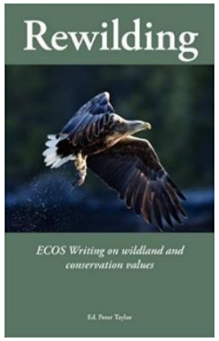
Effecten van grote grazers: resultaten van lange termijn onderzoek in NL

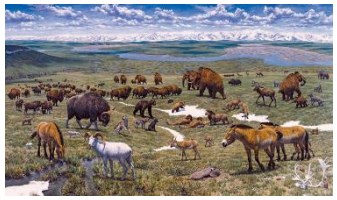
Chris Smit
Conservation Ecology Group
Rijksuniversiteit Groningen

university of groningen

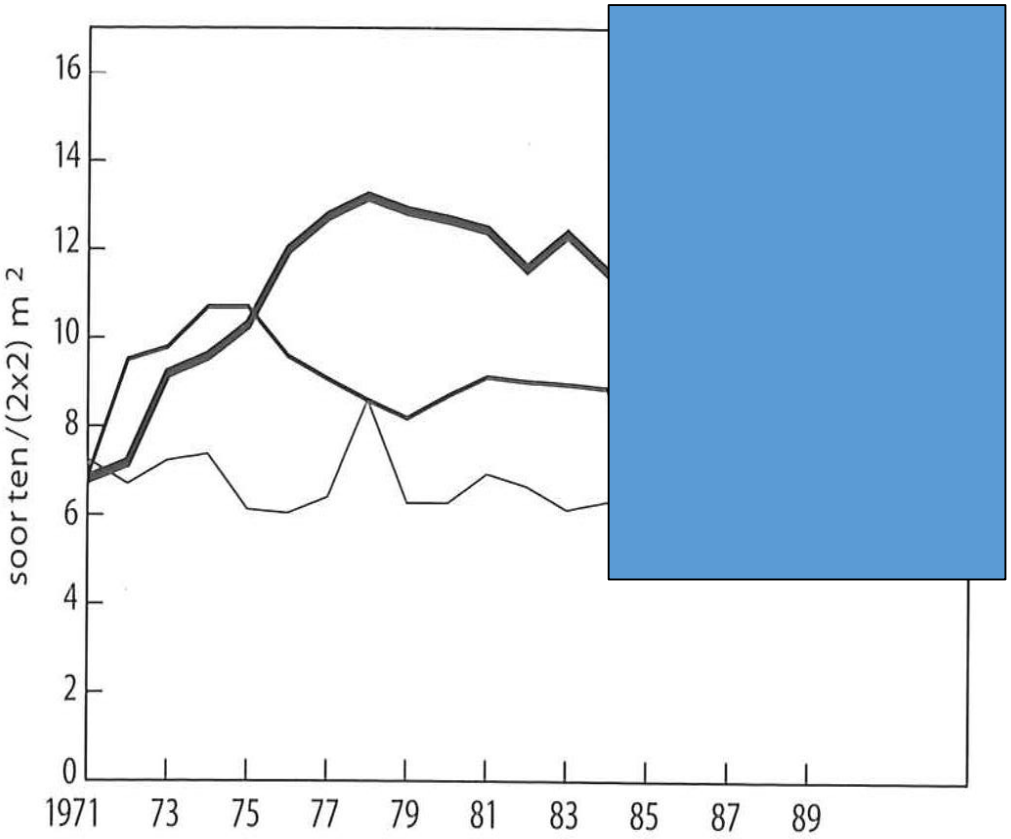
Outline

- The basics
  - begrazing vs. maaien, mechanismen, natuurlijk vs cultuur begrazing, verschuivende mozaieken, openheid prehistorisch landschap
- Wat's new?
  - Nieuwe inzichten van wetensch. studies
  - Rewilding (OVP)
  - Ecology of fear
- What's next ?
  - Nieuwe richtingen
  - Uitdagingen



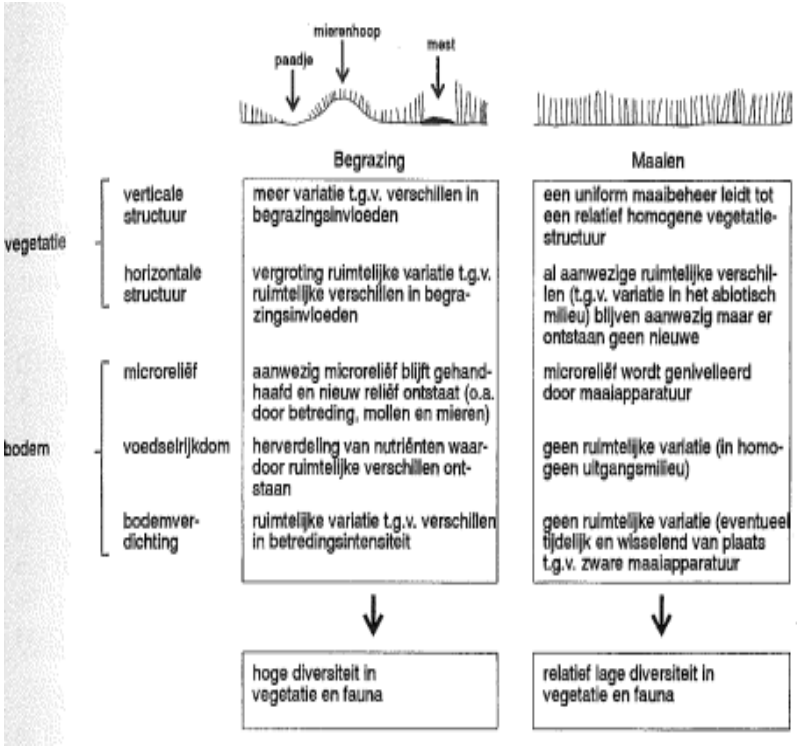


Begrazen vs maaien



Figuur 34-1.
Verloop van het aantal soorten planten per vier vierkante meter op de natuurlijke kwelder op Schiermonnikoog na het instellen van maaien en beweiden op een kwelder die al 13 jaar niet meer werd beweid.

Bakker et al 2003

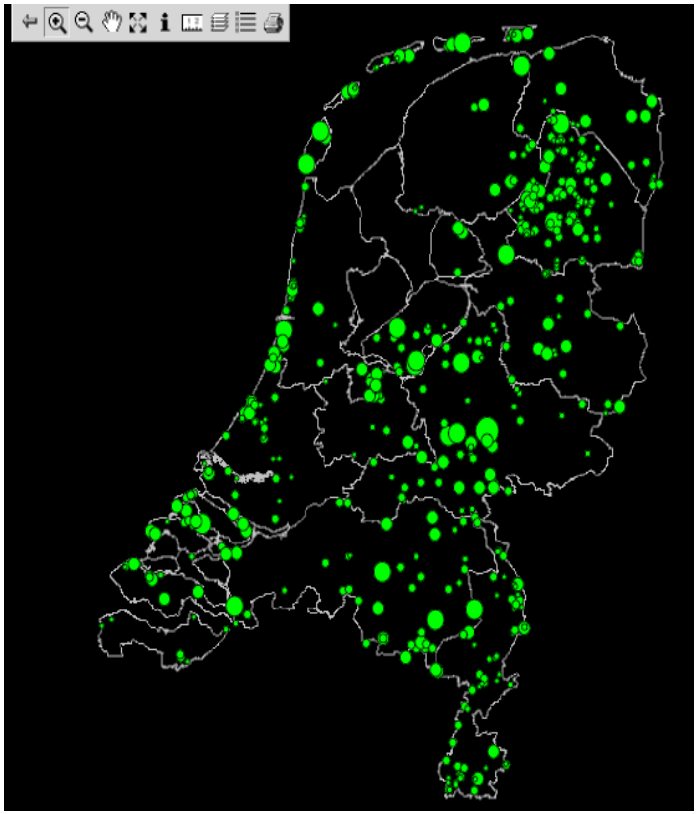


Figuur 7.2. Vergelijking tussen begrazing en maaien. Begrazing heeft alleen bovenvermelde gunstige uitwerking wanneer deze voldoende extensief is. Het betreft hier vooral de graslanden op drogere bodem; natte graslanden komen in het algemeen meer voor een maaibeheer in aanmerking.

