

Basic Geodesy

Article 11

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Polar Stereographic Projection

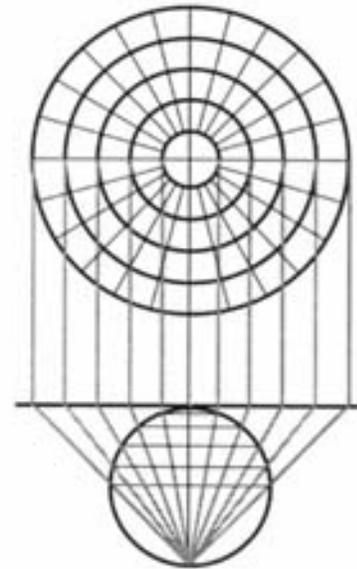
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This article is the second of four discussing the projections predominately used by NGA.

The Polar Stereographic projection is predominately used for producing maps and charts in the polar regions above 84° North and below 80° South. These limits were chosen because there are more land areas that are desired to be mapped on Transverse Mercator projection above 80° North (Northern Canada, Greenland, Northern Russia) than there are below 80° South (Antartica).

The Polar Stereographic is a conformal azimuthal projection, where parallels of latitude appear as unevenly spaced concentric circles and meridians appear as straight lines, centered on and radiating from the pole, respectively.

The projection surface is a plane, tangent at one of the poles and the projecting lines originate from the opposite pole (see Figures 1 and 2). When used with the Universal Polar Stereographic (UPS) grid, a scale factor of 0.994 is applied at the origin (pole), which effectively lowers the projection plane to approximately $81^\circ 07'$ latitude. This is done to mathematically minimize the maximum scale distortion of the tangent projection. As shown in Figure 2, the scale is exact (scale factor = 1) at approximately $81^\circ 07'$ latitude. The scale factor decreases to 0.994 at the pole. The scale factor is constant along any given parallel (paraphrased from DMA TM (Defense Mapping Agency Technical Manual) 8358.1 DATUMS, ELLIPSOIDS, GRIDS, AND GRID REFERENCE SYSTEMS, Edition 1, various authors, page 2-14). **NOTE: Both figures are generalized to help visualize the concepts and show the earth as a sphere instead of an ellipsoid.**



Stereographic

Figure 1

Figure 1 came from the National Geospatial-Intelligence College.

Figure 2 is a slightly modified diagram from DMA TM (Defense Mapping Agency Technical Manual) 8358.1 DATUMS, ELLIPSOIDS, GRIDS, AND GRID REFERENCE SYSTEMS, Edition 1, various authors, page 2-15).

Next Article - Lambert Conformal Conic Projection

The next article will discuss the Lambert Conformal Conic projection which is used on most small scale (also referred to as "world scale") maps and charts, especially if those sheets have a large East-West extent.

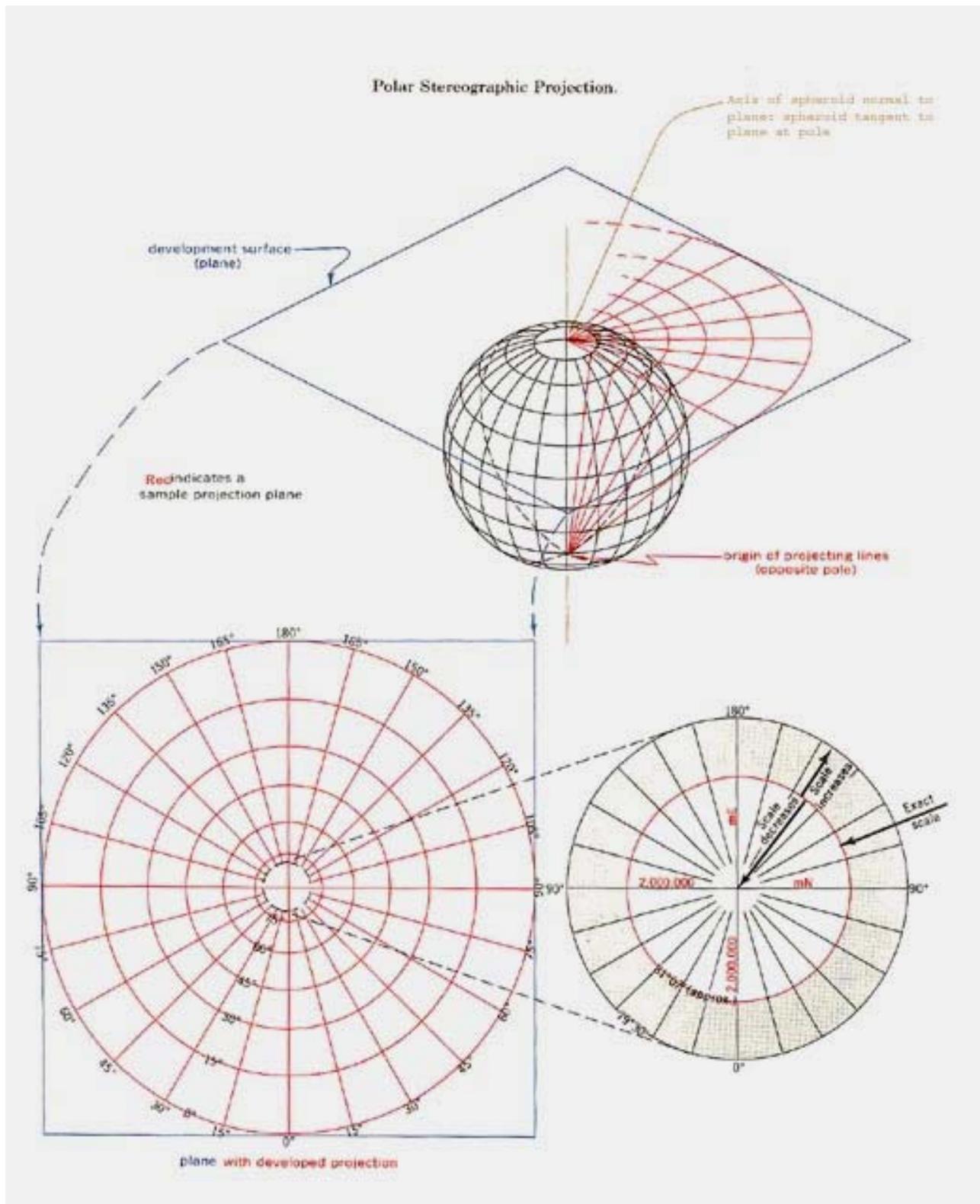


Figure 2. Polar Stereographic Projection.