Karst Groundwater Model Demonstration

Sandy Trout
Co-Chairman – 2001 National Cave & Karst Management Symposium

Abstract

This is a presentation using a groundwater model to simulate the movement of water and various pollutants from the surface through karst to caves, movement through soils to aquifers, and the resulting effect as these waters are retrieved for various uses. After a brief introduction to groundwater and its importance the remainder of this presentation provides instructions for use and maintenance of the model, concepts the model can demonstrate, and the mechanics of a demonstration. The level of information for the would-be presenter can be adjusted from basic to very technical. This presentation will focus on the basics of "how-to" utilize the model in a presentation designed to educate, inform, and enlighten your intended audience on any or all aspects of ground or surface water and its impact on karst, caves, aquifers, and the like. Topics covered will be: (1) "Target your Audience," (2) "Mechanics of Presentation," (3) "Materials List," (4) "Handouts," (5) "Using your Mistakes to your Advantage," (6) "Question and Answer Period."

Introduction

This presentation is a basic "How-To" guide for presentations using a groundwater model exhibiting loam vs. karstic soils and observation of the movement of surface water through these soils. Following an introduction to groundwater and the importance of hydrology to caves, the remainder of this presentation provides instructions for the use and maintenance of the model, concepts the model can best demonstrate, and the mechanics of a demonstration.

Definition

groundwater: The simplest definition is that groundwater is water contained in saturated soil and rock materials below the surface of the earth. groundwater is not "new" water; it is "recycled" water that is related to all other water on earth by a process known as the hydrologic cycle.

The source of groundwater is precipitation. As moisture falls upon the earth's surface, a portion runs off the land into lakes, streams, rivers, and other reservoirs and a portion soaks into the ground. That portion travels through several zones. It first travels through an unsaturated zone consisting of soil materials or layers of sand and gravel. Below this zone is the saturated zone called groundwater.

Discussion

The groundwater model simulates movement of water and various pollutants from the surface through karst to caves versus the movement of water and pollutants through soils and gravel to an aquifer (stored water). Eastern caves provide up to 80% of water for human usage in both urban and suburban areas. While western caves provide much less, there are many caves providing water for private use and for communities. Therefore, it is apparent we must educate the public on the careful conservation of this most valuable of resources as well as the protection of people.

YOU ARE WHAT YOU DRINK . . . springs, wells, and caves are the most common water sources. It is rare to drink water that does not go through a cave system. Water contains minerals as well as pollutants. *Surface* pollutants can be observed almost immediately, that is, rain water runoff from pavement, hillsides, buildings, and also from sewer drains. *Sub-surface* pollutants might take months and, in some cases, years to observe pollutants at the subsurface. A few ways to observe the degree of pollution is from observation wells and caves. Karst and cave hydrology is becoming increasingly important as gauges to determine levels of pollutants in our water supply.

The groundwater model demonstrates pollutants traveling from the surface and is a dra-

matic "eye-opener" for the general populace. Most people, no matter their age, have never heard the term "karst" and have never thought about drinking water coming from a cave. This model creates a wonderful opportunity to educate, inform, and demonstrate the importance of clean water to them and to our caves.

Mechanics of the Model Presentation

1.Target your audience: know your audience, be it children, teachers, or professional hydrologists this model and presentation can be geared toward that audience. Set your goal and adjust the style of the presentation. Ask questions and wait for answers.

2.Cover your model while using visual aides, (slide show, video, and the like) and while discussing your subject. Your audience will be fascinated by the model and its impact should be reserved for your "grand finale."

3.Use of slides and/or video with your presentation is very effective. They are readily available for purchase or rent from Project Underground, the city or county water department, or the like.

4.Use posters showing caves, karst, and the water cycle. These may also be obtained from various sources such as, American Cave Conservation Association, Project Underground, National Speleological Society, Cave Softly, or government agencies, to name a few.

5.Materials needed vary from food coloring, towels, syringes, containers, buckets, and pitchers, depending on your objective and audience. Experiment with more than one color of food dyes to represent different types of pollutants. You might consider using a darker shade of food dye if your audience is large so that it can better be seen; however, keep in mind this technique requires more cleaning time.

6.Handouts are always informative and educational and are something your audience may take with them to refresh them on the information you have given and may also be obtained from the above sources.

7.Involve your audience . . . use volunteers where possible. Example: have several people on hand to pump water from your model as you speak. Show and explain the action taking place.

8.Use your mistakes to your advantage. Many, many "unknowns" occur in our environment. Example: red groundwater in the loamy soil section of the model has leached into your green cave/karst section and it looks brown? Great! No problem! This occurs in nature. Use your "accident" to your advantage to explain this to your audience.

9.Clean-up is very important. Flush the model numerous times until all traces of food coloring are gone and water runs clear.

10.Have a question and answer period. You will be asked questions during the demonstration; however, ask that questions be reserved until the end of the presentation.

This will end the presentation. It is very effective and educational. Protecting the quality of our water is becoming urgent and education is the key. Clean water is not only crucial to the preservation and protection of our caves, but is crucial to the preservation of people everywhere.