Restoration unknown: consequences of sediment removal and increase in riparian vegetation on ecosystem functioning along gradients in contamination and hydrologic connectivity

Ximena Mesa, Florida International University
Research mentor: John Kominoski, Department of Biological Sciences

Goals

- Assess changes in aquatic ecosystem function following a large-scale restoration, involving removal of contaminated sediment.
- Determine how restoration capacity interacts with relative level of contamination and hydrologic connectivity.

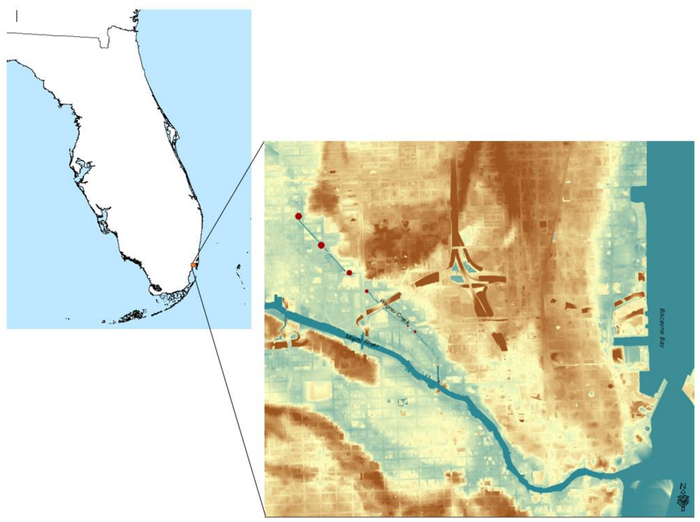

Figure 1. Digital elevation map of Miami River watershed and location of study sites on Wagner Creek, Miami, FL. Size of red circles indicates contamination gradient of dioxins, heavy metals, PAHs, fecal coliform bacteria.

Research Methodology

Study System: Wagner Creek and Seybold Canal

- Largest tributary to the Miami River
- Most contaminated water body in the State of Florida
- Upstream to downstream contamination gradient
- Bidirectional hydrologic connectivity, varies with seasonal and tidal influences
- Restoration efforts: dredging sediments and reducing stormwater runoff and pollution

Experimental Studies

Dissolved oxygen (DO) and ecosystem metabolism

- Installed DO and PAR sensors at four sites along the upstream-downstream gradient
- Model effects on gross primary productivity (GPP) and ecosystem respiration (ER) before and after restoration

Antibiotic Resistant (AR) bacteria

- Conduct antibiotic and dioxin tolerance assays
- Compare AR bacteria frequencies in water and sediments between contaminated and reference sites
- Measure abiotic factors that might correlate with observed AR

Figure 2. From left to right. Creek daylights; near Kristy House looking upstream; water encroachment during high tide; the Creek meets the Miami River.

Expected Results

- Following restoration, we expect ecosystem metabolism to respond with increased metabolic rates, i.e. enhanced GPP, mainly as a result of increased abundance of primary producers. Low DO will indicate enhanced ER relative to GPP probably due to bacterial responses
- AR among stream bacteria may prove to be a complex of events dependent on exposure to contaminants and other environmental variables

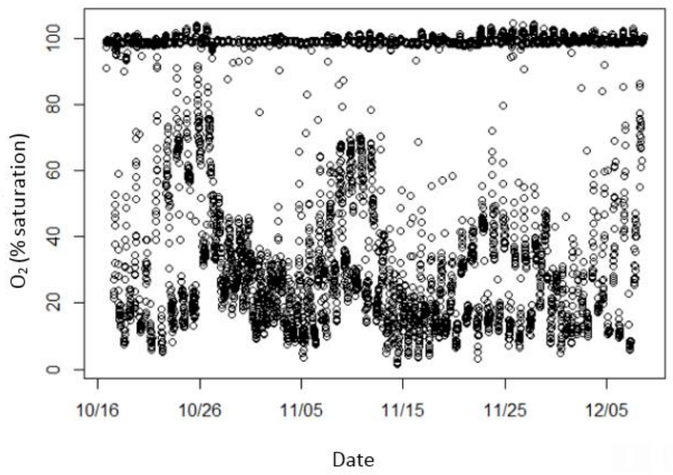

Figure 3. Oxygen saturation in upstream Wagner Creek

"Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation."

CREST Center for Aquatic Chemistry and Environment

xmesa002@fiu.edu

FIU Center for Aquatic Chemistry and Environment
NSF Center of Research Excellence in Science and Technology

http://crestcache.fiu.edu