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Editor's Note

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You are invited to submit stories for 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.

Review of *Dust: A History of the Small and the Invisible*

By Robert J. Ahrens, Director, National Soil Survey Center, Natural Resources Conservation Service, Lincoln, Nebraska.

A pedologist's concept of dust is often the under appreciated parent material that influences nearly all soils in some manner. We have learned that calcareous dusts deposited over thousands of years formed petrocalcic horizons in the Desert Project of New Mexico and that clay minerals that occur in the surface horizons of soils in Hawaii are influenced by dust from faraway sources. Joseph A. Amato's book *Dust: A History of the Small and the Invisible* (The University of California Press, 2001) presents a much broader view of dust. Dust is treated as an interdisciplinary thread that weaves the social, medical, and political history with the history of hygiene, public policy, and natural sciences.

The history of the concept of dust is essentially the history of the minute and minuscule; dust's origins are the Big Bang, but dust also comes from minerals, seeds, pollen, insects, molds, lichens, bacteria, bone, hair, hide, feathers, skin, blood, and excrement.

Amato demonstrates through examples from Western civilization that ideas about dust have changed drastically over the past several hundred years. The concept of dust has gone through a metamorphosis from an enduring condition to an enemy of sanitary civilization and then to an object of precise scientific study and technological manipulation.

Probably since the beginning of agriculture, the peasant has been labeled as coarse and dirty.

Peasants were associated with the color of earth and were considered inferior because of their proximity to dust and dirt. Many peasant dwellings from the Middle Ages to the mid-nineteenth century were one-room huts with little ventilation and continuous dust and smoke. However, dust was not limited to certain classes. During medieval times, royalty was not immune to dust and dirt. "The smell of Henry IV was so ferocious that his wife had to brew special perfumes to stand him and Louis XIII (Henry's son) prided himself on taking after his father." While many of the royalty were not exempt from body odor, lice, etc., they tried to distance themselves from the peasant by adopting manners. Since dust permeated all walks of life, manners became a way for high society to distance themselves from the dust and dirt that occurred in all echelons of society but that came to represent the peasant stock.

The Industrial Revolution further promoted dust and disease. Industrial cities, such as Liverpool, were noted for the most unhealthy conditions in England. Liverpool suffered a high death toll, and in the 1840s, the mean duration of human life in that city was 26 years, compared to 45 years in Surrey, England.

Interestingly, Amato shows that reforms of both products and philosophy spread throughout the nineteenth century as the means to control dust and hinder disease. While reformers wanted to purify society and combat dirt on all fronts, including

A wall of dust over Phoenix.

tradition and corruption, industrialists mounted an assault on the earth through activities ranging form mining, lumbering, and steelmaking to printing. Steel plows, gasoline tractors, dredges, and ditchers opened the earth to the winds.

As the Industrial Revolution promoted a new wave of dust, it also mass-produced tools and chemicals for cleaning bodies, homes, and cities. Industry mass-produced brooms, shovels, brushes, and soaps. The Bissell carpet sweeper and vacuum cleaner helped to control dust in the home. Hoses and lawnmowers promoted the establishment of lawns around the home and provided a barrier to dust. Manufactured clothing enhanced personal cleanliness, and improvements in food processing and packaging made stores, restaurants, and homes more sanitary.

During the Industrial Revolution, dust took on the character of soot, ash, and smoke rather than the soil and pollen of past ages. City dust became a mix of material from construction and manufactured wastes, and many cities produced dust specific to their area. Throughout the nineteenth century and well into the twentieth century, dust from industry fouled the soil, water, and air. The nineteenth century emphasized colossal things, large visions, immense undertakings, and sublime buildings. It saw industries grow, tracks laid across continents, soil displaced, and huge clouds of dust. The twentieth century continued the commitment to large-scale projects, but it also showed an interest in the microscopic and ultrafine. Regulations and technology deterred the dust produced from industry in the last part of the twentieth century. Also, dust became more scrutinized during the twentieth century. Volcanologists, meteorologists, soil scientists, epidemiologists, forensic scientists, and many other specialists began to focus on different aspects of dust.

