

Palaeo-environments

This is an exercise in interpreting the environment of deposition of a sequence of sedimentary rocks. For each formation name the lithologies and the sedimentary structures. The rose diagrams give the orientations of the sedimentary structures and from this the directions of wind and water can be deduced. Work out what environment is represented by the rocks of each formation. Using all this information and using Walther's Law draw a palaeo-environmental map for each formation.

TEACHER'S SECTION PALAEO-ENVIRONMENTS

This worksheet is quite challenging. Most students are able to interpret the environments except for the estuary. For that they need to be given clues e.g. where near the sea does the water flow reverse directions several times each day. Only the brightest manage to draw the maps.

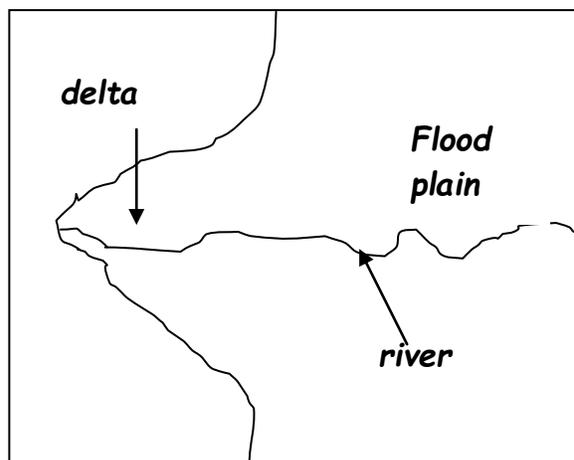
Here are the answers starting with the oldest.

Formation A

1 River deposits. the river was flowing westward.

2 Delta deposits. The delta was building out westward.

During the deposition of formation A Sea level was rising so although the delta was building out the coastline was retreating (transgression).



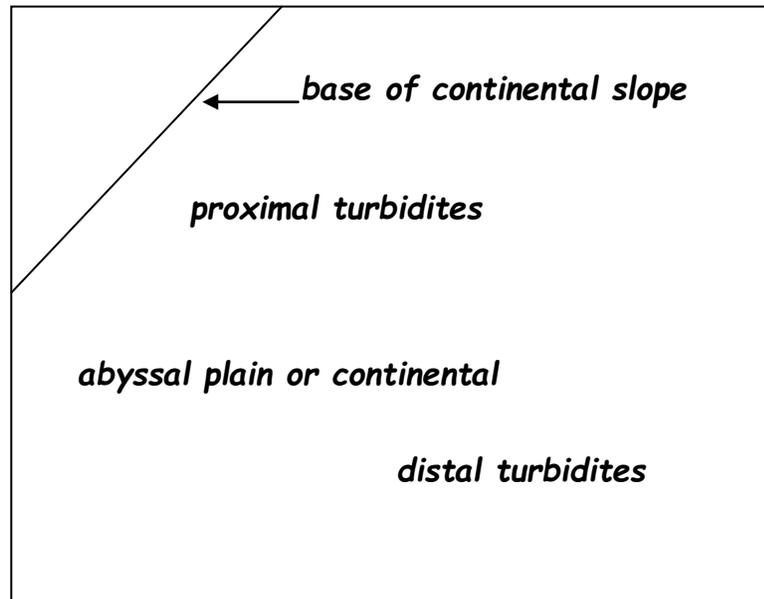
Formation B

3 Distal turbidites flowing SE

4 Intermediate turbidites flowing SE

5 Proximal turbidites flowing SE

During the deposition of Formation B the turbidite fan was building outwards. to the southeast



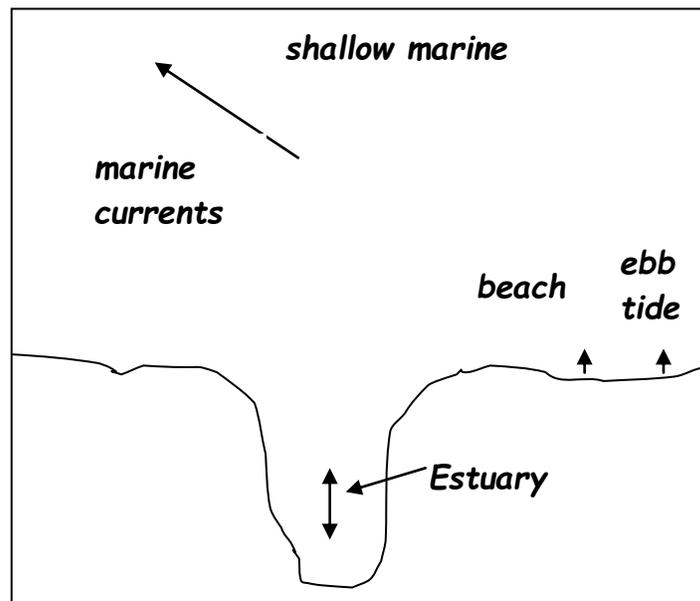
Formation C

6 Estuarine deposits with tidal deposits with water flowing upstream and downstream, north and south.

7 Beach deposits ebb tide flowing north.

8 Shallow marine with submarine dunes caused by major currents moving NW.

Formation C Represents a period of rising sea level and transgression.



