

For Society of Freshwater Sciences Annual Meeting 2017, Raleigh, NC, June 4-9, 2017

Session/Description: S25: Do mesocosm experiments play a meaningful role in freshwater research
Mesocosms (defined at any size and scale) have been a controversial tool of freshwater sciences, eliciting both criticism and praise for their role in development or testing applied resource issues and ecological theory. Despite greater control and replicability of mesocosm experiments, these are relatively small-scale systems and have significant limitations. In this session, we aim to renew this debate and review the current status of mesocosm science in freshwater research. We encourage scientists to submit talks that use data to support or question the general utility of mesocosm science in designing our freshwater futures. Questions of particular interest could include: Are mesocosms results reproducible and can mesocosm findings be accurately extrapolated to real ecosystem management? Do the benefits of control, random assignment of treatments and replicability in mesocosm experiments outweigh the limited ecological realism and spatiotemporal scale of these systems? How should mesocosms studies be designed to test ecological theory or what are the limits of mesocosm science?

Title: Ecological Realism of U.S. EPA Experimental Stream Facility Studies

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Abstract

The USEPA's Experimental Stream Facility (ESF) conducts meso-scale ecotoxicology studies that account for both structural and functional responses of whole stream communities to contaminants or other stressors. The 16 mesocosms of ESF are indoors and consist of a tiled run section (0.152 m W x 4.268 m L x 0.105 m D) that widens to a gravel riffle section (0.305 m W x 4.268 m L x 0.19 m D). They are intermediate size among studies reporting stream mesocosm results. Their set-up is unique for their size, with a high degree of engineering controls for continuous flow-through dose-response designs, yet fixed, chronic exposures to contaminants under conditions that quantifiably mimic real stream riffle/run habitat with consistent upstream renewal. With fifty standard operating procedures serving ESF studies, the background and boundary condition information is collected to determine the realism critical to the field relevance of the results. Parallel ex situ and in situ single species exposure formats including fish survival and fecundity metrics are also included. With this framework studies at ESF provide scientifically defensible evaluation of proposed aquatic life criteria.

179 words