

### Sample Solution - Confusion Matrix

Result table:

Classification	Wetland	Savanna	Urban	Agriculture	Water	Sum	UA [%]	Com.Err. [%]
Wetland	12	3	0	0	1	16	75.0	25.0
Savanna	2	28	1	3	0	34	82.4	17.6
Urban	0	0	15	2	0	17	88.2	11.8
Agriculture	0	2	4	21	0	27	77.8	22.2
Water	0	0	0	0	10	10	100.0	0.0
Sum	14	33	20	26	11	104		
PA [%]	85.7	84.8	75.0	80.8	90.9			
Om. Err. [%]	14.3	15.2	25.0	19.2	9.1			

### Explanation and Calculations

#### 1. Matrix Completion

- Instance 'Wetland' vs. 'Wetland' = 12
- Instance 'Urban' vs. 'Agriculture' = 2
- Number of samples for 'Urban' (sum of Urban column) = 20
- Number of classified 'Wetland' samples (sum of Wetland row) = 16

#### 2. Accuracy Metrics: Overall Accuracy

- Correct classifications = 12 (Wetland) + 28 (Savanna) + 15 (Urban) + 21 (Agriculture) + 10 (Water) = 86
- Total samples = 104
- OA =  $86 / 104 = 0.8269 \rightarrow 82.7\%$

#### 3. Accuracy Metrics: Producer's Accuracy for 'Urban'

- Correct: 15
- Total reference Urban: 20
- $PA = 15 / 20 = 0.75 \rightarrow 75.0\%$

#### **4. User's Accuracy for 'Urban'**

- Correct: 15
- Total classified Urban: 17
- $UA = 15 / 17 \approx 0.882 \rightarrow 88.2\%$

#### **4. Omission Error**

- Agriculture:  
 $PA = 21 / 26 = 0.808 \rightarrow \text{Omission Error} = 1 - 0.808 = 19.2\%$
- Water:  
 $PA = 10 / 11 \approx 0.909 \rightarrow \text{Omission Error} = 9.1\%$

#### **5. Commission Error**

- Agriculture:  
 $UA = 21 / 27 \approx 0.778 \rightarrow \text{Commission Error} = 1 - 0.778 = 22.2\%$
- Water:  
 $UA = 10 / 10 = 1.0 \rightarrow \text{Commission Error} = 0.0\%$

## Sample Solution – Validation in R

Simply work through the script.