Londo 1997

Begrazing in NL

- > 500 sites? (2003)
- Grote variatie tussen gebieden
  - Abiotiek, biotiek, begrazingsvormen
- Variatie in doelen
  - Variatie in resultaten (vaak combinatie van doelen)



http://www.synbiosys.alterra.nl/begrazing

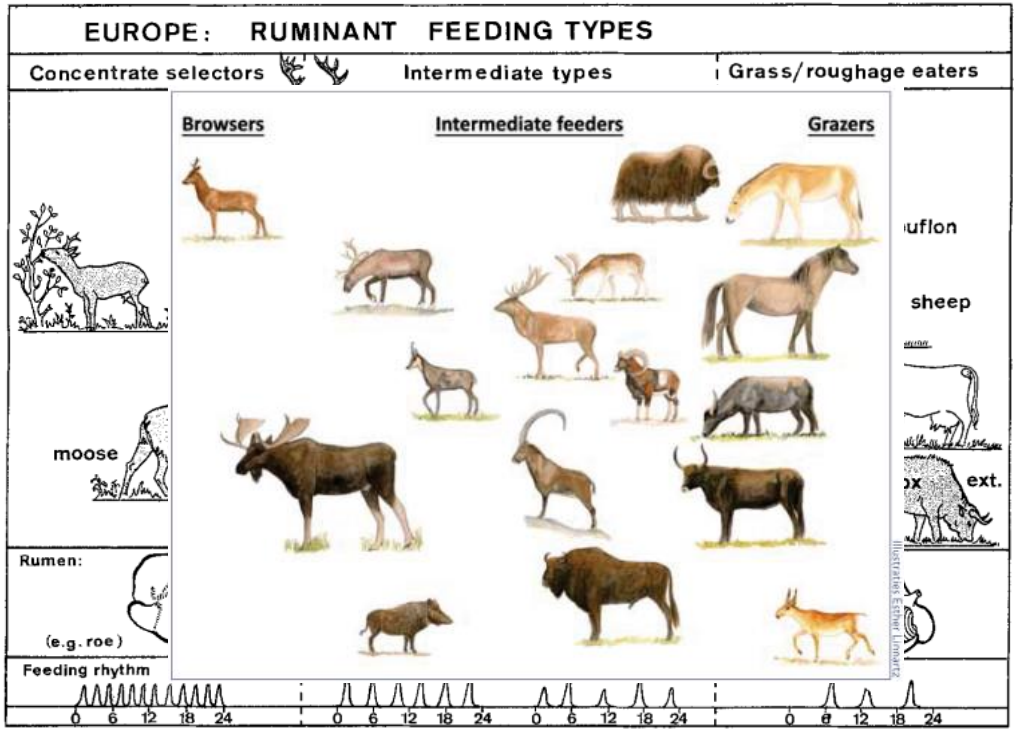
Begrazing: natuur vs. cultuur

- Natuurlijke begrazing
  - Ontwikkelen natuurlijke landschappen & levensgemeenschappen
  - Vergroten natuurlijke processen en geassocieerde heterogeniteit & biodiversiteit
  - Lage mate van menselijke beïnvloeding
- ‘Cultuur’ begrazing
  - Herstellen, behouden van cultuurlandschappen & levensgemeenschappen
  - Hoge mate van menselijke beïnvloeding

Smit & Putman 2011 (Ungulate Management in Europe)

Natuurlijke begrazing met grote herbivoren: theorie

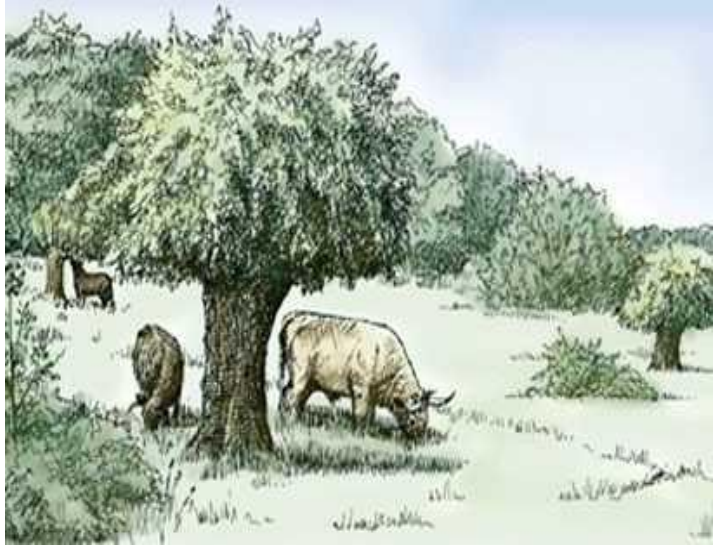
- Onderdeel van natuurlijk systeem
  - Jaarrond
  - Typen: snoeiers – grazers (Hofmann), complementair
  - Sociale kuddes, mix man/vrouw
  - Groot oppervlak (aanwezige heterogeniteit)

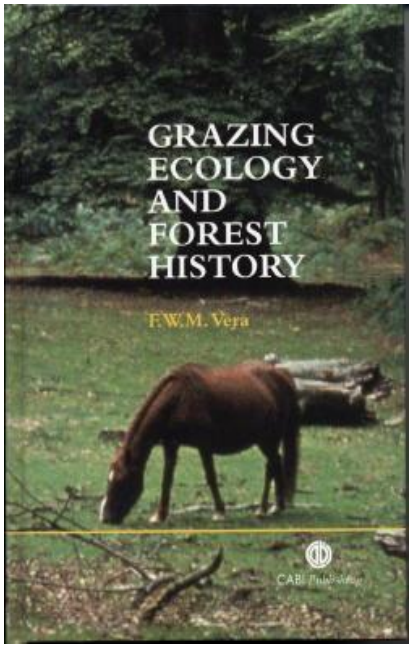


Erhart 2015 (Vakblad NBL)

Hofmann 1989 (Oecologia)

Openheid prehistorisch landschap?

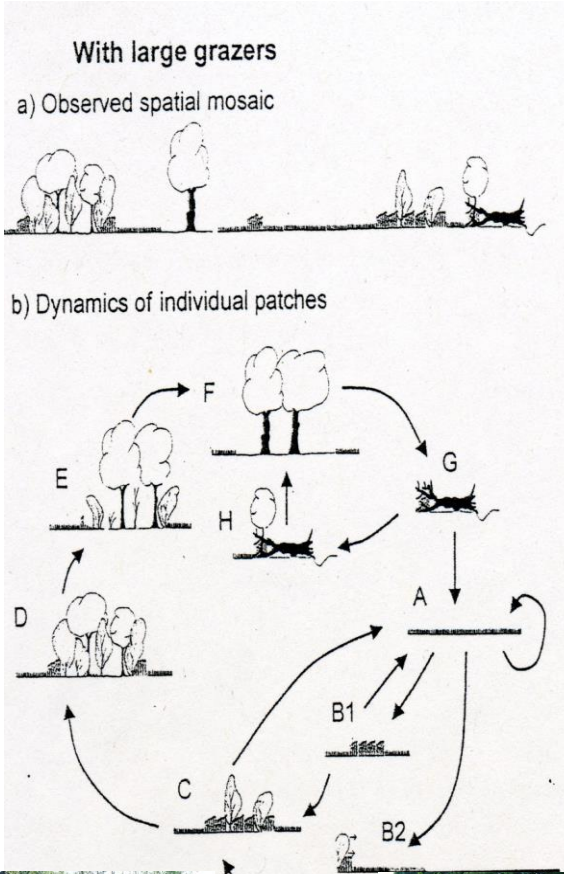


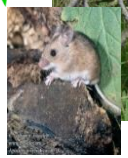


Discussie:

- Mitchell 2005 (JECOL): paleoecology
- Szabo 2009 (FEM): historical vegetation
- Whitehouse & Smith 2010 (QSR): fossil beetles
- Boulanger et al 2018 (Global Change Biology)
- Flojgaard et al 2018 (Global Change Biology)

