# PHAE Part Two: Identify your plot (online/at home)

This handout contains instructions for Part 2 of the lab. These tasks can all be done at home – you do not need to be in your plot to do this part of the lab.

In part 2.1, you will use Google Earth to select a study plot within the study site you identified in the Week 2 Lab.

In part 2.2, you will learn to measure the length of your stride. This will help you measure the sides of your plot, by walking a certain number of steps to measure a 20 meter length.

## Part 2.1: Locate your study plot within the study area

### Background information: choosing a plot size, shape, and location

Plot size often varies with the number of individuals present. In very dense areas, and for very small vegetation, smaller plot sizes are common. Larger plot sizes are typically used when there are fewer plants present.

The number of plots you should measure depends upon the size of your study area, the size of the plots, and the variability of the plants within the area. It’s good to have your plots cover about 5 – 10% of the overall study area. If the variability throughout the study area is low, it can be closer to 5%, but if the variability within the study area is high, it is good to sample more plots so that your data are more representative of the overall study area.

Sometimes the number of plots that can be measured is constrained by the time and resources that can be committed to the survey. In this class, you will be measuring just one plot.

Plots are most commonly either square, rectangular, or round. There are tradeoffs associated with each plot shape – for instance, it’s easier for one person to measure out a circular plot (by using a rope tied to a center point and walking in a circle), but it’s easier to subdivide a square into sub-plots. The choice of plot shape may also depend upon the size and shape of the study area, as well as what equipment and how many people you have.

In this class, the size and shape of the plot is already selected for you. You will be sampling one 400 m2 plot (a square plot that is 20 m long on each side).

*If the shape of your study area makes it impossible to sample a 20 m x 20 m square plot, you can change the shape, but it needs to be the same area if at all possible. For example, you could do a 1 m wide x 400 m long strip of roadside. If your plot size or shape is different than a 20 m x 20 m square, please note that when you turn in your data – contact me if you need any help adapting the sample protocols to your plot shape.*

