CARTOGRAPHIC AND GIS TECHNICAL NOTE

GLOSSARY OF COMMON GIS AND GPS TERMS

A

almanac
Information describing the orbit of each GPS satellite including clock corrections and atmospheric delay parameters. An almanac is used by a GPS receiver to facilitate rapid satellite acquisition.

altitude
Altitude is specified relative to either mean sea level (MSL) or an ellipsoid (HAE). Altitude above an ellipsoid is the distance from a precise mathematical model, whereas altitude above Mean Sea Level is a distance from a surface of gravitational equipotential that approximates the statistical average level of the sea.

AML
ARC Macro Language. A high-level algorithmic language for generating end-user applications. Features include the ability to create on-screen menus, use and assign variables, control statement execution, and get and use map or page unit coordinates. AML includes an extensive set of commands that can be used interactively or in AML programs (macros) as well as commands that report on the status of ARC/INFO environment settings.

analysis
The process of identifying a question or issue to be addressed, modeling the issue, investigating model results, interpreting the results, and possibly making a recommendation.

annotation
1. Descriptive text used to label coverage features. It is used for display, not for analysis.
2. One of the feature classes in a coverage used to label other features. Information stored for annotation includes a text string, the location at which it is displayed, and a text symbol (color, font, size, etc.) for display.

arc
1. An ordered string of vertices (x,y coordinate pairs) that begin at one location and end at another. Connecting the arc's vertices creates a line. The vertices at each endpoint of an arc are called nodes.
2. A coverage feature class used to represent linear features and polygon boundaries. One line feature can contain many arcs. Arcs are topologically linked to nodes (arc-node topology) and to polygons (polygon-arc topology).

ArcCatalog
File and data management module of ArcGIS. Can be used to create and manage metadata.

ArcGIS
A comprehensive desktop GIS software package developed by ESRI.

ArcMap
Editing and map making module of ArcGIS.

arc-node topology
The topological data structure used to represent connectivity between arcs and nodes. Arc-node topology supports the definition of linear feature and polygon boundaries, and supports analysis functions such as network tracing. See also topology.

archive
A preserved collection of historical data or information.

ARC/INFO
Private domain complete GIS software package from ESRI, Inc. that has very powerful modeling, analysis and output capabilities.

ArcSDE
Spatial database engine. This is a middleware that facilitates transactions between ArcGIS and a DBMS. This allows multi-users and simultaneous editing.

ArcToolbox
Data management and analysis module of ArcGIS. Contains geoprocessing tools.

ArcView
Private domain GIS software from ESRI, Inc. that allows users to organize, maintain, visualize, and disseminate maps and spatial information. This GIS software does not have the analysis and modeling capabilities of ARC/INFO.

area
1. A homogeneous extent of the Earth bounded by one or more arc features (polygon) or represented as a set of polygons (region). Examples: states, counties, lakes, land-use areas, and census tracts.
2. The size of a geographic feature measured in unit squares.

aspect
The compass direction toward which a slope faces, measured in degrees from North in a clockwise direction.

attribute
1. A characteristic of a feature in a Geographic Information System (GIS). Each identifiable feature has attributes. One common attribute of all geographic features is its position. Other attributes depend on the type of feature. Example: a road may have a name or designation number, pavement type, width, number of lanes, etc. Each attribute has a range of possible values called its domain.
2. A column in a database table.

attribute table
A tabular file containing rows and columns. In a GIS, attribute tables are associated with a class of geographic features, such as wells or roads. Each row represents a geographic feature. Each column represents one attribute of a feature, with the same column representing the same attribute in each row.

automated or attributed GPS data collection
A process by which GPS data is tagged with an attribute using automated methods. The GPS unit is directly connected to a laptop computer and automated data collection software. The user selects attributes from predetermined 'pick lists' to assign to GPS positions as they are being recorded.

azimuth
The horizontal direction of a vector, measured clockwise in degrees of rotation from the positive y-axis, for example, degrees on a compass.

B

background
Generic term used to refer to a type of base layer, especially as a reference for onscreen digitizing in GIS.

band
One layer of a multispectral image representing data values for a specific range of the electromagnetic spectrum of reflected light or heat (e.g., ultraviolet, blue, green, red, near-infrared, infrared, thermal, radar, etc.). Also, other user-specified values derived by manipulation of original image bands. A standard color display of a multispectral image shows three bands, one each for red, green and blue. Satellite imagery such as LANDSAT TM and SPOT provide multispectral images of the Earth, some containing seven or more bands.

band separate
An image format that stores each band of data collected by multispectral satellite scanning instruments in a separate file.

bandwidth
A measure of the volume of data that can flow through a communications link. Image data tend to exist as large data sets; thus moving image data sets from one computer to another requires high bandwidth or performance will be slowed. Also known as throughput.

base map (or base layer)
A map containing geographic features that is used for reference. Roads, for example, are commonly found on base maps.

basin
6-digit hydrologic unit delineated for the nation by USGS. Commonly used as a clip boundary.

bearing
A direction from your current position to some other point of interest. Bearings are measured in degrees (360 in a full circle), clockwise from either true or magnetic North. See also heading.

Boolean expression
A type of expression that reduces to a true or false (logical) condition. A Boolean expression contains logical expressions (e.g., DEPTH > 100) and Boolean operators. A Boolean operator is a keyword that specifies how to combine simple logical expressions into complex expressions. Boolean operators negate a predicate (NOT), specify a combination of predicates (AND), or specify a list of alternative predicates (OR). For example, DEPTH > 100 AND DIAMETER > 20.

border arcs
The arcs that create the outer edge boundary of a polygon coverage.

buffer
A zone of a specified distance around coverage features. Both constant- and variable-width buffers can be generated for a set of coverage features based on each feature's attribute values. The resulting buffer zones form polygons-areas that are either inside or outside the specified buffer distance from each feature. Buffers are useful for proximity analysis (e.g., find all cropland within 1000 feet of a stream).

byte
A memory and data storage unit composed of continuous bits, usually eight. For example, file sizes are ususaly measured in kilobytes (Kb) or megabytes (Mb).

C

Cartesian coordinate system
A two-dimensional, planar coordinate system in which x measures horizontal distance and y measures vertical distance. Each point on the plane is defined by an x,y coordinate. Relative measures of distance, area, and direction are constant throughout the Cartesian coordinate plane.

C/A-code
Coarse acquisition code. A family of PRN codes transmitted by GPS satellites. Each satellite is assigned one of 32 unique codes in the family. Each code consists of 1,023 chips and is sent at a rate of 1.023 megabits per second. The code sequence repeats every millisecond. C/A codes currently are transmitted only on the L1 frequency.

CD-ROM
Compact Disk-Read Only Memory. CD-ROM is an optical media. A CD-ROM 5.25-inch disk can hold about 650 megabytes of information. The IS0 9660 standard defines the format of data held on CD-ROM.

cell
See grid cell.

central meridian
A zone constant used when defining a map projection.

CEP
See circular error probability.

circular error probability (CEP)
A statistical measure of precision defined as the 50th percentile value of the two-dimensional position error statistic. A CEP value determines the radius of a circle within which % of the GPS positions measured over a period of time will fall.

clip
The spatial extraction of those features from one coverage that reside entirely within a boundary defined by features in another coverage (called the clip coverage). Clipping works much like a cookie cutter.

