

Importing/Georeferencing Google Imagery into ArcMap 10.1

FOR 353 (Fall 2013)

Lab Instructions:

In this lab you will learn to extract freely available imagery from Google Earth for use in a GIS. The skill set derived from this lab will allow you to understand the principles of bringing in non-georeferenced, unrectified historical aerial photographs (scanned) or Google screen captures for analysis (area measurements, change detection analysis).

For the lab, two methods are presenting for extracting and georeferencing Google screen captures for use in ArcMap 10.1. You are responsible for the following:

1. Read through both methodologies, lab exam questions may come from anything listed in this document
2. You are responsible for identifying an area for implementing Method 1. You will send your georeferenced image to your lab instructor for credit (15 pts)
3. For extra credit (x pts), georeference the same image using Method 2 methodology. Make sure to comment on the visual differences between both referenced images. Which one looks like a better fit? Compare the RMS error between both images
4. Compare both images from Page 15. List differences between both images. Why is the field behind Jordan Hall devoid of vegetation between 2002 and 2014? Why are the patterns different? (5 pts)

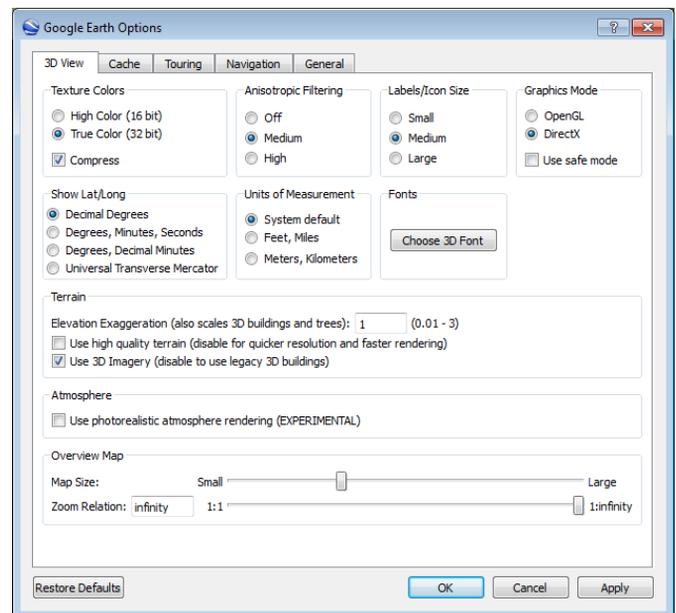
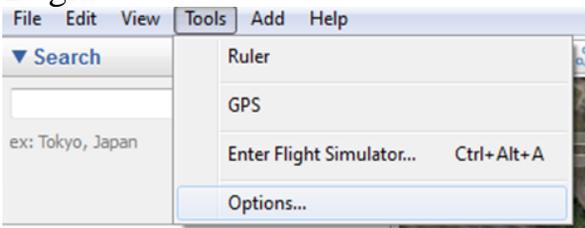
Method 1: (Georeferencing without basemap data)

ArcMap 10 now allows you to bring in imagery as basemaps (Method 2) to your project. However, this requires a robust network connection because you are constantly feeding in live data from their servers. As an alternative method to bring in satellite imagery into ArcMap, the following tutorial guides you through the steps of bringing in selected screenshots from Google Earth into ArcMap. One huge advantage of using Google Earth imagery is that you will be able to bring in **historical data** that is now available.

GOOGLE EARTH

You will navigate to the location in Google Earth that you want to bring in to ArcMap. Then, you will add 4 control points on each corner of the image, record their latitude/longitude coordinates, and export the image as a jpg file.

1. Open Google Earth
2. In the Layers panel (Sidebar), turn everything off
3. Go to Tools -> Options, and change the “Show Lat/Long” option to “Decimal Degrees



4. Navigate to the area and extent that you want to use in ArcMap

5. Press “r” on your keyboard. This will reset the view angle to be “top down” and rotates the map so that it is “north up”

