A GENERAL HYPOTHESIS FOR ECOLOGICAL CHANGE IN FLORIDA'S SPRINGS

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Understanding ecological change in Florida's springs is an urgent priority. Widespread changes include the loss of submerged aquatic vegetation (SAV), proliferation of benthic filamentous algae, and attendant impacts of these changes to higher trophic levels, as well as to public perceptions of ecological health. While nitrate enrichment is most widely invoked as the dominant causal mechanism, the spatial and temporal patterns of ecological change suggest the primacy of other controls. The hypothesis proposed here emerges from a synthesis of available evidence, and has two parts: 1) the role of slow variables (press-type stressors) and 2) the role of fast variables (pulse-type stressors). At both temporal scales, changes in the hydrologic regime are central, both via direct effects on the hydraulic shear environment and indirectly on water chemistry, water clarity (and thus ecosystem energetics), and sediment properties. The dominant press-disturbances include declines in bed shear and alterations to sediment redox conditions and water column oxygen tensions that are broadly coincident with reduced discharge. These slow-changing biophysical attributes cascade through the entire ecological community, and help explain spatial variation in ecological change. The temporal patterns of ecological change further suggest hydrologic controls, particularly the role of short-lived flow reversals in creating incipient conditions for dramatic ecological regime shifts, and reinforcing the biological feedbacks that mediate the competition between SAV and algae. While springs vary in their relative susceptibility to pulse and press disturbances, the hypothesis proposed here may be of utility in understanding the spatial and temporal patterns of change that have already occurred, and by extension also for predicting trajectories and timing of ecological recovery.

PRESENTER BIO: Dr. Cohen is a professor in the School of Forest Resources and Conservation at the University of Florida. His expertise is in ecosystem science and hydrology. He was a member of the UF CRISPS project team, and has 25 publications related to ecological and hydrological processes in Florida's springs