Forests before *Homo sapiens*

Historical baselines of European vegetation

Elena A. Pearce

AARHUS UNIVERSITET

ECONOVO
CENTER FOR ECOLOGICAL DYNAMICS
IN A NOVEL BIOSPHERE

TERRA NOVA

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www.elsevier.com/locate/tree

Review

A review of natural vegetation openness in north-western Europe

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Perspective

Biodiversity-rich European grasslands: Ancient, forgotten ecosystems

Angelica Feurdean[a,*], Eszter Ruprecht[b,c], Zsolt Molnár[c], Simon M. Hutchinson[d], Thomas Hickler[a,e]

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[e] Department of Physical Geography, Goethe University, Altenhöferallee 1, 60438 Frankfurt am Main, Germany

AND

The Holocene vegetation cover of Britain and Ireland: overcoming problems of scale and discerning patterns of openness

Ralph M. Fyfe[a,*], Claire Twiddle[b], Shinya Sugita[c], Marie-José Gaillard[d], Philip Barratt[e], Christopher J. Caseldine[f], John Dodson[g], Kevin J. Edwards[b], Michelle Farrell[h], Cynthia Froyd[i], Michael J. Grant[j,k], Elizabeth Huckerby[l], James B. Innes[m], Helen Shaw[n], Martyn Waller[k]

F.W.M. Vera

Journal of Ecology

Free Access

How open were European primeval forests? Hypothesis testing using palaeoecological data

FRASER J. G. MITCHELL

First published: 21 December 2004 | https://doi.org/10.1111/j.1365-2745.2004.00964.x

Quantitative reconstructions of changes in regional openness in north-central Europe reveal new insights into old questions

Anne Birgitte Nielsen[a,b,*,1,2], Thomas Giesecke[a], Martin Theuerkauf[c], Ingo Feeser[d], Karl-Ernst Behre[e], Hans-Jürgen Beug[a], Su-Hwa Chen[f], Jörg Christiansen[a], Walter Dörfler[d], Elisabeth Endtmann[g], Susanne Jahns[h], Pim de Klerk[i], Norbert Kühl[j], Małgorzata Latałowa[k], Bent Vad Odgaard[l], Peter Rasmussen[m], Jette Raal Stockholm[n], Ricarda Voigt[a], Julian Wiethold[o], Steffen Wolters[e]

How fragmented was the British Holocene wildwood? Perspectives on the "Vera" grazing debate from the fossil beetle record

Nicki J. Whitehouse[a,*], David Smith[b]

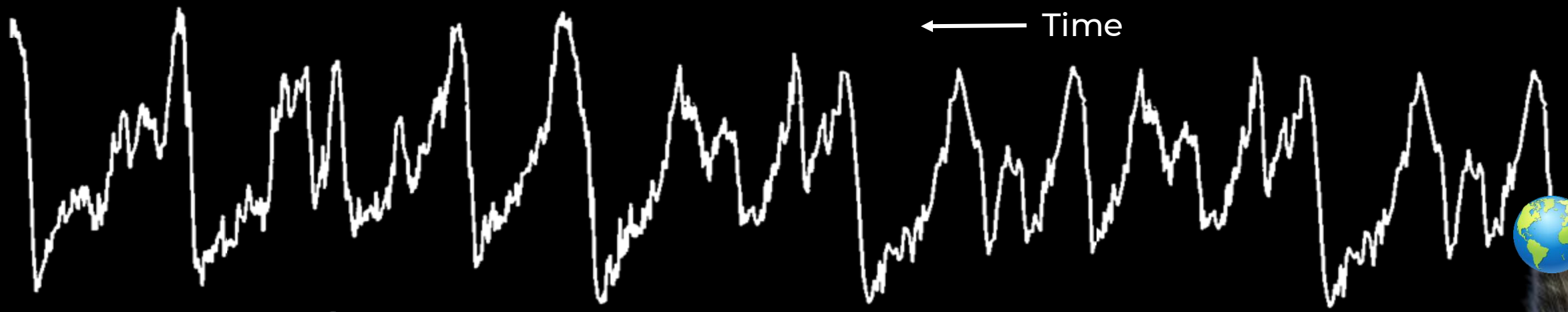
[a] Palaeoecology Centre, School of Geography, Archaeology and Palaeoecology, Queens University Belfast, Belfast BT7 1NN, Northern Ireland, UK
[b] Institute of Archaeology and Antiquity, University of Birmingham, Edgbaston, Birmingham B15 2TT, England, UK

“Mosaic… maintained by the grazing of large herbivores and by fire.”

Navarro & Pereira, 2012

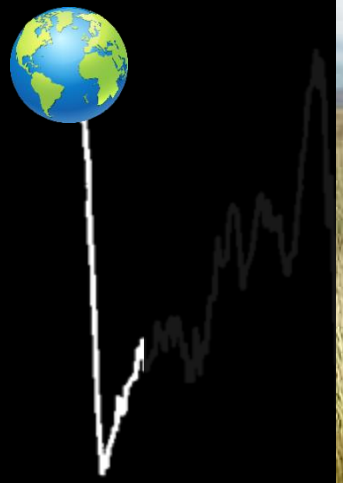
Interglacial period

The Holocene (12,000 – 0 BP)
~~Present Day~~



Glacial period

The Holocene
~~Present Day~~



RESEARCH ARTICLE | BIOLOGICAL SCIENCES |

People have shaped most of terrestrial nature for at least 12,000 years

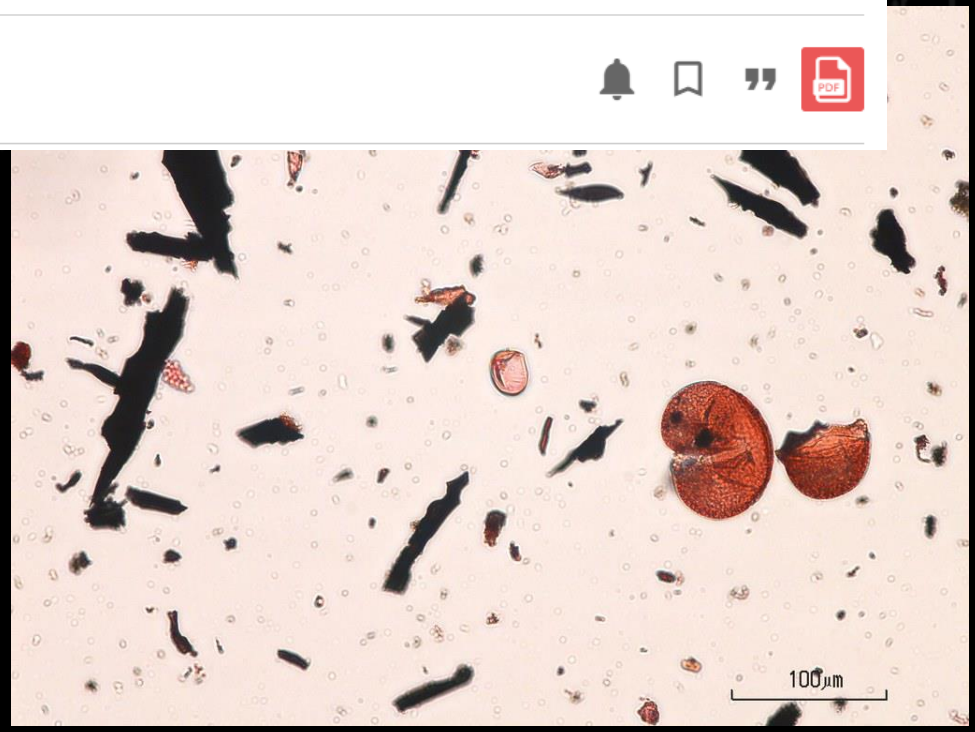
Erle C. Ellis, Nicolas Gauthier, Kees Klein Goldewijk, +14, and James E. M. Watson Authors Info & Affiliations

Edited by B. L. Turner, Arizona State University, Tempe, AZ, and approved March 4, 2021 (received for review November 13, 2020)

April 19, 2021 | 118 (17) e2023483118 | https://doi.org/10.1073/pnas.2023483118

THIS ARTICLE HAS BEEN UPDATED

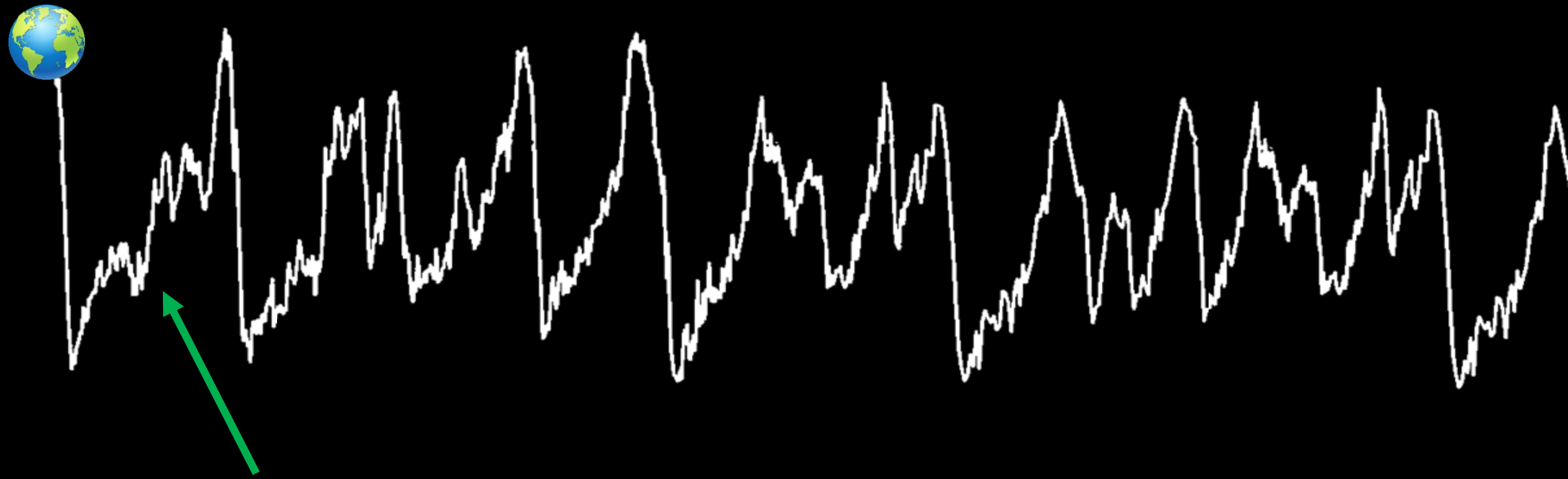
127,215 | 200



3.9% of temperate woodlands were uninhabited wildlands as early as 12,000 BP

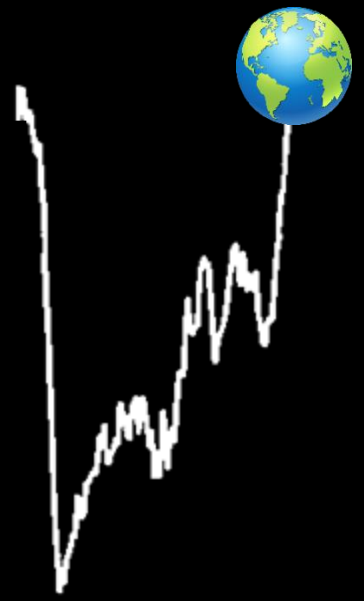
The Holocene

The Last Interglacial

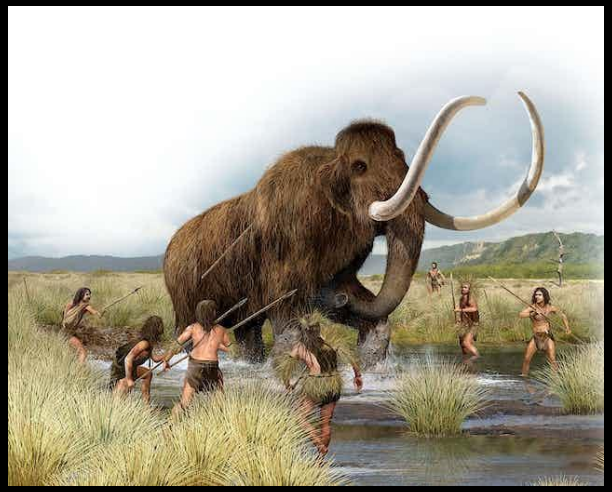


Homo sapiens arrive (~50,000 BP)

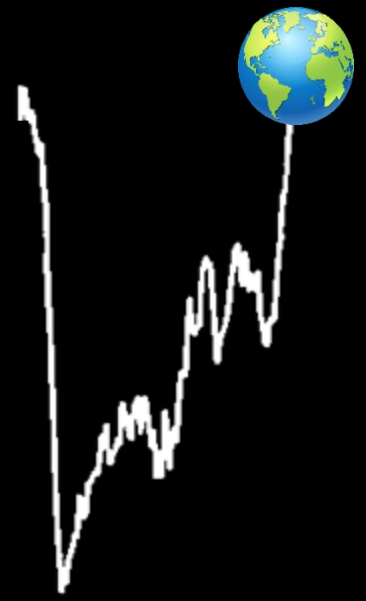
The Last Interglacial (129,000 – 116,000 BP)



