GLOSSARY

What's in a name? That which we call a rose
By any other name would smell as sweet.
—Shakespeare, Romeo and Juliet, *Act II, Scene II*

Glossary: A collection of glosses; a list with
explanations of abstruse, antiquated, dialectical,
or technical terms; a partial dictionary
—Oxford English Dictionary

Nope, "HEIMER." Doctor Livingheimer. The chap you want is in the next valley over. In my opinion, young fellah, you need a GIS.

absolute location: A location in geographic space given with respect to a known origin and standard measurement system, such as a coordinate system.

academic research: New learning derived from the activity of university and other scholars.

accuracy: The validity of data measured with respect to an independent source of higher reliability and precision.

active data: Data that can be reconfigured and recomputed in place. Spreadsheet term for data for attributes or records created by formulas within a spreadsheet.

ad hoc: For the particular case at hand.

address matching: Using a street address such as *123 Main Street* in conjunction with a digital map to place a street address onto the map in a known location. Address matching a mailing list, for example, would convert the mailing list to a map and allow the mapping of characteristics of the places on the list.

address range: The range from the highest to the lowest street number on one side of a street, on one block.

adjacency: The topological property of sharing a common boundary or being in immediate proximity.

affine transformation: Any set of translation, rotation, and scaling operations in the two spatial directions of the plane. Affine transformations allow maps with different scales, orientations, and origins to be coregistered.

analog: A representation where a feature or object is represented by another tangible medium. For example, a section of the earth can be represented in analog by a paper map, or atoms can be represented by ping-pong balls.

analysis: The stage in science when measurements are sorted, tested, and examined visually for patterns and predictability.

anonymous FTP: Ability to connect with another site on the Internet without a user account, and to download files. FTP is the file transfer protocol, available on a large number of computer systems. Log-in is usually under the name "anonymous" with the password set to your own user ID on the Internet.

arc: (1) A line represented as a set of sequential points. (2) A line that begins and ends at a topologically significant location, represented as a set of sequential points.

arc/node: An early name for the vector GIS data structure.

area: A two-dimensional (area) feature represented by a line that closes on itself to form a boundary.

area feature: A geographic feature recorded on a map as a sequence of locations or lines that, taken together, trace out an enclosed area or ring that represents the feature. Example: lake shoreline.

area qualitative map: A type of map that shows the existence of a geographic class within areas on the map. Colors, patterns, and shades are generally used. Examples are geology, soils, and land-use maps.

array: A physical data structure for grids. Arrays are part of most computer programming languages and can be used for storing and manipulating raster data.

ASCII (American Standard Code for Information Interchange): A standard that maps commonly used characters such as the alphabet onto one-byte-long sequences of bits.

attribute: A characteristic of a feature that contains a measurement or value for the feature. Attributes can be labels, categories, or numbers; they can be dates, standardized values, or field or other measurements. An item for which data are collected and organized. A column in a table or data file.

Autocad: A leading CAD program by Autodesk, often interfaced with GIS packages and used for digitizing, especially floor plans and engineering graphics.

AUTOCARTO (International Symposium on Automated Cartography): A sequence of computer cartography and GIS conferences.

AVHRR (advanced very high resolution radiometer): An instrument on the NOAA orbiting polar satellites that returns 1- and 4-km resolution data about the earth in four wavelengths. Used extensively for large-area land-cover and vegetation mapping and weather prediction.

azimuthal: A map projection in which the globe is projected directly onto a flat surface. Only one "side" of the globe can be shown at a time.

background image: A satellite image or air photo that serves as a backdrop for display and registration purposes only, rather than as a layer for analysis with the GIS.

base layer or map: A GIS data layer of reference information, such as topography, road network, or streams, to which all other layers are referenced geometrically.

batch: Submission of a set of commands to the computer from a file rather than directly from the user as an interactive exchange.

bearing: An angular direction given in degrees from zero, as north, clockwise to 360.
bell curve: A common term for the normal distribution.
big eight: The eight most popular GIS packages, established by the numbers of users, particularly among people getting started with GIS, at any given time.
biology: The study of living organisms and their vital processes.
bit: The smallest storable unit within a computer's memory, with only on and off states, codable with one binary digit.
block face: One side of a street on one block that is between two street intersections.
border: The area between the neat line and the edge of the medium or display area on which a map is being displayed. Occasionally, information can be placed within the border, but this area is usually left blank.
bounding rectangle: The rectangle defined by a single feature or a collection of geographical features in coordinate space, and determined by the minimum and maximum coordinates in each of the two directions.
browse: A method of search involving repeated examination of records until a suitable one is found.
buffer: A zone around a point, line, or area feature that is assumed to be spatially related to the feature.
byte: Eight consecutive bits.
CAD (computer-aided design): Computer software used in producing technical and design-type drawings.
CALFORM: An early computer mapping package for thematic mapping.
CAM (computer-assisted mapping): A map projection and outline plotting program for mainframe computers dating from the 1960s.
cartographic convention: The accepted cartographic practice. For example, water is usually cyan or light blue on a world map.
cartographic elements: The primitive component part out of which a map is assembled, such as the neat line, legend, scale, titles, figure, and so on.
cartographic spaghetti: A loose data structure for vector data, with order as the only identifying property of the features.
cartography: (1) The science that deals with the principles, construction, and use of maps. (2) The science, art, and technology of making, using, and studying maps.
CD-ROM: Compact disk read-only memory, a hardware storage device capable of making extensive data and software available for distribution on removable CDs or as offline storage for a microcomputer.
centroid: A point location at the center of a feature used to represent that feature.
CGIS (Canadian Geographic Information System): An early national land inventory system in Canada that evolved into a full GIS.
choropleth map: A map that shows numerical data (but not simply "counts") for a group of regions by (1) classifying the data into classes, and (2) shading each class on the map.
clarity: The property of visual representation using the absolute minimum amount of symbolism necessary for the map user to understand map content without error.
clump: To aggregate spatially; to join together features with similar characteristics into a single feature.
color balance: The achievement of visual harmony between colors on a map, primarily by avoiding colors that show simultaneous contrast when adjacent to each other.

color table: The part of the header record in a digital image file that stores specifications of colors based on simple index values, which are then stored in the data part of the image file.
complaint: To register a concern or problem with an agency, in this case by telephone from a person to a complaint hotline or service.
compression: Any technique that reduces the physical file size of data in a spatial or other data format.
compromise: A map projection that is neither area preserving nor shape preserving. An example is the Robinson projection.
compute: A data management command that uses the numerical values of one or more attributes to calculate the value of a new attribute created by the command.
compute command: In a database manager, a command allowing basic arithmetic on attributes or combinations of attributes, such as summation, multiplication, and subtraction.
computer mapping: Producing maps using the computer as the primary or only tool.
computer memory: A sequence of nonrandom bytes that are nonrecoverable after a computer has been turned off and on again.
conformal: A type of map projection that preserves the local shape of features on maps. On a conformal projection, lines on the graticule meet at right angles, as they do on a globe.
conic: A type of map projection involving projecting part of the earth onto a cone-shaped surface that is then cut and unrolled to make it flat.
connectivity: The topological property of sharing a common link, such as a line connecting two points in a network.
context-sensitive help: A component of a user interface that can reveal to the user information that assists with the current status of other elements of the user interface.
continuity: The geographic property of features or measurements that gives measurements at all locations in space. Topography and air pressure are examples.
contour interval: The vertical difference in measurement units such as meters or feet between successive contour lines on a contour map.
contour map: An isoline map of topographic elevations.
converge: The eventual agreement of measurements on a single value.
cookie-cut: A spatial operation to exclude area outside a specific zone of interest. For example, a state outline map can be used to cut out pixels from a satellite image.
coordinate pair: An easting and northing in any coordinate system, absolute or relative. Together, these two values, usually termed (x, y), describe a location in two-dimensional geographic space.
coordinate system: A system with all the necessary components to locate a position in two- or three-dimensional space; that is, an origin, a type of unit distance, and two axes.
CORONA: Originally a secret satellite-based remote sensing system carrying the early generation Keyhole cameras for the period 1960 to 1972. Very high resolution monochrome data from CORONA, some covering the United States, are now available online through the USGS's EROS data center.
credits: A cartographic element in which the sources, authorship, and ownership of the map and the map attributes are cited, often including a date or reference.

