Notice of Funding Opportunity

USDA-NRCS Soil and Plant Science Division

2019 Soil Science Collaborative Research Proposals

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1 SUMMARY INFORMATION

1.1 Overview

1.1.1 Federal Awarding Agency Name

U.S. Department of Agriculture (USDA) - Natural Resources Conservation Service (NRCS)

1.1.2 Funding Opportunity Title

2019 Soil Science Collaborative Research Proposals Notice of Funding Opportunity (NFO)

1.1.3 Announcement Type

Initial Announcement

1.1.4 Funding Opportunity Number

USDA-NRCS-NHQ-SOIL-19-GEN0010134

1.1.5 Catalog of Federal Domestic Assistance (CFDA) Number

10.903

1.1.6 Funding Opportunity Announcement Summary

The total funding available for this opportunity is $1,920,000. Eligibility is limited to institutions of higher education in the Cooperative Ecosystem Studies Unit (CESU) network. Applications are due by 5 p.m. Central Time on June 3, 2019, and must be submitted to Grants.gov and via email to Dave.Hoover@usda.gov and Pam.Thomas@usda.gov.

This competitive cooperative research program focuses on soil science and soil survey research topics and needs that have been identified through:

- NRCS Agency priorities,
- Soil and Plant Science Division priorities (SPSD),
- Regional-level National Cooperative Soil Survey conference committees, and
- National-level National Cooperative Soil Survey conference committees.

The objectives of the research are to:

- Promote research collaboration between NRCS SPSD and university cooperators on significant national and regional issues.
    - Proposals exhibiting substantial collaboration between the applicant, multiple National Cooperative Soil Survey (NCSS) cooperators (i.e., multi-state projects), and NRCS soil scientists (National Soil Survey Center (NSSC) research soil scientists, soil survey regional and Major Land Resource Area (MLRA) Soil Survey Office (SSO) soil scientists, State soil scientists, and/or resource soil scientists) will receive preference during the evaluation and selection process. Applicants seeking collaborative opportunities are encouraged to contact the National Soil Survey Center, respective Soil Survey regional director, and State soil scientist (contact information is available at https://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/contactus/).
- Provide technology transfer and training for NRCS staff.
    - Each proposal should include a technology transfer component that documents how research results can be incorporated into Soil Survey field or

office (databases, interpretations, etc.) functions. In addition, the plan should document how research findings will be shared with the NCSS (e.g., publications, webinars (required), onsite training, and/or other mechanisms).

- Assist in training of students in soil science and related fields.
    - Proposals that include a strong educational component (undergraduate and graduate student involvement) are encouraged as are proposals from early career scientists and faculty.

1.1.7 Estimated Key Dates

May 3, 2019	Release of Notice of Funding Opportunity
June 3, 2019, 5 p.m. Central Time	Applications are due
June 14, 2019	All proposals reviewed, and selections made with budget
July 5, 2019	Notifications to selected proposals
September 01, 2019	Award Period of Performance begins (start of selected research)

1.1.8 Federal Funding Floor and Ceiling Amounts

The funding floor for this announcement is $50,000. The funding ceiling is $300,000. There are twelve (12) priority research areas, listed below, each with its own approximate funding ceiling level. Eligible applicants can submit proposals to any of the priority research areas, but there must be a separate proposal for each submission. Funding levels for each priority research area are given as approximations to provide flexibility to proposal acceptance; not all proposals are expected to be submitted at exactly the approximate levels. Applicants may be asked to alter their proposal amounts in order to be considered so that the Agency retains the ability to maximize its investment.

2 USDA/NRCS/SSRA/SPSD (SOIL AND PLANT SCIENCE DIVISION) PRIORITY RESEARCH AREAS

The authorizing statutes and regulations for this opportunity are 16 U.S.C. 590a-f and 590q and 42 U.S.C. 3271-3274.

Proposals submitted under this request must be aligned with one or more components of the Soil Science Division priorities, which are:

- Improving procedures for soil and ecological site inventory,
- Increasing the efficiency of technical soil services,
- Supporting the National Cooperative Soil Survey (NCSS), and
- Maintaining the relevancy of soil information (providing scientific assistance to users of soil survey information).

The program intent is to promote research on collectively developed NRCS and NCSS priorities. The order of listing does not indicate priority.

The areas of research priorities are:

- Training development,
- New investigations,
- Regional (based on regional National Cooperative Soil Survey priorities), and

- Operations.

2.1 Training Development

2.1.1 Collaborate with universities to develop new technology for delivering soils and ecological site training to NRCS and partners

Description

Training is essential for high quality job performance by soil scientists and ecological site specialists working with the USDA-NRCS Soil and Plant Science Division. New technology is needed to augment traditional curricula and to capture the knowledge of experienced scientists before they retire. We are interested in working with universities to develop new technology for delivering soil survey and ecological training to NRCS and partner agencies. We are especially interested in developing interactive augmented reality for understanding the links between geomorphology, soils, hydrology, and ecosystems.

Examples of questions that illustrate the types of research needed

- Can 3-D landscapes be visualized using augmented reality to show how soil types, ecosystems, and water movement at the landscape scale are linked to geomorphology?
- Can video production of field trips be linked to teaching modules and reference handbooks?
- How can online distance learning be made more engaging and effective?

Examples of potential deliverables

- Interactive augmented reality for understanding geobiological landscapes in soil survey.
- YouTube teaching videos of ecogeomorphology.
- Innovative alternative solutions to mind-numbing and ineffective online distance learning.

Approximate funding level

- $50,000

2.2 New Investigations

2.2.1 Quantify soil organic carbon management in relationship to soil survey, conservation practices, and land management units

Description

Soil organic carbon (SOC) is an important soil property with roles in chemical, physical, and biological soil functions. The National Cooperative Soil Survey has long collected national- and local-level data on soil organic carbon. Additional information is needed to maximize the use of soil survey information in land management decisions. We seek projects that focus on soil organic carbon as it relates to soil survey taxa and spatial units for use in soil health and quality interpretation and/or projects focused of soil survey-based scaling of SOC. Projects would include proposals that develop new technologies and methodologies to predict SOC in soil taxa, ecological sites (related to state-and-transition models), and land management scenarios. We are particularly interested in direct ties to conservation practices on practical land management

units.

