NATIONAL COOPERATIVE SOIL SURVEY

Soil Survey Conference Proceedings

Charleston, South Carolina
January 27-31, 1969

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NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY

Charleston, South Carolina
January 27-31, 1969

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
Washington, D.C. 20250

March 5, 1969

SUBJECT: 1969 National Technical Work-Planning Conference of the Cooperative Soil Survey

TO: Recipients of Proceedings of the National Soil Survey Conference

Transmitted herewith are the Proceedings of the 1969 National Technical Work-Planning Conference of the Cooperative Soil Survey. Information on some of the items in the committee reports on which agreement was reached was released immediately after our conference through official channels for widespread use. Information on other items on which there was agreement will be released soon. But other items need further study. Thus, these committee reports should not be given widespread distribution. They have no official status in their present form.

Five (5) copies of these proceedings are being sent to each RTSC and about five (5) copies are being sent to the office of each State conservationist for distribution to the appropriate State experiment station soil survey leaders and to soil survey representatives of other agencies that are engaged in soil survey work in the State. In addition, sufficient copies are being sent for use by the State soil scientist, assistant State soil scientist, and soil correlator. The State soil scientist may wish to circulate one copy of this report among the GS-11 and CS-9 soil scientists; but in doing so, it should be made clear that the information, ideas, and data in there committee reports simply represent trends in thinking and progress of work. Thus, they do not necessarily represent official views, although many of the methods ultimately may be adopted officially.

Fifteen (15) copies are being sent to the Canada Department of Agriculture for distribution to key Canadian roll scientists.

R. D. Hockensmith
Director, Soil Survey Operations

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CONFERENCE ARRANGEMENTS AND PURPOSE

Roy D. Hockensmith

The 1969 National Technical Work-Planning Conference of the Cooperative Soil Survey was arranged and conducted somewhat differently than in formr year.. Instead of holding committee meeting. during the confer^nce, the committee work was done prior to the Conference, mostly by correspondence. This shift in arrangements required prompt response to request. from the chairmen of each committee to the member. of hi. committee.

Each of the committee chairmen was allotted up to 2 hour. (although some requested end used le.. than 2 hours) for presentation end discussion of each committee report. Some of the committee chairmen distributed draft copies of committee report. 2 or 3 week. in advance of the conference to the expected participants. This advance preview permitted the participants to become more knowledgeable of the subject, enter into the discussion. more intelligently, and thus contribute more meaningful idea.. A copy of each committee draft report we. in the hands of each participant during the presentation and discussion of each report. Some of the committee chairmen arranged with other member. of their committees to conduct . panel discussion to bring out the highlight. of the reports. This arrangement was fairly successful, but . strong effort was required to get participation from other. who were not member. of the committee. Following the conference, each committee chairman reworked the draft of hi. committee report to incorporate the necessary modification. that resulted from the discussions during the conference.

We did, however, continue the past practice of having a 15-minute presentation on the first dey by a representative from each of the four region. of the land-grant universities and by the Federal agencies in the Cooperative Soil Survey. These included the Federal Extension Service, Bureau of Public Roads, Bureau of Reclamation, Bureau of India" Affairs, end Bureau of Land Management. The Forest Service representative was unable to attend, but his prepared statement is included in these Proceedings.

The primary purpose of this conference Y.. to aid in the continued development and improvement of standards for carrying on all phases of soil survey work. Of special importance are technique. for field mapping, soil description.. legend.. soil classification, soil survey interpretations (both farm and nonfarm), and soil investigations; the development of adequate terminology with enough precision and standardization to permit maximum use of soil surveys; end method. of compiling soil maps end preparing manuscripts for the published soil surveys.

Emphasis was give" to ways to improve soil surveys and their interpretation. so they c." effectively help individuals and groups co select soil. for various purposes and to determine response of individual kind. of soil to management and manipulation. These continued improvement. give . ssurance that soil surveys are designed to help all people using soil., or guiding others in their use, to make the optimum selection among the alternatives for use and management in order to maximize investments of labor and money.

The nation.1 conference makes use of technical committee report. of the region.1 technical work-planning conference. of the Cooperative Soil Survey. The national committees study and express their views o" proposals made by the regional committees. In this way the region.1 committees have clearer guidelines in moving forward with their committee assignments in future work. The national conference i. held at Z-year intervals--in odd-numbered year.. Pour region.1 conference. (one in each land-grant university region) are also held once in 2 year. but in even-numbered years.

Participants in the national conference include (1) scientific end technical leader. of the Soil Survey staff from the nation.1 headquarters office and members of the principal soil correlators' offices; (2) one State soil scientist from each of the four group. of States who attend on a rotation basis; (3) on. to three lend-grant university representative. from each of the four land-grant university region.; (4) one representative of each Federal agency directly concerned with the National Cooperative Soil Survey; and (5) other. from the Soil Survey staff, SCS technical branches of closely related work, and other representatives of State and Fader.1 agencies when they have . definite place on the agenda.

Attendance at region.1 soil survey technical work-planning conference. of the Cooperative Soil Survey consists of one or more representatives from each of the land-grant universities;

one from each agency cooperating in the soil survey other than land-grant universities; SCS soil correlation staff in the respective RTSC; soil survey laboratories and soil survey investigations staff; State soil scientist, soil correlator, or both, and perhaps assistant State soil scientist in each State within each land-grant university region; one representative from other Federal agencies cooperating in the soil survey; one or two from the national headquarters office in the Soil Survey; and others, such as range and woodland conservationists, resource conservationists, conservation engineers, and agronomists on invitation by the regional conference steering committee. The chairmanship of each regional conference alternates between the land-grant university group and the SCS.

PARTICIPANTS AT 1969 NATIONAL SOIL SURVEY CONFERENCE
January 27-30, 1969
Sheraton-Fort Sumter Hotel
Charleston, S.C.

WASHINGTON OFFICE

Charles E. Kellogg, R. D. Hockensmith, C. W. Koechley, Roy W. Simonson, F. J. Carlisle, W. M. Johnson, A. c. Orvedal, Guy D. Smith, L. E. Derr, A. A. Klingebiel, J. D. Rourke, D. W. Swanson

WASHINGTON-FIELD STAFF

L. J. Bertelli, R. B. Daniels, Robert B. Grossman, J. M. Williams, A. J. Baur, K. W. Flach, J. E. McClelland, R. C. Carter, L. E. Garland, W. E. McKinzie

SCS SOIL SCIENTISTS ON STATE STAFFS

C. M. Ellerbe, T. B. Hutchings, C. W. McBee, Dirk van der Voet, L. D. Giese, J. J. Noll, Gordon S. McKee

OTHERS FROM scs

A. T. Chalk (State Conservationist, South Carolina)
Joseph P. Kuykendall (Field Representative, RTSC)
Minott Silliman, Jr. (Resource Development)
Darnell M. Whitt (Plant Sciences)
Harold C. Enderlin (Engineering)

REPRESENTATIVES FROM LAND-GRANT UNIVERSITY REGIONS

North-Central - N. Holowaychuk (Ohio)*, Richard Rust (Minn.), Clarence Scrivner (Mo.)
Southern - S. A. Lytle (La.)
western - A. R. Southard (Utah)
Northeastern - R. P. Matelski (Pp.)

REPRESENTATIVES FROM OTHER AGENCIES

Federal Extension Service - George H. Enfield
Forest service - Olaf C. Olson* and Adrian Palmer
Bureau of Indian Affairs - J. D. Simpson
Bureau of Land Management - Ronald L. Kuhlman and James Hagihara
Bureau of Reclamation - John T. Maletic
Bureau of Public Roads - Harold Rib

CANADA

Walter Ehrlich and J. S. Clayton

FAO

R. Dudal

* Unable to attend.

COMMITTEES FOR 1969 NATIONAL SOIL SURVEY CONFERENCE

Committee 1 - Technical soil monographs

A. A. Klingebiel, Chairman
B. A. Barnes
A. J. Baur
J. A. DeMent
C. W. Koechley
W. E. McKinzie
A. C. Orvedal
Guy D. Smith
Rudolph Ulrich

Committee 2 - Classes and phases of stoniness and rockiness

J. M. William, Chairman
F. J. Carlisle
S. A. Lytle
J. J. Noll
Olaf C. Olson
A. H. Paschall
Guy D. Smith

Committee 3 - Criteria for series end phases

J. E. McClelland, Chairman
A. J. Baur
J. E. Brown
J. A. DeMent
C. M. Ellerbe
W. E. McKinzie
R. I. Turner

Committee 4 - Application of new soil classification system

Roy W. Simonson, Chairman
J. K. Ableiter
T. B. Hutchings
C. W. McBee
John T. Maletic
A. H. Paschall
Guy D. Smith
R. A. Struchtemeyer
J. M. Williams

Committee 5 - Engineering application and interpretation of soil surveys

L. J. Bartelli, Chairman
F. W. Cleveland
R. W. Eikleberry
A. A. Klingebiel
C. W. Koechley
John T. Maletic
J. J. Noll
Adrian Pelzner
Harold Rib
John D. Rourke
Rudolph Ulrich
Keith K. Young

Committee 6 - Handling soil survey data (for more complete and accurate syntheses of data on soils to improve classification and predictions by use of electronic equipment)

A. C. Orvedal, Chairman
B. A. Barnes
F. J. Carlisle
G. R. Craddock
L. E. Derr
Klaus W. Flach
L. G. Giese
R. B. Grossman
W. M. Johnson
S. A. Lytle
Gordon S. McKee
Franklin Newhall
E. J. Pedersen
Richard Rust
R. A. Struchtemeyer
Dwight W. Swanson
Dirk van der Voet

Committee , - Soil moisture

R. B. Grossman, Chairman
C. M. Ellerbe
John T. Maletic
Gordon S. McKee
A. H. Paschall
John D. Rourke
Clarence Scrivner
Guy D. Smith
Dirk van der Voet
J. M. Williams

Committee 8 - Criteria for classification and nomenclature of made soils and definition of "topsoil," used to resurface cuts and fills

A. J. Baur, Chairman
J. K. Ableiter
J. E. Brown
J. A. DeMent
L. E. Derr
Klaus W. Flach
W. E. McKinzie
J. E. McClelland
J. J. Noll
Roy W. Simonson

Committee 9 - Climate in relation to soil classification end interpretation

T. B. Hutchings, Chairman
R. W. Eikleberry
L. D. Giese
A. A. Klingebiel
C. W. McBee
Franklin Newhall
E. J. Pedersen
Clarence Scrivner
R. A. Struchtemeyer
Dwight W. Swanson
Rudolph Ulrich
Keith K. Young

Committee 10 - Soil family criteria

W. M. Johnson, Chairman	F. J. Carlisle	A. C. Orvedal
B. A. Barnes	R. C. Carter	R. I. Turner
L. J. Bartelli	P. W. Cleveland	

Committee 11 - Soil interpretations at the higher categories of the new soil classification system

W. E. McKinzie, Chairman	J. E. McClelland	Rudolph Ulrich
P. W. Cleveland	A. H. Paschall	Dirk van der Voet
A. A. Klingebiel	John D. Rourke	Keith K. Young

Committee 12 - Priority of problems that need soil laboratory studies and realistic estimates of work required for each of these studies

Guy D. Smith, Chairman	F. J. Carlisle	E. J. Pedersen
L. J. Bartelli	Klaus W. Flach	P.. A. Struchtemeyer
A. J. Baur	R. B. Grossman	

Committee 13 - Soil survey procedures (priorities for field work and publication, special soil reports including progress and quality control, small-scale soil maps, quality control of field work, and recording and reporting roil survey users' opinions and criticisms of soil surveys)

L. E. Derr, Chairman	W. M. Johnson	Roy W. Simonson
B. A. Barnes	C. W. Koechley	Dwight W. Swanson
R. W. Eikleberry	J. J. Noll	
L. D. Giese	A. C. Orvedal	

Committee 1b - Forest soils--with . basis on mapping and interpretations

Olaf Olson, Chairman	L. D. Giese	R. A. Struchtemeyer
C. M. Ellerbe	J. J. Noll	Dirk van der Voet

NATIONAL SOIL SURVEY CONFERENCE

A G E N D A

Monday, January 27

9:oo a.m.	Introductions, purpose of conference, announcements, etc.	- Charles E. Kellogg
9:15	Welcome to South Carolina	- Albin T. Chalk
9:20	Statement by J. P. Kuykendall, Field Representative for the Southern States, Soil Conservation Service	
9:30	Statement by Charles g. Kellogg	
10: 30	Recent Developments in the Soil Survey in Canada	- Walter Ehrlich
10:45	Statements by Land-Grant University Representatives:	
	Northeastern Region	- R. P. Matelski
	southern Region	- S. A. Lytle
	North-Central Region	- Clarence Scrivner and Richard Rust
	Western Region	- A. R. Southard
1:oo p.m. to 5:oo p.m.	Uses of Soil surveys:	
	Forest Service	- Olaf C. Olson (unable to attend)
	Extension Service	- George H. Enfield
	Bureau of Reclamation	- John T. Maletic
	Bureau of Land Management	- Ronald L. Kuhlman
	Bureau of Indian Affairs	- J. D. Simpson
	Bureau of Public Roads	- Harold Rib
5:oo p.m.	Cartographic Suggestions to Improve Soil Map Compilation	- C. W. Koechley
7:oo	The World Soil Map	- R. Dudal

Tuesday. January 28

8:00 a.m.	committee 1 - Technical soil monographs	-A. A. Klingebiel
9:oo	Committee 2 - Classes and phases of stoniness end rockiness	- J. M. Williams
lo:oo	R E C E S S	
10: 15	Committee 3 - Criteria for series end phases	- J. E. McClelland
12 NOON		
1:oo p.m.	Committee 4 - Application of new soil classification system	- Roy w. Simonson
2:oo	Committee 5 - engineering application and interpretation of soil survey	- L. J. Bartelli
3:oo	R E C E S S	
3:15	Committee 6 - Handling soil survey data	- A. C. Orvedal
7:oo	Histosols	- Guy D. Smith

Wednesday. January 29

8:00 a.m.	Committee 13 - Soil survey procedure8	- L. E. Derr
1o:oo	RECESS	
10: 15	Committee 7 - Soil moisture	- R. B. Grossman
10:45	Committee 9 - Climate in relation to soil classification and interpretation	- T. B. Hutchings
12 NOON		
1:oo p.m.	Committee 8 - Criteria for classification and nomenclature of made soils and definition of "topsoil" used to resurface cut. and fills	- A. J. Baur
3:oo	RECESS	
3:15	Committee 10 - Soil family criteria	- W. M. Johnson
7:00	Slide-illustrated talks by Dr.. Simonson and Bartelli on the 9th International Congress of the ISSS in Australia and by Messrs. van der Voet and Garland on their work in Brazil.	

Thursday, January 30

8:00 a.m.	Committee 11 - Soil interpretations at the higher categories of the new soil classification ● ystem	- W. E. McKinzie
9:00	Committee 12 - Priority of problems that need soil laboratory ● hldias and realistic estimates of work required for each of these studies	- Guy D. Smith
1o:00	RECESS	
10: 15	Committee 14 - Forest soils--with emphasis on mapping and interpretations	- Olaf C. Olson (Report presented by L.D. Giese)
12 NOON		
1:oo	Additional discussion on reports by Committees 6 and 13.	
2:30	Summary of conference	- Charles E. Kellogg

Statement by J. P. Kuykendall

Welcome to the South Region and to Charleston, a beautiful city rich in tradition where--as the legend goes--the Cooper and Ashley Rivers join to form the Atlantic Ocean.

Certainly I bring regards from Ken Grant, our new Administrator. May I express his regrets that he cannot attend and his best wishes for a successful meeting.

Soil surveys made under the National Cooperative Soil Survey have become one of the most useful and unique services in SCS.

The nonfarm uses of soil survey information is increasing by leaps and bounds. There is an ever-growing number of contracts made by local units of government to help speed up soil surveys and to give interpretations for urban expansion, for developers and fur other purposes. This demand is even now taxing our resources in some areas--even with financial help from non-Federal sources. In the 1967 fiscal year, 254 special soil survey reports (of record) with maps and interpretations were prepared to fill local requests. For the fiscal year ending last July we had in process 633 such reports--a whopping 70 percent increase.

The Service and its cooperators are mapping twice as much as is being published in any form. In addition, we have 350 to 400 surveys where the field mapping is complete and are ready for publication. We can readily visualize a tremendous problem of making soil surveys and getting this information to the public. Thus, challenge No. 1 that I want to lay before you is: Find a way to speed up the dissemination of soil surveys and interpretations to our growing list of users.

In this connection, Administrator Ken Grant sends this word to you, and I quote: "I am personally concerned about the large number of soil surveys that are essentially completed but till not be published under present schedules for several years. This is not said to criticize but rather to recognize that we need to explore every means to accelerate publication."

If the demand for these special reports continues to grow in this same ratio--and it might--you can see how it would eat into our manpower resources even if non-Federal contributions should pay all of the costs of such reports. I raise this question: Can we Set the people i-o service this growing program, and still meet our other objectives?

We must maintain a mapping rate of around 50 million acres a year if we meet our goal for completion of a once-over survey of all our lends by the year 2000. Around 750 million acres of rapping meet current standards. twice that much remains to be done.

Let me speak briefly about our operations in the Soil Conservation Service.

We set priorities annually in each State, with the State Conservationist consulting with State, local, and other Federal groups to determine needs. These needs include (1) the completion of soil survey field work and publications; (2) requirements for operations programs such as resource conservation and development and watershed projects--or other such projects; (3) the demands of our regular conservation operations; and (4) the requests to prepare special surveys and interpetations for local units of government.

In this way we attempt to make the best use of Federal and non-federal funds available for general and specific work--and to make the best use of personnel available. I don't think I need to tell you that it is difficult to stretch the blanket to cover all of the cold feet in this bed.

We are also constantly faced with the problem of maintaining production with appropriations that are steadily losing their purchasing power. This you realize. And although it makes your task more difficult, it doesn't make it any less urgent.

By way of commending the work you have done, let me reminisce for a moment.

I well remember the days when Dr. Kellogg, and perhaps others of you, took a planetable, a sheet of white paper, an alidade, end a soils auger to the farm of a prospective cooperator,

---

Wield Representative, Southern Regional Technical Service Center, Fort Worth, Texas.

You drew in the boundaries of the fields; and by primitive standards, you sketched in the limits of each soil type and erosion condition. That was the soils map used by conservationists and farmers in those days.

I said your standards were primitive--at least by today's standards. Wasn't that before you even had the first approximation of a national soil survey program?

Now. I em looking forward to the time in this year, or most certainly in 1970, when Dr. Kellogg will join with other great scientists of the world and examine a bit of moon-soil brought back by astronauts.

Thia new information may not improve your soil classification scheme at all. But I submit that our leader in helping to develop a scientific world-wide sail classification system, has earned a place among the great nature scientists of all times--and doubtless can help in classifying whatever material is brought back from the moon this year--and whet will come from other planets in the future.

The comprehensive soil classification is scheduled for publication. This culminates many years of hard work. I am looking forward to seeing this publication, and I am sure that you and others throughout the world are also looking forward to seeing it.

Earlier I laid down a challenge to you. In part, it is one that you have heard before--but in my view, it is more encompassing. I want to see the day--and I hope to see it soon--when every owner or user of sail that you have mapped, has all of the information about that lend readily available to him. I mean the owner of a suburban lot as well es the owner of a ranch or farm.

I want to see the day come BOO" when every district conservationist, every county and urban planner, or other official, has interpretations available for nonfarm uses wherever such uses may be probable. I don't mean special surveys with interpretations. I mean interpretations that will be of value for whatever kind of soil survey that exists.

This requires that we develop new ways of doing things. Some of our older methods ate getting out of fashion. The coordination of soil survey interpretation procedures developed in our region is a new approach to coordinating and tying soil survey interpretations to the soil classification unit. We want to be sure that all people working with soil surveys are saying the same thing about like kinds of soil. You no doubt will hear more about this in your committee deliberations.

These statements add up to just one thing: let's get the people--all of them--rural and urban alike--to using these priceless surveys that you have made and are making. There is no other way, as I see if, for us to fully meet OUT obligation to our Government, end to the rapidly growing population that we serve.

Let me give you some background for this thinking--

Recently, one of our men was planning some television programs in one of our large metropolitan • r...* For one program he thought he would describe the benefits of soil surveys for urban uses. When asked if such information was available in the area, he said there was nothing except the basic survey with interpretations for farm uses. There was no immediate prospect of getting anything better for the 1.5 million people living within the viewing area Of the • Ution.

Now I ask you: Is there any reason for him to "sell" this service if he can't deliver?

You will remember a few year. ago we became concerned because great numbers of soil survey publications were gathering dust in warehouses.

Some of you--in SCS, in the universities, and in other agencies--along with our information people, designed . promotion program to get the publications in the hands of those who could use them--aid along with the booklets en understanding of how to use them. The program worked well wherever the local agency people really tried to get the surveys used. And in those places it was . boo" to agricultural programs.

But where this didn't happen, was the survey and publication worth its cost? Personally, I think not.

Sometimes I wonder if we don't have a slight case of the malaise that Barbara Walters of the NBC TODAY program credited to the television industry during the outcry against that medium after the Democratic Convention. She said: "We have done a good job of selling ourselves to ourselves. And perhaps we haven't considered well enough the needs and desires of the public we serve."

We have thoroughly informed ourselves of the value of the soil survey--and I don't minimize that in the least. But perhaps we have been talking about several cases where the surveys have been used well by a considerable number of urbanites, as well as the rural people.

Our problem now is to get this benefit into the hands of greatly increased numbers of people. I submit to you that the job of a soil scientist requires much more than mere technical competence.

Let me urge you to give this matter much consideration in this conference.

Ken Grant said to me the other day that he looks forward to seeing the proceedings from this workshop. I have a keen interest in the objectives of Committee No. 13. The multiplicity of your interests should make for meaningful reports.

Again, I welcome you to the South, and I commend you for the excellent job you are doing. My best wishes for a successful meeting.

OPENING STATEMENT

Charles E. Kellogg*

Wc can take satisfaction from the continuing increase in demand and use of soil surveys by farmers, engineers, end a great many other people. Our estimates show that for each dollar spent in making end publishing surveys, the savings to the public agencies and especially to individuals amount to somewhere between $40 as a low in thinly populated areas and $175 in areas of population expansion, over a period of approximately 25 years. These estimates are a bit old, and I am sure the figures are increasing es time goes on.

We have, of course, many opportunities for improvement in quality and efficiency. At the moment our greatest problem by far is the delay in publication after the field mapping end other research are completed. Because of the great demand for soil surveys, more funds have been available for mapping than for associated research, including that needed for soil correlation and interpretation, cartographic work of preparing the maps for reproduction, editing the manuscripts, and printing the finished soil survey.

We have had to resort to reproduction of field sheets end interim reports, based on soil handbooks, for local use; but until the soil surveys are published, they cannot be widely used. Those public and private agencies that work nationally, regionally. or statewide have few. if any, opportunities to use the soil surveys until they are finally printed. Yet their use by such agencies is extremely important in local areas.

We can hope that some means can be found to have coordinated financing for all aspects of the soil survey so that the enormous backlog of about 350 soil surveys can be reduced to a normal operating one.

We have bee" increasingly aware of cartographic costs for assembling soil maps that can be adequately reproduced. We found that several factors have operated to increase costs substantially all the way along the line from field work to final preparation. Most of these also decrease the accuracy of the maps and lead to errors of identification of the soils. Included are long soil symbols that cannot be placed within the areas to which they refer. Soil symbols that include both small and capital letters are commonly indistinguishable. Many soil surveys have unnecessary symbols that were used before the descriptive legend was tested and were not removed. And I should add here that, despite our best efforts, some mapping intended for publication still goes on without descriptive legends. On some maps the drainage is indistinct and so are the roads and some other features.

Attempts to separate out very narrow areas of contrasting soils increase costs end reduce quality of our maps. In mapping, the field soil scientist tends to exaggerate them. The" the cartographer is inclined to exaggerate them a bit more when he prepares the map. In some surveys these difficulties could have been avoided with soil complexes; in others, where it is important that small areas be identified separately, the beat way is to use symbols, either standard symbols, such as the one for rock outcrop, or ad hoc symbols that apply only to the specific soil survey. Either kind of symbol needs to be defined in terms of both the kind of soil sod the area represented by one symbol. Otherwise, the maps are difficult to read and to interpret accurately.

Another mistake that has increased some of our costs has been the "se of a much larger scale than necessary. Some of our recent surveys published at 1:20,000 would have been equally useful if published at 1:24,000, 1:31,250, or 1:31,680. Then too, some large survey areas, of which only 10 to 20 percent have soils with potentials for intensive use, have been published at large scales where most of each area could have been published at a smaller scale.

In order to meet public demand, especially in areas of expanding population and industry. we have given increasing emphasis to the soil interpretations needed for use in community development. On the whole I think we are performing a great public service because of the enormous investments required. The avoidance of their waste depends on understanding the characteristics of the soils. At the same time, other factors interact with the soils; and we must cooperate with engineers, geologists, economists, and others in making interpretations for alternative uses. Such cooperation can be arranged with state agencies, including state geologists

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end highway departments, and especially with the cooperating state agriculture, experiment stations.

In the United States we have been accustomed to evaluate public works, soil surveys, and similar resource activities in terms of only direct benefits. From the point of view of the principal effects on a community or other large area, these may turn out to be low. Ae I pointed out, soil surveys have cost-benefit ratios over a 25-year period of 1:40 to 1:175. Actually, the reel benefits are much higher if we teke account of the economic development of a county, community, or other large area because of the well-known multiplier effect. It has been our hope to get some studies of these effects in order to get more understanding of the real benefits that soil surveys have in community development. I suspect they would run three to seven times the direct effects.

The completion of the current system of soil classification for printing goes ahead. As we make progress, additional problems are uncovered all along the line from individual soil series to unite of the higher categories. We are hoping that those units above the soil series end families can have staff decision in the next several weeks. We do not feel that publication of the system should be delayed.

We have started in a small way to make a new soil map of the United States et 1:1,000,000, which can be interpreted for regional planning end some preliminary state planning. we expect to use the quadrangles recently arranged by the U.S. Geological Survey et 10° latitude by 10° longitude. When this is finished, we will have useful maps at 1:1,000,000 for most of the world.

We will be discussing at this conference our progress toward finding ways to get our hard date on soil morphology, our laboratory data, our engineering data, end our experience date on computer cards or tapes so that we can improve our interpretations, teat interrelationships, and improve the quality of our correlation.

We will be using the computer the same way the people of the Middle Ages used their no" nearly forgotton memory systems, in order to make ourselves more nearly prudent. For centuries, the prudent man was described as one having an excellent memory, who is able to see new combinations and relationships in his mind, and who has good foresight for the future. Our data have become so massive that we see no other way to remember them then to handle them with electronic equipment. Most of us have been disappointed that our roil data are not more widely used to nlighuri broad regional and national policy questions.

Since many of the data come from cooperative work, we are hoping especially that a consistent national coding system can be developed for use in SCS end by our cooperators in the state agricultural experiment stations.

Sometime soon we hope to have some studies directly with users on the convenience to them of the soil maps that we are now publishing. In order to take advantage of new cartographic techniques that permit cost reduction, today's published soil surveys have quite different maps in some respects than those of 25 years ego. The question is not primarily whet "we" like hut what the bulk of our users find easiest to use. That is, the user must be able to find himself on the map without ambiguity, he must be able to reed clearly soil symbols on the map, and then from there. go to the legend end to the interpretations. Just as a personal preference, I still see many advantages in the older line maps. I am mindful that houses burn down and roads change, both on the line maps and on those with aerial-mosaic backgrounds. But the land use that shows on the mosaic also changes. Where it has not changed, it helps the user to locate himself on the map. Where *it* has changed, it may make it somewhat more difficult for him. So far as I know, most people prefer the aerial-mosaic background. Yet, even here. we have several alternatives. Perhaps what we need now are a few simple maps of the same areas, made in different ways, and the,, test their convenience to users primarily concerned with farming and to users primarily concerned with community planning. People between us and the user. can help; but for such a test to be most efficient, we must get the judgments of the users themselves.

RECENT DEVELOPMENTS IN THE SOIL SURVEY OF CANADA

W. A. Ehrlich*

Again I welcome the opportunity to be here and to convey to you greetings and good wishes from the Canadian soil scientists and to wish you success in the conference.

Our program in soil surveys has not changed much since the initiation in 1963 of the program on soil capability for agriculture. Both the inventory of our soil resources through soil surveys and interpretations of soil capability for agriculture have bee" vigorously pursued; these activities were followed in some provinces by some mapping and grouping of soils in capabilities for forestry, wildlife and recreation.

To date the soil survey coverage by reconnaissance and detailed surveys is about 300 million acres. The inventory of soil capability for agriculture covers about 335 million acres. Surveys and capability inventories are expected to continue until the forested area of a" additional 600 million acres has been covered. In the forested area, the kind of survey followed is a broad reconnaissance type in which the mapping is based principally on interpretations of aerial photographs end ground control is exercised mainly through the use of helicopters. A survey of this kind, although more of an exploratory type, was carried out on about 150 million acres principally in the northern parts of the Great Plains Region.

The seventh meeting of the National Soil Survey Committee of Canada was held April 22 to 26 at the University of Alberta, Edmonton. Reports were presented on the taxonomic soil classification, international soil correlations, interpretations of soil survey information for use in crop yield assessments and for engineering purposes. and on other aspects related to soils.

I" the taxonomic soil classification minor changes were made in horizon nomenclature in the Chernozemic, Solonetzic and Gleysolic orders, and major changes in those of the Podzolic, Brunisolic and Regosolic. The Podzolic Order was split into two orders, Luvisolic (U.S. Alfisol) and Podzolic (U.S. Spodosol), the Luvisols being recognized by a textural (argillic) B and the Podzols by a Podzolic (spodic) B. With the Podzolic soils now are included the Acid Brown Wooded (Dystrochrept) types with Podzolic B horizons originally in the Brunisolic Order (mainly Inceptosols). To the Brunisolic Order, which has new names for groups and subgroups, are added the Podzol Regosols previously within the Regosolic Order. This removal from the Regosolic Order resulted in modifications of names and definitions of the soils remaining in this group.

A significant advance in the classification of soils was the adoption for use in the field of the upper three categories of the Organic Order. This and the "Histosols" as described in the United States, which were developed on similar concepts, appear to be the first classifications on organic soils char have been developed to this degree anywhere in the world. Some testing of criteria on organic soils was done in 1968 and It is apparent much more is needed. Not all personnel in our soils units are familiar with the application of the criteria, therefore some guidance through field trips is required. The organic soils tour in Western Canada in 1967, when five from the U.S. participated, helped the westerners. but our fellows in Eastern Canada have not had this opportunity. A" organic soils tour of two weeks' duration, similar to the one in 1967, is being planned for Easter" Canada this summer.

A notable contribution was made by J. S. Clayton in a report on international soil correlation in which three systems - the United States. Canadian and World systems - were compared. The material in this report is proving useful to persons concerned with genesis and classification, particularly those teaching a course in this field. The U.S. system is highly regarded in Canada and consequently is receiving a great deal of attention by teachers in the field of classification.

The topics of crop yield assessments and engineering applications from interpretations of soil survey information received some attention for the first time at our national meeting. It is

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believed by many that these interpretations will he of great importance in future planning. However, we have only limited data and much needs to be done before firm recommendations can be made.

Attention by the National Committee also has been given to climate as related to land and to soil classification. A subcommittee was established and the first report, although exploratory, provided proposal8 that will be studied. The proposals made by the subcommittee were as follows:

(1) An expansion of the use of the Hopkins-Williams formula (a trivariate quadratic regression on latitude, longitude and altitude) for estimating temperatures to cover the *remainder* of Canada. This has been done for 206 *stations* in the Great *Plains* Region.

(2) Climatic zonations for wheat, coarse grains, corn and forage crops. This is based on a biometeorological time scale of Robertson and the Hopkins-Williams temperature estimator. In this field the zonation map for wheat is in its final stages.

(3) Develop a better relationship for estimating the hazard of freezing temperatures from mean monthly minimum temperatures. To date some progress has been made in this area.

(4) Obtain more precise data on the effect of slope, aspect, elevation, bodies of water and depressed areas on local climate.

Our agrometeorologists have been quite active in this field and are providing us with computer services. During the last year the service published a series of technical bulletins, each a report for one site only, presenting information for weekly and seasonal irrigation requirements at various risk levels, occurrence of weekly and seasonal means of daily extreme temperature, and totals of precipitation end potential evapotranspiration, end for the lent dates in spring and first dates in fall of the occurrence of critical temperatures near freezing.

The information in these reports is intended to provide the basis for planning and designing irrigation systems and for evaluating potential for agricultural resource development for stations with representative climatological date.

The soil map of Canada is to be completed and printed for publication this year. This map will b. of the same scale (1:5,000,000) and will have the same detail as on the soil map of North America ● houn at Adelaide in August, 1968. Included with the Canadian classification units will be the U.S. and World equivalents. The inclusion of these additional units in the legend will ● aoi8c any user of the map In understanding more readily the soils with ● Imilrr names ● pplied elsewhere in the world.

Plans are being made for writing a monograph on the Soils of Canada. Initially arrangements will be made with the different survey units to sample end analyze certain soil profiles. The data from these profiles are to he relatively complete and will be included in the monograph. It is expected that this project will require three to four years La complete.

In conclusion, I wish to mention that there is an increasing demand in Canada for new roil survey information and for various interpretations of our present information. For some interpretations it is necessary to resurvey those lands covered in the early 1920's and to conduct more detailed investigations of lands on which intensive farming is being practiced. Resurveys will follow on most of the land but only when the needs dictate that time and staff must be devoted to such work in preference to other fields of activity. The end of soil surveys is not in sight.

REPORT OF THE LAND GRANT COLLEGE REPRESENTATIVE
OF THE NORTHEAST REGION

R. P. Matelski *

This brief will deviate from the usual of summarizing the previous year's Northeast Regional Conference. These are published and usually available. Instead, a response to a letter request about problems in the Northeast will be noted along with comments from the author. The official representative. Dr. R. A. Struchtemeyer, and a more knowledgeable individual about administrative problems of the soil survey, has suggested that I present the Northeast viewpoint.

Walter Lyford, of Harvard University, a one-time, long-time Northeast correlator, would like to put in a plea for increased work on organic matter. He believes we are still content in a complete analysis of soil with the percent of organic carbon. Fortunately, there is some thought to fractionate organic matter end also to investigate the extractable humic colloid, but here again we are et the coarse sieve state.

Another problem, thet from West Virginia, but also occuring in other states, is a further classification of strip mine spoil. At the series or mapping unit level, degree of basicity or acidity of the control section, possibly supported by quantitative measures of sulphur or coal could be a prim criterion. The presence or absence of soil or organic matter might also be useful.

There has been a suggestion by several (Maryland, Pennsylvania, and New Jersey) to delete or reduce the repetitious parts of the soil survey report, viz. Capability Croups of Soils.

As we work with educational materiels, the production of the slide sets by the western group, and by Dr. C. Smith to illustrate soil properties is commendable. New York would like to see, perhaps this national group, a development of additional educational materials; viz., on the new soil classification system, the landforms that predict soils. We at the Pennsylvania Agricultural Experiment Station are now publishing annual progress reports of the date of our Soil Characterization Laboratory viz., in 1968, Dauphin County (distributed). Also, to be published soon, all years (1956-1966 inclusive) summary of the laboratory work. Dr. M. R. Heddleson, our soil survey extension specialist, has just recently developed a 60 color-slide set on "How a Soil Survey Is Made," and a 12 minute color movie on "Using the Soil Survey." These are available on loan to appropriate groups.

The field identification of the fragipan is often difficult. Also, too often such names es Fragiochrept, Fragiudalf, Fragiudult guide the field man end others for the presence of the fragipan. The criteria for noting the different degrees of development are Poorly defined. The soil moisture content and the season seem to determine the presence of some fragipans, particularly those more weakly developed i.e. Wooster.

The stoniness classes as defined in the Manual and further worked on by the Regional Committees present problems for the Northeast. A. H. Paschall is on this national committee end will give many of our Northeast concerns. In addition, New York tends not to use Stony lend. Instead, extremely stony phases of one or more named series as low intensity units are mapped. The series name connotes additional worthwhile information. Pennsylvania uses Stony land as well as the extremely stony phases. Stony land in Pennsylvania is essentially devoid of trees.

Some experiment station workers would like more autonomy et the regional level. some national committees set up so much work for the regional to consider that not enough Line is left for the region's own problems.

Often there is an absence of information of the activities and staffing of the four special state laboratories (Maryland, Ohio, Pennsylvania, end Virginia) and the efforts of the other (12) state laboratories.

We just heard from A. T. Chalk that there is another state Soil Characterization Laboratory, that in South Carolina. Other states represented here, Utah, end Louisiana have mentioned to me they too have state laboratories. We don't seem to have all the information. There appears to be a need to have available the current soil survey research at the experiment stations.

Department of Agronomy, The Pennsylvania State University.

Perhaps this information could be provided by a national representative of the Experiment Station. This representative, other than the Land Grant University representatives, has not been often represented at this conference.

Similarly, the information on the current computer active work in soil survey at the experiment stations is lacking. Computer facilities are being used at Pen” State to process our soil characterization data. Programs to perform almost all laboratory calculations are now in “se. Physical, chemical. mineralogical and some morphological data from 438 soil profiles are stored on magnetic tapes for use in data acquisition and manipulation.

Finally, we might ask--how is the new soil classification system working? In Pennsylvania, our field and laboratory data show that it is not working. 0” a sample of 100 modal soils (picked, described, collected, and approved by the state soil scientist or the correlator or both, the Experiment Station representative. the local and/or Pennsylvania regional soil scientist and occasionally the regional correlator, and laboratory analyzed) 81, or 81 percent did not fit the classification. Particle sire classes for family groupings, the argillic and base saturation, in that order, were the chief offenders. Perhaps it might help to give a range to these and other characteristics. Perhaps there is a need far fewer requirements than the many now outlined.

It would be helpful to have a” additional regional correlator visit the field more often. I” Pennsylvania, no regional correlator has bee” on any field review for three years.

REPORT OF SOUTHERN REGIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE NATIONAL COOPERATIVE SOIL SURVEY

S. A. Lytle *

The biennial meeting of the Southern Regional Technical Soil Survey Work-Planning Conference was held at Clemson University, Clemson, South Carolina, on July 9, 10, 11, 1968, with C. M. Ellerbe, SCS, Chairman, and C. R. Craddock, Clemson University, Vice Chairman. The attendance of seventy-five included the land-grant college representatives of nine southern States and Puerto Rico, Forest service, Georgia School of Forestry, and the State Climatologist from South Carolina. The Land "se Specialist, Soils and Fertilizer Research Branch of the Tennessee Valley Authority was present, and was granted a voting membership in the conference.

The nine established committees developed reports by prior meetings and correspondence, and by meetings at the 1968 conference. The following committees presented reports at the conference:

Committee I. Criteria for Families, Series and Phases.

After a study of mineralogy classes, recommendations were made for changes in the definitions of some classes, and for further study of other classes. The need was recognized for a conference committee of qualified mineralogists to resolve future problems, It was recommended that a subdivision entitled "Source of Data" be added to new soil series descriptions. The committee suggested that the S-60 Southern Regional Clay Mineralogy Committee be requested to consider the use of mineralogy in the classification system and make recommendations.

Committee II. Classes and Phases of Stoniness and Rockiness.

The committee developed phase classes end names of phases of stoniness and rockiness similar to those of the 1966 Committee report and recommended the use of percentage of surface cover rather than the spacing between stones or rocks in developing phase classes for the southern region.

Committee III. Application to the New Classification System.

The committee reviewed Memorandum 66 and recomnended changes in the percentages of the inclusions in mapping units. The need was recognized for more emphasis on water table data end soil saturation in determining soil wetness. It was recomnended that a change be made in horizon designation symbols for organic layers of mineral soils. The need for maintaining a communications link between the old end new classification systems was emphasized.

Committee IV. Interpretations of Groups and Categories Higher than the Series.

The committee concluded that adequate guidelines are available for making interpretations at any level in the classification system. It recomnended that interpretations for all important soils in the Region be developed. using uniform procedures end specific criteria. The Committee recomnended that land capability interpretations at the family level be included with this project.

Committee V. Soil Moisture and Temperature.

The results of detailed study and testing by the committee showed that the depth-duration soil moisture classes presently established overlap classification units. The committee recommended that definitions should be used to separate water table from perched water table; that the collection of soil temperature data be continued; and that the lines separating soil temperature zones be refined.

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Committee VI. General Soil Maps.

The committee working with general soil map, scale 1:250,000 found that better interpretations can be made at the Great Group level than at the Suborder level. It was recommended that legends for small scale general soil maps have mapping unit descriptions in both technical and nontechnical language. The committee recommended that further testing of small scale soil maps should be made to determine what categorical levels will best serve the needs for the region.

Committee "II. Urban Interpretations.

The committee found few examples where structure and design requirements were changed to correct soil limitations. The committee recommended that uniform criteria should be developed for evaluating soils data in terms of suitability or limitations for non-farm uses, and that all interpretative criteria be combined in one source.

Committee "III. Soil Surveys for Forestry Uses.

The committee emphasized the need by foresters, and by owners and managers of forest lands for more soils information, including interpretative data relative to soil problems resulting from the use of machinery. It was recognized that there is a need by foresters for more training and experience in the use of the available soils information.

Committee IX. Priority of Problems Needing Laboratory Study.

A preliminary study of the laboratory needs reported by the States in the Southern Region resulted in the following recommendations: That all interested agencies involved with research affecting soil morphology, genesis, and classification should be provided with copies of information on the past, present, and immediate future projects of each agency in each State; that adequate pedon descriptions be prepared for all reference samples; that members of ell agencies with common interests attend each other's workshops; and that code numbers for analyses procedures of the SCS Soil Investigation Report No. 1 should be used on identical procedures by all agencies.

Southern Regional Map Project

This project was approved in 1967, and the committee was enlarged in 1968 to include the State experiment station representatives, the State soil scientists, and Regional Technical Service Center representatives (SCS) and other interested members of the conference.

At the 1968 conference, agreement was reached on the degree of density of road systems. lakes. cities, and towns best suited to the base map 1:2,500,000. Outlines were developed for the map legends and the text to accompany the map. State legends of associations of Great Groups were prepared and submitted to the chairman in November 1968. Matching maps across State boundaries of Texas, Oklahoma, Arkansas, and Louisiana were completed in January 1969, and the maps and legends were revised far these States. Joining the State segments of the regional map is continuing. The completion date for this project is 1970-71. The Southern Soil Research Committee has agreed to investigate procedurea for the publication of the map and report.

Tropical Soil Workshop

'l-he committee on the Tropical Soils Workshop presented a written report to the Southern Work-Planning Conference at the July 1968 meeting. This report included a tentative program and estimated expenses for a soils tour of Puerto R'c" and the Virgin Islands on August 5-14, 1969. The tour also includes studies of the geology, geography, geomorphology, vegetation and ecology of the islands, and observations of the use of tropical soils for urban development and for agricultural research. On January 2, 1969, the reported number of individuals planning to make the tour was fifty.

The next regular meeting of the Southern Regional Technical Soil Survey Work-Planning Conference will be held in 1970 at Baton Rouge, Louisiana, with S. A. Lytle, Chairman, and D. F. Slusher, "ice Chairman.

Report of the Ad Hoc Committee on Soil Survey Procedures

This committee has prepared the following outline of an orderly procedure for making changes in the new classification system. The proposal is for the review of suggested changes by a 5-man committee of responsible and interested persons selected from personnel of the cooperating agencies in soil survey.

Charge: Outline an orderly procedure for making changes in the New Classification System

A. Open meeting on July 9 for general discussion of procedures.

1. The chairman summarized results of 37 questionnaires returned by the members of the conference.

2. Dr. Kellogg suggested that the new comprehensive classification might be published in two volumes.

There seemed to be a consensus that Volume I might contain a basic explanation of the system, including discussion of diagnostic horizons and information about Orders, Suborders and Great Groups; Volume II might carry information about subgroups, family and series and be issued in looseleaf or other form so that it could be easily revised annually or biennially be either replacement pages or additional pages. Bartelli suggested that Volume II might include a key from Orders to Subgroups so that an up-to-date outline of higher categories would be available.

It was suggested that this new publication carry a list of all soil series ever used with an indication of their revision or current inactivity. Bartelli and others pointed out that such a procedure would present a great number of technical problems.

Dr. Winters suggested that State level committees be formed to funnel proposals for change or addition to the regional committee.

Grossman pointed out that time input by members of the regional committee would be large and that some special arrangement for time and funds may be desirable.

Ritchie suggested that on the regional level a permanent standing committee is needed, with representative from agencies involved in survey, classification, or soil formation work. Bartelli indicated that capability and interest should be prime criteria for membership on such a regional committee. Bailey suggested that personnel serve staggered terms so that there will be continuity.

Buol indicated that participation in this activity should be given status through clearance and approval by administrative personnel, including approval of time commitments and funding of travel to committee meetings. Grossman indicated that soil formation personnel in the States should be oriented closely co needs for research related to the new classification. Buntley suggested that proposals for change originating in the States should be documented and supported by research.

B. Committee meeting after open discussion.'

1. Constructive, documented suggestions from any individual can be sent to a proposed regional committee.

2. Any proposals far revisions or additions LO the new classification system must be documented with date or written justification Lo be considered by the regional committee.

3. Echelons or levels of activity.

3.1 State

3.11 A committee is strongly suggested but would not be required.
3.12 An individual. institution or agency may originate proposals at the State level, but it is hoped that they will be discussed with other individuals or agencies or a State committee before transmission to the proposed regional committee.

3.2 Region

3.21 A five-man committee is suggested.
3.211 The Regional Soil Survey Work Croup (Experiment Station people) will prepare a list of individuals who are able end willing to serve on the regional committee and send it to the Southern Soil Research Committee (SSRC). From this list the SSRC will designate two names for transmission through the office of the Principal Correlator to the SCS office of the Principal Correlator to the SCS Deputy Administrator for Soil Survey. These individuals will report annually to SSRC.

3.212 It is proposed that the Principal Soil Correlator will prepare a list of individuals in SCS who are able and willing to serve. Two from this list shall be appointed to the Regional Committee by the Deputy Administrator for Soil Survey.

3.213 The Principal Correlator will invite the Regional Office of the US Forest Service to designate a qualified individual to serve on the committee.

3.214 The terms of office will be staggered. At the start, one individual appointed by SSRC end one appointed by SCS shall serve two-year terms. All other terms are three years.

3.215 The committee may elect a chairman if desired.

3.22 The Principal Correlator shall be an ex officio member of the committee and can receive advice and suggestions from the committee.

4. This five-man committee shall be announced by the Deputy Administrator for Soil Survey upon completion of the appointment process.

5. This committee shall be considered a permanent standing committee of the Southern Soil Survey Work-Planning Conference and shall present reports and hold open discussion at every meeting of the W-P Conference.

6. This proposed regional committee nay ask the Executive Committee of the Southern Soil Survey Work-Planning Conference to appoint special committees or work groups for special needs such as revisions or changes involving soil mineralogy.

7. For each proposal coming to it this regional committee will recommend either:

(a) Forwarding the proposal to the appropriate person on the national SCS Soil Survey staff or to a national (or international) committee.
(b) Refer the proposal through the Principal Soil Correlator to a parallel regional committee (or committees) with similar problema.
(c) Send the proposal back to the State for further testing or additional documentation and justification.
(d) Rejection.

Committee Members

L. J. Bartelli	David Slusher
F. H. Beinroth	M. E. Springer, Chairman
R. J. McCracken, Recorder	Eric Winters, Advisor
Henry Otsuki	

REPORT OF NCR-3,
NORTH-CENTRAL REGIONAL TECHNICAL COMMITTEE

C. L. Scrivner*

This report is in two parts. Part I concerns activities of NCR-3, composed of Experiment station representatives. Parr II concerns activities at the North-Central Work-Planning Conference of the National Cooperative Soil Survey.

I. Activities of NCR-3

This regional committee is currently concerned with two projects:

(1) A bibliography of soil survey maps and report*.

(2) A proposed regional research project entitled "Soil Fabric and Mineralogy as Related to Genesis and Productivity of Soils, Particularly in the North-Central Region."

Both projects are as yet in the planning stage, but the proposed regional project has bee" submitted to NCA 1, end it is hoped that it will provide funds to the Experiment Stations for research. Approval and funding will probably depend upon how well we have outlined the need for regional research an the project as compared to individual experiment station research.

Considerable discussion at the meeting was centered around an apparent policy to decrease or omit the quantity of soil characterization data included in soil survey reports. The NCR-3 Committee recommendation is that such data should be included in soil survey reports.

II. North-Central Work-Planning Conference of the Cooperative Soil Survey

This conference met March 18-21, 1968, in St. Paul, Minnesota. with 86 participants. The conference worked through committees, the reports of which are in your possession. I should like to make a brief report of a" Experiment Station representative's view of the committees and their work.

Organic Soils

Three N.C. conference members, Farnham, Finney, and McKinzie, have done much of Lhe work summarized in the supplement dealing with organic soils. Their work thus constituted the regional work. The Delta County. Michigan, correlation has bee" completed and is the first under the new system.

Technical Soil Monographs end Bench Mark Soils

Actual progress here is slow, although the Red River Basin map has bee" completed by North Dakota, South Dakota, and Minnesota. Some important discussion questions raised are:

(1) Is it wise to omit soil characterization date from standard soil surveys with the assumption that the data will be published in the monograph?

(2) Should administrators assign personnel to the task of preparing the monographs?

Soil Moisture and Climate in Relation to Soil Classification

This committee, after several years of considering water tables. moisture movement, etc., shows a tendency to become a reaction committee but may be concentrating somewhat on the prediction of moisture regimes from climatic data.

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Forest Soils

This committee is concerned with the need for communication between soil scientists and forester*. A question which ❑ iSht be formulated from their discussions would be "Do standard soil surveys meet the needs of foresters?" or "What are the needs of foresters?".

Engineering Applications and Use of Soil Surveys for Suburban Planning

This committee was concerned with guide sheets for interpretations. A major problem appears to be a lack of data related to the needed interpretations. Some N.C. states are feeling the need in this area more acutely than others. Michigan, Ohio, Illinois and Wisconsin have begun to feel the impact. The other states will feel it later.

Soil Morphology and Soil Family Criteria

This committee used a different format in which various members lead the discussion of topics. Two observations were (1) that the use of clay mineralogy as classification criteria at the family level is without sufficient date, and (2) landscape position needs to be more formally recognized in the soil classification system.

Soil Correlation Principles, Procedures and Rules of Application of the New Classification System

This committee's session. were very well attended, reflecting the interest. A c-n concern appears to be the constant need to keep all concerned parties and organizations informed of actions and decisions. The conference went on record as approving a standing regional committee for reviewing proposals for changes in the soil classification system after it has been published. It was suggested that the Principal Soil Correlator might chair the committee.

Priority of Problem, that Need Laboratory Study end Estimates of Work Required

This committee attempted to estimate the various needs as a guide to SCS soil survey laboratories. It did not delve into the possibility of changing needs in the types of laboratory information that will be required.

REPORT OF WESTERN REGIONAL TECHNICAL WORK-PLANNING CONFERENCE
OF THE
NATIONAL COOPERATIVE SOIL SURVEY AT RIVERSIDE, CALIFORNIA
January 22-26, 1968

Welcome speech by Mr. T. P. Helseth, California State Conservationist.
Address by Dr. Charles E. Kellogg, Deputy Administrator for Soil Survey entitled "Opportunities and Problems in the National Cooperative Soil Survey Program."

Reports of Committees

Committee #1: Application of new soil classification to soil series and mapping units.

The committee discussed nomenclature and descriptions for map units in terms of families, subgroups and higher categories. They recommended that.

1. For the subgroup and higher categories that the category name be used.

2. Map unit descriptions include location, topographic position, elevation, climate, vegetation, a description of representative pedon of each component.

Dr. M. A. Fosberg is to prepare overlays of selected maps to show degree of generalization that is obtained as one goes from phases of series to phases of other categories. These are to be circulated to the committee.

The committee suggested more critical review of series drafts for improved communications among States.

Committee #2: Publication of Soil Survey maps and information. Recommendations for improvement of texts of published Soil Survey reports:

1. More emphasis in introduction of the report on what was found and economic implications related to soil.

2. More flexibility in the format.

3. Map unit descriptions be presented in tabular form.

4. More photographs of soils especially highly contrasting ones.

5. Make Genesis and morphology chapter optional.

6. Key interpretive maps be included.

7. State conservationist be given authority to clear manuscripts.

8. Cooperating agencies prepare brochures explaining how the published document can be used.

Committee #3: Soil Structure and Fabric

Committee recommended:

1. Differentiate between ped and volume consistence material with peds over 2 cm or under 1 mm will be characterized by volume consistence. This distinction should be noted as friable with firm granules, that is, the first term is for volume and the second for the ped consistence. Unit volume for testing volume consistence is 2 x 2 x 2 cm.

2. State the moisture states at time of description.

3. Natural structure be considered dynamic property with time and moisture condition.

4. Structure be the size, shape and durability--distinctness of whatever aggregates are present at the time the pedon is described and pedality.

5. Pedality be reserved for series criteria.

Committee #4: Soil Survey for Range and Forest Land,.

Recommendations:

1. Some soil associations in wildlands need interpretations by components as well as whole units.

2. In general, they agree with 1967 National Committee on classes and phases of stoniness.

3. Urged further consideration of map units based on families and higher categories.

The committee stated that exploratory mapping in Alaska is mostly phases of subgroups at a scale of 1:500,000.

In Nevada phases of families at 1:60,000.

In Idaho and Montana phases of families at 1:20,000.

In Hawaii phases of families at 1:24,000.

Committee #5: Several systems of climatic evaluation.

Recommended:

1. Soil temperature days be observed on 15th day of January, April, July and October to measure soil temperature.

2. (ETa 6) be computed for all states and maps prepared.

The committee stated that we need a new or improved formula for calculating potential end actual evapotranspiration, and as a start, Mr. M. D. Magnuson, Regional Climatologist, Salt Lake City, furnished a brief outline of the principal features of Thornthwaite and Penman equations.

Committee #6: Made and Shaped Soils.

Recommendations:

1. Made land be restricted in use to the point that at some later date this miscellaneous land type could be eliminated in favor of symbols.

2. Made soil be used only when soil cannot be classified as shaped or altered soils.

For areas greater than 2,000 acres, the following classes are proposed: Clayey, loamy. sandy, fragmental and undifferentiated.

For areas less than 2,000 acres, fill soil or cut and fill soils,-etc.

Shaped soil - handled as phases (terraced, leveled, etc.) and classified in the new system.

Altered soils - with fragments of diagnostic horizon, be classed as Arents. Without fragments of diagnostic horizons be classed Psamments, Fluvents and Orthents.

Committee #7: Benchmark Soil. and Technical Monographs

Recommendations:

1. Attempts be made to stimulate interest in writing benchmark soil reports.

2. Experiment Station representatives explore the possibility of using Benchmark soil reports as master's theses.

3. This committee be relieved of that portion of its charge pertaining to Technical Soil Monographs, at least temporarily.

Committee #8: Nonfarm interpretations of soil surveys.

Recommended:

1. In engineering interpretation pertaining to corrosivity of uncoated steel pipes that the soil features affecting this interpretation be listed in lieu of a rating class. If classes are needed they be limited to three.

2. Corrosivity Concrete be handled as an interpretation in lieu of a soil property.

3. Source of sand and gravel be listed as a probability (high, medium, low or none) of finding sand or gravel rather than as a suitability and that a statement as to kind, grade and quantity should be presented with the probability.

4. A handbook of nomenclature, procedures and interpretations be prepared for use by other disciplines.

5. Soil scientists be encouraged to publish on nonfarm uses of soil.

6. Regional site engineer, FHA (Federal Housing Administration) be invited to the 1970 Western Regional Planning Conference.

Additional single purpose interpretations needed are recreation, watershed hydrology, excavations bearing strength and frost action potential.

Committee ___: General maps for Resource Management Planning

Recommendations:

1. Soil maps prepared by abstracting detailed soil surveys as well as those prepared by reconnaissance methods be referred to as "General Soils Maps" and that a footnote be used to designate procedures for preparation.

2. All maps have both bar and fractional scale.

3. Base maps should have enough control to enable users to orient the maps.

4. Limit the use of soil series names in published reports and maps to those series which are established or approved by the principal correlator.

Committee #10: Priorities and workload estimates for Soil Survey Laboratory studies

The committee discussed the general classification and interpretation problems for which laboratory assistance is needed along with estimates of numbers of pedons involved.

Recommendation:

The committee be discontinued but formation of committees for coordinating and planning laboratory work in individual states be encouraged.

Other Activities

A field trip to study soil consistence provided an opportunity to compare our field impressions with modulus of rupture determinations in the laboratory and gave a break to enjoy the fine Riverside weather.

A panel discussion on Data Processing in Soil Survey programs and a farewell to Dr. J. E. McClelland at our banquet rounded out our activities.

The work group project was to make available a set of 35 mm color transparencies for use in illustrating the classification system. This has been accomplished using Dr. Fred Peterson's energies and Mr. William M. Johnson's time and slides.

A. R. Southard, Chairman
Western Work Group

A PROGRESS REPORT, U.S. WREST SERVICE

O. C. Olson

The principal purpose of the Forest Service soils program is to improve the overall quality of resource management on the National Forest System lands. Achieving this objective requires two major efforts or outputs by the soil scientists--(l) obtaining end interpreting technical, basic soil data, and (2) assisting management in putting this information to "se. The data collection and interpretation effort includes conducting soil surveys and local soil investigations in both of which interpretive studies are integral end essential parts. Forest Service policy is to conduct soil surveys on all National Forest System lands and interpret the information for multiple use management. The second major output by the soil scientists is concerned with the direct application of technical soils knowledge to specific management problems or situations. We refer to this activity as our soil management service. The services of skilled and experienced soil scientists are made available to management and to other technical Forest Service people for advice and counsel on soil uses end management problems.

The longer we work with surveys, the more we become convinced that some kind of a cross tie between technical soil information on one hand and lend "se decision making on the other is more or less essential. Soil management service, which is a tie, provides, additionally, opportunities for the soil scientists to work closely with a wide variety of disciplines and experience--foresters, engineers, lendscape architects, range scientists, hydrologists, end others. This coordination and cooperation pays dividends in many ways.

The collection of soil and soil-related landscape information is carefully designed and interpreted to fit the immediate and/or long-range management needs for each individual project or survey area. During the past calendar year we conducted cooperative, detailed soil surveys on some 2½ million acres nod special or reconnaissance soil surveys on another 4 million acres. Reconnaissance surveys are primarily made on large areas where general or limited specific information is needed quickly to meet a definite management purpose. Special, highly detailed soil surveys are made on small areas, too smell for the efficient scheduling of cooperative soil surveys. More than 600 soil management service jobs were accomplished during the same year.

Looking ahead, we see a number of improvements and modifications that are desirable in our developing soils program. Examples of changes that are aimed at keeping our soils program up to dste in terms of meeting the needs of the users are as follows:

(1) Because of the importance of having the project planners together, we see the Forest (rather than the Regional Office) as the principal staffing unit for the soil scientists.

(2) A, interest in soil and water management programs increases, information in greater detail will be needed for planning many of the comprehensive programs. For instance, the soil-rock-water-plant regime must be studied thoroughly for program planning involved with water yield increases. The characterizations end evaluations of soil substrata horizons, therefore, till extend in many soils to depths of 10 to 20 feet or more.

The use of geophysical equipment end closer coordination with the geologists are called for in extending our survey investigations continually deeper into the substrata.

(3) We are looking into infrared imagery and other remote sensing techniques to determine if they are capable of aiding the collection of certain information. To improve our soil survey mapping techniques, we are also looking forward to using more color aerial photography and small scale photography as adjuncts to the standard, black-and-white aerial photography.

To keep abreast of technical developments in the area of soil science In general end soil surveys In particular, we very much appreciate the opportunity to participate in meetings such as this conference. We benefit greatly from the exchange of knowledge and experiences among the cooperators of this group.

USE OF SOIL SURVEYS

George H. Enfield *

There is no need to take your time describing the Soil Survey to you because it's too much like describing a son or daughter to their mother. You know far more than I do about it and can even recall some of the labor pains during its birth.

The soil survey has its greatest use outside Washington. This inventory or appraisal of our soil resource6 is used by the men in the field. Like all other surveys its use varies from State to State and from county to county. One of the greatest problems is to keep our ever changing county personnel fully informed of the resources available. As you know we have gone through some transition periods. Some of us have known soils that have bee" give" three or more different names in our lifetime. It is sometimes a little difficult for our county extension staff to understand why there should be such a high divorce rate in a natural system as stable es the soil. The ever changing county personnel is at a far greater handicap. There are times when agents are moved from counties where the soils were formed on residual material to an area late Wisconsin glaciation or from the Piedmont to the Coastal Plains. The names of the soils that were once familiar are now foreign. The agents must leer" a new language and understand the meaning of the words.

I" the major agricultural counties where there is a modern soil survey of their county, it is used as reference to evaluate and compare opportunities in one area with another. To me this is one of its most important uses. Where it is possible to become well acquainted with crop production practices and yields under good management with the main agricultural soils of the county, it gives a good idea what can be expected on the same soil types in other areas of the county or area. It has bee" my belief that many of the writers of soil survey reports are a little cautious a" their yield estimates of the various crops. Of course, technology in crop production is ever changing end likewise yield potentials must be revised to remain consistent with present resources and economic environment. The spread between the productive and unproductive soils sometimes appears rather "arrow. Perhaps this observation is colored by what some believe that the poor farmers are forced to cultivate the less productive soils while the better farmers migrate to the fertile lands. If this is so the" there is a built-in bias on evaluations of land from observed yields.

Now to the question, How does Extension make use of the reports? I" many of the rapid expanding urban areas the cities are overrunning the countryside. Sooner or later someone starts either a study or planning commission end they often turn to the county agent for help. Where the agent is on his toes he acquaints them with the soil survey. Some of the county surveyors are college graduates and know about the surveys, others have forgotten about them and up until recently they were primarily built around agriculture and omitted the engineering phases. Where old surveys are all that is available, the agents usually look for help either from the university or locel Soil Conservation Service to furnish additional information not found in the reports.

I" some areas where there are a rather large mixture of soil problems, and especially where there are great differences of opinions on site suitability, a great deal of time is devoted to helping planning boards develop alternative lend use maps based on soil characteristics and limitations. This provides a sound base from which recommendations can be formulated. I" some areas the local governing bodies have employed extension personnel and placed them on their staff to help them develop the maps. They also work with the local people so they will understand the differences in the soil and why certain actions are recommended. Give" the facts, a" informal public will more readily accept changes in regulations and restriction the" where they are asked to confirm because someone thinks it will be good for them. I" some places this requires a much greater detailed survey than most of the surveys made 10 to 15 years ego. Under these conditions the suggestion is made to seek the assistance from competent help trained in this kind of work. No doubt you have bee" on the receiving end of such requests.

*Federal Extension Service, U.S. Department of Agriculture, Washington, D.C.

Each year there are about four million soil samples tested for individuals in this country. Soil tests are but one criteria as to availability of plant nutrients. These tests only indicate the quantity of soluble nutrients in a weak extractant. They in no way indicate the supplying power of the soil to replenish these nutrients once they have been removed from the solution. Neither does it reflect the speed by which this change will take place. This is a characteristic closely related to the soil characteristics associated with soil type. When properly interpreted soil tests provide a reasonably good indication where there will be profitable responses to an application of fertilizer. Many States have learned that some soils produce greater, and others lees, than you might think and this can be associated with certain soils. Where the type is known these are associated with the test results end as a result provide a more accurate Interpretation. Some of the States using such information are New York, Michigan, Illinois, Wisconsin, Iowa. Nebraska, and probably several others.

Another area where extension is making good use of the soil surveys is in land-use planning with the farmers. With the rapid change in land ownership and expansion of the commercial farmers, there are many questions on how to maximize the "et returns with the other resources available. New York end Michigan had held training programs for farmers to work out expected returns based on the productive capacity of the land. BY the use of some practical budgeting procedure the farmer can arrive at the returns that can be expected from various alternatives. This process of linear programming can be so complicated that most farmers are not willing to spend that much time pushing a pencil, and now we are waiting for the day when the computer will do the work for them.

We have tried to stress the importance of starting with the soil and placing the limitations, now culled perimeters, on the various situations. You see it's possible to farm some Class VII land if properly managed and if this is all You have you would probably use it rather than starve, but under land situation in this country I doubt if any would consider if advisable.

This type of educational work is rather intensive and it's not possible to help everyone, but for a few of the leading farmers that "ant to make such a study the procedure is available.

The one place where the surveys have been most useful to our extension people is to help answer some of the nitty-gritty questions about land values--values based on crop productivity. We find it far barter to have a reference that we can use and place the estimates on the third end uninterested parties than to give it your opinion. By following this action we are not trying to pass-the-buck. we just don't see any room in a noose for more than one neck at a time and we prefer that it not be ours if we can avoid it.

There are companies such as canning factories that want to locate in some counties. extension has been asked many times as to opinion where it would be most desirable. The survey makes it possible to pick out areas that best meet the crop needs and less subject to hazards that might cause failure. We have had some factories establish themselves without any suggestion only to find out later they missed the boat.

In Illinois, and I believe Utah, there was an attempt to adjust land assessments t" a productivity rating. I know several times this has been considered. Under these conditions, usually the support comes from the State staff rather than county personnel.

Extension itself is not so much concerned as how we can use the soil surveys but how we can get other people to use them. In the last 14 years that I have been with the Federal Extension Service, I have tried to make at least one person conscious of the need to get the surveys in the hands of the people that will use them. To the best of my knowledge, at least one or more persons in every State has accepted the responsibility to help initiate the soil survey to at least the extension personnel in the county shortly after a survey has been released. Many States have Jumped the gun and prepared interim reports on their own. Agents have received training to understand the differences of the major soil types in their counties. We believe some progress has been made. We know it's not perfect in some States but we believe there are places you would agree some remarkably successful work is being done. Some of the States have full time staff working in this area. Illinois, Virginia, Indians. California, and New York have some top men in the field. Wisconsin is good but their man is on loan to one of the South American countries at present.

We believe you have made the surveys quite useful, but we would he pleased if you would bold to the English names for the soil types for a few more years for some of us older men because we are having a hard enough time keeping up with the few changes you do make.

THE USE OF SOIL SURVEYS IN THE BUREAU OF RECLAMATION1/

I wish to express my appreciation to Dr. Kellogg and Dr. Hockensmith for providing this opportunity to attend your National Technical Work-Planning Conference. Because of the many and varied uses made of the soil survey within our agency, we have Found it most helpful to participate in both your regional and the national work-planning conferences. In this period of growth, improvement, and further development of the 7th Approximation, it is particularly important that user agencies remain abreast of the new concepts and progress being made.

The Bureau of Reclamation is engaged in multiple-purpose water development in the 17 Western States and in Hawaii and Alaska. We are also assisting some of the developing nations in planning multiple-purpose projects. Within the spectrum of multiple uses, including irrigation, power generation, flood control, recreational development, fish and wildlife preservation, salinity repulsion, municipal and industrial water supply, and pollution abatement, the soil survey provides a data base of much usefulness.

In planning the irrigation phase of water resource developments, the soil surveys provide a guide to the soil conditions and land Forms in the proposed project area. Where soil surveys are available, our work is Facilitated by having an interpretable grouping of facts regarding the soils of the area. Our interpretations are given in the Bureau of Reclamation "Irrigation Suitability Classification." Toe classification is founded upon an economic base. Accordingly, boundaries of soil mapping units and irrigation suitability classes do not neatly coincide, nor should we expect them to. There is, however, closer correspondence in some areas than in others. For example, we find a close correspondence in the Willamette Valley and a very poor correspondence in the Spokane Valley. Moreover, the economic basis makes it necessary to fit our irrigation suitability land class criteria to the economic, physical, and social environment of the proposed project. Regardless of the obvious differences in our respective survey objectives, soil survey serves several important functions. These are to (1) provide knowledge regarding soil conditions and land forms in an area proposed for irrigation, (2) establish . basis for transferring irrigation experience between areas, and (3) provide guidance and help reduce field work in performing broad inventory studies of irrigation potentials.

Because of these uses related to the irrigation function, we are engaged in several cooperative projects with the Soil Conservation service. This includes work In the Las Vegas and El Dorado Valleys in New Mexico; exchange of land data on the Bonneville Unit, Central Utah Project, Utah; and development of a soil survey for the Navajo Indian Irrigation Rcjcct wherein the Bureau of Reclamation is providing the field data required to prepare the soil survey of the area. In the development of the New Mexico State Water Plan, we are working with the University and the Soil Conservation Service in identifying land suitable for irrigation. Here a Bureau soil scientist is assisting in the preparation of a soil association map which is then interpreted for content of irrigation suitability classes. Other direct cooperative work involves preparation of the Type I comprehensive basin studies, particularly in the Missouri Basin, the Pacific Northwest, and the Pacific Southwest Basins.

In the work being done overseas, we are now attempting to identify soils down to the category of Great Soil Groups. This is being done to provide a data base For correlating experimental findings and to transfer experience.

In addition to the foregoing uses regarding the irrigation function, the soil survey finds ● pplicaticnn in making flood hydrology studies by providing information on the soil characteristics of the watershed areas above storage reservoirs. The soil surveys are also used to develop estimates Of erosional losses for computation of the reservoir sediment storage space. Information regarding surficial deposits of construction materials can be found by using the soil survey. They have also found usefulness in developing plans for the management of reservoir areas for recreational and fish and wildlife purposes. me ❑ *pr provide an input for the decision apparatus wed to select the best recreation areas, optimize wildlife habitat, select soil conservation practices, define desired ownership patterns, and develop the land management plans.

After our projects are constructed and placed into operation, they are turned over to the local people for management and further development of the land. During this stage, the soil survey provides a basis for extending the agricultural experiment data and Bureau development

1/John T. Maletic, Chief, Land Resources Branch, Office of Chief Engineer, Bureau of Reclamation, Denver. Colorado

farm data to individual farmers. Conversion of the land to irrigation farming is then largely handled through cooperation of the water users with their local soil conservation district.

As you have long recognized, new and further uses are developing for the soil survey. This, in particular, includes applications to urban planning. Also, with the emphasis on pollution control, the soil survey provides a means for locating potential waste water reclamation projects. The surficial conditions essential for developing ground-water recharge projects can be characterized by soil surveys. They may also find use in identifying non-irrigated areas containing excessive soluble salts which are contributing excessive concentrations of dissolved solids to river systems. This would provide clues to development of structural or nonstructural measures to reduce such mineral accretions in our waterways.

In view of the many uses being made of the soil survey, it seems to me that for the next third of this century and beyond, soil classification ought to avoid being burdened with an overly strong agricultural bias. From their inception, the image of soil surveys was one of serving the domain of agriculture and, as you have long recognized, it can no longer be a viable tool if it is clouded with the myopia of agricultural use . . . whether it is at home or abroad. To do so would sacrifice the value of the survey for broader planning needs.

To enable better coordination of our work, the list of the counties in which land classification will be conducted in 1969 is attached. The program involves detailed land classification on about 1,040,000 acres, reconnaissance land classification surveys on about 9,100,000 acres, and complete reconnaissance irrigation potential inventories covering the states of Kansas and Nebraska.

Related activities of general interest will be briefly described. We conduct a "Soil Scientist Training Institute" at Colorado State University, Fort Collins, each summer for a 5-week period. By August 1970, 95 percent of all Bureau soil scientists will have completed this course. It is aimed at updating skills and techniques in selecting lands for irrigation. The course is conducted in July and August with the Agronomy Department staff of the Colorado State University providing 4 weeks of instruction and the Bureau of Reclamation 1 week. Subject areas include soil chemistry, soil physics, geomorphology, soil morphology and classification, drainage, irrigation suitability classification principles and practices, economics, and project planning. We would be happy to have representatives of the Soil Conservation Service who must deal with irrigation problems attend the Institute.

Economic research as related to land classification is under way with Iowa State University. This research is examining the economic basis for the Irrigation Suitability Classification with the aim of identifying better procedures for both performing land classification field surveys and the related agricultural economic studies. Production functions are being developed for various crops under a wide range of soil conditions. Such studies would provide improved quantification and support for specifying land class differentials in the irrigation suitability survey. Field research under the Iowa State contract is currently being done at Oregon State University and at Colorado State University, and we hope to have additional work done in California and North Dakota. Data inputs to the study are also being obtained from projects overseas.

A study has been completed on the usefulness of colored photographs in performing irrigation suitability surveys. This study was done in North Dakota and covered an area of 23 square miles. We will be glad to make available use of these colored photographs so that you may determine their usefulness for delineating families, series, and types.

Further research and development work is under way in the application of computer models for predicting the quality of return flow waters and the effect of a given water quality on the chemistry of the soil. Irrigation of the soil is being simulated by the computer involving such dominate processes as cation exchange, solution and dissolution of gypsum and calcium carbonate, and through put of nonreactive ions. We are also supporting research at the Universities of Arizona and California aimed at developing a model for predicting the movement of nitrate through soils.

We are contemplating undertaking research in the near future to develop better and more efficient ways of conducting field measurements on soils. We need new and better instruments and procedures for making field measurements important to sustained irrigation suitability. The aim here will be not only to reduce imprecision but to decrease labor and increase output of productive work. A joint effort in this area with Soil Conservation Service participation would be welcomed.

COUNTIES IN WHICH IRRIGATION SUITABILITY SURVEYS
WILL BE MADE BY THE BUREAU OF RECLAMATION
CALENDAR YEAR 1969

Arizona

No work scheduled.

California

Fresno
Inyo
San Benito
San Bernardino
Tulare

Colorado

Moffat
Rio Blanco
Routt

Idaho

Ada
Canyon
Elmore
Gem
Madison
Owyhee
Teton

Kansas

All counties have either been covered with a subreconnaissance survey in the last year or will be in 1969.

Montana

No surveys are scheduled.

Nebraska

All counties in the state will be covered by a subreconnaissance survey.

Nevada

Churchill
Clark
Nye

New Mexico

San Juan

North Dakota

Cass
Dickey
Grand Forks
La Moure
McHendry
Pembina
Ransom
Richland
Sargent
Steele
Stutsman
Traill
Walsh

Oklahoma

No surveys are scheduled.

Oregon

Clackamas
Gilliam
Klamath
Langell
Marion
Morrow
Sherman
Umatilla

South Dakota

Many of the counties in eastern South Dakota will be covered by a reconnaissance land classification during 1969.

Texas

No surveys are scheduled.

Utah

Emery
Garfield
Kane
Uintah
Wayne

Washington

Grant
Lewis
Lincoln
Okanogan

Wyoming

Sweetwater

STATEMENT PROM THE BUREAU OF LAND MANAGEMENT

Ronald L. Kuhlman

We appreciate the opportunity to attend this work-planning conference. The Bureau of Land Management recognizes that we have a pressing need for effective soil. information to assist in the formulation of management decisiona affecting the 450 million acres of public lend under our administration.

We have found that the present SCS capability ratings of Class "I and Class "II for rangeland do not provide the resource manager with sufficient information to identify the productive capability of rangeland soils under the local climatic conditions. We now feel that we can identify what is needed from these classes. Therefore, we have developed procedures that are compatible with National Standards Soil Survey procedures but specifically directed to assisting in the decisions made by the Bureau.

The BLM soil inventory procedures are patterned after the National Standard Soil Survey techniques in terminology, analysis, sample collection, profile descriptions, classification, and mapping. This will provide continuity in BLM's soils program with those of other groups and agencies. These standards establish intensive end moderate survey techniques. BLM's soils program objectives will allow that moderate and reconnaissance techniques be used in most situations.

Emphasis is placed an inventories with interpetations that will apply directly to resource management needs of the public lands. It will also include soil classification for land use planning such as zoning, retention end disposal (these are BLM terms). The inventory procedures contain two mapping levels: (1) Low intensity and (2) high intensity. The low intensity will be the standard inventory conducted on most public lends end will consist of collecting adequate soils data to satisfy most management demands. Because public lands contain areas that are inaccessible, due primarily to rough and mountainous terrain, the inventory system is designed for flexibility to include a broad, reconnaissance-type inventory but still yield adequate data for planning purposes. Tbe high intensity inventory has been designed for special studies on specific sites or areas planned for intensive use end requiring detailed information.

The inventory procedure developed will expedite the collection of roil data in a standard manner. It is anticipated that the inventories will be conducted by Bureau Soil Scientists who are not only well qualified but who understand the needs of the long-range Bureau program.

We recognize that substantial assistance can be obtained from soil '"formation in estimating site potential and limitations and in formulating other Judgment which increases the validity and effectiveness of management decisions. This is a first step in the long road to full utilizations of soils information.

Recent Accomplishments

Since our last report in January 1967, we have made substantial progress in establishing a position for soils consideration in the Bureau. This includes:

1. The development of . work load for soil scientists in several States as a result of specialized assistance from our Service Canter soil scientists.

2. The completion of our Policy Manual regarding soils management. This policy describes the soil inventories, interpretations, and cooperative surveys on the Public Domain.

3. The completion of our Soils Manual draft describing (1) basic soil principles and (2) application of soils data in BLM field operation,. The field procedures and techniques in collecting, using, and interpreting soils information are included in this manual.

4. Cooperative Studies - We are continuing to fund the development of extensive soil inventory procedures through cooperative research studies.

These studies by State include:

Colorado - Colorado State University is conducting studies that emphasize range production potential in relation to soil morphology and characterization.

USGS is continuing to study the Badger Wash Watershed including its soil end vegetation relationships.

Idaho - University of Idaho is involved in special studies concerning the use of ADP in the storage and retrieval of soils date.
ARS is under contract to intensively study the hydrology of small watersheds including the soils within the watersheds.

Montana - ARS is continuing to study the frail lands as they are effected by grazing system end various soil conditions.

Nevada - University of Nevada has bee" studying soils in the Eastgate Basin es they relate to land treatment practices and runoff potentials. The University hes also completed a study in 12 rangeland watersheds throughout Nevada that included the relationship between soils and native vegetation.

New Mexico - San Luis Watershed Studies are involved in the hydrology of small watersheds including their soils effect on runoff and vegetation.

Oregon - University of Oregon is involved in a study on Resource Analysis Methodology which includes the use of multiband spectral analysis and its application to resource management. This also involved a study of the relationship between soils end native vegetation.

Utah - The University of Utah is studying soils associated with Pinon-Juniper cover on small watershed. end the effects of conversion of the P-J to range on runoff and erosion.

Sager Wash Studies also include a study of the soils involved in frail lands.

Wyoming - Stratton sagebrush hydrology studies Include work on the soil relationship to runoff end erosion under various management practices.

General - In addition, the Bureau is also actively participating in the W-89 interagency committee.

5. Soil Surveys Completed - Progress made on intensive surveys is limited primarily to a few instances where work was completed on a cooperative basis through the Soil Conservation service or with the universities. Examples are the SCS survey "ear Susanville, California, end Eugene. Oregon.

Additional soil survey her bee" conducted in Idaho by agreements with the Bureau of Reclamation end the University of Idaho.

Limited soil surveys on specific areas subjected to high investment for treatment end use have been conducted by the Bureau in all the eleven western States.

6. Extent of Use - With the nine individuals having the special talent of soils scientists located in various offices throughout the Bureau, we are in a much better position to make use of published end other available soils information than two year. ago. These people, who are familiar for the most part with the SCS survey techniques, can make interpretations of the soils information that is available for use by District and State Office personnel. Upon completion of the soils manual and handbook, training sessions will be scheduled for District end State Office personnel to refresh their memories on basic soil principle8 and explain how these principles can be applied in making better management decisions.

Problems

A primary problem encountered in making effective use of available soils information is the lack of land management interpretations for our type of land. In most cases, the management interpretations of the capability unite have been made for irrigated or farm-type operations and are not applicable to extensive areas of range and forest lands. Another problem is the continuity of soil surveys. Generally, standard soil surveys have been limited to the privately owned and agricultural lands. Thus, large blocks of adjoining public lands with grazing potential or other potential remain unsurveyed.

How Would We Like to Use Soil Information

We want our resource management people to have a good understanding of the nature and basic characteristics of soils and to be able to effectively interpret soils data so as to provide assistance in formulating multiple use management decisions.

We would like to be proficient in the conduct of both intensive and extensive soil surveys and to be able to effectively interpret the findings. With the aid of our new manuals, we can do this.

Increased emphasis manpower-wise, by BLM must be directed to the whole subject of soils. We cannot hope to give adequate emphasis to soil factors and characteristics in making management decisions without a substantial increase in time and effort devoted to the subject. We must train our field people in the use of soils date as well as identification of soil problems.

We expect management interpretations of soils data will continue to present problems because of highly variable resource conditions and multiple resources uses.

DISCUSSION - USES OF SOIL SURVEYS IN THE BUREAU OF INDIAN AFFAIRS

James D. Simpson *

Our rate of making inventories has slowed a great deal since I last reported to this work-planning conference. We inventoried less than 1.5 million acres during the past field season. This brings our total acres inventoried to nearly 40 million acres, which leaves a little over 10 million acres of Indian lands remaining to be mapped. These remaining acres are primarily forest lands.

Since we are "earing completion of the mapping of all Indian lands except the forested lands we are changing the direction of our program from collecting basic data to using the collected data and finishing inventory reports. The exception LO this change in program direction is the study of significant soil differences in the forested areas in a" effort to establish guidelines for setting up mapping units Lor use in the forest.

I" this forest work we are using the "continuous forest inventory" plots as the base areas far study. This will provide us with a" opportunity to correlate timber growth in (gross cubic volume) from remeasured plots over long periods of time with soil conditions. The soil mapping unit groupings far this work have bee" based on such growth and use factors as:

1. Available water and fertility holding capacity
2. Rate of movement "f water, air, and plant roots within the soil
3. Soil workability
4. Water erosion susceptibility
5. Wind erosion susceptibility
6. Soil depth
7. Degree of wetness

I" addition, very detailed chemical and physical analysis have bee" wade of the mapping units. As the timber growth and soils data are analyzed, these analyses may be of great value in helping to explain significant differences that may show up within the groupings of soil mapping units.

Our best progress in this area of work. has bee" at Red Lake Reservation, Minnesota. The gathering of both Limber growth end soils data has been completed and a contract negotiated with the Ford Forestry Center, Michigan Technological University, for developing a data analysis program for automatic data processing. This contract is Lo be completed early in October 1969.

Now I would like to briefly tell you of some of our thoughts about using soils data and the follow-through for maximum results. For the landowner to make real use of inventory data, I am sure we all will agree, requires an extensive education and information program. This is especially true if you are trying to give India" people sufficient understanding about their resources to enable them to make the decisions about the development, use, and management of their resources. Our Bureau believes such a program must be an integral part of any long range plans far India" agricultural resources. Therefore, in the soils part of this educational and information program we are emphasizing four basic areas of work. We like to think of these areas as the first four grades in learning to use soil and range inventory data as a tool for planning and LO create a better understanding of agriculture resources. These are not new learning steps in agriculture but we feel they are very fundamental to using soils data and efficient use of resources.

The first grade of this approach is teaching of the basic concept - lands are different and should be used. managed, end developed in a manner suitable to each. Following this concept represents one of the easiest ways to get efficiency in operations. For each dollar or hour of labor invested you can expect a uniform return on investment. Further if this basic concept is not fully understood end believed in by the user he can see little need for soils date.

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In the second grade we teach some of the basic problems in resource use and management that are caused by soil differences. We believe this will help to simplify our educational job. Discussions in many cases can be limited to one or more basic problems that are significant to a local area. Understanding of such basic problems also creates a "why" for application of measures or practices. The creation of a "why" is often helpful in motivating people to change their way of doing things. Some of the basic problems we use are water and fertility holding capacity, movement of water, air, and plant roots within the soil, soil workability and erosion susceptibility.

The third area of teaching is the principle of taking care of each basic problem. This step gives flexibility of choice to the operator allowing him to fit development, use, and management into his own economic end social conditions, A" example: Is use of the. principle of using cover to prevent water erosion. Stubble mulch tillage, mulching or spraying by highway departments and plastic covers by contractors are all ways 'of carrying out the principle - but the one to be used is determined by associated economic or social pressures.

The fourth grade in this approach is the teaching of ways to carry out each principle taught. In the past we feel many of the people we have worked with were started et this grade level without the benefit of the early grades. This may be in pert why many conservation programs have had a slow acceptance by operators and particularly the acceptance of the need for soil inventories in planning. We are finding more and more that unless operators fully understand and are capable of substantially contributing to the decisions about the development, use, and management of their resources they will very likely not carry out plans developed concerning their resources. Knowledge of needed practices or measures is helpful in that it gives the operator the benefit of what others have done to take care of the same kind of problems and forma a basis for estimating cost and labor requirement for doing a job.

In carrying out our educations1 and training program, we are using most of the conventional visual aide combined with field trips and informational publications. Land, pasture, and range Judging contests are encouraged in our cooperation with the Federal and State extension services. We believe these contests are one of the better ways of teaching what we have set up as the first grade - the teaching of the basic concept lands are different end should be used, managed, and developed in a manner suitable to each.

As further guidance to our program we have designed our soil and range inventory reports for each inventoried area to furnish much of the needed information for teaching these first four grades. In this way, we as soil scientists are able to cell on other technicians and teachers to assist in carrying out the program with assurance that somewhat the same story will be told.

In this program we are not attempting to develop people capable of determining specific needs or designing ● peciel practices - but we are hopeful that regardless of the use they are making of the resources as operator or owners they will have a much better understanding of the resources. They will understand in general "Why" the soil conservationist. range conservationist, soil scientist, engineer or outdoor recreation specialist is recommending and designing measures and practices to meet specific conditions demanded by their land. A few of our goals are:

> If the use is range, we want people using the land to understand the reason they cannot graze shallow ridges and deep "alley soils in the same manner is in part the differences in the water holding capacity of their soils. This in turn is also one of the prime factors in determining the kinds of grasses the site will support: or if the range is badly overgrazed end the soils are deep medium or coarse textured they can expect more rapid recovery the" they can from fine textured soils because of the difference in workability and the manner in which the more sandy soils utilize the limit moisture of the western range country and that the difference in range readiness in a given area is directly dependent on soil texture.

Under irrigated agriculture certainly operators should have a general understanding that low water holding capacity of soils demand light and frequent water applications for efficient water use: or if the soil is of a kind that permits very rapid movement of water through it, it will demand short runs, large heads of water and greater slopes for border irrigation or in many cases it may limit itself to sprinkler irrigation in order to meet a desired level of irrigation efficiency: people using land should certainly appreciate the difference in fertility holding capacity in soils and its effect on the amounts and frequency Of application of commercial fertilizers.

For the dry farmers, many of these same problems affect the efficiency of their operation in a like manner and must be understood and given consideration for successful operation.

As a final goal, we are shooting at greater consideration for land differences by all concerned as we attempt to bring into harmony the related physical, economic and social factors for a continuing efficient use of land resources.

NATIONAL SOIL SURVEY PROGRAM AND THE BUREAU OF PUBLIC ROADS

Harold T. Rib*

It is indeed a pleasure to participate in this conference and to discuss some of the related activities of the Bureau of Public Roads. In the more than ten years that I have worked with and used soil survey reports, I have been impressed with the valuable engineering information contained in these reports. It is noteworthy that this information has increased in quantity and quality over the years to where it now covers a large variety of engineering endeavors. The guidelines for the inclusion of this excellent information, I am informed, is largely the result of the work accomplished at former conferences of this type. You are to he congratulated for such fine work.

The Bureau of Public Roads has been involved with the National Soil Survey Program since the early 1950's and has beer, a leading advocate in the use of these reports in the highway field. There is no need to review our cooperative program with SCS over the years, or our recent reduction in participation. This has been adequately discussed by Mr. Pelzner et previous meetings and can be found in the proceedings. What I would like to do is to review some of the Bureau's overall goals for this program, note the degree to which the goals have been achieved, and indicate our present activities related to the SCS program.

Three of the Bureau's goals in this program were: first, to increase the value of the soil survey reports to engineers through the inclusion of special engineering sections, written in terms engineers could understand; second, to inform highway engineers of the value of these reports, and promote the use by engineers; and third, to elicit the cooperation of the State highway departments in preparing rhe engineering sections. How well these goals were achieved is evident by the number of highway organizations cooperating in the program and using the reports in their work. At the peak of the Bureau's participation, 39 highway departments were cooperating in the program, and still others were using the reports in their work. Even after the Bureau's reduction in participation and direct support, it was rewarding to note that all but a few highway organizations continued their participation in the program. This clearly attests to the value that has been placed on these soil surveys in the highway field.

The recent reduction in the Bureau's participation is not indicative of any diminishing interest, nor the lack of value of this program to us: it was simply one "f reorientation of goals. After approximately 15 years of participation, the techniques and format had been developed to a stage where the program changed from a research-oriented to a production-oriented program. As a production item, it was felt that the work could now best be accomplished at the State level where there could be direct contact between the participating parties without the Bureau acting as an intermediary. In addition, since the program was now production-oriented, research funds could no longer be provided. Actually, we have not completely faded out of the picture like "old soldiers," nor have we eliminated all funding support. Where a State highway department's program involves some research aspects, the use of Highway Planning and Research (HP&R) funds has been approved. For example, we presently have HP&R research programs underway in Arkansas and Florida. Tbe study in Arkansas is determining the clay mineralogy and chemistry of selected Arkansas soils. Some of this information has appeared in recent soil survey reports (Cleveland, Cross and """druf Counties). The study in Florida is evaluating the pedological classification system as a basis for field sampling in highway construction.

The Bureau's staff activities on the cooperative program. however, have been greatly curtailed. It is limited to the acceptance of the engineering sections of those soil reports for which HP&R funds were used by cooperating States. During the pest 2½ years, 49 engineering sections have been accepted. This represents our direct participation. Our greatest effort to this program which would be considered of value, has been more indirect. It is that of promoting through discussions end training programs the use of these soil survey reports in the various areas of highway engineering. For example, it has been competently demonstrated by several engineers that engineering soils maps -- maps delineating soil unite with similar engineering properties -- can be prepared directly from the modern soil survey reports with little additional work. Thus, in training programs where we discuss techniques for developing engineering soil maps, we demonstrate the technique for using the soil survey reports. Curing 1968, this technique was demonstrated in two courses presented to State highway organizations, attended by over 60 persons.

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In conclusion, it is seen that some of the Bureau's major goals in this cooperative program have coma to fruition, although more work isstill needed. Even though our direct participation has diminished, we are still interested in promoting the cooperation between State soil scientists end soils engineers. We are always advancing the use of these excellent reports in the highway field. I feel confident in predicting that as more of these soil survey reports become available, engineers will use them even more extensively. I also think that with the increasing need for soils information, especially for regional planning of major transportation systems, the data furnished by the Soil Scientists will be sought after even more vigorously.

Thank you.

ABOUT THE LEGEND OF THE

FAO/UNESCO SOIL MAP OF THE WORLD (*)

I. INTRODUCTION

A'joint project for the preparation of a Soil Map of the World, based on international cooperation, was started in 1961 by FAO and UNESCO. The map is being compiled, at a scale of 1:5,000,000, from existing material and from additional information collected in areas where specific data were lacking. A" international Pane, of experts. representing the major regions of the world. advises the project a" scientific and methodological matters. Furthermore, cooperatio" has been received from a great "umber of soil scientists from many countries who have contributed original material and have assisted in the organization of fieldwork and correlation meetings.

Drafts of different continental maps, prepared in the framework of the project, were presented at the Eighth International Congress of Soil Science held in Bucharest in 1964, The Advisory Panel, at its meeting in Moscow in ,966, reached a" agreement a" thr principles to be applied for the construction of a" international legend. A first draft of the world soil map was presented at the Ninth International Congress of Soil Science held in Australia in ,968. Upon recommendation of the Congress, publication of the map will start in 1969. It will be produced in sheets with continental or sub-continental coverage and be accompanied by explanatory texts. It is aimed at to complete the map for the next International Congress of Soil Science.

II. SOIL UNITS

In preparing a legend which can be applied on a global basis, one is faced with the fact that at present there is no generally accepted system of soil classification. The different systems presently in use show profound divergencies as a result of differences in approach or in relation to the different environments for which they have bee" created. It therefore appeared necessary to establish a common denominator between the different soil classification systems and to combine into one outline the major soil units which have bee" recognized in different parts of the world. I" this respect. international soil correlation was and is a" important aspect of the project.

The "Definition. of Soil Units for the Soil Map of the World" (FAO, Rome, ,968) were presented at the last Soils Congress in Australia. The proposed units and their definition, were agreed upon in principle. The comments and suggestions for improvement are now being incorporated into a final draft. The amended list of soil units is give" hereafter :

(*) Presentation by R. Dudal,
Soil Correlator (FAO), at the
Technical Work-Planning Conference of the USA
National Cooperative Soil Survey
Charleston, 27-30 January 1969

7S/83578

List of Soil Units

(December 1968)

FLUVISOLS	**J**
Dystric Fluvisols	Jd
Eutric Fluvisols	Je
Calcaric Fluvisols	Jk
Gleyic Fluvisols	Jg
RHEGOSOLS	**R**
Dystric Rhegosols	Rd
Eutric Rhegosols	Re
Calcaric Rhegosols	Rk
ARENOSOLS	**Q**
Dystric Arenosols	Qd
Eutric Arenosols	Qe
GLEYSOLS	**G**
Haplic Gleysola	G"
Humic Gleysols	Gh
Calcic Gleysols	Gk
Thianic Gleysols	Gd
Plinthic Gleysols	Gp
Histic Gleysols	Gm
Tundric Gleysols	Gg
RENDZINAS	**E**
RANKERS	**U**
ANDOSOLS	**T**
Haplic Andosols	Tn
Vitric Andosols	Tv
Gleyic Andosols	Tg
VERTISOLS	**V**
YERMOSOLS	**Y**
Haplic Yermosols	Yn
Calcic Yermosols	Yk
Gypsic Yermosols	Yy
Luvic Yermosols	Yl
XEROSOLS	**X**
Haplic Xerosols	X"
Calcic Xerosols	Xk
Gypsic Xerosols	Xy
Luvic Xerosols	Xl
SOLONCHAKS	**Z**
Haplic Solonchaks	Zn
Humic Solonchaks	Zh
Takyric Solonchaks	Zt
Gleyic Solonchaks	Zg
SOLONETZ	**S**
Haplic Solonetz	Sn
Humic Solonetz	Sh
Gleyic Solonetz	Sg
PLANOSOLS	**W**
Haplic Planosols	Wn
Humic Planosols	Wb
Solodic Planosols	Ws
CASTANOZEMS	**K**
Haplic Castanozems	K"
Calcic Castanozems	Kk
Luvic Castanozems	Kl
CHERNOZEMS	**C**
Haplic Chernozems	C"
Calcic Chernozems	Ck
Luvic Chernozems	Cl
Gleyic Chernozems	Cg
PHAEOZEMS	**H**
Haplic Phaeozems	Hn
Calcaric Phaeozems	Hk
Luvic Phaeozems	Hl
Gleyic Phaeozems	Hg
CAMBISOLS	**B**
Haplic Cambisols	Bn
Eutric Cambisols	Be
Calcaric Cambisols	Bk
Vertic Cambisols	Bv
Humic Cambisols	Bh
Andic Cambisols	Bt
LUVISOLS	**L**
Haplic Luvisols	L"
Chromic Luvisols	Lc
Ferric Luvisols	Lf
Albic Luvisols	La
Plinthic Luvisols	Lp
Gleyic Luvisols	Lg
PODZOLUVISOLS	**D**
Haplic Podzoluvisols	Dn
Gleyic Podzoluvisols	Dg
PODZOLS	**P**
Humo-Ferric Podzols	Pn
Ferric Podzols	Pf
Humic Podzols	Ph
Ochrir Podzols	PO
Placic Podzols	Pi
Cleyic Podzols	Pg
ACRISOLS	**A**
Haplic Acrisols	A"
Humic Acrisols	Ah
Plinthic Acrisols	Ap
Cleyic Acrisols	Ag
NITOSOLS	**N**
Dystric Nitosols	Nd
Eutric Nitosols	Ne
FERRALSOLS	**F**
Haplic Ferralsols	Fn
Ochric Ferralsols	Fo
Rhodic Ferralsols	Fr
Humic Ferralsols	Fh
Plinthic Ferralsols	Fp
HISTOSOLS	**M**
Dystric Histosols	Md
Eutric Histosols	Me
LITHOSOLS	**I**
Dystric Lithosols	Id
Eutric Lithosols	Ie

This list reflects a monocategorical classification of soil units, including what appear to be the "major soils" covering the earth's surface on the basis of present knowledge on their genesis. morphology and distribution. and on their significance as resources for production. Thr units of this outline arc called "soil groups" but may correspond to different categorical levels in existing soil classification systems. When compared to the USDA soil classification. correlation can most commonly bc made at the group or subgroup level; however, equivalents may range from the family to the order (see also Section V).

The different units are characterized by a set of measurable and observable properties. The differentiating criteria and diagnostic horizons used for the soil definitions were, to a great extent, borrowed from the USDA comprehensive system of soil classification. It is to be noted, however, that soil temperature and moisture have not been used as such in the formulation of thr definitions. Furthermore, certain horizons which in the USDA system have been used as diagnostic horizons, such as fragipan, duripan and petrocalcic horizons, have not been consistently observed or mapped on a world wide basin. In the present outline. they have therefore been recognized at phase level, at least where information was available. Other soil classification systems have contributed to the subdivisions and the nomenclature which were adopted. Whenever possible. traditional soil names have been maintained. For certain groups, new names had to be coined in order to avoid the confusion which the different use of certain terms in different countries had created.

III. MAPPING "NITS

The mapping units consist of associations of dominant and associated soil groups occurring within the limits of mappable physiographic entities. These associations may be phased according to the presence of indurated layers (fragipan, duripan or petrocalcic horizon) or hard rock at shallow depth, stoniness, salinity and alkalinity. Where information is available, the textural class and the slope class of the dominant soil group are indicated.

The soil associations are noted on the map by the aymbo, representing the dominant soil group followed by a figure which refers to the descriptive legend which gives the full composition of the association:
e.g. Lc 12 : Chromic Luvisols, Rendzinas and Vertisols
The soil associations are coloured according to the colour assigned to its dominant soil group.

The textural class of the dominant soil group is shown by a figure (respectively 1, 2 and 3. for coarse, medium and fine texture1 following the association symbol:
e.g. Lc 12-3 : Chromic Luvisols, fine textured, Rendzinas and Vertisols.

Where information on topography is available, the slope class is indicated by a small letter (respectively a, b or c. for level. rolling. mountainous) following the textural notation:
e.g. Lc 12-3b: Chromic Luvisols, fine textured, Rendzinas and Vertisols; rolling.

Saline and sodic phases are noted by adding the letters z or s respectively to the association symbol. Fragic, duric, concretionary, petrocalcic. lithic, gravelly and stony phases are shown by overprints (*).

For the first draft of the Soil Map of the World the number of associations per continent ranger between 200 and 400.

(*) The guidelines for the construction of the legend arc set out in detail in the above-mentioned report (FAO, Rome, 1968).

IV. CLIMATIC VARIANTS

The preparation of soil maps on a regional or continental scale has shown that certain soils, though occurring in different climatic conditions, have a similar morphology and chemical composition. The occurrence of similar soils in different environments may result from: (1) weak soil development on recent sediments which do not yet reflect a marked influence of the climate on soil formation (e.g., for Fluvisols); (2) the dominant influence of one or more soil forming factors other than climate (e.g., the occurrence in different climatic belts of Podzols on quartz sands, of Andosols on materials rich in volcanic glass or of Vertisols on sediments rich in montmorillonite); (3) the effect of previous weathering cycles on soil formation as a result of which soils show marks of climatic conditions which no longer prevail (e.g., the occurrence of Ferralsols in sub-arid conditions or of Chromic Luvisols in humid temperate areas).

The definitions of soil units given below do not reflect differences in soil temperature and soil moisture unless such differences are correlative with other soil characteristics which can be preserved in samples. However, it is felt that, in recognition of the importance of temperature and moisture as soil properties as well as production factors, similar soils occurring under different climatic conditions should be referred to as climatic variants. The number and nature of such "climatic variants" is under study. They could be marked on the soil map by an overprint of dotted boundaries or attention could simply be called to their occurrence by showing major climatic subdivisions on an inset map. An attempt is made to make separations which, besides a pedogenetic significance, also have a broad ecological implication which would open the way for establishing, on a regional basis, a relationship between soils and their agricultural potential, thus increasing the applicability of small-scale soil maps.

V TENTATIVE CORRELATION

The units which are compared here are those listed in the March 1967 supplement of the USDA Soil Classification, A comprehensive system, 7th Approximation (USDA, 1960), and the December 1968 amendment of the Definitions of Soil Units for the Soil Map of the World (FAO,1968). (The amended list is given above; the adjusted definitions will be issued by mid 1969).

To be complete and precise this correlation should be worked out at the level of thr fourth category of the USDA system. It is felt, however, that the listing of all subgroups would be too elaborate for the purpose of this general presentation. The correlation table has therefore been simplified along the following lines :

1. For the Soil Map of the World, soil moisture and soil temperature are not "srd as differentiating characteristics. Soils which occur under different climatic conditions. but are morphologically similar, may be separated as climatic variants. As a result, the suborders, groups and subgroups which key out essentially on account of their moisture regime and soil temperature are correlated on the basis of their other characteristics and are not listed in the table.

e.g.	typic cryaquolls	correlate like	typic haplaquolls (Humic Gleysols)
	calcic cryaquolls	" "	calciaquolls (Calcic Gleysols)
	histic cryaquolls	" "	histic haplaquolls (Histic Gleysols)
	argic cryaquolls	" "	typic argiaquolls (Gleyic Phaeozems)
	typic ustochrepts	" "	typic eutrochrepts (Calcaric Cambisols)
	udic haplustolls	" "	typic haplustolls (Haplic Castanozems)
	typic tropaquepts	" "	typic haplaquepts (Haplic Gleysols)
	typic dystropepts	" "	typic dystrochrepts (Haplic Cambisols)
	haplustox	" "	haplorthox (Haplic Ferralsols)
	xererts, uderts . . .	" "	vertisols (Vertisols)
	usti, udi, xeri-fluvents	" "	fluvents (Fluvisols).

It is to be noted that units for which variations in soil moisture and soil temperature are correlative with differences in other soil properties are, of course. shown separately. This applies to the suborders of the Alfisals and Mollisols which, though named after their soil moisture and temperature regime (e.g. udalfs, ustalfs, borolls, xerolls ...), differ also in other characteristics. The pergelic cryaquepts and pergelic cryaquolls are separated on account of their permafrost horizon.

2. As mentioned above, fragipans, duripans and petrocalcic horizons are shown on the Soil Map of the World as "phases" (marked as overprints where information is available). Therefore, groups and subgroups which are named and key out essentially on the presence of these horizons are correlated on the basis of their other characteristics and are not listed in the table :

e.g.	typic fragiaquepts	correlate as a	fragic phase of typic haplaquepts (Haplic Gleysols)
	humic fragiaquepts	" "	" " typic humaquepts (Humic Gleysols)
	typic duraquolls	" "	duric phase of typic haplaquolls (Humic Gleysols)
	natric duraquolls	" "	" " typic natraquolls (Gleyic Solonetz)
	argic duraquolls	" "	" " typic argiaquolls (Gleyic Phaeozems)
	natric durustalfs	" "	" " typic natrustalfs (Haplic Solonetz)
	petrocalcic calciustolls	" "	petrocalcic phase of typic calciustolls (Calcic Castanozems)
	petrocalcic paleustolls	" "	" " typic argiustolls (Luvic or Haplic Castanozems)
	paleorthids	" "	" " camborthids (Haplic Yermosols).

3. Pale-groups do not have specific equivalents in the list of units for the Soil Map of the World. Those which are separated on the presence of a petrocalcic horizon are shown as petrocalcic phases. as explained above. The abruptic (alb)aquic pale-soils often qualify as Planosols. The oxic subgroups fit the Nitosols. The remaining ones are combined with the argi- or haplo-groups (e.g. Argiudolls; Haplustalfs, etc.).

4. Considering the scale of the Soil Map of the World, a number of subgroups of the 7th Approximation cannot be shown separately, e.g. vermic, glossic, pachic, leptic, aeric, cumulic, ultic, udic; mollic subgroups are separated in the Yermosols and Xerosols only: vertic and andic subgroups in the Inceptisols: albaquic subgroups in the Pale-groupa. Alfic subgroups are separated in the Psamments only: oxic subgroups only in the Pale-groups. Ustalfs, Xeralfs and Quarzipsamments.

Correlation table

Soil Map of the World (Units, December 1968)		USDA 7th Approximation (Units, March 1967)	
FLUVISOLS			
Dystric Fluvisols	)		acid (1)*
Eutric Fluvisols	)	Fluvents	non acid
Calcaric Fluvisols	)		calcareous
Gleyic Fluvisols		(Fluventic) Aquents (2)	
RHEGOSOLS	(	Orthents (3)	
	(	Psamments (except oxic Quarzipsamments and alfic Psamments)	
Dystric Rhegosols			acid (1)
Eutric Rhegosols			non acid
Calcaric Rhegosols			calcareous
ARENOSOLS			
Dystric Arenosols		Oxic Quarzipsamments	
Eutric Arenosols		Alfic Psamments	
CLEYSOLS (4)			
Tundric Gleysols	(	Pergelic Cryaquepts	
	(	Pergelic Cryaquolls	
Thionic Gleysols	(	sulfureous families of Aquents and Aquepts	
Haplic Gleysols	(	Haplaquepts	
	(	non Fluventic Aquents (2)	
Humic Gleysols	(	Humaquepts (except Histic ones)	
	(	Haplaquolls (except Histic and Calcic ones)	
Calcic Gleysols	(	Calciaquolls (5)	
	(	Calcic Haplaquolls	
Plinthic Gleysols		Plinthaquepts	
Histic Gleysols	(	Histic Humaquepts and Histic Cryaquepts (except Pergelic ones)	
	(	Histic Cryaquolls and Histic Haplaquolls	

* The figures in brackets refer to the explanatory notes on pages 10 and 11.

Soil Map of the World	USDA 7th Approximation
RENDZINAS	Rendolls
RANKERS	Entic Haplumbrepts (normally also lithic)
ANDOSOLS	
Haplic Andosols	(Dystrandepts (6) (Eutrandepts (Hydrandepts
Vitric Andosols	Vitrandepts
Gleyic Andosols	Andaquepts
VERTISOLS	Vertisols (7)
YERMOSOLS	
Haplic Yermosols	non Mollic Camborthids
Calcic Yermosols	non Mollic Calciorthids with calcic horizon
Gypsic Yermosols	non Mollic Calciorthids with gypsic horizon
Luvic Yermosols	non Mollic Haplargids
XEROSOLS	
Haplic Xerosols	Mollic Camborthids
Calcic Xerosols	Mollic Calciorthids with calcic horizon
Gypsic Xerosols	Mollic Calciorthids with gypsic horizon
Luvic Xerosols	Mollic Haplargids
SOLONCHAKS	
Haplic Solonchaks	Salorthids
Humic Solonchaks	(Salorthidic Calciustolls (Salorthidic Haplustolls
Takyric Solonchaks	Salorthids (8)
Gleyic Solonchaks	saline phases of Aquepts or Aquents (9)
SOLONETZ	
Haplic Solonetz	Natriboralfs, Natrudalfs, Natrustalfs, Natrixeralfs
Humic Solonetz	(Natralbolls, Natriborolls, Natrustolls, (Natrixerolls, Natrargids, Nadurargids, (Natric Paleargids, Natric Palexerolls
Gleyic Solonetz	(Natraqualfs (Natraquolls
PLANOSOLS (10)	
Haplic Planosols	Albaqualfs (and some abruptic aquic Pale-soils) (10)
Humic Planosols	Argialbolls (and some abruptic aquic Pale-soils) (10)
Solodic Planosols	- (11)

Soil Map of the World		USDA 7th Approximation
CASTANOZEMS (12)		
Haplic Castanozems		Haplustolls (except salorthidic ones)
Calcic Castanozems		Calciustolls (except salorthidic ones)
Luvic Castanozems		Argiustolls
CHERNOZEMS (12)		
Haplic Chernozems	(	Haploborolls
	(	Vermiborolls
Calcic Chernozems		Calciborolls
Luvic Chernozems		Argiborolls
Gleyic Chernozems		Calcic Argiaquolls
PHAEOZEMS (12)		
Haplic Phaeozems	(	Hapludolls
	(	Vermudolls (in part, 13)
Calcaric Phaeozems		Vermudolls (in part, 131
Luvic Phaeozems		Argiudolls
Gleyic Phaeozems		Argiaquolls (except calcic ones)
CAMHISOLS		
Haplic Cambisols		Dystrochrepts (except andic ones)
Eutric Cambisols		Eutrochrepts (without carbonates in the cambic horizon) (except the andic ones)
Calcaric Cambisols		Eutrochrepts (with carbonates in the cambic horizon)
Vertic Cambisols		Vertic Eutrochrepts
Humic Cambisols		Haplumbrepts (except andic ones)
Andic Cambisols		Andic Dystrochrepts, Eutrochrepts and Haplumbrepts
LUVISOLS		
Haplic Luvisols	(	Hapludalfs
	(	Agrudalfs
Chromic Luvisols	(	Haploxeralfs
	(	Haplustalfs (except oxic ones)
	(	Rhodoxeralfs (except oxic ones)
	(	Rhodustalfs (except oxic ones)
Ferric Luvisols	(	Oxic Haplustalfs
	(	Oxic Rhodustalfs
	(	Oxic Rhodoxeralfs
Albic Luvisols		Eutroboralfs
Plinthic Luvisols		Plinthoxeralfs, Plinthustalfs
Gleyic Luvisols		Ochraqualfs, Umbraqualfs
PODZOLUVISOLS		
Haplic Podzoluvisols	(	Glossudalfs, Ferrudalfs
	(	Glossoboralfs
Gleyic Podzoluvisols		Glossaqualfs

Soil Map of the World		USDA 7th Approximation	
PODZOLS			
Homo-Ferric Podzols		Orthods (except placic ones) (in part, 14)	
Ochric Podzols		Orthods (in part, 14)	
Ferric Podzols		Ferrods	
Humic Podzols		Humods (except placic ones)	
Placic Podzols	(	Placorthods	
	(	Placohumods	
	(	Placaquods	
Gleyic Podzols		Aquods (except placic ones)	
ACRISOLS			
Haplic Acrisols	(	Hapludults, Rhodudults	
	(	Haplustults, Rhodustults	
	(	Haploxerults, Rhodoxerults	
Humic Acrisols		Humults	
Plinthic Acrisols		Plinthudults, Plinthaquults	
Gleyic Acrisols		Aquults (except Plinthaquults)	
NITOSOLS			
Dystric Nitosols	(	Oxic Palehumults, Oxic Paleudults, Oxic Paleustults	
	(	Oxic Palexerults	
Eutric Nitosols	(	Oxic Paleudalfs	
	(	Oxic Paleustalfs	
FERRALSOLS (15)			
Haplic Ferralsols	)	Haplorthox, Acrorthox, Gibbsiorthox	
Ochric Ferralsols	)		
Rhodic Ferralsols		Eutrorthox (in part)	
Humic Ferralsols		Humox	
Plinthic Ferralsols		Plinthaquox	
HISTOSOLS			
Dystric Histosols	)	Histosols	acid
Eutric Histosols	)		non acid
LITHOSOLS			
Dystric Lithosols	)	Lithic subgroups. very shallow classes	
Eutric Lithosols	)		

Explanatory Notes

(1) The dystric and eutric groups within the Fluvisols and the Rhegosols are separated et pH KCl 4.2. This is somewhat lower than the limit between the USDA acid and nonacid reaction classes separated at p" water 5.5, The figure of pH KCl 4.2 has been adopted in analogy with the separation made between Dystric and Eutric Histosols which is used in the Canadian soil classification.