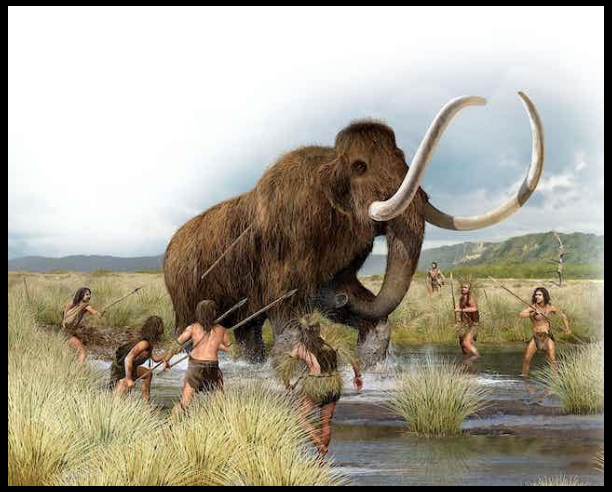
- Before *Homo sapiens* in Europe



The Last Interglacial (129,000 – 116,000 BP)



- Before *Homo sapiens* in Europe
- Before widespread hominin-induced landscape change
- Before megafauna extinctions
- Geologically recent
- Climatically similar



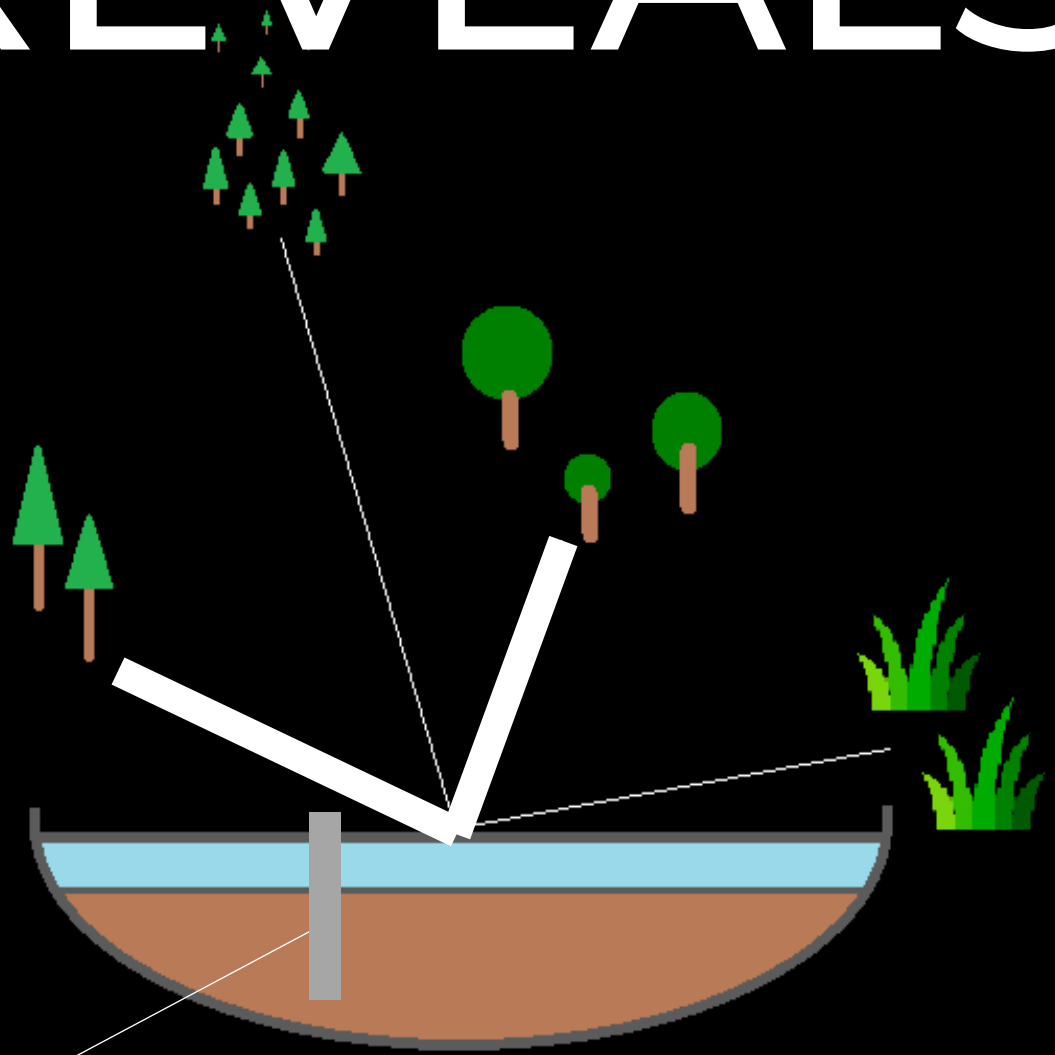
How open were European landscapes before modern humans?

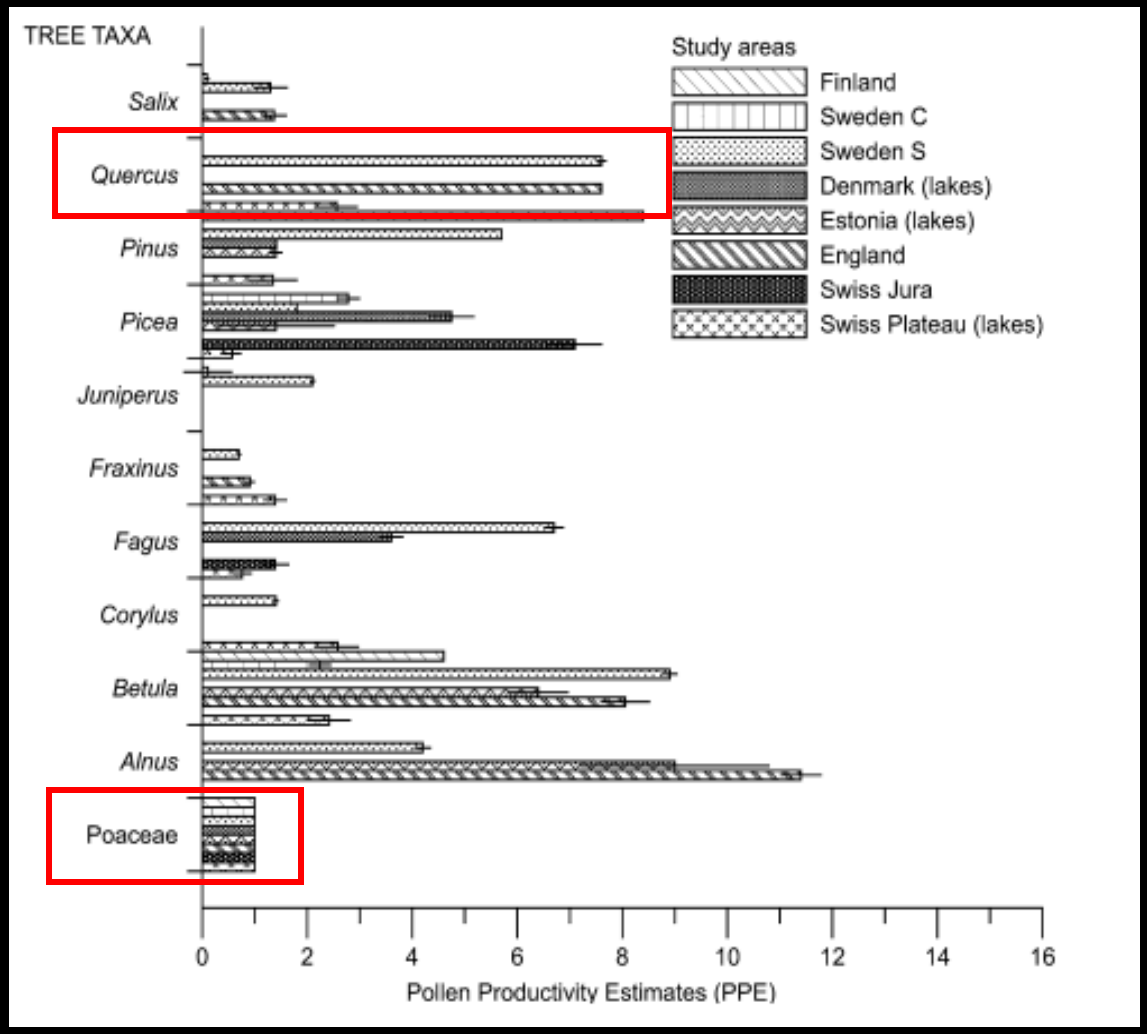
What dynamics shaped these landscapes?


adidas

100 µm

REVEALS (Sugita, 2007)





