APPENDIX C: USING GOOGLE EARTH PRO AND MICROSOFT EXCEL TO CREATE A PLANTING DESIGN

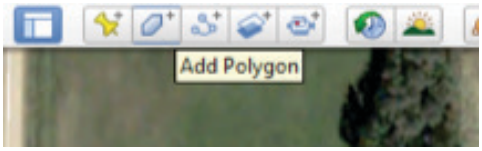
The following is a step-by-step tutorial on how to use the free Geographic Information System (GIS) program "Google Earth Pro" and the spreadsheet program "Microsoft Excel" to create a planting design. These particular programs have been selected because they are widely available at little to no cost. Similar steps would be followed using other GIS programs (e.g. many counties provide free online GIS software) or spreadsheet programs.

FINDING YOUR SITE

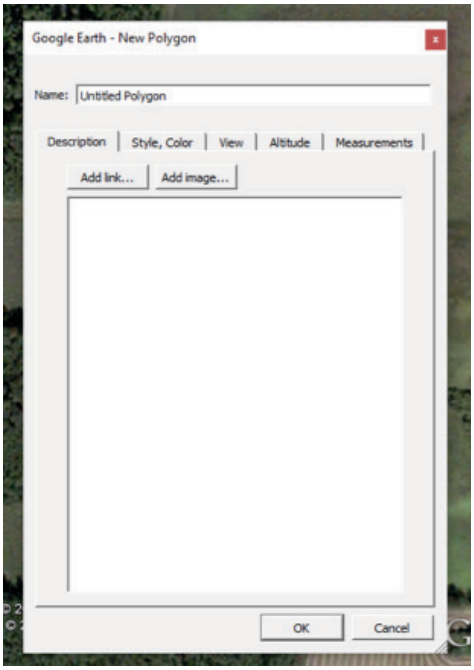
1. Calculate the latitude and longitude of your property by entering your legal land description into **https://www.lsdfinder.com/map**
2. Open up Google Earth Pro, paste your latitude and longitude into the "Search" bar in the top left corner, and hit "Enter"
3. Move to your planting site on your property by clicking and dragging the map along. Zoom in using your mouse scroller, or by clicking on the zoom in/out icons on the right hand side of the page (shown by the red circle).

CREATING PLANTING AREAS AND LINES

1. To define a planting area, click on the “Add Polygon” icon at the top left corner of the map.



This will open up a window titled “Google Earth – New Polygon”.

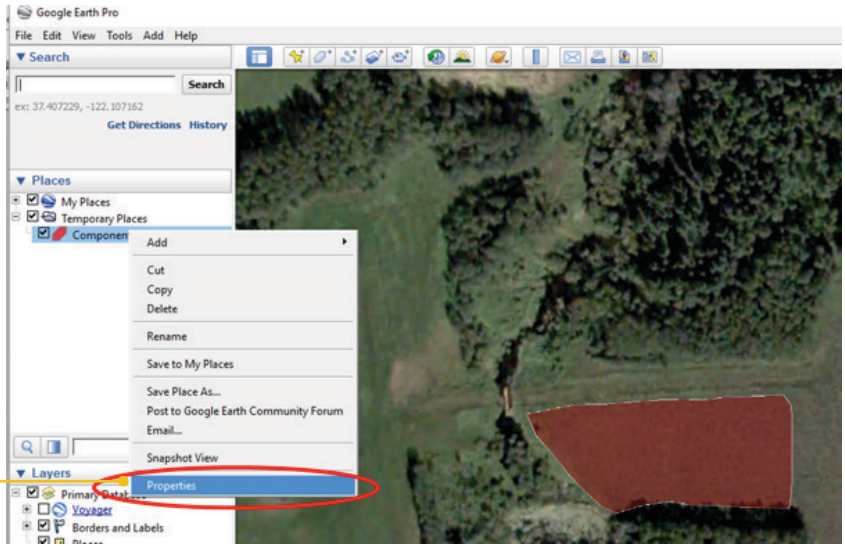


2. Define a planting area by clicking repeatedly along its borders. A polygon will gradually take shape as you do so. If you are unhappy with the position of one of the points, you can click and drag it to adjust it. Note that the point that you clicked on last will be what the new point connects to, so if you make edits to previous dots make sure you click on the correct dot before making a new one!

