

Paleogeography of the Early Triassic of the Western Interior Basin

1. Introduction

Paleogeography is the reconstruction of parts of the Earth's physical geography at a particular time in the geological past. Lithofacies maps illustrate the spatial distribution of different rock types at particular points in geological time that represent changing environments in the past. In this lab, you will examine 14 rocks and construct lithofacies maps of the Western interior Basin for the four time slices shown in the table below (spanning from 245-241 million years ago).

System	Formation	Member
Lower Triassic System	Thaynes Formation	Upper Black Limestone
		Lower Black Limestone
		Lower Limestone
	Upper Dinwoody	

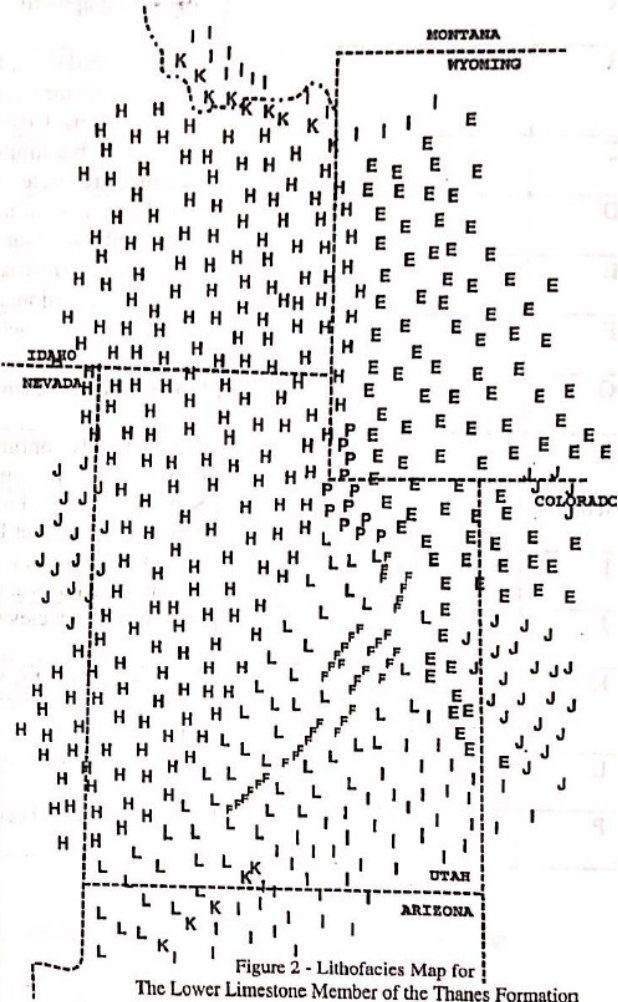
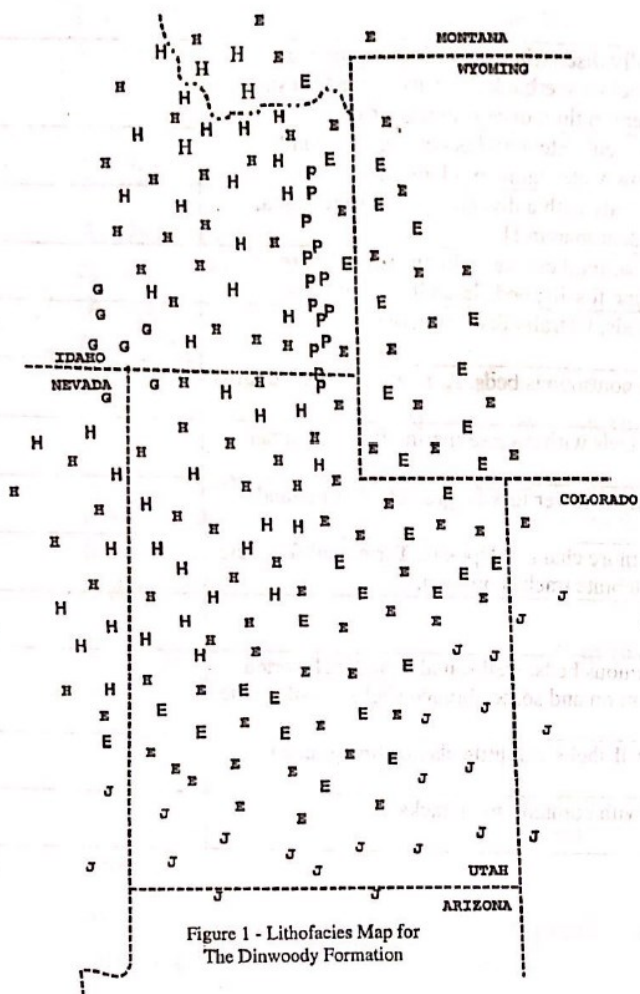
2. Procedures

