Most species in an ecosystem could help supply essential ecosystem services, according to a recent study. The researchers found that 84% of species in the grassland ecosystems they studied contributed towards at least one ecosystem service. Losing any of these species would therefore degrade the ecosystem services such an environment could provide.

The results suggest that, following the precautionary principle, conservationists should protect all of the species in an ecosystem as they cannot be sure which contribute to the provision of ecosystem services, and which may do so if conditions change. Given every species could contribute to ecosystem function in some way, the findings also suggest that ecosystems contain little functional redundancy: if a species is lost, there may be no other species that can take over the provision of the services it provided.

Ecosystem services underpin many of the basic services on which our societies depend, including our supply of drinking water, carbon uptake and pollination of crops. There are therefore important social and economic reasons for protecting them wherever possible.

The results of this study suggest that other biodiversity studies have underestimated the number of species required to maintain ecosystem services. Previous studies have suggested that multiple species are needed to provide ecosystem services over long periods of time or large areas. They have also suggested that different species contribute to different ecosystem services, or that different species will be needed to maintain or enhance these services as the environment changes in future. However, these studies have not examined how many species are needed to maintain many different ecosystem functions under many different environmental conditions. This latest research is the first attempt to look at all of these variables in a single analysis, as described above.

To do so, the researchers looked at data from 17 separate biodiversity experiments examining a total of 147 species in grassland ecosystems in different years, places, future environmental change scenarios or across different ecosystem functions. Each time, place, ecosystem function or environmental change scenario was described as a separate ‘context’.

The researchers first looked at how many species contributed to a single ecosystem function in each context. They then looked at whether different species contributed to ecosystem services in different contexts, before quantifying how the number of species increased as more contexts were added to the analysis.

They found that, in a single context, around 27% of species promoted ecosystem services, and this remained constant regardless of how many species were present. When the researchers looked at whether different species contributed to ecosystem function in slightly different contexts (for instance, looking at the same function, place and change scenario, but changing the year), they found there was limited overlap between the groups of species that delivered the services. More species promoted ecosystem functioning as more contexts were considered. For example, more species were needed to promote different ecosystems services in multiple years than were needed to promote different ecosystems services in one year. As more contexts were added, the number of species contributing positively to ecosystem function also increased.

The findings suggest conservationists and others responsible for managing biodiversity need to protect as many of the species in an ecosystem as possible to maintain the supply of ecosystem services. In particular, the study revealed for the first time that almost every species (both common and rare) in an ecosystem contributed at least once to the functioning of that ecosystem and their contributions were context dependent, making it hard to predict the effects of losing even a single species.


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