Comparison of Albedo, Temperature, and NDVI among Different Cover Types in Connecticut

Presentation on June 30th

Ziyan Chu

Objective

- Land cover types: Conifer, Deciduous, Grass, Urban and Water
- Objectives:
  - Surface Temperature (Kelvin)
  - Albedo
  - NDVI

Landsat Image

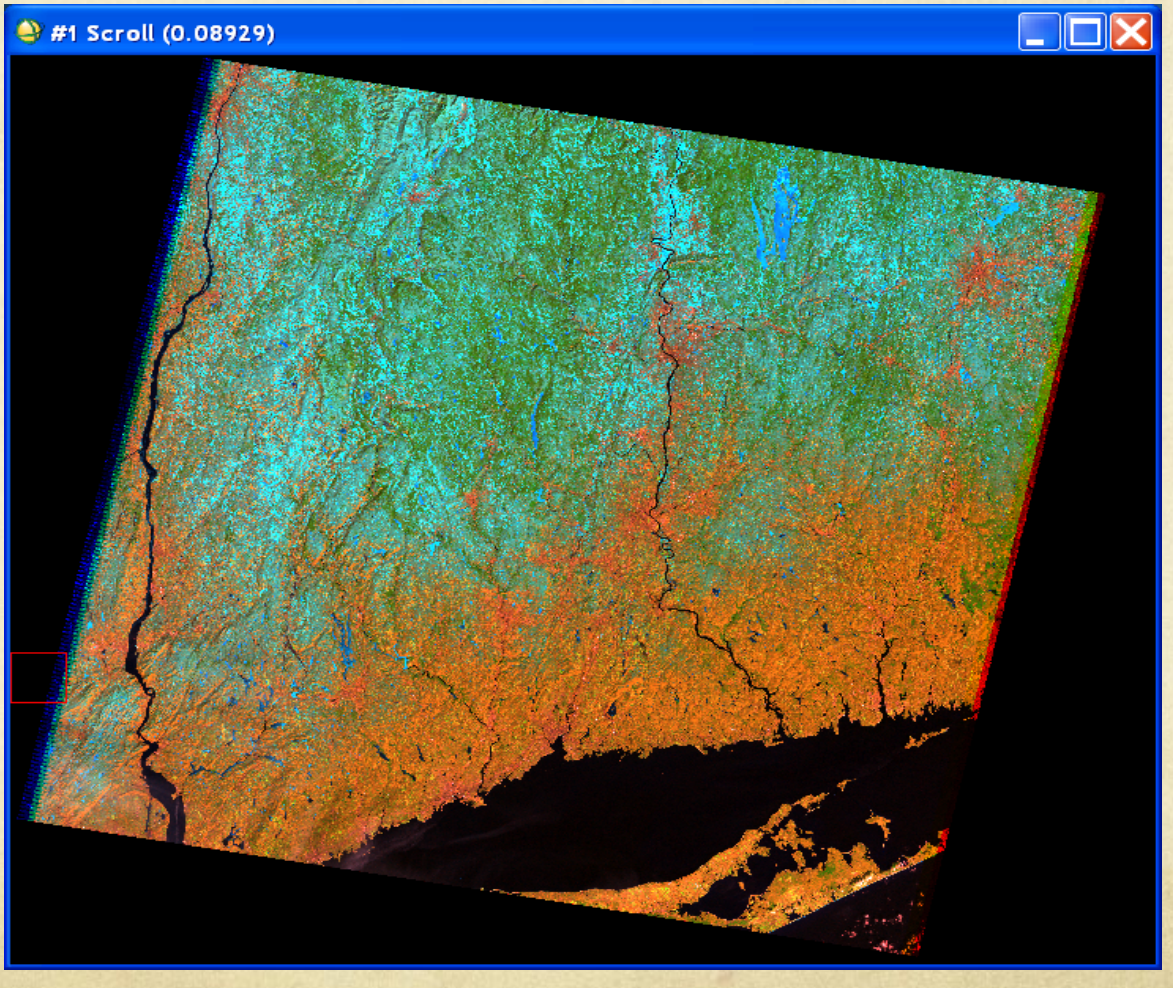
- Landsat 7 ETM+, SLC (Scan Line Corrector) – on
  - 8 bands totally
  - 2 thermal band
- Landsat 4-5 TM
  - 7 bands totally

Methods

- Images through a year: Mar, Apr, June, July, Aug, Nov
- Land cover: conifer, deciduous, grass, urban, water
- Step:
  - Create polygons (ROI) for each land cover type
  - Use the polygons from one image for other images
  - Calculate the average value for each type of polygon

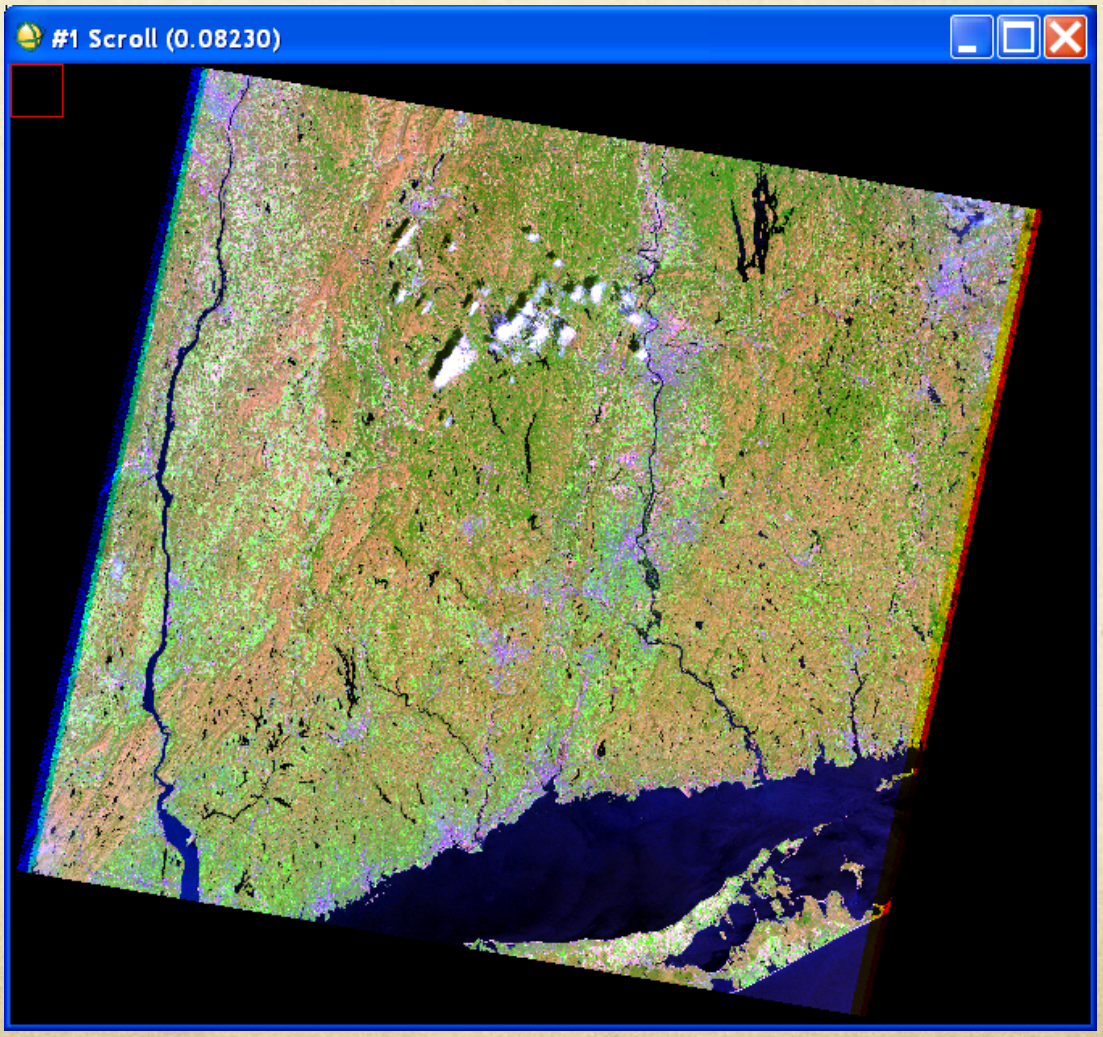
Landsat 7, SLC – on (741-RGB)

- Mar



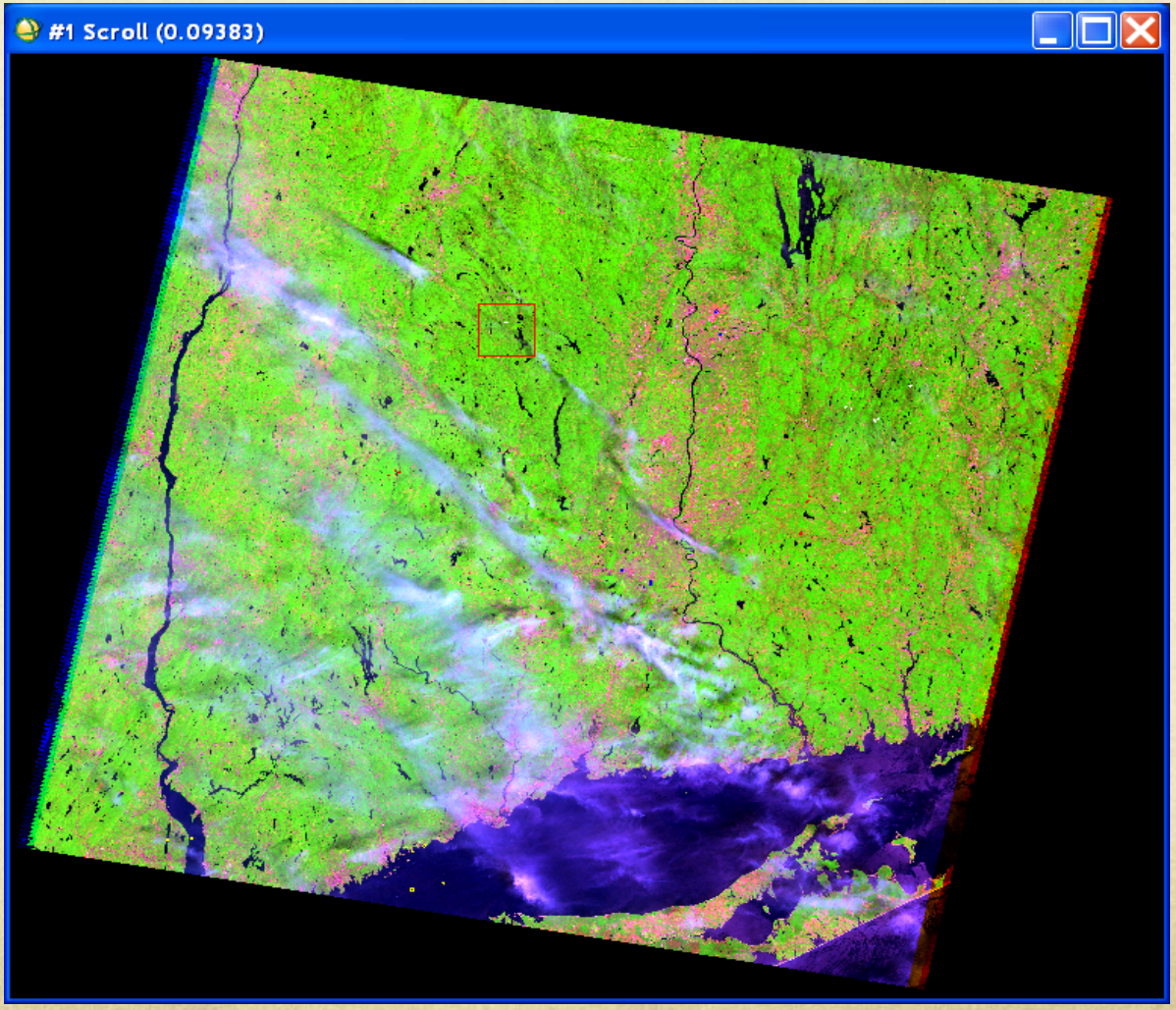
Landsat 7, SLC – on (741-RGB)

- Apr



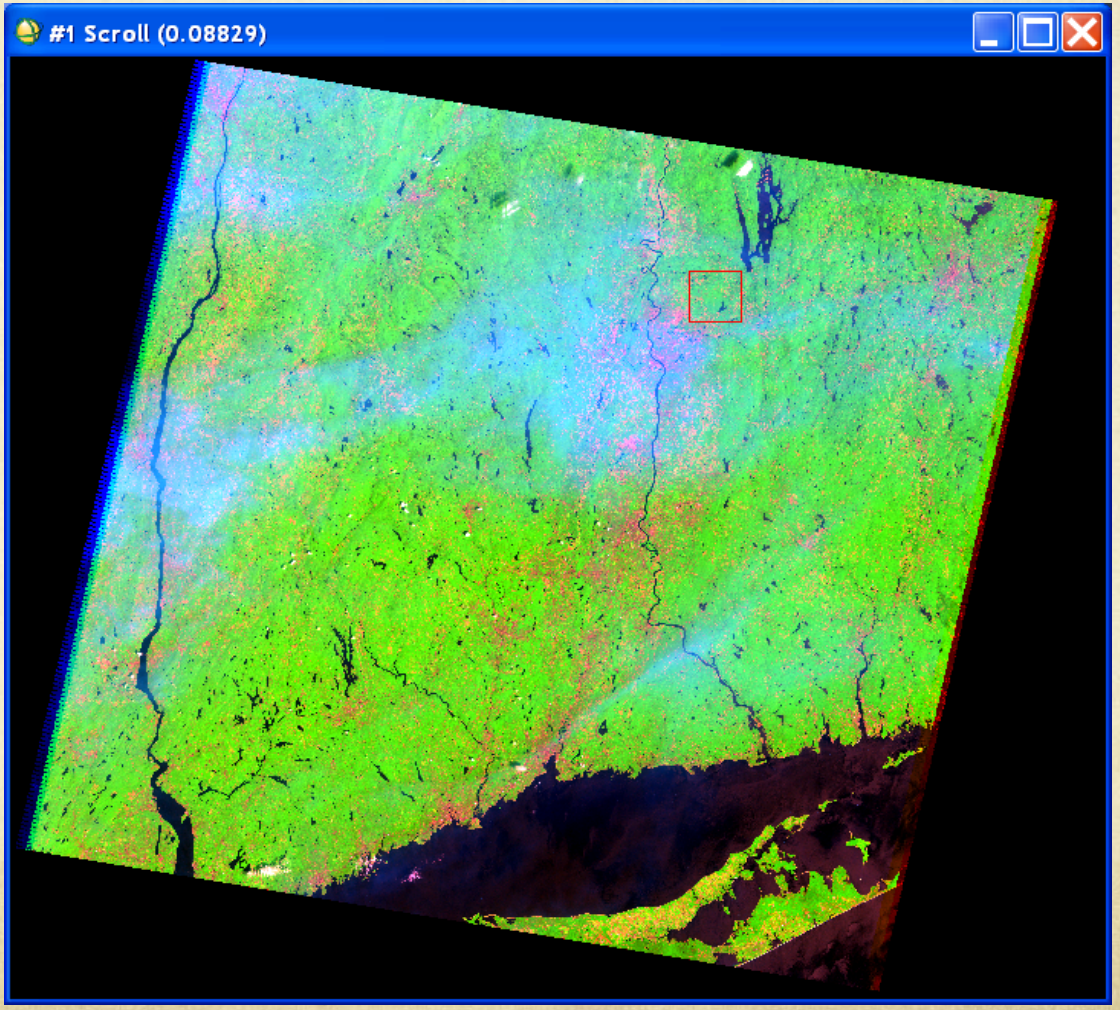
Landsat 7, SLC – on (741-RGB)

- June



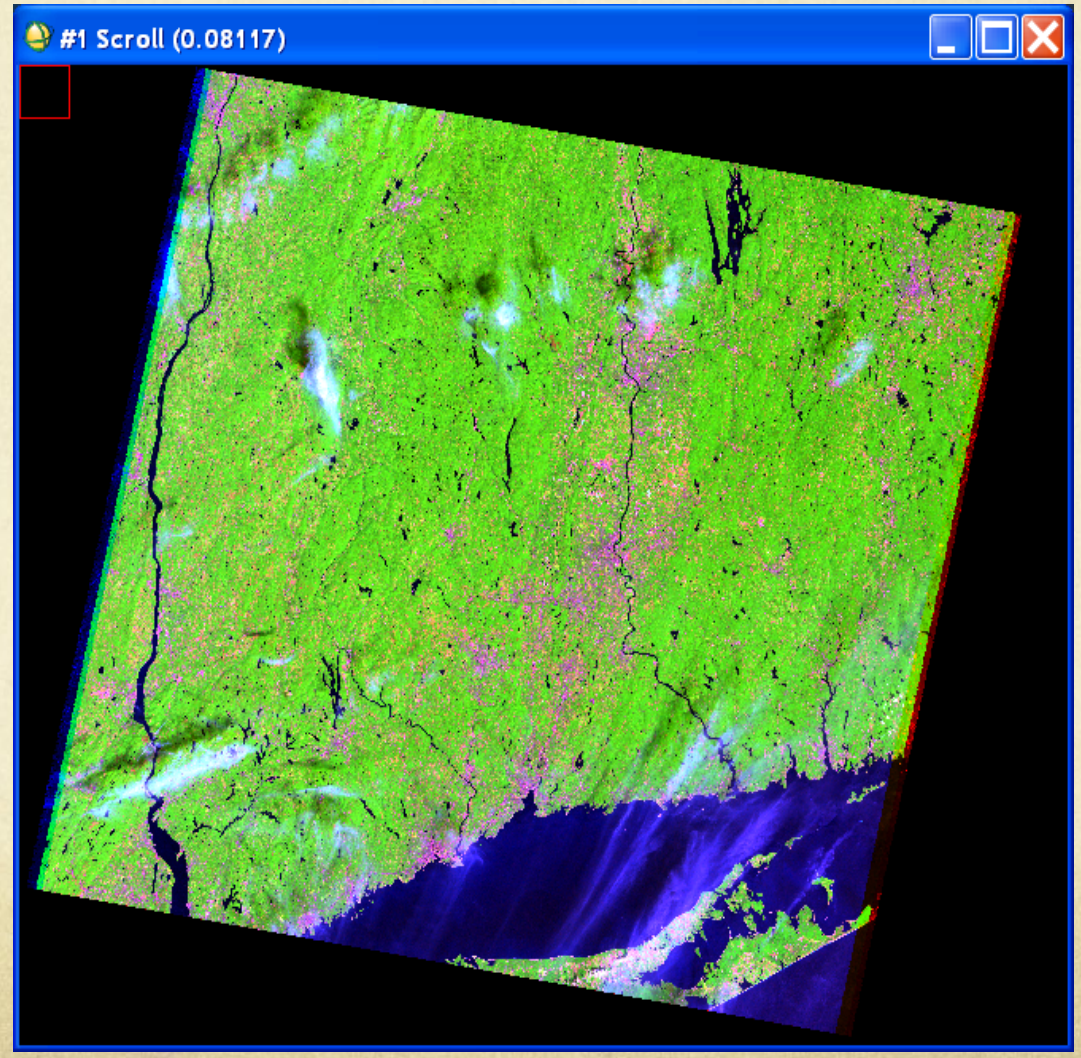
Landsat 7, SLC – on (741-RGB)

- Junly



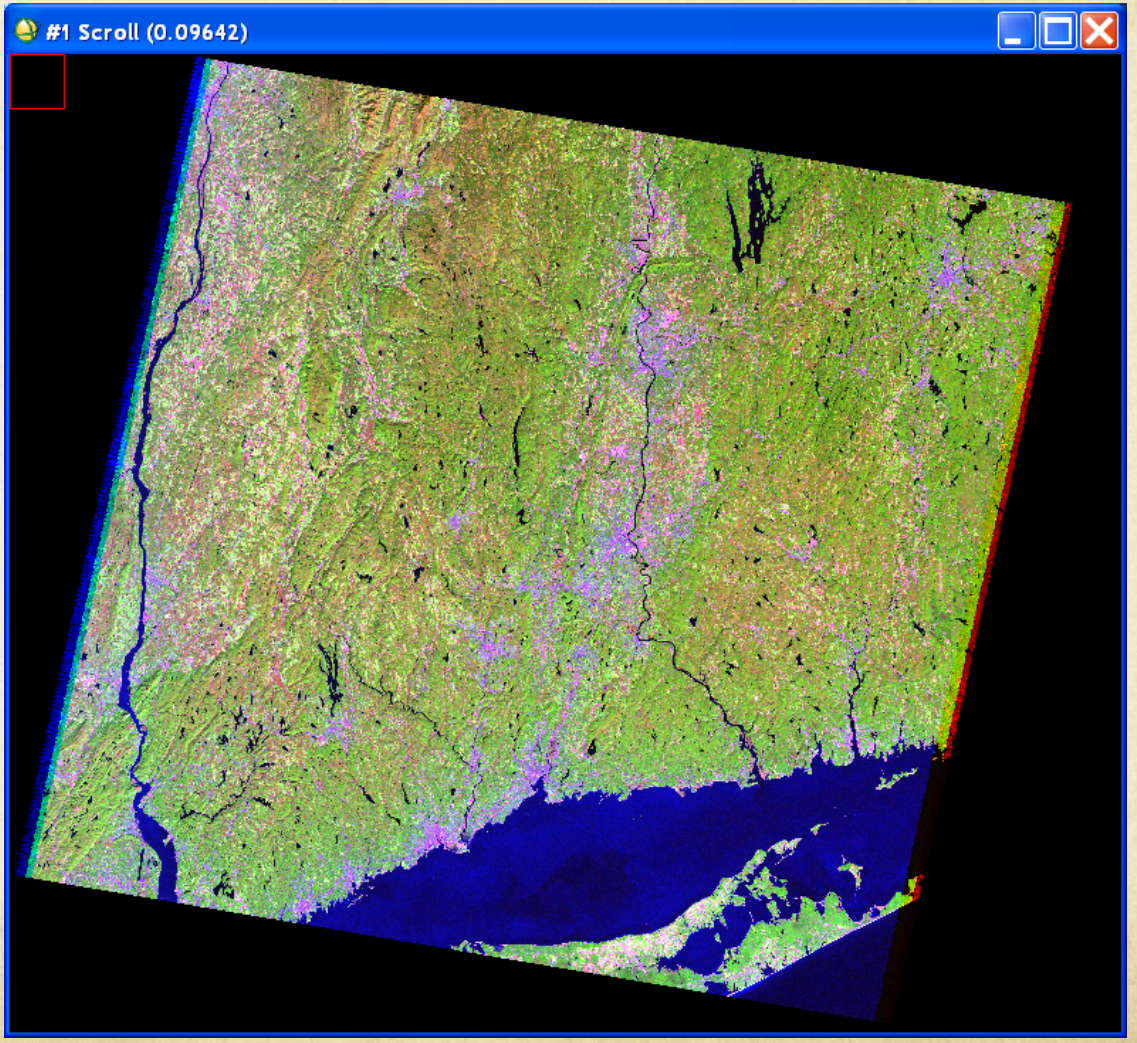
Landsat 7, SLC – on (741-RGB)

