

Wetland modelling in Forsmark

(WIM Forsmark 1.1)



UMEÅ UNIVERSITET

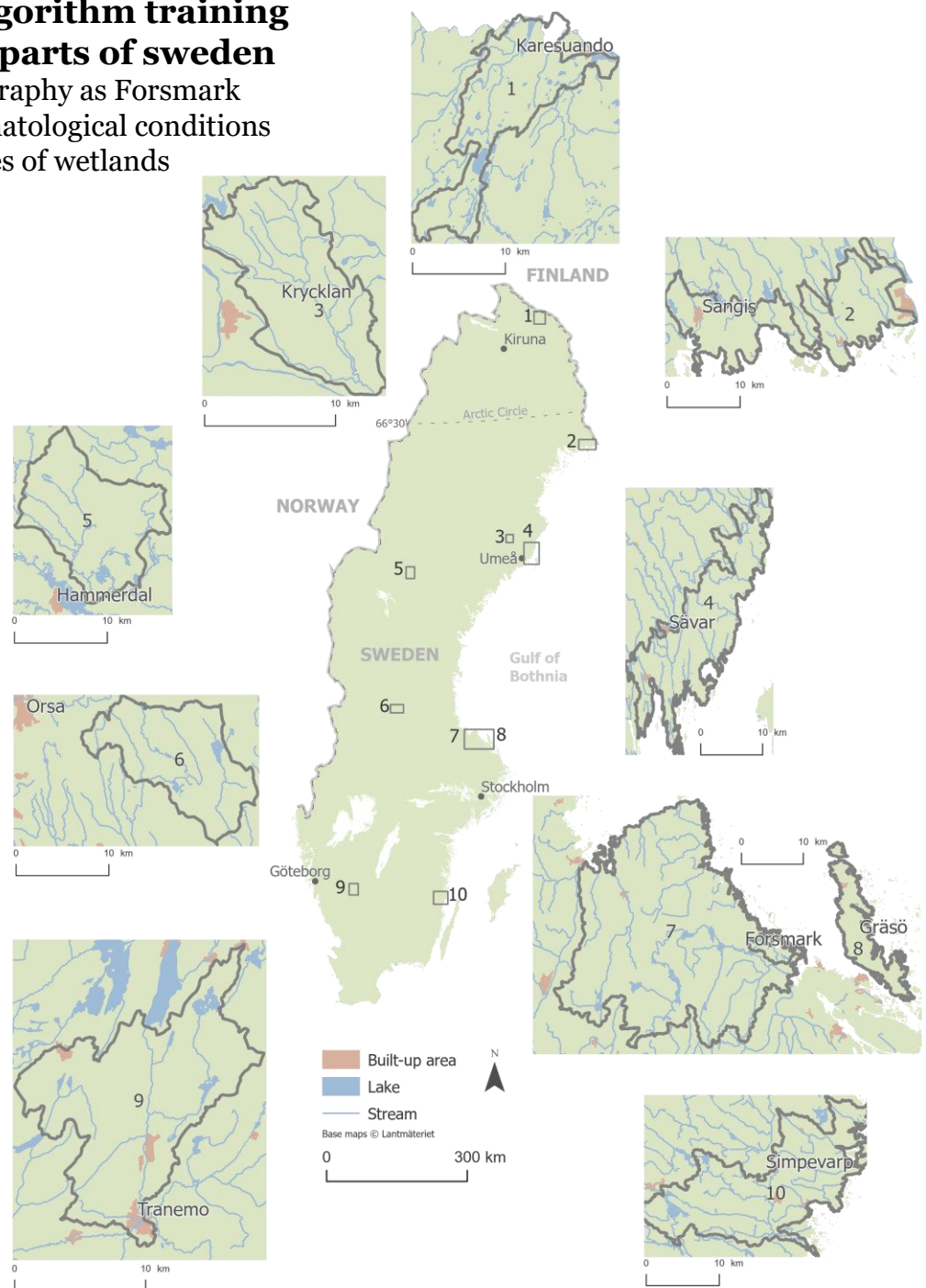
WIM Forsmark 1.1

- Tool for wetland prediction in Forsmark
- WIM (wetland identification model)
- The creation and testing of the WIM resulted in 2 peer-reviewed journal articles (O’Neil et al., 2018; O’Neil et al., 2019)
- Machine learning algorithm (Random Forests) predicts the areal extent of wetlands
- WIM part of Arc Hydro tools (ArcGIS Pro), the tool “wetland identification”
- Input data DEM, wetlands, surface water (lakes and modelled streams), raster layers 10 m resolution
- Prediction variables, TWI, DTW and curvature