Unlike for the Psamments, the reaction classes are also applied here to the coarse texcured Rhegosols and Fluvisols for the sake of *uniformity*.

(2) Nonfluventic Aquents are grouped with the Haplic Gleysols.

(3) The separation between Orthents and Psamments is made by using textural classes. Arents are grouped with the units of which they show fragments of diagnostic horizons.

(4) Halaquepts are not shown separately; they are marked as sodic phases. Neither do the Hydraquents have a specific place; part of them fall into the Thionic Gleysols, Psammaquents are shown as a coarse textured class of one of the other Gleysols.

(5) For the Calcic Gleysols the depth limit of the calcic horizon has been set at 100 cm, so that both Calciaquolls and Calcic Haplaquolls fell into this unit.

(6) The need has been felt to make a further subdivision within the Haplic Andosols in order to reflect the separation between Dystrandepts, Eutrandepts end Hydrandepts. It appeared, however, that not enough information was available to make such a subdivision et the scale of the map.

(7) It has been attempted to make a further subdivision between Pell- and Chrom-Vertisols. Here again, it seemed that et a world scale it is difficult to obtain the necessary information Co do so.

(8) Takyric Solonchaks cover the Takyrs of the USSR (saline soils of heavy texture, which form surface crusts sod show polygonal cracking). They are likely to correlate with Salorthids.

(9) Saline soils being saturated with water for more than one month a year cannot be classifled as Salorthids. Gleyic Solonchaks therefore probably correlate with saline phases of Aquepts or Aquents.

(10) No specific place is foreseen in he Soil Map of the World outline for the Pale-groups. Those which show abrupt textural changes sod aquic or albaquic features fit the Planosol definitions. The oxic Pale-groups fell into the Nitosols.

(11) The Solodic Planosols are meant to cover what has been called Solods. Many of these soils fit the Argialbolls but are separated here on a sodium saturation which exceeds 6 percent in some part of the B horizon. Some albaqualfic natric or some argialbollic natric subgroups (e.g. within the Xeralfs or Ustalfs) may also fit the Solodic Planosols (natric being understood here as subgroups with high sodium saturation but not having . natric horizon).

(12) The noncalcic subgroups of the Xerolls correlate as a climatic variant of the Phaeozems. The calcic subgroups, however, fall within the Chernozems or Castanozems, depending on the colour of their surface horizons.

(13) Only the calcareous Vermudolls correlate with the Calcaric Phaeozems. The other Vermudolls ore grouped with the Haplic Phaeozems.

(14) With the Ochric Podzols, it is attempted to ● epsrete within the Orthods the soils formerly called "Brown Podzolic." h definition is under study.

(15) The definition of the Ferralsols matches the one of the Oxisols. The subdivision of the Ferralsols, however, follows a different outline. The Rhodic Ferrslsols, normally formed on basic materials, cover most of the Eutrorthox. The Haplic and Ochric Ferralsols cover the Haplorthox, Acrorthox and Gibbsiorthox. The Ochric Ferralsols cover part of the kaolinitic families generally occurring under conditions of permanent humidity in equatorial regions.

FAO, Rome
January 1969

CARTOGRAPHIC SUGGESTIONS TO IMPROVE SOIL MAP COMPILATION

Charles W. Koechley[1/]

One of the very important objectives of the Soil Conservation Service in the National Cooperative Soil Survey is to increase the number of publications while improving the quality and shortening the time-lag between the completion of field work and the distribution of the published soil surveys. This involves not only the soil scientists at every level, but the cartographers, editors, and others.

To achieve these objectives requires good understanding of the other fellow's problems, and cooperation all along the line. Higher quality field work is essential if the production of good quality published maps is to be increased, the time-lag reduced, and the cost kept to a minimum. Most of you know that we have a backlog of more than 300 unpublished surveys for which the field work has been completed. We are, however, funded and staffed to produce maps for fewer than 50 publications annually. This indicates the need to examine the different parts of the work and, if necessary, reorganize it to bring about a balance to reduce the backlog and keep it under control from here on out. This could mean changes in assignments, funding, and staffing as well as changes in policy, procedures, and map format.

Greater attention must be given to long-range planning and the establishment of realistic and dependable deadlines. This is necessary so that all steps may be completed on time and in proper sequence to assure a smooth flow of work from the completion of the field surveys through the distribution of the publications.

To speedup operations, lower costs, and improve the quality of the work will, without a doubt, require some changes in our way of doing things. This may not only mean new procedures, formats, and the like, it may also mean doing a better job of the old and accepted procedures that are not now being followed universally or are not being done well. For example, a field mapping legend should be carefully planned and developed at an early stage in the soil survey to provide for the reasonable and foreseeable needs of the users. We not only need a good field mapping legend, but the field mapping itself needs to be carefully controlled to insure that the maps can be published at a minimum scale which will legibly present the significant soil delineations. Greater use needs to be made of ad hoc symbols to reduce the number of small delineations. Soil separations should not be made unless there is a significant difference in their use and management. The complexity of the delineations affect the map scale which has a direct and almost proportional effect on the cost of the map compilation and printing.

One of the most useful and important, old and proven, "tools" which is not fully used by all soil scientists is the stereoscope. The cartographers know photointerpretation is not being used properly as they often find drainage and bottom-land soils delineated on hillsides. Almost all drainage can be delineated easier, better or more accurately by photointerpretation combined with ground observations.

Soil scientists can be most helpful to the cartographers as well as the users by being careful to make the line work and lettering perfectly legible so that it can be easily read and not subject to misinterpretation. The soil survey should be carefully matched from one to another to be certain that the lines match and the soil symbols are correct. The field sheets should be dependably reviewed and corrected throughout the survey and before it is submitted to the Cartographic Division for publication. These suggestions may seem to be "old hat", but they are things that give the Cartographic Division many of its greatest problems which often lead to delays in publication and increases in the cost of publication.

With the improvement in airplanes, aerial cameras, lenses, and photographic materials it appears that ultra-high altitude aerial surveys may prove to be quite advantageous. In an attempt to reduce costs we have, for several years, been trying procedures using aerial photography in certain areas flown at ultra-high altitudes and at small scales. The idea is to make it possible to provide atlas sheet size photographs (10"x15" +) and to eliminate the need for mosaicking individual prints. This could save time and money, and improve on the photo-image quality of our base maps. This has now been used in a number of States and soil survey areas. In some places it has been used for field sheets. In most areas it has been used for transferring older soil surveys to new and up-to-date photo base maps. A number of different

[1/] Director, Cartographic Division

procedures for making the transfer or for using them directly as field sheets are now undergoing tests. We should within a short time be able to provide recommendations for one or two better ways of doing the job. At the present time it appears that this idea will be workable only in areas where there is little relief. It also appears that it can be used only where there is less than 300 feet difference in elevation within a radius of two miles from any point.

In these days of orbiting satellites we hear much of remote sensing. We usually think of it as applying only to the orbiting satellites, but the term actually includes any aerial photography. So the Soil Survey, the Soil Conservation Service, and others have actually been in the remote sensing business for more than 30 years. As improvements are made and knowledge gained, what we really think of as remote sensing will undoubtedly be much more helpful to soil scientists. For the immediate future, however, I think we need to think in terms of better aerial photography and perhaps the use of color and infra-red film. We have made several limited tests of color aerial photography. We find that the costs are still relatively high. In limited tests by a soil scientist it appears that color photography offers little advantage over the conventional black and white for detailed soil surveys at the present state of the art. The black and white infra-red, in my opinion, offers the greatest promise for immediate use by soil scientists for detailed soil surveys. It differentiates the well-drained and wet areas from the dry ones to a remarkable degree. It is, however, a contrasty film which is often objectionable to many users. This bears looking into, and with more widespread use and some improvement the contrasty feature might be more acceptable and actually prove to be highly satisfactory.

Remote sensing devices of a number of different kinds are being developed by NASA and the armed services. If you are interested in keeping up with the developments in this area, you can read articles that appear occasionally in some of the popular publications. I would refer you particularly to FORTUNE magazine, June 1968; the National Geographic, January 1969; TRUE magazine, early 1968; POPULAR MECHANICS, and others.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
Charleston, South Carolina
January 27-30, 1969

REPORT OF THE COMMITTEE ON TECHNICAL SOIL MONOGRAPHS

Regional Committee Reports.

Three 1968 Regional Technical Work-Planning Conference committee reports on Technical Soil Monographs were reviewed. The reports were from the "ester" (W), North Central (NC), and Northeastern (NE) Regions. The Southern Region did not have a monograph committee.

The three regional committees (W, NC, end NE) agree that technical monographs are needed as set forth in Soils Memorandum-39 (Rev. 1). They also agree with the recommendations of the 1963 National Work-Planning Conference committee report regarding the content of technical monographs and the areas for which they should be prepared. These items (listed in preceding sentence) do not present problems to the completion of technical monographs.

All three committees (W, WC, NE) reported difficulty in placing higher priorities o" the preparation of technical monographs than on other more pressing jobs such as the new classification system, soil correlation, and the coordination of soil interpretations. The committees also expressed difficulty in finding qualified soil scientists to work on technical monographs. Within the Soil Conservation Service most felt that the best opportunity for completing technical monographs is to obtain (on a contract basis) qualified soil scientists who have retired. Graduate students working on advanced degrees can contribute also to the completion of technical soil monographs. Securing priorities for this work and obtaining qualified men to write the monographs are the two major problems in getting more monographs prepared .

Progress on Technical Monographs.

1. The technical soil ❑ onogrwb of the Nashville Basin (Max Edwards, et al.) has bee" completed and is in the Information Division for final editing for publication.

2. The technical soil monograph of Central and North Texas (Oaks, et al.) is in the final stages Of completion. It is estimated that it will take about 2-a" months (working time) to complete the writeup of the laboratory data.

3. The technical soil monograph of the Red River Valley of Minnesota, North Dakota, and South Dakota is in the preliminary stages of preparation. Target date for completion is 1969.

4. A soil monograph of the soils of the Mississippi Delta has bee" started as a project of the Southern Regional Soil Research Committee and is now well under way.

5. The Northeast and North Central Regional Committees on Technical Monographs listed four areas each within their regions thst should be given priority for the preparation of technical monographs. It is not likely that thin work will be given high priority.

6. The "ester" Regional Committee on Soil Monographs agreed to restrict its activities to benchmark soils and to drop from the ● ,'?"da any activity on technical monographs during the next two years.

Technical Monographs on Soil Taxa

The National Committee on Technical Monographs suggests that consideration be given to technical monographs about soil taxa as wall as technical monographs for specific soil areas. The "monograph taxa" publication would be In the higher categories of the new system, but not all would be of the same category. It may be possible to have some monographs at the order level such a.8 for the Vertisols, the Oxisols, and the Histosols; other taxa may best be discussed at the suborder and perhaps some at the great group.

Organization of monographs by taxa would make In-depth discussions of soil genesis clearly possible. In-depth treatment of soil genesis by geographic areas (technical soil monograph areas) is difficult for two reasons. One IS that a monograph area is not large enough to cover the full range of. taxon; and the other is that every monograph area has several taxa, even at the order level, and to expect authors to cover comprehensively the genesis of all taxa in a monograph area Is unrealistic. (he Central Basin in Tennessee, for example, has five taxa at the order level.) Furthermore, such coverage, if It were possible, would result in considerable repetition because soils of a given taxon may occur in several monograph areas. Also It would result in the Information about the genesis of the soils of a taxon being scattered among several publications rather than being concentrated in One.

Another mason for ❑ o(LoBIIphs by taxa relates to information ● totrgc, processing, and retrieval by the we of automatic data processing. Within a few years we plan to have our basic soil data I" a computer system. This will make possible several things not feasible now. Among these are making summaries of data about soil characteristics, including limits; making numerous multiple regression analyses; and testing many hypotheses. While automatic data processing also will have important applications to monographs of soil areas, it would contribute more to monographs of taxa.

In general, the outline now used for technical monographs could be followed, with some adjustments, for the soil taxa monograph. In place of a soil association map, a small-scale map would be used to ❑ hw the location of the soil taxon being discussed. It would not be practical to describe and discuss all of the soil series under a high level taxon, although discussion of the subgroups might be considered. la-depth discussions of soil genesis, particularly of the relevant diagnostic horizons would be expected in monographs on soil taxa. The following I, a listing of orders ● "d ● ,bordere in the new soil classification system tbat show promise as taxa to be discussed in the proposed new soil taxa ❑ oaographnr

Entisols	Borolls	Ustalfs
Vertisols	Udolls	Xeralfs
Andepta	Ustolls	Aquults
Aquepts	Xerolls	Humults
Ochrepts	Spodosols	Udults
Tropepts	Aqualfs	Ustults
Umbrepts	Boralfs	Xerults
Albolls	Udalfs	Oxisols
Aquolls		Histosols

Committee Recommendations.

1. That the National Cooperative Soil Survey consider the proposed new "Monograph of Soil Taxa" as another kind of technical monograph that c." be prepared to provide greater "in-depth" study and evaluation Of the soil forming processes as related to soil classification ● nd interpretations.

2. That regional work-planning conferences react to the proposed Monograph of Soil Taxa as set forth in this committee report and provide the National Work-Planning Conference with suggestions for content, implementation, or for rejection of the proposal.

3. That selected members of the regional work-planning conferences review and evaluate the Technical Monographs of the Nashville Basin and of Central and North Texas (when available) and send their comments for change or improvement to the National Technical Work-Planning Conference for evaluation.

4. That the National Work-Planning Conference of the National Cooperative Soil Survey continue to encourage the preparation of technical monographs.

5. That the National Committee on Technical Monographs be placed on a standby basis to report on activities or recommendations made by regional conferences on technical monographs or Monographs of Soil Taxa to the next National Work-Planning Conference.

BENCHMARK SOILS

The National Soil Monograph Committee reviewed regional committee reports on benchmark soils.

The benchmark soil committees in the Northeast and Midwest made no recommendations. The Western regional committee urged that SCS State staffs and representatives of agriculture, experiment Stations stimulate interest in writing benchmark reports. The Southern region did not have a benchmark soil committee.

The 1967 National Work-Planning Conference report on technical monographs reported 41 completed benchmark reports and 27 in progress. Of the 27 in progress, 3 were completed in the last two years (2 from the Western States and 1 from the Northeast).

All regional committees reporting expressed the same problem--lsck of priority for doing this work as compared to other more pressing tasks. With ADP soon to become a reality some soil scientists have questioned the need for preparing benchmark reports.

The National Committee feels that it is important to assemble basic data by kinds of soil into benchmark soil reports for use in soil correlation and soil interpretations whether or not ADP is used. These data are needed to "feed into the computer" as well as to be available for those making decisions daily.

Recommendation.

1. The National Committee recommends that efforts be continued toward the completion of benchmark soil reports.

GENERAL (SMALL-SCALE) SOIL MAPS

The National Soil Monograph Committee reviewed regional committee report,, on small-scale maps and legends as they applied to published soil surveys, special reports, and RC&D project reports.

The Southern and the Western regions had a committee on general (small-scale) soil maps. Both regional committees explored the compilation and use of small-scale maps and interpretive legends. Some trials were made in the Southern States using different categorical levels of the new classification system on small-scale maps. All recommendations made by the committees were within present Service policy.

Recommendation.

1. The National Committee urges thst all soil scientists making small-scale maps follow the guidance provided in the following: (1) Soils Memorandum SCS-33 (Revised), August 14, 1961; (2) Advisory Solla-12 issued September 13, 1967; (3) article in May 1968 issue of Soil Conservation magazine on small-scale maps.

PUBLICATION OF SOIL SURVEY MAPS AND INFORMATION

The National Committee on Technical Monographs reviewed this regional committee report. A national committee does not exist for this topic.

The Western region had a committee on publication of soil survey maps and information. The objective of the committee was to help sped up and improve published soil surveys.

No recommendations were made that hsd not been considered previously by a national committee appointed by the Administrator two years ago for improving soil surveys and reducing costs. Some suggestions made in the report indicate a need for a better understanding of some of the tasks involved in preparing soil surveys for publication.

A new soils memorandum setting forth suggested changes in format of published soil surveys is in final draft form. Also a draft guide to authors of soil handbooks and soil survey manuscripts is in final review form.

There is need for the States to take a more active part In helping with the final task of publication, Including help on map compilation and editing. This item is discussed in more detail in the National Committee report entitled, "Soil Survey Procedures."

Consideration • hoold be given to having someone from the Washington Soil Survey staff discuss with members of the regional work-planning conferences the various problems related to preparing soil surveys for final publication.

Members of the Technical Soil Monograph Committee:

*B. A. Barnes	C. W. Koechley	Guy D. Smith
A. J. Baur	W. E. McKinzie	• FZudolph Ulrich
• J. A. DeMent	A. C. Orvedal	A. A. Klingebiel, Chairman

*not present for committee meeting.

Notes on discussion by the conference following presentation of committee report.

Technical Soil Monographs

G. D. Smith: Progress on technical soil monographs has bee,, very discouraging. After about eight years we have only one monograph ready for editing (Nashville Basin). Several others are under way but may not be completed for another year or two. It should be easier to find authors to write about taxa of the new classification system. . We might try this for the Mollisols, Histosols, and Vertisols at the order level and others at the suborder.

Orvedal: Monographs of soil taxa would serve a wider range of people. For example, soil scientists In Canada would be interested In a monograph on Histosols.

Bartelli: Writing monographs of soil taxa will not get away from provincialism. Authors will write mostly about the things they know locally.

Scrivner: I like the Idea of soil taxa monographs. They would be especially useful in teaching.

Flach: Why not • lant our efforts toward writing about diagnostic horizons.

Dudal: TAO has Prepared a • oaoglrpb on Vertisols with 40 contributors. It seems like . useful • ppmeh.

Johnson: Regional committees may not be in a good position to work on soil taxa monographs because taxa cross regional boundaries. The National Committee may need to help select the taxa to be discussed and to guide the extent of the area a taxa monograph should cover.

Klingebiel: There may be numerous problems that need to be resolved before proceeding with soil taxa monographs. Our committee thought monographs on soil taxa shared promise and wanted to present tbe idea to the National Work-Planning Conference. If this group felt it a worthy project then we • u(lgeat the regional conferences react to the proposal. Ye see no reason why my author could not write a soil taxa monograph about Vertisols, for example, within a State, a group of States or region, the United States, or the world. The larger the area to be covered the more likely it would be necessary to have more than one author. Certainly soil taxa monographs for broader areas would be preferable.

No discussion from the floor on benchmark soils.

General (Small-scale) Soil Maps

Koechley: Be sure that proper base maps are used.

No discussion from the floor on publication of soil survey maps and information.

The report was accepted by the Conference.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
Charleston, South Carolina, January 27-30, 1969

Report of the Committee on Classes and Phases of Stoniness and Rockiness

This is the third report prepared by this committee for the National Soil Survey Conference. Preparation of this report has followed a different procedure than used for the two previous reports. The Committee did not meet this year. Proposals were sent out by the chairman, and committee members responded by memorandum and by phone. This committee report was prepared giving due consideration LO Regional Committee reports and to the responses from committee members

The 1967 National Committee on Classes and Phases of Stoniness and Rockiness made 'our recommendations to the regional committees:

(a) Test the criteria for stoniness classes and phases on different size and shape of stones.
(b) Study the problem of rockiness with special attention to size of rock, spacing between rocks, and percent of surface covered by rocks.
(c) Make recommendations for classes and nomenclatures 'or the classes of rockiness.
(d) Suggest ways and means for broader phases in addition to the narrow phase names proposed. Any proposed phase should have significance in use and management of the classification unit.

REPORTS OF REGIONAL COMMITTEES

1. Report of the Northeast Regional Committee

This committee discussed and concurred in the recommendation made by the 1967 National Committee that the definition of stoniness classes be based on average spacing between stones. The area covered and the volume would be related to the size of the stones. The frequency spacing between stones as it relates to stoniness classes was discussed. The committee questioned the practicability of classes proposed by the 1967 National Committee based on spacing between stones of 40-100, 20-40, 10-20, and 5-10 feet. It was expressed that a consistent separation could not be achieved between spacings of 20-40 and 40-100 because of the error of observation. Field studies indicated that the wider the spacing between stones the larger the error of observation. The committee recommended basing classes on spacing between stones of less than 1 foot, 1 to 2.5, 2.5 co 5, 5 to 30, 30 to 100 and 100 or more 'ret.

The committee also considered a study made by soil scientists in New Hampshire which evaluated three methods to check the quantity of stones present in mapping delineations. Method 1 consisted of measuring stones in areas of 100 and 10,000 square feet size; Method 2 consisted of determining average distance between stones and average size of stones within an area of 100 and 10,000 square feet. Method 3 consisted of using a 100-foot transect selected at random within the test area. On test area 1, Method 1 recorded the largest percentage of the surface covered by stones. Methods 2 and 3 give a slightly lower percentage of surface covered but were quite similar in results. Method 3 was the most rapid. On test area 2, all three methods give similar results. Again, Method 3 was the most rapid.

2. Report of the Southern Regional Committee

This committee considered and agreed that percent surface coverage was a better criteria for classes of stoniness and rockiness than spacing between stones and rocks. They stated "the distance between stones is so variable that percent coverage is more reliably estimated by field soil scientists. Contrary to this, the other regions voiced approval of the recommendation made by the 1967 Committee report that the definition of stoniness classes be based on average spacing between stones. A majority of other regions did agree that percentage of rock-exposed surface was the best criteria for classes of rockiness.

This committee explored the ways and means of broader phases in addition to the narrow phases named in the ,967 committee report. It was decided that broader phases were not needed in the Southern Region.

3. Report of the North Central Regional Committee

This committee reported "that because of more important work no high priority or even low priority was given to initiating field studies for testing classes of stoniness and rockiness." The committee did recognize the need for mare Information on size of rocks, spacing between rocks and percent of surface covered with rocks. It was their conclusion that since only a very small area of each state in the North Central Region is subject to using classes of stoniness and rockiness that they should not attempt to make recommendations but to react to recommendations made in other areas. With this in mind the committee reacted to recommendations made by the 1967 National Committee on proposed classes of stoniness and proposed that three classes of stoniness would be adequate. The classes are as follows:

Class	Spacing in feet
1	20 - 100
2	5 - 20
3	1 - 5

The National Committee considered and rejected this proposal.

The committee did "at explore "ways and means" far broader phases of stoniness but did recognize the need and encouraged the development of broader phases.

4. Report of the Western Regional Committee

This committee was in agreement with the first three recommendations made by the 1967 National Committee. They point out, however, the recognition of all the phases of stoniness named in the National Report will not be needed for surveys on forest or range soils. This points toward the need of grouping the stoniness classes into broader phase limits.

Contrary to the National report this committee argued that rocky phases are appropriate for fine patterns of intermingled rock outcrop and soil. They agree that coarser patterns should be handled as complexes or associations. The National committee considered this statement but did not agree with the use of rocky phases.

RECOMMENDATIONS

The National Committee considered the regional reports in drafting recommendations. Several items were agreed to during the discussion of the report and are also reflected in the following recommendations:

(1) The Committee on Classes and Phases of Stoniness and Rockiness should be continued. The principal activity over the next two years should be to evaluate the class limits of stoniness and rockiness.

(2) Proposed classes and frequency spacing between stones:

Class	Spacing in feet
1	> 100
2	30 - loo
3	5 - 30
4	2.5 - 5
5	1 - 2.5
6	less than 1 foot end with less than 75 percent of the stones (boulders) touching one another
7	essentially paved with stones with 75 percent or more of the stones (boulders) touching one another

(3) Proposed phases:

Class	Narrow Phase	Broad Phase
1	Non-stony	
2	Slightly stony or bouldery	Somewhat stony or bouldery
3	Stony or bouldery	Somewhat stony or bouldery
4	Very stony or bouldery	Exceedingly stony or bouldery
5	Extremely stony or bouldery	Exceedingly stony or bouldery
6	Stony land	Stony land
7	Rubble land	Rubble land

(4) The definition of rockiness classes be based on percentage of rock-exposed surface.

Class	Approximate Percentage of Rock-exposed Surface
1	Less than 2
2	2 - 10
3	10 - 25
4	25 - 50
5	50 - 90
6	More than 90

(5) Rock outcrop should not be considered or named as a phase of a taxonomic unit defined in terms of horizons of the soil profile. They represent a complex or association of rock outcrop and one or more taxonomic units. It is recommended that map units which contain rockiness classes 2, 3 or 4 be named in the conventional manner for designating complexes or associations, etc. Theta-Rock outcrop complex (or association) or Rock outcrop-Theta complex (association). This convention will accommodate showing two intensities of rock outcrop in a survey area. However, in a few areas it will be desirable to show three intensities of rock outcrop. This can best be handled by the following convention:

Class	
2 rockiness	Theta rocky complex (association)
3 "	Theta very rocky complex (association)
4 "	Theta extremely rocky complex (association)

Class 5 will be named Rock land and Class 6 will be designated Rock outcrop.

The Regional committees indicated that their Committees on Classes and Phases of Stoniness and Rockiness would be discontinued. It was the belief of these committees that they had contributed all they could for the present. There still exists the need for testing the criteria for stoniness and rockiness classes to make sure that the class limits are right and are significant to use and management. Consequently, the report by Committee 2 will be referred to agencies conducting soil surveys for testing and comment

Membership of Committee

F. J. Carlisle, secretary
S. A. Lytle
J. J. Noll
O. C. Olson
A. H. Paschall
G. D. Smith
J. M. Williams, Chairman

Notes on Discussion of the Report by the Conference

Swanson: Painted out that the "0" class designation may be ambiguous in work with computers. He suggested that the classes be designated 1, 2, 3, etc. instead of starting with 0. It was agreed that the numbering of classes would be changed to start with the number 1.

Rust: Asked if the committee bad considered defining: the classes of stoniness in metric units instead of inches and feet. The chairman indicated that the metric equivalents could be added parenthetically following the English units of measure.

Hagihara: Indicated that the Bureau of Land Management will be investigating methods of classifying degrees of stoniness during the coming year.

Flach: Pointed out that stoniness classes 5 and 6 are not mutually exclusive as presented in committee recommendation 2. He wondered if both classes are needed. The chairman indicated that foresters think the distinction is a useful one far interpretations of importance to forest management. It was agreed that definition of classes 5 and 6 should be amended to make them mutually exclusive.

Daniels: Asked if the point-count grid system of measuring degree of stoniness had been considered. That method would give percent area covered with stones and it would be faster than the lime transect method.

Smith: Said percent of area covered by stones is not adequate for some interpretations made for forest management. Information 0" size and spacing of stones is needed to determine whether stoniness will limit "snaking out" logs, etc. The committee recommendation would provide for indicating two size classes, "stony" up to 24 inches in diameter and "bouldery" for stones larger than 24 inches in diameter. This would be in addition to spacing between stones.

Matelski: Asked how the proposed classes of stoniness are related to the present (Manual) classes. For stones about one foot in diameter the proposed classes 0, 1, 2, and 3 would be quite similar to those classes in the Manual. Stoniness class 4 in the Manual would be divided into proposed classes 4 and 5. Baur and Noll thought the proposal of the committee would not result in large changes from present names 'or stoniness phases in the Northeast Region but there would be some changes.

Baur: Suggested that stoniness class 6 might be defined as having something like 75 percent or more of the stones touching one another. The limit between classes 5 and 6 might be specified that way.

Johnson: Said he did not like the option of "sing "extremely stony" for both classes 4 and 5.

Hagihara: Reported that the Bureau of Land Management had found that stones up to about 15 inches in diameter did not bother range seeding drills much.

Simonson: Commented that he agreed that the stoniness classes should be defined in quantitative terms; the stoniness phases, however, should be defined in terms of soil behavior. HP thinks we should work further on this.

Carlisle: Commented that the intent of committee recommendation 3 was not to define stoniness phases in terms of stoniness classes but to provide guides that would lead to some uniformity in "sing stoniness terms in names of phases.

Orvedal: Suggested the limit between stoniness classes 0 and 1 was to" narrow for some interpretations; i.e.. a spacing of 100 feet was too small.

Simonson: Suggested we need to work more on the names proposed in recommendation 5 for complexes of named kinds of soil and rock outcrops; the form of the names is to" similar to current conventions for naming mapping "nits as phases of series.

Hutchings: Commented that recommendation 5 would be a modification of current conventions for naming complexes of soil and rock outcrops. Simonson pointed out that the committee recommendations do not have the force of instructions.

Grossman: Asked why the committee recommended that stoniness classes be defined in terms of spacing between stones and rockiness classes be defined in terms of percent of area covered by outcrops. Why the difference? The response was that the definition of rockiness classes in terms of percent of area coveted that are given in the Manual apparently are not causing serious difficulty and there did not seem to be sufficient reason co change them.

Bartelli: Recommended that the report of Committee 2 be referred to the agencies conducting soil surveys rather than to the regional committees of the soil survey. He thought the regional committees had contributed about as much to this subject as they could for the present.

The report was accepted by the conference.

REPORT OF THE COMMITTEE ON
CRITERIA FOR SOIL SERIES AND PHASES

Committee Members:

J.E. McClelland (Chairman) J. E. Brown C. M. Ellerbe R. I. Turner
A. J. Baur J. A. DeMent W. E. McKinzie

A. Objectives: In 1967 it was recommended that the committee be continued with the following charge:

"Lo complete its assignment of summarizing criteria being used in distinguishing soil series within families and to bring to your attention other problems that may be raised by the regional committees."

B. Committee reports were on hand from the southern. western, and north-central regions. Most of the discussion centers around regional reports.

C. The North-Central Committee reported on series criteria in four families involving 34 series. The families are:

Typic Argiaquolls, fine, montmorillonitic, noncalcareous, mesic.
Pachic Haploborolls, fine-loamy, mixed, frigid.
Typic Argiudolls, fine-loamy. mixed, mesic.
Typic Argiustolls, fine, montmorillonitic, mesic.

The characteristics listed below were used to help distinguish these series. The characteristics are not listed in the order of relative importance.

1. Texture (usually of control section)
   a. Clay content
   b. Sand content
   c. coarse fragments
2. Reaction
3. Depth to free carbonates
4. Thickness of solum
5. Thickness of horizons
6. Depth to bedrock or inhibiting layers
7. Nature of bedrock
8. Shape of a slope or landform
9. Structure
   a. Type
   b. Grade
   c. sire
10. Color
   a. Hue
   b. Value
   c. Chroma
11. Mottling and color of mottles
12. Consistence
13. Soil Climate
   . . Temperature
   b. Soil Moisture (precipitation)
14. B/A clay ratio
15. Mineralogy
Ib. Content of phosphorus end potassium
17. Exchangeable sodium content
18. Soluble salt content
19. erratic composition of soil material
   (Stratification. discontinuity, stone or pebble lines, etc.)
20. Horizon sequence
21. Thickness of transition between Al end B2t horizons

The South Region made a similar analysis of the critera for distinguishing soil series within families. Thirty-seven series in five families were studied. Tbe table of their results is included in Appendix I.

The Northeast committee reported in 1966. A table from their report summarizing their findings is included in Appendix II.

The Western State. analyzed 17 families (about 120 series). The results of this study together with a summary are included in Appendix III.

The reports from the four regions show similar series criteria and are used for similar classes of soils. None of the regions proposed specific limits that the various criteria should spa" before a new series is proposed. Ranges in single characteristics would be easier to specify if other characteristics remained constant. Probably when our descriptions are computerized the computer will be able to tell us the ranges in properties we have allowed within a sail series.

The Southern Regional Committee discussed mineralogy and made several recommendations. These include:

1. A study of the desirability of extending the mineralogy of the clay fraction to at least include fine-loamy and fine-silty families.

2. A revision in the definition of the fine-carbonatic mineralogy class to read: "Contains more than one-third (by weight) of carbonates in the less than 0.002 mm fraction as determined by a calcium carbonate equivalent greater than 33 percent."

3. The oxidic mineralogy class should be extended to cover resistant minerals other than quart*.

4. "Dominantly" in the ashy and cindery mineralogy classes should he replaced by "more than 50 percent" smaller than 2 mm in the ashy class and "mare than 50 percent" larger than 2 mm in the cindery class.

5. The 50 percent by weight limit for montmorillonite, halloysite, and vermiculite should be reduced, probably to 30 percent.

6. In the illitic class. 3 percent K_2O should be changed to 4 percent.

7. In official series descriptions a paragraph "Source of Data" should follow the "Series Proposed" or "Series Established" paragraph. The added paragraph should list the sources of the data upon which the classification of the soils is based including laboratory, soil moisture, soil temperature. water table. or other data.

The conference considered the above recommendations and agreed to item 2 with minor changes and to items 4, 6 end 7. They deferred action on items 1 and 3 at this time, at least until additional data are available.

Revision of the fine-carbonaric mineralogy class was approved as fallows: "Contains more than one-third (by weight) of carbonates expressed as CaC03 equivalent in the less than 0.002 mm fraction."

The recommendation in item 5 with respect to montmorillonite and vermiculite has been incorporated in the March 1967 supplement for the soil classification system. No action was recommended with respect to halloysite until additional data are available.

With respect to item 7, it was painted out by R. W. Simonson that it is desirable to restrict the length of soil series descriptions so that they can be reproduced on 1 page (front and back). William Johnson pointed out references had to be complete enough to locate the data. Dick Carter said the Southern Committee thought 2 or 3 lines would be involved. The chairman suggested that where unpublished data are involved it should be the responsibility of the State preparing the series description to ensure that at least 2 copies of the data are submitted to each of the Director of Soil Classification and Correlation and the appropriate Principal Soil Correlator. The conference approved item 7 with the above amplification.

The report of the Soil Structure and Fabric Committee of the Western States was referred to this committee. They suggest that both ped and volume consistence should be distinguished. They included more precise moisture status definitions. They also propose that soil structure and soil peds should be distinguished. Their proposals follow:

PROPOSED ADDITION TO SOIL CONSISTENCE TERMINOLOGY

The purpose of this proposed addition to the consistence concept is to distinguish ped consistence from larger volume consistence and to employ only field testable properties.

I. Unit of the soil material to which the consistence term applies:

A. Moderate and strongly constructed material; the consistence terms are applied to both the peds and to the bulk soil for materials in which ped sizes ate between 1 mm and 2 cm. Soil material with peds over 2 cm or under 1 mm size will be characterized by their volume consistencies only.

In tbe horizon description this distinction shall be noted by this wording, e.g. ". .; moderate fine granular; loose with very bard granules; friable with firm granules; .." (i.e., the first consistence term stands for the volume consistence. the second for the ped consistence).

The unit volume far testing volume consistence of structured material is about 2x2x2 cm.

B. Structureless or weakly structured material; consistence test is made on about 2x2x2 cm unit and only this volume consistence is reported.

II. Moisture status definitions

A. Dry (used for loose, soft and hard consistence evaluations): literally air dried for several days or the equivalent field condition.

B. Moist (used for loose, friable, and firm consistence evaluations): moist enough that material will show coherence with slight pressure but not so moist that it will show plasticity or free water surfaces (sandy materials may be loose and not show coherence).

C. Wet (used for plasticity and stickiness evaluations, with no distinctions as to structure or structureless):

1C. For plasticity: wet enough so that after thorough kneading it will form a wire but not so vet that it will show properties of 2C below;

2c. For stickiness: wet enough so thet after thorough kneading it will exhibit maximum stickiness, i.e., approximately that moisture content at which the soil will just show free water films when sharply jarred.

PROPOSAL TO DISTINGUISH SOIL STRUCTURE FROM SOIL PEDS (PEDALITY)

1. Peds or "natural structure" should be considered a dynamic property time and moisture.

2. Structure (no distinction as to ped, clod or fragment) is the size, shape end durability-distinctness of whatever aggregates are present at tbe rime the pedon is described with specified moisture content.

3. Structure is reserved for pedon descriptions and pedality is reserved for series class definitions.

The committee agreed that it is necessary to observe several pedons of a soil series under varying moisture conditions and over a period of time in order to determine whether a soil series has peds or pedality because observations on a single pedon at any one time may not reveal the range in structural regimes present in the soil.

The National Committee and the conference agreed to adopt tbe above proposals for trial "se. A few major changes in wording were introduced.

The Nation.1 Committee considered that standard terminology should be evolved for the description of roots, pores. and clay films in soils. The Soil Survey Manual provides general guidelines but is not specific. California, in cooperation with several Western States, has developed a set of definitions. These have been tested for 7 years or more and appear to be satisfactory. Descriptions of pores were abstracted from "Classification end Description of Soil Pores" by W.M. Johnson et al. as reported in Soil Sci. 89: 319-321. 1960.

The California definitions are outlined in "Definitions and Abbreviations for soil descriptions." The definitions for roots, pores. and clayfilms from these worksheets are included in Appendix IV. It will be noted that "o precise thickness limits are set for clay films. By implication moderately thick clay films range in thickness "ear the limits of very fine sand (0.05 to 0.10 mm) but extend into the fine sand range, A set of adjectives for evaluating organic matter content is also proposed.

Because of time limitations the National Conference did not have time to discuss the definitions in Appendix IV in detail. However, most participants had seen them earlier and it is recommended that they be tested on a national scale.

The need for official horizon designations for Histosols was pointed out to the committee because this committee appears to be most closely related to this subject. The committee asked for the reaction of the conference to the following courses of action:

1. Continue the present practice of numbering horizons in the sequence they occur below the surface. the upper horizon being number 1.

2. Follow the procedure recommended by Farnham, Finney .and McKinzie in November 1966 as follows:

Symbol	Kind of Horizon
F	Fibric
H	Hemic
S	Sapric
Lm	Marl
Lir	Bog iron
Ls	Sedimentary peat
Ld	Diatomaceous earth

In descriptions of a given pedon, subdivisions are indicated by placing a" arabic "umber after the symbol of the horizon. Thus, symbols such as Fl. F2, F3 are obtained. If the horizon is plowed or disturbed, the symbol p is used as a suffix to the horizon symbol as Upl. Vertical subdivision of horizons are numbered consecutively by kinds of horizons. Thus, for example, a sequence from the surface downward might be Spl, Sp2, Hl, S3, HZ, S4, IIAlb.

The conference discussed tier or layer designations for organic soils. Because lower case f and h letters are used for mineral soils. it was decided to designate organic layers using a" 0 and the first vowel in fibric, hemic, and sapric. The following tier designations were approved:

Designation	Organic Layer
Oi	Fibric
Oe	Hemic
Oa	Sapric
	Limnic Layer
Lca	Marl
Lco	Coprogenous
Ldi	Diatomaceous earth
	Other
f	Frozen
p	Cultivated
cn	Bog iron--usually containing concretiona

A" example of a horizon sequence is as follows: Oil, IIC1, O12, IIC2, Oe1, Oe2, IIC3, IIIC4.

D. The committee further recommends that it should be continued to study the need for additional definitions and to bring to your attention other problems that may be raised by the regional committees. For example, E. C. A. Runge (Univ. of Illinois) has pointed out that we have criteria for horizon boundary changes within a profile but we have no established criteria for evaluating the distance (rate of change) between two adjacent soil series.

Appendix I

CRITERIA FOR DISTINGUISHING SOIL SERIES WITHIN SELECTED FAMILIES IN THE SOUTH REGION

Family	Chromudic Pellusterts fine, mixed, iso-hyperthermic	Typic Argiudolls fine silty, mixed, thermic	Typic Hapludults clayey, kaolinitic, thermic	Humic Paleudults clayey, kaolinitic, thermic	Typic Paleudults clayey, kaolinitic, thermic	Typic Hapludults clayey, mixed, thermic	Typic Hapludalfs fine silty, mixed, thermic	Total Times Used 2/1	No. Times Order 1	No. Times Order 2
No. of Series	4	4	10		9	10				
Criteria										
A. Horizon										
Texture				2/	2		2/	1		1
Color	1 1/							1		2
Mottles (high chroma)	1							1	1	
Carbonates	1							1	1	
Salinity	1							1	1	
Bt Horizon								.		
Reaction		1							1	
Thickness			1					1	1	
Color	1	1	1		1	1		5	5	
Consistence					1	1		2	2	
Texture						1		1	1	
Sand/silt ratio					1			1	1	
Salinity	1							1	1	
Mottles		2						1		1
Low Chroma					1			1	1	
High Chroma					1.2			1	1	1
Other										
Horizon sequence and kind		2			2			2		2
Depth to rock		1						1	1	
Paralithic contact						1		1	1	
Solum thickness			1			1		2	2	
Silt content			1					1	1	
Exch. Al+++ and Total acidity			1					1	1	
Concretions		2								1
Permeability					2			1		1
Rock										
Parent rock fragments in solum					1.2			1	1	1
Stoneline in solum					1			1	1	
Chert fragments> 27;					1			1	1	
Pebbles, cobbles. & fragments					1.2			1	1	1
Mineralogy										
Mica in B2t					1			1	1	
Mica content			1					1	1	
Gypsum in subsoil	1							1	1	

1/ Numbers refer to 1st order or 2nd order criteria
2/ No report

Appendix II

Frequency of Occurrence of First Order Series Criteria in 12 Families

	Hue	Texture-Control Section	Silt Mantle	Consistence	Coarse Fragments	Thickness of Solum	Lithic Contact	Mineralogy	High Chroma Mottles	Presence of Mottles in Lower Solum	Structure	Expression of Glossic Properties
Frequency of Occurrence	7	7	1	4	6	2	2	5	2	2	1	1
Typic Udipsamments										x		
Aquic Fluventic Dystrochrepts	x							x				
Typic Dystrochrepts	x											
Typic Fragiochrepts	x	x						x	x			
Alfic Haplorthods	x	x		x	x							
Aquic Haplorthods		x								x	x	
Typic Haplorthods		x		x	x							
Entic Haplorthods	x							x				
Glossoboric Hapludalfs		x			x	x			x			x
Glossaquic Hapludalfs		x	x		x		x					
Typic Hapludults	x			x	x	x	x	x				
Aquic Fragiudults	x	x		x	x			x				

FACTORS SEPARATING SERIES WITHIN FAMILIES - Western States Report
(Numbers indicate frequency)

Typic Torriorthents, coarse-loamy, mixed, calcareous, mesic (6 series)	
Texture of control section	3
Soil moisture regime	4
Color	1
Reaction	1
Depth to contrasting material	
$CaCO_3$ content	1
Dystric Cryandepts, thixotropic (1 series)	
Incipient horizons	1
Thickness of A1 horizon	1
Mineralogy - ash	1
Typic Dystrandepts, ashy, isomesic (4 series)	
Texture	5
Structure	7
Consistence	5
Chroma (O.M. Cont.)	3
coatings	5
Typic Hydrandepts, thixotropic, isothermic (8 series)	
Texture	16
Structure	12
Consistence	11
Depth to bedrock	9
Presence of "1 horizon	7
Reaction	1
Typic Vitrandepts, ashy, mesic (8 series)	
Moisture regime	
Texture of control section	
Depth to bedrock	
Buried Bt	
Typic Vitrandepts, cindery, mesic (6 series)	
Moisture regime	
Mollic epipedon	
Mineralogy	
Texture of control section	
Reaction	
Thickness of sola	
Typic Cryochrepts, coarse-silty, nixed (4 series)	
Texture of control section	1
Depth to bedrock	2
Reaction)	
Base saturation)	4
Ash deposit (mineralogy)	3
Typic Xerochrepts, coarse-loamy. mixed. mesic* (3 series)	
Texture of control section	
Depth to bedrock	1
Color value	
*Classification as of January 1968	
Typic Haplumbrepts, fine-loamy, mixed, mesic (5 series)	
Soil depth	3
Color	2
Parent material	4
Reaction	2
Solum thickness	3
Drainage	1

Typic Haplargids, fine-loamy, mixed, thermic (16 series)

Depth to bedrock	1
Thickness of solum < 20"	1
Thickness of solum 720"	11
Calcic horizon	8
Ca horizon	4
Carbonate content (profile)	3
Coarse fragments < 15%	9
coarse fragments > 15%	3
Color of control section	12
Percent sand in control section < 50%	2
Percent sand in control section > 50%	9
Salinity	1

Typic Calciorthids, coarse-loamy, mixed, mesic (5 series)

Coarse fragments	2
Color	2
Parent materials	1
Texture of control section	1
Reaction	2
$CaCO_3$ content	3

Typic Argiustolls, fine, montmorillonitic, mesic (5 series)

Depth to bedrock	1
Calcic horizon > 20"	1
Calcic horizon < 20"	1
Color	1

Typic Haploxerolls, loamy-skeletal, mixed. mesic (8 series)

coarse fragments	6
Color	6
Texture of control section	3
Solum thickness	3
Reaction	6
Moisture regime	4
Contrasting materials	4
$CaCO_3$ content	6

Typic Haploxerolls, coarse-loamy. mixed. mesic (12 series)

Sail depth	6
Coarse fragments	10
Color	7
Parent materials	5
Texture of control section	3
Solum thickness	3
Reaction	3
Moisture regime	6
structure in control section	3
contrasting materials	6
$CaCO_3$ content	6

Calcic Haploxerolls, coarse-loamy. mixed, mesic (6 series)

Soil depth	3
Parent material	3
$CaCO_3$ content	3
Coarse fragments	3
Color	5
Texture	3
Drainage	2

Typic Argixerolls, fine, **montmorillonitic**, frigid (14 series)

Soil depth	1
Coarse fragments	5
Color	14
Parent material	4
Texture of control section	2
Solum thickness	4
Reaction	3
$CaCO_3$ content	I
structure	1

Calcic Argixerolls, fine-loamy, mixed, **mesic** (9 series)

Coarse fragments	4
Color (control section)	6
Texture of control section	7
Solum thickness	3
Reaction	4
$CaCO_3$ content or depth to carbonate	4
Structure	3
Moisture regime	7
Depth to contrasting materials	5

SUMMARY - WESTERN STATES

Factorted	Frequency
Color	60
Texture of control section	47
Coarse fragments	42
Calcium carbonate content	38
Depth to bedrock or contrasting materials	35
Thickness of solum	28
Structure in control section	26
Reaction or base status	24
Mineralogy	19
Consistence	16
Percent sand	9
Organic horizon	7
Coatings	5
Drainage	3
Salinity	1
Buried Bt horizon	1
Mollic epipedon	1

Roots and pores: (see pp.245-250 of "The Manual"). Abundance, size, orientation. and distribution within peds for both roots and pores are similar. In addition. to fully describe pores. continuity classes and morphology must be recorded.

Abundance classes:

roots	pores	No./Unit* area of surface
very few	very few	less than 1
few	few	1 to 3
plentiful	common	4 to 14
abundant	many	more than 14

*Unit is a square inch for fine, very fine, and micro roots and pares, a square yard for medium and coarse roots and pores.

Diameter classes except for micro size, follow those for granular structure:
- micro: less than 0.075 mm.
- very fine: 0.075 to I mm.
- fine: 1 to 2 mm.
- medium: 2 to 5 mm.
- coarse: over 5 mm.

Continuity classes (for tubular pares):
- continuous - individual pores extend throughout the horizon
- discontinuous - individual pores extend only part way through the horizon

Orientation classes (for roots and tubular pores):
- vertical - orientation in general is more vertical than diagonal.
- horizontal - orientation in general is more horizontal than diagonal.
- oblique - orientation is more oblique (approaching 45° from vertical) than either horizontal or vertical.
- random - orientation is in all directions.

Distribution within horizons:
- inped - most roots and pores are within peds
- exped - most of roots and pores follow interfaces between adjacent peds

Morphology of Individual Pores:

Type Modifiers:
- simple - tubular pores are not branched.
- dendritic - tubular pores are branched.
- open - pores are open at least at upper end, or at one horizontal end.
- closed - both ends of pores are sealed from access to air and water by organic or organic-mineral particles or clay flows.

Types :
- vesicular - roughly spherical or ellipsoidal in shape. not appreciably elongated in any direction.
- interstitial - irregular in shape with faces that are curved inward; formed by curved or angular faces of adjacent mineral grains. or peds, or bath.
- tubular - more or less cylindrical in shape, elongated in one direction.

Examples of descriptions of roots:

I. abundant very fine. plentiful fine roots.
II. plentiful very fine, few fine and medium, very few coarse roots.
III. plentiful very fine and fine roots spreading out horizontally (usually indicative of a more compact layer which. in an extreme case, may be a hardpan).
IV. plentiful very fine and fine roots concentrated along ped faces.
V. plentiful very fine and fine roots concentrated along vertical ped faces.

Examples of descriptions of pores:

I. many very fine discontinuous vertical inped simple closed tubular pores.

II. many very fine interstitial pores.

III. many very fine interstitial, many very fine, few fine tubular pores.

Notes: To the extent that some or all of the elements describing pores are used they will be employed in the order as follow: abundance, size, continuity, orientation, distribution, type modifiers, and types. A minimum (and the most common) description of roots will include frequency and size where the roots follow a normal distribution pattern. Pores should at least have the type indicated in addition to frequency and size and any obvious departures from the normal distribution.

Clay Films: These are described by recording their frequency of occurrence, their thickness, and their locations.

Frequency:

very few - less than 5% of the ped faces and/or pores contain cloy films.
few - 5 to 25% of the ped faces and/or pores contain clay films.
common - 25 to 50% of the ped faces and/or pores contain clay films.
many - 50 to 90% of the Qcd faces and/or pores contain clay films.
continuous - 90% or more of the ped faces and/or pores contain clay films.

Thickness:

thin - so thin that very fine sand grains are readily apparent in the film and/or sand grains are only thinly coated and held together by weak bridges. (Require magnification to determine thickness.)

moderately thick - very fine sand grains are enveloped by the film or their outlines arc indistinct. Broken edges of the clay films can be seen by use of a band lens. Where colloid is in bridges, broken bridges can be readily discerned with a hand lens.

thick - clay films and their broken edges are readily visible without magnification; films appear to be relatively smooth because the very fine and fine sand grains are entirely encompassed by the film. Where the colloid is in bridges. the bridges hold the soil mass firmly together and the very fine and fine pores are nearly filled with colloids; broken bridges are readily visible to the unaided eye.

Morphology of Clay Films: Oriented clay occurs as films on peds, inside of pores, or in bridges.

Clay films occur on Qed faces. Where the structure grade is weak or the soil is structureless, ped faces are indistinct or absent. It is probable that only when the structure grade is moderate or strong that clay films on ped faces are discernible.

Clay films line tubular or interstitial pores.

Oriented clay occurs as bridges holding mineral grains together. (This is probably an initial step that occurs before clay films line interstitial pores and is best observed in coarse textured soils.)

Colloid stains mineral grains.

In describing clay films care must be exercised not to confuse pressure faces with clay films. Pressure feces may arise because of slickensides (caused by soil slip), swelling that pushes structural aggregates together and makes their sides look smooth, and enlargement of roots in tubular pores.

Examples of Clay Film Descriptions:

Many moderately thick clay films in pores.
Common thin clay films on peds and in pores.
Continuous. moderately thick clay films on ped faces, common thin clay films in pores.
Colloid in bridges between mineral grains.
Colloid stains mineral grains.
Many moderately thick clay films in tubular pores.
Continuous thin clay films in interstitial pores.

The organic matter content of soils may be expressed using the following adjectives:

very low	$<$ 0.5% organic matter
low	0.5 - 1.0% organic matter
moderately low	1.0 - 2.0% organic matter
medium	2.0 - 4.0% organic matter
high	4.0 - 8.0% organic matter
very high	8.0 - 16.02 organic matter
extremely high	16.0 - 30.0% organic matter

NATIONAL SOIL SURVEY TECHNICAL WORK-PLANNING CONFERENCE
Charleston, South Carolina, January 27-30, 1969

Committee No. 4 - Application of the New Classification System

This committee submitted reports to the National Soil Survey Conference in 1965 end 1967. The present report is therefore the third,

Preparation has followed a different path for this report than for the two earlier ones in that the committee did not meet. Proposals were sent out by the chairmen and response8 received from committee members. A draft report was then prepared and circulated for review and comment. The present version of the committee report is based on the original proposals, on responses from committee members, and the discussion at the conference in Charleston.

This report has five main part9 plue a short introduction and a concluding section of recommendations for future activity. The first main part consists of summaries of and actions taken on regional committee reports. The second main part considers proposals for changes in Soils Memorandum-66. The third main part outlines a procedure for revising the classification system after publication. The fourth main part calls attention to problems with present family classes. The fifth main part is on the nomenclature for soil associations. A last brief section consists of recommendations for future committee activity.

A. Reports of Regional Committees

1. Committee on Organic Soils, North-Central Region

A supplement to the 7th Approximation outlining proposals for classification of Histosols was Issued recently. This supplement (1968) is based on conferences held last year, including that in the North-Central Region. Further action on the part of the national Committee is therefore not required now.

2. Committee on Soil Correlation ... and Classification, North-Central Region

This committee discussed several topics in addition to application of the new classification system. These were the current and future role of state and federal agencies in the Soil Survey program, facilitating proper communication between cooperating agencies in the program, methods for making most effective use of all available knowledge in completing final correlations, danger of field soil scientists becoming mapping technicians, and the results of a study of erosion class separations in Iowa.

Two topic,, on application of the classification system were considered. One was the definition of "family texture and series Control sections". The other was . li.t of problems encountered with current class criteria.

(a) Family texture and series control sections. The present definitions are awkward to use. Required changes to make the definitions more convenient are not readily evident and no suggestions for change, are therefore offered. This note is included in the regional and national committee reports, however, to record a difficulty in application even though a remedy is not known.

(b) Problems with current class criteria. A number of problems are listed in the regional committee report, This was done to record the problems in the hope that it will stimulate further search for solutions. The list is included here as a way of bringing the problems to the attention of a larger group of scientists.

1. Better drainage criteria are needed fur dark-colored alluvial soils.

2. Present limits between Aquic Hapludalfs and Aeric Ochraqualfs splits the somewhat poorly-drained class in Illinois. Mollic intergrades are also affected.

3. Limits are needed for classification of recent alluvial soils in which light-colored strata are interbedded in a dominantly dark-colored section.

4. Difficulties have been encountered in determining the minimum change required before a layer qualifies as a cambic horizon.

5. Present criteria do not permit differentiation of relict mottles from those that reflect current moisture regimes.

(The last item on page 37 of the 1967 Supplement to Soil Classification System states that low chroma mottles are diagnostic only under two specified conditions. One condition is that the horizon having the mottles is saturated with water at some time when that horizon is warmer than 5° C or 41° F. The other condition is that the soil be artificially drained. Observations must therefore be made of wetness to distinguish relict mottles from those that reflect the present moisture regime.)

6. Information on clay mineralogy is insufficient.

7. A better basis is needed to distinguish interfingering from tonguing of albic into argillic horizons.

(c) Procedure for revising classification system. An attachment to the regional committee report summarized reactions to a suggested procedure for revisions in the classification system after publication. A possible procedure to ensure an orderly process for the making of necessary revisions is discussed later as a major topic in this report.

3. Committee on Application of New Classification System, Southern Region

A substitute sentence was offered for one in Soils Memorandum-66. A second recommendation was that one statement be narrowed. Some concern was expressed about present criteria for distinguishing wet soils from those that are well drained. The nomenclature and horizon designations for Histosols were considered briefly.

A recommendation was also made that the explanation of closely similar families in Soils Memorandum-66 be changed because it permitted too much leeway. This is considered further later.

Dissatisfaction was expressed with present criteria for setting apart "et soils from well drained soils. Proposals for changes were not made, though the belief was expressed that more emphasis on water table data and soil saturation might help.

4. Ad hoc Committee on Soil Survey Procedures, Southern Region

The ad hoc committee discussed publication of the soil classification system and suggested procedures for making changes after publication. The suggested procedures are summarized in the following paragraphs:

Proposals for revisions or additions to the system might come from an individual or agency. Such proposals should be supported by data or a written justification before they were considered by a regional committee. A State committee for consideration of proposals was strongly suggested, though it would not be required.

A standing committee of the regional work-planning conference was recommended. This committee could have five members with terms staggered so as to provide continuity. The standing committee would be expected to present reports and hold open discussions at each regional work-planning conference.

The mechanism suggested for selecting members of the standing committee has several parts. It was suggested that the Regional Soil Survey Work Group of the State Agricultural Experiment Stations first prepare a list of' individuals on station staffs able and willing to serve on the standing committee. This list should be sent to the Southern Soil Research Committee, also representing the State Agricultural Experiment Stations, and that committee would select two names. These would be transmitted through the principal soil correlator to the Deputy Administrator for Soil Survey. These two individuals would report annually to the Southern Soil Research Committee.

It was suggested that the principal soil correlator prepare a list of individuals on the Soil Survey staff of the Soil Conservation Service able and willing to serve on the standing committee. Two names from this list would be appointed by the Deputy Administrator for Soil Survey, who would also announce the names of all committee members.

It was further suggested that the principal soil correlator invite the regional office of the U.S. Forest Service to designate a qualified individual to serve on the standing committee.

Last, it was proposed that the principal soil correlstor be an ex officio member of the standing committee.

Possible action on proposals received by the standing committee could take any one of the four paths, as follows:

(a) Accept and forward a proposal to a national committee or to the appropriate individual at national Soil Survey headquarters.

(b) Refer a proposal through the principal soil correlator to one or more parallel regional committees concerned with the problem or problems under consideration.

(c) Return a proposal to the State or originating agency for further testing or for additional Justification.

(d) Rejection.

A possible procedure for making changes in the classification system is outlined in the third major section of this national committee report.

5. Committee on Application of New Classification System, western Region

The western Regional Committee prepared a partial list of characteristics used to distinguish series within families; discussed possible nomenclature for mapping units consisting of families, subgroups. or classes in higher categories; and considered the kinds of descriptions that might be prepared for such mapping units.

The partial list of characteristics, to be expanded in future work of the committee, was reproduced in the 1968 report to record what had been done. Because the list of characteristics consists of those used as criteria for differentiating series within families, that list is not discussed further here. Rather. the list is left for consideration by the national Committee on Criteria for Series end Phases.

B. Proposals for Changes in Soils Memorandum-66

1. Permissible proportions of inclusions

A recommendation was made by the Southern Regional Committee that one statement on permissible proportions of inclusions in mapping unite named as phases of series be replaced. This suggestion applies to one sentence in Alternative I on page 12. The whole of Alternative I is reproduced first *or reference.

> "Alternative I. Three-fourths or more of the polypedons fit within the phase of the series that provides the name for the mapping unit or fit in closely similar phases of the same series or of other series in closely similar families of the same subgroup, in parallel families of like subgroups, or in other families closely similar in behavior. The moat extensive kind of soil must fall within the range of the phase providing the name for the mapping wit. As a rule, that kind constitutes more than half. The most extensive soil, however, may constitute no more than 35 percent of the mapping unit if 15 percent or more consists of a taxadjunct to the serlcs. Each of the inclusions of soils of closely similar series may constitute as much as 25 percent of the mapping unit but their aggregate proportion must not exceed 50 percent. Minor proportions of strongly contrasting soils are also allowed as inclusions but none of them individually may constitute more than 10 percent and their aggregate proportion may not exceed 15 percent."

The sentence which the Southern Regional Committee wants to change no" reads:

> "Each of the inclusions of soils of closely similar series nay constitute as much a.8 25 percent of the mapping unit but their aggregate proportion= must not exceed 50 percent."

The suggested substitute is:

> "Each of the inclusions of soil= of closely similar series may constitute as much as 49 percent of the mapping unit but none may be more extensive than the taxonomic unit giving the name to the mapping unit,"

The national committee recommends that the proposal be rejected for two reasons. First, the inclusion= of "soils of closely similar series" are meant to cover soils that differ enough from the most extensive component of a mapping unit to be recognized as named series rather than taxadjuncts. Second, choice of an upper limit of 49 percent for an inclusion would allow it to be as extensive for all practical purposes a= the kind of soil considered the major component. "hen the proportions of two kinds of soil unlike enough so that they are not taxadjuncts but fit separate named series are equal, the name of the mapping unit should show that it has two major component=.

The recommendation of the Southern Regional Committee suggests that some modification of the sentence in question might make it easier to comprehend. A possible substitute is therefore suggested as follows:

"Each of the inclusions of soils of similar series that are not taxadjuncts or the series providing the name for the mapping unit may constitute as much es 25 percent but the aggregate proportion of these inclusions ray not exceed 50 percent of the mapping unit."

2. Definition of closely similar families

The Southern Regional Committee suggests that the definition of closely similar families on page 10 of Soils Memorandum-66 is too broad and should be narrowed. Questions about the meaning of the present definition had also come up elsewhere previously.

The statement on page 10 of Soils Memorandum-66 now reads:

"(b) Closely similar families. Families are closely similar if they are alike on one or more counts, as for example: ..."

A possible expansion of that statement follows:

(b) Closely similar families. Families are closely similar it thev meet two requirements. First, the families consist of soils having combinations of characteristics that place them in the same subgroup or that make two families share a common limit in definition. Second, the families are alike on one or more counts. as for example:

(Numbered items 1 to 4, inclusive, at the bottom of page 10 and the top of page 11 of Soils Memorandum-66 would then follow without change.)

C. Procedure for Revising Classification System after Publication

A,, orderly procedure "ill be needed to make necessary revisions 1" the classification system after it has been published. Changes will be required in the future, as they have been in the past, to accommodate new information and improved understanding of existing information.

Possible sources of proposals for changes include staff members of all agencies in the soil survey program in the United States, Proposals for change may also come from soil scientists not directly engaged in the program, though these are less likely. Additional proposals may come from outside the United States. Any procedure that is developed should therefore provide for consideration of proposals from all these sources. A first draft of a procedure is outlined in the remainder of this section of the report.

The procedure outlined in thla section is meant to apply to changes in criteria or in level of generalization of the family category and to all changes in the order, suborder, great group, and subgroup categories. For the upper four categories, all kinds of changes include additions or deletions of classes and modifications in the definitions of classes. The procedure is not meant to apply to the recognition or dropping of series, redefinition of series, shifts in series placements, and changes in definitions of individual families. Such changes in the two lowest categories of the classification system can best be handled in the process of soil correlation for survey areas.

The word "proposal" "ill be used throughout the remainder of this section to ❑ ew, suggestions for the kinds of changes in the soil classification system described in the immediately preceding paragraph.

1. Routing of proposals from different sources

Proposals by the SCS soil scientists can be routed through the State soil scientist to the principal soil correlator. Proposals by soil scientists of cooperating agencies can also be routed through the state soil scientist or sent directly to a principal soil correlator. Proposals that come from foreign countries are expected to be sent to the Soil Survey headquarters in Washington, D. C. The routing and review of such proposals Will have to differ somewhat from those for proposals originating within the country.

2. Nature of proposals

A proposal sent to the principal soil correlator should Include an explicit statement of the change or changes being suggested. This statement should be accompanied by adequate evidence on the nature of the soil or soils in question. The evidence might consist of actual data on morphology and composition or of references to sources of such data. The sources should be readily available If references are used. A statement of the arguments for the making of a change or changes in the system should also be included. Thus, *or example, it is not enough to argue that the proposal would result I" more useful classes. The argument should state explicitely the ways in which the modified or added classes would be of value. Recommendations to drop classes should include supporting arguments.

3. Regional review of proposals

It is recommended that each regional work-planning conference have a standing committee to consider proposals. The major effort of such a committee would go into the review of proposals originating in the region. It might, however, be necessary for the committee to consider proposals originating I" other region, within the country or in other countries. It seems probable, however, that these last two kinds of proposals would require relatively little committee effort.

Membership of the standing committee could consist of the principal soil correlator as permanent chairman, plus six additional me". The six me" would all be members for a 3-year period. It Is suggested that two members could be replaced each year after the first 3-year period.

This national committee report does not suggest a mechanism for the selection of members of the standing regional committees. The decisions o" mechanisms is left to the regional conferences because those may need to differ from one region to another. It does seem advisable that members of the standing committee be selected so as to include representatives of the Soil Conservation Service and of cooperating agencies. Individuals chose" for the standing committee should be able and willing to review proposals for changes In the classification system and record their Judgments o" these proposals.

In addition to ths regular member., . committee could plan to Invite the participation of individuals well acquainted with the set of soils affected by . proposal. These individuals would be temporary members of the committee for consideration of an action on a given proposal.

The principal soil correlator would review each proposal together with the supporting evidence and arguments when those were received. Copies of the documents would be distributed to committee members and comments by the principal soil correlator could be Included. At this stage, the chairman or any other member of the committee could suggest that one or more additional Individuals In the region be invited to Join I" the review. The chairman would be responsible for extending Invitations.

Some proposals will affect the classification of soils in two or more regions. To insure that such proposals "111 be given consideration wherever they apply, a copy of each proposal received by a principal soil correlator could be sent to the Director. Soil Classification and Correlation, at the time that distribution is made to members Of the regional committee. The Director, Soil Classification and Correlation, should revie" each proposal to determine whether more than one region would be affected. If the proposal affects the classification Of soils outside the region of origin, the Director, Soil Classification and Correlation, would so advise the principal soil correlator. He, in turn, would send copies Of the proposal. the supporting evidence, and the arguments for change to the principal soil correlator or principal soil correlators of other regions as required.

Steps in review of such proposals would be the same for all regional committees. Reviews could be made simultaneously by two or more regional committees. Outside of the region of origin, however, revie" of a proposal would be optional for a committee. A proposal originating in one region and referred to another would not have to be acted upon by the committee in the second region. The decision to make a recommendation or not would be left with that committee. It would, however, notify the standing committee in the originating region that it was or was not going to offer a judgment on a given proposal.

The review made by a regional committee should be adjusted to the nature of a given proposal. If the change or changes called for by a proposal were small, committee members could revie" it together with the accompanying evidence and arguments and make a Judgment without further testing or study. On the other hand, if the changes called for by a proposal were substantial, a more complete appraisal of probable effects of those changes should precede the making of a judgment.

The principal soil correlator might conclude, upon receipt of a proposal, that some testing Of its effects was necessary. In the same way, one or more committee member, might see the need for preliminary testing after they receive the proposal and supporting documents. The principal soil correlator would be responsible for making necessary arrangements to test a proposal. A test might simply involve trial placement of series or it might require field studies. What might be required would have to be determined by the committee after a proposal had been received and examined.

Members of a regional committee, including temporary ones, would review a proposal, the supporting evidence, and the arguments for change. If some member of the committee did not consider himself "ell enough acquainted with the soils under consideration, he could withdraw at this stage from review of the one proposal end so inform the committee chairman. Each member acquainted with the soils in question would appraise the evidence and arguments for change and then outline his judgment as to "hat should be done. The statement so prepared would be sent to the committee chairman with copies to all other members.

Any one of three results might follow from the review of a proposal. Committee members could agree that a proposal should not be accepted. They could agree that a proposal should be accepted. They could split on acceptance or rejection. Action to be taken would depend upon which of these results followed from review of a proposal.

Given general or wide agreement that a proposal should not be accepted, the state or agency submitting the proposal would be so notified. Reasons for rejection of the proposal would be spelled out. A summary of the proposal and of the action taken would be sent to the Director, Soil Classification and Correlation, as a matter of record.

Given general or wide agreement that a proposal should be accepted, the state or agency from which the proposal came would also be notified. The proposal would the" be referred to a standing committee of the National Soil survey Work-Planning Conference. The procedure to be followed and the operations of that committee are discussed in a later subsection.

If tbe regional committee splits about evenly on a proposal, this should be considered rejection. The state or agency from which the proposal came should then be notified hod a summary of the propose.1 and its disposition sent to the Director, Soil Classification and Correlation.

4. National review of proposals

It is recommended that the National Soil Survey Work-Planning Conference have a standing committee to consider proposals. Most of the work of such a committee is expected to be the consideration of proposals that have been reviewed and accepted by regional committees. Some of its work is expected to be the review and making of recommendations on proposals from abroad. It may also be that occasions1 proposals will come first to the national committee rather than to regional committees, though that should be unusual.

Membership of the standing committee could consist of the Director, Soil. Classification and Correlation, as permanent chairman, plus eight additional men, two from each fourth of the United States. This first group of eight men would be expected to serve on the committee for a period of 2 years. After the first 2-year period, two members could be replaced each year.

Each of the four regional work-planning conferences would select two men to be members of the national committee. A pair of men from a single region could consist of a representative of each of the Soil Conservation Service and of the cooperating agencies, normally the State agricultural experiment stations.

The committee could plan to request participation by additional soil scientists well acquainted with soils affected by a given proposal. Such individuals would be temporary committee members for consideration of and action on a specific proposal.

Proposals received by the committee chairman would be examined together with the supporting • "ide"ce and arguments when those arrived. Copies of the document. would then be distributed to Committee members together with comments if those seemed necessary. After preliminary examination, tbe chairman or any other member of the comittee could suggest that one or more individuals be invited to Join in consideration of the proposal. The chairman would be responsible for extending invitations.

Consideration of proposals by the national committee could follow essentially the same pattern as that outlined for the regional committee in the preceding subsection.

If a given proposal covers soils with which a committee member is not acquainted, he could withdraw from review of it and so inform the chairman. Other comittee members, including temporary ones, would, however, be expected to review the evidence and arguments. Each man would then outline his judgment as to what should be done. His statement should include the reasons for the Judgment expressed. The statement would be sent to the comittee chairman with copies to all other member..

Committee deliberations might yield any one of three results, as for the regional committees. The members could agree that a proposal should not be accepted, They could agree that a proposal be accepted. They could split on acceptance or rejection. The action to follow would depend upon which of these results grew out of consideration of a proposal.

Given general or wide agreement that a proposal should not be accepted, the regional committee or the originating agency would be so notified. Reasons for rejection would be stated in this notification.

Given general or wide agreement that . proposal should be accepted, the regional committee or the originating agency would also be notified. The proposal would then be transmitted to the Deputy Administrator for Soil Survey, Soil Conservation Service, with recommendations. Ways and means of publishing changes in tht classification system growing out of these proposals are discussed in a later subsection.

If the national committee is about evenly divided on a proposal, this is to be considered rejection. Notification of rejection will be sent to the regional committee or to the originating agency along with an explanation of the action taken.

5. Review of proposals from abroad

Proposals for changes in the classification system may be received from soil scientists in other countries, though the number is expected to be small. It is anticipated that such proposals will come to Soil Survey headquarters in Washington, D. C.

Proposals received from abroad could be referred to the standing committee of the National Soil Survey Work-Planning Conference. Preliminary consideration of such a proposal might indicate that it affects the classification of soils important in one or more of the four regions in the United States. If thst situation holds, the proposal would be referred to the appropriate regional committee or committees for review and recommendations. Results of such review could be sent back to the national committee. Regional reports on such proposals should consist of recommendations, if any are made, plus a statement of supporting reasons.

Some proposals received from abroad may not affect the classification of important soils in any part of the United States. These proposals will be handled by the national committee without referral to regional committees. The review procedure for such proposals can be essentially the same as for those originating in the United Staten, except that temporary members may be enlisted from the ranks of foreign colleague8 well acquainted with the soils in question.

Recommendations developed by the national committee on proposals received from abroad would be transmitted to the Deputy Administrator for Soil survey.

6. Publishing approved proposals

Each proposal recommended for adoption by ths standing committee of the National Soil Survey Work-Planning Conference could be transmitted to the Deputy Administrator for Soil Survey, SCS, U.S. Department of Agriculture. Each proposal should be explicit as to changes recommended in the classification system and should be accompanied by a summary of the supporting arguments for making those changes.

A" accepted proposal or proposals could be issued as a supplement to the published classification system. Such supplements • hould be issued frequently enough to keep interested soil scientists informed, yet the number of supplements in force should be small. Perhaps it would be enough to issue . supplement after two or three proposals had been adopted, combining those in one document.

Not more than one or two supplements should be in force at the same time, Otherwise difficulties in using ths original publication and the supplements become unmanageable. It may be feasible to have each new supplement cover all changes made up to the time it was issued. Thus, • .oh new supplement would supersede the last preceding one. Only we supplement would then be in force at any given time.

The best means for distributing information on the approved changes will need to be worked out through experience. Some cutting and trying will be necessary to determine the most effective approach in the issuing of supplements.

D. Family Classes

Large numbers of family classes would be possible in the present system if all combinations of family differentiae were to be used. Some combinations of separate differentiae would not be expected to occur, but the total number of possible permutations is still large. This statement holds for individual subgroups as well as for the entire system. Nowhere nearly all of the permutations are represented as yet in the grouping of the soil series in the United States.

Tbe present guides allow free additions of more family classes to those already on the books. Such classes can be set apart by combining the individual differentiae of different kinds in ways unlike the combinations previously used within a given subgroup. It might be said that the classification system thus include8 a large number of empty family classes, i.e., family classes in which there are no series. Empty family classes are permissible with our present guides, classes not used now because no series has been defined that would require the addition of a family to the lint already recognized. To state this in another way, additional families can be placed on the books at any time by the "se of combinations of individual characteristics as specified la the 1967 supplement, provided the family so described had not been recognized earlier.

The provisional groupings of series into families at the present time suggest that too-y families are provided for some kinds of soil and too few for other kinds. Recognition of family classes obviously poses some problems. Such problems need to be brought to light so that efforts to provide solutions cm be undertaken.

The national committee recommends that each regional committee on application of the classification system review distinctions between family classes and the placement of series into family classes. Consideration should be focused especially on soils within the respective regions.

The effort would have several objectives. One objective would be to bring cut the bases used for distinguishing family classes and for placing series into those classes. These bases could then be examined more critically than is now possible. Another objective would be to test the validity of series placements. A third objective would be to bring to light the problems met in defining and distinguishing family classes and in placing series into such classes.

The existence of problems is now indicated by the provisional grouping of series. Additional study of the family placements of series could lead to possible solutions of the problems and also eventually to preparation of. guide for defining and distinguishing family classes.

E. Soil Association Nomenclature

Some difficulties have followed use of the word, Association, in naming mapping units at differing levels of generalization. Possible terms for construction of mapping unit names were therefore considered by this committee two years ago. The consideration was prompted by the use of identical names for a soil association on a detailed map and for a soil association on . general map for the same county. The same name was thus used with two meanings in a single survey that was being published. Similar conflicts can be expected again.

A recommendation was made by the 1967 committee on the basis of a split vote that the word, suite, be used in constructing names for soil associations on detailed maps, those published at scales of 1:20,000 or larger. It was later learned that this word had been used in world literature with at least two other meanings. Giving the term a third meaning would compound confusion. The proposal to use the word in naming mapping units he.6 therefore not been accepted.

The 1967 committee discussed the possibility of constructing a hierarchy of names for soil associations at different levels of generalization. The names in the hierarchy would, in a way, parallel those for categories in the classification system, e.g., subgroups, great groups, suborders, end orders.

Four possible sets of names were considered by the 19 committee. These are reviewed in the present report to ensure that the discussion will be continued. No set of terms was accepted by the 1967 committee.

The first possibility discussed was lifting words from the body of ordinary language and giving them specialized meanings. The words considered have meanings that partially parallel the meaning of the word, association. The list of words considered by the committee follows:

Agglomeration	Combination	Concourse
Aggregation	Combine	coterie
Assemblage	Composite	Society
Catenation	Concatenation	

The words listed already have connotations from ordinary use, connotations which make the words undesirable in constructing names for kinds of soil associations. For this reason, the idea of picking words from the body Of ordinary language was dropped.

A second possibility discussed in 1967 was that of restricting the word, association, to names Of separations shown 0" maps with scales Of 1:20,000 or larger. For general county maps, the soil associations would be called "soil landscapes" and for State maps they would be called "soil areas". These expressions would make the names of mapping units too long. Furthermore, the word, area, is already overworked.

A third possibility discussed by the 1967 committee was to add modifiers to the word, Association. Proposed modifiers were "detailed" and "generalized". The name of a mapping unit would thus include a phrase such as detailed association or generalized association. Adoption of the two modifier. would provide different names for two levels of generalization in naming soil associations. The committee decided that the resulting names of mapping units would become too long if this idea were adopted and dropped the ● uggeltion.

A fourth possibility discussed two years ago was the introduction of coined terms for soil associations at different levels of generalization. This proposal included the idea Of using the phrase, soil association, as a generic term ● rc1uaive1y to refer to all kinds of associations collectively. The suggested terms listed in sequence Of progressively higher levels of generalization are:

Complex	Macrosociation
Microsociation	Megosociation
Mesosociation	

This proposal would leave the term, complex, defined as at present.

One modification of the above proposal discussed briefly in 1967 would delete microsociation and provide three levels of generalization above that of the complex.

The 1969 committee is split, as was the 1967 committee, on the need for a hierarchy of names for associations. Many members feel that an effort to devise a set of names for soil associations at differing levels of generalization is not required at the present time.

F. Committee Recommendations

1. It is recommended that committees on application of the classification system function at the next regional soil survey work planning conferences. Discussions of changes that have been made in the classification system will be necessary. Furthermore, these regional committees could, to advantage, make a study of family classes, as discussed in a section of this report.

2. It is recommended that the committee of the national conference be continued to receive and deal with reports of the regional committees.

Membership of Committee

Roy W. Simonson, Chairman

J. K. Ableiter	A. H. Paschall
T. B. Hutchings	Guy D. Smith
C. W. McBee	R. A. Struchtemeyer
J. T. Maletic	J. M. Williams

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL SOIL SURVEY CONFERENCE
Charleston, South Carolina, January [illegible]

Report of Committee on Engineering Application
and Interpretation of Soil Surveys

Objectives:

1. Review regional working reports.

2. Evaluate proposals for improving coordination of interpretations.

3. Study procedure for standardization of formats for listing and distributing soil survey interpretations.

4. Promote the development of new procedures for making soil survey interpretations more effective in the town and country environment.

The procedure followed in preparing this report was to consider first the reports from regional committees. Copies were circulated to committee members who were asked to express their reactions to specific recommendations listed in the regional reports. The first part of this committee report deals with regional reports. Committee members were also asked to comment on specific recommendations made by the chairman. These recommendations suggest procedures for improved interdisciplinary coordination of soil survey interpretations. Additional topics were proposed by committee members.

Regional Reports

I. Report of Committee on Engineering Application and Interpretations of Soil Surveys - Northeastern Regional Technical Work-Planning Conference. This report recommends the following:

 a. Nonfarm uses such as campsites, athletic fields, play and picnic areas, lawns, landscaping, golf, and sanitary landfills be added to the present "Guide for Interpreting Engineering Uses of Soils."

 b. Columns 15 and 16 be deleted from table 7 of this guide and the new table (item a) will list soil limitations for sewage disposal.

 c. Interpretations for community development and recreation should be presented in a separate section of the published soil survey, if these interpretations are important in the county. (Isn't this being done?)

 d. The new table, titled "Estimated Degree of Soil Limitations for Community Development and Recreational Use" would show the degree of soil limitation and factors causing the limitations for the following items:

  (1) Septic tank filter fields (currently in table 7 would be moved to table 8 in order to conform to type of use and rating).

  (2) Sewage lagoons (currently in table 7 would be moved to table 8 in order to conform to type of use and rating).

  (3) Low building

   (a) With basements
   (b) Without basements

  (4) Campsites

   (a) Tents
   (b) Trailers

  (5) Parking lots and streets in subdivisions

(6) Athletic fields and intensive play areas

(7) Picnic areas

(8) Paths and trails

(9) Lawns, landscaping, and golf fairways

(10) Sanitary landfill

(a) Trench method
(b) Side-hill method

(11) Cemeteries

c. The National Committee should consider a handbook for soil interpretations. This handbook should include criteria needed for developing soil interpretations.

Reviewers recognize the need for including in the "Guide for Interpreting Engineering Uses of Soils" guides for developing predictions of soil behavior for new uses. The Committee questions adding more information to table 7. This table already is a formidable one. The Committee seconds the suggestion for a handbook for soil interpretations. This provides for better coordination of interpretations.

2. Report of Committee No. 6 - Uniform Interpretations of Soil Surveys of the Western Regional Technical Work-Planning Conference. This report recommends the following:

a. Classes of corrosivity for uncoated steel pipe not be used, but rather list and define those soil qualities and properties that affect corrosivity. These are total acidity, texture, drainage, salinity, stratification, and contrasting textures. Also, that corrosivity ratings in the National Guide be moved from table 6 to table 7 as an interpretation.

b. The present criteria for corrosivity of concrete pipe included in the National Guide present some problem in rating Western soils and needs further attention. The Committee also recommends that the corrosivity of concrete be included as an interpretation in table 7 in lieu of soil property in table 6.

c. A conflict exists in interpretation of terms between those used in definitions, p. 8, and heading in table 7 of the National Guide. The Committee recommends that the probability of finding sand or gravel be rated rather than suitability. It also recommends that statements describing kind, grading, quantity, position, etc. should be presented in table 7, together with the probability class.

d. The National Guide for Interpreting Engineering Uses of Soils be expanded to include recreation interpretations, watershed hydrology, excavations, bearing strength, and frost potential.

e. A "primer" or handbook of soil survey nomenclature, procedure, and interpretations be prepared and published for use of specialists in other disciplines. (Couldn't this function be picked up by Div. V of Soil Science Society of America?)

Western states have had problems with criteria for soil corrosivity, but other regions have not reported this limitation. The best solution may be to list properties causing corrosion, as suggested in the Western report.

3. Report of Committee 7 - Urban Interpretations, Southern Regional Technical Work-Planning Conference. This report recommends the following:

All interpretative criteria should be combined in one handbook. Criteria for interpretations should be removed from numbered memoranda, advisory notices, and other locations.

4. Report of Committee on Engineering Application and Use of Soil Survey Data for Suburban Planning - North Central Regional Technical Work-Planning Conference. This report recommends the following:

a. The Committee reported that experience has shown that the majority of users of soil maps DO want interpretations provided for their use. They hesitate to arrive at their own conclusions from soil descriptions and tables of estimated physical and chemical properties.

b. Each State prepare comprehensive soil interpretation sheets for each soil series that can be made available to soil-map users as soon as the soil map of a few or many acres is completed.

c. National Conference organize short courses for soil scientists concerned with making soil interpretations.

d. National Conference Committee consider standardization of the soil series interpretation sheets for use in all States.

e. National Committee review the interim reports prepared during the past five years and propose a suggested format and method of reproduction.

In view of the large number of interim reports in circulation, it presents a formidable task. Individuals can review and select parts from present publications. The Committee hesitates to recommend or suggest a format. Each situation may require a different approach. Reproducing drafts of the unedited manuscripts used in the published soil survey provide a good solution. Interpretive sheets similar to the one attached offer alternatives for partially completed surveys.

Reaction of Committee to Specific Topics:

The following questions were circulated to Committee members. A summary of their answers follows:

1. Do soil scientists need some kind of a document that will guide them in making soil survey interpretations? A national handbook for soil survey interpretations is needed to encourage better coordination of interpretations among the various political and resource areas. Also, a handbook will tend to insure a set of standards that will gain the confidence of those who use our soil maps. This handbook should contain definitions and criteria for making soil behavior predictions. It should discuss those soil properties and characteristics that affect the behavior pattern. It should be written for the soil scientist.

2. Comments on an example of an individual interpretive sheet for phases of soil series were solicited. All agreed that standardization of such a sheet is desirable, but some allowance should be made for recognizing interpretations unique to an isolated area. The Committee is in favor of promoting a uniform procedure to prepare, review, and distribute Established Soil Interpretations. The Established Soil Interpretation becomes the accepted standard for soil survey interpretation, as the Official Series Description is the accepted standard for series classification and description. Interpretations are listed for those phases significant to the use in question. Coordination becomes a procedure for comparing predictions of behavior for same kinds of soil rather than empirical ratings of independent slope, rockiness, or erosion classes.

The South Region is testing a procedure for coordinating soil interpretations. Each State responsible for the series description and classification is also responsible for maintaining an interdisciplinary coordination of soil survey interpretations. A copy of the description and interpretations for the Mimosa series is attached. These sheets are written for the technician. They can serve as part of the technical guide. With a certain amount of explanation and some revision, these sheets can be assembled for selected survey areas and given to nontechnical people for guiding sail use.

3. The 1966 report of this Committee urged the regional committees to collect data on costs of correcting soil limitations. A preliminary report of a study on costs of developments for different kinds of soil in St. Croix, Virgin Islands is attached. A team of workers--Including soil scientists, soil conservationists, engineers, and planners--rated the relative costs of site preparation, utilities installation, road construction, and housing construction casts for five major soils. Their preliminary work is being used by builders and it seems to be accurate. This study offers A challenging procedure for assigning real values to the more common limitation classes.

4. Some committee members are concerned over the skepticism of soil survey interpretation exhibited by some specialists in other disciplines. There seems to be a general deficiency in knowing how soil behavior predictions are made. This deficiency may be due to a serious gap in communication. This Committee recommends the following actions:

   a. A high-quality, color-sound movie be prepared. The movie should explain the fundamentals of soil behavior predictions, the synthesis of data from various sources, and the difference between the empirical and natural approach to soil classification and behavior. The movie should be directed toward the general public, it should not be prepared for the layman.

2. That a "primer" be issued [illegible] soil survey [illegible] to [illegible] specialists in other disciplines.

3. That soil scientists [illegible] published [illegible] by the [illegible] Agriculture [illegible].

Committee Recommendations

1. Regional committees devise formats, suggest contents, and [illegible] of a technical guide for soil survey interpretations.

2. Regional committees [illegible] the [illegible] and test [illegible] interpretations.

3. Regional committees formulate and promote information programs [illegible] aimed at specialists in other disciplines who are becoming prime users of soil surveys.

4. Regional committees test the [illegible] ratings for specific land uses. "Community Development Potential" prepared in McHenry County, Illinois by John [illegible] and [illegible] and residential ratings used in Florida are examples.

5. The national committee on engineering applications and interpretations of soil surveys should continue. Its charge should be to receive and review proposals made by regional committees and to test and evaluate these proposals for the improvement of soil survey interpretations.

Committee Members:

L. J. Bartelli, Chairman	[illegible]
R. W. Cleveland	Adrian Pelzner
R. W. Eikleberry	Harold Pitts
A. A. Klingebiel	J. D. Rourke
C. W. Koechley	Rudolph Ulrich
John E. Maletic	K. K. Young

Notes on discussion by the Conference following committee report:

Maletic: Dr. Heddleson (Extension Service, Pennsylvania State University) has prepared a color film on using soil survey. Those interested should check with Dr. Heddleson on availability.

Pelzner: These kinds of films should be made available to professional societies in other disciplines.

Bartelli: There is a need for a set of slides or a movie on how soil interpretations are made. Much of our past work deals with examples of how soil surveys are being used.

Hockensmith: It is important to point out limits as well as value of soil surveys.

Enderlin: There is a need for explicit criteria sheets that explain how we arrive at predictions of behavior.

Flach: Div. 5, SSSA is planning a program on engineering interpretations and will consider all suggestions.

Kellogg: As long as we continue to graduate soil scientists without calculus, our men are limited in explaining and making soil survey interpretations. The Washington staff has plans for developing a handbook of policy in soil survey. I am confused about sanitary landfills. Even sanitarians do not know what they need. Universities with trained people should work out requirements.

Klingebiel: Planning people and other users want the soil scientist to make predictions on soil behavior. In addition to basic data, they want limitation ratings. Only a few soil scientist believe that basic data are all that is needed. (The conferees supported Mr. Klingebiel's remarks.)

The committee report was accepted by the conference.

2 Attachments:
Description and Interpretations - Mimosa Series
Cost Study Report for Soils in St. Croix, Virgin Islands

S A M P L E

Established Series
Rev. JCT
10-67

MIMOSA SERIES

The Mimosa series is a member of the fine, mixed, thermic family of Typic Hapludalfs. These soils have dark brown loamy A horizons and strong brown or yellowish brown clayey B horizons. Phosphatic limestone bedrock is at an average depth of 4 to 5 feet.

Typifying Pedon: Mimosa cherty silt loam - cultivated
(Colors are for moist soil.)

Ap -- 0-6" -- Dark brown (10YR 3/3) and some brown (7.5YR 4/4) cherty silt loam; moderate fine granular structure; very friable; common fine roots; few fine black concretions; medium acid; clear smooth boundary. (4 to 8 inches thick.)

B1t -- 6-12" -- Brown (7.5YR 4/4) silty clay; moderate medium angular and subangular blocky structure; firm; common fine roots; continuous clay films; few fine black and dark brown concretions; few ½ to 3 inch angular chert fragments; strongly acid; gradual wavy boundary. (0 to 10 inches thick.)

B21t -- 12-22" -- Strong brown (7.5YR 5/6) clay, few fine and medium faint yellowish brown (10YR 5/4) and brown (7.5YR 4/4) mottles; moderate angular blocky structure; firm; few fine roots; continuous clay films; few fine black and dark brown concretions; strongly acid; gradual wavy boundary. (6 to 12 inches thick.)

B22t -- 22-30" -- Yellowish brown (10YR 5/6) clay, common fine and medium distinct brown (7.5YR 4/4), yellowish red (5YR 5/6), and pale brown (10YR 6/3) mottles; strong medium angular blocky structure; firm; few fine roots; continuous clay films; few fine dark brown and black concretions; strongly acid; gradual wavy boundary. (6 to 18 inches thick.)

B23t -- 30-40" -- Mottled yellowish brown (10YR 5/6), pale brown (10YR 6/3), and strong brown (7.5YR 5/6) clay; weak medium and coarse angular blocky structure; firm; few fine roots; patchy clay films; common fine dark brown and black concretions; strongly acid; gradual wavy boundary. (0 to 12 inches thick.)

B3t -- 40-50" -- Mottled light yellowish brown (10YR 6/4), yellowish brown (10YR 5/6) and light brownish gray (10YR 6/2) clay; weak medium and coarse angular blocky structure; very firm, common medium and large black concretions; some thick stains along cracks and on ped faces; strongly acid; gradual wavy boundary. (6 to 20 inches thick.)

C -- 50-55" -- Mottled light olive brown (2.5Y 5/4), light brownish gray (10YR 6/2), yellowish brown (10YR 5/4) and gray (N 6) clay; structureless, massive; very firm; common fine and medium black concretions, medium acid. (0 to 15 inches thick.)

R -- 55" -- Phosphatic limestone rock.

Type Location: Rutherford County, Tennessee; one mile southwest of Eagleville, 300 feet northeast of Eagle bench mark, and 1000 feet southeast of barn on Gordon Lamb farm.

Range in Characteristics: Thickness of solum and depth to phosphatic limestone bedrock range from 2½ to 5 feet. Some of the soil has outcrops of limestone rock or chert fragments or both. Rocky, cherty and non-cherty phases are recognized. The A horizons of the cherty phases consist of colluvium from associated cherty soils, and contains from 15 to 35 percent chert fragments by volume. Few to common chert fragments up to 3 inches in diameter may be in any horizon. In some places, the solum contains a small amount of shale fragments. Generally, few or no coarse fragments are in the solum below the surface layer. Reaction ranges from very strongly acid to medium acid in the upper horizons, and from medium acid to mildly alkaline just above bedrock. Phosphorous in each horizon ranges from medium to high. The Ap horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 3 or 4, except that where the soil is severely eroded chroma may be as much as 6. In most of the soil the color value of the Ap horizon is but slightly darker than 4 and where the A1 horizon is darker than value 3.5 it is less than 6 inches thick. A horizons which are cherty commonly have a slightly lower color value than those which are not cherty. Texture of the A horizon is silt loam or silty clay loam and as fine as silty clay or clay in severely eroded areas. The B1t horizon is silty clay loam in some pedons. The B2t horizon has few to common mottles of yellow, brown and red. Texture is clay or silty clay. The upper 20 inches of the B2 horizon typically contains about 50 percent clay and ranges from 45 to 60 percent. Clay content either increases or remains about constant from the upper boundary of the B horizon to bedrock. Structure of the B2 horizon is moderate to strong and consistence is firm to very firm. The B3 horizon is commonly mottled yellow, brown, gray, and red; but in some pedons it has dominant color of strong brown, olive brown or yellowish brown and few to many mottles. In some pedons it is structureless, massive. The C horizon is either profusely mottled yellow, brown, and gray or it has a dominant color of olive brown or yellowish brown and common to many mottles of gray and brown. It is clay or silty clay. Base saturation by sum of cations ranges from 60 to 90 percent at 50 inches below the top of the B horizon or in the subhorizon just above bedrock if shallower than 50 inches.

Competing Series and their Differentiae: These are the Archer, Bradyville, Braxton, Bushnell, Capshaw, Colbert, Hampshire, Lowell, McKamie, Needmore, Salvisa, and Talbott series. The Archer soils have sandy loam to sand surface horizons and a noticeable amount of sand in the upper part of the B horizon. Bradyville soils have Bt horizons redder than 7.5YR in hue. Braxton soils lack bedrock within a depth of 60 inches, the B horizon has 5YR or redder hue in the upper part, and base saturation is less than 60 percent at 50 inches below the top of the B horizon. Bushnell soils have gray mottles in the B2 horizon which ranges from slightly acid to mildly alkaline. The Capshaw soils have gray mottles in the lower part of the B horizon. Colbert soils have B horizons which have 10YR or yellower hue and a high shrink-swell potential, and they are shallower to bedrock. Hampshire soils have A horizons of color of 4 or higher value, base saturation of less than 60 percent at 50 inches below the top of the B horizons, and C horizons that are high in sand and coarse fragments. Lowell, Needmore and Salvisa soils have average annual soil temperature less than 59° F., and Lowell and Needmore soils have A horizons of color value of 4 or higher. Talbott and McKamie soils have B horizons commonly of 5YR or redder hue in at least the upper part. Also, McKamie soils are underlain by unconsolidated sediments.

Setting: Gently sloping to steep upland extending down from the edge of the Highland Rim into the Outer Central Basin and on outlying knobs and hills within the Inner Central Basin. Slopes range from about 2 to 35 percent. The soils have formed chiefly in clayey residuum weathered from phosphatic limestone. Average annual precipitation ranges from 45 to 60 inches and average annual temperature is about 60° F.

Principal Associated Soils: These are the Braxton soils listed as competing series, and the Armour, Ashwood, Dellrose, and Maury soils. Armour soils are dark brown and silty. Ashwood soils have mollic epipedons. Dellrose soils are dark brown, silty, and cherty. Maury soils have reddish B horizons and depth to rock is more than 60 inches.

Drainage and Permeability: Well drained. Permeability is moderately slow, and runoff is medium to rapid.

Use and Vegetation: About two-thirds of the soils have been cleared. Most cleared areas are used for growing pasture and hay; a few for growing small grain, tobacco, and corn. Many areas are idle. Wooded areas are in oak, hickory, black walnut, elm, maple, hackberry, black and honey locust, and red cedar.

Distribution and Extent: The Central Basin of Tennessee and in northern Alabama. The soil is extensive.

Series Established: Lincoln County, Tennessee, 1938.

Remarks: The Mimosa series was classified in the Gray-Brown Podzolic great soil group in the modified 1938 Yearbook classification.

SOIL SURVEY INTERPRETATIONS

[illegible] These soils have [illegible] limestone rock. [illegible]

ESTIMATED PHYSICAL AND CHEMICAL PROPERTIES 1/

Depth from Surface (inches)	Classification: USDA Texture	Classification: Unified	Classification: AASHO	% of Material Passing Sieve No.: #4	#10	#40	#200	LL	PI	Permeability in/hr.	Avail. Water Cap. in/in.	Soil Reaction	Shrink Swell Potential
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	25-45	8-2[illegible]	[illegible]	[illegible]	[illegible]	Low
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.14	4.5-5.5	[illegible]

[illegible]
[illegible]

Depth to rock [illegible] feet (avg.)   Hydrologic group: C

SUITABILITY OF SOIL AS RESOURCE MATERIAL 2/

Topsoil	[illegible]
Sand	[illegible]
Gravel	[illegible]
Roadfill	[illegible] traffic supporting capacity

DEGREE OF LIMITATION AND MAJOR SOIL FEATURES AFFECTING SELECTED USE

Highway location 2/	[illegible] slopes: Moderate; depth to hard rock Over [illegible] slopes: Severe; slope
Pond reservoir 2/	[illegible] slopes: Moderate; depth to rock (possible seepage) Over [illegible] slopes: Severe; slope (restricted reservoir area)
Pond embankments 2/	Moderate; depth to rock
Excavated ponds 2/	Severe; depth to rock, deep water table
Corrosivity - Uncoated steel 2/	Slight
Corrosivity - Concrete 2/	Slight
Foundations for low buildings 2/	0 to 25% slopes: Moderate; shrink-swell Over 25% slopes: Severe; slope
Septic tank filter fields 2/	Severe; permeability
Sewage lagoons 2/	0 to 2% slopes: Slight 2 to 7% slopes: Moderate; slope Over 7% slopes: Severe; slope
Streets and low-cost roads 2/	0 to 25% slopes: Moderate; depth to rock Over 25% slopes: Severe; slope
Light industries 2/	0 to 10% slopes: Moderate; depth to rock Over 10% slopes: Severe; slope

DEGREE OF SOIL LIMITATION AND MAJOR FEATURES AFFECTING RECREATIONAL DEVELOPMENT

Camp Areas [illegible]	[illegible]
Picnic Areas [illegible]	[illegible]
Playgrounds [illegible]	[illegible]
Paths and Trails [illegible]	[illegible]

CAPABILITY GROUPINGS AND POTENTIAL YIELDS--Improved Management of Level

Phases of Series 2/	Capability	Soil Loss		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		K	T						
1-3% slopes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible] slopes	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] slopes	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]						[illegible]	[illegible]	
[illegible]	[illegible]								
[illegible]	[illegible]								

WOODLAND

Phases of Series	[illegible]	[illegible]	[illegible]	Erosion Hazard	Windthrow Hazard	Plant Competition	Equipment Limitation	[illegible]	For Planting
[illegible] slopes	[illegible]	[illegible]	[illegible]	Slight	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] slopes	[illegible]	[illegible]	[illegible]	Moderate	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Woodland Grouping--[illegible]									

WILDLIFE

Use	Suitability Class and Major Soil Features Affecting Use
Openland Wildlife 2/	[illegible] [illegible] Over 12% slopes: [illegible]
Woodland Wildlife 2/	[illegible]
Wetland Wildlife 2/	[illegible]

RANGE

Give site name and kinds and amounts of vegetation under defined land [illegible]

[illegible]

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RELATIVE COSTS OF LAND DEVELOPMENT AND HOUSING CONTRACTS FOR DIFFERENT KINDS OF SOILS IN ST. CROIX, VIRGIN ISLANDS

LEGEND
- Less than 5 (see)
- 5 Moderate
- 10 High

LOCATION AND DENSITY	Clearing & Grubbing	Site Grading	Subsoil ... cu. yd.	Sediment ... cu. yd.	Transportation ...	Excavation cu. yd.	Private septic tank	Sewage treatment ...	Public sewer line lin. ft.	Electric - above ground lin. ft.	- buried lin. ft.	Telephone lin. ft.	Water ... lin. ft.	Concrete ... sq. yd. ... deep	Asphalt ... sq. yd. ... depth	Frame Construction	Concrete Block	Poured Concrete	Pre-fab	Pre-cast	Masonry	Category 1000 sq. ft.	Total Housing Construction Costs
1. [illegible] AREA, QUEENS QUARTER [illegible] SUBDIVISION ([illegible]) ([illegible] gravelly [illegible]) Density																							
a. 2-5 units / acre	5	5				5	10	10	5	5	5	5	5			1							5
b. 5-10 units / acre	5	5				5	[illegible]	10	5	5	5	5	5									1	5
c. 10-20 units / acre	5	5				5	[illegible]	10	5	5	5	5	5									1	5
d. 20 and over units / acre	5	5				5	[illegible]	10	5	5	5	5	5									1	5
Actual Projects Density																							
2. [illegible] DELIGHT [illegible] AREA ([illegible] clay) Density																							
a. 2-5 units / acre		1	15	10		0	0	1		1 to 10*				0	10	0						10	10
b. 5-10 units / acre	1	1	10	10		10	10	1						10	10	10						15	10
c. 10-20 units / acre	1	1	0	10		10	0	1						0	10	0						10	10
d. 20 and over units / acre	1	1	0	10		10	0	1						10	10	[illegible]						10	10
Actual Projects Density																							
3. PETER'S REST (Bowling Alley, Pan Am [illegible]) ([illegible]) ([illegible] clay loam) Density																							
a. 1-2 units / acre	1	1	5	5		1	1	10	1	1	1	1	1	5-	5	5						5	5
b. 2-5 units / acre	1	1	5	5		1	5	0	1	1	1	1	1	5-	5	5						5	5
c. 10-20 units / acre	[illegible]																						
d. 20 and over units / acre	[illegible]																						
Actual Projects Density	[illegible]																						
4. ST. CROIX CENTRAL HIGH SCHOOL AREA ([illegible] clay) Density																							
a. 2-5 units / acre		1		1		10	10	10	10	5	10	10	10	1	1	10						10	10
b. 5-10 units / acre	1	1	1	1		0	10	10	0	10	0	10	10	1	1	10						0	10
c. 10-20 units / acre			1	1		10	10	10	10	15	15	10	10	1		10						5	10
d. 20 and over units / acre		1	1	1		10	10	10	0	10	10	10	10	1	1	10						5	10
Actual Projects Density																							
5. MT. PLEASANT ([illegible]) ([illegible] clay) Density																							
a. 1-2 units / acre	1	1	10	5		1 to 10	1	10	1	1	1	1	1	5-	5-	5						5	3
b. 2-5 units / acre		1	10	5			5	10	1	1	1	1	1	5-	5	5						5	3
c. 10-20 units / acre																							
d. 20 and over units / acre																							
Actual Projects Density																							
6. CENTRAL AREA Approved [illegible]																							
a. 2-5 units / acre																							
b. 5-10 units / acre																							
c. 10-20 units / acre																							
d. 20 and over units / acre																							
Actual Projects Density																							

Column headers also printed (shaded columns, no values): LAND DEVELOPMENT & HOUSING CONST.; LAND DEVELOPMENT COST; SITE WORK; UTILITIES; ROAD CONSTRUCTION; TOTAL LAND DEVELOPMENT COSTS; HOUSING CONSTRUCTION COSTS; BUILDING COSTS [illegible]; TOTAL HOUSING CONSTRUCTION COSTS; COMBINED LAND DEVELOPMENT AND HOUSING CONSTRUCTION COST (dependent upon area and density)

SOURCE OF INFORMATION

* 1 to 10 depending on moisture

EXPLANATION OF FORMAT AND CONTENT OF

SOIL SURVEY INTERPRETATIONS WORK SHEET

(4-N-27413, REV. 4-69)

1. Place series n&me in upper left-hand corner on line above he&ding.

2. Place MLRA number of the type location of the series in the upper right-hand corner.

3. Place initials of author or authors and date on which the interpretation sheets were prepared or revised in upper right-hand corner below the MLRA number.

4. Give narrative description of the series in a nontechnical language. This narrative should be about the &&me as the first several paragraphs on series in published &oil surveys.

   a. Give in a brief lead sentence, two or three features that help the reader identify the series.

   b. Describe the general nature of the major horizons.

   c. You may want to mention the kind of material from which the soil developed.

   d. Tell the shape of the soil surface, the position of the soils on the landscape and the range of slope.

ESTIMATED PHYSICAL AND CHEMICAL PROPERTIES

5. If the physical and chemical properties are based on test data, footnote "Estimated Physic&l and Chemical properties" to that effect. You may want to give the number of profiles tested in this footnote.

6. The estimated properties should be given for the major soil horizons. Give ranges in these properties.

7. Many states have d&t& available on liquid limit and plastic index. Ranges in these values should be given when available.

8. Define the flood hazard in terms of frequency, duration, and time of year.

9. Specify depth to rock and the kind of rock (hard or rippable). Hard rock is defined as that which requires drilling and blasting for its economical removal.

10. Give the latest coordinated hydrologic group letter (A, B, C, or D).

11. Define wetness in terms of depth and duration of water table and time of year if known.

12. Some states m&y want to add wind erosion group in this block.

SUITABILITY OF SOIL AS RESOURCE MATERIAL

13. Rate whole soil for these uses.

DEGREE OF LIMITATIONS AND MAJOR SOIL USES AFFECTING SELECTED USE

14. Space is provided in each use so phases of series c&n be rated separately. Rate only the class determining phases for the particular u&e.

15. Use latest guides for making the ratings. Specify the guide used by footnote, e.g., Soils Memorandum-69, Regional Guides 1963, Soils Memorandum-45, etc.

CAPABILITY, SOIL-LOSS FACTORS, AND POTENTIAL YIELDS

16. List only those phases which are class determining. Slope phases should be determined from Table 2 of the Capability Classification Guide, South Region.

17. List the latest coordinated K and T values on sloping soils.

18. Give the potential yields of cultivated crops, pasture, or hay crops that are commonly grown on the soil. Potential yields approximate those obtained by good commercial farmers at the level of management which tends to produce the highest economic returns per acre. Show range of yield in round numbers and in the increments as follows:

crop	Increment	Range in Yield
Corn	5 bu	30 - 110
Soybeans	5 bu	10 - 50
Wheat or Oats	5 bu	10 - 90
Grain Soybean	5 bu or 250 lbs	500 - 7,500
cotton	50 lbs lint	350 - 750
peanuts	200 lbs	500 - 3,000
Tobacco	100 lbs	1,500 - 3,000
Rice	5 bu	
Pasture	½ AUM	
Hay Crops	0.2 tons or 400 lbs	

WOODLAND SUITABILITY

18. Rate only those phases that determine ordination. If all phases of a particular series have the same woodland suitability, write "All" in the column headed "Phases of Series."

WILDLIFE SUITABILITY

19. Rate only those phases that are class determining.

RANGE

20. Give site name and kinds and amounts of vegetation under potential (or climax) cover.

OTHER

21. space is provided for making interpretations for those uses that are important within a state or between several states. Potential yields for horticultural crops or other specialty crops and pasture groups are examples.

U. S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, FORT WORTH, TEXAS

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SOIL SURVEY INTERPRETATIONS

MLRA

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DEGREE OF SOIL LIMITATIONS AND MAJOR FEATURES AFFECTING RECREATION DEVELOPMENT

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UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL SOIL SURVEY TECHNICAL WORK-PLANNING CONFERENCE
Charleston, South Carolina, January 27-30, 19[illegible]

Report of Committee 6--Handling Soil Survey Data (for more complete and accurate syntheses of data on soils to improve classification and predictions by use of electronic equipment).

A. Introduction.

1. We are a new committee and this is our first report. At the January 1967 Work-Planning Conference of the National Cooperative Soil Survey (NCSS), the Committee on Soil Survey Procedures discussed the application of ADP (automatic data processing) to soil survey activities and agreed that the National Cooperative Soil Survey "should take a serious look at potential uses and practicality of ADP methods in its activities."

2. As the 1968 Regional NCSS Work-Planning Conferences did not have committees dealing with AD,', our national committee does not have regional reports to consider. The 1968 Western Regional Conference did have a panel discussion and North Central and Northeast conferences had short talks on the subject. While no regional conference recommendations were made about ADP, interest in this matter was displayed at all the conferences, particularly at the western one.

3. The National Cooperative Soil Survey has been collecting, processing, using, and publishing information about soils since its beginning in 1899. Although improvement* in handling information have been wde, we have been unable, especially in the last decade, to make full use of the data et hand. This deficiency is especially serious in statewide, regional, and nationwide planning and policy making for which soil information summaries are not only needed but must be produced on short notice to be effective.

4. With the development of the comprehensive soil classification system and the several-fold expansion of soil survey interpretations--where the real payoff comes--not only has the need for data increased, but the opportunities for rewarding use of data have increased even more.

5. Full use of data today means not only handling large volumes of date. but handling them rapidly; it means quick response to questions that we need to answer for ourselves, for Senators, Congressmen, planners, farmers, and others; and it means sophisticated analysis of data and synthesis of interpretations.

6. One important key to improved data handling is the proper use of electronic computers and other modern equipment.

B. Objectives.

1. The broad, long-range objective of this committee is to consider, evaluate, and recommend ways and means for achieving more complete and accurate analyses and synthesis of data an soils for the improvement of soil classification and soil predictions by use of electronic equipment.

2. The immediate and limited objective is to report on developments to date, to evaluate the present status, and to recommend action on a proposed national system for coding data about soil pedons (profiles).

C. Developments and Present statue.

1. At the 1967 National Cooperative Soil Survey York-Planning Conference, Dr. I,. D. Swindale, then of Hawaii, concluded his remarks about ADP in soil characterization by saying, "It is to be hoped that a suitable standard card end code system can be devised and published so that many workers in soil survey and characterization can use a uniform system and insure that information and results are readily interchangeable."

Since then, several other State experiment station soil scientists have expressed a need for a standard, nationwide system.