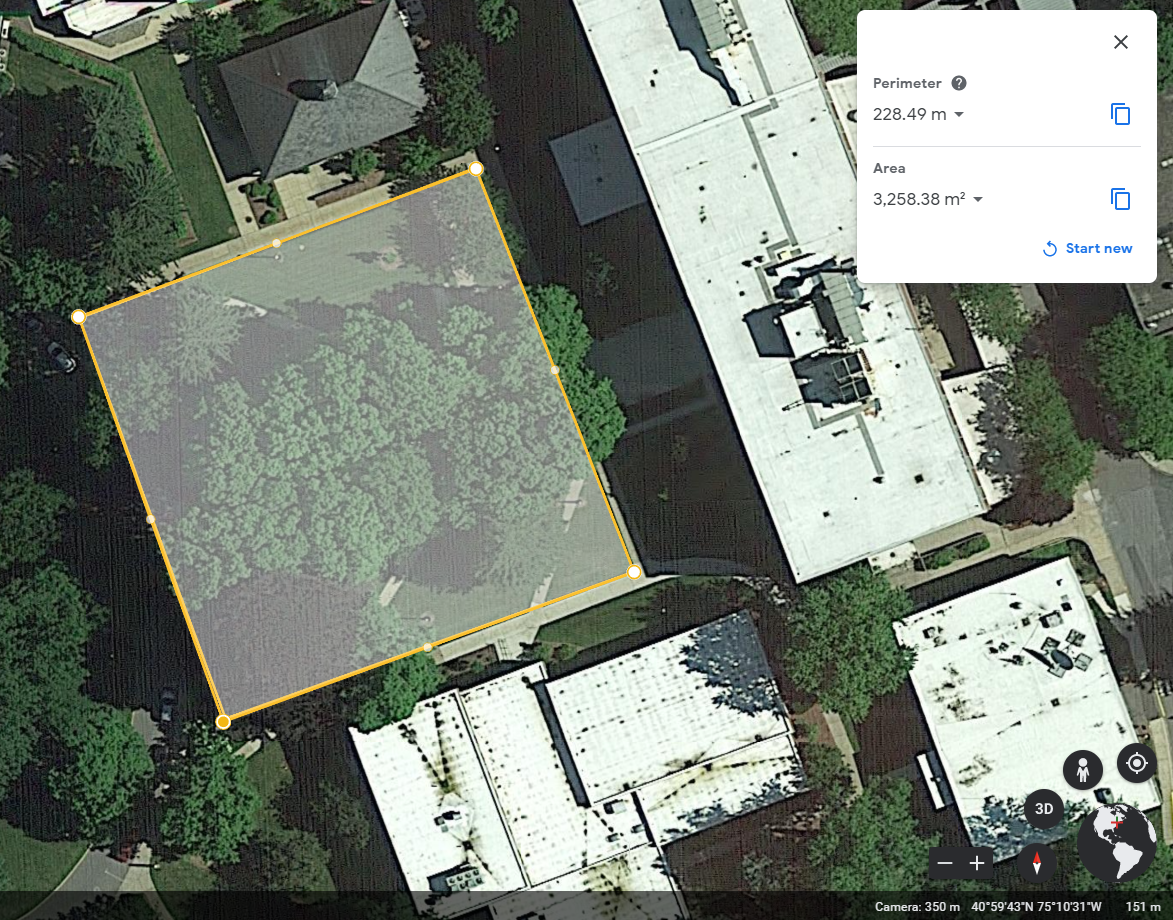
### Step 2.1.1: Choose a plot location

Open Google Earth to look at your study site from PHAE Part 1. If you did not save the project in Google Earth, re-draw your site boundaries using the instructions from PHAE Part 1.

At this point, you have two possible methods for choosing the location of your plot within that study site.

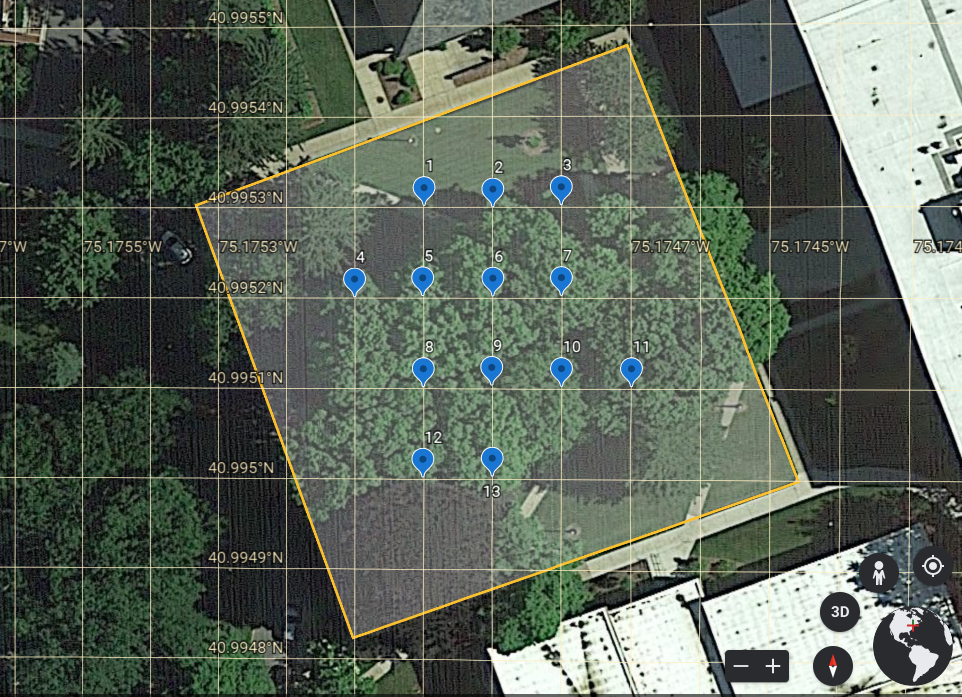
1. If you only have physical access to a portion of the site you chose, your plot will need to be in the area you have access to. In that case, you can skip to Step 2.1.2 (outlining your plot).
2. If you can potentially place your plot in several locations within the site, we can use random numbers to select the exact positioning.

