Neural network models in NMD

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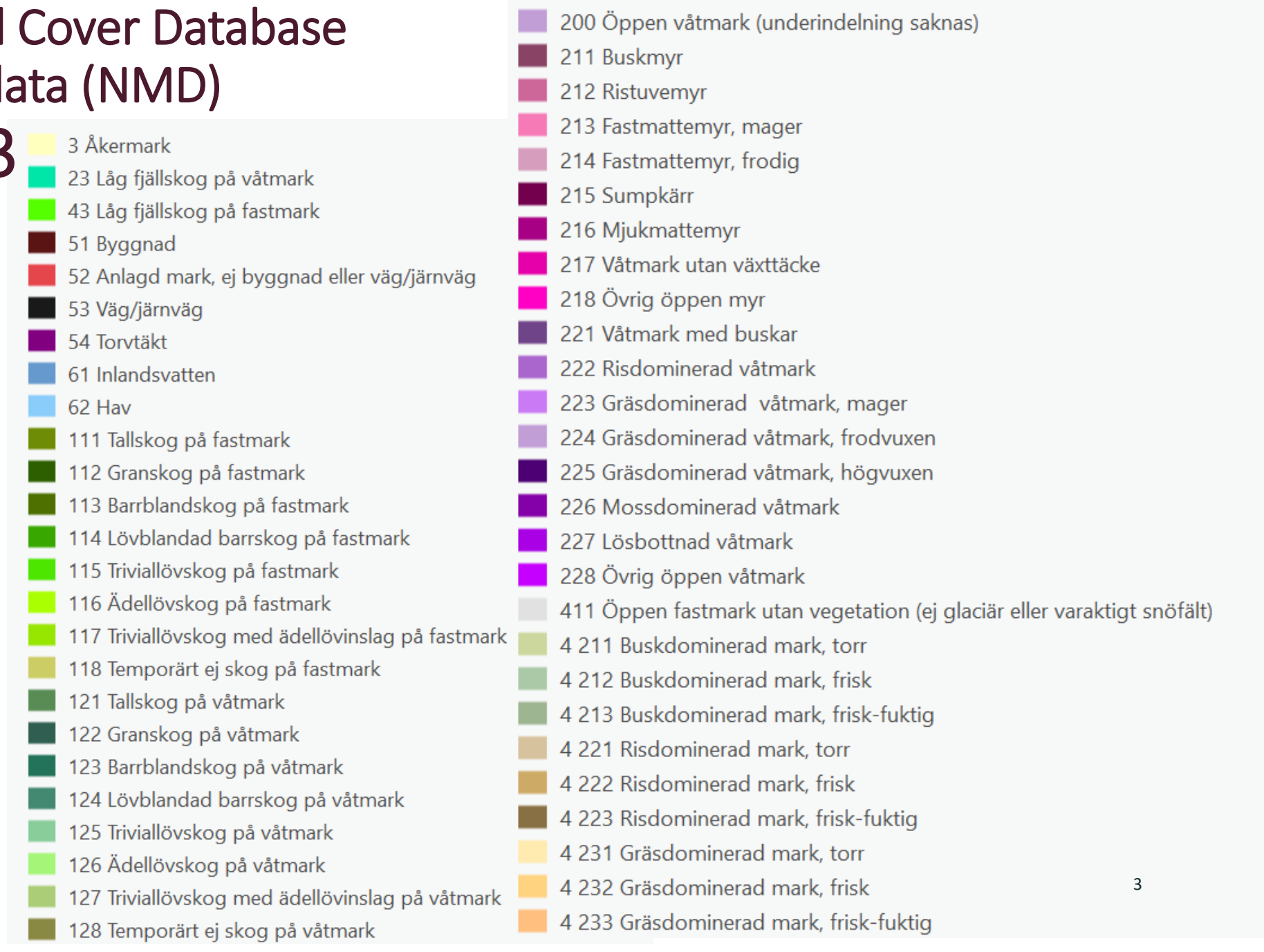
Swedish National Land Cover Database
Nationella marktäckedata (NMD)
Version 1.1 2018

- 25 classes in the base layer.
- 10 x 10 meter resolution.
- Commissioned by the Swedish Environmental Protection Agency produced by Metria.

2 Öppen våtmark
3 Åkermark
41 Övrig öppen mark utan vegetation
42 Övrig öppen mark med vegetation
51 Exploaterad mark, byggnad
52 Exploaterad mark, ej byggnad eller väg
53 Exploaterad mark, väg
61 Sjö och vattendrag
62 Hav
111 Tallskog (utanför våtmark)
112 Granskog (utanför våtmark)
113 Barrblandskog (utanför våtmark)
114 Lövblandad barrskog (utanför våtmark)
115 Triviallövskog (utanför våtmark)
116 Ädellövskog (utanför våtmark)
117 Triviallövskog med ädellövinslag (utanför våtmark)
118 Temporärt ej skog (utanför våtmark)
121 Tallskog (på våtmark)
122 Granskog (på våtmark)
123 Barrblandskog (på våtmark)
124 Lövblandad barrskog (på våtmark)
125 Triviallövskog (på våtmark)
126 Ädellövskog (på våtmark)
127 Triviallövskog med ädellövinslag (på våtmark)
128 Temporärt ej skog (på våtmark)
255 Moln/Oklassat

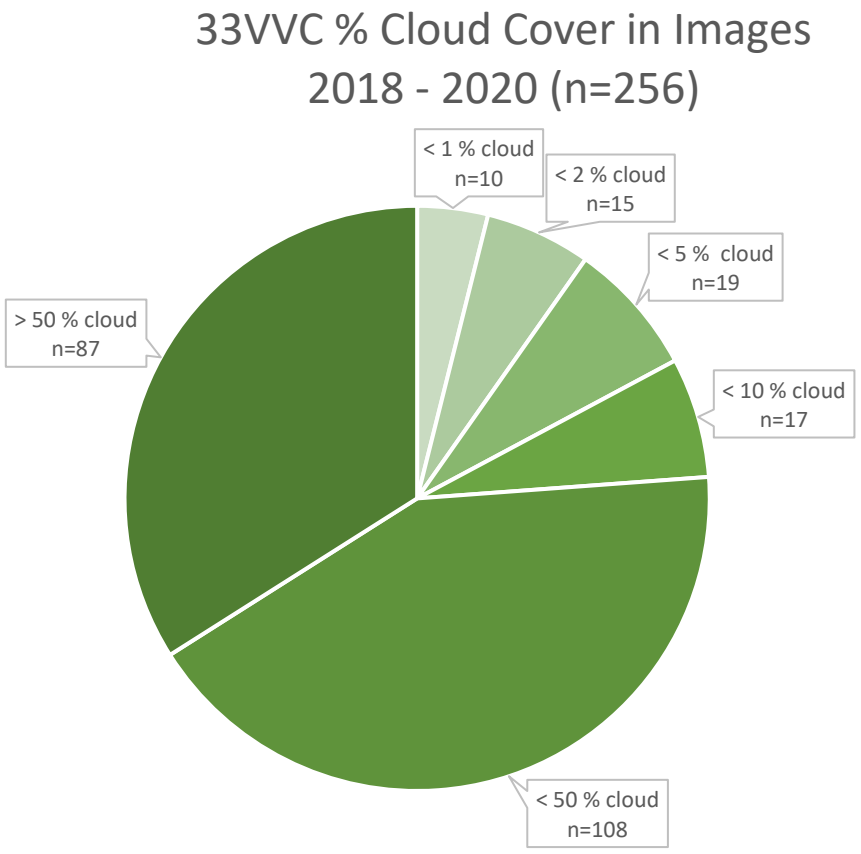
Swedish National Land Cover Database
Nationella marktäckedata (NMD)
Version 2.0 2023

