Responsibilities and the more than human in soil science

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- Defining what sorts of soil there are in the world, also defines what is known, what can be known, and what should be known about soil.

What kind of soil is this?
How do I categorize it as such?

- Geological origin
- Physical structure
- Grain size
- Unified soil classification system
- Preliminary classification of soil types

- Local knowledge/colloquial names of regional soils
- Soil capability
- Soil heath

Klingebiel and Montgomery's 1961 *Land-Capability Classification*

Class III soils: "severe limitations that reduce the choice of plants or require special conservation practices, or both…limitations of class III soils restrict the amount of cultivation: timing of planting, tillage resulting from moderately steep slopes; high susceptibility to water or wind erosion",

Class IV soils : "very severe limitations requiring very careful management and limited as a result of steep slopes; severe susceptibility to water or wind erosion; severe effects of past erosion"

TABLE 1.—Relationship of soil-mapping unit to capability classification

Soil-mapping unit	Capability unit	Capability subclass	Capability class
A soil mapping unit is a portion of the landscape that has similar characteristics and qualities and whose limits are fixed by precise definitions. Within the cartographic limitations and considering the purpose for which the map is made, the soil mapping unit is the unit about which the greatest number of precise statements and predictions can be made. The soil mapping units provide the most detailed soils information. The basic mapping units are the basis for all interpretive groupings of soils. They furnish the information needed for developing capability units, forest site groupings, crop suitability groupings, range site groupings, engineering groupings, and other interpretive groupings. The most specific management practices and estimated yields are related to the individual mapping unit.	A capability unit is a grouping of one or more individual soil mapping units having similar potentials and continuing limitations or hazards. The soils in a capability unit are sufficiently uniform to (a) produce similar kinds of cultivated crops and pasture plants with similar management practices, (b) require similar conservation treatment and management under the same kind and condition of vegetative cover, (c) have comparable potential productivity. The capability unit condenses and simplifies soils information for planning individual tracts of land, field by field. Capability units with the class and subclass furnish information about the degree of limitation, kind of conservation problems and the management practices needed.	Subclasses are groups of capability units which have the same major conservation problem, such as— e—Erosion and runoff. w—Excess water. s—Root-zone limitations. c—Climatic limitations. The capability subclass provides information as to the kind of conservation problem or limitations involved. The class and subclass together provide the map user information about both the degree of limitation and kind of problem involved for broad program planning, conservation need studies, and similar purposes.	Capability classes are groups of capability subclasses or capability units that have the same relative degree of hazard or limitation. The risks of soil damage or limitation in use become progressively greater from class I to class VIII. The capability classes are useful as a means of introducing the map user to the more detailed information on the soil map. The classes show the location, amount, and general suitability of the soils for agricultural use. Only information concerning general agricultural limitations in soil use are obtained at the capability class level.

What is soil and what is not soil?

Traditional soil science:

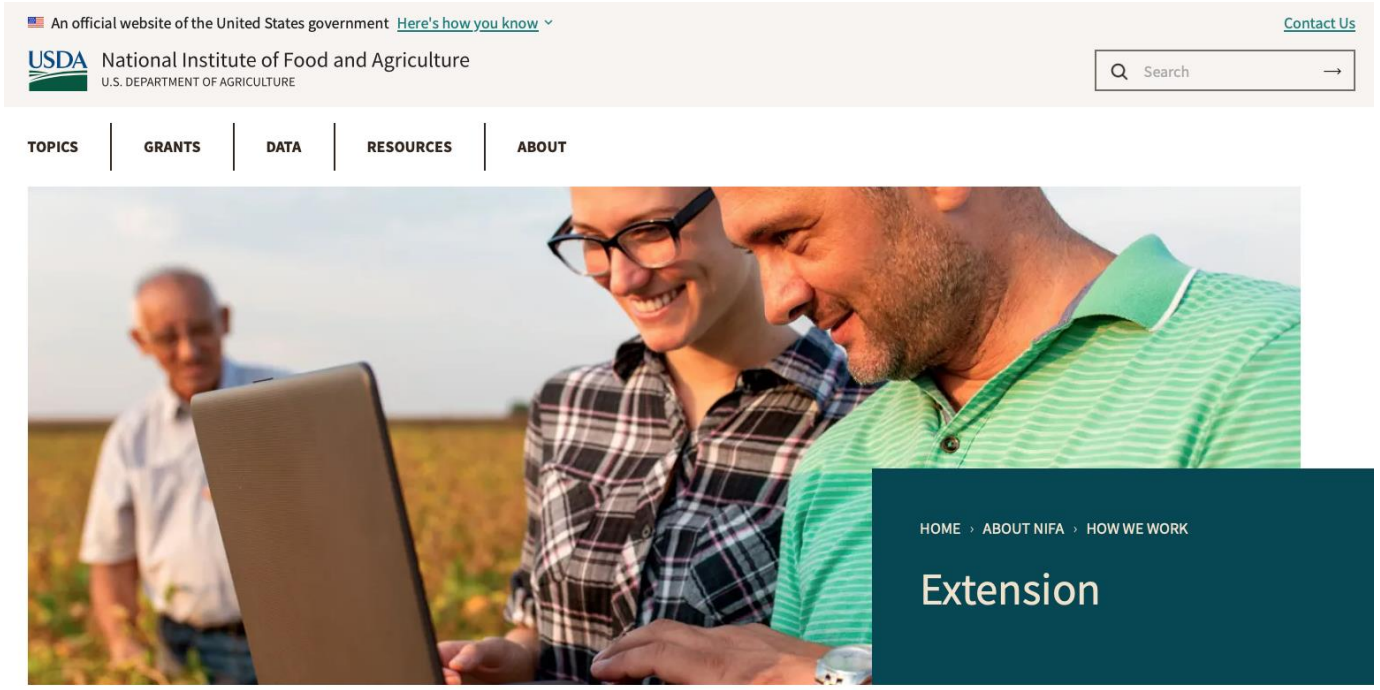
- Mineral content---what is missing--what to add (often measured for 'soil health' assessments), NPK
  - Rocks?
  - man-made soils, ex. Gravel?
- Organic content –what is in there–decayed plant matter, tissues
- Organisms--which animals and plants (what parts), at what time (residue)?
  - Worms?
  - Macrobes?
  - Microbes?
  - Roots, root exudates?
  - Free bacteria?
- Air, gases (from bacteria/root exudates), water
- For the purpose of soil science experiments–what is included and what is not included as soil matters for knowledge production, replicability (e.g. does it work as well in my field as in the soil scientists' experimental plot?), and soil management decisions (e.g. what soil amendments do I use)

