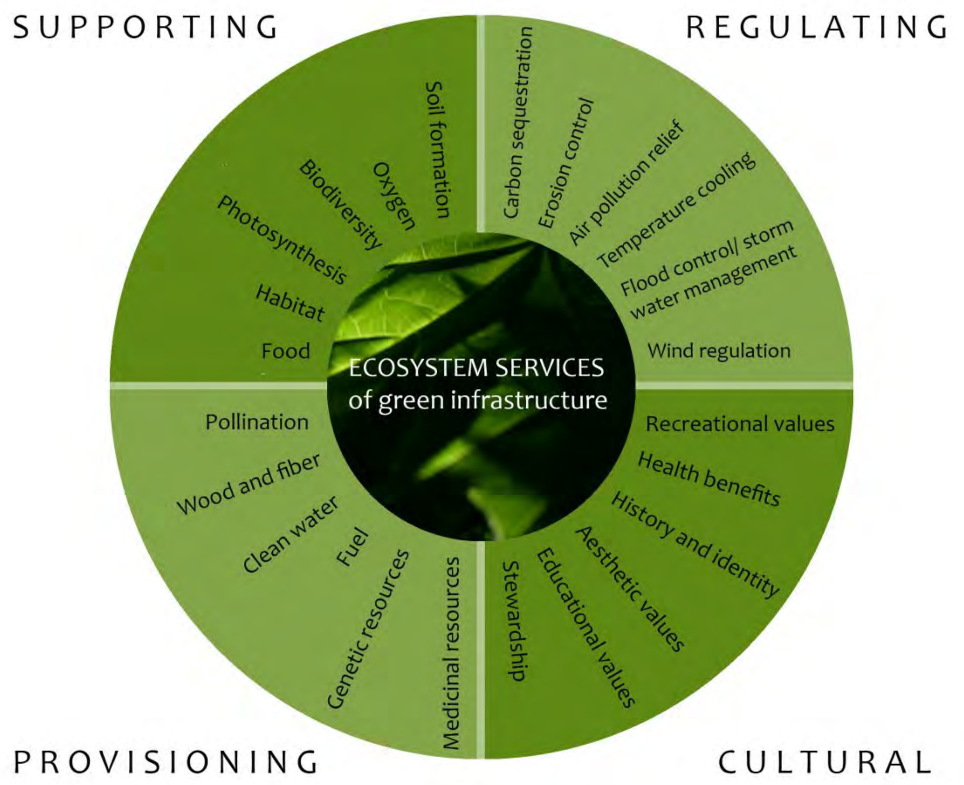
Träden in i framtiden

Henrik Sjöman
Göteborgs Botaniska Trädgård/Sveriges lantbruksuniversitet/Royal Botanic Garden Kew UK

Träd och ekosystemtjänster



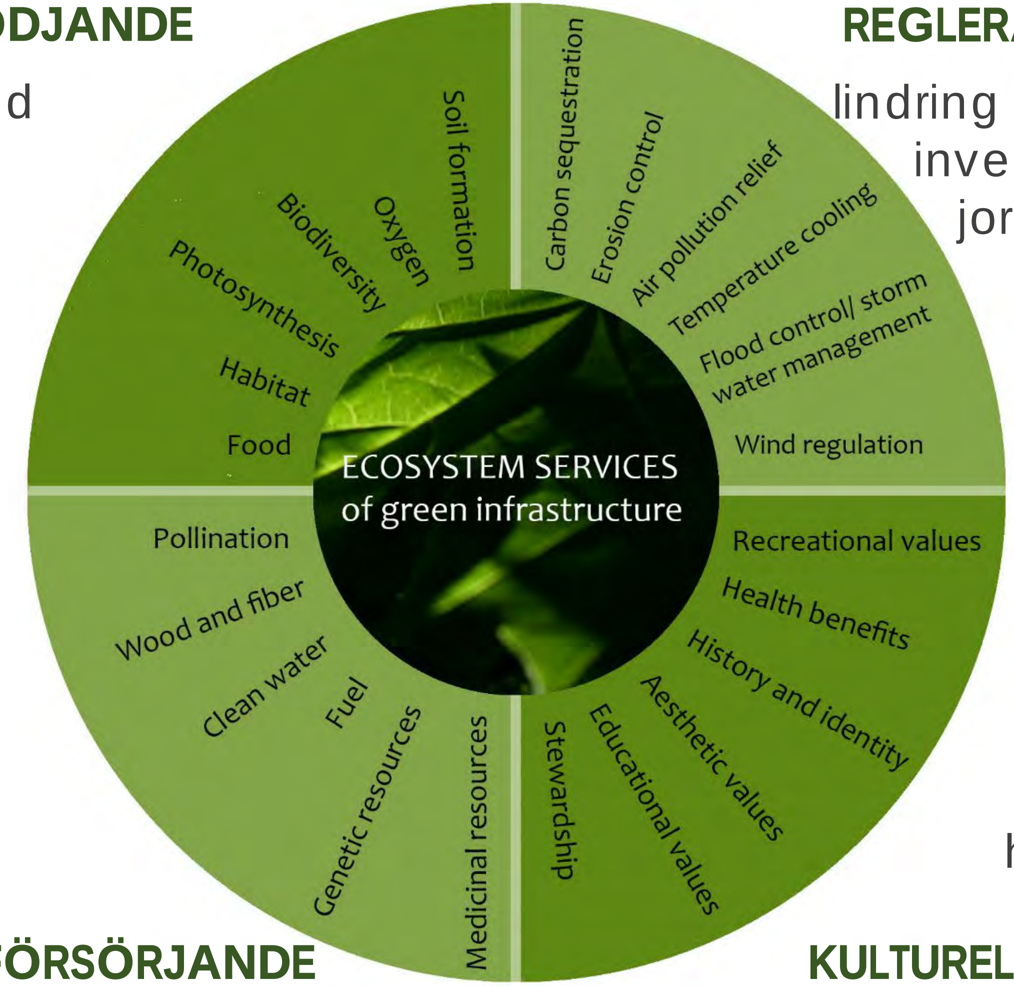
Deak Sjöman 2016

STÖDJANDE

jordens uppbyggnad
syre
biologisk mångfald
habitat

REGLERANDE

lindring av klimatförändringar
inverkan på mikroklimatet
jord förbättring - erosion
koldioxidbindning
dagvattenhantering
Föroreningshantering

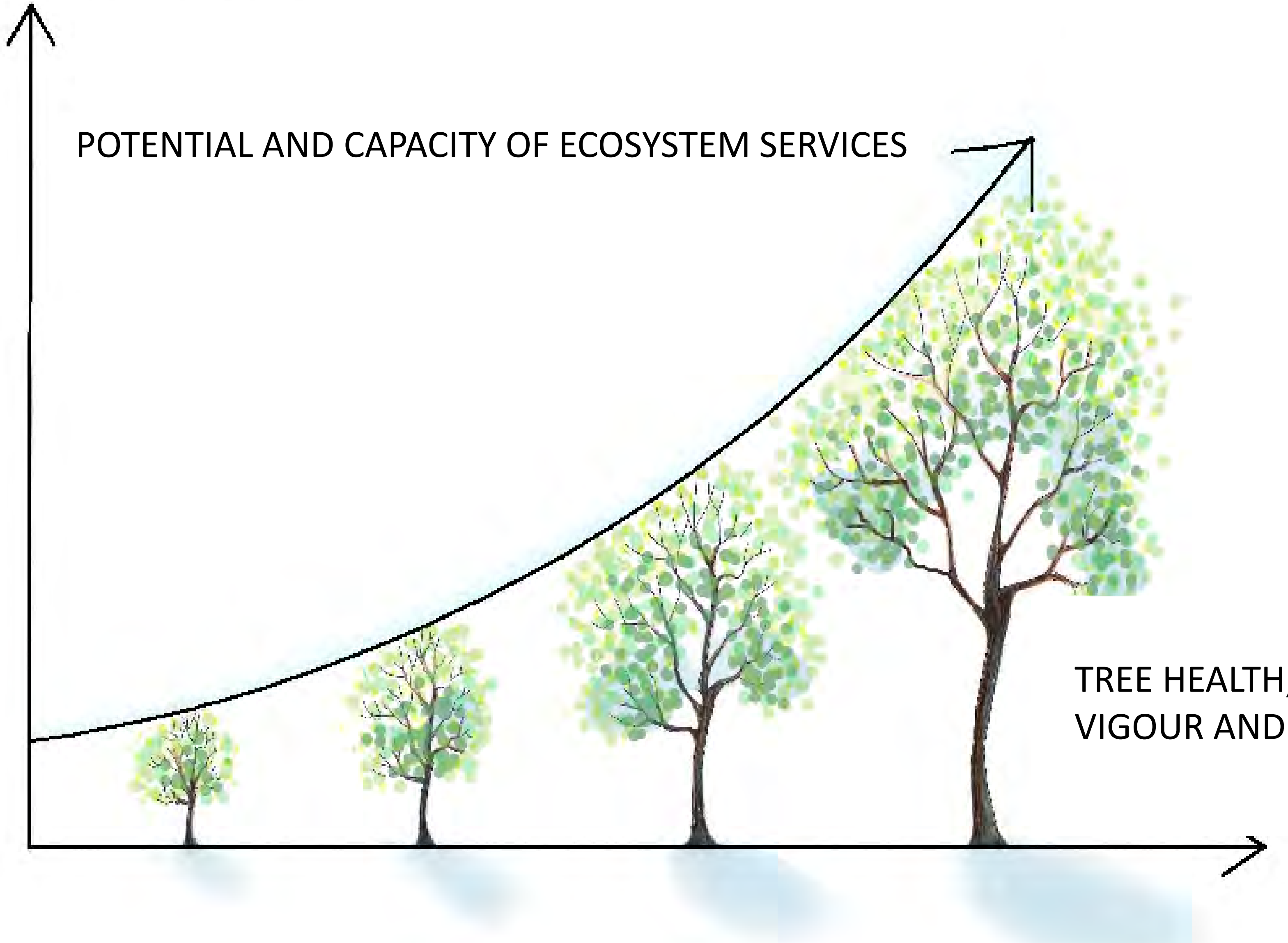


FÖRSÖRJANDE

mat
virke
bränsle
resurs

KULTURELLA

rekreativa kvaliteter
identitetsskapande
utbildande
hälsonyttiga kvaliteter
samhörighet



Source: Keith Sacre

Western Skåne 2017 and 2018, Rymdstyrelsen/Google/ESA/TT

Source; Aftonbladet & Copernicus

"Grassy parks are no longer viable in the face of global heating"

Phineas Harper | 18 August 2022 | 29 comments

In the face of climate change, Britain's lawned parks should be replaced with urban forests to help control city temperatures and keep green spaces green during hot summers, writes Phineas Harper.

Successive heatwaves have turned England's formerly green and pleasant land into an arid patchwork of yellow and brown. As the UK government declares droughts following the driest months since records began in 1836, it's clear the tradition of lush mown lawns and bucolic grassy parks is no longer viable in the face of global heating.

