



ECOSYSTEM SERVICES MARKET RESEARCH CONSORTIUM (ESMRC) REQUEST FOR PROPOSALS

Ecosystem Services Market Consortium LLC (ESMC) is working with partners and collaborators across the agricultural supply chain to invest in critical research to build a technologically advanced ecosystem services market to reward and incentivize beneficial impacts of sustainable agricultural practices and systems. The member-driven research consortium – known as the ESMRC - will support development of a cost-effective and scalable approach to farmer and rancher engagement in ecosystem service markets, an approach needed to scale the beneficial impacts of sustainable practice adoption on working agricultural lands. The ESMRC will also meet corporate and societal needs by quantifying, monitoring and verifying the environmental benefits achieved on an annual and ongoing basis. To achieve these goals, four ESMRC Working Groups have been established and tasked with developing and implementing specific research and development initiatives. The Working Groups, co-led by ESMC members and informed by Science Advisors chosen from a slate of national experts, will focus on the research, development, demonstration and deployment of cost-effective, scalable technologies and approaches to launch the market.

BACKGROUND INFORMATION

The current ESMC Protocol requires traditional soil testing for soil organic carbon, bulk density, and pH to quantify changes in soil carbon stocks resulting from adoption of sustainable practices to generate Scope 3 assets and Scope 1 credits. In the context of ESMC's Protocol, Scope 1 credits and Scope 3 assets represent varying levels of producer data inputs, monitoring, and verification requirements to best approximate the buyer demand for environmental assets. Scope 1 credits refers to those assets that are a result of conservation practice implementation for use in GHG and water quality markets. Scope 3 refers to GHG, water quality, and water efficiency assets that can be used in supply chain reporting. Existing soil carbon protocols require large investment of time and money. Cutting the costs of soil sampling and greenhouse gas monitoring would allow for ecosystem service market project beneficiaries to increase their net revenue and provide greater incentive for adoption of sustainable practices.

ESMRC Working Group 1 was established to support development of accurate, cost-effective and scalable quantification of agricultural management system impacts on soil

C and net GHG (carbon, methane and nitrous oxide). This includes supporting the development of innovative and advanced analytical tools and technologies, models, and sampling design approaches to cost-effectively quantify, assess, monitor, and verify systems based GHG impacts of the operations of farmers and ranchers while providing robust and transparent documentation of outcomes. This includes the utilization, testing and refinement of direct, modeled, and remote quantification tools and technologies with a goal to reduce burden on program participants, including agricultural sector participants, program operators, and verifiers. These quantification approaches and tools will be used and refined for use in market-based protocols, including through field testing in pilot projects.

PROJECT TITLE

WG1 PROJECT 1 - Soil Sampling Design Tool

PROJECT SUMMARY

This RFP seeks to engage one or multiple partners to build a web and/or mobile platform that generates a set of points for soil sampling based on publicly available input data that produces high accuracy estimates of soil carbon stock changes due to management at a reasonable cost. *Because this RFP requires both front-end and back-end development, we strongly encourage collaborative proposals that credibly demonstrate equal competence within the team on front-end design and geospatial and soil science expertise and back-end development.*

Cost-effective measurement of the impact of land management on soil carbon requires a sampling design that is both accurate and cost effective. In some areas, differences in soil types within a potential project can be large. Not taking this variation into account in sampling schemes can lead to inaccurate estimates of soil carbon at the project scale. At the same time, there is a need to balance highly accurate sampling design with minimizing cost so that farmers and ranchers are able to carry out required reporting and verification while still generating a profit from ecosystem services market payments. Rigorous sampling design, generated through stratification using publicly available data, will be necessary to increase accuracy of sampling schemes and minimize costs.

Yet, existing tools available for informing sampling either require expert knowledge—like clustering algorithms to define sampling strata—or time and money, like implanting a pre-sampling effort to inform subsequent sampling. There is a strong need for a tool that can create sampling schemes for non-technical users at low cost. The target user for such a tool would be a field agronomist or certified crop adviser in the United States, who has an undergraduate training in science, but would not have familiarity with spatial

statistics. The tool would provide a simple user interface that would generate sampling points the field agronomist could visit to collect samples, and would also document the technical assumptions and parameters of the sample design approach, but without requiring the user to make decisions about stratification parameters.

PROJECT GOALS

1. Develop a detailed design for how to solve the challenge of generating a high-accuracy soil carbon monitoring scheme for the United States that also optimizes for sampling cost. This design includes both plans for a geospatial back-end and a user interface.
2. Build the back end and front end of such a tool and host on a to-be determined platform
3. Document and share the code for the tool in a fully open-source manner so that the approach can be integrated into existing field sampling applications, and so it can be further developed in the future with additional approaches

SCOPE OF WORK

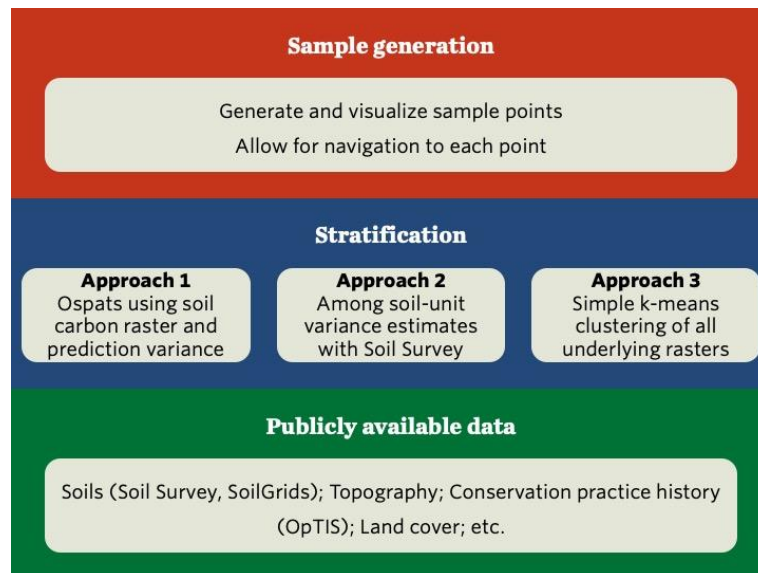
This project will focus on three phases: project design; project development; and project sharing.

