THE CENTENNIAL STORY OF SOILS PROGRAMS AT OSU

This short story was prepared to remind us of the changing role of soil science as we celebrate our centennial at Oregon State. The management and content of departments at OSU changed over time. I will refer in this short article about the soils activities as OSU-Soils, not attempting to specify the name of the department under which the soils work was done.

THE EARLY DAYS, 1907 -1945

Soils lectures were part of agriculture courses, taught to a small number of students, before the beginning of the centenary year, 1907. These were the first years following the establishment of Oregon State College at Corvallis. The first text books for soils in the USA date from about 1900. They came from the Northeast or the Midwest, and were heavily oriented to regional soil management concerns. Hence teaching in OSU-Soils the last decades of the 19th century and the early decades of the 20th century would have relied on transmitting information through lectures, by professors who were involved in the agriculture of Oregon. Reports written for the Experiment Station contained soils information on fertility trials in the Willamette Valley and on drainage in the "swampy" areas. The Willamette was a meandering stream, with large areas under water in the spring. Transportation was an issue for agriculture. Irrigation and salinity were the soils concerns east of the Cascades.

The Department of Agronomy, established as one of the first four departments at OSU, included teaching soils. Prof. Powers led the work on water management. In the 3rd and 4th decades, Ruzek taught soils in a course remembered and held in awe by students. He remembered not only the student's names, but also their fathers and uncles.

The relatively small classes and small numbers of soils faculty members during these start-up days, and then the depressed conditions of the 3rd decade, limited activity in soil science. Each professor had many responsibilities in teaching, research, and extension. One has to applaud their achievements, gained with limited resources.

This period of teaching, extension and research with scarce resources ended after World War II. The next period can not accurately be called a renaissance, because OSU-Soils did not look back to knowledge of the past, but used the newly available resources to invent itself. Interest in historical knowledge did not come until the end of the 20th century.

THE GROWTH OF SOIL SCIENCE, 1950-1975

OSU-Soils grew from about four full-time faculty members in 1945 to about 16 in 1970. Funds for research, teaching, and extension increased dramatically. Research funds were available both for increasing soil knowledge and for applications to crop production. It was a time of "full-steam ahead," for "doing things." With this financial support for a range of studies, we possibly spent less time than we should have in thinking about soils.

Several new areas of research were initiated, teaching and education became more specialized as more people were hired into faculty positions. Money was available to support students for graduate study. New tools and methods became available for soils studies from other disciplines. Ace Cheney, with an extension background, was an effective department administrator from 1952-1978. Following are some of the areas of OSU-Soils activity, how we made use of the available opportunities.

Increased crop yields, the objective of soil fertility work, required increases in nutrients available in soils. Prices of fertilizers decreased, and information was required on fertilizer

requirements for different crops and soils. The soil fertility program, based on field experiments, grew under the leadership of Tom Jackson, a field-man's field-man. Cooperation with, and funding from, the fertilizer industry boosted this work. Soil chemistry studies aided the fertility work. The concerns about excess fertilizer uses did not come until the end of this period.

Teaching the beginning soils course was modernized by Murray Dawson, a top College of Agriculture teacher, who won awards for his student-paced learning methods. Dawson became as well known for his beginning soils course as Ruzek had been in the earlier period. The range of competence available among the faculty members allowed teaching of advanced soils courses by specialists in the soils categories.

Cooperation with geomorphology specialists in the SCS (now NRCS) provided a landscape basis for mapping and classifying soils in Oregon. OSU-Soils, by then a Department of Soils, launched major studies in soils developed on volcanic parent materials, a large and unique group of soils in Oregon. Soil chemistry and mineralogy underpinned this work. Remnants of this program survived into the 3rd soils period after 1975, when the 11th order of soils, the Andisols, was being defined in the U.S. Soil Taxonomy.

The program in forest soils research, begun by Chet Youngberg, attracted graduate students who filled positions in forest soil management. The interest and need continued during this period as management of forests for multiple uses became an issue for society, and soils became recognized as a base for prosperous forests.

Water management for crops, irrigation, drainage, and crop water use were continued after 1950, with the emphasis gradually shifting to extension work. Another social issue to which OSU-Soils responded was control of erosion and furthering soil conservation. Studies of the erosion process in the Willamette Valley, and cooperation with USDA ARS in northeastern

Oregon, were parts of the program. Wheat producers in Oregon supported this program. The emphasis shifted from runoff control structures such as contours and dams, to control of erosion through crop management with a protective cover of plant residue and growing plants on the soil surface.

Several OSU-Soils faculty members worked on international USAID projects during this period, bringing soils knowledge to crop production in developing countries.

Soil biology began to play a major role at the end of this "soil chemistry and fertility dominated" period.

