GIS Basics

What is GIS?

A computer aided map and mapping system and associated attribute database.

A geographic information system (GIS) integrates hardware, software, and data for capturing, managing, analyzing, and displaying all forms of geographically referenced information.

GIS allows us to view, understand, question, interpret, and visualize data in many ways that reveal relationships, patterns, and trends in the form of maps, globes, reports, and charts.

What's the difference between GIS and GPS?

GIS (Geographic Information Systems) is a set of tools and techniques used to display and analyze information in a geographic, or "spatial," context.

GPS (Global Positioning Systems) is a technology that uses satellites to allow you to find your position on Earth by using a GPS device or unit.

GPS can be incorporated into GIS by using a GPS device to collect points, lines, or polygons, which can then be imported into a program that uses GIS tools to display that position as it is related to other known points on Earth.

How does GIS work?

GIS is able to bring together information from multiple sources to show relationships between different types of information. In order to do this, each piece of data in a relational database is tied to a specific location on the Earth's surface. Latitude and longitude are usually used for this and the locations to be viewed are attached to points on a geographic grid.

There are three different ways in which GIS data can be viewed. The first is the database view. This consists of the "geodatabase," also known as the data storage structure. In it, data is stored in tables, is easily accessed, and is able to be managed and manipulated to fit the terms of whatever work is being completed.

The second view is the map view. It is the most familiar to many people because it is essentially what many see in terms of GIS products. It is very powerful because it allows us to visualize patterns and relationships among data sets. GIS is in fact a set of maps that show features and their relationships on the earth's surface and these relationships show up most clearly in the map view.

In GIS "layers," one set of data is displayed "on top of" another to show spatial patterns and relationships on a map. For example, elevation at specific locations can show up in the first layer and then rates of precipitation at various places in the same area can be in the second. Through a GIS analysis, patterns about elevation and the amount of precipitation then arise. Typically, there is a base map which is always visible; other layers may be turned "on" or "off" (i.e., made visible or invisible).

The final GIS view is the model view which consists of tools that are able to draw new geographic information from existing datasets. These functions then combine the data and create a model that can provide answers for projects.

How does the Water Atlas use GIS?

The primary components of the Water Atlas geodatabase are water quality and hydrology information, which is available to users in both tabular and map views. Web pages on the Water Atlas organize this data by geography and topic and display it in a way that is easily understood.

Each water resource (Lake Baldwin or the Little Wekiva River, for example) has associated with it a group of webpages, and each webpage within that group is devoted to a particular topic area (Water Quality, Water Levels/Flows, Habitats/Ecology, etc.). Data about a particular water resource/topic area are displayed using maps, charts and graphs that help users to understand the meaning of the data and easily compare it to similar data found elsewhere on the Water Atlas or to established benchmarks. One might want to examine how the water quality of a particular lake has varied over time, for example, or to compare the water quality at a downstream point in a river with the water quality at its headwaters. Or one might want to know whether a lake's level is now significantly higher or lower than its historical average.

The Water Atlas also has tools that allow users to access information in the geodatabase more directly. The Data Download tool is used to download, view, graph and display data in a tabular view, while the Advanced Mapping tool is used to display, save and print data in a map view.

GIS Terms to Know

Attribute	A characteristic of a map feature described by numbers or characters, typically stored in tabular format, and linked to the feature by a user-assigned identifier. For example, attributes of a well, represented by a point, might include depth, pump type, and owner.
Base map	Mapped data layer which seldom changes and which is used repeatedly, usually to provide a fundamental spatial reference. Example: the outline of a county's political boundary.
Cartography	The art or technique of making maps or charts.
Contour	An imaginary line on the ground, consisting of points that are at the same elevation above or below a specified datum surface, usually mean sea level.
Feature	An object or aspect of the earth's surface, such as a road, vegetation, or townsite. On a map, it is termed a "map feature".
Geocoding	The process by which features of interest on a map, including street addresses, are assigned geographic coordinates: latitude and longitude X and Y points, or grid cells;
Latitude	Angular distance, in degrees, minutes, and seconds, of a point north or south of the Equator.
Longitude	Angular distance, in degrees, minutes, and seconds, of a point east or west of the Greenwich Meridian.
Map extent	The limit of the geographic area visible on a map, usually defined by a rectangle. In a dynamic map display, the map extent can be changed by zooming and panning.
Map layer	A logical separation of mapped data usually representing a theme or selected type(s) of feature, such as roads, political boundaries, etc.
Map	A graphic representation of the physical features (natural, artificial, or both) of a part or the whole of the Earth's surface, by means of signs and symbols or photographic image, at an established scale, on a specified projection, and with the means of orientation indicated.
Metadata	Structured information that describes, explains, locates, or otherwise makes it easier to retrieve, use, or manage an information resource. It may be used, for example, to document when a particular piece of information was collected, by whom, by what method, and under what conditions. Metadata is often called "data about data."
Pan	In a dynamic map, to move the viewing window up, down, or sideways to display areas in a geographic data set which, at the current viewing scale, lie outside the viewing window.
Projection	Whether you treat the earth as a sphere or a spheroid, you must transform its three-dimensional surface to create a flat map sheet. This mathematical transformation is commonly referred to as a map projection.
Relational Database	A database in which information is stored in tabular format, with related tables linked by common elements. For example, one table may link street address to parcel number, another table may list the zoning classification for each parcel. A relational database uses the parcel number as the link or "relational item" to produce a zoning classification for a street address.
Resolution	The accuracy with which the location and shape of map features are depicted for a given map scale.
Scale	Relationship existing between a distance on a map, chart, or photograph and the corresponding distance on the Earth.
Shapefile	A non-topological format for storing the geometric location and attribute information of geographic features.
Spatial Data	Information with a locational (geographic) component.
Topography	The shape of a surface.
Topology	A collection of rules that, coupled with a set of editing tools and techniques, enables a geodatabase to more accurately model geometric relationships.
Zoom	In a dynamic map, to change the scale of the entire display image to give the visual impression of movement of display elements towards or away from the observer.