The Coon Valley Member (Prairie du Chien Group) vs. Jordan Sandstone in Minnesota

When present, the Coon Valley Member is the lowermost member of the Oneota Dolomite within the Prairie du Chien Group and lies directly above the Jordan Sandstone (Fig. 1). The Coon Valley Member can sometimes be difficult to differentiate from the Jordan Sandstone because it is composed of varying rock types, including quartz-rich sandstone, and its presence and thickness varies throughout southeastern Minnesota. The various rock types of the Coon Valley Member include thinly bedded dolostone (Fig. 2), sandy dolostone (Fig. 3), shale (Fig. 4), and beds of fine- to coarse-grained, poorly sorted, quartz-rich sandstone (Fig. 5). Some or all of these rock types can occur within a single deposit of the Coon Valley Member (see Fig. 6).

When the Coon Valley Member is composed primarily of dolostone, sandy dolostone, and/or shale, differentiating it from the Jordan Sandstone is straightforward. In these instances, the Jordan contact is picked where dolostone and/or shale are no longer present and the rock type is entirely fine- to medium-grained, well sorted, quartz-rich sandstone (Fig. 7).

Picking a precise contact between these two units becomes increasingly more difficult when the Coon Valley deposit that lies directly above the Jordan Sandstone deposit is also composed of quartz-rich sandstone. Where this occurs, the contact is picked based on one or both of the following characteristics:

1) whether the sandstone is “clean” (does not contain any dolostone, shale, and/or glauconite) and/or

2) the overall sorting of the sandstone grains.

If the sandstone is **not “clean”** (as described above) then we would consider this part of the Coon Valley Member. Likewise, if the sandstone is **poorly sorted** then we would consider this part of the Coon Valley Member.

Sorting is a characteristic that describes the distribution of grain sizes within a sedimentary rock (Fig. 8). In this case, the distribution in size of the quartz sand grains. Sandstone deposits within the Coon Valley Member are fine- to coarse-grained and poorly sorted—meaning a wide range in size of quartz sand grains (from fine to coarse) are present within the deposit (see Figs. 5 and 8). In contrast, the upper Jordan Sandstone is typically medium-grained and well sorted—meaning the quartz sand grains within the deposit are all roughly the same size (medium; see Figs. 7 and 8). Another way to phrase it is that the sandstone deposits of the Coon Valley Member often have a mixture of quartz sand grain sizes while the sandstone deposits of the Jordan Sandstone are consistently one size.

The Coon Valley Member can vary in color, including gray, brown, tan to orange, white, and red to pink. The Jordan Sandstone is typically gray/white or tan/orange in color. **Note: color alone is typically not a unique enough characteristic to differentiate between the two and should not be relied upon.** Oftentimes the Coon Valley Member is harder and better cemented and will come out of the hole as rock chips or a mixture of chips and loose, individual grains of poorly sorted sand (see Fig. 3). In contrast, the Jordan Sandstone is typically softer and shows up in the cuttings as entirely loose, individual grains of well sorted sand (see Fig. 7).

Keep in mind that the Coon Valley Member is not always present within the Prairie du Chien, and that its presence and thickness can vary greatly even across a small geographic extent. Additionally, the scenario in which a sandstone deposit of the Coon Valley Member lies directly above the Jordan Sandstone can likely occur in any area of Minnesota where the Prairie du Chien Group is present. While not site-specific, our Bedrock Geology maps within our County Geologic Atlas publications (https://cse.umn.edu/mgs/county-geologic-atlas) can be a good starting point to check whether the Coon Valley Member is known to occur and its possible range in thickness within a particular county. This

information can typically be found in the Oneota Dolomite or Prairie du Chien Group unit description within the Description of Map Units section of the Bedrock Geology map plate.

