Data: what is it good for? Insights from network ecology

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Team science!



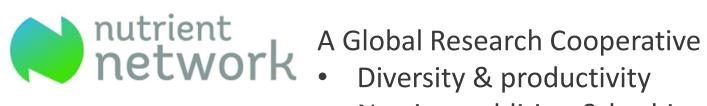
Led by: Elizabeth Borer & Eric Seabloom



Led by: Yvonne Buckley



Led by: Rob Salguero-Gómez



- Nutrient addition & herbivore exclusion



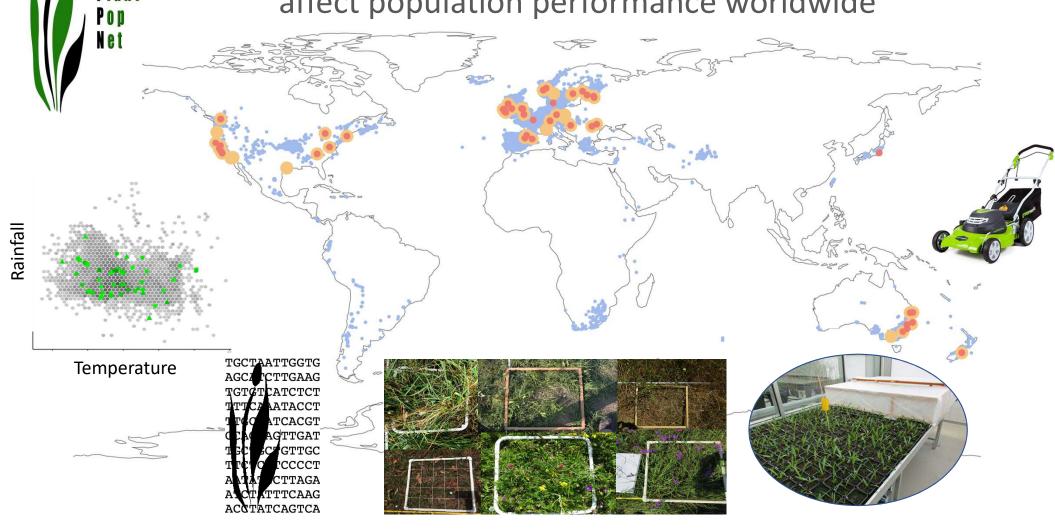
>100 PIs >90 sites





How climate, biotic interactions and human management affect population performance worldwide

Plant









Demographic data from published matrix models for >1000 species

Growth, survival, reproduction

100 Journal of Ecology

Journal of Ecology 2015, 103, 202-218



FORUM

The COMPADRE Plant Matrix Database: an open online repository for plant demography

Roberto Salguero-Gómez^{1,2,3*}, Owen R. Jones^{4,5}, C. Ruth Archer⁶, Yvonne M. Buckley^{2,3}, Judy Che-Castaldo⁷, Hal Caswell^{8,9}, David Hodgson¹⁰, Alexander Scheuerlein¹, Dalia A. Conde^{4,5,11}, Erik Brinks¹, Hendrik de Buhr¹, Claudia Farack¹, Fränce Gottschalk¹, Alexander Hartmann¹, Anne Henning¹, Gabriel Hoppe¹, Gesa Römer¹, Jens Runge¹, Tara Ruoff¹², Julia Wille¹, Stefan Zeh¹, Raziel Davison⁶, Dirk Vieregg¹, Annette Baudisch⁶, Res Altwegg¹³, Fernando Colchero^{4,14}, Ming Dong¹⁵, Hans de Kroon¹⁶, Jean-Dominique Lebreton¹⁷, Charlotte J. E. Metcalf^{18,19}, Maile M. Neel¹², Ingrid M. Parker²⁰, Takenori Takada²¹, Teresa Valverde²², Luis A. Vélez-Espino²³, Glenda M. Wardle²⁴, Miguel Franco^{25†} and James W. Vaupel^{1,4,26†}

Team science: what is it good for?

- Enables generality in ecology to be tested at global scale
- Assembly of unprecedented data sets
- Establishment of scientific networks
- Training for early career scientists
- Sustainable
- Engagement of diverse knowledge, skills & opinions
- Consensus of interpretation & conclusions

nutrient network Does non-native origin inform on ecology?



