GEOLOGIC MAP OF THE SOUTH-CENTRAL SAGAVANIRKTOK QUADRANGLE, NORTH SLOPE, ALASKA

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The bedrock geologic map interpretation of the Sagavanirktok area and associated text and figures appearing on this poster are preliminary, and have not undergone technical review. ***The contents of this poster should not be considered complete or final until it is formally published by DGGS.*** **A peer-reviewed version of this map, unit descriptions, and cross section will appear in a pending, formal DGGS publication.**

This map is a simplified version of the one presented at the Alaska Geological Society Technical Conference, 2009.

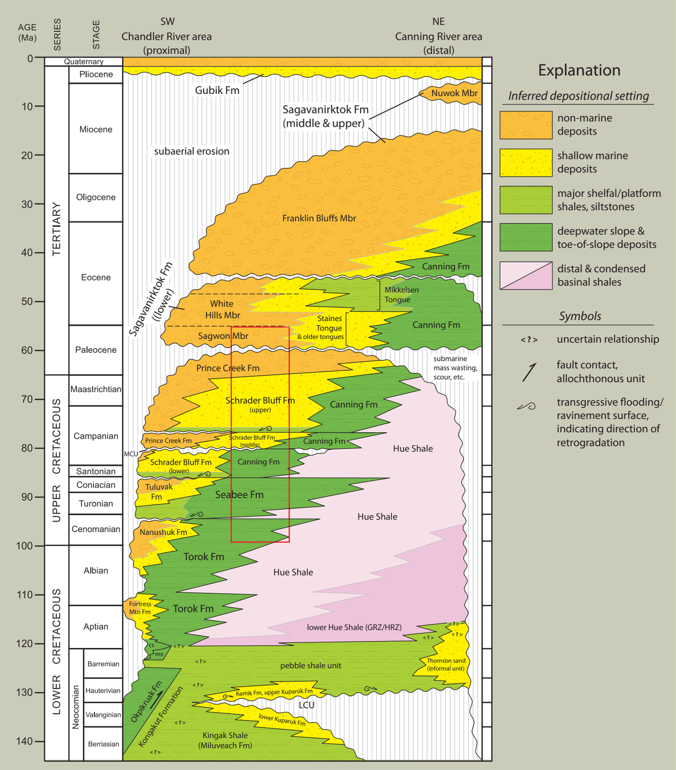
ABSTRACT

Detailed inch-to-mile bedrock geologic mapping, stratigraphic studies, and interpretation of subsurface data in the east-central North Slope foothills provide new insight into stratigraphic evolution and structural style of an otherwise poorly understood area.

Mapping and related stratigraphic studies resulted in the documentation of mappable, northeast prograding, transgressive-regressive cycles within the Campanian-Paleocene Prince Creek-Schrader Bluff-Canning sequence. Canning Formation turbidites identified west of the Toolik River are the westernmost surface exposure of these strata. The Canning Formation at the Toolik River is overlain by a terrestrial lower tongue of the Prince Creek Formation (newly identified in the map area) that thins eastward into marine middle Schrader Bluff Formation east of the Toolik River. The lower tongue of the Prince Creek Formation (elsewhere the middle Schrader Bluff Formation) is separated from the overlying upper Schrader Bluff Formation by a shaley interval that represents a regional Campanian transgressive flooding event prior to the northeastward progradation of the younger part of the Prince Creek-Schrader Bluff-Canning sequence. This shaley interval can be correlated between surface exposures and the subsurface throughout the map area.