6. Press F11 to make your map go full screen

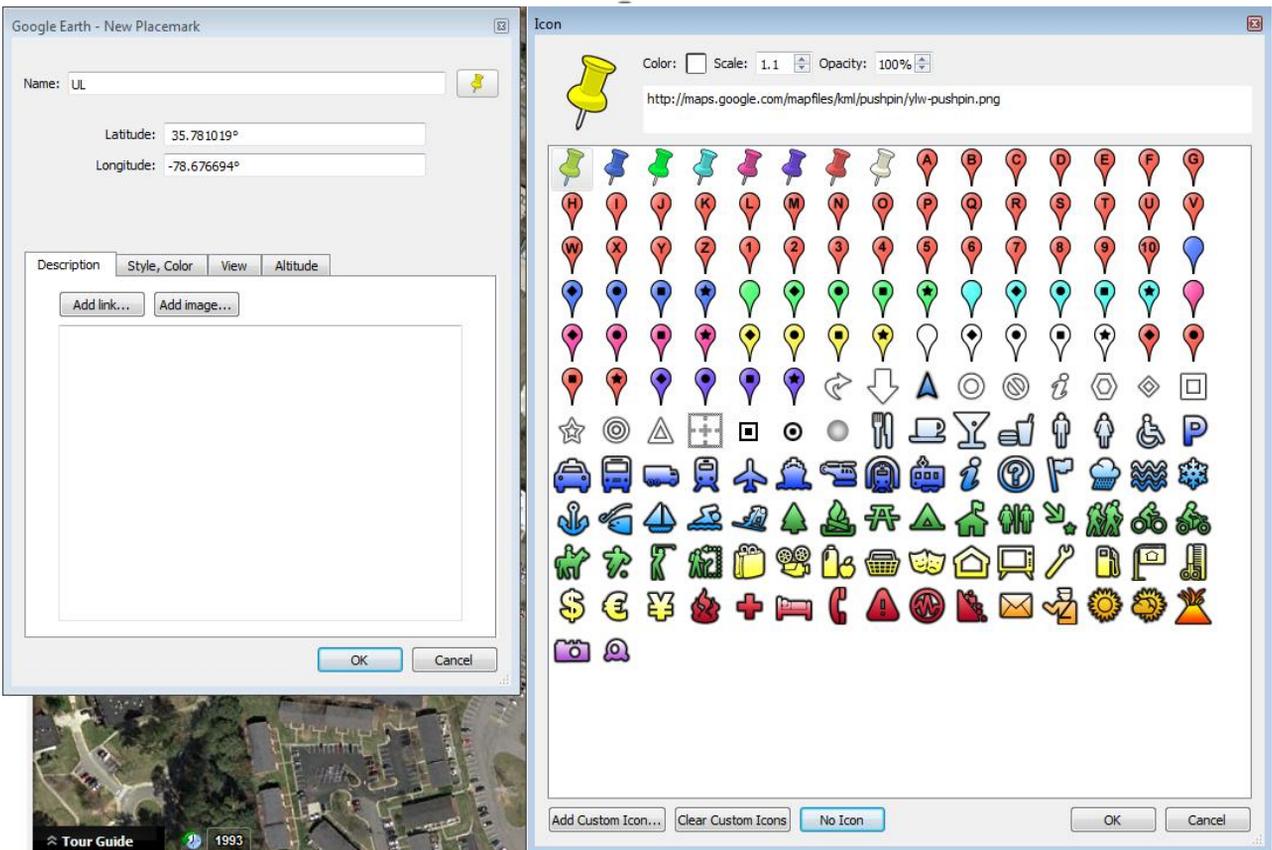
7. Click on the “add placemark” button



8. Move the icon from the middle of the screen to the top left corner of the map (make sure to leave the ‘New Placemark’ dialogue open, this will allow you to left click-hold-move; also don’t place the icon in the absolute upper left corner otherwise it won’t be visible when you save your image)

9. Rename the icon “UL”

10. Click the button to change the icon



12. Jot down (or copy and paste) the latitude and longitude coordinates somewhere you can access later

13. Repeat the process and add icons for UR, BL, BR

14. Now it's time to export the image. Go to File -> Save -> Save Image and save your file

ARCMAP

Now you will import your Google Earth image, and georeference it based on the 4 control points you created.

1. Open ArcMap

2. Go to View -> Data Frame Properties and select the Coordinate System tab

3. Choose Predefined -> Geographic Coordinate Systems -> World -> WGS 1984

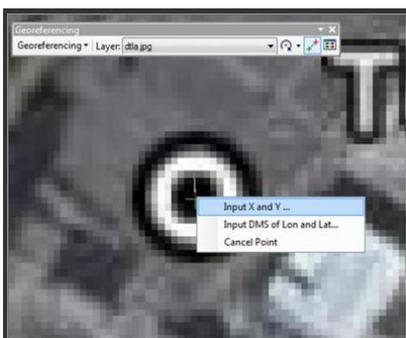
4. Go to Customize -> Toolbars -> Georeferencing

5. Add the image file from Google to ArcMap. If it prompts you to build pyramids, click ok

6. Zoom into the top left corner of your satellite image

7. From the georeferencing toolbar, click the “add control points” button 

8. Hover over the exact center of the top left icon you created, and LEFT click once



9. Now, RIGHT click once and click on “Input X and Y...”

10. Add the correct coordinates for your Top-left control point.

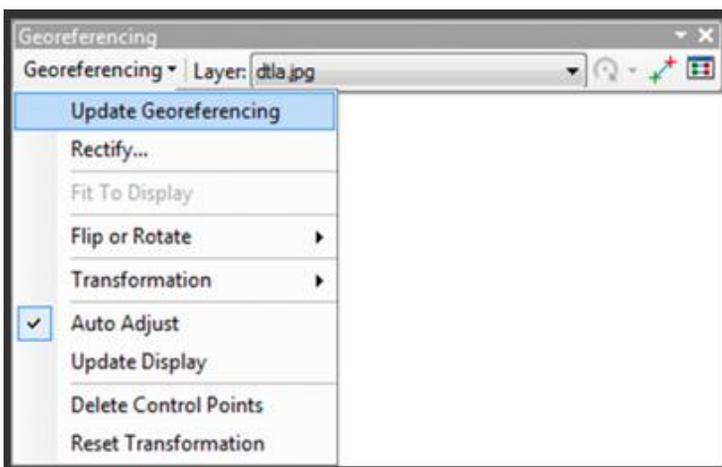
WARNING: Remember that “X” is LONGITUDE and “Y” is LATITUDE

11. Repeat the process for the remaining 3 control points. If the map has disappeared from your view port, just right click on the layer, and select “zoom to layer”

12. Select ‘View Link Table’ to look at your reference points to see the extent of your RMS error. (Record the RMS error at top and then save the file)

