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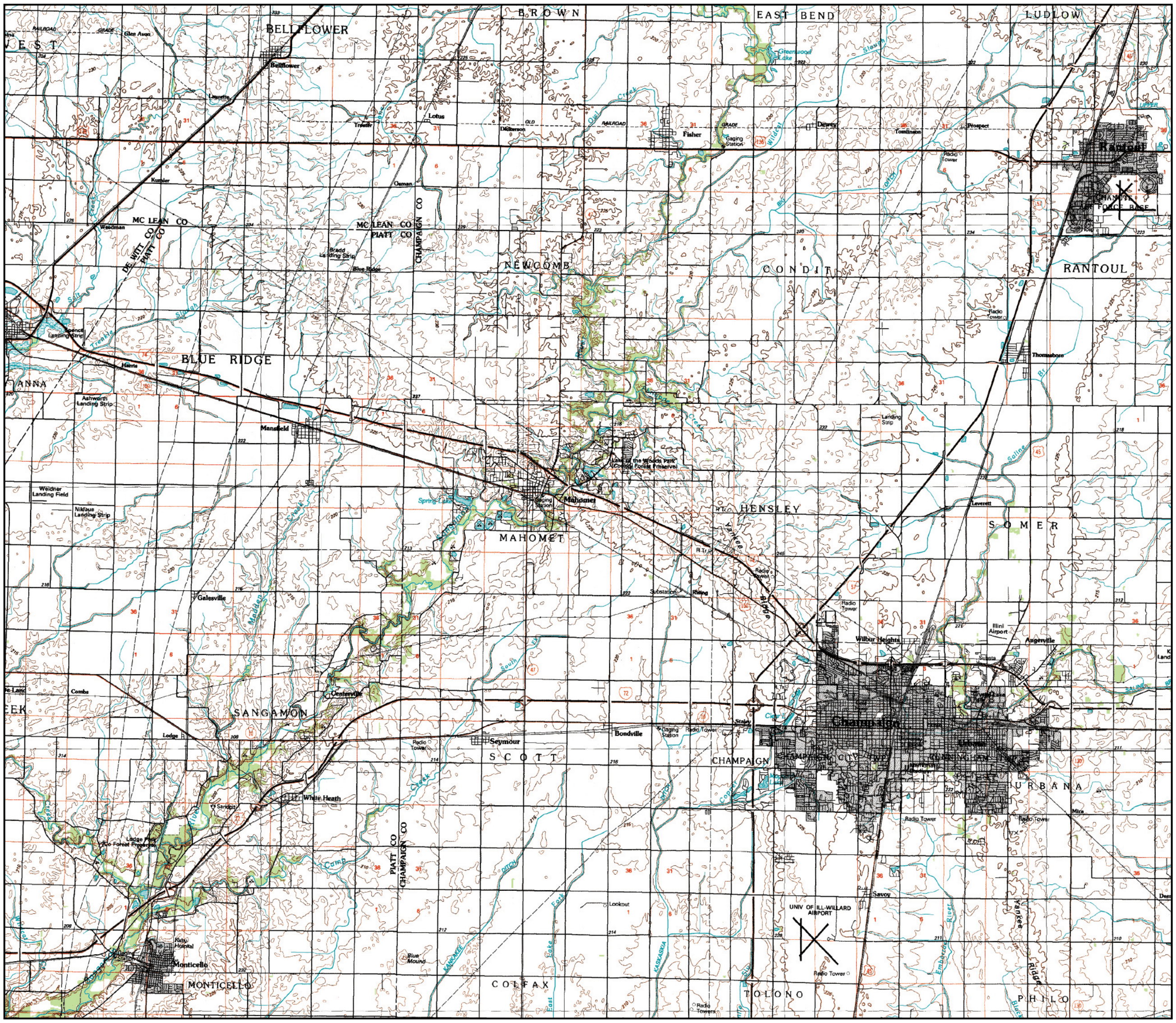
Illinois Department of Natural Resources
Illinois State Geological Survey

How to Read Illinois Topographic Maps



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Cover photo: Topographic map, Champaign-Urbana, Illinois, and surrounding area.

Originally published in 1972 as Guide to the Use of Illinois Topographic Maps, William E. Cote, author. Revised in 1978 by Myrna M. Killey, Paul B. DuMontelle, and David L. Reinertsen. Further revised in 2005 by Joel A. Steinfeldt, Frederick J. Blanford, Troy J. Simpson, Wayne T. Frankie, and Myrna M. Killey. The careful reviews of C.P. Weibel, C.J. Stohr, and D.O. Nelson are gratefully acknowledged.

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Illinois Department of Natural Resources
ILLINOIS STATE GEOLOGICAL SURVEY
William W. Shilts, Chief
Natural Resources Building
615 E. Peabody Drive
Champaign, IL 61820-6964
217-333-4747
www.isgs.uiuc.edu

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INTRODUCTION

Topographic maps show the configuration of the land surface (topography) by a system that uses contour lines to indicate the elevation of land features. The maps also show surface waters such as rivers, lakes, and swamps and man-made features such as roads, dams, canals, railroads, houses, and factories.

Topographic maps have many uses. They may, for example, be used to plan hiking trips or to find slopes suitable for sledding, in-line skating, or off-road biking. Anglers and hunters use topographic maps to find good fishing and hunting spots. Planners use them to site facilities and for road construction. Scientists use topographic maps for many purposes, including interpretation of the landscape.

This guide discusses the use of standard 7.5-minute topographic quadrangle maps published by the United States Geological Survey (USGS). Current topographic maps for specific areas may be purchased from the Illinois State Geological Survey (ISGS) at 615 East Peabody Drive, Champaign, IL 61820-6964. The phone number is (217) 333-4747. The ISGS *Index to Topographic Maps of Illinois* aids map selection and includes ordering instructions and price information for topographic maps and other map series. Inquiries about general map information should be directed to the ISGS Public Information Office. More information about mapping and the ISGS can be found online at www.isgs.uiuc.edu.

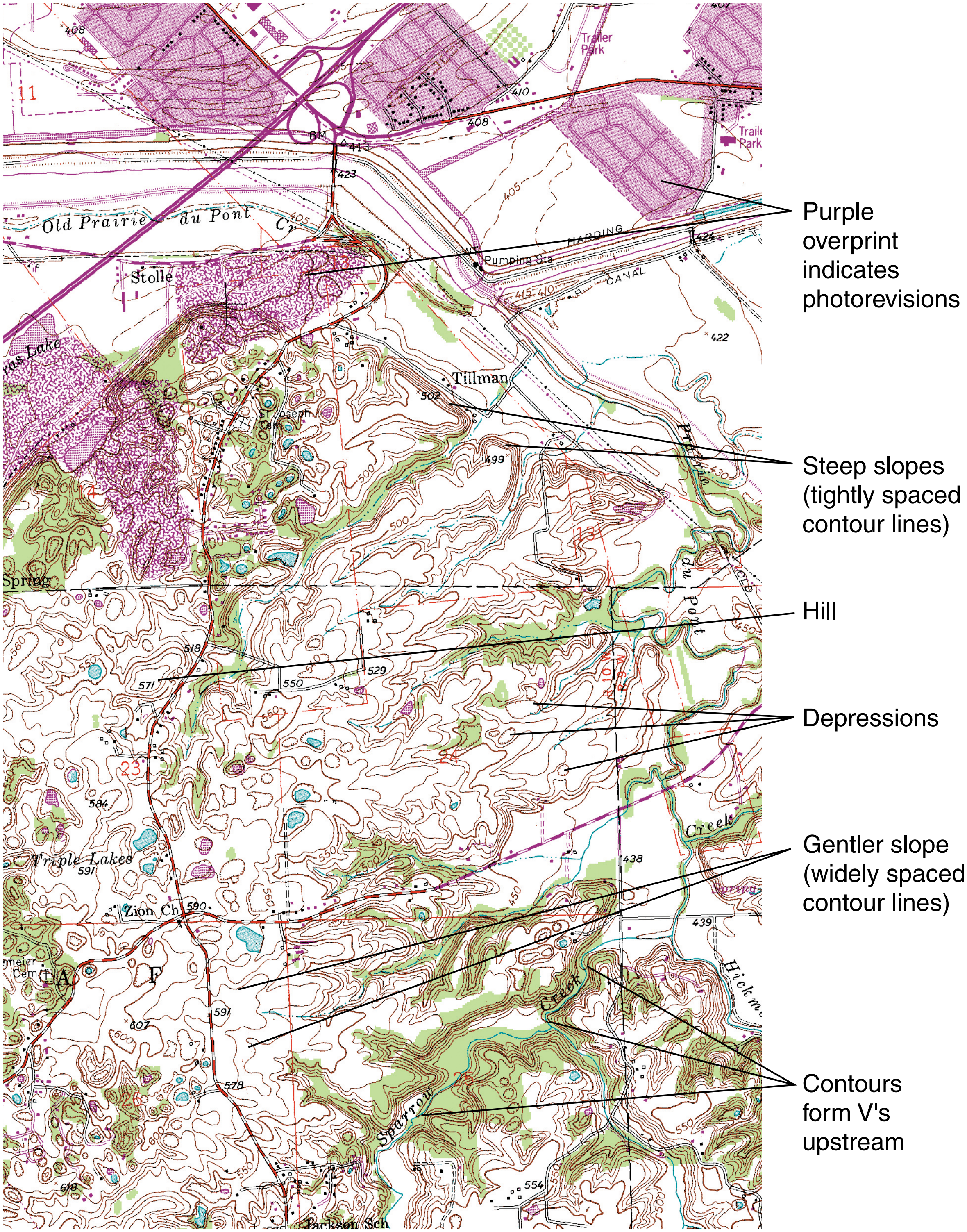
The annotated bibliography at the end of this document provides more advanced information about the use of topographic maps. Publications regarding the interpretation of the landscape through the study of landforms and the processes that created them are also listed.