To reduce ground temperatures and keep urban green spaces habitable and verdant even in 40-degree summers, a radical shift in landscape design is needed.

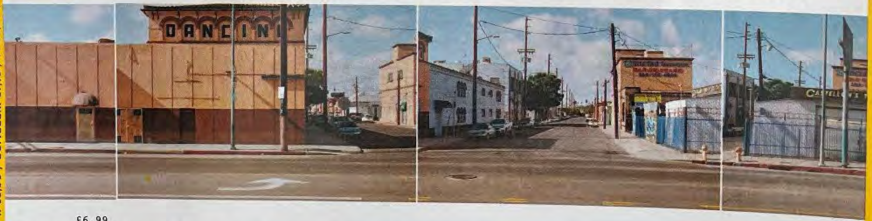
07.2021

NATIONAL GEOGRAPHIC

Along one Los Angeles street, wealthy areas are shady and cool.

The tree canopy decreases and temperatures rise as you drive south.

On a warming planet, this divide between rich and poor leaves many at risk.



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BEATING THE HEAT

PUBLISH ABOUT BROWSE

PLOS ONE

OPEN ACCESS PEER-REVIEWED

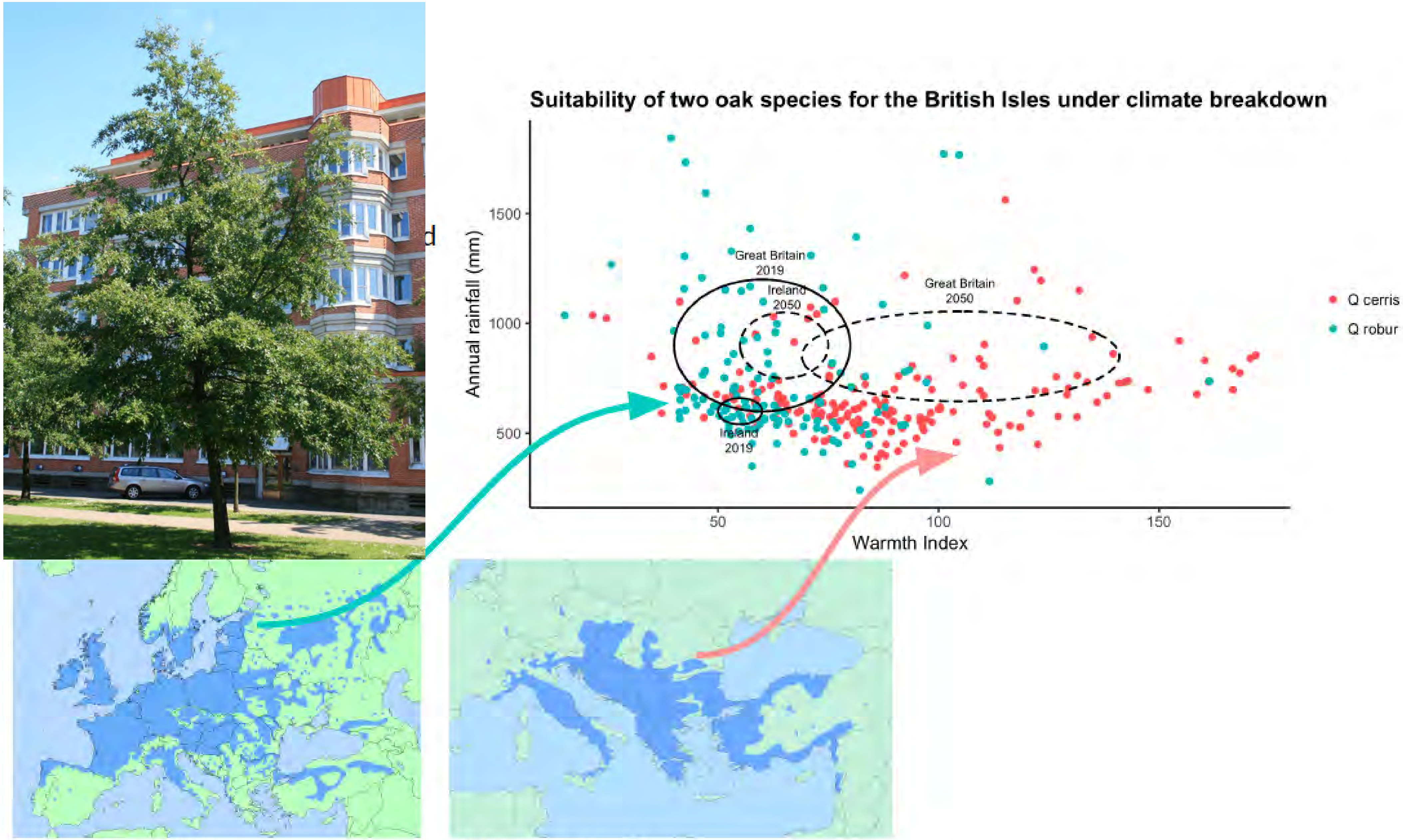
RESEARCH ARTICLE

Understanding climate change from a global analysis of city analogues

Jean-Francois Bastin, Emily Clark, Thomas Elliott, Simon Hart, Johan van den Hoogen, Iris Hordijk, Haozhi Ma, Sabiha Majumder, Gabriele Manoli, Julia Maschler, Lidong Mo, Devin Routh, Kailiang Yu, Constantin M. Zohner, Thomas W. Crowther

Published: July 10, 2019 • https://doi.org/10.1371/journal.pone.0217592

existing major cities. As a general trend, we found that all the cities tend to shift towards the sub-tropics, with cities from the Northern hemisphere shifting to warmer conditions, on average ~1000 km south (velocity ~20 $km.year^{-1}$), and cities from the tropics shifting to drier conditions. We notably predict that Madrid's climate in 2050 will resemble Marrakech's climate today, Stockholm will resemble Budapest, London to Barcelona, Moscow to Sofia, Seattle to San Francisco, Tokyo to Changsha. Our approach illustrates how complex climate data can be packaged to provide tangible information. The global assessment of city analogues can