CLU
Common land unit. A vector outline of tracts and/or fields. Many CLU polygons make up a coverage. The definition adopted for use in USDA service centers is: "The smallest unit which has a permanent, contiguous boundary, common management or treatment, common owner, or common client association." An example of a CLU might be a CRP field, a fenced pasture, or a strip in a crop/fallow rotation.

column
The vertical dimension of a table. A column has a name and a data type applied to all values in the column.

compression
A software tool used to reduce the size of large raster files. Compression can be lossless, which preserves image quality, or lossy, which sacrifices some image quality for the sake of greatly reduced file size. Examples include MrSID and JPEG2000.

conditional operator
A symbol or keyword specifying how to compare values. Conditional operators are used to query a database. Examples from SQL include: = (equal to) BETWEEN < (less than) LIKE > (greater than) CONTAINING

connectivity
The topological identification of connected arcs by recording the from- and to-node for each arc. Arcs that share a common node are connected.

constellation
1. A specific set of satellites used in calculating positions; 3 satellites for 2D fixes, 4 satellites or more for 3D fixes.
2. All of the satellites visible to a GPS receiver at one time. The optimum constellation is the constellation with the lowest PDOP.

contiguity
The topological identification of adjacent polygons by recording the left and right polygons of each arc.

continuous data
A surface for which each location has a specified or derivable value. Typically represented by a grid, tin, or lattice (e.g., surface elevation).

contour
A line connecting points of equal surface value.

contour interval
The difference in surface values between contours.

coordinate
A set of numeric quantities that describe the location of a point in a geographic reference system. A coordinate pair describes the location of a point or node in two dimensions (ususally x-y), and a coordinate triplet describes a point in three dimensions (x-y-z). A series of points (two or more) is used to describe lines and the edges of polygons or areas. Coordinates represent locations on the Earth's surface relative to other locations.

coordinate system
A reference system used to measure horizontal and vertical distances on a planimetric map. A coordinate system is usually defined by a map projection, a spheroid of reference, a datum, one or more standard parallels, a central meridian, and possible shifts in the x- and y-directions to locate x,y positions of point, line, and area features. A common coordinate system is used to spatially register geographic data for the same area.

coverage
1. A digital version of a map forming the basic unit of vector data storage in ARC/INFO. A coverage stores geographic features as primary features (such as arcs, nodes, polygons, and label points) and secondary features (such as tics, map extent, links, and annotation). Associated feature attribute tables describe and store attributes of the geographic features.
2. A set of thematically associated data considered as a unit. A coverage usually represents a single theme such as soils, streams, roads, or land use.

coverage extent
The coordinates defining the minimum bounding rectangle (i.e., xmin,ymin and xmax,ymax) of a coverage or grid. All coordinates for the coverage or grid fall within this boundary.

coverage units
The units (e.g., feet, meters, inches) of the coordinate system in which a coverage is stored.

CSSM
The Content Standards for Spatial Metadata. A document produced by the Federal Geographic Data Committee (FGDC) that describes spatial metadata.

cursor
1. A graphic pointer used with a mouse to point to a location on a terminal screen.
2. An internal pointer to a record in a table which provides a mechanism for processing a selected set of records. The cursor is moved one by one through the set while operations such as display, query and update are performed.

Customer Service Toolkit
Customer Service Toolkit (CST) is a collection of software tools for USDA field employees who work with the public, primarily with farmers and ranchers. It is also useful to partner agencies, such as Conservation Districts and Departments of Natural Resources, and others who provide conservation planning and resource assessment information. CST provides specific tools and interfaces for working with ArcGIS.

D

dangle length
Minimum length allowed for dangling arcs during a cleaning process. Cleaning removes dangling arcs that are shorter than the dangle length.

dangling arc
An arc having the same polygon on both its left and right sides and having at least one node that does not connect to any other arc. It often identifies where a polygon does not close properly (e.g., undershoot), where arcs don't connect properly, or where an arc was digitized past its intersection with another arc (i.e., overshoot). A dangling arc is not always an error. For example, dangling arcs can represent cul-de-sacs in street centerline maps. See also dangling node.

dangling node
The endpoint of a dangling arc not connected to another arc.

data capture
The collection of GPS attributes and position information for geographic features.

database
A logical collection of interrelated information, managed and stored as a unit, usually on some form of mass- storage system such as magnetic tape or disk. A GIS database includes data about the spatial location and shape of geographic features recorded as points, lines, areas, pixels, grid cells, or tins, as well as their attributes.

database design
The formal process of analyzing facts about the real world into a structured database model. Database design is characterized by the following phases: requirement analysis, logical design and physical design.

data conversion
The translation of data from one format to another. GIS software supports data conversion from many geographic data formats such as DLG, TIGER, DXF, and DEM.

data dictionary
1. (GIS) A catalog of all data held in a database, or a list of items giving data names and structures. Also referred to as DDID for data dictionary/directory.
2. (GPS) A description of the features and attributes relevant to a particular project or job. This description includes feature names, data type classifications (point, line, area), attribute names, attribute types and attribute values. After being created, a data dictionary can be used to control the capture of features and attributes.

data integrity
Maintenance of data values according to data model and data type. For example, to maintain integrity, numeric columns will not accept alphabetic data.

data model
1. The result of the conceptual design process. A generalized, user-defined view of the data related to applications.
2. A formal method of describing the behavior of the real-world entities. A fully developed data model specifies entity classes, relationships between entities, integrity rules and operations on the entities.

data set
A named collection of logically related data items arranged in a prescribed manner.

data type
The characteristic of columns and variables that defines what types of data values they can store. Examples include character, floating point and integer.

database management system (DBMS)
A set of computer programs for organizing the information in a database. A DBMS supports the structuring of the database in a standard format and provides tools for data input, verification, storage, retrieval, query, and manipulation. Examples of database management systemes include Access, SQLserver, Oracle, Informix, and DBASE.

datum
A set of parameters and control points used to accurately define the three-dimensional shape of the Earth (e.g., as a spheroid). The datum is the basis for a planar coordinate system. For example, the North American Datum for 1983 (NAD83) is a common datum for map projections and coordinates within the United States and throughout North America.

DEM
See digital elevation model.

descriptive data
Tabular data describing the characteristics of geographic features. Can include numbers, text, images, and CAD drawings about features. Also referred to as attribute data.

digital elevation model (DEM)
1. A digital representation of a continuous variable over a two- dimensional surface by a regular array of z-values referenced to a common datum. Digital elevation models are typically used to represent terrain relief. Also referred to as 'digital terrain model' (DTM).
2. An elevation database for elevation data by map sheet from the National Mapping Division of the U.S. Geological Survey (USGS).
3. The format of the USGS digital elevation data sets. USGS DEMs are produced by the Survey Branch of the United States Department of the Interior, consisting of a regular array of elevations referenced in the Universal Transverse Mercator (UTM) coordinate system. These data correspond to the standard 1:24,000-scale 7.5 x 7.5- minute quadrangles or 1:250,000 one-degree map sheets. Elevations are in meters or feet referenced to mean sea level.

DGM
Digital Geospatial Metadata. DGM was approved in June 1994 by the Federal Geographic Data Committee (FGDC). DGM describes the specifications for the content, quality, condition, and other characteristics of metadata (data about data). The standard provides a common set of terminology and definitions for the documentation of geospatial data. DGM establishes the names of data elements and groups of data elements to be used for these purposes, definitions of these data elements and groups, and information about the values that are to be provided for the data elements.

digital terrain model
See digital elevation model.

digitize
1. To encode geographic features in digital form as x,y coordinates.
2. The process of using a digitizer to encode the locations of geographic features by converting their map positions to a series of x,y coordinates stored in computer files. Pushing a digitizer button records an x,y coordinate. A digitized line is created by recording a series of x,y coordinates.

digitizer
1. A device that consists of a table and a cursor with crosshairs and keys used to digitize geographic features.
2. Title of the person who uses a digitizing device.

digitizing
See digitize.

dilution of precision (DOP)
An indication of the quality of a GPS position which takes account of each satellite's location relative to the other satellites in the constellation and their geometry in relation to the GPS receiver. A low DOP value indicates a higher probability of accuracy. Standard GPS applications are --PDOP -Position (three coordinates), HDOP -Horizontal (two horizontal coordinates) VDOP- Vertical (height only), TDOP -Time (clock offset only).

DIME
See GBF/DIME.

directed network
A network in which each arc has an associated direction of flow. Direction of flow can be determined by arc direction (e.g., each arc is digitized so that it is oriented downstream), a value in an item in an attribute table, or through the use of a selection file.

discrete data
Geographic features containing boundaries: point, line or area boundaries.

dissolve
The process of removing boundaries between adjacent polygons that have the same values for a specified attribute.