Examples of questions that illustrate the types of research needed

- How does SOC scale across soils, landscapes, and ecosystems?
- What soil, landscape, and ecosystem properties are most important for determining SOC potentials?
- How do conservation practices impact SOC content and variability; and how does soil taxa interact with that impact?

Examples of potential deliverables

- Scalable mapping tools and products for SOC.
- Pedotransfer functions to derive potential SOC levels by soil taxa.
- Demonstration of the linkages between soil map units, ecological site elements, and SOC content and function.

Approximate funding level

- $300,000

2.2.2 Support production of raster soil property maps that support interpretations

Description

The Soil and Plant Science Division has launched "Soils2026," an ambitious initiative to provide an inventory of soils and provisional ecological sites for all areas of the U.S. by 2026. Soils2026 aims to provide basic soil and ecological site information useful to natural resource professionals. This effort will employ digital soil mapping to produce the next generation of soil information products in a flexible, raster-based format for rapid interpretation of soil properties and precision conservation planning across the United States.

The Digital Soil Mapping Focus Team, comprised of collaborating members from the National Cooperative Soil Survey, was formed to support Soils2026. The team will apply the latest digital soil mapping methods to produce nationwide, 30-m resolution, continuous soil property predictions for 12 key soil properties at six depths. The predictions will include estimates of uncertainty. The option exists to expand the list of properties or add other ancillary raster data that support interpretations for use-and-management decision making, precision conservation, or other user needs. High-resolution, flexible, raster-based soils information will allow for rapid assessment and decision making for conservation and land management needs at local and national scales. Fundamental pedology and communication of soil knowledge will be the primary focus of this effort, yielding a framework for annual delivery of nationwide, seamless, raster-based soils data. This framework will foster an environment of continuous improvement and support a complete, consistent, correct, comprehensive, and current soils inventory of the United States.

Examples of objectives that illustrate the types of research needed

- Methodology to predict continuous soil properties at six depths using property measurements from NCSS point data, including generation of prediction intervals. Include evaluation of 2D versus 3D modeling approaches for specified depth predictions.
- Methodology to compare performance of global versus regional models; and if regional models outperform global, then methodology to combine regional model results into

seamless products.

Examples of potential deliverables

- A digital soil mapping workflow to develop nationwide, 30-m resolution, continuous soil property predictions for 12 soil properties from NCSS point data and accompanying uncertainty estimates. This workflow will include scripts written in the R language or other applicable software available to NRCS employees.
- 30-m resolution raster layers for each of the 12 targeted soil properties at each of the six depths.
- Spatial representation of uncertainty for the predictions of each property at each depth.
- Nationwide, 30-m resolution covariate layers including, but not limited to, terrain and spectral data derivatives.

Approximate funding level

- $70,000

2.2.3 Calculate soil classification from soil properties

Description

Correct classification according to the current edition of Soil Taxonomy is critical to the progressive refinement of our national soil survey products. Component classification is typically updated during focused soil projects, but many years may be needed before the entire set of components are updated to the current edition of Soil Taxonomy—possibly after the next edition of the "Keys to Soil Taxonomy" are published. Various components of taxonomic membership (e.g. soil moisture regimes, presence of certain diagnostic features, and epipedons) are used by the vast array of soil interpretations. These interpretations are a major part of the foundation upon which all soil conservation plans are built. Our internally used morphologic data are far less consistent than the associated data elements for our (SSURGO) components. This inconsistency is the result of the gaps in and vintage of our taxonomic information. Future use of the morphologic data (e.g., NASIS pedons) hinges upon extensive reviews and updates that will require both NRCS staff expertise and some forms of automation.

To date, there are no general-purpose algorithms that can assist soil scientists with the automatic (or even semi-automatic) classification of soil profile data according to the rules specified in "Keys to Soil Taxonomy." Development of said algorithms could assist with the monumental tasks outlined above given sufficient data to support classification and a re-imagined representation of the keys that is traversable by both humans and machines.

Examples of objectives that illustrate the types of research needed and potential deliverables

1. Development of a new "container" (data structure) for the narrative, rules, and underlying logic of "Keys to Soil Taxonomy." This new data structure would serve as the working copy of the keys. Changes to the hierarchy, criteria, and associated narratives would happen in the new structure. The data structure would be used to generate future versions of the human-readable keys. The logic of the keys would be traversable by machine-readable algorithms.
2. Development of a suite of algorithms for preparing arbitrary soil data for classification. This would include assessment of diagnostic features and depths, diagnostic properties, soil moisture regime, soil temperature regime, and all other data required

to navigate the new representation of the keys as specified in objective 1. Algorithms will be developed in the R language and maintained as part of the "SoilTaxonomy" package as hosted by the NCSS. Documentation and validation procedures (e.g., "unit tests") are required.

3. Development of an algorithm for applying the rules defined by a machine-readable Keys to Soil Taxonomy using data as prepared in objective 2. The algorithm should allow for semi-automated classification in the absence of required data elements. The algorithm could be developed in the R language and maintained as part of the "SoilTaxonomy" package as hosted by the NCSS. Documentation and validation procedures (e.g. "unit tests") are required.

Approximate funding level

- $100,000

2.2.4 Collaborate on a project with Climate Hubs to systematically include advances in climate science and application to ecological site description database

Description

Climate variability is the most formidable natural challenge to agriculture of every kind. The USDA Climate Hubs and partners have been tasked with developing and delivering information that enables climate-informed decision making at the ecosystem level and the individual stakeholder level (www.climatehubs.oce.usda.gov).