- Aug



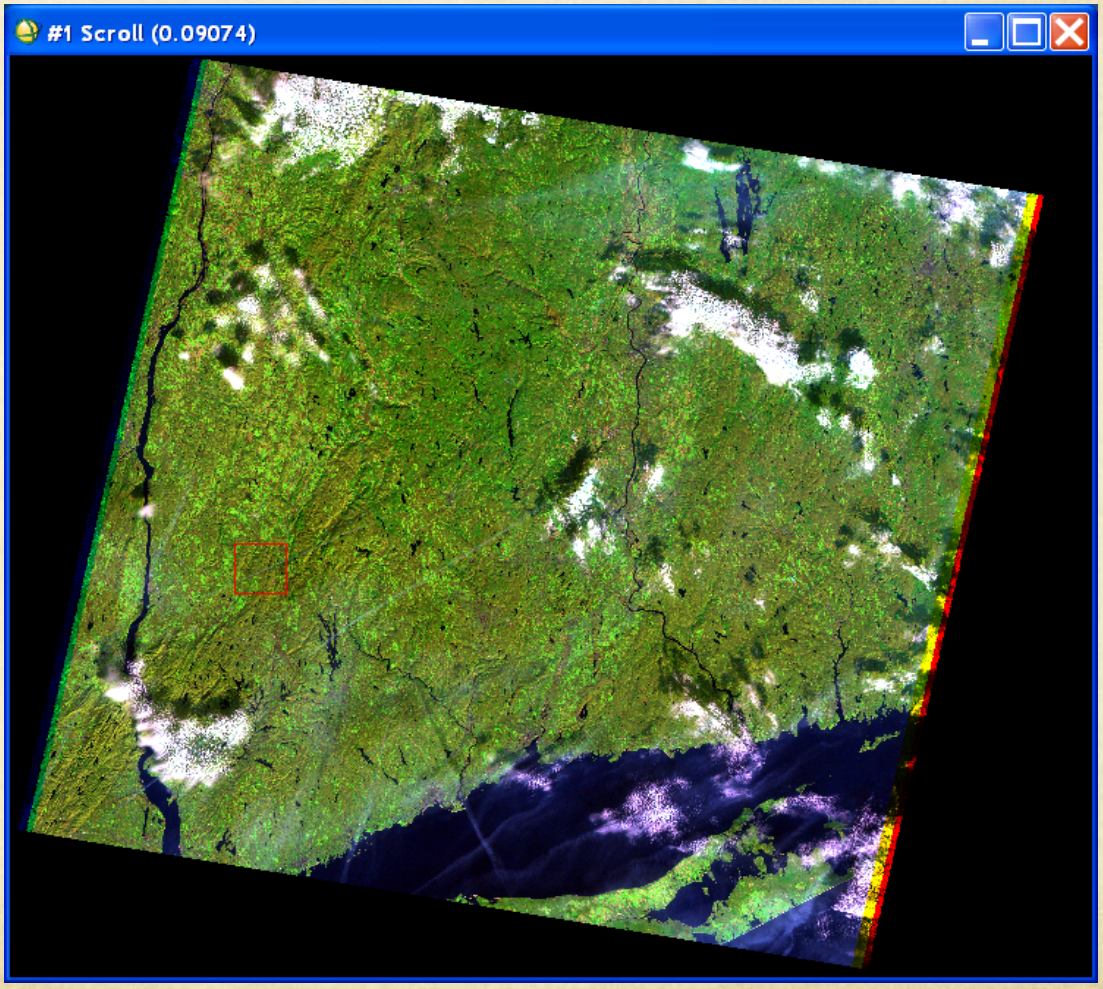
Landsat 7, SLC – on (741-RGB)

- Oct 20



Landsat 7, SLC – on (741-RGB)

- Nov, 1999

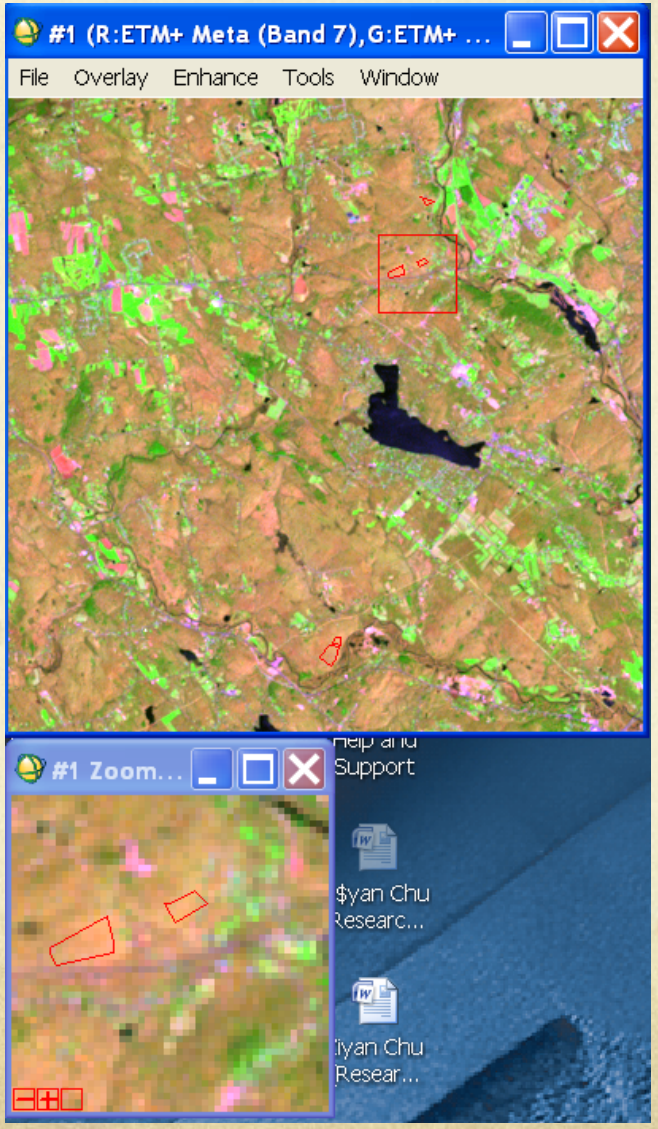


Polygons for Landsat 7 from the image in Apr

- Conifer

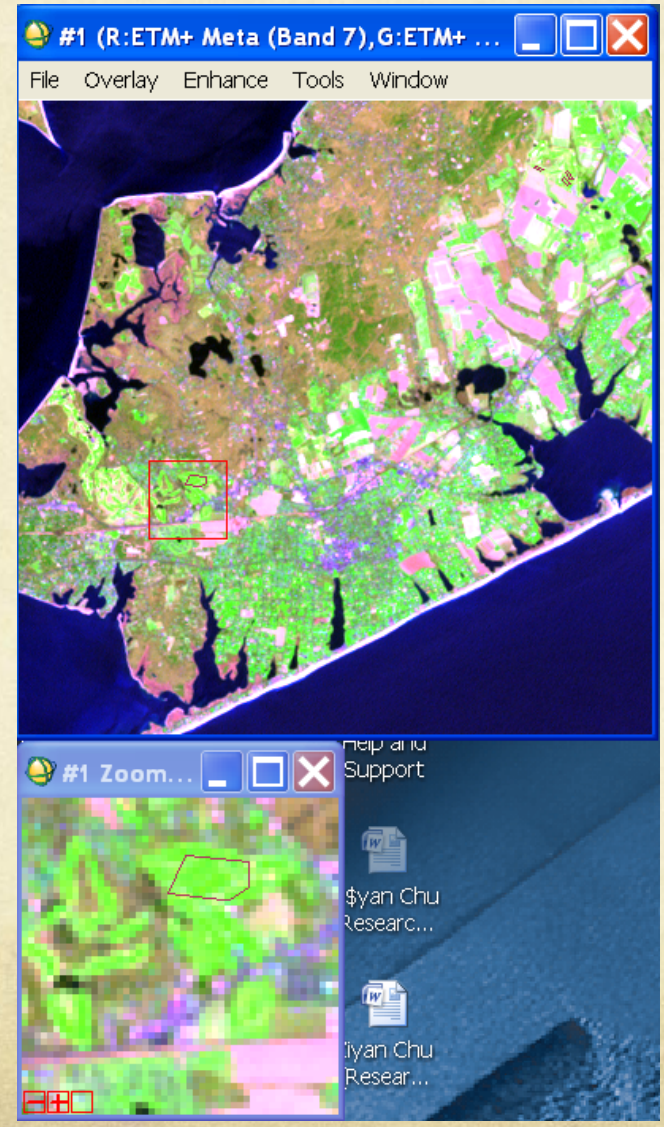
Polygons for Landsat 7 from the image in Apr

- Deciduous



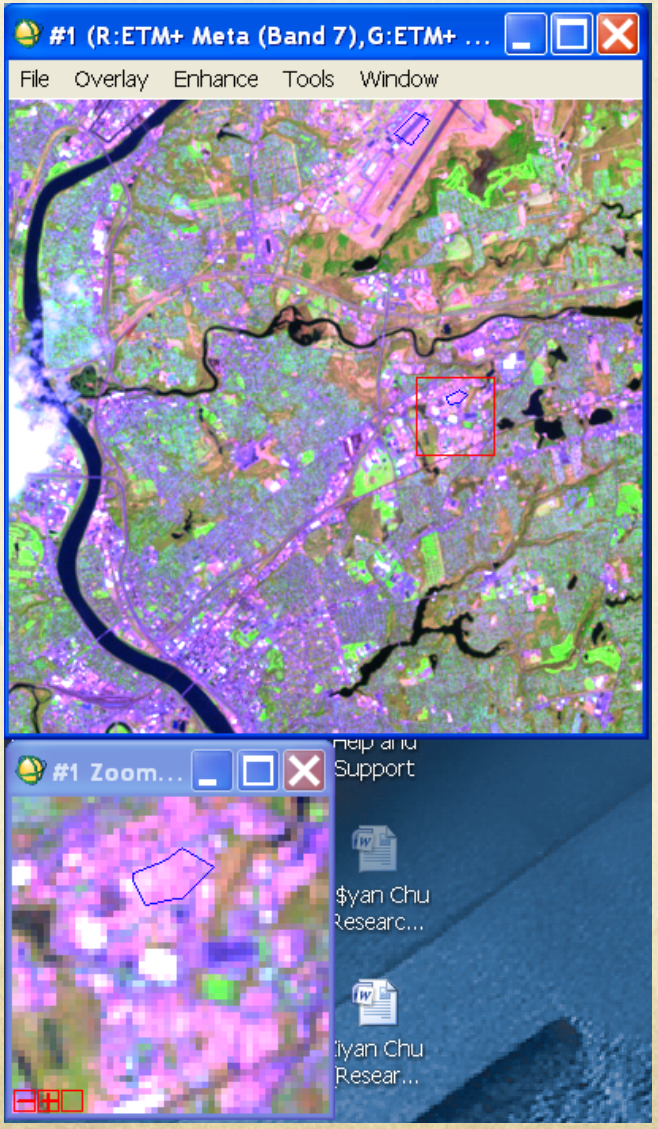
Polygons for Landsat 7 from the image in Apr

- Grass



Polygons for Landsat 7 from the image in Apr

- Urban

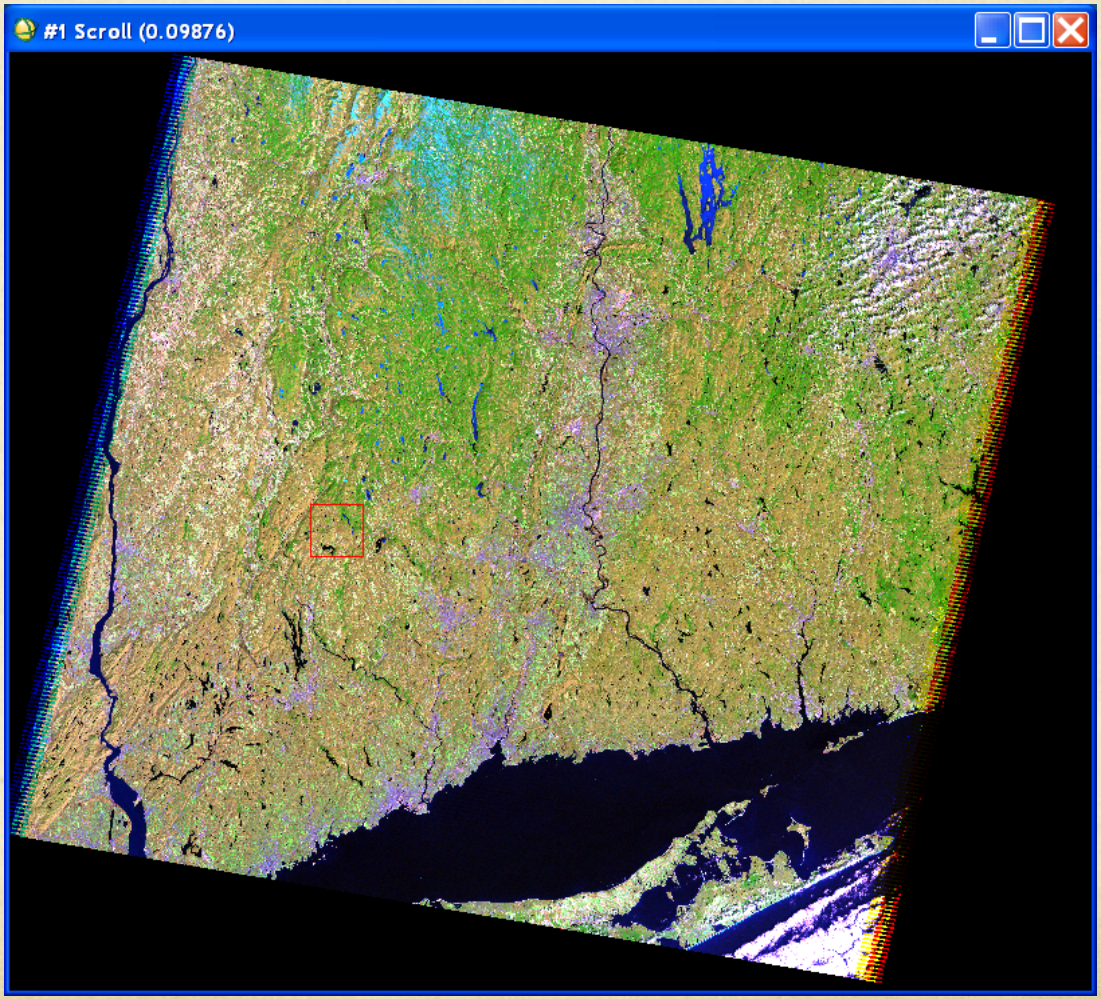


Polygons for Landsat 7 from the image in Apr

- Water

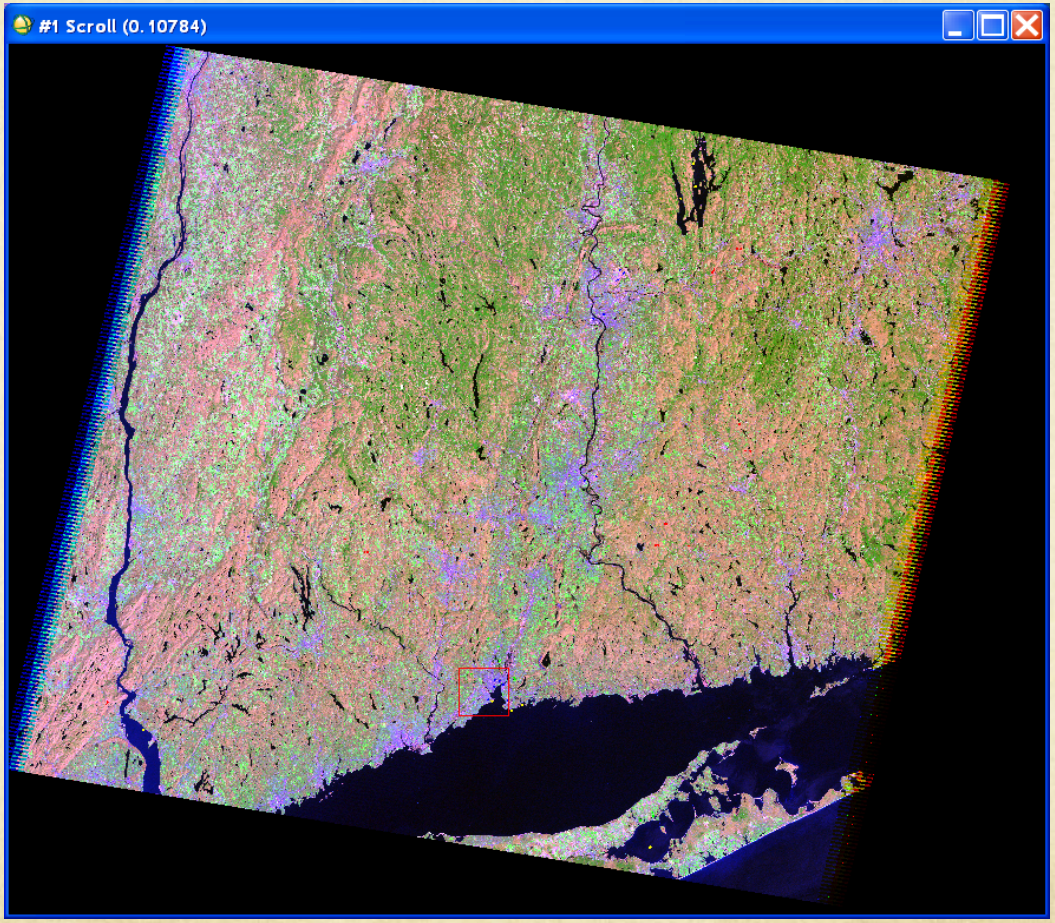
Landsat 4-5 TM (741-RGB)

- Mar



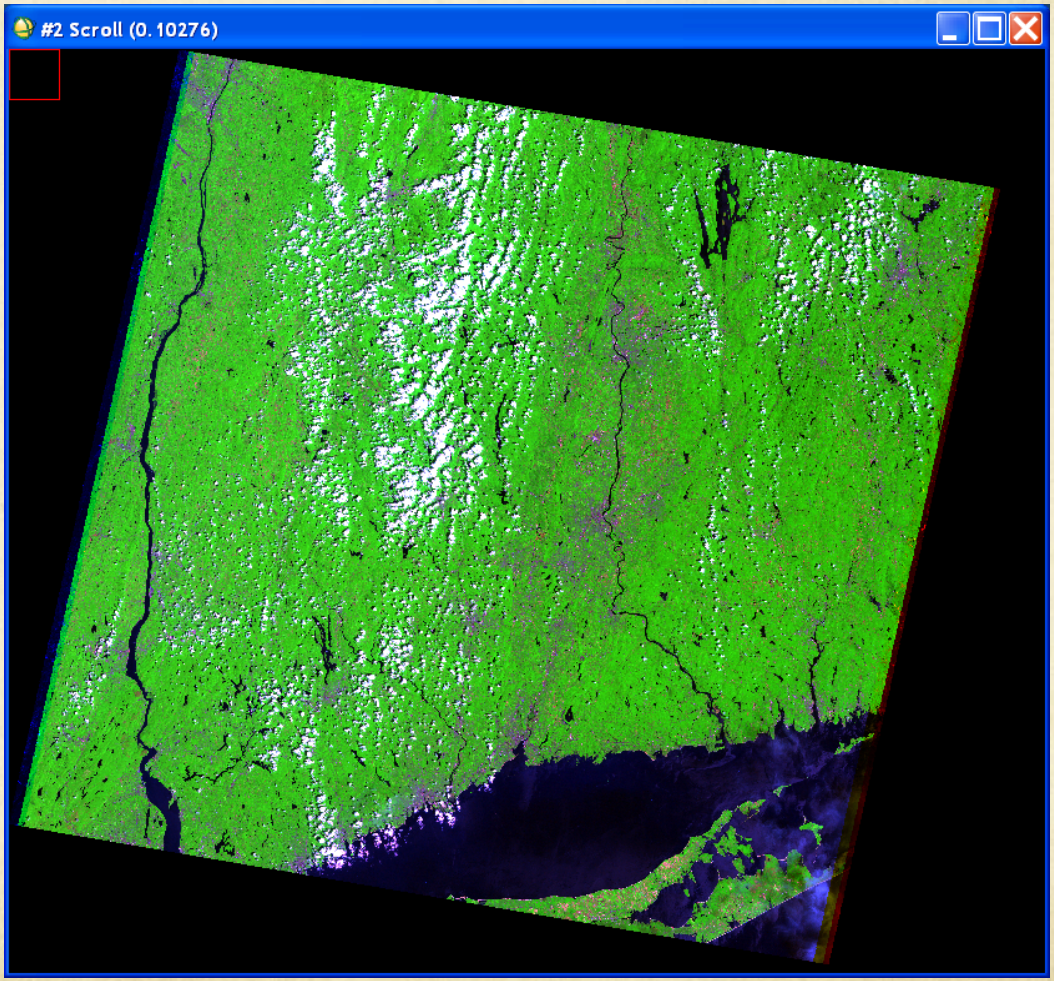
Landsat 4-5 TM (741-RGB)