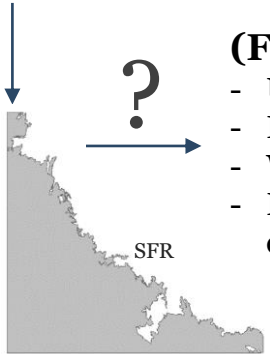
Areas for algorithm training in different parts of sweden

- Similar topography as Forsmark
- Different climatological conditions
- Different types of wetlands



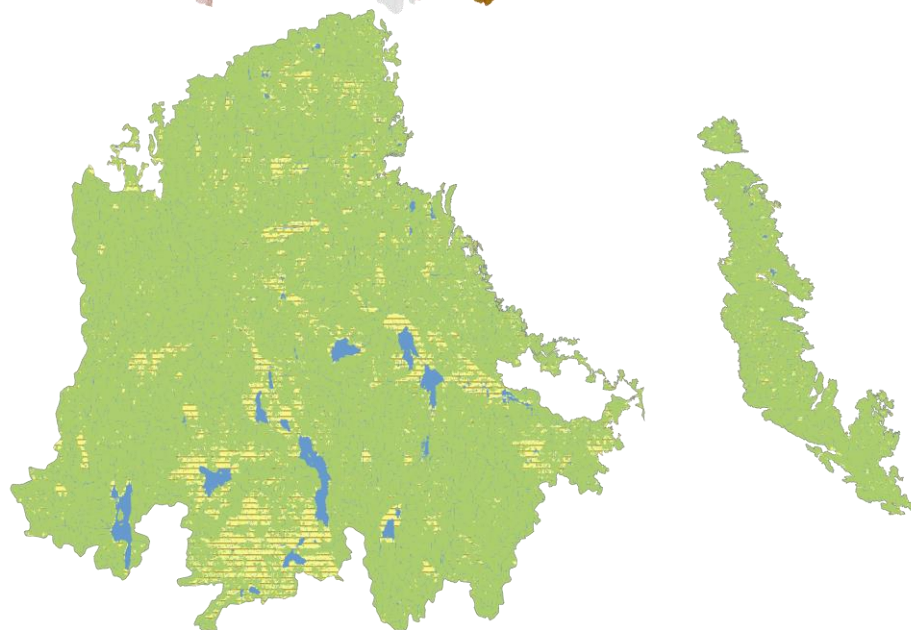
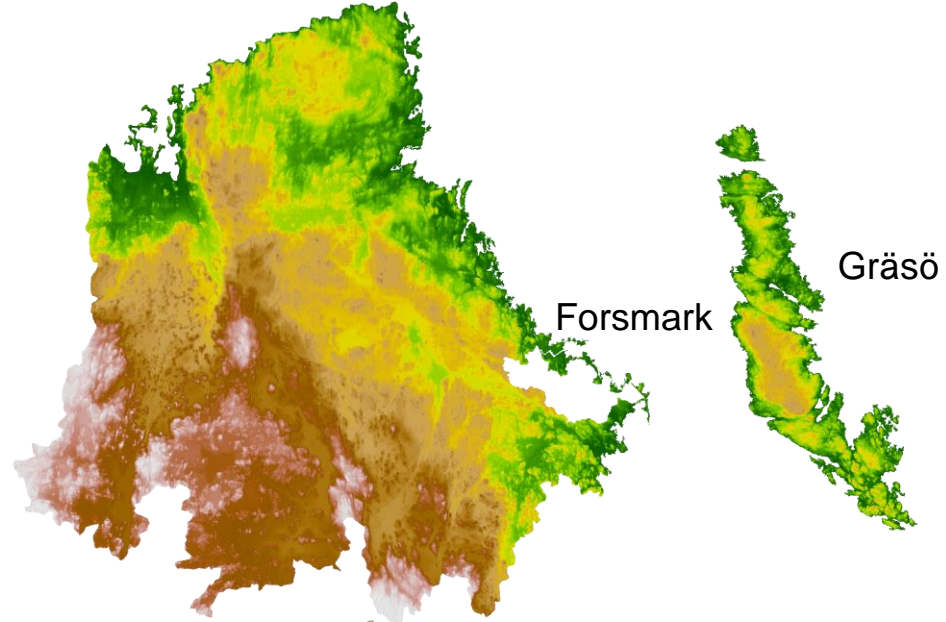
Present Forsmark terrestrial area

- Run algorithms
- Accuracy assessment

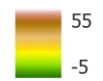


(Future landscape)

- Untamo data
- Run algorithms
- Wetland identification
- Biosphere object deliniation



Elevation (m.a.s.l.)