Quercus robur

Quercus cerris

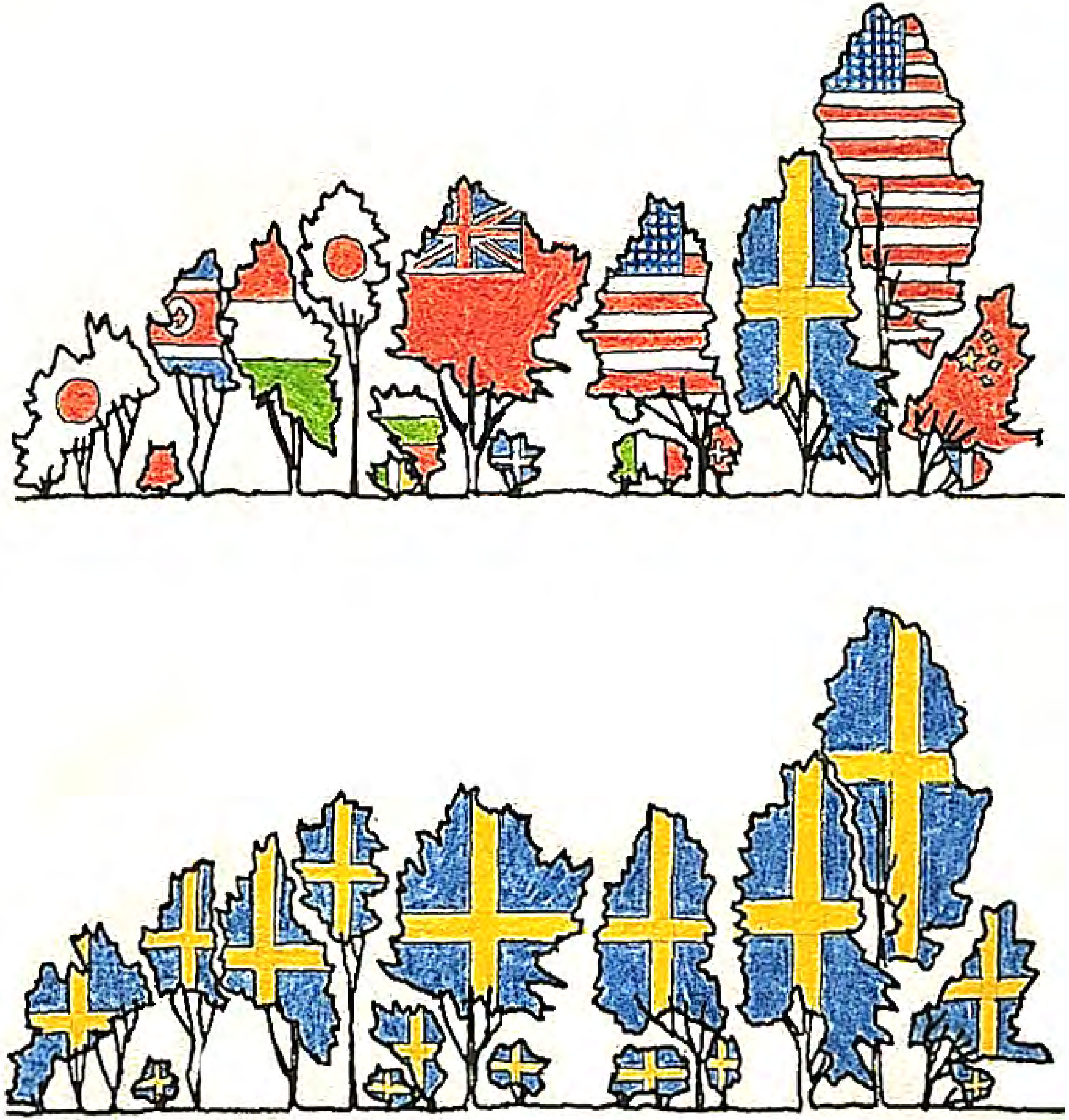


Illustration: Roland Gustavsson

Acer pseudoplatanus

Acer opalus

Acer campestre

Acer monspessulanum

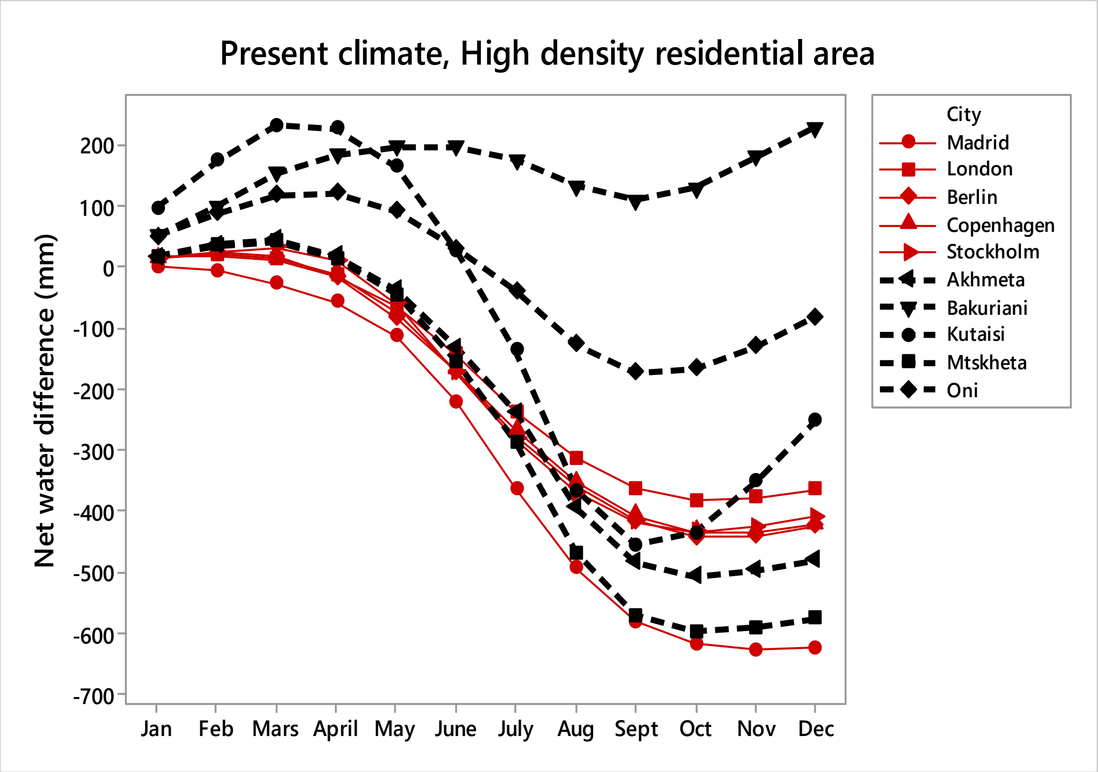
Carpinus betulus

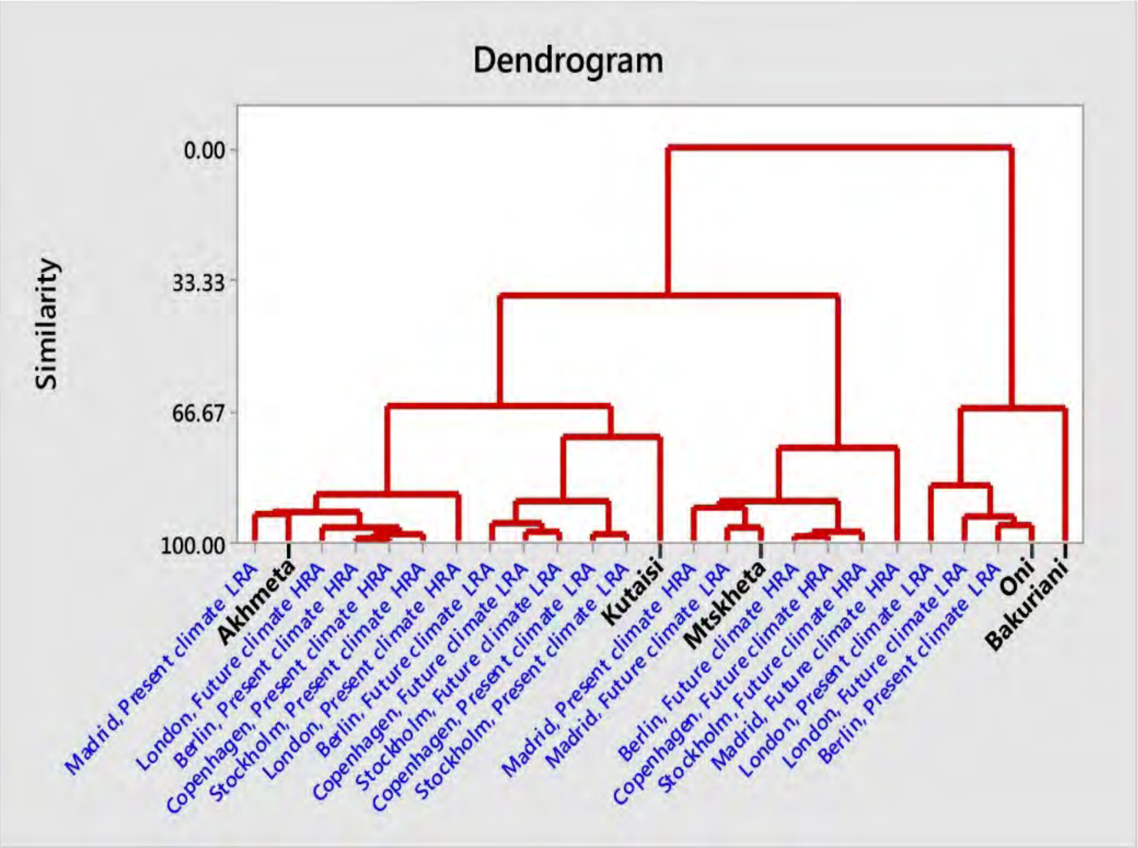
Figure 1. Location of the different forest reserve study sites in Georgia located in black.

$$PET = 16\left(\frac{L}{12}\right)\left(\frac{N}{30}\right)\left(\frac{10T_a}{I}\right)^{\alpha}$$

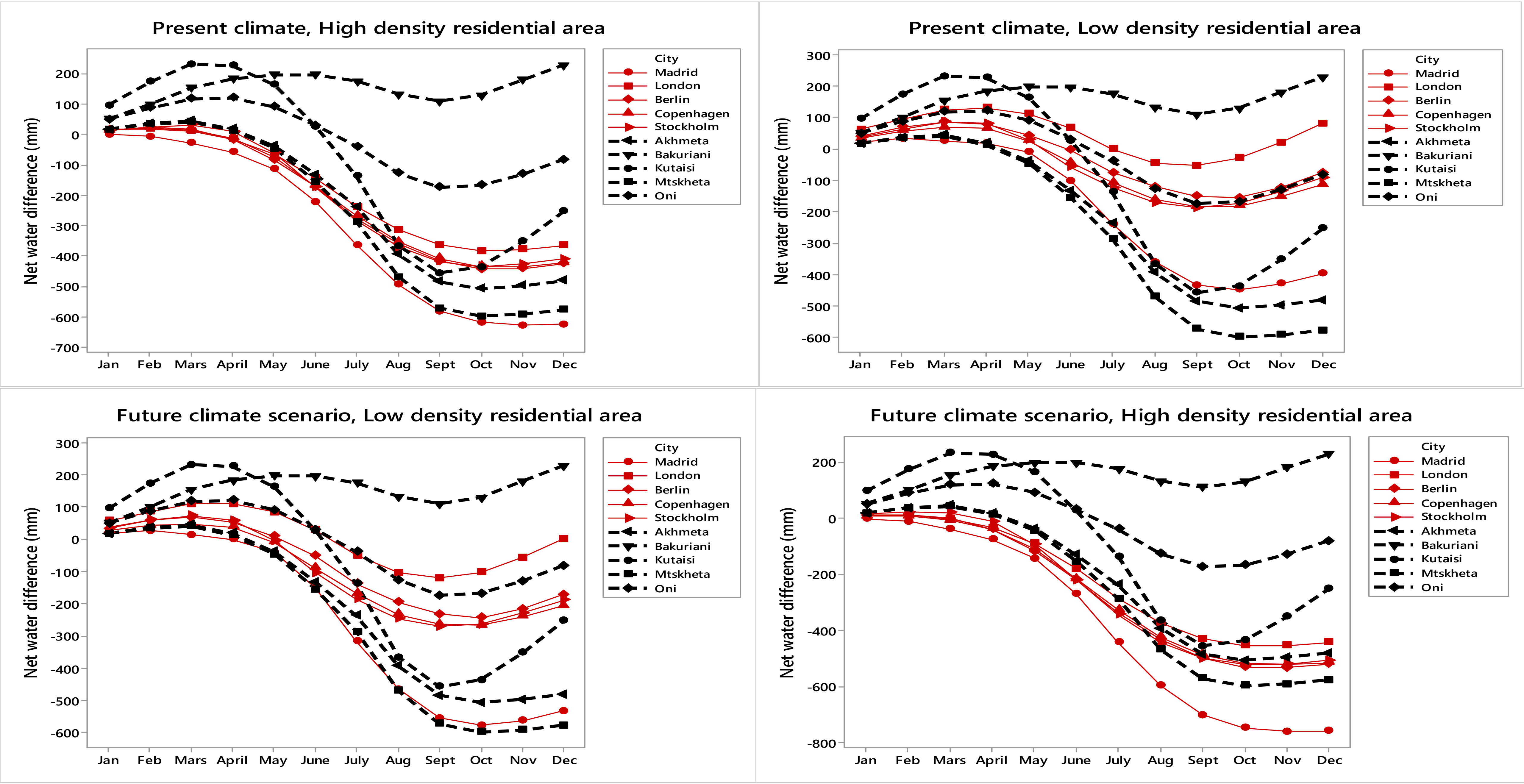
$$\alpha = (6{,}75 \times 10^{-7})I^3 - (7{,}71 \times 10^{-5})I^2 + (1{,}792 \times 10^{-2})I + 0{,}49239$$

$$I = \sum_{i=1}^{12}\left(\frac{T_{ai}}{5}\right)^{1{,}514}$$





(Sjöman et al. 2019)



Present climate, High density residential area
Present climate, Low density residential area
Future climate scenario, Low density residential area
Future climate scenario, High density residential area
Net water difference (mm)
Jan
Feb
Mars
April
May
June
July
Aug
Sept
Oct
Nov
Dec
City
Madrid
London
Berlin
Copenhagen
Stockholm
Akhmeta
Bakuriani
Kutaisi
Mtskheta
Oni

Steppe Forests in Central Georgia


Carpinus orientalis

Steppe forest with *Zelkova carpinifolia* (west Georgia)

Zelkova carpinifolia

Celtis caucasica (northeast Georgia)