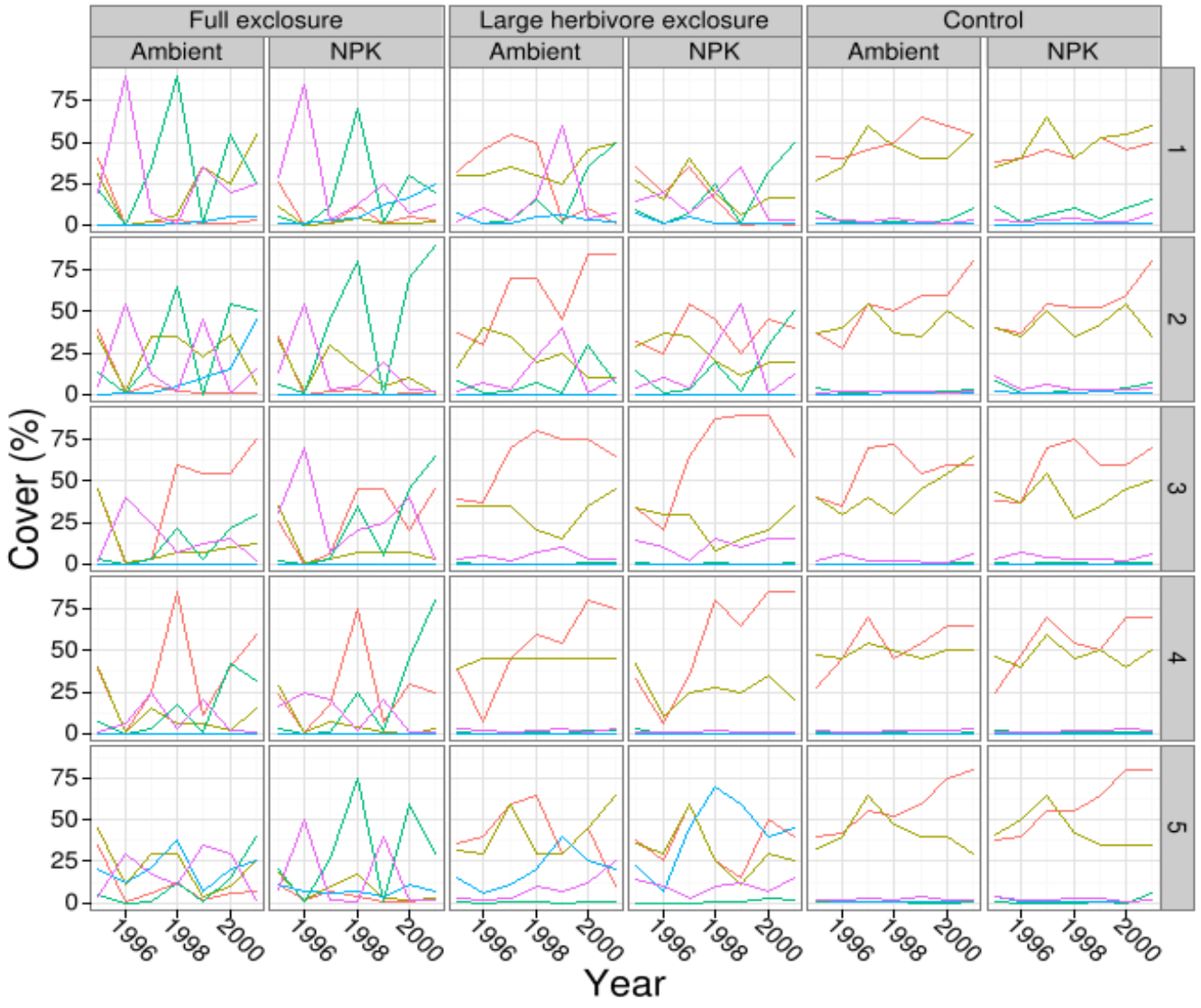
Verschuivende mozaïeken





Smit et al 2010 (BAAE)
Smit & Verwijmeren 2011 (Pl Ecol)
Schepers & Smit 2011 (Acta Oec)
Smit & Ruifrok 2011 (JVS)
Langbroek et al 2013 (DLN)

Begrazing stabiliseert samenstelling



Alberti et al 2017 (Ecology)

Wereldwijd mechanisme: reductie dominantie → plant biodiversiteit

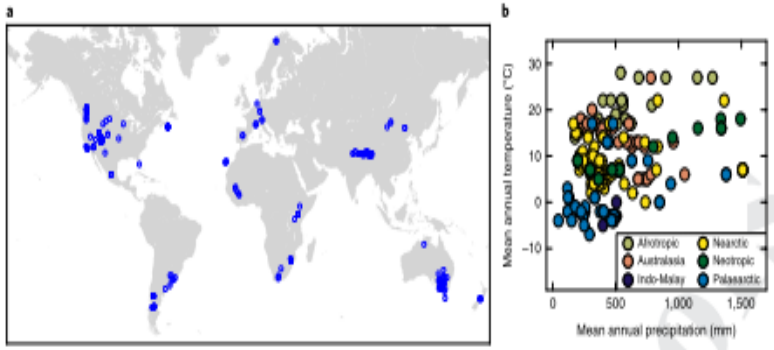


Fig. 1 | Location and climate of sites. **a**, Locations of the 252 grassland and savannah ecosystems where 1,212 grazed and ungrazed plots were located. All sites are represented by a single-sized open blue circle. Areas where symbols overlap appear to be darker blue. **b**, These study sites represent six biogeographic realms and encompass broad gradients of mean annual temperature and precipitation. Additional site details are provided in Supplementary Tables 1 and 2.

Koerner et al 2018 (Nature Ecol & Evol)

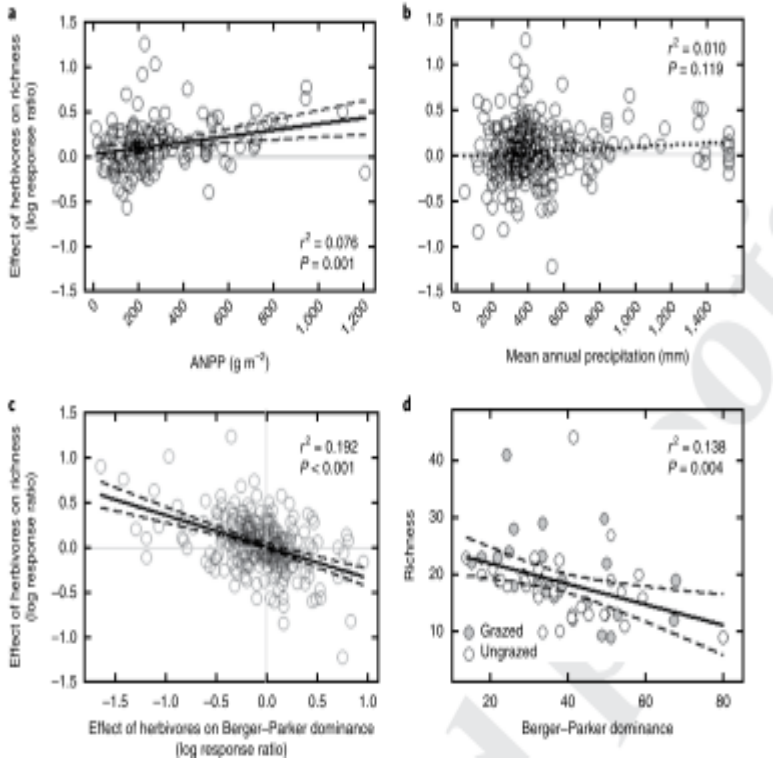
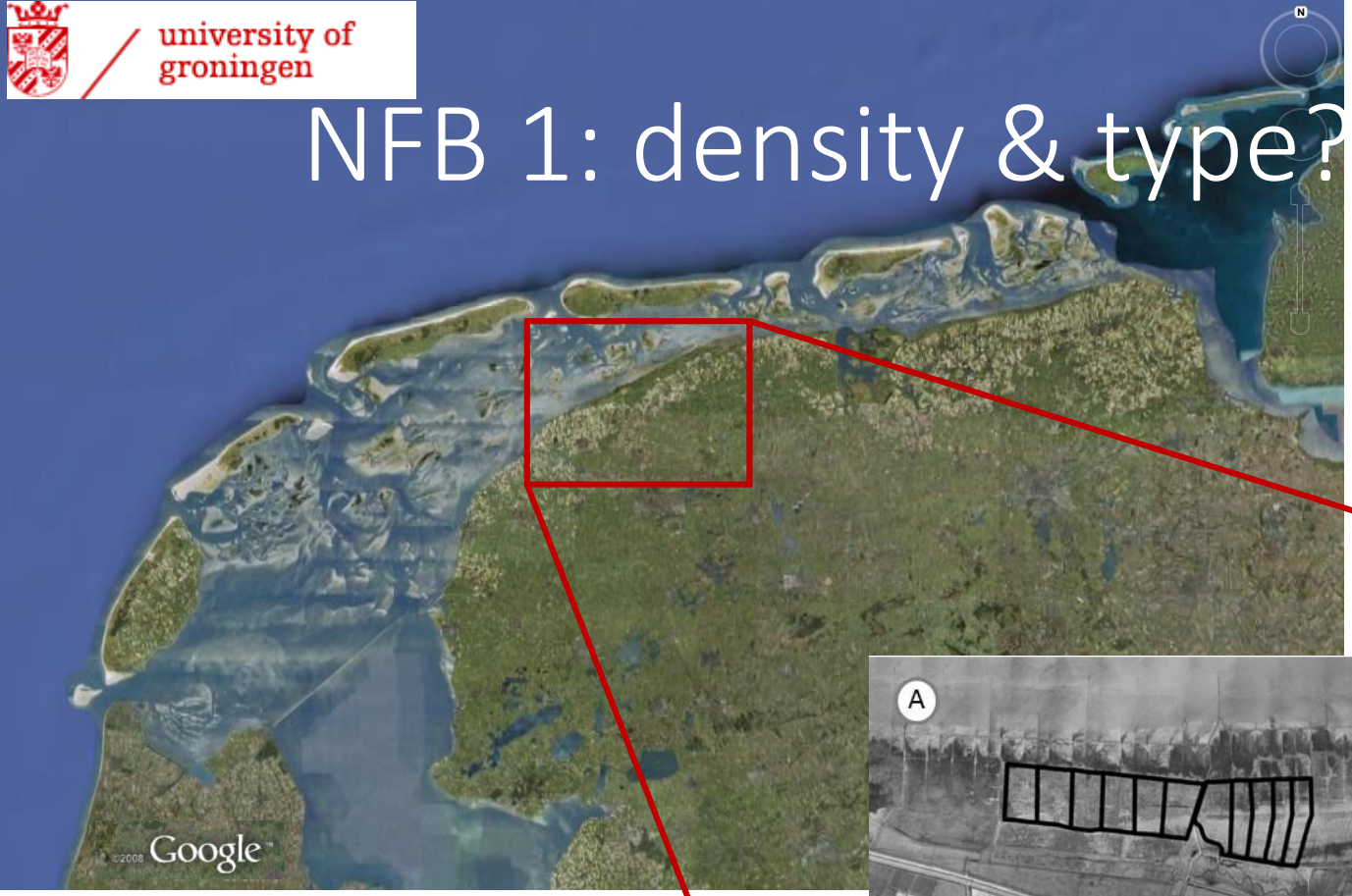
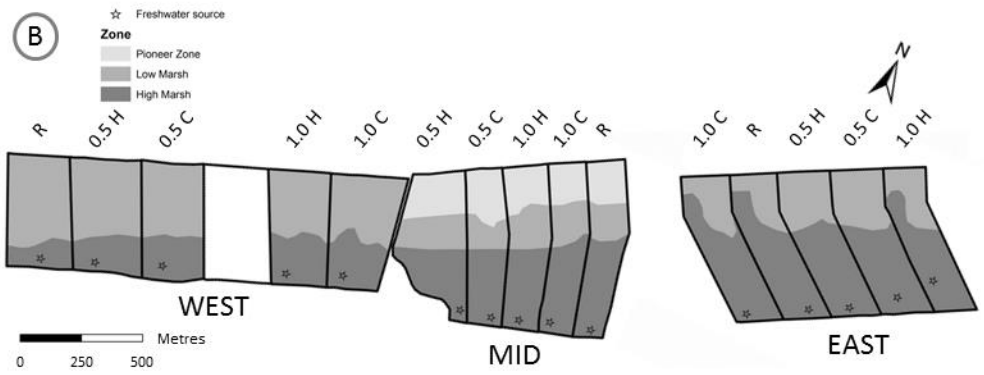