Surface water

Wetland

Other

0 10 km



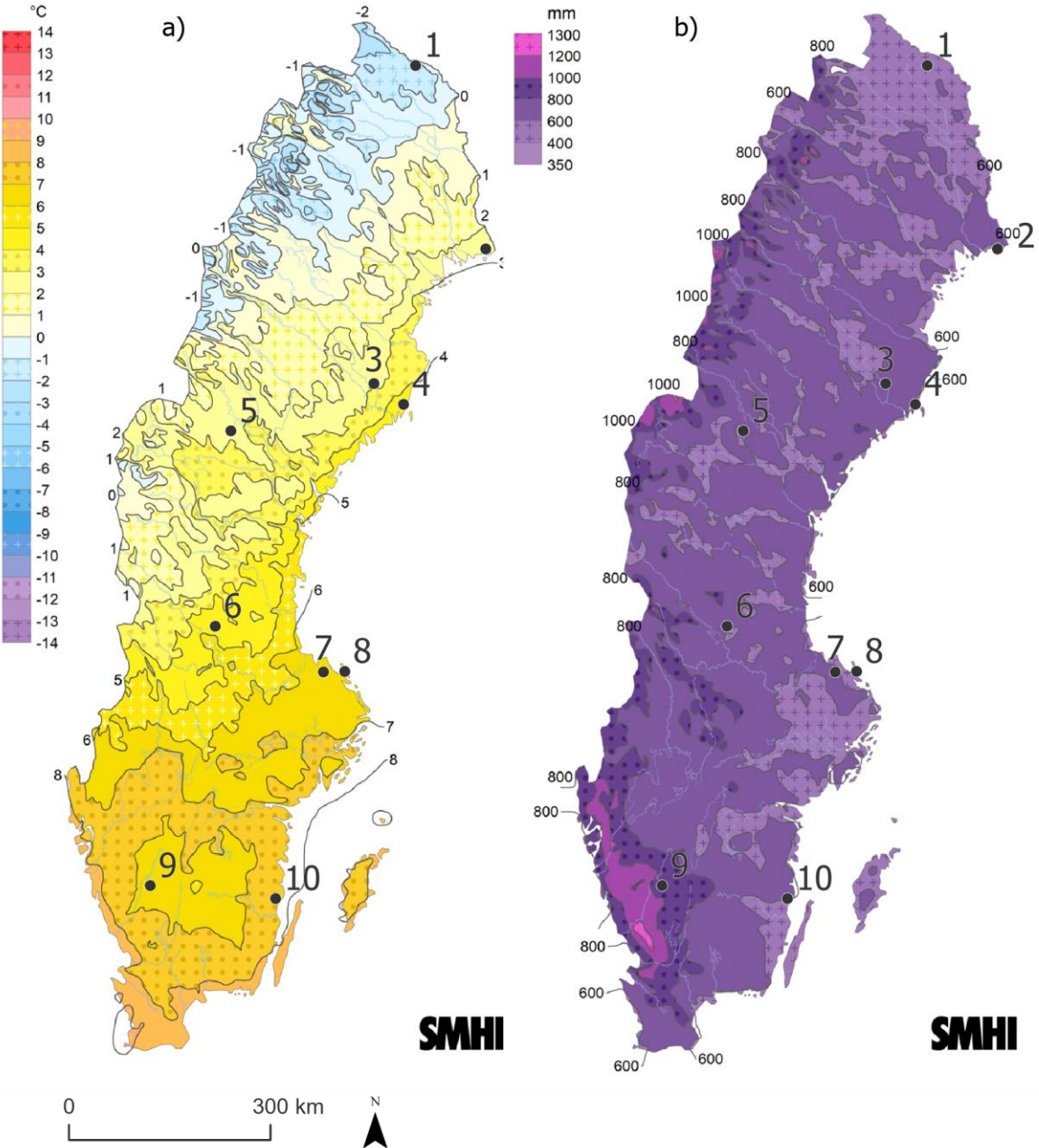
Base maps © Lantmäteriet

Area	Reference location	Area (m2)	Elevation (m)			Slope (percent rise)			
			Max	Min	Range	Mean	STDV	Max	Min
1	Karesuando	163867000	453,9	320,4	134,0	3,0	4,2	71,7	0,0
2	Sangis	246764000	60,2	-1,7	61,9	3,2	5,0	98,5	0,0
2	Krycklan	121523200	372,6	107,0	265,6	9,9	9,3	185,5	0,0
4	Norum	319203200	62,1	-0,1	62,2	3,0	3,1	65,2	0,0
5	Hammerdal	161921900	385,6	302,9	82,7	3,5	4,4	60,7	0,0
6	Skattungbyn	150890300	392,4	246,0	146,4	3,5	3,3	58,3	0,0
7	Forsmark	893797500	55,2	-10,0	65,2	3,1	3,0	82,7	0,0
8	Gräsö	100204400	27,1	-0,1	27,1	5,0	4,1	62,7	0,0
9	Tranemo	180368600	276,9	150,7	126,2	5,1	5,4	101,6	0,0
10	Laxemar	304423300	110,8	-3,6	114,3	7,4	6,1	79,0	0,0
	Validation area	19483782	27,4	-1,6	29,0	3,8	3,3	32,8	0,0

