Most of Wisconsin was covered by thick layers of ice following the climate cooling that started 100,000 years ago. Extensive glaciers covered the state up to 13,000 years ago. The southwester part of the state was not glaciated, and it is generally known as the Driftless Area. The ridge and valley soils are used for agriculture, whereas the steeper parts of the landscape are under forest. The landscape is a pleasing pattern of valley bottoms, steep forested bluffs, and cropped fields. The original vegetation was oak savanna (Hole, 1976).

The area is covered with loess, and the underlying rock consists mainly of dolomitic limestone overlying sandstone. A common soil profile consisting of a 90-cm loess layer over red clay over limestone is shown in Fig. 1. The thickness of the loess layer as well as the red clay varies greatly. The depth to dolomitic limestone also varies across the landscape and in the Driftless Area. In this soil profile, the loess and the underlying red clay are not well mixed (Fig. 1). The red subsoil clay is often designated as a 2Bt, and sometimes as a beta B, it has more than 80% clay and is strongly structured. It often lacks horizon development and may have chert gravel and stones (Frolking et al., 1983).

It is generally assumed that the red clay is a weathering product of the limestone that is locally enriched with loess and other aeolian material that was deposited in the periglacial periods (Frolking et al., 1983). The percentage of impurities in the limestone is up to 15%. Before the red clay was buried with loess it was probably much deeper and a typical Terra Rossa (red clay soil formed from weathering of limestone) as is found in parts of the Mediterranean (Yaalon, 1997) and other parts of the world (Mella and Mermut, 2010).

In several of the dolomitic limestone quarries in the Driftless Area, we have observed large bodies of this red clay at depth (Fig. 2). These occur as layers a few meters wide often on top of a chert layer that is highly resistant to weathering, but they are also found in horizontal tunnels or cavities. Sinkholes and piping are common in relatively soluble bedrocks like dolomitic limestone. Rainwater is slightly acid and acidity commonly increases when water moves through the soil. The dolomitic limestone is dissolved (Fig. 3), and clay transported by the percolating rainwater is deposited in cavities in the rock (Fig. 4). This is an iso-volumetric replacement of limestone by clay (Frolking et al., 1983). The chert is not significantly weathered, as can be seen in the cavity in Fig. 2. The red clay in the dolomitic limestone is a form of soil loss that is different from soil erosion by wind or water.