Experimental research has played a leading role in the predominance of U.S. agriculture in global markets and in maintaining sustainable ecosystems. This research is intensive and expensive and can only be conducted in limited, usually highly controlled, situations. The challenge of experimental agricultural research has always been to determine relevance to locations and conditions beyond the original study area. A major challenge to delivering relevant information from research to end-users is determining where (at the farm and field scale) and when (at an annual scale) specific experimental results apply. The NRCS Ecosystem Dynamics Interpretive Tool is being developed and can be a useful platform to determine the extent of these research results.

Another related challenge is to understand how these mapped ecosystems will shift under the changing climate (temperature, precipitation) or climatic variations and extremes. Determining the climatic vulnerability of ecosystems is important to understanding research applications.

In this notice of funding opportunity, we are requesting proposals that will develop new technologies and methodologies to examine vulnerability of ecosystem properties (related to state-and-transition models) to climate using historical records or projected climatic changes. This work will evaluate, refine, and improve the relevance of climate research for site-specific application and evaluation within individual ecosystems. Proposals should address how Climate Hubs can collectively evaluate, synthesize, and spatially distribute information to enhance the spatiotemporal relevance of agricultural research in addressing climate challenges.

Examples of objectives that illustrate the types of research needed

- Tools to produce scalable maps identifying landscapes and sites that are particularly vulnerable to common climate impacts (e.g., drought, flooding, insect invasion, or plant invasion) or regional climatic shifts.
- Methodology to incorporate climatic parameters into the ecological site database to

determine possible shifts in state-and-transition models based on changes in climate.
- Mechanisms for incorporating agricultural or climate-based experimental and modeling results into ecological site descriptions to determine the extent of application of these research results.

Approximate funding level

- $200,000

2.3 Regional

2.3.1 West Region, National Cooperative Soil Survey, Research Priority Area

Description

Dust production presents substantial hazards to human health and substantial risk of environmental degradation. Quantifying the distribution of soil-landscapes at high risk for dust production is critical to land management in the western United States. In particular, we are interested in determining what soils, landforms, and ecological sites and states are most vulnerable to becoming future dust sources and in identifying these high risk landscapes that may require management to mitigate future dust production.

Proposals will be considered from entities outside of the West NCSS Region, but any study location or area must be within the Region. A map of the NCSS regions can be viewed at https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/partnership/ncss/?cid=nrcs142p2_053475.

Examples of questions that illustrate the types of research needed

- What are the key soil and landscape parameters for predicting high risk landscapes?
- Do SSURGO data on their own, or in combination with other data products, provide the requisite data for predicting high risk landscapes?
- How effective are existing dust production indices at predicting high risk landscape across the greater western region?
- Can we predict future “hotspots” of dust production?
- Do we need to incorporate dust production risk into ESDs, possibly in the state-and-transition models?

Examples of deliverables include

- Regional maps identifying high risk dust production landscapes that incorporate NCSS data and products.
- Mechanisms for incorporating risk of dust production into ecological site descriptions.
- Guidelines on use of the most appropriate dust production indices for the western region.
- Modification of existing dust production indices for the western region.
- Development of new dust production indices for the western region.

Approximate funding level

- $150,000

2.3.2 North Central Region, National Cooperative Soil Survey, Research Priority Area

Description

Existing soil maps of the North Central United State have traditionally been made at the order 2 scale (i.e., 1:24,000). Although these SSURGO-level maps provide much useful information, they do not have the resolution needed for many applications, such as precision agriculture. There is a need, therefore, to augment current SSURGO-level maps with order 1 soil maps that can identify the locations of various soil map unit components within existing polygons.

For precision agriculture, such high-resolution maps can help producers tailor their applications of nitrogen and phosphorous fertilizer according to soil properties, such as organic matter, soil texture, and depth to water table, and thereby increase economic efficiency and reduce stream pollution. We are interested in working with universities in the North Central NCSS to develop methods to produce high resolution, field-scale soil maps using Digital Soil Mapping (DSM) techniques that may include LIDAR, spectral band ratios, unsupervised and supervised classifications, predictive modeling, and other geostatistical techniques that provide information about uncertainty and guide sampling designs.

Proposals will be considered from universities and colleges formally associated with the National Cooperative Soil Survey. Proposals will be considered from entities outside of the North Central NCSS Region, but study locations and areas must be within the Region. A map of the NCSS regions can be viewed at https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/partnership/ncss/?cid=nrcs142p2_053475.

Examples of questions that illustrate the types of research needed

- Can DSM techniques locate and delineate soil components more accurately than traditional soil mapping methods?
- To what extent can flood plain boundaries, ridgetop boundaries, and slope percent values be improved by DSM?
- What are the most significant ways DSM can be used for conservation planning?

Examples of deliverables include

- Comparison of traditional soil maps and DSM soil maps with verification data.
- Demonstration of how spatial data generated by DSM can specifically be applied to conservation planning or enhance ecosystem services.
- Development of procedure showing which combination(s) of DSM techniques are most effective for generating high resolution, field-scale soil mapping.

Approximate funding level

- $150,000

2.3.3 Northeast Region, National Cooperative Soil Survey, Research Priority Area

Description

The NCSS has conducted surveys in over 92 percent of the United States; however, the overwhelming majority of the population resides in urban communities. The USDA was originally known as “The People’s Department.” According to the 2010 census, 80.7 percent of the U.S. population live in urban areas. It is this high percentage of the populace that would benefit greatly from a quality soil inventory. Because of the extreme variability of anthropogenic soils,

the volume of impermeable surfaces, and problems with site accessibility and logistics, urban environments pose a unique challenge to conducting soil surveys. To meet the urban resource needs, newer soil inventory methods and models must be developed and relevant interpretations must be created.

Research is needed to develop a screening protocol for characterizing important soil properties and for testing and detecting various substances, such as potential contaminants. This information would be invaluable for urban agriculture, community gardening programs, storm water management, and general ecosystem service delivery. It would provide much needed point data for urban soil survey. New methods of analysis should be considered.

There is great interest in the use of urban areas for supporting community outreach programs that NRCS currently provides with financial and technical assistance. Such practices as high tunnels, urban agriculture, community gardens, agroforestry, and green infrastructure should all be accompanied or preceded by a quantitative soil investigation. Such an investigation should also serve as a data point for urban soil survey.

