

# What is GIS?

Source: Ohio State University Extension  
Natural Resources  
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## What Is GIS?

A geographic information system (GIS) is a computer-based information system that is designed to work with data referenced by spatial or geographic coordinates. Therefore, a GIS is both a database system, with specific capabilities for spatially referenced data, as well as a set of operations for working with these data. Within a GIS, the data are represented as points, lines, or polygons (Figure 1) along with their associated characteristics (attributes) of the phenomena that the points, lines, or polygons represent. For instance, points can represent the location of a heritage or a cultural resource site within a national forest, and the attributes associated with this site may identify the historical period of the American Indian tribe that once inhabited the area. Lines can be used to represent linear features such as roads, rivers, and streams, while polygons can be used to represent area features such as forest stands, vegetation types, or other land uses.

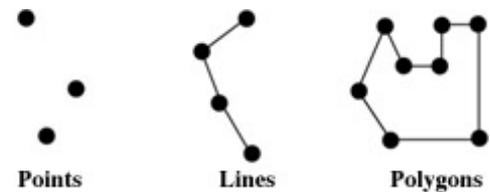


Figure 1: Elements of geographic data

There are two formats in which geographic data can be represented -- raster-based systems and vector-based systems. The differences between these systems are based in the way in which the earth's surface is perceived, represented, and stored. In raster-based systems, the earth's surface is decomposed into discrete uniform cells, and each cell (pixel) represents a specific area of the earth. Each cell is assigned a value that represents an attribute or characteristic of the geographic location. In such a system, location is inherent in the storage structure, identified by the row and column to which a cell or a pixel is assigned. Raster data are computationally easier to manipulate, but generally require greater amounts of storage space. In vector-based systems, objects as well as their characteristics or attributes are defined. These defined characteristics include the x, y coordinate location. Vector data are often preferred for display purposes, because it maintains a truer representation of an object's shape. Figure 2 provides an illustration of how an object would be represented in a raster and a vector format.

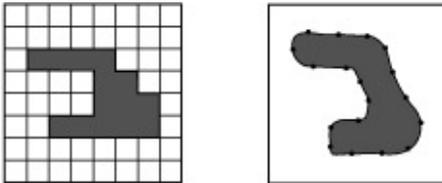


Figure 2: Representation of object in raster and vector format

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## GIS Components

A GIS is an integrated system that consists of hardware, software, data, and users. As Figure 3 illustrates, these components interact to address spatial questions that can be used to facilitate more efficient decision-making processes. Overall, the components of a GIS are dynamic. Advancements in technological developments in GIS computer hardware, software, and data acquisition techniques compel users to pursue additional training to develop the necessary technical skills that will support the use of a GIS to its fullest potential.

The United States Geological Survey (USGS) developed a classification scheme that can be used to either identify GIS users as system users or end users. System users are individuals who have worked extensively with GIS hardware and software, and therefore are technically experienced in using GIS as an analysis tool. These users usually have the capability to perform system maintenance and solve application problems. End users are focused on working with the products generated within a GIS framework, and this group of users tends to know enough about the technical capabilities and functions of GIS in order to obtain what they want or need from the system, but their skills do not tend to encompass system maintenance.

Users are the most important component of a GIS. State-of-the-art facilities and comprehensive databases require highly trained individuals. Typically, 80-90 percent of the financial resources of a GIS project are directed to data acquisition and manipulation efforts. Therefore, it is essential for a GIS user to have the necessary skills

to process the data as well as have a comprehensive understanding of how the data-base was generated. Computer hardware and software are highly variable components of the system, possessing a wide range of capabilities and costs. Computer sizes are defined by speed, disk space, random access memory, types of input/output devices, number of users, and costs. Purchasing the appropriate hardware and software requires careful consideration of the applications that will be used in a GIS project.

### Analysis Techniques

Spatial analysis functions distinguish a GIS from other types of information systems. These functions use the spatial and nonspatial (attribute) data in a GIS database to address questions about the real world. In essence, the GIS database is a model of the real world that can be used to simulate certain aspects of reality. A model can be used to address questions about what exists now, what might exist in the future, as well as what existed in the past. All of these questions involve predictions that occur in time and space. The analysis functions of a GIS provide a user with the appropriate tools to simulate and predict the impact of various management scenarios for a given land area. GIS techniques, such as overlay analysis (Figure 4), buffering (Figure 5), and network analysis (Figure 6) are illustrated here.