Broström *et al.* 2008

Open vegetation

Herbaceous

Heath

Light woodland

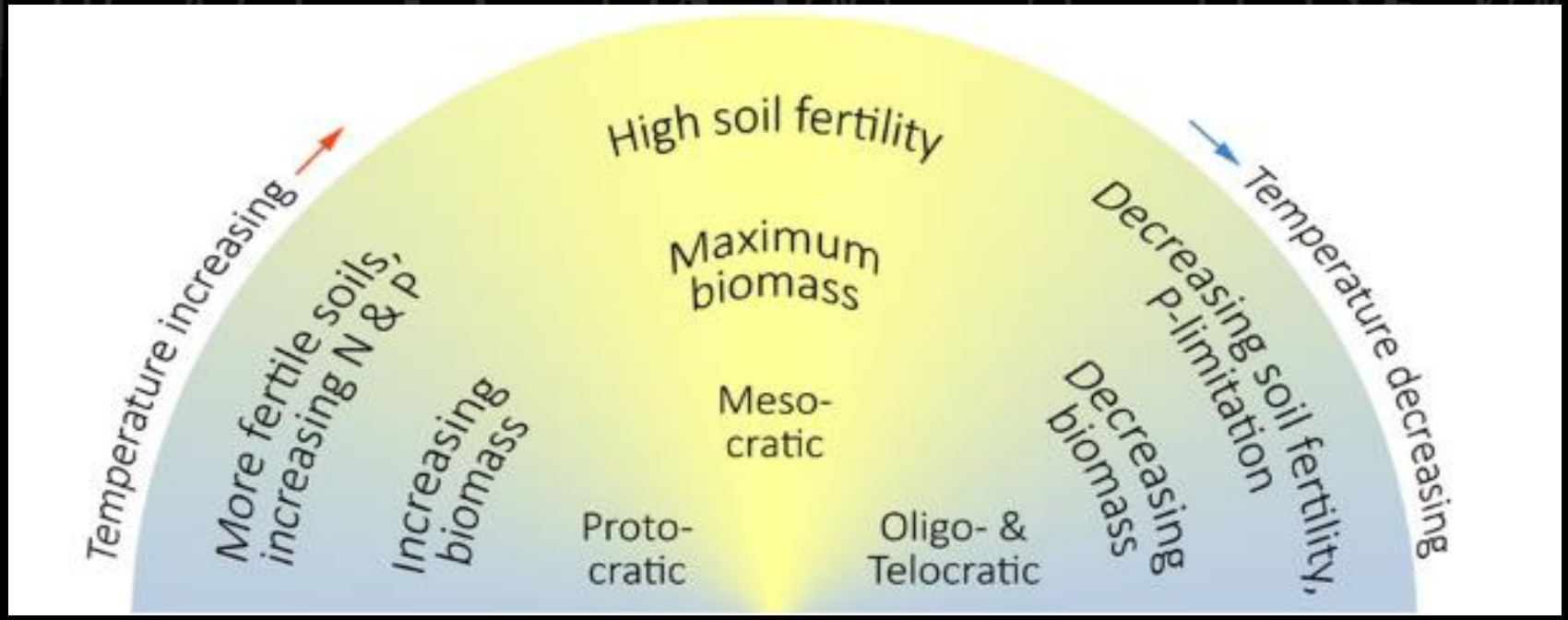
Shade intolerant trees

Intermediate trees

Closed forest

Shade tolerant trees

Openness in the "high forest" temperate period

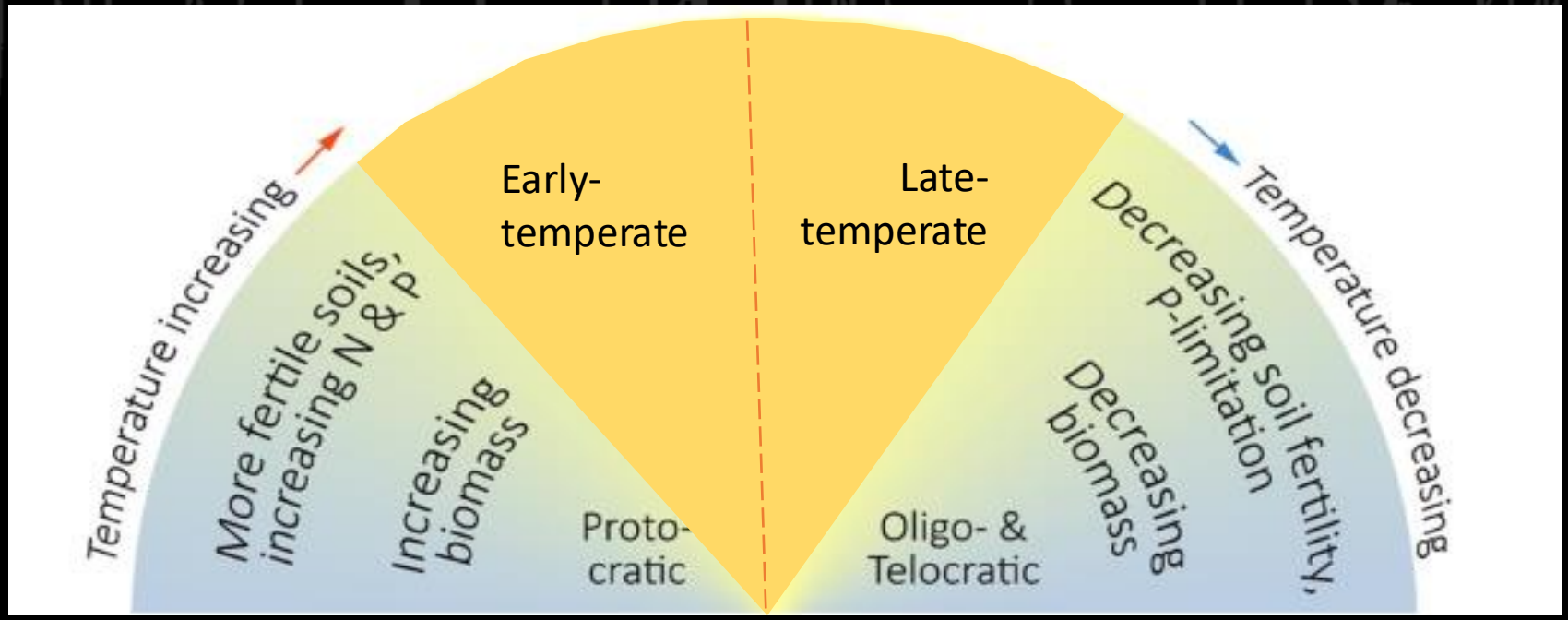


Start

End

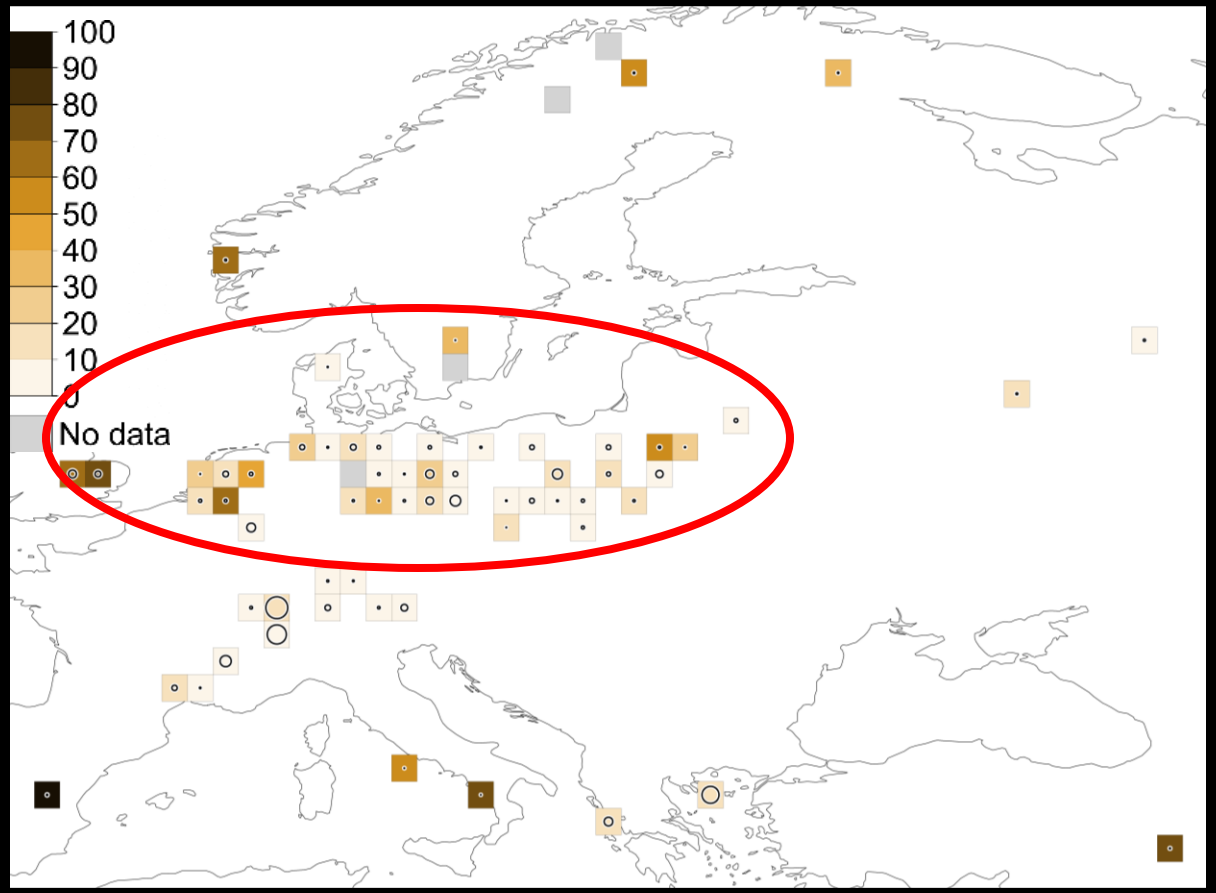
Adapted from Felde *et al.*, 2020

Openness in the "high forest" temperate period

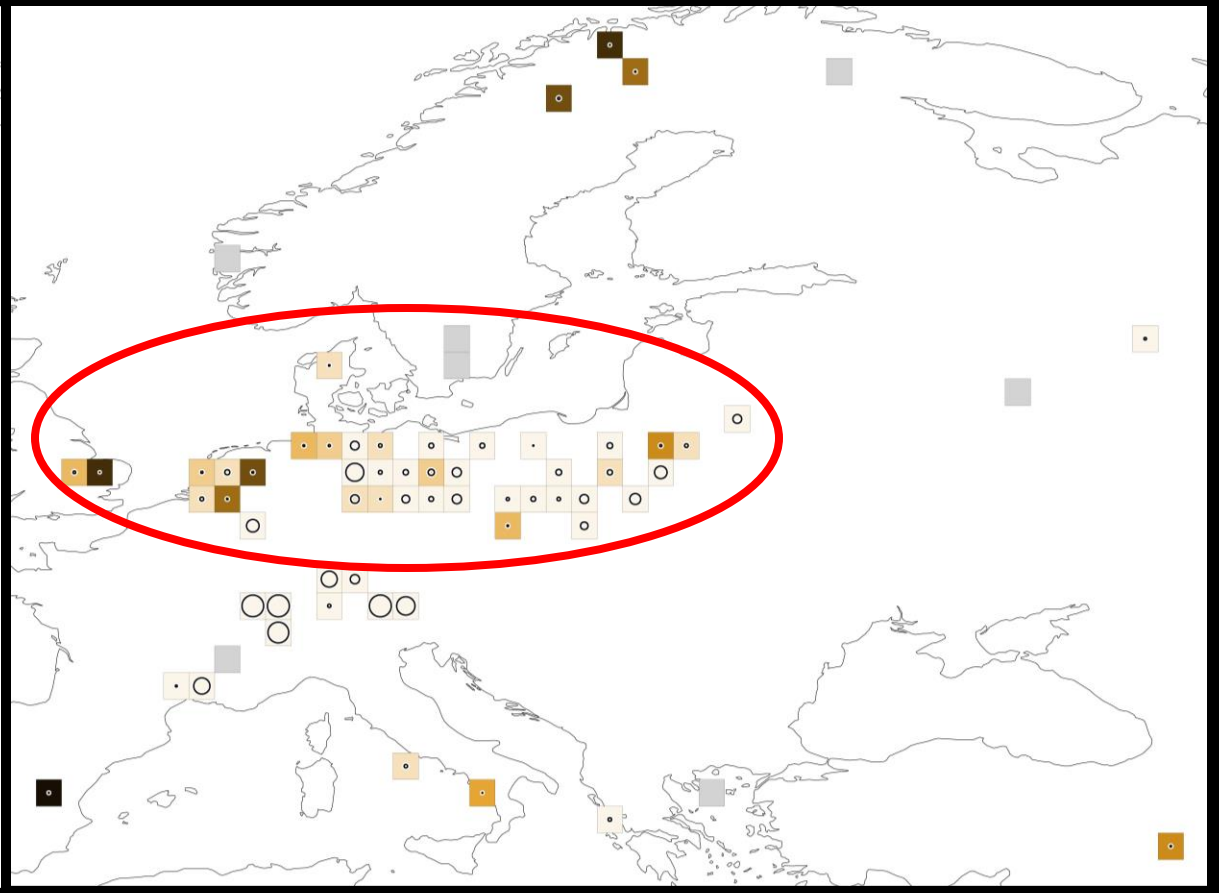


