

Aaron Goodman  
GEOG 411

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#### Unit 4: Image Classification **RETRY**

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*When redoing my project, I determined with very little doubt that my initial technical difficulties were exacerbated by my working on an external SSD. I repeated the full process, this time working on my C:\ drive, and I ran into no hiccups or slowdowns.*

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1. Below is the segmentation parameter space I used for Object-based classification:

- 'Spectral detail' = 14
- 'Spatial detail' = 16
- 'Minimum segment size in pixels' = 4

2. I chose these values for my parameter space because:

- A greater spectral detail (14) can better discern between similar-looking 'developed' and 'barren' pixels; and 'ridge' and 'barren' pixels
- A greater spatial detail (16) can better classify smaller features, like thin plots of 'planted' land cover
- A small segment size (4) because **segments of ( 4 pixels \* 30m/pixel ) = 120m** ensures sensitivity to thinner features like roads, runways, lawns, or water

3. I created my classification schema by adapting and simplifying the NLCD2011.

classname	classvalue
water	0
developed	1
barren	2
ridge	3
planted	4

4. I kept designations from NLCD2011 like 'water', 'developed', 'barren', and 'planted' because they accounted for most land cover types in our image of Greater Las Vegas. While NLCD's designation for 'planted' land cover typically refers to pasture and cropland, I kept the name here because I thought it was suitable for the vegetation in urban Las Vegas like at golf courses, which appears prominently in a CIR composite. I eliminated NLCD's 'forest' classes altogether, because there are virtually no instances of forest land cover in Greater Las Vegas. I did the same for 'wetlands' and 'shrubland', and created a fifth class called 'ridge' to classify features distinct from 'barren' land due to their topographic or geologic complexity.

5. Training Samples **RETRY**

classname	classvalue	#/samples	pixel%
water	0	50	10.46
developed	1	58	4.40
barren	2	50	47.99
ridge	3	50	36.47
planted	4	54	0.68

See Map 3; Map 4

6. Object-based classification results: Confusion Matrix **RETRY**

	C_0	C_1	C_2	C_3	C_4	Total	U_Acc	Kappa
C_0	10	0	0	0	0	10	1	0
C_1	0	7	1	2	0	10	0.7	0
C_2	0	0	2	8	0	10	0.2	0
C_3	0	2	11	23	0	36	0.638889	0
C_4	0	6	0	0	4	10	0.4	0
Total	10	15	14	33	4	76	0	0
P_Acc	1	0.466667	0.142857	0.69697	1	0	0.605263	0
Kappa	0	0	0	0	0	0	0	0.451659

6, cont.

**Pixel-based classification results: Confusion Matrix **RETRY****

	C_0	C_1	C_2	C_3	C_4	Total	U_Acc	Kappa
C_0	9	0	1	0	0	10	0.9	0
C_1	0	8	1	1	0	10	0.8	0
C_2	0	0	4	15	0	19	0.210526	0
C_3	1	1	5	17	0	24	0.708333	0
C_4	0	5	4	1	0	10	0	0
Total	10	14	15	34	0	73	0	0
P_Acc	0.9	0.571429	0.266667	0.5	0	0	0.520548	0
Kappa	0	0	0	0	0	0	0	0.359328

**User's accuracy: 1 - Commission Error Rate**

class	Object-based <b>RETRY</b>	Pixel-based <b>RETRY</b>	Object-based	Pixel-based
water	100%	90%	90%	50%
developed	70%	80%	70%	80%
barren	20%	21.0526%	50%	76.9231%
ridge	63.8889%	70.8333%	68.4211%	65.5172%
planted	40%	0%	20%	10%

**Producer's accuracy: 1 - Omission Error Rate**

class	Object-based <b>RETRY</b>	Pixel-based <b>RETRY</b>	Object-based	Pixel-based
water	100%	90%	100%	100%
developed	46.6667%	57.1429%	50%	66.6667%
barren	14.2857%	26.667%	23.8095%	35.7143%
ridge	69.697%	50%	81.25%	73.0769%
planted	100%	0%	100%	100%

6, cont.