In cases where picking a precise Prairie du Chien/Jordan contact is important to the proper construction of a water well (e.g., ensuring code-compliance), the Minnesota Geological Survey can review and interpret drill cuttings (and gamma logs, if collected) prior to well completion given reasonable notice and availability of our bedrock geologists at the time of the request. Drill cuttings should be well-labeled, and samples taken every 5 feet from the land surface to the deepest available depth drilled, with depth measurements reported from the land surface as the zero point of reference, are preferred. While not always necessary, a gamma log (if collected) can also be helpful. Gamma logs paired with drill cuttings can often provide greater context and an added degree of certainty for stratigraphic interpretation.

Figures

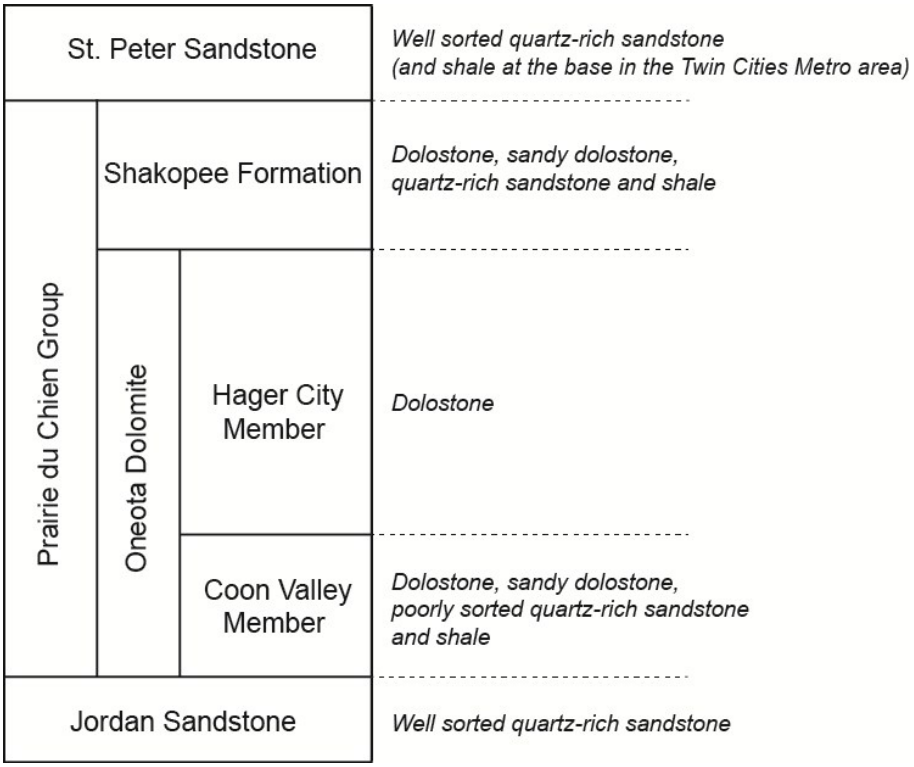

Figure 1. Generalized stratigraphic column describing the vertical location of the St. Peter Sandstone, members of the Prairie du Chien Group, and the Jordan Sandstone units in relation to one another. To the right are summarized descriptions of the common rock types associated with each unit.