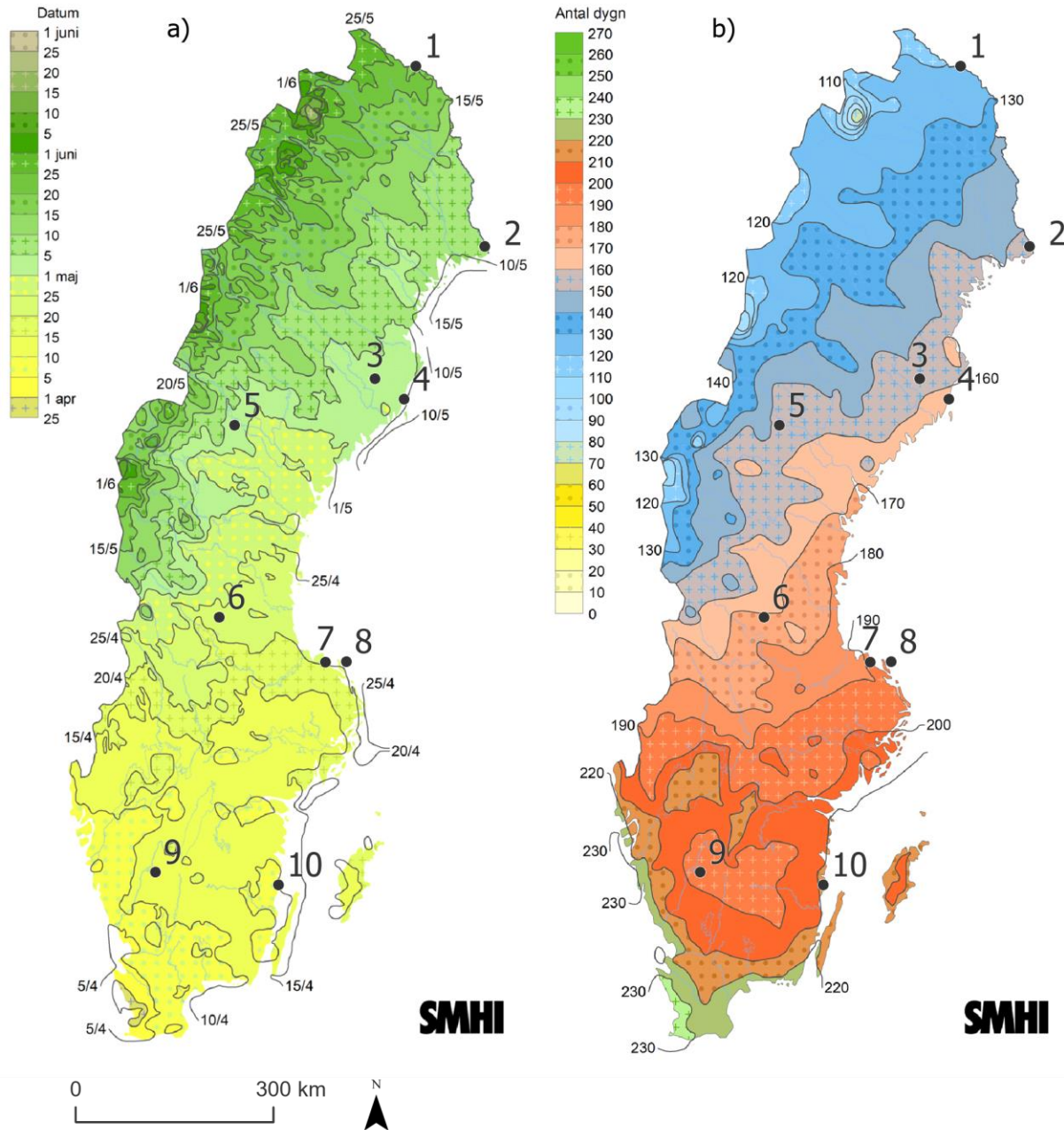
Area	Reference location	Area (m2)	Wetland (%)			Other land use (%)				
			Total	In forest	In open land	Lake	Forest	Open land	Arable land	Built-up area
1	Karesuando	163867000	34,9	0,5	33,4	11,5	50,1	37,6	0,0	0,0
2	Sangis	246764000	18,3	9,6	8,8	1,9	82,5	12,8	2,1	0,2
2	Krycklan	121523200	8,1	5,4	2,7	0,6	93,8	3,7	1,8	0,0
4	Norum	319203200	17,9	9,6	8,3	3,0	81,3	12,2	3,1	0,5
5	Hammerdal	161921900	34,3	15,7	18,6	4,0	74,0	20,5	1,5	0,0
6	Skattungbyn	150890300	25,5	13,4	12,1	3,0	84,3	12,5	0,2	0,0
7	Forsmark	893797500	10,8	5,9	4,9	2,6	80,7	9,3	7,4	0,0
8	Gräsö	100204400	3,8	1,9	1,9	0,4	84,2	11,4	4,0	0,0
9	Tranemo	180368600	14,2	9,6	4,6	3,1	69,8	12,9	12,7	1,5
10	Laxemar	304423300	3,3	1,5	1,8	4,7	86,0	5,9	3,4	0,0
	Validation area	19483782	13,1	3,6	9,5	7,5	78,1	12,7	1,7	0,0