2. A standard system that most or all soil scientists would use would have great advantages in the sharing of data between the Soil Conservation Service and the cooperating State experiment stations and other cooperators, and also among the experiment stations themselves. Data could then be shared in the form of tapes or decks of cards. Only a few experiment stations now are using ADP for handling data about soil morphology, but others are starting, and many are interested; and the SCS is under way too.

3. To develop a nationwide coding system now--before substantial investments are accumulated in systems individually developed and put into use--is important. Developmental work was started several months ago. A survey of the scope of soil survey data, and the kinds of questions we want computers to help us answer, led to the concept of a soil data system (SDS). This system needs to be oriented more towards storage and retrieval of information than towards computation, although many computations, including multiple regressions, must be possible. This system will be made up of several files. Those presently envisaged are:

   (a) Pedon data (PD) file to be made up of pedon data (PD) records. A record in this file consists of the pedon (profile) description and the laboratory data (chemical, phyaicel, and mineralogical) of the pedon. It is far the pedon data (PD) record that a coding system has bee" developed.

   (b) Soil classification (SC) file to show the placement of all soil series in the comprehensive system and to indicate the status of soil series; i.e., whether they are established or tentative. Printouts from this file will become volume 2 of the soil classification manual. (By having this information in a computer file, updating and issuance of revised editions of this volume will be facilitated.)

   (c) Series' description (SD) file to contain all of the current soil series descriptions.

   (d) Soil interpretations (SI) file to contain information on 6011 use (or experience) as well as interpretations (predictions) of soil behavior far a variety of uses. (Perhaps more than one file may be needed here.)

   (e) Cartographic soil data (CSD) file to contain information about the geographic distribution of soils so as to be retrievable in both tabular and graphic forms.

4. On August 21-23, 1968, a j-day ADP workshop was held in the Washington area for the purpose of developing, insofar as possible, a coding system for the Pedo" Data records file. As this is the file that will contain the records of the morphological, physical, chemical, mineralogical, and biological data on individual pedons (profiles). it will contain the truly basic information about our soils. It is for the pedon data (PD) record that a nationwide coding system is needed most urgently and also from which the benefits of a nationwide system are likely to be the greatest.

   (a) Participants in this workshop were:

Charles E. Kellogg (part time)	Frank J. Carlisle
I,. D. Swindale	Paul Lemmon
R. Ii. Rust	E. J. Pedersen
Guy D. Smith	Dwight W. Swanson
Klaus Flach	A. C. Orvedal
Clyde Johnson (pert time)	

   (b) Even though State experiment station interests were well represented at this workshop, the development and acceptance of this code was deemed urgent enough to seek greater participation by experiment stations before the next round of Regional NCSS Work-Planning Conferences. I" August 1963, Dr. Charles E. Kellogg wrote to the chairmen of the four Regional NCSS Work-Planning Conferences requesting names of State experiment station soil scientists that the respective chairmen recommended as reviewers of the code being developed at the workshop.

He pointed out that knowledge and experience in automatic data processing as well as in soil survey work are necessary. The following soil scientists were recommended:

O. W. Bidwell (Kansas)
Do" Franzmeier (Indians)
F. D. Hole (Wisconsin)
R. T. Odell (Illinois)
R. H. Rust (Minnesota)
C. L. Scrivner (Missouri)
L. P. Wilding (Ohio)
S. W. Buol (North Carolina)
Curtis L. Godfrey (Texas)

From other sources, the following names are added:

Matthew Drosdoff (New York)
O. A. Nielson (Montana)
Rodney Arkley (California)
L. D. Swindale (FAO, Rome; formerly Hawaii)

5. Two digitizers have been purchased for use by the SCS Cartographic Units. This equipment will be used to digitize--to record "X" and "Y" coordinates for points and lines on maps. It also has the capability of recording "Z" (elevation) along with "X" and "Y" coordinates. The functional characteristics will have a bearing on the design Of a complete soil data system.

6. The editorial section (SCS Division of Information) recently has rented a MT/ST (magnetic tape/selectric typewriter). This will facilitate editing by reducing the amount of retyping that will be needed. It also can serve as an input device for use with computers.

D. Pedon Data Records File.

1. The document describing the proposed coding system for the pedon data (PD) record is made up of the following parts:

   A. General.

   B. Items for the PD record (a list of the kinds of data and spaces allotted for each kind).

   C. Instructions and codes (an explanation of every item in Part B).

   D. Appendix (mainly illustrations of the PD record and some suggested procedures for coding and converting data for entry into the PD record).

   (Because of the combined length of Parts A, B, C, and D--about 77 pages--copies are not a part of this committee report.)

2. The pedon data record is designed to accommodate a pedon (profile) description and the kinds of laboratory data issued in Soil Survey Investigations Reports. Where there were questions about whether to include or exclude items of information, the items were included if the information is needed for classification or interpretations. The proposed record la long, but a long record seems unavoidable if the complete range in descriptive material and laboratory data for soils of the entire United States is to be accommodated. For no single pedon are there likely to be entries in all the data fields, and a device for shortening the record in many places is provided.

3. Even though the record is long, it may not provide for all data that may be collected in the course of special research projects, but the record is designed so that data fields can be added to accommodate special information while still maintaining intact the basic record.

4. Partly because the PD record is long, the code is designed with the assumption that this record will be put on tape. To use cards is possible, but because of the record length, so many cards will be needed that their use For the PD record will be cumbersome.

5. The record is designed to facilitate computer programming for searching for and retrieval of any desired items of information or any combination of such items. Also, for convenience in making statistical analyses, numerical codes are specified wherever possible to reflect the sequential order of characteristics of qualities. For example, codes for grades of soil structure progress from "1" for "structureless," to "7" for "strong."

6. Insofar as possible, the record is designed to accommodate information exactly as it is given in soil descriptions and laboratory reports, but some interpretation "f original information, particularly of soil description:, will be necessary to fit the information into classes provided in the record. While clerks can be trained to enter most of the data, the services of soil scientists will be needed for some of the coding.

7. To encode descriptions and laboratory data directly as specified for the PD record is possible but is not recommended. For parts of the PD record, the procedure CR" be simplified by encoding original information more nearly as it is in descriptions and using the computer to make the conversions to the codes specified i-or the PD record. For example, instead of having the encoder enter "5" for yellow, he could enter the Munsell notation "Y" and the computer can be used to convert tne "Y" to "5". Errors can be reduced and considerable edit-checking accomplished by this procedure. Some suggestions for entering original data for subsequent conversion to the PD record are made in Parts C and D of the proposed coding system. me procedures developed and followed for getting data into the PD record are expected to vary somewhat from office to office depending upon help and facilities available locally, and complete standardization of such procedures is not proposed. What is proposed is that the PD record--the record for storage, retrieval, and interchange--conform to a rigid format regardless of how this conformity is attained.

8. The proposed PD record does not yet provide for grain-size data and certain other data that we get from soil engineering laboratories. No particular difficulty is envisaged in making provision for these data if the basic features of the proposed format are sound.

9. me soil data system must be compatible with other systems being developed in the Soil Conservation Service. Development Of a range data system, a woodland data system, and a watershed data system are under way. No serious problem is anticipated in attaining compatibility.

E. Recommendations.

1. This Committee approves of the actions, set forth in this report, that already have been taken in the interest of bringing about appropriate use of ADP in the National Cooperative Soil Survey and recommends that this effort be sustained and, if possible, increased.

2. It recommends that the proposed coding system for the pedon data record be submitted to the persons listed in paragraph C 4 (b) for review early in 1969.

3. It recognizes that appropriate action following the first round of reviews will depend on the results of these reviews, but it recommends that work on the coding system be pushed as vigorously as possible and that the effort to have a standard coding system be continued.

4. This Committee recommends that regional conference committees be established to deal with the handling of soil survey data.

5. This Committee recommends that it be continued. Proposed activities are:

(a) To monitor and evaluate continuing efforts to improve handling and use of Soil Survey data.

(b) To call the attention of the National Cooperative Soil Survey leadership to new techniques, procedures, or equipment for data handling that merit evaluation and testing for possible use in the Soil Survey.

Committee Members:

B. A. Barnes*	R. B. Grossman	E. J. Pedersen*
F. J. Carlisle	W. M. Johnson	Richard H. Rust
G. R. Craddock*	S. A. Lytle	R. A. Struchtemeyer*
L. E. Derr	Gordon S. McKee	Dwight W. Swanson
Klaus W. Flach	Franklin Newhall*	Dirk van der Voet
L. G. Giese	A. C. Orvedal, Chairman	

* Not present at the Charleston conference.

CONFERENCE ACTION.

1. The Conference added the following names to the list of reviewers of the proposed coding system:

E. P. Whiteside (Michigan)
G. W. Petersen (Pennsylvania)

2. With these additions to the list of reviewers, the Conference accepted the Committee report.

3. During a hasty explanation of the proposed coding system, by Mr. Swanson, some comments were made about certain parts of the system. These comments, and those already received from committee members and a few others, will be considered along with those expected from experiment station reviewers. me principal comments made at the conference were as follows:

   (a) Orvedal reported that copies of a memorandum to Committee 6 from Dr. Petersen of Pennsylvania, dated January 22, 1969, were available to Conference participants. This memorandum contains some suggestions based upon ADP experience at Pennsylvania State University.

   (b) I" regard to coding parent material, Dr. Grossman suggested that the name of the geologic formation (time-stratigraphic designation), if known, also should be put in the PD record. Such Information would be useful in projecting probable mineralogical composition Of soils. This suggestion was countered by a reminder that names of geologic formations are not well correlated among States and to put the formation name into the PD record therefore would be of limited value.

   (c) Dr. Flach observed that the proposed PD record did not provide for soil temperature. He suggested that the soil temperature noted when the pedon is described should be included in the PD record. Dr. Smith replied that useful soil temperature data could be obtained best by systematic soil temperature measurements and that recording a single measurement (at time of soil description) was of very limited value. Orvedal reminded the Conference that the proposed PD record was limited to data collected when a description is written (and samples collected) and does not provide for recording properties, such as soil temperature, that may be measured repeatedly on the same pedon over a period of time.

   (d) Dr. Kellogg expressed some disappointment with the vegetation classes.

   (e) Dr. Maletic suggested that provision should be made far indicating if the pedon described is under irrigation because of the transient soil properties associated with irrigation.

   (f) Dr. Flach suggested that, in coding soil horizons, Arabic numbers be substituted far the conventional Roman numerals to indicate lithologic discontinuities. He argued that this change would reduce the spaces required and make tabulating easier.

   (g) Johnson suggested that gastropod shells and fossil bones should be added to data item 45.

(h) Grossman suggested some rearrangement so as to place data items 33 and 45 in closer proximity to one another or possibly combine them into one data item.

(i) Koechley said that, under data item 3, the requirement that coordinates will be "recorded to the nearest unit (foot)" needs to be changed.

(j) Dudal relayed a comment from Dr. Swindale that the PD record was very long and, if possible, should be shortened.

(k) Rust stated that he was not unduly concerned about the length of the PD record, and that we should not be deceived by the length of the instructions because computer operations require explicit instructions.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE
OF THE COOPERATIVE SOIL SURVEY
Charleston, South Carolina, January [illegible], [illegible]

Report of the Committee on Soil Moisture

The [illegible] National Soil Moisture Committee made two formal recommendations to the regional committees:

(1) Place emphasis on the formulation of descriptive statements of the water table regime in terms of kind of water table, depth of occurrence, duration, and time of year, which would replace drainage classes of the Soil Survey Manual and be used in the new classification system in place of morphological features in present definitions.

(2) Consider alternative terminology for the description of rates of water movement through the soil that would be in keeping with terminology used by soil physicists, and would be descriptive of the conditions under which the measurement was made.

In addition, it was suggested that the regional committees collect information on studies of field soil moisture regimes, attempt to coordinate activities of regional soil moisture and climate committees, and review the moisture criteria in the new classification system.

The Northeast, Southern, and North Central Regions had committees on soil moisture. Their reports were reviewed and the recommendations have been considered. Four subject areas will be considered in this report: water table regimes; rates of water movement; moisture regime and climate; and guidelines for evaluation of the moisture regime.

1.0 Water Table Regime

1.1 The Problems and Their Status

The subject of water table regimes has been of long standing importance to the Moisture Committee. The Soil Survey Manual contains a set of drainage classes. These are defined on the basis of the length of time the soil is wet; morphology is not a necessary part of the definitions. The classes represent an integration of the intrinsic permeability of saturated soil, the relative amounts of runoff or run-on for an area, and the so-called internal soil drainage. The last-named is "that quality of a soil that permits the downward flow of excess water through it." It reflects both intrinsic permeability and the soil moisture regime. A soil may have a high intrinsic permeability, but because of topographic position, climate, or both, have a shallow water table over much of the year. Resultantly, the internal soil drainage class may be "none" or "very slow."

There have been several attempts to formulate classes that would be more numerically descriptive of the water table regime and could replace or supplement the drainage classes of the Manual. It has been recognized that depth to the water table, length of time saturated, and perhaps time of year when saturated, should be part of the class definitions. Moreover, it may be desirable to indicate whether the water table is perched or continuous.

The Comprehensive Classification System has introduced another element to the problem. The definitions focus on morphology of the soils rather than the water table regime. The principal reason for this is that the water table regime changes with soil use. Even if soils that are artificially drained are excluded, there are still large changes that may occur, as for example, when trees are removed. Another reason is that we do not have the information available about the water regime of most soils. The current definitions of some subgroups do permit classification based on the water table regime alone. This has been a recent innovation mainly from the Western Region. For other subgroups, no provision has been made if the water table regime is known and at variance with the morphology.

The Northeast Committee suggested a set of water table regime classes (see Appendix). This proposal has not been tested. Classes are defined for the depth to the apparent water table (level in an unlined borehole) during the period of the year when water tables are relatively shallow. December 1 to April 30 was suggested for the Northeast. Other areas would require different periods. The classes of shallow water table stand would be subdivided on position of the water table when relatively deep. Two formulations for these subdivisions were suggested: maximum distance below the bottom of the depth class descriptive of the period of shallow stand; and depth above which the water table occurs most of the time.

The Southern Committee considered various formulations of depth-duration classes. None satisfactorily separated taxa below the suborder level of the new classification system. Water table information for three years on certain North Caroline soils was reviewed. Aquults had water tables within 15 inches of the ground surface (phrased "in or within 6 inches of the A1") for over one-half month per year. Udults had water tables within this depth for less than one-half month.

Both the Northeast and Southern Committees expressed concern about the definition of water tables. The Southern Committee recommended that the term, water table, if unqualified, denote "continuous saturation below the measured level," and that perched water tables should be "closely indicated and reported." The Northeast Committee indicated that most observations were of apparent water tables (level at which water stands in unlined borehole), and that lined boreholes often measure the apparent water table because of inadequate sealing. It was further observed that all water tables are perched at some depth.

1.2 Recommendations

The National Committee wishes to encourage continued emphasis on the measurement of water tables and on attempts to formulate classes descriptive of the water table regime. Regional committees should explore the scheme suggested by the Northeast Committee. In its particulars, the proposal may not be applicable for other areas. The underlying idea, however, may have merit. With the advent of automatic data processing, it has now become feasible to analyze large quantities of water table information. Hopefully, this should lead to the more rapid analysis of possible sets of classes. There is the further question whether automatic data processing may not make sets of classes less necessary, since if the information is encoded with sufficient flexibility, answers may be generated to questions as these arise.

The regional committees may wish to consider amending the definition of water tables to specify the thickness of a perched water table (see 1965 National Committee Report for definitions). The National Committee feels this is unnecessary. It is understood that the base of a perched water table would be within the usual depth of observation in a soil survey, the order of two meters. There is, however, considerable sentiment to define the thickness of a perched water table. It is a subject the regional committees may wish to consider. Review of the definitions pertaining to wetness in the comprehensive classification system would seem useful. But perhaps the review should be held in abeyance until after the system has been stabilized for a period.

2.0 Rates of Water Movement

2.1 The Problems and Their Status

Both the rates of water movement and the application of information on these rates depends markedly on the moisture content or more accurately the tension range specified. At field capacity and lover water contents (tensions above 1/3-bar for medium and fine textures), the principal question for the soil survey is how rapidly water moves relative to plant needs. This is not an active area of inquiry by the soil survey, although it has great importance in soil management groupings. The rate of movement at moisture contents roughly between field capacity and saturation is currently emphasized. These rates affect the design of small sewage disposal systems. The rate of movement at or near saturation has long received emphasis. This rate determines the kind of drainage system that would be suitable. It also partially determines the potential for pollution, resulting from long-range movement of substances in the soil water. Such movement may be determined by aspects of a site--such as slope configuration or kind of underlying rock--which are outside the definition of the mapping unit and may not be described adequately in the soil association description.

The 1967 National Committee made certain suggestions on terminology for water flow. These were reviewed thoroughly by the Northeast Committee, and particularly by Dr. David Hill to whom the National Committee is indebted. Some review Of methods and terminology may be helpful as background to the recommendation to follow. There are both laboratory and field methods of determining rates of water movement. These methods may be divided into measurements of saturated and unsaturated flow, and those subject to analysis by Darcy's law and those that are not. The soil survey is mainly concerned with two measurements: the laboratory determination of vertical flow in saturated cores, commonly referred to as the Uhland care method; field determination of unsaturated flow by the auger-hole percolation test. me former is the basis for the numerical limits attached to the permeability classes Of the Soil Survey Manual; these classes are used in current published soil surveys. Units of velocity are employed. Permeability, as the term is define.3 by soil physicists, has units Of length squared. It is incorrect to attach units Of velocity to the term permeability. The auger-hole percolation test is widely used to evaluate sites for sewage disposal systems. In contrast to the Uhland core method, which measures so-called one-dimensional flow, usually vertical, the percolation test measures so-called three-dimensional flow. The data Obtained by the Uhland core method are subject to analysis by Darcy's law; for the most part the percolation test data cannot he so analyzed. The same terminology is not appropriate to describe the results Of the two methods.

2.2 Recommendations

The National Committee recommends that the term, saturated hydraulic conductivity, should be used for data expressed as a velocity and obtained by analysis using Darcy's law of measurements on saturated cores; and that the tern, percolation rate, should be used for measurements by the auger-hole method. The permeability classes in the Soil Survey Manual may be renamed hydraulic conductivity classes with no change in class limits. Although the data on which these are based were not analyzed by Darcy's law, it turns out that since the head and length of the core were "early equal, they may be considered hydraulic conductivity values. The term, permeability, may be used for the intrinsic property of perviousness of the soil material to liquid or gas; but if units are indicated these should be length squared, not velocity. Measurements by the auger-hole method may be analyzed by Darcy's law, but commonly this is not possible because conditions have "at bee" defined adequately. Percolation rates, therefore, usually may not be referred to as unsaturated hydraulic conductivity.

3.0 Moisture Regime and Climate

3.1 The Problems and Their Status

The objective is to improve the predictions about the soil moisture regime by use of weather data. The problem nay be approached in two different ways. I" one, the emphasis is placed on calculations using climate information to predict the soil moisture regime. I" the Other, climate data are used to extend and apply information that has bee" gathered on the soil moisture regime. The suitability Of approach depends somewhat on the kind of climate and whether the water table regime or the capillary moisture regime is under study. If weather from year to year ranges narrowly, direct measurement becomes more feasible. I" the western United States, where large areas have low, variable precipitation and deep water tables, emphasis has bee" put on predicting the capillary moisture regime from climate data. In the eastern United States, where precipitation is greater and less variable, and the proportion of soils with shallow water tables is higher, emphasis has been put On measurements of the water table regime. Activities Of the regional committees reflect these differences. The last Southern and Northeaster" Committees put major emphasis on characterization of water table regime. The North Central Committee focused on prediction of moisture regime from climate data. The Western Region did not have a soil moisture committee but has a climate committee, a concern of which has bee" prediction of the soil moisture regime.

3.2 Recommendations

Regional moisture committees should keep abreast and encourage attempts to use climate information to characterize the soil moisture regime. Many of these attempts are extremely sophisticated. The regional committees might perform a useful service by interpreting such studies, pointing out their implications to the soil survey. More emphasis should be put on the use of weather deta to interpret and apply short-term moisture regime studies. The results of these short-term studies are largely determined by the prrcipitatioh over the period of measurement. Their interpretation requires that a relationship be established between the precipitation for the period of measurement and the long-term precipitation. The regional committees should consider the kind and form of information about the weather for the period of measurement which should accompany published soil moisture regime data,

4.0 Guidelines for Evaluation of the Soil Moisture Regime

4.1 Problems and Their Status

The publication on soil temperature, SCS-TP-144, has proved extremely valuable. It provides a point of departure for the soil scientist concerned with characterization of the soil temperature regime. The National Committee believes that a parallel publication is needed on the field soil moisture regime, Work on such a publication would be a means of implementing some of the recommendatiohs contained in the previous section on moisture regime and climate.

4.2 Recommendations

The regional committees should make recommendations on the topics to include and the organization of a publication On evaluation of the soil moisture regime. The regional committees might begin by reviewing SCS-TP-144. The objective of the two publications may be similar, but moisture characterization has more aspects. We would need to decide which aspects to include and which to omit. Characterization of the soil moisture regime involves measurements on the amount and state (tension) of the water, and the rate at which it moves. Moisture characterization is widely done in the laboratory as well as in the field. Do we want to discuss laboratory results? We might in the sense of how they may be approximated from observations that can be made in the field, as for example, the relationship between clay percentage and Ii-bar water retention. Perhaps the rate of water movement should be excluded. In this regard, percolation tests are described in several publications including SCS publications such as Agric. Inf. Bull. 243; various methods of determining hydraulic conductivity are discussed very adequately in American Society of Agronomy Monograph No. 9; and the relationship between morphology and percolation rate is explored in SCS-TP-101. Then, too, there is the question of the balance between information on how to do things and an explanation of general characteristics. The publication on soil temperature achieves a good balance.

Suppose we formulate as the primary objective to assist the field soil scientist to obtain information on the field moisture regime of soils of an area, exclusive of considering the rate of movement. There are at least three topics which should be treated. One would be the estimation of the moisture regime from long-term weather information. Another would be recommendations on how to collect soil moisture information. The techniques used for water table studies differ from those for characterizing the capillary moisture regime. The third would be the interpretation of short-term measurements; this requires their integration with long-term weather data (section 3.1). The National Committee suggests that the North Central Committee give its attention to the first and third topics. Regarding the second topic, we have perhaps more experience with characterization of the water table regime than with the capillary moisture regime. The National Committee suggests that the Northeast and Southern Committees place emphasis On the water table regime. As a Start they might review the statement prepared by Daniels and Gamble on groundwater studies, and consider its integration with the water table definitions contained in the report of the 1965 National Committee. Your chairman has been involved in the establishment of short-term studies of the capillary soil moisture regime and would be willing to comment if requested by the regional committees.

5.0 Summary of Recommendations

A. The committee should be continued.

B. Emphasis on the measurement of water tables and on attempts to formulate descriptive classes is encouraged. Regional committees should explore the descriptive scheme suggested by the Northeast Committee. (See section 1.2.)

C. The term, saturated hydraulic conductivity, should be used in reference to water flow if the values are expressed in units of velocity and are based on analysis of measurements on saturated cores by application of Darcy's law. (See section 2.2.)

D. The term, percolation rate, should be used in reference to water flow if the measurements were obtained by the common auger-hole method and have not been subject to analysis by application of Darcy's law. (See section 2.2.)

E. Regional committees should consider the kind and form of information about the weather for the period of measurement which should accompany published soil moisture regime data. (See section 3.2.)

F. The regional committees should make recommendations on the topics to include and the organization of a publication on evaluation of the soil moisture regime that would serve a function similar to SCS-TP-144, "Soil Temperature Regimes--their characteristics and predictability." (See section 4.2.)

(.0 Conference Reaction

Sections 1.0 and 2.0 were presented orally. section 3.0 was not discussed as such but received attention in the course of the report of the Climate Committee, which report should be consulted. Section 4.0 was mentioned briefly and no response obtained from the meeting.

There was appreciable sentiment for defining the thickness of a perched water table. Dr. Bartelli was in favor of doing so. Both Dr. Smith and Dr. Maletic commented on the problem of defining the water table in clayey soils. Such soils may be under zero tension but a water table would not be observed in a well. The problem of alternative terminology for rates of water movement was rather thoroughly discussed. Dr. Kellogg pointed out that some people would prefer that we use relative permeability estimates rather than give figures. The sense of the group would seem to be that alternative terminology is desirable, and the terms suggested are reasonable, but there does not seem a strong 'sense of urgency about making changes. It would seem a subject that should be put in abeyance.

Committee "embers:

R.B.Grossman, Chairman
C. M. Ellerbe
J. T. Maletic
G. S. McKee
A. H. Paschall
J. D. Rourke
C. I.. Scrivner
G. D. Smith
D. van der Voet
J. M. Williams

Appendix - Suggestions for water table classes by the Northeast Committee

Depth of Winter Water Table* (inches)	Annual Fluctuation Below the Bottom of Apparent Winter Water Table Depth Class** (inches)
< 0 (ponded)	0
	0 to 20
	20 to 40
	40 to 80
	> 80
0 to 10	0
	0 to 20
	20 to 40
	40 to 80
	> 80
10 to 20	0
	0 to 20
	20 to 40
	40 to 50
	> 80
20 to 40	0
	0 to 40
	40 to [illegible]
	> [illegible]
40 to 80	0
	0 to 80
	> 60
> 80	

* Water table within the depth limits 50 percent or more of the time December 1 to April 30 in 7 or more years out of 10.

** This could be defined as the maximum distance below the bottom of the winter depth class or the depth that the water table remains below most (perhaps 90 percent) of the year.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE
OF THE
COOPERATIVE SOIL SURVEY
Charleston, South Carolina January 27-30, 1969

Committee No. 8 - Criteria for Classification and Nomenclature of Made Soils and Definition of "Topsoil" Used to Resurface Cuts and Fills

A draft of this report, prepared on the basis of correspondence with committee members, was discussed at the conference in Charleston, South Carolina. The report, as now written, has bee" shortened. and contains corrections and changes resulting from conference discussion.

Committee Objectives:

1. Evaluate new data as available.
2. Propose a definition for "topsoil" used to resurface cots and fills.
3. Review the 1967 National Committee definition for Made land.
4. Review the 1967 National Committee recommendations for Made soil and propose a definition for Cut and fill land.
5. Propose nomenclature for mapping units based on taxonomic names at the family or higher level.
6. Review the Northeastern and Western 1968 Reports on Made soil end provide answers and assistance for problems. (No other regions had reports on the subject.)
7. General recommendations.

NEW DATA AND OTHER INFORMATION

1. Mapping rearranged or altered soils in the Netherlands.

Dr. Simonson furnished a statement October 9, 1968 on mapping in the Netherlands. He stated, "Early attempts were made by the Dutch to distinguish reworked soils at the suborder level in their classification system. That resulted in so many practical problems in mapping that this approach was dropped for most situations. Efforts to distinguish soils at the suborder level were continued for two kinds of reworked or modified soils. One set consisted of the mineral soils left where peat had bee" harvested for commercial purposes. Tbe other situation consisted of reworked Podzols in which the B horizons bad bee" obliterated."

In summary, the remainder of Dr. Simonson's report shows that the present approach in the Dutch soil survey is to divide the reworked or modified soils into two groups; namely, (1) soils classifiable in the system, and (2) soils not classifiable in the system.

Delineations of soils classifiable in the system carry two symbols, one to show the classification of the principal kind of soil within the give" body, and the second to show the kind of disturbance or alteration. Disturbance has not been great enough to eliminate diagnostic features. and the mapping units are phases.

Delineations of soil, not classifiable in the system have been altered to the point of obliterating diagnostic features. Symbols are used to show the kind of alteration which has taken place. The mapping units are equivalent co miscellaneous land types used in the United States.

2. Durargidic Arents

Mr. J. Ellsworth Brown provided an extract from the Canyon Ares, Idaho, soil survey manuscript that describes a mapping unit correlated as Durargidic Arents.

3. Transect studies

Transect studies were supplied to the 1967 National Committee by California, Delaware, Kansas, Maryland, Mississippi, Kentucky, Tennessee, Texas, Virginia. and West Virginia. No new transect data was available to our 1969 Committee.

TOPSOIL

The term "topsoil" is widely used, but there is no consistent definition for the word. Published definitions range from lengthy statements. which list alternative meanings, to short one sentence statements. The following definition of topsoil found in the May 1962 Supplement to the Soil Survey Manual, page 186, is a" example with multiple meanings:

> "TOPSOIL is a general term that is used in at least four senses: (1) for the surface plowed layer (Ap) and thus as a synonym for surface soil; (2) for the original or present Al horizon, and thus exceedingly variable in depth among different soils; (3) for the original or present A horizon, and (4) for presumed fertile soil or soil material, usually rich in organic matter, used to top-dress road banks, parks, gardens, and lawns."

A" example of a short definition is listed in "Standard Definitions of Terms and Symbols Relating to Soil Mechanics, ASTM Designation: D653 - 67", published by the America" Society for Testing and Materials, as follows:

> "TOPSOIL.--Surface soil, usually containing organic matter."

Modified definitions are also given I":

1. Soil Science Society of America Proceedings, Vol. 20, No. 3, 1956. pp 430-440.
2. A Dictionary of Agricultural and Allied Terminology by John Winburne, 1962.
3. The Thesaurus of Engineering and Scientific Terms. Department of Defense, 1967
4. Webster's ""abridged Dictionary.

RECOMMENDATIONS

The following recommendations are aimed at reducing rhe ambiguity of the term "topsoil" by narrowing its meaning, and eliminating synonyms for terms otherwise adequately defined.

1. Adopt a definition which limits the meaning of topsoil to soil material used to top-dress roadbanks, lawns, etc. Exclude synonymous meanings such as surface soils, Al. and Ap horizons.
2. TOPSOIL.--Earthy material used as top-dressing for house lots. grounds for large buildings, gardens. road cuts, or similar areas. The earthy material has favorable characteristics for production of desired kinds of vegetation or can be made favorable by treatment and lacks substances toxic to plants.
3. Encourage users of topsoil to state specifications for the material which they plan to use for topsoil. Example: texture, coarse fragment content, organic matter content. exchangeable sodium percentage, and reaction. The proposed definition given above is in genera, terms. For this reason. specifications are "ceded to meet locally intended use.
4. Encourage Regional Committees to develop a check list that might be used in developing specifications for particular uses of topsoil.

MADE LAND

The 1961 National Committee Report o" Criteria for Classification and Nomenclature of Made Soils proposed the following revised definition for Wade land:

> "Made land consists of areas filled or covered artificially with miscellaneous material including trash, stones, and industrial waste, but excluding areas covered with essentially earthy materiel to a depth of 40 inches or more."

In their 1968 report. the Western Region asked for deletion of the 40 Inch cover of earthy material from this definition.

Our committee members divided on the question of adopting the 1968 Western recommendation.

Arguments in favor of a thickness limit are: (1) Distinguishing Made land from heterogenous and homogeneous earthy materials. Without some limit. it appears that Made land would be recognized regardless of whether the earthy covering was 20 inches thick or 20 feet thick. (2) Useful interpretations for plant growth ca” be made if thickness of earthy cover is know”. If both covered and uncovered areas are combined, interpretations cannot be made for such usage.

The committee has no data or records of field experience to support a thickness limit. For these reasons it seems appropriate to omit a specific thickness of earthy covering from the definition of Made land. Phases may be used, as needed, for making satisfactory interpretations.

I” their 1968 report, the Northeast Region recommended that the name Made land be replaced by the term “Fill”, modified by a” appropriate term. Example: Fill, industrial waste; Fill, sanitary.

The committee rejected this proposal. The term Made land is retained because of its historic use, and to free the word “Fill” for other possible use as “Fill land”.

RECOMMENDATION

Adopt the following change in the definition for Made land in the 1951 Soil Survey Manual, page 308:

> Made land consists of areas filled or covered artificially with ❑ ‘scellaneous material including trash, stones, and industrial waste. The miscellaneous material may or may not be covered by fine earthy material. Phases for recognition of thickness of earthy covering as well as the kind of miscellaneous material may be used if needed far interpretation purposes.

MODIFICATIONS OF 1967 NATIONAL COMMITTEE RECOMMENDED ITEMS 2-5, PAGE 116-117

The committee reviewed recommendations 2 thru 5 in the ,967 National Report, and also the portions of the 1968 Western and Northeaster” Reports related to these items. We are now recommending some changes and additions to the 1967 statements. I” doing so. we recognize that more will have to be learned than is now know” about rearranged, reworked. and shaped soils before the problems of classification and nomenclature can be fully resolved.

Before taking up discussion and recommendations for this section of our report, we need to list the items with which we are dealing:

1. The term Made soil
2. Cut and fill land as a new miscellaneous land type
3. Homogeneous earthy material
4. Heterogenous earthy material
5. Shaped soils
6. Arents

Made soil

The term "Made soil” as a name for mapping units is still in contention. Sentiment has weakened, but the term or a variation of it, still has appeal as a name for heterogenous “earthy material”. The 1968 Western Report says, “This miscellaneous group (Made soil) should only be used when soils cannot be classified as recommended below for Shaped and Altered soils. This group will have low predictability for Interpretation”. The 1968 Northeast Report includes a qualified statement that the term Made soil is preferred over “Cut and fill land”. The term Made soil has not bee” used to date in a final correlation

The arguments against use of "Made soil” as a mapping unit name are:

1. Possible confusion for readers of our publications. "Made soil", for example. could be interpreted as a” undifferentiated combination of textures of the Made series. This arises from the fact that we use the word “soil” in the names of some undifferentiated units consisting of two or more series or two or more types of one series.

2. ‘Increased confusion between our meaning of “soil” and engineer’s concept of the whole regolith as soil.

3. Inconsistency between the use of a name like 'Made soil" and certain long established miscellaneous land types. for example, Alluvial lend. If "Made soil" is accepted, would not Alluvial land need to be changed to Alluvial soil? This applies to a number of other miscellaneous land types.

For these reasons, terms like "Cut and fill land" and "Fill land" seem more appropriate than "Made soil".

Cut and fill land

If we abandon the term "Made soil", we need an acceptable substitute or substitutes for heterogenous earthy material consisting of mechanical mixtures of solum, or solum and underlying material without discernable fragments of diagnostic soil horizons. Cut and fill land, a new miscellaneous land type, may be an appropriate substitute. If this does not meet all the needs, Fill land could be added.

RECOMMENDATION

Adopt "Cut and fill land" as a new miscellaneous land type; a proposed definition is:

Cut and fill land. Consists of areas in which the soil or the soil and the underlying regolith has been greatly modified by appreciable removal in some places and comparable addition in others. Over the major part of an individual body. the cuts are deep enough to remove all or nearly all of the diagnostic horizons end the fills are thick enough to bury the original solum to depths of 20 inches or more. The pattern of cuts and fills is complex and the soil material is variable. Classifiable soils may be present in the proportions permissible as mapping inclusions. Modifiers to indicate the nature of the materials might follow the phrase "Cut and fill land". One example is "Cut and fill land, shale materials". The name of a series might be used in lieu of "shale" If that were appropriate. Example: Cut and fill land, Berks material.

Homogeneous earthy material

This soil materiel, without fragments of diagnostic horizons, has a narrow range in texture and other important characteristics both vertically and laterally. It is homogeneous enough to warrant reasonable predictions both from the standpoint of soil characteristics and interpretations. Examples given in 1966 Regional Reports are the hydraulic fill at Mare Island, California, and the leveled strip m'ne spoil in West Virginia. Areas such as these present possibilities for description and classification at the series level or at a higher level in the classification system. There are several alternatives for classifying end naming homogeneous soil materials:

1. Series level. Classification and naming at the series level is possible if soil materiels are uniform and occur in areas large enough to be mapped.

2. Family or higher level. Opinion varies on classification and naming at levels higher than the series. The 1967 National Report, end the 1968 Western Report contained recommendations for classifying soils without fragments of diagnostic horizons at the suborder level.

   At the suborder level, these soils could be named as Psamments, Fluvents, or Orthents, according to the criteria for these Orders. If important, they could be further classified into Great Groups on the basis of temperature and moisture as is done in the Classification Scheme. Application of the criteria for subgroups and families could be applied for finer breakdowns. Example: a hydraulic fill area in the Southwest that qualified as a Fluvent might be classified as Typic Torrifluvents; coarse-silty, mixed, nonacid, mesic. If series names are not used, it would seem that the suborder name followed by a general textural class name would be sufficient. Example: Orthents, clayey; Fluvents, loamy. The nomenclature does not become cumbersome by the "se of these suborders. No textural class name is needed for the Psamments.

In contrast, four members of our committee were opposed or had strong reservations toward classifying and naming mired earth, material unless this can be done at the series level. Their main argument was that we lack experience and data on which to base sound recommendations for classifying and naming these soil bodies.

If not classified at the series or higher level, a miscellaneous land type would be used Example: Cut and fill land. or Fill land.

Heterogenous earthy material

This soil material, without fragments of diagnostic horizons, has a wide range of texture, other important characteristics, or both. The 1968 Western Report implies that this soil material would not be classified in the new classification system. Our 1969 committee member., with one exception, agreed that this soil material should be classified as miscellaneous land types. Cut and fill land, or Fill land seems appropriate. Textures or other modifiers may be added. Example: Cut and fill land, mixed; Cut and fill land, stony; Cut and fill land, Berks material. The dissenting member stated that "Eve" very heterogenous materials can be classified as complexes at some categorical level. This is important if we are to fulfill that part of our job asking for a national soils inventory. Soils in these complexes have very many properties in common with each other and with surrounding soils. The potential of a heterogenous 'cut and fill' complex in the San Joaquin Valley will be very different from that of a" equally heterogenous complex in Iowa or Maine. Likewise, different kinds of 'cut and fill' land within a survey area may differ greatly among each other in chemistry. fertility, and mineralogy. This type of land is usually used intensively, and more and more of it is being crested every year."

Shaped soils

Recommendation 5 of the 1967 National Report for "shaped soils" is satisfactory. Shaped soils are restricted to soils classifiable as phases of taxonomic units (series). (The 1967 National Report and the 1968 "ester" Report use the term "classifiable as phases of taxonomic units". They do not use the term "series".) Excluded from "shaped soils" are materials chat fall into homogeneous or heterogenous earthy materials, such as (I) cuts and fills which remove all or "early all diagnostic horizons, and (2) fills thick enough to bury the original solum 20 inches or mare. The 1968 Western Report recommended phase names as follows: terraced, filled, shaped, leveled, smoothed, and stripped. This allows many degrees of freedom in their naming. There is danger that all available names will be used and different names will be assigned delineated bodies that are the same or nearly the same. Terms that are selected should preclude the use of phase names for delineations which might be a miscellaneous lend type or a complex. A term like "terraced phase", for example. suggests that mapped areas might consist of deep cuts and thick fills. or complexes of cuts, fills and original soil.

Arents

Soils with original diagnostic horizon mixed by ripping., deep plowing, or some other similar operation sufficiently to destroy the original normal sequence. but not to the extent that fragments or parts of the horizons can no longer be identified are in the suborder Arents in the New Classification System. The 1967 National Report and the 1968 Western Report are I" agreement on the above statement; the West lists these soils under Altered soils. Our recommendation 5 given below is a restatement of recommendation 4 in the 1967 National Report.

The final correlation, approved February 24, 1967, for the Canyon Area, Idaho, includes a unit of 832 acres named "Durargidic Arents". The soils in this ""it, originally of the Chilcott, Elijah. Sebree, and Vickery series, have bee" drastically altered by deep plowing which not only destroyed the original horizon sequence, but mixed the different soils together. Fragments of diagnostic horizon can be identified, but "at the original soil or horizons. The material is described as "ranging from sandy loam to silty clay. mostly noncalcareous, but contains fragments of a ca horizon. and has fragments of a" argillic horizon and a duripan, and typically overlies remnants of a duripan at 24 to 40 inches". (See comment by "r. J.M. Williams under NOTES at end of this report.)

RECOMMENDATIONS

1. Adopt two categories for dealing with earthy materials consisting of fill material. or mixed solum or solum and underlying material without discernable fragments of diagnostic horizons:

a. Homogeneous earthy material with a relatively narrow range in texture, other important characteristics, or both. Alternatives for classifying and naming are:

(1) treat as series
(2) treat as classes at levels above the series

b. Heterogenous earthy material with a wide range in texture, other characteristics, or both.

(1) treat as a miscellaneous land type. Example: Cut and fill land, or Fill land
(2) treat as classes at levels above the series

2. Include in shaped soils phases of soil taxonomic units (series) resulting from smooching, leveling. or grading, in which:

a. Diagnostic horizons required within pedons have not been destroyed or interrupted. or

b. Diagnostic horizons have not been buried to depths of more than 20 inches.

Leveled phase is tentatively recommended as the phase name for "shaped soils".

3. Apply the criteria for Arents to soils in which the original diagnostic horizons have been mixed by ripping, deep plowing, or other operations, but not to the extent that the fragments or parts of the horizon can no longer be identified. Excluded from this category are soils in which disturbance has not been deep enough or Profound enough to extensively dislocate diagnostic horizons.

Soils which qualify for Arents are to be classified and named with existing or new taxonomic units.

MAPPING UNIT NAMES FOR DISTURBED OR REARRANGED SOILS AND VARIOUS KINDS OF EARTHY FILL MATERIAL BASED ON TAXONOMIC NAMES AT THE FAMILY OR HIGHER LEVEL

Illustrations of proposed taxonomic class names are given under the discussion of Homogeneous earthy material and Arents. We still lack experience in general use of such names and for this reason the committee offers no specific recommendations.

SPECIAL REQUESTS LISTED IN 1968 REGIONAL REPORTS

Western Region

The "eat requested help from the National Conference in finding subgroup and family criteria for Arents with fragments of original horizons. Our committee considered the request, but failed to produce quantitative terms that could be used as criteria for classes.

Northeast Region

The Northeast requested liberalization of the definition of Urban land. The present definition for Urban land is, "land so altered and obscured by urban works and structures that identification of soils is not feasible . . . use of this miscellaneous land type is restricted to closely built-up parts of cities." The Northeast report states, "It was agreed by the committee that the last part of this definition does not adequately cover the needs in areas of rapid suburban development where large areas have had diagnostic horizons destroyed, yet, the percentage of land covered by roofs. pavements. etc. is generally leas than 25 percent even on 1/8 acre lots."

The following items dealing with Urban land were considered briefly by the conference:

1. Redefine Urban land to include a fairly wide range of conditions where a dominant portion or all of the original soil has been disturbed and covered by housing. industrial, and business developments. Two conditions would be included in Urban land:

a. Closely built-up parts of cities where urban works and structures have altered or obscured all of the original soil.

b. Built-up areas where construction of houses, industrial plants, and business buildings with associated roads, parking areas, etc. has covered part of the original soil and a dominant portion of the remainder has been disturbed by cuts deep enough to destroy all or "early all diagnostic horizons, and fills thick enough to bury the original solum to depth of 20 inches or more. Classifiable soils may be present in the proportions permissible as mapping inclusions.

This redefinition was not acceptable to the conference.

2. Urban land may be used with a series name to form complex mapping units. Example: Beltsville-Urban land complex.

3. Boundaries for phases of soil series should be extended into housing and industrial areas as far as it is possible to do so with a reasonable degree of accuracy. Urban land or Series-Urban land complexes should be used only where it is not feasible to use phases of soil series.

GENERAL RECOMMENDATIONS

Work is needed on the following items both at the Regional and National levels.

1. Continue study of classification and naming of soils that have been more or less altered by mechanical means.

2. Obtain more sail descriptions before and after mechanical alteration. Obtain more descriptions and other information on the nature of filled bodies of soil. Example: degree of uniformity of material; distribution of components. Such information would help in naming mapping units.

3. Hake an inventory of miscellaneous land types in published soil surveys, and in recently correlated, but not yet published. sail surveys.

4. Develop definitions at the National level far all miscellaneous land types not listed in the Soil Survey Manual.

We recommend retaining the National Committee, and retaining or establishing Regional Committees for work on these subjects.

Change the name of the committee to Miscellaneous Land Types and Soil Materials Committee.

"embers of Committee 8:

J. K. Ableiter	K. W. Flach*
A. J. Baur, Chairman*	J. E. McClelland*
J. E. Brown	W. E. McKinzie*
J. A. DeMent	J. J. Noll*
L. E. Derr*	R. W. Simonson*

*Members present at Charleston January 27-30

NOTES ON DISCUSSION DURING PRESENTATION OF COMMITTEE REPORT

Definition of topsoil

Smith: Substitute earthy material for soil material in the definition to avoid pedologist's narrow definition of soil.

Johnson: Seconds Smith and recommends adding "gardens" in the definition.

Bartelli: Would like to drop "topsoil" but Johnson. Kellogg end Hockensmith recommend that "topsoil" be retained. Bartelli points to different standards for topsails far highways and gardens, but Kellogg points out that the specifications for topsoil have to fit specific uses.

Baur: Ye will delete "with or without amendments" as suggested by Dr. Grossman, and add 'lack of toxic substances" suggested by Dr. Kellogg.

Made land: Kellogg suggests two phases, Made land, and Made land covered with fine earthy materials. Bartelli points out that if cover is more than 40 inches it becomes soil by our definition.

Modification of ,967 National Committee Recommendations

1. Made soil

Baur: Made soil has not shown up in any correlation.

Carlisle: Objects to Made soil; says that a miscellaneous Land type should not be a kind of soil.

Kellogg: Miscellaneous land types have been misused; if a* area behind a dam becomes filled with sediment, this is soil. (Mentioned for example, Holland.) Made soil can be used for economic crops. and miscellaneous Land types cannot.

2. Homogeneous earthy materials: Opinions differed whether they should be classified at family or higher level or only at the series level.

3. Arents: Williams stared that instead of Durargidic Arents, we now would use Arents or Argidic Arents and phase name.

RECOMMENDATIONS

Kellogg: Miscellaneous land types should not be usable far commercial crop production. This committee got starred because of reclaimed badly eroded land near Natchez, Mississippi. Our problem is the Large areas that are excellent for plant growth.

Johnson: A Lot of irrigated Land is on extremely variable Land especially if sprinkler irrigation is used.

Regional Committees

western committee wants quantitative terms for classification of *rents. Smith stated that there are no Typic Arents; there are just Arents and phases of Arents. But could be Argidic Arents at the subgroup level.

Northeastern Region wants a broader definition of Urban Land. such as proposed in la end lb. (See Special Bequests. pp 6-7)

Kellogg: Some people may interpret this as no longer having to map in urban fringe areas.

Bartelli: In some surveys, we map complexes of Urban land and series; item lb is in conflict with our present policies far naming mapping units.

Simonson: If more than 10 percent is strongly contrasting, covered by streets and houses, then the mapping entity is a complex.

Kellogg: This is cutting it too thin; we should consider mainly the area not covered by houses.

Bartelli: If we get 70 to 100 foot lots then it might be Urban complex, but this does not apply to one house on a LO acre estate.

Kellogg: Use of "urban" is politically unwise.

Smith: Item Lb is too wide; 30 percent not soil should be a complex in a miscellaneous land class.

Carlisle: If 20 percent would make miscellaneous land type, we would have to redefine our present miscellaneous Land types.

Kellogg: The report is accepted with such changes as meet the general consensus of the group.

CLIMATE IN RELATION TO SOIL CLASSIFICATION AND INTERPRETATIONS

Committee 9, NCSS TWC, Charleston, S. C. 1969

Reports of Regional Committees

1. The North Central Region reported Illinois had prepared state maps showing precipitation, temperature and runoff as estimated by the difference between precipitation and potential evapotranspiration. Runoff estimates were by the method of Thornthwaite and Mather.

John McClelland presented studies based on analyses of temperature and precipitation data from several north central and western states. The method was that proposed by Arkley and Ulrich in which monthly temperature data are used to estimate potential evapotranspiration. When combined with monthly precipitation data a prediction can be made of the number of days the moisture-control section is continuously dry or continuously moist.

Minnesota has used monthly temperature data to calculate potential evapotranspiration for the corn and soybean growing seasons. Combined with precipitation data an estimate of moisture content of the rooting zone is made. Estimates of moisture "available" on June 1, July 1, August 1, and September 1 are calculated (by computer program) and used in productivity analyses.

Missouri reported the preparation of a state soil-climate map from water-balance studios. using the Thornthwaite method. In addition, daily water balances were calculated far 60-year periods and potential evapotranspiration was converted to potential depth of soil drying. When such data are graphed along with water penetration resulting from each rain. the time-depth distribution of moist and dry zones in the soil are estimated. Probabilities of dry or moist conditions for specified combinations of depth and time periods can be estimated. Frequency of cyclic wetting and drying with depth was predicted.

Water-balance studies of the type reported appear to have promise for soil classification and interpretation. Temperature is the main parameter of estimated potential water use and the method is thus related to present family criteria.

It was recognized that in some instances meteorologists can make mare precise estimates of water balances where humidity. wind speed and other variables are measured. However. data are scarce. Pan-evaporation data are also favored by many meteorologists. It was recognized that computed water balances should be checked against pan-evaporation where such data are available. U. S. Dept. of Corn. Tech. Paper No. 37, summarizes some such studies. Meteorologists may be able to relate evapotranspiration and pan-evaporation,

It was recognized that the water balances studied applied mainly to soils without water tables or water additions from surrounding areas.

2. The Western States Committee proposed a "Sail Temperature Days Program" for collecting soil temperature at 20 inches on the important benchmark soils. The readings to be made on or about April 15, July 15, October 15 and January 15. They developed a work sheet to encourage uniform observations and records. Sample attached.

State and Regional Naps of potential evapotranspiration for the frost free period (ETp 32°) were prepared for the Western States in conjunction with River Basin studies.

3. The Southern Regional Committee devoted all available time to the soil moisture portion of their assignment.

4. There is an overlap in assignments between the activities of the Soil Moisture and Climate committee. In some regions the functions are combined into one committee.

Many of the comments to the chairman for this committee of this conference dealt with soil moisture.

Current Activities

1. The inclusion of soil temperature as a criterion for soil classification stimulated field measurements of soil temperatures. Throughout the country the effort has varied markedly between states. A complete inventory is not available for all of the states. The following information was assembled for the Western States and indicates the effort being made in that section.

California *	103 sites on 5 E-W transects.
Colorado	In 16 soil survey areas - No. of sites not given.
Montana *	16 locations.
Nevada *	98 locations.
New Mexico	66 locations, 1 to 3 year period with about 3 sites - read monthly
Oregon *	80 locations - readings quarterly plus summer.
Utah *	21 locations - 10 bimonthly. 11 quarterly
Washington	63 locations - monthly readings
Wyoming	20 transects with 4 to 8 sites each, quarterly readings. In additio" daily recordings of soil temperature (ESSA) at 4 experimental substations.

* Used form devised by Western Committee

Comments submitted with the reports indicated:

a. The 59°F. soil temperatures in some areas are extending farther north than was anticipated based on air temperatures and kind of vegetation.

b. Irrigation reduces the average summer temperature by as much as 9°F. in some months,

c. Temperature measurements should include the summer months to better evaluate average summer temperature and to obtain peak temperatures.

d. The difference in aspect between north and south exposures on slopes of 30 to 43 percent. caused temperature differences of 7 to 10°F. In some instances this placed the soils on the south slopes in mesic families and those on the north slopes in frigid families.

e. The soil temperatures range up to as much as 8°F. warmer than air temperatures in some locations during warm periods.

f. Some stations varied as much as 13°F. between years even when read same day and month.

g. Soil moisture estimates have bee" made in conjunction with temperature readings at some locations. If temperatures are read only quarterly this is of little value. When temperatures are read monthly. a moisture determination assists in evaluating the moisture regime.

h. Since the soil moisture regime is used as a pertinent criterion for classification in some categories. there is need for a uniform procedure to evaluate the moisture regime.

2. Dr. C. L. **Scrivner,** University of Missouri reported on the studies made at the Missouri station in the use of climatic data to evaluate soil moisture regimes.

Soil moisture regimes are determined. in part. by amounts of rainfall and evapotranspiratio". Those two determinants are particularly important in soil systems without water tables and without "runon" or lateral seepage from adjacent soils. Only runoff and deep percolation losses of water need be quantified to complete the characterization of moisture regimes on such soils.

Daily estimates of potential evapotranspiration were made by the method of Thornthwaite and Mather. Daily amounts of precipitation and estimated potential evapotranspiratio" are converted into depths of soil moistening and soil drying by taking into account the available moisture storage capacities of the various horizons, and by making specific assumptions.

The use of potential evapotranspiration and the combination of assumptions made suggest that the method develops a sort of climatic potential for moistening and drying the soil. The predicted moist-dry zones in the soil would be expected to most nearly coincide with measured amounts of water in soils that are permeable to depths great enough to accommodate the fluctuations in water and root depths. Permanent vegetative cover of deep-rooting perennials such as forest trees or alfalfa also favor agreement between observed and predicted moisture regimes.

In dry climates, where potential evapotranspiration exceeds precipitation, the prediction equations should be more nearly sufficient for characterization of the soil moisture regime than they would in moist climates where precipitation exceeds evapotranspiration. In moist climates some measure of excess precipitation is needed. Table II summarizes the data for several stations in terms of number of months when the soil moisture is predicted to be fully recharged and the amounts of precipitation that fell when the soil was fully recharged. This latter figure which represents excess moisture was found to be nearly the same as the annual P - PE amounts determined from mean monthly water balances.

The analysis of data for Missouri suggests that a numerical description of the soil moisture regime of some soils may be possible. Included would be a mathematical prediction of annual depth-frequencies of dry-moist cycles; frequency and duration of dry periods for given depths; numbers of months when the soil moisture is completely recharged and excess moisture. A mean monthly water balance showing the seasonal expected amounts of precipitation and potential evapotranspiration would add to the numerical description.

The approach taken in predicting frequencies of moist-dry cycles may have many applications. The annual frequency of dry-wet cycles for a given layer represents the number of times that layer should be expected to release its available water to growing plants. Thus it places a relative importance on each layer as a medium for root activity. From the standpoint of soil classification, a quantitative expression of the relative importance of various layers would be a large step in the direction of giving weighted values to profile features in the quantitative decision of whether or not two soil individuals were of the same series, family, or any other category of the classification system.

TABLE II

THE NUMBER OF MONTHS IN 500 MONTHS WHEN THE SOIL IS COMPLETELY RECHARGED AND THE ANNUAL AVERAGE AMOUNT OF EXCESS RAINFALL

Station	Number of Months	Excess Moisture (Inches)
Tarkio	75	3.98
Chillicothe	75	5.54
Brunswick	81	4.16
Macon	104	6.34
Columbia	115	6.96
Salem	145	11.12
Sikeston	130	13.10

The prediction of aeration regimes may be possible if the frequencies of dry moist zones are combined with a" analysis of the volumes of soil air when the soil is moistened to field capacity. Such information on volume distribution can be generated from the large number of determinations that have been made of bulk density, particle density and amounts of water retained et 1/3 atmosphere tension. Many soil horizons with large contents of expanding lattice clays have very little air-filled pore space remaining when the soil is at field capacity. At the moisture content they are poorly aerated. The frequency and duration of moist periods in such soil horizons should be related to aeration. It is possible that many soils described as poorly or imperfectly drained on the basis of profile color patterns.

could be better described as poorly aerated with the quantitative aspects described as indicated above. The claypan soils of Missouri appear to fall within this group. They have been described as poorly drained and yet water tables can rarely be demonstrated except for brief temporary ones. perched above the claypan.

The graph of annual frequency of recharge to given depths is shown in the graph for the Columbia, Missouri station.

3. John Rourke, in charge of World Soil Geography Unit. discussed the procedure developed in the World Soil Geography Unit for describing the moisture status of a well-drained soil at specific times during a normal or actual water year based on normal or actual monthly precipitation and a normal water depletion factor

Moisture status is calculated in terms of moisture profile diagram. namely a rectangle where the distance downward from the top indicates the depth below the surface of the soil, and the distance from the left indicates the fraction of the available water capacity which is occupied by water at a particular depth. The rules for adding moisture (accretion) and subtracting moisture (depletion) are arbitrary. They are based. however. on procedures usually employed in water balance bookkeeping and on limited observation of water removal every second day from various depths and tensions in soil.

The procedure for calculating moisture status uses 200 discrete units or slots. each representing one millimeter of AWC. These slots are arrayed in an upright rectangle 10 units wide and 20 units tall. The 20 horizontal rows of slots correspond to 20 separate layers in the soil. each with an AWC of 10 mm. The IO slots in each row conveniently depict the fraction of the AWC in each layer which is occupied by water. During accretion. empty slots are filled one at a time, millimeter by millimeter. During depletion. each millimeter of water is removed in increments of 1, 2, or 5 millimeters of net potential evapotranspiration, NPE, according to the numbering of the slot an the diagram.

Data used to calculate moisture regimes at WSGU are mainly normal monthly precipitation (MP) and normal monthly potential evapotranspiration (PE). Precipitation normals based. if possible. on at least 20 to 30 years of recent record are chosen to best represent the area of interest. PE normals should be from the same location as the precipitation normals. or nearby, and should have the same temperature regime. PE normals, worldwide. are available in the eight volume set. Average Climatic Water Balance Data of the Continents. by the C. W. Thornthwaite Associates.

4. Dr. Walter Ehrlich from the Canadian Soil Survey reviewed briefly the work being done in Canada in using climatic data to calculate water budgets, irrigation requirements and climatic suitability of regions far agricultural production.

The paper "Use of Soil Water Estimates for Interpreting Climate in Relation to Soil Classification" by Wolfgang Baier describes the versatile budgeting procedure. This has been developed specifically to accept standard climatic data for estimating variations in daily soil water by making use of physical and biological concepts of water movement in the soil and water uptake by crops. Adjustments for runoff. drainage,. different soil water release characteristics and the effect of atmospheric demand rate on the AE/P ratio are also incorporated.

This method estimates the soil moisture regime with a good degree of accuracy.

5. Dr. Ray Daniels discussed the Water Table Studies he is conducting in North Carolina. Continuous water-table data ranging from 1 1/2 to 5 years duration have been collected from parts of the upper and middle Coastal Plain in North Carolina. Approximately 120 observation wells representing 45 sites have been used. Soils ranging from Typic Paleudults to Typic Umbraquults are included. We have found that it is difficult to compare water levels at different locations if data from the same year are not available. This severely limits the usefulness of date collected at different times and increases the difficulty of applying data to various problems. The tremendous volume of date collected from even a few wells also make it difficult to make meaningful interpretations from raw data. Some method of generalization is needed.

To help overcome these problems, the Soil Survey Investigation staff at Raleigh has been working with Dr. L. A. Nelson at N. C. State University to develop a regression model suitable for water table data. This is a computer based study. A model including month, rainfall and antecedent rainfall explains 64 percent of the water table variation. A second model maximum temperature and open pan evaporation explains 81 percent of the water table variation. The last model is being refined and some variables such as maximum temperature may be dropped.

The regression model being developed will allow us to predict the water-table regime for a site for an average year. and for extreme wet and dry years. If more detailed information is wanted. the predicted levels for single storms. such as hurricanes, could be predicted. Long term water-table data from carefully selected sites may be desirable for research needs, but with our best model only 2 years of data is needed.

Recommendations

1. Regional Committees take the leadership in assembling the soil temperature data onto a standard form so it can be summarized by states and regions. The data will then be available for many users. If this is not done much valuable data will be lost and the time and effort expended to gather it will be wasted.

2. The form attached or one similar be approved and printed to accomplish this task.

3. The Regional Committees have an initial report available by January 1970 or their next committee meeting.

4. The Soil Scientists be encouraged to make temperature readings for the summer months in addition to quarterly readings.

5. In areas where soil moisture regime is pertinent to soil classification, soil moisture determinations should be made in conjunction with soil temperature determinations at appropriate depths and intervals of time.

6. That further testing be done to relate soil moisture regime estimates from climatic data to soil moisture measurements.

7. The committee be continued.

Committee:

* T. B. Hutchings, Chairman

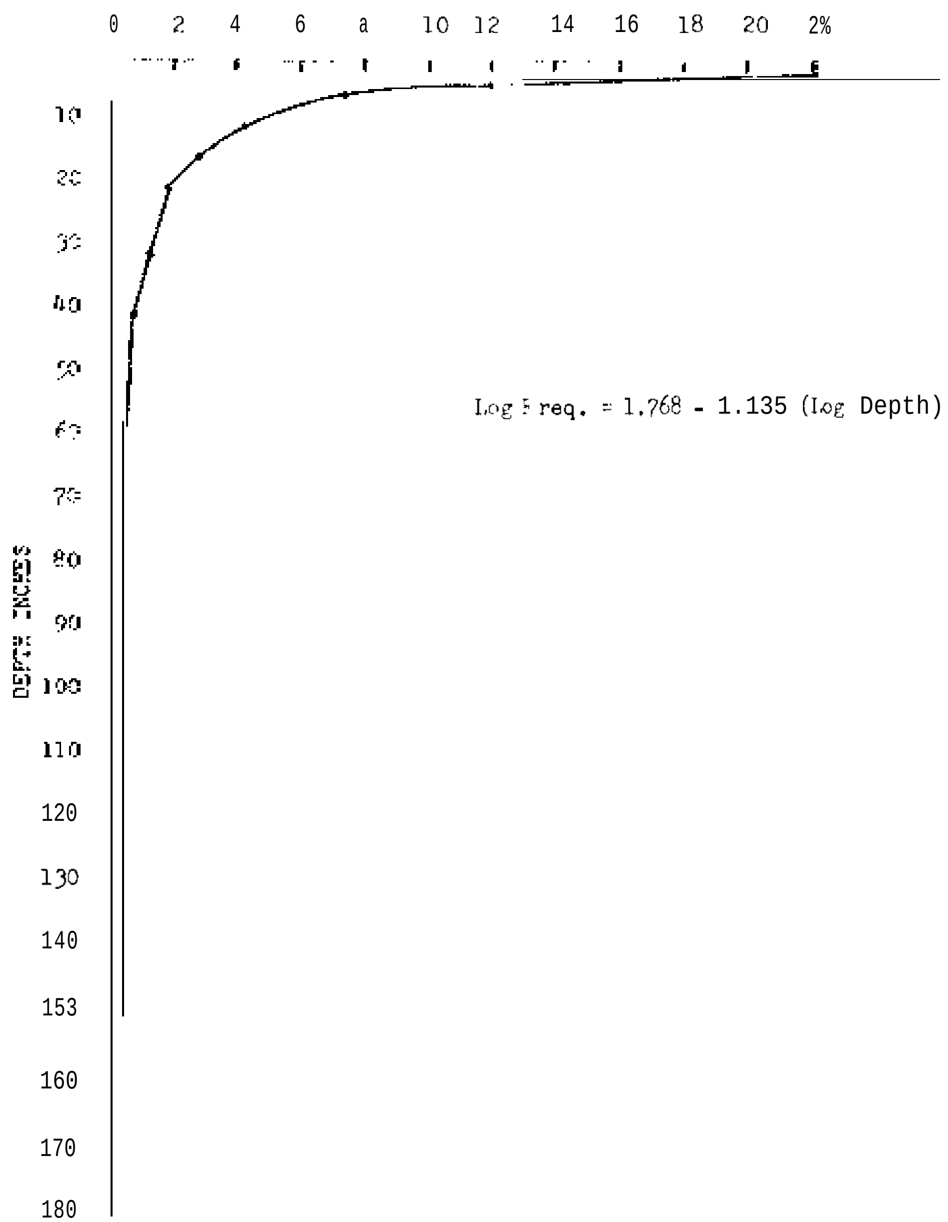
R. W. Eikleberry
* L. D. Giese
* A. A. Klingebiel
* C. W. McBee
Franklin Newhall
E. J. Pedersen

* Clarence Scrivner
R. A. Struchtemeyer
* Dwight W. Swanson
Rudolph Ulrich
Keith K. Young

* Present at Meeting

COLUMBIA, MISSOURI

ANNUAL FREQ. OF RECHARGE TO GIVEN DEPTHS



UNITED STATES DEPARTMENT Of AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL TEMPERATURE

Soil Type ______ Field Symbol ______ Photo No. ______ File No. ______

Area ______ Date ______ Stop No. ______

Location ______

Classification ______ Climate ______ P. ______ T. ______ J. ______ J. ______

N. Veg. or Crop ______

Parent Material ______ Physiography ______

Relief ______ Slope ______ Aspect ______ Elevation ______

Drainage ______ Permeability ______ Runoff ______ Erosion ______

Moisture ______ Gr. Water ______ Salt or Alk. ______ Stoniness ______

Month	Time of Day	Temperature			Moisture	Month	Time of Day	Temperature			Moisture
		Air	1"	20"				Air	1"	20"	

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REPORT OF COMMITTEE 10

Soil Family Criteria

The charge given to this committee in 1967 was "to receive and review proposals and recommendations made by regional committees, and to test and evaluate these and other proposals for the improvement of soil family criteria."

The committee reviewed the 1967 Report of the Committee on Soil Family Criteria, especially the recommendations; conference committee reports of the North Central, Northeast, and Southern Regions; a memorandum dated November 13, 1368, from Guy Smith to the principal soil correlators concerning the problem posed by large soil families; and suggestions made by committee members themselves.

1. 1967 Report of National Committee on Soil Family Criteria.

   It was noted that all but three of the 1967 conference committee recommendations have been accepted and executed. After additional consideration of Recommendation No. 1, the Soil Survey Staff concluded that thixotropy should be treated in the section on soil texture as a family criterion. (See March 1967 Supplement, page 41.)

   Recommendations 4 and 5 were not adopted in the preparation of the March 1967 Supplement; apparently this was an oversight, not a deliberate rejection of the recommendations. The committee believes that these recommendations have merit and repeats them, slightly reworded, in the 1969 recommendations.

2. Regional Committee Reports

   A. North Central Region--1968 Comnittee on Soil Morphology and Soil Family criteria.

      There is very brief mention of some aspects of family criteria in this report but no specific recommendations are given.

   B. Southern Region--1968 Committee on Criteria for Families, Series and Phases.

      The Southern Committee made some valuable suggestions for sharpening the definitions of soil mineralogy criteria, and also recommended additional study and testing of the criteria. The national committee believes that further study is needed and that to make significant changes in the mineralogical criteria at this time, requiring complete review of all soil families, would excessively delay the publication of the system.

      On January 20, 1969, Hr. Slusher of Louisiana forwarded to the Committee copies of the most recent recommendations of the S-60 Southern Regional Technical Comnittee on soil mineralogy. These recommendations reached the Chairman too late to be communicated to Committee members before the Work-Planning Conference. Copies of the recommendations were given to Committee members in attendance at Charleston and they were read and discussed in the Conference as a whole. It was pointed out that laboratory analyses indicate a general similarity between the clay mineralogy of the less than 2 micron fraction and the clay mineralogy of the 2 to 50 micron (silt) fraction of a given soil horizon. This means, of course, that the information wanted by Recommendation 5 of the S-60 Committee usually can be predicted from other soil characteristics used in classification. The Conference did not voice approval of the S-60 Recommendations 1 and 2. It was pointed out that the present mineralogy criteria used at the family level cover S-60's Recommendations No. 3 and 4.

   C. Northeast Region--1968 Committee on Family Criteria and Testing Families.

      This committee suggested that the family mineralogy criteria be given more intensive study; that consideration be given to use of a clay mineralogy criterion in non-clayey textural groups; that no changes be made in the mineralogy criteria until further study indicates a real need for change.

3. The Problem of Large Soil Families.

Appendix I of Soils Memorandum 11 (Rev. 2) carries the statement that the section on competing series and their differentiae "is to list the closely related series, e.g., those of the same family and of neighboring subgroups in the system, and give the differentiating characteristics for each. All competing series should be covered that have common limits in definition with the one being described." At the same time, we are trying to fit all the official series descriptions on two pages. As Guy Smith pointed out, It is obviously impossible to list and compare 50 to 100 series and still hold the length of the descriptions to two pages. The alternatives considered by the committee to solve this problem are these:

(a) Key to series in large families.

Use clay type, depth to free carbonates, depth to lithic or paralithic contact and similar criteria to construct the keys. Only the series in the same group of series in the key would be listed and compared in the official description.

(b) Phases of soil families.

Criteria like those used in keys could be the bases for phases of families. Again, only those series in the same phase would be listed and distinguished from one another in the official series description.

(c) List and compare only the 10 or so series most closely related to the one being described, basing selection on the judgment of those soil scientists most familiar with these particular series.

(d) Eliminate overlapping and duplicating soil series, thus reducing soil families to manageable numbers. It was pointed out that this is a desirable alternative and one that should be tried, but the fact is that no one can say yet whether or not this procedure will really solve the problem, or eve" help very much in reducing the sizes of the large families.

4. Soil Texture and Related Criteria in Families of Tropepts and Oxisols.

Recently, comparison of Hawaiian with Puerto Rica" soil families of Tropepts and Oxisols revealed some discrepancies. In Puerto Rico soil scientists have followed the Brown Book and supplements rigorously. In Hawaii, though, series have bee" grouped into families according to "apparent texture," based mainly on wet soil consistence. Experience in Hawaii suggests strongly that to combine the families that differ in "apparent texture" will result in loss of significant potential for soil interpretations. University of Hawaii studies using ADP techniques, for example, showed close correlation between wet consistence and cation-exchange capacity, type of dominant clay mineral, moisture-holding capacity, and other characteristics. Rather the" labeling these families with different texture group names, though, the committee believes that they should be identified by different wet consistence classes.

5. Family Criteria for Histosols.

A classification system supplement that describes the classification of Histosols was released in September 1968. Criteria suggested at the family level are:

(a) Particle-size classes, in terric subgroups only.

(b) Mineralogy (and related features, such as chemistry).

(c) Reaction.

(d) Mean annual soil temperature (except in Cryic and Pergelic subgroups).

(a) Other criteria, such as depth and thickness of soil.

Indications to date suggest that these family criteria are satisfactory. The committee found no reason to recommend revision of, or additions to, these criteria. The committee does believe that the Histosol family criteria should be rigorously tested and evaluated with the aim of improving the classification.

6. Committee Recommendations.

Recommendation 1. Thatafootnote be added to the section on mineralogy classes applied to clayey soils, as follows: "If the ratio of 15-bar water to measured clay equals or exceeds 0.6, the relative proportions of different clay minerals in the less-than-2 mm. fraction determine the mineralogy class."

Recommendation 2. That the particle-size classes characterized as the determinant size fraction for family mineralogy refer to particle sizes determined by sieving and sedimentation methods used in the Soil Survey Laboratories. References to the published methods should be cited. It should be emphasized that it is not the intention of this statement to require PSDA in order to classify a soil.

Recommnendation 3. The regional committees on soil family criteria be encouraged to continue study and testing of the existing family criteria, and make recommendations for the improvement of the family classification.

Recomnendation 4. That studies be pursued vigorously under the leadership of the principal soil correlators to determine which series in the large families can be suspended or dropped.

Recommendation 5. That keys to the soil series in large families be developed and used, if necessary, to shorten lists of competing series in standard series descriptions.

Recomnendation 6. That in Tropepts and Oxisols the family textural criteria be applied according to the current rules, but that in addition the families be further subdivided by use of a wet consistence criterion to be determined by study of the series descriptions in families defined according to "apparent texture,"

Recommendation 7. That the family criteria for Histosols be studied and tested vigorously, especially in the North Central and Western regions. The committee suggests that task forces be set up by the principal soil correlators to give special attention to the classification of Histosols.

Recommendation 8. That this committee be retained for at least two years longer. Its charge should be to receive, review, and evaluate recommendations from regional committees, task groups, and others.

Committee Members:

B. A. Barnes
L. J. Bartelli*
F. J. Carlisle, Secretary*
R. C. Carter*
F. W. Cleveland
W. M. Johnson, Chairman*
A. C. Orvedal*
R. I. Turner

* Present at Charleston meeting.

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF
THE COOPERATIVE SOIL SURVEY
CHARLESTON. SOUTH CAROLINA, JANUARY 27-30, 1969

REPORT OF THE COMMITTEE ON
SOIL INTERPRETATIONS AT THE HIGHER CATEGORIES OF THE
NEW SOIL CLASSIFICATION SYSTEM

This report is the result of committee deliberation prior to the NWPC and contains suggestions made by members of the NWPC.

The Soil Interpretations at the Higher Categories of the New Soil Classification System Committee had the following objectives:

1. Review legends and maps submitted.

2. Provide guidance to regional committee..

3. Explore information as to scale of maps and level within the current classification system to use in preparing the map.

The following regional committee reports were reviewed by the Committee.

Northeast Regional Committee Report

Tne Northeast Committee concentrated their efforts on the topics suggested by the 1967 National Committee. The Committee discussed possible interpretations that could be made and suggested farming, forestry. housing, and recreation. The Committee examined existing general soil maps, both state and regional. that could be adapted or modified for making interpretations. The general soil maps from Delaware, Maryland, New Jersey, New York, Pennsylvania, and Vest Virginia were discussed. It was concluded that interpretations can be made by using phases of great groups for all the above States except West Virginia. Regional mops were not discussed. The Committee also chose the general soil map of Franklin County, Massachusetts, and prepared a legend at the great group level. Using this same legend, interpretations for farming, forestry, housing, and recreation were made and presented in tabular form. Limitations for each were shown as either slight, moderate. or severe.

Recommendations by Northeast Regional Committee:

1. That the greet group is the logical categorical level for making both farm and non-farm interpretations. At the great group level the scale of the general soil map is large enough to make significant interpretations. The Committee also suggests that town and township interpretations should be made at the subgroup Categorical level.

2. That the explanation of the criteria used in determining the limitations and definitions of the meaning of the limitations would be helpful to the user.

3. That any family or phase nomenclature below the categorical level of the category used in the legend be used to provide the information that would be required in making the interpretations.

Southern Regional. Committee Report

The chairman of the Southern Regional Committee sent the charges, as outlined by the National Committee to all committee members, who in turn submitted their recommendations for each charge. The general soil map from Fisher County, Texas, scale 1:253,440 and the general soil map of the Rolling Plains Area were selected and sent to the committee to be used in the discussion of the charges. The committee examined the map legend of the general soil map of the Rolling Plains Resource Area and the Fisher County general soil map, and prepared a legend that was accepted by the committee. The Committee agreed that of the two alternatives, suborder or great group, presented in the charge by the National Committee the great group was the best for their map. However, they agreed that more specific interpretations could be developed at the family level for a map at the scale of 1:250,000. The committee also prepared an interpretative table and a description of one of the associations which would supply the users additional information.

Recommendations by Southern Regional Committee:

1. The legend for the general soil map should be prepared in sufficient detail, either as a descriptive legend or in an abbreviated form, to give the users the necessary soils information. Considering the needs of the users interpretative information should be presented for the components of the associations.

2. The committee considered the problem of base maps for general soil maps and suggested that the cartographic unit should be consulted as to the best available 'base maps prior to the development of the general soil map. In addition, a memorandum may be needed to indicate the scale of base maps suitable for general soil maps.

3. The committee recommended that more development and testing of general soil maps be done for larger areas on smaller scale maps to determine what categorical levels will best serve the needs.

World Soil Geography Unit

Within the World Soil Geography Unit, basic soil maps are compiled using all published as well as unpublished, information on the soils themselves plus information on geology, relief, vegetation, climate. land-use, management practices, geography, etc. In some instances, intensive use is made of airphoto interpretation. The scale of mapping is usually at a scale of 1:1,000,000, although in rare instances the mapping has been at scales as large as 1:250,000.

From these maps certain very general interpretations. useful for broad planning, are made. These interpretations include both farm and nonfarm (engineering) uses. See attachments No. 1 and No. 2 showing a portion of the tabular material prepared to accompany maps of Thailand at a scale of 1:250,000.

Discussion and Recommendations by Committee:

Up to the present time the preparation of detailed soil surveys and their interpretations at the level of phases of soil series has been our principal concern. There is a continuing need for this activity.

In recent years there has been increased interest in community and regional planning, lake and river basin investigations, and studies in shifts or potential shifts in land-use. These activities emphasize the need for county, state, regional. and national small-scale maps with legends designed to show different kinds of interpretations. Numerous small-scale maps are available that have legends designed to show the principal kinds of soils but only a few have good interpretive legends.

Experience in the preparation of interpretive small-scale maps based on our revised system of soil classification is limited. To assist personnel engaged in this activity we need to distribute examples of existing maps and their legends and to systematically test the categorical level within the classification system that best serves the needs of users for which the small-scale maps are designed. As additional information becomes available, a set of guidelines can be evolved.

After it has been determined that a small-scale map is needed for a specific purpose the following items should be investigated.

1. Select a good base map that shows those cultural features that are important to the intended users of the map.

2. Determine the kinds or combinations of mapping units that are most useful.

3. Determine the map scale that is adequate to show the essential information.

4. Use all available information about soils. geology, topography. climate, and land-use.

The following references will be useful in the development of small-scale maps and legends.

1. Soils Memorandum SCS-33 Rev. dated August 14, 1961.

2. Advisory Soils #12, dated Sept. 13, 1967.

3. Small-scale maps for the big picture. by Arnold C. Orvedal, Soil Conservation, May 1968. Vol. 33. No. 10.

The committee suggests the following guidelines on map-scale and legend for mull-scale maps to obtain maximum interpretive value:

(a) County maps. Use phases of associations of soil series as components in the legend as we have in the past with map scales ranging from 1:125,000 to 1:250,000 (2 to 4 miles per inch). I" some few instances larger scales may be needed.

(b) State maps. Use phases of associations of families of subgroups as components in the legend with map scales ranging from 1:500,000 for small States to 1:1,000,000 for moderate (average size States). I" some States phases of associations Of subgroups nay be the better categorical level to use. See attachment No. 3.

(c) Regional maps. (Larger than one State). For small regions use the same legend and mop scale as for States (b above) and for moderate and large size regions use phases of associations of subgroups as components in the legend at map scales of from 1:750,000 to 1:2,500,000. Phases of associations of great groups may also be used. See attachment No. 4.

(d) National naps. "se phases of associations of great groups at map scale of 1:1,500,000 to 1:7,500,000. Phases of associations of subgroups may also be used.

The above guide regarding map components should be adjusted to meet the needs of tile map users and the scale of the maps. 'The most specific interpretations can be made for phases of sail series in large scale maps. In smaller scale maps as on a State map, more cartographic generalizations are made resulting in a larger "umber of unnamed soils making up the mapping units. The names of the mapping units and the interpretations that cm be made from them are less specific.

The committee recommends that consideration be give" to the use of standard scale maps. The committee also recommends, where possible, to use the same scale of maps and categorical level, in preparing county, State or regional maps because it is much less difficult to compile a map involving maps of more than one county, State or region if they are the same scale.

Recommended activities far Regional Committees:

1. Refine and test some of tbe items (guides and criteria) set forth in the national report.

2. Develop small-scale maps and legends of counties. states and regions using the new classification system with special emphasis on good interpretive legends.

3. Review the possibility of using more than one categorical level in preparing a legend for a state or regional small-scale map. For example, would it be advisable to use phases of associations of families, subgroups and great groups as components in a state legend where the complexity of the soils is quite variable in a state.

It is recommended that this committee be continued to:

1. Review the small-scale maps and interpretive legends submitted by the regional committees and prepare guidelines for the preparations of small-scale maps and interpretive legends.

2. Provide information to the states and regions on availability of general soil maps, base maps and other interpretive maps and legends that would be helpful to those compiling maps and legends.

Committee Members:
W. E. McKinzie, Chairman
Dirk van der Voet, Secretary
*F. W. Cleveland
A. A. Klingebiel
J. E. McClelland
*A. H. Paschall
John D. Rourke
*"udolph Ulrich
*Keith K. Young
*Members on Committee not present at the NWPC.

Notes on Discussion after Presentation of Committee Report:

Connotative Legends.

L. J. Bartelli -- Do we allow coded legends?

C. E. Kellogg -- I prefer not to use a coded legend--use 1, 2, 3, 4, etc. on the map and then the code used in the legend.

A. C. Orvedal -- They preferred using the coded legend for their working copies of maps and that the Final symbols to be placed on the printed map will be determined later.

Interpretative tables.

C. E. Kellogg -- Limit information in the table and cover in the text.

L. J. Bartelli -- Do not imply too much in table.

H. Rib -- Systems of engineering classification have specific limits. Recommends not be shown on interpretative table of small-scale maps.

A. C. Orvedal -- Use a range for suitability and limitation ratings for mapping units where specific rating cannot be made.

Small-Scale Maps.

C. E. Kellogg -- Need small-scale maps for different kinds of areas--different things will need to be emphasized in different areas. Example: Connecticut vs. Utah.

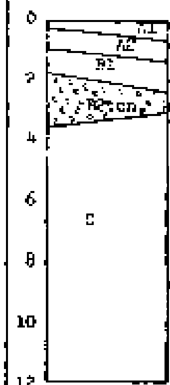
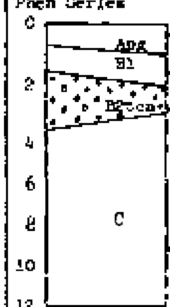
R. W. Simonson -- A need exists for real small-scale maps, world, national and state, on a single page or sheet. Approximately 10 separations.

General.

C. E. Kellogg -- Use base maps of standard scale. Avoid odd scales. General map vs. small-scale map--prefers term "small scale". Use "relief" not "topography".

The committee report was adopted by the conference.

MAJOR SOILS OF NORTHEASTERN THAILAND: THEIR GEOGRAPHIC SETTING, PROFILE CHARACTERISTICS, LAND USE, CROP POTENTIAL, AND MANAGEMENT PROBLEMS AND REQUIREMENTS

MAP UNIT		GEOGRAPHIC SETTING	APPROX. PERCENT OF MAP UNIT AREA	PROFILE OF SOIL SERIES THAT TYPIFIES THE SUBGROUP	PRESENT LAND USE, MAJOR CROPS, AND MANAGEMENT PROBLEMS	LAND USE AND CROP POTENTIAL AND MANAGEMENT REQUIREMENTS
SYMBOL	NAME					
AUPd-1	Plinthic Paleustults with ironstone gravel on undulating plains and Oryzic-Plinthic Tropudults with ironstone gravel on nearly level plains, all from old alluvium.	Undulating and nearly level, old alluvial plains, with sandy or loamy surface layers over a layer of gravel-size, hard, ironstone concretions that lie above clayey layers. Sandstone, shale, siltstone, and other rocks below these alluvial sediments.				
		Plinthic Paleustults--well drained brownish and reddish soils with sandy or loamy surface layers over a layer of ironstone concretions; formed in old alluvium on undulating parts of plains.	65%	Phon Phi Say Series  Brown (7.5YR 5/4) sandy loam; weak, granular structure; many fine roots; pH 6.0; clear, smooth boundary. Yellowish-red (5YR 4/6) sandy loam; weak, blocky structure; few bleached silt grains on ped surfaces; many fine and few medium roots; pH 5.5; gradual, smooth boundary. Yellowish-red (5YR 5/8) sandy clay loam; moderate, blocky structure; few hard ironstone concretions; many fine and few medium roots; pH 5.0; abrupt, wavy boundary. Strong-brown (7.5YR 5/8) very gravelly sandy clay loam; gravel consists of irregularly shaped ironstone concretions 1/4 to 1 inch in diameter; thin clay films; few fine and medium roots; pH 5.5; clear, smooth boundary. Light-gray (10YR 7/2) clay, with few ironstone concretions and many multicolored mottles; roots absent; pH 5.0.	Open forest of spiny shrubs and small twisted trees; small areas cleared for shifting cultivation, but yields are low and fields are abandoned after 2 or 3 years.	Poorly suited for cropland, suitable for adapted grasses, such as Hybrid Napier grass, Para grass or Pangola grass; these would provide forage for buffalo and cattle.
		Oryzic-Plinthic Tropudults--poorly drained, brownish and grayish soils with sandy or loamy surface layers over gravelly clay layer with ironstone concretions; formed in old alluvium on nearly level, narrow valleys.	20%	Phen Series  Brown (7.5YR 4/3) sandy loam; many strong brown mottles; structureless, massive; many fine roots; pH 6.0; abrupt, smooth boundary. Yellowish-red (5YR 5/6) sandy loam; common, hard ironstone concretions; weak, blocky structure; few fine roots; pH 5.5; clear, wavy boundary. Light-brown (7.5YR 6/4) and light-gray (10YR 7/2) very gravelly clay, gravel consists of irregularly shaped, hard ironstone concretions; thin clay films; few fine roots; pH 5.0; clear, smooth boundary. Light-gray (10YR 7/2) clay, with multicolored mottling.	Mainly wetland rice, one crop per year; yields are low because of low fertility and inadequate supply of water. Crops fail in dry years. Too dry for crops in dry season.	Two crops of rice can be grown if fertilized and irrigated during dry season; but commonly too high to be irrigated without pumping water from ponds or streams.
		Ultic Paleustalfs--well drained, brownish and yellowish soils with sandy or loamy layers over clayey subsurface layers; formed on old alluvium on undulating, high parts of plains.	15%	See Map Unit AUPr-1, Korat Series.	See Map Unit AUPr-1.	See Map Unit AUPr-1.

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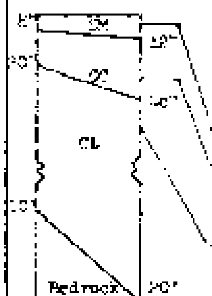
SUITABILITY OF SOILS FOR ENGINEERING USES

MAP UNIT	GEOGRAPHIC SETTING	PERCENT OF MAP UNIT AREA	SOIL PROFILES SHOWING SOIL LAYERS, DEPTHS FROM SURFACE, AND OVERALL DEPTH TO BEDROCK	ENGINEERING CLASSIFICATION AND DESCRIPTION OF EACH SOIL LAYER	SUITABILITY FOR: SURFACE COURSE	BASE COURSE	FILL MATERIAL	NATURAL FOUNDATIONS (INCLUDING SUBGRADE)	SHALLOW EXCAVATIONS	REMARKS
F1 ([illegible] and [illegible] were combined as F1.)	Undulating and nearly level plains; mainly under low forest and thorny scrub. Occurs in small areas throughout the Korat Basin; several large areas are in the Sakon Nakhon Basin.									
	Undulating and nearly level plains. Soils moderately well drained and poorly drained, containing layer of ironstone gravel. Some [illegible] cultivation on undulating plains; some wetland rice in narrow valleys.	90%		Silty sand (SM).	Fair.	Unsuited.	Fair.	Fair to poor.	Fair (somewhat difficult to dig in ironstone layer.) Unsuited May through October (pits will fill with water)	Clayey gravel, especially suitable for surface course, readily available; suitable for coarse aggregate after sifted of fines.
				Clayey gravel (GC) (ironstone gravel), 5 to 32 inches thick.	Good.	Poor.	Fair.			
				Clay of low plasticity (CL).	Poor.	Unsuited.	Fair.			
	Highest parts of undulating plains. Soils well drained. Mainly under forest of large trees.	10%	Silty sand underlain by clay of low plasticity like that in 70% of Map Unit X1.							

Attachment No. 3

		lity for:			Limitati... for:		
Map Symbol	Name	Pasture	Range	Wind-breaks	Septic Tank Filter Fields	Founda-tions**	Shrink-Swell
1	Typic Arguistolls, fine-silty mixed, mesic, nearly level	Fair 14	Good	Fair 14	Moderate-7 to Severe-5,7	Slight to Moderate-1	Moderate
2	Typic Haplustolls, fine-silty mixed, mesic, sloping; and Udic Haplustolls, fine-silty, mixed, mesic, gently sloping; and Typic Ustorthents, fine-silty, mixed, mesic, calcareous, steep	Good	Good	Good	Moderate-5,7 to Severe-6,7	Moderate-1 to Severe-13	Moderate to Low
		Good	Good	Good	Moderate-7 to Severe-5,7	Moderate-1 to Severe-13	Moderate
		Fair 10,14	Good	Fair 10,14	Severe-6	Moderate-1 to Severe-13	Low to Moderate
3	Typic Ustipsamments, sandy, mixed, mesic, rolling and Typic Ustipsamments, sandy, mixed, mesic, hilly	Poor 12,8	Good	Fair 12,14	Slight to Moderate-5	Slight	Low
		Poor 12,8	Good	Fair 12,14	Severe-6	Severe-13	Low

buildings with light load.

er table.
hazard.

o 5 percent).
(5 to 10 percent).
lopes greater than 10 percent).
e.
low water-holding capacity.
ntent.

ll potential.

position, and resistance to piping

USDA SCS LINCOLN, NEBR. 1969 - 5R

SELECTED PARTS OF
PRELIMINARY LEGEND
NORTHEASTERN UNITED STATES
1:1,000,000 Soil Map
June 1968

Attachment No. 4

(Connotative Symbols Used in Initial Draft Only)

ALFISOLS
AA-AQUALFS
AAF-FRAGIAQUALFS
AAFa-1 Typic Fragiaqualfs, silty, sloping (NJ-20)
AAFa-2 Typic Fragiaqualfs and Aeric Fragiaqualfs, loamy, sloping
AAFa-3 Typic Fragiaqualfs and Aeric Ochraqualfs, silty, sloping
AAFb-1 Aeric Fragiaqualfs and Typic Fragiaqualfs, loamy, sloping
AAFb-2 Aeric Fragiaqualfs, loamy, and Aquic Fragiudalfs, silty
AAFb-3 Aeric Fragiaqualfs and Humic Haplaquepts, silty, sloping
AAO-OCHRAQUALFS
AAOa-1 Typic Ochraqualfs, loamy, level (Va-A2b4)
AAOa-2 Typic Ochraqualfs, and Glossaquic Hapludalfs, clayey, sloping (NY-PV)
AAOa-3 Typic Ochraqualfs, clayey, and Typic Dystrochrepts, loamy, sloping (Pa-C,CWo,Co)
AAOa-4 Typic Ochraqualfs, clayey and Dystric Eutrochrepts, silty, level, sloping (Me-AAOa(3))
AAOa-5 Typic Ochraqualfs, clayey, and Rockland, sloping (NY-PR)
AAOb-1 Aeric Ochraqualfs, clayey, sloping, moderately shallow (NY-L)
AAOb-2 Aeric Ochraqualfs and Typic Ochraqualfs, clayey, sloping (NY-CC)
AAOb-3 Aeric Ochraqualfs and Mollic Ochraqualfs, loamy, sloping (NY-LH)
AAOb-4 Aeric Ochraqualfs and Mollic Ochraqualfs, clayey, sloping (NY-OR)
AAOb-5 Aeric Ochraqualfs and Glossic Hapludalfs, clayey, sloping (NY-OJ)
AAOb-6 Aeric Ochraqualfs and Glossaquic Hapludalfs, loamy, sloping, moderately shallow (NY-Js)
AAOb-7 Aeric Ochraqualfs and Mollic Haplaquepts, clayey, sloping (NY-FL)
AAOh-1 Mollic Ochraqualfs, clayey, level (Vt-16,20,24)
AD-UDALFS
ADF-FRAGIUDALFS
ADFa-1 Typic Fragiudalfs, silty, sloping (Pa-Al,LCJ)
ADFa-2 Typic Fragiudalfs and Aquic Hapludults, silty, level (Del-1?)
ADFd-1 Aquic Fragiudalfs, silty, sloping (NJ-4)
ADFd-2 Aquic Fragiudalfs and Aeric Fragiaqualfs, loamy, sloping (Pa-CRW)
ADFh-1 Ochreptic Fragiudalfs and Aeric Fragiaqualfs, loamy, sloping (Pa-CVP,W)
ADH-HAPLUDALFS
ADHa-1 Typic Hapludalfs, loamy, sloping (NJ-21)(Pa-CHP)
ADHa-2 Typic Hapludalfs, loamy, moderately steep (Va-10-12) (Pa-HCG,Aa)
ADHa-3 Typic Hapludalfs, loamy, steep (NJ-1)
ADHa-4 Typic Hapludalfs, stony, sloping (Va-h14a3)
ADHa-5 Typic Hapludalfs and Typic Fragiudalfs, loamy, sloping (Pa-CbL)
ADHa-6 Typic Hapludalfs and Ultic Hapludalfs, clayey, sloping (Pa-ME)
ADHa-7 Typic Hapludalfs and Ultic Hapludalfs, loamy and clayey, moderately steep (Md-HF)
ADHa-8 Typic Hapludalfs, Typic Dystrochrepts, and Typic Hapludults, loamy, sloping (NJ-2)
ADHa-9 Typic Hapludalfs, clayey, and Typic Dystrochrepts, loamy, steep (WV-41)

ENTISOLS
EA-AQUENTS
EAH-HAPLAQUENTS
EAHa-1 Typic Haplaquents and Typic Ochraquults, loamy, level (Va-Ale4)
EAP-PSAMMAQUENTS
EAPa-1 Typic Psammaquents, stony, sloping (NY-CV)
EAPa-2 Typic Psammaquents and Typic Haplaquolls, level (NY-JG)
EF-FLUVENTS
EFD-UDIFLUVENTS
EFDa-1 Typic Udifluvents and Fluventic Haplaquepts, loamy, level
EO-ORTHENTS
EOD-UDORTHENTS
EODc-1 Aquic Udorthents, sandy, and Alfic Udipsamments, level (NY-CQ)
EP-PSAMMENTS
EPQ-QUARTZIPSAMMENTS
EPQa-1 Typic Quartzipsamments, sloping, stony (NY-CV)
EPQa-2 Typic Quartzipsamments and Aquic Quartzipsamments, sloping
EPQa-3 Typic Quartzipsamments, Psammentic Hapludults and Typic Hapludults, sandy, sloping (Md-LG)
EPQa-4 Typic Quartzipsamments and Typic Haplaquods, sandy, sloping (NC-LLS)
EPQa-5 Typic Quartzipsamments and Arenic Paleudults, loamy, sloping (NC-LN)

H-HISTOSOLS
H-1 Histosols, undifferentiated (NJ-10)(NY-Mu)(Me-PM)(NC-M)
IA-AQUEPTS
IAF-FRAGIAQUEPTS
IAFb-1 Aeric Fragiaquepts and Typic Fragiaquepts, loamy, sloping (Pa-AEA,EEL,MCC,EME,ELE)
IAFb-2 Aeric Fragiaquepts and Typic Fragiaquepts, loamy, sloping (NY-VM,EL) (PA-BTA,MCO,VM,VMA,UML)
IAFb-3 Aeric Fragiaquepts and Aquic Fragiorthods, loamy, sloping (NY-BM)
IAH-HAPLAQUEPTS
IAHa-1 Typic Haplaquepts. loamy, level (Md-A)
IAHa-2 Typic Haplaquepts, Aeric Humaquepts, and Aquic Dystrochrepts, sandy to clayey; and Typic Psammaquents, level (NJ-15)
IAHb-1 Aeric Haplaquepts, clayey, sloping (Pa-AH)
IAHe-1 Fluventic Haplaquepts, Fluventic Dystrochrepts, and Fluventic Eutrochrepts. silty and loamy, level (WV-19)
IAHe-2 Fluventic Haplaquepts. Aquic Fluventic Dystrochrepts, and Aquic Fluventic Eutrochrepts, loamy, level (NY-WH)
IAHe-3 Fluventic Haplaquepts and Typic Fragiudults, loamy, sloping (WV-22)
IAHh-1 Mollic Haplaquepts and Typic Haplaquepts. loamy, level (Me-IAHh-1)
IAHh-2 Mollic Haplaquepts and Typic Haplaquepts, loamy, sloping (Me-IAHh-2)
IAHh-3 Mollic Haplaquepts, clayey, and Typic Haplaquolls, loamy, level (NY-t)
IAHh-4 Mollic Haplaquepts, clayey, Typic Eutrochrepts, loamy, sloping (NY-LG)
IAM-HUMAQUEPTS
IAMa-1 Typic Humaquepts and Typic Haplaquepts, silty, level
IAMa-2 Typic Humaquepts, clayey, and Typic Dystrochrepts, low. sloping (WV-15)
IAMc-1 Cumulic Humaquepts and Typic Haplaquepts, loamy, level
IO-OCHREPTS
IOY-DYSTROCHREPTS
IOYa-1 Typic Dystrochrepts, loamy, level (NY-Bf,H)

Report of Committee 12, Realistic Estimates of SCS Soil Survey Laboratory Workload

Background

The Inspector General's audit of the Soil Survey Laboratories included the recommendation that we "Develop procedures for planning, programming, and budgeting the laboratory work, as jointly determined by State and laboratory personnel, needed to meet fully field soil survey and research needs." The report was quite specific in indicating that the laboratories had an inadequate staff to meet these needs quantitatively.

Advisory SOILS-1?, dated November 21, 1x7, pointed out that the Regional Soil Survey Work Planning Conferences had been asked to place on their agenda the problem of development of realistic estimates of the soil survey laboratories workload. It pointed out that funds for additional laboratory work are most apt to come from funds now being devoted to field work.

Activities Of Committee

The report of the committee was prepared by correspondence.

Reports of all regional committees on this subject were reviewed. Following the meetings of these committees, estimates of work needed by the SCS laboratories were submitted by each State office by years for a 1 I-year period. The estimates included (1) numbers of pedons of benchmark sails to be characterized; (2) numbers of samples for small projects such as texture checks, determinations of mineralogy, carbonate content, for classification of series; and (3) research projects needed to assist in mapping and classification. A summary and analysis of these estimates is attached.

The summary shows a need for a" average increase of about 55 percent over the FY 68 production of the SCS laboratories. However, the average for the first five years is almost 50 percent greater than for the second five years. Thus, the requests for the next five years are greater than FY 68 production by about 80 percent.

The committee believes that the requests for the first five years are on the low side. They are for work that is needed for mapping, classification, and interpretation but represent the minimum projection of needs, particularly for interpretations. The committee believes the estimates for the second five-year period are appreciably less than will be wanted at that time and represent, in part, the normal tendency of the human mind to discount the future. In a few States, the Agricultural Experiment Stations plan increases in their laboratory work, but this is "at responsible for most of the differences between the estimates of work wanted in the two five-year periods.

Appreciable increases in SCS laboratory output can be achieved with relatively modest increases in costs. The laboratories currently have 35 positions and five vacancies (including secretarial positions). An increase of 18 positions (including secretarial help) should increase production by about 80 percent. Most but not all of the new positions should be of low grade, GS-6 or less. Recruitment would probably take about a year if it begins in 1969 early enough to recruit June graduates.

Space and equipment are not limiting at Beltsville or Lincoln. The Riverside laboratory would be more efficient if a small addition were made in the main laboratory so that all the work would be in a single building but little new space is needed. A 33 percent increase in the laboratory budget should increase the capability by 75 to 80 percent.

The committee notes that the Joint Task Force on Research on Soil and Land Use makes the following statements in its report (196?, RPA 101-A).

"We have accumulated much good information about soil properties which can be determined in the field. As the demands on the soil increase in our modern society, however, the increasing intensity of soil use and the large capital inputs required demand information which only laboratories and more sophisticated field studies can provide. Currently, these needs are served by three understaffed national soil survey laboratories, three special state laboratories and supplementary piecemeal local efforts, principally in twelve states. A major coordinated effort planned deliverately to develop a body of data pertinent to modern problems is essential for orderly and efficient use of soil resources with conservation."

Laboratory data are justified only by their use. Frequently, data from one State can be used in several States. Conversely, some problems can be solved only by data from two or more States. Consequently, problems should not be approached purely on a State by State basis. Some need cooperation of two or more States, and if work requested in one State can be used in others the planning should be joint. The State soil scientists, principal soil correlators, Experiment Station leaders and the soil survey laboratories should periodically discuss priorities of problems and methods of attack, including both field and laboratory studies. Such groups meet every other year at the Regional Work Planning Conferences. No additional travel is required if plans are discussed at those meetings, but only one of the regional committees recommended that it be continued. This committee believes that problems change and periodic review of plans is essential to the best use of limited facilities. It believes, therefore, that there should be standing regional committees to make these reviews. Following the discussions at the Regional Technical Work Planning Conferences, the problems within each State should be reviewed at the next meeting that discusses the State annual and long-range plans of soil survey operations. The needs and plans for research and SCS and other laboratory work need to be discussed with our cooperators at these meetings. Participation by Experiment Station representatives is important partly because they may be able to do some of the needed work, and partly because problems can often be used for theses in the graduate schools, particularly for SCS soil scientists on educational leave.

The functions of this committee in the future will depend on future events. We believe it should be retained to report to this conference on the functioning of the regional committees.

The Committee, therefore, makes the following recommendations:

1. That the Service explore ways and means of increasing the capacities of the existing SCS soil survey laboratories by about 60 percent through full staffing.

2. That standing Regional committees be established to review plans for investigations and laboratory work and suggest priorities for that work; that these committees include the principal soil correlator and a soil survey laboratory representative in their membership.

3. Following the Regional Work Planning Conferences, needs and plans for research and laboratory work should be reviewed in each State at the meeting that discusses the State annual and long-range plans of soil survey operations.

4. That this committee be continued to report on the functioning of the regional committees.

Committee Members:

L.J. Bartelli	R. B. Grossman
A. J. Baur	E. I. Pedersen
F. J. Carlisle	Guy D. Smith, Chairman
K. W. Flach	R. A. Struchtemeyer

Discussion

Dr. Bartelli suggested that non-federal funds supplied to the Service through agreements to accelerate soil surveys might be used in part to pay for soil survey laboratory work on samples collected in the survey area.

[illegible] Investigations [illegible]

	FY 1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
Alabama	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Alaska	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Arizona	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Arkansas	[illegible]	[illegible]	[illegible]							
California	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Colorado	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Connecticut			[illegible]	[illegible]						
Delaware	[illegible]	[illegible]	[illegible]	[illegible]						
Florida	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Georgia	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Hawaii		[illegible]								
Idaho	[illegible]	[illegible]								
Illinois	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Indiana	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Iowa	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Kansas	[illegible]	[illegible]		[illegible]	[illegible]		[illegible]		[illegible]	[illegible]
Kentucky	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
Louisiana	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Maine	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Maryland	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]					
Massachusetts	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				
Michigan	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Minnesota	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Mississippi	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				
Missouri		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Montana		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Nebraska	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Nevada	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
New Hampshire	[illegible]			[illegible]						
New Jersey	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
New Mexico	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
New York	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
North Carolina	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
North Dakota	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ohio	[illegible]	[illegible]								
Oklahoma			[illegible]		[illegible]		[illegible]			
Oregon	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]		
Pennsylvania										
Puerto Rico	[illegible]		[illegible]		[illegible]		[illegible]		[illegible]	
Rhode Island										
South Carolina	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
South Dakota	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Tennessee	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Texas	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Utah	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Vermont	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				
Virginia	[illegible]	[illegible]								
Washington	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
West Virginia	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
Wisconsin	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	
Wyoming	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
TOTAL	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Small Projects – Number of [illegible]

	Fis. [illegible]	1920	1921	1922	1923	1924	1925	1926	1927	1928
[illegible]	12	12		12	12	12	12	12	12	12
[illegible]										
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]								
California	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Colorado	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Connecticut	[illegible]	[illegible]	[illegible]	[illegible]						
Delaware	[illegible]									
[illegible]										
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]							
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Indiana										
Iowa	[illegible]									
Kansas	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Kentucky	[illegible]	[illegible]								
Louisiana	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Maine	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Maryland	[illegible]									
Massachusetts										
Michigan	[illegible]	[illegible]		[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Minnesota	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Mississippi	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Missouri	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Montana	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Nebraska	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Nevada	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
New Hampshire	[illegible]	[illegible]								
New Jersey	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
New Mexico	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
New York	[illegible]	78								
North Carolina										
North Dakota										
Ohio	[illegible]	[illegible]								
Oklahoma	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Oregon		[illegible]			[illegible]		[illegible]	[illegible]	[illegible]	
Pennsylvania										
[illegible]										
[illegible]										
South Dakota	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Tennessee										
Texas										
Utah	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Vermont	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Virginia	[illegible]	[illegible]	[illegible]							
Washington	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
West Virginia	[illegible]	[illegible]								
Wisconsin / Wyoming	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Calculation of Workload Increases

Base year FY 1968:	1918 samples (276 pedons)	
	1052 samples (small projects)	
	2970 samples	
	600 samples from S.S.I.	
	2370 samples originating in States	

State estimates of needs:

(first 5 years)	4211 samples (small projects)	
	17045 samples (pedons)	
	2436 samples (research projects)	
	23692 ÷	4738 samples per year
		600 samples from S.S.I.
Projected workload		5338 samples
Base-year production		2970
		2368 increase (80%)

REPORT OF COMMITTEE 13

Soil Survey Procedures
(Priorities for soil survey field work and publication)

The recommendations of the 1967 national committee were reviewed. The regional work-planning conferences in 1968 did not have committees with this title; however, several of their committees discussed subjects related to the work of committee 13 of the 1969 national committee. The Southern Regional Technical Work-Planning Conference had an ad hoc committee with the title of "Soil Survey Procedures." The charge to this ad hoc committee was to outline an orderly procedure for making changes in the New Classification System. Committee 4, Application of New Soil Classification System, will consider recommendations made by the ad hoc committee of the southern region.

The January 1967 recommendations of the national committee on soil survey procedures have been or are being placed into policy or procedures memoranda or advisories.

A new committee on "Handling soil survey data" has been established and will report to the 1969 conference.

Objectives: The Soil Survey Procedures Committee developed the following objectives:

1. Shorten the time lag between completion of soil survey field work, including draft of manuscript for editing and distribution of the published soil survey. (15-month maximum time lag)

2. Develop procedures that will balance soil survey field work and soil survey publication.

3. Improve the quality of soil survey and special reports issued prior to distribution of the published soil survey.

Background Information

Currently, soil survey areas are being completed (field work and draft of manuscript) at about twice the publication rate.

In addition, field work has been completed on about 265 soil survey areas that have not been published. Even with a modest planned increase in soil survey publications ([illegible] publications for fiscal years 1969-1972), the backlog will continue to increase so that by 1972 the backlog of unpublished soil surveys will be approximately 386. It has been estimated that 19 million dollars will be required to edit the manuscripts, prepare the soil maps for printing, and print these 386 unpublished soil surveys.

It has been estimated that between 500 and 600 special soil survey reports will be issued in fiscal year 1969. A few of these are supplements needed for updating published soil surveys or soil information is needed on part of the soil survey prior to completion of field work in the entire soil survey area. However, most of the special soil survey reports are being issued because of the unfortunate lag in publishing soil surveys. Most of these special soil survey reports would not be needed and considerable money would be saved and services increased if, somehow, publication could be speeded up so as to print the surveys between 1 and 1 1/2 years after completion of field work.

Because of the important advantages of published soil surveys, the committee urges a continued search for ways and means for streamlining procedures so that soil surveys can be published within 1 year after completion of field work, and for seeking ways to get the backlog published.

To eliminate the current backlog of unpublished soil surveys and publish future soil surveys within 18 months after completion of field work, we recommend additional fund input for soil survey publications and the development of procedures that would permit the soil survey staffs in the States to contribute additional inputs toward soil map construction and manuscript preparation.

The committee recommends the following:

1. The Administrator's Committee on "selection of soil surveys for publication" in consultation with the State conservationists re-evaluate all soil surveys having completed field work and place them in one of the following two priorities:

   Priority A - Soil survey areas currently experiencing rapid land use change, major soil problems in relation to current land use or anticipated land use adjustments, large numbers of people needing the survey, major or multiple programs in the area needing the soil resource information, significant non-Federal financial contribution toward the soil survey, status of cartographic work toward completion of the manuscript soil map. (This is not an exhaustive set of criteria--it should be further developed by the Administrator's Committee and the State conservationists.)

   Priority B - All soil survey areas not placed in priority A will be placed in priority B. Such areas will be serviced with copies of the draft manuscript prepared for publication and copies of soil survey field sheets, interpretative maps, or other suitable maps until soil survey field work and publication are brought into balance and the backlog of soil surveys in priority A are published.

2. Each State conservationist should re-evaluate all progressive soil surveys and place them into one of the two priorities listed in item 1. If any of the current progressive soil surveys are placed in priority B, they should carry a low priority for completion of field work. Such areas can be served by special reports and copies of soil survey field sheets, interpretative maps or other suitable maps until soil surveys placed in priority A are published.

   The same type of evaluation should be made of all nonprogressive soil survey areas and areas not currently in the soil survey schedule.

   The re-evaluation of priorities in progressive and nonprogressive soil survey areas may reveal a need for adjustment of soil survey work in the State.

3. Suggested procedures that will reduce costs, distribute workload, and speed up the soil survey publication:

   A. Use high altitude aerial photographs as base maps for soil surveys, where feasible (variation in terrain less than 300' within a two-mile radius of any point).

      This will eliminate the cost of constructing aerial photo mosaic base maps for the published soil survey for such areas.

      The soil survey field sheet will cover the same size as the published soil map, thus reducing the amount of "map join" work required by the field soil scientist and by cartographic.

      The use of high altitude photographs for soil surveys will reduce the number of soil survey field sheets for areas covered by special reports. Also, aerial photographs should be taken at the time of year that will produce high-quality base maps which would speed up the survey and aid in better placement of soil boundaries.

      The committee recommends that the Director of the Cartographic Division develop criteria for the use of high flight photographs and have each State and appropriate cartographic unit make an evaluation of all soil survey areas to determine: (1) Soil survey areas where high altitude aerial photographs can be used as base maps for soil surveys (exclude modern published soil surveys), and (2) soil survey areas now covered by high flight maps and determine whether or not such maps can be purchased by SCS. State plans for the use of high flight maps should include SCS State funds, or local funds, for their purposes.

      Cartographic Memorandum-2 (Rev. 1), dated September 8, 1967, on the use of high altitude aerial photographs, will need to be updated and reissued.

B. Reduction of excessive mapping units on field sheets

Each State will review the final correlation for all soil surveys that are not being processed for publication by cartographic or the editorial unit (soil survey backlog) and determine those surveys that have an excessive number of mapping units on the field sheets. Use the criteria set forth in Advisory 803X.5-17, dated September 13, 1968, as a basis for this evaluation. For those soil surveys with excessive numbers of mapping units, the State conservationist will arrange for field soil scientists or others at the State level to transfer the soil survey to new base maps. These new base maps may be controlled mosaic atlas sheets or high flight aerial photographs or other suitable base maps as suggested by cartographic. This procedure will speed up preparation of soil naps for publication.

