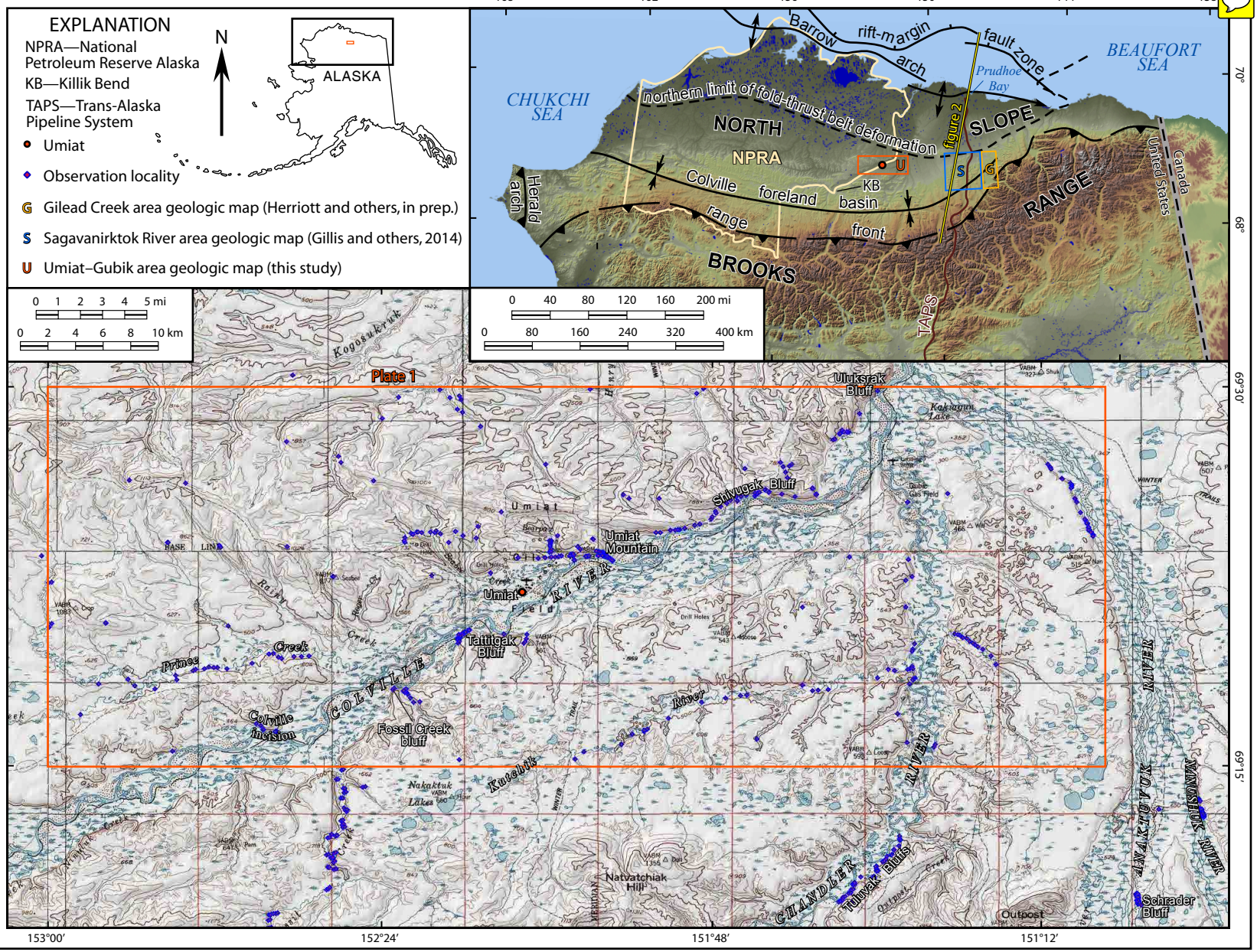
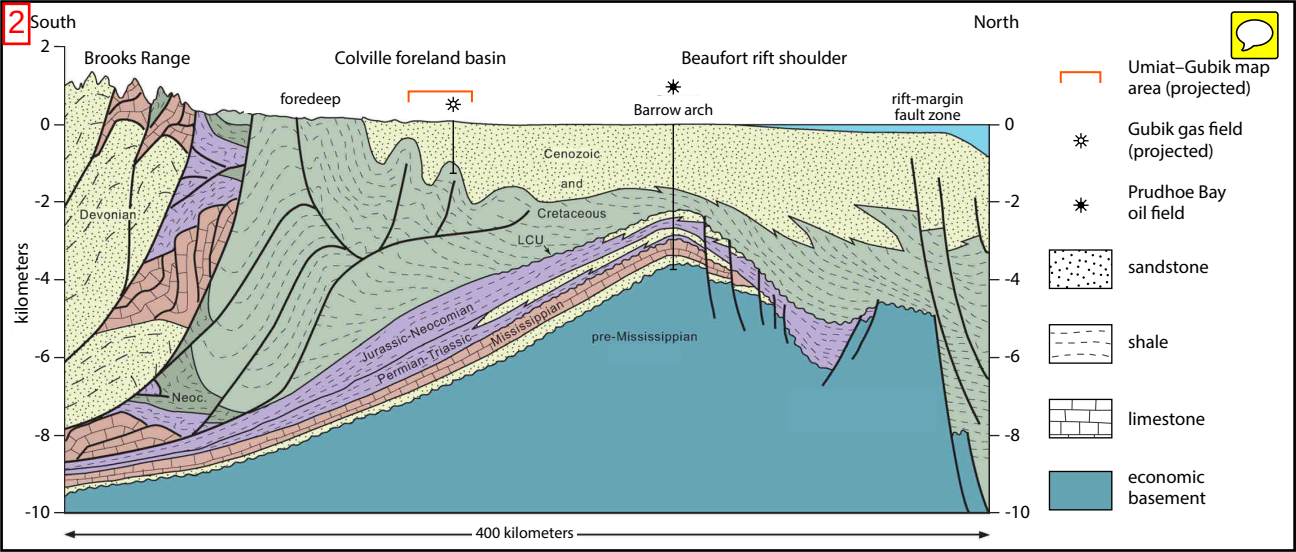
cover photo


