

WAGENINGEN
UNIVERSITY & RESEARCH

SEEA-EEA Experimental biodiversity account for the Netherlands 2006–2013

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MAIA Webinar 30 March 2019

Biodiversity indicators

CBD:

- Trends in **extent** of selected ecosystems
- Trends in **abundance** and **distribution** of selected species
- Trend in status of **threatened species**
- Changes in **genetic diversity**

SEEA-EEA:

- Tier 1: ecosystem **extent**
- Tier 2: species **richness**; extinction risk
- Tier 3: species **abundance**

Contents

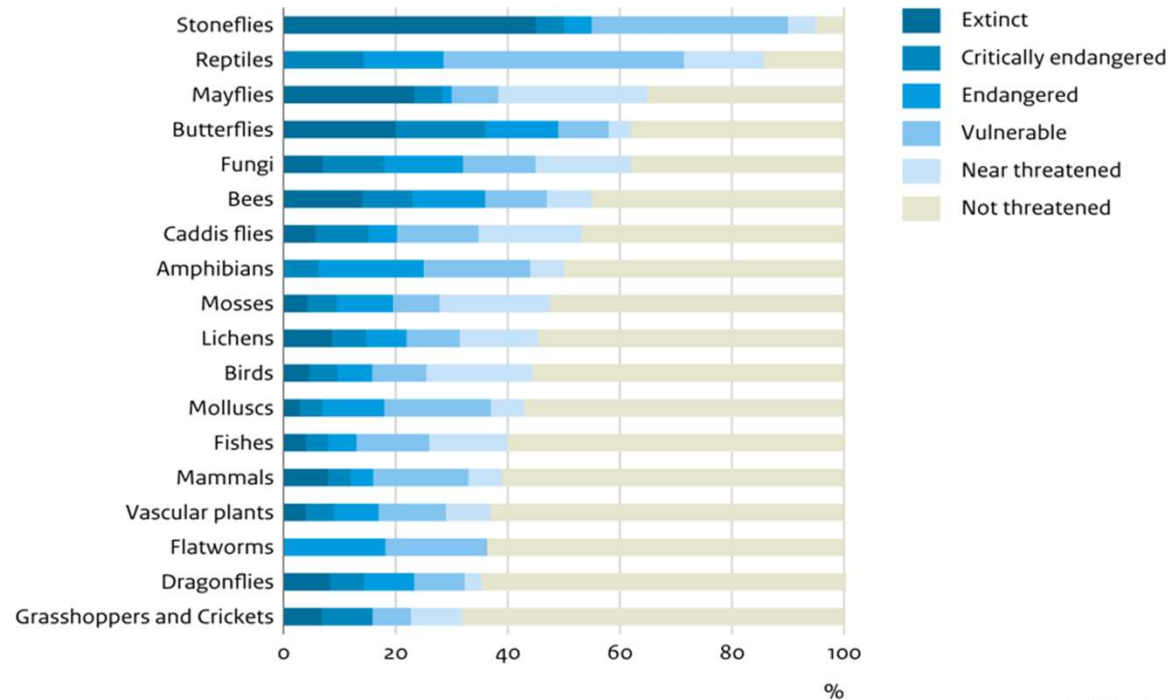
- Extent
- Threatened Species account
- **Species abundance #1 (LPI)**
- Species abundance #2 (MSA)
- **Spatial diversity modeling**
- Main approach
 - Data from operational monitoring networks
 - And *some* validated citizen science data
 - Wrangling data into SEEA account moulds

Ecosystem extent

	Dry nature										Agriculture		Urban			Other		
	Forest	(Semi) nat. Grassland	Heathland	Wetlands	Dunes (open)	Dunes (vegetated)	Salt marsh	Beach	Drift sand	Fresh water	Sea	Agriculture	Field borders	Built-up	Infra-structure	Public green space	Unpaved	unknown
Opening stock	313,224	49,841	38,343	37,006	24,010	13,679	12,737	9,612	4,272	408,344	5,643	1,867,094	18,440	448,358	109,774	70,931	342,027	1,529
Additions																		
From dry nature	4,634	4,063	6,501	5,186	2,541	4,034	158	605	569	3,140	2,407	19,681	5,284	3,496	1,659	1,536	11,752	71
From fresh wwater	227	536	167	570	1	0	0	0	194	59	667	71	1,045	296	177	1,196	136	
From sea	0	0	0	0	357	0	614	2,511	1	1,160	0	0	47	74	0	857	22	
From agricultural	8,423	19,955	732	8,418	16	0	1	0	119	6,095	0	5,516	22,644	18,860	7,027	1,828	83,738	178
From urban	2,665	805	156	442	54	1	0	6	126	2,227	16	11,428	321	6,275	2,332	2,132	22,939	57
From other	10,637	9,227	1,147	2,112	78	8	2	8	110	5,622	40	90,905	4,438	27,309	6,816	5,175	44	217
total additions	26,586	34,586	8,703	16,728	3,046	4,044	774	3,130	1,120	18,244	2,523	128,197	32,757	57,033	18,204	10,849	120,526	681
	8%	69%	23%	45%	13%	30%	6%	33%	26%	4%	45%	7%	178%	13%	17%	15%	35%	45%
Subtractions																		
To dry nature	6,343	5,126	4,042	4,150	4,464	2,278	649	233	1,005	1,695	3,483	34,588	3,076	1,849	617	1,789	23,219	109
To fresh water	605	1,158	143	866	140	38	1	12	178	1,160	5,720	375	1,097	652	479	4,426	1,197	
To sea	0	0	0	3	140	4	445	1,812	2	59	0	0	4	12	0	28	12	
To Agriculture	7,992	15,192	1,017	724	1	0	8	0	30	737	0	22,644	5,516	9,260	1,770	718	95,305	38
To urban	3,696	856	124	43	219	618	867	83	186	1,519	121	27,387	329	3,658	2,848	4,232	39,205	95
To other	5,921	4,304	228	280	44	497	402	39	108	1,332	879	82,591	1,325	13,597	5,879	3,520	217	44
Total subtractions	24,558	26,637	5,553	6,066	5,007	3,435	2,372	2,179	1,510	5,342	5,643	172,930	10,622	29,466	11,778	10,738	162,400	1,495
	8%	53%	14%	16%	21%	25%	19%	23%	35%	1%	100%	9%	58%	7%	11%	15%	47%	98%
Net change	2,028	7,949	3,150	10,663	-1,961	609	-1,598	951	-391	12,901	-3,120	-44,732	22,136	27,567	6,426	111	-41,875	-814
	1%	16%	8%	29%	-8%	4%	-13%	10%	-9%	3%	-55%	-2%	120%	6%	6%	0%	-12%	-53%
Closing stock	315,252	57,790	41,493	47,669	22,049	14,288	11,138	10,563	3,882	421,246	2,523	1,822,362	40,576	475,925	116,200	71,042	300,153	715