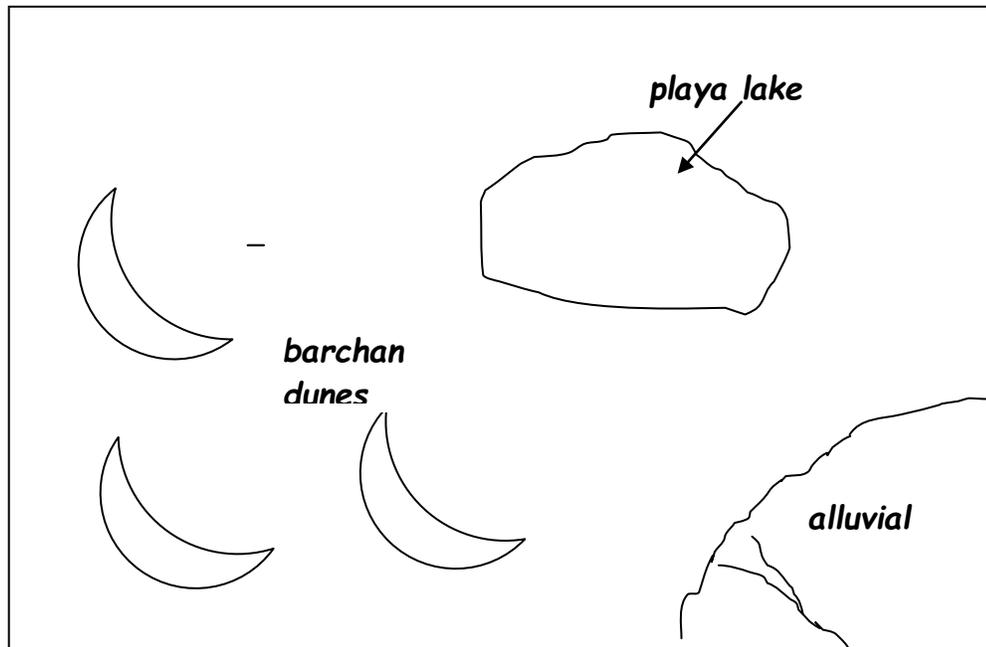
Formation D

9 Playa lake deposits wind blowing NE.

10 Barchan dunes wind blowing NE.

11 Alluvial fan with water flowing NW

During the deposition of this formation the dunes were advancing over the playa lake deposits and the alluvial fan was advancing over the dunes.