critical six: The GIS functional capabilities included in Dueker's GIS definition, map input, storage, management, retrieval, analysis, and display.

cylindrical: A type of map projection involving projecting part of the earth onto a cylinder-shaped surface that is then cut and unrolled to make it flat.

data: A set of measurements or other values, such as text for at least one attribute and at least one record.

data analysis: The process of using organized data to test scientific hypotheses.

data definition language: The part of the database management system that allows the user to set up a new database, to specify how many attributes there will be, what the types and lengths or numerical ranges of each attribute will be, and how much editing the user is allowed to do.

data dictionary: (1) A catalog of all the attributes for a data set, along with all the constraints placed on the attribute values during the data definition phase. It can include the range and type of values, category lists, legal and missing values, and the legal width of the field. (2) The part of a database containing information about the files, records, and attributes rather than just the data.

data entry: The process of entering numbers into a computer, usually attribute data. Although most data are entered by hand, or acquired through networks, from CD-ROMs, and so on, field data can come from a global positioning system receiver, from data loggers, and even by typing at the keyboard.

data-entry module: The part of a database manager that allows the user to enter or edit records in a database. The module will normally allow both entry and modification of values, and will enforce the constraints placed on the data by the data definition.

data exchange: The exchange of data between similar GIS packages among groups with a common interest.

data exchange format: The specific physical data format in which exchange of data between similar GIS packages takes place.

data extremes: The highest and lowest values of an attribute, found by selecting the first and last records after sorting.

data format: A specification of a physical data structure for a feature or record.

data mining: Revisiting existing data to explore for new relationships using new and more powerful tools for analysis and display.

data model: A logical means of organization of data for use in an information system.

data retrieval: The ability of a database management system to get back from computer memory records stored there previously.

data structure: The logical and physical means by which a map feature or an attribute is digitally encoded.

data transfer: The exchange of data between noncommunicating computer systems and different GIS software packages.

database: (1) A collection of data organized in a systematic way to provide access on demand. (2) Any collection of data accessible by computer. (3) The body of data that can be used in a database management system. A GIS has both a map and an attribute database.

database manager: A computer program or set of programs allowing a user to define the structure and organization of a database, to enter and maintain records in the database, to perform sorting, data reorganization, and searching, and to generate useful products such as reports and graphs.

datum: A base reference level for the third dimension of elevation for the earth's surface. A datum can depend on the ellipsoid, the earth model, and the definition of sea level.

DBMS (database management system): Part of a GIS, the tools that allow the manipulation and use of files containing attribute data.

decennial census: The effort required by the U.S. Constitution that every 10 years all people in the nation be counted and their residences located.

decimal: A counting system based on 10.

default: The value of a parameter or a selection provided for the user by the GIS without user modification.

defoliation: The removal of the healthy leaves of a plant or tree.

Delaunay triangulation: An optimal partitioning of the space around a set of irregular points into nonoverlapping triangles and their edges.

DEM (digital elevation model): A raster-format gridded array of elevations.

DEP (New York City Department of Environmental Protection): The city's government agency for the environment.

dependent variable: The variable on the left of the equals sign in a formula model, whose values are determined by the values of the other variables and constants.

design loop: The iterative process in which a GIS map is created, examined for design, improved, and then replotted from the modified map definition until the user is satisfied that a good design has been reached.

desktop mapping: The ability to generate with ease a variety of map types, symbolization methods, and displays by manipulating the cartographic elements directly.

desktop metaphor: For a graphical user interface, the physical analogy for the elements with which the user will interact. Many computer GUIs use the desktop as a metaphor, with the elements of a calendar, clock, files and file cabinets, and so on.

device independence: The ability of software to run with little difference from a user's perspective on any computer or on any specialized device, such as a printer or plotter.

difference of means: A statistical test to determine whether or not two samples differ from each other statistically.

DIGEST: A U.S. military and NATO data transfer standard, best known as the format for the Digital Map of the World, which is in the Defense Mapping Agency's vector product format (DIGEST-A).

digital elevation model: A data format for digital topography, containing an array of terrain elevation measurements.

digital orthophoto quad (DOQ): One element of a national mapping effort to cover the lower 48 United States at a 1-meter ground resolution with monochrome air photos in digital format with a $1:12,000$ equivalent ground extent. Collections of DOQs are distributed compressed on CD-ROM.

digitizing: Also called semiautomated digitizing. The process in which geocoding takes place manually; a map is placed on a flat tablet and a person traces out the map features using a cursor. The locations of features on the map are sent back to the computer every time the operator of the digitizing tablet presses a button.

digitizing tablet: A device for geocoding by semiautomated digitizing. A digitizing tablet looks like a drafting table but is sensitized so that as a map is traced with a cursor on the tablet, the locations are identified, converted to numbers, and sent to the computer.

dimensionality: The property of geographic features by which they are capable of being broken down into elements made up of points, lines, and areas. This corresponds to

features being zero-, one-, and two-dimensional. A drill hole is a point, a stream is a line, and a forest is an area, for example.

disease host: The animal or plant that plays the role of nourishing or sheltering a disease. For Lyme disease, this is usually the mouse or the deer.

disease transmission: Passing a disease from one individual to another.

dissolve: Eliminating a boundary formed by the edge or boundary of a feature that becomes unnecessary after data have been captured; for example, the edges of sheet maps.

distortion: The space distortion of a map projection, consisting of warping of direction, area, and scale across the extent of the map.

distributed network: A network-connected set of locations each storing one element of a system. A distributed GIS may have the GIS software running on a workstation but use data dispersed at many computer storage locations over a local or wide area network.

DLG: A vector format used by the USGS for encoding the lines on large-scale digital maps.

dot map: A map type that uses a dot symbol to show the presence of a feature, relying on a visual scatter to show spatial pattern. Most often used where point features are the GIS data, but dots can be scattered at random throughout areas.

double digitized: The same feature captured by digitizing twice.

download: To move a file across a network for eventual residence locally.

dropout: The loss of data due to scanning at coarser resolution than the map features to be captured. Features smaller than half the size of a pixel can disappear entirely.

drum scanner: A map input device in which the map is attached to a drum that is rotated under a scanner while illuminated by a light beam or laser. Reflected light from the map is then measured by the scanner and recorded as numbers.