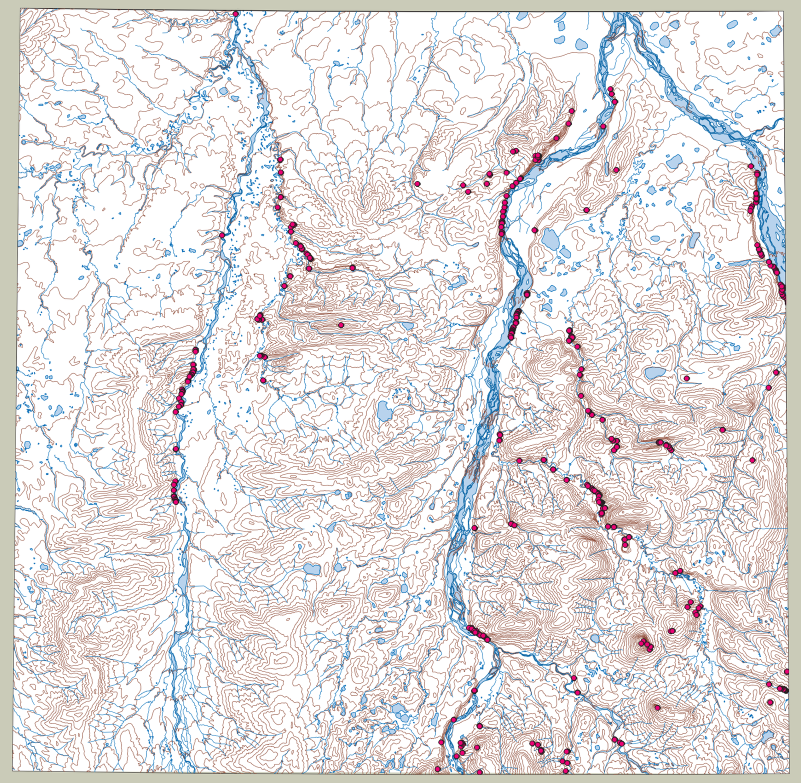
Outcrop exposures in the map area are sparse due to abundant Quaternary cover, however new integration of subsurface information and bedrock mapping shed light into the lateral continuity of regional faults and folds in the area. Most of the faults in the map area lack a significant surface expression, although they result in hangingwall anticline-footwall syncline pairs that sometimes display small-scale faulting and parasitic folding near their cores. The new mapping has improved our understanding of fold geometry, including the recognition of progressive changes in the trend of fold axes, perhaps related to the age of contractional deformation. Furthermore, we were able to document significant variability in the plunge of some large anticlinal structures, a key component in evaluating hydrocarbon trapping mechanisms.

CHRONOSTRATIGRAPHIC CHART



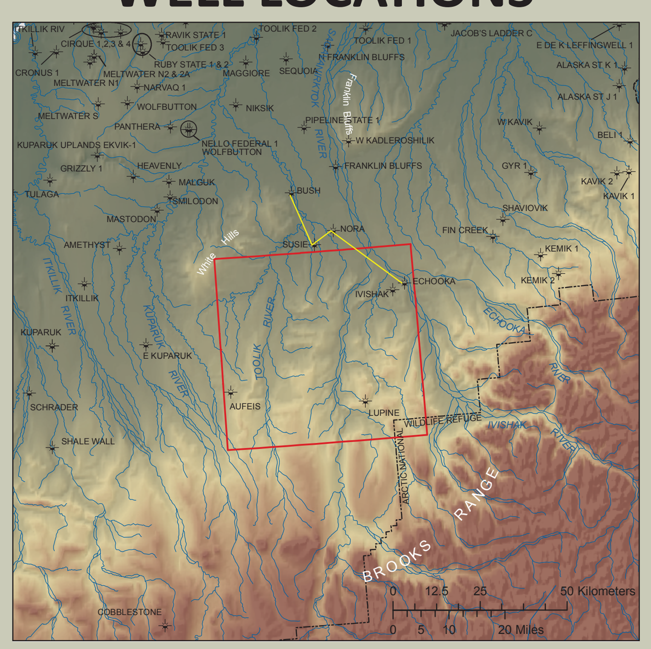
Chronostratigraphic column for the Colville basin, Alaska, revised from Mull and others (2003) and Garrity and others (2005). Abbreviations as follows: Fm, Formation; Mbr, Member; Mtn, Mountain; LCU, Lower Cretaceous unconformity; MCU, mid-Campanian unconformity; cs, Cobblestone sandstone of Fortress Mountain Formation (informal); ms, manganiferous shale unit (informal). The red box approximates stratigraphy exposed in map area.

