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LIFE17 GIE/IT/000561

Scenari futuri sull'effetto dei cambiamenti climatici sulle foreste

Future scenarios on the effect of climate change on forests

Giorgio Vacchiano (Università di Milano)

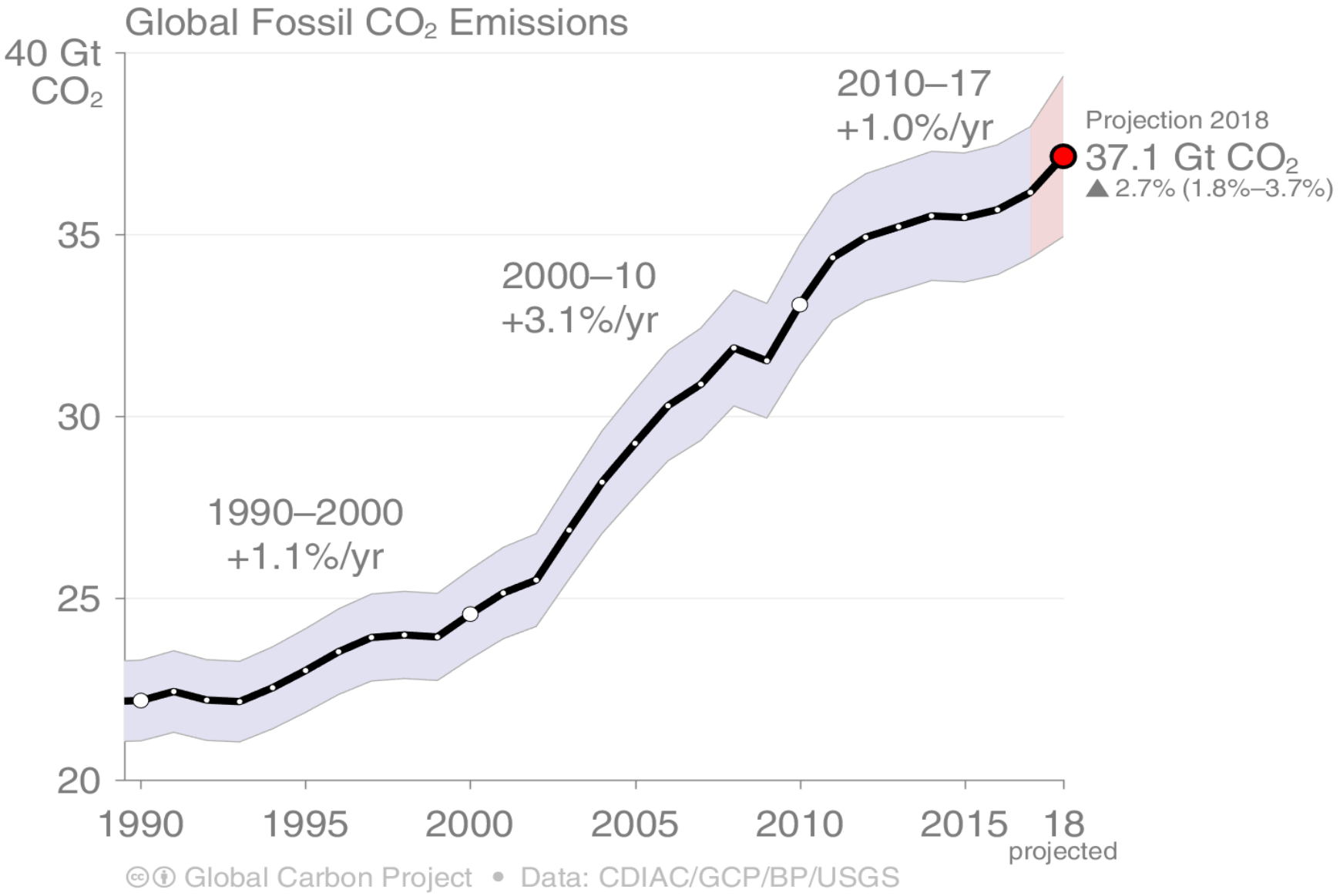
PALERMO | 11 NOVEMBRE 2019

LIFE E RETE NATURA 2000

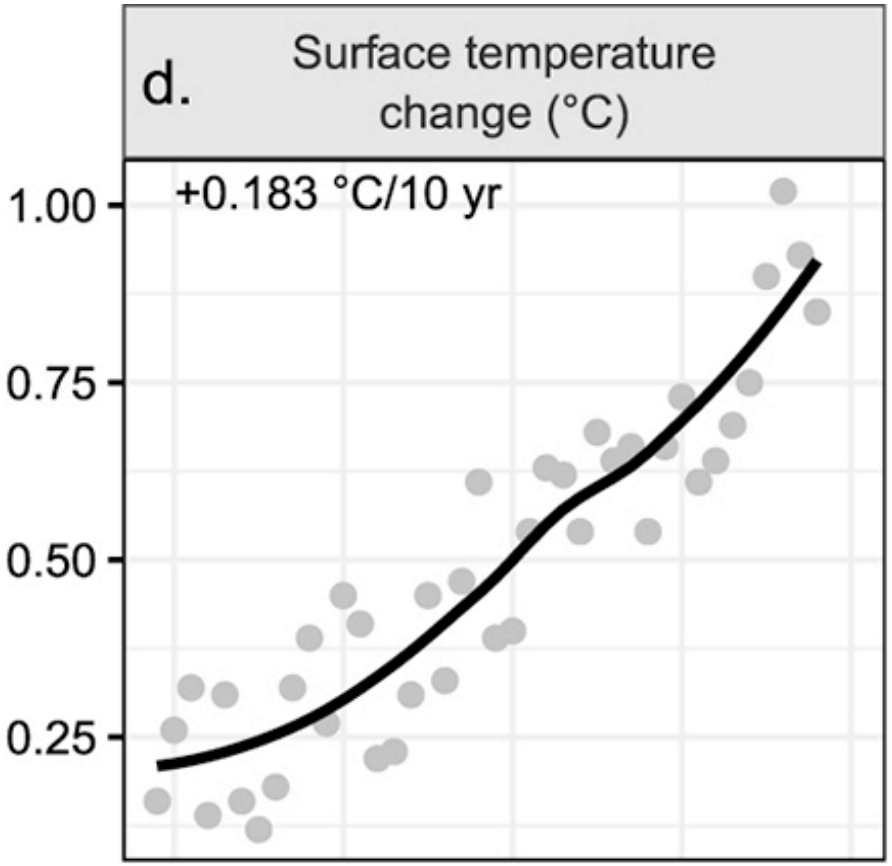
Dall'esperienza dei Progetti verso un modello condiviso per la Gestione Forestale

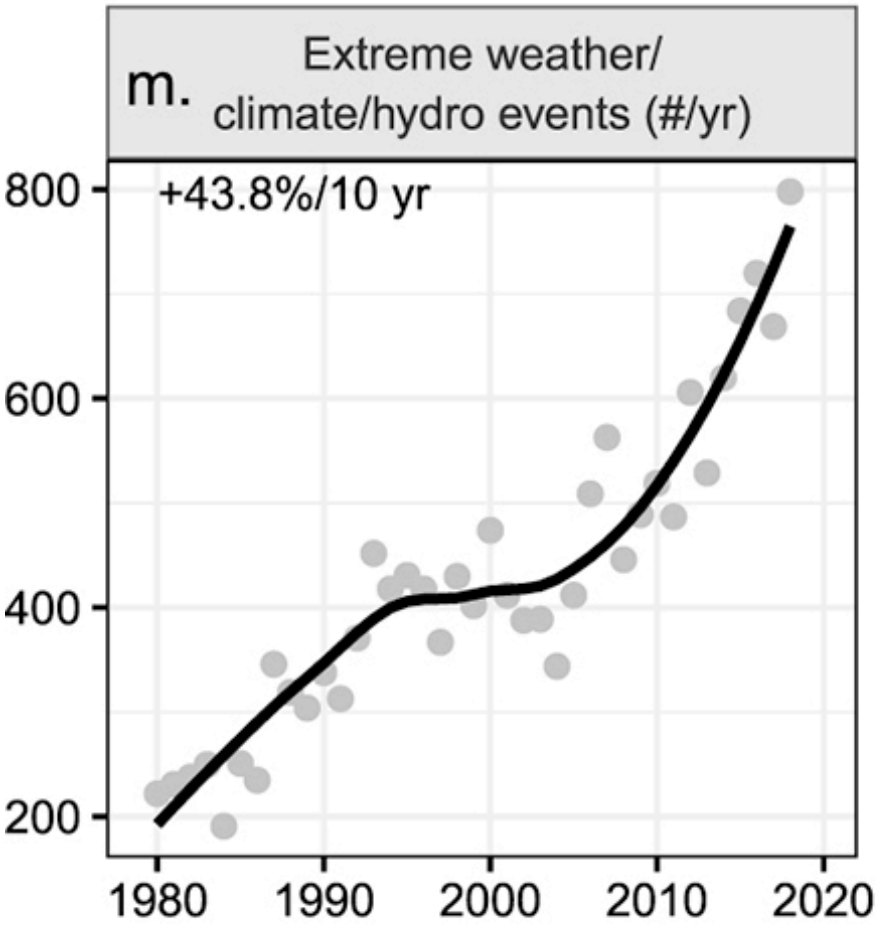
LIFE AND NATURA 2000 NETWORK

From Projects experience to a shared model for Forest Management

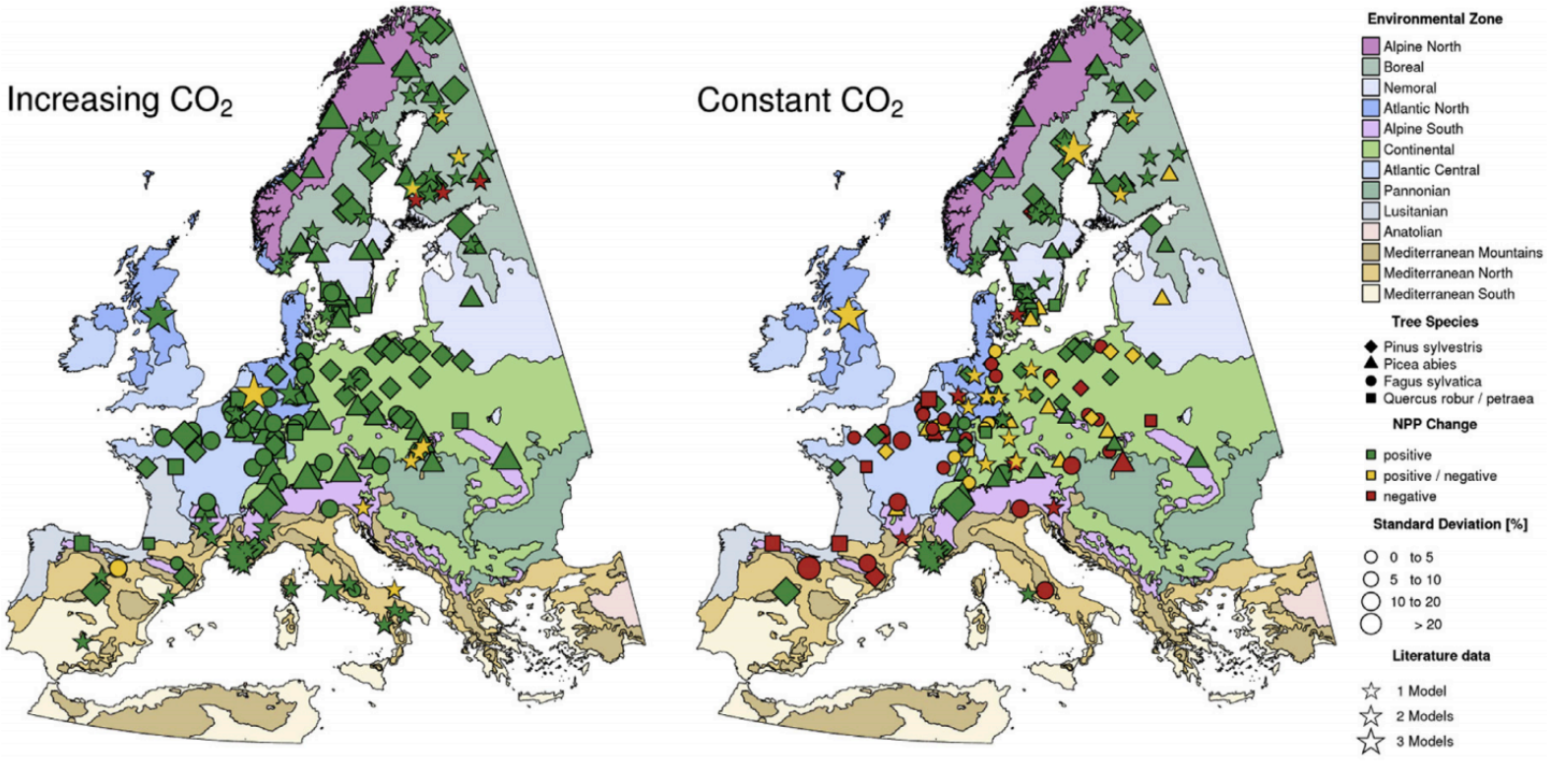

Global Fossil CO_2 Emissions
40 Gt CO_2
35
30
25
20
1990–2000
+1.1%/yr
2000–10
+3.1%/yr
2010–17
+1.0%/yr
Projection 2018
37.1 Gt CO_2
▲ 2.7% (1.8%–3.7%)
1990
1995
2000
2005
2010
2015
18
projected
Global Carbon Project • Data: CDIAC/GCP/BP/USGS