Dueker's definition of GIS: "A special case of information systems where the database consists of observations on spatially distributed features, activities or events, which are definable in space as points, lines, or areas. A geographic information system manipulates data about these points, lines, and areas to retrieve data for ad hoc queries and analyses."

DX-90: A data transfer standard in use among the members of the International Hydrographic Organization, primarily to assure standardization and free exchange of digital nautical charts.

DXF: Autocad's digital file exchange format, a vector-mode industry standard format for graphic file exchange.

dynamic segmentation: GIS function that breaks a line into points at locations that have significance, and that can have their own attributes. For example, the line representing a highway can have a new node added every mile as a mile marker that can hold attributes about the traffic flow at that place.

easting: The distance of a point in the units of the coordinate system east of the origin for that system.

ecology: The science concerned with the interrelationship between organisms and their environments.

edge matching: The GIS or digital map equivalent of matching paper maps along their edges. Features that continue over the edge must be "zipped" together and the edge dissolved. To edge-match, maps must be on the same projection, datum, ellipsoid, and scale and show features captured at the same equivalent scale.

editing: The modification and updating of both map and attribute data, generally using a software capability of the GIS.

editor: A computer program for the viewing and modification of files.

elevation: The vertical height above a datum, in units such as meters or feet.

empowerment: Placing power in the hands of the citizen by providing effective and timely information.

encapsulated PostScript: A version of the PostScript language that allows digital images to be included and stored for later display.

end node: The last point in an arc that connects to another arc.

entity by entity: Any data structure that specifies features one at a time, rather than as an entire layer.

entomology: The branch of zoology that deals with insects.

enumeration map: A map designed to show one census enumerator the geographic extent and address ranges within a district.

environmental assessment: Using measurement and analysis to show the collective consideration of the local environment and its threats to individuals.

environmental violation: Breaking a law related to the environment, such as illegal storage of toxic substances.

EOS (NASA's Earth Observation System): A multisatellite 15-year program to increase drastically the amount of data available about the earth's land, water, clouds, ice, and air.

EOSDIS: The information distribution, dissemination, and storage section of the EOS program, which eventually will provide full network access to the data collected by all the various instruments and programs.

epidemiology: The science that deals with the incidence, distribution, and control of disease in a population.

equal area: A type of map projection that preserves the area of features on maps. On an equal-area projection, a small circle on the map would have the same area as on a globe with the same representative fraction. See also **equivalent**.

equatorial radius: The distance from the geometric center of the earth to the surface, usually averaged to a single value for a sphere.

equirectangular: A map projection that maps angles directly to eastings and northings. A cylindrical projection, made secant by scaling the height-to-width ratio. The nonsecant or equatorial version is called the Plate Carree. Credited to Marinus of Tyre, about A.D. 100.

equivalent: A type of map projection that preserves the area of features on maps. On an equal-area projection, a small circle on the map would have the same area as on a globe with the same representative fraction. See also **equal area**.

error band: The width of a margin plus and minus one standard error of estimation, as measured about the mean.

expected error: One standard deviation in the units of measure.

export: The capability of a GIS to write data out into an external file and into a nonnative format for use outside the GIS or in another GIS.

FAQ: A list of frequently asked questions, usually posted on a network newsgroup or conference group to save new users the trouble of asking old questions over again.

fat line: Raster representation of a line that is more than one pixel wide.

feature: A single entity that composes part of a landscape.

field: The contents of one attribute for one record, as written in a file.

field variable: A geographic value that is continuous over space.

figure: The part of a map that is both referenced in the map coordinate system rather than the page layout coordinates and that is the center of the map reader's attention. The figure is contrasted against the ground, or background. For example, on a map of New York State, the state is the figure, and surrounding states, though shown and labeled, are part of the ground and may be toned down.

file: (1) A collection of bytes stored on a computer's storage device. (2) Data logically stored together at one location on the storage mechanism of a computer.

file header: The first part of a file, which contains metadata rather than data.

file server: A computer whose primary function is to store data and make them available on a network as part of a distributed system.

find: A database management operation intended to locate a single record or a set of records or features based on the values of their attributes.

FIPS 173: The federal information processing standard maintained by the USGS and the National Institute of Standards and Technology that specifies a standard organization and mechanism for the transfer of GIS data between dissimilar computer systems. FIPS 173 specifies terminology, features types, and accuracy specifications, as well as a formal file transfer method.

fix: A solution to a software problem or bug. Usually, a section of a computer program or a file to be overwritten to correct the problem, called a "patch."

flat file: A simple model for the organization of numbers. The numbers are organized into a table, with values for variables as entries, records as rows, and attributes as columns.

flatbed scanner: A map input device in which the map is placed on a glass surface and the scanner moves over the map, converting the map into numbers as it moves.

flattening (of an ellipsoid): The ratio of the length of half the short axis of the ellipse to half the long axis of the ellipse, subtracted from 1. The earth's flattening is about 1/300.

flow map: A linear network map that shows, usually by proportionally varying the width of the lines in the network, the amount of traffic or flow within the network.

fonts: A consistent design for the display of the full set of English or other language characters, including special characters such as punctuation and numbers.

format: The specific organization of a digital record.

FORTRAN: An early computer programming language, initially for converting mathematical formulas into computer instructions.

forward/reverse left: Moving along an arc, the identifier for the arc connected in the direction/opposite direction of the arc to the immediate left.

fourth dimension: A common way of referring to time; the first three dimensions determine location in space, the fourth dimension determines creation, duration, and destruction in time.

freeware: Software and data made available on the Internet to any user at zero cost. Immense amounts of freeware, including operating systems and GIS packages, are available.

FTP (File Transfer Protocol): A standardized way to move files between computers. It is a packet switching technique, so that errors in transmission are detected and corrected. FTP allows files, even large ones, to be moved between computers on the Internet, or another compatible network.

fully connected: A set of arcs in which forward and reverse linkages have identically matching begin and end nodes.

functional capability: One of the distinctive processes that a GIS is able to perform as a separate operation or as part of another operation.

functional definition: Definition of a system by what it does rather than what it is.

fuzzy tolerance: Linear distance within which points should be snapped together.

gateway: The entry point to all servers and other computers associated with one project or organization. For example, the U.S. Geological Survey, although spread across the country and throughout many computers, has a single entry point or gateway for its information sources.

GBF (Geographic Base File): A database of DIME records.

general-purpose map: A map designed primarily for reference and navigation use.

generalization: The process of moving from one map scale to a smaller (less detailed) scale, changing the form of features by simplification, and so on.

geocode: A location in geographic space converted into computer-readable form. This usually means making a digital record of the point's coordinates.

geocoding: The conversion of analog maps into computer-readable form. The two usual methods of geocoding are scanning and digitizing.

geodesy: The science of measuring the size and shape of the earth and its gravitational and magnetic fields.

geographic coordinates: The latitude and longitude coordinate system.

geographic information science: (1) Research on the generic issues that surround the use of GIS technology, that impede its implementation, or that emerge from an understanding of its capabilities. (2) The scientific use and study of methods and tools for the capture, storage, distribution, analysis, display, and exploitation of geocoded information.

geographic pattern: A spatial distribution explainable as a repetitive distribution.

geographic property: A characteristic of a feature on earth, usually describable from a map of the feature, such as location, area, shape, distribution, orientation, adjacency, and so on.

geographic search: A find operation in a GIS that uses spatial characteristics as its basis.

geographic(al) information system (GIS): (1) A set of computer tools for analyzing spatial data. (2) A special case of an information system designed for spatial data. (3) An approach to the scientific analysis and use of spatial data. (4) A multi-billion-dollar industry and business.

geographical surface: The spatial distribution traced out by a continuously measurable geographical phenomenon, as depicted on a map.

geography: (1) A field of study based on understanding the phenomena capable of being described and analyzed with a GIS. (2) The underlying geometry and properties of the earth's features as represented in a GIS. (3) The science concerned with all aspects of the earth's surface, including natural and human divisions, the distribution and differentiation of regions, and the role of humankind in changing the face of the earth.

geoid: A complex earth model used more in geodesy than cartography or GIS that accounts for discrepancies over the earth from the reference ellipsoid and other variations due to gravity and so on.

geometric test: A test to establish the spatial relationship between features. For example, a point feature can be given a point-in-polygon test to find whether it is "contained" by an area.

