

Copernicus HRL-WAW for monitoring agricultural landscapes and identifying and monitoring wetlands in Norway

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High Resolution Layer: Water & Wetness (WAW)

Spatial resolution
10 x 10 m

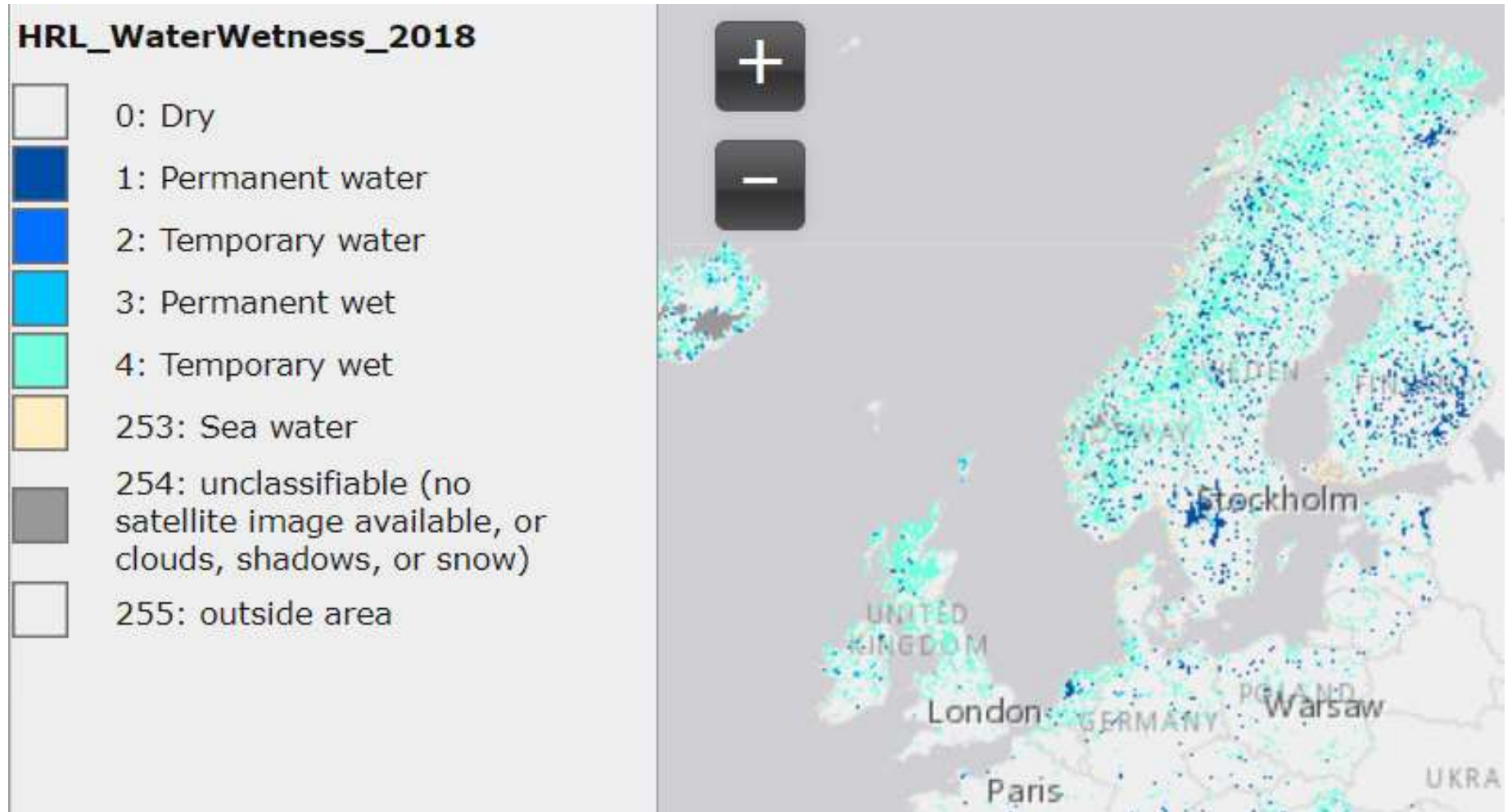
Reference year
2018 (2012-2018)

Input

- Sentinel-2
- Sentinel-1
- ...

Production

- NDWI
- Soil moisture
- ...



Assess the **potential** and **accuracy** of HRL-WAW
for monitoring agricultural landscapes and identifying
and monitoring wetlands in Norway

Agricultural monitoring program	(3Q)
Area Frame Survey	(AR18x18)
Topographic map	(N50 water)



Aim: to explore the potential of HRL-WAW to support monitoring of agricultural landscapes in Norway

- Building/infrastructure
- Abandonment
- New cultivation
- Production type
- Declining number of farms
- Structural changes
- Policy
- Climate
- Monitor to control whether agri-environmental goals are met