- Apr



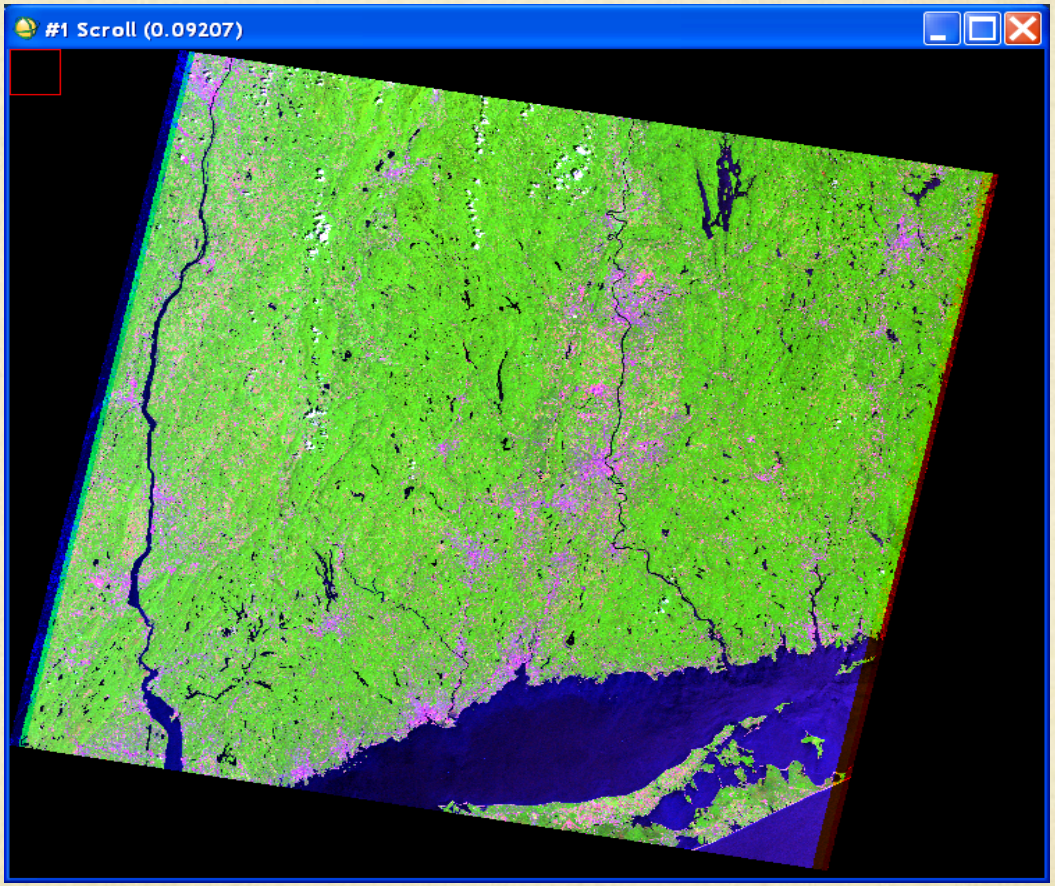
Landsat 4-5 TM (741-RGB)

- June



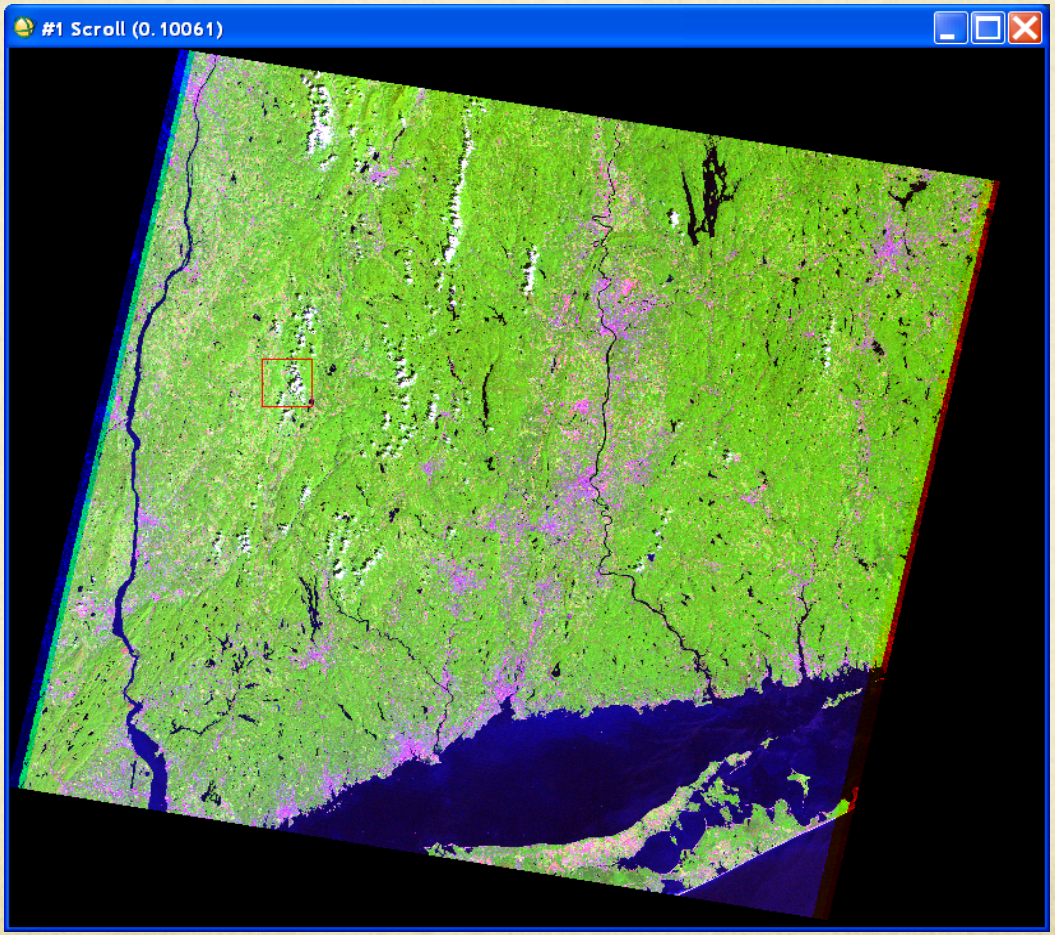
Landsat 4-5 TM (741-RGB)

- July



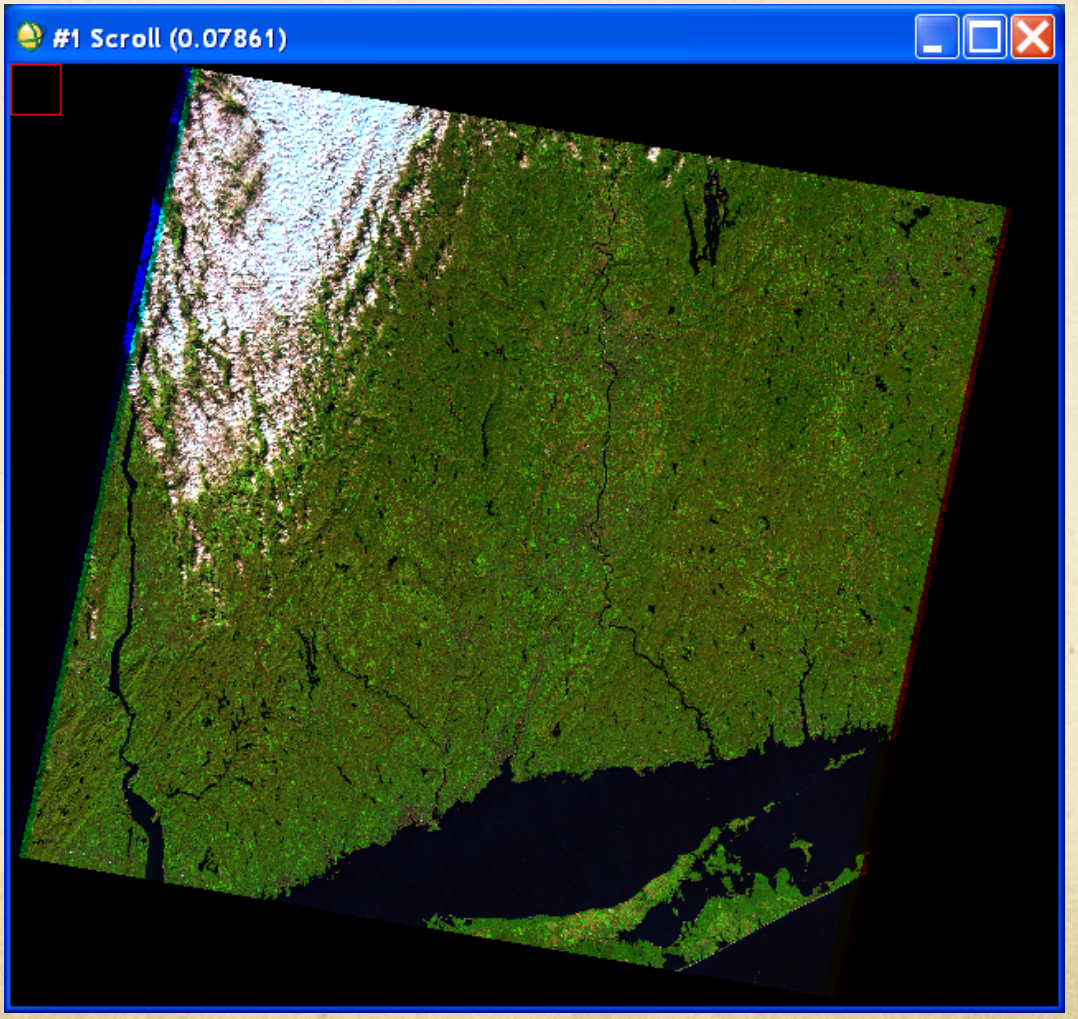
Landsat 4-5 TM (741-RGB)

- Aug



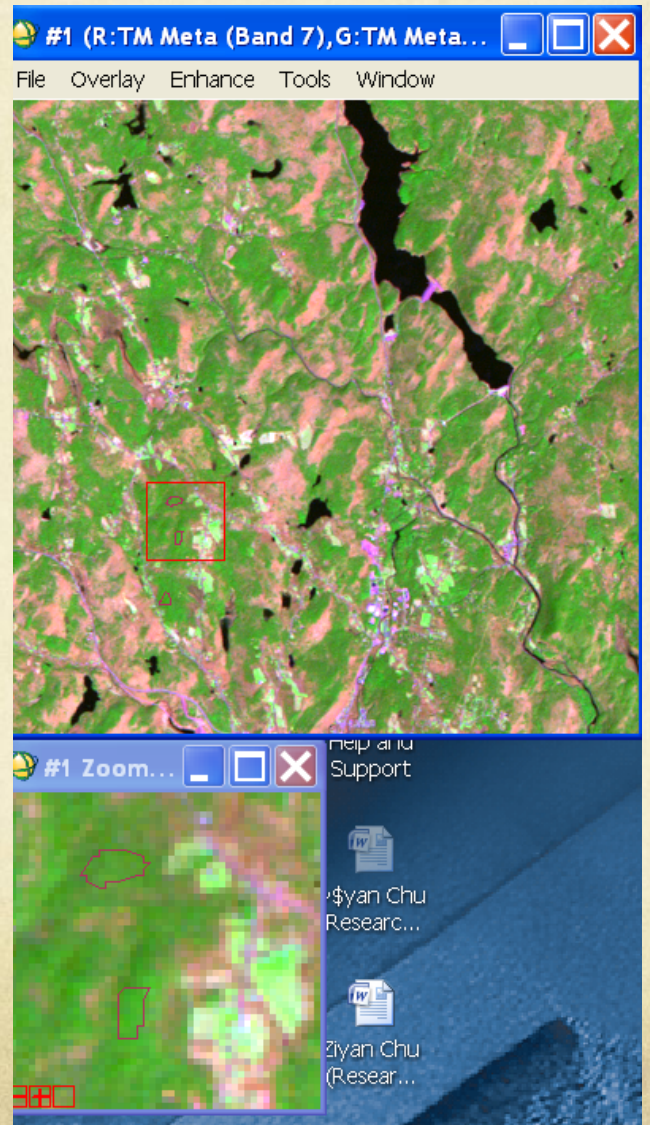
Landsat 4-5 TM (741-RGB)

- Oct 28



Polygons for Landsat 4-5 TM from the image in Apr

- Conifer

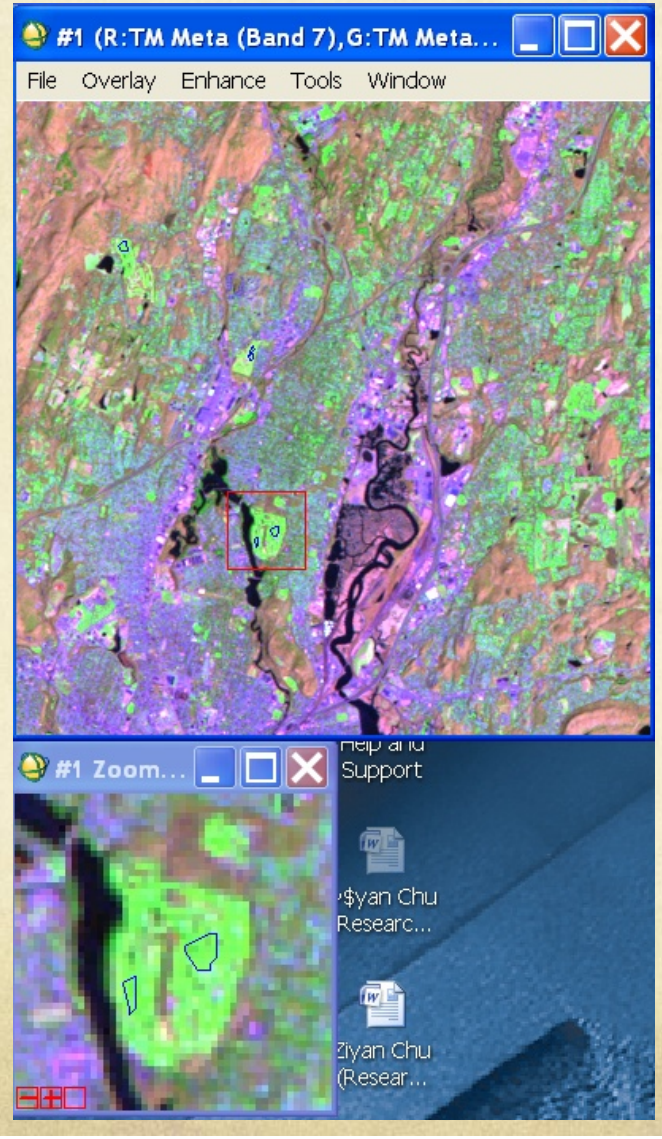


Polygons for Landsat 4-5 TM from the image in Apr

- Deciduous

Polygons for Landsat 4-5 TM from the image in Apr

- Grass

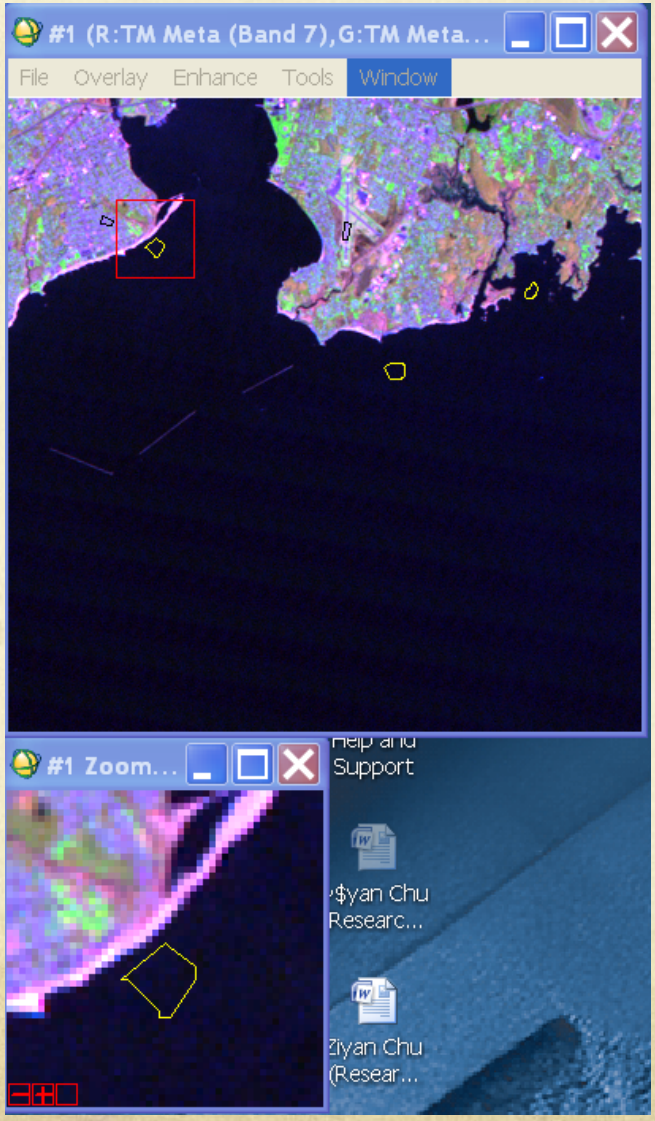


Polygons for Landsat 4-5 TM from the image in Apr

- Urban

Polygons for Landsat 4-5 TM from the image in Apr

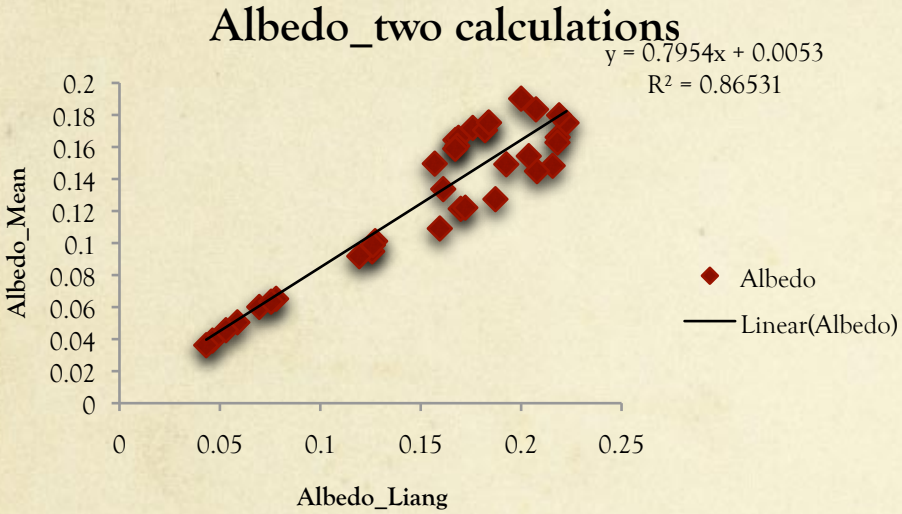
- Water

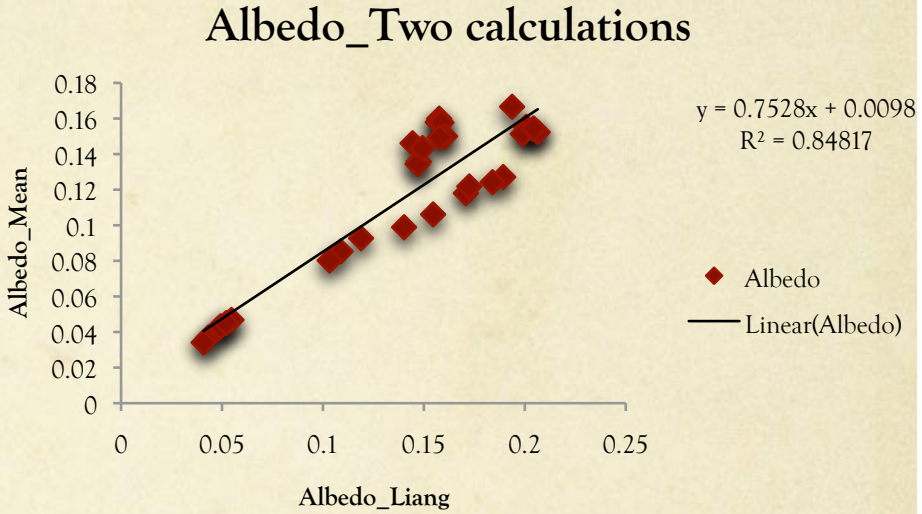


Calculation

- Albedo_Liang: Convert Lansat reflective band DN's to reflectance. Use Liang method to weight reflectances and obtain overall albedo.
- Albedo_Mean: Convert Landsat reflective band DN's to reflectance. Get the average value from all the bands.
- Temperatue (K): Convert Landsat thermal band DN's to radiance. Then convert radiance to Temperature (K) by 1260.56 / alog ((607.76 / B1) +1)
- NDVI: (NIR-RED)/(NIR+RED)