EXPLANATION
NPRA—National Petroleum Reserve Alaska
KB—Killik Bend
TAPS—Trans-Alaska Pipeline System
Umiat
Observation locality
Gilead Creek area geologic map (Herriott and others, in prep.)
Sagavanirktok River area geologic map (Gillis and others, 2014)
Umiat–Gubik area geologic map (this study)
N
ALASKA
0 1 2 3 4 5 mi
0 2 4 6 8 10 km
0 40 80 120 160 200 mi
0 80 160 240 320 400 km
168°
162°
156°
150°
144°
138°
70°
69°
69°30'
69°15'
153°00'
152°24'
151°48'
151°12'
CHUKCHI SEA
BEAUFORT SEA
Barrow arch
rift-margin
fault zone
Prudhoe Bay
northern limit of fold-thrust belt deformation
NORTH SLOPE
NPRA
figure 2
Herald arch
Colville foreland basin
range front
BROOKS RANGE
United States
Canada
TAPS
Plate 1
Kogosukruk
Uluksrak Bluff
Kakagun Lake
Shivugak Bluff
Umiat
Umiat Mountain
Umiat Field
COLVILLE RIVER
Tattigak Bluff
Prince Creek
Colville Incision
Fossil Creek bluff
Kuguktuk River
Nakaktuk Lakes
Natvatchiak Hill
CHANDLER RIVER
Tuluvak Bluffs
Outpost
Schrader Bluff
NANUSHUK RIVER
NAKATOVAK RIVER
BASE LINE
WINTER TRAIL
MERIDIAN


2
South
North
Brooks Range
Colville foreland basin
Beaufort rift shoulder
foredeep
Barrow arch
rift-margin fault zone
Cenozoic and Cretaceous
LCU
Devonian
Neoc.
Jurassic-Neocomian
Permian-Triassic
Mississippian
pre-Mississippian
kilometers
2
0
-2
-4
-6
-8
-10
400 kilometers
Umiat–Gubik map area (projected)
Gubik gas field (projected)
Prudhoe Bay oil field
sandstone
shale
limestone
economic basement

A
3
B
C
D

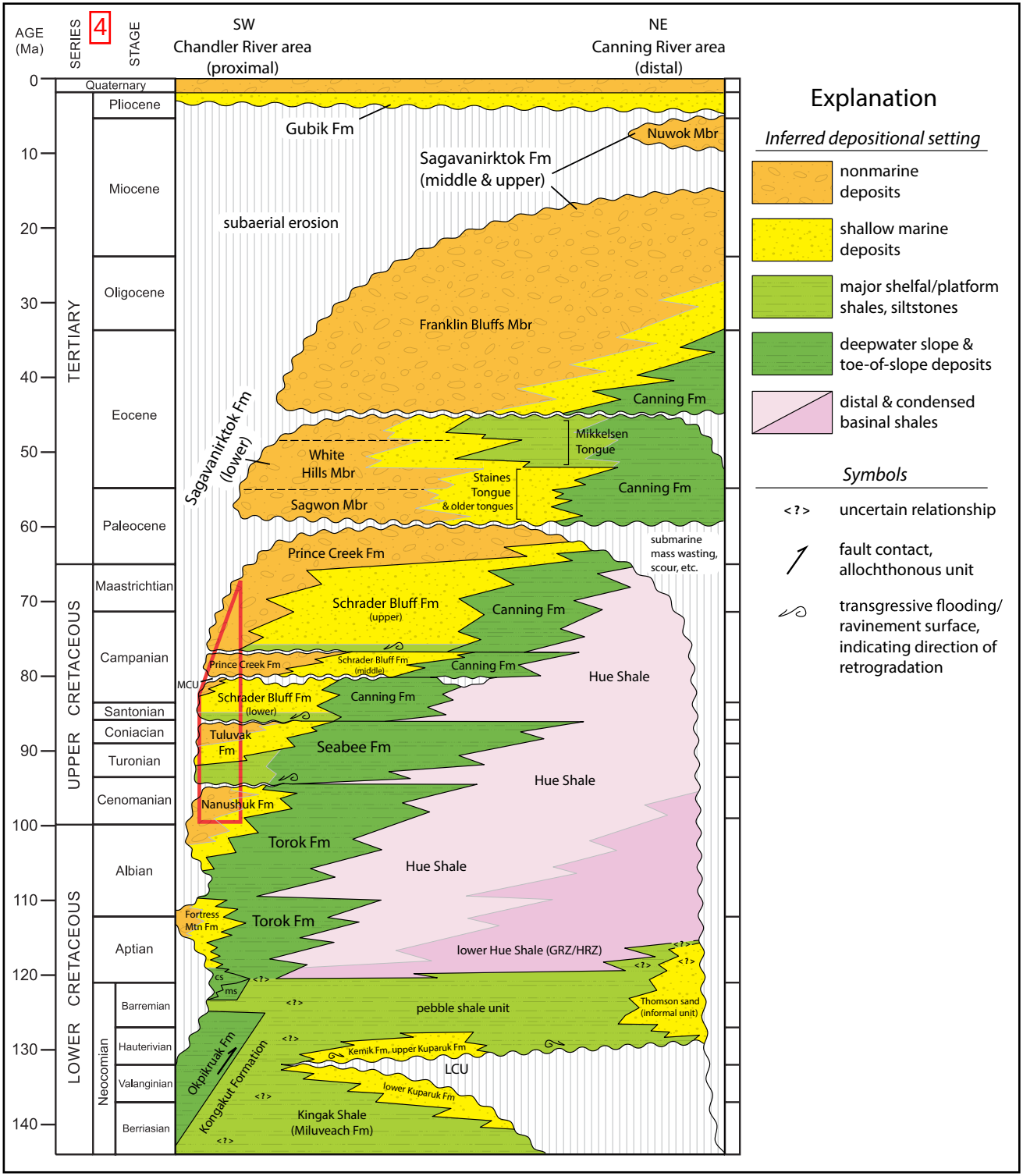
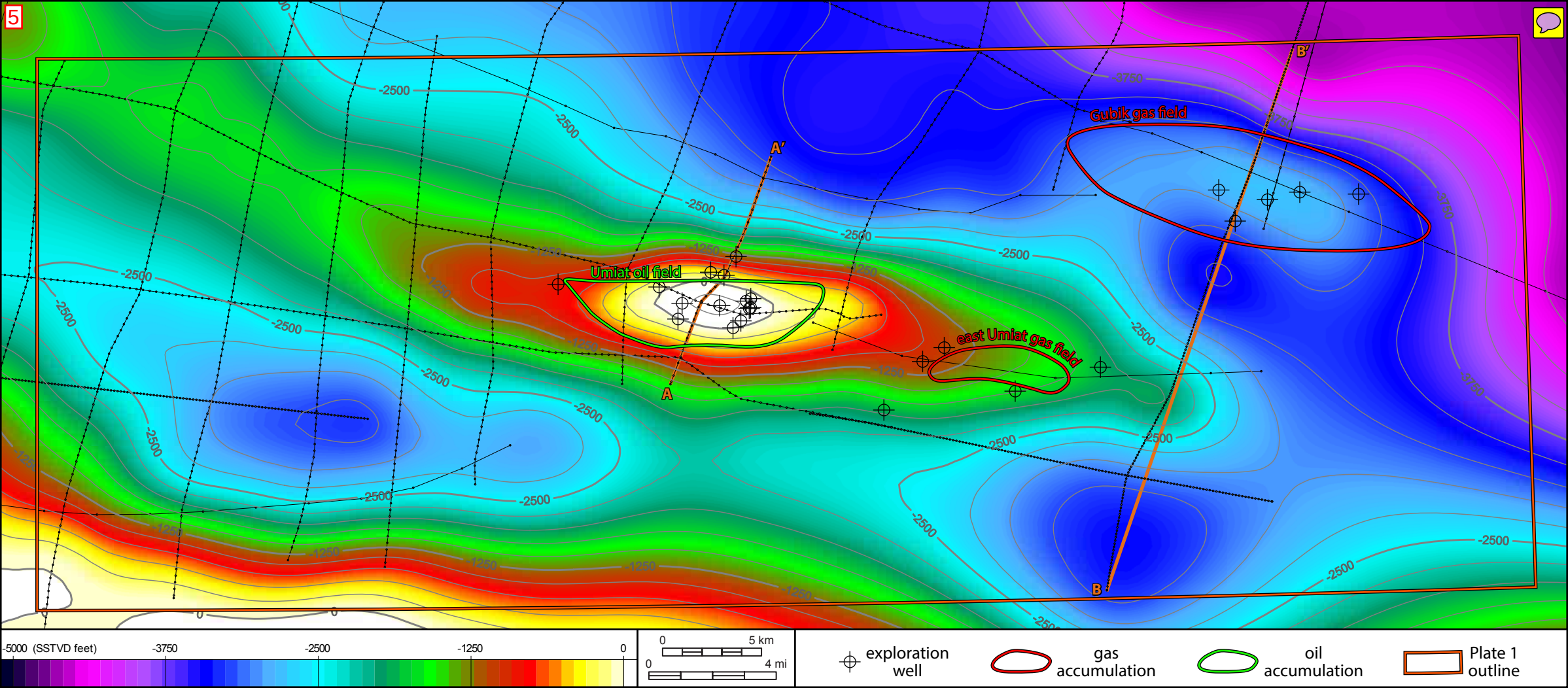

