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

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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.

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

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 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.

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

Figure 3. Oxygen saturation in upstream Wagner Creek

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