Adapted from Felde *et al.*, 2020

Early-temperate



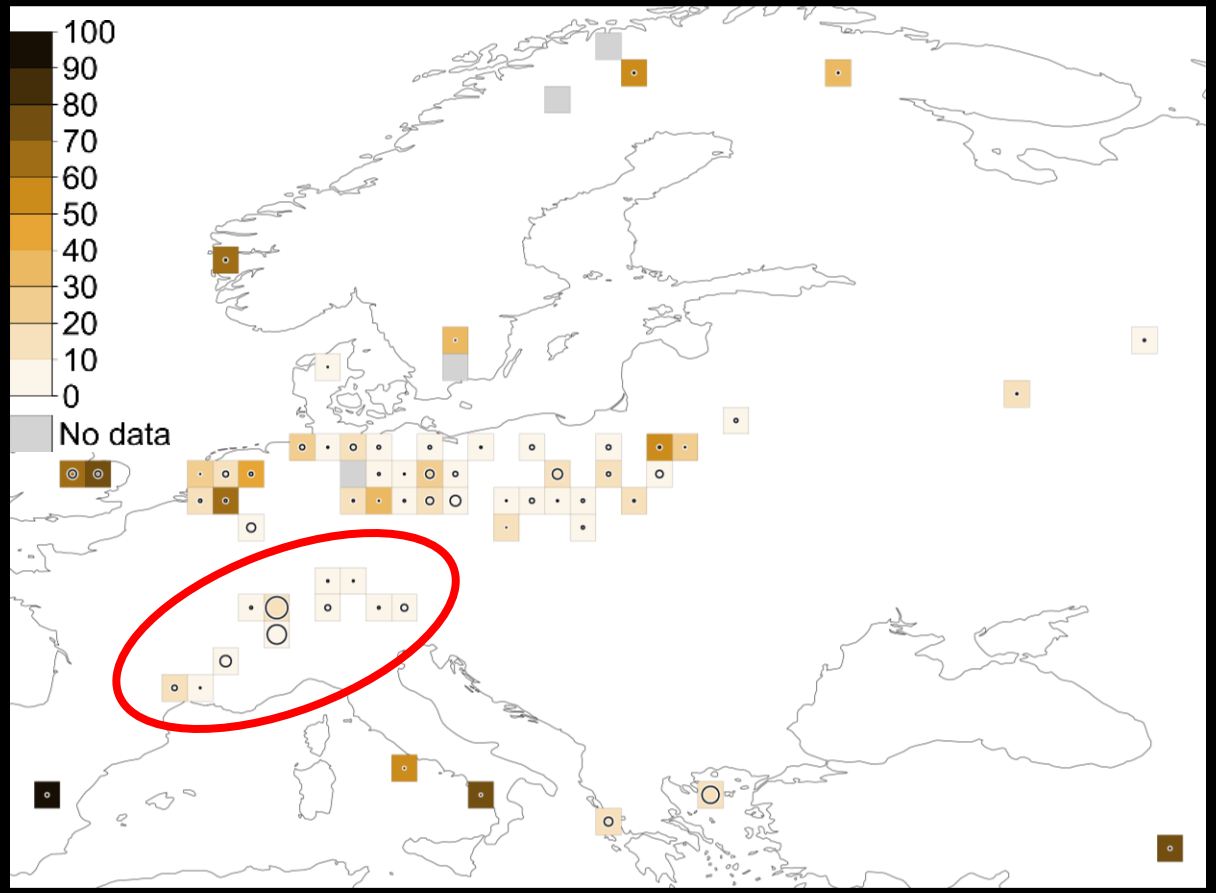
Late-temperate



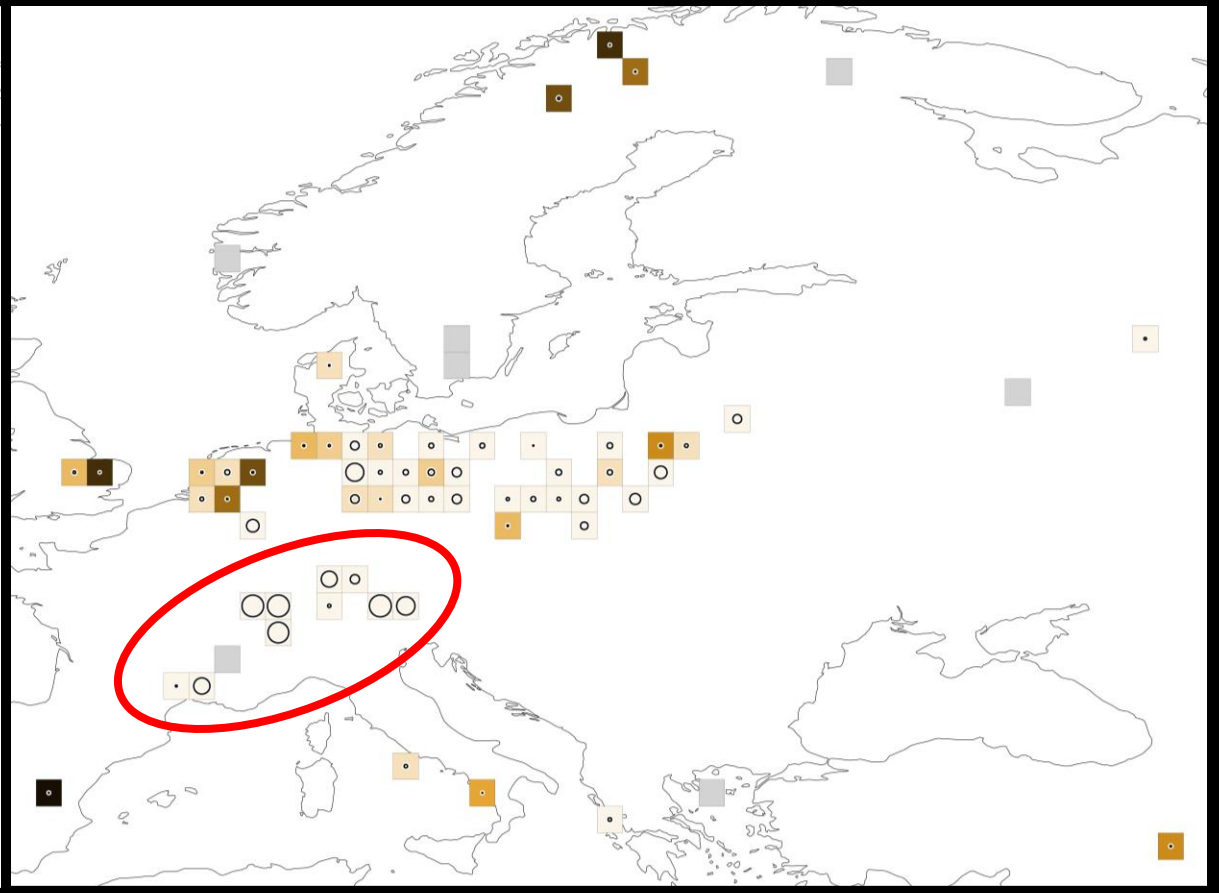
Open vegetation

Pearce *et al*. 2023, Sci. Adv.

Early-temperate



Late-temperate

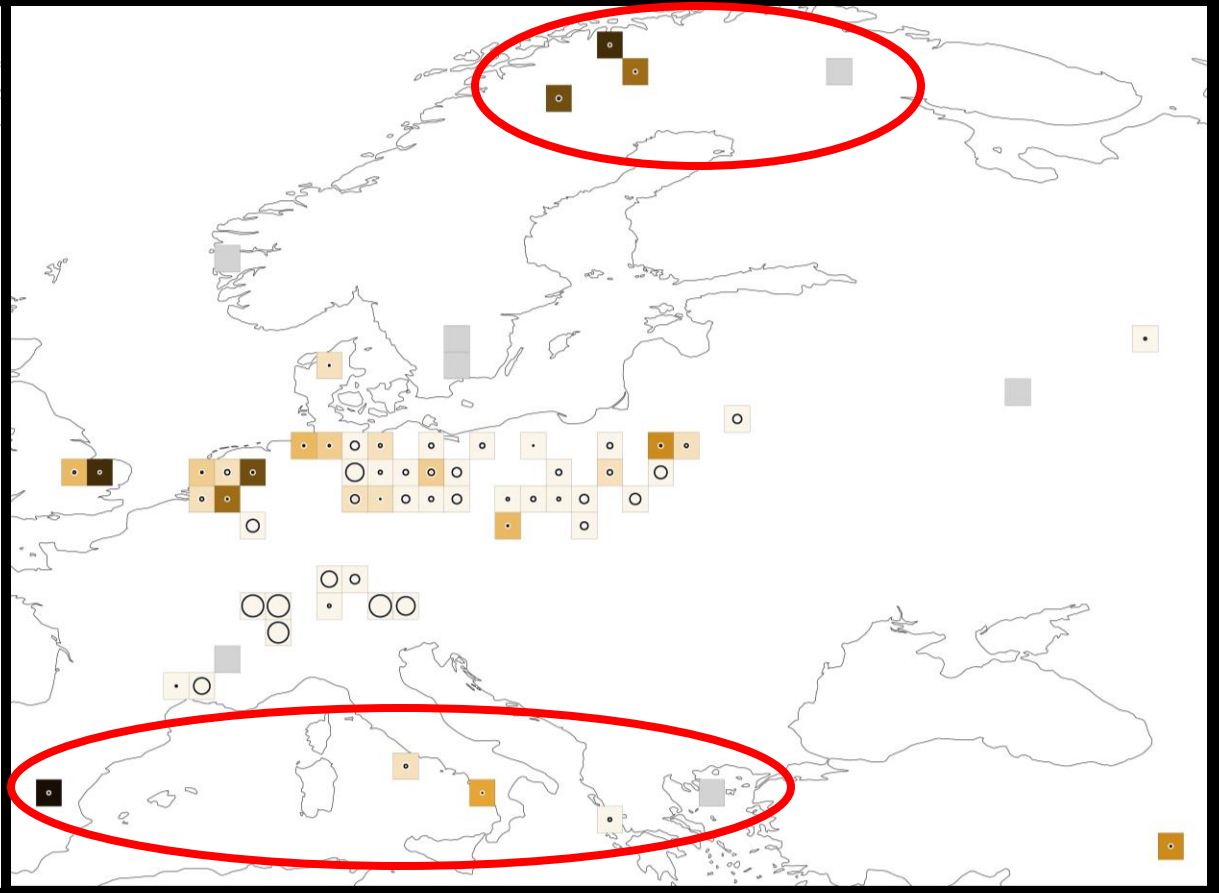


Open vegetation

Pearce *et al*. 2023, Sci. Adv.

Early-temperate

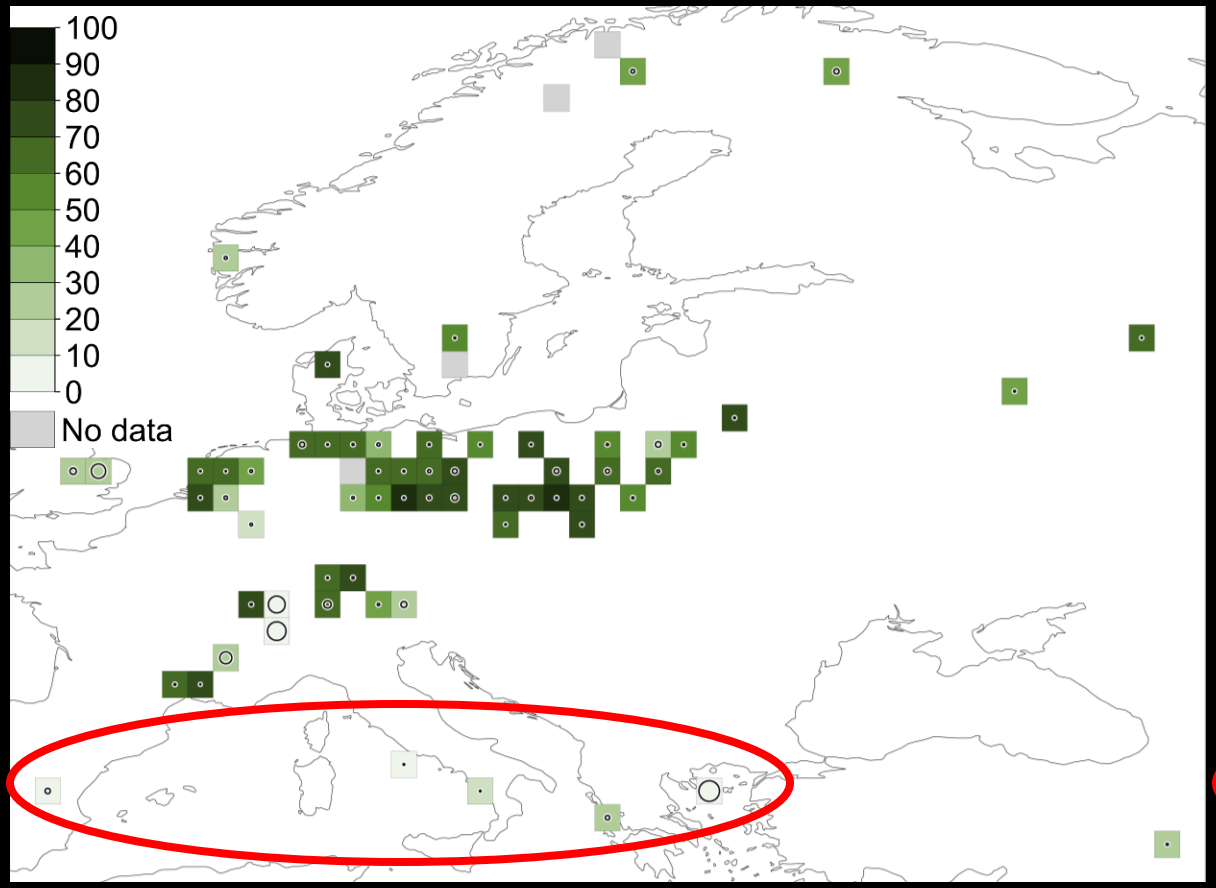
Late-temperate



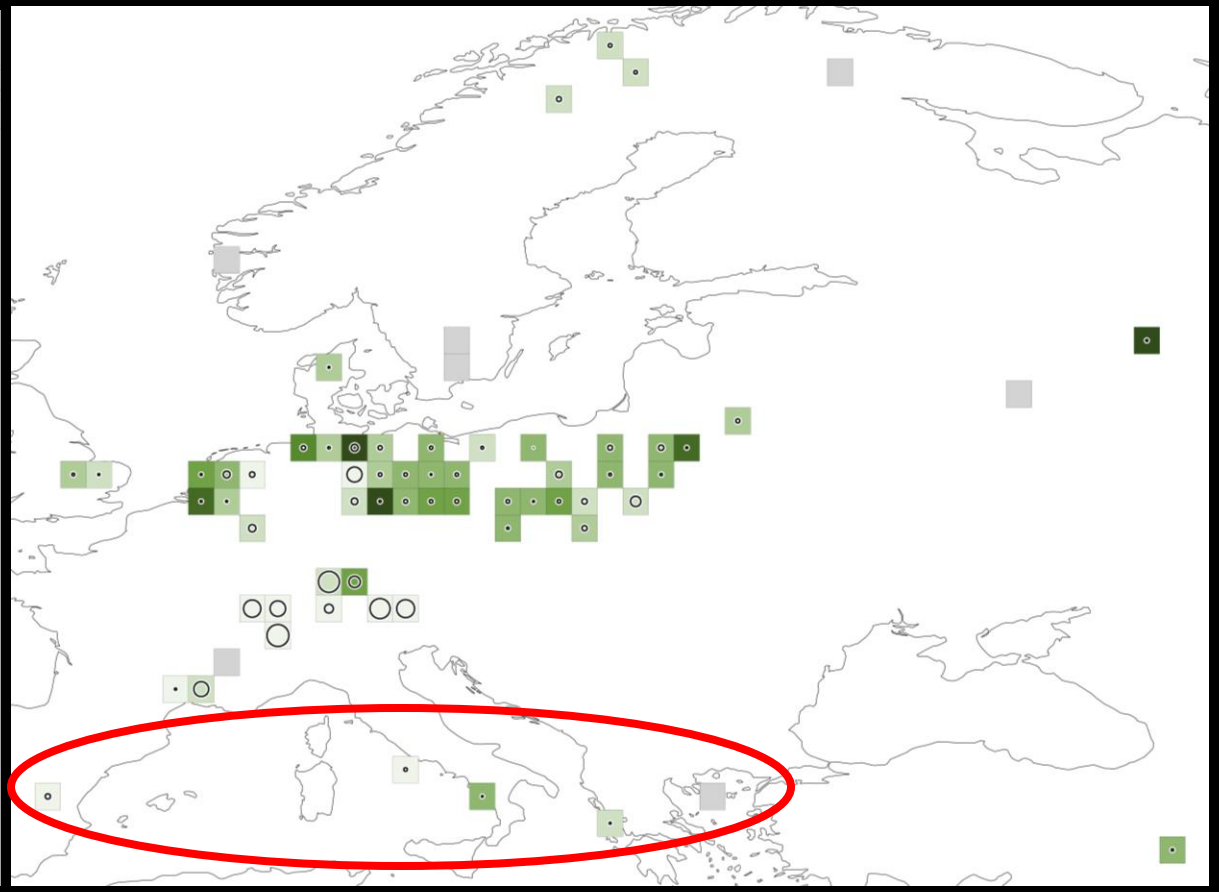
Open vegetation

Pearce *et al*. 2023, Sci. Adv.

