ArcGIS Pro instructions for classification of Planet imagery for SAV mapping.

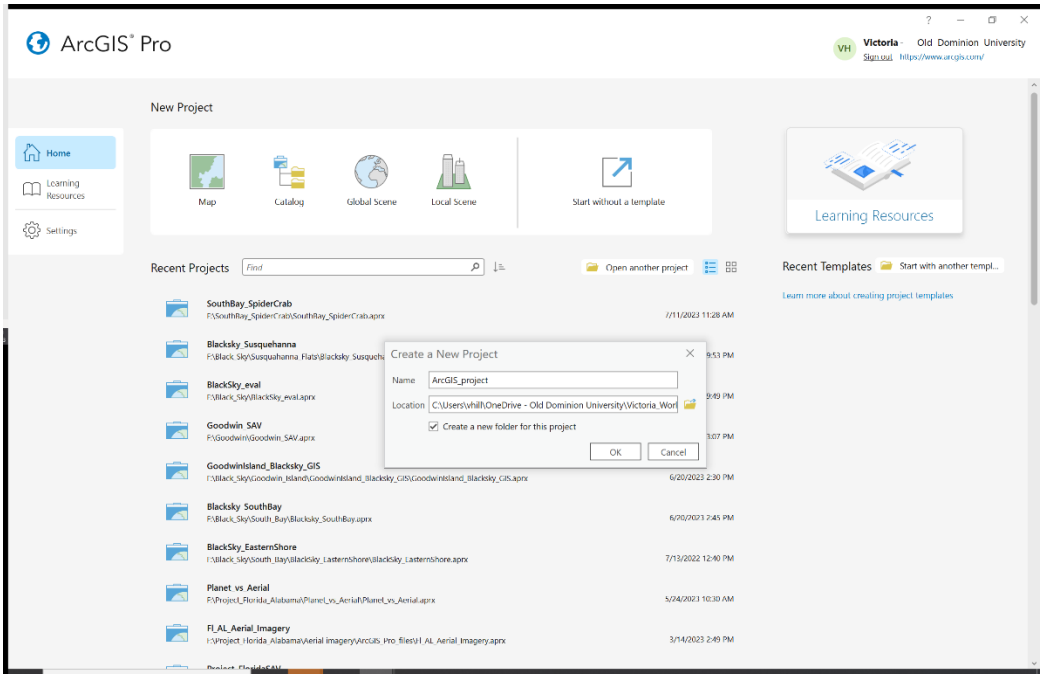
1. **Load images in project**
2. **Mosaic tiles**
3. **Composite with DEM raster**
4. **Load existing schema or make a new schema**
5. **Generate training patches**
6. **Classify image**
7. **Using Python scripts to batch process imagery**

Before you come to the workshop.

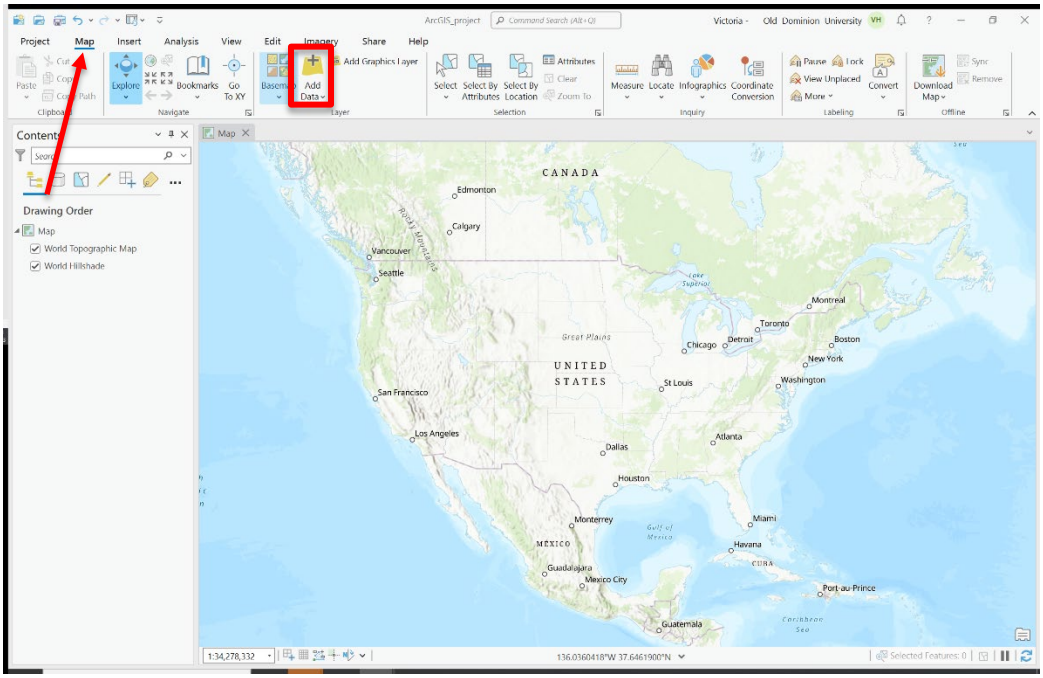
You will need either ArcGIS Image Analyst or ArcGIS Spatial Analyst.

