



Sveriges lantbruksuniversitet  
Swedish University of Agricultural Sciences

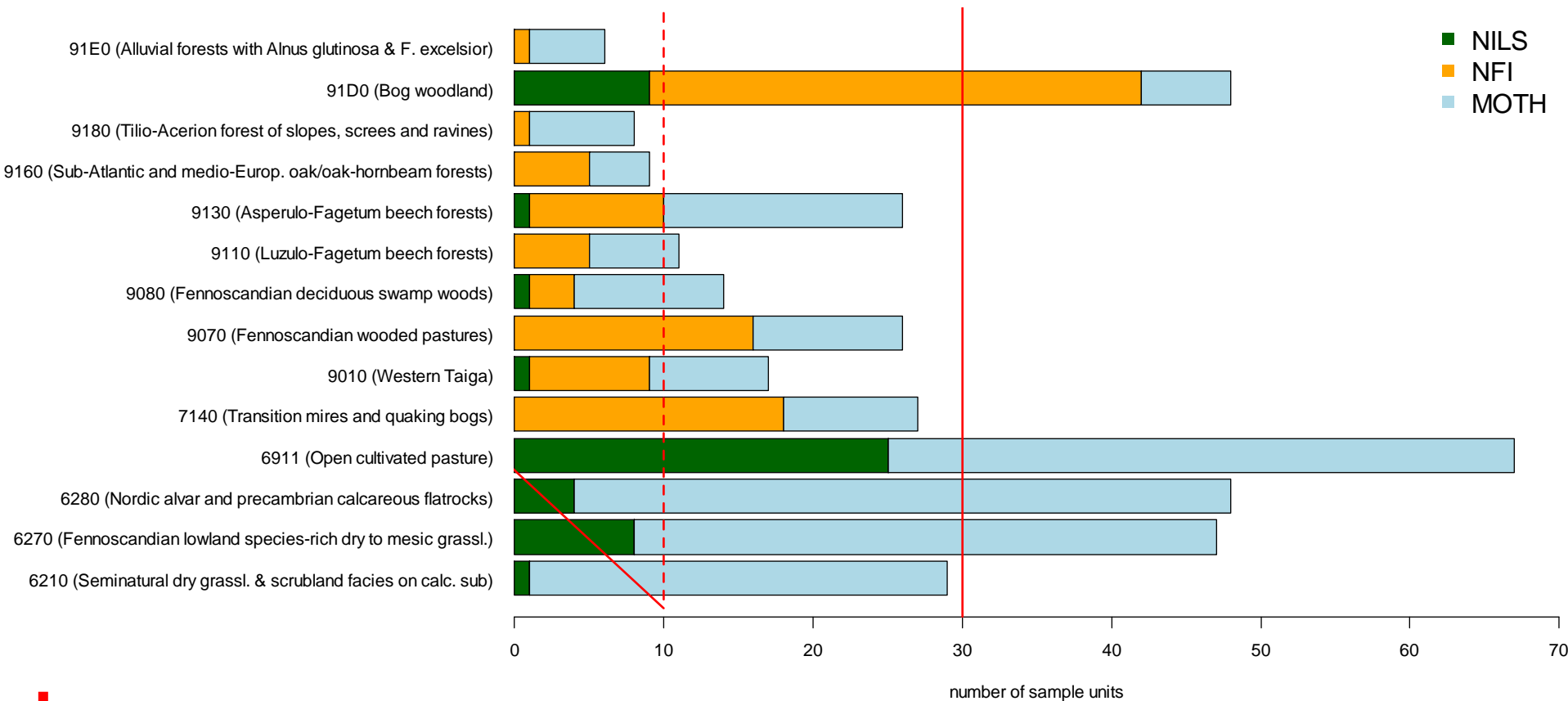


**MOTH**  
Monitoring of  
Terrestrial  
Habitats

# Combining survey data



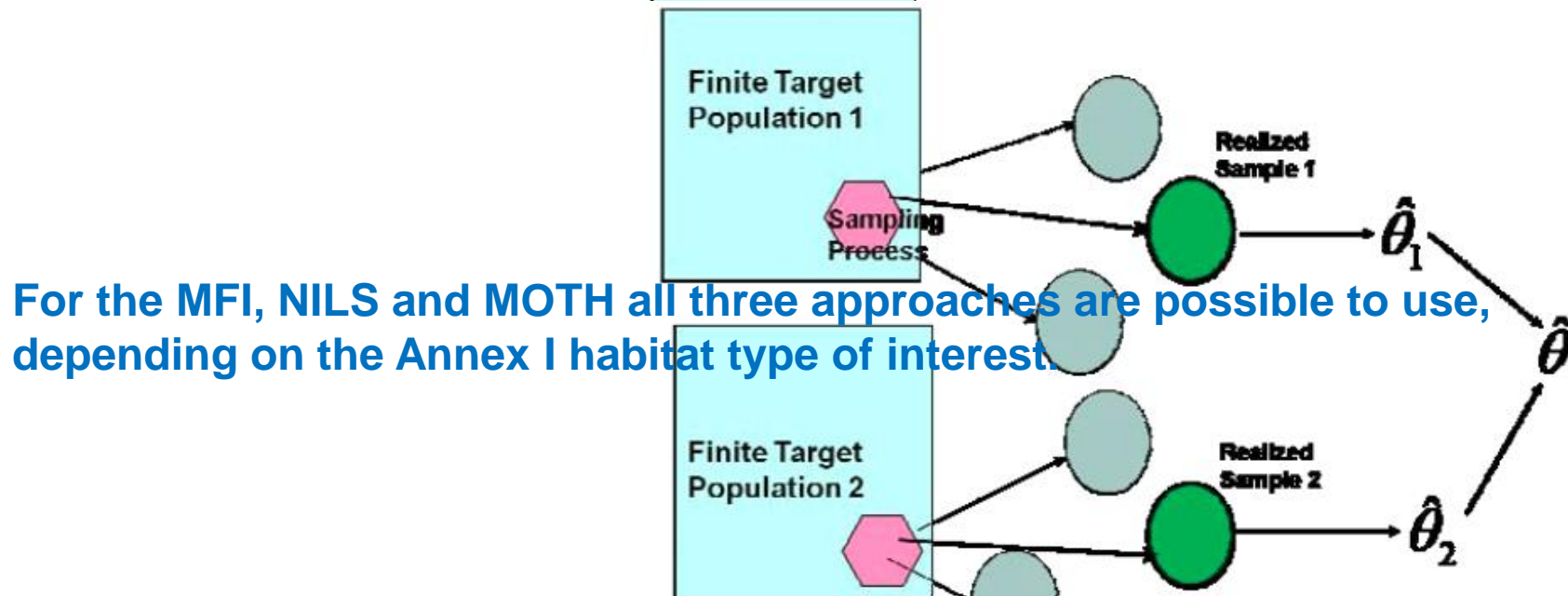
# The problem:



Each survey provide not enough data to describe the status of several sparse / rare Annex I habitat types!