GIF: An industry-standard raster graphic or image format.

GIS/LIS: A U.S. national conference on geographic information and land information systems, sponsored by most GIS professional organizations and held annually.

globe: A three-dimensional model of the earth made by reducing the representative fraction to less than 1 : 1.

GNU: A free software foundation organization that distributes software over the Internet.

goodness of fit: The statistical resemblance of real data to a model, expressed as strength or degree of fit of the model.

GPS (global positioning system): An operational, U.S. Air Force–funded system of satellites in orbits that allow their use by a receiver to decode time signals and convert the signals from several satellites to a position on the earth's surface.

gradient: The constant of multiplication in a linear relationship; that is, the rate of increase of a straight line up or down. See also **slope**.

graduated symbol map: A map type that varies the size of a common geometric symbol to show the amount of an attribute at points or at centroids of areas. For example, cities could be shown with circles of area proportional to population, or census tracts could have a proportional circle divided as a pie chart at a representative point inside the tract.

GRASS: A GIS software package (see Section 8.5).

graticule: The latitude and longitude grid drawn on a map or globe. The angle at which the graticule meets is the best first indicator of what projection has been used for the map.

grid cell: A single cell in a rectangular grid.

grid extent: The ground or map extent of the area corresponding to a grid.

GRID: (1) A United Nations program to assemble, use, and disseminate data sets of global extent of use to United Nations and other agencies. (2) The raster module of the ESRI Arc/Info GIS software.

gridded fishnet map: A map of a three-dimensional surface showing a set of profiles, often parallel to the x, the y, or the viewer's axis so that the surface appears three dimensional, as a raised fishnet viewed in perspective.

ground: The part of the body of the map that is not featured in the figure. This area can include neighboring areas, oceans, and so on. The ground should fall lower than the figure in the visual hierarchy.

GRS80 (Geodetic Reference System of 1980): Adopted by the International Union of Geodesy and Geophysics in 1979 as a standard set of measurements for the earth's size and shape. The length of the semimajor axis is 6,378,137 meters. Flattening is 1/298.257.

GUI (graphical user interface): The set of visual and mechanical tools through which a user interacts with a computer, usually consisting of windows, menus, icons, and pointers.

gypsy moth: A tussock moth introduced into the United States in Boston about 1869. The early stage is a gray-brown, mottled hairy caterpillar that defoliates trees.

harmony: The property by which the elements of a map work together to create a balanced aesthetic whole.

helpline: A telephone service available to software users for help from an expert.

hexadecimal: A counting system based on 16.

hierarchical: System based on sets of fully enclosed subsets and many layers.

hierarchical data model: An attribute data model based on sets of fully enclosed subsets and many layers.

highlight: A way of indicating to the GIS user a feature or element that is the successful result of a query.

histogram: A graphic depiction of a sample of values for an attribute, shown as bars raised to the height of the frequency of records for each class or group of values within the attribute.

HPGL (Hewlett Packard Graphics Language): A device-specific but industry-standard language for defining vector graphics in page coordinates.

HSI: A system of specifying color as three values: hue, saturation, and intensity, respectively.

hue: A color as defined by the wavelength of the light reflected or emitted from the map surface.

hypertext: Textual information in which direct links can be made between related text through "hot links," where pointing to a highlighted term moves the user to the text context for that term in the same or a different document.

hypothesis: A supposition about data expressed in a manner to make it subject to statistical test.

hypsometric map: A map of topography involving a color sequence filling the spaces between successive contours, usually varying from green through yellow to brown.

identify: To find a spatial feature by pointing to it interactively on the map with a pointing device such as a mouse.

image depth: The numbers of bits stored for each pixel in a digital image.

image map: A map that in two dimensions shares many of the characteristics of a map; that is, cartographic geometry, some symbols, a scale and projection, and so on, but is a continuous image taken from an air photo, a satellite image, or a scanner. A scanned paper map used as a backdrop in a GIS becomes an image map.

import: The capability of a GIS to bring data in an external file and in a nonnative format for use within the GIS.

incinerator: A plant designed to burn waste, often producing power as a by-product but primarily for disposal. Often thought to substitute air pollution for ground pollution.

independent variable: A variable on the right-hand side of the equation in a model whose value can range independently of the other constants and variables.

industry-standard format: A commonly accepted way of organizing data, usually advanced by a private organization.

information: The part of a message placed there by a sender and not known by the receiver.

information system: A system designed to allow the user to be delivered the answer to a query from a database.

inset: A map within a map, either at a smaller scale to show relative location, or a larger scale to show detail. An inset may have its own set of cartographic elements such as a scale and graticule.

installation: The step necessary between the delivery of GIS software and its first use, consisting of copying and decompressing files, data, registering licenses, and so on.

installed base: The number of existing implemented systems.
integrated software: Software that works together as part of a common user interface, rather than software that consists of separate programs to be used in sequence.
intensity: The amount of light emitted or reflected per unit area. A map that has high intensity appears bright.
intercept: The value of the dependent variable when the independent variable is zero.
internal format: A GIS data format used by the software to store the data within the program and in a manner unsuitable for use by other means.
Internet: A network of many computer networks. Any computer connected to the Internet can share any of the computers accessible through the network. The Internet shares a common mechanism for communication, called a protocol. Searches for data, tools for browsing, and so on are available to ease the tasks of "surfing" the Internet.
interoperability: The extent to which users, software, and data can move between computer environments without change or retraining. In a fully interoperable GIS, the user interface will look and feel the same in two different environments (say, a microcomputer and a Unix workstation), and the same set of functions will have the same effect on the same data.
interval: Data measured on a relative scale but with numerical values based on an arbitrary origin. Examples are elevations based on mean sea level or coordinates.
in-vehicle navigation system: A navigation aid allowing the driver of a car, pilot of a plane, or navigator of a boat direct assistance during operation. Combinations of GPS, on-board digital maps, GIS functions such as routing, and voice information are common in these systems. Most use outside aids. Those using the sensed motion of the vehicle are called "inertial."
isoline map: A map containing continuous lines joining all points of identical value.
join: To merge both records and attributes for unrelated but overlapping databases.
key attribute: A unique identifier for related records that can serve as a common thread throughout the files in a relational database.
killer app: A computer program or "application" that by providing a superior method for accomplishing a task in a new way becomes indispensable to computer users. Examples are word processors and spreadsheets.
label: Any text cartographic element that adds information to the symbol for a feature, such as the height number label on a contour line.
label placement rules: The set of rules that cartographers use when adding map text, place-names, and labels to features. Some rules are generic to the map as a whole, while others relate to point, line, and area features specifically. Well-designed maps follow the label placement rules and use them to resolve conflicts between the labels, as labels should never be plotted over each other.
label point: A point digitized within a polygon and assigned its label or identifier for use in topological reconstruction of the polygon.
land-cover map: A map showing the type of actual surface covering at a given time. Categories could be grassland, forestlands, cropland, bare rock, and so on.
land-use map: A map showing the human use to which land is put at a given time. Categories could be pasture, forestland, agricultural land, wasteland, and so on.
landmark: A TIGER term for a geographic feature not a part of the census features.
Landsat: A U.S. government satellite program collecting data about the earth's surface in the visible and infrared parts of the spectrum. Two instruments, the multi-spectral scanner (79-meter resolution) and the thematic mapper (30-meter resolution), have been used. Landsat 7 was launched in 1999, with an enhanced thematic mapper that images at 15-meters.

