

# Forests before *Homo sapiens*

## Historical baselines of European vegetation

Elena A. Pearce



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IN A NOVEL BIOSPHERE

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## A review of natural vegetation openness in north-western Europe

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## Perspective

## Biodiversity-rich European grasslands: Ancient, forgotten ecosystems

Angelica Feurdean<sup>a,\*,</sup> Eszter Ruprecht<sup>b,c,</sup> Zsolt Molnár<sup>c,</sup> Simon M. Hutchinson<sup>d,</sup> Thomas Hickler<sup>a,c</sup><sup>a</sup>Senckenberg Biodiversity and Climate Research Centre (BKC-F), Frankfurt am Main, Germany<sup>b</sup>Hungarian Department of Biology and Ecology, Babeş-Bolyai University, Republic 42, Cluj-Napoca RO-400015, Romania<sup>c</sup>MTA Centre for Ecological Research, Institute of Ecology and Botany, Vácrátó H-2163, Hungary<sup>d</sup>School of Environment and Life Science, University of Suffolk, Suffolk, Great Britain ME1 4WT, UK<sup>e</sup>Department of Physical Geography, Goethe University, Altenhöfstrasse 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<sup>a,\*,</sup> Claire Twiddle<sup>b,</sup> Shinya Sugita<sup>c,</sup> Marie-José Gaillard<sup>d,</sup> Philip Barratt<sup>e,</sup> Christopher J. Caseldine<sup>f,</sup> John Dodson<sup>g,</sup> Kevin J. Edwards<sup>b,</sup> Michelle Farrell<sup>h,</sup> Cynthia Froyd<sup>i,</sup> Michael J. Grant<sup>j,k,</sup> Elizabeth Huckerby<sup>l,</sup> James B. Innes<sup>m,</sup> Helen Shaw<sup>n,</sup> Martyn Waller<sup>k</sup>

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

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

Nicki J. Whitehouse<sup>a,\*,</sup> David Smith<sup>b</sup><sup>a</sup>Palaeoecology Centre, School of Geography, Archaeology and Palaeoecology, Queens University Belfast, Belfast BT7 1NN, Northern Ireland, UK<sup>b</sup>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

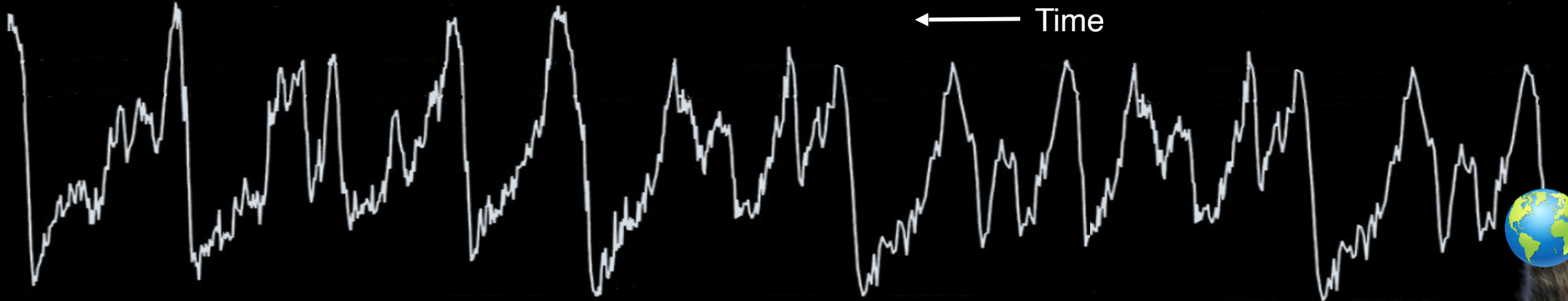


# Interglacial period

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



← Time



# 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)

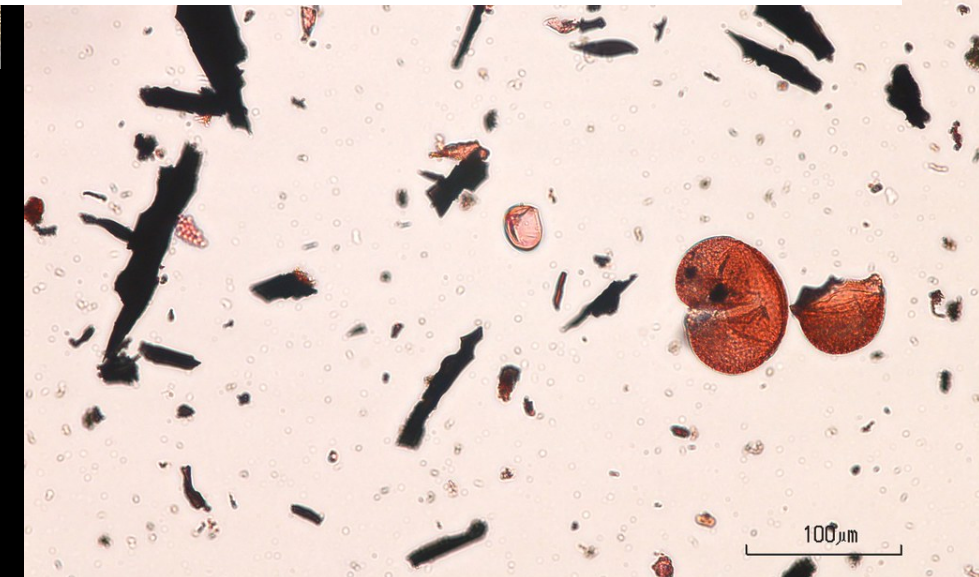
April 19, 2021 | 118 (17) e2023483118 | <https://doi.org/10.1073/pnas.2023483118>

THIS ARTICLE HAS BEEN UPDATED

 127,215 | 200



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

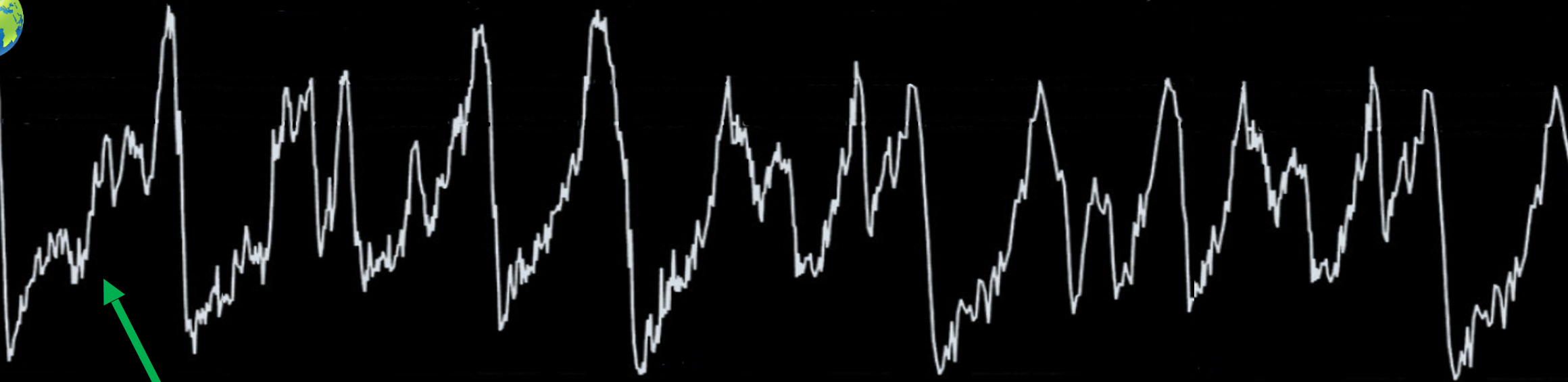




The HoloceneThe Last Interglacial



*Homo sapiens* arrive (~50,000 BP)

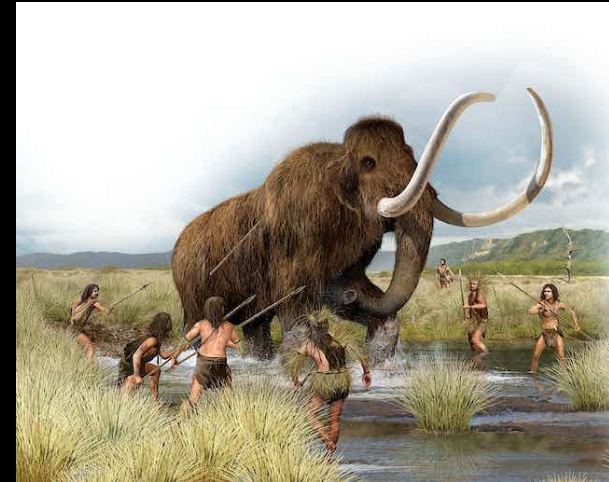




## The Last Interglacial (129,000 – 116,000 BP)



- 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





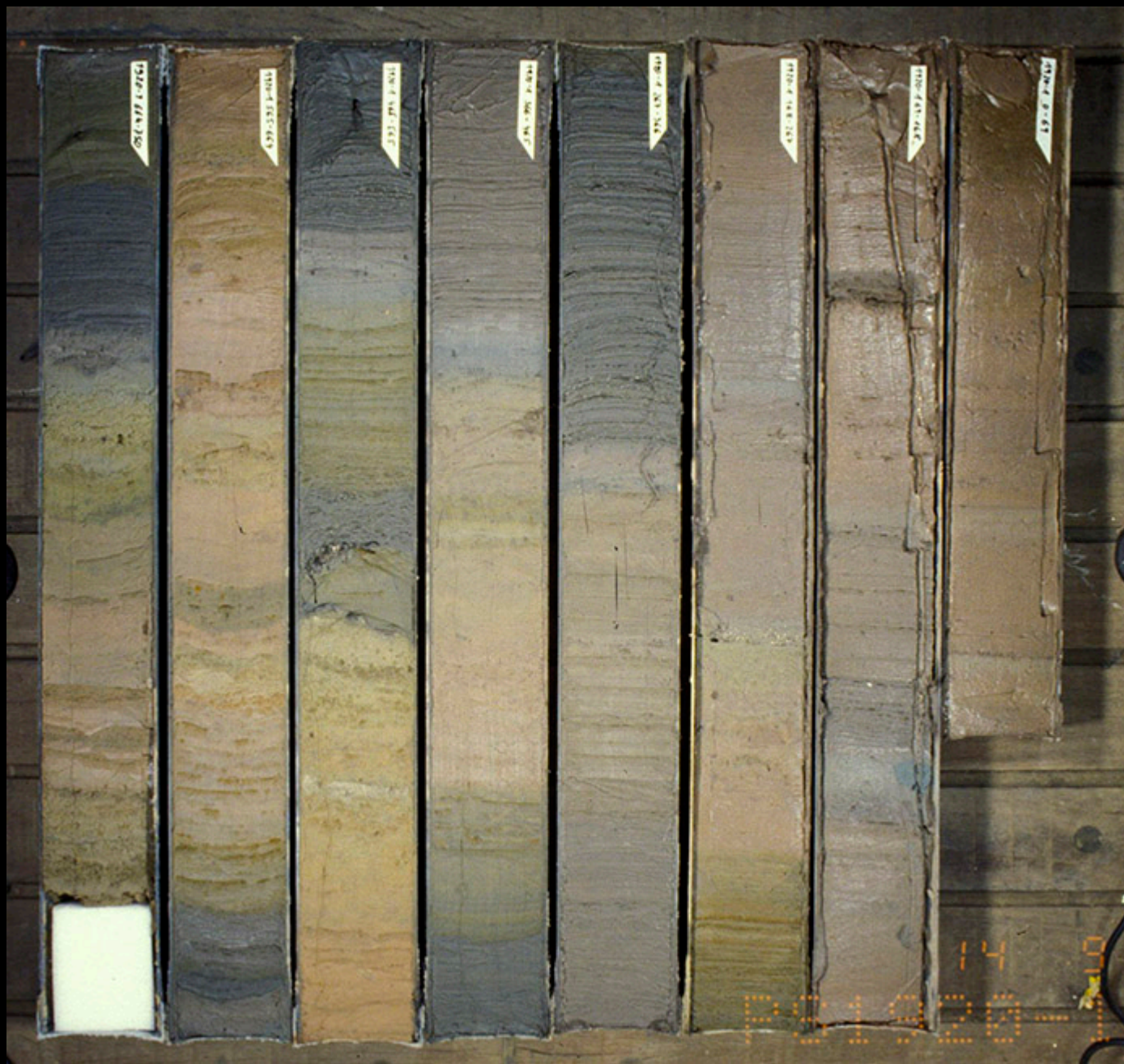
How open were European landscapes  
before modern humans?

