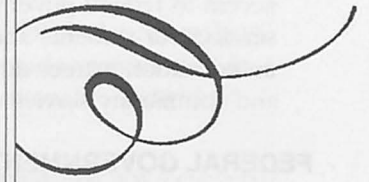


WHAT'S SHAKING? GOVERNMENT INFORMATION ON THE ENVIRONMENT AND NATURAL SCIENCE

by Linda R. Zellmer,
Indiana University Bloomington,
Bloomington, Indiana



Shortly after noon on June 18, 2002, people in southern Indiana were surprised by a magnitude 5.0 earthquake. While people near the epicenter experienced ground shaking, people further away, noticed little things, such as a wobbling computer monitor and a slight pop of the windows. When a geologist from the Indiana Geological Survey, who was working in the Geology Library, said that it may have been an earthquake, I immediately checked the National Earthquake Information Center's web site (<http://neic.usgs.gov>) for information. Before the calls from the press and the public started five minutes later, I had learned that initial reports placed the location of the earthquake in southern Illinois; within 30 minutes the location of the epicenter had been changed to Darmstadt, Indiana. Information on the earthquake is still available on the NEIC web site (<http://earthquake.usgs.gov/eqinthenews/2002/usfnbk/map.html>)

Earthquake information is one of the more exciting forms of natural science information available from the government. However, a wide variety of information on the environment, natural sciences and natural and environmental hazards is available from many federal and state government agencies. More and more, people are looking for information about a specific location, or the area in which they live, because they are thinking of buying or building a house or purchasing property and wish to avoid natural and environmental hazards. Site specific information can be found on topographic maps, aerial photographs, flood insurance maps, soil maps printed in soil surveys or wetland inventory maps. However, like other government information, some of this information is gradually being moved to the Internet.

U.S. GEOLOGICAL SURVEY (U.S.G.S.)

The first thing people who are looking for environmental and natural science information want to know is location of their site. This is best accomplished by viewing a large-scale map of their area. The U.S. Geological Survey was established in 1879 for the purpose of "classification of the public lands, and examination

of the geological structure, mineral resources, and products of the national domain." (1) Today the Survey is the primary mapping agency in the United States. Their principal map product, the topographic map, shows the elevation of the land surface using contours or lines of equal elevation (Figure 1). In most cases, a U.S. Geological Survey topographic map will provide the most detailed view for people seeking environmental information. Topographic maps are produced at different scales (the relationship between distance on a map and the distance on the ground). The largest scale topographic map available from the U.S. Geological Survey is produced at a scale of 1:24,000 (a given distance on the map is 24,000 times that distance on the ground). Topographic maps can be used to identify areas with steep slopes, which have closely-spaced contours, and possible floodplains which have flat areas along rivers and streams. Older editions of topographic maps can be used to examine land use change over time or identify past land use.

The Geographic Names Information System (GNIS) link (<http://geonames.usgs.gov/>) is a digital place name index that can be used to search for over 2,000,000



FIGURE 1. A portion of the Indiana University campus shown on the Bloomington, Indiana U.S.G.S. 1:24,000 topographic map.

place names that appear on U.S.G.S. topographic maps. GNIS can be used to identify which topographic map covers a specific area. The GNIS database does not include features such as caves and ruins; active military bases are also no longer in the database.

In addition to topographic maps, the U.S. Geological Survey also publishes thematic maps on a wide variety of topics, including geology, mineral resources, land use, land cover, base maps of states and other areas, satellite image maps (for some areas) and orthophotoquadrangles (aerial photographs that have been corrected for the tilt of the airplane taking the picture) (Figure 2). Digital spatial data for Indiana which can be used in geographic information systems, including the digital raster graphics (scanned topographic maps) and digital orthophotoquadrangles, can be downloaded for free from the Indiana Spatial Data site at Indiana University (<http://storage.iu.edu/DOQQS/index.html>). Because these files are large, they may be difficult to download on a slow connection. Therefore, the Indiana Geological Survey sells this data on CD-

ROM. Data for the entire state can be purchased for \$100; smaller areas are available for \$10 per CD-ROM. Several commercial web sites can be used to view U.S.G.S. digital topographic maps. They include Microsoft Terraserver (-HYPERLINK "<http://terraserver-usa.com/>"—<http://terraserver-usa.com/>), which has both topographic maps and orthophotoquadrangles, TopoZone (<http://www.topozone.com>) and the Maptech Map Server (<http://mapserver.maptech.com/homepage/index.cfm>).

