

Land use in my neighborhood Part I.

We are beginning a 2-part project looking at forests and land use in your home neighborhood. The goal is to measure trends in forest development in modern Ohio. You will look at your home: an area you know well enough to corroborate results from aerial photos.

A short history of forests in Ohio is included in my lecture segments “Moving westward” and “Industrial uses of forests”, and in pages 361-368 of the book *Americans and Their Forests*. You should review your notes and read this section before you write your final report (Part II of the project).

The assignment

Please use the image-processing program ImageJ to systematically sample land uses in aerial photos taken around the time of your birth. Do this using any of the public computers in the Alden Library (click on Start > Programs > Miscellaneous Applications > ImageJ) or download ImageJ to your own computer (you can download it free from <http://rsb.info.nih.gov/ij/download.html>, but you also need a plugin which I can give you).

A. Become familiar with ImageJ.

1. **Print out “ImageJ Basics”** at <http://rsbweb.nih.gov/ij/docs/pdfs/ImageJ.pdf>. This is a brief summary of commands and procedures. It will help you solve problems.
2. **Insert your USB drive** holding the aerial photo files in the computer’s USB port (if your photos are already on your hard drive, skip this step).
3. **Run ImageJ.** Click on the ImageJ icon (a little black microscope, unless you are using a Mac, in which case it’s yellow). After a long wait, a tool bar will appear.
4. **Open your aerial photo file.** On the tool bar, click on File > Open. Navigate to your NHAP photo (the one taken in the 1980s), and click on it. Maximize its size on the screen (click on the maximize button in the upper right).
5. **Set the scale.** Start by measuring the width of the whole photo.
 - a. Click on the “Straight Line Selection Tool” (fifth button from the left). Notice that a cross (“+”) cursor appears on the photo.
 - b. Position the cross exactly on the left edge of the image (put it on the edge between the image and the black margin, not on the outer edge of the black margin).

- c. Click and hold down the left-hand mouse button. Drag a horizontal line across to the right edge of the image. Release the button. You should now have a red or yellow line across the photo.
- d. On the tool bar click Analyze > Measure. A “Results” window will appear. Read the length of the red line in inches in the right-most column (call it “Photo Width” and write it down). Click on the red “X” button in the upper right of the Results window (in answer to the query, no, you don’t need to save the measurement).
- e. You know that the scale of the photo is 1:80,000, so you can now calculate the length of the red line in meters on the ground:

$$\text{Photo Width (in inches)} \times 2.54 \text{ cm/inch} = \text{Photo Width (in cm)}$$

$$\text{Photo Width (in cm)} \times 0.01 \text{ m/cm} = \text{Photo Width (in meters)}$$

$$\text{Photo Width (in m)} \times 80,000 = \text{Photo Width On the Ground (in m)}$$

- f. On the tool bar click Analyze > Set Scale. A “Set Scale” menu will appear. Enter the Photo Width On the Ground (which you just calculated in “e”, above) in the white box labeled “Known distance”. In the white box labeled “Unit of length”, enter “meters”. Click the “OK” button.
- g. Now you can use the straight line tool to measure any distance on the ground. Try measuring a few distances until you feel comfortable with distance measurement.

6. Zoom and scroll. Hold down the “CTRL” key and push “+” a few times. You should zoom into the photo. On the tool bar click the “Scrolling tool” (the hand). Notice the hand cursor appearing in the photo. Two purple rectangles appear in the upper left of the photo; they show you where the view is within the photo as a whole. Click and drag your way around the photo. If you have problems with heights, this may make you feel sick! Hold down “Ctrl” and push “-” a few times to zoom out from the photo.

7. Measure an area. Zoom in a few clicks. Drag the photo around until you find a relatively large, clearly defined area on the ground (a field, a patch of woods, etc.) which occupies 30-40% of the width of the photo. On the tool bar, click the “Freehand selections” tool (the heart-shaped icon; fourth button from the left). Position the cross (“+”) cursor on the edge of the clearly defined area, click, and trace the outline of the area. With a little practice, you should be pretty good at this (don’t worry if you’re not exactly on the edge).

When you have outlined the whole area, release the mouse button and click on Analyze > Measure. The size of the area you outlined should appear in the “area” column in units of m². Try measuring a few more areas until you feel comfortable with this tool.

B. Set up your sample grid

8. **Locate your home.** Using the zoom and scroll tools, explore the aerial photo to find your home. Look at obvious features on the aerial photo such as roads, rivers, shopping centers, ball fields, etc. With a little pondering you will recognize them as landscape features near your home. Move along the roads until you recognize your house.

