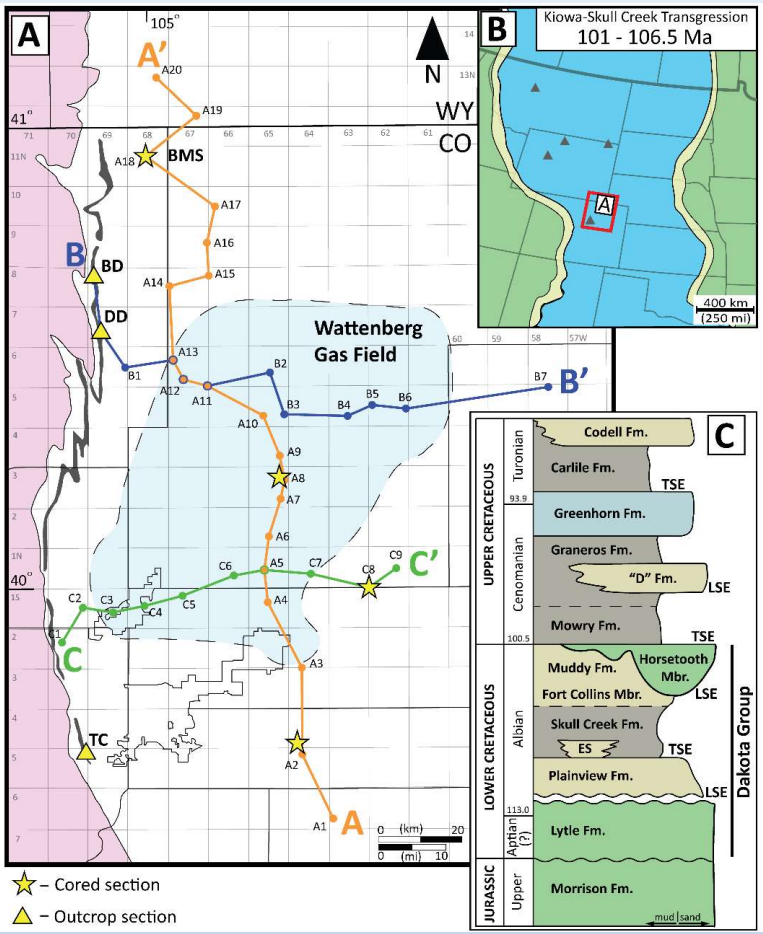
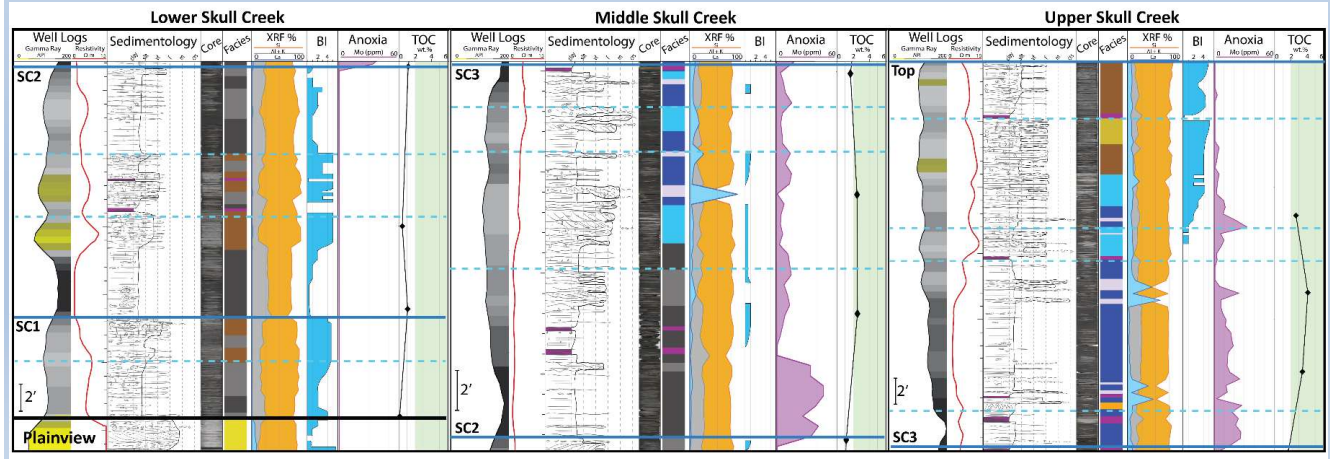