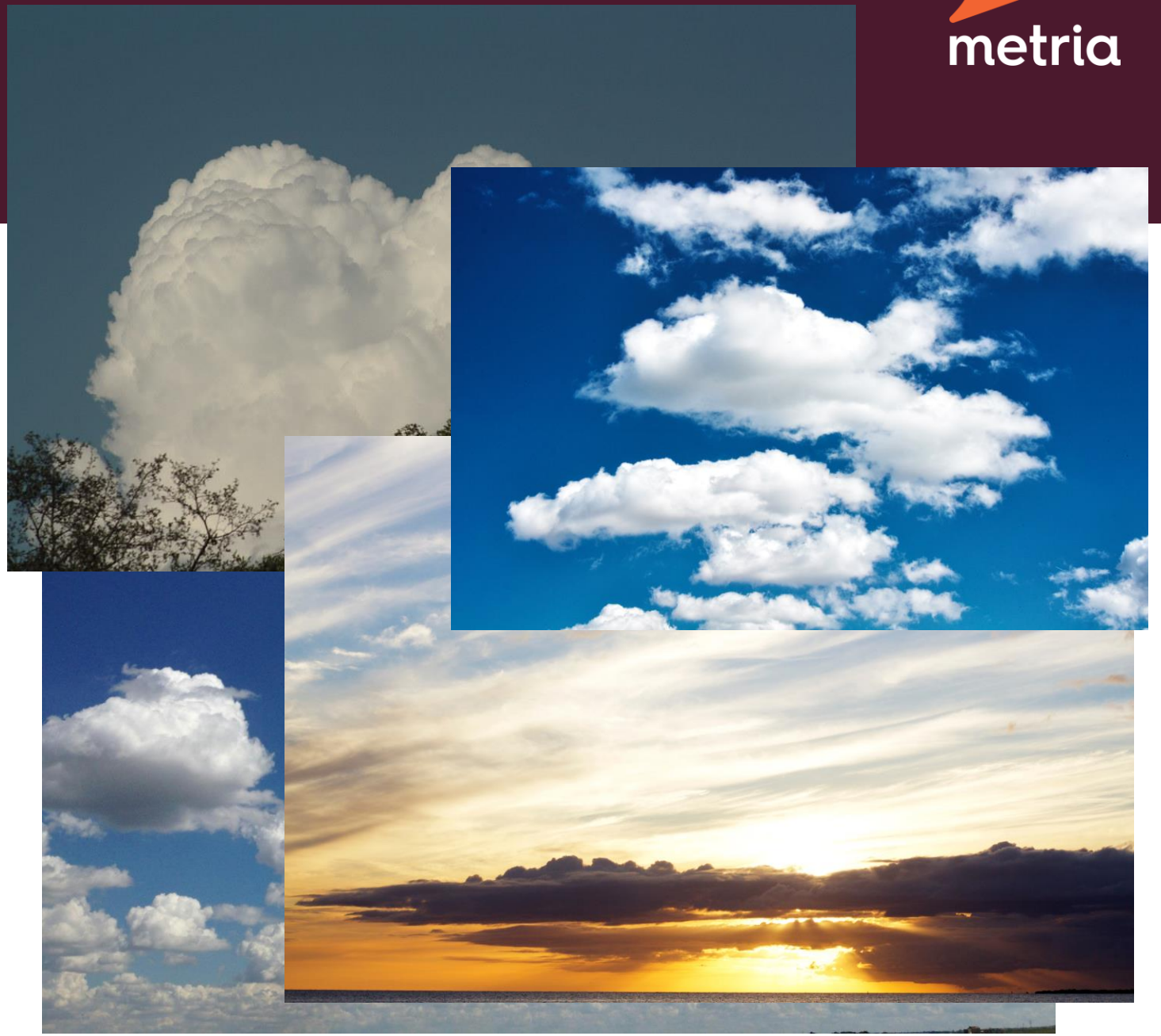
52 classes in the base layer



CLOUDS

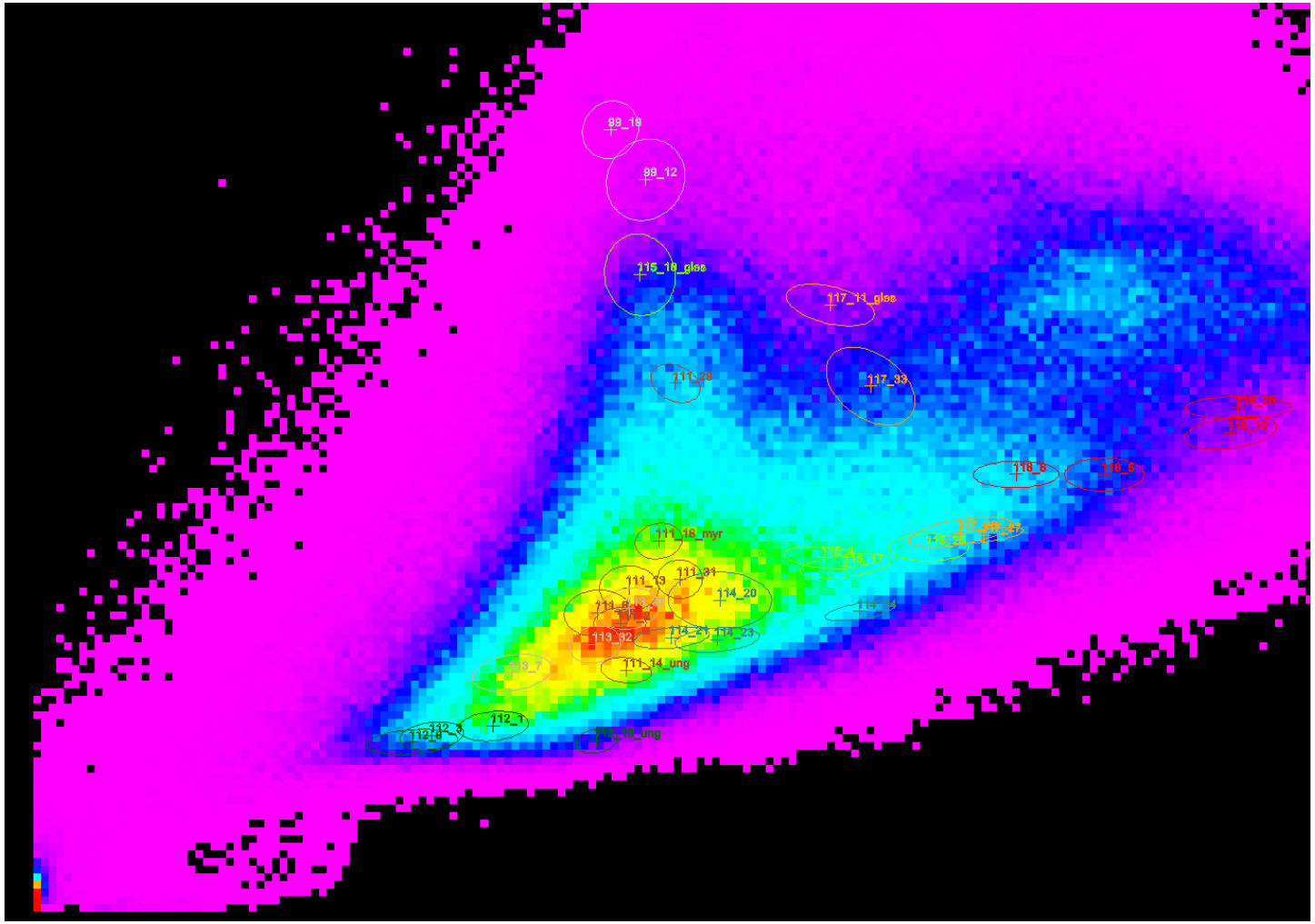
Clouds


33VVC % Cloud Cover in Images
2018 - 2020 (n=256)
< 1 % cloud
n=10
< 2 % cloud
n=15
< 5 % cloud