C. Soil survey field sheets

The soil survey legend should be designed end controlled so that most of the unneeded mapping units are not recorded on the soil survey field sheets. The unneeded mapping units that are recorded on the field sheets will either be removed from the original sail survey field sheets prior to their submission to the cartographic unit for assembly into a soil manuscript map, or the correlated mapping unit.5 will be transferred to new base maps, These new base maps may be controlled mosaic atlas sheets, high flight aerial photographs, or other suitable base maps as suggested by cartographic. This places the responsibility on each state to produce a soil map that can be used direct by cartographic for map assembly without cartographic removing unneeded mapping units in the drafting process.

This procedure "ill permit the soil scientist to make needed adjustments of napping unit boundaries as he eliminates the unneeded mapping units from the soil survey field sheets. This will result in a higher quality soil survey than adjustment made by correlation alone.

Field soil scientists producing soil surveys that can be used direct by cartographic for map compilation without removing unneeded mapping units in the drafting process will improve quality of soil surveys used prior to publication and speed up the preparation of soil maps for the published soil survey.

Also, this procedure will permit contractors for cartographic work to "se the soil survey field sheets for manuscript soil map construction.

The committee recommends that a sail survey policy memorandum be developed by the Washington office to place the responsibility at the State level to produce soil maps that can be used direct by cartographic to compile manuscript soil maps without removing unneeded mapping units in the drafting process.

D. Manuscript for use in the published soil survey

Editing the text for the published soil survey is an essential and tine-consuming activity. Editorial work on soil survey manuscripts must be kept in balance with the recommended increase in production of manuscript soil maps.

The present editorial staff is producing about 40 percent of the needed output of edited manuscripts required to keep current with the recommended production of manuscript soil maps.

Currently, fund limitations and personnel ceilings appear to reduce the possibility of significant additions to the editorial staff in the Washington office. Therefore, the committee assumes that much of the required increase in edited soil survey manuscripts will have to be accomplished elsewhere.

The SCS editors tell us that draft copies of soil survey manuscripts will have to be improved if the output of edited manuscripts produced by the current editorial staff is to be increased. Also, the editorial staff "ill have to be substantially increased if edited soil survey manuscripts are to be kept in balance with the recommended increase in manuscript soil maps.

We suggest that the field soil scientist can improve draft copies of soil survey manuscripts by using recent well-written soil survey manuscripts and published soil surveys in the same major land resource area as a guide to details of format, contents, organization, style of writing, and even phraseology in developing soil survey handbooks and manuscripts for additional soil survey areas.

All technical material must reflect the conditions in the survey area so that we have a sound basis for soil classification, correlation, and interpretation.

The State conservationist must set up State soil survey responsibility to provide personal guidance for each author as he starts to prepare his first draft of a soil survey manuscript. This guidance would be provided by a soil scientist or an editor located in the State office. (The editor located in the State office will be discussed later in this report.1 The work of each author would be checked at brief, regular intervals to insure that his work was maintained at an acceptable level of quality from start to finish.

The soil scientist writing specialist position should be reestablished at GS-12 level in the three RTSC's that do not have them. (The Lincoln RTSC is staffed with such a position.)

Each State that plans to write two or more soil survey manuscripts per yew should employ an editor for staff leadership in editing soil survey manuscripts and special soil survey reports. This individual will work with the soil scientist on the State staff responsible for soil survey manuscripts. The Washington office Will provide the training and technical guidance to such individuals.

The editor, at the State level, will be responsible for producing a soil survey manuscript that will require the minimum amount of review in the Washington editorial unit.

The Washington editorial unit and the Chief, Manuscripts for Published Soil Surveys (Hyattsville) office, will be staffed to provide training and technical guidance to editors in the State, proofread, and make final checks on manuscripts prior to submission to GPO and in addition, will edit soil survey manuscripts from those States having insufficient work to justify employment of an editor on the State staff.

In addition, each State should make full use of the provisions in Soils Memorandum-41 (Rev. 1), dated April 27, 1967. "Multicounty areas that have essentially the same kinds of soil should be considered as a soil survey publication area if one text can be prepared for the entire multicounty area. This is of prime importance if a single county is too small to be a publication area."

The procedures proposed in this committee report, when activated, will aid in the balancing of funds and manpower needs for map construction, manuscript writing and editing. and publication with expenditures for mapping.

The committee suggests that it be continued.

Suggested future activities of the committee:

1. Evaluate the impact of recommended procedures on the problem.9 of imbalance between field mapping and soil survey publication that permits a backlog of unpublished soil surveys to accumulate each year.

2. Continue to search for ways to improve the quality and quantity of soil surveys produced (including publication) in the National Cooperative Soil Survey.

Committee members:

B. A. Barnes*
R. W. Eikleberry*
L. D. Giese
W. M. Johnson
C. W. Koechley
D. W. Swanson
J. J. Noll
A. C. Orvedal
R. W. Simonson
L. E. Derr, Chairman

*Not present at Charleston

Notes and suggestions by the conference during and following the committee report 1-29-69.

Klingebiel: Priorities have been considered in selection of soil surveys for publication. Emphasis in past priority selections have been given to areas of rapidly expanding industry and population into rural areas.

Derr: The committee wanted to stress the importance of a reevaluation of all soil surveys in the backlog of unpublished soil surveys. Also, the States should reevaluate priorities in progressive and nonprogressive soil survey areas.

Grossman: Soil survey editors should be placed in the Regional Technical Service Centers.

Simonson: I do not like the term "boiler plate" as it is used in the committee report. Each soil survey manuscript should be written for a specific soil survey area.

Derr: We will rewrite this section of the committee report and delete the term "boiler plate" and substitute other terms to explain the recommendation in this section of the committee report.

Kellogg: We need some study with users of soil maps as to what symbolization to use on soil maps. Most complaints on this item come from people between soil scientists and users--county agents, district conservationists.

Enfield: I hope that county agents are considered users of soil surveys. If such a study is set up, county agents should be included in the evaluation of symbols on the published soil maps.

Bartelli: Offered the observation that a soil survey is not complete when the last acre is mapped. We must not leave the impression that a soil survey is complete prior to the publication of text and soil maps.

Klingebiel: State conservationists should recognize that soil survey programs carry through publication.

Baur: Editors are difficult to recruit to edit soil survey manuscripts.

NATIONAL SOIL SURVEY TECHNICAL WORK-PLANNING CONFERENCE
Charleston, South Carolina, January 27-30, 1967

Report of Committee 14 - Forest Soils

I. The committee reviewed the following regional committee reports:

A. Report of Committee No. 4, North Central Regional Workshop.

1. This committee discussed the need for better communications between so,, scientists and foresters. They concluded that the communication block might be overcome by (a) encouraging foresters to participate in soil survey field operations and reviews, (b) holding special workshops to facilitate a better understanding of mutual problems. and (c) encouraging forestry schools to include suitable soil courses for all forestry students (this was in the form of a" endorsement by the committee of an earlier suggestion to review the curricula of the schools).

The National committee agrees that a communication block exists. We question, however, the advisability of using the field reviews for training potential users of the so,, survey. These reviews are largely technical in nature and invariably are tightly scheduled. Attendance by large groups of people makes inefficient both the technical review and the understanding of "what's going on" by the users. On the other hand, we heartily endorse the suggestion of special workshops to demonstrate what the soil survey will provide as well as what it won't. Such workshops mny need to be arranged both during the early stages of the survey (to make desirable changes as brought out by the discussion "f mutual problems) and at the time survey reports are available for use.

Our committee commends the North Central Committee on its desire to improve the training of forestry students by encouraging the inclusion of suitable soil courses in the curricula. Forestry students, as well as other students aspiring to be land or resource managers, would benefit greatly from those courses that promote . better understanding of natural Landscapes and the fundamental relationships played by soils in the overall management of these landscapes.

2. The North Central Committee pointed out the need for additional studies, including research to determine the significance of the different properties of soils that affect woodland production and to provide better site Index curves, and recommended that encouragement be given research groups to proceed as rapidly as possible in providing the needed information, end. to facilitate the use of existing research information, the soil scientists should distribute pertinent bibliographies to each other.

The National committee, oE course, endorses these views. It further recommends that needed research subjects be submitted on a continuing basis to the graduate departments of the universities. We believe that most schools would appreciate having greater backlogs of problems from which suitable and meaningful research projects could be developed and studied.

3. Finally, the North Central Committee recommended that foresters be encouraged to participate in establishing criteria and in developing descriptive legends for soil surveys in forested areas "in order to meet the needs of forestry. recreation, wildlife, and other special Interests."

As "forestry" moves increasingly in the direction of multiple use management. a broad look must be taken of the soil information needs of the land managers of forested areas. A few examples will show how these needs vary.

Example A: Consideration is being given to the development of criteria far taxation of forest Lends in South Carolina based on general soil maps (roll associations). The Foresters' Council has endorsed this proposal which will require legislative action by the 1969 General Assembly. Preliminary guides have been prepared by a consulting forester based on general soil maps currently available. Such appear adequate to meet the needs.

Example B: An industrial ownership of a large area of bottomland hardwoods may have as its management objective the production of large size high quality veneer stock and sawtimber. Management compartments may be of large sizes involving a broad spectrum of commercial species (20 to 80 individual species). Conceivably a soil survey based on soil associations might be adequate and well adapted 'o the extensive needs of management.

Example C: A farm woodland owner manages for woodcrop production as well as recreation, wildlife, and woodland grazing. This owner would desire that the surveys be of an intensity and accuracy sufficient to permit Interpretations for all these uses.

Example D: A private ownership of 100 acres is devoted entirely to the production of high quality Christmas trees. Management is very intensive and Includes fertilization, cultivation, weed control using herbicides, insect control by insecticides, disease control utilizing fungicides, pruning, shearing, and shaping. Maintenance of soil fertility, soil protection, and species suitability are critical for continued profitable operations. Soil management information in great detail is needed. Other operations requiring very detailed soils information are forest tree nurseries and seed orchards.

These examples suggest the type and intensity of soil surveys the, might be designed for a particular objective or for certain parcels of forested land. It is very probable that the Less intensive information would be obtained in most soil surveys, but that it would be unreasonable to attempt gathering over county-size areas the level of soil information needed for the latter examples. Very detailed soil survey information and specific soil management information are best obtained through special or supplementary surveys and investigations. This committee urges, therefore, that potential users of soil survey information be Informed about its limitations as well es its utility. Soil surveys should be designed in consideration of the needs of woodland managers and other users but this does not mean that all of their soil information needs will be satisfied.

B. Report of Committee No. "III, Soil Survey Forest Committee, Southern Regional Workshop.

1. In response Lo an earlier charge. meetings were held in four southern States with foresters to determine the extent that their needs were being met. explore new approaches, discuss presentation of data, etc. After discussing reports of these four meetings, the Southern Soil Survey Forest Committee made the following recommendations:

   (a) "Each State soil scientist review the need for revisions of slope classifications for woodland uses and that interpretations be designed for the various types of equipment used in harvesting and site preparation. When soil scientists are developing or revising legends which will be used for woodlands. foresters should be consulted."

   (b) Where soil complexes and associations are Included in a soil survey, complete descriptions of the individual soil taxonomic units should be Included."

(c) "Prior to mapping extensive areas of land, where the present and foreseeable primary use is woodland, the ownership managers be consulted as to their needs. The Soil Survey should be designed to accurately meet these needs."

2. A regional study of the quantification of hardwood competition and pine seedling mortality (artificial regeneration rating) was referred to and accepted by the Southern Forest Environment Research Council.

3. To better coordinate soil survey work with interested user groups, the Southern Committee recommended that the States be urged to continue to hold meetings to accumulate information on the needs of foresters and other users of the soil survey.

The National Committee agrees with the Southern Committee that meetings to inform foresters and others of the utility of soil surveys and to better consider their collective needs are useful indeed. Our previous comments concerning the North Central's report are equally applicable here.

C. Report of Committee No. 4, Soil Survey for Range and Forest Lands, Western Regional Workshop.

1. This Western Committee discussed the use of higher categories in the definition of mapping units in soil surveys of various intensities in Alaska, Central Lahontan Basin Area in Nevada and California, certain National Forest areas in Idaho and Montana, and in Hawaii. The mapping units are primarily phases of families in the medium intensity surveys (1:20,000 scale), associations of phases of families in the reconnaissance surveys (1:60,000 scale), and associations of phases of subgroups in the exploratory survey (1:500,000 scale). Except for the Hawaii survey, these surveys were so designed because of the general lack of defined soil series for the survey areas. The units appear to be relatively uniform (within the phases of families) in most cases, and are adequate for the interpretations being made. The Western committee is convinced that families and classes of higher categories can be used successfully in the definition of mapping units. They do, however, find the classification names awkward for use in reports.

   The National committee splits on geographical lines regarding the prospect of using such units in the definition of mapping units. In the North Central, Northeast, and Southern Regions where soil series have been established and are readily usable, units higher than the soil series are not recommended by the regions. In the Western Region, where soil series have not been established over extensive areas, the use of higher classification levels is gaining in favor, at least for reconnaissance and other special soil surveys. It is agreed by this committee that for mapping soils on areas where soil series have not been formally established nor is time available to adequately establish them, the use of classes of the higher categories in the definition of mapping units is preferable to using non-correlated and non-approved soil series names.

2. The Western committee discussed the mapping techniques that are commonly used on forest, range, and other wild land areas in the region. "Mapping units are based on natural landscape units. Dominant taxonomic units are identified within these delineations but the mapping units are not delineated on the basis of the taxonomic units. In mountainous areas geomorphic and topographic relationships tend to be very important and access tends to be very difficult. Stereoscopic study of photographs to extend information gained on the ground, in most cases, is essential to efficient delineation and identification of mapping units."

This committee agrees fully that the mapping techniques described are meaningful and appropriate. Excepting perhaps the highest intensity surveys, most soil mapping of forested areas proceeds generally in similar fashion. The degree to which associations of soils are recognized in the individual mapping units will depend largely upon the soil patterns and mapping scales but it will also depend partly on the objectives of the survey. As intensity of survey increases. the prevalence of soil associations as mapping units tends to decrease.

3. The Western committee developed a suggested List of characteristics and associated features to be included in the descriptions of mapping units. They also recognized that some associations need interpretations by components as well as by whole units.

The National committee agrees with the suggested list of characteristics to be included in a mapping unit description for forest, range, and other wild lend areas. We would, however. like to emphasize that all associations require interpretations by components as well as some by whole units.

II. Committee Proposals Concerning Mapping and Interpretations of Forest Soils.

A. In the study of forest soils and the development of soil interpretations designed to meet important needs of land managers, the National committee places great emphasis on the importance of adequate characterizations nnd evaluations of the soil substrata horizons. Among other things, substratum properties directly Influence (1) the overall rooting environment and thus ran play an Important part in species suitability and soil productivity capacity, (2) soil mantle stability, (3) soil-water relationships, end. of course. (4) a number of facets relating to road construction. Two simple examples are offered.

In parts of the glaciated section in Pennsylvania an Oquaga channery silt loam is mapped. Bedrock is encountered generally at depths between 20 end 40 inches. The bedrock in some of these areas is often shattered to depths of 10 feet or more. In these shattered areas site Index for oak Is often in the 70's; in the solid bedrock areas site Index may be less than 30 feet.

On portions of the Idaho Batholith. weathered but massive and slowly Permeable granitic bedrock underlies sandy loam sola at depths of 15 to 30 Inches. The native vegetal cover commonly consists of blq sagebrush-grass communities. On the immediately adjacent areas, similar sola (in gross characteristics) are underlain by fractured and weathered and readily permeable bedrock. These soil areas support quality stands of ponderosa pine and other coniferous species.

Criteria used for differentiating soil units for farm crops do not, as a general rule, Involve substrata conditions to the degree that is meaningful end necessary for forest crops and the management of forested lands, and especially for mountainous Lands. forested or otherwise.

B. The National committee takes this opportunity to stress the importance of the general soil maps and other soil maps of comparatively smell scale in forest end woodland management. Such maps (assuming they are well designed end of good quality) are admirably suited for general planning by managers of large public and private holdings, by county end State planners, by various Federal Agencies, and by private consulting fins and organizations. Rather than having little value because of lack of detail (as is frequently inferred) these smaller scale maps have considerable utility for a wide variety of planning purposes. And much of their attractiveness to land managers and resource planners In general lies in the fact that the maps are not cluttered with detail. The information presented is relatively easy to comprehend by non-soils people.

One of the significant trends I” resource management planning today is the rate at which program planning for increasingly larger areas “f land seems to be accelerating. Multiple use planning on the National Forests is now on the basis of Ranger District units which commonly consist of one hundred thousand LO several hundreds “f thousands of acres. River basin planning involves watershed areas running into the millions of acres. Rural Area Development programs involve planning on county-size areas as well as portions of entire States and even regions. Timber companies appear to be increasing their land ownership and many are rapidly changing from timber "holding" to total resource management.

I” recognition of the potential that the smaller scale soil maps and their accompanying interpretive information have for getting broad scale planning programs on a realistic soil base, the planning, design, and conduct of such surveys should be expedited I” every possible way. They should be encouraged. After all, there Is a vast acreage in these United States upon which detailed soil surveys are not likely to be conducted in the “ear future but upon which, nevertheless, much resource planning is taking place with little or no data available concerning the basic soil resource. It behooves us to consider the timeliness of soil survey Information as well as the amount of detail when it comes to survey plans end design.

III. Committee Recommendations for the Future.

A. It is recommended that the National committee be continued with two tasks. The first of these would be to follow up on the communication block, including, perhaps, a more comprehensive analysis of the problem and a positive approach towards its solution. if the situation does not show improvement with the present proposed actions.

The second of these tasks would be to explore more thoroughly the interpretive aspects of the smaller scale soil surveys of forest, range, and other wild land areas.

The committee report end recommendation that the committee be continued were approved by the conference.

Committee Members:

C. M. Ellerbe
L. D. Giese (Acting Chairman)
J. J. Noll
R. A. Struchtemeyer
R. van der Voet
O. c. Olson, Chairman

January 30, 1969

Report of Committee 14 - Forest Soils

Comments on Report

Dr. Kellogg: "Soil scientists and foresters pick out blocks together."

"...limitations of soil survey--need to learn how to say 'I don't know.'"

"...cannot meet all the needs of the users."

"Page 3, 1:60,000 scale is a mistake--should have used 1:62,500."

Comment by someone: "Probably because it was the only scale available."

Dr. Kellogg: "Should be mutual interest in both fields to overcome communication block."

Mr. W. Johnson: "Small scale soil maps emphasized too much as meeting needs. Maps are being used for multiplicity of purposes--small scale maps will not supply the information."

Dr. Kellogg: "We need both--more detailed maps needed in operations phase."

Mr. Scrivner: "...not worried...value great from small scale maps...need for reconnaissance level surveys to get information for broad planning groups...would get attention from users and a source of backing."

Dr. Bartelli: "Surveys should be more low intensity detail rather than small scale."

Mr. Giese: "Committee did not suggest small scale maps will meet all the needs of foresters."

Dr. Guy Smith: "Inference that forester must be acquainted with hundreds of series--would be easier for him to become acquainted with meaning of the higher levels rather than so many series--soil scientists do not appreciate the problems others have with series."

Dr. McClelland: "Private companies (forest) with soil scientists on their staffs make surveys comparable to medium intensity surveys--are paying for this detail."

Dr. Kellogg: "Interpretations are going to be in the engineering field--skid roads across certain soils cause land slides--must have a reasonable scale to pick up."

Others: Discussion on soil classification in Pennsylvania. Need for a different series vs. phasing a series because of difference in site index.

Dr. Grossman: "Minor communications block - people concerned with trees put a large amount of effort into characterizing the moisture and temperature regime - we should do more."

Mr. Orvedal: "General soil map interpretations needed by map units - problem of contrasting soils in same map unit - need to agree on ground rules.
- California working with community planners - they want a single rating for each unit.
- entire area rated as severe if only 30% of area is severe.
- ground rules need to be stated and agreed upon."

SUMMARY OF CONFERENCE

Charles E. Kellogg

Since the proceedings of the conference will be reproduced and available, I have no intention of attempting a review of all we have done here.

We have had our meeting in one of the most history-conscious end pleasant cities in the United States. Also we have met in a state where the developments in soil science and in agricultural science as a whole have had an enormous influence to raise the potential of both farm and forest production.

Many of our discussions have gone over familiar ground. Techniques in soil science and in the related science* change. Tbe problems people have change. The effect of technology on our resources and on our lives has been great. Perhaps we recognize more of the advantages than we do of the costs of the technology itself. partly because these costs can be delayed for awhile.

Some of our topics have been on the agenda "early every year for some 30 years or more, and I suspect that many of them will be discussed for the next 30 years. Yet, most times that we travel over the same ground. we see more. We see more opportunities and more problems.

Some of the oldest topics at these conference* have been reading and writing. As soil scientists, most of us do not write enough--not nearly so ouch as I feel we should. And we have a great deal to write about. ""consciously some me" feel that when they have learned something, this something is known by most other sail scientists. But this is not true. We have mot-e opportunity than other soil scientists to study sails in the field, which is the only place they really can be studied. We can take soil samples into the laboratory for detailed examination. But we cannot take a soil into the laboratory any more the" we can a volcano or river. I mean in no sense that the work we do in the laboratory is unimportant. Without it we could not make progress. But the final interpretation must consider the whole soil, including its environment. To apply interpretations for use, we must also consider the social end economic environment, not the soils alone. There is no use worrying about the productivity of a soil under commercial farming if it* area is too small or if it is 200 miles from a railroad or other means of heavy transport. Yet we may need to study Its potential under a new or changed economic environment.

Most of the me" at this conference have had a greet many opportunities to travel, to learn, end to see relationships between soils end other natural features and between soils end the wide variety of successful and unsuccessful attempts at various uses. Much of this travel has been at public expense. I feel strongly that me" with those opportunities have an obligation to write. Our scientific literature is not built up primarily by broad end sweeping generalizations. It is built up mainly by thousands of carefully recorded and explained studies of soil characteristics and their relationship* to the environment and to technology.

Writing is closely related to reading. And thinking is closely related to both. Throughout the world there are close relationships between the soils of a place and how people live end how they could live.

The great French historian of art, Elie Faure, wrote in his History of Art, "Between the soil of the country and the intelligence of men, there have always bee" close analogies which we find are logical and necessary as soon as we understand that the mind invents nothing--discover* everything."

Of course, how people live and how they could live is related to other things, including their religion, historical backgrounds. their language, and all the other influences. One does not explain in the same way about soils to an American farmer, to a Congolese peasant, to a prime minister in Asia trained in law, and to a school boy. To understand how people think and communicate, we turn not only to anthropologists and philosophers hut also to the great writer*--those who were able to capture in writing, including poetry, how people think and how they respond to association with other people.

We do not go over the same ground each time, of course. Most times we have some new subjects. Perhaps the discussions we have had on the "se of computer technology to improve our interpretations and to make full "se of our great masses of date my turn out to be the start of a great new forward thrust in the Soil Survey. Certainly I do not know Just how it will turn out but I can predict that it will not be easy to meet our goal.

Another topic that we have discussed two or three times, and again at this conference, is the problem of describing, naming, classifying, and interpreting the increasingly large number of acres of soils having potential for farming and for other uses that have been moved about with heavy machinery. As time goes on, we shall have continually increasing numbers of such acres to map, for which we will need sound interpretations, in both urban and rural areas. that do not fit well into our present conventions. We must not let the conventions of earlier days block us in meeting this need. Perhaps some of these older conventions have outlived their relevance.

We can safely say that our progress in the National Cooperative Soil Survey has been great. This progress has resulted from progress in all aspects of soil science and in many of the related sciences. I Chink we can say that we have learned mare about the soils of the United States in each 10-year period since 1899 than in the previous 10-year period. Our path may appear to be a bit uneven because we have stopped only now and then for large summaries, such as the soil section of the Atlas of American Agriculture of 1935, the first edition of the Soil Survey Manual in 1937, the USDA Yearbook Soils end Men in 1938, the second edition of the Soil Survey Manual in 1951, end the Comprehensive system of soil classification - 7th Approximation in 1960.

With the publication of the current system of soil classification we will develop many new ideas far the years ahead. First of all, I think we will find many very useful interpretations from the higher categories in our system of classification. Also we are going to find needs for change in the system. Actually, I think we are living in a time "hen soil science will expand greatly. That is, it will if we work at it end put our minds to the many interactions that we can see in the future.

I cannot end without saying how pleased we are to have our associates from Canada with us, Dr. Ehrlich and Dr. Clayton. Also we are happy to have Dr. Dudal here from FAO to take part in our conference.

NATIONAL COOPERATIVE SOIL SURVEY

Soil Survey Conference Proceedings

New Orleans, Louisiana
January 23-27, 1967

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Proceedings of ----

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY

New Orleans, Louisiana

January 23 - 27, 1967

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UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
Washington, D. C. 20250

April 28, 1967

To: Participants and Committee Members of the National Technical Work-Planning Conference of the Cooperative Soil Survey

From: R. D. Hockensmith, Director, Soil Survey Operations, SCS

Subject: Report of the 1967 National Work-Planning Conference of the Cooperative Soil Survey

Transmitted herewith is the report of the 1967 National Technical Work-Planning Conference of the Cooperative Soil Survey.

Information on some of the items in the committee reports on which agreement was reached was released immediately after our conference through official channels for widespread use. Information on other items on which there was agreement will be released soon. But other items need further study. Thus, these committee reports should not be given widespread distribution. They have no official status in their present form.

Five (5) copies of these proceedings are being sent to each RTSC and about five (5) copies are being sent to the office of each State conservationist for distribution to the appropriate State experiment station soil survey leaders and to soil survey representatives of other agencies that are engaged in soil survey work in the State. In addition sufficient copies are being sent for use by the State soil scientist, assistant State soil scientist, and soil correlator. The State soil scientist may wish to circulate one copy of this report among the GS-11 and GS-9 soil scientists, but in doing so it should be made clear that the information, ideas, and data in these committee reports simply represent trends in thinking and progress of work. Thus, they do not necessarily represent official views although many of the methods ultimately may be adopted officially.

This National Conference is held at 2-year intervals--in odd-numbered years. Four regional conferences (one in each land-grant university region) are also held once in 2 years but in even-numbered years. The next National Conference is scheduled for January 27 to 31, 1969 at Hotel Fort Sumter, Charleston, South Carolina.

The next regional conferences are tentatively scheduled as follows:
Northeastern region, New York, New York--January 22 to 26, 1968;
Southern region, Clemson, South Carolina--July 8, 9 and 10, 1968;
Northcentral region, St. Paul, Minnesota--March 20 to 23, 1968;
Western region, Riverside, California--January 22 to 26, 1968.

The primary purpose of these conferences is to aid in the continued development and improvement of standards for carrying on all phases of soil survey work. Of special importance are techniques for field mapping, soil descriptions, legends, soil classification, soil survey interpretations (both farm and non-farm), and soil investigations; the development of adequate terminology with enough precision and standarization to permit use of automatic data processing to aid in making more rapid and effective use of soil survey information; and methods of compiling soil maps and preparing manuscripts for the published soil surveys. Much of the work is performed by technical committees prior to the conferences.

The National Conference makes effective use of technical committee reports of the regional technical work-planning conferences of the Cooperative Soil Survey. The national committees study and express their views on proposals made by the regional committees. In this way the regional committees have clearer guidelines in moving forward with their committee assignments in future work.

Participants in the National Conference include (1) scientific and technical leaders of the Soil Survey staff from the National headquarters office and members of the principal soil correlators offices; (2) one State soil scientist from each of the four groups of States who attends on a rotation basis; (3) one to three land-grant university representatives from each of the four soil survey committees of the four land-grant university regions; (4) one representative of each Federal agency directly concerned with the National Cooperative Soil Survey; and (5) others from the Soil Survey staff, SCS technical branches of closely related work, and other representatives of State and Federal agencies when they have a definite place on the agenda.

Attendance at regional soil survey technical work-planning conferences of the Cooperative Soil Survey consists of one or more representatives from each of the land-grant universities; one from each agency cooperating in the soil survey other than land-grant universities; SCS soil correlation staff in the respective RTSC; State soil scientist, or soil correlator or both and perhaps assistant State soil scientist in each State within each land-grant university region; one representative from other Federal agencies cooperating in the soil survey; one or two from the National headquarters office in the Soil Survey; and others, such as range and woodland conservationists, conservation engineers, and agronomists on invitation by the regional conference steering committee. The chairmanship of each regional conference alternates between the land-grant university group and the SCS.

R. W. Simonson [signature]

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

PARTICIPANTS AT 1967 NATIONAL SOIL SURVEY CONFERENCE
January 23-27, 1967
Jung Hotel, New Orleans, Louisiana

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F. J. Carlisle
B. A. Barnes
R. D. Hockensmith
Charles E. Kellogg
A. A. Klingebiel
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WASHINGTON-FIELD STAFF (SCS)

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Paul E. Lemmon (Plant Sciences Division)
Paul Nylander (Engineering Division)
H. 0. Ogrosky (Watershed Planning)
V. W. Silkett (Resource Development)

REPRESENTATIVES FROM LAND-GRANT UNIVERSITY REGIONS

North Central - Francis D. Hole (Wisc.); H. P. Ulrich (Purdue); J. V. Drew (Nebr.)
Southern - G. R. Craddock, (S.C.)
Northeastern - David E. Hill (Conn.); Nobel K. Peterson (N.H.)
Western - Alvin R. Southard (Mont.)
University of Hawaii - L. D. Swindale

REPRESENTATIVES FROM OTHER AGENCIES

Federal Extension Service - E. J. Williamson
Forest Service - John A. Williams, Adrian Pelzner
Bureau of Indian Affairs - J. D. Simpson
Bureau of Land Management - William L. Mathews, Lyle Linnell
Bureau of Reclamation - John T. Maletic (Paper submitted)
Bureau of Public Roads - Adrian Pelzner substituted for Harold Rib

CANADA - Walter Ehrlich

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE
OF THE
COOPERATIVE SOIL SURVEY
New Orleans, Louisiana, January 23-27, 1967

Charles E. Kellogg

Our soil surveys are used by more and more people each year. They serve as bridges between the body of knowledge about soils that has been built up through research and experience and specific tracts of land. Yet at this time rural America continues to face serious adjustments in soil use. I should like to talk with you briefly about the probable role of the Soil Survey in guiding these adjustments in ways to promote economic development. That is, we will have a big role if we deserve to have it. That is up to us.

Since around 1890 in the United States, the volume of knowledge about soils and their behavior has doubled, or more than doubled, each lo-year period over the previous one. As you know, we already recognize about 70,000 to 80,000 kinds of soil in the United States. Each has a unique combination of a great many characteristics. These combinations of characteristics determine the behavior of each kind of soil and its response to management or manipulation when used for farming, forestry, range, highways, housing, recreation, and so on.

The soils of the country have been studied, classified, interpreted, and mapped cooperatively with the land-grant colleges of agriculture. This has been very fortunate. They have the lion's share of the research results we need to help us. It is through the Soil Survey that the results of other soil and related research of USDA, the State agricultural experiment stations? and other research institutes are made available for predictions of the behavior of kinds of soil under different uses and with alternative management systems.

Sources of information are world wide. Traditionally American soil scientists have studied cooperatively with soil scientists throughout the world. Many from overseas have worked with us in our country and we have worked with them in theirs. The same combinations of soil-forming factors produce identical kinds of natural soils anywhere in the world. Thus, many countries have soils similar to ours in the United States. The results of research and experience abroad are as useful to us as our own results provided we know where the soils fit in our nationwide system of soil classification.

Over the last 15 years we have developed a much improved system of soil classification that greatly aids this process of transferring results of research among countries and among States within our country. Not only that, the system also permits more nearly quantitative predictions at lower categorical levels and far better generalizations at high categorical levels. I am confident that we have much greater potential for making interpretations useful for economic development than we have been able to make in the past.

Improvement in American Farming

American farming continues to face drastic changes in soil use as it continues to advance its already high level of efficiency. Efficiency is promoted in two broad general ways: (1) by selecting for use those kinds of soil that are most responsive to the combinations of practices made possible by modern science and technology; and (2) by fully utilizing the knowledge of natural science, social science, and technology to work out farming systems with the highest outputs for the inputs on a sustained basis. In practice it is not easy to separate these two important influences. Analyses of crude statistics have led to false claims for the effects of some combinations of practices. For example, the increased yields of potatoes, corn, and several other crops have been attributed wholly to improved management whereas soil selection has commonly been an important factor. For example, in the South when farmers had available high quality fertilizers at low cost after TVA, they could afford to fertilize their forage crops. With the reduced power rates they could have refrigeration. This made it possible to use the sloping and erosive soils for forage and to concentrate the corn on less sloping soils more nearly suitable for corn and where water control is easier. Similarly, soil selection had a great deal to do with increased yields of potatoes in Maine.

Early settlers in the United States brought their farming systems with then. Where they settled on soils somewhat like those they had in Europe, these systems worked fairly well. In the Great Plains wholly new systems had to be developed. In the rampaging settlement of the 19th century success or failure of many farm families was primarily accidental. Those who happened to get on soils that were responsive under the state of the farming arts at that time became prosperous and conservative. Those who settled on unresponsive soils failed and some became radicals. In the early 30's they were called "Oakies." Although the westward expansion was generally sucessful, if we ignore thousands of heart-breaking failures during the 19th century, it was mainly these failures that got the Soil Survey started at the end of the 19th century.

It seems clear that American farming will become increasingly competitive Those lacking understanding of soil selection, business management, and the technical basis for their enterprises will continue to fail. To keep American farming competitive means education and change. Yet a side effect of many recent price support programs having a historical base has been against change.

As science and technology developed, unlike kinds of soil responded very differently to new and specific combinations of crop varieties, water control, fertilizers, and pest control. During the early years of farming, fertilizers were very costly. Consequently farmers placed a high premium on soils having already a moderate to abundant supply of plant nutrients, even though they had other characteristics that made water control and mechanized tillage very difficult.

Thus some of the soils that were highly prized by farmers of even 30 to 40 years ago can no longer be used successfully for crops. Many of these soils have been converted to less intensive uses or to nonfarm uses, and many more acres of the same kinds of soil should be converted. Their continued use contributes' to soil erosion and sedimentation or to soil blowing; but more important, their continued use for farming contributes to rural poverty. These soils simply do not respond economically to additional inputs of labor and materials compared to other soils under the current farming arts.

Yet many kinds of soil that are naturally low in fertility and were considered poor for farming 30 to 40 years ago can now be made highly productive under new combinations of practices that include low-cost fertilizer, improved plant varieties, and effective water control at low cost.

I would suppose that somewhere around 45,000,000 acres are now used for crops that are not well suited to economic farming; yet we have a large acreage, around 200,000,000 acres, that could be used under modern systems for economic farming. Outstanding examples of such kinds of soil are found in the Coastal Plain of the southeastern part of the United States, all the way from eastern Virginia to east Texas. Under the present state of the farming arts and competition there is hardly an acre of soil in this region that naturally has sufficient nutrients for the plants. But with the present cost of fertilizers, whether a man puts on 500 pounds per acre or 800 pounds per acre does not affect his operating budget very much. Because of their low relief, water control systems are not very expensive. The total heat units are high; the growing season is long, and moisture is comparatively abundant because of the natural rainfall. Water for supplemental irrigation can be had fairly easily.

While there appeared to be large surpluses of several key crops. adjustments in farming that brought into use new acres of cropland through land clearing and development were difficult to say the least. To many, the cost of price support and of storage beyond reasonable insurance against emergencies seemed high. (I cannot resist adding that these costs seemed high when compared to no cost; they don't seem so high if compared to the tax and price benefits for several other segments of the American economy.) Now the situation is changing. Demands for farm products within the United States and to meet commitments abroad call for at least modest increases in production. Certainly a significant part of the needed increases can be had by improved systems of farming on responsive soils already being cultivated. A great deal could come from the development of arable soils from responsive soil now covered with brush and trees. At the same time those acres of soil now used for crops but not well suited to farming should be devoted to less intensive uses or to nonfarm uses because of their low productivity for crops under any known combination of practices.

Actually we in the United States have an abundance of soils suitable for cropping, for forestry, for housing, and for the many other nonfarm uses. With reasonable soil selection and management systems, there is no need to cultivate soils giving low yields, nor to put houses where they will slip down hill, crack up, or be flooded.

Considering the attachment people have for their home sites and their communities, adjustments of farming from unsuitable soils to suitable ones are slow. The best time to make efforts to help people seek the kinds of soil most suitable for farming is during periods of expansion in farming. The same is true in helping people seek kinds of soils suitable for housing and other nonfarm purposes--when these needs are expanded. Thus we need more precise general soil maps at scales of about 1:1,000,000 that show the potential arable soils of high quality.

Responsibility Over Land

Most early settlers along the eastern seaboard came there because they wanted land--the great symbol of security to people of the 17th and 18th centuries. Because the aristocracy and the church controlled most land in Europe, people came to America for land and opportunity, They wanted to avoid the kinds of control that had existed in western Europe.

So during our history. the American people have adhered to the policy of private use and ownership of land that gives returns in the short-run--within the working life of a family. They have agreed to public ownership of land that gives returns only over long periods and of land urgently needed for public purposes, such as roads, schools, parks, and the like.

Thus the Constitution of the United States provides that the rights of control, or the police power, over private land are responsibilities of the States. Laws for rural zoning and land-use regulations must come from State legislatures. Thus, zoning ordinances, of which there are many, are promulgated and policed by local governments as provided for by State legislation. The Federal government, however, has responsibility for promoting the general welfare, including that in rural areas. This, of course, includes research, especially such activities as the Soil Survey, which must- operate nationally to be effective. In addition, these research programs are also cooperative with other appropriate institutions.

During the last 30 years many of the programs aimed at balancing farm production have rested partly on the general welfare clause of the Constitution without a pooling of national responsibility with the State authority for zoning and land-use regulations. It seems to me that ways should be looked for whereby Federal and State authorities can somehow be pooled in the interest of avoiding wastes of public and private funds, of resources, and of human labor. Since we have so much land in the country with highly responsive soils for farming that are not now used for farming, it seems a pity to continue to useunresponsive soils where returns,management and labor are bound to be low.

As we have discussed at other meetings, we in the Soil Survey are obligated to define alternatives for soil use. In the strict sense we do not make recommendations or decisions. These are made by State and local boards established for the purpose. Their decisions are subject to review by the courts. If such boards are to be successful, they must draw citizens affected by the decisions into the planning process.

Our job in the Soil Survey is to furnish citizens all the reasonable alternatives for the use of individual kinds of soil, together with predictions of the outcome of these alternatives, in as nearly quantitative terms as possible. This requires the assembly of an enormous amount of data synthesized into terms that can be readily understood.

Although we have made a good deal of progress, I think we have great unrealized potentials. When I go out to a county that I have studied a bit in advance, I can usually predict the answer that I will get from a work unit conservationist or a county agent if I ask "What are the principal problems here?" Most commonly I am told the problems for making the existing system of use function better. Unhappily, I get many of these kinds of answers from soil scientists. The major purpose of national and international soil correlation is to make available information to local people about other uses and systems that may be adapted to their soils even though they have not previously considered them. Actually, we do a great deal of this. But most of the study comes after some business man, farmer, or cooperator has quizzed us about a proposal. Very commonly in my experience we have been asked, "Could strawberries be produced here if a suitable processing plant were available'?" We have been asked similar questions about many vegetable, fruit, fiber, and other special crops, in fact, about most crops in the whole long list. But not commonly have we ourselves, as soil scientists, made the original proposal of these alternatives. Here is where we have been weak. Now, of course, in considering a new alternative, many other people need to take part. Are there enough farmers to justify a processing plant? Are capital and management available to operate it? Somebody needs to make an analysis of the market, and so on. But in our published soil surveys we have left out many alternatives--alternatives to which the soils were adapted--that should have been clear to us from a study of what people have done successfully under the same conditions elsewhere.

Objectives in Planning

To realize our function in planning, we need to work with many other people. We do not need to be able to do everything ourselves and certainly should not get into areas in which we lack competence. Yet we do need to know enough about it to realize what kinds of helpful studies can tie made. This field is changing very rapidly. Modern computers make possible orderly projections of population and of demands for education, public health, and goods and services of many kinds.

We must continually bear in mind the principle of combined resource use. This principle, of course, derives from a more basic one. the principle of interactions, which we have discussed many times. This is a key principle in weighing the influence of one or more soil characteristics in that great combination that makes a soil of a certain kind. This term "combined resource use" is used in two related senses: (1) the use of the same acre for several purposes, say watershed protection, recreation, and forestry; and (2) interactions among different uses of different tracts of land within a given region, trade area, or community.

To take a simple example, farming alone is rarely efficient enough to pay all the costs for transport and social services. Even though the soils were highly responsive, most of us would be very slow to recommend a new farming settlement: in a wild area that did not also have potentials for other enterprises--say for some combination from among mining, hydroelectric power. forestry, ranching, or others. This is one of the reasons why farming has done so well in the Midwest. The costs of transport and all the social services are widely shared by many activities. Now. of course, this can be turned around to show that an efficient system of farming helps promote other activities.

Community Planning

We all understand that community planning has two separate but overlapping steps, general planning and operational planning. The soil survey contributes to both. We know that maps for the two purposes are quite different. For general planning one must have a fairly small scale in order to visualize a county, community, or trade area as a whole. With the resources thus displayed, people can see about where roads should be built, recreational areas planned, farming protected. forest reserves set aside, future housing developments expected, and so on. After presenting the alternatives clearly, for the development of any one of these, people need a map on a larger scale, around 1:20,000 or 1:15,840.

Then too, in community planning one rarely has an opportunity to start from scratch. People are living there. They have their individual goals and plans. These too are relevant parts of the data that need to go into defining the alternatives, not just the soils, water, and plants. People need to be fully aware of new opportunities and the prospective changes in competition between the alternatives.

We can call the attention of local boards to successful planning and zoning elsewhere under comparable situations. There are now a good many examples to be drawn from. But I again emphasize, we cannot make the decisions. We must resist this. Unless the local boards take the responsibility, our efforts and theirs will be wasted.

The stakes are very high in community planning. The amounts of money being wasted from using soils unsuitable for housing, roads, and the like are simply enormous. If the alternatives are made clear, it is easier to do community planning than national planning. People living in a community share the schools, hospitals, roads,
police force, and all the other services. If these are bad, all 1
suffer. If they are good, all benefit. If the farming does very well, there is more business and more taxes coming into the community for social services in the towns. If the economic enterprises in the towns do well, there are more taxes coming in that benefit people on farms.

We should like to emphasize again the fact that many kinds of skills are essential in planning resource use with people. I know that we have an important contribution to make. But so do hydrologists, economists, foresters, political scientists, engineers, lawyers, and many others. In this age of specialization some of us have trouble communicating with these other groups. Success with our work depends on our learning to do just that. We do not have to go so far as to become an engineer or an economist or a political scientist to be familiar enough with the subject and the jargon to talk with them and cooperate on mutual problems. Some people say that specialization leads to narrow-mindedness. I do not believe this. I have never seen an example of it. But I have see many instances where narrow-minded people have specialized.

If we are to realize the potentials for the use of soil surveys, and I think the potential is enormous for national, regional, and community planning, we must be able to communicate clearly with many kinds of people. We must learn about these other facets that are vital to success and we must be able to explain our contribution in rather simple terms. And when I say "simple," I do not mean superficial or silly. And our knowledge of soils and their behavior must be as broad and as deep as we have the imagination, intelligence, and discipline to deliver.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE
OF THE
COOPERATIVE SOIL SURVEY
New Orleans, Louisiana, January 23-27, 1967

H. B. Martin

1. Welcome 'to the Southern *Region* and to New Orleans.

2. Regards from D. A. Williams and regrets that he could not attend. His best wishes for a successful meeting.

3. Soil surveys made under the National Cooperative Soil Survey have become one of the most useful and unique services of the SCS. Soil surveys are made cooperatively with State agricultural experiment stations, other Federal agencies, soil conservation district governing bodies, county governments, and other local organizations and groups.

The use of our soil survey information in non-farm endeavors is growing by leaps and bounds. There have been a number of contracts made this year by local, county, city and ocher units of government to help speed up soil surveys and to give fresh interpretations for urban expansion, for highway locations, for developers and other purposes. It is getting to be big business. It resulted in strong support in the last session of Congress to pass Senate Bill 902 (Now P.L. 89-560) which recognizes that the SCS must not only make soil surveys, but help with their interpretations for agricultural areas as well as non-agricultural areas. This bill passed with almost unanimous vote in both houses.

Planning commissions; engineers, construction companies; planning consultants; county, city and town governing bodies are finding the soil survey very useful in avoiding problem soils. What we have learned about selecting soils for farm and forestry use can be applied equally well to selecting soils for use in housing, highways and many other uses. There is no need to put houses where they may slide downhill, settle and crack, or be flooded, or where they cannot be beautified with growing plants. Soil maps interpretated for use in rural-urban fringe areas contain information on the engineering properties of soils that involve their suitability as subgrades for roads and foundations for buildings, for *septic* tank disposal systems and iocation of pipelines.

There is a great need to speed up the soil survey program and at the same time to reduce costs. I think it is a challenge to all of us to find ways and means of reducing Coats of soil mapping and publications. Our Administrator has emphasized this fact many times and is giving it his personal attention.

It has become obvious that many of the critical demands cannot wait for published soil surveys. Even with the highest achievable rate of publishing soil surveys under our regular publication series, it is going to be necessary to make greater use of soil survey field sheets and published soil reports to meet urgent demands for soils information. While we can and should release soil survey material as it becomes available; we, of course, do not want to sacrifice necessary quality. Also, we should not sacrifice our goals of placing our findings in libraries for future reference and for more widespread use by the public.

Cur Administrator, in a message to the State conservationists, said: "We must find new and effective ways of making soil maps and interpretative reports available in advance of the time published soil surveys can be available. We intend to step up the rate of publication of soil surveys but the best we can do will not be fast enough to meet the urgent demands for soil survey information from planning boards and other potential users of soil surveys. This means that instead of waiting for published soil surveys, we must devise special reports that can be reproduced quickly, making use of reproduced field sheets and usable, interpretive explanations." He further stated that excellent progress is being made in moving correlations along, but there are still, however, opportunities for improving correlations and reducing their costs. He emphasized to the group the great importance of good initial reviews, and good progress reviews which, if acted upon promptly, can avoid unnecessary costs. He concluded by saying that this is a matter of good management.

In Fiscal Year 1966 the SCS used 18.5% of its appropriated conservation operations funds in the soil survey program. While the job is growing bigger, the Federal dollars for assisting in this work are not increasing. It is hoped that more non-Federal dollars can be made available to speed up the cooperative soil survey program. Dollars that can be used for men to do mapping, and dollars that can be used for publication. It is estimated that about $700,000 of non-Federal funds for soil surveys are available to the SCS in the 1967 Fiscal Year. In addition, other cooperators in the National Cooperative Soil Survey are using about $2,182,000 under their own administrative direction. It will be a challenge to everyone repreeented hare today to help secure moredollars for this important work; a particular challenge to secure more non-Federal dollars.

We are moving into a period of regional, area and county planning. More and more emphasis will be placed on soil surveys. We are already experiencing more and more requests for soil surveys in areas of rapid expansion of population and industry. The ability of the world to feed its people will be receiving an acid test during the next few years. Assistance is being requested from soil scientist6 in the U.S. to help in the development of crop-producing lands in other parts of the world. The soil survey is a basic step in this development program, and the work being done by soil scientists in the U.S. is a basis for making soil inventories and interpretations in other parts of the world.

Gentlemen: My best wishes for a successful meeting.

Dr. Leahey stated in his 1965 report that ARDA in 1963 organized a Canada Land Inventory Section that was given the responsibility of obtaining an inventory of the land resources in the settled and fringe areas of Canada. This inventory was to cover present land use, and the soil capability for agriculture, forestry, wildlife and recreation. ARDA officials approached the National Soil Survey Committee and a cooperative arrangement was made, and later accepted by the senior administrators, to provide a soil capability for agriculture inventory and later give some assistance for inventories for forestry, wildlife and recreation. In 1963 a soil capability classification for agriculture was devised, similar to yours in most respects, and the survey was initiated in the same year. Today, four years later, all the areas with soil surveys, of about 250 million acres, have been covered. This encompasses practically all the land in farms although our farm lands do not exceed 200 million acres. The ARM boundaries, however, have been extended to about 600 million acres to cover the areas with some potential for development in either one or more of the inventories to be made. The inventory for agriculture will be extended to cover another 50 million acres, that of forestry about the same total acreage, but in part this latter coverage will be for lands not included in the agricultural inventory. To date about one-fourth of the 300 million acres for the forest inventory has been covered. Because of a shortage of trained personnel it will take another five years to complete this project. The inventory for recreation within the ARDA boundary is expected to be finished next year and the inventory for wildlife, separated into fowl and ungulates, is expected to be completed by 1970. All the inventories are based primarily on soil survey information.

Colored maps on soil capability for agriculture on the scale of 1:250,000 are being printed. At this scale a total of 80 different maps will be needed to cover the area. Also at this time, maps at the scale of 1:50,000 are being scribed and are being run through a scanner to determine the acreages of the delineated areas. The scanner, assumed to be the first one of its kind in the world, can scan a map of 48 inches by 48 inches and record the acreages of individual or multiple unit6 on tape in 10 minutes. Theoretically the scanner can read an area as small as 1/100 of an inch. At present this instrument is being tested and likely will not be in full operation until March, 1967. The problem is not the speed at which the scanner operates but at the speed maps are prepared for the machine. At present a 30 inch by 30 inch map on the average requires about two days to prepare for scanning.

We are preparing a soil map of Canada at the scale of 1:4,000,000 and an additional one with modifications to suit the requirements set forth by those responsible for the FAO/UNESCO world soil map. The latter map is being prepared in a manner that will permit a correlation of soils and boundaries along the International Border. This correlation, in part, was facilitated last summer when a roils tour from Manitoba to British Columbia was made with participants from the United States, Mexico, Argentina, Canada and FAO, Rome, represented by Dr. R. Dudal, principal correlator for the world soil map. To finalize our map for North America, however, it will be necessary to make some adjustments along the border, particularly in the Great Plains and mountainous areas of the west.

An interesting and useful tour of organic soils was made last fall in parts of Wisconsin and Minnesota in company with representatives from the north central and western regions and from Canada. A similar type of tour is planned in 1967 for western Canada, beginning in Manitoba and finishing in British Columbia. This tour is scheduled to pass along a route where a number of organic soils have been sampled and are presently being analyzed for fiber content, ash content, water-holding capacity, pH, bulk density and sodium pyrophosphate solubility. I have asked Dr. Rouse Farnham to participate and would be happy to have anyone else from the United States who would like to come. This exchange of ideas on mutual problems has been very useful especially to us in Canada and I think tours of this kind help to overcome some of the obstacles we are faced with as well as orienting our thinking and subsequent criteria used in definitions of soils in the classification scheme.

The preceding section of the report is a brief review of some of the major soil activities in Canada and in conclusion I wish to thank you. Dr. Kellogg, and your colleagues for the assistance and courtesies extended to us in Canada and the invitation to attend this meeting.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
New Orleans, Louisiana, January 23-27, 1967

Report of the Land Grant College Representative of the Northeast Region

David E. Hill

The Northeast Soil Survey Work Planning Conference was held in New York City, January 24-27, 1966. The Conference was attended by 38 members representing thirteen experiment stations, 15 state staffs, regional correlators and Washington office representatives of the Soil Conservation Service and representatives from regional cooperators, U. S. Forest Service, and Vermont Department of Forests and Waters. We were especially happy to have experiment station and SCS representatives from Kentucky, Ohio, and Virginia join us at the conference. Invitations, extended to these states, were prompted by the reorganization of SCS areas of responsibility Hopefully, these new contacts will be maintained for their contributions to the conference broadened our scope by increasing communications between the Northeast Region and the North Central and Southern Regions. I realize that the three states involved have had their own alliances in the past and that most will continue to maintain these in the future but the benefits accrued by their attendance at both regional meetings are well worth consideration.

While on the subject of communication between regions, I was very happy to receive several copies of the report of the Northcentral Regional Workshop to pass on to our Committee Chairman. I think that each region should follow suit in the future. This will improve communication between regions and enable regional committees to keep abreast of their counterparts in other regions, Of course, many of the thoughts of regional committees are passed on through the reports of national committees, hut I'm afraid that much dialogue is lost in the process.

Five committees met in conference session on the first day of the conference. The following day, seven committees reported, two of which had completed their tasks by correspondence. The committees were:

1. Benchmark Soils (permanent committee)
2. Technical Soil Monographs (permanent committee)
3. Series, Types and Phases.
4. Classes and Phases of Stoniness and Rockiness.
5. Soil Moisture.
6. Made Soils.
7. Northeast Soil Association Map.

Most of our committees had specific charges given them by corresponding national committees. Only the Committee on the Northeast Soil Association Map functioned due to charges initiated within the region.

The Benchmark Soil and Technical Monograph Committees reported the usual lack of accomplishment of the programs during the past biennium because of conflicts in time. In 1964, we called to the attention of Experiment Stations and State SCS Administrators the needs of the program but without apparent success. A few Benchmark reports are in the mill but none have been published in the Northeast since 1964. Also, the Technical Monographs program is stalled because of lack of authors.

A committee was formed to explore the possibility of completing a Northeast Soil Association Map. Interest was generated by the Northeast Soil Research Committee and the work planning conference was asked to evaluate the need and assess the feasibility of such a project. Plans for such a regional association map were suspended in 1960 pending completion and adoption of the new soil classification system. The committee passed a favorable report on to the Northeast Soil Research Committee, testifying to its need and feasibility and also suggesting that project financing and personnel assignments should come from Experiment Station and University organizations.

The Committee on Criteria for Soil Series, Types and Phases, in response to the need for studying the criteria used in differentiating series, types, and phases in the new Soil Classification System, outlined a program of study to be completed before the National meetings. This supplemental report has been circulated. The Committee limited its study to the analysis of criteria being used to separate series within families.

The Committee on Stoniness and Rockiness was concerned with evaluating the proposals of the National Committee and making specific recommendations on limits for classes of stoniness and provide phase designations and definitions based not only on the percentage of surfaces covered by stones but spacing between stones and volume of stones above the surface. In addition, the Committee was to test classes of rockiness in the field much the same way as stoniness classes were tested,

The Committee on Soil Moisture spent considerable time discussing permeability classes in relation to the method in which rates are obtained, Since the Uhland core method and the auger hole method are not comparable in theory, caution must be exercised in applying these two methods in determination of permeability classes. The use of the Uhland core method for interpreting permeability for septic tank performance was also cautioned, especially in soils with lithologic discontinuities. The committee further discussed other topics as requested by the National Committee.

The Committee on Made Soils did not receive a specific charge from its National Counterpart but in the discussion which followed the presentation of the 1965 National Report, it was agreed that there was a need for actual measurements and descriptions of disturbed areas. The members of the regional committee made such measurements this past summer and a supplemental report was submitted this past fall and forwarded to the appropriate National Committee.

Following presentation of committee reports, we had a half-day symposium and discussion of soil percolation testing. The purpose of this symposium was to present various facets of percolation test research being conducted in the Northeast. Studies at Beltsville involved long range or sustained teats; those in Pennsylvania involved variations incurred in constant and variable heads and pilot computer studies assessing the relationship between percolation rates and various physical properties of the soil determined in Pennsylvania's soil characterization program; those in Connecticut involved studies in the principles of water flow in percolation teat hales and site and seasonal variation.

The remaining time was devoted to discussions of National Committee reports not represented by Northeast Regional Committeea and other special topics of mutual interest.

Following presentation of the last topic "Projected Soil Survey Schedule", the conferees had a lively discussion about scheduling of surveys and recent changes in the correlation procedures. The conference went on record with a unanimous vote to urge that an additional correlator be added to the Principal Correlator's Office to:

1. increase field contacts in preparing correlations, and

2. to reduce the amount of special assistance that is nor being required to handle the increased work load due to increased areas of responsibility within the region.

The Chairman for the 1968 conference is Walter J. Steputis, SCS, Orono, Maine 04473; Vice-Chairman is Dr. Roland A. Struchtemeyer, Agronomy Department, University of Maine, Orono, Maine 04473.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WRK-PLANNING CONFERENCE
OF THE
COOPERATIVE SOIL SURVEY
New Orleans, Louisiana, January 23-27, 1967

Report of the Land-Grant College Representative
of the Southern Region

G. R. Craddock

This report is a summary of recant coordinated activities and plans of the Experiment Station Representatives in soil survey in the Southern Region; and a report of the biennial Southern Regional Soil Survey Technical Work Planning Conference held at Lexington, Kentucky on June 7-9, 1966 with H.H. Bailey, University of Kentucky, Chairman and J. H. Winsor, SCS, Vice-Chairman.

General Conference

About 61 delegates were at the Conference. Representatives attending the Conference were from the SCS, State Experiment Stations, Forest Service, Tennessee Valley Authority and Colleges that teach Agriculture. Representatives were present from ten Southern States and Puerto Rico.

The Conference adopted a document entitled Purpose, Policies and Procedures which provides guide lines for the operation and activities sponsored by the Southern Regional Soil Survey Technical Work-Planning Conference. This document clearly delineates responsibilities of the Executive Committee and Officers.

Committees developed reports by prior correspondence and meetings at the Conference. These include:

1. Climate in Relation to Soil Classification and Interpretation.
2. Classification and Nomenclature of Made Soils.
3. Classes and Phases of Stoniness and Rockiness.
4. Application of the New Classification System.
5. Organic Soils.
6. Soil Surveys for Forestry Uses.
7. Soil Survey Reports and Maps.
8. Engineering Application and Interpetation of Soil Surveys with Special Preference to Urban Fringe and Irrigated Areas and Highways.
9. Fragi pans.

A new group, the Southern Forest Environment Research Council, participated in the Conference. A representative of this group was made an official delegate.

Clemson will host the Work-Planning Conference in 1968. Travel restrictions have prevented this group from meeting in Puerto Rico.

Soil Survey Related Activities

Interest in the engineering, forestry and non-farming uses of soil survey information is rapidly expanding in the Southern Region. County and State Planning Boards are not only requesting soils information but are hiring soil scientists as consultants.

Several of the States have recently published State Soil Haps. The scale 1:1,000,000 has been generally adopted. Joining with adjacent States has been primarily comparable at the major land resource areas.

There is interest in the area in developing effective ways to teach the New Classification System. During the conference at Lexington a Symposium was held on Teaching the New Classification System. Dr. Neher, Professor, Texas College of Arts and Science, Kingsville, Texas and Curtis L. Godfrey, Associate Professor, Texas A&M, presented a paper before the Southern Regional Groups at Lexington entitled A Study and Teaching Guide for the Nev System of Soil Classification. Other participants were Dr.. B. L. Allen, Dr. M. E. Springer, Dr. A. J. Baur and Dr. G. D. Smith. Mr. R. E. Daniel1 served as moderator.

The Southern Regional Soil Survey Work Group has for several years been interested in the tropical soils of Puerto Rico. Under prime consideration is a proposal for the sponsorship of a Tropical Soils Seminar or Conference to be held in Puerto Rico in 1969.

UNITED STATES DEPARTMENT OF AGRICULTURE
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NATIONAL TECHNICAL WORK-PLANNING CONFERENCE
OF THE
COOPERATIVE SOIL SURVEY
New Orleans, Louisiana, January 23-27, 1967

Report of NCR-3 Representative

H. P. Ulrich

The NCR-3 Soil Survey Committee Meeting in Chicago January 9. 196.7, accepted your invitation to present things which were of more concern to the region and then selected me to be their representative.

There are several ways in which the University programs are contributing to expanding and developing soil survey programs. The popular land judging program has been brought to a higher level in the University competition and is leading to more interest in soils. The soil science courses including classification and survey courses are in some measure providing recruits for the Federal and State staffs.

In the research field graduate programs are providing information that will aid in a better understanding of the management, genesis and classification of soils. It is believed that soil laboratories must provide a great deal more data to support the new classification system. Such information will aid in the classification, the mapping, and management recommendations.

Most of the increased demand for soil survey material has come from urban expansion or county planning activities. A report prepared by Marvin T. Beatty, Soil Extension Specialist for Wisconsin, shows that 10 years ago use of soil surveys was largely in Conservation Farm Planning. Today this continues, but use of the materials is expanding for local and regional land use planning, subdivision plat review, for development of zoning and sanitation ordinances, for higway engineering, for economic planning for agriculture, for soil test recommendations, etc. Beatty emphasized the need for using segments of the soil reports tailored to fit a variety of needs.

In Indiana 7 counties have offered $25,000 to secure and support a soil survey program for their counties, 5 of which are chiefly for urban expansion. This will largely make up the reduced allocation from Federal funds. However, there continues to be a shortage of trained personnel to make the surveys. There is also concern that inadequate use will be made of existing older surveys of good quality. We think that this stem6 from 2 sources. (1) The effort to make all present day mapping suitable for eventual publication. (2) that not enough latitude is given to district conservationists in the use of older surveys which are less accurate in slope and erosion detail. Many of the older soil reports would be suitable for local programs including urban development if soil extension personnel assisted in their use.

In the publication field States are putting out general soil maps, county detailed reconnaissance maps such as those of Wisconsin, interim reports such as those of Ohio, and in Indiana a sesquicentennial volume called Natural Features of Indiana, chapters of which covered the geology and soils of the State.

One of the things which is needed is a bibliography of the soil reports and related information. There are frequent calls at the Land Grant College Libraries for soil reports and materials related to classification and use. Local use is dominant, but there are calls for materials from other States and foreign countries. At the Purdue Library use is made of the Highway Research Board Bibliography of Agricultural Soil Maps dated 1957. There is no bibliography which lists all soil reports by whomsoever made nor related information on management and use. This is a valuable teaching and research tool which the USDA might be best equipped to prepare.

Clay mineralogy is one aspect of the New Classification System in which there is much interest. When E. P. Whiteside proposed including clay mineralogy among the family criteria it was expected that there would be consultation with the clay mineralogists to develop the best use of this tool. At the present time it is necessary to make classifications with little or no information. At this time there are no acceptable standards for determining the clay mineralogy because the methods are still in the experimental stage, various size fraction8 are in use, the proportion of non-crystalline material cannot be ● ccurataly determined, and the interpretation of x-ray and DTA patterns has not been standardized. Furthermore the clay mineralogy has not been reliably related to the management properties of the soil. The NCR-3 soil survey committee proposed that the National Work Planning Conference attempt to resolve these problems with the clay mineralogists. It was also suggested that information presented by the various N.C.R. States at the Lincoln workshop about 1966 be assembled and dir tributed.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY

Report of The Land-Grant College Representative of The Western Region

A, R. Southard
Montana State University

Western Regional Technical Work Planning Conference for Soil Survey met in Denver, Colorado, January 25-28, 1966. Chairman for the conference was Dale S. Romine, Colorado State University.

Invitational Papers

Soil Surveys Have Gone to Town
A. A. Klingebiel, Soil Conservation Service

Principles Involved in Selecting Lands for Irrigation
J. T. Maletic, Bureau of Reclamation

Range Lands in the Soil Survey Program
Charles Terwilliger Jr., Colorado State University

Committees and Their Activities

1. Series, types and phases.

   Dealt with classification of soils with sola which are likely to be destroyed by cultivation. No agreement was reached on even a single point.

2. Soil Survey Reports and publications.

   Motion to delete Range section from the report was defeated. It was recommended that an effort be made to strengthen this section of the soil survey report and bring it into line with other interpretive groupings.

3. Soil Structure - Completely new personnel on this committee. It was suggested that this committee:

   A. Explore possibility of developing a standard set of visual aids depicting grades of soil structure.

   B. Explore the possibility of developing single names to depict combinations of type, class and grade of both primary and secondary forms of soil structure.

C. Also suggested that causes and genesis of soil structure might be a suitable area for research effort.

4. Soil Surveys on Range and Forest Lands.

A. Developed a 16 page glossary of landform definitions.

B. Suggested a modification to the recommendations of the National Committees of 1965 concerning rockiness and stoniness.

% Surface Covered	Phase desisnation	
O-10	Sl. Stony	Sl. Rocky
10-25	Stony	Rocky
25-50	V. Stony	V. Rocky
50-90	Ext. Stony	Ext. rocky complex or rockland
90+	Rubble land	Rock outcrop

5. Climate, Soil Classification and Interpretation.

Work of this committee shows that in general the Great Soil Groups fall into distinct climatic belts whose limits are in general satisfactorily defined by using 3 temperature ranges $<45^{\circ}$, 45°-54° and $>54^{\circ}$. The committee urged use of climatic data in interpretations of climatic-soil relationships.

6. Soil Correlation Procedures

Urged keeping soil correlation cards up to date.

7. Made & Shaped Lands

Concluded that classification of made lands will in most cases be limited to the Order level as shaping is less apt to destroy these criteria.

8. Soil Surveys in Urban and Fringe Areas

Suggested a closer look at present procedures and attempt to keep abreast of the times by consulting others involved in interpretations in urban and fringe areas.

A 20 item bibliography was prepared.

9. Bench mark soils & technical monographs

All states have established Bench Mark Soil phases and have characterized some. Eight Bench Mark Reports are in progress.

10. Western Work Group project:

To assemble & distribute series descriptions and analytical data of soils which represent the mapping units in the bulletin, Soils of Western United States.

To assemble slides to represent categories of soil classification system.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

National Technical Work-Planning Conference
of the
cooperative Soil survey
New Orleans, Louisiana
January 23-27, 1967

Report on Progress of Forest Service Soils Program

John A. Williams
Region 3

Accomplishments

The soils program in the Forest Service has evolved into four separate and distinct items. These are:

Surveys

Standard
Special
Reconnaissance

Soil Management Services

Reports

Manuscripts for publication
In Service Reports

Training

Soil Scientists
Land Managers

Each item is now briefly discussed.

1. surveys

To date the Forest Service has surveyed 37.6 million acres. This figure breaks down as follows:

Standard Surveys	14,932,460 acres
Special Surveys	2,000,000 acres
Reconnaissance	7,535,119 acres
Mantle stability	13,467,000 acres

The total of acres surveyed may not seem spectacular to many, but to us it represents a significant accomplishment. During the past 8 or 9 years in addition to mapping we have been developing mapping procedures for wild mountainous lands, training our field men, developing and selling the program and training our land managers to effectively use the soil survey data and other soils information. On each count we are making and have made significant progress and the results are beginning to show. We intend to continue to progress.

Our reconnaissance work has been rather strongly special purpose oriented, but coverage of this much country has provided a lot of useful information. A lot of the reconnaissance can be supplemented later with more detailed and refined surveys.

2. Soil Management Services

This item is one that is growing constantly. This kind of activity takes care of pressing problems involving soils, The work includes, assistance to our engineers in road and trail location, study of soils on revegetation and reforestation projects, foundation conditions at Job Corps sites, erosion areas, small watersheds, etc. The use of specialists in this activity is most advantageous to management and in many oases it is a vital followup on surveyed areas. The demand for this sort of work is so strong in some regions that the jobs are set up by priority and where the load is heavy the jobs have to be deferred. We don't like to be in this position because we like to be able to honor the requests and to give our people this much needed service. Therefore, we continue to strive for additional soil management people in each region. Funds and personnel ceilings affect us here.

To date we have handled sane 1,500 separate jobs and at present several of our regions are working as many as 50 jobs per year. About 1.5 million acres have been mapped through this service and most of them are of sufficient intensity that no additional mapping is needed for inclusion in a progressive survey.

3. Reports

We have completed a number of manuscripts for publication in the regular soil survey series. In other cases we have cooperated with our SCS counterparts in preparation of manuscripts. The publication rate is not all we would like but we have full realization of the many problems connected with publication and your diligent and sincere efforts to improve the situation.

The quality and usefulness of our in-service reports continues to improve. Suggested formats for both narrative and tabular material are available. In many case8 the proposed formats work well, in others they are modified to fit the situation. Our field soils notebooks are set up in accord with this format and thus there is a considerable saving in the time requirement for the reports. We make full use of illustrative photographs both colored and black and white. Every effort is made to present the material in tabular form and thus reduce verbage. We find that this approach provides us with a good useful working tool. The writer has heard pleasant statements concerning the quality and usefulness of our report6 both in hi6 region and in other regions. We know you can't beat quality and therefore this is what we shoot for.

4. <u>Training</u>

We continue to avail ourselves of technical training in such fields a6 correlation, report writing, etc., extended to us through the courtesy of the Soil Conservation Service. We very much appreciate this training opportunity.

We are taking advantage of the advanced training in soil science at Cornell and Iowa State. All our regional leaders have attended this training and we are making a dentin our second line people. This instruction fills an urgent and critical need for technical workers who have been out of school for quite some time. Frau personal experience the writer know6 the course is not as difficult as reported and is in fact an enjoyable experience.

We have received good value from the training of our land manager'8 and other personnel. To be sure, direct training is an expensive and time consuming task but it has been found to pay good substantial dividends. I'm sure that such training will be carried on for sometime to come but it may be at slower rate. A course of programmed material for self-training for our administrative people has been developed. The effectiveness of this material ha6 yet to be fully tested.

Cur part of the Forest Service Manual (FSM 2550) and Handbook (FSH 50) is completed and in use. The Manual establishes policyandthe Handbook establishes and describe6 operating procedures. Completion and issuance of these documents were signal steps in graining continuity and uniformity of action. Both of these volumes can be amended as needed to reflect changes and variations in operations. At long last we now have the "what to do" and the "how to do" into the record. The writing and editing of the two sections was a long, hard job.

Use of Surveys and Other Soils Data

Our surveys and related data are being put to good use. The degree of use appears to vary from region to region, but on an overall basis our efforts are being well accepted. Our information is being used in nearly all major activities such as timber, grazing, watershed management, recreation, wildlife, and engineering. Our in-service soil survey reports are specifically geared to provide interpretations for the above items. For several of these items we have worked out our own interpretation procedures. In this endeavor we have requested and obtained advice and assistance from the various resource divisions at the Washington and Regional levels.

As we get more area mapped one can note an increase in the use of the information. This is particularly true as we block out sizeable areas on a single forest and get increased coverage on the ranger districts. Apparently familiarity in this case does not breed contempt but produces affection for and use of the product.

The soil management services serve a myriad of purposes and it is here that the use of soils information comes into full play. Through this medium, we are able to be of service in a number of ways. Firstly, our information helps the man on the ground to make better and sounder decisions. Secondly, our studies have in many cases helped to correct erroneous conclusions regarding the condition of a piece of land. Thirdly, through these services we are able to help keep our managers out of "trouble" and in most cases bring about a significant saving of money.

Future Plans

We have good plans in the Division for moving ahead with the soils program on an integrated basis with other activities of the Division of Watershed Management as well as with other phases of Service activities. Here we face the same limitations as the other agencies; namely, personnel ceilings and lack of funds to employ people adequately trained to do this kind of work.

We have entered a phase of close joint effort with vegetation specialists, hydrologists and watershed scientists in inventorying the National Forest watersheds. This is proving to be a most satisfactory arrangement and it has been found that soils as a base is highly important. The team approach provides for ready and easy communication between the several disciplines represented. We make use of the standard soil hydrologic groups with modifications to suit our purposes. We are searching for and detecting erosion problem areas, sediment source areas, and areas with potential for improved water yield.

We now are in the process of making reconnaissance surveys using the new classification system down to the family level. This approach seems to work well and the use of the classification units provides a means of making better interpretations. This procedure has worked well in a recent River Basin Survey and we expect it will work equally as well in other ventures.

cooperation

We continue to enjoy our close cooperative working relationships with the various members of the Cooperative Soil Survey. In particular, we appreciate the assistance given us by the Soil Conservation Service state staffs and the Principal Correlator's staffs. We are proud to be considered a8 a part of the National Cooperative Soil Survey.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFEKENCE
Of THE
COOPERATIVE SOIL SURVEY
New Orleans, Louisiana, January 23-27, 1967

Education In Use of Soil Surveys

E. J. Williamson
Federal Extension Service

The use or' published soil survey reports has changed dramatically in many parts of this country during the past ten years as a result of cooperative efforts of several agencies, universities and individuals. The use of soil surveys ten years ago was primarily for conservation planning on farms. while this use is just as important today, it has rapidly expanded to non-agricultural professional interests of engineers, planning commissions, sanitarians, tax assessors, realtors, developers, and builders, to name a few.

From the engineering standpoint, soil survey maps and interpretations are of vital importance in the planning and development of public works facilities, in the design of storm sewer and utility systems, streets, roads, and highways; and in the location and extent of borrow, gravel and quarry areas. City, county and regional planning commissions are using soils information increasingly in the preparation of long-range comprehensive development plans and in application to zoning ordinances, subdivision regulations and other land use problems. During the preparation of a plan, soils data are used to adjust land use, transportation, and community facility plans to the natural resource base. Specifically, soils data are used by the planning commission to help select and develop desirable spatial distribution patterns for industrial, commercial, residential, agricultural, and recreational development; and in the selection of highway, airport, pipeline and cable route locations with particular consideration given to soils data in planning for the reservation of permanent agricultural and recreational greenbelts and open spaces.

Health department officials today are using soil survey information more and more as a basis for review, approval, or disapproval of seepage fields for private sewage disposal systems, location of public disposal systems and lagoon sites, and for the control of ground water pollution.

Today land values throughout the country, even in the very remote sections, are influenced by the prospect of the land being used at some time for homes or industrial purposes. Soil surveys are lending invaluable information for adjustment of tax assessment to agricultural lands based on production indexes and lands with future development potential based on suitability of the soil for construction of buildings, roads, septic tanks, etc.

Certain real estate agencies have for many years used soil survey information as a guide in buying and selling agricultural lands. However, a more recent development is their recognition of the importance of soil survey information as a basis for an orderly development of urban and suburban areas. One of the reasons influencing realtors in some sections of the country to become soil survey conscious is the fact that other agencies and individuals are beginning to require soils information before purchasing land. For example, more and more county and city ordinances are allowing building permits to be issued only on sites with soils passing percolation standards set by county or city health departments; many have regulations prohibiting subdivision developments on flood plains.

To the experienced land developer, soil surveys provide the information for selecting the best sites for developments. Soils data such as slope. susceptibility to erosion, percolation rate, flooding potential, depth to water table, bearing strength, and depth to bedrock, give the developer detailed knowledge of the general characteristics of the site as well as surface and subsurface characteristics for establishing soundly constructed buildings without fear of sliding, settling, cracking OK flooding; and where they can be beautified with growing plants.

It is quite apparent from the many different uses being made of soil surveys today by both agricultural and "on-farming interests that educational programs must be focused to specific clientele users. Many of the States are refocusing their extension educational programs to meat this need. As new county soil survey reports are released, many of the States are timing their educational programs to coincide with the survey report release and distribution. Generally a minimum of two meetings is held in the county: one, for the agricultural leaders in the county (the roil district supervisors and watershed leaders, extension council, county commission board, FHA and ASC county committees, officials of farm organizations, and representatives of farm loan associations, farm cooperatives, production credit associations and farm management associations); the other as a general meeting, or, in some counties, depending on site and interest, a series of meetings intended to reach all potential users of the report. Included are fans operators and landowners, and special interest groups such as bankers and Others in the landing business, sanitarians, urban and county planning commissioners, realtors, land appraisers and assessors, city and county engineers, contractors, members of civic clubs and organizations, women's groups, ministerial groups; fans equipment, feed, seed and fertilizer dealers, and many others.

The coordination and planning of these meetings are carried through jointly by representatives of the Cooperative Extension Service, Soil Conservation Service, and the Agricultural Experiment Station. This joint planning usually occurs with officials of the associated county agencies-- the County Agricultural Agent and the work unit conservationist. Plans are developed at this time for the meetings, tours and events that introduce the soil survey report and its adaptable uses and to place copier in the hands of interested persons. Usually resource personnel, including State and area representatives of Extension, the Experiment Station, and the Soil Conservation Service who assisted in making the survey, are utilized in presenting the material at the county or community meetings. Publicity is essential for drawing large attendance, and various media are used and directed to both agricultural and non-farm users. Such media include the use of county extension circular letters, newspaper articles and editorials, and radio and TV announcements.

While education programs in the use and distribution of soil survey reports have been employed in many of the States for several years, it has only been in the past decade that nationwide emphasis has been given. The early soil survey educational programs were geared mainly to agricultural interests, principally in the use of the report for farm planning and soil management. Today the educational emphasis is much wider; it involves the non-farm land resource interests and users as well.

In a paper given by O. W. Bidwell[1] of Kansas, at the Soil Science Society of America annual meeting at Columbus, Ohio in November 1965, 33 States reported having soil survey distribution education programs in effect as of July 1, 1965, and 10 additional States reported plans for such programs as new soil survey reports were released. In this study, the State consensus was that at least three meetings per county were needed to provide all interested persons with an opportunity to attend. The paper showed that, for the period of January 1, 1960, through July 1, 1965, 176 counties had received their soil survey reports through planned distribution education programs. It was a period in which the Soil Conservation Service had published 191 reports. The study further indicates that the most important element in the success or failure of community meeting was how well persons in the audience were trained to use the soil survey report. Programs to carry out this objective vary with different States, and with different counties within the State, and are altered to fit the community needs.

The value of a county soil survey report does not end with the community meeting; nor does the responsibility of the county agricultural leaders end for seeking additional uses and publicity for the soil survey. The success of an educational program depends on seeing that the information is used properly. To accomplish this goal, a program of continuous educational emphasis of the report is required, one of relating how soil-related land use problems can be prevented through its use--such as, building footing and foundation failures, malfunction of septic tank disposal systems, wet basements, water erosion of farm fields, roads and gardens; flooding; or as a guide in making land use planning decisions, such as subdivision layout and design, highway location and design, and park and open space planning, and, of course, for the purpose that soil surveys historically have been used--the determination of agricultural capabilities of land.

1/ Bidwell, O. W., Educational Programs to Aid Agricultural Users of Soil Survey Reports; Soil Surveys and Land Use Planning Publication--1966, Soil Science Society of America and American Society of Agronomy, 627 South Segoe Road, Madison, Wisconsin 53711

The uses of soil survey information, indeed, are many. As the problems confronting our affluent society increase daily in complexity and our treasured resources of open space and rural elements of the landscape diminish, it is quite evident that implementation of soil survey information for land use decision is at hand.

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William L. Mathews
Bureau of Land Management

We appreciate the opportunity to attend this work-planning conference. The Bureau has a pressing need for more effective soils information to assist in the formulation of management decisions affecting the 457 million acres of public land under BLM administration.

Soils data and interpretive techniques needed fall into two primary categories. The first involves areas to be intensively treated in conjunction with watershed rehabilitation, livestock or wildlife forage improvement, and other multiple use programs or for regional planning and land classification. The level of investments for treatment programs often varies from approximately $5 to $15 per acre. In these cases rather intensive soil surveys are usually waranted.

The second category of soils information needed is that which would assist in guiding the management of the vast acreage that is managed on a vary extensive basis. In the range management effort, for example, we currently have an average of one field man for each 600,000 acres of public land administered. On this basis we do not have the ability to use, or the need for detailed survey information. We nevertheless are required to develop management plans designed to accomplish certain objectives that are tied to the potentials of the site.

Soil information can be of substantial assistance in estimating site potential and limitations and in formulating other judgement which increases the validity and effectiveness of management decisions. We have a long way to go.

Recent Accomplishments

Since our last report to you in February 1965 we have made progress. This includes:

1. Establishment of Service Centers at Portland and Denver composed, to a large extent, of specialized technicians. Included is a soil scientist at each Service Center. These technicians are responsible for:

    a. Devising and adapting methodology to meat the Bureau's need.
    b. Formulation of handbooks, manuals, etc.
    c. Training
    d. Providing on-the-ground assistance on special problems.

2. Developed and issued a manual release on "Soil Survey Policy" -- revised 12/1/65 (BLM Manual release 7-2).

3. A soils manual is presently being developed by the BLM. At the present time it will consist of two parts: (1) Basic Soil principle6 and (2) the practical application of 60116 date snd use of such information in the BLM field operations. Coupled with the research studies and utilizing all available soil survey information, guideline6 will be developed for collecting additional pertinent field data required to assist in making interpretation6 for land management use. Field procedure6 and techniques in collecting, using and intepreting soils information will also be included.

4. Cooperative Studier, - We are attempting to develop improved extensive soil inventory procedure6 through cooperative research studies. Oregon State University is developing a resource analysis mthodology which is basically a reconnaissance method to inventory soils and vegetative data utilizing available resource inventory information to determine a site classification system.

   Colorado State University is conducting a similar study for the BLM with more emphasis being placed on range production potential in relation to roil morphology and characterization.

   The BLM is also participating in studies to determine the values of utilizing multiband photogrammetry or imagery in resource analysis. Some of the anticipated soil inventory uses would be the preliminary delineation of wet-marshy areas, drainageways, bodies of water, slops aspects, topography and vegetation. Early investigations of multiband imagery have shown that these items are much sharper and more clearly defined than on normal pan photography.

5. Soil Survey Map - The Portland Service Center prepared a consolidated soil survey index map of the 11 Western States and Alaska which indicated the extent and location of soil surveys that have been completed by the U.S. Department of Agriculture. This map is bared on a soil survey index map prepared by the U.S. Department of Agriculture, SCS, in July 1964. The roil survey6 depicted on the map are adequate for operational planning and are to be utilized where applicable by BLM to the fullest extent possible. There are soil surveys available in some areas adjacent to or in the vicinity of considerable public land6 which provide a good indicator of the condition6 that might prevail over a larger ares.

6. Soil Surveys Completed - Progress made on intensive surveys is limited primarily to a few instances where work was completed on a cooperative basis through the Soil Conservation Service or with a University. Examples are the SCS survey of the Folson District in California, and the soil survey on public lands in the Willamette Basin conducted by Oregon State University Experiment Station.

   Limited soil surveys of certain specific areas subjected to high investment for treatment or use have been conducted by Bureau technicians.

Current Use of Soil Survey Information by BLM

Extent of Use

With soil scientists on the Soil and Watershed Staffs in our Denver and Portland Service Centers and one each in several of the western States the Bureau is in a much better position to make use of published and other available soils information than it was 2 years ago. These people, who are familiar for the most part with the SCS survey techniques, can make interpretations of the soils information that is available, for use by district and State office personnel. Upon completion of the soils manual and handbook by the SCS soil scientists, training sessions will be scheduled for district and State office personnel to refresh their memories on basic soil principles and how these principles can be applied in making better management decisions.

Problems

The primary problems encountered in making effective use of available soils information is the lack of land management interpretations for our type of land. I" most cases, the management interpretations of the capability units are made for irrigated or agricultural type operations and are not applicable to extensive areas of range and forest lands. Another problem is the continuity of soil surveys. Generally, standard soil surveys are limited to the privately owed lands and agricultural lands. Thus, large blocks of adjoining public lands that have grazing potential or other potential remain unsurveyed.

How would we like to use Soil Information

We want our resource management people to have a good understanding of the nature and basic characteristics of soils and to be able to effectively interpret soils data so as to provide assistance in formulating multiple use management decisions.

We would like to be proficient in the conduct of both intensive and extensive soil surveys and to be able to effectively interpret the findings.

Problems of Implementation

Increased emphasis manpower-wise, by BLM must be directed to the whole subject of soils. We cannot hope to give adequate emphasis to soil factors and characteristics in making management decisions without a substantial increase in time and effort devoted to the subject. We must train our field people in how to use soils data as well as identifying a soils problem.

Management interpretations of soils data will continue to present problems because of highly variable resource conditions and multiple resource uses.

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James D. Simpson
Bureau of Indian Affairs

I appreciate this opportunity to again work with the conference. Taking part in this conference not only helps to keep one up to date on new developments in soil survey but it always seems to renew my interest, and of course one enjoys visiting with so many old friends.

The Bureau of Indian Affairs' soil and range inventory program has moved forward in terms of acres inventoried at about the same annual rate as in the past few years. However, we have suffered our knocks budget wise and in personnel ceilings. We have also lost a few men to foreign assignments. We are more than 84% complete in inventorying Indian range land and cropland. Approximately 10 million acres of forest land remains to be inventoried, leaving a total of about 18,000,000 acres yet to be inventoried.

Of special interest in the area of mapping has been a two year study of forest soils and their significance to intense forest management. This has been a joint study with our Bureau's foresters. The main purpose of the study was to gather information that would be of special value in establishing mapping units for inventcrying Indian forest lands. We were especially interested in developing procedures that would permit correlation and coordination of the forester's knowledge of the forest and our knowledge of soils. The study included the "se of automatic data processing for manipulating the forest and soil data that will be obtained by inventories. Automatic data processing will also be used to help determine significant soil differences as related to intense forest management. Our first step in this work has been to start identifying soil conditions found on "Continuous Forest Inventory" plots located in Indian Forests. The correlations of the forest and soils data from these plots should be very helpful. In this area of our work we received some very helpful suggestions from Eric A. Bourdo, Jr., Director of the Ford Forestry Center at Michigan Technological University, Alberta, Michigan. He has accumulated a large amount of similar data about "Continuous Forest Inventory" plots in that part of the country.

Generally speaking, in this study, forest soil sites were evaluated based on their properties and qualities as a media for plant growth and the stability of the site against erosion plus any inhibitory factor such as wetness. overflow, stoniness or others that might affect the use of the soil.

As a result of this study we are now working on a soil and forest inventory procedure that we believe will be very useful in intensifying timber management on Indian lands. Overall, in the Bureau of Indian Affairs cur soil and range inventory program is reaching what might be called a utilization and maintenance stage. This is a stage in our work that we have looked forward to for a number of years. Now our soil scientists will have time to concentrate on teaching people to understand and use the data collected.

During the past few years we have been placing special emphasis on use of soils information in range management. On many reservations we are fortunate in having large holdings under the same management that in many cases can be divided based on range sites into separate management units within the overall operation unit. This gives us a unit for management that responds more or less uniformly to management and investments made for improvement. Such units are especially efficient when it comes to harvesting the grass produced. Because of uniform site conditions the whole unit can be subjected to the same grazing pressures rul thus grazed uniformly. Whereas if widely different sites make up the management unit, as in many pastures today and they are subjected to the same grazing pressures, some sites are overused and others are underused resulting in a low efficiency of harvest or overgrazing.

This is not a new approach but one that is difficult to sell to most persons associated with range use. Our efforts have borne some fruits. At the Mescalero Reservation in New Mexico we have been able to get approximately 20,000 acres, representing four major sites fenced into seven pastures, each pasture was watered plus assurance of management based on kinds and amounts of grass. Each pasture is predominantly a loamy, steep gravelly, shallow and steep shallow or steep very shallow site. On the Hualapai Reservation in Arizona similar developments have been made on 12,000 acres. In Wyoming, the manager of what is known as the Arapahoe Ranch has requested assistance in helping to fence that ranch on a site basis.

Our soils laboratories have been consolidated in the last yaar into one laboratory. This laboratory is located at Gallup, New Mexico. Its work has been expanding not only in quantity of work but in the kinds of work done. Testing of road materials has been the area of greatest expansion. This work now includes testing of soil, gravel, concrete and black top materials as they relate to road construction.

Another key use of soil and range inventories may be illustrated by a recent experience of the Ute Mountain Tribe, located at Towaoc, Colorado. The tribe has been exploring ways of increasing its income. It has a reservation land resource of 567,000 acres. Naturally, its first concern is to develop the resource potential of the reservation.

In order to get a factual, unbiased opinion from a knowledgeable source, the tribe asked Colorado State University to prepare a feasibility report for a Ute Mountain Tribal Herd. The herd operation was to be confined to an area called the "Ute Pasture." It was their lay opinion that five hundred head of cattle could be run here under present conditions.

Upon investigation the University personnel found out through study of the area and existing records and a review of the recent soil and range inventory, that under present conditions the addition of a Tribal herd of 500 head was not advisable. However, the soil and range inventory showed that there were 51,100 acres now covered with Pinon-Juniper with a good potential for growing grass. This land, if cleared and reseeded, would increase the grazing capacity by a probable 14,600 cow months and if successfully done would make possible the grazing of 1,500 cows.

Since the immediate establishment of a SW-head Tribal herd was not feasible from the standpoint of present grazing capacity, as shown by the soil and range inventory, the University then prepared a feasibility development and management report on the potential represented in the 51,100 acres of Pinon-Juniper. On the basis of this report, the Tribe has programmed an expenditure of $748,399 over the next five years, beginning with 1966. The 1966 operations consisted of a contract with a local vendor who has chained 30,700 acres of 51,100 acres to be cleared. This 30,700 acres will be cleared by burning and reseeding to adapted grasses in calendar year 1967. The remaining acreage will be chained and burned in 1967. By the year 1971, it is expected the 51,100 reseeded acres will support 1,500 head of cattle.

This potential resource development could not have been fully realized without the soil and range inventory. We believe resource inventories are essential for good resource planning.

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Summary of Activities in the Bureau Oi Reclamation

John T. Maletic
Office of Chief Engineer

The responsibilities of the soil scientist to society are taking on new dimensions.. .dimensions paced by the advances in technology and fired by the fuels of the population explosion. Challenges and opportunities abound. The soil scientist has a role in fitting land resources into new concepts of conservation that involve man's total environment.. .in adjusting from an agriculture producing surpluses to one facing deficits... in achieving better and improved use of the available water supply...in guiding the development of improved living and recreational space...in helping solve agriculture-related water quality problems, and in assisting the under-developed nations to move towards new goals of food production. He is in an occupational shortage category and needs to stimulate students to enter his field of study. Your day-to-day work is interwoven into the complex of disciplines striving to meet these challenges. It is good to see an operational group such as this meet to consider new ideas and to chart new approaches that will help solve the land and water use problems arising in a rapidly changing world.

The Bureau of Reclamation is conducting land resource investigations in all of the 17 Western States and in 6 cooperating nations. During the current fiscal year the investigations in the Western States will be directed towards identifying the suitability of about 4.8 million acres of land for sustained irrigation use. This is shown in Table 1 attached, which identifies the States and projects involved. In making the selection of these irrigable lands we will be referring to and interpreting the available soil surveys. The soil survey findings will be used in many of our reports to describe the natural soil bodies. This information serves as an important starting point in making predictions of the effect of irrigation on land resources. A foremost principle is that irrigation water induces important changes in the soil and these changes need to be forecast if one is to make a suitable selection of irrigable land. There fore, in the land classification surveys which we conduct it is essential that meaningful categories be established that express future conditions under irrigation. In the performance of such surveys it is thus most helpful to know the kinds of soil present and to understand their behavior. For those of you working in the 17 Western States I urge you to become aware of the areas in which we are conducting surveys and to cooperate with our field staffs toward achieving a coordinated and useful effort in the study of the landscapes involved.

Currently close cooperation is underway among the SCS, the land grant universities, the Bureau of Reclamation, and other agencies in the study oi land resources for the Missouri River Basin and the Columbia-North Pacific Type I Comprehensive Basin Studies. Similar cooperation is underway on some of the Type II comprehensive studies, and the work will spread to other river basins. I hope this experience will Provide new insights into our respective endeavors and will contribute toward better allocation of land and water among the many potential uses.

Outside the comprehensive river basin studies we are presently engaged in a &way cooperative program with the Bureau of Indian Affairs, Soil Conservation Service, and New Mexico State University in the preparation of a soil survey on the Navajo Indian Irrigation Project. The irrigation works for this project are being designed and constructed by the Bureau of Reclamation with the close cooperation of the Bureau of Indian Affairs. The New Mexico State University will operate an experiment station on the project. The basic soil survey planned for the area will provide a means to extend the experimental results to other areas of the project. Working together the four agencies have made preliminary studies of the field conditions and have developed a joint survey legend for the field work. During our field work, in connection with the land classification survey, observations will be recorded in a manner that will permit the development of a basic soil survey. Through this cooperative effort the land classification and soil survey will be attained with savings of effort and funds. We are glad to have this opportunity to cooperate in such field studies.

Work in the underdeveloped nations is increasing, and here many difficult problems are being encountered. The general lag of tropical soil research behind that in the temperate zones is hurting. There is a need to better organize the classification of the natural soil bodies occurring in the tropical zones. Confusion in terminology and differences in the definitions of important higher and the lower categories of the various classification schemes in use, make application of soil survey data more difficult and cumbersome than it ought to be. Users of available soil survey data in these areas must carefully establish the basis on which the classifications were performed and then check the adequacy and accuracy of the delineation of the all too often loosely defined taxonomic units. It is hoped that the new classification system will be pushed toward more complete definition of the kind of soils occurring in the tropics.

Our work in the tropics has shown the need to develop very different standards for the land classification survey, including, of course, the measurement of many parameters not routinely considered on western temperate zone soils. Of particular usefulness is the application of the single point charge characteristics of soils, i.e., total cation exchange capacity (CEC), permanent charge CEC, variable charge CEC, and anion exchange capacity (AX). Evaluations of problems related to potential toxicity of aluminum, manganese, and iron are also conducted. The need for lime requires special study and the status of soil science is such that empirical, field trials must still he used to determine just how the soil and crop will react to liming. The paddy rice soils undergo complex, dynamic chemical reactions and therefore special consideration is being given to the development of appropriate standards for classifying lands to be devoted to such use. The whole of these land resource investigations in the tropics is aimed at identifying land areas that can be successfully and permanently irrigated under the local social, economic, and physical setting of proposed project areas. With increasing commitments to underdeveloped nations, I would urge soil surveyors to renew their interest in tropical soils.

During the past 2 years the Bureau has been engaged in the study of the relationship of climatic zones to crop production under irrigation in the 17 Western states. A preliminary report on the findings of this study was presented at the &stern Regional Technical Work Planning Conference of the Soil Survey held in Denver one year ago. This work is now being completed and a final report will soon be issued. In this study the climatic factors, length of growing season, occurrences of temperatures 90°F or above, and the inches of summer rainfall were mathematically related to the gross crop value that could be obtained on land with no deficiencies in soil, topography, or drainage, and crop production under irrigation and with a full water supply. The mathematical relationship was used to delineate five climatic zones in the 17 Western States, each expressing a defined range in gross crop value. In this process, areas obviously not suited for irrigation development were separately outlined. In defining the zones within the potentially productive areas, somewhat “natural” groups related to adapted cropping patterns were selected. Thus, the map shows area suitable for production of subtropical crops, the cotton and corn lines were approximated, and the areas capable of producing only hay and pasture were delineated. The climate-crop studies done by Dr. T. B. Hutchings of the SCS were helpful in developing part of the mathematical concept used in the study.

In the Bureau of Reclamation’s training program for soil scientists, your new system of classification is being taught. The training program is conducted annually in cooperation with the Agronomy Department of the Colorado State University. The training is aimed at updating the skills and knowledge of our soil scientists, as related to the selection of lands for irrigation. We are privileged to have this opportunity to work closely with Colorado State University. The instruction in the new classification system given by Mr. Dale Romine should provide a sound basis for communication between your soil scientists and ours. I similarly hope that the soil surveyors of the SCS will make an effort to study the Bureau of Reclamation's system for selecting irrigable lands, particularly the principles and the interdisciplinary cooperation involved.

In closing I thank you for the opportunity to participate in your regional and national work planning conferences. I wish you a very successful conference.

TABLE I

USBR FY67 LAND CLASSIFICATION PROGRAM

State(s)	Region	Name of Investigation	Type of Study	Estimated irrigable acreage Full supply	Suppl. supply
Arizona	3	San Pedro-Santa Cruz	Feasibility		3,500
Arizona	3	Gila Project Mesa Unit Ext.	Feasibility	5,000	
Ariz.-New Mex.	3	Upper Gila River Proj.	Feasibility	4,000	54,000
Ariz.-New Mex.-Utah Nevada	3	Lower Coln. River Basin	Basin		
California	2	Central Valley Basin	Basin		
California	2	California Region	Basin		
California	2	Fair Play Unit	Recon.	5,000	
California	2	East Side Division	Feasibility		1,486,000
California	2	Sonora-Keystone Unit	Feasibility	4,860	
California	2	North Coast Proj.-Eureka Division	Feasibility		16,800
California	2	North Coast Proj. Paskenta-Newville	Feasibility	12.000	
California	2	Sespe Creek Project	Feasibility		47,330
Calif.-Nevada	2	Washoe Proj. Hope Valley Div.	Feasibility		4,000
Calif.-Nevada	2	Washoe Proj -Newland Extension	Feasibility	18,100	
California	3	Mojave River Project	Feasibility	18,400	20,000
California	3	Santa Margarida Proj.	Feasibility	2,180	3,960
Colorado	4	Bluestone Project	Feasibility	1,900	2,650
Colorado	4	Grand Mesa	Feasibility	14,540	17,160
Colorado	4	Upper Gunnison	Feasibility	10,000	18,000
Colorado	4	Basalt Project	Feasibility	14,320	6,127
Colo.-New Mex.	5	Rio Grande River Basin	Basin		
Colorado	7	Upper Arkansas River Basin	Basin		
Idaho	1	Lower Snake River Basin	Basin		
Idaho	1	Southwest Idaho Proj.-Garden Valley Div.	Feasibility	137,000	28,000
Idaho	1	Upper Snake River Proj.-Dave Crandall Div.	Feasibility		528,000
Idaho-Washington Oregon-Wyo.-Mon.	1	Columbia North Pacific	Basin		
Idaho-Utah	4	Bear River Project	Feasibility	8,500	4,000
Kansas	7	Kansas Basin Project	Basin		
Kansas-Nebraska Colorado-Wyo.	7	Missouri River Basin Comprehensive Study	Basin		

TABLE 1 -Continued

State(s)	Region	Name of Investigation	Type of Study	Estimated irrigable acreage Full supply	Suppl. supply
Kansas	7	Scandia Unit	Feasibility	16,000	-
Montana	6	Marias Mill, Milk Div.	Feasibility	75,000	
Montana	6	Missouri-Yellowstone tributaries	Basin		
Montana	6	Northeast Montana Div.	Basin		
Montana-N. Dak., S. Dak.-Wyo.	6	Mo. River Basin Comprehensive Survey	Basin		
Nebraska	7	Mid State	Feasibility	140,000	
Nevada	3	Moapa River Project	Feasibility	6,000	3,300
New Mexico	5	Pecos River Basin	Basin	-	
New Mexico	5	Portales Project	Feasibility		59,000
North Dakota	6	Garrison	Advanced Planning	250,000	
Oregon	1	Northern Coast Rivers	Basin	50,000	
Oregon	1	Upper John Day Project	Reconnaissance	5,200	20,000
Oregon	1	Deschutes Proj.-Central Div.	Feasibility	15,000	109,000
Oregon	1	Umatilla Basin Project	Feasibility	60,000	40,000
Oregon	1	Willamette River Proj.-Carlton Div.	Feasibility	50,000	
Oregon	1	Willamette River Proj.-Molalla Div.	Feasibility	160,000	-
South Dakota	6	Oahe Unit	Feasibility	495,000	
South Dakota	6	Big Sioux Basin	Basin		
Texas	5	Texas Basin Proj., Lower Rio Grande Unit	Feasibility	250,000	
Texas	5	Texas Basin Proj., Sinton Unit	Feasibility	200,000	
Utah	4	Central Utah Project	Reconnaissance	159,000	75,000
Wyoming	7	Cassa-Horseshoe Unit	Feasibility	2,908	2,719
Wyoming	7	La Prele Unit	Feasibility		12,400
Total				2,189,908	2,560,146

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE
OF THE
COOPERATIVE SOIL SURVEY
New Orleans, Louisiana, January 23-27, 1967

The Bureau of Public Roads Withdrawal from the National Soil Survey Program

Adrian Pelzner

Two years ago, at the 1965 Work-Planning Conference, I spoke to many of you regarding the Bureau'8 reduced participation in the National Soil Survey Program. Now, two years later, I have to report that the Bureau has, for all intent8 and purposes, withdrawn from the program.

Perhaps a few questions and answers will help clarify what the Bureau did in this program, why they withdrew, what actions they have taken and what are the consequences of withdrawing.

What did the Bureau do in the National Soil Survey Program?

A8 many of you know, the Bureau'8 activities in this program were quite extensive. In addition to performing the engineering test8 for some of the samples collected by SCS, the Bureau acted as a clearinghouse for the test data furnished by the State Highway Departments. Bureau personnel reviewed and checked the test report8 and prepared consolidated table8 of test data for submission to Soil Conservation Service. Bureau personnel also reviewed and commented on the manuscript versions of the engineering section8 of county or area soil surveys.

What were the reasons for the Bureau's withdrawal from the program?

After considerable analysis and evaluation of the soil survey program, the conclusion was reached that the Office of Research and Development of the Bureau of Public Roads could no longer be active in the program. It was felt that after approximately 15 year8 of participation in the program, the work had graduated from a research-oriented program to an engineering or operational program. The format for reporting test data, estimated engineering properties and engineering interpretations was well established. Other reasons for withdrawal from the program were the heavy pressures on a limited number of Bureau staff soil research engineers in coordinating soils research in the extensive Highway Planning and Research Program. There was also a need for these same engineers to be actively engaged in staff research.

What actions have been taker. by the Bureau in connection with its withdrawal from the program?

Two circular memoranda, dated October 27, 1965, and December 22, 1965, have been sent to the Bureau's Regional and Division Engineers as well as to each State Highway Department. These memoranda advised that effective January 1, 1966, SCS would assume responsibility for receiving and processing test reports from State Highway Department laboratories. These memoranda also stated that Highway Planning and Research funds could no longer be used in financing the testing of samples collected by SCS or in providing assistance in the writing of the engineering sections. In December, 1966, the Bureau notified SCS that it would no longer make technical reviews for those engineering sections which had been financed with Highway Planning and Research funds. However, these engineering sections would still have to be formally accepted by the Bureau for documentation purposes even though a technical review would not be made.

What are the consequences of the Bureau's withdrawal from the program?

The Bureau's withdrawal from the program may seem to many of you a rather unfortunate circumstance. However, in some ways the Bureau's withdrawal could be considered advantageous. Many of the State Highway Departments have elected to continue their participation in the program. Since the Bureau will no longer act as a clearinghouse and middleman, more direct contact should take place between soil scientists and State Highway Department soil engineers. Both of these trained personnel have an interest in identifying and mapping the soils in their State. Both have a lot of knowledge, within their own disciplines, concerning the performance and capabilities of the soils in certain areas. The State soils engineer may not know the pedologic name of a soil that is susceptible to slides--but he certainly knows the general geographic location and the physical properties of these soils. On the other hand, although the soil scientist may not be familiar with those engineering properties that make the soil slide susceptible., he certainly can readily identify and specifically locate the soil.

With sufficient cross contact between the soil scientist and the soil engineer will come a better understanding and more complete knowledge of their subject of common interest-soils.

Thank you.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY

New Orleans, Louisiana, January 23-27, 1967

Report of the Committee on Technical Soil Monographs

Objectives

The Soil Monograph Committee had the following objectives:

1. Review regional soil monograph committee reports
2. Review progress to-date on monograph
3. Explore possibilities for continuing work on monographs
4. Review regional reports on benchmark soils, the Southern report on soil survey reports, and the report on a Northeast soil association map

SOIL MONOGRAPHS

Committee Reports

We reviewed the 1966 soil monographs reports from the Western, North Central and Northeastern regions. The Southern region did not have a monograph committee but provided a short statement on this subject. All of these reports reflected general acceptance of the 1965 National Soil Monograph Committee recommendations. The reports also reflect the lack of authors and higher priority on other work as the main obstacles to undertaking new monographs.

More specifically, the Western regional report stressed the need for selecting priority areas, and making long range plans for collecting data and selecting authors for each monograph area.

The North Central states also emphasized the need for a method to collect and catalog soil data by areas. Their report contained a list of priority areas for the region.

The Northeastern region agreed to use the 1963 Major Land Resource Regions map of the United States as the basis for soil monograph areas, Soil monograph area committees were designated. Each committee consists of the State Soil Scientist and the State Soil Survey Leader(s) for each state which forms all or part of a monograph area. Organizational machinery was agreed on, but authors are lacking.

Soil Monographs in Progress

Monograph on the Soils of Central and North Texas. The first draft of the narrative part was written by Harvey Oakes in 1965. Dr. George Kunze of Texas A and M University has completed the laboratory studies and is writing the interpretations.

Monograph of the Soils of the Nashville Basin of Tennessee. Max Edwards is working with the Tennessee Agricultural Experiment; Station and the SCS State office in writing the monograph.

Monograph on the Soils of the Red River Valley Area of the North. The Work Plan for the monograph has been signed by the Directors of the Agricultural Experiment Stations and the State Conservationists of the SCS of North Dakota, South Dakota, and Minnesota. Work is in progress on preparation of the general soil map for the area.

Recommendations for Continuing Work on Monographs

After reviewing the regional reports and looking at progress to-date, the Committee searched for ways to get new monographs under way. In our deliberations, we recognized that there are many high priority jobs in soil survey and monograph writing will have to be fitted in as opportunity permits. With this in mind, we arrived at the following recommendations:

1. Continue efforts to prepare soil monographs as directed in Soils Memorandum SCS-39. The 1963 National Committee report contains suggested outlines for monographs. We believe these outlines can serve as a basis for the writing.

2. The 1963 Major Land Resource Region and Areas Map of the United States and proposals for technical monographs attached to the 1963 National Committee report should be used as a guide for selecting areas. Modifications can be made as needed.

3. Washington and RTSC staffs should review with the states the possibility for initiating technical monographs in the near future for a few areas, perhaps one for each SCS region (Land Grant College Region). Selection of these areas should be such that (a) they include important soils of different soil orders, (b) competent authors are in the area, (c) a considerable body of knowledge about geomorphology and soil properties already exists, and (d) a number of soil survey areas are on the 10 year publication schedule.

The Committee suggests investigation of the following Technical Monograph areas as listed in the 1963 National Committee report as possibilities for writing:

TM	LRA
89	143, 144, 145, 146
71	111
58	94, 96
84	131
81	128
79	124, 125, 127
59	95
35	52, 53
39	58, 59
42	64, 67, 68 (with 69?)
1	1

4. If areas can be found where initiation of work is feasible, the Administrator should assign responsibility to a State Conservationist to develop the work plan and prepare the manuscript.

5. Soil survey appraisals conducted by the Washington Soil Survey Operations staff should include inquiries about technical monographs, Agreed to items on this subject should be included in the report.

6. Inactivate the Soil Monograph Committee for the next two years but retain a chairman to report to the next conference on progress. This recommendation is made because the present work load of able soil scientists is such that only limited progress can be foreseen. when a few monographs have been printed, the committee should be reactivated to evaluate these reports,

BENCHMARK SOILS

The Committee reviewed the Western and Northeastern regional committee reports on benchmark soils. These committee reports contained a tabulation of published benchmark reports and those in progress. In addition, the committee had on hand a memo from W. E. McKinzie giving an up-to-date tabulation on benchmark soil reports for the Midwest region and a memo from J. A. DeMent giving comparable information for the southern states.

A list of printed Benchmark soil reports and a list of those in preparation is attached (Appendix 1). Most of these reports were completed several years ago, with fewer being currently completed. The Committee believes that these reports are valuable and the program of preparing them should be continued. Work will have to be fitted into a schedule of priorities for preparing reports of all kinds. These reports are the only medium in the SCS for compiling published and unpublished data on properties and behavior of selected soils. They are a comprehensive basis for projecting existing data to soils for which we have no data.

SOIL SURVEY REPORTS AND MAPS

The Committee reviewed the report of the Southern Regional Work-Planning Conference, on this subject, but did not have time to make specific recommendations.

NORTHEAST SOIL ASSOCIATION MAP

The Committee noted that the Northeast region is proposing a soil association map of that region. (Land Grant Region or SCS region according to the wishes of Ohio, Kentucky, and Virginia). The Committee believes that such a map would be very useful for teaching and regional planning if the scale is suitable.

Committee Members

B. A. Barnes
J. A. DeMent
J. V. Drew
A. A. Klingebiel
J. W. Kingsbury
C. W. Koechley
R. M. Marshall
W. E. McKinzie
A. C. Orvedal
G. D. Smith
Rudolph Ulrich*
A. J. Baur, Chairman

*Not present for committee meeting

Visitors

F. Newhall
H. O. Ogrosky
E. J. Williamson
C. E. Kellogg
A. R. Southard
P. E. Lemmon

Notes on discussion by the conference following committee report 1/24/67

Kellogg: Benchmark soil reports might be improved if Land Grant Colleges or other agencies kept records for ten years or so on soil temperature and soil moisture regimes. Graduate students might contribute to soil monographs by designing part or all of their thesis work to provide information for segments of monographs.

Bartelli: The S-14 Project is completed in the Southern States and is being published by major land resource areas. Do these publications qualify as Technical Monographs?

Smith : During development of publication plans there were no thoughts of serious conflict with Technical Monographs because the S-14 Project did not include soil classification or soil association maps.

Bartelli: S-14 publications for the Delta and Black belt of Alabama and Mississippi and for the Coastal Plain are at the printers. Could these have two numbers, one for S-14 and one for Technical Monograph?

Kellogg : This might be possible.

The report was accepted by the conference.

APPENDIX I

Status of Benchmark Soil Reports
January 1967

Published-1/	State	In Progress	State
Arredondo	Florida	Adolph	Wisconsin
Canfield	Ohio	Alderwood	Washington
Caribou	Maine	Alford	Indiana
Catalina	Puerto Rico	Bingham	Utah
Cecil	North Carolina	Blanton	Florida
Chiefland, Hernado, and Jonesville	Florida	Blount	Indiana
		Bridgehampton	Rhode Island
Clarion	Iowa	Commerce	Louisiana
Clermont	Indiana	Condon	Oregon
Dalhart	Texas	Crowley	Louisiana
Davidson	North Carolina	Decatur	Alabama
Drummer	Illinois	Dickson	Tennessee
Fargo	North Dakota	Everglades	Florida
Fayette	Wisconsin	Fox	Wisconsin
Flanagan	Illinois	Hagerstown	Maryland
Grantsburg	Illinois	Humboldt	Nevada
Hastings	Nebraska	Lebanon	Missouri
Hoytville	Ohio	Ontonagon	Wisconsin
Jacana	Puerto Rico	Richfield	Kansas
Keith	Nebraska	Rosebud	Nebraska
Klej	Florida	Springerville	Arizona
Lakeland	Florida	Stambaugh	Wisconsin
Leon	Florida	Tetonia	Idaho
Lynchburg	South Carolina	Vaiden	Alabama
Marshall	Iowa	Walla Walla	Oregon
Mexico	Missouri	Webster	Minnesota
Monona	Nebraska	Yolo	California
Moody	South Dakota		
Morton	North Dakota		
Norfolk	Florida		
Paxton	Connecticut		
Perrine	Florida		
Pompano	Florida		
Red Bay	Florida		
Reeves	Texas-New Mexico		
Ritzville	Washington		
Ruston	Mississippi		
Santiago	Wisconsin		
Scranton	Florida		
Trenton	Utah		
Vergennes	Vermont		
Weld-Rago	Wisconsin		

1/ Includes mimeographed and printed releases, and Agricultural Experiment Station numbered bulletins.