OSU Soils in the Present Era, 1975 -2007

Change came rapidly to OSU-Soils after 1975, reflecting the rapid changes in the world around us. We made changes to adjust to new realities, to the new ways of looking at soils demanded by society. These changes were made in a reality of decreased financial support, which lasted during the entire 30-year era. The faculty roster gradually decreased to less than ten by 2005, professional people have difficulty in making changes in their professional life, and the client base in agriculture was not yet totally convinced that we should be responding to these new realities. The change was to an ecosystem perspective on soils, to a bio-geo-chemical approach to soil functions at a watershed level. Soils are integral to providing the functions of recycling of nutrients, decomposition of hazardous materials, partitioning of incoming rain and radiant energy, and providing a stable base for our varied activities. These functions all depend on the particular structure of pores in the soil.

Within this context, what has happened in OSU-Soils?

Soil biology has "come into its own." Studies in soil as a habitat for microbiologically-mediated processes were the base. Biodiversity is a major characteristic of soils, much of which has still to be unraveled. The carbon and nitrogen cycles in cultivated and in forest soils with applications to global warming and pollution of water were major studies. The new forest soils program was a component.

Soils are seen in relation to the landscapes they occupy. Modern soil mapping and studies of soil genesis rely on new geo-techniques and on models for soil development. Water flow in soils is described in relation to the structure of pore sizes and continuity; large and continuous pores for drainage and small pores for water storage characterize movement of pollutants to ground water and surface water.

The advantage of using soils for disposal of organic wastes (e.g., high rates of decomposition), are used in various applications. The disadvantages (e.g., heavy metal accumulation) are sometimes discussed. The waste disposal program of the Oregon Department of Environmental Quality (DEQ) received active input from OSU-Soils for questions of soils information and standards for small-scale septic systems. With this background, private consultants assumed the main responsibility for design of these septic systems.

Soil fertility research and extension for crop production is still a major OSU-Soils component. Addition of nutrients is still required for increased production. A new component is protection of water from excess nutrients leaching from soils.

Soil science teaching has changed as society has asked for more and different soils information. Interests of students have also changed. The soil science basics remains the same, the applications have changed. At the department level, teaching, research, and extension are more closely integrated; each faculty member may be involved in several aspects. Soils courses

are now also taught by Department members resident at Eastern Oregon University and at the new campus at Bend.

And overall are the questions of sustainability, the issues so important for soils. Soil degradation in various manifestations such as loss of organic matter, compaction, and erosion are issues discussed well beyond the professional soils community. The rush to grow crops for bio-fuel production may disturb soil scientists. Will this be a repeat of the maximum production concern common until 20 years ago? Soil degradation from loss of organic matter needs to be considered. Is degrading our soils the best answer we can suggest for prolifigate energy consumption or for solution of national economic problems?

During the 1970s we found some gaps in our soils knowledge as we applied it to ecosystems. For example, some of Oregon's soils developed on volcanic parent materials have high phosphate contents. These relatively new rocks have not been through geological cycles that result in loss of phosphate. We found that phosphate is not always immobile in soils; it leaches to groundwater as well as moving with erosion to surface water. We did not have this knowledge because we had not asked the relevant questions. What other question have we not asked? This leads to our recent interest in history of ideas in soil science, and in indigenous knowledge about soils in other cultures. Did we lose soils knowledge from our earlier period in the first half of the 20th century where there was less rush to complete studies and more time for evaluating and summarizing? Can we retrieve some of this knowledge?

Our Future in Soil Science

This section is not an expert glimpse into the future, it is a personal list of what I see as examples of the major issues for OSU-Soils in the next 25 years.

Some unique opportunities could develop for soil management. As an example, cold water is required to maintain some of the fish stocks society now values. Soils could be managed to provide cooler stream water by encouraging percolation and slow release while discouraging rapid surface runoff to streams.

Sustainability will continue to occupy thinking in soil science, for example soil degradation from undesired effects of soil management systems for our varied uses of soils. How would intensification of food production change soil properties over many years?

Effective transmission of soils knowledge to the public and to decision-makers has been a priority on the soils agenda for all of the 20th century. It continues to be. What methods can we devise that could be more effective in having soil knowledge become a more important part of decision-making? Soil scientists have very modest general management skills; learning these skills would enhance our status in multi-discipline projects and hence our stature as seen by the public. Can we ensure that soil science as a discipline is not lost in the coming competition of responses to society's needs?

And then some intriguing issues. Can rare soils become endangered and lost, no longer able to perform the special functions in eco-systems? What are the implications? And then there are the people/soils issues. How can we use the special knowledge of soils expressed in ways different from those we normally employ in our studies. We would need to know how soils are seen in art and literature and by people with different ways of knowing about soils. How do the major institutions in our society "see" soils? Are soils part of our "sense of place" and of who we are?

Fill in your own list.

Finally on my list, how would our teaching of soil science need to be changed if we decided that some of these issues should be examined by the soil scientists of tomorrow – our students?

We do not know the future of OSU-Soils, but we know it will be full of exciting opportunities.

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on the Eve of our Centennial, April 2007