Fig. 2 | Herbivore effects on plant communities. **a**, Relationship between ANPP and the response of plant species richness to herbivory (ln(G/UG)), where G is the average plant species richness in grazed plots and UG is the same measurement in ungrazed plots ($n = 132$; Data Subset 1 in Supplementary Table 3). **b**, Relationship between MAP and the response of plant species richness to herbivory ($n = 244$; Data Subset 2 in Supplementary Table 3). **c**, Relationship between the change in dominance (Berger–Parker dominance) and the change in species richness as a function of herbivory (ln(G/UG)) ($n = 252$; all data). **d**, Relationship between dominance (Berger–Parker dominance) and species richness for grazed and ungrazed plots combined. This analysis is based only on studies with a common plot size of 25 m² ($n = 58$). The dashed lines represent 95% confidence intervals.

university of groningen

NFB 1: density & type?





	H–C	Dens.	Mechanism
Plants			
Cover *E. Atherica*	=	(↓)	trampling / defoliation
vegetation type			
Vegetation height			
high marsh	=	↓	trampling / defoliation
low marsh	=	↓	trampling / defoliation

Beweidingsregime

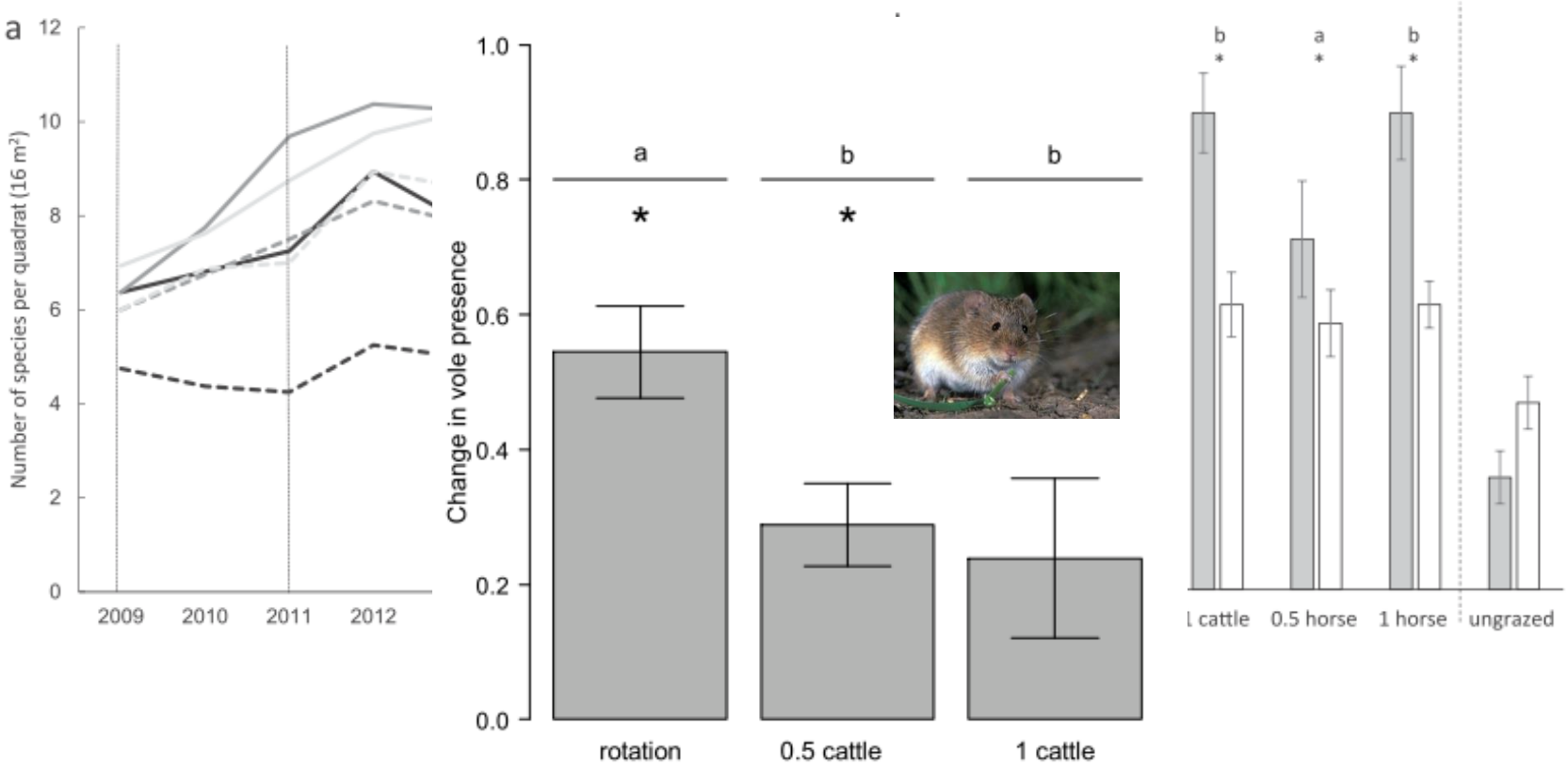
Effect	Paarden (dier/ha) 1	Paarden (dier/ha) 0,5	Runderen (dier/ha) 1	Runderen (dier/ha) 0,5
Soortenrijkdom planten	++	(+)	++	(+)
Reductie van Zeekweek	++	(+)	++	(+)
Hoogte vegetatie	– –	–	– –	–
Variatie in structuur ('patches')	–	+	+	++
Bloemproductie (Zeeaster) korte termijn	–	o	–	o
Bloemproductie (Zeeaster) lange termijn	(– –)	(+)	(+)	(+)
Bloemzoekende insecten	– –	o	–	o
Soortenrijkdom ongewervelden	– –	(–)	– –	(–)
Insecten op Zeeaster	(– –)	(–)	(– –)	(o/+)
Variatie in vegetatiehoogte (nesthabitat)	–	+	–	+
Vertrapping van vogelnesten	++	++	+	+
Voedsel voor zangvogels	(–)	?	?	?
Geschiktheid voor ganzen	++	+	+	o/+
Geschiktheid voor woelmuizen	– –	–	–	o/?

– – sterke afname; – afname; o geen effect; + toename; ++ sterke toename

effect gunstig effect ongunstig

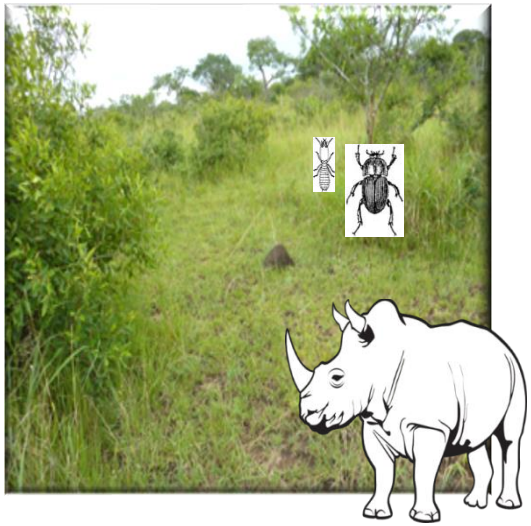
Esselink et al 2016 (DLN)
Van Klink et al. 2016 (iAGEE)

NFB 2: Rotatie beheer (fluctuerende dichtheden)