## In General: If data from more than one surveys are available:

1. Using the survey with the most reliable results
2. Pooling the data (pooled approach\*)
3. Weighting the results (separate approach\*)

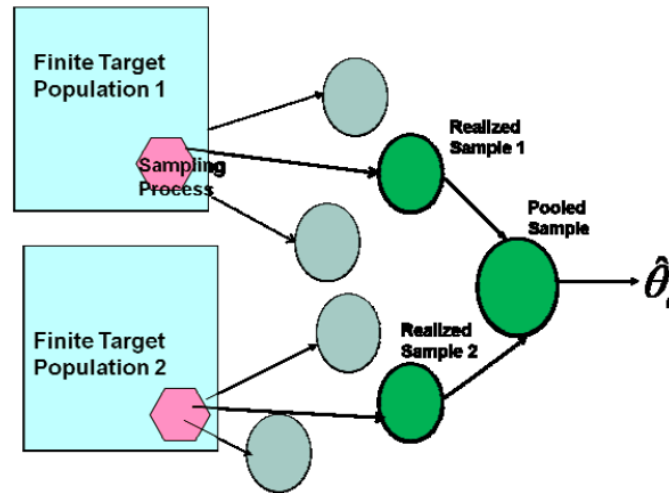


# 1. Using the survey with the most reliable results

NFI - Boreal biogeographic region:

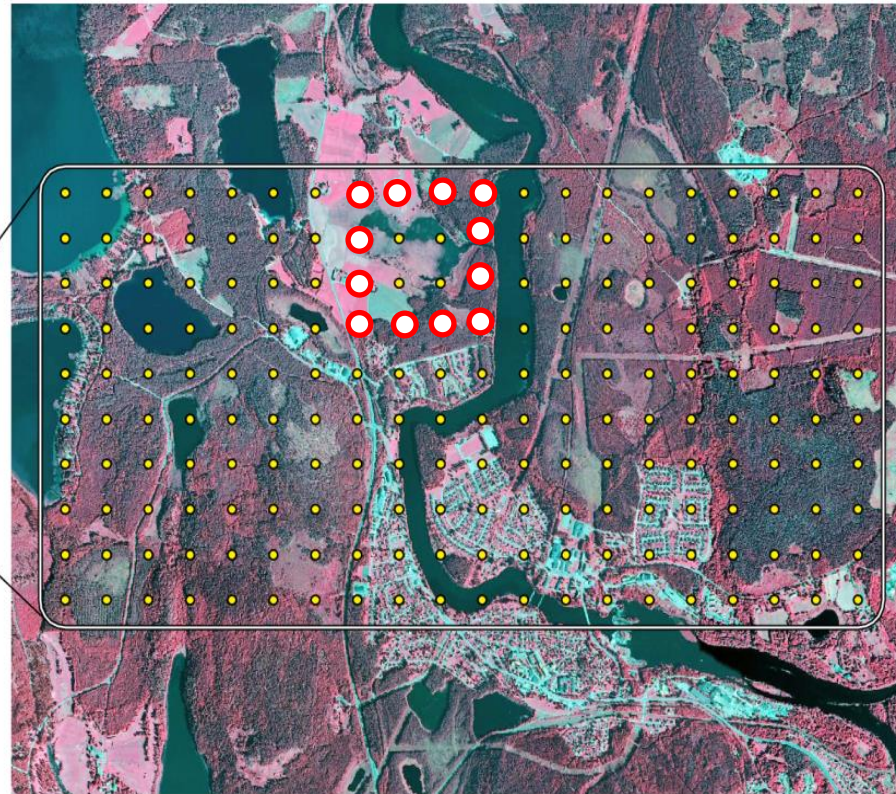
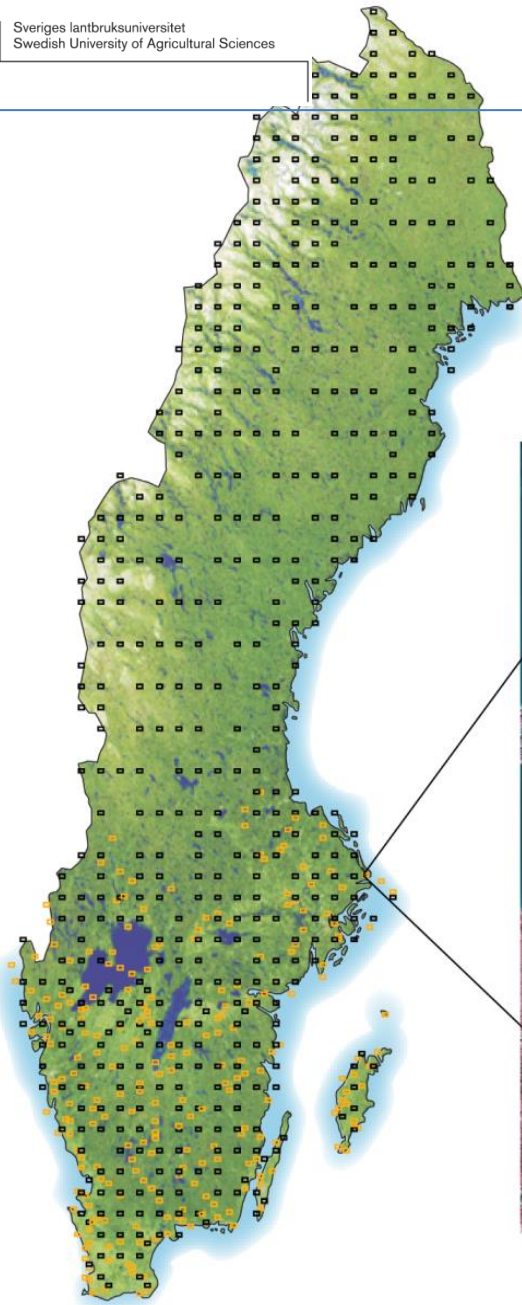
9010: 1375 hits (cv of area estimation: 0.04)  
7140: 1784 hits (0.03)  
9740: 2114 hits (0.03)