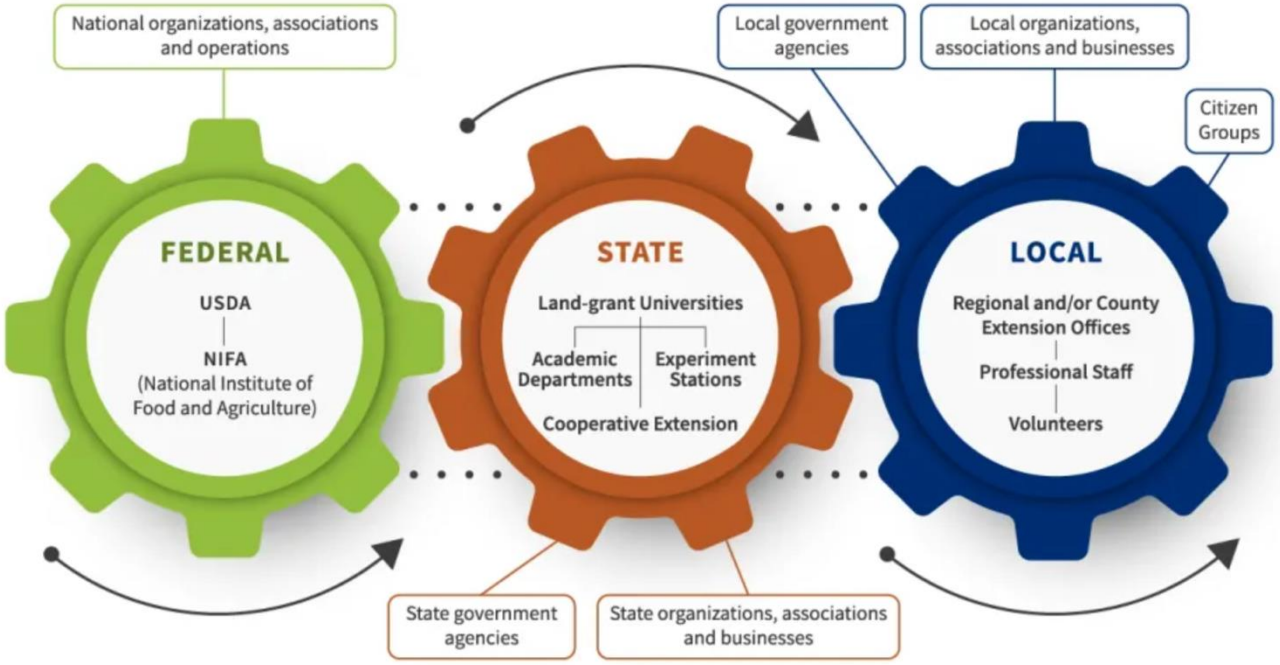
How to research, train, and think about soil using ethics-by-design thinking:

1) Model choice in lab research: using different models, e.g. not just one organism or set of minerals switchgrass, mycorrhizal colonization, root exudates, prairie strips
2) Long-term trials in ecological field research/ testing 'business-as-usual models'
3) Exploratory/ aspirational models of field research
   - Where what is 'aspirational' is decided through conversations with farmers, researchers, community members each year, so the questions farmers want answers to and those that researchers want to pursue are aligned. long-term agroecological research
4) Experiential learning–what does the soil microbiome/microbiome do in the field not just that it does it
   - Microbiome (soil)/ Macrobiome (local agroecology)

Cooperative Agricultural extension system

- Experiential learning





SHARE

Extension provides non-formal education and learning activities to people throughout the country — to farmers and other residents of rural communities as well as to people living in urban areas. It emphasizes taking knowledge gained through research and education and bringing it directly to the people to create positive changes.

All universities engage in research and teaching, but the nation's more than 100 land-grant colleges and universities have a third, critical mission — extension. Through extension, land-grant colleges and universities bring vital, practical information to agricultural producers, small business owners, consumers, families, and young people.

NIFA supports both universities and local offices of the Cooperative Extension System (CES) to provide research-based information to its range of audiences. As the CES federal partner, NIFA plays a key role in the mission by distributing annual congressionally appropriated formula grants to supplement state and county funds.

Improving Lives in Rural and Urban Areas

The hallmarks of the extension program — openness, accessibility, and service — illuminate how cooperative extension brings evidence-based science and modern technologies to farmers, consumers, and families. Through extension, land-grant institutions reach out to offer their resources to address public needs. By educating farmers on business operations and on modern agricultural science and technologies, extension contributes to the success of countless farms, ranches, and rural business. Further, these services improve the lives of consumers and families through nutrition education, food safety training, and youth leadership development.

Past, Present, and Future

In 2014, NIFA and our land-grant university partners celebrated 100 years of Cooperative Extension in the United States. The Smith-Lever Act formalized extension in 1914, but its roots go back to agricultural clubs and societies of the early 1800s. The act expanded USDA's partnership with land-grant universities to apply research and provide education in agriculture. Over the last century, extension has adapted to changing times and landscapes, and it continues to address a wide range of human, plant, and animal needs in both urban and rural areas. Today, extension works

‘soil’ your undies challenge

USDA Natural Resources Conservation Service
U.S. DEPARTMENT OF AGRICULTURE


I need to improve my soil health!
Wow! My soil is looking pretty healthy!

Thank you for your attention!

Comments? Questions?
please email me:
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