

Research Assistant position in gully erosion research (begins fall semester 2020)

The Department of Geosciences at East Tennessee State University has an opening for a Research Assistant (Masters level) to work on gully erosion research. We have identified four potential projects that the candidate may work on. Please read project descriptions below as the successful candidate will work on one of these projects.

Interested students should contact Dr. Ingrid Luffman (luffman@etsu.edu). Dr. Luffman is available to meet with students at the SEDAAG meeting in Wilmington, NC to discuss.

Project 1: Identify seasonal and synoptic scale meteorological drivers for erosion

The student will use existing erosion pin and meteorological datasets (consisting of six years of weekly data). Seasonal trends will be examined using spectral analysis (on the Fourier-transformed time series data), and synoptic trends will be examined with correlation and cross-correlation due to the variable return periods for synoptic scale events. Identifying the drivers for erosion at seasonal and synoptic scales will advance the understanding of gully erosion processes using a data-driven approach.

Project 2: Identify patterns of, and drivers for, erosion, mass wasting, and sediment transport at the event scale

Study 1: ISCO automated water samplers will be deployed to collect samples of runoff associated with rainfall events. Water samples will be collected from catchment areas specifically constructed to trap sediment and runoff. Sediment samples will be collected from the trap for bed load estimation.

Study 2: Time-lapse digital cameras will be set up prior to an event, using the local weather forecast to identify upcoming storm events. Automated image analysis methods to assess change from one time step to the next will be evaluated. Preliminary time-lapse work during fall 2017 (McConnell et al., 2018) identified several issues to resolve. First, the sheer number of images collected requires significant manpower or some type of automated image processing. Second, current freeware is unable to handle shifting shadows in the gullies due to sun angle and cloud cover. One of the outcomes of this project will be to explore commercially available image processing tools and to develop a methodology to automatically evaluate change in a series of time-lapse photographs under these conditions. The methodology will then be transferrable to other studies using time-lapse image analysis in other locations.

Project 3: Compare three different methods to estimate sediment yield and erosion rates.

The student will conduct field data collection to estimate sediment yield and erosion rates in an existing gully system on ETSU's Valleybrook campus using 1) a network of erosion pins; 2) sediment traps; and 3) aerial surveys/photogrammetric methods. Data will be collected before and after the winter erosion season using all three methods. Sediment yield and erosion rates will be calculated for each method and compared.