | Shale, gray, soft. BF---------- | 12.0 |
| 132 | Slope with coal rubble. SW---------- | 5.0 |
| 131 | Covered---------- | 70.0 |
| 130 | Shale, dark gray, carbonaceous, and thin interbedded coal. SW- | 5.0 |
| 129 | Covered---------- | 197.0 |
| 128 | Sandstone, gray, fine to medium grained, subangular, fairly well sorted, abundant dark grains. DC---------- | 15.0 |
| 127 | Slope covered with coal rubble. SW---------- | 6.0 |
| 126 | Sandstone, gray, very fine grained, silty, abundant dark grains, current ripple bedded. SP---------- | 3.3 |
| 125 | Covered---------- | 31.0 |
| 124 | Sandstone, gray, very fine grained, calcareous, current ripple bedded. SP---------- | 2.5 |
| 123 | Shale, gray, soft. BF---------- | 5.0 |
| 122 | Sandstone, gray, very fine grained, silty, current ripple bedded. SP---------- | 2.3 |
| 121 | Covered---------- | 56.0 |
| 120 | Sandstone, gray, very fine grained, current ripple bedded. SP- | 1.0 |
| 119 | Slope covered with coal rubble. SW---------- | 5.0 |
| 118 | Covered---------- | 55.0 |
| 117 | Sandstone, gray, fine to medium grained, poorly sorted, subangular to angular, abundant dark grains, some plant debris. DC | 3.5 |

Section A178

Measured on the east slope of the Kokolik River in a northeast direction from NE NW SW sec. 24, T. 1 S., R. 40 E. to CS NE NW sec. 5, T. 1 S., R. 39 E.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part)--continued | |
| 116 | Sandstone, gray, very fine grained, current ripple bedded. SP- | 2.5 |
| 115 | Covered---------- | 32.0 |
| 114 | Shale, gray, carbonaceous, and thin interbedded coal. Interval is mostly rubble covered slope. SW---------- | 5.0 |
| 113 | Covered---------- | 35.0 |
| 112 | Sandstone, gray, very fine grained, silty. DS---------- | 1.0 |
| 111 | Covered---------- | 59.0 |
| 110 | Sandstone, gray, very fine grained, large scale, low angle trough crossbedding. DC---------- | 18.0 |
| 109 | Covered---------- | 8.0 |
| 108 | Shale, gray, soft. BF---------- | 1.0 |
| 107 | Coal; burned laterally. SW---------- | 11.0 |
| 106 | Slope covered with clinkers.---------- | 10.0 |
| 105 | Shale, gray, soft, and some very thin interbedded sandstone, gray, very fine grained, BF-SP---------- | 15.0 |
| 104 | Slope covered with coal rubble. SW---------- | 7.0 |
| 103 | Covered---------- | 10.0 |
| 102 | Shale, gray, soft, and some very thin interbedded sandstone, gray, very fine grained, current ripple bedded. BF-DS--------- | 25.0 |
| 101 | Sandstone, gray, very fine grained, current ripple bedded; some carbonaceous material. DS---------- | 1.5 |
| 100 | Shale, gray, soft, and some very thin interbedded sandstone, gray, very fine grained. BF-DS---------- | 25.0 |
| 99 | Shale, dark gray, soft. BF---------- | 1.5 |
| 98 | Coal. SW---------- | 0.2 |

## Section A178

Measured on the east slope of the Kokolik River in a northeast direction from NE NW SW sec. 24, T. 1 S., R. 40 E. to CS NE NW sec. 5, T. 1 S., R. 39 E.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part)--continued | |
| 97 | Shale, dark gray, soft. BF---------- | 1.0 |
| 96 | Sandstone, gray, very fine grained, current ripple bedded. SP- | 1.9 |
| 95 | Shale, dark gray, soft. BF---------- | 5.0 |
| 94 | Covered---------- | 42.0 |
| 93 | Shale, gray, soft, and some very thin interbedded sandstone, gray, very fine grained. DS---------- | 28.0 |
| 92 | Sandstone, gray, very fine grained, current ripple bedded. SP-- | 9.0 |
| 91 | Covered---------- | 21.0 |
| 90 | Slope covered with coal rubble. SW---------- | 10.0 |
| 89 | Shale, dark gray, soft. BF---------- | 25.0 |
| 88 | Shale, dark gray, carbonaceous, and some thin interbedded coal. SW---------- | 5.0 |
| 87 | Covered---------- | 27.0 |
| 86 | Shale, dark gray, carbonaceous. SW---------- | 0.5 |
| 85 | Coal. SW---------- | 3.0 |
| 84 | Covered---------- | 43.5 |
| 83 | Sandstone, gray, very fine grained, noncalcareous, current ripple bedded. SP---------- | 4.0 |
| 82 | Covered---------- | 410.0 |
| 81 | Sandstone, gray, very fine grained, a few thin lenses of gray and white chert pebbles and cobbles, abundant plant stem impressions and wood fragments, large scale low angle trough crossbeds. DC---------- | 20.0 |
| 80 | Sandstone, gray, very fine grained, current ripple bedded, carbonaceous shale partings. SP---------- | 1.0 |
| 79 | Siltstone, gray, calcareous; abundant, plant impressions. DS-- | 2.5 |

Section A178

Measured on the east slope of the Kokolik River in a northeast direction from NE NW SW sec. 24, T. 1 S., R. 40 E. to CS NE NW sec. 5, T. 1 S., R. 39 E.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part)--continued | |
| 78 | Shale, dark gray, partly carbonaceous; very thin laminae of coal 15.0 ft and 3.0 ft below the top. SW---------- | 24.0 |
| 77 | Siltstone, gray, shaly, calcareous---------- | 3.5 |
| 76 | Shale, dark gray, soft, and a few very thin interlaminated siltstone, gray, calcareous. BF-DS---------- | 8.0 |
| 75 | Coal; 0.1 ft thick shale parting 0.1 ft above the base. SW---- | 12.0 |
| 74 | Siltstone, gray, calcareous, contains abundant leaf and stem impressions, and some very thin interbedded shale, gray, silty. DS-BF---------- | 12.0 |
| 73 | Shale, dark gray, carbonaceous; abundant very silty laminae. BF | 1.0 |
| 72 | Siltstone, gray, calcareous, abundant plant impressions; a paleosoil.---------- | 1.0 |
| 71 | Shale, dark gray, carbonaceous. SW---------- | 2.8 |
| 70 | Sandstone, gray, very fine grained, calcareous, abundant plant impressions and fragments, large scale trough crossbedded. DC- | 21.0 |
| 69 | Covered---------- | 178.0 |
| 68 | Sandstone, gray, very fine grained, calcareous, large scale, low angle trough crossbedded. DC---------- | 10.0 |
| 67 | Siltstone, gray, very dolomitic, very hard; a small lentil about 10 ft in diameter---------- | 1.5 |
| 66 | Sandstone, gray, very fine grained, calcareous, and very thinly interbedded siltstone, gray, calcareous. Interval is finely laminated and has carbonaceous shale partings. SP---------- | 5.3 |
| 65 | Very poorly exposed. Shale, dark gray, soft, at the top, and some very thin interbedded sandstone, gray, very fine grained, throughout rest of interval.---------- | 23.0 |
| 64 | Sandstone, gray, very fine grained, silty, calcareous, current ripple bedded. SP---------- | 2.0 |
| 63 | Shale, dark gray, partly carbonaceous. SW---------- | 19.0 |

Section A178

Measured on the east slope of the Kokolik River in a northeast direction from NE NW SW sec. 24, T. 1 S., R. 40 E. to CS NE NW sec. 5, T. 1 S., R. 39 E.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part)--continued | |
| 62 | Sandstone, gray, very fine grained, silty, current ripple bedded. SP---------- | 2.0 |
| 61 | Shale, gray, soft. BF---------- | 4.8 |
| 60 | Sandstone, gray, very fine grained, current ripple bedded. SP- | 3.0 |
| 59 | Shale, dark gray, partly carbonaceous, and very thin interbedded sandstone, gray, very fine grained. BF, SW, DS---------- | 32.0 |
| 58 | Coal. SW---------- | 4.5 |
| 57 | Shale, gray, carbonaceous. SW---------- | 0.5 |
| 56 | Covered---------- | 37.0 |
| 55 | Slope covered with coal rubble. SW---------- | 5.0 |
| 54 | Shale, dark gray, carbonaceous. SW---------- | 17.0 |
| 53 | Shale, dark gray, soft, and some very thin interbedded sandstone, gray, very fine grained. BF-SP---------- | 55.0 |
| 52 | Slope covered with coal rubble. SW---------- | 5.0 |
| 51 | Shale, dark gray, soft, and some very thin interbedded sandstone, gray, very fine grained. BF-DS---------- | 12.5 |
| 50 | Sandstone, gray, very fine to medium grained, poorly sorted, subangular, abundant dark grains, large-scale low-angle trough crossbedded. DC---------- | 20.0 |
| 49 | Coal, scoured on the top by bed 50. SW---------- | 3.4 |
| 48 | Shale, dark gray, carbonaceous. SW---------- | 11.6 |
| 47 | Shale, dark gray, soft, and some very thin interbedded sandstone, gray, very fine grained. BF-DS---------- | 50.0 |
| 46 | Shale, dark gray, carbonaceous. SW---------- | 0.3 |
| 45 | Coal. SW---------- | 0.1 |
| 44 | Shale, dark gray, carbonaceous. SW---------- | 0.5 |

Section A178

Measured on the east slope of the Kokolik River in a northeast direction from NE NW SW sec. 24, T. 1 S., R. 40 E. to CS NE NW sec. 5, T. 1 S., R. 39 E.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part)--continued | |
| 43 | Coal. SW---------- | 0.2 |
| 42 | Shale, dark gray, soft, carbonaceous. SW---------- | 0.5 |
| 41 | Coal. SW---------- | 2.5 |
| 40 | Shale, dark gray, very carbonaceous at the top. SW---------- | 12.0 |
| 39 | Covered---------- | 40.0 |
| 38 | Sandstone, gray, very fine to medium grained, poorly sorted, subangular; large scale low angle trough crossbedded, some carbonaceous material on partings, scattered clay pebbles. DC- | 25.0 |
| 37 | Shale, gray, soft, and some very thin interbedded siltstone, gray. BF-SP---------- | 65.0 |
| 36 | Shale, dark gray, carbonaceous, and some coal. SW---------- | 20.0 |
| 35 | Covered---------- | 55.0 |
| 34 | Sandstone, gray, very fine to medium grained, poorly sorted, subangular, large-scale low-angle trough crossbedded, contains plant impressions and cobbles of gray chert and light gray quartzite. DC---------- | 30.0 |
| 33 | Shale, dark gray, carbonaceous. SW---------- | 10.0 |
| 32 | Shale, dark gray, soft, and some very thin interbedded sandstone, gray, very fine grained, calcareous, and siltstone, gray, calcareous. BF-SP-DS---------- | 53.0 |
| 31 | Sandstone, gray, very fine grained, calcareous, carbonaceous material and muscovite grains on some partings.---------- | 3.5 |
| 30 | Shale, dark gray, carbonaceous, soft. SW---------- | 2.5 |
| 29 | Coal. SW---------- | 2.5+ |
| 28 | Shale, dark gray, carbonaceous; some bone coal. SW---------- | 14.0 |
| 27 | Covered. Some dark gray shale and siltstone in slope rubble.-- | 290.0 |
| 26 | Coal, clean, bright; base in permafrost. SW---------- | 4.7+ |