n=19
< 10 % cloud
n=17
< 50 % cloud
n=108
> 50 % cloud
n=87

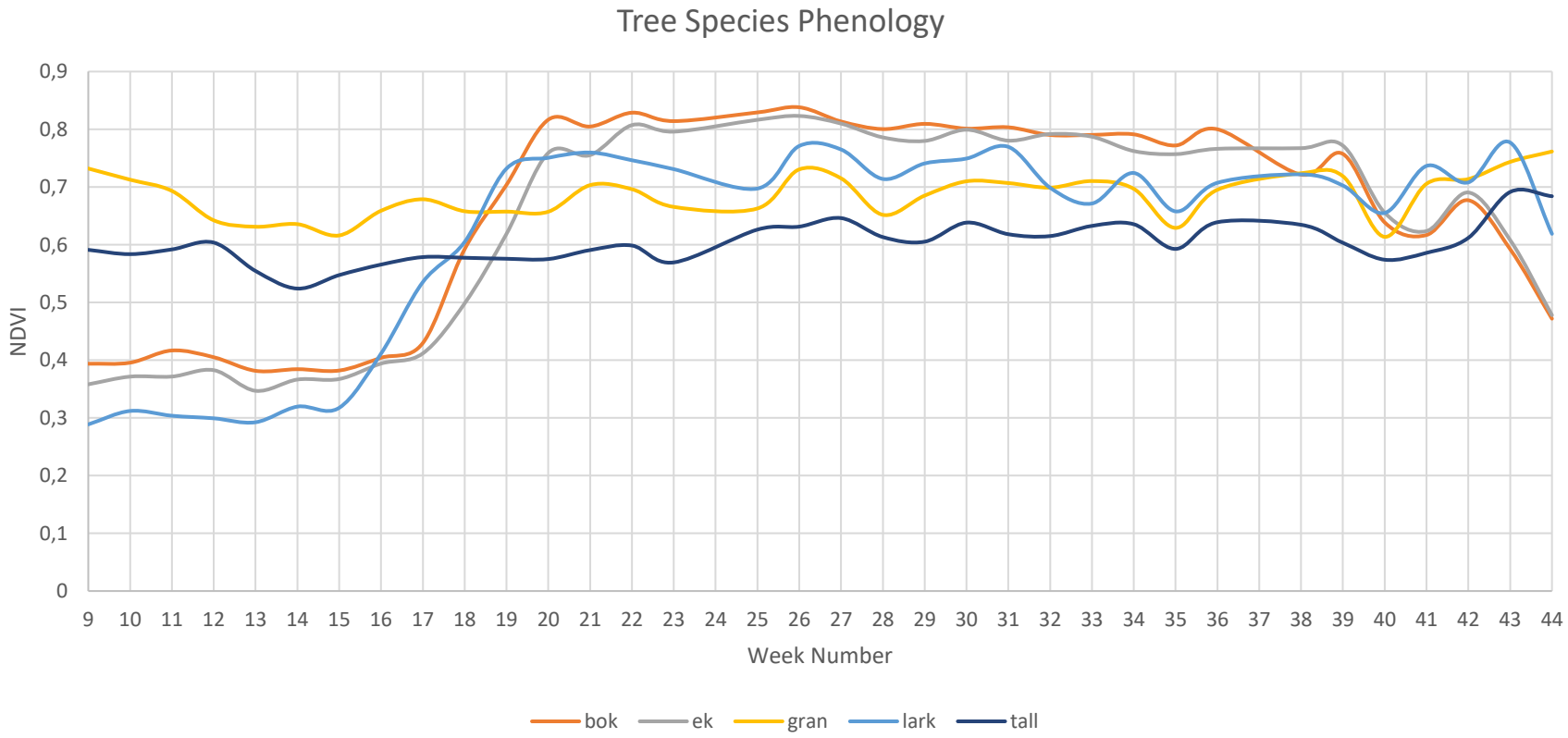


TREE SPECIES CLASSIFICATION

Previous method for forest classification – maximum likelihood, feature space, NMD 2018



