

Defra Darwin Initiative Impacts of Invasive Alien Species

Earth Observation

Charles George

France Gerard



Primary Objective

Use EO to produce a baseline map of habitats and invasive species on the Akrotiri Peninsular, suitable for future monitoring of hydro-ecological change
Identify invasives Acacia, Casuarina



Imagery

Seasonal variations

Temporal dataset

3 April 2018: WorldView-3

6 July 2018: WorldView-2

2m Resolution

	Wavelength
CoastalBlue	427.3
Blue	477.9
Green	546.2
Yellow	607.8
Red	658.8
RedEdge	723.7
NIR1	832.5
NIR2	908



Temporal Data

April - WV-3

CoastalBlue	427.3
Blue	477.9
Green	546.2
Yellow	607.8
Red	658.8
RedEdge	723.7
NIR1	832.5
NIR2	908



July - WV-2

CoastalBlue	425
Blue	480
Green	545
Yellow	605
Red	660
RedEdge	725
NIR1	832.5
NIR2	950

Jul'19	CoastalBlue	425
Jul'19	Blue	480
Jul'19	Green	545
Jul'19	Yellow	605
Jul'19	Red	660
Jul'19	RedEdge	725
Jul'19	NIR1	832.5
Jul'19	NIR2	950
Apr'19	CoastalBlue	427.3
Apr'20	Blue	477.9
Apr'21	Green	546.2
Apr'22	Yellow	607.8
Apr'23	Red	658.8
Apr'24	RedEdge	723.7
Apr'25	NIR1	832.5
Apr'26	NIR2	908

Combined April and July imagery into one dataset used for classification

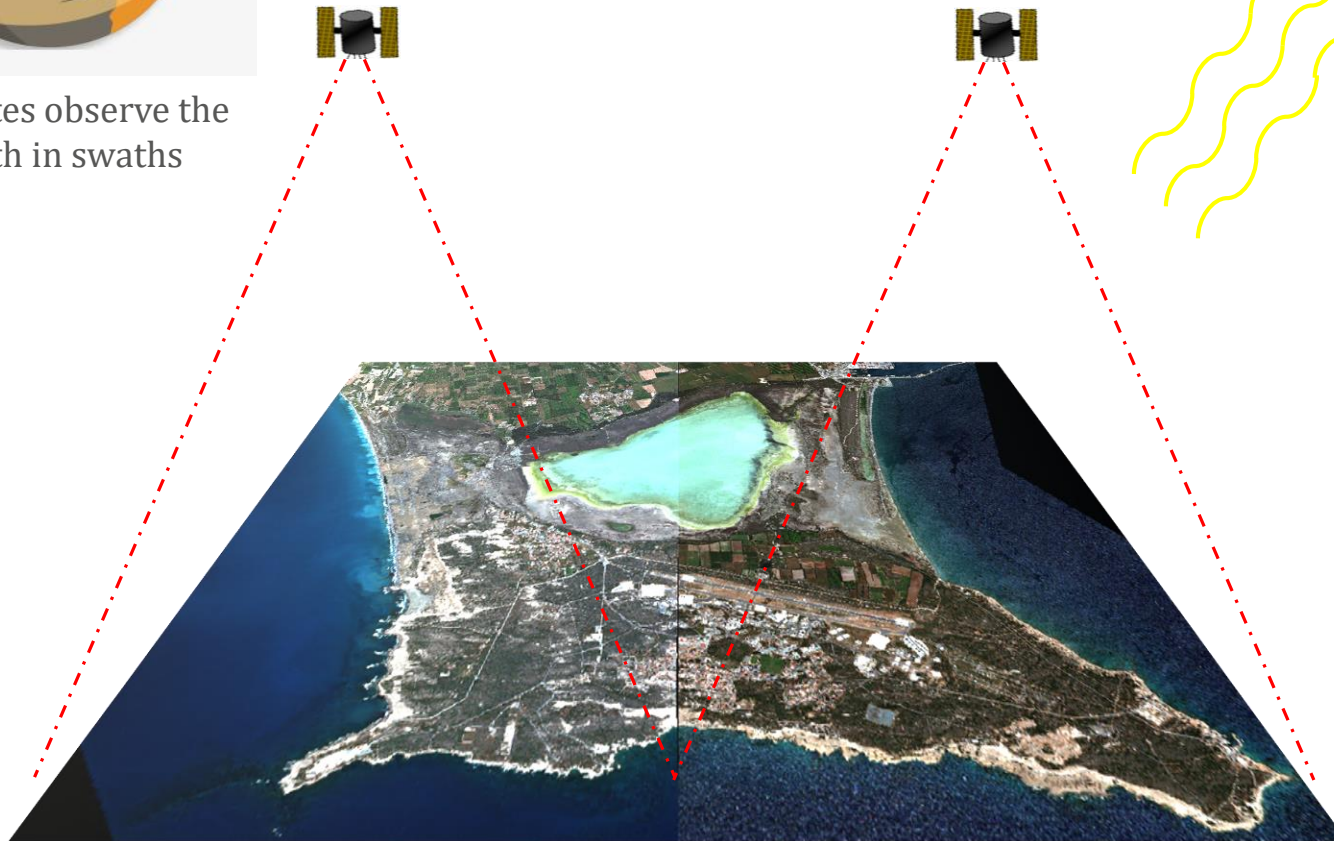
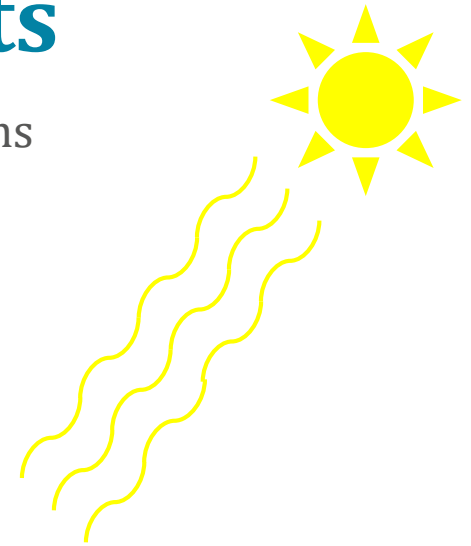
View Angle Effects