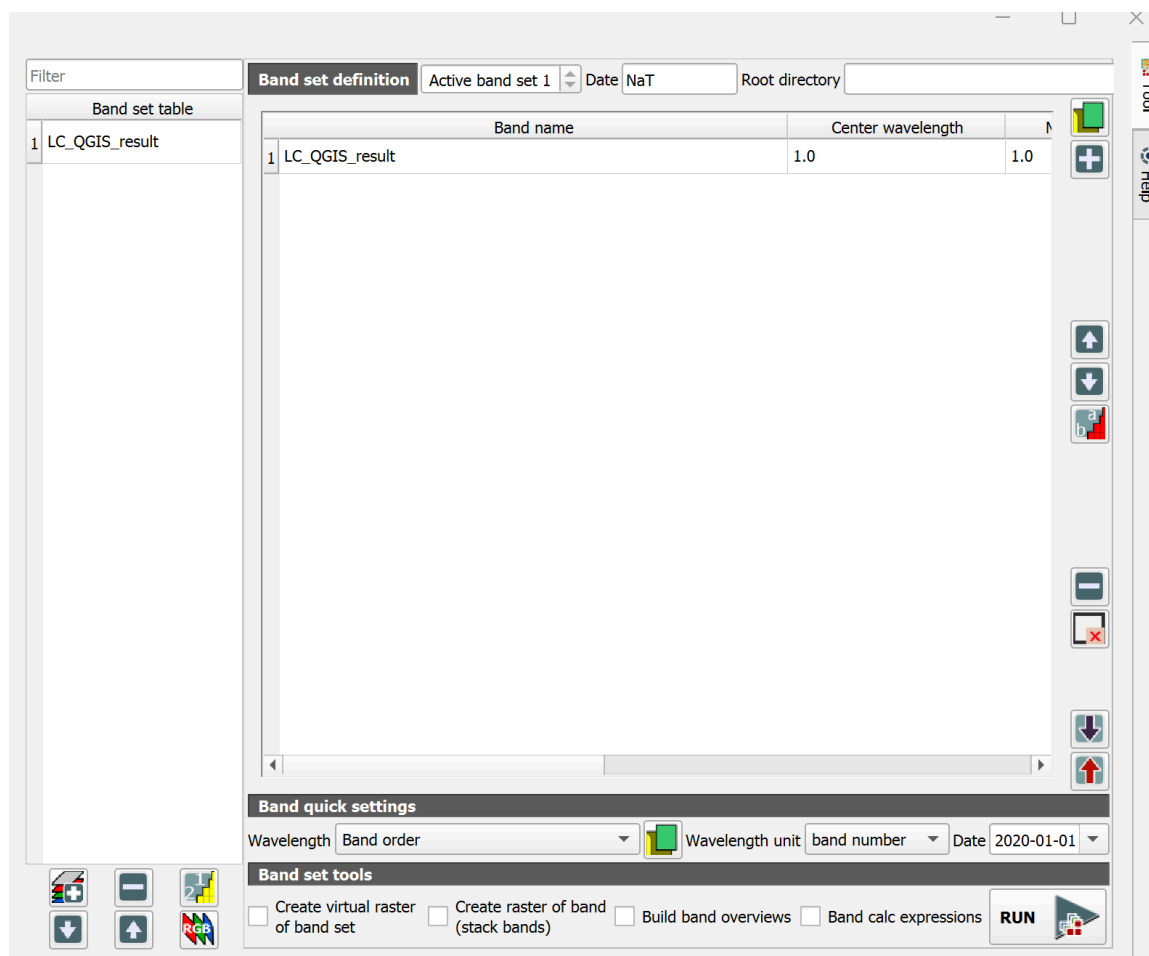
## Sample Solution – Validation in QGIS

### Project Setup

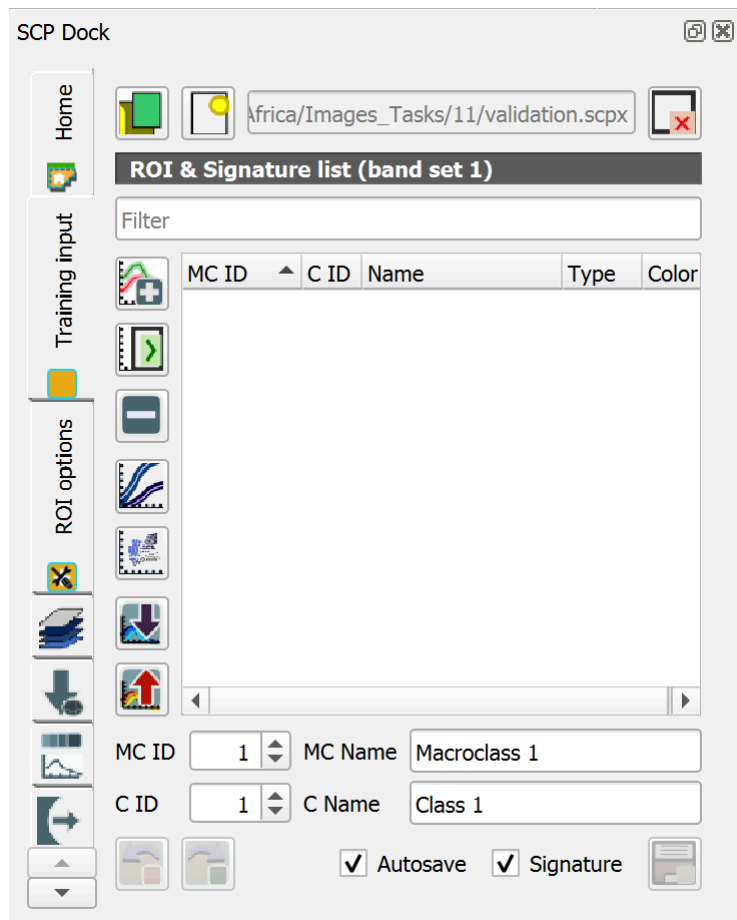
- Start QGIS and create a new project file.
- Get a background map using **Web -> QuickMapServices -> OSM -> OSM-Standard**.
- Load the Raster file containing your landcover classification results from lecture 9d and the shapefile “ground\_truth”.

### Set up the Validation

- First, we need to use the Band Set tool in SCP to set our classified raster image. Remember to select “Create virtual Raster of band set”

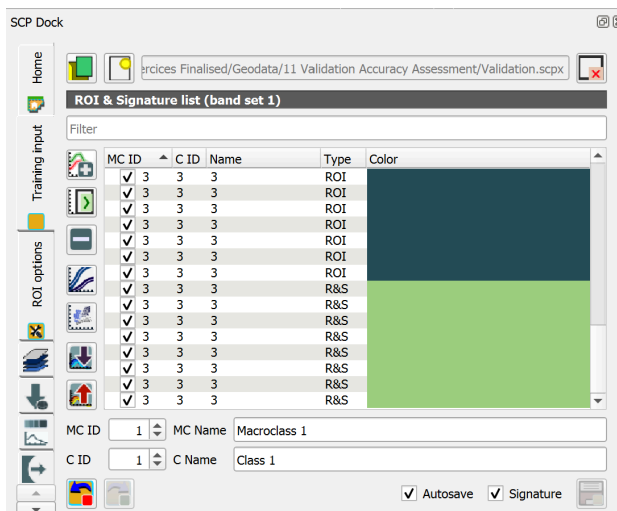


- Next, in the SCP dock, we need to create a new ROI to put out the ground\_truth shapefile. Create a new roi by clicking on the symbol with the yellow circle on the top left in the SCP dock and choosing a folder. Pick a suitable name, I choose “Validation”