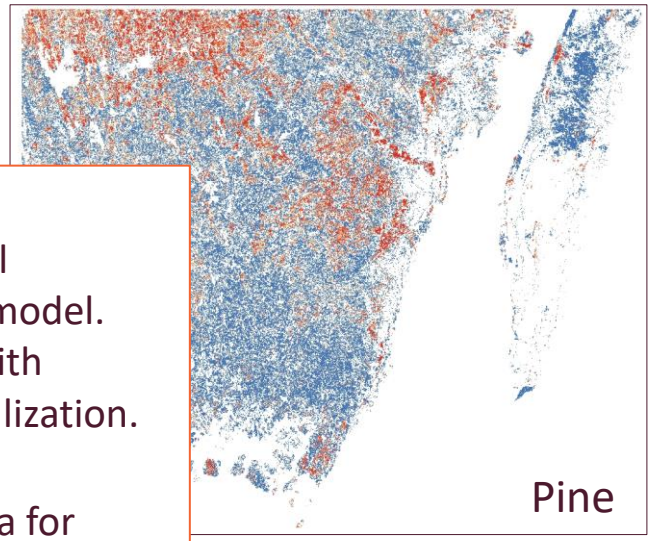
Time-Series Classification

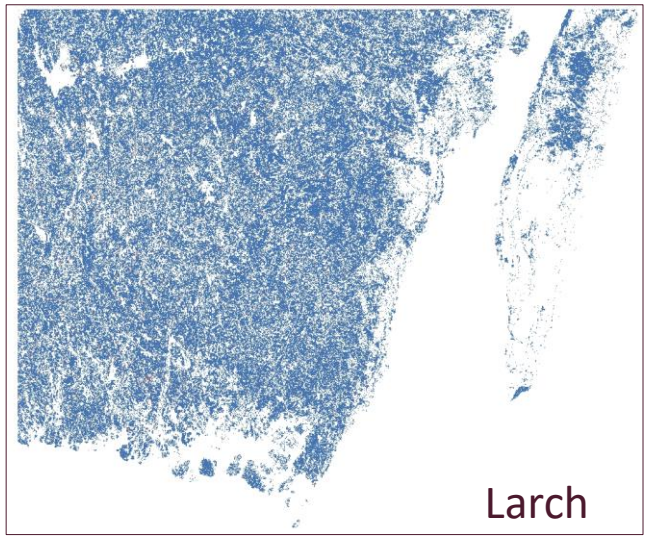


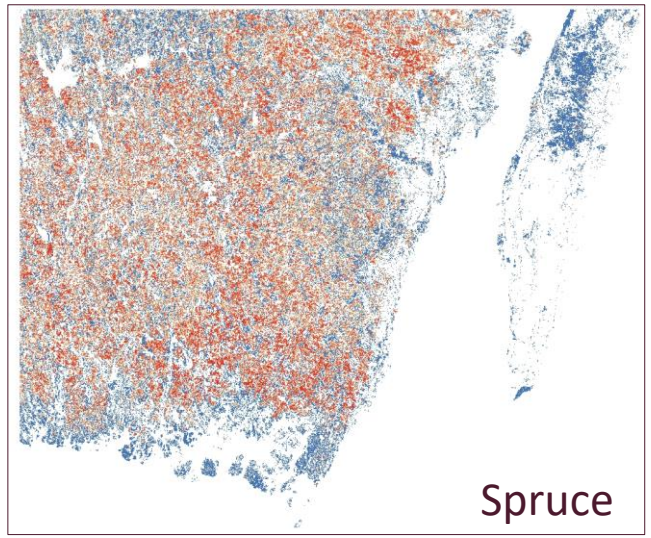
Continuous tree species layers

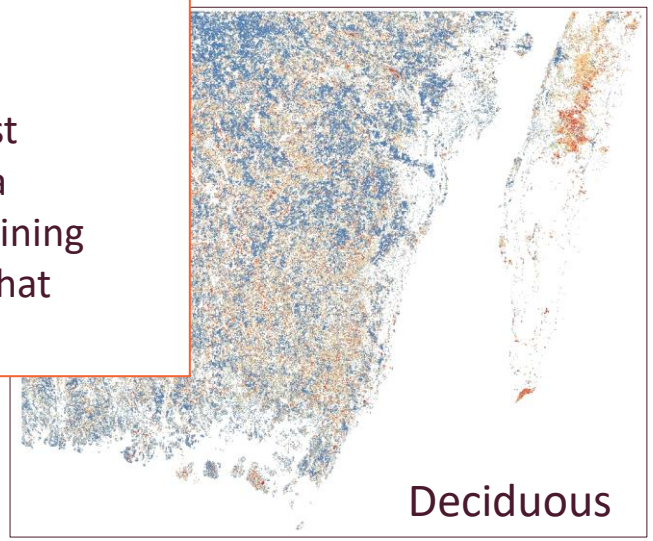
0-100 % cover

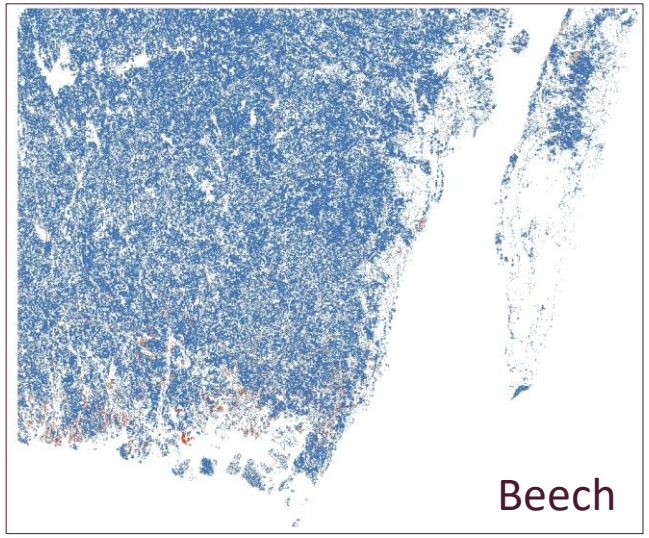
- Model:
  - LSTM per pixel classification model.
  - Base model with granule specialization.
- Input data:
  - Sentinel-2 data for three years.
- Reference data:
  - National Forest Inventory data
  - NMD 2018 training areas (somewhat modified)