GENERAL INFORMATION

A map represents on a flat surface all or a part of the Earth's surface and its features drawn to a specific scale. Maps show the shape, size, and location of natural and man-made features and the relationships of these features to one another. Like pictures, maps readily show information that would be impractical to express in words. Imagine, for example, how difficult it would be to describe the shape of Illinois.

For most USGS topographic maps, the land area depicted is a quadrangle. A 7.5-minute quadrangle is a rectangular shape that covers about 55 to 59 square miles, or 7.5 minutes of latitude and longitude. Quadrangle maps are published at the scale of 1:24,000 (1 inch on the map represents 24,000 inches, or 2,000 feet, on the ground).

All of Illinois is topographically mapped in the 7.5-minute quadrangle series. Periodically these topographic maps are revised, primarily to show cultural changes such as the construction of roads and buildings. Aerial photographs are used to revise the maps, which are labeled as photorevised, and the changes are shown by purple overprint (fig. 1). The USGS issues a series of corrected aerial photographs in 7.5-minute format that also is available from the ISGS.



Contour interval 10 feet.

Figure 1 *Features commonly depicted on topographic maps are shown on a section of the Cahokia Quadrangle in southwestern Illinois.*

SYMBOLS AND COLORS

A standard system of symbols and colors is used to illustrate topographic map features. Some of the more common symbols and colors are shown in figure 2. A comprehensive list of USGS symbols appears in *Part 6 Publication Symbols Standards for 1:24,000- and 1:25,000-Scale Quadrangle Maps* and online at http://mac.usgs.gov/mac/isb/pubs/booklets/symbols/index.html.

CONTOURS	**SURFACE FEATURES**
Topographic	Levee
Index	Sand, dunes, or shifting sand
Intermediate	Intricate surface area
Supplementary	Gravel beach or glacial moraine
Depression	**ROADS AND RELATED FEATURES**
LAND SURVEY SYSTEMS	Primary highway
U.S. Public Land Survey System	Secondary highway
Township or range line	Light duty road
Location doubtful	Unimproved road
Section line	Bridge
BOUNDARIES	**VEGETATION**
National	Woods
State	Scrub
County or equivalent	Orchard
Incorporated city or equivalent	**RIVERS, LAKES, AND CANALS**
Park, reservation, or monument	Intermittent stream
BUILDINGS AND RELATED FEATURES	River; stream
Building	Disappearing stream
School; church	Perennial lake; intermittent lake or pond
Campground; picnic area	Dry lake
Cemetery: small; large (Cem)	Well or spring; spring or seep
MINES AND CAVES	**RAILROADS AND RELATED FEATURES**
Cave	Standard gauge single track; station
Quarry or open pit mine	Standard gauge multiple track
Gravel, sand, clay, or borrow pit	**TRANSMISSION LINES AND PIPELINES**
SUBMERGED AREAS AND BOGS	Power transmission line: pole; tower
Marsh or swamp	Telephone line

Figure 2 *Common symbols and colors used on USGS topographic quadrangle maps.*

MAP MARGINS

The margins of USGS topographic maps contain much useful information. The mapped quadrangle's name, taken from a city, town, or prominent natural feature within the quadrangle's boundaries, is given in the margin, as are the names of adjoining quadrangles (fig. 3). The margins contain the date the map was made, the map scale, the projection, the quadrangle's orientation and location, the agency that prepared the map, and other facts.

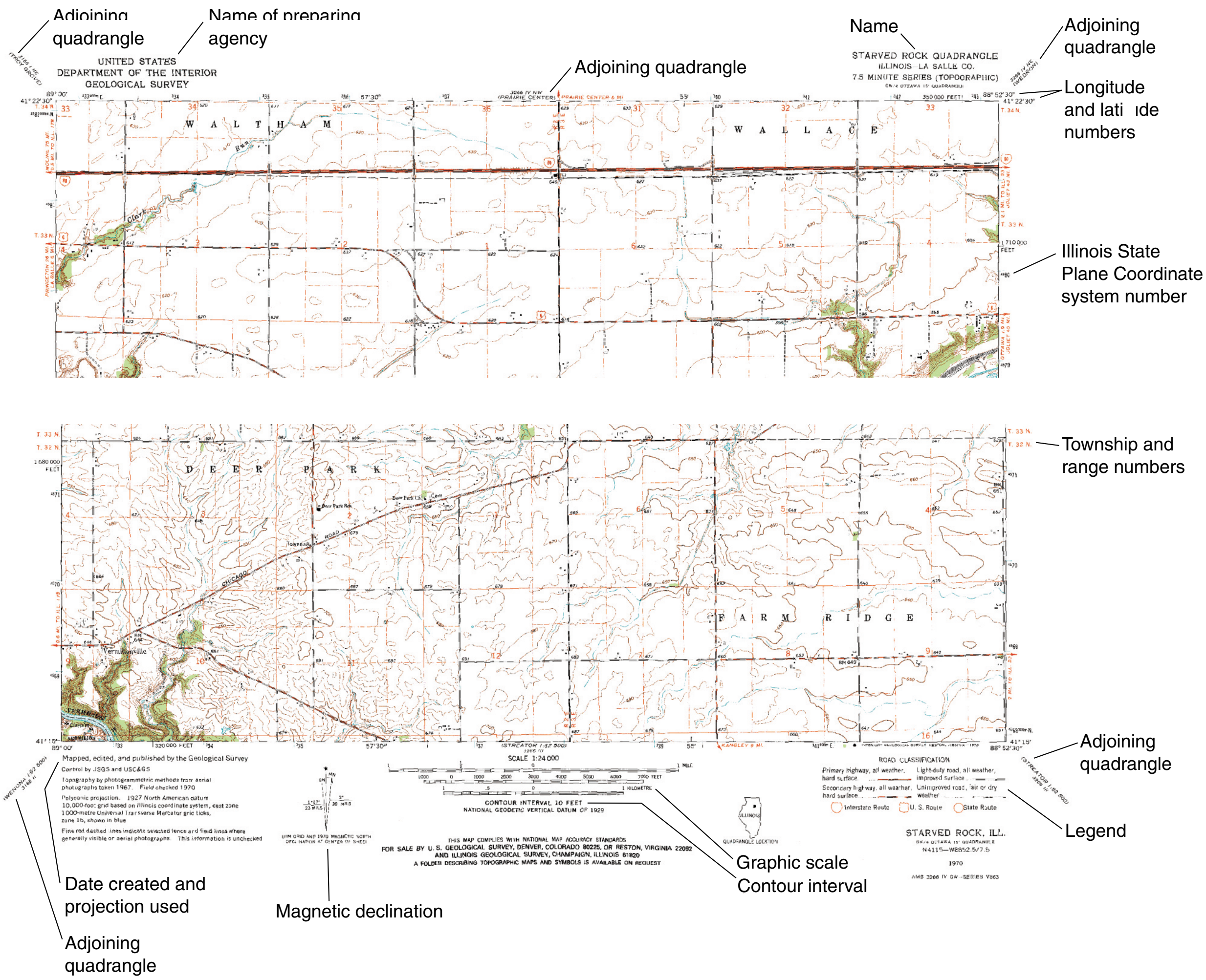


Figure 3 *Information found in the margins of USGS topographic quadrangle maps.*

Topographic maps also have a graphic scale, or bar scale, along the map margin (fig. 4). The graphic scale consists of a bar divided into segments, each of which represents an equal distance on the map. The segment on the left of the bar scale usually is divided into smaller equal units than the right side to make it easier to measure smaller distances. The bar scale is especially convenient when the user does not have a ruler or measuring scale; the map distance between two points can be transferred to the edge of a card or paper, which then can be used to make distance measurements on the bar scale.

