National Cooperative Soil Survey Newsletter

December 1999
Issue 9

In This Issue—

Editor's Note

Issues of this newsletter are available on the World Wide Web (www.statlab.iastate.edu/soils/soildiv). Click on NCSS and then on the desired issue number of the NCSS Newsletter.

You are invited to submit stories for future issues of this newsletter to Stanley Anderson, National Soil Survey Center, Lincoln, Nebraska. Phone—402-437-5357; FAX—402-437-5336; email—stan.anderson@nssc.nrcs.usda.gov.

The Early Soil Survey: Engine for the Soil Conservation Movement

By Douglas Helms, Historian, Natural Resources Conservation Service, Washington, D.C.

Aspects of soil conservation and avoidance of land degradation are only a few of the interpretations found in soil surveys. Our current level of knowledge of soils, their use, and the ability to advise land users arose from several historic developments. First, one had to be able to identify and describe significant soil characteristics and to classify soil bodies (at least at the lowest level). Second, land users, soil scientists, and other researchers, through a combination of empirical observations and scientific research, had to learn the factors leading to soil degradation. Finally, they needed to develop recommendations, or interpretations. One interpretation might be the recognition that some soils are not suited to particular uses. More often, the interpretations involved a range of management recommendations. The interpretations had to be related to a particular soil type. To utilize the recommendations, one needed to identify the soil type on the map and on the landscape.

In the 100-year history of the National Cooperative Soil Survey, soil scientists have mapped 90 percent of the Nation's private land, 48 percent of American Indian land, and 47 percent of the public lands. About 78 percent of the total land area of the United States has been mapped. Published soil surveys consist of maps, tables, and narrative information about soils—their uses, potentials, and limitations. This paper examines not only the history of soil surveys for soil conservation, but also the relationship of the national soil survey program to the broader soil conservation movement.

Soluble Salts: Land Use and Land Degradation

Soil survey cooperators have selected 1899 as the year in which the soil survey effort began in earnest. In 1899, the Division of Soils (which had been established in USDA as the Division of Agricultural Soils in 1894) sent soil surveyors to work in four locations—Cecil County, Maryland, the Connecticut Valley, the Salt Lake Valley of Utah, and the Pecos Valley of New Mexico. At that time, there was a great deal yet to be learned about the science of the soil and its response to management. The ability to map and classify soils and to measure characteristics had to grow apace with the ability of scientists to make meaningful interpretations for land users. In the realm of interpretations for soil conservation and good land use, perhaps the most accurate and financially valuable interpretation the early soil surveyors could make rested on their ability to identify soluble salts in the soil and water of Western states. The information could help guide the development of irrigation projects. In irrigated areas in dry climates, soluble salts accumulated and crusted on the surface through capillary action and evaporation. Often, the salts also became concentrated in a raised water table. Both conditions restricted plant growth but could often be corrected by

a drainage system that permitted water to flush the salts down through the soil profile and into the drainage system. Identification of the potential problem called for added expense that needed to be calculated in the cost of opening land to agriculture. By the time the soil survey began, Eugene W. Hilgard of the University of California had described most of the processes leading to white and black alkali. His prescription for reclamation through a drainage system for leaching, augmented by applications of gypsum for the black alkali, corrected many situations. Lyman Briggs, the bureau's soil physicist, and Thomas Means and Frank Gardner, early surveyors in the West, built on the work of Hilgard in developing methods to identify soluble salts.

Local residents or land agents sometimes voiced displeasure with surveys that pointed out the limitations of soils for particular uses. In 1899, Milton Whitney, first head of the soil survey, sent Thomas H. Means and Frank D. Gardner to survey the valley of the Pecos River at the invitation of local land developers. Their report suggested that, with a drainage system for the alkali problem, farmers could raise alfalfa for livestock but that a combination of soil, water, and climate made the area unsuited to vegetables and fruit crops. The Pecos Irrigation and Improvement Company, which was then advertising the area as truck crop and orchard land, requested and received an investigation by the Office of the Secretary of Agriculture into the Pecos Valley report. The report largely exonerated Whitney.

Some of the early Bureau of Reclamation projects suffered for lack of attention to soil issues, including alkali problems. Farmers on reclamation projects led the call for greater attention to soil when they testified to the Fact Finding Commission of 1923-1924 that repayments should be based in part on differences in soil productivity. The soil survey was a valuable tool in selecting Western lands for agriculture.