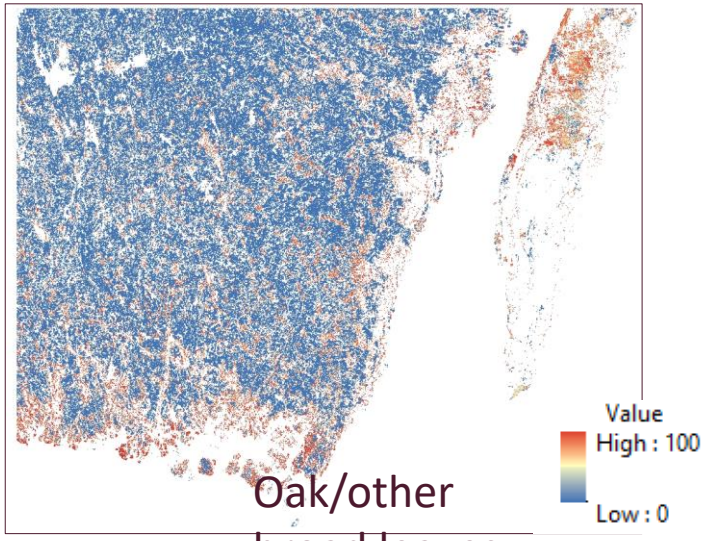




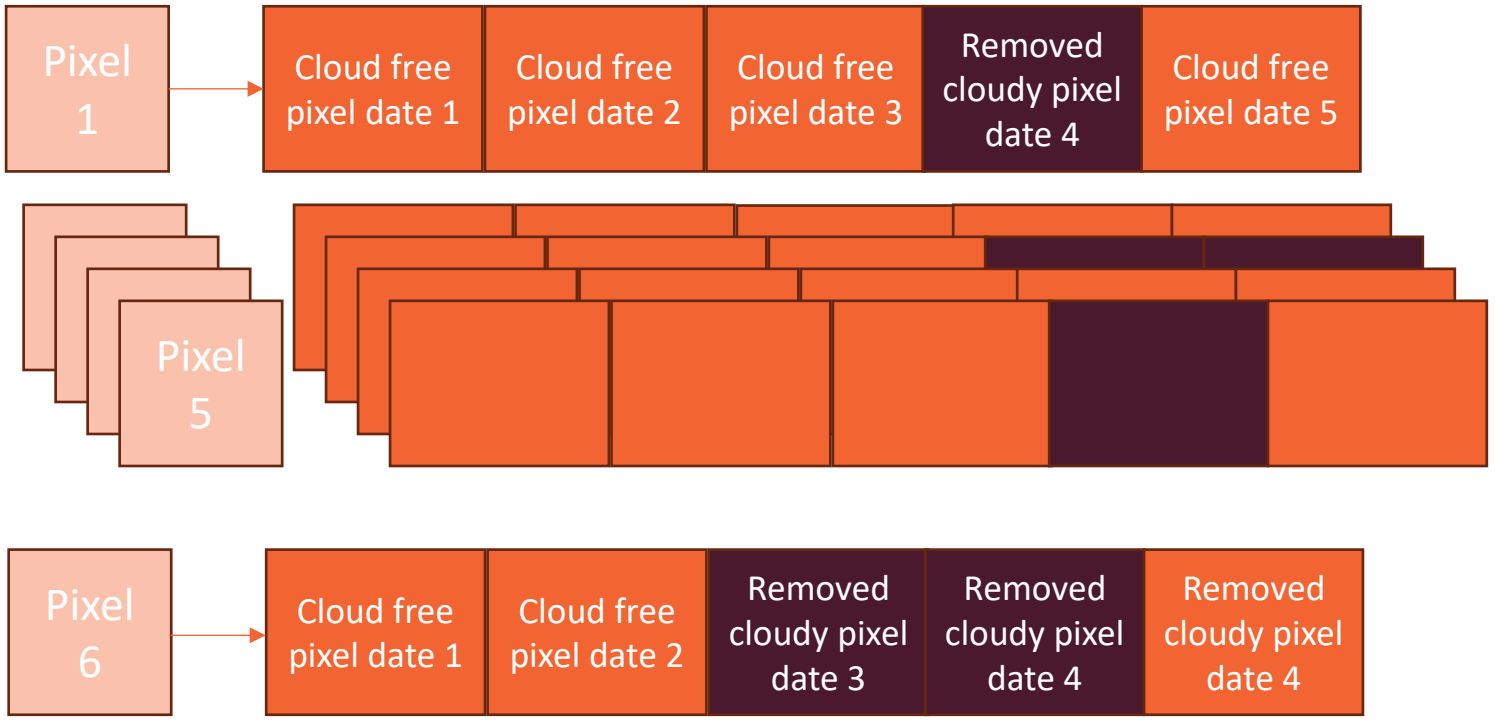






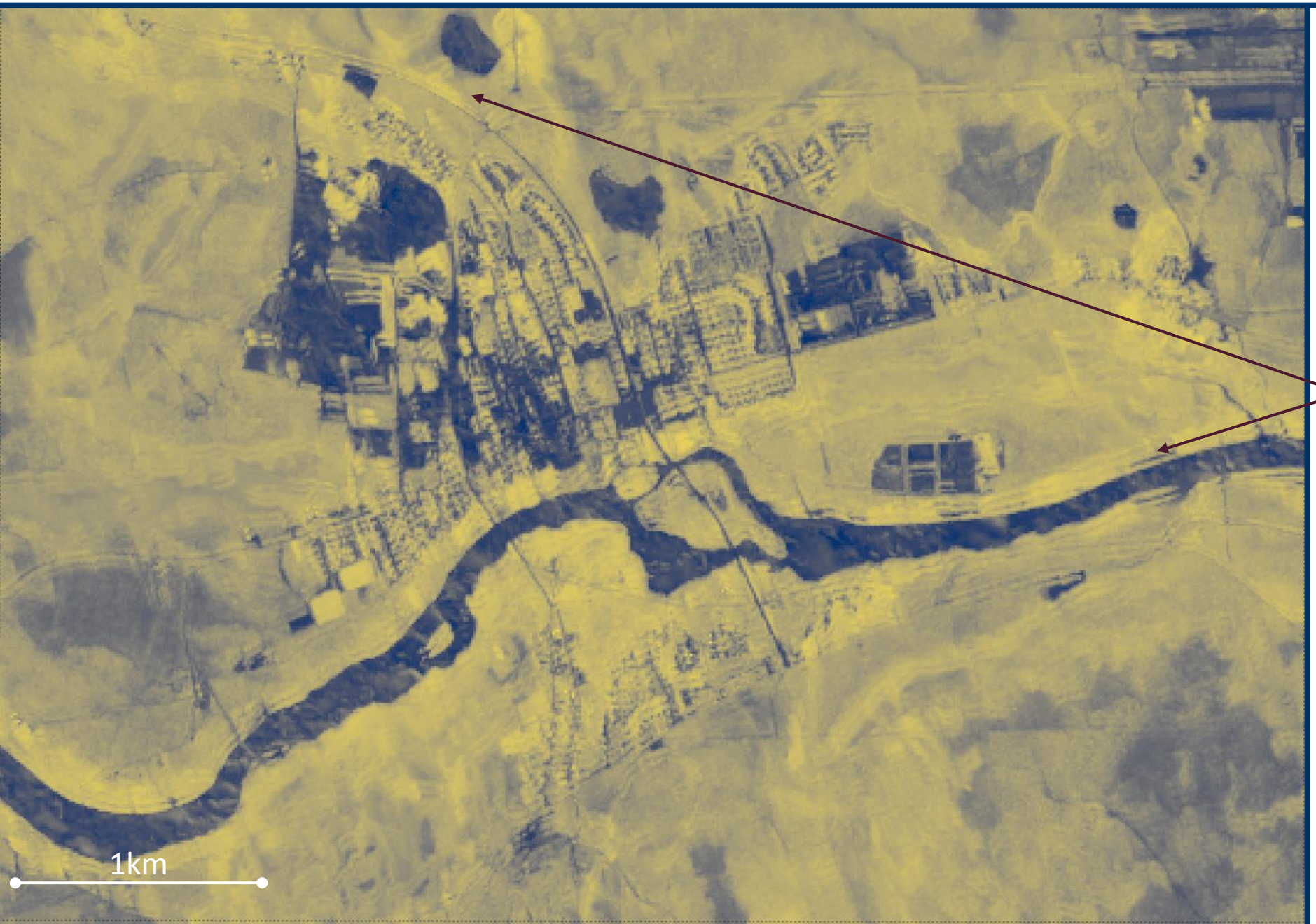


Different length cloud free Sentinel-2 timeseries per pixel



- Enough data will still be available for the timeseries to behave