Effect of Hydroperiod on Phosphorus Availability in a Restored Calcareous Subtropical Wetland

The Hole-in-the-Donut region of the Everglades National Park has undergone restoration after decades of farming and invasion by exotic species. Prior research has determined that soil development after restoration has caused a shift from nitrogen to phosphorus (P) limitation. This study was designed to determine how changes in hydroperiod affect the availability of P in restored sites, where more frequently flooded sites were expected to have higher levels of organic P accumulation as a result of its longer hydroperiod. Soil P parameters (total and extractable P, P isotherms), microbial biomass P (MBP – chloroform extraction) and extracellular enzyme activities (phosphatase) were measured in surface soils (0-5 cm) during contrasting seasons (wet and dry) in a reference wetland and at two sites in the process of restoration for 7 and 10 years. Measured TP values were highest at the 7-year old site, followed by the 10-year old site and lowest at the reference site. Labile inorganic P ($NaHCO_3$-P_i), MBP, and enzyme activities were all significant when comparing each of the three sites seasonally. Soil EPC_0 values were only moderately significant between reference and restored sites but when seasonal data were added into the analysis, these values became more significantly different. Extracellular enzyme activity responded to P availability with an inverse relationship between soil P levels (TP, extractable P, MBP) and phosphatase activity. Restoration in this ecosystem is highly dependent on development of P limitation; therefore, these results indicate hydroperiod is an important factor to consider when determining restoration strategies in these systems.