

Innovationscenter
for Økologisk Landbrug

Biodiversity and beneficial insects -benchmarking habitats on farmland

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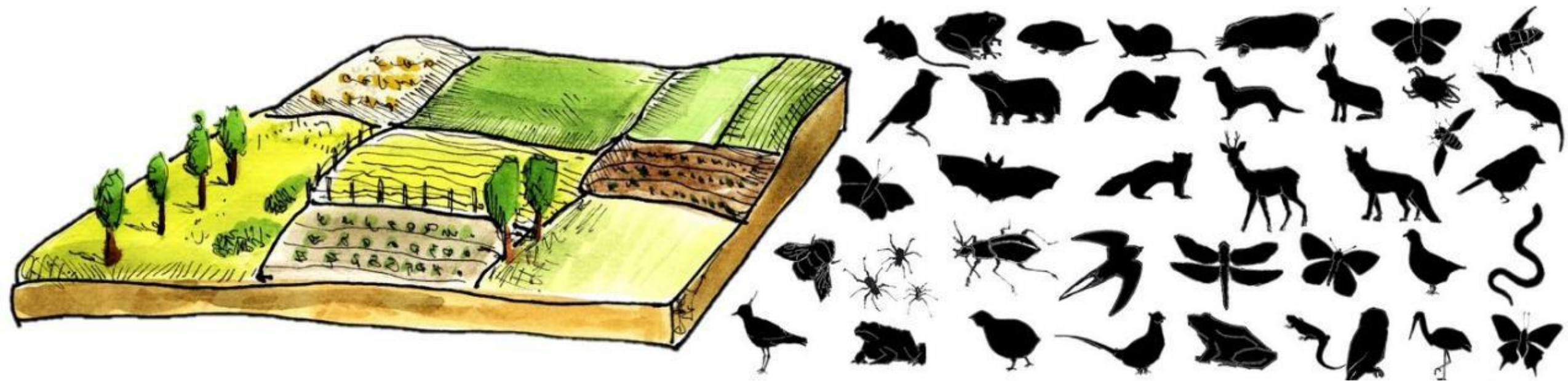
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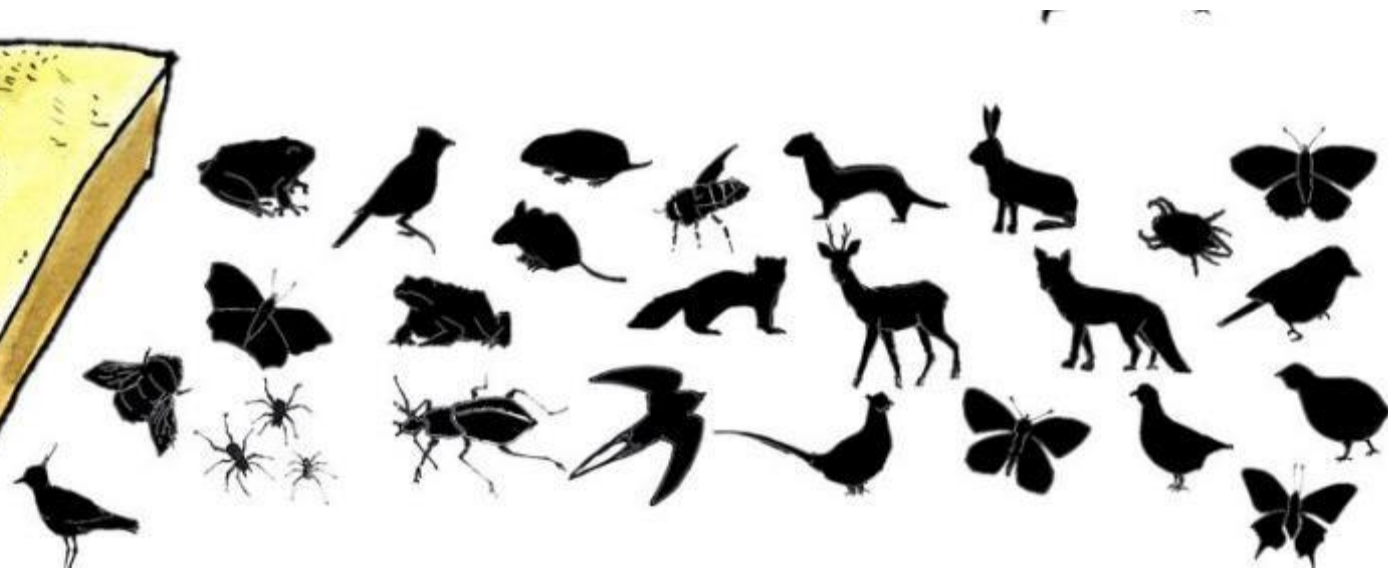
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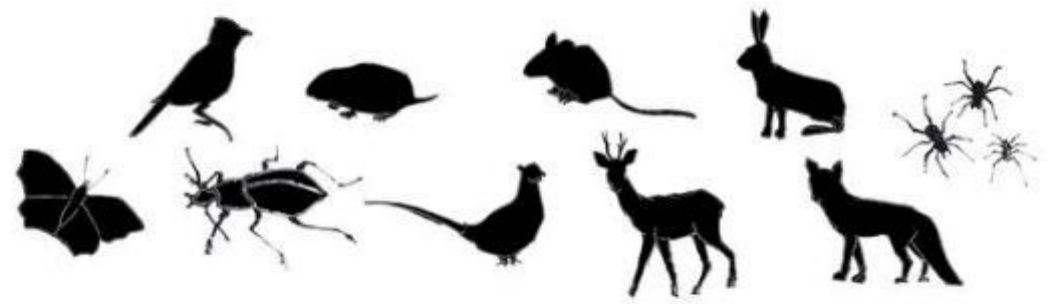
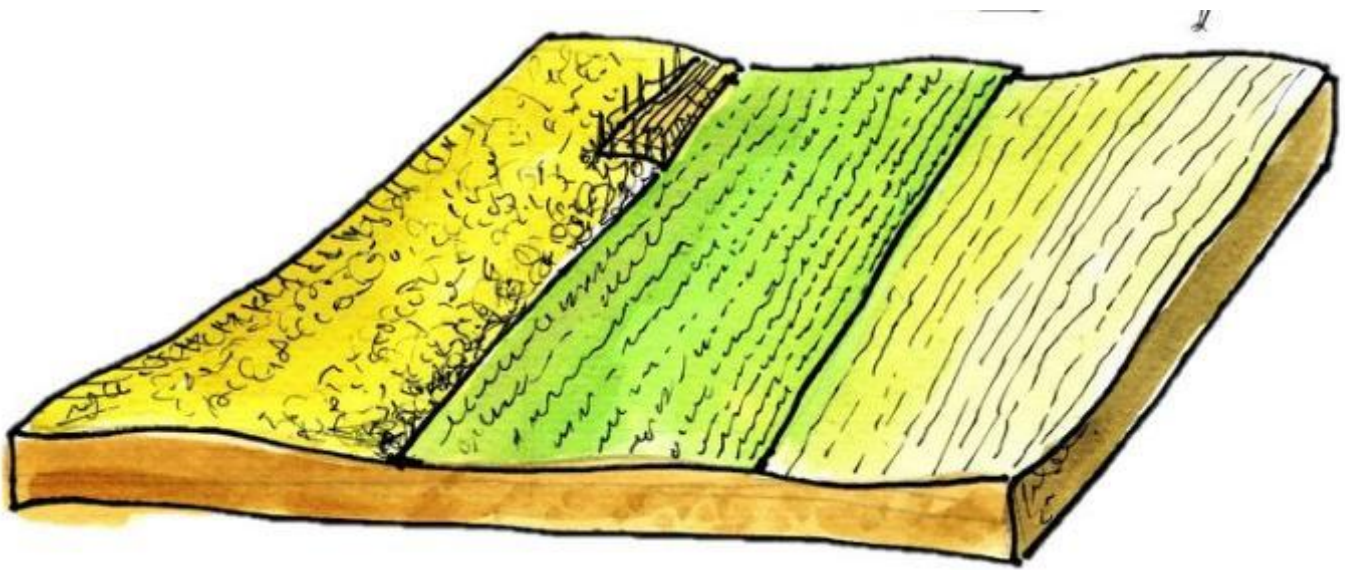
STØTTET AF

