Sveriges lantbruksuniversitet
Swedish University of Agricultural Sciences

MOTH
Monitoring of Terrestrial Habitats

MOTH – Demonstration of an integrated North-European system for monitoring terrestrial habitats using two phase sampling

Starting position before MOTH:

two national inventories:

National Forest Inventory (NFI)	~ 50000 sample plots
National Inventory of Swedish Landscape (NILS)	~ 7570 sample plots

(6280) *Nordic alvar*: **4 hits**
(6270) *Fennoscandian lowland species-rich dry to mesic grasslands*: **8 hits**
(6210) *Semi-natural dry grasslands on calcareous substrates*: **1 hit**
(9080) *Deciduous swamp woods*: **4 hits**

→ Inadequate information about sparse Annex I habitats : not possible to deliver enough data for the description of the status of these habitat types.

What can we do?

Rising sample size?

two national inventories:

National Forest Inventory (NFI)	~ 100000 sample plots
National Inventory of Swedish Landscape (NILS)	~ 15000 sample plots

(6280) *Nordic alvar*: 4 hits **8 hits**
(6270) *Fennoscandian lowland species-rich dry to mesic grasslands*: 8 hits **16 hits**
(6210) *Semi-natural dry grasslands on calcareous substrates*: 1 hit **2 hits**
(9080) *Deciduous swamp woods*: 4 hits **8 hits**

→ Inadequate information about sparse Annex I habitats : not possible to deliver enough data for the description of the status of these habitat types.

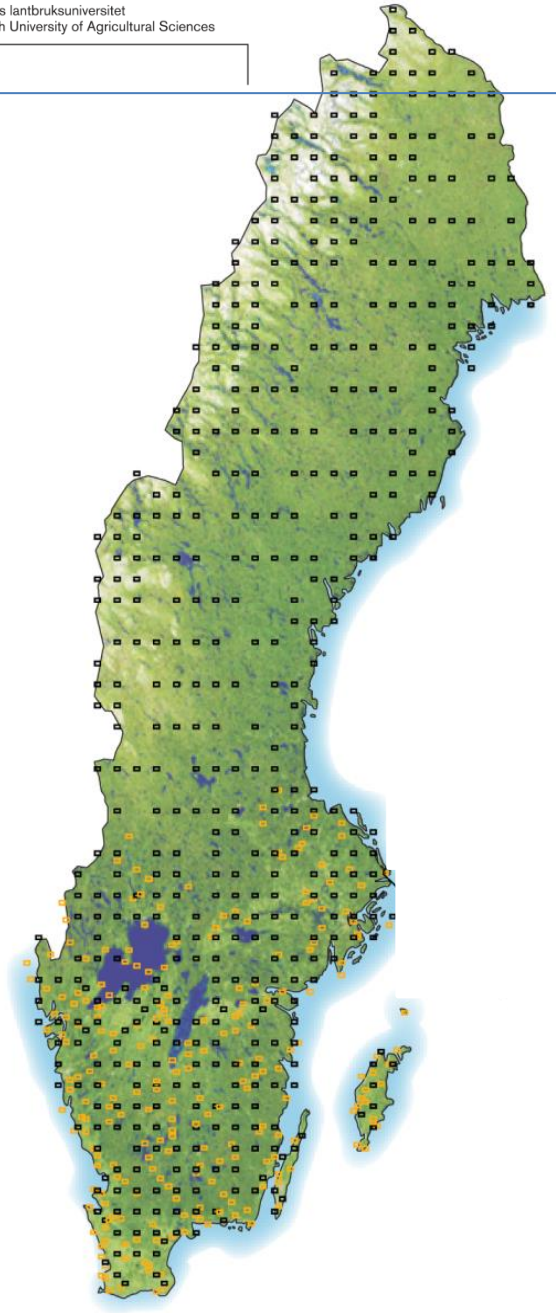
What can we do?

Change the design / methodology?

Two steps:

1. Identifying areas where Annex I habitats probably occur using remote sensing methods

2. Sampling these areas using random sampling

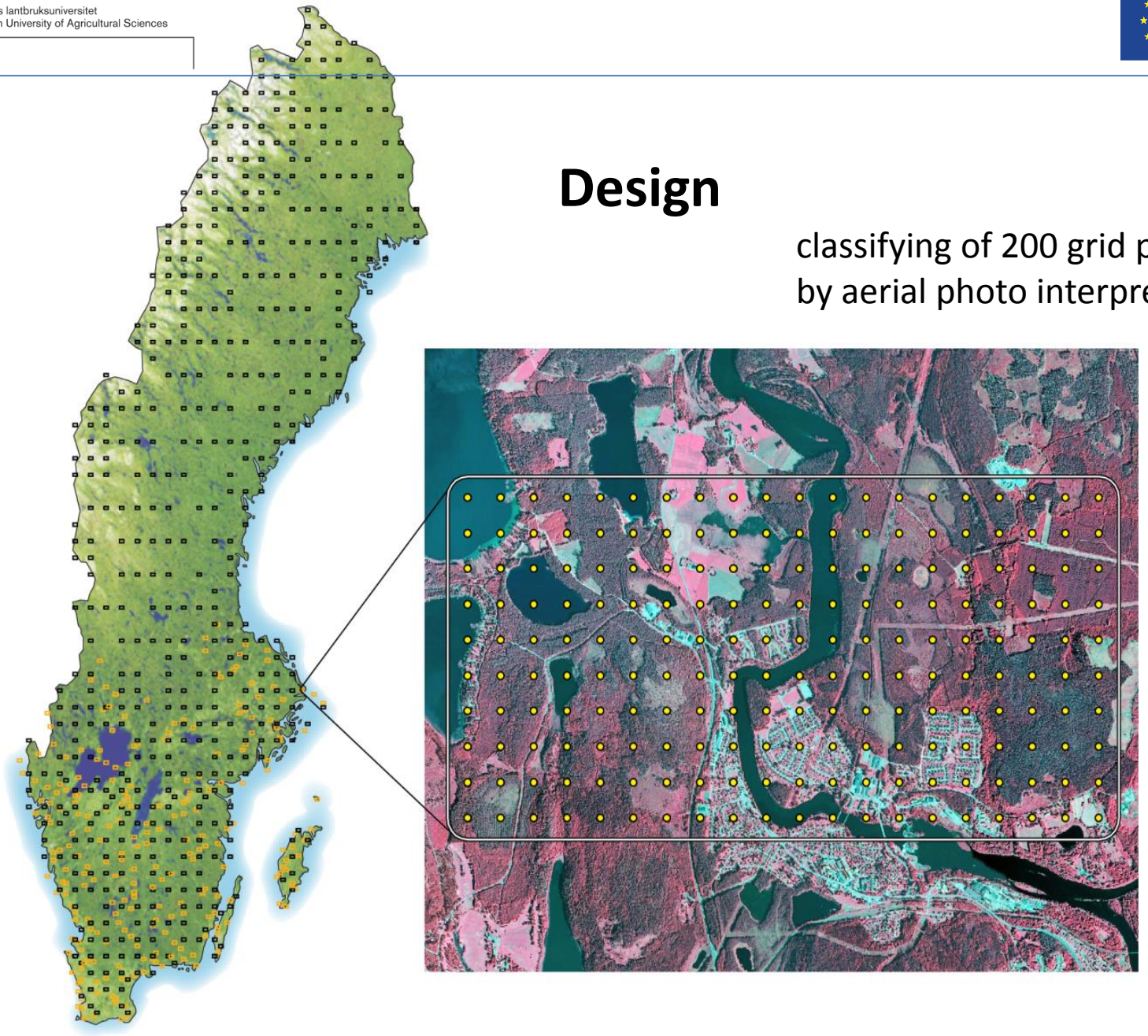


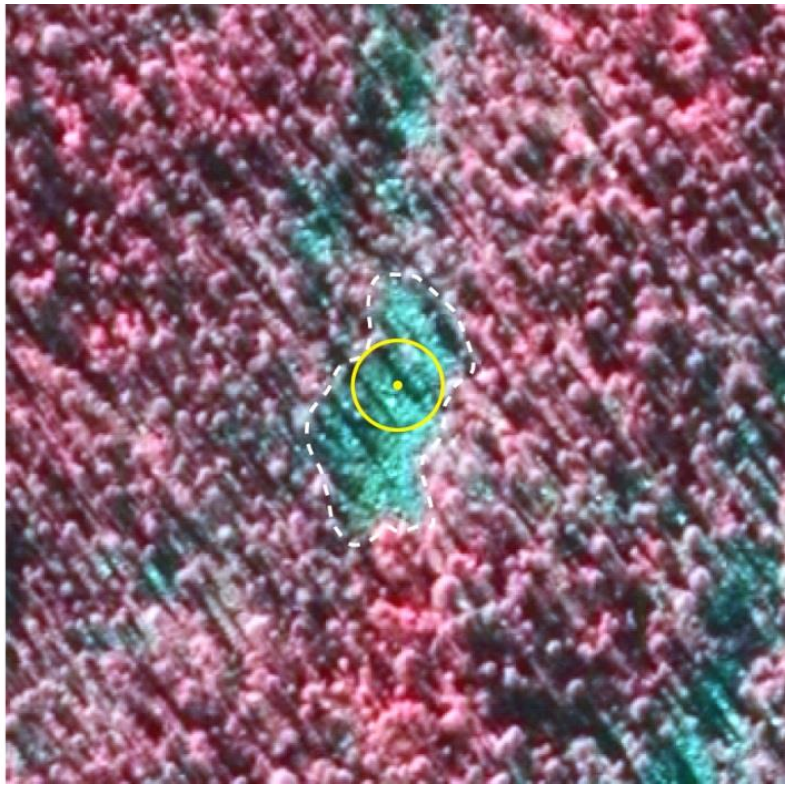
Design

- 5 x 2.5 km sample units
  (following the sampling design of NILS)
  (3.5 sampling years of five)
- 5 x 2.5 km sample units
  (additional sampling units)

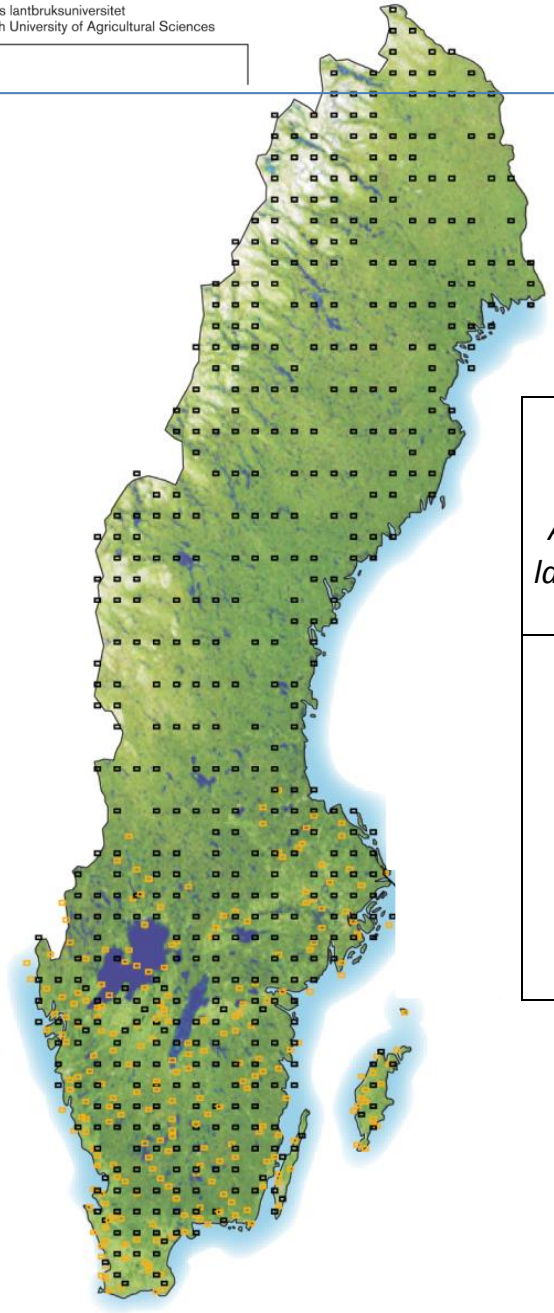
Design

classifying of 200 grid points
by aerial photo interpreters



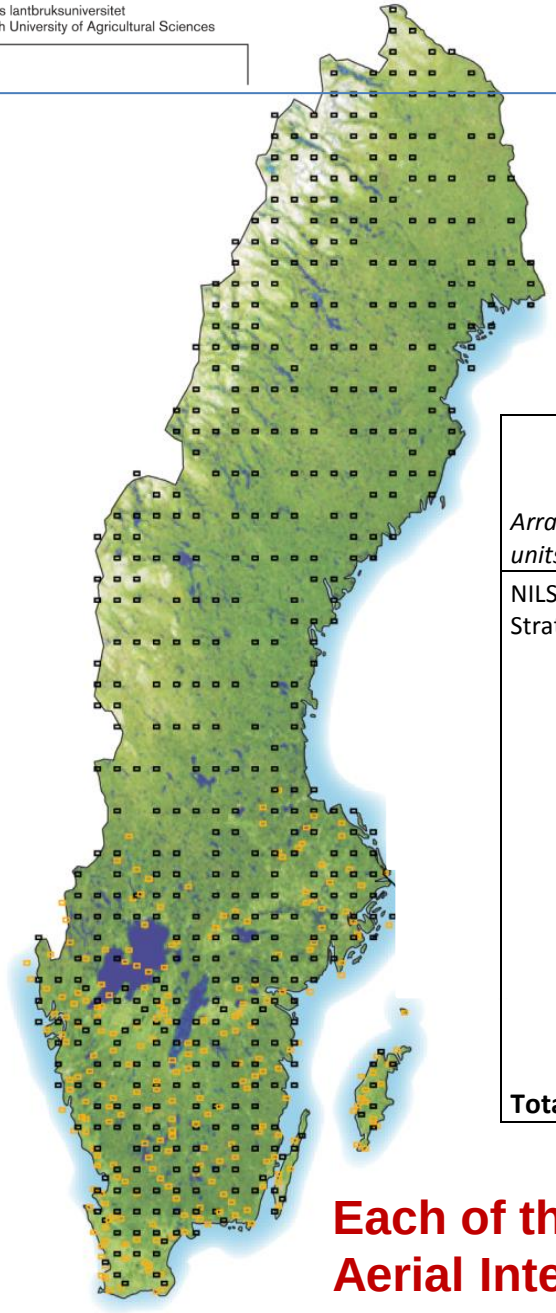


→ Each grid point was classified according to a classification scheme containing ~114 Aerial Interpretation classes (AI)