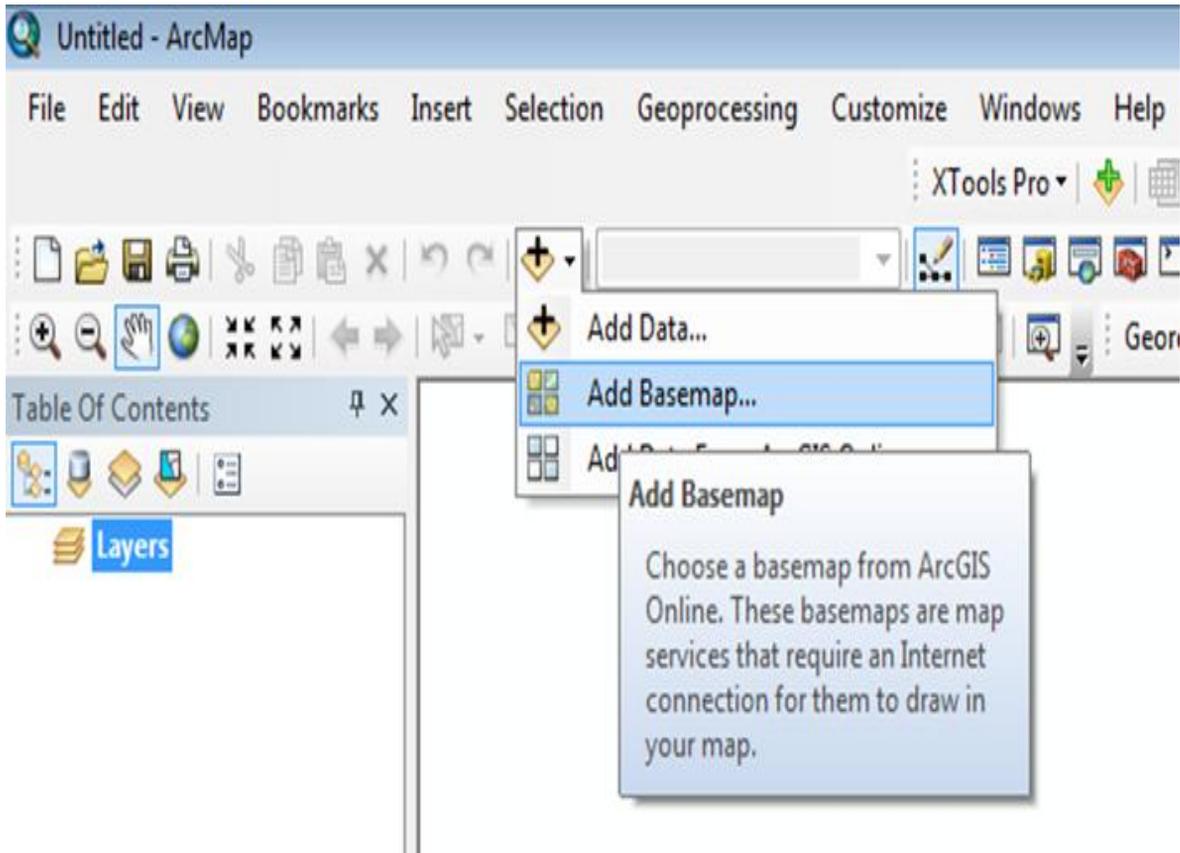


13. To finish your georeferencing, click on the “Georeferencing” menu item from the toolbar, and select “Update Georeferencing”

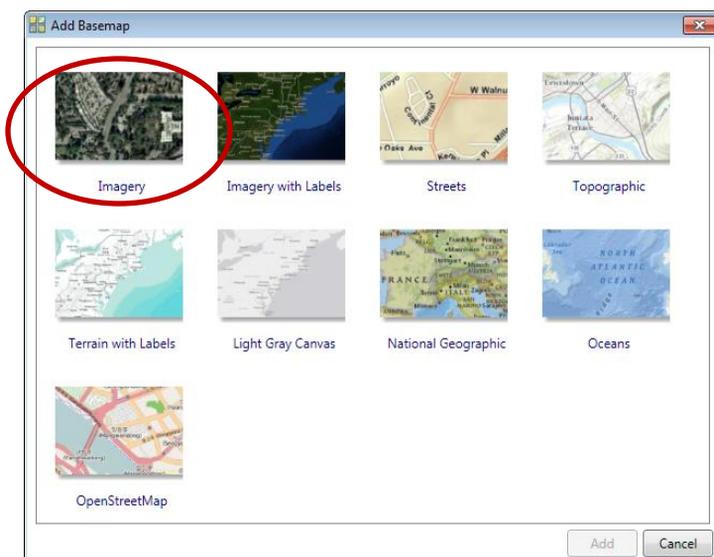


Method 2: (Using basemap data for georeferencing)