AGE (Ma)
SERIES
4
STAGE
SW
Chandler River area
(proximal)
NE
Canning River area
(distal)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
Quaternary
TERTIARY
UPPER CRETACEOUS
LOWER CRETACEOUS
Pliocene
Miocene
Oligocene
Eocene
Paleocene
Maastrichtian
Campanian
Santonian
Coniacian
Turonian
Cenomanian
Albian
Aptian
Neocomian
Barremian
Hauterivian
Valanginian
Berriasian
Gubik Fm
Nuwok Mbr
Sagavanirktok Fm
(middle & upper)
subaerial erosion
Franklin Bluffs Mbr
Canning Fm
Mikkelsen
Tongue
Sagavanirktok Fm
(lower)
White
Hills Mbr
Staines
Tongue
& older tongues
Sagwon Mbr
Canning Fm
Prince Creek Fm
submarine
mass wasting,
scour, etc.
Schrader Bluff Fm
(upper)
Canning Fm
Prince Creek Fm
Schrader Bluff Fm
(middle)
Canning Fm
Hue Shale
MCU
Schrader Bluff Fm
(lower)
Canning Fm
Tuluvak
Fm
Seabee Fm
Hue Shale
Nanushuk Fm
Torok Fm
Hue Shale
Fortress
Mtn Fm
Torok Fm
lower Hue Shale (GRZ/HRZ)
cs
ms
pebble shale unit
Thomson sand
(informal unit)
Okpikruak Fm
Kongakut Formation
Kemik Fm, upper Kuparuk Fm
LCU
lower Kuparuk Fm
Kingak Shale
(Miluveach Fm)
Explanation
Inferred depositional setting
nonmarine
deposits
shallow marine
deposits
major shelfal/platform
shales, siltstones
deepwater slope &
toe-of-slope deposits
distal & condensed
basinal shales
Symbols
<?>
uncertain relationship
fault contact,
allochthonous unit
transgressive flooding/
ravinement surface,
indicating direction of
retrogradation

