

**PALEOLIMNOLOGICAL ASSESSMENT OF SIX LAKES ON THE KISSIMMEE CHAIN, WITH IMPLICATIONS FOR RESTORATION OF THE KISSIMMEE-OKEECHOBEE-EVERGLADES SYSTEM, FLORIDA, USA**

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The Kissimmee Basin in south central Florida contains a large, freshwater network that includes the Kissimmee River and nearly 2 dozen lakes that are headwaters of the Florida Everglades. Management of these lakes is an important part of Everglades restoration. We report a paleolimnological investigation of 6 lakes in the Upper Kissimmee Basin. Engineering activities connected the lakes and permanently altered hydrology in the 19th and 20th centuries. The lakes were naturally meso-eutrophic, but changes in lake levels and nutrient loading led to various degrees of eutrophication. Cyanobacteria were present historically at low levels in Lakes East Tohopekaliga, Cypress, and Tohopekaliga, but increased during the 20th century. Lake Jackson lacked cyanobacteria until recently, but Lakes Kissimmee and Marian had high levels of cyanobacteria since predisturbance times. Profound changes occurred after engineering activities eliminated large natural fluctuations in water levels that periodically dried large portions of the lake basins. Salt-tolerant biological indicators, particularly diatoms, ostracods, and *Ruppia maritima*, alternated with freshwater organisms prior to hydrological alterations. Plant macrofossils, stable isotopes, and C/N ratios showed that macrophytes in Lakes Cypress, Jackson, East Tohopekaliga, and Tohopekaliga progressed from submerged to floating and emergent taxa in recent times. Lakes Kissimmee and Marian showed greatest evidence of former associated wetlands, and by inference colored dissolved organic carbon, but they persistently lacked large variations in water levels and submerged macrophytes. We recommend disconnecting these lakes from each other and from the Kissimmee River to reestablish large, natural fluctuations in water levels that were part of healthy ecosystem function. Former wetlands should be restored to slow the downstream cascade of nutrients to Lake Okeechobee and the Everglades. This study shows that paleolimnology is useful for assessing hydrological changes that have affected lake ecological integrity, and that it can help to better inform lake restoration efforts.