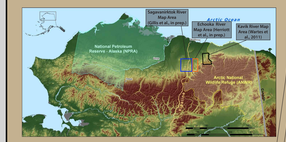
# Detailed Geologic Mapping and Overview of Structural and Stratigraphic Studies in the East-Central North Slope Foothills, Alaska

Trystan M. Herriott[1], Marwan A. Wartes[1], Robert J. Gillis[1], Paul L. Decker[2], Wes Wallace[3], Andrea M. Loveland[1], Rocky R. Reifenstuhl[1], and David L. LePain[1]
[1]Alaska Division of Geological & Geophysical Surveys (contact: trystan.herriott@alaska.gov), [2]Alaska Division of Oil and Gas; [3]University of Alaska Fairbanks

**The Sagavanirktok and Echooka rivers areas geologic maps and accompanying figures and captions presented here are preliminary and have not yet undergone rigorous technical and peer review. We will formally publish these maps (Gillis et al. in preparation (Sagavanirktok); Herriott et al., in preparation (Echooka), as well as our observations and conclusions regarding these areas, through our Division of Geological & Geophysical Surveys publications group. Please contact trystan.herriott@alaska.gov, marwan.wartes@alaska.gov, or robert.gillis@alaska.gov for further information regarding this poster.**

## Regional Context




### Colville Foreland Basin Depositional Cycles

Paleocene-Miocene: Sagavanirktok Fm. topsets & Canning Fm. slope-basin facies deposition.

*sequence boundary(?)*

Santonian-Campanian-Maastrichtian-Paleocene: Prince Creek Fm. nonmarine facies, Schrader Bluff Fm. marine topsets, & Canning Fm. slope-basin facies deposition. Seismic resolution of key sequence boundaries and flooding surfaces is problematic, perhaps due to thick coal-bearing units. Significant lowstand erosion and submarine masswasting (MCU, possibly other events), transgressive flood-backs, and forced regressions occurred within this cycle.

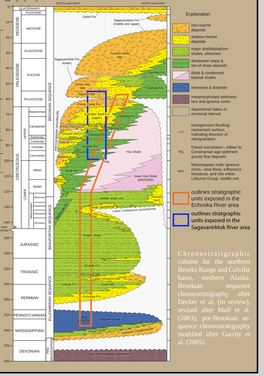
*transgressive surface*

Ceomanian-Turonian-Coniacian: Tuluvak Fm. topsets & Seabee Fm. slope-basin facies prograde eastward across pre-existing Nanushuk-Torok terrace and into underfilled basin farther east. In the study area, the basin received substantial sandy and conglomeratic deepwater deposits of this cycle.

*major transgressive surface*

Albian-Cenomanian: Nanushuk Fm. topsets & Torok Fm. clinoforms prograde east and northeast as genetic couplet, building a thick terrace of nonmarine, shallow marine, and deepwater facies. Study area records rapid transition from distal slope and basin floor facies of the Torok Fm. (and Gilead succession) to condensed Hue Shale.

## Chronostratigraphy




Chronostratigraphic column for the northern Brooks Range and Colville basin, northern Alaska. Brookian sequence chronostratigraphy after Decker et al. (in review), revised after Mull et al. (2003); pre-Brookian sequence chronostratigraphy modified after Garrity et al. (2005).

## Stratigraphy and Structure Highlights

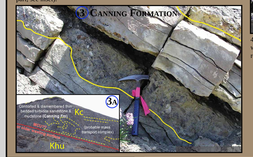
### 1 TKpc–Tss Contact

1—Coal-bearing Prince Creek Formation strata are unconformably overlain by the nonmarine Sagavanirktok Formation (Sagwon Member) at Sagwon Bluffs.

### 2 Schrader Bluff Formation

2—Depositional packages of shale and siltstone that coarsen and thicken upward into well-bedded sandstone are interpreted as marine shoreface parasequences of the Schrader Bluff Formation.

### 3 Canning Formation

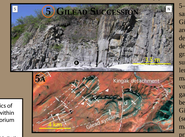



3—Channelized pebble and cobble conglomerate within the otherwise fine-grained Canning Formation may record the regionally significant mid-Campanian unconformity (MCU); another candidate for this surface lies lower in the Canning Formation, where a probable mass transport complex overlies a tongue of the Hue Shale (upper part; see inset).