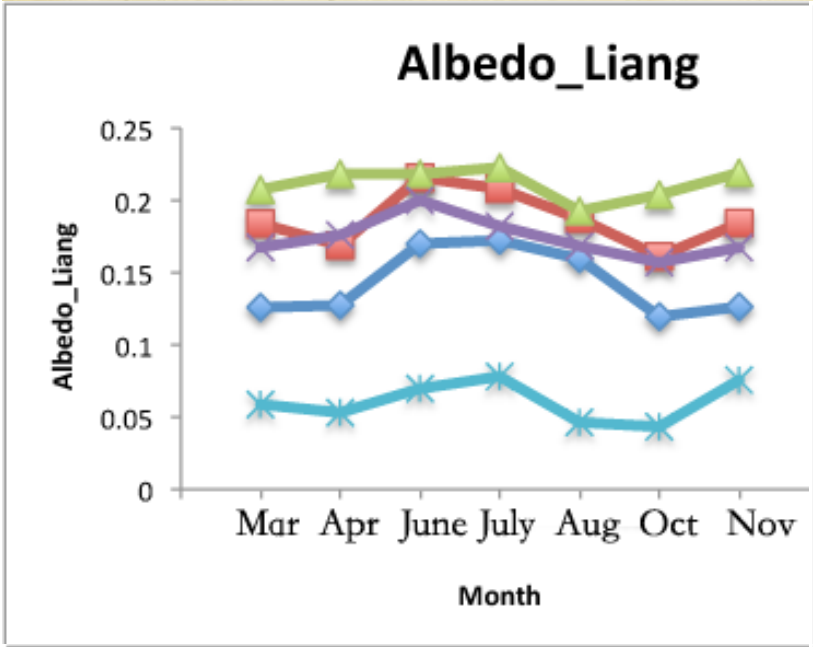
Albedo comparison

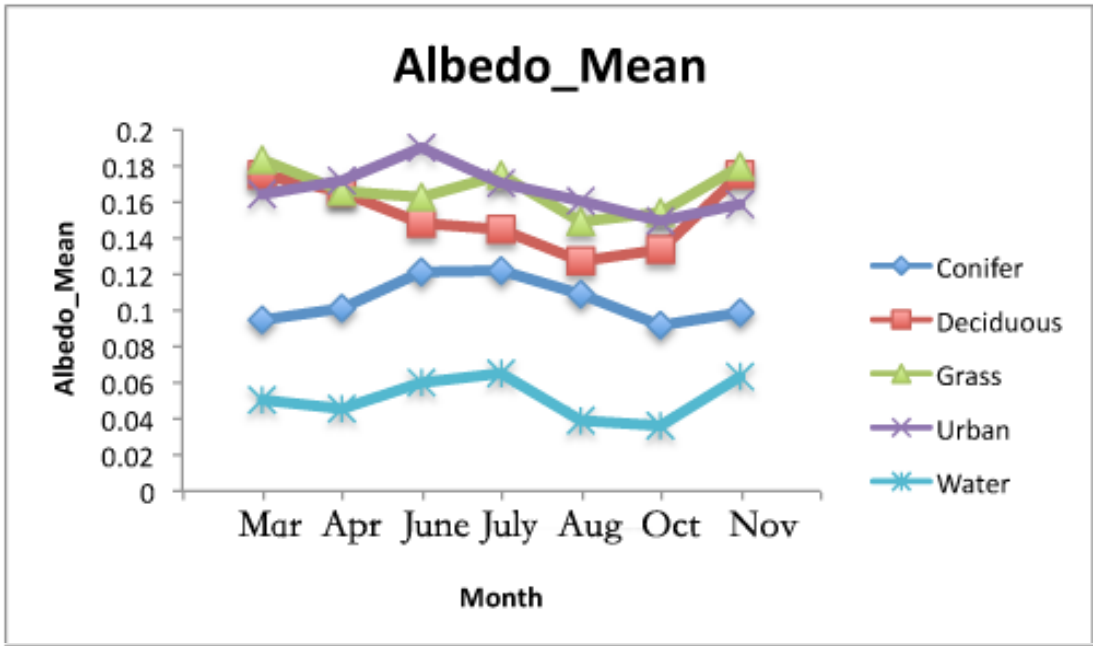


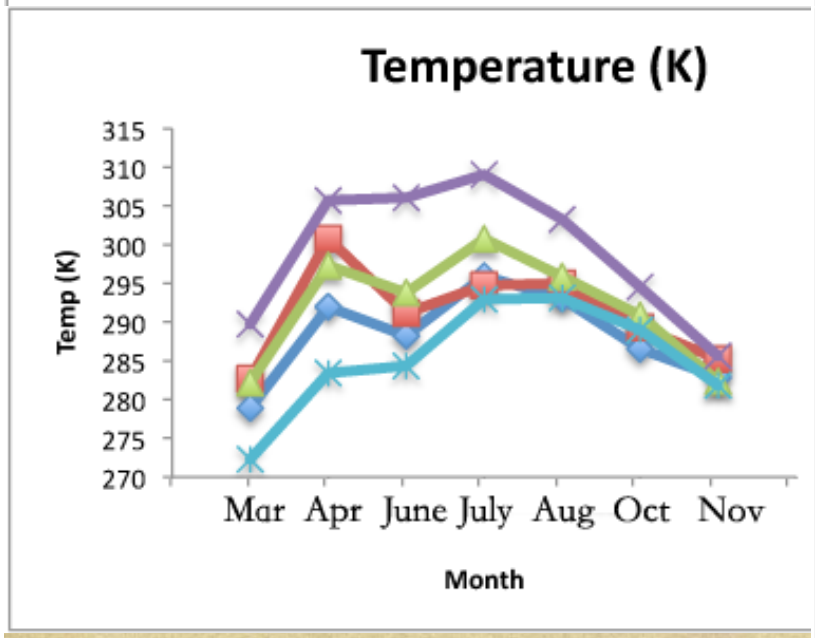


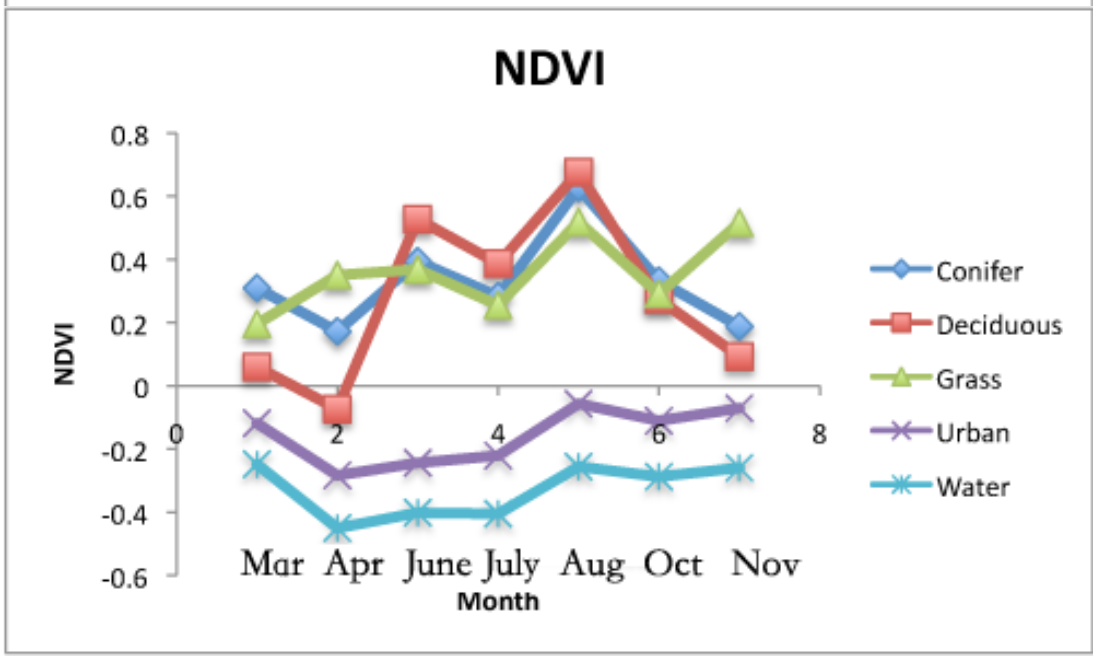
Left: Landsat 7, Right: Landsat 4-5

Landsat 7

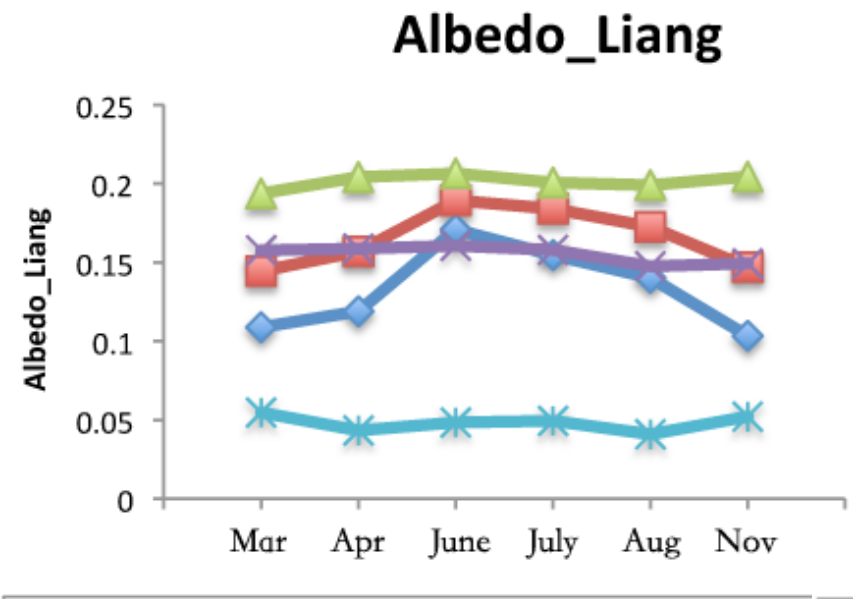

Albedo_Liang
Albedo_Liang
0.25
0.2
0.15
0.1
0.05
0
Mar Apr June July Aug Oct Nov
Month

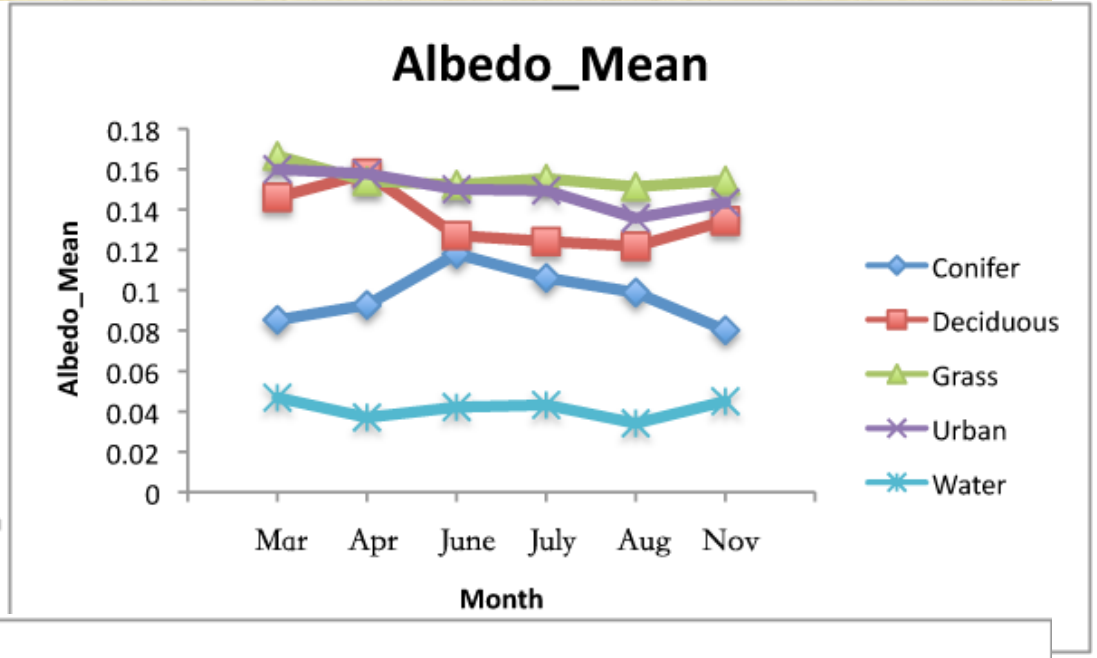

Albedo_Mean
Albedo_Mean
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Mar Apr June July Aug Oct Nov
Month
Conifer
Deciduous
Grass
Urban
Water

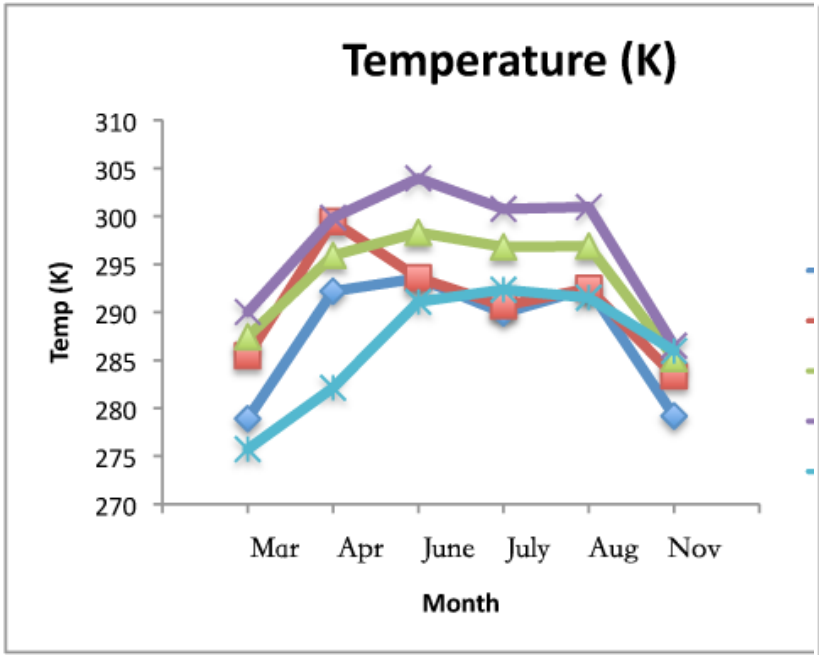

Temperature (K)
Temp (K)
315
310
305
300
295
290
285
280
275
270
Mar Apr June July Aug Oct Nov
Month

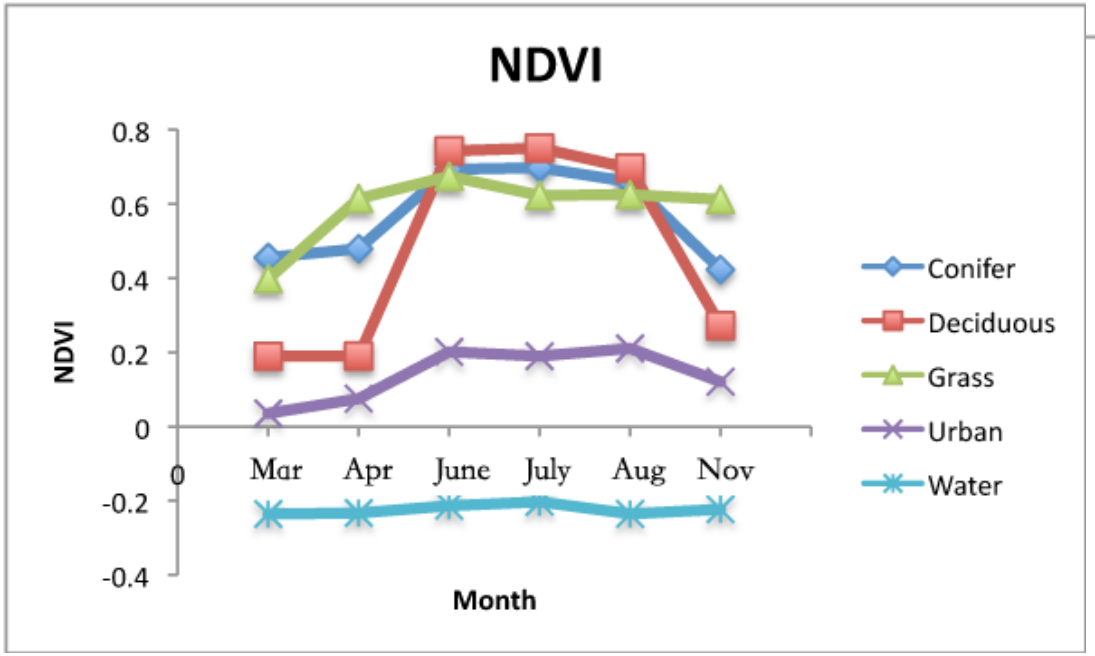

NDVI
NDVI
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
0
2
4
6
8
Mar Apr June July Aug Oct Nov
Month
Conifer
Deciduous
Grass
Urban
Water

Landsat 5


Albedo_Liang
Albedo_Liang
0.25
0.2
0.15
0.1
0.05
0
Mar
Apr
June
July
Aug
Nov


Albedo_Mean
Albedo_Mean
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Mar
Apr
June
July
Aug
Nov
Month
Conifer
Deciduous
Grass
Urban
Water


Temperature (K)
Temp (K)
310
305
300
295
290
285
280
275
270
Mar
Apr
June
July
Aug
Nov
Month

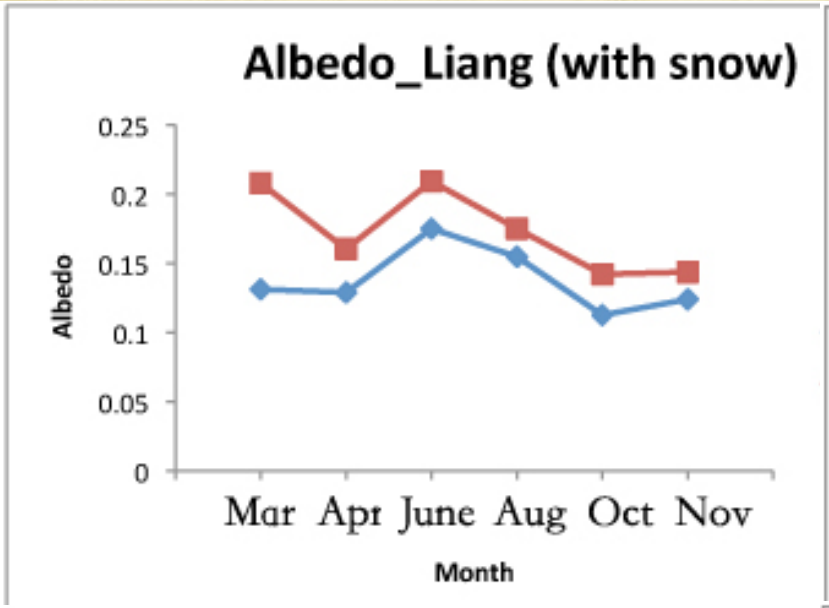

NDVI
NDVI
0.8
0.6
0.4
0.2
0
-0.2
-0.4
Mar
Apr
June
July
Aug
Nov
Month
Conifer
Deciduous
Grass
Urban
Water

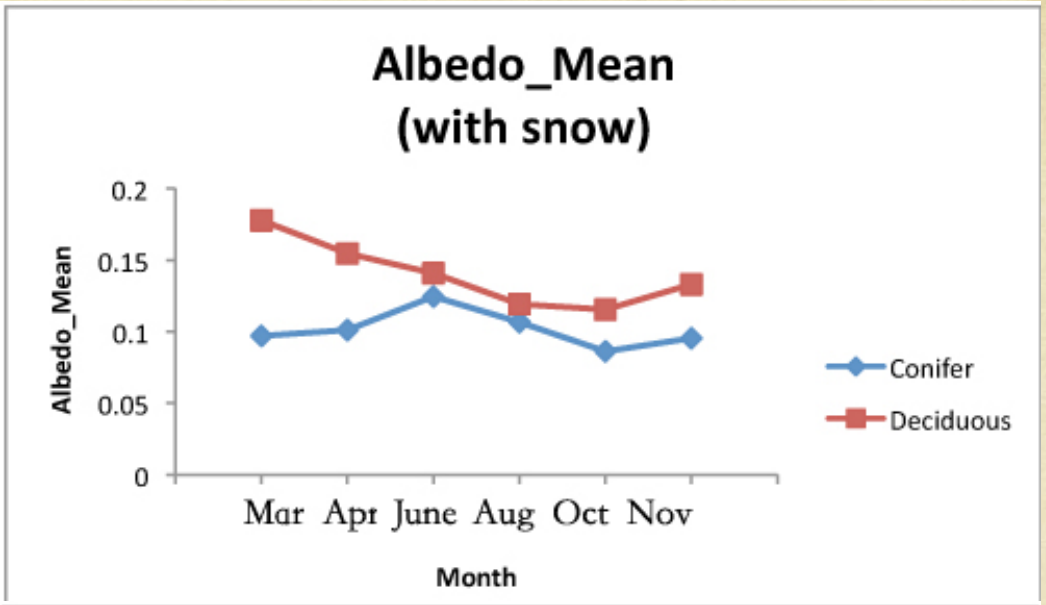
Next step for temperature

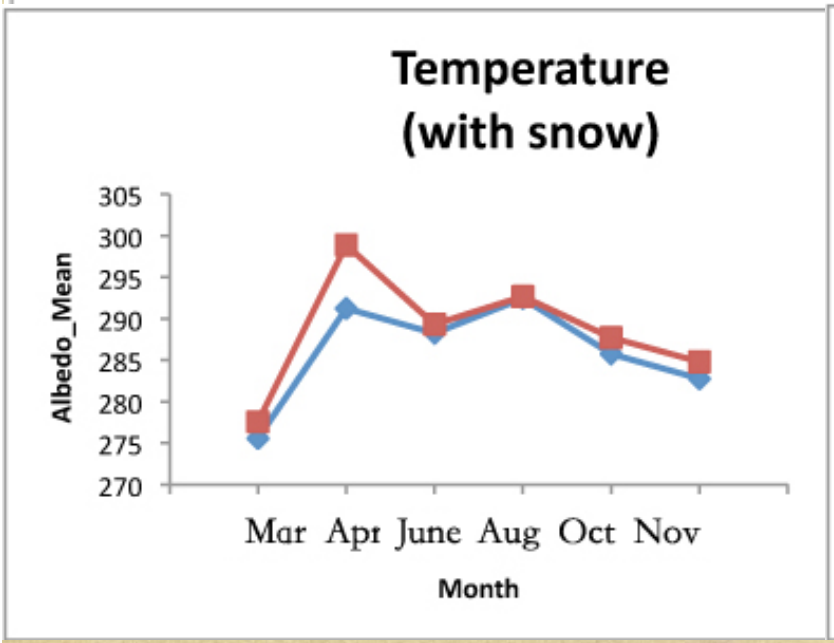
- Get the sounding information to calculate the air temperature at 925m and 850m
- Calculate the air temperature for all the polygons (at different altitudes)
- See how much differences between air temperature and the surface temperature got previsouly (exclude the influence of warmer or colder days)

