KEARNEY FOUNDATION OF SOIL SCIENCE

Understanding and Managing Soil-Ecosystem Functions across Spatial and Temporal Scales

CALL FOR 2 YEAR PROPOSALS
Due Date: August 28, 2009, 10:00 pm.

FINAL CALL FOR THIS MISSION

The Kearney Foundation of Soil Science is an endowment-supported program that funds research in the University of California system. The Kearney Foundation of Soil Science is soliciting research proposals that address its 2006-2011 mission: **Understanding and Managing Soil-Ecosystem Functions across Spatial and Temporal Scales.**

Mission Overview

Soils on the landscape (soilscapes) are complex physical, chemical and biological systems that involve processes and interactions occurring within and between the atmosphere, hydrosphere, biosphere and geosphere. These systems are dynamic in space and time and involve a constant interaction with environmental drivers. Scale issues are at the heart of many environmental problems because different processes may be dominant at different spatial and/or temporal scales. Research across multiple spatial and temporal scales is necessary to fully understand the large-scale response and the underlying processes regulating the response. Few processes in nature operate in a linear fashion, but rather in a strong non-linear manner. While a system may initially resist changes from a forcing factor, a relatively small change at some point may push the system across a threshold that leads to an abrupt change in the response.

The focal point of this mission is to conduct multi-scale (spatial and/or temporal) basic and applied research that has clear relevance to land management decisions and policies. Research within the spatial continuum from molecular to regional scale (regional defined here as the state of California) and the temporal continuum from seconds to millennia are appropriate (Figure 1). Environmental management and decision making is often made at scales much larger than experimental plots, resulting in a great amount of uncertainty from the extrapolation of research results across scales. A large portion of the research supported by this mission will center on transitions between scales at which important ecosystem processes of interest occur and interact, as well as analyzing relationships between the scale of management decisions and the scale of assessment and monitoring. For example, mathematical models of flow and transport processes that best represent soil characteristics at the plot scale may not be the appropriate descriptors of the same processes at the larger watershed scale. By working at appropriate scales for management decisions and monitoring, the economic feasibility and social acceptability of potential management options and related policies can be more readily assessed.