### 4 Seabee Formation

4—Anticline-syncline fold pair in sandstone and mudstone of the Seabee Fm., which within the study area is sand-prone and stratigraphically encased by excellent source rocks of the Hue Shale (see inset); this unit is commonly petroliferous.

### 5 Gilead Succession



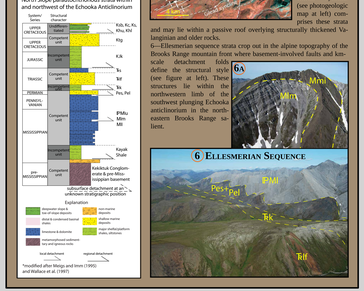

5—Amalgamated sandstones of the Gilead succession are interpreted as deposits of high-density sediment gravity flows; subsurface equivalents farther west may provide reservoir targets in the gas-prone foothills belt. The the Gilead syncline (see photogeologic map at left) comprises these strata and may lie within a passive roof overlying structurally thickened Valanginian and older rocks.

### 6 Ellesmerian Sequence

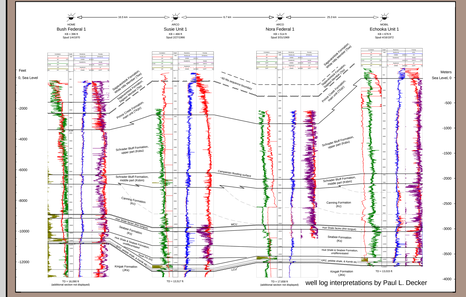



6—Ellesmerian sequence strata crop out in the alpine topography of the Brooks Range mountain front where basement-involved faults and km-scale detachment folds define the structural style (see figure at left). These structures lie within the northwestern limb of the southwest plunging Echooka anticlinorium in the northeastern Brooks Range salient.

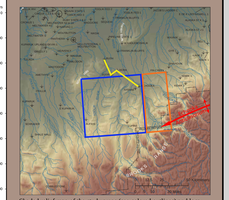
Mechanical-stratigraphic characteristics of North Slope parautochthonous strata within and northwest of the Echooka Anticlinorium



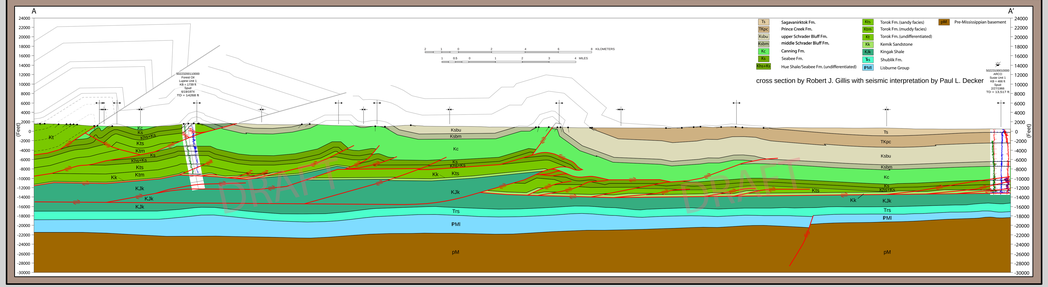

## Sagavanirktok River Area Well Logs and Preliminary Cross Section




well log interpretations by Paul L. Decker



Shaded relief map of the study areas (see colored outlines) and locations of wells and major physiographic features. Well correlation line demarcated in yellow (see well log correlation at left).


A
A'
Ts Sagavanirktok Fm.
TKpc Prince Creek Fm.
Kdbu upper Schrader Bluff Fm.
Kdbm middle Schrader Bluff Fm.
Kc Canning Fm.
Ks Seabee Fm.
Khu Hue Shale/Seabee Fm. (undifferentiated)
Ktu Torok Fm. (sandy facies)
Khl Torok Fm. (muddy facies)
Kk Torok Fm. (undifferentiated)
Kb Kemik Sandstone
Kjk Kingak Shale
Ta Shublik Fm.
PIMl Lisburne Group
pM Pre-Mississippian basement
VERTICAL EXAGGERATION 2.5X
KUPARUK-1 (BP)
TOTAL 1 (BP)
Sinclair 1 (Sinclair)
Sinclair 1 (Sinclair)
Sinclair 1 (Sinclair