in a similar way, even if individual dates have been removed.
- Heavy dependence on the cloud mask.

Sentinel-2 Geometry



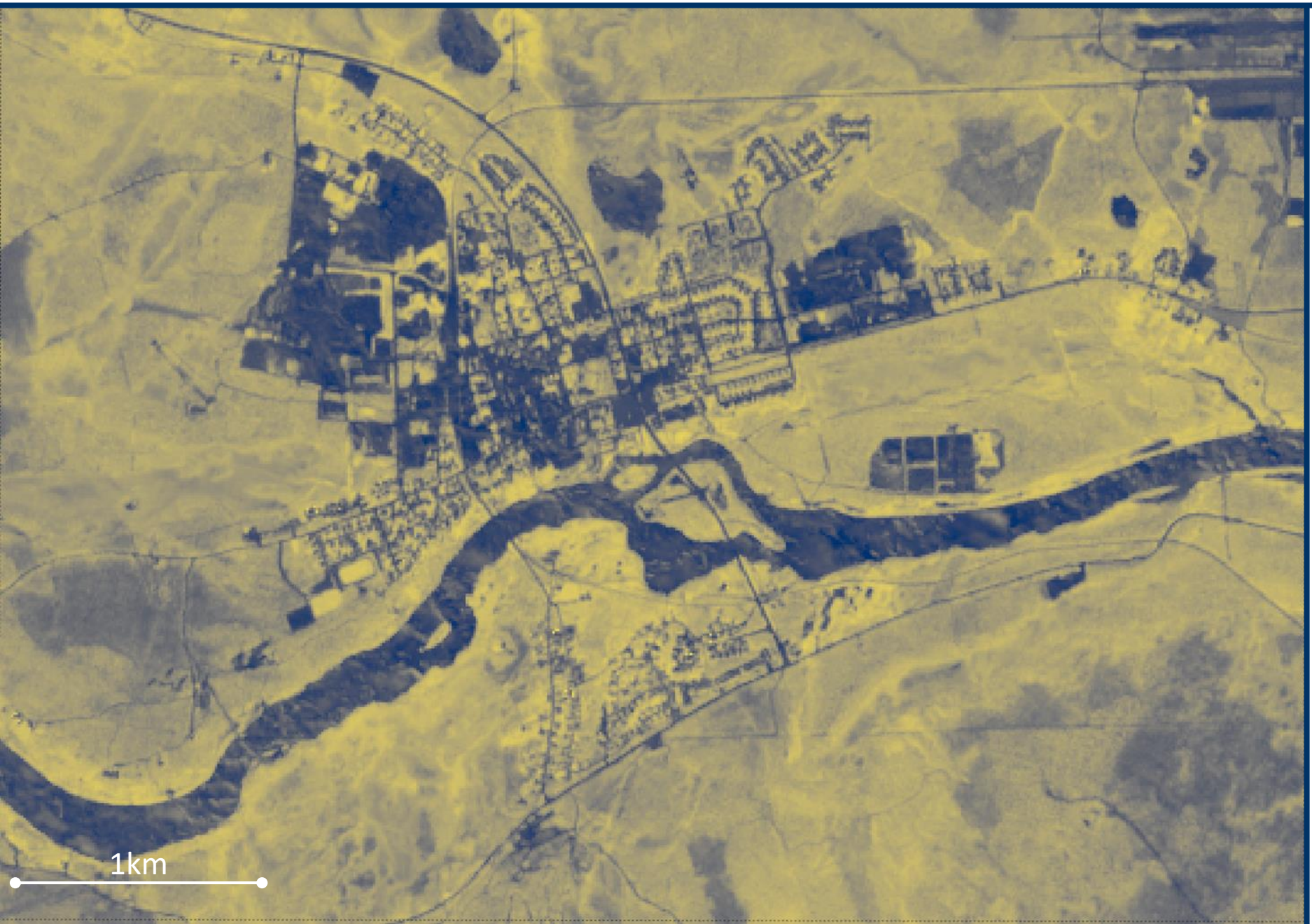
33VVJ, 2016
Max NDVI composite image

Without extra geometric correction

Visible ”goast objects”