Presently, our technology has enabled us to examine many different types of dust, including cosmic dust. Dust is still a matter of curiosity and concern. Dust from mining, quarrying, construction, and agricultural operations continues to pose immense dangers. Rachel Carson's *Silent Spring* showed how dust from agriculture could poison the environment, harming living organisms from the smallest bacteria to the largest mammals. Public concern about soil, water, and air pollution led to regulations of industrial emissions. In 1978, the U.S. Government banned aerosol spray cans containing chlorofluorocarbons, which are understood to destroy the ozone layer, which protects the earth from the sun's ultraviolet rays.

Today, many people are far removed from the world of dust. Computers and virtual reality allow us to fight smart wars, fly planes, and travel around the world in the comfort of our homes. Legions of people have more contact with representations of life than with life itself and know more about computers and screens than they do about soils and rivers. Hopefully, the pendulum will swing back to a more balanced approach, and people will enjoy the enrichment experienced by many field soil scientists today.

Pedology and its view of dust have also changed during the past hundred years or so. Our ideas of soil genesis began with the notion of soil derived solely from the underlying bedrock to an appreciation of the complicated and multiple sources of parent material, including dust.

Amato presents a broad perspective on dust that at first made me feel uncomfortable. Some terms are not precisely defined, and muck is used in a different context than soil. The Dust Bowl of the 1930s is mentioned, but not in great detail. Despite these shortcomings, reading Amato's book is a rewarding experience because it shows the connections that dust has with history and political issues. ■

Guy D. Smith

Guy Smith Interviews

By Craig Ditzler, National Leader for Soil Classification and Standards, National Soil Survey Center, Natural Resources Conservation Service, Lincoln, Nebraska

From time to time we receive requests for the publication *The Guy Smith Interviews: Rationale for Concepts in Soil Taxonomy*, which was published cooperatively by the Soil Conservation Service, Soil Management Support Services, and Cornell University in 1986. Our supply has been completely exhausted for some time, so we have been unable to supply copies upon request.

We have scanned the text of the original document and have posted both MSWORD and PDF versions of the files on our Website (http://soils.usda.gov/technical/classification/taxonomy/rationale/). Each file type is about 3MB.

One advantage of these files is that you can search the document for key words and find all references to a given subject. The original document contained complete transcripts of the interviews on two microfiche pages in a pocket at the back of the book. We tried to include these with the files, but we could not obtain a high-quality copy that could be read and translated accurately by our optical scanner. Therefore, the electronic files of the document do not include the text from the microfiche.

I have discussed this project with Dr. Armand Van Wambeke, original collaborator for the publication at Cornell University (now professor emeritus), and he supports the effort to make the document available electronically and confirms that there are no copyright restrictions limiting the use and distribution of the document. ■

Holocene Organic Carbon Losses in Some Nevada and Utah Relict Paleosols

By W.D. Nettleton,[1] M.D. Mays, and R. Burt, Natural Resources Conservation Service, Lincoln, Nebraska.

Introduction

One concern in global warming is the impact it will have on the gaseous emission from soils. An increase of 3 ^{0}C in temperature over the next 50 years may decrease soil organic carbon (SOC) by 10 to 15 percent in the top 30 cm of soils, resulting in a total emission of 50 to 100 Pg of C into the atmosphere (Lal et al., 1995). In this paper, we estimate the SOC losses from some Nevada and Utah relict paleosols since the late Pleistocene. We assumed that the mean annual temperatures of the Great Basin area of the American Southwest may have fallen 7 to 8 ^{o}C during the glacial maximum (Brakenridge, 1978).

