

Going underground: Guide for Subsurface Investigations



Left: Olmsted SWCD feedlot technician Martin Larsen led trainees through a former commercial cave at the Minnesota Cave Preserve near Stewartville. The cave walkthrough was part of a Nov. 20 training about subsurface investigations. **Right:** The daylong training also included a mock site walkover to give attendees a feel for a typical project investigation in southeastern Minnesota. **Photo Credits:** BWSR

An updated tool is available for Minnesota conservation staff who conduct subsurface investigations to assess geological risks.

Minnesota staff of the USDA's Natural Resources Conservation Service (NRCS) produced the Guide for Subsurface Investigations, which outlines procedures for investigating potential geological risks associated with structural engineering projects. The new information presented in the guide will help conservation staff design and select practices that minimize geological risks. A November training near Stewartville equipped staff to apply the guide's principles in the field.

Geological risks can be present when conservation practices are installed in areas with karst topography, soft sandstone, loose coarse-grained deposits or other geological features that may prevent the practice from functioning as intended. These deposits, often represented by large areas of surficial sands, can increase the risk of groundwater contamination.

According to the Minnesota Pollution Control Agency (MPCA), active karst — areas where less than 50 feet of sediment covers the bedrock — is present in southeastern Minnesota throughout Fillmore, Goodhue, Houston, Olmsted, Wabasha

and Winona counties. Because southeastern Minnesota's karst topography is especially prone to sinkhole development, installing conservation practices in this region can carry risks.

"Southeast Minnesota is unique relative to other parts of the state due to its thin sediment cover and karst landscape," said Tim Weisbrod, NRCS geologist. "Identifying karst features



such as sinkholes, springs, caves and enlarged bedrock fractures is important for conducting geologic investigations in southeast Minnesota.”

When a landowner encounters a resource concern (such as severe erosion) that potentially involves a structural conservation practice, staff begin this investigation process. GIS is used to create maps of the project site that allow staff to view geological layers and make decisions accordingly. Investigations include a site walkover to look for sinkholes, stream sinks, sieves, springs, seeps and sandstone bedrock within range of an existing practice or a proposed practice site.

Sometimes a subsurface investigation — which involves drilling to look for sands, bedrock and gravel below the surface — is needed to verify soils or geological features. Updates to the guide provide detailed instructions for conducting subsurface investigations.

The Guide for Subsurface Investigations was developed in February 2017 and updated in October 2019. The November 2019 field training near Stewartville gave conservation staff hands-on practice.

The daylong training included presentations, field exercises and a cave tour. Trainees included staff from NRCS, soil and water conservation districts and technical service areas. Among the trainers were Weisbrod, NRCS Agricultural Engineer Elizabeth Oolman



Trainees approach the entrance to a former commercial cave during a Nov. 20 training near Stewartville. Equipped with headlamps, the group explored several hundred feet of passages while Olmsted SWCD feedlot technician and avid spelunker Martin Larsen explained the geology of the area and pointed out bedrock formations.

and NRCS Area Resource Soil Scientist Dan Nath.

“The purpose of this training was to educate staff on how to use a combination of available GIS databases and features which are identifiable in the field to investigate our conservation practices,” Weisbrod said.

Trainers covered the steps in a typical investigation. Those include making GIS-derived maps to determine the geology of a project area, identifying a practice’s potential risk, and completing a geological siting risk assessment. The goal of the training was to enable field staff to perform investigations on structural, water-holding practices, or elevate an investigation’s

findings to the correct technical staff.

On Minnesota Cave Preserve land near Stewartville, the group completed a mock site walkover. The site walkover was tied to the extensive mapping of caves and caverns in the preserve. A depression 75 feet in diameter and disappearing stream prompted the group to consider altering their design or pursuing non-structural practices to resolve the erosion resource concern. Walking through valleys and across hilltops, trainees got a feel for a typical project investigation in southeastern Minnesota.

While some continued to evaluate siting risks from the surface, others went

underground. Olmsted SWCD feedlot technician Martin Larsen, an avid spelunker and president of the Minnesota Cave Preserve, led the second group through a former commercial cave entrance. With headlamps on, the group explored several hundred feet of passages, just dozens of feet below the field site. Martin explained the geology of the area and pointed out bedrock formations as the group descended deeper underground.

With the updated guide, technical staff can carefully examine a site’s geological features to better assess potential risks and account for them during project planning and design.