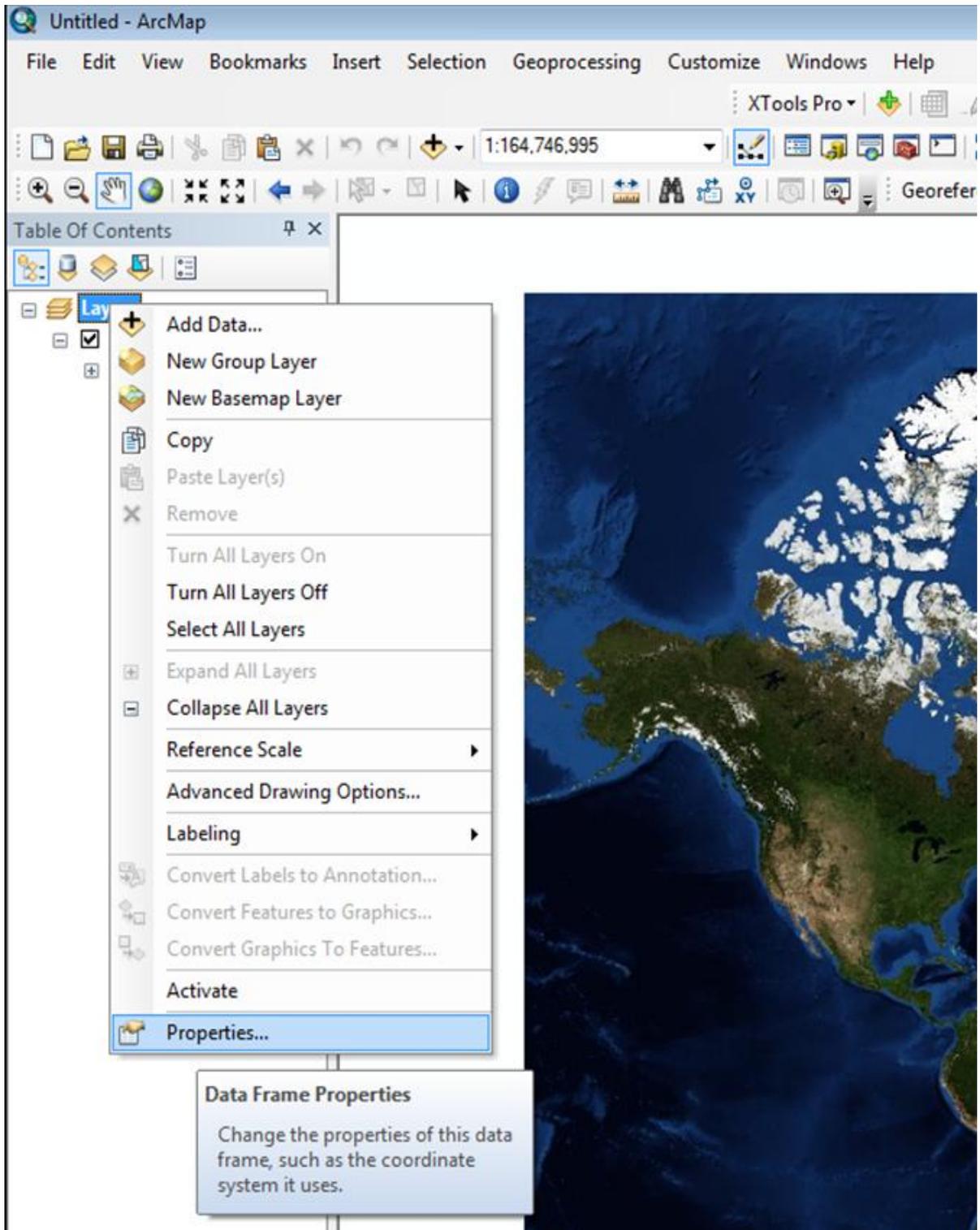
Add Basemap



Choose Imagery



Set Data Frame Properties – Tab ‘Coordinate System’

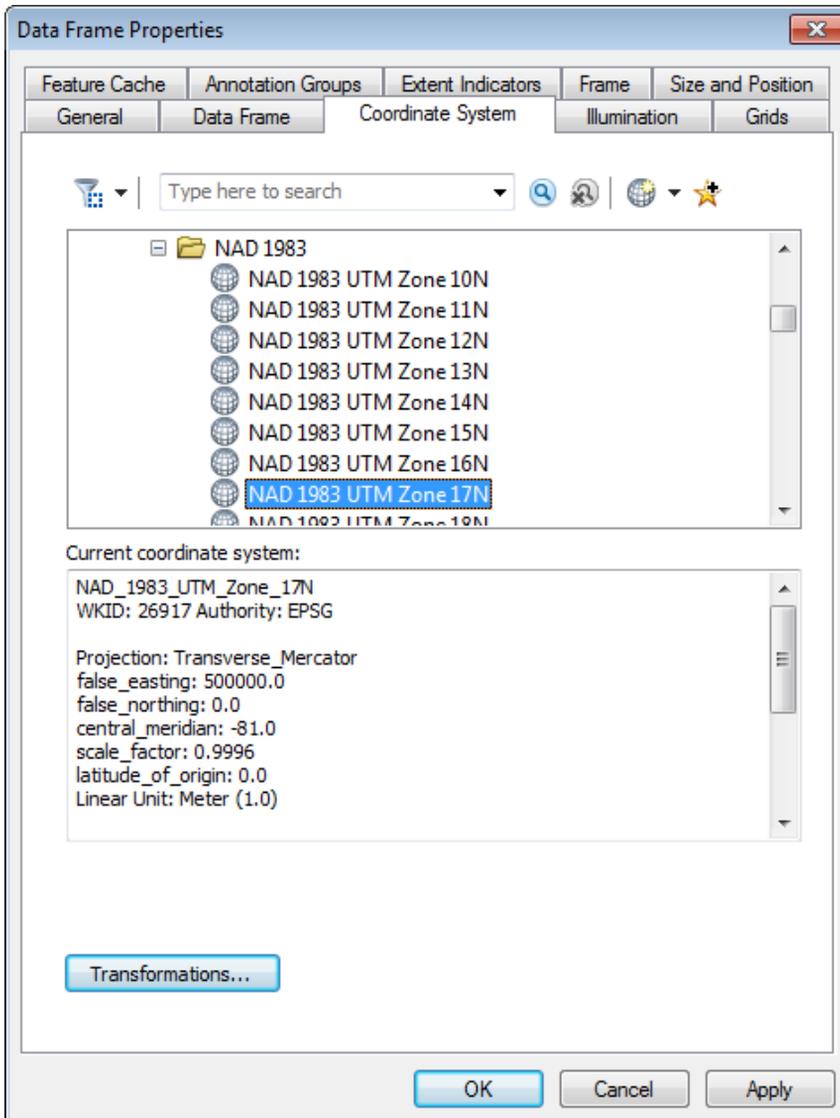


The screenshot displays the ArcMap interface with the 'Table Of Contents' pane on the left. A context menu is open over the 'Layer' folder, listing various actions. The 'Properties...' option at the bottom of the menu is highlighted. A tooltip box is positioned below the menu, containing the following text:

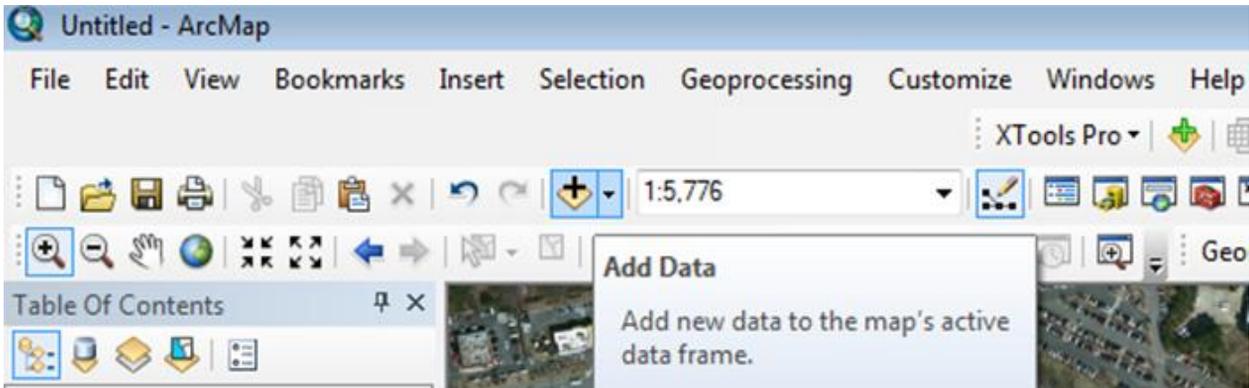
Data Frame Properties
Change the properties of this data frame, such as the coordinate system it uses.

The background of the screenshot shows a satellite map of North America, with the United States and parts of Canada visible. The software's menu bar and toolbar are also visible at the top of the window.

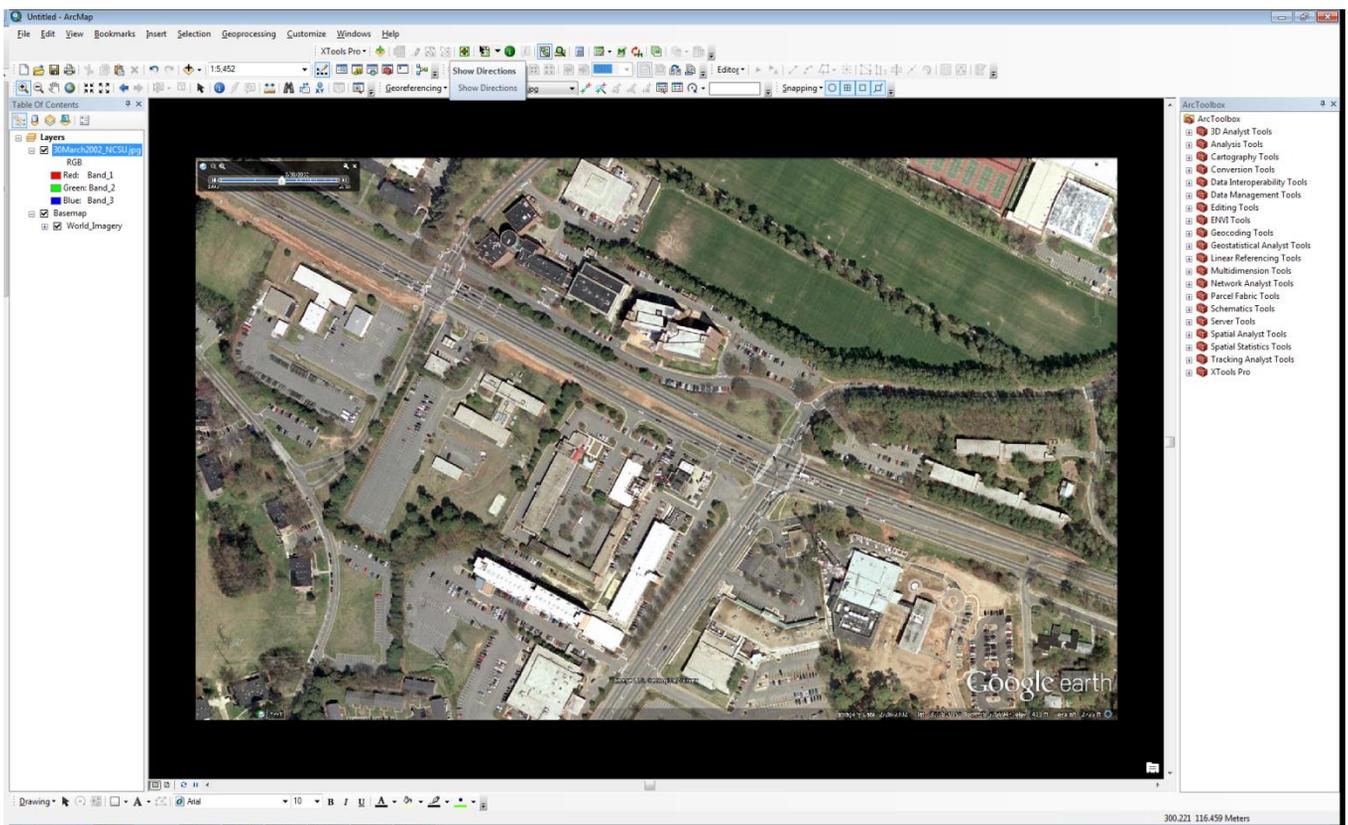
Coordinate System: Projected Coordinate Systems → UTM → NAD 1983 UTM Zone 17