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NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY, New Orleans, Louisiana, January 23-27, 1967

Report of the Committee on Criteria for Soil Series and Phases

A. Objectives: In 1965 it was recommended that the committee be continued with the following charge:

"To encourage the four regional committees to summarize the criteria used in distinguishing soil series and phases within families in their respective regions and to submit their reports to the national committee."

B. Committee reports were on hand from the North Central, Northeastern, and Western regions. The committee on the Application of the Soil Classification System in the Southern States had a few comments pertinent to the objectives of our committee. Most of the discussion centered around the regional reports.

C. Discussion and Recommendations:

The North Central committee discussed soil phase and series definitions. The soil type and phase definitions are consistent with the Soil Survey Manual. They did recommend that where a mollic epipedon is overlain by recent overwash 6 to 15 inches thick, the soil type name of the buried profile should be the soil type name of the mapping unit. For example, if a Wabash silty clay loam profile receives 6 to 15 inches of silt loam overwash, the soil type name should be Wabash silty clay loam, silt loam overwash (phase). Thus the distinction between Wabash silty clay loam and Wabash silty clay, both covered by 6 to 15 inches of overwash, would be maintained. The National Committee did not agree with this suggestion. Where this distinction is significant, other phase names can be used to distinguish between these two units.

The soil series definition in the North Central Committee report is a slight elaboration of the definition in our 1965 committee report. We objected to the inclusion of the words "observed stable internal" in the following statement: "Thus it may be said that series criteria per se are based on those observed stable internal properties that can serve as differentiae to subdivide the soil families."

The North Central committee mentioned that in the Comprehensive Soil Classification System, soil differentiae are normally selected from within a depth of about 2 meters. Use of soil characteristics at greater depths for series criteria are not precluded. Advisory SOILS-2,dated January 11, 1966, is the draft of a memorandum about the application of the new system of soil classification. This memorandum does restrict the portion of the soil to be considered in differentiating soil series among mineral soils to about the upper 2 meters of the mineral soil. The National Committee recommends that, where needed in grossarenic subgroups the portion of the soil that may be considered in differentiating soil series or higher categories in the system of soil classification, should extend deeper than 2 meters below the soil surface providing there is evidence above that depth that the genetic horizon is present. As an example the committee considered that in Ultisols, if evidence of a" upper boundary of the argillic horizon occurs within 2 meters of the soil surface and the texture of at least the upper 20 inches of the soil is loamy fine sand or coarser, the control section should be extended below 2 meters. It does not seem reasonable to change the classification of a soil from an Ultisol to a" Inceptisol because of the presence of a" argillic horizon just above or below 2 meters.

The Southern committee on the Application of the Soil Classification System suggested that there is a need to investigate mottles as evidence of wetness in relation to the criteria used in the System. The committee agreed that the relationship of physical wetness conditions in soils to soil colors and mottles should be carefully studied by all of the regional committees.

The Northeastern committee report included a summary of criteria currently used to distinguish soil series in the families of 12 subgroups. They observed that hue, texture, presence of coarse fragments, mineralogy, and consistence are the properties most commonly used to separate series in the families studies. Hue is the feature that is most commonly mentioned as a differentiating characteristic but it is not necessarily the primary differentiating characteristic. Difficulties exist in selecting the main differentiating characteristics where there are only a few members in one family in contrast with large families. Because of the difficulty of determining the range of a differentiating characteristic permissible within the limits of a soil series and also of deciding the relative weight that should be assigned to multiple characteristics, the Northeastern committee concluded that series criteria could only be stated in general terms.

The National committee discussed the procedure to be followed in distinguishing soil series and phases within families. They agreed that it is not practical to study every soil at this time and suggest that a few families in 2 or 3 representative Typic subgroups in each order should be studied. The families should include series from more than one state and more than one region if possible. The cooperation of the Principal Soil Correlators will be requested in the selection of the families. It is estimated that about 5 or 6 families in each region with about 10 soil series each will be sufficient for this study.

The Northeastern committee developed a format for recording soil series criteria information. With slight modifications it is proposed that this format and explanation of terms will be used by the National committee. We would like the 4 regional committees to have information recorded on this form for each series in the selected families. Each series in the family will be compared with all other established soil series or tentative soil series with descriptions approved by the Principal Soil Correlator in the same family. The differentiating characteristics will be recorded, their range and the relative importance of each will be estimated. This information together with soil series descriptions and other pertinent data will be forwarded to the National committee after the regional committees have assessed the data for which they are responsible. A report of the combined findings will then be prepared by the National committee. The report will record only the limits that are being used.

The Western States Regional Committee proposed that the range of the dominant soils of a mapping unit (consisting of the named phase plus closely similar phases) should not be sharply differentiated from the range of the named phase in soil survey publications and handbooks. Inclusions should be restricted to those soils that are not closely similar to the named phase and that have different management interpretations. Otherwise mapping unit descriptions will consist of an elaboration of limits of inclusions. The National committee agreed with this statement in relation to soil survey reports only.

Profiles less than 7 inches thick are common in Alfisols in northern Manitoba and in the Rocky Mountains. Most of these are unsuitable for cultivation. It is recommended that these "micro" profiles be distinguished in the classification system at some level higher than the series level.

The committee recommends that official soil series descriptions include a statement indicating the sources of the data or of the estimates pertinent to the classification of the soil series.

It is suggested that the Southern region be encouraged to establish a soil series and phase committee to deal with ranges in characteristics of soil series.

D. The committee further recommends that it be continued to complete its assignment of summarizing criteria being used in distinguishing soil series within families and to bring to your attention other problems that may be raised by the regional committees.

E. Committee Members

R. W. Eikleberry
R. I. Turner
K. W. Flach
L. E. Garland (Absent)
R. B. Grossman
F. D. Hole
E. A. Perry
A. s. Robertson
J. E. McClelland, Chairman

Visitors

C. E. Kellogg
V. W. Silkett
G. R. Craddock
W. A. Ehrlich
D. W. Swanson

F. Drs. Kellogg and Smith suggested a few changes in wording in the report in the discussion that followed. The report was accepted by the conference.

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Report of the Committee on Classes and Phases of Stoniness and Rockiness

Reports on classes and phases of stoniness and rockiness from all Regional Committees were available to this Committee. Three of the regional committees reviewed the 1965 National Committee's recommendations and offered alternative recommendations.

These alternative recommendations on class limits and suggested phase names are summarized in Table I of the Appendix. It is to be noted that the Regional Committees are far apart in their suggestions.

The Midwest report did not make recommendations for class limits and phase designations but asked for a Regional Committee to develop techniques for examining stony and rocky soils, and also asked that people with research facilities be assigned to the committee. There is no information on the action taken.

The Southern Regional Committee believes that the National Committee's recommendations call for too many classes and too many phases. This committee also considered but rejected the proposal that all fragments larger than 2 mm enter into the criteria for the unit name. Also rejected "as a suggestion that stones within the soil pedon be included as a part of the class criteria.

The Southern states, through a Forest Service survey party, checked the ability of field men to estimate the various classes of stoniness in the field. Reliability of estimates where classes had small ranges in percent of ground covered is very low. Separations based on classes of 1 to 5, 5 to 15, and 15 to 25 percent are the easiest to estimate with a reasonable degree of accuracy. This trial is reported in Appendix II of the 1966 Report of the Southern States Committee on Classes and Phases of Stoniness and Rockiness.

The Southern states furnished some measurements on extent of rockiness for a number of different soils in Kentucky. See Table III of the Appendix for this information.

The Northeastern states went on record as favoring, insofar as possible, the existing system of phase designation as outlined in the manual, but believe some modification in class definitions will be needed. Spacing between stones and volume of stones above the surface are equally important as the percentage of surface covered by stones and rocks, and are more important in interpreting the classes into phases. The Northeastern Committee presented a table to show the effect of different sizes on the spacing between stones. A modification of this table is shown in Table II of the Appendix.

Table II shows the significance of size in relation to spacing. If a spacing of 20 feet is considered the minimum for use of tillage or harvesting implements stones of 1 foot in diameter would cover but 0.23 percent of the land surface but if the stones are 5 feet in diameter the spacing of 20 feet is obtained although the stones occupy 3.7 percent of the ground surface.

Part of the differences in class limits shown in Table I may be due to differences in characteristic size of stones in the regions concerned.

The Northeastern Regional Committee considered and rejected inclusion of amount of stones in pedons as part of the criteria for classes of stoniness. Data in Table IV shows the great variability in stone content within the pedon. The Northeast believes that descriptions of named soil series provide the best guide to stoniness within the pedon.

Other information as photographs and charts showing size and location of stones or boulders on specific blocks of land was available to the committee. This is mentioned briefly in the Appendix under the heading "Other Information."

The National Committee considered the regional reports and the available data and makes the following recommendations:-

1. The definitions of stoniness classes be based on average spacing between stones. The area covered and the volume would be related to the size of the stones.

2. Give consideration to the use of the terms "stony" and "bouldery" and use the bouldery option when stones are larger than 24 inches in diameter. Use either term when both conditions are present, depending on which size stone has the most influence on use and management of the area.

3. Proposed classes and frequency spacing between stones -

Class	Spacing in feet	Phase name
0	> 100	
1.1	40 - 100	Slightly stony
1.2	20 - 40	Moderately stony
2.1	10 - 20	stony
2.2	5 - 10	very stony
3.1	1 - 5	Extremely stony
3.2	< 1	Rubbly

4. Rocks should not be considered a phase of soils as rocks are "non soil" and really represent a complex of rock outcrop and one or more soil series.

5. The spacing used for stoniness classes is not satisfactory for rockiness classes as the area of rock outcrop would be significant in any unit.

6. Rockiness classes must consider the spacing between rock outcrops and size of the area covered by the rock outcrop. An example of classes used and nomenclature used in a National Forest area is:-

   Rocks 1 to 10 feet across covering 10 to 25% of area = Rocky

   Rocks 1 to 10 feet across covering 25 to 50% of area = Very rocky

   Rocks covering more than 50% of the area is Rockland or a Rock outcrop-soil series complex.

7. Regional Committees should:

   (a) Test the criteria for stoniness classes and phases on different size and shape of stones

   (b) Study the problem of rockiness with special attention to size of rock, spacing between rocks, and percent of surface covered by rocks

   (c) Make recommendations for classes and nomenclatures for the classes of rockiness.

   (d) Suggest ways and means for broader phases in addition to the narrow phase names proposed. Any phase should have significance in use and management of the classification unit. (See Dr. Kellogg's remarks under Discussion.)

8. The National Committee should be continued to:

   (a) Review any suggested changes in stoniness classes

   (b) Define the phases named in the Committee report or alternate names received after the Regional meetings

   (c) Make recommendations for classes of rockiness and suggest nomenclature for the classes.

<u>Committee members present</u>

A. H. Paschall, Chairman
W. H. Bender
F. J. Carlisle
Grant M. Kennedy
B. J. Wagner
J. M. Williams
S. J. Zayack

<u>Visitors</u>

D. E. Hill
Dr. C. E. Kellogg
P. E. Lemon
Lyle Linnell
A. Pelzner

Discussion B. J. Wagner, Recorder

W. M. Johnson requested clarification on measurement - by volume or by area. The Committee's report considered area as percent of surface covered by stones or boulders. Volume was not discussed except to recognize that it could be a problem.

Dr. Kellogg, commenting on class limits, stated that he does not know if the classes are right. The Committee should make it clear that in working these classes into the classification recognition is given to use and management.

F. J. Carlisle asked if the distance given is between edges of stones or the centers of stones.

A. H. Paschall - The calculation given in table from Northeast is between edges, and this does not integrate between size and area covered. The table in the Appendix recognizes the diameter as well as spacing between stones.

The shape and amount of stone above ground is important - whether flat or rounded.

Dr. Kellogg - If other soil characteristics are also limiting we need some broader classes, for example shallow or very shallow soils. The finer classes cannot be used on soils such as these. They do not affect use and management. There should be a reason for the separation. This is true for other factors as erosion or slope.

J. Williams - Some correlations being made on forest lands are based on distance between stones as this distance is significant in use and management.

Dr. Smith - The Southern Regional Committee did point out that these classes needed to be different.

S. J. Zayack - In the Northeast we considered use and management for cultivated land, forestry and other uses in making these classes. The classes used could be fitted to purposes of mapping - i.e. forestry, row cropland, etc.

Dr. Kellogg - Some range soils, too steep for cultivation, are better range soils if they are stony, In places they mulch with stones. Our limits, both upper and lower, must be flexible. There is no sense in having "arrow phase limits if not significant.

Dr. Flach put in a plug for use of the metric system in class definitions - supported by Dr. Kellogg.

Dr. Baur asked if the Regional Committee's suggestions were for Specific uses.

A. H. Paschall - The Western Region limited their recommendations to extensive use as range or forestry. The Southern Region was not specific but recognized a need for flexibility. The Northeastern Region aimed at "all-purpose" classes. Thus classes 2.1, 2.2 and 2.3 might group as class 2 for extensive use; 2.1, etc. for very intensive use; and split between 2.2 and 2.3 for areas of row crops using large machinery.

L. J. Bartelli - It needs to be made clear that these identify classes but only suggest possible phase names.

APPENDIX

Table I

Stoniness and Rockiness Classes, Class Limits, Percent Covered, 'Suggested Phase Names According to Manual and Revisions Proposed by National, Northeastern, Southern and Western States Regional Committees

Suggested Phase Name 1/	Manual Class	Manual %	National Com. Class	National Com. %	Northeastern States Class	Northeastern States %	Southern States Class	Southern States %	Western states 2/ Class	Western states 2/ %
	Classes and Class Limits - Percentage of Surface Covered									
No phase designation	-		0	.01	-		0	2		
Slightly stony (if needed)			1.1	.01-.1	1.0 1.1 1.2	.01 .01-.05 .05-.1				0-10 2-10
stony	0. 1.	.01 .01-.1	1.2	.1-2	2.1 2.2 2.3	.1-.5 .5-1.0 1.0-1.5	1	2-10	-	10-25
Very stony	2.	.1-3.0	1.3	20-10	3.1 3.2	1.5-2 2.0-3.0	2	10-25	-	25-50
Extremely stony	3	3.0-15	2.1 2.2	10-25 25-50	4.1 4.2	3.0-10 10-50	3	25-50	-	50-90
Stony land	4	15-90 15-50								
Very stony land	4	50-90								
Stony land and series							4	50-90		
Rubbly			3.1	50-90	5	50-90				
Rubble land	5	90+	3.2	90+	6	90+	5	90+		90+

1/ Phase names for rockiness parallel those for stoniness except extremely rocky might also be labelled as extremely rocky complex, Rockland or rock outcrop plus a series name or series name plus rock outcrop. Rock outcrop would be substituted for Rubble Land.

2/ For extensive use as Range or Forestry.

APPENDIX

Table II

Number, Square Feet and Percentage Cover Per Acre by Square Stones of Different Average Dimensions With Different Equidistance Spacing

space Between stones or Boulders in feet(X)	Item[2/]	0.5	0.83	1.00	1.5	2.0	2.5	5.0
		Average Diameter of Stones in Feet (D)[1/]						
	NNo P/A	19360	13003	10890	6970	4840	3556	1210
1	A Area/A	4840	8972	10890	15682	19360	22225	30250
	P Percent/A	11.11	20.59	25.00	36.00	44.44	51.02	69.40
	N	1440	1282	1210	1031	889	774	436
5	A	360	885	1210	2320	3556	4838	10890
	P	0.82	2.03	2.77	5.32	8.16	11.10	25.00
	N	395	371	360	329	303	279	194
10	A	99	256	360	740	1212	1744	4850
	P	0.22	0.58	0.82	1.69	2.78	4.00	11.10
	N	104	100	99	94	90	86	69
20	A	26	69	99	212	360	538	1740
	P	0.06	0.16	0.23	0.49	0.82	1.24	3.7
	N	27	26	26	25	25	24	21
40	A	7	18	26	56	100	150	1000
	P	0.02	0.04	0.06	0.13	0.23	0.34	2.2
	N	4	4	4	4	4	4	4
100	A	1	3	4	9	16	25	100
	P	T	0.01	0.01	0.02	0.04	0.06	0.2

Form and calculations by P. E. Lemon 1/31/67

1/ Assuming square stones spaced equidistant at the center of square areas.

2/ Calculations as follows:

$$N = 43560/D+X)^2$$

$$A = D^2N$$

$$P = A/43560$$

TABLE III

Summary of Rock Outcrop Data on Eight Mapping Units in Kentucky

Reported by R. E. Daniel[1]

Mapping Unit	Land Use	Percent Rock Outcrop	Percent Rock Outcrop Average
Corydon and Fredonia very rocky silty clay loam	Pasture	5.5-10	8.3
Caneyville very rocky silty clay loam	Woodland	13-25	17.2
Fredonia very rocky silty clay loam	Pasture	14-25	18.3
Cynthiana-Rockland complex	Pasture	32-75	43.5
Rockland-Limestone	Woodland	26-47	35.3
Caneyville silty clay loam	Pasture	2.5-8	6.0
Waynesboro silt loam	Pasture	1.1	1.1
Faywood silt loam	Cropland and Pasture	1.2-2.5	1.5

APPENDIX

Table IV

Amount of Stones Within the Soil

Part A - Volume of stones in excavated pits 1/

Pit No.	stone Volume cubic feet	Pit Volume cubic feet	% of Volume stones
1	3.13	41.4	7.5
2	7.64	41.4	18.4
3	2.09	41.4	5.0
4	7.40	41.4	17.8
5	4.25	41.4	10.3
6	9.69	41.4	23.4
7	2.67	41.4	6.4
8	2.53	41.4	6.1
9	11.22	41.4	27.1
10	8.71	41.4	21.0
Total	59.33	414.0	14%

1/ Pits are about 66' apart along a transect. Dimensions of the pit were 9'x2½' at the surface and 3' deep. Pits made by backhoe and had shape commonly formed by that instrument. Volume was determined by 2/3 (9x3) x2.3=41.4'. The soil series was identified as Scriba. Report prepared by E. C. Rice, Soil Scientist.

Part B - Percentage of stones along a transect line 3' below the soil surface 2/

Soil	Percentage on Surface	Percentage in Soil
Parishville and Moira	10	11
Grenville and Bombay	2	5
Kars, very stony	5	27

2/ Transects were 100' long. Ungraded road banks or excavations which lacked evidence of stone removal or additions were selected. Percentage of stones on the surface and along an imaginary line 3' below and parallel to the surface was calculated. Report submitted by N. B. Hulbert.

Other Information

Other information furnished for Committee use consisted of photographs of classes, charts outlining locations and sizes of stones from plots in Maine and at Harvard Forest, and four transects with point measurements to illustrate variability in rockiness. These are listed or summarized below:

Photographs furnished by Grant Kennedy -

C3944-5 Auburn very rock loam, estimated about 5% rock outcrop

C4767-6 Profile of Auburn very rocky loam. Soil has lithic contact and rock outcrop shown on photo C3944-5

C4464-8 Argonaut extremely stony loam 25 to 50% stones one to five feet apart

C4259-4 Glenbrook rocky loamy coarse sand, 3 to 5% rock outcrops, Rocklands in background.

Maine submitted charts of three plots to illustrate classes 2, 3 and 4 as outlined in the manual. These are summarized as follows:

Stoniness Class	Percent Surface Covered	Size Range sq. ft.	Spacing Range ft.	Average Spacing ft.
2	0.2	1-2	2-40	8
3	8.0	1-25	2-20	5
4	20.0	3-50	2-4	2+

The class 2 plot is considered as limited for ordinary crop use. The class 3 plot is used for blueberry culture with use of small machinery. The class 4 plot is also used for blueberries but all cultivation is by hand tools.

Mr. Lyford submitted a chart of a 100x100 ft. part of PH1 Harvard Forest. All stones and boulders were plotted as to location and size. This has been termed a very stony phase. Surface coverage amounted to about 5%. Spacings would average less than 5 feet and size range from 1 to 25 square feet.

Mr. Lyford also submitted a chart of a 66 acre tract, plotting the location of each boulder or stone and then dividing the tract into areas with spacings of 0-1, 1-5, 5-20, and 20-50 feet apart. More than three-fourths of the area had spacing of less than 20 feet, and the greater spacing was so intermingled that separation as a mapping unit would be of doubtful value.

Mr. Howard of Vermont submitted information from four transects made in range country.

Observations were made at 50 feet intervals and recordings made on the occurrence of base rock and various depths to rock. These transects were in Glover and Woodstock soils and are summarized below:

Transect No.	Number of Times Rock Encountered				
	Surf ace	< 10"	10-20"	20-40"	> 40"
1	3	2	3	4	4
2	2	2	7	10	7
3		5	4	5	2
4		3	2	3	5
Total	5	12	16	22	18

These data indicate that consideration needs to be given to rocks at very shallow depths as well as rock exposed at the surface.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL SOIL SURVEY TECHNICAL WORK-PLANNING CONFERENCE
New Orleans, Louisiana, January 23-27, 1967

Report or the Committee on Application of the Nev Classification System,

The committee held its second meeting on January 24, 1967 with 11 members present. Nine visitors sat with the committee at various times during the full-day session. The procedure followed was to consider first the reports from regional committees, next the draft memorandum on application of the new classification system distributed with Advisory SOILS-2, dated January 11, 1966, and last some additional topics. This committee report is organized in three main parts. The first main part deals with reports of regional committees, the second main part is about the guide for application of the new classification system, and the third main pert consists of recommendations for future activities. Each of there main sections is subdivided into subsections.

A. Reports of Regional Committees

1. Reports on organic roils.

Regional committee reports were received from the Nortb Central and Southern Regions from conferences held in 1966. The fleld study propoeed in the North Central committee report was made in October 1966, it has resulted in proposals for further changes in the subdivision of Histosols.

The report of the Southern Regional Committee raised questions as to selection of characteristics to be diagnostic for suborders, great groups, and subgroups. Additional field studies are being made in the Southern Region this year. Proposals worked out within the last year for subdivision of the Histosol order will be tested further in that region.

No action by the National Committee on either of the regional Committee reports seems necessary. Efforts to develop a better classification of soils in the Histosol order are being continued, as is clearly necessary. The National Committee did not feel that it had useful suggestions to offer at this time,

2. Report on fragipans, Southern Region.

The regional committee report is concerned chiefly with description of fragipans and with characterization of their degrees of expression. A list of characteristics believed to be common to fragipans is included in the regional committee report. This list is reproduced below 80 as to bring it to the attention of a wider audience.

a. The fragipan horizon is mottled generally with shades of gray, brown, and red.

b. A polygonal color pattern is observable.

c. Some fragipans exhibit bisequal characteristics and others do not.

d. Consistence is most always firm or greater where moist.

e. It displays brittleness when moist.

f. It is compact and appears to have a significantly greater bulk density than horizons above and belov it.

g. Voids are usually present in most fragipans and are largely of the vesicular type.

h. Opinion was about equally divided that oriented clays were readily observed between a definite "yes" and indefinite "yes".

i. Textures listed were generally silt loam, very fine sandy loam, or loan. The (a) line dominated as textures observed in fragipans.

j. The question of structure was also about equally divided between angular blocky and subangular blocky.

k. The majority indicated most fragipans observed were between 12 and 39 inches (a), but could be between 28 and 36 inches or below 36 inches in some profiles.

l. Most agreed a perched water table was apparent.

m. Roots in the fragipan generally were confined to and followed down the gray streaks.

n. Most indicated the fragipans were most common on 0-3% slopes but could range up to 8-12% which was not very common.

The Southern Regional committee also discussed soil horizons which contain some plinthite and have characteristic6 of fragipans. At the time of the committee meeting in 1966. it was recommended that such horizons should not be considered fragipans, though review of this recommendation was also suggested whenever more information became available. Further studies of soil horizons containing plinthite have been made since the regional committee meeting. At the present time, horizons with the characteristics of fragipans are called fregipans, whether they contain plinthite or not. Soils having fragipans in which the volume of plinthite exceeds a certain minimum are now being classified as Plintbitic Fragiudalfs.

The National Committee noted that plans have been made for Rank J. Carlisle, Jr. to study fragipans in different parts of the country in an effort to improve their description and the characterization of degree of expression. It is hoped that greater standardization will follow from the study. A field trip was made in 1966 to study several soils with fragipans in Louisiana and another is scheduled for May 1967 in Illinois and Indiana. Field studies will be extended to other states as that is possible. 'The hope is that the study will ultimately lead to better written guides for the description and characterization of fregipans.

3. Report on the application of the new classification system - North Central Region.

Five topics were discussed by the regional committee and recommendations were made for changes in the classification system on two items. The five topics were considered by the National Committee, as indicated in subsequent paragraphs.

3.1 Definition of Albolls.

The North Central committee recommended that the minimum thickness of the mollic epipedon be reduced so that certain series which had been considered Planosols of grasslands would be included in the suborder of Albolls. No action on this suggestion was taken by the National Committee because the definition of the Alboll suborder has been modified so that it does include the soils in question.

3.2 Differentiation of Alfisols and Ultisols.

The North Central committee recommended that the distinction between these two orders on the basis of chroma of the argillic horizon be dropped, which would leave base saturation as the sole criterion. This recommendation has been adopted and is reflected in the October 1966 summary of changes in the 7th Approximation.

3.3 Classification of eroded soils.

The North Central committee would like to modify the definition of Udolls in some way so that loss of the mollic epipedon would not require that a given soil be classified in another suborder. As the present definition stands. a number of soils would lack a mollic epipedon after being severely eroded and thus be classifiable as Alfisols or Inceptisols. The North Central committee did not offer specific recommendations, pending further studies of eroded soils.

During discussion of this topic by the National Committee, a suggestion which has come from the North Central Region subsequent to the conference last spring was considered briefly, The suggestion was that some combination of the profile distribution pattern of organic matter and the ped coatings in the B horizon might be used to define Udolls rather than requiring that they have a mollic epipedon. The prospect was considered poor by the National Committee because an effort has been made to use dark ped coatings in defining and distinguishing soils in the past but was dropped because it failed to work out well.

3.4 Wetness criteria.

The North Central committee report points out that some soils have colors commonly associated with wetness, though such soils are not necessarily wet. It is further stated that soils in which peds have gray surfaces and brown interiors in the control section are placed in the wettest suborder on the basis of present criteria. The North Central committee felt that some change should be made In present criteria but opinion was divided as to what should be done.

During the discussion of this part of the regional committee report in the meeting of the National Committee, it was reported that series fitting the somewhat poorly drained class, as defined in the Soil Survey Manuel, must be distributed into Aeric and Aquic subgroups. Some of the somewhat poorly drained soils fit Aeric subgroups and others fit Aquic subgroups. This distribution was not considered to be good, though it was recognized in the discussion that mottling was not an infallable key to soil wetness.

A suggestion was made during the discussion of wetness criteria that observations on depths to water tables or on ground water levels might be helpful in sorting out the characteristics consistently associated with wetness from those that are not.

3.5 Calcisquolls.

An objection is rsised in the North Central report to the present definition of the Typic and Aeric subgroups. The Harpster series is an example of soils that have to be classified in an Aeric subgroup because they lack the required mottles within 20 inches of the surface. It is believed that these soils are as vet as any in the suborder of Aquolls and should be classified in a Typic subgroup. The regional. committee felt that some changes should be made in present definitions so that the Harpater series and similar soils would be included in Typic subgroups. Definite suggestions for changes were not proposed in the regional report nor did they grow out of the discussion in the National Committee.

4. A report on application of the new classification system - Southern Region.

This report summarizes committee discussions and offers recommendations for changes plus requests for clarification in the draft memorandum distributed with Advisory SOILS-2, January 11,1966. The recommendations for modification or clarification apply to the following items:

(a) Concept and use of the taxonomic inclusion
(b) Mapping inclusions of strongly contrasting soils
(c) The naming of monotype series
(d) Naming soil associations at different levels of generalization
(e) Mottle chromas as evidence of wetness
(f) Limits for proportions of coarse fragments
(g) Soil depth classes at the family level

Items (a), (c), and (d) in the above list were considered at some length by the National Committee; a summary of the discussion together with recommendations are reported in later sections of the report. Item (e) was discussed in connection with the subsection on wetness criteria in the North Central Regional Report, Item (g) was left for consideration by the committee on soil family criteria.

4.1 Mapping inclusions of strongly contrasting soils.

The regional committee felt that no provision had been made in the draft memorandum on application of the new system for inclusions consisting of minor areas of strongly contrasting soils. It was asked that the draft memorandum be modified so as to cover such soils, This recommendation was endorsed by the National Committee.

4.2 Limits for proportions of coarse fragments.

The Southern Regional Committee recommended a lower limit of 40 percent of coarse fragments for soils in the loamy skeletal and clayey skeletal families. This limit was believed to be more nearly in line with past practice than a figure of 50 percent. No opinion was expressed on sandy skeletal soils because virtually no information about them was available to the committee.

The National Committee notes that the recommendation from the Southern Regional Committee was considered during the conference on the classification system in December 1966. At that time, measurements of proportions of coarse fragments in several soils, including some in Europe, were reviewed. As a result, a lower limit of 35 percent coarse fragments by volume hss been introduced to replace the 50 percent figure, The 35 percent limit will be included in the forthcoming summary of changes in the 7th Approximation,

B. Proposals for Changes in the Guide on Application of the New Classification System

1. Replacement of the phrase "taxonomic inclusions"

The Southern Regional Committee recommended clarification of the concept of taxonomic inclusions as It is used in the draft memorandum distributed with Advisory SOILS-2, dated January 11, 1966. The committee also suggested that a substitute name be found for the concept, The suggestion that some change be made has also been received from other sources. What might best be done wan discussed at some length by the National Committee.

The word "inclusion" has been used for many years for the included small bodies of unnamed soils within the larger bodies shovn as delineations on maps and named in legends. Consequently, the concept of mapping inclusions seems to have a prior claim on the word, "inclusion". The expressions, “mapping Inclusions” and “taxonomic inclusions”, are enough alike so as to be confusing to a number of people.

The phrase as a whole might be replaced or the word, inclusion, might be replaced. Four substitute words have been proposed as possible replacements for inclusion, vie,

addendum
adjunct
appendix
extra

The Southern Regional Committee suggested the word “deviant” as a substitute for the whole or a part of the phrase “taxonomic inclusion”. A further suggestion was made to adopt a coined term as a replacement for taxonomic inclusion. The phrase “splinter series” has been used and an expression related to that could be coined. It was suggested that a term such as "plesioseries" could replace "taxonomic inclusion”. The formative element, plesio, means almost.

During the discussion, the argument was made that "taxonomic" should apply to a classification system as a whole rather than to any class. It was further proposed that en adjective form derived from the word taxon would be more appropriate than taxonomic.

The committee finally settled on the expression "taxal deviant" as the best expression it could now find. Some. question was raised about the word deviant on the ground that a soil so designated was really closely related to the series to which it was being tied in the naming process. Deviant of itself suggested a considerable difference rather than a small one,

The committee was in agreement that the phrase "taxonomic inclusions” should be replaced. The majority of the committee favored the phrase "taxal deviant” as a replacement,

2. Naming phases of "mono-type" series,

Objections have been raised to use of the word, series, rather than the texture class name in the names of phases of monotype series, The naming of such phases is discussed on the bottom of page 12 and the top of page 13 of the draft memorandum sent out with Advisory SOILS-2, January 11, 1966. The Southern Regional Committee recommended modification of the draft guide to allow the use of texture class names as has been done in the past,

The National Committee also recommended that a convention be adopted to allow use of texture class terms as parts of the names of phases of monotype series as well as other series,

3. Names for soil associations.

The Southern Regional Committee recommended that mapping units named as soil associations be restricted to county end state general soil maps. That committee further asked the National Committee to propose new nomenclature for use in low intensity detailed surveys,

The mapping units on mall-scale general maps of counties included in published surveys have been named as soil associations for a number of years, Furthermore, a few of the mapping units shown on the 1:20,000 or 1:15,840 published maps have also been named as soil associations. Identical names turned up for a soil association on the general soil nap of a county and for one of the separations on the detailed map in one instance. This should be avoided,

Some of the difficulties that have been encountered in use of the word "association", possible need for a terminology to cover soil association'& different levels of generalization, and past use of the phrase were discussed at length by the committee.

The tern "soil association" has been used as a generic expression for all kinds of mapping units that have repeating patterns of component soils. Thus, the complex is one kind of soil association but one in which the pattern is of fine mesh. The component soils cannot be set apart at the mapping scale in use, mostly 1:15,840. The word "association" itself has been used in the naming of mapping units recognized in low intensity surveys and on general soil maps of counties, states, and countries. Lastly, the word association is used for organizations of people, It has been argued that the word should be dropped from soil survey work on that account.

In its discussion, the committee was in full agreement to retain the present definition of the complex. No change should be made in the concept or name.

Next, the committee recognized that some action should be proposed to get away from the confounding of man units on general and detailed soil naps for counties. A recommendation is offered on this later, following a further summary of the committee discussion.

The committee considered the possibility of devising a hierarchy Of names which would be somewhat parallel to those of subgroups, great groups, suborders, and orders in the classification system, at least to the extent of denoting levels of generalization. The various possibilities considered during the discussion are recorded in this report, thou& the committee did not wish to suggest such nomenclature.

One alternative would be to lift words from the body of ordinary language, each of which would have a meaning analogous to that of association. Examples of such terms are:

aggregation
combination
composite
society

The committee felt that such words had connotations from past use-history which would make them undesirable for our purpose.

A second possibility considered in the committee session was a proposal to restrict the word "association" to names on 1:20,000 and 1:15,840 mans. This would then require e shift to e phrase such as soil landscape and soil area for general county and state maps. A modified version of this proposal would use "detailed association" on the more detailed maps, "generalized association" for county maps, and "soil area" in the naming of mapping units at hi&her levels of generalization. The committee members thought that the word, area, was already overworked and its introduction with still another meaning would not be wise. Further, the committee does not recommend the use of phrases such as "detailed association" and "generalized association" because of the resulting length of names required for mapping units.

A third possibility would be the introduction of coined terms for soil associations at differing levels of generalization. This proposal included the idea of using "soil association" exclusively as e generic term to refer to all kinds collectively. This would not permit use of the word "association" in the names of any nap units. The coined terms offered in the proposal could provide a total of four or five levels of generalization. The suggested names, listed in sequence of progressively higher levels of generalization are:

complex
microsociation
mesosociation
macrosocietion
megasociation

A variation of this proposal would drop the term "microsociation" and allow four levels of generalization.

After considerable discussion of these alternatives, the committee voted on two propositions. A majority favored the devising of some new name for soil associations on 1:20,000 or 1:15,840 maps and the continued use of the word association in naming mapping units on general county maps. The committee proposes the introduction of the word "suite" for mapping units of the kind that have been named as associations on detailed maps.

4. Mapping units named as single phases.

Suggestions were received by the committee that changes should be made in the conventions for naming mapping units as single phases. These suggestions apply to the minimum proportion of the dominant kind of soil and to the maximum allowable proportion of one strongly contrasting soil. The proposed changes vould increase the allowable proportions of strongly contrasting inclusions and raise the minimum for the dominant kind of soil. These suggestions were discussed but no change from the present guide in the draft memorandum is recommended by the committee, More experience with the present guide and more evidence of difficulties with the stated conventions should be at hand before modifications are considered.

C. Committee Recommendations for the Future

1. It is recommended that committees on application of the new system of soil classification function at all of the next regional soil survey work-planning conferences, The summary of changes in the 7th Approximation prepared to replace the one issued in 1964 will be distributed during the current calendar year. A substantial number of changes have been made in the system since 1964. It therefore seems highly desirable 'that the effects of these changes be examined carefully in each of the regions . Certainly, the consequences of changes that have been made will not all have been foreseen.

2. It is recommended that the National Committee be continued with two tasks. The first of these would be to receive the reports of regional committees and deal with the problems the'; those committees had encountered. A second task would be to outline an orderly procedure for the making of necessary changes in the soil classification system once it was ready for formal publication.

Committee member6 present at meeting:

Roy W. Simonson, Chairman

J. K. Ableiter
L. J. Bartelli
F. C. Carter, Secretary
R. E. Daniell
C. M. Ellerbe
Rodney F. Harner
Y. H. Haven6
R. D. Hockensmith
George Holmgren
W. M. Johnson
J. D. Simpson
H. P. Ulrich

Visitors present for some part of the committee discussion were:

A. R. Southard
F. D. Hole
John D. Rourke
L. D. Swindale
F. J. Williamson
Charles E. Kellogg
W. L. Matthews
Lyle Linnell
Noble Peterson

Notes on Discussions After Presentation of Committee Report. to Conference as a Whole, January 26, 1967

Kellogg: what would be the difference on the detailed soil map between a Ruston-Cuthbert suite and a Ruston-Cuthbert complex?

Simonson: In the Ruston-Cuthbert suite the bodies of Ruston and Cuthbert soils could be set apart on the field sheets (1:15,840) if the purpose of the survey warranted the expense, In the Ruston-Cuthbert complex the component soils could not be mapped separately.

Lewis: The word, suite, has two pronunciations in some part of the country, which is a disadvantage. In the South, it may be pronounced "suit" or "sweet".

Flach: The proposed concept for the word, suite, is much different from that which has been used by the soil survey in New Zealand for a long time. Selection of some other term would seem preferable to choosing one already in use by another soil survey organization.

Turner: The phrase, taxal deviant, highlights differences rather than similarities. Would it not be better to select an expression that emphasizes the similarities? Soils that have been called taxononic inclusions and would now be called taxal deviants are much like the series to which they are tied, are they not? Should not similarity be emphasized?

Paschall: Was consideration given to using the term, variant, rather than taxal deviant?

Simonson: The use of variant as a substitute for taxal deviant was not considered because the former term had already been appropriated for another purpose.

Kellogg: More consideration should be given to the use of ad hoc symbols for soils of small acreages and strongly contrasting. Such symbols must be defined as to kind of soil and also as to the acreage represented by each symbol. Symbols would also need to be tailored for each soil area. The use of ad hoc symbols to avoid additional mapping units of small acreage has not been exploited as it should be.

Barnes: Very few of the soil survey manuscripts now define spot symbols adequately. In some manuscripts no definition of spot symbols are given.

Koechley: Ad hoc symbols that are used should be defined so that they do not conflict with the standard symbols that go on the field sheets.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONF'ERENCE OF THE COOPERATIVE SOIL SURVEY
New Orleans, Louisiana, January 23-27, 1967

Report of the Committee on Engineering Application and Interpretation of Soil Surveys with Special Reference to Highways and Community Planning

The committee met on Tuesday evening and Wednesday afternoon. All members, with the exception of Rudolph Ulrich who is ill, were present. Mr. Bender served as secretary.

Regional Reports

I. The committee reviewed the following regional committee reports:

A. Report of Committee No. 2 Soil Survey Reports and Publications. Western Regional Conference.

1. This committee recommended that the range section in published soil surveys be dropped. Much of this section duplicates material listed in the soil series and mapping-unit descriptions. This conflict has been resolved in a recent reissue of Soils Memorandum-55.

2. Another recommendation asks the National Committee to consider adding liquid limit, plastic estimates, and compacted permeability to engineering tables in published soil surveys. The National Committee rejected this proposal because most soil scientists would not be able to estimate these characteristics with a reasonable degree of accuracy. However, such estimates may be possible after researching through electronic processing. This is something for the future. The apparent disparity in soil corrosivity ratings for concrete conduits between Soils Memorandum-53 and Engineering Memorandum-46 has been explained in a memorandum to the regional committee chairman by Messrs. Klingebiel and Francis.

B. Report of Committee No. 8, Soil Surveys on Urban and Urban Fringe Areas. Western Regional Conference.

No issues were raised in this report, but rather provided the regional workshop a commendable guidance statement for making and using soil surveys in rural areas experiencing rapid-urban expansion.

C. Report of Committee on Engineering Applications and Interpretations of Soil Survey Data in Non-Farm Areas. Southern Regional Conference.

This committee forwarded nine instruction sheets. These sheets were prepared for guiding interpretations in non-farm soil use. These were not intended for immediate use, but rather for field testing and discussion. These sheets were reviewed and will be returned to the regional committee with comments. Copies also have been circulated to other regional committees for their reactions.

D. Report of Committee on Engineering Applications of Soil Survey Data. North Central Region.

This committee reported on the impressive progress being made in compiling and coordinating engineering data used for interpreting soils for engineering use. It is the feeling of this committee that in dealing with engineering interpretations we need to remain aware that many engineers prefer and can use quantative data on those related soil characteristics. Also, this data. must be as accurate as possible. This workshop submitted a guide for rating soil bearing strength. This guide has merit, but we recommend changing the title to “Soil Limitations for Light Structures." The National Committee has been informed that a guide sheet entitled “Soil Limitations for Low Buildings” will be issued as an attachment to a SCS memorandum on Guides for Recreational Interpretations. The National Committee requests the North Central Regional Committee modify their working guide to serve as a supplement to the guide issued in the SCS memorandum.

E. Report of Committee on Use of Soil Surveys for Suburban Planning. North Central Region.

This committee made a statement worthy of repeating in this report, that is, “Rating sheets should be used as guides, not as arbitrary rules." This allows for deviations from ratings supplied by the guides. Also, the National Committee hesitates to recommend a precise policy for arriving at a rating of a soil-use limitation. After considering ratings of individual factors, the most limiting may be the best selections, but in a certain use the best policy may be one of reflecting the interreaction among the rating factors.

E. In summary of Regional Workshop activities it is very evident that these committees expend much energy in documenting their experiences through the guide sheets. These guide sheets are reviewed by other regional committees and the National Committee. Eventually, after much testing and review, they appear as portions of the SCS soils memoranda and soils handbooks. The handbook "Guide for Interpreting Engineering Uses of Soils" is in reproduction and will be issued in the very near future. It is recommended that this handbook be made available to participants of the National Cooperative Soil Survey. State Highway personnel who cooperate in soil testing should be considered. Another example, soils memorandum including guides for recreational interpretations is in final form and will also be issued soon. The National Committee proposed to continue screening guide sheets and forwarding to Dr. Kellogg for Soil Conservation Service consideration.

II. Training in Non-Farm Soil Survey Interpretations:

The National Committee researched the possibilities of on-campus training facilities in city and regional planning. The Georgia Institute of Technology and the University of Arkansas conducts a two-week summer institute in Urban Planning on the campus of Georgia Tech. Professor Howard K. Menhinick, a leader in this field, has agreed to modify the curriculum of this institute to fit our needs. The committee recommends that the Soil Conservation Service send three men--a soil scientist, engineer, and a soil conservationist to monitor the institute this summer. In addition, the committee recommends that the national training committee of the Soil Conservation Service consider this institute in their next meeting. A copy of this motion will be forwarded to this agency. Mr. William H. Bender has been selected to represent the soil survey at this institute.

III. Mr. Val Silkett discussed the progress of the Resource and Conservation Development Projects. These projects are vehicles for channeling the resources of Public Agencies into a single objective, that is, improving the economic situation in rural communities. These projects place a heavy drain on soil information. Both general and detailed soil surveys arc used. The project in Gwinnett County, Georgia, which is unique in that it is part of the Greater Atlanta metropolitan area, was presented as an example of intensive use of soil survey.

IV. Reproduction of soil survey field sheets for interim use. Mr. Kocchley explained a cheap procedure which has merit. The quality of this reproduction is no better than the original drafting of the soil scientists. Joining, open boundaries, delineations without symbols, and sloppy symbols plague these sheets.

Committee Recommendations

It is recommended that this committee be continued with the following responsibilities.

1. Continue the review, testing and sorting of guide material prepared by the Regional Committees for making interpretations of soil survey.

2. The handbook for interpreting engineering use of soils will be issued in the near future. The Regional Committees are requested to assemble comments and experiences in using this guide and forward them to the National Committee for consideration.

3. The Regional Committees are urged to facilitate the collection of experiences and research in the broad field of "correcting soil limitations in non-farm uses." For example, what changes are made in designs of concrete slab foundations when the soil limitations vary from slight to severe. Or what physical soil manipulations are being made to overcome soil limitations. The National Committee will evaluate these findings and make them available to other regions.

Committee Members:		Visitors
Lindo J. Bartelli, Chairman	C. W. Koechley	G. R. Craddock
B. A. Barnes	0. C. Lewis	V. W. Silkett
W. II. Bender, Secretary	R. M. Marshall	Paul Lemmon
R. W. Eikleberry	A. C. Orvedal	Alvin R. Southard
R. W. Flach	Adrian Pelzner	Charles E. Kellogg
L. E. Garland *	J. D. Simpson	Noble Peterson
F. D. Hole	Rudolph Ulrich *	Walter Ehrlich
A. A. Klingebiel	S. J. Zayach	

*Committee members not present at workshop.

Kellogg: In regard to the last point mentioned in the job ahead, I believe it is possible to overcome limitations on a soil with severe limitations by redesigning a foundation at a cost of say a thousand dollars; however, I believe that the universities should look into this matter.

Psschall: Engineers are concerned about the term "low buildings" used in one of your guide sheets. In other words, the term "low buildings" is objectionable to them as is the term "bearing strength." You can overcome this by using the term "light buildings."

Nylander: In connection with light buildings, a good term to use when necessary, is "normal foundation loading."

Grossman: Department of Civil Engineering, University of Illinois, recently published a study on factors that determine the effectiveness of lime stabilization. The critical factors are probably largely incorporated in our new classification system. The North Central Regional Committee should determine the extent to which the new classification system permits grouping of the Illinois soils according to their lime reactivity. Organic matter is critical in this respect and we also have this information in our new classification system.

Orvcdal: With regard to lime stabilization, if the lime required is in the vicinity of 6 to 7 percent, this is a reasonable amount; but if the requirement ranges up to 12 percent, then this is too high.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE
OF THE COOPERATIVE SOIL SURVEY
New Orleans, Louisiana, January 23-27, 1967

Report of the Committee on Soil Survey Procedures

The reports of two regional committees and other items brought to our attention were considered by this committee. The two reports considered were those of the 1966 Western Regional Committee on Soil Correlation Procedures and the 1966 North Central Regional Committee on Soil Correlation Principles, Procedures, and Rules.

Comments on the two regional committee reports and comments and recommendations concerning two additional items constitute the report of the committee.

1. Consideration of report of the western Regional Committee.

Two recommendations made by the Western Regional Committee are similar to, or parallel in part two, recommendations made by the 1965 National Committee on Soil Correlation Procedures. The present committee endorses these recommendations of the 1965 National Committee, which are repeated here for convenience and to give them emphasis.

A. 1. "It is recommended that information be included in the report of the initial field review....on the quality of the latest approved descriptions for the soil series occuring in the survey area. It is intended that this would involve a review of the series concepts as well as the series descriptions themselves. Plans should be made at the time of the field review, or shortly thereafter, for revision of series descriptions that are considered inadequate. The State soil scientist should arrange for assignments of responsibility and target dates for revised draft descriptions of those series having type locations within the State. For those series having type locations outside the State, he should notify the appropriate State soil scientist or the principal soil correlator of the date the revised series description will be needed. In any event, the principal soil correlator should be informed of the plans for revision of series descriptions."

A.2. "/It is/ recommended that a comprehensive progress field review be made approximately one year prior to completion of the mapping. It is intended that this field review include a thorough review and testing of the documents of the survey and preparation of a draft field correlation that is as nearly complete as possible. New and revised series descriptions that are needed for completion of the correlation should be ready for final review and approval by the principal soil correlator at this time."

The committee noted that the intent of these two recommendations will be included in procedures set forth in the Soil Correlation Manual that is being prepared.

The objectives of several other recommendations of the Western Regional Committee have either been dealt with in recent SCS Soils Memoranda or Advisory Notices of the SCS Regional Technical Service Centers or plans have been made to provide the requested guidelines in documents that are being prepared. Consequently, no action by this committee on these recommendations seemed necessary. The subjects of the recommendations and the documents or- comments concerning them are as follows:

a. Format and guidelines for the description of the several kinds of soil mapping units for use in soil survey manuscripts and descriptive legends. A Guide to Authors of Soil Survey Manuscripts is being prepared.

b. Rules for naming the several kinds of soil mapping units. Guidelines to supplement those given in the Soil Survey Manual will be included in the Soil Correlation Manual that is being prepared.

c. Legends for soil surveys that include more than one level of mapping intensity. SCS Soils Memorandum 62, l-27-66.

d. Availability to State soil scientists of the latest soil series descriptions. SCS Soils Memorandum 11, rev. 12-21-65.

e. Regional groupings of soil series in the soil classification system. Regional groupings of series at the family and subgroup levels of the present classification system will be wde during 1967, according to present schedules.

f. Use of a set of "soil correlation cards" for each survey to facilitate preparation of the field correlation and the final correlation . This procedure is currently being tested in each of the four soil correlation regions.

2. Report of the North Central Regional Committee.

The only recommendation of the regional committee concerned names for mapping units of monotype series. It was referred to the Committee on Application of the New Soil Classification System of this conference. That committee dealt with the recommendation.

3. Application of automatic data processing methods to soil survey activities.

The committee devoted about half of its time to a discussion of the possibilities for applying automatic data processing (ADP) methods to soil survey activities. As a part of that discussion Dwight Swanson discussed several examples of applications of data processing methods that he has made. These included storing a large amount of engineering test data for soils on a set of punched cards, processing the data to provide aids useful in estimating properties of soils for which test data are lacking, and testing alternative class limits for grouping soils. He also showed the committee an example of how descriptive morphological data can be put in a form suitable for ADP methods. Use of ADP methods by the Soil Survey laboratories for calculations involved in their work and the analysis of Hawaiian soil survey data using ADP methods reported by Dr. Swindale were noted.

It was pointed out that advantages of ADP methods should be considered for aspects of the work that require recall or manipulation of a large amount of data or information and for tedious jobs. In considering possibilities for improving the efficiency or effectiveness of soil survey activities by using ADP methods we need to know which activities would likely be amenable to the methods, what we would want from the methods, and the practicality of applying the methods.

The committee agreed that the soil survey should take a serious look at potential uses and practicality of ADP methods in its activities.

The committee recommends that a work group be appointed to (a) develop a priority list of needs In soil survey work that can be met by automatic data processing methods, and (b) consult with specialists in the automatic data processing field to determine the practicality of using such methods to meet those needs.

4. The committee suggests that it be continued. Suggested future activities of the committee are:

a. Consideration of and dissemination of information concerning improved field techniques for examining and mapping soils, such as new or improved tools for examining soils and special aerial photography as an aid for mapping soils. This would involve asking regional committees to compile available information on new tools and new techniques.

b. Further consideration of automatic data processing methods may be desirable.

Committee members:

A. R. Aandahl *	J. W. Kingsbury
F. J. Carlisle, Chairman	E. A. Perry
R. E. Daniell	R. S. Robertson
C. M. Ellerbe	D. W. Swanson
R. D. Hockensmith	B. J. Wagner, Secretary
W. M. Johnson	H. P. Ulrich

The following people participated full-time or part-time in the committee meeting in New Orleans: L. D. Swindale, W. L. Mathews, P. E. Lemmon, C. W. Koechley, J. D. Rourke, and J. A. Williams.

* Not present at meeting in New Orleans.

Notes on discussion by the Conference following committee report, 1-26-67.

Kellogg: Would like to have seen the committee place emphasis on the need for more effective progress field reviews. Effective progress reviews that identify inadequacies of the survey and that specify by whom and when the deficiencies are to be corrected are essential to reduce waste of funds and to improve efficiency and effectiveness of the soil survey. Common deficiencies that should receive special emphasis in reports of progress reviews are: excessive detail on field sheets relative to objectives and publication plans for the survey, excessively long map symbols, unnecessary mapping units in the legend, incomplete or inadequate soils handbooks, and the like.

Kellogg: Thinks a work group should be set up in the Washington office to consider application of automatic data processing methods.

Johnson: We must be careful to avoid having ADP specialists tell us how to run our program. Statisticians may suggest a large volume of studies that would outweigh advantages of the method.

Koechley: We need a young soil scientist who is well trained in statistics and in ADP methods. He should understand the soil survey program and what we need from ADP.

Kellogg: Would be pleased to have requests from the Principal Correlators for training of man on their staffs in ADP. Training of people on State staffs is also needed.

It was pointed out in discussion that there are many places throughout the country where training in ADP can be obtained.

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Report of the Committee on Soil Moisture
and
Partial Report of the Committee on Climate

The moisture and climate committees met jointly for one of the two sessions. Most of the time of the moisture committee was devoted to self education. Reports were given by several members; these appear in an appendix. The reports by Hill and by Turner do not appear in the appendix; the report by Williams was not presented orally.

1.0 Subjects Discussed

1.1 Water Table Dafinitions: A set of water table definitions was proposed in 1963. These definitions were reviewed and modified in 1965, and again reviewed this year. No changes were suggested by the 1967 committee. The committee discussed the importance of oxygen content and temperature of the water in determining the influence of extended saturation on soil color. The fact that continuous free water is commonly not observed in fine-textured soils was recognized, but no modifications in the water table definitions were offered. The possibility of defining saturation in fine-textured soils on the presence of water in excess of that retained by natural fabric against 5- to 10-cm. tension should be explored.

1.2 Water Table Depths and Duration Classes: Two regional committees discussed the water table depth classes proposed in 1965:

0 to 10 inches
10 to 20 inches
20 to 40 inches
40 to 80 inches
80 to 240 inches
>240 inches

The principal advantage of this set of classes is that the depths coincide with limits in the new classification system. The northeast committee recommended adoption. The north-central committee also recommended adoption, but stated that a break at 60 inches may be useful. Opinion was divided within the northeast committee whether depth should be measured from the top of the 0 horizon or from the top of the first mineral horizon. Both regional committees stressed the superiority of defining water table by depth-duration classes rather than by depth alone.

Paschal1 and Turner emphasized the difficulties in inferring the soil moisture regime from morphology (see Appendix.) It was pointed out that the origin of the moisture committee was concern with the drainage classes in the Soil Survey Manual. The influence of high carbonate on the morphological expression of wetness was commented upon. The possibility of using the proportion of crop failures as an index of wetness received attention, as did whether perched and true water tables should be distinguished in establishing criteria of wetness. The possible importance of deep water tables, the order of 7 maters. was reviewed, Deep water tables receive considerable attention in the USSR. No experience was brought forth by the committee in support of their importance.

1.3 Rate of Water Movement Through Soil: Much interest now centers on evaluation of sites for small sewage disposal systems. Percolation tests are being widely made for this purpose. An article by Witwer[1/] provides a good description of the subject from the point of view of a sanitarian. The northeast committee had a symposium on percolation testing. Franzmeier's comment at the symposium that evaluation of soils for sewage disposal gives tacit approval to the use of small sewage systems should be borne in mind. Concern was expressed in the national meeting over the possible effects of effluent at a distance from the originating sewage disposal installation.

1.31 Permeability classes. Permeability classes in the Soil Survey Manual and those proposed subsequently in national committee reports are based on measurements by the Uhland core method. This determination yields a measure of rate of water conduction in the saturated state (so-called saturated hydraulic conductivity). Percolation rates are now mostly being obtained by the auger hole method. These are field measurements usually made to assess suitability for small-scale sewage disposal systems. They yield an estimate of the rate of movement of water for what is usually an unsaturated condition. The values are not comparable to those obtained by the Uhland core method. The Uhland core determinations, however, since they measure saturated flow, are relevant to design of tile drainage systems. With this as background, the regional committees were asked whether modification of the present permeability classes should be attempted until percolation test data had been more fully integrated into our thinking. The response of the regional committees was to put the subject of class limits in abeyance.

1/ Witwer, D. B. Soils and their role in planning a suburban county. In Soil Surveys and Land Use Planning, edited by L. J. Bartelli, *et al.* Amer. Soc. Agron., Madison, Wis. 1966.

1.32 Percolation test evaluation. 2/ Hill 3/ emphasizes the need to distinguish between percolation tests under saturated and unsaturated conditions. He indicates that most tests are performed under unsaturated conditions even after prolonged wetting. Under conditions of unsaturated flow, a gravel zone under coarse loamy material acts as a barrier to water movement. Under saturated flow conditions, however, this same gravel zone does not impede. As Hill suggests, there is a tendency to assess the probable percolation test results for a soil based on its performance under saturated flow conditions, when in fact the tests are rarely if ever run on saturated material,. There is the further question whether testing in the saturated state has relevance. Once the soil is saturated, for many purposes the jig would seem to be up. Moreover, should rates of lateral ground water movement be considered a soil property? Is it not rather a property of a landscape unit that usually includes several soils?

Hill makes the further point that laboratory hydraulic conductivity obtained by the Uhland core method, since it measures saturated flow, "is greatly increased by the presence of large pores in the soil, whereas, the percolation rate from a test hole may be decreased by the presence of large pores." He than goes on to state that it is not surprising that the field percolation rates and the laboratory determinations of saturated flow of cores are not proportional.

1.33 Terminology. 4/ Both permeability and conductivity are constants in different formulations of Darcy's Law, which relates the volume of fluid transmitted per unit time per unit cross sectional area to the driving force. Permeability is descriptive of the medium. It has units of length squared. Permeability is related to conductivity by

$$\text{Permeability} = \frac{\text{conductivity} \times \text{viscosity fluid}}{\text{density fluid} \times \text{gravitational constant}}$$

Conductivity is expressed in velocity units (inches/hr.). If the material in transport is a liquid, the term, hydraulic conductivity, is commonly used. "Hydraulic conductivity" would seem more suitable than "permeability" as a name for the present permeability classes since these are commonly defined in velocity units (inches/hr.). There are several methods for measuring the hydraulic conductivity. They have been divided 5/ into field and laboratory methods,

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2/ The following discussion of Hill's work is by the committee chairman. Hill reported orally to the national committee.

3/ Percolation testing for septic tank drainage, Hill, D. E. Conn. Agr. Exp. Sta. Bul. *678. 1966.*

4/ Discussion by committee chairman.

5/ Methods of Soil Analysis Part 1, C. A. Black, Ed., Agronomy Monograph No. 9. Amer. Soc. Agron., Madison, Wis. 1965.

and within field methods to those suitable for above and below the water table. The methods yield hydraulic conductivity data if the assumptions are obeyed. Percolation tests differ from the hydraulic condutivity measurements.

The units of the test results may be the same, but the geometry of the percolation test is not usually defined, and so the hydraulic conductivity cannot be calculated.

The suggestions to follow are offered for discussion.

Drop the term, permeability, where units of rate (inches/hr., for example) are applied. Substitute "percolation rating" where appropriate.

Use the term, unsaturated percolation, for the values obtained by the common auger hole field test unless evidence of saturation is supplied.

Use the term, saturated percolation, if accompanied by evidence of saturation during the auger hole field test.

Apply the term, hydraulic conductivity, only to percolation test data that have been analyzed in terms of Darcy's Law.

Refer to data obtained on saturated cores by the so-called Uhland core method as "saturated hydraulic conductivity" values. Do not equate them with unsaturated percolation values.

1.4 Available Water:[6/] Estimates of available water from the water-retention difference between 15-bar and some lower tension are so hedged with uncertainties that there is a question whether they are worthwhile. It is now generally accepted that determinations of the retention at low tension on fragmented samples, unless coarse textured, frequently lead to overestimations of available water. Available water is commonly reported on a volume basis (in./in.) and allowance is usually made for coarse fragments. Use of 0.1- or 0.06-bar in place of 1/3-bar is common for materials high in sand and low in clay. Lass attention seems to be paid to the possibility that 1/3-bar is unsuitable for very clayey materials. People have drawn attention to the desirability of determining several points on moisture desorption curves. There is a feeling that water retention can be related to clay mineralogy more closely than it is now. The north-central committee suggests that the term "available water" be changed to "plant available water." Their point is that the roots have to get to the moisture in order for it to be available. Root growth may be restricted because of temperature, physical impedance, high water table, lack of certain nutrients. Perhaps the term, "water retention difference," would be suitable for the laboratory number.

6/ Discussion by committee chairman.

Evidence has been accumulating to indicate little difference in the retention against 0.06- or D.l-bar by fine and medium sand separates. The vary fine sand retains markedly more. The question arises whether particle-size breaks in the sands other than the proportion of very fine sand have much utility in respect to moisture retention.

The possibility of measuring water retention at 0.06-bar on sands was discussed briefly.

1.5 Yield Soil Moisture Regime: 7/

The reports in the Appendix should be consulted. Holmgren outlines the use of climate information to estimate the soil moisture regime. Newhall presents a preliminary analysis of some long-term soil moisture data for the Great Plains Dryland Stations. Williams presents the views of the Western States concerning application of the moisture criteria in the new classification system. Paschall discusses the problems encountered in proper assessment of the soil moisture regime in the Northeastern States.

For the 1965 national meetings, the chairman wrote the State soil scientists for information on long-term soil moisture data or studies in progress to obtain such data. A summary was distributed to committee members. For the 1967 meetings, inquiries were sent to the ARS personnel in hydrology and to the Forest Service. Replies were circulated to members of the national committee. Information was also obtained on the soil moisture measurements being made by the Snow Survey. Franklin Newhall has been given assistance in his attempt to utilize the soil moisture data obtained by the Great Plains Dryland Stations (see Appendix). Several ARS hydrology installations have been visited.

Out of these activities has come a conviction by the chairman that the Washington staff should have one or more man devoting an appreciable part of their time to the integration of soil moisture information into the soil survey. Those involved should be conversant with climatology, soil morphology and classification, and plant-soil relationships. A principal activity should be to work with people in ARS and the Forest Service. The personnel in these other agencies need to more closely integrate their work with the soil survey. Their study areas need to be evaluated in terms of the soils represented and their classification in the new system. Attention needs to be paid to obtaining data that are relevant to classification, and which can be interpreted by the soil survey. Such considerations should be voiced when the studies are planned. To realize this, two things would be needed: the administrative doors opened in Washington; end the presence during the early planning of soil survey representatives who have the technical competence to gain the respect of the personnel at the field locations.

7/ Discussion by committee chairman.

The reaction of the national committee was that the problems of working from the Washington level downward ware extremely formidable. Contact should be at the State level. State soil survey personnel should work with the personnel in charge of the field soil moisture projects.

Formal recommendation C was an outgrowth of these discussions.

2.0 Formal Recommendations

A. The soil moisture committee should be continued.

B. The principal activity over the next two years should be the formulation of descriptive statements of the water table regime in terms of kind of water table, depth of occurrence, duration, and season of year, which would replace drainage classes of the Soil Survey Manual and be used in the new classification system in place of morphological features in framing definitions.

C. A request listing the specific soil moisture information needed by the Soil Survey should be included in the next statement on research needs submitted by the SCS to the ARS.

D. The regional committees should consider alternative terminology for the description of rates of water movement through the soil that (1) would be in keeping with terminology used by soil physicists, and (2) would be descriptive of the conditions under which the measurement was made.

3.0 Suggestions to Regional Committees

A. Coordinate activities of regional moisture and climate committees. Characterization of the moisture regime from climate information would seem a possible fruitful area of mutual concern. Another area of mutual concern might be situations where soil temperature estimates from climate data may be invalidated by the water regime, for example, where moving water tables occur or where large quantities of irrigation water from deep wells are applied.

B. Consider formal recommendations B and D of the national moisture committee.

C. Collect information on field soil moisture regimes. Keep the national moisture committee informed of such studies.

D. Review the moisture criteria in the new classification system and make recommendations for changes if needed. Such a review might be combined with an assessment of what kind of field soil moisture information is available and what would be desirable.

4.0 Participants

Moisture Committee	Climate Committee	Visitors
R. B. Grossman,* Chairman	Rudolph Ulrich, Chairman	W. A. Ehrlich
L. T. Alexander	J. V. Drew*	D. E. Hill
J. V. Drew*	R. W. Eikleberry	Charles E. Kellogg
G. S. Holmgren*	R. F. Harner	L. D. Linnel
Franklin Newhall*	Y. H. Havens	A. R. Southard
A. H. Paschall*	C. M. Ellerbe	
J. D. Rourke*	J. W. Kingsbury	
G. D. Smith*	Franklin Newhall,* Actg. Chairman	
R. I. Turner*	B. J. Wagner	
J. M. Williams		

* Present

5.0 Conference Discussion

Smith: Saturated hydraulic conductivity a little long for tables.

Barnes: Cannot use abbreviations in column headings.

Orvedal: What about research in field soil moisture regimes?

Grossman: Problem of coordination with groups doing research.

Kellogg: Perhaps we should arrange a meeting in Washington with people in the Forest Service and Agricultural Research Service.

Smith: Have attempted to coordinate. Problem is that they make functional studies of moisture as related to other variables, not a study of the regime itself. Also lack standard methods. Often short-term projects.

Grossman: We have to supply the assistance needed to get the kind of information required by the soil survey from projects by other agencies.

Hole: Sporadic and uncoordinated neutron probe installations in Wisconsin.

Flach: No information available of use to Soil Survey in the vicinity of Riverside.

Orvedal: Remember climatologists. Should strengthen our ties with ESSA.

Kellogg: Permeability versus hydraulic conductivity? We see no objection to the change, but permeability is now used in publications. This is another problem for discussion and correction in the revised Soil Survey Manual.

Swindale: State Experiment Station Directors might help in getting funds for cooperative moisture regime projects.

APPENDIX

Climatic Inference of Soil Moisture

G. S. Holmgren

I. Construction of Water Balance Sheet

A. For Watershed

$$SM = P - Q - ET$$

B. For Pedon

$$sm = p - q - et + q' - d$$

where

SM, sm = soil moisture
P, p = precipitation
Q, q = runoff
q' = "run on"
d = deep percolation

II. Evaluation of Variables

A. Precipitation
Problem of extrapolating climatic data

B. Runoff
Complex relation between slope, texture, bulk density, vegetation and rainfall intensity

C. **Deep percolation**
Depends on rainfall frequency, texture, slope, etc.

D. "Run on"
Related to integrated runoff from higher geomorphic positions

II. E. Evapo-transpiration

1. Water supply non-limiting: Estimation from weather parameters

a. Thornthwaite; temp, day length

$$E_T = 1.6\ (10\ T/I)^a$$

where
E_T = potential transpiration/mo.
T = mean air temp. (°C.)
I = heat index; sum of 12 monthly indices given by
$i = (T/5)1.514$
a is a cubic function of I

b. Blaney and Criddle; temp, day length, relative humidity, crop constant

$$u = ktp(114-h) = kc$$

where
k = crop constant
t = mean monthly air temp.
p = monthly % of daytime hours in year
h = mean monthly rel. humidity
c = climatic factor (composite value)

c. Turc; temp, length of season, radiant energy, crop constant, precipitation

$$E = \frac{P+a+V}{\left\{1 + \left(\frac{P+a}{e} + \frac{V}{2e}\right)^2\right\}^{\frac{1}{2}}}$$

where
E = evap. in 10 day period (mm.)
P = precipitation in 10 day period (mm.)
a = est. evap. (in 10 day period) from bare soil assuming no precip. > 10 mm.
V is a crop factor Incorporating dry yield, length of growing season and a crop constant
e is evap. capacity of air calculated from temperature and incoming radiant energy

2. water supply limiting

a. Availability of water over range

Uniform - Veihmeyer

Decreasing

b. Effect of soil depth

c. Effect of vegetation type

III. Summary

Quantitative inference to pedon soil moisture regime from soil, landscape and climatic variables is extremely difficult and has a large inherent uncertainty. It is doubtful whether the Soil Survey should be concerned with unraveling these relationships. The alternative is to extead directly observed data using "judgment" incorporating these variables. Efforts should therefore be extended toward developing local inference patterns rather than universal relationships.

Collection and Analysis of Long-Term Soil Moisture Data

Franklin Newhall

The regime of soil moisture has been given considerable importance in the new system of soil classification. The cumulative or continuous duration of time during the year that some soils in some layers are dry is regarded as a diagnostic morphological property of these soils. The duration of the dry condition in soil, being a complicated function of external factors such as time and intensity of precipitation and solar radiation, and of internal factors such as soil texture and aggregation, does not usually follow normal monthly rainfall in a straightforward manner. Therefore, it becomes necessary, first, to determine what is the actual soil moisture regime and, second, to see if it can be approximated by a practical method of using climatological data.

To meet the criterion "Dry Soil" in the new system of soil classification, it was decided 1) that soil would be regarded as dry when its moisture content was equal to or less than that at 15 bars tension, and 2) that the chief layer of interest was the moisture control section, originally extending from 10 down to 40 inches but now extending from 7 to 20 inches. It was realized that the layers below the moisture control section would also be of interest, and they were studied, but the layer above the control section, which reflect mainly day-to-day rainfall during the unfrozen period, was not studied. Analysis techniques used in climatology were used on the soil moisture data. This means that the record for a given soil preferably would had to have been taken at the same site and under the same ground cover for a number of years.

To actually obtain soil moisture data, previous work by the Soil Moisture Committee was the starting point. Questionnaires were sent out in 1965 and 1966 by the Chairman of the Soil Moisture Committee, asking for information on long-term soil moisture records. These went first to the State soil scientists and later to a selected list of hydrologists, hydraulic engineers, soil scientists and agronomists of the Agricultural Research Service. **The excellent response indicated that a great many data have** been recorded, particularly in recent years and that these were freely available to any one who wished to come after them. It was not entirely possible, however, to tell from the replies exactly which data would meet requirements which had been tentatively set up. These requirements were: 1) Records for ten years or longer from a single site with only one kind of plant cover, preferably grass. 2) The 15 bar moisture percentage known, or alternatively, the site available for visiting at the present time and sampling for 15 bar moisture. 3) The record taken six or more times per year. 4) The moisture sampled at several depths down to one meter or more. Because of the uncertainty about which data would be suitable, the known data were evaluated and collected during personal visits, at which time additional data were sought and, where possible, data sites visited.

Most of the data from the old USDA Dry Land Agriculture (DW) Stations were obtained from the archives at Bushland, Texas, maintained by the ARS. Data for Garden City, Kansas, North Platte nnd Scottsbluff, Nebraska Dickinson and Mandan, North Dakota, and Ardmore and Newell, South Dakota were copied and the stations later visited. DLA Stations which were not visited but for which data were obtained, were Colby and Hays, Kansas, Havre and Huntley, Montana, Tucumcari, New Mexico, Williston, North Dakota, Woodward, Oklahoma, and Dai hart, Texas. Akron, Colorado was visited but no data secured. Other data were obtained from ARS Stations at Rosemont, Nebraska, McCredie, Missouri, and Fennimore and Colby, Wisconsin, and the first three of these stations visited. Data for about 10 Iowa locations were obtained at Ames from the Iowa Agricultural Experiment Station, but none of the locations was visited.

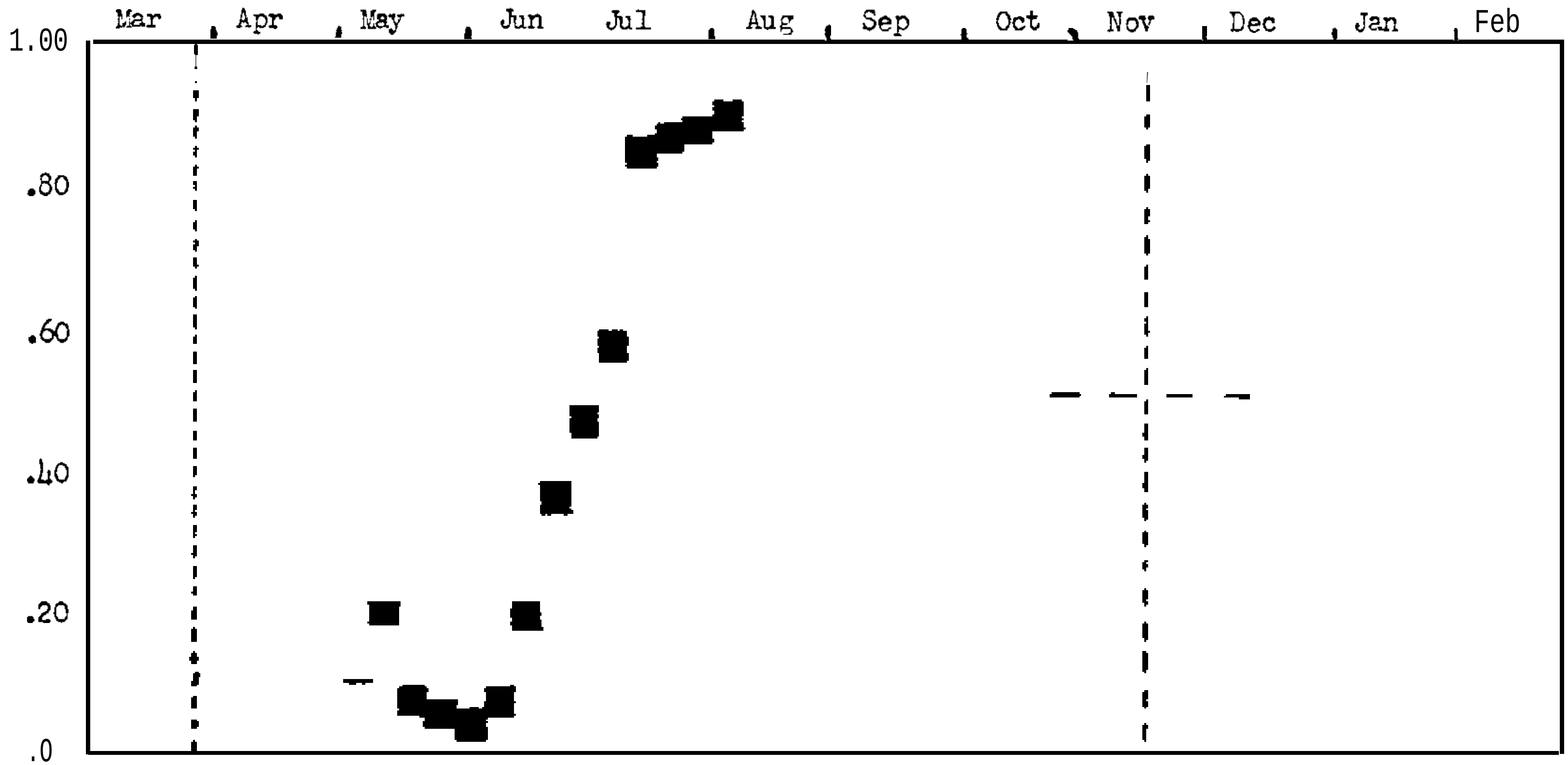
Discussion with personnel at various stations indicated that a great many more data exist than were collected. These uncollected data usually would fail to meet even relaxed criteria fur long-term soil moisture records. The data were usually taken in connection with specific, short-term experiments and are under a variety of plant covers.

A simple analysis of some of the data gives the probability of dry ground. Soil moisture percentages which had been observed during the same calendar week of any year were classified as either dry or non-dry. according to whether the moisture percentage was equal to or less than the percentage at 15 bars tension, or was greater than at 15 bars tension. This was done for 9 locations using moisture in the 7-20" layer and 4 locations using moisture in the 24-36" layer. The probabilities, plotted for successive weeks, present a regime of probability of a dry control section or layer, see Figure 1, Moisture Control Section, and Figure 2, 24-36" layer at Havre, Montana.

The preliminary analysis given here, merely expressing probability as above or below the 15 bar moisture percentage, uses only part of the information contained in the record oi soi 1 moisture. It is hoped that later analyses wi.ll use more information to depict the moisture regime in more detail, particularly at higher moisture contents. But since the number of precipitation data will probably always be much greater than the number of soil moisture data, it is also hoped that analyses of soil moisture regimes will lead to depiction of precipitation regimes useful in soil classification and interpretation.

Fig. 1 PROBABILITY OF DRY* sm. IN THE 7 TO 20" LAYER

Havre, Montana
Record: 1916-48; 517 soil moisture observations from continuous wheat plots
Soil: Joplin clay loam

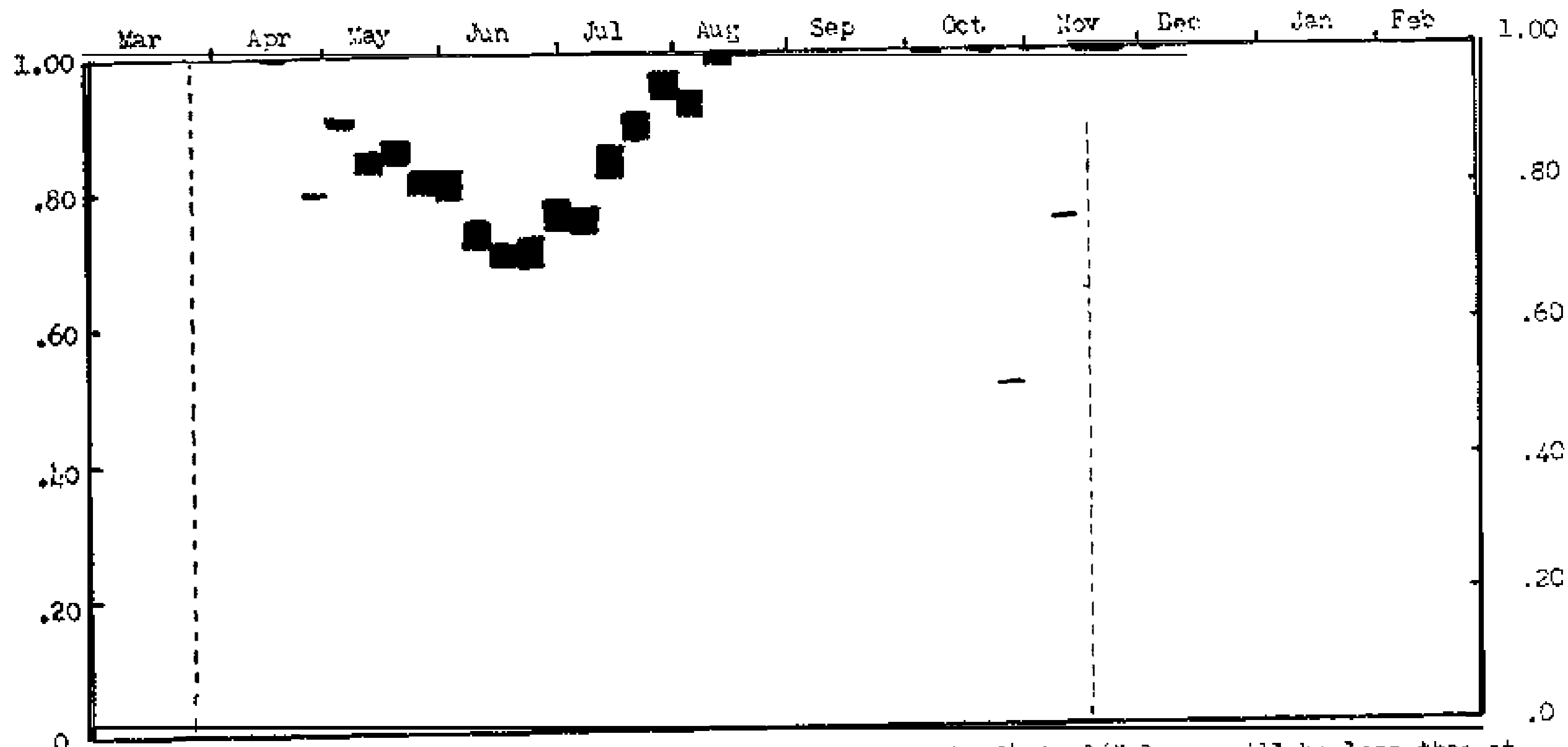


*Ordinate: Observed (unsmoothed) probability that the soil moisture in the 7 to 20" layer will be less than at 15 bars tension. Top of mark indicates the probability, thickness of mark indicates relative number of observations in the given calendar week.
Abscissa: Calendar date by weeks from March 1st. (No more than one probability value per week)
Note: Dotted vertical lines give date when average daily air temperature rises to 32° F in Spring and drops to 28° F in Autumn, as interpolated between average monthly temperatures.

Fig. 2

PROBABILITY OF DRY* SOIL IN THE 24 TO 36" LAYER

Havre, Montana
Record: 1916-48; 519 soil moisture observations from continuous wheat plots
Soil: Joplin clay loam



*Ordinate: Observed (unsmoothed) probability that soil moisture in the 24 to 36" layer will be less than at 15 bars tension. Top of mark indicates the probability, thickness of mark indicates relative number of observations in the given calendar week.

Abscissa: Calendar date by weeks from March 1st. (No more than one probability value per week)

Note: Dotted vertical lines give date when average daily air temperature rises to 32° F in Spring and drops to 28° F in Autumn, as interpolated between average monthly temperatures.

Soil Moisture Problems in the Northeastern States

A. H. Paschall

Rainfall, on the average, is adequate to supply the needed soil moisture in the Northeastern States. Possible exceptions are the shallow and the sandy soils.

Ground water levels, as measured in lined wells, show a common pattern. The level lowers beginning in May or June, reaches a low point in August or September and starts rising toward the surface in September or October. Wet soils reach their peak in December or January, and the less wet soils peak in February or March, except in very wet years when the peak occurs in December for all soils. These statements on ground water apply to soils with free surface drainage. They do not apply where there is ponding by natural or artificial means.

Five drainage classes are recognized in the Northeast: well, moderately well, somewhat poorly, poorly, and very poorly, The ground water pattern for the four classes showing restriction in drainage is illustrated in Figure 4, page 7 of Walter Lyford's publication - Water Table Fluctuations in Periodically Wet Soils of Central New England. Harvard Forest Paper No. 8, Harvard University.

It is noted from this figure that during the growing seasons the moderately well and somewhat poorly drained soils show a ground water level below 60 inches in dry years, below 40 inches on average years, and above 40 inches for a good part of the wetter years. The poorly drained and very poorly drained soils have water tables below 40 inches during dry years, above 20 inches on average years, and, frequently at surface during wet years.

Our problems can he catalogued in this manner:

I. Problems of the Wet Suborders

a. In fine-textured soils, too many very poorly drained soils fail to make the 60% of the mass requirement and so are Aeric.

h. In other textures, the opposite is true - too many poorly drained soils do make the 60% requirement and so are Typic. An additional requirement might help this -ie.- no subhorizon or layer within certain specified depth or part of the control section that have dominant chromas of 3 or more.

c. In Spodosols there are no mottles in the AZ, and if present in the B horizon, mottles are masked by organic matter. This is true in Aquods. The new requirement of 8 transition between the albic and the spodic horizon may be the answer to this. We have no information on this. This will apply to Haplaquods. Some of our soils may be Sideraquods and there is no way to show mottles in the top of the spodic horizon.

d. Many oi our soils are formed in materials with 2 chroma; thus, we have to go back to the "are saturated with water" phrase, and all Northeastern soils are saturated with water at some season of the year.

II. Problems of the "Dryer" Suborders

There are no dry soils in the Northeast so there are problems in the "Udi" and "Hapl" groups.

a. The moderately well drained and the well drained soils fall in the Typic subgroup in Entisols and Inceptisols. There is also the problem of most of our moderately well drained soils spilling over into the Aquic subgroup and that, of course, can be worked out by changing series specifications.

b. Low chroma mottles are not as universal as high chroma mottles in our moderately well drained soils. This is particularly a problem in the zone surrounding the Spodosol soil areas in the Northeast. a

C. The A 2 horizons of our well drained Glossoboric Hepludalfs exhibit mottles of high chroma. The Glossoboric Hapludalfs occur in areas around the Spodosols.

Application of the Moisture Criteria of the Classification System in the Western States

J.M. Williams

This report is in response to your request that I contact the States in the Western Regional area and get an expression on where we stand on the application of the moisture criteria in the system of classification. Representatives of all States were present at a classification workshop held in Portland during October of 1966. Comments that I make will reflect attitudes and remarks at that meeting.

A small minority expressed the opinion that soil moisture should be deleted as a criteria from soil classification. It was their opinion that the use of soil moisture as a criteria in classification would lead to inconsistency in classification. They pointed out the very meager data on soil moisture, limited weather stations in some areas from which climatic data can be projected, and the lack of studies correlating climatic values and soil moisture. It was thought that personal bias and not facts would determine the classification in many cases.

The majority felt that the soil moisture regime is a needed and useful criteria in the classification system. There were some questions as to what part of the soil profile the soil moisture criteria should be applied. A committee studied available data and recommended a control section 7 to 20 inches in depth. This was approved by a majority of the conference participants.

There was some discussion on application of the criteria. It was the consensus of opinion that additional data on soil moisture regimes were needed before a uniform application of the system could be effected. Sevens1 lines of action were discussed.

It was expressed that there is an immediate need to collect data on the soil moisture regime of key bench mark soils, These data can serve as reference points for applying soil moisture criteria. This initial study should be expanded to cover other bench mark soils as time and resources permit.

It was also the feeling that a study should be made correlating weather data with soil moisture regiws. It was pointed out that we have a number of weather stations in each State that have rather complete long-time data. We need to determine if these data can reliably be interpreted to reflect soil moisture regimes. Procedures need to be standardized for calculating soil moisture for climatic values.

There apparently exists some confusion under what conditions the soil moisture should be determined. An example was given of fallowed wheat land which would be dry for a significant period when cropped and moist on fallow years. A standard procedure needs to be adopted.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE
OF THE
COOPERATIVE SOIL SURVEY
New Orleans, Louisiana, January 23-27, 1967

Committee Report on Criteria for Classification and Nomenclature of Made Soils

The committee met Tuesday evening and again Wednesday morning. All members were present. In addition, Dr. Kellogg and Dr. Lemmon sat with us for part of the time. Grant Kennedy acted as secretary.

The committee spent the first session in a review of its assignment and discussed several of the soil conditions and problems with which individual members were familiar. Dr. Kellogg reminded the group that the Soil Survey Manual is inadequate in the treatment of miscellaneous land types. He expressed his conviction that a land type should not be used to name sizeable soil areas suitable for the production of the common commercial crops regardless of the fact that the soil may have been disturbed by leveling for irrigation, truncated by erosion and later reshaped by the bulldozer, or formed by hydraulic filling. It was soon evident that the committee had a long way to go if agreement were to be reached on how to name the various mapping units. Dr. Kellogg suggested the use of a general name in which the word “soils” would form a part. An objection was raised to the use of “made soils” because the name would be confused with a soil series name.

During the past year, the Chairman of the committee received a number of reports covering transect studies in California, Delaware, Kansas, Maryland, Mississippi, Kentucky, Tennessee, Texas, Virginia and West Virginia. Summaries of the rather lengthy reports from Mississippi, Tennessee, and Texas were sent to the committee members together with the complete reports from Kansas and Virginia. The California report was sent to all members of the committee directly from California. A report was received recently from Iowa regarding the consistency in mapping soil series, soil slope, and the eroded condition of the soil. There was not time to reproduce and distribute copies of this report to the cowittee. Furthermore, the report did not deal directly with the matter of man-made soils.

In addition to the reports of the transect studies, the committee also received the reports of the Northeastern, Southern, and Western regional committees on this subject including descriptions of observed man-made or disturbed soils.

The committee reviewed the reports of the transect studies briefly. The following statements should help to get an understanding of the kind of observations made in the several States which carried on the work.

CALIFORNIA STUDY

Three kinds of soil areas were reported by Grant Kennedy. These ware a hydraulic fill area, an area of deep cuts and fills for a subdivision, and an area where the soils had been altered by leveling and deep tillage.

The hydraulic fill area at Mare Island was seen to be relatively uniform and indicated that the characteristics of the soils could be predicted with some degree of accuracy from a few observations. The problems of mapping and classification would appear to be essentially the same as those for Alluvial soils. Such soils would classify as Orthents, Psamments, or Fluvents.

The soils in the area of deep cuts and fills were varied and formed a complex pattern. The heterogeneous mixture is not practical to classify below the level of Entisols. The author of the report suggested the name, "Made soils, complex."

The area of altered soils had been leveled and then "ripped" by a large chisel. The principal soil series was the San Joaquin series. Ripping fractured the duripan and caused displacement and arching of fragments of the diagnostic horizons above the duripan. Most of the disturbance occurred in the immediate path of the ripper. Where the ripping is wide-spaced, most of each pedon has the diagnostic horizons intact. Such areas could be classified as a ripped phase of the San Joaquin series. With closer spacing of the ripping, a complex of the San Joaquin soil and of X soil series, or a variant, might be the answer.

MISSISSIPPI STUDY

Transects were made in two general areas--the loess belt and the Delta. Eleven transects with 100 profile descriptions were reported from the loesa belt. Each examined pedon was classified into one of the following four classes: a) Memphis silt loam; b) Memphis silt loam, thin solum; c) Loring silt loam; and d) unclassified. Because the Memphis silt loam, thin solum, had a solum thinner than 32 inches--the minimum thickness permitted by the Memphis series description--this class was really a thin solum variant. The unclassified soils were of two kinds: a) Those that were cut almost to the C horizon; and b) those that consisted of fill and lacked an argillic horizon. The following composition of the transects was reported:

Memphis silt loam	39 percent
Memphis silt loam, thin solum	29 percent
Loring silt loam	3 percent
Unclassified	29 percent

A few of the profiles were seen to classify as Arents because of the recognizable fragments of the argillic horizon of Memphis silt loam.

The area in the Delta was shaped and leveled for drainage and irrigation, A total of 134 profiles were described briefly. Thirty-four percent of the disturbed soils were fills and sixty-four percent were cuts. The average fill was 7.5 inches and the average cut was 8.4 inches. All but 10 percent of the pedons were classified into present series based on texture, color, and reaction.

TENNESSEE STUDY

Five transects were reported from the loess country of northwestern Tennessee. The results were summarized es follows by the men doing the work:

"1. There is great variability in the amount of soil that has been removed and/or filled.

2. Only a small part of the area has enough of the original solum in place so that the series can be identified.

3. Once reclaimed, such areas are not conspicuous in the landscape. If the soil scientist is not already aware of the location of a reclaimed area, or if he does not carry out intensive field investigations, he is likely to map these areas as Memphis series, severely, or very severely eroded phases."

TEXAS STUDY

Transects were reported from two sections of the State--Collin end Erath counties in the north and the lower Rio Grande Valley. Brief profile descriptions were written for almost 300 sites.

The transects in the north dealt with the presence or absence of a mollic epipedon and with the thickness of the mollic epipedon, if present. All of the profiles were classified into established soil series on the basis of the information. The conclusion was that most mapping units would be a complex of Mollisols or of Mollisols and series from other orders.

The transects in the Rio Grande Valley were in areas that had been leveled for irrigation. The conclusion was that 42 percent of the pedons had surface horizons with a thickness that fell well within the limits of the Willacy series and that an additional 33 percent had surface horizons, though thicker or thinner, still fell within the limits of the series. About 15 percent of the pedons classified as Hidalgo series and about 10 percent were unclassified. These later were treated as mapping inclusions. The conclusion was that leveling had not changed the family or subgroup classification of the soil.

The review of the transect studies brought to mind the range of conditions presented by reshaped, altered, or man-made soils. Conditions range from shallow to deep cuts and from shallow to deep fills. The result may be a soil essentially alluvial in character with or without numerous strata or it may be an extreme complex of cuts and fills with wide variations in depth, texture, color, and reaction.

With these considerations in mind, the committee reviewed the reports of the regional committees.

REPORT OF THE NORTHEAST REGIONAL COMMITTEE

No critical comments were made by members of the national committee regarding the proposed use of "made soils" or to the proposed guidelines of the regional report. The profile descriptions of "made soils" from Delaware, Kentucky, Maryland, Massachusetts, and New York followed the general pattern of those reported in the transect studies already reviewed. Interest was expressed, however, in the transect of a graded mine spoil in West Virginia where the individual profiles were consistently similar in texture, color, amount of coarse fragments and low pH. As a result of shortage of time, the national committee did not spend as much time on the Northeast report as it probably deserves.

REPORT OF THE SOUTHERN REGIONAL COMMITTEE

The report of this committee was supplemented by descriptions of disturbed soils and materials from Kentucky, South Carolina, and Virginia. Due to the lack of a quorum at the meeting of the Southern Regional Committee, no recommendations were forwarded for the consideration of the national committee.

REPORT OF THE WESTERN REGIONAL COMMITTEE

The national committee found this report to be a constructive statement and spent some time in a review of the regional committee's recommendations. Statements here will refer either to specific recommendations or to portions of recommendations of that report.

Recommendation A

"Discontinue use of the term Made Soil. Artificially made or altered soil may be considered as soil under the present soil classification system,"

The reaction of the national committee was that this was an acceptable statement. This matter, however, came up again in the discussion.

Recommendation B

The national committee agreed with the intent of the proposed definition of Made land but offers the following definition as a replacement. "Made land consists of areas filled or covered artificially with miscellaneous material including trash, stones, and industrial waste, but excluding areas covered with essentially earthy material to a depth of 40 inches or more." The proposed change makes the definition specific in terms of depth of earthy material and eliminates the reference to non-suitability for commercial crop production.

Recommendation C

The national committee concurred in these recommendations except for the replacement of "commercial production" by "plants."

Recommendation D

The national committee concurred in items D1 and D2 but felt that the limits of item D3 were too severe. It appeared that a hydraulic fill could be a good example of a fine-silty family and that some of the man-made soils could be in areas other than those covered by the three temperature classes: frigid, mesic, and thermic.

Recommendation E

The statement about the ripping of soils caused the national committee to review again the amount of change in the San Joaquin soil relative to the spacing between the rows traversed by the ripping machine. With wider spacing, it would seem that a complex of San Joaquin-X series should be recognized if the acreage were sufficient. The altered soil would appear to be too greatly changed to be recognized as a phase. It was agreed that classification should be at the lowest level consistent with accuracy and suitability of nomenclature.

The national committee also suggests that the recognition of Arents be confined to soils mixed in place so that fragments of a diagnostic horizon transported by dump truck to a new area would not be the basis for the recognition of an Arents in the new site. In addition, a significant number of fragments of a diagnostic horizon should be present to justify the classification of Arent. This illustrates, of course, a problem common throughout the application of the classification system. The national committee was in general agreement with items E1, E2, and E3.

Recommendation F

The example "sandy, loamy, and clayey Entisols, filled complex" gave rise to two questions or objections by members of the national committee. a) An undifferentiated unit such as "sandy, loamy, and clayey Entisols" cannot at the same time be identified as a "complex" as that term is used in soil correlation. b) There was concern, though not general, about the reception of the nomenclature as names of mapping units by users of the published Soil Survey. This concern did not apply to the placement of units in the classification system.

Recommendation G

The national committee was in general agreement with the statements of this recommendation.

FURTHER DISCUSSION

Various proposals for naming complexes of cuts and fills were discussed. For example, certain suburban areas have been named as a complex of a series and urban land. An example is Aura-Urban land complex. Where condition6 are too complex to be handled properly by two series names, use of one series name followed by "complex" has been used. An example is Rhoades complex.

About this time Dr. Kellogg returned and asked about the names of those soils that were too limited in extent to qualify as series. One device is to recognize a "variant" of a related series in the same family or subgroup. This doesn't always prove to be feasible because there may not be a related series. Dr. Kellogg objected to the name, "Sandy, loamy, and clayey Entisols" to identify the complex units of small extent in the published Soil Survey. He suggested the use of "Made soils" as a general name to place in the map legend below which the individual mapping units could be listed. The committee proposed the following alternatives for consideration:

Miscellaneous kind6 of soil
Made or modified kinds of soils
Han-made kinds of soils
Man-made soils
Made soils

It was suggested also that the individual units be identified directly without the use of a general heading. Three examples were listed:

Man-made soils, loamy
Made soils, loamy
Loamy-Made soils

By a divided vote, the committee showed a preference for' "Made soils, loamy."

Dr. Kellogg added that he thought the names for the small-sized units should be treated as "ad hoc" names for use in the local area and should not need to be controlled by definitions at the national level. It was evident that the committee was too divided on this latter point for it to be accepted and so the suggestion by Dr. Kellogg is passed along a6 a subject for further thought.

RECOMMENDATIONS

The recommendations of the national committee are:

1. Change the proposed definition of Made land by the Western region to read, 'Made land consists of areas filled or covered artificially with miscellaneous material including trash, stones, and industrial waste, but excluding areas covered with essentially earthy material to a depth of 40 inches or more."

2. Materials consisting of the following are to be considered as soil if capable of supporting plants:

   A. Materials consisting of mechanical mixtures of sola and parent materials from one or other soils without discernible fragments of diagnostic horizons.

   B. Artificial fills of earthy materials with:

      (1) No diagnostic horizons or

      (2) Buried diagnostic horizons if they are buried deeper than 20 inches, or if they are buried to depths between 12 and 20 inches and the thickness of the buried solum is less than half the thickness of the overlying deposits. (This is essentially recommendation C of the report of the Western Commit tee.)

3. Soils included under 2 above are to be classified in the Psamment, Fluvent and Orthent suborders of the order Entisols.

   A. The soils are to be recognized as Named soils and classified with existing or new soil series if characteristics enable classification at this level of the system.

   B. Naming of mapping units will follow conventions presently in use. (The above are items D1 and D2 of the report of the Western committee.)

4. Soils with original diagnostic horizons mixed by ripping, deep plowing, etc., sufficiently to destroy the original normal sequence, but not to the extent that the fragments or parts of the horizons can no longer be identified, will be classified in the suborder Arents of the order, Entisols.

   A. The soils are to be recognized as Named soils and classified with existing or new series.

   B. Naming of mapping units will follow conventions presently in use.

C. The position of fragments of diagnostic horizons within the soil profile and the nature of these fragments should be considered as criteria for soil series.

D. The geographic extent of Arents is to be limited to the areas where disturbance or mixing originally occurs.
(Recommendation 4, aside from D, is recommendation E of the report of the Western committee).

5. Shaped Soils should be considered as phases of soil taxonomic units resulting from smoothing, leveling, end grading in which:

A. Diagnostic horizons required within pedons have not been destroyed or interrupted, or

B. Diagnostic horizons have not been buried to depths of more than 20 inches.

The use of shaped phases of soils, because of present standards end criteria for soil classification, will therefore be Limited in most instances to the soils in orders in which smoothing, grading, or leveling operations are not apt to destroy features diagnostic for any of the soils involved in more than 50 percent of the area under consideration.
(Recommendation 5 is essentially recommendation G of the report of the Western committee).

It is recognized that these recommendations do not cover specifically the heterogeneous areas of cuts and fills. The national committee failed to go as far as the Western committee in this respect.

The matter of the need to continue the committee was discussed. Al though this subject might be considered to be within the jurisdiction of the committee on the "Application of the new classification system" there appeared to be enough work ahead to justify the continuance of the regional committees and of a national committee for the next two years. In fact, it was noted that two of the regional committees recommended that they be continued. There is still a need to study further the delineation end composition of mapping units, end in particular, there is a need for better agreement on nomenclature.

COMMITTEE MEMBERS

J. Kenneth Ableiter, Chairman

A. J. Beur
R. C. Carter
J. A. DeMent
Klaus W. Flach
Rodney F. Harner

Y. Harmon Havens
Grant M. Kennedy, Secretary
J. E. McClelland
W. E. McKinzie
Roy W. Simonson

NOTES ON DISCUSSION AFTER PRESENTATION OF COMMITTEE REPORT

Bartelli: Does the use of three temperature classes mean that we can't recognize a soil in Puerto Rico?

Ableiter: This is the very point. the national committee objected to in the recommendation by the Western committee to use only three temperature classes. We did not agree to the proposed limitation.

Kellogg: The committee did fine on theory but broke down on nomenclature.

Smith: What do you do when you have sand brought in and dumped and then followed by a load of clay?

At about this time, Kellogg polled the group, and the conference accepted the report. The following discussion, however, followed.

Johnson: What is the objection to labeling such soils according to their placement in the classification system, such as loamy Arents?

Bartelli: Why not use "sandy Fluvents, Level" for an area of hydraulic fill?

Kellogg: The discussion is concerned with only those areas with too low an acreage to qualify as a series and with too heterogeneous a character to be handled in the usual way.

Johnson: Yes, but what about what happens to 5000 acres of heterogeneous made soils?

Orvedal: I think the use of "ad hoc" symbols will solve a part of this.

Kellogg placed two sets of alternatives on the board:

1. Fluvents, level
   Psamments, level

2. Made soils, loamy
   Made soils, clayey
   Made soils, silty

He then polled the group as to preference. The result was a tie--14 to 14.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
New Orleans, Louisiana, January 23-27, 1967

Report of the Committee on Climate in Relation to Soil Classification and Interpretations

The Committee on Climate considered the discussion and recommendations of the 1965 National Committee and the responses by the Regional Committees on Climate in 1966. It also considered several items of business brought up by members of the Committee and it held a joint session with the Committee on Soil Moisture. Several items of information carried in the national and regional reports were regarded as not requiring restatement.

Studies of Climatic Indices

The Committee noted that the actual and potential evapotranspiration indices computed according to the method of Arkley and Ulrich had been essentially completed in the 11 Western States according to the report from that region. The Committee also recalled that much work of a generally similar nature had been accomplished during past years in both the Northeast and the South. Much of the Great Plains, has been characterized by another index, the Precipitation-Effectiveness Index, P-E. Parts of the North Central region are apparently the only places where the development of climatic indices is being carried on. The Committee, after considering the fact that success in the use of various climatic indices seems to vary from region to region, agreed with the North Central Committee's endorsement of the basic Thornthwaite-Mather computations as a useful method of water balance computation. It should be noted that the Arkley-Ulrich computations, which the Western Committee recommended be applied all over the country, are based on the Thornthwaite-Mather method. The Committee also offers the caution to those planning to make Thornthwaite-Mather calculations that very little is gained by computing potential evapotranspiration for the individual months of all years of a long weather record compared to using only the normals.

Securing Basic Data from Climatologists

The Committee, recognized that the assembly of basic data, including complete climatological descriptions, by kinds of soil within major land resource areas continues to be very important to the production of technical monographs and benchmark soil reports.

Recommendation: The Committee recommended continuing participation by cooperating climatologists in recording and interpreting climatic date for publication in soil monographs and reports on benchmark soil:;.

Soil Temperature Measurements in Soil Classification and Interpretation

The Committee felt strongly tnat the 1965 Committee recommendation, especially in regard to classification, should be again made. Discussion indicated that soi 1 temperatures obtained by direct observation by soil scientists were extremely valuable in making decisions for the new system of soil classification. The Committee felt that observations covering more than one year on the same soil would provide a useful test of assumptions and techniques. The Committee felt that the lack of detailed response in 1966 to the 1965 recommendation wa s due to the fact that the program had not gotten well under way until 1966.

Recommendation: The National Committee recommends that the regional committees on climate encourage tine States to continue to collect soil temperature data to use in determining average annual soil temperature for soil classification and interpretation and to use SCS-TP-144 as a guide in making soil temperature measurements, and that a detailed report be made at the next Regional Work-Planning Conference.

The Committee felt that soil temperature data taken by soil scientists should be exchanged between adjacent states and between the SCS and cooperating agencies, to increase the data available for classifying similar soils in various areas.

Recommendation: The Committee recommended that once each year the State soil scientists summarize or list the soil temperature and soil moisture data that were collected in their state during the year and send copies to the State soil scientists of adjoining states, to the principal soil correlators, and to people in cooperating agencies who are concerned with soil classification and interpretation.

The Climate Committee noted that the Soil Moisture Committee planned to recommend that SCS suggest to ARS the establishment of standardized soil moisture stations for making observations at regular short intervals for an extended period of time. Because of the equal importance of soil temperature, the Climate Committee felt that its measurements should also be suggested to ARS by SCS.

Recommendation: Soil temperature data should be observed in conjunction with soil moisture data, if special stations are established by the ARS. These stations should be sited on soils of major extent and importance, that is, benchmark soils or their equivalent. Standards for locations and for depths to be sampled should be determined in cooperation with SCS soil scientists and climatologists.

The Committee discussed the seemingly vast quantity of temperature data taken by other agencies for various purposes, and discussed methods of inventorying these data and making them available to soil scientists for use in classification and interpretation. The Committee realized that widely distributed questionnaires and solicitations usually give small results without personal follow-up. Therefore, the Committee calls to the attention of the State soil scientists, the possibility of getting existing soil temperature data useful for their State from ARS and other sources by personal contact.

Guidelines for the Application of Soil Series Temperature Criteria

The Committee noted with great interest work done by the Southern Regional Committee on guidelines for the application of soil series temperature criteria. They have prepared a regional map for the Southern States on which the 59° and 71.6' F. isolines of soil temperature have been depicted. Zones with soil temperature 2 degrees above and below each of these isolines were also depicted on these maps and it is suggested that taxonomic inclusions would be permitted within these zones.

The Committee feels that it is important that the States agree concerning the location of the critical isolines and that a regional map is an effective device for securing such agreement. The Committee also agrees that regions should develop for themselves, those devices which are useful to them in applying temperature criteria. The Committee thought, however, that the words of Soils Advisory #2 give less restrictive guidance for the occurrence of taxonomic inclusions than does the Southern Region map. The Committee felt that the delineation of tolerance limits focuses undue attention on soil temperature, which is just one of several important differentiating elements used in making decisions about taxonomic inclusions. The Committee felt that regions might prepare maps depicting the 47°, 59° and 71.6" isolines but could not recommend that tolerance lines be placed on such a map.

Climate Section of Published Soil Surveys

The Committee briefly reviewed the progress in the production of the climate section of the published Soil Surveys since steps were taken in 1960 to up-date this section. The Committee, noting that in nearly all cases the new sections are being prepared by the ESSA State Climatologists, felt that these climatologists should be commended for the excellent sections they have prepared for the published Soil Surveys.

Recommendation: The Committee recommends that SCS commend the ESSA State Climatologists for the excellent climate sections they have prepared for the published Soil Surveys.

The Committee, in discussing the relations between State soil scientists and State climatologists noted the problems that have arisen because of the recent efforts to shorten the text of published Soil Surveys. The Committee also noted that the average length of the climate section had increased greatly since 1960 and acknowledged that some of the recent sections are too long. The Committee felt that a poor solution to the problem of length was to have material deleted by the Soil Survey editorial section after it was painstakingly prepared by the State climatologists. The Committee also felt it was not feasible for State soil scientists to request informally that climatologists shorten, contrary to present directives, their contributions. The Committee thought that SCS owed the climatologists a formal statement of a new or changed policy.

Recommendation: The Committee recommended that the editorial section, in conjunction with the Committee on Soil Survey Manuscripts, develop a set of guidelines for the preparation of the climate section. These guidelines should conform with recent thinking on the proper size of the climate section.

Climatic Interpretation in Published Foil Surveys

The Committee felt that in the published soil surveys the discussion of the effect of climate on agriculture end soil formation leaves something to be desired. That is, the soil scientist too rarely takes information on climate and Joins it with information on soils or on agriculture in a synthesis which discusses the effects of climate.

Recommendation: The Committee recommended that the regional committees investigate the possibility of encouraging some young authors to prepare brief discussions for the climate section of the effects of climate on use end management of soil. The discussions should be written at a level such that the high school teacher could use them in teaching. The same type of discussion should also be encouraged in writing of the effects of climate on soil formation.

Joint Meeting with Committee on Soil Moisture

Action taken during this meeting is reported by the Committee on Soil Moisture.

Future Committee Activities

The Committee noted that soil temperature measurements will probably continue to bc important in soil classification during the next two years, and that there will probably be changes in the climate section of the published Soil Surveys. It also felt that additional problems in the use of temperature as a criterion in soil classification might arise, and that a climatological solution to the problem of soil moisture might be proposed.

Recommendation: The Committee recommended that it be continued.

Comments on This Report by the Conference

Dr. Kellogg asked the conference whether, in view of pressures for reducing the amount of text in the published Soil Surveys, it felt that a climate section should be retained. Most participants did.

Dr. Kellogg suggested that there might be a new type of chapter in which climatic information for the published Soil Survey would be included. This chapter might be entitled, "Factors Affecting Soil Use" and subdivided into "Natural," under which climatic information would fit, and "Social," (factors).

Participants in Committee Deliberations

Committee Members

J. V. Drew
R. W. Eikleberry*
C. M. Ellerby*
Rodney F. Harner* - Secretary
Y. Harmon Havens*
J. W. Kingsbury*
Franklin Newhall* - Chairman
Dwight W. Swanson*
Hudolph Ulrich
B. J. Wagner*

Visitors

Nobel K. Peterson
Alvin R. Southard
John A. Williams
Paul E. Lemmon

*Committee members present at New Orleans meeting.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFEKENCE OF THE COOPERATIVE SOIL SURVEY, New Orleans, Louisiana, January 23 - 29, 1967

Report of Committee on
Soil Family Criteria

The charge given to this committee after the 1965 conference in Chicago was "to receive and study the proposals of regional committees and to study and evaluate soil family criteria." In addition, the committee made some proposals for additional family criteria.

The committee first reviewed changes in family criteria made since the October, 1956 Supplement was issued. The committee then discussed the following questions and proposals:

1. Family Depth or Thickness Classes

   The Southern Regional Conference Committee on Application of the New System proposed soil thickness classes of

   < 20 inches) In Entisols, Inceptisols,
   20 - 40 inches) Aridisols, Spodosols, Alfisols,
   > 40 inches) and Ultisols

   This proposal was not accepted, on the grounds that it forces us to create families and series that we are not yet ready to accept. The committee expressed its approval, instead, of the family depth criteria in the newly revised Supplement. They are:

   Shallow: (1) < 20 inches to the upper boundary of a petrocalcic horizon or to a paralithic contact, in Orders 1, 3, 4, 5, 6, 7, and 8 except in pergelic subgroups (of Cryaquepts, Cryumbrepts, etc.)
   (2) < 40 inches to a lithic or paralithic contact in Vertisols and Oxisols

2. Content of coarse fragments in skeletal families.

   The 1966 Western States Committee on Application of the New System proposed retaining the 50% limit on coarse fragments in the skeletal textural groups. The 1966 Southern States Committee on Application of the New System recommended a sliding scale of limits on coarse fragments in skeletal families, as follows:

   Sandy skeletal > 20% coarse fragments
   Loamy skeletal > 40% coarse fragments
   Clayey skeletal > 60% coarse fragments

It was noted that the newly revised Supplement specifies more than 35 percent by volume coarse fragments in all skeletal families. After some discussion it was agreed to accept the 35 percent limit. The committee noted that 35 percent by volume is approximately equal to 50 percent by weight.

