

MGS Luncheon Meeting

Wednesday, March 2nd

11:45 am – Billings Petroleum Club

Please join us for lunch (\$14) and the talk (no charge)

RSVP – montanageologicalsociety@gmail.com , or 406-259-8790

An email reminder will be sent 3 days prior to the talk

ANNA PHELPS

Geologist

SM Energy Company



Facies, Architecture, and Sequence Stratigraphy of the Devonian-Mississippian Sappington Formation, Bridger Range, Montana

The Late Devonian-Early Mississippian Sappington Formation in Montana is a marine unit comprised of lower and upper organic-rich shale members and a middle calcareous siltstone member. The Sappington Formation was deposited during a period of complex paleogeography in Montana, characterized by deposition in sub-basins and onlap onto structural highs, and eustatically- and tectonically-driven transgressive-regressive cycles. Detailed outcrop analysis was conducted on the Sappington Formation across the Bridger Range in southwestern Montana to better understand the Sappington Formation depositional system and changing regional paleogeography. The Sappington Formation is further interpreted in a stratigraphic architectural framework to improve the ability to predict hydrocarbon reservoir heterogeneity within Late Devonian-Early Mississippian strata more regionally.

Fourteen facies within the Sappington Formation are identified: 1) organic-rich mudstone and siltstone; 2) silty mudstone; 3) clay-rich, calcareous siltstone; 4) quartzose siltstone, 5) interlaminated siltstone and mudstone; 6) lenticular siltstone and mudstone; 7) wavy siltstone and mudstone; 8) combined flow siltstone; 9) ripple laminated siltstone; 10) convoluted siltstone; 11) tabular siltstone; 12) low-angle-stratified sandstone; 13) fossiliferous dolomite; and 14) oncoid-bearing floatstone. Genetically related facies are assigned to facies associations that generally represent deposition along a wave-storm-dominated prograding shoreface-shelf system sourced from the Beartooth Shelf to the south. Stratigraphic sequences, surfaces, and systems tracts are interpreted based on facies relationships, depositional processes, and regional stratal stacking patterns. The sequence stratigraphic framework includes two full depositional sequences, the oldest including a TST and HST, the second including a TST, HST and FSST, and a third sequence containing a TST and HST continuing into the overlying Lodgepole Formation. Depositional sequences are interpreted to be controlled by glacioeustatic, third-order sea level fluctuations, whereas basin geometry and configuration is inferred to be tectonic in origin.

Analysis of facies stacking and stratigraphic architecture indicate significant lateral lithologic heterogeneity on the field and reservoir scale. Observed facies heterogeneity and architectural complexity of the Sappington Formation may help explain hydrocarbon production heterogeneity of the contemporaneous Bakken Formation in the Williston Basin and might have strong implications for new development and secondary recovery for the Bakken Formation in the Williston Basin.

Biography

Anna Phelps is a geologist at SM Energy in Billings, Montana. Anna obtained her B.A. degree in Geology at Colorado College (2010) and M.S. Degree in Geology at the University of Montana (2015). This presentation is the work of her M.S. thesis.

At Colorado College, Anna explored Front Range geology and conducted research on the Late Devonian Chaffee Group near Crested Butte, Colorado. Between college and graduate school, Anna spent a winter traveling in Southeast Asia and a couple years working on a ranch on the Upper Southfork of the Shoshone River outside of Cody, Wyoming. In Wyoming, she regularly admired the Absaroka volcanics from horseback (one of the best ways to study geology!).

At the University of Montana, Anna led the UM AAPG Imperial Barrel Award Team to win the Rocky Mountain Regional Competition and compete at the International Competition at AAPG ACE. Also while working on her M.S. degree, Anna interned with Conoco Phillips and Apache Corporation in Houston, Texas, which ignited her excitement about working in the oil and gas industry. Anna is currently working as an exploration geologist for SM Energy, evaluating Rocky Mountain basins from Canada to Mexico.