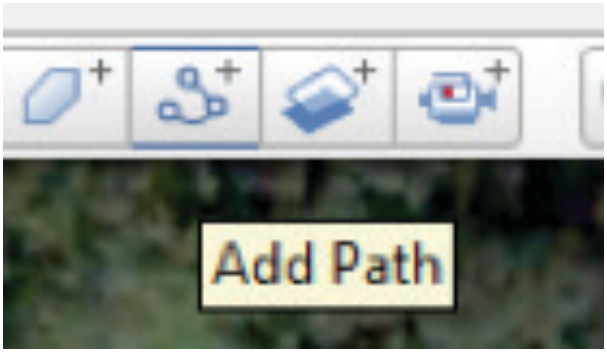
3. When you are satisfied with the size and shape of your polygon, click on the **"Measurements"** tab in the "Google Earth – New Polygon" window. Change **Area** units to Hectares or Acres according to your preference using the drop-down menu. You can then see the area of the polygon that was created. Change the **name** of the polygon to something that describes what is in it and how large you want it to be. For example, the polygon in the picture has been renamed "Component 1: 80% balsam poplar, 20% white spruce, 0.44ha".

4. You can also change the style and colour of the polygon by clicking on the **"Style, Color"** tab. In addition to changing the **colour** of the area, it is recommended that you change its **opacity** to ~40%. This will allow you to see the land covered by the polygon.

5. When you are satisfied with your polygon, click **"OK"** on the **"Google Earth – New Polygon"** window. You can find the polygon item under **"My Places"** on the bar to the left of the map. To edit the polygon, right click on it and select **"Properties"**. This will bring back the **"Google Earth – New Polygon"** window.