**Overall accuracy:**

Object-based classification: 60.5263% > Pixel-based classification: 52.0548%

Object-based Kappa: 0.451659 > Pixel-based Kappa: 0.359328

Surprisingly, my second attempt at image classification produced results with even lower accuracy, despite my inclusion of many more training samples. Again, the models struggled the most with the 'barren' class, and showed considerably worse performance in classifying land types like 'ridge' and 'planted' as well. I presume that this means that my greater quantity of training samples were of a lower quality. This seems to be supported by a significant decrease in Producer's accuracy in almost all classes, in both types of classification.

Again, I am most surprised by the models' low performance in classifying 'planted' land cover. I would have expected better scores due to the spectral uniqueness of these features.

7. See Map 5

8. See Map 6



RETRY

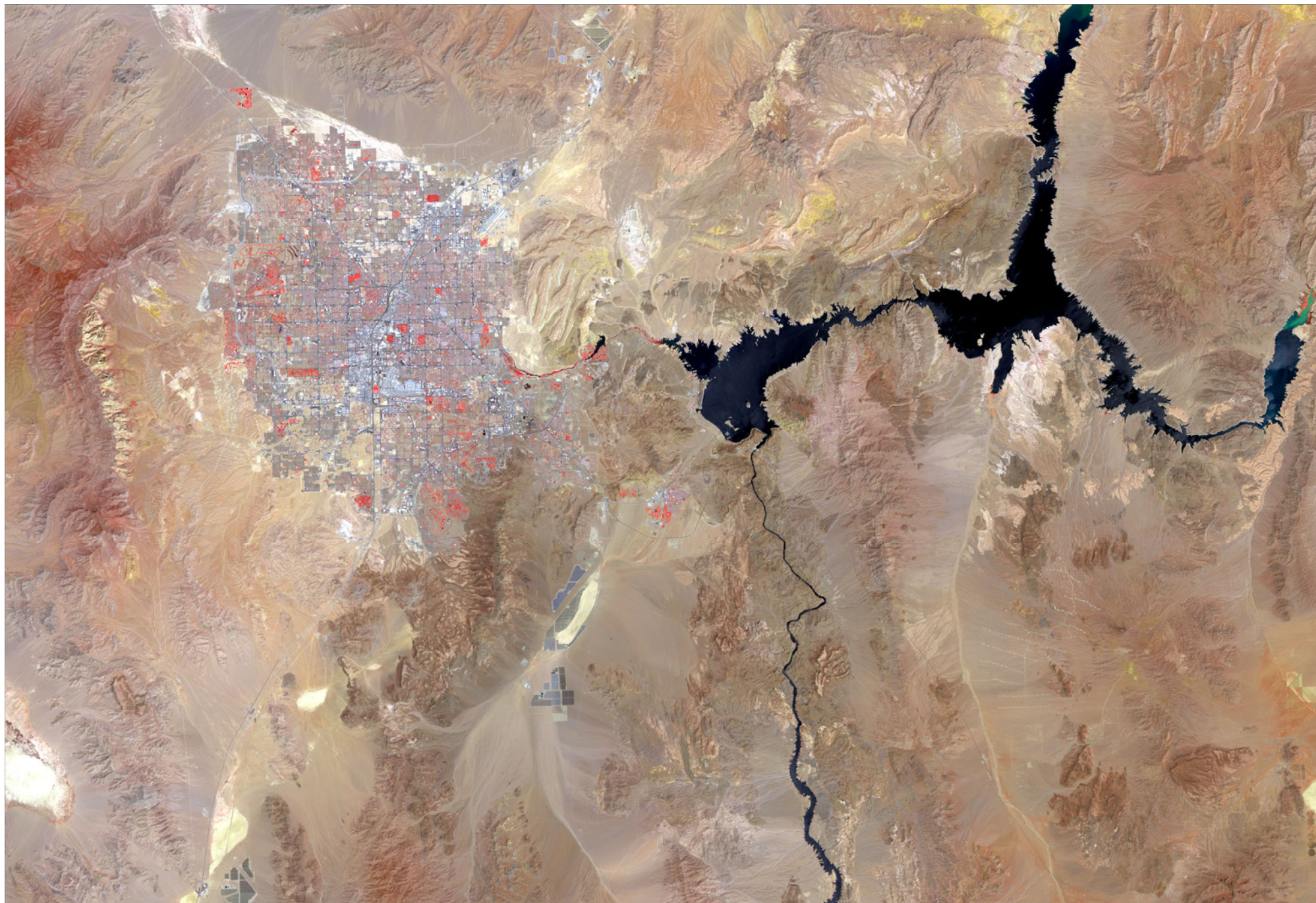


image acquired by Landsat 8 on 2020-05-02

## Map 1: Greater Las Vegas (Landuse Composite)

WGS 1984 UTM Zone 11N

X: 114°50'53"W 0 4.25 8.5 17 Miles

Y: 35°59'47"N

Scale: 1:520,000

■ NIR (B5)  
■ RED (B4)  
■ BLUE (B2)

cartography by Aaron Goodman for UCLA MAGIST GEOG 411 Fall 2024  
data source: Landsat 8-9 Operation Land Imager and Thermal Infrared Sensor Collection 2 Level-1 Data