Fonden for **økologisk landbrug**

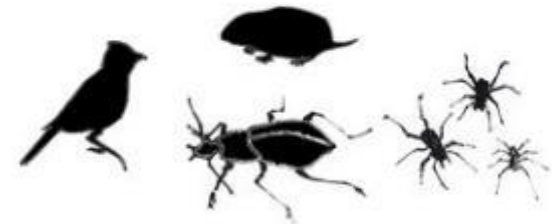
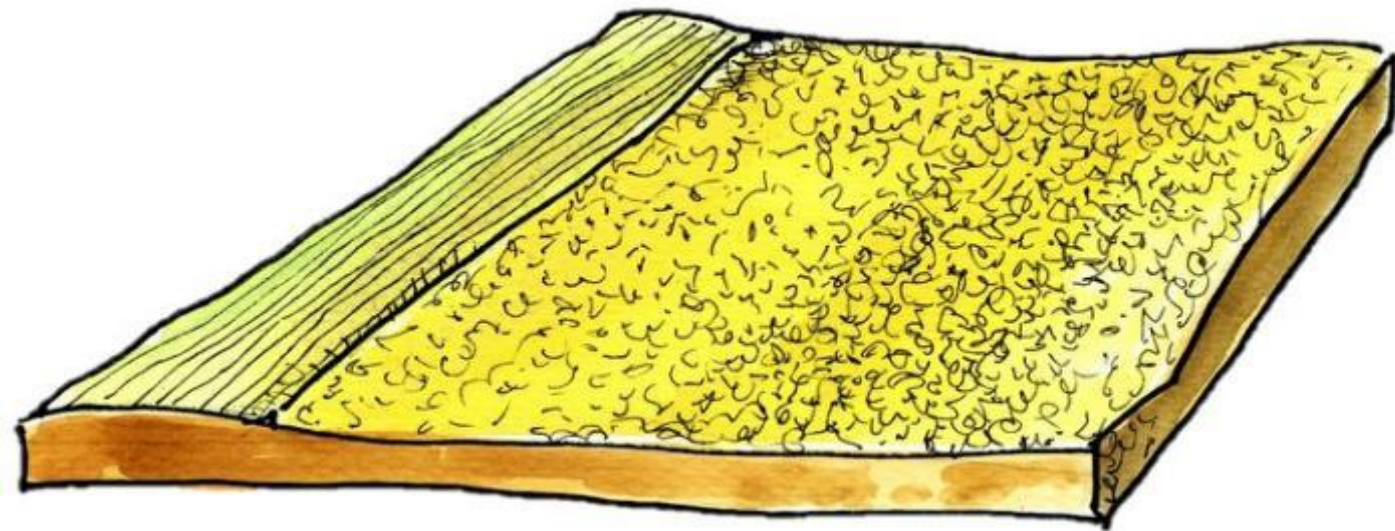




- edges
- crop diversity
- carbon



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- edges
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- carbon



25. july 2023

26 days of drought, followed by the
wettest july (and year) ever measured.

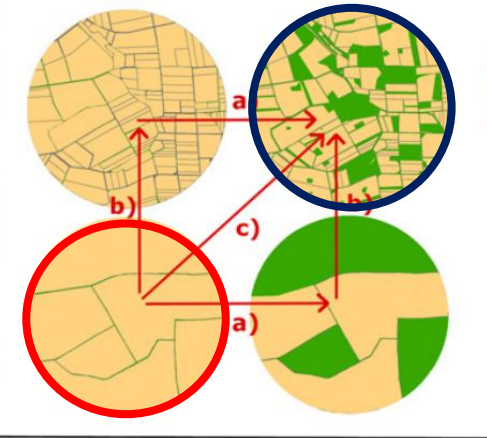


Biodiversity and edge density

Syntese af 49 studier over i alt 1515 landskaber fra hele Europa (Martin et al., 2019)

High boundary length per area

Edge density

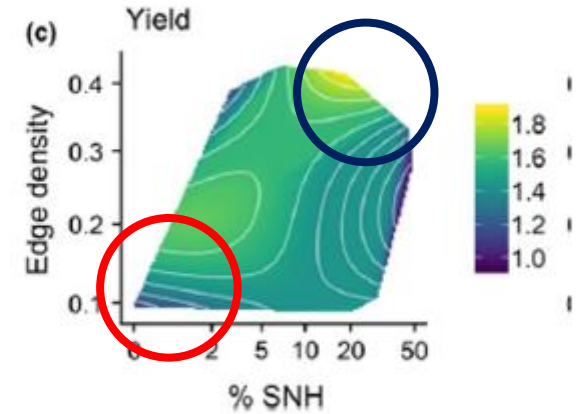
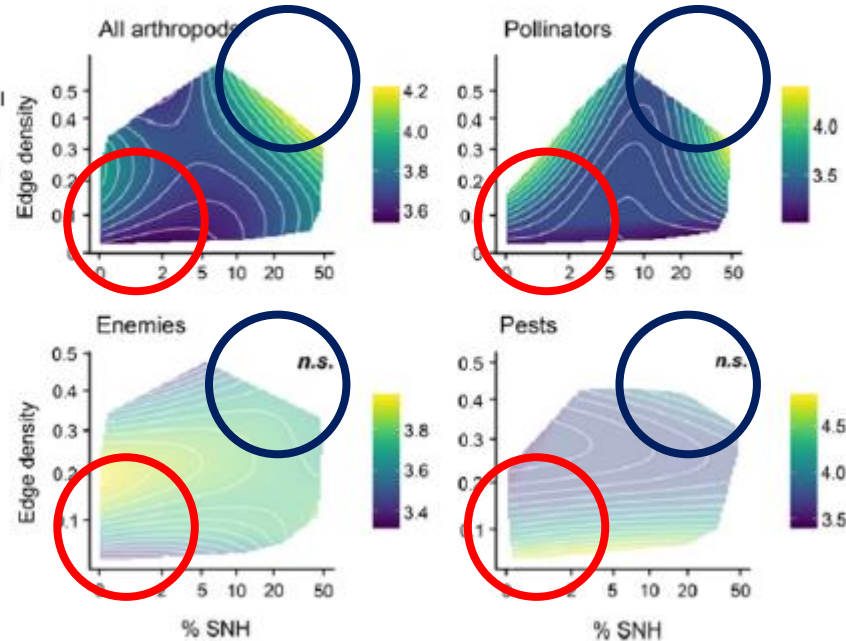


■ seminatural habitat
■ cultivated arable land

Habitat amount

← Arable high

→ SNH high



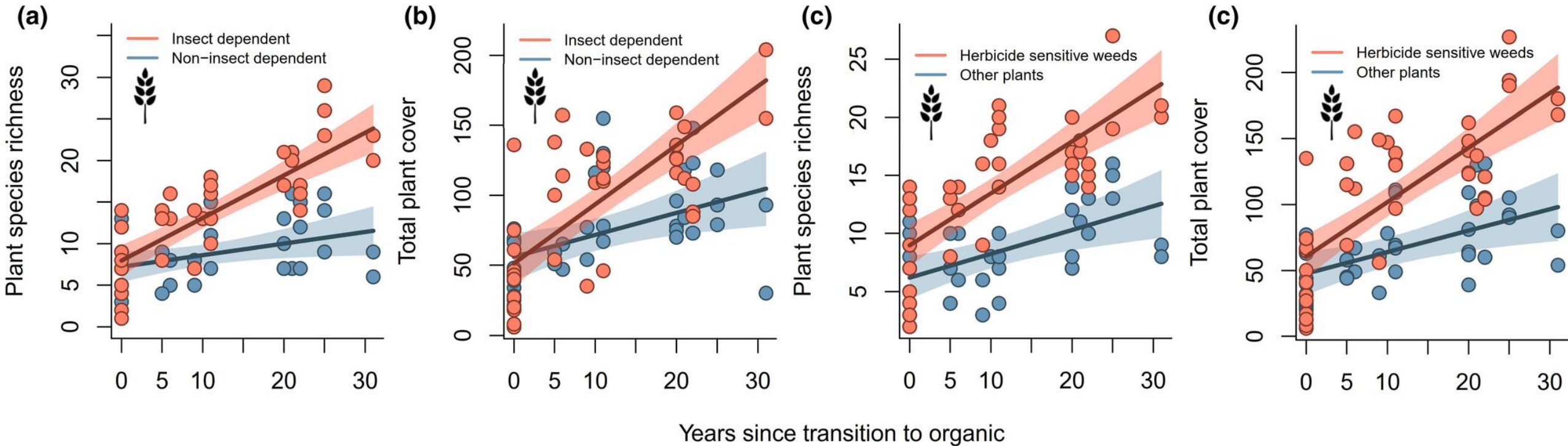
Positive effects are achieved at 2 x 10 meter rows of landscape element per hectare (100 x 100m)

Edge density = 0.4 km of edge/ha

%SNH = 20% (hvis rækker bliver 10 meter brede)



Biodiversity is a slow moving wave



“Loss of functions (species) in an ecosystem is the equivalent of randomly removing rivets from a plane.