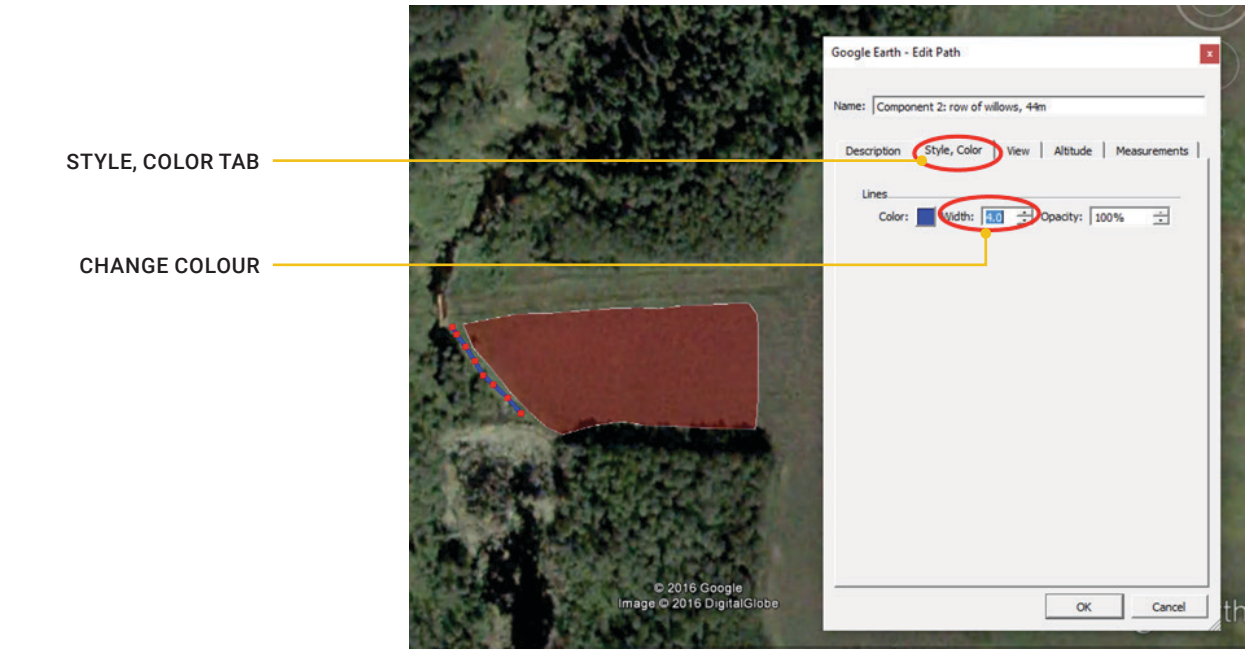


6. You may also wish to create a linear planting, if for example you are planting along a streambank. To do so, click on the **"Add Path"** icon on the top left corner of the map.



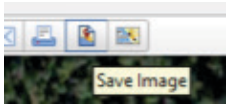
7. This will open a **"Google Earth – New Path"** window. The instructions are very similar to making a polygon. After you have defined your line on the map, click on the **"Measurements"** tab and change the units to meters or feet. Then change the name of the linear planting into something that describes its species and length.

8. Edit the style and colour of the linear planting by clicking on the **"Style, Color"** tab. You may wish to increase the width of the line to make it more visible. When you are satisfied with the planting, click **OK**.