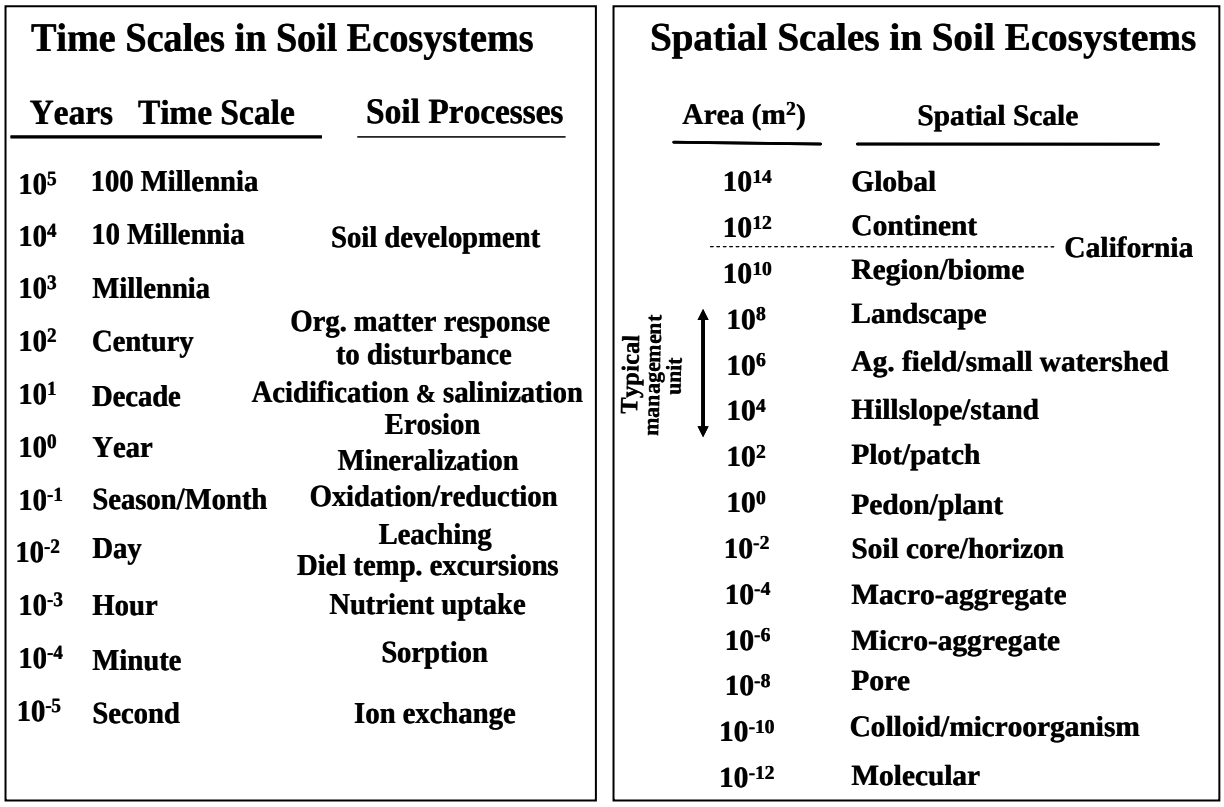

Figure 1. Representation of spatial and temporal scales in soil ecosystems. Most land management and policy decisions require knowledge of processes occurring within the hillslope to landscape spatial scales and within the day to decade temporal scales.

Goals of the current Kearney Foundation of Soil Science mission are to:

- Investigate how ecosystem properties, processes, functions and services are controlled by soil biophysical and biochemical processes across spatial and temporal scales;
- Conduct multi-scale basic and applied research that demonstrates clear relevance to land management decisions and policies;
- Examine transitions between scales at which important soil-ecosystem processes occur and interact; and
- Examine the relationships between the scale of management decisions and the scale of investigation, assessment and monitoring.

Research Areas

Funding is available to support two year research projects beginning in January 2010. Many, if not all, traditional soil-ecosystem research topics are well suited for this mission, but funded research topics under this mission will be unique in that they will i) address multiple spatial and/or temporal scales and ii) provide information that is clearly relevant to land management decisions and policies. While numerical modeling efforts are encouraged as a component of research proposals, projects must demonstrate an experimental approach that will examine fundamental mechanisms to support model formulation, calibration and validation across multiple spatial and/or temporal scales. Priority will be given to research proposals that demonstrate a direct application to land management decisions and policies in California.

Examples of research central to the soil system that could be addressed under this mission are:

1) Spatial and temporal variability of greenhouse gas emissions across landscape- to regional-level greenhouse gas budget assessments.
2) Biogeochemical cycles across ecosystems and landscapes, i.e., carbon, nitrogen, pathogens, and other contaminant loads from atmospheric (e.g. acids, nutrients, dust), to terrestrial (e.g. irrigated agriculture, animal agricultural operations), to riparian, aquatic (surface and ground waters) and wetland systems.
3) The feedback between landscape-level edaphic variation and evolutionary response within both plant and soil communities.
4) The effects of changes in the nature of plant-animal-soil feedbacks over space and time on soil functions from the soil pore to the landscape scale.
5) Scaling of the genomic control of microbial processes that act upon nitrogen, carbon, other nutrients and contaminants to the fluxes of metabolic products that are essential nutrients for plant primary productivity or have negative impacts on the environment.
6) Short- and long-term effects of prescribed or wild fires on soils of contrasting landscape positions and plant communities.
7) Short- and long-term impacts of manure and/or organic waste applications on soil C, N, salt, and pathogen balances of agricultural landscapes.
8) Biological, chemical and hydrological soil processes at the interfaces between agriculture/urban, agriculture/wildland, and wildland/urban environments.
9) Scaling up of the interactive processes between air quality, soils, agricultural production, and water quality (surface and ground waters) that occur at the field scale.
10) Assessment of economic, policy and social implications/applications of proposed management options that involve different temporal and spatial scales.
11) Effects of pore to watershed scale hydrologic flowpaths on transport of environmental constituents within the vadose zone.
12) Spatial/temporal dynamics of hydrological and biogeochemical processes within ecosystems that experience strong seasonal dynamics (e.g., vernal pools).
13) Assessment of spatial/temporal dynamics as related to soil-ecosystem restoration and remediation in natural and managed systems.
14) Assessment of changes in soil attributes across pedological sequences (e.g., chronosequences, toposequences, climosequences).
15) Up-scaling and down-scaling of soil survey information to quantify near surface processes in the field with uncertainty analysis to support resource management and policy decisions.