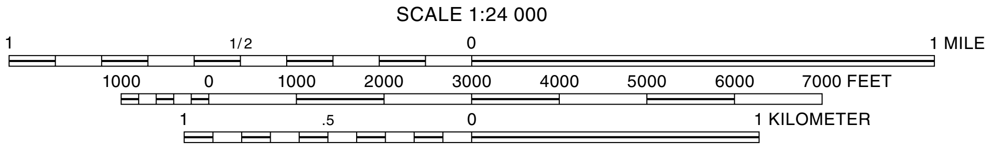


Figure 4 *Graphic scale for a 1:24,000-scale map.*

MAP SCALE

Map scale expresses the mathematical relationship between a distance measured on a map and the same distance measured horizontally on the ground. This relationship generally is expressed as a ratio or a fraction—for example, 1:24,000 or 1/24,000, which means that a unit (such as 1 inch) measured on the map represents 24,000 of that same unit measured on the ground. In other words, 1 inch on the map represents 24,000 inches, or 2,000 feet, on the ground.

A 1:100,000-scale topographic map (5/8 inch on the map represents about 1 mile) cannot show as much detail as a 1:24,000-scale map, because the 1:100,000-scale map represents 32 times more surface area on a map sheet that is only slightly larger than the sheet for a 1:24,000-scale map. In other words, more detail, but less land area, is shown on a larger-scale map. Less detail, but more land area, is shown on a smaller-scale map (fig. 5).

At one point, the USGS published maps with the contours plotted in meters instead of feet, but that practice has ended. No maps were published with contour lines plotted in both meters and feet.

MAP ORIENTATION

North is represented as the direction toward the top of a USGS quadrangle map, and east is shown toward the right. The top and bottom map boundaries are parallels of latitude, and the right and left boundaries are meridians of longitude (fig. 3). In addition to outlining the mapped area, these boundaries also locate the area’s position on the Earth.

Meridians are oriented toward geographic north (true north), not magnetic north, which is the direction in which a compass needle points (fig. 6). The difference between true north and magnetic north is called magnetic declination. True north, magnetic north, grid north, and magnetic declination are given in the lower margin of a quadrangle topographic map (fig. 3). The magnetic declination is given for the year the map was created and is suitable only for the mapped area in that year. Updated declination information is available from the USGS. When working in the field with topographic maps, a geologist uses true north as the principal reference direction. In order to plot information on the map in terms of true north, geologists must compensate their compass readings by the angle of magnetic declination for the area in which they are located.

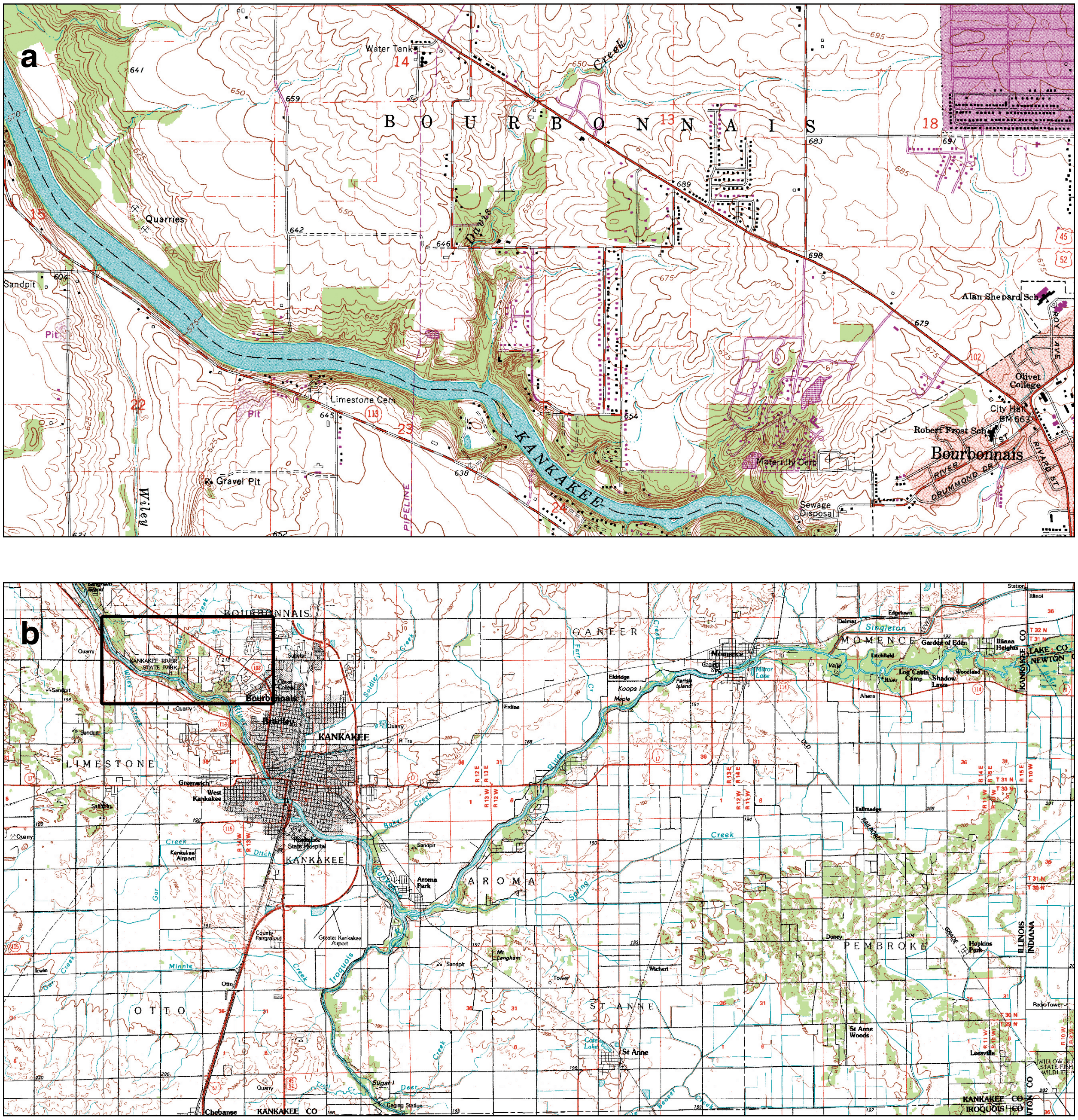


Figure 5 An area near the Kankakee River in Illinois is shown on the 1:24,000-scale map (a). The same area, indicated with a black outline, is shown on a 1:100,000-scale map (b). More detail, but less land area, is shown on the larger-scale map (a).

Many people now use the Global Positioning System (GPS) for positioning that often is quicker and more accurate than is possible from a topographic map. GPS is a navigation system that uses orbiting satellites that transmit signal information to receiver units on Earth. By comparing the time it takes for a signal to be transmitted and received from three or more satellites, GPS receivers calculate a user's longitude, latitude, and elevation and display it on an electronic map.

LOCATING FEATURES

It is essential for the user of a topographic map to be able to locate features of interest and to describe their locations clearly. Features of interest may be areas such as lots, farmland, cities, counties, or states or points such as radio towers, well sites, schools, or surveyors' markers.

