THE INDIANA GEOLOGICAL SURVEY
A LOOK AT THE FUTURE

Supplement to Special Report 44

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AUTHOR OF THIS REPORT

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DEPARTMENT OF NATURAL RESOURCES
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The Indiana of today and its geologic needs are vastly different from those perceived so well by David Dale Owen 150 years ago. Although Dr. Owen did not foresee all the forward-looking changes detailed here, we trust that given his remarkable insight, he would approve if he were here on this sesquicentennial anniversary of his founding of the Indiana Geological Survey. Even though Indiana did not become a major mineral-producing state and did not become independent of outside geologic resources as envisioned by Owen, the Geological Survey developed into an organization that has made major contributions to the understanding of the geology of the state and to the development of its mineral resources. Today the Geological Survey has an expanded mission to provide geologic information that contributes to the exploration, development, and wise management of Indiana's natural resources and to the safety and well-being of its citizenry.

Even though the Indiana Geological Survey of today is involved in important and sometimes vital programs, the question remains: Is there a need for the Survey today, next year, another 150 years? My answer is yes provided the organization remains flexible enough to adapt to the changing needs of the people it serves.

Part of the adjustment will require a change in the approach to problem solving that not only affects methodology but also provides a new sense of mission and purpose. This approach will be project oriented and will emphasize the direct impact of geology on the economic well-being of the state and on the lives of its citizens. The new approach will not be a traditional one whereby individual workers identify a general area of research, but it will be an interdisciplinary one whereby a problem will be defined, a research program will be designed, and the requisite talents will be drawn on to solve it. This approach will also emphasize interaction with geologists in other state agencies and federal agencies. A synergistic relationship will be established whereby the Geological Survey will draw on the data and knowledge generated by geologists from other divisions in their local or site-specific studies. The Survey, in turn, will provide these agencies with the regional framework information that is necessary to accomplish their studies or tasks.

The Geological Survey will therefore continue to concentrate on the following goals:

Research needed to better understand the geologic history of Indiana will continue. A thorough scientific framework is essential for the evaluation of industrial minerals, geologic hazards, ground-water problems, economic planning, and other related issues. Research concerning the formation and occurrence of oil, gas, coal, and mineral deposits will be directed toward enhancing the recovery of these valuable commodities and diminishing the risk of their exploitation.

Improved coordination of efforts and communication with other state agencies and with federal agencies operating in Indiana are needed to avoid wasteful duplication of effort and to share human and material resources efficiently.

During the past 150 years the Indiana Geological Survey has developed a large and comprehensive data base on the geology of the state. By implementing the changes in emphasis and approach outlined above, the Survey will be poised to use this tremendous resource to become a viable and indispensable...
contributor to the future economic development of the state and to the welfare of its citizens.

There are a number of areas where our efforts can have the greatest impact in attaining these goals. We have, for example, initiated a major effort to learn more about the Quaternary deposits of Indiana. These sediments cover, in varying thickness, nearly all the land surface in the state, and they contain more than half of Indiana's potable ground water as well as important deposits of such industrial minerals as sand and gravel, peat, and marl. In addition, the impact of these sediments on the health and safety of the citizens of Indiana cannot be overemphasized. We recognize the need for gaining a better understanding of the origin and characteristics of these sediments to assess their potential as hosts for natural resources, their ability to serve as waste-disposal sites, their ability to maintain stable slopes or substrates for construction, their susceptibility to failure from earthquake shock, and their potential for erosion.

We have initiated several projects aimed at filling some specific gaps in our knowledge of these materials. For example, we are currently cooperating with the Division of Water of the Indiana Department of Natural Resources to learn more about the origin, characteristics, and distribution of the glacial deposits of the state. In the course of this project we expect to develop models that will help to predict the character and distribution of aquifers. We also hope that we will increase our understanding of the location, quantity, and quality of those industrial minerals contained in the deposits. Cooperative studies with other state agencies and with federal agencies have been proposed for determining the seismic risks to sediments in the greater Evansville area and for studying the history of water-level fluctuations in Lake Michigan to aid coastal planners in assessing future risks from high lake levels.

In support of these studies we have acquired new equipment, including a powerful drilling rig and wireline logging instruments that will greatly enhance our data-gathering efforts. We also are constructing a sample-preparation, testing, and storage facility that will be twice the size of our present antiquated structure.

We also recognize the importance of the bedrock that is the foundation of the state and are especially aware of the economic importance of the industrial minerals that it hosts. We plan to provide a focus for our study of these rocks through a newly created Basin Analysis Section that will carry out research on the bedrock geology of the state without regard to political boundaries. The section will emphasize cooperation with the federal and other state surveys in conducting basinwide research that will be limited only by geologic boundaries. The section will use a multidisciplinary approach to problem solving that will coordinate the efforts of sedimentologists, stratigraphers, geophysicists, geochemists, and paleontologists.

The first task of the Basin Analysis Section will be to develop a better understanding of the origin of the Mississippian and Pennsylvanian rocks that contain all of Indiana's coal resources and most of its known petroleum reserves. By determining the sedimentary systems in which these rocks were deposited and the tectonic controls on their deposition, we hope to delineate areas where deposits of low-sulfur coal might occur, assess the geologic factors that may adversely affect underground mining, and develop predictive models of the distribution of porosity in petroleum reservoirs so that these resources can be recovered most efficiently.

We also hope to gain a better understanding of the distribution, thickness, and character of the older, deeply buried rocks in southwestern Indiana where data from recent seismic surveys suggest a deep trough or rift. Because similar structural features in other areas commonly serve as hosts for petroleum and other mineral resources, their potential occurrence in Indiana deserves special study.