https://doi.org/10.1093/biosci/biz088

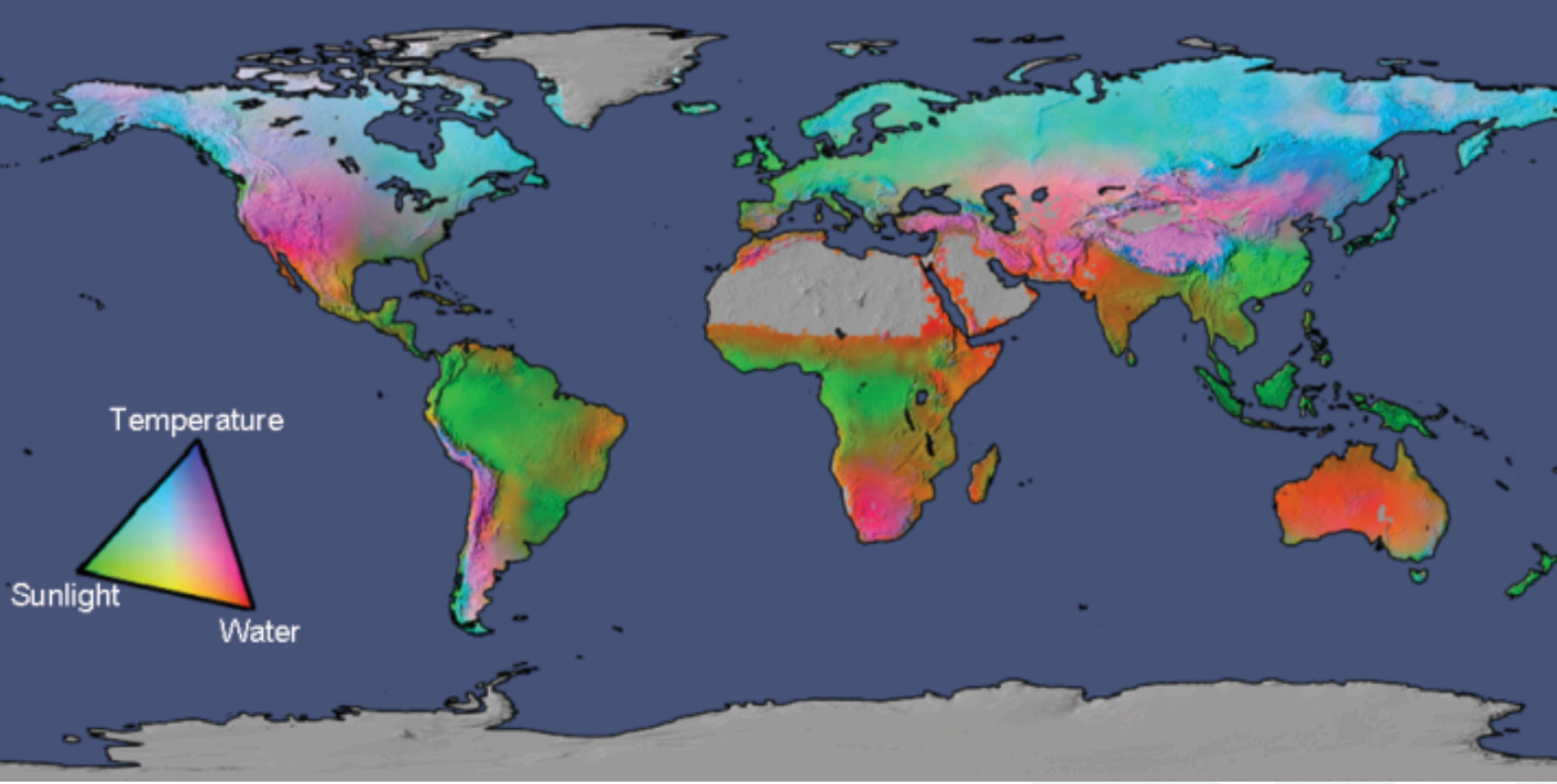




Effect on Net Primary Productivity

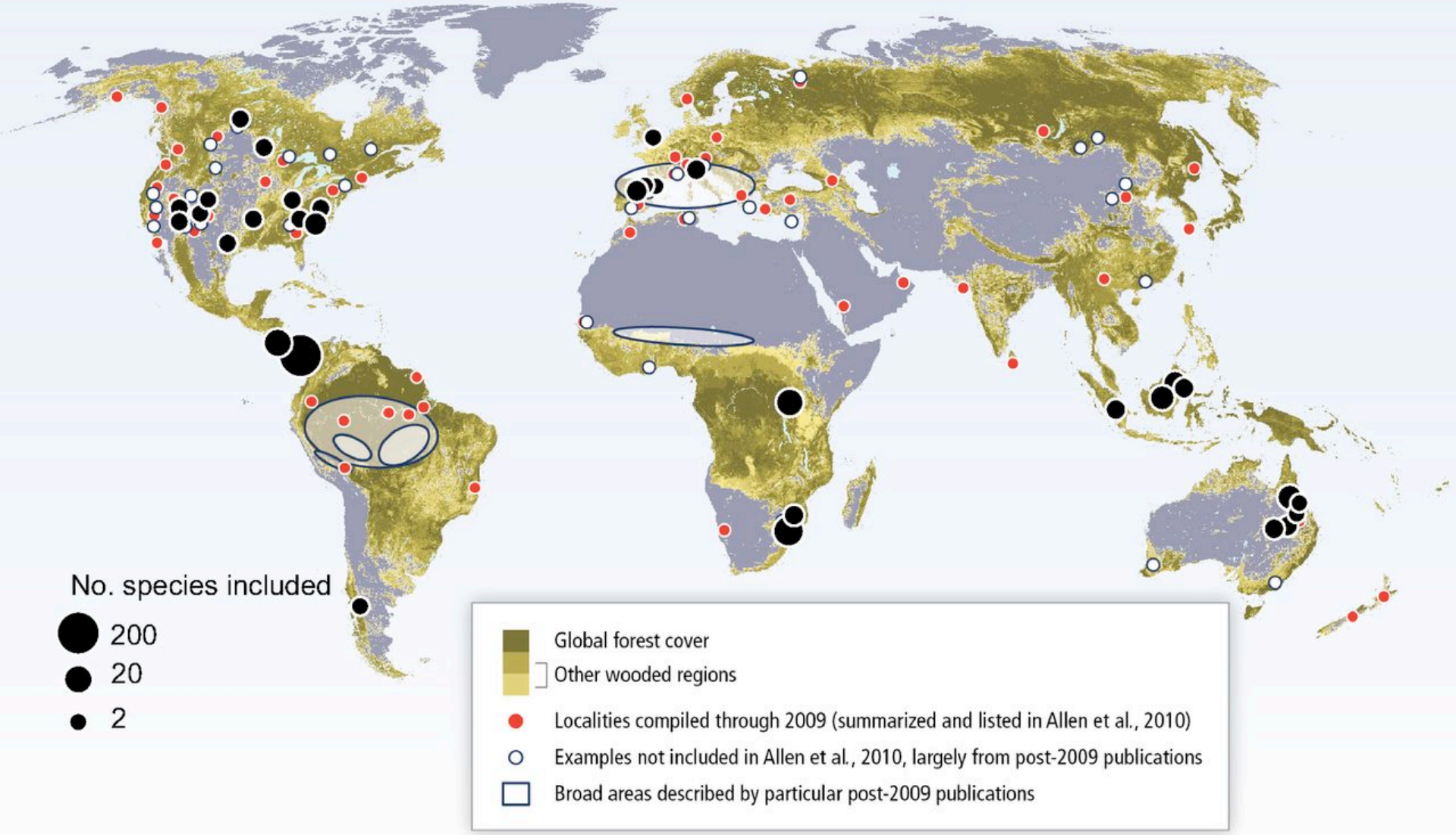


https://www.sciencedirect.com/science/article/pii/S030147971400379X



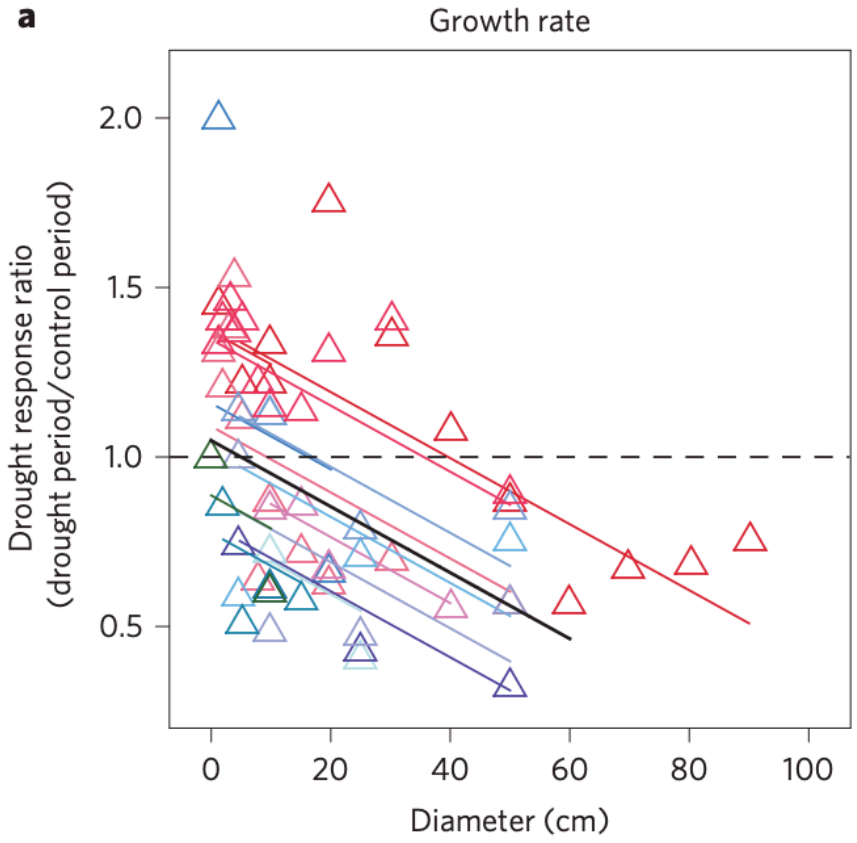
Potential limits to vegetation net primary production based on fundamental physiological limits

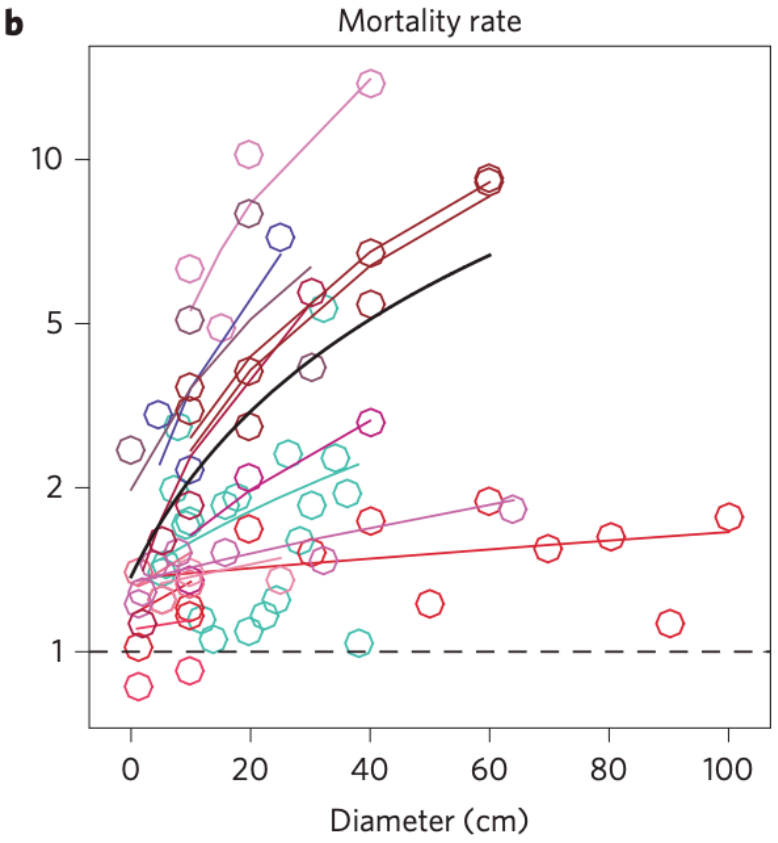
https://onlinelibrary.wiley.com/doi/10.1111/j.1365-2486.2006.01134.x