**RETRY**

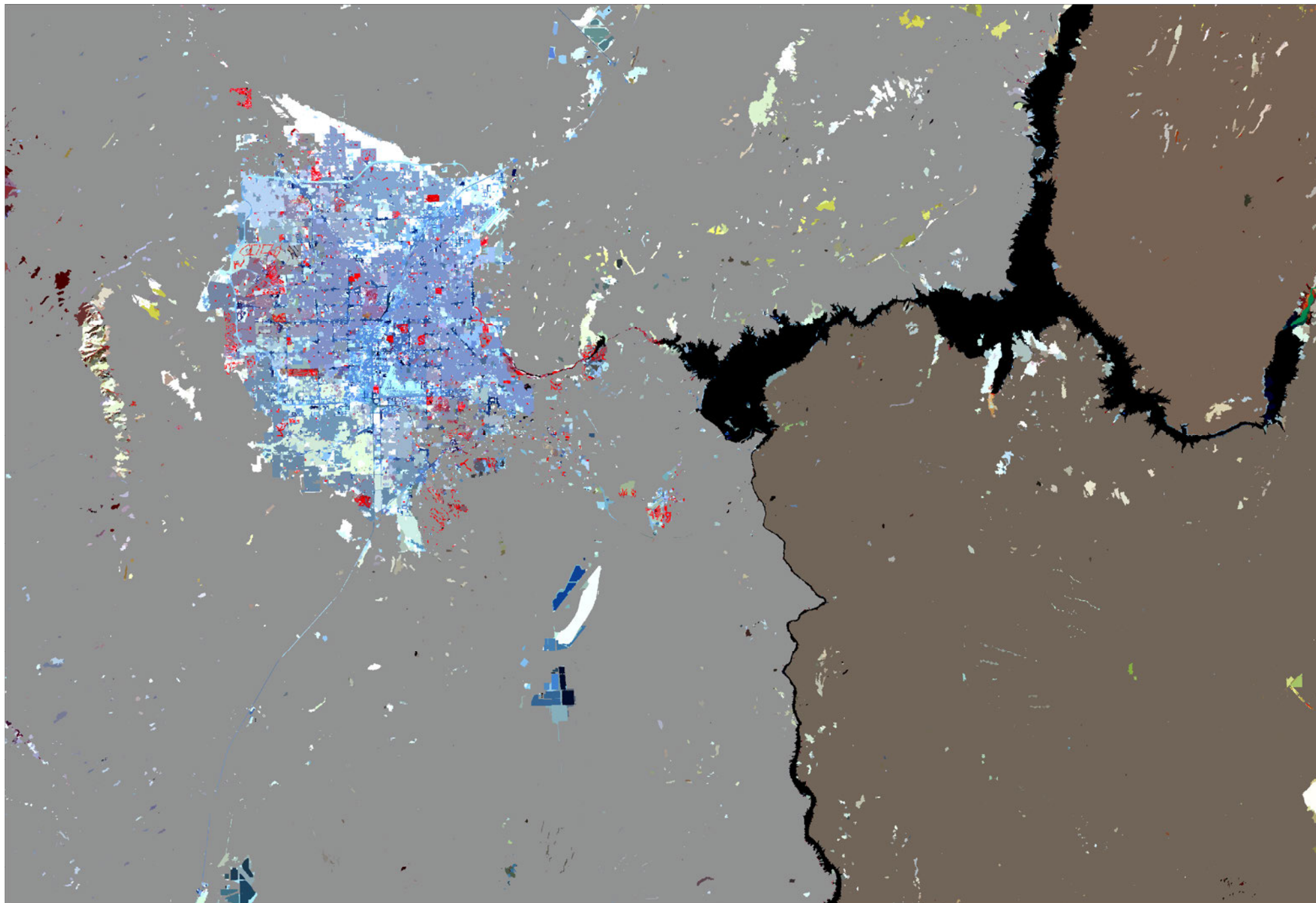


image acquired by Landsat 8 on 2020-05-02

## Map 2: Segmented Image

WGS 1984 UTM Zone 11N

X: 114°50'53"W 0 4.25 8.5 17 Miles

Y: 35°59'47"N

Scale: 1:520,000

cartography by Aaron Goodman for UCLA MAGIST GEOG 411 Fall 2024  
data source: Landsat 8-9 Operation Land Imager and Thermal Infrared Sensor Collection 2 Level-1 Data

