24. State Plane Coordinate System

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Shown below in Figure 2.25.1 is the southwest corner of a 1:24,000-scale topographic map published by the United States Geological Survey (USGS). Note that the geographic coordinates (40 45' N latitude, 77° 52' 30" W longitude) of the corner are specified. Also shown, however, are ticks and labels representing two plane coordinate systems, the Universal Transverse Mercator (UTM) system and the State Plane Coordinate (SPC) system. The tick labeled "1 970 000 FEET" represents a SPC grid line that runs perpendicular to the equator and 1,970,000 feet east of the origin of the Pennsylvania North zone. The origin lies far to the west of this map sheet. Other SPC grid lines, called "northings" (not shown in the illustration), run parallel to the equator and perpendicular to SPC eastings at increments of 10,000 feet. Unlike longitude lines, SPC eastings and northings are straight and do not converge upon the Earth's poles.

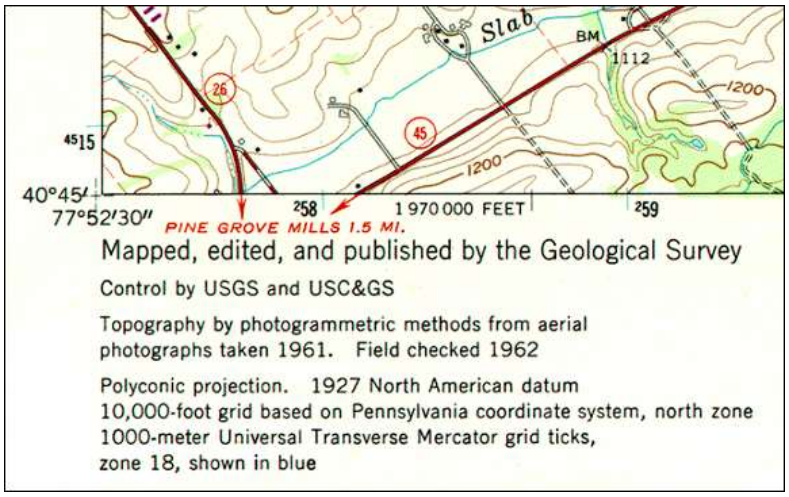

Figure 2.25.1 Southwest corner of a USGS topographic map showing grid ticks and labels for three different coordinate systems, including the SPC coordinate system.

Credit: USGS. "State College Quadrangle, Pennsylvania"

The SPC grid is a widely-used type of geospatial plane coordinate system in which positions are specified as eastings (distances east of an origin) and northings (distances north of an origin). You can tell that the SPC grid referred to in the map illustrated above is the older 1927 version of the SPC grid system because (a) eastings and northings are specified in feet and (b) grids are based upon the North American Datum of 1927 (NAD27). The 124 zones that make up the State Plane Coordinates system of 1983 are based upon NAD 83, and generally use the metric system to specify eastings and northings.

State Plane Coordinates are frequently used to georeference large scale (small area) surveying and mapping projects because plane coordinates are easier to use than latitudes and longitudes for calculating distances and areas. And because SPC zones extend over relatively smaller areas, less error accrues to

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positions, distances, and areas calculated with State Plane Coordinates than with UTM coordinates.

In this section you will learn to:

1. describe the characteristics of the SPC system, including map projection on which it is based; and
2. convert geographic coordinates to SPC coordinates.

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