



A Single State Plane Zone for Washington?
(DRAFT ONLY replacement – Updated Feb. 2010.)
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This started off as a bit of whimsy deploring a proposal in Washington by some people actively promoting the use of the South state plane zone as the default for the adoption of a single reference state plane zone in Washington. (The original form of this writing used the term “secant” incorrectly and contained sloppy references to projections and grids. I have since realized that there is some merit in continuing to build upon the original to include information about determining the types of grid systems one might use for projects or GIS base layers.)

Much of local (city, county, state) legacy GIS grid data is derived from the NAD27 datum in the North and South zones (feet). After the NAD83 datum transformations became available through the NGS, US Corps of Engineers, and consequently ESRI software, many converted their data within the appropriate zone. Currently many use the NAD83 HARN datum in both zones and will have trouble with the newer NAD83 (NSRS 2007) as there is no transformation readily available from within popular software.

These grid coordinate systems are frequently referred to as projections as their properties are defined within “projection files” and the software and transformation tools are found in the “Projections and Transformations” sections of the software and the documentation.

Many states are attempting to ease the use of coordinate transformation processes that non-surveyors and engineers would have to employ to use geographic data by creating a new, single grid system - here is my argument: this creates yet another coordinate system from which coordinate transformations would have to be performed, so the ease-of-use theory presumes that people are not going to be interacting with legacy datasets.

Should the Single Zone be North or South?

In the State of Washington, there is some discussion with regard to defining a single state plane zone. Part of the reasoning has to do with easing the transfer of geospatial datasets. Some administrative offices of the State use the Washington South, state plane zone for many of their datasets, and favor use of this zone as the default for a single zone. Do we really need to have one zone? Is there another alternative that makes more sense?

The most populated places in the State are within the Washington North, state plane zone. We can infer with reasonable assuredness that areas with dense populations have a greater need for accuracy and precision with regard to an increased density of mapped facilities and infrastructure. We would suspect that there are more parcels of land, where land has higher values requiring more land surveys, and the engineered facilities to support them.



Figure 1 – Washington State Plane Zones with GNIS populated places, originally developed as part of an assignment for successful completion of a workshop concerning projections within the University of Redlands, MS GIS Program.

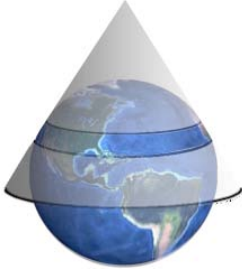
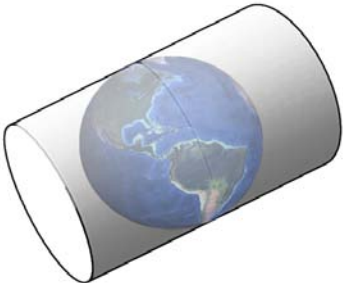
Washington Grids: State Plane Coordinate System and UTM

In the State of Washington, two state plane zones are used for mapping purposes that are adequate for land surveys. They are both based on a conical, Lambert Conformal projection. The Lambert Conformal projection slices through the Earth along intersecting arcs where distance measurements are considered true (scale factor 1.0000). The North and South zones differ by where the slices are made through the east and west direction through the State. The state plane system was derived to allow for better accuracy and precisions for survey measurements and calculations within the states.

The UTM grid system, originally associated with the military is used for many natural resource applications. It is based on the cylindrical, Transverse Mercator projection:

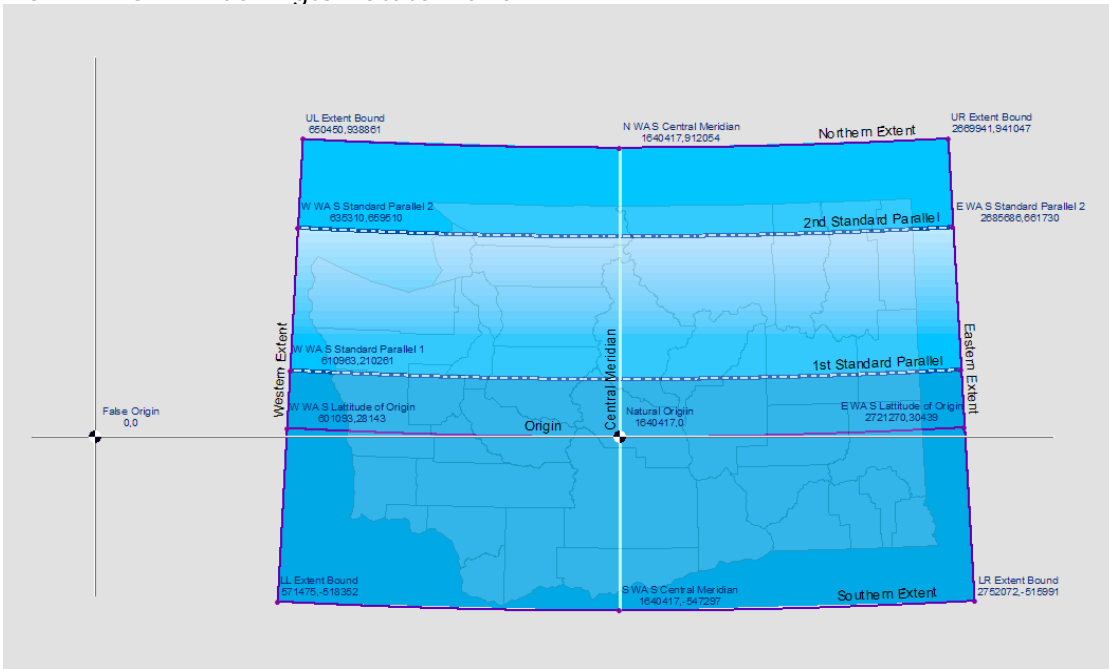
1. The UTM system is used on the USGS quadrangle topographic maps. USGS topographic maps are not copyrighted and as a result have been used as the base maps for many scientific studies and applications for natural resources.
2. Measurements are in meters which are better suited for the needs of scientific calculations.
3. Many natural resource applications cover large areas of land, or need to interface with data from large areas and this is consistent with properties of the UTM system.



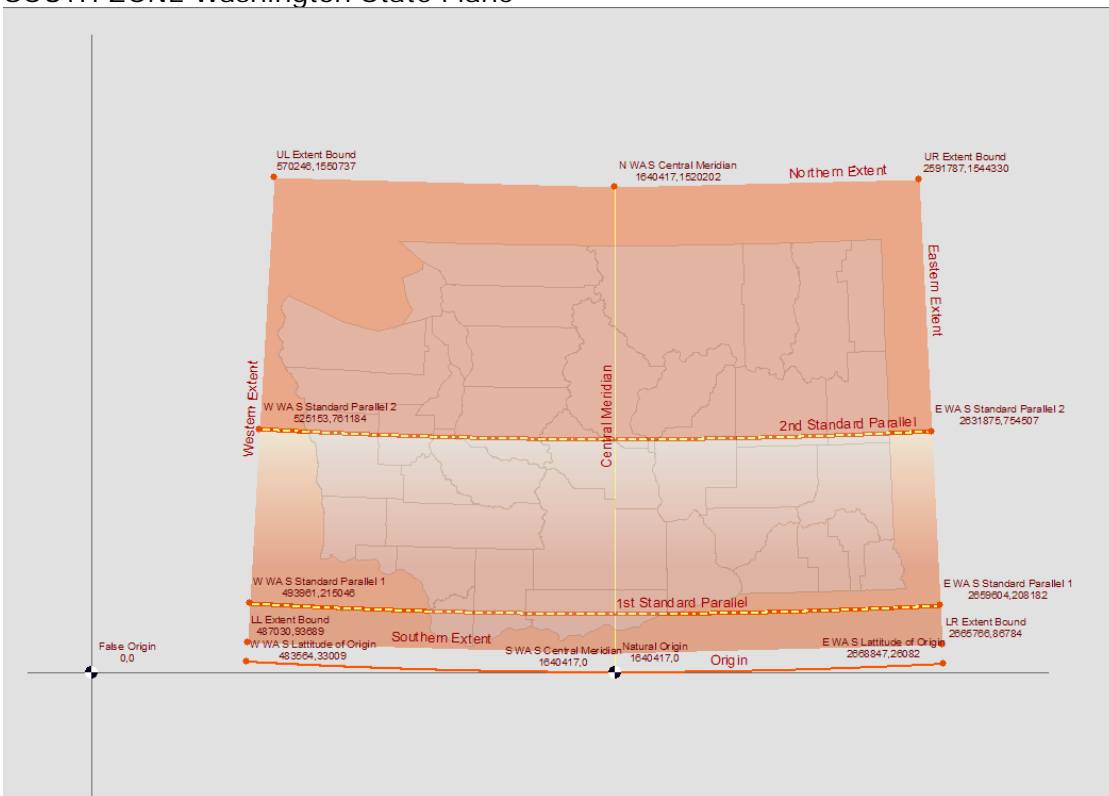
	<p>Washington State Plane North grid system is derived from a Lambert Conformal projection. The Lambert Conformal projection is based on a cone that bisects the Earth along two arcs in the EW direction, along which measurements are true. In the Washington North zone, the arcs are along latitudes 47.500000 degrees and 48.733333 degrees North. The central meridian is at -120.833333 East.</p>
	<p>The UTM grid system is derived from combination of a projection and datum. The Transverse Mercator projection centered upon a central meridian, which in Zone 11 is at -177 degrees W longitude. Zones are created that are 6 degrees in longitude, with the Central Meridian (CM) at 3 degrees. Further, a grid is created by intersecting the zones at 8 degree intervals of latitude.</p>
	<p>Since measurements are only true at the CM, a scale factor of .9996 is applied at the CM to minimize the distortion outward from the CM across the zone. This has the net effect of shifting the cylinder downward, below the CM. At about 180 km from the Central Meridian both East and West are lines where the measurements are true. At the center the scale factor is .9996 (approaching 1 to each line parallel to the CM, thence increasing to the edge of the zone.)</p>