Threatened species



Source: Species organizations; WUR

CBS/mar19
www.clo.nl/en105216



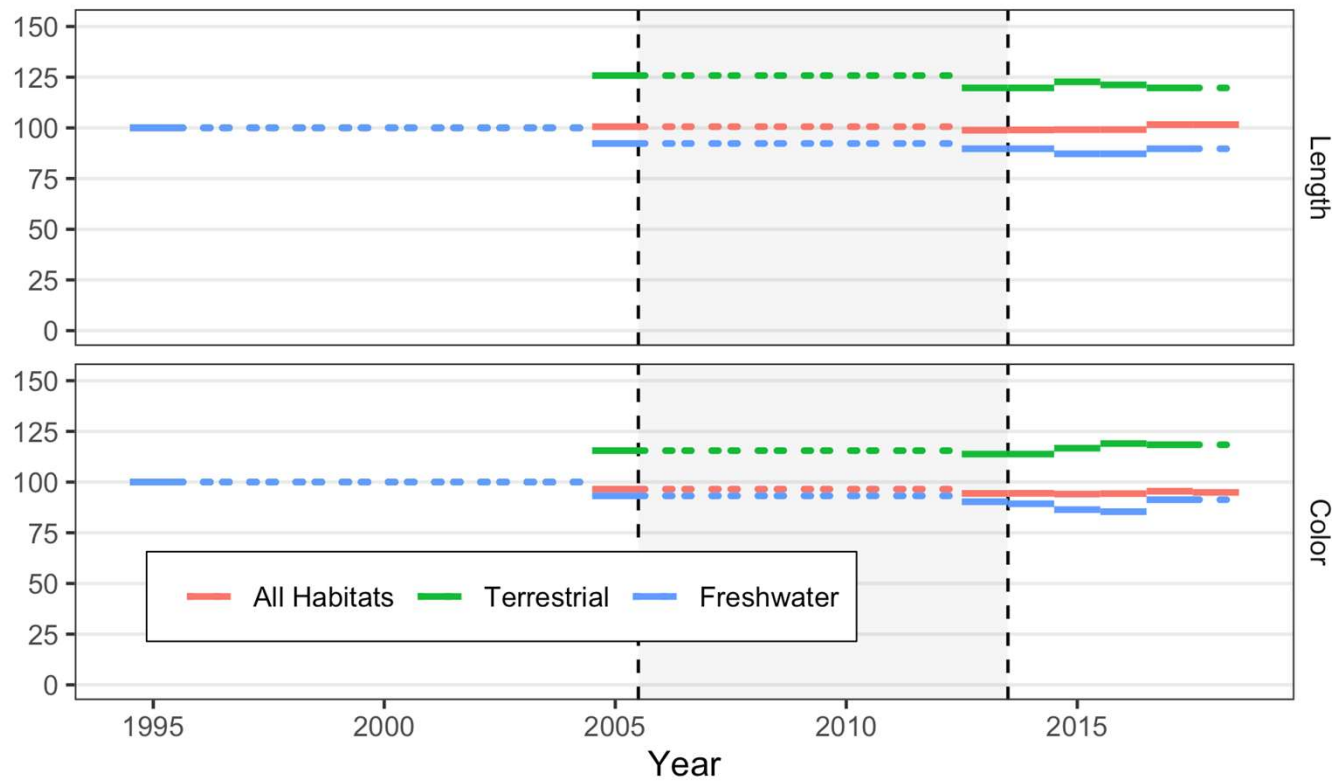
Threatened species (cont.)

	Goup name	(Dutch)	1995	2005	2009	2015	2017	2018	2019
Animals	Stoneflies	Steenvliegen		•					
	Reptiles	Reptielen	•	•	•				
	Butterflies	Dagvlinders	•	•	•				•
	Mayflies	Haften		•					
	Bees	Bijen		•				•	
	Caddis flies	Kokerjuffers		•					
	Amphibians	Amfibieën	•	•	•				
	Molluscs	Weekdieren		•					
	Fishes (fresh water)	Zoetwatervissen	•	•		•			
	Mammals	Zoogdieren	•	•	•				
	Birds	Vogels	•	•			•		
	Flatworms	Platwormen		•					
	Dragonflies	Libellen	•	•		•			
	Grasshoppers and Crickets	Sprinkhanen en krekels	•	•		•			
Plants	Macrofungi	Paddestoelen	•	•	•				
	Mosses	Mossen		•		•			
	Lichens	Korstmossen	•	•		•			
	Vascular plants	Vaatplanten		•		•			



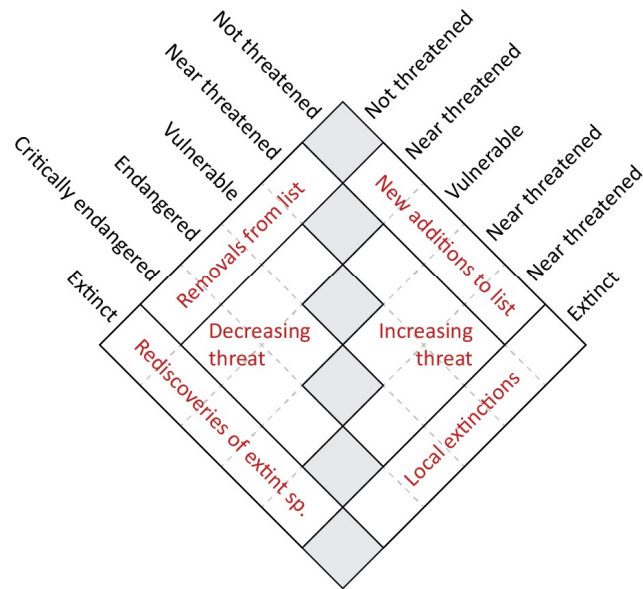
Threatened species (cont.)

Red List Indicator (per broad ecosystem type)
(1995=100)

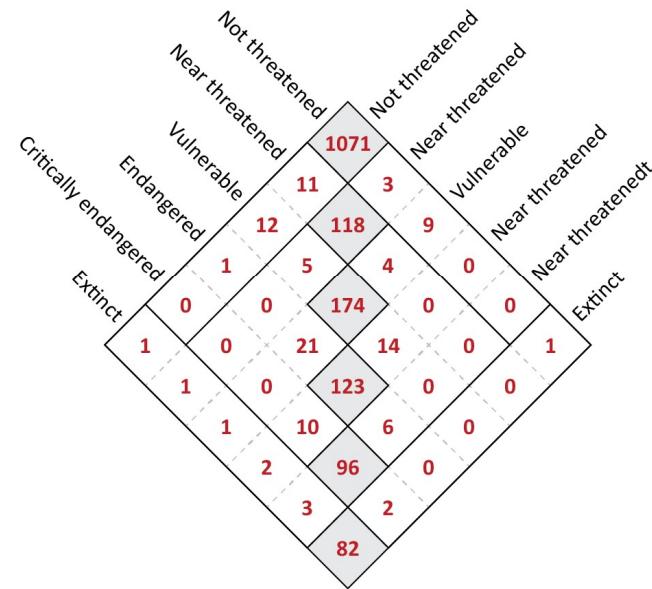


Threatened species account

RL status (opening year) RL status (closing year)



RL status (2005) RL status (2013)