5 x 2.5 km units
(following the sampling design of NILS)

	Biogeographical region:					
	Alpine	**Boreal**		**Continental**		
Array of landscape units:	*Base*	*Base*	*Extra*	*Base*	*Extra*	sum:
Year:						
2010	18	40	0	5	0	63
2011	28	91	0	8	0	127
2012	28	90	47	8	14	187
2013	27	93	50	7	11	188
Total:	101	314	97	28	25	565



5 x 2.5 km units
(following the sampling design of NILS)

	Biogeographical region:					
	Alpine	**Boreal**		**Continental**		
Array of units:	*Base*	*Base*	*Extra*	*Base*	*Extra*	sum:
NILS Stratum						
1			93	1800	2307	4200
2		2800	2800	2400	1600	9600
3		4600	2800			7400
4		8800	4600			13400
5		12221	7632	1400	968	22221
6		7308	1200			8508
7		8400				8400
8	1200	8000				9200
9	400	8400				8800
10	17043	2042				19085
Total:	**18643**	**62571**	**19125**	**5600**	**4875**	**110814**

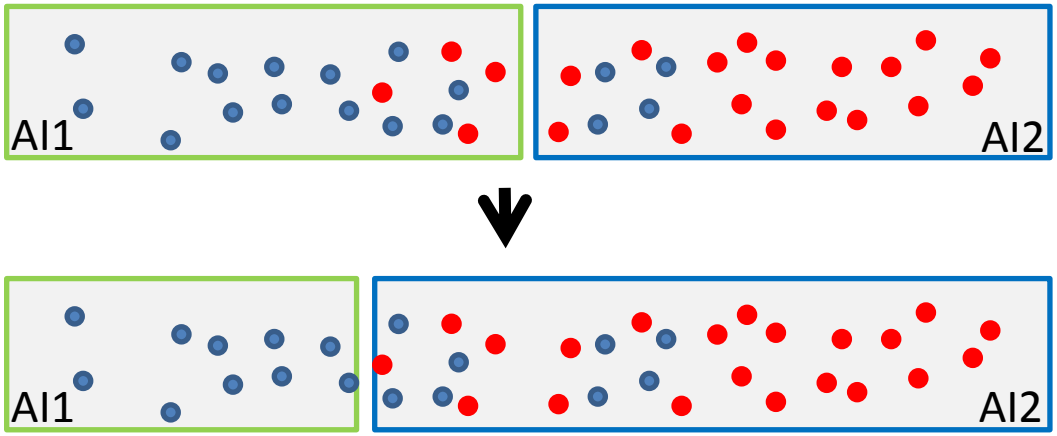
Each of these 110814 grid points were assigned to one Aerial Interpretation Class (AI) (following Skånes et al. 2007)

Changes made concerning Skånes et al. 2007

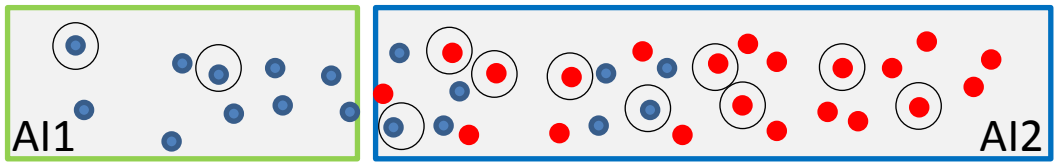
1. merging AI classes

2. broaden AI classes

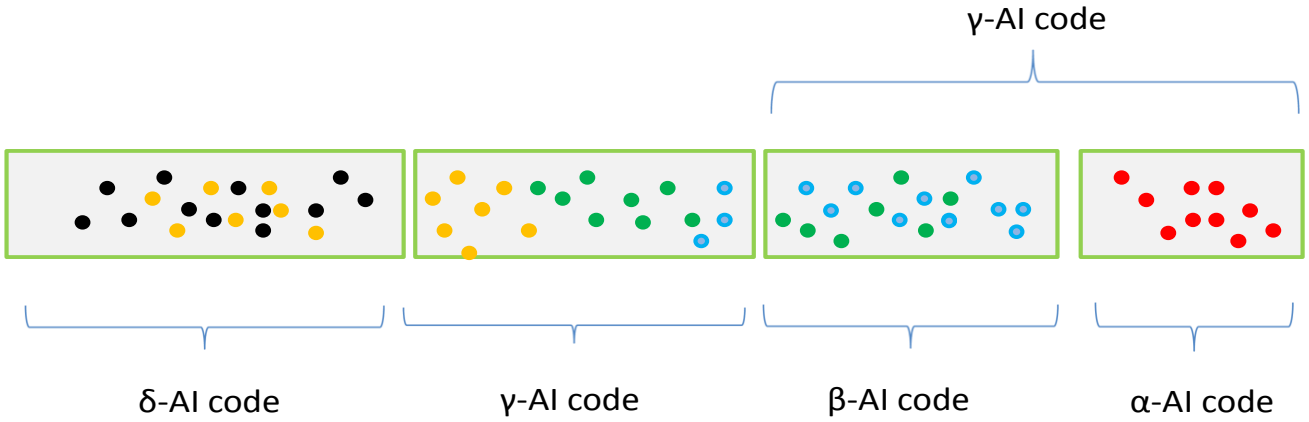
- Annex I habitat A
- Annex I habitat B

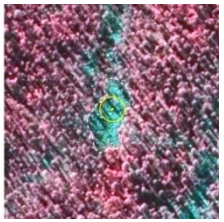


3. sampling all AI classes with different probabilities



selected for field sampling





Different Annex I habitat types

non Annex I habitat types

Class type	Description of class type
α	Single Annex 1 habitat
β	Collective code for Annex 1 habitats from similar habitat groups
γ	Collective code for Annex 1 habitats from different habitat groups
δ	Collective code including both Annex 1 habitats and Non Annex 1 habitats
ε	Single Non Annex 1 habitat
ζ	Group of Non Annex 1 habitats
η	Basecode in series

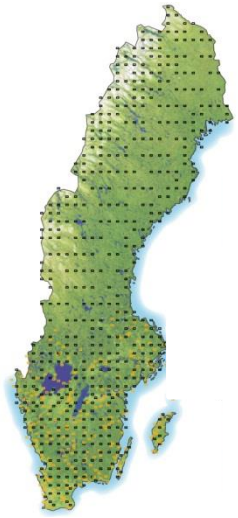
Focus in MOTH: Sparse habitat types

We were not interested in common Annex I habitat types that were covered by the NFI and NILS