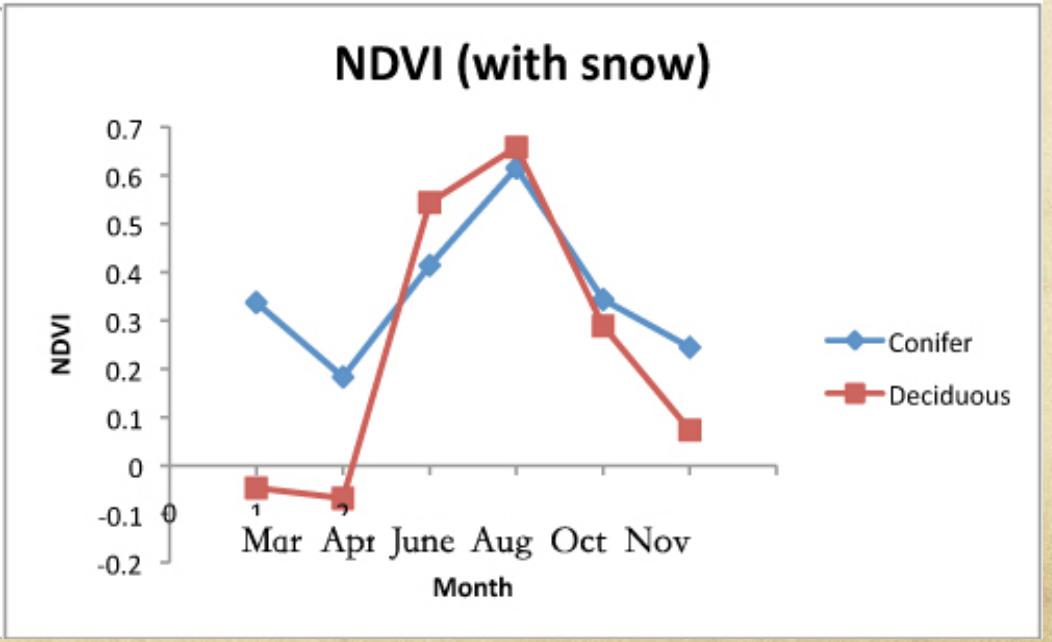
Thank You

Snow issue (Landdat 7)

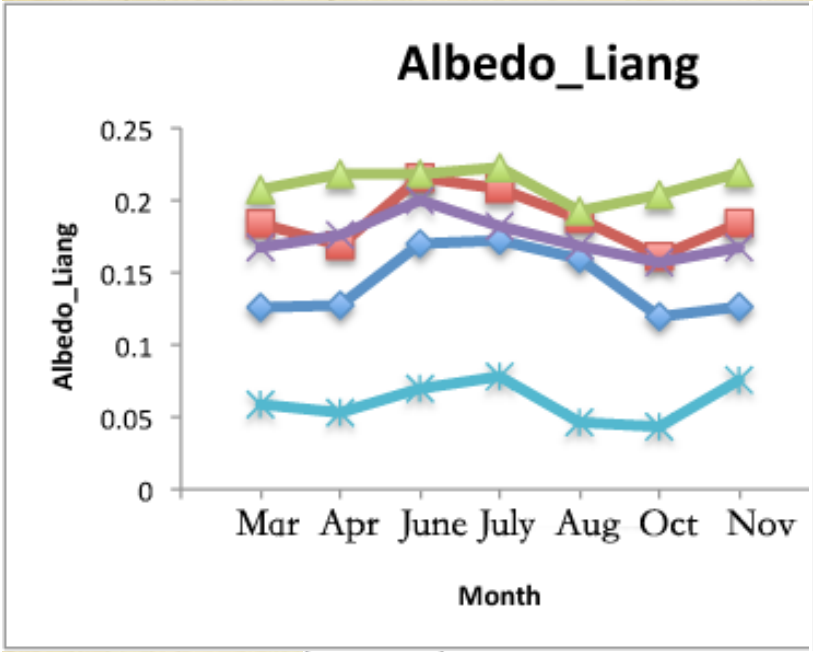


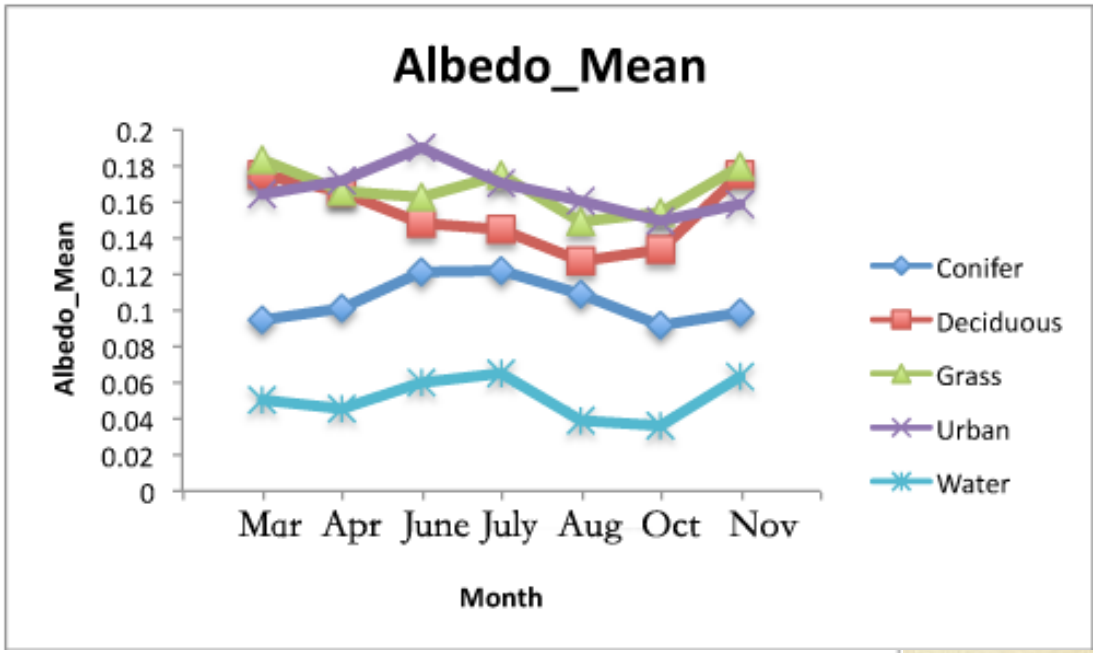


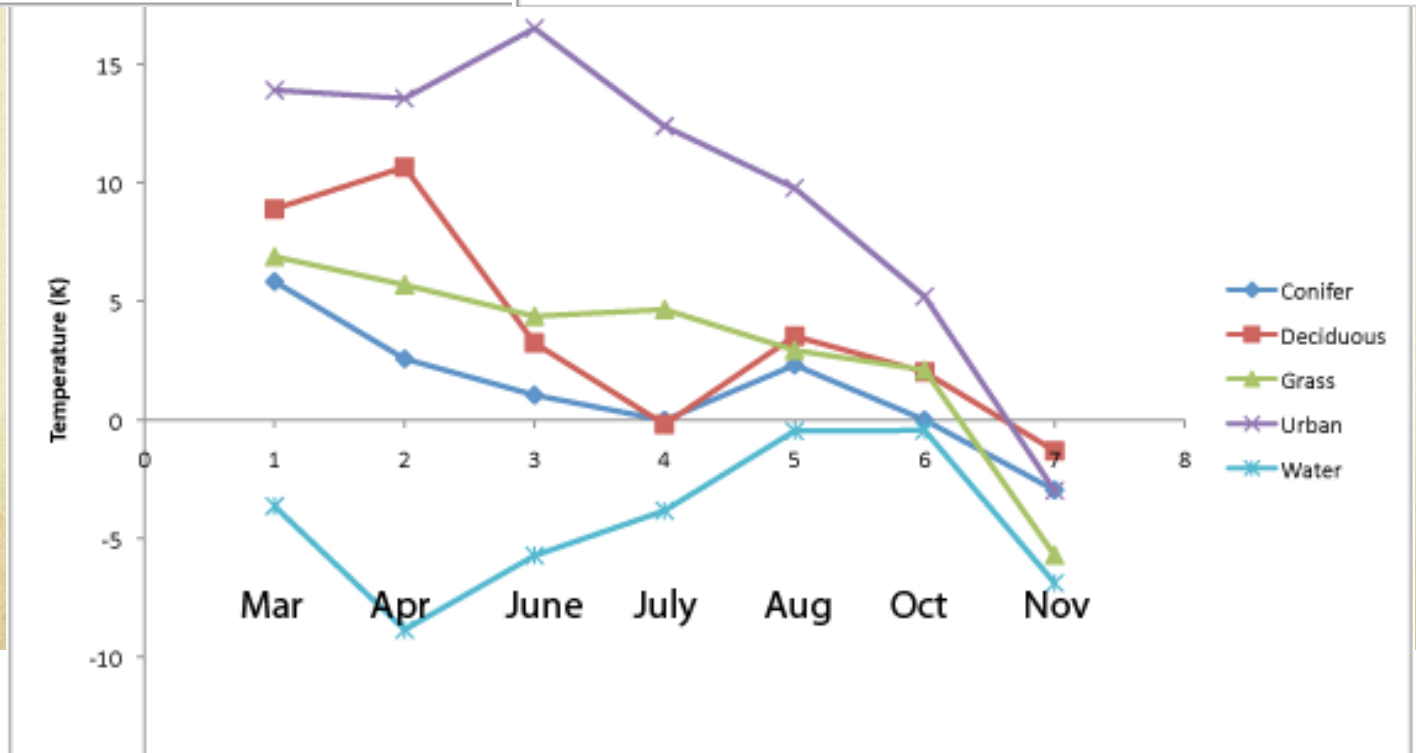


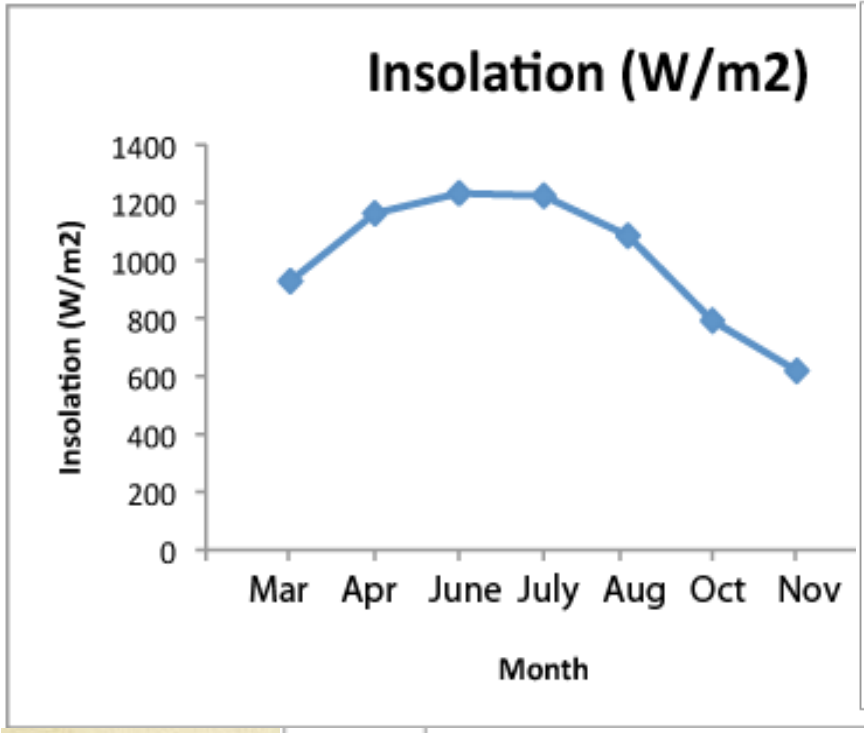


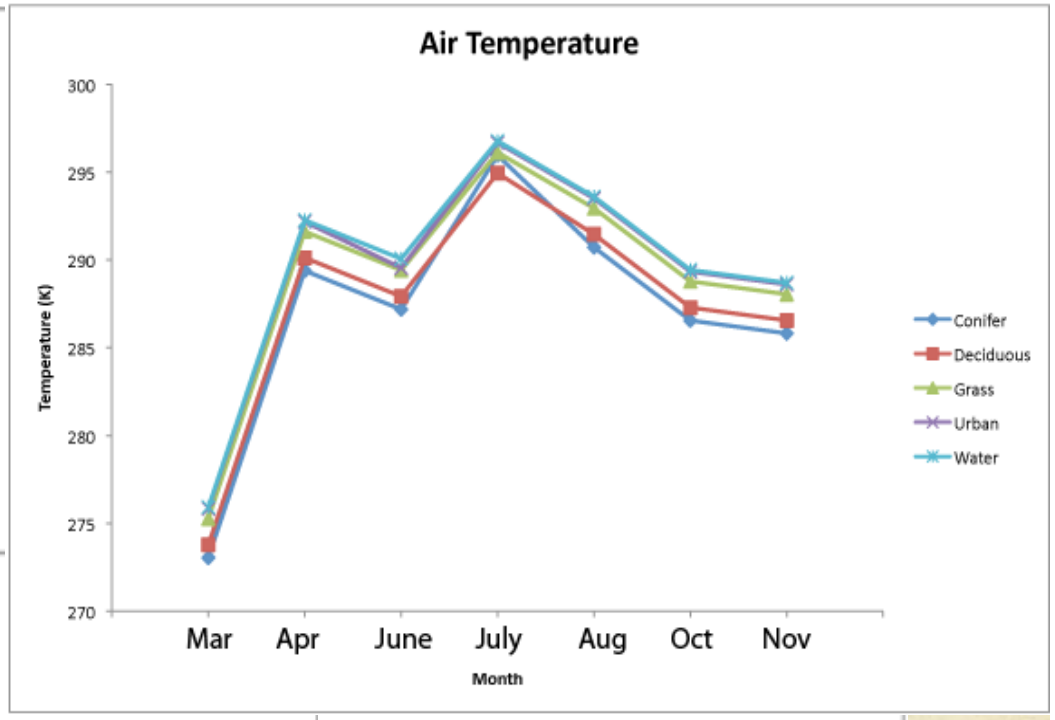
Relative Temperature (Landsat 7)

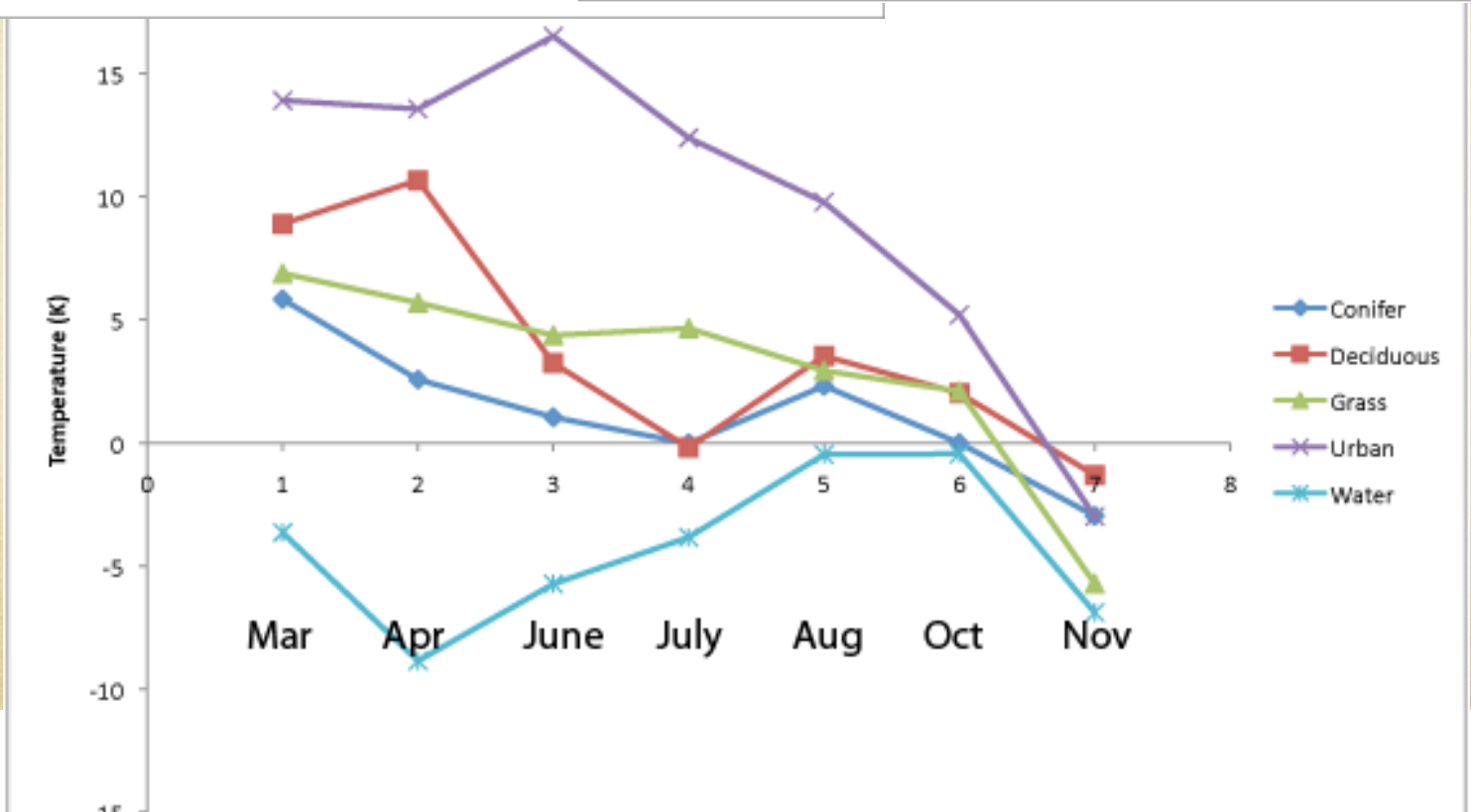




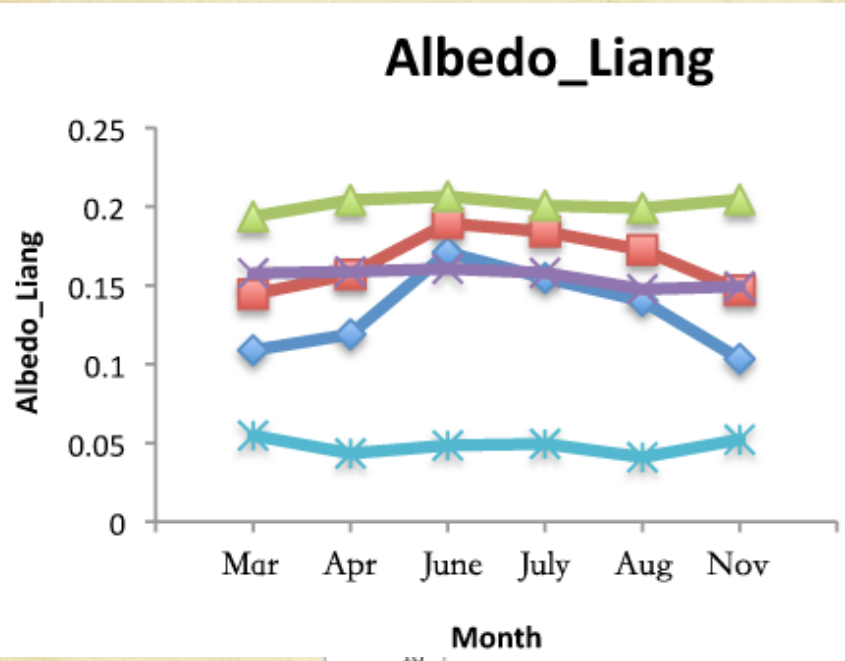


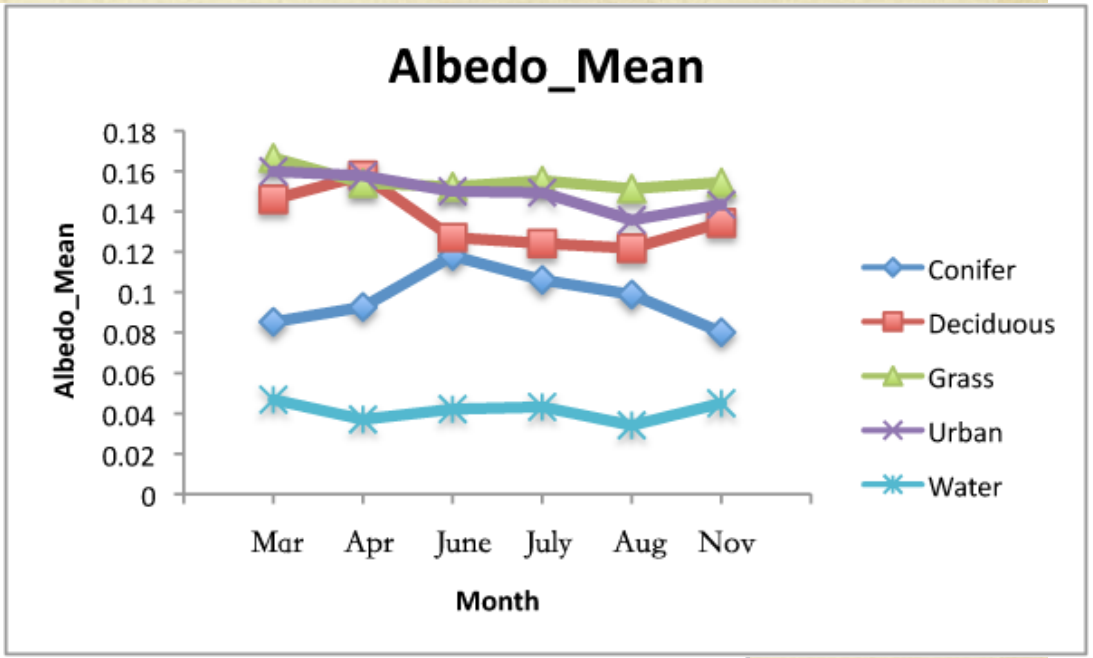

Insolation (W/m2)
Insolation (W/m2)
1400
1200
1000
800
600
400
200
0
Mar
Apr
June
July
Aug
Oct
Nov
Month