Table 1

| Field Name | Well Name | Well Operator | Completion Date | Latitude | Longitude | Uppermost Formation Pick | Depth Interval (feet) | Pick Source | Comment (this study) | Interpretation (this study) |
|---|---|---|---|---|---|---|---|---|---|---|
| Umiat oil field | Umiat Test No. 1 | U.S. Navy | 10/05/1946 | 69.39667 | -152.32750 | Seabee | 9–915 | K. Bird (GMC Top Picks) | -- | Seabee at surface |
| | Umiat Test No. 2 | U.S. Navy | 12/12/1947 | 69.38333 | -152.08112 | Nanushuk | 80–1060 | K. Bird (GMC Top Picks) | Quaternary: 9–80' (Collins, 1958) | Nanushuk near surface |
| | Umiat Test No. 3* | U.S. Navy | 12/26/1946 | 69.38667 | -152.08472 | Nanushuk | 60–total depth | K. Bird (GMC Top Picks) | not sampled: 9–60' (Collins, 1958); total depth at 572' in Kn (Collins, 1958) | Nanushuk near surface |
| | Umiat Test No. 4 | U.S. Department of Interior | 07/29/1950 | 69.38778 | -152.07889 | Nanushuk | 90–total depth | K. Bird (GMC Top Picks) | not sampled: 1—90' (Collins; 1958); total depth at 840' in Kn (Collins, 1958) | Nanushuk near surface |
| | Umiat Test No. 5 | U.S. Department of Interior | 10/4/1951 | 69.38361 | -152.07973 | Nanushuk | 65–1060 | Collins, 1958 | not sampled: 0–65' (Collins, 1958); probably spudded in Kn (Collins, 1958) | Nanushuk near surface |
| | Umiat Test No. 6 | U.S. Navy | 12/12/1950 | 69.37778 | -152.09166 | Seabee | 30–220 | K. Bird (GMC Top Picks) | not sampled: 3–100' (Collins, 1958); top of Ks at 31' (Collins, 1958) | Seabee near surface |
| | Umiat Test No. 7 | U.S. Navy | 04/12/1951 | 69.37473 | -152.10139 | Seabee | 50–380 | K. Bird (GMC Top Picks) | Quaternary: 4–50' (Collins, 1958) | Seabee near surface |
| | Umiat Test No. 8 | U.S. Department of Interior | 08/28/1951 | 69.39861 | -152.11278 | Seabee | 20–60 | K. Bird (GMC Top Picks) | Quaternary: 5–20' (Collins, 1958) | Seabee near surface |
| | Umiat Test No. 9 | U.S. Navy | 01/15/1952 | 69.38639 | -152.16695 | Nanushuk | 6–1090 | K. Bird (GMC Top Picks) Collins (1958) | -- | Nanushuk at surface |
| | Umiat Test No. 10 | U.S. Navy | 01/10/1952 | 69.40028 | -152.12889 | Nanushuk | 5–250 | K. Bird (GMC Top Picks) | Nanushuk thrusted over Seabee at 250' | Nanushuk near surface |
| | Umiat Test No. 11 | U.S. Navy | 08/29/1952 | 69.40722 | -152.09723 | Tuluvak | 22–775 | K. Bird (GMC Top Picks) | -- | Tuluvak near surface |
| | Seabee Test No. 1 | Husky Oil NPR Operations, Inc. | 04/15/1980 | 69.38015 | -152.17534 | Seabee | 100–280 | K. Bird (GMC Top Picks) | -- | Seabee near surface |
| | Umiat No. 18 | Linc Energy Operations, Inc. | 4/29/2013 | 69.38483 | -152.11935 | data held confidentially | -- | -- | -- | -- |
| | Umiat No. 23H | Linc Energy Operations, Inc. | 3/20/2014 | 69.39439 | -152.19634 | data held confidentially | -- | -- | -- | -- |
| Gubik gas field | Gubik Test No. 1* | U.S. Navy | 8/11/1951 | 69.43389 | -151.47583 | Schrader Bluff (Barrow Trail Member) | 67–295 | Robinson, 1958 | Pliocene to Recent: 12-67' (Robinson, 1958) | Ksblbt near surface |
| | Gubik Test No. 2 | U.S. Navy | 12/14/1951 | 69.41944 | -151.45722 | Schrader Bluff (Barrow Trail Member) | 160–555 | Robinson, 1958 | no core or cuttings from 12–160' (Robinson, 1958) | Ksblbt near surface |
| | Gubik Unit No. 1 | Colorado Oil and Gas | 11/12/1963 | 69.42896 | -151.41352 | Schrader Bluff | 110–1136 | K. Bird (GMC Top Picks) | Schrader Bluff members not picked | Ksblbt near surface |
| | Gubik No. 3 | Anadarko Petroleum Corporation | 4/14/2008 | 69.44150 | -151.44243 | Tuluvak | 1079–? | Well Completion or Recompletion Report and Log (AOGCC) | Schrader Bluff not designated; top Seabee not picked | Ksblbt near surface |
| | Gubik No. 4 | Anadarko Petroleum Corporation | 4/6/2009 | 69.42966 | -151.29387 | Tuluvak | 1461–2315 | Well Completion or Recompletion Report and Log (AOGCC) | Schrader Bluff not designated; top Seabee not picked | Ksblsh near surface |
| east Umiat gas field | East Umiat Unit No. 1* | Devon Energy Production Corporation LP | 3/28/1964 | 69.34485 | -151.74372 | Tuluvak | 17–510 | K. Bird (GMC Top Picks) | -- | Ktu near surface |
| | East Umiat Unit No. 2 | McCulloch Oil Co | 5/21/1969 | 69.35911 | -151.86162 | Tuluvak | 12–? | K. Bird (GMC Top Picks) | top Seabee not picked | Ktu near surface |
| | Colville Unit No. 1 | McCulloch Oil Co | 3/11/1970 | 69.33747 | -151.91276 | Prince Creek/Schrader Bluff | 23–? | K. Bird (GMC Top Picks) | top Tuluvak not picked | -- |
| | | | | | | Seabee | 1640–2950 | K. Bird (GMC Top Picks) | uppermost formation pick that provides stratigraphic context | Ksblrc near surface |
| | Colville Unit No. 2 | McCulloch Oil Co | 12/25/1971 | 69.36526 | -151.83368 | Tuluvak | 23–-? | K. Bird (GMC Top Picks) | top Seabee not picked | Ktu near surface |
| | Chandler No. 1 | Anadarko Petroleum Corporation | 4/4/2009 | 69.35527 | -151.63356 | Tuluvak | 120–1070 | Well Completion or Recompletion Report and Log (AOGCC) | -- | Ksblrc near surface |

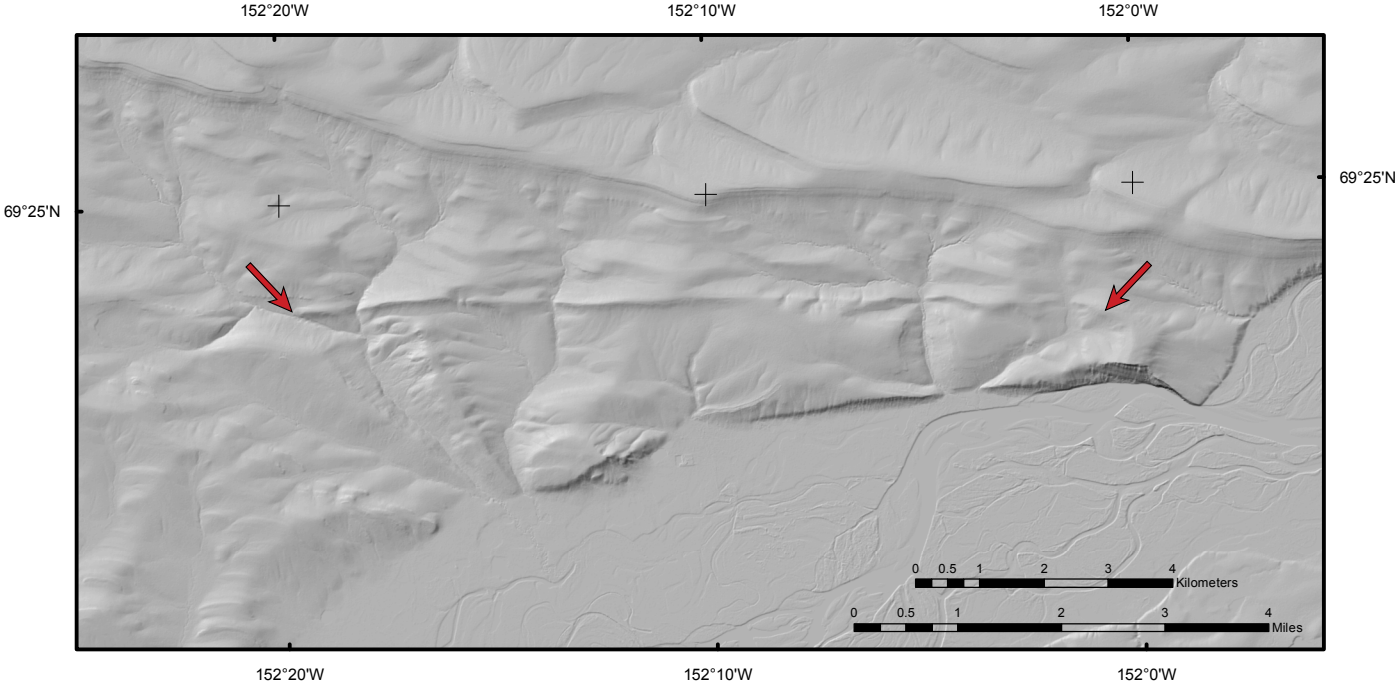
-- not applicable
* discovery well
~~AOGCC—Alaska Oil and Gas Conservation Commission~~
Latitude and longitude reported in NAD 27

