METHODS

We followed Reporting Standards for Evidence Based Synthesis (ROSES, <https://www.roses-reporting.com/>, Haddaway et al., 2018) to create a quasi-systematic map of advances and knowledge gaps in the ecology of ecosystem services since Kremen (2005). In November 2019, we searched the University of Colorado Boulder subscription to Clarivate Web of Science (WOS) Core Collections database (Clarivate Analytics, Philadelphia, PA) using the Boolean search string: TS=(“ecosystem service\*” AND ecolog\*) NOT TS = econo\* NOT TI = cost NOT TI = social pref\* NOT TI = valu\* NOT TI= govern\* NOT TI = paymen\*. Results were then refined to the Science Citation Expanded database, English-language articles, within the WOS Ecology category, from years 2006-2019 (present in the database by 2019-11-23, our query date). We did not search other databases, grey literature, or other sources of evidence.

Our query returned 1932 unique primary research articles from peer-reviewed academic journals. We randomly assigned a roughly equal number of articles among a 14-person review team and evaluated title and abstracts (together) against our exclusion criteria. Our exclusion criteria aimed to screen out review, meta-analyses, and methods papers, studies that focused on social dimensions rather than the ecology of ecosystem services, and ecological research studies that inadequately or unclearly measured or linked driver and response metrics to ecosystem function or services. We used Google Forms to capture abstract screening data.

We excluded 1149 articles at abstract review stage, randomly selected half of the 783 articles that remained, and randomly assigned the 392 selected articles equally among the review team for full-text review. No person reviewed the same article at both abstract and full-text screening stages, and 63 of the 392 were reviewed independently by two people. 119 more articles were excluded at full-text review, and 273 studied retained for meta-data coding extraction. We used Qualtrics to capture exclusion data and meta-data coding. When an answer was unclear, we discussed how to code as a group and when needed a third person in the group reviewed the study.

All data were compiled, quality controlled for logical consistency and completeness, and prepared for analysis in R (R Core Development Team, 2020). Full data methods are described in Appendix xx: Ecology of Ecosystem Services Data Methods.

The extracted meta-data include raw and quality-controlled responses to our Qualtrics survey for retained studies. It also includes each study’s citation information as provided by our Web of Science search results, and details data manipulations made for quality control or to prepare data for narrative syntheses (see ‘qa\_note’ and ‘lulc\_note’ columns, and Data Methods for more details on data treatment for syntheses). Double-reviewed papers have records for individual reviewer responses (‘doublerev’ == TRUE & ‘version’ == “individual”) and consolidated answers that were reconciled by reviewers when answers conflicted (‘doublerev’ == TRUE & ‘version’ == “final). All single-reviewed studies only have one response per question (‘doublerev’ == FALSE & ‘version’ == “final” for all). All reviewer information is anonymized.

REFERENCES

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Kremen, C. (2005). Managing ecosystem services: What do we need to know about their ecology? *Ecology Letters*, *8*(5), 468–479. https://doi.org/10.1111/j.1461-0248.2005.00751.x

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