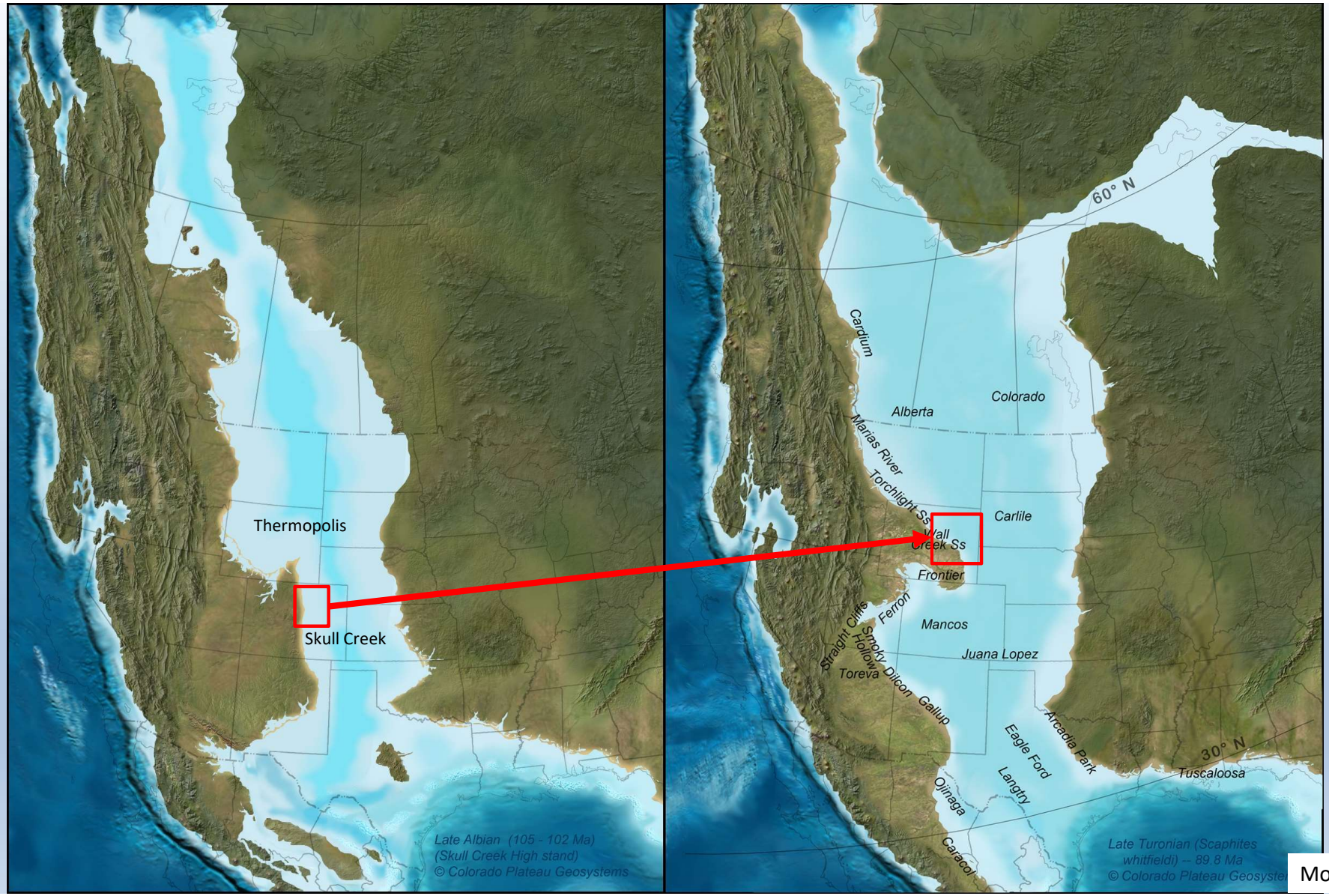
Patrick Sullivan, PhD Student, Exp. Grad. Spring 2024