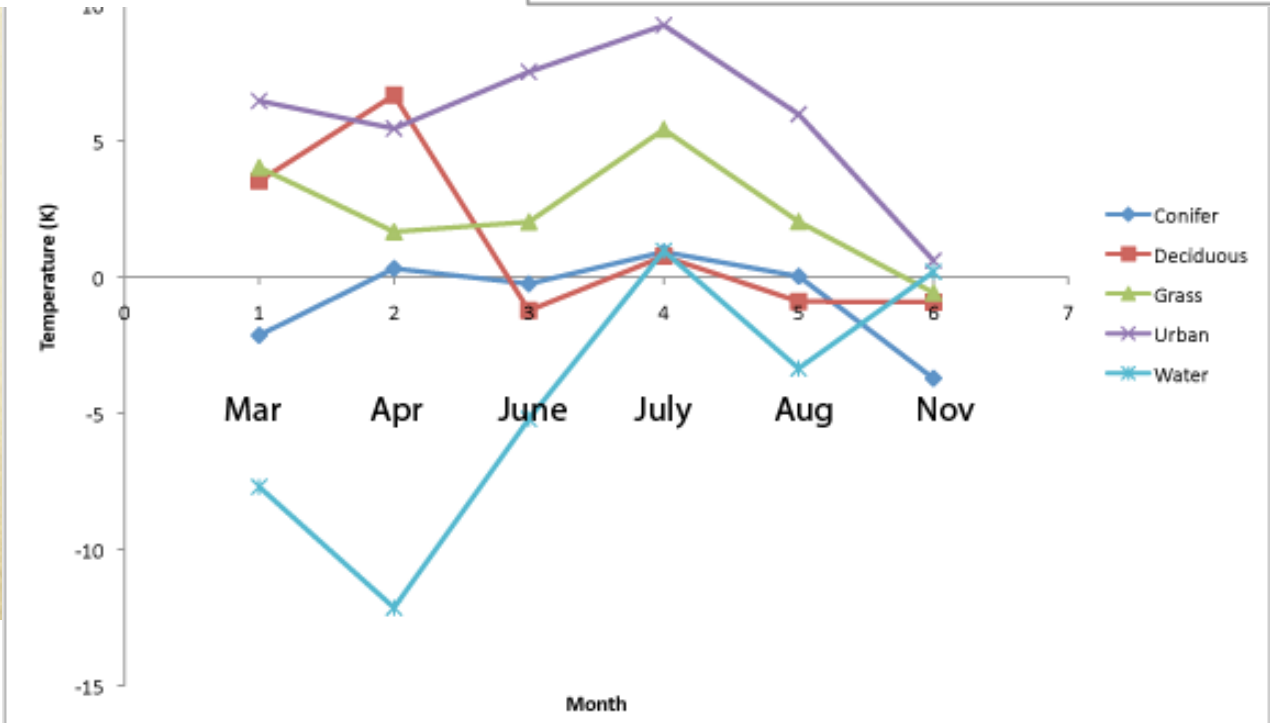

Air Temperature
Temperature (K)
300
295
290
285
280
275
270
Mar
Apr
June
July
Aug
Oct
Nov
Month
Conifer
Deciduous
Grass
Urban
Water

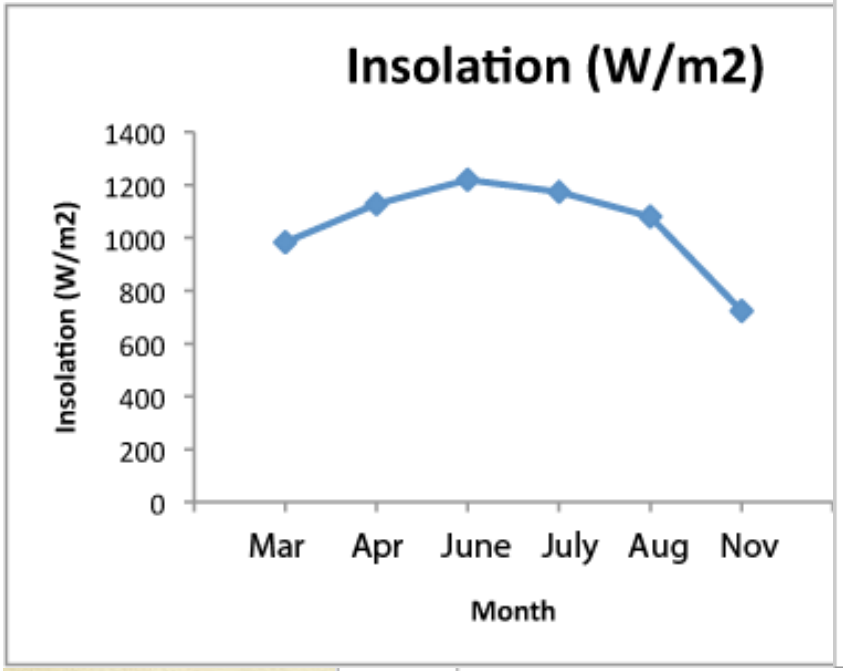

Temperature (K)
15
10
5
0
-5
-10
0
1
2
3
4
5
6
7
8
Mar
Apr
June
July
Aug
Oct
Nov
Conifer
Deciduous
Grass
Urban
Water

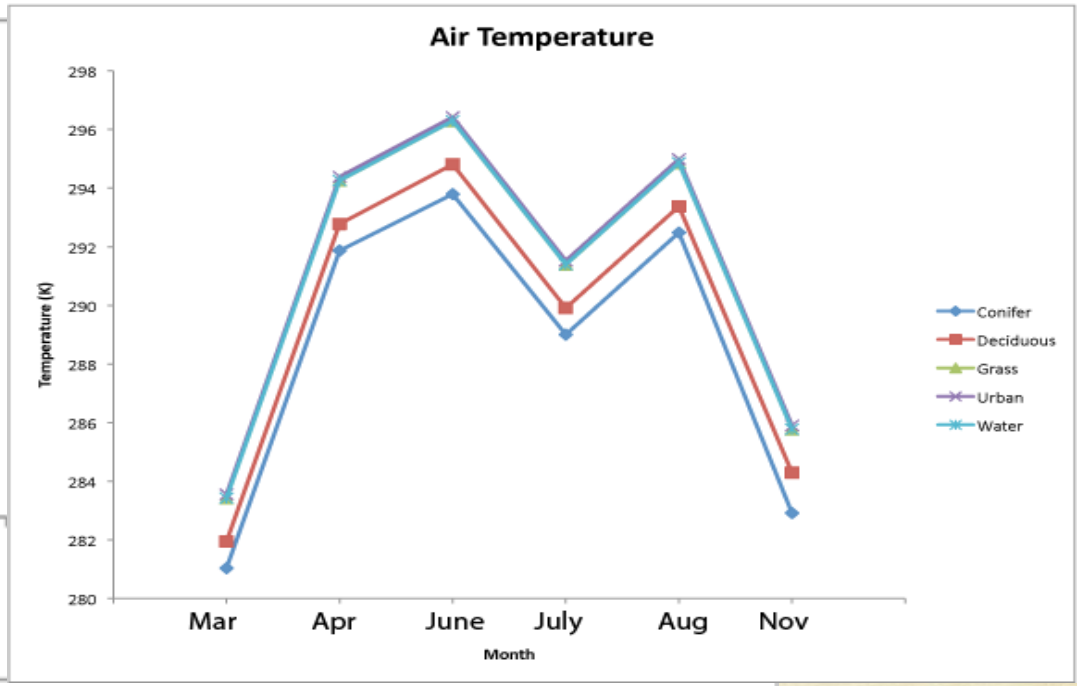
Relative Temperature (Landsat 5)

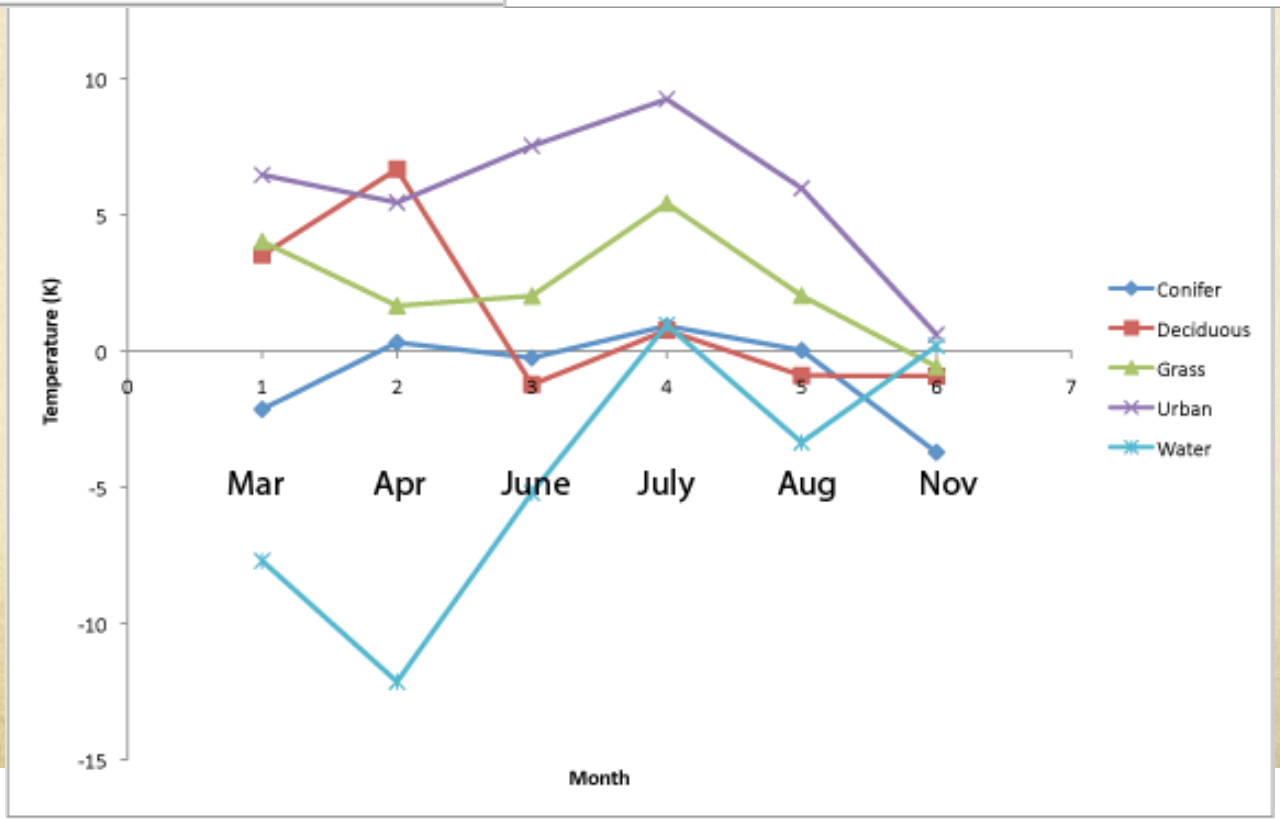




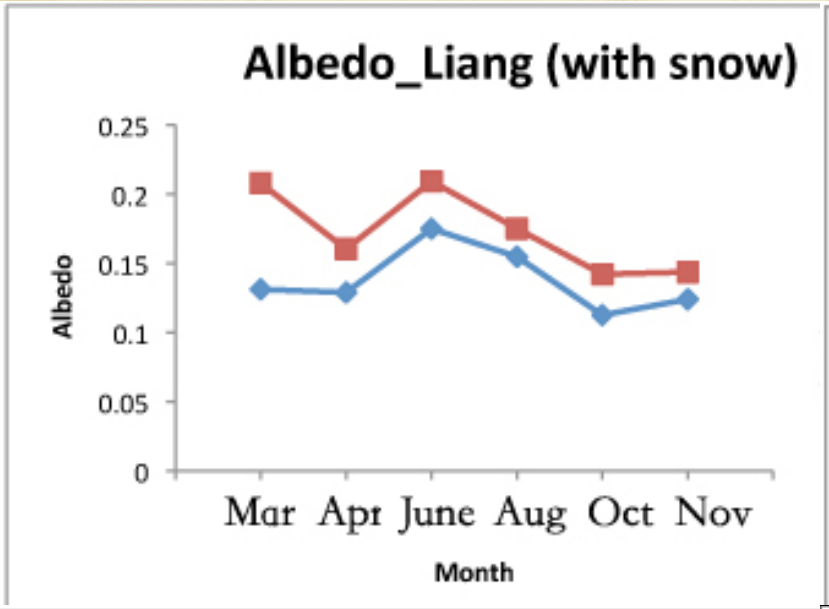


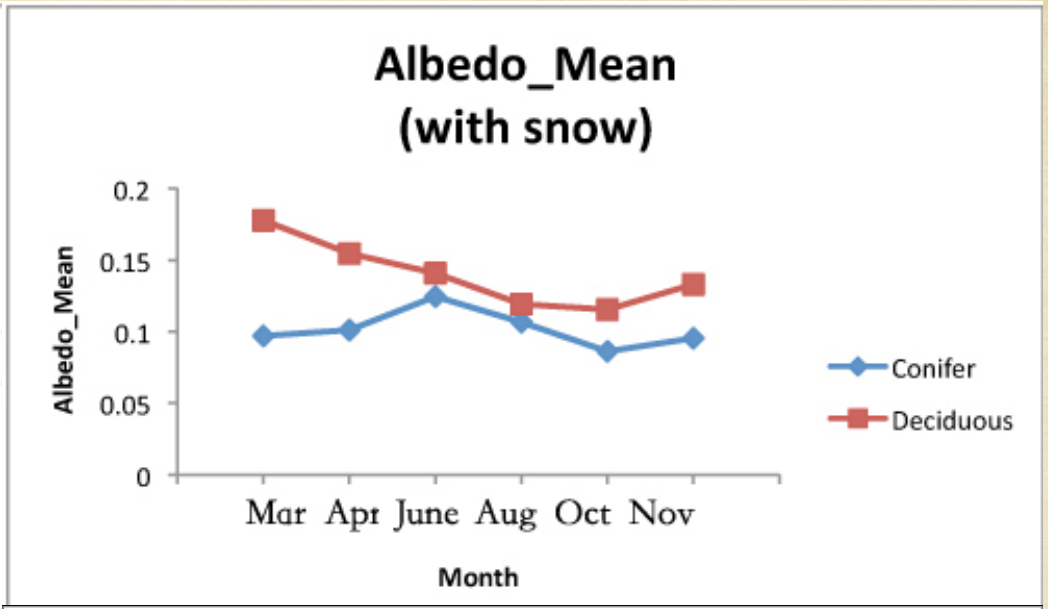

Insolation (W/m2)
Insolation (W/m2)
1400
1200
1000
800
600
400
200
0
Mar
Apr
June
July
Aug
Nov
Month

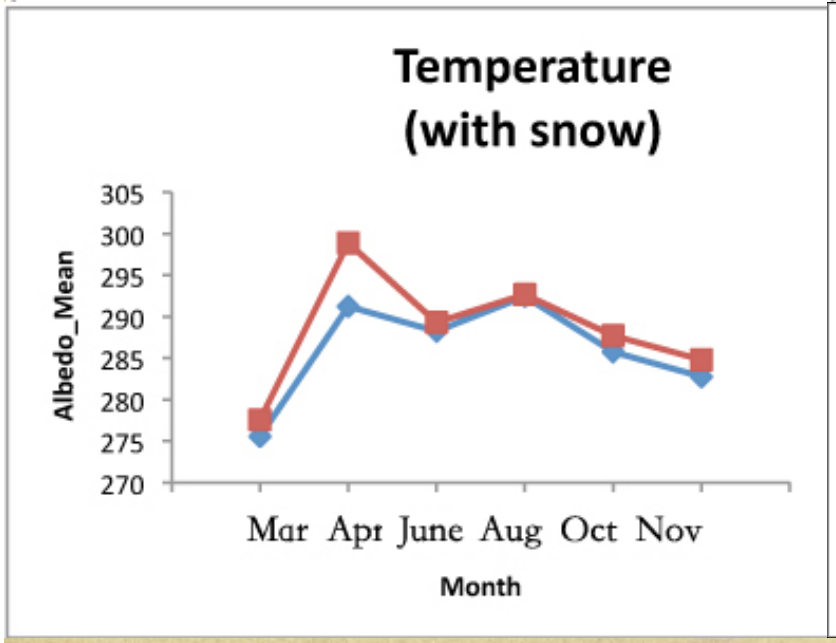

Air Temperature
Temperature (K)
298
296
294
292
290
288
286
284
282
280
Mar
Apr
June
July
Aug
Nov
Month
Conifer
Deciduous
Grass
Urban
Water

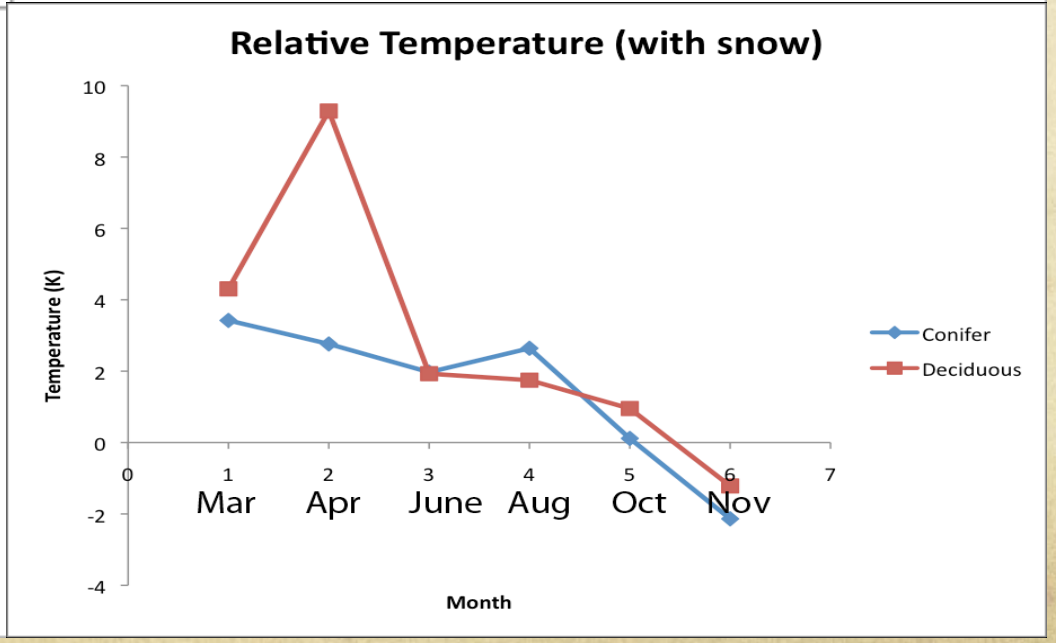

Temperature (K)
10
5
0
-5
-10
-15
0
1
2
3
4
5
6
7
Mar
Apr
June
July
Aug
Nov
Month
Conifer
Deciduous
Grass
Urban
Water

Relative Temperature (with snow)

