

**“Waltherian” Facies Shifts:  
A Basic Exercise in Outcrop-based Sequence Stratigraphy**

Note: Stratigraphic Data and Maps are From VanWagoner, 1992  
This exercise was designed by Dr. Jen Aschoff as a basic exercise in sequence stratigraphy for  
Undergraduate Petroleum Engineering Students at Colorado School of Mines  
Facies interpretations have been simplified.

**Learning Objectives:**

1. **Walther’s Law**
2. **Facies interpretation**
3. **Basic sequence-stratigraphic correlation using outcrop data**

1. For the 3 stratigraphic columns and facies descriptions provided (Figure 1 and Table 1):
  - a) Interpret the depositional environments for each facies in the 3 stratigraphic columns provided (Figures 1). For your answer, fill in the “Depositional Environment Interpretation” column of Table 1. This question may require you to research each environment in your book, or at the library. Cite your sources!

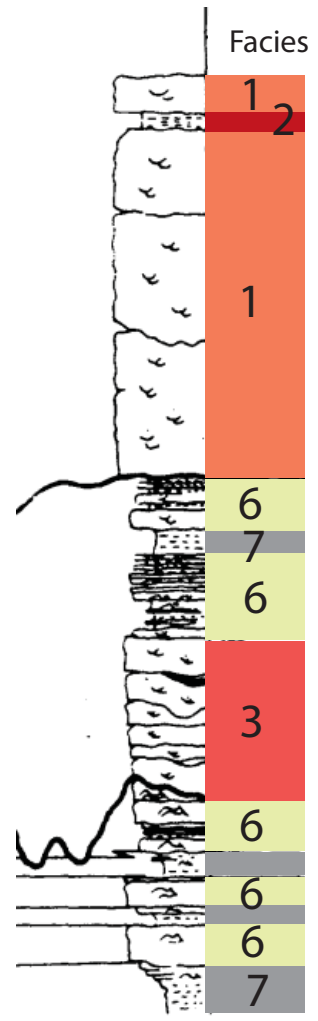
*Choose from the following depositional environments:*

Offshore Marine  
Lower Shoreface  
Upper Shoreface  
Tide-dominated Estuary  
Braided Fluvial (thick-bedded)  
Meandering Fluvial (thin-bedded)  
Floodplain

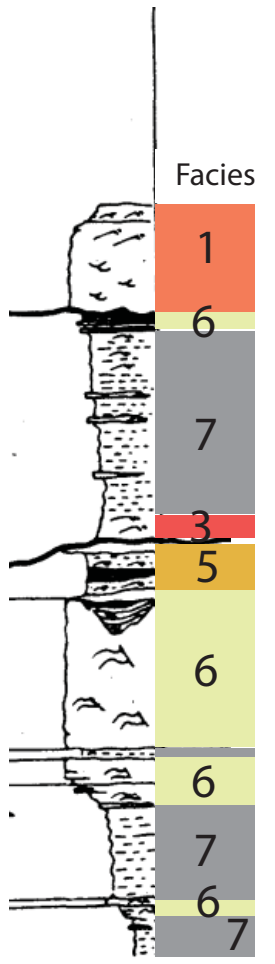
- b) List the evidence that supports your interpretation. For your answer, fill in the “Evidence” column of Table 1
- c) Pick the “non-Waltherian”, vertical shifts in facies. That is, facies *that are* adjacent to each other in the vertical stratigraphy but *would not* be adjacent to each other in the modern map-view. Hint:  
“NON-Waltherian” Examples (don’t follow Walther’s Law)  
Ex1: offshore marine deposits overlain by fluvial  
Ex2: fluvial deposits overlain by offshore marine  
Waltherian Examples (DO follow Walther’s Law)  
Ex1: floodplain deposits overlain by fluvial channel deposits  
Ex2: offshore marine deposits overlain by lower shoreface deposits
- d) Distinguish the basinward from the landward shifts.  
“**basinward shift**” (or, **sequence boundary**): overlying facies record a more proximal environment (such as alluvial fan, fluvial) than the underlying facies.  
“**landward shift**” (or, **flooding surface**): overlying facies record a more distal environment (such as offshore marine, or lower shoreface) than the underlying facies.

- e) Draw lines that correlate (connect) similar non-Waltherian shifts (i.e., connect the basinward shifts with other basinward shifts, and landward shifts with landward shifts).
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2. Describe and illustrate the evolution of the landscape through time as recorded by these strata. Do this by picking time-lines for each of the stratigraphic columns and drawing a paleogeographic map for each time-line using the map provided (Figure 2).

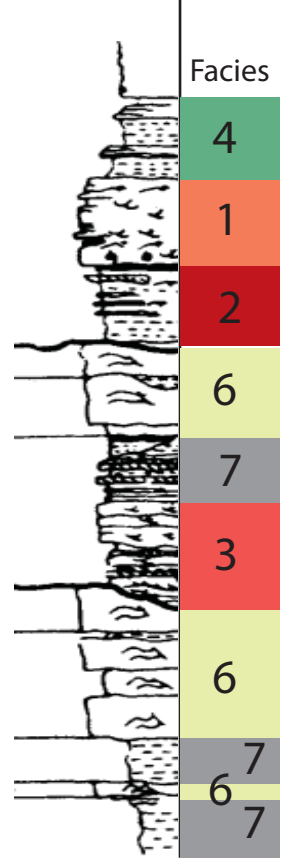
J  
Coal Canyon



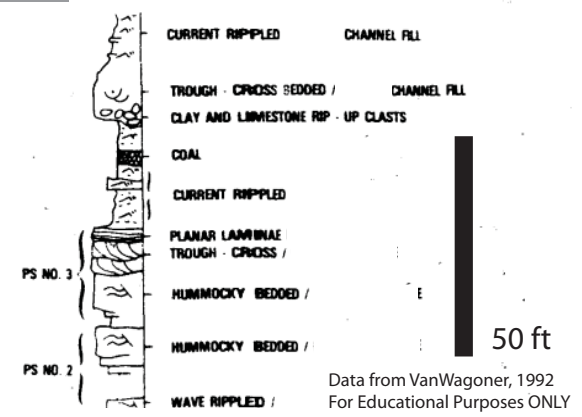
H  
West Thompson Pass



E  
Thompson Canyon



**LEGEND**



Facies	Description	Depositional Environment Interpretation	Evidence
1	Thick, lenticular (channel) beds of trough cross-stratified and planar-tabular cross-stratified medium to coarse-grained sandstone.		
2	Thin, discontinuous beds of massive mudstone with root traces and coaly material.		
3	Thin, lenticular (channel) beds of planar-tabular and wedg-planar cross-stratified fine- to very fine-grained sandstone.		
4	Thin, discontinuous beds of sigmoidal cross-bedded and flaser-bedded sandstone with numerous, thin mud drapes and bi-directional ripple cross-laminations.		
5	Thick, semi-continuous, sheet-like beds of planar-tabular and hummocky cross-bedded very fine- to fine-grained sandstone. Marine trace fossils.		
6	Thick, semi-continuous, sheet-like beds of hummocky cross-bedded very fine- to fine-grained sandstone. Marine trace fossils.		
7	Black to gray, massive shale with marine trace and body fossils.		

