1 Meta-analysis reveals that hydraulic traits explain cross-species patterns of drought-induced tree mortality across the globe.

Anderegg WR, Klein T, Bartlett M, Sack L, Pellegrini AF, Choat B, Jansen S
show author affiliations

Proc Natl Acad Sci U S A. 2016 May 3; 113(18):5024-9

Recommendations:

Good **24 Jun 2016**

Bernhard Schmid
F1000 Ecology
University of Zurich, Zurich, Switzerland.

Michael O'Brien
F1000 Ecology
University of Zurich, Zurich, Switzerland.

CONFIRMATION | SYSTEMATIC REVIEW / META-ANALYSIS | TECHNICAL ADVANCE

DOI: 10.3410/f.726295514.793519925

Predicting the vulnerability of tree species to drought is a growing challenge facing ecologists and plant biologists as drought events are expected to increase in intensity and frequency for many forests across the globe. One only needs to look at the effect of the El Niño event during 2016, which has caused drought and forest dieback in multiple locations, including Southeast Asia and Central America, in order to see the relevance of the meta-analysis presented by Anderegg et al. (2016). Futhermore, linking plant traits to drought-induced mortality provides a useful mechanistic tool for contributing to our ability to assess the response of forest to severe drought. The results of this global meta-analysis show that hydraulic traits in particular are useful predictors of drought mortality across species but that the importance of specific traits varies between angiosperms and gymnosperms. These results reinforce the need to incorporate traits into vegetation–climate models in order to more accurately predict the impacts of drought, which has been a growing focus of ecologists and climate modellers alike in recent years {1,2}.

References

1. **Integrating ecophysiology and forest landscape models to improve projections of drought effects under climate change.**
Gustafson EJ, De Bruijn AM, Pangle RE, Limousin JM, McDowell NG, Pockman WT, Sturtevant BR, Muss JD, Kubiske ME. Glob Chang Biol. 2014 Aug 22;
PMID: 25155807 DOI: 10.1111/gcb.12713
2. **Diversity in plant hydraulic traits explains seasonal and inter-annual variations of vegetation dynamics in seasonally dry tropical forests.**
Xu X, Medvigy D, Powers JS, Becknell JM, Guan K. New Phytol. 2016 May 18;
PMID: 27189787 DOI: 10.1111/nph.14009

Disclosures
None declared

Add a comment

Abstract:

ABSTRACT

Drought-induced tree mortality has been observed globally and is expected to increase under climate change scenarios, with large potential consequences for the terrestrial carbon sink. Predicting mortality across species is crucial for assessing the effects of climate extremes on forest community biodiversity, composition, and carbon sequestration. However, the physiological traits associated with elevated risk of mortality in diverse ecosystems remain unknown, although these traits could greatly improve understanding and prediction of tree... more »
mortality in forests. We performed a meta-analysis on species' mortality rates across 475 species from 33 studies around the globe to assess which traits determine a species' mortality risk. We found that species-specific mortality anomalies from community mortality rate in a given drought were associated with plant hydraulic traits. Across all species, mortality was best predicted by a low hydraulic safety margin-the difference between typical minimum xylem water potential and that causing xylem dysfunction-and xylem vulnerability to embolism. Angiosperms and gymnosperms experienced roughly equal mortality risks. Our results provide broad support for the hypothesis that hydraulic traits capture key mechanisms determining tree death and highlight that physiological traits can improve vegetation model prediction of tree mortality during climate extremes.
DOI: 10.1073/pnas.1525678113

Comments:

COMMENTS add a comment

F1000 Faculty Reviews are comprehensive, open access, topical reviews written by members of the prestigious **F1000 Faculty**. These peer reviewed articles provide context on emerging themes in biology and medicine.

view all

Developmental Biology | Evolutionary Biology | Genomics & Genetics | Ecology

From Darwin's Origin of Species toward a theory of natural history

Ferdinando Boero
F1000Prime Reports 2015 7:(49) *(12 May 2015)*

Full text | PDF | Abstract on PubMed

Ecology

Non-native invasive species and novel ecosystems

Daniel Simberloff
F1000Prime Reports 2015 7:(47) *(02 Apr 2015)*

Full text | PDF | Abstract on PubMed

Librarian Resources
Press Office
F1000 Specialists
F1000 Updates
About/Contact

Article Recommendations
F1000Prime Reports
F1000Prime Faculty
Blog
Subscribe
F1000 Mobile
About
FAQs
Contact

Work
FAQ
Contact

Articles
Advisory Panel
Blog
Submit
Author Guidelines
Register
About
Contact

Download the mobile app today