The U.S. Geological Survey's web site (<http://www.usgs.gov/>) offers links to several other interesting and useful resources. They include *The National Atlas of the United States*® (<http://www.nationalatlas.gov/>), a cooperative venture between the U.S.G.S., ESRI, Inc. and other federal agencies. The *Atlas* is an interactive mapping site that can be used to create maps of the United States on over 400 different themes, such as agriculture, mineral resources, geology, water resources, West Nile Virus and population. A link to the National Earthquake Information Center (NEIC) ([A black and white aerial photograph of a portion of the Indiana University campus. The image shows a dense network of streets, including a prominent grid pattern on the left side. Buildings of various sizes and shapes are scattered throughout the area. The terrain appears relatively flat, and the overall appearance is that of a well-developed urban or campus environment. The image is presented as a digital orthophotoquadrangle, which is a type of aerial photograph that has been corrected for perspective distortion.](http://</p></div><div data-bbox=)

FIGURE 2. A portion of the Indiana University campus shown on a digital orthophotoquadrangle.

neic.usgs.gov), a unit of the Geological Survey, can be used to find information on earthquakes. In 1996 the U.S. Bureau of Mines merged with the Geological Survey. Since the merger, the Survey has continued to publish *Minerals Yearbook* and has migrated it to the web (<http://minerals.usgs.gov/minerals/pubs/myb.html>). The *Yearbook* provides information on mineral commodities and resources in world countries and U.S. states. The state listings include black and white maps showing the location of mineral resources in a state. Finally, the U.S.G.S. Learning Web (<http://www.usgs.gov/education/index.html>) offers links to educational information for students, teachers and the general public.

INDIANA GEOLOGICAL SURVEY

The Indiana Geological Survey is the primary earth science agency in the state of Indiana. It collects and disseminates information on the geologic, mineral, energy and water resources of Indiana. The Survey also has a collection of older aerial photographs, some of which were taken as early as the 1930s. The Indiana Geological Survey's web site (<http://igs.indiana.edu/index.cfm>) and their Indiana Geology site (<http://igs.indiana.edu/geology/index.cfm>) contains information on the geology of Indiana, such as mineral resources, caves, fossils and Indiana's geologic history. This page also contains links to several Indiana geologic maps, descriptions of places of geologic interest, a geological glossary and educational resources. The Indiana Geological Survey publishes printed reports related to the geology and mineral resources in the state. Several popular-interest publications, including their circulars on rocks, caves and fossils, are presently out of print and being revised. Indiana Geological Survey publications available for sale are listed in the publication list on the IGS Information web site (<http://igs.indiana.edu/survey/index.cfm>).

One resource from the Indiana Geological Survey that is of particular interest is a new interactive mapping site developed for the I-69 corridor study, titled *A GIS Atlas for Southwestern Indiana*. This atlas can be reached from the IGS Interactive Maps and Geospatial Data Downloading page (<http://igs.indiana.edu/arcims/index.cfm>). The *Atlas* contains over 170 thematic layers of data from a wide variety of sources that can be mapped, displayed, printed and downloaded. In the interactive atlas the layers, which are viewed on a base map showing county boundaries in southwestern Indiana, deal with subjects such as coal, hydrology, biology, the environment, geology, infrastructure, demographics and history (Figure 3). Maps can be viewed online or printed. The spatial data used in the *Atlas* is also available as Indiana Geological Survey Open-File Study 01-23, titled *A Geographic Information System Atlas for Southwestern Indi-*

ana (Price: \$90.00). The Indiana Geological Survey is developing an electronic atlas for the state of Indiana. New layers are added each month. The atlas, titled "A GIS Atlas for Indiana", is available at <http://igs.indiana.edu/arcims/statewide/index.html>.

Another interactive mapping resource available on the Interactive Maps web site is the *Lake Rim GIS*. It contains a wide variety of natural science information on northwestern Indiana, the state's most densely populated region.

ENVIRONMENTAL PROTECTION AGENCY (EPA)

The Environmental Protection Agency is an independent U.S. government agency that was established in 1970 (2). Its mission is "to protect human health and to safeguard the natural environment—air, water, and land—upon which life depends" (2). The EPA monitors air and water quality, and enforces compliance with environmental standards. One of the most important EPA resources, titled *Where You Live* (<http://www.epa.gov/epahome/wherelive.htm>) allows users to search for environmental information about a place. From the *Where You Live* site, users can locate superfund sites, view reports and maps related to air quality, get information about their watershed, or identify sites in the area that have released toxic chemicals. *Envirofacts* (<http://www.epa.gov/enviro/>) can be used to search multiple databases for information about sites that could adversely affect the environment of an area and its watersheds. This information would be useful to people interested in buying a home or land, because landowners are held liable for the costs of cleaning up environmental damage.

