Our Common Ground

Iowa Department of Natural Resources

Iowa Geological Survey
Resource Information Fact Sheet 2005-4

Getting the Picture with GIS

When data from many sources are combined, mapping can be a very powerful tool: issues can be explored, trends more easily discerned, and relationships between different variables can be identified. Our job is to provide the necessary information, training, and assistance to various governmental, educational, business, and private citizen groups using Geographic Information Systems (GIS) to make natural resource and environmental decisions.

Fulfilling Our Purpose

GIS at the Iowa Department of Natural Resources (DNR) was established by the 1987 Iowa Groundwater Protection Act. GIS staff have collected stream, lake, wetland, groundwater, and aquifer data which can be used to analyze the links between land use and water quality when developing watershed plans to improve water quality.

Staff are involved in creating large GIS data sets that cover the entire state. Those involved in managing or studying natural resources require such data as soil types, topography, land use, vegetation, water features, and geology. Data for administrative and political boundaries, transportation routes, census, section lines, and place names are also needed. This basic data and other program data are collected, stored, and documented in the DNR's Natural Resources GIS (NRGIS) Library (www.igsb.uiowa.edu/nrgislibx). Natural resource collaborations and partnerships are more productive when everyone shares their information, so our GIS data in the Library are readily available and free of charge.

Along with environmental protection efforts, usage of GIS has expanded to almost all DNR programs, including forestry, wildlife, parks and preserves, energy, and waste reduction. GIS staff work extensively with others in the DNR to develop basic data, provide GIS hardware and software training, and offer assistance with other geospatial technologies, including global positioning systems (GPS), remote sensing, delivery of on-line map data, and special

Data Sets Available from the NRGIS Library

- Administrative & Political Boundaries
- Aerial & Satellite Imagery
- Agricultural
- Basins (watersheds)
- Biologic & Ecologic
- Cultural & Demographic
- Elevation ("3-D" topographic maps)
- Environmental Regulation
- Geographic (referencing systems)
- Geologic
- Hydrologic
- Infrastructure
- Land Description
- Scanned Topographic Maps

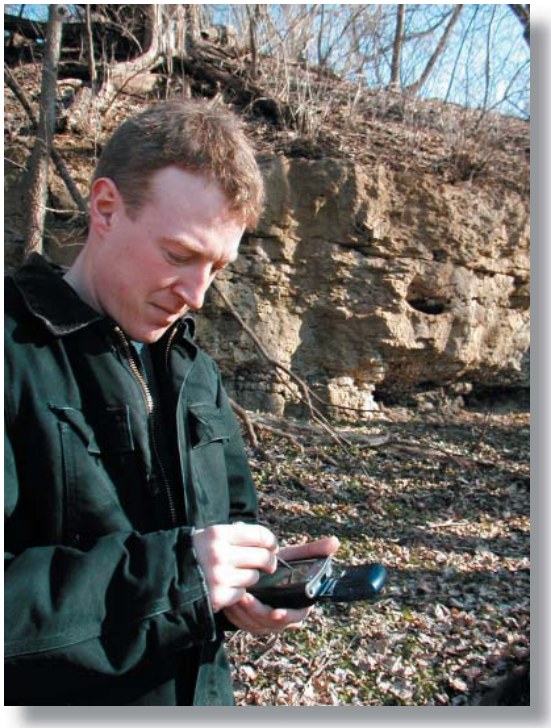

Figure 1. *A member of the GIS staff collects data using a Global Positioning System (GPS) receiver. GPS receivers can be modified to collect tabular data on specific characteristics (outcrop, weather conditions, surrounding flora) of the landscape. These data are then downloaded to a computer and tied to the point generated on a GIS file. GPS points provide a more accurate analysis of trends or patterns in natural resources. The ability to enter tabular data at the point of collection ensures accurate attribution and lessens the likelihood of data being mistakenly entered while transferring from a field notebook.*

applications to customers with an Internet Mapping Service (IMS). By helping GIS users develop their own specific data and by integrating this data with what has already been compiled in the NRGIS Library, a more robust analysis of data is possible.