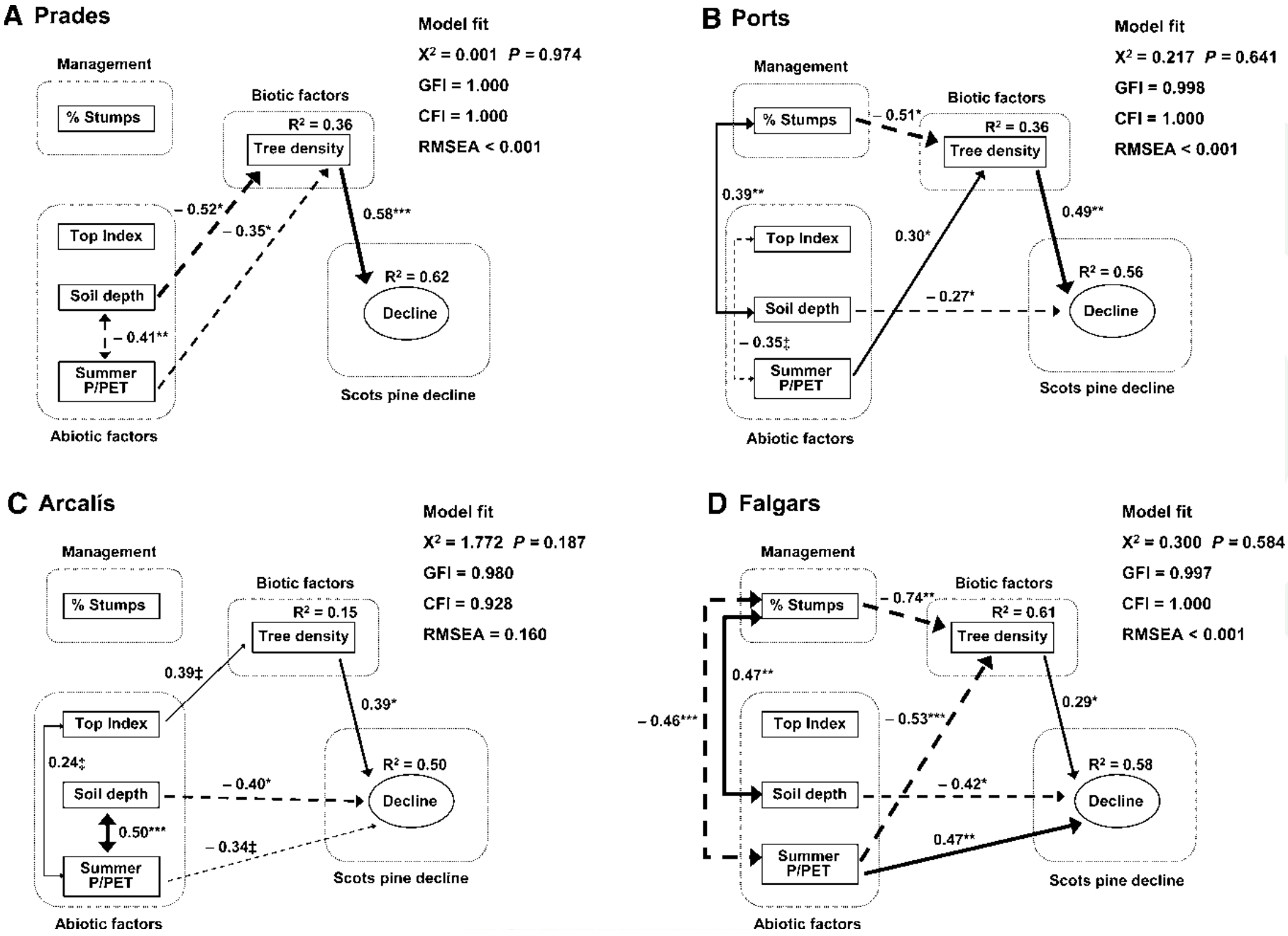
https://www.pnas.org/content/113/18/5024

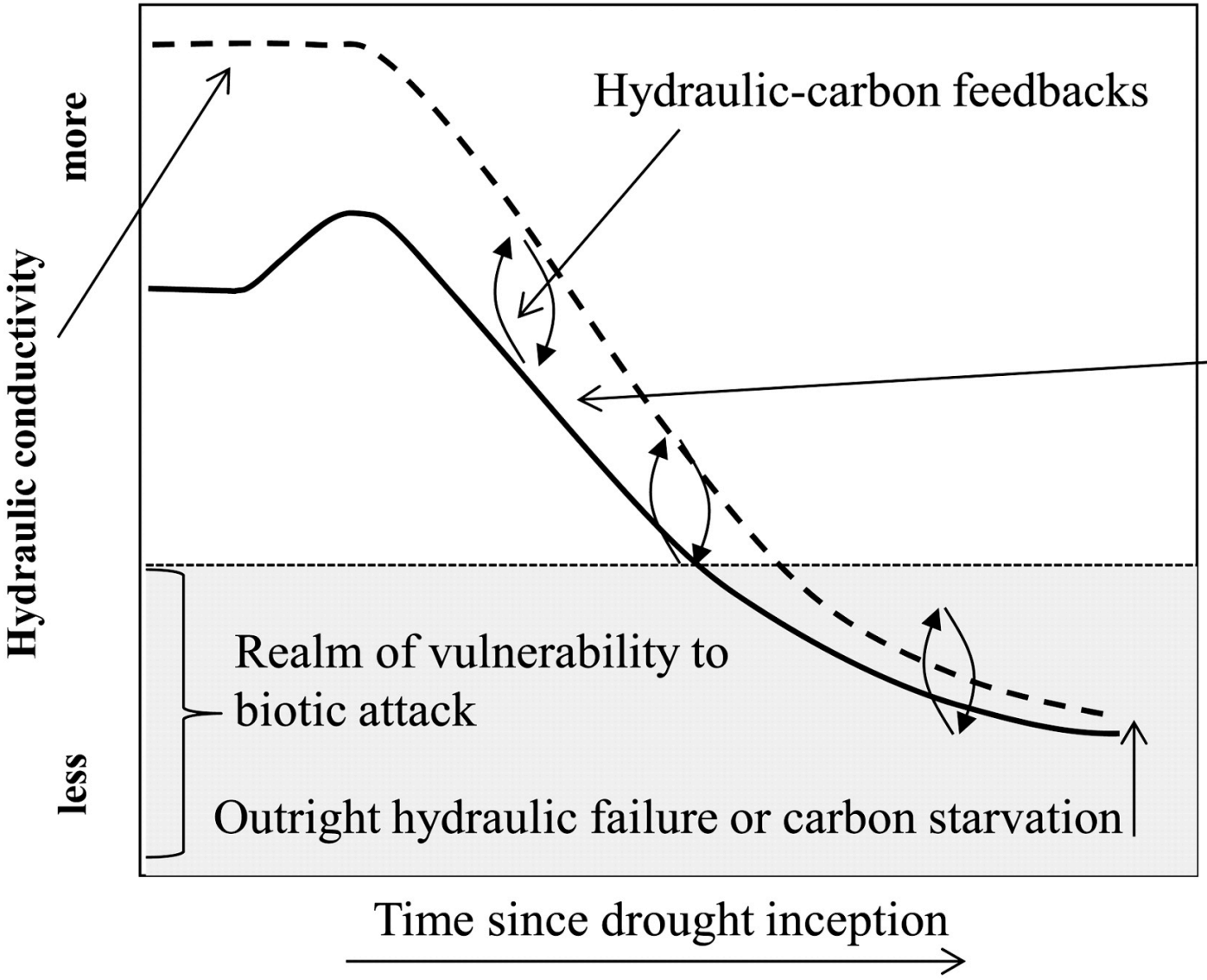
https://www.nature.com/articles/nplants2015139





https://link.springer.com/article/10.1007/s10021-012-9615-2





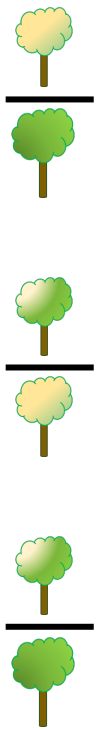
http://www.plantphysiol.org/content/155/3/1051

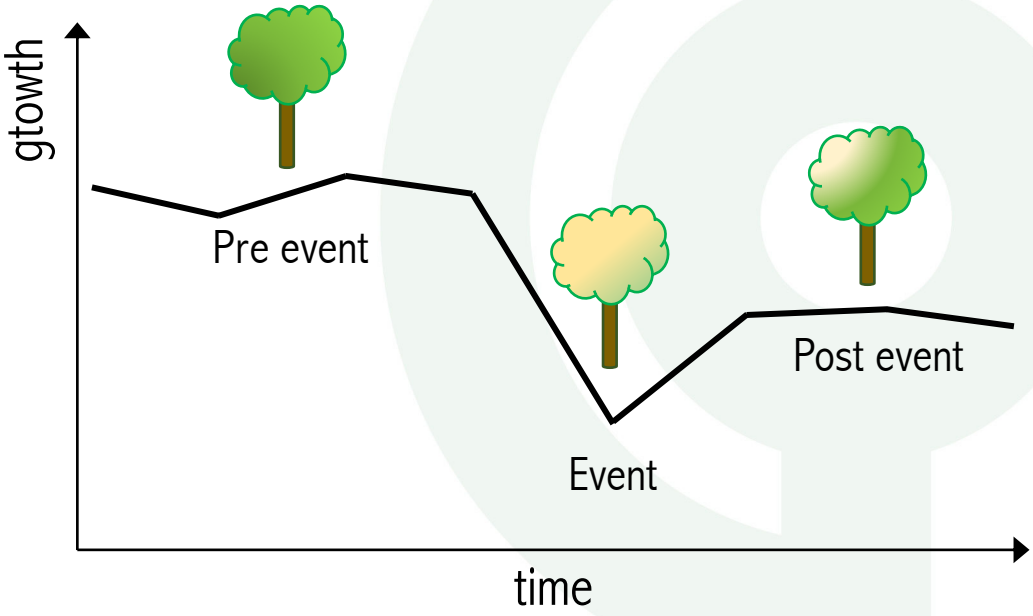
Castagneri et al., in prep.

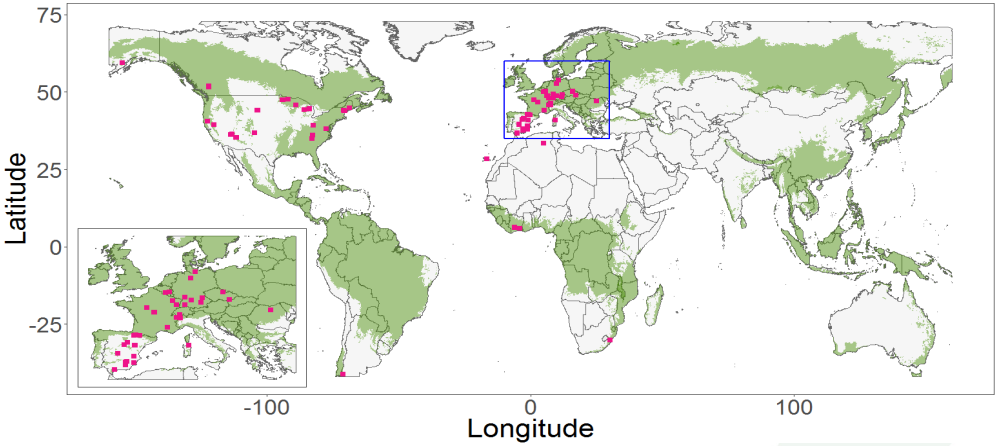
$$\text{Resistance} = \frac{\text{Event}}{\text{Pre}}$$

$$\text{Recovery} = \frac{\text{Post}}{\text{Event}}$$

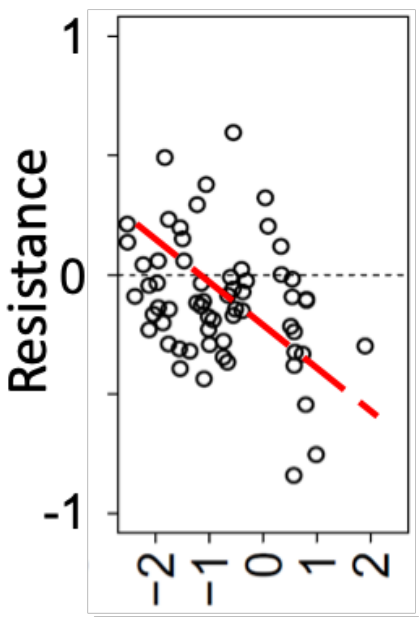
$$\text{Resilience} = \frac{\text{Post}}{\text{Pre}}$$

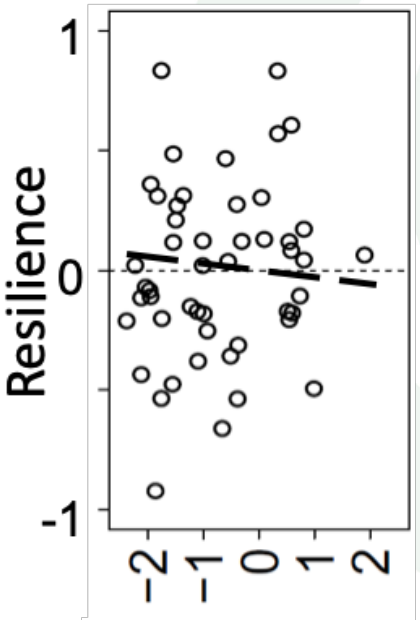




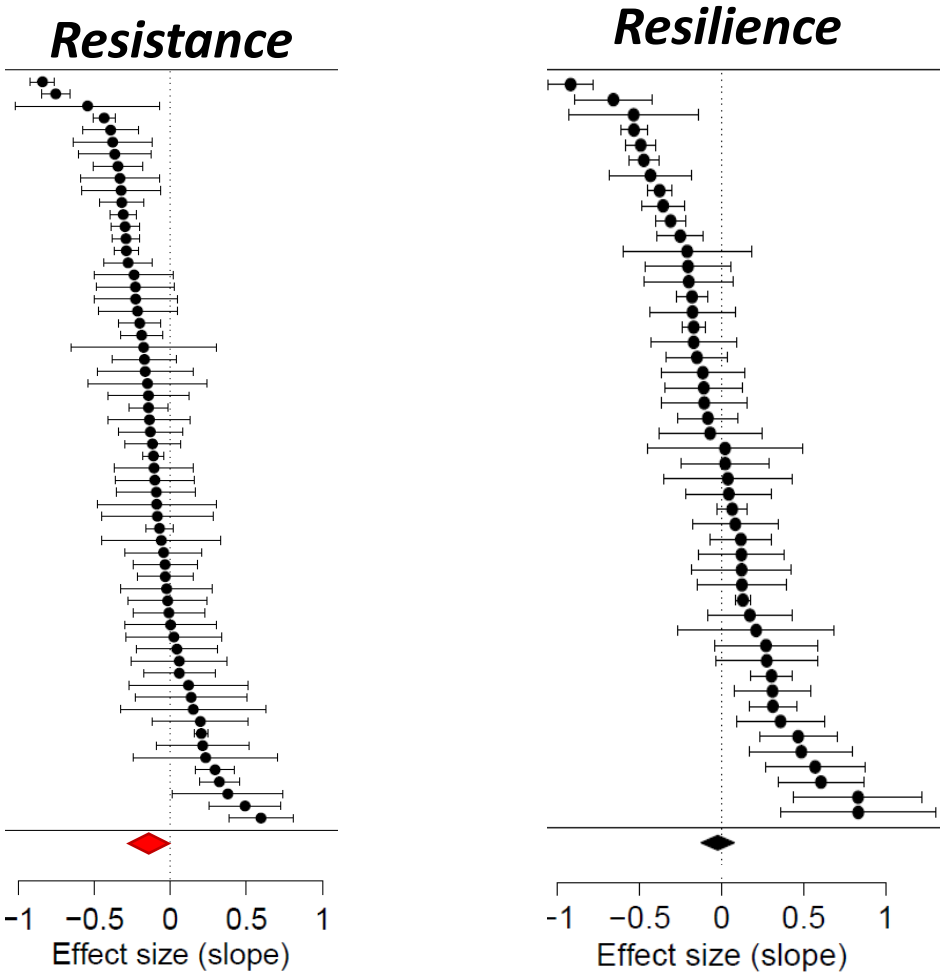


Castagneri et al., in prep.