Proposals will be considered from entities outside of the Northeast NCSS Region, but study locations and areas must be within the Region. A map of the NCSS regions can be viewed at https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/partnership/ncss/?cid=nrcs142p2_053475.

Examples of questions that illustrate the types of research needed

- What key soil properties need to be quantified to optimize ecosystem service delivery in urban areas? Are they land use dependent and predictable to any degree?
- Can any land use history and landscape parameters allow for modeling or predicting urban soil properties? Can any digital soil mapping techniques assist us in urban soil survey?
- Can toxic residual content and heavy metal content be mapped within an urban soil map?
- What do we need to know about assessment of potential contaminants other than trace metals for urban ag? How do we know what contaminants are important and when we should test for them?
- Black carbon is ubiquitous in urban soils. Are there any suitable easy-assessment methods? Some literature suggests a relation to color. Do we need a new page of black color chips for urban areas?
- How can we readily identify particulate (<2 mm) artifacts in soils?
- Should we sample for microbiology during urban soil investigations?
- What soil properties are needed to create interpretations for urban agroforestry and urban agriculture?
- How can we assess and interpret storm water management potential?
- What other urban soil characteristics need to be collected to generate urban soil interpretations?
- What kinds of information can GPR, EMI, pXRF, magnetic susceptibility, and drones provide? When are they useful?
- What types of vegetative communities are best suited to human-altered (e.g., artifactual) soils, and what properties are important?
- What do we need to know about “sealed” soils? They make up a major portion of our urban landscapes (e.g., 63% of land area in NYC). What characteristics are important

and how can we characterize them?

Examples of Potential Deliverables

- Urban soil inventory methodology, standards, and procedures.
- Point data collection method and model for predicting heavy metal contamination and bioavailability.
- Urban soil interpretations.
- Onsite investigation protocol for urban agriculture suitability.
- Onsite investigation protocol for green infrastructure suitability.

Approximate funding level

- $150,000

2.3.4 South Region, National Cooperative Soil Survey, Research Priority Area

Description

Coastal Zone Soil Survey (CZSS) focuses on producing soil maps and data in the coastal zone, including the dunes, marshes, beaches, anthropogenic coastal areas, and the shallow, subtidal subaqueous soils (submerged lands) where submerged aquatic vegetation (SAV) is either growing or has the potential to grow. Blue carbon pools located in the coastal zone are of particular interest to planners and policy makers. Recent work has illustrated the value of soil survey for scaling up individual soil sampling points to produce regional and national spatial coverages based on geology and landscape. This is especially important in calculating blue carbon stocks because coastal ecosystems vary in shape, size, and soil composition across landscapes. There is a need for scientific, statistically-sound projects of regional scope to inventory soil carbon stocks in coastal ecosystems (tidal marshes, mangroves, subaqueous areas, and near shore wetlands). We are seeking projects that quantify blue carbon across scales using soil survey techniques and procedures with a focus on the coastal areas of the South Region of the National Cooperative Soil Survey.

Proposals will be considered from universities and colleges formally associated with the National Cooperative Soil Survey. Proposals will be considered from entities outside of the South NCSS Region, but study locations and areas must be within the Region. A map of the NCSS regions can be viewed at https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/partnership/ncss/?cid=nrcs142p2_053475.

Examples of questions that illustrate the types of research needed

- What level of landscape delineation is needed to describe coastal blue carbon stocks?
- How should SSURGO map products be developed and used to best describe coastal carbon stocks?
- How should ecological sites, state-and-transition models, and dynamic soil property information be integrated into CZSS?

Examples of Potential Deliverables

- Regional maps of blue carbon stocks incorporating NCSS data and products.
- Uncertainty maps of blue carbon with guidance on sample and data element needs.
- Demonstration of the linkages between carbon stocks and elements of soil maps and ecological sites.

Approximate funding level

- $150,000

2.4 Operations

2.4.1 Develop risk assessment interpretations for FSA, NRCS, and RMA priorities (e.g., soil drought resistance index); expand Newhall model to real-time soil moisture model

Description

Soil survey databases can be used as part of systems for predicting soil response to many land uses and characteristics that are of interest to USDA agencies. The databases are of interest specifically to the following agencies in the Farm Protection and Conservation Mission Area: Farm Service Agency (FSA), Natural Resources Conservation Service (NRCS), and Risk Management Agency (RMA). Public pressure demands that conservation dollars be spent on landscapes where the most benefit will be obtained. Climate change and soil health issues require that soils that are vulnerable to damage, susceptible to drought, and risky to farm should be identified for either protection or removal from production. Yearly production is closely related to rainfall and number of growing degree days during the crop year. The objective is to combine these data sources and expected outcomes into a cohesive model of soil health and production that is useful for managing risk and production.

Examples of questions that illustrate the types of research needed

- What models could be used to assist RMA to assist in the evaluation of the veracity of insurance claims within a production cycle? RMA is very concerned with the distribution of productivity and risk on the landscape.
- How can RMA be helped in regard to the effect of conservation practices and soil health enhancements in the reduction of risk and increase in production?
- All FPAC agencies are interested in combining data and information from SSURGO (inherent soil properties) with dynamic soil health properties, season-specific or model-generated weather attributes, and potentially other data sources to develop dynamic predictions of farm scale production to inform multiple program purposes. What resources would be needed to accomplish this?

Examples of Potential Deliverables

- A prototype dynamic spatial productivity model that incorporates the effects of soil health, applied conservation practices, inherent soil properties, and weather during the year to inform insurance claims and environmental benefits.