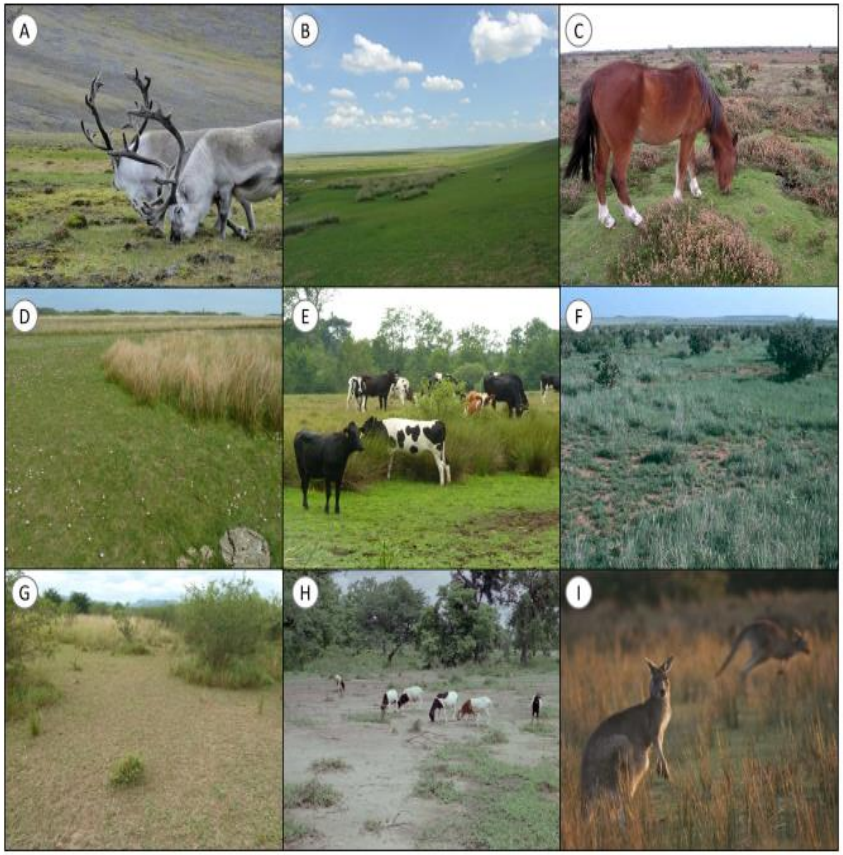
Lagendijk et al 2017 (AGEE), 2018 (Mammal Res), 2018 (BAAE)

Biocompactie & bioturbatie



- Processen kwelders Schier ~ savannas Zuid-Afrika
- Feedbacks betreding → bodem macrofauna → vegetatie

Biocompactie & bioturbatie



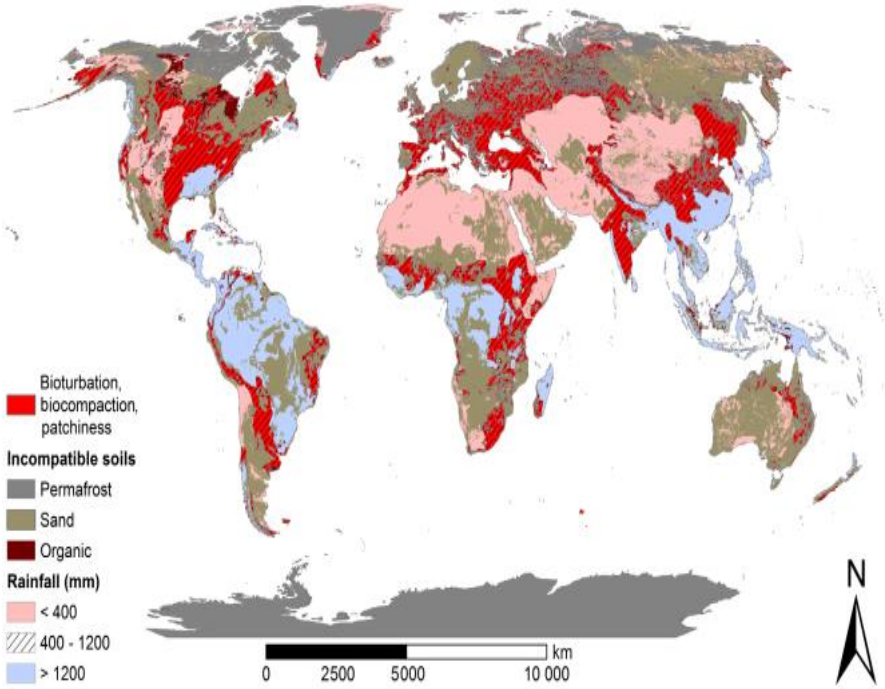


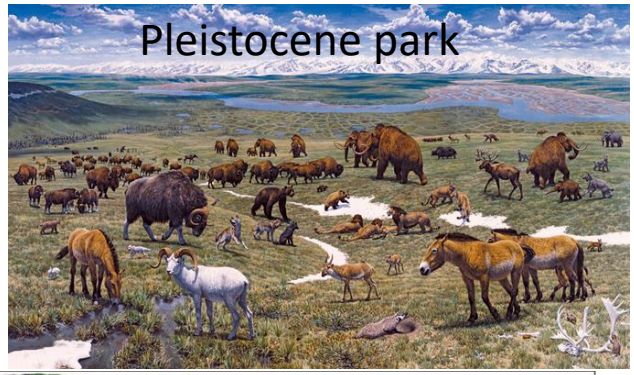
FIG. 1. Grasslands from nine geographically separated regions showing spatial mosaics of lawn and tall plant communities co-occurring where large herbivores are present. (A) Tundra, Arctic (source: ehow.com); (B) steppe, Mongolia (source: fao.org); (C) temperate heathland, UK (source: geographic.org.uk); (D) temperate salt marsh, northwestern Europe (photo: Ruth Howison); (E) temperate grassland, northwestern Europe (photo: Han Olff); (F) mixed prairie, south-central United States, Texas (source: fao.org); (G) semi-tropical savanna, Southern Africa (photo: Ruth Howison); (H) dryland, Sahel (photo: Johan van de Koppel); (I) temperate savanna, southeastern Australia (source: nationalgeographic.com).

Howison et al 2017 (Ecol Mono)

Rewilding = hot: multiple organizations & sites

Jeroen Helmer

Zimov & Zimov



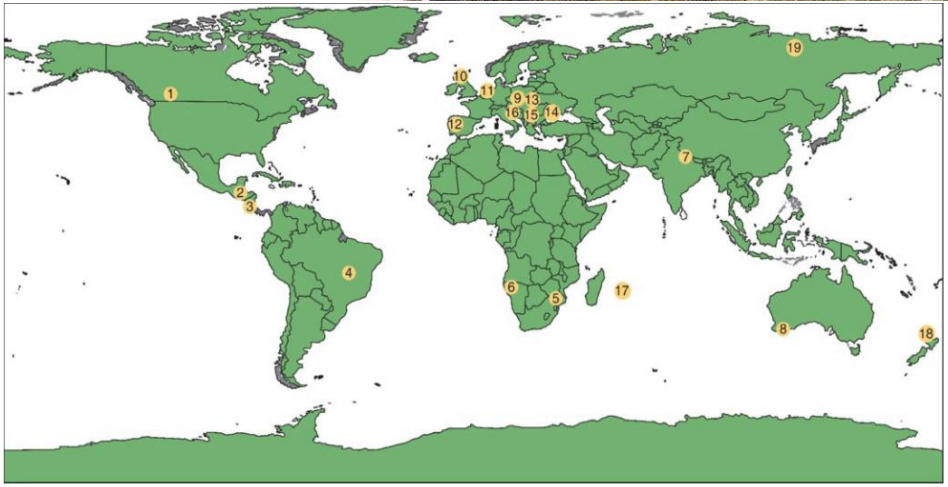
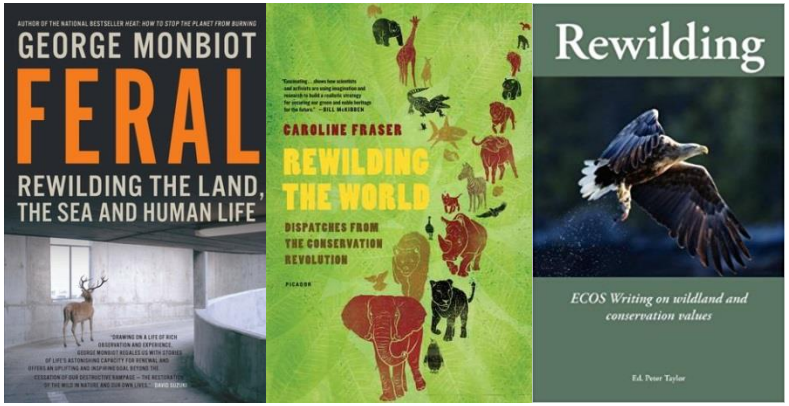


Figure 23.2 Rewilding projects in practice. 1. Yellowstone to Yukon. 2. Paseo Pantera. 3. Area de Conservacion Guanacaste. 4. Cerrado-Pantanal. 5. Great Limpopo Transfrontier Conservation Area. 6. Iona-Skeleton Coast TFCA. 7. Terai Arc Landscape. 8. Gondwana Link. 9. European Green Belt. 10. Alladale Wilderness Reserve. 11. Oostvaarderplassen. 12. Western Iberia. 13. Eastern Carpathians. 14. Danube Delta. 15. Southern Carpathians. 16. Velebit. 17. Mascarene Islands. 18. New Zealand. 19. Pleistocene Park.