Section A178

Measured on the east slope of the Kokolik River in a northeast direction from NE NW SW sec. 24, T. 1 S., R. 40 E. to CS NE NW sec. 5, T. 1 S., R. 39 E.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part)--continued | |
| 25 | Covered---------- | 45.0 |
| 24 | Sandstone, gray, very fine to medium grained, poorly sorted, subangular, abundant dark grains, large-scale low-angle trough crossbedded. DC---------- | 22.0 |
| 23 | Shale, dark gray, and interbedded shale, dark gray, carbonaceous; a few very thin beds of siltstone, gray. BF-SW-DS---------- | 36.0 |
| 22 | Shale, dark gray, carbonaceous; a few laminae of coal. SW----- | 17.0 |
| 21 | Mostly covered. A few very thin sandstone beds are exposed.--- | 130.0 |
| 20 | Shale, dark gray, very carbonaceous; a few laminae of coal. SW | 5.0 |
| 19 | Sandstone, gray, very fine grained, silty, poorly sorted, abundant dark grains, current ripple bedded, some plant impressions, probably lenticular. SP---------- | 6.0 |
| 18 | Mostly covered. Probably mostly shale. One thin tabular sandstone is current ripple bedding on the upper surface. | 97.0 |
| | | 4,743.7 |

Section A178

Measured on the east slope of the Kokolik River in a northeast direction from NE NW SW sec. 24, T. 1 S., R. 40 E. to CS NE NW sec. 5, T. 1 S., R. 39 E.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part)--continued | |
| 17 | Sandstone, gray, fine grained, poorly sorted, subangular, abundant dark and colored grains, large-scale low-angle trough crossbedding, some finely disseminated carbonaceous material on partings. DC---------- | 22.0 |
| 16 | Covered. Probably gray shale and sandstone.---------- | 5.0 |
| 15 | Sandstone, gray, very fine grained, fairly well sorted, scattered muscovite, abundant dark grains, calcareous, finely disseminated plant material on partings, large, flat current ripple bedded. SP---------- | 2.5 |
| 14 | Shale, dark gray, silty, abundant finely disseminated plant material; very thin siltstone has mollusk trail. PD---------- | 16.0 |
| 13 | Sandstone, gray, very fine grained, fairly well sorted, abundant dark and colored grains, fairly large scale, low angle trough crossbedded, some plant impressions on bedding planes. Current direction generally East to West. DC---------- | 18.0 |
| 11 | Shale, gray, fissile, soft.---------- | 15.0 |
| 12 | Covered. Probably mostly shale.---------- | 15.0 |
| 10 | Covered. Low topography suggests mostly shale with some very thin interbedded sandstone.---------- | 23.0 |
| 9 | Sandstone, gray, very fine grained, very poorly sorted, subangular, abundant dark grains, slightly calcareous; probably a small distributary channel or a splay. Current direction generally east to west.---------- | 5.0 |
| 8 | Covered. Low topography suggests shale with possibly very thin interbedded sandstone.---------- | 55.0 |
| 7 | Shale, black, slightly carbonaceous, scattered black plant impressions, and sparse very thin very lenticular laminae of coal.---------- | 16.0 |
| 6 | Covered. Low topography suggests shale and some very thin interbedded sandstone.---------- | 55.0 |
| | Corwin Formation (part)---------- | 4,991.2 |

## Section A178

Measured on the east slope of the Kokolik River in a northeast direction from NE NW SW sec. 24, T. 1 S., R. 40 E. to CS NE NW sec. 5, T. 1 S., R. 39 E.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Top of the Kukpowruk Formation: | |
| 5 | Sandstone, gray, very fine grained, subangular, fairly well sorted, 50 percent dark and colored grains, non-calcareous, small scale, fairly high angle trough crossbedded. DC---------- | 43.0 |
| 4 | Covered. Low topography suggests shale.---------- | 80.0 |
| 3 | Low ridge topography suggests a thin sandstone outcrop.-------- | 5.0 |
| 2 | Covered. Low topography suggests mostly shale.---------- | 210.0 |
| 1 | Shale, gray, soft, and thin interbedded sandstone, gray, very fine grained, calcareous, abundant dark grains, scattered plant impressions; interval weathers to low ridge.---------- | 28.0 |
| | Kukpowruk Formation (part) | 366.0 |

## Section A278

Measured on the west slope of the Kokolik River in NC sec. 13, T. 1 S., R. 40 W. Location shown on plate 1; this section not shown on plate 2.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part): | |
| 45 | Sandstone, gray, very fine grained, current ripple bedded in the middle, small-scale low-angle trough crossbedding at the top and bottom; a splay with channels. SP---------- | 7.0 |
| 44 | Shale, gray, very silty. BF---------- | 6.0 |
| 43 | Siltstone, gray, sandy, current ripple bedded. DS---------- | 4.6 |
| 42 | Shale, gray, firm. BF---------- | 0.6 |
| 41 | Coal, bright, banded, minor dull banded.---------- | 1.6 |
| | Coal, dull banded, very thin bright banded.---------- | 0.46 |
| | Coal, bright banded.---------- | 0.5 |
| | Coal, dull banded.---------- | 0.95 |
| | Coal, thin bright banded, thin interbedded fusain.---------- | 0.8 |
| | Shale, dark brown, carbonaceous.---------- | 0.05 |
| | Coal, bright banded.---------- | 0.4 |
| | Shale, dark brown, carbonaceous.---------- | 0.1 |
| | Coal, bright banded.---------- | 0.06 |
| | Shale, dark brown, carbonaceous.---------- | 0.11 |
| | Coal, bright banded.---------- | 0.3 |
| | Shale, dark brown, carbonaceous.---------- | 0.02 |
| | Coal, bright banded.---------- | 0.15 |
| | Shale, dark brown, carbonaceous.---------- | 0.3 |
| | Coal, bright banded.---------- | 0.35 |
| | Shale, dark gray, very carbonaceous.---------- | 0.04 |
| | Coal, bright banded.---------- | 0.3 |
| | Shale, dark brown, very carbonaceous.---------- | 0.45 |
| | Coal, bright banded, some thin dull banded.---------- | 1.7 |
| | Shale, brown, very carbonaceous.---------- | 0.05 |
| | Coal, bright banded, some dull banded.---------- | 2.9 |
| | Face cleats N6W | 11.59 |
| 40 | Shale, gray, rooted, forms seat rock---------- | 0.9 |
| 39 | Limestone nodules, gray, very silty.---------- | 0.9 |
| 38 | Siltstone, gray, shaly. DS---------- | 0.2 |
| 37 | Sandstone, gray, very fine grained, some silty partings, current ripple bedded. SP---------- | 1.2 |

## Section A278

Measured on the west slope of the Kokolik River in NC sec. 13, T. 1 S., R. 40 W. Location shown on plate 1; this section not shown on plate 2.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part)--continued | |
| 36 | Shale, medium gray, silty, BF---------- | 0.9 |
| 35 | Limestone, gray, very silty.---------- | 0.7 |
| 34 | Siltstone, gray, and thinly interbedded to interlaminated shale, dark gray, silty; one laminae of coal 1.0 ft below top. DS---- | 4.6 |
| 33 | Shale, dark gray, fissile; 0.2 ft thick layer of limestone, gray, very silty, 0.4 ft below top.---------- | 1.9 |
| 32 | Limestone, gray, very silty; thickens laterally to 1.2 ft; 0.1 ft thick cone-in-cone concretions on the top.---------- | 0.5 |
| 31 | Shale, dark gray, black, carbonaceous. SW---------- | 0.5 |
| 30 | Sandstone, gray, very fine grained, calcareous; small rounded concretions at the base; vertical and horizontal circular, rough textured burrows, one-quarter to three-eights-inch diameter; small three-toed dinosaur tracks 1 to 2-inches in diameter as casts on underside. DS---------- | 1.5 |
| 29 | Siltstone, gray, and thinly interbedded shale, gray, silty. BF-DS | 2.4 |
| 28 | Sandstone, gray, very fine grained, current ripple bedded, and some very thin interbedded siltstone, gray, shaly, SP---------- | 0.8 |
| 27 | Siltstone, gray, and very finely interbedded shale, gray, very silty; 0.1 ft thick carbonaceous shale layer near the base. BF-DS | 2.9 |
| 26 | Sandstone, gray, very fine grained, current ripple bedded, in flat beds, and thin partings of siltstone, gray. SP---------- | 6.4 |
| 25 | Shale, gray, very silty, and thin interbedded sandstone, gray, very fine grained; layer of rounded, knobby concretions of limestone, gray, very silty, up to 0.8 ft thick, near the top. BF-SP---------- | 2.5 |
| 24 | Limestone, gray, very silty, lenticular.---------- | 0.2 |
| 23 | Shale, gray, firm, and some very thin interbedded sandstone, gray, very fine grained. BF-SP---------- | 5.2 |
| 22 | Limestone, gray, very silty; irregularly bedded.---------- | 0.2 |

## Section A278

Measured on the west slope of the Kokolik River in NC sec. 13, T. 1 S., R. 40 W. Location shown on plate 1; this section not shown on plate 2.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part)--continued | |
| 21 | Sandstone, gray, very fine grained, carbonaceous partings, current ripple bedded, and some interbedded siltstone, gray; interval becomes more shaly at the top; 0.3 ft thick layer of limestone, gray, very silty, 2.2 ft below top. SP---------- | 10.7 |
| 20 | Shale, dark gray, fissible, soft, and some very thin interbedded sandstone, gray, very fine grained, very silty, current ripple bedded. BF-SP---------- | 6.8 |
| 19 | Coal. SW---------- | 2.1 |
| 18 | Shale, dark gray, fissile, and some very thin interbedded sandstone, gray, very fine grained, very silty, current ripple bedding. BF-SP---------- | 27.5 |
| 17 | Coal. SW---------- | 2.3 |
| 16 | Shale, gray, soft, and some very thin interbedded sandstone, gray, very fine grained, very silty, current ripple bedded. BF-SP---------- | 44.0 |
| 15 | Sandstone, gray, very fine grained, thin bedded, and some very thin interbedded siltstone, gray. SP---------- | 1.5 |
| 14 | Sandstone, gray, very fine grained, fairly well sorted, current ripple bedded, carbonaceous material on partings. SP---------- | 0.5 |
| 13 | Siltstone, gray, scattered carbonaceous material, and interlaminated sandstone, gray, very fine grained, carbonaceous. SP---------- | 2.1 |
| 12 | Sandstone, gray, very fine grained, small scale channeling at the base, current ripple bedded at the top; parting of siltstone, gray, 0.1 ft thick, 0.2 ft below top. SP---------- | 0.8 |
| 11 | Siltstone, gray, sandy, and interlaminated shale, dark gray, very silty. DS-BF---------- | 1.2 |
| 10 | Sandstone, gray, very fine grained, current ripple bedded. SP- | 3.2 |
| 9 | Shale, gray, soft, and a few laminae of sandstone, gray, very fine grained. BF---------- | 7.9 |
| 8 | Coal (Base not exposed). SW---------- | 4.5+ |