What dynamics shaped these  
landscapes?









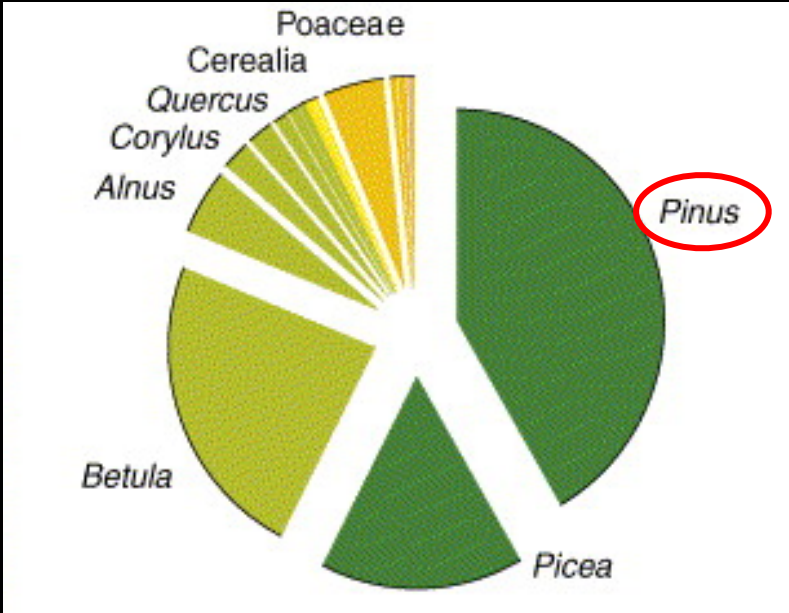






# REVEALS

Sugita (2007)