Randomly choosing a location is a good way to position plots without bias. To do this, we can overlay a grid of points on the study area, assign a number to each of the points that fall within the potential sampling area, and use a random number generator to select points that will become plot centers.

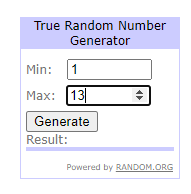


*Figure 1: A study site in front of Stroud Hall on the ESU campus, with an area of 3258 m2. A plot could be positioned anywhere within this site.*

1. In Google Earth, open the Main Menu  , and then open Settings.
2. In the Formats and Units section, make sure that Units of Measurement is set to “*Meters and kilometers*”, and Latitude/Longitude formatting is set to *Decimal*.
3. Go to the Map Stylemenu. At the bottom, turn on gridlines.
4. You will now see a grid on top of the map. The vertical lines run North – South, and the horizontal lines run East – West (these are latitude and longitude lines).
5. Within your study site, number each of the points where a vertical and a horizontal line cross. Skip the points that are closer than 14.14 meters to one of the edges of your study area. (These points are possible centers of the plot. If we choose a center that is too close to the edge of our study area, part of the plot will fall outside of the study area.) You can use the placemark features in Google Earth to do this, but any other method that works for you is also fine. (Some options – take a screenshot and draw on it in a drawing program, draw a sketch of the grid on paper, etc.)
6. Use a random number generator (such as www.random.org) to randomly select one of your points. The randomly selected point will be the center of your plot. *There should be some trees in your plot – if there are not any trees near your randomly selected point, generate a new number.*



*Figure 2: A study site in front of Stroud Hall, with latitude-longitude gridlines, and each intersection of those lines marked with a point.*



*Figure 3: The random number generator at random.org, set to randomly choose a number between 1 and 13 (the number of possible points in the Stroud Hall site).*

### Step 2.1.2: Outlining your plot

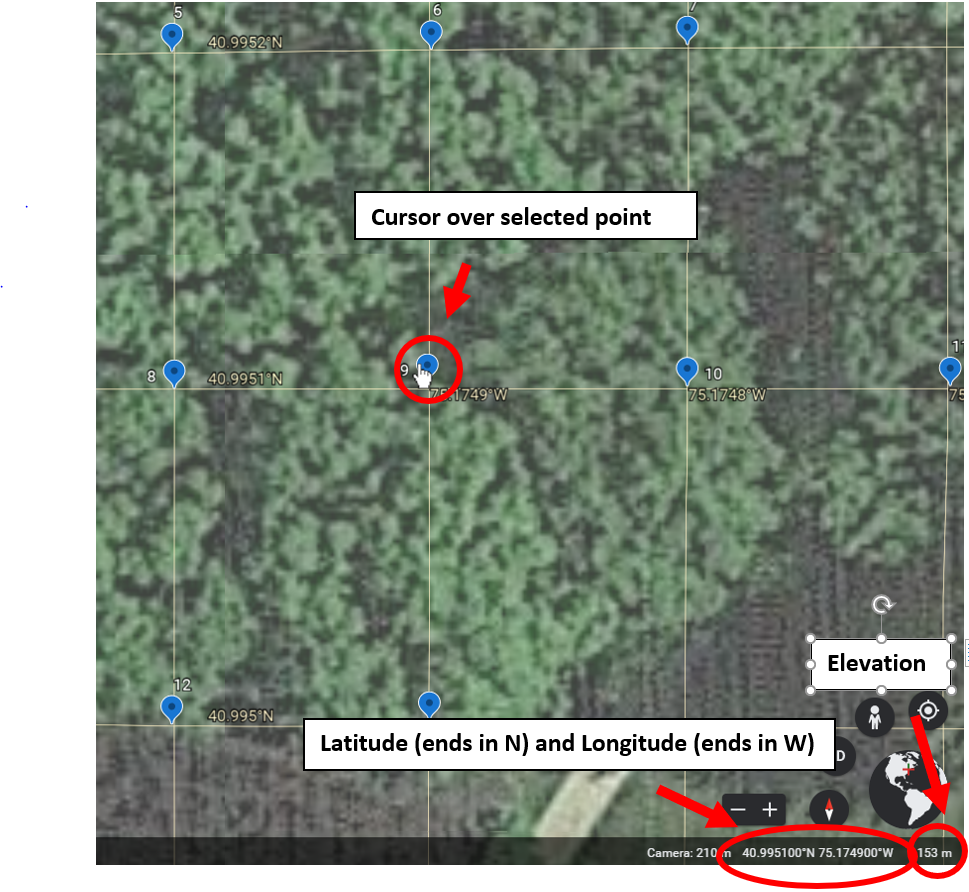
Now that we’ve identified the location of the center of your plot, we need to outline its sides.

