Lab: Editing Data in ArcMap and Digitizing in Google Earth

Claudia Herbert, 2019

Datasets used*:* ASTGTM2_N30E110_dem.tif, basemap

Tools to use: Google Earth Pro (desktop application), Snipping (desktop), (in Arc Map) Conversion Tool, Symmetrical Differences, Measure tool, Contour

Learning objectives:

1. Digitize and Export .kml from GoogleEarth
2. Import .kml to ArcMap
3. Calculating area of vegetation conversion
4. Using Digital Elevation Models to make Contour Lines
5. Use symbology to create the final map

Due:

Lab Questions:

1. **How did images change as you went back in time? How does the number of images change with zoom? Why do you think this is?**
2. **What Datum is the DEM and polygons from Google Earth in?**
3. **How much previously vegetated land was submerged by the Three Gorges Dam (meters^2)**
4. **What is the elevation of the water in the dam? Why might this be helpful information?**

Maps: 2 screenshots of google earth
1 map showing the vegetation under water and elevation contours

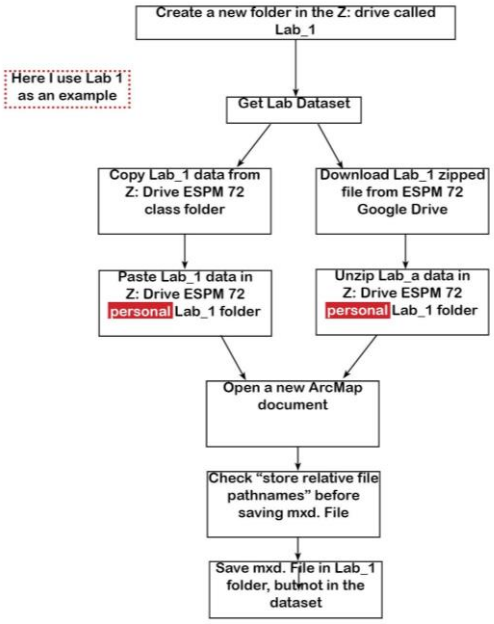
Tools: 2 tools with descriptions

----------**CONTINUE TO NEXT PAGE FOR LAB INSTRUCTIONS**----------

LAB STARTS HERE

Section I. Digitize and Export .KML

1. Start the lab by downloading or accessing the *'Lab4_GoogleEarthDigitizing'* to your personal folder from the class z-Drive.
    1. Create a new folder in the Z: drive called *Lab_4*
    2. Copy and paste *Lab_4* files from the Google-Drive into your user folder on the Z: drive
    3. Unzip or extract the files to your new *Lab_4* folder.

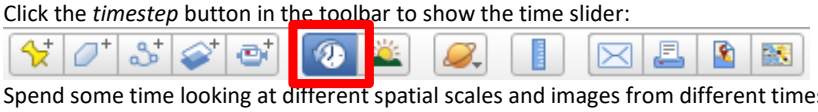


2. Open *GoogleEarth*, use the desktop file search bar and type in 'GoogleEarth' and you should see an icon

3. Once the program is open, make sure you have your toolbar at the top (View ➔ Toolbar)

4. Zoom to your area (type in Three Gorges Dam)
    a. You may get multiple suggestions so scroll through the recommended list to find the appropriate one.

5. Click the *timestep* button in the toolbar to show the time slider:

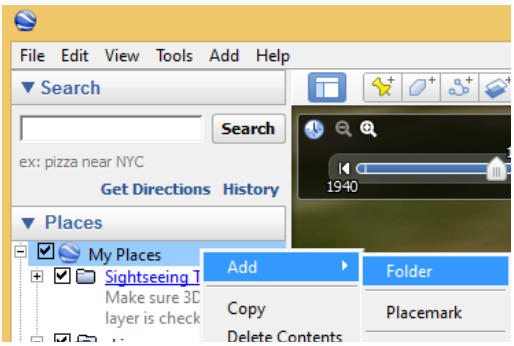


6. Spend some time looking at different spatial scales and images from different times available.

Q1: How did images change as you went back in time? How does the number of images change with zoom? Why do you think this is?