## 2. Pooling the data (pooled approach)



- difficult if the designs of the surveys differ strongly (like the NFI and NILS)
- possible for NILS and MOTH for the years 2010-2013:

- The MOTH 5x2.5 km landscape units are a part of the NILS 5x5 km landscape units
- The 12 NILS field sample plots are a part of the 200 MOTH grid points



## Combining NILS and MOTH in the alpine biogeographic region:

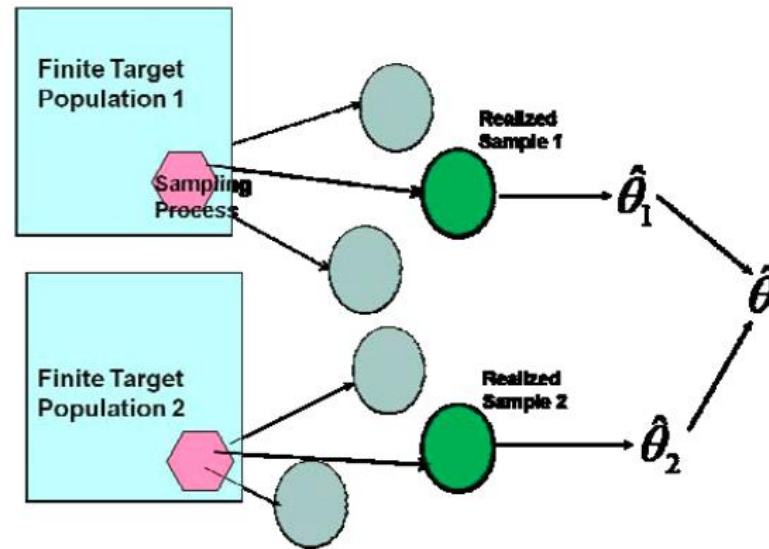
Annex I habitat type	hits (NILS+MOTH 2010-13)	areal	sd	cv
3210	3	13566	3582.4	0.26
3220	14	12030	870.6	0.07
4060	778	1908345	289274.4	0.15
4080	96	103526	24104.2	0.23
6150	211	398592	103812.5	0.26
6170	39	59604	28579.8	0.48
6430	12	8414	816.4	0.10
7140	283	509386	58650.2	0.12
7143	5	11997	1394.7	0.12
7162	9	9095	664.1	0.07
7230	80	157897	30158.8	0.19
7240	6	11525	2905.6	0.25
7296	16	14655	6105.4	0.42
7298	76	145121	44871.6	0.31
7310	26	50527	13483.0	0.27
7318	5	5539	2650.8	0.48
8110	21	105733	42935.5	0.41
8220	11	13749	4562.2	0.33
9010	180	798208	169078.8	0.21
9040	319	1358235	210717.1	0.16
9050	21	52281	13112.3	0.25
9140	2	4372	2854.9	0.65
9740	62	147374	18449.6	0.13
9750	3	1333	437.8	0.33

**NILS 2008-2012: 4060  
1819483 (12%)**

**But the NILS survey  
is only completed  
Within the period  
2008-2012 – pooling  
Here is not the best idea!**

**NILS 2008-2012: 9040  
1288362.069 (14%)**

### 3. Weighting the results (separate approach)



$$\hat{A}_{comb_{h,r}} = w_{surv1} \hat{A}_{surv1_{h,r}} + (1 - w_{surv1}) \hat{A}_{surv2_{h,r}}$$

unbiased:  $w_{surv1}$  ?



