

PROJECT ANNOUNCEMENT

**US Army Corps of Engineers (USACE)
Engineer Research and Development Center (ERDC)**

Title: Machine Learning (ML) of Forest Stand Metrics to Quantify Carbon Storage

Announcement Type: Initial Announcement

Funding Opportunity Number: W81EWF-23-SOI-0004

Assistance Listing Number: 12.630

Date Issued: 23 Mar 2023

Key Dates: Phase I announcement will be open to receive statements of interest continuously until 5:00PM Central Time (CT), 22 Apr 2023, at which point all statements of interest must be received.

If invited to Phase II, full proposal applications will be due at 5:00PM Central Time (CT), 22 May 2023.

Estimated Award Ceiling: \$150,000 will be available for the first year of the cooperative agreement.

Estimated Total Program Funding: \$480K (\$150,000 for Base Year, \$160,000 for Optional Year 1, and \$170,000 for Optional Year 2)

Agency Contact: Chelsea Whitten, Chelsea.M.Whitten@usace.army.mil

I. Program Description

A. Short Description of Funding Opportunity

This cooperative agreement is an opportunity to identify criteria to quantifying carbon storage potential in forests and forested wetlands. Specifically, the aim of this research is to quantify the basic forest stand metrics through the application of machine Learning (ML) to remotely sensed data. The project will leverage global data to develop understanding of forest growth and successional conditions at a local level. Numerous environmental variables and forest inventory data must be incorporated to train ML algorithms on high performance computing systems (HPCs) to achieve resolutions that lead to understanding of carbon stores at a local level (e.g., a single DOD installation).

B. Background

Climate change is a fundamental factor driving changes in ecosystems and how they function. Land managers are searching tools to improve operational, planning, business, and resource allocation decisions when it comes maintain forests and forested wetlands. Carbon storage and sequestration is an ecosystem function that helps to regulate the climate change and provides ecosystem services that benefit society. This benefit is realized at global scales from local, national, and global inputs.

Forests and forested wetlands store a disproportionately large volume of carbon on the landscape, sequestering carbon at higher rates than many other habitats. Environmental and bioclimatic variables directly impact the development of a forest ecosystem, and therefore, its ability to store carbon based on its growth and successional conditions. Recent interest has focused on the need to understand carbon dynamics in US Forest Service lands, global forests, as well as DoD lands, resulting in the evolution and expansion of Machine Learning (ML) attempts to quantify forest carbon through quantification of forest stand metrics (e.g., tree diameter or tree density). Unfortunately, few studies have succeeded at assigning forest stand metrics across large areas from remotely sensed data leaving a knowledge gap that must be addressed to develop a tool that can predict carbon sequestration potential across a range of forested ecosystems.

C. Program Description/Objective

This research project focuses on quantifying basic forest stand metrics through the application of ML to remotely sensed data. The project will leverage global data to develop understanding of forest growth and successional conditions at a local level. Numerous environmental variables and forest inventory data must be incorporated to train ML algorithms on high performance computing systems (HPCs) to achieve resolutions that lead to understanding of carbon stores at a local level (e.g., a single DOD installation).

Knowing that understanding dominant forest habitat type and forest volume (as calculated from tree height, diameter, and density) will yield significant understanding to forest carbon storage, the purpose of this work is to demonstrate that basic forest inventory metrics (e.g., tree diameter and density) may be effectively quantified from ML. The Government is not expecting the periods of performances to overlap.

Objectives:

The objectives of the project for the initial year are as follows:

1. Develop technical team and identify initial study area(s) of interest.
2. Develop and test a proof of concept outlining novel methods to quantify basic forest stand metrics.
3. Compile a repository of forest inventory data from national and international partners.
4. Validate accuracy of resulting, prototype forest stand metrics.

The objectives of the project for Optional Year 1 are as follows:

1. Expand the study area(s) and refine the prototype novel methods (developed during initial year) to quantify basic forest stand metrics.
2. If required, expand the repository of forest inventory data from national and international partners to cover the second year's study area.
3. Validate accuracy of resulting, large area forest stand metrics by prioritized areas of interest.
4. Generate peer-reviewed journal article with ERDC researchers to describe the application of novel methodologies to quantify basic forest stand metrics developed during initial year of the project.