Identifying Soil Erosion Phases and Promoting Soil Conservation

The Bureau of Soils (previously the Division of Soils) furthered the awareness of soil erosion as a problem facing American agriculture. The bureau was also active in the wider progressive conservation movement through William John McGee, one of the major scientific figures in the Federal Government in the 19th and early 20th centuries. When McGee joined the Bureau of Soils in 1907, Milton Whitney, the chief of the bureau, placed him in charge of the unit "Soil Erosion Investigations." The largely self-taught McGee was already a man of importance in the infant conservation movement when he joined the bureau. At various times he listed his occupations as geologist, ethnologist, anthropologist, and hydrologist. He had justifiable claims to all of those titles.

The son of an Irish immigrant farmer, McGee was born on April 17, 1853, near Farley in Dubuque County, Iowa. He left school at 14 but benefited from tutoring in Latin, German, mathematics, and astronomy by an older brother who had attended college. He learned blacksmithing and built and sold agricultural implements, when not exploring the countryside with his brothers. In 1878, he published papers on glacial drift and prehistoric burial mounds. From 1877 to 1881, he carried out his own topographic and geological survey of 12,000 square miles in northeastern Iowa and published "The Pleistocene History of Northeastern Iowa."

John Wesley Powell hired McGee as a permanent employee of the U.S. Geological Survey in 1883, where he published the first generalized geologic map of the United States. McGee followed Powell to the Bureau of American Ethnology when Powell became director in 1893. McGee eventually published some 30 reports on native peoples from 1894 to 1903. He was appointed to the Bureau of Soils following a stint as director the St. Louis Public Museum. Whitney recommended McGee to the Secretary of Agriculture on March 22, 1907, for the "purpose of enabling the bureau to take up the important study of soil erosion or wash, and sedimentation which has not hitherto been fully investigated for inability to obtain a man with the necessary training and attainments."[1] Whitney informed the Secretary that McGee had only recently been appointed by President Theodore Roosevelt to the Inland Waterways Commission, where he would be working with the Forest Service, with the Engineering Department of the Army, and with the Hydrographic Service of the Department of the Interior. This position would afford McGee an "opportunity to push these investigations with the assistance and advice from these other branches of the Government service, whose work is really dependent upon and made necessary to a large extent, by the erosion of the soil."[2] His grasp of the interrelated nature of resources was advanced for the time. As a member of the waterways commission, he pushed for a natural resources conference. Finding that the Lakes-to-the-Gulf Deep Waterways Association planned to call together a score or more governors for a conference restricted to

[1] W.J. McGee Personnel File, Selected Personnel Files, RG 16, NA.

[2] Milton Whitney to Secretary of Agriculture, March 22, 1907, W.J. McGee Personnel File, Selected Personnel Files, RG 16, NA.

waterways improvement needs and water resources development, McGee and his colleagues won President Theodore Roosevelt's pledge to call a Conference of Governors on Conservation of Natural Resources. McGee, while employed in the Bureau of Soils, and Gifford Pinchot, chief of the Forest Service, shaped the conference. Pinchot helped organize the conference held at the White House in May 1908 but recalled that it was McGee "who pulled the laboring oar" (Pinchot, 1947). The governors were allowed to speak briefly, but the substance of the published proceedings rested on the presentations by the experts in resources, whom McGee had selected. The conference, along with the published volume of speeches, which called attention to the need for conservation, was a seminal event in the history of the conservation movement. Pinchot's assessment of McGee's status in the conservation movement was unqualified: "W.J. McGee was the scientific brains of the Conservation movement all through its early critical stages" (Pinchot, 1947). The historian Samuel Hays, who examined what he termed the "progressive conservation movement" spanning 1890-1920, concurred, calling McGee the "chief theorist of the conservation movement" (Hays, 1959).

McGee acquired his interest in erosion during his studies for the U.S. Geological Survey. While studying erosion as a geological process, he became a prescient observer of human-induced, accelerated erosion. In studying Mississippi's coastal plain, he found soils "adapted to distinct crops and special modes of tillage; and they are differently affected by old-field erosion, which has already wrought lamentable destruction in different portions of the coastal plain, and is progressing with ever-increasing rapidity" (McGee, 1892). McGee also produced a Bureau of Soils bulletin on soil erosion that was the bureau's most complete treatment of the issue at that point. During the later part of his career, McGee studied ground water, or what he called subsoil water. The bulletins that were published after his death correctly identified the need to view soils and water resources as a unit. McGee is not remembered for his Bureau of Soils ground water bulletins, mainly because they set forth theories of capillary action, hydrology, and water cycle and consumption that further scientific investigation has found wanting. But McGee remains a central figure among Federal employees in the progressive conservation movement. He was still employed in the bureau when he died on September 4, 1912, in his quarters at the Cosmos Club.