1. **Load images in project**

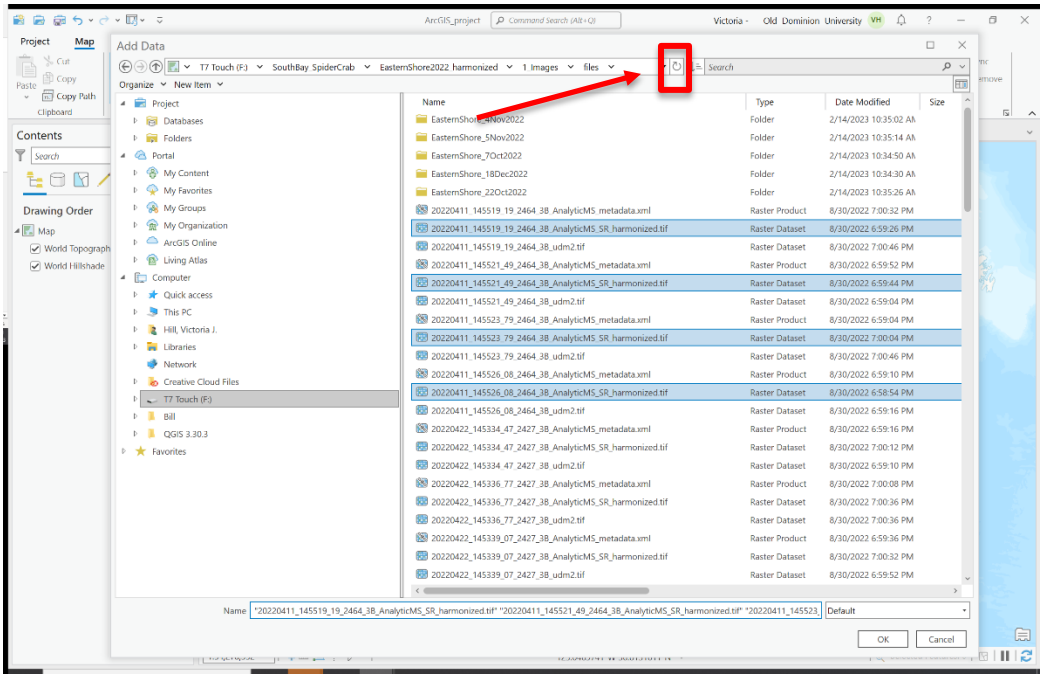
   Open ArcGIS, make a blank map template. I recommend making a new folder for your project. Place all your files into this folder.



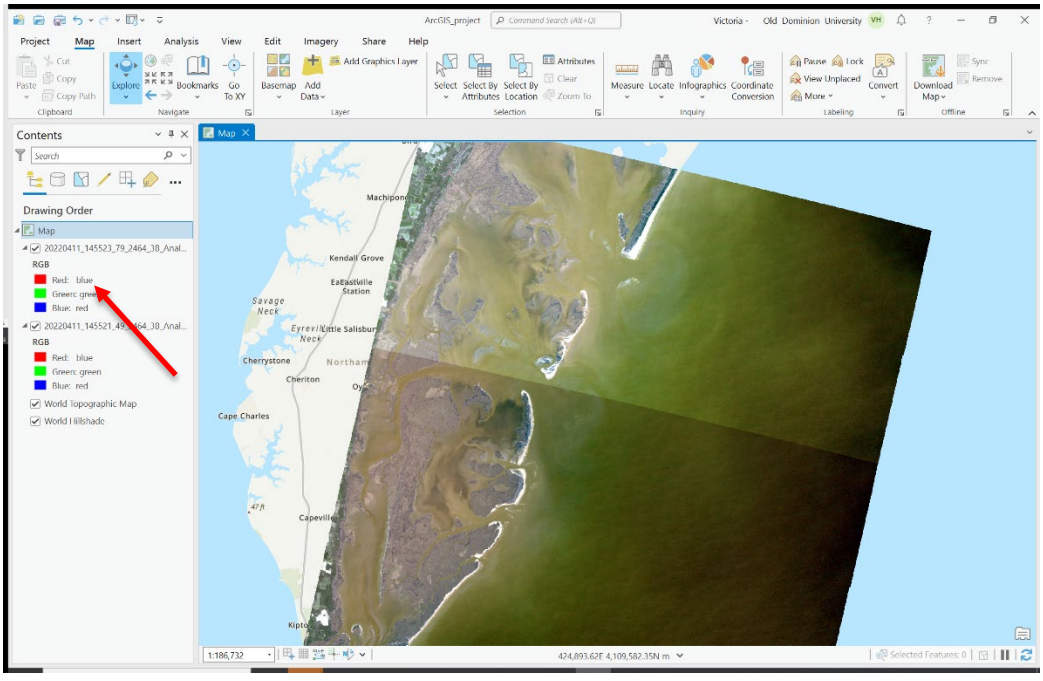
Click on Map on the top toolbar, and then click on the Add Data Icon



Navigate to the location of the image file that you want to load. ***IF YOU DON'T SEE YOUR FILE AND YOU JUST PLACED IT IN THE FOLDER YOU WILL NEED TO REFRESH THE VIEW****CLICK THE LITTLE CIRCLE WITH AN ARROW ICON NEXT TO THE DIRECTORY PATH. It may take a minute or so to load the images.

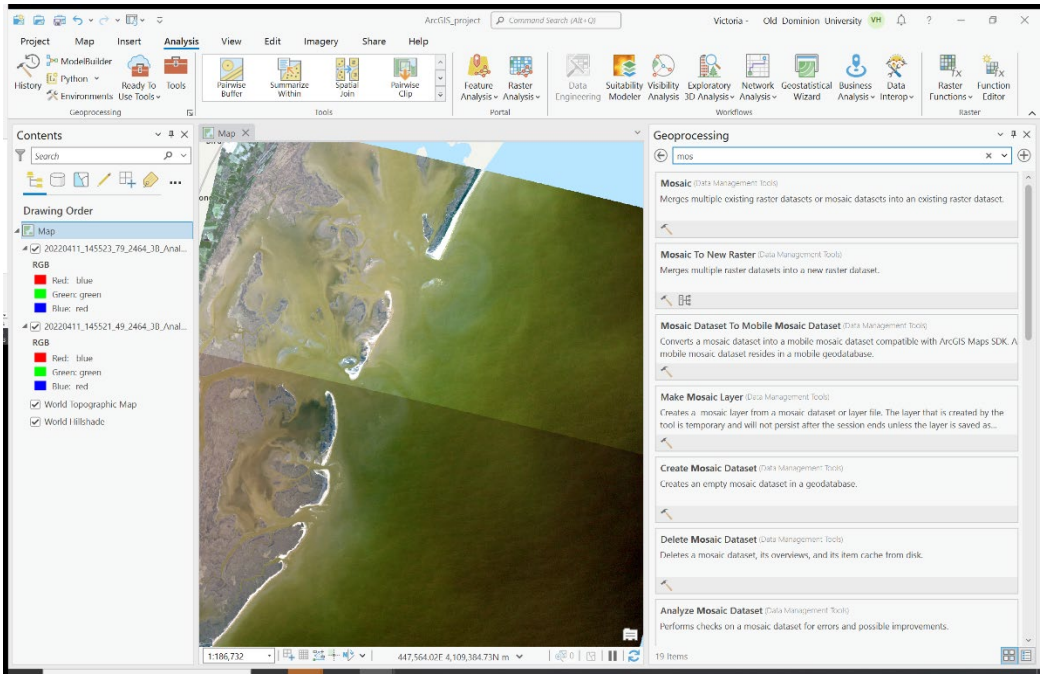


When your image is open you will want to select the correct RGB bands for best visualization. Right click on the band to change, can also right click on the image layer and select symbology.



