One of the most interpretive aspects of creating geologic maps is defining map units. A map unit is a collection of rock types that share a common age and mode of origin. In some cases, deciding what rock types should be grouped together is straightforward as there is one main type with well-defined boundaries with other rock types (e.g. fine grained gabbro within a mafic dike). In many cases, however, there are gradations between rocks of a particular class (e.g. limey shale \(\rightarrow\)shale\(\rightarrow\)silty shale) and gradational contacts with surrounding rocks. Then it becomes more challenging to define the rock types that will comprise a particular map unit. One must decide if the difference are significant enough and the areal distribution of the rock types is significant enough at the scale of the map to warrant breaking out the units (splitting) into separate subunits. Or should the various rock types be consolidated into one unit (lumping). There are no set rules for how this iterative process of lumping and splitting should be done, which is why the name on a map is important - Each mapper must decide what descriptive criteria they will use to define their map units.

For this exercise, we will be working with the Geologic Map of Minnesota (Morey and Meints, 2000) to evaluate how these authors chose to group rock types into map units. Several copies of the map are laid out in lab, but it can also be accessed as a pdf file from the class website.

1) For each of the major geological eras, identify a unit that contains a large variety of rock types (lumped) and one that has only a few main rock types (split). Fill out the table below with the unit and its map symbol, the rock types it contains, and the general area of the state where the unit occurs (note that not all units are contiguous and may occur in multiple areas). (8 pts)

**Paleozoic Era**

A. Lumped Unit: __________________________ Map Symbol________
   Rock Types: _____________________________________________________________
   Location: _______________________________________________________________

B. Split Unit: __________________________ Map Symbol________
   Rock Types: _____________________________________________________________
   Location: _______________________________________________________________
Mesoproterozoic Era
A. Lumped Unit: ____________________ Map Symbol ________
   Rock Types: ___________________________________________
   Location: __________________________________________
B. Split Unit: ____________________ Map Symbol ________
   Rock Types: __________________________________________
   Location: __________________________________________

Paleoproterozoic Era
A. Lumped Unit: ____________________ Map Symbol ________
   Rock Types: __________________________________________
   Location: __________________________________________
B. Split Unit: ____________________ Map Symbol ________
   Rock Types: __________________________________________
   Location: __________________________________________

Late Archean Era
A. Lumped Unit: ____________________ Map Symbol ________
   Rock Types: __________________________________________
   Location: __________________________________________
B. Split Unit: ____________________ Map Symbol ________
   Rock Types: __________________________________________
   Location: __________________________________________

2) As we will discuss in Week 5’s lecture, there is a hierarchy to the classification of map units. For stratified rocks (sedimentary and volcanic) the groupings are: Supergroup → Group → Formation → Member. Most commonly, units with formation or member status are shown discrete units on geologic maps. Look through the description of map units and find two examples of the progression from Group to Formation (be sure to list all the formational subdivisions of the group). (2 pts)
   Group ____________________ Formations _______________________
   __________________________
   __________________________
   __________________________

   Group ____________________ Formations _______________________
   __________________________
   __________________________
   __________________________
3) Devonian-aged rocks, which occur in southeastern Minnesota, are distinguished into groups, formations, and members. Draw a flow chart showing the subdivisions of the Devonian strata as described in the Description of Map Units. Put a * next to those subdivisions that are shown as their own map units. (2 pts)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Formations</th>
<th>Members</th>
</tr>
</thead>
</table>

4) Note that several of the Devonian units are broken out (split) in Mower County, but all are lumped into a Devonian Rocks, undivided unit in Freeborn County. Why do you think the mappers did this? (Clue, check out the Density of Bedrock Outcrop diagram). (1 pt)

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