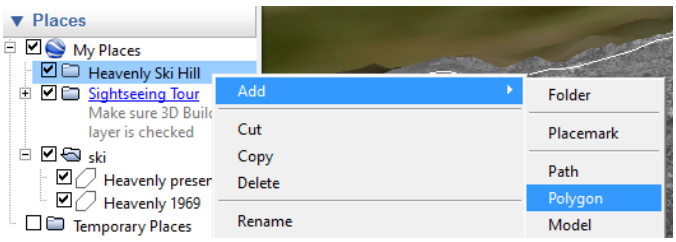
7. Find a good timestep post dam construction where you can see the water outline
    a. try: zoom in and out and toggle the screen so you can see Quyuanzhen and Letianxizhen simultaneously, this might be a good zoom to see the entire dam

8. Create a folder
    a. Right-click “My Places”
    b. Navigate to “Add -> Folder”
        i.



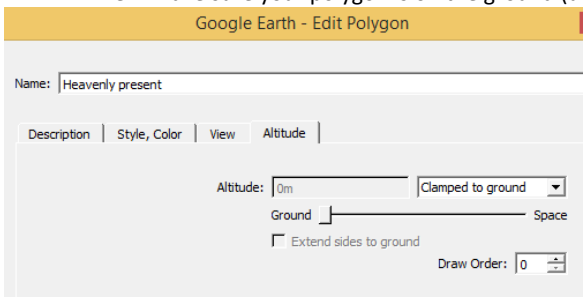
    c. Name it for your study area and year; for example, “YangtzeRiver_YourYear”
    d. click ‘OK’

9. Create a polygon layer
    a. Right-click your new folder -> Add -> Polygon



b. Name it for the present extent of the Yangtze River; e.g. "YangtzeRiver_Year"
    i. **DO NOT HIT OK**!!! (if you did, right-click on your layer and click properties to get back in)
c. Adjust the color of your polygon so you can see what's going on
    i. Go to the 'Style, Color' tab
    ii. Change the color (anything is fine)

d. Change the Area dropdown to "Outlined"
    i. DO NOT HIT OK
e. Make sure your polygon is on the ground (under the "Altitude" tab)



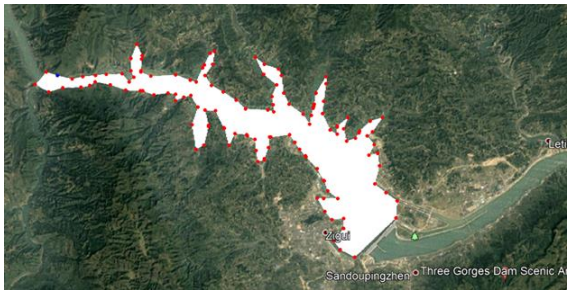
    i. DO NOT HIT OK
f. Make a polygon of the river boundary **prior to dam construction**
    i. Begin to draw your polygon by left clicking on the main 3D Viewer.
    ii. Choose a natural feature you can see in both image dates to be your start point for both polygons. (I chose the river fork and that seemed to work)
        1. **hint:** start at the lower bank so you can see your work as you add points
        2. Use your zoom, rotate, and pan to get around the map as you go
    iii. Note that you can also hold and drag to draw, but this makes editing the shape difficult
        1. Right-click a point to delete it (or drag it to a new location)
        2. Notice that the last point you created is blue (green when your mouse is near it); this means that the next point you create will be after that one
            a. Left-click a point to activate it (and make it blue)
    iv. Once you are done and happy with your polygon, save the layer by clicking "ok" (it doesn't have to be perfect!)

v. 