landscape: That part of geographic space showable on a map, including all its features.
latitude: The angle made between the equator, the earth's geometric center, and a point on or above the surface. The south pole has latitude −90 degrees; the north +90 degrees.
layer: A set of digital map features collectively (points, lines, and areas) with a common theme in coregistration with other layers. A feature of GIS and most CAD packages.
learning curve: The relationship between learning and time. A steep learning curve means that much is learned quickly (usually thought to be the opposite). A difficult learning curve is one where learning takes place slowly, over a long period.
least squares: A statistical method of fitting a model, based on minimizing the sum of the squared deviations between the data and the model estimates.
legend: The map element that allows the map user to translate graphic map symbols into ideas, usually by the use of text.
level of measurement: The degree of subjectivity associated with a measurement. Measurements can be nominal, ordinal, interval, or ratio.
line: A one-dimensional (length) map feature represented by a string of connected coordinates.
line feature: A geographic feature recorded on a map as a sequence of locations tracing out a line. A stream is an example.
line thickness: The thickness, in millimeters, inches, or other units, of a line as it appears on a map.
linear relationship: A straight-line relationship between two variables such that the value of the dependent variable is a gradient multiplied by the independent variable plus a constant.
link: The part or structure of a database that physically connects geographic information with attribute information for the same features. Such a link is a defining component of a GIS.
LIS (land information system): The surveying profession's term for GIS where the data are for land ownership.
local area network: An arrangement of computers into a cluster, with network linkages between computers but no external link. Usually, this allows sharing data and software licenses, or the use of a file server.
locate: See **identify**.
location: A position on the earth's surface or in geographic space definable by coordinates or some other referencing system, such as a street address or space indexing system.
logical structure: The conceptual design used to encrypt data into a physical structure.
longitude: The angle formed between a position on or above the earth, the earth's geometric center, and the meridian passing through the center of the observing instrument in Greenwich, England, as projected down onto the plane of the earth's equator or viewed from above the pole. Longitudes range from −180 (180 degrees west) to +180 (180 degrees east).
LUNR (Land Use and Natural Resources Inventory System): An early GIS in New York State.
macro: A command language interface allowing a "program" to be written, edited, and then submitted to the GIS user interface.

magic number: Any number that has a specific value for a specialized need.

map: A depiction of all or part of the earth or other geographic phenomenon as a set of symbols and at a scale whose representative fraction is less than 1 : 1. A digital map has had the symbols geocoded and stored as a data structure within the map database.

map algebra: Tomlin's terminology for the arithmetic of map combination for coregistered layers with rasters of identical size and resolution.

map design: The set of choices relating to how a map's elements are laid out, how symbols such as colors are selected, and how the map is produced as a finished tangible product. The process of applying cartographic knowledge and experience to improve the effectiveness of a map.

map millimeters: A coordinate system based on the dimensions of the map rather than those of the features represented on the earth itself, in metric units.

map overlay: Placing multiple thematic maps in precise registration, with the same scale, projections, and extent, so that a compound view is possible.

map projection: A depiction of the earth's three-dimensional structure on a flat map.

map title: The text that identifies the coverage and content of a map. This is usually a major map element, and can be worded to show the map theme or the map's content.

map type: One of the set of cartographic methods or representation techniques used by cartographers to make maps of particular types of data. Data, by their attributes and dimensions, usually determine which map types are suitable in any given map context.

Maptitude: A GIS software package (see Section 8.5).

mask: A map layer intended to eliminate or exclude areas not needed for mapping and analysis.

matrix: A table of numbers with a given number of rows and columns.

mean: A representative value for an attribute, computed as the sum of the attribute values for all records divided by the number of records.

mean center: For a set of points, that point whose coordinates are the means of those for the set.

mean sea level: A local datum based on repeated measurements of sea level throughout all of its normal cycles, such as tides and seasonal change. The basis for elevations on a map.

measurement: A quantitative assessment of a phenomenon.

median: The attribute value for the middle record in a data set sorted by that attribute.

medium: A map medium, for example, is the material chosen on which to produce a map: paper, film, Mylar, CD-ROM, a computer screen, a TV image, and so on.

menu: A component of a user interface that allows the user to make selections and choices from a preset list.

meridian: A line of constant longitude. All meridians are of equal length on the globe.

metadata: Data about data. Index-type information pertaining to the entire data set rather than the objects within the data set. Metadata usually includes the date, source, map projection, scale, resolution, accuracy, and reliability of the information, as well as data about the format and structure of the data set.

metaphor: For a GUI, the physical analogy for the elements with which the user will interact. Many computer GUIs use the desktop as a metaphor, with the elements of a calendar, clock, files and file cabinets, and so on.

metric system: A system of weights and measures accepted as an international standard as the Systeme International d'Unites (SI) in 1960. The metre (meter in the United States) is the unit of length.

microcomputer: A stand-alone computer containing at least a microchip, a keyboard, a display, and some sort of memory, running under an operating system. Typically, microcomputers have separate elements, and extensions such as network links, graphical pointers, and peripheral storage are added to a core system.

military grid: A coordinate system based on the transverse Mercator projection, adopted by the U.S. Army in 1947 and used extensively for world mapping.

MIMO system (map in–map out): A term used to describe a first-generation computer mapping system designed to capture the map by computer and reproduce it.

missing data: Elements where no data are available for a feature or a record.

missing value: A value that is excluded from arithmetic calculations for an attribute because it is missing, not applicable, or is corrupted, and has been signified as such.

mixed pixel: A pixel containing multiple attributes for a single ground extent of a grid cell. Common along the edges of features or where features are ill defined.

MLMIS (Minnesota Land Management System): A very early statewide GIS.

model: A theoretical distribution for a relationship between attributes. A spatial model is a theoretically expected geographic distribution determined by a specified form such as an equation.

modeling: The stage in science when a phenomenon under test is sufficiently well understood that an abstract system can be built to simulate the real system.

modular computer program: A computer program composed of integrated sections of reusable functions rather than a single program.

mosaic: The GIS or digital map equivalent of matching paper maps along their edges. Features that continue over the edge must be "zipped" together and the edge dissolved. To edge-match, maps must be on the same projection, datum, ellipsoid, and scale, and show features captured at the same equivalent scale. See also **edge matching**.

mosaicing: The GIS or digital map equivalent of matching multiple paper maps along their edges. Features that continue over the edge must be "zipped" together, and the edge dissolved. A new geographic extent for the map usually has to be cut or clipped out of the mosaic. For mosaicing, maps must be on the same projection, datum, ellipsoid, and scale, and show features captured at the same scale.