Analysis is only as good as the quality of the available data, and many projects require precise locational information. In such cases, it is necessary for staff to visit the site of interest. When traveling in the field, GIS staff utilize GPS receivers to collect accurate locational data and gather specific information about a site's characteristics (Figure 1). These receivers provide tremendous benefits by increasing the efficiency, accuracy, and consistency of data collection.

Internet Map Service (IMS)

Two methods have been developed by DNR for accessing data, the NRGIS Library and IMS sites. The NRGIS Library allows the user to download data for use in desktop GIS. Use of GIS datasets can require specific and often expensive software. IMS applications provide on-line access for those who want to view or visually analyze pre-selected GIS layers of specific interest, which makes this data more accessible to novice users. IMS is the product of 20 years of planning and data collection. With recent developments in web technology, it provides new ways to make data available to the public (Figure 2). IMS and GIS are burgeoning technologies with great potential for improving management decisions. Currently the DNR hosts eight IMS applications related to specific needs in the DNR. For a full listing of IMS applications, visit www.iowadnr.gov and click on *Mapping (GIS Interactive)*.

The premier DNR IMS site is currently the *Watershed Atlas*. This atlas contains extensive watershed and water quality information. The DNR's *Watershed Atlas* is a great way to conduct preliminary investigations of water quality. Find out more by visiting the *Mapping* site and clicking on *Watershed Atlas*.

The DNR is also developing a web-enabled search engine for DNR regulated facilities. The *Facility Explorer*, created for the One Stop Program – a cooperative venture between the Iowa

DNR and the U.S. Environmental Protection Agency – links GIS and regulatory program-specific information for permitted facilities throughout Iowa. Facilities range from factories to farmer cooperatives and include many other business types. Presently, data from several programs have been integrated into the *Facility Explorer* and other programs will follow. Find out more by clicking on *Facility Explorer* from the *Mapping* site.

Historical Perspective

The NRGIS Library includes information derived from satellite imagery and aerial photography. Satellite imagery provides a historical snapshot that can be used to analyze change. For example, changes in land use can be derived by comparing previous satellite land cover information to current land cover information (Figure 3). Increases in urbanization or other land changes can be seen (e.g., row crop to Conservation Reserve Program set aside). These changes can be critical for planning and development by decision makers.

Another example of data that can be used to illustrate historical perspective is the Library's collection of aerial photography. USGS 1990 black and white (i.e., DOQ) photography can be compared to the 2002 color infrared (CIR) photography (Figure 4). This photography, when paired with interpretations of satellite imagery, gives a more detailed picture of changes in land use over time. When disparities are found, the higher resolution photography can be used to see details of change. In cases where land use changed from agricultural to urban, these photographs may identify factories, warehouses, or residential housing.

GIS can assist in understanding what is "on the ground." The application of GIS as a tool to assess the interaction of multiple variables is limited only by the user's imagination, making it a very powerful resource for decision makers and others throughout the state.

Visit our website www.igsb.uiowa.edu or the others listed in this article to *get the GIS picture* of what is "going on" in Iowa.