It will continue flying for a while, but suddenly there will be catastrophic failure.”

-Ehrlich and Ehrlich, 1981



Australian BLANK Project

- Cattle brought to Australia in 1788
- 12 patties/day/cow
- Took months or years to decompose
- 200,000 ha / year grassland lost
- Flies everywhere
- Disease and medicine
- Parasites in most cows
- WHY??

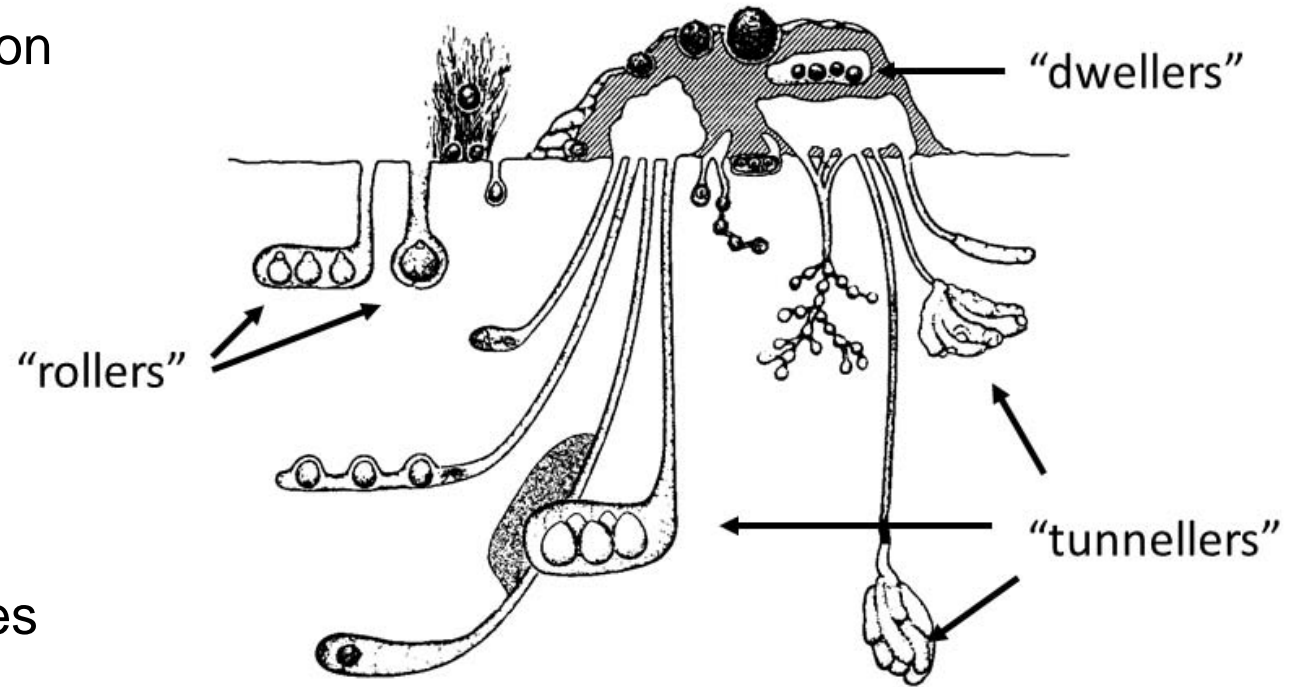
- 1970





Australian Dung Beetle Project

- 43 species of dung beetle introduced
- Today the population is 28 million cattle
- More grassland is freed than used
- Patties dispersed within days
- Up to 96% reduction in flies
- Up to 85% reduction in parasites
- Less disease



Floate, 2023

Lack of bees in China

China heard about European honeybees

Imported to China (invasive)

More diligent than Chinese honeybees

Combined with extreme pesticide use,
intensive land-use, and ectoparasites...

Globally pollinators are estimated to have a
yearly worth in labor of about
2,400,000,000,000 dkk (TRILLION). That is
the Danish gross domestic product in 2023.





With pollinators

- Coffee
- Juices
- Most fruit
- Honey
- Wine
- Olives
- Chocolate
- Vanilla
 - Already hand-pollinated (~50 kr/piece)
 - Imagine if **ONE** strawberry cost the same?
- Most micronutrients
 - Study from sub-Saharan Africa pollinator-dependent diets reduces nutrient deficiency
 - Particularly iron and vitamin A lead to "hidden hunger" - they are prevalent in fruits.





Without pollinators

- 66% of what we eat, divided among 25% of crops
- Wind-pollinated crops
 - The grasses: Grains, corn, rice
 - Some nuts: Walnuts, pistachios, hazelnuts
- Tubers
 - Potatoes especially
 - Sugarbeet/sugarcane
- Leafy greens
 - Spinach, salad
- Bananas (for now)
- Chemically-manufactured vitamins