## Section A278

Measured on the west slope of the Kokolik River in NC sec. 13, T. 1 S., R. 40 W. Location shown on plate 1; this section not shown on plate 2.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part)--continued | |
| 7 | Shale, gray, soft, and some very thin interbedded sandstone, gray, very fine grained. BF-SP---------- | 25.9 |
| 6 | Sandstone, gray, very fine grained, silty, current ripple bedded. SP---------- | 1.7 |
| 5 | Shale, gray, firm; a few laminae of sandstone, gray, very fine grained. BF---------- | 6.2 |
| 4 | Sandstone, gray, very fine grained, current ripple bedded. SP- | 3.8 |
| 3 | Covered. Probably gray shale.---------- | 12.8 |
| 2 | Shale, dark gray, carbonaceous, and some thin interbedded Coal. SW---------- | 5.0 |
| 1 | Sandstone, gray, very fine grained, current ripple bedded, rooted. SP---------- | 2.3 |
| | Corwin Formation (part) | 269.99 |

## Section A378

Measured in a north-south trending tributary of Avingak Creek in E 1/2 sec. 23, SW 1/4 sec. 13, E 1/2 sec. 14, E 1/2 sec. 11, SE 1/4 and NW 1/4 sec. 2, T. 1 S., R. 39 W.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part): | |
| 176 | Sandstone, gray, fine to medium grained, fairly well sorted, subangular, abundant dark grains, some plant debris, some clay galls. DC | 40.0 |
| 175 | Covered rubble slope forms break between sandstone benches. | 30.0 |
| 174 | Sandstone, gray, very fine to medium grained, poorly sorted, subangular. DC | 5.0 |
| 173 | Coal. SW | 7.4 |
| 172 | Covered | 127.0 |
| 171 | Shale, gray, a few very thin carbonaceous to coaly layers, and some very thin interbedded sandstone, gray, very fine grained, silty. SP | 27.0 |
| 170 | Covered | 225.0 |
| 169 | Covered slope with carbonaceous shale and coal rubble. SW | 5.0 |
| 168 | Covered | 55.0 |
| 167 | Sandstone, gray, very fine grained, silty, current ripple bedded. SP | 11.0 |
| 166 | Covered | 55.0 |
| 165 | Shale, gray, and interbedded fairly thick and thin sandstone, gray, very fine grained, current ripple bedded. BF-SP | 27.0 |
| 164 | Sandstone, gray, very fine grained, small scale low angle trough crossbedded at the base, current ripple bedded at the top. SP | 5.0 |
| 163 | Covered | 137.0 |
| 162 | Shale, gray, soft. BF | 1.0 |
| 161 | Coal. SW | 0.4 |
| 160 | Shale, gray, soft. BF | 2.5 |
| 159 | Covered | 5.0 |

Section A378

Measured in a north-south trending tributary of Avingak Creek in E 1/2 sec. 23, SW 1/4 sec. 13, E 1/2 sec. 14, E 1/2 sec. 11, SE 1/4 and NW 1/4 sec. 2, T. 1 S., R. 39 W.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part)--continued | |
| 158 | Coal. SW | 0.5 |
| 157 | Shale, dark gray, BF | 0.4 |
| 156 | Sandstone, gray, very fine grained, silty; some plant impressions; fines upward. SP | 5.5 |
| 155 | Covered | 54.0 |
| 154 | Shale, gray, silty, and very thin interbedded sandstone, gray, very fine grained, silty. BF-SP | 15.0 |
| 153 | Covered | 55.0 |
| 152 | Shale, dark gray, a few very thin carbonaceous layers, and some very thin interbedded sandstone, gray, very fine grained, silty, current ripple bedded. BF-SP | 26.0 |
| 151 | Coal, bright banded. SW | 3.6 |
| 150 | Shale, gray, and several interbedded (as much as 5.0 ft thick) sandstone, gray, very fine grained, silty, current ripple bedded. SP | 67.5 |
| 149 | Coal. SW | 0.5 |
| 148 | Shale, dark gray, some carbonaceous layers, and some very thin interbedded sandstone, gray, very fine grained, silty. SP-BF-SW | 8.0 |
| 147 | Sandstone, gray, very fine grained, silty, current ripple bedded. SP | 2.5 |
| 146 | Shale, gray, soft, some carbonaceous layers, and some very thin interbedded sandstone, gray, very fine grained, silty; a few thin laminae of coal. BF-SP-SW | 34.0 |
| 145 | Sandstone, gray, very fine grained, silty, some carbonaceous material and plant impressions, current ripple bedded. SP | 7.2 |
| 144 | Shale, gray, and some very thin interbedded sandstone, gray, very fine grained. BF-SP | 19.0 |
| 143 | Coal. SW | 0.4 |

## Section A378

Measured in a north-south trending tributary of Avingak Creek in E 1/2 sec. 23, SW 1/4 sec. 13, E 1/2 sec. 14, E 1/2 sec. 11, SE 1/4 and NW 1/4 sec. 2, T. 1 S., R. 39 W.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part)--continued | |
| 142 | Sandstone, gray, very fine grained. DS---------- | 0.5 |
| 141 | Shale, dark gray. BF---------- | 5.0 |
| 140 | Sandstone, gray, very fine grained, silty, current ripple bedded. SP---------- | 4.0 |
| 139 | Shale, dark gray, partly carbonaceous, and interbedded siltstone, gray, abundant plant impressions. BF-DS---------- | 14.0 |
| 138 | Sandstone, gray, very fine grained, silty, some plant impressions, current ripple bedded. SP---------- | 9.5 |
| 137 | Sandstone, gray, very fine to medium grained, poorly sorted, subangular, large scale low angle trough crossbedded. DC------ | 26.0 |
| 136 | Covered---------- | 9.5 |
| 135 | Slope covered with coal rubble. SW---------- | 5.0 |
| 134 | Covered---------- | 23.0 |
| 133 | Coal. SW---------- | 2.6 |
| 132 | Shale, gray, soft. BF---------- | 0.9 |
| 131 | Sandstone, gray, very fine grained, silty, carbonaceous plant impressions. SP---------- | 16.0 |
| 130 | Sandstone, gray, very fine to medium grained, large scale low angle trough crossbedded. DC---------- | 23.5 |
| 129 | Shale, dark gray, carbonaceous, abundant plant impressions, and a few laminae and beds of coal as much as 0.5 ft thick. BF-SW- | 33.0 |
| 128 | Sandstone, gray, very fine grained; carbonaceous debris; current ripple bedded. SP---------- | 5.0 |
| 127 | Shale, gray, soft. BF---------- | 5.5 |
| 126 | Slope covered with coal rubble. SW---------- | 5.0 |
| 125 | Covered---------- | 62.0 |

## Section A378

Measured in a north-south trending tributary of Avingak Creek in E 1/2 sec. 23, SW 1/4 sec. 13, E 1/2 sec. 14, E 1/2 sec. 11, SE 1/4 and NW 1/4 sec. 2, T. 1 S., R. 39 W.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part)--continued | |
| 124 | Coal. SW | 0.5 |
| 123 | Shale, gray, soft. BF | 18.0 |
| 122 | Sandstone, gray, very fine grained, silty, and some very thin interbedded siltstone, gray; burrowed at the base; rooted at the top. SP-DC | 3.8 |
| 121 | Shale, dark gray, soft, some very thin carbonaceous layers, and two 1.5 to 2.0 ft thick interbedded sandstone, gray, very fine grained, silty; 0.3 ft thick coal 15 ft below top. BF-SW-DS | 26.0 |
| 120 | Coal. SW | 0.5 |
| 119 | Shale, gray, soft. BF | 0.4 |
| 118 | Sandstone, gray, very fine grained, calcareous, and some very thin, interbedded siltstone, gray; thickens to 6.0 ft laterally; contains several very large stumps and abundant fossil wood. SP | 2.9 |
| 117 | Shale, gray, silty. BF | 5.7 |
| 116 | Coal, bright banded. SW | 2.0 |
| 115 | Shale, black, very carbonaceous. SW | 0.6 |
| 114 | Coal. SW | 0.1 |
| 113 | Shale, dark gray, carbonaceous. SW | 0.9 |
| 112 | Siltstone, gray, contains disseminated carbonaceous material. DS | 1.9 |
| 111 | Sandstone, gray, very fine grained, silty, current ripple bedded. SP | 3.3 |
| 110 | Covered | 3.2 |
| 109 | Shale, gray, soft. BF | 1.3 |
| 108 | Sandstone, gray, very fine grained, silty. SP | 2.2 |
| 107 | Covered | 16.0 |

## Section A378

Measured in a north-south trending tributary of Avingak Creek in E 1/2 sec. 23, SW 1/4 sec. 13, E 1/2 sec. 14, E 1/2 sec. 11, SE 1/4 and NW 1/4 sec. 2, T. 1 S., R. 39 W.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part)--continued | |
| 106 | Sandstone, gray, very fine grained, silty, current ripple bedded. SP---------- | 5.5 |
| 105 | Covered---------- | 64.0 |
| 104 | Slope covered with coal rubble. SW---------- | 5.0 |
| 103 | Covered---------- | 16.0 |
| 102 | Shale, gray. BF---------- | 2.0 |
| 101 | Sandstone, gray, very fine grained, current ripple bedded. SP- | 1.2 |
| 100 | Covered---------- | 17.0 |
| 99 | Slope covered with coal rubble. SW---------- | 5.0 |
| 98 | Covered---------- | 55.0 |
| 97 | Slope covered with coal rubble. SW---------- | 1.0 |
| 96 | Covered---------- | 70.0 |
| 95 | Slope covered with coal rubble. SW---------- | 1.5 |
| 94 | Sandstone, gray, very fine grained. SP---------- | 2.5 |
| 93 | Covered---------- | 26.0 |
| 92 | Slope covered with coal rubble. SW---------- | 2.0 |
| 91 | Sandstone, gray, very fine grained. SP---------- | 2.0 |
| 90 | Covered---------- | 16.0 |
| 89 | Slope covered with coal rubble. SW---------- | 2.0 |
| 88 | Sandstone, gray, very fine grained. SP---------- | 2.0 |
| 87 | Covered---------- | 40.0 |

