Soil and Water Sciences Department
Graduate Student Exit Seminar

Speaker: Joshua Papacek
Ph.D. Dissertation Degree Candidate

Advisor: Dr. Patrick Inglett

Title: A New Normal? Intensification of Harmful Algal Blooms in the Indian River Lagoon Under Shifting Nutrient Ratios and Sources

Date: Monday, June 11th
Time: 3:00 pm – 4:00 pm
Location: McCarty Hall A, Room G186

Increasing nitrogen (N) and phosphorus (P) supply to coastal systems is strongly linked to the expansion of harmful algal blooms (HABs) globally. However, there is also increasing evidence that the specific forms (e.g. organic vs. inorganic) and ratios of N and P play a role, and these nutrients may also be supplied by “internal” biogeochemical processes. The objective of my dissertation research was to determine whether shifting nutrient regimes and internal processes are potential factors related to recent HABs in the Indian River Lagoon (IRL), a subtropical estuary in Florida. First, a 20-year-long data set of water quality was analyzed using several multivariate and time series trend analyses to determine if specific nutrient ratios may be changing temporally. In a second study, uptake experiments were carried out by tracing N substrates into biomass from cultures of ‘Superbloom’ phytoplankton and tracking the disappearance of P from culture solution. Lastly, the potential for biological nitrogen fixation (BNF) to supply new N to blooms was tested over a two year study on samples collected from the water column in the IRL. Changepoint analyses detected significant shifts in P concentrations, and consequently N:P ratios, which changed approximately one year prior to significant blooms. Additionally, ‘Superbloom’ phytoplankton were significantly associated with high organic N:NO₃⁻ ratios, and uptake results directly confirmed cultures’ preference for chemically-reduced N (i.e. NH₄⁺) and the ability to use organic N and P. BNF assays found that water column rates were highly episodic and most significantly linked to available P concentrations among other variables. Furthermore, *nifH* gene sequencing revealed that a diverse assemblage of bacteria capable of BNF were consistently present in the IRL. Together, these results suggest that recent shifts in nutrient ratios favor HABs with advantageous physiological traits as well as BNF, which has previously been an otherwise unaccounted internal source of N for the IRL.

For our off-campus students, off-campus faculty, and on-campus students who cannot attend, this seminar can be viewed via live or watched at a later date via this link: [Joshua Papacek](mailto:Joshua.Papacek@ufl.edu). In addition, all seminars are archived for viewing on our [SWSD Seminar Page](http://swsd.ufl.edu/seminars).