

A Case Study

Harrisonburg High School is in a fairly new building, opening for classes in 2006. Located west of Harrisonburg, Virginia, it required a substantial excavation into the adjacent hillside to situate the building. The rock that was excavated was the Edinburg Formation, which consists of interbedded limestones and calcareous shales, with local pockets of carbonaceous material. The rock layers were deposited approximately 450 million years ago, when the area was covered in a shallow tropical sea. In exposing the rock layers to air, however, the balanced system of weathering and landscape development was disrupted, and a “shale barren” of talus was created on the north end of the cut. In contrast, no such feature developed on the south end of the cut. In addition, weathering of a carbonaceous layer that was exposed during the excavation has substantially stained the exposure at the north end but not the south. As a result, the southern end has substantial plant growth stabilizing the slope, but the northern end does not. The Science department initiated a plant ecology experiment, but is unsure whether or not the slope can be stabilized without more information. As a result, the opportunity to study the situation as a learning experience has become an interest area. But in order to make effective predictions, the inquiry of the students needs to consider mathematical information, including the dip angle of the rock layers, the rate of weathering and erosion, soil saturation percentage, and measurements of ground surface temperature throughout the day. All of the measurements can be modeled and used to describe the materials quantitatively, but also to make extrapolations from data collected. As a result, the mathematical model generated will allow students to make accurate decisions on courses of action to take.