Normal annual mean temperature and precipitation, 1991-2020



Normal start of the growing season and number of days, 1991-2020





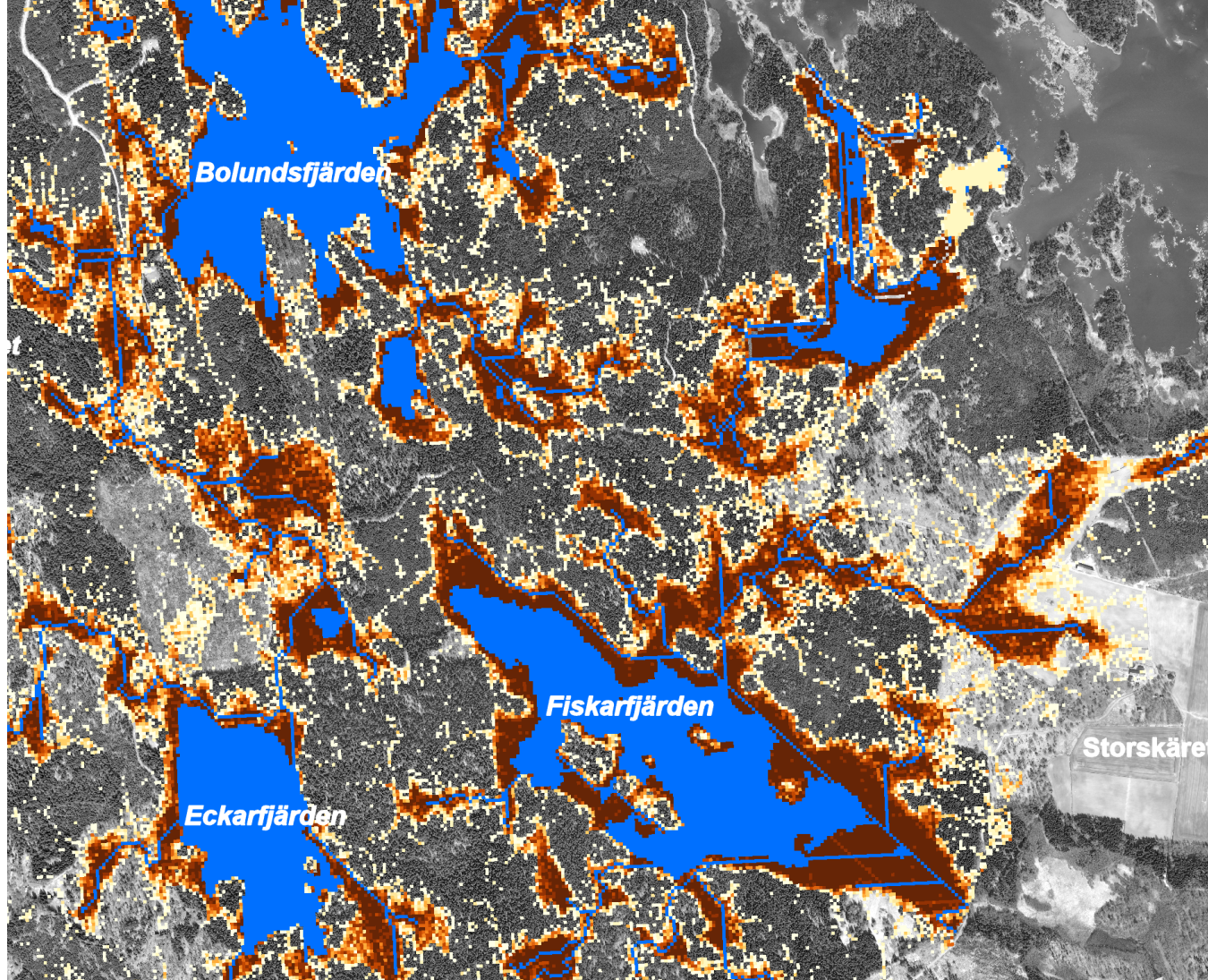
- | | | | |
|---|-------------|---|-----------------|
|  | Wetland |  | Lake/sea |
|  | Forest |  | Validation area |
|  | Arable land |  | Stream |
|  | Open land | | |