3. Application of soil family mineralogy criteria.

   The North Central 1566 Committee on Soil Family Criteria recommended that determination of soil mineralogy for family classification be based on the same proportion of the soil as is used to determine the family textural group. No action was taken on this recommendation, because the committee understands that this change has already been made in the revised Supplement.

4. Mineralogy classes in clayey soils.

   The 1966 North Central committee suggested that measurements of soil expansion, as developed by the Lincoln Soil Survey Laboratory, might provide improved limits for mineralogy classes in clayey families. This idea was discussed briefly, but the committee did not endorse it, believing that more direct measures of clay mineralogy are available.

5. One committee member, Dr. Grossman, made several proposals for revision of soil family criteria (memo to committee chairman dated December 2, 1966). Some of his proposals were adopted and appear in committee recommendations. Two proposals were not endorsed by the committee at this time, but they do seem worth testing in more detail. They are:

   Define control section for family mineralogy to extend from the top of the first mineral horizon to a lithic contact or to one meter, whichever is shallower. Make a" exception for soils having argillic, natric, or oxic horizons, the midpoint of which occurs below one meter. For these latter soils, the bottom of the control section is either the base of the above diagnostic horizons or two meters, whichever is shallower. The control section shall be divided at 25cm. except for lithic subgroups, and at one meter for soils with control sections over one meter thick.

   Use mineralogy of the clay fraction partially to determine placement for soils with one-fourth or more of the control section having over (5?18?)

> percent clay. Clay mineralogy to be indicated individually for the parts of the control section if differences are contrasting. If clay mineralogy is not contrasting, then one term based on average properties of the control section is used to describe the clay mineralogy. Mineralogy of the nonclay to be determined on the average properties of: the control section.

The argument advanced for the above is this: the clay mineralogy usually is more important to agricultural use than the mineralogy of the nonclay; the importance of the clay mineralogy for agricultural use commonly decreases with depth in the soil; and the impression of soil development on the clay mineralogy tends to decrease with depth.

6. Family groupings for extensibility.

Some time was spent in discussion of Dr. Grossman's proposal to combine clay percentage and bulk density in order to improve the predictive value of family groupings for extensibility. The committee believes that the idea has not been tested sufficiently to warrent its adoption at this time. It is suggested that the proposal be studied further during the next two years. Following is a brief explanation:

> A better job of defining the organization of soil material can be done so as to improve predictive value of family groupings for extensibility. This would require the combination of texture and bulk density. Porosity of the dry fabric as measured by the natural-clod method should be combined with clay percentage. The grams of clay (preferably non-carbonate clay) pet- 100 cc. of porosity, measured as described above, has more predictive value for extensibility than clay percentage alone. The number should be substituted for clay percentage in the Vertisol and Vertic subgroup definitions. The argument for such a number comes from the jack-in-the-box model for extensibility. The numerator (clay percentage) is the strength and length of the spring. The denominator (porosity of dry fabric) is the height of the box into which the spring is compressed. What happens when the box opens (the soil expands) is the quotient of the characteristics of the spring and of the box.

7. Proposed chloritic mineralogy class.

It was brought to the attention of the committee that there may be a need for a chloritic mineralogy class. The committee was unable to formulate a recommendation. The assistance of the Soil Survey Laboratory people and other mineralogists is solicited in order to determine whether or not such a class is really needed. If soils actually exist with chlorite mineralogy, they currently would be placed in the mixed mineralogy class.

Committee Recommendations

RECOMMENDATION 1. That the thixotropic class be listed in family criteria with consistence classes under "other characteristics."

RECOMMENDATION 2. That sepiolite be added to the definition for the attapulgitic mineralogy class in the revised Supplement.

RECOMMENDATION 3. That for soils that do not completely disperse, the clay contents be estimated from the 15-bar water retention. Following are details: Clay percentage should be estimated as 2.5X the 15-bar water for all horizons if one-half or more of the control section has a 15-bar water to measured clay ratio equal to or greater than 0.6. If the ratio of organic carbon to measured clay as per above exceeds 0.1, then the 15-bar determination should be on material treated to remove organic matter with hydrogen peroxide.

RECOMMENDATION 4. That a footnote be added to the section on mineralogy classes applied to clayey soils stating that the clay mineralogy of the whole soil should be determined when the ratio of 15-bar water retention to measured clay equals or exceeds 0.6.

RECOMMENDATION 5. That the particle-size classes characterized as the determinant size fraction for family mineralogy refer to size fractions as determined by standard particle-size distribution analysis as done by the Soil Survey Laboratories.

RECOMMENDATION 6. That a footnote be added to item C on page 6-2 of the current Supplement stating that in those Alfisols and Ultisols with fragipans in which the argillic horizon and the fragipan are coincidental, the particle-size classes apply from 25 cm (10 inches) below the surface to the top of the fragipan or to 1 m (40 inches), whichever is shallower. (Note: In the October, 1966 Supplement fragipans are not a part of the textural control section for families.)

RECOMMENDATION 7. That reaction classes not be used to subdivide sandy, sandy-skeletal, and fragmental textural families.

RECOMMENDATION 8. That the several regional committees on soil family criteria be requested to investigate the possibility of using the proposals outlined under committee discussion item 5 above, and to consider related alternatives, to see if more meaningful mineralogy classes can be defined.

RECOMMENDATION 9. That this national Committee on Soil Family Criteria should continue to exist for at least another two years. Its charge should be to receive and review proposals and recommendations made by regional committees, and to test and evaluate these and other proposals for the improvement of soil family criteria.

Committee Members:

L. J. Bartelli
A. J. Baur
R. C. Carter
R. B. Grossman
G. G. S. Holmgren
W. M. Johnson, chairman
Grant M. Kennedy
W. E. McKinzie
A. C. Orvedal
A. S. Robertson
R. W. Simonson
R. I. Turner, secretary

The following people also participated part-time or full-time in the committee meetings in New Orleans: G. R. Craddock, J. V. Drew, W. A. Ehrlich, Charles E. Kellogg, P. E. Lemmon, and A. R. Southard.

Notes on discussion by the Conference following committee report, 1/27/67

DeMent: Noted need for bulk density and non-carbonate clay percentage, which the labs are not all determining at the present time.

Flach: Are there grossarenic soils in fine families?

Johnson: Yes.

Flach: Do you use clay mineralogy of both horizons?

Johnson: No, one uses sand mineralogy of the upper horizon and clay mineralogy of the lower one.

Smith: Noted that reason for the grossarenic subgroup was that the major part of the rooting zone is sand. Therefore wonder if it isn't redundant to add a siliceous family to the grossarenic soils. Don't know of any case in which sand mineralogy of grossarenic soil is not siliceous.

Craddock: Mentioned that some grossarenic soils, with clayey argillic horizons, would be kaolinitic, and that it will take special care to separate these from other kaolinitic soils.

Grossman: Do we know that the sands in all grossarenic soils are siliceous?

Smith: Yes, all are siliceous.

Grossman & Flach: Both expressed wish to use the clay mineralogy of the sand horizons in grossarenic soils.

Flach: Wonder if all thixotropic soils are Hydrandepts.

Johnson: No, not all of them.

Smith: Pointed out that Andepts will be subdivided into three family classes in lieu of textural groups: cindery, ashy, and thixotropic.

Kellogg: Believe that the thixotropic class would be better treated as a special textural class than as a consistence class.

Paschall: Pointed out that lithic Spodosols have a depth limit of 12 inches, conflicting with the proposed shallow family limits.

Smith: No, the lithic subgroups of Spodosols now have a 20-inch limit.

Paschall: Do we retain the calcareous reaction class in sands?

Johnson: Yes.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

National Technical Work-Planning Conference
of the Cooperative Soil Survey
New Orleans, Louisiana - January 23-27, 1967

Report of the Committee on Soil Interpretations at the Higher Categories of the Current Classification Scheme.

The committee met for the first time on January 23, 1967.

As this was a now committee, the following objectives were framed around the title of the committee:

(1) Determine what useful interpretations could be made at levels above soil families.

(2) To explore:

(a) At what level above the family that useful and specific interpretations and recommendations can be made.

(b) The possible mechanics for expressing factors needed for making these interpretations.

(c) The most suitable map scale from which these interpretations can be made.

To acquaint the committee with similar work that has been done in other parts of the world, John D. Rourke, of the World Soil Geography Unit, explained to the committee the experience of the unit in making interpretations, mainly for engineering purposes, from soil maps at a scale of 1:1 million. When the unit was first conceived, it was felt that the most specific interpretations or recommendation for both farm and nonfarm uses could he made from a map consisting of information both on soils and certain aspects of the landscape, primarily landform and the underlying geologic or parent material on which the soils occur. The experience of the unit over the succeeding years has borne this out.

On the generalized maps compiled by the unit, the soils are classified at the level of either the Great Soil Group in the old classification scheme or at the Order, Suborder, or Great Group level in the current classification scheme. The mapping units consist of associations of "phases" of soils in a given category. The "phases" consist primarily of various combinations of landforms and of geologic or parent materials; this approach of using "phases" is also employed to provide information on shallow soils, stony soils, and the presence of such things as ironstone, permafrost and petrocalcic layers.

The experience of the unit during this past 20 years of using the current classification scheme has been that useful interpretations can be made from maps al a scale of 1:1,000,000 on which the soils arc shown as association of phases of Groat Croups.

Conclusions:

1. It is apparent that certain interpretations can be made from soil maps on which the soils are classified in the higher categories of the current classification scheme. The specificity of these interpretations will be determined to a large extent by the degree to which the soil properties are expressed in 'the criteria of the taxon used.

2. After a rather hurried and cursory study, the committee concluded that certain interpretations could be made from a map on which the soils arc expressed at the Order level. However, except for the Histosol and Vertisol Orders, these interpretations would be very general in nature. The Committeo also concluded that at the suborder level, the specificity of these interpretations would vary somewhat among the various Orders.

3. It appears that maps on which the soils are expressed at the Great Group or Subgroup levels, including certain criteria considered at the family level, would offer a tool from which rather specific interpretations could be made. For some of the suborders, however, certain specific interpretations could be made; this will be explored further by the committee. It should be recognized and emphasized at this point, that there are, and will be interpretations needed that cannot and should not ho made from these maps.

4. It does not appear to be possible to account for all the items that would be of importance or significance to those farm and nonfarm interpretations that could be made from a map with the soils expressed at the Great Group or Subgroup levels within the framework of the scheme at these levels.

5. The committee was unable at this time to arrive at a conclusion concerning a map at a scale of 1:1,000,000 versus a map at 1:250,000 or a combination of the two scales. (Perhaps maps at various scales will be needed.)

Recommendations:

1. That a committee be established in each region, in the near future, for the purpose of considering soil interpretations at the higher categories of the current soil classification scheme. In regions whore committees are already working on soil association maps, an additional charge could be assigned to explore the interpretations for farm and nonfarm uses that could be made from maps at the higher categories.

2. That the regional committees examine the existing maps, both State and Regional, that could be adapted or modified for this purpose.

3. That the regional committee select a county where a detailed soil and soil association map is available and is-part of a State or Regional map and:

a. Describe the mapping units of a county soil association map in the nomenclature of the current classification system and prepare a legend.

b. Examine this new legend and determine, for each of the mapping units, the most useful categorical level, Suborder or Great Group, for making both farm and non-farm interpretations.

c. After this judgment has been made, determine what additional words; e.g., from the nomenclature used at the family or phase levels, would have to be added to the Suborder or Great Group names in order to provide the information that, in their opinion, would be required for making the interpretations.

d. Prepare map using legend.

e. Consider what supporting tabular or text information would be required.

4. It is also recommended that the regional committees arrange to meet this summer to initiate work on the preparation of a map and legend.

It was recommended that the committee be continued. Future activities would be as follows:

1. Review legends and maps submitted.

2. Provide guidance to regional committees.

3. Explore information as to scale of maps and level within the current classification to use in preparing the map.

Committee Members:

A. R. Aandahl* (Chairman)
B. A. Barnes
W. H. Bender
K. W. Flach
F. D. Hole (Secretary)
A. A. Klingebiel
R. M. Marshall
J. E. McClelland
W. E. McKinzie (Acting Chairman)
A. H. Paschall
J. D. Rourke
* Not present for committee sessions

Visitors:

C. E. Kellogg
P. E. Lemmon
P. Nylander
L. D. Swindale

Notes on Discussion after presentation of Report No. 11

C. E. Kellogg: Major shifts in land use in this country require us to know where there are tracts of responsive soils not now farmed and where unresponsive tracts are farmed. We need a good 1: 1,000,000 soil map of this country to help us show these kinds of interpretations. The skill and experience of our World Soil Geography group is available to us. We must learn to use topographic, climatic, geologic and other maps besides soil maps in delineating significant boundaries at the 1:1,000,000 scale. Then we need to learn to express the legend in useful phases of soil groups and suborders, and to use the map for interpretations related to farm and nonfarm uses. In some, great groups will be most useful in the legend; in other orders, suborders and subgroups may prove to be the best.

R. B. Grossman: Will very high level photographs be used in preparing the proposed map of the U.S.A.?

C. E. Kellogg: That is under discussion.

A. J. Baur: Is the committee's request specific enough to the regions to elicit the desired materials?

W. E. McKinzie: We ask for examples of legends prepared in terms of phases of suborders and great groups, with examples of interpretive uses.

A. C. Orvedal: We do need to learn to express interpretations at the level of the legend of the proposed soil map of the U.S.A. Until now we have made interpretations only of large scale maps.

J. D. Rourke: We hope that the regional committees will develop legends and interpretive schemes using the excellent state and regional maps that they have already been published. We wish to get their thinking and approaches.

C. E. Kellogg: Ozarkia, Appalachia. the Great Lakes Region are just three of the regions for which plans are not being made. We can contribute to the plans. Who will help California to plan for the water supply of that State? We have a contribution to make there.

The committee report was accepted by the conference.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE
OF THE COOPERATIVE SOIL SURVEY
New Orleans, Louisiana, January 23-27, 1967

Report of the Committee on Updating Soil Correlations of Old But Good Published Soil Maps

The committee met for the first time on January 25 and discussed three main topics. These are as follows:

I. Determining the adequacy of published soil surveys in the United States.

II. Format for updating published soil surveys.

III. Development of an operational plan for updating published soil surveys.

Discussions of these three topics are summarized in the main body of the report with each considered in a separate major section. Recommendations of the Committee are given in each major section.

These topics are particularly significant in that the use of time and funds required to remap an area unnecessarily will, in effect, withhold soil surveys from areas that do not have good maps. Many published soil surveys, inadequate by present standards,. can be updated at costs relatively small to that of remapping the area. Added significance to these topics is contained in Section XI of the September 1966 Report of Study Group on Soil Survey Publications and Reports (see attachment #1 to the present report).

J. Determining the adequacy of published soil surveys in the United States

A. It is recommended that each State review all published soil surveys in the state and, relative to their adequacy for the operational planning needs of the survey area, classify them as follows:

1. Maps, descriptions, and interpretations are adequate.

2. Either the correlations, soil descriptions, or interpretations need updating, or training of users is required to distinguish phases within mapping units that are not shown but are significant to present needs. (Slope and erosion, for example, are omitted from some of the older published surveys. With proper training, however, the user can identify these features in the field. Also, "line maps" were printed

for the older published surveys. Again, the user can be trained to obtain maximum benefit.)

3. Supplemental soil mapping of specific areas or map units is required. (In this category most of the mapping is satisfactory thus remapping the entire area is not required.)

4. Remapping of the entire area is required.

The second and third categories, above, could then be considered for updating should the need arise.

B. Classification into the above categories must be uniform within and among states. Decisions should be based on whether the published soil survey can be used for the majority of the anticipated interpretations needed for the area in question. The committee agrees, however, that criteria for evaluation will vary from one area to another. The following general guidelines for evaluation are suggested:

1. Accuracy in the placement of soil delineation boundaries.

2. Accuracy in the composition of delineated areas with regard to taxonomic units.

3. Sufficiency of mapping detail for present needs and the amount of work required to make sufficient.

4. The adequacy of descriptions for classification purposes.

5. Adequacy of interpretative material.

6. Number of copies available.

7. When evaluating, disregard the date of publication and type of base map (some of the older publications with "line maps" may be as useful as more recent publications).

C. The committee recognizes the need for making these evaluations at minimum cost, A proposal for a statistical analysis of transects &cross randomly designed blocks was rejected on the basis of prohibitive costs involved. A majority of the committee feel that judgment on the part of the State soil survey staff and map users will suffice for the evaluation. It is agreed, however, that field work may be necessary in some areas. In such instances, transect studies and strip mapping are suggested as possible procedures.

II. For&t for Updating Published Surveys

A. Supplements to published soil survey reports were reviewed. The majority of these were for the purpose of updating interpretative material for special uses. All involved rather recent published soil surveys. On the basis of the study, the following recommendations are made.

1. Avoid excessive costs. In some instances a pamphlet or simple booklet is adequate. Elaborate binding, photographs, and other decorative material may add to the cost of publication without substantially increasing its usefulness.

2. Refer to the published soil survey being supplemented.

3. Avoid duplication of material that can be obtained in the original publication.

4. List appropriate map units for the soils involved, This allows direct reference to maps in the original publication.

5. Encourage cooperating agencies to participate in both the preparation and financial support of the supplement.

6. Control, insofar as possible, supplements published by local agencies. Local planning commissions, for example, may (1) show great interest in updating published soil survey, (2) furnish financial assistance, and(3) offer considerable publicity to the soil survey program. It is recommended, however, that there be a memorandum of understanding between such agencies and the Soil Conservation Service to the effect that material for the supplement be edited by the SCS prior to publication. This will insure a minimum of mistakes in the supplement.

III. Development of an Operational Plan for updating published soil surveys.

A. The committee recommends that an Operational Plan be developed prior to updating a published soil survey. The term "Operational Plan" instead of "Work Plan" is to avoid confusion with the work plans developed for unsurveyed areas.

B. The following guidelines are suggested for developing the plan:

Operational Plan for Updating
the June 1941 Published Soil Survey
of __________________ Area

1. List the information needed (interpretative material, remapping of specific areas, recorrelating certain units, etc.).

2. State who will furnish the information (SCS and other agencies).

3. Show schedules for beginning the work and the expected date of completion.

4. State who will publish the supplement (SCS, other agencies, or cooperative).

5. Signatures of representatives of cooperating agencies.

The committee feels that implementation of a program for updating published soil surveys will be in effect within the next 2 years. In view of this it is recommended that the committee be discontinued.

Committee Members:

J. M. Williams, Chairman*
J. K. Ableiter
L. T. Alexander*
F. J. Carlisle
R. E. Daniell
J. A. DeMent**
R. D. Hockensmith
C. W. Koechley
O. C. Lewis
E. A. Perry
Guy D. Smith
H. P. Ulrich
S. J. Zayach

Visitors:

C. E. Kellogg

* Absent at New Orleans meeting.
** Acting Chairman at New Orleans meeting.

Discussion of the Report:

C. W. Koechley - Evaluators of published soil surveys should investigate the possibility of obtaining enlarged copies of maps where scale is inadequate. Particularly where "line maps" are involved.

C. E. Kellogg - We are vulnerable to criticism where we remap and republish areas having published soil surveys. The deficiencies are often due only to recognized changes in soil use or potential. Such deficiencies can be corrected at relatively low cost through updating.

A. A. Klingebiel - Did the committee consider only operational planning? It seems that we should consider adequacy for general planning, apart from operational planning.

V. W. Silkett - The SCS is under increasing pressure for broad resource planning. A recently completed survey for this purpose is not always essential. We should take advantage of older published surveys, reconnaissance surveys, and other available information not now in general use. Bring all sources of information together with instructions on how to use. County Resource Area Maps being used for RC&D projects need improvement.

NOTE - Subsequent to a general discussion on comments of Messrs. Klingebiel and Silkett, the committee agrees that some published soil surveys, deemed inadequate for operational planning, may be of value for broad resource planning. In such cases, appropriate comments should be made during the evaluation.

L. J. Bartelli - Some of our people are not trained in resource planning. Thus, soil association maps may not contain the information needed for RC&D projects.

C. E. Kellogg - Emphasis must be given to training users of published soil surveys. Many users hesitate to use old published surveys because of lack of training in how to use them. Furthermore, we must not assume that recent mapping is always correct or that old mapping is always incorrect. Each published soil survey must be evaluated on its own merit according to the needs of the area.

R. H. Grossman - Should this committee be discontinued? Perhaps a committee such as this could consider ways and means of making published soil surveys less expensive.

Answer - The charges of this committee have been dispensed with. New charges should involve another committee.

Attachment No. 1
to the
Report of Committee on Updating Soil Correlations and Interpretations
of Old but Good Published Soil Maps

Extracted from the Report of Study Group on Soil Survey Publications and Reports, September 1966.

XI. Making Better Use of Older Published Soil Surveys:

We recommend that maximum use be made of older published soil surveys. Approximately 640 published soil surveys with "line maps" that were printed during the 1920-40 period are still available for distribution and use. These are published soil surveys that are not considered standard by present day concepts. The deficiencies in these surveys may be minor or of major importance to proper classification and interpretation.

Many of these soil surveys could be made useful. They need to be evaluated individually for reliability or quality. Those serviceable to our program of service should be supplemented with additional information to bring them reasonably up to date. Supplemental survey work could still be done on an individual request basis as needed.

Many of these older surveys lack important interpretations. They could be supplemented with additional interpretive information to make them more useful.

Some people lack experience in using soil maps not on aerial photographs. They can be trained in workshops to use these older surveys effectively with the supplemental Information developed to make them more useful.

Considering the pressure the Service is under to supply soil surveys, we should not resurvey areas covered by reasonably good published soil surveys. We should concentrate instead on critical areas of adjustment having only very old soil surveys or none at all.

Implementation of Recommendation:

A soil survey memorandum should be prepared to set up procedures on making maximum use of older published soil surveys and should be made consistent with Planning Memorandums 8 and 9.

(The above extract is from a report composed of a study group appointed by the Administrator. Recommendations for such a study group were made by the State Administrators at their annual conference in September 1965.)

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil conservation service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE
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New Orleans, Louisiana, January 23-27, 1967

Automatic Data Processing in Soil Characterization

L. D. Swindale

Data for soil characterization has been collected from 51 benchmark soil series in Hawaii, almost all of them in duplicate. Chemical analyses have been carried out by Soil Conservation Service laboratories, physical properties by the Hawaiian Sugar Planters' Association Experiment Station, and mineralogical and total chemical analyses by the Hawaii Agricultural Experiment Station of the University of Hawaii. The data will probably be published as a Soil Survey Investigations Report.

It has been used to good effect in setting up soil series and higher soil groupings and in developing the classification system for tropical soils. There is much more, however, to be learned from the data, which cost an estimated $200,000 to obtain, about the soils and their relationships to their environment. It is possible, to take a simple example. to determine the mean values and coefficients of variation of the measured soil properties in a Great Group. For a property with a small coefficient of variation, the mean value may be a very useful approximation to the value of that property for all soils in the Great Group.

Multiple regression techniques allow the determination of many relationships between properties. They are simple to learn and are described in many texts on statistics (1, 3, 4.) The techniques are also easy to apply, using a suitable high-speed computer if the data has first been assembled onto punched cards or magnetic tape.

The work described in this report was carried out with the assistance of a basic research grant from the Cooperative State Research Service of the U. S. Department of Agriculture. Additional support was provided by the Hawaii Agricultural Experiment Station. Computer time was made available by the Statistical and Computing Center of the University of Hawaii. The considerable assistance of Sheo J. Pandey, Assistant in Research in Soil Science, in preparing punched cards and obtaining results is also acknowledged.

PUNCHED-CARD SYSTEM AND REGRESSION METHODS

Description of Punched-Card System

The characterization data from all 51 series together with the detailed profile descriptions and data on genetic factors has been assembled onto a set of punched cards. Six cards are necessary for the data from one horizon of one profile. The cards, their color banding, and the data collected upon them are described in Table 1. Most of the cards have room for additional data, crop yields, or engineering and other interpretive data.

A diagram of Card l--Horizon Description is shown in Fig. 1. The first coloumn is blank to meet the requirements of the computer programs used. The next nine columns contain an identification number. Columns 11 to 54 contain the descriptions of morphological features of one horizon with a separate code for each feature. An example of the code boundary is given in Fig. 2. Codes for the other features were developed from the well-known Soil Conservation Service code for soil profile descriptions. Experience showed that it was advantageous to arrange the code in an orderly sequence if possible; that is from least to most, weakest to strongest, or lowest to highest.

Numerical data obtained by analyses were punched into appropriate columns of the remaining cards. The data was arranged wherever possible with either four or five columns for one property. Unnecessary numerals were dropped, but the decimal points, although unnecessary, ware retained to make it easier for inexperienced people to enter the data on the cards without error. Maintaining a standard number of columns for the properties and retaining the decimal points made it easier to write the subsequent computer programs.

Full details of the cards and codes are to be published by Mr. S. J. Pandey and myself probably in the Indian Journal of Soil Science.

Description of Regression Methods

Two computer programs for regressions have been used in this work. The Mulreg program (5) was devised at the Statistical and Computing Center, University of Hawaii, specifically for use with the IBH 7040 computer. The program will handle simple, multiple and stepwiae linear regression, factor analysis, discriminant analysis, analysis of variance and co-variance, and chi-square analysis. The operations can be performed on grouped or ungrouped data, with or without weights and using up to 100 variables. The program uses approximately 31,000 storage locations in the 7040 and, therefore, cannot be run simultaneously with other programs. For the purposes of the regressions performed in this work, the Mulreg program was modified to enable up to 200 transformations to be performed on the data before the regressions were obtained. A second modification enabled the computer to calculate and print out the results of regression calculating for any given property for groups of data that were not used in obtaining the regression formulae. This modification made it possible to fill in missing data on the cards.

A second program called Persub was devised by Bottenberg and Ward primarily for psychological testing of U. S. Air Force inductees. Because results from this testing were obtained by regression analysis, the program was fairly easily modified for the purposes of soil characterization. This program provides simple, multiple and stepwise linear regression, factor analysis, analysis of variance and co-variance, and allows the testing of a large number of mathematical models set up to explain a given set of data.

The Mulreg program had advantages in that it provides means and standard deviations for all the variables, tests of the significance of the regression coefficient for each variable and tests of the significance of the regression as a whole. It also allows for the calculation of design criteria which permit orthogonal comparisons between sub-groups of the data,

The Persub program had advantages in allowing partial print out of the original data for checking purposes, and calculation and print out of all the correlation coefficients between pairs of variables. This helps in setting up the regression model, The program also performs stepwise regressions much more rapidly than the Mulreg program. On balance both programs have advantages for different purposes and have been retained and used.

In order to include coded descriptive data in the regressions, two basic approaches are possible: (i) if the code used for a descriptive feature is developed in a logical sequence, the code or its square, logarithm or some other transformation can be used directly as though it were a measured variable; (ii) if the code is not or cannot be developed in a logical sequence, it can be replaced by a set of dummy variables (see 3, p. 134). These dummy variables may be a series of weighted +1 and -1 or a series of 1 and 0. The first set is preferable on statistical grounds, and can be developed within the Mulreg program. The second set is simpler and can be developed within either program.

REGRESSION RESULTS

Prediction of C.E.C.

The operation of the programs are best described by a series of examples. The first example is an attempt using the Mulreg program to predict the C.E.C. of the low humic latosols from four soil properties: pH, per cent C, free Fe_2O_3, and 15-bar H_2O; and three descriptive soil features: texture, stickiness, and the depth below the surface of each horizon. Table 2 shows the results using firstly only the four soil properties and secondly including the morphological features.

The first regression has an R^2 of 0.52; that is, 52 percent of the variation in C.E.C. can be explained by variations in the four soil properties given. The R^2 value improves to 66 percent when the morphological date is included. Statistical tests of the regression coefficients show that pH and sic v cl have no significant effect upon the C.E.C.; that is the regression coefficients for these variables do not significantly differ from zero.

The coefficient of variation for C.E.C. in the low humic latosols is only about 20 percent. By use of this regression we have reduced the unexplained variation to about 7 percent. Hence, it is probably true that we have no need to determine C.E.C. for any soil in this group again if we have these other properties and features available to use in predicting it. It is also worth noting two additional things about the regressions. Firstly, if average values for all other properties are used, we can, merely by rubbing a soil from this group between our fingers, determine its C.E.C. by noting the texture or stickiness or both. Secondly, the fact that texture and stickiness sre significant in the regression implies that throughout the State they are being determined in a standard manner.

Prediction of Bulk Density

C.E.C. is fairly easy to determine anditis probable that people will continue to determine it whether this is necessary or not. Bulk density, however, is difficult to determine and yet it is au important porperty to know for soil genesis, soil classification and plant growth. To develop a regression equation for bulk density, a modification of the Persub program was used which automatically tests each independent variable for its importance as a predictor of the dependent variable. The results are shown in Table 3 in which the independent variables tested are shovn on the left and their contribution to the cumulative R^2 value on the right. The first and most important independent variable is the description of the root distribution. Then follows pH, structural grade, exchangeable K and several others. The table indicates that a regression of bulk density on the first five variables would explain 69 percent of tbe variation in bulk density; a regression based on seven separate independent variables would explain 76 percent. Kit&r of these would probably suffice for a useful prediction of bulk density,

The relationship between bulk density and root distribution is in accord with the general experience that roots are unable to penetrate dense soils. Relationships of bulk density to structure are also in accord with expectation. &changeable K, 15-bar water and soil texture are different measures of the type and amount of clay and therefore, by difference, of the amount of residual heavy minerals in these soils from basalt. Their relationships to bulk density probably arise from this. The relationship to pH also probably arises from the heavy minerals which increase with increasing weathering and leaching while the pH decreases. Careful analysis of relationships revealed by regression is always important to the proper understanding of the significance and value of the regression. It is entirely possible for an apparent regression relationship between two variables to arise from a few values of one variable which diverge widely from a closely grouped set of values. Proper analysis of the values will reveal aberrant ones and allow proper judgement of the validity of the regression relationship.

In Table 3 the variable "Roots" occurs twice. This indicates that the relationship between bulk density and roots is not, linear. Either the code for the variable "roots" is not properly sequential, and this should not normally be so except by error, or some power of the variable is involved. An advantage of the Persub program is that it allows this testing of any variable either coded or continuous for non-linearity. For example , if the variable "structural grade" which has the code 1 = very weak, 2 = weak, 3 = moderate, 4 = strong, is shown to be non-linear, it becomes advisable to test the efficiency of a new code in which the numbers used arc the squares or cubes or some other power of those given above. If a linear regression results from the use of code numbers 1, 4, 9 and 16, this then becomes a better code to express the effect of structural grade than the code 1, 2, 3 and 4.

Prediction of Mean Annual Rainfall

For each soil characterized, a value for mean annual rainfall has been obtained. It is then possible to develop a simple regression equation showing the effect of the independent variable rainfall on soil properties such as pH, percent C, and Base Saturation. It is also possible to carry out the inverse procedure to develop a regression for mean annual rainfall on soil properties. This will allow the prediction of mean annual rainfall values for soils in the group where rainfall data is unavailable. In a manner similar to that explained for the bulk density example, the effect of several independent variables on the R^2 value was first determined. The results are shown in Table 4. Nearly 90 percent of the variation in mean annual rainfall for the low humic latosols can be explained by the four variables: exchangeable Na, elevation, percent C and exchangeable Mg. The relationships to elevation and percent C are fairly obvious. The relationships to exchangeable Na and Mg probably relate to the cycling of salt from sea spray and the inadequacy of leaching in soils with lower rainfalls.

CONCLUSIONS AND RECOMMENDATIONS

Soil characterization data on 51 soil series is voluminous. It would be a very long and difficult task to derive all available information from this data by manual analysis. The data can, however, be put onto punched cards, and by the use of suitable and simple codes morphological data for the profiles sampled can also be included in the card deck. Full and very complete analysis of the data then becomes a relatively simple matter. The examples given are all in regression analysis of the data; to predict C.E.C., bulk densities and mean annual rainfalls for soils in the low humic latosol group. Many other analyses are possible, including soil correlation, soil classification, analysis by genetic factors, relationships between sub-groups and sorting for numerous interpretive groupings. Once the card and code systems have been designed, the cost of putting all the information on the cards is relatively small and is much less than the value of the results obtainable. It is to be hoped that a suitable, standard card and code system can be devised and published so that many workers in soil survey and characterization can use a uniform system and ensure that information and results are readily interchangeable.

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TABLE I

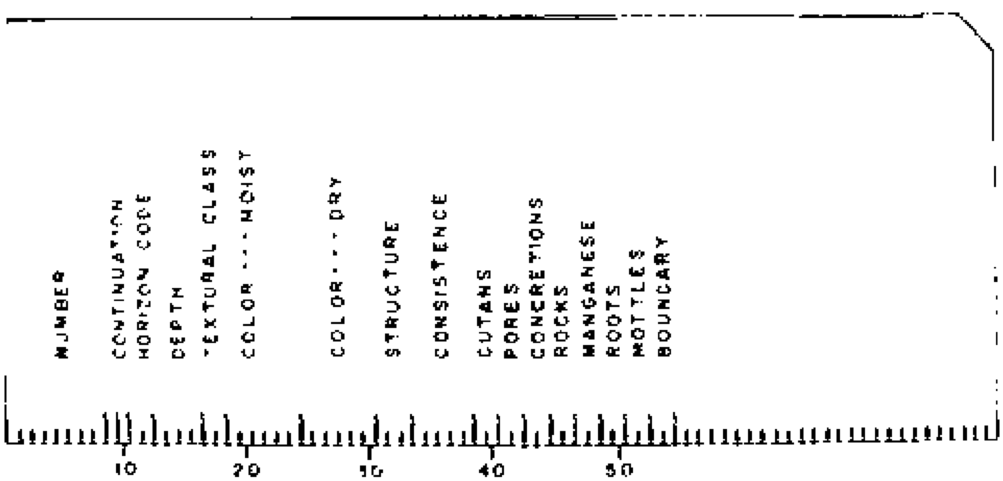
CODING SOIL CHARACTERS

CARD NO.	COLOR	CONTENTS
1	PINK	HORIZON DESCRIPTION
2	ORANGE	CHEMICAL PROPERTIES
3	YELLOW	TOTAL ANALYSIS
4	GREEN	SOIL PHYSICS
5	BLUE	CLAY MINERALOGY
6	PURPLE	SOIL ENVIRONMENT

FIG. I

CARD ONE FORMAT

HORIZON DESCRIPTION



EIG. 2

BOUNDARY CODE (COL. 53 & 54)

	SMOOTH	WAVY	IRREGULAR	BROKEN
ABRUPT	1	2	3	4
CLEAR	5	6	7	8
GRADUAL	9	10	11	12
DIFFUSE	13	14	15	16

TABLE 2

REGRESSION OF C.E.C. ON PROPERTIES OF LOW HUMIC LATOSOLS

Not Including Morphological Data

C.E.C = 4.78 + 0.20 (pH) + 3.63 (%C) − 0.33 (Free Fe_2O_3)

+ 0.33 (Bar Water)

R^2 = 0.52 F regression = 12.3**

Including Morphological Data

C.E.C. = 1.22 + 0.91 (pH) + 3.46 (%C) − 0.32 (Free Fe_2O_3)

+ 0.33 (15 Bar Water) − 1.32 (sicl v finer)

− 0.64 (sil v finer) − 0.02 (sic v cl)

+ 0.61 (sl stk v stk) − 0.04 (Av. depth of horizon)

R^2 = 0.66 F regression = 8.48**

TABLE 3

BULK DENSITY PROGRAM - LOW HUMIC LATOSOLS

CUMULATIVE CONTRIBUTION OF INDIVIDUAL VARIABLES TO R^2

DEPENDENT VARIABLE : BULK DENSITY

INDEPENDENT VARIABLES	R^2
1 ROOTS	0.57
2 pH	0.59
3 STRUCTURAL GRADE (ENTIRE GROUP)	0.63
4 EX K	0.66
5 15 BAR H_2O	0.69
6 TEXTURE	0.72
7. ROOTS	0.76
8 STRUCTURE TYPE	0.76

TABLE 4

RAINFALL PROGRAM - LOW HUMIC LATOSOLS

CUMULATIVE CONTRIBUTION OF INDIVIDUAL VARIABLES TO R^2

DEPENDENT VARIABLE : RAINFALL

INDEPENDENT VARIABLES	R^2
1. EXCH NA.	0.40
2. ELEVATION	0.71
3. XC.	0.82
4. EXCH MG.	0.89

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE
OF THE
COOPERATIVE SOIL SURVEY
New Orleans, Louisiana. January 23-27. 1967

Concluding Remarks

Charles E. Kellogg

An outline of the main problems and opportunities of the Soil Survey during the next few years as they appeared at the conclusion of the conference follows.

I

The demands for soil maps and interpretations for different purposes in both general and operational planning will continue to increase. Because of increasing investments per acre, generally the benefits in dollars from the use of published soil surveys for each dollar of expenditure will also continue to increase, both in farming and in nonfarming uses of soils. Now the benefit ratios run from about 40 to 175, not counting advance use before publication.

II

In addition to the heavy load of continuing our soil surveys and moving them through publication we have several other urgent jobs that need doing:

A. During the remainder of this calendar year we must complete the statement of the system of soil classification and prepare it for publication as soon thereafter as possible. The publication will need to include general guidelines for its application in the field.

B. Over the years we have sent out a large number of soil memoranda, most of which include both policy and procedure. Now we need to pull out the parts dealing with policy in a separate guide and to prepare at least five manuals, most of which are at least well started. We need manuals for

1. Soil correlation procedures;
2. Preparation of manuscripts for published soil surveys;
3. Cartography in the field and field offices;
4. Collection of samples and examination of soils for laboratory work, including field laboratory methods; and
5. Interpretations may be in several parts. One for soils engineering is nearly completed.

C. Since the new classification is based more clearly on soil properties, we need new general soil maps of the United States, with interpretations for our work and that of many other Federal agencies. We have urgent need for such a map at a scale of 1:1,000,000. Later we should have one at 1:2,500,000. We are finding urgent need for soil maps at scales of 1: 250,000.

D. Beginning soon we need to begin any necessary revision of the Soil Survey Manual, which is needed in training both within SCS and in the universities.

III

We also have several urgent problems with our going program.

A. Perhaps our biggest single problem is to catch up in the publication of good soil surveys so that people generally can have the results promptly. Through several measures taken in the last decade the cost of publication has not increased despite the increase in salaries and other costs. This is true also of the cost for map assembly in the Cartographic Division. Of course it is unfair to include the cartographic costs under publication alone since soil maps must be assembled on an accurate base for many uses.

B. Our greatest opportunities for cost reduction lie in more specific work plans that are held to by field party leaders and their supervisors. For example, many work plans have called for publication at 1:20,000, but the detail was not controlled and the maps were actually published at a scale of 1:15,840 at extra cost. Then too, some maps published at 1:20,000 could have been published at 1:24,000.

In addition, many manuscript soil maps are expensive to handle because of unnecessarily long symbols. Long symbols are difficult to place within the specific areas to which they apply, Then too, the greater the number of digits in the symbol, the more chances for error. Unhappily it is not uncommon for our cartographic people to find anywhere from 25 to 125 soil symbols on maps that do not appear in any legend or in the final correlation: Of course, the cartographic people are not able themselves to know if a mistake was made by the field mapper or by the party leader in making up the legend. An important cause of unnecessary long symbols is using symbols on a "statewide legend" as the symbols to put on field sheets. If a statewide legend is helpful, these symbols can be put in the special legend for a soil survey area but short symbols on the maps that guide the user to the names and long symbols in the legend.

High costs have been required in some detailed surveys from attempts to enclose with boundaries vary small spots of contrasting soils within larger soil areas. It is much better to use an *ad hoc* symbol for such contrasting soils. As the *Manual* provides, any such symbol needs to be defined in terms of the nature of the soil and the size represented by one symbol. Occasionally it is necessary to indicate very narrow bands of soils from alluvium along a stream, Commonly these are exaggerated if indicated by soil boundaries. Instead it is better to use an ad hoc, special, well-defined stream symbol that indicates the situation.

C. In many places large and unnecessary costs result from vague and infrequent progress reviews. Any time the responsible people in the State office do not know how well a soil survey is progressing, a progress review is called for. Such reviews need to be specific as to what, who, and when. For some soil surveys the time between the initial review and the first draft of the soils handbook has been far too long. Soils handbooks are especially important to the use of soil surveys by engineers and work-unit conservationists within SCS. By having the soils handbook early, it can be checked and expanded as the work progresses. For the use of copies of field sheets an up-to-date soils handbook is necessary. Also copies of some part or all of the field sheets may be needed by others in advance of publication.

Both delays and extra cost can be avoided by a thorough field review sometime in advance of the final field review. This advance thorough review can uncover ommissions or errors in the maps or legend while the field party is still in the area and able to make the corrections in less time than anyone else.

D. In some areas it is necessary to get out copies of the field sheets with a reproduced soils handbook as a special report in advance of completion for publication, or at least for part of an area. Where this material has not gone through a cartographic unit or been edited, there are likely to be several kinds of errors that may mislead our users. The State office needs to review both field sheets and text very carefully.

For many users copies of field sheets are unsatisfactory. Useful maps need to be assembled on controlled mosaics to remove distortions. Where this is done, we should try to arrange for assembly in such a way that the sheets can be used for the publisbed soil survey. Unless we are careful, people may get the wrong idea that “special” reports represent our principal product. Further, these are not regularly made available to the many Federal and State agencies and private agencies who operate on a regional or national basis.

The cost of special or interim reports should be kept as low as possible, except for the maps if they can be used in a published soil survey, in order to conserve funds of SCS and of cooperators available for getting the soil survey completed and published.

Many old but good published soil surveys need only to have soil correlations and interpretations brought up to date to be useful. The problems of doing this and of training people unfamiliar with using line maps were discussed. Suggestions will be coming to the field soon on the evaluation of older good soil surveys and their updating.

E. It has been brought out clearly in our discussions of soil survey interpretations that the Soil Survey has the obligation of furnishing data about soils and how they behave, soil maps, and suggestions of reasonable alternatives for using the soils shown on the map along with the probable outcomes of such uses. The Federal Government has no direct authority over private land and certainly the Soil Survey does not make decisions on the use of private land nor make specific recommendations since these depend on the economics of location and other facts. To avoid the appearance of recommendations, we use few, moderate, or severe limitations. not satisfactory, moderately satisfactory, or unsatisfactory. It is our responsibility to give users alternatives as clearly defined as our data permit, including alternative uses that may not be familiar to people in the local area. in fact, this is the purpose of having a nationwide system of classification related to the systems of other countries. Through the classification we can use the results of research and experience from other areas, other States, or even other countries.

IV

All the supervisory soil scientists need to be aware of training needs and resources, both within the Department and in the universities.

A. Many field soil scientists still have difficulty with simple field drafting for making clearly legible field sheets. Whenever such needs are recognized, Mr. Koechley and his associates can give a training session to help the men acquire the necessary skills.

B. It is becoming increasingly important that soil scientists be able to write clearly for both professional and nonprofessional readers. Published soil surveys are used by a large number of people, many of whom are not trained in soil science. Contrary to current opinion, the major difficulties that soil scientists have with writing do not lie with technical terms. These they use almost daily in their conversation and they know quite well what they mean. They have many more difficulties with words from the common language that they use only in writing. The meaning of these they do not understand well. Because of poor sentence structure and vagueness, some writing becomes so ambiguous that the author fails to communicate accurately. As this happens, our work loses its effectiveness.

In nearly all soil survey areas any imaginative soil scientist finds new and important relations that he may be inclined to take for granted but that are not known to other people. Many opportunities for worthwhile published papers that would be interesting and helpful to our colleagues are passed by. Good technical papers do not need to be long. They need only to deal with an important subject clearly.

C. For most of us reading offers the best opportunity to enlarge our experience and to develop new skills. First of all we need to be familiar with what our colleagues in soil science are learning so that we can have the benefit of their results forunderstanding the soils we are working with and for developing the best possible interpretations. Within any one county there are not likely to be many data about the important kinds of soil. Yet most soils in a county are also found in other counties, in other States, and in other countries. Our published soil surveys can be most helpful If we make full use of what has been learned about the same kinds of soil elsewhere.

The more we work with tax appraisers, planners, and others concerned with land for productive use, the more we need to understand enough about economics to get our own material in shape so that our soil information plays its full role in arriving at economic decisions. Here 1 am thinking especially of production economics and the economics of development. To work well together, economists must know something of our field and we must know something of theirs; otherwise we cannot be understood, nor can we get our information organized in the most useful ways. The same can be said about statute law and common law in the United States. Under the Constitution certain powers are given the Federal Government and others are functions of State governments. We must further understand that regulations, such as land use regulations and zoning ordinances, are subject to review by the courts. A violator has the right of a jury trial. If members of the jury, representing the responsible people of the community, feel that they also would have violated the ordinance because it did not make sense, the man goes free. These kinds of decisions vary even in different parts of the country.

At one time many of our soil scientists were weak in geomorphology and plant physiology. I believe that now we are taking geomorphology into account better than formerly. After all, geologists are fellow earth scientists. I think we are somewhat better in plant physiology than we were at one time, but that may be only a hope.

It seems abundantly clear from our discussions that we have a great deal to gain from more orderly use of computer technology. We have so many kinds of soil with unique combinations of soil properties that it is almost hopeless for an individual to deal with this vast amount of data in an orderly way by the old methods. The steam engine, the gasoline motor, and the electric motor have given our arms tremendous additional power. The function of the brain is to take in information, store it, and work out the interactions, but like the arm the human mind has some kind of maximum capacity. The computer gives much greater power to the brain in an analogous way that the motor gives greater power to the arm. Prof. Swindale has already given us a useful demonstration of one application with the computer. We can discover many more useful interactions and correlations. Perhaps among certain great groups of soils, or even suborders, we may find that we do not need everything that we are now putting in our descriptions or getting from the laboratory.

Once we have made some progress along these basic lines we may be able to plug in our experience data and make more nearly quantitative and accurate interpretations. We shall have a committee exploring this problem. In view of the work that has already been done we are hoping that the results of this comnittre will be useful in starting discussions at the next regional conferences, with a much fuller discussion at the next national conference. In the meantime I hope as many soil scientists as possible can take some training in computer technology, at least enough to know what kinds of descriptions we need to have and to know the potentialities and limitations of this new technology. The computer does not eliminate the brain but aids it.

Finally, I should like to say a word about professionalism. We have had some tough, high-level dialogue at these conferences. I feel we are doing better. Mastery of the tough scientific dialogue searching for the truth, not to win an argument, is the mark of a true professional. I hope that all of us can stimulate this kind of discussion at all levels in our Soil Survey.

NATIONAL COOPERATIVE SOIL SURVEY

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NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY

FILE COPY

Chicago, Illinois

January 25 - 29, 1965

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
Washington, D. C. 20250

April 30, 1965

To: Participants end Committee Members of the National Technical Work-Planning Conference of the Cooperative Soil Survey

From: R. D. Hockensmith, Director, Soil Survey Operations, SCS

Subject: Report of the 1965 National Work-Planning Conference of the Cooperative Soil Survey

Transmitted herewith is the report of the 1965 National Technical Work-Planning Conference of the Cooperative Soil Survey, which include6 committee raporte and abstracts of talks by Charles E. Kellogg; A. Leahey; Nobel K. Paterson; Harry Hudson Bailey; B. P. Whiteside; M. A. Fosberg; John L. Retzer; E. J. Williamson; Curtis McVee; J. D. Simpson; Harold L. Parkinson; Adrian Pelener; end John Quay. The committee reports are:

- Technical soil monographs
- Criteria for series, types, and phases
- Classes end phases of stoniness end rockiness
- Application of new classification system
- Engineering applications and interpretation of soil surveys
- Soil correlation procedures
- Soil moisture
- Classification end nomenclature of made soils
- Climate in relation to soil classification and interpretation
- Soil family criteria
- Organic soils
- Planer shapes of soil area*

Information on some of the items in these reports on which agreements were reached were released immediately after our conference through official channels for widespread use. Information on other items on which there was agreement will he released soon. But other items need further study. Thus, these committee reports should not be given widespread distribution. They have no official status in their present form.

Sufficient copies ere being sent to the office of each State Conservationist for distribution to th' ropriate State experiment station soil survey Leaders end to soil s____, representatives of other agencies that era engaged in soil survey work in the State. In addition sufficient copies are being sent for use by the State soil scientist, assistant State soil scientist and soil correlator. The State soil scientist may wish to circulate one copy of this report among the GS-11 and GS-9 soil scientists, but in doing so it should be made clear that the information, ideas, end data in these committee reports simply represent trends in thinking and progress of work. Thus, they do not necessarily represent official views although many of the methods ultimately may be adopted officially.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
Chicago, Illinois, January 25-29, 1965

Charles E. Kellogg

I should like to talk with you briefly about the place of agriculture in economic development and some of the current problems on which the Soil Survey will have opportunities for usefulness;

Every advanced country in the world without exception got its start toward economic and industrial development from agriculture, along with fishing and forestry. This principle is now fairly well understood and accepted. That an efficient agriculture is also essential to sustain economic development is not so widely eppraciated.

In their concern about economics, people may overlook that in a society so complex as our8 all of the things we have result from labor applied to natural resources. At the beginning of 'this century about one-third of our working people were engaged in fanning, fishing, and forestry; about one-third in mining and manufacturing and about one-third in services--school teachers, government workers, barbers, and all the rest. The fraction for manufacturing has not changed. but that for farming. fishing and forestry has greatly declined and the proportion in services is now well over one-half. Still city people cannot get wealthy simply by trading vests with one another.

American Farming to 1930

Since the middle of the 19th century end especially since 1900, American agriculture has changed faster than most of us realize, even faster than many of us in agriculture appreciate. Formerly the words "agriculture" and "farming" were used nearly synonymously. This is no longer possible without great confusion. Somewhat less than one-third of the people now employed in agriculture actually work on farms. The figure for farm workers is about six million, including family labor. Another six million manufacture machines, chemicals, and the like for farmers to use in production, Then about eleven million are engaged in processing farm products. Thus a great deal that was formerly done on farms is now done in the city. Statistically, many agricultural workers have moved from farms to the cities as agriculture has become more industrialized and urbanized. In addition, other workers in steel, automobiles, traneport, and other services also contribute to agriculture, a8 well as to other segments of economy.

In the United States, early agriculture was not only synonymous with farming but it was once primarily mixed farming. Most early farmers produced many kinds of fruits, vegetables, grains, and animals. As farmers moved West where the alternatives were fewer, they specialized in grain. Others had specialized in 'rice and tobacco fairly early.

We might look briefly at the period from 1900 to 1914. Although some farmers specialized, most of our farms were mixed ones with a high level of subsistence.

Taxes were low. Most of the power was raised as hay and oats while now it is supplied by the oil and electric companies. Farming was spread over a very large area that included much land with poor soils. Homesteading came to an end almost with a bang in 1910. The land-use adjustment that started around 1912, and that should have continued, was interrupted by World War I.

This period of 1900 to 1914 was really a great one for American farmers. They had "parity" but did not know it. Even the word yet had to be coined. The United States owed Europe money and these loans were serviced with farm exports. There were many alternative opportunities in the towns and cities for farm boys and girls. It was just before the War that farmers started voting taxes on themselves for assessment--district roads and bought automobiles. soon many were buying tractors. Their taxes increased and their expanses increased.

Instead of having a continuation of the adjustment to take poor soils out of use, the very high prices from 1914 to 1919 made it possible for poor farmers on poor soils to keep going. At the beginning of that War rural people accounted for more than one-half of the total population; at the end of it over one-half of our population lived in the cities. Urbanization has kept going since that time.

When the First World War was over, the United States was a creditor nation. Europe owed us money. Europeans were unable to buy our farm products as they had before. U.S. farming was greatly depressed. Yet the cities--city industries and services--seemed to be going strong, with personal war-time savings and credit. The stock markets were booming. Some far-seeing people were worried, about the consequences of a depressed agriculture but bills passed by the Congress to bring about 'orderly marketing of farm products ware vetoed,.

Then came the crash in 1929. It took this terrible bang to get some people to realize the importance of agriculture in sustaining economic growth as well as for initiating it. One wonders if we shall all need to relearn the same lesson?

USDA and Land-Grant Colleges of Agriculture

I should like to go back now and say a word about the institutions we know so well--the USDA and the land-grant colleges. (1) Both ware organized during, the War between the States, There was no great public clamor for either. They came into being because of the great vision of a few far-seeing people.

The USDA developed into a kind of national university. It was concerned mainly with research and exploration and the use of the results to help farmers and others concerned with agriculture to adopt better practices, to improve their lives, and to insure consumers food and fiber of dependable quality at reasonable prices. People in the USDA and the colleges bad a great deal in common. They worked together. In 1887 the then Commissioner of Agriculture invited the agricultural colleges to meet in Washington in order to discuss a plan for a permanent organization., This was just after the Hatch Act granting research funds to the colleges had passed. They did organize under the name "Association of American Colleges of Agriculture and State Experiment Stations."1/ The

1/ After several changes in name, the organization is now called the "National Association of State Universities and Land-Grant Colleges."

Department itself nursed this little association for many years. Its annual reports, beginning with 1888, were published as bulletins of the Department of Agriculture through 1909. Dr. A. C. True of the Office of Experiment Stations worked closely with the leaders. Together with them he organized a series of summer graduate schools, which were held every other year on various campuses from 1902 through 1916. Faculties were drawn partly from the Dapartmant, but mainly from the colleges. Five years after the last one of these, in 1921, the present Craduate School in the USDA was established.

Far more important than these efforts at graduate training were the scholarly seminars characteristic of the Department during its first 75 years. Many of these were organized by research scientists within the USDA; others also included scientists from the Smithsonian Institution, the U. S. Geological Survey, and the National Bureau of Standards.

Then about 1911 or so a note of disharmony arose. Both the Department and the colleges had been doing what we now call "extension." I suppose that by 1912 the Department had more such agents in the southern States than the collages. The presidents of the colleges liked the idea of extension but they did not know quite how to organize it. Yet they trusted Secretary of Agriculture Houston. Finally agreement was reached that this work would be cooperative and that the direct relations with farm families would be handled by the colleges. Thus was born the Smith-Lever Act of 1914 under which we have now what we call "cooperative extension." This seemed to settle the question of jurisdiction. The direct relations with farmers would be handled by the colleges.

Then In the early thirties came the New Deal. The country faced a deep crisis and all sorts of programs were initiated to reduce distress and to get agriculture again performing its additional 'role in economic development. At the very start, the New Deal did use the extension agents, but after a little while many of its bureaus were dealing directly with farmers. Again there arose tension. But extension is a fairly adaptable organization and has now found its role in the counties as informal coordinators. At least under the usually good conditions, the county agent is the informal "chairman of the board" who helps in the coordination of both State and Federal programs in terms of needs within the county.

The USDA changed greatly. Although Henry Wallace and M. L. Wilson presided over a great seminar period--a program any university would have been proud of--Wallace also presided over the change of USDA from a national university to the arm of the Federal government for agricultural policy. Even though agricultural research actually increased, this kind of intellectual effort had little to do with the atmosphere of decision in the Department after Wallace left.

Interdisciplinary Research and Extension

Another great change came about 1939. Although the best agricultural scientists were aware of the importance of interdisciplinary research and application earlier, It had an amazing new emphasis during the early 1940's. It was not the dramatic single improvements that gave the great increases in farm production and efficiency, but the combinations of practices that captured the benefits of the interactions among practices and between them and the soil. (2)

Clearly we are no longer concerned in an advanced country only with what e soil will produce with simple management. Tha question is, "What can we make of this kind of soil using our machines, chemicals, improved varieties, pest sntrol, and so on?" Some of our most productive soils today were among those rejected for farm use only 30 years ago. look what has been done, for example, with the soils of Florida. Other soils that were used in 1933 have been too unresponsive to continue in use.

Some say that these developments have made the kind of soil less important' since many can be brought to the same high level of yields. Nothing could be farther from the truth. The management routes to high yields and similar efficiency on contrasting kinds of soil are very different. A wrong choice can be financially disastrous.

Changes in Commercial Farming

Since the beginning of the Second World War we have seen, therefore, a great substitution of capital in the form of city-made production goods and of management skill for both labor and land. For the period 1962-4 had we used the practices of 1939-42, it would have taken 518 acres of land instead of the 334 acres we did use to have had the same production, or 55 percent more acres.

This has given high premiums to good management and severe penalties for poor management. Fanners lacking management skill, including both business and technical skill, have been forced out of commercial farming. No activity in the United States is more competitive than commercial farming.

Most commercial farms are now highly specialized. Few have more than three important enterprises; many only one. The managers have learned about their enterprises in far greater depth than formerly. This fact has enormous implications for both the colleges, the USDA, and private suppliers of farm production goods.

Actually commercial farms are about as urbanized now as the traditional urban business.

Food Processing

The advances in food processing, which we pretty much take for granted, have been equally dramatic. They have given consumers much better materials with far less waste and spoilage. How else could we get food to our great population centers?

Remember too,' in all of this, the average American uses a smeller percentage of his working time for food than the people of any other country, even counting the cost of farm programs, In fact, one can raise this question., about the so-called farm "subsidies," just who is subsidizing whom?

Land Values

Another great change since 1939 has been the enormous increase in land values- City people have bid up land for living space and recreation. Some have bought land to hedge on inflation and to escape part of their income tares, especially by changing ordinary income into capital gains. But especially have farmers competed with one another for land to enlarge their units, to use bigger machinery, and become more efficient.

At current prices, the unit costs of commercial farmers are lower if we do not count increased land values. If we do count them, most have higher unit costs.

New Problems

Prom the beginning, the agricultural leadership has more or less assumed that if farmers were shown how to handle efficiently their soils, water, plants, and animals, they would be automatically better off. This has not happened that way in rural areas.

It was easier to expand production than to lower it for several reasons. For example, one cannot turn in big machines for little ones.

The technology that helped some farm managers, and especially consumers, threw other rural people out cf work at home. Some call this the "backlash" of technology.

Agricultural leadership has not kept up with these rapid changes. The whole agricultural establishment--USDA, agricultural colleges, and farm organizations--appear to others to be conservative, defensive, unimaginative, and quarrelsome. We have not even brought our own language up to date. We ssy "agriculture" when we mean only "farming," and "agricultural" land when we mean cropland. We still say that one farm worker feeds himself and 34 other people and thus ignore the many other agricultural workers.

What are the main problems in the rural areas?

Education has been seriously lagging behind urban and especially suburban communities for many years, even in "good" farming areas. Schools are poor; emphasis is still given to vocational agriculture for boys who haven't a chance to get such work as more than laborers; a smaller percent get to college; and those who do go to college are less wall prepared.

What is the agricultural establishment doing about this? Some are doing a little--far. too little,

Underemployment is great in rural areas. Probably about 18 percent of nonfarm people are poor, and about 43 percent of farm families.

Jobs, including jobs in industry, are needed in rural areas.

Public health facilities in rural areas have not kept pace with those in cities.

On these three most basic problems what have the colleges, the USDA, and the farm organizations really done? Not enough, and no one else has taken the leadership. Believe me some group--some different group--must take it if these three do not.

A basic trouble is that many of us in agriculture have not even cared enough to inform ourselves to the point where we can read about and discuss rural problems!

Perhaps even more, so many of us look at these areas to see what our particular department, bureau, or what not can contribute. We cannot tell that until we first identify the problems and potentialities without regard to agency or speciality.

Modern planning requires competent resource examination and economic forecasting.

Now it is possible to forecast population changes, energy requirements, what people will want to use, and so on. For their national planning Prance is doing an excellent job. (3) So are many large American corporations. All of this is done with mathematics developed since the and of the Second World War.

Within these projections adjustments can be planned, problems ahead can be anticipated and avoided before they arise,

Geographic areas can be studied and industry planned for by government loans or grants to the private sector to get development going.

Soil survey

In such work our soil surveys can be enormously important for both general and operational planning. But not soil surveys alone. knowledge of minerals and water are needed to predict industrial potential,. Tbe economics of development is an essential skill, Then too,. the design of a useful soil survey, and especially of its interpretations, must be based on a good understanding of the problems--of the problems people really have in rural, urban, and urban-fringe areas.

The soil survey has always needed good soil scientists. It still does, of course, and some of these must read, study, and work with others quite beyond what we've traditionally done. Science and technology are growing at an exponential rate. In each decade our methods change far more than in the previous one. It will take hard study just to stay even.

We cannot expect to be able to train economists and others to use soil surveys without interpretation. This means to me that soil scientists must learn much more about plants, animals, engineering, and economics than we can expect experts in these fields to learn about soils. Unless we prepare ourselves to go a great deal more than half way to cooperate with others, we will not be effective.

(1) Association of American Agricultural Colleges and Experiment Stations. Proceedings of Annual Conventions. 1888- 19 14.

(2) Kellogg, Charles E.
Interactiona in Agricultural Development. In "Science, Technology, end Development," United States papers prepared for the United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areae. (Geneva, 1963) Vol. III. Agriculture, pp. 17-24. Washington 1962.

(3) Bauchet, Pierre
Economic Planning: The French Experience. (Trans. by Daphne Woodward.) 299 pp. Heinemann. London 1964.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

RATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
Chicago, Illinois, January 25-29, 1963

Soil Surveys in Canada

A. Leahey

I welcome this opportunity to convey to you greetinga and good wishes from the Canadian soil survey staffs and to wish you success in your deliberations. This is not an unselfish wish as we will benefit directly if you can find satisfactory solutions to some of the stubborn problems under consideration at this meeting. As in the past, we will continue to look to you for leadership in many technical matters. Canadian pedologists admire you for the constant efforts you are making to improve the quality and usefulness of all aspects of what is involved in the general term "soil surveys" and for your willingness to give technical advice on request without any patronizing.

I appreciate the invitation you have extended to me to discuss some facets of soil survey work in Canada. At your 1963 conference I talked about our organizational base for soil surveys, our history in this field and the increasing demands we were facing for interpretation of our data for many purposes. I also discussed briefly our then new Agricultural Development and Rehabilitation Act (ARDA) and its possible significance to the soil survey. Today I would like to devote moat of my time to the relationship between ARDA and the Canadian Soil Survey.

Two years ago ARDA organized a Canada Land Inventory Section that was charged with the responsibility of carrying out with the cooperation of other governmental agencies an inventory of the land resources in the settled and fringe areas of Canada. This inventory is to cover present land use, and soil capability for agriculture, forestry, recreation, and wildlife.

Our National Soil Survey Committee, at its last meeting in March 1963, decided that it would attempt to formulate a national soil capability for agriculture that if acceptable would be implemented by the various cooperative soil survey organizations with assistance from ARDA. This proposal was accepted by our senior administrators and later in that year we devised such a classification which is now being put into effect across the country. While our system of capability classification resulted from the efforts of many persons in Canada, I would like to specifically mention advice we received from Dr. Kellogg and Mr. Klingebiel in its development.

Our capability classification has seven classes; the first four for cultivated field crops, the fifth class for perennial forage crops where the land can be improved for such crops by the use of farm machinery, the sixth class for land which has some natural grazing capacity but on which such improvement practices are not feasible, and a seventh class that has no capability for either cultivated field crops or perennial forage crop*. No inferencea can be made from this classification on the capability of soils for tree or small fruits, ornamental plants, forestry, recreation, or wildlife.

Since our soil surveys have been, in the main, of a reconnaissance type, our capability classification is being implemented at thie level. Considering that we only have a relatively small number of experienced men who can group our soils into capability classes, and that we have about 250 million acre8 to cover, I feel the progress we have made to date has bean satisfactory. We expect to complete most of the field end of this task by the end of 1965 and completion of all previously soil surveyed areas by the end of 1966.

Cur present intention is to publish soil capability maps at a scale of 1:250,000 for the entire area included in the Canada Land Inventory. However, in the future we may include in each new soil survey report soil capability maps on the same scale as the basic soil map. I expect the first of this series of 1:250,000 maps to be published this spring.

While we have had to use our moat experienced pedologists on this soil capability task, the survey organizations have been strengthened in several ways by our close association with ARDA. These benefits might be listed es follows:

(1) Appointment to the Ottawa headquarters of three regional corralatora for soil classification and interpretive groupings. These corralators are: Dr. W. A. Ebrlich, Dr. D. B. Cann, and Mr. P. Lajoia. All of these men have bad.20 or more years' experience in the provinces.

(2) An authorized increase in our federal professional position.9 in the provinces of nearly 50 percent.

(3) A considerable increase in the number of seasonal student assistant positions.

(4) A marked increase in the staff of our central cartographic office.

If we can hold this general *increase in our* staff. we should be able to carry out more intensive surveys and to enlarge the scope of our work. Certainly we must advance as rapidly as we can to meet existing:, demands for reliable information on our soils.

The capability classifications required by ARDA for forestry, recreation, and wildlife have not advanced beyond the experimental stages. However, this week a meeting of forestry officials is being held in Ottawa to formulate a national soil capability classification for forestry. While as yet we in cooperative soil survey organizations have no direct responsibility for implementing these classifications, we do have an obligation to provide assistance and cooperation. At present we have no idea how much effort this will require on our part.

We have committed ourselves to actively participate in the FAO-UNESCO World Soil Map project by collaborating with the United States and Mexico in the preparation of a soil map of North America. As a necessary first step in this project, we have recently started on the compilation of a soil map of Canada on a scale of 1:4,000,000. Insofar as soil texture, stoniness and slope are concerned, we are following the new experimental map of the United States. However, we will follow our own system of soil Classification on this map. Just the same we will be willing to modify or change our classification to fit into whatever classification system is adopted for the North American map.

Even though the United State8 and Canada will be issuing national maps using different soil classification systems, I would suggest that it is in the mutual interest of both countries to make a serious attempt to match boundary lines along the border. We may not be able to achieve this in all cases a8 sometimes soils do change at or near the border, but let us look at the situation in both countries before we publish our national maps.

In concluding this review of some recent soil survey developments in Canada, I would like to mention that two weeks ago we suffered a great loss in the sudden death of Dr. W. L. Hutcheon, Dean of the Faculty of Agriculture, University of Saskatchewan, and Director of the Saskatchewan Soil Survey. Les Hutcheon was a tower of strength to pedological research not only in Saskatchewan but throughout Canada.

Since this occasion may be the last time I will be attending your technical work-planning meetings, I would like on my own behalf to thank you and your colleagues who are not here today for all the courtesies and assistance I have received from you over the past 20 years.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
Chicago, Illinois, January 25-29, 1969

Report of the Land Grant College Representative of the Northeast Region

Nobel K. Paterson

The Northeast Cooperative Soil Survey Work-Planning Conference hold on January 20-23, 1964, in New York City was well attended by representatives of the thirteen experiment stations and of the Soil Conservation Service. Granville A. Quakenbush wee the conference chairman. Mr. David Hill, Vice-Chairman, noted that the change from five to three and one-half days for the conference resulted in both economy end better attendance.

Following individual work sessions, six committees reported to the conference:

- Benchmark soils
- Soil correlation
- Laboratory characterization of soils
- Soil moisture
- Technical soil monographs
- Soil survey in urban-fringe areas

There are 81 Benchmark soils in the Northeast, Reports of three have been published, five are in preparation, ten hold high priority for study. Seven technical Soil Monographs, which are to be developed in the Northeast have target dates of 1964 through 1967. It is felt that administrative officials of the Soil Conservation Service and the experiment stations should be encouraged to assign personnel end time for the completion of these reports. Letters, so stating, were written by Granville A. Quakenbush, Chairman.

A series of symposiums were held on the remaining subjects studied by the National Soil Survey Work-Planning Conference of 1963.

Eight "Special Topics" were also presented, two of which were of particular interest. (1) Classification of stoniness and rockiness in soils, and (2) Soils interpretations for community planning--a two-volume case study for the town of Hanover, Massachusetts. A committee was appointed to study classification of stoniness and rockiness and to report to the appropriate national committee by January 31, 1965. Soil survey interpretationa in the urban-fringe areas is an important subject in the Northeast where residential areas continue to expand into farming lands. The report prepared for the town of Hanover, Massachusetts, could serve as a guide to the type of material that could be useful for other towns throughout the area. Several requests for town plans similar to the Hanover report have been received by the Soil Conservation Service. Four are to be prepared in Now Uampshire.

The efforts of the Soil Conservation Service to acquaint land-grant college personnel with the new classification system through training sessions and published material is greatly appreciated. The visit Of Dr. Lyle T. Alexander to the University of New Hampshire to address the local chapter of The Society of Tba Sigma Xi on his studies concerning Strontium 90 and his lecture to the soils students on tropical soils, provided valuable information that would not normally be available to the scientists and students at the university. The close cooperation of experiment station personnel and soil scientists employed by the USDA has been mutually beneficial. The annual training sessions conductad at the University of New Hampshire for the USDA soil scientists brought about a close working relationship.

A summary of observations by individual representatives of the land-grant college of the Northeast is given below:

> A delay in the publication of county soil survey reports was noted.
>
> An attempt to use the "tentative schema for classification of clay films" on the very thin, .005 mm, and a portion of the thin, .005 to .05 mm, was unsuccessful.
>
> There was disappointment at the omission of a committee on Laboratory Characterization from the 1965 national conference.
>
> Pleasure was expressed that there is to be a committee on the application of the new soil classification system.
>
> The teaching of the new soil classification system is a challenge to the University faculty member of the Northeast and the efforts of the Soil Conservation Service to keep the personnel of the land grant colleges informed of changes and revisions is appreciated.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY

Report of the Land-Grant College Representative of the Southern Region

H. H. Bailey

This report gives the highlights of recent coordinated activities, progress, and plans of the experiment station representatives in soil survey in the Southern Region,

The biennial Southern Regional Soil Survey Technical Work-Planning Conference mat at Texas A & M University, College Station, Texas, on February 11-13, 1964, with J. R. Coover, SCS, as chairman and C. L. Godfrey, Texas A & M, as vice-chairman.

A. General Conference

1. About 55 persons from the SCS, Forest Service, and State experiment stations attended the conference. Stete representatives were present from nine southern States and Puerto Rico; representatives from Alabama, Arkansas, South Carolina, and Virginia were not present.

2. Committees developed reports by prior correspondence and meetings at the conference. The committees for 1964 and those proposed for 1966 are as follows:

Committees 1964	Committees 1966
I Climate in relation to soil classification and interpretation	I Climate in relation to soil classification and interpretation
II Made or shaped soils, classification and nomenclature	II Classification and nomenclature of made soils
III Application of the new soil classification system	III Criteria for classification of soils in the comprehensive system
IV Technical soil monographs	IV Classes and phases of stoniness and rockiness
V Organic soils. morphology and classification	V Organic soils
VI Improvement of soil survey procedures	VI Soil surveys for forestry use

VIA	Soil surveys for forestry use		
VII	Soil survey reports and maps	VII	Soil survey reports and maps
VIIIA	Highways and other large facility foundations	VII?.	Soil surveys in urban, fringe and related areas
VIIIB	Application of soil survey information to urbanization		
IX	General soil map of states		

3. There is an increasing interest in the engineering, forestry, and nonfarming uses of soil survey, In some areas the largest users of soil survey information are in the nonfarming group. Recognition of this user shift is resulting in reports being prepared with these new needs in mind.

4. As more, soil survey reports are becoming available, the need for a survey education program has become increasingly apparent. A successful educational program in this field embraces several disciplines outside of agriculture - engineering and health, for example, An additional problem in this area is the adoption of the new comprehensive schema of soil classification which will require some explanation to the users of soil surveys.

5. The development of monographs on the soils of inter-state (and intra-state) physiographic regions is continuing. Authorships will generally be. cooperative between the SCS and State personnel.

6. General soil maps for States were considered. The general opinion is that these maps should be: to a scale of 1:1,000,000; information in three categories; in color at high categories. General format for the region is recommended, but with each State probably having to develop its own legend. Joining with adjacent States should be comparable to the major land resource areas, However, some felt the join should he at a lower level.

7. A set 'of general guide lines for operation of the conference is being prepared. A main point of interest is to give one vote each to one State representative and one SCS representative from each State, in the region es well as the principal correlator, representative of the Cartographic Unit, and representative of the Forest Service regional office for those matters of a policy nature.

8. Puerto Rico and Kentucky offered to host the conference in 1966. After consideration of the possible administrative problems involved in travel, the conference voted to accept the invitation from Kentucky.

B. Southern Regional Soil Survey Work Group Meeting at the SRSSTW-PC

Chairman - Curtis L. Godfrey

The Southern Regional Soil Survey Work Group mat at College Station, Texas, Tuesday, February 11, 1964, during the meting of the SRSSTW-PC.

Summary:

1. It was pointed out that there is only one official representative from each State on the work group. This person should be the spokesmen and voting representative from his State on official policy matters both in the Soil Survey Work Group and the Southern Regional Soil Survey Technical Work-Planning Conference.

2. A memorandum was circulated subsequent to the meeting asking for verification of the official representatives, Regional Soil Survey Work Group. The response indicated:

Alabama	- Joe B. Dixon	N. Carolina	- R. J. McCracken
Arkansas	- M. E. Horn	Oklahoma	- Fenton Gray
Florida	- R. G. Leighty	S. Carolina	- G. R. Craddock
Georgia	- H. F. Perkins	Tennessee	- M. E. Springer
Kentucky	- H. H. Bailey	Texas	- C. L. Godfrey
Louisiana	- S. A. Lytle	Virginia	- S. S. Obenshai"
Mississippi	- H. B. Vanderford	Puerto Rico	- Juan Juarez, Jr.

3. Even though there is only one official representative from each State the group was urged to solicit the aid of other State workers in cooperating on soil survey work.

4. The group decided to have informal meetings at the time and place of the Southern Agricultural Workers Conference each year. The call or notification of such a meeting would be through the Work Group Chairman on an as needed basis. A called meeting is scheduled for February 3, 1965, in Dallas to discuss teaching of the new classification scheme.

5. A committee was selected to screen propoaals and select a proposed regional project for presentation to the Southern Regional Soil Research Committee. The committee consisted of: C. L. Godfrey, Texan, Chairman; Fenton Gray, Oklahoma; F. W. Miller, Mississippi; H. H. Bailey, Kentucky.

6. In view of the interest of many soils workers in "climate," it was noted to the group that Regional Project S-47 - Micro-Macro Climatic Relationships - is active in several States. Individuals were encouraged to contact workers on this project and cooperate with them where feasible.

UNITED STATES DEPARTMENT OF AGRICULTURE
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NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
Chicago, Illinois, January 25-29, 1965

Report of NCR-3 Representative

E.P. Whitesida

A. In the past two years NCR-3 has been concerned chiefly with 6 regional project on the "Productivity of the Soils of North Central United States." This resulting bulletin will be printed by the University of Illinois 68 a NCR publication. This is a companion bulletin to be used with NCR-76, "Soils of the North Central Region", that was published several years ago.

In this bulletin the productivity of major soils in each of the associations shown on the regional soil association map (in NCR-76) are estimated for each of the crops commonly grown and of pasturage produced at average and high levels of management. Estimates of annual tree growth in fully stocked stands are also given. This bulletin has been edited, approved for publication, and should be available in April 1965.

B. Principles of soil correlation have also bean discussed at each of our lost two meetings. At our conference in Lincoln, Nebraska, in 1964, the following statements of three principles was unanimously approved by the 12 State representatives on the committee and forwarded to Dr. Kellogg (with copies going to Dr. Simonson and Dr. Smith) for consideration.at the national level. Those statements of principles are:

1. In actual operations, we observe, describe, sample, and analyze three dimensional soil portions smaller than pedons. These portions of pedons are grouped into classes of the classification sys tern.

2. We want to consider all the observed or measured profile properties in the natural soil classification system, (We want a soil classification based on the solum, when present, plus observed underlying materials.)

3. At the series level, we want to consider all the differentiating profile properties beneath the plow depth and those diagnostic at higher categories within the plow depth,

Together, the above statements clearly imply that at least one category is needed below the series level in the natural soil classification system. We greatly appreciate the serious consideration that is being given these statements at the national level.

C. State members of the NCR-3 committee have also been quite convinced during the peat two years that the interstate correlation work is being under emphasized. This is receiving consideration at the present time in the choice of our next regional project. We will probably try to move so as to help correct this imbalance in the National Cooperative Soil Survey. However, our present resources and personnel are not sufficient to rectify the situation in our region.

D. NCR-3 has also responded to a request from NCR-55 (microbiology) to designate representative soil series for study in the region, Three series have been designated in each State and priorities have been suggested for their microbiological characterization as time and resources permit. We plan to help select sites for sampling as NCR-55 indicates it is ready to initiate those studies.

NCR-3 committee members are: A. R. Aandahl; J. K. Ableiter; H. F. Arneman; 0. W. Bidwell; J. A. Elder; F. D. Hole; N. Holowaychuck; R. T. Odell; H. W. Omodt; F. F. Riecken; C. L. Scrivner; H. P. Ulrich; F. Westin, chairmen; and E. P. Whiteside.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
Chicago, Illinois, January 25-29, 1965

Report by the Land-Grant College Representative
of the Western Region

Mayaard A. Fosberg

The Western Soil Survey Work Group made the last assignments last January 28. 1964, for completing the manuscript for the "Soils of the Western United States." This publication was completed and the distribution to the contributing states made the first of December, Tba states outside the western states should have received their copies just recently. For anyone outside the western states who is interested in getting a copy may write to: Warren Starr, Department of Agronomy, Washington State University. Those people within the western states will hava to obtain a copy from the soil survey representative at the land-grant university in their state,

The map and manuscript has been reviewed with you before but I will quickly summarize some of its main features.

There are 13 color groups on the soil association map representing groups of similar soils regions. The subgroups or lower level of generalization are associations of closely related great soil groups. The map units of each level of generalization is described. The genesis and morphology of soils and relationships between soil occurrence and other landscape features are treated for the regions. Kinds of soils, their proportionate area, associated physical characteristics of the landscape, and climate are described for each soil association. Native vegetation, present land use and needed management is given. Thirty-six great soil groups and eight miscellaneous land types are described. Their occurrence, distribution, and relationships to physiography, climate, and vegetation are discussed. The great soil group concepts represent currant thinking in the western states,

This publication has bean sponsored by the Western Soil Survey Work Group, financed by the agricultural experiment stations of the land-grant universities. However, this is prepared jointly with the state soil scientist of the Soil Conservation Service.

Future projects for the work group were discussed at our Seattle meeting with the Western Regional Technical Work-Planning Conference for Soil Surveys January 28, 1964.

Suggestions included:

(1) A detailed morphology and genesis study of selected great soil groups common to most western states.

(2) An interpretation project studying the climatic influences and testing the homogeneity of some of the great soil groups based on the Western Soil Association map.

(3) Develop a manual for iaboratory and other technical information about the great soil groups of the regional map, including sets of slides. This could be a very useful manual for educational purposes.

(4) Consider soil monographs based on the regional great soil group map. Boundaries for the soils included in a monograph could be based on suitable physiographic units.

(5) Develop a uniform set of nomenclature and illustrations for geomorphic units of the landscape that are associated with soils in the western states.

The Western Regional Technical Work-Planning Conference for Soil Survey was held in Seattle, Washington, January 28-31, 1964. The following committees were set up for the 1966 meeting.

Committee No. 1 - Series, types, and phases (application of new classification system). Ellis Knox, Chairman, Oregon State University.

Committee No. 2 - Soil survey maps and publications. Rudolph Ulrich, Chairman, SCS, Portland, Oregon

Committee No. 3 - Soil structure. Stanley A. Buol, Chairman, Arizona State University,

Committee No. 4 - Soil surveys on range and forest lands (guides for surveys). J. A. Williams, Forest Service, Albuquerque, New Mexico.

Committee No. 5 - Climate, soil classification and interpretation. R. J. Arkley, Chairmen, University of California.

Committee No. 6 - Organic soils. Fred Schlots, Chairman, SCS, Seattle, Washington,

Committee No. 7 - Made or shaped soils. E. A. Naphan, Chairman, SCS, Reno, Nevada,

Committee No. 8 - Soil surveys on urban and fringe areas, design and interpretations, J. U. Anderson, Chairman, New Mexico State University.

Committee No. 9 - Benchmark soils and technical monographs. G. H. Simonson, Chairman, Oregon State University.

Research Work Group - M. A. Foaberg, Chairman

Western Soil Survey Work Group - M. A. Fosberg, Chairmen
Stanley Buol, Vice Chairman

The Western Regional Technical Work-Planning Conference for Soil Surveys will be held at Denver, Colorado, January 1966.

Dale S. Romine, Chairman, Colorado State University
E. M. Payne, Vice-Chairman, SCS, Denver, Colorado

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
Chicago, Illinois, January 25-29, 1965

Report on Progress of Forest Service Soil Survey

J. L. Retzer

Accomplishments

The Soil Scientist Staff of the Forest Service remains at about 60 people. The staff is currently limited by personnel ceilings and finances. There is also a scarcity of trained applicants for jobs in the soil science and eurvey fields.

In 1964 the Forest Service surveyed 2,883,000 acres. The total surveyed acreage from the start of the survey in 1958 is about 9,300,000 acres.

Work continuea on the Forest Service Manual (FSM 2550) and Handbook (FSH 50) for the soil survey activity. The Forest Service Manual establishes policies and the Handbook establishes and describes operating procedures. There will, of course, be a need for careful cross-checking with the Soil Conservation Service and other cooperating agencies to avoid statements at cross purposes. Some of these adjustments and corrections will undoubtedly come after the manual and handbooks have been issued, but there needs to be no concern regarding changes since both of these volumes are amended frequently to meet needed variations in operations.

Problems

1. We still, continue having minor problems regarding the boundaries of soil survey areas. However, the original work and memoranda from the SCS and Forest Service regarding this problem have greatly facilitated the cooperative work in all of our soil survey areas. As a result of these instructions, a great deal of friction end misunderstandings have been completely avoided. Problems remain in some States where the principle of this procedure is not yet fully accepted, This occurs more frequently in the eastern than in the western States. As the other public land agencies, namely, the Bureau of Land Management, the Indian Service, the Bureau of Reclamation, etc., develop soil survey programs, it will be more and more important that boundaries for survey areas be accepted on other than county lines. Even now it is fully recognized that some counties in the west are too large for survey areas, whereas some counties in the east are a great deal too small for publication areas.

2. An increase in efficiency of soil surveys is an essential job that must be accomplished. We hope to do this by better survey party organization. We expect to sharpen the duties and responsibilities of each member of the survey activity beginning with the party members, the

party leader, and the branch chief in our regional offices. If these people clearly understand their duties and responsibilities, it should tend to create a closer knit working team in which all members understand the importance of the jobs they are performing.

We intend to adopt standard formats for our Field Soil Notebook, Soil Management Reports, and Soil Survey Reports. It is our feeling that formats are no tests of the skills of a report writer, but that a well written report, using good English and requiring complete coverage of subject matter is a far greater mark of high attainment for people who write reports. It is emphasized here that there will be close integration of reports by the Forest Service and cooperating agencies. On the other hand, it nhould be recognized that it is deeirable to vary somewhat the kind of report that deals with mountain lands in comparison to reports dealing primarily with cultivated lands. This topic and table formats will be discussed with the SCS Washington editor for soil survey reports and others in the Washington office. It is emphasized that our objective in this matter is for the attainment of greater efficiency and better quality soil survey reports.

3. To date only three reports dealing with National Forest lands have been published since 1958. Two of these reports, namely, the Trout Creek and Frazier Alpine Areas in Coloredo, were completed surveys previous to the start of the program. The third area is Habershim County in Georgia. A portion of this county includes National Forest lands but it is only one of five counties included in a Ranger District which was surveyed by the Forest Service. It should be quite clear to all concerned at this conference that this publication rata could backfire severely and it would be very easy to say that publisbed soil survey reports were not needed at all. We hope that this can be corrected by more publications in the near future. It is the published reports that hold the entire program together. Without them there would be no national standards for classification, interpretations, etc. Instead there would ba 50 different surveys, each with its own methods and procedures, etc., and no national compilation of data at all.

4. We still have a number of problems dealing primarily with phase classes and nomenclature of phaeas.

   (a) We need to constantly examine the significance of slope classes in relation to the kind of management practiced on different lands. For example, the class limits eotablisbed for cultivated land are totally inadequate or not needed for lands on steep mountain slopes. We continue to have problems between ourselves and our cooperators regarding slope class limits that fit the capability classification and interpretations, but that are meaningless with respect to the suitability interpretations needed by the Forest Service in mountain and forested lands,

(b) Rocky and stony phases is a problem needing urgent attention since a very high proportion of the lands managed by the Forest Service are rocky and stony. The classes discussed in Handbook 18 appear to be irrelevant for our management problems. Not only era some problems in mountain lands not covered at all by the present phase classes, but the quantities of rocks and stones in mountain lande have far different degrees of significance than for other lands.

(c) Land shapes. There is and will continue to be a need' to recognize certain land forms or land shapes in mountain lands that are highly significant to the use and management of those lande. So far, land form phases have been largely rejected by the correlatora but this does not limit the significance of these phases to kind of management practiced in mountains. We need an objective and standard type of nomenclature to handle the subject of land forms. Reluctance to recognize land forma at the phase level appears to stem from their misuse in the early days of the survey when geology and land forms were accepted as mapping unit boundaries in lieu of actual boundaries of taxonomic unite,

(d) Aspect and elevation, In many places differences in aspect and elevation result in different soils. but in other place6 the differences are less than can be recognized at the series level. Nevertheless, they are significant to wildland menage- ment and the growing of native vegetation. Perhaps the measurement and evaluation of soil heat may provide some clue to this problem, Certainly It is one that should be given more attention and-study in mountain lands.

5. The use of specialists in soil management service activities is increasing but not as rapidly as it should. Some regions have more work than they can do along this line whereas other regions have practically no requests for assistance. This kind of activity was specifically established in the beginning of the program to take care of urgent and pressing problems involving soils following such calamities as forest fires, floods, and for other purposes such as tree planting, road location, etc. We feel that the staffing of people at this level will be very advantageous to the management; people and it will permit us to keep soil scientist6 'continually occupied with soil surveys.

We continue to strive for two GS-12 soil management people for each region. Although we have financed the positions and the jobs -are available and urgent, we have succeeded only in one or two, instances of having reached the goal of these two full time specialists *in a region,*

6. We have not yet sufficient headway in getting soils used at the multiple-use planning level. Some areas have been planned on this basis with complete satisfaction and a good carryover from one Ranger to the next on the same District. We have surveys in many area* which apparently have not been used to their fullest extent. The planning emphasis appears to be on "people needs" at the Ranger level. What this means is that the planning is done on the basis of publicpressure rather than on a knowledge of the total potentials and productive capacity of the soils for the entire Range District.

We seem to have made somewhat better progress in the use of soil information at the project or the work level. At this level information has been used in nearly all major activities, such as timber, engineering, recreation, wildlife, grazing, and on such intensive use areas a* nurseries, seed tree orchards, experimental areas, etc. Engineering has for the most part made more effective use of soil counseling than have other major activities. There is considerable interest and activity on the part of the experiment stations to have their experimental areas mapped in detail as a basis for assisting them in making interpretations from their research results. The reverse of this is true foradministratively established seed tree orchards and nurseries where essentially no information has been sought or used previous to establishment of these areas. Likewise, timber management apparently is among those who have made the least use of soil information, despite the fact that such information could probably benefit their program more than any other activity of the Forest Service.

Training and Uses of Surveys

We continue the search for better and more efficient ways to train administrative and management people to become familiar with and use soil information in their activities. In the past this has been done directly by soil scientists, but the level of talent required for teaching diverts our best people from other pressing duties of the soil program for which only they are trained, Direct teaching is also a very expensive procedure since it take8 the talents of the soil scientist a8 well a8 the full time attention of administrative people for a considerable period.

To be more effective in this kind of instruction we are preparing a programed instruction course for training administrative people, In this manner, self-training will be possible. It will also be possible to distribute the training material to the different Forest Supervisor Offices for their own training without the presence of soil scientists. We will know more about the efficiency of this procedure within another year.

Technical Training for Soil Scientists

We continue to avail ourselves of technical training in such fields as correlation, report writing, etc., extended to us through the courtesy of the Soil Conservation Service. We appreciate thfs training opportunity since we are in no position to conduct such schools at the present time.

The advanced training in soil science offered at Cornell University has now been extended to all of our regional leaders and some of our second line people. We hope that this kind of training will continue since it fills au urgent and critical need for technical workers who have been out of school for a period of five years or more.

We currently have one man doing graduate work. We have transferred to Forest Service Research two men with Ph. D. degrees who were originally working with us on surveys. We think this is a good and profitable move for the entire Forest Service.

Plans

We have good and strong plans in the Division for moving ahead with the soil program on an integrated basis with other activities of the Division of Watershed Management as well as with other phases of activities within the Service. We are, of course, faced with the same limitations in this respect as are other agencies; namely, personnel ceilings and lack of funds to employ people adequately trained to do this kind of work.

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Educational Methods Used by States for Introducing Soil Surveys

E. J. Williamson
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It is indeed a pleasure to attend and participate this week in the National Technical Work-Planning Conference of the Cooperative Soil Survey, When Mr. Hockensmith approached me several weeks ago regarding the possibility of discussing "Uses of Soil Surveys by the State Cooperative Extension Service," I soon realized that our office files were quite inadequate for the task. Consequently, I asked the State Extension Conservationists and Soil Specialists to review briefly the State educational programs which they have found to be effective in alerting the public, urban as well as rural, to the uses of newly published soil surveys.

While educational methodology varies to some degree from one State to the other, it is interesting to note the similarity in techniques being used by many of the States. A decade ago, not much more than the agricultural potential was considered; today there is considerable interest in the use of soil surveys by many nonfarming groups.

For instance, in Maryland the Extension Service cooperated with the Soil Conservation Service and the Agricultural Experiment Station in the last five soil survey reports by conducting educational meetings in each of the five counties. The Extension Agents sent circular letters to a selected group of public officials, business and professional people, inviting them to an educational meeting on the new county soil survey report, Separate meetings were conducted for the farmers. The major uses of the reports by Maryland have been in analyzing farm businesses, planning crop rotations assisting with the development of adequate water supplies and drainage, assisting nurserymen, counseling sod growers, and working with urban developers, city planners, realtors, and bankers.

South Carolina reports that seven new county soil surveys have been released. At the time each of the new survey reports was released, a meeting was held involving the following people: all county agricultural workers; district foresters; highway, city, power and other utility engineers; health department personnel; local legislative delegations: banking, building and loan, and other lending agency personnel; farm and civic leaders; and county and district school superintendents. About half of the program time at these meetings was devoted to informing the group about the different uses of the soil survey reports, with the remaining time spent on learning how to use the reports. Soil survey reports were distributed at these meetings. Since the release of the seven new county surveys, a number of other counties have expressed considerable interest in expediting their county field work toward earlier publication dates, Several have offered to appropriate extra county funds above the already appropriated State funds to speed up this work, Many of these counties are realizing the value of the reports to their tax reassessment, zoning and urbanization problems. A leaflet, entitled "Soil Survey Report--How it Concerns You," has been prepared for State distribution to alert the State regarding the potential uses of Boil survey reports.

The Boil survey educational program in Texas begins during the time of the field work and collection of the soil survey data. The local soil conservation district, in cooperation with the Soil Conservation Service and Texas A & M University, hosts a meeting for the key agricultural, business, professional and official leaders of the county. The purpose of this meeting is to acquaint the leaders with the survey and develop a plan for insuring that the county inhabitants are aware of the soil survey work and its progress. On completion of the survey and prior to publication release, a core-action group is formed to plan county educational meetings on the use and distribution of the soil survey report. This action group includes representatives of all agricultural agencies and key county and organizational leaders. A program is formulated to include leader familiarization, community meetings, tours, field days, promotion and the use of mass media facilities. In the State of Texas, highway construction people probably make the greatest use of soil surveys Outside of agriculture, with pipeline and petroleum related industries next, followed by banking and business people and real estate developments.

Iowa reports that as newly published county soil surveys become available, Extension and the Soil Conservation Service in cooperation with the soil conservation districts and other local leadership conduct educational meetings in the county, usually on a township basis, to acquaint the rural people with what they need to know for effective use of the report. Separate meetings are held for professional workers and nonfarming clientele, This approach has been used in eleven counties during the past five years with excellent success. A leaflet. "The Spotlight is on Iowa Soils," was cooperatively written and released Statewide by the Soil Conservation Service and Iowa State University to acquaint the general public with the current uses made from soil surveys in Iowa. One of the most rapidly growing uses of soil surveys today in Iowa is by assessors and taxing bodies. In a number of cases, counties are making sizable monetary contributions to hasten the completion of surveys in the interest of establishing a more equitable and realistic tax base on agricultural land.

In the State of Connecticut, the soil survey usage is mainly that of farm planning and special needs by the State Development Commission, the Regional Planning Agencies, and Town Conservation, Planning, and Zoning Commissions. Cnly one county of the eight counties of Connecticut has a published soil survey to date; however, another is in the publication process with the remaining six counties in various stages of work, two of which are nearing completion.

In Pennsylvania, the method used for alerting the rural and urban users of newly released soil survey reports is vary similar to the methods used in Kansas and New York. A meeting is held with community leaders. and includes planning commission members, health department officials, county commissioners, school board members, highway officials, etc. The main emphasis at this meeting is on how the report can be used in community planning end development. A different meeting is held for those with agricultural interests--farmers, district supervisors, ASCS and FHA personnel, etc. At both meetings, the various sections of the report are highlighted and explained relative to the many uses and implications. The number of people appearing on the program is kept to a minimum. Usually, the Extension Agronomist, State soil conservationist and the soil scientist responsible for the county mapping are involved along with the local work unit conservationist and county agent, Uses of new soil survey information are also stressed at a series of agronomy-agricultural-dealer meetings each winter. Here feed, fertilizer, seed and equipment dealers are shown how the information of soil surveys can be used for their benefit. Community planning schools, conducted by the Pennsylvania Rural Areas Development Committee and the Department of Public Instruction are including discussions centered around the use of soil surveys. Here the main emphasis is on the importance of soils information and why the report should be considered in the initial stages of resource planning. Most of these people will not be using the reports directly, but need to appreciate the benefits from land use planning and the serious results from lack of use. Another idea that Pennsylvania is finding useful is the county informational leaflet explaining briefly the use of soil survey reports which are distributed prior to the release of the county report. (Example, "How the Soils in Pike County Will Shape Our Future.")

Aside from the numerous agricultural uses of the soil surveys, Minnesota lists such nonfarming uses as assisting in the preparation of interpretive urban soil maps for metropolitan planning commissions, a proposed use involving recreation land use planning with the Minnesota Recreation Resource Commission; highway construction uses such as soil site locations with similar engineering properties; commercial tree planting sites; and the determination of land values by land appraisal agencies.

Ohio attributes their successful soil survey program to efforts of the five-member Soil Inventory Board composed of an agency representative from the Division of hands and Soil of the Ohio Department of Natural Resources, the Soil Conservation Service, the Ohio Agricultural Experiment Station, the Ohio State University, and the Agricultural Extension Service. The board is responsible for guiding the soil survey program, all the way from assigning county priority status of work to be undertaken, to the dissemination of information regarding a newly released county soil survey. The first educational effort of the board in the county is to pull important segments of society together that have an interest in being informed as to the nature of the soil survey work and its possible implications in total community development. Usually, at this time, a small leaflet is developed, briefly explaining the need for a new soil survey and the various uses that can be made of the report, once it is available for distribution. (Example, "Mahoning County--Soil Survey.") Another important aspect of the Ohio program is the progress report that is developed during the interim of county survey work. (Example, Progress Report No. 24. An Inventory of Ohio Soils--Warren County.) This progress report provides factual information on soil resources of the county to the people and provides an opportunity for making some of the information available for use during the survey or shortly thereafter.

In deciding on future progressive survey areas in Indiana, Extension and the Soil Conservation Service cooperate closely by holding information meetings with local paople to explain soil surveys and their value. When a county is selected for a soil survey, the local people are asked to organize, through their soil conservation district, a committee of persons who ara interested in obtaining soil survey information. This group, of 10 to 20 people acting as a steering committee, helps to guide the progress of the survey and the educational program 'needed to make it known to the public. A concerted effort is made to reach the county planning commissions, highway departments, health services, urban contractors, realtors, etc., with survey reports. As a part of the educational training meting, these groups are taken on a tour of selected soil sites, associating the idea that learning by field examination is batter than learning by listening alone. Similarly, meetings are held for the agricultural users of the survey.

Oklahoma reports that 16 of the 77 counties in the State have new soil survey reports, 14 of which have had organized education meetings for disseminating the report to the public, with the remaining two county reports to be carried to the public during February of 1965. The educational program consists of a team approach involving representatives of Extension Service, the Experiment Station, and the Soil Conservation Service who assist in organizing the training meetings in use of the soil surveys. The training team arranges first a training school for representatives of the agricultural agencies and leaders of the county, and follows by scheduling training sessions for agricultural and non-farming interests in the application and use of the reports.

If the time would permit, similar educational programs could be related for Michigan, Wisconsin, South Dakota, Nebraska, New Mexico, California, etc. However, in closing, I would like to briefly review the training program for soil survey report distribution used in Kansas. It is one which I believe is a worthy example for consideration by any State wishing to develop a strong educational program to alert the general public to the use of new soil survey reports.

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Curtis McVee
Bureau of Land Management

Prior to specifically discussing the use of soil surveys by the Bureau of Land Management, I would like to discuss some recent developments which have affected the Bureau's Resource Management Program,

The 88th Congress passed the Classification and Multiple Use Act, P.L. 88-607 together with other milestones of conservation legislation affecting the 477 million acres of public lands administered by the Bureau of Land Management. This act recognizes both the complexity of multiple resource use and management. It directs the Secretary to review the public lands in light of specific criteria and to separate all public lands into two categories: Lands suitable for disposal and land more suitable for retention and continued management in the public interest. Criterion are presently being developed to describe lands eligible for both categories.

To be eligible for disposal, public lands administered by the BLM will probably have to meet one of tbe following limitations:

1. Required for the orderly growth and development of a community;

2. Chiefly valuable for residential use or development;

3. Chiefly valuable for commercial or industrial use or development; and

4. Chiefly valuable for agricultural use exclusive of grazing and forage crop production,

Public lands will be retained and managed for any one or any combination of the 10 possible uses envisioned in the act.

1. Domestic livestock grazing;
2. Fish and wildlife development and utilization;
3. Industrial development;
4. Mineral production;
5. Occupancy;
6. Outdoor recreation;
7. Timber production;
8. Watershed protection;
9. Wilderness preservation; and
10. Preservation of public values.

Long-range plans are indeed necessary to pursue such a task--which will result in land use and land tenure decisions implicating future generations of Americans searching for the use of public lands.

Currently the Bureau is developing a planning system which we hope will meet this goal. Planning units which contain public lands having homogeneouo characteristics and use patterns are delineated and the development of long-range plans will bo initiated this year. Initially, these plans will concentrate on resource demands, rosource management and development needs and potentials.

Initially these plans will utilize whatavar inventory information is available. Forage surveys and range condition and trend classifications are completed for most public lands, theee include external soil characteristics. Forestry and timber surveys are currently being completed. Both a recreation and wildlife inventory is in progress. A mineral's inventory is essentially completed. Soil surveys of various types and intensities are available in a few areas. In many situations, the plan will rewgniee and schedule in a logical sequence the gathering of additional resource information.

However, the Bureau has responsibility to conduct a going management and improvement program, which must go on simultaneously with the long-range planning function. For example, the first problem facing our range managers is to continue development of a grazing program to properly utilize the existing forage. This is accomplished by utilizing:

1. Initially a range survey

2. Perfected by

    a. Actual use and utilization records
    b. Condition and trend data
    c. Allotment analysis including soils information.

As management intensifies, the manager will become more concerned with the potential of a given site for additional forage production. Because of practice limitations, certain areas are not presently susceptible to the introduction of improved forage plents. Because of experience, many areas can.be selected for certain treatments by gathering only some of the most basic typa of soils information utilizing a simple reconnaissance procedure. Other areas where experience is not available and critical problems exist and wber? large investments in intensive conservation practices are programmed, the resource manager must have the best and most accurate resource information obtainable upon which to base his decision.

In an effort to broadly identify one of tba typical problems facing the Bureau, we recently completed whet we call a "frail lands" inventory identifying over six million acres of public lands which are in very advanced stages of erosion.

Special emphasis will be placed on designing management programs for these area*. As resource information is perfected, these plans will become more precise.

Soil surveys are being obtained by the Bureau of Land Management in areas which have an apparent potential for intensive conservation treatment and where critical edaphic problems occur. Generally, these are by contract arrangements with the SCS or some research institution. Engineering and construction types of soils analysis are utilized, and the Bureau conducts soil investigations in localized areas, prior to the installation of conservation practices, to help determine potentials and to classify lands for various uses including the production of agricultural crops.

A resource manager faced with making daily management and development decisions knows that it is impossible to have too much resource information. However, the limitations of manpower and funds--lea6 than four cent6 per acre per year for range management and soil and watershed development of the millions of acres--often dictate that the manager is inadequately informed and must substitute judgment and experience.

The three pilot BLM-SCS soil surveys, one each in Montana, Nevada and New Mexico have been completed. Basically, the purpose of these studies was to become familiar with procedures and evaluate these on public lands. Baeed upon this experience, the Bureau has made several decisions:

1. Not to enter into an intensive soil survey program for a.11 public lands at this time.

2. Soil inventories will primarily be limited to areae proposed for long-term multiple resource management and where soil surveys will furnish additional information needed to solve critical soils related resource problems. Costa of soil surveys appear prohibitive when considering all lands administered by BLM and our personnel and money budgets.

3. Cur soil survey staff report also recommended the development of the soil science technology within the Bureau by placing a trained and experienced soil's man on the BLM Washington office staff.

4. The staff report recognized that the Bureau has an immediate need for a soil survey method--probably reconnaissance--which could gather only the very essential type information suitable for the majority of our programs at the present intensity of management. This method could also identify problem areas and it should be complementary to other BLM resource inventories.

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Coordinated Slide and Tape Lecture

by
James D. Simpson
Bureau of Indian Affairs

A coordinated slide and tape lecture was presented that reviewed the activities of the Branch of Land Operations, Bureau of Indian Affairs. The presentation emphasized the use of soil and range inventories in resource use and management.

Special attention was focused on the need for greater emphasis by all levels of the administrative and technical staffs to put into effect the basic idea that lands are different, and because they are, they need different use and management. This basic idea applied in the form of establishing, as nearly as possible, land units that are uniform in nature is a fundamental step in increasing the efficiency of farm and ranch operations. Such efficiency improvements are essential if agriculture is to be successful in its competition with other industry.

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Use of Soil Surveys in the Bureau of Reclamation

Harold L. Parkinson

I appreciate the opportunity to be with you this week and to discuss briefly some of the Bureau of Reclamation uses of soil survey work. In a way this meeting is like "old home" week for me as I spent the first ten Years of my adult life working in soil survey activities for the Soil Conservation Service. I have seen several old friends at this meeting and look forward to making many new acquaintances before the conference is over. Mr. Maletic regrets that he was unable to attend and extends his best wishes for a successful conference.

As most of you know, the Bureau of Reclamation activities are in the 17 Western States. We are engaged in planning, constructing, and operating single and multiple-purpose water resource development projects. We perform land classification surveys as a part of the investigations involved in planning irrigation projects. At previous meetings we have described the principles upon which our land classification is founded. I will take this opportunity to describe the flow of work involved in our land classification and to show the uses made of soil survey in this process.

I have prepared an exhibit illustrating the usual flow of work associated with an economic land classification and a determination of the irrigable area. As you can see from this display, the flow of work has been divided into four lines to reflect the various items of work being accomplished. The top line shows the work can be braodly divided into pre-survey. survey, and post-survey activities. The second line shows that the pre-survey and survey activities are all designed to establish arability of the Land, while the post-survey activities are directed toward establishing irrigability. The latter activity is a period of plan formulation, The third line shows the summary of work items in the land classification. The bottom line includes some of the more important details involved in accomplishing the items shown in line three,

Arable land is defined for our land classification somewhat differently than normal. We define arable land as:

> "Lend which, in adequate sized units and if provided with the essential improvements of leveling, drainage, irrigation facilities. and the like, would have a productive capacity, under sustained irrigation to meet all production expenses, including irrigation operation end maintenance costs and a reasonable return on the farm investment; to repay a reasonable amount of the cost of project facilities; and to provide a satisfactory level of living for the farm family.

> "The irrigeble area comprises that portion of the arable area which is subject to farm use under ultimate development of the project or unit under construction. It is determined within the arable area by consideration of any limitations imposed by water supply, cost of facilities, and service to specific tracts."

In other words the arable lends are those suitable for irrigation end the irrigable lends are the particular arable lands included in the project plan. Looking back at the exhibit va see that the first six steps in our land classification are involved in the initial inspection of the area. These steps are taken to acquaint the soil scientist and the agricultural economist with the general soils, topography, physiogrephy. and drainage conditions. At this time we try to locate and inspect suitable correlation areas where irrigation is being used on the common soils occurring in the project area, Determination of the methods of irrigation which will be the basis for the classification specifications, the anticipated irrigation labor requirements, lend development costs, and the productive levels are also important steps in the initial inspection. In the second phase, shown on the exhibit between numbers 6 and 12, we secure all available soil survey date. In addition, we order our base maps, secure data on the climate, end evaluate the quality of irrigation water. If data on water quality are not available, steps are taken to secure such data.

In the next phase, numbers 12 to 18, the lend classification specifications are developed, It is et this point that farm budgets are made and the payment capacity of the principal lends are determined. If available, we use soil survey data at this time to appraise the distribution of soil bodies located in the project area, We also secure a preliminary estimate of the OM&R charges for the project so we have a reliable basis for establishing the minimal permissible productivity levels and the maximum land development costs which may be included in the arable area. The next step in this phese is to relate productivity to physical characteristics. In this step we are making a prognosis of future productivity under a vastly changed soil-moisture regime. At this point any available soil survey data aro very useful in our interpretation of soil water relationships. In addition, the soil survey data provide valuable clues on the location of lands on which problems may be encountered, Present and future water table conditions are given careful attention et this point. Control of a water table with irrigation is often very costly under circumstances of slowly permeable substrata materiels. If conditions indicate a water table is apt to develop under irrigation, careful thought must be given to the maximum height it can be permitted to rise. This height has an important bearing on productivity, project construction costs, farm development costs, and project feasibility.

Pertinent soil survey date are applied to determine the areal extent of the important soil differences. Soil characteristics which appear to limit productivity because of soil-water relationships are carefully studied by appropriate in-place field tests and the results correlated with laboratory studies. Where detailed soil survey data are available and supported by laboratory characterizations, our studies are expedited.

Land development coat estimates are an important part of land classification survey. Good quality topographic maps are essential for adequate appraisals. Out land classification specifications show a permissible range in value, expressed in dollars, for each land class. Soil survey data are thus useful in appraising the maximum permissible cuts which can safely be made and as support for productivity levels which can be anticipated after the land forming is complete.

Drainage studies are a necessary part of land classification and arability cannot be established until these studies are completed. The estimation of the rise and fall of a future water table necessarily requires considerable data from deep borings. These establish depth of present water table, slope of water table, depth of barrier, continuity of aquifers, and noncapillary porosity. Pump-in and bail-out tests are made in representstive areas to establish the in-place permeability rates.

I will not go further into details concerning our classification at this time. However, as you can see from the exhibit, we classify the land, review the classification, determine the arable acreage, prepare maps and exhibits, and write our reports. An important part of each Land Classification Appendix report is a presentation of the soil survey data, particularly descriptions of the more important soil series and types.

The soil survey has been and will continue to be used to facilitate and improve land classification. The newer type soil survey reports which have been released during the last few years are more useful than older reports. Land classification costs can be reduced where good soil survey data are available. We believe that the following problems need additional study for mutual benefits,

1. More research is needed to characterize the changes in mappable characteristics that occur on soils with irrigation. This could include such conditions as silty irrigation water, variable water table levels, increased organic matter accumulation variations in water quality, land forming changes, changes in pH, changes in lime accumulation, and other similar items.

2. Quantitative studies are needed which relate soil characteristics to soil qualities under irrigation.

3. Many more studies are needed on drainage than are now available. How high can a water table be maintained under various conditions of cropping and recharge conditions without serious soil deterioration? How tolerant are various crops to fluctuating water table conditions? We have contacted many sources on this and have found a very wide range of opinions.

4. The effect of slope on productivity under irrigation also needs further study.

In addition to the use we make of soil survey data in our land classification, the Bureau also utilizes soil survey data in hydrology studies. Soil series and types have important relationships to rata of run-off in watersheds and tha amount of sedimentation which can be expected into reservoirs. Our hydrologists very carefully study your soil data as an aid in these evaluations.

The Bureau of Reclamation would like to see greatly improved coordination between the soil survey program and the land classification. Such coordination has been achieved in various areas in the past and excellent results were achieved. For example, the basic soil survey work was very closely tied to the land classification program on the Garrison Diversion Unit in North Dakota. Soil profile notes and laboratory data were freely exchanged and soil characteristics were often discussed in the field by the soil scientists from the two organizations. It is safe to say that the work for each group was expedited, total costs were reduced, and improved accuracy resulted from this cooperation. In Kansas and Nebraska, the soil survey legends were adjusted for easy conversion to land classification requirements. Undoubtedly, other examples of excellent cooperation could be given. Our representatives attend your regional work-planning conference each year. They have the current and anticipated land classification program available. This would be an excellent place to start an improved survey coordination program.

