

Map Datum

A datum is a mathematical model which approximates the shape of the Earth. It allows calculations such as position and area to be done in a consistent and accurate manner. The datum is physically represented by a framework of ground monuments whose positions have been accurately measured and calculated on the reference surface (such as benchmarks). Lines of latitude and longitude on a map are referenced to a specific map datum. Every chart has a map datum reference and is usually listed in the title block of the chart.

The Global Positioning System uses an earth centered datum called the World Geodetic System 1984 or WGS 84. WGS 84 was adopted as a world standard from a datum called the North American Datum of 1983 or NAD 83. There is little difference between WGS 84 and NAD 83. The WGS84 datum is the only world referencing system in place today. WGS84 is the default standard datum for coordinates stored in GPS units. WGS 84 is the reference frame used by the U.S. Department of Defense (DoD) and is used for all its mapping, charting, surveying, and navigation needs.

Users of GPS are cautioned that they must **always** check the datum of the maps they are using. Many GPS units have multiple datums and they sometimes get changed. Therefore, it is imperative to check the datum of a GPS unit before each use. To share or overlay coordinates onto a map, matching datums need to be used. It is important to check the datum of the map and GPS receiver to make sure they match. Geocaching, for instance, uses the WGS84 datum by default.

Most USGS maps in the US are NAD27 CONUS datum which uses the Clarke 1866 mathematical model. Later USGS maps are NAD83 datum and use the UTM projection from the center of the earth. When using USGS maps it is important to double check the datum the map is recorded in.

Changing the datum on your GPS and not moving would cause the latitude and longitude to change. Using www.topozone.com, a place mark put on the 4-H Building at the Oklahoma State University campus has coordinates that read UTM 14 673457E, 3999688N for NAD83/WGS84. If switched to NAD27, the coordinates now read: UTM 14 673489E, 3999482N. This is a shift of 32 meters east and 206 meters north which is quite substantial.

If using ArcView 8.x, you can correct the errors from switching between datums by using NADCON in the ArcToolbox.

References:

<http://www.ngs.noaa.gov/faq.shtml#WGS84>

http://www.gmat.unsw.edu.au/snap/gps/clynch_pdfs/Datumintr.pdf (Describes datums and the associated errors)

<http://www.ngs.noaa.gov/>