- A. Describe and interpret rocks. There are 14 rocks in the study collection that cover a range of depositional settings. Each rock has a letter that corresponds to a letter shown on the 4 maps attached to this lab, simply meaning that this particular rock type was found in every place where you see the letter appear on the maps. Identify the rocks and interpret the deposition setting where they were likely formed and fill this in on the chart on the following page (see also figure 5.3 in tectonics settings chapter)
- B. Make paleoenvironmental overlays. Using tracing paper provided by your instructor, make a paleoenvironmental overlay for each map. This is done by first drawing the state lines as a guide and then secondly by contouring around the areas covered by the same letters or individual rock types.
- C. Label the depositional environment on the map and color them in (see color scheme below). If you are not exactly certain what the depositional environment is, then fill in the ones you are sure of and then try to determine them by a process of elimination. For example, a quartz sandstone could be either a beach, barrier island, dune, or river channel. By examining what the sandstone is surrounded by, you can narrow it down, remember that depositional environments change in a predictable way down gradient from mountain to sea.

When coloring the map units, the typical colors used on the lithofacies maps depends on the lithology, see examples listed below:

- | | |
|--|---|
| 1. Arkose—red | 2. Conglomerate—brown |
| 3. Coarse sandstone—red orange or yellow green | 4. Medium qtz ss – yellow |
| 5. Ferruginous siltstone – pink | 6. Fossiliferous limestone –sky blue |
| 7. Oolitic limestone – white | 8. Unfossiliferous limestone – blue or grey |
| 9. Black shale – black | |

Facies	Description	Notes	Interpretation
A		Coarsening upward	
B		Variable lithologies, laterally discontinuous with fining upward sequences. Common channel to overbank deposits, some terrestrial flora and fauna. Coal present in thin discontinuous seams.	
C		Similar to L but limited to areal extent and occurring in mounds. Contains a restricted shallow water fauna of clams and snails	
D		Thin, laterally continuous beds with a diverse open marine fauna, more planktonic fauna present than in H.	
E		Dominantly terrestrial fauna; mud cracks and animal tracks are common, occasional marine fossils; beds laterally continuous	
F		Cross-bedded, lenticular beds, laterally discontinuous.	
G		Finely laminated, laterally continuous beds, Animal burrows are rare.	
H		Thin, laterally continuous beds with diverse marine fossils, animal burrows are common.	
H or h		Same as H above, but contains fewer fossils, great silt-fine sand content, and thinner beds.	
I		Similar to unit B but with more channel deposits. Terrestrial flora and fauna. Mudcracks and vertebrate tracks common.	
J		An area of high elevation.	
K		Irregular to laterally continuous beds, well round and well sorted grains. Cross-bedding common and some abraded shelly fossils at the top.	
L		Contains many broken fossil shells and little clay or fine grained content.	
P		Thin to irregular bedding with common mudcracks.	



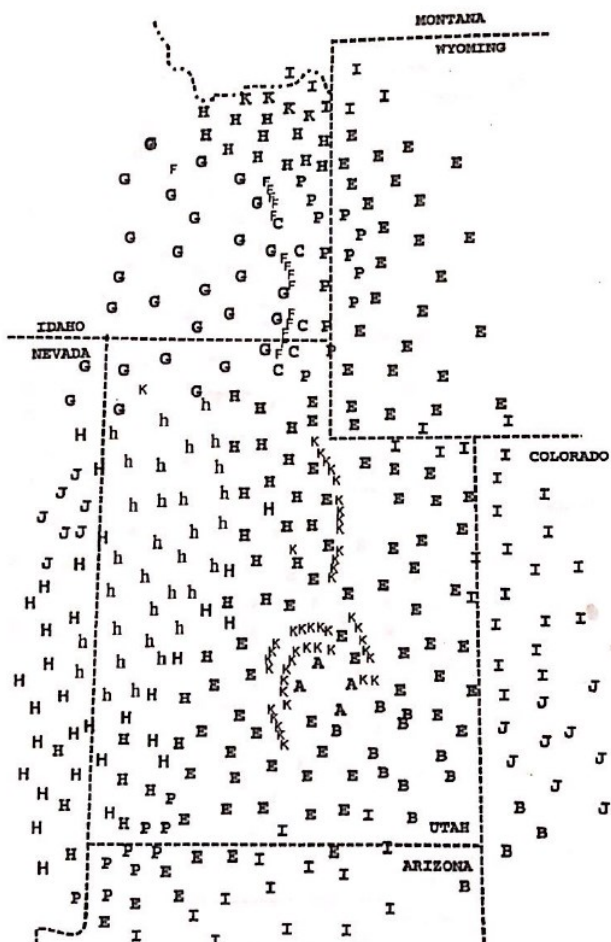


Figure 3 - Facies map of the
Lower Black Limestone Member of the Thanes Formation