STRATIGRAPHIC RELATIONSHIPS AND SEDIMENTOLOGY OF THE WALL CREEK-TURNER SYSTEM, POWDER RIVER BASIN, WY.

About Me…

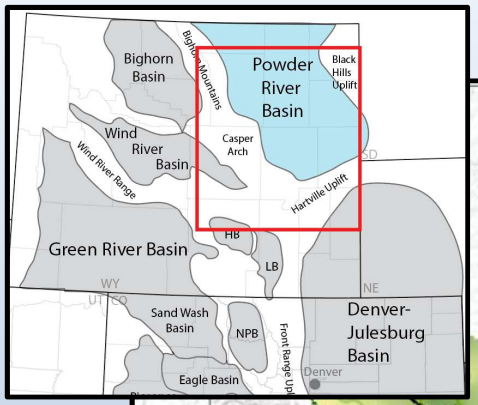

A
105°
A'
A20
A19
41°
N
WY
CO
A18
BMS
A17
A16
B
BD
A15
A14
DD
Wattenberg
Gas Field
A13
B2
B1
A12
A11
B3
B4
B5
B6
B7
B'
A10
A9
A8
A7
A6
C6
A5
C7
C8
C9
C'
40°
C2
C3
C4
C5
A4
C1
C
A3
TC
A2
A
A1
0 (km) 20
0 (mi) 10
– Cored section
– Outcrop section
B
Kiowa-Skull Creek Transgression
101 - 106.5 Ma
A
400 km
(250 mi)
C
UPPER CRETACEOUS
LOWER CRETACEOUS
JURASSIC
Turonian
Cenomanian
Albian
Aptian (?)
Upper
93.9
100.5
113.0
Codell Fm.
Carlile Fm.
TSE
Greenhorn Fm.
Graneros Fm.
"D" Fm.
LSE
Mowry Fm.
TSE
Muddy Fm.
Horsetooth Mbr.
Fort Collins Mbr.
LSE
Skull Creek Fm.
ES
TSE
Plainview Fm.
LSE
Lytle Fm.
Morrison Fm.
Dakota Group
mud | sand

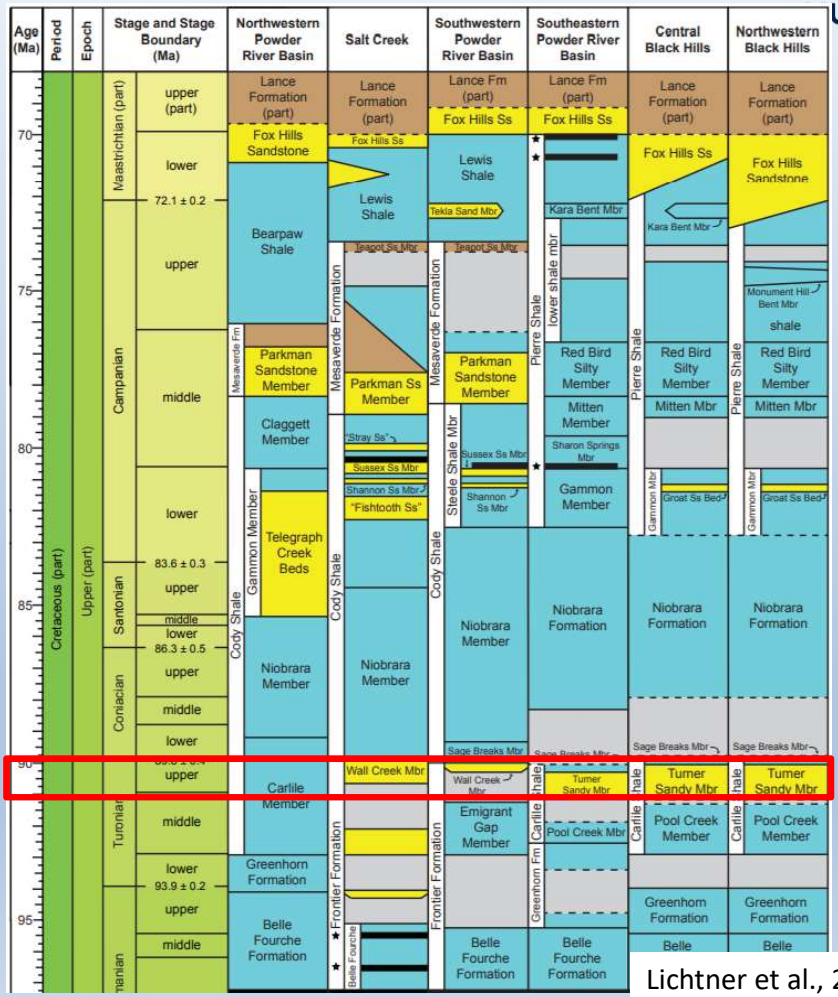

Lower Skull Creek
Middle Skull Creek
Upper Skull Creek
Well Logs
Sedimentology
Core
Facies
XRF %
BI
Anoxia
TOC
SC2
SC1
SC3
Top
2'
Plainview