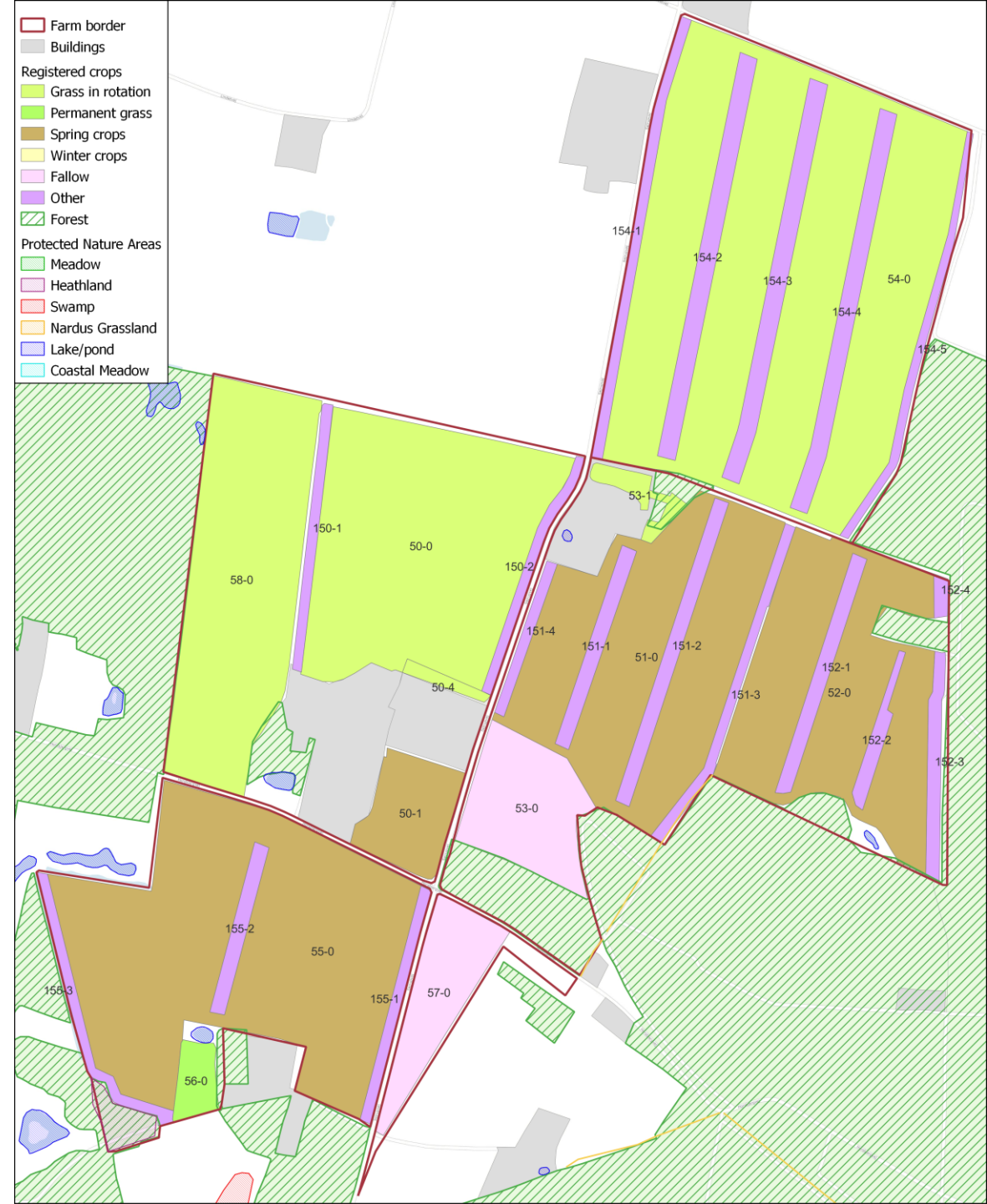
Biodiversity Lift Screening and Meeting



- I crunch some numbers, decide what potentials I see.
- I coordinate with the farmer, to decide a suitable date, and also to gain as much insight into the farm as possible, before the meeting.
- At the meeting, we go for a walk around the farm, so I can see current state of the farm, confirm that the potentials I saw from the numbers still apply.
- Then we discuss the numbers, discuss my recommended actions, and decide which actions to move ahead with.
- Back at the office I provide a concrete plan for how to move ahead with the recommended actions, and send all the numbers, minutes of the meeting and recommendations to the farmer.

Pre-screening

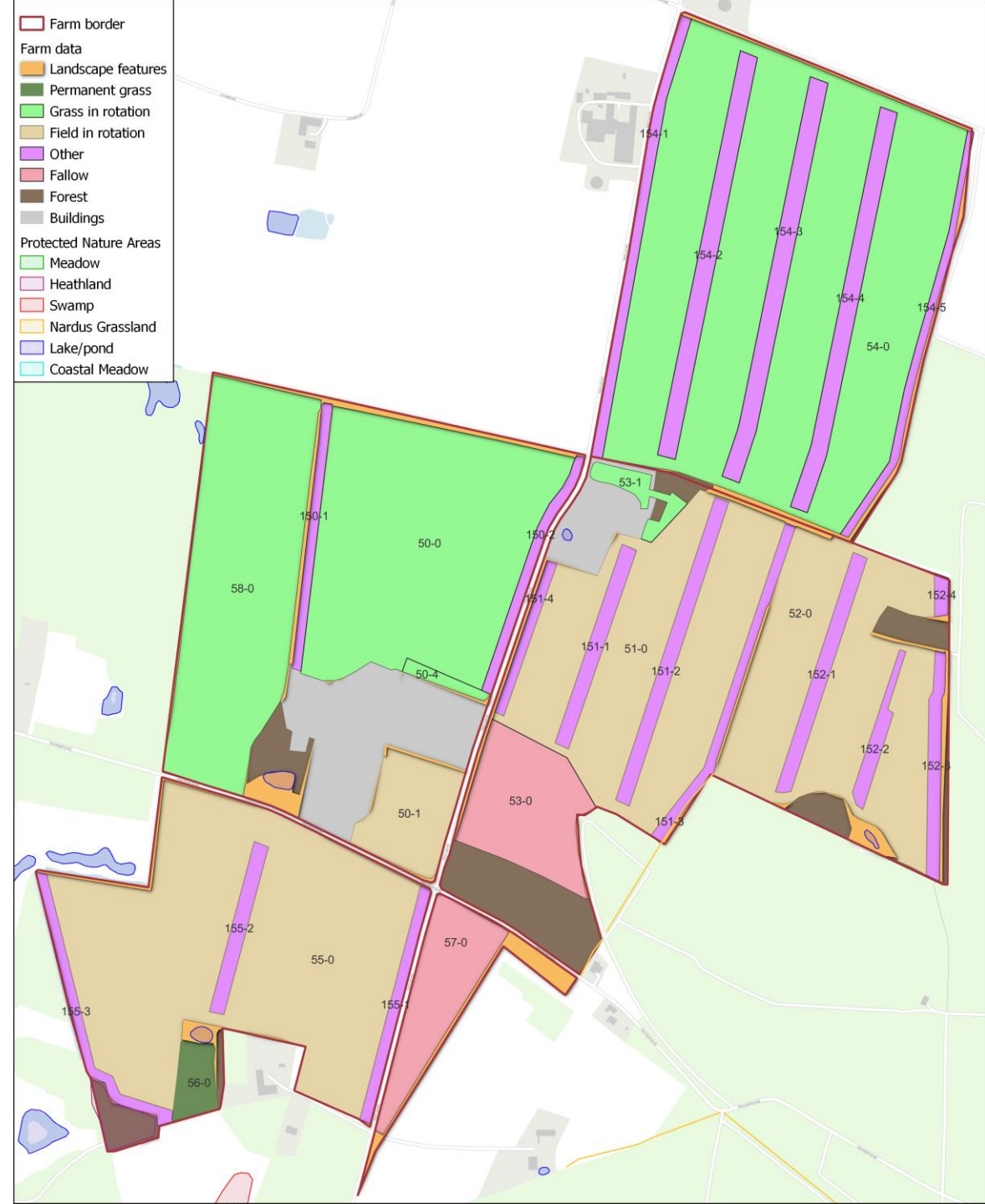
- Importing data from many sources
- Using GIS software
- Buildings, farm border, registered crops, protected nature areas, forests, HNV, sediment type