RETRY

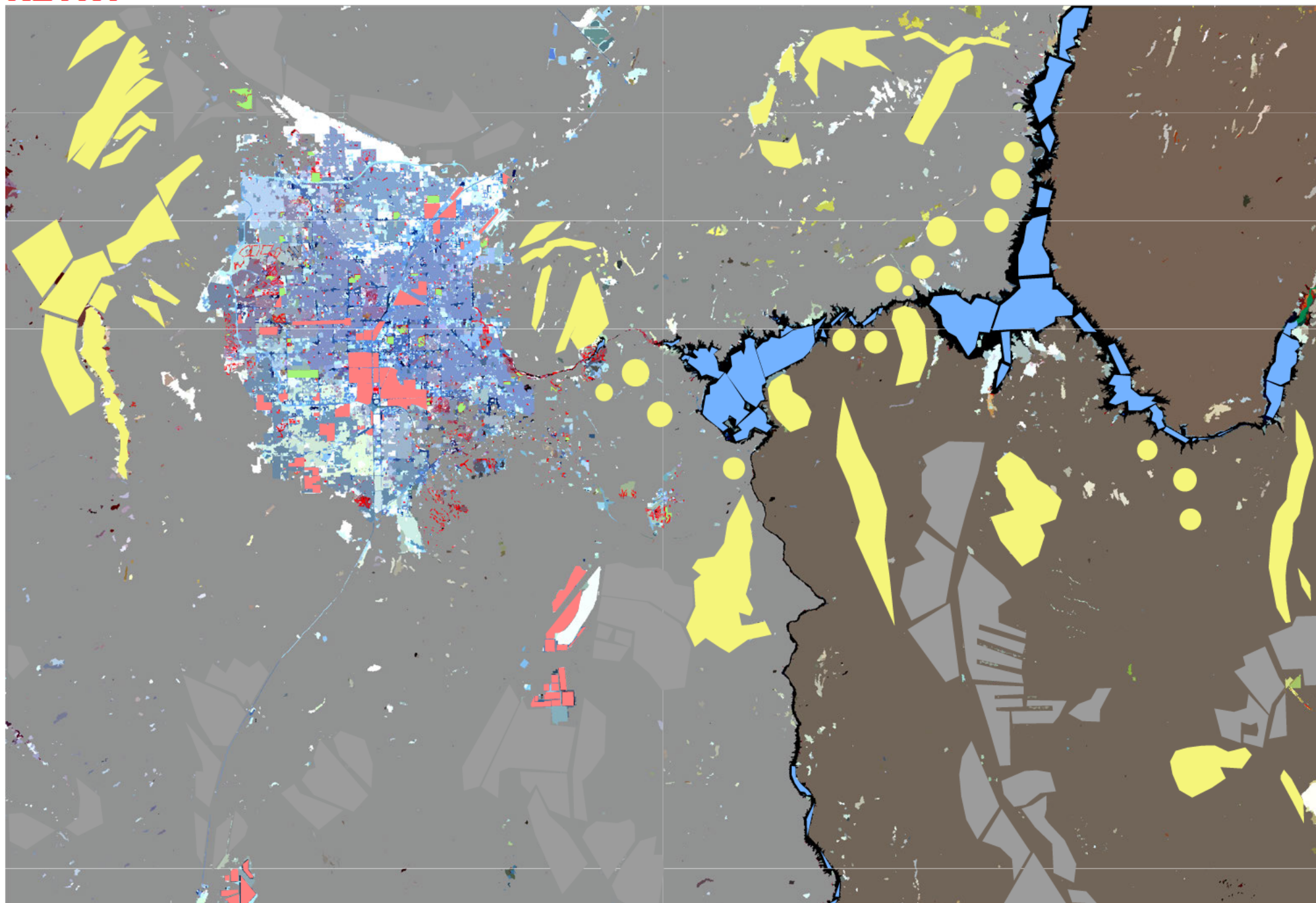


image acquired by Landsat 8 on 2020-05-02

## Map 3: Training Samples over Segmented Image

WGS 1984 UTM Zone 11N

X: 114°50'53\"W 0 4.25 8.5 17 Miles

Y: 35°59'47\"N

Scale: 1:520,000

barren  
developed  
planted

ridge  
water

cartography by Aaron Goodman for UCLA MAGIST GEOG 411 Fall 2024  
data source: Landsat 8-9 Operation Land Imager and Thermal Infrared Sensor Collection 2 Level-1 Data



