A framework for conducting riverscape genetics studies

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Research in landscape genetics has provided new insight into the role of past events in shaping present genetic diversity, and the effectiveness of conservation measures on observed genetic variation. Recent publications have provided designs for conducting landscape genetic studies and improving statistical methods for analyzing landscape effects on genetic variation, but in this context the river functions only as a feature of the landscape rather than as the landscape, itself. Aquatic ecologists continue to develop conceptual models to understand riverine landscapes (riverscapes) by including the physical habitat, processes that produce and maintain those habitats, and the inherent physical structure of the stream network. We present a framework for the design of a riverscape genetics study that describes 1) how to establish a sampling design while considering the spatial scale, and unique hydrologic characteristics of freshwater habitats, and 2) analytical tools that are available for the integration of genetic and spatial environmental data in aquatic environments. Our framework provides the first steps toward the formation of theory, analytical tools, and methods for the developing field of riverscape genetics.