Clean-up and screening

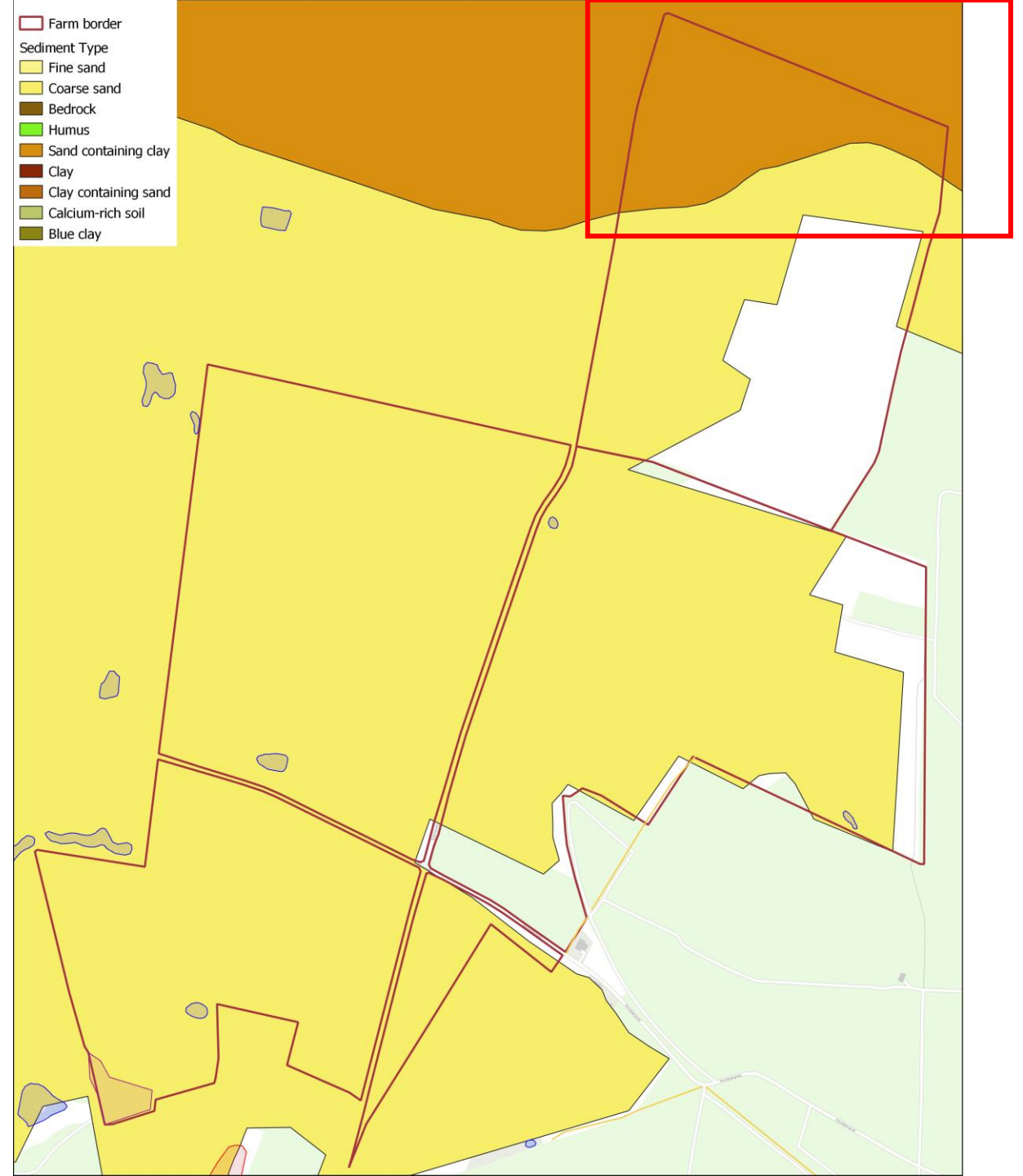
- Isolating range to areas of interest
- Categorizing farm data
- Identifying landscape features

- Looking at the potential for biodiversity, as opposed to species richness. If a farmer is actively doing something to improve conditions on his farm, he should be rewarded.
- It isn't his fault that his neighbors are destroying their potential for biodiversity.



Sediment type

- Defining sediment type
- This influences which measures are recommended.
- E.g. humus-rich soils should be prioritized taken out of rotation
- Generally don't plant "thirsty" trees in sandy soil.
- Similarly don't plant succulents or "dry" herbs in heavy clay



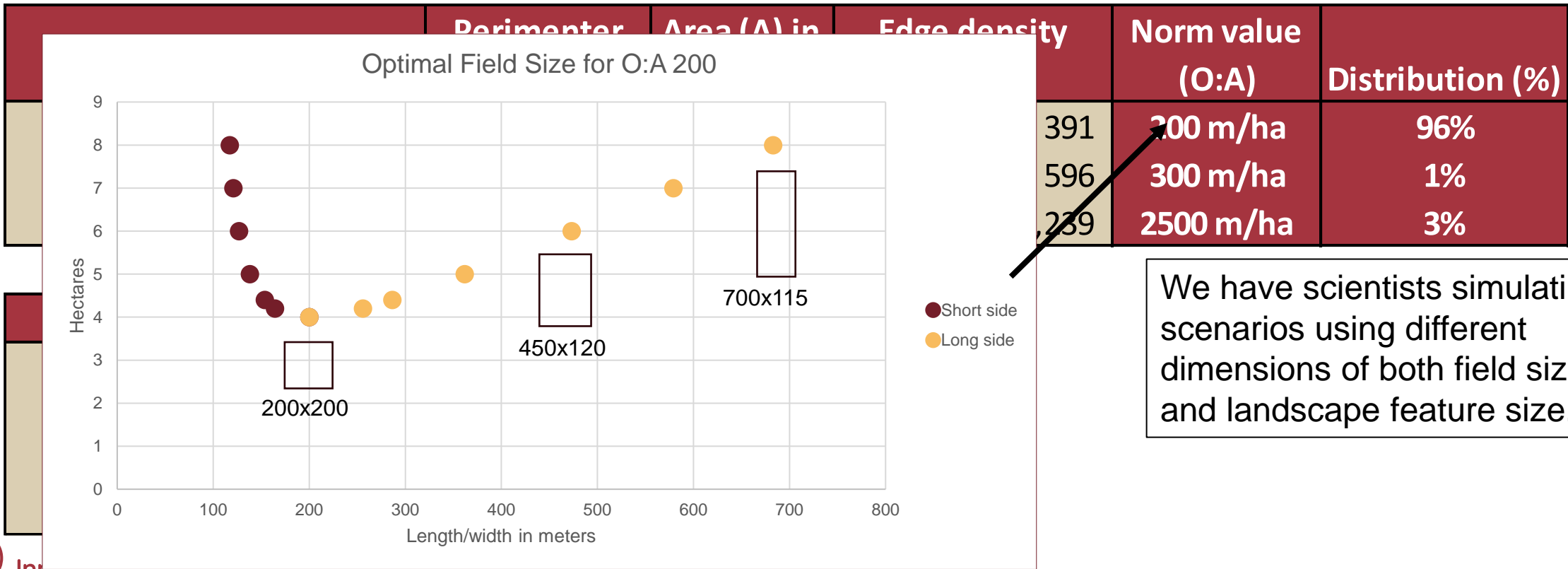
	Hectares	Percentage
TOTAL AREA:	96.7	100%
BUILDINGS:	4.8	5%
FOREST:	4.0	4%
CULTIVATED AREA:	87.9	91%
FALLOW:	4.6	5%

Cultivated Area	Perimeter (O) in meters	Area (A) in hectares	Edge density (O:A)	Norm value (O:A)	Distribution (%)
Fields in rotation	33,052	84.5	391	200 m/ha	96%
Permanent grass	310	0.5	596	300 m/ha	1%
Landscape features	24,139	2.9	8,239	2500 m/ha	3%

Fields in Rotation	Hectares	Percentage
Winter crops	-	0%
Spring crops	31.16	37%
Grass in rotation	36.56	43%
Other crops	12.14	14%



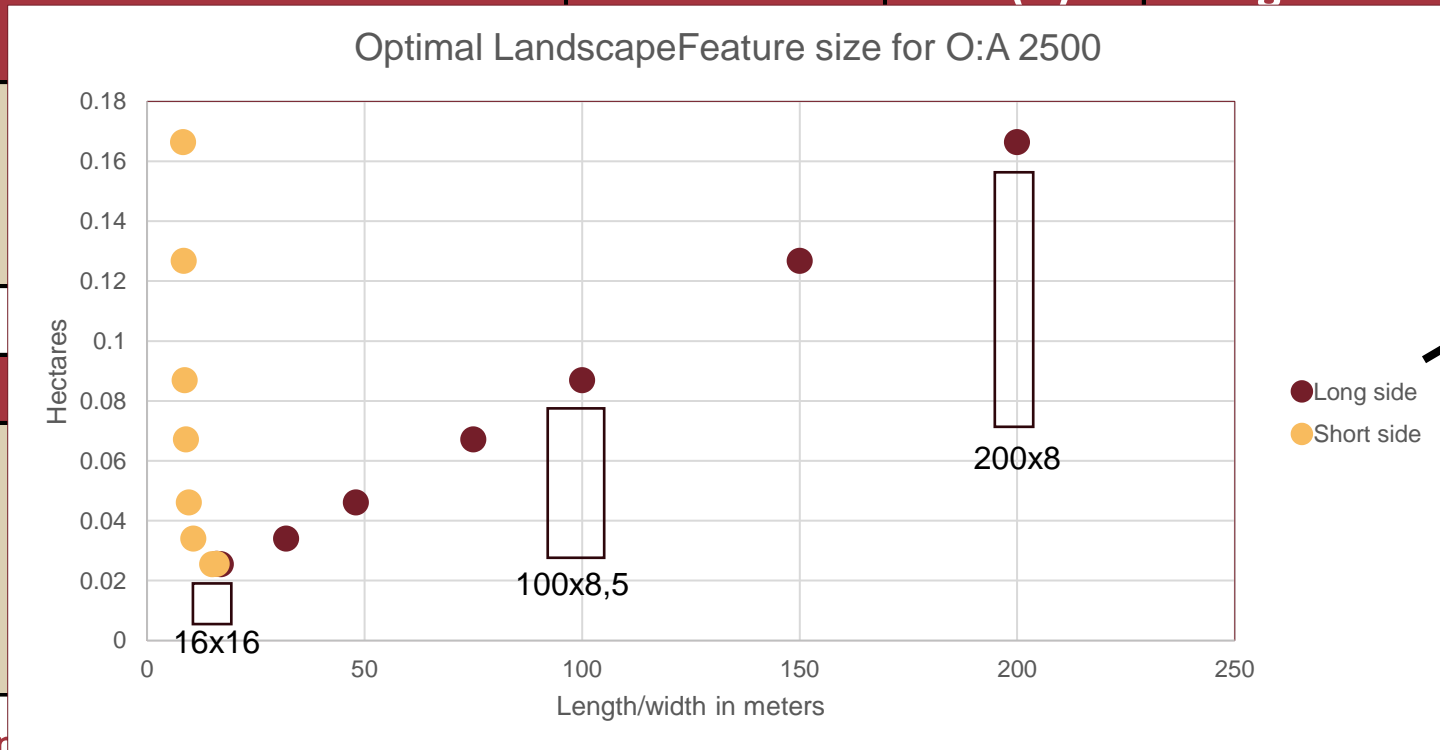
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We have scientists simulating scenarios using different dimensions of both field size and landscape feature size.