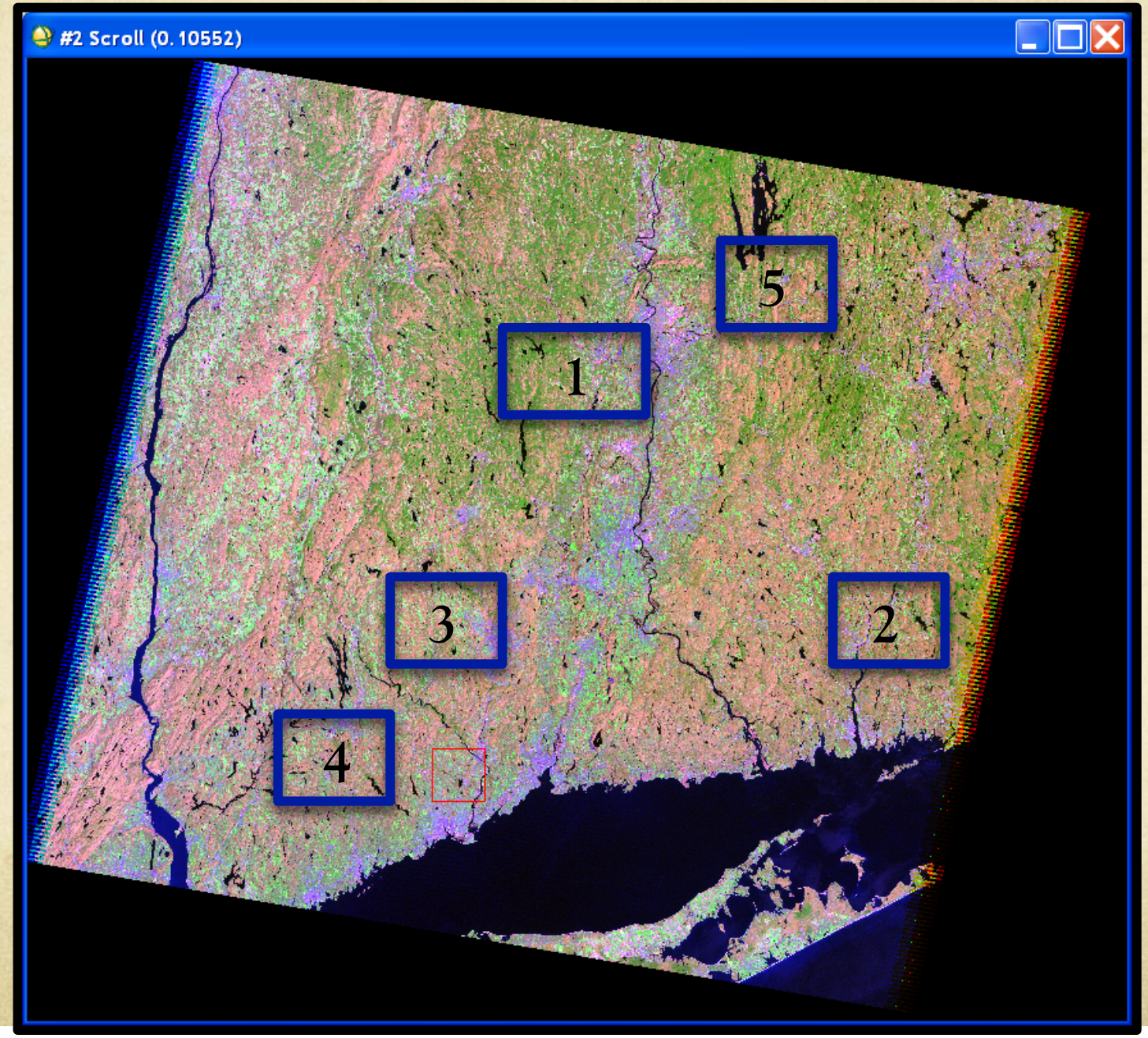




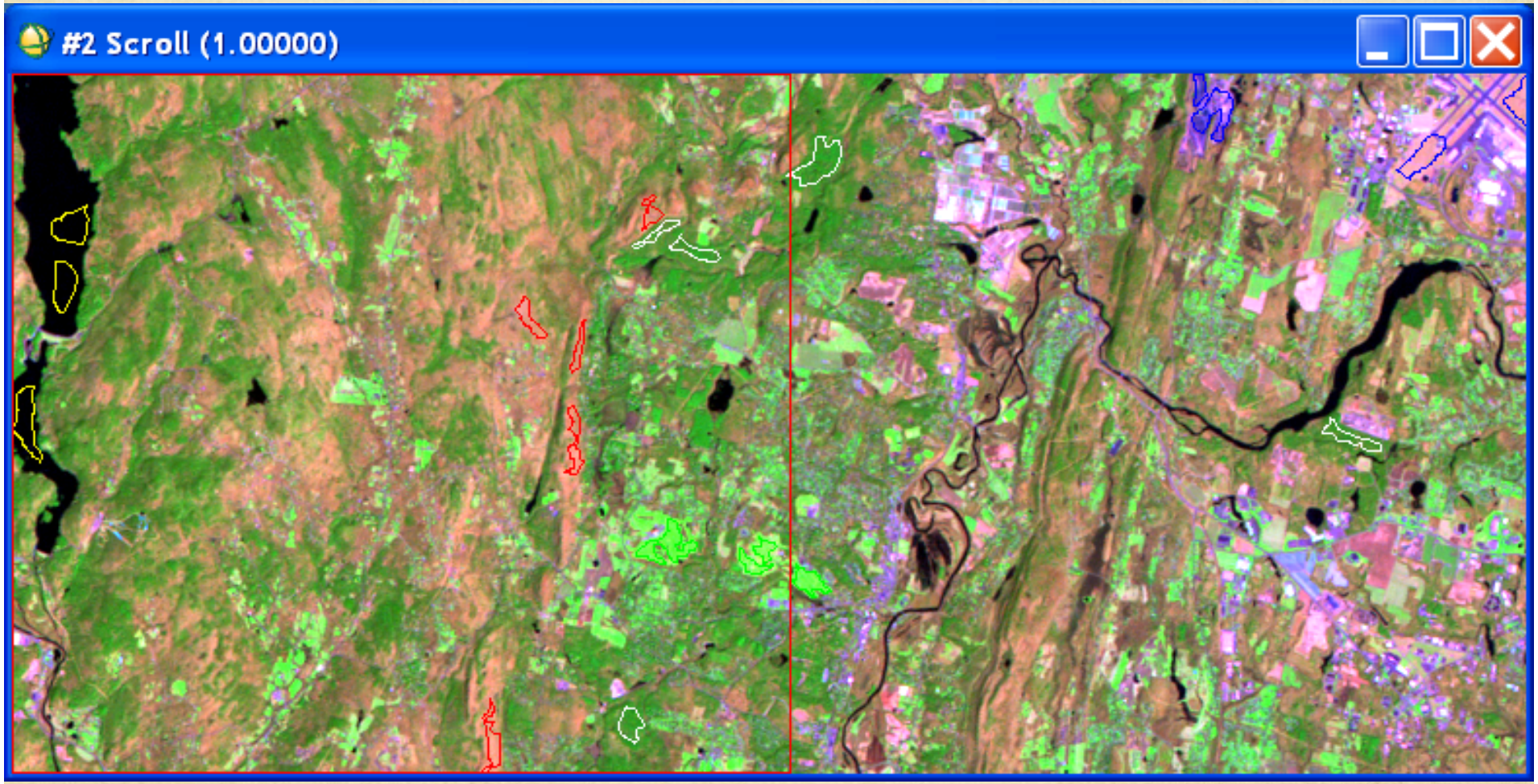




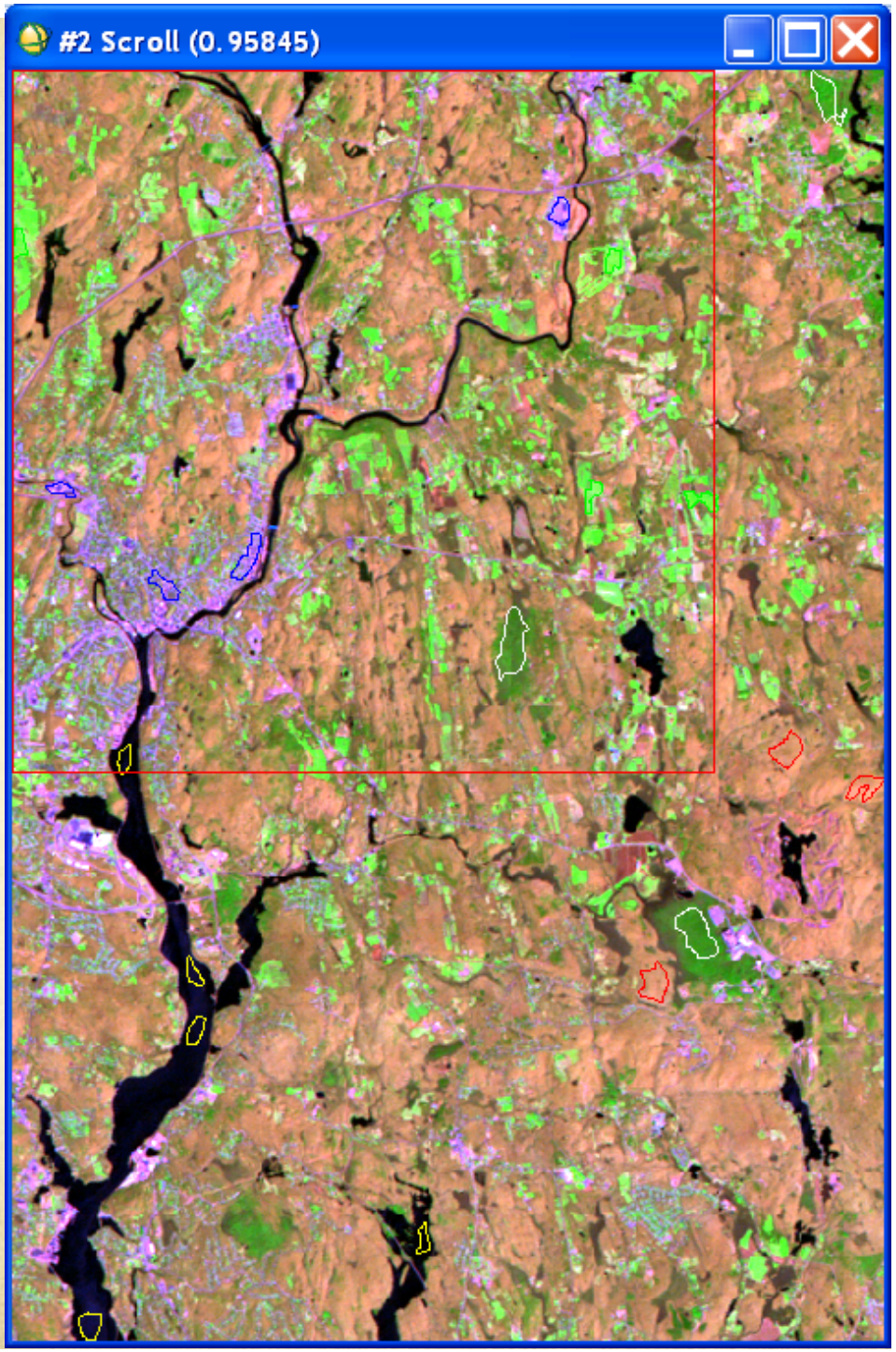
Localized Polygons (Replicas)