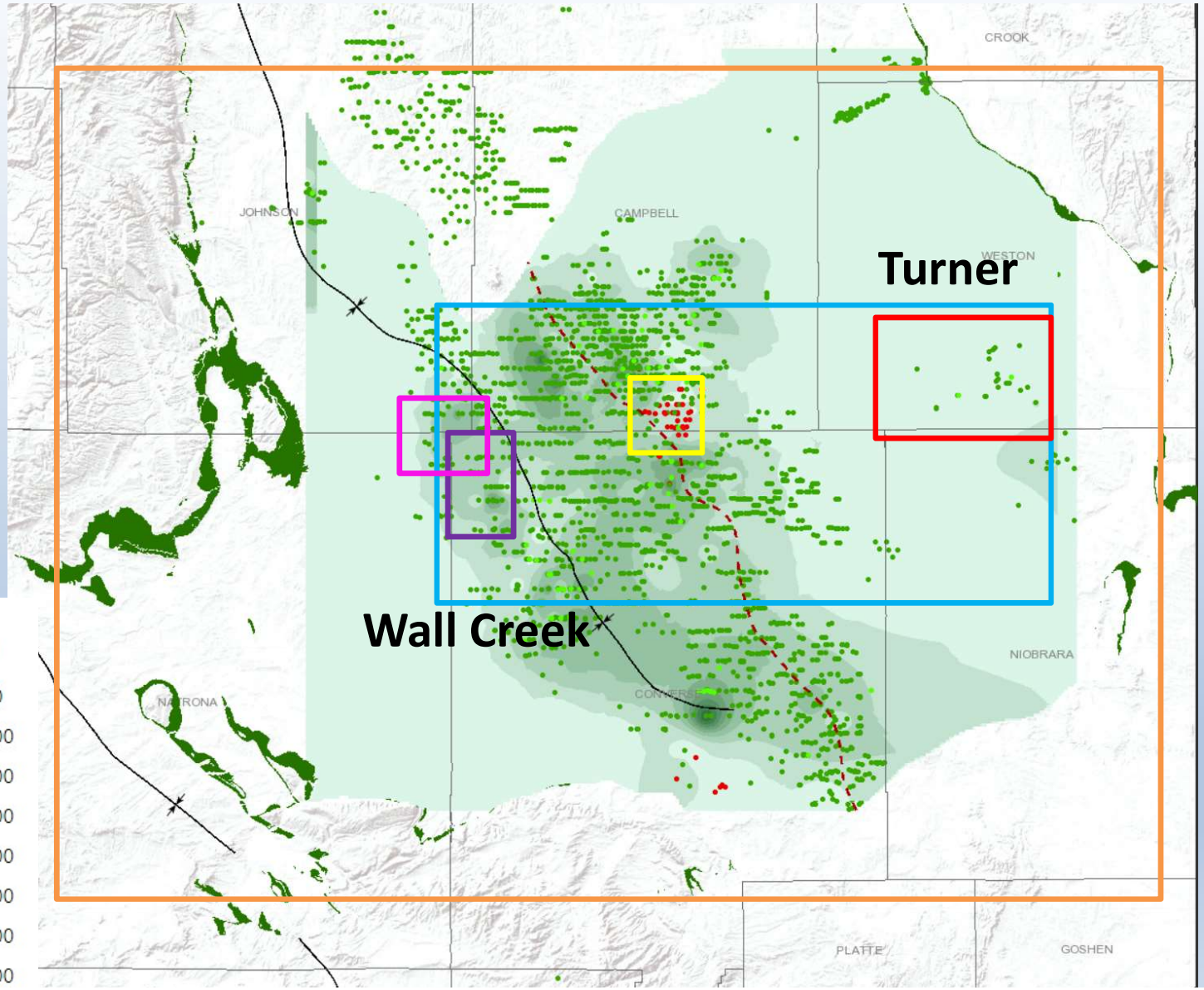
Mod. Blakey, 2018

Wall Creek-Turner System





Lichtner et al., 2020



BBL (18 mo)

- < 42,000
- 42,000 - 84,000
- 84,000 - 126,000
- 126,000 - 168,000
- 168,000 - 210,000
- 210,000 - 252,000
- 252,000 - 294,000
- 294,000 - 336,000
- 336,000 - 378,000
- 378,000 - 420,000