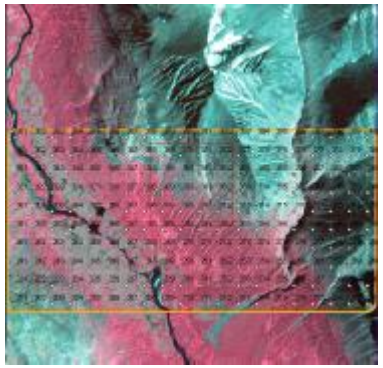
→ Need for selection rules in the second sampling phase – the field sampling

Field visit priority	Expected % of grid-points visited	Minimum number of gridpoints visited	Maximum number of gridpoints visited
1	75%	15	70
2	15%	10	30
3	10%	5	15
4	0%	0	0

1. Design



phase I: remote sensing



Classifying according to AI classes

selection of field sampling plots

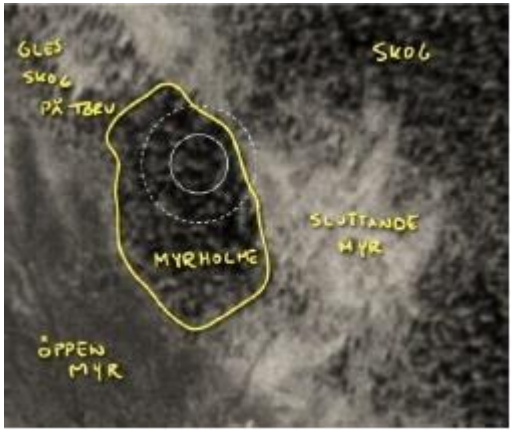
random sampling
of all grid points within
each AI class with different
priority according the target
Annex I habitat types

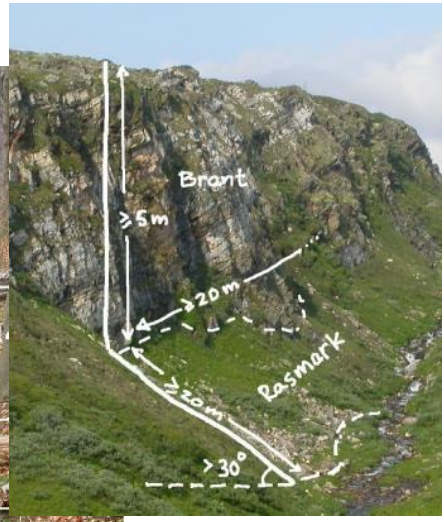
phase II:
Field sampling

Instruktion för Habitatinventering i NILS och MOTH, 2012

Version 2012-04-13

Hans Gardfjell, Åsa Hagner
Skoglig Resurshushållning
SLU
901 83 Umeå





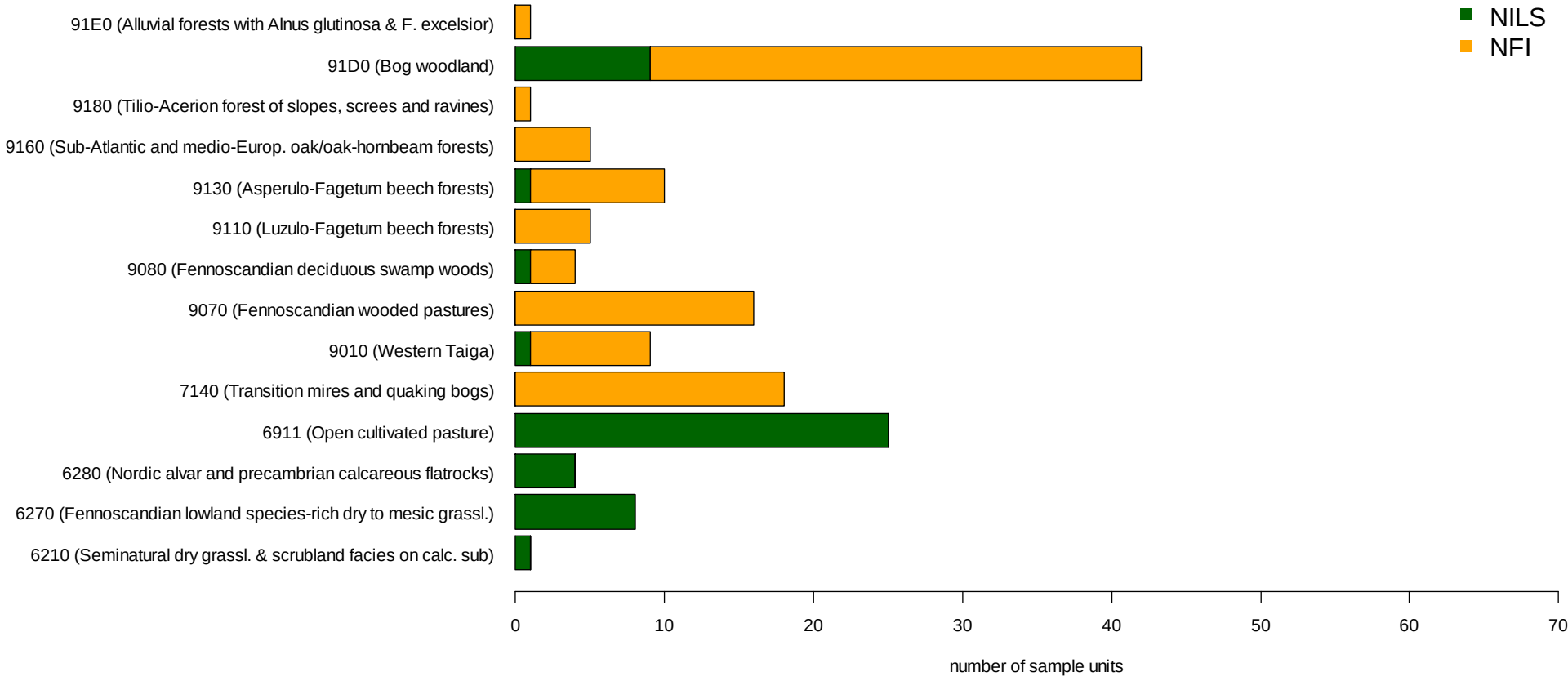
Field visited sample plots

	Biogeographical region:					
	Alpine	**Boreal**		**Continental**		
Array of units:	*Base*	*Base*	*Extra*	*Base*	*Extra*	sum:
NILS Stratum						
1			22	64	102	188
2		212	155	273	105	745
3		202	86			288
4		284	87			371
5		474	276	135	91	976
6		285	44			329
7		251				251
8	57	207				264
9	29	374				403
10	2011	150				2161
Total:	**2097**	**2439**	**670**	**472**	**298**	**5976**