Motif: A graphical user interface standard common on Unix workstations.

multimedia: The use of multiple simultaneous means of communication in a single document, normally including sound, graphics, animation, and hypertext.

multispectral scanner: An instrument carried on the Landsat series of satellites capable of capturing four parts of the spectrum simultaneously for pixels 79 meters on a side.

multitask: The ability of a computer's operating system or GIS to handle more than one process at once; for example, editing and running a command sequence while extracting data from the database and displaying a map.

municipality: An administrative division of geographic space, usually for the purposes of election or service delivery.

Murphy's law: "Anything that can go wrong will go wrong." Long linked to the public use of computers.

NAD27 (North American Datum of 1927): The datum used in the early national mapping of the United States. The Clarke 1866 ellipsoid was used and locations and elevations were referenced to a single point at Meade's Ranch in Kansas.

National GIS Curriculum: An NCGIA-sponsored national college curriculum for GIS, used in many colleges and universities worldwide and with available teaching materials.

National Spatial Data Clearinghouse: A World Wide Web resource that serves as a cross-reference point for the distributed database of all U.S. government public-domain and other geographic information.

NCGIA (National Science Foundation's National Center for Geographic Information and Analysis): A three-university consortium funded to assist in GIS education, research, outreach, and information generation.

neat line: A solid bounding line forming the frame for the visually active part of a map.

network: Two or more computers connected together so that they can exchange messages, files, or other means of communication. A network is part hardware, usually cables and communication devices such as modems, and part software.

network conference group (also network news group, usenet group, List): An Internet resource on which users with similar interests can share broadcast exchanges on information. Several major GIS groups exist, including comp.infosystems.gis; also called GIS-L.

network map: A map that shows as its theme primarily connections within a network, such as roads, subway lines, pipelines, or airport connections.

newsgroup: A discussion area on the Internet for asynchronous many-to-many discussions.

NOAA (National Oceanic and Atmospheric Administration): An agency of the U.S. Department of Commerce that provides digital and other maps for navigation, weather prediction, and for physical features of the United States.

node: (1) At first, any significant point in a map data structure. Later, only those points with topological significance, such as the ends of lines. (2) The end of an arc.

node snap: Instructing the GIS software to make multiple nodes or points in a single node so that the features connected to the nodes match precisely, say at a boundary.

nominal: A level of measurement at which only subjective information is available about a feature. For a point, for example, the name of the place.

normal distribution: A distribution of values symmetrically about a mean with a given variance.

normalize: To remove an effect biasing a statistic; for example, the influence of the size of the sample.

northing: The distance of a point in the units of the coordinate system north of the origin for that system.

null hypothesis: The state opposite to that suggested in a hypothesis, postulated in the hope of rejecting its form and therefore proving the hypothesis.

object-oriented: Computer programming languages and databases that support "objects." Objects are standard "classes" that contain all the properties of an object. As a simple example, an object class could be a point and contain the latitude and longitude of the point, a feature code for the point, such as "radar beacon" and any text necessary to describe the object.

oblate ellipsoid: A three-dimensional shape traced out by rotating an ellipse about its shorter axis.

oblique: A map projection in which the center line of the map is not at right angles to the earth's geographic coordinates, following neither a single parallel nor a meridian.

observation: The process of recording an objective measurement.

Odyssey: A first-generation GIS developed at Harvard to implement the original arc/node vector data structure.

online manual: A digital version of a computer application manual available for searching and examination as required.

OpenLook: A set of GUI specifications agreed upon by several software vendors for an interoperable graphical user interface. Sun's Open Windows is an example of an implementation of OpenLook.

Open/GIS: An active effort to assure interoperability among GIS software packages by specifying a standard set of functions and a common user interface.

operating system: The suite of software programs and utilities necessary for the control and use of a computer, including as a minimum the management of files and use of the computer's processor.

ordinal: A level of measurement at which only relative information is available about a feature, such as a ranking. For a highway, for example, the line may be coded to show a jeep trail, a dirt road, a paved road, a state highway, or an interstate highway, in ascending rank.

origin: A location within a coordinate system where the eastings and northings are exactly equal to zero.

orthophoto map: An image map that is an air photo, corrected for topographic and other effects. A specific type of mapping program, at 1 : 12,000, by the USGS.

OS/2: A microcomputer operating system produced by the IBM Corporation.

overlay: A GIS operation in which layers with a common, registered map base are joined on the basis of their occupation of space.

overlay weighting: Any system for map overlay in which the separate thematic map layers are assigned unequal importance.

page coordinates: The set of coordinate reference values used to place the map elements on the map and within the map's own geometry rather than the geometry of the ground that the map represents. Often, page coordinates are in inches or millimeters from the lower left corner of a standard-size sheet of paper, such as A4 or $8\frac{1}{2}$ by 11 inches.

parallel: A line of constant latitude. Parallels get shorter toward the poles, becoming a point at the pole itself.

parameter: A number, value, text string, or other value required as the consequence of submitting a command to the GIS.

parcel: A land surface partition recognized by law for the purpose of ownership.

patch: A fix to a program or data set involving a sequence of data that are to be overwritten onto an older version.

Pathfinder: A U.S. government prototype effort to use data mining of the older Landsat and other data to provide complete GIS coverages of the United States at different periods.

PC (personal computer): A self-contained microcomputer, providing the necessary components for computing, including hardware, software, and a user interface.

PCMCIA: A credit card–like device interface for microcomputers and other devices, such as GPS receivers, that meets the standards of the Personal Computer Memory Card International Association. PCMCIA cards can act as memory, as connectors to

disk drives, as links to other types of devices, and perform many other functions, and they are interoperable across computers.

perfect sphere: A three-dimensional figure traced out by all possible positions of an arc of a fixed radius about a point. A good approximation of the shape of the earth.

permanent map: A map designed for use as a permanent end product in the GIS process.

pheromone: A hormonal substance excreted by an individual that elicits a response in the same species.

physical structure: The mechanical mapping of a section of computer memory onto a set of files or storage devices.

picture symbol map: A map type that uses a simplified picture or geometric diagram at a point to show a feature type. For example, on a reference map, airports could be shown with a small airplane stick diagram, or picnic areas by a picnic table diagram.

pixel: The smallest unit of resolution on a device, often used to show one grid cell at the highest display resolution.

place-name: A text cartographic element that links the language given name to a feature by placing it close to the symbol to which it corresponds, such as a city name as text next to a filled circle.

point: A zero-dimensional map feature, such as a single elevation mark as specified by at least two coordinates.

point feature: A geographic feature recorded on a map as a location. Example: a single house.

point mode: A method of geocoding in semiautomated digitizing, in which one press of the cursor button sends back to the computer only one (the current) tablet location.

polar radius: The distance between the earth's geometric center and either pole.

polygon: A many-sided area feature consisting of a ring and an interior. An example is a lake on a map.

polygon interior: The space contained by a ring, considered part of a polygon.

polygon left: Moving along an arc, the identifier for the polygon adjacent to the left.

polygon right: Moving along an arc, the identifier for the polygon adjacent to the right.

population: The total body of objects from which a sample is taken for measurement.