Original Pollen Percentages



# Open vegetation



Herbaceous



Heath

# Light woodland

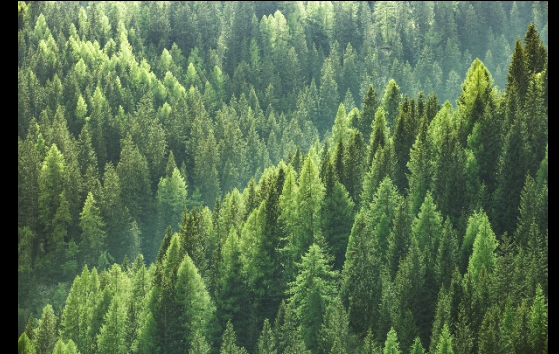


Shade intolerant trees



Intermediate trees

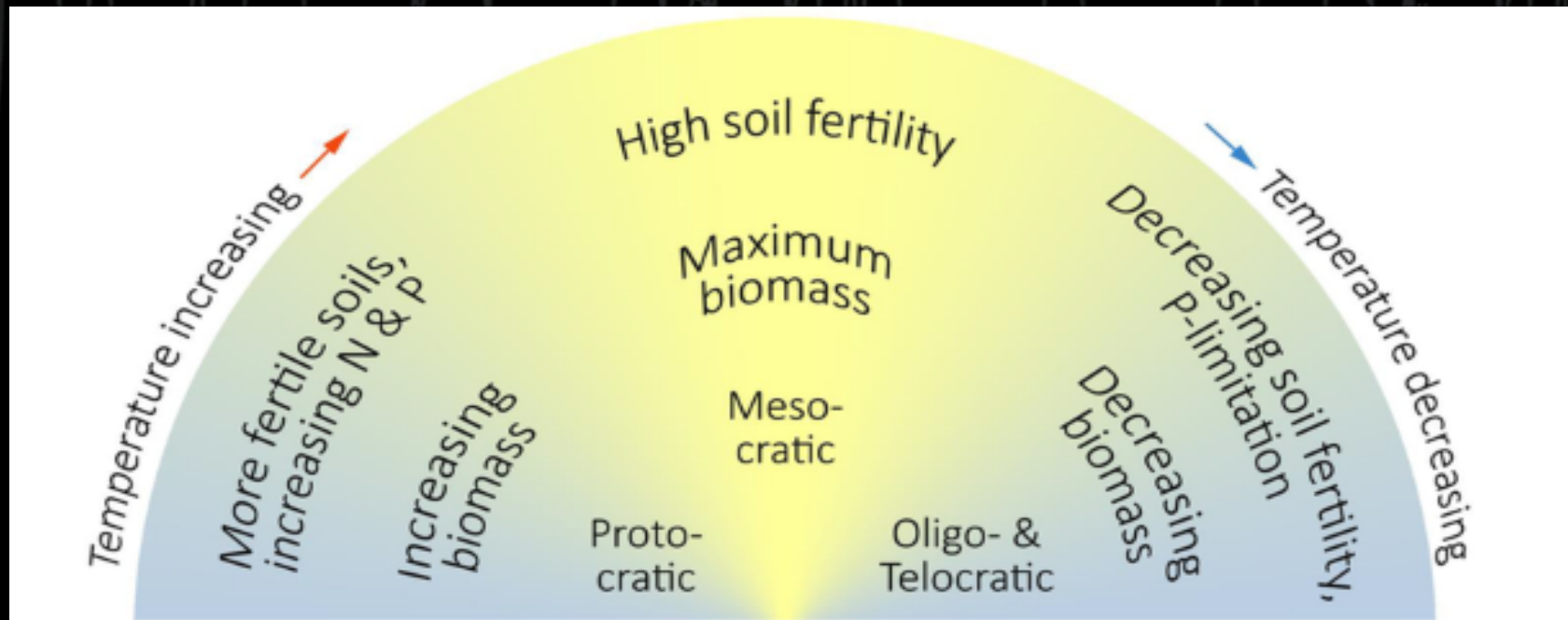
# Closed forest



Shade tolerant trees



# Openness in the “high forest” temperate period



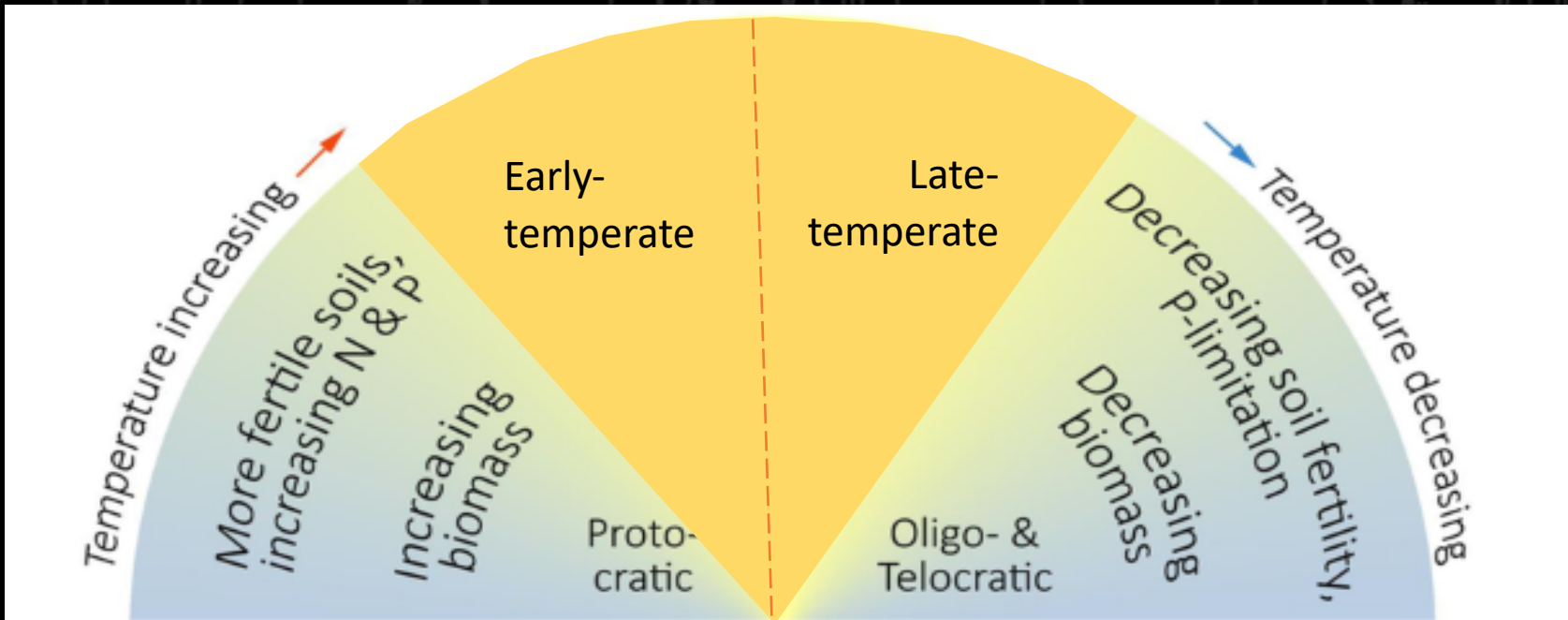
Start

End

Adapted from Felde *et al.*, 2020



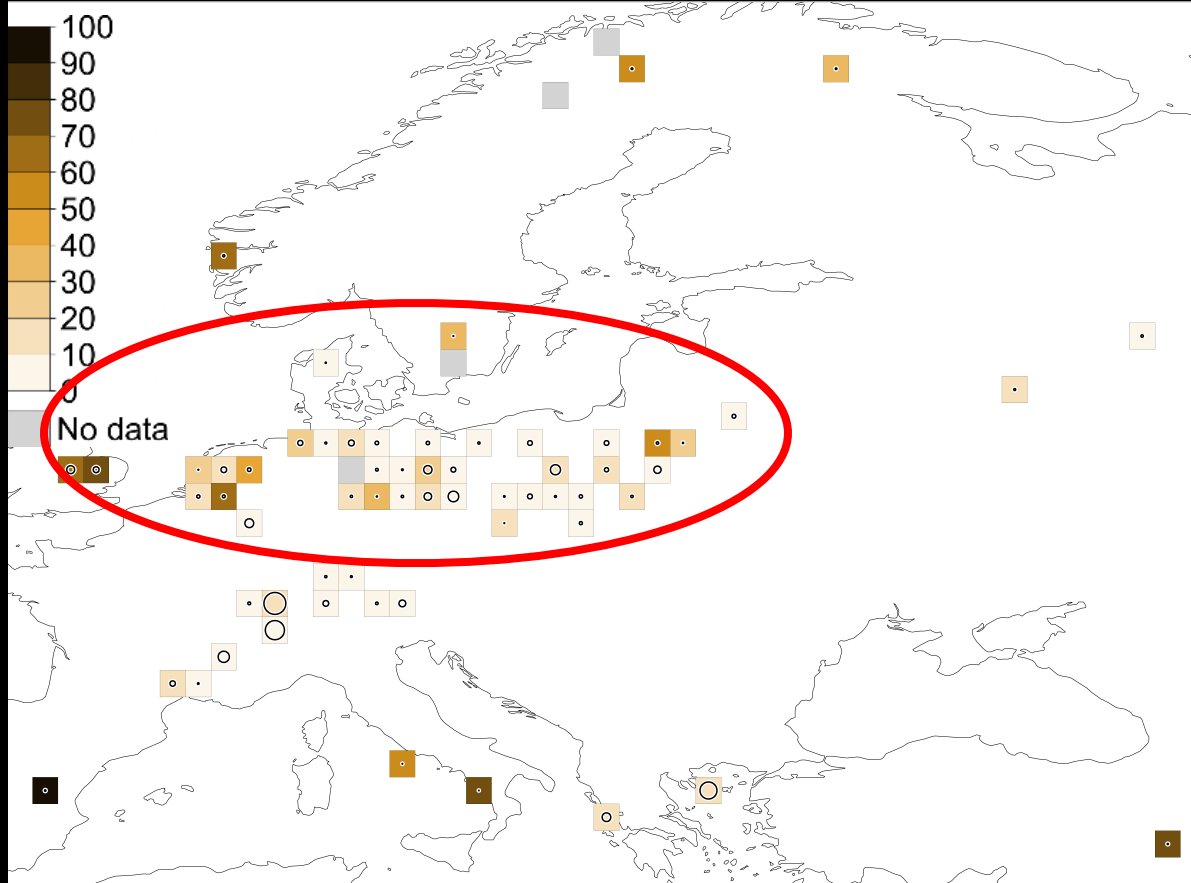
# Openness in the “high forest” temperate period