Methods and Materials

The similarity of climate, vegetation, geomorphic history, and kinds of soil within the Great Basin and parts of the adjoining states (fig. 1) made the study feasible. The area has a moist winter-spring, dry summer-fall climatic pattern with broad temperature and precipitation ranges (Kincer, 1941). The vegetation includes mountain big sagebrush (*Artemisia vaseyana*) and related cold-tolerant species at the highest elevations (fig. 2); big sagebrush (*Artemisia tridentata*) and juniper (*Juniperus spp.*) at intermediate elevations (fig. 3); and low sagebrush (*Artemisia arbuscula*) and related desert species at the lowest, warmest elevations (fig. 4).

Figure 1.—Location of the study areas within and near counties of the Great Basin. Included are numbers of pedons sampled in the four counties. The map is modified from Morrison, 1965.

[1] W.D. Nettleton, 402-437-5310, dennis.nettleton@.nssc.nrcs.usda.gov.

Figure 2.—Nearly level late Pleistocene surface on Table Mountain. The vegetation is mountain big sagebrush (*Artemisia vaseyana*), lupine (*Lupinus*), and scattered short grasses. (Thesis research area, Mays, 1982.)

Figure 3.—An east-facing nose position on a convex ridge at an intermediate elevation. The vegetation includes big sagebrush (*Artemisia tridentata*), bluebunch wheatgrass (*Agropyron spicatum*), juniper (*Juniperus*), and rabbitbrush (*Crysothamnus*).

Figure 4.—An area of the Karlo-Fertaline soil landscape on a bypassed alluvial fan surface. Elevation is 1,650 meters, the mean annual temperature is 7 ^{0}C, and the mean annual precipitation is 28 centimeters. The Karlo soil, a Haploxerert, supports rabbitbrush (*Crysothamnus*), and the Fertaline soil, an Argidurid, supports low sagebrush *(Artemisia arbuscula).*

We included 22 soils in areas of residuum, pedisediment, and till from intermediate extrusive volcanic rocks of the John Day belt in Nevada and the Tonopah belt in southwestern Utah (Oldow et al., 1989). The soils are on extensive interstream-divide surfaces that lower through one or more scarps to present-day flood plains. The Black Canyon transect is typical (fig. 5). We assumed that these interstream divides are stable since they were bypassed by Holocene erosion surfaces. Assuming, then, that these surfaces are all late Pleistocene or older, they would have formed under the influence of one or more pluvial-interpluvial cycles. The cycles would have included periods of greater effective moisture as the ancient lakes rose, perhaps by increased precipitation or only by lowered temperature. All the soils are well drained. Most of the climatic data for the sites are from soil descriptions (Benham, 1997).

Results

The mean annual soil temperature (MAST) data closely match elevation (fig. 6). The local scientists had inferred the climatic data from expert opinion techniques (Brasher and Benham, 1996) because in most cases there were no nearby weather stations. Soils were analyzed at the National Soil Survey Laboratory (Soil Survey Laboratory Staff, 1996). Bulk density (Db) data are necessary in calculations of the accumulation of SOC in kg m^{-2} (OCp) in each pedon. That is, OCp equals SOC in the horizon * Db * horizon thickness * volume fraction of fine earth * 0.1. The OCp is the sum of the SOC for the pedon to the lowest horizon included, commonly the lowest B horizon. We used Statgraphics Plus for all statistics (Manugistics, Inc., 1997). Where necessary, the data were transformed to obtain more normal distributions for the statistical analysis.

A close relationship occurs between OCp and MAP in this cool-season rainfall pattern (fig. 7). In this environment, a MAP of 37 cm separates the Mollisols from all of the other soils, i.e., the Aridisols, Vertisols, Inceptisols, and Alfisols. Most Mollisols also have an OCp accumulation of more than 5.2 kg/m^2. One pedon (7051), an Aridic Haplustalf, contains more OCp than some of the Mollisols. Pedons 6840 and 6834 are Mollisols but have an OCp accumulation of less than 5.2 kg/m^2. All of the Mollisols have mean annual soil temperatures of $\leq$ 6.0 °C (fig. 8).

