nature portfolio

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Reporting Summary

Nature Portfolio wishes to improve the reproducibility of the work that we publish. This form provides structure for consistency and transparency in reporting. For further information on Nature Portfolio policies, see our Editorial Policies and the Editorial Policy Checklist.

Statistics

For all statistical analyses, confirm that the following items are present in the figure legend, table legend, main text, or Methods section.

n/a	Confirmed	
☐	☒	The exact sample size (*n*) for each experimental group/condition, given as a discrete number and unit of measurement
☐	☒	A statement on whether measurements were taken from distinct samples or whether the same sample was measured repeatedly
☐	☒	The statistical test(s) used AND whether they are one- or two-sided *Only common tests should be described solely by name; describe more complex techniques in the Methods section.*
☐	☒	A description of all covariates tested
☐	☒	A description of any assumptions or corrections, such as tests of normality and adjustment for multiple comparisons
☐	☒	A full description of the statistical parameters including central tendency (e.g. means) or other basic estimates (e.g. regression coefficient) AND variation (e.g. standard deviation) or associated estimates of uncertainty (e.g. confidence intervals)
☐	☒	For null hypothesis testing, the test statistic (e.g. *F*, *t*, *r*) with confidence intervals, effect sizes, degrees of freedom and *P* value noted *Give P values as exact values whenever suitable.*
☒	☐	For Bayesian analysis, information on the choice of priors and Markov chain Monte Carlo settings
☐	☒	For hierarchical and complex designs, identification of the appropriate level for tests and full reporting of outcomes
☐	☒	Estimates of effect sizes (e.g. Cohen's *d*, Pearson's *r*), indicating how they were calculated

Our web collection on statistics for biologists contains articles on many of the points above.

Software and code

Policy information about availability of computer code

Data collection	Data were collected into csv files using Microsoft® Excel® for Microsoft 365 MSO (Version 2407 Build 16.0.17830.20166) 64-bit.
Data analysis	Analyses were completed in R 4.3.2 (R Core Team 2023) using packages metafor 1.4.1 (Viechtbauer 2010; Viechtbauer 2024), sf 1.0-16 (Pebesma & Bivand 2023) and dplyr 1.1.4 (Wickham et al. 2023). References Pebesma, E. & Bivand, R. (2023) Spatial Data Science: With Applications in R. . Chapman and Hall/CRC, New York, https://doi.org/10.1201/9780429459016. R Core Team (2023) R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing, Vienna, Austria. ISBN 3-900051-07-0, Available from http://www.R-project.org. Viechtbauer, W. (2010) Conducting meta-analyses in R with the metafor package. Journal of Statistical Software, 36, 1-48. Viechtbauer, W. (2024) Metafor 4.7-11 Calculate Effect Sizes and Outcome Measures. Wickham, H., François, R., Henry, L., Müller, K. & Vaughan, D. (2023) dplyr: A Grammar of Data Manipulation. R package version 1.1.3. https://CRAN.R-project.org/package=dplyr.

For manuscripts utilizing custom algorithms or software that are central to the research but not yet described in published literature, software must be made available to editors and reviewers. We strongly encourage code deposition in a community repository (e.g. GitHub). See the Nature Portfolio guidelines for submitting code & software for further information.

Data

Policy information about availability of data

All manuscripts must include a data availability statement. This statement should provide the following information, where applicable:

- Accession codes, unique identifiers, or web links for publicly available datasets
- A description of any restrictions on data availability
- For clinical datasets or third party data, please ensure that the statement adheres to our policy

The data availability statement reads:
The effect size datasets that led to Figures 3 – 5 and Extended Data Figures 2 – 5 are available on Figshare.
Dataset header rows explained. https://doi.org/10.26187/deakin.26264369.v1
Effect size dataset SMD and SMCC. https://doi.org/10.26187/deakin.26264366.v1
Effect sizes using MD and MC. https://doi.org/10.26187/deakin.26264360.v1
Effect sizes using MD excluding outliers. https://doi.org/10.26187/deakin.26264351.v1

The site-level dataset was provided to referees for peer review. A condition enabling participation of project leaders was that these data remain private.

Research involving human participants, their data, or biological material

Policy information about studies with human participants or human data. See also policy information about sex, gender (identity/presentation), and sexual orientation and race, ethnicity and racism.

Reporting on sex and gender	NA
Reporting on race, ethnicity, or other socially relevant groupings	NA
Population characteristics	NA
Recruitment	NA
Ethics oversight	NA

Note that full information on the approval of the study protocol must also be provided in the manuscript.

Field-specific reporting

Please select the one below that is the best fit for your research. If you are not sure, read the appropriate sections before making your selection.