Among the projects aimed at attaining these goals is a cooperative geologic-mapping project, funded through the U.S. Geological Survey, which is directed toward gaining a better understanding of Lower Pennsylvanian rocks in which potentially low sulfur coal might occur. A proposal has also been
prepared to engage with the Illinois and Kentucky Geological Surveys in a cooperative study of the coal-bearing rocks of the Eastern Interior Basin, a geologic feature common to all three states. In addition, we have greatly enhanced our ability to study the stratigraphy and structure of the deep basin in southwestern Indiana by employing a geophysicist who specializes in high-resolution seismology and who has his own equipment and by acquiring equipment donated by Chevron Oil Field Research.

The Survey has long been involved in assessing the environmental aspects of the geology of Indiana. This program has primarily involved statewide mapping of the geologic factors that affect man’s use of the land, but in the future greater emphasis will be placed on the study of more specific environmental problems. These problems may involve such natural phenomena as earthquakes, karst subsidence, landslides, shoreline erosion, and potentially harmful concentrations of radioactive substances. Other problems may involve such manmade hazards as toxic-waste contamination and mine subsidence. In the Survey’s effort to provide solutions to problems involving natural and manmade geologic hazards, a major goal will be to study the geologic factors that impact on these problems. We will provide basic information on the location, causes, and effects of environmental hazards to those charged with monitoring and mitigating these hazards in the state.

We have formed an Environmental Geology Section to address these tasks, and we have identified a number of problems that we are uniquely qualified to study because of the equipment and expertise available to us. Such projects as a study of the predictability of water-level fluctuations in Lake Michigan and a study of the effects of earthquakes on thick lacustrine deposits in the Evansville area have already been mentioned in another context, but we have also proposed or have begun a number of other projects. We have nearly completed a study of the distribution of radioactive material that may be a source of radon gas in the state for the U.S. Environmental Protection Agency, and we are cooperating with the Indiana State Board of Health in its radon studies. We have proposed a study of the natural occurrence of high concentrations of lead and arsenic in ground water to the U.S. Environmental Protection Agency. We have recently completed an assessment of the Mount Simon Sandstone as a receptacle for liquid toxic wastes, a project that was funded by the Underground Injection Practices Council, and we have proposed to the UIPC and the EPA a broader study of other deeply buried rocks that will determine the ability of these rocks to receive hazardous wastes.

Coal mining has brought tremendous economic benefits to Indiana, but it has also presented the state with environmental problems. The Geological Survey is actively pursuing a program that addresses some of these problems. We are currently engaged in a project funded by the Department of Reclamation for mapping the location of abandoned underground mines and for determining the present and potential areas of subsidence. We are also proposing a study of the geologic controls on mine subsidence in selected areas of the state. The Survey is presently involved in three projects, funded by the U.S. Office of Surface Mining through the Department of Reclamation, that are studying the geologic and hydrologic factors involved in reclaiming three abandoned surface mines.

The Geological Survey serves as a repository of vast amounts of data, and we have placed a high priority on developing a computer management system for the more than 20 data sets that exist within our organization. One example is the more than 70,000 oil-well records on computer disks that are readily available to the public and private sectors. Graphic display by computer is also a part of this effort. In support of this endeavor a data-management team has been organized and personal computers have been obtained for all sections of the Geological Survey. The Coal and Petroleum Sections have a long-standing reputation of service and cooperation by providing needed information to the energy industry and to the public at large. The new emphasis on computer data
management will have a major impact on the analysis and efficient dissemination of the large database in these two areas. To enhance the capabilities of the Drafting Section a computer-graphics system has been installed to aid in the timely dissemination of these data.

A recent marketing analysis has demonstrated the need for better communication between the Geological Survey and the public sectors. In an effort to provide the Survey with a higher profile the following steps have been taken:

1. A section of Educational Services and Public Relations that answers directly to the Director and State Geologist has been established.

2. A Financial Officer with a strong business and marketing background has been added to our staff to provide expertise in marketing both the products and the image of the Indiana Geological Survey.

3. A program for the preparation and distribution of video tapes concerned with earth-science education has been initiated with "The Geologic Story of Turkey Run State Park," and video tapes of various field and office activities will be used as aids in illustrating the Survey program to laypersons.

4. A program of field trips for the general public will be re instituted, and at least one field trip a year will be conducted.

5. A display area in which the public can view specimens of rocks, minerals, and fossils from Indiana will be provided.

6. The Director is giving an oral monthly report to the Advisory Council of the Bureau of Water and Mineral Resources.

Improvements in the performance and effectiveness of the Indiana Geological Survey in carrying out its mission are being pursued by developing, maintaining, and supporting a competent, innovative work force. To maintain pace with expanding technology in a wide variety of areas, including science, methodology, and management, a high priority has been placed on the continued education of our staff. Education in the classroom at Indiana University is of course one important method. But education will be encouraged by other means, including: (1) taking advantage of special program capabilities within the private sector, federal and state agencies, and other universities; (2) encouraging access to the scientific community at large; and (3) sharing new methodologies of research. The strength of the Survey for the future is in its professional and technical staff and their ability and willingness to adapt to changing technology, not only to be capable of but also to be in the forefront of meeting the needs of the State of Indiana and its citizenry.

In summary, the Geological Survey with its professional staff, modern technology, and innovative ideas is looking forward to playing a vital role in Indiana's future during its next 150 years. This will be a time of expanding needs for crucial energy resources for economic development that will have to go hand in hand with concern for protection of the environment and safe water supplies. The Geological Survey will be working with other state agencies and with federal agencies to guide Indiana in the development and management of its natural resources.