McGee's prestige brought attention to the bureau's role in soil conservation, but he by no means originated it. A cadre of young soil scientists concerned about the effects of soil erosion developed in the early Bureau of Soils. Published soil surveys increasingly referred to soil erosion and the need for soil conservation, along with some suggested lines of action. The early soil surveyors had taken notice of soil erosion from the beginning of their work, both as a factor of soil classification and of soil management recommendations. They were developing what we now call the soil type, soil bodies that share significant soil properties. Soil surveyors began seeing separations based on erosion. Clarence W. Dorsey surveyed the area around Lancaster, Pennsylvania, in 1900 and described Hagerstown clay: "These soils may be said to be the Hagerstown loam from which the top covering of loam has been removed, exposing the clay subsoil...." (Dorsey, 1901). Jay A. Bonsteel, who surveyed St. Marys County, Maryland, the same year, noted that cultivating slopes of Leonardtown loam resulted in "scalds or washes" which needed permanent sod (Bonsteel, 1901). Bonsteel, while jointly serving as Professor of Soil Investigations at Cornell University early in the century, examined the so-called worn-out soils around Ithaca. Like Whitney and others of the period, Bonsteel was among the ranks of those questioning Justus Liebig's theory that repeated cropping diminished the available plant food in the topsoil. Bonsteel believed that many farmers around Ithaca cultivated a subsoil far different from the topsoil cultivated by their ancestors. The stone fences where the topsoil lodged provided the evidence. Reacting perhaps too strongly to Liebig's thesis, he averred that erosion was "one of the agencies totally destroying the validity of the hypothesis of soil deterioration by removal of crops." Further, he cited the effects of wind erosion in the Northeast as a "greatly underestimated" factor in the alteration of the soil (Bonsteel, 1905).

In 1910, the surveyors began to identify "eroded" phases of established soil types. As the soil survey matured, it adopted a nomenclature that grouped soil types into a soil series. The series combined a place name followed by a texture designation, as in Jordan sandy loam. In time, the surveyors added slope and degree to the soil type designation. In 1911, surveyors identified a large area of "Rough Gullied Land" in Fairfield County, South Carolina.

Hugh Hammond Bennett, who had joined the soil survey in 1903, began to relate recommendations to particular soil types. For instance, concerning Orangeburg sandy loam of Lauderdale County, Mississippi, he wrote, "If the gentler slopes are not terraced and the steep situations kept in timber, deep gorgelike gullies or 'caves' gradually encroach upon cultivated fields,

eventually bringing about a topographic situation too broken for other than patch cultivation" (Bennett et al., 1912). Bennett's *The Soils and Agriculture of the Southern States* highlighted erosion and advised that some soil types were unsuitable for cultivation or in need of conservation measures if used for agriculture (Bennett, 1921). Later, when Bennett was head of the Soil Conservation Service, he and his colleagues used susceptibility to erosion as a key element in the land capability classification system.

In time, Bennett became the most recognizable link between the soil conservation movement and the early Bureau of Soils. Rather than being a lone voice, Bennett was in fact among compatriots. Though not mentioning McGee specifically, Bennett made clear the importance of atmosphere in the Bureau of Soils, created in part by McGee. Bennett, a half century after the event, recalled that it was Thomas Nelson Chamberlain's paper on "Soil Wastage," delivered at the conference of governors in 1908, that "fixed my determination to pursue that subject to some possible point of counteraction" (Bennett, 1959).

