Rethinking Biodiversity Patterns and Processes in Streams

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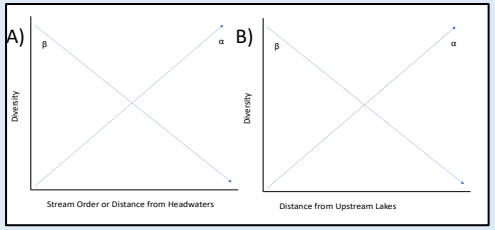
Background

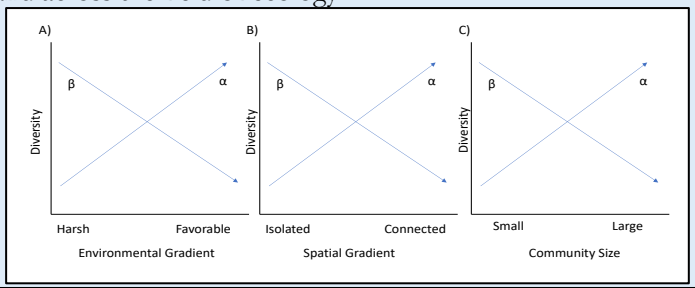
- Stream ecology frameworks, like the River Continuum Concept, Serial Discontinuity Concept, and Might Headwaters Hypothesis describe biodiversity patterns changing longitudinally along the river network, as proxies for spatial and environmental gradients.
- Support for these frameworks is mixed and mainly applicable to the stream ecosystems in which they were developed.
- In addition, these frameworks have placed less emphasis on the specific mechanisms driving biodiversity patterns.



Hypothesized relationships for patterns of α and β diversity as a function of A) distance from the headwaters and B) distance from upstream lakes

New Conceptual Framework

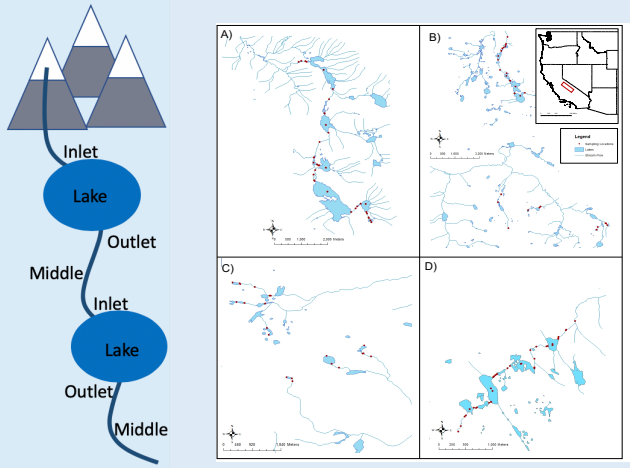
- Shifting focus from longitudinal patterns of diversity to changes along spatial and environmental gradients
- Direct link to ecological processes, understanding the influence of ecological drift, ecological selection, and dispersal.
- Making stream ecology generalizable across stream types, biomes, and across the field of ecology



Hypothesized relationships for patterns of α and β diversity along A) environmental gradients to understand influence of ecological selection, B) spatial gradients to understand influence of dispersal, and C) community size gradients to understand influence of ecological drift.

Case Study

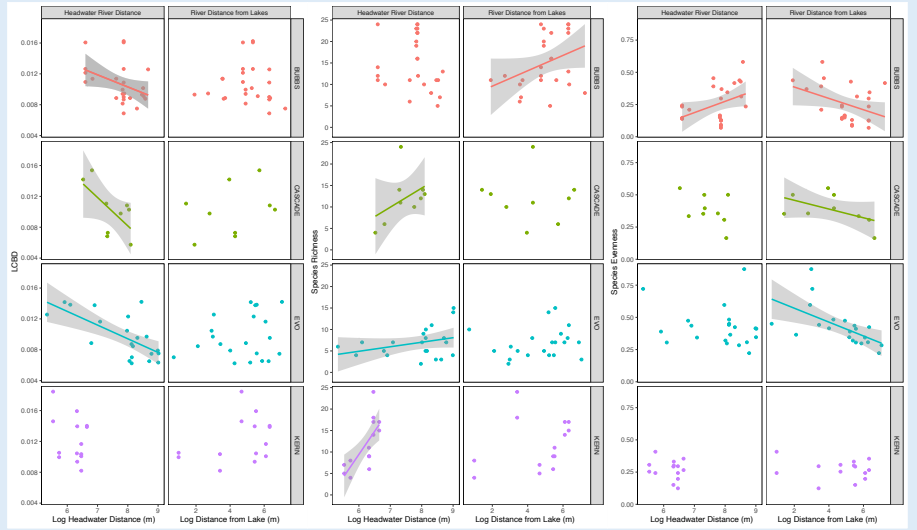
- Alpine Lake-Stream Networks in Sierra Nevada, CA
- Sampled stream macroinvertebrate communities and environmental parameters along the river network and at varying distance from upstream lakes



Conclusions

- Support for RCC and MHH, where species richness increases and beta diversity decreases moving downstream from headwaters
- Support for SDC, where community evenness is highest near lake outlets and decreases moving downstream from lakes
- Ecological drift appears to primarily structure community variability (beta-diversity) with lesser effects of dispersal and selection
- Ecological drift, ecological selection, and dispersal appear to play equal roles in structuring local community diversity (richness)

Biodiversity Patterns from Stream Eco Frameworks



Biodiversity Patterns/Processes from New Framework