

Georeferencing a raster dataset in ArcGIS 9.x

Related guides:

- [Georectifying an image in ArcGIS 9.x](#)

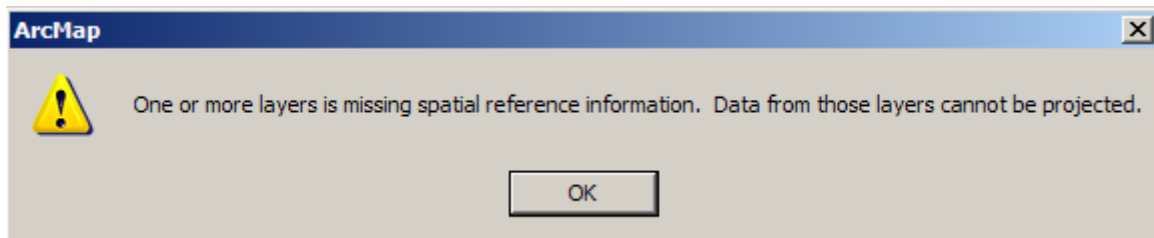
Requirements:

- ArcGIS 9.x
- Unreferenced raster file

Quite often you will want to load a raster file into ArcMap which does not have all of its georeferencing information in a format that is recognized by ArcMap. This guide explains how to create a World Header File which will allow ArcMap to recognize the image's correct and full georeferencing information. This procedure assumes that you have access to all of the necessary georeferencing information such as the image's projection, pixel dimensions, number of columns and rows, and the coordinates of the four corners of the image (or at least the lower-left or upper-left depending upon the file type (see below for details). Such information is most often found in a metadata file that bears the same name as your image file, but has an extension such as .doc, .txt, .xml, or .met among others. If you do not have access to all of this information, you may need to georectify your image. For information about this process see the tutorial "How to Georectify an image in ArcGIS 9.0".

How do you know if you need to manually georeference your dataset?

If you open ArcMap, attempt to load a raster dataset and come up with a warning message such as the one below, it is quite possible that ArcMap does not recognize or cannot find the georeferencing information for your dataset. In this case you will need to create a georeferencing file that ArcMap will recognize.



Procedure:

1. To begin the process of georeferencing your image you will need to create a "world header file". Open a text editing application such as Notepad. (To open Notepad click the Start menu in the lower left-hand corner of your screen. Select Programs and then Accessories. Click on Notepad to open the application.)

2. The contents of a world header file comprise six lines and look like this:

```
20.17541308822119
0.000000000000000
0.000000000000000
-20.17541308822119
424178.11472601280548
4313415.90726399607956
```

The first line refers to the x-scale of your image which is the dimension of a pixel in map units in x direction (horizontal in this case).

The second and third lines refer to rotation terms (for the purposes of this exercise it is safe to assume that these terms are both 0).

The fourth line refers to the negative of y-scale which is the dimension of a pixel in map units in y direction (vertical in this case).



The fifth and sixth lines are the x,y map coordinates of the center of the upper-left pixel in the image.

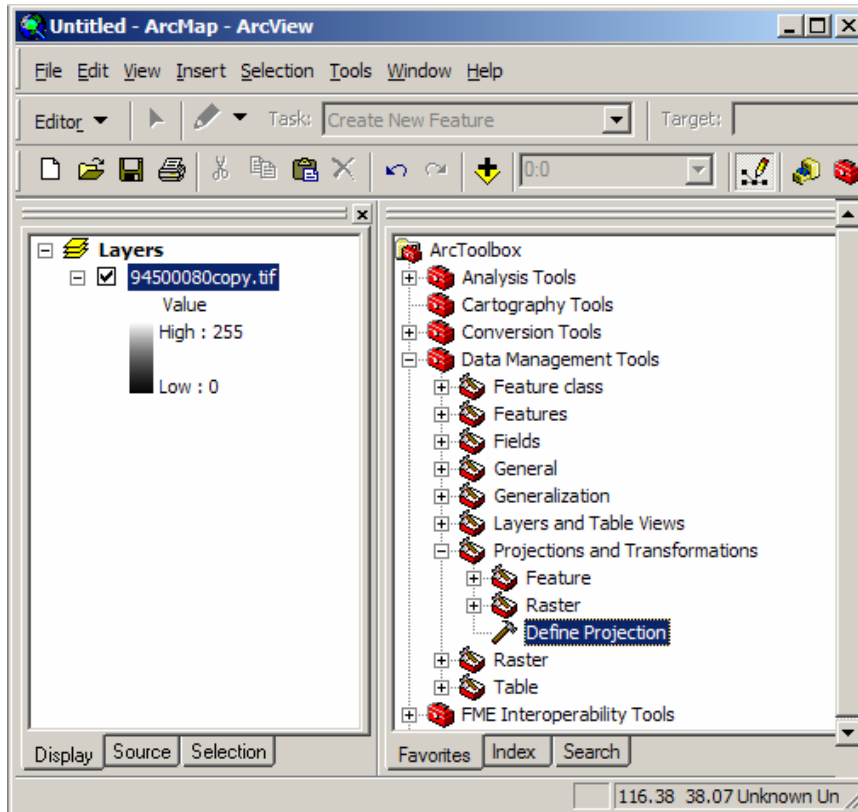
If we take as an example an orthophoto of downtown Montreal that has a pixel resolution of 1 meter squared and the upper left-hand pixel is located at 295869, 5044100 meters in the MTM (Modified Transverse Mercator) Zone 8 coordinate system, then the world header file would simply look like this:

```
1
0
0
-1
295869
5044100
```