1. First, determine the latitude and longitude of your plot center. The best way to do this requires that you have the map project saved to a Google account. (*If you don’t have a Google account and don’t want one, skip #2a and use the method in #2b instead.*)

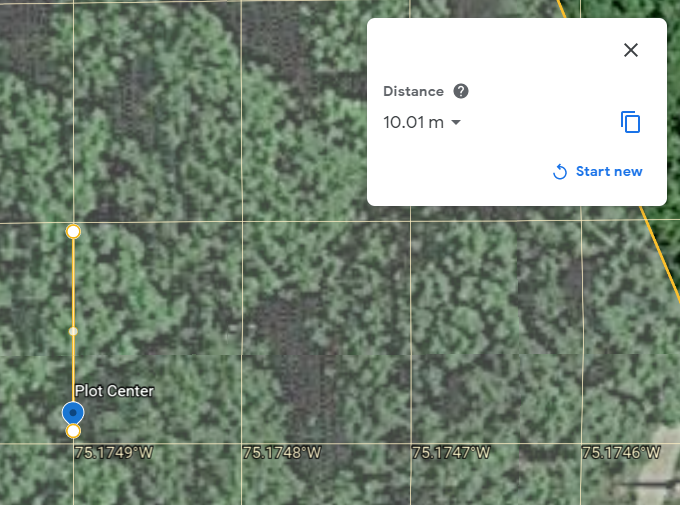
2a) If you didn’t use placemarks in Step 2.1.1, you will need to make one now. Go to Projects  → New Feature → Add Placemark and put a placemark at the center of your plot. Click on the placemark. This will open a white box in the upper right corner. Click on the edit button  in that box. This will open a panel on the left side of the screen. In this panel, scroll down until you see Latitude and Longitude. Record these numbers, and make sure you get all of the decimal places.

2b) If you can’t use placemarks, you can read the latitude and longitude directly off the map. Hover your mouse over the center of the plot and read the numbers in the bottom right corner (see Figure 4). This is slightly less precise (fewer decimal places), so I recommend option 2a if you can. Also notice that this method uses North and West notation instead of positive and negative degrees (75.17 W instead of -75.17 longitude).

