Soil is complex, including solid, liquid, and gas components in a dynamic, heterogeneous mixture. A key characteristic determining the extent of soil solid interaction with the liquid and gas components is the amount of solid surfaces present in a given soil. The surfaces of solids are their interface with soil liquid and gas components, dictating the rate and extent of many of the chemical, physical, and biological processes associated with soil. Because the solid component of soil is comprised of small grains and particles with varying size, composition, and arrangement, surface area of the solids in a given soil can vary widely, ranging from as much as 800 to $<10 \text{ m}^2/\text{g}$. (For comparison, a football field has about the same surface area as 5 g of soil with 800 $\text{ m}^2/\text{g}$ surface area.)

Despite its importance for understanding soil processes, determining the amount of surface area per mass of soil solid, termed \textit{specific surface area}, can be quite challenging. Existing methods are either time consuming and imprecise, or require extensive equipment and specialized handling of necessary reagents. Recently, a new technique has been proposed and narrowly tested to determine soil specific surface area, making use of water adsorption to soil solid surfaces at varying soil-water potential energies. This new technique is promising because it is relatively fast and requires less specialized and costly equipment. Thus, it would be feasible to adopt as a routine procedure that could be widely implemented by many researchers in soil science, geology, hydrology, and geotechnical engineering.

Our goals are to (i) evaluate the water adsorption-based approach in comparison to more traditional methodologies for determining soil specific surface area, and (ii) to use this technique to characterize specific surface area for a range of soils with varying mineral and organic components. Research will involve laboratory-based methods for determining soil mineralogy and physical characteristics, and field work associated with sample collection and pedological interpretation of sample origins and importance.