Slieve Carran, Ireland



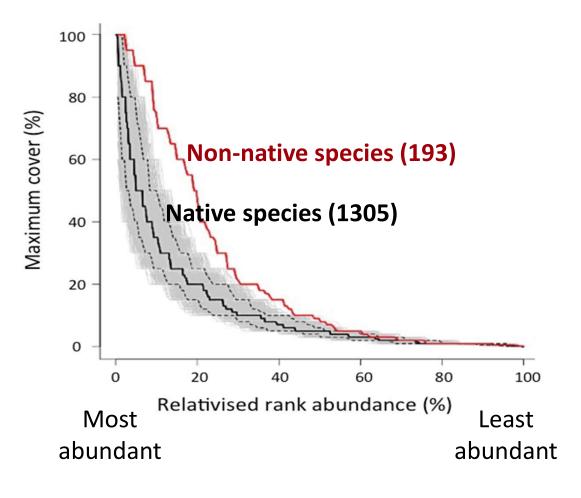


Pinjarra Hills, Australia

Burrawan, Australia



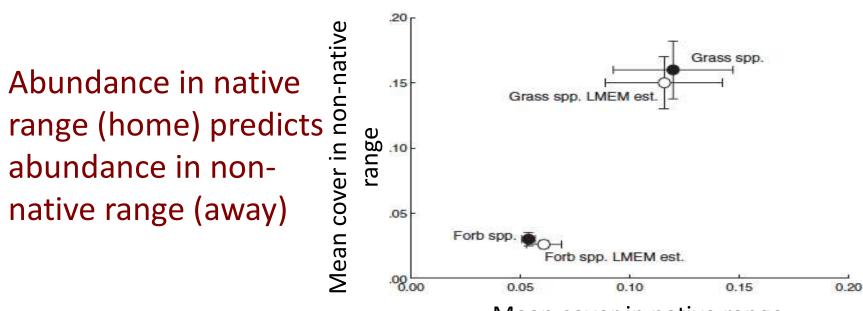
Non-native species in grassland plots are found at higher abundance than native species – 64 grassland sites in 13 countries



Seabloom, Borer, Buckley et al. 2015 Nature Communications



26 spp., 39 sites, 8 countries



Mean cover in native range

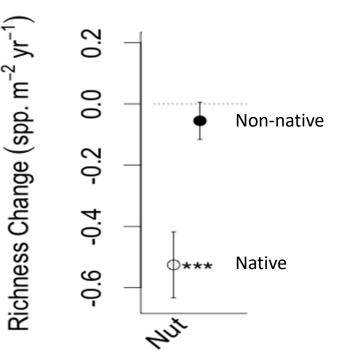
Firn et al. 2011 Ecology Letters



Non-natives are more abundant BUT they are equally abundant in their native range Non-natives are a biased sample of native species pool



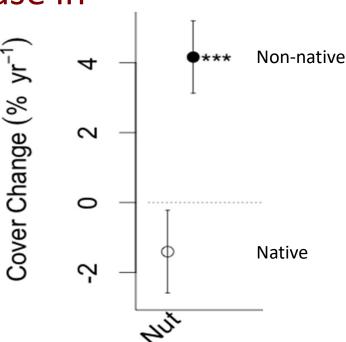
In fertilised grasslands native species richness declines, non-native species richness stays the same