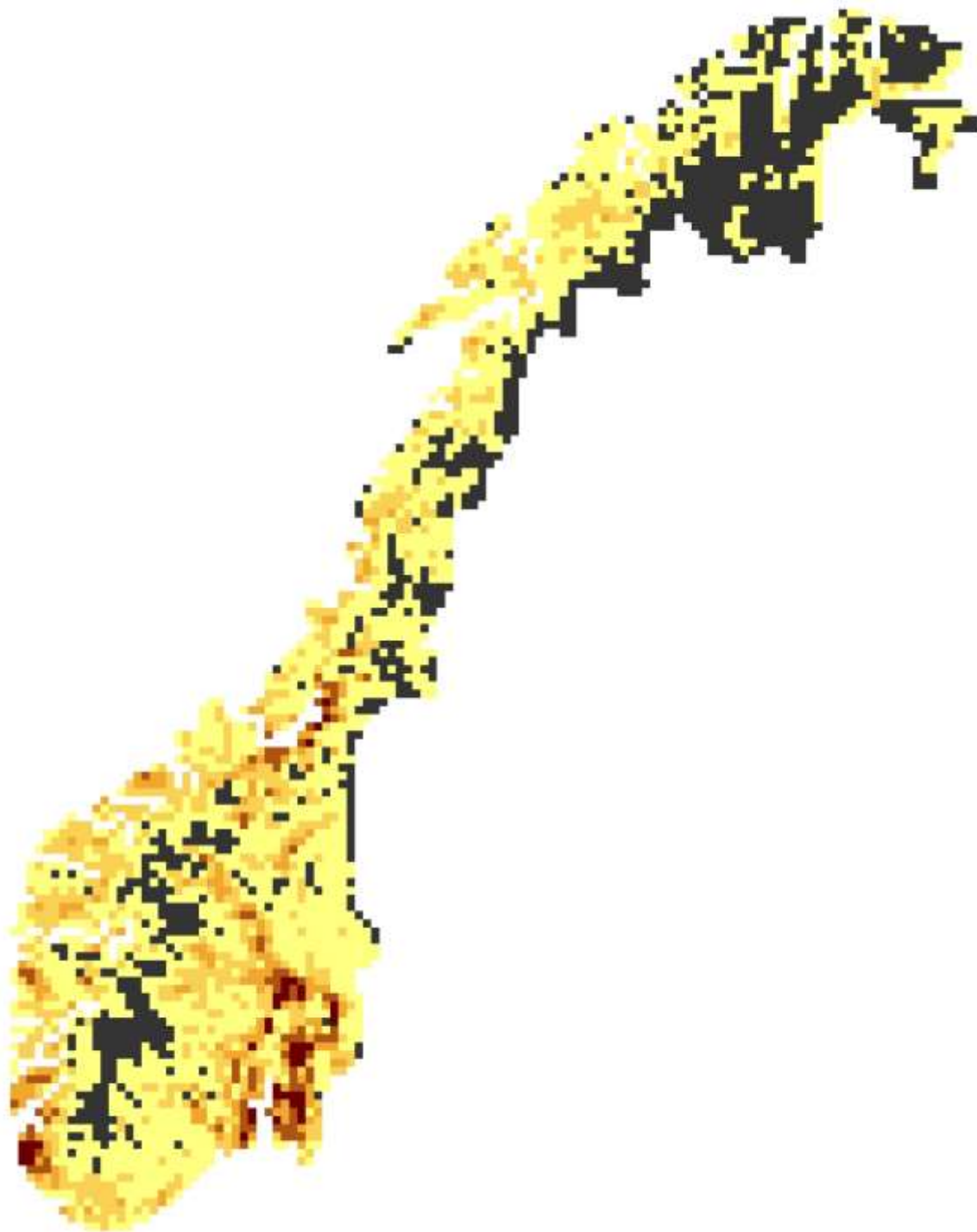
Agriculture in Norway

- 3.5 % agricultural land
 - 1 million hectare

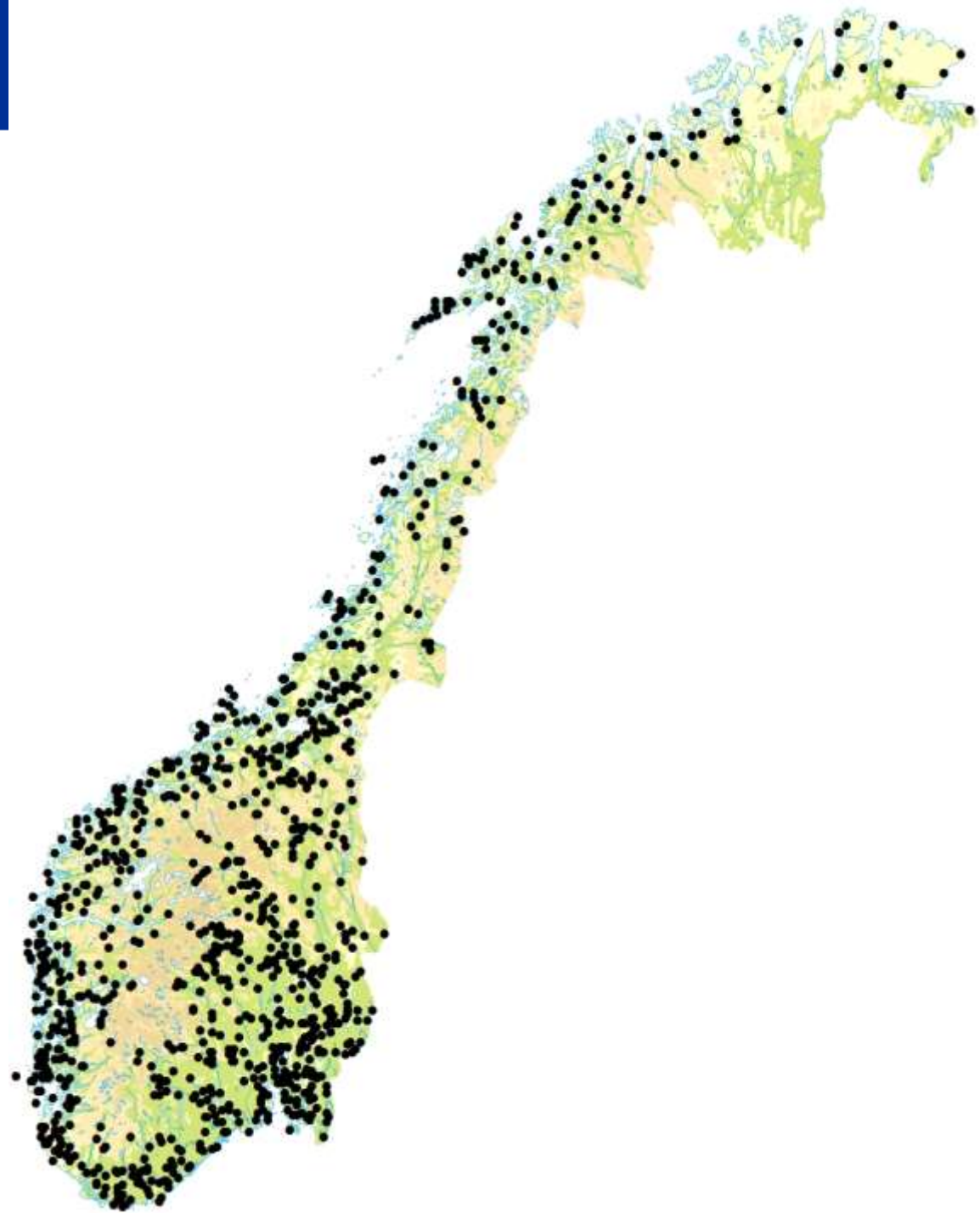


Agriculture in Norway

- 3.5 % agricultural land
 - 1 million hectare



- Statistical sampling survey
- 1 x 1 km monitoring squares
- N = ca. 1 000
- 5 years interval
- Record present state and monitor changes in Norwegian agricultural landscapes





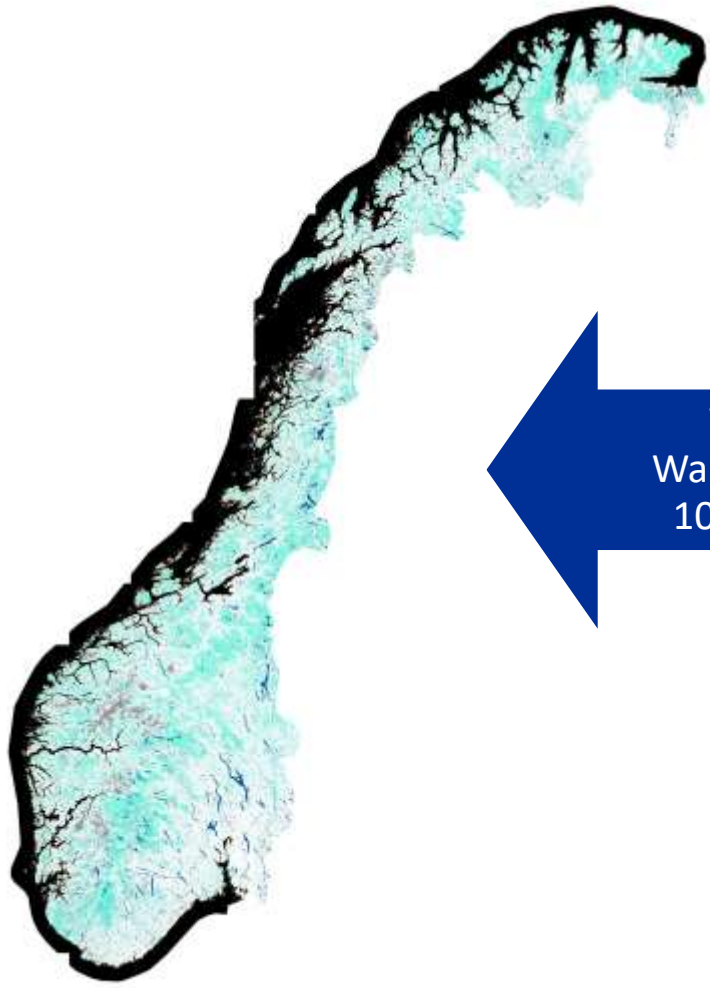
Streams and ditches



	Change
Østfold/Akershus	1.6 %
Oppland/Buskerud	0.2 %
Vestfold/Telemark	1.2 %
Rogaland	2.3 %
Vestlandet	0 %
Troms	1.0 %

Photo: O. Puschmann (NIBIO)