The objectives of the project for Optional Year 2 are as follows:

1. Conduct a final accuracy assessment and if required, refine the established methods to increase basic forest stand metric accuracy.
2. Generate a peer-reviewed journal article(s) in conjunction with ERDC researchers integrating all study conclusions.
3. Develop and present public seminars based on study findings.

Successful applicants should have expert knowledge of: 1) forestry, natural resources, and carbon storage; 2) field data collection capabilities; 3) compiling national and global forest inventory databases; 4) experience developing novel approaches to machine learning of forest characteristics.

Areas of expertise that may be required in combination to perform this study include:

- 1) Capacity to collect and/or compile forest inventory data at up to global scales.
- 2) Advanced computing capabilities for ML applications to characterize forest metrics.
- 3) Development of novel ML approaches to improve forest inventory, forest characterization, and/or forest carbon storage research with local and global applications.

D. Public Benefit

Forests and forested wetlands play an important role in the capturing and storing carbon through a process referred to as sequestration. These ecosystems store a disproportionately large volume of carbon on the landscape, sequestering carbon at higher rates than many other habitats. Carbon sequestration reduces the amount of carbon dioxide in the atmosphere and, therefore, reduces greenhouse gases. Increased greenhouse gases are one factor driving climate change and associated storms. Carbon sequestration is viewed as one way to reduce global climate change and the hazards associated with it (i.e., increased flooding, storm surge, and coastal inundation).

It is estimated that flooding damage resulted in over \$3B in property and agriculture losses in the United States during 2021. The development of ML to quantify forest carbon through quantification of forest stand metrics (e.g., tree diameter or tree density) will improve the data available to determine the carbon sequestration potential within forests and forested wetlands. This applied research will enhance the knowledge of US and global forests, with particular emphasis on quantifying basic forest metrics that enable volumetric carbon storage calculations. The findings of this cooperative agreement will be made publicly available through the release of public reports or peer-reviewed journal articles as well as public seminars describing results. Federal agencies, state agencies, non-governmental organizations (NGO's), and private landowners will be able to utilize this work to improve land management strategies and carbon sequestration potential.

E. Authorization: 10 USC 4001

F. Legal Requirements

Each Cooperative Agreement awarded under this announcement will be governed by 2 CFR 200, "Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards", 2 CFR 1100 Subchapter D—Administrative Requirements Terms and Conditions for Cost-Type Grants and Cooperative Agreements to Nonprofit and Governmental Entities and the DoD research general terms and conditions located at <https://www.nre.navy.mil/work-with-us/manage-your-award/manage-grant-award/grants-terms-conditions>.

G. Program-Specific Requirements

II.Federal Award Information

The following information applies to awards issued under this announcement:

- This is one-time initiative.
- The Government anticipates 1 Federal award from this announcement, but reserves the right to award more or less
- The total amount of funding expected to be awarded through this announcement is \$480K if all three (3) years are funded.
- The expected amount of funding for each award is \$150K for Base Year/Year 1, \$160K for Optional Year 1/Year 2, and \$170K for Optional Year 2/Year 3.
- Award(s) from this announcement will be Cooperative Agreement(s)
- The anticipated period of performance is three (3) years, if all three years are funded.
- Applications for renewal or supplementation of existing projects are eligible to compete with applications for new Federal awards
- The government reserves the right to accept only portions of an application and to negotiate with potential awardees
- Government's substantial involvement includes the following: The ERDC will work cooperatively with the investigator to identify issues related to experimental design and project execution, including identification of potential sites, field data collection and analysis, and the development of novel methodologies. ERDC scientists will participate in the preparation of peer-reviewed journal papers and conference presentations to insure

wide dissemination of these findings

III. Eligibility Information

A. Eligible Applicants

This opportunity is restricted to non-federal partners of the Great Lakes – Northern Forest Cooperative Ecosystems Studies Unit (CESU).

Disclosures of current and pending support made in this application may render an applicant ineligible for funding. Prior to award and throughout the period of performance, ERDC may continue to request updated continuing and pending support information, which will be reviewed and may result in discontinuation of funding.

Religious organizations are entitled to compete on equal footing with secular organizations for Federal financial assistance as described in E.O. 13798, “Promoting Free Speech and Religious Liberty.”