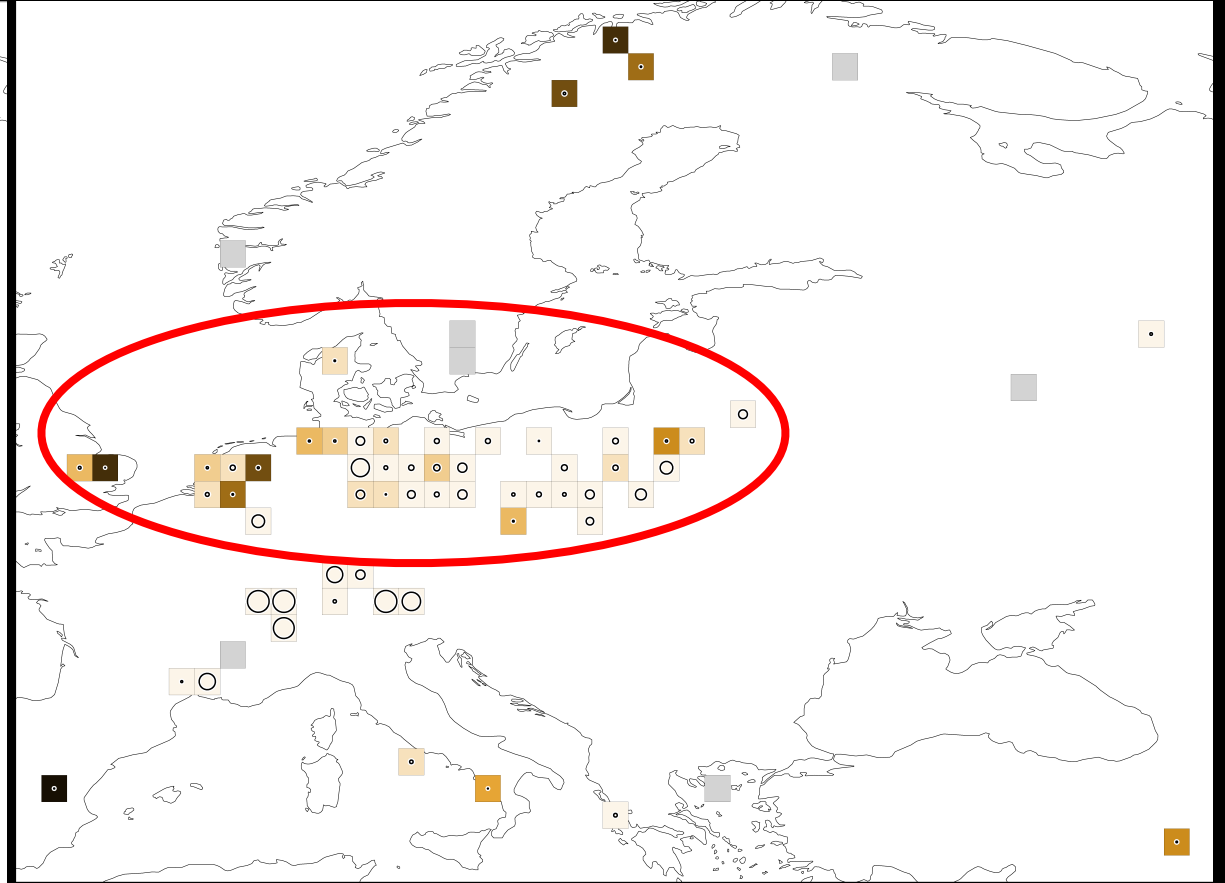
Adapted from Felde *et al.*, 2020



Early-temperate



Late-temperate



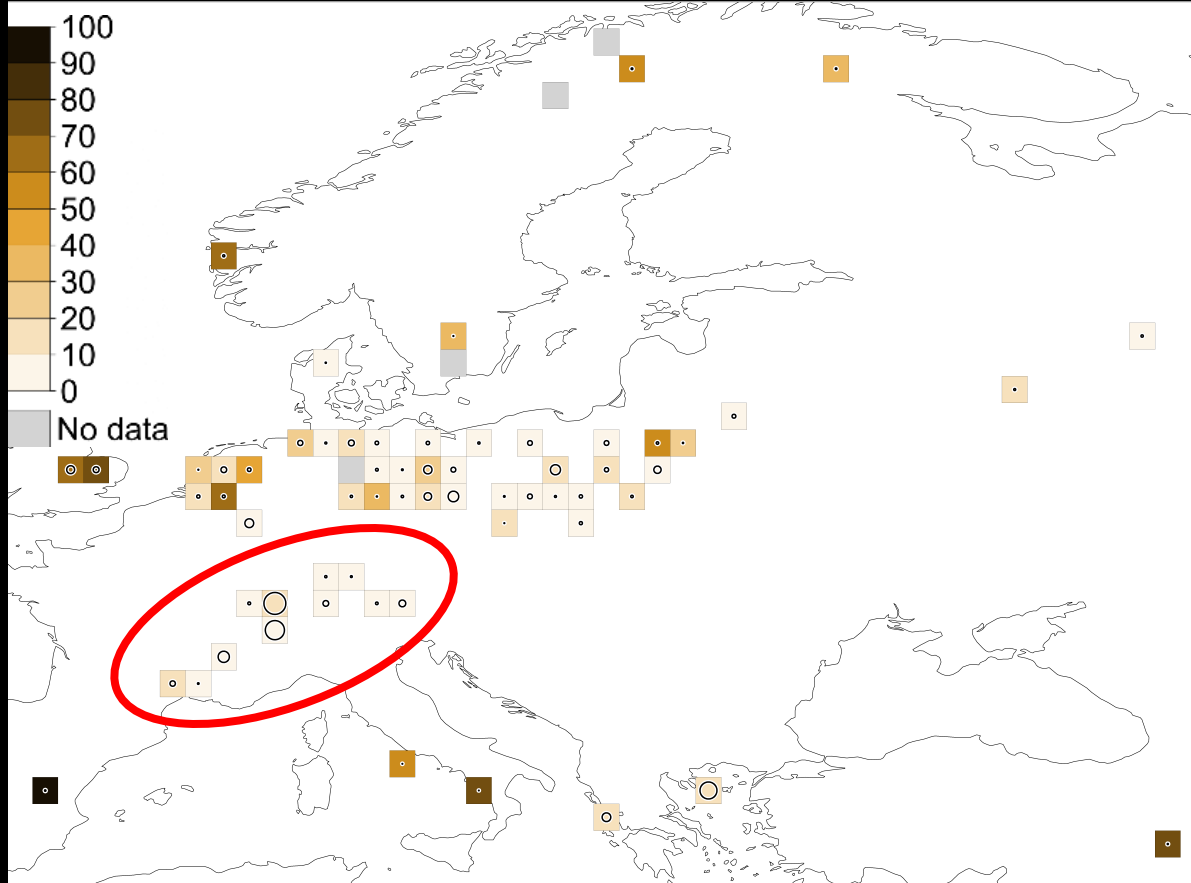
# Open vegetation

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

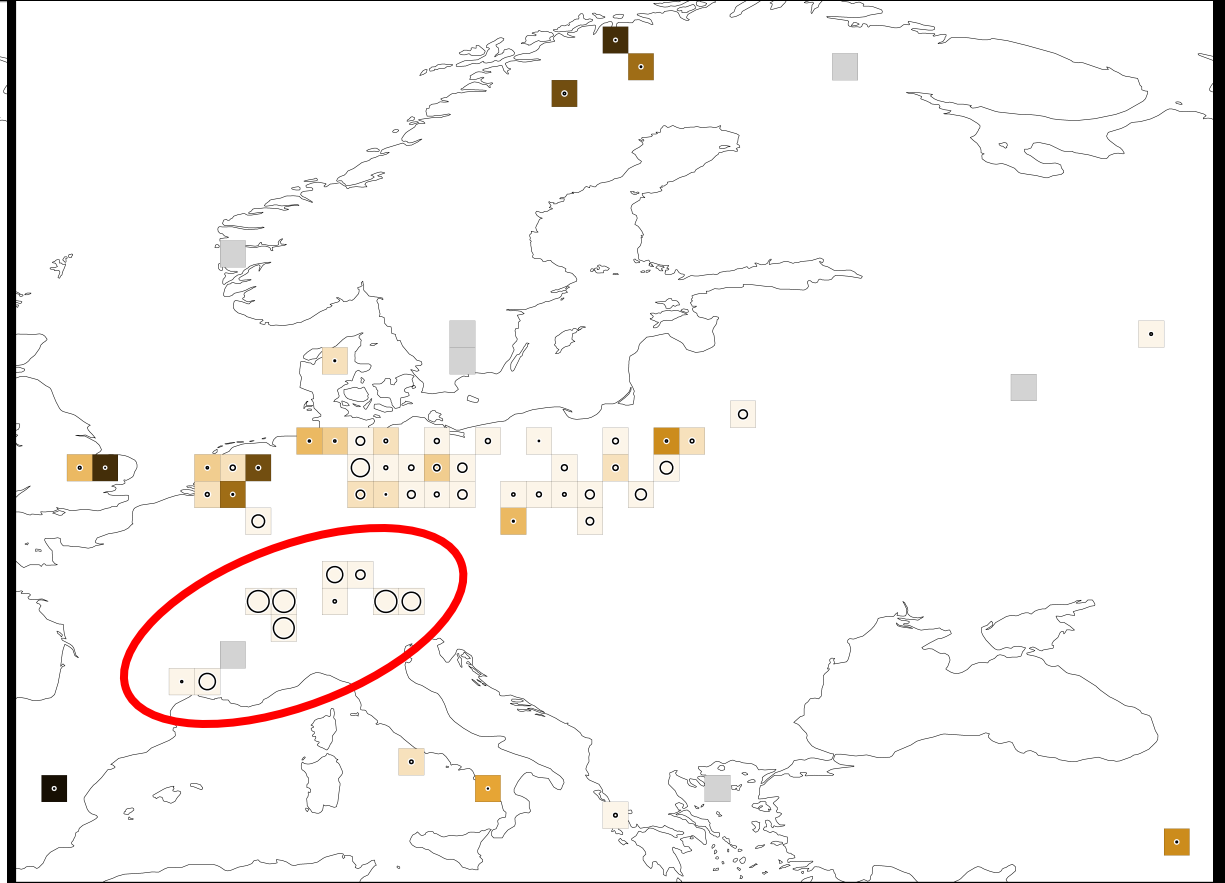




Early-temperate



Late-temperate



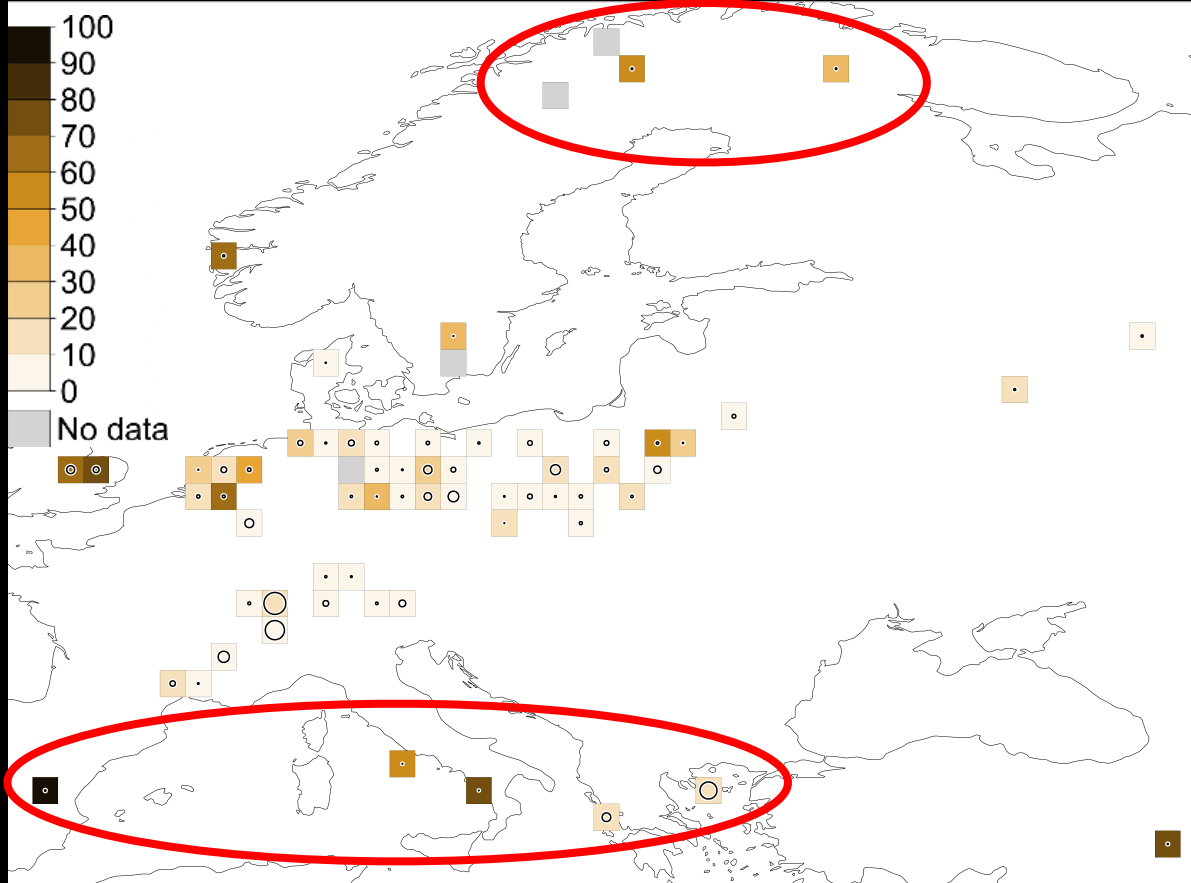
# Open vegetation

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

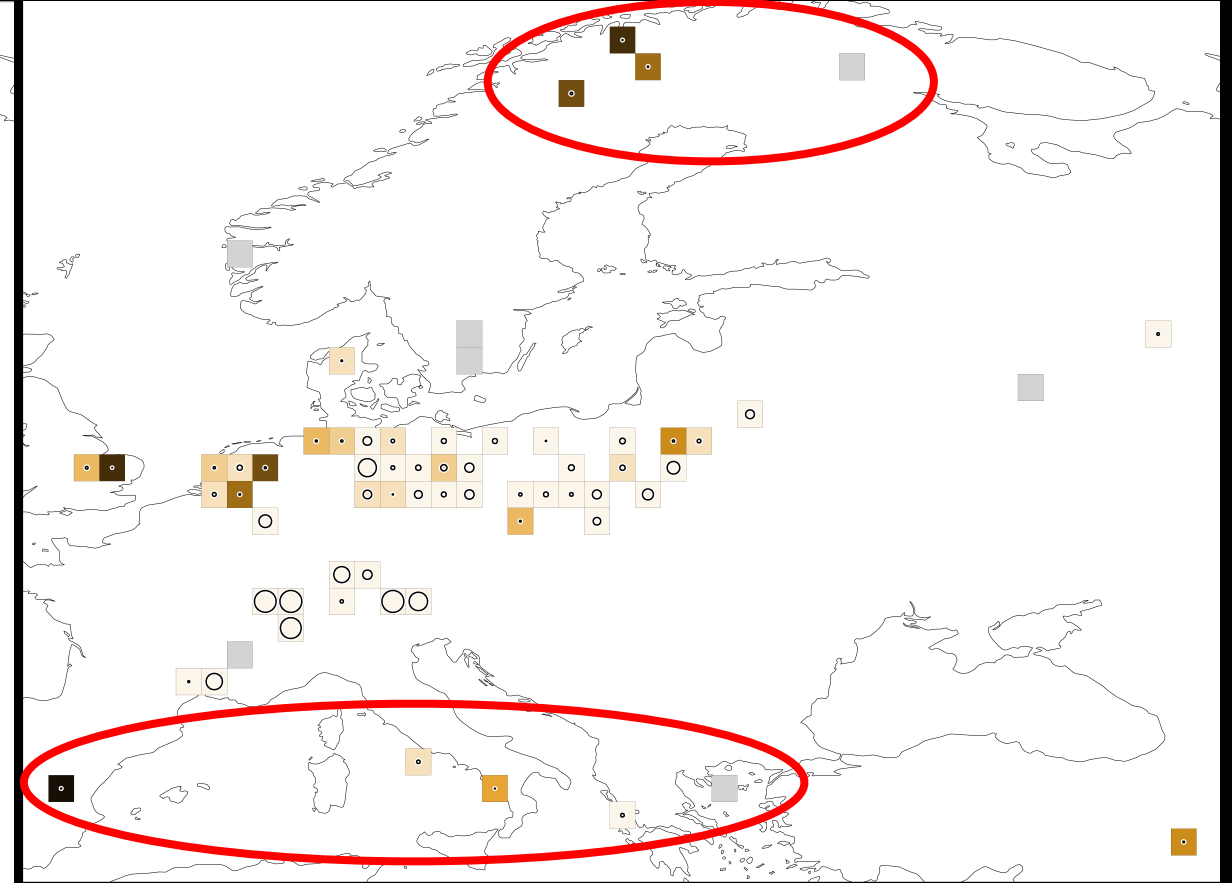




Early-temperate



Late-temperate



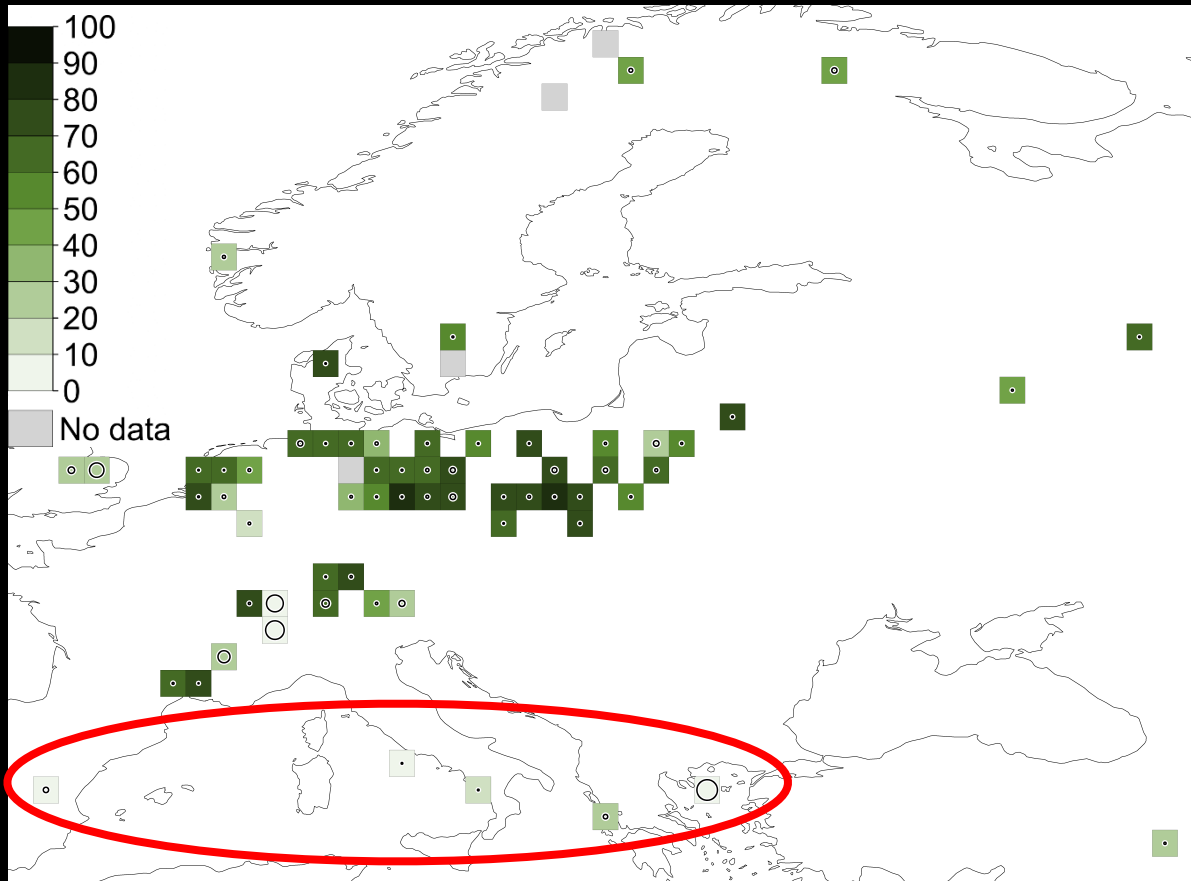