Area Descriptions

Distance and direction There are two ways to describe areas. The first is distance and direction, frequently called "metes and bounds." In this type of description, the direction and length of the area's boundary line are given from a chosen point of origin. This orientation allows the map user to follow the area's perimeter and return to the point of origin. Such descriptions may include landmarks such as rivers, mountains, or trees and are used to describe the boundaries of lots, farms, cities, counties, states, or land grants. For example, the 1818 act admitting Illinois as a state describes Illinois boundaries:

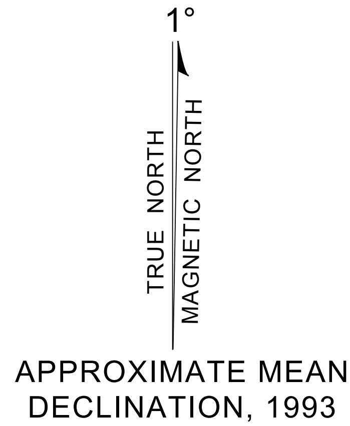


Figure 6 Magnetic declination information is given in the lower margin of a topographic map. The center line indicates geographic north. Grid north is given by the line to the left of geographic north and applies to the Universal Transverse Mercator (UTM). Magnetic north is the direction a compass needle always points. Declination from true north is usually given in mils. One mil equals 1/6,400 of 360 degrees.

". . . the said State shall consist of all the territory included within the following boundaries, to wit: Beginning at the mouth of the Wabash River; thence up the same and with the line of Indiana, to the northwest corner of said state; thence east with the line of the same state, to the middle of Lake Michigan; thence north along the middle of said lake to the north latitude forty-two degrees thirty minutes; thence west to the middle of the Mississippi River; and thence down along the middle of that river to its confluence with the Ohio River; and thence up the latter river along its northwestern shore to the beginning . . . ."

Township and range In 1785, a rectangular system of land survey was adopted to divide all newly settled U.S. territories. By this system, commonly referred to as the township and range system, 29 current states in the central and western United States were divided into a network of townships 6 miles square, or 36 square miles in area (figs. 7 and 8). Reference lines, called base lines and principal meridians, also were established. In Illinois, there are two base lines and two principal meridians (fig. 9). In addition, part of eastern Illinois was surveyed from the Second Principal Meridian, which is located in Indiana.

The top and bottom boundaries of a township are called township lines; the east and west boundaries are called range lines. Starting from the intersection of a base line and a principal meridian, the strips of territory between township lines were numbered consecutively toward the north and south; the strips of territory between range lines were numbered consecutively toward the east and west (figs. 7 and 8).