B. Cost Sharing or Matching

This action will be 100% funded by USACE.

C. Conflict of Interest

a) General Requirement for Disclosure

You and your organization must disclose any potential or actual scientific or nonscientific conflict of interest(s) to us. You must also disclose any potential or actual conflict(s) of interest for any identified sub recipient you include in your application. We may have to ask you more questions if we need more information.

At our discretion, we may ask you for a conflict-of-interest mitigation plan after you submit your application. Your plan is subject to our approval.

b) Scientific Conflict of Interest

Scientific collaborations on research and development projects are generally the result of close collaboration prior to the submission of applications for support. Accordingly, these collaborations should be considered when considering potential conflicts of interest. The potential conflict is mitigated by the disclosure of these collaborations, and the list of current and pending support you provide for senior and key researchers. Therefore, you must include in your list of current and pending support all collaborators, even if they did not formally provide support.

D. Other

a) Licensure or Certification

You must include the Acknowledgment of Support and Disclaimer on all materials created or produced under our awards. This language may be found in the Terms and Conditions included in the award documents.

E. Certifications, representations, and assurances

1. To apply for grants and other funding opportunities the applicant entity must have an active registration in the System for Award Management (SAM). Applications will not be accepted through Grants.gov or other methods unless the entity is registered in SAM. Registration in SAM now includes the acceptance of Certifications and Assurances. See <https://www.grants.gov/web/grants/grantors/grantor-standard-language.html> for details on how to register in SAM, and Grants.gov
2. The Federal Assistance Certifications Report is an attestation that the entity will abide by the requirements of the various laws and regulations; therefore, as applicable, you are still required to submit any documentation, including the SF-LLL Disclosure of Lobbying Activities (if award value exceeds \$100,000.00), and, if applicable, informing DoD of unpaid delinquent tax liability or a felony conviction under any Federal law.
3. Certification Regarding Disclosure of Funding Sources. By checking "I Agree" on the SF 424 (R&R) block 17 you agree to abide by the following statement: "By signing this application, I certify the proposing entity is in compliance with Section 223(a) of the William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021 which requires that: (a) the PI and other key personnel certify that the current and pending support provided on the proposal is current, accurate and complete; (B) agree to update such disclosure at the request of the agency prior to the award of support and at any subsequent time the agency determines appropriate during the term of the award; and (c) the PI and other key personnel have been made aware of the requirements under Section 223(a)(1) of this Act. I am aware that any false, fictitious, or fraudulent statements or claims may subject me to criminal, civil, or administrative penalties. (U.S. code, Title 218, Section 1001)."

IV. Application and Submission Information (2 Phase Process)

A. Phase I: Submission of Statement of Interest (SOI)

1. Materials Requested for Statement of Interest/Qualifications:
 - a. Please provide the following via e-mail attachment to: Chelsea Whitten via

Chelsea.m.whitten@usace.army.mil (Maximum length: 2 pages, single-spaced 12 pt. font).

i. Name, Organization and Contact Information

ii. Brief Statement of Qualifications (including):

- Biographical Sketch,
- Relevant past projects and clients with brief descriptions of these projects,
- Staff, faculty or students available to work on this project and their areas of expertise,
- Any brief description of capabilities to successfully complete the project you may wish to add (e.g. equipment, laboratory facilities, greenhouse facilities, field facilities, etc.).

Note: A proposed budget is NOT requested at this time.

The administrative point of contact is (Chelsea Whitten via Chelsea.m.whitten@usace.army.mil)

2. ERDC will only accept SOIs submitted on or before 22 Apr 2023, 5:00PM Central Time (CT).

Based on a review of the Statements of Interest received, an investigator or investigators will be invited to move to Phase II which is to prepare a full study proposal. Statements will be evaluated based on the investigator's specific experience and capabilities in areas related to the study requirements.

B. Phase II (if invited): Submission of Full Application Package

1. Address to Request Application Package

The complete funding opportunity announcement, application forms, and instructions are available for download at Grants.gov.