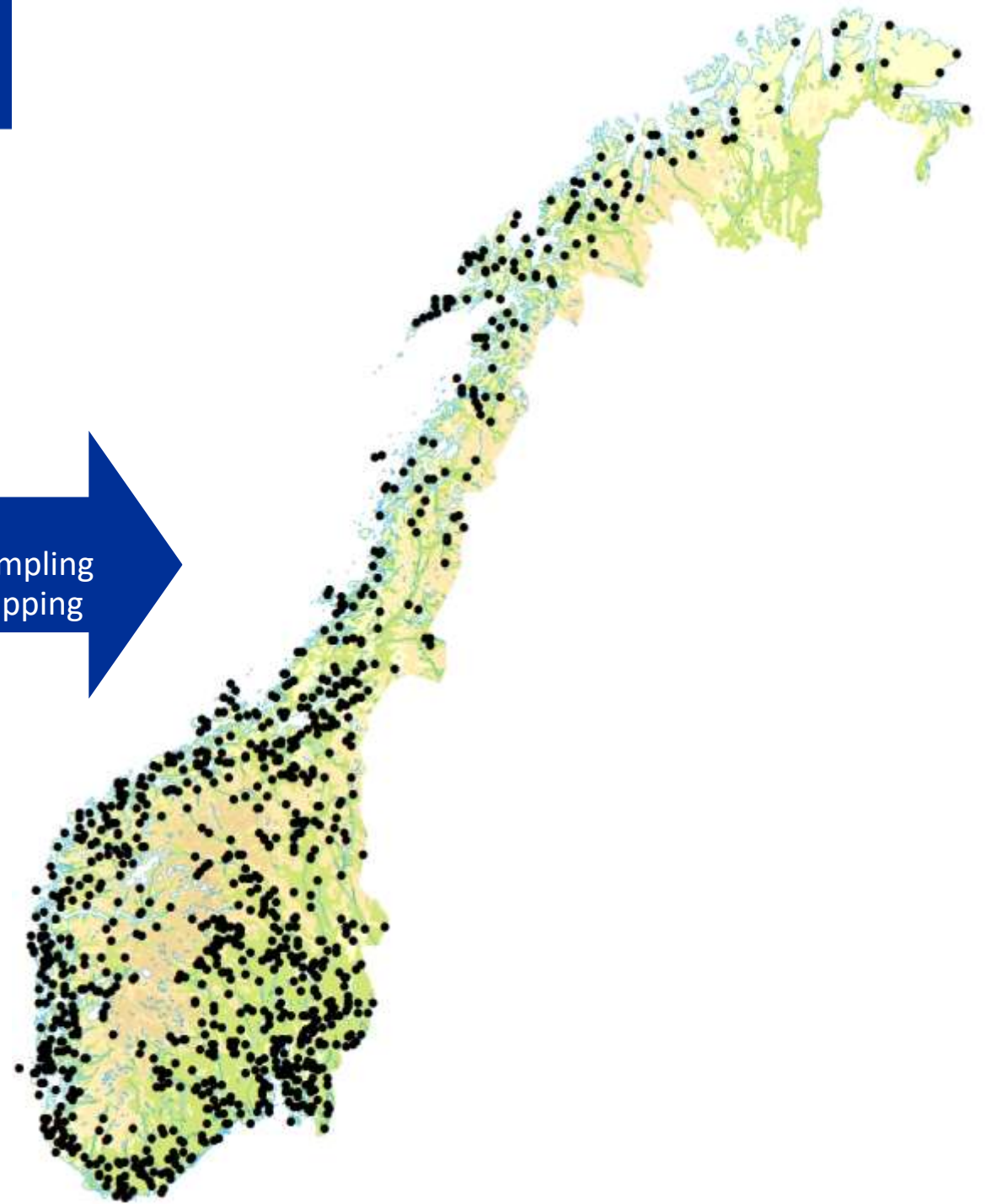
Compare WAW and 3Q



0 100 200 km

WAW
Wall-to-wall
10 x 10 m

3Q
Statistical sampling
Detailed mapping



Thematic accuracy

Classes

- Permanent water
- Temporary water
- Permanent wet
- Temporary wet

Land types

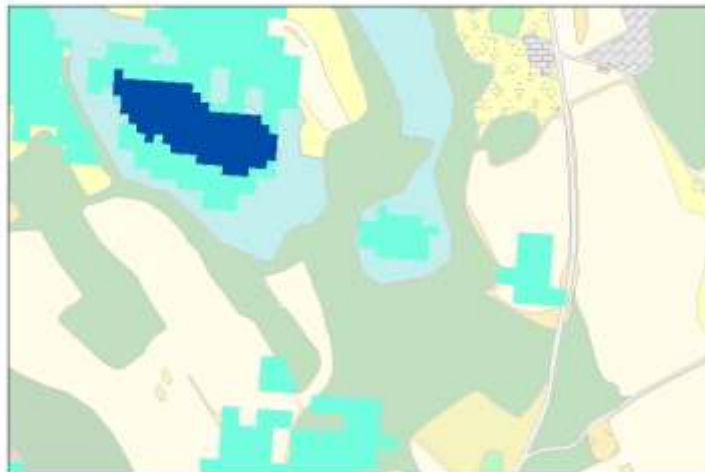
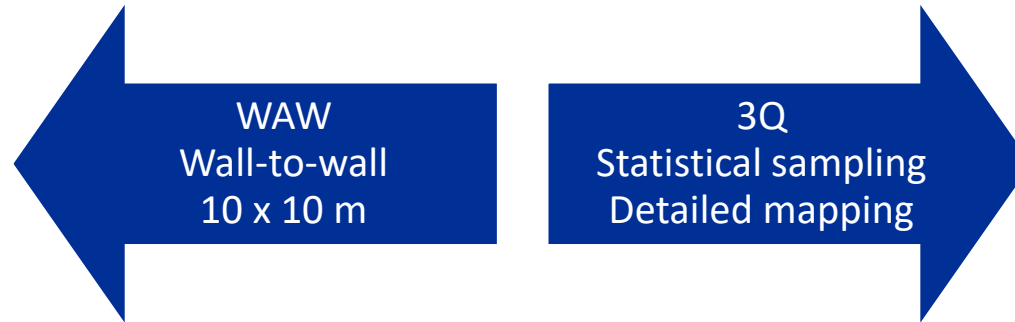
- Freshwater
- Seawater
- Wetlands

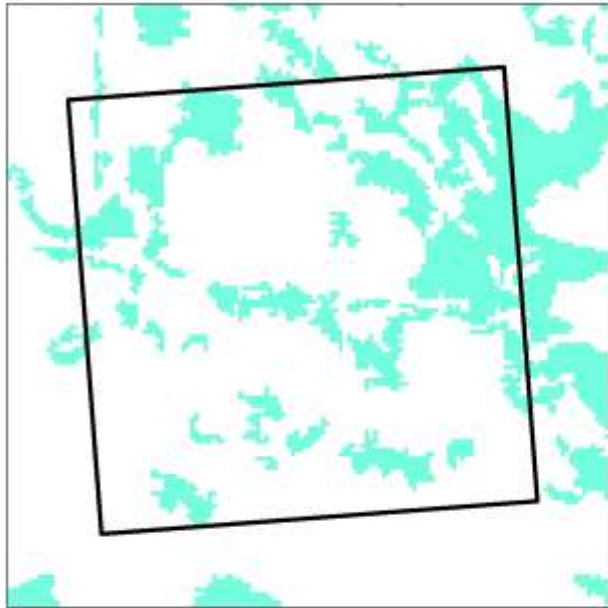
Point objects

- Water habitat island
- Wetland habitat island
- Farm pond

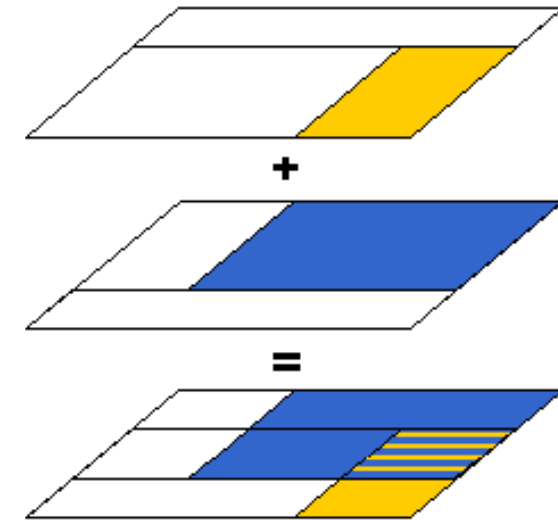
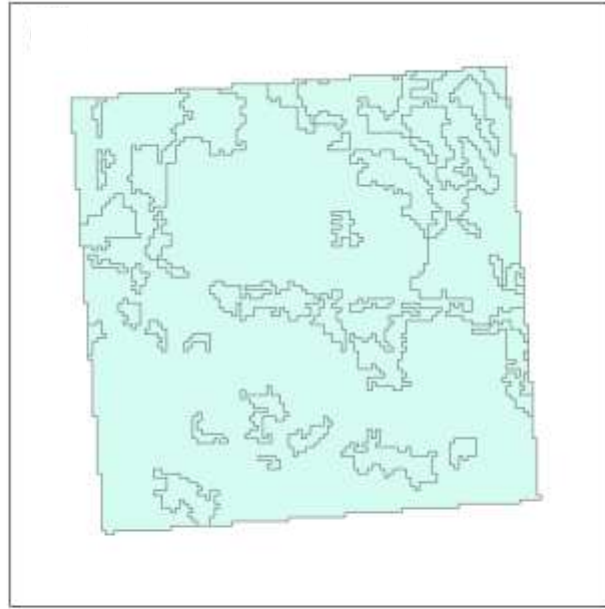
Linear objects