# Open vegetation

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

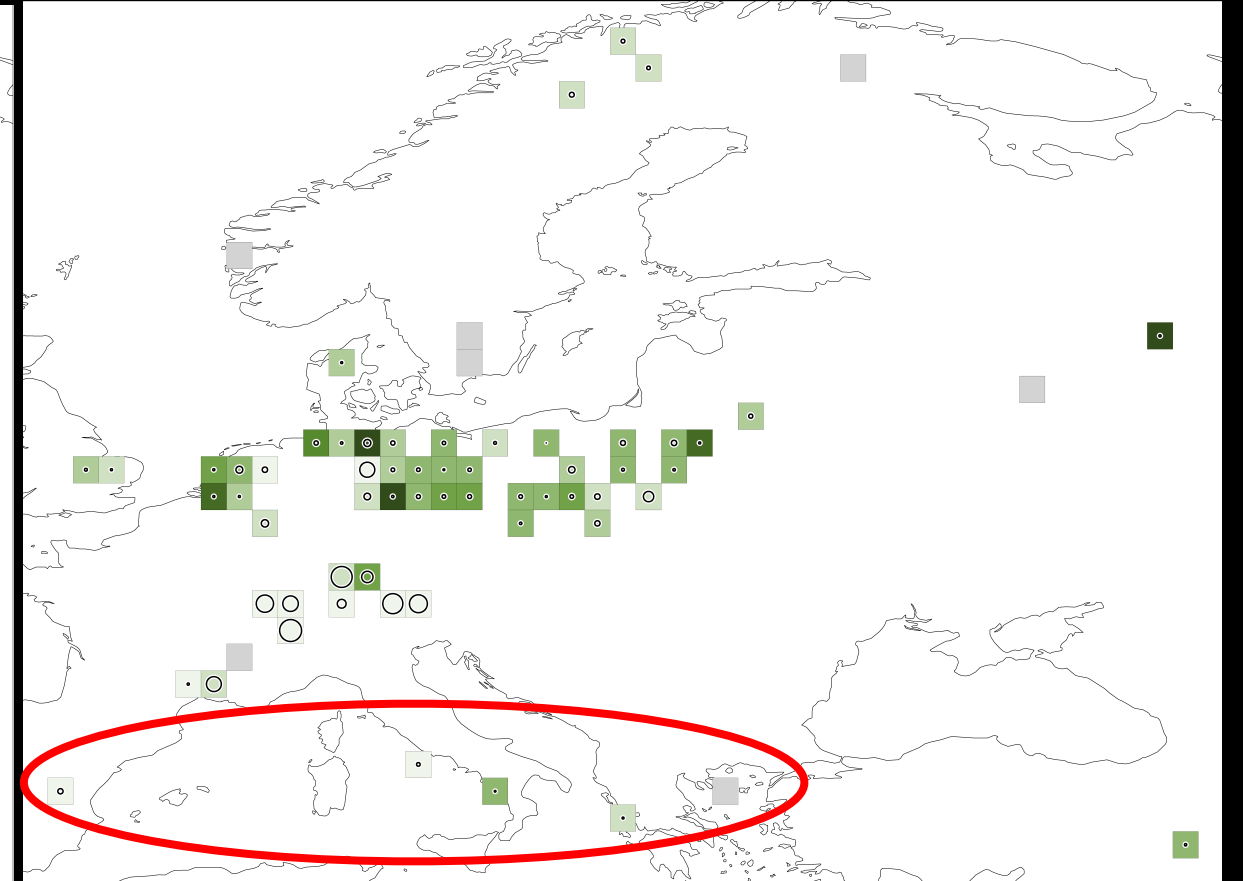




Early-temperate



Late-temperate



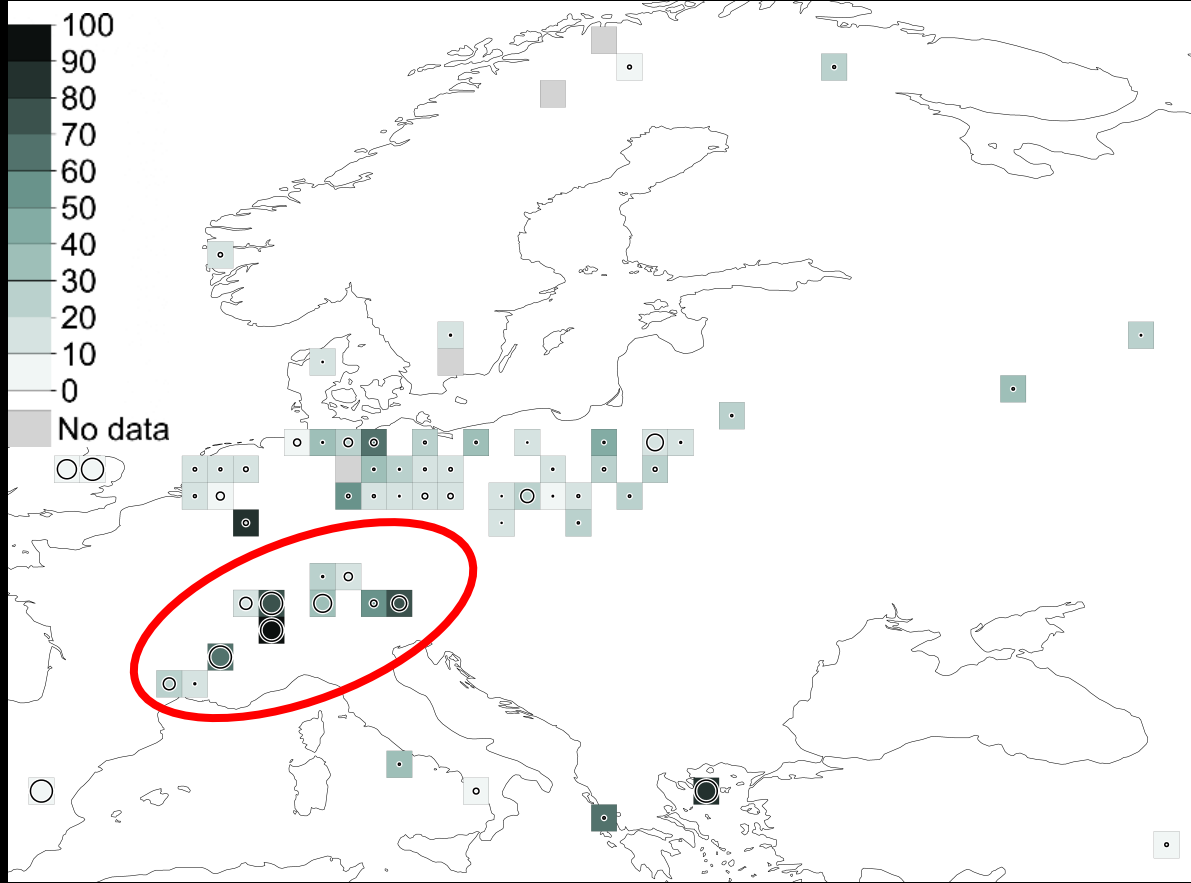
# Light woodland

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

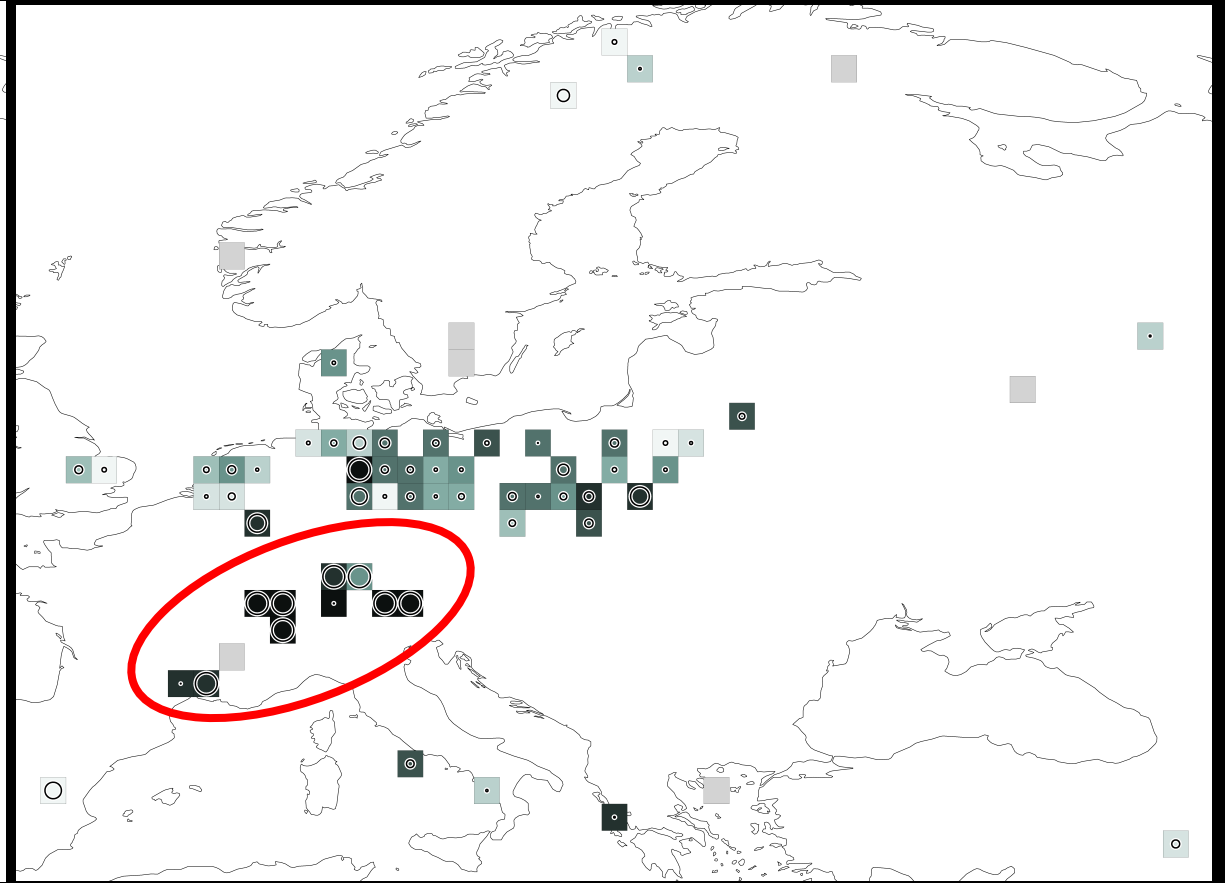




Early-temperate



Late-temperate



# Closed forest

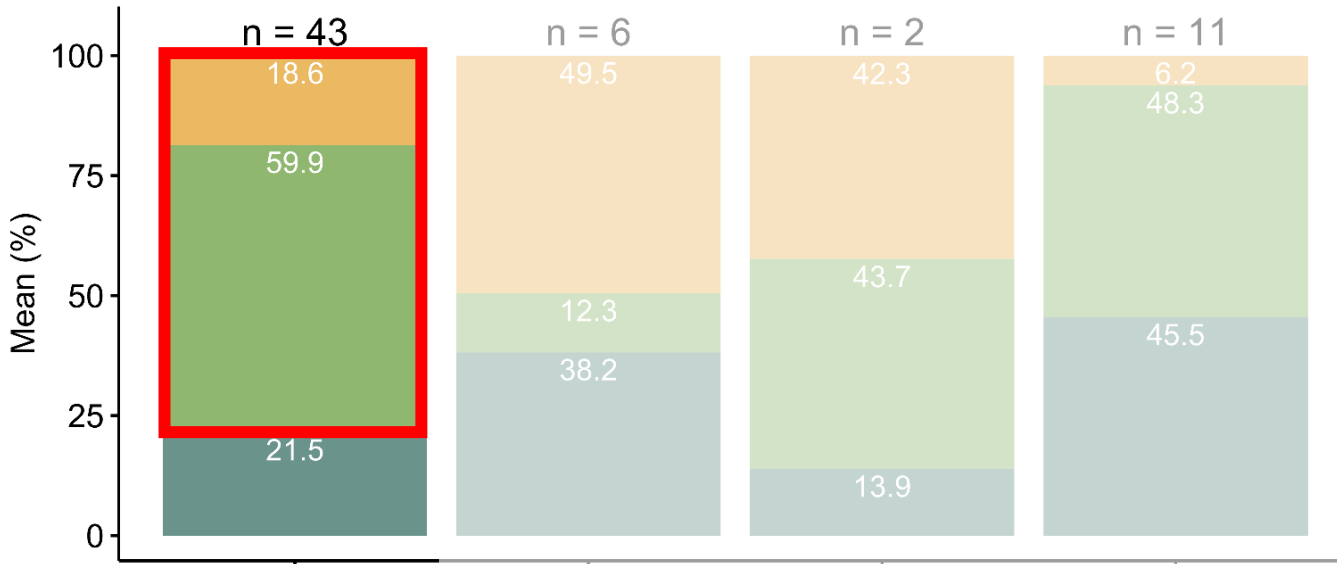
Pearce *et al.* 2023, Sci. Adv.



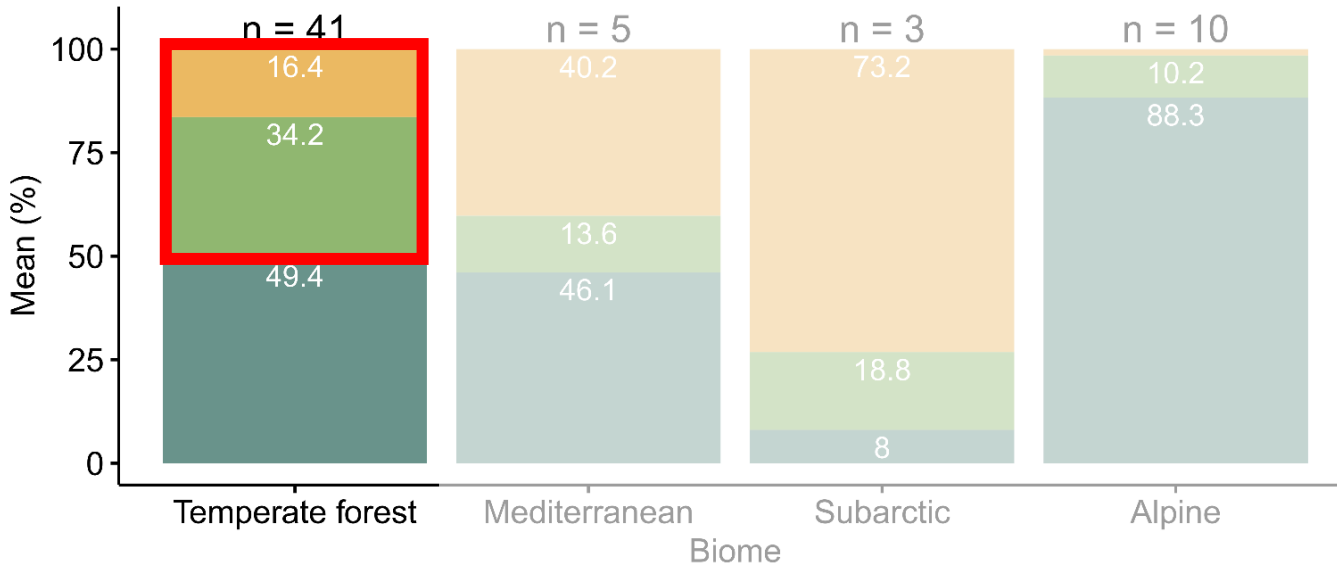


Over  
**50%**  
open  
vegetation  
& light  
woodland

Early-temperate



Late-temperate