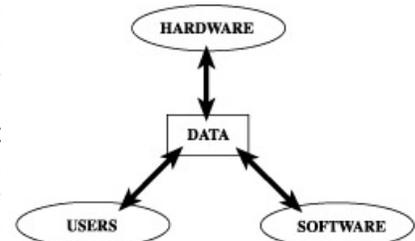


Figure 3: Components of GIS

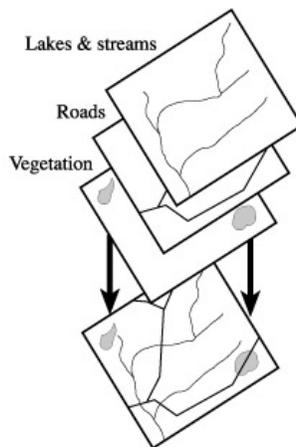


Figure 4: Overlays

### GIS Applications in Natural Resources

Since its inception, GIS technology has been strongly associated with the mapping and management of natural resources. Although GIS continues to be used for automating the making of forest maps, attention is largely focused on developing and using the modeling capabilities of GIS software to analyze natural resource issues and concerns. In forestry, some models simply automate the calculation of timber yields, help select timber for either harvest or conservation, or analyze potential forest-management alternatives. Within this decade, GIS will be used increasingly to interface with predictive models, providing forest managers with a critical tool to aid in the analysis and comparison of integrated resource-management alternatives.

GIS-based modeling approaches have emerged to integrate wildlife habitat concerns in the forest management process. Spatial data can be used to determine the availability of viable habitat for specific species types as well as estimate the habitat needs of a given species by observing wildlife populations at specific locations. Regardless of the

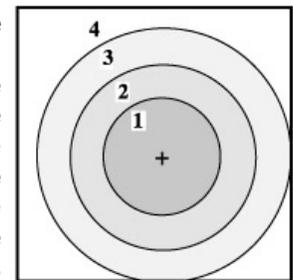


Figure 5: Buffers

application, GIS is proving to be an effective mechanism to manage the diverse interests, resources, and demands that are encompassed by natural-resource development. Developed and applied correctly, a GIS can provide resource managers with powerful information that will aid them in the development of resource-management and planning decisions.

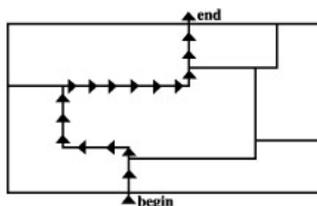


Figure 6: Network Analysis

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# Hosting a GIS Day Event

Source: ESRI White Paper

## Goal and Purpose of Event

The goal and purpose of GIS Day is to educate children and adults about how geography and geographic information system (GIS) technology make a difference in their lives while highlighting your company or organization's GIS contributions to the community.

Geography Matters! That's the message of your events. You, as users of GIS technology, have invested a great deal of effort in your GIS. Now is the time to showcase your work with events that will educate others on the significant contribution GIS technology is making in their communities and lives.

## Target Audience

An important step in planning your event is deciding who your audience will be. This will help you develop your event and decide which activities you will present. Here are a few questions that will assist you with your decision.

- What age group do you want at your event?
- Is this an internal event for your company, or will the public be invited?
- Will you invite prospective and/or current clients?
- What is the GIS knowledge of the audience?

## Decide What Type of Event You Would Like to Hold

Once you have decided who your target audience will be, then you can decide what type of event(s) you will hold. Following are a few suggestions for different types of events. A list of materials available for you to use at your event(s) follows the event descriptions. Feel free to mix and match activities to customize your own special event. For example, you may want to combine an open house with a radio station remote broadcast.

## Event Types

### *Open House*

This is a great way to get people to actually see GIS in action in your own organization. It also saves you the time and effort of having to transport equipment to a different location.

### *School Presentation/ Demonstration*

The goal of this event is to educate schoolchildren about how geography through the technology of GIS affects their everyday lives.

### *Map Gallery*

Team up with other companies and organizations in your area and invite the public to a map gallery, displaying maps created with each company/organization's GIS. This event would be very similar to an art exhibit. The map gallery could be held at your organization, local library, school, or other public facility.

### *User Group Meeting*

Hold your next user group meeting on GIS Day.

### *Media Event*

Web page spotlight—Spotlight your GIS application on your company's Web site. This can be a story describing your company's use of GIS or even an interactive demonstration using an Internet Map Server software. Be sure to link to the GIS Day Web site or a sponsor's affiliated site for your audience to learn more about GIS and how it affects the world around them. Use the GIS Day Web page templates found on this CD.