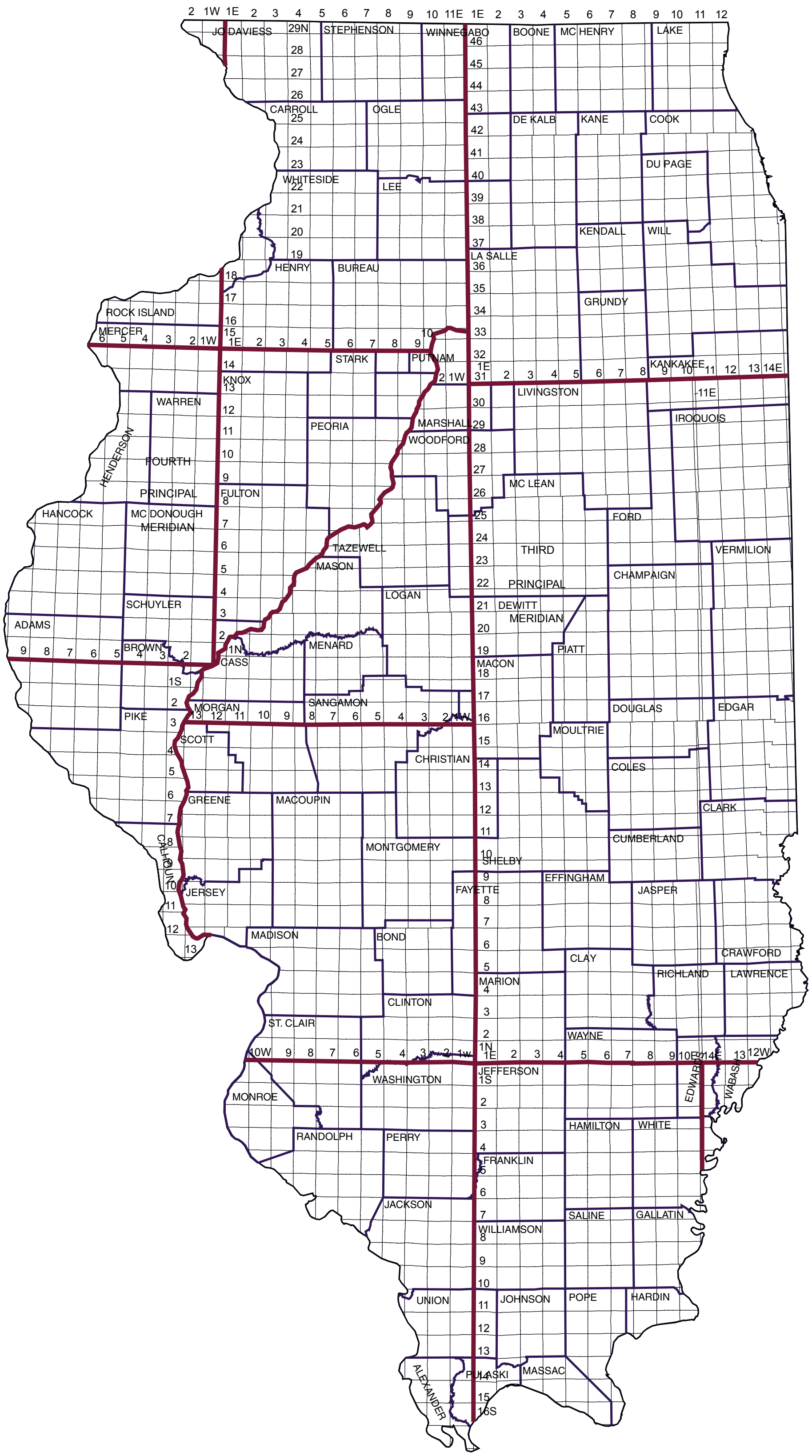


Figure 7 *An index map of counties, townships, and ranges for Illinois.*

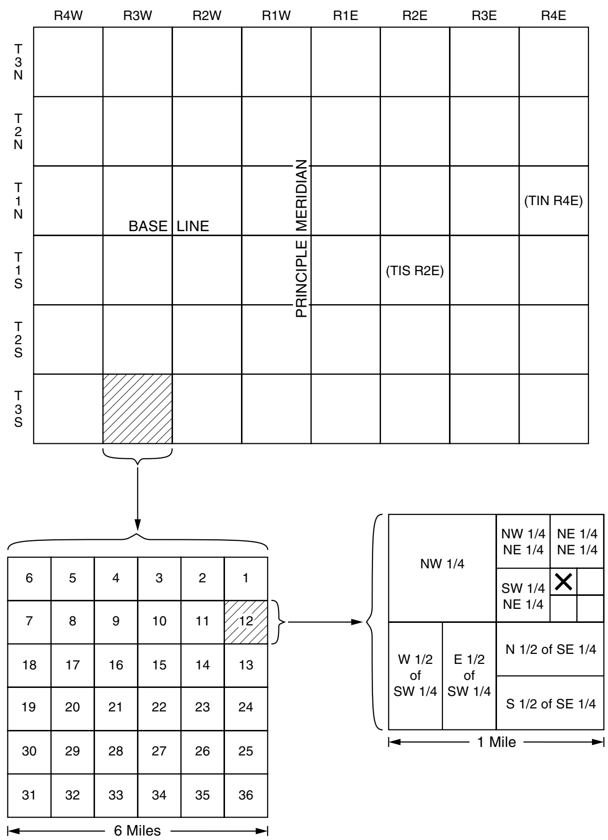


Figure 8 *Subdivision of land by township, range, and section.*

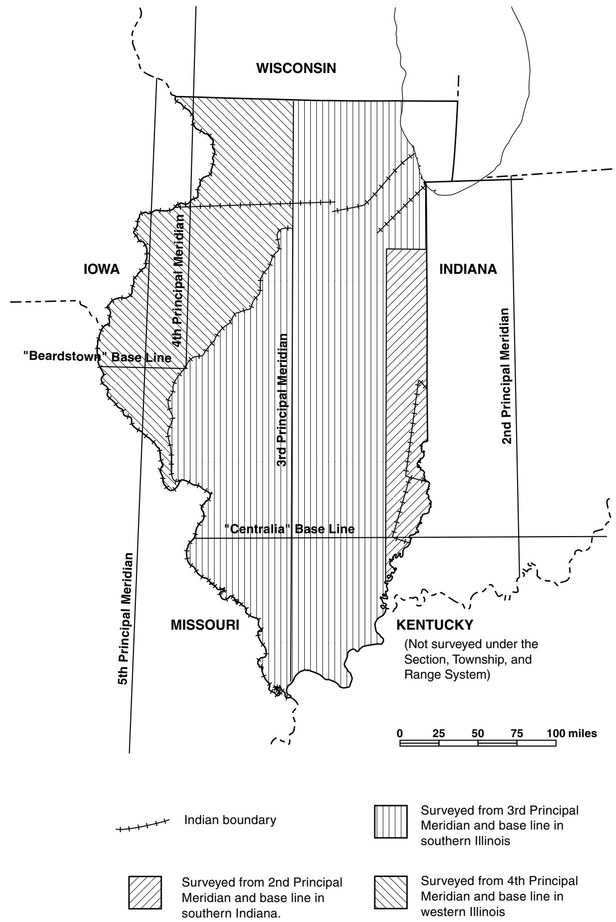


Figure 9 *Principal meridians and base lines of Illinois and surrounding states.*

Therefore, each township is designated by two numbers, a township number and a range number. For example, the first township north and east of the intersection of a base line and a principal meridian is designed as Township 1 North, Range 1 East. In practice, this designation is abbreviated as T1N, R1E (often shown with periods). Farther northward the townships are designated T2N, R1E; T3N, R1E; and so forth. On many topographic maps, township and range numbers are printed in red or black along the map boundaries. The numbers also are printed next to the township and range lines within the map.

The township and range system permits the accurate identification of most parcels of land in Illinois. In the early 1800s, each normal township was divided to the best of the surveyor's ability into 36 sections (each section shown in fig. 8). On quadrangle maps, section numbers are printed in red or in black. Each section can be subdivided into halves, quarters, quarter-quarters, and even quarter-quarter-quarters to locate features or parcels of land. To illustrate how the township and range system is used to locate features, the location of point X in figure 8 is described as follows: northwest quarter of the southeast quarter of the northeast quarter of Section 12, Township 3 South, Range 3 West. The location of point X is abbreviated as NW¼SE¼NE¼ Sec. 12, T3S, R3W.

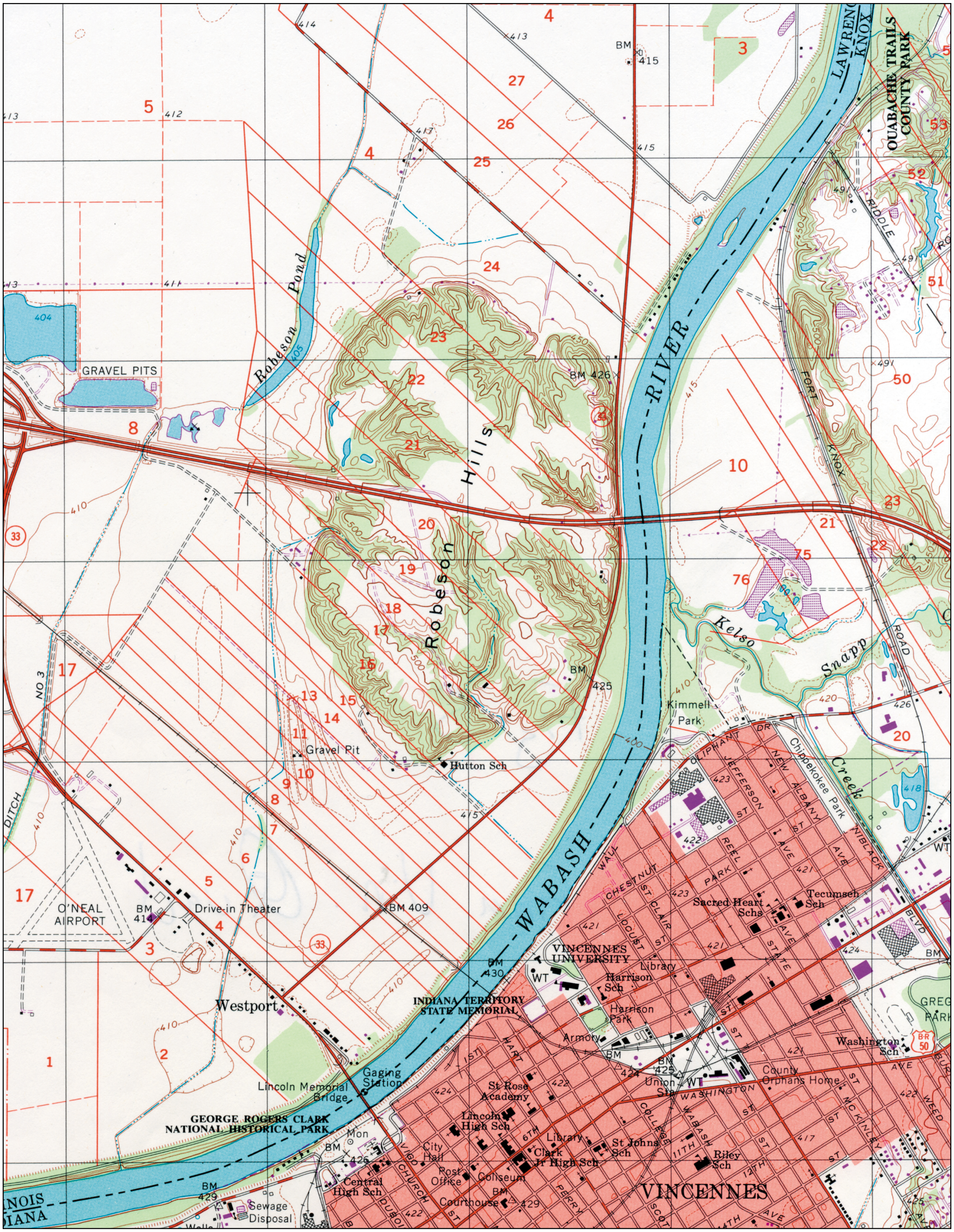


Figure 10 *A section of a topographic map of Vincennes Quadrangle in Lawrence County showing discontinuities and interruptions in the grid system in Illinois.*

Note that the township and range lines in figure 7 do not form a perfect rectangular grid over the state because different parts of Illinois were surveyed from different base lines. The most striking offsets occur along the Illinois River, because the land west of the river and west of the Third Principal Meridian north of Putnam County was surveyed from the "Beardstown" Base Line. Land east of the Illinois River and east of the Third Principal Meridian north of Putnam County was surveyed from the "Centralia" Base Line. Minor offsets, which occasionally produce irregular sections, were necessary because of the Earth's curvature. The surveyors corrected for the effects of curvature by offsetting the range lines in an east-west direction. These corrections were usually made at regular 30-mile intervals.

Imperfections in the rectangular grid also resulted where surveys from different principal meridians were joined. Figures 7 and 9 show what happened when the survey from the Second Principal Meridian in Indiana met the survey from the Third Principal Meridian in Illinois. From Iroquois County south to White County, only narrow partial townships could be made where the two surveys met. These partial townships are all located in R11E and, in most places, are less than one section wide.

Some discontinuities and interruptions can be noted in the grid system in Illinois (figs. 9 and 10). These irregularities are the result of land grants dating from the French colonization (figs. 1 and fig. 10) and old Indian treaty boundaries that were honored when the grid system was established. The old land grants are found mainly along the Wabash, Illinois, and Mississippi Rivers in southern Illinois, because these rivers were the main travel and trade routes along which settlement first occurred.

Point Descriptions

Points of interest may be located and described by using (1) physical landmarks, (2) spherical coordinates (latitude and longitude), or (3) plane coordinates.

Physical landmarks The physical landmark method is used as a point of orientation for the map user and also as the point of origin for the distance and direction system of location discussed earlier. In other words, a feature can be located on a map by its distance and compass direction, or angle, from another fixed location. The standard practice is to state the compass direction with reference to the four principal points—north, east, south, and west. Compass bearings often are measured clockwise in degrees from north and can range from 0 degrees (north) through 90 (east), 180 (south), 270 (west), to 360 (north again).