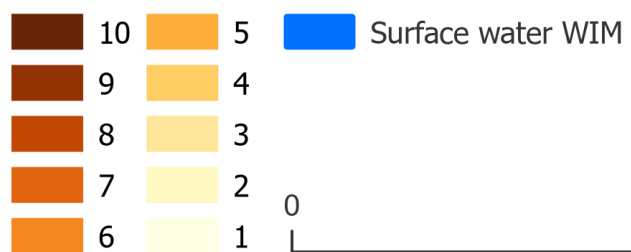
Coordinate system: SWEREF 99 18 00

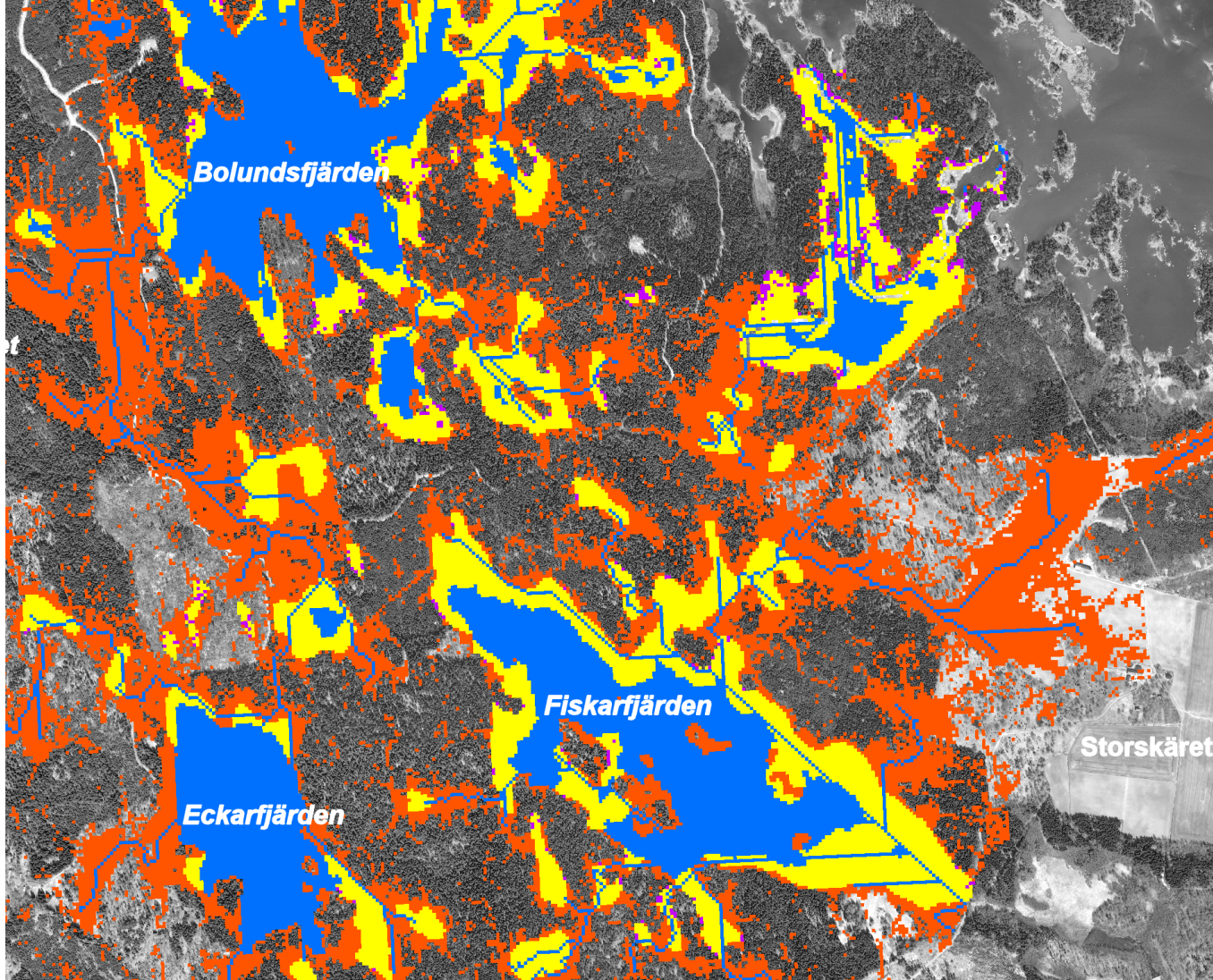


Base maps © Lantmäteriet



Predicted wetland (No. of hits)