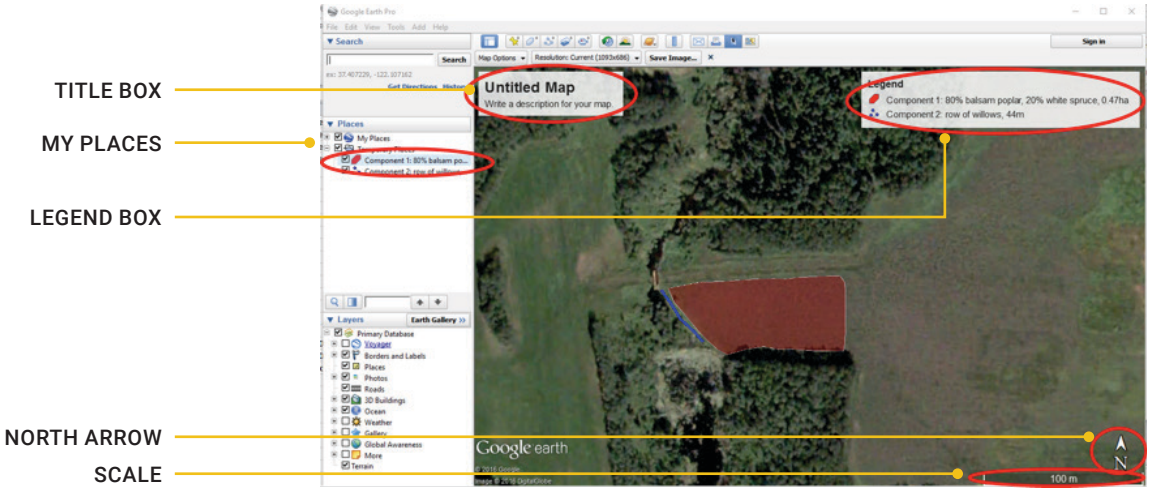


SAVING AN IMAGE OF YOUR SITE

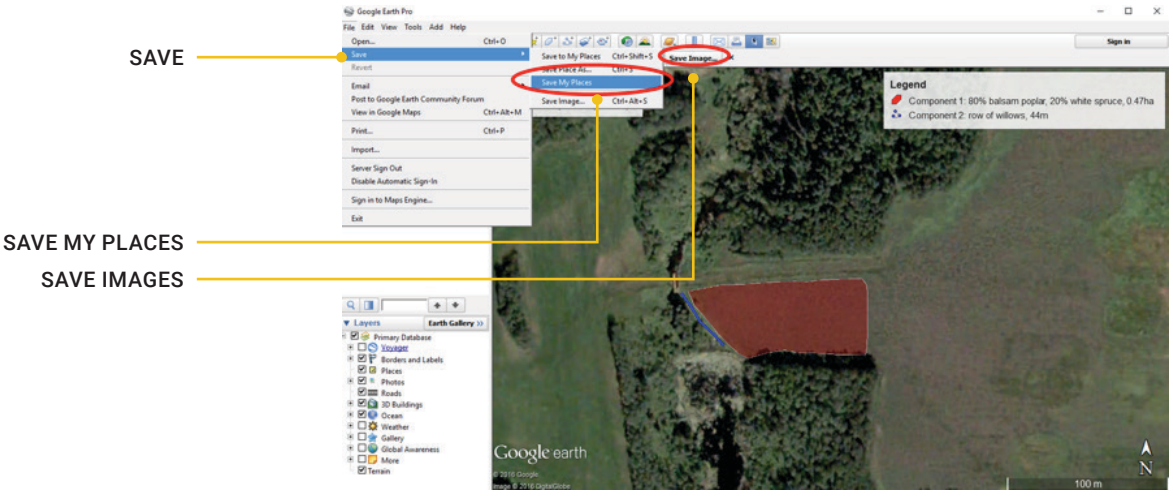
1. Once all your planting areas and lines have been created, it is time to save an image of your site. Click on the **"Save Image"** icon directly above the map.



2. A Title Box, Legend Box, North Arrow, and Scale Line should appear on your map. You can move any of these features around by clicking and dragging them. Click on the **Title Box** to edit it. Editing the text of the legend is more difficult — to do so, you need to edit the names of the planting polygons and paths that you made. As described above, this can be done by right clicking on each item under **"My Places"** on the bar to the left of the page, and selecting **"Properties"**.

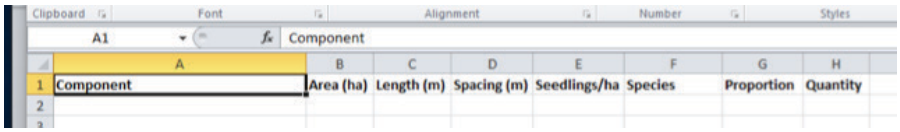


3. When you are satisfied with the contents of your image, click **"Save Image"**. Clicking **"File>Save>Save My Places"** is also recommended, as it will make it possible to access and edit planting items next time Google Earth Pro is opened.

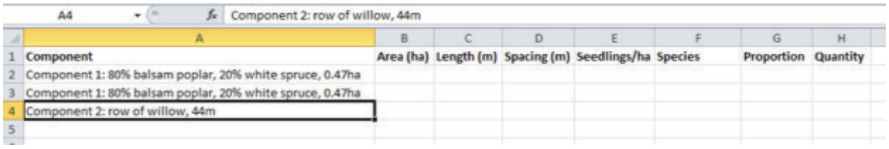


CALCULATING THE NUMBER OF SEEDLINGS REQUIRED FOR YOUR PLANTING DESIGN

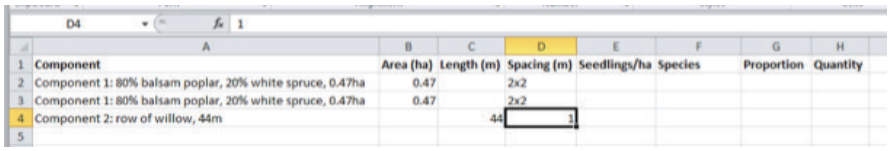
1. Open up **Microsoft Excel**. Fill in the first eight columns with the headings: **"Component", "Area (ha)", "Length (m)", "Spacing (m)", "Seedlings/ha", "Species", "Proportion",** and **"Quantity".** Use Imperial units if you are more comfortable with them.