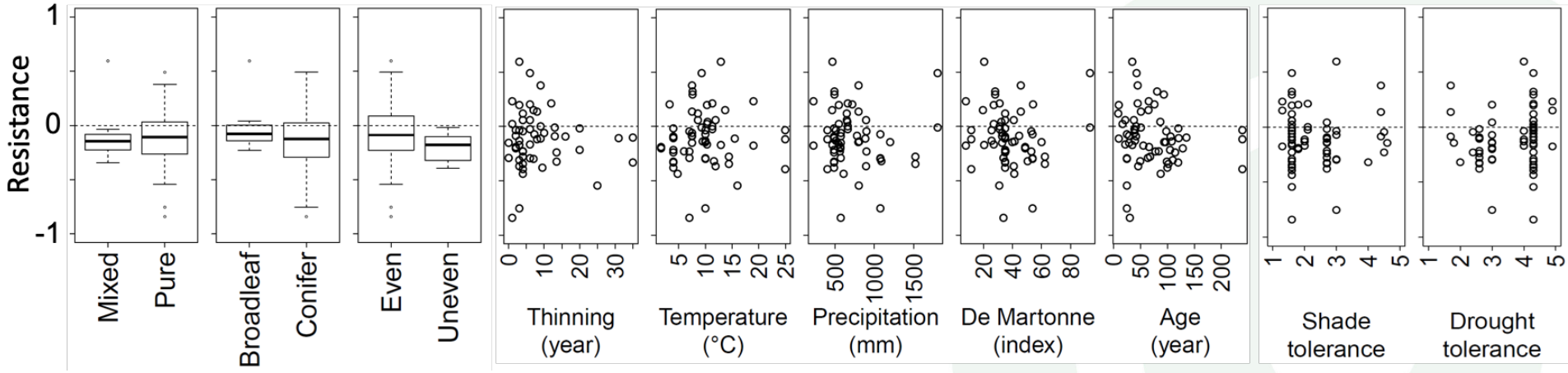


Effect of competition (basal area)



Castagneri et al., in prep.

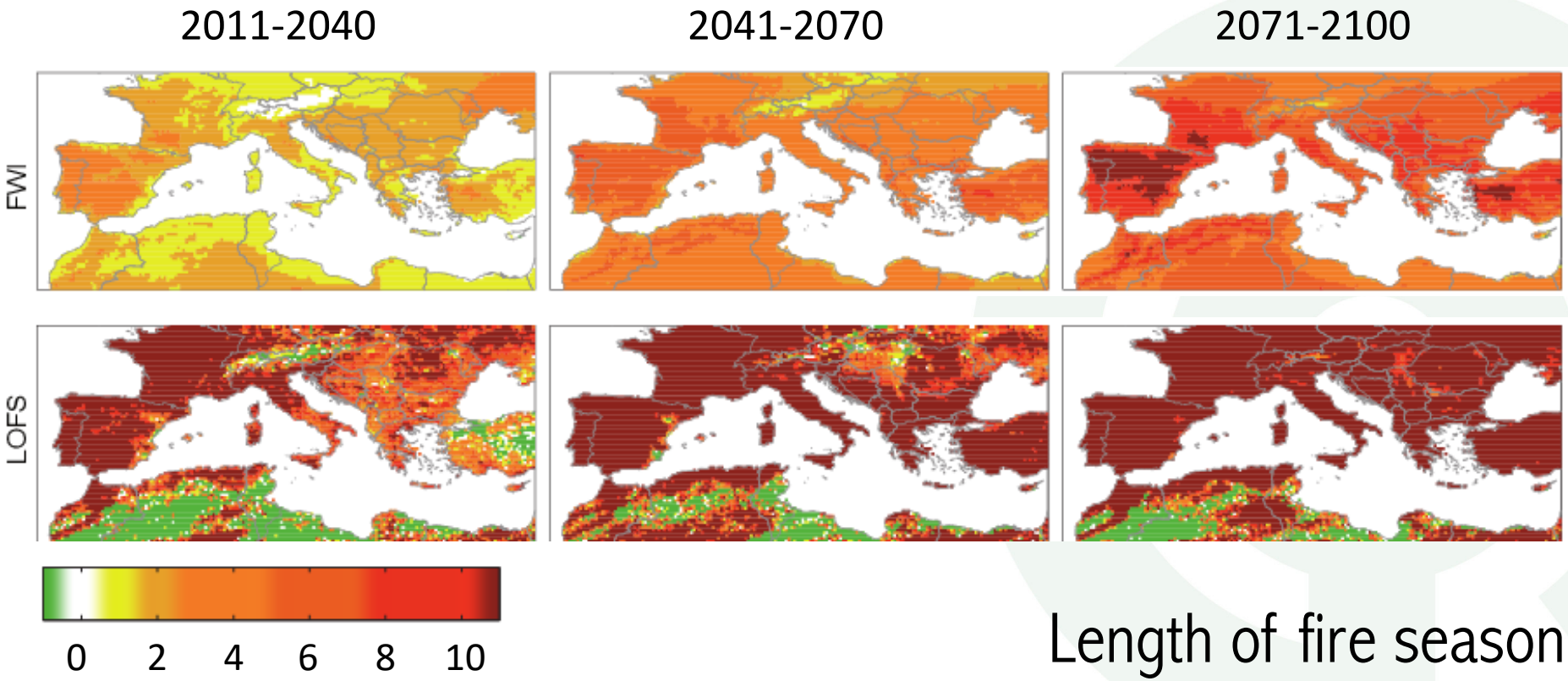
Effect of competition (basal area)



No identified cause for observed differences in R/R (structure, composition, climate, age, life traits)

Castagneri et al., in prep.

Fire Weather Index

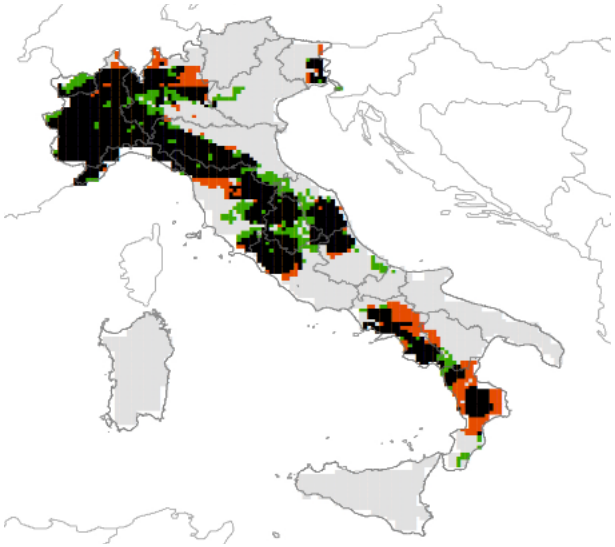


Length of fire season

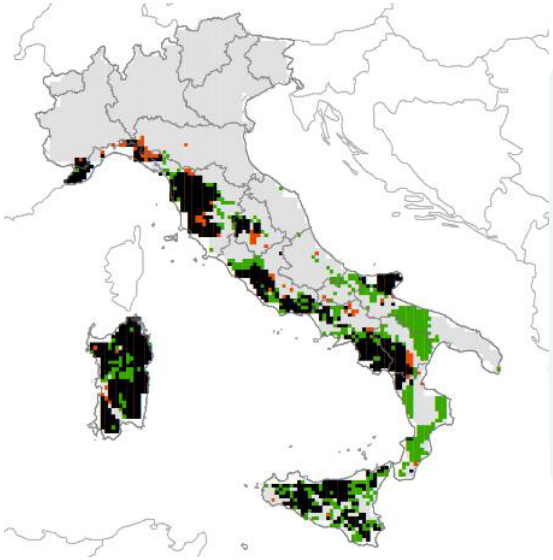
https://link.springer.com/article/10.1007/s10584-013-1005-z

