

Paleogeography of Arkansas and Surrounding Regions

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 9 rocks and construct facies maps of the Arkansas state and surrounding areas for four time slices shown in the figure below. The facies span from Late Chesterian (~325 million years ago) – Desmoinesian (~312 Million years ago).

	System	Series	Formations
Younger	Pennsylvanian System	Desmoinesian	Hartshorne
		Atokan	Atoka
		Morrowan	Bloyd
	Mississippian System	Chesterian	Pitkin, Fayetteville
Older	Preexisting strata		Stanley, Jackfork

2. Procedure:

A) Describe and interpret rocks. There are 9 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 depositional settings where they were likely formed and fill this in on the chart on the following page.

B) Contour around the areas covered by the same letters or individual rock types, then color in the contoured areas using the color key on the following page.

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 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 from mountain to sea.

Facies	Rock Name	Notes	Paleoenvironmental interpretation
A		Grey to black. Many fossils. Laterally continuous.	
B		Fine- to coarse-grained, oolitic, and fossiliferous laterally continuous.	
C		Laterally continuous variable sand-sized lithologies with asymmetrical cross-beds and ripple marks. Nonmarine and marine fossils present.	
D		Variable lithologies, laterally discontinuous. Common stream channel and flood deposits, some terrestrial flora and fauna. Coal present in thin, discontinuous seams.	
E		Same as A, but with less fossils, lithology is strictly black and fissile, and horizontal trace fossils present.	
f		Lobe-shaped in map view. Repeated fining-upwards grain sizes in graded beds.	
G		Finely laminated, laterally continuous beds. Animal burrows are rare. Sediments made from calcareous oozes.	
H		Feldspar-rich. Lobe-shaped in map view.	
I		Composed of angular bits of basement rock. Basement rock has undergone low-grade metamorphism and was exhumed due to mountain building processes.	

Color key:

1. arkose sandstone – red
2. breccia/conglomerate – brown
3. coarse to medium quartz sandstone – yellow
4. fossiliferous shale or siltstone – grey
5. fossiliferous limestone – sky blue
6. unfossiliferous limestone – blue or royal blue
7. black shale – black
8. various terrestrial facies – green

Paleogeography of Arkansas: Part 2

Now that you have identified and mapped out the rock types and probable depositional environments found in the Mississippian and Pennsylvanian of Arkansas and surrounding areas, you will use that information to interpret the geologic history of the area.

- 1) Make sure you understand how time advances among each of your maps. Labels may help.
- 2) Remember that in geology we interpret layers and events from oldest to youngest (or from the bottom up), so begin by looking at the oldest map (Chesterian Series). You should have a good idea of what the depositional environment is and be able to infer the geographic setting. In which direction was the source area (land)? The sea?
- 3) Consider the same factors for Time 2, and then compare how the area has changed since the rocks represented in Time 1 were deposited. It may be helpful for you to cut out and lay Figure 2 on top of Figure 1, carefully lining up the state lines, so you can easily see how environments may have shifted or changed completely.

Do this for each map – consider what it means on its own and compare how it has changed since earlier times.

Finally, write a short paleogeographic history of the area. Be sure to address:

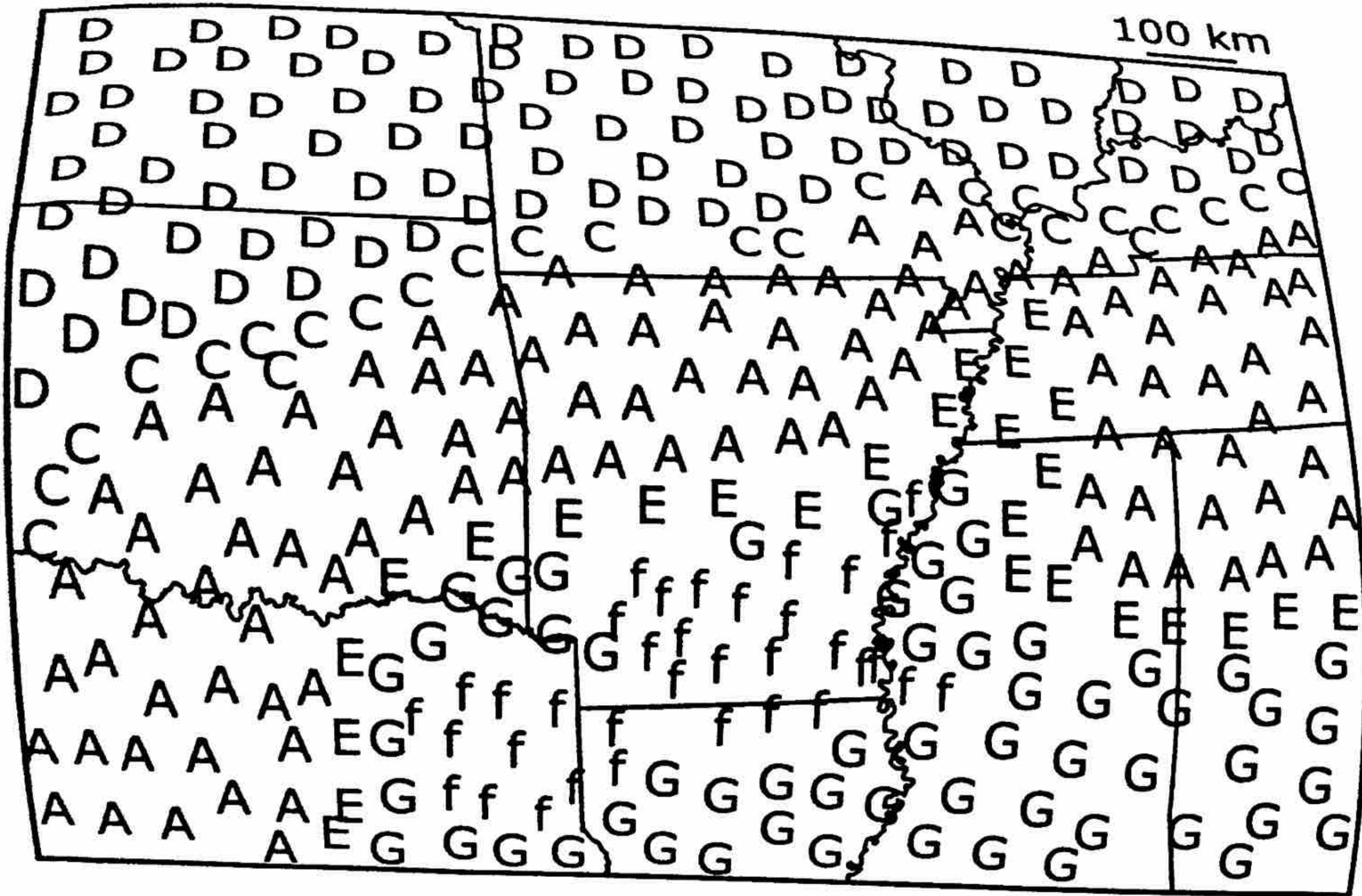
- The specific depositional environments for each time slice
- The location (direction) of land and sea at each time
- Whether changes between times might be related to a change in sea level, *being sure to specify whether it is a transgression or regression.*
- Anything else curious you may notice – 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 parts oldest to youngest.

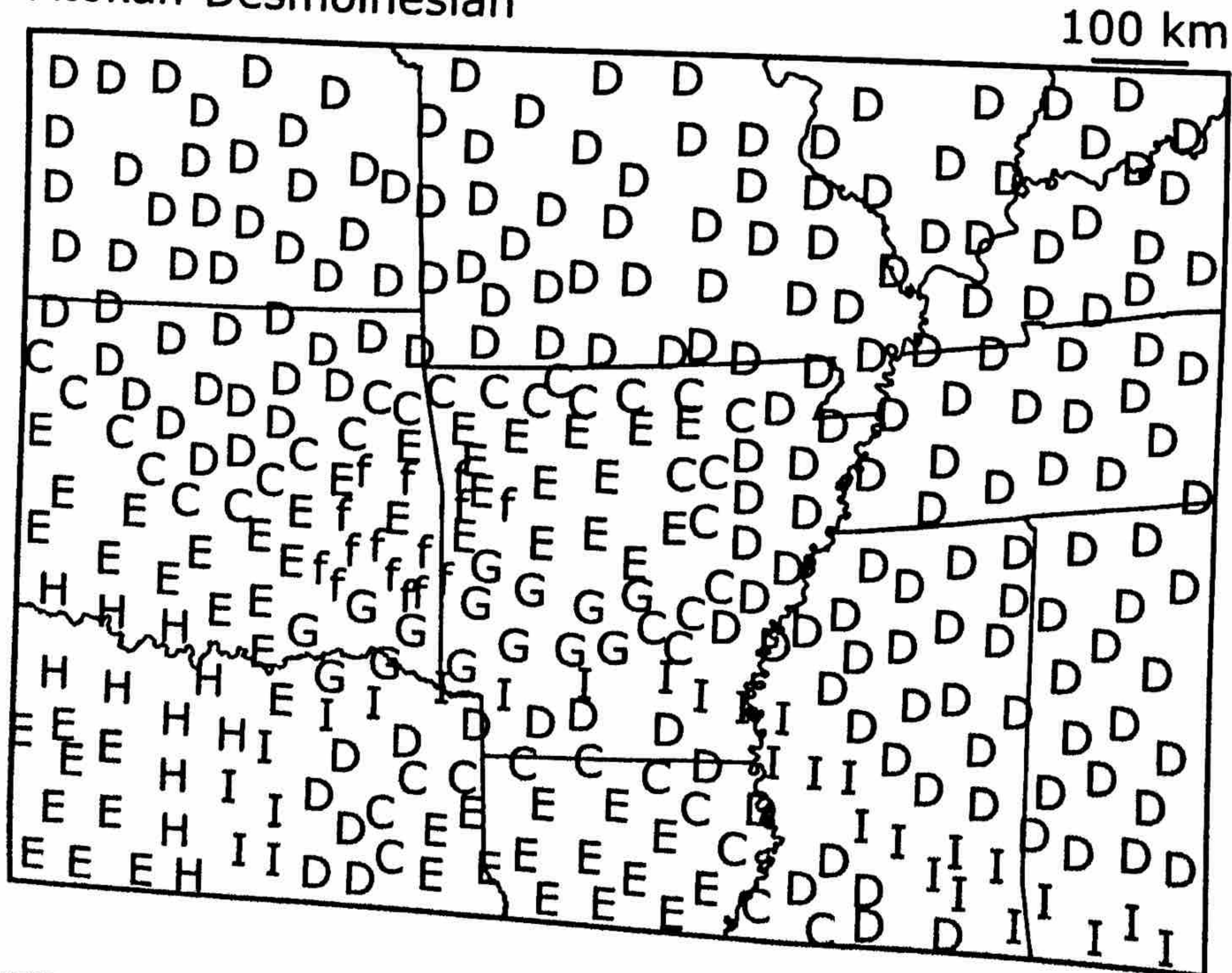
Project deliverables:

