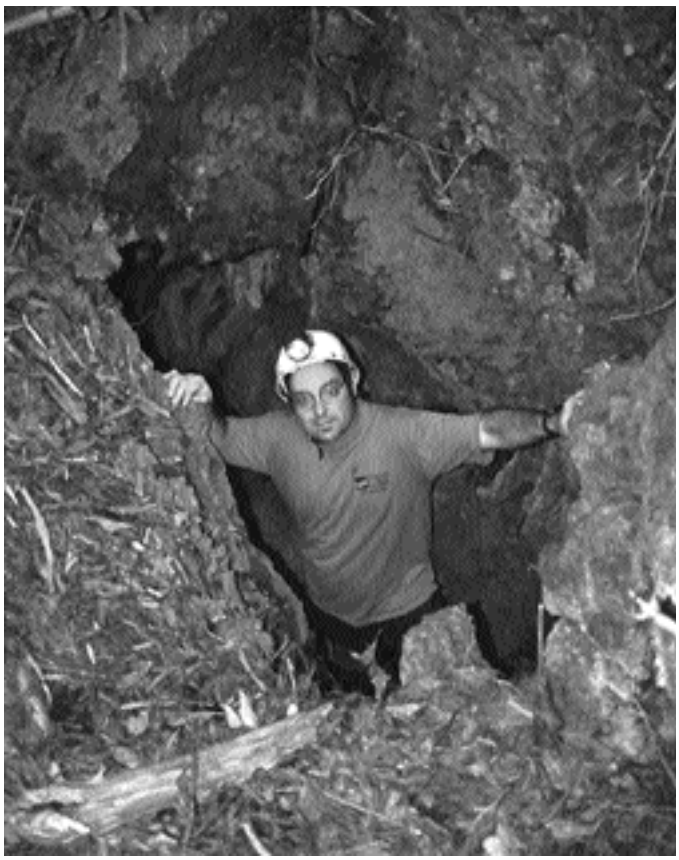
INTRODUCTION TO CAVE AND KARST GIS

BERNARD W. SZUKALSKI
ESRI Cave & Karst Program, ESRI, 380 New York Street, Redlands, CA 92373-8100, USA

A geographic information system (GIS) is a software system that stores, analyzes, and displays geographic data and related information. GIS is a relatively new science and technology that brings together many different disciplines. It is based on the fact that much of the data and information we need to use has an inherent geographic location and is related spatially. GIS delivers the capabilities to store, manage and query geographic data, and produce maps and reports. More importantly, GIS provides the analytical tools to help understand the spatial distribution of geographic information and model its interactions, in many cases finding patterns and relationships previously unrecognized.



Once used only by a select few organizations and research institutes, today GIS is used by many cities and towns, states, most government agencies, businesses, schools, universities, and many other organizations worldwide. GIS is used in a diverse range of applications such as environmental management, health care, telecommunications, archaeology, forestry, transportation, agriculture, local government, law enforcement, marine ecology, electric utilities, education, petroleum exploration, and more. The list of users continues to grow as GIS technology and the supporting computing environment evolves and becomes more powerful and less costly.

Although GIS has been used by environmental managers for decades, the use of GIS to study and manage caves and karst is a relatively new and rapidly growing area. Many environmental consulting companies now use GIS to solve problems in karst areas. State and local government agencies incorporate karst layers in their GIS databases and use that information in daily activities. Since the adoption of the Federal Cave Resources Protection Act of 1988, federal government agencies such as the National Park Service, Bureau of Land Management, and US Forest Service have begun to explore the ways that a GIS can help to manage and protect cave resources. Even independent caving organizations and cave and karst conservancies have begun to explore GIS.

Cave and karst GIS has proven to be useful and effective in many ways. GIS is used to integrate and manage different kinds of karst data and to create high quality maps that incorporate many other layers of information. Advanced rendering capabilities are used to visualize caves and karst features in 3D. Beyond simple tasks, GIS analytical and modeling capabilities are increasing our knowledge of caves and karst and helping make informed decisions. GIS is used to understand and mitigate the impacts of proposed landfills, highway construction, housing development, and landuse changes in karst areas. GIS is used to determine cave potential and for groundwater management and modeling. At a more detailed level, GIS is used to query and manage cave inventory data and is being employed to understand the spatial relationships within the cave and also to identify relationships with the external environment as a whole. Many of these applications present new technical challenges as well as insight.

The full potential of cave and karst GIS has only begun to be explored. The papers in this issue demonstrate just some of the variety of ways it is being used today. Many of the topics represent new and unique applications of GIS in cave and karst research, conservation, and management. We can learn much and gain inspiration from these examples and can look forward to the continuing evolution and expansion of GIS in the cave and karst domain. The results will be better understanding, management, and conservation of these unique resources.