RETRY

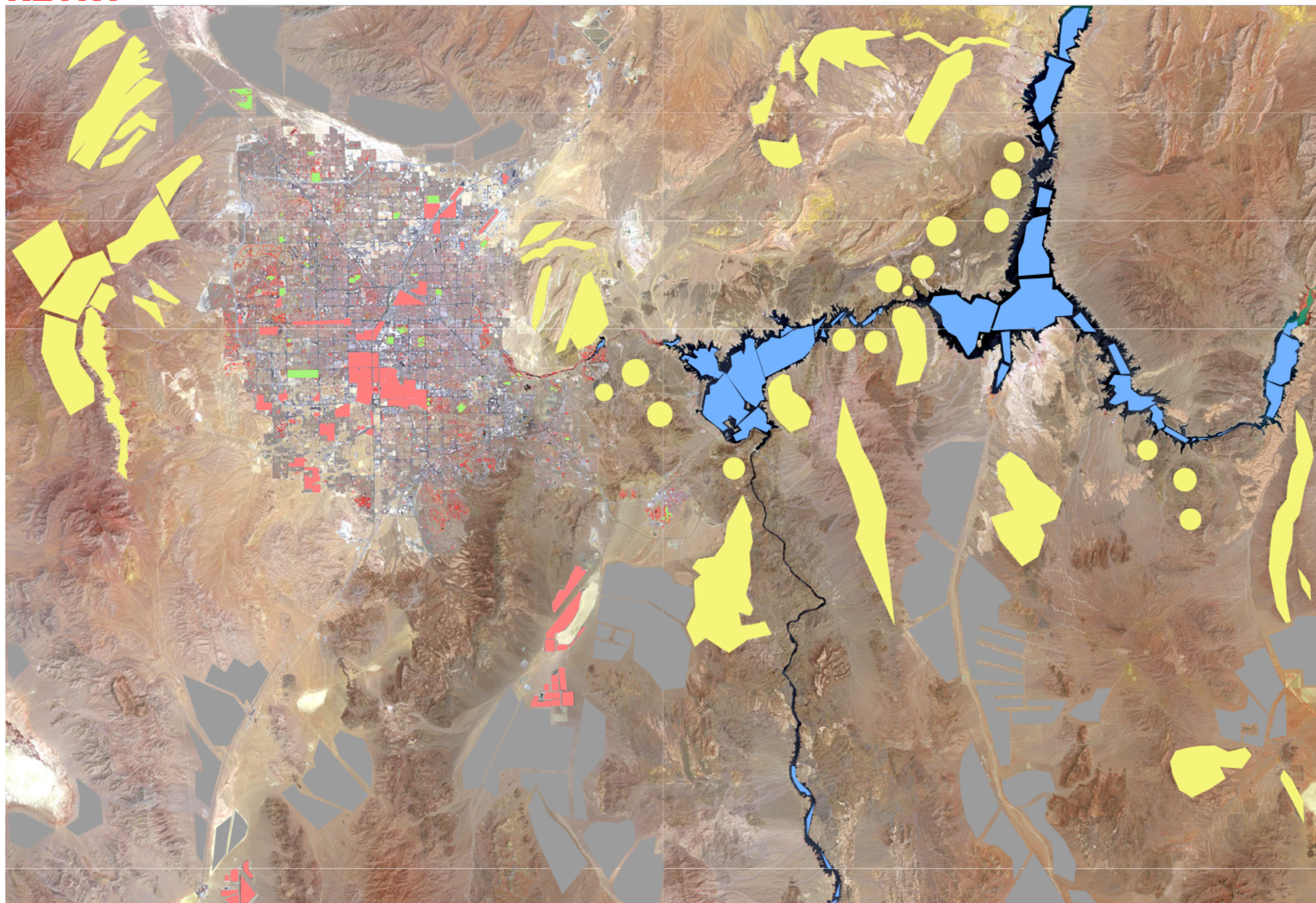


image acquired by Landsat 8 on 2020-05-02

## Map 4: Training Samples over Source Image

WGS 1984 UTM Zone 11N

X: 114°50'53"W 0 4.25 8.5 17 Miles

Y: 35°59'47"N

Scale: 1:520,000

barren