The administrative point of contact is (Chelsea Whitten via Chelsea.m.whitten@usace.army.mil)

2. Content and Form of Application Submission

All mandatory forms and any applicable optional forms must be completed in accordance with the instructions on the forms and the additional instructions below.

a. SF 424 R&R - Application for Federal Assistance

b. Full Technical Proposal – Discussion of the nature and scope of the research and technical approach. Additional information on prior work in this area, descriptions of available equipment, data and facilities, and resumes of

personnel who will be participating in this effort should also be included.

- c. Cost Proposal/Budget – Clear, concise, and accurate cost proposals reflect the offeror's financial plan for accomplishing the effort contained in the technical proposal. As part of its cost proposal, the offeror shall submit a full budget in sufficient detail so that a reasonableness determination can be made. A recommended template will be included in the invitation to Phase II. The SF 424 Research & Related Budget Form can be used as a guide but is required if the sub-recipient uses it. The cost breakdown should include the following, if applicable:

1. Direct Labor: Direct labor should be detailed by level of effort (i.e. numbers of hours, etc.) of each labor category and the applicable labor rate. The source of labor rates shall be identified and verified. If rates are estimated, please provide the historical based used and clearly identify all escalation applied to derive the proposed rates.
2. Fringe Benefit Rates: The source of fringe benefit rate shall be identified and verified.
3. Travel: Travel costs must include a purpose and breakdown per trip to include destination, number of travelers, and duration.
4. Materials/Equipment: List all material/equipment items by type and kind with associated costs and advise if the costs are based on vendor quotes and/or engineering estimates; provide copies of vendor quotes and/or catalog pricing data.
5. Subrecipient costs: Submit all subrecipient proposals and analyses. Provide the method of selection used to determine the subrecipient.
6. Tuition: Provide details and verification for any tuition amounts proposed.
7. Indirect Costs: Currently the negotiated indirect rate for awards through the CESU is 17.5%.
8. Any other proposed costs: The source should be identified and verified.

- d. R&R Senior/Key Person Profile

1. Biographical Sketch
2. Disclosure of Current and Pending Support:
 - i. A list of all current projects the individual is working on, in addition to any future support the individual has applied to receive, regardless of the source.
 - ii. Title and objectives of the other research projects.
 - iii. The percentage per year to be devoted to the other projects.
 - iv. The total amount of support the individual is receiving in connection to each of the other research projects or will receive if other applications are awarded.
 - v. Name and address of the agencies and/or other parties supporting the other research projects.
 - vi. Period of performance for the other research projects.

e. SF-LLL Disclosure of Lobbying Activities (if award value exceeds \$100,000.00)

f. Data Management Plan:

A data management plan is a document that describes which data generated through the course of the proposed research will be shared and preserved, how it will be done, or explains why data sharing or preservation is not possible or scientifically appropriate, or why the costs of sharing or preservation are incommensurate with the value of doing so. See also: DoD Instruction 3200.12.

<https://www.esd.whs.mil/Portals/54/Documents/DD/issuances/dodi/320012p.pdf?ver=2019-04-30-073122-220>

Data management plans are generally 2 pages in length, and must include the following considerations:

- (1) The types of data, software, and other materials to be produced.
- (2) How the data will be acquired.
- (3) Time and location of data acquisition, if scientifically pertinent.
- (4) How the data will be processed.
- (5) The file formats and the naming conventions that will be used.
- (6) A description of the quality assurance and quality control measures during collection, analysis, and processing.
- (7) A description of dataset origin when existing data resources are used.
- (8) A description of the standards to be used for data and metadata format and content.
- (9) Appropriate timeframe for preservation.
- (10) The plan may consider the balance between the relative value of data preservation and other factors such as the associated cost and administrative burden. The plan will provide a justification for such decisions.

3. ERDC will only accept full application packages submitted on or before 22 May 2023, 5:00PM Central Time (CT).

4. Submission Instructions

Choose **ONE** of the following submission methods:

a. E-mail:

Format all documents to print on Letter (8 ½ x 11”) paper. E-mail proposal to Chelsea Whitten via Chelsea.m.whitten@usace.army.mil.

b. Grants.gov: <https://www.grants.gov/>:

Applicants are not required to submit proposals through Grants.gov. However, if applications are submitted via the internet, applicants are responsible for ensuring that their Grants.gov proposal submission is received in its entirety.

