12. Horizontal Datums

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Geographic data represent the locations and attributes of things on the Earth's surface. Locations are measured and encoded in terms of geographic coordinates (i.e., latitude and longitude) or plane coordinates (e.g., UTM). To measure and specify coordinates accurately, one first must define the geometry of the surface itself. To see what I mean, imagine a soccer ball. If you or your kids play soccer you can probably conjure up a vision of a round mosaic of 20 hexagonal (six sided) and 12 pentagonal (five sided) panels (soccer balls come in many different designs, but the 32-panel ball is used in most professional matches. Visit Soccer Ball World for more than you ever wanted to know about soccer balls). Now focus on one point at an intersection of three panels. You could use spherical (e.g., geographic) coordinates to specify the position of that point. But if you deflate the ball, the position of the point in space changes, and so must its coordinates. **The absolute** (though not the relative) **position of a point on a surface, then, depends upon the shape of the surface**.

Every position is determined in relation to at least one other position. Coordinates, for example, are defined relative to the origin of the coordinate system grid. A land surveyor measures the "corners" of a property boundary relative to a previously-surveyed control point. Surveyors and engineers measure elevations at construction sites and elsewhere. Elevations are expressed in relation to a **vertical datum**, a reference surface such as mean sea level. As you probably know, there is also such a thing as a **horizontal datum**, although this is harder to explain and to visualize than the vertical case. **Horizontal datums define the geometric relationship between a coordinate system grid and the Earth's surface.** Because the Earth's shape is complex, the relationship is too. The goal of this section is to explain the relationship.

Specifically, in this section of Chapter 2 you will learn to:

1. explain the concept of a horizontal datum;
2. calculate the change in a coordinate location due to a change from one horizontal datum to another;
3. estimate the magnitude of "datum shift" associated with the adjustment from NAD 27 to NAD 83.

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