Compass bearings also can be given as a measured number of degrees (up to 90˚) east or west of north or east or west of south. Compass directions are abbreviated as N10˚E (10 degrees east of north), S60˚W, and so forth. For example, the Illinois State Geological Survey building is located 0.28 miles N70˚E of Memorial Stadium on the University of Illinois Urbana-Champaign campus. The accuracy of the landmark's location is limited and depends on the object's size. For instance, the location of a town shown as a point on a map is less precise than the location of a school in that town, and a school less precise than a surveyor's marker. Because of the great amount of area to be covered on a comparatively small piece of paper, it is helpful to remember that the width of an average pencil line on a 7.5-minute quadrangle map represents a strip approximately 40 feet wide on the ground.

Figure 11 *Longitude and latitude system for the Earth.*

Spherical Coordinates: Latitude and Longitude
The Earth's coordinate system can be used to locate features on a map quickly and accurately. Every point on the Earth's surface has a unique location with respect to latitude and longitude (fig. 11). In this system, locations are expressed as degrees north or south of the equator and east or west of the prime meridian. Accuracy may be increased by dividing each degree into 60 minutes (') and each minute into 60 seconds ("). For example, the approximate location of the Illinois State Geological Survey building is 40˚ 06' 04" N, 88˚ 13' 43" W. Regardless of the system used to describe the location of a point on a map, the precision that can be attained is determined by the map's scale and accuracy. Precision increases as map scale becomes larger. The location of the Survey building just described was from a 7.5-minute quadrangle map. It would be more difficult to locate the Survey building on a map with a smaller scale.

Due to the convergence of longitude grid lines toward the north pole, the distance of degrees changes along latitudes (an east-west direction). For example, 5 minutes of longitude (measured along latitudes in an east-west direction) near Cairo in southern most Illinois is equal to about 4.58 miles, but 5 minutes of

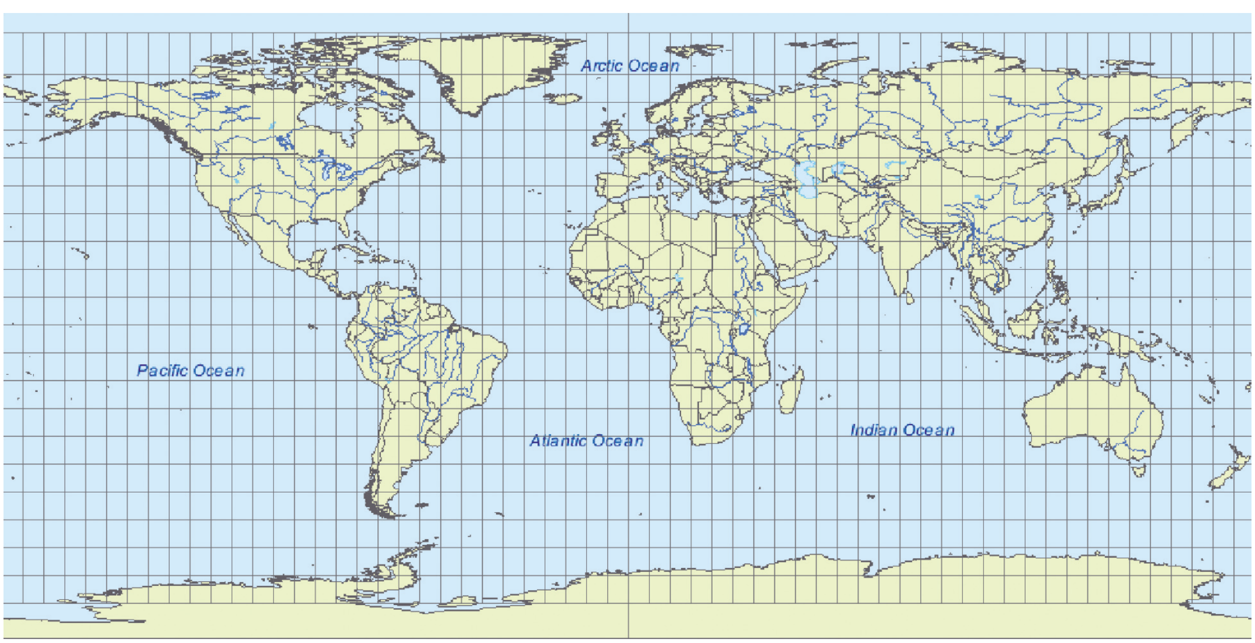


Figure 12 *Universal Transverse Mercator coordinate system.*

longitude in northern Illinois in the Chicago area is equal to about 4.26 miles—more than a quarter of a mile shorter.

As already noted, topographic maps are bounded by meridians of longitude and parallels of latitude, and the coordinates for the boundaries are given in the map margins. Usually the map boundaries are subdivided into coordinate intervals. On 7.5-minute maps, the boundaries are subdivided into 2.5-minute segments.

Plane coordinates The plane coordinate method, which is used to locate points shown on quadrangle maps, mathematically projects points such as physical landmarks and latitude-longitude intersections from a curved surface onto a flat surface. Projecting a curved surface onto a flat surface is a necessity for map-making, but the process always introduces distortions in shape, area, direction, and distance. Systematic plane coordinate systems were invented to standardize mapping of large areas while minimizing the resulting distortion.

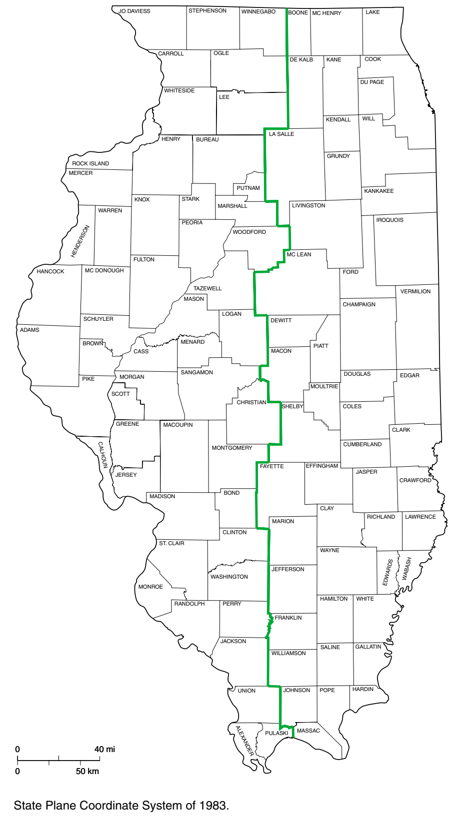


Figure 13 *State Plane Coordinate System of 1983.*

The two plane coordinate systems commonly indicated on USGS topographic maps are the Universal Transverse Mercator (UTM) system (fig. 12) and the State Plane Coordinate System (SPCS) (fig. 13), both of which are designated by grid tick marks along the margins of the topographic maps (fig. 3). Information about these systems is also found in the topographic map's margins. More information about grid systems may be found in the U.S. Coast and Geodetic Survey's *Special Publication No. 303,* included in the bibliography at the end of this document.

Universal Transverse Mercator System The grid-based UTM system is used for positioning by researchers, scientists, emergency service personnel, and members of the armed forces. The UTM system divides the Earth's surface into a grid with 60 north-south zones, each covering a strip 6 degrees wide in longitude and 8 degrees in latitude, except in the polar regions (fig. 12). Each zone is identified by a number and a north or south designation, and each has an unique origin and central meridian. Any point in a zone can be defined in terms of meters north and east of the origin. Complete UTM coordinates are given as bold, black numbers appearing at the upper left and lower right corners along the border of a 7.5-minute quadrangle map (fig. 3). The UTM grid lines are indicated on 7.5-minute USGS quadrangle maps in intervals of 1,000 meters by blue ticks in the map margins or with full grid lines (fig. 3). The meter value is shown for dashes nearest the southeast and northwest corners of the map.

State Plane Coordinate System Designed in the 1930s by the U.S. Coast and Geodetic Survey, the SPCS is individually applied to each of the 50 United States. Updated in 1983, this system divides the United States into 120 relatively small areas, called zones, in order to reduce map distortion. Like the UTM and longitude and latitude systems, the SPCS is designed to tie into the national geodetic network of more than 250,000 horizontal control stations surveyors use to determine location.