- Stream
- Ditch





0 1 000 m



Polygon overlay

Key points:

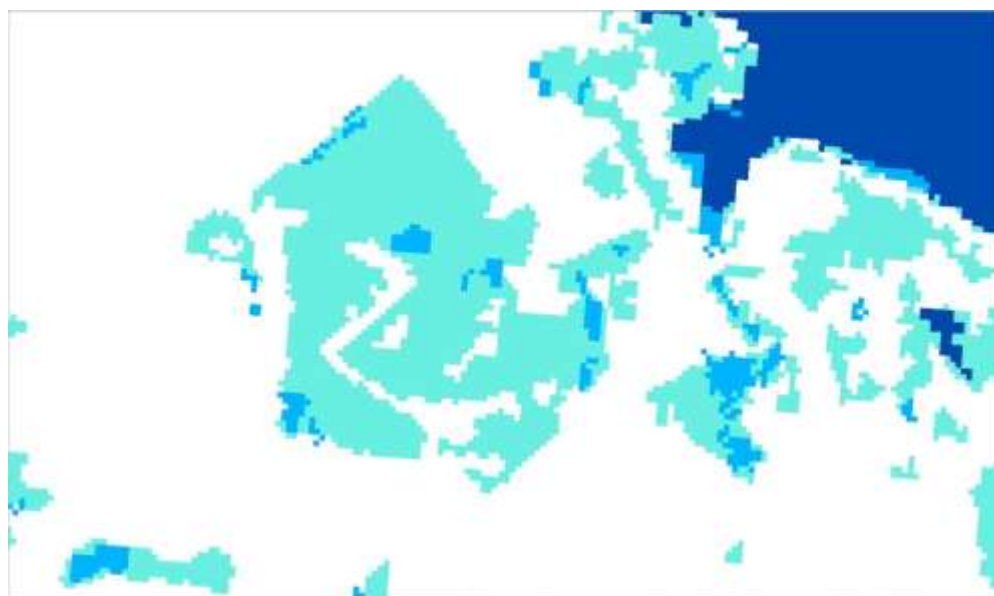
- Permanent water in WAW is usually correct (96 %)
 - ... but water is missing (42 % of fresh water in 3Q is not Permanent water)
- 8 % of Permanent wet is wetland
 - 0.6 % of wetland as Permanent wet
 - 58 % of wetland as Temporary wet
 - 41 % of wetland as Dry
- 47 % of agricultural land is classified as Temporary wet
 - 46 % of Permanent wet is agricultural land
 - 58 % of Temporary wet is agricultural land

There seems to be too much Temporary wet in the agricultural landscape

Key points:

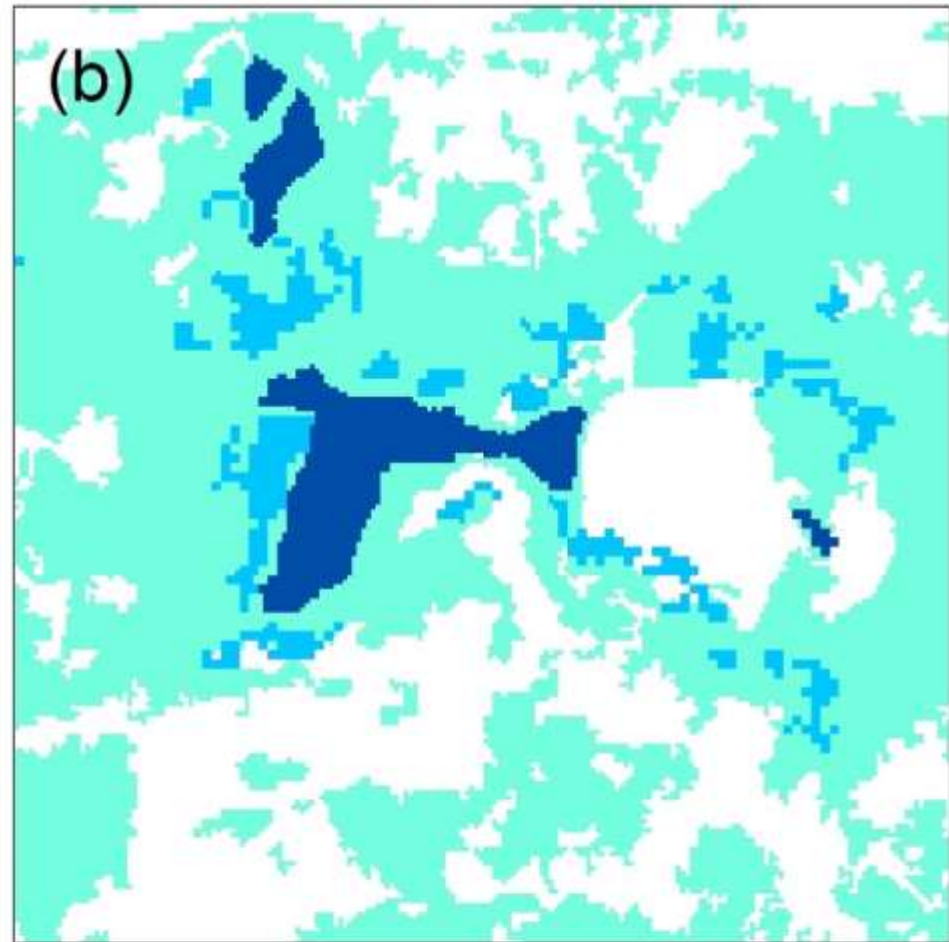
- Low detection of point objects
 - Farm ponds (74 % Dry)
 - Wetland habitat islands (38 % Dry)
 - Water habitat islands (41 % Dry)
- Low detection of linear objects
 - Streams (70 % Dry)
 - Ditches/canals (50 % Dry)

