

Topographic Map Primer

Modified from Dr. Pamela Gore's *Topographic Maps* at Georgia Perimeter College:
<http://gpc.edu/~pgore/Earth&Space/topomaps.html>

Topographic maps represent the three-dimensional configuration of the land by using lines and symbols. They show the location and shape of mountains, valleys, plains, streams, wooded areas, roads, buildings, and many other features.

Most topographic maps of the U.S. are printed and distributed by the U.S. Geological Survey. Topographic maps of Pennsylvania may be purchased from the USGS or from various map companies and hiking, camping, or nature stores.

Features of topographic maps

Contour lines

Topography is the elevation of the land surface, and it is shown on topographic maps with **contour lines**, which are drawn in brown. A contour line is an imaginary line on the surface of the Earth connecting points of equal elevation.

Contour line rules:

1. Each contour line represents one elevation.
2. Contour lines never cross.
3. The vertical spacing (difference in elevation) between contour lines is known as the **contour interval**. Typical contour intervals are 10, 20, 50, and 100 feet. The contour interval is generally given in the **legend** of the map.
4. Every fifth contour is printed darker. These lines are called **index contours**. If the contour interval on a map is 20 feet, then the 100', 200', 300' (etc.) contours will be **index contours**.
5. **Closely spaced** contour lines represent **steep** slopes. **Widely spaced** contour lines represent **gentle** slopes.
6. Remember that **streams and rivers flow downhill** (from higher elevations to lower elevations). **Where a contour line crosses a stream or river** (or even a dry gully or valley), the contour lines are bent sharply, forming a "V". The **point of the "V" points uphill or upstream**. (Look at map and think about this for a minute.)
7. Ridges are shown by contour lines that bend *downhill*.
8. **Closed depressions** are indicated by contour lines that form roughly a circle, with short "tick marks" or "hachure marks" perpendicular to them **on the downhill side**. Examples of closed depressions are sinkholes and craters, or other bowl-shaped depressions.

9. A series of concentric contour lines represents a hill.

Colors

The colors on a topographic map are symbolic of different map features.

- Blue = water
- Green = forest
- Brown = contour lines
- Black = cultural features (buildings, place names, boundary lines, roads, etc.)
- Red = principal roads
- Pink = urban areas
- Purple = revisions to an older map, compiled from aerial photos. If an area has become urbanized, this may be shown as purple shading on the new, revised map.

Symbols

A variety of topographic map references give the key for common map symbols, including boundaries, roads, buildings, railroads, types of vegetation, marshes, quarries and mines, water and coastal features, etc. The USGS page showing the meaning of topographic map symbols is online at <http://erg.usgs.gov/isb/pubs/booklets/symbols/>.

Latitude and Longitude

The edges of many topographic maps are bounded by lines of **latitude** and **longitude**. The large maps available from the U.S. Geological Survey are called **topographic quadrangle maps**. The size of the quadrangle is given in degrees, minutes, and seconds.

For latitude and longitude:

1 degree (1°) = 60 minutes (60')

1 minute (1') = 60 seconds (60")

The **lines that run east and west**, bounding the top and bottom of the map are **latitude lines**. Look at the left and right top corners of the map to see the latitude of the line that forms the top (northern) edge of the map.

The **lines that run north and south**, bounding the left and right sides of the map are **longitude lines**. Look at the top and bottom corners on the left to see the longitude of the line that forms the left (western) edge of the map.

Intermediate latitude and longitude lines (for various seconds or minutes) are found along the edges of the map. Please note that the degrees may have been left off (as an abbreviation), and you may see only minute and second designations. The degrees are listed only at the corners on most maps.

Also note that there are other numbered lines on the map and tick marks along the map edges. Some of these are other systems of measurement, such as **Universal Transverse Mercator** (UTM) lines. *If you are looking for latitude and longitude markings, you will need to ignore these other lines and tick marks. Look for the tick marks labeled with minutes (') and seconds (").*

Maps covering 7.5 minutes (7.5' or 7'30") of latitude and longitude, and maps covering 15 minutes (15') of latitude and longitude are common. Maps covering a large region are typically 1° x 2° quadrangles, or 30' x 60' quadrangles.

Topographic maps at the equator that cover 7.5' x 7.5' are basically square. The 7.5' x 7.5' maps become narrower as you approach the poles because the lines of longitude converge poleward.

Scale

Scale is the relation between the size of the map and the size of the real area, on the ground. There are three ways to represent the scale of a map:

1. **Verbal scale** - such as saying "1 inch = 5 miles".
2. **Bar scale** (or graphical scale) - indicated by a line or bar with distances marked in miles, feet, or kilometers.
3. **Ratio scale** (or **fractional scale**) - a fraction representing the relationship between one unit on the map and one unit on the ground. *Example:* 1:24,000 or 1/24,000. This ratio (or representative fraction) indicates that "one unit on the map is equal to 24,000 units of the same size on the ground." This holds true for any units. You may consider the units to be inches, centimeters, feet, or any other unit of measure. The units are always the same on both sides of the fraction. It is the proportion between the map and the real world that is being expressed. Simple mathematics can **convert** a ratio (or fractional scale) to any desired comparison of units.

Quadrangle name

On the large U.S. Geological Survey topographic maps, the quadrangle name and location is generally found in the upper and lower right corners of the map. The quadrangle is named for a town or other feature in the quadrangle.

The names of the surrounding quadrangles are present in small letters along the edges at the corners of the map.