Also the least abundant species matter for human wellbeing! The role of rare species on grasslands

An increasing body of research supports the necessity of biodiversity to maintain the ecosystem services we humans depend on, such as the provision of food and water, or the control of pests or climate. However, it remains unknown whether it is just the number of species by itself, or rather the characteristics of the dominant species (those that are more abundant at each place), the ones that drive the effect of biodiversity on ecosystem services. Additionally, researchers have largely focused on those species we can see, those that are above the ground, such as plants or insects. However, the last decade has seen an increasing awareness of the key importance of the organisms growing belowground, such as soil bacteria, or mycorrhizae. These are crucial for plant growth and for the general ability of natural ecosystems to capture and recycle nutrients.

It is no secret that the budget for nature and biodiversity conservation is, at best, very limited; and thus we need to prioritize somehow conservation efforts. To do so, it would be very helpful to know which amongst the many species that populate the planet are the most important for the provision of the ecosystem services we humans depend on. That was, however, a nearly impossible task as individual research groups can only be experts on some of the many species living in our planet, or in some of the many services we require from nature. A large collaborative research project, the Biodiversity Exploratories, has solved this important research gap by joining the effort of 300 different researchers. This join effort provided a unique database measuring more than 4600 species in 150 grasslands across Germany. The species measured cover the whole trophic chain both above and below the ground, with species that are primary producers that fix CO2 using energy from the sun, such as plants, to those that eat the plants (herbivores) or their residues (decomposers), and to those who eat the latter (carnivores). The authors grouped these species into above- and belowground organisms and into common (those that are very abundant in a given place) and rare species (those of which only a few individuals are present in a given place). The study, which was led by Dr. Santiago Soliveres and Prof. Eric Allan, from the University of Bern (Switzerland), shows that the diversity of aboveground rare organisms is particularly important to maintain healthy ecosystems that provide high levels of food provision, pest resistance, or cultural and recreational services, such as birdwatching. Apart from the positive role of biodiversity in general, the authors identified particularly influential species that are associated to high levels of many ecosystem services. These species are ubiquitous between the common and the rare species, and between those thriving above or belowground. What these important species have in common, instead, is their sensitivity to the intensification of land use. For example, they are very sensitive to the increase in fertilizer added by the farmer, or the amount of times that a grassland is mown throughout the year. Of course, mowing and fertilization are aimed at increasing the provision of food that each property generates; however, what this study shows, are the indirect costs that the intensification of agriculture will have for the helpful and positive work that nature does freely for us. The authors of the study also argue that their results could be used to restore degraded environments by identifying those species that can immediately promote relatively high

levels of many ecosystem services and which establishment should be promoted first.

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Locally rare species influence grassland ecosystem multifunctionality.
Soliveres S, Manning P, Prati D, Gossner MM, Alt F, Arndt H, Baumgartner V, Binkenstein J, Birkhofer K, Blaser S, Blüthgen N, Boch S, Böhm S, Börschig C, Buscot F, Diekötter T, Heinze J, Hölzel N, Jung K, Klaus VH, Klein AM, Kleinebecker T, Klemmer S, Krauss J, Lange M, Morris EK, Müller J, Oelmann Y, Overmann J, Pašali? E, Renner SC, Rillig MC, Schaefer HM, Schloter M, Schmitt B, Schöning I, Schrumpf M, Sikorski J, Socher SA, Solly EF, Sonnemann I, Sorkau E, Steckel J, Steffan-Dewenter I, Stempfhuber B, Tschapka M, Türke M, Venter P, Weiner CN, Weisser WW, Werner M, Westphal C, Wilcke W, Wolters V, Wubet T, Wurst S, Fischer M, Allan E
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