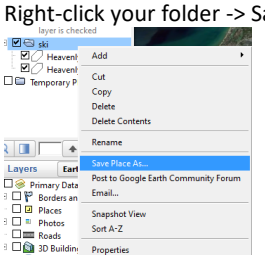
TAKE A SCREENSHOT OF THE IMAGE WITH YOUR POLYGON AND IMAGE DATE (Snip tool or PrtScn)

Hint: *to take screenshots on windows, use the 'Snipping tool'*

10. Find a clear image post-dam construction, make a polygon of the river boundary **post to dam construction**
    i. hint: if you don't know when that is, google Three Gorges Dam or click through different years to see if you can spot the change
    b. Repeat step "f" to create a historic layer, making sure the date is in the title
    c. **TAKE A SCREENSHOT OF THE IMAGE WITH BOTH POLYGONS**

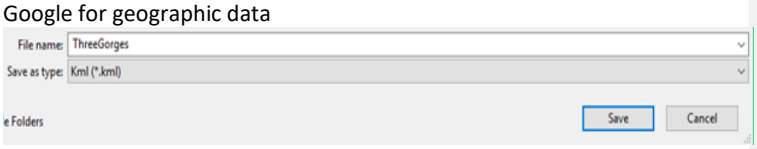


11. Export your 2 polygons as .kml files
    a. Right-click your folder -> Save Place As



    b. Navigate to the folder you'd like to save it to

c. Change “save as type” to Kml (*.kml), make sure its saved in a folder you can later access.
    i. note: Kml stands for Keyhole Markup Language and is a format used by Google for geographic data

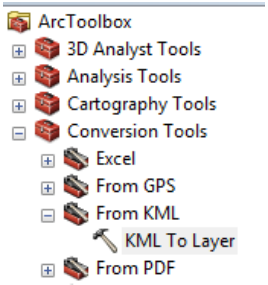


Section II. Import .kml to ArcMap

12. Set up a new ArcMap document (.mxd) for lab 4
    a. Open a new ArcMap document.
    b. Save as a .mxd file named *Lab_4_LastName_FirstName* to your *Lab_4* folder
    c. Navigate to your *Lab_4* folder and add the files to your ArcMap document
    d. Save your ArcMap document regularly.
        i. Remember to go to Map Document Properties and click the box next to ‘store relative file pathnames.’

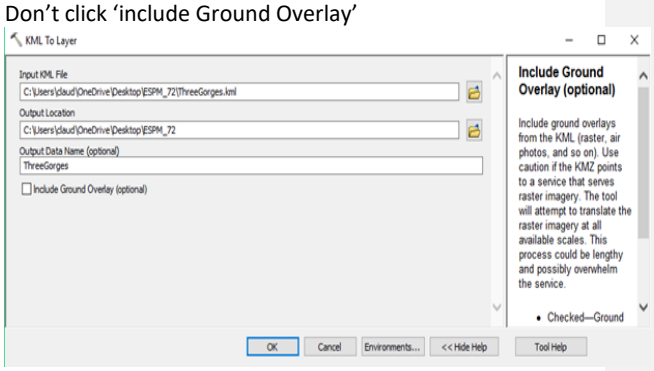
13. Connect to your folder for this lab and add the DEM raster file ‘ASTGTM2_N30E110_dem.tif’ from the Lab 4 class folder
    a. Navigate to the Catalog tab on the right of Arc and click the ‘Connect to New Folder’ tab
        i. Connect your copied Lab_4 folder and load ‘ASTGTM2_N30E110_dem.tif’

14. Convert your new .kml files into shapefiles in Arc
    a. Open the Toolbox  located on the top navigation bar **or** under ‘Cataloge -> System Toolboxes’
        i. Navigate to: Conversion Tools -> From KML -> KML to Layer



        ii. Double Click on the ‘KML to Layer’ tool
            1. **Input KML** – navigate to the KML file you just made
            2. **Output location** – *choose the folder you created for today (e.g. Lab_4)*
            3. **Output Data Name** – choose an appropriate name, you can keep it the same as the polygon name from Google Earth Pro

a. Don't click 'include Ground Overlay'



b. With these three files in on your map, check that the Datums are the same
    i. right click on the layer in the Table of Contents and go to the Source tab on Properties

Q2: What Datum is the DEM and polygons from Google Earth in?

