How to Identify the Coordinate System of a Shapefile When it is Not Explicitly Defined

ArcMap 8.3

If you receive a data set that will not display properly with your other spatial data, it probably does not have a coordinate system explicitly defined. If you have no other information (verbal communication etc.) that indicates what the coordinate system of the data is, you will have to figure that out by trial and error.

Definitions:

- For the purposes of this paper, "explicitly defined" means that a shape file has an accompanying projection file, that describes the coordinate system of the data. This is often referred to as a "prj" file because it has a ".prj extension.
- *N.B.: "defining" a coordinate system merely means writing out the prj file that states what the coordinate system is. You cannot change the actual coordinate system of a data layer by changing the definition. If you write out the wrong definition file, you will just make the situation worse, by attaching incorrect information to the data set.*

- The "Data Frame" is the large window in ArcMap where feature and image layers are displayed.

The process involves displaying the unknown data set with known data sets, until you find a match, and the data overlays properly. We will rely on ArcMap's "reproject on-the-fly" functionality for this process. This works when the Data Frame coordinate system is set. *Do not do this from within the Customer Service Toolkit environment. Close Toolkit, and start ArcMap from the Windows Start menu.*

The sequence is:

- Set the Data Frame coordinate system.
    - Right-click in the Data Frame and choose Properties.
    - Select the Coordinate System tab.
    - Navigate to the desired coordinate system using the folders. (see recommended options below)
- Load the data with the unknown coordinate system.
- Load data with a known coordinate system, that you know covers the same area as the unknown data set.
    - If the data with the unknown coordinate system displays properly, then you have ascertained its correct coordinate system. You

should use ArcCatalog to explicitly define the coordinate system for the "unknown" data set.

- Right-click on the layer in ArcCatalog, select Properties.
- Choose the "Fields" tab in the Shapefile Properties.
- Click on the "Shape" field name.
- In the Field Properties dialog, click the ellipsis (…) to the right of "Spatial Reference".
- In the "Spatial Reference Properties" dialog, use the Select button to apply the correct coordinate system.
- You should use the same coordinate system that you used for the Data Frame.

- If the data with the unknown coordinate system does not display properly, you will have start over by trying a different Data Frame coordinate system. To avoid potential errors, exit ArcMap and restart for each separate attempt to match coordinate systems.

Typically the data set without a prj file will have a coordinate system that is either:

- The Oregon State Lambert coordinate system, normally used by all Oregon State agencies.
- State Plane, NAD 1983, either Oregon North zone or Oregon South zone. This is often used by surveyors.
- In Geographic coordinates, WGS84, the default for many GPS units.

The Oregon State Lambert coordinate system is not defined by default in ArcMap 8.3, and cannot be selected directly in the Data Frame properties Coordinate System tab. You can add it the "Favorites" list by:

- Creating a folder "Coordinate Systems" under C:\Documents and Settings\[firstname.lastname]\Application Data\ESRI\ArcMap\
- Pasting the file NAD_1983_Lambert_Conformal_Conic.prj into that folder.
- You can obtain the NAD_1983_Lambert_Conformal_Conic.prj file from the Oregon NRCS web site:

  - http://www.or.nrcs.usda.gov/technical/gis-tips.html

Similarly, the Oregon State Lambert coordinate system is not available as a choice in the Spatial Reference Properties dialog. To define the coordinate system of a shapefile known to be in the Oregon State Lambert coordinate system:

- Copy the file NAD_1983_Lambert_Conformal_Conic.prj into the same directory as the shapefile.
- Rename the copy so the root part of the name matches exactly the name of the shapefile, e.g.

- if the shapefile is called “cult_res_waypoints.shp”,
- NAD_1983_Lambert_Conformal_Conic.prj becomes “cult_res_waypoints.prj”.