Hunting for future urban trees

Moldavia

Qinling Mt. China

Qinling Mt. China


Caucasus Mt. Georgia


Carpathian Mt. Romania


Sierra Nevada Mt. USA

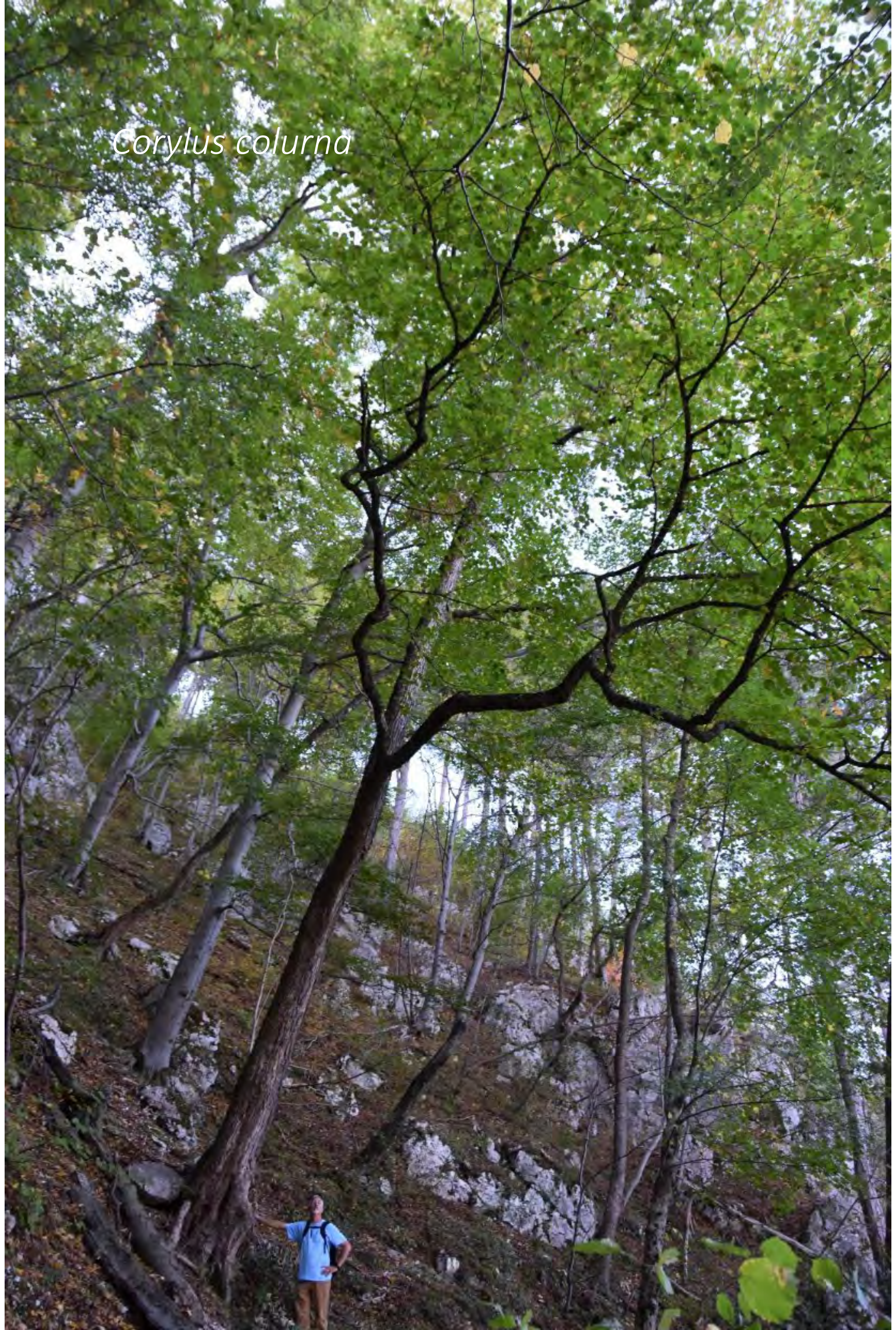

Appalachian Mt. USA


Kunashir, Russia


Hokkaido, Japan


Crimea, Ukraine


Delaware, USA


Corylus colurna


Pinus nigra

Science of the Total Environment 853 (2022) 158603

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journal homepage: www.elsevier.com/locate/scitotenv

Native pedunculate oaks support more biodiversity than non-native oaks, but non-native oaks are healthier than native oaks: A study on street and park trees of a city

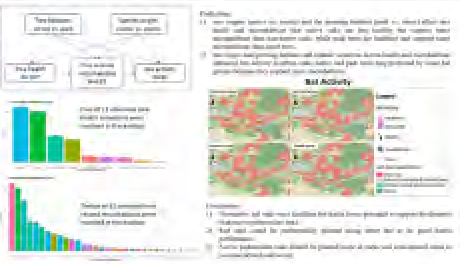
Monika Laux [a], Hailiang Lv [a,b,*], Martin H. Entling [c], Jens Schirmel [c], Aditya Narang [c], Mario Köhler [d], Somidh Saha [a,e]

[a] Institute for Technology Assessment and Systems Analysis (ITAS), Karlsruhe Institute of Technology, Karlstraße 11, 76133 Karlsruhe, Germany
[b] Heilongjiang Bayi Agricultural University, Xinfeng Road 5, 163316 Daqing, China
[c] University of Koblenz-Landau, Fortstraße 7, 76829 Landau, Rhineland-Palatinate, Germany
[d] City Horticulture Office (Gartenbauamt), Municipality of Karlsruhe, Lammstraße 7a, 76133 Karlsruhe, Germany
[e] Institute for Geography and Geoecology (IfGG), Karlsruhe Institute of Technology, Kaiserstraße 12, 76131 Karlsruhe, Germany

HIGHLIGHTS

- Non-native red oaks were healthier than native pedunculate oaks in a city.
- Native pedunculate oaks provided more microhabitats than non-native red oaks.
- Nine bat species from four genera were recorded in this study.
- Bat activity differed by oak species and locations (parks or streets).
- *Plecotus* bats favored native pedunculate oaks over non-native red oaks.

GRAPHICAL ABSTRACT



ARTICLE INFO

Editor: Elena Paoletti

Keywords:
Tree health
Tree microhabitats
Bat activity
Native oaks
Street trees

ABSTRACT

Trees in cities provide multiple ecosystem services. However, simultaneously ensuring healthy trees with high habitat diversity can be challenging in a harsh urban environment. We compared health, microhabitats, and bat activities between native (*Quercus robur* L.) and non-native (*Quercus rubra* L.) oaks growing in different urban habitats (street vs. park) in Karlsruhe, southwestern Germany. We randomly selected 167 oak trees with a diameter at breast height (DBH) >20 cm across the city from Urban Tree Registrar. We performed tree health assessment, dendrometric, and microhabitat inventory. We recorded the four-day bat activities on 45 native and non-native oaks with acoustic loggers installed on the trees. We found that non-native oaks were healthier than native oaks but provided less abundance and richness of microhabitats. Tree size (positive effect) and pruning (negative effect) strongly influence microhabitat richness and abundance. In addition, park trees hosted significantly more microhabitats than street trees. We recorded the activities of 9 bat species from 4 genera. *Pipistrellus* bats were more active in park trees than street trees. Long-eared bats (*Plecotus*) were more active near the native than non-native oaks. Bats are likely favored by microhabitats such as fork split, lightning scar, and woodpecker "flute" that are more common in less healthy trees. We conclude that non-native red oak can be planted alongside streets, where the conditions are harsher than in parks to better adapt to climatic changes and stay healthy with less maintenance. The preservation of native pedunculate oak trees, especially within parks, is paramount for urban biodiversity conservation because of their potential to provide microhabitats and supporting bats.