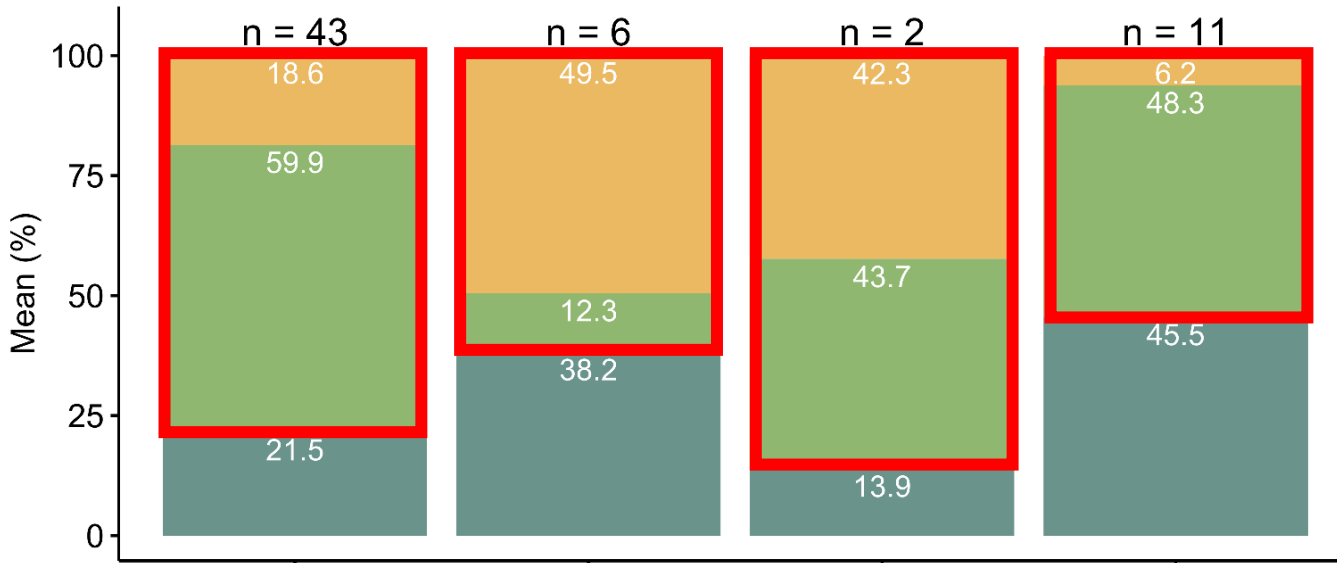


Land cover type Open vegetation Light woodland Closed forest

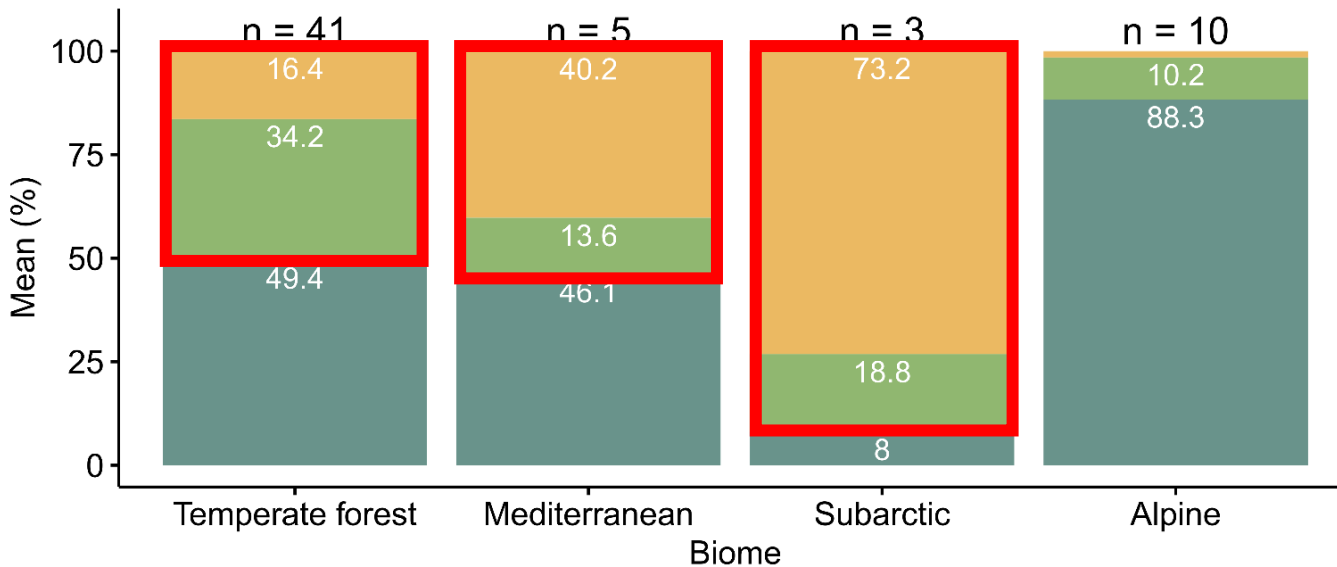


Over  
**50%**  
open  
vegetation  
& light  
woodland

Early-temperate



Late-temperate



Land cover type   Open vegetation   Light woodland   Closed forest

## Early-temperate

*Corylus*  
*Quercus*



## Late-temperate

*Carpinus*  
*Corylus*





## Early-temperate

*Poaceae*  
*Cyperaceae*



## Late-temperate

*Poaceae*  
*Cyperaceae*



How open were European landscapes  
before modern humans?

