26. SPC Zone Characteristics

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In consultation with various state agencies, the National Geodetic Survey (NGS) originally devised the State Plane Coordinate System in the 1930s with several design objectives in mind. Chief among these were:

1. **plane coordinates** for ease of use in calculations of distances and areas;
2. **all positive values** to minimize calculation errors; and
3. a maximum error rate of **1 part in 10,000.**

Plane coordinates specify positions in flat grids. Map projections are needed to transform latitude and longitude coordinates to plane coordinates. The designers did two things to minimize the inevitable distortion associated with map projections. First, they divided each state into zones small enough to meet the 1 part in 10,000 error threshold. Second, they used slightly different map projection formulae for each zone. The curved, dashed red lines in the illustration below for Figure 2.27.1 represent the two standard parallels that pass through each zone. The latitudes of the standard lines are one of the parameters of the Lambert Conic Conformal projection that can be customized to minimize distortion within the zone.

Positions in any coordinate system are specified relative to an origin. **SPC zone origins are defined so as to ensure that every easting and northing in every zone are positive numbers.** As shown in the illustration below, SPC origins are positioned south of the counties included in each zone. The origins coincide with the central meridian of the map projection upon which each zone is based. The easting and northing values at the origins are not 0, 0. Instead, eastings are defined as positive values sufficiently large to ensure that every easting in the zone is also a positive number. The false origin of the Pennsylvania North zone, for instance, is defined as 600,000 meters East, 0 meters North. Origin eastings vary from zone to zone from 200,000 to 8,000,000 meters East.

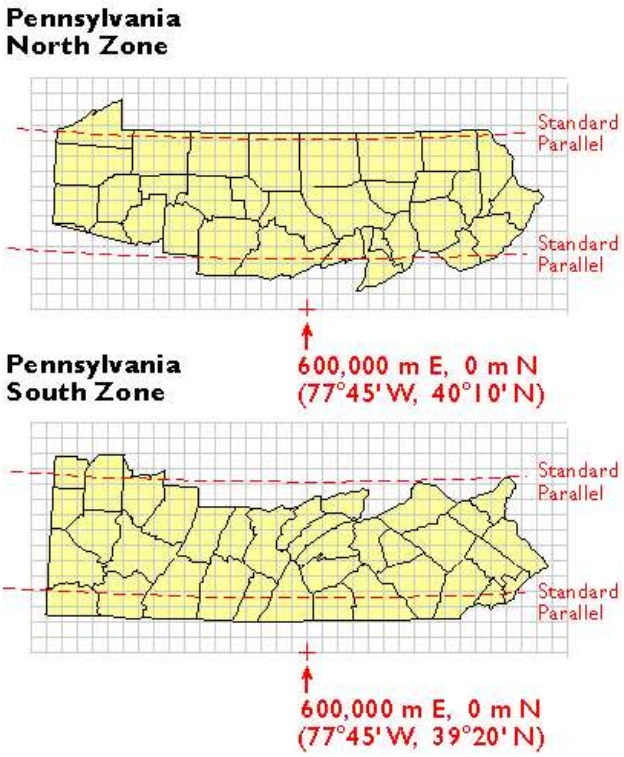

Figure 2.27.1 Schematic view of two State Plane Coordinate System zones, showing the counties that make up each zone (in yellow), the origins of each zone, and the standard parallels of the map projections upon which the zones are based, along which scale distortion is zero.

The State Plane Coordinate System will be affected by NGS' National Spatial Reference System modernization that was planned for 2022. in the new system, each state will have several "layered" plane coordinate systems, including a statewide layer for ease of use in GIS analyses, and one or "default" layers made up of zones that minimize distortion for surveying and engineering applications. You can read up on SPCS 2022 at the National Geodetic Survey's web site.

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‹ 25. The SPC Grid and Map Projections | up | 27. Map Projections ›

Navigation

- login

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