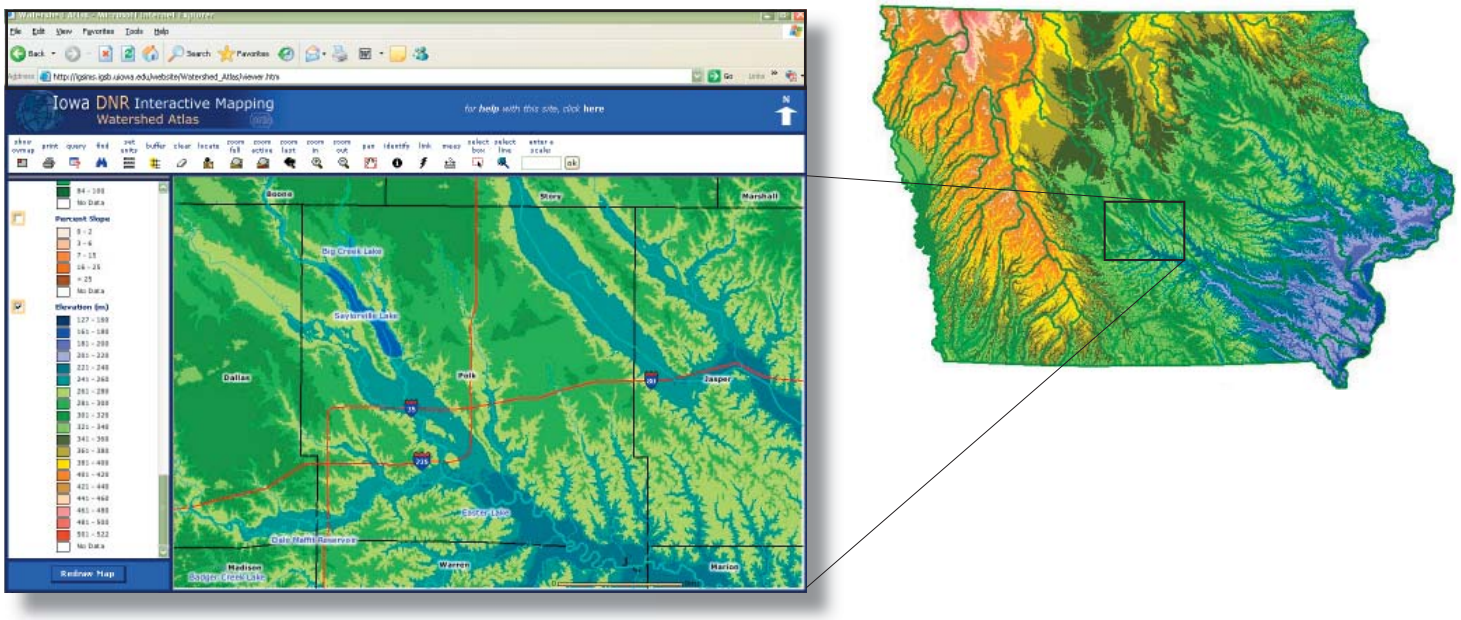

Figure 2. *The Watershed Atlas enables statewide analysis of water-related issues. Attributes such as elevation, soil erosion, and slope can be overlain to gain an understanding of what is occurring in a particular watershed. This map shows the land surface elevation of Polk County.*