<https://www.cbs.nl/en-gb/society/nature-and-environment/natural-capital>

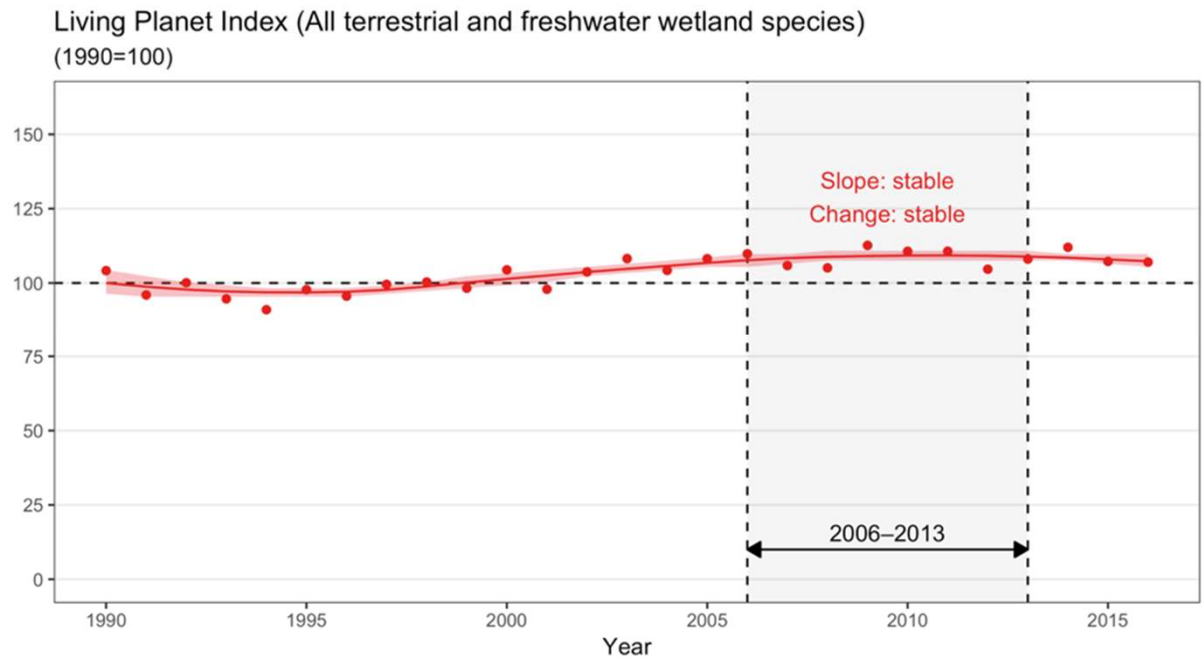


Threatened species account

	Red List categories						Total Red List	Least concern	Total
	Extinct	Critically endangered	Endangered	Vulnerable	Near threatened				
Opening stock (2005)	90	108	151	205	133	687	1084	1771	
Additions									
Local extinctions	3					3		3	
Rediscoveries of local extinct species		3	2	1	1	7	1	8	
From lower threat categories		6	14	4		24	0	24	
From higher threat categories			10	21	5	36		36	
New additions to list		0	0	9	3	12		12	
Removals from list							24	24	
Total additions	3	9	26	35	9	82	25	107	
Reductions									
Local extinctions		2	0	0	0	2	1	3	
Rediscoveries of local extinct species	8					8		8	
To lower threat categories		10	21	5		36		36	
To higher threat categories		0	6	14	4	24		24	
New additions to list							12	12	
Removals from list		0	1	12	11	24		24	
Total reductions	8	12	28	31	15	94	13	107	
Closing stock (2013)	85	105	149	209	127	675	1096	1771	



Species abundance changes: LPI



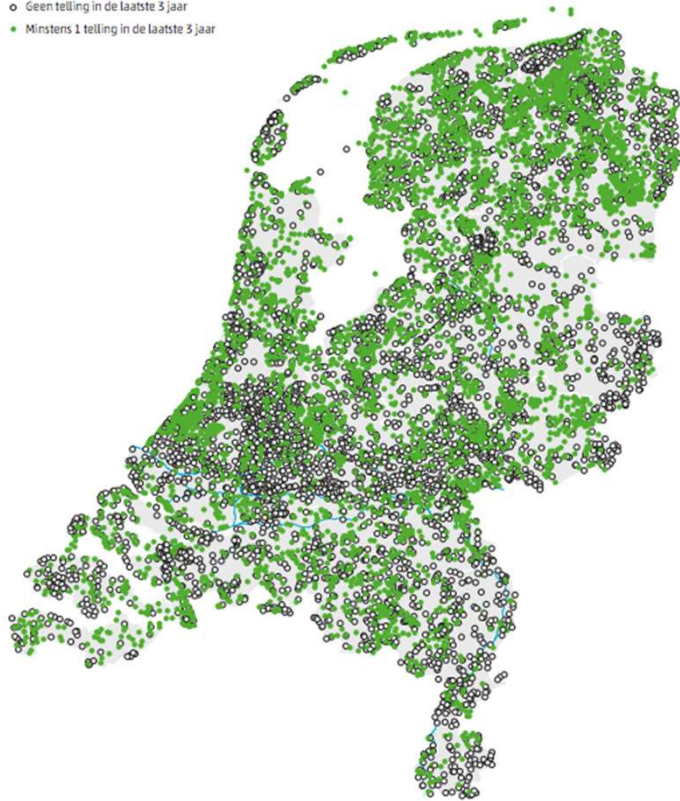
<https://www.cbs.nl/en-gb/society/nature-and-environment/natural-capital>