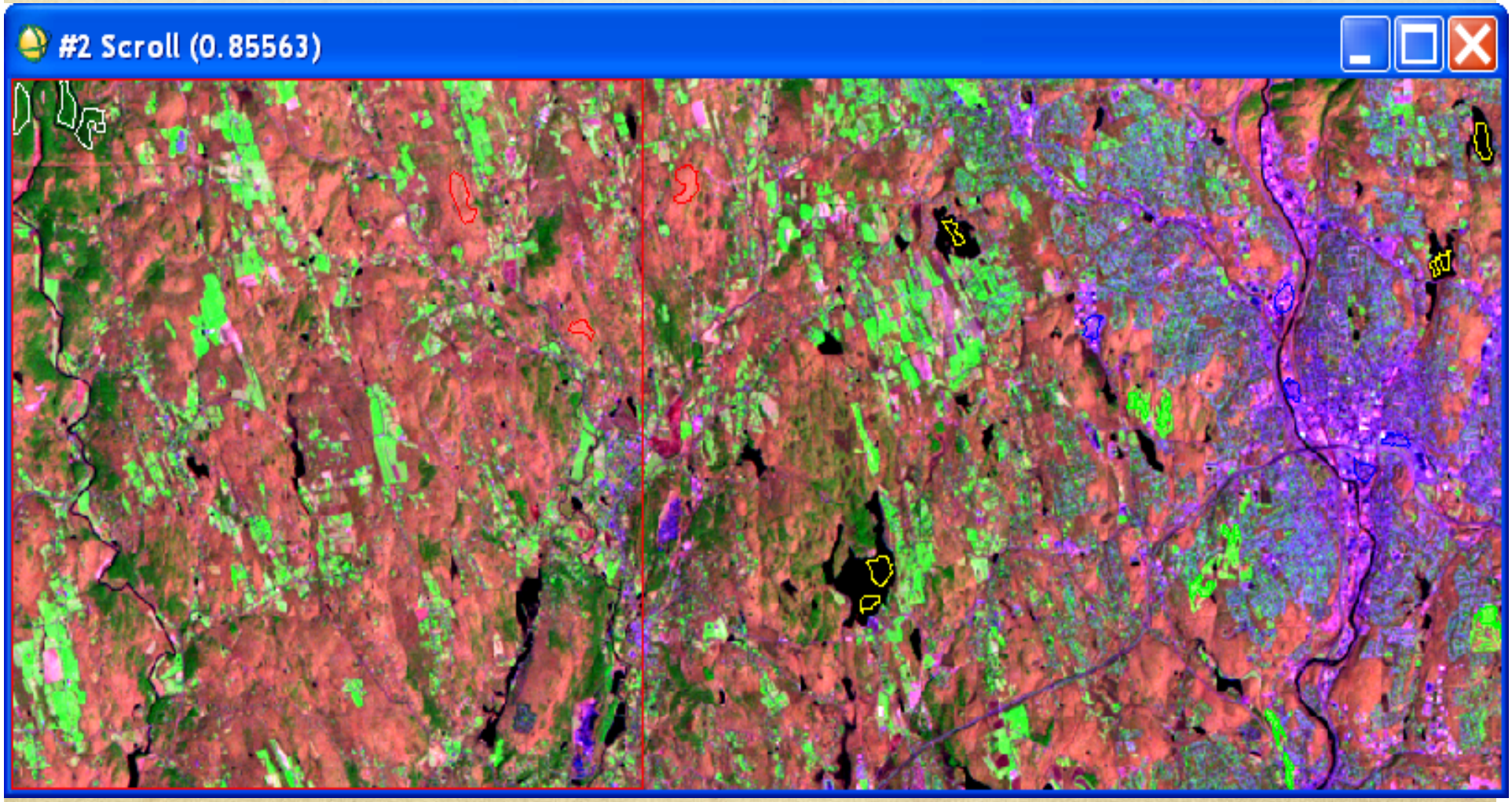
Replica 1



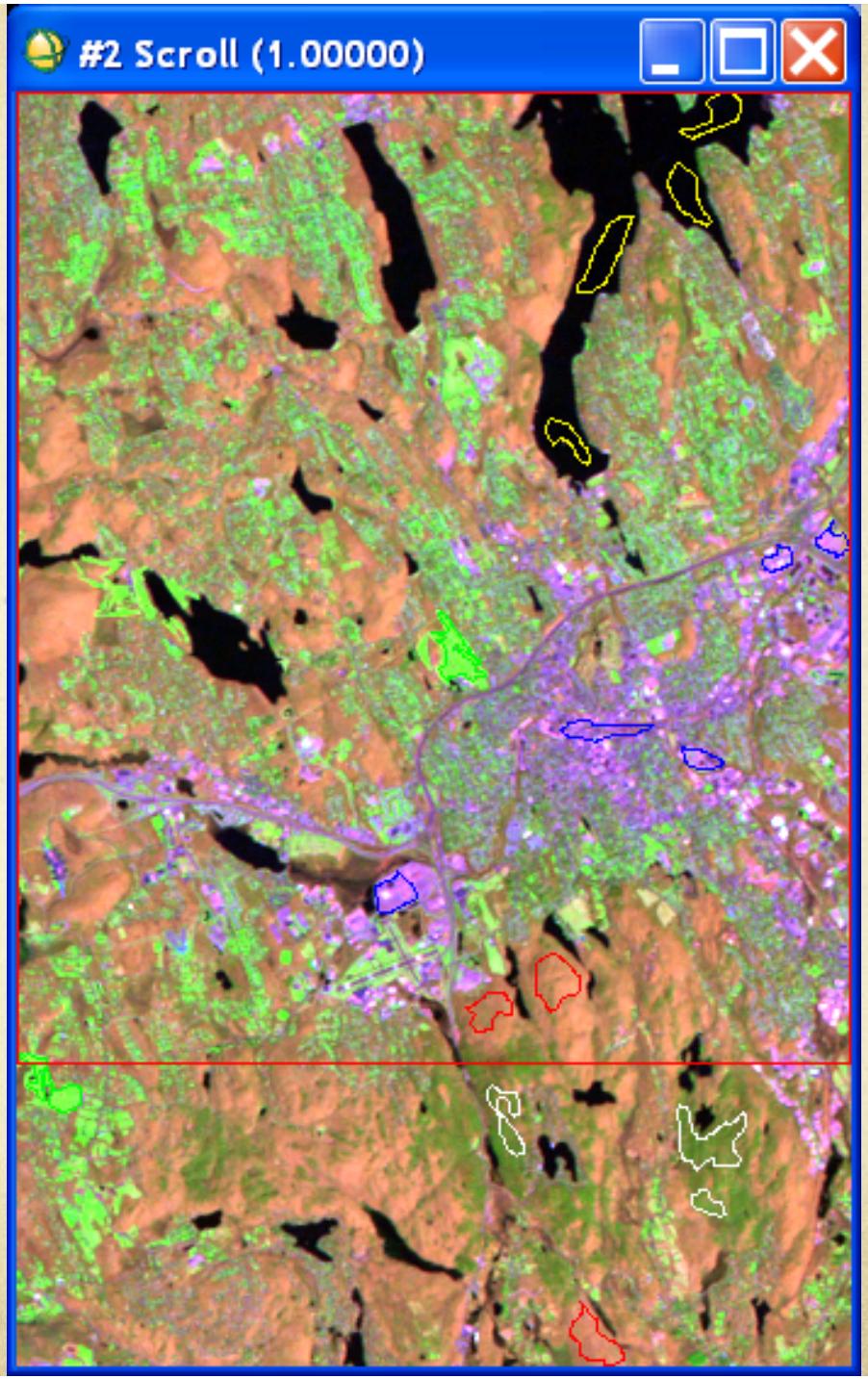
Replica 2



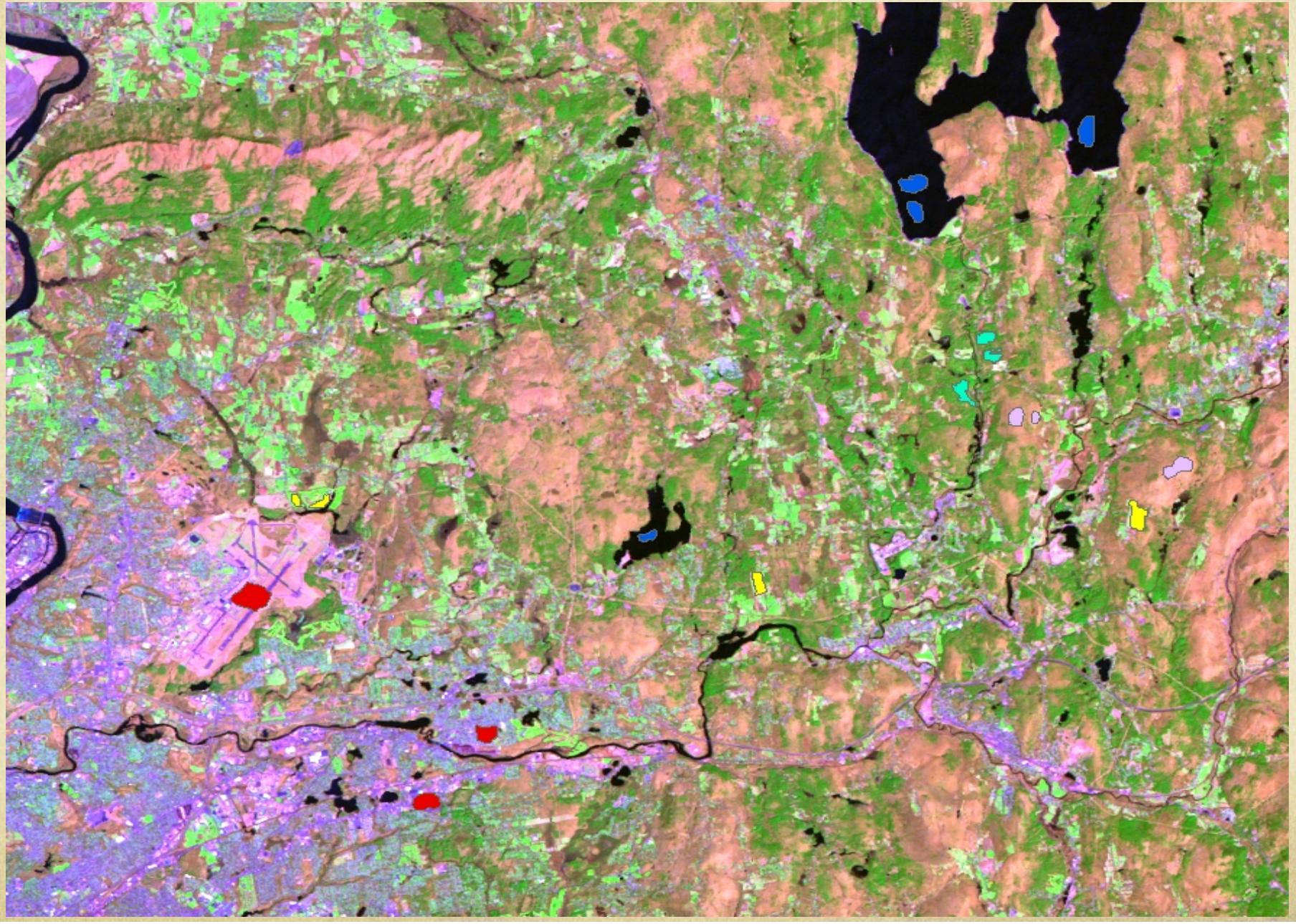
Replica 3



Replica 4

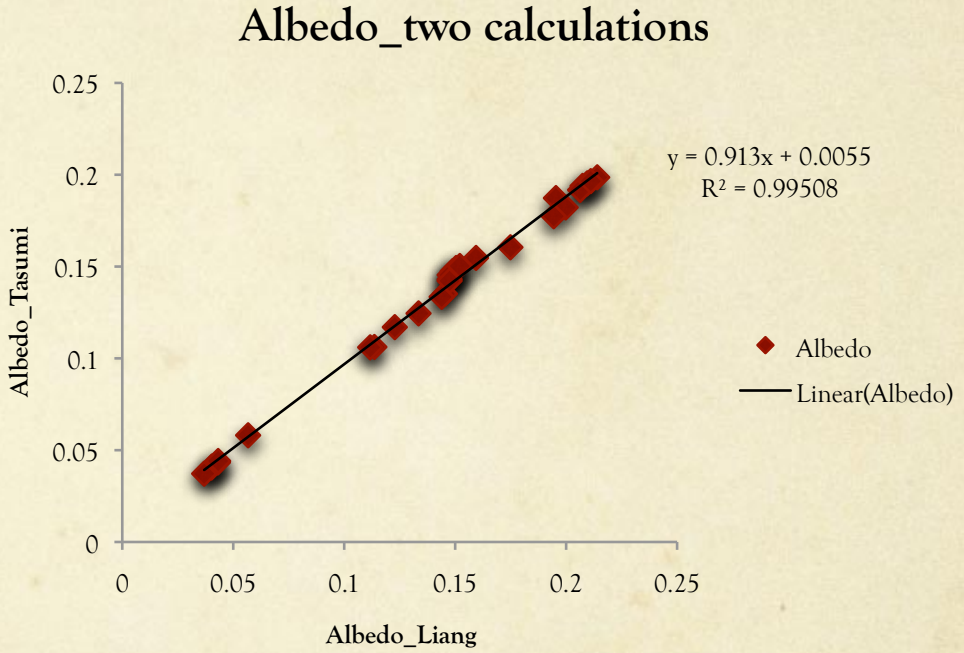


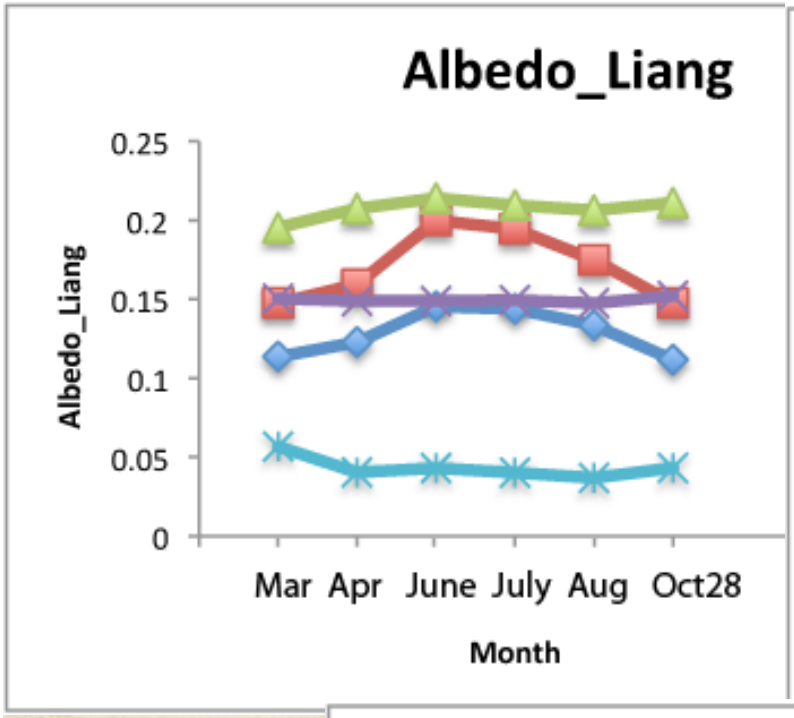
Replica 5

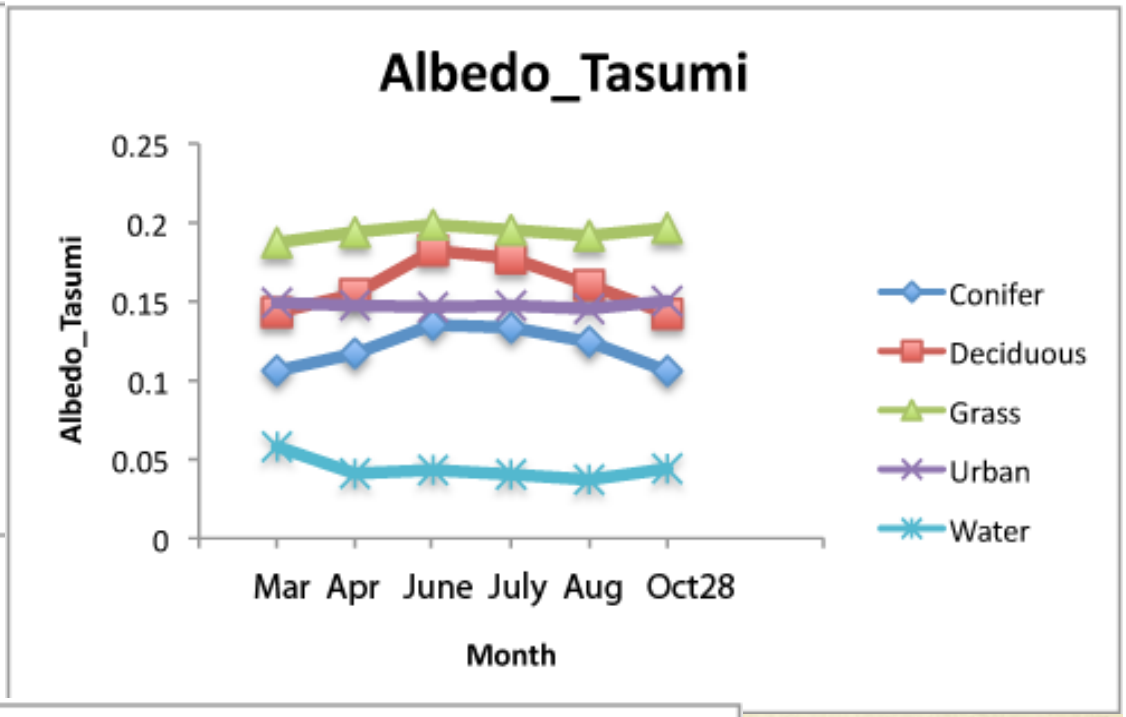


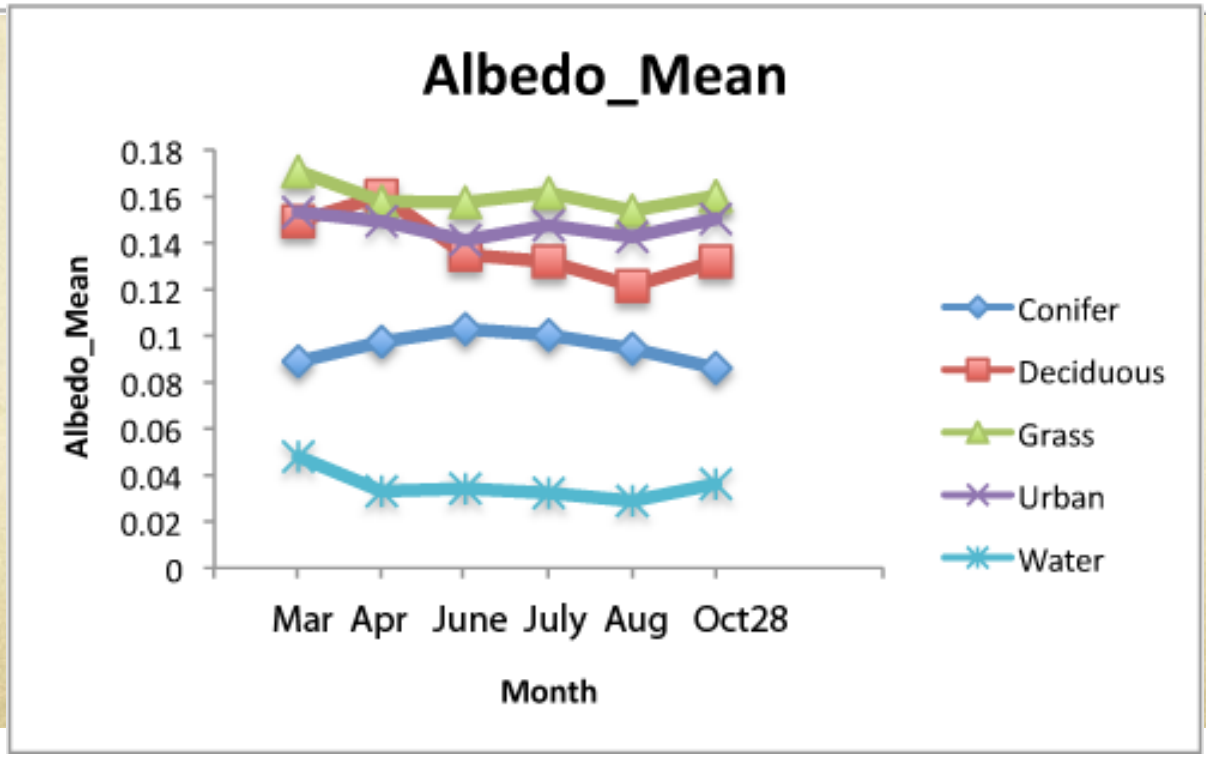
Replica 1

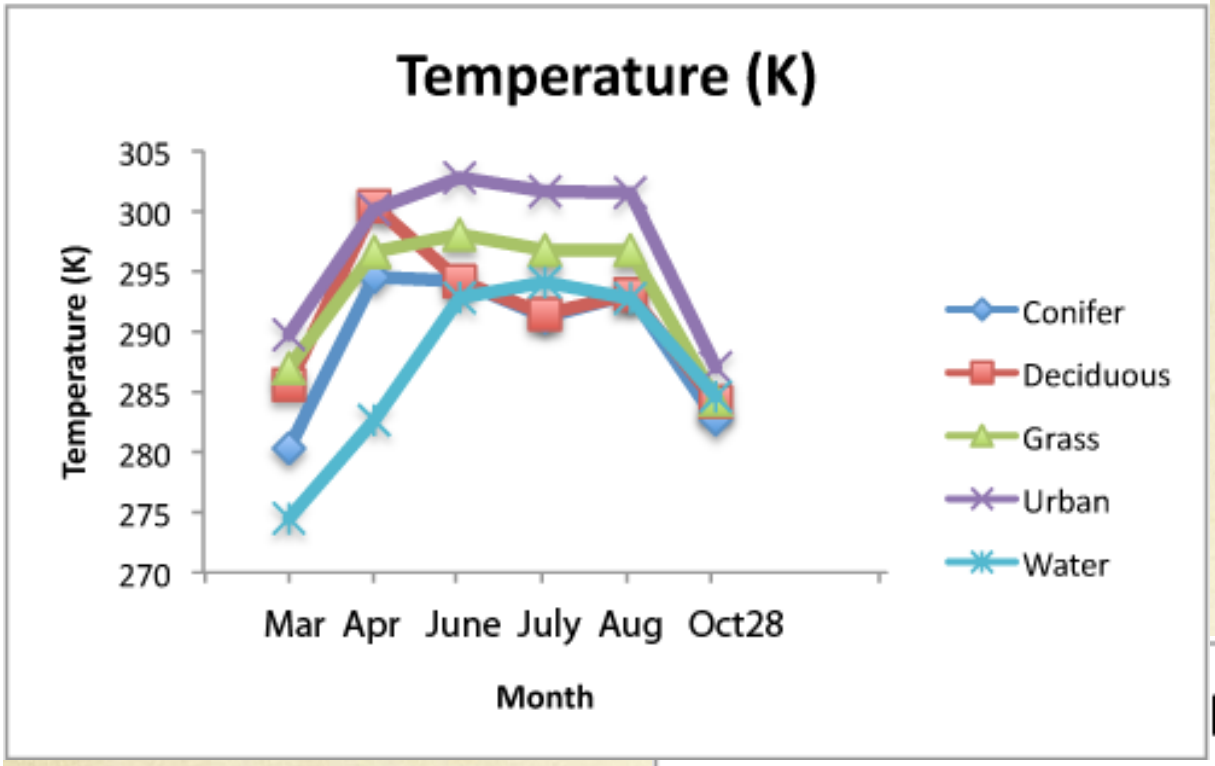
- Albedo
  - Liang
  - Tasumi
  - Average
- NDVI
- Relative Temperature

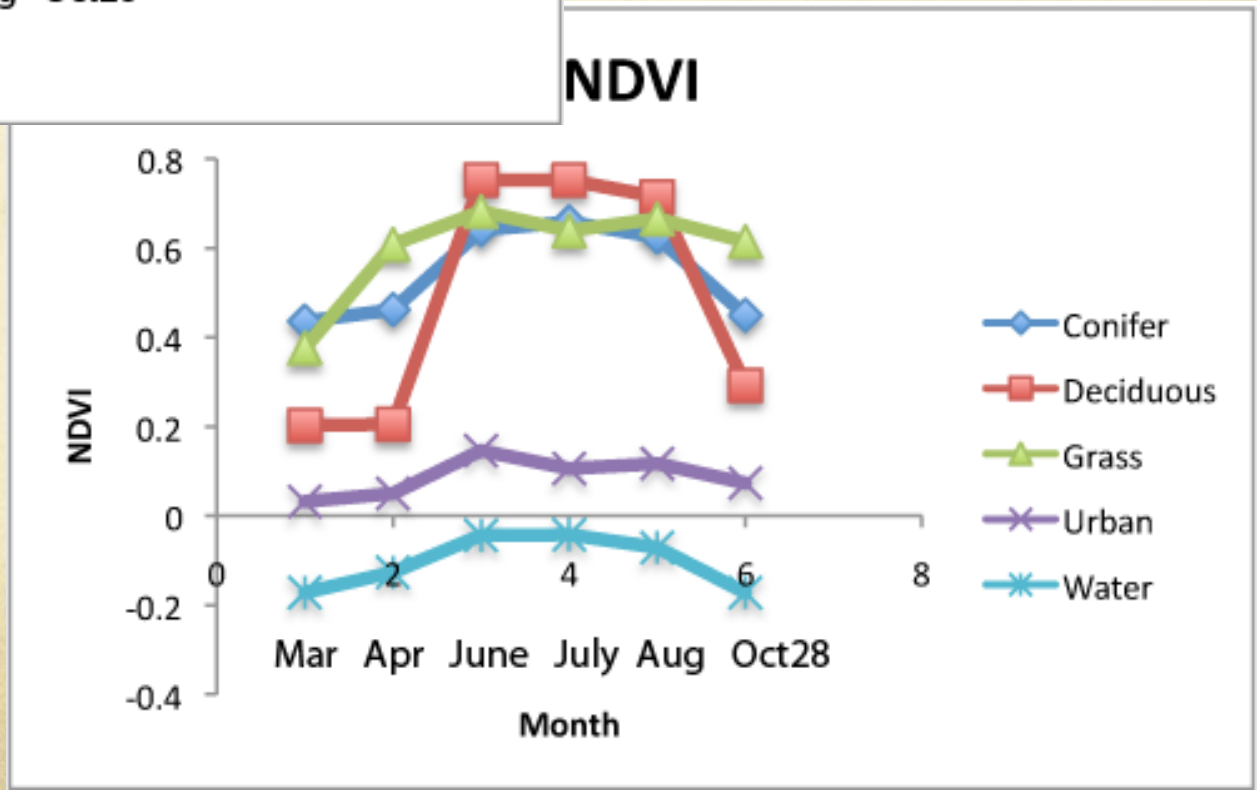


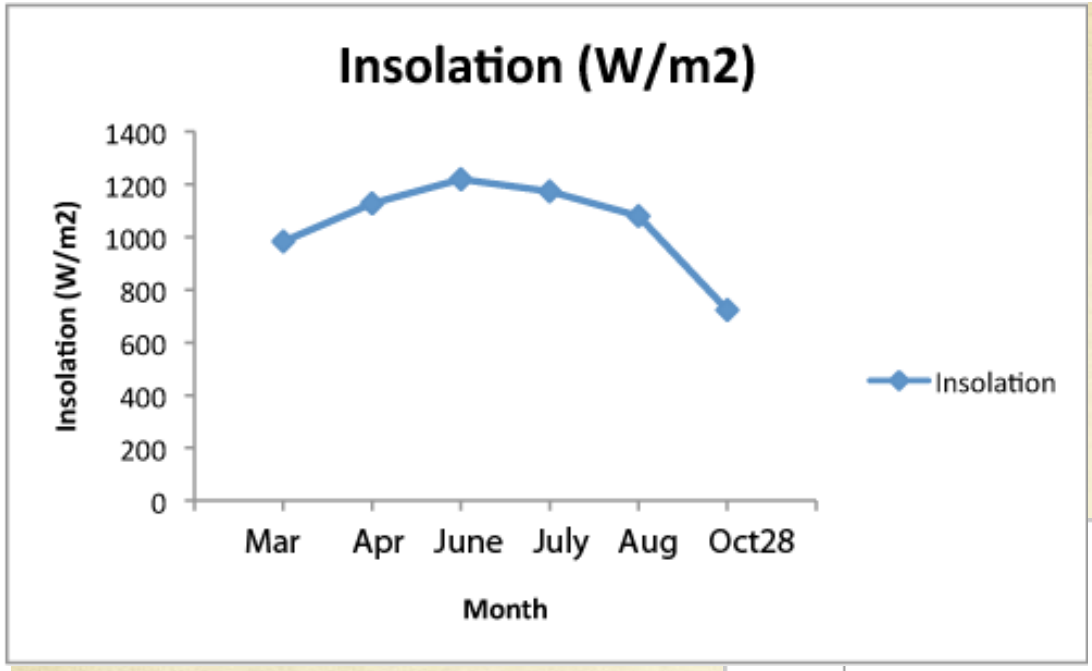

Albedo_Liang
Albedo_Liang
0.25
0.2
0.15
0.1
0.05
0
Mar Apr June July Aug Oct28
Month


Albedo_Tasumi
Albedo_Tasumi
0.25
0.2
0.15
0.1
0.05
0
Mar Apr June July Aug Oct28
Month
Conifer
Deciduous
Grass
Urban
Water

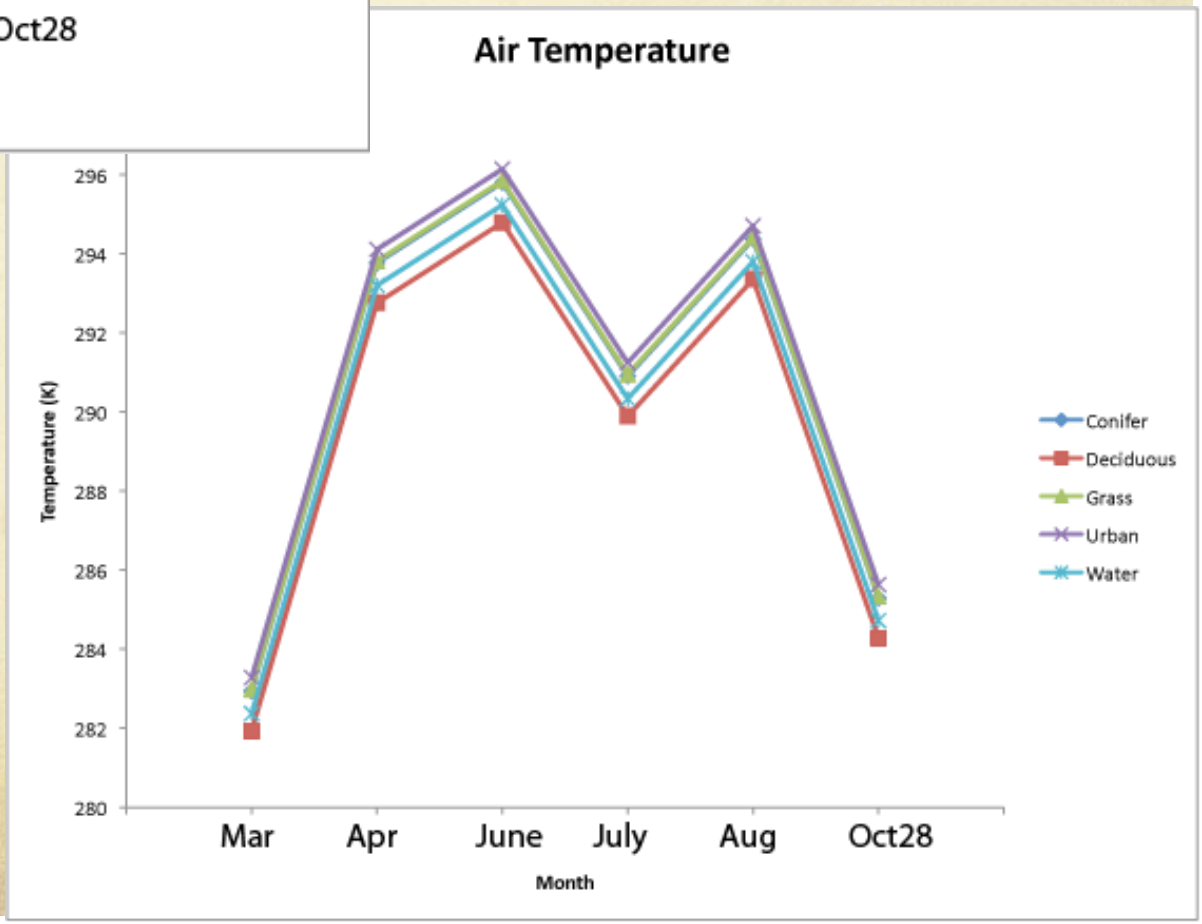

Albedo_Mean
Albedo_Mean
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Mar Apr June July Aug Oct28
Month
Conifer
Deciduous
Grass
Urban
Water


Temperature (K)
Temperature (K)
305
300
295
290
285
280
275
270
Mar
Apr
June
July
Aug
Oct28
Month
Conifer
Deciduous
Grass
Urban
Water

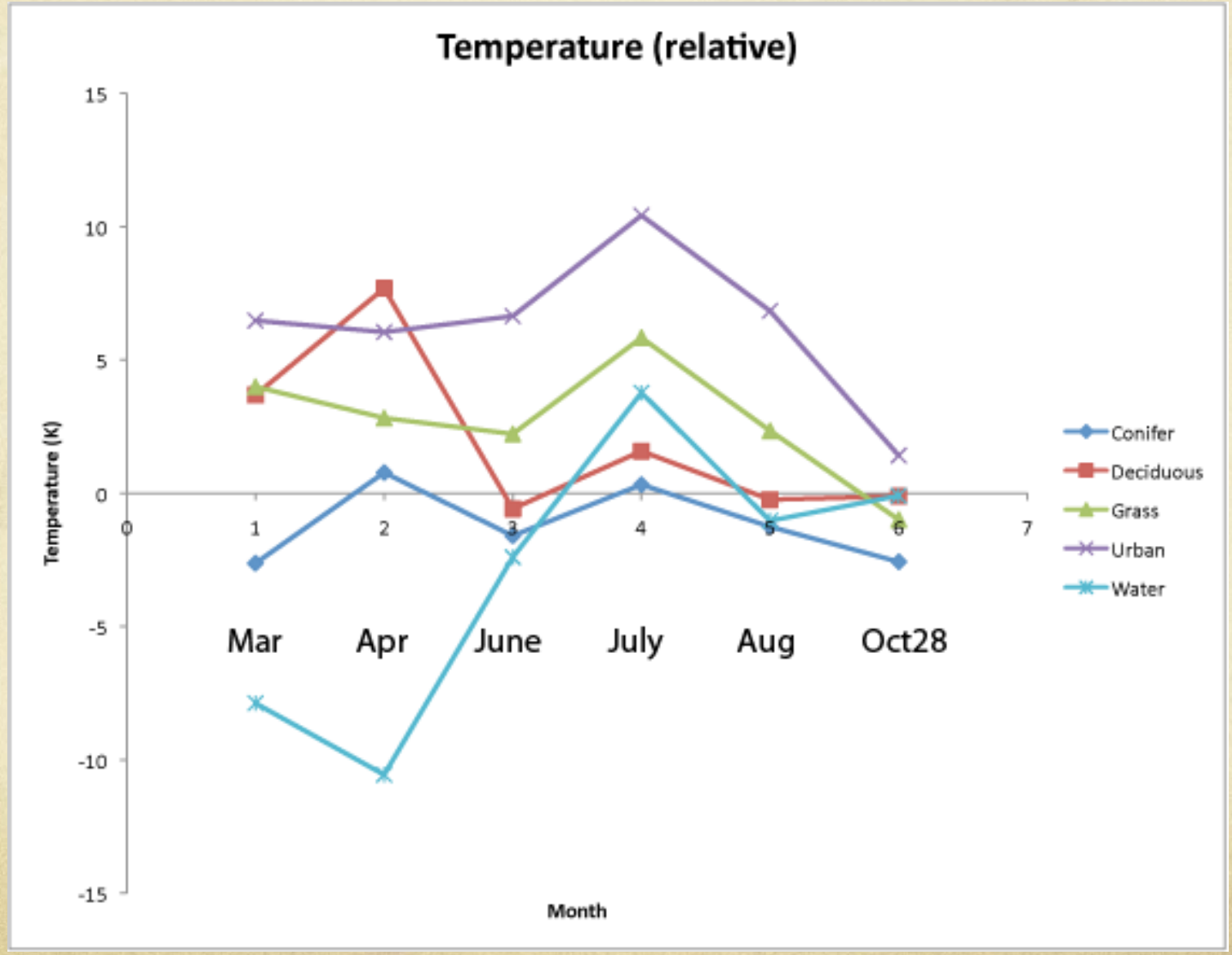

NDVI
NDVI
0.8
0.6
0.4
0.2
0
-0.2
-0.4
0
2
4
6
8
Mar
Apr
June
July
Aug
Oct28
Month
Conifer
Deciduous
Grass
Urban
Water



Note: Altitude of Deciduous is higher than Conifer in this case.



Replica 1


Temperature (relative)
15
10
5
0
-5
-10
-15
Temperature (K)
0
1
2
3
4
5
6
7
Mar
Apr
June
July
Aug
Oct28
Month
Conifer
Deciduous
Grass
Urban
Water

Replica 1 vs Whole