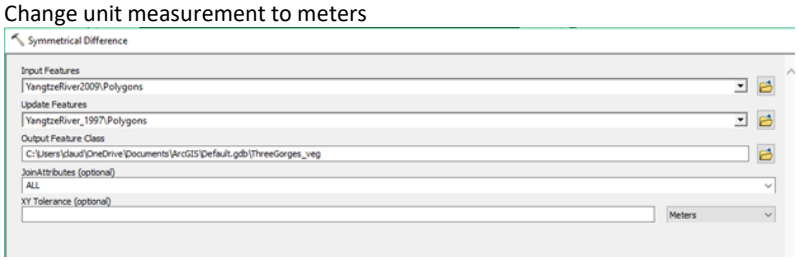
Section III. Calculating area of vegetation conversion

In this section, we will be doing some raster calculator work to estimate the amount of vegetation flooded in the construction of the dam. From a climate perspective, flooded vegetation during dam construction produces a large amount of GHGs as they decompose. If you wanted to estimate this potential warming impact, the first step would be figuring out how much vegetated land will be submerged. We are going to compare areal images from pre- and post-dam construction, by analyzing the difference in the area we can estimate the amount of vegetation submerged.

15. Check your table of contents to make sure both of your converted-kml polygons are showing in ArcMap.
    a. Feel free to add a basemap: File -> Add Data -> Add Basemap
    b. Compare this with your digitized polygon, how close did you get?

16. The Analysis toolbox has a function called Symmetrical Difference: Toolbox -> Analysis Tools -> Overlay -> Symmetrical Difference
17. Double click on Symmetrical Difference
    a. Add the two polygons you want to be comparing
        i. input: your post-dam polygon
        ii. update: your pre-dam polygon
    b. Save the file to your Lab 4 folder and add a name that is meaningful to you
    c. JoinAttributes: ALL

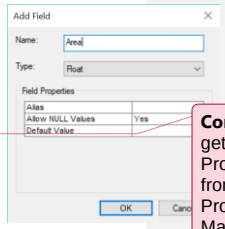
d. Change unit measurement to meters



18. Click ‘Ok’
19. Check to see if this new layer has been added to your table of contents. If not, add it now.
20. With our new polygon, let's calculate the area to estimate submerged vegetation

a. There are a few ways to do this. We can use the measure tool or in our attribute table. The following steps will be outlining how to ‘add field’ and use Calculate Geometry in the attribute table to calculate the area.
b. Open the attribute table for the newly created polygon
    i. right click on the layer and go to ‘attribute table’
c. navigate to the Table Options in the upper left corner and click ‘Add field’

d. Name the field something like ‘Area’ and select ‘Float’
e. Scroll to the right of your attribute table and find your new field
    i. Right click on the top of the new field header
f. click ‘Calculate Geometry’ and choose ‘Area’
    i. Accept the pop-up windows



If this section isn't working bc you are getting an error message about it needing to be in Projected Coordinate System, then use the Project tool from lab 3. Navigate to the Project tool under Projections and Transformation in the Data Management toolbox.

Open the tool, then add the Symmetrical Difference polygon you created as the layer to project, save it to a folder that you know, and then use the finger/hand button to the right of the box to specify coordinate you wish to transform.

Once that is opened, expand Projected Coordinate System, scroll to UTM (expand), scroll to the one with WGS 1984 (expand), expand Northern Hemisphere, and then scroll to the option with 49 as the section. This is the one we want as our projection.

Click 'OK' on the Project tool.