Network ecological monitoring

7.3.6 Meetpunten aantalsmonitoring broedvogels (BMP), 1984-2018

- Geen telling in de laatste 3 jaar
- Minstens 1 telling in de laatste 3 jaar

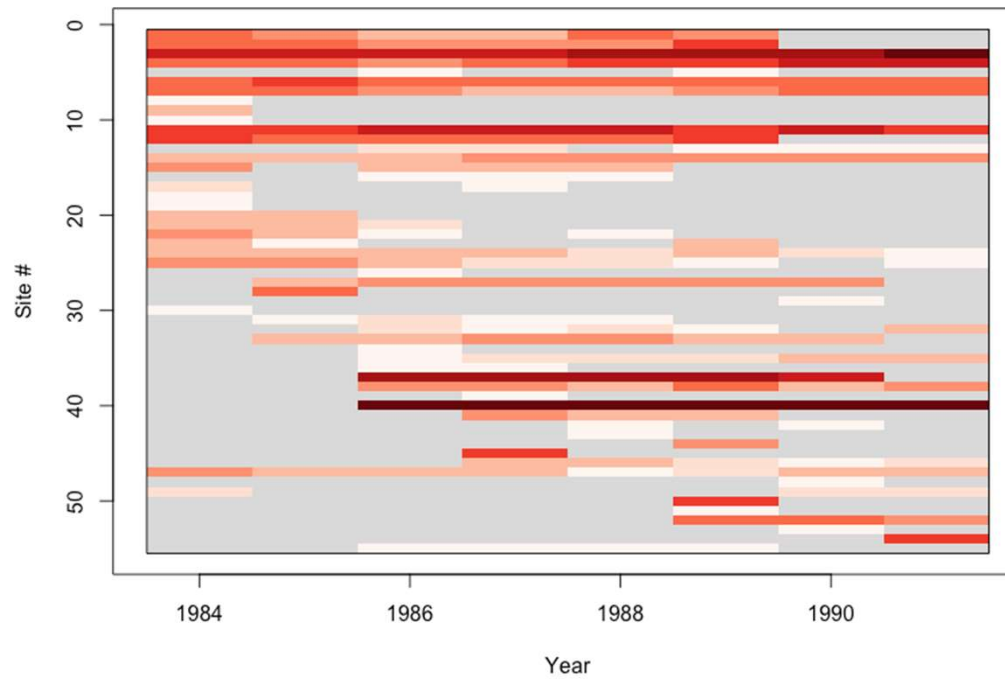


7.10.7 Meetpunten aantalsmonitoring vlinders, 1997-2018

- Geen telling in de laatste 3 jaar
- Minstens 1 telling in de laatste 3 jaar



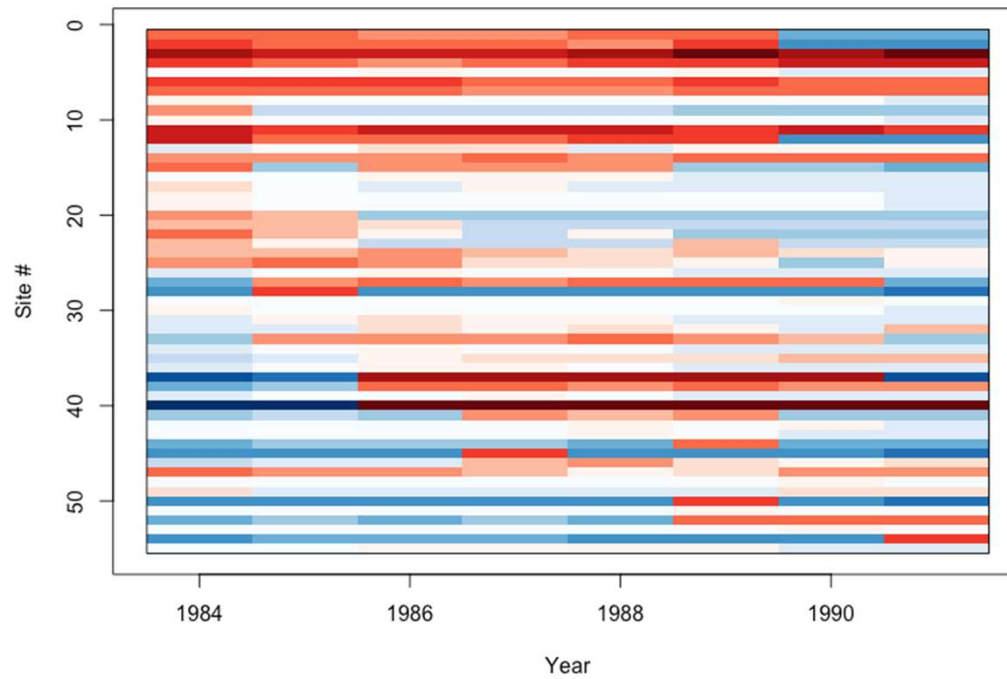
Skylark observations



<https://www.cbs.nl/en-gb/society/nature-and-environment/natural-capital>

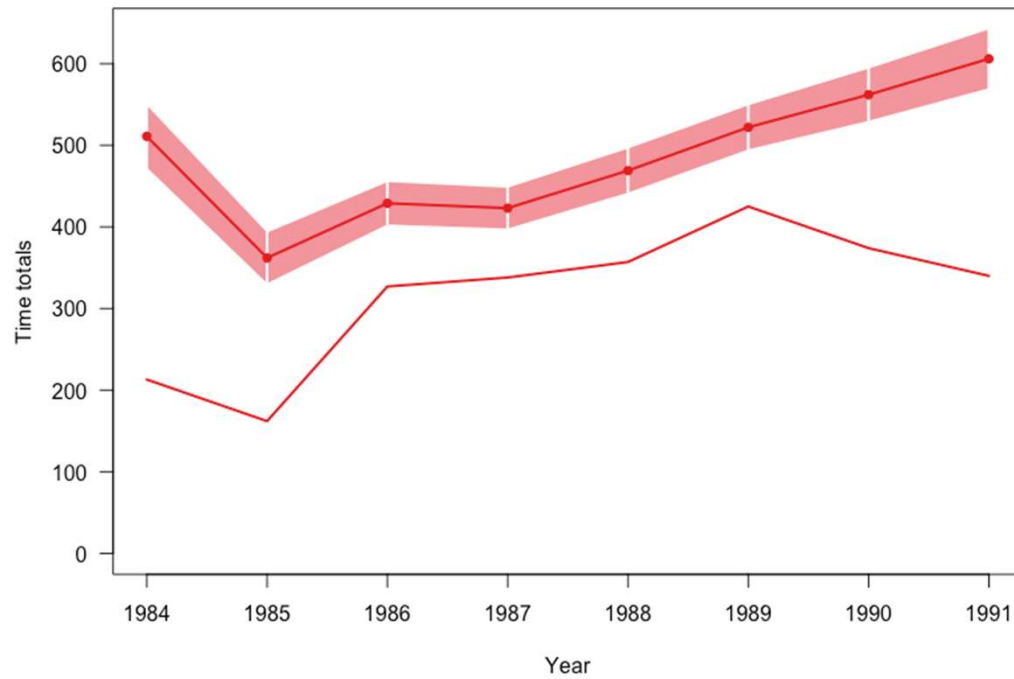


Imputed observations



<https://www.cbs.nl/en-gb/society/nature-and-environment/natural-capital>

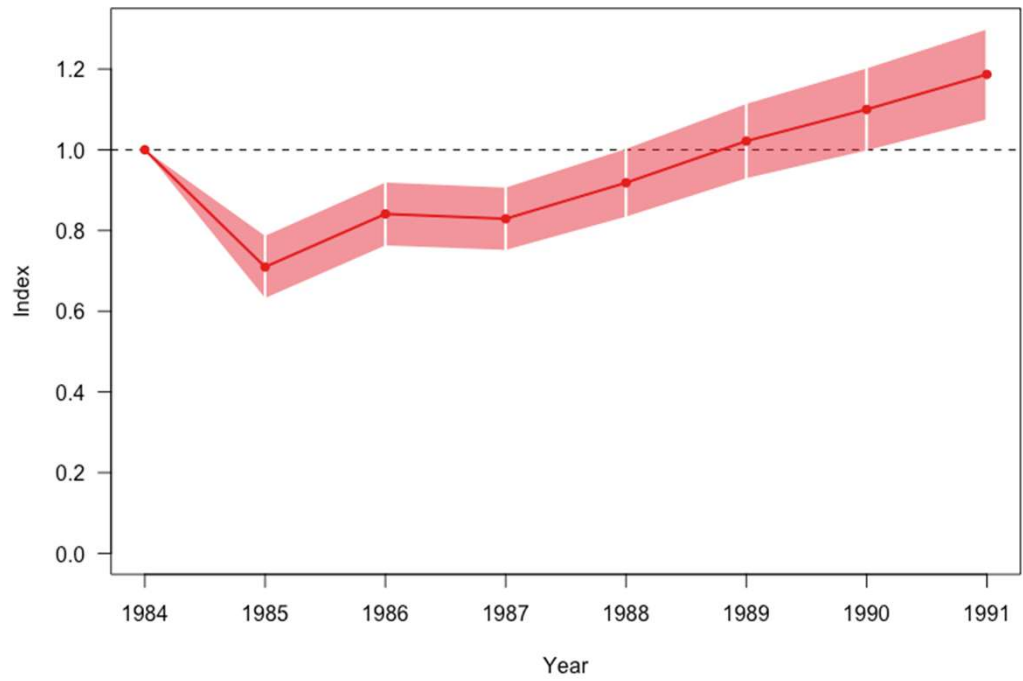
Time-totals



<https://www.cbs.nl/en-gb/society/nature-and-environment/natural-capital>

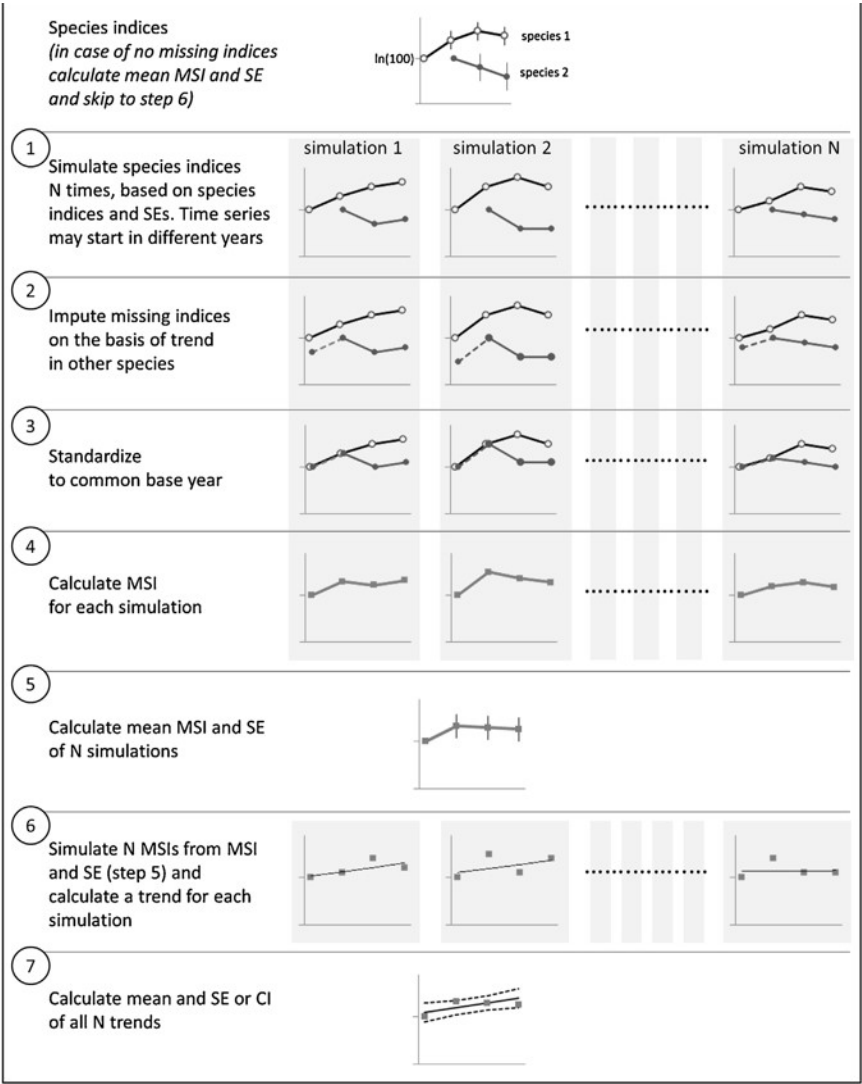


Index values

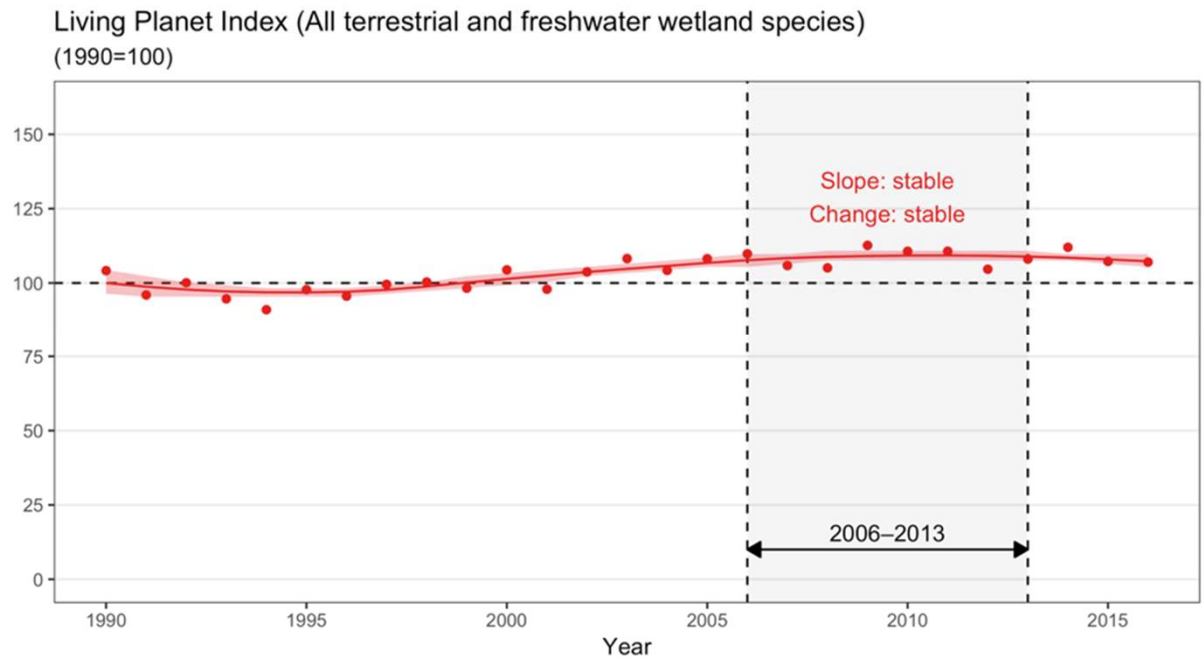


<https://www.cbs.nl/en-gb/society/nature-and-environment/natural-capital>

Multi-species aggregation



Species abundance changes: LPI