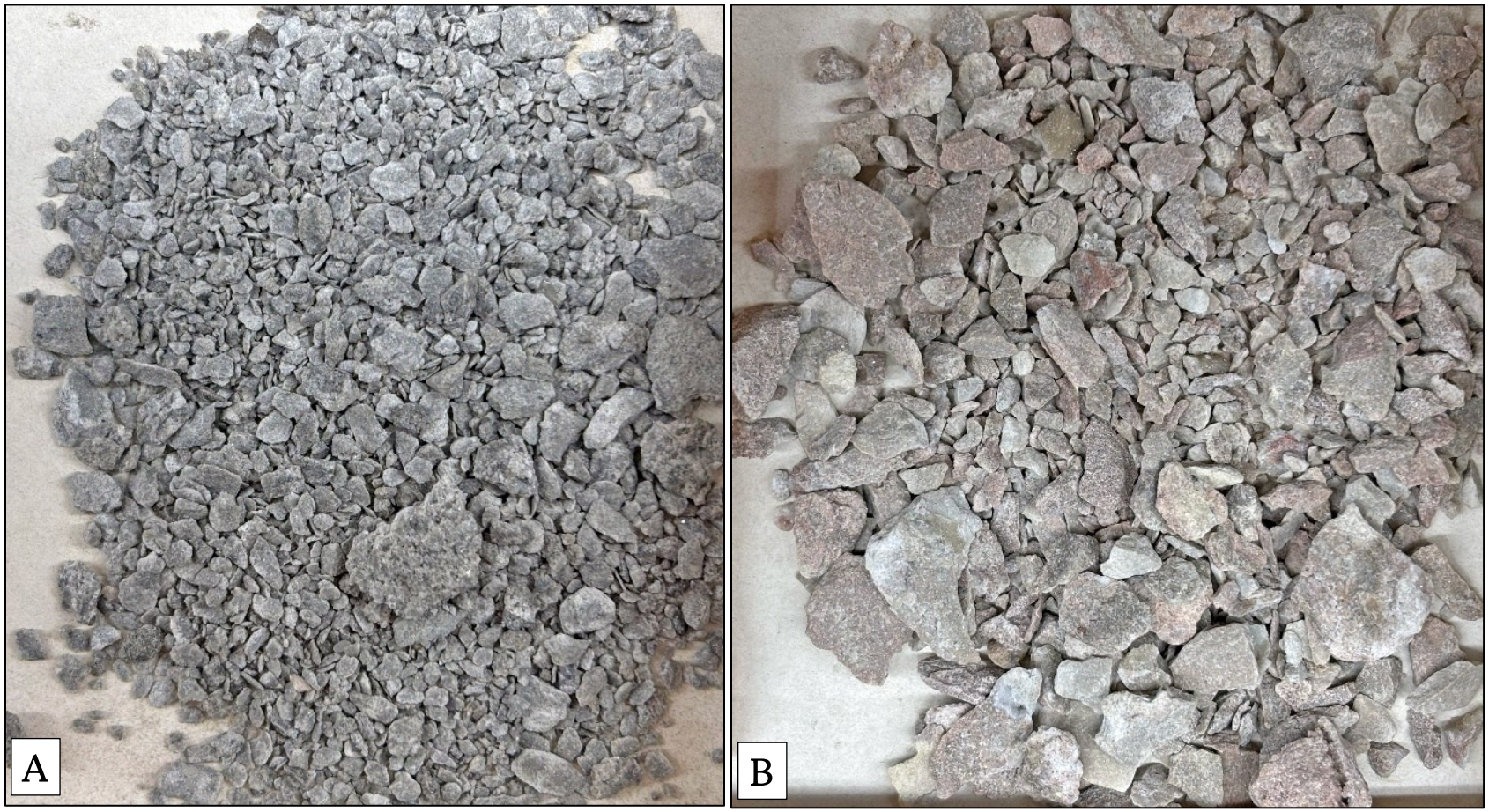

Figure 2. Drill cutting examples of **dolostone** found within the **Coon Valley Member**. A) Gray dolostone from a well in Olmsted County. B) Pink to light brown dolostone from a well in Hennepin County.