## Section A378

Measured in a north-south trending tributary of Avingak Creek in E 1/2 sec. 23, SW 1/4 sec. 13, E 1/2 sec. 14, E 1/2 sec. 11, SE 1/4 and NW 1/4 sec. 2, T. 1 S., R. 39 W.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part)--continued | |
| 86 | Sandstone, gray, very fine to medium grained, very thin tabular trough crossbedded, and some interbedded Shale, gray, sandy; interval is mostly shale 17-25 ft above the base. DC?---------- | 35.0 |
| 85 | Shale, gray, soft. BF---------- | 0.5 |
| 84 | Coal. SW---------- | 10.8 |
| 83 | Covered. Interval appears to be mostly gray shale.---------- | 76.0 |
| 82 | Sandstone, gray, very fine grained, silty, current ripple bedded. SP---------- | 3.5 |
| 81 | Shale, gray, soft, and a few laminae of sandstone, gray, very fine grained. BF-SP---------- | 18.0 |
| 80 | Covered---------- | 145.0 |
| 79 | Coal. SW---------- | 0.5 |
| 78 | Shale, gray, and very thin interbedded sandstone, gray, very fine grained. BF-SP---------- | 10.5 |
| 77 | Sandstone, gray, very fine to medium grained, poorly sorted, subangular, some carbonaceous debris, large scale low angle trough crossbedded. DC---------- | 10.0 |
| 76 | Sandstone, gray, very fine to medium grained, and interbedded shale, gray, sandy. DC-BF---------- | 5.0 |
| 75 | Sandstone, gray, very fine to medium grained, poorly sorted, subangular, some carbonaceous debris, large scale low angle trough crossbedded. DC---------- | 20.0 |
| 74 | Covered---------- | 29.0 |
| 73 | Slope covered with carbonaceous shale and coal rubble. SW----- | 5.0 |
| 72 | Covered---------- | 25.0 |
| 71 | Shale, dark gray, carbonaceous. SW---------- | 3.0 |
| 70 | Covered---------- | 40.0 |

## Section A378

Measured in a north-south trending tributary of Avingak Creek in E 1/2 sec. 23, SW 1/4 sec. 13, E 1/2 sec. 14, E 1/2 sec. 11, SE 1/4 and NW 1/4 sec. 2, T. 1 S., R. 39 W.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part)--continued | |
| 69 | Shale, dark gray, carbonaceous, and very thin laminae of coal. SW---------- | 5.0 |
| 68 | Shale, gray, and some very thin interbedded sandstone, gray, very fine grained. BF-SP---------- | 40.0 |
| 67 | Covered---------- | 53.0 |
| 66 | Slope covered with coal rubble. SW---------- | 5.0 |
| 65 | Covered---------- | 62.0 |
| 64 | Slope covered with coal rubble. SW---------- | 5.0 |
| 63 | Covered---------- | 37.0 |
| 62 | Sandstone, gray, very fine to medium grained, poorly sorted, subangular, abundant colored grains; large scale, low angle trough crossbedded. DC---------- | 24.0 |
| 61 | Sandstone, gray, very fine grained, carbonaceous. SP---------- | 1.0 |
| 60 | Shale, gray, soft, silty, and some very thin interbedded and interlaminated sandstone, gray, very fine grained, current ripple bedded. BF-SP---------- | 99.0 |
| 59 | Slope covered with coal and carbonaceous shale rubble. SW----- | 5.0 |
| 58 | Shale, gray, soft. BF---------- | 20.0 |
| 57 | Sandstone, gray, very fine grained, silty, current ripple bedded, some very thin lenses of limestone, gray, silty. SP--- | 9.0 |
| 56 | Covered---------- | 86.0 |
| 55 | Sandstone, gray, very fine grained, silty, small scale, low angle trough crossbedded. SP---------- | 2.5 |
| 54 | Covered---------- | 78.0 |
| 53 | Sandstone, gray, very fine grained, silty, current ripple bedded, carbonaceous debris, some clay pebbles. SP---------- | 3.0 |

## Section A378

Measured in a north-south trending tributary of Avingak Creek in E 1/2 sec. 23, SW 1/4 sec. 13, E 1/2 sec. 14, E 1/2 sec. 11, SE 1/4 and NW 1/4 sec. 2, T. 1 S., R. 39 W.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part)--continued | |
| 52 | Shale, gray, BF---------- | 14.0 |
| 51 | Shale, dark gray, carbonaceous. SW---------- | 5.0 |
| 50 | Shale, gray, and some very thin interbedded sandstone, gray, very fine grained, silty, SP-BF---------- | 21.0 |
| 49 | Covered---------- | 26.0 |
| 48 | Shale, dark gray, carbonaceous, and a few laminae of coal SW--- | 2.0 |
| 47 | Sandstone, gray, very fine grained, silty. DS---------- | 0.5 |
| 46 | Shale, dark gray. BF---------- | 1.5 |
| 45 | Covered---------- | 31.0 |
| 44 | Shale, dark gray, carbonaceous, and a few very thin laminae of coal. SW---------- | 4.5 |
| 43 | Shale, dark gray, and a few 2-4 ft thick interbedded Sandstone, gray, very fine grained, silty, current ripple bedded. SP----- | 41.0 |
| 42 | Covered---------- | 27.0 |
| 41 | Sandstone, gray, fine to medium grained, poorly sorted, subangular, abundant dark grains. DC---------- | 37.0 |
| 40 | Covered. Probably gray shale.---------- | 40.0 |
| 39 | Sandstone, gray, very fine to medium grained, poorly sorted, subangular, abundant dark grains; carbonaceous partings. DC--- | 16.0 |
| 38 | Slope covered with coal rubble. SW---------- | 5.0 |
| 37 | Covered---------- | 35.0 |
| 36 | Slope covered with coal rubble. SW---------- | 5.0 |
| 35 | Covered---------- | 15.0 |

Section A378

Measured in a north-south trending tributary of Avingak Creek in E 1/2 sec. 23, SW 1/4 sec. 13, E 1/2 sec. 14, E 1/2 sec. 11, SE 1/4 and NW 1/4 sec. 2, T. 1 S., R. 39 W.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part)--continued | |
| 34 | Sandstone, gray, very fine grained, trough crossbedded in the lower part, current ripple bedded in the upper 0.8 ft; large plant fragments and fossil wood. DC-SP---------- | 8.2 |
| 33 | Covered---------- | 475.0 |
| 32 | Shale, gray, soft, partly silty, and some very thin interbedded sandstone, gray, very fine grained, silty, current ripple bedded. BF-DS---------- | 40.0 |
| 31 | Sandstone, gray, very fine grained, thin current ripple bedded, and three 0.5-1.0 ft thick interbedded shale, gray, silty. SP- | 8.3 |
| 30 | Shale, dark gray, and a few laminae of sandstone, gray, very fine grained. Some creek cobbles here are oil saturated. BF-DS | 29.0 |
| 29 | Slope covered with coal and carbonaceous shale rubble. SW----- | 5.0 |
| 28 | Shale, gray, soft, and three 2-3 ft thick interbedded sandstone, gray, very fine grained, silty, current ripple bedded. BF-SP--- | 93.0 |
| 27 | Covered---------- | 680.0 |
| 26 | Sandstone, gray, very fine grained, silty, current ripple bedded, fragments of large plants. SP---------- | 11.0 |
| 25 | Shale, gray, soft. BF---------- | 0.5 |
| 24 | Bone coal at the base with thin interbedded shale, dark gray, carbonaceous in the remaining parts of interval; one 0.3 ft thick bed of bright coal at the top. SW---------- | 5.5 |
| 23 | Shale, gray, firm. BF---------- | 2.0 |
| 22 | Sandstone, gray, very fine grained, silty, thin current ripple bedded, abundant carbonaceous debris and plant impressions. SP- | 8.0 |
| 21 | Shale, gray, silty, and some very thin interbedded siltstone, gray. BF-DS---------- | 21.0 |
| 20 | Sandstone, gray, very fine grained, calcareous; abundant carbonaceous shale partings; current ripple bedded. SP-------- | 22.5 |

## Section A378

Measured in a north-south trending tributary of Avingak Creek in E 1/2 sec. 23, SW 1/4 sec. 13, E 1/2 sec. 14, E 1/2 sec. 11, SE 1/4 and NW 1/4 sec. 2, T. 1 S., R. 39 W.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part)--continued | |
| 19 | Shale, gray, silty, BF---------- | 11.0 |
| | Corwin Formation (part) | 4,457.2 |

## Section A378

Measured in a north-south trending tributary of Avingak Creek in E 1/2 sec. 23, SW 1/4 sec. 13, E 1/2 sec. 14, E 1/2 sec. 11, SE 1/4 and NW 1/4 sec. 2, T. 1 S., R. 39 W.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Kukpowruk Formation: | |
| 18 | Sandstone, gray, very fine to fine grained, poorly sorted, subangular, abundant black and white grains, some clay galls in local lenses, large-scale low-angle trough crossbedded; small burrows and snail trails. DC---------- | 63.0 |
| 17 | Shale, gray, and a few very thin interbedded sandstone, gray, very fine grained. DF-PD---------- | 75.0 |
| 16 | Covered. Low topography suggests interval is mostly shale.---- | 140.0 |
| 15 | Sandstone, gray, very fine grained, calcareous; no visible bedding. SP---------- | 5.0 |
| 14 | Shale, gray. BF---------- | 87.0 |
| 13 | Sandstone, gray, very fine to medium grained, poorly sorted, subangular, abundant dark grains, large scale, low angle trough crossbedded. DC---------- | 17.0 |
| 12 | Shale, dark gray, soft, and a few thin interbedded sandstone, gray, very fine grained, flat bedded. PD---------- | 92.0 |
| 11 | Sandstone, gray, very fine grained, very thin flat bedded; some vertical, rounded, smooth-walled burrows about 1/4-inch diameter; one burrow about 0.1 ft in diameter with spreita; looks like a small Diplocraterion. PD---------- | 5.2 |
| 10 | Shale, dark gray, firm, and a few very thin interbedded sandstone, gray, very fine grained, flat bedded; some snail trails. PD---------- | 46.5 |
| 9 | Covered. Slope rubble is mostly gray shale and sparse thin gray sandstone.---------- | 555.0 |
| 8 | Sandstone, gray, very fine grained, and thin interbedded shale, gray. PD---------- | 9.0 |
| 7 | Covered---------- | 45.0 |
| 6 | Sandstone, gray, very fine to fine grained, poorly sorted, abundant dark grains; no visible bedding. PD---------- | 17.0 |
| 5 | Covered---------- | 48.0 |