DLG
1. Digital line graph files from the U.S. Geological Survey (USGS), including data from the base map categories such as transportation, hydrography, contours, and public land survey boundaries.
2. The digital format standards published by USGS for exchanging cartographic data files and in which the USGS delivers digital line graph data sets.

domain
The domain of a GIS attribute determines the set of possible values for that attribute. A domain can be set of numbers, characters, or strings. For example the domain for the attribute 'Pavement type' may be the set of strings ('Gravel','Bitumen', Concrete).

DOP
See dilution of precision.

DOQ
Digital orthophoto quadrangle. Digital representation of an aerial photograph or other remotely sensed data that have been rectified to produce an accurate image of the earth by removing tilt and relief displacements which occurred when the photo was taken. Standard USGS format is one quarter of a 7.5' quad. Data is provided at the 1:12000 scale. The DOQ combines the image characteristics of a photograph with the accuracy and scale associated with a map. Typical base layer required for GIS functionality.

DOQQ
Digital Orthophoto Quarter Quad. USGS provides DOQ data in quarter quad format for ease of use and to minimize storage requirements. Four DOQQs may be joined to form a full-quad DOQ.

DRG
Digital Raster Graphic. Scanned 1:24,000 scale USGS topographic quad. Can be used as a backdrop and to manually measure distance and obtain location coordinates, but cannot be spatially manipulated.

double precision
Refers to a high level of coordinate accuracy based on the possible number of significant digits that can be stored for each coordinate. Some GIS software allows data sets to be stored in either single- or double-precision coordinates. Double-precision coverages store up to 15 significant digits per coordinate (typically, 13 to 14 significant digits), retaining the accuracy of much less than one meter at a global extent.

drape
A perspective or panoramic rendering of two-dimensional features superimposed on a surface.

DTM
Digital terrain model.

DXF
Data Exchange Format. A format for storing vector data in ASCII or binary files. Used by AutoCAD and other CAD software for data interchange. DXF files can be converted to GIS coverages.

E

edge matching
An editing procedure to ensure that all features that cross adjacent map sheets have the same edge locations. Links are used when matching features in adjacent coverages.

ellipsoid
In geometric terms, a closed surface of which all planar sections are ellipses. In GIS and mapping practices, an ellipsoid is a specific mathematical representation of the earth that more closely approximates the shape of the surface than a sphere does.

encrypted signals
Signals transmitted by satellites that are coded to deny certain users the reception of those signals. The PLGR uses crypto keys (information physically loaded into each PLGR unit) to correct the false data and provide full accuracy performance.

entity
A collection of objects (persons, places, things) described by the same attributes. Entities are identified during the conceptual design phase of database and application design.

entity relationship diagram
A graphical representation of the entities and the relationships between them. Entity relationship diagrams are a useful medium to achieve a common understanding of data among users and application developers.

EOS
Earth Observation Satellite. An effort to study the earth as a system while tracking long-term changes on a global scale. EOS, a mission of the National Aeronautics and Space Administration (NASA), will produce petabytes (1,000 terabytes) of satellite image data and also large-scale data sets (terabytes [1,000 gigabytes] a day) to be manipulated and analyzed.

ephemeris
A description of the path of a celestial body indexed by time. The navigation message from each GPS satellite includes a predicted ephemeris for the orbit of that satellite valid for the current hour.

Equator
The parallel of reference 0 North or South.

external polygon
See universe polygon.

F

feature
In a GIS, a physical object or location of an event. Features can be points (a tree or a traffic accident), lines (a road or river), or areas (a forest or a parking lot).

feature attribute table
A table used to store attribute information for a specific coverage feature class.

feature class
1. A classification describing the format of geographic features and supporting data in a coverage. Coverage feature classes for representing geographic features include point, arc, node, route-system, route, section, polygon and region. One or more coverage features are used to model geographic features; for example, arcs and nodes can be used to model linear features such as street centerlines. T he tic, annotation, link, and boundary feature classes provide supporting data for coverage data management and viewing.
2. The conceptual representation of a geographic feature. When referring to geographic features, feature classes include point, line, area, and surface.

FGCC
Federal Geodetic Control Committee: a standards committee concerned with accuracy levels in geodetic control. Within the United States, coordinate control is based on the National Geodetic Survey's published control points and is a basis for collecting data.

FGDC
The United States Federal Geographic Data Committee. Composed of representatives of several federal agencies and GIS vendors, the FGDC has the lead role in defining spatial metadata standards, which it describes in the Content Standards for Spatial Metadata.

field
In a database, another term for column.

field data collector
An electronic device that collects and stores observation information from survey instruments. Two types of devices are available: one records x,y,z coordinates using a satellite-based global positioning system (GPS), and the other device records distance and bearing.

FIPS
The Federal Information Processing Standards. FIPS deals with a wide range of computer system components including the components of most GISs: hardware, storage media, data files, codes, interfaces, data transmission, networking, data management, documentation, programming languages, software engineering, performance, security, and so forth. FIPS 173 is the precursor to the SDTS (Spatial Data Transfer Standard), which includes standardized definitions for a variety of digital mapping terms and addresses federal requirements for accuracy. FIPS provides a U. S. government standard state and country identification code; standards approved for use by U.S. government agencies. FIPS 152-2 includes POSIX.lcompliance.

format
The pattern into which data are systematically arranged for use on a computer. A file format is the specific design of how information is organized in the file. DLG, DEM, and TIGER are geographic data sets with different file formats.

from-node
Of an arc's two endpoints, the one first digitized.

functional surface
A surface representation which stores a single z-value (as opposed to multiple z-values) for any given x,y location. Functional surfaces are also referred to as 2.5-dimensional surfaces.

fuzzy tolerance
The fuzzy tolerance is an extremely small distance used to resolve inexact intersection locations due to limited arithmetic precision of computers. It defines the resolution of a coverage.

G

gazetteer
A work of geographic reference that supplies place name and location information. When a place name is known, a gazetteer can provide the coordinates of the place. Most atlases contain gazetteers. Well-known digital gazetteers are the USGS Geographic Names Information System (GNIS) and the gazetteer in the Digital Chart of the World (DCW). In ARC/INFO the gazetteer spatial index is done as a grid of alpha and numeric references which is converted into a polygon coverage. Places (points or polygons) are then overlaid with this grid, then sorted alphabetically. This produces a list of place names sorted both alphabetically and by reference grid number.

GBF/DIME
For the 1980 census, the U.S. Census Bureau produced Geographic Base Files (GBF) and Dual Independent Map Encoding (DIME) files, containing census geographic statistical codes and coordinates of line segments for most metropolitan areas. DIME files provide a schematic map of a city's streets, address ranges, and geostatistical codes relating to the Census Bureau's tabular statistical data. DIME was replaced by TIGER for the 1990 Census.

generalization
In general, reducing the number of points used to represent a line.

geocode
The process of identifying the coordinates of a location given its address. For example, an address can be matched against a TIGER street network to determine the location of a home. Also referred to as address geocoding.

geodatabase
An object-based GIS data model developed by ESRI for ArcGIS that stores each feature as rows in a table. Personal geodatabases store data in a Microsoft Access .mdb file. Corporate geodatabases store data in a DBMS such as SQLserver or Oracle. This data structure supports rules-based topology and allows the user to assign behavior to data.

geodetic datum
A mathematical model designed to fit part or all of the geoid (the physical earth's surface). Defined by the relationship between an ellipsoid and a point on the topographic surface established as the orgin of a datum. World geodetic datums are typically defined by the size and shape of the ellipsoid and the location of the center of the ellipsoid with respect to the center of the earth.

geographic data
The locations and descriptions of geographic features. The composite of spatial data and descriptive data.

geographic database
A collection of spatial data and related descriptive data organized for efficient storage and retrieval by many users.

geographic feature
A user-defined geographic phenomenon that can be modeled or represented using geographic data sets in a GIS. Examples of geographic features include streets, sewer lines, manhole covers, accidents, lot lines, and parcels.

geographic information system
See GIS.

geographic data model
The different formats geographic data is stored in, including vector, raster, TIN, and tables.

geoid
The particular equipotential surface which coincides with mean sea level (MSL), and which may be imagined to extend through the continents. This surface is everywhere perpendicular to the force of gravity.

geoid height
The distance from the geoid or mean sea level to a particular point in the ellipsoid. Also called the geoid separation, geodial undulation or orthometric height.

geometry
Geometry deals with the measures and properties of points, lines and surfaces. In a GIS, geometry is used to represent the spatial component of geographic features.

georeference
To establish the relationship between page coordinates on a planar map and known real-world coordinates

georelational model
A geographic data model that represents geographic features as an interrelated set of spatial and descriptive data. The georelational model is the fundamental data model used in most GIS.

geospatial data
Information that identifies the geographic location and characteristics of natural or constructed features and boundaries on the earth. The information may be derived from, among other things, remote sensing, mapping, and surveying technologies.

