**PROJECT APPLICATION SUMMARY: An examination of sediment resuspension and algal bloom dynamics in Florida Bay: algal drivers and dynamics in a unique subtropical estuary.**

**1. Introduction for Addressing the Priority Action Items:**

a. Situation, Need & Previous Efforts: The availability of organic and inorganic nutrients from either internal or external sources can facilitate algal bloom in fresh and marine waters. The subtropical estuary that is Florida Bay has undergone significant changes over the past decades resulting in several ecosystem-level changes including seagrass die-off events, peat collapse, sea-level rise, episodic hurricanes, climatic shifts, and ongoing ecosystem restoration (Rudnick et al 2005; Glibert et al 2021; Julian et al Submitted). These changes in part have led to physiologically favorable conditions for algal growth (Glibert et al 2021). Internal nutrient dynamics could also play a significant role in the distribution, extent, and duration of algal blooms in Florida Bay (Zhang et al 2004; Blakey et al 2015).

Florida Bay has a history of episodic mass mortality of seagrass communities across the bay (Hall et al 2021). These die-off events are suspected to be driven by a combination of factors, due to the hydrologic modification of the upstream Everglades and the geomorphology of Florida Bay, hypersaline conditions, bottom-water anoxia (due to high temperatures), sulfide toxicity, eutrophication, dense algal blooms and low light attenuation due to turbid conditions is suspected to cause these seagrass mortality events (Durako et al 2001; Hall et al 2021). It is hypothesized that a combination of climatic conditions including discrete metrological events during warmer seasons and lower rainfall periods leads to higher evaporation and stratification could lead to high-stress conditions in the seagrass communities complicating long-term prediction of die-off risk. However, it is suggested that minor modifications to upstream freshwater deliveries via coastal creeks could alleviate hypersalinity in north central Florida Bay (Lee et al 2016). What is unknown with this potential hydrologic modification is the change in nutrient inputs to the bay.

Post Irma mangrove die back and resulting WQ (source)

Sediment dynamics

Algae bloom and speciation – phlips et al, blakey et al., berry et al. ,

In this study, we focus on understanding the role of nutrients and sediments associated with changes to coastal creeks over the past x. Specifically, we will evaluate sediment and surface water nutrients and characteristics to gain a better perspective on sediment resuspension and nutrient redistribution in this section of Florida bay to … seagrass and algal dynamics. In this portion of Florida Bay, sediment resuspension is a persistent issue (Fig x) . Seagrass meadows are vital ecosystem components that support countless species and provide essential ecosystem services. Sediment resuspension and algal blooms can significantly reduce light attenuation and thereby affecting the health of seagrass beds. Therefore understanding sediment resuspension and algal bloom dynamics will help guide restoration efforts to protect and improve the ecological integrity of Florida bay. Thus, the overall aim of our study is to …

b. Objectives: This proposed study has x objectives: 1) quantify the sediment characteristics, nutrient concentrations, and storage of southern Lake Ingram and the nearshore environment, 2) develop or refine remote sensing products associated with algae and sediment in western Florida, and 3) perform a time-series analysis of existing remote sensing data from the Sentinel satellites to evaluate fine-scale temporal and spatial dynamics of algae and sediment in western Florida Bay. The proposed work addresses the following questions: a) while sediment resuspension is common in Florida bay how do sediment characteristics such as bulk density, grain size, percent organic matter, and nutrient concentration and storage vary across the region? b) How do water column characteristics such as dissolved and particulate nutrients and algal biomass spatially vary in this region of Florida Bay? c) what are the potential sources of nutrients and sediment from coastal creeks and canals d) remote sensing question?

We hypothesize that sediment and material transport from the nearshore environment and/or coastal creeks facilitate the proliferation of algal blooms in central and western Florida Bay.

c. Applications, Benefits, and Importance: Algal blooms occur seasonally in Florida bay, with some years producing harmful algal blooms (HABs) while other years nuisance or phytoplankton algae blooms occur (Blakey et al 2015; Glibert et al 2021). Regardless of the type of bloom, algal blooms can significantly impact ecosystem health through hypoxia, shading of benthic organisms, or in the case of some HABs species that produce toxins. The anticipated results of this study will inform our understanding of potential drivers and sources of nutrients (internal and external or autochthonous and allochthonous) that can fuel algal blooms. Additionally, results from this study will also provide information on sediment dynamics within this portion of the bay. Both algal blooms and sediment resuspension are processes that can significantly impact benthic communities such as seagrasses and sponges in Florida Bay. The proposed work addresses the “**Nutrient Management to Reduce Harmful Algal Blooms (HABs)**” priority and addresses Goal 5 of the US EPA Strategic Plan to ensure clean and safe water for all communities. This study will also contribute to the larger goal of actively improving water quality throughout South Florida coastal ecosystems by enhancing monitoring and our understanding of algal bloom dynamics.

**2. Methods & Approach**

d. Description of Major Tasks:

e. Environmental Impact:

f. Future Efforts:

**3. Project Management**

g. Administration:

h. Roles & Responsibilities:

**4. Support Requirements & Conditions**

i. Permit or cooperation required:

j. Data or facility access:

**5. Project Schedule**

k. Milestone & deliverable schedule

**6. Environmental Results – Outputs & Outcomes**

l. Outputs:

m. Tracking outputs & outcomes:

**7. Programmatic Capability & Past Performance**

1. TZ Osborne (PI), KR Reddy, P Julian (coPI). 2020. Sediment and Nutrient Mapping of Lake Okeechobee. South Florida Water Management District. $200,000. *All project objectives were met on time and completed the work successfully providing estimates of nutrients in the sediment of Lake Okeechobee to the South Florida Water Management District. All reports were submitted and approved by the South Florida Water Management District and currently, 2 scientific paper is in preparation.*

2. TZ Osborne (PI), P Julian (coPI). 2021. Taylor Slough Soil Phosphorus Assessment. Everglades National Park. $80,000. *The project is being managed successfully. 1 scientific paper is currently in preparation. Following sampling associated with this project, another scientific paper is expected.*

**8. Budget summary**

a. Personnel:

b. Fringe benefits

c. Travel

d. Equipment

e. Supplies

f. Contractual costs

h. other

j. indirect costs

k. total costs

Leveraged resources

**9. Distinguishing between subawards v/s contracts**

**10. Voluntary cost share/match and other leveraged funds**

**11. Partnerships with other entities**

**12. Information Transfer**

**13. Literature Cited**