Mancобрara Stratigraphy Unraveled: A Tale of Mancos to Niobrara Stratigraphic Continuity Across the Upper Turonian to Campanian Western Interior Seaway*

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Search and Discovery Article #30649 (2020)**
Posted January 27, 2020

*Adapted from oral presentation given at 2019 AAPG Rocky Mountain Section Meeting, Cheyenne, Wyoming, September 15-18, 2019

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Abstract

It has long been known that laterally time-equivalent sediments deposited in uppermost Turonian through Campanian time in the Western Interior Seaway vary in composition from west to east. Presently, this once continuous stratigraphic interval has been segmented into basins by Laramide tectonism and geographic areas by governmental entities resulting in many different names being given to the same stratigraphic interval. Complications arise when correlating from one basin to another. There is a desire by many geologists to push the eastern, carbonate-dominated, prolifically oil and gas productive Niobrara Formation name west into the realm of the clastic dominated Blue Gate Member of the Mancos Shale. Work on Western Interior biostratigraphy and radiometric dating confirms that at least part of the Mancos Shale is time equivalent with the Niobrara Formation with no gap in deposition along this west to east transect. In the absence of a clear-cut distinction regarding which formation name to use due to the various lateral lithologies, the lure of a blended name such as “Mancibrara” is strong. This study is a synthesis of the work of many previous authors and is a clarification of the Niobrara to Mancos transition across the Douglas Creek Arch. It presents a western-side-of-the-seaway look at what occurred while the Niobrara Formation was being deposited to the east.

References Cited

Birgenheier, L.P., et al., 2017, A depositional model for offshore deposits of the lower Blue Gate Member, Mancos Shale, Uinta Basin, Utah, USA: Sedimentology, v. 64, p. 1402-1438.


Ressetar, R., et al., 2014, Correlation of Niobrara-Equivalent Strata in the Eastern Uinta Basin, Utah: Poster created by The Utah Geological Survey and the University of Utah as part of a four-year, multidisciplinary study of the Upper Cretaceous Mancos Shale in the Uinta Basin of eastern Utah.


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Why do this?

Identify all prospective stratigraphic intervals on the Douglas Creek Arch and in San Arroyo field, Grand County, Utah.

“Can I call it Niobrara if it doesn’t have chalky benches?”
What did I learn?

• Strata time-equivalent to part of the Niobrara formation in the Denver Basin continues and changes composition westward across the Douglas Creek Arch and into the Uinta Basin. Well.... Duh!.

✓ The Lower Blue Gate Shale Member/Mancos Shale contains a **Niobrara equivalent** or “**Mancobrara**” interval on the Douglas Creek Arch and in the Uinta Basin.
Where: Uinta-Piceance Province

Geologic Assessment of Undiscovered Oil and Gas Resources of the Mancos/Mowry Total Petroleum System, Uinta-Piceance Province, Utah and Colorado By Mark A. Kirschbaum 2003
Chapter 6 of Petroleum Systems and Geologic Assessment of Oil and Gas in the Uinta-Piceance Province, Utah and Colorado in U.S. Geological Survey Digital Data Series DDS-69-B
USGS Uinta-Piceance Assessment Team
Uinta-Piceance Province cont.

The “Niobrara” in the San Arroyo 60 mudlog shows no chalky benches. Can I call it Niobrara?
Where: This interval in outcrop

One thin limestone and silty, calcareous mudstone
Outcrop just west of Mack, CO
Where: Niobrara Formation - East

Kelly Bruchez and Nate Rogers measuring section near Kremmling
Near Hanksville, UT

No calcareous beds are evident

Where: Blue Gate Member/Mancos Shale - West
Niobrara (Upper Cretaceous) Depositional Setting

**Key Points**
1. Major Orogenic Belt to West shedding siliciclastics eastward
2. Broad, flat shelf to East
3. Continuous N/S Seaway with complex and strong current flows
4. Warmer chalk-rich water from South
5. Coccoliths, copepods, & planktonic forams thrive in the warmer waters
6. Cooler, denser, nutrient-rich Arctic water from North

Regional West-to-East Cross-Section adapted from Kauffman, 1977

Longman and Luneau, RMS SEPM talk April 2019
How: The Denver Basin Niobrara Formation

Modified from Locklair and Sageman (2008), *Siewert et al. (in review)
Drake and Hawkins, 2012
How: Meanwhile, in the Uinta Basin

Modified from Drake and Hawkins, 2012
Cole et al., 1997
How: The middle way
How: Niobrara equivalent is equivalent to?

Modified from Drake and Hawkins, 2012
Cole et al., 1997
How: Correlation schemes at Hell’s Hole Field

Hell’s Hole #9126    Hell’s Hole #9131
1.5 Miles

Base Mancos B/Prairie Canyon (UGC)
Latest Niobrara DJ ~82 Ma

84.3+/-1 Ma
89.3+/-1 Ma

Earliest Niobrara DJ ~89 Ma

Dakota Silt/Coon Springs
Vincelette and Foster
Rogers
Fisher
Ressetar
Sediment starved shelf deposits:

- Coccolithophores present indicating suspension settling of tests and fecal pellets containing tests. Highest calcite content.
- Highest likelihood place for Type II kerogen and mixed Type II-III.

Modified from Birgenheier et al., 2017 from Bhattacharya 2010
How: Location Map of the Hell’s Hole to San Arroyo
How: Cross Section - Hell’s Hole to San Arroyo

- Dakota Silt/Coon Springs
- Prairie Canyon
- Lower Blue Gate Shale Member
- Fisher
- Ressetar
- Rogers
- Sediment Starved Shelf

Hell’s Hole #9126
San Arroyo #60
What did I learn revisited:

• Strata time-equivalent to part of the Niobrara formation in the Denver Basin continues and changes composition westward across the Douglas Creek Arch and into the Uinta Basin.

✓ The Lower Blue Gate Shale Member/Mancos Shale contains a Niobrara equivalent or “Mancobrara” interval on the Douglas Creek Arch and in the Uinta Basin.
All the same beast below the surface

Borrowed from the website: https://www.thnk.org/blog/creative-leadership-slaying-the-four-headed-hydra/THNK School of creative Leadership
THANK YOU

Utah Gas Corporation
• Tyson Foutz
• Norm Schwalm

Contributors offering crucial guidance:
• Donna Anderson
• Peter Bucknam
• Gus Gustafson
• Mark Longman
• Katie Joe McDonough
• Larry Rasmussen
• Nate Rogers
• Rob Sterling

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