Forest cover unchanged
Increasing forest cover
Decreasing forest cover

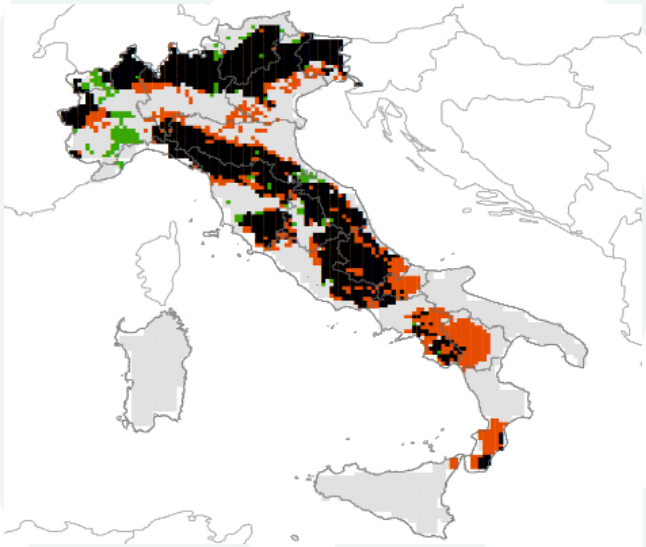
Castanea sativa



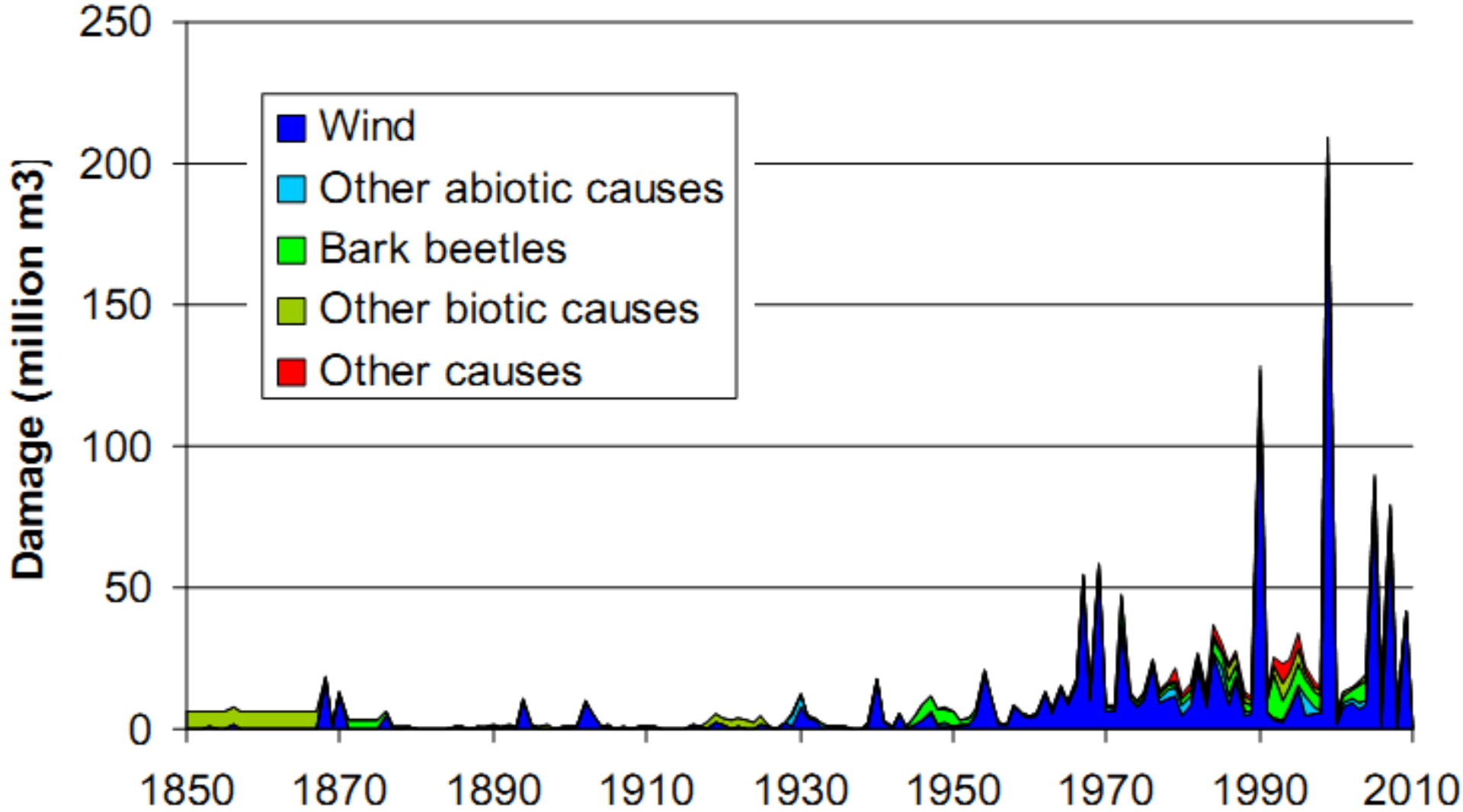
Mediterranean scrub



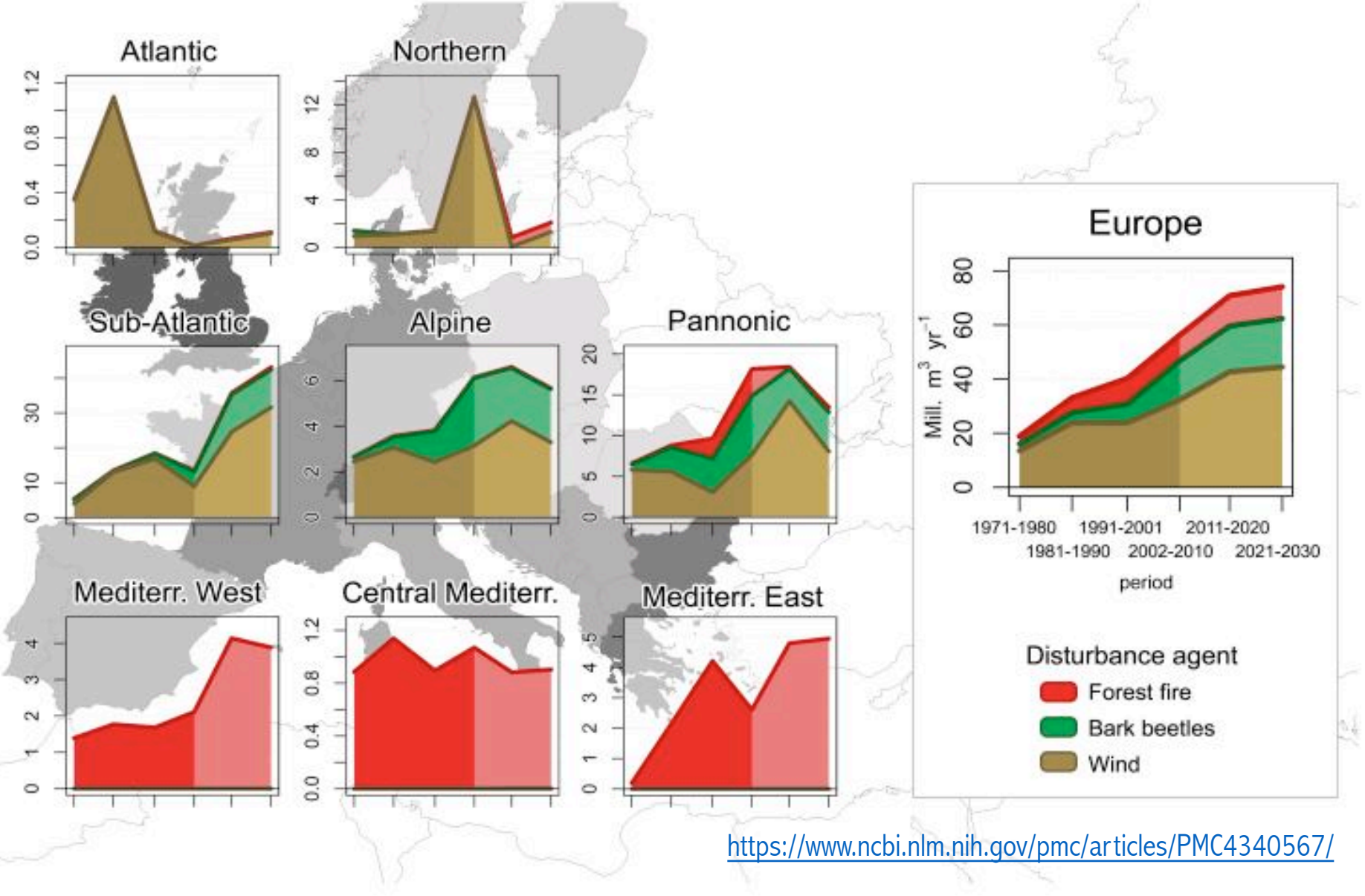
Fagus sylvatica



http://www.minambiente.it/comunicati/ambiente-parte-consultazione-su-piano-nazionale-adattamento-cambiamenti-climatici



https://dissertationesforestales.fi/pdf/article1841.pdf

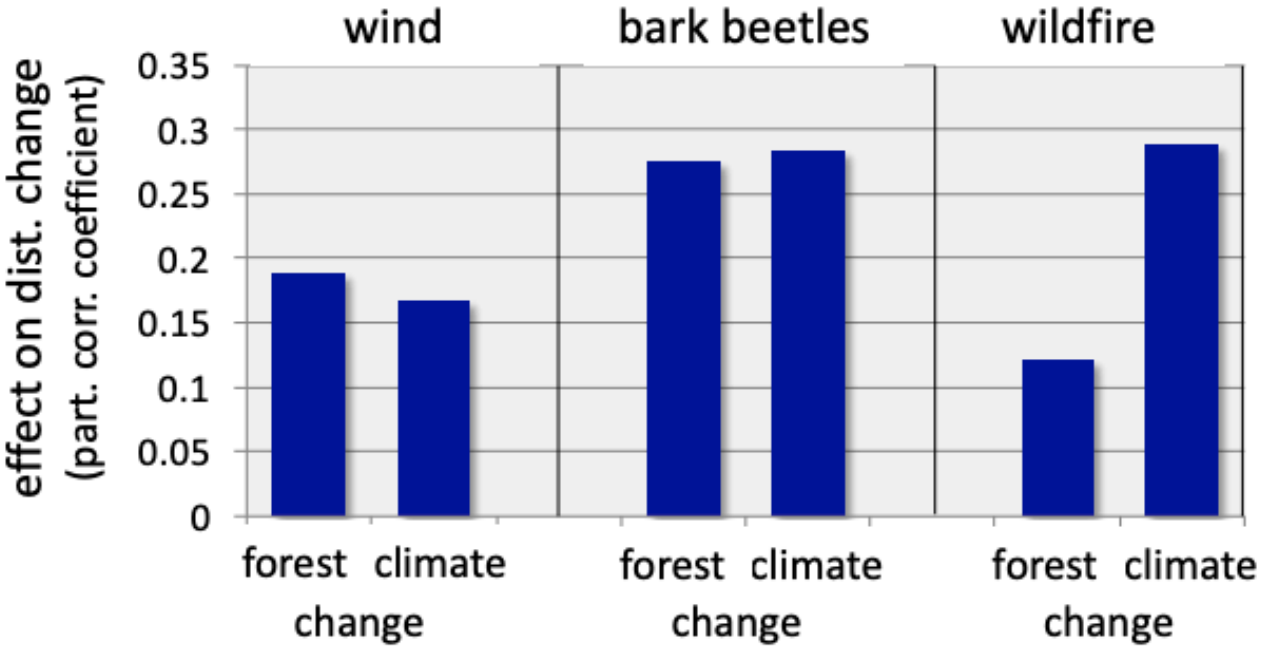


https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4340567/

Climate change is an important driver of increasing disturbances

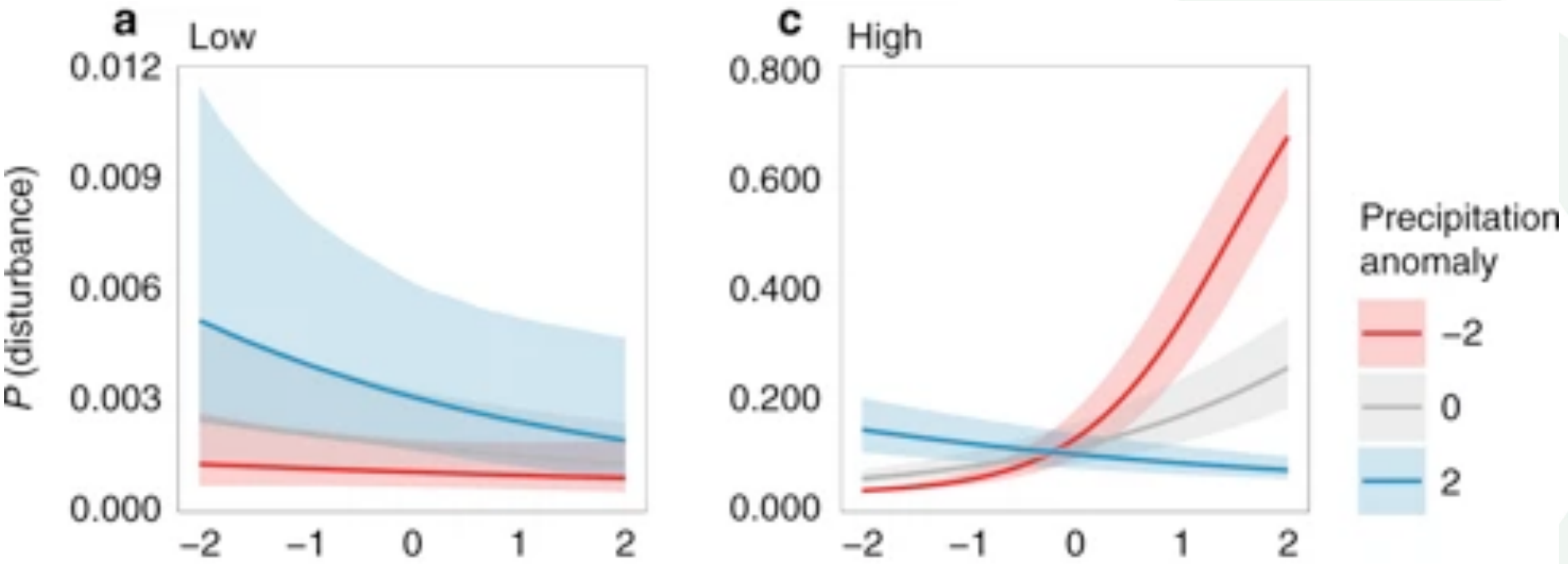
…but…

also management contributed (via changes in forest structure and composition)

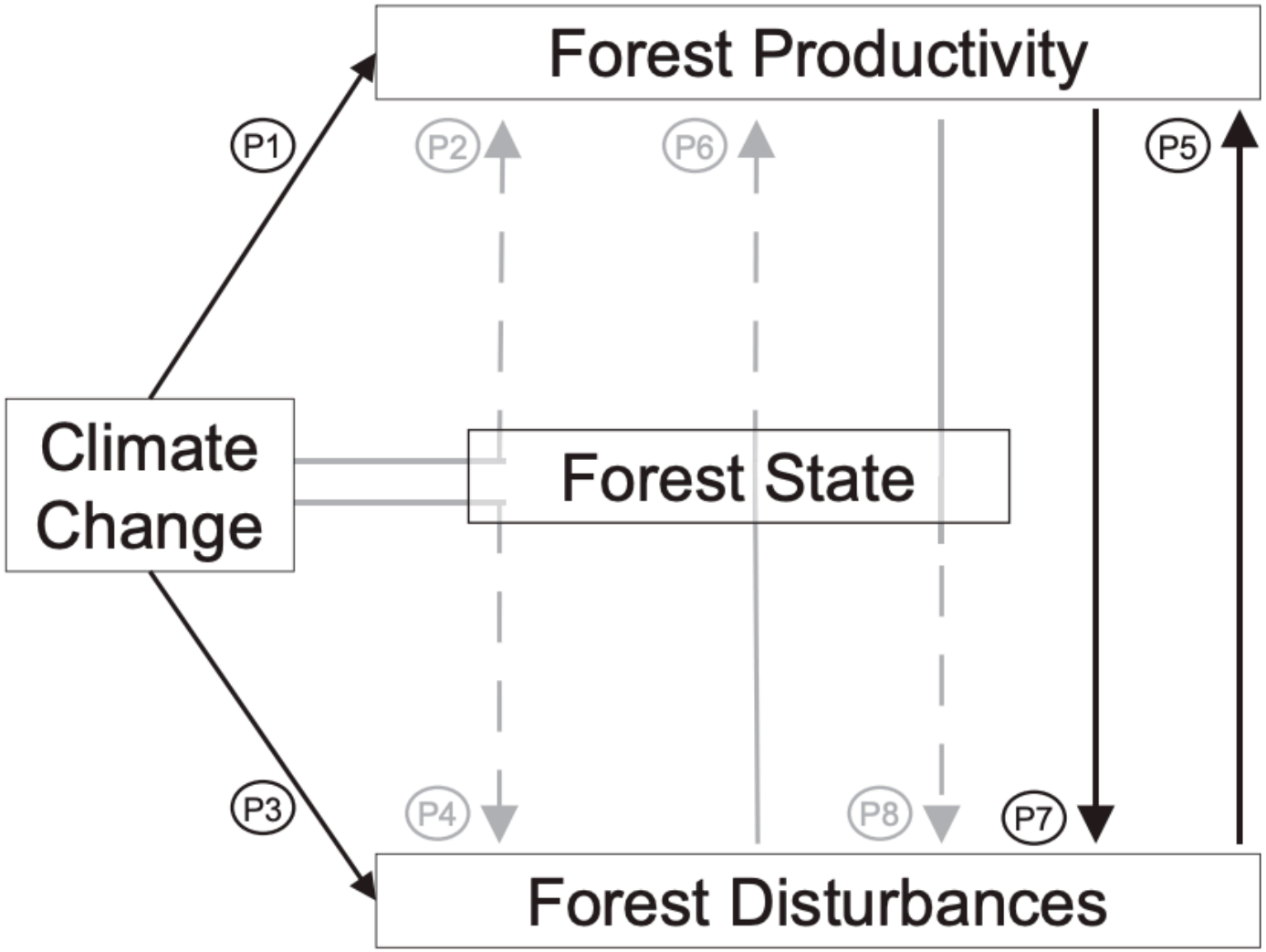


Seidl et al. (2011, Glob. Change Biol.)