Payne, 2017

Heger, 2017

Dellenbach, 2019

Bone, 2020

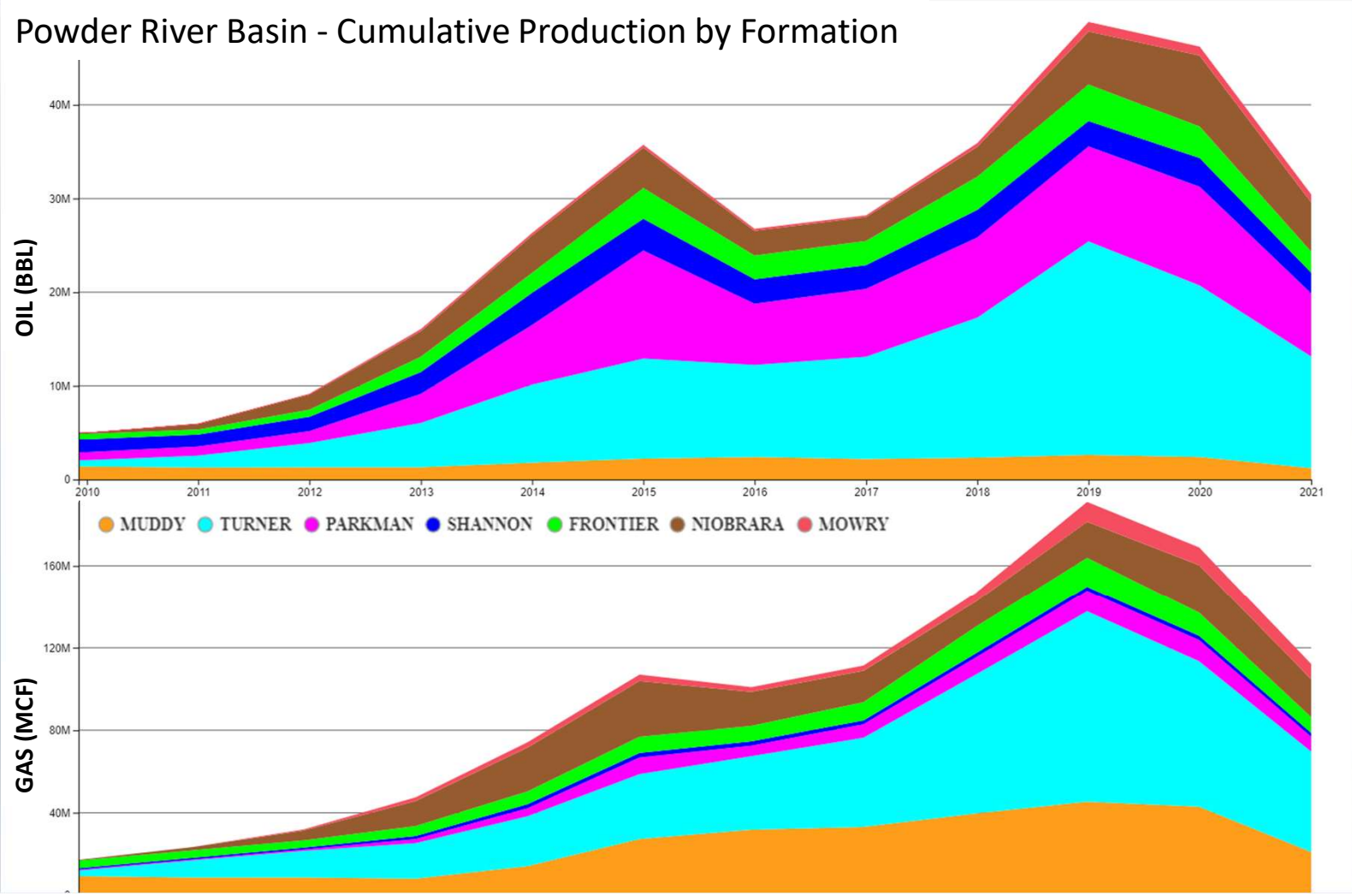
Milar, 2020

Sullivan (Proposed)

COLORADO SCHOOL OF MINES MUDTOC

WSGS, 2019

Wall Creek-Turner Petroleum System



Drillinginfo, 2021

Depositional Environments

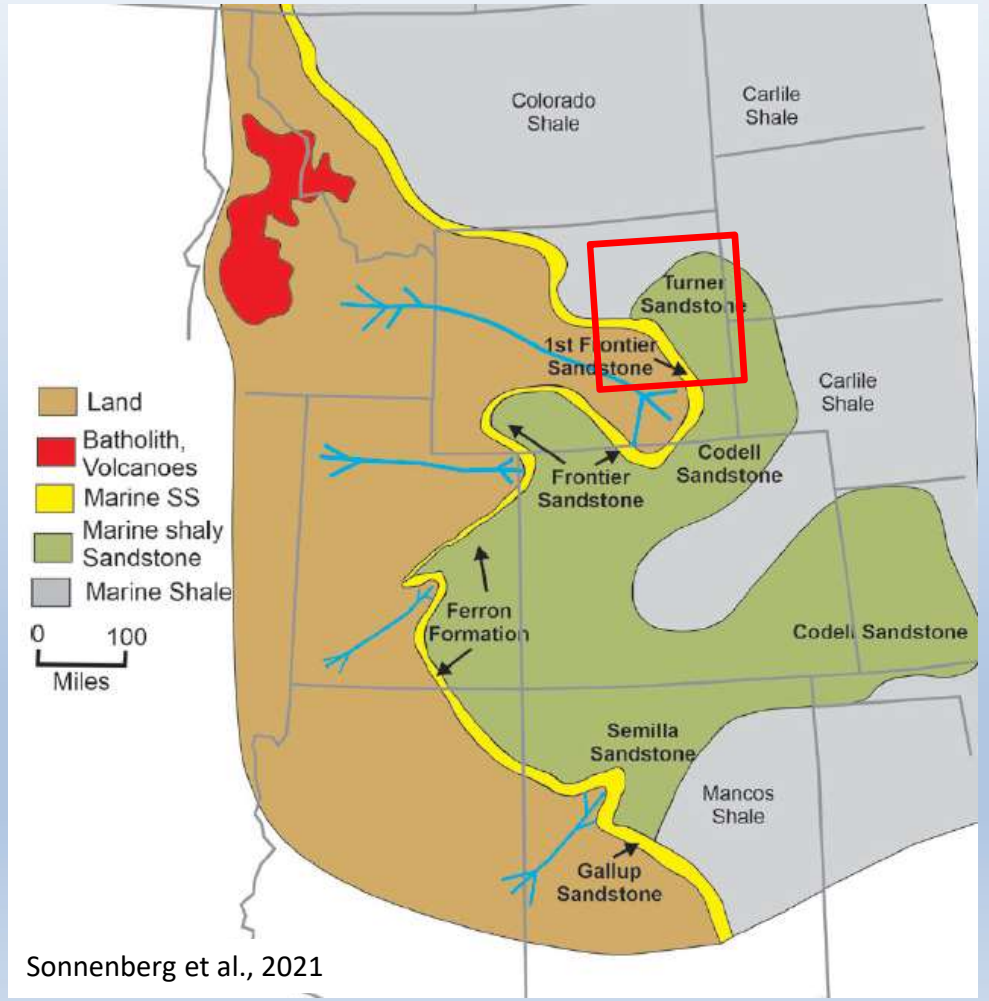
Table 3.1 Summary of the nomenclature and varying interpretations of depositional environment and sediment transport.