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	Perimeter	Area (A) in	Edge density	Norm value (O:A)	Distribution (%)
	391			200 m/ha	96%
	596			300 m/ha	1%
	239			250 m/ha	3%



We have scientists attributing qualitative data to landscape features with different dimensions.

All to improve the advice we can provide based on this relatively simple tool.

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All parts of the screening are objective.

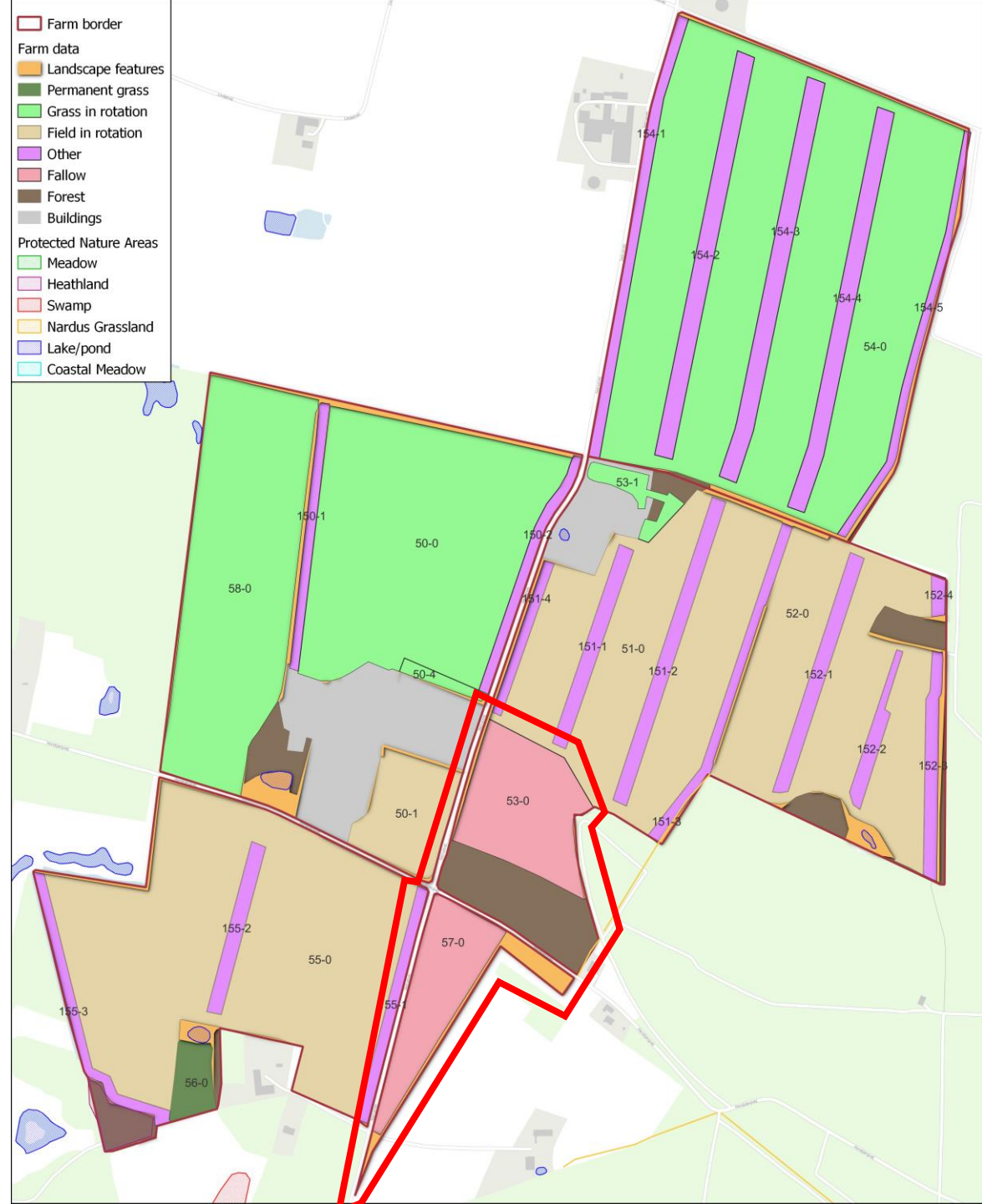
With available map data, it is possible to screen and track development of farms over time.



fid	CVR	Anvendelse	sfe_nr	Polygon	Perimeter	Areal	Anv	O:A	Strukturel	Kvalitativ	Manglende meter til O:A - Omdrift
94	38381547	græs	100167190	50-0	1317	9,58	Br	137,474			599
108	38381547	græs	100167190	58-0	1357	7,69	Br	176,463			181
105	38381547	vårkorn	100167190	55-0	2357	13,33	Br	176,819			309
102	38381547	brak	100167190	53-0	702	2,63	Br	266,92			-176
104	38381547	græs	100167190	54-0	5393	18,68	Br	288,704			-1657
95	38381547	vårkorn	100167190	50-1	531	1,67	Br	317,964			-197
127		anlæg	100167190	127	799	2,48	A	322,177			0
99	38381547	vårkorn	100167190	51-0	2882	8,58	Br	335,897			-1166
100	38381547	vårkorn	100167190	52-0	2653	7,58	Br	350			-1137
128		anlæg	100167190	128	441	1,15	A	383,478			0
107	38381547	brak	100167190	57-0	774	1,99	Br	388,945			-376
106	38381547	perm.græs	100167190	56-0	310	0,52	Bg	596,154			0
124		anlæg	100167190	124	754	1,14	A	661,404			0
19	38381547	andet	100167190	154-3	1155	1,37	Br	843,066			-881
18	38381547	andet	100167190	154-2	1159	1,37	Br	845,985			-885
122		skov	100167190	122	429	0,5	S	858			0
20	38381547	andet	100167190	154-4	1155	1,32	Br	875			-891
120		skov	100167190	120	3032	3,12	S	971,795			0
5	38381547	andet	100167190	151-1	607	0,58	Br	1046,55			-491
11	38381547	andet	100167190	152-1	713	0,68	Br	1048,53			-577
6	38381547	andet	100167190	151-2	902	0,86	Br	1048,84			-730
23	38381547	andet	100167190	155-2	512	0,48	Br	1066,67			-416
103	38381547	græs	100167190	53-1	479	0,42	Br	1140,48			-395
13	38381547	andet	100167190	152-3	650	0,54	Br	1203,7			-542
119		skov	100167190	119	301	0,24	S	1254,17			0
142		element	100167190	142	245	0,19	Bf	1289,47			0
22	38381547	andet	100167190	155-1	682	0,5	Br	1364			-582
12	38381547	andet	100167190	152-2	467	0,34	Br	1373,53			-399
17	38381547	andet	100167190	154-1	1244	0,89	Br	1397,75			-1066
98	38381547	græs	100167190	50-4	273	0,19	Br	1436,84			-235
4	38381547	andet	100167190	150-2	715	0,48	Br	1489,58			-619
14	38381547	andet	100167190	152-4	149	0,1	Br	1490			-129
8	38381547	andet	100167190	151-4	464	0,31	Br	1496,77			-402
7	38381547	andet	100167190	151-3	969	0,64	Br	1514,06			-841
3	38381547	andet	100167190	150-1	751	0,49	Br	1532,65			-653
24	38381547	andet	100167190	155-3	861	0,56	Br	1537,5			-749
21	38381547	andet	100167190	154-5	1179	0,63	Br	1871,43			-1053