Small and narrow objects are not detected

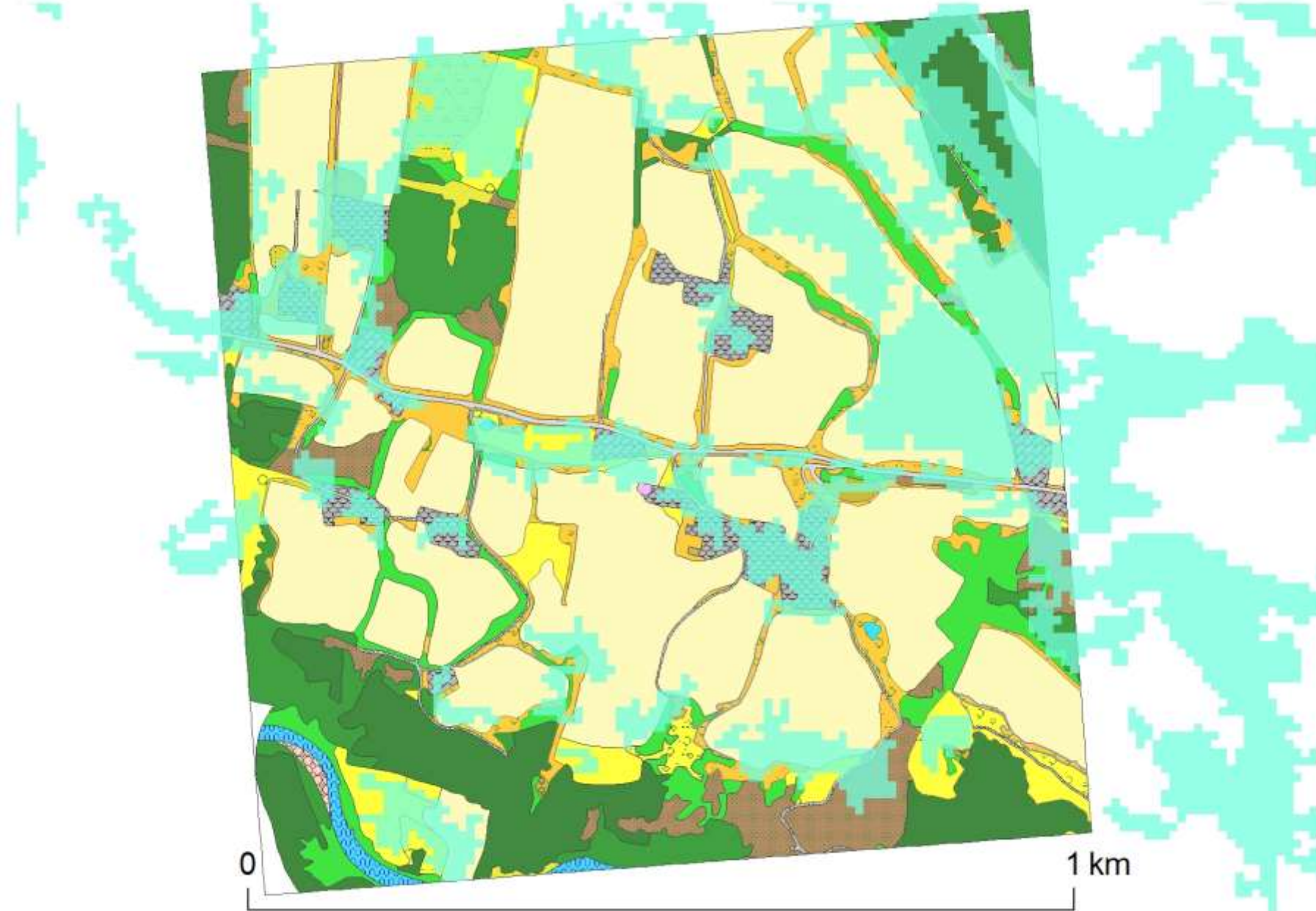


- Dry
- Permanent water
- Temporary water
- Permanent wet
- Temporary wet
- Sea water
- Unclassifiable
- Outside area

Temporary wetness



Patterns?



Now we move from agricultural landscapes to the rest of Norway...



Water (whole country)



We analysed waterbodies according to their size:

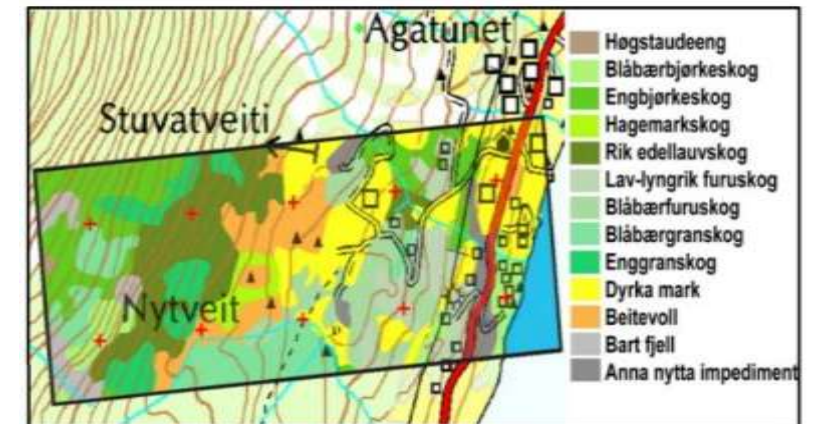
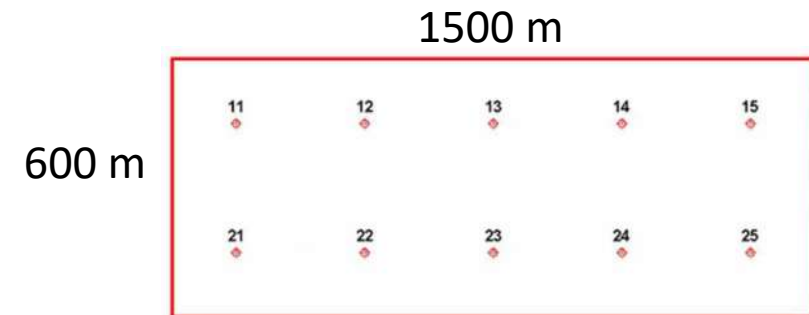
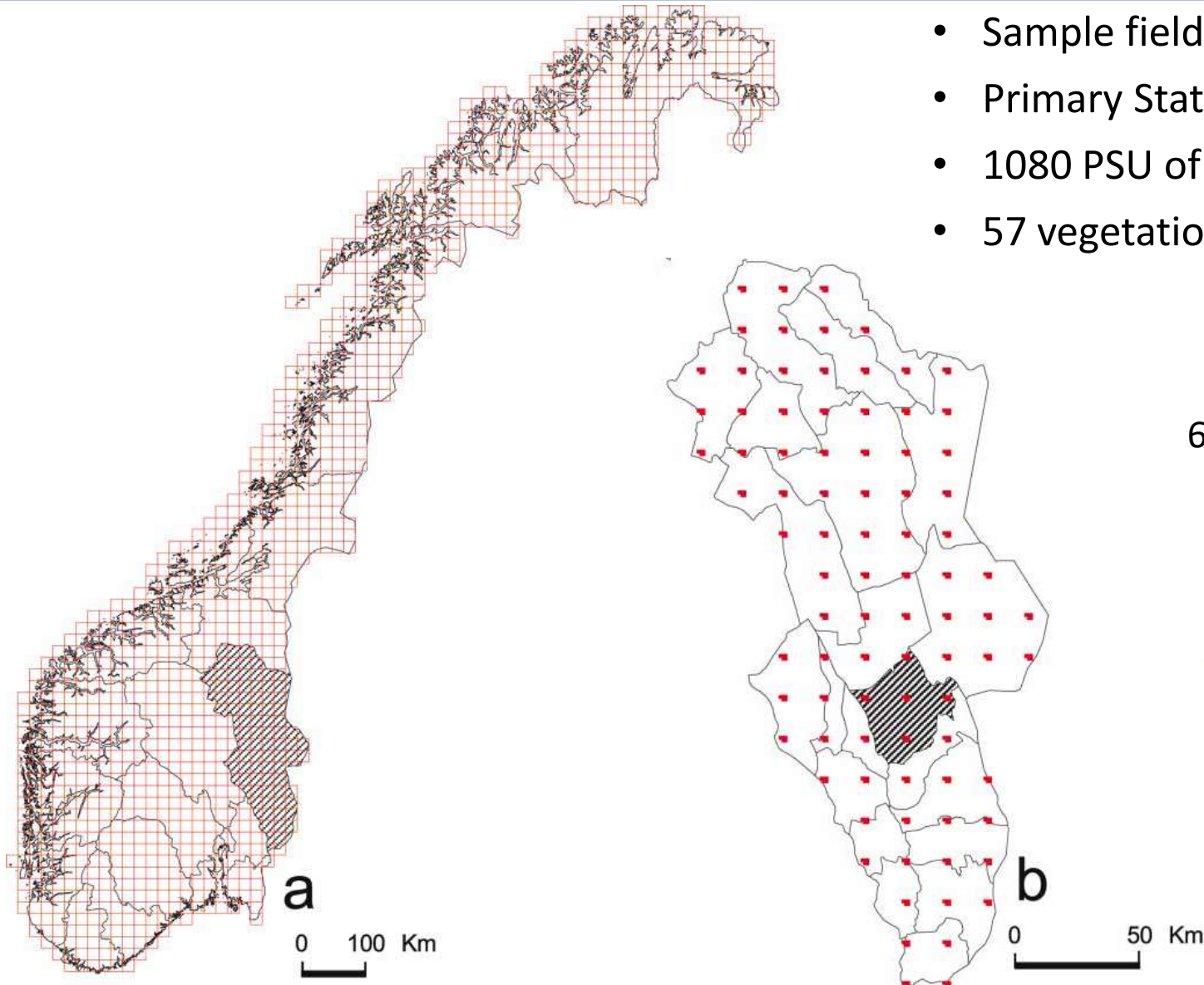
- Small lakes are not detected in HRL-WAW
- Lakes above 2 hectares are detected
- The area of WAW water exceeded 80 % of lake area first for lakes larger than 20 hectares

Aim: to explore the potential of HRL-WAW for peatland and wetland detection and monitoring throughout Norway