Radio station or local TV station remote from your event—Many radio stations will broadcast from your site for a small fee, and some will even do it for free if they think there's enough public interest to warrant it. Local cable stations are always looking for local interest stories for their broadcasts, so be sure to invite them to your event as well. Refer to the Media Guide document on this CD for help.

Local press—Local newspapers also like to showcase local events, so an invitation should be extended to your local newspapers. Contact the news, business, or humaninterest editors and "pitch" your event to them. Refer to the Media Guide document on this CD for help.

### **Suggestions for All GIS Day Events**

- Obtain the proper approvals for all events—schools, organizational meetings, and so forth.
- Display maps.
- Always make time during your event (or at the end of your event) for questions and answers.
- Ensure that your presentation is easy to understand for those who are unfamiliar with GIS. Ask someone with little or no GIS knowledge to review your presentation/materials beforehand, as it is sometimes very different to speak in non-GIS lingo when you have been proficient in GIS for a period of time.
- Make your presentation as fun as it is interesting and interactive, especially if there are children present. Ask questions and give away small prizes to those who answer correctly.
- Make sure your audiovisual equipment is working properly and will broadcast effectively for the number of people you are expecting.
- Test all equipment and run through your presentation/demonstration the evening before. Audiovisual equipment is very sensitive, and you never know when you might blow a projection bulb.

### **Interactive Activity Ideas**

How does your organization use GIS?

- Circulate maps made with your GIS applications showing individual layers of data you use in your work.
- Ask the participants to identify what information/data is being displayed in each map and what kind of problems you could solve using that information/data.
- Once all the participants have identified the data and the potential questions/problems to be solved using each data layer, ask each participant what types of questions/problems they think could be solved if all data layers were used together.
- Now demonstrate how your company/organization uses the data sets together and what types of questions/problems you solve.

This activity highlights your organization's use of GIS while engaging the participants in an interactive exercise highlighting the GIS concept of layering data to solve problems.

Play a geographic jeopardy game—What state in the United States has the largest population? How many states have a city named Orange? What state has the highest percentage of males? What country spends the most money per student on education? Ask students to answer these questions and any others you think are interesting, using GIS and their knowledge of geography. You may download free data sets to use in this activity from [www.esri.com/data/online/index.html](http://www.esri.com/data/online/index.html).

You be the city manager—Has your community had a recent local planning issue such as siting a new landfill or fire station? Use it as the basis for a debate/game using GIS for determining where to site the facility.

Pattern recognition—Display maps showing patterns and ask the audience to tell you what the pattern is or what problem/question is being answered/solved. Use the sample screen shots included on the GIS Day CD or make your own. Give prizes for the correct answers.

Make a city/town sandwich—Stacking data in a GIS is very similar to making a city/town sandwich—a layer of this, a slice of that. Sandwiches can also be made to suit individual needs. Ask the participants to create their own city/town sandwich by having them offer suggestions of the sorts of data they would use if they were building a GIS for their city or town.

### Get the Word Out

- Invitations should be sent out one month prior to the event. Any earlier and people tend to forget. Any later and most invitees will have schedule conflicts. If you mail your invitations, you may also follow up with a reminder e-mail with accompanying directions to your event.
- Mail, e-mail, or fax invitations.
- Newspaper or Web page announcement. Run these announcements in a timely manner to help advertise your events.
- Call attention to your event with an announcement of its occurrence.
- Media coverage.
- "Pitch" your event to a local events newspaper, magazine, or broadcast reporter, and invite them to your event.
- Notify GIS and geography organizations of your event so they may direct interested parties to you.
- Register the event on the GIS Day Web site at [www.gisday.com](http://www.gisday.com). Web site visitors will be able to search for an event in their local area.
- Send reminder e-mails three to four days prior to the event.

### Registration

You will want to be properly prepared to receive your guests. Registration is not mandatory but is highly recommended, especially if you will be hosting an open house and have limited space. The most effective ways to accomplish this are:

- Mail or fax
- Phone
- E-mail
- Web page

At the very least you will probably want your attendees to submit their name and contact information. Asking for their profession and title is also helpful in customizing your activities/demonstrations. After they have registered, it is nice to follow up with a confirmation of their registration and directions to the event. Confirmation can also be done by any of the ways listed above.

Good luck hosting your next GIS Day Event!