Seabloom, Borer, Buckley et al. 2015 Nature Communications

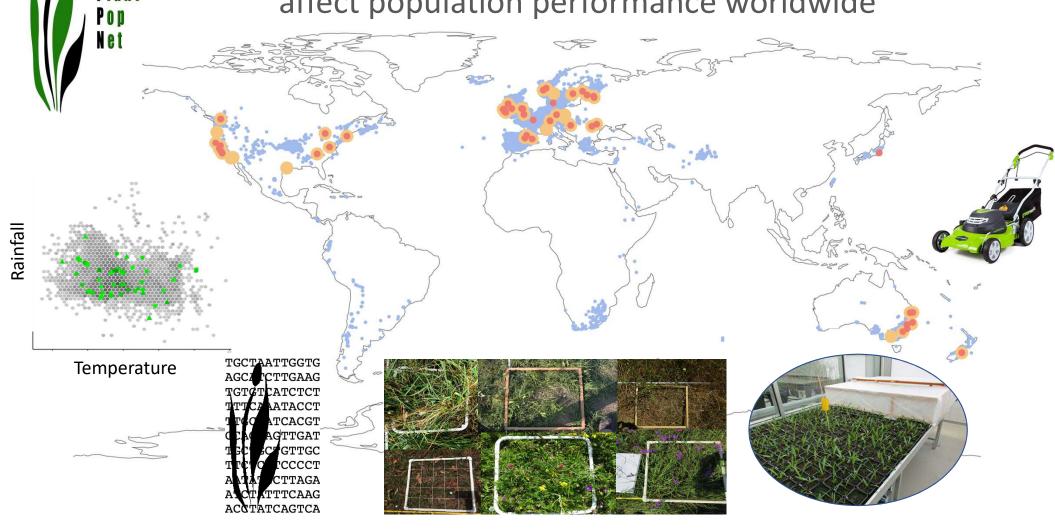


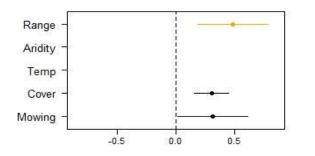
Non-native species increase in cover in response to fertilisation



Seabloom, Borer, Buckley et al. 2015 Nature Communications How climate, biotic interactions and human management affect population performance worldwide