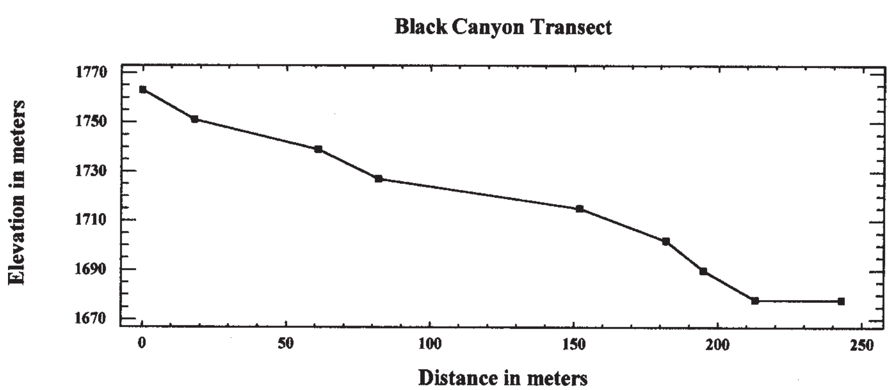

Figure 5.—Location of pedon 7051 on the Black Canyon transect.

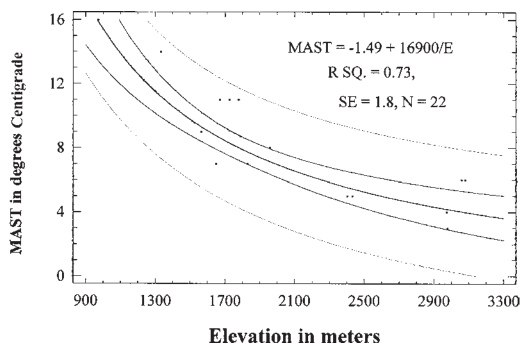

Figure 6.—Relationship between mean annual soil temperature and elevation for the 22 soils.

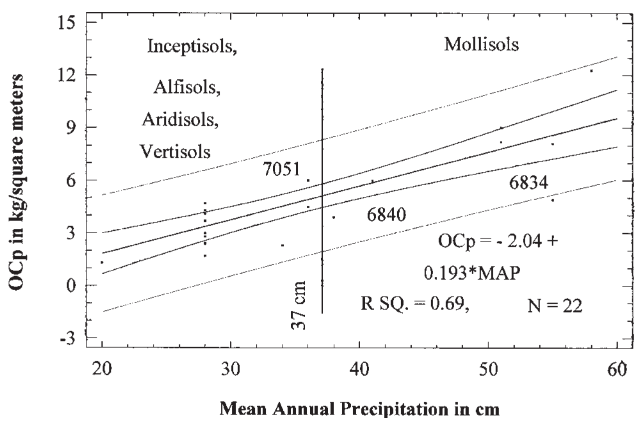

Figure 7.—General distribution of the soils relative to total organic carbon and the mean annual precipitation.

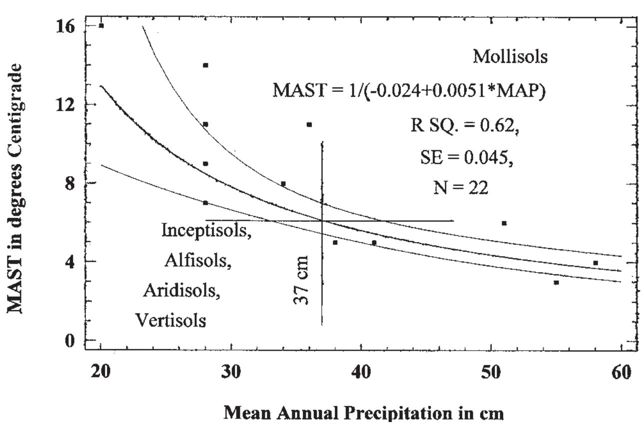

Figure 8.—Distribution of the soils relative to mean annual soil temperature and mean annual precipitation.