GIF
Graphics interchange file or graphics interchange format.

gigabyte, Gb
A measure of data size. A gigabyte of data is equivalent to 1,000 megabytes, or one billion bytes of data

GIRAS
Geographic Information Retrieval and Analysis data files from the U.S. Geological Survey. GIRAS files contain land use/land cover information for areas in the United States, including attributes for land use, land cover, political units, hydrologic units, census and county subdivisions, federal landownership and state landownership. These data sets are available to the public in both map and digital form.

GIS
Geographic information system. An organized collection of computer hardware, software, geographic data, and personnel designed to efficiently capture, store, update, manipulate, analyze, and display all forms of geographically referenced information. Outputs include cartographic displays, spatial analysis, and tabular reports. A GIS uses geography or space as a common key between data sets. Information is linked only if it relates to the same geographical area. It is an analysis tool that allows analysis and display of spatial relationships between mapped features.
Questions GIS can provide information on:
> location- What is at X location?
> condition- Where is X located?
> amount/extent- How much X is present?
> trends- What has changed since ..?
> patterns- What spatial patterns exist?
> modeling- What if ....?

global positioning system (GPS)
A system of satellites and receiving devices used to compute positions on the Earth.

GOSIP
Government Open System Interconnection Protocols are U.S. government procurement specifications for OSI protocols (see OSI). The government has mandated that all federal agencies standardize on the OSI model and implement OSI-based systems for GOSIP. Most vendors (Sun, IBM, HP, DEC, etc.) have either complied or are working toward compliance.

GPS
See global positioning system.

GPS Control Segment
The component of the GPS system, currently administered by the US Air Force, which controls the operation of the NAVSTAR satellites.

graphical user interface (GUI)
A graphical method of controlling how a user interacts with a computer to perform various tasks. Instead of issuing commands at a prompt, the user performs desired tasks by using a mouse to choose from 'a dashboard' of options presented on the display screen. These are in the form of pictorial buttons (icons) and lists. Some GUI tools are dynamic and the user must manipulate a graphical object on the screen to invoke a function; for example, moving a slider bar to set a parameter value (e.g., setting the scale of a map).

GRASS
Geographical Resources Analysis Support System. A public domain image processing and geographic information system (GIS) originally developed by the US Army Corps of Engineers. Software upgrades are currently in development at Baylor University.

great circle arc
An arc formed on the surface of the earth by the intersection of a plane that passes through the center of the Earth and two points on the surface of the earth, constituting the shortest distance on the Earth's surface between those two points.

Greenwich mean time (GMT)
See universal time coordinated (UTC). In discussions about GPS, they are often used interchangeably.

GRS-80
The ellipsoid used by the WGS-84 and NAD-83 datums. The best worldwide fit to the geoid.

grid
1. Two sets of parallel lines intersecting at right angles in a plane coordinate system.
2. A geographic data model representing information as an array of equally sized square cells arranged in rows and columns. Each grid cell is referenced by its geographic x,y location. See also raster and grid cell.

grid cell
A discretely uniform unit that represents a portion of the Earth, such as a square meter or square mile. Each grid cell has a value that corresponds to the feature or characteristic at that site, such as a soil type, census tract, or vegetation class.

GUI
See graphical user interface.

H

HAE
Height above ellipsoid

heading
The current direction in which one is moving. See also bearing

horizontal dilution of precision (HDOP)
See dilution of precision (DOP) and position dilution of precision (PDOP).

HUC Hydrologic unit code.
A numerical attribute assigned to various sized hydrologic units.

hydrologic unit (HU)
An area of land upstream from a specific point on a stream (designated as the mouth or outlet), which is defined by a hydrologic boundary that includes all of the source area that could contribute surface water runoff directly and indirectly to the designated outlet point.

I

identity
The topological overlay of a coverage (input) with a polygon coverage (identity).

image
A graphic representation or description of a scene, typically produced by an optical or electronic device. Common examples include remotely sensed data (e.g., satellite data), scanned data, and photographs. An image is stored as a raster data set of binary or integer values that represent the intensity of reflected light, heat, or other range of values on the electromagnetic spectrum.

index
Special data structure used in a database to speed searching for records in tables or spatial features in geographic data sets.

INFO
A tabular DBMS used by ARC/INFO to store and manipulate feature attribute tables and other related tables.

interface
For data communication, a hardware and software link that connects two computer systems or a computer and its peripherals, or a software to software link.

Internet
An international consortium of wide area networks that operate using a standard set of addresses allowing machine-to-machine connectivity on a global scale. The Internet is an outgrowth of a Defense Advanced Research Projects Agency (DARPA) research project in the early 1970s to provide connectivity between scientists running computer simulations in different locations. Additional regional, private, and public networks have joined the Internet over time.

interpolation
The estimation of values of a surface at an unsampled point based on the known values of surrounding points.

intersect
The topological integration of two spatial data sets that preserves features that fall within the area common to both input data sets.

ionosphere
The band of charged particles 130 to 190 kilometers above the earth's surface.

ionosphere delay
The variable delay experienced by a wave propagating through the ionosphere. The delay introduces a variable error in GPS positions.

ISO
The International Organization for Standardization. A worldwide federation of national standards bodies (e.g., ANSI from the US.) that develops international standards. A Technical Committee (ISORC211) is developing international Geographic Information|Geomatics standards. Among many other computing standards, IS0 maintains an SQL standard and is developing an extended version, SQL3, which will support queries on geographic data sets.

isoline
A line on a surface connecting points of equal value.

item
A column of information in an attribute table, for example, a single attribute of a record in an tabular data file.

J

join
See relational join

K

kilobyte, Kb
A measure of data size. A kilobyte of data is approximately 1,000 bytes.
L

label point
See point.

Landsat
A series of satellites that produce images of the Earth. The Landsat remote sensing satellite program was developed by NASA (National Aeronautics and Space Administration). Landsat data are provided in .BIL (band interleaved by line) or .BIP (band interleaved by pixel) formats.

latitude
The north/south component of a location on the surface of an ellipsoid. Latitude is an angular measurement north or south of the equator. Traditionally latitudes north of the equator are considered as positive and those south of the equator as negative.

lattice
A surface representation that uses a rectangular array of mesh points spaced at a constant sampling interval in the x and y directions relative to a common origin. A lattice is stored as a grid, but represents the value of the surface only at the mesh points rather than the value of the entire cell.

log
To store data in the memory of a GPS receiver or on a computer disk.

LTA
Land Type Association. USFS delineated unit of land with similar designated soil, vegetation, geology, topography, climate and drainage.

layer
A thematic set of spatial data described and stored in a digital database or map library. Layers organize a database or map library by subject matter (e.g., soils, roads, and wells). Conceptually, layers in a database or map library environment are exactly like coverages.

