

Changes in precipitation patterns due to climate change is a growing threat to global biodiversity and ecosystem functions. While water availability can affect the structure of ecological communities via changes in species diversity and species interactions, their effects can vary among taxonomic groups and trophic levels. However, our current understanding of the mechanisms underlying these distinct responses is limited. Further, synthesis work on the effects of water availability on ecological communities has been largely focused on selected trophic groups from a few habitats. However, the taxonomic, functional, and phylogenetic diversity of communities may differ in their responses to water availability. To address this issue, we conducted a meta-analysis on the responses of aquatic and terrestrial plant and animal communities to changes in water availability. We predict that taxonomic diversity will be affected more strongly than functional diversity since functional redundancy may counteract precipitation effects on functional diversity. In addition, we expected that decreased precipitation will reduce the percent cover and biomass of plant communities and that these responses will vary depending on functional groups due to their different sensitivity to precipitation changes. Here, we synthesize 981 observations worldwide and show that most studies on community-level responses to water availability were conducted in Asia (49.5%), Europe (29.1%), and North America (21.4%). To date, only a small number of studies have focused on aquatic invertebrates (4.2% of the total case studies). In terrestrial habitats, we found significant decreases in the taxonomic and functional diversity of plants and soil invertebrates in response to decreased water availability and vice versa. In contrast to our prediction, the functional diversity of animals responded more strongly than taxonomic diversity likely due to the turnover of functionally distinct species. However, plant communities did not show significant differences in functional and taxonomic diversity in response to water availability. In addition, macroinvertebrate diversity significantly decreased in response to decreased precipitation in aquatic habitats. Precipitation changes affected aquatic and terrestrial communities differently since the diversity of aquatic invertebrates responded more strongly than terrestrial invertebrates and plants, under decreased precipitation conditions. The results from this meta-analysis can be used to identify and address knowledge gaps in community-level responses to precipitation changes and the underlying causes explaining variation on these responses.