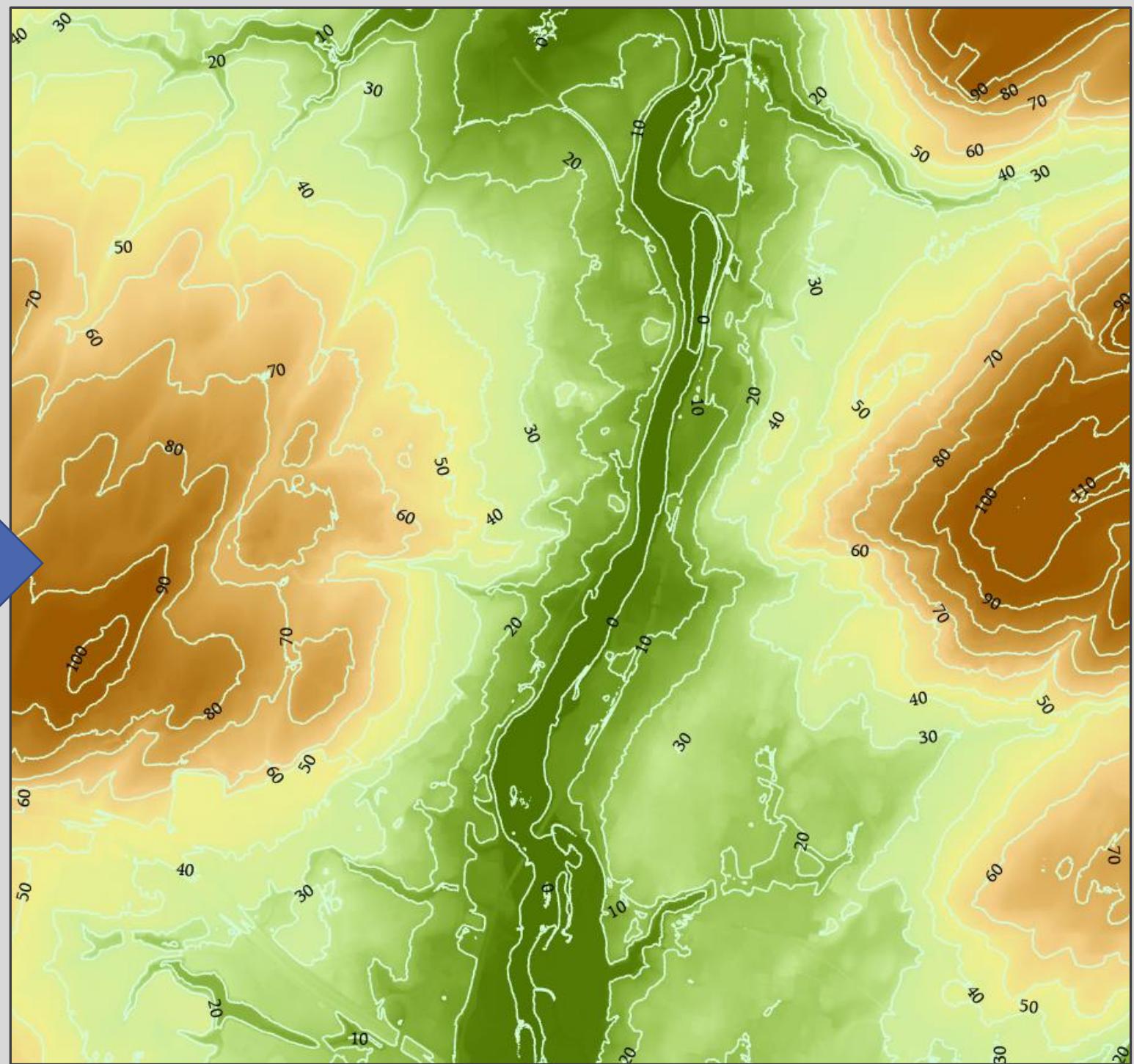
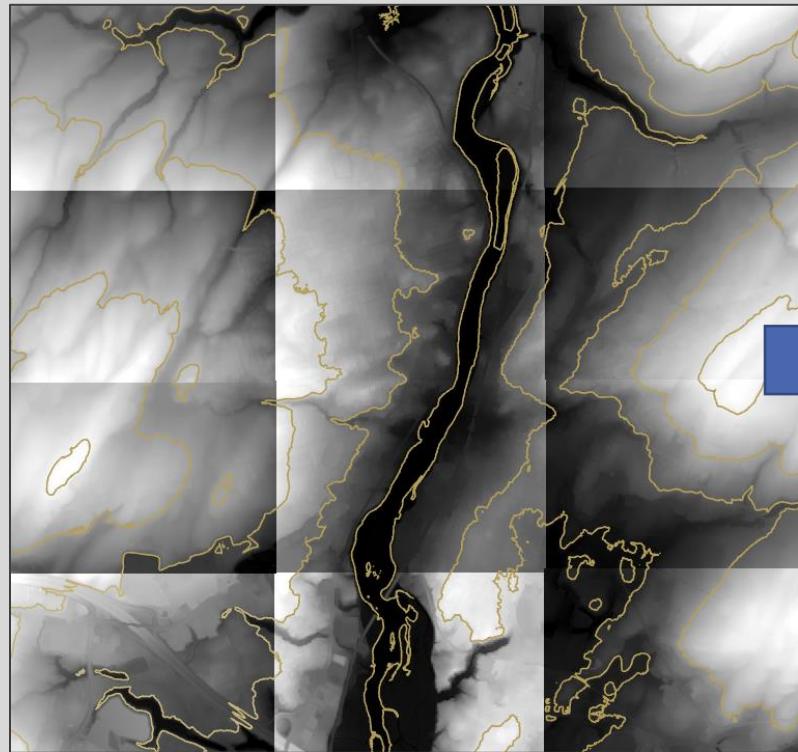


# G.I.S Portfolio 2021 - 2022:

## Remote Sensing, Statistics, Python example work.

Analyst: Alex Bevilacqua

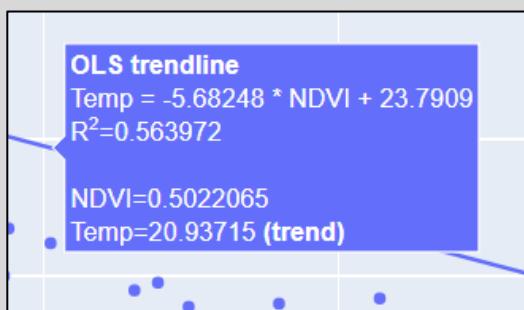
## Contour Mapping From Digital Elevation Models



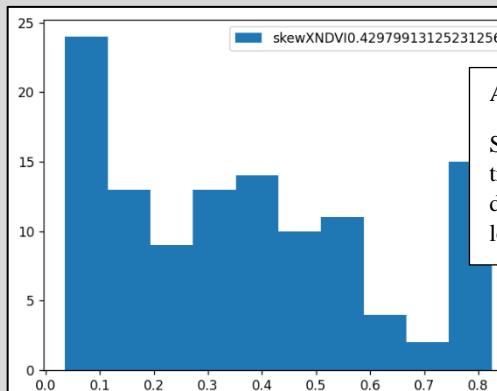
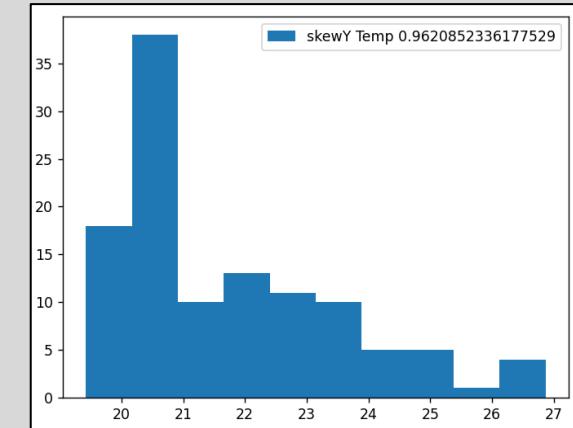
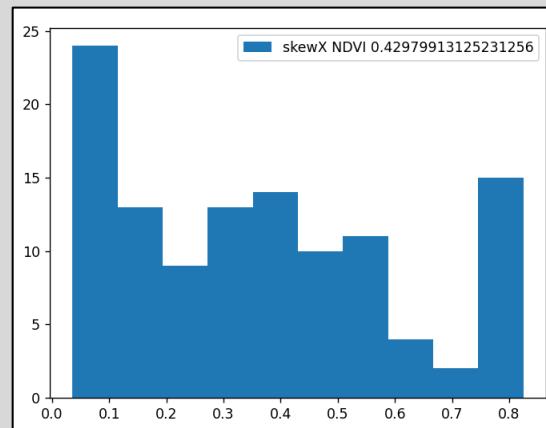
# Managing Workflow with Python

