

Table 1 | Key differences between freshwater and terrestrial ecosystems in physical, chemical, habitat and community properties and their hypothesized effect on community processes

| Category | Property | Ecosystem comparison | Relevant process | Hypothesized effect on process | Reference |
|------------------|--|---|---------------------|---|---|
| <i>Physical</i> | Buoyancy | Water > air | Dispersal | Intrinsic dispersal ability is greater in freshwater than on land | Bonte <i>et al.</i> 2012; Cornell & Harrison 2013; Srivastava & Kratina 2013 |
| | Terminal velocity | Air > water | Dispersal | Intrinsic dispersal ability is greater in freshwater than on land | Denny 1990; Dawson & Hamner 2008 |
| | Spatial structure of environmental variation | Terrestrial > marine > freshwater | Selection (abiotic) | Greater environmental structure on land could lead to stronger species sorting compared to freshwater | Herfindal <i>et al.</i> 2022 |
| | Light attenuation | Water > air | Selection (abiotic) | Freshwater < terrestrial (greater niche differentiation) | Stomp <i>et al.</i> 2007 |
| <i>Habitat</i> | Habitat structure | Rivers: dendritic Lakes: isolated Terrestrial: open (2D) Marine: open (3D) | Dispersal | Dispersal limitations (extrinsic) are greatest in freshwater habitats, and lowest in marine habitats | Baguette <i>et al.</i> 2013; Kappes <i>et al.</i> 2014; Wubs <i>et al.</i> 2016; Comte & Olden 2018 |
| | Habitat stability | Terrestrial > freshwater | Speciation | In situ speciation plays larger role in dynamics of freshwater than terrestrial communities | Gillespie 2004; Miller <i>et al.</i> 2018 |
| <i>Chemical</i> | Food quality | Freshwater > terrestrial | Selection (biotic) | May increase insect consumer populations and thus consumptive pressure in freshwater systems | Elser <i>et al.</i> 2000; Twining <i>et al.</i> 2021 |
| <i>Community</i> | Species richness per area | Freshwater > terrestrial | Speciation | In freshwater habitats the diversification rates-per clade or lineage per unit time is highest | Miller <i>et al.</i> 2018; Rabosky 2020; Miller 2021 |
| | Frequency of generalists | Freshwater > terrestrial | Selection (biotic) | Consumptive pressure expected to be stronger in aquatic compared to terrestrial habitats | Pringle <i>et al.</i> 2016; García-Girón <i>et al.</i> 2020 |
| | Naïvete to predators | Freshwater > terrestrial | Selection (biotic) | Consumptive pressure expected to be stronger in aquatic compared to terrestrial habitats | Cox & Lima 2006; Anton <i>et al.</i> 2016, 2020 |
| | Saturation of communities | Freshwater > terrestrial | Selection (biotic) | Competitive selection is weaker in freshwater habitats | Shurin <i>et al.</i> 2000; Shurin & Smith 2006; Alofs & Jackson 2014 |