Satellites observe the earth in swaths

April imagery was made of two swaths

- Needed classifying separately



Looking into the sun Looking away from the sun

WV-3 swath width ~13km

Training/Validation Data

1st Field campaign

- 1st week in July '19
- 2.5 days
- FG & CG with Oliver Pescott
- Familiarisation and vegetation recording
- Lost majority of the data due to technical problem

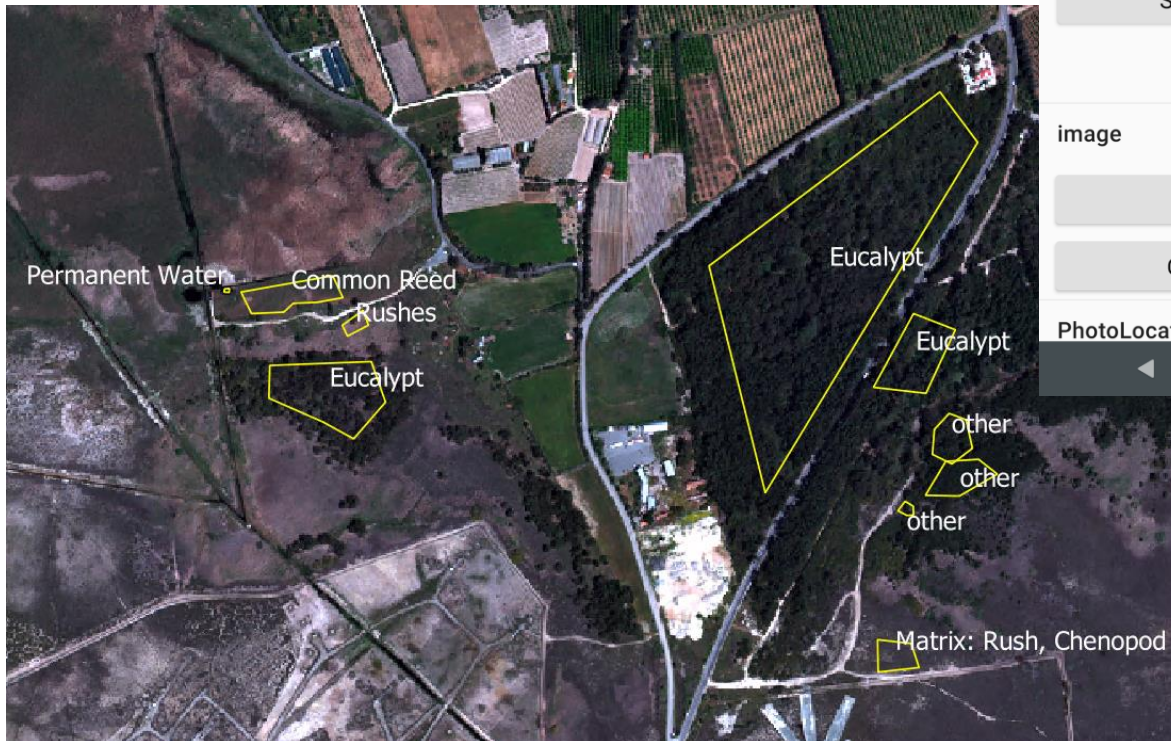
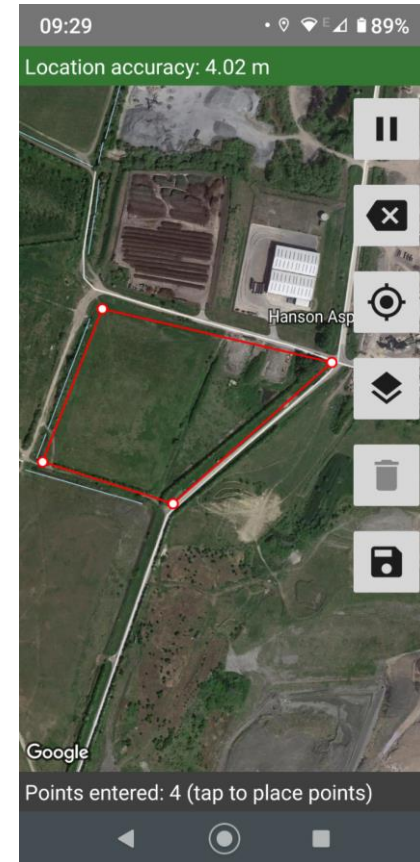
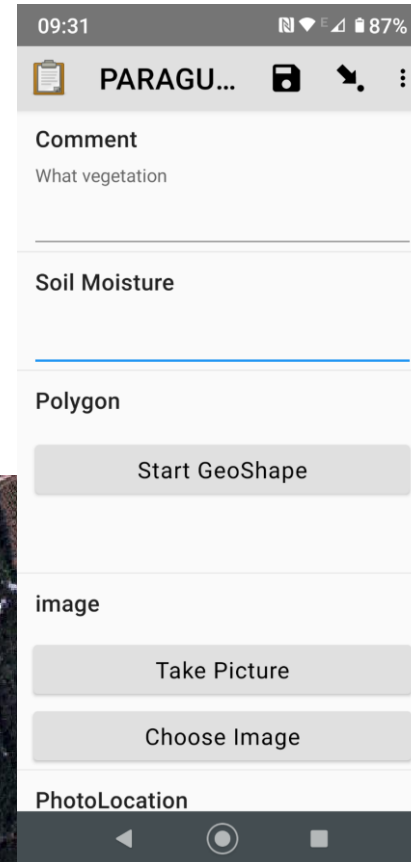
2nd Field campaign

- Planned for April '20
- More comprehensive areal coverage
- Fly drone over mixed woodland to separate out Acacia & Casuarina
- COVID-19!!!

Training/Validation Data

ODK – open data kit

- Open source – lots of resources online
- Easy to tailor your own applications
- Construct shapefiles
- Take Photos
- Have your own basemap
- Polygons good for training data
- Points good for validation