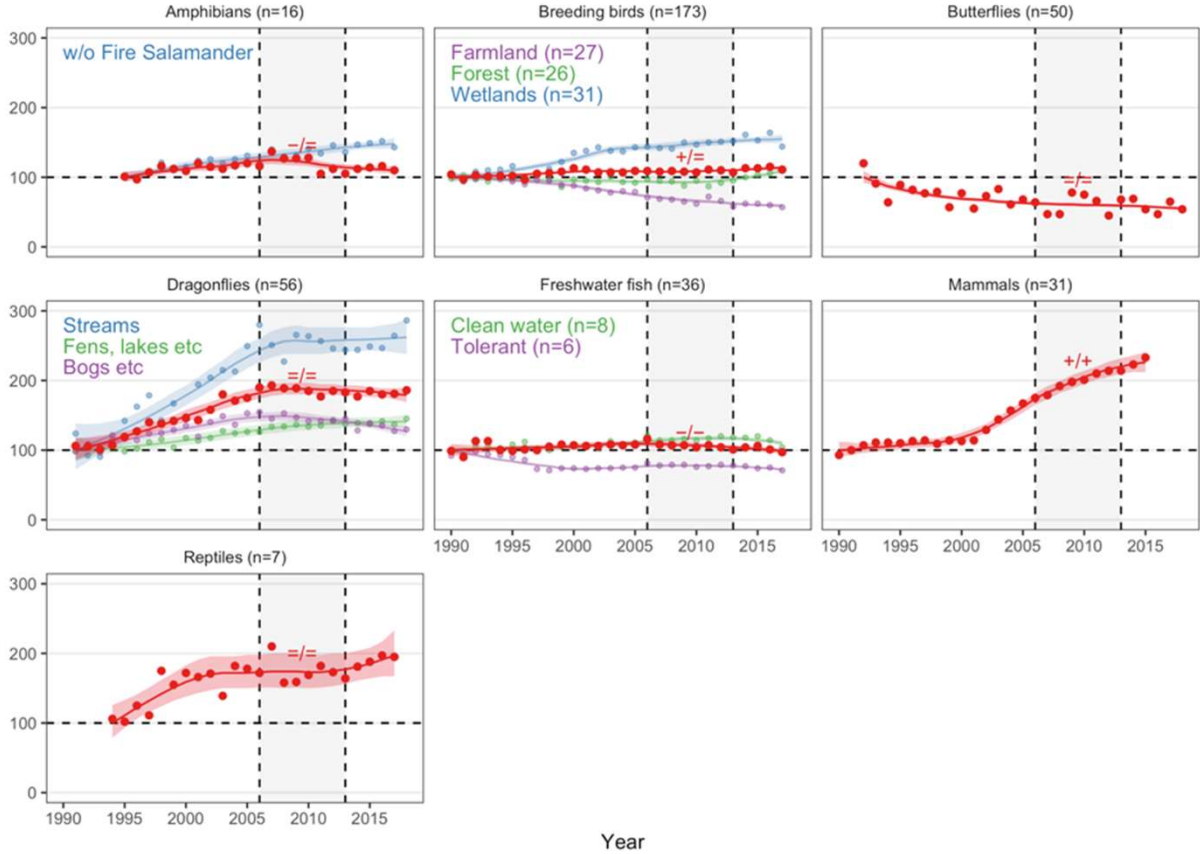


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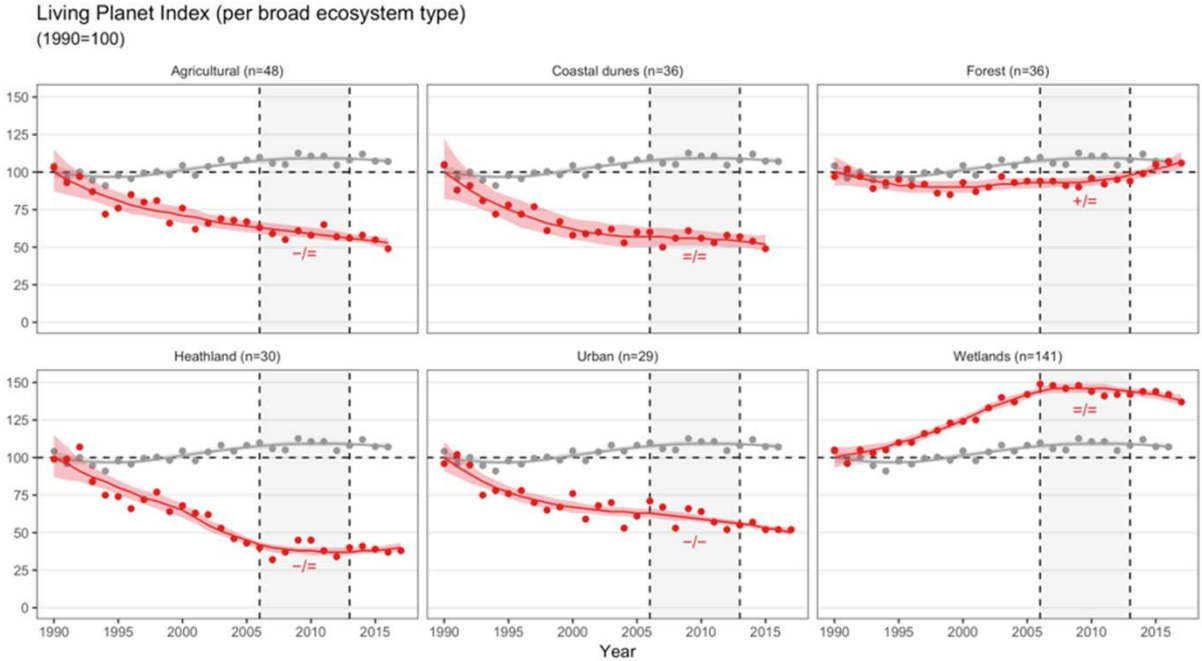


LPI per species group

Living Planet Index (per species group)
(1990=100)



LPI per ecosystem type



<https://www.cbs.nl/en-gb/society/nature-and-environment/natural-capital>

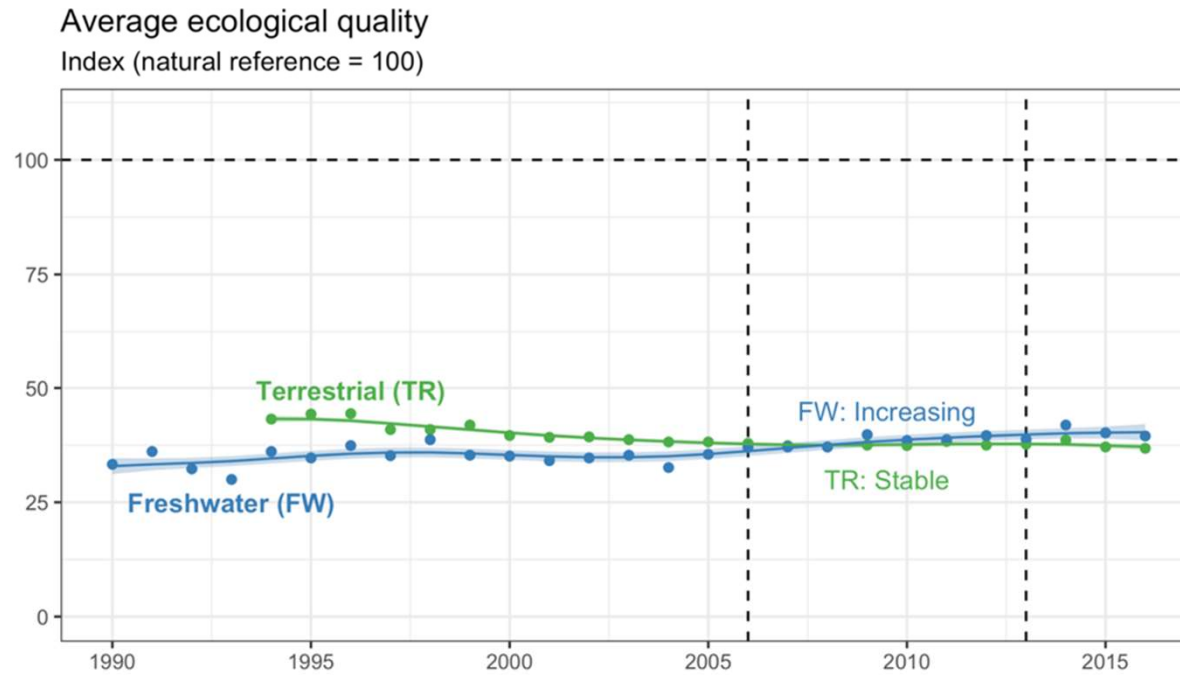


LPI account

Ecosystem (sub)type	CLO	Living Planet index		Change in LPI		Assessment
		2006	2013	Absolute	Relative	
All Terrestrial and Freshwater	1569	107.7	108.9	1.21	1%	Stable
Terrestrial	1579	85.0	87.0	2.0	2%	Stable
Terrestrial nature	1581	59.0	60.0	1	2%	Stable
Forest	1162	93.0	98.0	5	5%	Increasing
Open nature	1586	39.0	38.0	-1	-3%	Stable
Heathland	1134	42.0	37.0	-5	-12%	Decreasing
Coastal Dunes	1123	57.0	54.0	-3	-5%	Stable
Freshwater and wetlands	1577	144.0	144.0	0	0%	Stable
Agricultural	1580	63.0	56.0	-7	-11%	Decreasing
Urban	1585	63.0	56.0	-7	-11%	Decreasing



Alternative approach: Mean Species Abundance (MSA)