## Section A378

Measured in a north-south trending tributary of Avingak Creek in E 1/2 sec. 23, SW 1/4 sec. 13, E 1/2 sec. 14, E 1/2 sec. 11, SE 1/4 and NW 1/4 sec. 2, T. 1 S., R. 39 W.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Kukpowruk Formation--continued | |
| 4 | Sandstone, gray, very fine to fine grained, poorly sorted, subangular, abundant dark grains; no visible bedding. PD------ | 4.0 |
| 3 | Covered. Probably mostly shale.---------- | 124.0 |
| 2 | Sandstone, gray, very fine to medium grained, poorly sorted, subangular, abundant dark and colored grains; no visible bedding. DC?---------- | 20.0 |
| | Kukpowruk Formation | 1,352.7 |
| | Torok Formation (Part): | |
| 1 | Covered. Low topography and slope rubble suggest gray shale. | 25.0+ |

## Section A478

Measured on north-south trending tributary of Elusive Creek in W 1/2 sec. 1, T. 2 S., R. 36 W., W 1/2 sec. 36, W 1/2 sec. 25 and W 1/2 sec. 24, T. 1 S., R. 36 W.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part): | |
| 76 | Sandstone, gray, very fine to medium grained, poorly sorted, subangular, abundant dark grains; a very large distributary channel; possibly an upper delta plain sequence. DC---------- | 18.0+ |
| 75 | Shale, gray, soft. BF---------- | 6.0 |
| 74 | Coal; base is covered. SW---------- | 2.0+ |
| 73 | Covered---------- | 25.0 |
| 72 | Shale, dark gray, partly carbonaceous. SW---------- | 10.0 |
| 71 | Sandstone, gray, very fine to fine grained, poorly sorted, subangular; a few thin layers contain clay galls; small scale, thin, tabular trough crossbedded. DC---------- | 21.0 |
| 70 | Shale, dark gray, carbonaceous. SW---------- | 13.5 |
| 69 | Sandstone, gray, very fine grained, silty, current ripple bedded. DS---------- | 0.5 |
| 68 | Shale, gray, soft. BF---------- | 3.0 |
| 67 | Sandstone, gray, very fine grained, silty; thin current ripple bedded, a few layers of limestone, gray, silty, up to 0.4 ft thick. SP---------- | 17.0 |
| 66 | Shale, gray, soft, and some very thin interbedded sandstone, gray, very fine grained, current ripple bedding. BF-SP-------- | 18.0 |
| 65 | Sandstone, gray, very fine grained, silty. SP---------- | 7.5 |
| 64 | Shale, gray, soft. BF---------- | 4.0 |
| 63 | Coal. SW---------- | 2.0+ |
| 62 | Covered---------- | 70.0 |
| 61 | Shale, dark gray. BF---------- | 2.0 |
| 60 | Shale, dark gray, carbonaceous. SW---------- | 2.5 |
| 59 | Shale, dark gray, soft. BF---------- | 5.5 |

Section A478.

Measured on north-south trending tributary of Elusive Creek in W 1/2 sec. 1, T. 2 S., R. 36 W., W 1/2 sec. 36, W 1/2 sec. 25 and W 1/2 sec. 24, T. 1 S., R. 36 W.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part)--continued | |
| 58 | Sandstone, gray, very fine grained, thin current ripple bedded. SP---------- | 4.5 |
| 57 | Shale, dark gray, very silty. BF---------- | 6.0 |
| 56 | Sandstone, gray, very fine grained, silty, and some very thin interbedded siltstone, gray, current ripple bedded; fines upward with some very thin interbedded shale, gray, very silty, at the top. SP---------- | 20.0 |
| 55 | Shale, dark gray, and a few laminae of sandstone, gray, very fine grained. BF---------- | 10.0 |
| 54 | Coal. SW---------- | 11.6 |
| 53 | Shale, gray, soft. BF---------- | 8.6 |
| 52 | Sandstone, gray, very fine grained, silty, current ripple bedded. DS---------- | 2.4 |
| 51 | Covered.---------- | 16.0 |
| 50 | Shale, black, very carbonaceous to coaly. SW---------- | 0.3 |
| 49 | Shale, dark gray, soft. BF---------- | 3.6 |
| 48 | Sandstone, gray, very fine grained, silty, and very thinly interbedded siltstone, gray, current ripple bedding; one 0.2-ft thick limestone, gray silty, 1.5 ft below the top. SP------ | 3.5 |
| 47 | Shale, dark gray, and some very thin interbedded sandstone, gray, very fine grained. DS---------- | 17.2 |
| 46 | Coal, contains gray carbonaceous shale partings. SW---------- | 1.5 |
| 45 | Shale, dark gray. BF---------- | 1.8 |
| 44 | Sandstone, gray, very fine grained, very silty, current ripple bedded; some horizontal burrows; rooted near the top. SP------- | 4.8 |
| 43 | Shale, dark gray, and some very thin interbedded and interlaminated sandstone, gray, very fine grained, silty, and siltstone, gray. BF-DS---------- | 9.5 |

Section A478

Measured on north-south trending tributary of Elusive Creek in W 1/2 sec. 1, T. 2 S., R. 36 W., W 1/2 sec. 36, W 1/2 sec. 25 and W 1/2 sec. 24, T. 1 S., R. 36 W.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part)--continued | |
| 42 | Sandstone, gray, very fine grained, very silty. SP---------- | 4.0 |
| 41 | Shale, dark gray, soft, some very silty laminae. BF---------- | 10.5 |
| 40 | Sandstone, gray, very fine grained, current ripple bedded. DS- | 1.0 |
| 39 | Covered.---------- | 89.0 |
| 38 | Sandstone, gray, very fine grained, calcareous, current ripple bedded. SP---------- | 11.0 |
| 37 | Covered---------- | 402.0 |
| 36 | Sandstone, gray, very fine grained, current ripple bedded. SP- | 7.0 |
| 35 | Covered---------- | 392.0 |
| 34 | Sandstone, gray, very fine to medium grained, poorly sorted, subangular. DC---------- | 19.0 |
| 33 | Covered.---------- | 98.0 |
| 32 | Sandstone, gray, very fine to medium grained, poorly sorted, subangular; large scale, low angle trough crossbedded. DC----- | 14.0 |
| 31 | Covered---------- | 24.0 |
| 30 | Mostly covered. Slope rubble is mostly shale, gray, and some sandstone, gray, very fine grained. BF-DS---------- | 22.0 |
| 29 | Covered---------- | 110.0 |
| 28 | Sandstone, gray, very fine grained, silty. SP---------- | 8.0 |
| 27 | Covered---------- | 81.0 |
| 26 | Sandstone, gray, very fine to fine grained, poorly sorted, subangular. DS---------- | 12.0 |
| 25 | Covered---------- | 195.0 |
| 24 | Sandstone, gray, very fine grained. SP---------- | 5.0 |

Section A478

Measured on north-south trending tributary of Elusive Creek in W 1/2 sec. 1, T. 2 S., R. 36 W., W 1/2 sec. 36, W 1/2 sec. 25 and W 1/2 sec. 24, T. 1 S., R. 36 W.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part)--continued | |
| 23 | Covered. Probably gray shale---------- | 665.0 |
| | Corwin Formation (part)--------- | 2,518.3 |
| | Kukpowruk Formation: | |
| 22 | Sandstone, gray, very fine to fine grained, fairly well sorted, no visible bedding. DC---------- | 16.0 |
| 21 | Poorly exposed shale, gray. BF---------- | 48.0 |
| 20 | Sandstone, gray, very fine to medium grained, poorly sorted, subangular, thin fairly small scale trough crossbedded. DC---- | 10.0 |
| 19 | Poorly exposed shale, gray. BF---------- | 20.0 |
| 18 | Sandstone, gray, very fine to fine grained, fairly well sorted, current ripple bedded; part of unit looks like a SP---------- | 48.0 |
| 17 | Poorly exposed shale, gray and very thin interbedded sandstone, gray, very fine grained, silty. PD---------- | 102.0 |
| 16 | Sandstone, gray, very fine to medium grained, poorly sorted, subangular, abundant dark grains; no visible bedding. DC------ | 23.0 |
| 15 | Poorly exposed. Probably mostly shale---------- | 38.0 |
| 14 | Sandstone, gray, very fine to medium grained in the lower part, fines upward to very fine grained the upper 4.0 ft. DC-SP----- | 10.0 |
| 13 | Shale, gray. BF---------- | 9.0 |
| 12 | Sandstone, gray, very fine to medium grained, poorly sorted, subangular, abundant dark grains. DC---------- | 17.0 |
| 11 | Poorly exposed shale, gray. BF---------- | 19.0 |
| 10 | Sandstone, gray, very fine to medium grained, poorly sorted, subangular, abundant dark grains. DC---------- | 11.0 |
| 9 | Poorly exposed. some shale, gray, silty, and some black layers with finely disseminated carbonaceous material. BF---------- | 85.0 |
| 8 | Sandstone, gray, very fine to medium grained, poorly sorted, subangular, abundant dark grains. DC---------- | 9.0 |

Section A478

Measured on north-south trending tributary of Elusive Creek in W 1/2 sec. 1, T. 2 S., R. 36 W., W 1/2 sec. 36, W 1/2 sec. 25 and W 1/2 sec. 24, T. 1 S., R. 36 W.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Kukpowruk Formation (part)--continued | |
| 7 | Shale, gray, silty. BF---------- | 14.0 |
| 6 | Sandstone, gray, very fine grained, calcareous, no visible bedding.---------- | 17.0 |
| 5 | Covered. Probably mostly shale.---------- | 22.0 |
| 4 | Sandstone, gray, very fine to fine grained, poorly sorted, subangular, scattered plant impressions. DC---------- | 23.0 |
| 3 | Covered. Probably mostly gray shale.---------- | 92.0 |
| 2 | Sandstone, gray, very fine to fine grained, poorly sorted, subangular, some dark grains, no visible bedding.---------- | 16.0 |
| | Kukpowruk Formation | 649.0 |
| | Torok Formation (part): | |
| 1 | Covered. Probably gray shale.---------- | 60.0+ |

## Section A578

Measured on Elusive Creek in a south to north direction in the EC sec. 23, T. 1 S., R. 36 W.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part): | |
| 16 | Sandstone, gray, very fine to medium grained, poorly sorted, subangular; some clay galls and carbonaceous plant impressions. DC | 38.0+ |
| 15 | Shale, dark gray, silty. BF | 25.0 |
| 14 | Coal. SW | 2.0+ |
| 13 | Covered | 82.0 |
| 12 | Sandstone, gray, very fine to medium grained, poorly sorted, subangular; some limestone concretions. | 9.0 |
| 11 | Shale, gray, silty. BF | 7.5 |
| 10 | Coal. SW | 2.0+ |
| 9 | Covered | 87.5 |
| 8 | Sandstone, gray, very fine grained, current ripple bedded, and some very thin interbedded siltstone, gray. SP | 12.5 |
| 7 | Shale, gray and some very thin interbedded sandstone. | 21.4 |
| 6 | Shale, gray. BF | 5.2 |
| 5 | Coal, bright and dull banded. | 2.1 |
| | Coal, bright banded with some dull bands. | 3.9 |
| | Coal, thin bright banded and sparse dull coal bands. | 1.1 |
| | Coal, bright, banded. | 2.0 |
| | Fusain. | .03 |
| | Coal, bright banded and sparse dull coal bands. | 1.0 |
| | Fusain, top, bottom, and bright bands in the middle. | 0.7 |
| | Coal, bright, banded. | 0.7 |
| | Fusain. | 0.1 |
| | Coal, bright banded. | 0.9 |
| | Shale, dark gray, very carbonaceous. | 0.4 |
| | Coal, bright, banded. | 0.2 |
| | Shale, dark gray, very carbonaceous. | 0.4 |
| | Coal, bright banded. | 0.2 |
| | | 13.73 |