One of Bennett's college classmates, Royall Oscar Eugene Davis, a chemist in the Bureau of Soils, wrote bulletins titled *Soil Erosion in the South* and *Economic Waste From Soil Erosion*, as well as a bulletin on a different type of soil degradation, *The Effect of Soluble Salts on the Physical Properties of Soils*. While the bulletins by McGee, Bennett, and Davis gave water erosion preeminence as a conservation concern, E.E. Free produced a classic treatment of wind erosion in *The Movement of Soil Material by Wind.*

Franklin Hiram King's pioneering work in soil management addressed soil conservation and maintenance in a broad sense, not just for the purpose of halting erosion. In 1894, before joining the Bureau of Soils, he had written a Wisconsin Agricultural Experiment Station bulletin on wind erosion and its amelioration. King left the bureau over a dispute with Whitney. Whitney believed that most soils had sufficient fertility for continuous and undiminished crop production, whereas King had demonstrated the value of soil amendments to increase production. Whitney added a disclaimer to one of King's Bureau of Soils bulletins, and King had to publish some of his soil management bulletins privately after leaving the bureau. King nevertheless remained a very active, innovative soil scientist and earned a reputation as one of the pioneering soil physicists in the United States. He studied his favorite topic, soil management, in China, where he wrote *Farmers of Forty Centuries: Or, Permanent Agriculture in China, Korea and Japan*. Decades later, the book so impressed Robert Rodale, proponent of organic farming, that his Rodale Press reprinted the 1911 publication.

Expanding Soil Conservation Research

The Bureau of Soils ventured once again into soil erosion research in the late 1920's and unleashed the energies of some staff interested in the topic. It is probable that a change in leadership partially accounts for the reinvigorated interest in soil erosion. A.G. McCall replaced Whitney as chief of the bureau in 1927 and remained in charge of soil investigations when the bureau was merged into the Bureau of Chemistry and Soils with Henry G. Knight as chief.

Understanding and measuring the properties related to erosion held great promise for devising soil conservation practices. Working in the laboratory in the late 1920's, H.E. Middleton of the Bureau of Chemistry and Soils analyzed soils from various points around the country and made substantial progress toward understanding the complex chemical and physical properties and processes related to erodibility. Simultaneously, Hugh Hammond Bennett was gradually moving his campaign for soil conservation beyond the confines of the soil survey division to educate the public and politicians through writing and speaking engagements. He had identified areas where the combination of geography and agricultural systems caused serious erosion. As a first step in attacking the problem, he wanted research on erosion conditions and conservation measures. Based largely on his campaign, Congress authorized a series of soil erosion experiment stations. Bennett selected the locations for the stations, where interdisciplinary teams of researchers established plots to measure erosion conditions under different types of crops, soils, and rotations and various agricultural management practices and structures. A few state experiment station staff members had carried out similar experiments, but the Federal impetus led eventually to an accumulation of national data on the erodibility of soils. The origin of the erodibility data that currently supports conservation planning tools, such as the Universal (and Revised) Soil Loss Equation, stretches back to these pioneering studies.

With the creation of the Soil Conservation Service in 1935 and with Bennett as its first chief, the interpretation of soils for soil and water conservation was firmly established. But Bennett's success was not the genesis of soil conservation and soil survey connections. Rather, he had built upon an earlier awareness in the Bureau of Soils of how the soil survey might help to conserve the Nation's soils.

References

Bennett, Hugh H., et al. 1912. "Soil Survey of Lauderdale County, Mississippi." In *Field Operations of the Bureau of Soils, 1910*, pp.733-784. Washington, D.C.: Government Printing Office.

Bennett, Hugh H. 1921. *The Soils and Agriculture of the Southern States*. New York: The MacMillan Company.

Bennett, Hugh H. 1959. *The Hugh Bennett Lectures*. Raleigh: The Agricultural Foundation, Inc., North Carolina State College.

Bonsteel, Jay A. 1901. "Soil Survey of St. Marys County, Maryland." In *Field Operations of the Division of Soils, 1900*, pp. 125-145. Washington, D.C.: Government Printing Office.

Bonsteel, Jay A. 1905. "Worn Out Soils." In *Bureau of Farmers' Institutes and Normal Institutes. Report for the Year 1904.* Albany, New York: Brandow Printing Company.

Dorsey, Clarence W. 1901. "A Soil Survey Around Lancaster, Pennsylvania." In *Field Operations of the Division of Soils, 1900*, pp. 61-84. Washington, D.C.: Government Printing Office.

Hays, Samuel P. 1959. *Conservation and the Gospel of Efficiency: The Progressive Conservation Movement, 1890-1920*. Cambridge, Massachusetts: Harvard University Press.

McGee, W.J. 1892. "Report of Mr. W.J. McGee." In *Thirteenth Annual Report of the U.S. Geological Survey to the Secretary of the Interior. 1891-1892*. Part 1. Washington, D.C.: Government Printing Office.

Pinchot, Gifford. 1947. *Breaking New Ground*. Washington, D.C.: Island Press. ■

Wait Just One Minute! Where Do You Stand?

