Introduction to Topographic Maps

By Kim Sowder

Topographic maps are a very special type of map used by people throughout the United States for many applications. Topographic maps are different from the more familiar highway maps because they show the terrain, or surface of the Earth. The U.S. Geological Survey creates topographic maps and is responsible for the content and updating of the information shown on them. There are more than 54,000 topographic maps that cover the United States; 711 of these cover Indiana. If you learn to read a topographic map, you can understand how hikers, planners, geologists, and others find these maps essential to their interests.

Latitude and Longitude

The Earth is a big place; in order for people to understand where they were on the Earth and the relative location of everything else, people who made maps—called cartographers— instituted a system of lines on maps of the Earth. These lines that run from pole to pole (north-to-south) are called latitude. The lines that run around the Earth (east-to-west) are called longitude. Latitude and longitude are measured in degrees. The symbol for degree is °. Degrees are subdivided into minutes; there are 60 minutes in one degree. The symbol for minutes is ′. Minutes are also subdivided into seconds; there are 60 seconds in one minute. The symbol for seconds is ″. Longitude is measured from 0° to 180° east and west from a line known as the Prime Meridian, or Greenwich Meridian (because it runs through Greenwich, England). Latitude is measured from 0° to 90° north and south from the Equator. The 0° and 180° lines of longitude create the boundaries between the eastern and western hemispheres. The Equator (0° latitude) is the dividing line for the northern and southern hemispheres. The United States lies in the western hemisphere of longitude and the northern hemisphere of latitude.

About Topographic Maps

Topographic maps cover an area of the earth that is 7.5 minutes (written as 7.5′ or equal to 7°30′) of longitude by 7.5 minutes of latitude. If you look at the corners of the map area on a topographic map sheet, you will see the longitude and latitude values for your map area. Along the edges are tic marks showing minutes and seconds spaced at 2.5-minute intervals. Cartographers strive to keep their maps neat, so the degrees are not repeated along this boundary; similarly, if there are zero seconds, there will not be a number indicating the seconds. If you trace those tic marks at the 2.5-minute intervals for longitude and latitude to where they intersect, you will see a black + symbol within the map. That + symbol is called a graticule.

The primary scale for topographic maps is 1:24,000. This ratio means that 1 inch on the map equals 24,000 inches on the ground, so 1 inch on the map is roughly 2,000 feet on the ground (24,000 inches divided by 12 inches per foot equals 2,000 feet). At 1:24,000 scale, relatively small features such as houses can be represented on the map.

Standardized colors and symbols are used on topographic maps, so regardless of which of the 54,000 plus maps you are looking at, the colors and symbols will be the same for the features shown. Black and red, and any tint of them, such as gray or pink, represent manmade features. Highways, buildings, water towers, and legal boundaries, for
example, will be represented this way. Water features will be shown in blue. Vegetation, such as forests or grass, will be shown in green. Updated information may be shown in purple; this is to alert the reader that this is information that has changed since the map was originally created. Topographic lines are shown in brown. The U.S. Geological Survey has created an index, or key, to all the symbols on the topographic maps. You can get a copy of this key by calling the U.S. Geological Survey at 1-800-USA-MAPS or by going to their Web site (http://earthshots.usgs.gov/Help-GardenCity/legendsUSGStopo).

Topographic maps show the three-dimensional earth on a two-dimensional piece of paper. The brown topographic lines are contours: contours are imaginary lines that connect points of equal elevation. The numbers along the lines tell you the elevation (from relative sea level) of that contour. Contour line values are at regular intervals; the map contains a note just below the scale bars at the bottom-center that lets the reader know the contour interval. The contour interval is the difference in elevation between each contour line. It is not always the same from map to map, so it is important to note the value. Every fifth contour is a heavier line; this is called an index contour. Index contours give you a visual break and make it easier to follow the contour lines and calculate contour elevation values for the unlabeled lines. Occasionally, you will see a dashed contour line on a map; these are extra contours called supplementary contours. The value of a supplementary contour is one-half of the contour interval.

Contour lines represent the land surface, so the spacing of the contour lines helps determine the steepness of the terrain. If contour lines are close together, the elevation is changing quickly, so the terrain is steep. Notice the close spacing of the contours west of the White River near Elliston on the map below left. Widely spaced contours indicate flatter terrain. Contours also give you information about the direction a stream flows. Look along a stream on a topographic map (see below) and notice where a contour crosses it. The contour will form a “V”; the closed end of the V points to the upstream direction, or the direction from which the water is flowing. Another way to remember this is to imagine the contour V is like a cup; water will pour out of the open end of the V (downstream).

There are many more features of topographic maps that make them a valuable tool to people in many different professions. By learning to read topographic maps, you can more easily visualize the Earth’s surface and get a better perspective on geographic relationships.