The SPCS divides large states into several zones, often along political boundaries such as county lines. For instance, Illinois is divided into the East Zone and the West Zone by a boundary that runs north and south along county borders roughly in the center of the state (fig. 13). Each zone is mapped on a projection chosen to reduce distortion. Illinois uses the *Transverse Mercator* projection.

Once a zone is projected, a coordinate system is created for the zone by establishing a false origin to the west of the zone's central meridian and south of the zone's southern edge. For Illinois, the origin is established 500,000 feet to the west outside the zone so that all the measurements based on it are positive numbers. A specific location is identified by how many feet to the east and north that location is from the false origin, the name of the state, and the zone.

Unlike the UTM grid, SPCS numbers appear only at the upper right and lower left corners as block numbers. Unlabeled SPCS tick marks are found on the outside of the map boundary, and a careful look reveals that the tick marks extend over the boundary slightly into the map area.

SHOWING THE SHAPE OF THE LAND SURFACE

On USGS topographic maps, the shape of the land surface is shown by a series of brown contours (also called contour lines). A contour on a map represents a corresponding imaginary line on the ground

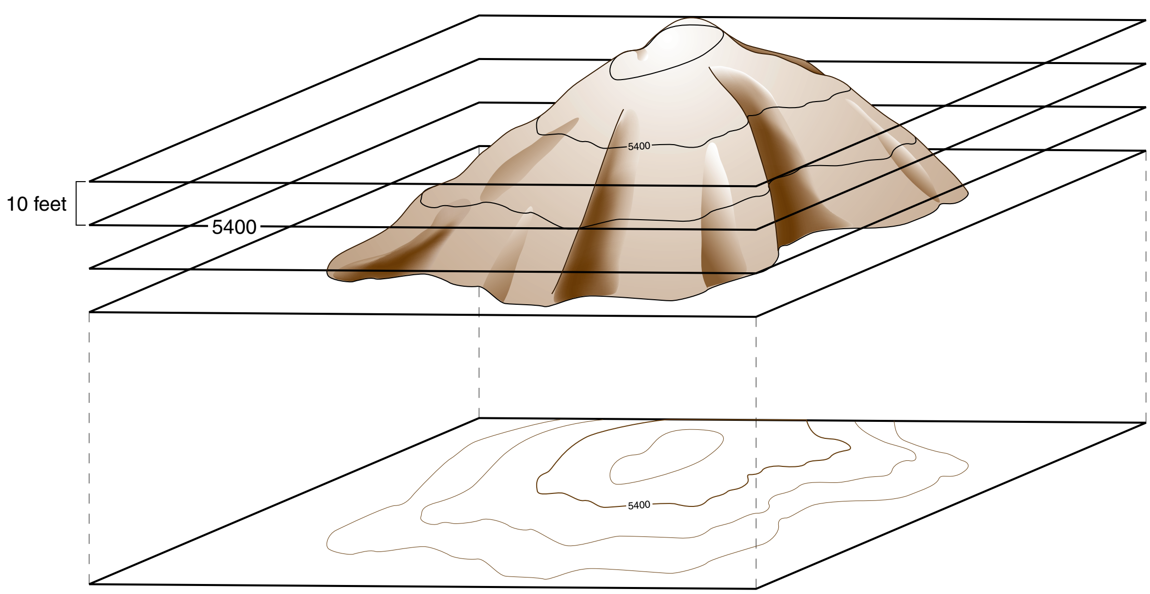


Figure 14 *A contour line represents an imaginary line on the ground that has the same elevation along its entire length. Contour interval is the vertical distance between two adjacent contour lines. The contour interval is 10 feet on this representation.*

that has the same elevation (altitude) above or below sea level along its entire length (fig. 14). A contour interval is the vertical distance between two adjacent contour lines. The contour interval is given at the bottom of the map (fig. 3).

Relief

The contours on a topographic map are used to determine relief, which is the difference in elevation between any two points. Maximum relief refers to the difference in elevation between the highest and lowest points in the area being considered. The amount of relief determines the contour interval that is used on topographic maps. A small contour interval, such as 5 or 10 feet, may be used where relief is low, such as on most topographic maps of Illinois, where relief generally is only a few tens of feet. In rugged mountainous areas, such as parts of Nevada and Colorado, where the relief is many hundreds of feet, contour intervals as large as 50 to 100 feet

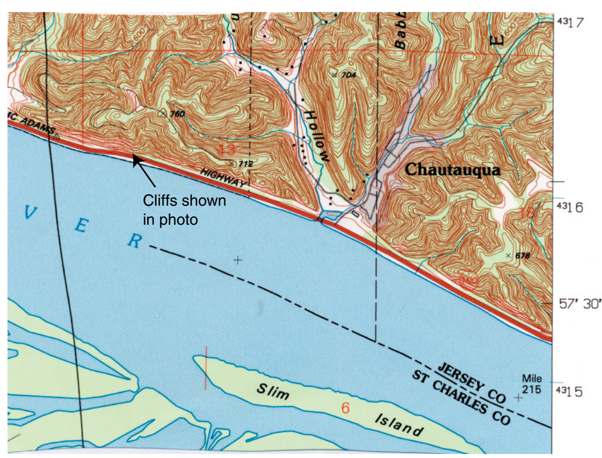
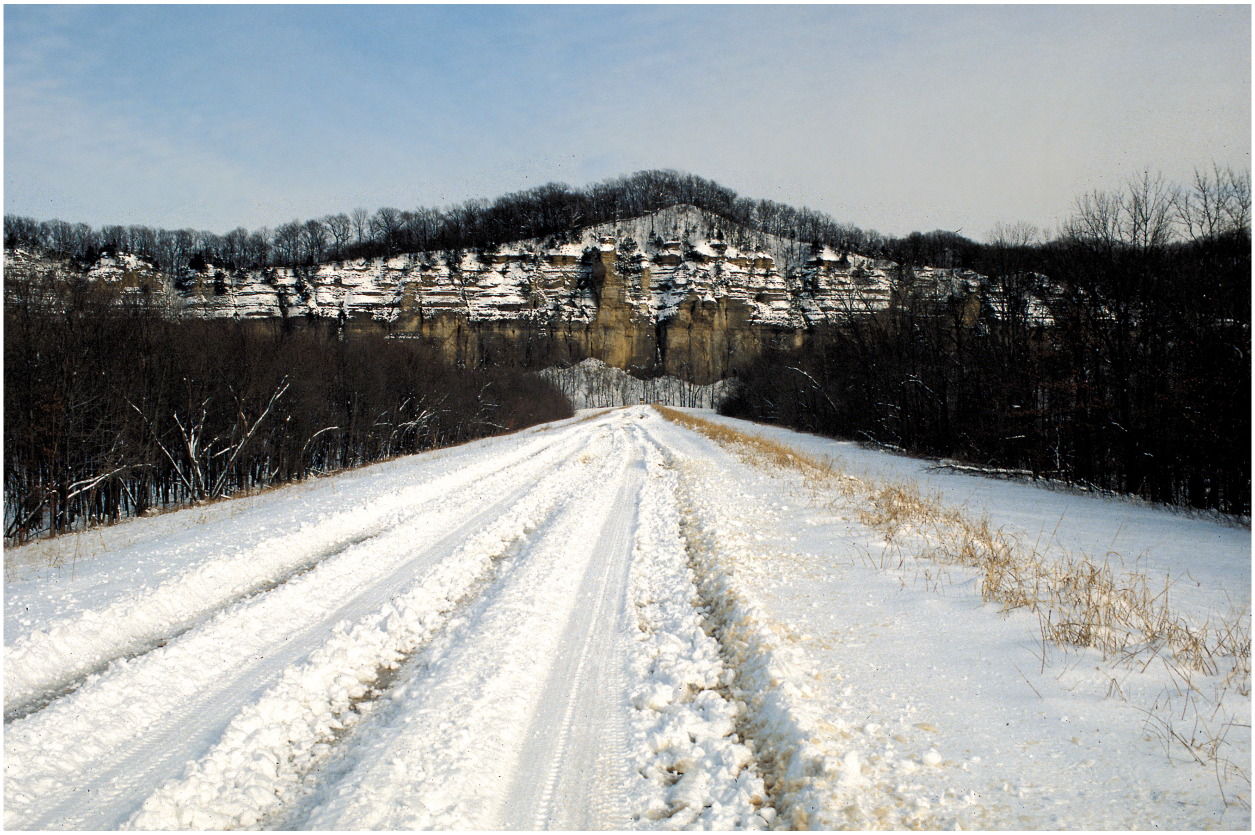