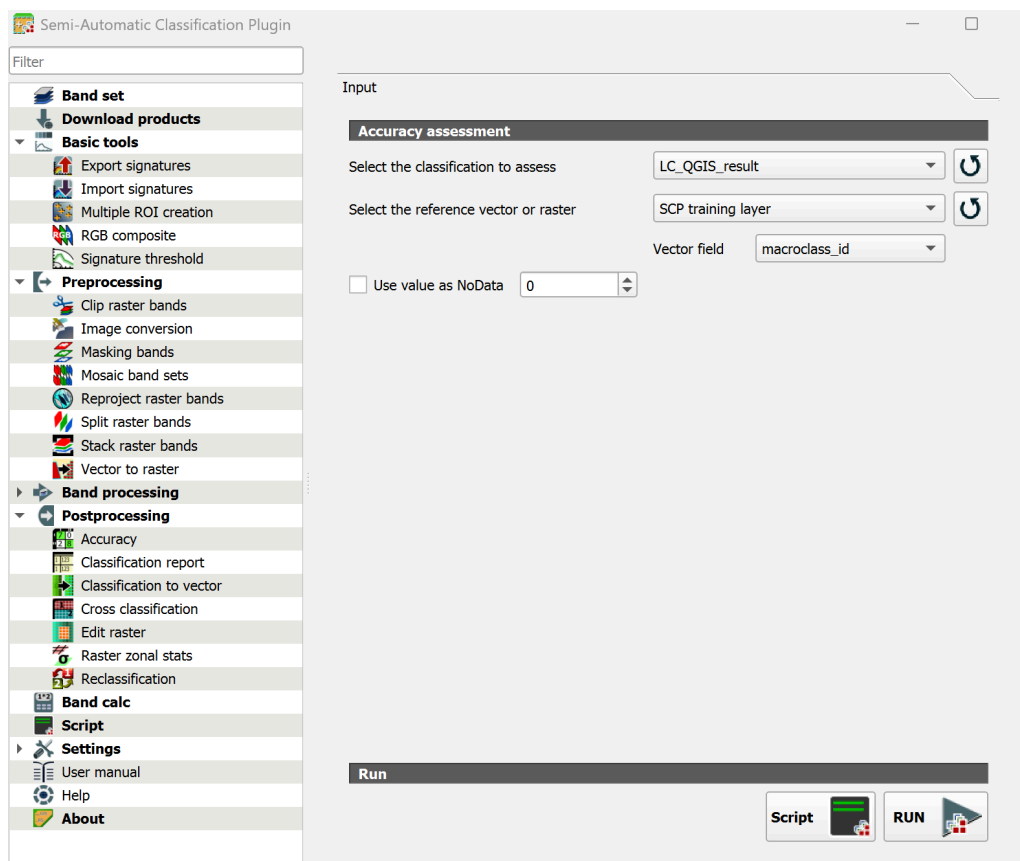


- Now we should add our shapefile. In the Basic Tools tab under Import signatures, select Vector import. Select the correct file path to the ground\_truth shapefile and use the truth\_no attribute for all fields, like so:
- Also, check the box “Calculate Signature” to receive more spectral information

Results in Dock:



- Finally, we can run the Accuracy Assessment under Scp -> Post Processing -> Accuracy. In the classified Raster and your newly created ROI. Set the Attribute field to Macroclass and then run the tool



- SCP will have generated an output table with a Confusion Matrix

Semi-Automatic Classification Plugin

Filter

Band set

Download products

Basic tools

Export signatures

Import signatures

Multiple ROI creation

RGB composite

Signature threshold

Preprocessing

Clip raster bands

Image conversion

Masking bands

Mosaic band sets

Reproject raster bands

Split raster bands

Stack raster bands

Vector to raster

Band processing

Postprocessing

Accuracy

Classification report

Classification to vector

Cross classification

Edit raster

Raster zonal stats

Reclassification

Band calc

Script

Settings

User manual

Help

About

Input

Output

RasterValue	Reference	Classification	PixelSum
1	1	1	9
2	1	2	1
3	2	2	6
4	3	2	1
5	3	3	7

ERROR MATRIX [pixel count]

	> Reference		
V_Classified	1	2	3
1	9	0	0
2	1	6	1
3	0	0	7
Total	10	6	8
PA [%]	80.2368	100.0000	91.2323
UA [%]	100.0000	75.0000	100.0000
Kappa hat	1.0000	0.6589	1.0000

Overall accuracy [%] = 91.0974  
Kappa hat classification = 0.8585

Area unit = degree^2  
SE = standard error  
CI = confidence interval  
PA = producer's accuracy  
UA = user's accuracy