Early-temperate



Late-temperate



Light woodland

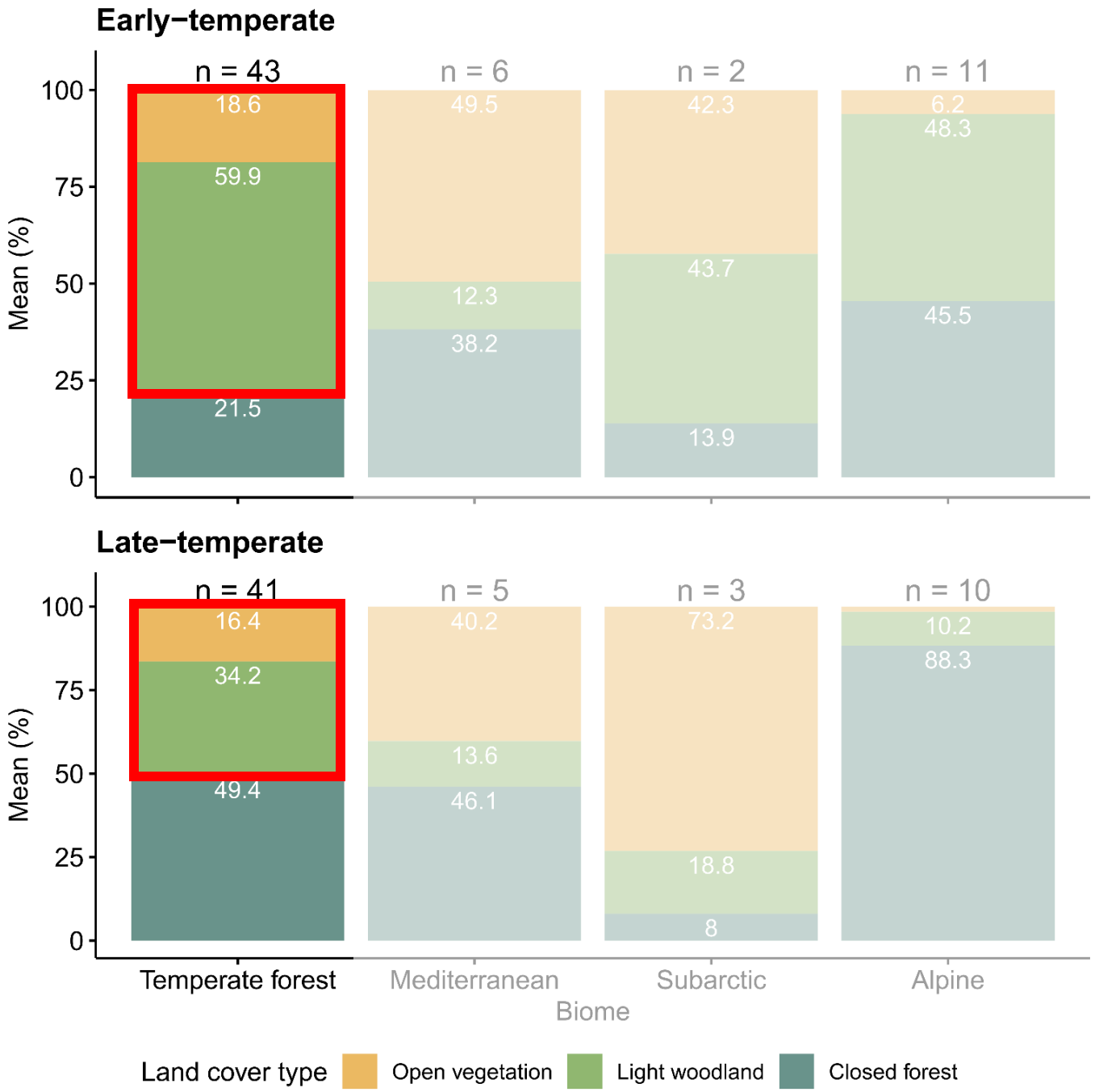
Pearce *et al*. 2023, Sci. Adv.

Early-temperate

Late-temperate

Closed forest

Pearce *et al*. 2023, Sci. Adv.

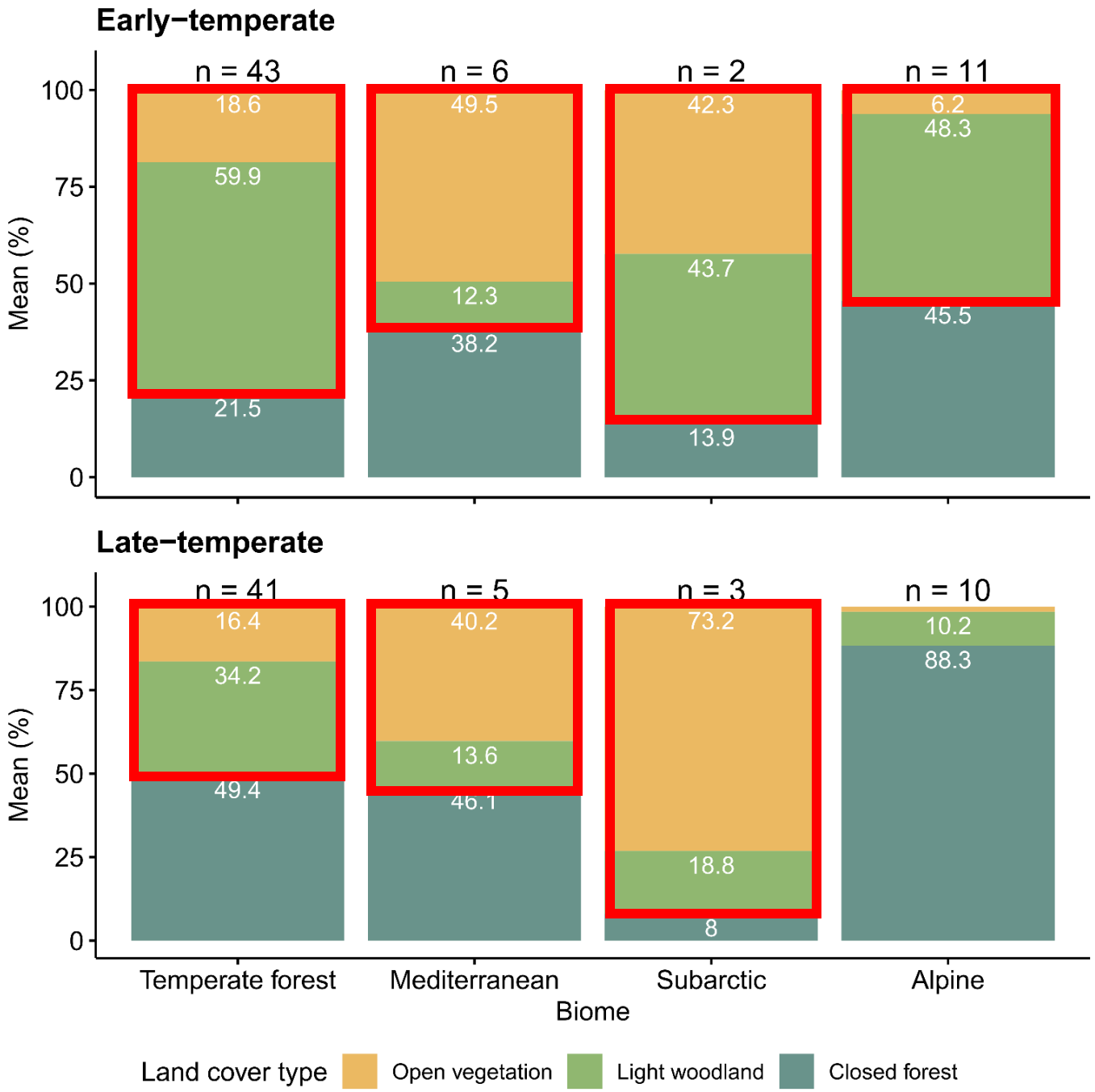


Over

50%

open vegetation & light woodland

Pearce *et al*. 2023, Sci. Adv.



Over

50%

open vegetation & light woodland

Pearce *et al*. 2023, Sci. Adv.

Early-temperate

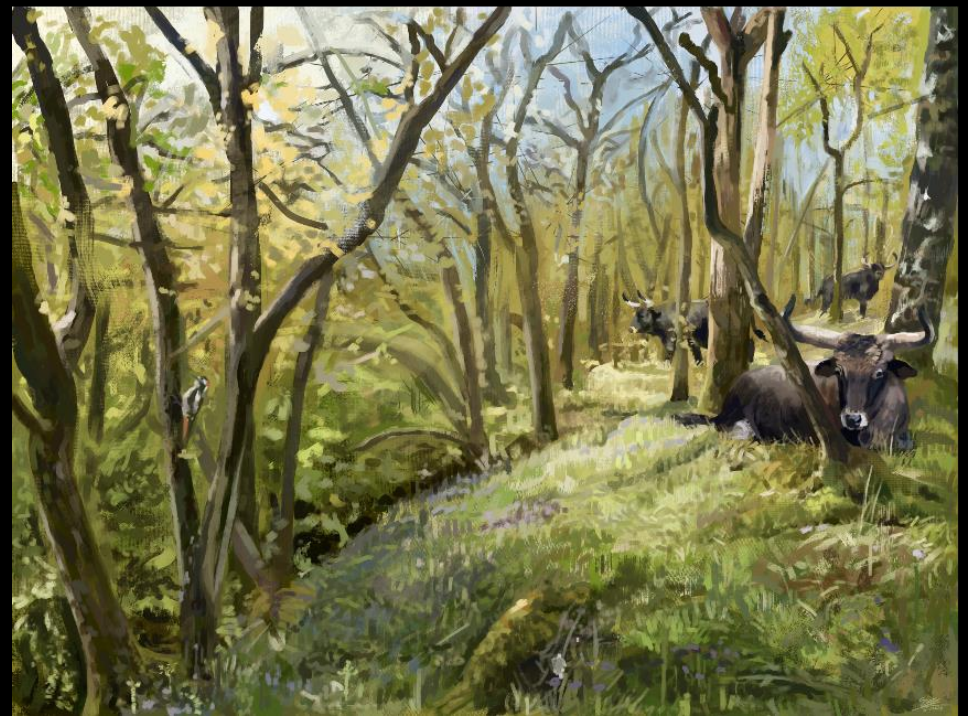
Corylus
Quercus

Hassel
Eg

Late-temperate

Carpinus
Corylus

Avnbøg
Hassel



Pearce *et al*. 2023, Sci. Adv.

Early-temperate

Poaceae
Cyperaceae

Græsser
Siv

Late-temperate

Poaceae
Cyperaceae

Græsser
Siv

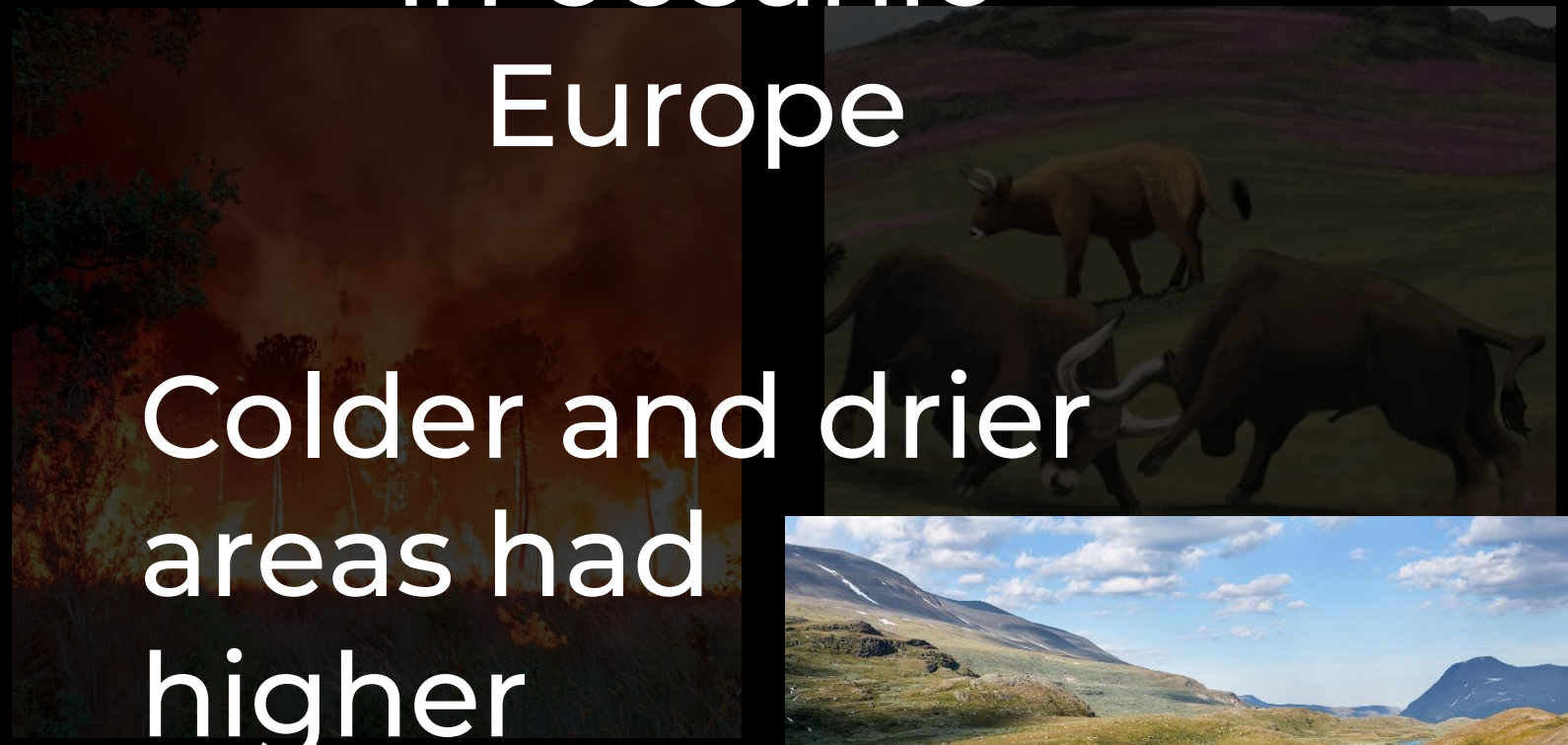
Pearce *et al*. 2023, Sci. Adv.