Project design

The first phase of the project will entail developing a detailed proposal for both the geospatial back end of the tool and the user interface. The approach to project design should also be outlined in the proposal. The project design phase of the contract will be to go into greater technical depth and to get more detailed feedback from the team of scientists advising the development of this tool. The tool will be developed for the United States.

The project design phase should include details about the following minimum features:

- Users can hand draw an AOI using a desktop or mobile device. The AOI can be discontinuous for non-adjacent fields. Users can also import field boundary files
- Based on the AOI, underlying soil data and covariates will be used to generate sampling points. The figure below captures a conceptual design of how publicly available data could be used to generate soil sampling points. This diagram represents a few possible approaches. The proposal should detail the applicants vision for how to solve this problem and may or may not include approaches in the conceptual diagram below.



- A set of sampling locations will be generated, visualized, and can be navigated to either through the platform or exported to another platform.
- The sampling scheme will quantify the likely accuracy of the proposed sampling approach. Different market-based efforts have different requirements for accuracy and it is essential to quantify the likely error of a given approach..
- The tool will document and export basic information on the methods used, assumptions, and accuracy statistics.
- The tool will allow for use of additional data--such as soil samples from a baseline sampling effort--to generate more refined sets of sampling points.
- The tool will provide summary output information of the sampling design process. This may include information such as which covariates were most strongly weighted in the stratification process.

Project development

After submission of the project design, the scientific advisory committee for this project will provide feedback on the approach and the design will be refined. After refinement, the project will move into the development phase. During this phase, the awardee should plan to have bi-weekly check-ins with the advisory team to report on progress and get feedback. Code versioning should be tracked through a GitHub repository to be set up by The Nature Conservancy.

Project sharing

The code for this project should be fully open source. This is necessary for the back-end approaches to sampling design to be integrated into any existing field sampling tools, like LandPKS. It is also necessary for future development of the backend, such as addition of other algorithms, addition of other data sources, or scaling the tool to cover

new geographies. It is also necessary for the front-end to be publicly available so that it can be integrated into a broader Monitoring, Reporting, and Verification platform to be developed for the entire ESMC.

PROJECT DELIVERABLES

- Project design document. This will outline, in more detail than in the proposal, the proposed approach for both the geospatial back end and the front end.
- Final version of the tool, to be hosted on a to-be-determined platform
- All code clearly documented and shared on a GitHub account to be set up by an ESMRC member organization

PROJECT TIMELINE

August 1 - September 1st:

Development of in-depth description of approach (Project Design)

September 1st - September 15th:

Review and discussion of proposed approach and delivery of feedback from ESMRC team

September 16th - December 15th:

Development of beta version of back and front-end platforms, done with regular input from ESMRC team

December 16th - December 31st:

External review by other ESMC members and feedback

January 1, 2021 - February 15, 2021:

Incorporation of feedback and development of final product and sharing of code

PROPOSAL FORMAT

- Executive summary
- Description of approach: both back-end and front-end
- Description of proposed deliverables
- Timeline and budget
- Project team
 - Background information on all collaborating partners
 - Portfolio of similar or related work/research projects
 - Document significant capacity in both geospatial/soils back-end and front-end development
 - Project management strategy/techniques
- Contact information for two references
- Risks and mitigation strategies to executing services, deliverables, timeline, and on budget

Funding notes for contractors: Identification of in-kind or cash match funding (non-federal) is encouraged but not required. Institutional overhead is limited to 10% by FFAR. The unrecovered overhead cannot be used as match.

SELECTION CRITERIA

Proposals will be reviewed for technical and scientific soundness by a subgroup of members of the Working Group Science Advisory Committee with additional external members with relevant technical expertise in geospatial science and soil mapping. Proposals will be reviewed for completeness, feasibility of approach and timeline, budget, and documentation of past experience with both front- and back-end development as well as geospatial science and soil science. The reviewers may request additional information as part of the review process.

SELECTION TIMELINE

Proposals must be submitted as a PDF document by email to Caroline Wade, ESMRC Program Director, at cwade@ecosystems-services-market.org by July 3rd, 8pm ET. Final decisions will be made by July 17th and all vendors will be notified by July 20th. If you have questions regarding this RFP, please contact Stephen Wood at stephen.wood@tnc.org.

PROJECT ADVISORY COMMITTEE

Dorn Cox - OpenTEAM
Jeff Evans – The Nature Conservancy
Jeff Herrick – USDA ARS
Clare Kazanski – The Nature Conservancy
Brendan Malone – CSIRO
Cristine Morgan – Soil Health Institute
Steve Rosenzweig – General Mills
Caroline Wade - ESMC
Skye Wills – USDA NRCS
Steve Wood – The Nature Conservancy