**Supplemental information**

*Brief summary of the two original papers*

The Vellend et al. ([2013](#_ENREF_17)) data synthesis focused on patterns of biodiversity change in terrestrial vascular plants. The data collated for this synthesis came from 346 studies that had monitored >16,000 non-experimental, ‘local-scale’ vegetation plots ranging from 5 to 261 years. Vellend et al. ([2013](#_ENREF_17)) summarized these time-series by calculating log response ratios (LRR) that quantified the proportional change in plant species richness from the initial to final year of the study, and divided LRR by the number of decades to derive a proportional rate of species loss. The authors found that the distribution of LRR values was not significantly different from zero. Some LRR were < 0, indicating that local species richness had declined through time. Some LRR were > 0, indicating that local species richness had increased through time. But on average, the negative and positive values of LRR formed a normal curve centered on zero, suggesting there has been no systematic loss of local species richness at the sites that had been monitored.

The synthesis by Dornelas et al. ([2014](#_ENREF_5)) collated data from peer-reviewed papers and publicly available databases that: (1) had time-series of > 3-yrs, (2) used consistent sampling methods, and (3) reported abundance estimates for all species in samples. Their final dataset comprised 100 time-series that had monitored 35,613 species of mammals, birds, fishes, invertebrates, and plants at 430,324 latitude and longitude coordinates. Although the synthesis included a limited number of freshwater and terrestrial systems, the vast majority of data included in Dornelas et al. ([2014](#_ENREF_5)) were from marine systems, primarily from cruises that had monitored plankton, or from seabird, fish, and cetacean diversity. The authors regressed estimates of species richness at each location as a function of time, and found the distribution of slopes was not different from zero. While some slopes were < 0, indicating that local species richness had declined through time, others were > 0, indicating that local species richness had increased through time. When averaged across the two opposing trends, the authors found no evidence for systematic declines in local species richness despite major changes in the composition of species. The authors proposed that biotic homogenization may explain, in whole or part, the observed temporal patterns of α- and β-diversity.

*Unresolved contradictions*

Gonzalez et al. ([2016](#_ENREF_8)) noted that the results and conclusions of the Vellend et al. ([2013](#_ENREF_17)) and Dornelas et al. ([2014](#_ENREF_5)) data syntheses contradict the conclusions of numerous other studies and data syntheses that have compared anthropogenically disturbed habitats to reference systems ([Alroy 2017](#_ENREF_1); [Aronson et al. 2014](#_ENREF_2); [e.g., Benayas et al. 2009](#_ENREF_3); [Gerstner et al. 2014](#_ENREF_7); [Moreno-Mateos et al. 2017](#_ENREF_11); [Murphy and Romanuk 2014](#_ENREF_12); [Newbold et al. 2016](#_ENREF_13); [Newbold et al. 2015](#_ENREF_14)). The authors have argued these other studies are flawed. For example, after Murphy and Romanuk (2013) used a comparison of 327 heavily disturbed to less disturbed reference habitats to show an average 18% decline in local species richness, McGill et al. ([2015](#_ENREF_10)) dismissed the study as being biased by the selective use of search terms like ‘species loss’, which may have missed studies documenting increases in richness. Similarly, after Newbold et al. (2015) used the PREDICTS database to document a mean 14% loss of local species richness in 380 datasets that allowed an impacted habitat to be compared with a spatial reference serving as a control, McGill ([2015](#_ENREF_9)) argued that results of the study were not as broadly representative of human impacts on biodiversity as were the Vellend et al. ([2013](#_ENREF_17)) and Dornelas et al. ([2014](#_ENREF_5)) syntheses, which they said, had *“averaged across all forms of human impact.”*

Rather than Vellend et al. ([2013](#_ENREF_17)) and Dornelas et al.’s ([2014](#_ENREF_5)) being more comprehensive or less biased studies, we think there is a different reason why the conclusions of these two studies differ from those that have used spatial references to quantify diversity change. Studies that have used spatial references have focused most of their attention on habitats that have undergone direct habitat loss and conversion (Figure 1, types A and B). These represent the dominant form of land use change on the planet are the single largest drivers of local biodiversity change ([Brooks et al. 2002](#_ENREF_4); [Foley et al. 2005](#_ENREF_6); [Sala et al. 2000](#_ENREF_15); [Tilman et al. 2001](#_ENREF_16)). The *a priori* expectation that habitat loss and conversion leads to losses of local diversity has been clear from the beginning, allowing researchers to collate studies that were designed for a common purpose, and which have had the proper references and baselines to detect change.

In contrast, data syntheses that have used time-series data, such as those by Vellend et al. ([2013](#_ENREF_17)) and Dornelas et al. ([2014](#_ENREF_5)), have collated data from biological monitoring programs that were designed for a variety of different purposes. But importantly, almost none of these were designed to monitor biodiversity change caused by habitat loss and conversion. Few ecologists monitor biodiversity in cities and farm fields, let alone quantify changes in biodiversity before and after initial land conversion. Instead, most biological monitoring programs are set up to produce time-series data in intact patches, or patches of habitat that are undergoing or recovering from some form of stress (Figure 1, types C-G). Therefore, we propose that data syntheses of studies that have used spatial references to quantify biodiversity change have, as a general rule, documented the impacts of habitat loss and conversion – which represent the dominant drivers of biodiversity change across the planet. In contrast, data syntheses that have used time-series from biological monitoring programs have, for the most part, focused on the remaining habitats – those parts of the globe that have yet to be demolished by humans, but which are, nevertheless, being subjected to a plethora of forms of environmental change (climate change, species invasions, altered disturbance regimes, pollution, etc.). These forms of environmental change would be expected, a priori, to influence local richness in qualitatively different ways, which may help explain why studies like Vellend et al. ([2013](#_ENREF_17)) and Dornelas et al. ([2014](#_ENREF_5)) have found no consistent trends.

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