Result of the field work – Continental biogeographic region

habitat-code	NILS	NFI	MOTH	Prio	Natura 2000 habitat
6210	1	-	**28**		Semi-natural dry grasslands and scrubland facies on calcareous substrates(Festuco-Brometalia)
6270	8	-	**39**		Fennoscandian lowland species-rich dry to mesic grasslands
6280	4	-	**44**	1	Nordic alvar
6911	25	-	**42**	2	Open cultivated pasture
7140	0	18	**9**	2	Open mires
9010	1	8	**8**	2	Western taiga
9070	0	16	**10**	1	Wooded pastures
9080	1	3	**10**	1	Deciduous swamp woods
9110	0	5	**6**		Luzulo-Fagetum beech forests
9130	1	9	**16**		Asperulo-Fagetum beech forests
9160	0	5	**4**		Sub-Atlantic and medio-European oak or oakhornbeam forests of the Carpinion betuli
9180	0	1	**7**	1	Broadleaved hardwood forest in slopes, screes and ravines
9740	9	33	**6**	2	Mire woodland
9750	0	1	**5**	1	Alluvial forest
9999	384	3729	**456**	3	Non-annex 1 habitat (reason noted)

Result of the field work – Continental biogeographic region



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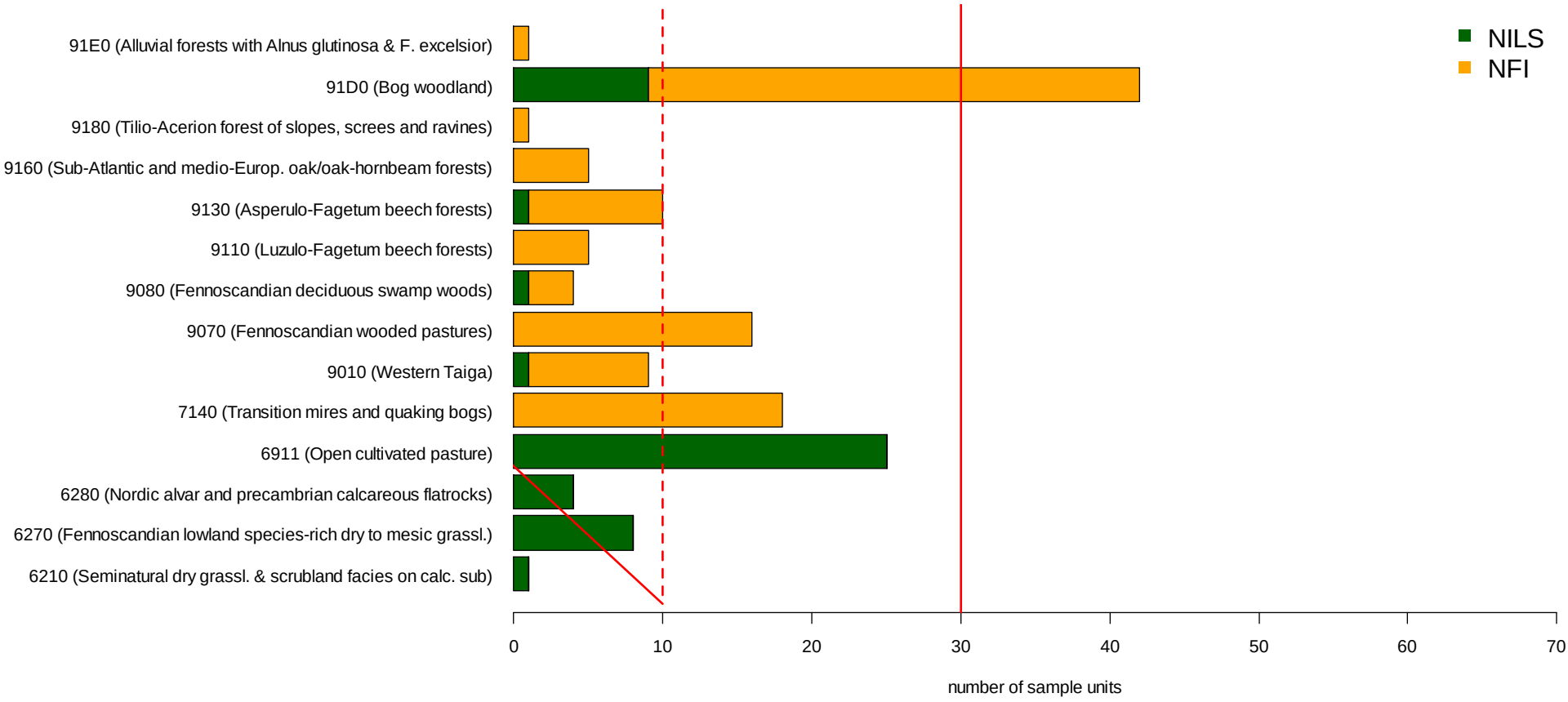
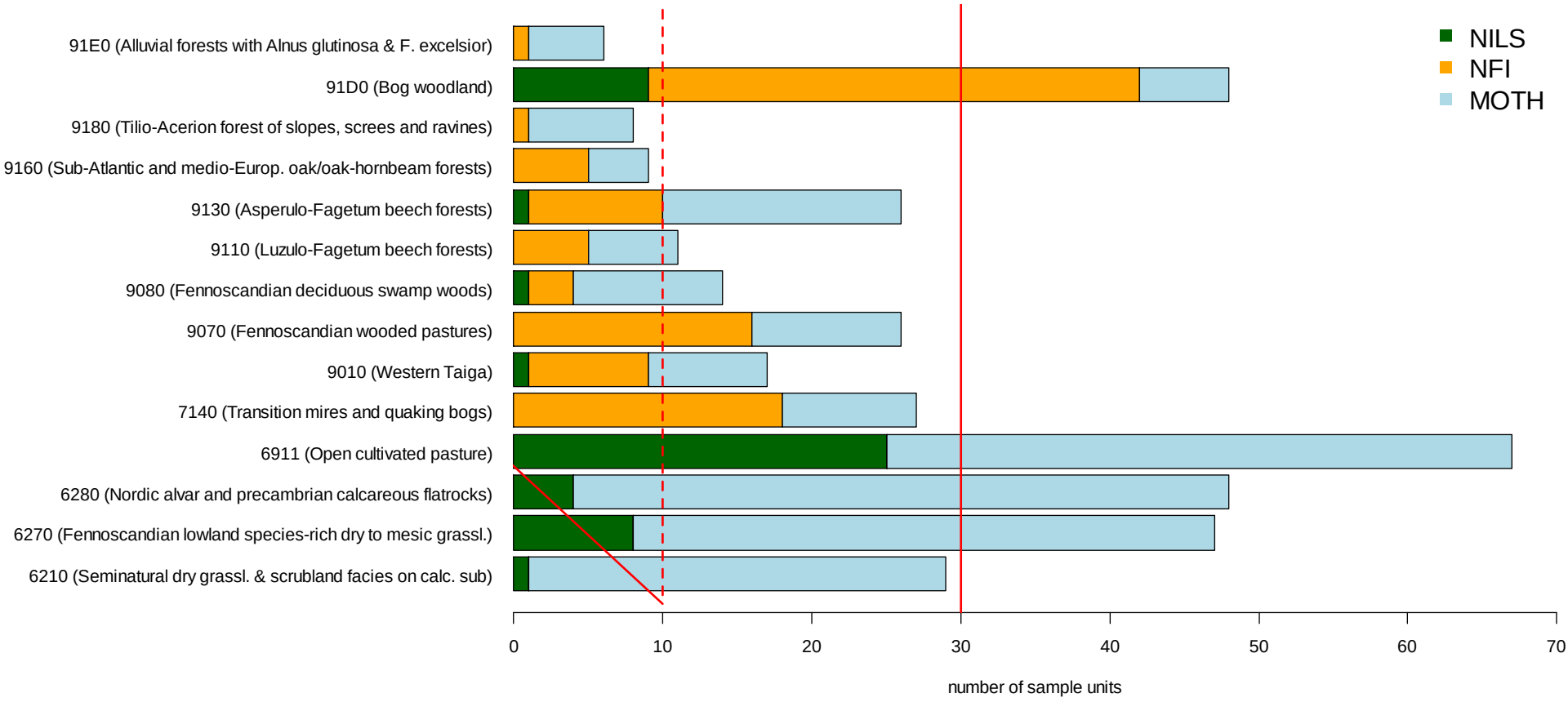
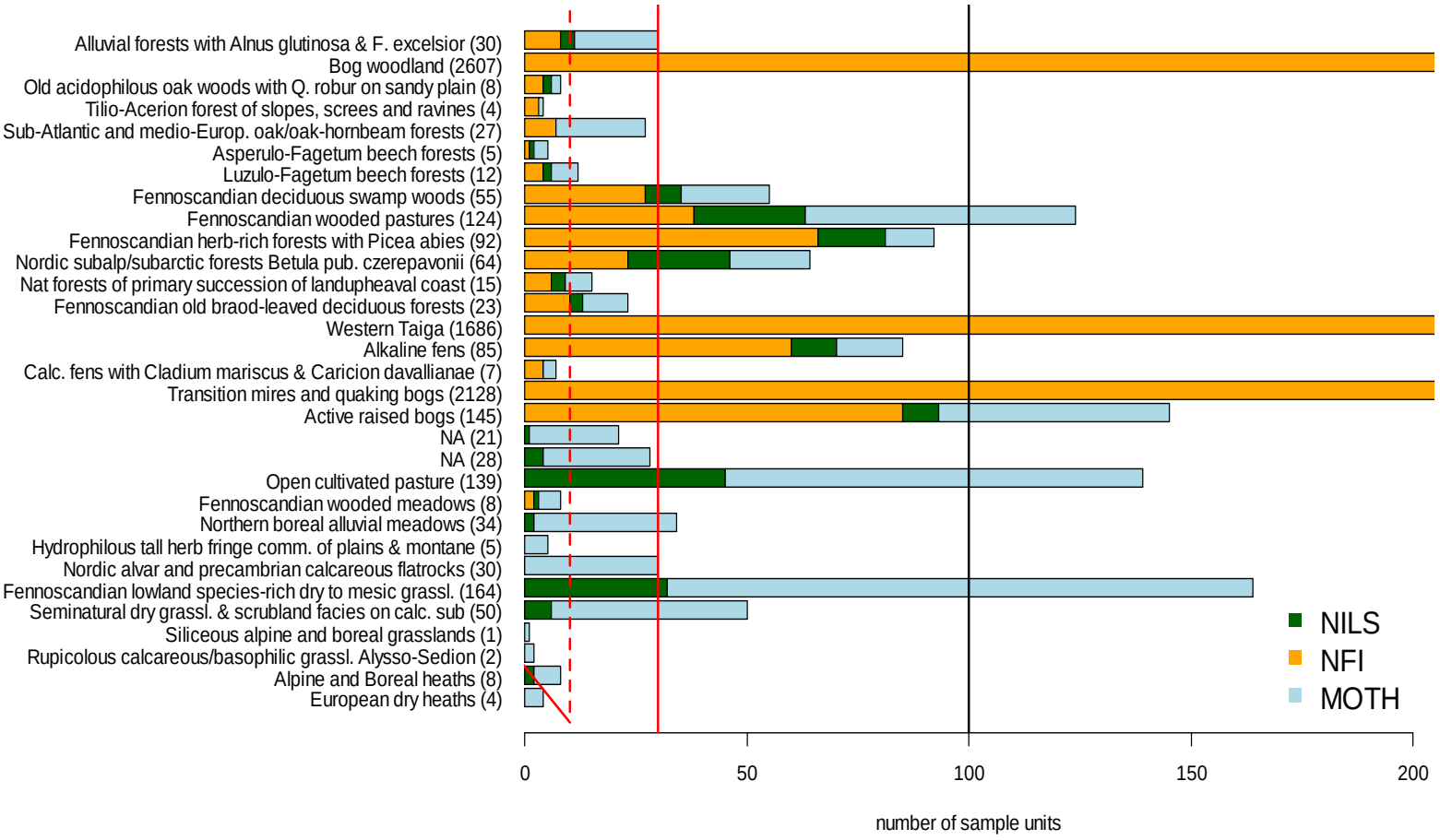