Plant

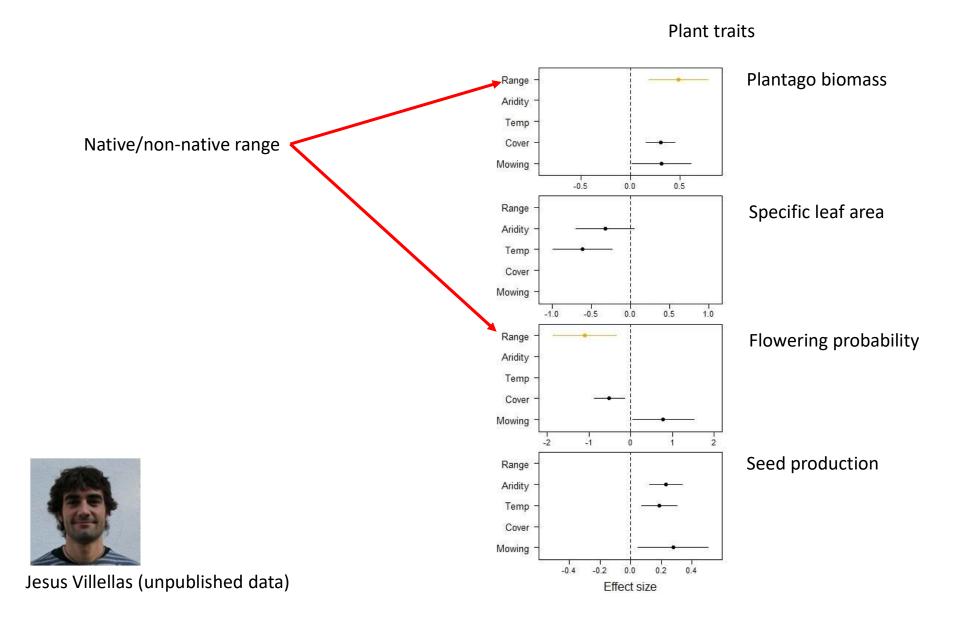


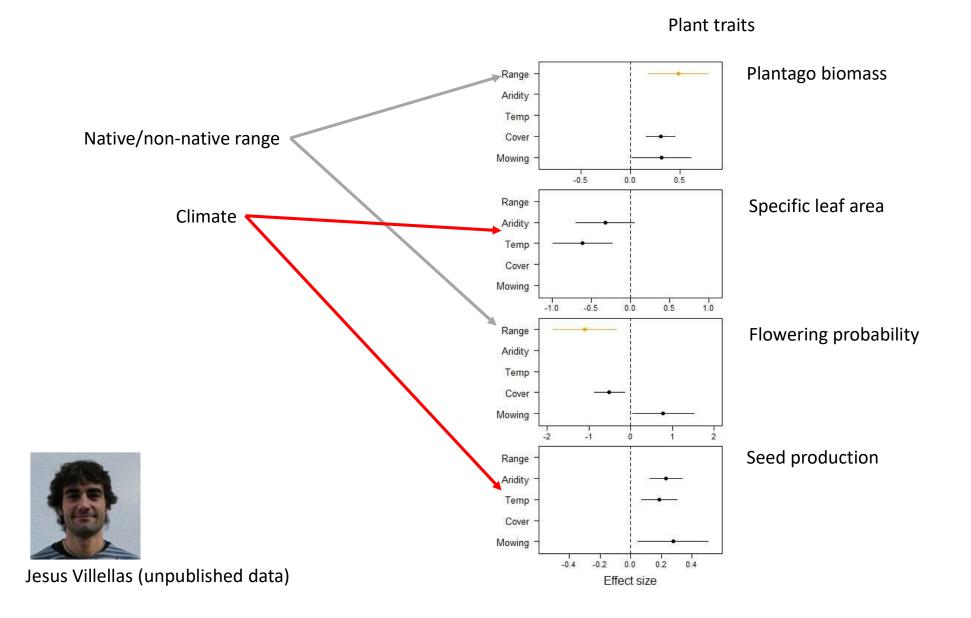


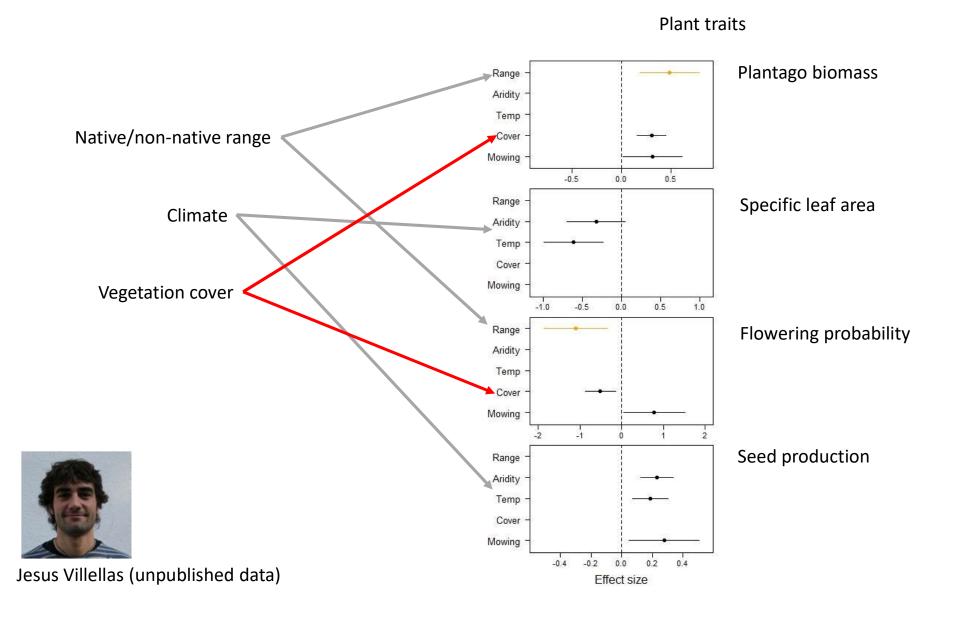
Plantago biomass

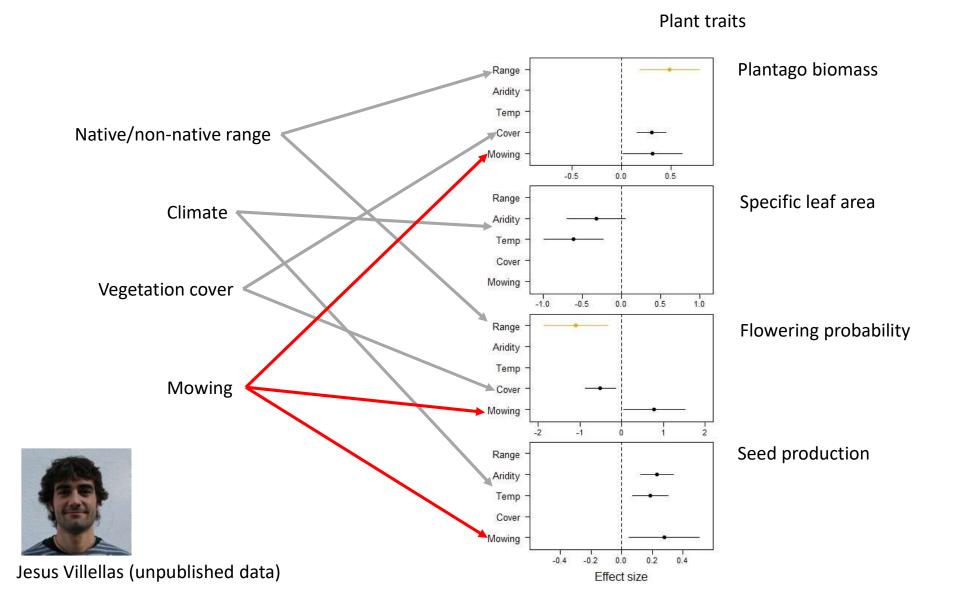


Jesus Villellas (unpublished data)

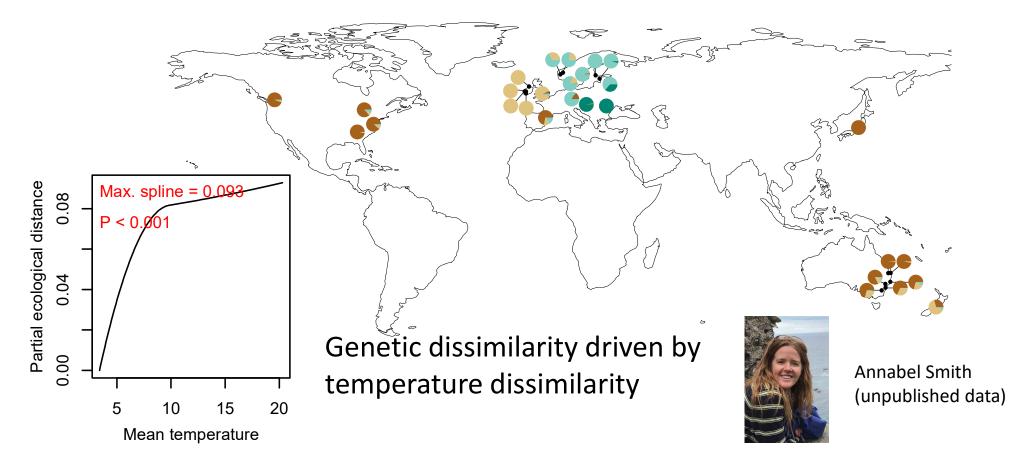








Strong geographic structure in population genomics & possible environmental filtering in non-native range



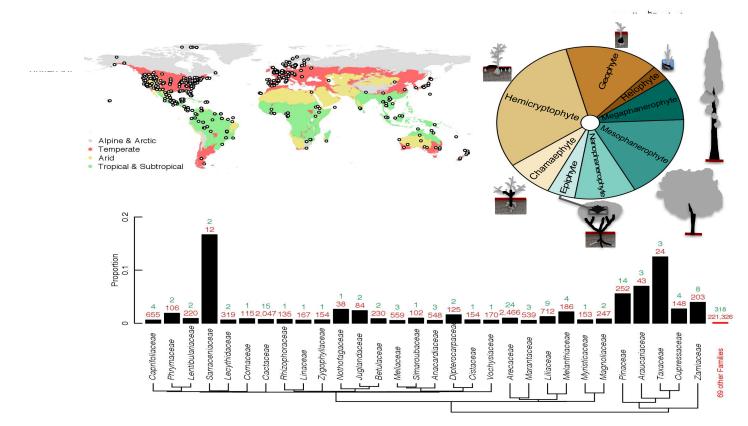


- Quantification of plant life history strategies
- Predicting population performance in geographic & environmental space