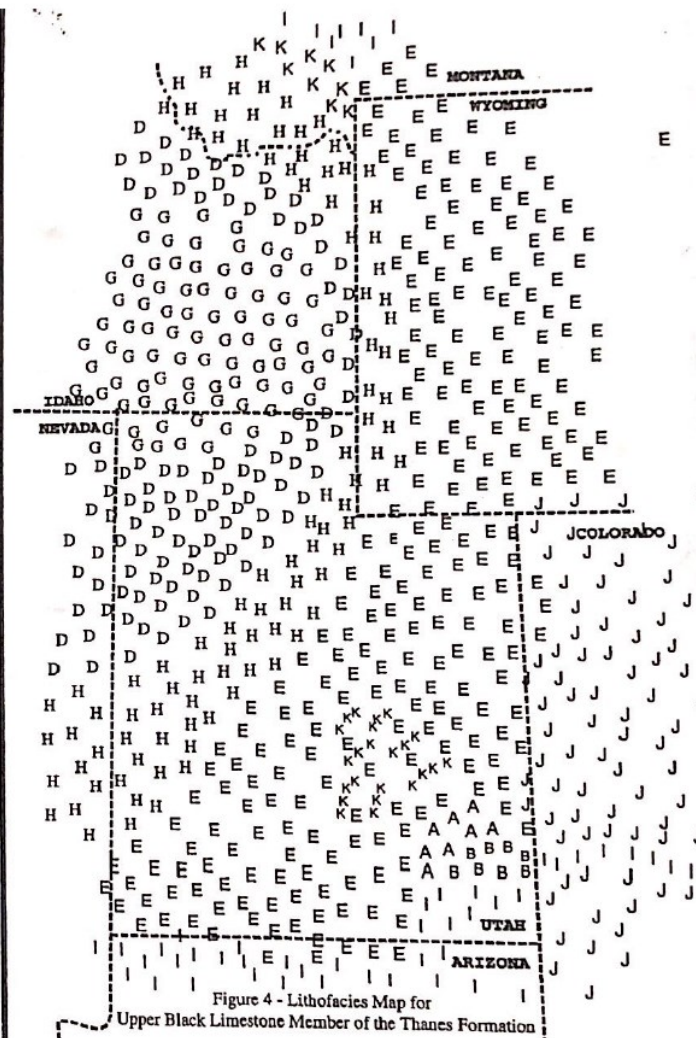


Figure 4 - Lithofacies Map for
Upper Black Limestone Member of the Thanes Formation

Paleogeography of the Early Triassic of the Western Interior Basin: Part 2

Now that you've identified and mapped out the rock types and probably depositional environments found in the Early Triassic of the Western Interior, it's time to use that information to interpret the geologic history of the area.

1. Make sure you have all of your maps labeled (figure 1, figure 2, etc). Feel free to cut them apart so you can look at each map separately.
2. Remember that, in geology, we interpret things from oldest to youngest (or from the bottom up), so begin by looking at figure 1. You should have a good idea of what the depositional environment is (e.g. cratonic beach to shelf, or orogenic alluvial fans and rivers) and be able to infer the tectonic setting. In which direction was the source area (the land/mountains)? Which direction was the sea?
3. Consider the same factors for figure 2. Next, compare how the area has changed since the rocks represented in figure 1 were deposited. It may be helpful for you to lay figure 1 on figure 2, carefully lining up the state lines so you can see how the environments may have shifted or changed completely.
4. Do this for each map – consider what it means on its own and compare how it has changed since earlier times (i.e. redo step 3 for each map).
5. Finally, write a short geologic history of the area, much like you did for the correlation exercise. Be sure to address:
 - a. The specific depositional and tectonic environment for each time slice
 - b. The location (direction) of the land and sea at each time.
 - c. Whether changes between times might be related to a change in sea level. Be sure to specify if it's a transgression or regression.
 - d. Anything else you have noticed—For example, does it look like the tectonic environment changed? Were any features constant through time? Etc.

This can be a narrative or a list/outline of key points—just make sure it follows a logical order (and describes things oldest to youngest)