https://www.nature.com/articles/s41467-018-06788-9



Predicted response of disturbance probability to temperature anomaly, modulated by precipitation anomaly



https://iopscience.iop.org/article/10.1088/1748-9326/aa5ef1/meta

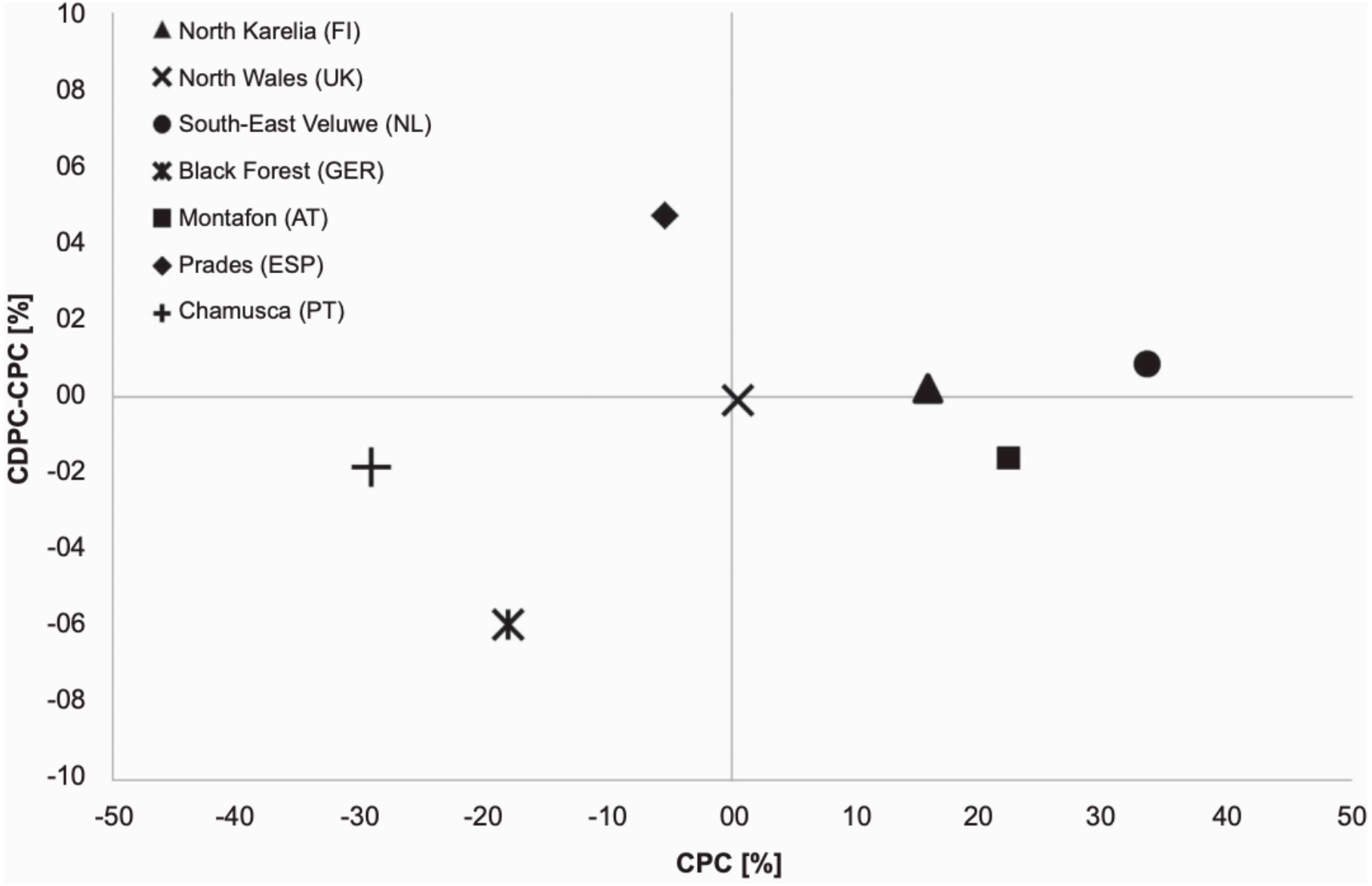
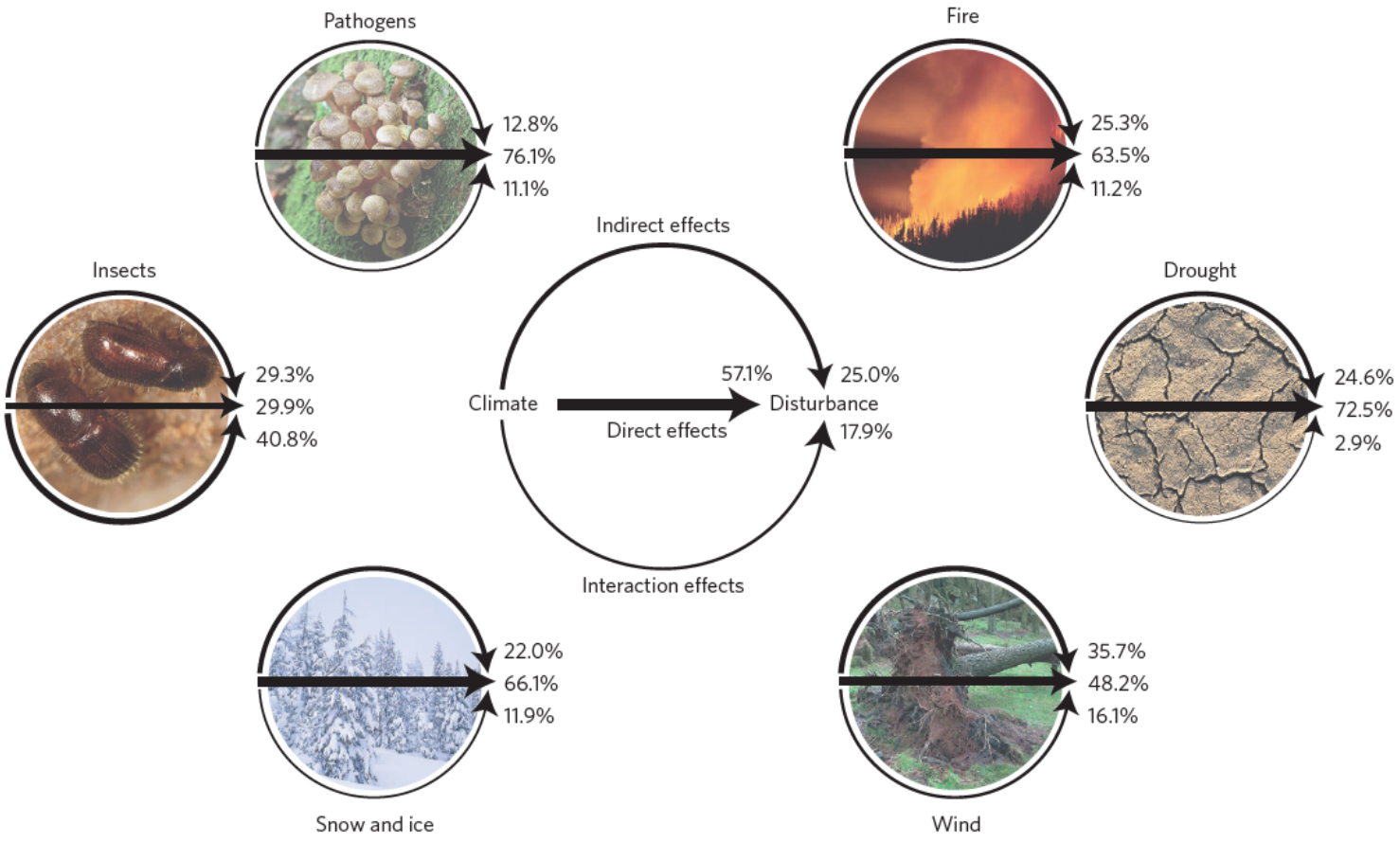


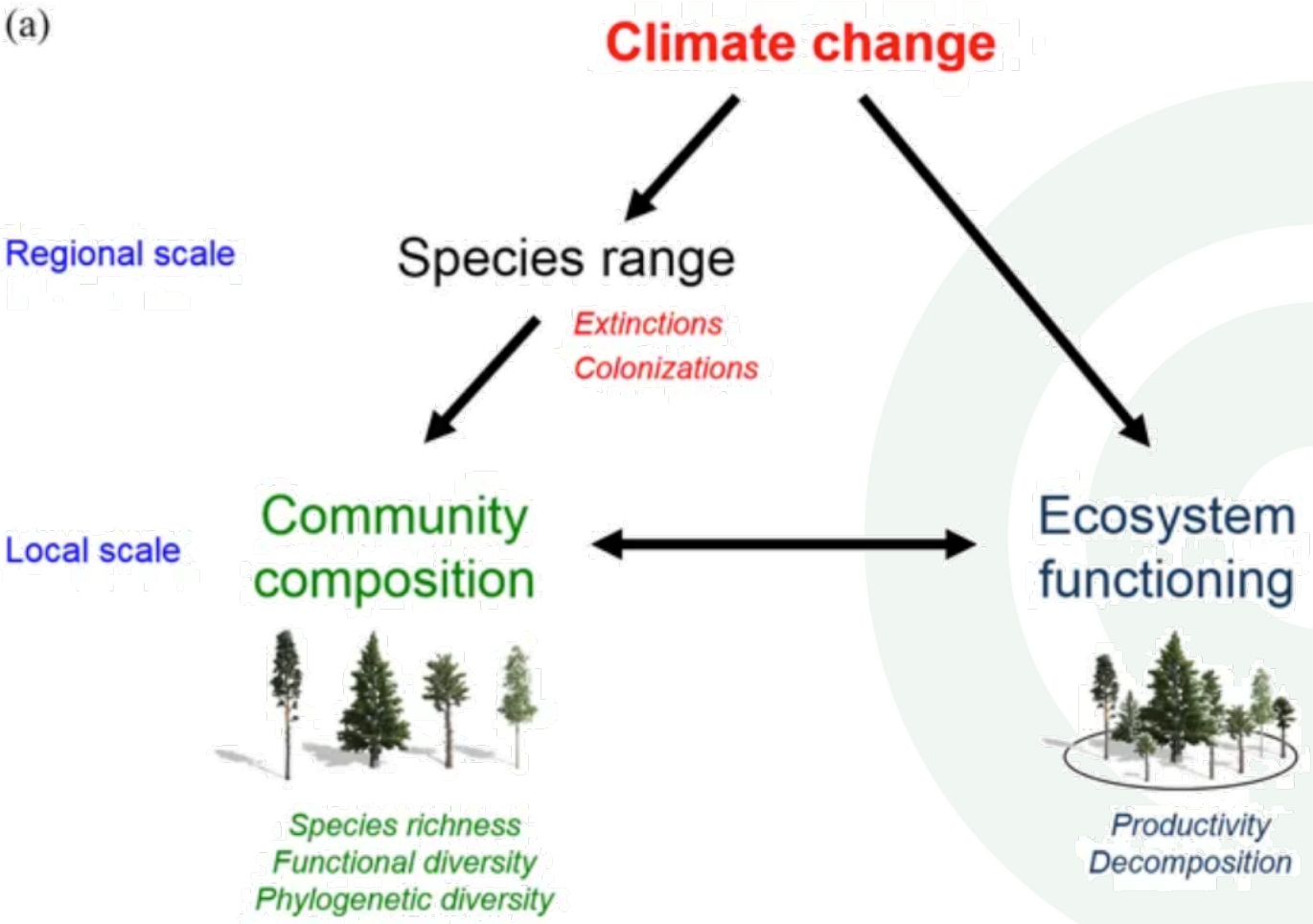
Figure 3. Difference of productivity change induced by climate change and disturbances (CDPC) and climate change only induced productivity changes (CPC) over climate change only induced productivity changes (CPC) for the longest available simulations in each forest case study. Note that the data for Prades and North Wales are the average over the forests stands as shown in table SOM2.