By Dick Arnold, Senior Soil Scientist, Natural Resources Conservation Service, Washington, D.C.

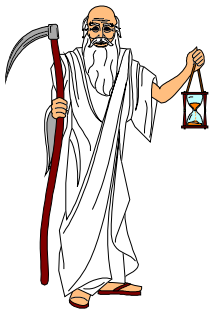
We are close to arriving. It is the arrival of the end of a time period—a year is passing; a decade is ending. A century ticks away, and a millennium will soon flash by. There is sadness because of the speed with which days rush by; there is joy because tomorrow's dawn is bright and full of promise.

I look back on 50 years of association with the National Cooperative Soil Survey with complete astonishment. It seems only a while ago that I was a student trainee with the Soil Conservation Service in southern Iowa and people were teaching me about augers and spades, aerial photos and alidades, landscapes and parent materials, and soils and how to recognize them as specific components within map units. Now, five decades later, I often wonder about some of the marvelous things I was introduced to in the beginning.

There are many new questions—usually more philosophical. For example, what is the need and meaning of a basic unit? Is there one for classifying and another one for mapping? Is there a law or set of principles that can help us explain and devise systems of information that improve our understanding while contributing to the storehouse of scientific knowledge? What seems to remain as a constant is the uncertainty with which we assimilate the facts about our beloved pedosphere.

Struggling to See Ahead

I want to tell you about some events that are actively affecting the geoderma,



the pedosphere, the world out there that has such a difficult time making inroads into the psyche of our culture, our department, our agency, and our people. A committee has been looking at the future and its implications for the structure, function, and response of our agency in the years ahead.

I know your horizons are not limited by the edges of a pedon, or even a polypedon, but I don't know if you see the stars in the sky at night and think about the names, the myths, and the support that the incomprehensible universe has provided numerous generations before ours. I don't know if the rising sun and its steady march across the sky until the last rays of the day's sunset cause you to ponder the majesty of music and literature throughout the world that draws its sustenance from this daily event. I hope that your horizons are not limited by the physical constraints of yonder skyline or by the lack of curiosity about what lies just beyond.

I'd like to share with you a viewpoint about our efforts as visionaries striving to "see beyond the obvious." The obvious deals with erratic events of weather and agriculture, elections and the power of politics, a sense of tomorrow with its nearsightedness and short-term gains and losses, and the frustrations of budgeting, down sizing, marketing, partnering, survival, and image building. For me the obvious is here, but it is not a useful guide for

positioning the world on a better track.

At the core of what lies ahead is the concept of "sustainability." This concept represents many things to many people, and there must be a thousand reports on all facets of it. Put simply, sustainability is humankind's need for harmony with this planet called Earth. Many an earlier culture saw sanctity in Nature—a sacredness of belonging, of being a part and a partner. They had a sense of togetherness, of harmony, and of a future that was undefined and indeterminable. Sustainability in this context is far, far beyond the daily troubles and struggles each of us face, isn't it? Even if the concept does not touch directly on religion, it does envelop values and principles, ethics and morality. A sustainable Earth in which humans are merely components, important ones, but only components in a chain of events whose millennia are unnumbered is something that lies far beyond the obvious.

I don't have answers or solutions. Rather, I have this opportunity to mention what I call "global driving forces" and relate them to some international conservation concerns. Your list is likely better, and you can expand it as you see fit. I have selected five driving forces that I believe will influence the world so much that their ramifications will markedly affect the United States in the years ahead or will dictate major changes in how and when policies are promulgated. The five are population growth, food production and distribution, poverty, land degradation, and climate change.

Driving Forces

Population growth is so fast in some parts of the world that people attempting to manage limited resources are pushed beyond their current capacity. A younger and younger population all too often is less skilled in the knowledge necessary to cope, thereby setting in motion potentially disastrous consequences. There are no easy answers or solutions, just some potentially scary impacts if we continue to do nothing.

The *production and distribution of food* may seem closer to home because we have lots of prime farmland, have good range and pasture lands, and our forest reserves seem pretty secure. We grow, process, package, and market food products as varied as there are imaginations. In some countries the basic food is still grain, or simple grain products, with only a glimmer of hope of protein from meat. Is our food production sustainable? By what definition? What level of inputs are needed now, next year, next decade, and how might it change in the future? Three centuries from now there might be a different perspective. How can soil science help? Do we know the limitations and resilience of our soil resources?