### 3. Weighting the results (separate approach)

$$W_{surv1} = \frac{var_{surv2}}{var_{surv1} + var_{surv2}}$$

The use of the variance here is critical:

- Variance estimation for a low number of hits is critical
- Variance is 'a function of n' which means an estimate based on few hits often have a lower variance than an estimate based on many hints even if the cv is lower

		hits	estm. Area	estm. SD	CV	weight
4080	NILS	17	89396	27192	0.30	0.6
	MOTH	65	116439	33720	0.29	0.4

### 3. Weighting the results (separate approach)

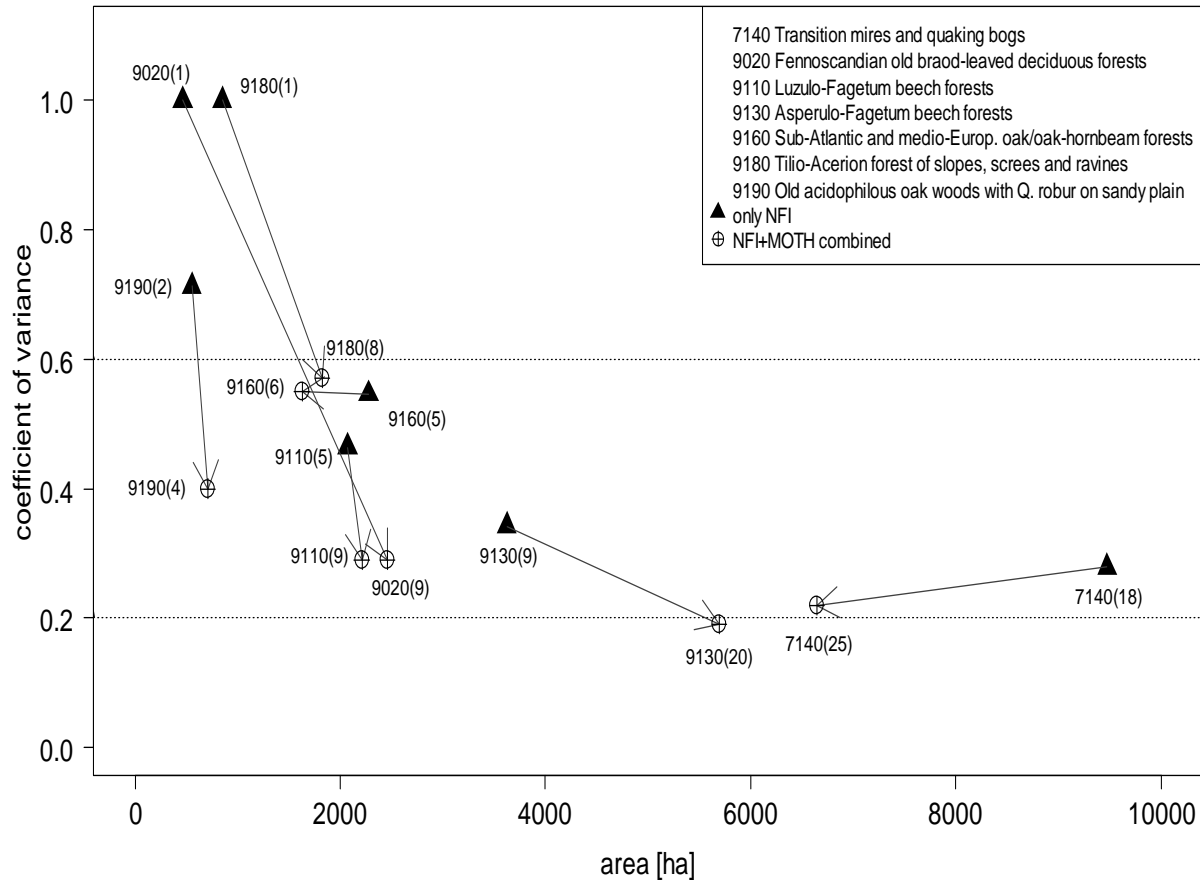
Can we use the area weight instead?