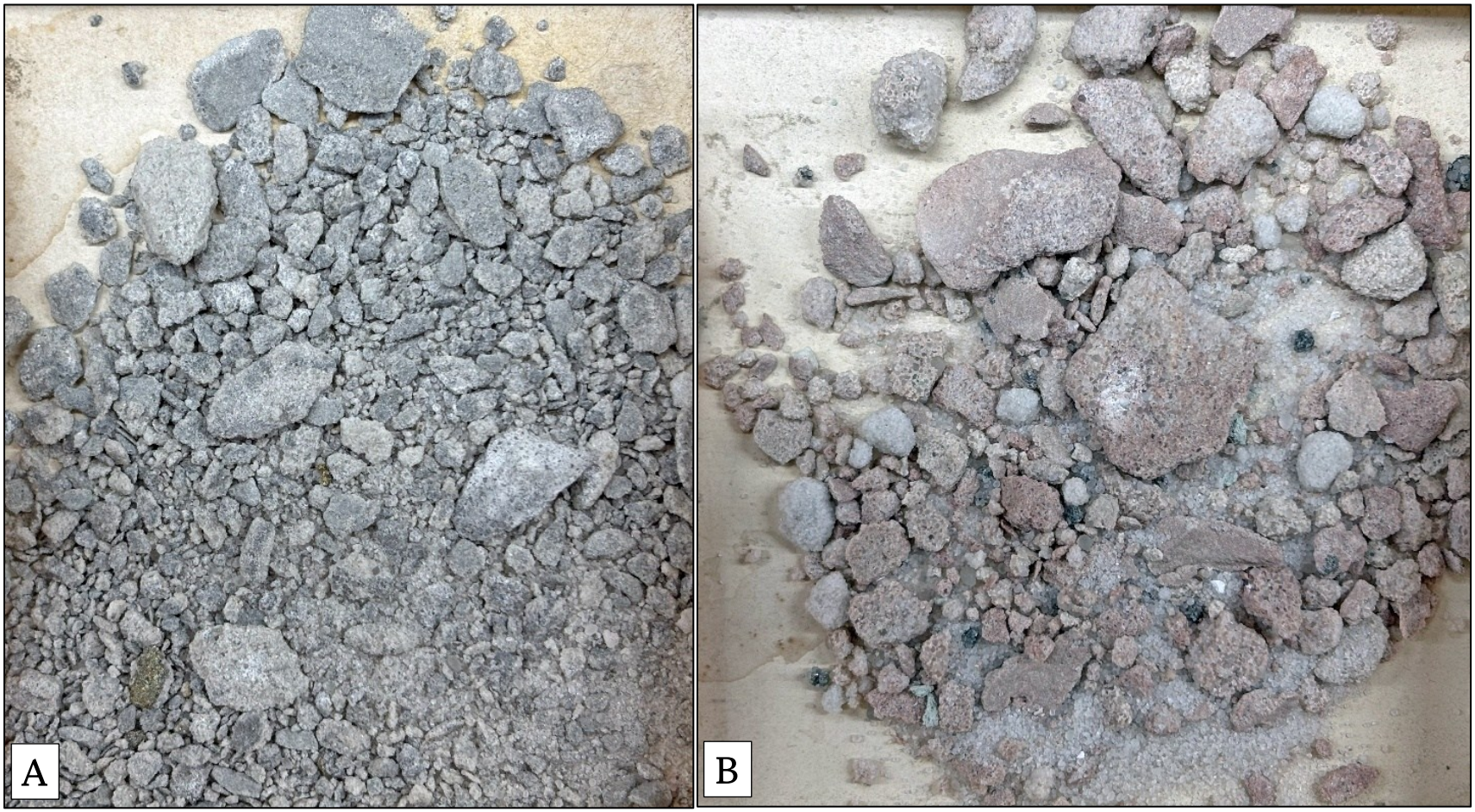

Figure 3. Drill cutting examples of **sandy dolostone** found within the **Coon Valley Member**. A) Gray sandy dolostone from a well in Olmsted County. B) Pink to white sandy dolostone from a well in Hennepin County. Note the grains of sand within the dolostone chips as well as loose sand grains.