All applicants choosing to use Grants.gov to submit proposals must be registered and have an account with Grants.gov. It may take up to three weeks to complete Grants.gov

registration. For more information on registration, go to <https://www.grants.gov/web/grants/applicants.html>.

Organizations must have a Unique Entity Identifier (UEI) and active System for Award Management (SAM) registration to apply for Federal financial assistance.

C. Application Withdrawal:

An applicant may withdraw an application at any time before award by written notice via email. Notice of withdrawal shall be sent to the agency point of contact identified in this announcement and are effective upon receipt.

D. Funding Restrictions

Per 2 CFR § 200.216, funds may not be used to procure telecommunications equipment or video surveillance services or equipment produced by

- Huawei Technologies Company,
- ZTE Corporation Hytera Communications Corporation,
- Hangzhou Hikvision Digital Technology Company,
- Dahua Technology Company
- any subsidiary or affiliate of such entities

Funds from an award may not be used to attain fee or profit.

V. Application Review Information

A. Selection Criteria

Applications will be evaluated using the following criteria, listed in descending order of importance:

- Technical merits of the proposed research and development; and
- Potential relationship of the proposed research and development to Department of Defense missions

B. Review and Selection Process:

Each application will be reviewed based on the selection criteria above rather than against other applications submitted under this Announcement.

Based on the Peer or Scientific Review, proposals will be categorized as Selectable or Not Selectable (see definitions below). The selection of the source for award will be based on the Peer or Scientific Review, as well as importance to agency programs and funding availability.

i. Selectable: Proposals are recommended for acceptance if sufficient funding is available.

ii. Not Selectable: Even if sufficient funding existed, the proposal should not be funded.

Note: The Government reserves the right to award some, all, or none of proposals. When the Government elects to award only a part of a proposal, the selected part may be categorized as Selectable, though the proposal as a whole may not merit such a categorization.

In addition to the technical/program review, the DoD performs a budget review and a risk review as directed by 2 CFR 200.206, including a review of the Federal Awardee Performance and Integrity Information System (FAPIIS). Applicants may review information in FAPIIS and comment on any information entered into that system. Comments made by applicants will be taken into account in addition to other information in considering applicants' integrity, business ethics, and record of performance.

VI. Federal Award Administration Information

The notification e-mail regarding a selection is not authorization to commit or expend DoD funds. A DoD grants officer is the only person authorized to obligate and approve the use of federal funds. This authorization is in the form of a signed Notice of Award. Applicants whose applications are recommended will be contacted by a DoD grants officer to discuss any additional information required for award. This may include representations and certifications, revised budgets or budget explanations, or other information as applicable to the proposed award. The award start date will be determined at this time.

VII. Reporting Requirements

The terms and conditions of the award will provide the specifics on how to submit the reports and any required sections for those reports.

In accordance with 2 CFR 200.328 (Financial Reporting) and 2 CFR 200.329 (Program Performance)

Report	Requirements/Form	Frequency	Means of Submission
ERDC Progress Report		upon submission of SF 270	E-mail
Research Performance Progress Reports (Interim and Final)	OMB Control Number: 0704-0527	Annually	E-mail
Financial Report	SF 425	Quarterly	E-mail
Payment Report	SF 270	Monthly	E-mail
Closeout Report		Once	E-mail

Awardees will need to comply with the reporting requirements in 2 CFR 170: Reporting Subaward and Executive Compensation Information.

The terms and conditions of the award will provide the specifics on how to submit the reports and any required sections for those reports.

VIII. Federal Contacts

Questions should be directed to:

Chelsea Whitten
Grants Officer
Chelsea.m.whitten@usace.army.mil

Questions regarding Grants.gov should be directed to the toll-free number 1-800-518-4726 and email at support@grants.gov.

IX. Other Information

The Federal government is not obligated to make any Federal award as a result of the announcement. Only grants officers can bind the Federal government to the expenditure of fund.

Applicants are advised to monitor Grants.gov for potential amendments to this Notice of Funding Opportunity. You can also elect to be automatically notified by Grants.gov whenever there is a change to the opportunity.

Applications must not include any information that has been identified as classified national security information under authorities established in Executive Order 12958, Classified National Security Information.