Approximate funding level

- $100,000

2.4.2 Develop workshops to bring together experts for improving soil classification to meet emerging natural resource issues

Description

Soil Taxonomy is the premiere standard for soil classification and mapping. It used not only by the United States but in over 100 countries worldwide. It is not, however, a static system. It needs to adapt to new information, technologies, and advancements in our understanding of soils. Furthermore, since it forms the basis for the USDA soils inventory, it must also be adapted

to changes in the needs of our farmers, ranchers, and producers. It has not been updated completely since 1999. This initiative will gather experts in soil taxonomy and classification to systematically review proposals for change and to identify areas that need additional study. Workshops will be 1 week in length and will include field reviews and writing sessions. At the end of each workshop, action items will be assigned for participants to work on at their home institutions. The ultimate goal is to revise Soil Taxonomy so that an updated version can be published in 2025.

Examples of Potential Deliverables

- Workshops related to soil moisture regime.
- Evaluation of an urban soil order.
- Development and need for new epipedons.
- Refinement of diagnostic horizons.
- Application to soil conservation interpretations.
- Draft of new soil order(s).
- Protocol for use of moisture regimes.
- New soil diagnostic horizon with specific field and laboratory criteria.
- Proposed interpretations based on soil classification and properties to assist conservation planning.

Approximate funding level

- $100,000

2.4.3 Support research to address SPSD and NRCS mission priorities, targeted to 1890s, HSI, and Tribal universities and colleges and to new faculty at other schools

Description

The recently signed “Agriculture Improvement Act of 2018” (commonly referred to as the 2018 Farm Bill) has reinforced Congress’ commitment to underserved, socially disadvantaged, beginning, and veteran populations and producers. These terms are mentioned more than 185 times in the bill. With this Farm Bill, Congress has provided a clear mandate to the Secretary of Agriculture and eligible partners to the “maximum extent practicable” to conduct outreach to these groups. Both the United States Department of Agriculture as a whole and the Natural Resources Conservation Service (NRCS) as an agency have been committed to improving engagement with these groups through initiatives such as Strike Force, the 2501 Program, and Conservation Innovation Grants.

As a part of NRCS, the Soil and Plant Sciences Division (SPSD) currently has offices located on the campus of five Historically Black Colleges and Universities and one of the Hispanic Serving Institutions, these being Alabama A&M University, University of Arkansas at Pine Bluff, Florida A&M University, North Carolina A&T University, Tuskegee University, and Universidad de Puerto Rico Mayagüez. Since 2012, SPSD has sponsored 10 agreements with these institutions totaling $500,000. Together with these institutions, the SPSD has accomplished such goals as flight and data analysis using unmanned aerial vehicles, rapid soil carbon assessment using VNIR spectroscopy, characterization of trace metals in agronomic and forest samples, and sponsoring soil judging teams. To date, SPSD has not partnered with Tribal Colleges and Universities; however, we desire to engage with this group and with new soils and ecology faculty at any institution.

This year we want to expand our collaboration to engage the outreach component of institutions. We are accepting proposals from professors whose research can be targeted to underserved farmers, ranchers, and foresters in communities served by institutions. Preference will be given to applicants that involve multi-state, multi-level collaborations and work related to soils and ecological site inventory and how this information can be used to inform or improve the conservation of natural resources on operations of underserved communities.

Approximate funding level

- $100,000 each for 1890s, HSI, and Tribal schools and $100,000 to support new university faculty

3 FEDERAL AWARD INFORMATION

3.1 Estimated Funding

The total amount of Federal funding the agency expects to award through this announcement is $1,920,000.

3.2 Start Dates and Performance Periods

Projects may be 1 or 2 years in duration. Applicants should plan their projects based on a project start date of September 01, 2019.

3.3 Types of Federal Award

The agency plans to award cooperative agreements pursuant to this opportunity. All agreements will be through the Cooperative Ecosystem Studies Unit (CESU). The agency will be substantially involved in the work performed under the agreement and will undertake activities such as project monitoring to permit specified kinds of direction or redirection of the work because of interrelationships with and impacts on other projects

3.4 Number of Awards

The agency expects to make 12 awards, one in each of the research priority topic areas.

3.5 Procurement Contracts

The agency does not expect to award procurement contracts associated with this announcement.

3.6 Eligibility of Renewal or Supplemental Project Applications

Applications for renewal or supplementation of existing projects are eligible to compete with applications for new Federal awards. An application for renewal means a proposal submitted to continue an existing agreement that meets the objectives and requirements of this NFO. An application for supplementation of an existing project means a proposal to add components to an existing agreement so that it would meet the objectives and requirements in this NFO.

4 ELIGIBILITY INFORMATION

4.1 Eligible Applicants

Applicants and applications must meet eligibility criteria by the application deadline to be considered for award. Eligible applicant type is determined by the implementing program statute.

- Private institutions of higher education in the CESU network
- Public and State-controlled institutions of higher education in the CESU network

4.2 Cost Sharing or Matching

There is a not a specific match amount required. However, proposals will be evaluated in part on the relative contribution of non-Federal resources to the project. Cost sharing may be achieved with contributions of cash, services, materials, equipment, or third party in-kind contributions.

5 APPLICATION AND SUBMISSION INFORMATION

5.1 Address to Request Application Package

All standard forms necessary for this announcement are included in the Grants.gov application package. Applicants may request paper copies of materials by contacting Dave Hoover, (402) 437-4013, or by written request emailed to Dave.Hoover@usda.gov.

5.2 Content and Form of Application Submission

To be considered for funding under this opportunity, an application must contain:

5.2.1 Application Form

Standard Form 424 Application for Federal Assistance. Applicants must use this document as the cover sheet for each proposal. See Instructions for Completing SF-424 located in the Related Documents tab of this announcement on Grants.gov.

5.2.2 Standard Form (SF) 424A, Budget Information - Non-Construction Programs

Fill in all spaces as appropriate. Section B, Item 6, Column 1 should reflect the agency funds, and Column 2 should reflect any applicant's matching funds. This form is the summary budget for the project. See Instructions for Completing SF 424A located in the Related Documents tab of this announcement on Grants.gov.