LCD
Liquid-crystal display. The screen of a PLGR GPS unit.

left-right topology
The topological data structure ARC/INFO uses to represent contiguity between polygons. Left-right supports analysis functions such as adjacency. See also topology.

legend
1. The reference area on a map that lists and explains the colors, symbols, line patterns, shadings, and annotation used on the map. The legend often includes the scale, origin, orientation, and other map information.
2. The symbol key used to interpret a map.

library
A collection of spatially related layers. A library has a spatial extent which applies to all layers in the library.

line
1. A set of ordered coordinates that represents the shape of geographic features too narrow to be displayed as an area at the given scale (e.g., contours, street centerlines, or streams), or linear features with no area (e.g., state and county boundary lines).
2. A single arc in a coverage.
3. A line on a map (e.g., a neatline).

line-in-polygon
A spatial operation in which arcs in one coverage are overlaid with polygons of another coverage to determine which arcs, or portions of arcs, are contained within the polygons. Polygon attributes are associated with corresponding arcs in the resulting line coverage.

linear event
See event.

linear feature
A geographic feature that can be represented by a line or set of lines. For example, rivers, roads, and electric and telecommunication networks are all linear features.

logical connector
One of the reserved words AND, OR and XOR used to build complex logical expressions in a query.

logical expression
A combination of items, system items, system variables, literals and arithmetic logical operators from which a value of TRUE or FALSE is derived.

logical operator
Another term for Boolean operator. See Boolean expression.

longitude
The East/West component of a location on the surface of the Earth. Longitude is usually measured as an angular value East or West of the Greenwich meridian (London, England). Traditionally longitudes East of Greenwich are considered as positive and those West of Greenwich as negative. This is a negative value in Montana.

lookup table
1. A special tabular data file containing additional attributes for features stored in an associated feature attribute table.
2. A special lookup table in which numeric item values are classified into categories. For example, well depth can be recorded explicitly in the feature attribute table, but displayed and used as a set of classes, such as 0 to 250 feet, 251 to 500 feet, and so on.

M

macro
A text file containing a sequence of commands that can be executed as one command. Macros can be built to perform frequently used, as well as complex, operations. The ARC Macro Language (AML) is used to create macros for ARC/INFO.

MAGIP
The Montana Association of Geographic Information Professionals (MAGIP) was formed on April 21, 2004. MAGIP is a non-profit professional association that works to identify and support the strengths of individual members, find solutions to individual and collective problems, and address the needs of the Montana GIS community as a whole. See http://www.magip.org

many-to-one relate
A relate in which many records in one table are related to a single record in another table.

map
An abstract representation of the physical features of a portion of the Earth's surface graphically displayed on a planar surface. Maps display signs, symbols, and spatial relationships among the features. They typically emphasize, generalize, and omit certain features from the display to meet design objectives (e.g., railroad features might be included in a transportation map but omitted from a highway map).

map extent
1. The rectangular limits (xmin,ymin and xmax,ymax) of the area of the Earth's surface displayed using a GIS. Map extent is specified in the coordinate system of the coverage or other geographic data set used. Typically, the extent of the geographic database (or a portion of it defined by a zoomed-in view) defines the map extent for display.
2. The geographic extent of a geographic data set specified by the minimum bounding rectangle (i.e., xmin,ymin and xmax,ymax).

map library
An organized, uniformly defined collection of spatial data partitioned by layers and tiles into component parts called map sections. The data in a map library are indexed by location for optimal spatial access. A map library organizes coverages spatially by tiles and thematically by layer.

map limits

The rectangular data area on the graphics page in which geographic features are displayed. All geographic data are drawn within the map limits, and none outside the map limits. Map titles and legends can be drawn outside the map limits.

map projection

A mathematical model that transforms the locations of features on the Earth's surface to locations on a two- dimensional surface. Because the Earth is three-dimensional, some method must be used to depict a map in two dimensions. Some projections preserve shape; others preserve accuracy of area, distance, or direction. See also coordinate system. Map projections project the Earth's surface onto a flat plane. However, any such representation distorts some parameter of the Earth's surface be it distance, area, shape, or direction.

map query

The process of selecting information from a GIS by asking spatial or logical questions of the geographic data. Spatial query is the process of selecting features based on location or spatial relationship (e.g., select all features within 300 feet of another; point at a set of features to select them). Logical query is the process of selecting features whose attributes meet specific logical criteria (e.g., select all polygons whose value for area is greater than 10,000 or select all streets whose name is 'Main St.'). Once selected, additional operations can be performed, such as drawing them, listing their attributes or summarizing attribute values.

map scale

The reduction needed to display a representation of the Earth's surface on a map. A statement of a measure on the map and the equivalent measure on the Earth's surface, often expressed as a representative fraction of distance, such as 1:24,000 (one unit of distance on the map represents 24,000 of the same units of distance on the Earth). 'Large scale' refers to a large fractional value such as 1/24,000. A large-scale map shows a small geographic area in greater detail. 'Small scale' refers to a smaller fractional value such as 1/1,000,000. A small-scale map shows a large geographic area in less detail.

map units

The coordinate units in which a geographic data set (e.g., a coverage) is stored in a GIS. Map units can be inches, centimeters, feet, meters, or decimal degrees.

megabyte, Mb

A measure of data size. A megabyte of data is equivalent to 1,000 kilobytes, or one million bytes of data.

meridian

A line running vertically from the North Pole to the South Pole along which all locations have the same longitude. The Prime Meridian (0) runs through Greenwich, England. From the Prime Meridian, measures of longitude are negative to the West and positive to the East up to 180, halfway around the globe.

metadata

Data about the content, quality, condition, and other characteristics of data.

minimum bounding rectangle

A rectangle, oriented to the x and y axes, which bounds a geographic feature or a geographic data set. It is specified by two coordinates: xmin,ymin and xmax,ymax.

minimum mapping units
For a given map scale, the size or dimension below which a long narrow feature is represented as a line and a small area as a point. For example, streams and rivers will be represented as lines if their width is less than .10 inch, and polygons smaller than .125 inch on a side will be represented as a point.

MLIAC
Montana Land Information Advisory Council. Established by the state legislature in 2005 through the Land Information Act. The Council advises the Department of Administration on the planning and grant process established in statute, as well as providing policy level direction in the advancement of Geographic Information Technology in general. See
http://itsd.mt.gov/policy/councils/mliac/mliac.asp

mlra
Major Land Resource Areas. These are groupings of similar ecological areas based on soils, vegetation, climate, and landform.

model
A representation of reality used to simulate a process, understand a situation, predict an outcome, or analyze a problem. A model is structured as a set of rules and procedures, including spatial modeling tools available in a geographic information system (GIS).

mouse
A hand-controlled hardware device for interacting with a computer terminal or entering data from a digitizer. A mouse is used to make selections and position the cursor to fields in computer forms when interacting with graphical user interfaces. A digitizer mouse is used to trace features and enter x,y coordinates of features.

MSS
Multispectral scanner. An instrument on some satellites used for imaging the earth. An MSS image will have data recorded by the scanner from three or more bands of the electromagnetic spectrum. GIS software can read multispectal images in various formats.

MSL
Mean sea sevel. See geoid.

multipath
Interference similar to 'ghosting' on a television screen which occurs when GPS signals arrive at an antenna having traversed different paths (e.g. after getting reflected from buildings, trees, or cliffs). The different paths yield different pseudo range estimates and introduce errors into computed GPS positions.

N

NAD-27
North America datum of 1927. Technically, only a horizontal datum employing the Clarke 1866 ellipsoid. Height values are expressed in terms of the NGVD (National Geodetic Vertical Datum) of 1929.

NAD-83
North America datum of 1983. Like NAD-27, technically only a horizontal datum. Its geometric definition is almost identical to WGS-84. For GPS purposes, the NAD-83 and WGS-84 datums are identical. Uses the GRS-80 ellipsoid.

NAVSTAR
The official name for the GPS satellites. NAVSTAR is an acronym for 'NAVigaion Satellite Timing And Ranging.'