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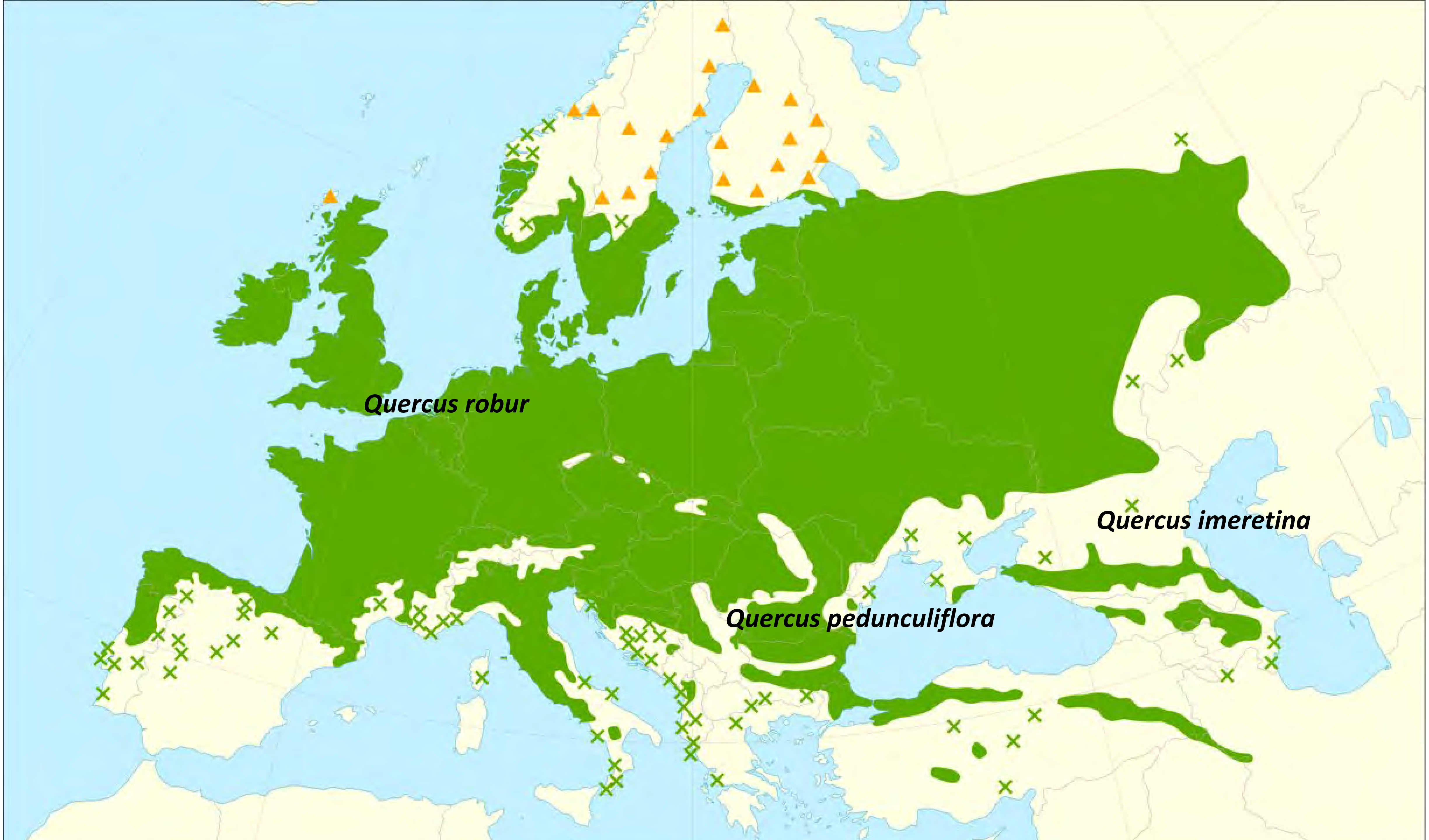
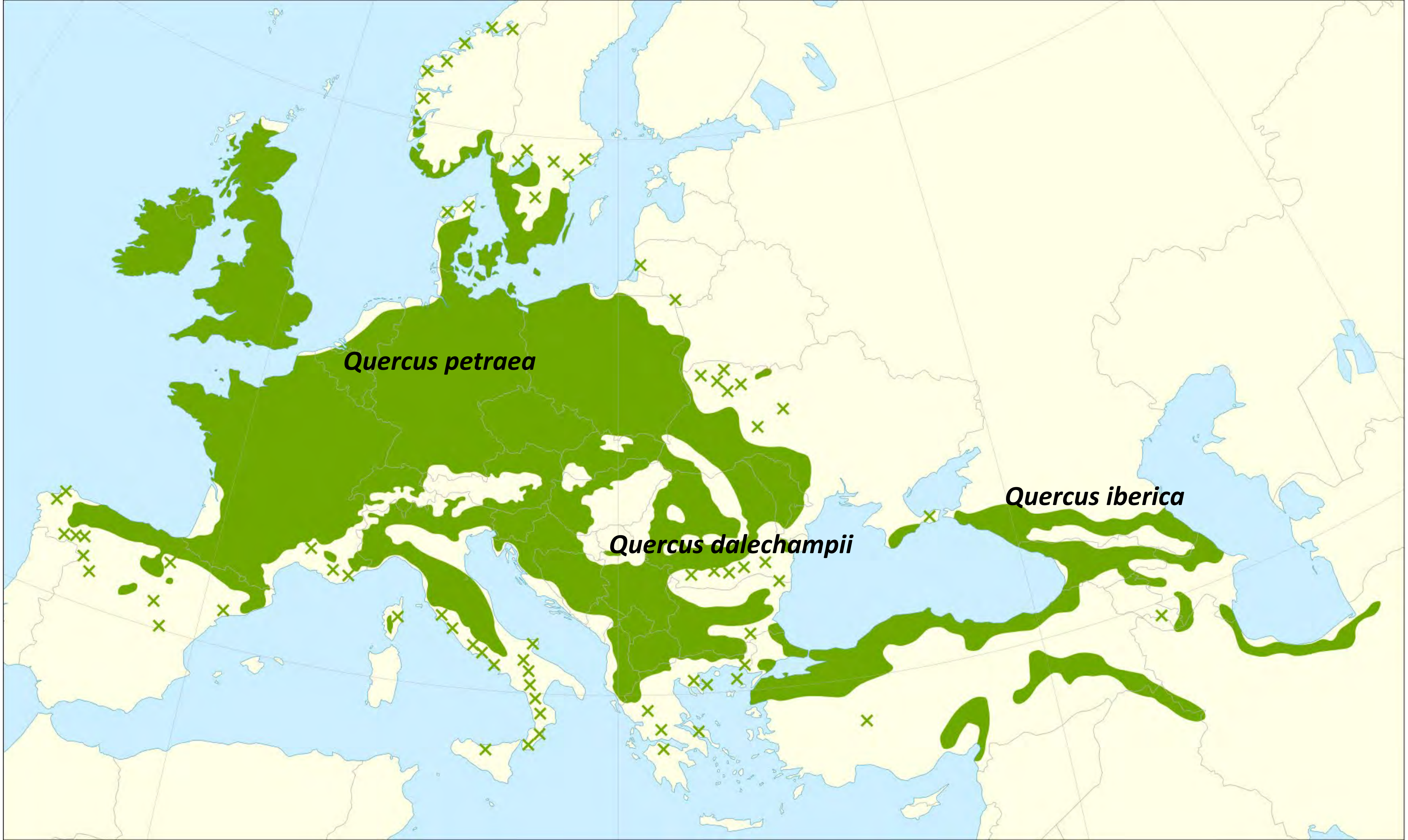
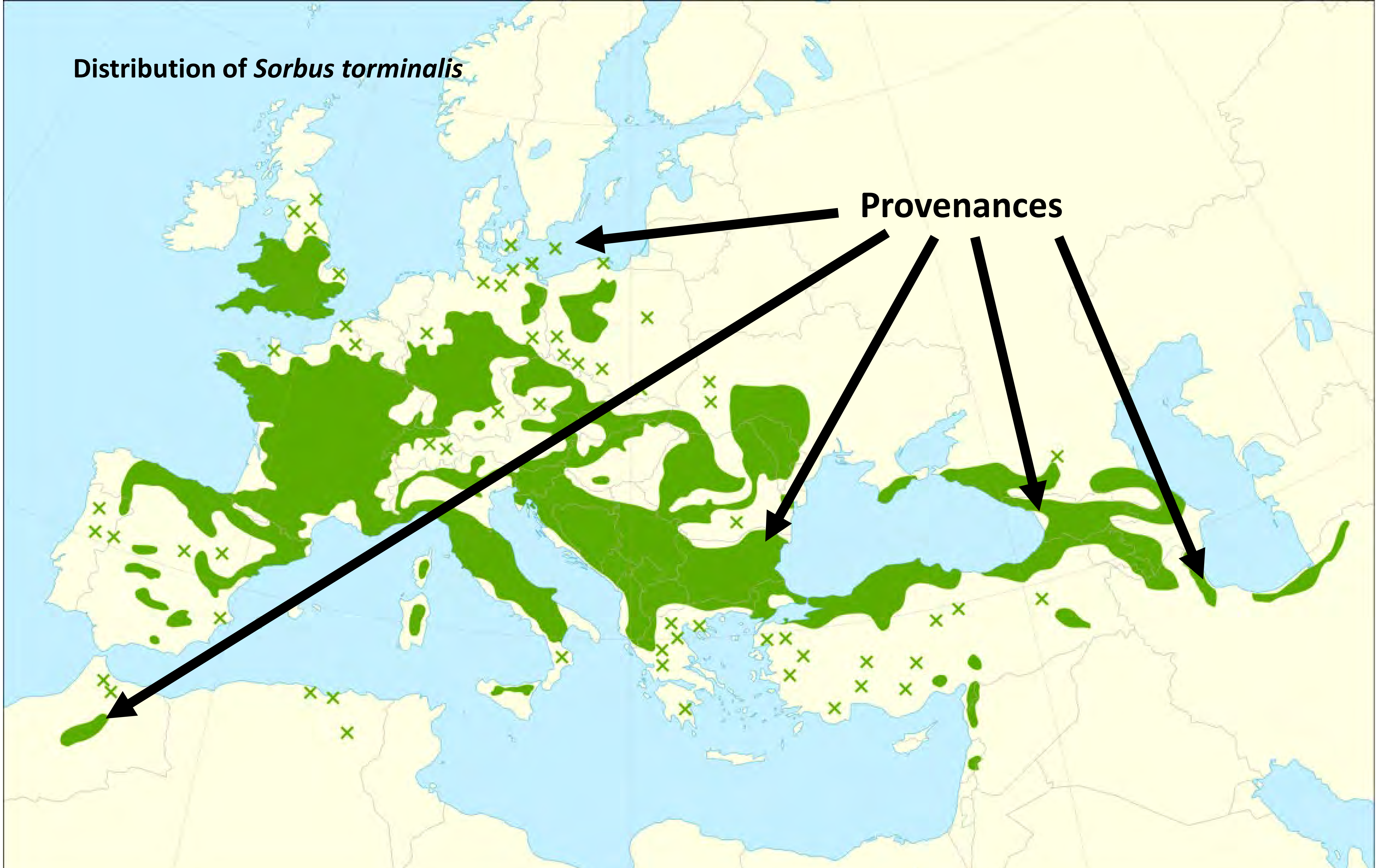