5.2.3 Budget Narrative

In a separate narrative titled "Budget Narrative", explain and justify all requested budget items/costs. Detail how the totals on the SF-424A were determined and demonstrate a clear connection between costs and the proposed project activities. For personnel salary costs, include the base-line salary figures and the estimates of time (as percentages) to be directly charged to the project. Describe any item that under the applicable Federal cost principles requires the agency's approval and estimate its cost. See Instructions for Completing Budget Narrative located in the Related Documents tab of this announcement on Grants.gov.

- As required in Title 2 of the Code of Federal Regulations Part 200, Subpart F Audit Requirements, all U.S. states, local governments, federally-recognized Indian tribal

governments, and non-profit organizations expending $750,000 USD or more in Federal award funds in a fiscal year must submit a Single Audit report for that year through the Federal Audit Clearinghouse's Internet Data Entry System. Therefore, any U.S. states, local governments, federally-recognized Indian tribal governments, and non-profit organizations applying under this opportunity must include one of the following statements in its budget narrative:

> "My organization was required to submit a Single Audit report last year. The reporting period covered was from (insert date) to (insert date). This report, filed under EIN # (insert EIN), is available on the Federal Audit Clearinghouse Single Audit Database website (https://harvester.census.gov/facweb/) or will be by (insert date)."
>
> OR
>
> "My organization was not required to submit a Single Audit report last year."

A current NICRA, if requesting indirect costs, must be provided with the application.

5.2.4 Standard Form (SF) 424B, Assurances - Non-Construction Programs.

Applicants, by signing and submitting an application, assure and certify that they are in compliance with the following Federal regulations:

- 2 CFR Part 417, Government wide Debarment and Suspension (Non-procurement)
- 4 CFR Part 418, New Restrictions on Lobbying
- 2 CFR Part 421, Government wide Requirements for Drug Free Workplace (Financial Assistance)

5.2.5 Certification and Disclosure of Lobbying Activities

Under Title 31 of the United States Code, Section 1352, an applicant or recipient must not use any federally appropriated funds (both annually appropriated and continuing appropriations) or matching funds under a grant or cooperative agreement award to pay any person for lobbying in connection with the award. Lobbying is defined as influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress connection with the award. Submission of an application also represents the applicant's certification of the statements in 2 CFR Part 418, Appendix A-Certification Regarding Lobbying. If you/your organization have/has made or agrees to make any payment using non-appropriated funds for lobbying in connection with this proposal AND the Federal share exceeds $100,000, you must also complete and submit the SF LLL, Disclosure of Lobbying Activities located at 2 CFR 418, Appendix B. See 2 CFR, Subpart 418.110 for more information on when additional submission of this form is required.

5.2.6 AD-3031

Assurance Regarding Felony Conviction and Tax Delinquent Status for Corporate Applicants. Although the text of this document states it is applicable only to corporate entities, USDA policy requires that all entity types complete it.

5.2.7 Unique Entity Identifier and System for Award Management (SAM)

Each applicant (unless the applicant is an individual excepted from those requirements under 2 CFR §25.110(b) or (c), or has an exception approved by the Federal awarding agency under 2 CFR §25.110(d)) is required to: (i) Be registered in SAM before submitting its application; (ii)

provide a valid unique entity identifier (Data Universal Numbering System (DUNS) number) in its application; and (iii) continue to maintain an active SAM registration with current information at all times during which it has an active Federal award or an application or plan under consideration by a Federal awarding agency. The agency may not make a Federal award to an applicant until the applicant has complied with all applicable unique entity identifier and SAM requirements and, if an applicant has not fully complied with the requirements by the time the agency is ready to make an award, it may determine that the applicant is not qualified to receive a Federal award and use that determination as a basis for making a Federal award to another applicant.

Entities must obtain a DUNS and register in SAM prior to registering with Grants.gov. A description of each is below. Entities are strongly encouraged to apply early for their DUNS number and SAM registration.

Data Universal Numbering System (DUNS) Number: A Dun and Bradstreet DUNS number is a unique, nine-digit sequence recognized as the universal standard for identifying and keeping track of over 70 million businesses worldwide. Applicants must obtain a DUNS number. Information on how to obtain a DUNS number can be found at http://fedgov.dnb.com/webform or by calling 1-866-705-5711.

System for Award Management (SAM) Registration: SAM is the official Federal system that consolidated the capabilities of Central Contractor Registry, Federal Agency Registration, Online Representations and Certifications Application, and Excluded Parties List System. To register, go to: https://www.sam.gov/portal/public/SAM. The Federal Service Desk is available for registration assistance and can be contacted via the Help tab at the website listed above.

5.2.8 Submission Dates and Times

Applicants must submit proposals via Grants.gov and via e-mail as an attachment to the following address: Dave.Hoover@usda.gov and Pam.Thomas@usda.gov. Proposals must be received by 5 p.m. Central Time on June 3, 2019. Late submissions will not be reviewed or considered. The agency will rely on system generated date and time receipt documentation to determine whether applications meet the submission deadline. Applicants must contact Dave Hoover at Dave.Hoover@usda.gov to confirm receipt.

5.2.9 Intergovernmental Review

This funding opportunity is not subject to Executive Order 12372, "Intergovernmental Review of Federal Programs."

5.2.10 Funding Restrictions

Funds may not be used to pay any of the following costs unless otherwise permitted by law, or approved in writing by the Authorized Departmental Officer in advance of incurring such costs:

- Costs above the amount of funds authorized for the project;
- Costs incurred prior to the effective date of the grant;
- Costs which lie outside the scope of the approved project and amendments thereto;
- Entertainment costs, regardless of their apparent relationship to project objectives;
- Compensation for injuries to persons, or damage to property arising out of project activities;
- Consulting services performed by a Federal employee during official duty hours when

such consulting services result in the payment of additional compensation to the employee; and
- Renovation or refurbishment of research or related spaces, the purchase or installation of fixed equipment in such spaces, and the planning, repair, rehabilitation, acquisition, or construction of buildings or facilities.

This list is not exhaustive. Questions regarding the allowances of particular items of cost should be directed to the administrative contact person listed in this announcement.

