

Geoscience 001 Field Trip Reedsville & Bald Eagle Formations near Potter's Mills

There is a large exposure south of Potter's Mills, approximately 12 miles east of State College, where we can study the Reedsville and Bald Eagle Formations, which overlie the Coburn Formation. The Reedsville is still within the Upper Ordovician period and has a total thickness in this area of around 200 m; we're going to look at the uppermost part of it, just below the overlying Bald Eagle Formation.

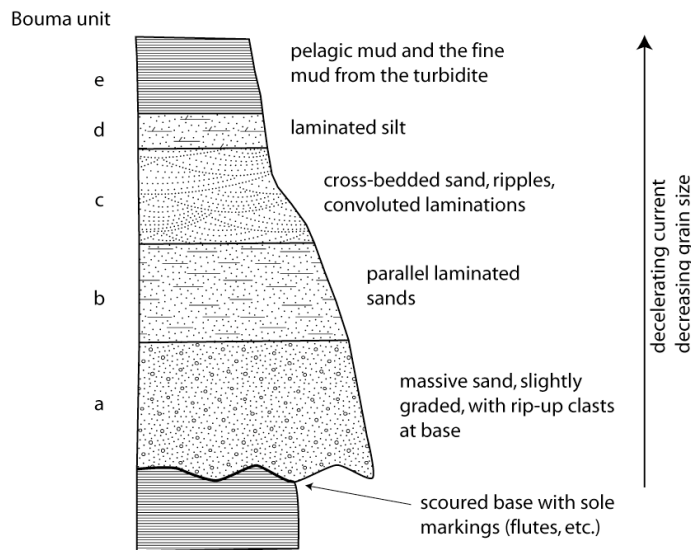
As before, work with a partner — each group will turn in one lab report.

Reedsville Formation

Have a glance at the upper Reedsville, seen at the far southern edge of this exposure; it is similar to the lower Reedsville in that it consists of this easily eroded sedimentary rock that you should be able to identify (i.e., identify this before proceeding). Work your way up-section, to the north, until you start seeing more resistant beds sticking out of the weaker material — this is the part of the Reedsville we want to focus on. These resistant beds are turbidites, deposits from submarine avalanches. Turbidites represent fairly dramatic events; they are usually triggered by large earthquakes and they travel rapidly and deposit sediment in a matter of an hour or so. They are also a means of transporting coarser sediment (because the current velocity is quite high) into a deep-water setting, where clays and muds would normally be found.

The following figure may be useful as you study these turbidites.

The Idealized Turbidite



Closer to the source, you may see units a or a and b, further from the source, you may see c,d,e, or d,e

What to Turn In for the Reedsville: (remember, one report per group)

1. A detailed 2 m stratigraphic column of a part of the Reedsville, paying close attention to the composition and bedding contacts and grain size variations within the resistant beds.
2. A couple of paragraphs that present your observations and interpretations about this sequence of rocks. What can you say about the depositional environment of the easily eroded parts of this formation?

What are the turbidites composed of (what minerals compose the sediment particles)? Closely spaced turbidites (short stratigraphic distance between adjacent turbidite layers) means higher frequency of the turbidites. Turbidites may vary in thickness due to distance from the source of the avalanche, or from varying sizes of avalanches. Look for and then comment on stratigraphic trends you observe in thickness or frequency — does this imply anything about changing distance from the source of the turbidites over time?

Bald Eagle Formation

The Bald Eagle Formation is still within the Upper Ordovician period and has a total thickness in this area of around 200 m; we're going to look at a section near the base of the formation.

There are a number of things to look at here and take notes on, and questions to answer, but the aim of it all is to get a sense of what the depositional environment was like, what the regional geography might have looked like, and how things changed relative to the time of the Reedsville.

In the way of background, recall that sandstones are composed of particles that are derived from the weathering, erosion, and transport from some uplifted source. The composition can give us some general clues about the type of area that was providing the sediment — was it a volcanic arc, a region of uplifted metamorphic rocks, a region of folded and uplifted sedimentary rocks? The best clues about the source region come from the largest particles, so it is worth focusing some attention on the largest grains you see, which will be pebbles in this case. The roundedness of the grains, and the range of mineralogy can provide some clues about the transport distance and time (well-rounded grains of quartz suggest long transport; less well-rounded grains of a variety of compositions suggest briefer transport). Sedimentary structures like cross-beds, ripples, mud-cracks, etc., can also provide some useful information about the environment of deposition and the flow direction and strength of flows associated with the deposition of the sediment.

Color can sometimes provide useful information, but it is not a conclusive piece of information (still, it provides some useful suggestions). For instance, reddish color in sandstones and shales comes from hematite, which commonly forms in terrestrial environments (i.e., above sea level), whereas, greenish colors and dark gray colors are more commonly associated with deeper, marine environments.

Finally, pay attention to the larger-scale relationships of the beds. In river environments, it is common to see channels, where a coarse sandstone fills a scoured-out depression cut into the underlying beds. In contrast, there are fewer channels in deltaic environments due to stronger subsidence, and fewer channels in shallow marine shelf sands due to the lack of focused current flow such as occurs in a river.

What to Turn In for the Bald Eagle:

A paragraph that document, explain, and interpret your observations on the following aspects of the Bald Eagle Formation seen in this exposure. Your report should include sketches.

The diagrams on the backside of this lab handout should provide useful in making observations and interpreting them.

1. Sedimentary Structures

A. Sketch (include a scale) 3 different sedimentary structures you can find, including a brief statement of what you infer about the depositional environment based on the sedimentary structure. The examples provided with this lab give you a general idea of what the sketches should look like.