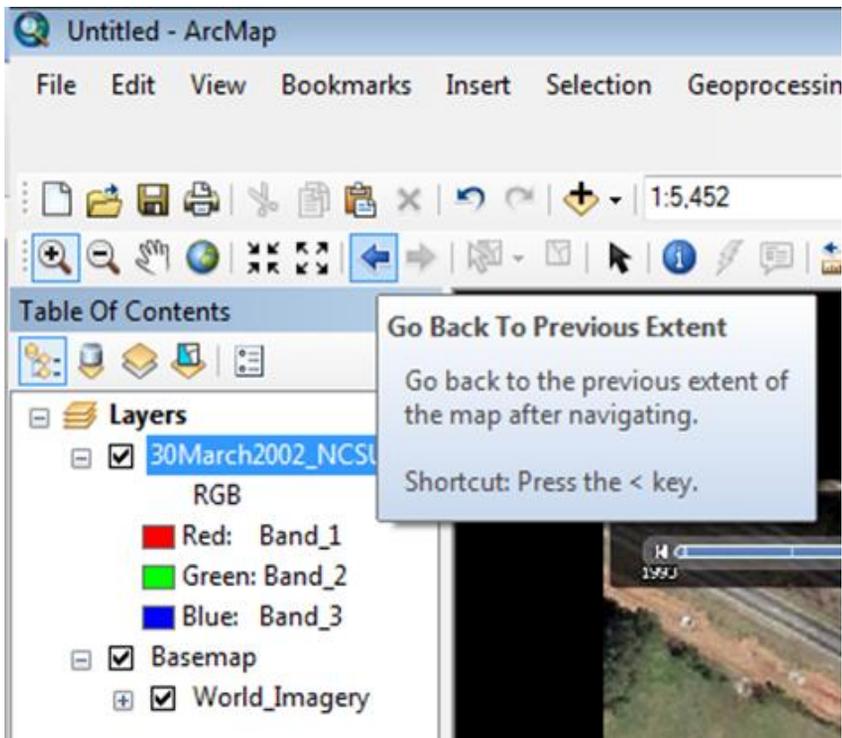
Next, 'Add Data', navigate to '30March2002_NCSU.jpg (you can also use your own area screen capture, make sure that it is not so rural as to not having many control points)



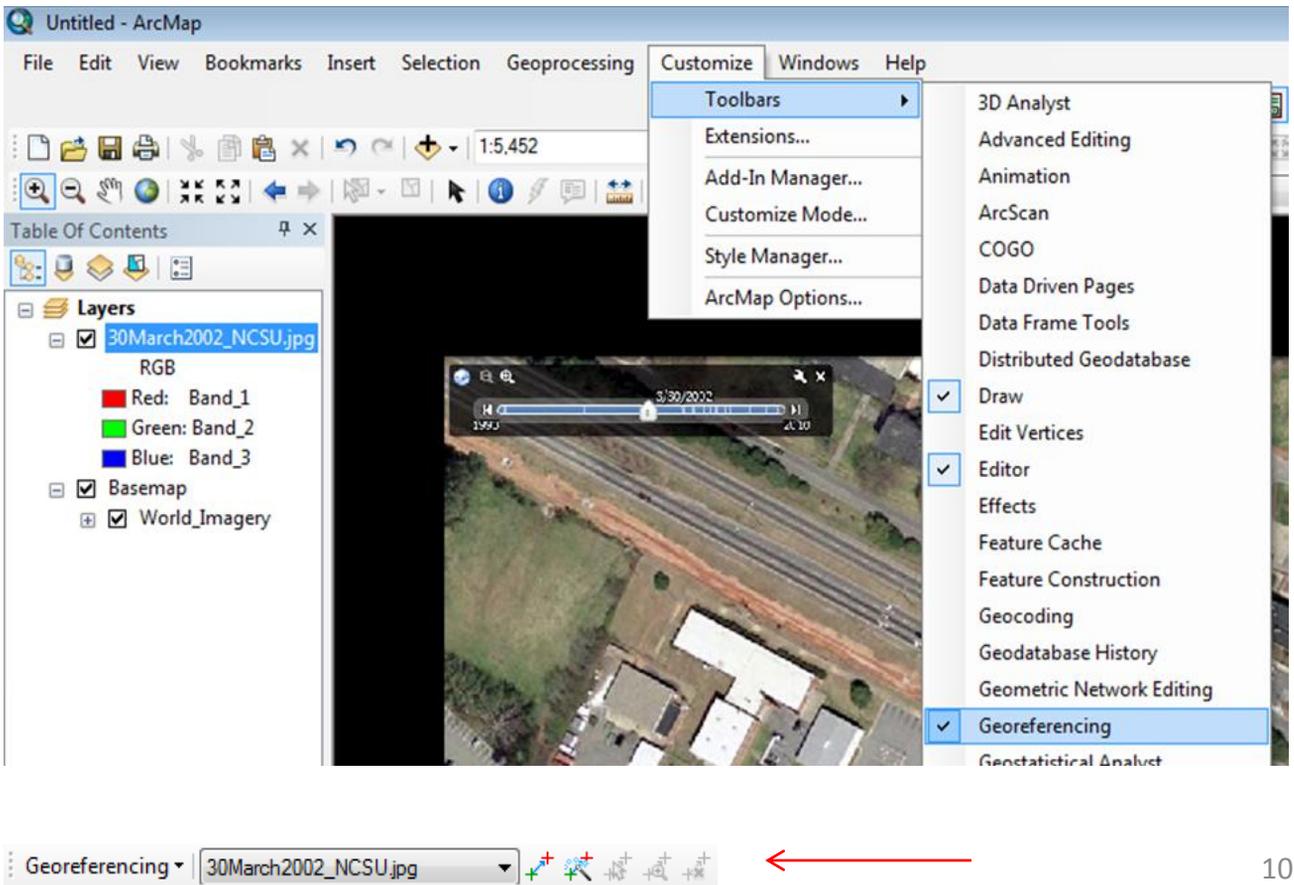
Rt click in TOCs on Google Image --> click 'Zoom to layer'