You may be interested in our proposed land classification program for fiscal year 1966. I have prepared a list of projects or units which we propose to investigate during this period. This list is by states so that those of you representing these states will be able to follow the program better. Before reading the list, I should point out that we have two types of irrigation service--full service where presently dry lands are furnished a full supply, and supplemental service where an existing irrigated project is furnished additional water to bring them up to a full supply. As you can imagine, the supplemental service may range from a very small additional increment to nearly a full supply. Land classification requirements under such circumstances vary widely. The objectives in land classification for supplemental service lands are to (1) delineate areas of nonarable lands presently irrigated which would not benefit from additional water, (2) estimate the additional drainage problems that would be anticipated with more water, (3) to establish the general character of the arable lands as a basis for measuring benefits, and (4) secure sufficient data to assure that the farmers will indeed benefit from more water and that the additional benefits will more than offset the costs.

The classification intensity necessary to achieve these objectives may vary from a briaf reconnaissance to a conventional detailed classification. Recent soil survey data on projects requesting supplemental water are particularly useful to us.

The acreages slated for the various projects are very approximate, and represent the estimated ultimate irrigable acreage. In most instances, classification work extends over a period of several years if a large acreage is involved, In some instances most of the claooification work has been completed prior to FY 1966.

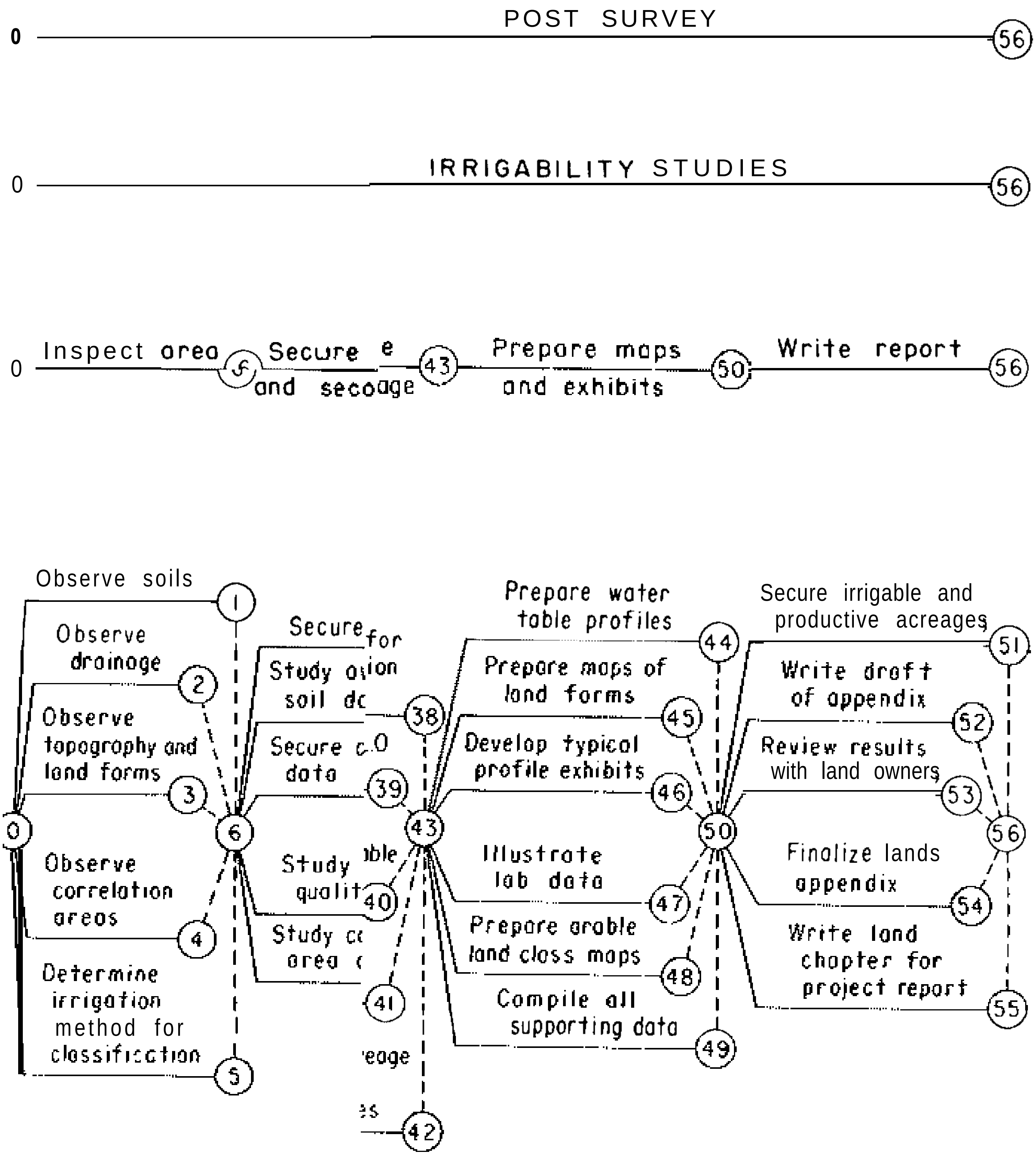
With this brief background I will read the work program.

BUREAU OF RECLAMATION
Proposed Land Classification program
FY 1966

State	Reg	Project or Unit	Service	Approximate Acreage
Arizona	3	Central Arizona	Suppl	1,150,000
	3	Upper Gila River Resin	Suppl	12,500
California	2	North Coast Project-English Ridge Unit	Suppl	49,000
	2	North Coast project-Knight6 Valley Unit	Suppl	156,000
	3	East Kerns Project-Antelope Valley	Suppl	500,000
	3	Amargosa River Basin	F&S	316,000
	3	Boregos Valley	F&S	26,500
	3	Morongo-Yucca Valley	F	?
Colorado	7	MRB--Upper South Platte Unit	S	12,400
Idaho	4	Sear River' Project	F&S	30,000
	4	Burns Creek	S	528,000
Kansas	7	MRB--Marais Du Cygnes River Basin	F	40,000
	7	MRB--Kaw Division	F&S	70,000
	7	MRB--Wilson Unit	F	25,000
	7	MRB--Kipp Unit	F	7,000
	7	MRB--Scandia Unit	F	20,000
Montana	6	MRB--Marias-Milk Unit	F	?
	6	MRB--NE Montana Basin Survey	F	?
Nebraska	7	MRB--Elkhorn Unit	F	50,000
	7	MRB--Big Blue Unit	F	40,000
	7	Mid State project	F&S	150,000
	7	Nemaha River Basin Unit, M.R.B.	F	30,000
Nevada	2	Washoe Project--Newlands Extension	F&S	150,008
	3	Moapa Valley pumping project	F&S	9,300

State	Reg	Project or Unit	Service	Approximate Acreage
North Dakota		0		
Oregon	1	Carlton Division	F	27,500
	1	Molalla Division	F	160,000
Oklahoma		0		
South Dakota	6	MRB--Oahe Unit	F	495,000
Texas	5	Sinton Unit	F	200,000
	5	Lower Rio Grande Valley Unit	F	250,000
Utah	4	Bear River Project	S&F	30,000
	3	Dixie Project	S&F	20,000
Washington	1	Yakima Project Supplemental Storage Division	S	'460.000
Wyoming	7	MRB--La Ptele Unit	F	6,000

In closing, I want to thank you for this opportunity to discuss some aspects of our land classification with you. I am looking forward to participation in the committee meeting. Thank you.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Observe soils
Observe drainage
Observe topography and land forms
Observe correlation areas
Determine irrigation method for classification
Secure for
Study soil
Secure data
Study quality
Study area
Prepare water table profiles
Prepare maps of land forms
Develop typical profile exhibits
Illustrate lab data
Prepare arable land class maps
Compile all supporting data
Secure irrigable and productive acreages
Write draft of appendix
Review results with land owners
Finalize lands appendix
Write land chapter for project report
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UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

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NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
Chicago, Illinois, January 25-29, 1965

Reduction in Participation by the Bureau of Public Roads in the National Soil Survey Program

Adrian Pelzner

I am going to speak to you on what I consider to be a rather serious subject--reduced participation by Public Roads in the National Cooperative Soil Survey Program. Public Roads participation in the National Soil Survay Program has a long his tory. It began in the early fifties after an exchange of correspondence between the Department of Agriculture's Chief of the Buraau of Plant Industry and the Department of Commerce's Commissioner of Public Roads. At first, cooperation by Public Roads provided all the assistance in the preparation of engineering information and the testing of soil samples for evaluating the engineering properties. Later on, the cooperation was expanded to include most of the State Highway Departments. Through the combined efforts of State soil scientists and Public Roads officials, wa now have 39 State Highway Departments cooperating in this work. The fact that so many highway departments are cooperating in the program and using the information indicates the high regard most highway engineers have towards it. The information the engineering section contains, such as tables of test data, estimated properties of the mapped soils and their engineering interpretations can be extremely valuable. As more and more areas of the United States are covered by soil survey reports, the program will assume greatar and greater importance to highway engineers.

Why than is the Bureau of Public Roads taking steps to reduce its participation in the program? There are two answers to this question. First the work, from our viewpoint, has now graduated from a research-oriented program to an engineering or operational program. We feel that the type of information contained in the engineering sections has proved its value and that the methods are well established. In addition, the format for reporting test data, estimated engineering propertiea and the engineering interpretations is also well established. A highway oriented user should not have a problem with the contents of the engineering section. His major problem, if any, would be lack of coverage in the particular area with which he is concerned. Since the research phase has so nearly faded out of the picture, we believe our participation should be reduced.

The second answer to the question of our reduced participation in the program is simply a matter of staffing. In a recant analysis of our soils personnel time, a 12-week period was chosen at random. The analysis revealed that ten research personnel directly concerned with this program had spent approximately 50 percent of their available time on it. Furthermore, whan considering the combined efforts of the entire soil research staff, this one program used 20 percent of all available man-hours. Wa have concluded that we simply cannot spend this much time on one program, As some of you may know, the Bureau of public Roads sponsors research by the State Highway Departments through its BPR program. This program'has grown very rapidly. The Bureau of Public Roads now has surveillance responsibilities for research and development having a total value of approximately 20 million dollars. In the soils research area alone, we have had an increase in surveillance responsibilities of well over 100 percent in the past three years. In addition, there are many areas of the national highway research program that require a basic approach. Some of the needed basic research does not fit in the HPR program. It is, nevertheless, extremely important and the Bureau of Public Roads should be actively concerned with it through its staff research. These two problems, surveillance of research responsibilities and the need for staff research, have contributed to our decision to reduce our participation in the National Soil Survey Program. Another factor in our decision is the fact that, with our responsibilities and work load increasing, our staff has been decreasing.

The Bureau of Public Roads has no intention to separate itaclf entirely from the National Soil Survey Program. With the assistance of our field offices we intend to continue our efforts to induce all of the State highway departments to cooperate in the program and we, in the Washington office, will be available to provide consulting services as needed.

Our reduction in participation should in no way be thought of as a reflection on the value of 'the program. Most highway engineers that have had contact with the engineering sections of the soil survey reports are convinced of their value. On behalf of these engineers, I should like to take this opportunity to recognize the effectiveness of the State soil scientists 'and the officials of the Soil Conservation Service, and call attention to the important help they have given to the highway engineering profession.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
Chicago, Illinois, January 25-29, 1965

Dow Planners Use Soil Surveys

John R. Quay

The best layed plans of planners sometimes have to be modified between the time they are prepared and the time they are put into action. This speech is an example. As some of you are aware, there was a meeting of SCS personnel last week in Philadelphia. The purpose of this meeting was to explore urban uses of soils information. I had planned to use some of the knowledge that I gained as part of the text for this talk. I had also planned to write this speech last Sunday afternoon. As copies of the local newspaper will show, mother nature had plans (and the ability to carry them out) that directly influenced my plans. The Saturday sleet storm took down trees and power lines in our area and instead of spending Sunday afternoon writing a speech, I spent it in conducting an experiment--trying to convert the heat calories of red oak fireplace wood into BTUs for space heating. Although I do not have the usual charts, graphs. calculations, etc., to back up my conclusion, I can assure you that this is an inefficient way to try to heat a house.

The speech that you are about to listen to will be an ed-lib talk from a rough outline that I prepared last night by the flickering light of a fireplace fire in temperatures of about 400F. Obviously, it will be short.

Mr. Roy Hockensmith told me I had 15 or 20 minutes to discuss "How planners use soil surveys." last week I spent 20 hours listening to representatives of nine States explain how soil surveys were being used by urban planning authorities. I am not capable of summarizing this 20 hours into 20 minutes. Also it would not be fair to people who presented this work. However, I would like to assure you that the scope of this work ranges all the way from projects Such as the seven-county Cape Kennedy Impact Area framework planning that is taking place in East Central Florida and the detailed mapping and planning project of southeastern Wisconsin through the single county-city-township and village and even down to the small three or four-lot subdivision and in some cases to the individual urban lot. The problems that are being dealt with range from the "glamourous" or at least well publicized septic type disposal of sanitary waste through to the corrosion problems of gas and other utility lines. Even such "far out" projects as helping in the selection of sites for hospitals.

I would like to confine my following remarks to a PAST--PRESENT--FUTURE evaluation of using soils information for urban and regional planning purposee as I see them,

PAST

In the past soils information, the soil sciences, and other related knowledge ha8 not been used to the extent that it could or should have been used. The reasons for this are many sod varied. Scale of maps, interpretations of basic scientific data, availability of data, understanding of the problem, political and social climate for its use, agencies charged with regional responsibilities in the planning field, trained soils end planning talent, so called cultural lag--the lag that develops in a democratic sad bureaucratic society between 8 demonstrated need for action and the authority and resources to execute an action program. All of these have had 8 role to play in the creation of some of the urban and regional messes that our society has to deal with today.

There is not much we a8 soil8 expert8 can do about most Of the pest except ask WHY, try to find the answer, and then try not to make the same mistakes again today. We might make mistakes, but please let them be the mistakes of this generation and the thinking of today's people-- not a repaat of the lest generation's mistakes.

PRESENT

Today the people are not only asking for but I believe demanding that some system of order and some long-term beneficial relationship between man made environment and the natural environment in which it is being placed be established. The recent increase in the number and scope of local and regional planning authorities is a good indication of this. The people want a better physical environment. They have made thio known to the legislative bodies and they in turn created or allowed to be created planning agencies to de81 with this problem.

Right now we are in 8 stage of cut and try 88 far 8s soils work goes. Recently I had the opportunity to review 71 different examples of direct application of 80118 data to some of these urban and region81 planning problems.

These 71 examples dealt with 30 different type8 of applications. They were from all parts of the nation and no two of them were exactly the same. Just es it might be said there is no perfect soil, it might also be said that there is no perfect example of urban use of soils data.

However, it is possible to draw some general conclusion from some of this work.

1. Soils data is needed in order to do a good planning job.
2. There is 8 pressing need for colored interpretative maps which relate the basic scientific data to the problems of the ares..

3. The need for this data is WOW--before complicated social, political, and economic jurisdictions are created and massive development programs ere initiated. The facts BEFORE the decision, not after, when you can only eay "it ebould not have been done that way."

FUTURE

As to the future--I believe that urban soils work is going to be another great challenge to the soils specialist, Society recognizes your great contribution in the field of food and fiber production. Although we have an over abundance of many farm products in this nation, there are many parts of the world that need increased agricultural production if all of the peoples of the world are to be adequately fed and clothed. Your know-how is available and can be applied to these problems in other parts of the world.

But how do we fit our cities into the natural landscape? Wow do we fit them in and make them vork? How do we sculpture our cities so that they take a shape and form that respects the basic and unbreakable laws of nature? These are some of the questions that the soil scientist is going to have to help society find the answers.

Your skills have helped reduce tbe man-hour needed per unit of agricultural production and has made available much of the population of the urban areas. In a sense your skills are going to be required in the aolving of a problem that they helped create.

In order to find the answer to some of the above posed questions, I believe that we are going to have to view some of our natural resource problems from a new vantage point,

There will be more emphasis placed on being part of a planning team. Our urban complexes and modern technology have become so complex that it is too much to expect of any one man that he have all of the technicel knowledge that has to be used today.

There will be more emphasis placed on regional problems and regional investigations. We are our brothers keepers and nowhere does this show up more than in our urban areas. A decision by a men 50 or 100 miles from your home may polute your water supply or even take it away from you. It may kill off your vegetation or flood you out of your house or job. We have to look at these problems on a regional level.

There will be more emphasis placed on total natural resources of the environment, The relationships and interplay between different natural resource8 has to be better understood in our urban areas.

There will be more emphasis placed on the problems of the community and a greater effort made to -relate the actions-of the individual property owner to the community as a whole.

If we are to even solve some of these problems, we are going to have to emphasize the preproblem approach to this kind of work. It can be said that planning is nothing more and nothing less than preventative medicine. The doctor knows that the human being is susceptible to smallpox and, therefore, 'recommends that the patient be inoculated -against the disease BEFORE he is exposed to it. The planner knows that the house built on peat will fail to serve society well and economically--that it will very soon become a sick patient in the hospital instead of a bealthy productive member 'of society.

The soils specialist will have to inform society as to the whereabout of the nest holes of future urban blight as well as the location of future (we hope) urban gardens of Eden.

'Thank you, gentlemen.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PUNNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
Chicago, Illinois, January 25-29, 1965

Report of the Committee on Technical Soil Monographs

Tbe following members of the national committee on technical soil monographs met with the chairman on Tuesday morning and afternoon: A. R. Aandahl, A. J. Baur, J. A. DeMent, A. A. Klingebiel, Nobel K. Peterson, and K. P. Wilson. (Unfortunately, two of the members, A. C. Orvedal and Rudolph Ulrich, were forced to be absent because of illness. A third member--J. Gordon Steele--recently retired.) Mr. Wilson served as secretary of the comittee. Visitors were Dr. Kellogg, Mr. Koechley. and Mr. Quay.

The committee reviewed the reports of the regional technical soil monograph committees of tbe Northeast, the Southern States, and the North Central States and considered ways and means of moving ahead vith the preparation of soil monographs.

The comittee wishes to call attention to the report of the 1963 national committee and to repeat the following from tbat report:

> "The purpose of technical monographs is to provide a series of publications for comprehensive discussion of morphology, classification, and genesis of soils by rather large geographic areas and by some unique small ones.
>
> "The committee visualizes the following potential users of technical monographs:
>
> 1. Party leaders of soil aurveye in writing their reports.
> 2. Soil ecientiets interested in learning about the soils of an area.
> 3. Laymen with some technical background and an interest in soils.
> 4. Professional men working with soils or with an interest in soils.
> 5. Teachers of soils."

The 1964 report of the Northeast regional committee on technical soil monographs included a list of areas from the 1962 regions1 report with proposed authors and target dates. The major concern in 1964 was tbat nothing had been done in two years, and that there was need to call attention of the administrative people in the Soil Conservation Service and in the cooperating agencies, such as the experiment station, the importance of the work so that qualified personnel could be made available. The national committee recognizes that the preparation of soil monographs competes with the regularly scheduled work of correlation and publication of soil surveys and agrees with the 1963 national committee report on the emphasis for long-range planning,

The 1964 report of the regional comittee from the Southern States on technical soil monographs was pessimistic, as was the Northeastern report, on the progress being made over the region despite the fact that Mr. Oakes was moving ahead with the monograph from Texas. The Southern comittea stated that the determination of the suitability or desirability of areas for monograph6 was outside the realm of responsibility or ability of the committee. The members felt that this was a job for the States and the National Cooperative Soil Survey. The national comittee feels that the members of the Southern committee, as members of the National Cooperative Soil Survey are in a position to make recommendationa on these points. A question was raised by the regional committee regarding the amount of laboratory data to be included either in the text or in the appendix of the monograph. The regional committee also questioned the requirement that all laboratory data be accompanied by a complete profile description. The national comittee stands firm on this last point and is of the opinion that the matter of the quantity of laboratory data is handled adequately by the report of the 1969 national comittee. gee item "f" under 2 on page 3 of the report. The Southern, regional comittee did a creditable job in clarifying a number of questions raised by the former regional committee.

The North Central regional committee made a number of ‘suggestions and; recommendations including the following:

(1) That a permanent comittee be set up In each State to plan for the preparation of monographs;

(2) That a list of 12 proposed areas be considered as having first priority. This list was arranged so that each of. the 12 States would have major responsibility for ‘one area.

(3) That the national committee draw up buidelines for the planned publication series of monographs including the routing of the manuscript text through editorial channels.

(4) That consideration be given to the possibility of including interpretations in the monographs.

The national committee considers items 1 and 2 to be very good but does wish to propose a change in item 1. This will be brought out in the recommendations of the committee.

The national committee was of the opinion that the technical soil monographs would follow the routing of soil survey reports in the Department editorial channels and that no undue trouble or delay should be expected in editing. Further, it was thought that the publication could carry a series number of both the cooperating experiment station and of the Department if that is wanted.

In respect to the inclusion of interpretations, the members of the national committee think that interpretations should be placed in a separate publication rather than: combined with the text on genesis, morphology, and classification because of the more transient character of much of the interpretive data, Such a separate document could be prepared to accompany the monograph.

For purposes of information, the national committee wishes to report:

(1) The soil monograph, "The Soils of Central and North Texas, their Morphology, Genesis, and Classification," by Harvey Cakes and George Kunze is eeeentially completed except for the section on the laboratory data and the interpretation of the laboratory data, Dr. Kunze states that the laboratory work is in various stages, of completion and that he plans to start writing the section on the. interpretation of. the laboratory data by June 1 of this year.

(2) Work has been initiated for a monograph on the soils of the Red River Valley. A meeting was held in Fargo last February during which plans were laid for getting needed laboratory data and for the preparation of the 8011 reap.

Correlation of 'the soils of Walsh County, North Dakota;' in 1965 and of Norman County, Minnesota, in 1966 will firm UP concepts of many of the soil series involved in the general 8021 map.

(3) Word has been received that plans have been made for Mr. Edwards to proceed with a soil monograph on the soils of the Central Basin of Tennessee.

(4) This latter development illustrates that contracts can be arranged whereby Federal retirees can work on soil monographs without affecting their retirement status. We understand that this applies also to experiment station personnel.

After conaidareble discussion, pro and con, the national committee makes the following recommendations:

(1) That a permanent committee be established for each soil monograph area. This committee is to consist of the State soil. scientist and the State soil survey leader for each State

which forms a part of the soil monograph area. Thus, the committee for a particular soil monograph area nay consist of men from one, two, or more States. Likewise, the same State soil scientist end State soil survey leader may serve on a number of soil monograph area committees depending on the number in the State. Thus, there would be no State committee. Each committee will select its own chairmen and add members from the cooperating agencies es thought to be helpful by the committee. The duties of the committee would be to:

(a) Review the boundaries or limits of the soil monograph area.

(b) Develop plans for assembling data and obtaining additional data.

(c) Suggest authors and assistants for the preparation of the monograph.' These selected people would constitote the working ad hoc committee.

(2) That four regional technical soil monograph committees be continued for the purpose of:

(a) Reviewing the progress of soil monograph area committees.

(b) Making recommendations to line officers for priorities for the preparation and publication of monographs.

(c) To provide general technical guidance to monograph erea committees.

(3) That the Administrator of the Soil Conservation Service, together with the State conservationists, take the necessary steps to carry out the preparation of technical soil monographs as outlined by Soils Memorandum SCS-39 dated March 29, 1961. It is important that the State conservationist work with the administretive officers of cooperating agencies to see that cooperative soil monograph committees are set up.

(4) That the Soil Conservation Service prepare e map showing the soil monograph areas as outlined in tbe January 1963 report of the national committee for distribution to the States.

(5) That each monograph area committee report to the regional soil monograph committees before the 1966 regional meetings on:

(a) available information,
(b) plans for obtaining additional information, and
(c) possible completion date (suggested?).

(6) That the national committee be continued to provide general guidance and to review reports of the regional committees.

Committee Members:

A. R. Aandahl
A. J. Baur
J. A. DeMent
A. A. Klingebiel
Nobel K. Peterson
K. P. Wilson
J. Kenneth Ableiter, Chairman

Discussion:

Kellogg: I have two comments. One is that the function of the regional committees is to develop monograph areas. This charge needs to be strengthened in the 1965 report of the national committee. The second is that in some areas several States are involved so that the monograph area committee would be too big to work well. I suggest that an ad hoc cowittee be appointed by the monograph area committee to actually do most of the work.

Ableiter: The intent of the national committee is to have an ad hoc committee.

Wilson: Many of the large areas were found to have been subdivided so that generally not more than two or three States will be involved.

Bender: Bench-mark reports are not mentioned as competing.

Ableiter: The Southern committee report did oonsider the matter of bench-mark reports but did not consider there was any competition except for time.

Klingebiel: Bench-mark reports provide sons good information for monographs. Time is the only conflict.

NOTE: The above report includes two slight modifications from that given orally at the conference so as to meet the comments by Dr. Kellogg.

J.K.A.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
Chicago, Illinois, January 25-29, 1965

Report of the Committee on Criteria for Soil' Series, Types, and Phases

A. Objectives: In 1963, it was recommended that the committee be continued with the following charges:

1. To develop guidelines for soil series criteria for use in the different classes In the Revised System of Soil Classification; and

2. To examine the existing definitions of the concept of soil series .as outlined in The Manual and the Revised System of Soil Classification and to explore its improvement.

B. Committee reports were on hand from the North Central and Western States Soil Survey Workshops held in 1964. The North Central States proposed a control section thickness of 10 to 40 inches. They discussed a proposal to limit soil series criteria to properties of the solum or the solum plus the substratum. No recommendation was made regarding the latter subject.

The Western States Soil Survey Workshop considered that series differentia should be limited to the solum or the control section. They suggested that the volume of stones within the solum or the control section should be considered in distinguishing soil series, particularly in range and woodland areas. They discussed horizons of lime accumulation as series criteria, but made no recommendations. The committee considered that all of these differentia may be used either at the phase or series level and no direct recommendations were made by the committee pertaining to these subjects.

C. Discussion: The soil phase as defined in The Manual is a subdivision of a class in the natural system of soil classification. Thus, a phase of soil series is a subdivision of a soil series. The subdivision is based on any characteristic or combination ef characteristics potentially significant to man's use or management of the soils belonging to a particular soil series. It follows then that, except where monophase series occur, more precise statements and predictions can be made concerning soil use, management, and productivity for a phase of a soil series than can be made for a soil series,

The committee discussed phase nomenclature. It concluded that phase names generally have not been correlated beyond soil survey boundaries. Two kinds of phases have been recognized: (1) Phases that deviate from normal such as eroded phases: and (2) Phases that consist of subdivisions of soil series such as slope phases. Long mapping unit names are cumbersome to use. An effort is being made to keep the names brief yet distinctive from all other mapping unit names in a soil survey area. The following guidelineshave been used in the naming of mapping units with respect to phase distinction:

1. Where only one phase of a soil type occurs in a soil survey area the mapping unit name has included the soil type name, with or without a slope or other phase designation depending on local preferences.

2. Where more than one slope phase of a soil series occurs in a soil survey area, the slope range in each mapping unit has been included in the mapping unit name.

3. Where degrees of stoniness and rockiness have been mapped they have been indicated by modifiers of the type name in all mapping units including the name of the dominant unit.

4. Where more than one phase of drainage, depth class, salinity, alkalinity, etc. has beem mapped, the name of the phase of the dominant mapping unit has usually been omitted.

5. Slope and erosion, where used, are the last modifiersof the mapping unit name, degree of erosion being the last modifier. Where appropriate moderately or severely eroded phases are always indicated in the mapping unit name.

The committee discussed guidelines for soil series criteria. It was recognized that the inclusion of the soil series in the revised system of soil classification establishes many limits in the properties of soil series. In addition, soil series criteria are limited to significant subdivisions of differentiating criteria used at higher categories in the system together with other properties not considered as differentiating criteria for higher categories.

The committee does not have any specific recommendations to make regarding guidelines for soil series criteria. It did discuss the presence of authigenic soil lime as a series criteria but made no specific recommendation. The committee considered that a summary of the characteristics used to differentiate series in all of the States would be helpful to develop guidelines. This could best be attained by examining soils within families and recording the criteria used in distingufshing soil series. Soil series often differ from similar soil series in several characteristics. It does not seem likely that a range in one characteristic can be spelled out that will be very specific because of the interaction of other characteristics on soil properties.

D. The committee recommends that it be continued with the following charge: "To encourage the four regional committees to summarize the criteria used in distinguishing soil series and phases within families in their respective regions and to submit their reports to the national committee.

The national committee will then consolidate this information and discuss the possibility of establishing specific guidelines for soil series criteria."

E. Committee Members:

John E. McClelland, Chairman
R. W. Eikelberry
Klaus W. Flach
Robert B. Grossman
John T. Maletic
Lloyd E. Garland
Donald E. McCormack
Edward H. Templin
Robert I. Turner
Lloyd E. Tyler
J. Melvin Williams

All members participated in the meeting except John T. Maletic was represented by Harold L. Parkinson.

Visitors participating in all or part of the committee meetings in Chicago:

Maynard A. Fosberg
Charles E. Kellogg
A. Leahey
C. W. Luscher
Adrian Pelzner

F. Discussion:
Charles E. Kellogg: A format should be recommended for the regional committee to follow in compiling their reports. The national report should emphasize that while phase names are not correlated across survey area boundaries, the actual mapping units should be correlated across both state and survey area boundaries.

E. P. Whiteside: The survey should include a statement about the kind of phase distinctions made within series of each family. (This recommendation has been included in the recommendations from the committee.)

G. The committee report was accepted by the conference.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

National Technical Work-Planning Conference of the Cooperative Soil Survey
Chicago, Illinois January 25-29, 1965

Report of the Committee on Classes and Phases of Stoniness and Rockiness,

The purpose of the Committee is to review existing class limits for stoniness and rockiness; to recommend changes, if needed; and to suggest desirable nomenclature for phases where interpretations are needed for intensive use (Farming) or extensive use (forestry or range land).

The need for such a committee became apparent in the Northeastern States when it became necessary to have phase designations for Intensive use (Farmland) and Extensive use (Forestry) in the same survey area.

The Northeastern Committee made field studies relative to the quantity of stones (expressed as percentage of surface coverage). These quantities were grouped into classes with suggestions for combining classes into phases, Those working primarily with farm land recommended a grouping much like those listed in the Manual. Those working on forest lands propose a different range which combined classes 0, 1 and 2 of the Manual and split Manual class 4,

Circulation to the National Committee of the findings of the Northeastern Committee brought from California a recommendation for classes for extensive uses which are not greatly different from the classes proposed by the Northeastern Workers in forestry. The Northeastern and the California recommendations are shown in the table following:

Classes Recommended for Stoniness

	Intensive Use Northeast		Extensive Use Northeast	Extensive Use California
Class 0	0.0-.1	0.0-.1		
1	.1-3	0.1-3	0-3	0-2
2	3-15	3-20	3-15	2-10
3	15-40	20-40	15-40	10-25
4	40-90	40-80 or YO	40-90	25-50
5	90+	80 or 90+		50-90
6				

The Committee deliberations soon brought out evidence that there is a lack of understanding about what is meant by stoniness. Some workers do not adhere to the Manual definitions that stones are larger than 10 inches in diameter. To some, any coarse fragment larger than gravel is a stone.

Gravel and cobbles and related sized fragments are considered part of the soil, whether in or on the top of the soil. These fragments are recognized in designating the textural class of the soil. This is consistent with the Manual (see page 214).

Stones (larger than 10 inches in diameter) or boulders (larger than 24 inches in diameter) are "Not soil," and are not a part of the textural class designation for the soil although our conventions for designating stony or rocky phases make it appear as though the phases are a part of the textural class designation. (See Manual pa&e 296)

Classes for stoniness are expressed in terms of the percent of surface area covered and include those coarse fragments more than 10 inches in size that cover the surface or are partly imbedded in the surface layer.

The Committee originally planned to cause as little disturbance as possible in the existing manual classes. When rockiness was considered this idea was abandoned and a decision reached to make the stoniness and rockiness classes have similar limits,

The Committee considered and rejected the following proposed classes as too great a departure from past actions and as failing to meet needs for phase designations for extensive use.

Class No.	Lower limit	Upper limit	Proposed phase	Old phase
1	0	.01-.1	None or slightly stony	stony
2	.01-.1	2-4	stony	very stony
3	2-4	10-20	very stony	extremely stony
4	10-20	30-50	extremely stony	miscellaneous land type
5	30-50	90	rubble	"
6	90+		rubbleland	rubble land

The Committee concluded that to be fully useful for interpretation for intensive uses there is need for more breakdowns in the lower classes - and for interpretation for extensive use there is need for more breakdowns in the higher classes. The Committee also suggests the same class limits for both stoniness and rockiness.

The limits proposed break into four groups. The first class 0 is primarily for descriptive purposes. It would seldom be used as a phase. The next three classes designated as 1.1, 1.2, and 1.3 are primarily for interpretation into phases for intensive use. The next two classes designated 2.1 and 2.2 could be used in phase interpretations for intensive or extensive uses.

The last two classes designated 3.1 and 3.2 are primarily for use in phase interpretations for extensive use. The class limits and suggested phase designations are shown below.

Suggested Class Limits and Phase Designations

Class	Class limits percent surface covered	Phase designation stoniness phase	Phase designation rockiness phase
0	<.01	-----	-----
1.1	.01-.1	slightly stony	slightly rocky
1.2	.1-2	stony	rocky
1.3	2-10	very stony	very rocky
2.1	10-25	extremely stony(1)*	extremely rocky
2.2	25-50	extremely stony(2)*	complex of series name-- Rockland
3.1	50-90	Rubbly	Complex of Rockland series
3.2	90+	Rubble land	Rock outcrop

The Committee solicits suggestions for abetter nomenclature. It believes that classes should be defined more fully than by percentage of area covered. Therefore it offers these recommendations.

Recommendations:

1. That this report, with any alterations or additions made by the conference be submitted to Regional Committees for testing, comments and improvements.

2. That the committee be continued with a specific charge to:
   (a) Receive comments and recommendations from Regional Committees.
   (b) Improve definitions of classes.
   (c) Improve phase designations to which classes may be assigned.

* These phase designations are not satisfactory. Calling class 2.1 a very stony phase results in a radical departure from past usages of stoniness phases.

Committee Members	Visitors
A. H. Paschall, Chairman	C. E. Kellogg
W. H. Render	C. W. Koeckley
F. J. Carlisle	C. W. Lusher
R, D. Headley	C McVee
R. C. Kronenberger	M. E. Noble
L. R. Wohlets	J. Quay
J. L. Retzer	E. H. Templin

Discussion of Report

Dr. Kellogg pointed out that designation of classes for stoniness end rockiness is an old old problem - and one for which we need more data and information before a sound solution can be reached.

G. D. Smith suggested that naming be started at class 3.2 and progress upward. This would enable use of more modifiers in the lower ranges.

Answer. That is possible - but it means a big departure from names of phases used in the past.

K. W. Flach questioned the need for class 0 which can have fewer than 4 stones per acre.

Answer. The class would probably never be used as a phase but is useful in describing unusual conditions - for example stones or rocks in deep loess soils.

W. Ehrlich What are the size of stones?

Answer. Stones are larger than 10 inches in diameter. Boulders may be used where the size exceeds 24 inches in diameter.

E. H. Templin. The total amount of coarse fragments of all sizes is important where land is not plowed. Did the Committee consider classes of total percent covered by fragments of all sizes above 2mm.?

Dr. Xellogg. Such classes would be difficult to use as determination of volume is very difficult.

E. H. Templin. Suggested that the Committee be given a different composition with representation and a chairman from a region other than the Northeast (the Manual classes originated in the Northeast).

Dr. Kellogg requested that other regions send in their suggestions backed up by studies and data.

E. H. Templin. Must all sizes be named in the phase?

Answer. No - the phase name is merely a handle to separate one unit from another. It is not intended to describe the unit.

R. W. Simonson. As I heard one part of the report, I understood that stoniness was to be included in the textural class names. The arrangement of modifiers in the names assigned phases does suggest that stoniness is a part of the texture designation. Was it the intent to include stoniness in the concept of texture.

Answer. It was not the intent of the Committee to include stoniness in the concept of texture. The Committee intended to continue the present conventions for designating stoniness phases.

R. W. Simonson. Are the names given in the list meant to be for stoniness classes, stoniness phases, or both.

Answer. Classes would be designated by numbers. The names given are offered as possible phase designations. Phases would be determined by combining classes or parts of classes as set forth in the Manual.

R. W. Simonson. Is it proposed that these limits be tested in the future or that they be adopted? I would wonder about the prospects of estimating stoniness with the accuracy suggested by the class limits.

Answer. The classes are to be tested.

Wm. Johnson. Suggested that classes 0 and 1 might be combined.

R. Mateski. Did the Committee consider classes of stoniness within the soil profile?

Answer. The Committee considered surface cover only. The amounts of stones within the profile would vary with the kind of soil and would require volume determinations - and volume of stones is difficult to obtain.

K. W. Flach. Engineers claim that for accurate data the sample must be 10 times larger than the largest particle.

R. B. Grossman. Do these classes apply to the 0 horizon?

Answer. The classes are for surface stones or rocks. They may be partly imbedded in the surface horizons.

J. L. Retzer. Surface coverage by stones affects the usability and the growth rate of plants. Stones in the soil can be handled by soil descriptions but should be related to use and management.

Dr. Kellogg. We are trying to get classes, that when related to soil series will enable us to make better interpretations. These classes cannot be used by themselves - they must be used with the series.

E. H. Templin. Cannot the same thing be shown by using estimated percent coverage rather than the class or names?

Dr. Kellogg. Percent can be used. These classes are strictly guidelines for groupings.

M. E. Noble. Will the phase designations be the same for stoniness and rockiness?

Answer, The modifying adjective will be the same for classes 0 to 2.1. Where rockiness exceeds about 25 percent surface coverage (class 2.2) the designation will indicate a complex of a named series and Rockland.

Dr. Kellogg. I am pleased to see the interest from other sections. Investigations should be carried on in all sections so that specific data will be available for the development of classes. I would like to see someone make actual measurements, inch by inch, of stones, roots, coarse fragments etc. in a cross section of soil under a single tree in a forest. The results might be very interesting.

A. H. Paschall
2-65

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
Chicago, Illinois, January 25-29, 1965

Report of the Committee on Application of New Classification System

The committee met for the first time on January 26, 1965, and discussed four main topics. These are as follows:

1. The defining of series concepts and the recording of those concepts in standard descriptions.

2. Guidelines for allowable tolerances in the stretching of family class limits by series class limits.

3. Conventions for the naming of map entities.

4. Report of a Southern regional committee on application of the new system.

Discussions of these four topics are summarized in the main body of the report with each considered in a separate major section. Recommendations of the committee are given as a last item in each section.

1. The defining of series concepts and the recording of such concepts in standard series descriptions.

How this might best be done after the new classification system was adopted had been discussed et four regional workshops held in December 1964.

Two alternative procedures discussed at the workshops were considered by the committee and these are as follows:

Alternative 1. The concept of a series and the standard description of that series are to be developed so that the allowable spans in characteristics fall within the spans of definitive characteristics of the family in which the series is classified.

Alternative 2. The concept of a series and the standard description of that series are to be developed so that (1) the norm for the series falls within the allowable spans of definitive characteristics of the family in which the series is classified, and (2) the section of the series description on range in characteristics indicates the stretching of family class limits that will be permitted.

After some discussion, the committee considered the first as the better alternative of the two.

The committee recommends that this alternative be followed in the development of *series* concepts and in the preparation of standard series descriptions.

2. Guidelines for allowable tolerances in the stretching of family class limits by series class limits.

It was recognized in the discussion of the two alternative approaches in the development of series concepts and 'the preparation of standard *series* descriptions that some stretching of family class limits by series class limits would occur in practice. This would be true for those series that fall within a given family but have some limit or limits in characteristics coinciding with those of the family. Problems are not expected for all series but seem likely for a considerable number. It was recognized in the discussion that mechanical application of family class limits could be expected to require establishment of many series of minor acreage and would also introduce the danger that some soil characteristics would be overemphasized at the expense of others. It was also argued that some guidelines should be available so as to reduce the risk that series would be proposed on the basis of differences that were smaller tban the normal errors of observation,

The committee recommends that a draft statement ha prepared to provide guidelines insofar es possible, that this draft be circulated for review and criticism to committee members, and that the draft be tested through preliminary use. 'It is further recommended that a draft statement of guidelines be examined at the regional work-planning conferences next year on the basis of experience obtained with the new classification system by that time.

3. Conventions for the naming of map entities.

A draft statement discussed at the several workshops last December includes a proposal for changing present conventions to increase the permissible proportions of inclusions within a set of delineated soil bodies named as a single' phase. An abbreviated version follows:

> Fifty percent or more of the soil in the individual map entity falls within the range of the phase used to provide the name. The remainder consists largely of other phases closely similar to the named phase but no one comprises more than 25 percent, Part of 'the remainder may consist of contrasting phases but no one of those comprises more than 5 percent and the aggregate of all are not more than 15 percent.

A suggestion was made that the proportions of contrasting phases in a set of soil bodies named as one phase might reach but not exceed 10 percent, There was a question as to whether this was too high..

Suggestions ware made for revisions of the draft statements to place greater emphasis on degree of similarity or contrast of inclusions, to provide additional examples, and to indicate that weight should be given to the kinds of interpretations that would be keyed to the map entities. These suggestions have been recorded with the file copies of the draft statement and will be used in its revision,

The discussions in the draft statement on complexes, soil associations, undifferentiated groups, and miscellaneous land types were reviewed and discussed briefly. These involve little or no change from conventions now in effect.

It was agreed that the explanation of the undifferentiated group should be modified to indicate that component soils are similar in behavior, for the most part.

No mention is made in the draft statement of variants, which is an oversight, The variant is to be covered in the revised draft statement.

The committee recommends tbat the proposed revisions be made in the statement about conventions for naming of map entities as soon as possible and that the guide thus developed be issued as one of the SOILS memoranda.

4. <u>Consideration of report of Southern Regional Conference</u>.

4.1 Lithologic discontinuities in soil profiles.

A question was raised in the committee report about lithologic discontinuitles. How are they identified? How big a difference in texture of the adjacent layers is necessary to establish the presence of a lithologic discontinuity?

It was pointed out during the discussion of the National Committee that no known guide would provide answers across the board to these questions. So far, the identifications of lithologic discontinuities have been worked out through experience. Studies have been made in a number of instances, some with combined field and laboratory approaches, some with field techniques, and some with laboratory techniques. No set pattern for such studies can be proposed with the present understanding of soils. Examples of soils in which there were lithologic discontinuities are included in the monograph on the 7th Approximation.

4.2 Training program on new classification system.

The Southern Regional Committee urged that a strong training program be organiead for field scientists so that they would acquire as soon as possible adequate understanding of the diagnostic horizons and other features serving as criteria, in the new system. The possibility of accomplishing training through a correspondence course was mentioned. The National Committee noted that the need for additional training on the classification system had also been recognized in the opening remarks on this conference.

The National Committee had no suggestions to offer as to how a training program might be organieed and put into effect, though the merits of the proposal of the Southern Regional Committee were recognized.

4.3 Proposal for study of fragipans.

The Southern Regional Committee proposed that plans be made for the study of means of recognition, characteristics, and strength of expression of fragipans. It was suggested that a committee or subcommittee be established for such a study,

The National Committee discussed the proposal and offered the suggestion that a committee be set up in the Southern Region to assemble and examine available information on fragipans a* a first step. This could then lead to efforts to improve the present definition of the fragipen, to attempt more accurate characterization of degree of expression, and to see what features might be used to identify more consistently fragipans with the minimum recognizable degree of expression.

4.4 Suggestions for changes in the 7th Approximation.

The suggestiona for modification of class limits offered in the regional committee report have already been considered in preparing modified definitions end in making changes in the system as recorded in the summary of changes issued last summer. Further consideration of the suggestions for changes did not, therefore, seem necessary.

Committee Members:

Roy W. Simonson, Chairman
Harry H. Bailey
L. J. Bartelli
0. W, Bidwell *
Lacy I. Harmon
R. D. Hockensmith
G. S. Holmgren
W. M. Johnson
D. F. Slusher, Sec.
J. D. Simpson *
Guy D. Smith
Maurice Stout, Jr.

Visitors:

Walter Ehrlich
Rouse Farnham
Charles E. Kellogg
Charles W. Koechley
Roy P. Matelski
M. E. Noble
John Quay
E. J. Williamson

* Not present for committee sessions.

Notes on Discussions after Presentation of Committee Report to Conference as a whole, January 28, 1965

DeMent: The purpose of a sliding scale for proportions of permissible inclusions in mapping entities could be clarified to advantage. In the landscape, contrasting soils often occur in the same proportions as similar soils. Whey then have a eliding scale? Is it because the contrasting soils are more obvious or is it because they are more important than similar soils when considering the use and management of a mapping unit? The meaning of "similar" and "contrasting" soils should be spelled out more clearly.

Simonaon: We are already using a eliding scale in practice. The changes in the rules would bring them more in line with present practice, which is considered to be fairly satisfactory.

Rartelli: I think it would be helpful if the definition of contrasting could be supplemented by reference to eoil behavior. This would aid in clarifying the definition of contrasting soils.

Templin: Are the limits referred to in the first recommendation of the committee absolute or are they applicable within the tolerance limit6 to be developed under the second main topic?

Simonson: Recommendations of the committee are that series concepts and that records of thoae concepts in series descriptions be developed 80 that each description fits within the range of some family. This means that the limits for preparation of series descriptions are absolute.

Templin: The development of tolerances or departures from limits are unneceasery if the limits are absolute.

McCormack: One of the moat important justifications offered for allowing tolerances in series limits was the ability to measure differences in the field. Thie ability is a matter of mapping or application of the taxonomic or mental concept end does not necessarily affect the definition of the mental concept. Would it not be more desirable to set limits rigidly within the system and keep this separate from the problems of identifying the resulting limits in the field?

Simonson: We need to allow for errors of observation and get men to understand that such allowances are recognized. Otherwise, there will be numerous efforts to establish new series on the basis of small differences, even distinctions within the error of observation. Some effort will be made to establish new series despite any guides on tolerances but the hope is that the number might be smaller.

Kellogg: We have limits in the accuracy of observations 'possible both in the field and in the laboratory. At. one time we published data on pH carried to the second decimal place but this has been stopped because it is beyond the accuracy of reasonable observations. There is no use in setting limits that we cannot observe. A further consideration of importance is the interactions among soil properties. We do not have any way of measuring such interactions and expressing them in numbers. We have to rely on judgment; the application of judgment cannot be replaced.

I should think that 50 percent would be a higher proportion of inclusions than would be desirable. We would, for example, want to show a much lower proportion of Rock outcrop in bodies of Tama silt loam. On the other hand, there could be situations where loam and sandy loam ought to be combined. It would, therefore, seem well to have more example6 of permissible inclusions. At the same time, we must never fail to realize that judgment must be exercised and that this exercise is extremely important,

Tyler: We have seen examples of rigid adherence to family criteria with undesirable effects on series concepts. Will series be redefined to fit within families even though the family criteria are untested or have been. tested relatively little?

Johnson: Family criteria have been tested as a result of the development of the system.

Kellogg: Families have not been set up indiscriminantly. They have been checked against series descriptions and against criteria for classes in higher categories.

Simonson: It would be my hope that family class limits, as wall as the limits of classes in higher categories, would not ba applied mechanically. Such application is possible and probably will be attempted. but I do not think that the approach will provide the best classification of soils.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
Chicago, Illinois, January 25-29. 1965

Report of the Committee on Engineering Application and Interpretation of Soil Surveys with Special Reference to Urban Fringe and Irrigated Areas and Highways

Committee V held its third meeting in Washington, D. C., in October 1963. During this meeting the committee finalized drafts of guides for nonfarm soil survey interpretation. In the preparation of these drafts, the committee enlisted the assistance of corrosion engineers, sanitation engineers, representatives of Federal Housing and the Highway Research Board in addition to many State specialists of various related disciplines. Resultantly, the U. S. Soil Conservation Service issued Soils Memorandum SCS-53 which outlines Service procedures for developing soil interpretations for nonfarm uses. The following guides were issued: (1) Soil Corrosivity, (2) Soil Shrink-Swell Behavior Classes, (3) Septic Tank Filter Fields, and (4) Sewage Lagoon Requirements and the Criteria Used in Evaluating Soils for Developing Lagoons.

In its ad hoc operations, the committee received guides for soil survey interpretations being used in the various States. The various guides produced by the regional workshops also were reviewed. As a follow-up of this activity, the Service has issued Advisory Soils-25, which includes Guides for Recreational Interpretations of Soil Surveys. This notice includes statements on soil limitations for buildings in recreational areas; for paths and. trails; for intensive play areas; for picnic areas subject to intensive use; and for intensive camp areas.

In addition, the committee received reports from the Northeast, North Central, end Southern Regional Workshops. These reports were reviewed by committee members and many of the recommendations from these regional workshops served as a basis for the national committee releases.

Committee Activities During Workshop

A joint meeting was held with Committee VII - Soil Moisture. The highlight of this joint session was the discussion of the work on soil percolation by Franzmeir, et al., on sustained testing of a problem soil, Christiana silt loam, and by Longwell and Springer, who attempted to evaluate soils for sewage disposal fields according to the method for maintaining constant head of water. The purpose of Franzmeir's investigation was to study the effect on the percolation rate of some of the procedural variables, such as the method of digging the holes, the method of preparing the surface of the sidewall, the depth of the water in the hole, the diameter of the hole, and, especially, the length of time of saturation. Both studies cautioned that data from the standard percolation test outlined in the Manual of Septic Tank Practice must be interpreted with caution; the most variable factor being the length of the soil soaking period on fine-textured soils when the soil is at low moisture content. Longwell and Springer suggest that at least five or more holes be used at a given site in order to rationalize the extreme variability among boles. They believe that seven holes running for seven days should give good estimates. The Septic Tank Manual requires a 24-hour soaking period. The committee urges the authors to publish their findings in a medium that will reach the sanitary engineer.

As a result of a request by Committee V to Dr. Kellogg, the Soil Conservation Service Laboratories issued a statement--"Estimation of Maximum Potential Vertical Soil Extensibility from Bulk Density Measurements." This report has been given wide distribution end is the basis for predicting shrink-swell behavior of soils. Ae a follow-up, Dr. Grossman presented a statement to the committee that describes the procedure for estimating change in elevation of soil surface. This statement is attached.

The committee discussed the various guides for determining soil limitations in broad land uses. These uses were considered to be the ultimate, and that in order to arrive at these ultimate ratings. guides should be prepared for rating the elemental uses. For example, prior to rating a soil's suitability for recreation use, one must learn the soil's behavior for golf courses, camping, picnicking, and other subrecreational uses.

The committee has agreed to review such guides that are now in use and comments ere to be submitted to the chairmen by March 1. The committee plans to review the reworked drafts during a 1965 summer meeting. At that time recommendations for national or regional release will be made. Some guides will be restricted to local use; others will have national application.

Committee Recommendations

I. Two separate guides for engineering sections of soil survey reports--from the Great Plains States, compiled by Grant Woodward, and from the Worth Central States, compiled by the Principal Soil Correlator's Office in Urbana--were circulated among Committee V members. Tbe committee applauded the work of these two eeparate ventures but noted the limitations due to their regional scope. The committee recommends that these guides be incorporated into a single document with nationwide application. Furthermore, the committee suggests the following title, "Guide for Making Soil Engineering Interpretations, Including Published Soil Surveys."

The committee has been advised by Mr. Klingebiel that a group composed of Woodward, Crvedal, Garland, and Nylander has been assigned the task of preparing this national document. Mr. Garland is appointed to repreeent Committee V on this project.

In order to meet this objective, Committee V proposes the following procedure:

1. Members of Technical Service Centers and of Committee V (copies of both regional documents were circulated prior to the national workshop) complete their review and submit comments to Grant Woodvard. Technical Service Center, Lincoln, Nebraska, by February 15, 1965.

2. Woodward's committee redraft guides and submit to Soil Conservation Service office in Washington.

3. Soil Conservation Service will circulate document for wide review within each State, TSC, SCS Laboratory, and BPR. The States should be encouraged to enlist the assistance of all cooperators, especially State Highway Departments.

II. The committee has received requests from the regional workshops for assistance in developing training procedures in soil engineering and its application. Workshops for both engineers and soil scientists that were conducted by the Service a few years ago proved to be very effective. The committee recommends that the Service-consider scheduling joint training activities for State leaders in engineering and soil survey along the lines of the former workshops, Also, the committee recommends that a statement pointing out the needs and responsibility plus suggested procedures for meeting these needs be released to each State Consewationiat as a supplement-to the document discussed under item I.

III. As a result of a joint deliberation with Committee VII -- Soil Moisture, the committee recommends that the SCS Laboratories take the leadership in preparing a statement that summarizes selected literature and research of the last two decades in soil-water movement, It was emphasized that work relating soil moisture flow with soil morphology be included.

It is recommended that Committee V be continued.

Committee Members:		Visitors
Lindo J. Bartelli, Chairman *	D. E. McCormack *	Charles E. Kellogg
Harold L. Parkinson *	D. F. Slusher *	A. Leahey --
Russell C. Kronenberger *	W. H. gander, Sec. *	E. J. Williamson
Lloyd E. Garland *	Adrian Pelzner *	C. W. Koechley
John Quay *	Rudolph Ulrich	J. A. DeMent
A. A. Klingebiel *	A. C. Crvedal	C. W. Luechev
		C. V. McVee
		R. P. Matelski

*Present at workshop.

Discussion After Committee Report

Kellogg: Are there any comments on the request made for assistance from the laboratory?

Smith: Many people are competent enough to fulfill the request presented by this committee. Maybe some of them can be asked to do this job. The personnel in the laboratories are limited as to the amount of outside work that they can do. Dr. Kellogg will have to decide what they can do, realizing that we can't satisfy every request.

Kellogg: What are your ideas on the training needed?

Bartelli: The committee believes that there are many well-qualified trainers in the Soil Conservation Service, and is suggesting a training program along the lines carried on by the Service about 10 years ago. The training at these sessions was conducted by soil scientists and engineers of the Soil Conservation Service. Bach State could then follow-up with a training program within the State, using personnel from both the Washington and State office levels.

Johnson: The kind of training that we had eight or ten years ago was well done and was well received. I suggest that we seriously consider another round of this kind of training.

Kellogg: Perhaps we can use people from State highway departments to help in this kind of training.

Johnson: Representatives from the Technical Service Center, State Engineers, and Mr. Orvedal were quite effective in their training program.

Estimate of Maximum Soil Extensibility from Natural-Clod Bulk Density Measurements

Many soil material6 change volume with change in moisture content. The potential for volume change can affect the classification of the soil for engineering purposes. As part of the bulk denoity determination, the Soil Survey Laboratories regularly measure the change in fabric volume with change in moisture. The purpose of this statement is to describe how these measurements of fabric volume change may be used to estimate the maximum potential displacement or change in elevation of a soil surface.

The natural-clod method is used to determine bulk density. The coating employed (Saran) is sufficiently elastic that it remains attached to the surface of the clodduring changes in its volume. The volume of the clod can therefore be measured at different moisture contents, and in turn different bulk densities can be calculated. Bulk densities at a moisture content near field capacity and at air- or oven-dryness are regularly determined. The bulk density for a moisture content near field capacity is obtained from the volume of the clod after desorption under 1/3-bar pressure (1/10-bar for coarse textures). The change in thickness per unit of thickness is obtained by subtracting from unity the cube root of the ratio of the moist (near field capacity) fine-earth fabric bulk density over the dry fine-earth fabric bulk density. In equation form: $1 - \sqrt[3]{\frac{Dbm}{Dbd}}$. This expression is multiplied by the horizon thickness to obtain the change in thickness of the horizon. The change in thicknesses for the several contributing horizons are summed to obtain the change in thickness of a multiple-horizon zone.

The Soil Survey Laboratories usually report the bulk density of the fine-earth fabric; weight and volume of coarse fragments (> 2-m.) are excluded. Coarse fragments do not change volume significantly with changes in moisture, They therefore act as a diluent and reduce tba change in thickness as calculated from the fine-earth fabric bulk densities. To compensate, the change in thickness is reduced by the volume fraction of coarse fragments.

In January 1964, a report was distributed that contained estimates of changes in thickness from hulk density measurements for about 100 soils. The change in thickness for a borieon or several horizons combined was referred to as the Maximum Potential Movement (RPM). The change in thickness per unit thickness of moist soil was referred to as the Coefficient of Maximum Potential Movement, a dimensionless number. Use of the word "movement" was an unfortunate choice because it suggests actual mass displacement. The word "extensibility" suggested by George Holmgren, has now been substituted.[1/] Maximum Potential Extensibility is reported as inches per inch and also ininches. The inch-per-inch values are the same as the earlier Coefficient of Maximum Potential Movement. The inch-per-inch unit is more tangible than a coefficient, and should be more easily understood, particularly as the same unit is widely used for available water.

Table 1 contains illustrative data for Beaumont soil, an Aquultic Mazaquert.

1/ Extensile: "Capable of being extended, or stretched or spread; eusceptfble of enlargement." Extensible and extensile are equivalent. Extensibility is a noun form of extensible (Webster's 2nd Ed.).

Table 1. Natural clod bulk densities and extensibility values for Beaumont clay (S59Tex-123-1).

Identification		Depth	Fine-Earth Fabric Bulk Density			Maximum Potential Extensibility	
			Moist		Dry		
Horizon	LSL No.	in.	H_2O%	g./cc.	g./cc.	in./in.	inches
Alp	11592	0-7	31.6	1.33	1.76	0.088	0.62
Al2	11593	7-13	32.6	1.33	1.83	0.100	0.60
Al3	11594	13-24	35.8	1.30	1.89	0.117	1.05
AC1	11595	24-32		1.318	1.918	0.119	0.95
AC2	11596	32-44	34.0	1.33	1.94	0.119	1.43
C	11597	44-60	33.2	1.37	1.96	0.112	1.79
0-60 inches							6.4
Measured section minus surface horizon						0.110	

a. Derived value.

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UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPRRATIVE SOIL SURVEY
Chicago, Illinois, January 25-29, 1965

Report of the Committee on Soil Correlation Procedures

The discussiona of this committee and its recommendations to the Conference are concerned with technical aspects of correlation procedures. The committee has been concerned with ways in which the rate of completion of correlations can be brought into better balance with the rate of mapping. We are not, however, concerned simply with the rate of completion of correlations. We are concerned also with the quality of soil correlation. Changes in procedure that are adopted should hold promise of improving the quality as well an the 'rate of soil correlation.

The 1964 Regional Soil Survey Work-Planning 'Conferencea of the North Central States and the Northeastern States each included a committee on soil correlation procedures. The views of the present committee regarding suggestions contained in the two regional reports are included in this document.

The views and recommendations of the committee regarding suggestions which were presented to it are given in the remainder of this report under two general headings. The first group of items concerns certain steps in the correlation procedure. Items under the second heading are relevant to soil correlation but do not concernspacific steps in the correlation procedure,

A. Items concerned with certain steps of the soil correlation procedure.

1. The first recommendation is baaed on a proposal of the Northeast Regional Committee. It is recommended that information be included in the report of the initial field review, or in the report of the first progress review, on the quality of the latest approved descriptions for the soil series occurring in the survey area. It is intended that this would involve a review of the series concepts as well as the series descriptions themselves. Plans should be made at the time of the field review, or shortly thereafter, for revision of series descriptions that are considered inadequate. The State soil scientist should arrange for assignments of responsibility and target dates for revised draft descriptions of those series having type locations within the State. For those series having type locations outside the State, he should notify the appropriate State soil scientists or the principal soil correlator of the date the revised series description will be needed, In any event, the principal correlator should be informed of the plans for revision of series descriptions.

   If the intent of this proposal could be carried out, it would accomplish two things:

a. Work required for series descriptions that are inadequate would be atarted earlier in the course of each survey and proportionally lese work would be required when the survey is near completion.

b. The process of preparing revised series descriptions end the review of the draft descriptions would bring to light questions that might otherwise be overlooked until completion of the survey. This would allow more time to study problems and to seek solutions before a final correlation is needed.

2. The second recommendation is also based on a propoael of the North-east Regional Committee. We recommend that a comprehensive progress field review be made approximately one year prior to completion of the mapping. It is intended that this field review include a thorough review and tenting of the documents of the survey and preparation of a draft field correlation that is as nearly complete es possible. New and revised series descriptions that are needed for completion of the correlation should be reedy for final review end approval by the principal correlator at this time.

If this procedure were followed, about one year would be available prior to completion of the field work in which to correct deficiencies which might be found in the documents of the survey and to collect additional date that might be needed to complete the correlation of soils.

3. We recommend that the final field review report end the field correlation be components of e single document and that the draft soil survey report manuscript should be sent to the principal correletor along with the report of final field review and field correlation.

There are two reasons for this recommendation. First, a report of final field review that does not include a field correlation is of relatively little usefulness as a step towards making the survey ready for publication. Second, circulation of the combined report of final field review and field correlation for approval by each agency cooperating in the survey of the area (a procedure now followed for the final field review) would assure that each cooperating agency would have an opportunity to comment on the field correlation before it is sent to the principal correlator.

It was elso urged that the possibility be explored of using a format for the field correlation such that it would not be necessary to retype the soil legend in the process of completing the correlation. A format with lines parallel to the long dimension of sheets with extra columns for notes at later steps of correlation was suggested as one possibility.

4. Our fourth recommendation concerns general adoption of the procedure that has been followed in the Southern States of holding a correlation conference prior to completion of the intermediate correlation,

It has been a regular practiceof the principal correlator for the Southern States to have the soil survey party chief, the State soil scientist, and/or the soil correlator who prepared the field correlation participate in a correlation conference prior to completing the intermediate correlation. Representatives of the agencies cooperating in the survey have been asked to participate in the correlation conference and they commonly have done so. The conferences usually are held in the office. of the principal correlator. This correlation procedure has contributed much toward improving and expediting soil correlations in the Southern States. 'The advantages of this procedure have been the following:

a. It provides an opportunity to deal with difficult correlation problems through verbal discussion, thus avoiding long-and difficult correspondence. It is important, however, that a'written record be made of the alternatives considered and the reasons for decisions made as the result of such verbal discussions. Otherwise the same questions may be raised again in the process of completing the final correlation.

b. It is an important training medium for all participants.

c, Time of the correlation staff is used more efficiently.

It is urged by this committee that provisions be made to adopt generally the correlation procedure that is outlined above. In order for this procedure to have maximum effectiveness, it is essential that the correlation conference be held within a matter of months after completion of the field correlation so that the party chief will be available to participate.

5. The North Central Regional Committee has suggested changes in two of the major steps of our current procedures for completing correlations. The following statement is from the report of the North Central Regional Committee:

"In the past, central coordination of soil correlation has been accomplished mainly by having the final correlation made by the Director, Soil Classification and Correlation. This procedure requires that much of the time of the staff of the Director be devoted to correlation work and does not leave adequate time for (1) review, approval, reproduction and distribution of soil series descriptions; (2) assisting in the development of series concepts especially by participation in field studies; (3) work on the soil classification system; and (4) assisting in the training of soil scientists.

"Central coordination of soil correlation can be accomplished mainly through coordination of the soil classification system, especially concepts of soil series.

"It is suggested that the intermediate correlation be dropped and that the final correlation be made by the principal soil correlators under the following conditions:

(1) That the field correlation and the final correlation cannot include a soil series for which there is not an up-to-date series description that has been reviewed and approved by the Director, Soil Classification and Correlation.

(2) That tha Director, Soil Classification and Correlation can amend the final correlation at any time until such an amendment would seriously hinder publication of the survey.

(3) That the people concerned with the field correlation (some of these may be in an adjacent State) can ask the Director, Soil Classification and Correlation to review any aspect of the final correlation. In the event of the failure to reach agreement, a statement may be footnoted in the published report pending further study of the classification.

"Although the Director, Soil Classification and Correlation can amend the final correlation, the principal soil correlator is held responsible for any errors in the correlation except as amended by the director.

"Condition No. 1 requires that the field anticipates during the progress of a survey all needs for up-to-date series descriptions of proposed, tentative, and established series if they are to avoid delays in the preparation of field correlations.

"A tentative series may be established (1) by prior correlation or (2) by inclusion in a final correlation and not amended by the Director, Soil Classification and Correlation."

A majority of our committee reacted favorably to the suggestions of the regional committee quoted above, although reaction of the committee as a whole was mixed. The range in views expressed by individuals during discussion of the proposal was approximately as follows:

a. The suggested procedure could and should be implemented now.

b. The effect of the proposal apparently would be elimination of one of the three present steps in the correlation review process for individual survey areas and this would be undesirable.

c. The effect of' the proposal would be dropping the <u>requirement</u> of one of the three present steps in the correlation review process for individual survey areas but would <u>permit</u> that review where it is deemed desirable, <u>if</u> it could be done in a reasonable time.

d. The suggested procedure could not be adopted generally with good results until the new classification scheme is actually in use and a majority of the inadequate soil series descriptions have been revised. It would save time and could be implemented as it becomes technically possible.

e. No single, fixed set of correlation review procedure6 would be equally useful and appropriate to all the situations existing in the country.

B. Items relevant to soil correlation procedures but not concerned with specific steps in the correlation procedure. These items were not discussed in detail by the committee.

1. The first of this second group of items concerns a suggestion by the North Central Regional Committee of procedures for making changes in the soil classification system. It is recognized that we need a regular procedure for affecting needed changes in the soil classification system, as no single person will have all of the knowledge necessary to make changes that are needed. We recommend that the procedures suggested by the North Central Regional Committee he referred to the four regional soil survey conferences for their consideration and' suggestions during the coming year. The statement of the North Central Regional Committee is as follows:

"Procedure for making changes in the soil classification system and in other correlation aspects of the National Cooperative Soil Survey

"Although a vague procedure does exist for making changes in the National Cooperative Soil Survey, it is not clearly understood by soil scientists generally. The procedure outlined here is au attempt to make it more formal and better understood by soil scientists and others.

"The National Cooperative Soil Survey must have a proper balance between stability and flexibility. To achieve stability it must be generally impossible to make ill-coneidered changes. To grow there must be an opportunity to make changes--flexibility--but they must be made in an orderly manner. When made they must reflect the best combined judgment available to the National Cooperative Soil Survey.

"It is suggested that a national committee on soil classification and correlation and similar regional committees be established. Their duties would include mainly those of the present committee on criteria for series types and phases plus changes in the soil classification system.

"Suggested members on these committees are as follows:

National committee:
- Director, Soil Classification and Correlation, Chm.
- Director, Soil Survey Investigations 1/
- Representative of each land-grant college region
- Representative of each federal agency making soil surveys
- Principal soil correlators

Regional committee:
- Representative of land-grant college region on national committee, Chm.
- Principal soil correlatora involved or their representatives
- Others selected by the officers of the regional workshop

1/ Not included in the report of the regional committee, but added by the 1965 national committee.

Steps in the suggested procedure

"1. A proposed change may be submitted directly to the national comittee or indirectly via a regional comittee,

"2. The national comittee will evaluate the proposed change, send it with their evaluation to the regional committees for their study and recommendations.

"3. The regional committees will study the proposed' change and send their recommendations to the national committee.

"4. The national committee will review the recommendations of the regional committees. If the national committee believes that the proposed change should be made, it should recommend its adoption to the Deputy Administrator for Soil Surveys, Soil Conservation Service.

"5. The Deputy Administrator for Soil Surveye, Soil Conservation Service, will review the proposed change. If he believes that it represents the best combined judgment of the National Cooperative Soil Survey, he approves it and it becomes adopted by the National Cooperative Soil Survey.

"6. ESCOP may review any action."

2. The Northeast Regional Committee recommended that interstate and interregional correlation studies should be given increased emphasis. They suggested that priority ehould be given to increasing the staff of the principal corralator's office to help meet this need.

Our committee discussed briefly two alternatives for increasing the manpower available to work on interstate correlation:

a. Increasing the regular staff of the principal corralator's office.

b. Details of men on State staffs to the principal correlator's office.

It was visualized that men detailed to the principal correlator'a office would work on intermediate correlations and on series concepts involving interstate correlation problems. The latter commonly would involve field work in several States.

In terms of increased output of the principal correlator's office, the efficiency of short term details could be expected to be low. The effectiveness of people on such details could be expected to increase as duration of the detail increased. The major benefit of short details--a matter of several months--would be training in soil correlation.

Cur committee does not have a recommendation regarding this item.

3. The committee discussed very briefly the need to codify procedures and guidelines that are now used in completing correlations. It was suggested that Dr. Simonson's office be asked to prepare a statement of guidelinea that are now used in completing correlations. It was also suggested that the statement of guidelines should be available for study and comment by the regional soil survey conferences next year.

4. The committee recognizes the need for more emphasis on completing the review, approval, and general distribution of new and revised soil series descriptions. The committee did not discuss this problem and we recognize tbat the work of the committee is not completed.

Committee members:

A. R. Aandahl
F. J. Carlisle, Chairman
L. I. Harmon, Recorder
R. D. Hockensmith
W. M. Johnson
N. K. Peterson
R. W. Simonson
Guy D. Smith
Maurice Stout
L. R. Wohletz
E. P. Whiteside

The following. people also participated part-time or full-time in the committee meeting in Chicago: Walter Erlich, James DeMent, Dr. Kellogg, John Retzer, Maynard Fosberg, and Curtis McVee.

Notes on discussion by the Conference following committee report, 1/28/65

Kellogg: The committee is placing emphasis on the need to develop complete supporting documents and recommendations for the field correlation and Dr. Kellogg agrees with this emphasis. If the field correlation and supporting documents are not in good shape, there will be delays in completing the final correlation. The report emphasizes the need for revision of series descriptions that are inadequate.

Kellogg: (In reference to item B1 of the report) There is no naad to involve ESCOP in review of items that would be dealt with by the proposed committees. These committees would be concerned with technical procedures, not administrative ones, and it would be quite impractical to involve ESCOP.

whiteside: (In reference to item B1 of the report.) It was the intent of the regional committee to include in the suggested procedure some arrangement that would provide administrators of cooperating agencies an opportunity to consider administrative aspects of changes in procedures that would affect activities of people who work under their direction. That is the reason for reference to ESCOP in the suggestions of the regional committee.

Bartelli: (In reference to item A4 of the report.) In practice, the correlation conference has consisted of a thorough review of the field correlation, either in the office of the principal correlator or in a State office. The intermediate correlation is prepared in the office of the principal correlator after the correlation conference.

Kellogg: Favors holding the correlation conference in the office of the principal correlator.

Baur: Does not consider the field work of a survey completed until the soils handbook and other supporting documents are completed. If the field correlation and the documents of the survey are of good quality, completion of the correlation should not be delayed.

Eikleberry: Favors the recommendation that the draft soil survey report manuscript be sent to the principal correlstor along with the report of final field review and field correlation.

Simonson: It seemed to me that the report of the committee from the North Central Region carried the implication that making the present intermediate correlation serve as the final correlation would save man-hours. I think that more rather than less man-hours should be given to the examination of supporting information for each correlation and to the testing of the validity of the separations shown on the field sheets. Enough deficiencies of one kind or another come through in enough of the intermediate correlations now to persuade ma that we cannot afford to devote less man-hours to the work in correlation of soils of individual survey areas unless we are willing at the same time to accept lower quality. I think that more rather than less effort will be necessary if soil survey findings are to meet the needs in the next ten years, because I think that the survey findings will be used In more ways and will have to withstand more severe tests through use than has been true in the past.

Kellogg: It is important to point out that errors and deficiencies in the field correlation and the intermediate correlation for individual areas are still being uncovered in the director's office, These errors and deficiencies will need to be eliminated early in the correlation review process in the future if we are to reduce the time required to somplete the final correlation of individual surveys. More rapid development of final correlations must not lower quality of the correlations. Rather, more emphasis must be given to the preparation of higher quality field correlations.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECRNICAL WORK-PLANNING CONFERENCE OF TUB COOPERATIVE SOIL SURVEY
Chicago, Illinois, January 25-29, 1965

Report of the Committee on Soil Moisture

Our committee discussed the following topics: permeability, water table definitions, classes of water table depth and duration, available water, and field soil moisture studies. The entire discussion of permeability and part of the discussion of water table depth classes took place in a joint meeting with the Engineering Application and Interpretation Committee.

The 1963 Moisture Committee indicated that effort should be concentrated on (a) definition of water table, (b) available moisture, and (3) characterization of water tables and relation to soil morphology and drainage classes. These topics, with the exception of the relation of water tables to soil morphology and drainage classes, were explored by the present cowittee.

Permeability

The 1963 committee recommended a set of permeability classes based on hydraulic conductivity measurements by the Uhland core method. These classes were intended to replace those in the 1951 Soil Survey Manual. The 1963 national committee provisionally accepted the proposed permeability classes with the request for more information on critical limits and on the differences between results obtained by the auger-hole and Uhland core methods.

Two regional committees commented on the 1963 national committee report. The Northeastern Committee reacted negatively to the FHA auger-hole method because of the empiricism of the determination end poor reproducibility due to variable conditions; the committee favored the Uhland core method and also suggested that the Uhland core and FHA auger-hole methods should be compared. The North Central committee dwelt on the class names and limits.

Two reports[1/] on percolation tests using the auger-hole method were reviewed. Fransmeier and associates studied percolation for Christiana soil, a deep fine-textured soil formed from red silts and clays of the Coastal Plain. The lower B horizon in which the percolation rate was

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1/ Fransmeier, D. P., Brasher, B.R., and Ross, S. J. Jr. Soil percolation rates during sustained testing. Dec. 1964. Mimeographed.
Longwell, T. J., and Springer, M. E. Percolation tests on Tennessee soils. Mimeographed.
Requests for copies of these reports should be directed to the senior authors. D. P. Fransmeier is a soil scientist, Soil Survey Laboratory, SCS, Beltsville, Maryland. T. J. Longwell is a soil scientist, SCS, Knoxville, Tennessee.

measured has a silty clay texture and a bulk density of 1.8 g./cc. et field capacity. Holes were dug to a depth of 36 inches. A constant 6-inch head of water was maintained in the hole. A vacuum syphon device was used to maintain the head. (This device ha8 eeveral advantages; the authors should be written for the particulars.) Soaking was continued for about 8 month, and percolation measurements were made periodically. Two aspects of the work are of particular interest. First, percolation rates at the end of 24 hours of soaking, the length of time specified for the standard percolation test, ranged from .08 to over 7.5 inches per hour. This is almost a hundredfold difference and suggest8 that a 24-hour pre-soaking period is insufficient time, As a point of reference, the critical limit for percolation for septic tanks is one inch per hour. The second point of particular interest concerns the pattern of moisture movement. Most of the movement away from the source was horizontal rather than downward. Significant upward movement also occurred.

The joint committee was of the opinion that the permeability classes previously proposed should be held in abeyance. These class limits are based on the Uhland core determination. Few Uhland core determinations are now being made; the auger-hole method is used instead. The auger-hole method has limitations. Results are highly dependent on the extent of saturation as is shown in the report by Franzmeier and associates. Furthermore, the determination is usually made at 8 standard depth of about three feet. This depth may not coincide with the zone of minimum permeability for the soil.

The committee recognizes the need by field soil scientists for guidelines to estimate permeability. Permeability estimates in units of flow are required by law in some communities as part of their construction ordinances. The committee requests the Soil Survey Laboratories to assemble a report on permeability that would be of importance to field soil scientists. The report would include among other things: the studies by Franzmeier et al. and by Longwell and Springer; use of standard laboratory characterization data to assist tbe estimation of permeability; and a review of literature.

The region81 committee8 are requested to review the problem8 with permeability classes.

Weter Table Definition8

A set of water table definitions written by Dr. Robert D, Miller was proposed in 1963 and given in the 1963 nation81 committee report. In slightly modified form it is repeated at the end of this section. The definitions proposed in 1963 were reviewed by the region81 committees. The Northeast committee felt that the classical definitions used by professionals in hydrology should have precedence. The classical definitions are more conceptual end less operational than the proposed definitions. An example of a classical definition of water table is, "The upper surface of 8 zone of saturation. No water table exists where that surface La formed by an impermeable body." (Meinzer, 1923, page 22.) The North Central and Southern committees doubt that virtual water table is required. The same sentiment was strong in the 1965 national committee. Furthermore, it was questioned whether virtual water table is actually a kind of water table. The principal reason that the national committee decided to include virtual water table is to have a complete set of definitions. During the discussion from the floor the question wa8 raised whether "hanging" water teble could be substituted for virtual water table. This require8 investigation. The national committee recognizes that the reference to "further deepening" in the perched water table definition requires clarification. No proposals are offered, however. It is felt that this would probably have to be left to the judgment of individuals. The chairman of the national committee plans to prepare a statement that will contain the water table definitions and will discuss the kinds of water tables a8 defined that would be measured given several hypothetical soil conditions 'and instrumentation. By instrumentation is meant the position of the bottom of the boreholes and whether or not they are lined boreholes. The statement would be circulated to regional committees for comment8 and additions.

The national committee suggest8 to the regional committees that attention be shifted from the definition of water tables to the development of a better understanding of how to make the kind of water table measurements that will be meaningful.

> "Apparent Water Table. The level at which water stands (adequate time allowed for adjustments) in an unlined borehole is the apparent water table. It may or may not coincide with the water table as defined elsewhere, and may vary according to the depth of the borehole.
>
> "Water Table. When a lined borehole La drilled from the surface downwards, the level of the bottom of the hole when seepage of water into the hole is first observed (adequate time allowed for adjustments) is the level of the water table, providing the water doe8 not rise to a significant height above the bottom of the hole.
>
> "Perched Water Table. If a water table is found by drilling a lined borehole from the surface downward, and if it is observed that further deepening of the lined borehole causes the equilibrium level of water in the hole to subside or to disappear, then the water table observed was a perched water table. Its level is designated as the level at which the water table was f Lrst encountered. A perched water table is likely to be encountered where a pervious stratum lies above a less pervious stratum.

"Artesian **Water Table**. **If, after water first** appears in a lined borehole, it subsequently **rises** to an equilibrium level significantly above the bottom of the hole, **the** final level of water in the lined **borehole** is the level of the artesian water table.

"Virtual Water Table. **If conditions, as observed by tensiometric measurements, are as if a static water** table existed at a level that can be computed from **tensiometer** readings, that level is designated as the virtual water table if a lined **borehole** fails to reveal a water **table when** driven to the indicated depth,., A virtual water table is likely to occur at or just below the bottom of a fine stratum that overlies a coarse stratum or where well decomposed muck overlies peat."

Classes of Water Table Depth and Duration

The 1963 national committee listed the following set of depth classes:

Very shallow	**0 to 15 inches**
Shallow	**15 to 30** inches
Moderately shallow	30 to 60 inches
Moderately deep	60 to 120 inches
Deep	120 to 240 inches
Very deep	---
(No significant influence)	More than 240 inches

The regional **committees** were requested by the 1963 national **committee** to review these **limits** relative to the control section. The Nor **theas** t regional **committee recommended** that **measurements** should be given for the depths which fall within the vary shallow (0 to 15 inch) class. They **also** indicated that the **30-** and 60-inch breaks are especially convenient for engineering interpretation. The North Central regional committee favored the proposed **set** of depth classes and indicated that one of the depth class limits should be the **same** as the bottom of the control section. The Southern **committee** suggested that "very deep" apply to over 240 inches and the term "no significant influence" be deleted **because** water table differences below 240 inches do affect ahelterbelts. They also proposed that depths be measured from the top of **the** 0 **horizon** and they asked that the **ponded** condition be clarified.

The national committee did not know why it would be useful to have depth classes that coincided with the lower limit of the control section. The question **was** entertained whether the depth **classes** for perched and true water **tables** should differ. The answer **involves** the question **whether** the effects of perched and true water tables generally differ. It was observed that the distinction between perched and true water tables is artificial to a degree as they grade together. Recent studies in Ohio **soils** were discussed **(Summary** of Soil and Water Studies. 1960 - 1961 - 1962, Ohio Department of Natural Resources, Division of Lands and Soil.) This study shows that the difference in water table depths among soils in the catena is lees then morphology and management experience would suggestwbere true and perched water tables' are 'not distinguished. The better drained soils probably have a perched water table'whereas the poorly and very poorly drained soils probably have true water tables. If a distinction between parched and true water tables is made, then the difference between water table relations among the soils of, the catenary aasocia- tions becomes much greater than if the two water tables era not distinguished. This subject requires further consideration.

The national coamittee proposed the following depth classes for considera- tion by the regional committees:

0 to 10 inches
10 to 20 inches
20 to 40 inches
40 to 80 inches
80 to 240 inches
>240 inches

By oversight, names for these classes were not discussed. Tbe committee felt that measurements should be made from the top of the 0 borieon. These classes should be discussed by the regional committees.

Duration of water tables was also discussed. The five classes of duration proposed in the 1960 national report and repeated in the 1963 report were acceptable.

The depth and duration classes as formulated would pertain to average con- ditions. The national committee felt that the probability of occurrence needs to be included in the description of water table conditions. No specific suggestions were made however.

The possible number of combined depth and duration classes is very large. It was the consensus of the national committee that an attempt should be made to define classes that combine depth and duration of water table. Also these classes should include the maximum depth as well as the minimum depth if this is feasible. Time did not permit the development of specific proposals. Tbe regional committees are requested to comment on the pro- posal of combined depth end duration classes and also on the question of probability of occurrence statements.

Finally, in reference to the description of both depth and duration classes of water table, it should be a matter of record that tbe committee debated whether descriptive statements and actual measurement values would not be better than classes. The committee felt that classes were useful, but if measurements were available and descriptive statements were feasible, class descriptions ehould be avoided.

Available Water

Comments of tbe regional committee6 on the 1963 national committee. report concerned methods of measurement and expression of the results. The Northeast committee forwarded e number of 1/3- minus 15-bar determinations that were made by the Pennsylvania State University. The 1965 national committee did not Concern itself with methods of measurement or means of expressing tha results. gather, in the brief time devoted to the subject, the committee concentrated on how laboratory measurements of 1/3- minus 15-bar should be stratified in order to obtain the maximum predictive value. It was felt that the stratification should be by more tben just texture alone. Kinds of soil fabric should be defined. Included in the definitions of these fabrics would be texture, mineralogy, and organic matter content. The master horizon would also be included in the definition of the fabric where it would be thought relevant, The committee discussed that it may not always be possible to work directly from the classification of the soils because horizon thickness is a factor that would effect classification but not the amount of water expressed in inch-per-inch values. For example, soils with horizons that meet the requirements for Bpodic horizons may be classified as inceptisols because the spodic horizon is too thin. Water-retention characteristics of these thin Bpodic horizons may be the same as those of thicker spodic horizons.

Tbe regional committees are requested to explore the possibilities of stratifying 1/3- minus 15-bar water retention values by classification of the soils in the new system, It is hoped that the Soil Survey Laboratories can do likewise. A minimum objective might be the weighted average to e depth of one meter or to where roots are restricted, whichever is shallower. For uniformity the measurements should be restricted to 1/3- minus 15-bar values. This may require exclusion of soil materials falling in the Bandy family textural class because it has been well established that use of 1/3-bar tension leads to underestimation of the available water for such textures. It is suggested that the 1/3-bar values should have been determined on either cores or natural clods and not on fragmented samples. The data should be reported both as percentages and as inch-per-inch values. Presence of coarse fragments will confound the relationships. In the exploratory stages it would be advisable to report the values both exclusive and inclusive of the volume fraction of coarse fragments present.

The committee recognizes that available water is a poor term and that e more operational term is desirable. No suggestions were made, however, and the regional committees are solicited for suggestions.

Field Moisture Studies:

The State soil scientists were requested prior to the national committee meeting to supply information on long-term moisture investigations in their respective states. The intent of the request was to obtain a general idea rather than a complete bibliography of the number and kinds of long-term moisture studies completed or in progress. About 40 of the States responded. Approximately 20 States have long-tans moisture studies and about a dozen rather promising sources of information were indicated, A compilation of replies can be obtained from the national committee chairman.

The regional committees are requested to continue the collection of information on field moisture studies that have been completed or are in progress. The compilation prepared for the 1965 national committee would provide a starting place for the regional committees. The projects should be evaluated relative to the following objective: the development of indices based on weather records that could be used to predict the soil moisture regime with reasonable reliability.

The possibility of moisture studies by field soil scientists was discussed. It would be preferable to select sites near weather substations. Studies on irrigated land may be useful. Such studies would be for a relatively short period of time usually--five years or less. Several short-term studies on similarly classified soils may provide as much information on the relationship between climate and the soil water regime as a single long-term (20-year) study. These studies would have the sane objective as mentioned before--the use of weather records to predict the soil moisture regime.

In summary, the regional committees are requested to do the following:

A. Review again the question of permeability classes in view of the switch to the auger-hole method.

B. Collect information on water table studies. Review these projects relative to the proposed water table definitions and determine the kinds of water tables that are being measured. Advise the national committee whether perched and true water tables should be distinguished in water table studies.

C. Explore the assembly of 1/3- minus 15-bar water-retention values. Consider what should be the minimum objective. A suggestion is given in this report.

D. Assemble information on long-term moisture studies completed or in progress. Consideration might be given to the formulation of a detailed outline for a field moisture study to be conducted by a soil scientist in charge of a survey.

<u>Comments on Report by National Committee</u>

Kellogg: Why not hanging water table instead of virtual?

Smith: Why measure depth of vater table from the top of the O horizon?

Templin: Need depth class for ponded condition. Better to have depth classes follov a progression. Might use 2.5 as baoe for the progression. Give five classes.

Matelski: Pennsylvania has much information on auger-hole method. Will send to Moisture Committee. One finding is that percolation on poorly drained soils reaches 1 inch per hour in August. In winter, even on sand, percolation at 36 inches approaches zero inches per hour.

Johnson: Can we measure effective available water in the field rather than in the laboratory? What about the wilting-point value?

Farnham: Energy relationships in organic soils are different. Available water concepts for mineral soils do not work well., Must approach problem in field for organic soils.

Flach: Sentiment 1/3- and 15-bar inadequate for some soils. Need to distinguish laboratory measurement of 1/3- minus 15-bar from difference between field capacity and permanent wilting point.

Whiteside: Michigan uses 0.06 - 6 bar for readily available water. Above 6 bar. growth rate drops rapidly based on studies of adventitious tomato roots.

<u>Committee Members</u>

*H. H. Bailey
O. W. Bidwell
*G. S. Holmgren
*K. W. Flach
*J. E. McClelland
*A. H. Paschall
*R. I. Turner
*R. B. Grossman, Chairman

*Those present at committee meeting.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
Chicago, Illinois, January 25-29, 1965

Report of the Committee on Classification and Nomenclature of Wade Soils

The acreage of land affected by filling, earth moving operations, dredging and other mechanical means has increased greatly in the past one or two decades. In tha Soil Survey Manual we find that Wade land is the term which would most nearly fit these areas. This term, however, has not been entirely satisfactory and we have been searching for better terminology.

Made land is defined in the Soil Survey Manual as consisting of "area6 filled artificially with earth, trash, or both, and smoothed, It occurs most commonly in and around urban areas." It appears from this definition that the term "Made land" was originally intended for a fairly limited kind of land. In practice, however, Wade land mapping units have included areas ranging from rubbish dumps to soil altered by earth moving equipment, deep plowing, or other means. There is a wide range in value of these areas for crop production and other uses.

In many survey areas mapping units were set up to recognize and separate these various kinds of "made land." The problem of finding correct names for them has been troublesome. Are all of the areas proparly classed as Made land? Should some new terms be coined for areas consisting of earthy material?

In 1962 regional committees began efforts to work out batter guide lines for classifying "Made land." In 1963 a verbal report on this subject was presentad to the national conference. The 1965 national cowittee had three regional committee reports to review as a basis for its work.

Objectives

With this as background our 1965 committee listed the following objectives:

1. Review available regional reports.
2. Review the Manual definition of Wade land and consider possible revision of this definition,
3. Develop guidelines for recognition and naming of areas which might fall outside a revised definition of Made land.

Regional Committee Reports

The following regional committee reports were available:

1. Northeast Region. Excerpt from report of Committee on Improving Soil Survey Operations, 1962.

2. Western Region report, Committee No. 7, Made or Shaped Soils, January 1964.

3. Southern Region report, Committee II, Made or Shaped Soil, Classification and Nomenclature, 1964.

Recommendations in the Northeastern and Western regional reports were accepted covering the following points:

1. Restrict Made land to essentially non-earthy material.

2. Use Made soil as a broad class name for material consisting of a mixture of solums and underlying material or artificial fills of earthy materials.

The committee noted that the report from the Southern region used the term "soil material" or Made soils" for "soils" without diagnostic horizons. The list of criteria for classifying "Made soil" in the Southern report was reviewed, However, due to the lack of time these criteria were not considered in sufficient detail to offer critical comment.

Recommendations:

1. Revise the definition of Made land as follows:

   Made land consists of areas filled or covered artificially with miscellaneous material including trash, stones, and industrial waste, but excluding areas of essentially earthy material. Made land is not suitable for commercial crop production.

2. Adopt a new term, "Made soil," with the following definition.

   Made soil consists of areas of earthy material which have been greatly disturbed or changed by man. As a result, their characteristics are so diverse or variable that it is not practical to place them in existing series, Likewise, it is not feasible to write new series descriptions to fit them. Nevertheless, certain general characteristics can be described and alternate uses can be suggested for these disturbed areas.

The committee recognized inherent difficulties in use of the word "soil" in the broad class name Wade soil. The main difficulty is that soil as defined in our recommendation is used in the sense of earthy material in contrast to a natural body with naturally developed characteristics. In spite of this reservation the term "Wade soil" was favored by the committee over others which were proposed. Before settling on the term "Made soil" the committee spent considerable time searching for alternative names. Among those considered were: Wade soil, formed soil, Wade earth, Made land earthy, and Wade ground.

3. Recognize as named soils those areas consisting of earthy material disturbed or modified by man in which the characteristics are such es to enable placement in existing soil series or recognition of new series. Most of the soils in this category are Entisols.

   This recommendation is consistent with the second paragraph under Made land in the Soil Survey Manual, which reads, "Stabilized land areas with clearly developed soil characteristics or even those with young soils if definable and uniform enough to map and especially if arable, should be classified as soils even though originally made or reworked by man."

4. Where two or more classes of "Wade soil" are established in a survey area, modifying adjectives must be added for differentiation. The modifiers should followthe term "Made soil" in order to keep these unite in alphabetical sequence in the published report, Modifying adjectives reflecting a soil characteristic or mode or origin may be used, for example:

   Made soil, sand and clay
   Made soil, calcareous
   Wade soil, smoothed

   The above rule also applies to Wade land,

Future committee work

It is recommended that this committee be discharged. We suggest that regional committees be appointed to review tbe adequacy of several of the miscellaneous land types listed in the Soil Survey Manual. Some which need attention are alluvial land, strip mines, and urban land. Recommendations, if any, from regional committees would then need to be reviewed by a national committee.

Committee Members	Visitors
A. J. Baur, Chairman	Dr. Kellogg
J. K. Ablaiter	Dr. Simonson
R. D. Headley	Dr. Retzer
E. H. Templin	
L. E. Tyler	
J. M. Williams	
K. P. Wilson	

General Session Comments 1/28/65

Kellogg: Agreed that the definition of Made laud given in Soil Survey Manual was intended to be quite narrow, but thst big machines have changed this.

Kellogg: Did the committee consider "shaped soils?"

Baur: In committee discussions it was concluded that most areas of "shaped soil" could be classified se phases of named soils; areas which could not be so classified should be named "Made soil" with 8 modifier added if desired to give the name more connotation.

Kellogg: This is not what I wanted the committee to study. We need detailed information on the character of areas that have been smoothed or shaped.

Templin: If material is so mixed that it cannot be described, it will be classed se "Made soils." If it can be described, it will be classed se a phase of named soils. Field tests on three areas in Kansas with cuts and fills to six feet showed that complexen of soil series with a phase name added could be used snd correlations were made accordingly.

Kellogg: What was committee report of last year?

Simonson: Objected to the name "Made soils." He consider8 these kinds of areas as miscellaneous land classes, end believes we should not use the word soil as part of the name for a miscellaneous land type. We have only general descriptions of some of these areas. We need more actual measurements and dsts before we can do a good job of classifying them.

Kellogg: This is what 1 wanted the committee to study.

Simonson - I do not think they had enough information available.

Smith - The committee had some reservations about use of the term "soil" as used in their report under "Made soil." Materials of this kind do have some properties of soil, certainly by the end of the first year, Therefore, they are soil and the committee should not be concerned over the use of tha term "soil."

Kellogg - We will have to continue work on this subject because we have not received adequate guidance from this committee.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORE-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
Chicago, Illinois, January 25-29, 1965

Report of committee on
Climate in Relation to Soil Classification and Interpretations

The committee on climate reviewed the 1963 Rational Work-Planning Conference Report on Climate. Specific attention was given to the recommendations made by the national committee. The committee then referred to the regional reports on climate. The North Central and Northeastern regions did not prepare a committee report on climate last year.

Climatic Indices Studies

The 1963 national committee recommended that the Western States continue their computations of climatic data and the testing of the climatic indices procedure for calculating actual and potential evaporation for estimating potential plant growth as outlined in Hilgardia by Arkley and Ulrich. Eight of the 11 Western States reported that they had completed the computations necessary to make these climatic Interpretations and that the data were in various stages of publication. The other three States are well along toward completion of this work. The State climatologists have cooperated fully with the Service in the computation and publication of these data. Soil scientists in these States are now studying the relationship of these climatic indices to the kinds and amounts of cultivated crops, trees, and grasses that can be grown under defined levels of management.

Recommendation:' The committee recommended that the Western States continue to test the climatic indices procedure as outlined in Hilgardia by Arkley and Ulrich and to report their progress at the next regional work-planning conference. It was suggested that the State soil scientists check with appropriate people in the Bureau of Reclamation and with other agencies for any additional data or methods that may be useful in making soil-climatic interpretations.

Climatic indices and isoline maps have been developed for most of the Western States. Some coordination of soil interpretations would result if these climatic indices were coordinated across State lines and a regional isoline map prepared.

Recommendation: The committee recommends that consideration be given to the coordination of these data among the 11 Western States and that the individual State isoline maps be joined.

Soil Climatic Phases

The Southern committee on climate reported that where soil interpretations were different for the same kind of soil when it occurred in two different climatic zones, that this interpretation be made through the use of climatic zones shown on a map. The soil name would not include a named climatic phase. The committee concluded that more specific information was needed before further consideration be given to naming all climatic soil phases.

Recommendation: The committee recommended that the Service continue to recognize the importance of climate in soil interpretations as they have in the past. This may be done (a) either In the soil description or in other descriptive material, (b) through the use of climatic zones shown on maps, or (c) through the use of named soil climatic phases.

Basic Soil Studies on Micro-Macro Climatic Relationships

The Southern climatic committee reviewed the work under way at the University of Kentucky on project S-47 dealing with micro-macro climatic relationships and recommended that other research groups participate in this kind of a project. In brief, this project deals with measuring micro and macro climates at a given location and includes such items as temperature at 5 feet and at 3 inches above sod and above bare ground; 1 inch, 4 inches, 20 inches, and 2 meters below the surface of the soil under sod and under bare ground. In addition, measurements on precipitation, evaporation, wind velocity, and total solar radiation are being made. Adjacent to this area of detailed instrumentation a plot of soil (ideal soil) is being farmed to corn under a very high level of management, Including supplemental irrigation; thus the only limiting factor in plant growth is the solar energy available to the area and the genetic limitations of the plant. Similar studies are reported to be under way in other parts of the country.

This kind of work is basic to our understanding of the effects of climate on soil interpretations. The national committee felt that there was a need for a summary report on the progress and availability of data on this kind of work and concurred in the recommendation of the Southern committee that other States be encouraged to participate in projects such as regional project S-47.

Recommendation: The national committee recommends that the regional committees on climate encourage each State in their region to review work of this nature (S-47 project) that is being carried out in their State and to present this information to the regional committee on climate at the next regional work-planning conference.

Relating Climate to Soil Interpretations

A great deal of effort has been put forth by each State during the past two years in an effort to coordinate soil interpretations by kinds of soil within major lend resource areas. This was the result of instructions contained in SCS Advisory Notice W-226 dated April 29, 1963. Major emphasis was placed on benchmark soils. Climatic date pertinent to soil interpretations should be a part of these basic data. The committee felt that the benchmark soil approach; (the assembly of basic data by kinds of soil within major land resource areas) is basic to our understanding and interpretations of soil.

Recommendation: The committee recommends continued participation by the States in recording basic data for benchmark soils including pertinent climatic date and that the regions1 committees on climate report on the progress being made in this work.

Soil Temperature Measurements in Soil Classification and Interpretation

Soil temperature has now become a part of our new soil classification system. There is good reason to believe that these same soil temperature classes will be useful in making soil interpretations. Some additional soil temperature measurements at depths shallower than those suggested for soil classification may be helpful in soil interpretations. Special emphasis should be given to soil temperature measurements In soil areas (1) where additional information is needed to characterize the soil for classification purposes end (2) where soil temperatures may be important in soil interpretations. For example, what are the relationships of mean annual soil temperatures, growing season soil temperatures and summer soil temperatures to (1) growth and yield of citrus? (2) growth and yield of cotton? (3) growth and yield of corn for grain? end (4) growth end yield of other important agricultural crops?

Details regarding soil temperature regimes, their characteristics end predictability are included in the publication SCS-TP-l&April 1964, by Smith, Newhall, Robinson, end Swanson, end in other publications listed as references in this publication.

The committee is of the opinion that soil temperature measurements should be coordinated. We suggest that the Principal Soil Correletors in consultation with other cooperators of the Soil Survey prepare a statement amplifying the need for information about soil temperature and that they make specific recommendations about the methods to be used. In particular guides are needed on depths end time at which soil temperatures should be recorded. Otherwise it would be difficult to coordinate soil temperature measurements between soil survey areas. In addition mercury thermometers used in determining soil temperatures usually need calibration. Instructions on how this can be done should also be issued.

Recommendation: The nations.1 committee recommends that the regional committees on climate encourage each State to make soil temperature measurements in accordance with prescribed methods and with the technical guidance of the Principal Soil Correlator end that a progress report be made et the next regional work-planning conference.

Future Committee Activities

Recommendation: The committee recommends that they be continued so that further guidance can be provided to the regional committees on climate.

Participants in Committee Deliberations

Committee Members

H. H. Bailey *
0. W. Bidwell
R. W. Eikleberry *
R. B. Grossman *
R. D. Headley *
A. A. Klingebiel * - Chairman
R. C. Kronenberger *
J. T. Maletic
A. C. Orvedal
M. Stout, Jr. * - Secretary
R. Ulrich
L. R. Wohletz *

Visitors

R. D. Hockensmith
A. Leahey
c. McVee
M. E. Noble
A. L. Parkinson
A. Pelzner
N. K. Peterson
J. L. Retzer
J. M. Williams

* Committee members present at Chicago meeting.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY, Chicago, Illinois, January 25-29, 1965

Report of Committee on Soil Family Criteria

A. Introduction

The Committee on Soil Family Criteria met on Wednesday afternoon and evening. Present were all members, except Dr. Scrivner. Other participants in the Committee discussions were Dr. Kellogg, Mr. Ableiter, and Mr. Noble. Mr. D. E. McCormack was secretary.

B. Regional Reports

The Committee received no regional conference reports bearing on its area discussion.

C. Other Sources of Suggestions to the Committee

A number of suggestions for revision of soil family criteria came from regional orientation conferences held in the autumn of 1964. Also, informal suggestions were received from several State representatives and individuals. All of these suggestions received consideration during Committee deliberations.

D. Discussion

The chairman reviewed changes in family criteria that have been proposed since the June 1964 Supplement was issued. These changes will be transmitted to all cooperators by Dr. Smith in 1965. Included are two new mineralogy classes, gibbsitic and limonitic (primarily for soils in Puerto Rico and Hawaii).

The Committee discussed also the following proposals and questions:

1. At what category of the System should soil thickness be used as a differentiating characteristic? The Committee consensus was that this characteristic is most appropriately used for differentiation at the family level.

2. Apply clay mineralogy classes to textural classes having less than 35 percent clay.

   The Committee rejected this proposal.

3. Should the content of coarse fragments in the skeletal classes be varied according to texture of the fine earth? It was proposed in the West that the allowable content of coarse fragments be adjusted as follows:

sandy skeletal: 20% coarse fragments
loamy skeletal: 40% coarse fragments
clayey skeletal: 60% coarse fragments

The argument for this sliding scale of coarse fragments is that the moisture-holding capacities and other physical characteristics of soils would be more nearly equilibrated. The Committee is of the opinion that the present 50 percent lower limit for coarse fragments in skeletal families is questionable, but is unwilling to accept the above proposal without more data and testing.

4. Soil families be further subdivided according to three degrees of expression of argillic horizon: minimal, medial, and maximal. Definitions proposed by California soil scientists.

The Committee agreed that the proposed definitions of each class might well serve to differentiate series, but that this criterion represents a level of generalization that is clearly below the family.

5. Divide the "isomesic" temperature class into two temperature classes, with the division point at 59°F.

This proposal was discussed and accepted (See Committee recommendations).

6. How shall control sections be handled in family groupings if they consist of layers that are thinly stratified and of strongly contrasting textures?

The Committee discussed this question at length. 'Strongly contrasting textures" are defined on page 6-3 of the June 1964 Supplement. At present, the definition requires that a weighted average texture of the control section be used. The Committee agreed that, to be relevant, the strongly contrasting strata should comprise at least three layers with an aggregate thickness of at least six inches, or more than one-third of the thickness of the control section, whichever is thinner. See Committee recommendations.

7. Add another continental temperature class for soils with a mean annual temperature of more than about 72°F.

The Committee considered this proposal but found little to discuss, pro or con. Further argument and more data bearing on the question are needed. See Committee recommendations.

8. Shall soils that are shallow to ortstein or to thin, iron-cemented sheets be classed as thin families?

The Committee considers that these are not quite comparable situations, and that separate rules must apply. The crux of the matter is the degree of permeability of the horizons to roots. See Committee recommendations.

9. Shall soils with a lithic contact at depths less than ten inches b-e placed in the same families as those that are ten to twenty inches to a lithic contact?

Under the current rules, soils that are less than ten inches thick over a lithic contact have no control section for textural classes, and the result is families without textural designation. Thus the ten-inch limit automatically becomes a family (and therefore a series) criterion. The Committee agreed that this is an undesirable convention, and made a recommendation'to change it.

E. Committee Recommendations and Suggestions

RECOMMENDATION 1:

Add to Paragraph a, page 6-2 of the June 1964 Supplement the following statement:

For soils having a lithic contact within ten inches of the surface, the family textural class is determined by the weighted average of the texture of soil above the lithic contact.

RECOMMENDATION 2:

Add to the family textural classification the following new classes:

a. Clayey stratified: the control section contains at least three relevant strongly contrasting strata in which the fine earth has more than 35 percent clay.

b. Loamy stratified: the control section contains at least three relevant strongly contrasting strata in which the fine earth has less than 35 percent clay.

RECOMMENDATION 3:

In the family temperature classification, the following four classes shall be used for the marine ("iso") group:

Less than 47°F.
47 - 59°F.
59 - 71.6°F.
More than 71.6°F.

Note: A satisfactory term for the class having mean annual temperature above 71.6°F. is needed.

RECOMMENDATION 4:

The several regional work-planning conferences be asked to test the present and proposed limits of coarse fragments in skeletal families and to send their recommendations to the national committee.

RECOMMENDATION 5:

The Soil Survey laboratories be asked to furnish data on "available moisture supply" and other physical properties pertinent to the argument on limiting values of coarse fragments in skeletal families.

RECOMMENDATION 6:

Soils shallow to ortstein shall not be classified in thin families, inasmuch as ortstein horizons are invariably discontinuous and cracked and are therefore pervious to roots.

RECOMMENDATION 7:

Soils shallow to thin iron-cemented layers ("ironstone sheets") may or may not be classed in thin families, depending on whether the ironstone layer is impervious to roots.

RECOMMENDATION 8:

The various regional conferences be requested to consider the need for an additional continental temperature class, for soils with mean annual temperature of more than 71.6°F. (And seasonal variability of 9°F. or more).

RECOMMENDATION 9:

The Southern Regional Conference be asked to re-examine the thickness classes of Ultisols and Oxisols and to make recommendations to the national conference.

RECOMMENDATION 10:

The Committee on Soil Family Criteria should be permitted to exist for at least another two years. There will be a continuing need for study and evaluation of soil family criteria. There is, moreover, a need to receive and study the proposals of regional committees on this subject.

F. Committee Members

W. M. Johnson, chairman	Nobel K. Peterson	E. H. Templin
L. J. Bartelli	C. L. Scrivner	R. I. Turner
A. J. Baur	Roy W. Simonson	L. E. Tyler
D. E. McCormack, Secretary		

G. Conference Action

The Committee Report was accepted by voice vote of the Conference.

H. Conference Discussion of the Committee Report on Soil Family Criteria.

GROSSMAN: In reference to the proposal for a sliding scale of coarse fragments, it should be noted that the one-third minus 15 bar water retention bears little relation to clay content, except where clay percentage is Quite low, but instead is more closely related to silt percentage. Hence, the sliding scale for coarse fragments percentage' should be related to silt rather than to clay.

For stratified situations, would there be an advantage in indicating the extremes in texture, in addition to the weighted average; e.g., "coarse sand to clay?"

JOHNSON: It is possible that we may need to come to that. It is apparent that considerable more testing of the family criteria is needed.

DR. KELLOGG: Mr. Ableiter and Dr. Aandahl should 'present to their regional committees or to the next national conference some information on the'need for the extension of the control section below the solum'but above 40 inches in soils with argillic and natric horizons. Particularly, we need more information on available moisture supply and crop behavior.

JOHNSON: We must be aware that if the family criteria appear to be too restrictive to us, we are likely to have much difficulty in series definitions.

MCCLELLAND: Would an ironstone sheet at shallow depth cause a soil to be placed in a thin family?

JOHNSON: Yes, if the ironstone sheet is continuous beyond the limits of the pedon, and if it is also impervious to roots.

SMITH: We tried in earlier approximations to define a hard sesquioxide sheet, but failed because of the difficulty of differentiating such a sheet from hardened laterite.

DR. KELLOGG: Referring again to the recommendation on a sliding scale of coarse fragments, 50 percent is a generalization. You surely would have a difference in available moisture between sandy skeletal and clayey skeletal. More work needs to be done on this question.

GROSSMAN: why not classify the clay mineralogy when the clay content of the control section is less than 35 percent?

SMITH: When the clay content is more than 35 percent, the clay dominates the behavior of the soil, whereas it is our thought that the silt and sand tend to dominate soil behavior when the clay content is below 35 percent. Certainly there are differences in soils with less than 35 percent clay, depending on the kind of clay, but these can be handled at the series level.

MCCLELLAND: Probably all the petrocalcic soils that lack argillic horizons are thin.

SMITH: In soils with ortsteins, the soil includes the ortstein whether roots penetrate it or not.

DR. KELLOGG: Petrocalcic horizons just north of the Sahara are as much as 30 feet thick. We must consider the upper part as part of our soil, but not the whole 30 feet. Therefore, in the Manual, we proposed one meter as the thickness limit in such soils.

MCCORMACK: Aren't the soil thickness classes defined on the basis of root penetration, regardless of genetic horizons?

SMITH: NO. In the 7th Approximation you will notice that the soil is defined as the depth of penetration of the native perennial plants, or or to the base of the genetic soil horizons. See the first paragraph on page 1 of the "Brown Book." Thus, in the few places where the soil contains horizons impermeable to roots, the soil is deeper than plant rooting.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation service

MTIOML TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
Chicago, Illinois, January 25 - 29, 1965

Report of the Committee on Organic Soils

I. Reports of regional committees

Reports of all four regional committees were reviewed and consideration given to their recommendations.

All four regions conducted field trials of some nature using the new system.

II. Histosol - current definition (Organic carbon determination vs. loss on ignition was discussed as methods to use in determining minimum organic content. Soil Survey Laboratories to assist in deciding best method.)

III. Committee recommendations

A. Control sections

Drained vs. undrained definitions - Some committee members felt that the arbitrary "40 and 60" would Le adequate in most cases if a firm definition of "drained" be spelled out. The committee suggested that if 40" is used for "drained" the definition should specify the following: Evidence of a plowed surface layer or other evidence of drainage indicating that initial subsidence has occurred.

B. Dysic - pH 1N KCl 5 or less
Euic - pH 1N KC1 more than 5.0

The committee discussed means by which pH can be determined in the field. A correlation of typical samples was presented using several methods of determining pH. It was pointed out that pH in salt solution was preferable to pH H20 because (a) replacing power of cations follows the lyotropic series and (b) pH with H_2O fluctuates seasonally, generally increasing on drying. The committee suggests that consideration be given to using pHydrion with salt solution for a quick field test. The Hellige method, using powder, might eliminate problems in reading. The committee recommended that pHydrion and Hellige methods be correlated with potentiometer readings.

(Note - Farnham will check on the effect of drying on pH)

C. Diagnostic horizons

1. Some changes in the 1963 recommendations have been made for the purpose of clarifying criteria.

a.[1/] Type I Fibric Horizons - least decomposed stage

(1) Must have more than 2/3 fibers in the total mass of the material, More than 50 percent of the fibers must be so well preserved as to not change color (decrease in chroma - Munsell) when rubbed wet or must resist becoming disintegrated or greasy (see 2 and 3 under Type II).

(2) Increase of one or more units color value (Munsell) when pressed wet.

(3) Sodium pyrophosphnte extract on white filter paper that is higher in value or lower in chroma than 10YR 7/3.

Type II Mezic (formerly Lenic) - intermediate decomposition stage

(1) Fiber content between 1/3 to 2/3 of total mass.

or (2) If fiber content exceeds 2/3 of total mass over 50 percent of fibers will decrease at least one unit in chroma (Munsell) when rubbed wet.

or (3) If fiber content exceeds 2/3 of total mass and does not change color upon rubbing but over 50 percent of fibers are easily broken down and/or become greasy when rubbed wet.

Type III Sapric - most decomposed stage

(1) Must have less than 1/3 fiber in total mass of material,

(2) No color change when rubbed wet.

(3) Sodium pyrophosphato extract on white filter paper that is lower in value and higher in chroma than 10YR 7/3.

(4) The high mineral content sapric horizons (50 percent plus mineral) have dry color values of 5 or more.