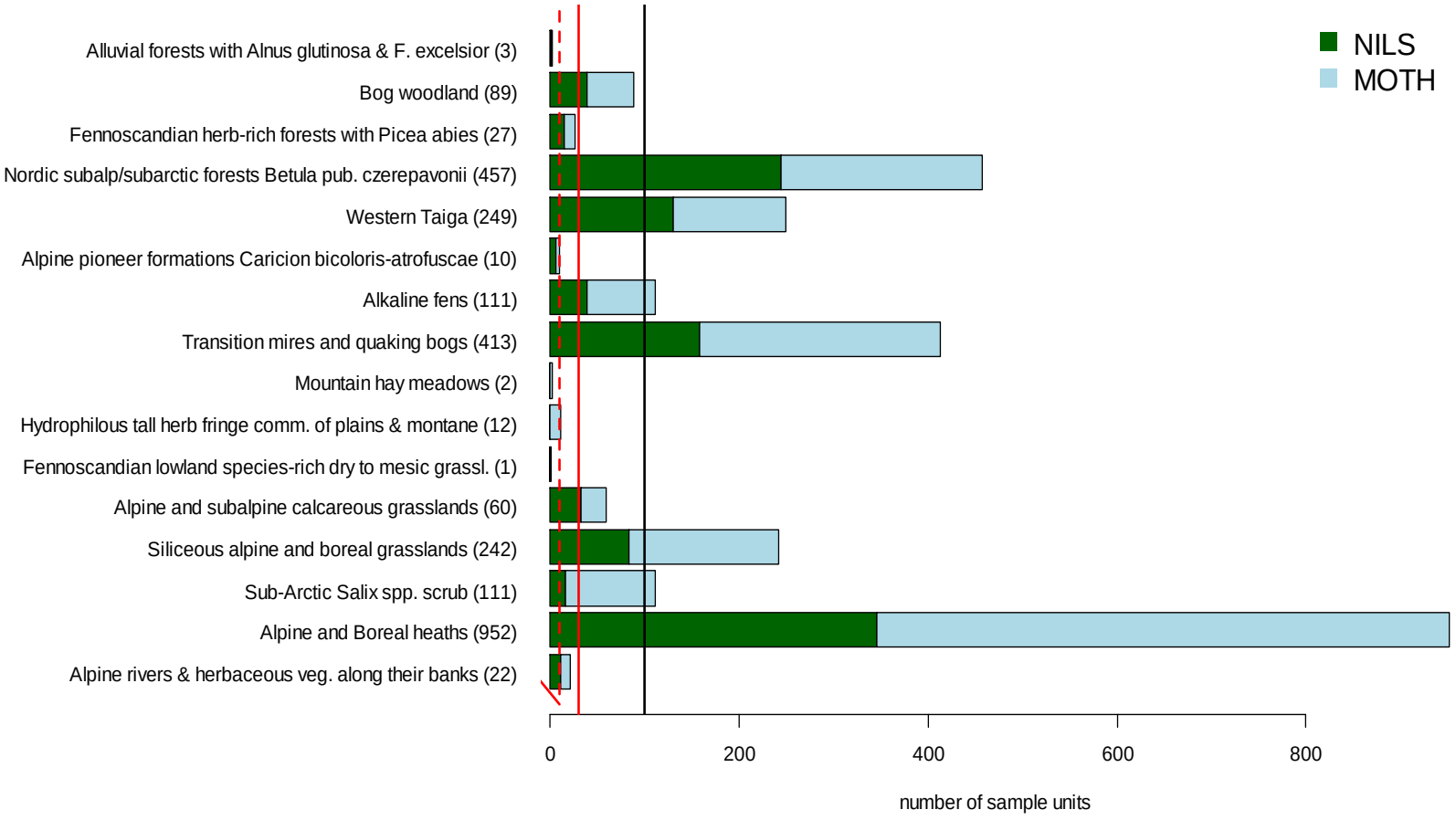
Result of the field work – Continental biogeographic region