<https://github.com/alex-bev/alex-bev/blob/7e8966068ac48cdb2ea29e71f3bb968bf07e12a6/Plotting%20Two%20Var.ipynb>

```
C:\Users\alexb\PycharmProjects\pythonProject1\venv\Scripts\python.exe C:/Users/alexb/PycharmProj  
Enter Working Directory Path: C:\Users\alexb\Desktop\G.I.S\hopesGetTheJob\  
Enter Input Data Type ex. .xlsx or .csv: .xlsx  
Enter File Name: CrapDataCSV  
  
DATA CHECK:  
Temp RedEdgeMEAN NDVI NDMI Clay Ferrous  
0 26.799177 1.169873 0.092259 -0.262286 1.217136 2.003730  
1 24.164173 1.201906 0.108946 -0.195203 1.250613 1.778360  
2 19.885519 4.218787 0.808930 0.377763 2.554699 1.898364  
3 20.545644 2.997709 0.749780 0.281862 2.351621 1.677952  
4 19.921514 4.255348 0.803429 0.392025 2.601530 1.846103  
5 20.511680 2.861976 0.727741 0.274151 2.285741 1.622705  
6 20.351289 4.175673 0.793473 0.380895 2.529526 1.856480  
7 20.753316 2.987778 0.700190 0.259863 2.212431 1.708162  
8 20.557142 3.785349 0.810279 0.348445 2.488054 1.828332  
9 22.390840 2.547105 0.606893 0.165214 1.850821 1.801636  
Input Desired x Variable: NDVI  
Input Desired y Variable: Temp  
  
X mean =  
0.36431500881186113  
  
Y mean =  
21.720716429985018  
  
Would you like to check distribution skewness? Yes  
Apply transformations? 1 = Yes, 2 = No. 1
```

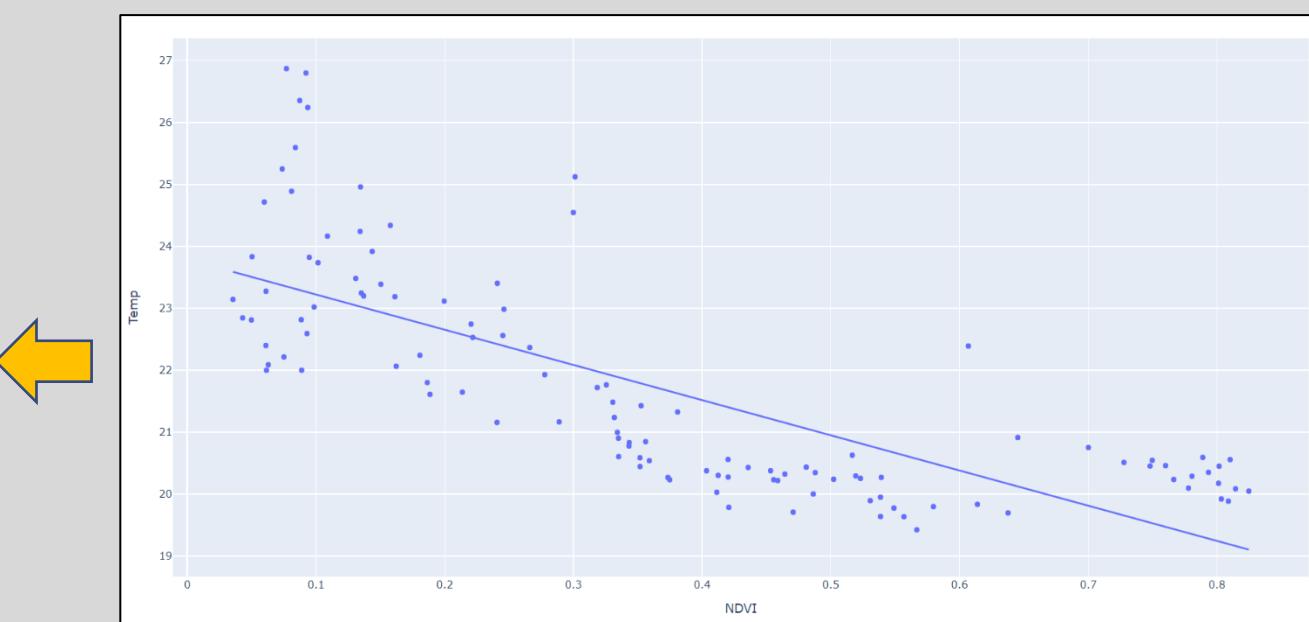
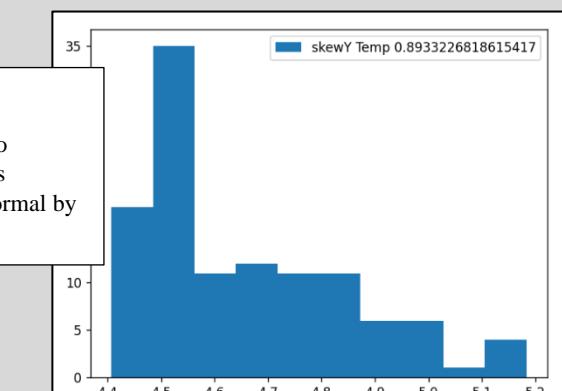


In this example we quickly test the relationship with an ordinary least squares regression. With automatically produced plots outputs.



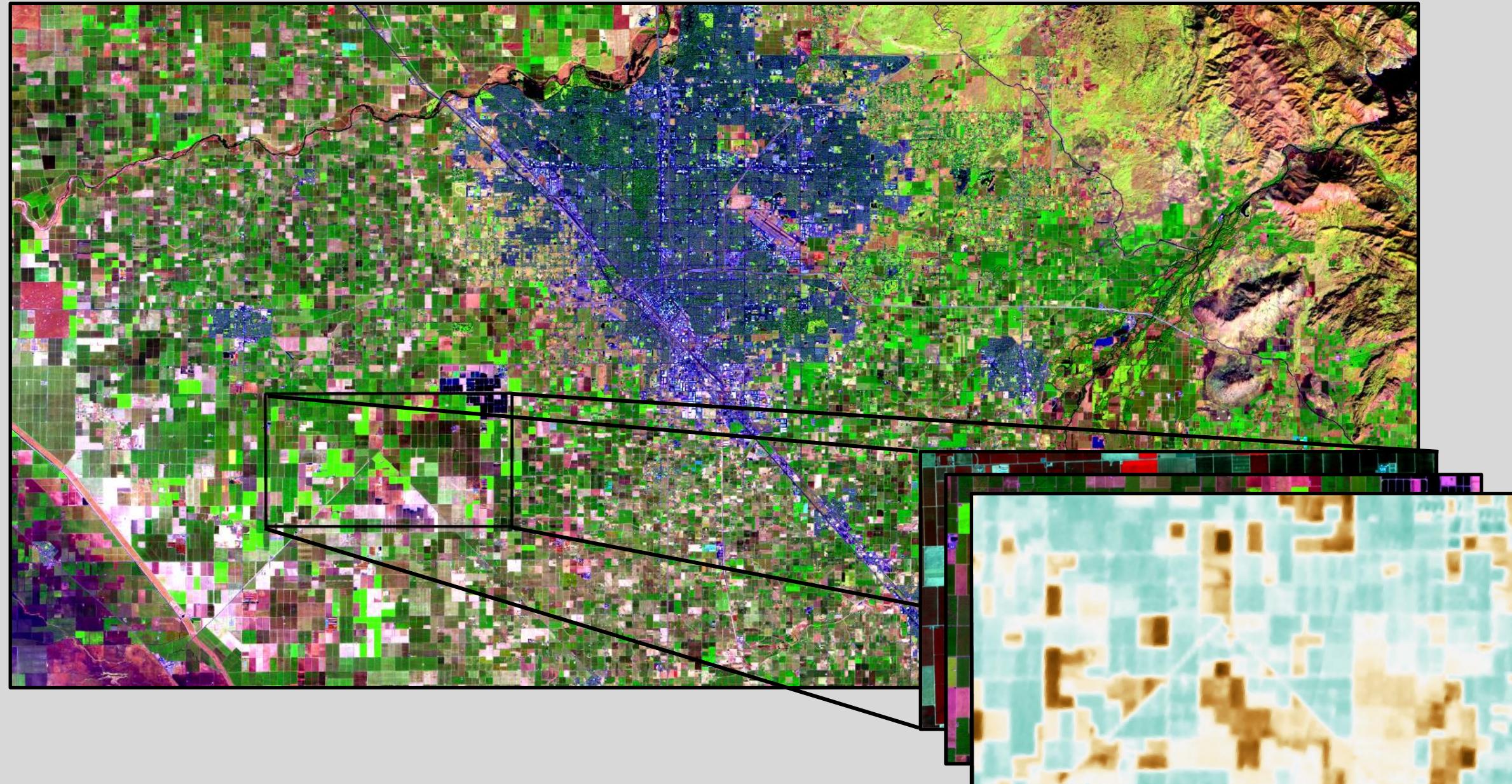
After Transformations loop:

Square root applied to y variable; no transformation applied to x as it was determined it reasonably approx. normal by loop conditions.