- Peatland and wetlands are important for biodiversity
- Organic soils store large amounts of carbon
- Many drivers of change (building/infrastructure, climate change, expanding bioeconomy, new cultivation, abandonment of outfield grazing...)
- Norway's National Land Resource Map covers 60 % of the country - primarily land below the treeline
- We do not have a good map of wetlands in the mountains

Area Frame Survey for Norge - AR18 x 18

- Sample field mapping
- Primary Statistical Unit at centre of 18×18 km squares
- 1080 PSU of 1500×600 m (0.9km^2)
- 57 vegetation types

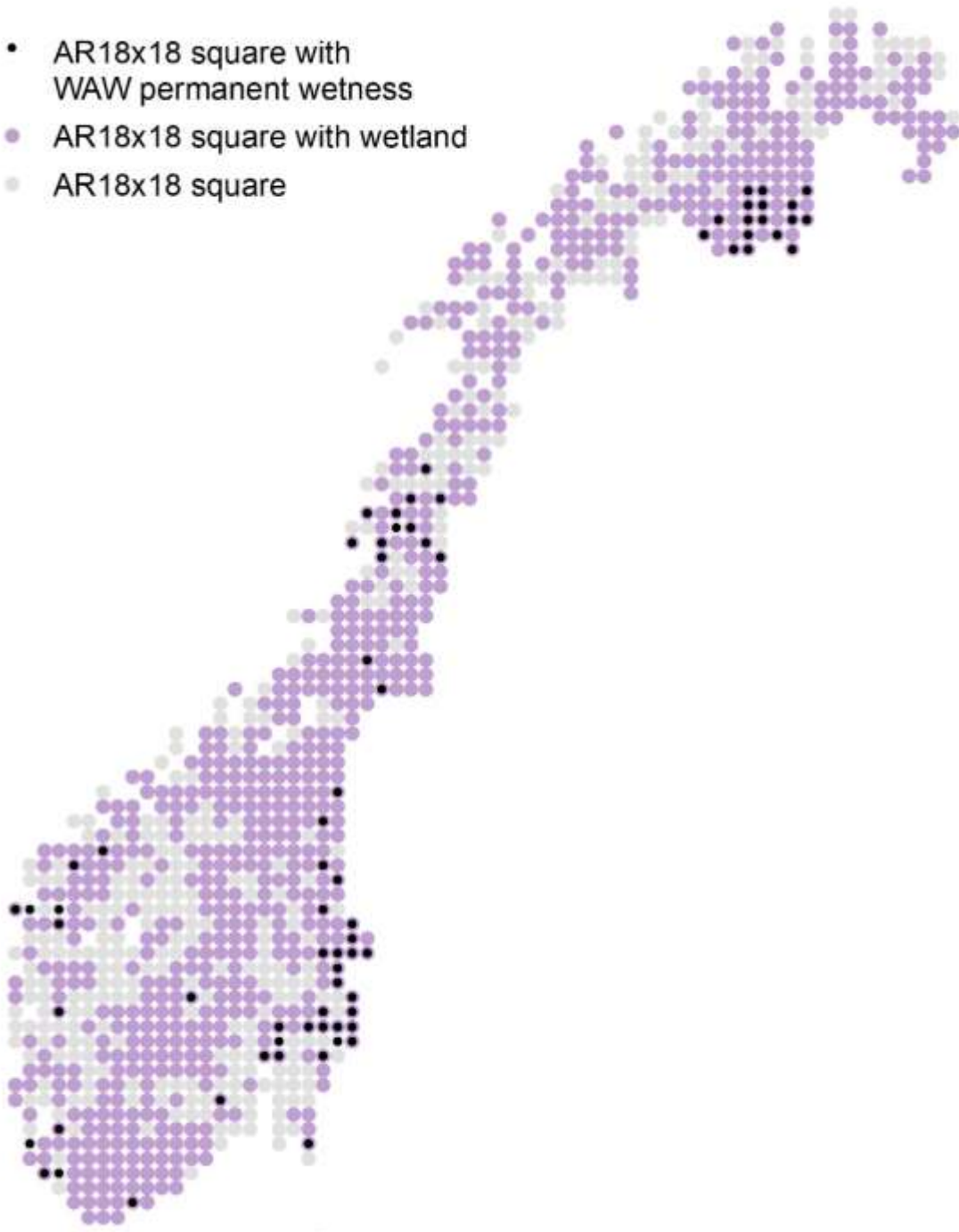


Key points:

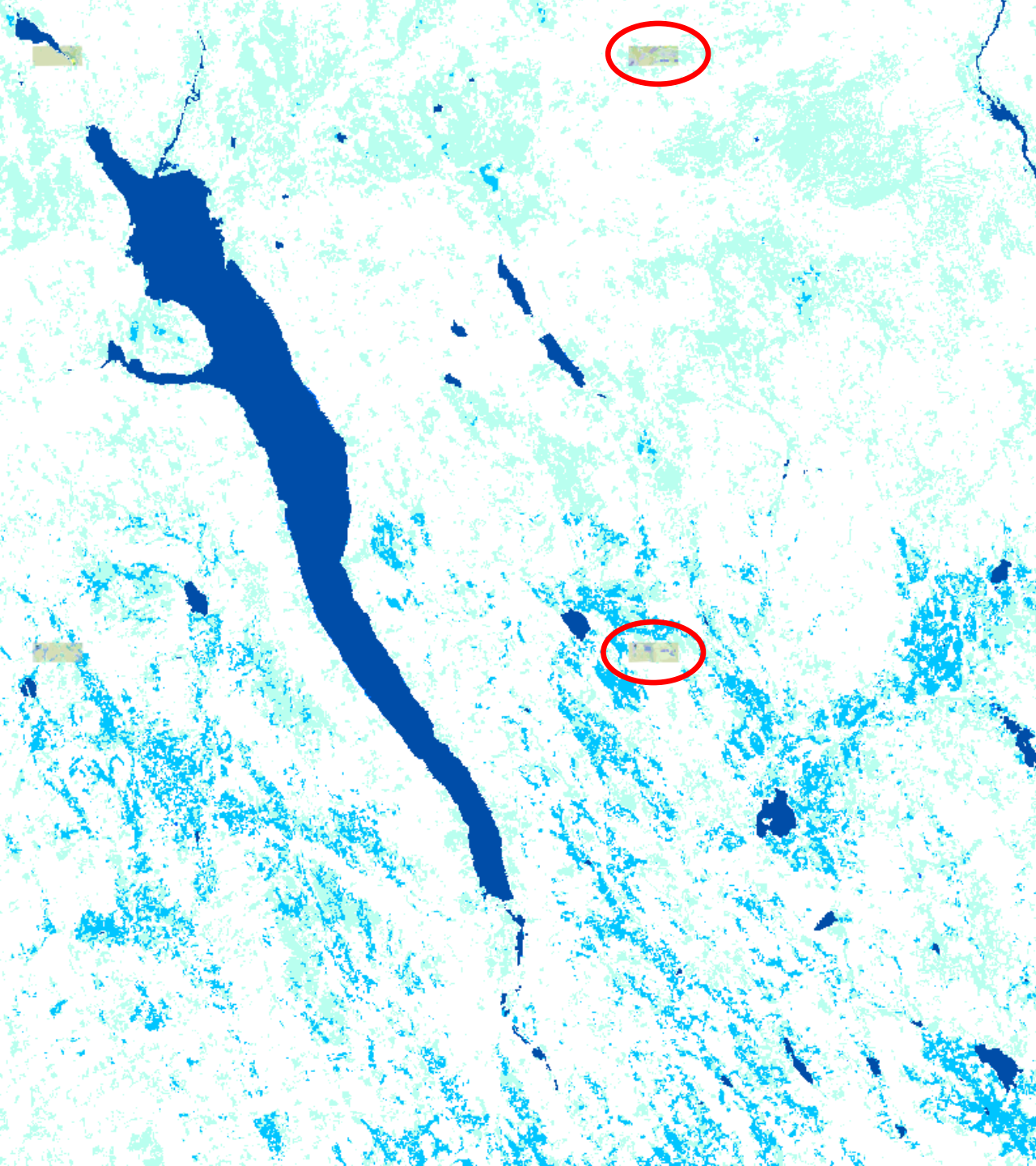
- Permanent water in WAW is usually correct
... but some water is missing (11 % is classified as Dry)
- 67 % of Permanent wet is wetland
... but only 0.8 % of wetlands are classified as Permanent wet
- 73 % of wetlands are classified as Temporary wet
... but 26 % are classed as Dry
- There seems to be too much Temporary wet: over half of heath, meadows and other open dry land