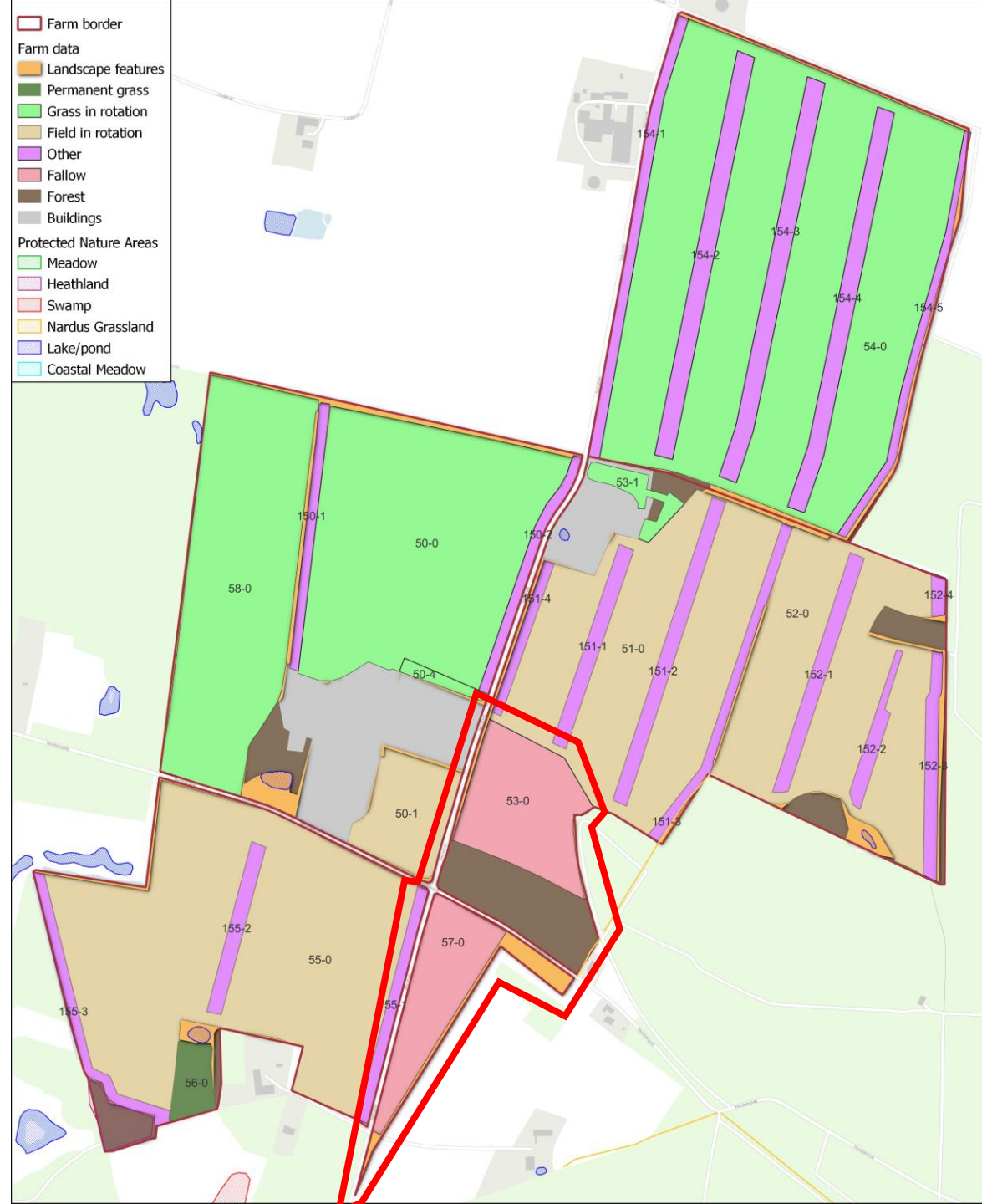
Fallow

- The fallow areas are already placed in areas where they can stay for the foreseeable future.
- The more permanent a habitat is allowed to become, the more biodiversity it will attract and "produce"



Recommendations

- The fallow fields are close to a viking burial site. These are protected by Danish Law.
- This means no planting trees within 100 meters of the burial site.
- In DK it has become common practice to plant "flower mixes", containing annuals. These are rarely native, and thus only provide food for pollinators, but don't contribute to completing a lifecycle.
- Instead, plant clump/tufted grasses that will develop into overwintering spots for insects and mammals.
- Combine with native flowers such as bird's foot trefoil.



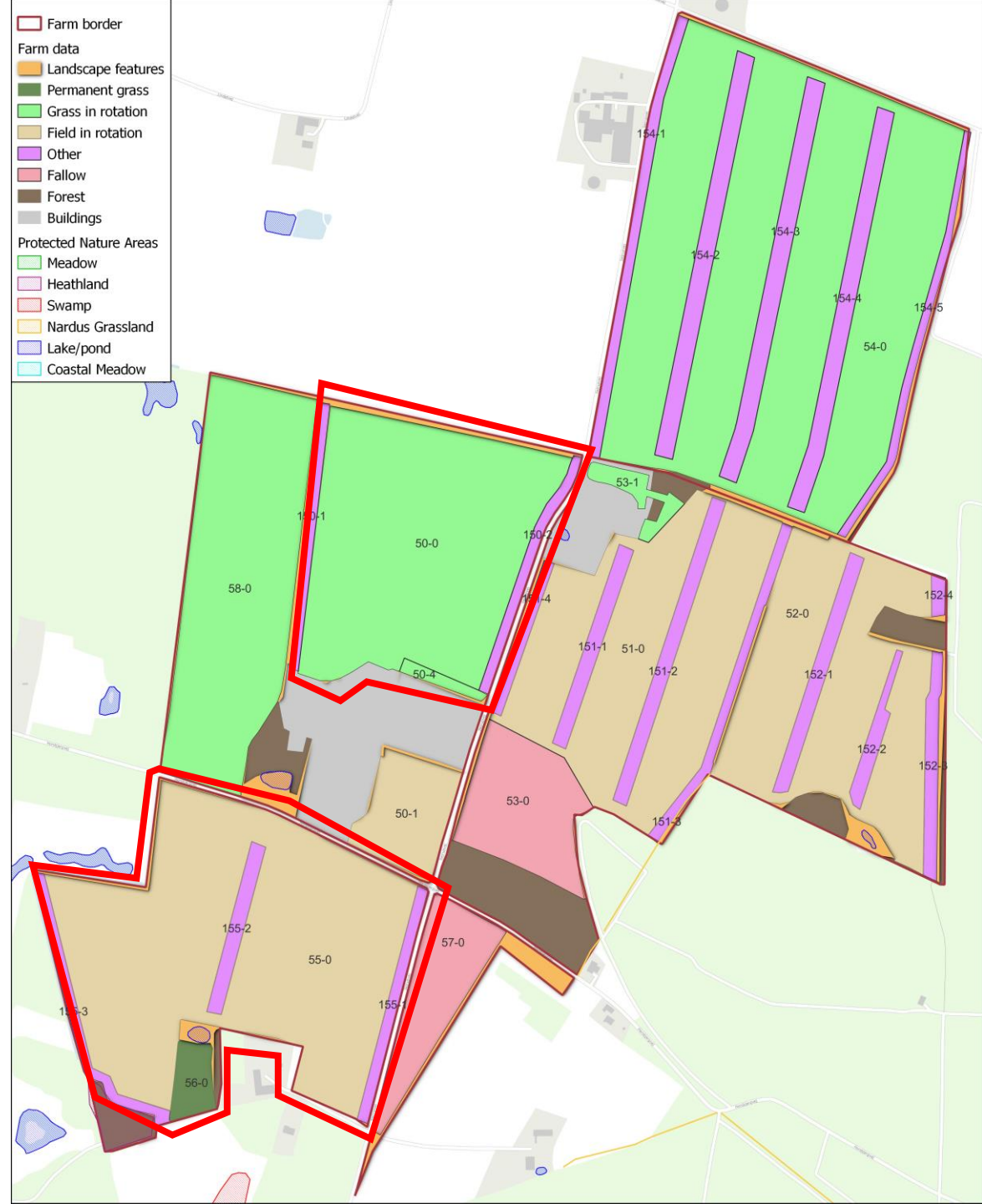
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Recommendations