Conclusions

The mean annual temperatures of the area studied may have fallen as much as 7 or 8 ^{o}C during the glacial maximum (Brakenridge, 1978). Therefore, all of the soils except for pedons 7046 and 7048 would likely have been Mollisols during the glacial maximum (fig. 9). Thus, all of the ground soils with MAP of <37 cm would have lost SOC in reaching their present levels. Table 1 shows that the mean estimated OCp losses were 60 percent for the Aridisols, 43 percent for the Alfisols, and 24 percent for the Mollisols. These are the mean percentage losses of the mass of SOC estimated to be present in the soils in areas of andesite in late-Pleistocene time. Although the climatic and vegetation ranges are typical for the region, there may be differences in OCp losses resulting from variations in parent material, topography, and geomorphic age.

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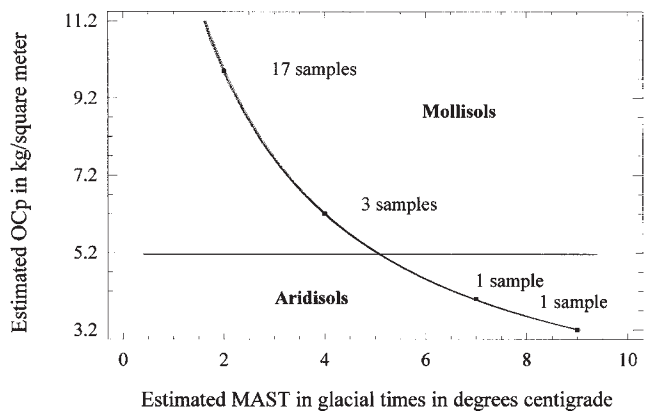

Figure 9.—Relationship between organic carbon accumulated in the pedons and the mean annual soil temperatures in glacial time.

Table 1.—Estimated organic carbon loss of some relict paleosols through the Holocene

Aridisols			Alfisols			Mollisols		
Pedon no.	OCp Holocene	OCp Pleistocene	Pedon no.	OCp Holocene	OCp Pleistocene	Pedon no.	OCp Holocene	OCp Pleistocene
7046	1.3	3.2	7348	2.3	9.9	6840	3.9	9.9
7515	3.7	9.9	7050	4.5	6.2	6839	6.0	9.9
7346	1.7	6.2	7051	6.0	6.2	78560	8.2	9.9
6987	4.3	9.9				78561	9.0	9.9
6988	2.8	9.9				6833	8.1	9.9
6989	4.1	9.9				6834	4.9	9.9
6992	2.4	9.9				78562	12.3	9.9
6994	4.7	9.9						
6997	4.3	9.9						
6999	3.0	9.9						
69100	4.3	9.9						
7048	4.7	4.0						
Sum	41.3	102.5		12.8	22.3		52.4	69.3
Mean	3.44	8.54		4.27	7.43		7.49	9.90
S.D.	1.18	2.54		1.86	2.14		2.83	0.00
Loss	5.10			3.16			2.41	
% loss	*60*			*43*			*24*	

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Publication Backlog

By W.W. Johnson, Soil Scientist, Natural Resources Conservation Service, Major Land Resource Area Soil Survey Region 8, Phoenix, Arizona.

It seems that the publication backlog has a long history in the soil survey program. Garry Muckel recently told Stan Anderson that the backlog dates back to 1899, when we completed four surveys and published only three. In his master's thesis, David Rice Gardner compiled an exhaustive research of the history of the soil survey program. In several places in his manuscript, he made reference to the publication process in general and the backlog specifically.