8.5 % of Norway is wetland, but only 0.1 % of HRL-WAW is class 3

- AR18x18 square with WAW permanent wetness
- AR18x18 square with wetland
- AR18x18 square



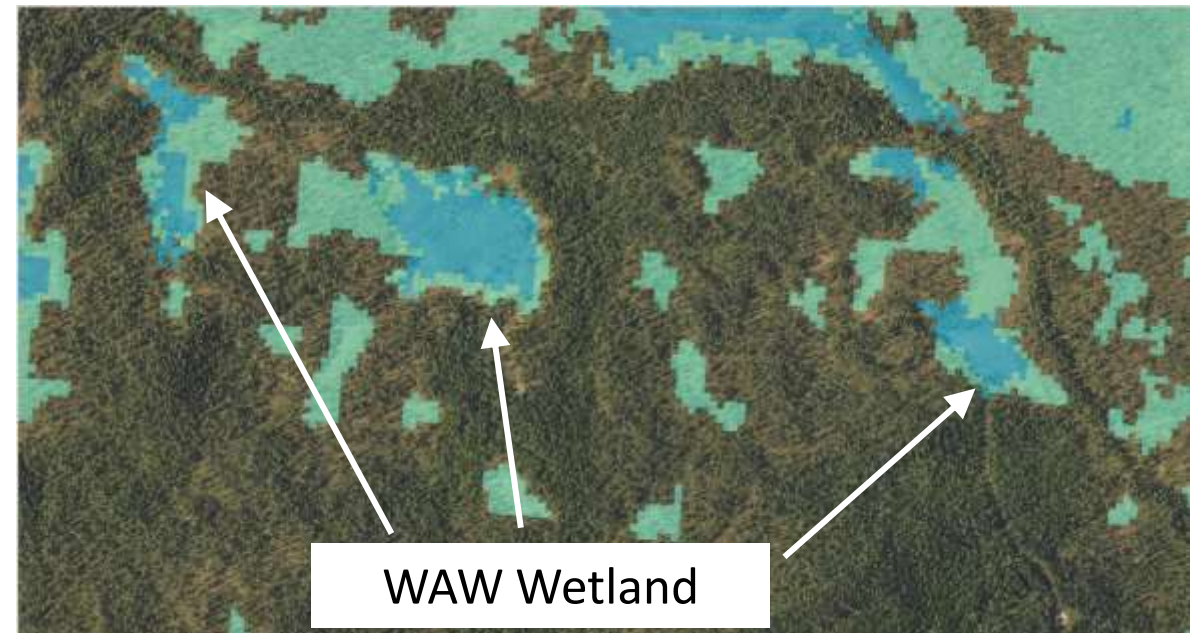
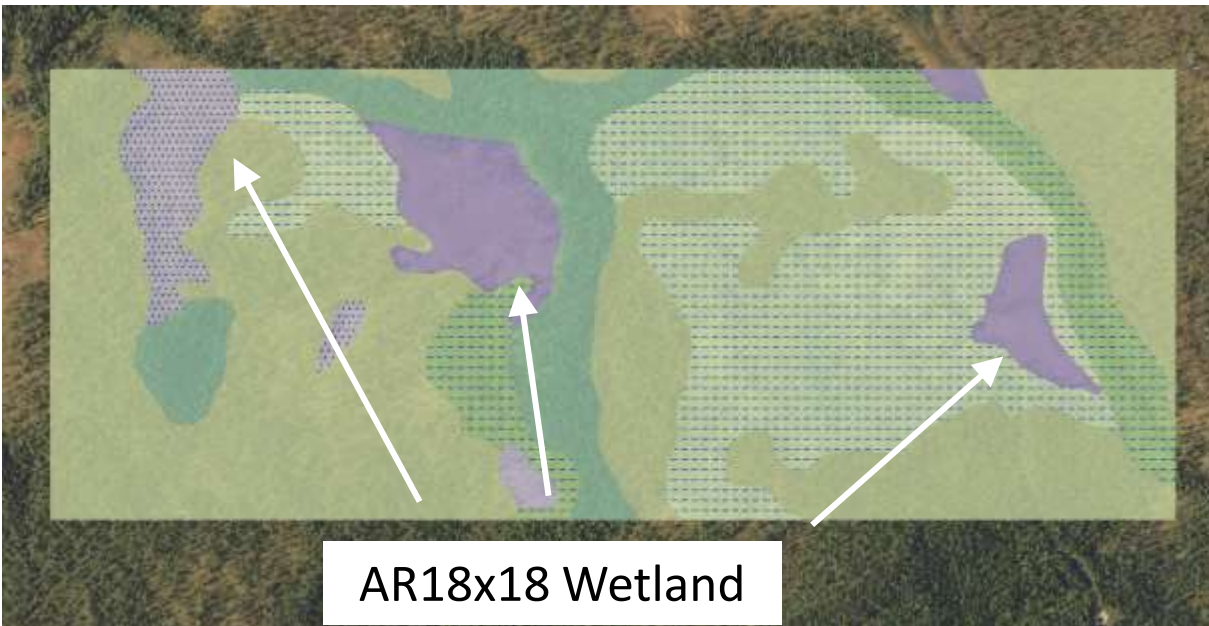
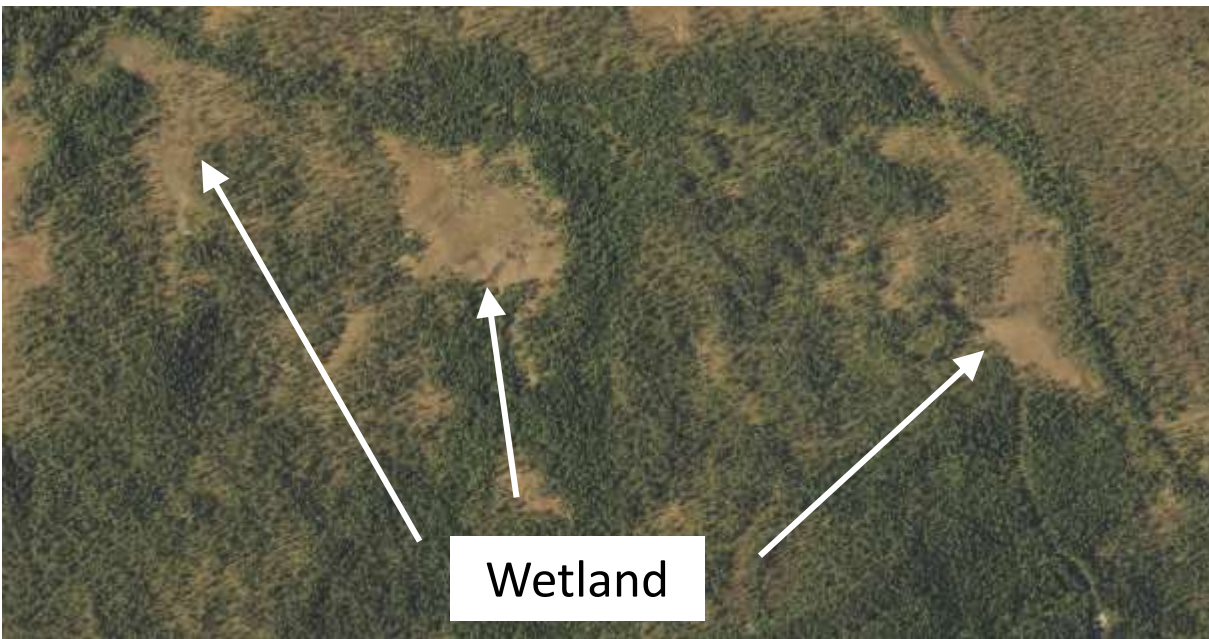
AR18x18 squares containing wetland (purple) and Permanent Wetness (black)