STATION LOCATIONS



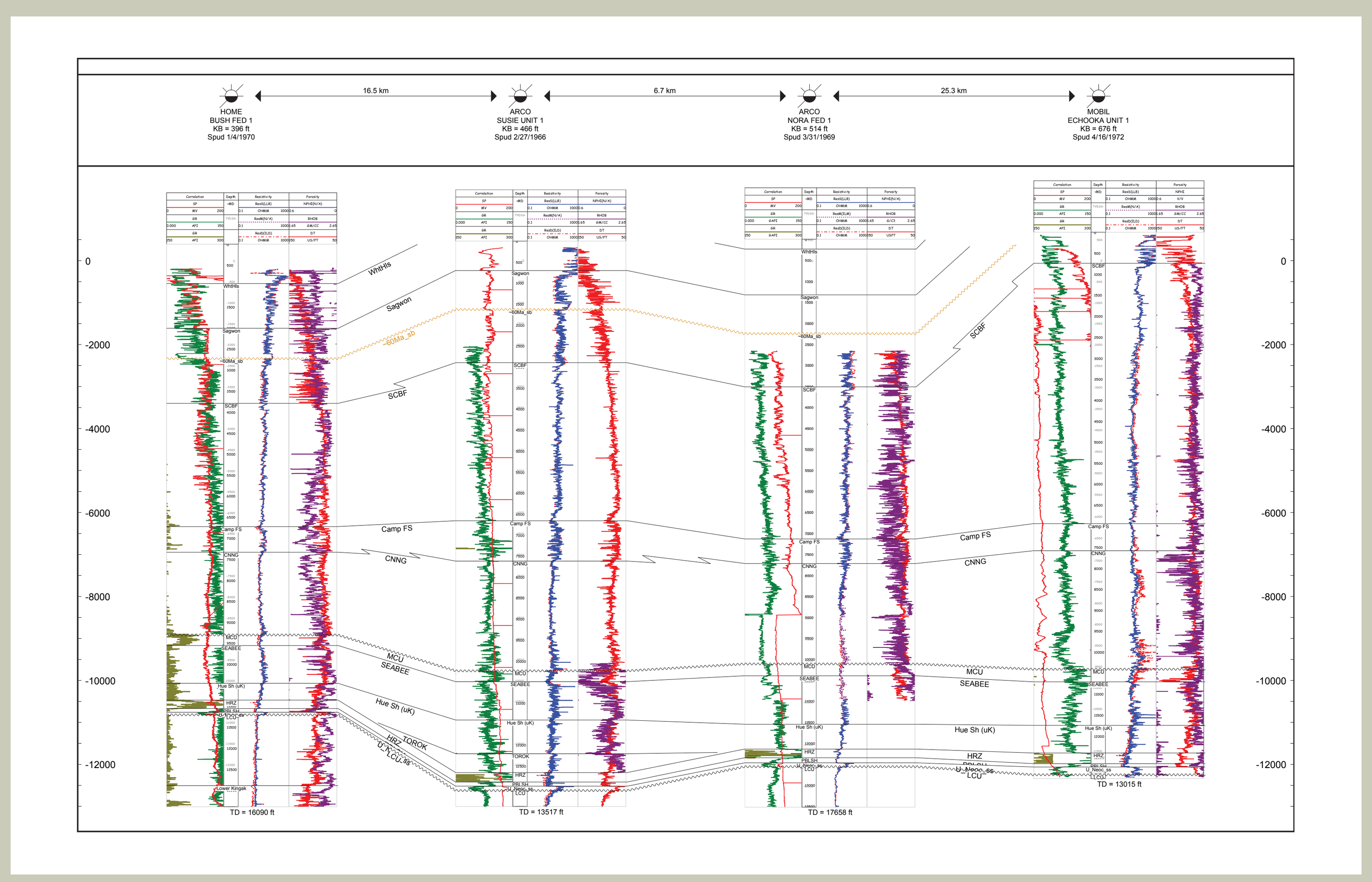
This map shows the distribution of ~800 bedrock stations that were visited during the 2008 field season (pink dots). Because of widespread Quaternary cover, most surface bedrock exposures were located along river cuts. A combination of surface mapping and subsurface interpretations from well and seismic data provided a more detailed representation of the map area.

