

Lapointe, B. and M. Clark. 1992. Nutrient Inputs from the Watershed and Coastal Eutrophication in the Florida Keys. 15:4: 465-476.

Abstract: Widespread use of septic tanks in the Florida Keys increase the nutrient concentrations of limestone groundwaters that discharge into shallow nearshore waters, resulting in coastal eutrophication. This study characterizes watershed nutrient inputs, transformations, and effects along a land-sea gradient stratified into four ecosystems that occur with increasing distance from land: manmade canal systems (receiving waters of nutrient inputs), seagrass meadows, patch reefs, and offshore bank reefs. Soluble reactive phosphorus (SRP), the primary limiting nutrient, was significantly elevated in canal systems compared to the other ecosystems, while dissolved inorganic nitrogen (DIN; NH_4^+ and NO_3^-), a secondary limiting nutrient, was elevated both in canal systems and seagrass meadows. SRP and NH_4^+ concentrations decreased to low concentrations within approximately 1 km and 3 km from land, respectively. DIN and SRP accounted for their greatest contribution (up to 30%) of total N and P pools in canals, compared to dissolved organic nitrogen (DON) and dissolved organic phosphorus (DOP) that dominated (up to 68%) the total N and P pools at the offshore bank reefs. Particulate N and P fractions were also elevated (up to 48%) in canals and nearshore seagrass meadows, indicating rapid biological uptake of DIN and SRP into organic particles. Chlorophyll a and turbidity were also elevated in canal systems and seagrass meadows; chlorophyll a was maximal during summer when maximum watershed nutrient input occurs, whereas turbidity was maximal during winter due to seasonally maximum wind conditions and sediment resuspension. DO was negatively correlated with NH_4^+ and SRP; hypoxia ($\text{DO} < 2.5 \text{ mg l}^{-1}$) frequently occurred in nutrient-enriched canal systems and seagrass meadows, especially during the warm summer months. These findings correlate with recent (<5 years) observations of increasing algal blooms, seagrass epiphytization and die-off, and loss of coral cover on patch and bank reef ecosystems, suggesting that nearshore waters of the Florida Keys have entered a stage of critical eutrophication.