How open were European landscapes before modern humans?

What dynamics shaped these landscapes?

Pearce *et al*. 2023, Sci. Adv.

More openness in oceanic Europe



Colder and drier areas had higher vegetation openness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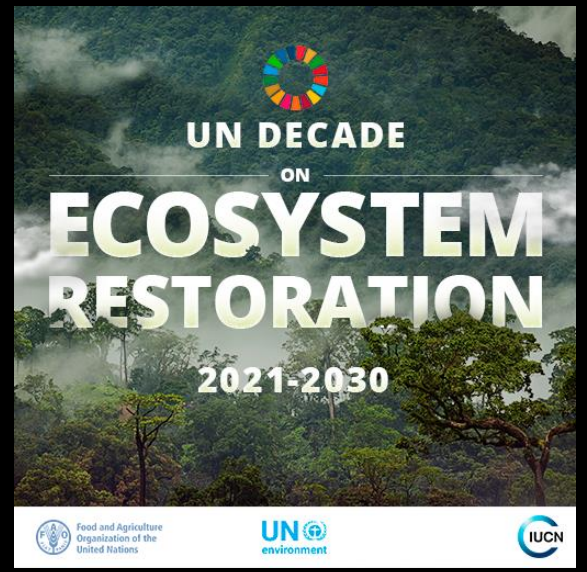
Conclusions

- Open vegetation and light woodland were substantial
- Driven by disturbance regimes beyond climate

- Baseline choice matters
- Support for rewilding



In practice?

- Rethink land-use
- Reintroduce keystone species
- Restore lost processes

Thank you!

Jens-Christian Svenning

Signe Normand

Florence Mazier

TERRANOVA

Forests before *Homo sapiens*

Historical baselines of European vegetation

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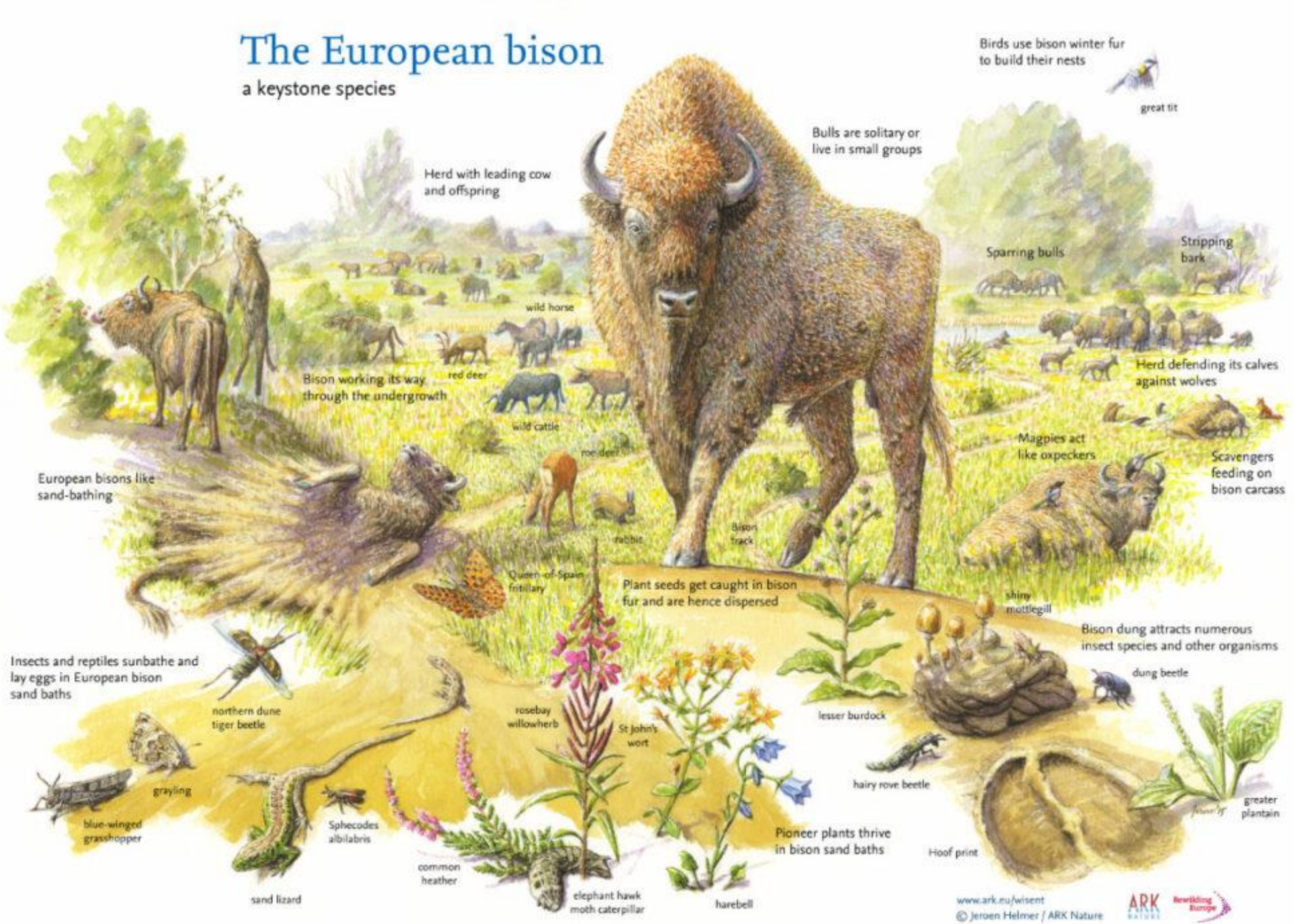
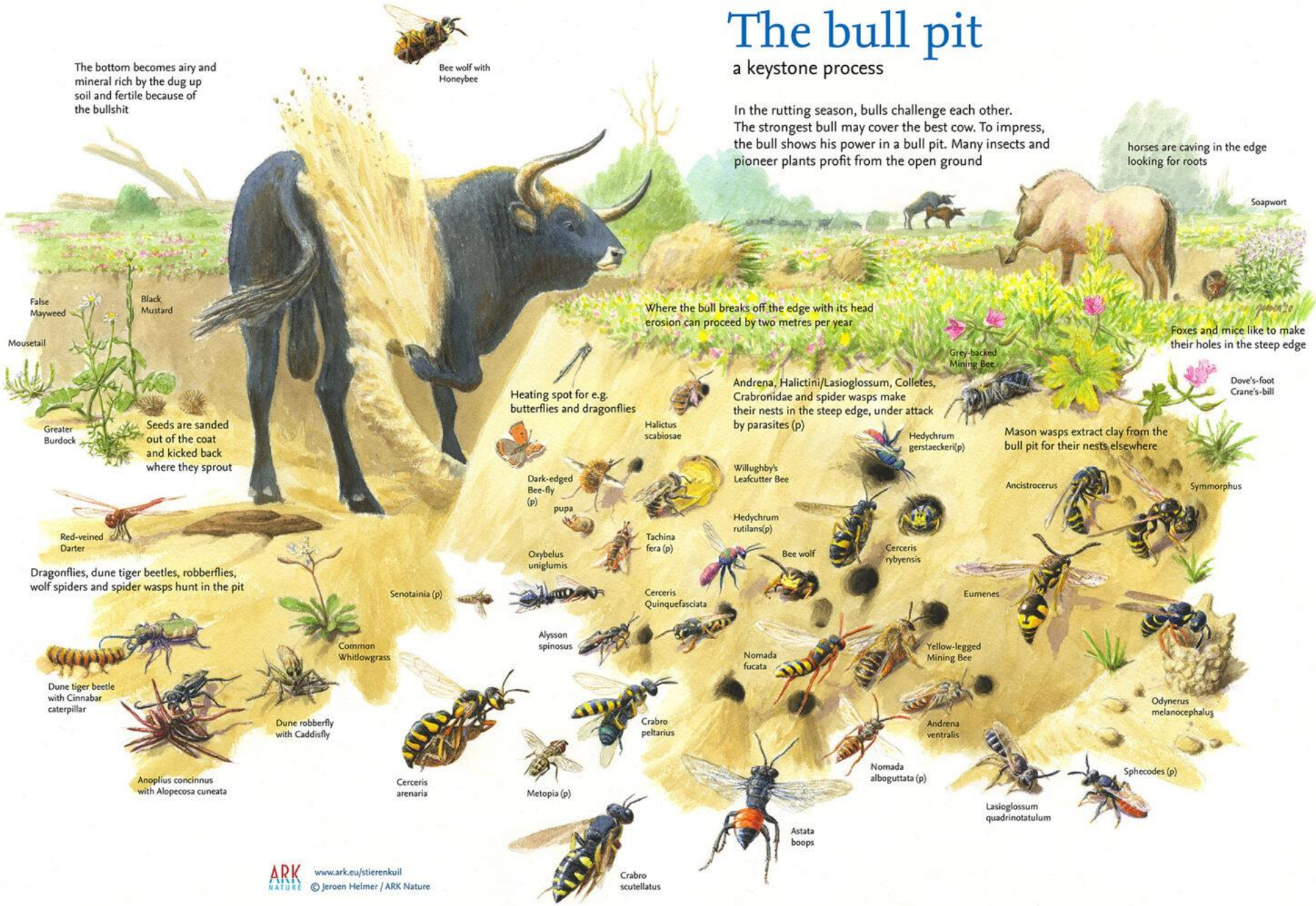
MARIE CURIE ACTIONS