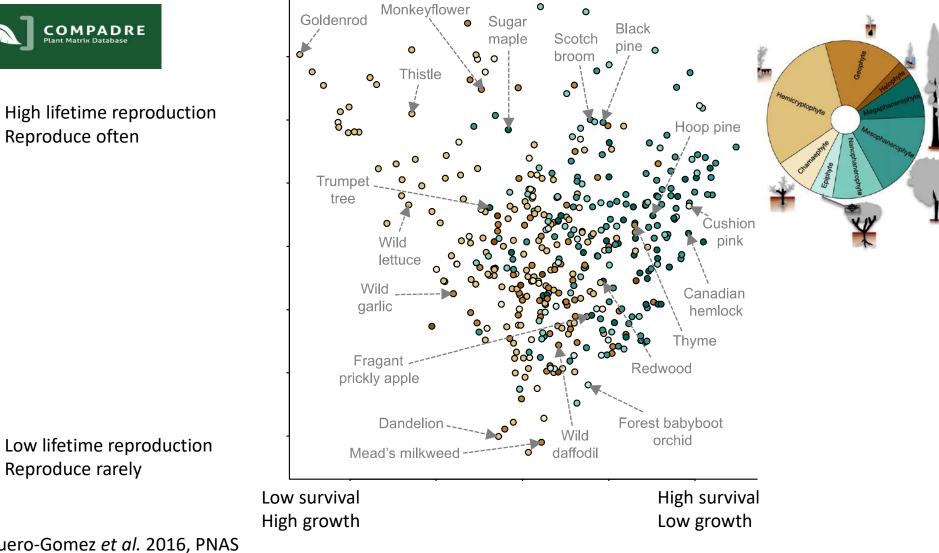
Fast-slow continuum and reproductive strategies structure plant life-history variation worldwide

Roberto Salguero-Gómez^{a,b,1}, Owen R. Jones^{c,d}, Eelke Jongejans^e, Simon P. Blomberg^a, David J. Hodgson^f, Cyril Mbeau-Ache^g, Pieter A. Zuidema^h, Hans de Kroon^{i,2}, and Yvonne M. Buckley^{a,j,k,2}





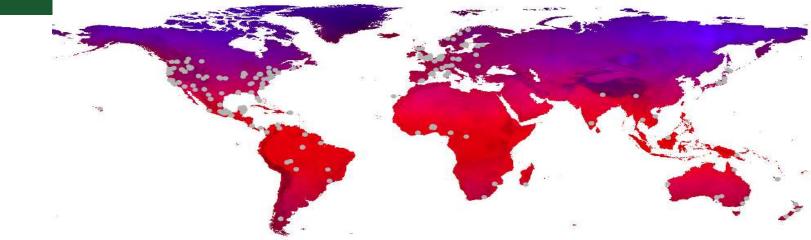
High lifetime reproduction **Reproduce often**



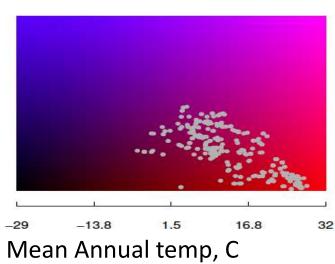
Salguero-Gomez et al. 2016, PNAS

Reproduce rarely









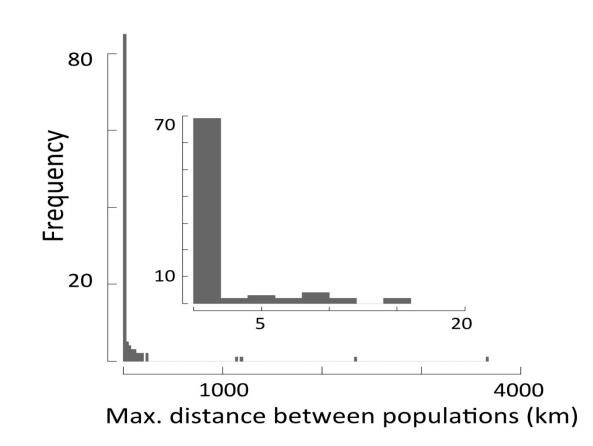
Can we use climate, geography & phylogeny to predict population performance?