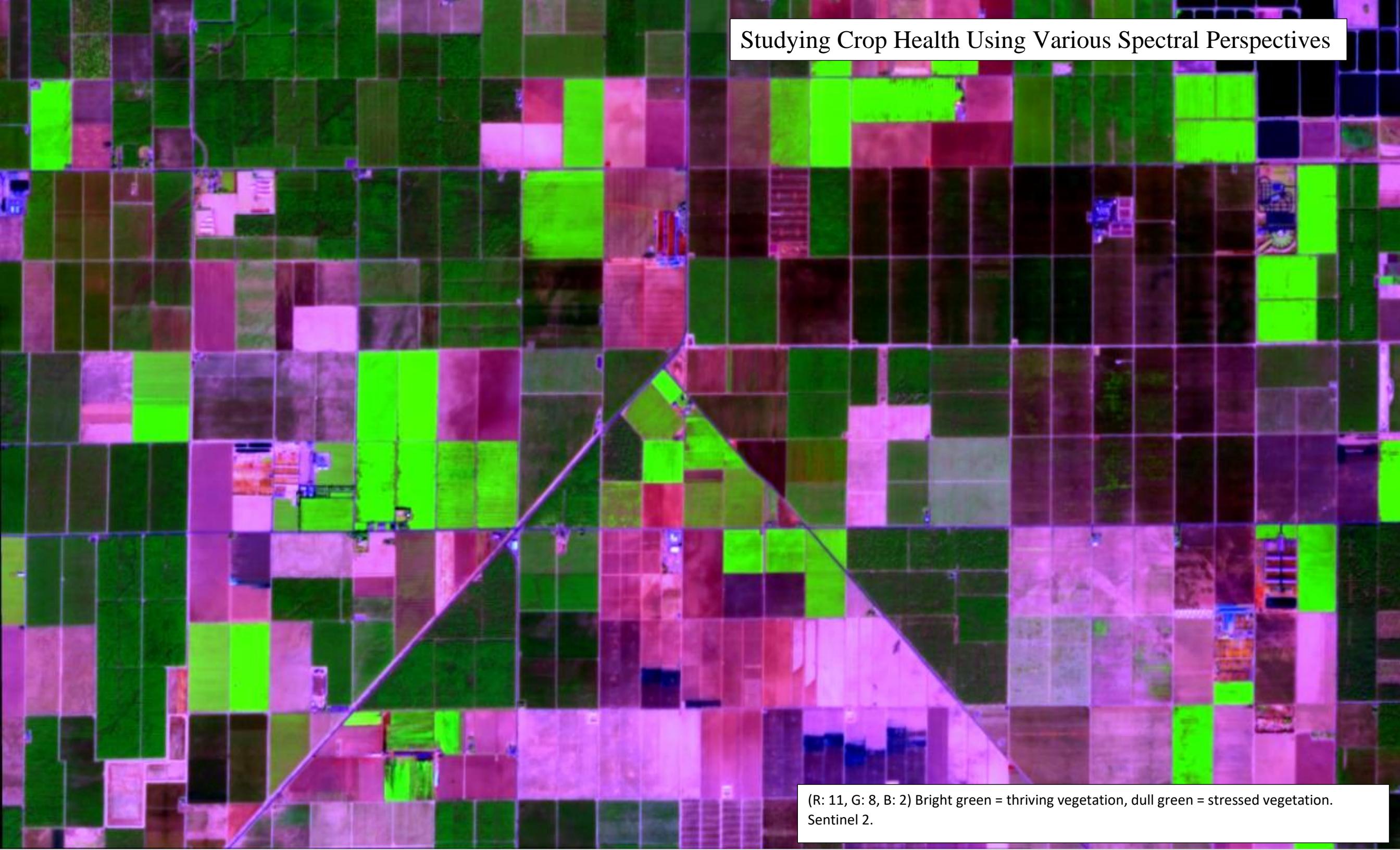


# A Look at San Joaquin Valley Agriculture Using Sentinel 2 Multi Spectral (10 m) and Landsat 8 TIRS (100 m)

California, USA 11/02/2020