2. Mosaic

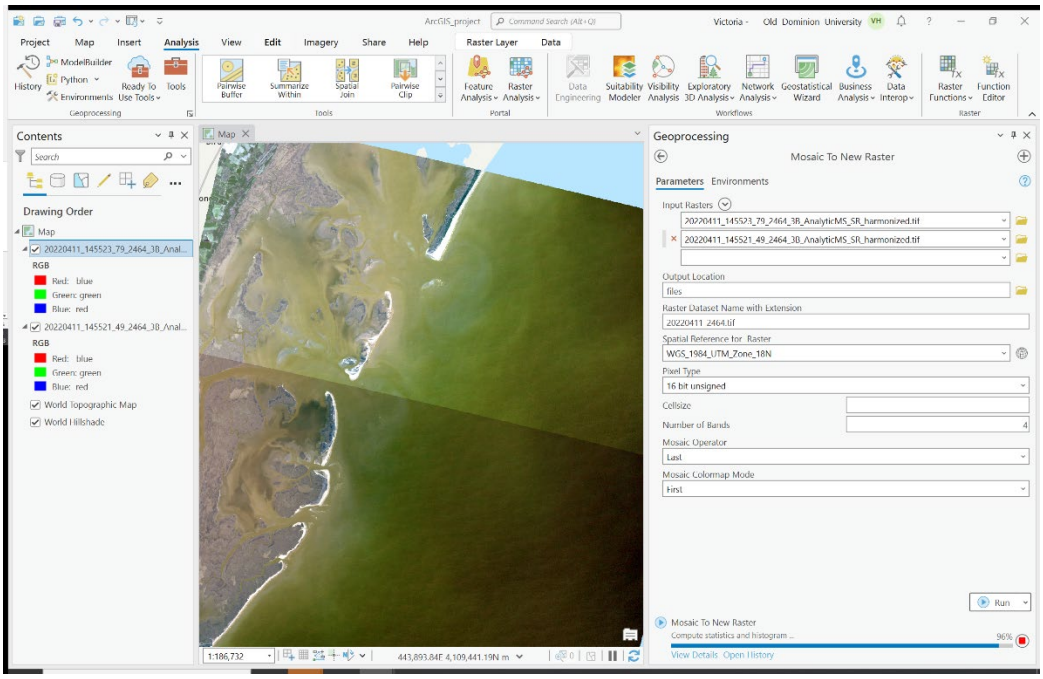
If you have more than 1 tile for the same day from the same sensor, I recommend that you mosaic them into one image. Use
Analysis | Tools |Mosaic to new raster



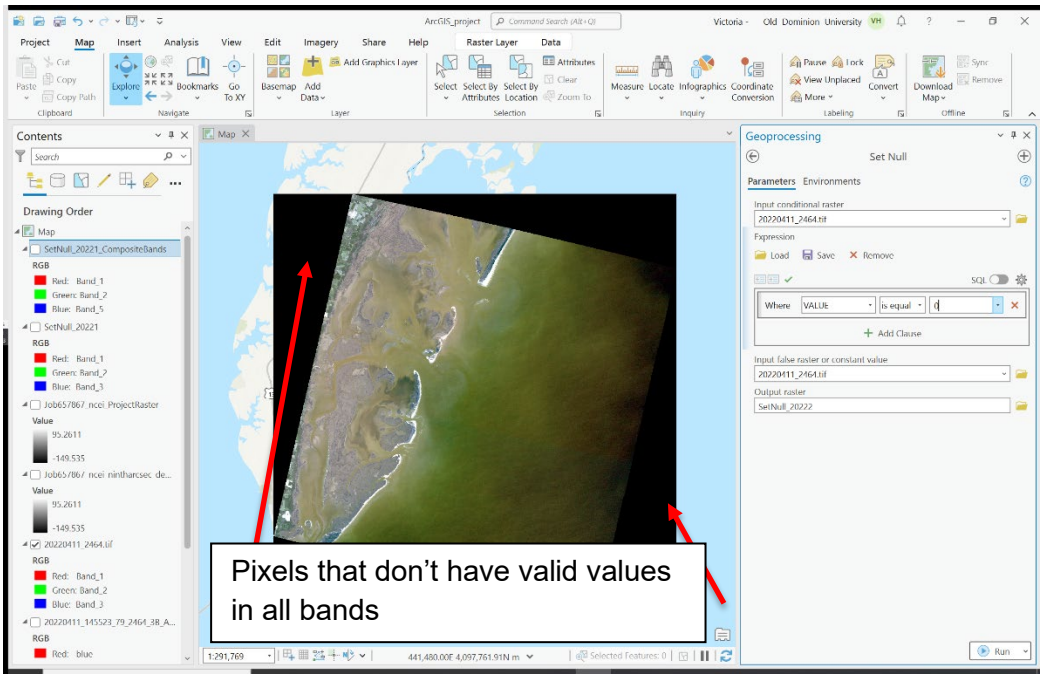
Select your tiles to mosaic and set an output file. I recommend the following naming style, which preserves the date (20220411) and sensor number (2464):

20220411_145519_19_2464_3B_AnalyticMS_SR_harmonized.tif
to; 20220411_2464_mosaic.tif

Use the spatial reference from existing images, make sure to enter the number of bands, it will be the same as your input tiles. Make sure to select the correct pixel type, you can check the original tiles by right clicking in them, selecting properties and source. Original Planet files are 16 bit unsigned.
A new raster will be made.