What dynamics shaped these  
landscapes?



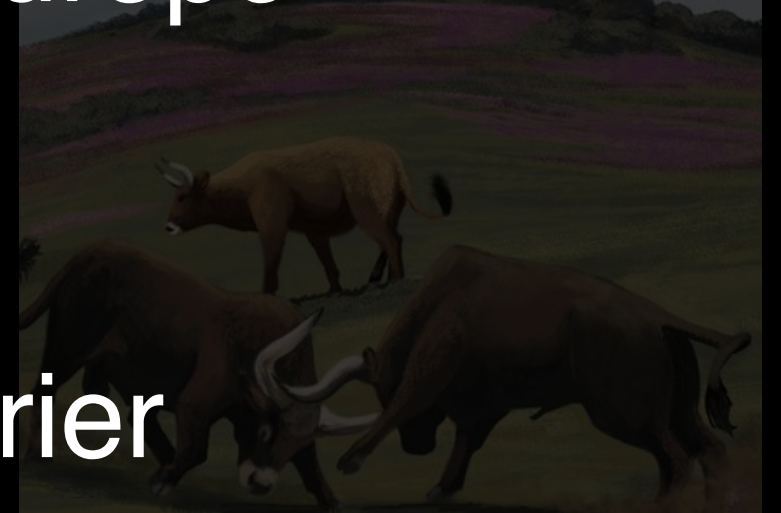
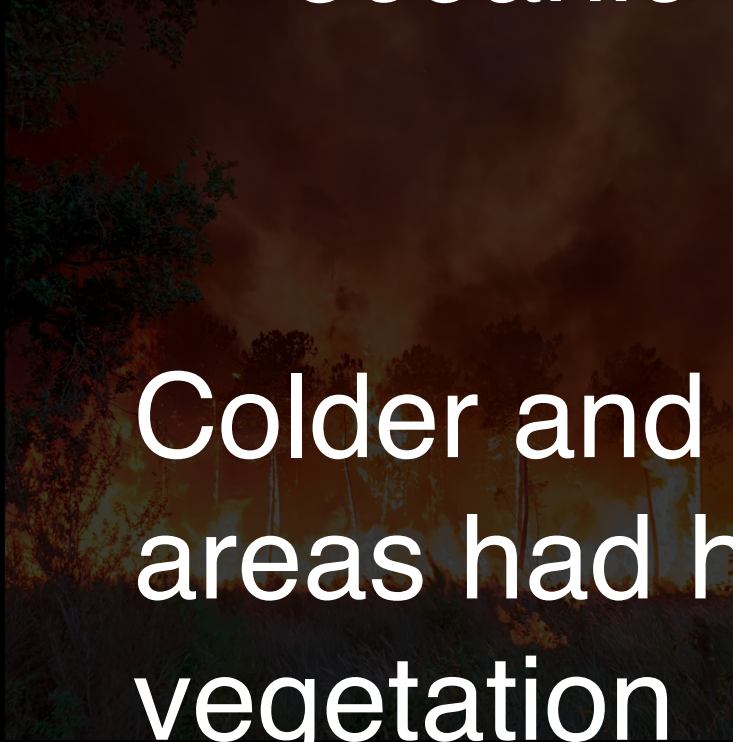




# More openness in oceanic Europe



Colder and drier  
areas had high  
vegetation  
openness

















# Conclusions

- Open vegetation and light woodland were substantial
- Driven by disturbance regimes beyond climate
- Baseline choice matters
- Support for rewilding





# Goals

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Diverse, heterogeneous ecosystems:

- Open-ended
- Process-led





# Thank you!



Jens-Christian Svenning



Signe Normand



Florence Mazier



TERRANOVA



# Forests before *Homo sapiens*

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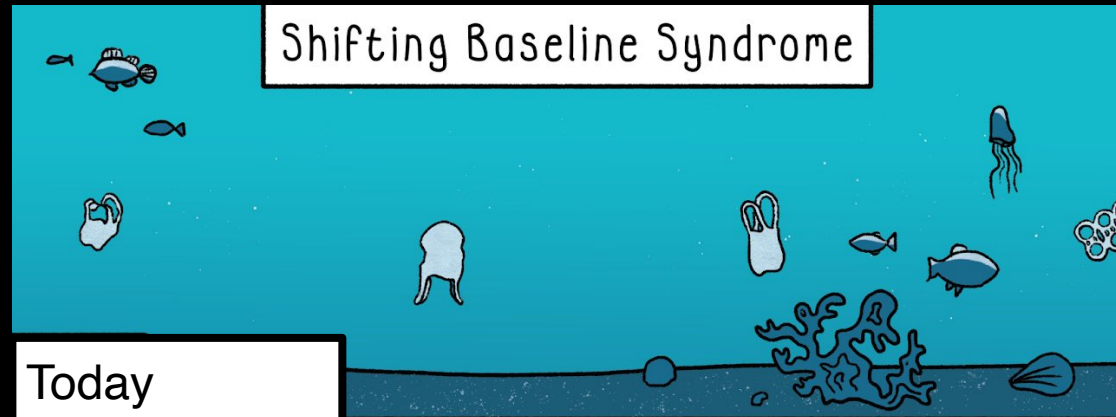


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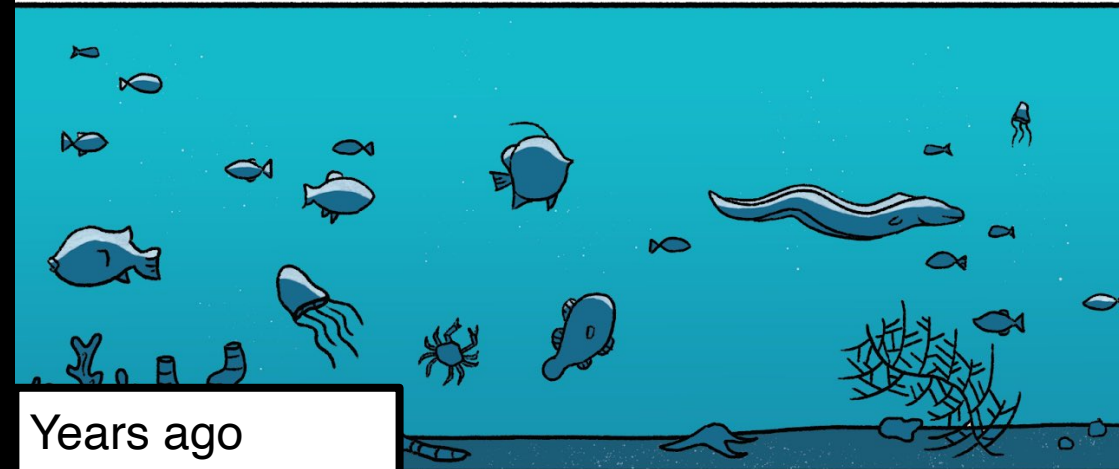
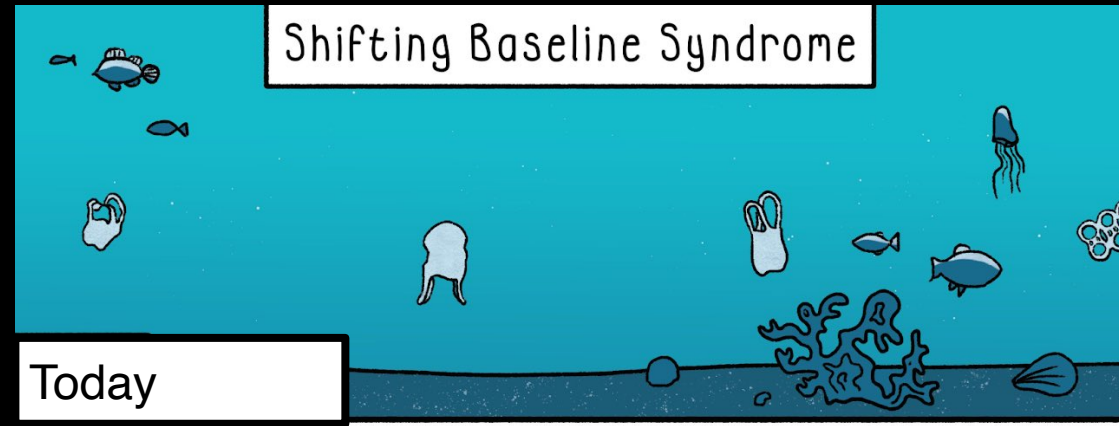
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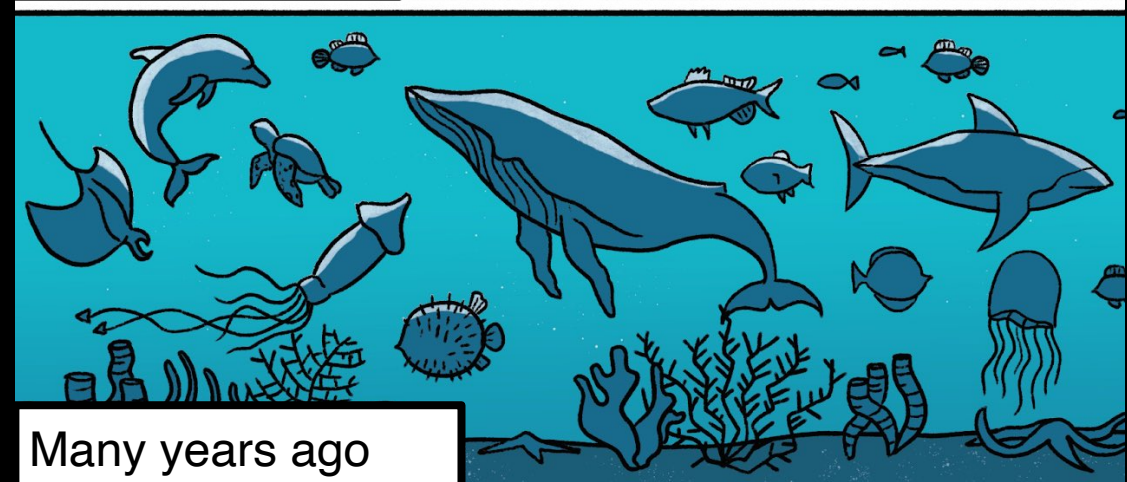
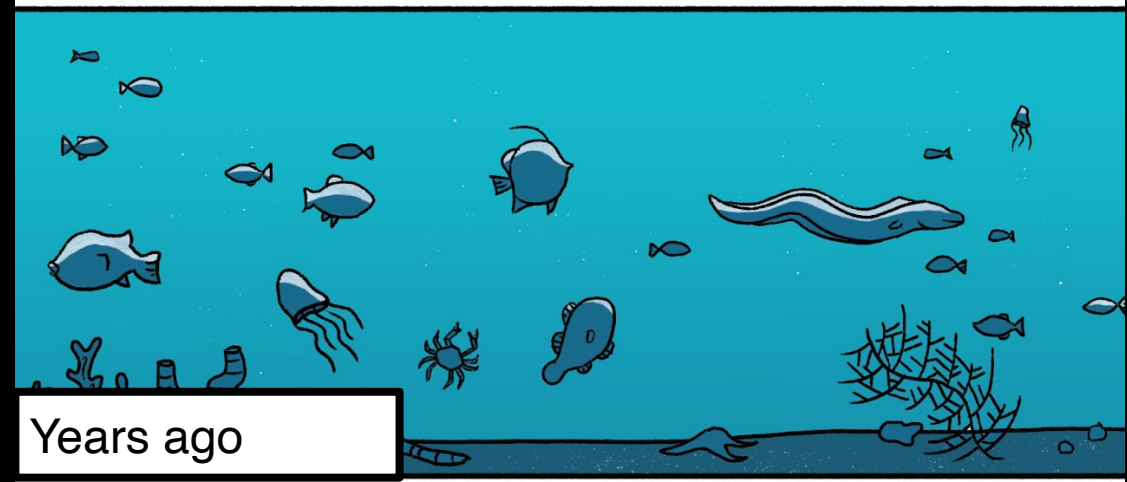
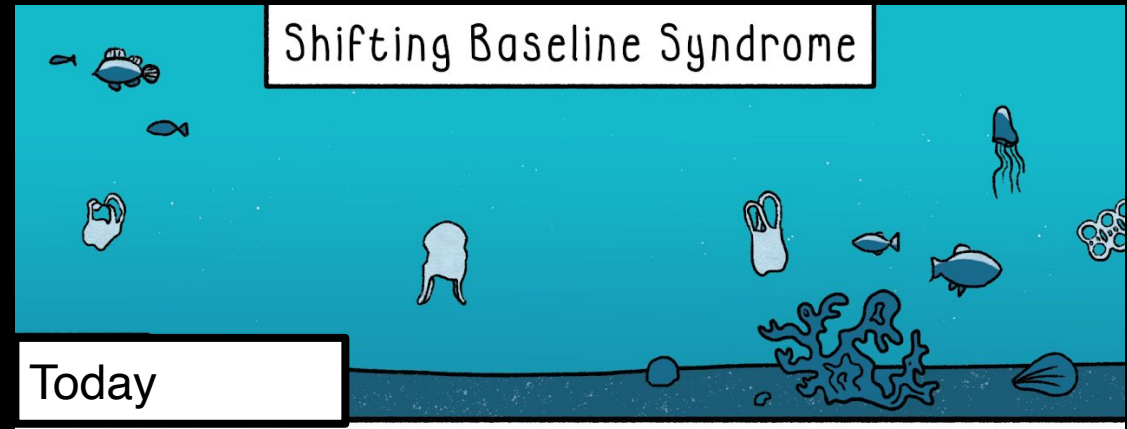