On the tool bar, click the “Point selection” tool. Position the cross cursor exactly on top of your home and click. On the tool bar, click on Image > Show Info. In the window that appears, scroll down to “Point Selection”. Write down the x and y coordinates of your home listed **inside the parentheses** (not the decimal fractions to the left of the parentheses).

9. **Create a grid.** Click Plugins > Grid Matlack. A “Grid” window will appear. In the white box beside “Area per point” enter “40000” (4 followed by four zeros). In the white boxes labeled “x coordinate...” and “y coordinate...” enter the x and y coordinates of your home, which you wrote down in step 8 (above).

10. **Numbering grid squares.** Count *down* five grid squares from your home, and *left* five squares. This grid point is column 1, row 1. The point to the right of it is column 2, row 1; and the point to the right of the that is column 3, row 1. When you get to column 10, row 1; you go up to the next row and start with column 1, row 2. We will collect data at every grid point between column 1, row 1, and column 10, row 10.

To help remember which point you are at, use the paint tool to number the grid lines around the 10x10 grid you are using.

C. Collect data

Examine the land use at each grid point and enter it on the data (below). Classify land use as

deciduous forest (large trees)	deciduous forest (small trees)
old field (rough with sparse trees)	lawn/pasture (smooth, no trees)
row-crop agriculture	water
conifer forest	urban/pavement/building
disturbed soil	other

The “Field Guide to Aerial Photos” at the course web site will help you decide what you’re looking at. Jody, Michael, and Krysta can also help you interpret aerials.

If a grid point falls on a forest patch, measure its **area** in meters². Measure how far the grid point is from the nearest **forest edge** in meters. If the grid point falls outside the forest, measure the distance to the nearest edge of the nearest forest.

Feel free to record any other observations about land use at the point.

Record your data by column and row at each point. This is very important because you will need to come back to these points in the 2000s aerial photo!

Report your results using the attached sheet. Hand it in at class time Monday 28, April.

To hand in Part I

Please fill in the blanks below (questions 1 – 4), and write a short essay to answer each of questions 5 - 9.

All essays must be typed and should be at least 100 words long.

Clearly number each essay. Show the number of words at the top of each essay.

Be sure to answer all parts of the question!

These results are from _____ (town), _____ (state), in ZIP code area: _____.

1. Enter the number of sample points observed in each land-use category:

Young deciduous forest	_____
Old deciduous forest	_____
Old field	_____
Pasture/lawn	_____
Row-crop agriculture	_____
Conifer forest	_____
Water	_____
Urban/pavement	_____
Disturbed soil	_____
Other	_____

3. Enter the average area of forest patches in units of meters in the real landscape (not area on the aerial photo) _____

4. Enter the average distance to the nearest forest edge in units of meters in the real landscape (not distance on the aerial photo)

Forested sample points	_____
Unforested sample points	_____

Essays

5. At the time of your birth, do you think forest was increasing or decreasing in your neighborhood? Why do you think that?

6. Based on your measurements reported in “1” above, what is the dominant land use and do you think it is increasing or decreasing? Why? If you said “increasing” what other land use do you think is converting to the dominant land use? If you said “decreasing” what land use is causing this decline? Why?

7. Based on your measurements of the aerial photos, why do you think forest patches occur where they do? Do they correspond to a natural feature of the landscape? Are they shaped by surrounding land uses? Explain your answer.

8. Based on your aerial photos, does forest occur in isolated patches surrounded by other land uses, or does forest surround patches of other land uses, or somewhere in between? Is forest in long narrow strips, or tight clusters? Describe the pattern of forest in the landscape.

9. Edge effects: The edge of a forest fragment experiences increased light and air movement which may affect forest plants and animals up to 50 meters into the forest. How many of your forested points are within 50 meters from the forest edge? How do you think edge effects have influenced plants and animals in the forest in your photo? Would you consider edge effects to be a serious problem in your neighborhood? Why or why not?

Column	Row	Land use 1980s	Edge dist. 1980s	Area 1980s	Land use 2000s	Edge dist. 2000s	Area 2000s	Observations
1	1							
1	2							
1	3							
1	4							
1	5							
1	6							
1	7							
1	8							
1	9							
1	10							
2	1							
2	2							
2	3							
2	4							
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2	6							
2	7							
2	8							
2	9							
2	10							
3	1							
3	2							
3	3							
3	4							
3	5							
3	6							
3	7							
3	8							
3	9							
3	10							
4	1							
4	2							
4	3							
4	4							
4	5							
4	6							
4	7							
4	8							
4	9							
4	10							

Column	Row	Land use 1980s	Edge dist. 1980s	Area 1980s	Land use 2000s	Edge dist. 2000s	Area 2000s	Observations
5	1							
5	2							
5	3							
5	4							
5	5							
5	6							
5	7							
5	8							
5	9							
5	10							
6	1							
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