Other examples of projects funded in 2006, 2007 and 2008 can be examined at: 2006 - 2007 - 2008 Approved Research Projects

Proposal Types and Funding Restrictions

Proposed research projects should not exceed two years in duration. Two categories of proposals will be considered:

Standard Proposals: One or more PIs applying a disciplinary approach to a research hypothesis/question. Standard research proposals have a maximum funding limit of $45,000 per year.

PLEASE NOTE: ONLY ONE STANDARD PROPSAL WILL BE ACCEPTED PER PRIMARY PI.

Multidisciplinary Proposals: A minimum of three PIs applying a multidisciplinary approach with a minimum of three distinct disciplines to the project. The distinct disciplines could include a physical, chemical, biological, and/or social-economic component (e.g., microbiology, soil chemistry, and soil physics/hydrology examining the fate and transport of mercury in wetland ecosystems). These larger projects must clearly demonstrate involvement of different disciplines and demonstrate how the disciplines are integrated in pursuit of the proposed project. Multidisciplinary projects have a maximum funding limit of $120,000 per year for a minimum of 3 PIs. Given our expected funding level, we anticipate being able to fund only 1 or 2 multidisciplinary projects with this call.

Multi-campus projects and inclusion of a significant Cooperative Extension component to the research (especially from farm advisors who will provide guidance on activities in managed landscapes) are particularly encouraged. All PIs must have University of California or UC - ANR affiliation. Graduate students are encouraged to prepare proposals in collaboration with their major professor and to be submitted under the name of their major professor.

Restrictions on the use of Kearney funds:

- Funds do not support salary of faculty and other career employees
- Only in-state fees for graduate students are allowed
- Travel is restricted to U.S. travel
- Equipment is not allowed unless prior approval has been obtained from the Kearney Foundation.
- There is no indirect cost.

An annual progress report and final report are required for each project. Grantees must participate in meetings of the Kearney Foundation.

Proposal Submittal Requirements

Details are available at **http://kearney.ucdavis.edu –**

(http://kearney.ucdavis.edu/PROPOSAL%20SUBMISSION%20REQUIREMENTS.pdf)

Submittal Date: No later than 10 pm, August 28, 2009.

Proposals are to be submitted electronically using the Kearney Foundation Web-based proposal submission system: **https://uckearney.org/2006**

Evaluation Criteria and Award Announcement:

All proposals will be reviewed and ranked by external reviewers and the Kearney Technical Committee according to the following principal criteria of quality:

- **Competence** — Technical soundness of the proposed research questions and approach; innovativeness of research; feasibility of successfully completing the research within the designated timeframe, capability and recent research performance of the principal investigator(s), and adequacy of the resources available.

- **Intrinsic Merit** — Likelihood that the research will lead to new discoveries, or important advances, does not duplicate existing research funding of the PIs, and will improve our understanding of soil-ecosystem functions across multiple spatial and temporal scales.

- **Relevance** — Likelihood that the research will contribute to the achievement of the 2006-2011 Kearney Foundation mission and to the advancement of the soil science discipline. Priority will be given to those proposals that successfully address soil-ecosystem processes across multiple scales and demonstrate strong application for addressing land management and policy decisions in California.

Questions concerning proposal preparation may be directed to Randy Dahlgren (Director) or the Program Manager by email: Kearney@ucdavis.edu or voice: 530-754-9668.