The distribution of food has been called a cause for starvation and malnutrition in some countries because statistically there are enough supplies to provide adequate nutrition for all. So why isn't it so? Why must we continue to produce lesser minds and bodies to populate the next society of humans? Is it politics? Is it unbridled economic development? Is it the haves and the have-nots? What conditions must prevail for economic thresholds to be lowered? Is nutritious food not only a basic human need but also right?

Ouch. *Poverty* is something we don't like to hear much about. Sure there's a little poverty down the road, at the other end of town, or way out in the rural areas. Watch your television; see places that have no sanitary facilities, no clean water to drink, or cook with, or bathe in. See the bloated bellies of kids and those sunken sad eyes staring into nowhere. Poverty usually means lack of hope, lack of resources, lack of support, lack of jobs, lack of opportunities to grow and prosper. And if you have almost nothing, how do you become a productive world citizen? Civil unrest is all too often a likely companion of the downtrodden, the dispossessed, the hopeless.

Land degradation is something with which we are more comfortable. Certainly, a half-century of saving land for tomorrow's children has given us a legacy of understanding stewardship—a concept yet to dominate land management in our country. Land care programs, as products of governments, seem to make important strides in turning the tide of past land abuse. Individuals in the Peace Corps and NGO's (nongovernmental organizations) have numerous stories of success—but the progress is not fast enough or in enough places to stem the tide of potential disaster in some food-producing areas. Do you know how to create new soils that are better than the existing ones? What are the criteria? What is the cost? Where do you stand?

Climate change is a driving force that is always here. It has triggered major geologic events. It has forced prior cultures to disappear, forced people to leave their homes and dissipate like snow in the wind. The big thing this time isn't that CO_2 will increase and influence the warming of the Earth (the Earth has been there before). What seems to be significant this time is the rapidity with which change is occurring, and by most reports the problem is exacerbated by modern society and its dependence on fossil fuels to support its ever-increasing demand for energy. The industrial revolution initiated numerous technological advances that each of us enjoy today. But—as thermodynamics

Arnold continued on page 9

Soil Centennial Song

This song was written by Charles Hibner and presented with guitar accompaniment at the beginning of the wrap-up session for the Santa Fe Soil Survey Field Review on October 7, 1999. It was written in celebration of our Soil Survey Centennial.

For the last 100 years we have been mapping soils.
We've mapped them from the mountains to the sea.
In heat and cold, as we grow old, they have become our toils.
We'll keep on looking for that Bt.

Some started out as Desert Soils back in the early days.
And though they aged less than a hundred years,
they became Durargids, then Argidurids, somewhere along the way.
If they change again, it may bring us all to tears.

Oh but how I love working with those soils.
It's about the best job that there is around.
You work in the fresh air, and you haven't got a care.
You're at home in that hole dug in the ground.

The survey team dug out the pits for every soil pedon.
They worked very hard to get them wide and deep.
They were all scribed, as they described, the features that are on
that profile whether on gentle slopes or steep.

Oh but how they love working with those soils.
It's about the best job that there is around.
They work in the fresh air, and they haven't got a care.
They're at home in that hole dug in the ground.

The MO office's review team looked at all these pits.
They made some notes and put in a word or two.
Others had their say and along the way, it all began to fit,
as we made adjustments to make the soils true.

Oh but how they love working with those soils.
It's about the best job that there is around.
They worked in the fresh air, and they didn't have a care.
They were at home in that hole dug in the ground.

So now I hope the next 100 years are as good as the last.
As we learn to map soils better than ever before,
we'll have our fun working in the Sun, and always have a blast,
as field reviews go on forevermore.

Oh but how we love working with those soils.
It's about the best job that there is around.
We work in the fresh air, and we haven't got a care.
We're at home in that hole dug in the ground. ■

A Soil Survey Centennial Proclamation

By Nathan McCaleb, State Soil Scientist, Natural Resources Conservation Service, Lincoln, Nebraska.

