Lake Okeechobee, the largest natural freshwater lake in the nation, exclusive of the Laurentian Great Lakes, covers approximately 1,732 km² (730 square miles) and has a maximum storage capacity of 3.92 billion tons (1.05 trillion gallons) with the average water depth of 5.7 m (19 feet). Due to global warming and the Atlantic Multidecadal Oscillation (AMO) impact, which is based on long term changes in the temperature of the surface of the North Atlantic Ocean, Lake Okeechobee experienced a historical drought and the present water level in Lake Okeechobee is at a historic low and the inflow to Lake Okeechobee has been reduced by 40% of the average daily mean due to the AMO impact.

Army Corps of Engineers has performed a large-scale implementation of ASR (Aquifer Storage and Recovery) in the Kissimmee River Basin by involves injecting water into an aquifer through wells or by surface spreading and infiltration in wet seasons and then pumping it out back to Lake Okeechobee in dry seasons. Due to the ASR operation, there is a potential for various ecological and chemical changes on flora and fauna, including both positive and negative feedbacks of the sediment stabilization and phosphorus concentrations in the lake water, in the receiving surface waters. The degree of the impact depends on the quantity and types of metals, alkalinity, and minerals in the recovered water during the dry seasons.

Evaluation of environmental effects in Lake Okeechobee must be taken into consideration such as the complex nature of the ecosystem, both in terms of its distinct ecological zones (pelagic, littoral, near-shore fringe) and the diverse array of native biota that depend on this water resource. However, this study will be focused on the metals, alkalinity, and mineral impacts on water quality of lake water and phosphorus stability of sediments in Lake Okeechobee due to the ASR operation.

In this research, five different ratios between ASR water and lake water are considered to study how different amount of ASR water injected can impact the chemical equilibrium between lake water and ASR water, and the following influence on phosphorus stability in lake sediments.

The main purpose of this study is: (1) To identify the relevant water quality modeling mechanism that may be sensitive to the change due to the ASR operation; (2) To explore the role which pore water plays between ASR water, lake water and sediments; (3) To provide a holistic assessment related to the phosphorus, examine and analyze the relevant metals and minerals that affect the phosphorus stability of the sediments in Lake Okeechobee; (4) To supply some advice on appropriate ASR operation to reduce the phosphorus release and eutrophication potential from lake sediments.

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Approved for distribution by Ni-Bin Chang, Committee Chair, on March 13, 2010.
The public is welcome to attend.