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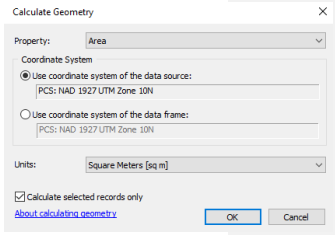
Click 'OK' on the Project tool.

Once the tool has run, find the new polygon you have created and add it to your table of contents. Now open its attribute table and try running the Calculate Geometry tool.

Once the tool has run, find the new polygon you have created and add it to your table of contents. Now open its attribute table and try running the Calculate Geometry tool.

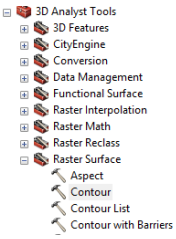
ii. Make sure 'Area' is selected and check that the units are square meters.

Q3: How much previously vegetated land was submerged by the Three Gorges Dam (meters^2)



Section IV. Using Digital Elevation Models to make Contour Lines

The Digital Elevation Models (DEM) we will be using for this lab is from the satellite ASTER. If you want to read more about the satellite, click here. In Lab 1 we looked at isolines to determine the elevation of the highest peaks around Tahoe. Today we will be using the raster DEM to create isolines in Arc to determine the elevation of the water in the Three Gorges Dam. **What is the elevation of the water in the dam? Why might this be helpful information?**



21. For this portion, we will be using the Contour tool in the Raster Surface Toolbox.
    a. Note: Make sure you save your ArcMap document before this step
    b. Navigate to this tool by opening your toolbox, then clicking 3D Analyst Tools -> Raster Surface -> Contour
22. Double click on Contour to open the tool

If you are having problems opening the Contour tool, it may be because your 3D Analyst Extension is not turned on.

Go to 'Customize' in the top toolbar, navigate to 'Extensions' and then click the box next to 3D Analyst.

Arc's default is to not have the extensions turned on, but when you run into similar problems trying to open tools in the future it could be that the package it relies on is not turned on. This is can be a helpful thing to check!

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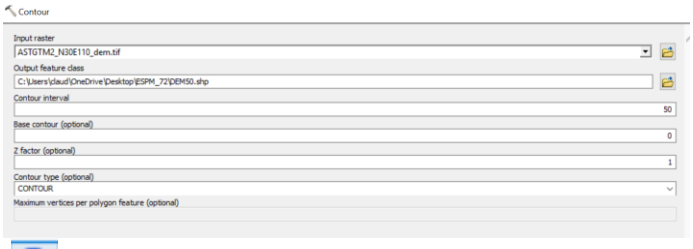
    a. input raster: ASTGTM2_N30E110_dem.tif
    b. output feature class: navigate to your lab 4 output folder and then name the feature class "DEM50m"
    c. contour interval: 50
        i. If you look into the ASTER satellite, there is a 10- to 25-meter error so we are setting our contour interval to be in groups of 50 to limit some of this

error. You can mess around with the interval, but keep the data resolution when selecting intervals

d. keep all other settings as default and click 'OK'



23. Use the  tool we used in the first lab to find the elevation of the water line for the Three Gorges Dam

Q4: What is the elevation of the water in the dam? Why might this be helpful information?

Section V. Use symbology to create final map

Display your created polygon showing land lost (use symbology)
Add DEM-derived isolines
Add a basemap (file -> add data -> add basemap)
Map elements (north arrow, scale, title, cartographer name, legend, inset map)
Produce your final map – be creative with layout

Don't forget your screenshots from Google Earth and a description of 2 tools!
The Monday lab section will have an additional week to complete this lab and is encouraged to attend the Tuesday lab 9-12.

Consider:

1. Select only layers that you think are helpful
2. Extent: How zoomed to you want to be? What are you trying to show?

Be sure to:

3. Adjust the legend
4. Change the title
5. Correct the cartographer's name
6. have an inset map

----------END OF LAB----------