2. Fill in the names of the planting components that you created in Google Earth Pro under the **"Component"** column. Make multiple rows for components that have multiple species within them, as it is necessary to calculate the quantity of each species separately. For example, in the demonstration planting design, Component 1 has both balsam poplar and white spruce, and therefore will have two rows in the spreadsheet.



3. Fill in the **Area** values (if the planting is an area) or **Length** values (if the planting is a line) of each component. Fill in the desired plant spacings.

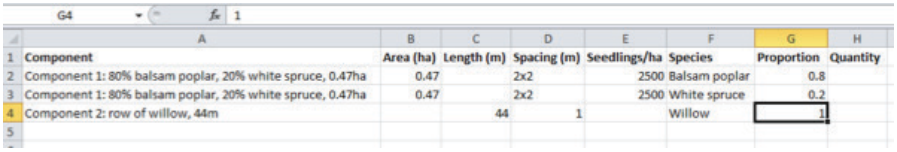


4. For the area plantings, fill in the number of seedlings per hectare/acre at the spacing you have chosen. Use the reference table **(Table 5)** to convert common spacing values to number of seedlings per hectare or acre.

Table 5. Conversions of common spacing values into seedlings per hectare and acre.

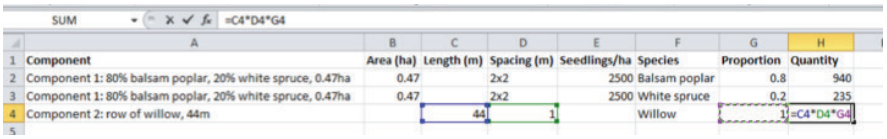
Seedlings per hectare		Seedlings per acre	
Spacing (Meters)	Number of seedlings	Spacing (Feet)	Number of seedlings
1.0x1.0	10,000	3x3	4,840
1.5x1.5	4,444	5x5	1,742
2.0x2.0	2,500	6x6	1,210
2.5x2.5	1,600	8x8	681
3.0x3.0	1,111	9x9	538
3.5x3.5	816	11x11	360
4.0x4.0	625	12x12	303
4.5x4.5	493	14x14	222
5.0x5.0	400	15x15	194

5. Fill in the species names and their proportions in each component. For example, Component 1 in the demonstration has 80% balsam poplar and 20% white spruce, so 0.8 and 0.2 were put in the Proportion column beside each species respectively.



	A	B	C	D	E	F	G	H
1	Component	Area (ha)	Length (m)	Spacing (m)	Seedlings/ha	Species	Proportion	Quantity
2	Component 1: 80% balsam poplar, 20% white spruce, 0.47ha	0.47		2x2	2500	Balsam poplar	0.8	
3	Component 1: 80% balsam poplar, 20% white spruce, 0.47ha	0.47		2x2	2500	White spruce	0.2	
4	Component 2: row of willow, 44m		44	1		Willow	1	
5								

6. The formulas for calculating the quantity of species in each component are:
   a. For area plantings: Quantity=Area*Seedlings/ha*Proportion
   b. For linear plantings: Quantity=Length*Spacing*Proportion



	A	B	C	D	E	F	G	H
1	Component	Area (ha)	Length (m)	Spacing (m)	Seedlings/ha	Species	Proportion	Quantity
2	Component 1: 80% balsam poplar, 20% white spruce, 0.47ha	0.47		2x2	2500	Balsam poplar	0.8	940
3	Component 1: 80% balsam poplar, 20% white spruce, 0.47ha	0.47		2x2	2500	White spruce	0.2	235
4	Component 2: row of willow, 44m		44	1		Willow	1	=C4*D4*G4
5								

7. **Congratulations!** You have calculated the quantity of seedlings of each species required for your planting design. It may be advisable to round your quantities to the nearest 10 or 15, as seedlings often come in bundles of these numbers.