Result of the field work – Boreal biogeographic region



Result of the field work – Alpine biogeographic region

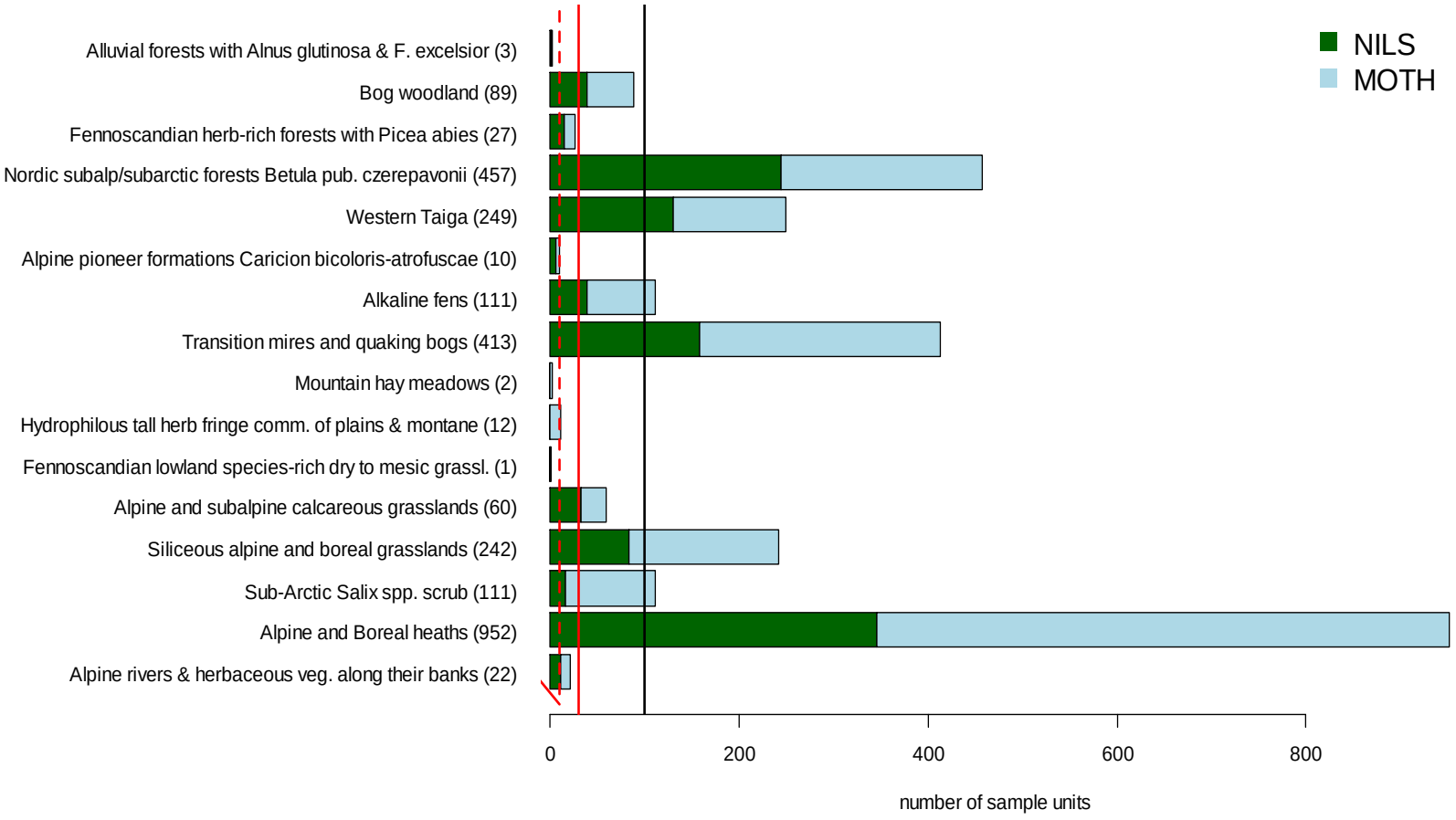


Result of the field work – Alpine biogeographic region

Areal Estimation follows Särndal et al. (1992)

Annex I habitat	code	nb of hits	areal	sd	cv	group
Fennoscandian natural rivers	3210	3	12383.62	3398.88	0.27	freshwater habitats
Alpine rivers & herbaceous veg. along their	3220	10	10067.05	490.79	0.05	freshwater habitats
Alpine and Boreal heaths	4060	588	1811534.50	191375.37	0.11	heath & scrub
Sub-Arctic Salix spp. scrub	4080	91	100600.37	23719.78	0.24	heath & scrub
Siliceous alpine and boreal grasslands	6150	157	376788.17	94730.19	0.25	grasslands
Alpine and subalpine calcareous grasslands	6170	27	54801.26	23272.89	0.42	grasslands
Fennoscandian lowland species-rich dry to r	6270	1	585.83			grasslands
Hydrophilous tall herb fringe comm. of plair	6430	12	8531.36	823.52	0.10	grasslands
Mountain hay meadows	6520	2	1328.15			grasslands
Open cultivated pasture	6911	2	4938.59			grasslands
Blanket bog (*active only)	7130	1	1390.44			bogs, mires & fens
Transition mires and quaking bogs	7140	249	506995.26	55848.38	0.11	bogs, mires & fens
Alkaline fens	7230	71	150854.38	29647.16	0.20	bogs, mires & fens
Alpine pioneer formations Caricion bicoloris	7240	4	10185.91	2937.25	0.29	bogs, mires & fens
Aapa mires	7310	18	46544.71	10453.13	0.22	bogs, mires & fens
Palsa mires	7320	2	1150.58			bogs, mires & fens
Siliceous scree of the montane to snow leve	8110	20	106220.55	42931.68	0.40	rocky habitats
Calcareous & calcshist screes of montane to	8120	1	1495.10			rocky habitats
Siliceous rocky slopes with chasmophytic ve	8220	7	10265.41	2342.64	0.23	rocky habitats
Western Taiga	9010	117	759805.93	129128.26	0.17	forests
Nordic subalp/subarctic forests Betula pub.	9040	208	1295228.50	148940.23	0.11	forests
Fennoscandian herb-rich forests with Picea	9050	12	47831.93	10707.72	0.22	forests
Medio-Europ. subalp. beech woods Acer & F	9140	2	4414.81	2883.30	0.65	forests
Bog woodland	91D0	50	143481.51	17829.45	0.12	forests