> ... An important innovation, though a decidedly mixed blessing at first, was the introduction, about 1913, of automobiles for field parties of the Soil Survey. ... Model T transportation tended to speed up survey progress somewhat, but not nearly enough to offset other developments which were continually adding to the time required for mapping and publication. (Gardner, p. 84)

Before the advent of the automobile, fieldwork was performed out of a horse-drawn buggy. Not unlike today, it is cruel irony that technological advances in one area often come at the expense of another area. According to Gardner, the "other developments," such as increased detail and accuracy of mapping, higher standards in cartography, and closer technical control, including inspection and correlation, resulted in a doubling of the inputs per acre of soil surveys mapped and published. This situation is not unlike the one today with NASIS, SSURGO, GIS, GPS, etc.

> ... In 1933, with the nation entering the period of its greatest demand for modern, detailed soil surveys, a major unsolved problem of the Soil Survey, a time lag between completion of field surveys and publication of the results, had become, if anything, worse. This time lag for most surveys was five years or more. Of the two surveys noted in chapter 3.32, that of Jennings Country, Indiana, completed in 1930, was not published until 1940, and the McKenzie County, North Dakota survey, completed in 1933, was published in 1942 ... In some other instances, the lag was more than fifteen years. (Gardner, p. 116)

Wow! Ten to fifteen years to publish a soil survey. Sound familiar? The following should sound familiar as well. The accelerated effort to complete the mapping of all the cropland in the U.S. back in 1986-87 following passage of the 1985 Food Security Act was not a new idea. In 1933, in an effort to "put men to work" and cope with the deepening depression, emergency relief funds were available to the soil survey. The College Deans and Experiment Station Directors and the Land-Grant College Association requested that the immediate expansion of the soil survey result from the use of these funds.

> ... Accordingly, Acting Division Chief Kellogg developed a proposed Public Works Administration project

> which was to provide personnel and materials for cartographic and publication work, on a scale sufficient to eliminate within one year the entire backlog of unpublished soil survey reports, and to place the publication program on a current basis. This proposed project, together with an itemized plan for completion of the detailed soil survey of the agricultural area of the United States in ten years (also prepared by Kellogg), was forwarded by the Bureau Chief to the Information Director Eisenhower, and to the Office of the Secretary. Neither proposal ever saw the light of day. (Gardner, p. 201)

Eliminating the publication backlog in 1 year was an ambitious goal indeed. The plan never had a chance. World events were looming on the horizon. The Nation would soon be at war.

> In common with some other efforts going on in the world in 1942 ... cartographic facilities and trained personnel were needed for military map-making; field survey parties melted as soil surveyors, like everybody else, found themselves in uniform; soil scientists together with geologists and others, developed and applied techniques of military interpretation of soil maps; special field parties were assigned to extensive soil surveys such as those for the planting of guayule by the Emergency Rubber project; the Bureau's stock of unpublished soil survey reports, already in paralyzing backlog without a war, accumulated further, as the publication program was cut to less than half of capacity. (Gardner, pp. 230-231)

Sometime between 1945 and 1957, they got a handle on the backlog:

> At the present writing (1957) ...Federal appropriations for the Soil Survey have been appreciably increased since the integration. One important result of the additional funds has been the final elimination of the burdensome backlog of unpublished soil survey reports. Publication is now on a current basis. (Gardner, p. 245)

Sometime between 1957 and 1972, they let it get out of hand again. There was a publication backlog when I hired on with the outfit in the fall of 1972. For over 30 years, we've talked about being able to publish a survey within a year of completing the fieldwork. To my knowledge, we accomplished that feat only once. I suppose the fact that it was the soil survey of the District of Columbia is only a coincidence.

When we reorganized in 1995 and the MOs were created, there was a "mandate" at the first MO Leaders meeting in Scottsdale, Arizona, to eliminate the backlog in 2 years. It was a "just do it" approach, with no real strategy or reallocation of resources to make it happen. Most importantly, there didn't seem to be any attempt to study where, when, and why the delays occurred. Maybe the current effort will be more successful.

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