$$\text{area weight} = \frac{\text{number of possible sample units}}{\text{number of selected samples units}}$$

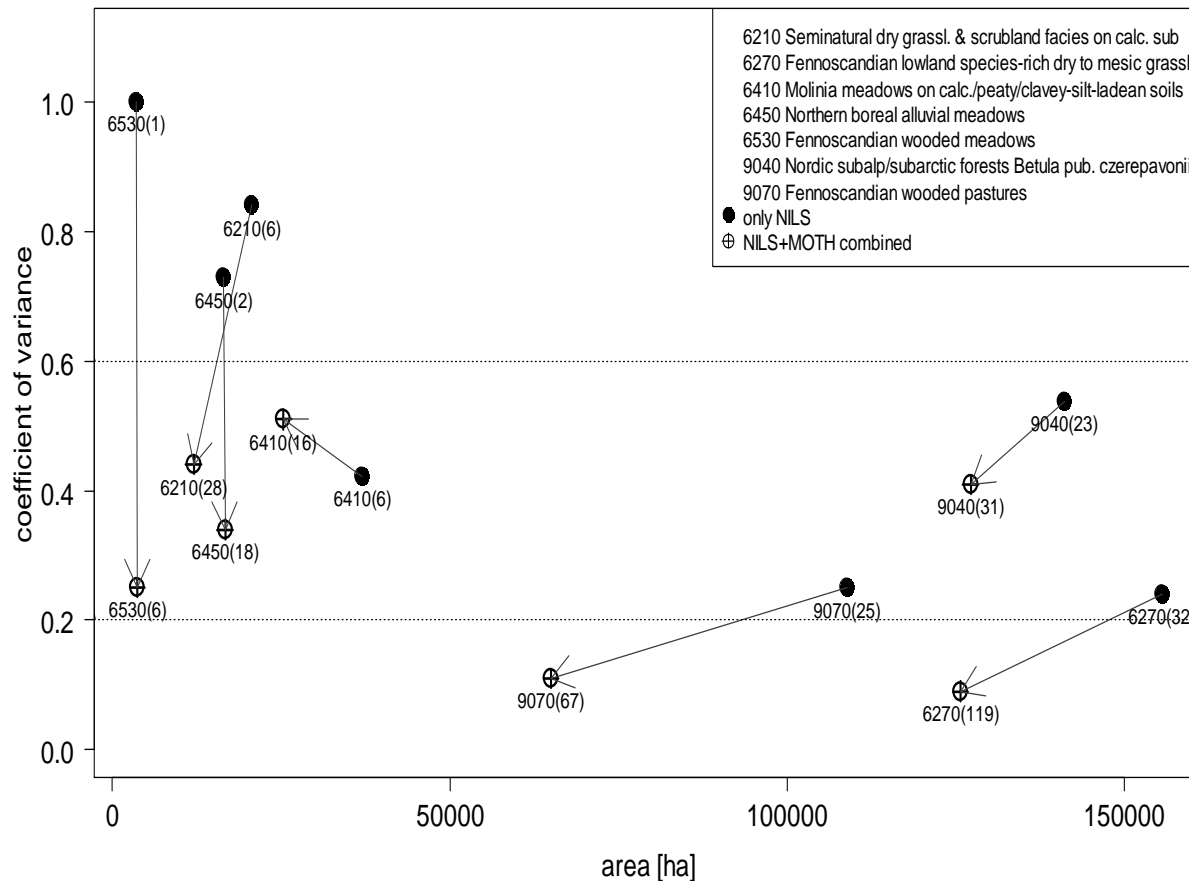
→ High area weight = low sample size, low probability to describe a heterogeneous landscape correct