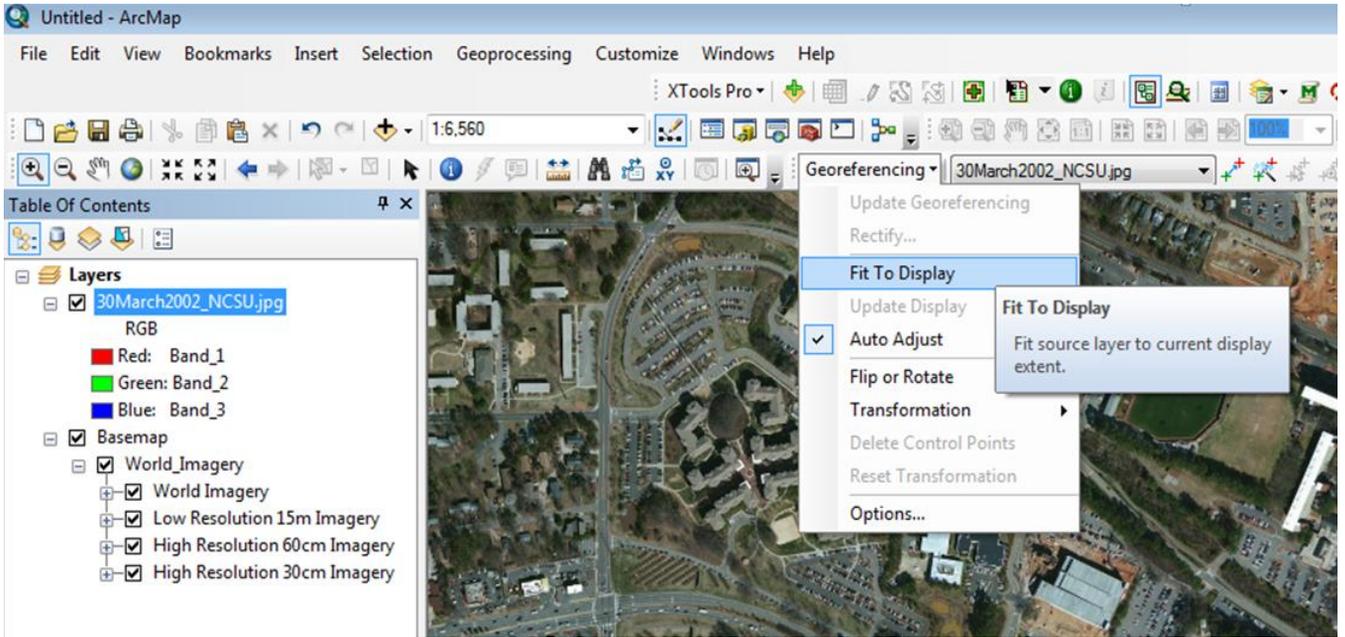
Click back arrow to go back to previous extent



Add the 'Georeferencing Toolbar'



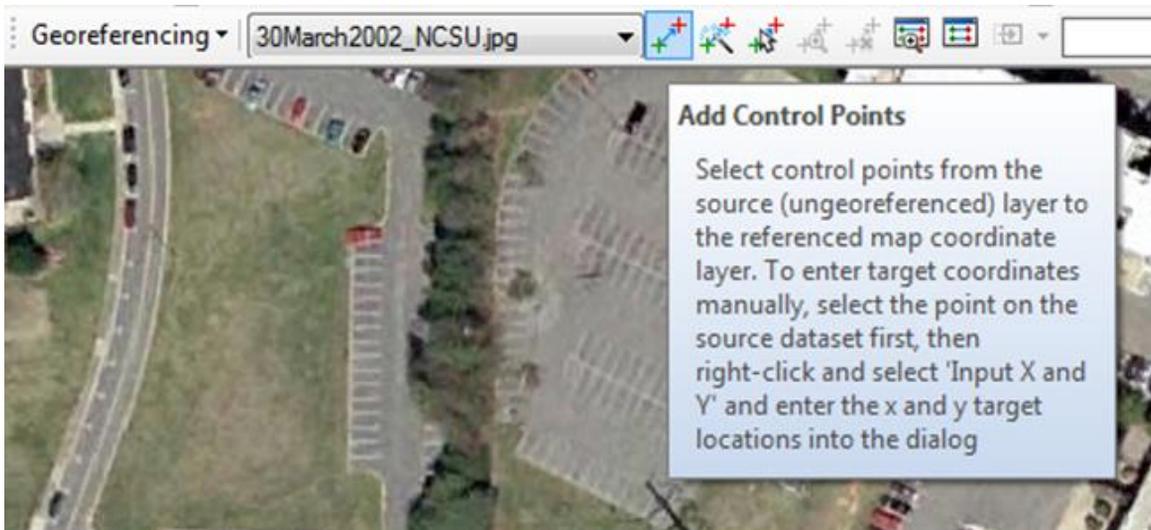
'Fit To Display' will bring your image onto the basemap image