You will want to make all pixels outside of your valid image pixels equal to NaN so that it doesn't impact your classification later in the process. Use
Analysis | Tools |Setnull.
Your mosaic image is the input conditional file, the expression is "Where VALUE is equal to 0", your false file is the mosaic file. The resulting raster has all pixels where the value was 0 set to NaN



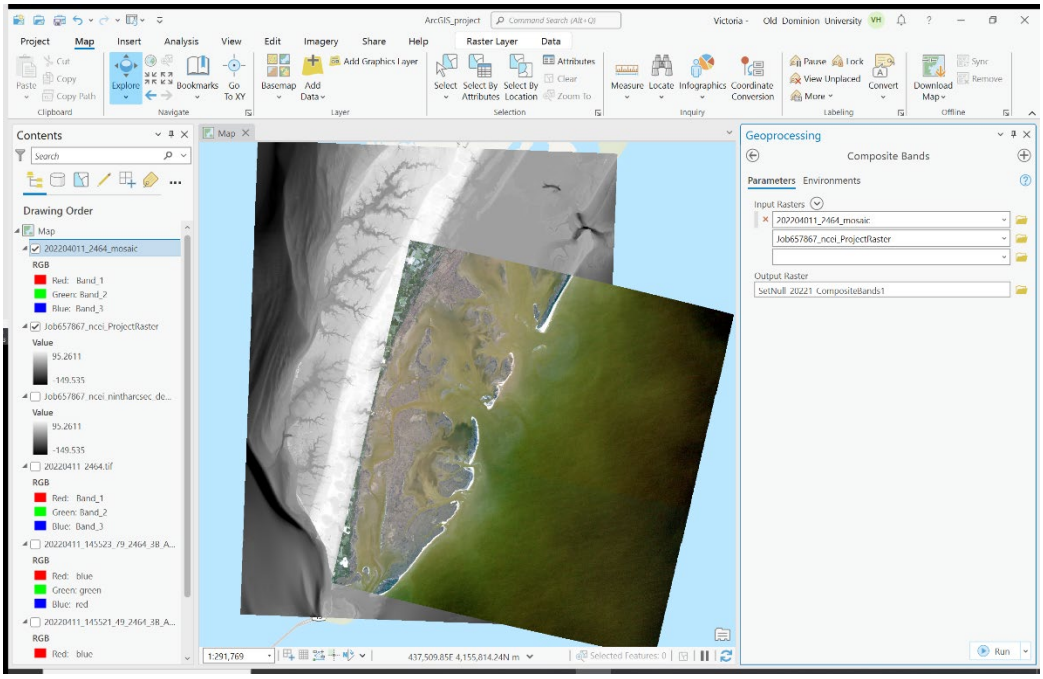
3. **Composite bands - add DEM as a 5th (or 9th) band to your image.**

   Now composite the mosaic image (after setnull for outside pixels) with the DEM raster

   Use Analysis | Tools | Composite Bands

   Add the DEM raster second in the input raster's so it will be added as the 5th (or 9th) band.