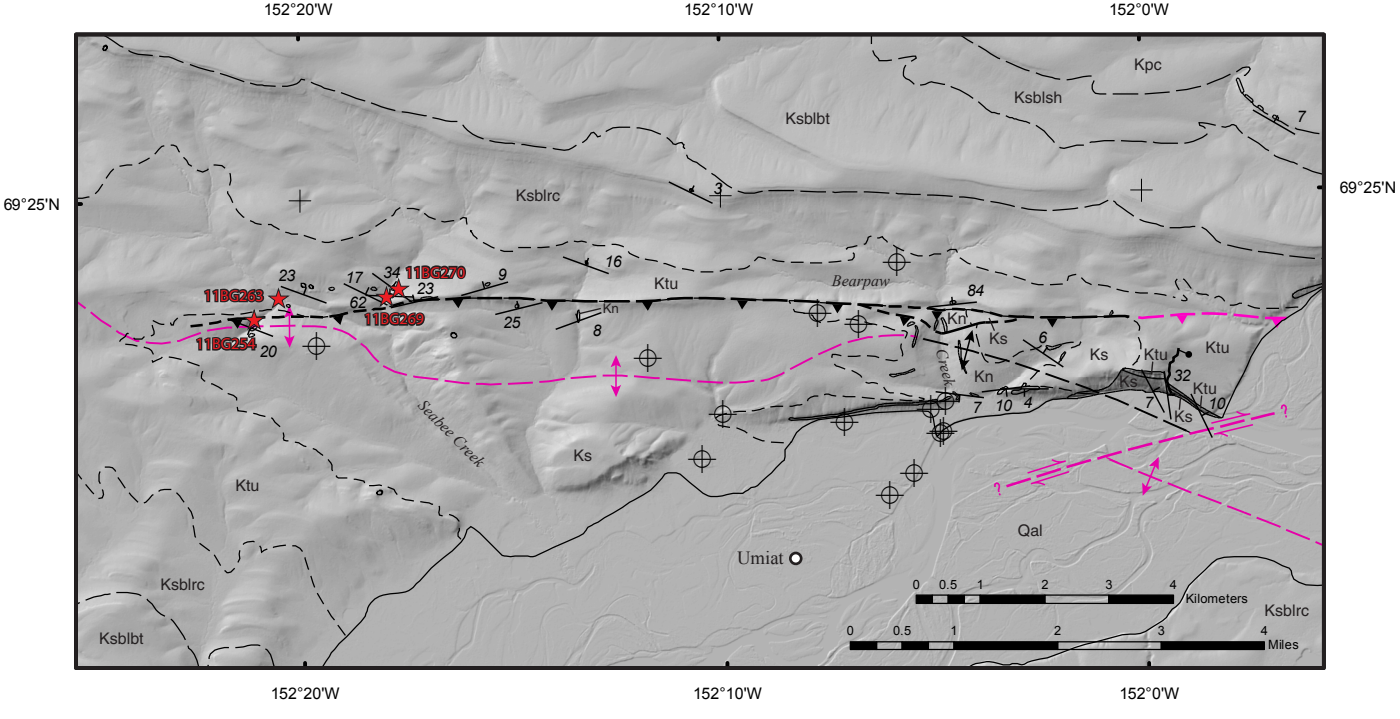

5
Gubik gas field
Umiat oil field
east Umiat gas field
A
A′
B
B′
-2500
-1250
-3750
0
-5000 (SSTVD feet)
-3750
-2500
-1250
0
0
5 km
0
4 mi
exploration well
gas accumulation
oil accumulation
Plate 1 outline