Figure 15 *Cliffs along the Mc Adams Highway are shown on this section of a topographic map of the Grafton Quadrangle in Jersey County. Contour lines run together, indicating a very steep slope. V-shaped contour lines point upstream. Successive contours represent higher elevations.*



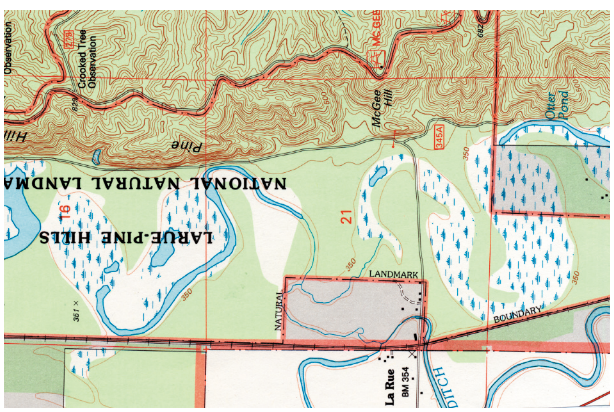


Figure 16 *Contour lines near the upper parts of hills form closures on the topographic map. Compare this photograph of the top of McGee Hill in the Shawnee National Forest in southern Illinois with its depiction on a topographic map of Wolf Lake Quadrangle in Union County. Contour lines near the upper parts of hills form closures on the topographic map.*

are used. In general, maximum relief of an area is characterized as low (0 to 250 feet), medium (250 to 500 feet), or high (more than 500 feet).

Contours

The use of contours is illustrated in figures 15, 16, and 17.

1. Contours are widely spaced on gentle slopes, closely spaced on steep slopes, evenly spaced on uniform slopes, and unevenly spaced on irregular slopes.

2. The contours on concave slopes are closer together near the tops of the slopes than near the bottoms.

3. Contours on convex slopes are closer together near the bottoms of the slopes than near the tops.

4. Contours that run together indicate a very steep or vertical slope.

5. Contours rarely cross or intersect each other. An exception would occur in the case of an overhanging cliff or a natural bridge.

6. Contour lines bend upstream and upvalley; that is, V-shaped contours point upstream. In the upstream direction, the successive contours represent higher elevations. For example, if you were standing on a stream bank and wanted to get to the point at the same elevation directly opposite on the other bank, without stepping up or down, you would need to walk upstream along the contour at that elevation to where it crosses the stream bed, cross the stream, and then walk back downstream along the same contour (fig. 1).

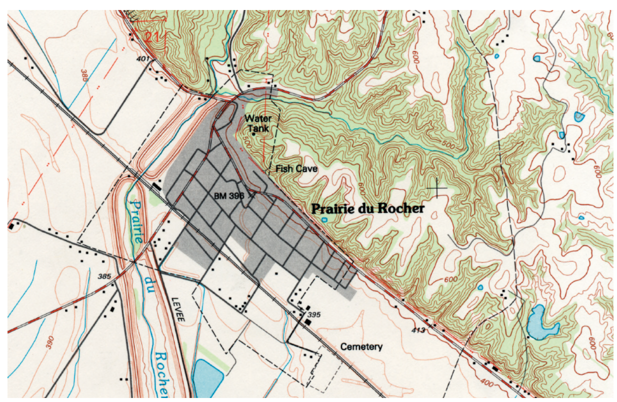


Figure 17 *Compare this photograph of the town of Prairie du Rocher and a section of the topographic map from Prairie du Rocher Quadrangle in Randoph County to see that convex slopes are closer together near the bottoms of the slopes than near the tops.*

7. Contour lines near the upper parts of hills form closures. McGee Hill in figure 16 is a good example of a closure. The top of a hill is higher than the highest closed contour line. All contour lines eventually close, either on the map or beyond its margins.

8. Depressions (low-lying areas with no outlet for surface drainage) are shown by closed hachured contours. Hachured contours have short lines on the inside pointing downslope (fig. 17, bottom center of map, and fig. 10, bottom left of map).

9. Neither the crest of a hill nor the bottom of a valley is ever shown by a single contour line.

10. A stream flows at an elevation lower than the elevation of the contour line nearest the stream.

11. Spot elevations are shown by italicized (slanted) numbers on topographic maps. Spot elevations supplement information given by contour lines. Spot elevations are shown at specific places, such as road intersections, hill summits, and lake surfaces.

12. An established benchmark, indicated on a topographic map by an X with the letters "BM" beside it, is a relatively permanent marker embedded in a fixed object that indicates a precisely determined elevation.

13. Dashed contour lines indicate half of the contour interval (fig. 10).

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GLOSSARY

base line A line extending east and west used as a reference line for establishing the township and range system of dividing the land.

benchmark A specific surveyed elevation above or below sea level at a specific point on the map, labeled as BM on the map.

concave Curved as the inside surface of a sphere.

contour interval The vertical distance between two adjacent contour lines, given on the bottom map margin.

contour line A line on the map representing a corresponding imaginary line on the ground that has the same elevation (altitude) above or below sea level along its entire length, depicted as a brown line on USGS topographic maps.

convex Curved as the exterior of a sphere.

elevation Altitude, or the height to which something is elevated above a point of reference. Mean sea level is the most common point of reference.

gradient The average slope of the land surface between two points on the map. Gradient is the difference in elevation between two points divided by the straight line distance between those two points.

latitude The north-south measurement of the Earth's coordinate system used to locate points on a map; measured in degrees, minutes, and seconds.

legend A list and brief explanation of the symbols, colors, scales, and magnetic declination of the map, often located on the bottom map margin.

longitude The east-west measurement of the Earth's coordinate system used to locate points on a map; measured in degrees, minutes, and seconds.

magnetic declination The angular difference between true north and magnetic north. Declination is usually measured in mils. One mil equals 1/6,400 of 360 degrees.

map A representation on a flat surface of all or part of the Earth's surface and its features drawn to a specific scale.

margin The area surrounding the map containing information such as the location, scale, features, and type of map; the agency that produced the map; and the date of the map.

meridian A line extending north and south used as a reference line for establishing divisions of the land.

minute Also called a minute of arc, a minute is a unit of angular measurement equal to 1/60 of a degree, or 60 seconds.

parallel One of the imaginary lines encircling the globe used to mark longitude. These equidistant lines extend in the same direction as the equator and never meet.

principal meridian The main imaginary line running north and south crossing a base line at a definite point, used to describe geographic locations.

plane coordinates The use of mathematically located tick marks on the map to locate points of interest; information on the plane coordinates is found along the map margin.

projection The representation of one thing onto another, such as a curved, three-dimensional land surface onto a two-dimensional map.

range See township and range.

relief The difference in elevation between two points; maximum relief is the difference between the highest and lowest points on a map.

scale A mathematical expression of the relationship between the distance measured on a map and the same distance measured horizontally on the ground; expressed as a ratio or a fraction (for example, 1:24,000 means 1 unit [such as 1 inch] represents 24,000 units [inches] on the surface).

section A 1-mile-square division in the township and range system. One square mile equals 640 acres; generally 36 sections constitute a township and range.

tick mark A small dash used to represent a point on a scale.

township and range A rectangular system of land survey established in 1785 to divide newly settled land; township lines are the north-south boundaries; range lines are the east-west boundaries.

The Geoscience Outreach program of the Illinois State Geological Survey uses many channels to inform the public about the geology and mineral resources of the state and the results of the Survey's research projects. The Survey distributes nontechnical publications, offers sets of rock and mineral specimens to Illinois schools and educational groups, presents lectures and exhibits, responds to inquiries, conducts workshops for teachers, and leads field trips. The Survey's full-day field trips, conducted in widely separated areas of the state, offer teachers, students, and the general public the opportunity to learn about the geologic processes that shaped the land and formed the rocks and glacial deposits.

The Geoscience Outreach program is specifically designed to assist in the teaching of earth sciences and to help citizens understand how the research programs of the Illinois State Geological Survey help to protect the environment and strengthen the economy of Illinois.