Face cleat direction N12W
Butt cleat direction N86E

Section A578

Measured on Elusive Creek in a south to north direction in the EC sec. 23, T. 1 S., R. 36 W.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part): | |
| 4 | Shale, dark gray, slightly carbonaceous, and a few laminae of siltstone, gray, calcareous. DS---------- | 8.6 |
| 3 | Sandstone, gray, very fine grained, silty, current ripple bedded, abundant carbonaceous material. SP---------- | 5.4 |
| 2 | Sandstone, gray, very fine grained; carbonaceous partings; low angle, small scale, trough crossbedding, lenticular; a splay channel scoured into the underlying shale. SP---------- | 3.1 |
| 1 | Shale, gray, silty. BF---------- | 2.0 |
| | Corwin Formation (part) | 324.93 |

Section A678

Measured on Elusive Creek in a south to north direction in the NE 1/4 sec. 24, T. 1 S., R. 36 W.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part): | |
| 16 | Sandstone, gray, very fine grained, small scale, fairly high angle trough crossbedded; a very large distributary channel. Two large sandstone benches above Bed 16 to the north suggest an upper delta plain environment. DC---------- | 15.0+ |
| 15 | Slope covered with coal rubble. SW---------- | 5.0 |
| 14 | Shale, gray, and some very thin interbedded sandstone, gray, very fine grained. BF-SP---------- | 29.0 |
| 13 | Covered---------- | 45.0 |
| 12 | Covered. Slope rubble indicates mostly shale with a splay sandstone at the top.---------- | 20.0 |
| 11 | Slope covered with coal rubble. SW---------- | 5.0 |
| 10 | Covered---------- | 40.0 |
| 9 | Slope covered with coal rubble. SW---------- | 5.0 |
| 8 | Shale, dark gray. BF---------- | 10.0 |
| 7 | Sandstone, gray, very fine grained, silty, current ripple bedded; a very large splay.---------- | 16.0 |
| 6 | Covered. Mostly shale at the base.---------- | 17.0 |
| 5 | Coal---------- | 9.8 |
| 4 | Shale, gray, soft, and a few very thin interbedded sandstone, gray, very fine grained, very silty. BF-DS---------- | 34.0 |
| 3 | Limestone, gray, silty, irregularly bedded.---------- | 0.4 |
| 2 | Shale, gray, very silty. BF---------- | 0.9 |
| 1 | Sandstone, gray, very fine grained, very silty, some limestone nodules, gray, 1.5 ft below the top.---------- | 5.0+ |
| | Corwin Formation (part) | 257.1 |

Section A778

Measured in the NC sec. 9, T. 1 S., R. 38 W. Along tributary of Avingak Creek.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part): | |
| 22 | Sandstone, gray, very fine to very coarse grained, poorly sorted, subangular, abundant dark grains. DC---------- | 28.0 |
| 21 | Covered---------- | 204.0 |
| 20 | Slope covered with coal rubble. SW---------- | 5.0 |
| 19 | Covered---------- | 124.0 |
| 18 | Sandstone, gray, very fine to medium grained, poorly sorted, subangular; small scale trough crossbedded. DC---------- | 8.0 |
| 17 | Covered---------- | 72.0 |
| 16 | Sandstone, gray, very fine to medium grained, poorly sorted, subangular, abundant dark grains; small scale, low angle trough crossbedded. DC---------- | 18.2 |
| 15 | Shale, dark gray. BF---------- | 8.0 |
| 14 | Shale, dark gray, carbonaceous; some laminae of bone coal. SW- | 4.0 |
| 13 | Shale, dark gray. BF---------- | 2.0 |
| 12 | Sandstone, gray, very fine grained, current ripple bedded. SP- | 4.5 |
| 11 | Covered---------- | 25.5 |
| 10 | Sandstone, gray, very fine grained. SP---------- | 5.5 |
| 9 | Shale, dark gray. BF---------- | 2.0 |
| 8 | Slope covered with coal rubble.---------- | 5.0 |
| 7 | Covered---------- | 38.0 |
| 6 | Shale, dark gray. BF---------- | 5.0 |
| 5 | Sandstone, gray, very fine grained, current ripple bedded. SP- | 4.5 |
| 4 | Shale, dark gray. BF---------- | 1.6 |
| 3 | Shale, dark gray, carbonaceous, some laminae of coal. SW------ | 1.0 |

## Section A778

Measured in the NC sec. 9, T. 1 S., R. 38 W. Along tributary of Avingak Creek.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part)--continued | |
| 2 | Shale, dark gray. BF---------- | 12.0 |
| 1 | Sandstone, gray, very fine grained, current ripple bedded. SP- | 2.0 |
| | Corwin Formation (part) | 574.8 |

## Section A878

Measured on the east slope of the Utukok River in secs. 20, 21, and 28, T. 1 N., R. 33 W.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part): | |
| 42 | Sandstone, gray, very fine to medium grained, poorly sorted, subangular; abundant wood and plant impressions; small- to large-scale trough crossbedded; a thick narrow distributary channel. | 13.0 |
| 41 | Shale, dark gray, and some very thin interbedded sandstone, gray, very fine grained, silty. BF-DS | 124.0 |
| 40 | Shale, dark gray. BF | 2.0 |
| 39 | Sandstone, gray, very fine grained, current ripple bedded. SP- | 2.5 |
| 38 | Shale, dark gray. BF | 2.0 |
| 37 | Covered | 30.0 |
| 36 | Sandstone, gray, silty, very fine grained, current ripple bedded, and some very thin interbedded shale, gray, very silty at the top. SP-BF | 7.5 |
| 35 | Covered. Coal rubble covers 5.0 ft of slope 20 feet below top- | 56.0 |
| 34 | Slope covered with coal rubble. SW | 5.0 |
| 33 | Covered. Topography suggests shale and very thin interbedded sandstone. BF-DS | 157.0 |
| 32 | Coal. SW | 0.5 |
| 31 | Shale, gray, soft. BF | 5.0 |
| 30 | Sandstone, gray, very fine grained, silty, current ripple bedded. SP | 0.5 |
| 29 | Shale, gray, soft. BF | 4.0 |
| 28 | Slope covered with coal rubble. SW | 5.0 |
| 27 | Shale, gray, soft, and some very thin interbedded sandstone, gray, very fine grained, silty. BF-DS | 49.0 |
| 26 | Sandstone, gray, very fine grained, current ripple bedded. SP- | 1.8 |

Section A878

Measured on the east slope of the Utukok River in secs. 20, 21, and 28, T. 1 N., R. 33 W.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part)--continued | |
| 25 | Shale, dark gray, and sparse very thin interbedded sandstone, gray, very fine grained. BF-SP---------- | 51.0 |
| 24 | Covered. Slope rubble and topography suggest a bay shale fill and distal splay sandstone interval.---------- | 130.0 |
| 23 | Coal. SW---------- | 1.5 |
| 22 | Covered. Slope rubble and topography suggest a bay fill shale and distal splay sandstone interval.---------- | 20.0 |
| 21 | Slope covered with coal rubble. SW---------- | 5.0 |
| 20 | Covered. Slope rubble and topography suggest a bay fill shale and distal splay sandstone interval.---------- | 120.0 |
| 19 | Slope covered with coal rubble. SW---------- | 5.0 |
| 18 | Covered. Slope rubble suggests a bay fill shale and distal splay sandstone interval.---------- | 136.0 |
| 17 | Poorly exposed. Shale, gray, and some interbedded siltstone, gray. BF-DS---------- | 24.0 |
| 16 | Slope rubble composed of carbonaceous shale. SW---------- | 5.0 |
| 15 | Covered. Topography and slope rubble indicate shale, gray, and some thin interbedded sandstone, gray, very fine grained. BF-DS---------- | 160.0 |
| 14 | Sandstone, gray, very fine to medium grained, poorly sorted, subangular. DC---------- | 6.0 |
| 13 | Shale, dark gray. BF---------- | 3.0 |
| 12 | Slope covered with coal rubble. SW---------- | 5.0 |
| 11 | Covered. Slope rubble is mostly gray shale and some very thin gray sandstone.---------- | 235.0 |
| 10 | Sandstone, gray, very fine to fine grained, poorly sorted, current ripple bedded; some small scale trough crossbedded. SP | 7.5 |
| 9 | Covered---------- | 28.0 |

Section A878

Measured on the east slope of the Utukok River in secs. 20, 21, and 28, T. 1 N., R. 33 W.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part)--continued | |
| 8 | Slope covered with coal rubble. SW---------- | 5.0 |
| 7 | Shale, dark gray, and some very thin interbedded sandstone, gray very fine grained. BF-DS---------- | 14.0 |
| 6 | Sandstone, gray, very fine to medium grained, poorly sorted, subangular, abundant dark grains; large scale, low angle, trough crossbedded. DC---------- | 47.0 |
| 5 | Mostly covered. Slope rubble indicates mostly dark gray shale and some very thin interbedded sandstone; one carbonaceous shale about 30 ft above the base; the upper 5 ft are dark gray shale. BF-SP---------- | 94.0 |
| 4 | Slope covered with carbonaceous shale and coal rubble. SW----- | 5.0 |
| 3 | Shale, gray, soft. BF---------- | 5.0 |
| 2 | Sandstone, gray, very fine grained. SP---------- | 2.0 |
| 1 | Shale, dark gray, soft. BF---------- | 9.0 |
| | Corwin Formation (part) | 1,587.8 |