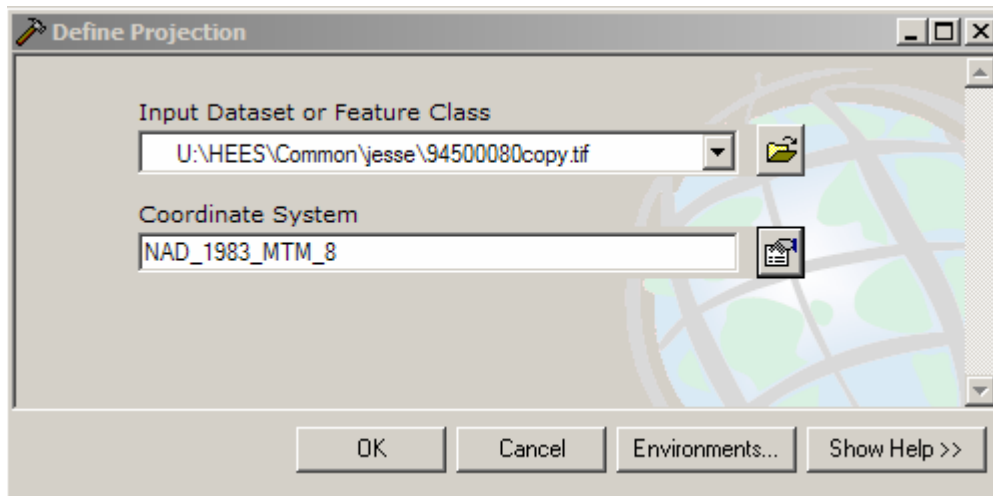
If you are only given the coordinates of the centroid of the center pixel in your image (must be in meters) it will be necessary to do a quick calculation in order to figure out the coordinates of the upper left-hand pixel. As long as you know the dimensions of each pixel and the number of columns and rows you will be able to find the coordinates of a corner pixel. This is easiest when the location of the whole pixel is recorded as the location of the upper left-hand corner of the pixel. This is not always the case and if location is recorded as the center of the pixel you will have to change your calculation slightly to account for the distance of half the length of a pixel. With any luck the metadata file for your image will indicate whether the pixel coordinates refer to the center or edge of each pixel.

EXAMPLE: The coordinates of the center of your image is found at the projected MTM coordinates of 299868.5, 5040100.5 meters. If you know that each pixel is 1 square meter, then you can work backwards to find the location of the upper left-hand pixel. If your image contains 8000 rows and 8000 columns, simply subtract 4000 from the value of the x-coordinate and add 4000 to the y-coordinate. This means that the location of the upper left-hand pixel is 295868.5, 5044100.5.

3. Create a header file by typing the six lines of information for your raster image in Notepad. In order for ArcMap to recognize this file as the world header file of your raster image it must be saved with the appropriate extension name. In Notepad select “Save As” from the “File” menu. Browse to the location of your raster image file and give your notepad text file the same name with the .tfw file extension. (example: if your image is called montreal.tif, then your world header file will need to be called montreal.tfw, if it is montreal.jpg then montreal.jpw, montreal.gif would be montreal.gfw.)
4. Now open ArcMap and create a new empty map.
5. To load the image that you wish to georeference in ArcMap click the “File” menu and select “Add Data”. Browse to the desired image, select it and click OK.
Otherwise, click this icon  to open the “Add Data” dialogue box.
6. More than likely if ArcGIS did not recognize your image’s georeferencing information, it will not recognize the correct projection of your image either. In this case you will need to supply ArcGIS with the correct projection information for your image. To do this we will use a tool in the ArcToolbox. If the ArcToolbox window is not visible, click on the small red toolbox icon .
7. In the ArcToolbox window, click the small box with the + next to “Data Management Tools” and then the box next to “Projections and Transformations” in the drop-down list. Double click “Define Projection”.



8. A dialogue window will appear such as the one below. Click the folder button at the end of the first line to browse to your image file. Click the button at the end of the second row to select the coordinate system specified in your image's metadata file.



9. Your image file should now successfully overlay with any other, properly projected data. As well, any spatial analysis carried out using your image should be correct. Congratulations!

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Last Updated: Nov 2006