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT (IDEM)

The Indiana Department of Environmental Management is the state counterpart of the Environmental Protection Agency. The Department is the primary environmental protection agency in the state of Indiana. Their mission is to protect public health and improve the environment in Indiana. IDEM has developed an extremely useful interface to the U.S. Environmental Protection Agency's community environmental data titled *Bringing Environmental Information Home* (<http://www.in.gov/idem/communityinfo/index.html>). The site also offers users convenient one-stop shopping for community-level environmental information that is not easily located on the EPA web site. From the *Bringing Environmental Information Home* site, users can enter their zip code and retrieve information on EPA-Regulated facilities map potential hazardous materials sites and public institutions, such as schools and hospitals, and locate information about a watershed. Another interesting link on the IDEM community web site is *Window to My Environment*,

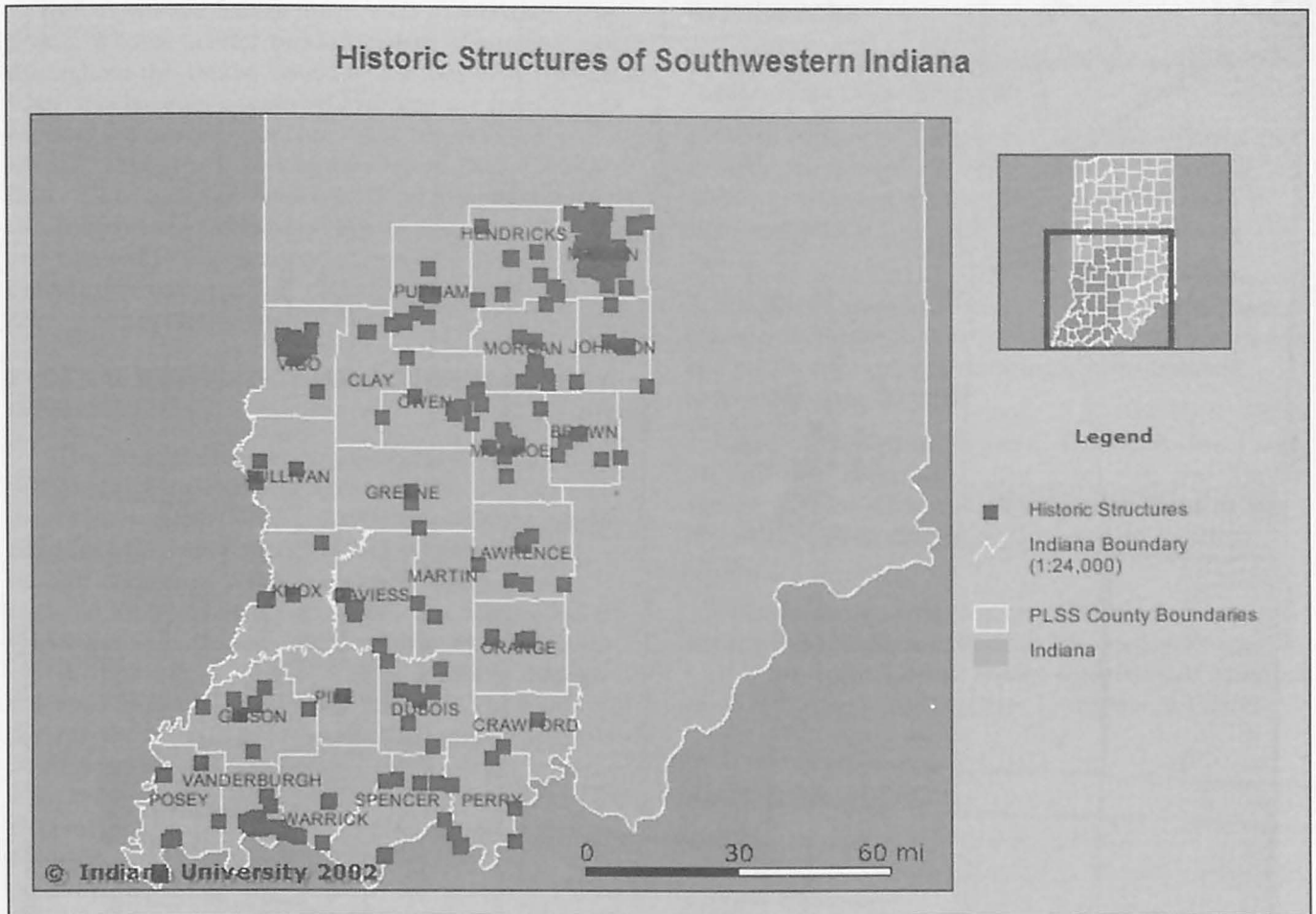


FIGURE 3. Image of a map showing historic structures from the *GIS Atlas for Southwestern Indiana*.

which links to an EPA interactive mapping site that combines environmental and population data.

