REQUEST FOR LETTERS OF INTEREST FOR A PROJECT TO BE INITIATED THROUGH THE COOPERATIVE ECOSYSTEM STUDIES UNITS (CESU) NETWORK

PROJECT TITLE: GREAT SMOKY MOUNTAINS NATIONAL PARK- LONG-TERM ECOLOGICAL MONITORING DATA ANALYSES

The National Park Service (NPS) is seeking the assistance of principal investigator(s) for a project involving the analysis of long-term ecological monitoring data to provide trends in resource condition and to address inter-disciplinary questions that provide insight on the health of the Park's ecosystems.

This project requires a principal investigator with experience in quantitative ecological analysis of terrestrial and/or aquatic systems.

ELIGIBILITY:
This opportunity is open to non-federal members of the CESU National Network. Information on the CESU National Network can be accessed at https://www.cesu.org.

Background:

Great Smoky Mountains National Park is world-renowned for its biodiversity, abundant wildlife, cultural resources, scenic vistas, and a wide variety of outdoor recreational opportunities. It has been recognized internationally as both an International Biosphere Reserve and a World Heritage Site. The Superintendent and park management team depend on scientific research and monitoring to inform management decisions.

The National Park Service's (NPS) long-term ecological monitoring program, known as "Vital Signs Monitoring," was designed to provide the minimum infrastructure needed to track the overall condition of natural resources in parks and to provide early warning of situations that require intervention. Park vital signs are a subset of physical, chemical, and biological elements and processes of park ecosystems that are selected to represent the overall health or condition of park resources, effects of stressors, or elements that have important human values (NPS 2014). The Smokies ecological monitoring program began in the early 1990s and re-focused in 2011 toward critical natural resource issues, or Vital Signs, which reflect a new understanding of natural ecological processes and roles of an increased number of interacting stressors.

Protocols for data collection for some Vital Signs experienced minimal changes since the 1990s, others, such as Vegetation Communities and Soil Quality, are relatively recent. For the latter, although data sets are not yet sufficient to fully assess trends and monitoring efficacy, we hope to develop data analysis tools we can apply when future data collection cycles are completed.

Data Available

The ecological monitoring program focuses on six Vital Signs: Acid Deposition, Vegetation Communities, Soil Quality, Water Chemistry, Freshwater Communities, and Climate Changes. Attached spreadsheet has a summary of these Vital Signs and associated metrics.

The sampling design follows a scalable approach, where plot arrays are established in several watersheds selected to represent the park as a whole and data collection is coordinated in time and space across disciplines as much as possible. Metrics for multiple Vital Signs are collected in each plot, tracked for changes/trends per plot, aggregated to the watershed scale, and the whole Park. Data are collected at a frequency ranging from every five years (e.g., soil quality and forest health) to bi-monthly (water quality) or even weekly, daily, or hourly (climate and acid deposition), depending on the nature of the parameter and the amount of effort (human hours) required to collect it. The period of record ranges from 2016/17 to present (soil quality and forest health), 1980 to present (acid deposition), or longer (climate, 1922).

Data analysis- The Big Questions

At the simplest level, vital signs monitoring seeks to track the *condition* of the resource, the *trend* of its condition, and the *confidence* with which the condition and trend are stated. As the Park's resources do not exist in a vacuum, an integrated analysis is more telling of the ecosystem's health and potential inter-relationships between vital signs. Assistance with analysis of related or co-located data across disciplines is a primary need.

Examples of ecological questions of interest include:

- To what extent are changes in vegetation communities, aquatic communities, soil quality, acid deposition, water chemistry, and climate influencing and directing each other? Similarly, how do water quality/chemistry [e.g. base cations, sulfate, nitrogen, carbon (TOC/DOC and organic acids), acid deposition, climate, vegetation communities, soil quality, and freshwater communities influence and direct each other?
- Are tree vigor or species richness directly related to acid deposition, water quality/chemistry, climate, and/or soil quality?
- Are there water quality, forest health, acid deposition, or soil chemistry metrics that help explain aquatic macroinvertebrate diversity, relative abundance, etc.?
- How are changes in climate metrics correlated with disturbance regimes, forest productivity, carbon storage and cycles, acid deposition, terrestrial and aquatic biodiversity, and water quality/chemistry?
- How do measured in-Park trends compare to historic regional and in-park averages and trends; this can be answered for acid deposition and climate, but less so for the other Vital Signs?
- Conduct trend analysis for all 6 Vital Signs to tease out which metrics within each Vital Sign are most informative/provide trigger points for concern.
- For discussion, for which additional variables do we have or want to develop metric thresholds that would serve as trigger points for concern?

Brief Description of Anticipated Work and Deliverables:

1. Review of existing data sets (description attached) for each vital sign to verify we have the sampling design and power to detect status and trends for each vital sign, at a recommended level of confidence commensurate with the associated vital sign discipline.
    a. Review of existing data to understand if changes in sampling frequency are needed.
    b. A review and understanding of what other data sources exist, beyond but related to vital sign data, that may inform needed analyses.
2. Recommendations for and implementation of needed analyses to answer inter-vital sign questions, such as those above, including review of potential data limitations or needs to be able to answer questions that are of interest to the park.
3. Consultation time and a handbook with R script to conduct the analyses on a regular basis to look at the long-term trends and provide insight into how best to protect the Park for future generations.

PERIOD OF PERFORMANCE:

The period of performance of this Cooperative Agreement will be determined when the partner is selected and the Agreement awarded. It is expected to extend 15 months.

Tentative start date: October 2024

Tentative end date: December 2025

MATERIALS REQUESTED FOR LETTER OF INTEREST/QUALIFICATIONS:
A detailed study proposal and cost estimate is not requested at this time.

Your Letter of Interest should include:

1. Name; department, university or organization; CESU affiliation; and contact information.

2. Brief Statement of Qualifications including: a) Biographical Sketch; b) Relevant past projects and clients with brief descriptions of these projects - demonstrated results including published works; c) Staff, faculty or students available to work on this project and their areas of expertise. (Maximum length 2 pages, single-space 12 pt. font).

3. A summary of your vision for implementing this project that includes strategy, approach, and special capabilities, timelines, roles and responsibilities of personnel, specific tasks to be conducted, and deliverables. Please be as specific as possible. (Maximum length: 4 pages, single-space 12 pt. Font)

FUNDING: The project will be funded up to $60,000**.** This project will be administered by the National Park Service through a Cooperative Agreement or Task Agreement upon mutual agreement on the application of the CESU Network IDC rate (17.5%).

DEADLINE: The deadline for responding to this letter of interest is **May 31, 2024, by 5:00pm ET**.

REVIEW: Letters of Interest will be evaluated based on qualifications and experience of principal investigator, and project team and proposed approach. Based on review of the Letters of Interest, a principal investigator will be invited to prepare a full application.

CONTACTS: Letters of Interest should be directed to Paul E. Super (paul_super@nps.gov) by the closing date. Questions regarding the proposed scope of the project can be addressed to Paul E. Super, Research Coordinator (paul_super@nps.gov, 828-926-6251).

Attachment: GRSM_VS_Dataset_Summary_27Sept2023.xlsx

National Park Service. 2014. Conceptual plan for vital signs monitoring — Great Smoky Mountains National Park. Natural Resource Report. NPS/GRSM/NRR—2014/854. National Park Service. Fort Collins, Colorado