Nomenclature	Interpreted Depositional Environment	Sediment Transport Processes & Mechanism	Reference
Wall Creek-Turner: Unit VIII, Unit VII, Unit VI	Channels, nearshore bars, offshore bars	Destructive tide-dominated delta	Merewether et al.1979, p.68, 91
Turner: Type 1 SS	Lowstand shelf edge sands	Sea level drop	Weimer and Flexer 1985, p. 138, 144-145
Turner: Type 2 SS	Intertidal or estuarine valley fill	Sea level rise	
Turner: Type 3 SS	Valley fill, normal marine shelf sand	Sea level rise	
Lower Turner: Type 1 SS	Wave-dominated Shelf	Major river-dominated delta; minor storm influence	Rice and Gaskill 1988, p.69-70, 72
Lower Turner: Type 2 SS	Wave-dominated shelf	Offshore-flowing submarine channelized currents	
Upper Turner	Storm-dominated shelf, below fwwb	Storm currents	
Lower Turner	Wave-dominated, tide-influenced upper shoreface	Wave-generated currents, tidal currents, minor storm influence	Sawyer 1990, p. 198-202
Middle Turner	Lower shoreface to inner shelf	Reworking by storm currents	
Upper Turner	Lower shoreface to inner shelf	Reworking by storm currents	
Wall Creek-Turner: Unit VII	Middle to outer shelf sand sheet	Storm-generated currents, minor wave-generated currents	Winn 1991, p. 97-99
Turner	Shallow marine shelf, distal delta lobe, nearshore-marine close to lowland vegetation	Deltaic, transgressive onlap during early sea level rise	Merewether 1996, p. T33-34.
Wall Creek-Turner	Wall Creek: strand line, reworked shoreface	Wall Creek: long-shore currents, storm waves	Melick 2013, p. 156
	Turner: proximal - distal shelf hyperpycnites	Turner: sediment gravity flows	
Upper Turner-Wall Creek	Isolated shelf sand body, sand ridge	Storm-generated currents	Gustason 2015, abs.