Max NDVI
0.9
0.0

Sentinel-2 Geometri



33VVJ, 2016
Max NDVI composite image

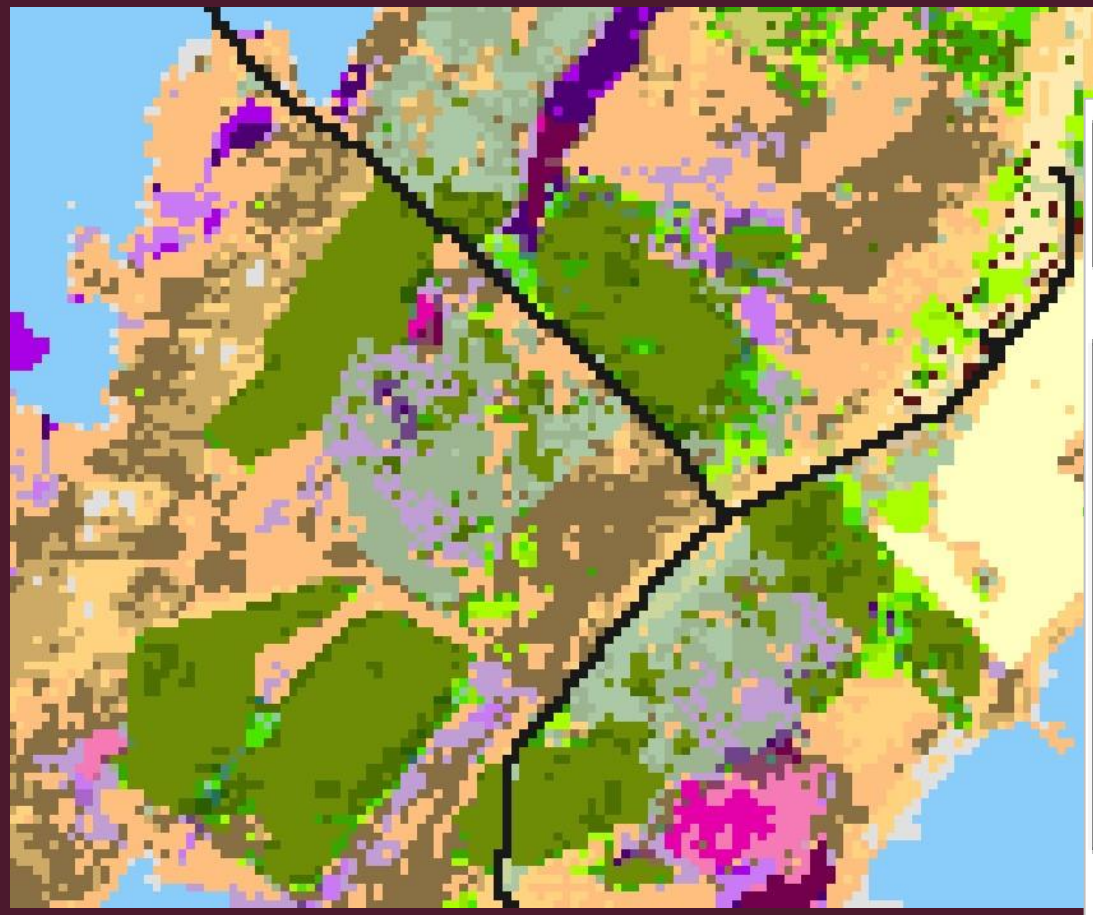
Geometric correction is based on simply measuring geometric error against e.g. road data and exclude images below our quality treshold.

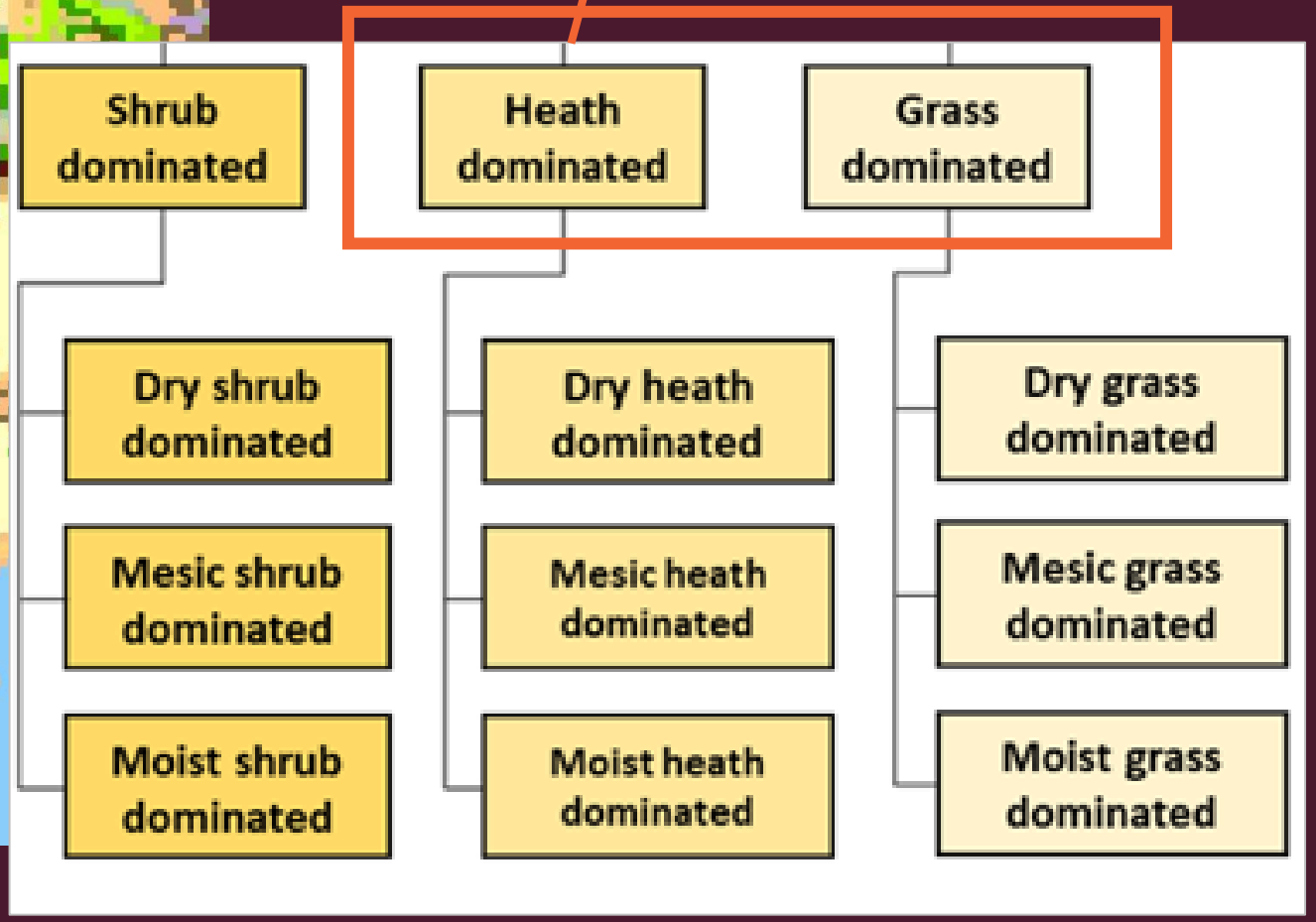
Max NDVI
0.9
0.0

OPEN LAND WITH VEGETATION

Open land with vegetation

Separated with neural network model





Neural networks for separating heath and grass

Model:

- Simple shallow neural network for, per pixel, multiclass classification.