PostScript: Adobe Corporation's page definition language. An interpreted language for page layout designed for printers but used as an industry standard for vector graphics.

precision: The number of digits used to record a measurement or which a measuring device is capable of providing.

prediction: (1) The scientific ability to forecast the outcome of a process in advance. (2) The ability of a model to provide information beyond that for which measurements are available.

prime meridian: The line traced out by longitude zero and passing through Greenwich, England. The prime meridian forms the origin for the longitude part of the geographic coordinates and divides the eastern and western hemispheres.

proceedings: The formal record of the papers and other prepared presentations at a professional or scientific conference. Usually available to conference attendees, then distributed as a soft-cover book.

professional publication: Books, journals, and other information designed primarily for those using GIS technology as part of their job.

proprietary format: A data format whose specification is a copyrighted property rather than public knowledge.

public domain: Information that has been made available to the general public and is distributed and redistributed without copyright or patent.

quad tree: A way of compressing raster data based on eliminating redundancy for attributes within quadrants of a grid.

query: A question, especially if asked of a database by a user via a database management system or GIS.

query language: That part of a DBMS allowing submission of queries to a database.

***r*-squared:** A common term for the coefficient of determination.

radar mapping system: An active form of remote sensing in which a radar beam is transmitted to earth and the signals reflected are detected and stored. These systems have the distinct advantage of being operable at night, through clouds, and through vegetation, and therefore are used extensively for mapping in the tropics and for mapping terrain.

RAM: That part of a computer's memory designed for rapid access and computation.

random: Having no discernible structure or repetition.

range: The highest value of an attribute less the lowest, in the units of the attribute.

raster: A data structure for maps based on grid cells.

ratio: A level of measurement at which numerical information is available about a feature, based on an absolute origin. For land parcels, for example, the assessed value in dollars would be an example, the value zero having real meaning.

real map: A map that has been designed and plotted onto a permanent medium such as paper or film with tangible form, and is a result of all the design and compilation decisions made in constructing the map, such as choosing the scale, setting the legend, selecting the colors, and so on.

realistic perspective map: A map of a three-dimensional surface showing a colored or shaded image draped over a topographic surface and viewed in perspective.

record: A set of values for all attributes in a database. Equivalent to the row of a data table.

reference map: A highly generalized map type designed to show general spatial properties of features. Examples are world maps, road maps, atlas maps, and sketch maps. Sometimes used in navigation, often with a limited set of symbols and selected data. A cartographic base reference map is often the base layer in a GIS.

relate: A DBMS operation that merges databases through their key attributes to restructure them according to the needs of a user's query, rather than as they are stored physically.

relational DBMS: A database management system based on the relational data model.

relational model: A data model based on multiple flat files for records, with dissimilar attribute structures, connected by a common key attribute.

relative location: A position described solely with reference to another location.

remote log-in: The ability of a computer user to log directly into another computer through a network connection or a modem.

remotely sensed data: Data collected by a sensor that is not in direct contact with the area being mapped. Active remote sensing involves transmitting a beam that is detected after reflection; passive remote sensing simply measures light from the sun being reflected by objects being sensed. Similar instruments for remote sensing can operate from aircraft or satellites.

renumbering: Use of the DBMS to change the ordering or ranges of attributes. Also, especially in raster GISs, to change the numbers within grid cells into categories.

report: A listing of all the values of attributes for all records in a database. A report is often printed as a table, for verification against source material, and for validation by examination.

report generator: That part of a database management system that can produce a listing of all the values of attributes for all records in a database.

representative fraction: The ratio of a distance as represented on a map to the equivalent distance measured on the ground. Typical representative fractions are 1 : 1 million, 1 : 100,000, and 1 : 50,000.

residual: The amount left when the observed value of the dependent variable has subtracted from it that predicted by a model, in units of the dependent variable.

resource management: The intentional control or influence of environmental elements to accomplish particular goals.

restrict: Part of the query language of a DBMS that allows a subset of attributes to be selected out of the flat file.

retrieval: The ability of a database management system or GIS to get back from computer memory records that were stored there previously.

RGB: The system of specifying colors by their red, green, and blue saturations.

ring: A line that closes upon itself to define an area.

rubber sheeting: A statistical distortion of two map layers so that spatial coregistration is accomplished, usually at a set of common points.

run-length encoding: A way of compressing raster data based on eliminating redundancy for attributes along rows of a grid.

sample: A subset of a population selected for measurement.

saturation: The amount of color applied per unit area. Perceptually, saturated colors appear rich or solid, whereas low saturation colors look washed out or pastel-like.

scale: (1) The geographic property of being reduced by a representative fraction. Scale is usually depicted on a map or can be calculated from features of known size. (2) The part of the map display that shows the scale of the map figure as either an expression of values (the representative fraction as a number) or as a graphic, usually a line on the map labeled with an equivalent and whole-number length on the ground, such as 1 kilometer or 1 mile.

scaleless: The characteristic of digital map data in abstract form of being usable and displayable at any scale, regardless of the scale of the map used to geocode the data.

scanning: A form of geocoding in which maps are placed on a surface and scanned by a light beam. Reflected light from every small dot or pixel on the surface is recorded and saved as a grid of digits. Scanners can work in black and white, in gray tones, or in color.

scientific approach: A method for rationally explaining observations about the natural and human world.

scientific visualization: Use of the human visual processing system assisted by computer graphics, as a means of direct analysis and interpretation of information.

search: Any database query that results in successful retrieval of records.

search engine: A software tool designed to search the Internet and WWW for documents meeting the user's query. Examples: Yahoo, Alta Vista, and Google.

secant: A map projection in which the surface used for the map "cuts" the globe at the map's representative fraction. Along this line there is distortion-free mapping of the geographic space. Multiple cuts are possible, for example, on a conic projection.

select: A DBMS command designed to extract a subset of the records in a database.

server: A computer connected to a network whose primary function is to act as a library of information that other users can share.

shareware: Data or software placed in the public domain for distribution, but whose use or support involves the payment of a (usually token) fee to the author.

sift: To eliminate features that are smaller than a minimum feature size.

simulated hill-shaded map: A map in which an apparent shading effect of raised topography is produced by computer (or manually) so that the land surface appears differentially illuminated, as it would in low sun angles naturally.

simultaneous contrast: The tendency for colors at the opposite ends of the primary scale to "jump" when placed together; for example, red and green.

SLF: An early Defense Mapping Agency data format.

sliver: A very small, narrow polygon caused by data capture or overlay error that does not exist on a map.

slope: The constant of multiplication in a linear relationship; that is, the rate of increase of a straight line up or down. See also **gradient**.

snap: Forcing two or more points within a given radius of each other to be the same point, often by averaging their coordinate.

software package: A computer program application.

sort: To place the records within an attribute in sequence according to their value.

spatial data: Data that can be linked to locations in geographic space, usually via features on a map.

Spatial Data Transfer Standard (SDTS): The formal standard specifying the organization and mechanism for the transfer of GIS data between dissimilar computer systems. Adopted as FIPS 173 in 1992, SDTS specifies terminology, feature types, and accuracy specifications as well as a formal file transfer method for any generic geographic data. Subsets for the standard for specific types of data, vector and raster, for example, are called "profiles."

spatial distribution: The locations of features or measurements observed in geographic space.