> Coutts et al. (2016) Ecology Letters



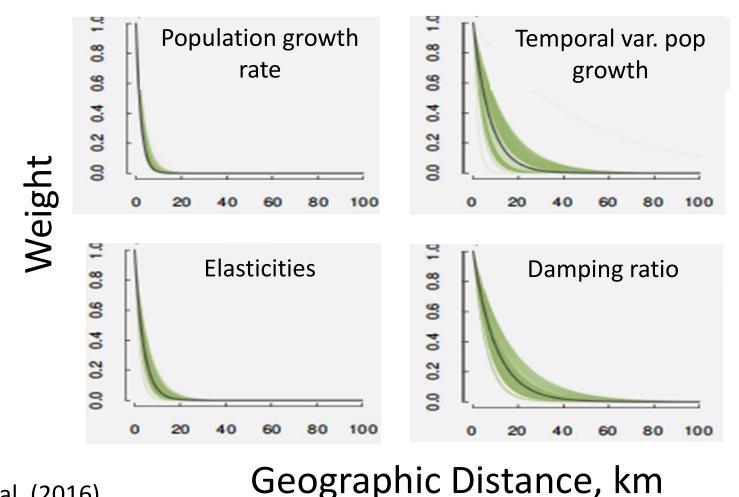
550 populations210 species66 families

53% > 1 pop/species

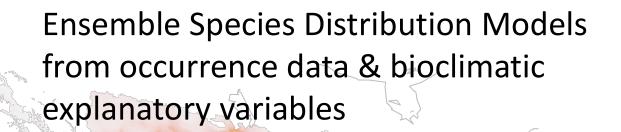


Coutts et al. (2016) Ecology Letters

Predictive capacity of geographic distance decays rapidly within 20km



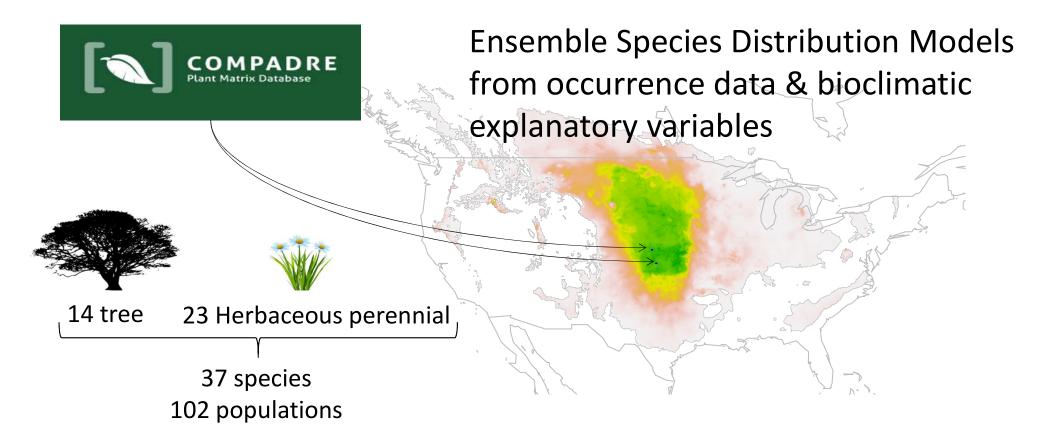
Coutts et al. (2016)

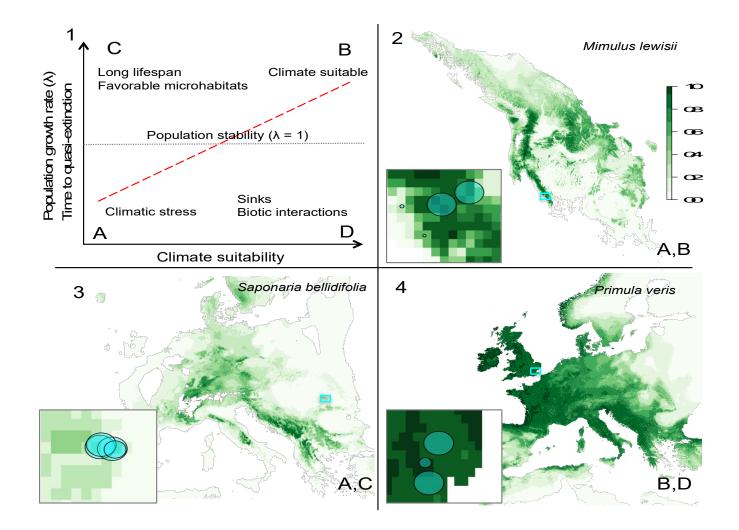


V.)