Heger, 2017

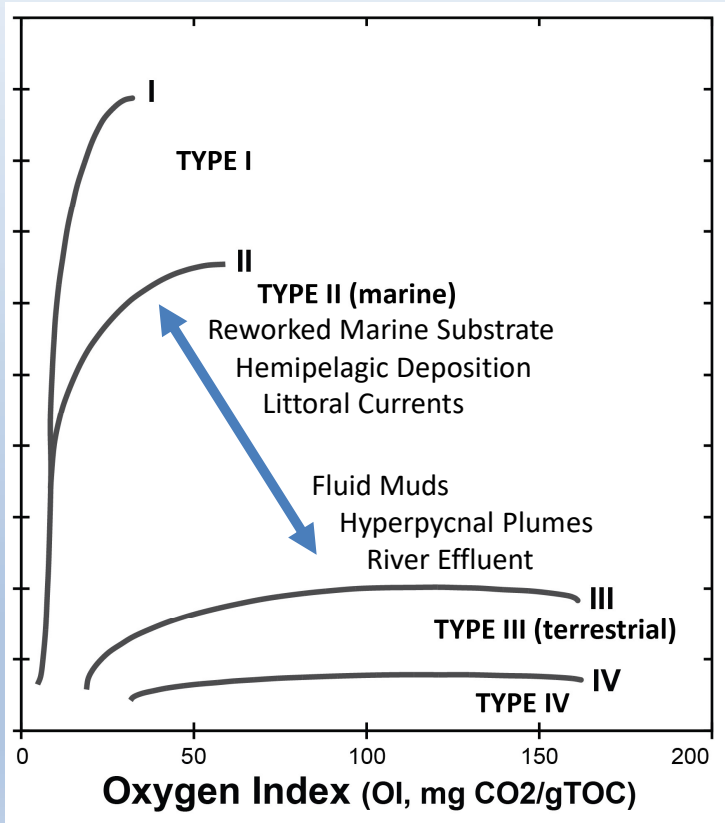
Depositional Environments

Kirschbaum and Mercier, 2013



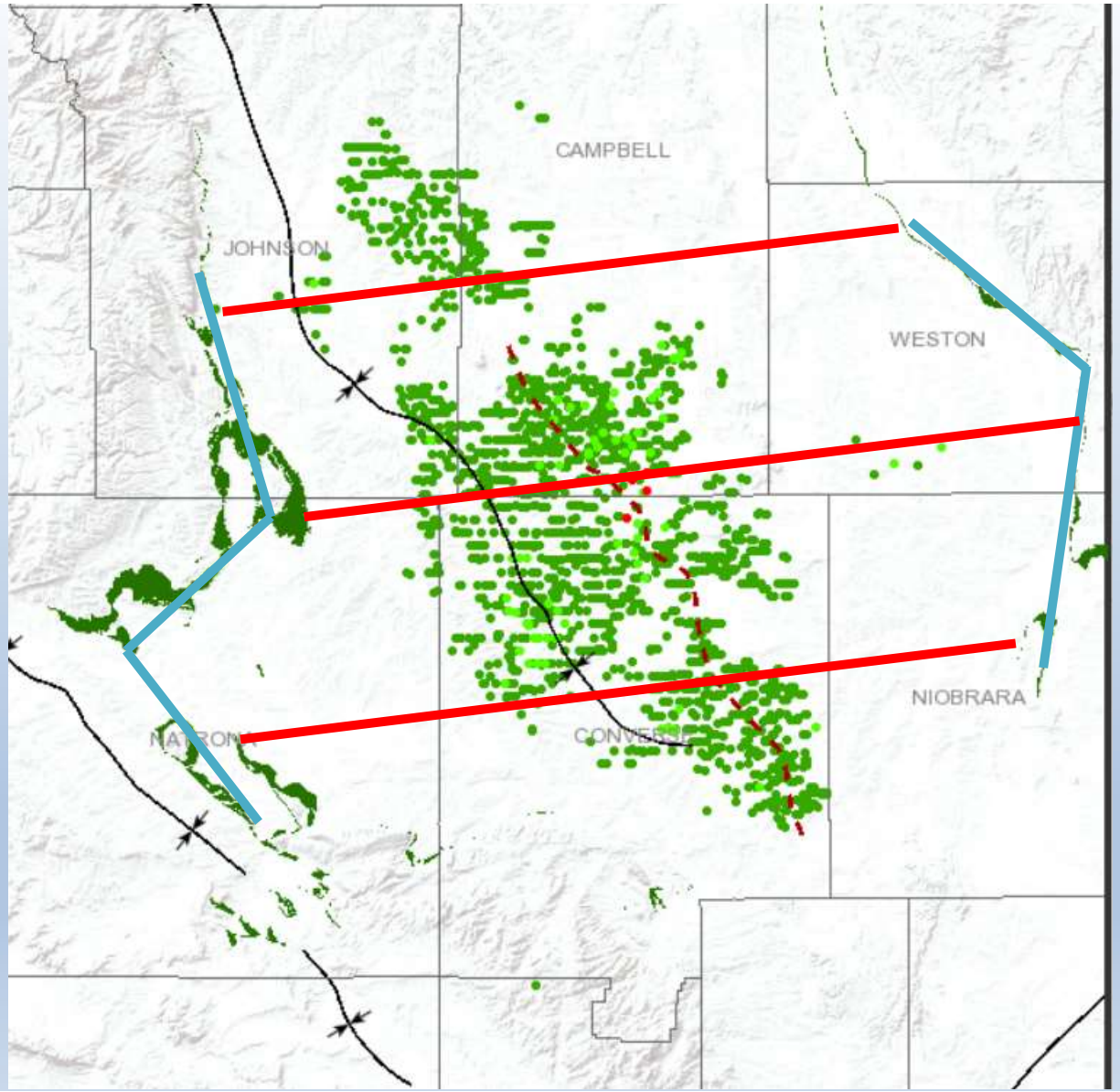
Sonnenberg et al., 2021

Mudstone Geochemistry



Research Goals

1. Characterize the **stratigraphic relationships** and depositional sequences within the Wall Creek-Turner system.
2. Determine the **dominant sedimentary processes** in the Wall Creek-Turner system and characterize their effect on reservoir quality and distribution in the Powder River Basin.
3. Investigate the interbedded mudstones in the Wall Creek-Turner System and determine if organic geochemistry be used to infer the **nature of internal unconformities and shoreline retrogradation** in the late Turonian CWIS.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Depositional Environments