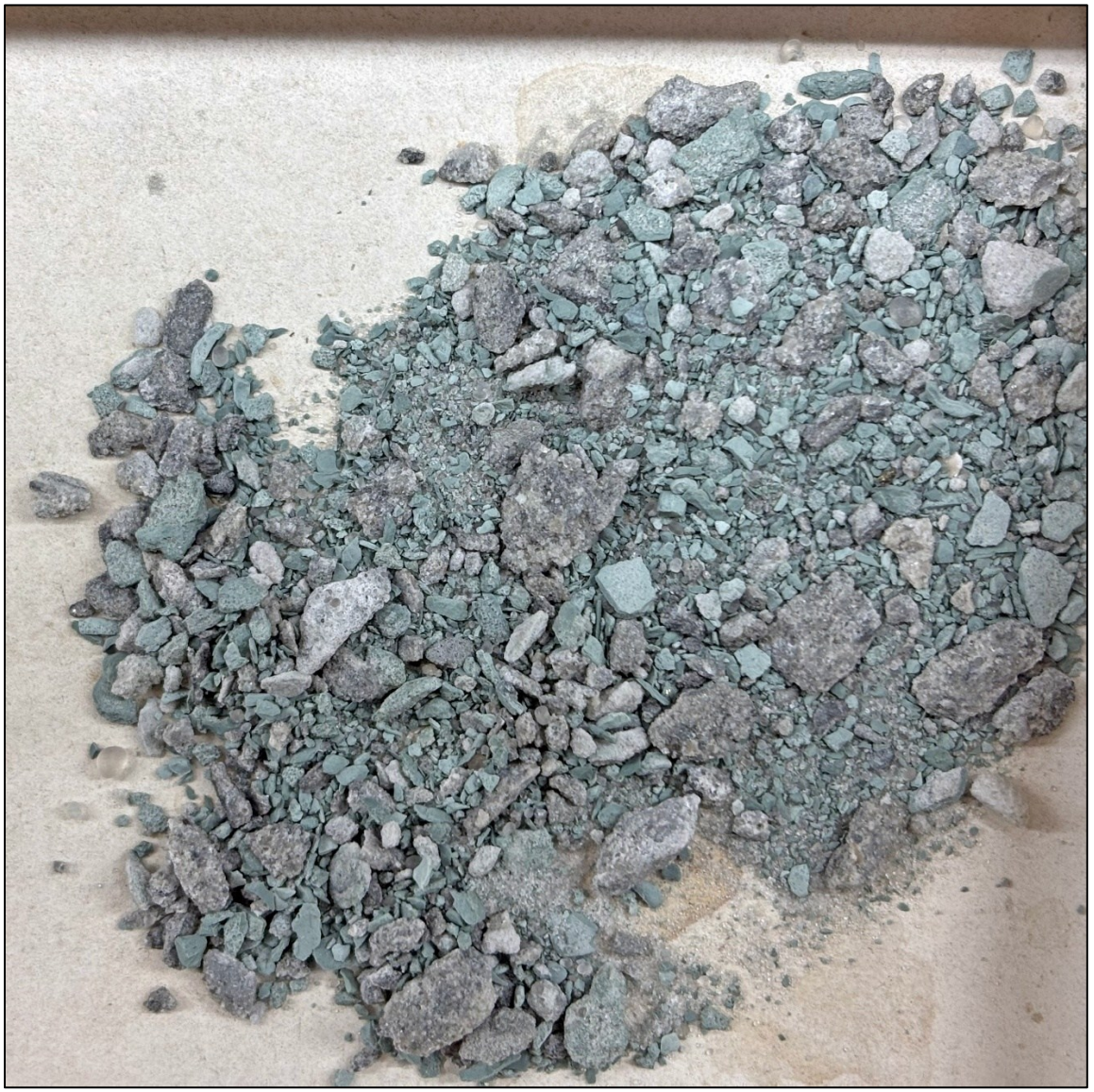

Figure 4. Drill cutting example of green **shale** (with some sandy dolostone) found within the **Coon Valley Member** from a well in Olmsted County.