## Section A978

Measured on the east slope of the Kokolik River in a southward direction through the center of sec. 34, T. 1 S., R. 40 W., and the north-center of sec. 3, T. 2 S., R. 40 W.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Undivided Corwin Formation (part): | |
| 53 | Shale, dark gray. BF---------- | 3.0 |
| 52 | Sandstone, gray, very fine grained, silty, current ripple bedded. SP---------- | 2.2 |
| 51 | Shale, dark gray. BF---------- | 2.5 |
| 50 | Sandstone, gray, very fine grained, silty. SP---------- | 2.4 |
| 49 | Shale, dark gray. BF---------- | 7.0 |
| 48 | Shale, black, and some laminae of bone coal. SW---------- | 1.0 |
| 47 | Coal. SW---------- | 0.3 |
| 46 | Shale, dark gray, a few laminae of bone coal. SW---------- | 4.5 |
| 45 | Sandstone, gray, very fine grained, very silty, current ripple bedded, and thinly interbedded shale, dark gray, silty, SP-BF | 5.5 |
| 44 | Shale, dark gray, black, some carbonaceous layers. SW--------- | 36.0 |
| 43 | Sandstone, gray, very fine grained, current ripple bedded; some small scale trough crossbedding. SP---------- | 5.5 |
| 42 | Shale, very dark gray, silty. BF---------- | 3.5 |
| 41 | Sandstone, gray, very fine grained. SP---------- | 4.0 |
| 40 | Shale, dark gray, some silty laminae. BF---------- | 13.0 |
| 39 | Sandstone, gray, very fine grained, silty, and thin interbedded siltstone, gray; interval fines upward. SP---------- | 20.5 |
| 38 | Sandstone, gray, very fine grained, some tabular crossbedded and some current ripple bedded. SP-DC---------- | 13.0 |
| 37 | Covered---------- | 20.0 |
| 36 | Sandstone, gray, very fine grained. SP---------- | 8.5 |
| 35 | Covered. Probably mostly shale.---------- | 22.0 |

Section A978

Measured on the east slope of the Kokolik River in a southward direction through the center of sec. 34, T. 1 S., R. 40 W., and the north-center of sec. 3, T. 2 S., R. 40 W.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Undivided Corwin Formation (part)--continued | |
| 34 | Sandstone, gray, very fine to medium grained, poorly sorted, subangular; some carbonaceous inclusions and plant impressions; large scale, low angle tabular crossbedded; weathers to large ridge. DC | 18.0 |
| 33 | Covered. | 285.0 |
| | Corwin Formation (part) | 1,748.0 |
| | Kukpowruk Formation: | |
| 32 | Sandstone, gray, very fine grained, calcareous, very hard; tabular corssbedded. DC | 9.0 |
| 31 | Slope covered with sandstone rubble. | 42.0 |
| 30 | Sandstone, gray, very fine grained; very thin tabular crossbedded. DC | 15.0 |
| 29 | Covered. Probably a bay fill shale and distal splay sandstone sequence. | 114.0 |
| 28 | Sandstone, gray, very fine grained, subangular; tabular large scale, low-angle trough crossbedded. DC | 8.0 |
| 27 | Shale, dark gray, silty. | 54.0 |
| 26 | Sandstone, gray, very fine grained. DC | 7.0 |
| 25 | Covered. Probably a bay fill shale and distal splay sandstone sequence. | 155.0 |
| 24 | Sandstone, gray, very fine grained, shaly in the middle, tabular crossbedded. DC | 14.0 |
| 23 | Covered | 116.0 |
| 22 | Sandstone, gray, very fine to medium grained, poorly sorted, subangular; tabular, large-scale, low-angle trough crossbedded. DC | 19.0 |
| 21 | Shale, dark gray, and some very thin interbedded sandstone, gray, very fine grained. BF-DS | 22.0 |

Section A978

Measured on the east slope of the Kokolik River in a southward direction through the center of sec. 34, T. 1 S., R. 40 W., and the north-center of sec. 3, T. 2 S., R. 40 W.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Kukpowruk Formation--continued | |
| 20 | Sandstone, gray, very fine to fine grained, poorly sorted, subangular; tabular, large-scale, low-angle trough crossbedded. DC---------- | 12.0 |
| 19 | Shale, dark gray, and some very thin interbedded sandstone, gray, very fine grained. BF-DC---------- | 102.0 |
| 18 | Sandstone, gray, very fine to fine grained; very thin, tabular trough crossbedded. DC---------- | 5.0 |
| 17 | Covered. Looks like bay fill shale.---------- | 35.0 |
| 16 | Sandstone, gray, very fine grained. SP---------- | 3.0 |
| 15 | Covered. Slope rubble is shale, dark gray, silty, and sparse thin interbedded siltstone, gray, and sandstone, gray, very fine grained.---------- | 228.0 |
| 14 | Poorly exposed sandstone, gray, very fine grained, tabular, crossbedded. DC---------- | 5.0 |
| 13 | Covered---------- | 95.0 |
| 12 | Sandstone, gray, very fine grained. DC---------- | 5.0 |
| 11 | Mostly covered. Some shale, gray, in the lower part of the interval.---------- | 347.0 |
| 10 | Sandstone, gray, very fine to fine grained, fairly well sorted, subangular; large-scale, low-angle, trough crossbedded. DC---- | 11.0 |
| 9 | Very poorly exposed. Shale, dark gray, silty, and some very thin interbedded siltstone, gray. BF-DS---------- | 118.0 |
| 8 | Sandstone, gray, very fine to fine grained, poorly sorted, subangular, abundant black and white grains; low angle, fairly large scale, trough crossbedded. DC---------- | 14.0 |
| 7 | Covered---------- | 97.0 |
| 6 | Sandstone, gray, very fine grained; thin, low angle, tabular crossbedded. DC---------- | 5.0 |
| 5 | Covered---------- | 42.0 |

## Section A978

Measured on the east slope of the Kokolik River in a southward direction through the center of sec. 34, T. 1 S., R. 40 W., and the north-center of sec. 3, T. 2 S., R. 40 W.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Kukpowruk Formation--continued | |
| 4 | Sandstone, gray, very fine to fine grained, poorly sorted, subangular; tabular, low-angle trough crosssbedded. DC--------- | 12.0 |
| 3 | Siltstone, gray, very shaly. BF---------- | 26.0 |
| 2 | Sandstone, gray, very fine grained, calcareous; tabular, low angle trough crossbedded. DC---------- | 11.0 |
| | Kukpowruk Formation (part) | 477.4 |
| | Torok Formation (part): | |
| 1 | Poorly exposed. Shale, gray, mostly covered by terrace gravels on low benches.---------- | 75.0+ |

Section A1078

Measured on the west slope of the Kokolik River in a southwesterly direction in SW 1/4 sec. 33, T. 1 S., R. 40 W., and E 1/2 NE 1/4 sec. 5, T. 2 S., R. 40 W.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part): | |
| 30 | Sandstone, gray, very fine to medium grained; small scale, trough crossbedded with current ripples. DC---------- | 12.5 |
| 29 | Covered---------- | 82.0 |
| 28 | Slope covered with coal rubble. SW---------- | 5.0 |
| 27 | Covered---------- | 15.0 |
| 26 | Sandstone, gray, very fine to medium grained, poorly sorted, subangular; large-scale, low-angle trough corssbedded. DC----- | 26.0 |
| 25 | Covered---------- | 105.0 |
| 24 | Shale, dark gray, and some very thin interbedded sandstone, gray, very fine grained, silty. BF-SP---------- | 12.0 |
| 23 | Covered---------- | 44.0 |
| 22 | Poorly exposed sandstone, gray, very fine grained.---------- | 10.0 |
| 21 | Covered---------- | 90.0 |
| 20 | Sandstone, gray, very fine grained. Probably a splay.--------- | 2.0 |
| 19 | Shale, dark gray, carbonaceous at the top and some very thin interbedded sandstone, gray, very fine grained. BF-DS--------- | 15.0 |
| 18 | Covered---------- | 24.0 |
| 17 | Sandstone, gray, very fine grained, silty, current ripple bedded. SP---------- | 1.5 |
| 16 | Shale, dark gray, and some very thin interbedded sandstone, gray, very fine grained, silty. BF-DS---------- | 26.0 |
| 15 | Covered. Slope rubble suggests shale, gray and sandstone, gray, very fine grained. BF-DS---------- | 25.0 |
| 14 | Shale, dark gray, silty, and very thin interbedded sandstone, gray, very fine grained, silty. BF-DS---------- | 25.0 |

Section A1078

Measured on the west slope of the Kokolik River in a southwesterly direction in SW 1/4 sec. 33, T. 1 S., R. 40 W., and E 1/2 NE 1/4 sec. 5, T. 2 S., R. 40 W.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part)--continued | |
| 13 | Sandstone, gray, very fine grained, silty, low-angle tabular crossbedded with scour surface at the base; large-scale, low-angle trough crossbedded in the middle; current ripple bedded at the top; fines upward. SP---------- | 42.0 |
| 12 | Shale, dark gray, and finely interbedded sandstone, gray, very fine grained, and siltstone, gray. BF-DS---------- | 3.5 |
| 11 | Shale, dark gray, slightly carbonaceous. SW---------- | 2.5 |
| 10 | Coal. SW---------- | 0.8 |
| 9 | Shale, dark gray, carbonaceous. SW---------- | 2.6 |
| 8 | Siltstone, gray, current ripple bedded. DS---------- | 12.0 |
| 7 | Shale, very dark gray. BF---------- | 8.0 |
| 6 | Sandstone, gray, very fine grained, silty, and interbedded Siltstone, gray, at the top; fines upward. SP---------- | 11.6 |
| 5 | Shale, dark gray to black, and some very thin interbedded sandstone, gray, very fine grained, silty. BF-DS---------- | 42.0 |
| 4 | Sandstone, gray, very fine grained, current ripple bedded. SP- | 6.5 |
| 3 | Shale, dark gray, and very finely interbedded siltstone, gray. BF-DS---------- | 7.0 |
| 2 | Sandstone, gray, very fine grained, current ripple bedded. SP- | 2.0 |
| 1 | Sandstone, gray, very fine to medium grained, poorly sorted, subangular. Only the upper part is exposed.---------- | 10.0 |
| | Corwin Formation (part) | 670.5 |

## Section A1178

Measured on the east slopes of the Kokolik River in a southerly direction in SW 1/4 sec. 4 and NC sec. 9, T. 2 S., R. 40 W.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part): | |
| 42 | Shale, black, carbonaceous. SW---------- | 12.0 |
| 41 | Sandstone, gray, very fine grained, silty, and thinly interbedded shale, gray, very silty. SP---------- | 5.5 |
| 40 | Shale, dark gray, silty. BF---------- | 3.2 |
| 39 | Sandstone, gray, very fine grained, silty, current ripple bedding. SP---------- | 6.8 |
| 38 | Mostly covered. Lower 10 ft are gray shale and thin gray sandstone. BF---------- | 24.0 |
| 37 | Shale, dark gray, and some laminae of bone coal. SW---------- | 5.0 |
| 36 | Covered---------- | 35.0 |
| 35 | Shale, dark gray, silty, and some very thin interbedded sandstone, gray, very fine grained. BF-DS---------- | 8.0 |
| 34 | Shale, dark gray, and some interbedded bone coal. SW---------- | 3.0 |
| 33 | Shale, gray. BF---------- | 1.0 |
| 32 | Sandstone, gray, very fine grained, silty, current ripple bedded. SP---------- | 4.5 |
| 31 | Covered---------- | 75.0 |
| 30 | Shale, dark gray, and some laminae of bone coal. SW---------- | 5.0 |
| 29 | Sandstone, gray, very fine grained, silty. SP---------- | 3.0 |
| 28 | Covered---------- | 22.0 |
| 27 | Sandstone, gray, very fine to fine grained, poorly sorted, subangular; tabular crossbedded. DC---------- | 14.0 |
| 26 | Covered---------- | 67.0 |
| 25 | Shale, dark gray. BF---------- | 5.0 |
| 24 | Sandstone, gray, very fine grained, silty, current ripple bedded. SP---------- | 2.5 |