→ low area weight = high sample size, higher probability to describe a heterogeneous landscape correct

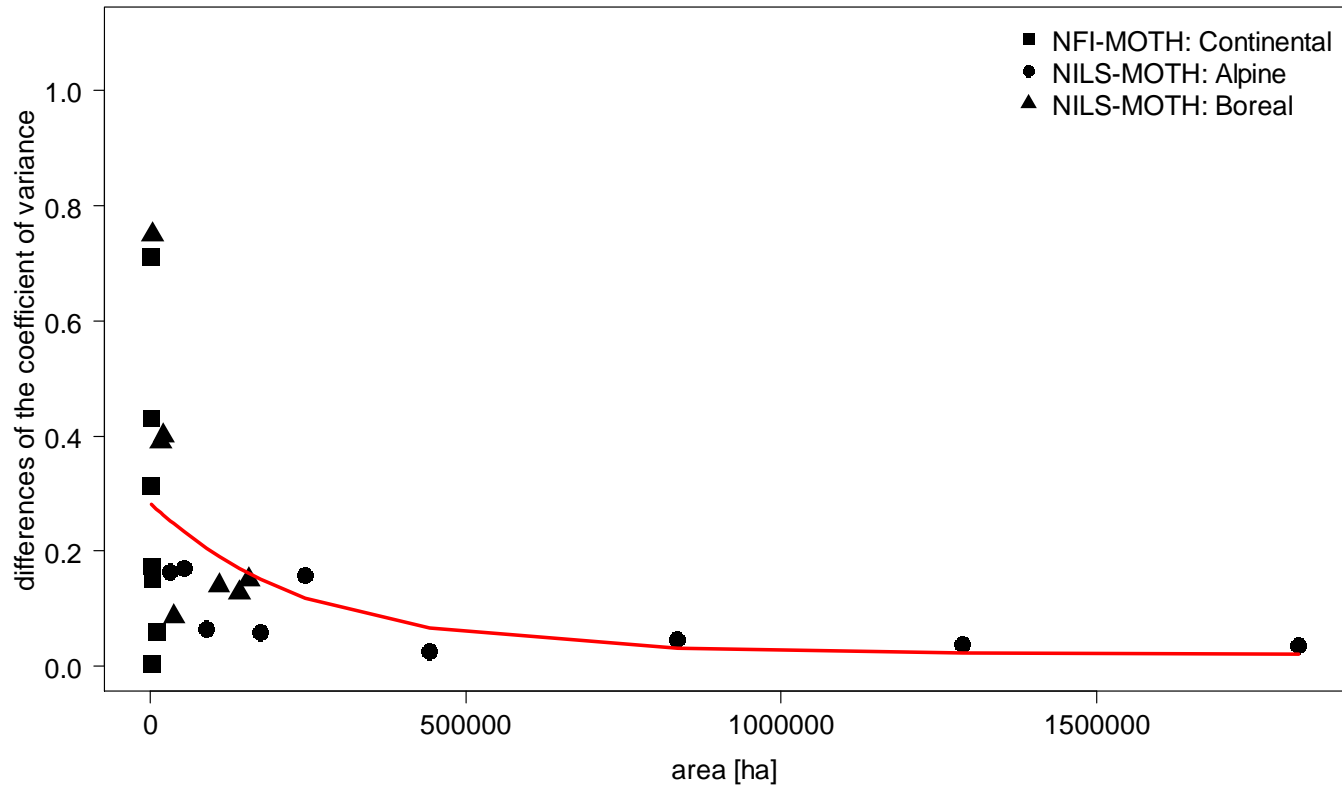
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## But:

- each weighting method will give different results
- there is no method that determines the 'right' weighting factor
- Pooling should be preferred!