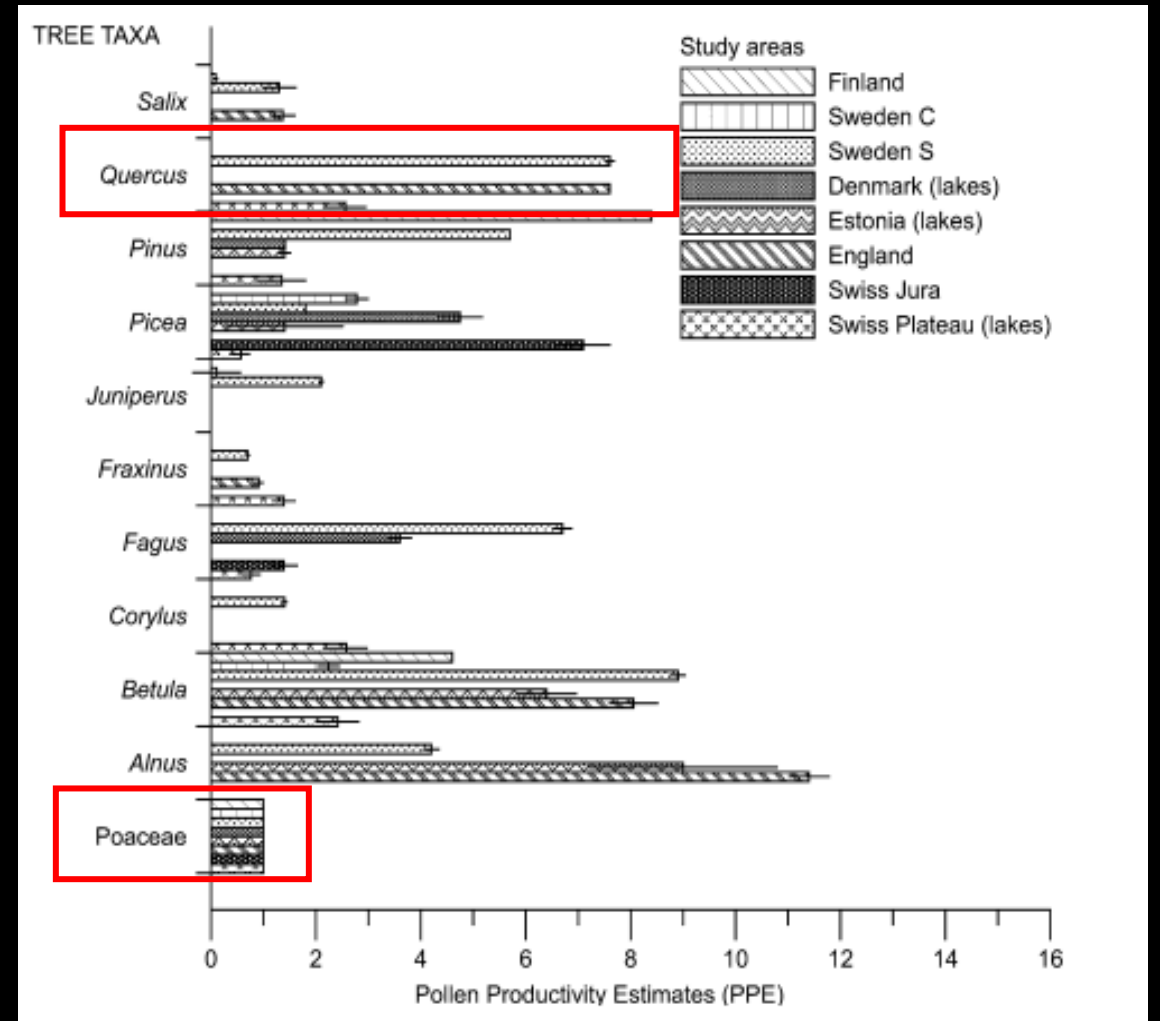
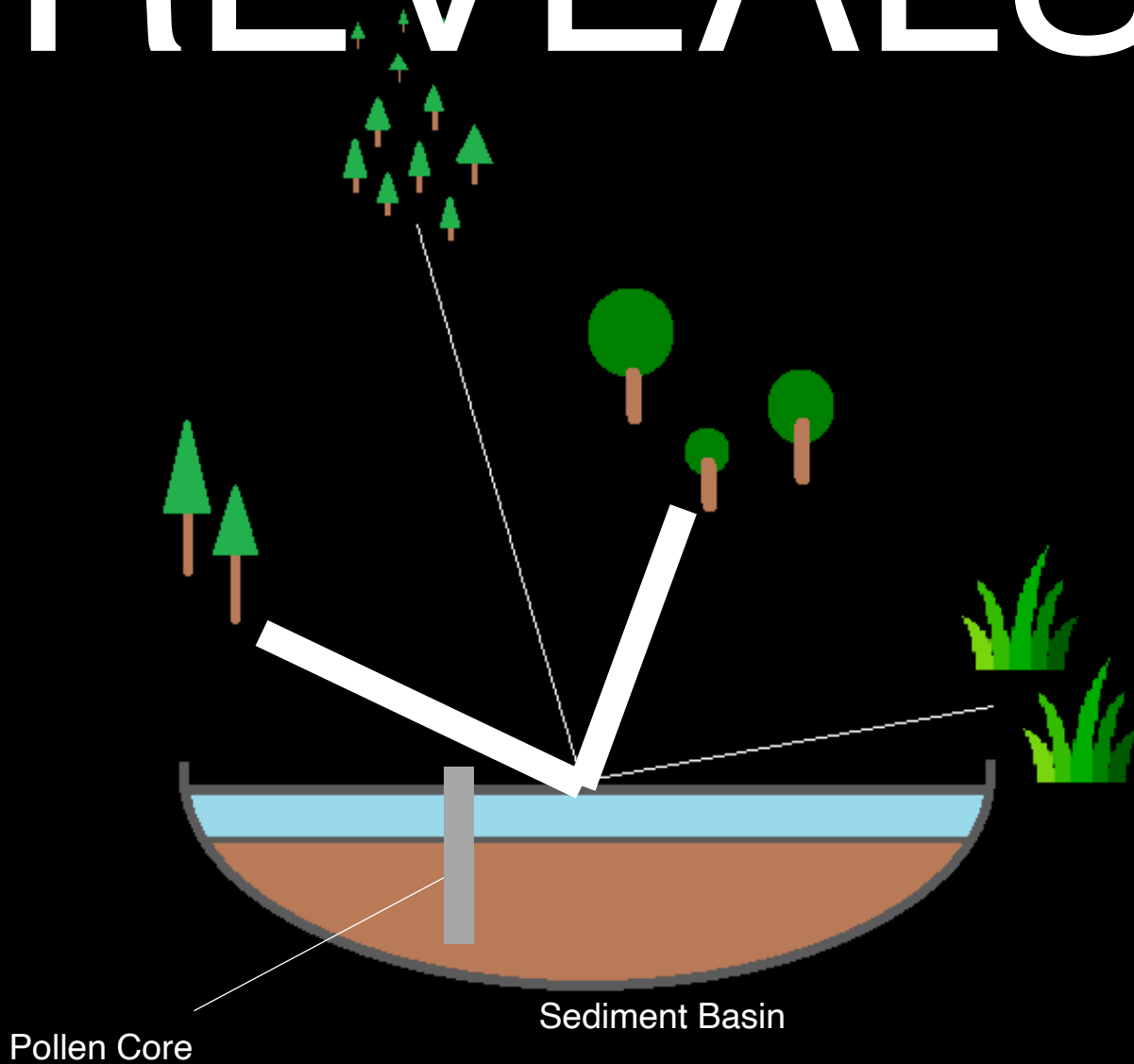






# REVEALS

(Sugita, 2007)





# REVEALS (Sugita, 2007)

Regional Estimates of Vegetation Abundance from Large Sites