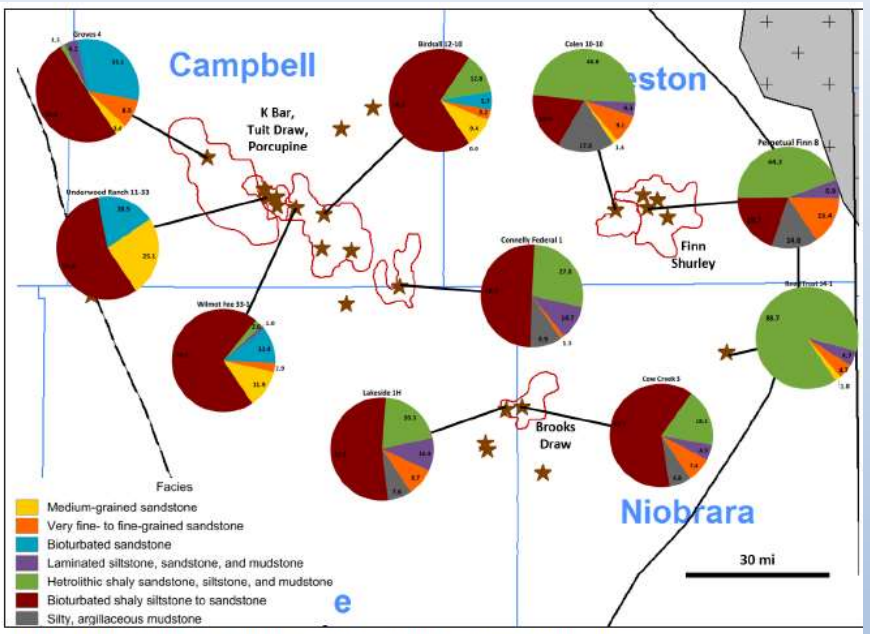
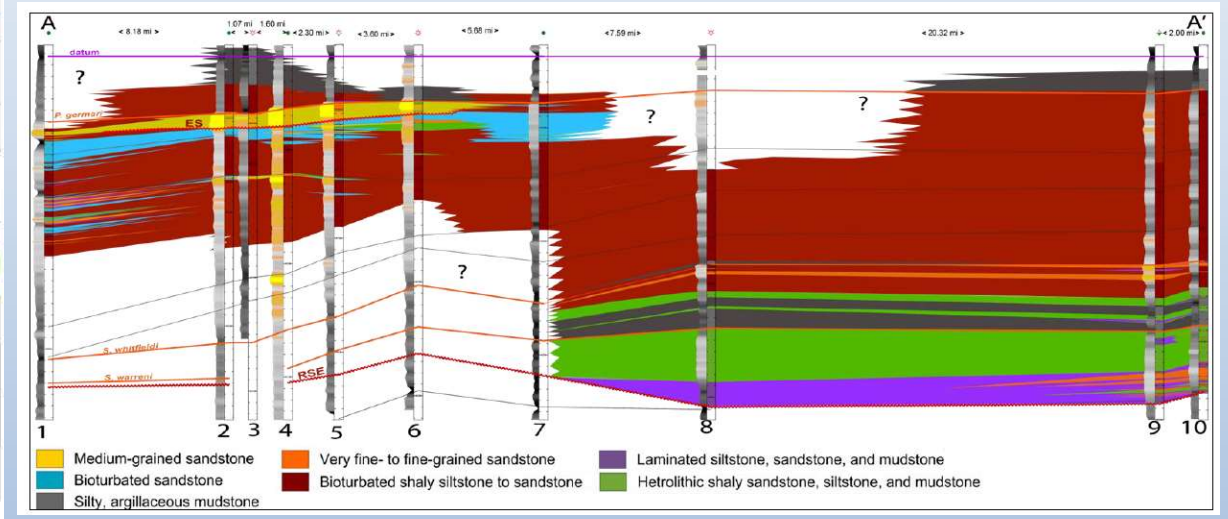


Figure 4.40 Calculated facies distributions from the Turner cores



Heger, 2017