Result of the field work – Alpine biogeographic region



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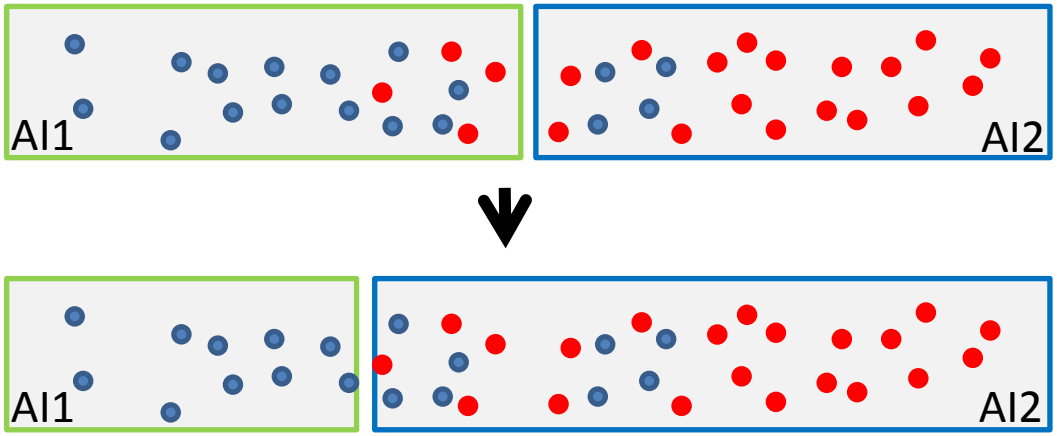
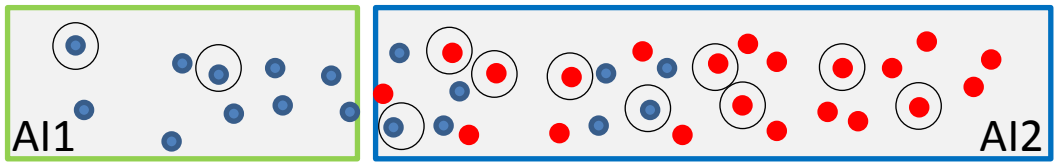


3. sampling all AI classes with different probabilities



selected for field sampling

Result of the field work – Alpine biogeographic regi

NILS: 4060
1819482.759 (12%)

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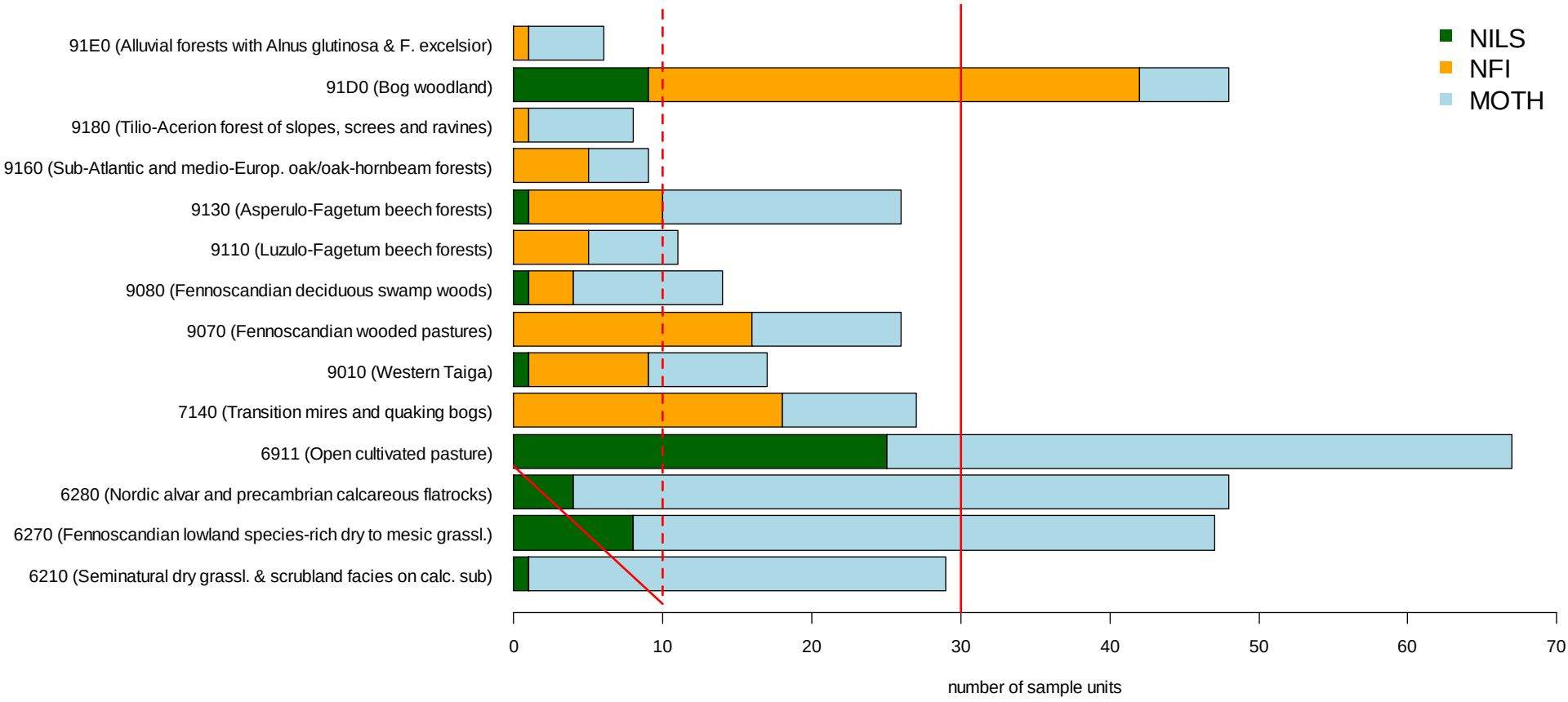
Result of the field work – Continental biogeographic region



Summary:

- Two phase design was successfully applied to describe the status of sparse and common habitat types
- Aerial photo interpretation is a good tool in phase I to distinguish between potential Annex I habitat areas and areas with high degree of anthropogenic impact.
- Further development: AI class system needs still improvements as to many AI classes exists which makes the selection in phase II difficult (possible solution see presentation about seashore inventory and After Life plan)
- Need for combining the data of different monitoring schemes