Sandom et al 2013



Multiple conceptual, opinion & review papers

Table 1. A Taxonomy of the Major Terms Mentioned in this Review with a Brief Explanation of Their Re
Usage

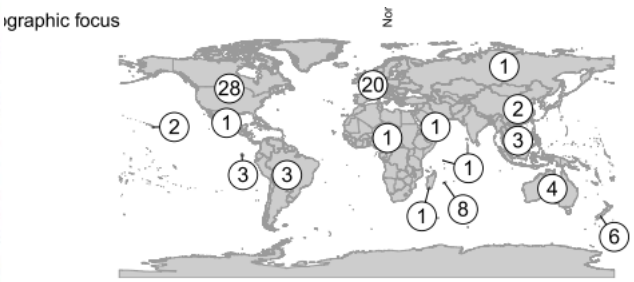
Umbrella Term	Term	Key Element in Usage	
Restoration	Restoration (in a strict sense)	Restoring original composition and function	[
	Functional restoration	Prioritizing function over species composition	[
	Reforestation		[
	Revegetation		[
	Rehabilitation		[
	Reclamation		[
	Ecological engineering		[
Conservation Translocation	Reintroduction		[
	Reinforcement		[
	Assisted gene flow		[61]
	Pleistocene reintroduc		[55]
	Conservation introduct		[8]
	Assisted colonizatio		[8]
	Assisted migratio		[9]
	Ecological replacem		[8]
	Restocking		[62]
Rewilding	Trophic rewilding		[12]
	Pleistocene rewilding		[55]
	Ecological rewilding		[13]
	Passive rewilding		[12]

Corlett 2016 (TP

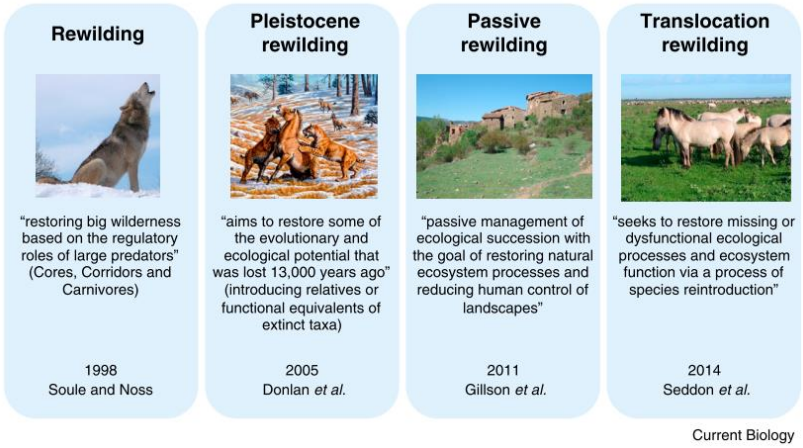
VIEWPOINT

Rewilding: A Call for Boosting Ecological Complexity in Conservation

Néstor Fernández[1,2], Laetitia M. Navarro[1,3], & Henrique M. Pereira[1,3]

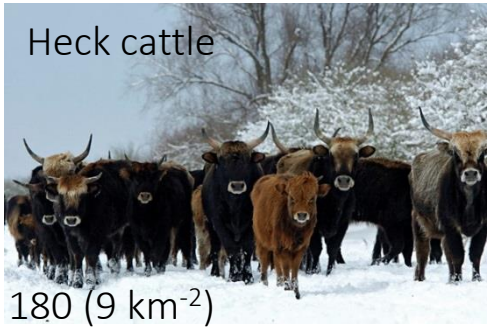


Svenning et al 2016 (PNAS)



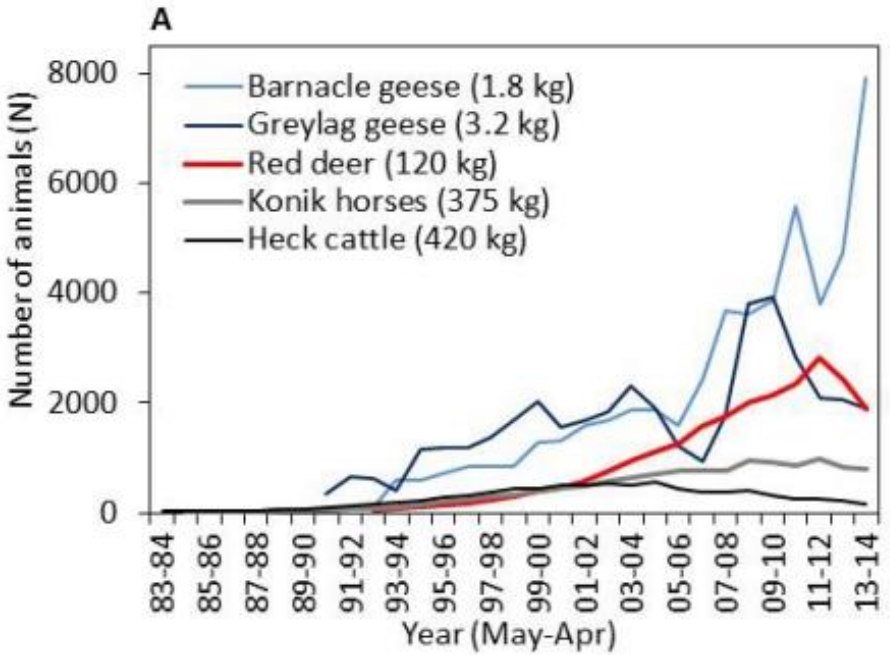
"Rewilding is the new Pandora's box in Conservation" Nogués-Bravo et al 2016 (Current Biol)

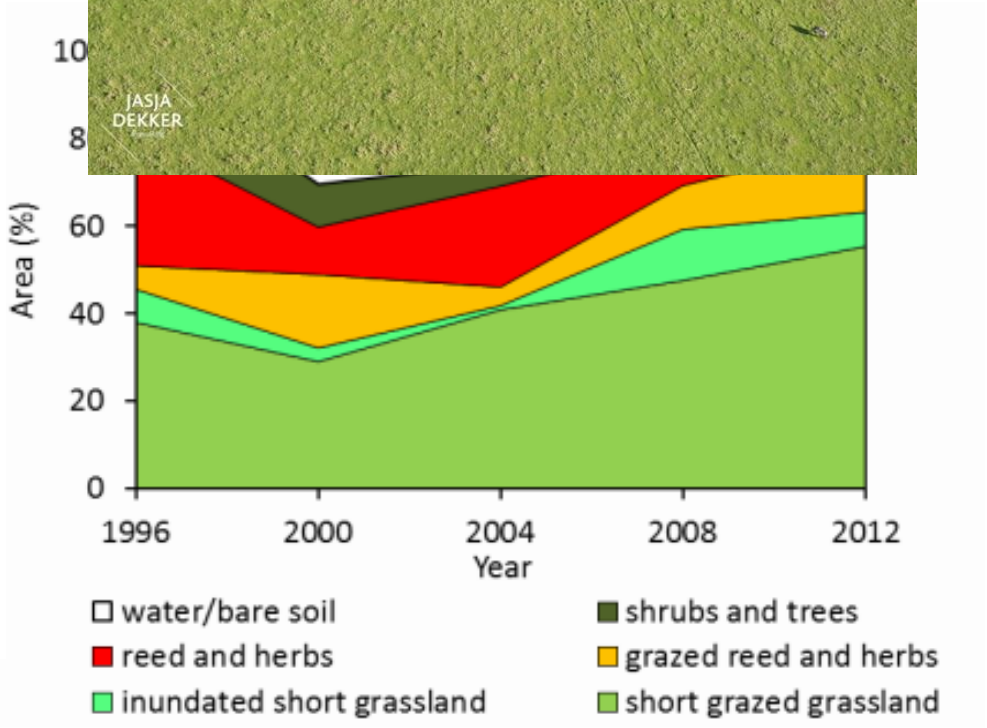
OVP: rewilding with large herbivores



Dec 2016

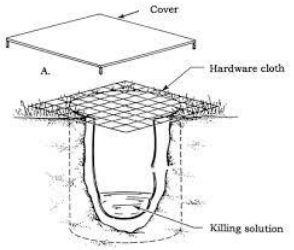
Open landschap





Cornelissen et al 2017

What's new

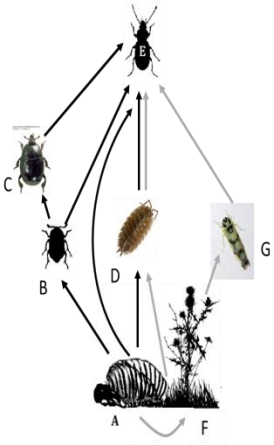


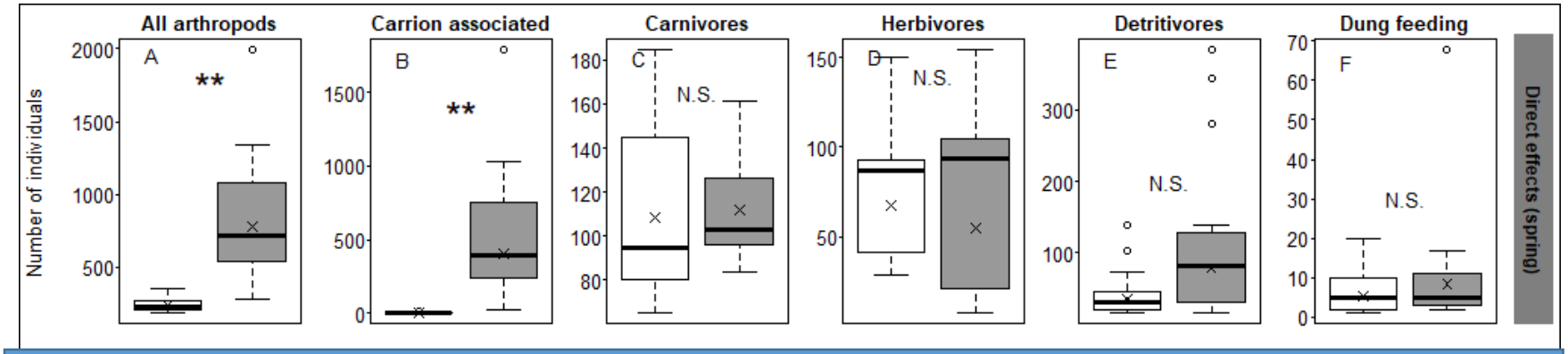
van Klink et al, 2016 (AGEE)