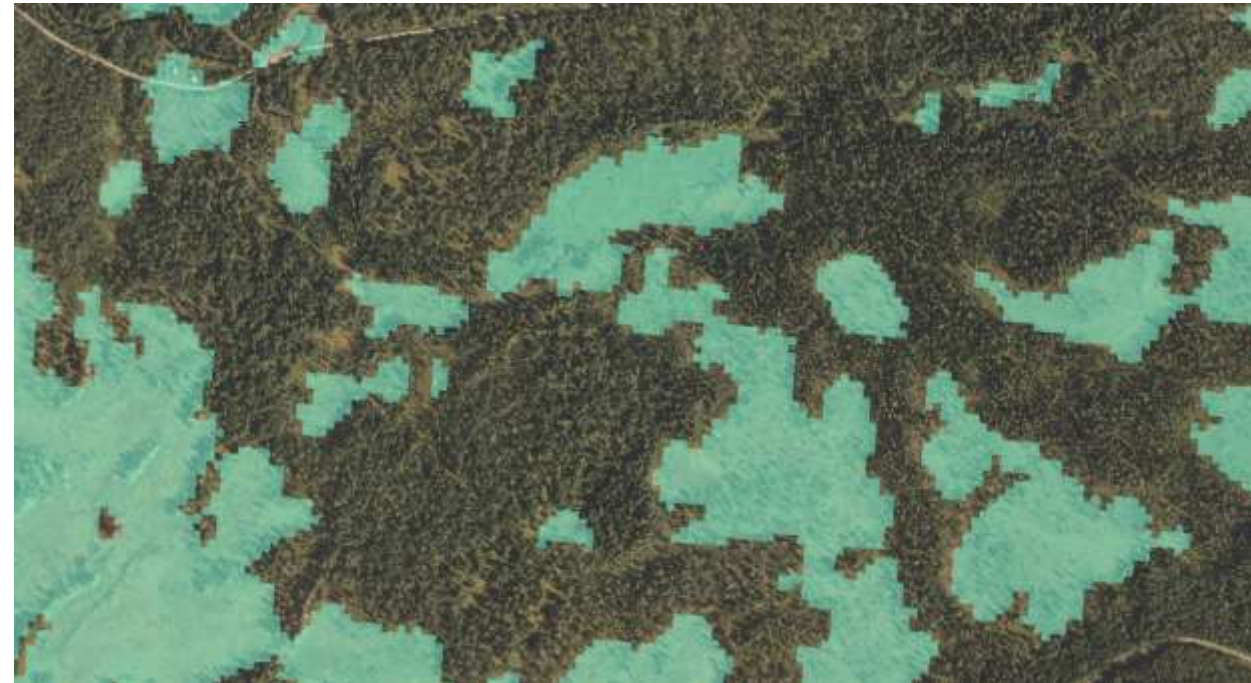
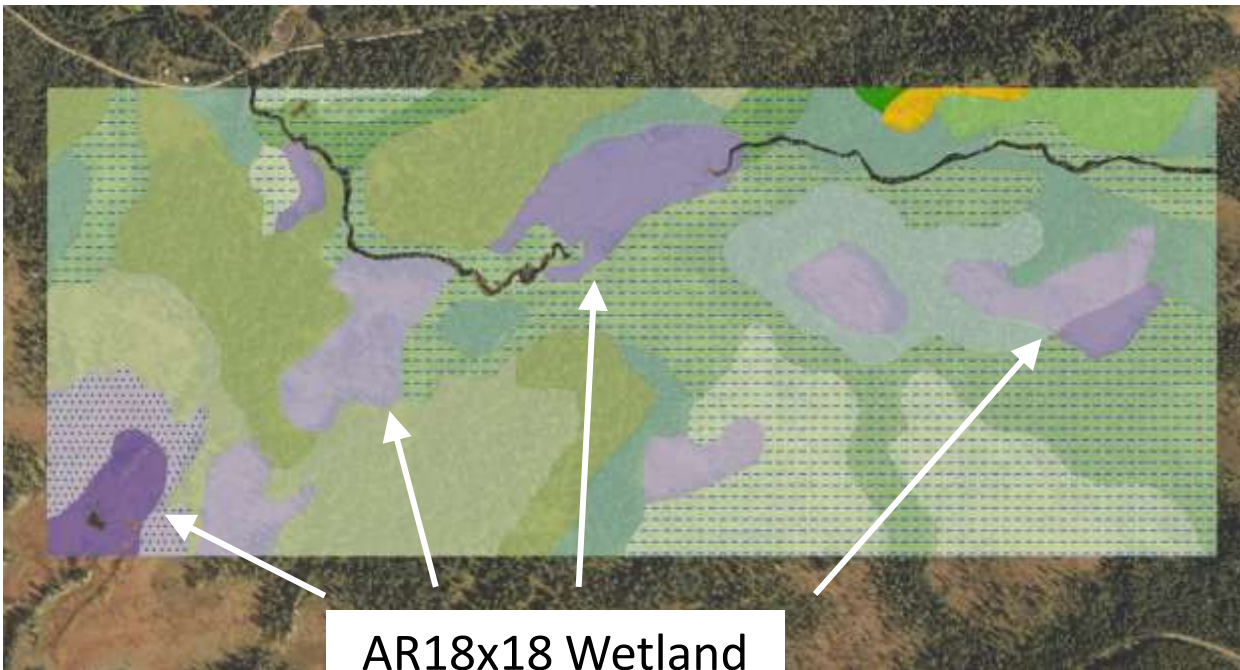
Class 3, Permanent wet, is almost absent

Class 3 is much more abundant in the lower part of the figure.

- In this area, rather good correspondence with class 3 in WAW

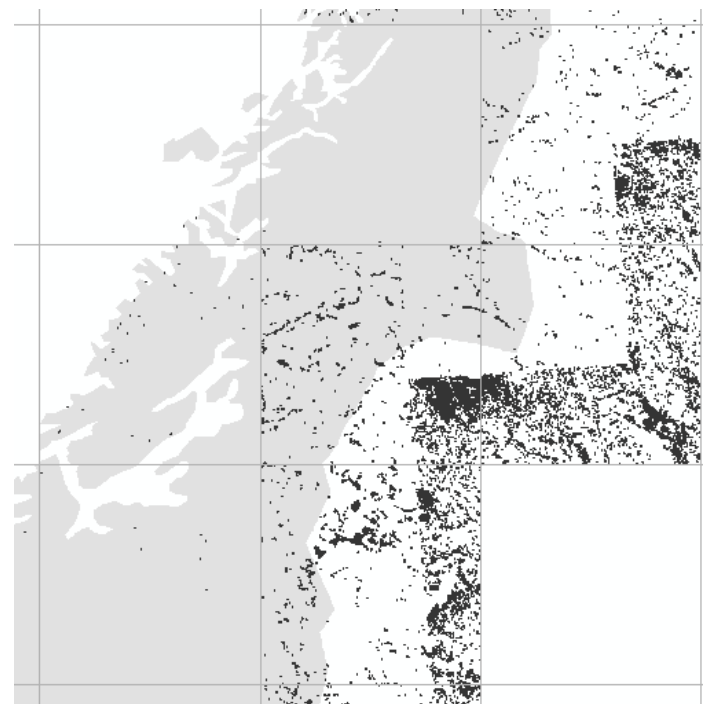


- Very similar landscape
- Bogs and fens
- Only Temporary wet in WAW
- Class 3 is missing
- The river (class 1) is also missing



Evidence of problems with the underlying data
and/or production errors

The location of Permanent wet in Norway
and the tiles of HRL-WAW



- We appreciate that definitions do not fully overlap, nevertheless...
- A third of Norway is classified as Temporary wet – this is too much (to be useful)
- Only 0.1 % is classified as Permanent wet – this is too little
- Ground truth = 8.5 % wetlands (+ 3.8 % peatland forest)



Conclusions:

- The current version of HRL-WAW is not sufficiently accurate or reliable to assist with mapping or monitoring in Norway.
- We already have good maps and a good monitoring system for agricultural landscapes...
- However, we lack detailed, regularly updated information in more remote landscapes, especially above the treeline.
- HRL-WAW may play a role if the current weaknesses and errors can be resolved.
- Could service providers work more closely with national experts to validate and adapt products and thus increase usefulness and user uptake?

Inconada project

<https://inconada.eu/>

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