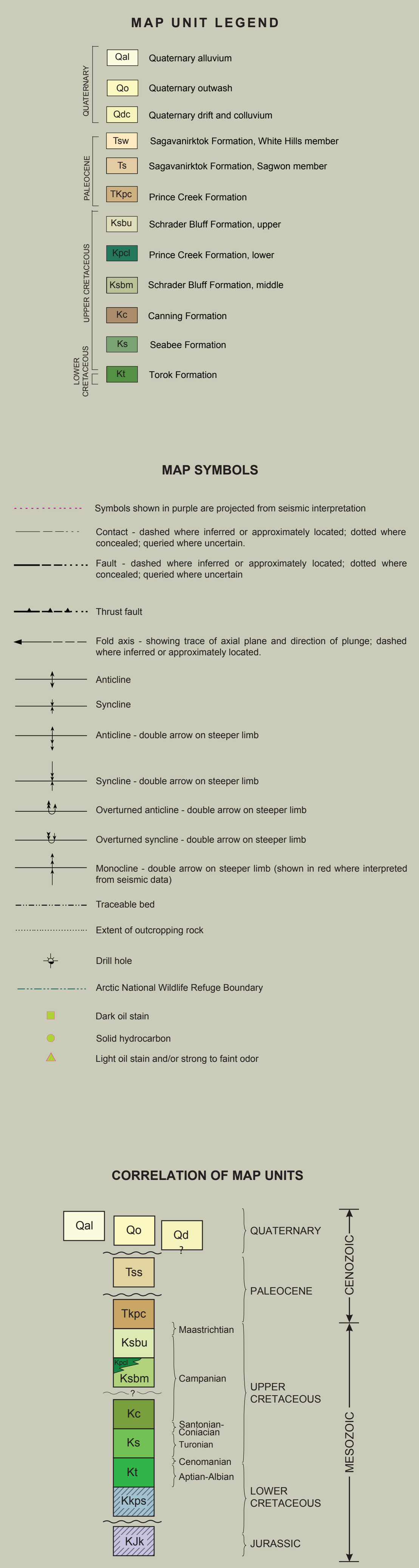
WELL LOCATIONS



Shaded relief map of the study area (outlined in red) and locations of wells and major physiographic features. Well correlation line is shown in yellow (see correlation below).

WELL LOGS





OVERVIEW OF MAPPING CONSTRAINTS

The Sagavanirktok geologic map was developed through the integration of field mapping and stratigraphic studies by DGGS and DOG in the summers of 2007 and 2008, analytical results from samples collected in the field, public and private subsurface data, and aerial photograph interpretation. The new field mapping builds upon existing published and unpublished mapping by DGGS and others cited above. Stratigraphic units reflected on the map are based on the revised nomenclature of Mull and others, 2003 and further refined from stratigraphic studies by DGGS (Decker and others, 2009) concurrent with the field mapping. The entire map area was scouted by helicopter for rock exposures during the course of two summer field seasons and all known outcrops were visited by one or more geologists during foot traverses or helicopter spot landings. Unit identification, bedding attitudes, structural data, and analytical data from samples collected at field stations were used to ground truth and refine the interpretation of subsurface data. Proprietary 2d seismic data consisting of 7 lines oriented approximately normal to the structural trend and 3 strike lines were interpreted prior to field activities with the aid of public well data from the Aufeis, Lupine, Ivishak, and Echooka wells. These data served to define the continuity and plunge of major structures and helped to project lithologic and structural contacts into areas of significant Quaternary cover where surface constraints were limited or lacking. Structural forms, such as plunging fold trains, evident from aerial photography and rubble traces that commonly define ridges further contribute to the map interpretation in areas of little or no outcrop. In most cases, rubble traces were visited to confirm formation calls and all interpretations were reconciled with available subsurface information.

ACKNOWLEDGEMENTS

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P.L. Decker (2000, 2001, 2007, 2008)
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T.D. Hubbard (2008)
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