☐ Life sciences ☐ Behavioural & social sciences ☒ Ecological, evolutionary & environmental sciences

For a reference copy of the document with all sections, see nature.com/documents/nr-reporting-summary-flat.pdf

Ecological, evolutionary & environmental sciences study design

All studies must disclose on these points even when the disclosure is negative.

Study description	A meta-analysis of 62 projects examining interactions of fire severity with other covariates
Research sample	Occurrence or abundance of species, morphospecies, or higher taxa before/after fire or in burnt/unburnt areas after the fire. These provide matched contrasts from which effect sizes can be derived. Further details about individual projects are provided in Supplementary Information Table 2.
Sampling strategy	Project-specific sampling including plots, cameras and other methods. Details about individual projects are available in Supplementary Information Table 2. Sample sizes were those that could be achieved with the available resources.
Data collection	From the methods section: We gathered site-level data for 62 projects (Supplementary information Table 2) by inviting contributors to join our collaboration. We emailed leaders of projects studying post-fire biodiversity impacts that were funded by the Australian Government's Wildlife and Habitat Bushfire Recovery Program. We promoted our proposal on social media in summer 2021-2, ran a workshop at the Ecological Society of Australia conference in November 2021 and held a two-day on-line symposium in February 2022. Projects were collated throughout 2022 after potential contributors contacted us. Projects had to include site level data from sites burnt in 2019–20 within the megafire region 14. To ensure a minimum level of treatment replication, enabling means and standard deviations to be estimated, datasets needed at least three burnt and unburnt sites (e.g., survey points, plots, or transects), or three sites with before-after data and at least three non-zero records across all sites (at the species/taxon level). Projects also

	needed to report either an estimate or index of abundance (44 projects), occurrence (17 projects), or probability of occurrence after accounting for detection (1 project). Although we canvassed researchers for a full range of response variables, the datasets provided included almost exclusively presence-absence or abundance data. Abundance and occurrence effect sizes were similar, justifying using both together (Extended Data Fig. 2c). Only one project met all other criteria but reported responses that were not related to abundance or occurrence (effects of grazing on reproduction in one orchid species), and thus was omitted from analysis. Five other projects were excluded because they did not have at least three unburnt sites. Project details in Supplementary Information Table 2, and SI Table 8 indicate who collected data in each project.
Timing and spatial scale	Before data were from surveys from 2015-2019. Burnt/unburnt designs included data from 2020-2022. Most projects were from eastern Australia ranging from south-east Queensland to eastern Victoria, with an additional four projects from Kangaroo Island, South Australia, and one from south-west Western Australia (see Fig. 1).
Data exclusions	Data exclusions are documented in Extended Data Table 3.
Reproducibility	NA. Requires independent gigantic dataset after future extensive megafires.
Randomization	There was no randomisation in before-after designs, and these were confounded with high rainfall after the fires. They were excluded from our main analysis. Projects with burnt/unburnt designs were stratified random designs, with sites randomly selected, within areas burnt or unburnt by the wildfires. Sites were constrained by practical considerations associated with accessibility, placing spatial limits on randomisation.
Blinding	Blinding is not relevant because researchers had to visit sites of known treatment (burnt or unburnt).

Did the study involve field work? ☒ Yes ☐ No

Field work, collection and transport

Field conditions	This meta-analysis collated data from separate field projects (Supplementary Information Table 2)
Location	Most projects were from eastern Australia ranging from south-east Queensland to eastern Victoria, with an additional four projects from Kangaroo Island, South Australia, and one from south-west Western Australia (see Fig. 1). Supplementary Information Table 2 provides further details.
Access & import/export	Permits are detailed in Supplementary Information Table 2.
Disturbance	Typically field workers drive to sites using existing tracks then walk to the field data collection point, minimising site disturbance.

Reporting for specific materials, systems and methods

We require information from authors about some types of materials, experimental systems and methods used in many studies. Here, indicate whether each material, system or method listed is relevant to your study. If you are not sure if a list item applies to your research, read the appropriate section before selecting a response.

Materials & experimental systems

n/a	Involved in the study
☒	☐ Antibodies
☒	☐ Eukaryotic cell lines
☒	☐ Palaeontology and archaeology
☒	☐ Animals and other organisms
☒	☐ Clinical data
☒	☐ Dual use research of concern
☒	☐ Plants

Methods

n/a	Involved in the study
☒	☐ ChIP-seq
☒	☐ Flow cytometry
☒	☐ MRI-based neuroimaging

Plants

Seed stocks	NA
Novel plant genotypes	NA
Authentication	NA