- Completed facies chart
- Four colored paleographic maps
- Paleogeographic history of Arkansas on separate sheet of paper, written or printed.

Early Atokan

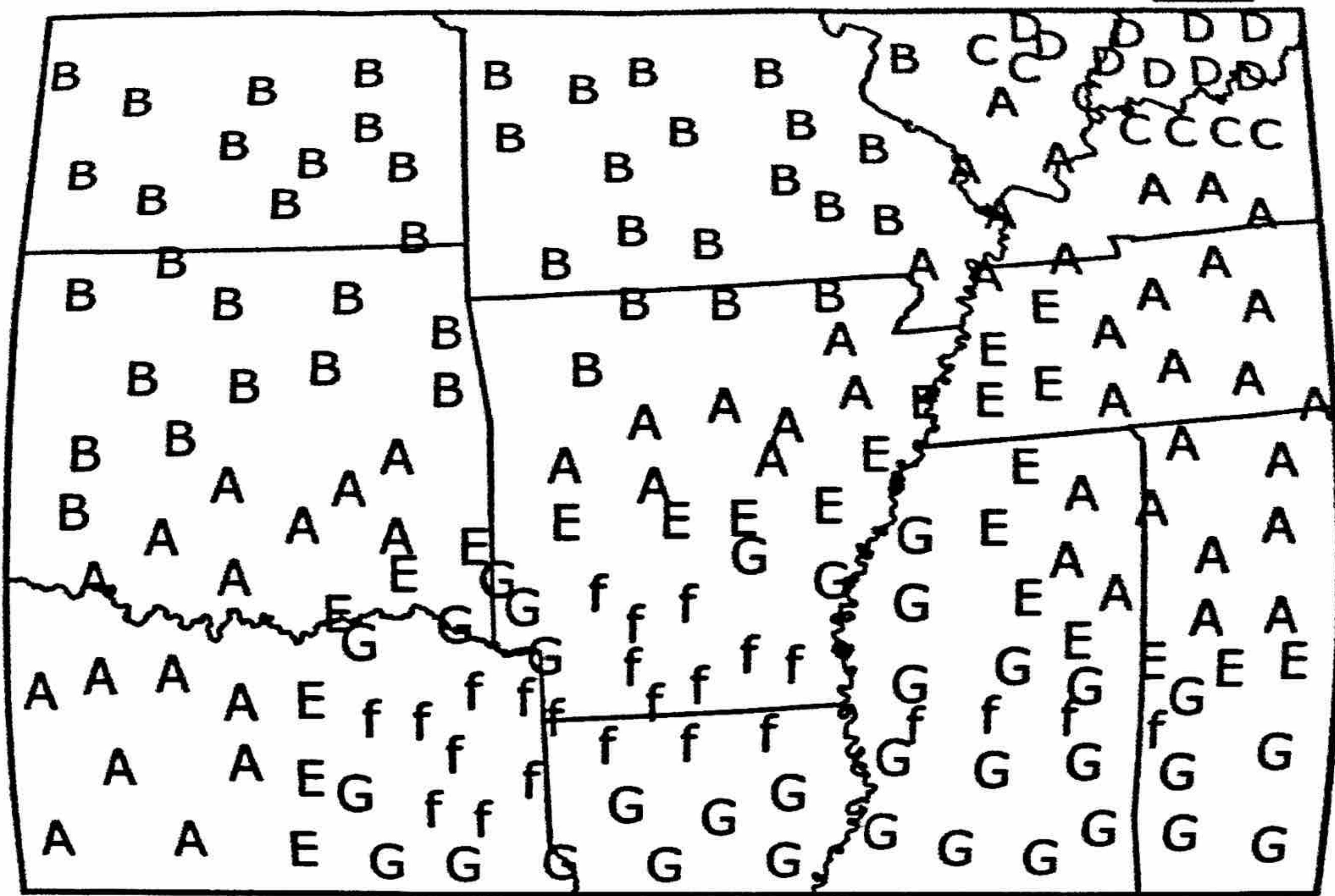


Atokan-Desmoinesian



Late Chesterian

100 km



Middle Morrowan

100 km