B. Describe the approximate flow direction indicated by at least 5 different sets of cross-beds (from 5 different stratigraphic levels)

2. Composition

What is the mineralogy or lithology (if the pebbles are actual rocks rather than single minerals) of the larger grains in these beds? What does this suggest in terms of a source region?

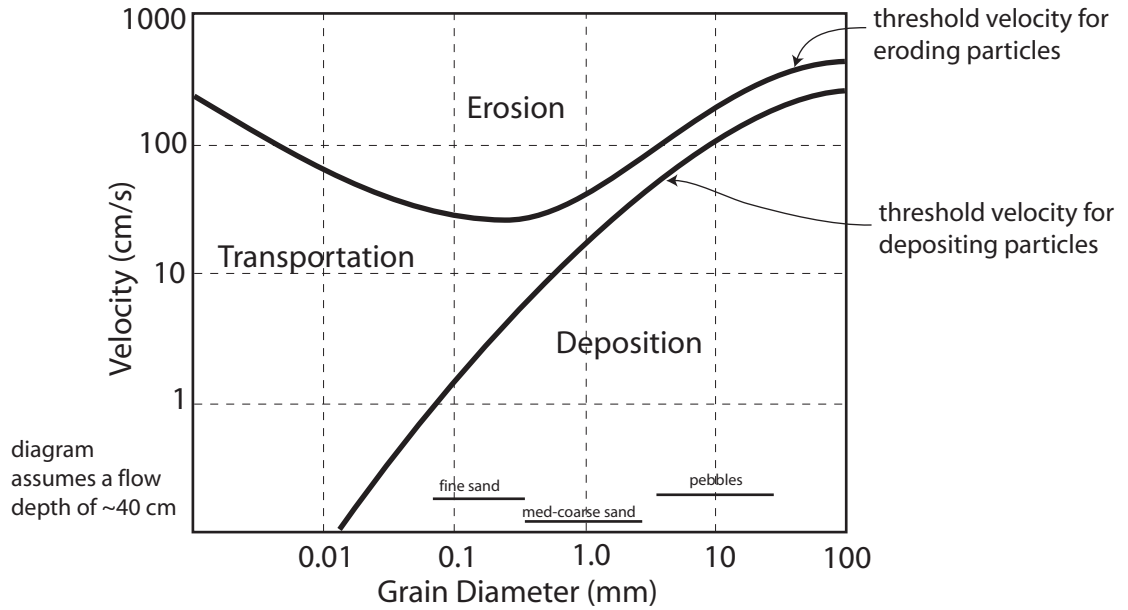
3. Grain Size, Shape, and Color

How big are the largest particles? (give approximate diameter in mm). Are the grains well-rounded, slightly-rounded, angular, or variable (some rounded and some angular)?
What color are the sediment particles?

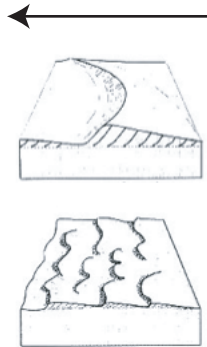
4. Summary of Observations and Interpretations

Write a couple of paragraphs in which you summarize the inferences derived from the above observations, being sure to answer the following. What was the depositional environment like? Where was this place relative to sea level? What was the source region like? Where was the source region most likely located?

Hjulstrom Diagram can be used to estimate approximate flow velocities

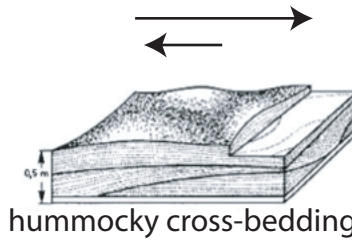


UNI-DIRECTIONAL FLOW



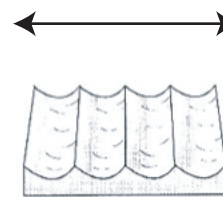
asymmetric ripples, waves, dunes

MIXED FLOW



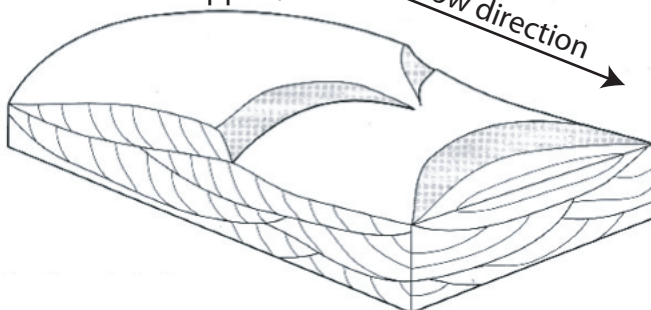
hummocky cross-bedding

OSCILLATORY FLOW



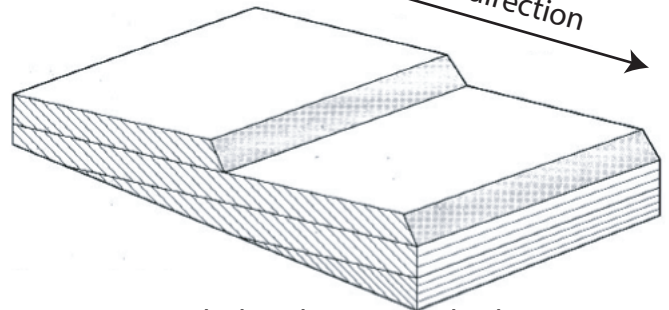
symmetrical ripples

sinuous-crested ripples/dunes



trough cross-beds

straight-crested ripples/dunes



tabular, planar cross-beds