Training Data



Had to use other sources

- Non-native plant species dataset archived on EIDC

But not great coverage

Not all species covered

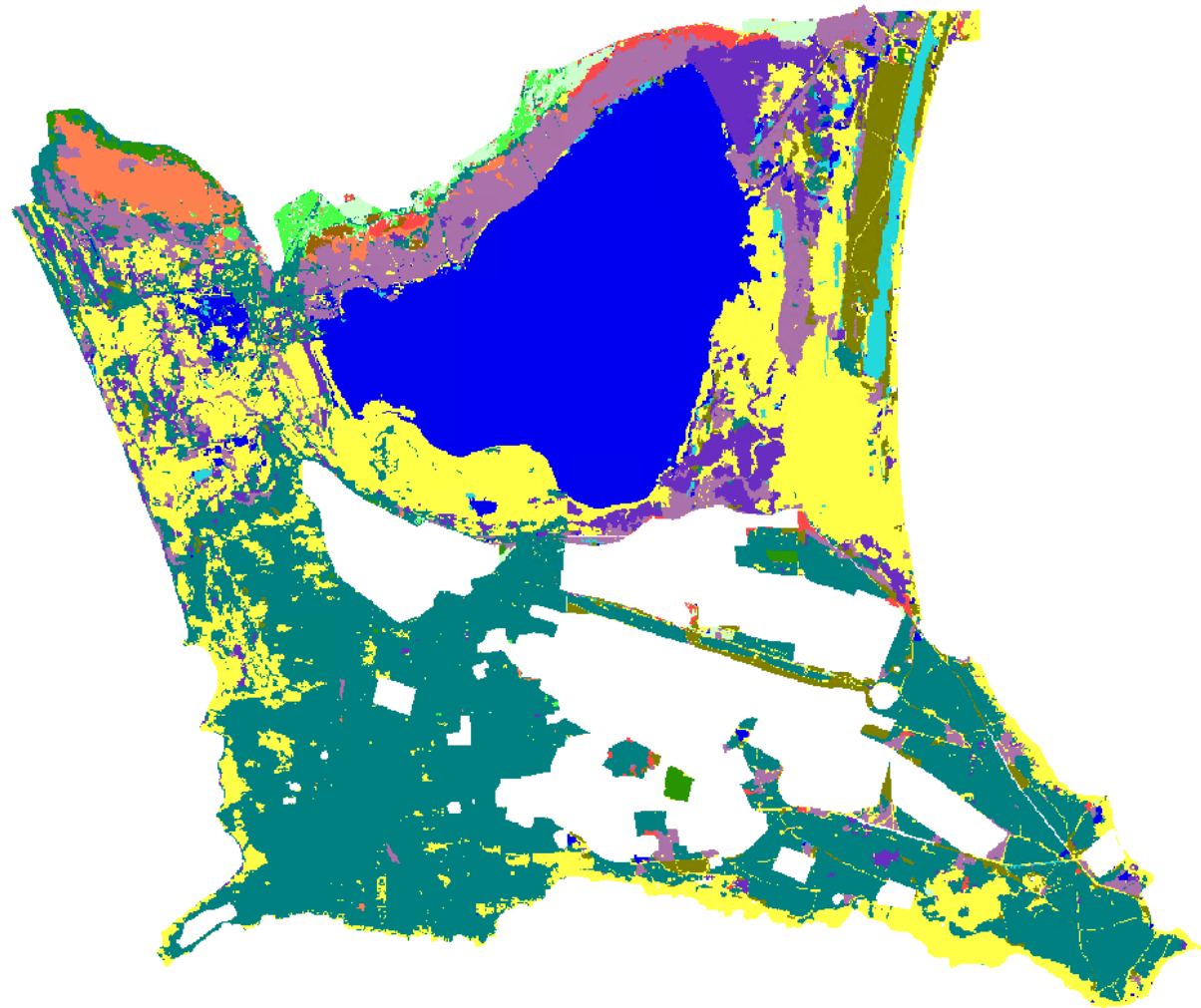
Training involved some 'guesstimating'

Classification

Areas such as:

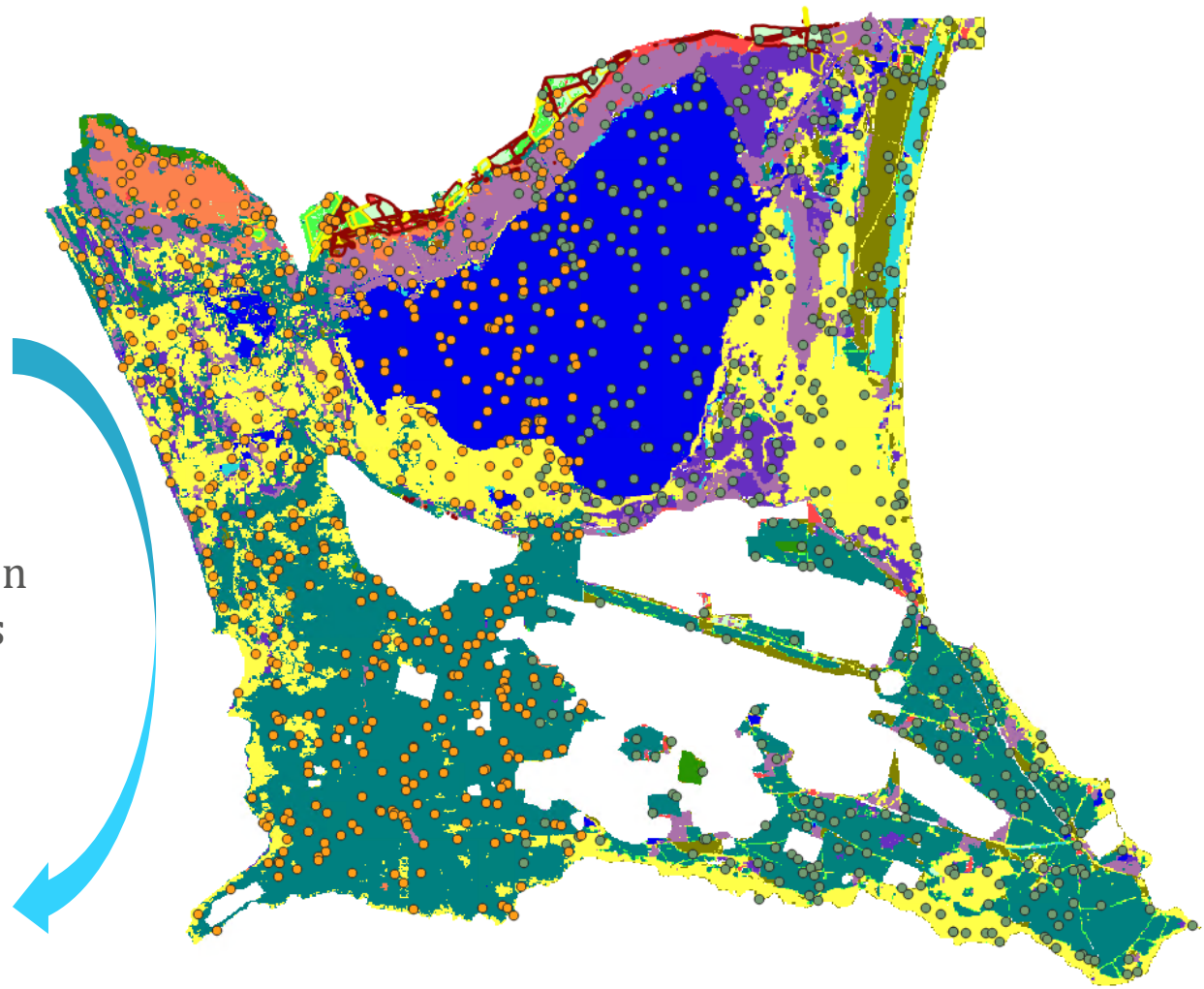
- Sea
- urban/built up fabric
- Arable

were masked out



Validation

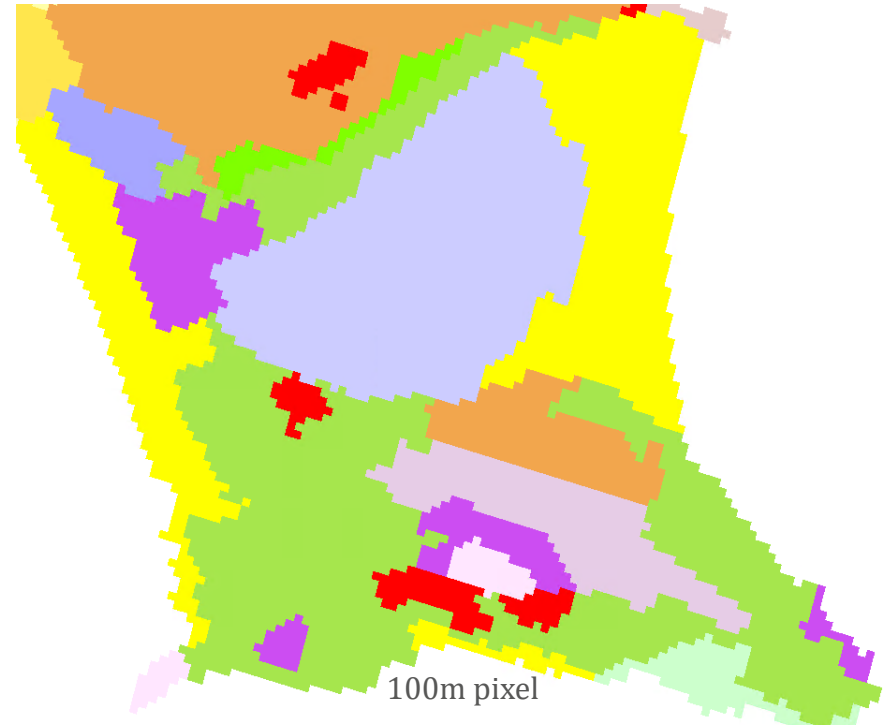
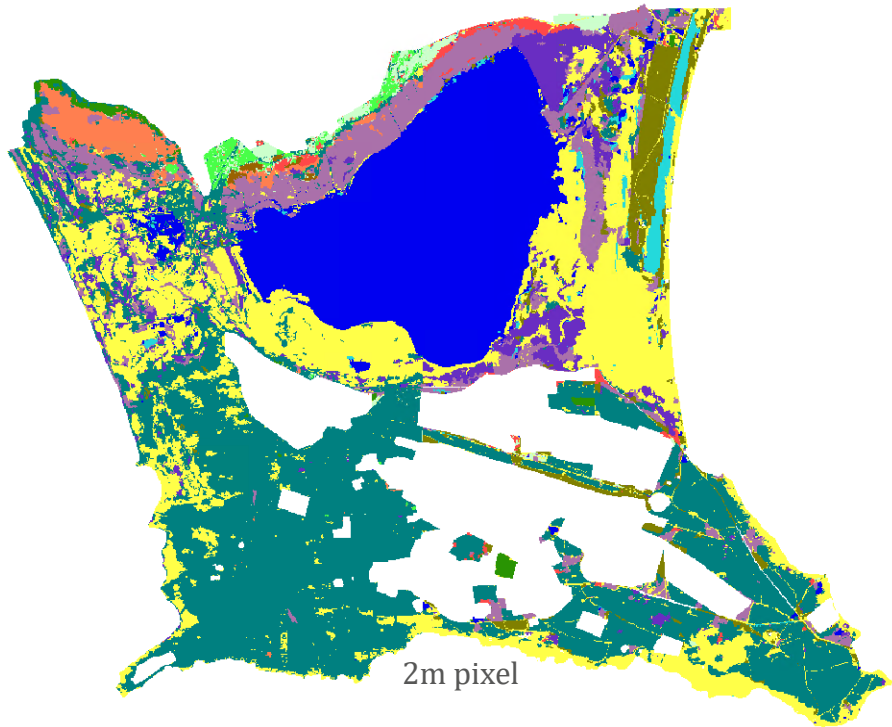
- Ongoing – finish by end March
- Random locations stratified by class
- Independent - Oliver Pescott Botanist
- Note for each point what the landcover is **without** reference to the classification
- Compared to classification to give accuracy statistics



Shapefile Attribute Table

ID	EASTING	NORTHING	Val_class
1	0	500948	3833541
2	1	500176	3833493
3	2	499684	3833467
4	3	499426	3833443
5	4	501248	3833437
6	5	499800	3833431
7	6	499808	3833385
8	7	499176	3833371

Comparison with CORINE



- | | | | |
|---|-----------------|---|------------------|
|  | Salt Lake |  | Garrigue |
|  | Eucalyptus |  | Grass |
|  | Mixed Woodland |  | Saltmarsh |
|  | Acacia |  | Rush Salt Meadow |
|  | Bare |  | Common Reed |
|  | Temporary water |  | Casuarina |
|  | Sparse Veg | | |

- | | |
|---|--------------------------------------|
|  | 2 Discontinuous urban fabric |
|  | 3 Industrial or commercial units |
|  | 6 Airports |
|  | 11 Sport and leisure facilities |
|  | 16 Fruit trees and berry plantations |
|  | 23 Broad-leaved forest |
|  | 28 Sclerophyllous vegetation |
|  | 30 Beaches |
|  | 32 Sparsely vegetated areas |
|  | 37 Salt marshes |

Other Outputs

Classification Tutorials

- 6 Sessions
- Open source QGIS software
- Basics of RS, leading to classification of Akrotiri Peninsular using Sentinel-2 data.

Technology work note

- Mapping habitats using drone technology
- Practical guidance to setting up and flying a drone campaign for environmental monitoring

Questions/Discussion?