NORTH ZONE Washington State Plane



SOUTH ZONE Washington State Plane

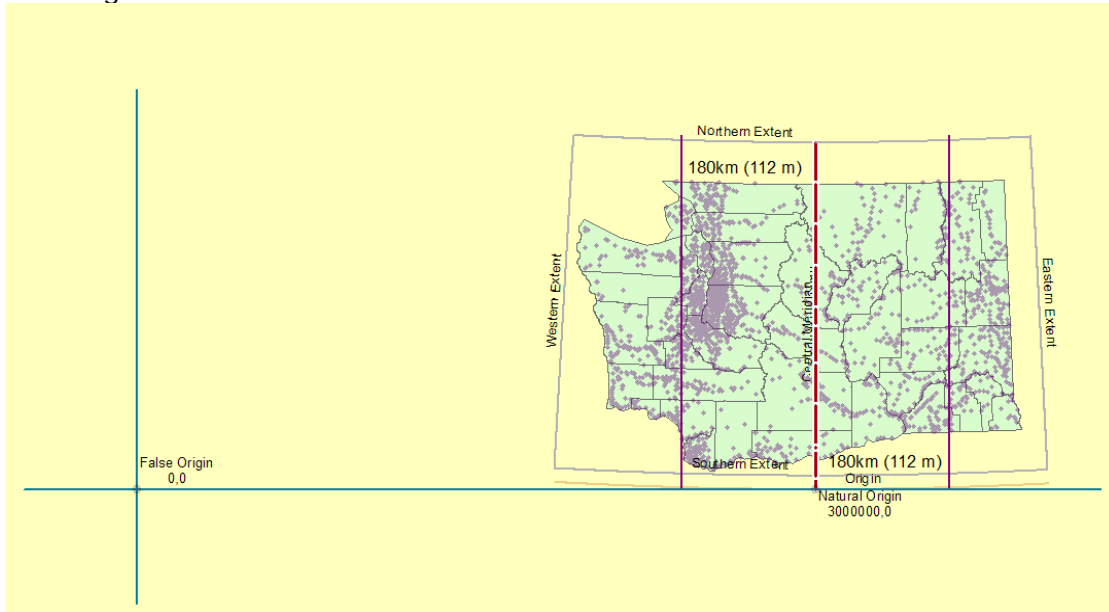


Washington Tim Grid (modified UTM)

A new grid system is introduced (for fun), the Washington Tim grid is introduced, similar to a UTM grid zone with the following properties: Central Meridian (CM) W -120.5, Origin N 45.333333 (same as present South) with 3000000, 0 origin coordinates. A scale factor of .9996 is used at the Central Meridian (consistent) with the UTM system, which reduces distortion across the grid. Measurements are near true at about 180 km and on either side of the CM. The two lines of minimal distortion then are parallel to the CM and are roughly consistent with populated places. Distortion associated with the CM is roughly within the Cascades. (Populated places are shown as purple dots).

This grid was invented to suggest an alternative to simple north and south zones derived from the shape of a state to a single zone that may be more amenable to the physical and human geographies of the state – which in this case would seem to make sense. Populated places are near lines of least distortion, where we would expect more surveys and the need for greater accuracy and precision.

Washington Tim Grid



(False Origin was determined such that the new state plane coordinate values should appear “different” than those associated with past NAD27 and NAD83 zones.)



References:

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