Integrated reporting

Ecosystem (sub)type	Extent			Living Planet index				MSA ecosystem quality			
	2006	2013	Change	2006	2013	Change	assessment	2006	2013	Change	assessment
All Terrestrial and Freshwater				107.7	108.9	1%	Stable				
Terrestrial				85	87	2%	Stable				
Terrestrial nature				59	60	2%	Stable	37.8	37.8	0	Stable
Forest	326903	329540	1%	93	98	5%	Increasing	32.3	35	8%	Increasing
Open nature				39	38	-3%	Stable				
Heathland	38343	41493	8%	42	37	-12%	Decreasing	32.6	32.3	-1%	Stable
Coastal Dunes	24010	22049	-9%	57	54	-5%	Stable	47.1	43.9	-7%	Decreasing
Semi-natural grassland	49841	57790	14%					29.2	33.4	14%	Increasing
Freshwater and wetlands				144	144	0%	Stable				
Freshwater	408344	421246	3%					36.2	39.8	10%	Increasing
Wetlands	37006	47669	22%					47.5	45.9	-3%	Stable
Agricultural	1867094	1822362	-2%	63	56	-11%	Decreasing				
Urban	519289	546967	5%	63	56	-11%	Decreasing				

Notes:

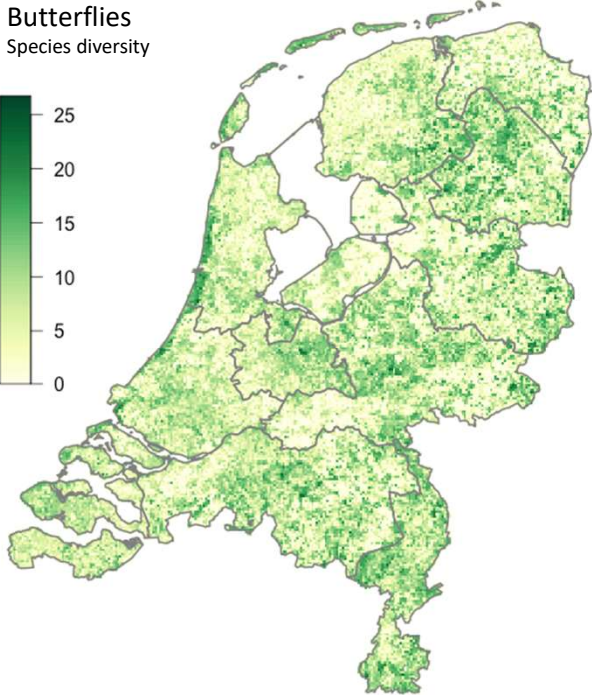
Forest' includes permanently vegetated coastal dunes

