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SYSTEM-LEVEL HYPOTHESIS TESTING: A NOVEL APPROACH TO DEVELOPING PARSIMONIOUS MODELS OF COMPLEX ECOSYSTEM DYNAMICS

Parsimonious conceptualizations of interactions among ecosystem components (e.g., channels, floodplains, and aquifers) and currencies (e.g., water, heat, carbon, nutrients) are important to advancing aquatic science. Competing conceptual models can represent alternate *system-level hypotheses* (SLHs) that should be rigorously tested, falsified, and refined. However, rigorous SLH testing requires formalization of corresponding simulation models that provide a rapid means of: 1) strategically adding and removing model complexity to create model variants, and 2) managing and analyzing predictions from model variants that may falsify and subsequently allow refinement of SLHs. We are developing Network Exchange Objects (NEO), a software framework to support iterative design of ecosystem models via SLH testing. NEO allows components of models (equations) to be coded individually and organized into nested hierarchies of algorithms. At run time, algorithms can be recombined at any level of the hierarchy to create model variants and thus test alternate SLHs. Ultimately, NEO facilitates evaluation and blending of model algorithms (e.g., alternate representations of water movement, nutrient dynamics, and carbon fixation) to represent ecosystem processes with an appropriate balance among model complexity, realism, and generality

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[Back](#)