DEFINING PROJECTIONS

This help guide will describe how to define a coordinate reference system (Define Projection) and how to project data from one coordinate reference system to another coordinate system (Project).

Why define a coordinate reference system or a projection?

All the layers (raster or vector) in your map will display correctly if they have the same coordinate reference system or projection or the same datum. If you have several map layers in the Table of Contents in ArcMap and one does not display with your other data the problem may be with projections. The most critical issue in dealing with coordinate systems is knowing what the projection is and having the correct coordinate system information associated with a dataset.

If you are planning on doing any kind of measurement (distance, area) you need to use a projection which has distance units, e.g. metres, feet.

How do I know whether my data has a defined a coordinate system or a projection?

There are several ways to determine the coordinate system / projection of your data:

1. In ArcMap or ArcCatalog open the properties of the data and select the Source Tab (Right > Properties > Source). If your data has a coordinate reference system (e.g. GCS_North_American_1983) or a projection defined (e.g. UTM_NAD83_Zone17N) it will be displayed in the Source Window.
2. If the Source Tab window says Unknown Units use My Computer to go to the directory where the data is located and look for a .prj file. This is a text file that describes the coordinate system or projection. Open this text document with Notepad or Word Pad.
3. Look at the metadata. Metadata includes any documentation you have for your data.

How to define a coordinate system / projection and how to re-project data

You can define a coordinate system for data using the following options:

1. Geodatabase feature dataset, feature class, or raster dataset: using the Define Projection tool in the Data Management toolbox
2. Shapefile: using the Define Projection tool in the Data Management toolbox
3. ArcInfo Coverage: using the Define Projection tool in the Coverage toolbox

If the data has a coordinate system definition, but it does not match the coordinate system used by the rest of your geospatial data, you can reproject the data using the following tools:

1. Geodatabase feature dataset, feature class, or raster dataset: using the Project tool or Project Raster tool in the Data Management toolbox
2. Shapefile: using the Project tool in the Data Management toolbox
3. ArcInfo Coverage: using the Project tool in the Coverage toolbox
Using the Define Projection Tool

To define a projection Universal Transverse Mercator, North American Datum 1983, UTM Zone 17 North. This is a good projection for South Western Ontario.

1. Open ArcToolbox and expand Data Management Tools and Projections and Transformations.
2. Double click on the tool Define Projection to open.
3. To select a Coordinate System input click the button at the right.
4. In the Spatial Reference Properties window make sure the XY Coordinate System tab is selected.
5. Click the Select… button
6. Select the following:
   I. Projected Coordinate systems
   II. UTMNAD 1983
   III. NAD 1983 UTM Zone 17N
   IV. Click OK and OK.

Using the Project Tool

The Project Tool changes the coordinate system of your input data or feature class to a new output dataset or feature class with the newly defined coordinate system including the datum and spheroid.

If you have shapefile or a raster with a Geographic Coordinate System (GSC_North_American_1983 with a Datum – D_North_American_1983) you can project the data to a Projection such as NAD 1983 UTM Zone 17N.

1. Open ArcToolbox and expand Data Management Tools and Projections and Transformations.
2. Expand the Feature folder if your data to be projected is vector and the Raster folder if your data is raster (grid).
3. Double Click the Project Tool to open it.
4. For Input Dataset or Feature Class use the drop down button to select the dataset or drag the dataset from the Table of Contents in ArcMap or ArcCatalog.
5. If the dataset has a defined Input Coordinate System it will display as greyed out.
6. For the Output Coordinate System use the button to the right and in the Spatial Reference Properties click the Select… Button.
7. In the Spatial Reference Properties window make sure the XY Coordinate System tab is selected.
8. Select the following:
   a. Projected Coordinate systems
   b. UTMNAD 1983
   c. NAD 1983 UTM Zone 17N
   d. Click OK and OK to run the tool
9. The new projected dataset or feature class will be added automatically to your map.