On October 6, 1999, Mike Johanns, Governor of Nebraska, signed a proclamation designating 1999 as the "Year of the Soil Survey Centennial." Representatives of the United States Department of Agriculture, Natural Resources Conservation Service, and the Nebraska Natural Resources Commission were present at the ceremony. Following is the text of the proclamation:

State of Nebraska Proclamation

WHEREAS, Soils are crucial to the economic life and well-being of Nebraska and have vital functions—including food and fiber production and carbon sequestration—as well as being the base for our homes, shopping centers, schools and industries; and

WHEREAS, The understanding of soil is essential to good management and to building resources for the future. It is a wise investment to maintain and improve our knowledge of soils; and

WHEREAS, The National Cooperative Soil Survey Program is a partnership led by the Natural Resources Conservation Service of federal land management agencies, state agricultural experiment stations and local units of government that provide soil information; and

WHEREAS, Each state in the United States has selected a state soil. Nebraska established Holdrege silt loam as its official state soil; and

WHEREAS, 1999 marks the 100th anniversary of soil surveys

NOW, THEREFORE, I, Mike Johanns, Governor of the State of Nebraska, DO HEREBY PROCLAIM the year 1999, as

YEAR OF THE SOIL SURVEY CENTENNIAL

In Nebraska, and I do hereby urge all municipalities, counties, health departments, planners and developers to use soil surveys in land use planning decisions.

I also hereby urge the Natural Resources Conservation Service to complete the modernization of Nebraska soil surveys according to federal appropriations and mandates and provide the Geographic Information System databases to the Nebraska Natural Resources Commission.

IN WITNESS WHEREOF, I have hereunto set my hand, and cause the Great Seal of the State of Nebraska to be affixed this Sixth day of October, in the year of our Lord One Thousand Nine Hundred and Ninety-Nine.

Attest: Signed by Secretary of State Scott Moore and Governor Mike Johanns


Proclamation

The Nebraska State Governor introduces key leaders of the Soil Survey Program in Nebraska. From left to right: Nathan McCaleb, NRCS State Soil Scientist; Dayle Williamson, Director of the Nebraska Natural Resources Commission; Governor Mike Johanns; Mark Kuzila, Director of the Conservation and Survey Division at the University of Nebraska in Lincoln; Steve Chick, NRCS State Conservationist; and Gary Muckel, NRCS, National Soil Survey Center.

Arnold continued from page 1

suggests—you cannot get something for nothing. The balance, the harmony, the cycling and renewal patterns have been disturbed, and, while trying to reach again a dynamic equilibrium, we are partners and victims of this huge, huge uncontrolled global experiment. If we can't stop it, can we mitigate the changes?

There are fascinating scenarios for us to spin about where, when, and how much change might occur. The pedosphere is the "excited skin," the geomembrane of the terrestrial ecosystems, the source of functions that sustain us and make our environment tolerable for human habitation. Where could we do triple cropping? Can multiple cropping be a useful complement to the multinational monoculture operations that seem to take over? How do you predict failure thresholds of soils, and what is the sequence in which such failures might occur? Can we make "anthropogenic" soils that give us a time window on sustainability?

Conservation Issues

I've tried to give you an idea of driving forces that will change the world we have known. Humankind has been evident as a problem but is also the solution. The uncertainty of the limits of our brains gives us optimism for the future. There are lots of things to consider as we imagine the conservation issues facing the world in the next few decades or centuries. Let me mention a few:

- increasing number of people
- food supplies; food safety; food security
- demand for and supply of energy
- health
- poverty
- jobs and training
- education—present and lifelong
- declining productivity; land degradation; soil quality
- loss of biodiversity
- water supply—quantity and quality
- energy conservation; resource recycling
- resource access; land tenure
- women's role in society; world organizations
- international aid; international research
- world negotiations, protocols, and treaties
- sustainability
- desertification
- persistent organics
- fisheries
- forests
- greenhouse emissions
- trade agreements; trade organizations
- standards for almost everything; the ISO's

And Then

Some futurists believe that as voice recognition computers become more available, people will talk more and write less. They think we will develop into an oral-aural society where speech can be translated easily and we can readily interact and be understood by people who speak and read other languages, thereby becoming more like a global community. Literacy and illiteracy would take on rather new meanings as we depend less on the written word. Others believe that the written word will continue to be important for a long time to come because it enables us to refine and sharpen our thoughts and ideas and to enjoy the beauty and emotion of such thoughts.

Sustainable development can only be a product of human endeavor, and, insofar as you are human, you can think about it, care about it, discuss it, and act upon it. Governments are generally designed to be for the good of the people of a country, a nation, or a region. Maybe a world government could have the interests of a world and all of its component parts as its major responsibility.

Just maybe you start with a little horizon in a little pit and let it take you where it will. As I reflect for a moment, I realize that I did and I have been most fortunate. ■