SPOT (System Proprietaire pour l'Observation de la Terre): A French remote sensing satellite system with 10- and 20-meter resolution and stereo capability.

spreadsheet: A computer program that allows the user to enter numbers and text into a table with rows and columns and then maintain and manipulate those numbers using the table structure.

SQL (Structured Query Language): A standard language interface to relational database management systems.

standard deviation: A normalized measure of the amount of deviation from the mean within a set of values. The mean deviation from the mean.

standard distance: A two-dimensional equivalent of the standard deviation, a normalized distance built from the standard deviations of the eastings and northings for a set of points.

standard parallel: A parallel on a map projection that is secant and therefore distortion free.

state plane: A coordinate system common in utility and surveying applications in the lower 48 United States and based on zones drawn state by state on transverse Mercator and Lambert conformal conic projections.

stepped statistical surface: A map type in which the outlines of areas are "raised" to a height proportional to a numerical value and viewed in apparent perspective. The areas then appear as columns, with a column height proportional to value.

stream mode: A method of geocoding in semiautomated digitizing, in which a continuous stream of points follows a press of the cursor button. This mode is often used for digitizing long features such as streams and coastlines. It can generate many data very quickly, so is often weeded by generalization.

subsetting: Extracting a part of a data set.

SURFACE II: An early computer mapping package from the Kansas Geological Survey.

SYMAP: An early multipurpose computer mapping package.

symbol: An abstract graphic representation of a geographic feature for representation on a map. For example, the feature could be a canal, the symbol a blue line of a given thickness.

symbolization: The full set of methods used to convert cartographic information into a visual representation.

table: (1) An arrangement of attributes and records into rows and columns to assist display and analysis. (2) Any kind of organization by placement of records into rows and columns.

TCP/IP: A network communications protocol that forms the basis of most of the communications on the Internet.

temporary map: A map designed for use as an intermediate product in the GIS process, and not usually subjected to the normal map design sequence.

test of means: Hypothesis test to establish whether two samples with their own means and standard deviations are drawn from the same overall population.

thematic map: A map designed primarily to show a "theme," a single spatial distribution or pattern, using a specific map type.

TIF: An industry-standard raster graphic or image format.

TIGER: A map data format based on zero, one, and two cells, used by the U.S. Census Bureau in street-level mapping of the United States.

TIN: A vector topological data structure designed to store the attributes of volumes, usually geographic surfaces.

tolerance: The distance within which features are assumed to be erroneously located different versions of the same thing.

topographic map: A map type showing a limited set of features but, including at the minimum, information about elevations or landforms. Example: contour maps. Topographic maps are common for navigation and for use as reference maps.

topologically clean: The status of a digital vector map when all arcs that should be connected are connected at nodes with identical coordinates, and the polygons formed by connected arcs have no duplicate, disconnected, or missing arcs.

topology: (1) The property that describes adjacency and connectivity of features. A topological data structure encodes topology with the geocoded features. (2) The numerical description of the relationships among geographic features, as encoded by adjacency, linkage, inclusion, or proximity. Thus, a point can be inside a region, a line can connect to others, and a region can have neighbors. The numbers describing topology can be stored as attributes in the GIS and used for validation and other stages of description and analysis.

toxic release: Release of a toxic substance into the environment, such as the venting of a poisonous gas into the air.

transparent overlay: An analog method for map overlay, where maps are traced or photographed onto transparent paper or film and then overlain mechanically.

transverse: A map projection in which the axis of the map is aligned from pole to pole rather than along the equator.

units: The standardized measurement increments for values within an attribute.

Unix: A computer operating system that has been made workable on virtually every possible computer and has become the operating system of choice for workstations and science and engineering applications.

unsupervised classification: The grouping of pixels by their numerical spectral characteristics without the intervention of direct human guidance.

update: Any replacement of all or part of a data set with new or corrected data.

upward compatibility: The ability of software to move on to a new version with complete support for the data, scripts, functions, and so on, of earlier versions.

U.S. Census Bureau: A division of the Department of Commerce that provides maps in support of the decennial (every 10 years) census of the United States, especially the census of population.

user group: Any formal or informal organization of users of a system that share experiences, information, news, or help among themselves.

user interface: The physical means of communication between a person and a software program or operating system. At its most basic, this is the exchange of typed statements in English or a programlike set of commands.

USGS (United States Geological Survey): An agency of the Department of the Interior and a major provider of digital map data for the United States.

UTM (universal transverse Mercator): A standardized coordinate system based on the metric system and a division of the earth into sixty 6-degree-wide zones. Each zone is projected onto a transverse Mercator projection, and the coordinate origins are located systematically. Both civilian and military versions exist.

validation: The process by which entries placed in records in an attribute data file, and the map data captured during digitizing or scanning, are checked to ensure that their values fall within the bounds expected of them and that their distribution makes sense within the GIS.

value: The content of an attribute for a single record within a database. Values can be text, numerical, or codes.

variance: The total amount of disagreement between numbers. Variance is the sum of all values with their means subtracted and then squared.

vector: A map data structure using the point or node and the connecting segment as the basic building block for representing geographic features.

vector (disease): A disease that requires an intermittent host for transmission, such as the mosquito in malaria.

verification: A procedure for checking the values of attributes for all records in a database against their correct values.

version: An update of software. Complete rewrites are usually assigned entirely new version numbers (version 3), whereas fixes and minor improvements are given decimal increments (version 3.1).

virtual map: A virtual map is one that has yet to be realized as a tangible map; it exists as a set of possible maps. For example, the same digital base map and set of numbers can be an entire series of possible virtual maps, yet only one may be chosen to be rendered as a real map on a permanent medium.

VisiCalc: A spreadsheet package for first-generation microcomputers. Supported data tables in flat files.

visual center: A location on a rectangular map, about 5% of the height above the geometric center, to which the eye is drawn perceptually.

visual hierarchy: The perceptual organization of cartographic elements such that they appear visually to lie in a set of layers of increasing importance as they approach the viewer.

volume: A three-dimensional feature represented by a set of areas enclosing part of a surface. In a GIS, usually the top surface only.

VPF (Vector Product Format): A data transfer standard within DIGEST for vector data.

warping: See **rubber sheeting**.

WGS84 (World Geodetic Reference System of 1984): A higher-precision version of the GRS80 used by the U.S. Defense Mapping Agency in world mapping. A common datum and reference ellipsoid for hand-held GPS receivers.

WIMP: A GUI term reflecting the primary user interface tools available: windows, icons, menus, and pointers.

workstation: A computing device that includes as a minimum a microprocessor, input and output devices, a display, and hardware and software for connecting to a network. Workstations are designed to be used together on local area networks and to share data, software, and so on.

World Data Bank: One of the first digital maps of the world, published in two versions by the Central Intelligence Agency in the 1960s.

World Wide Web (WWW or W3): A distributed database of information stored on servers connected by the Internet and special-purpose software for browsing, searching, and downloading.

X-Windows: A public-domain GUI built on the Unix operating system with computer graphics capabilities, written and supported by the Massachusetts Institute of Technology and the basis of most workstation shareware on the Internet.

zero/one/two cell: TIGER terminology for point, line, and area, respectively.

zip: See **mosaic**.

zone (for a coordinate system): The region over which the coordinates relate with respect to a single origin. Usually, some part of the earth or an administrative unit.

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