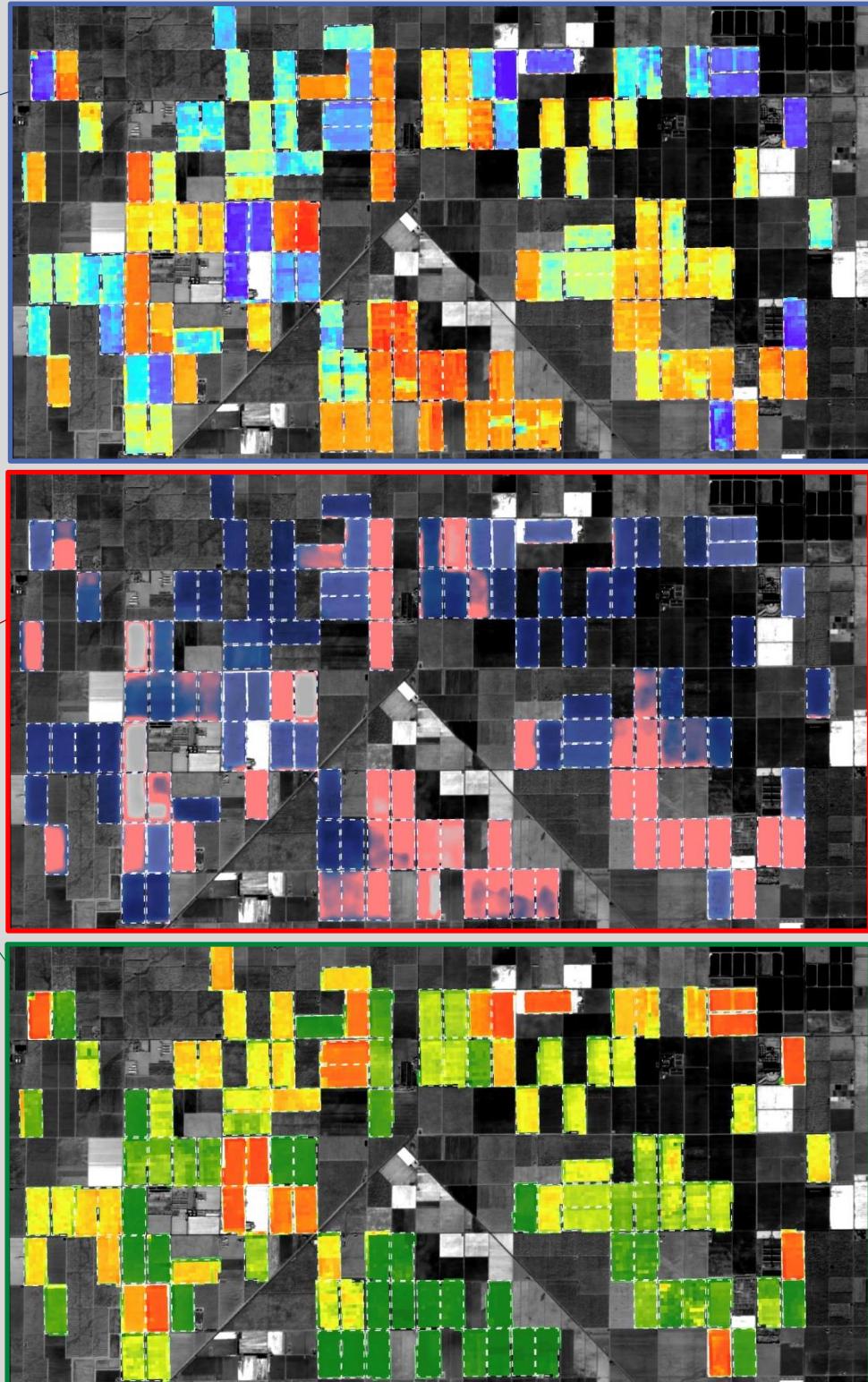
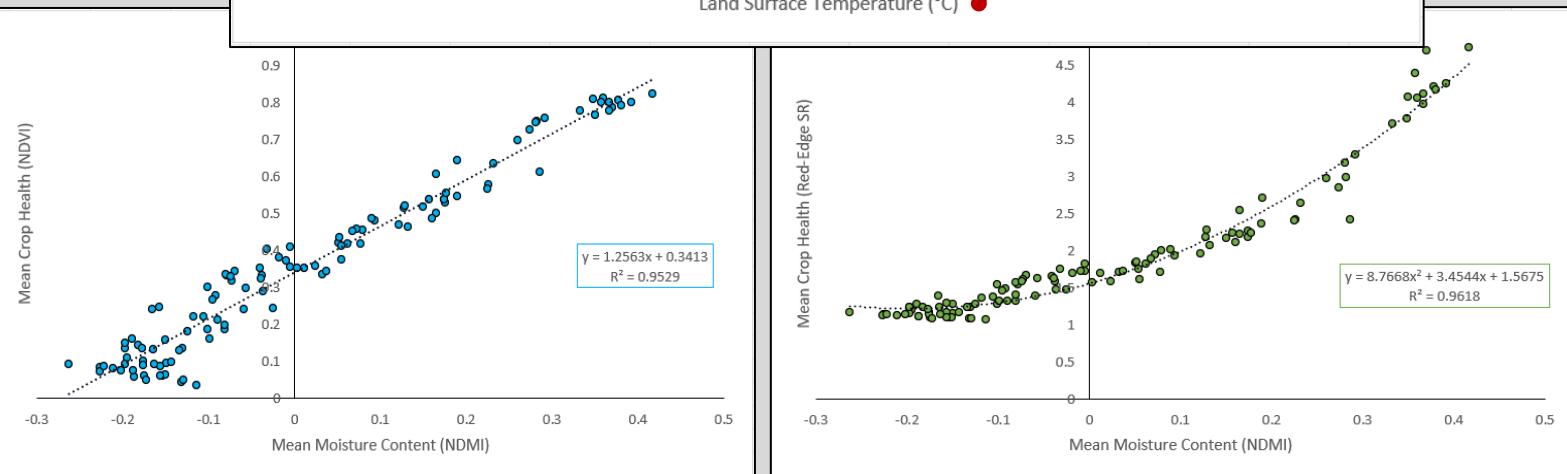
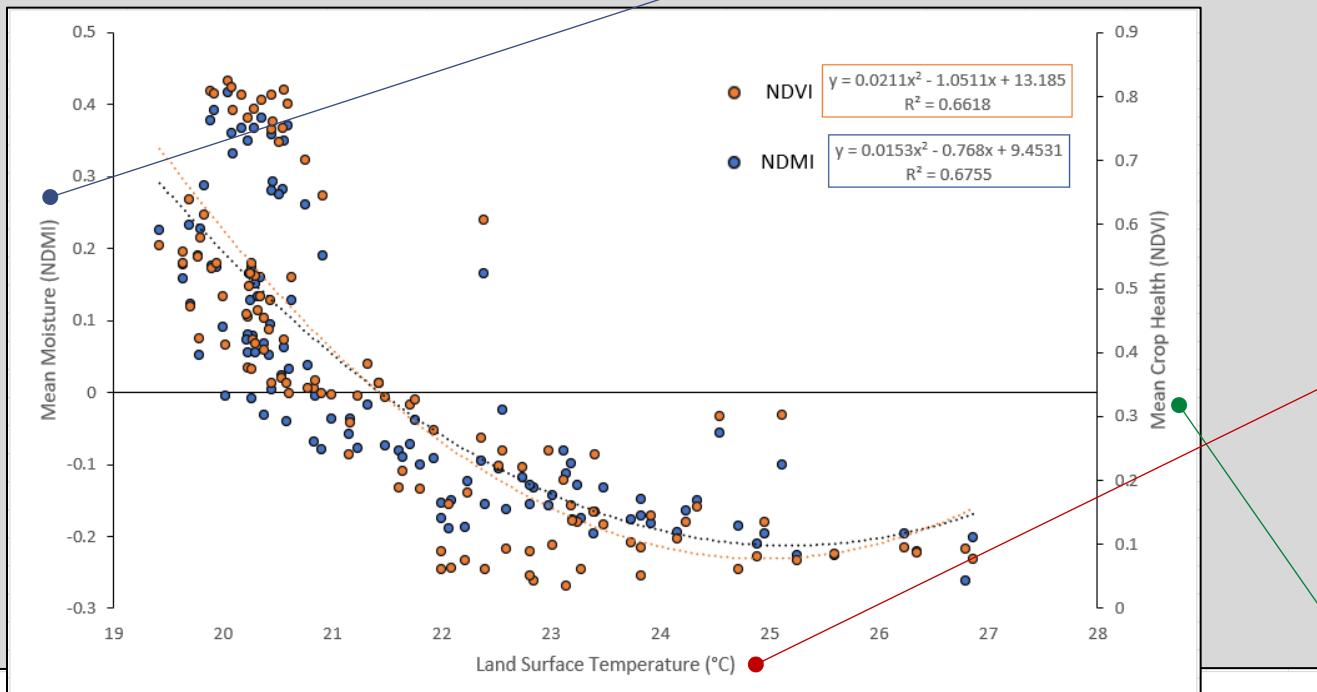
# Studying Crop Health Using Various Spectral Perspectives