- Field 50-0 and 55-0 are too big
- 50-0 is missing 600 meters of edge (300 meters of landscape feature)
- 55-0 is missing 310 meters of edge (150 meters of landscape feature)
- Plant rows of trees, like on the rest of the farm, but prioritize native trees that produce both flowers and fruits for biodiversity.
- Species such as hawthorns, blackthorn, dog-rose and willow benefit biodiversity.

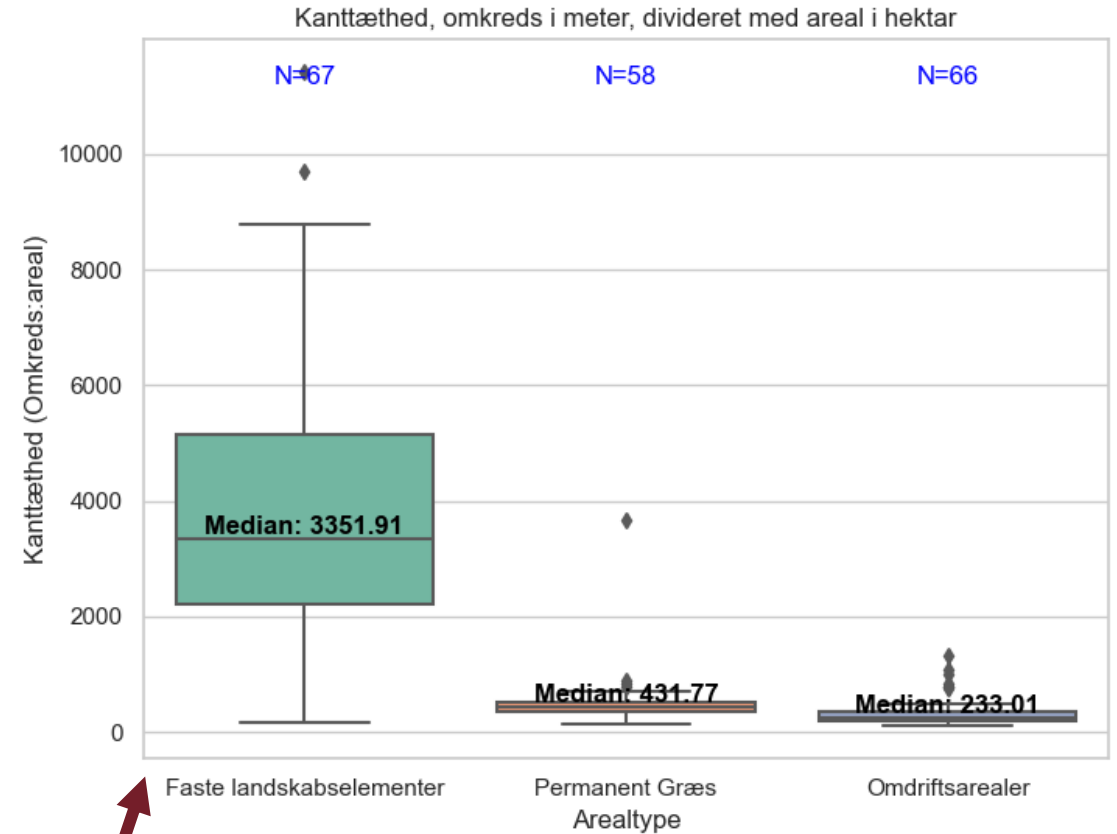
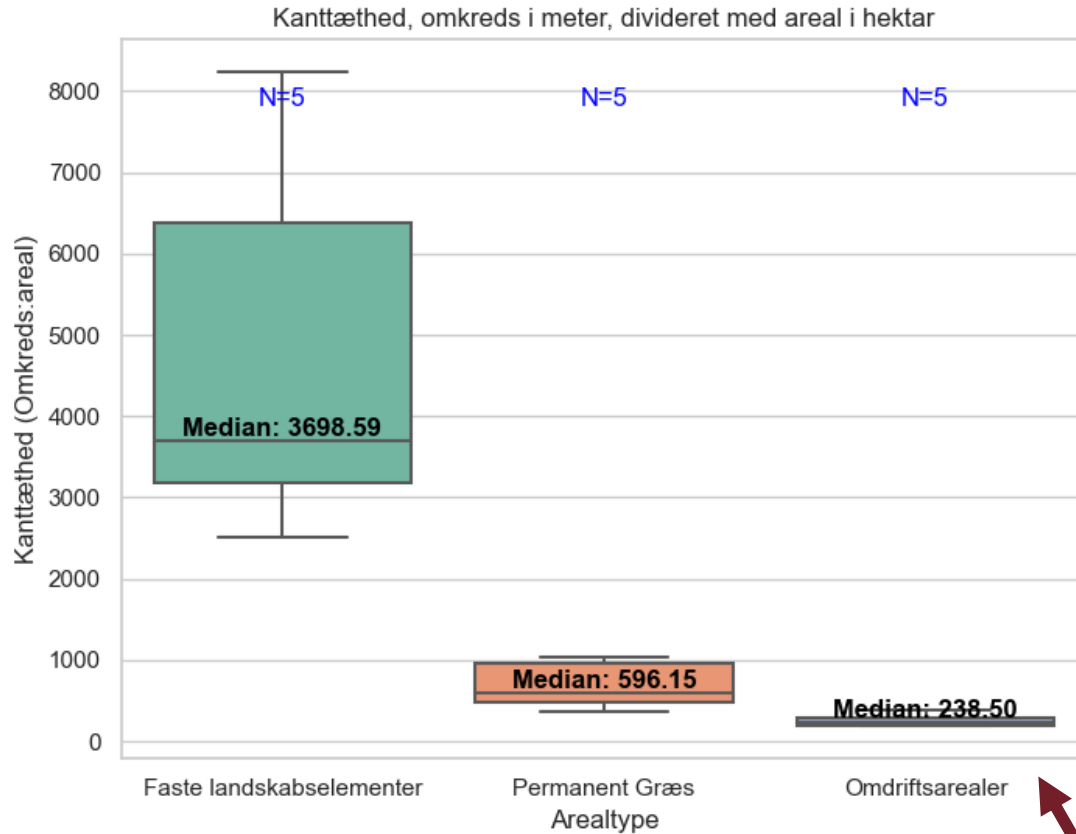


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Benchmarking



Total Area	XX TOTAL O:A 2024	Median O:A 2024	Missing edge to median
Fields in Rotation	235	233	0
Permanent Grass	487	432	0
Landscape Features	3.160	3.352	17.678

Conclusion

- The consequences of ignoring the loss of biodiversity are bigger than most of us can fathom.
- We CRITICALLY need to provide large nature areas for red-listed species
- BUT we also need to eat...
- We are completely dependent on biodiversity in organic farming, so we ALSO need to create space for diversity on farms
- Biodiversity Lift can provide the necessary framework to advise and disseminate the need for "space" in organic farming

