

## **REQUEST FOR PROPOSALS FOR A PROJECT TO BE INITIATED THROUGH THE COOPERATIVE ECOSYSTEM STUDIES UNITS (CESU) NETWORK**

**PROJECT TITLE:** CESU - Disentangling the effects of rainfall and water management actions on the water levels and flows in the Everglades National Park.

**DEADLINE:** 5:00 pm, Friday, May 20, 2023

Everglades National Park (ENP) has been actively involved in Comprehensive Everglades Restoration Plan (CERP) and non-CERP projects to improve the quantity, quality, timing, and distribution of water moving through the Everglades. Information that enhances our understanding of the relative influence of rainfall and restoration projects on the ENP hydrology would help Park Managers to better manage wildlife and habitat that depend on hydrological changes. Currently, the ability to quantify such information is lacking.

The National Park Service (NPS), South Florida Natural Resources Center (SFNRC), a division of Everglades National Park, seeks proposals to identify potential collaborators to assist the park in identifying the influence of restoration projects on the hydrology of the ENP. Quantifying the relative influence of the hydrologic drivers will help NPS to develop effective water management strategies to meet the desired target for the ecological restoration in the ENP.

### **BACKGROUND**

Over the past several decades, freshwater inflow to Everglades National Park has been intensively managed with a series of water management projects to increase the availability of water deliveries to Everglades National Park (ENP) for ecological restoration while providing for other water-related needs of the region, including water supply and flood protection. In 1948, Central and Southern Florida (C&SF) Project was authorized to provide flood control and water supply to a growing population in south Florida. C&SF project greatly altered the region's hydrology by modifying the natural, rainfall-driven runoff from the Everglades landscape. Such changes came with many unforeseeable and negative ecological consequences in the ENP. In late 1960s, a series of projects were implemented as part of the expansion of the C&SF Project into southern Miami-Dade County. These projects were generally focused on increasing water levels and flows in the ENP, particularly in Taylor Slough while providing the necessary flood control to adjacent agricultural areas. In 2000, The Comprehensive Everglades Restoration Plan (CERP) was authorized by congress to modify the C&SF Project and reestablish the pre-drainage hydrology including water flow, depths, timing, and distribution to prevent the further degradation of the Everglades. Since the passage of CERP, several CERP and non-CERP projects were constructed. As a result, various water control plans such as Interim Operational Plan, Everglades Restoration Transition Plan and Combined Operational Plan were developed and implemented to promote water deliveries to ENP from upstream basins.

Beside freshwater inflows from upstream watersheds, another major source of water to ENP is the rainfall, which is a key hydrologic driver of the ENP ecosystem. Therefore, a small change in rainfall is expected to have a large influence on region's hydrology (e.g., water levels, flows distribution and timing). Typically, there is a seasonal pattern of rainfall in south Florida with

approximately 70% of the rainfall falling in the wet season (May – October) and 30% during the dry (November – April). However, nonstationary nature of climate phenomenon such as North Atlantic Oscillation (NAO) and the El Niño Southern Oscillation (ENSO) greatly influence the amount of rainfall, causing significant variability year to year. For example, NAO and ENSO tend to cause higher rainfall than average and result in anomalously high-water levels.

Water levels in the ENP are joint influences of rainfall, evapotranspiration, and inflow from upstream watersheds driven by water management activities. Evapotranspiration generally follows seasonal pattern with less interannual variability. But there is significant variability in rainfall and frequent changes in water management operations due to restoration projects, which is complicating our understanding of the influence of specific restoration projects. Kotun and Renshaw (2014) investigated the management influence of several restoration efforts in Taylor Slough since 1960 using a double-mass curve approach. But this study only focused on a few structural flows in the upstream of the Taylor Slough and didn't perform a comprehensive analysis in the larger landscape area including Shark River Slough. Since the study was published, there have been many changes in water management operations that deliver flows to ENP. Currently, we can't differentiate the changes in water levels that results from changes in inflows (driven by water management due to hydrologic restoration, or emergency deviations in operations due to extreme rainfall conditions) or changes in the rainfall pattern (driven by direct rainfall variability). Identifying the right water management operations in the future to meet the desired restoration target is premised on the understanding of the attribution of influence of restoration efforts implemented so far. Earlier approaches have demonstrated utility but not comprehensive enough to disentangle in the relative effects of these factors on the marsh water levels.