Notice that it is in the general area, however the scales do not match



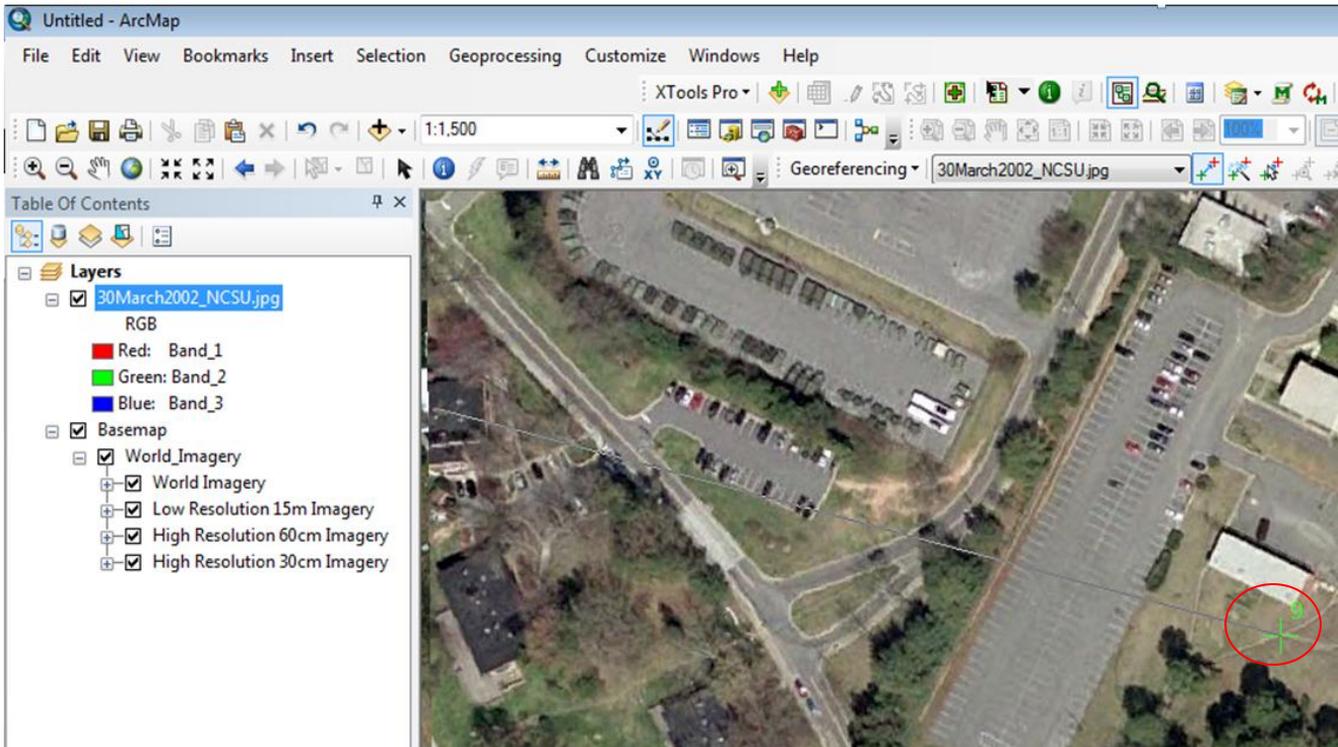
Next, we want to add control points....



We need to locate at minimum 5 points throughout the image that you can see on both the basemap and the image you are rectifying. Don't choose the tops of buildings due to displacement issues.



First place cursor on visible point of Google image, left click, then take cursor to TOCs and uncheck the Google image so that it is not visible, then click on the same feature on the basemap (you may need to click on the tool that selects reference points – this allows you to left click-hold and move the reference point to the appropriate location on the basemap)



Select 'View Link Table' to look at your reference points to see the extent of your RMS error. This error should be < 5 meters. Within this table you can select and delete rogue reference points. Save this table once you are finished.

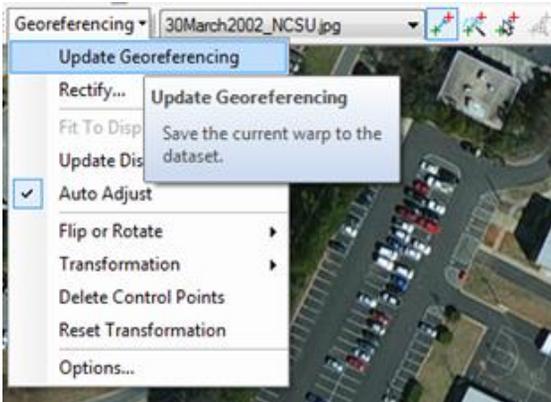


Link	X Source	Y Source	X Map	Y Map	<Residual_x>	Residual_y	Residual
<input checked="" type="checkbox"/>	1	1893.374475	-260.811831	710400.152112	3962313.664149	0	0
<input checked="" type="checkbox"/>	2	905.201060	-115.583416	709961.505670	3962348.643785	0	0
<input checked="" type="checkbox"/>	3	334.023711	-106.212206	709718.275178	3962344.757159	0	0
<input checked="" type="checkbox"/>	4	327.829434	-1125.869153	709720.138774	3961907.132189	0	0
<input checked="" type="checkbox"/>	5	1576.984421	-907.149695	710256.317972	3962017.860536	0	0
<input checked="" type="checkbox"/>	6	1258.969040	-498.590724	710116.220816	3962188.517127	0	0
<input checked="" type="checkbox"/>	7	1642.722498	-12.168693	710281.718022	3962403.226932	0	0
<input checked="" type="checkbox"/>	8	1756.541078	-156.087011	710333.311876	3962340.917432	0	0
<input checked="" type="checkbox"/>	9	537.290716	-678.748270	709807.054573	3962103.982583	0	0

Auto Adjust Transformation: 1st Order Polynomial (Affine)

Degrees Minutes Seconds Forward Residual Unit : Unknown

Once finished, select 'Update Georeferencing' from the toolbar. This will embed the georeferencing into the image through the creation of an associated worldfile.



What changes can you see between 2002 and 2013?