Quercus robur
Quercus imeretina
Quercus pedunculiflora

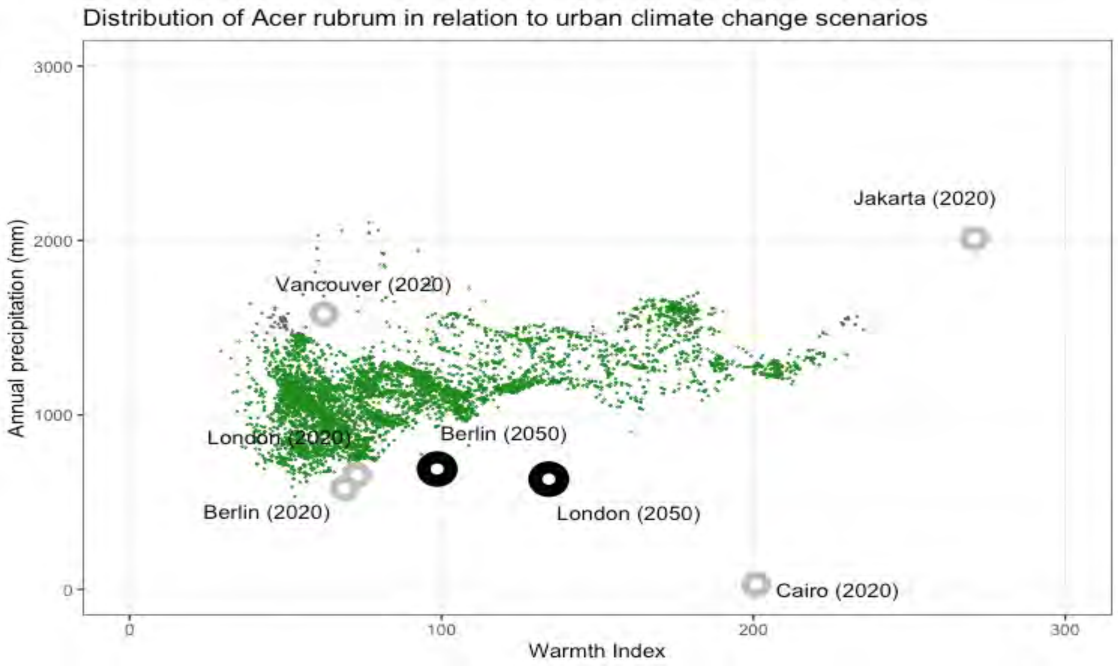

Quercus petraea
Quercus iberica
Quercus dalechampii

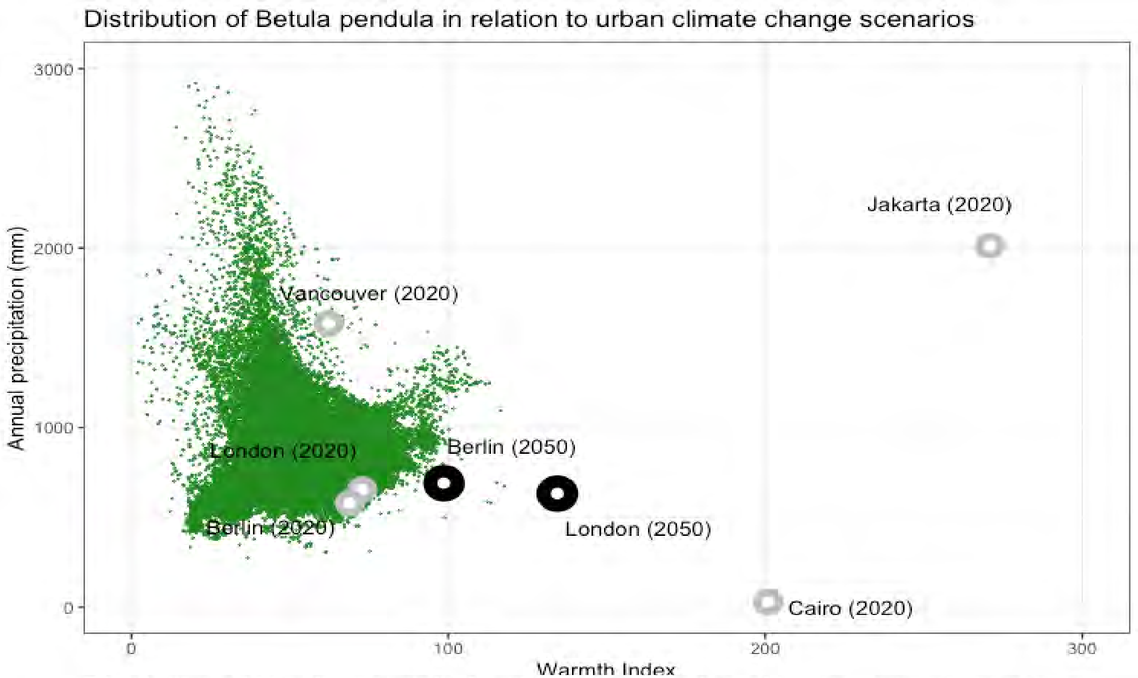
Begrepp vid framtida trädanvändning

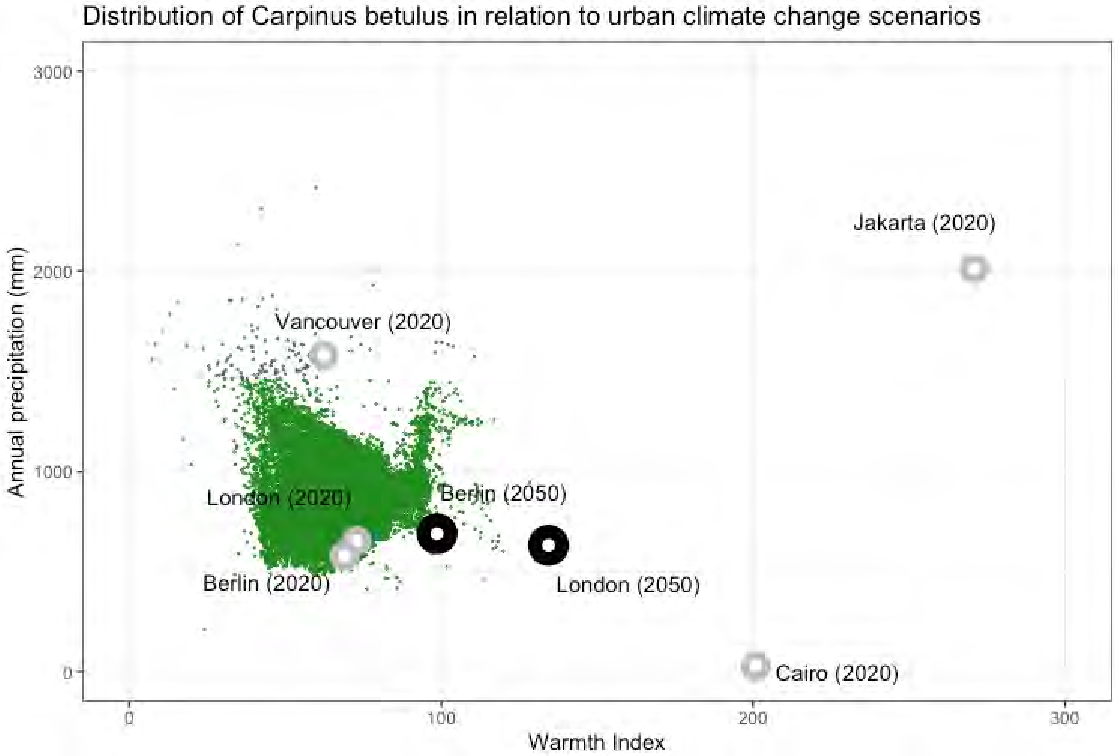

Distribution of *Sorbus torminalis*
Provenances

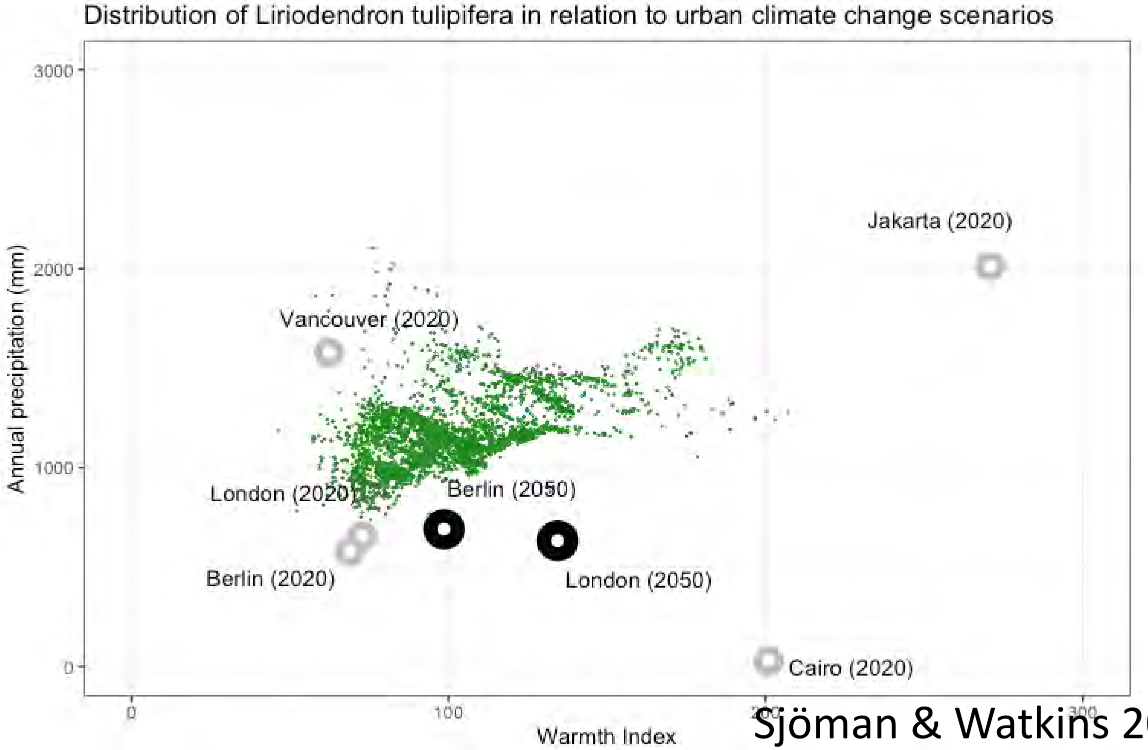
Ecotype

Taibai Mt. 2008. Anders Busse Nielsen (Sjöman et al. 2010)



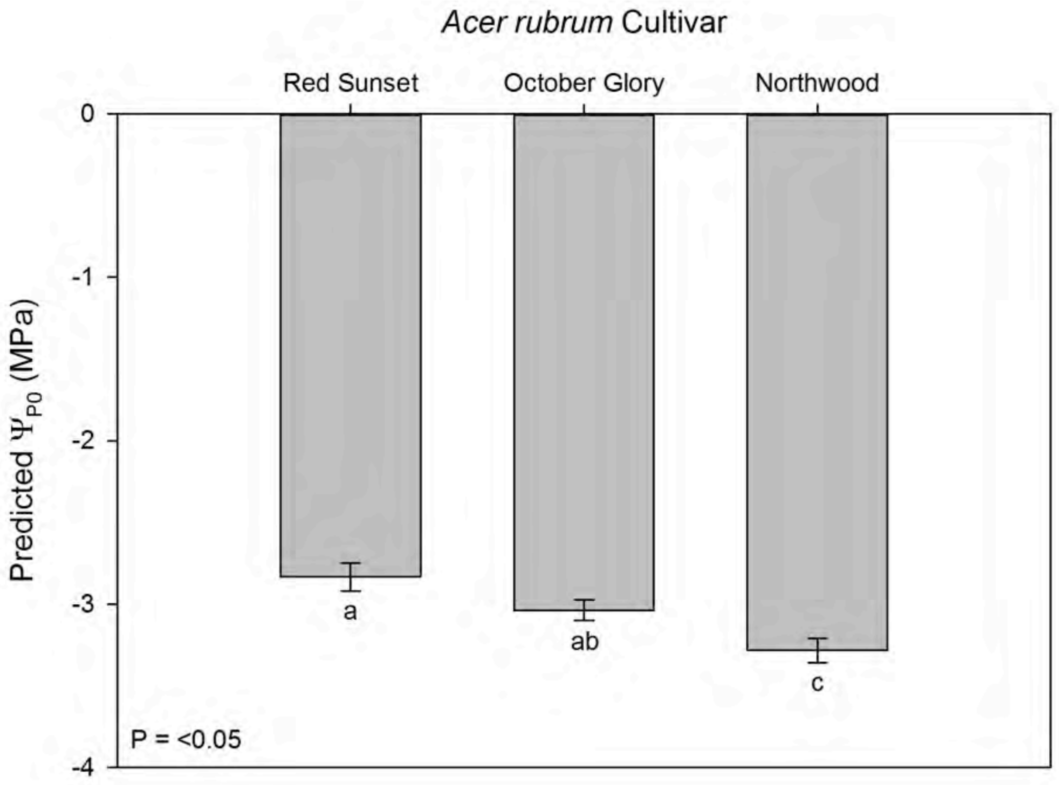






Sjöman & Watkins 2023

Acer rubrum



(Sjöman, Hirons & Bassuk 2015)