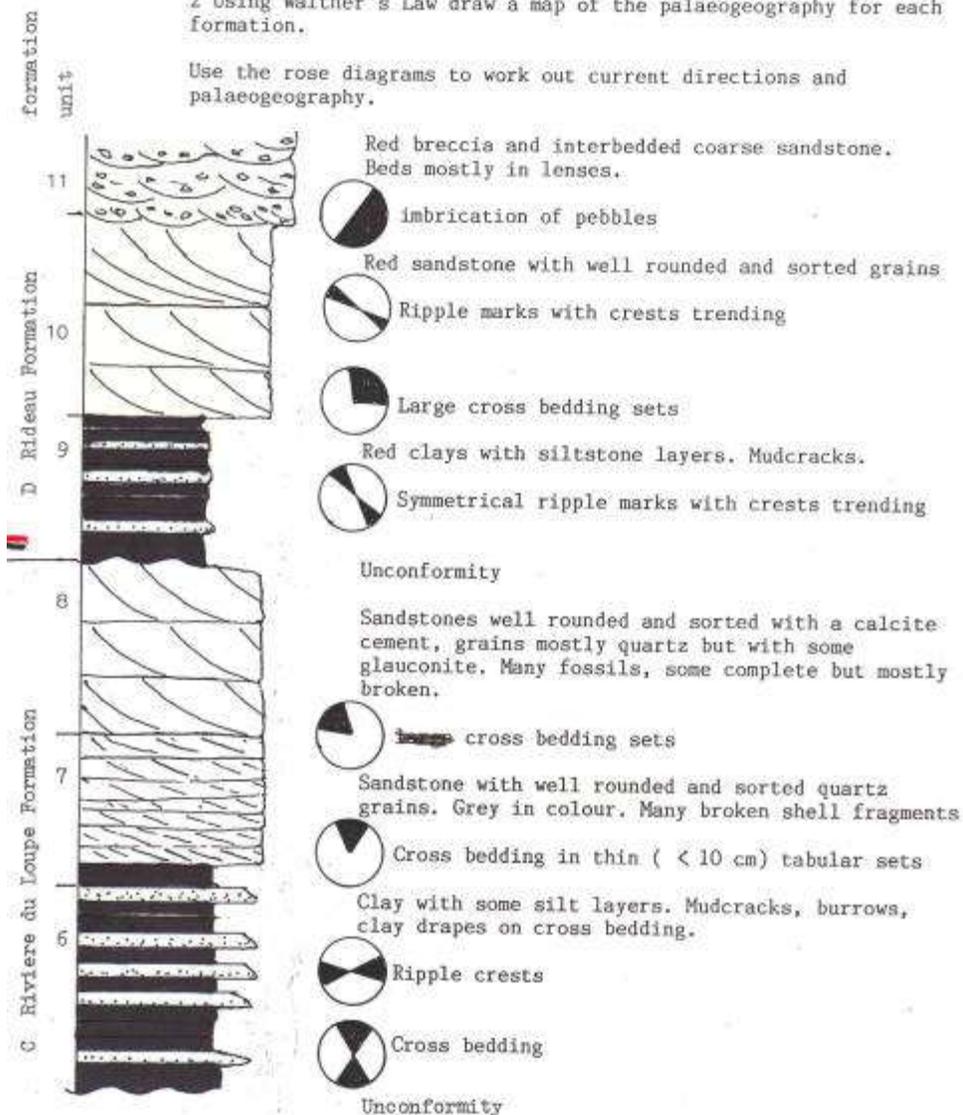
PALAEO-ENVIRONMENTS

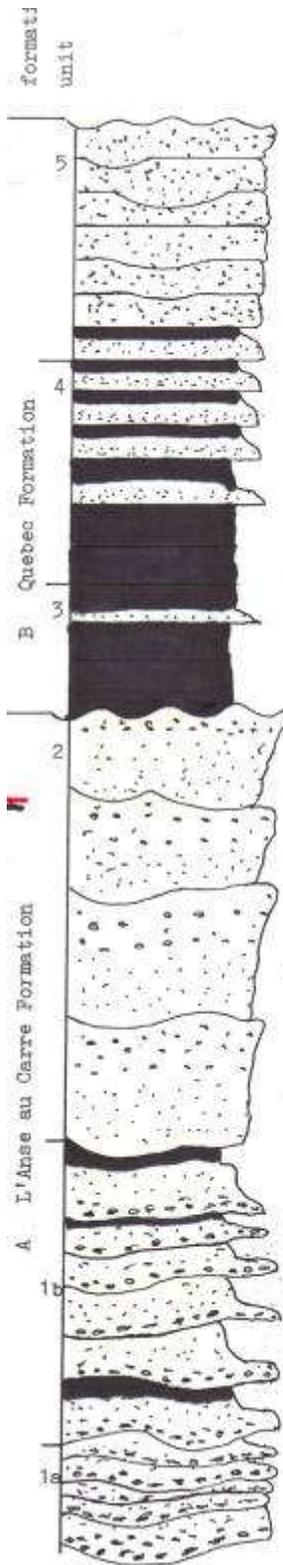
The following sequence of strata was mapped in Eastern Canada.

1 Interpret the environment of deposition for each unit.

2 Using Walther's Law draw a map of the palaeogeography for each formation.

Use the rose diagrams to work out current directions and palaeogeography.





Coarse greywacke sandstones often with channelled bases. Individual beds are often greater than 2m thick. Black shales form only a small part of the sequence. Many of the sand grains are fragments of volcanic rock.

Beds of greywacke sandstone usually about 15cm thick interbedded with black shales.



Flutes



Grooves

Black shales with thin (< 2cm) greywacke sandstones

Unconformity

coarsening upward cycles between 5 and 10m thick with occasional coal seams.



channels



cross bedding

fining upward cycles between 50cm and 2m thick with erosive bases. Sandstones grey and micaceous.



cross bedding

Conglomerate with thin sandstones and black shales
Conglomerate often contains mudflakes.