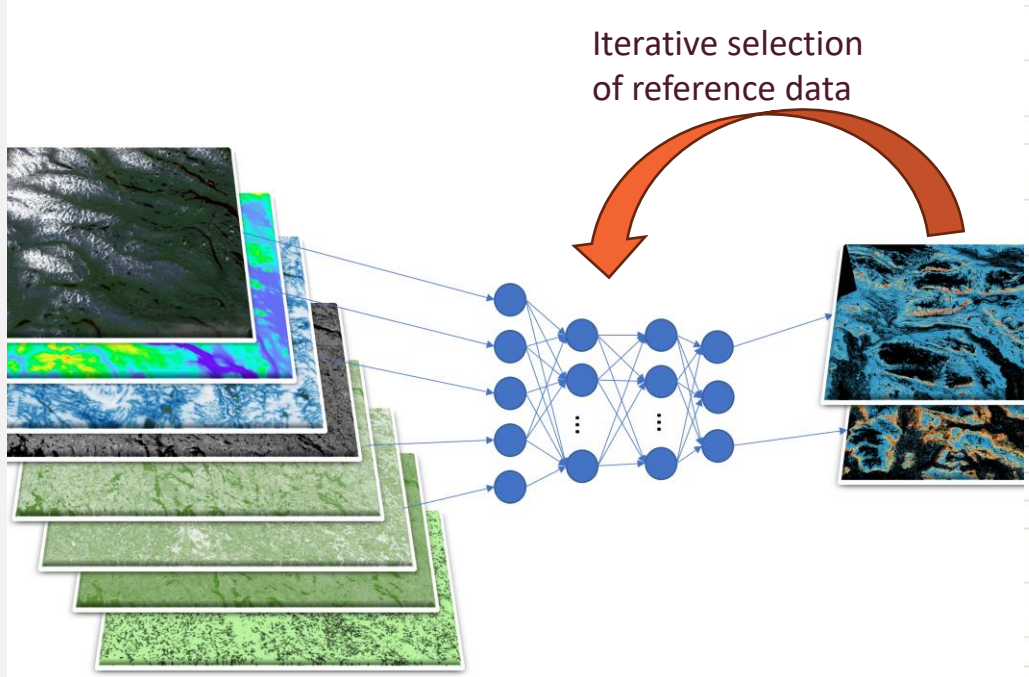
Indata for prediction:

- Max-NDVI:
  - Monthly, three years
  - Yearly, three years
- Laser data metrics (relative and terrain).
- Soil moisture index.

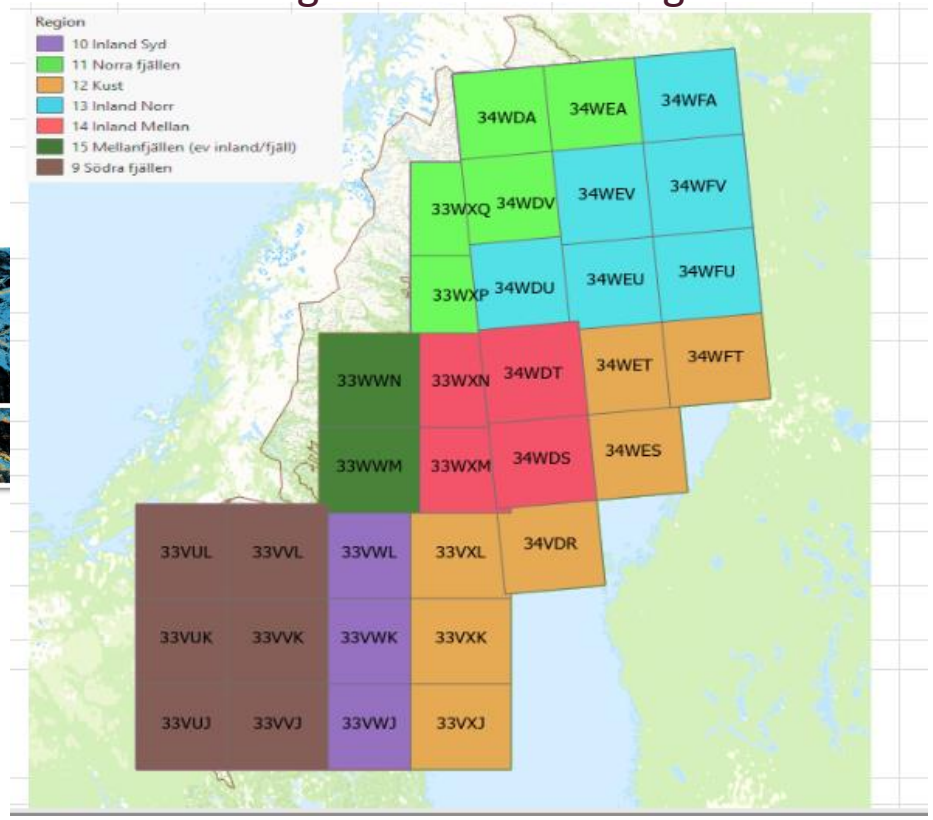
In total 36 features

Reference data:

- Manually collected areas using aerial photo interpretation, supported by various data sources, such as data from the Swedish Board of Agriculture.
- In total over 3000 areas (120 000 pixels) all over Sweden.



Region wise modelling



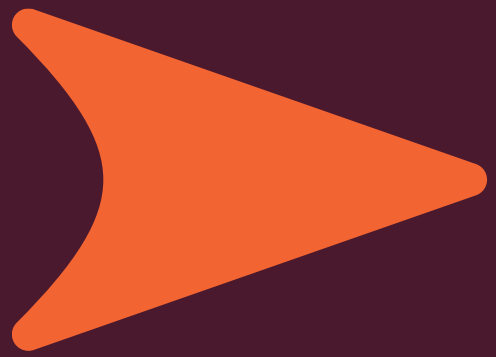
Shrub and moisture classes were separated during postprocessing based on threshold values applied to bush cover and the soil moisture index.

Status

- Entering the final phases of NMD 2023 production.
- Continuous validation is being carried out by SLU.
  - Tree species classification is partly evaluated against the National Forest Inventory and through aerial photo interpretation of randomized sample plots.
  - Open land classes are validated using aerial photo interpretation in randomized sample plots.
  - Tree species classification can be benchmarked against the previous NMD version and shows significant improvement.
  - Open land with vegetation generally shows good classification quality.

Sidfot

metria



metria

a Spir Company