   Use naming convention 20220411_2464_composite.tif

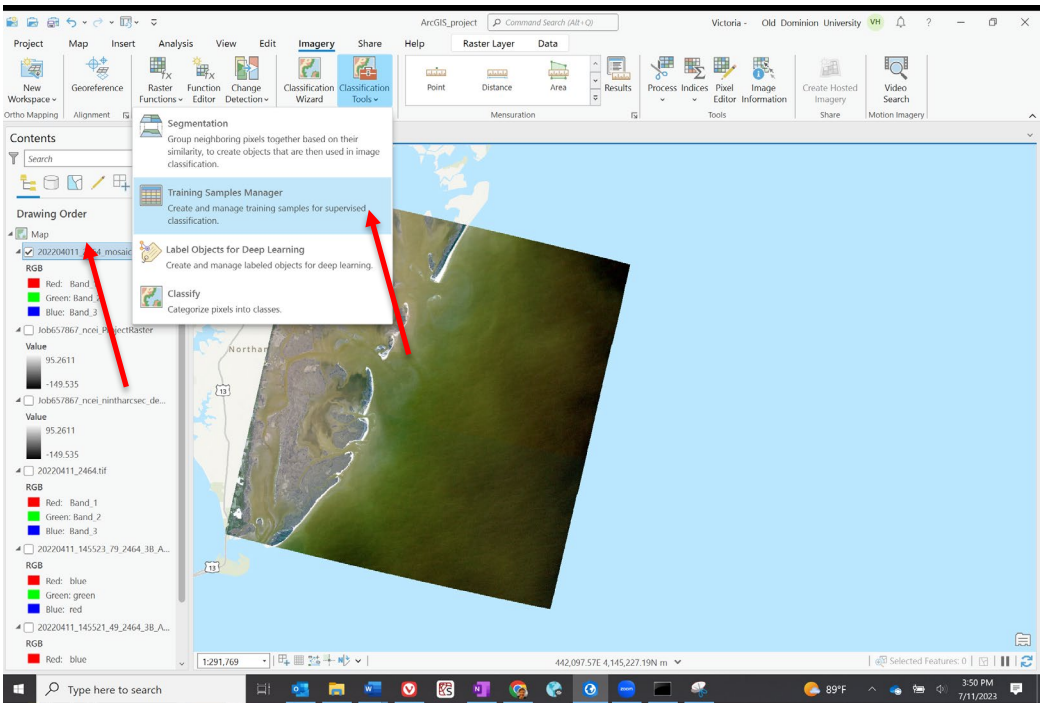


4. **Classifying**

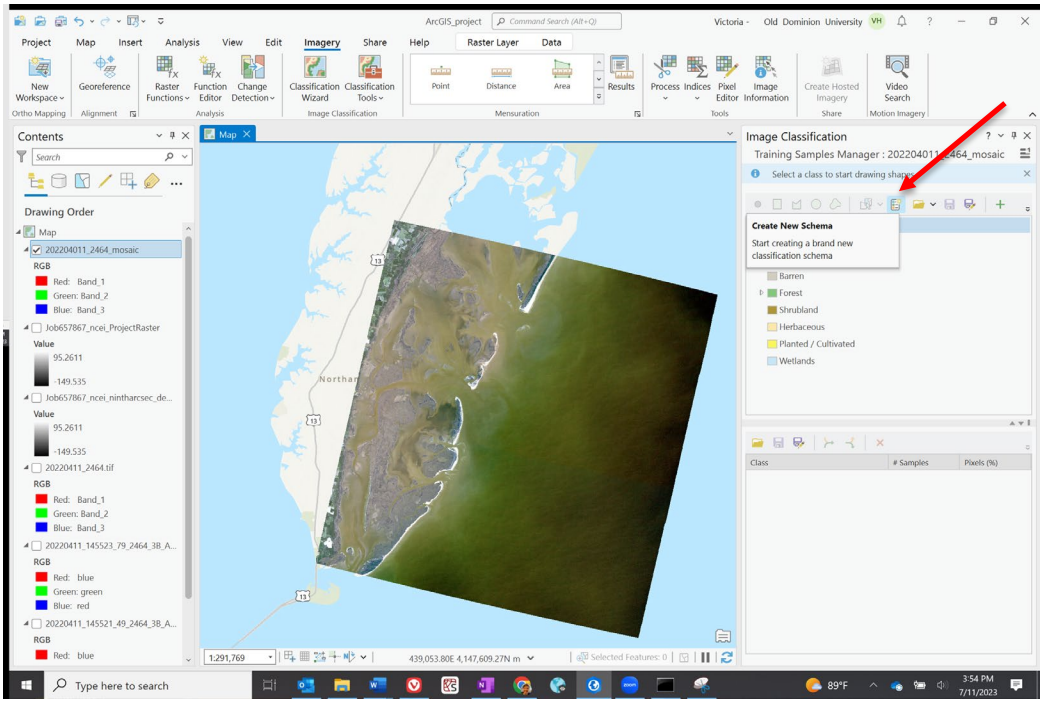
Decide on your classification schema, I am using the schema below. You can make your own, however, always make SAV subclass with values of 10 to 19, this is important in running the batch codes. You do not need to use all the classes on your schema, but having a master schema that you use instead of a new one for each site is useful for the future. I have several depths of SAV within some sites and they have different spectral characteristics, that is why I have three SAV subclasses.

Master class	**subclass**	**Class value**
Submerged vegetation		10
	DeepSAV	11
	SubmergedSAV	12
	EmergentSAV	13
	BenthicAlgae	14
Submerged Unvegetated		20
	Sand	21
	Mud	22
Optically deep		30
	Deepwater	31
	ShallowTurbid	32
	SuspendedSediment	33
	BlackWater	34
Terrestrial		40
	Marsh	41
	Beach	42
	TerrestrialVegetation	43
	Urban	44
Other		50
	Glint	51
	Cloud	52

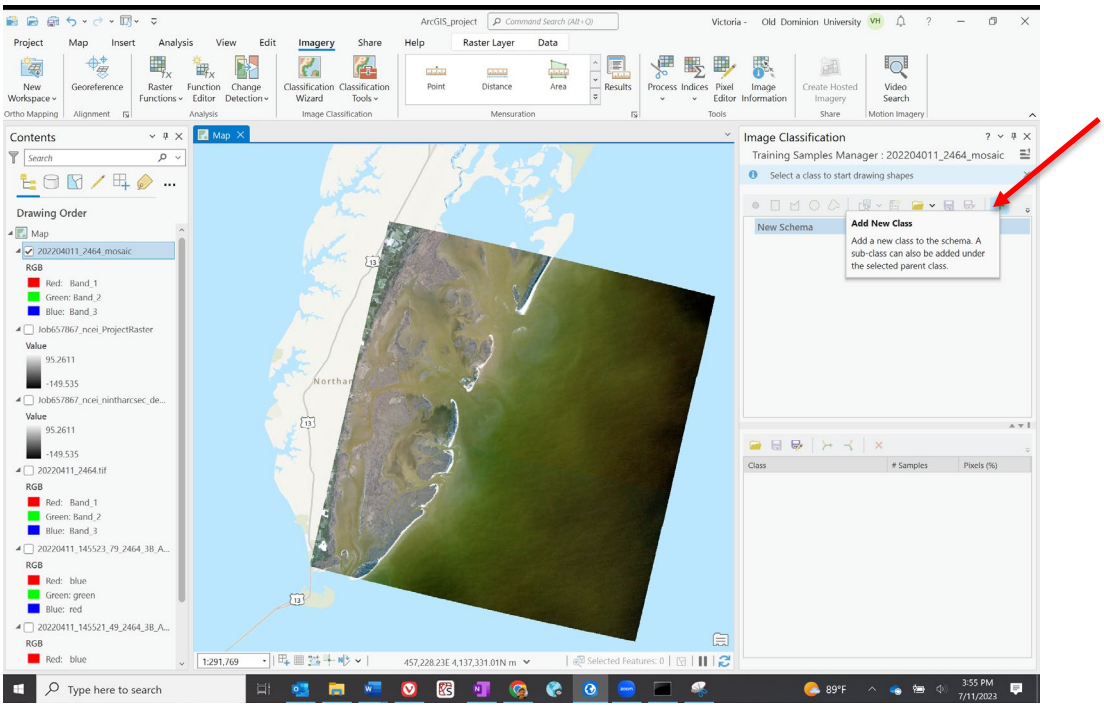
With your image selected in the drawing panel on left, click on Imagery on the top toolbar, then Classification tools, then Training samples manager