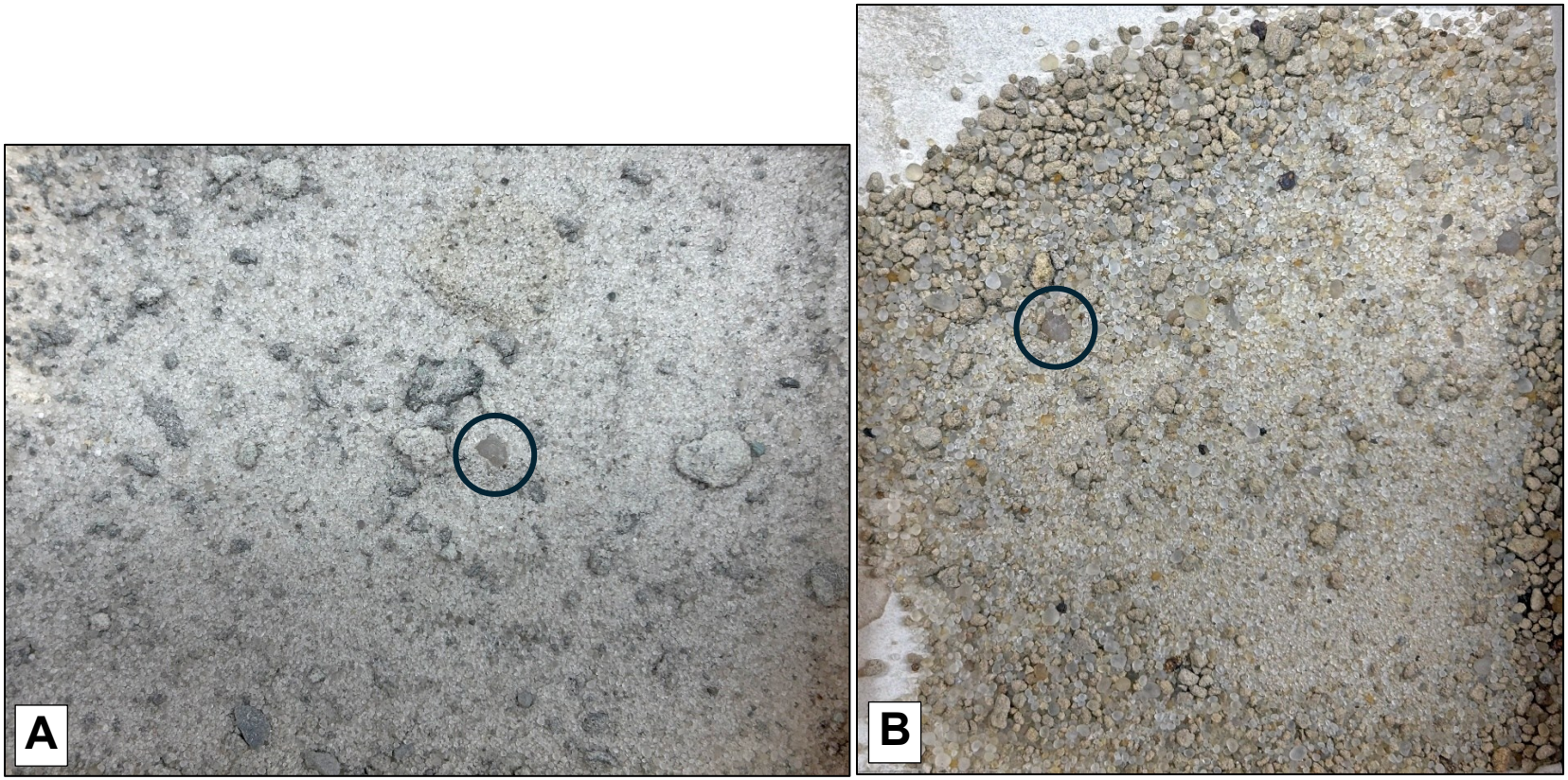

Figure 5. Drill cutting examples of **poorly sorted quartz-rich sandstone** found within the **Coon Valley Member**. A) Gray/white poorly sorted quartz-rich sandstone from a well in Dakota County. B) Yellowish gray poorly sorted quartz-rich sandstone from a well in Washington County. Note the presence of coarse quartz sand grains (examples highlighted in black circles), as well as various rock types other than sandstone intermixed within the samples.