developed

planted

ridge

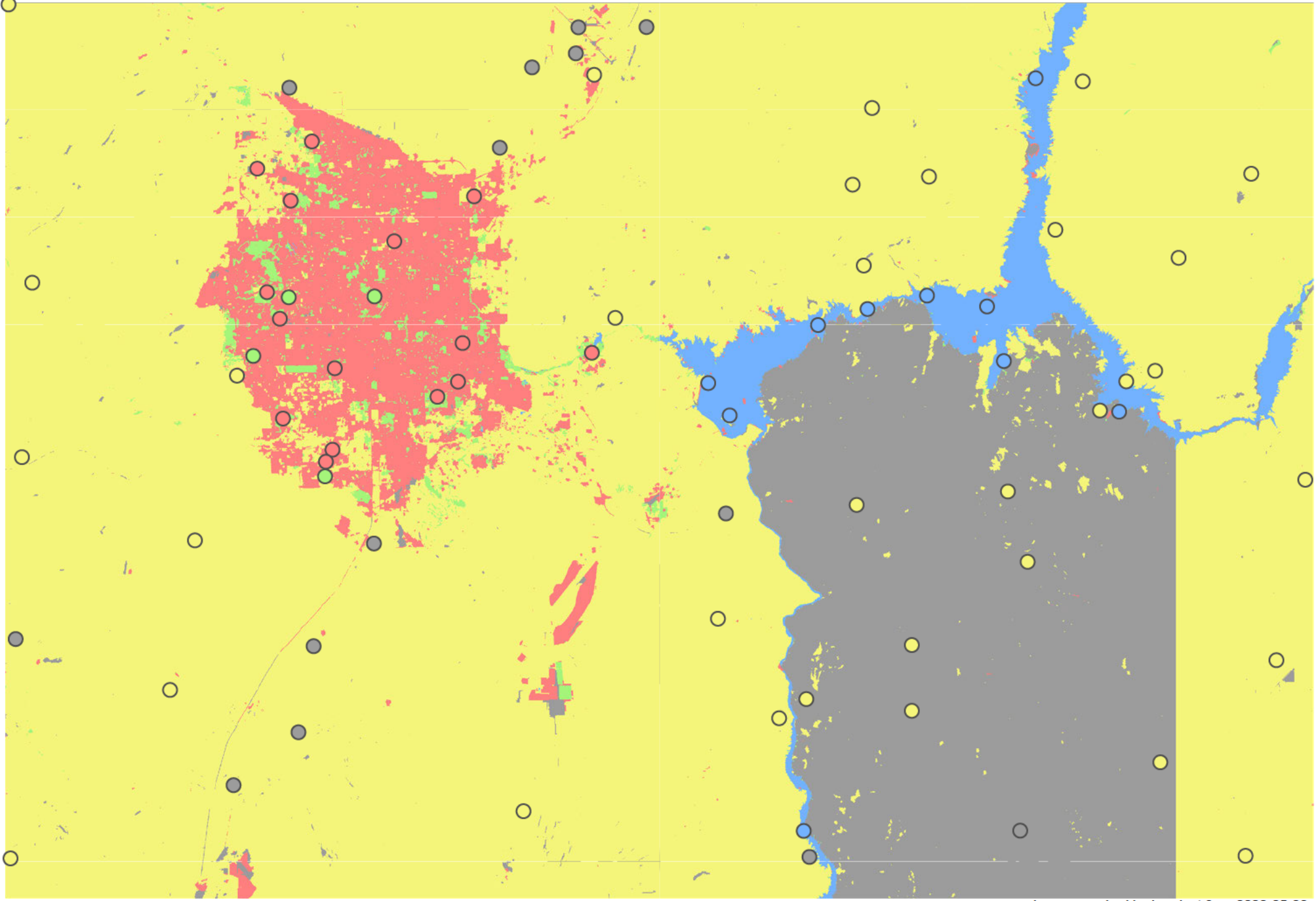
water

cartography by Aaron Goodman for UCLA MAGIST GEOG 411 Fall 2024

data source: Landsat 8-9 Operation Land Imager and Thermal Infrared Sensor Collection 2 Level-1 Data