The proposed project will employ a “data-driven” non-stationary analytical techniques that uses long-term observed data (e.g., rainfall, water levels and flows) in multiple locations of Shark River Slough and Taylor Slough and develops a methodology to quantitatively evaluate relative effects of rainfall and restoration projects on water levels and flows. Understanding such relationships enables us targeted, effective management of water resources to protect the Everglades ecosystem. The outcome of the project will help determine the most effective restoration options, which is of great importance for future restoration planning as well as retrospective assessment of earlier restoration efforts.

## **OBJECTIVES**

This project aims to: 1. develop a “data-driven” approach using long-term observed data that can be used to quantify the relative effects of rainfall and restoration projects on the marsh water levels and flows; 2. synthesize available observed hydrologic data and provide information on trends and variability.

## **ANTICIPATED WORK**

The success of this project will depend on the collaboration between the cooperator and the NPS. NPS staff will have significant involvement with the project to ensure the study and resultant products meet the NPS needs. SFNRC staff will provide any background references, documents, research, or other guidance, assistance in the field and with application for a research permit.

The PI's team will develop the project's technical program in support of this project. Project performance may require the following activities:

- a. Gather monitoring data in south Florida region in several locations of Shark River Slough and Taylor Slough within ENP;
- b. Perform data evaluation, analysis, and interpretation;
- c. Provide written progress reports, according to a specified schedule;
- d. Participate and provide oral reports at progress meetings;
- e. Develop a draft and final technical report with management recommendation for Park Managers' review and approval. Preparation of a publication to submit to a peer-reviewed journal is also suggested.

Upon selection, the PI's team may be asked to update their proposal and collaborate with SFNRC staff to develop a Statement of Work for the cooperative agreement process. Once underway, project status updates will be required at a minimum, each year of the agreement to demonstrate progress toward meeting project goals and objectives.

## SCOPE

**Timelines:** The project is designed as a 2-year study with an estimated start date of Sept. 15, 2023 and end date of Sept. 14, 2025. Proposals are welcome to adjust the duration and start date, although the start date must begin before Oct 1, 2023.

**Budget:** NPS will provide funding in an amount not to exceed \$275,000.00 for the work described in accordance with the approved budget for this project. Partial funding in an amount not to exceed \$175,000.00 is available for Fiscal Year (FY) 2023; the remainder of the funding, \$100,000.00 is contingent upon the availability of FY 2024 funds. All awards are subject to the availability of funds per the Anti-Deficiency Act, satisfactory performance, and compliance with the terms and conditions of the Federal award.

This project will be implemented under a Cooperative Ecosystem Studies Unit (CESU) agreement already in place with your institution, which sets the indirect cost rate at 17.5%.

## ELIGIBILITY

This opportunity is open to non-federal members of the CESU National Network. Information on the CESU National Network can be accessed at <http://www.cesu.psu.edu/>.

## HOW TO APPLY

Interested Principal Investigators are invited to submit an application package of no more than six (6) pages. The package should cover the following areas, which will be used to evaluate the applications received:

1. *Research Team Experience/Qualifications:* Outline your qualifications (a) as a Principal Investigator(s), (b) relevant work on the hydrology of watersheds, and (c) relevant to large land management agency operations (NPS and/or federal-level experience preferred). Briefly, outline your institution's research capacity (e.g., special facilities, equipment, centers, or institutes related to this study) and CESU affiliation. Please include information for key collaborators, who will also work on the project.

2. *Methodology*: Describe how you would approach the project, including staffing, methodology, and timelines. Describe your vision for the project. Are there any objectives that are particularly exciting? Are there any that feel weak, missing, or odd? How does the applicant define success for the project, and how will they measure project success. The applicant should also include a discussion of how the applicant will transfer results of the project, including resources developed (such as datasets, reports, webinars and/or training materials) to NPS and interested stakeholders.

3. *Logistics*: Detail a thorough and reasonable budget breakdown. A sample template of the budget showing budget categories and detail necessary is attached for your reference. Use of this template is not required. There is some flexibility within the itemized list above, but please be specific (e.g., institutional tuition and graduate student costs as well as faculty salary rates and schedules). Please also quantify potential institutional match (e.g., finances, equipment, services). NOTE: Institutional match is not required. Please provide a clear statement that you would be able to complete the project with the available funds.

## **CONTACTS**

**Questions** regarding technical requirements and/or scope of the proposed project should be addressed to Rajendra Paudel, Ecosystem Modeler, SFNRC [rajendra\_paudel@nps.gov; (305) 224-4250].

**Submit** your application package by no later than 5pm, Friday, May 20, 2023 to Carol Daniels, Senior Science Advisor, South Florida Caribbean-CESU [carol\_daniels@nps.gov; (305) 323-7542]. Please use the subject line “CESU Proposal: Disentangling rainfall and water management,” to ensure that the email is properly received and reviewed.