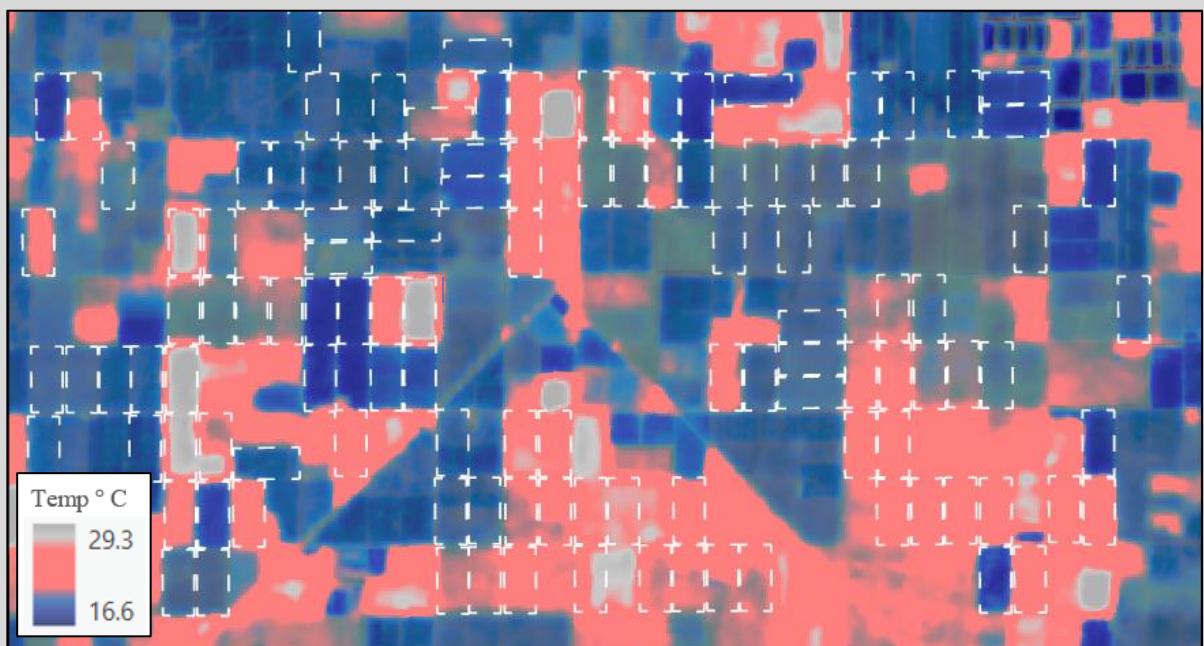
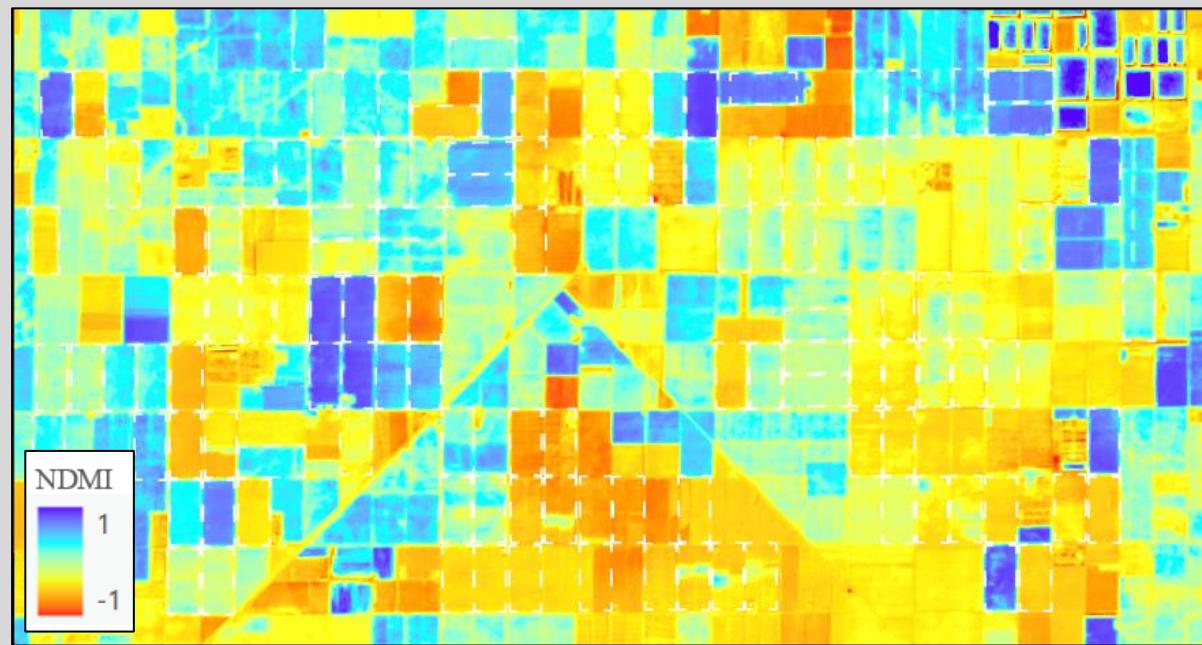
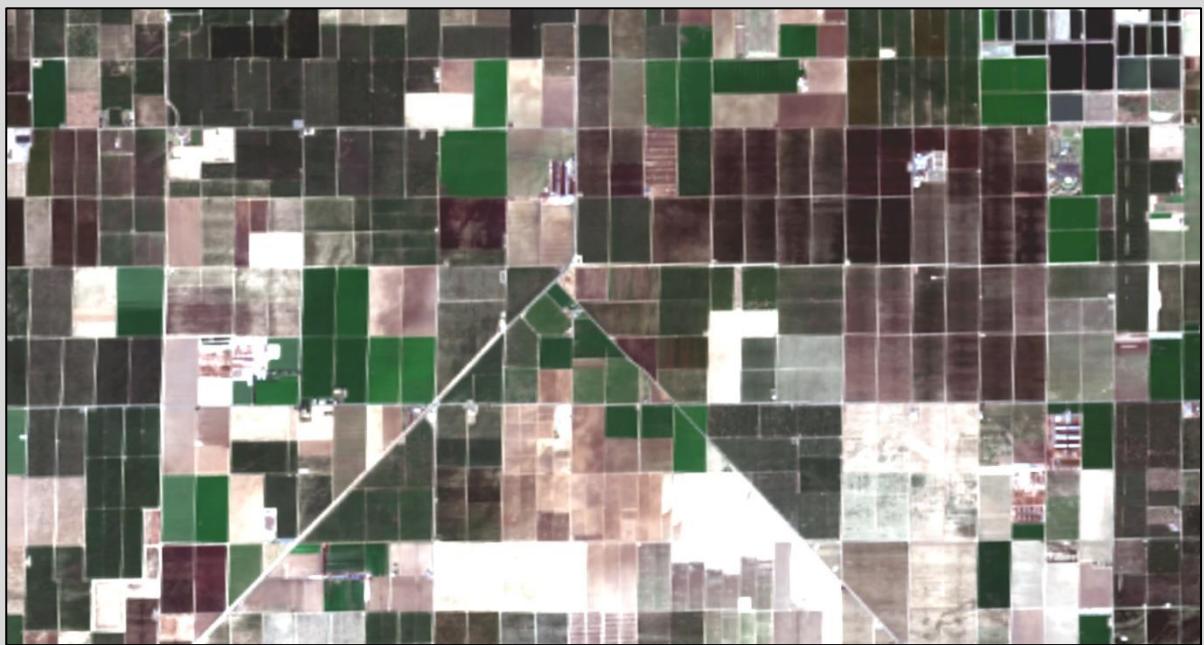


(R: 11, G: 8, B: 2) Bright green = thriving vegetation, dull green = stressed vegetation.  
Sentinel 2.

# Crop Monitoring with Zonal Statistics

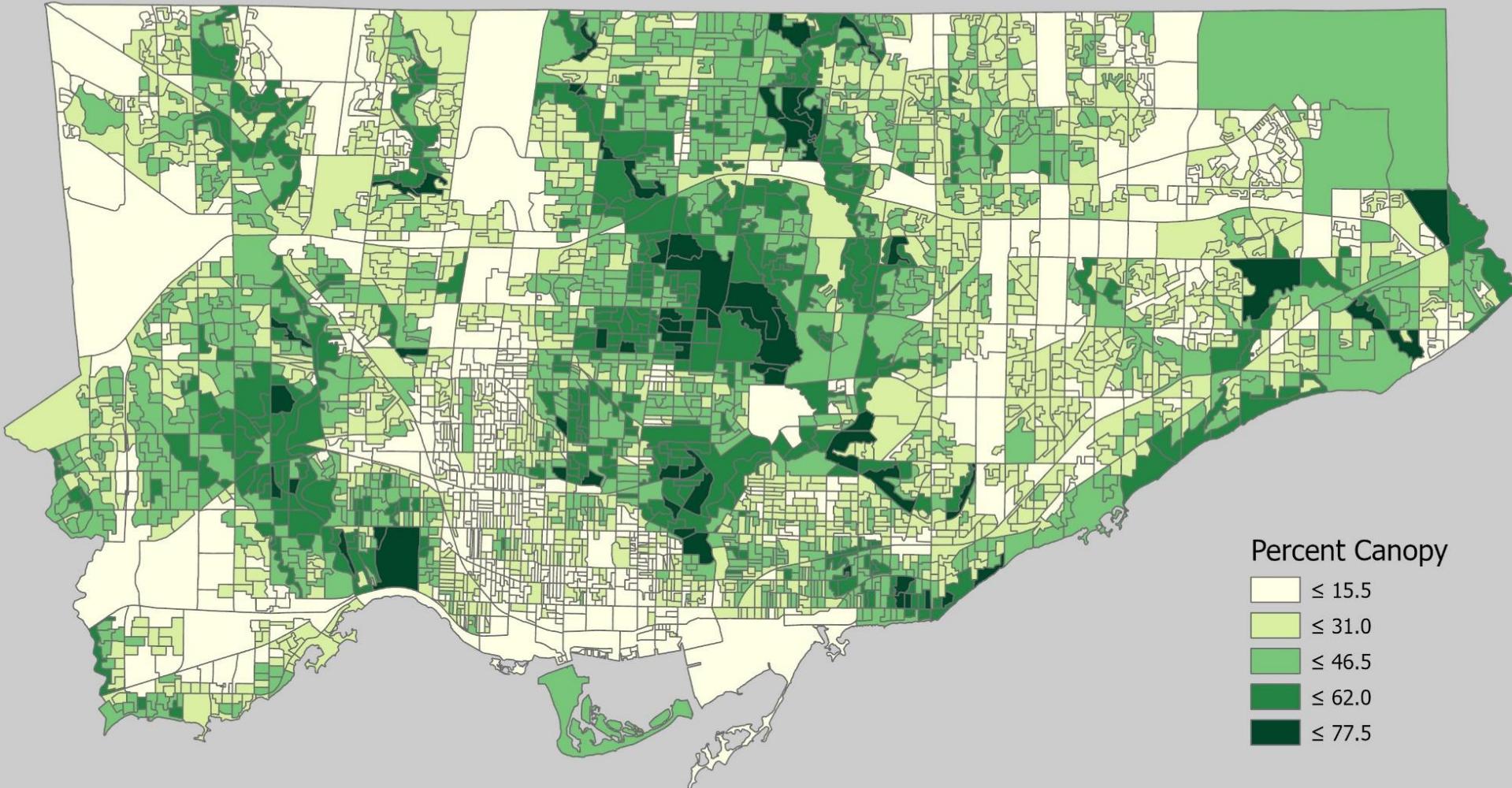
Testing correlations between variables can produce regression models like these are able to aid in the prediction and prepare for future condition. In this example we note relatively strong correlations especially between detected moisture content and Vegetation indices. 101 agricultural plots were selected for statistics.