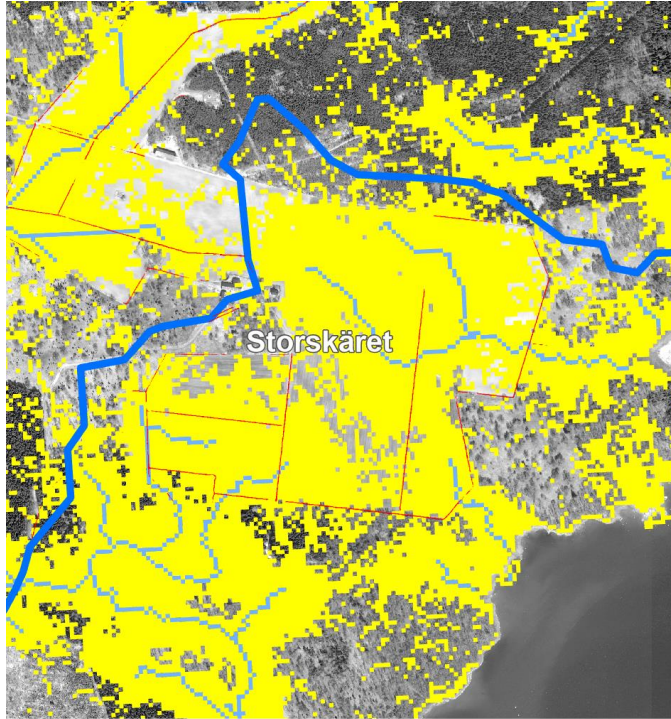
Wetland

- WIM
- Property map
- Wim and property map
- Surface water WIM

Base maps © Lantmäteriet

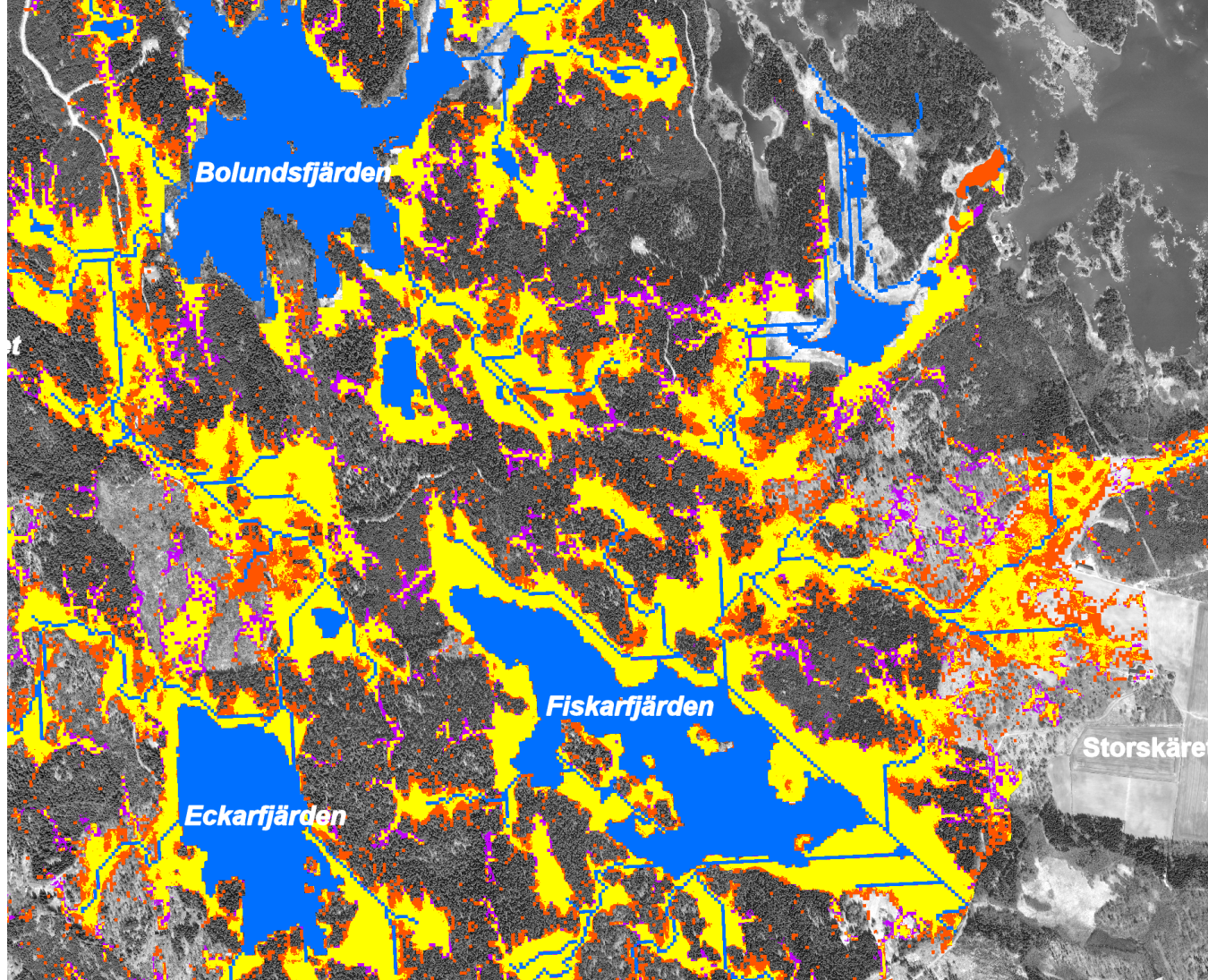


	Precision	Recall	f1-score	Support
Hitmap 10 algorithms	0,315	0,956	0,474	23285



-  Wetland WIM
 -  Surface water WIM
 -  Validation area
 -  Ditches from SLU
- Base maps © Lantmäteriet





Wetland

- SLU
- WIM
- SLU and WIM
- Surface water WIM

Base maps © Lantmäteriet



Modelled wetland Percentage	
WIM and SLU	59,3
WIM	31,2
SLU	9,4

Conclusion/further work/discussion

- Promising results
- Only areal extent of wetlands predicted, depth of wetlands?
- Add another predictor variable if possible, soil type?
- Several values for flow initiation threshold (FIT), now only 4 ha is used
- How should we use WIM Forsmark 1.1 for the future landscape?