Urban' includes built-up environments and public green space

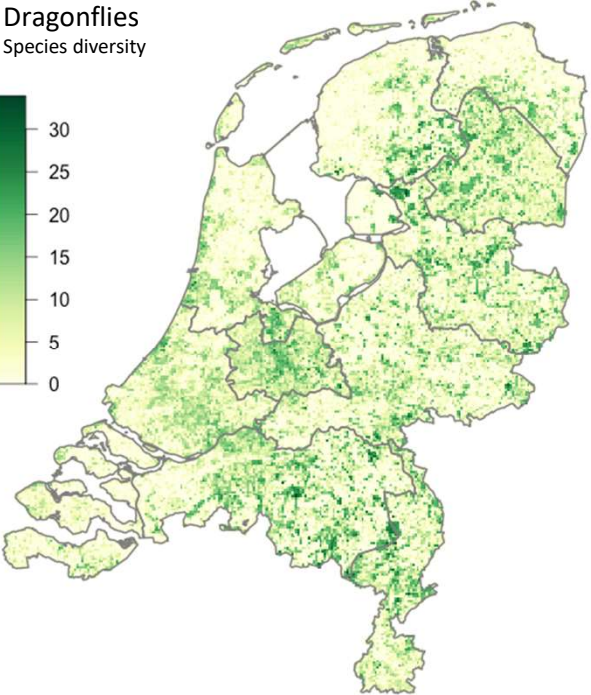


Biodiversity: occupancy modelling

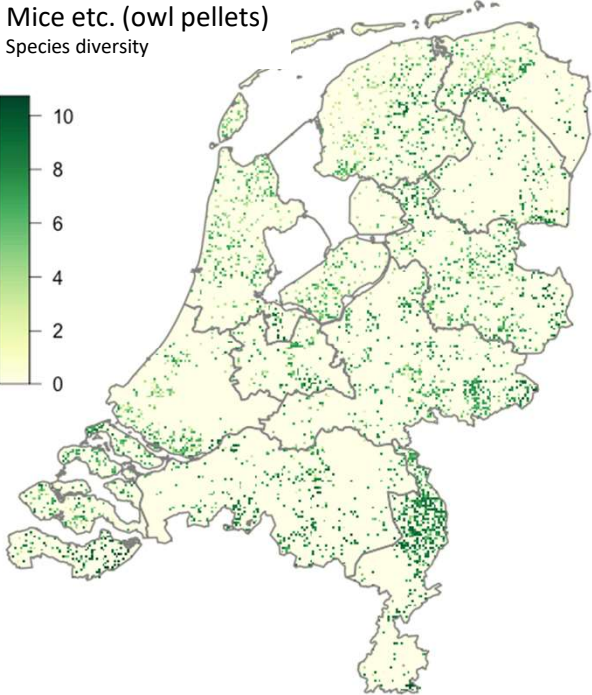
Butterflies
Species diversity



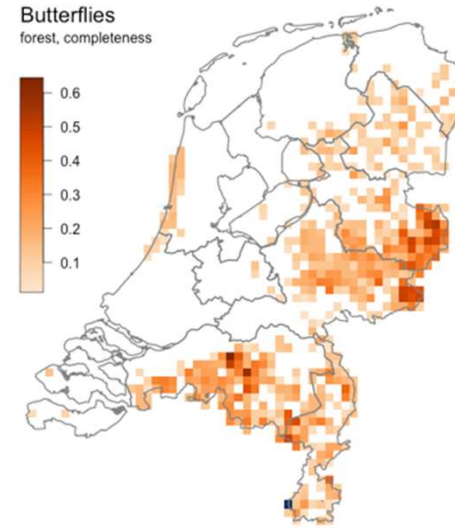
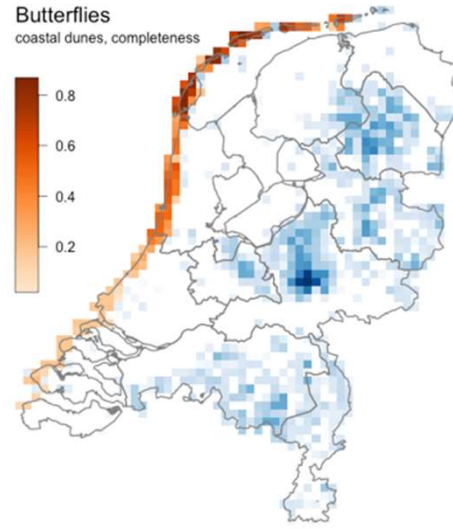
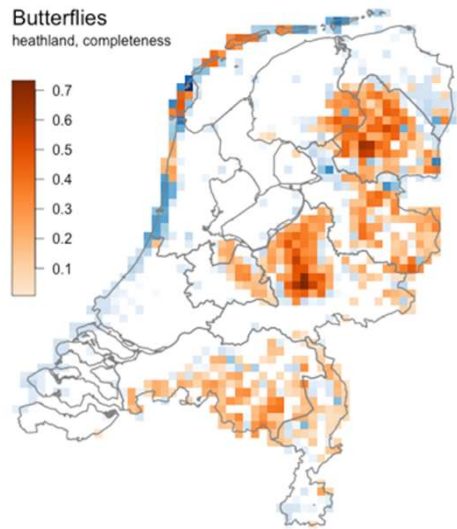
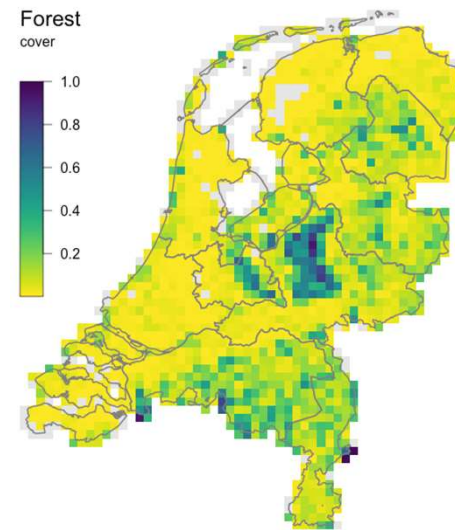
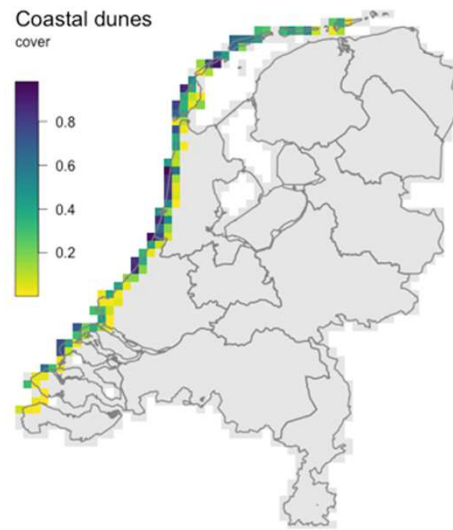
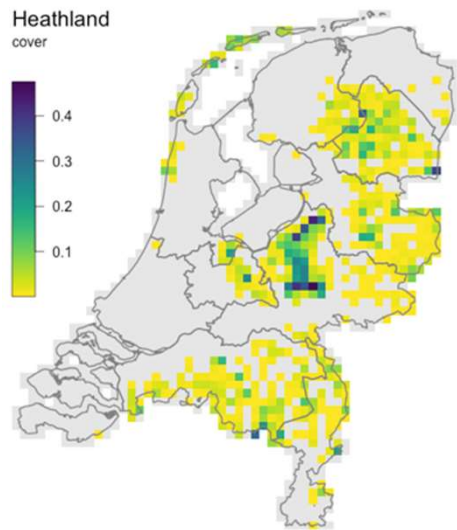
Dragonflies
Species diversity



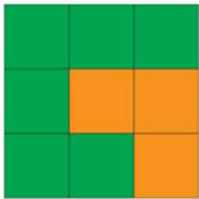
Mice etc. (owl pellets)
Species diversity