# Tree Canopy Cover Over Toronto Dissemination Areas

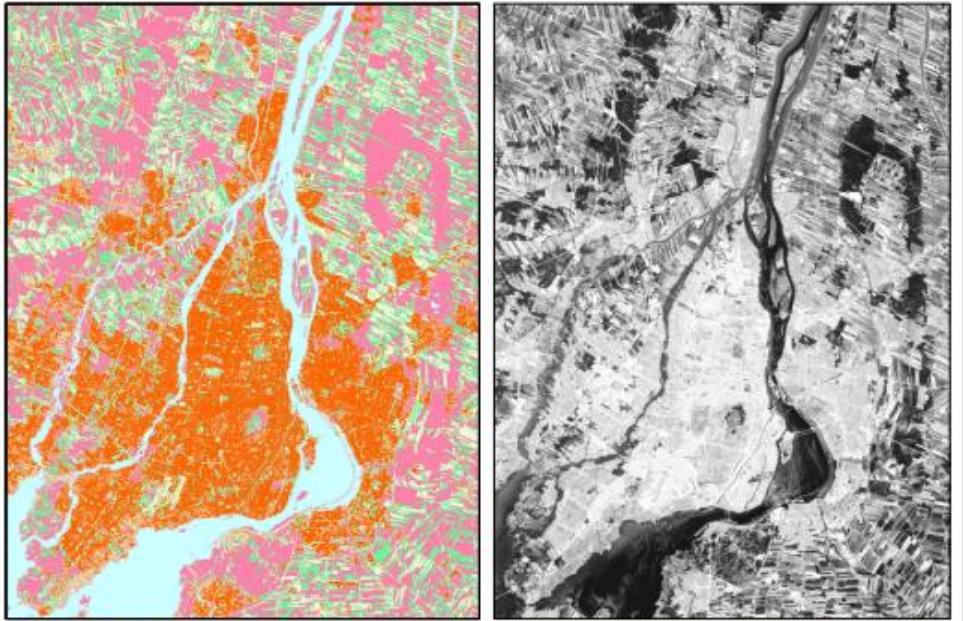
## Toronto, Canada



Choropleth map of Toronto, Canada using an Equal interval classification scheme to communicate Tree canopy cover as a percentage for each dissemination area. Data was derived using zonal statistics on a raster land cover classification collected (2007) and dissemination area data (2006) retrieved from Toronto.ca and Statistics Canada  
Map By: A.Bevilacqua B00845847. 2022-01-18. Spatial Reference: NAD 1983 UTM Zone 17N.



## Classification of Land Cover: Various Methods

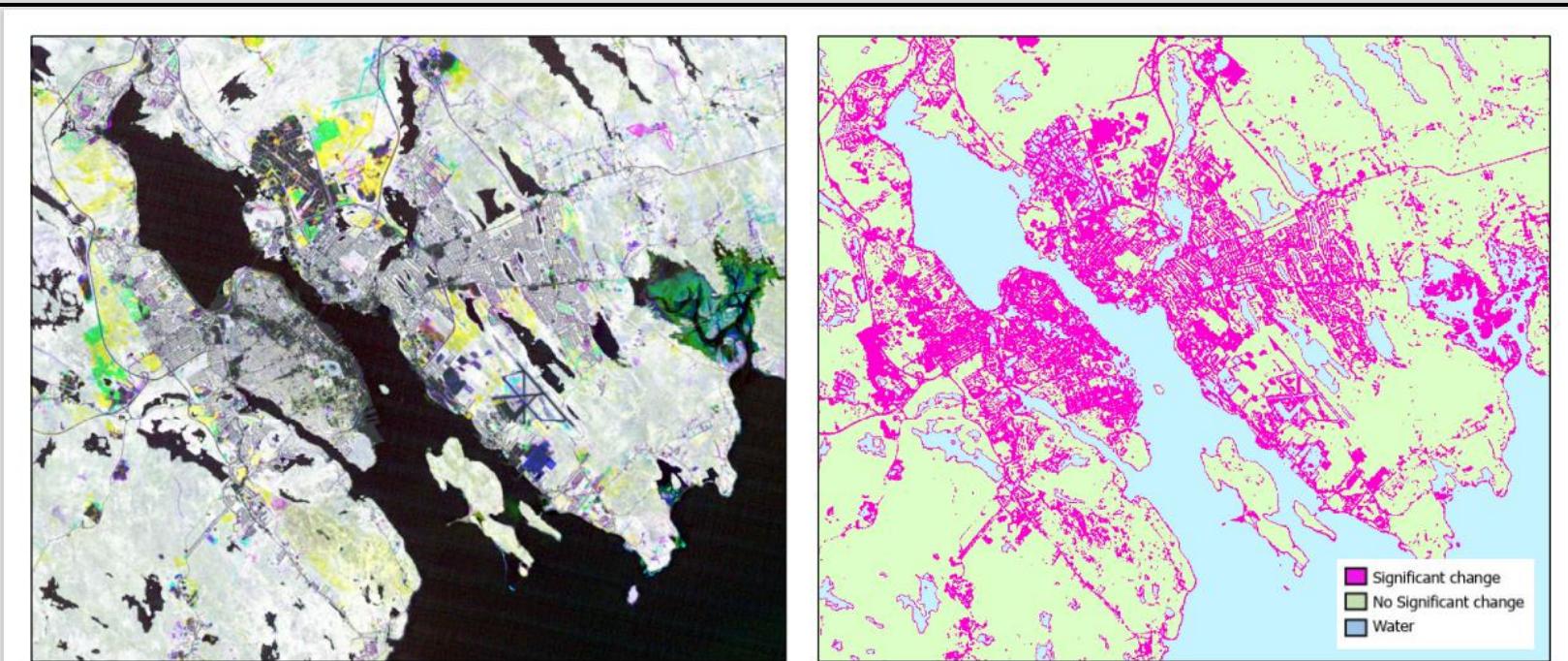


CLASSIFICATION CLASSES

- SOIL
- LOW VEGETATION
- DENSE VEGETATION
- BUILT
- WATER

Unsupervised Classification of Montreal (top left) using Principal components 1 - 3 and mean red texture raster as input layers displayed in the bottom left (3,2,1) and top right respectively. Bottom right map is a natural colour composite. Study area extent included in base map insert. Landsat 8 OLI image provided by USGS Earth Explorer acquired 2017-07-30. Spatial Reference: UTM Zone 18. Map by Alessandro Bevilacqua B00845847.