Figure 6. An interval of drill core from Ramsey County that passes through the Coon Valley Member (Prairie du Chien Group) and Jordan Sandstone. Note how this single deposit of the Coon Valley Member is composed of a mixture of thinly bedded rock types (primarily dolostone and sandy dolostone in this example) while the Jordan Sandstone is entirely well sorted sandstone. Up is towards the left.

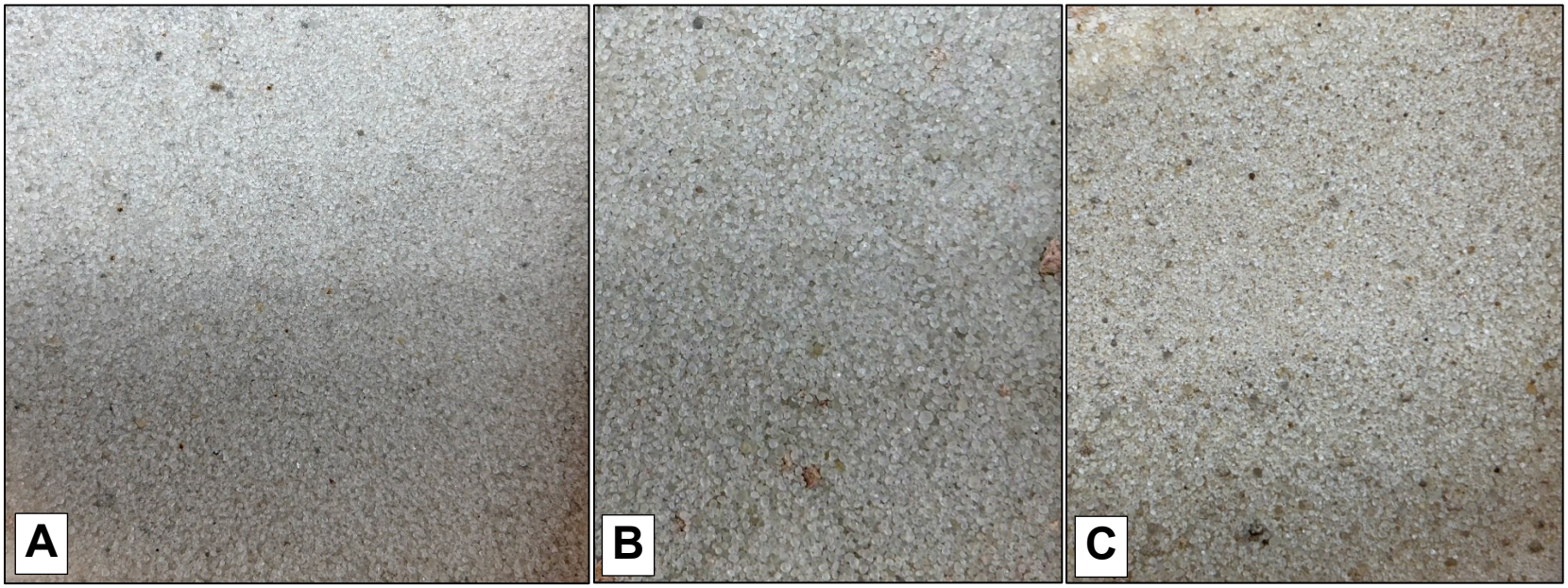

Figure 7. Drill cutting examples of **well sorted quartz-rich sandstone** found within the **Jordan Sandstone**. A) Gray/white well sorted quartz-rich sandstone from a well in Olmsted County. B) Gray/white well sorted quartz-rich sandstone from a well in Hennepin County. C) Gray/white well sorted quartz-rich sandstone from a well in Washington County. Note the consistency in size of the quartz sand grains, as well as the lack of coarse sand and other rock types in each sample.