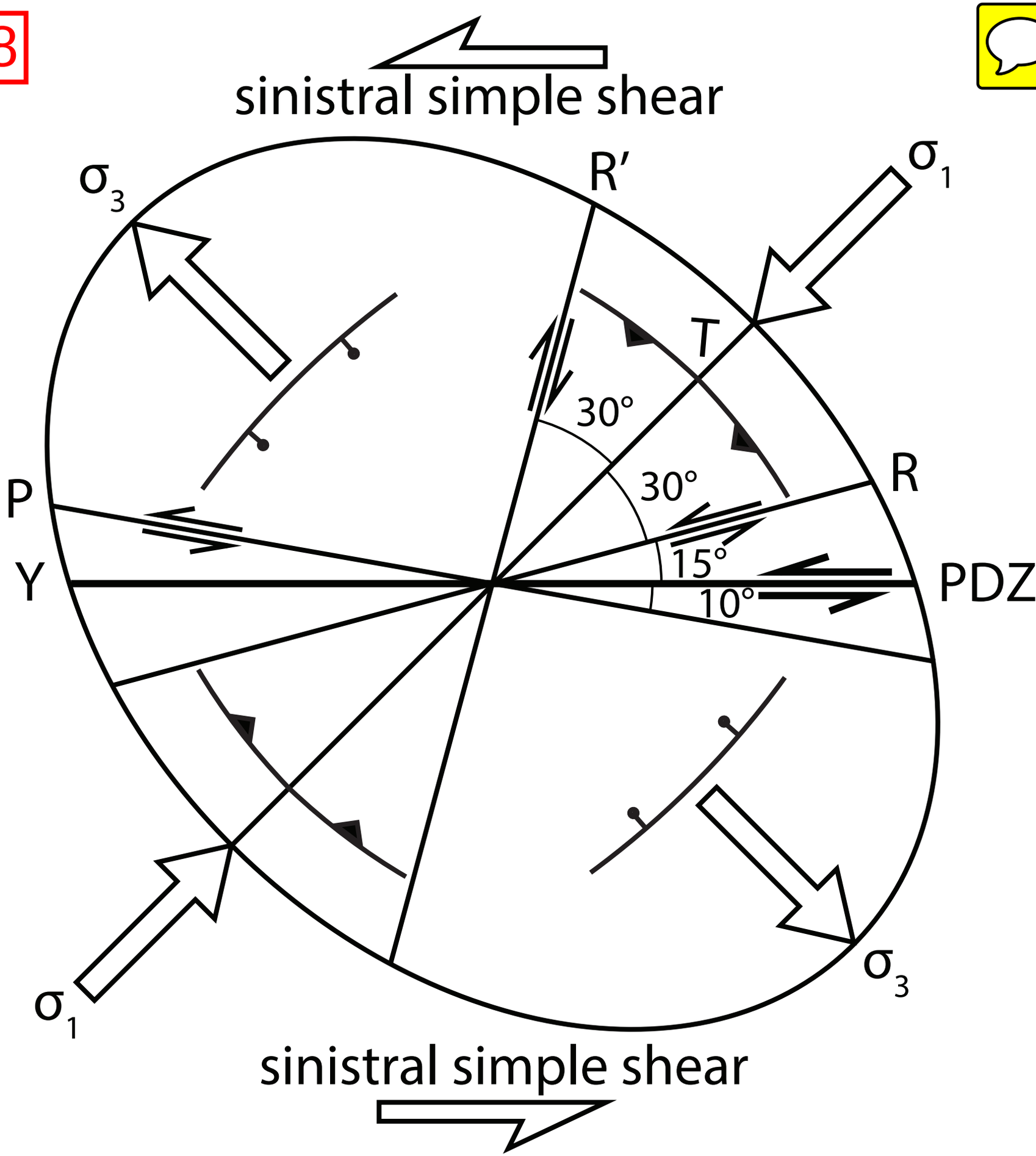
A
6

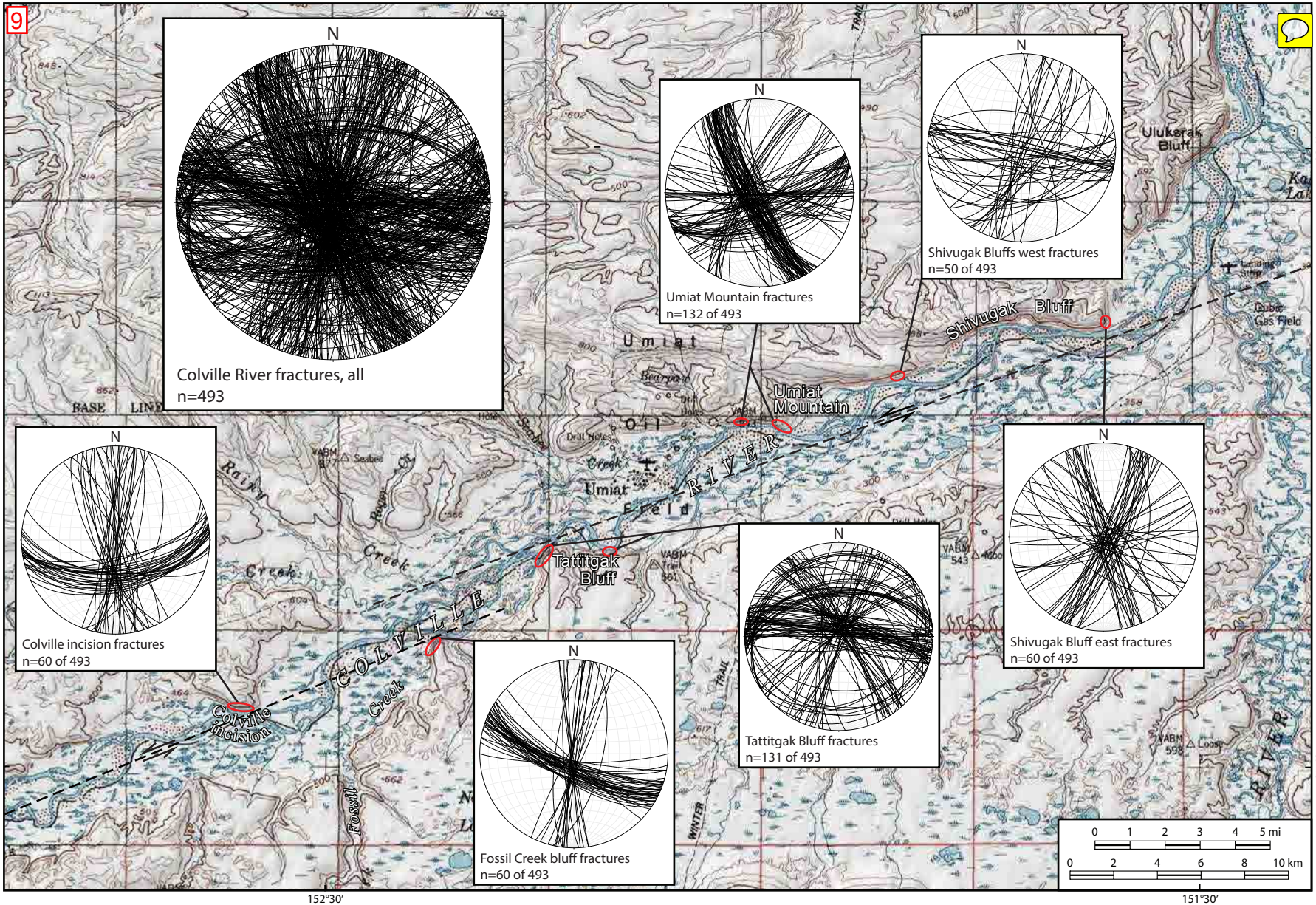
B

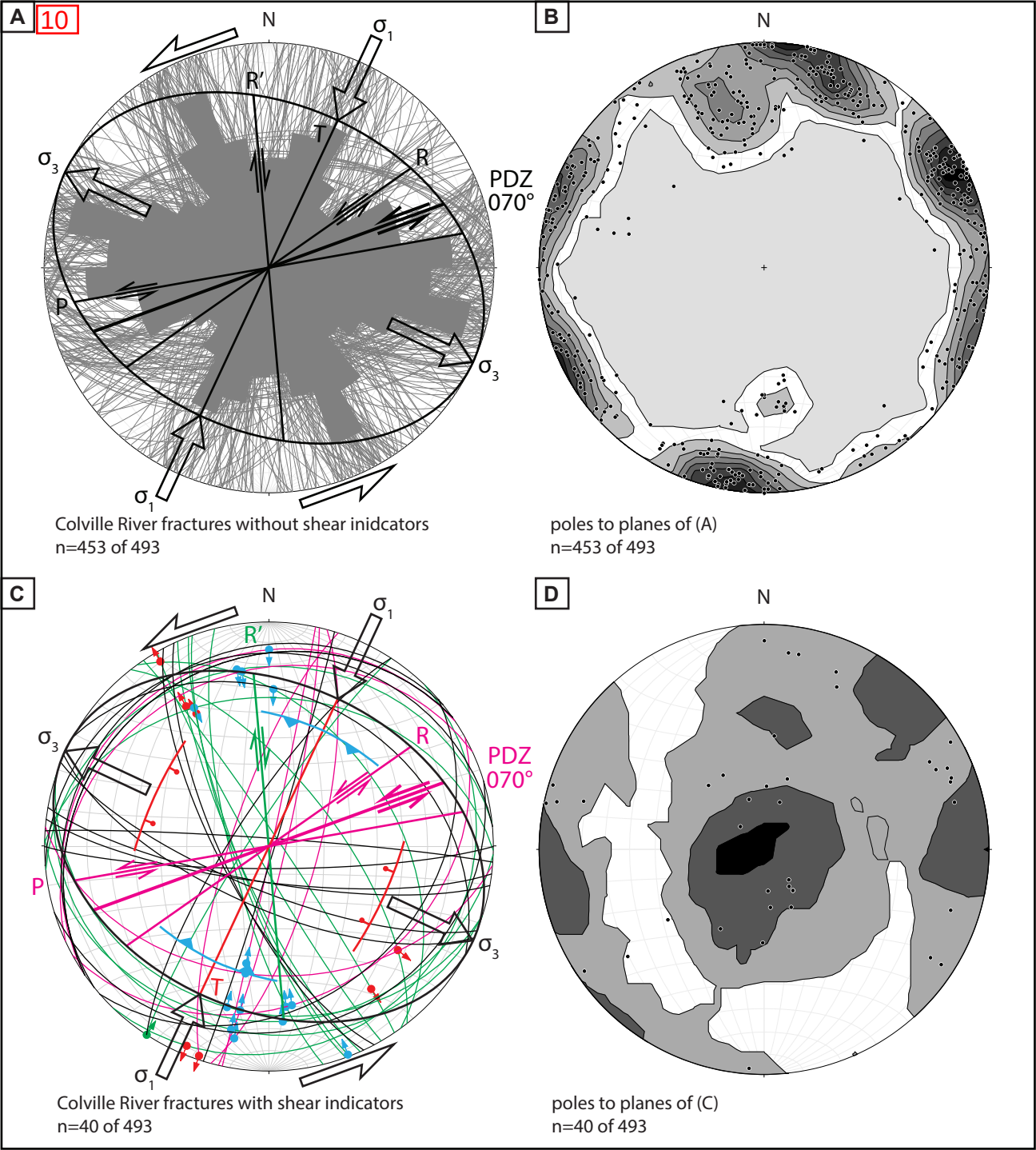
7


152°20'W
152°10'W
152°0'W
69°25'N
0 0.5 1 2 3 4 Kilometers
0 0.5 1 2 3 4 Miles


152°20'W
152°10'W
152°0'W
69°25'N
Kpc
Ksblsh
Ksblbt
Ksblrc
Ktu
Bearpaw
Creek
Kn
Ks
Seabee Creek
Qal
Umiat
11BG263
11BG270
11BG269
11BG254
0 0.5 1 2 3 4 Kilometers
0 0.5 1 2 3 4 Miles


sinistral simple shear
σ3
R′
σ1
T
30°
30°
R
P
15°
Y
PDZ
10°
σ1
σ3
sinistral simple shear


9
N
Colville River fractures, all
n=493
N
Umiat Mountain fractures
n=132 of 493
N
Shivugak Bluffs west fractures
n=50 of 493
N
Colville incision fractures