https://iopscience.iop.org/article/10.1088/1748-9326/aa5ef1/meta

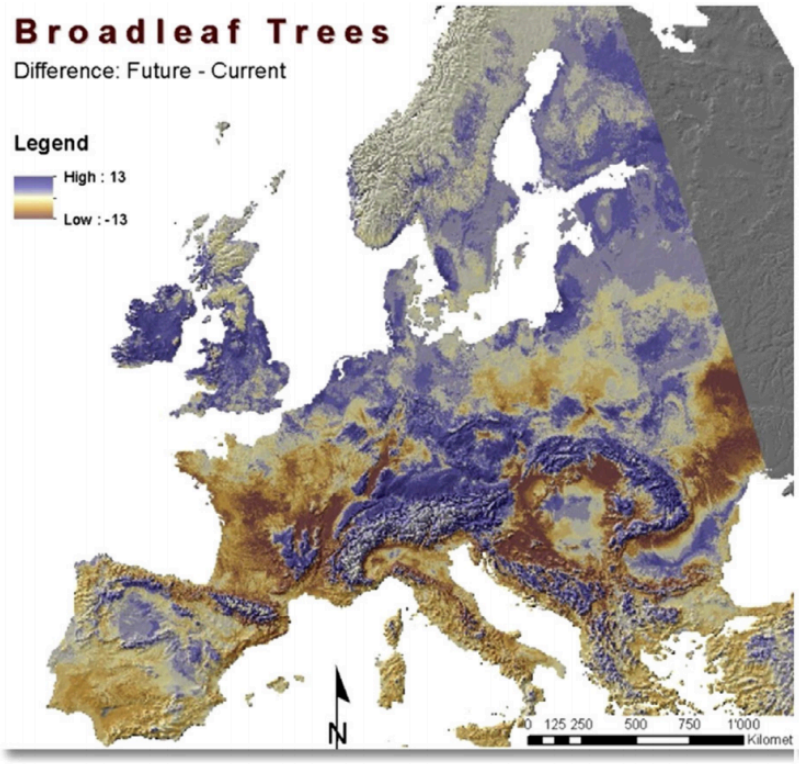
Interaction between disturbances

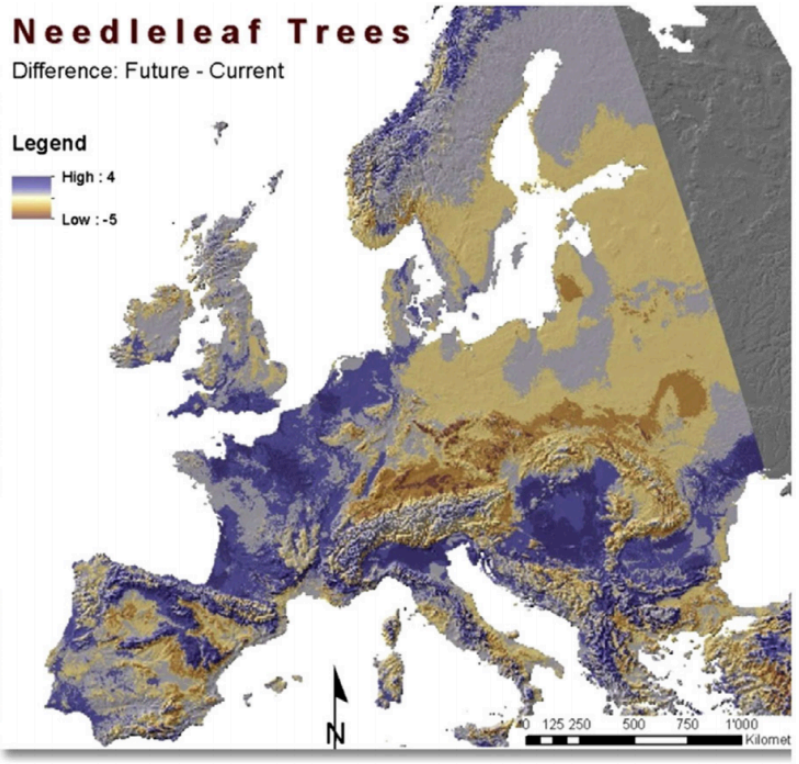


https://www.nature.com/articles/nclimate3303



https://www.nature.com/articles/s41598-018-23763-y





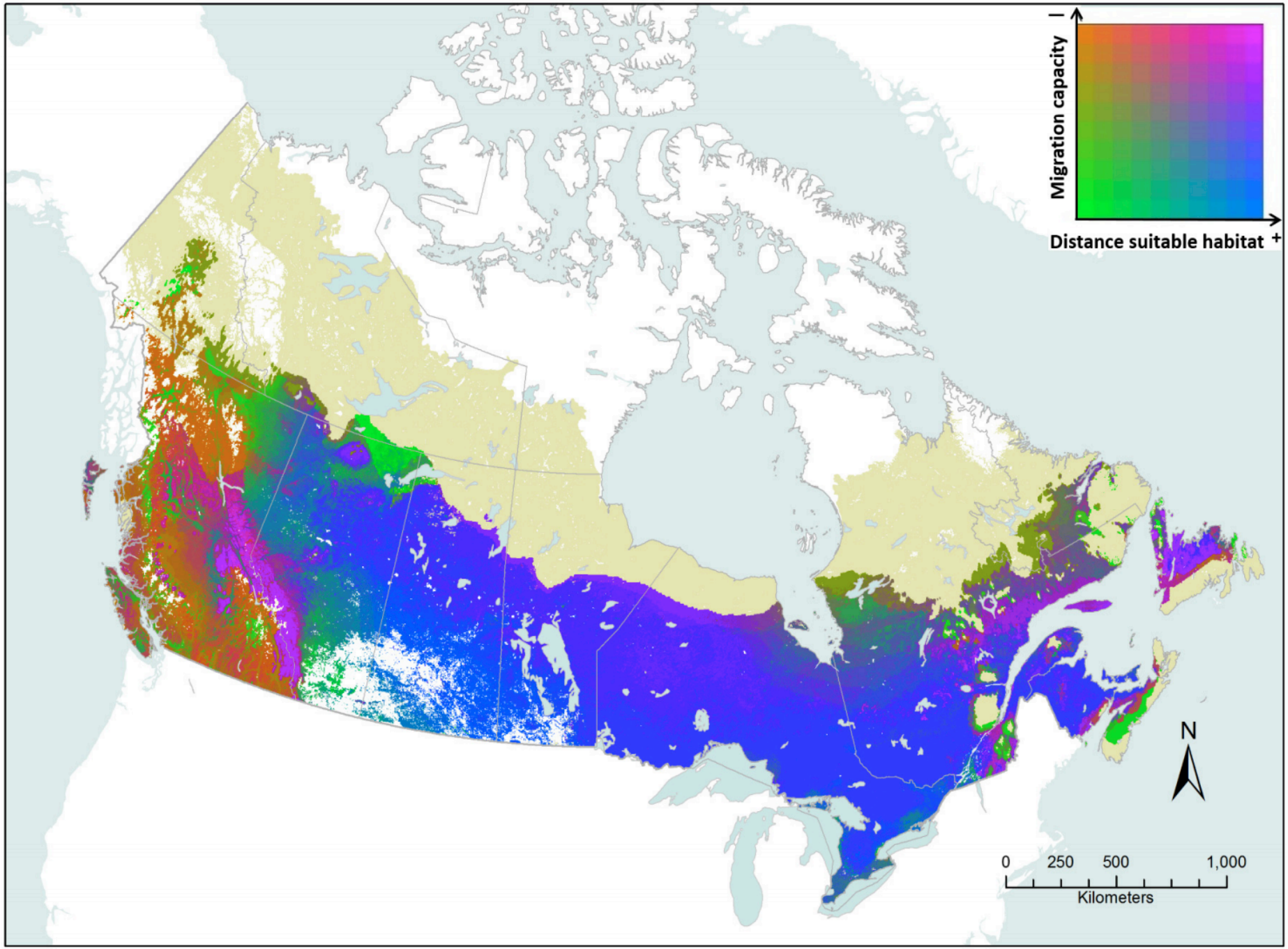
https://www.sciencedirect.com/science/article/pii/S030147971400379X

Summer drought

Control

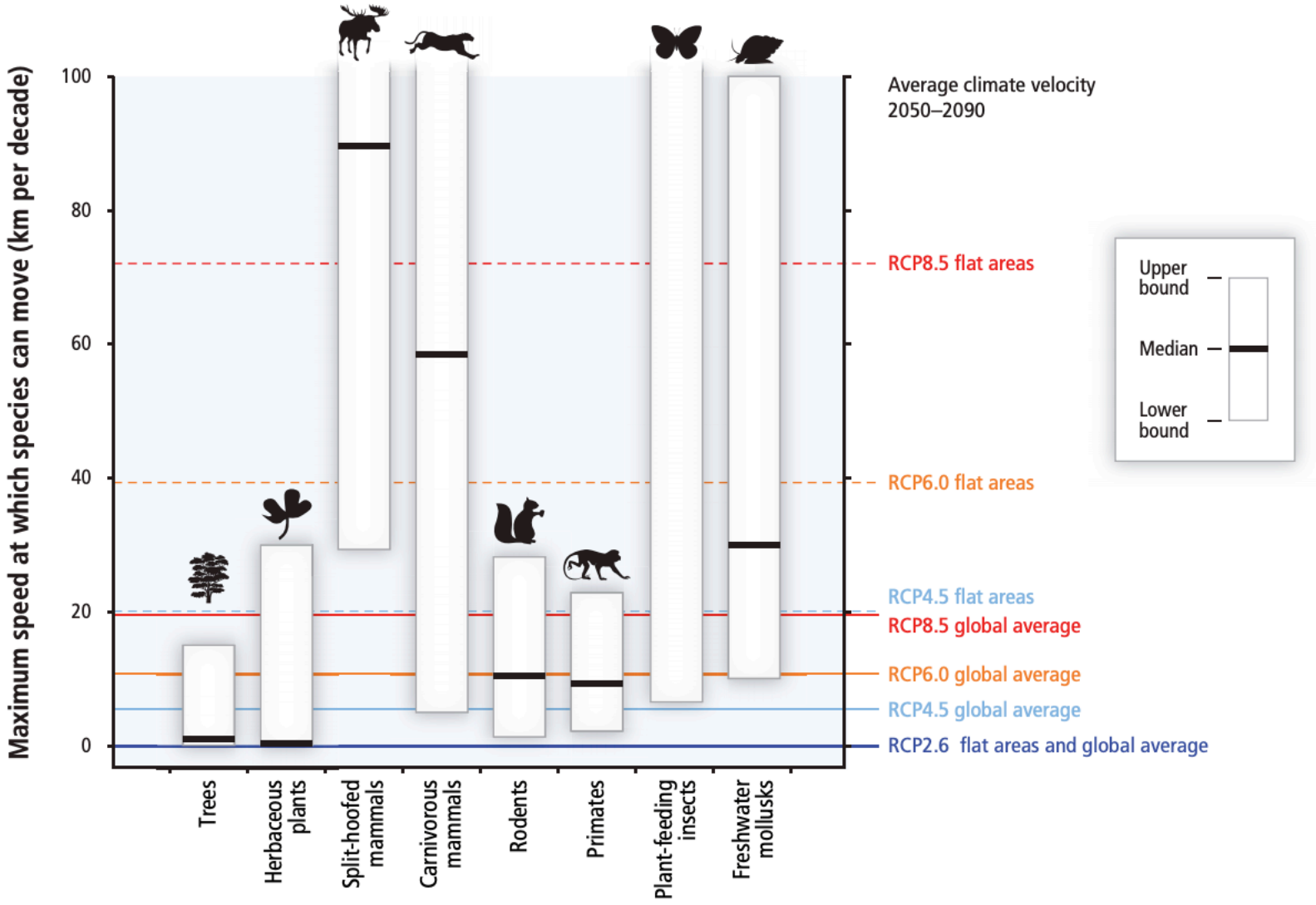
Pine regeneration during drought by Christoph Bachofen, WSL