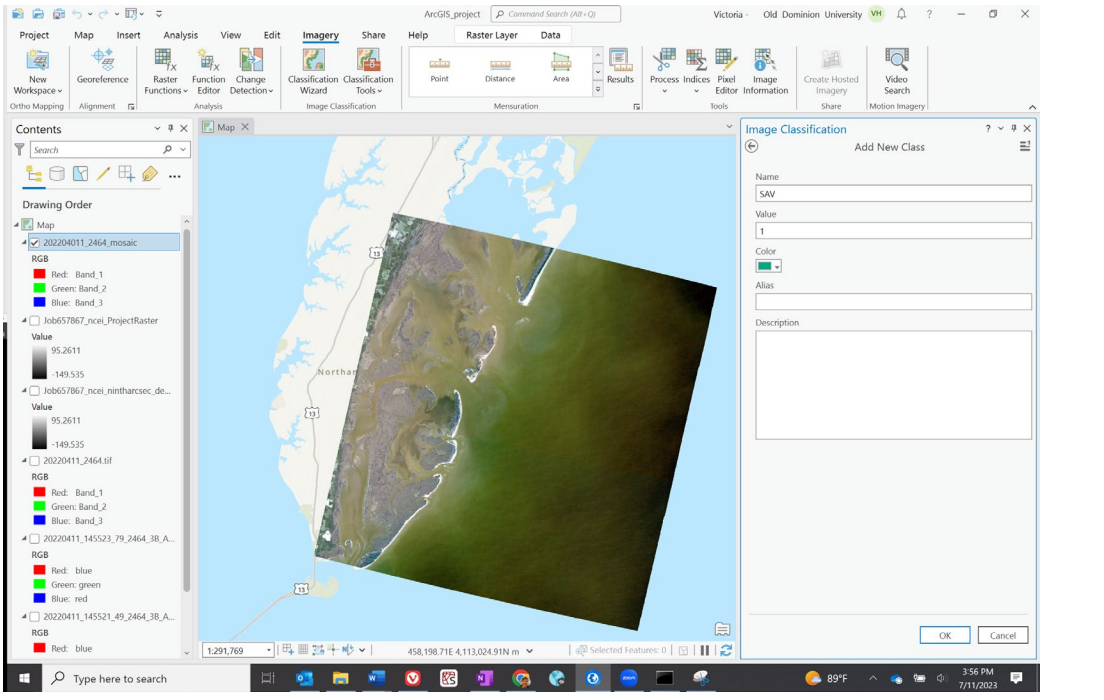
Select “Create New Schema”



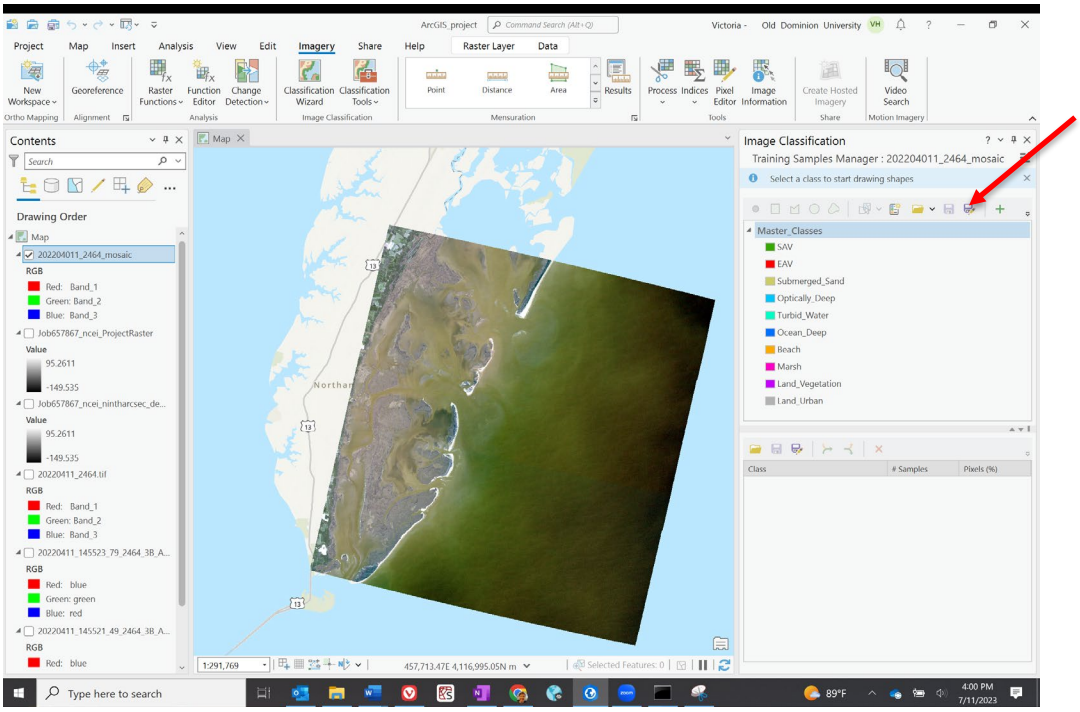
Click on the green cross to add a new class to your schema.



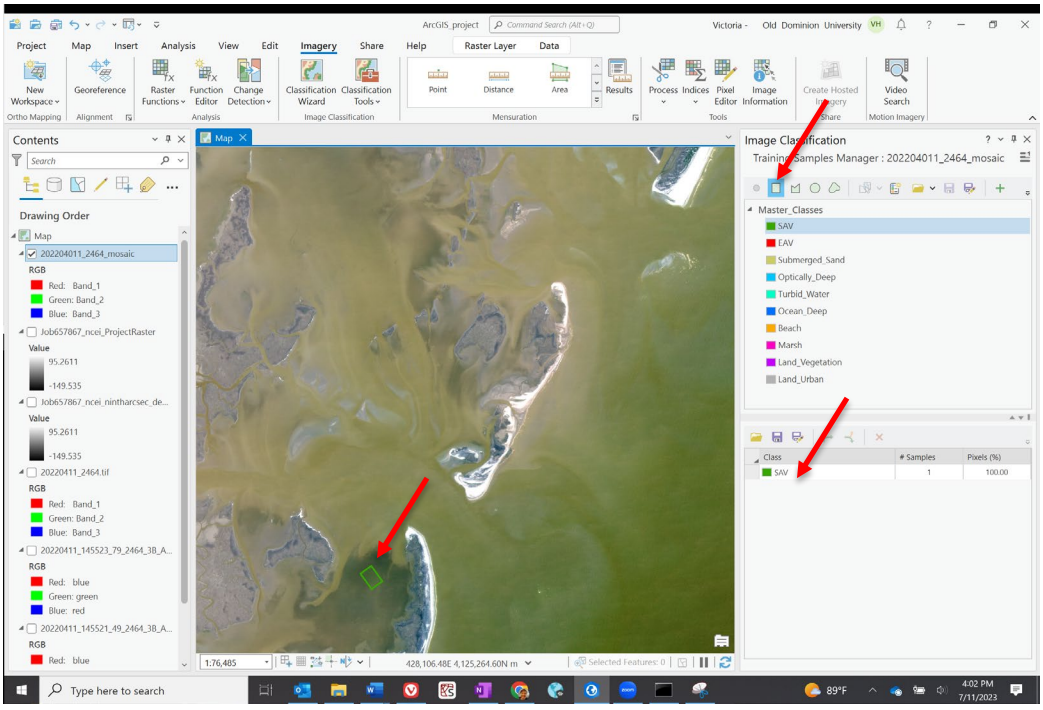
Name your new master class, start with Submerged_vegeation, give it a value of 10. Click ok, and repeat adding new classes until you have all your classes. To create the subclasses highlight the master class before clicking on add class.