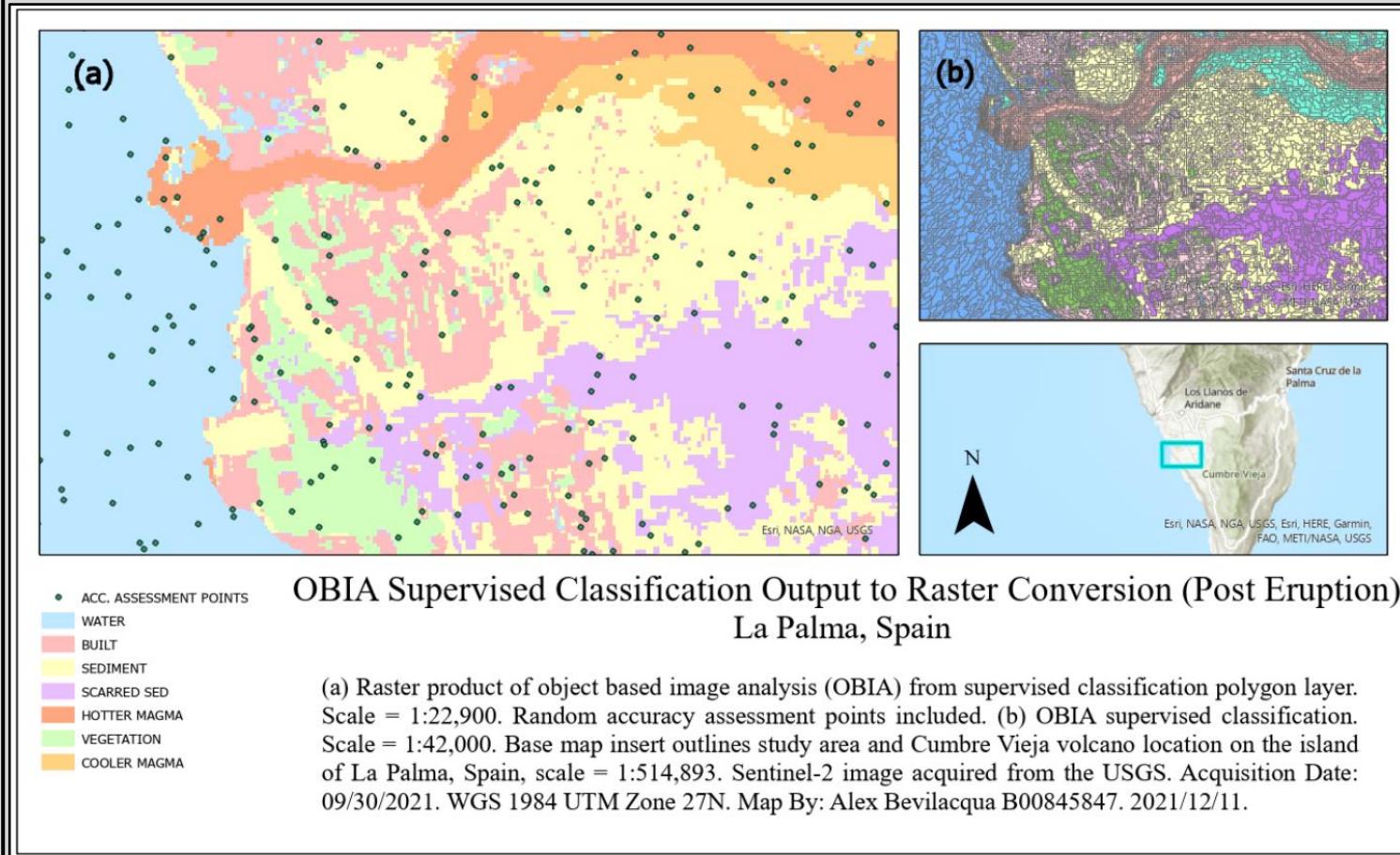
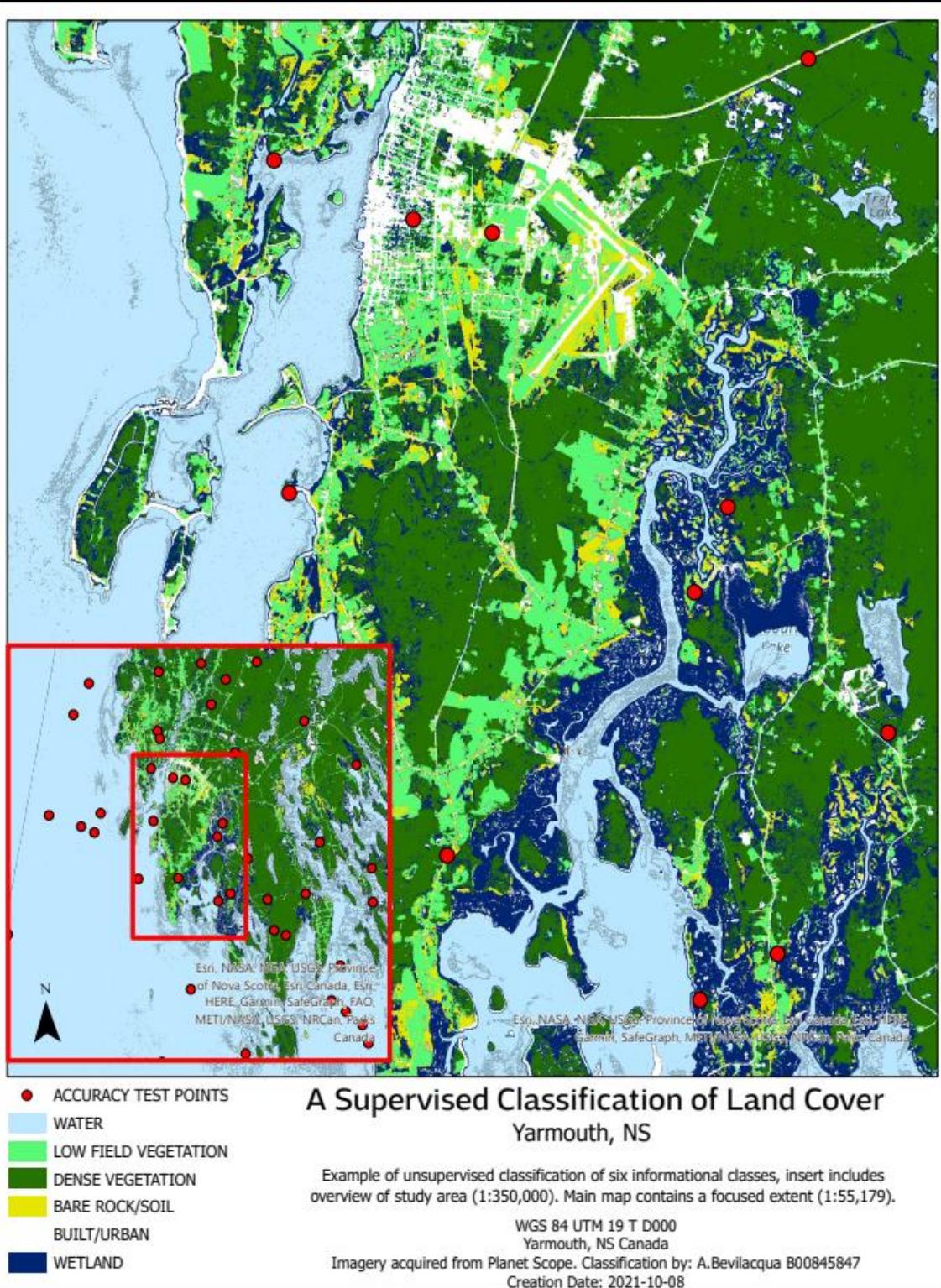
Esri, NASA, NGA, USGS, Esri, CGIAR, USGS, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NRCan, Parks Canada, Ville de Montréal, Esri Canada, Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS, NRCan, Parks Canada, Esri, USGS

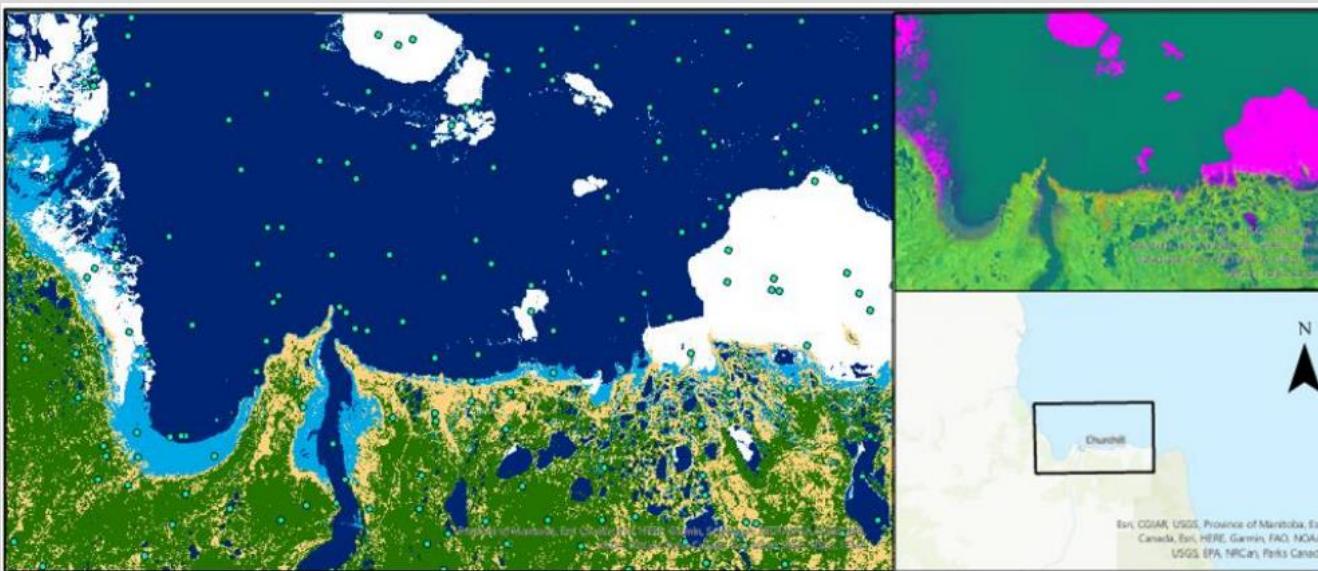


Supervised Classification Using NDVI for 1987, 1992 and 2009  
Halifax, Nova Scotia, Canada

Map represents the output (right) of a supervised classification of 3 stacked NDVI raster layers for the years 1987, 1992 and 2009. Where R = 1992, G = 1987, B = 2009 (left). Map by A.Bevilacqua 2021/12/03.