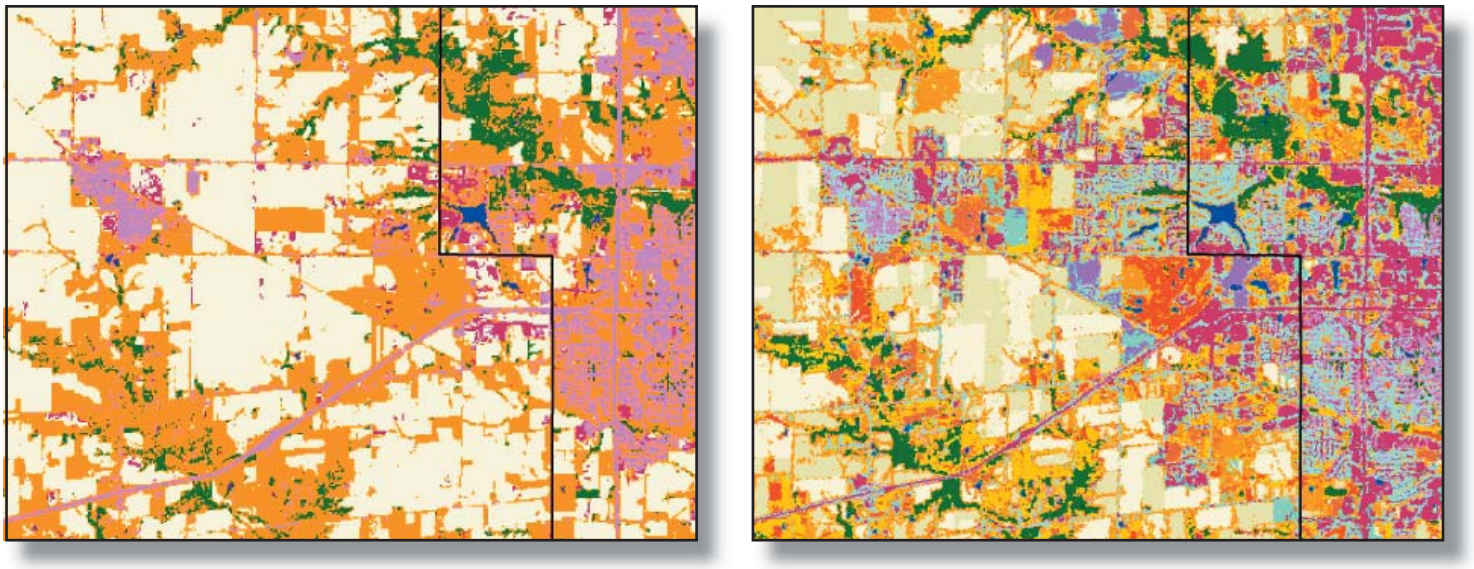

Figure 3. *Side-by-side comparison of 1992 land cover (left) and 2002 land cover (right) maps derived from satellite imagery. The 2002 land cover has much more detail and shows the transition of Polk and Dallas counties (boundary shown by black line) from agricultural to urban to land uses. Map colors: light yellow – row crop, shades of orange – grasslands, magenta – commercial/industrial, light blue and pinkish-purple – residential, green – forest, purple – quarries.*

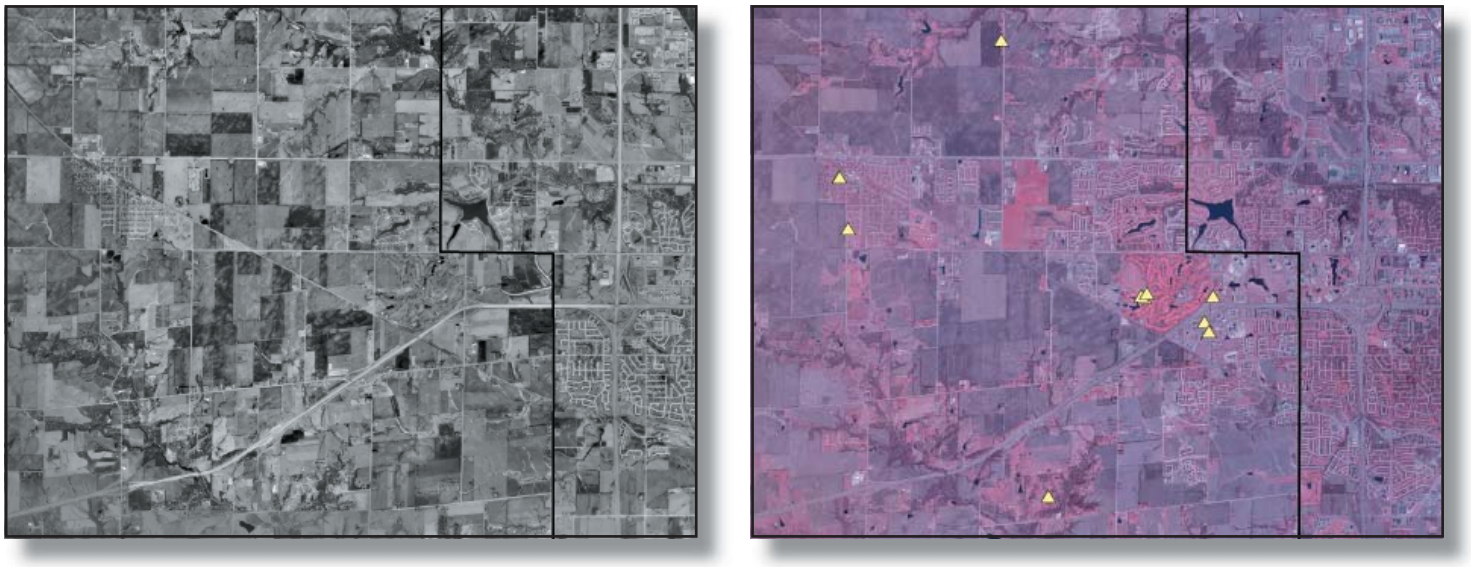

Figure 4*. Comparison of 1992 black and white photography (left) and 2002 color infrared photography (right) of the area shown in Figure 2. Details of building development can be seen. By adding the approximate locations of wells to the CIR (represented by triangles), decision makers can see if proposed projects affect wells used for drinking, industrial, or irrigation purposes.*

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