Section A1178

Measured on the east slopes of the Kokolik River in a southerly direction in SW 1/4 sec. 4 and NC sec. 9, T. 2 S., R. 40 W.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part)--continued | |
| 23 | Slope covered with carbonaceous shale and coal rubble. SW----- | 5.0 |
| 22 | Covered---------- | 23.0 |
| 21 | Sandstone, gray, very fine grained, silty, current ripple bedded. SP---------- | 3.0 |
| 20 | Shale, gray, silty, and a few laminae of sandstone, gray, very fine grained. BF---------- | 7.5 |
| 19 | Sandstone, gray, very fine grained, current ripple bedding, and thin interbedded shale, gray, very silty. SP---------- | 13.0 |
| 18 | Shale, dark gray, silty. BF---------- | 10.0 |
| 17 | Shale, dark gray, carbonaceous, and some very thin laminae of bone coal. SW---------- | 5.0 |
| 16 | Shale, dark gray, silty, and some very thin interbedded sandstone, gray, very fine grained, silty. BF-DS---------- | 30.0 |
| 15 | Covered---------- | 30.0 |
| 14 | Shale, dark gray, silty, and some very thin interbedded sandstone, gray, very fine grained, silty. BF-DS---------- | 22.0 |
| 13 | Covered---------- | 27.0 |
| 12 | Shale, black. BF---------- | 5.0 |
| 11 | Sandstone, gray, very fine grained, silty, current ripple bedded. SP---------- | 10.0 |
| 10 | Covered---------- | 25.0 |
| 9 | Shale, dark gray, and some very thin interbedded sandstone, gray, very fine grained. BF-SP---------- | 10.0 |
| 8 | Covered---------- | 15.0 |
| 7 | Shale, dark gray, and some very thin interbedded sandstone, gray, very fine grained. BF-SP---------- | 33.0 |

Section A1178

Measured on the east slopes of the Kokolik River in a southerly direction in SW 1/4 sec. 4 and NC sec. 9, T. 2 S., R. 40 W.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part)--continued | |
| 6 | Sandstone, gray, very fine to medium grained, poorly sorted, subangular; tabular crossbedded; fines upward. DC---------- | 12.5 |
| 5 | Covered---------- | 14.0 |
| 4 | Shale, dark gray, carbonaceous, and a few laminae of bone coal. SW---------- | 3.0 |
| 3 | Shale, dark gray. BF---------- | 3.5 |
| 2 | Sandstone, gray, very fine grained, silty, current ripple bedded. SP---------- | 3.5 |
| 1 | Shale, dark gray, and some very thin interbedded sandstone, gray, very fine grained, silty. SP-BF---------- | 20.0 |
| | Corwin Formation (part) | 631.5 |

## Section A1278

Measured in a west to east direction on the north slopes of the Utukok River in the SC sec. 10, T. # N., R. 35 W. Location shown on plate 1; section not shown on plate 2.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part): | |
| 20 | Shale, dark gray, partly carbonaceous. BF---------- | 6.0 |
| 19 | Shale, dark gray, very carbonaceous, and some laminae of coal. SW---------- | 1.0 |
| 18 | Sandstone, gray, very fine grained, silty, current ripple bedded. DS---------- | 1.8 |
| 17 | Shale, dark gray, and some very thin interbedded sandstone, gray, very fine grained, silty. BF-SP---------- | 4.4 |
| 16 | Sandstone, gray, very fine grained, silty, current ripple bedded. SP---------- | 2.2 |
| 15 | Shale, dark gray, carbonaceous. SW---------- | 0.7 |
| 14 | Coal. SW---------- | 1.2 |
| 13 | Shale, dark gray, carbonaceous. SW---------- | 0.2 |
| 12 | Coal. SW---------- | 0.3 |
| 11 | Shale, gray, partly carbonaceous, and thin interbedded siltstone, gray. BF-DS---------- | 25.0 |
| 10 | Shale, dark gray, silty, and some thin interbedded siltstone, gray, shaly. BF-DS---------- | 13.0 |
| 9 | Coal. SW---------- | 0.1 |
| 8 | Shale, dark gray, carbonaceous. SW---------- | 0.7 |
| 7 | Coal, bright. SW---------- | 0.7 |
| 6 | Shale, dark gray, carbonaceous. SW---------- | 0.2 |
| 5 | Sandstone, gray, very fine grained, current ripple bedded; 1/4-inch wide smooth-walled vertical burrows; some root casts. SP---------- | 1.4 |
| 4 | Shale, dark gray, carbonaceous, with laminae of coal. SW------ | 0.9 |

## Section A1278

Measured in a west to east direction on the north slopes of the Utukok River in the SC sec. 10, T. # N., R. 35 W. Location shown on plate 1; section not shown on plate 2.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part)--continued | |
| 3 | Sandstone, gray, very fine grained, silty, current ripple bedded. SP---------- | 1.6 |
| 2 | Shale, dark gray, silty, and some thin interbedded sandstone, gray, very fine grained, and siltstone, gray. BF-DS---------- | 16.8 |
| 1 | Sandstone, gray, very fine grained; low angle, large-scale trough crossbedded, plant impressions. DC---------- | 25.0+ |
| | Corwin Formation (part) | 103.2 |

## Section A1378

Measured on the east slope of the Kokolik River in a south to north direction in NW 1/4 NW 1/4 sec. 1, T. 1 N., R. 39 W., C SW 1/4 and SE 1/4 NW 1/4 sec. 36, T. 2 N., R. 39 W. Location shown on plate 1; not shown on plate 2.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part): | |
| 24 | Covered. Slope rubble suggests the presence of a fairly thick coal at the top. SW | 63.0 |
| 23 | Sandstone, gray, very fine grained, some medium-grained, scattered pebbles; some plant impressions; partly tabular crossbedded. DC | 19.0 |
| 22 | Sandstone, gray, very fine grained, silty; current ripple bedded; grades upward into siltstone, gray, current ripple bedded. SP-DS | 13.0 |
| 21 | Shale, gray. BF | 5.0 |
| 20 | Sandstone, gray, very fine grained. SP | 5.5 |
| 19 | Shale, gray, silty, and interbedded 2-3 ft thick siltstone, gray, current ripple bedded. BF-DS | 12.0 |
| 18 | Coal. SW | 6.2 |
| 17 | Shale, gray, hard, large plant impressions. SW | 0.8 |
| 16 | Coal. SW | 4.3 |
| 15 | Siltstone, gray, shaly. DS | 2.5 |
| 14 | Siltstone, gray, sandy, ripple bedded. DS | 2.5 |
| 13 | Shale, gray, very silty. BF | 4.0 |
| 12 | Sandstone, gray, very fine grained; abundant plant impressions; current ripple bedded; fines upward. SP | 5.5 |
| 11 | Siltstone, gray, sandy in parts, current ripple bedded. DS | 12.0 |
| 10 | Sandstone, tan, very fine grained, some medium grained, poorly sorted, subangular; abundant plant impressions; some burrows; some tabular crossbedded and some current ripple bedded; lower 1.0 ft is very thin and flat bedded. SP | 7.0 |
| 9 | Shale, dark gray, silty, top and bottom, and thick interbedded sandstone, gray, very fine grained, very silty, in the middle. BF-DS | 18.0 |

## Section A1378

Measured on the east slope of the Kokolik River in a south to north direction in NW 1/4 NW 1/4 sec. 1, T. 1 N., R. 39 W., C SW 1/4 and SE 1/4 NW 1/4 sec. 36, T. 2 N., R. 39 W. Location shown on plate 1; not shown on plate 2.

| Bed No. | Lithology | Thickness (ft) |
|---|---|---|
| | Corwin Formation (part)--continued | |
| 8 | Coal, bright banded. SW<br>Face cleats parallel dip direction N7W<br>Butt cleats are 90 degrees to face cleats---------- | 3.9 |
| 7 | Sandstone, gray, very fine grained, some medium grained, poorly sorted, subangular, some tabular bedded, plant impressions. DC- | 14.0 |
| 6 | Shale, dark gray, and a few 1.5-3.0 ft thick interbedded sandstone, gray, very fine grained, silty; current ripple bedded. BF-SP---------- | 83.0 |
| 5 | Coal. SW---------- | 8.9 |
| 4 | Shale, dark gray, carbonaceous. SW---------- | 3.0 |
| 3 | Shale, dark gray, and some very thin interbedded sandstone, gray, very fine grained. BF-SP---------- | 31.0 |
| 2 | Sandstone, gray, very fine grained, silty, current ripple bedded. SP---------- | 2.6 |
| 1 | Shale, dark gray, and some very thin interbedded sandstone, gray, very fine grained, silty, current ripple bedded. BF-SP- | 35.0 |
| | Corwin Formation (part) | 361.7 |

## REFERENCES CITED


Ahlbrandt, T. S., 1979, ed., Preliminary Geologic Petrologic, and Palontologic results of the study of Nanushuk Group rocks, North Slope, Alaska, U.S. Geological Survey Circular 794, in press.

Barnes, F. F., 1967, Coal Resources of the Cape Lisbourne-Colville River Region, Alaska: U.S. Geological Survey Bulletin 1242-E, 37 p.

Callahan, J. E., and Sloan, E. G., 1978, Preliminary report on analyses of Cretaceous coals from northwestern Alaska: U.S. Geological Survey Open-File Report 78-319, 29 p.

Chapman, R. M., and Sable, E. G., 1960, Geology of the Utukok-Corwin Region, Northwestern Alaska: U.S. Geological Survey Professional Paper 303-C, 167 p.

Coleman, James M., 1976, Deltas-Processes of Deposition and Models for Exploration: Continuing Education Publication Company, Inc., 102 p.

Fisk, H. N., 1961, Bar-Finger Sands of Mississippi Delta: American Association Petroleum Geologist Symposium Geometry of Sandstone Bodies Volume (1961), p. 29-52.

Horne, J. C., Ferm, J. C., Caruccio, F. T., and Baganz, B. P., 1978, Depositional Models in Coal Exploration and Mine Planning in Appalachian Region: American Association Petroleum Geologists Bulletin, v. 62, no. 12, Dec. 1978, p. 2379-2411.

Martin, G. C. and Callahan, J. E., 1978, Preliminary report on the coal resources of the National Petroleum Reserve in Alaska: U.S. Geological Survey Open-File Report 78-1033, 29 p.

Schrader, F. C., 1904, A reconnaissance in northern Alaska: U.S. Geological Survey Professional Paper 20, 139 p.