5.2.11 Indirect Costs Limitations

- The indirect cost rate will be limited to 10% in accordance with the Agency's annual appropriations act. The 10% indirect cost rate applies to both federal and non-federal funds. Indirect costs must be calculated as follows. First, multiply the NICRA rate by the base stated in the NICRA to arrive at Amount A. Next, multiply the statutory limit of 10% by the total of all direct costs to arrive at Amount B. The lower of Amount A and B is the amount of indirect cost to include on the budget.
- No unrecovered indirect costs may be applied as part of an applicant's cost share or match. Unrecovered indirect cost means the difference between the amount charged to the Federal award and the amount which could have been charged to the Federal award under the recipient's approved negotiated indirect cost rate (2 CFR 200.306(c)).
- To be eligible to recover any indirect cost under a Federal award, recipients must either 1) have a current negotiated indirect cost rate agreement (NICRA) with a Federal agency that has not expired; or 2) qualify for use of the de minimis rate authorized by 2 CFR 200.414(f). In order to qualify for the de minimis rate, the recipient must have never had a NICRA. A State, local, or tribal governmental department or agency unit that receives more than $35 million in direct Federal funding is not eligible for the de minimis rate.
- Entities that are eligible for the de minimis rate who already have a de minimis rate agreement must use the rate and base specified in the agreement, which is modified total direct costs (MTDC) as defined by 2 CFR 200.68 and also excluding the amount of each subcontract exceeding $25,000. Note that MTDC excludes certain costs from the base to which the rate is applied. A copy of the applicant's de minimis rate agreement must be provided with the application. If a recipient is eligible to use the de minimis rate, but does not have a de minimis rate agreement, use an indirect cost rate of no more than 10% of MTDC when preparing the budget. If selected for award, a de minimis rate agreement will be executed along with the award.

6 PROPOSAL FORMAT

Proposals must contain the following sections and adhere to the following guidelines:

a) Project title

b) Identification of which research priority number the proposal is being written to address.

c) Problem statement/Need and justification for project: Identify priority area to be addressed.

d) Expected project deliverables that will contribute to achieving the Soil Survey mission

e) A brief review of current related literature

f) Research objective(s)

g) Hypothesis to be tested

h) Research methods and procedures. Provide enough detail to allow evaluation of the adequacy of the approach and methods for meeting project objectives. As applicable, the methods should include:

- Description of project area, including soils, topography, land use and vegetation, and climate
- Field sampling and measurement design, techniques, and methods
- Laboratory analyses (include specificmethods)
- Data analysis, including statistical procedures if applicable
- Description of the involvement of NRCS soil scientists (including required/requested field or laboratory support from KSSL) and NRCS SPSD (including KSSL, NSSC, MLRA Soil Survey Office, SSR, and State staffs)

i) Project timetable, including:

- Sample collection and fieldmeasurements (if needed)
- Laboratory analyses (if needed)
- Data analyses
- Data interpretation
- Report/manuscript writing

j) Information transfer plan. Describe means for disseminating information of the research results and promoting its application, including project reports, peer-reviewed publications, guidebooks, new technique methods, software, workshops, etc.

k) Documentation of the involvement of and training provided to graduate and/or undergraduate students and to NRCS field scientists.

l) References

m) Letters of support from Soil Survey regional director(s) and the State soil scientist(s) with responsibility for area within which research will be conducted, and any appropriate NSSC research soil scientist(s).

n) Investigator's qualifications. Include resumes of the principle investigator(s) (limited to 2 pages and 15 pertinent publications).

o) Brief description of existing facilities

p) Existing collaborative agreements/relationships with NRCS

q) Results from prior NRCS support

7 APPLICATION REVIEW INFORMATION

7.1 Proposals will be evaluated according to the following merit/technical criteria

Relevance and importance: Does the proposal fit within the mission of the Soil Survey and directly address a research priority described in Section 2? Are the results potentially applicable

to more than one State or MLRA?

Scientific merit: Does the proposed research have potential to expand the fundamental knowledge in its specific area(s)? Is it scientifically sound? Is the investigator aware of past research in the area? Is the proposal well written, organized, and complete?

Feasibility: Are the hypotheses, objectives, methodologies, designs, and techniques adequate and completely described? What is the likelihood of success given the methods, timeframe, and funding proposed?

Information transfer: Can the proposed research results enhance and improve our ability to meet one or more parts of the Soil Survey mission? Does the proposal address methods to transfer knowledge gained and potential impact of the results?

Training: Does the proposal have a strong educational component and provide for student support?

Collaboration: Does the proposal explicitly document direct collaboration with multiple NCSS collaborators and NRCS/NSSC affiliated soil scientists?

Qualifications of the investigators: Are the qualifications of the investigators adequate to complete the proposed research? Are the facilities and equipment adequate?

Budget: Is the budget reasonable and adequate for the proposed research? Proposals that include matching funds are encouraged and will receive extra weight in the evaluation and selection process.

7.2 Risk Criteria

The agency will check SAM to ensure the applicant is not suspended or debarred, which would preclude receiving an award. In addition, prior to making a Federal award with a total Federal share greater than the simplified acquisition threshold ($250,000), the agency must review and consider any information about the applicant that is in the designated integrity and performance system accessible through SAM (the Federal Awardee Performance Integrity Information System, FAPIIS) (see 41 U.S.C. 2313 and 2 CFR 200.205(a)).

To further comply with the requirements at 2 CFR 200.205, the agency has established the following risk review process and related standards that an applicant must meet to be considered for award:

a) Financial Stability. The applicant certifies that it maintains adequate financial resources or cash flow to meet its financial obligations on a routine basis and successfully complete any agreement it may be awarded.

b) Quality of Management Systems and Ability to meet Management Standards prescribed in 2 CFR Part 200. The applicant certifies it has a financial management system adequate to segregate and track federal funds. It further certifies is has adequate systems in place for proper agreement administration; compliance with the standards outlined in 2 CFR Part 200 Section D for procurement, property, and records management; and required financial and performance reporting.

c) History of Performance. If the applicant has previously obtained Federal financial assistance award, it certifies that it has never failed to materially comply with the Federal award terms and conditions and further that it has never had an award

terminated on that basis.