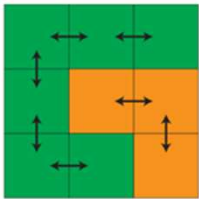
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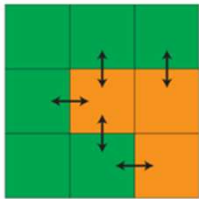
Landscape spatial structure



a)



b)



c)

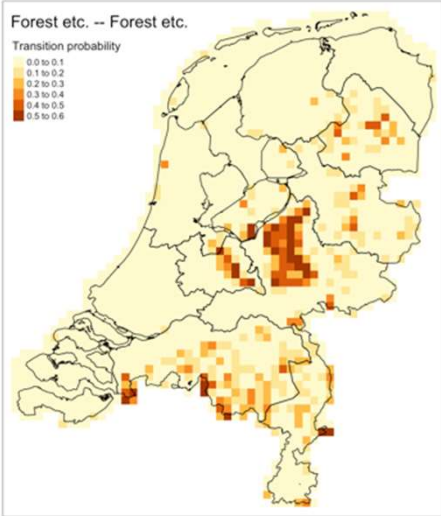
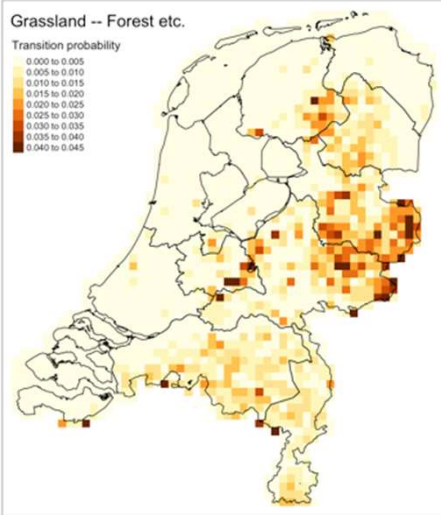
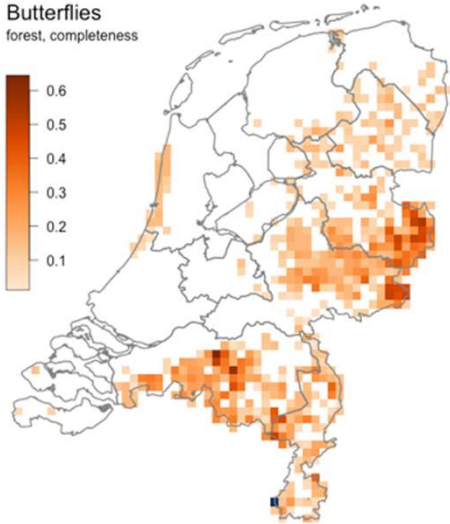
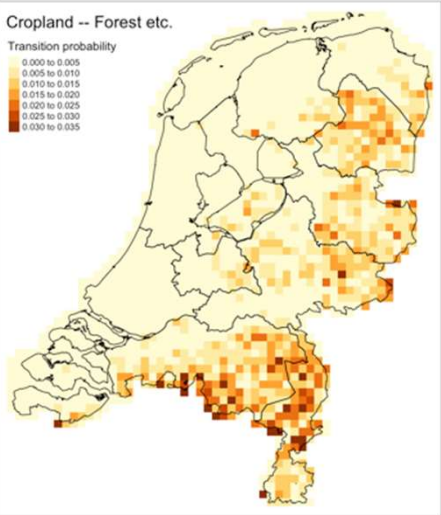
Land cover classes
■ A
■ B

	A	B
A	10/24	5/24
B	5/24	4/24

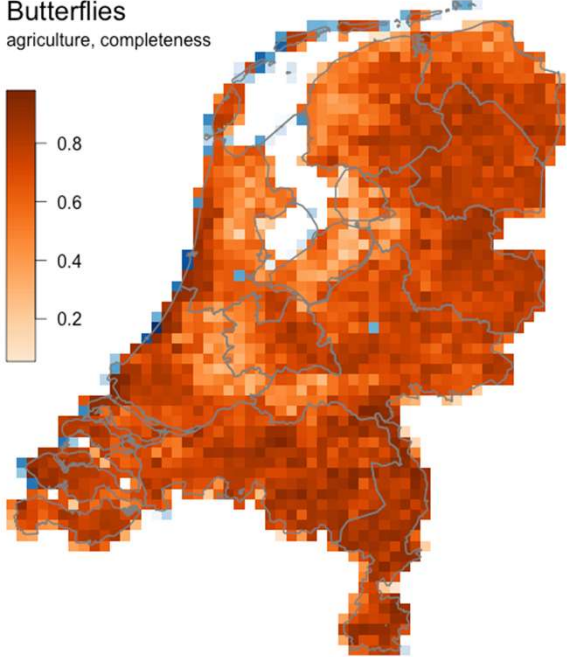
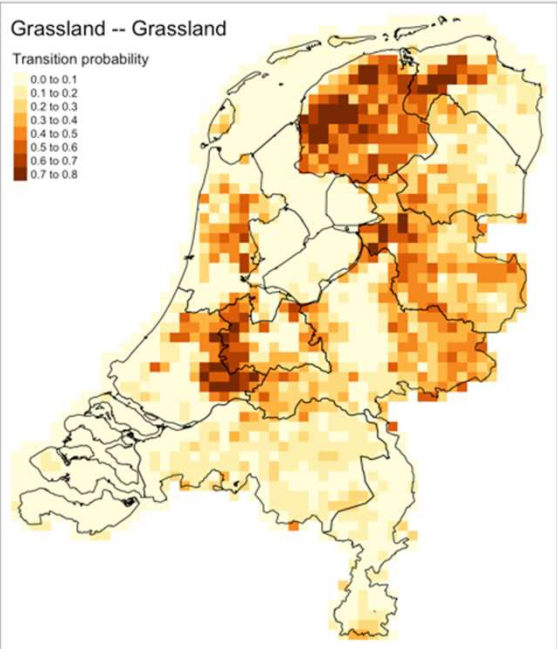
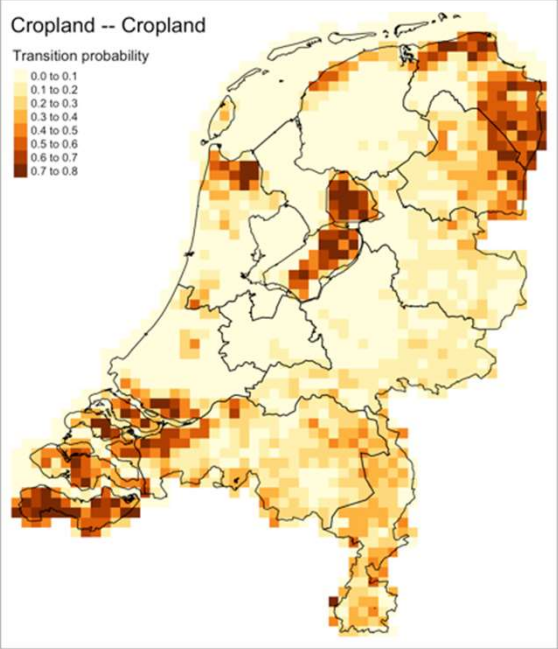
d)



Ex. 1: forest



Ex. 2: agricultural ecological 'deserts'



Conclusion

- **SEEA-EEA extent accounting** enables tier 1 biodiversity accounting (*extent*)
- **Expert-knowledge and some data** allows tier 2 biodiversity accounting (*species diversity; extinction risk*)
- Intensive (volunteer-driven) **monitoring programs** allow tier 3 accounting (*abundance trends*)
- **Dense monitoring + modelling** allow hi-res spatial analysis.



Follow-ups (considered for MAIA)

- Definitive approach to trend detection over accounting interval.
- Linking spatial biodiversity to landscape structure
 - Beta diversity
 - Rise of habitat generalists
 - Decline of habitat specialists



Facts that matter