university of groningen

What's new

Dode dieren: heterogeniteit & biodiversiteit

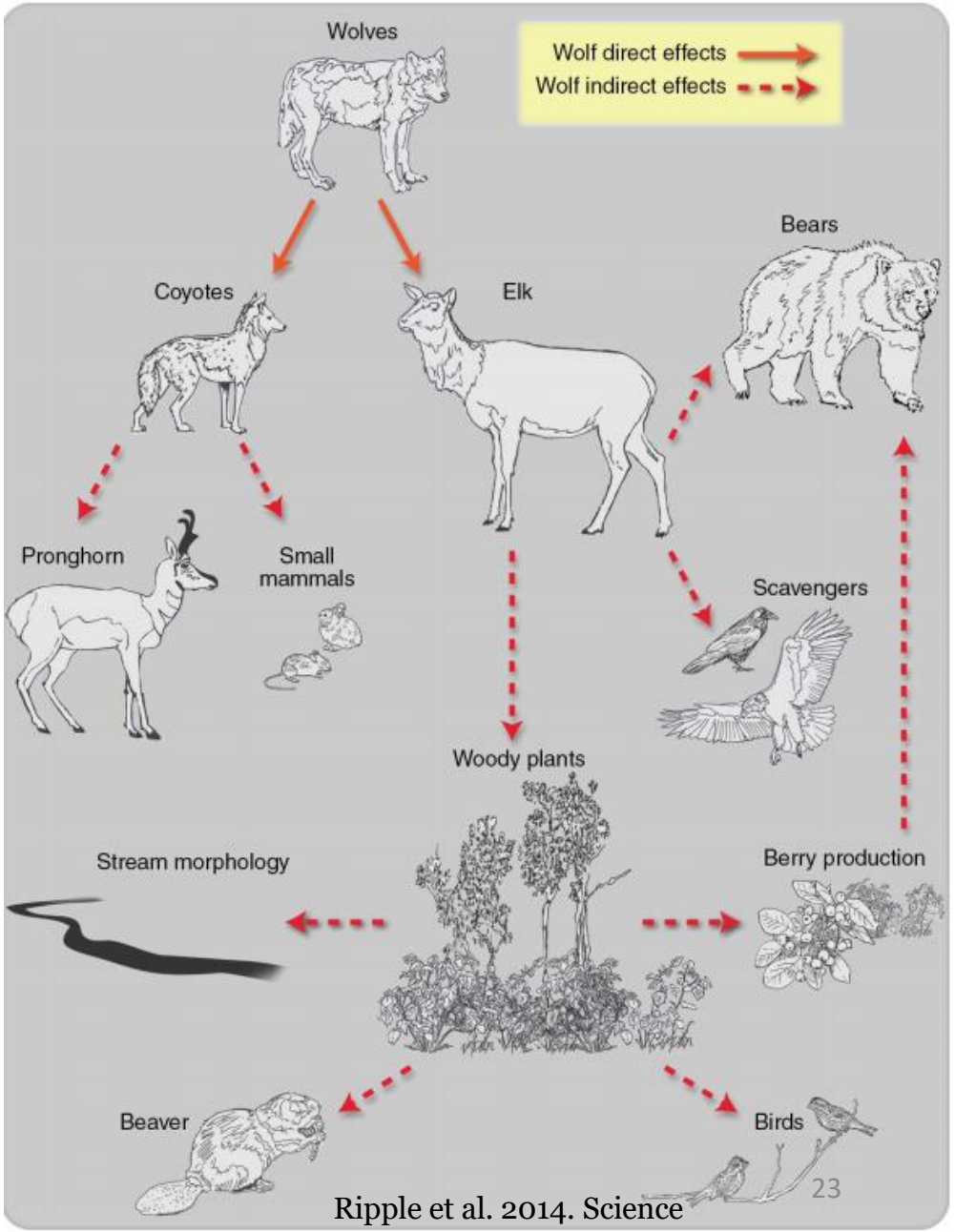




van Klink et al, in prep

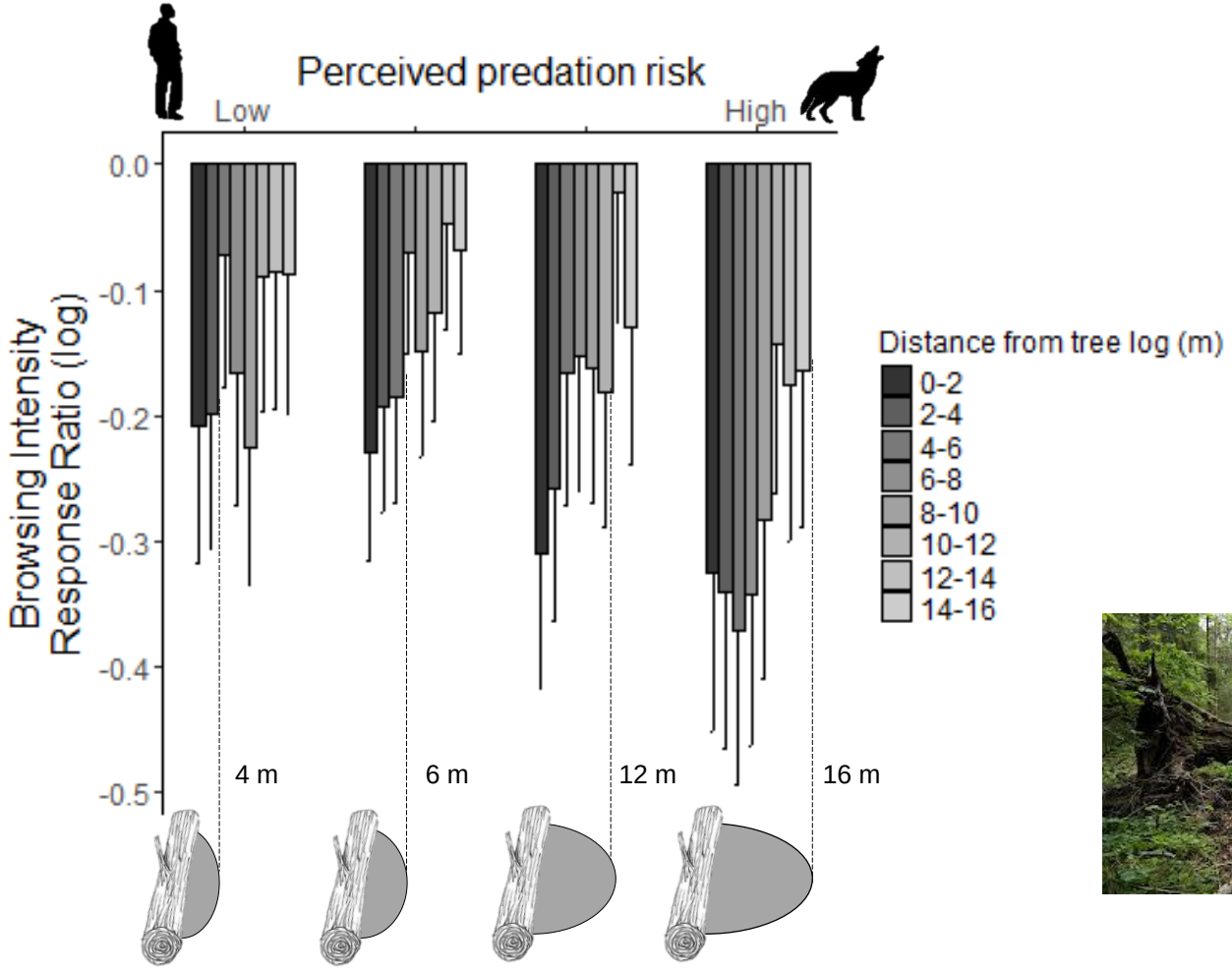
Trophic cascading effects of returning large carnivores

Ripple & Beschta 2011 Biol Cons



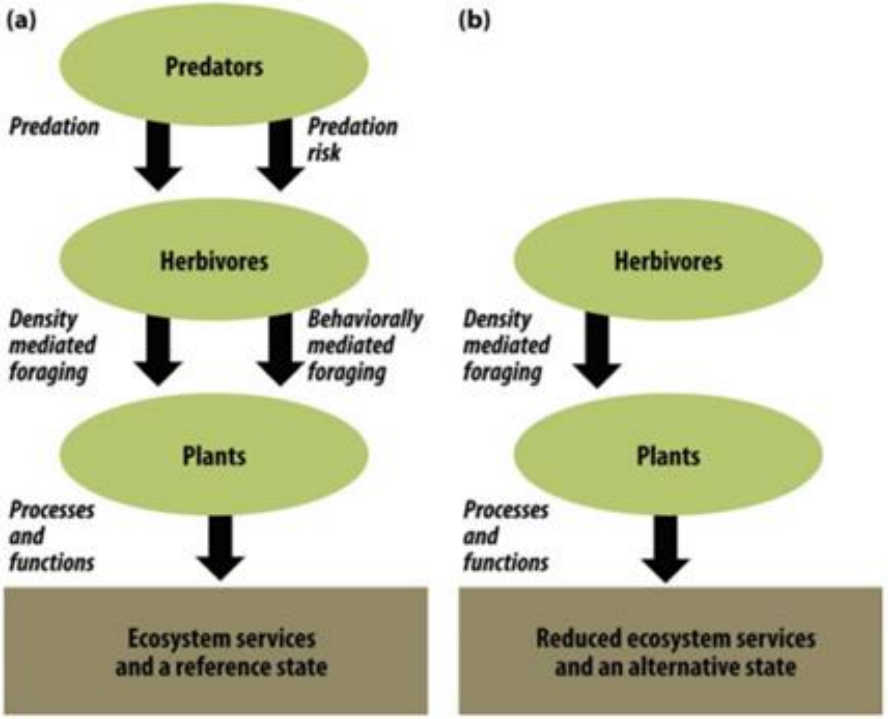
Ripple et al. 2014. Science

Strongest browsing reduction in high risk areas



Van Ginkel et al 2018 (Ecosystems)

