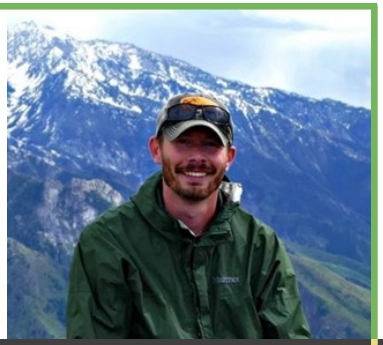
PBS-SEPM MARCH LUNCHEON

Tuesday, March 21, 2023 – 11:30AM

Bush Convention Center - 105 N Main St, Midland, TX 79701

$25 Early Bird Rate | $35 Walk-In/Late RSVP | $10 Student | *Free* Virtual

Register by 3PM on 3/17: www.pbs-sepm.org/events | info@pbs-sepm.org | (432) 279-1360

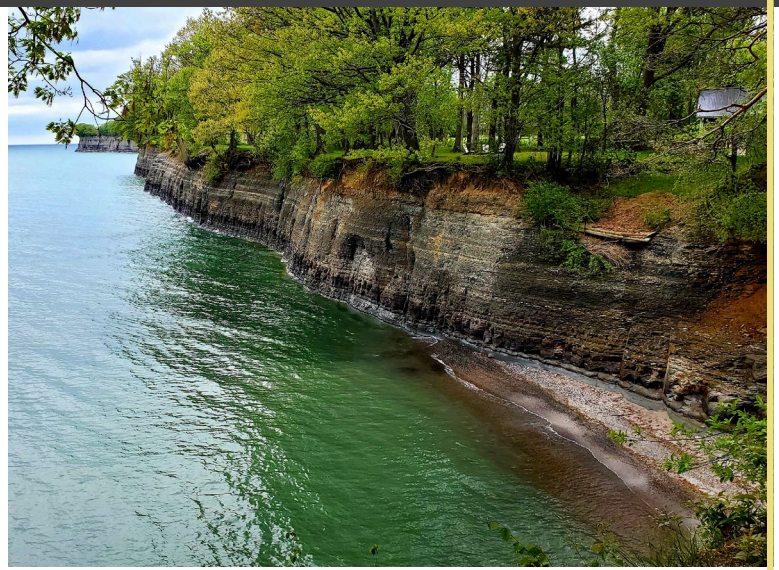


The Occurrence of Critical Minerals in Fine-Grained Strata: Insights from the Upper Devonian of Western New York State

Randy Blood – Founder, DRB Geological Consulting

ABSTRACT

Over the coming decades, global demand for critical minerals is projected to increase rapidly. Several organizations (the IEA and the USGS) have underscored the importance of defining the abundance and geographic distribution of these minerals, many of which are required materials for Li-ion battery development and may be found in black shale deposits. To-date, little attention has been given to understanding the geologic controls on the occurrence of these elements in black shale. Here we investigate depositional and diagenetic processes which may concentrate critical minerals into discrete beds, potentially providing more favorable economics for extraction. The Point Gratiot Bed, a prominent, laterally continuous black shale marking the Upper Devonian Mass Extinction occurs near the top of the Hanover Shale. An eastward thickening wedge of sediment, informally termed the Beaver Meadow Beds occurs between the Point Gratiot Bed, and the base of continuous black shale in the overlying Dunkirk Shale. The unit thickens eastward from about 15 cm at Dunkirk, NY to over 10 meters at Java Village, NY, roughly 75 km away. The section is dominated by grey shale with an eastward increase in the occurrence of abundant, thin, pyritic black shale beds. These beds merge westward via erosional overstep and/or non-deposition with the base of the continuous black shale of the Dunkirk. Thin black shale beds have sharp basal and upper contacts, with the upper contact often undulatory at outcrop scale, and bioturbated with planolites and chondrites-like burrows. We have identified two modes of deposition for thin black shale beds: 1) the lowermost beds are organic-rich hyperpycnites, likely the result of storms flushing lagoonal muds out to sea, and 2) beds associated with transgression which are often accompanied by a basal pyrite lag which may disappear upslope. We conducted elemental analysis using energy dispersive X-Ray Fluorescence across this interval at one-centimeter intervals from numerous exposures. Preliminary data shows enrichment of critical minerals, specifically Co, Cu, Ni, and to a lesser extent Zn, associated with pyrite. Moreover, we have identified four phases of pyrite occurrence in the unit. We conclude that transitional deposits between black and gray shale may provide a source of critical minerals in fine-grained strata. Metals critical to the construction of lithium-ion batteries are closely associated with pyrite. While pyrite often occurs as microscopic grains within black shale, it often occurs as larger macroscopic nodules, concretions, and fossils within gray shale immediately subjacent to black shale.



BIOGRAPHY: *Randy Blood is a geologist and petrophysicist based in the greater Pittsburgh area working on various aspects of Paleozoic strata in the Appalachian Basin. He is the founder of DRB Geological Consulting and a co-founder of Wildlands Research. He has worked unconventional organic-rich mudstone and tight gas sand reservoirs for over 15 years. Much of his research focuses on building gas-in-place models, understanding hydrocarbon storage mechanisms, and building holistic geological models to explain the accumulation and distribution of reservoir facies. Most recently he has begun work creating resource assessments of critical minerals in various deposits in North America. Randy leverages his subsurface experience combined with extensive fieldwork to better understand depositional and diagenetic processes which may concentrate critical minerals in sedimentary strata. He has delivered over 60 talks and posters, published full-length journal articles in several special publications, lead multiple core workshops, and numerous field trips focusing on the geology of organic-rich mudstones.*