RETRY



**Map 5: Object-based classification results w/ 76 A.A.P.**

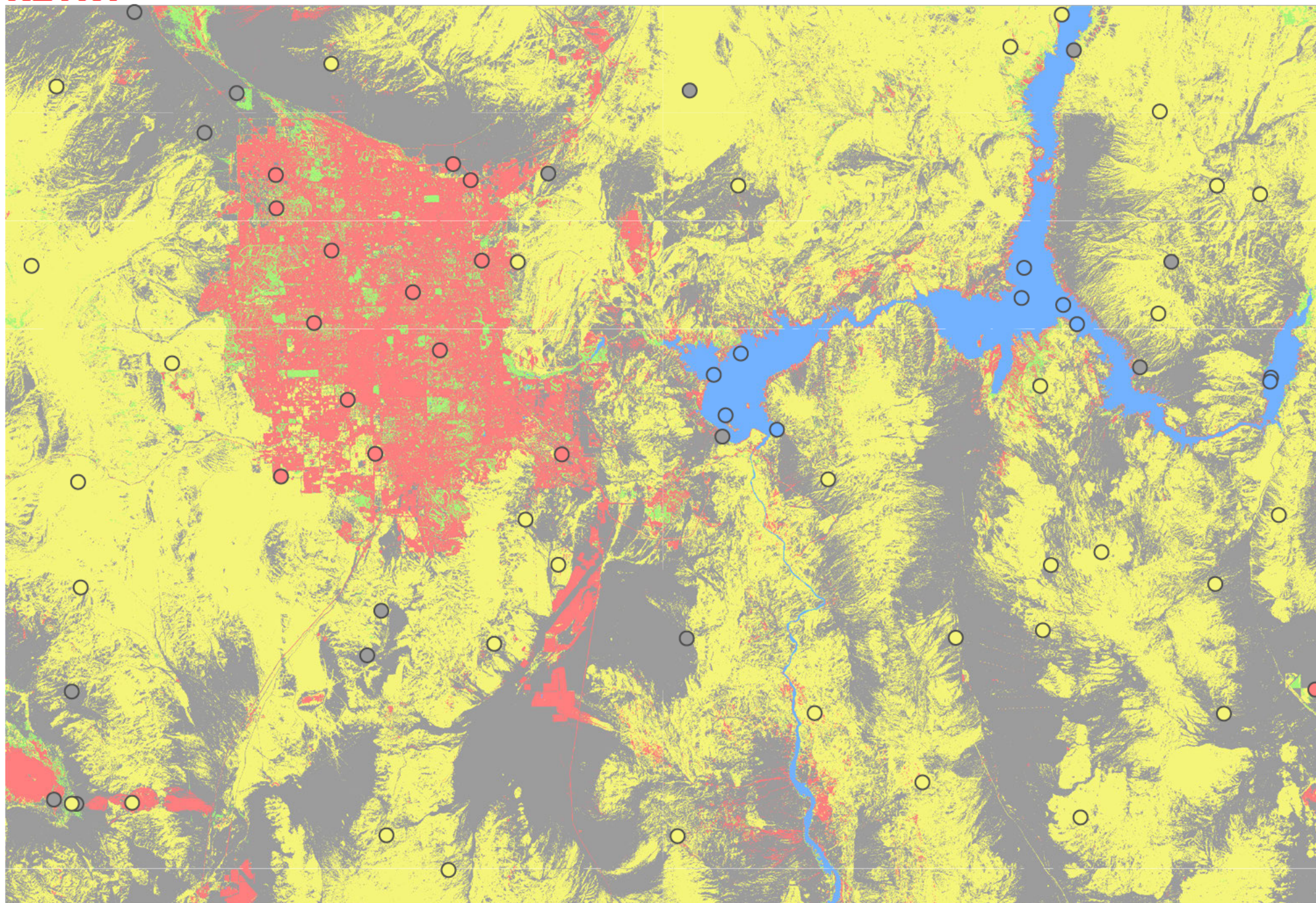
image acquired by Landsat 8 on 2020-05-02

WGS 1984 UTM Zone 11N  
X: 114°50'53"W  
Y: 35°59'47"N  
Scale: 1:520,000

- barren
- developed
- planted
- ridge
- water



RETRY



**Map 6: Pixel-based classification results w/ 73 A.A.P.**

image acquired by Landsat 8 on 2020-05-02

WGS 1984 UTM Zone 11N

X: 114°50'53"W 0 4.25 8.5 17 Miles

Y: 35°59'47"N

Scale: 1:520,000

barren

developed

planted

ridge

water

cartography by Aaron Goodman for UCLA MAGIST GEOG 411 Fall 2024  
data source: Landsat 8-9 Operation Land Imager and Thermal Infrared Sensor Collection 2 Level-1 Data