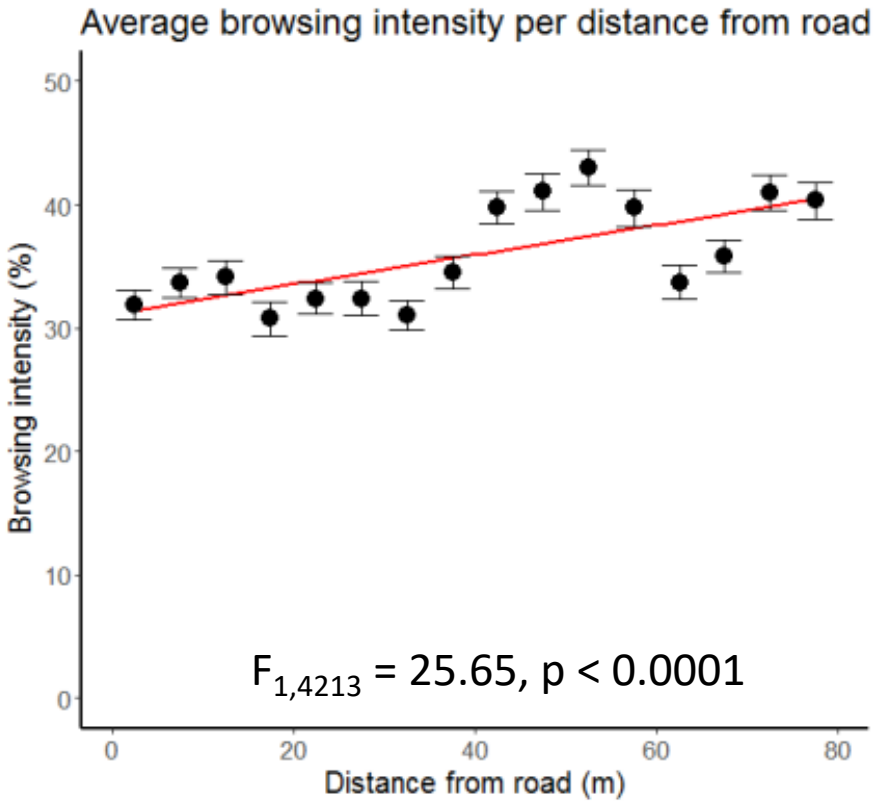
Fear of humans? Effect of distance to roads on deer browsing patterns



(Beschta & Ripple, 2009)

?

Landscape of fear by humans?



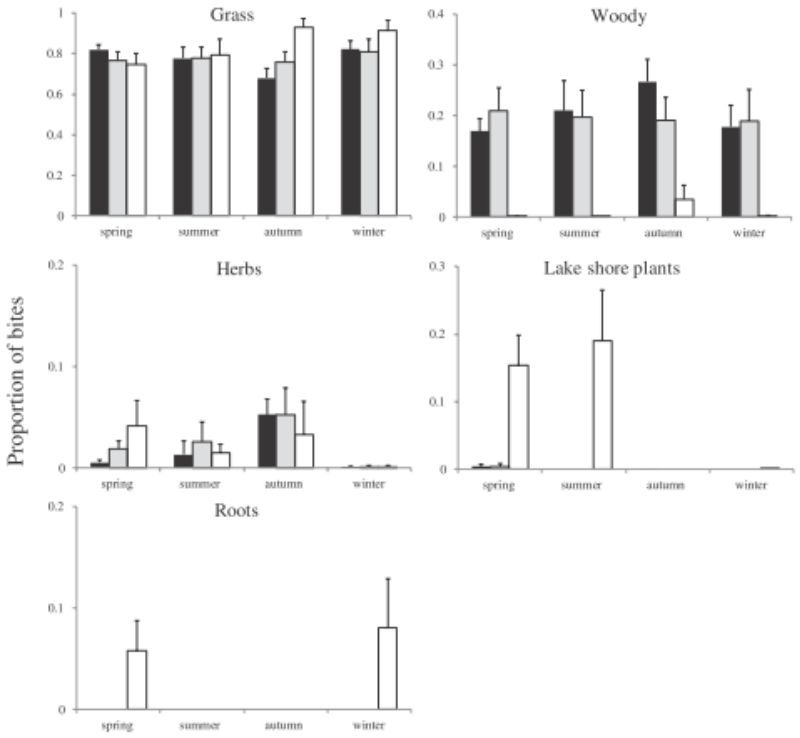
Brouwer, 2017; Mols et al, in prep

Applying the concept of 'human induced ecology of fear': human activities to manage ungulates?

Ongoing research project at the National Park Veluwezoom! (PhD Bjorn Mols)

Uitdagingen

- Veel ervaringen, maar weinig wetenschappelijke data over:
  - Toegevoegde (ecologische) waarde van 'completer' herbivoren assemblage
  - "" sociale kuddes
- 'Rewilding': wat zijn meetbare doelen?
  - Discussie nodig
- Wat zijn natuurlijke dichtheden?
  - OVP: ecologische vs. maatschappelijk draagkracht



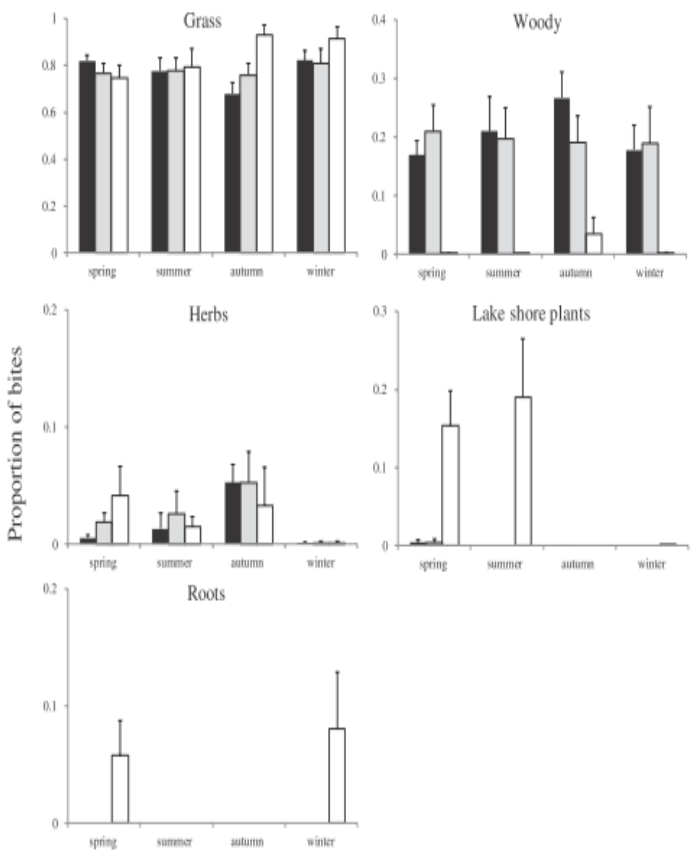
Cromsigt et al 2017 (Rest Ecol)

Figure 1. Average proportion (+SE) of bites of different food types in the diet of European bison (black bars), cattle (gray bars), and horse (white bars) during the four seasons. Seasons were defined as spring (March–May), summer (June–August), autumn (September–November), and winter (December–February). Please note different scaling of y-axes for the different food types. Consumed lake shore plants were predominately sedges and rushes.

Effecten van grote grazers: resultaten van lange termijn onderzoek in NL

Chris Smit
Conservation Ecology Group
Rijksuniversiteit Groningen

Niche separation? Cattle, horses, Wisent



- Theorie ok,
- Wisent en rund, verschillend?
- Lijkt er op
- Maar indien allemaal tezamen, is er meerwaarde?
- bewijs in veld moeilijk te vinden (lastige proef)

Figure 1. Average proportion (+SE) of bites of different food types in the diet of European bison (black bars), cattle (gray bars), and horse (white bars) during the four seasons. Seasons were defined as spring (March–May), summer (June–August), autumn (September–November), and winter (December–February). Please note different scaling of *y*-axes for the different food types. Consumed lake shore plants were predominately sedges and rushes.

Cromsigt et al 2017

Sociale kuddes / Sexual segregation (ruminants)

- Ruckstuhl & Neuhaus 2002 (Biol Reviews)
- Mannen en vrouwen doen anders, eten anders, en hebben dus andere ecologische effecten.
- Voor eerste 2 bewijs; voor laatste redelijk aannemelijk
- Stierenkuilen?