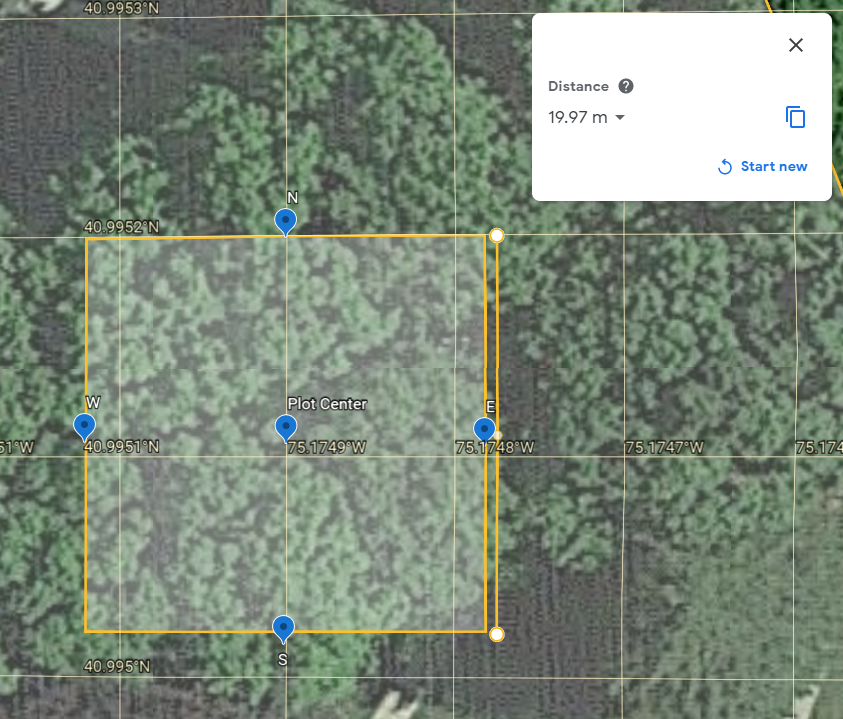
1. Determine the elevation of the center of your plot by hovering your cursor over your point and reading the number in the lower right corner (see Figure 4).
2. Use the Ruler  tool to measure 10 meters in each cardinal direction (north, south, east, west) from your plot center. If you can, put a placemark at each of these 10 meter distances (see Figure 5). If you can’t, find another way to note these points (drawing on a screenshot or another method).
3. Use the Draw Line or Shape  tool to draw a square based on these four points. The cardinal directions should be in the middle of each side (see Figure 6). *The four points should not be the corners of the square – the sides of the square should face N, S, E, W.*
4. Use the Ruler  tool to check that the sides of your plot are ~20 m long. If they are too long or too short, adjust your plot borders until the square is 20 x 20 m. (It might not be exact – between 19.9 and 20.1 is ok).
5. Using one of the methods described in Step 2, record the latitude and longitude of each corner of your plot.



*Figure 4: Obtaining latitude, longitude, and elevation of the center of your plot. Do not use the number next to “camera” as elevation – that is a measure of your “zoom”, not the elevation of the terrain. In this example, the elevation is 153 m above sea level, not 210 m.*



*Figure 5: Measuring a point ~10 meters north of the plot center. You may not be able to get the line to be exactly 10 m – between 9.9 and 10.1 is okay.*



*Figure 6: Outlining a 20 m x 20 m square plot based on the four points surrounding the plot center. Remember, you are not connecting those four points as the corners of your square – you are using them as guidelines to draw a square that has sides facing N, S, E, W.*

**Enter your data from Step 2.1.2 here:**

|  |  |
| --- | --- |
| **Elevation at center point (in meters)** |  |

*Remember that longitude values should be negative in our hemisphere (so if your value is 75.15 W, enter – 75.15). Enter all of the decimal places you have – the more precision, the better.*

|  |  |  |
| --- | --- | --- |
| **Point** | **Latitude** | **Longitude** |
| **Center** |  |  |
| **NW Corner** |  |  |
| **NE Corner** |  |  |
| **SW Corner** |  |  |
| **SE Corner** |  |  |

