A Spatially Structured Modeling Approach for Fish in River Networks

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Riverine fish provide many ecosystem services in support of human well-being, including food, recreation, and biodiversity. Under future drivers of land use and climate change, inland waters are likely to be impaired, and conservation and protection of fish species and services in these systems will be a focus of environmental management. We developed a model that simulates the response of populations of multiple fish species – a metacommunity – to multiple stressors across a stream network. The model is spatially-explicit and age-structured, with three components: habitat suitability, based on multiple stressors; population dynamics, including species interactions; and movement across a spatial river network. The current application of the model is to the Willamette basin in Oregon, with 138 river segments. Although this model is relatively simple, complexity can be built in as appropriate; for example, the representation of anadromy. We have linked this model to dynamic watershed inputs in an integrated modeling system for watershed assessment and prediction.