NBS
National Bureau of Standards, now known as NIST See NIST.

neatline
A border line commonly drawn around the extent of a map.

nesting features
The ability of the GPS software to record a point feature while already recording a line or area feature.

network
1. An interconnected set of arcs representing possible paths for the movement of resources from one location to another.
2. A coverage representing linear features containing arcs or a route-system. Also known as network coverage.
3. When referring to computer hardware systems, a local area network (LAN) or a wide area network (WAN).

NIST
National Institute of Standards & Technology is the agency that produces the Federal Information Processing Standards (FIPS) for all U.S.A. government agencies except the Department of Defense.

NMAS
National map accuracy standards are specifications of accuracy standards for well-defined map points on published maps that are specified by the U.S. Geological Survey and revised by the U.S. Bureau of the Budget.

NRIS
Natural Resource Information System, Montana State Library, Helena. The Montana Natural Resource Information System (NRIS) Geographic Information System (GIS) acts as a clearinghouse for GIS databases and provides services to state, federal, private, non-profit, and public groups or individuals needing access to GIS technology.

node
1. The beginning and ending locations of an arc. A node is topologically linked to all arcs that meet at the node.
2. In graph theory, the location at which three or more lines connect.
3. The three corner points of each triangle in a tin. Every sample point input to a tin becomes a node in the triangulation. A triangle node is topologically linked to all triangles that meet at the node.
4. Clearinghouse site that is electronically linked to facilitate distribution of geospatial data.

node match tolerance
The minimum radial distance within which two nodes will be joined (matched) to form one node.

normalization
A conceptual database design task that involves applying data dependency to a data model to avoid data inconsistencies by prohibiting redundancy.

O

OGC
The Open GIS Consortium, a group composed of software vendors, academics, government agencies, consultants and software integrators, dedicated to open systems geoprocessing. Their first project is to develop an open geodata interoperability specification (OGIS).

OGIS
The Open Geodata Interoperability Specification being developed by OGC to support interoperability of GIS systems in a heterogenous computing environment.

one-to-many
A relate in which one record in a table is related to many records in another table.

online access
Direct access to data that does not involve file transfer.

optical disk
A digital data storage technology that uses optical media to store information. Optical disks are slower, but store more data and cost less per unit of stored data than magnetic disks. Several optical platters can be installed in a single device called a jukebox. Optical disks are used when very large amounts of data need to be stored.

origin
The reference location for a planar coordinate system, usually represented by the values 0,0. The place where a trip starts. This is usually the home for most consumers. For a population group, an origin could be a census tract or a city. Origins are represented as nodes in a network coverage, as points in a point coverage, and as label points in a polygon coverage.

orthometric height
See geoid height.

orthophoto
Photograph which results from processing aerial photographs to remove distortion and displacement. Like maps, they have one scale (even in varying terrain) and like photographs, they show the terrain in actual detail (not by lines and symbols). True distances, angles and areas may be measured directly without making corrections for image displacement.

OSI
Open Systems Interconnect, a seven-layer hierarchical reference interface and communications model sponsored by ISO, 1984, known as the OSI Reference Model: layer 7--applications, layer 6--presentations, 5--session, 4--transport, 3--network, 2--data link, 1--physical. This model is incorporated at the operating system level. The OSI model is used to develop interfaces and integrate two dissimilar systems (i.e., PCs and UNIX or UNIX and mainframes).

overdetemined position
A 3D GPS position which was computed using more than four satellites. The extra satellite(s) in the solution provide a degree of mathematical redundancy in the solution which can be used to eliminate a number of errors in the GPS system, thereby producing more accurate positions.

overlay
See topological overlay.

overshoot

That portion of an arc digitized past its intersection with another arc. See also dangling arc.

P

page extent

Defines a rectangular portion of the graphics page to be displayed.

pan

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.

parallel

A property of two or more lines that is separated at all points by the same distance.
A horizontal line encircling the Earth at a constant latitude. The Equator is a parallel whose latitude is 0. Measures of latitude range from 0 to 90 North of the Equator and from 0 to -90 to the South.

parity

A form of error checking used in RS232 serial data transfer. Parity can be sent of even, odd, or none. A digital message is composed of Is and 0s. The parity of a byte is the binary sum over the length of that byte. A parity error results when one of the bits in a byte is changed so that the parity of the byte changes during transmission.

P-code

Precision code. A PRN code transmitted by GPS satellites on the L1 and L2 frequencies.

PDOP

See dilution of precision and position dilution of precision.

PDOP mask

The highest PDOP value at which a receiver will compute positions.

PDOP switch

The PDOP value at which a receiver will switch from computing 2D or 3D positions.

pixel

A contraction of the words picture element. The smallest unit of information in an image or raster map. Referred to as a cell in an image or grid.

PLSS

Public Land Survey System. The grid consisting of sections and townships that is used to describe real property ownership in much of the west. PLSS is not a coordinate system (i.e., location of lines and nodes cannot be computed mathematically).

point

1. A single x,y coordinate that represents a geographic feature too small to be displayed as a line or area; for example, the location of a mountain peak or a building location on a small-scale map.
2. A coverage feature class used to represent point features or to identify polygons. It is not recommended to have point and polygon features in the same coverage. When representing point features, the x,y location of the label point is also the location of the feature. When identifying polygons, the label point can be located anywhere within the polygon.

point-in-polygon
A topological overlay procedure which determines the spatial coincidence of points and polygons. Points are assigned the attributes of the polygons within which they fall.

polygon
A coverage feature class used to represent areas. A polygon is defined by the arcs that make up its boundary and a point inside its boundary for identification.

polygon-arc topology
The topological data structure ARC/INFO uses to represent connectivity between arcs to form polygons. Polygon- arc topology supports the definition of polygons and analysis functions such as topological overlay.

polygon overlay
A topological overlay procedure that determines the spatial coincidence of two sets of polygon features.

position dilution of precision (PDOP)
A unitless figure of merit expressing the relationship between the error in user position and error in satellite positions. Geometrical PDOP is proportional to 1 divided by the volume of the pyramid formed by lines running form the receiver to four or more satellites observed. Thus a small PDOP is associated with widely separated satellites.

PostScript
PostScript is a page-description computer language developed, marketed, and trademarked by Adobe Systems, Inc. PostScript is supported on most laser printers. PostScript is particularly useful in computerized typesetting applications and desktop publishing with graphics. PostScript files can be plotted on non-Postscript plotting devices by means of Raster Image Processor (RIP) software.

precision
Refers to the number of significant digits used to store numbers, and in particular, coordinate values. Precision is important for accurate feature representation, analysis and mapping. GIS software may support single precision and/or double precision.

PRN
See pseudorandom noise code.

profile
A vertical sectional view of a surface derived by sampling surface values along a section line.

projection
See map projection.

projection file (.prj)
1. A coverage file that stores the parameters for the map projection and coordinate system of a geographic data set (e.g., a coverage).
2. A text file containing input and output projection parameters that can be used to convert a geographic data file from one coordinate system to another.

pseudonode
A node where two, and only two, arcs intersect, or a single arc that connects with itself.

pseudorandom noise code (PRN)
Deterministic binary sequences with noise-like properties. Also called pseudo-noise codes. These codes are used in spread-spectrum communications systems and in ranging systems such as GPS. Two PRN codes are transmitted by GPS satellites: the CIA-code and the P-code.

Q

quadrangle (quad)
See topographic map.

quadtree
A spatial index which recursively decomposes a data set (e.g., image) into square cells of different sizes until each cell has a homogeneous value. Quadtrees are often used for storing raster data.

query
See map query.