NATURAL RESOURCES CONSERVATION SERVICE (NRCS)

The Natural Resources Conservation Service (formerly the Soil Conservation Service) is the agency responsible for producing soil surveys, which are books of maps showing the different types of soils that occur in an area. Many soil surveys are produced at the county level; one survey covers a complete county. In addition to soil types, soil surveys provide information on whether the soil in an area would be suitable for a given land use. A list showing Indiana counties with dates of their soil surveys is available at: http://soils.usda.gov/survey/printed_surveys/indiana.html. Links to lists of soil surveys for other states are available at: <http://www.statlab.iastate.edu/soils/soildiv/sslists/pub-st.html>.

Like much government information, soil surveys are changing too. In some cases, new soil surveys are being distributed on CD-ROM. These digital soil surveys

are similar to the printed soil surveys; text and maps (but not the spatial data used to create the maps) are stored as pdf documents that can be viewed on a computer. Digital spatial data that can be used with geographic information system (GIS) software can be downloaded from the Natural Resources Conservation Service's Soil Survey Geographic (SSURGO) data site http://www.ftw.nrcs.usda.gov/ssur_data.html. With a GIS the SSURGOs data can be analyzed to identify areas with soil properties that would be suitable for specific land uses. Print and digital soil surveys can be obtained from the State Conservationist, 6013 Lakeside Blvd., Indianapolis, IN 46278-2933.

FISH & WILDLIFE SERVICE (FWS)

The U.S. Fish and Wildlife Service (<http://www.fws.gov>) was established in 1940 (4), although it was preceded by several other agencies that date back to 1871. The Service works to conserve, develop and restore habitats for fish and wildlife and protect endangered species. The Fish and Wildlife Service manages National Wildlife Refuges throughout the United States,



FIGURE 4. Portion of the Flood Insurance Rate Map showing an area of the Indiana University Campus.

as well as wildlife habitat areas, such as wetlands. The Fish & Wildlife Service produces maps of wetland areas throughout the United States, which they offer for sale. They also have an interactive mapping site (http://www.nwi.fws.gov/mapper_tool.htm) that can be used to identify wetlands in an area of interest. Digital spatial data of wetlands can be downloaded from their web site (<http://wetlands.fws.gov/downloads.htm>). This data can be used in a geographic information system in conjunction with U.S.G.S. digital raster graphics or digital orthophotoquads.

FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA)

The Federal Emergency Management Agency (FEMA) is an independent agency of the U.S. Government that was established in 1979 (5). FEMA is responsible for emergency planning and preparation, and disaster mitigation. As the agency in charge of the National Flood Insurance Program, it is responsible for floodplain management and mapping. They produce Flood Insurance Studies, which are available through the Federal Depository Library Program. The Flood Insurance Studies are preliminary reports on possible flood hazards that are used to develop Flood Insurance Rate Maps (Figure 4), which are official, approved documents that can be used to plan flood mitigation. Flood Insurance Rate Maps show the boundaries of areas that have been identified as 100-year and 500-year floodplains, which are areas which have a 1% and 0.2% chance of flooding in any given year.

Like many other Federal Agencies, FEMA is moving to provide more information digitally. Their interactive natural hazard mapping site (<http://www.hazardmaps.gov/atlas.php>) can be used to map the locations of earthquakes, floodplains, hail storms, hurricanes, landslides, tornadoes, tsunami, volcanoes and wind storms. Flood Insurance Rate Maps are being converted into data that can be used with geographic information system software (Q3 Flood Data). The FEMA Flood Map Store (<http://store.msc.fema.gov/>) can be used determine whether Q3 Flood Data, Flood Insurance Studies and Flood Insurance Rate Maps are available for a given area. If the map or study for that area has been scanned, it can be viewed online. Maps and Studies available for an area can also be ordered from the site.

FEMA and ESRI, Inc., a GIS software company, also have an interactive hazard mapping web site. The ESRI-FEMA Hazard Awareness site (<http://www.esri.com/hazards/>) is an interactive mapping site that can be used to map the location of flood hazard areas, historic tornadoes, hail storms and hurricanes and recent and historical earthquakes. Unfortunately, the Darmstadt, Indiana earthquake is too recent to be mapped on the site.

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ABOUT THE AUTHOR:

Linda R. Zellmer
Head, Geology Library
Indiana University