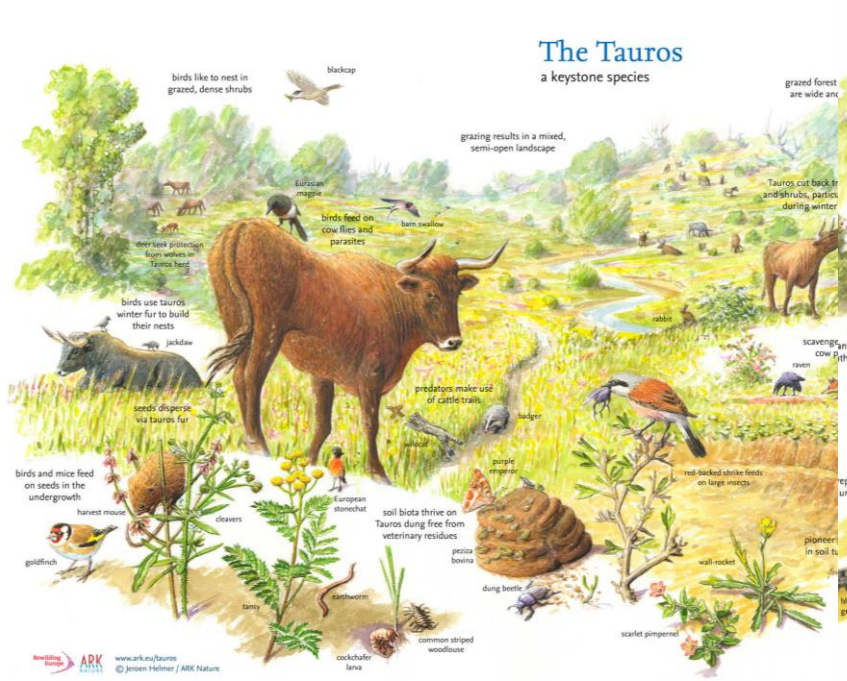


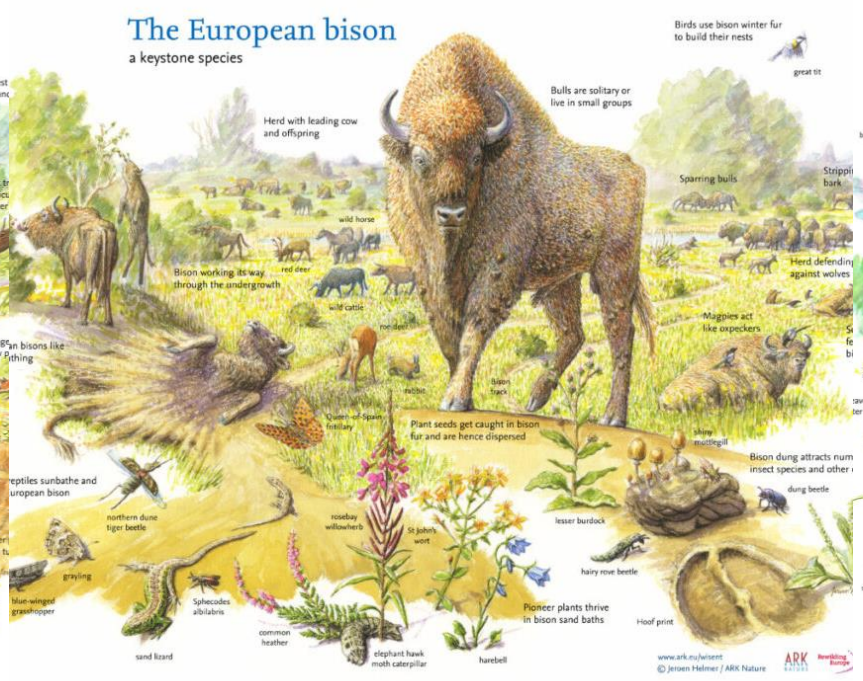
Jeroen Helmer / Ark Nature

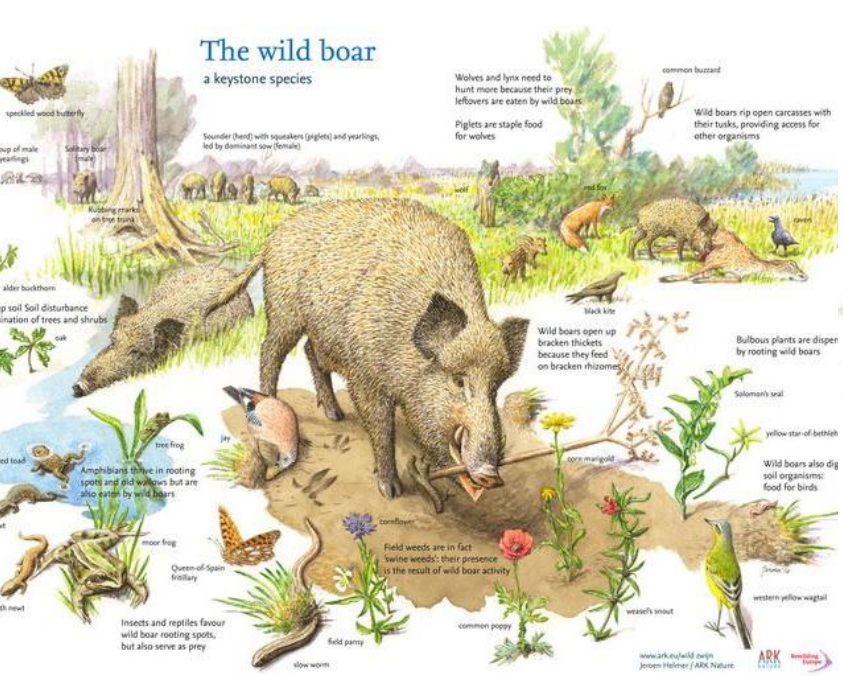

Bee wolf with
Honeybee
Heating spot for e.g.
butterflies and dragonflies
Dark-edged
Bee-fly
(p)
pupa