Submission of a proposal constitutes certification that an applicant meets these standards.

7.3 Review and Selection Process

Proposals will be screened for completeness and compliance with the provisions of this notice. The agency intends to make a selection and award without conducting any discussions or allowing applicants to correct deficiencies or omissions in their applications. Consequently, they must ensure their applications are complete and accurate. However, while the agency intends to make a selection and award without discussions, it reserves the right to conduct discussions for the purpose of allowing applicants to revise their applications to correct deficiencies or omissions identified by the NRCS. If this is done, the agency will conduct discussions with all applicants and identify deficiencies and omissions and give applicants and opportunity to submit a revised application by a common cut-off date.

Each proposal which meets the requirements of this request will be evaluated by a selection panel, potentially consisting of Soil and Plant Science Division national leaders, MLRA region leaders, NSSC research soil scientists, State soil scientists, and MLRA SSO leaders as determined by the director of the National Soil Survey Center. The proposals recommended for funding will be reviewed by the Director, Soil and Plant Science Division, who is the approving official and will make the final award decisions.

7.4 Awards Over the Simplified Acquisition Threshold (if applicable)

Notice to applicants:

a. Prior to making a Federal award with a total Federal share greater than the simplified acquisition threshold ($250,000), the agency must review and consider any information about the applicant that is in the designated integrity and performance system accessible through SAM (the Federal Awardee Performance Integrity Information System, FAPIIS) (see 41 U.S.C. 2313 and 2 CFR 200.205(a));

b. An applicant may review information in FAPIIS accessible through SAM and comment on any information about it that a Federal awarding agency previously entered;

c. The agency will consider any comments by the applicant, in addition to the other information in the designated integrity and performance system, in making a judgment about the applicant's integrity, business ethics, and record of performance under Federal awards when completing the review of risk posed by applicants as described in 2 CFR 200.205, Federal awarding agency review of risk posed by applicants.

7.5 Anticipated Announcement and Federal Award Dates

The agency anticipates announcing or notifying successful and unsuccessful applicants by July 5, 2019 and expects to have Federal awards in place by September 01.

8 FEDERAL AWARD ADMINISTRATION INFORMATION

8.1 Federal Award Notices

The agency will provide notice that an application has been selected before it actually makes the

Federal award. As such, the selection notification is not an authorization to begin performance. Any pre-award costs incurred by the awardee will not be reimbursed. The Notice of Grant and Agreement Award (form NRCS-ADS-093) signed by the authorized agency representative is the only authorizing document and will be provided electronically to the entity's authorized representative for signature.

Both successful and unsuccessful applicants with be notified of the award decision via letter.

8.2 Administrative and National Policy Requirements

All project funds will be used in accordance with 2 CFR 200 and NRCS' General Terms and Conditions. A copy of the General Terms and Conditions may be obtained by contacting the Federal Awarding Agency Contacts listed in this announcement.

8.3 Reporting

Reporting will follow the terms and conditions of the award but will generally include electronic submission of semiannual progress reports, quarterly financial status reports, and final reports. Coordination and communication with the Responsible Official (RO) from the Soil Science Division, who will be designated on the official CESU agreement, is required. A final presentation of the deliverables to the Soil and Plant Science Division in the form of a webinar will also be required.

If the Federal share of any agreement awarded under this opportunity notice may include more than $500,000 over the period of performance, recipients must also comply with the post award reporting requirements reflected in Appendix XII of 2 CFR Part 200 —Award Term and Condition for Recipient Integrity and Performance Matters.

9 QUESTIONS REGARDING THIS ANNOUNCEMENT

Questions regarding this announcement must be submitted to the Program Contact or Administrative Contact identified below via email with the Opportunity Number in the subject line. Questions must be submitted by May 16, 2019. A questions-and-answers document addressing all questions will be posted to the Related Documents tab of this announcement in Grants.gov as a modification by May 20, 2019.

Program Contact: Dave Hoover, Director, National Soil Survey Center

Phone: 402-437-4013 (office), 402-470-7600 (cell); email: Dave.Hoover@usda.gov

Administrative Contact: Michele Devaney, Grants Management Specialist

Phone: 801-524-4587; email: Michele.Devaney@usda.gov

10 OTHER INFORMATION

10.1 Freedom of Information Act (FOIA)

Proposals to NRCS are considered to be confidential information. Proposals are not shared with individuals or entities seeking public disclosure through the Freedom of Information Act (FOIA) without the consent of the applicant. More specifically, Executive Order 12600 and USDA FOIA regulation 7 CFR Part 1, Subpart A requires the NRCS to provide notice to applicants that a third

party has requested copies of their business information and requires NRCS to consult with applicants regarding the releasing their records.

10.2 Government Obligation

The Federal Government is not obligated to make any Federal award as a result of the announcement. Only authorized federal officials can bind the Federal Government to the expenditure of funds.

10.3 Additional Information

This request represents the continuation of annual funded research projects for the last 10 years. It is anticipated that there will be continued funded research at a level dependent on agency priorities and allocations.

More information on the USDA/NRCS soils program can be found at http://soils.usda.gov.

U.S. Department of Agriculture Non-Discrimination Statement

In accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its Agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs). Remedies and complaint filing deadlines vary by program or incident.

Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotape, American Sign Language, etc.) should contact the responsible Agency or USDA's TARGET Center at (202) 720-2600 (voice and TTY) or contact USDA through the Federal Relay Service at (800) 877-8339. Additionally, program information may be made available in languages other than English.

To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at https://www.ascr.usda.gov/filing-program-discrimination-complaint-usda-customer and at any USDA office or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by:

(1) mail: U.S. Department of Agriculture

Office of the Assistant Secretary for Civil Rights

1400 Independence Avenue, SW

Washington, D.C. 20250-9410;

(2) fax: (202) 690-7442; or

(3) email: program.intake@usda.gov.

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