DON’T FORGET TO SAVE YOUR SCHEMA, USE THE LITTLE 3”INCH DISK ICON

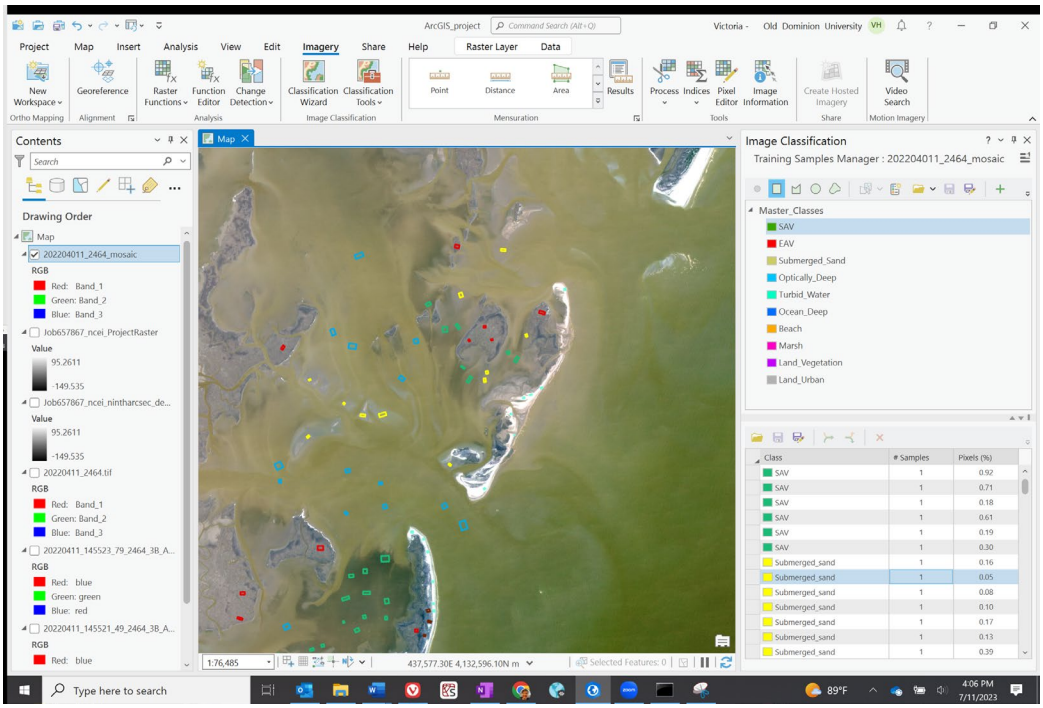


You will now create your training patches. Select a class in your schema, select a shape (square, circle, polygon), draw on the map where you want your training patch to be.

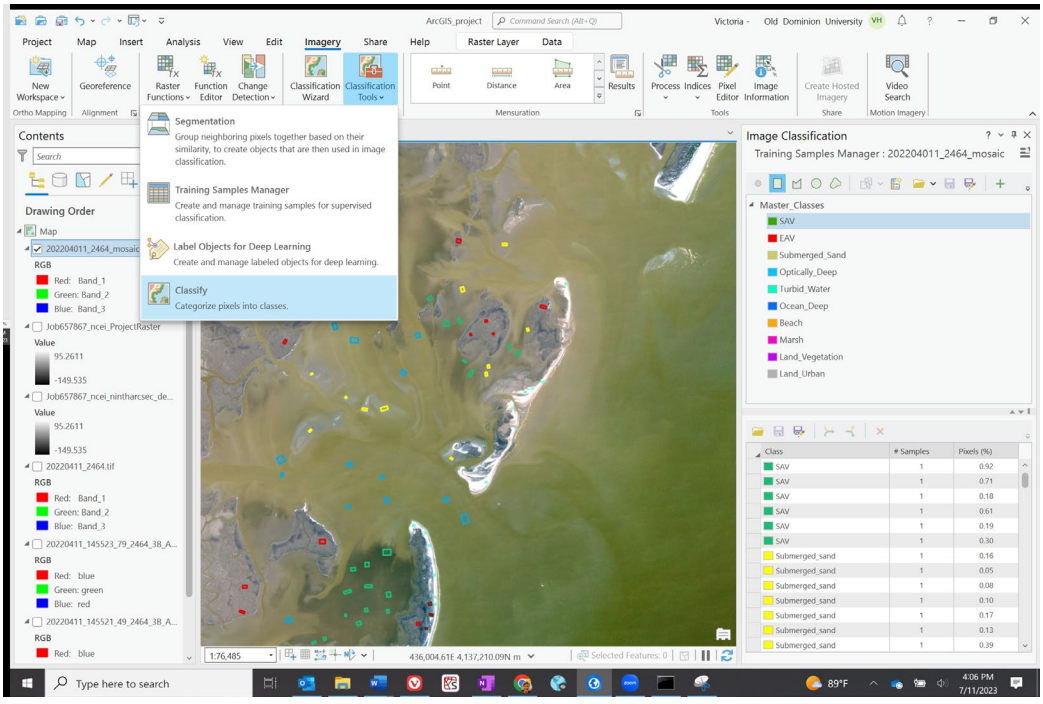


Keep drawing your training patches, select another class and draw patches for that.
DON’T FORGET TO SAVE YOUR TRAINING PATCHES, USE THE LITTLE 3”INCH DISK ICON