https://esajournals.onlinelibrary.wiley.com/doi/pdf/10.1002/ecs2.2108

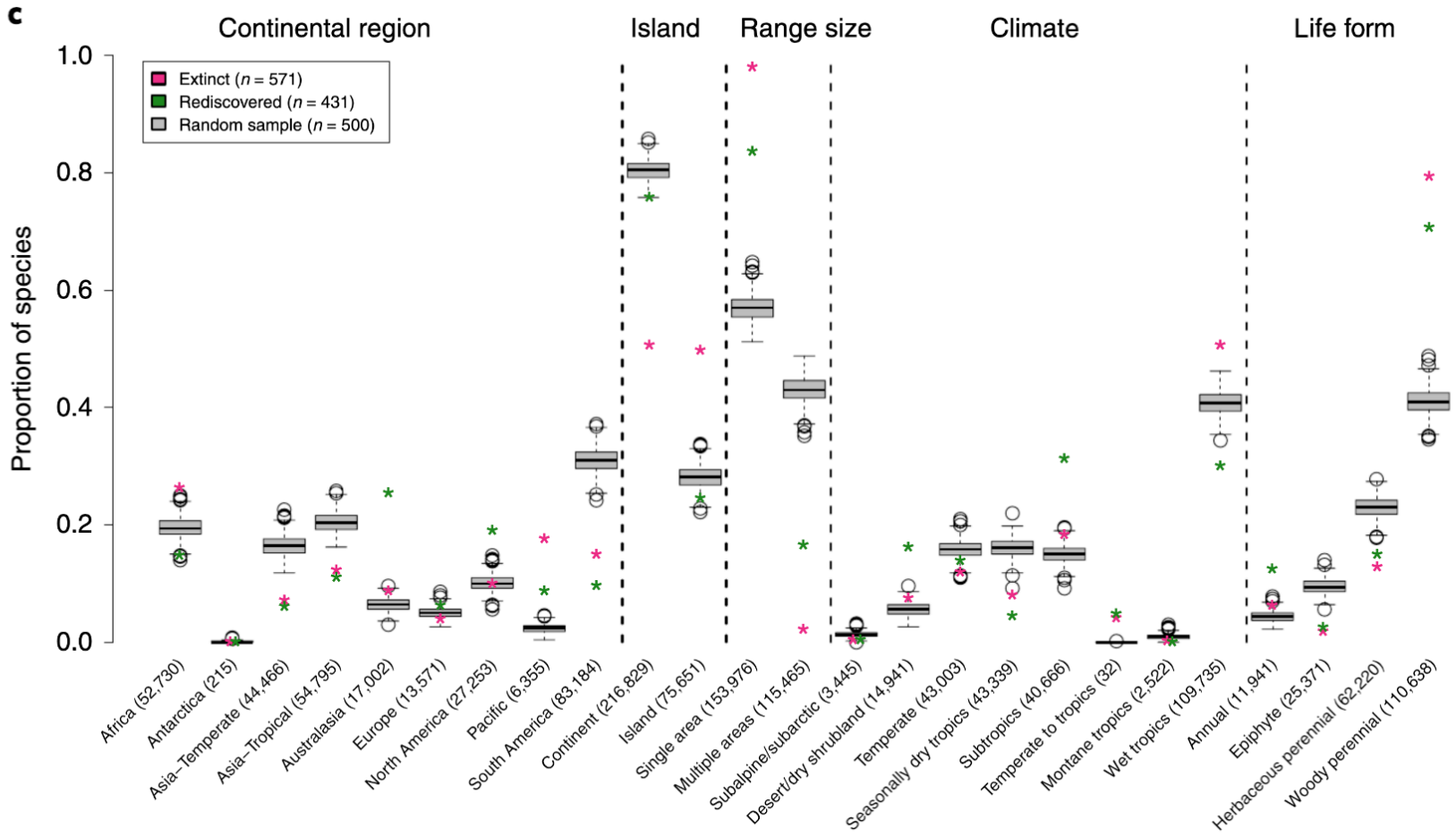


https://esajournals.onlinelibrary.wiley.com/doi/pdf/10.1002/ecs2.2108

IPCC AR5 WG2 Figure SPM.5

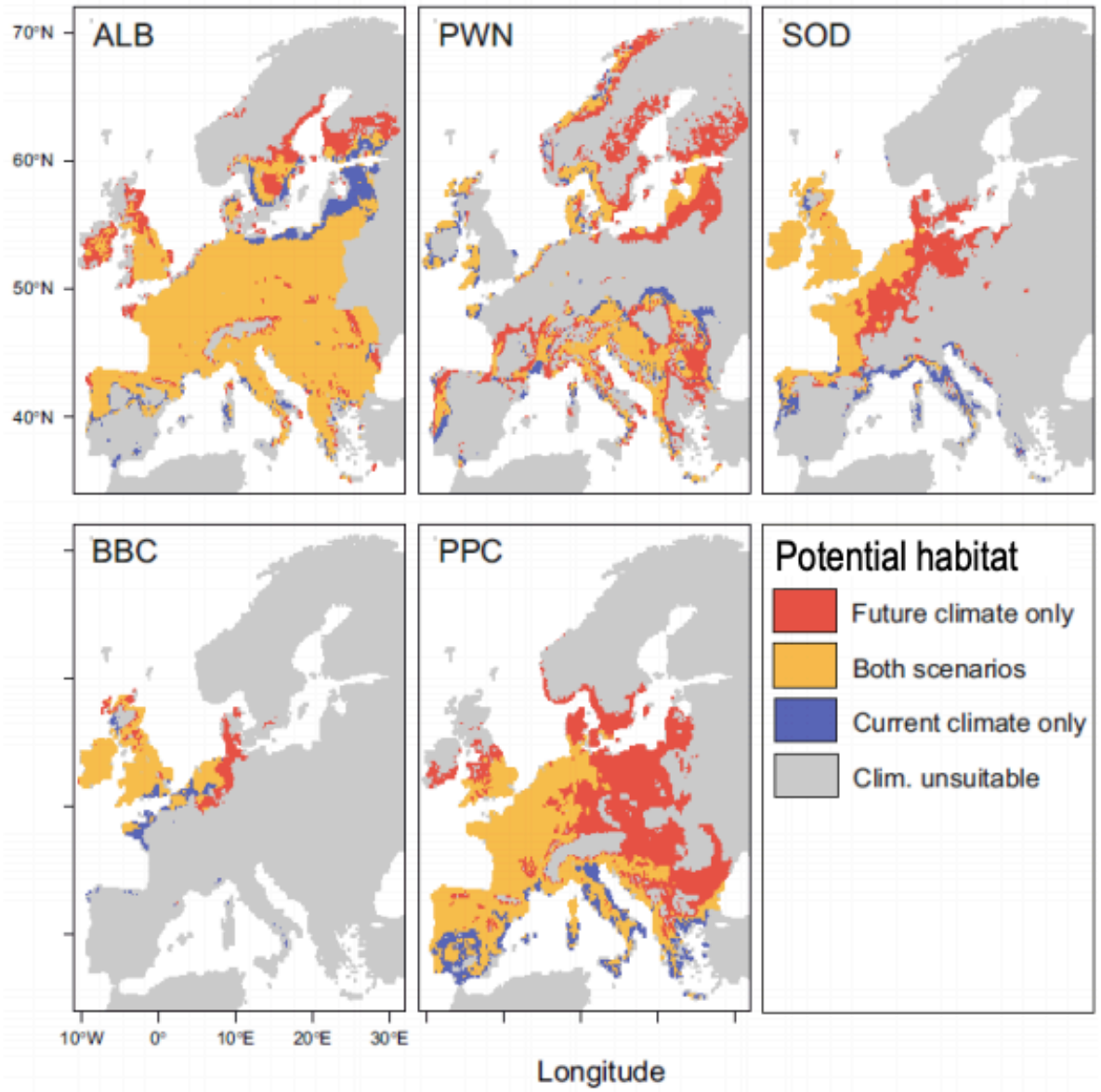


Proportion of extinct plant species



https://www.nature.com/articles/s41559-019-0906-2.epdf

Potential spread of invasive alien pests

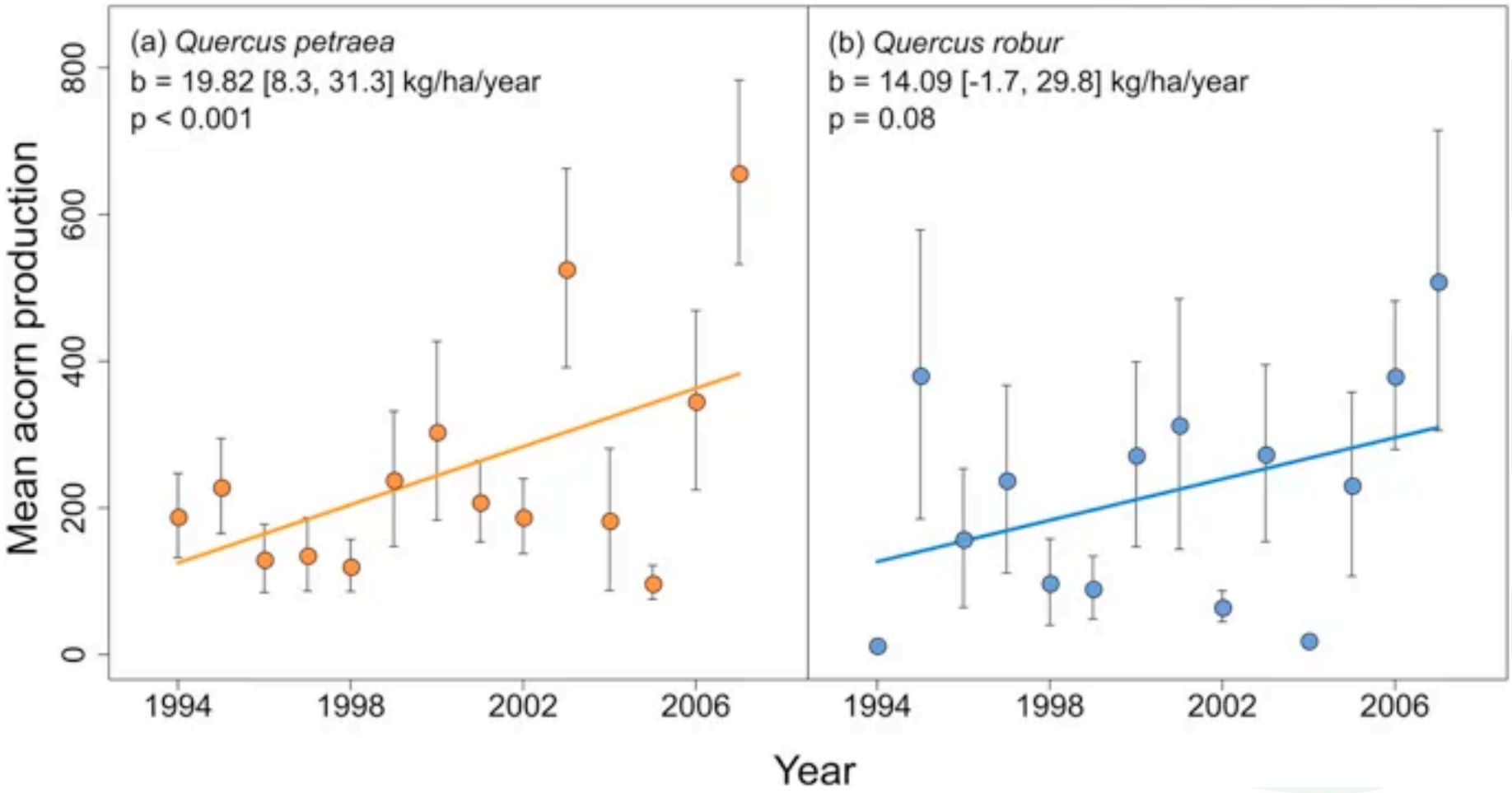


Asian long-horned beetle (ALB), pinewood nematode (PWN) and pitch pine canker (PPC) could establish on > 1 Mill. km² already under current climate

Climate change until 2050 will increase the potential range of pine pests (PWN and PPC) by ~50%

Seidl et al. (2018, Nature Communications)

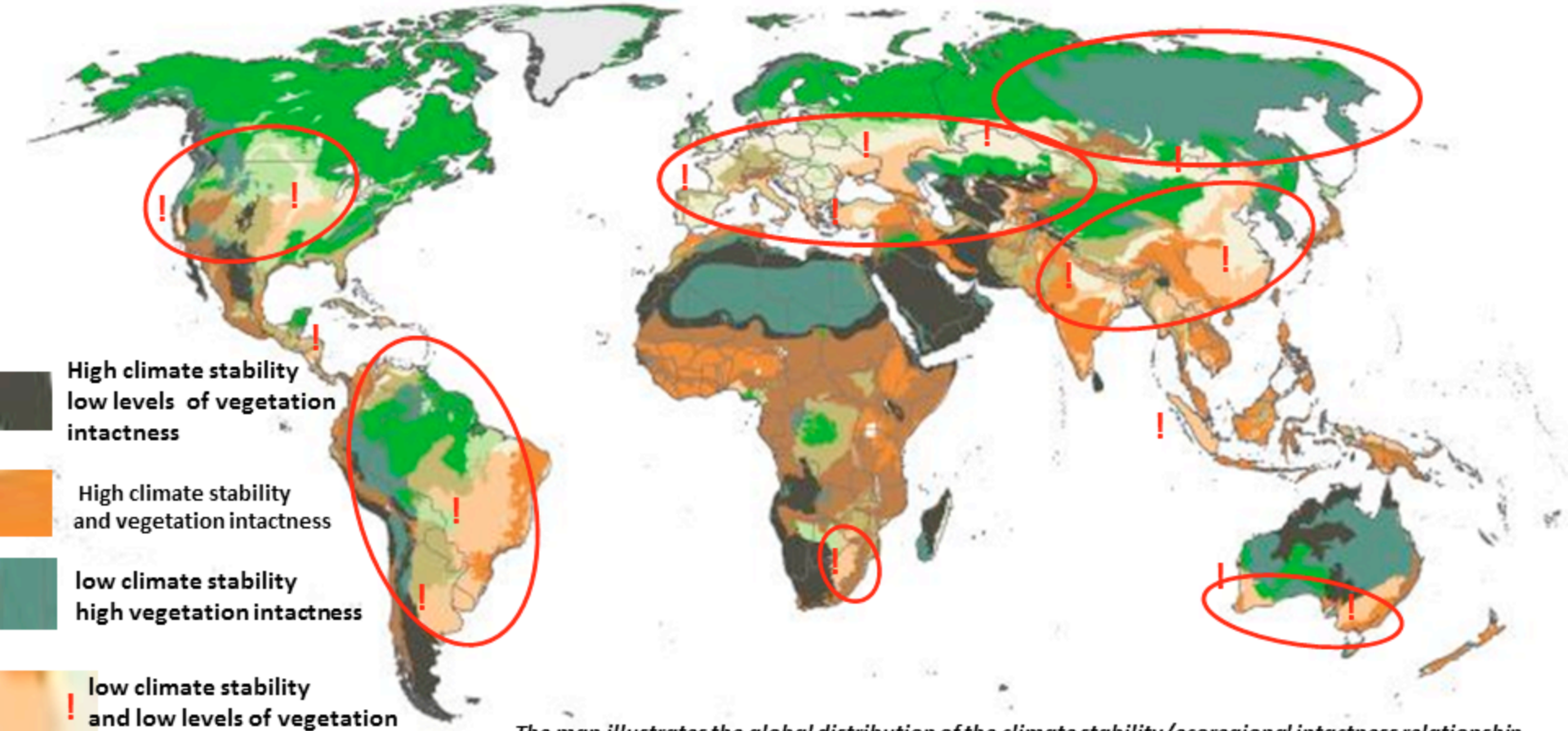
Effect on seed production



https://www.nature.com/articles/s41598-017-09172-7

Ecosystem climate change vulnerability and conservation

Mapping vulnerability and conservation adaptation strategies under climate change James E. M. Watson, Nature Climate Change September 2013



The map illustrates the global distribution of the climate stability/ecoregional intactness relationship. Ecoregions with both high climate stability and vegetation intactness are dark grey. Ecoregions with high climate stability but low levels of vegetation intactness are dark orange. Ecoregions with low climate stability but high vegetation intactness are dark green. Ecoregions that have both low climate stability and low levels of vegetation intactness are pale cream.

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Grazie per l'attenzione

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