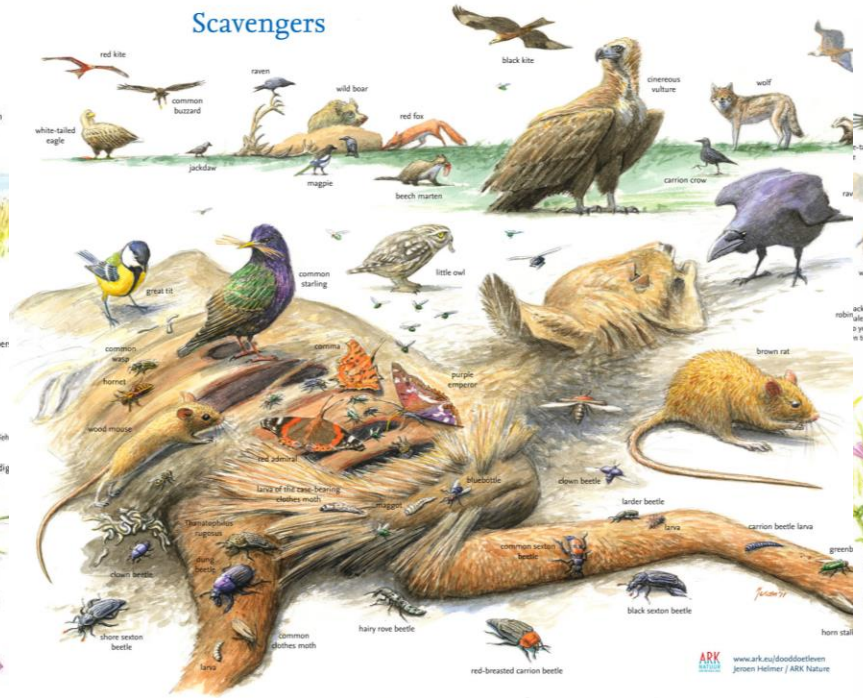


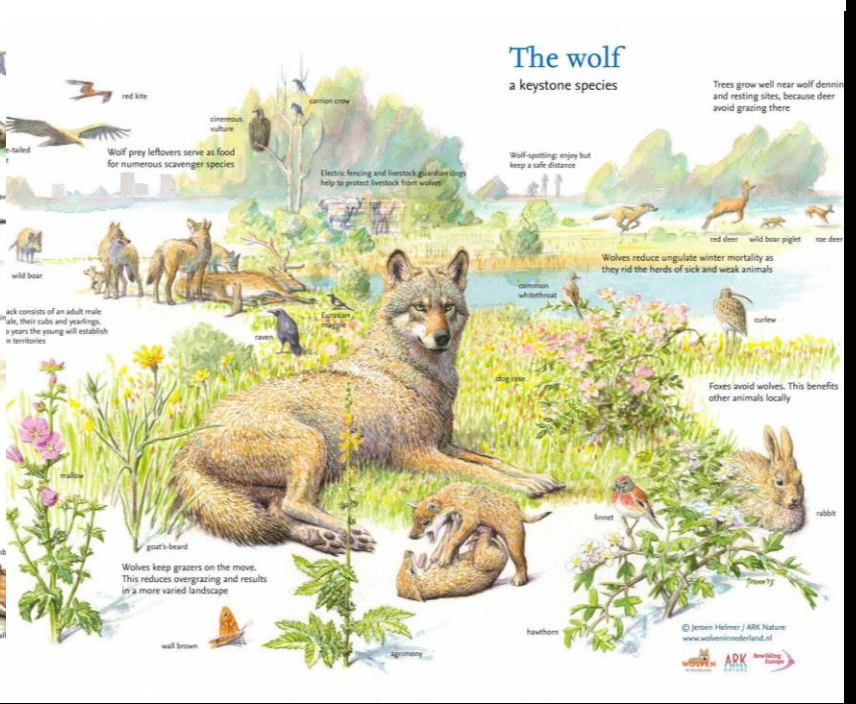
Jeroen Helmer / Ark Nature





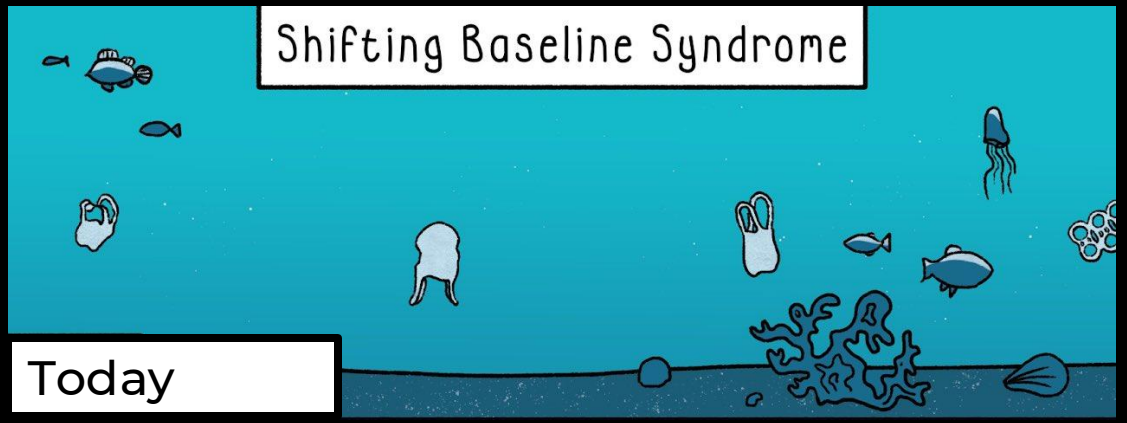


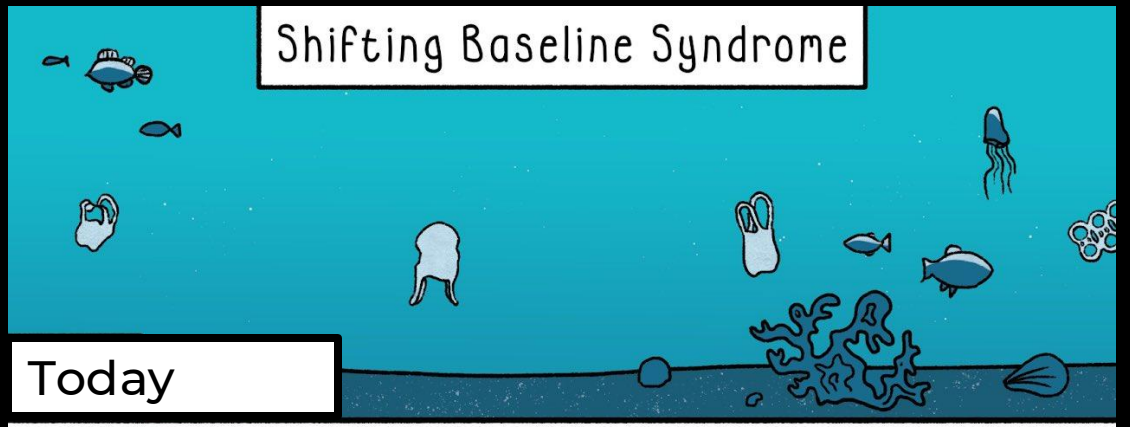




Jeroen Helmer / Ark Nature


Knepp Estate, UK


Shifting Baseline Syndrome
Today


Shifting Baseline Syndrome
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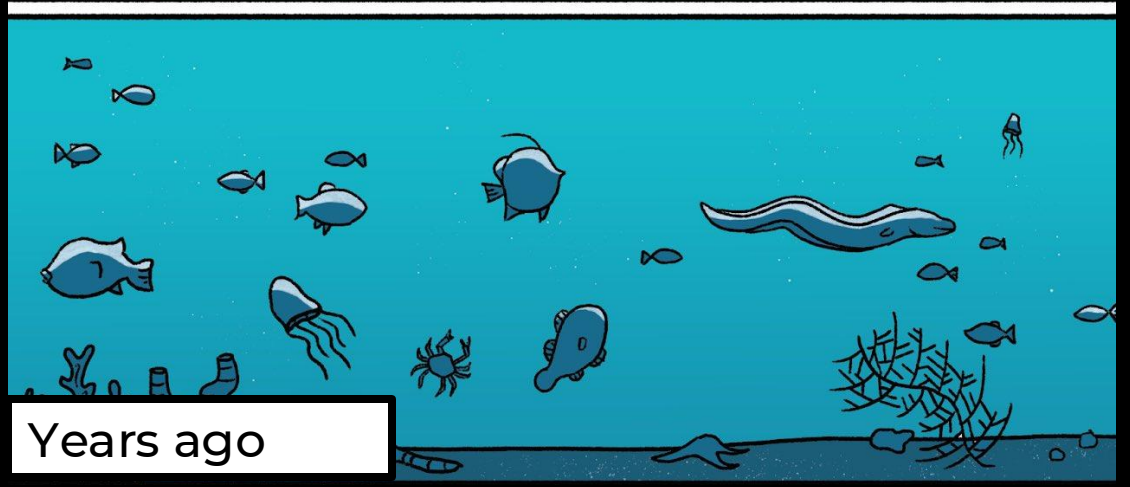
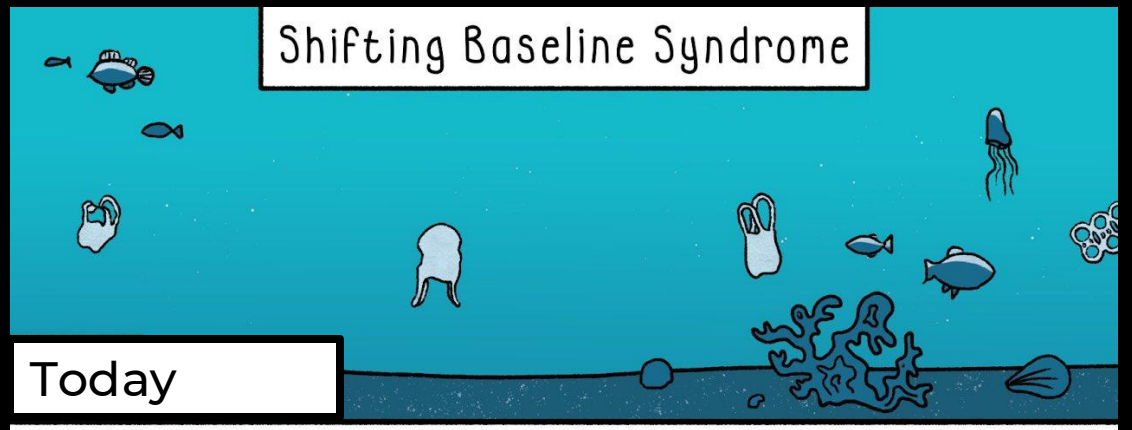
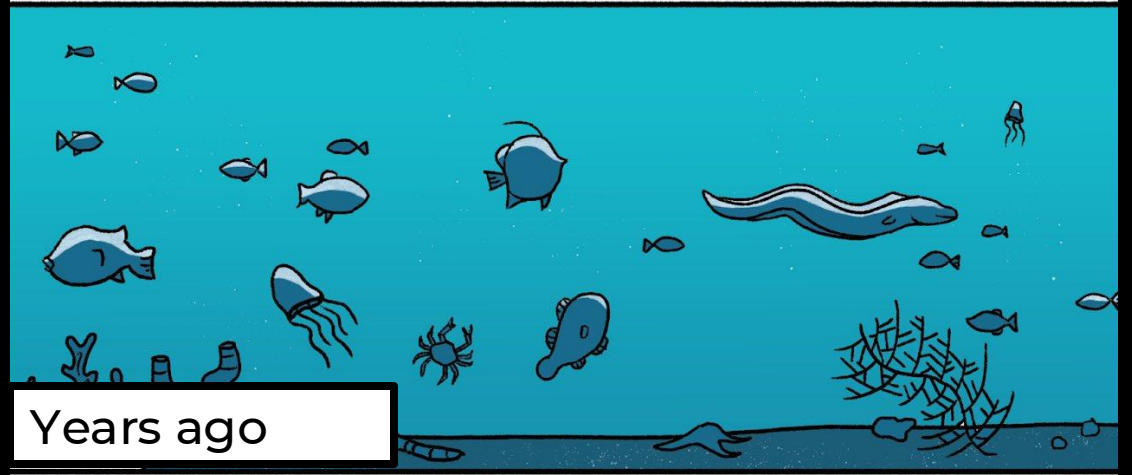
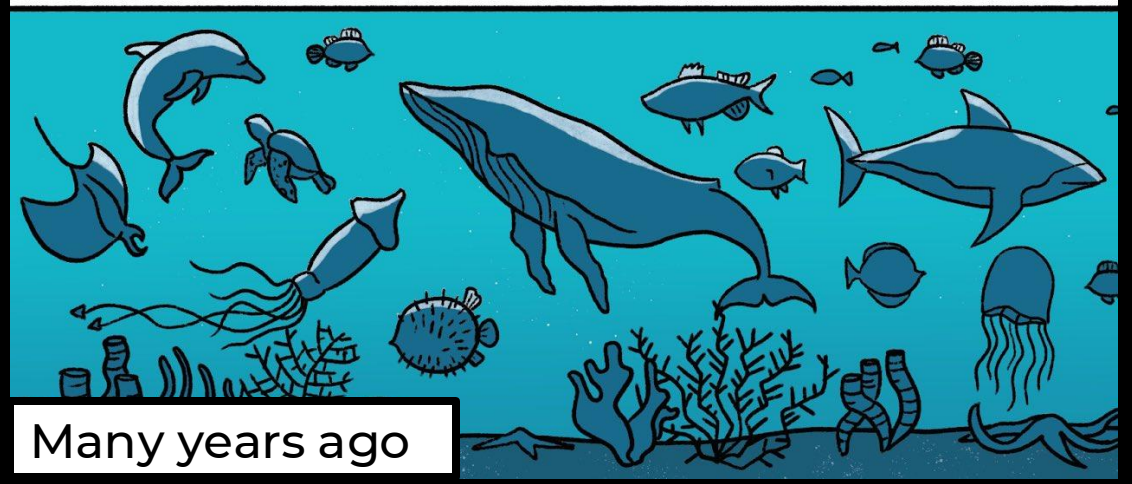
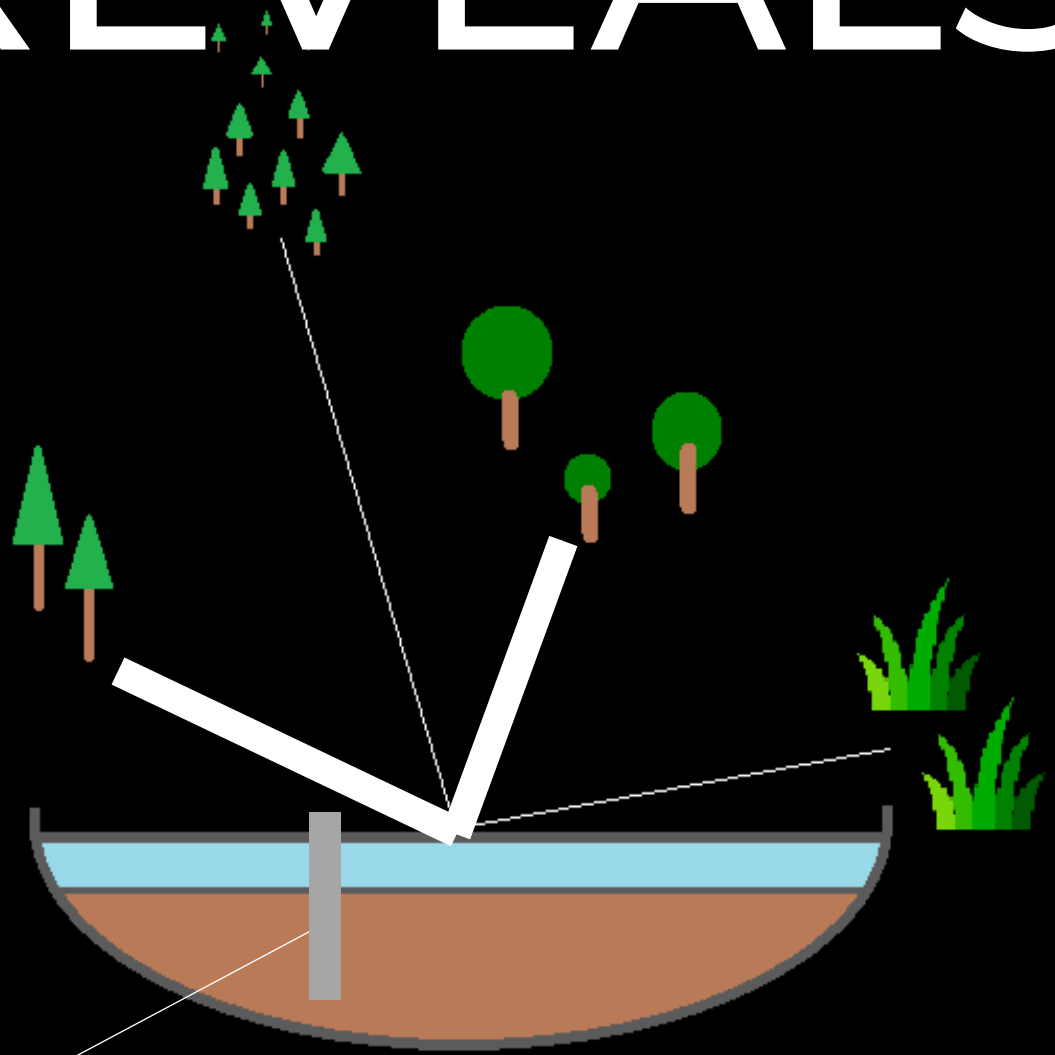

Years ago

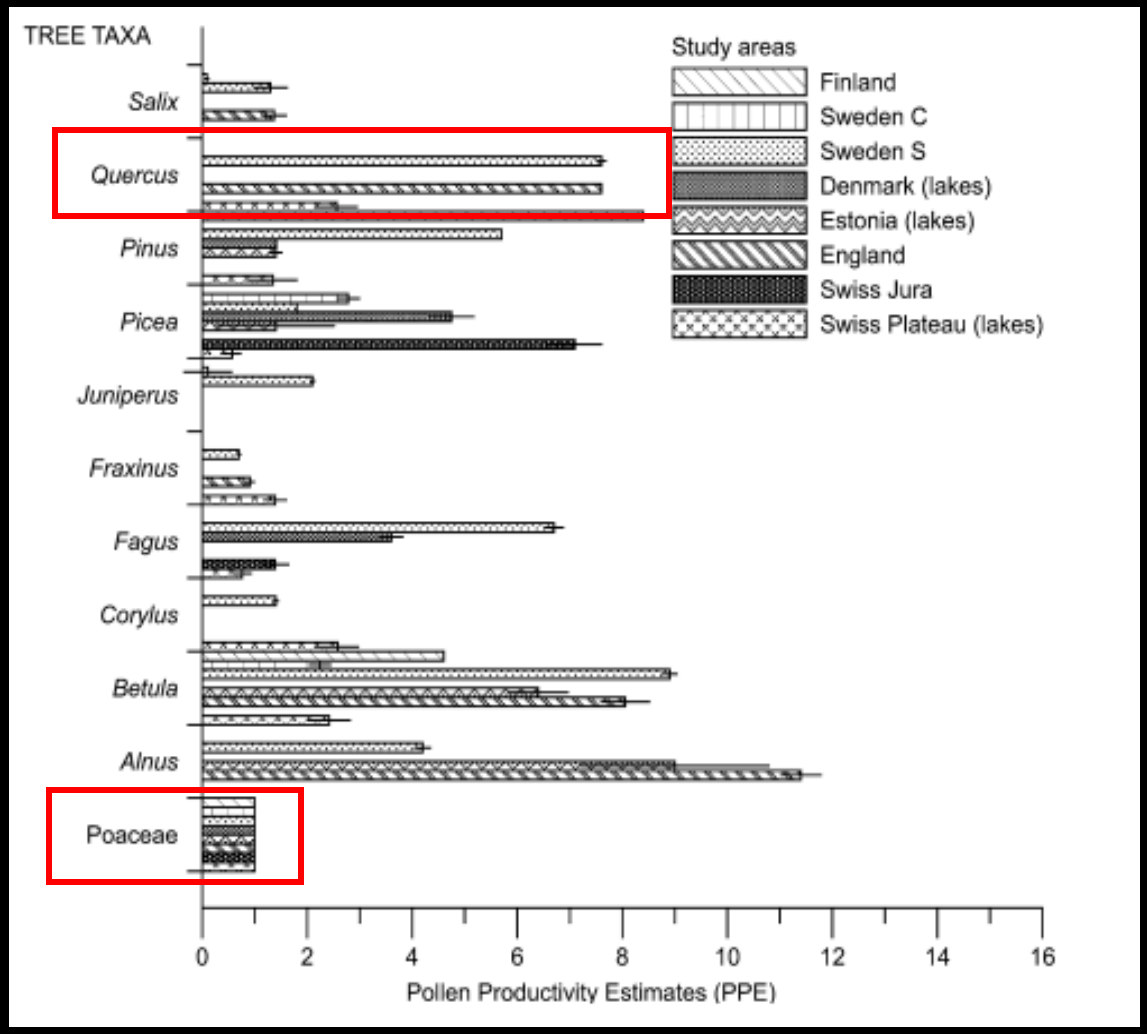

Shifting Baseline Syndrome
Today


Years ago


Many years ago

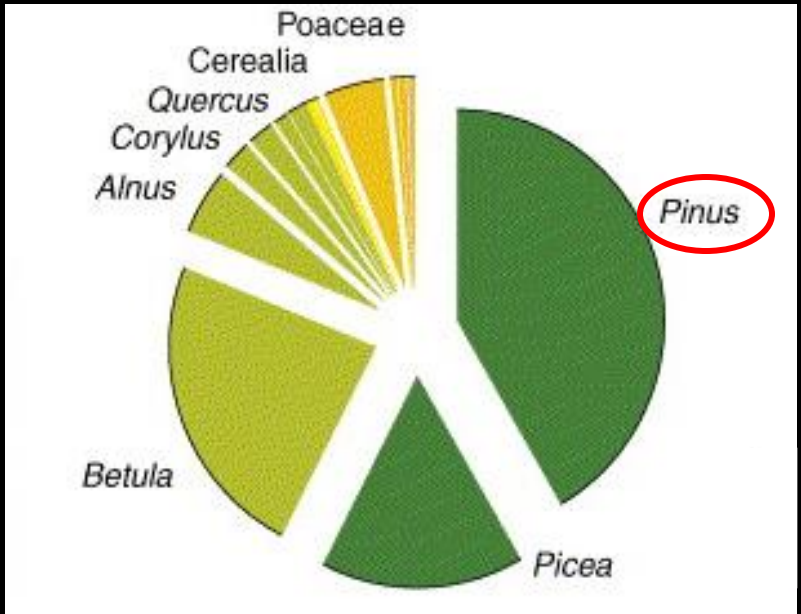
REVEALS (Sugita, 2007)





Broström *et al.* 2008

REVEALS Sugita (2007)



Original Pollen Percentages

Anderson et al., 2006

REVEALS (Sugita, 2007)

Regional Estimates of VEgetation Abundance from Large Sites