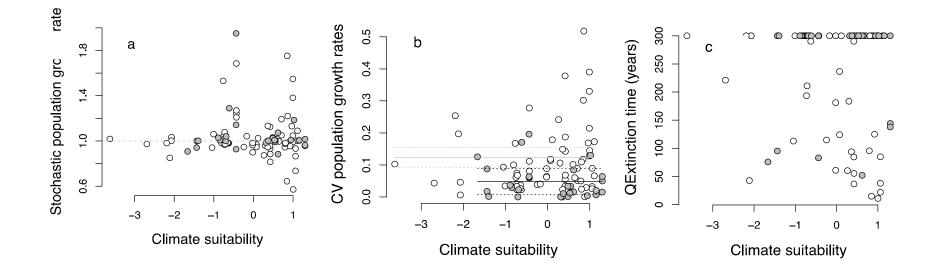


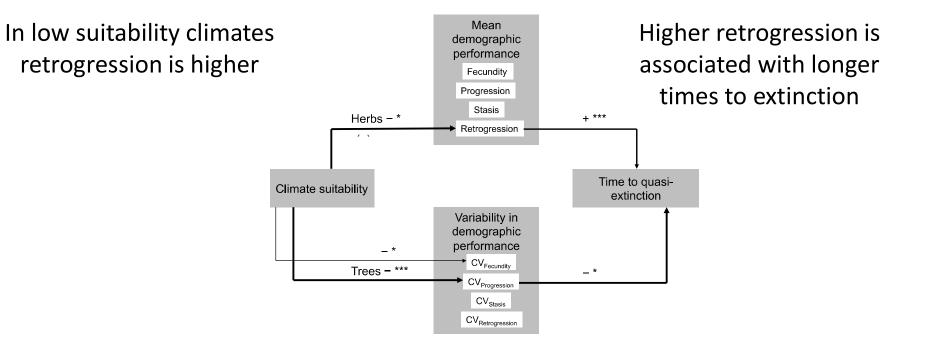
Csergö et al. (2017) Ecology Letters



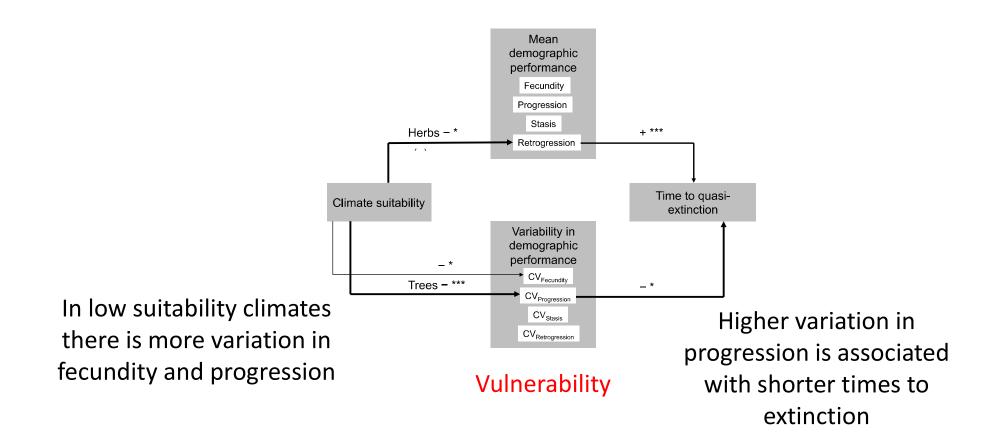


No effect of climate suitability on integrated population performance





Resistance



What happens to populations in low suitability climates?

- Pockets of resistance even in low suitability climates – persistence through survival and shrinkage
- Vulnerability to extinction is increased through variable survival and growth

- Coordinated & consistent data collection, tied to interesting questions/hypotheses can lead to useful and insightful generalisations
- Team science is good for data collection (+ other benefits)
- Building networks of data collectors leads to strong, long-term and sustainable projects

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Thanks!

- Nutnet data collectors & curators
- COMPADRE & COMADRE data collectors, digitisers & curators
- Plantpopnet data collectors & curators