R

raster
A cellular data structure composed of rows and columns for storing images. Each unit in the grid is assigned a value associating it with the corresponding attribute data. Selection of grid size forces a tradeoff between data resolution (and detail) and system storage requirements. Data can be converted to vector data through the process of vectorization.

rasterize (rasterization)
Conversion of vector data to raster data.

raster models
Rasters come in a wide variety of formats from simple grids to complex, multi-band imagery. Some commonly used models include GRIDS, DOQQ, geoTIF, DEM, MrSID, JPEG2000, and various forms of satellite imagery.

record
1. In an attribute table, a single 'row' of thematic descriptors. In SQL terms, a record is analogous to a tuple.
2. A logical unit of data in a file. For example, there is one record in the ARC file for each arc in a coverage.

rectification
The process by which an image or grid is converted from image coordinates to real-world coordinates. Rectification typically involves rotation and scaling of grid cells, and thus requires resampling of values.

relate
An operation that establishes a temporary connection between corresponding records in two tables using an item common to both (i.e., relate key). Each record in one table is connected to those records in the other table that share the same value for the common item.

relational join
The operation of relating and physically merging two attribute tables using their common item.

remote sensing
Acquiring information about an object without contacting it physically. Methods include aerial photography, radar, and satellite imaging.

resampling
The process of reducing image data set size by representing a group of pixels with a single pixel. Thus, pixel count is lowered, individual pixel size is increased, and overall image geographic extent is retained. Resampled images are "coarse" and have less information than the images from which they are taken. Conversely, this process can also be executed in the reverse.

resolution
1. Resolution is the accuracy at which a given map scale can depict the location and shape of geographic features. The larger the map scale, the higher the possible resolution. As map scale decreases, resolution diminishes and feature boundaries must be smoothed, simplified, or not shown at all. For example, small areas may have to be represented as points.
2. Distance between sample points in a lattice.
3. Size of the smallest feature that can be represented in a surface.
4. The number of points in x and y in a grid or lattice (e.g., the resolution of a U.S. Geological Survey one-degree DEM is 1201 x 1201 mesh points).

RMS error
Root mean square error. A measure calculated when registering a map to a digitizer, indicating the discrepancy between known point locations and their digitized locations. The lower the RMS error, the more accurate the digitizing or transformation.

row
1. A record in an attribute table. The horizontal dimension of a table composed of a set of columns containing one data item each.
2. A horizontal group of cells in a grid, or pixels in an image.

route
In GPS, the consecutive ordered points that are used for linear or areal calculations.

rubber sheeting
A procedure to adjust coverage features in a non-uniform manner. Links representing from- and to- locations are used to define the adjustment.

run-length encoding
A data compression technique for storing raster or gridded data. Run-length encoding stores data by row. If two or more adjacent cells in a row have the same value, the 'run' is recorded, as opposed to recording an individual value for each cell. The more adjacent columns having the same value, the greater the compression.

S

SA
See selective availibility.

satellite image
A picture of the Earth taken from an Earth-orbital satellite. Satellite images may be produced photographically or by on-board scanners (e.g., MSS).

satellite geometry
The current position and movement of GPS satellites relative to each other and to a particular GPS receiver.

scale
See map scale.

scale bar
A map element that shows the map scale graphically.

scanning
The process of capturing data in raster format with a device called a scanner. Some scanners also use software to convert raster data to vector data.

SDTS/TVP
Spatial Data Transfer Standard/Topological Vector Profile. A United States Federal standard designed to support the transfer of different types of geographic and cartographic spatial data. This standard specifies a structure and content for spatially referenced data in order to facilitate data transfer between dissimilar spatial database systems. TVP addresses a wide variety of vector data types, models, and structures, as well as associated attribute data. Also known as Federal Information Processing Standard (FIPS) 173.

selective availability (SA)
The policy and procedure of denying to most nonmilitary GPS users the full accuracy of the system. SA is achieved by dithering the satellite clock and degrading the navigation message ephemeris. The effects can be removed with encryption keys. The error in position caused by SA can be up to 100 meters, but differential GPS techniques can eliminate most of the errors introduced by SA.

SEP
See spherical error probability.

shapefile
Vector file format developed by ESRI and originally used by ArcView. This data model features distinct polygon structure and does not support topography. A shapefile is actually composed of a group of files. The minimum number required to define a shapefile is 3, with file extensions .shp, .shx, and .dbf.

signal to noise ratio (SNR)
Also called signal level. An arbitrary unit used to describe the strength of a satellite signal. SNR ranges from 0 (no signal) to around 35. Higher-elevation satellites have SNRs in the high teens to low 20s. SNRs lower than 4 are considered unusable. See also SNR Mask.

single precision
Refers to a level of coordinate accuracy based on the number of significant digits that can be stored for each coordinate. Single-precision numbers store up to 7 significant digits for each coordinate, retaining a precision of 5 meters in an extent of 1,000,000 meters.

sliver polygon
A small areal feature commonly occurring along the borders of polygons following the topological overlay of two or more coverages.

slope
A measure of change in surface value over distance, expressed in degrees or as a percentage. For example, a rise of 2 meters over a distance of 100 meters describes a 2% slope with an angle of 1.15. Mathematically, slope is referred to as the first derivative of the surface.

snapping
The process of moving a feature to coincide exactly with coordinates of another feature within a specified snapping distance, or tolerance.

SNR
See signal-to-noise ratio.

SNR Mask
The lowest signal strength at which a receiver will use a satellite for positioning.

spatial analysis
The process of modeling, examining, and interpreting model results. Spatial analysis is useful for evaluating suitability and capability, for estimating and predicting, and for interpreting and understanding. There are four traditional types of spatial analysis: topological overlay and contiguity analysis, surface analysis, linear analysis, and raster analysis.

spatial data
Information about the location and shape of, and relationships among, geographic features, usually stored as coordinates and topology.

spatial feature
See geographic feature.

spatial modeling
Analytical procedures applied with a GIS. There are three categories of spatial modeling functions that can be applied to geographic features within a GIS: (1) geometric models, such as calculating the Euclidean distance between features, generating buffers, calculating areas and perimeters, and so on; (2)coincidence models, such as topological overlay; and (3) adjacency models (pathfinding, redistricting, and allocation). All three model categories support operations on spatial data such as points, lines, polygons, tins, and grids. Functions are organized in a sequence of steps to derive the desired information for analysis.

spatial query
See map query.

spherical error probability (SEP)
A statistical measure of precision defined as the 50th percentile value of the three-dimensional position error statistics. Thus, half of the results are within a 3-D SEP value. See CEP.

spheroid
Mathematical figure closely approaching the geoid in form and size and used as a reference for geodetic surveys and subsequent mapping. The reference spheroid (also called the ellipsoid) is a spheroid determined by revolving an ellipse around its shorter (polar) axis. Until 1980, no one spheroid fit the geoid well in all parts of the world; therefore, different ellipsoids were preferred in different areas. Today, GRS (Geodetic Reference System) 80 has been accepted as the best worldwide fit to the geoid.

spike
1. An overshoot line created erroneously by a scanner and its rasterizing software.
2. An anomalous data point that protrudes above or below an interpolated surface representing the distribution of the value of an attribute over an area.

spline
A mathematical curve used to smoothly represent spatial variation. A spline operation inserts vertices to create a curve in an arc.

SPOT
Systeme Pour l'Observation de la Terre. A large scale international space remote sensing program originating in France. SPOT has developed into a large-scale international program with ground receiving stations and data distribution outlets in more than 30 countries. SPOT was the first system to use linear array sensors and pushbroom scanning techniques. It was also the first to use pointable optics.

SSURGO
Soil SURvey Geographic database. Digital representation of standard NRCS soil survey information. Data is distributed as a full coverage of the soil survey area and by individual 7.5' quad at the 1:24000 scale. Data set consists of map data, attribute data, and metadata in modified DLG or ARC file formats. SSURGO data is not suitable for site-specific or precision farming applications.

state plane coordinates
Special definitions of the Transverse Mercator and Lambert Conformal map projections adopted by statute in the USA. There is one set of such zones for the NAD-27 datum and another for NAD-83.