n=60 of 493
N
Fossil Creek bluff fractures
n=60 of 493
N
Tattitgak Bluff fractures
n=131 of 493
N
Shivugak Bluff east fractures
n=60 of 493
Umiat
Oil
Field
Umiat Mountain
Shivugak Bluff
Tattitgak Bluff
Colville Incision
COLVILLE
RIVER
Rain Creek
Rough Creek
Fossil Creek
Uluksrak Bluff
Quber Gas Field
BASE LINE
WINTER TRAIL
0 1 2 3 4 5 mi
0 2 4 6 8 10 km
69°30'
69°15'
152°30'
151°30'




Colville River fractures without shear inidcators
n=453 of 493

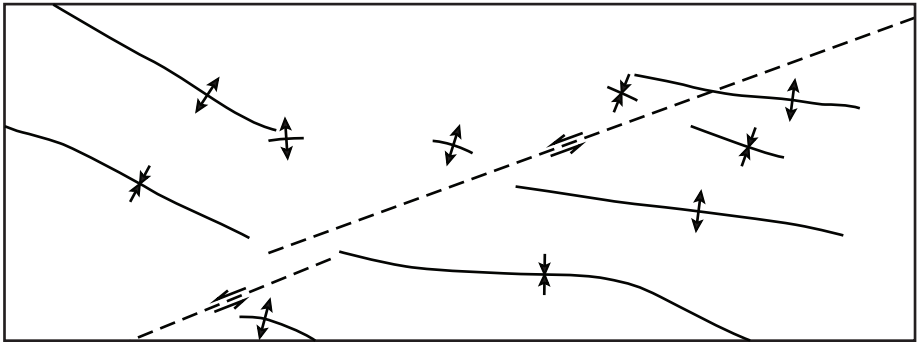
poles to planes of (A)
n=453 of 493

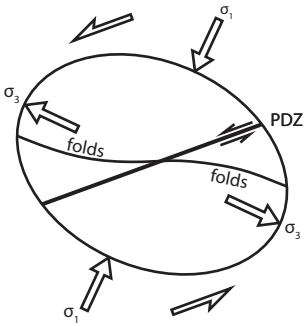
Colville River fractures with shear indicators
n=40 of 493