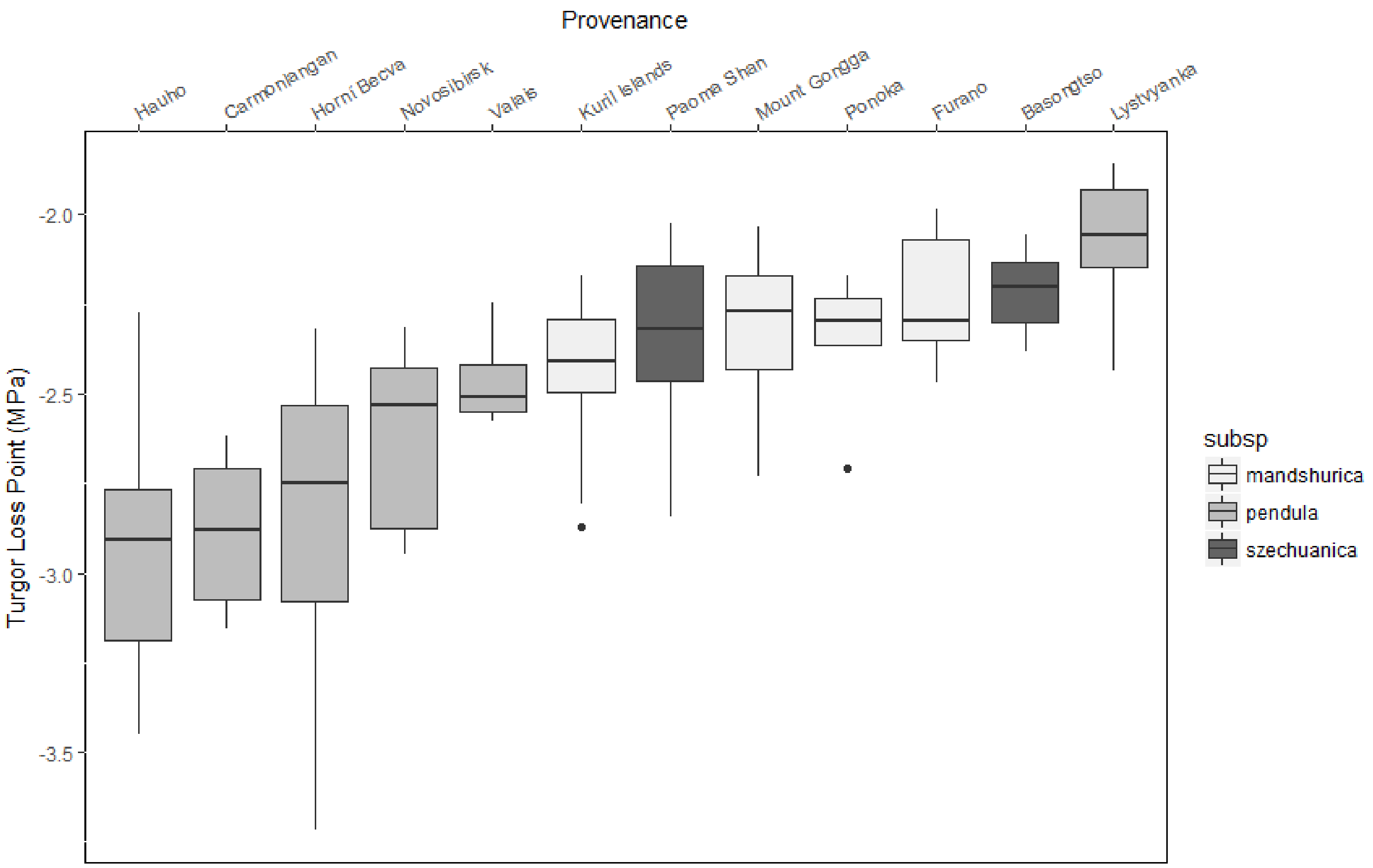
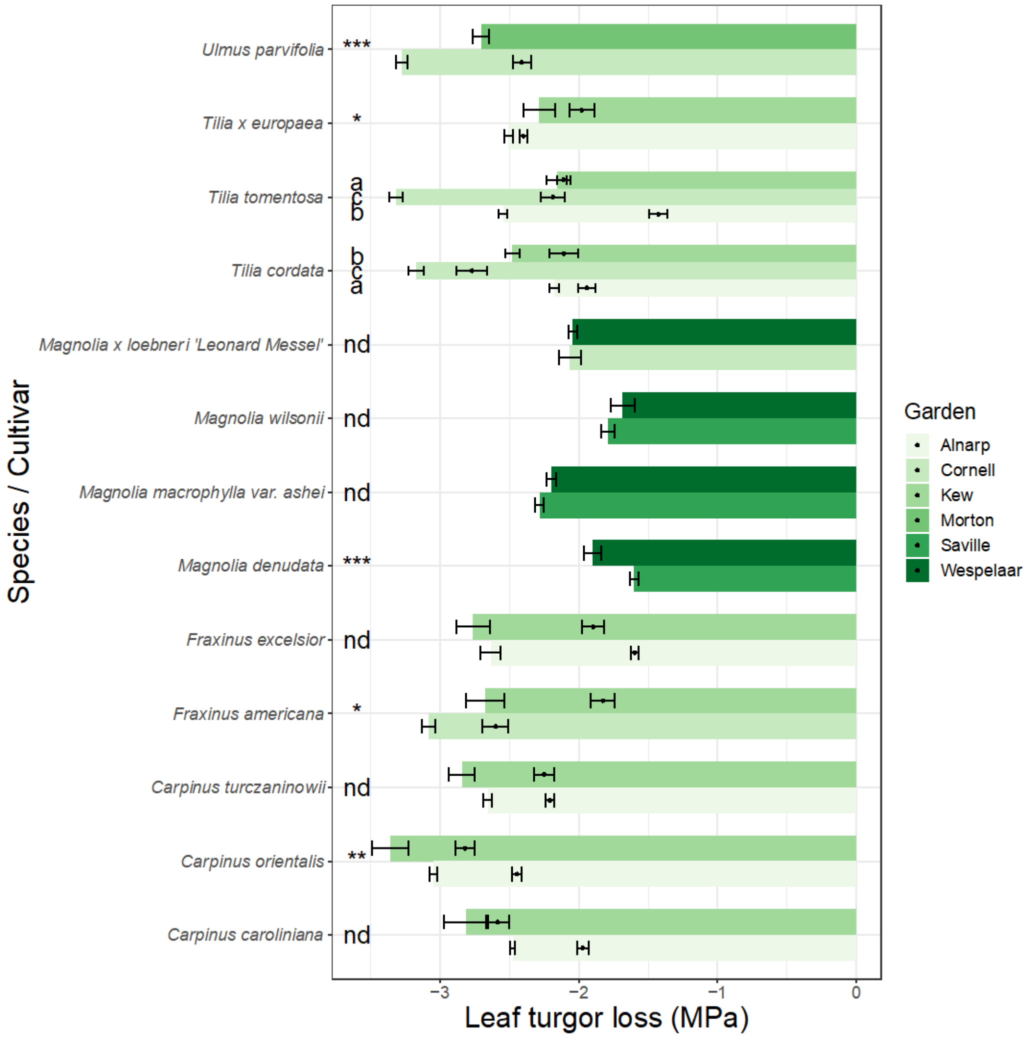


Figure 2.

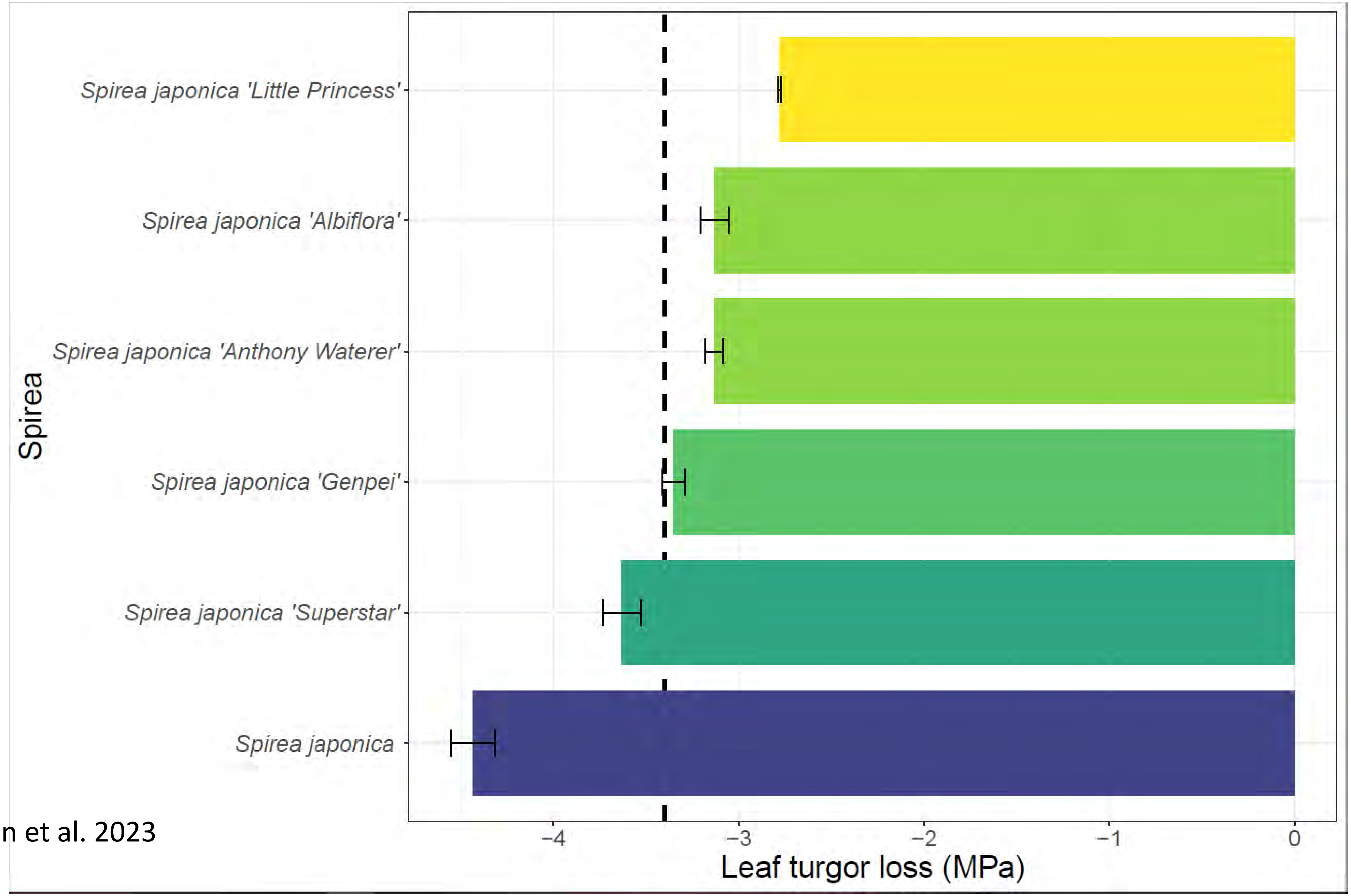
Boxplot of the estimated leaf turgor loss point from different collection sites of Betula pendula.