STATSGO
STATe Soil Geographic database. Soil maps which are more generalized than detailed soil survey maps or SSURGO data, distributed as complete state coverage at 1:250,000 scale. Used for river basin, state and multi- county planning purposes.

striping
An artifact common in raster data such as DEMs. Multispectral scanners that sweep multiple scan lines simultaneously often produce data containing systematic striping or banding.

subbasin
8-digit hydrologic unit delineated for the nation by USGS. Commonly used as a clip boundary.

subregion
4-digit hydrologic unit delineated for the nation by USGS. Commonly used as a clip boundary.

subwatershed
14-digit hydrologic unit. The size of each unit is approximately 10,000 to 40,000 acres. In some cases, the subwatershed can be as small as 3,000 acres. May be used as a clip boundary for large scale data sets.

surface
A geographic phenomenon represented as a set of continuous data, such as elevation or air temperature over an area. A clear or sharp break in values of the phenomenon (breaklines) indicates a significant change in the structure of the phenomenon (e.g., a cliff), not a change in geographic feature. Surfaces can be represented by models built from regularly or irregularly spaced sample points on the surface.

surface model
Digital abstraction or approximation of a surface. Because a surface contains an infinite number of points, some subset of points must be used to represent the surface. Each model contains a formalized data structure, rules, and x,y,z point measurements that can be used to represent a surface.

SV
Abbreviation for satellite vehicle or space vehicle. Each GPS satellite is an SV.

symbol
A graphic pattern used to represent a feature.

T

table
A set of data elements that has a horizontal dimension (rows) and a vertical dimension (columns) in a relational database system. A table has a specified number of columns but can have any number of rows. A table is often called a relation. Rows stored in a table are structurally equivalent to records from flat files in that they must not contain repeating fields.

template
1. A coverage containing common feature boundaries, such as land-water boundaries, for use as a starting place in automating other coverages. Templates save time and increase the precision of topological overlays.
2. A map composition template containing neatlines, North arrow, logos, and other cartographic map elements.
3. An empty tabular data file containing only item definitions.

terabyte, Tb
A measure of data size. A terabyte of data is equivalent to 1,000 gigabytes, or one trillion bytes of data.

theme
1. The overall topic of a map layer in which the spatial variation of a single phenomenon is illustrated (e.g., classified vegetation, shaded relief, landuse, land ownership)
2. A user-defined perspective on a coverage, grid, tin or image geographic data set specified, if applicable, by a coverage name and feature class or data set name, attributes of interest, a data classification scheme, and theme-specific symbology for drawing.

thematic data
See descriptive data.

tic
Registration or geographic control points for a coverage representing known locations on the Earth's surface. Tics allow all coverage features to be recorded in a common coordinate system (e.g., Universal Transverse Mercator [UTM] meters or State Plane feet). Tics are used to register map sheets when they are mounted on a digitizing tablet and to transform the coordinates of a coverage (e.g., from digitizer units [inches] to UTM meters).

TIFF
Tagged interchange (image) file format. An industry-standard raster data format. TIFF supports black-and-white, gray-scale, pseudocolor, and true-color images, all of which can be stored in a compressed or uncompressed format. TIFF is commonly used in desktop publishing and serves as an interface to numerous scanners and graphic arts packages.

TIGER
The Topologically Integrated Geographic Encoding and Referencing data format used by the U.S. Census Bureau to support census programs and surveys. It was used for the 1990 census. TIGER files contain street address ranges along lines and census tractlblock boundaries. This descriptive data can be used to associate address information and census/demographic data with coverage features.

tile
The spatial unit by which geographic data is organized, subdivided, and stored in a map library. Tiles subdivide the area covered by a map library and organize the library data by location (e.g., counties might be the tiles in a statewide database). A tile can be a regular, geometric shape (e.g., a map sheet), or an irregular shape, such as a county boundary.

tin
Triangulated irregular network. A surface representation derived from irregularly spaced sample points and breakline features. The tin data set includes topological relationships between points and their neighboring triangles. Each sample point has an x,y coordinate and a surface, or z-value. These points are connected by edges to form a set of non-overlapping triangles used to represent the surface.

to-node
Of an arc's two endpoints, the one last digitized. See also from-node.

topographic map
1. A map containing contours indicating lines of equal surface elevation (relief), often referred to as topo maps.
2. Often used to refer to a map sheet published by the U.S. Geological Survey in the 7.5-minute quadrangle series or the 15-minute quadrangle series.

topological overlay
An analysis procedure for determining the spatial coincidence of geographic features.

topology
The spatial relationships between connecting or adjacent coverage features (e.g., arcs, nodes, polygons, and points). For example, the topology of an arc includes its from- and to-nodes, and its left and right polygons. Topological relationships are built from simple elements into complex elements: points (simplest elements), arcs (sets of connected points), areas (sets of connected arcs), and routes (sets of sections, which are arcs or portions of arcs). Redundant data (coordinates) are eliminated because an arc may represent a linear feature, part of the boundary of an area feature, or both. Topology is useful in GIS because many spatial modeling operations don't require coordinates, only topological information. For example, to find an optimal path between two points requires a list of the arcs that connect to each other and the cost to traverse each arc in each direction. Coordinates are only needed for drawing the path after it is calculated.

track
To make a pseudo range measurement of a GPS satellite.

transformation
The process that converts coordinates from one coordinate system to another through translation, rotation, and scaling. ARC/INFO supports these transformations: similarity, affine, piecewise linear, projective, NADCON datum adjustment using minimum-derived curvature transformation, and a polynomial transformation to warp grids and images.

tuple
A row in a relational table; synonymous with record, observation.

triangulated irregular network
See tin.

U

undershoot
An arc that does not extend far enough to intersect another arc. See also dangling arc.

union
A topological overlay of two polygonal spatial data sets which preserves features that fall within the spatial extent of either input data set; that is, all features from both coverages are retained.

universal time coordinated (UTC)
The time scale based on the atomic second but occasionally corrected, by the insertion of leap seconds, to keep it approximately synchronized with the Earth's rotation.

universe polygon
The first record in a polygon attribute table. It represents the area beyond the outer boundary of the coverage. In ARC/INFO it's the only polygon that never has a label point, and so has a User-ID value of 0. Its area equals the negative sum of all the polygons in the coverage. Also referred to as the external polygon.

USNMAS
U.S. National Map Accuracy Standards. Accuracy standards for published maps in English units defining measurements for horizontal and vertical accuracy. It is described in absolute terms; however, it is not described in statistical terms and some inconsistencies have been noted, thereby making it unusable for engineering mapping (large-scale mapping), and is not convenient to use in conjunction with mapping from space (remote sensing).

US survey foot
Defined as 1200/3937 meters. The official unit of linear measure for the NAD-27 datum.

UTM
The Universal Transverse Mercator Map projection. A special case of the Transverse Mercator projection. Abbreviated as the UTM grid it consists of 60 North-South zones, each 6 degrees wide in longitude.

V

vector
Data type comprised of x-y coordinate representations of locations on the earth that take the form of single points, strings of points (lines or arcs) or closed lines (polygons) known as features. Each feature has an associated attribute code for identification. Data can be converted to raster data through a process know as rasterization.

vectorize (vectorization)
Conversion of raster data to vector data.

vector models
Points, lines, and polygons can be stored in coverages, shapefiles, or geodatabases.

vertex
One of a set of ordered x,y coordinates that constitutes a line.

W

watershed
11-digit hydrologic unit. The size of each unit is approximately 40,000 to 250,000 acres. Commonly used as a clip boundary.

waypoint
A GPS point which can be given a name and location either prior to fieldwork or in the field. Waypoints are useful for navigation purposes an can be used as a reference for a particular site. This makes returning to the same site possible at a later date.

WGS-84
A set of parameters, established by the U.S. Defense Mapping Agency, for determining geometric and physical geodetic relationships on a global scale. The system includes a geocentric reference ellipsoid; a coordinate system; and a gravity field model.

X

X Windows
A system developed at MIT that allows applications to be displayed in windows and shared among different workstations and terminals.

Y

Y-code
The encrypted P-code.

Z

z-value
The value of a surface at a particular x,y location (e.g., elevation). Often referred to as spot values or spot elevations.

zoom
To enlarge and display greater detail of a portion of a geographic data set.