**Paste an image of your finished map from Google Earth here:**

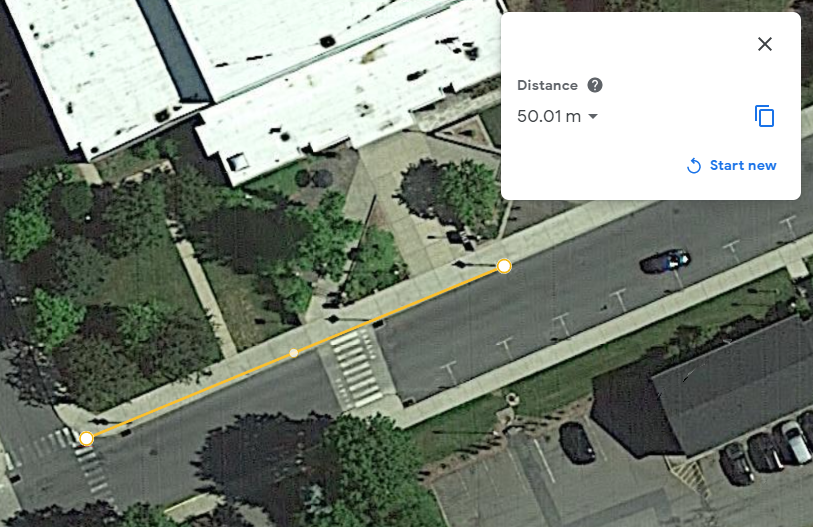
## Part 2.2: Measure your stride (home – online and outdoors)

Before you go to your site, it will be useful to know the length of your *stride* – how long each step you take is. This is a great way to measure distances when you don’t have access to a long measuring tape. Instead of using a 20m measuring tape, you can figure out how many steps it takes you to walk 20 meters, and then walk that number of steps to measure that distance.

If you have access to a long measuring tape, you can skip this part and use the measuring tape to measure out your plot. Otherwise, before you go to your plot, complete the instructions below.

1. To measure your stride, go back to Google Earth and find a location that is convenient to access and has clear landmarks (like your street and driveways/mailboxes/buildings etc. along that street).
2. Use the Ruler  tool to measure a 50 meter distance. Line the distance up with landmarks you know you can find in person (again, like the edge of a driveway, a mailbox, a tree, etc.)
3. Go outside and find your landmarks. Walk from one landmark to the other, using your normal stride (don’t take steps that are bigger or smaller than how you normally walk). Count your steps.
4. Divide the number of steps by 50, to get the number of steps you take per meter.
5. Multiple your steps-per-meter by 20 to get the number of steps you should take to measure out one side of your plot (20 meters).

*Why are we not just directly measuring the number of steps it takes you to walk 20 meters? Because the length of your steps can vary. If you walk a longer distance, you get a more accurate average stride length.*



*Figure 7: Stride measuring example outside of Dansbury Commons on the ESU campus. In this case, you could count the number of steps it takes to walk from the end of the crosswalk (left) to the point on the sidewalk aligned with the tree (right).*

|  |
| --- |
| **Example calculations:**  *It takes me* 94 *steps to walk the* 50 *meter distance.*  94 / 50 = 1.88. *It takes me 1.88 steps to move one meter. (Yes, you can’t take fractions of steps. This is fine - don’t round for now.)*  1.88 x 20 = 37.6. *It will take me 37.6 steps to measure out a 20 m distance for the side of the plot. (Now we can round – In the field, I’ll take 38 steps.)*  *It will also be useful to know the number of steps it takes to cross from one corner of the plot to the opposite corner. The diagonal of a square is the length of its side times .*  20 x = 28.28  1.88 x 28.28 = 53.2. *It will take me 53.2 steps to walk from one corner of the plot to the opposite corner. (I’ll round again and take 53 steps.)* |

**Enter your data from Step 2.2 here:**

|  |  |  |
| --- | --- | --- |
| **Measurement/calculation** | **Value** | **Units** |
| **Number of steps** |  | # steps in 50 m |
| **# steps divided by 50** |  | Steps per meter |
| **Steps per meter x 20** |  | Number of steps you need to measure 20 meters (plot side) |
| **Steps per meter x 28.28** |  | Number of steps you need to measure diagonally across your 20 m x 20 m plot (corner to corner) |