(Hannus et al. 2021)

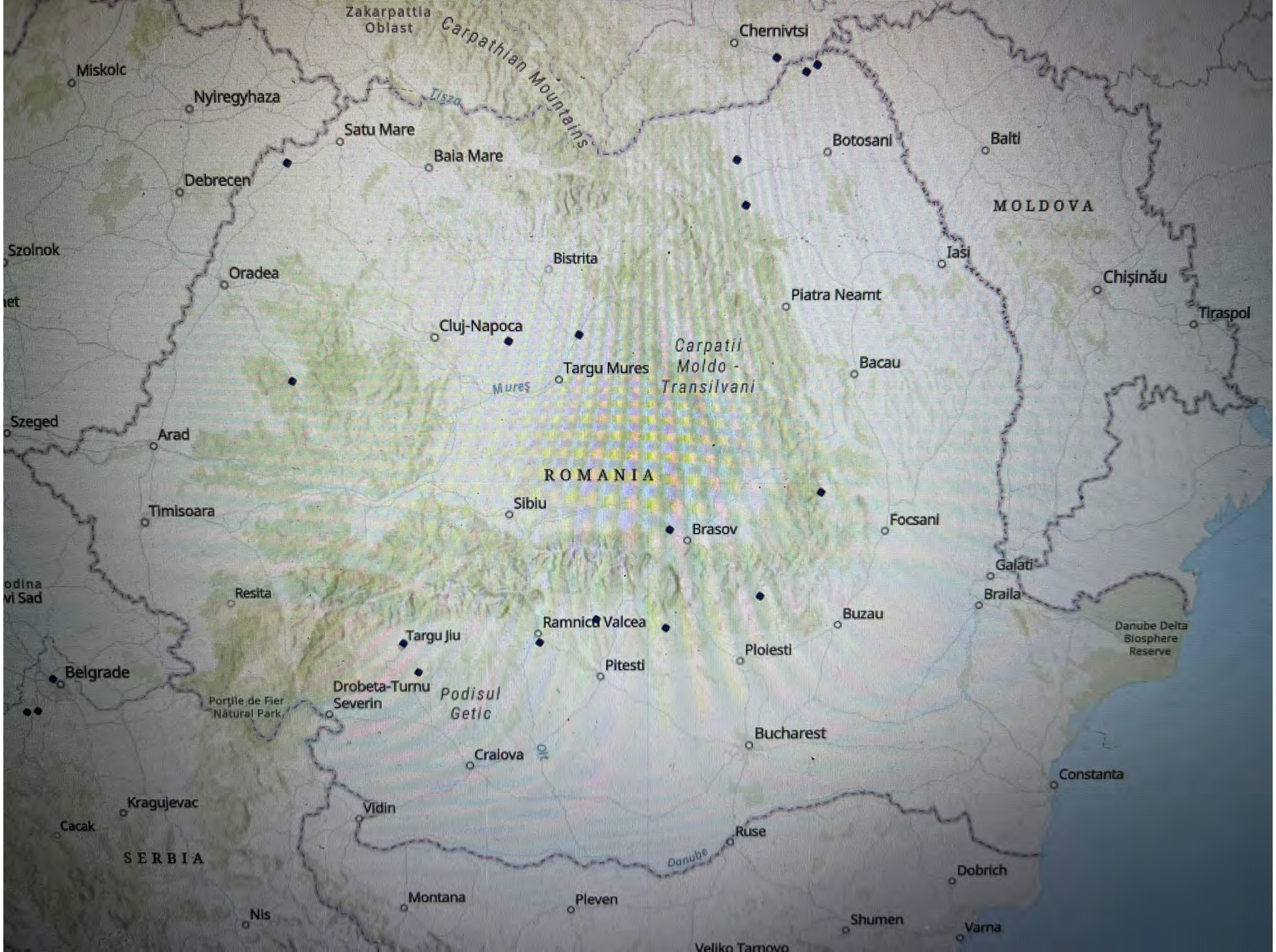


Tilia tomentosa, Moldavia 2010

(Hirons et al. 2021)



Sjöman et al. 2023



Zakarpattia Oblast
Carpathian Mountains
Chernivtsi
Miskolc
Nyiregyhaza
Tisza
Satu Mare
Baia Mare
Botosani
Balti
Debrecen
MOLDOVA
Szolnok
Bistrita
Iasi
Oradea
Chișinău
Piatra Neamt
Tiraspol
Cluj-Napoca
Carpatii Moldo - Transilvani
Targu Mures
Bacau
Mureș
Szeged
Arad
ROMANIA
Sibiu
Timisoara
Focsani
Brasov
Galati
Braila
Resita
Danube Delta Biosphere Reserve
Ramnicu Valcea
Buzau
Targu Jiu
Ploiesti
Pitesti
Belgrade
Drobeta-Turnu Severin
Podisul Getic
Porțile de Fier Natural Park
Bucharest
Craiova
Olt
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Dobrich
Montana
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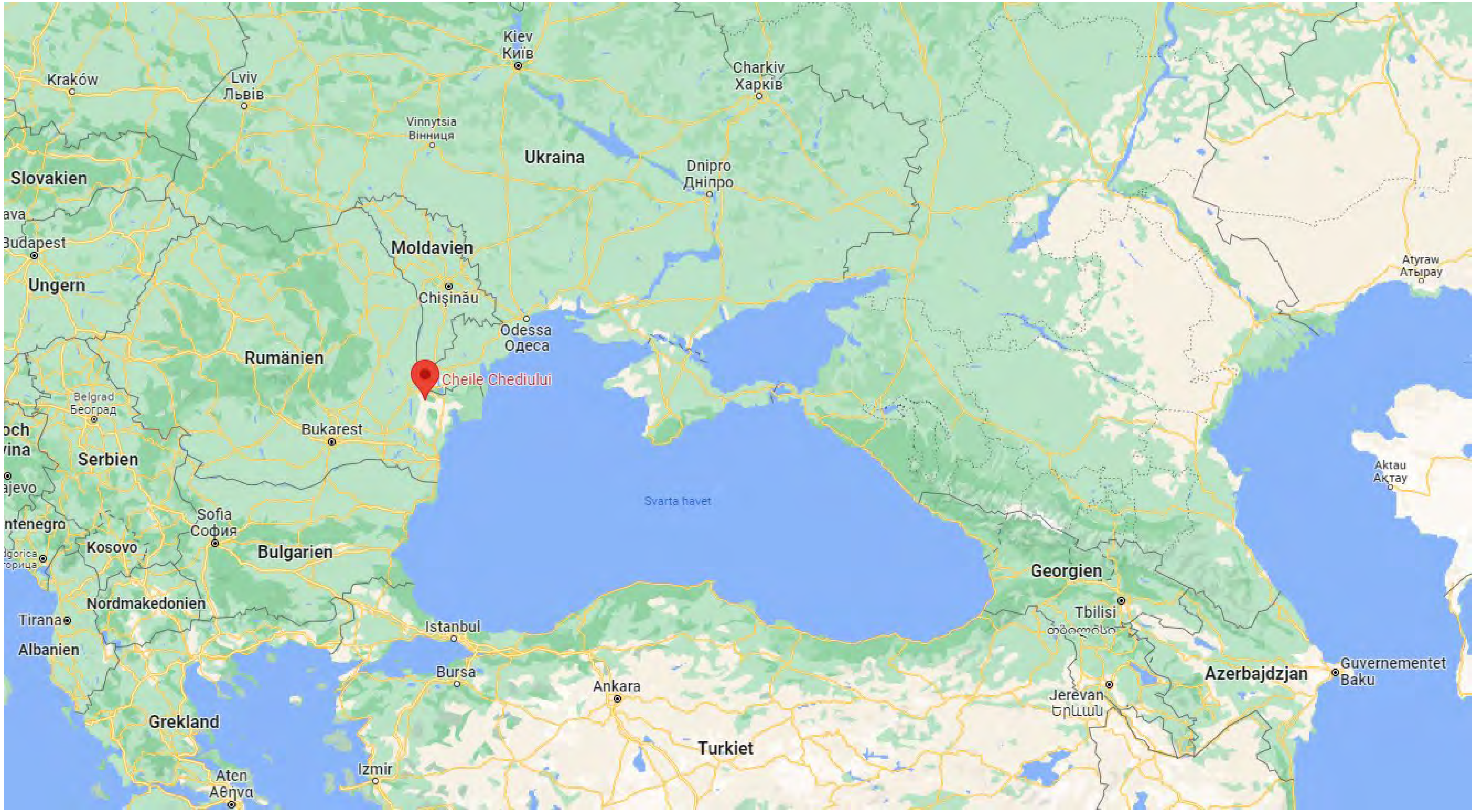
Nis
Shumen
Varna



Source: Google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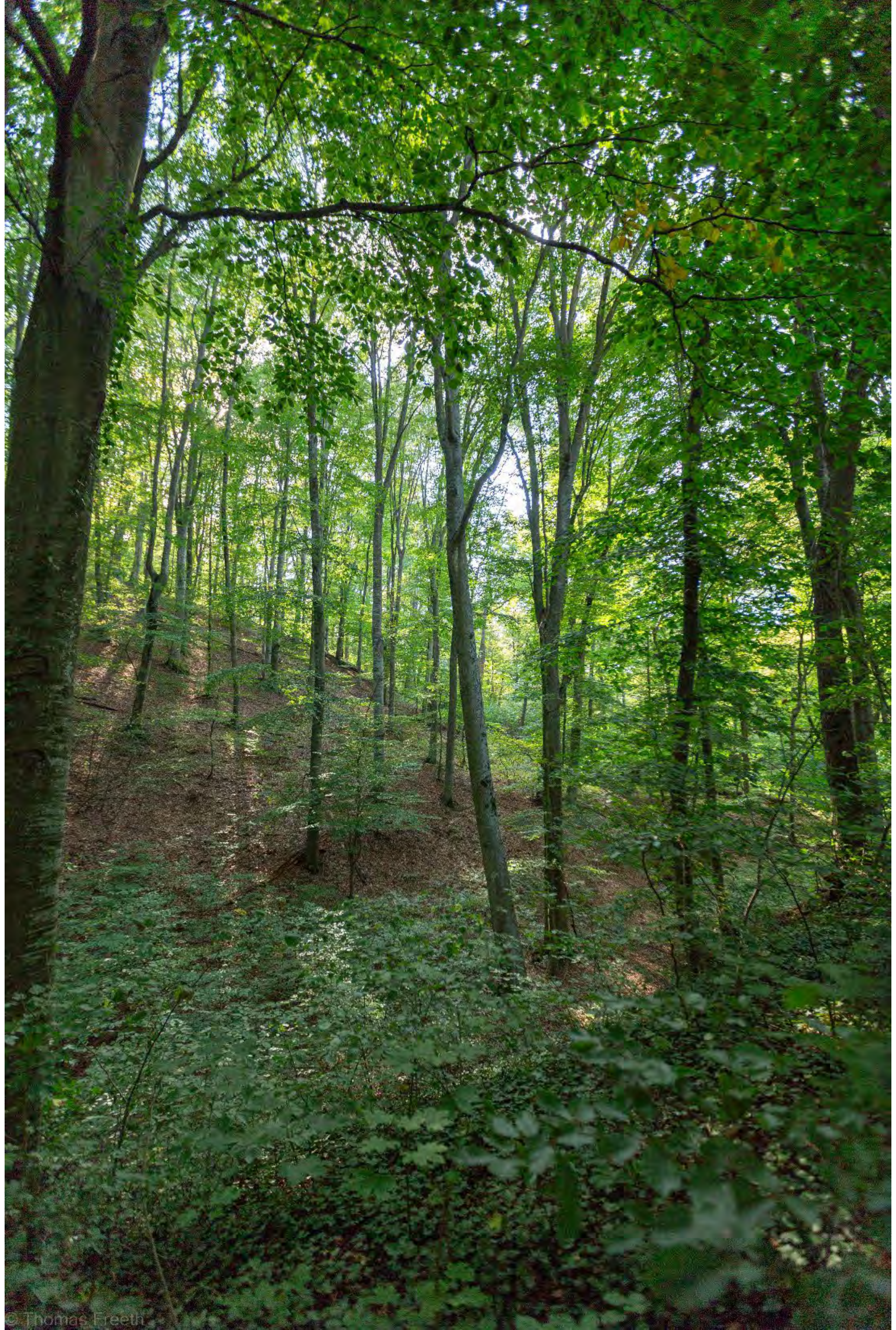
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