poles to planes of (C)
n=40 of 493

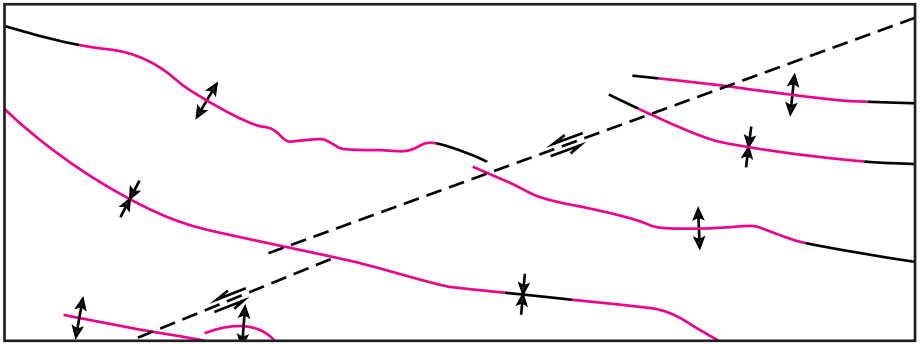
A

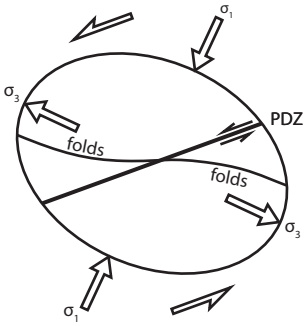
11





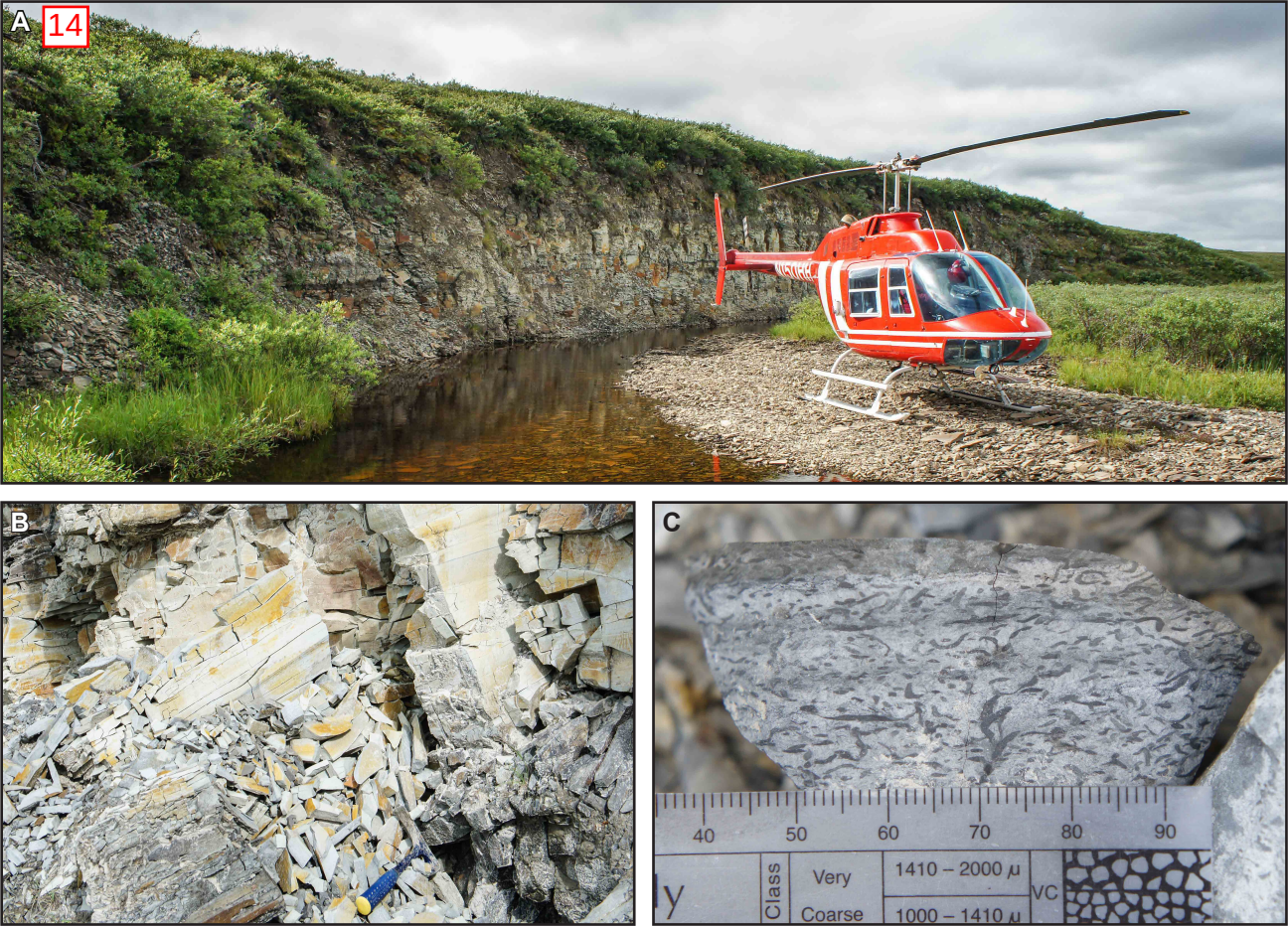

B

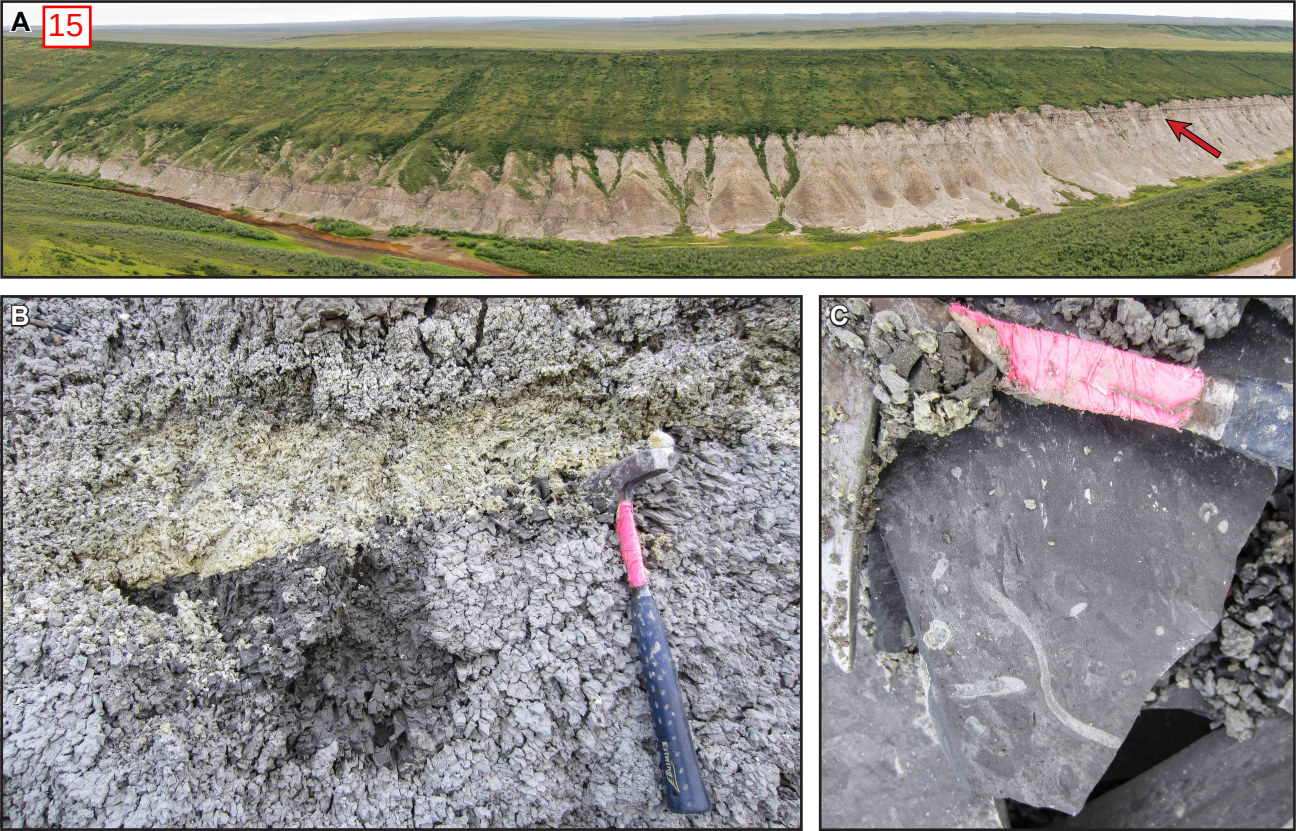




A
12
B
C

A
13
B
C


A
14
B
C
40
50
60
70
80
90
Class
Very
Coarse
1410 – 2000 μ
1000 – 1410 μ
VC


A
15
B
C

A
16
B
C

A
17
B
C

A
18
B
C