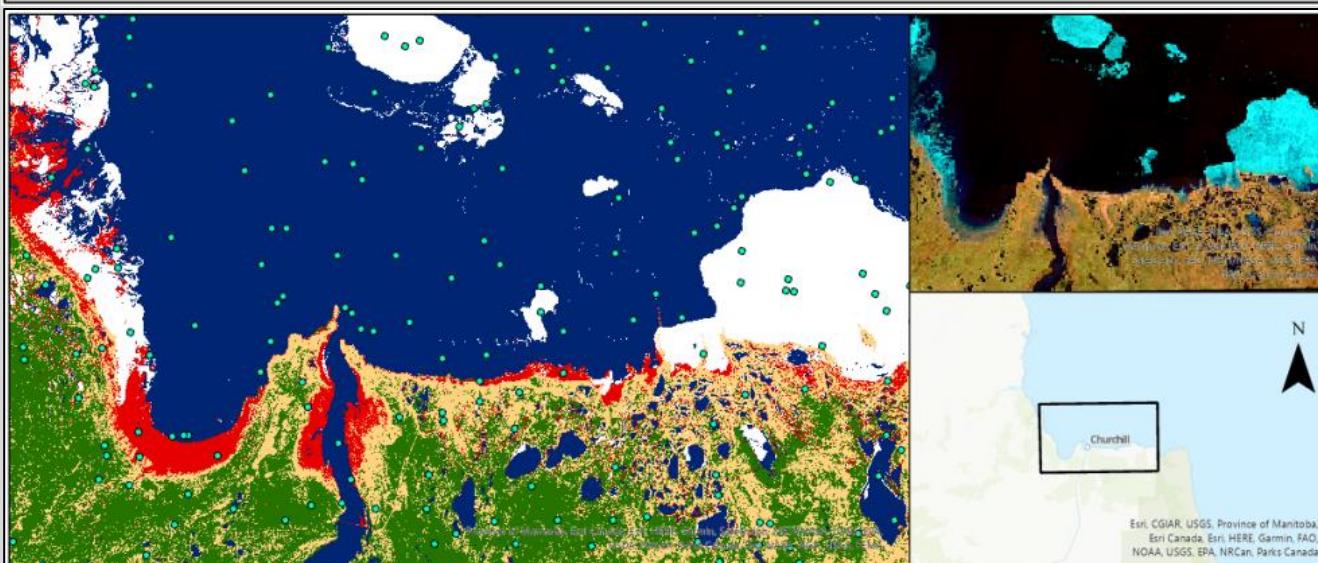
Esri, NASA, NGA, USGS, Province of Nova Scotia, Esri Canada, Esri, HERE, Garmin, SafeGraph, METI/NASA, USGS, NRCan, Parks Canada





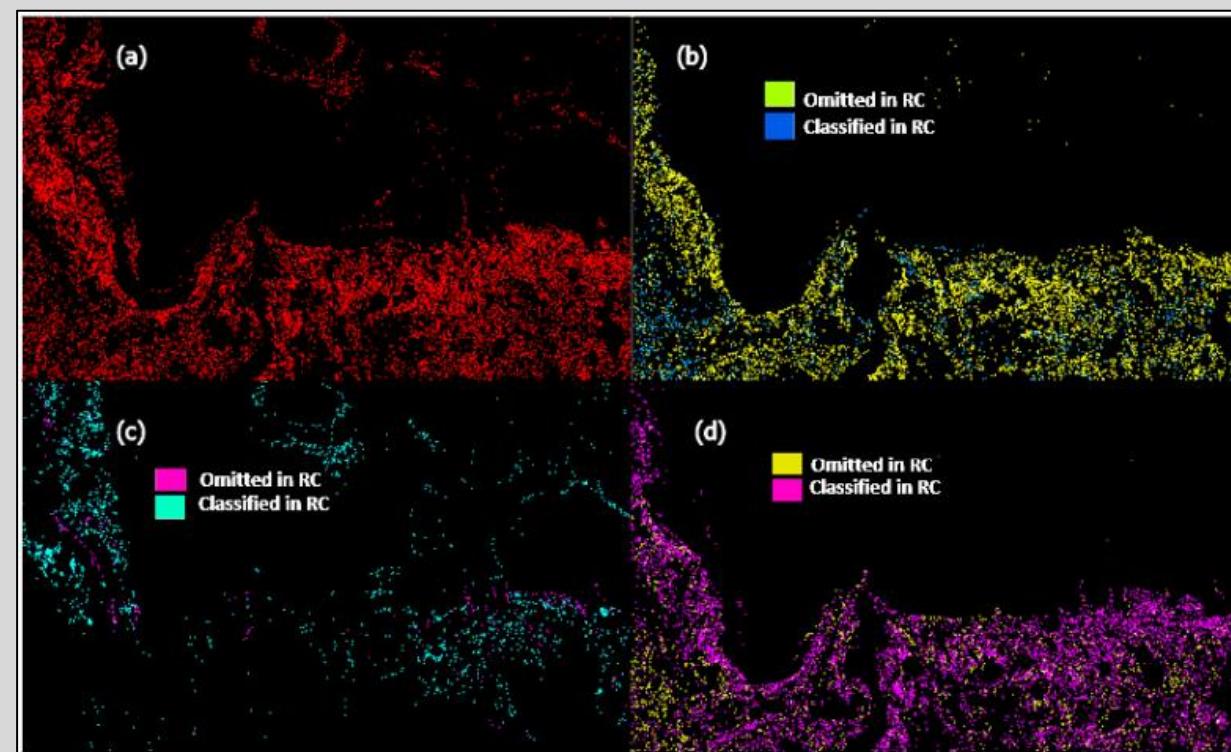
**SUPERVISED CLASSIFICATION USING TASSELED CAP TRANSFORMATION AS INPUTS**  
Churchill, Manitoba

Supervised classification output of Tasseled-Cap transformation classification using Landsat 8 OLI bands 2 - 7. This map consists of the classification output (left) and the Tasseled-Cap transformation layer input (top left panel) and the extent of the study area (bottom right). The scale in classification extent is 1:264,592, the scale in the top left insert is 1:999,670 and the scale for the bottom left insert is 1:4089571.  
Created BY: A.Bevilacqua 2021. Spatial Reference: GCS WGS 1986 Web Mercator Auxiliary sphere



**SUPERVISED CLASSIFICATION USING TASSELED CAP TRANSFORMATION AS INPUTS**  
Churchill, Manitoba

Supervised classification output of raw image classification using Landsat 8 OLI bands 2 - 7. This map consists of the classification output (left) and Raw image image in a 7,5,4 band composite (top left panel) and the extent of the study area (bottom right). The scale in classification extent is 1:264,592, the scale in the top left insert is 1:999,670 and the scale for the bottom left insert is 1:4089571.  
Created BY: A.Bevilacqua 2021. Spatial Reference: GCS WGS 1986 Web Mercator Auxiliary sphere



**Fig2.** Locations of pixels that were disagreed upon between Raw imagery supervised classification (RC) and classification using Tasseled Cap transformation inputs (TC). Legend refers to pixels that were omitted from RC and therefore classified as specified class in the TC layer and vice versa. (a) Location of all disagreement pixels. (b) Disagreement pixel locations within the VEGETATION informational class. (c) Disagreement pixel locations in the ICE informational class. (d) Disagreement pixel locations in the ROCK/SOIL informational class.

**Table2.** Confusion Matrices produced for Tasseled Cap classification (top) and Raw Imagery classification (bottom) using 206 accuracy test points.

REFERENCE DATA							
ClassValue	WATER	ICE	VEGETATION	ROCK/SOIL	FLUVIAL DEPOSITS	Total	U_Accuracy
WATER	103	0	0	0	0	103	1
ICE	0	25	0	0	0	25	1
VEGETATION	0	0	33	11	1	45	0.733333333
ROCK/SOIL	0	1	4	16	0	21	0.761904762
FLUVIAL DEPOSITS	2	0	0	3	7	12	0.583333333
Total	105	26	37	30	8	206	
P_Accuracy	0.980952381	0.961538462	0.891891892	0.533333333	0.875		
Kappa	0.841427572						
MAP DATA							
ClassValue	WATER	ICE	VEGETATION	ROCK/SOIL	FLUVIAL DEPOSIT	Total	U_Accuracy
WATER	102	0	0	0	0	102	1
ICE	0	25	0	0	1	26	0.961538462
VEGETATION	0	0	30	11	1	42	0.714285714
ROCK/SOIL	1	1	6	17	0	25	0.68
FLUVIAL DEPOSIT	2	0	1	2	6	11	0.545454545
Total	105	26	37	30	8	206	
P_Accuracy	0.971428571	0.961538462	0.810810811	0.566666667	0.75		
Kappa	0.813106288						