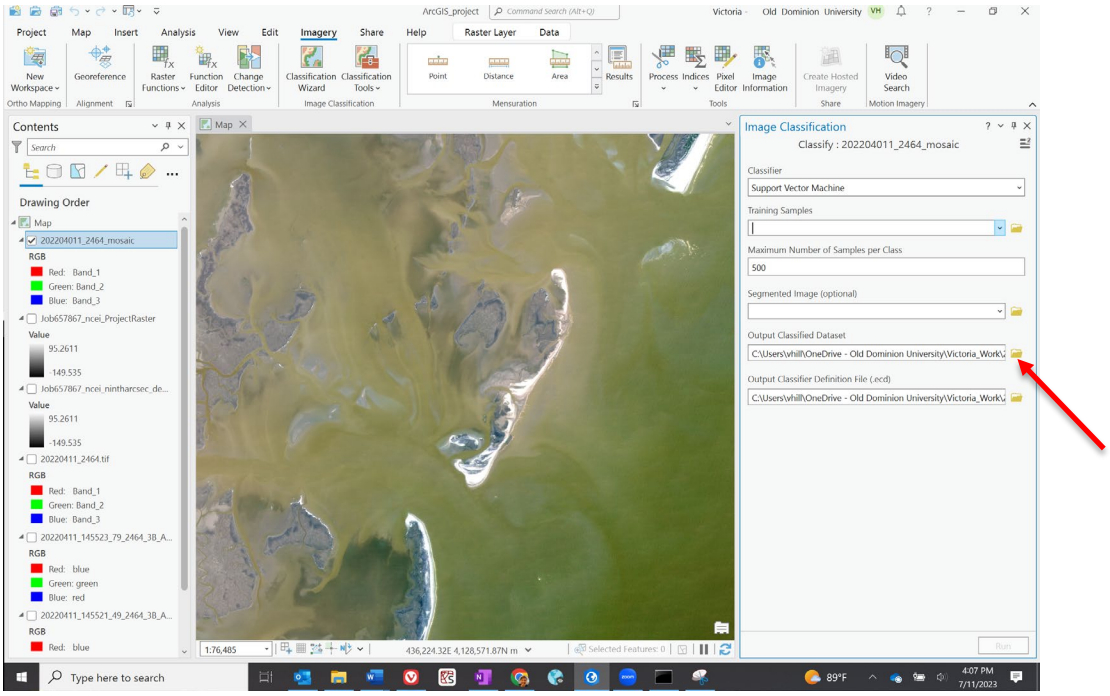
I save my training patches with the same file name as the image, i.e 20220411_2464.shp



Run classification. Use Classification tools and Classify



Use Support Vector Machine as the classifier, add your new training patches file. Then click run. The default is to save your classified file to the geodatabase. Select another location, I use the same naming convention as all the other files.
i.e 20220411_2464_classified.tif



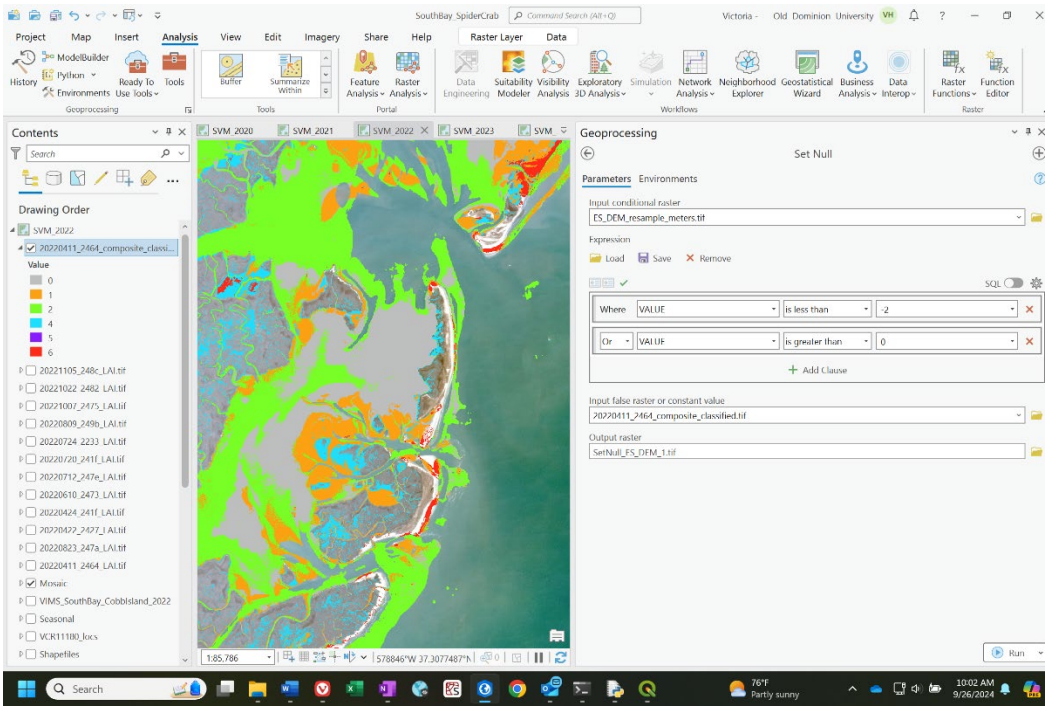
Once you have your classified file, take look you may need to add more training patches for some classes.

5. Post-processing

You can also apply some additional masking using your DEM to remove any pixels that are deeper than the survival depth of your vegetation.

Analysis | Tools |Setnull.
Your DEM is the input conditional file, the expression is “Where VALUE is less than -2”, your false file is the classified file. The resulting raster has all pixels where the DEM is deeper than -2m set to NaN

**you can add another clause to also remove land, using DEM values greater than 0. This will produce a raster with all pixels with depth less than -2 and greater than 0.



You can calculate the area of each of you classified types by right clicking on the classified layer and choosing attribute table. This gives you the number of pixels that have each classification type. You can calculate the area by using a pixel area of $9m^2$ for Planet imagery.