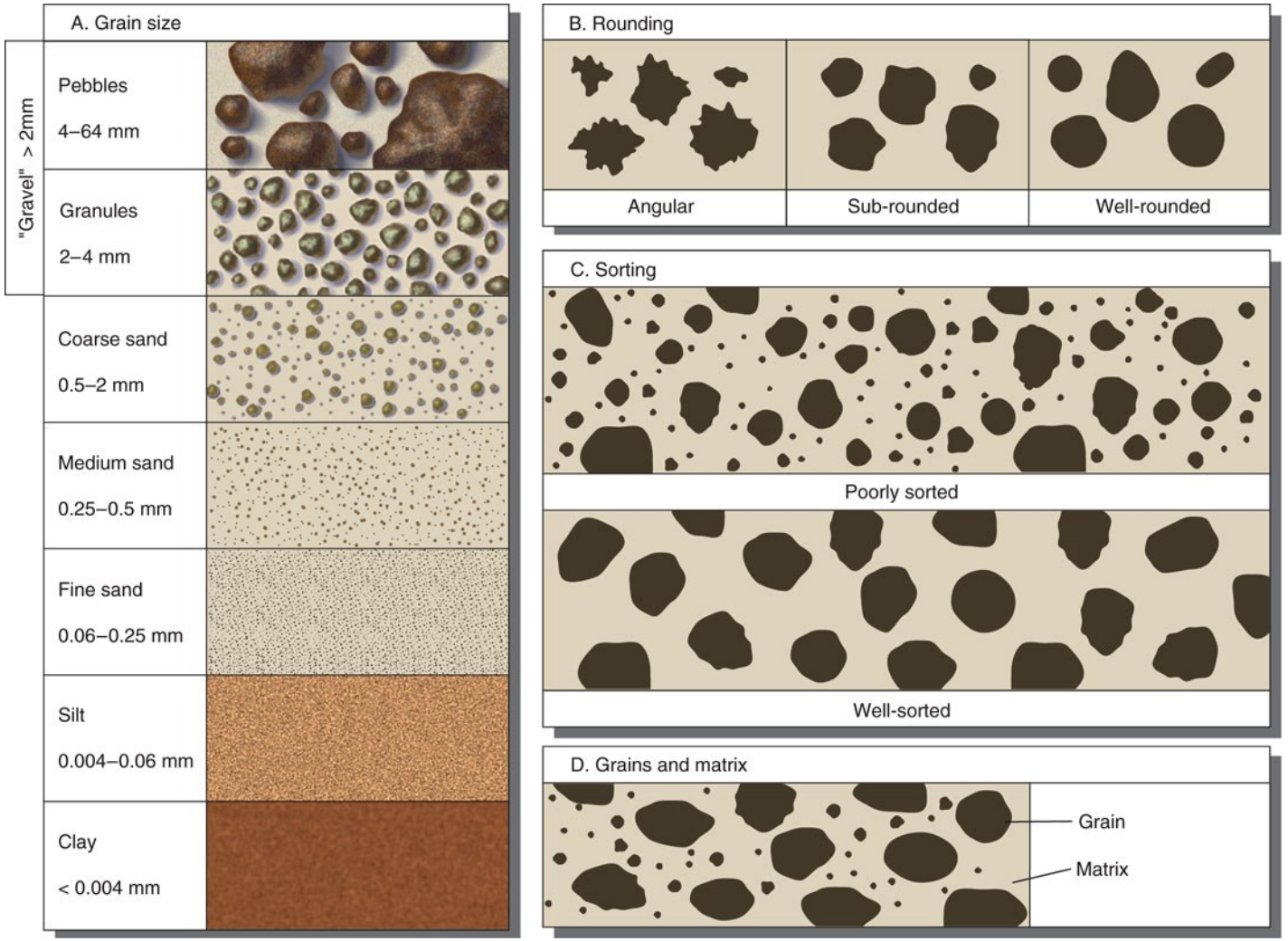

Figure 8. Grain size classification chart (A) with examples of rounding (B), sorting (C), and grains vs. matrix (D) characteristics (Image reference: https://www.geologyin.com/2015/11/study-reveals-how-climate-influences.html).