1/ From North Central Regional Organic Soil Committee Report, R, Farnham, 1964.

b. The name nesic is subject to change because the term is used at the family level for temperature classes.

c. Use of pyrophosphate to distinguish between horizon types and between sapric and sedimentary peat.

d. Unique organic materials (Guy Smith's litter over rocks).

IV. Taxa of suborders

10.1 Saprists
10.2 Mesists — all have diagnostic' horizons
10.3 Fibrists
10.4 Leptists - lack diagnostic horizons

V. Taxa of great groups

A. Criteria

1. Cryic class - has permafrost or has ice in the soil for more than ten months of the year!

2. Dysic and Euic classes based on pH's.

3. Sphagno and Hypno Fibrists unique - easy to identify by their nature. Sphagno is 5 or less in pH and Hypno is over 5 in pH.

4. Classes in Leptist - committee recommends following revisions from 1963.

a. Dysic and Euic classes have been removed at great group level and will be considered at family (or series?) level. This was done to shorten names.

b. The kinds of horizons (dominance of a horizon type) considered at this level are as follows:

(1) Saproleptists - sapric materials dominate

(2) Mesoleptists - mesic materials dominate

(3) Fibroleptists - fibrfc materials dominate

(4) Cryoleptists are retained as of 1963 report,

VI. Taxa of subgroups

May be best considered by giving specific examples. Much is a repeat of addendum report given limited circulation by Cuy Smith, May 1963.

A. Eusaprist

1. Typic - entire control section with sapric horizon.

2. Clastic - 50 percent mineral matter in organic part of control section.

3. Interic - two diagnostic horizons in control section.

4. Thaptic - buried mineral soil in control section.

5. Limnic - limnic horizon in control section.

6. Lithic - rock in control section.

7. Hydric - like typic except H_2O layer in control section.

B. Saproleptist

1. Typic - in this case, dominantly thin sapric materials over mineral soil material lacking mollic epipedons, spodic or argillic diagnostic horizons (can have ochric epipedon and/or a gleyed horizon).

2. Thaptic - mineral material has either a mollic or umbric epipedon or a spodic or argillic horizon.

3. Limnic - may include boy: iron as well as marl,

4. Clastic - high mineral content in organic part of control section.

5. Cumulic - alternate layers of organic and mineral.

6. Stratic - alternating different kinds of thin organic horizons.

7. Lithic - over rock.

8. Hydric - like typic except H_2O layer.

VII. Family criteria

A. Carbonatic

B. Calcareous

C. Sulphurous

D. Ferruginous

E. Woody

F. Toxic elements - Al, Zn, etc.

G. Texture of substratum - weighted average texture

H. Acidic

VIII. Series criteria

A. Minnesota is presently placing Histosols into series. This classification will be circulated to committee members and other interested parties, particularly in Michigan and Florida.

B. Florida has made good progress in placing series in the scheme but has not proposed family names. Thay have a proposed taxonomic key for organic soils of Florida. Trial mapping in both Florida and Minnesota indicates the system is workable and that field personnel are able to use the established criteria in the field.

Ix, Application

A. Idealized scheme - the chairman feels that the number of units in the system can be held to a workable minimum.

1. In Minnesota and Florida mapping units were not excessive in number.

2. A coded legend wan used in mapping trials in Minnesota as an educational aid to acquaint soil scientists with the system. A copy of this legend is attached. This type of legend numbering system would be dropped in favor of a State legend after the surveyors were acquainted with the system.

X. Miscellaneous

A. Structural features

These nay be needed for recognizing structural features. Structural features of significance may occur only in clastic subgroups of Saprists or in Saproleptists which contain 50 percent plus mineral content.

B. Experience has shown that field estimates of organic matter are frequently too high. Recent laboratory data in California and Minnesota shw that many soils will not qualify (too low in organic matter content) for Histosols even though classified as such in the field. Clay and silt mineral admixtures are involved in most errors. This is not considered serious because it is believed that field men will become more proficient as laboratory checks become available.

Questions on Organic Soil Committee Report

1. Grossman: Why is pH used in definition of classes instead of bases?

   Templin: By using pH, we are using an operational definition and we have lots of data.

2. Ehrlich: (Canada) How do you know underlying material has a buried horizon? Most material under organic soil has such an horizon.

   Guy Smith: Find buried soils in nature (as podzol) that is genetic apart from the organic material.

   Kellogg: In some cases, however, we do see influence of organic matter. May he developing right along with organic matter. Think Ehrlich has a good point.

3. Grossman: Should we specify ratio of KC1 to solids? Farnham cited Finnish work and discussed field technique for determinations.

4. Kellogg: Organic soils are different from mineral soils, we may have to use more operational methods.

5. Kellogg: On the sliding scale formula for minimum organic requirements of Bistosols. Might even apply the Bodenburc soils (mineral) in Matanuska Valley of Alaska because of high organic matter content in these soils. Control section might change between virgin and cultivated.

6. Whiteside: (Submitted his question by letter since he was not present when report was given.)

   In defining the diagnostic master horizons of Histosols, I would like to avoid the splitting of series in those shallow to mineral materials where there is less than a 12 inch subsurface diagnostic horizon. This might affect many of our shallow organic series by splitting those commonly 12 to 40 inches thick into a 12 to 24 inch group and a 24 to 40 inch group (assuming the drained condition).

   Would it be fessihle to reword the definition of master organic horizons as underscored below:

   "The diagnostic master horizons of Histosols must bc at least 12 inches thick in the case of drained soils and 18 inches thick in the case of undrained soils. They do not include the upper 12 inches of the organic soil if drained, or the upper 18 inches, if not drained, except where the organic horizons are less than 24 inches thick."

This would give preference to the subsurface organic horizons where the organic layers are greater than 24 inches thick, but give considerable weight to the surface where it exceeds the subsurface layers in thickness.

7. **Wilson:** A member of the committee has sent a suggestion of the name MIXIC in place of MESIC for the intermediate organic materials, MIXIC is from the Greek word MIXIS which means an intermingling. Your chairman feels this word is acceptable. It is short and appropriate.

<u>Committee Members</u>

F. J. Carlisle
James A. DeMent
F. S. Farnham*
Klaus W. Flach
G. S. Holmgren
A. H. Paschall
D. F. Slusher
Guy D, Smith
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*Committee chairman

<u>Visitors</u>

Walter Ehrlich (Canada)
Charles E. Kellogg
Roy Matelski (Pennsylvania)
E. P. Whitesida (Michigan)

HISTOSOLS

(Suborder - Great Group)

10.1 Saprists

- 10.11 Cryosaprists
- 10.12 Dysaprists
- 10.13 Eusaprists
- 10.14 Lusaprists

10.2 Mesists (Lenists)

- 10.21 Cryomesists
- 10.22 Dysmesists
- 10.23 Eumesists
- 10.24 Lumesists

10.3 Fibrists

- 10.31 Cryofibrists
- 10.32 Sphagnofibrists
- 10.33 Hypnofibrists
- 10.34 Dysfilbrists
- 10.35 Eufibrists

10.4 Leptists

- 10.41 Cryoleptists
- 10.42 Saproleptists
- 10.43 Mesoleptists
- 10.44 Fibroleptists
- 10.45 Luleptists

Coded Organic Soil Legend for Minnesota

Fraction Symbols

Denominator
(Control section excluding surface)

First Digit
Suborder level - kinds of diagnostic subsurface horizons

1 = Diagnostic sapric horizon
2 = Diagnostic mesic horizon
3 = Diagnostic fibric horizon
4 = No diagnostic horizon

Second Digit
Great group level - base status of diagnostic subsurface horizon or-dominant horizon type if not diagnostic

A) Soils with diagnostic subsurface horizons
1 = Dysic (low base - pH KC1 5.0 or less)
2 = Euic (high base - pH KC1 more than 5.0)
3 = Sphagno (Sphagnum moss peat diagnostic horizon)
4 = Hypno (Hypnum moss peat diagnostic horizon)

B) Soils without diagnostic subsurface horizons (Leptists)
5 = Sapric dominantly
6 = Mesic dominantly
7 = Fibric dominantly

Third Digit
Kinds of control sections - Subgroup level

A) All organic control section
0 = Typic - only 1 diagnostic subsurface horizon
1 = Interic - two diagnostic subsurface horizons
2 = Clastic Dysapric - 50% + mineral pH 5.0 or less
3 = Clastic Eusapric - 50% + mineral pH more than 5.0

B) Contrasting material in control section
4 = Thaptic - buried soil
5 = Limnic - limnic substratum
6 = Lithic - rock

Numerator
(Surface horizon)

First Digit

0 = Organic (Histosol)

Second Digit
(Surface horizon type)

1 = Sapric
2 = Mesic
3 = Sphagnofibric
4 = Hypnofibric
5 = Fibric
6 = Sands
7 = Loams
8 = Clays
9 = Anthropic (burned, scalped, mined)

Third Digit
(Base status of surface horizon)

1 = Dysic (low base - pH KC1 5 or less)
2 = Euic (high base - pH KC1 more than 5.0)
3 = e (slight effervescence with HCl)
4 = es (strong effervescence with HCl)
5 = cv (violent effervescence with HCl)

Fourth Digit
Specific kind of substratum in lower part of control section

0 = Organic
1 = Sands - s, ls
2 = Loams - sl, sil, 1, cl, sicl, si
3 = Clays - sic, c
4 = Marl
5 = Sedimentary peat
6 = Bog iron
7 = Pumicite
8 = Diatomite
9 = Rock

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
Chicago, Illinois, January 25-29, 1965

Report of the Committee on Planar Shapes of Soil Areas (linear features) in Relation to Interpretation

This committee is a continuation of the 1963 committee entitled "Shape of Soil Areas."

Briefly, the main problem is the lower potential for crop use and management of a soil where it exists in small or irregular shaped areas associated with less suitable soils for crop production. The problems are described in the 1963 report.

None of the regions had a committee on this subject in 1964.

We discussed the 1963 report and the desirability of having our soil scientists devote time to this activity. We concluded that we have more important things to do now. It may be a suitable problem for a graduate student. The needed research would require (1) the establishment of some relationships of production cost to size and shape of soil areas, (2) the selection of samples within a given soil landscape or pattern, and (3) estimating the decreased potentials resulting from application of the above relationships.

We recommend that the committee be dropped.

Committee Members:

*A. R. Aandahl, Chairman
*W. H. Bender
*L. E. Garland
*Lacy I Harmon
R. D. Hockensmith
J. D. Simpson
J. Cordon Steele

Visitors:

M. A. Fosberg
Charles E. Kellogg
R. D. Headley
John L. Retzer

NATIONAL COOPERATIVE SOIL SURVEY

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Chicago, Illinois
March 25-29, 1963

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Proceedings of ----

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE

OF THE COOPERATIVE SOIL SURVEY

FILE COPY

Chicago, Illinois

March 25 - 29, 1963

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
Washington 25, D. C.

July 10, 1963

To: Participants and Committee Members of the National Technical Work-Planning Conference of the Cooperative Soil Survey

From: R. D. Hockensmith, Director, Soil Survey Operations, SCS

Subject: Report of the 1963 National Work-Planning Conference of the Cooperative Soil Survey

Transmitted herewith is the report of the 1963 National Technical Work-Planning Conference of the Cooperative Soil Survey, which includes abstracts of talks by Charles E. Kellogg; Val W. Silkett; A. Leahey; Guy D. Smith; Luther Robinson; W. S. Ligon; Roy W. Simonson; T. B. Plair; John L. Retzer; J. D. Simpson; Myrvin E. Noble; Adrian Pelzner; John T. Maletic; Roy P. Matelski; Curtis L. Godfrey; R. J. Arkley; F. P. Riecken; A. A. Klingebiel; and J. Gordon Steele; and reports of the commi ttees. The committee reports are:

- Criteria for series, types, and phases
- Soil surveys in urban-fringe areas
- Organic soils
- Soil correlation principles, procedures, and rules
- Laboratory characterization of soils
- Soil morphology
- Climate in relation to soil classification and interpretation
- Technical soil monographs
- Soil moisture
- Shape of soil areas
- Soil texture, coordination of textural grades and grain siee

Information on some of the items in these reports on which agreements were reached were released immediately after our conference through official channels for widespread use. Information on other items on which there was agreement will be released soon. But other items need further study. Thus, these cob mittee reports should not be Riven widespread distribution. They have no official status in their present form.

Sufficient copies are being sent to the office of each State Conservationist for distribution to the appropriate State experiment station soil survey leaders and to soil survey representatives of other agencies that are engaged in soil survey work in the State. In addition sufficient copies are being sent for use by the State soil scientist, assistant State soil scientist and soil correlator. The State soil scientist may wish to circulate one copy of this report among the GS-11 and CS-9 soil scientists, but in doing so it should be made clear that the information, ideas, and data in these committee reports simply represent trends in thinking and progress of work, Thus, they do not necessarily represent official views although many of the methods ultimately may be adopted officially.

R. D. Hockensmith

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
Chicago, Illinois, March 25 - 29. 1963

THE SOIL SURVEY

Charles E. Kellogg

Gentlemen, I am sorry that plans of the Senate Committee on Appropriations made me ask you to rearrange your program. I should much rather had my report in the beginning.

First of all, I think most of you know that during the next two and 4 helf years or so I will be spending 4 third of my time on 4 study of the American agricultural colleges and associated experiment stations and extension services under 4 grout supplied by the Carnegie Corporation. I talked about the matter with the Directors and pointed out to them that they would have a little less travel,, yet they all suggested I go ahead with it. Everybody agreed that.1 go ahead with it (except my wife) so I will have 4 little less time for extras in the next two and a half years than I have had. And I shall always try to remember to tell the State Conservationists when I'm in 4 State on this kind of work, but if I forget it sometime, I hope no one will think I'm slighting them.

I think the prestige of our Soil Survey work has increased steadily with people generally, both in this country nnd overseas. The prestige is nice, but it involves responsibilities. When we change our terms and our definitions of terms, in fairness we must explain them internationally.

The financing of the Soil Survey has steadily improved. A4 I recall, when I first started in the Department we had on the order of one-qunrter million dollars. I don't remember exactly--and that doe:: not count the cost of publications, so it might have been as much 4s $350,000. The States were putting in about a quarter of 4 million, We had altogether, then, considerably lens than 4 million dollars. Now the tot41 is in the neighborhood of 20 million dollars or so. In the Service we've been spending about 16.8 million this fiscal year. Now that includes watershed funds to accelerate soil surveys and funds from other activities of the Service that must be used to supplement our regular Soil Survey financing, The State and local financing has not increased so much as the Fader-41 financing. This is 4 source of considerable embarrassment to me. At the Senate Hearing last Monday, the chairman insisted that we put into the Record the amount of State and local funds used for soil survey work, by States. We reported 4 lump sum in former years. but now it must be by States. And our information is not so accurate 4s I wish it were. I do hope that all of you State soil scientists., particularly, will try to get somewhat more precise annual estimates of both State and county funds, because I have a hunch we may be asked for these data every year from now on.

The biggest problem that we have now, and elwayr have bad in the Soil Survey, is the maintenance of balance. I hope we have balance at a high level and not get it by pulling something down instead of by pulling other things up. Ever since I've been in the Soil Survey I have heard two voices. On the one side, "Oh, the trouble with Kellogg is he's lntererted only in Podzols, Solonetz, and all that kind of stuff. What we want is a practical map that, we can use." And on the other side ere the 'people. that say, "Kellogg is ruining the Soil Survey by talking about crop yields, agronomy. horticulture, forestry, or what not that has nothing to do with soil science." I suspect this will always be. Continually, we must point out that one cannot have a practical map unless it is based on firm science, and not only basic science but also technology. To a great extent the state of technology determines what soil ourveye people need. It determines to a great extent the relative importance we should give to different. soil characteristics, It makes a great deal of difference whether we think people are going to be using the soil under irrigation or without irrigation. Of course, we can't afford to design soil surveys as if every area would someday be used in the most intensive manner. We have to use some judgment in these things. So we must have firm science and a reasonable analysis of prospective technology.

The soil survey must be interpreted, On the Appropriations Committee last Monday, every Senator who is favorable to. this work is so because he thinks it will help improve the efficiency of soil use in the country. And as long as we can achieve our. goals fairly well, he is not going to bother to look beneath end see how much is done in the various phases of our work. He is willing to leave the details to us.

During the last several years I've been interested in seeing what has happened to soil surveys in the world that have neglected either side of the balance, either the science or. the, interpretation. And I can tell you what happens to them: They go out of, business. It's,, just a shame that some of them have, but they have or soon will.

And then I should like to see a bit better balance between the Federal end the State effort. It's not only funds hut also the feeling of responelbillty. I sometimes feel like putting the Lord's Prayer right in the middle of one of the work plans in some States to see whether the director would eee it when he signs it. Many would, but some would not. (Of course, some might not disagree with it if they did see it.)

Some of our college teaching of soil science worries me. Judging by the graduates we get, some teaching is narrow and provincial, with almost nothing about the Tropics, the desert, or the Arctic, or even about the important soils that don't exist in the State where the teaching is being done. This is a serious handicap to the graduates. Students going to school in Michigan or Illinois, say, may think that they are going to be working with corn, wheat, and alfalfa. If we look at what has happened to former graduates, we see that the chances that they are right are very poor. One can teach the principles of soil management and plant physiology just as well with pineapples, rubber, cocoa, sugarcane, and coffee as wlth corn and wheat. In fact, I think these boys from the Midwest would be interested. I think it's a shame to bring young men into the land-grant colleges here and talk to them about the fertilization of corn. First of all, most of them probably know more about it than the professors. They've bean doing it under the direction of their fathers and it's old stuff, not very interesting. Sometimes I wonder if the reason why we have so few graduates in soil science is not that the boys are so bored they change to something else? And it is such a pity! Nobody in the whole agricultural fraternity has the human interest material that we have in soil science. Seventy percent of the people of the world live in the country, and how they live is conditioned by the kind of soil they have. And there is a wide literature to use. I know etudents are very interested in the soils of the world and how they are used. Wow do people live and farm successfully on a Ground-Water Laterite soil? This can be very interesting. At the same time one can develop the principles of their formation and change, and it doean't make it less interesting thet we, tie it to how people live. The same is true of many of our other kinds of soil.

Thus we have the question, who are going to be the future leaders in our work? In ten years a lot of us here today won't be around, partly because of age and partly because of automobile accidents, plane wrecks, and so on. This matter of future leaders is serious. We must have in the Soil Survey a lot of young men who are smarter than any of ua in this room. We must have. Our work must continue to be improved and changed as technology changes. Simply to maintain our present level and extend it into the future is to reach mediocrity.

Another point that bothers me (and I may have mentioned it before).is that. our people in the Soil Survey don't write enough. When I look over the technical journals in English and see the number of papers written by men in the Soil Survey--we are over 1,300--I don't see anything like a fair proportion. This means that a great many of our most valuable observations are, to a considerable extent, going to waste. Partly, I think this is because if a coil scientist works long in a county, he thinks that no one outside the county is interested in what he learned, One of our outstanding man--Joe Mcon--used to assume that if he knew something, everybody else must know it too. And this isn't so. Practically every county in the United States has unique potentialities and problems that are related to tbe kinds of soil, both scientifically and technically. Then too, some of our man seem to feel that if they do write an article, it must be in the stilted language characteristic of many scientific articles. And they think it's got to be Long, say up to the maximum pages permitted in the Proceedings or in Soil-Science. Yet, the shorter the better. Editors of these journals are delighted to have good two-page articles. I hope you encourage our people-to write more.

We have had a committee here working on the problem of soil surveys in the urban fringe. This interesting work is bound to increase;; I know there is some confusion now. Some of the planning people do not understand our terms and we don't understand theirs. Some of us could get so enthusiastic about how we should like to see the suburban land handled, that we forget that as Federal officers we have only technical decisions. The Constitution doesn't provide the Federal Government with authority to do rural zoning and to make land use regulations, except for the Government-owned property; Of course, the Faderel Government can bribe some of these States a bit by saying, for example, "If you take the billboards off the highways, we'll give you a little more money." But in the Soil Survey we must not forget to be unbiased scientists and technicians trying to present the facts and trying to clarify the problems so that the local authorities can make the best decisions. They will not always be the ones most obvious to us. These people have other things to take into account besides soils in making their decisiona. Some of them, are elected and. they have to take account of their constituents. (You know the first job of a politician is to get elected and the second job is to get re-elected, He has to take account of that.).

The President's budget just sent to the Congress includes $132,000 for us to plan with other agencies how we should go about the planning of soil surveys in the suburban areas. We made a tentative map based upon census and metropolitan studies. We must improve that map and set some priorities on areas. We also need to have as nearly common policies as possible on cost sharing. We already have an interagency committee involving the Rousing and Home Finance Agency, the Bureau of Public Roads; the Department of Health, Education and Welfare, and our Service, The work will involve our cooperators and cooperators of these agencies, so part of the job is getting acquainted within the States. This will be quite a job. I think the climate is reasonably favorable to go ahead with the committee work as best we can whether we get the appropriation or not. But, of course,. we can do tha job much more quickly if we do bave it.

I understand that Val Silkett went over the new authorities in the Service with you--the Rural Areas Development Program, the rural renewal projects, the conservation and development projects, income-producing recreation, and cropland conversion. These programs are part of the Secretary's aim to make positive suggestions about land use rather than the negative one represented by the Soil Bank. These programs will have a considerable influence on the priorities for soil surveys in many communities. Certainly, if a lot of money is going to be spent on thorn, the time to get the soil survey is beforehand and not after they have failed, with soil scientists brought in only for the post-mortem.

We have made a good deal of Progress in soil mapping. Our, figures leave a little to be desired, We need to have better figures on the acres reported by our cooperators. Wow, the figures for soxe counties are not entirely clear as to wbether or not they include what the State people did. We need to have better figures. Por fiscal year 1962 the Service figure is 63.371.506 acres of new and conversion mapping with CC-01 funds. We should exceed this figure for 1963 perhaps by a million or so acres..

The publication of soil surveys goes slowly. Only 36 surveys are 'scheduled to go to the Government Printer in 1963 and only 40 in 1964. We have the problem of getting the soil correlation, the map work, and the text of the soil survey for the same area at the same time.

I had wanted to talk a bit about soil correlation. Now thet Dr. Simonson is here he can check ma. We have made some staff changes with an nddltional assistant principal correlator next June in the Cornbelt end in the Far West. And I'm hoping tha next budget will allow us to do a little more, porticulerly in the Great Plains. Wa have had an additional high level position in Dr. Simonson's office.

We have some real problems in soil correlation. But first of all, I think, our soil descriptions have improved. Emphesis on interpretations and the work on the 7th Approximation have forced us to look more carefully et the soils than we bad formerly. And as we do that, we find soil characteristics that were not previously noted and recorded accurately. As farmers change their practices, wa find that combinations of soil characteristics have a different relevance than formerly, We find that the limits of our soil series and of the phases within them have not always been in the proper places. We discover this not only through the official correlation route but also through the interpretation route. It becomes clear that many of the older soil series are either vague or wrong. Another big influence has been the kind of work that Dr. Ruhe and his staff are doing. This work is greatly improving our knowledge of soils and where some of the boundaries ought to come in both their classification and mapping. Theoretically, by main strength and awkwardness, a man can make a good soil survey in a complex landscape without knowing how the various soils are formed. Eut it would be a rare thing. If one knows how tha soils are formed and is able to read the landscape, he gets the boundaries in better places. We may even get some changes in "our' definitions of the kinds of soil:

Also we find (and I do not need to emphasize this in the Middle West!) that some of us 'have been using quite different concepts in soil classification; and even different combinations of characteristics are included under the same series name! For cxample, for a long time the way nonconforming layers or materials beneath the sola have been handled in Now York end Pennsylvania in contract with the way used in Michigan and Illinois, Such differences must be resolved, I think all of you have had the problem of soil series that need testing and do not have adequate descriptions. Partly this is because we have legends all over the older States, to say nothing of Alaska, Puerto Rico, and Hawaii.

Because we have about 1530 people working in the Soil Survey, we've got to give weight primarily to evidence rather" than unsupported judgment; and I mean evidence that is written down. Because so many people ere involved they must be able to look at the coil' descriptions and interpret them alike. All 1530 of us cannot So out and look et the soils together. Catting togethar in the field used to be the standard way to handle e ooil correlation dispute. But, gentlemen. this is now impossible; we've got to handle sot!. correlation largely through the written evidence.

Thus we have this important job of revising snd bringing up to date our soil series descriptions. I should like especially to emphasize that the soil correlation recommendations made withiu the States in the field reviews and field correlations, and in the intermediate correlations, must be within the definition of these series.: It is wasteful to send forward soil units for correlation that do not fit within the official series descriptions that we have, revised ones, or new descriptions that follow the procedures.

When I think of Dr. Simonson's office, I often think of the Supreme Court. In this country we are especially interested in the opinions of the Supreme Court. We don't much care so much about the decisions--some of us do, but,: mostly not; yet we are anxious to reed the opinions. This is in contrast to Britain where everybody is interested in the decisions and nobody cares about the opinions. So these Supreme Court decisions on shelves around the room make Up the conscience of the United States. Many representatives and senators, and even Presidents, have passed bills, signed bille, or issued administrative regulations suspecting that they were unconstitutional. But they could satisfy their constituents clamoring for something and leave it to the Supreme Court to straighten things out.

Gentlemen, I think we have something analogous in the Soil Survey--in Dr. Simonson's office. Say you have arguments within Iowa, or between Iowa end Illinois, or between other States--and our State soil scientists want to avoid difficulties with experiment stations, and the two experiment stations want to avoid a row, and so on--and so you just send the whole mess up to Dr. Simonson knowing that he will have to make the correlation fit the. descriptions. At least I think there is some of this.

Much as I em ashamed to say so, we still have several areas where the descriptive legends and the soil handbooks are written as late as possible--just in time for the final field reviews. I don't know how many of these we have now, but certainly enough to count. I know two things abwt those surveys: they aren't good soil surveys end they aren't being reasonably well used in farm and ranch planning. Sure, they may go into the farm-plan folders, because somebody said that a farm-plan folder bad to have a soil map, Where this is done, the survey ends with a whole lot of odds and ends that should have been taken care of in the first progress review, or at least in the second one. And they cannot be well taken care of without remapping. In some of those surveys, Dr. Simonson, I wonder if we are not trying to get 8 good, gold-plated correlation when we will have rather poor soil maps and interpretations at best? If we have to slight some of our correlations, perhaps such areas are the ones to slight since .a soil survey made without 8 descriptive legend is not going to be good anyway. Perhaps you can put in Some footnotes, Roy, explaining that if the survey had been done properly, we should have done' it some other way. Of course, some people won't like these, especially those really responsible for the delays. This illustrates a violation of the principle I mentioned earlier--that people who support our work do so because it is highly Useful, and such surveys aren't fulfilling their function. I feel 8 little sensitive about this matter because I have to defend the work as it actually is. I can think of e few men in our work whose education would be considerably improved on this point if they could join me when we sit across the table and review the budgets in the House and in the Senate. What do you think we talk about there? Fragipans, and Podzols, and stone linen?

We do not. Wa talk about what thase surveys can do by giving people predictions about their crops, soil, and water management problems; about where they can put houses; end so on. That is what we talk about. And than when I find we've got surveys going where the descriptive legends aren't even written until just before the field review, I know I've not bean telling the truth to the peopie in the Budget and the Congress about those particular soil surveys. And a few of these hurt the many good ones we have. I shall write to staff about this' later.

Every man here want5 to have good soil correlations because to have a national soil survey that makes any sense to our users it must be consistent nationally. We cannot possibly have enough research funds for every State to do research on every kind of soil, Wa must exchange information among our States, A mistake in the soil correlation in either, State ruins this process that we must all depend on.

Then too, some of us that don't want to give up some old precedents that were established years ago on the basis 'of what we knew then, on the basis of the demands made of soil survey5 then, and on the basis of the practices that farmers were using then. Wa don't want to give up those precedents established with much less skill under different conditions. And I recall the fellow who was telling me, "Well, we don't *need to* worry about thin national consistency as long as we have consistency over the State lines." But we cannot have consistency over *State* lines without national consistency because there are not enough big rivers making State borders. If we hava to have clarity across State lines, we have got to have it the whole way.

This reminds ma of an old story on the New Deal, In the southern part of the United States a rural church happened to be located over an oil field. As a result the church received a large sum for, the oil royalties. The congregation, was determined to use this for religious purposes. But they got into an argument': one group wanted to fix up the old church and another, more radical, group, wanted to have a new church. And so they did about as wa do here in this conference, they appointed a committee to wrestle with the dispute. Yet the committee came out with a set of recommendations unanimously approved. First, they would build a new church; second, they would build the new church from the materials of the old church; and, third, they would continue to attend service in the old church until the new church was finisbed. I think this illustrates how we fry to handle some of our soil correlations, at least before they gat to Dr. Simonson's office,

When we have new knowledge we must work it into the classification, this is our obligation, our purpose,, We must work the new knowledge into our series descriptions and phase descriptions. Of course, these changes cause other changes in what we do. I, too, dislike to tear up some of my old notes and start all over again. We know there are professors that haven't torn up any notes in twenty years: But'we have got to do it, I don't suppose any survey is going to last forever but I am hoping that I can say that our present surveys will be quite useful for 30 or 40 years. We may have such drastic change5 in some counties that the soil text won't be valid for 30 years but

but I think most maps will be. And in this next 30 or 40 years we are going to see a lot more changes in agriculture than we saw in the pest 30 or 40 years. Honestly gentlemen, I think we've only just started to apply science to agriculture. We haven't seen anything yet. And this also means that everybody working in this field has to be a lot smarter than those working in it now-'-the farmers end the work-unit conservationists in our Service 'as well as the soil scientists.

So we are committed to having soil' correlations that nerve many interpretations, not only the Ones in agronomy end horticulture, but also interpretations in hydrology, forestry, range management, and engineering. And Dr. Simonson has to think about these, Simply because predicted crop yields are similar is not final evidence one way or the other about many of the eeparations we are making.

I mentioned that we will send only about 36 soil surveys to the Government Printer this year. Since we are mapping about three times as fast as we are publishing, a day of reckoning is coming. I know that. a lot of soil survey6 get called completed in the field when they are not. I went out on one of those recently. It bad been "completed" for about a year but somebody raised. questions. Some research was done, The mapping was wrong and some of the classification was wrong. A year later it hadn't been revised, yet all the time it was reported as "field work completed." So I am afraid we have to be': careful about the figures for completed soil surveys. But certainly we do have a great many. Thus clearly we have got to step up our publication. We ought to go from 36 to about 65 a year, and soon thereafter to 75. Not too long ahead we, should have 200 nav publishad soil surveys each year. This is going to take a lot of hdrd scheduling and a lot of work. Already we are havingtrouble getting soil survey reports on time. Rankly, we have still more trouble with party leaders on some 'experiment station staffs. A while back a dean wrote to his Sanator about how long it took for the USDA to get out a published soil survey. Yet all the delay was due to his own staff! The steff man who wrote the letter didn't tell him who specifically held up' the job. We don't want to get to the place where 'we can't use experiment. station people as party leaders.' But If they cannot write the reports, what are we to do? We cannot expect people to continue their support of our work unless they can get the reeulte in a reasonable length of time. This applies especially to our State conservationists, experiment station directors, and the like. Yet we are having published soil surveys in the hands of users within leas than three years after the field work is completed end ready for correlation.

I get the feeling that some soil surveys are held up by a little quarreling about correlations. Maybe we can find a way of putting a few footnotes explaining the problem, which the author won't like, but which may help keep the show on the road.

Target dates for the cartographic work, the correlations, and the report are always a problem. We have a committee, at Beltsville of Dr. Simonson or his representative, Dr. Steele or his representative, and Mr. Koechley or his representative. They take notice of the target dates given by the State offices and the principal correlator's offices. To have a map come out within six months or a year, the people in the Cartographic Division have to make the laydown long in advance. If they make this leydown end then somebody does not write the report or the soil correlation does not get finished in time, these maps are sitting on the shelves just waiting. Thus, the cartographers need to be reasonably certain that correlations and reports will be coming along before they start, Every time somebody unilaterally changes one of these target schedules many people are upset end the whole job is delayed. There were eleven of them that dropped out last year. This does not seem reasonable to me, nor were the excuses.

We have been experimenting with the cold-type press in contrast to the usual hot-lead printing. We probably will make some more trials. I am not satisfied that we had a good comparison of cost on the lest one. Dr. Steele thinks that we can perhaps save some money end time by setting up the more complicated tables in that way even if the manuscript es a whole is reproduced by hot-lead. And then we are very close to the point of issuing an order that no more galley proofs will go to the field, Is that going to make everybody very nervous? There is a limit to the changing on reports that helps them. When you men get beck home, look up the soil surveys that have been published for more than three years, end find one that is right in all respects.

When we compare most any kind of jobs, be they administrative or the making of published soil surveys, our inclination is to compare one we have got in hand with the ideal one with everything just right. Such comparisons era invalid. I never hope to see either the perfect orgenieation or the perfect soil survey. We need to compare whet we have with what we can reasonably expect to get, not the ideal. And what we can reasonably expect will take a lot of hard work.

We are also concerned that among the States some 14 do not have any recent published soil survey. The principal soil correletors must know where those States are. We ought to do something about them.

I think the quality of our soil survey manuscripts is better, a little bit et least, but our writers still use too many long words. The technical words are not their biggest problem; they know what they mean. The big trouble is with words in the language that they rarely use in daily conversation. Some tend to pad the soil survey report with general discussions of rotations, seedbed preparation, general range management, end so on. These are appropriete in the soil survey report to the extent that they tell the reader about the soil as related to the soil map and that bring out the differences in the kinds of soil shown on the map. I looked et one not long ago that had a long statement on the importance of preparing a good seedbed. But no where did the writer tell his readers whet a good eeedbed was, whether firm or loose or whet, nor was it related to the soils. He was just padding the report.

We have under preparation a new Writer's Randbook. This is now out for review. I hope when it comes beck we shall need only a few days more review.

We have bean vary plsaaed with the improvement within the States on the distribution of the newly published soil surveys. The Extension Services in many States have taken hold of this in good shape.

We are pleased that many of our people in the Service are learning to use the published soil surveys in farm and ranch planning. Some had never used maps other than photographs of the field sheets. They couldn't imagine doing without them. Of course, if you ask farm planners what they want, most say they want just what they have been getting (except for pay). But where a *little* educational effort has beep made, the published maps are being used. Since these have the correlated soil names, it is easier and better for the farmer to follow through and to revlee-his plan with changes in our informatlon and data.

As 1 pointed out to the committee on urban land, I hope all of you who have a chance will encourage these people in 'the urban area, Particularly the planners. whether. appointed, elected, or professional, to do the writing about soil surveys. They are inclined to ask us to do it: and I know that we will have to do quite a bit. of it. Yet it is much more effective if they do it. So try to encourage thaw. Maybe we can encourage the people in Charleston, in San Antonio, and ln Lake County here.

I have been a little' disappointed with the slow progress on benchmark soils. I suppose that is one of the things that can be put aside since we lack specific target dates. I was hoping we could go faster with that program because a network of these benchmarks on our prluclpal soils would halp a great deal in correlation and for interpretation. And it will give us in the Service and la the experiment etatlona a firmer basis for coordination across State lines. Yet this work has resulted la some pooling of funds among Illi noia and, Wisconsin stations. *That 'one* experiment station uses *1* ts appropriated funds to support work in another State on a common soil association area is wonderful progress.

We have some problems with interpretations over wlde areas. Soils are continua and drop yields are *not* the same over tbe entire range of quite a few of our soil series. Still we should always have explanations of why the soils of any, one: area give yields above or below the average for the series,

Another 'factor basic to the o&relation of Interpretations is unlike phase breaks within a series. On slope phases thle problem is quite serious. We *cannot* have *good* results with thaalope breaks at the same places with contrasting soils." But within a soil series, the breaks should be alike, even in different States. Without such coordination it is difficult to coordinate capability units acroaa State lines. The principal correlatore are obligated to correlate those phases as much ae they are the soil series or other taxonomic unite.

I need to eey a little about our Soil Survey Laboratory. This is tbe kind of money that la hard to coma by because when we defend our appropriations, one of the early questiona we get asked is bow much of this money is going to be spent in Washington and the State offices and how much to the districts. Usually the Congress likes to see a high proportion of the money going to the field work. Thus gentlemen, I am afraid that we are going to have to ask the State conservationists to supply some help for tbe laboratory. I doubt that it will be practical to try to support all of the work in the laboratory that we need from money allocated only to the Washington office. I am going to try and work out some scheme on this that will be acceptable to the State conservationists and try to explain the matter to them at their next meeting. Now, of course, we do a great deal of laboratory work and we shall do our best to meet the needs. And on this point I believe that the State experiment stations should do a little bit more in this area. Some of them are doing quite a bit; and some of them do none of it. So we have the situation where some States spend a lot of money on laboratory work, yet here in other States we have to do everything, even to the pH determinations. I wish you from the State experiment stations would try to push a little on that problem to see if you cannot help a bit more.

Our work in geomorphology is going forward in Iowa, Oregon, New Mexico, and North Carolina. I hope we can expand it more, especially where the States are helping to pay for it. I don't know of any single activity that has helped our soil scientists read the landscape more than our research in geomorphology. I think that the two weakest places years ago in our Soil Survey were geomorphology and plant physiology. I am very pleased with the effect this work has had. Our range-soil project goes forward out of Salt Lake City. Here we are learning the relation between range plants and soils. Ultimately the results would test some of the current concepts of climax vegetation. Curiously though, the first result of that research has been to question our concepts of range conditions in this part of the country. The men studied virgin soils in areas that were surrounded by aa lava. No hoofed animals could get on the soil, yet the surface looks as if it had been over-grazed. We have greatly underestimated the nature1 effects of frost and possibly other factors in producing bare places among the plants.

Then we have the windbreak project getting under way in the Great Plains. I haven't had much chance to talk with anybody about how that's going.

Dr. Kubota continues his research cooperatively with the USDA Plant, Soil, Nutrition Laboratory at Cornell. The cobalt story is getting more and more nailed down and so are the relations of molybdenum and copper. Some of the most interesting is that with selenium deficiency. You all recall our concern with excess selenium; now we are concerned with selenium deficiencies. It seems to be related to white muscle disease of animals, or muscular dystrophy. I found in New Zealand last November that they had been working on this problem for a long time and now have standard procedures for handling the sheep on soils low in available selenium. Yet we haven't any way now to put the selenium into the soil or feed; it has to be injected into the animals.

On scheduling, I want to say a bit more, especially to the State soil scientists and the principal correlators. For one thing, we need further emphasis on our annual work planning conference in each State. I want to emphasize that this is primarily an administrative conference. The professor of soils and the State soil scientists are primarily technical advisors at these confarencea. The purpose of the Soil Survey in any State is to serve the needs of the people in.. the State and our aim is ,to have together the responsible end. knowledgeable representatives of the main contributing and using agencies. They know the facilities available; the needs of the State; and what is the best program. Congressmen are getting more and more interested in the work of these conferences. I prepared many letters to members of the Congress explaining how we do this. The matter came up in the House Hearings this year. I explained that in Washington we didn't feel qualified to make these local determinations. At this conference each county, or district, or area is given it6 priority. Yet some of' these reports show that nobody wan there from the experiment station over the rank of an assistant professor. This disturbs me. It is not whet I have told the Congressmen. We need more emphasis that this conference is really an <u>administrative</u> one. It should include the State conservationists, the Dean of Agriculture, or Director of the experiment station," and other responsible <u>administrative</u> people. The soils people in the experiment station and the State eoil scientists are to help see that this plan is carried out.

We are continuing our work in training. I had hoped that we would have a fund in the Washington office to help with interstate transfers of soil scientists to broaden their experience. We have done most of this between north and south, but we also need more of it between east and 'west"& well. If any of you find a man that would benefit by such transfers, try to encourage it by calling it to the attention of his State conservationist and to our offices in Washington. Cur training in basic soil science is going ahead at this moment at both Cornell and Corvallis. 'The purpose of these courses is not to teach our men to do soil correlations, to make interpretations, or to map soils. This we can do satisfactorily in the Service. These courses are primarily to teach the boys to learn to read (this is the main function of any University). Reading requires familiarity with all the symbols. If one sees something like this: $\frac{y}{a} = \int \frac{b}{x} dx$, 'he must know what the symbols mean. Thus being able to read means familiarity with the mathematical, chemical, and other symbols of science. If a man gete an education, it mostly comes after he has been through the University. Do any of you hear about soil scientists in the Service who do not have opportunities to advance? Or do not have an opportunity to study? Once in awhile such statements float back to me. If you find any real situations, we should like to know about them. I don't honestly think there is a man in the Service who doesn't have an opportunity. Now he may not have it immediately, next week or next month, but he does have a reasonable opportunity, and an opportunity for some research and professional work in addition to his regular soil mapping. We have tried hard to make this true. And this applies to directors, principal soil correlators, end State soil scientists, too.

Thank you, gentlemen.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PUNNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
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New Authorizations for Soil and Water Conservation

Val W. Silkett

I think you just sew what happened to my speech. It dropped on the floor and I'm not sure that I picked it up in the right order. I want to say first of all that it is a real pleasure' to be here and to meet with this group again. I think the last time I had a chance to talk with you was at St. Louis three or four years ago, I'm particularly glad to see Elmer Offerman and John Quay here this morning and also the wide range of agencies'; both State and Federal, represented here at this particular meeting. I think it's fine that we can get together in conferences of this kind and talk about problems and formulate some of our basic policies by which we carry on our soil survey work. Roy made a statement awhile ago and said that the program has been modified slightly, I would say it's been modified a lot when the Administrator can't get here and he sends a Field Representative to take his place.

To start out this discussion, I know that some of you here have had the opportunity to sit through detailed discussions about the new legislation and the new authorities that the Soil Conservation Service and the Department of Agriculture has in soil and water conservation programming and adtion. So some of what I say is going to be repetition, but since I can't separate those who have had the information from those who have not, I'll have to give you the whole load of hay.

I shall, as I go along, indicate where I think that Soil Survey and related activities fit into these new authorizations; however, I want to point out that soils and soil survey is one of many tools that will be used in developing these new authorizations., The woodland conservation, biology, agronomy fields and engineering in particular will all play major roleo in the development of these new authorizations.

First of all, I think. in order to get a background and understanding, for this you will recall that the Secretary of Agriculture shortly after this Administration took office announced the Rural Area Development concept. Now, for a long time the Rural Area Development concept, and it may still be in some places, was in a state of confusion. It wae not well understood and people were looking, in the States and in the Department of Agriculture as well, for a new, program. Actually Rural Area Development is a concept; it is a philosophy and not a program. It is one which envisions program development through lay committees of people engaged in agriculture, and in business, though they be doctors, bankers or farmers getting together and devising a program for that particular area of land, or a county with the assistance of the technical agencies of the Department of Agriculture. The intent is to concentrate the facilities of the Department on a program developed by local people--a long range program--and to step up and accelerate needed action in that particular area. Now then, this need not apply to the soil and water resources alone but rather should encompass both the social and economic aspects of development as well, This is the background, then, of some of the new legislation that's been passed. As I said, Rural Area Development had not been in operation very long until it became apparent that it needed to be strengthened in various ways. And so new legislation was written, developed, and presented to the Congress. Fundamental to that, there are four principles that we should have in mind when we think about this new legislation. going back to what Roy said a moment ago about cropland in excess of our needs, there is one first principle, then, that underlies this legislation and that is the necessity for *converting* some cropland to other income-producing uses, such as woodland, grassland, or recreation, and related to this guiding principle is tbe full knowledge of the outmigration of farm people that is taking place.

The s e c o principle which underlies these authorizations is the need for ways to maintain and enhance the economic position of rural people. Means other than crop income or returns from certain livestock products must be established.

The third principle is the necessity for establishing a rural-urban working relationship to bring about a mutual understanding and appreciation of the contribution that each makes to the economic and cultural welfare of the Nation.

And, fourth, a means to provide for sound community development of natural resources and economic opportunities so that people have a better place to work and live,

These four principles are the ones on which the new authorizations are based. Row, let's see what these authorizations are. I'm not going to attempt to cover them in detail because you can read the bulletin that Roy called to your attention a moment ago and you can read the Food and Agricultural Act of 1962 as well as I can, so I'm going to talk in terms of how these sections of the Law have been implemented, and the status of them now. When we get through with each particular section of it, I'm going to stop and if there are questions you want to ask, that will be your chance to do so.

The first section that I want to talk about is the cropland conversion phase of the Food and Agricultural Act of 1962. The major move back of this, of course, is the first one I mentioned: the conversion of cropland to other income-producing uses. The primary thing that I want to dwell on here is that this is a cropland conversion program that is based on soil surveys interpreted in land capabilities. The principle of this is that the Department of Agriculture will contract for land conversion to woodland, grassland, or recreational purposes and in so doing will pay a certain amount of money for an adjustment payment and, in addition, will oost-share on the necessary conversion practices which go on contracted land.

A further point that I would make with you, that is very significant and an advance in the soil and water conservation action program of the Department, is the fact that these conversion contracts must be based on a farm conservation plan developed through a soil conservation district by the technical assistance of the Soil Conservation Service. This, I think you will agree, is a major change in approaching the land conversion problem. You'll also sense, those of you who are familiar with the Great Plains program, that this is an extension of the principles of the Great Plains program to areas outside the Great Plains. Many people feel that the step does not go far enough, as in the Great Plains program, where the entire farm and the entire conservation system is specified in a long-term contract, but nevertheless, it is a step in the right direction. I could add also from my standpoint, that another great advance is the acceptance by ASCS of the principle of a farm conservation plan or a ranch conservation plan as a basis for the development of a planned land conversion program. Now then, this is on a trial basis. This is not extended to every county or every State in the United States. To start out with, the amount of funds that we think will be made available for thie is relatively small. I should mention here that this program is under the leadership of ASCS. The amount of funds that have been requeated for the 1964 fiscal year is about six million dollars. That, obviously, would not cover very much of a land conversion program. Thirteen States and 41 counties in the United States are working on this particular phase of action. In the Cornbelt there ere four of the thirteen States selected for trial. They are Minnesota, Wisconsin, Iowa, and Missouri; with two counties in Minnesota, I believe, four in Wisconsin, two in Missouri, and two in Iowa. This particular section of the Law is being implemented and the intent is: if the bugs can be worked out of the program; it itis acceptable to farmers; and if this is a way by which a significant amount of cropland can be converted to either grassland, recreation, or woodland, or other income-producing uses, then it will likely be extended to other States and perhaps to all States, Now, are there any questions on this?

Let's go on to Section 102 of the Law. This particular part of the Law provides authority for Resource Conservation and Development projects. These are locally initiated and sponsored projects, much in the same manner as 566 Watersheds are locally sponsored, except that the concept is broader in scope than simply the control of soil erosion and tbe impoundment of water or agricultural water management. Certainly in a Resource Conservation and Development project the prime moving purpose would be the development of natural 'resources available in the area, but more than that--the development of these should be carried further to bring about an improvement of the economic, employment, and industrial development situation within that particular area. At the present time in the 1964 Budget we are asking for a pilot appropriation of about 6½ million dollars to get underway in this particular activity. We envision that this will start out rather slowly in areas of somewhere from one-half million to a million acres in extent. Maybe one county, maybe two or more contiguous counties or parts of counties. Logically it might be built around a watershed but not necessarily so. You can see that this will involve an accelerated approach and poosible concentration in a particular area of technical assistance; of cost-sharing; or financial aids and grants if necessary. These projects must be locally initiated and sponsored so that there is some kind of local organization that has some overall authority for working with Pederal and State agencies. District governing bodies and local governmental subdivisions may be sponsors. Now, as I say, this will probably go rather slowly at first because we do not envision more than about one per field representative area in the United States, that's five, maybe a couple more, but this will be to start the program and get it under w&y. Already in the Administrator's office there are 110 proposals from 38 States and the official application forms aren't even out in the field yet. Incidentally, I ask you to make a note here, particularly Soil Conservation Service people, to be sure and read Resource Conservation end Development SCS Memos 1, 2 and in two or three weeks, Memos 3 and 4. One and two are already in the field.

Now, in relation to soil surveys in Resource Conservation and Development projects we believe that no long-range overall planning can be done well without adequate soils information. This will mean that in some instances it will be necessary to bolster up staffs within these areas; to assign additional soil scientists, as well as engineers, or other technicians, depending upon the problems that are in the area, in order to give us the basic information that we may need in developing a long-range plan with local people. We envision thet there will be a project coordinator. His job will be to expedite the project and work with local groups, State and Federal agencies in order to bring about the necessary coordination for bringing into development the overall plan that is adopted by the local people. Any subsequent staff or any additional staff would be added to work units or area offices that are already in existence.

While I'm on the subject of Resource Conservation and Development projects, I will add right here that the Soil Conservation Service has been assigned a the leadership for this par ticular authorization.

Now, lot me go on to another authorization that is similar to RC&D Projects. This is the authorization that deals with Rural Renewal. Rural Renewal is under the leadership of Fanners Home Administration. The Soil Conservation Service will have a stake in the technical planning and technical action that goes on within one of these projects. Now, instead of being developed or directed primarily at the development of natural resources as are Resource Conservation and Development projects, Rural Renewal will be directed primarily at improving the economic and employment conditions within a given area. This is the major difference in the two types of projects. In short, Rural Renewal will be largely centered in areas of economic underdevelopmeat and chronic underemployment, whereas a Resource Conservation and Development project may be located anywhere where there are natural resource problems. Now, let me pause here and see if there are any questions about this particular part of the presentation.

Question: Will this be limited strictly to development of agricultural resources or will it take in other aspects of development outside of agriculture?

The answer is that it will take in other considerations outside of agriculture. I envision particularly in C and D projects that we may be dealing with the Department of the Interior, with the Department of Health, education and Welfare, and others. I'm quite sure that we will be making contacts with Commerce. In particular, Smell Business Administration, where these areas might fall into ARA designated counties. Does that get at what you were talking about? Any other questions? I will add in r-elation to that question I think that coordination of various authorities and types of assistance is going to be one of the prime requirements of those who have to deal with RC&D project.

Now let me, then, rush along because I'm taking more time than I had intended. I want to talk here just a moment about the assignment of the Soil Conservation Service in the field of recreation. I want to talk about recreation in two phases. One is the recreational aspect8 that come into Small Watershed Development undor Public Law 566, This is separate and apart from income-producing recreation on non-federal lands, OK for the most part, privately-owned lands. In the amendments to Public Law 566, which covers Sections 103 to 107 in the 1962 Food and Agricultural Act, I expect the one which has drawn the principal amount of interest from people who are dealing with watershed projects outside the Service is the recreational features, wherein (and I'm going to be quite broad on this and not detailed at all)--the Department of Agriculture, i.e., Soil Conservation Service may cost-share up to 50 percent for easements and rights-of-way for additional land for recreational development and for "minimum basic facilities" for recreational purposes. This includes roads, electricity, water, shelter buildings, picnic areas, perking lots, and various things of this kind. SCS can also provide the engineering and technical help that goes along with this. Now, at the present time this is a mushrooming and burgeoning segment of our work because obviously under a situation of this kind, many, many watershed associations or local sponsoring agencies are very much interested. Some of them have backed up end begun to ecquire land or set up a legal entity so they can acquire land for recreational purposes. Wisconsin, particularly, in the Bad Axe Watershed, in Glen Bills, Twin Parka Watersheds, all three--are particularly illustrative of this particular activity because they are developing rather comprehensive recreational plans for the local *community* in these areas. Every State in the Cornbelt, to my knowledge, is exploring it OK working on some projects in this recreational phase. Obviously, it is an advantage to a local community and to the sponsoring agencies to make use of these amendments to the Law. SO this is moving rapidly and that's about all to say about it. I have a number of details in my notes, but let's just keep in mind that this is a cost sharing proposition with regard to the integration of recreation in 566 watershed projects.

Now, the other phase of recreation is a matter of technical assistance to private owners who want to get into the recreational business. This is now within the scope of our authorization and I can say unreservedly that recreation has become another land use, the same as cropland, pasture, or woodland. We are moving into this and developing technical specifications and we will need soils interpretations. We already need them badly in some places, We may need different techniques of mapping and we may need some special types of investigations ineofar as soils are concerned. And that goes for engineering and biology as wall. We are not strangers to this kind of work. Actually in our farm pond construction, and in many other things, we do in helping plan farms, particularly in the eastern part of the United

States, we have been in the recreational business for a number of years. We know a little bit--more than a little bit--about it. To some of the States in the Midwest and in the Croat Plains this, I'm sure, will be a new approach, a new phase of tha program because we simply have not thought in terms of recreational activities.in our planning and development of conservation plane with landowners and operators. In addition, to technical assistance and placing recreation development as one of our major responsibilities FHA may now make loans to individuals for recreational developments on an operating farm. The operator can't take the whole farm out of production, but be can add recreational developments as a part of his enterprise. FHA can make loans for development of a recreational development on that farm or ranch.

And, third, the Agricultural Stabilization and Conservation Service is developing a list of practices and a list of cost-sharing items in the recreational field on which they will cost-share. Now in this connection, ASC is,,in nearly every State, setting up recreational projects. This means only that there will be a county designated in that State where they will cost-share for recreational purposes. They have only a small amount of money, about $50,000 per State to put into cost sharing for this particular purpose and I think their adjustment payment is limited to $10,000 per farm in this particular phase. Again this is on a trial basis. Recreational projects on any individual farm must be developed in the same way that other land conversion plans are being developed under Section 101. In other words, wbat I am saying is they must have a farm conservation plan certified by SCS and developed through their local soil conservation district.

Now, let me stop here and see if there are any questions you want to raise about this. I'm just hitting the high spots,

(A question was asked but it is not audible.)

Oh, yes, you're thinking of the list of practices. Yes, John points out that ASC has already developed a list of practices and we're engaged in some areas in working up specifications. These practices include such things as roads, picnic areas, fireplaces, nature trails, various types of water impoundments and associated facilities,

Yes, the same type of picnic or recreational facilities that might generally be considered in any kind of a development that would be used by tbe general public. Any other comments or questions?

The USDA is moving rapidly into river basin type surveys, becoming an active partner with the Corps of Engineers, Department of Interior, and others. However, in order to implement the Senate Report from the select Senate Committee on Water Resources of the United States, in other words the Kerr Committee, the Department of Agriculture; the Department of Interior, the Department of Defense; and Department of Health, Education and Welfare have begun to coordinate their plans for developing river basin surveys. This is resulting also in coordinated budgeting at the Bureau of the Budget level. The reason I mention this is that this is a different approach then we've had before, when planning for surveys and budgeting was not so well coordinated, Here is an approach where, as the Budget is being prepared for each year and any one of the Departments indicate a river basin survey, than other interested Departments can also submit a budget request for that particular basin survey. Basically that's the mechanism that will help coordinate this work. In the Cornbelt we are now actively engaged in an overall survey of the Ohio River Basin. This involves 12 States and is a sizable undertaking. We are doing this in cooperation with the Department of Defense, Corps of Engineers, particularly. ERS and Forest Service is working with us in the Department in developing a work Plan for this. In addition we are setting up a planning party in the Wabash River Basin. The party will be headquartered at Indianapolis. Also as a part of the Ohio we are setting up a Basin Planning party for the Kanawha River in west Virginia. Also the Merrimac Basin has been authorized and there's a planning party working at Sullivan, Missouri, in developing an overall plan.

Now, for next Year we expect to move into the Fox River in Wisconsin. We expect to move into the Grand River in Michigan. We will be working, I think, with the Corps of Engineers on the upper Mississippi tributaries which involves everything above St. Louis that flows into the Mississippi River. There may be others.

So you can see thnt this is going to develop into an effort of some magnitude. The reason I bring it up is that if ever soil surveys and soil correlation are important, they are certainly important in this work because we are already running into some difficulties with regard to our statistical samples. When we use expanded data, we must know whether we're talking about the same soil in two different States, the same capability unit, etc. We have simply got to get moving on these differences; otherwise we are really in a jam. I'm sure that ERS, Forest Service, and particularly we will be making wide use of not only the expanded conservation needs data but also reruns of the statistical sample data and new mapping that we may have to do to bolster that information.

Let me say again it's been a real pleasure to be here and meet with You, talk with you a little bit in a very sketchy manner.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
Chicago, Illinois, March 25 - 29, 1963

THE SOIL SURVEY PROGRAM IN CANADA

A. Leahey

One of the reasons I'm glad to appear before you is it gives me a chance to express once again the appreciation of the Canadian soil survey organizations for all the help we've received from the American soil surveys. In particular, the staff of the Division of Soil Surveys since 1945 has been the greatest foreign influence on our work as we've been invited to draw freely by direct contact from your vastly greater experience, This direct contact has been achieved by many joint studies, field trips, by participation in each others national conferences, and by communicating on a personal basis. Our relations with You certainly have been happy and profitable to us.

I would like to give you a little historical background on the development of soil surveys in Canada as that has an important bearing on the present situation and problems we face. The youthfulness of soil survey and soil classification work in Canada may be illustrated by the fact that it started just about 40 years ago in a few provinces. Another way of measuring its youthfulness is to look back and see what methods of classification we used in the early days. The first soil survey report published in Canada is Saskatchewan Soil Survey Report No. 1, published in November, 1923. The legend on the soil map, with two exceptions, is on strictly textural basis; namely, fine sands, fine sandy loam, loam and clay. The exceptions to strictly textural mapping was a legend for creek bottoms, gumbo flats, and ranching land. I'm not just sure how the ranching land crept in, but it was apparently for rough territory with many different textures which couldn't be handled by the simple classification. The first mention of soil series appears in Saskatchewan Soil Survey Report No. 4 published in January, 1926. Soil zones end zonal profiles and also soil horizon designations of A, B, C, first appeared in Report No. 8, published in 1929. A similar situation prevailed in the other three Provinces, namely Alberta, Manitoba, and Ontario, where soil surveys were started before 1929. The pioneers who got soil survey work going in Canada had little or no experience in soil mapping and classification, so those of us who served as assistants or party leaders had really no adequate training for the job we were supposed to be doing. We just had to use methods that were within our very limited understanding and to be willing to learn by our mistakes. The period 1930 to 1935 practically were lost years as far as soil surveys were concerned. Perhaps not entirely lost since the information collected, while limited in scope, and inadequate by today's standards, proved to be exceedingly useful. Hence when the federal government voted money to rehabilitate the prairie agriculture, one of the first steps taken was to revive the old provincial soil survey organizations to get surveys going in an active way and from there it mapped over into the other provinces where the rehabilitation act did not apply. Since 1936 soil surveys in Canada have been on a stable basis, although staffs have been relatively small.

The pattern of Federal-Provincial relationships In supporting soil surveys bears some relation to yours, but it certainly is entirely different from that of Australia and New Zealand. Our pattern is strong Federal-Provincial soil survey organizations within each Province, under the direction of professors of soils and housed in the colleges, and relatively weak In so far as numbers are concerned at the Federal headquarters in Ottawa. The fact that soil survey* were strictly provincial at the start and have remained under provincial jurisdiction, resulted in a number of different techniques being used, each with rather devoted adherents. It was realized quite early by both Federal and university people that this resulted in an undesirable situation. The solution we arrived at was to form a national committee with provincial and Federal representation of each soil survey organization. Since this committee was formed in 1940, we have made progress in ironing out these differences by discussion and by mutual agreement.

In regard to the type of surveys carried out in Canada it was early decided to direct most attention to the reconnaissance type of soil mapping in order to obtain initial inventory of our soils. We have made fairly good progress in this matter, and to date we have covered over two hundred million acres and have issued about 200 soil maps for distribution. At the same time for particular needs we have made a considerable number of detailed and semi-detailed surveys. Few of these have bean published however, but blueprint copies have been given to engineers and others who require the information. A considerable acreage has also been covered by exploratory surveys chiefly to locate land which might be suitable for agricultural development in our' northern forests. In this connection I would like to say that up until comparatively recent times, and in particular in Western Canada, the use of soil survey information for land settlement purposes hao strongly influenced soil survey programs. While at present there is little or no pressure to develop virgin areas for farming we are still very much interested in finding out how much potential arable land we have in Canada.

Since the last war we have been following a fairly systematic long-range program in a reasonably orderly manner. However, rather suddenly we are faced with a great demand for interpretive information and a large expansion of the demands for detailed and special surveys. Since our experienced staff is limited in numbers, difficult decisions have to be made as to our program in the next few years. We believe we cannot drop our existing program of research for long without ultimate damage. However, in the immediate future it would appear that major emphasis will have to be given to what might be considered as service work.

I'd just like to say a few words on the demand for interpretive information as It exists at present. For many years in our reports we have given information on comparative productivity of the various soils for crop production. While there has been increasing demand for assistance In interpreting survey information for many different purposes, it has only been within the last two or three years that this demand has blossomed forth in a big way. This came about basically because of the increasing confidence in soil survey information, but three more direct reasons may be stated.

First, the inauguration of crop insurance programs based on the expected productivity of the soils; two, the passage of the Agricultural Development and Rehabilitation Act by the Federal Parliament; and third, the demands of our soil fertility men and agronomists for grouping soils for management purposes. Our national committee decided to give top priority to the interpretive Classification required for agricultural development and rehabilitation. While we have not yet decided on the details of the system we need for such purposes, there appears to be general agreement that we will adopt a system which will be patterned on your land use capability classification. While you may well have doubts about land use capability groupings based on reconnaissance soil survey information, I believe that such a classification will show the soils we believe are suitable for permanent arable agriculture, those that are marginal, and those not suited for arable agriculture.

In conclusion I would mention that presently there is a great demand in Canada for new soil survey information and for the organization of our present information into interpretive groupings for vsrious purposes. Our immediate problem is how to meet the more pressing demands with the present limited staffs and at the same time obtain and train new personnel.

UNITED STATES DEPARTMENT OF AGRICULTURE
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NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
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USE OF SOIL SURVEYS IN ARDA

A. Leahey

The reason for setting up the Agricultural Rehabilitation and Development Act in Canada was chiefly because we have many rural people who 8re getting a substandard of living at the present time. The percentage of farmers in Canada with annual incomes of less than $1,200 is 21 percent, very much higher in some provinces than In others. This low income for many of our rural residents has been a matter of concern to all our political parties. In 1960 the Minister of Agriculture introduced an Act called the Agricultural Rehabilitation Development Act, ARDA for short, which permits the Federal Government entering into agreement with the provinces for alternative uses of land that are presently classified as marginal. the development Of income and employment opportunities in rural areas, and for the conservation of the soil and water resources of Canada. I would say that many objectives of this Act are the same as your RAD program and perhaps some of the ideas have been lifted right from it. Under our act a separate branch of our department has been established to direct the Federal participation in the program. The role of other branches of departments is not as yet entirely clear. However, where our present work is of value to or impinges On the ARDA program, good cooperation is expected. One of the things that ARDA wants is a much greater emphasis on soil surveys. One great difficulty we are encountering in enlarging our survey staff to meet this demand is enlisting additional competent staff. Soil surveying just does not appeal to most of our better university graduates under our present economic conditions. However, the principle has been accepted that ARDA needs for more soils information should be met by enlarging the present soil survey organizations rather than setting up a new soil survey organization.

We have great hopes that our ARDA program will result in improving the lot Of our rural residents and in promoting better land use and conservation measures. This view is not based on just a pious hope, but on our past experience with governmental assisted programs for rehabilitation in parts of our Prairie provinces and in the Maritime Provinces. The success of these rather local and somewhat restricted programs augurs well for 8 national program of wider scope.

UNITED STATES DEPARTMENT OF AGRICULTURE
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NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE OPERATIVE SOIL SURVEY
Chicago, Illinois, March 25- 29,1963

The New Soil Classification System

Guy D. Smith

AS all of you know the publication of the system for the Seventh International Soils Congress was quite incomplete in several respects. We had no classification that we thought would be satisfactory for the soils of the Tropics; we had no general agreement on how to classify the organic soils; and we had not begun work on the placement of our soil series into families. As soon as the affairs of the Congress were wound up and as rapidly as we could spare the time, our staff went to work to test the differentia of the 7th Approximation, applying them to our soil series to see what kinds of groupings resulted. This was the same procedure we used on earlier Approximations, but with the 7th Approximation we began to develop the family category. We have gone through now at least three, and perhaps it's four, placements Of series into families, each time to see where our differentia made difficulties, using the groupings that resulted as a test of the utility of the differentia. Obviously in a natural classification the ultimate test is whether you have the things grouped together that have the most properties in common. Things that are most nearly alike should be together in the classification.

The first tests of families showed rather clearly that many of our difficulties were in the subgroup category. We could not develop the families without, at the same time, working on the subgroups and the higher categories. It's been impossible to make a very firm general statement about how long it would take to complete the system, but since about 1952, I've always made the same general statement, namely that it would be at least three or four years before we could complete the system. I've been quite consistent on that all the time, but I'm beginning now to think that the three-four year estimate has some actual meaning in terms of three or four years, and not three or four or more.

The groupings we have now still have some bugs in them. They're not entirely satisfactory. Some soils certainly seem to be misplaced in the system by the differentis we have been using. We attempted to Isolate and to correct the most obvious of those flaws the last two weeks.

One problem has been that the soils in the West seem to be different from those in the rest of the country and don't behave as they should. We have never found a comfortable place to put the soils of the Pacific Coast. So we are going to try to find homes for them in a couple of new suborders, perhaps three. We have, you know, over the years developed our concepts of great soil groups in the Middle West and in the East; then we tried to force the Western soils into those groups, and that's been the source of much of our trouble.

With these changes, and with a little change in the definition of the order of Ultisols to reduce the emphasis on babe saturation, it seems to be that we have now a system that can be published. It isn't going to he perfect--there will still be soils that will be out of place when we publish; there will be soils whose classification will be in doubt; and there will be soils that we will be unable to classify. We plan a publication that will Include all the soil series of the United States by name; as many as possible of these will be grouped Into families and the families into subgroups and 80 on up the scale. Because we have varying amounts of information about soils, our placement of the series into families will have varying reliability. We can indicate some of this in the text by having groupings that are fairly firm printed in a specific type; groupings that we think are probably right, but that have some uncertainty, can be indicated by the use of a different type, perhaps italics. 'Series that are not classifiable can be so Indicated, together with the reason why we cannot classify them. Some series, for example, were established many years ago in area6 where we are not now working, and will be impossible to classify because we lack information about them. We don't have the time available to study all of these old survey areas. We know that some series will be unclassified simply for lack of information. There are other series, commonly old ones again, about which we have too much information to classify. We may know that in one State a series is classifiable In one family, in a particular suborder or order, whereas in another State the same series belongs in a different place in the system. I don't know just how many of these series there are, but we expect to have, a number that will cover a range of places in the system; We hope to indicate by notes that these soils are not classified in the system because the series have been split geographically by the differentia used. At this moment we may not have the information needed to make a wise decision in every case as to the future of each of these series.' There will be other series, of course, in which a minor part of the series falls outside of the limits of a single family. We will base the classification of all of the series on our central concept of the series and not on the extremes in range of properties allowed within the series. We all know that when we adopt the new system that there will be a rather long period when we are adjusting our definitions of series so that they fit into the system completely. This adjustment will eventually involve additional testing of the limits of the dlfferentia we have used. Some will need modification, so that the classification is never going to be final. It will always be something that we'll work on so long as we are learning about soils.

However, we make progress by steps. The next step, we hope, will be a summary of the family placements that have been made. I hope to have this prepared sometime before the year is over and reproduced In a draft form so that it can be circulated to the staff of the Service and to the Experiment Stations and other cooperating agencies for review and criticism. This will be complete Insofar as we can make it with soil series grouped into families of various subgroups. We will have to allow a reasonable number of months for review of this document by our staff. I am sure it will require at least six months and possibly more. When the review is completed by the staff, and the changes are indicated, we will try to put it into a final document that' can be printed. This final draft will be circulated before it is printed, so that you will, each of you, have two more chances to review what has been done and to indicate any errors that you find. When the draft of the final document has been corrected, we hope thatit will be published. My best guess is that this will take about three years. As Dr. Kellogg and Mr. Silkett have pointed out this morning, we have a program that is being used and that has to go on. We can't stop our other work in order to finish the classification. I know that when it is printed there will still be flaws In the system, there will be soils grouped in such ways that their bedfellows will be rather strange. The development of the necessary changes in differentia to give the best groupings we can have will be a continuing process.

Hockensmith: You see, maybe by spending more time on this now we will save time in the years to come. What I'm thinking about, Guy, is, for example, the correlation process. It seems to me that this whole correlation business could be speeded up tremendously if every GS-7, GS-9, and GS-11 had a clear concept Of the criteria and the placement of each soil in its proper "pigeon-hole" or niche in the classification system. I think that could speed up this business of correlation tremendously. Now, do you want to comment on that?

Smith: I'm not in the correlation business. I used to be and I got into this job of developing a classification because I couldn't correlate the soils of the Cornbelt and the Northeast, I felt that it was an impossible task for my mind without some tool that would let me arrange the soils into groups Of similar soils. I needed the groupings to locate problems of correlation and get them worked out. Because I wasn't smart enough to remember the names of a thousand or so soil series and remember all of their properties, I needed a systematic arrangement that would help me remember the properties. That is the primary reason that I got into this job; I felt it was essential to have such a system and I found as usual when you tell Kellogg something needs to be done, he's quite apt to say, "Alright, do it." It hasn't been easy to do. I think, though, that It will be extremely useful in correlation; it will narrow the problems of correlation, I think, to the point where they can be identified and where the information that is needed to resolve the problems can then be collected. I think it's quite important to appreciate that the basic reason that we have never been able to say what constitutes a soil series is that we are treating with soil series at once. In dividing any one series one has to think of all the other 7,000 series. They all compete wlth each other. You cannot define one series by itself, for any time that you modify the definition of a soil series you are also modifying the definitions of one or more other series. Most of us are not smart enough to handle very large numbers of series. Possibly Dr. Ligon has been fortunate in having a smaller number of series and in having more time and experience to work with them, and has his under a bit better control. Nevertheless, I think that with time there will be more series in the Southeast and there will be fewer series in the West. These will come as we look more carefully at the soils.

Whether the new system will aid in correlation is not an easy question to answer from another viewpoint. Certainly it will aid in the identification of specific soil properties, but as Dr. Simonson has pointed out again and. again, it is possible to become a prisoner of one's classification. The differentia that are used in the 7th Approximation will get very great emphasis and those that have not been used can easily be overlooked. Yet, in defining a soil, one must think of all of its properties and not just the ones that have been used as differentia. We have been able to use only a very few soil properties to define our taxa. Soils have a great many other properties, and we must be on our guard to be sure that these others, which may actually be more important from some viewpoints than those we have used, do not get overlooked. This is a very real danger of the consequences of the&option of the new system. The classification can become purely mechanical and if it does, then I think then it may get us Into some serious troubles. I do think that the classification can be very helpful In identifying problems. I think that, from the looks of the family groupings that we have, it will also be useful in our interpretations. Now, there will need to be more caution used in the making of interpretations for taxa higher than series than we have been using for interpretations of series, but I think that &the family level there is going to be a reasonably close correspondence to our capability units and our capability classes. That seems to be working out a little better than I hoped it would, although those of you who have looked at the last placements realize that it isn't yet perfect by any means. While we have two more chances to eliminate errors. I do not expect that we will get them all out.

Ulrich: Will the next publication be called the 8th Approximation?

Smith: It will probably just be called a comprehensive system. The 8th Approximation will be the working draft that you will get showing all of the families and series. The system that we print probably will not carry a number.

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Climate-Soil-Yield Relationships

Luther H. Robinson

(Introductory remarks by A. C. Orvedal: Mr. Hockensmith mentioned that the relationships of climate to soils and crop yields are important, especially on the Great Plains. I can odd that the search for quantitative measures of these relationships thus far ha8 been rather frustrating, especially for winter wheat on the Great Plains. While general qualitative relationship8 between climate and crop yields have been known for a long time, these lack the specificity needed today. Our ultimate goal has been to find some way of predicting, with reasonable confidence, the probability of yields being above or below selected level8 on different kinds of soils under different systems of management. Our approaches thus far have been limited mainly to testing the applicability of Climatic indexes already established rather than the design and testing of new ones. Mr. Robinson will report on our rather modest effort.)

Introduction: The work reported here is a continuation of research efforts by the Soil Conservation Service in the field of climate-soil-yield relationships. Most of this recent work has been done by Robinson in collaboration with Newhall and Swanson under the general direction of Orvedal.

Our primary objective ha8 been to seek improvement8 in the criteria, particularly productivity Criteria, for placing soil type8 and phases into the Land Capability Classification System. This work ha8 been mainly, but not exclusively, for the Great Plains. We also have provided some climatic indices to assist in the differentiation of soils in other parts Of the United States that have climatic limitations. These effort8 will be described briefly after the main discussion on the Great Plains work.

Two broad approaches to productivity evaluation of Great Plains soils have been investigated. The lack of sufficient recorded observations ha8 been a' limitation in both approaches.

The first approach was made several year8 ago by Newhall, Swanson and Johnson with cooperation from the Agricultural Research Service and was reported at. previous work-planning conferences. These authors show that if a series of crop yields are available for any particular site, these can provide the most direct mean8 of characterizing the production potential for that site in the form of yield probability estimates. The problem with this approach is the scarcity of suitable data; about the only places where we have enough years of recorded yield data on identified soil type8 or phases is at the Dryland Experiment stations. In order to apply this approach, long-time Crop-yield record8 are needed on many more soil types and phases in many other location8 to represent the different kinds of soils in the pertinent climatic ranges, and under the principal systems of management.

Since it was not feasible to extend this direct annroach., we tried the second one. This was to reexamine the application of indices derived from climatic data. The first step of this second approach was to search the literature for methods of computing soil moisture from climatic data and to obtain information about the factors involved in attempting such procedures.

The literature search showed that while several articles dealt with tests and evaluations of methods, comparisons between computed and measured soil moisture values were surprisingly scarce for the Great Plains. Without such comparisons, sound evaluations of methods were not possible.

It also showed that the interaction of several factors make extremely difficult the explanation of how the soil moisture regime varies from place to place. The result has been the development of approximate empirical equations based on assumed relationships to soil moisture.

Moisture removal from soils is an interesting study that has received much attention, particularly in recent years, and has been the subject of much debate. The accompanying graph (Fig, 5) from a paper by Denmead and Shaw (1962) is one of several illustrations tbey present to demonstrate how different environmental conditions affect the rate of withdrawal of soil moisture tinder Iowa cornfield conditions. In general, if the weather is clear, dry, and hot, and soil moisture is plentiful, the actual evapotranapiration rate is greater than the calculated potential rate; if the weather is partly cloudy and humid, or overcast and humid, it is not. This relationship may explain, at least in part, why exiating empirical formulae for estimating soil moisture have met with some degree of success in England and the humid parts of United States, but are of very limited value in areas that have large percentage of clear dry days during the growing season, as in the Greet Plains.

This situation is true not only in the Great Plains but has been reported by others, such as Pruitt (1958) in California and Garnier (1956) in noncoastal West Africa. These authors suggest a saturation deficit correction in addition to the other corrections made in mean temperature computations of soil moisture.

The rooting habits of crops are also important to water removal from soils. In some early studies, Weaver (1926) showed that wheat roots develop to depths to which water is available. In Western Kansas where we have been interested in depicting the soil moisture regime;, 'depth of rooting is probably most frequently limited by depth of water penetration, except where there are hardpans or other layers that neither roots nor water can penetrate.

Another factor in moisture relations of soils is the effects of microclimate. These effects are the results of aspect of a particular slope, and associated climatic variables. This factor may not be as important a variable in the Great Plains as in other parts of the country where local relief is greater.

In addition to literature on the factors affecting the water regime in soils, several articles were reviewed on soil moisture computation. We soon became aware of the limitations of several methods for computing soil moisture from climatological data. If we want to use the climatic record, we are limited by the kinds of data common to this record. These are mainly data on temperature and precipitation amounts. pate on rainfall intensities, wind, humidity, and net radiation are still sufficiently scarce to limit the application of formulae that include them as parameters.

So much for the literature review.

A few years ago, the climatic index called "precipitation-effectiveness index" or "P-E" was promoted for testing on the Great Plains. This index, introduced about 30 years ago, is derived from a formula relating observed precipitation to an estimate of total evaporation, which, in turn, is derived from a relationship of temperature to pan evaporation. Note that this index does not yield any soil moisture values. Neither doe6 it provide for adjustments for differences in available water capacities among soils. It is, however, an index that accommodates both temperature and precipitation in such a way that it seems to be correlated, at least in some places, with average productivities of crops and kinds of land use. This Index apparently has been helpful in the Great Plains but not in California,

In order to find something better than the P-B index, we investigated methods for computing soil moisture, on the assumption that there ought to be a good relationship between soil moisture and crop yields.

Theoretically, from the "water balance" or "bookkeeping" methods of keeping track of soil moisture, we should be able to predict soil moisture content at any time. Inasmuch as our literature search revealed almost no comparisons between measured and computed soil moisture, by any water-balance method, on the Great Plains, we first made a pilot test of one method--the Thornthwaite water-balance method. The location selected was Colby, Kansas, and the data on measured soil moisture were from the record of the Dryland Experiment Station at Colby, Kansas. At this station for an eleven-year period, soil moisture bad been measured at approximately weekly intervals while wheat wan actively growing, and sporadically throughout the rest of the year. Computations were made using daily temperature and precipitation records 80 that a computed soil moisture value could be obtained on the daye that soil moisture samples were taken, The computed soil moisture wan compared with measured soil moisture on both continuous wheat plots and on wheat-fallow plots.

The results showed that the computed soil moisture values did not come as close to the measured soil moisture values as we had hoped. Cm the continuous wheat plots the differences were less than on the wheat-fallow plots. Figures 1, 2, 3, and 4 illustrate representative relationships. For the crop years on the wheat-fallow plots, the mean measured available soil moisture was 4.66 inches. The computed soil moisture value.8 differed from the measured by a mean of +1.5 inches, but deviations for some individual observations were as high as 4 inches. On the continuous wheat plots, the mean measured available moisture was 1.66 inches. Tbe computed moisture values differed from the measured by a mean of -0.14 inches, but deviations of 2 inches for individual observations were not uncommon. These values are from spring to harvest. generally April to July.

Once the wilting point was reached, as it commonly was in July, the computed moisture values followed measured values fairly closely until the next spring, on continuous wheat plots; but deviations, frequently were large between spring and harvest, a season critical to crop yields.

Even though the water-balance method yielded insufficiently accurate estimates of soil moisture, there was nevertheless a possibility that computed "actual" evapotranspiration (ET_a) might be correlated with crop yields. Arkley and Ulrich (1962) have found ET_a useful index of expected plant growth in California. We tried to determine if ET_a is a useful index of wheat yields in the Great Plains. At the same time, we sought to relate the older P-g index to crop yields too,

The yield records came from 13 Central and Southern Great Plains Dryland Experiment Stations. Because of the importance of the April-through-June growing conditions, we decided to confine our analyses to the April-through-June periods. In the case of. P-E a later check against annual indices showed that the spring growing season index gave a higher correlation coefficient with yield for some records but-lower for others. In the case of ET_a the book-keeping was kept up for the entire 12 months even though only the ET_a values for April, May, and June were ueed in this anelysee. Each set of climatic indices was compared to the yield of wheat under three conditions. Tho first was continuous wheat; the second, wheat-fallow rotation; and the third, wheat-sorghum-fellow rotation, Comparisons of both ET_a and P-E with yield first were made on a harvest-by-harvest basis, rather than on the basis of long-term averages, On the harvest-by-harvest basis, the reletionohips of these climatic indices to yields were amazingly poor., Correlation coefficients were computed for some of the relationships that looked best but even these were very low.

The second comparison was made on the basis of au average yield for all years under each management system at each station, and using average ET_a's end P-E's for each station.

Figure 6 is a map showing the location of the Dryland Experiment Stations from which data were obtained. The dashed lines indicate the separations between the north central, middle and southern groups of stations. This grouping was done to see whether the values of ET_a and P-B varied progressively from east to west, by latitudinal belts, as would be expected theoretically.

The next two graphs (Figures 7 and 8) show a comparison of the average yield of wheat for all years on the wheat-after-fallow plots with the average spring growing season (April-June) climatic index at each station for the same years.

The first of these graphs (Figure 7) shows the relationships of the average April-June ET_a's to average yields. Note that the southern stations do not fit as well into the general upward trend es the other stations.

In the next graph (Figure 8) we sea the relationship of average April-June P-E's to average yields.

Correlation coefficients were also computed for the average index values and whaat-after-fallow yields at each of the 13 Dryland Experiment Stations. The correlation coefficient for average April-June ET_a with yield was 0.41. The correlation coefficient for average April-June P-E with yield was 0.85. It does appear from this preliminary study that average April-June P-E is a fairly good estimator of average productivity of wheat in a wheat-after-fallow rotation, The same comparisons have been worked up for wheat-after-wheat. The graphs look similar but no correlation coefficients were determined. This is as far as we bave gone using the Actually Observed Wheat yields from Dryland Experiment Station records.

Recently we decided to see what could be done with estimated wheat yields from another source rather than using measured wheat yields. To do this we compared the average yearly ET_a 32° and P-E indices against yield estimates from the productivity rating tables in recent soil survey reports. These reports came from the following Great Plains Counties: Kimball County, Nebraska; Greeley, Hamilton, Stanton, and Stevens Counties, Kansas; Cimarron, Texas; Beaver, Harper, and Jackson Counties, Oklahoma; Hansford, Carson, Wilbarger, and Haskell Counties, Texas.

Two sets of graphs were prepared, the first showing P-E valuee computed for each of the counties listed above. These values were compared to published estimated yields on soil phases in three soil family groups. The second set compared ET_a 32° values with estimated wheat yields for soil phases in the same three soil family groups. In general the P-g index showed a better relationship to estimated wheat yields than ET_a 32°. However, the variation from a general trend of increased yield with increased index value was greater than was seen in Figures 7 and 8 on data taken at Dryland Experiment Stations.

In summary, neither P-E nor ET_a were useful in predicting the variation of wheat yields with climatic variation on a harvest-by-harvest basis. Average April-June P-E, however, does appear to be a useful but not highly precise indicator of yields. As we pointed out earlier, the Thornthwaite water-balance gave insufficiently accurate predictions of soil moisture in the Great Plains, particularly under wheat-fallow rotation experiments.

We have been involved in two other fairly lengthy projects to provide climatic guidelines in other parts of the country, The first of these was to prepare a map showing potential evapotranspiratfon and actual evapotranspiration for the freeze-free season along transects across parts of United States. A four-inch soil moisture storage capacity was assumed in computing actual evapotranspiration. Copies of this map were distributed in lete 1961 to the soil correlators (interpretation) for evaluation by them. We expect to get their evaluations at this conference,

Tbe second project was to seek a climatic basis for determining the northern limit of practicable grain-corn production on soil physically suited for corn. A Growing-Degree-Day Index was computed for several stations in the Northern Lake States and Northeastern United States to provide a trial basis for locating the zone of change. Bill Bender will report at this conference on the testing of this climatic-index.

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SOIL MOISTURE UNDER WINTER WHEAT AFTER FALLOW
COLBY. KANSAS IN 1930

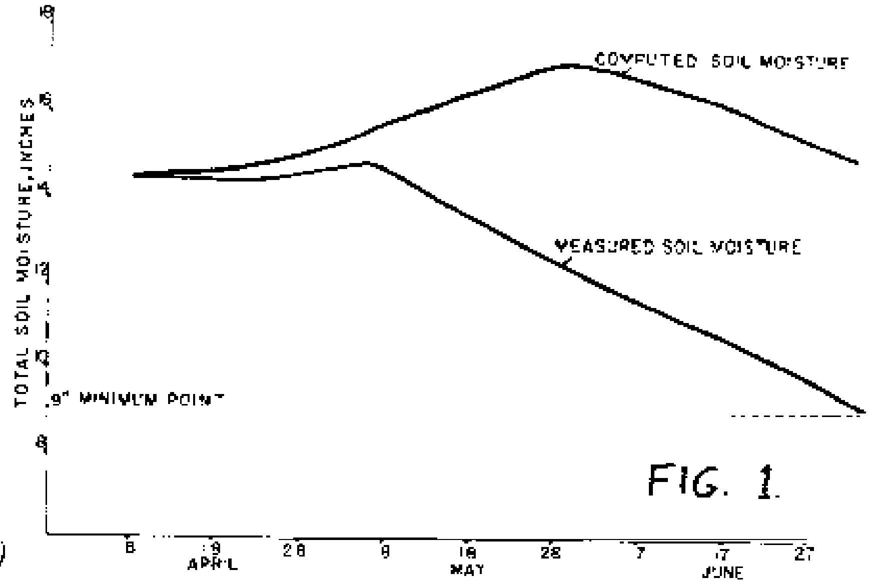

FIG. 1.

SOIL MOISTURE UNDER WINTER WHEAT AFTER FALLOW
COLBY KANSAS IN 1927

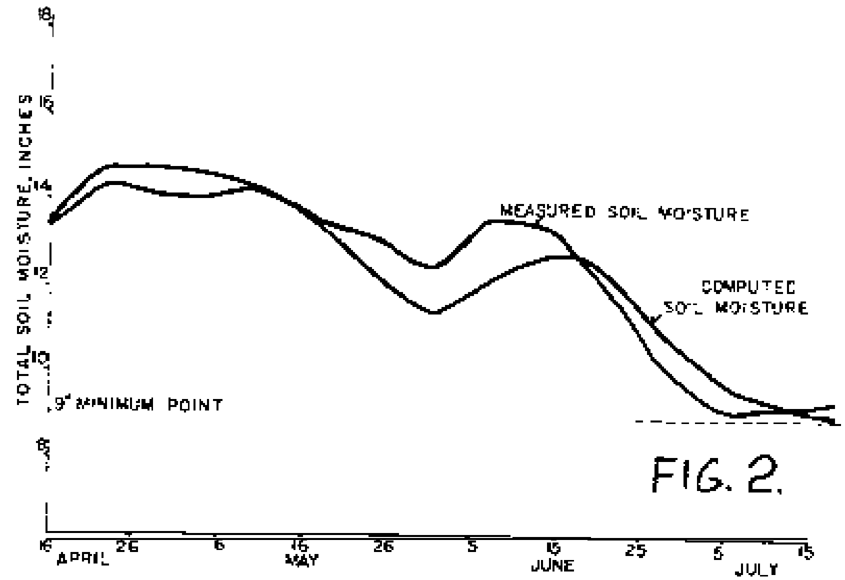

FIG. 2.

SOIL MOISTURE UNDER WINTER WHEAT AFTER FALLOW
COLBY, KANSAS IN 1929

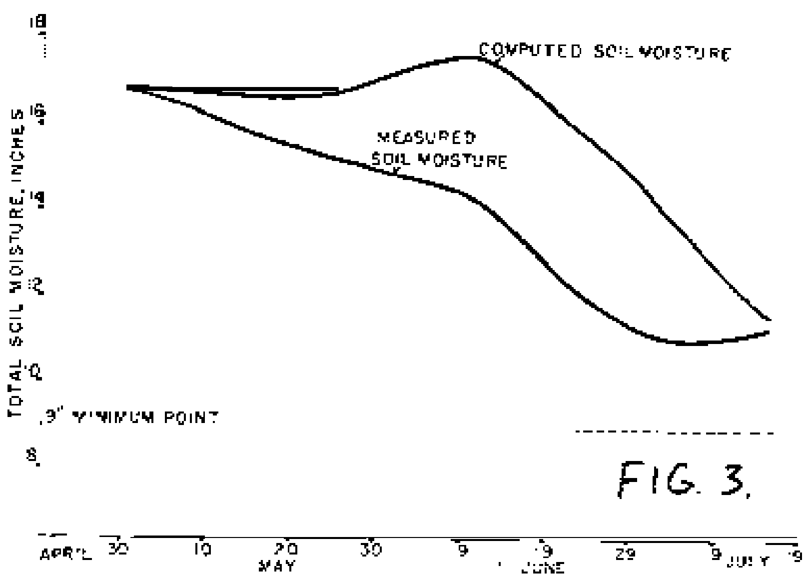

FIG. 3.

SOIL MOISTURE UNDER CONTINUOUS WINTER WHEAT
COLBY, KANSAS IN 1930

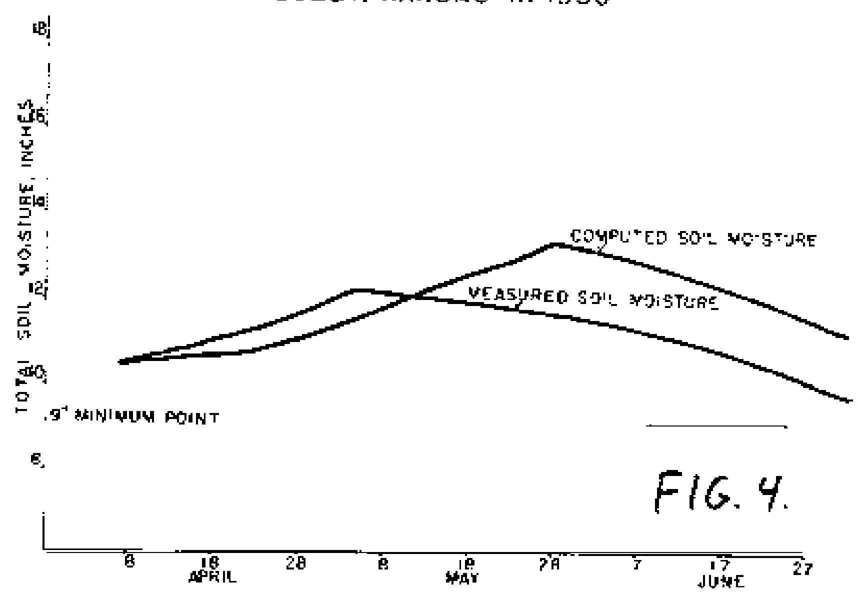

FIG. 4.

ACTUAL EVAPOTRANSPIRATION RATE VS. SOIL MOISTURE CONTENT

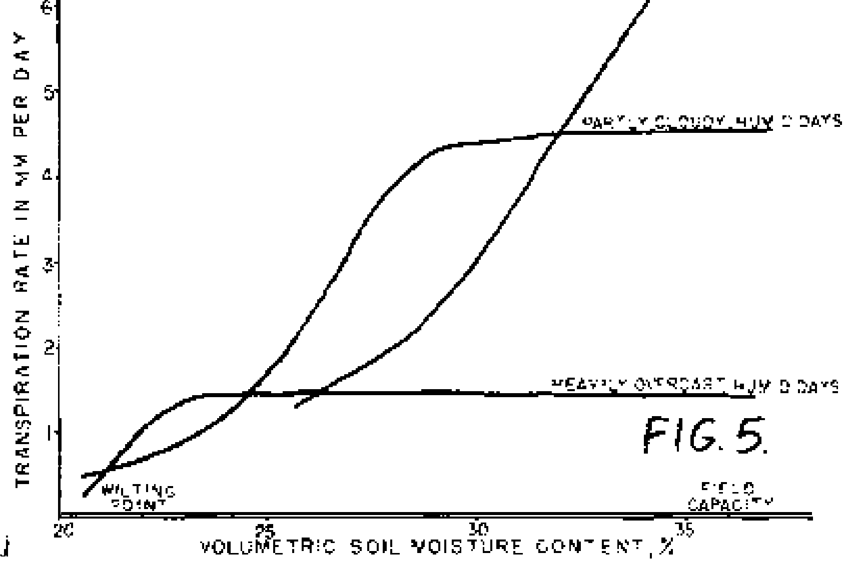

FIG. 5.

DRYLAND EXPERIMENT STATIONS WITH CLIMATIC AND WINTER WHEAT YIELD DATA

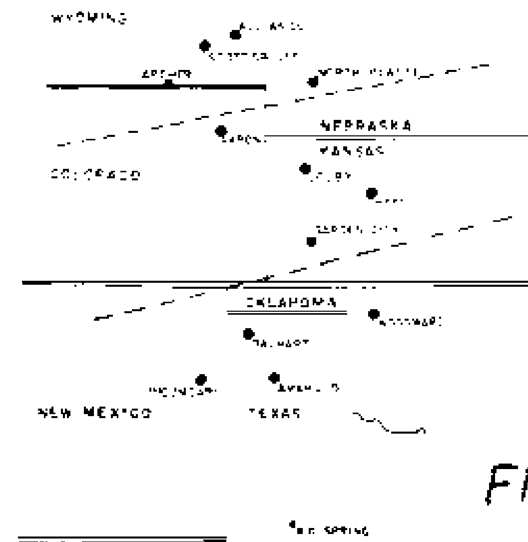

FIG. 6.

WINTER WHEAT AFTER FALLOW IN RELATION TO GROWING SEASON ACTUAL EVAPOTRANSPIRATION AVERAGES FROM SOUTHERN GREAT PLAINS DRYLAND EXPERIMENT STATIONS

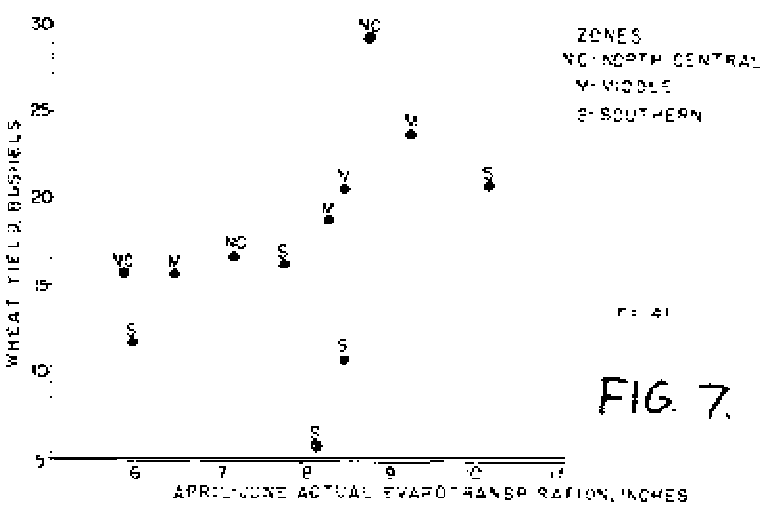

FIG. 7.

WINTER WHEAT YIELD AFTER FALLOW IN RELATION TO GROWING SEASON PRECIPITATION-EFFECTIVENESS AVERAGES FROM SOUTHERN GREAT PLAINS DRYLAND EXPERIMENT STATIONS

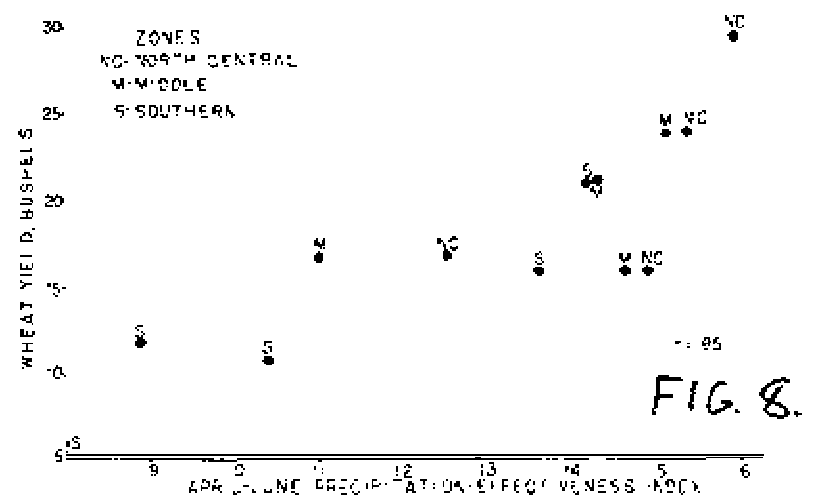

FIG. 8.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
Chicago, Illinois, March 25-29, 1963

Scheduling the Work of the Principal Soil Correlator's Office
Southern States

William s. Ligon

At the outset, I want t.o make it clear that credit for any success we may have had in the Southern States in scheduling work and turning it out belongs to our entire staff, both technical and secretarial, and to the cooperation of the personnel concerned in our States.

General Scheduling Procedure

Our work schedules for each coming calendar year are due on June 15 and those for the fiscal year on December 15. Thus, twice annually the schedules prepared cover a period of 1.8 months, Prior to the dates they are due, we prepare our individual schedules as completely as we can at the time from the various sources of information available. Our individual schedules are then combined into a chart with our names as separate column headings and a line on the chart for each week. This chart is posted for ready reference and is kept currant as schedule changes and additions are made.

Scheduling Intermediate Correlations and Soil Survey Report Manuscripts

In Hay, we receive the mimeographed form "Target Dates for Completion of Soil Survey Field Sheets, Soil Correlations, and Soil Survey Reports," in triplicate, from each of our States. It covers a period of three years. On it, target dates have been suggested by the States for final field reviews, for manuscripts to be in the State office, and for manuscripts to reach the principal correlator's office. We review the dates listed for field correlations and for report manuscripts to be sent to our office during the coming year, and indicate on the form appropriate tentative dates for submitting the intermediate correlations and the survey report manuscripts to the Washington office. Normally these dates are chosen to permit a Period of two months for intermediate correlations and manuscripts to reach the Washington office except when it is necessary to space them farther apart on the schedule to avoid conflicts and heavy peak loads. We send one copy of this form to Washington, return one to the State, and keep the third, This schedule of target dates then becomes the basis for placing these items tentatively on our work schedules.

We then send a memorandum to the State soil scientists listing all of the proposed dates for intermediate correlations for the coming year and where they are to be held, and ask each man to confirm the dates or to suggest alternatives for his State. In the same memorandum we list dates that are already firm and therefore unavailable for correlation work, such as those for the training sessions in soil correlation, work-planning conferences, principal correlators' conference, SSSA, and SCSA. As the correlation dates are firmed, tboy are so indicated on our schedule chart.

We work with the several State soil scientists toward keeping the manuscripts on schedule. Reminders are sent to them when manuscripts do not come in as scheduled. We also keep the State 'soil scientists aware of the importance of keeping the manuscript on schedule in order to keep an even work load in tbe editorial section, cartographic section, and the publication section.

Once the manuscript is received in the principal cot-relator's office, we propose to keep it moving according to a simple time schedule we have set up with the Beltaville office, as follows:

(1) Manuscript in principal correlator's office -- about two months.

(2) Manuscript in Beltsville office for editing -- variable but generally five or six months.

(3) Editor's copy in principal correlator's office and State office -- one or two months.

(4) Editor's copy in the hands of the publisher -- variable, generally four to eight months.

(5) Galley proof in principal correlator's office and State office -- one or two months. Galley proofs are sent to us now only when there appears to be a special justification -- perhaps when an unusual amount of editing was needed.

The rule of keeping the reports on schedule is followed quite closely. We urge the State soil scientists to keep us posted on the status of the field manuscripts and to keep them on schedule until they are in our hands. Once in a great while one bogs down and gets behind schedule. Some of the longer delays result from having to return manuscripts to State offices for revision. A few times we have been able to keep somewhere near the schedule by substituting a well-prepared manuscript of another county sent in ahead of schedule. On occasions we have sent *reports on to* Beltsville in poorer shape than we would have liked in order to keep them from getting too far behind schedule. This is undesirable and we hope that the capabilities of the State staffs as well as our own have improved to the point,. that we can avoid such situations hereafter.

Intermediate Correlation Procedures

Most of our intermediate correlations of the regular county surveys are held in Knoxville where we have the advantage of ready access to all of our files of series descriptions, soil survey reports, laboratory data, correspondence, and soil sample files. Another advantage is more efficient time distribution of the correlation staff. We generally complete an intermediate correlation in two or three days, leaving the remainder of the week for us to use on other work. Much of this time would be lost in travel if the correlations were held in the field. Also, the travel to Knoxville is distributed among the States whereby no great burden is put on any one State or individual as 'it would be if the principal correlator or his assistant had to hold some 19 intermediate, correlations in the field each year.

Personnel participating in intermediate correlation8 varies considerably among States, but usually consist8 of the principal correlator, the senior soil correlator, and the party chief, as a minimum. The State soil scientist or his assistant and the experiment station representative commonly participate. A representative of the Forest Service is generally present When the Forest Service has been a cooperator in the survey. In a few instances, a party chief of anothar county survey that will be coming up for correlation participates for the training involved.

The conference type of intermediate correlation is an important training medium. We feel that it has contributed much toward improving and expediting the correlation, work. Furthermore, it has tbe great advantage of offering the opportunity to thrash out the correlation problems through verbal discussion. We feel that this is much more effective and efficient than trying to do so through correspondence. This is especially true if the field correlation has not been very thorough. In this connection, Soils Memorandum SCS-44, Requirements for Field Correlations, and discussions we have had at intermediate correlatfona bave done much to improve the quality of field correlations, generally. We have urged that the field correlation be the moat thorough and far-reacbfng of all, as it gives the beat opportunity for all field and State personnel concerned to make their contribution to the correlation decisions. In the interest of economy, we have suggested that when the field correlation is thorough, one men might be selected to represent the field correlation group at the intermediate correlation., This has already been done in one or two instances with acceptable results.

We do not favor attempting to combine the intermediate correlation with the field correlation. The latter takes longer and has to deal with a mass Of detail that should all be out of the way and reflected 'in correlation recommendations for consideration at the intermediate correlation. In many instance8 the field correlation uncovers the need for additional work prior to the intermediate correlation. Furthermore, combining the intermediate correlation with the field correlation would require additional work by the principal correlator or his assistant that should be done at the State level; and it would require much more of our time.

We hold most of the intermediate correlations of experiment station farm8 and other small research areas in the field. One or more sites of each soil type and the more important phases are studied.

In all of our intermediate correlations, we require information copies of descriptions of proposed new series for which a current official description is not available; to attach to all copies of the correlation memorandum, We also require profile descriptions and bagged soil sample8 of new series and certain mapping units of particular correlation difficulty to be submitted to Dr. Simonson. Delays caused by these requirement8 are infrequent and seldom very long any more. The materials required are generally made available by the time the intermediate correlation memorandum is prepared and typed. Somewhat more serious are the occasional instances in which we are unable to complete the intermediate correlation because of insufficient or conflicting information, and additional field study is required. In such cases, the delay is ordinarily no more than two to four weeks. When questions are raised by Dr. Simonson's office about items in the intermediate correlations, we answer them promptly if we have the necessary information; otherwise, we generally obtain it from the field fairly readily.

One important factor that expedites our correlation work is the relatively few instances of soils for which we do not already have established or wall-defined tentative series in which to place them. This results from the large amount of detailed survey work that has been done throughout the south, leaving no very large areas for which classification of most of the soils has not already been worked out fairly well. However, some weaknesses in our classification that involve basic changes in series criteria have become apparent in recent years. Measures being taken to correct these weaknesses are slowing some of the correlations to a certain extent.

Soil Survey Report Procedures

We try to help our States with their soil survey reports in three general ways: (1) work conferences with the authors, (2) a review of examples of each author's work, and (3) a training program.

A work conference is planned with the author about the time ha is ready to write. In this work conference, the report writing specialist in the State, the report writing specialist from the principal correlator's office, and the author make a detailed outline of the soil survey report. Standard write-ups are supplied as needed, and samples are written on the major parts of the report -- usually an association description, a description of a series and several mapping units, and a capability unit description. These samples are left for the author to use as a format for writing additional descriptions.

The report writing specialist in the principal correlator's office reviews parts of reports as requested by the States. The amount of this work that can be done is limited, and many of the report writing specialists for the States are now in a position to make these reviews.

We hold annually a one-week training session for authors, especially the prospective authors, on how to write clearly. We feel that this training program is effective in promoting the writing of good reports. In the future we hope to have a training workshop for the State personnel that have the responsibility. for guiding report writers in the preparation of the manuscripts. A well-trained report writing specialist in each State would give the writers more individual guidance in their writing job than our office can give and, in this way, help to improve the quality of soil survey reports.

Processing Soil Series Descriptions

From the official list of soil series. we prepare a list for each State comprising the series for which maintenance of up-to-date soil series descriptions is its responsibility. We send this list to the State soil scientist, the and the senior soil correlator.

Draft copies, double spaced, of proposed revised series descriptions are prepared in the States to which the series are assigned and are channeled through the senior soil correlator to our office. The number of draft copies submitted for each series is three times the number of States listed under "Distribution" in the series description. Our secretary then circulates the draft copies for comment to supervisory personnel, Federal and State, in those States concerned with the series, with a dead line, usually six weeks, for returning the draft copies with comments written directly on them. Our secretary maintains a file with a separate folder for each series in which the returned copies with comments are placed as they are received.

After the dead line has expired, our secretary sends the contents of the folder to the senior soil cotrelator, vho reviews all of the comments and incorporates those he judges to be appropriate into one copy of the draft or prepares a second one. This revision and all of the comments are than returned to our office and our secretary places the folder in our pending file of proposed descriptions. As time permits, we review the proposed draft, along with all of the comments, and edit it. A final draft is then typed double spaced, and submitted to Dr. Simonson for review, mimeographing, and distribution,

By this procedure, all comments receive consideration and we review and edit proposed series descriptions only one rime -- in connection with preparation of the final draft that is submitted to Dr. Simonson.

Non-Agricultural Uses of Soil Surveys

We want to say a few words about our activities that deal with the non-agricultural uses of soil aurvay information.

Interest in this field increased greatly among our SCS supervisory personnel during the past year. At the request of State conservationists and State soil scientists, members of our staff scheduled meetings on this subject in seven of our eleven States. Four of these were State-wide meetings of soil scientists, two were attended by State office staffe and specialists, and one by area conservationists and soil scientists. Objectives of these meetings were:

(1) To bring about a realization and enthusiasm for this wider use of soil surveys on the part of line and staff officers of SCS.

(2) To develop techniques for use of both large scale detailed maps and small scale general maps in planning end accomplishing sound programs.

(3) To train soil scientists In the preparation of guide lines for multiple interpretation8 of soil surveys.

(4) To give direct assistance on special interpretations.

The results of our activities in this field have been very gratifying. Among other things, we have stressed the importance of sound mapping legends, good soil handbooka, accurate maps, and the need for correlation of tbe surveys on which the programs are based, The area conservationists are realizing the importance of these activities and their responsibilities for supporting them. Some of our recent correlations reflect a well-organized program at the area level.

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In conclusion, much progress has been made in developing the understanding that the responsibility In the States for keeping correlations and reports on schedule and supplying supporting documents for the correlations is shared by all of the line and staff officers. Interpretationa needed to justify soil separations and put them to use require the assistance of the work unit conservationist, the biologist, the engineer, and the forester. We have been receiving very good cooperation from these people in the Southern States.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
Chicago, Illinois, March 25 - 29, 1963

Soil Correlation

Roy W. Simonson

Work in soil correlation is in many ways like living in a house which is continually being rebuilt. We use what was done by our predecessors according to the understanding of soils in their dcy. This is of value but can not meet present needs. Changes from paet practice are consequently necessary. To return to the analogy of the house, we cannot simply tear it down and build a new one, yet we must modify or replace the old part by part as we are using it. The need for continuing change stems from two factors in particular, One of these is the effect on soil correlation at any given time of the prevailing system of soil classification and concept. of coil. The other is the improvement in. recent years of standards and techniques for describing and characterizing soils.

We live always with the effects of the systems of soil classification that were developed and used in the past. Thio has been true and will continue to be true long after my professional career is ended. Whenever any ooil series is recognized and established, that series is set up within some framework for soil correlation which includes the soil classification system in use at the time an well as the concept of soil iteelf. These are important parts of the background against which series are established and against which the soils of individual survey areas are classified into eeries.

The impact on soil correlation of the prevailing concept of soil is well demonstrated in the little booklets published as instructions to field parties by the Bureau of Soils in the early part of the century. Booklets were published in 1902, 1903, 1904, 1906, and 1914 at least. These are the ones I have found; if there are others they have escaped my attention. The earliest appearance of the soil series in these booklets is in the one published in 1903. In that booklet, the soil series is defined indirectly but rather completely, well enough to show what the men have had in mind. The definition runs something like this - Knowing as we do how soils are formed by the weathering of rock in place or by the deposition of sediments by running water, wind, or ice, we know that soils formed at any Riven time from sediments being laid down simultaneously have the same compostion, A group of such soils differing in texture but having the same composition are to be considered a series. Further, the 1903 booklet adds that one can expect to find all types of the Norfolk series, including sand at the one extreme and clay at the other. Series were thus first recognized and defined in this country on the basis of a concept of soil which considered it to be exclusively a product of weathering.

By 1906, the framework for soil correlation had already been changed. The decision had then been made to subdivide the country into physiographic provinces or regions and to restrict each series to one such province or region. A map showing these provinces and regions must have been available in 1906 inasmuch as one was 'published in 1907. Redefinitions of a number of series are given in the 1906 booklet, end acme of those that had been oatabliahed in the preceding three years were dropped from active use.

This change during the first few years that series were being recognized in this country is an example of modifications of the framework for soil correlation which follow as the concept of soil evolves or.88 the classification system in use is modified.

Series that era established on the basis of one framework for soil correlation do not disappear when that framework is modified. If the system of soil. classification in use is changed or is' the concept of soil. is modified in the light of newly acquired knowledge, these have their impact: on the framework for soil correlation. Series recognized within earlier frameworks remain, however, both in publications that have been issued in the past and in the minds of men engaged in soil surveys. Sometimes I wonder if series concepts are immortal; at least I know they are long lived. Some part of the earliest concept still persists for a number. of series even now, 60 years efter the series wae first introduced in soil surveys.

The concepts of a number of series still in use go back in part to the days when physiogrephic provinces ware a major element in the framework for soil correlation. This geographic frame work, spelled out explicitly. in U. S. Bureau of Soil Bulletin 96 exactly a half century ago was tha basis for recognizing a number of series. Bulletin 96 specifically states that any one series is to be confined to one phyoiographic province or region. There was no need to examine and compare soils occurring in two physiographic provinces or regions. These were automatically classified as different series. The impact of the use of physiographic and regions is still of consequence in the approaches to soil classification on the part of men today, as well as having been responsible for a number of series that remian to use. Some of the series have been redefined slightly or substantially, and other provide us vith a number of the problems in correlation.

A little more than 30 years ago a system of soil classification developed by Marbut became part of the framework for soil correlation. This new system became part of the background for setting up series. We therefore have series set apart for soils on opposite sides of the boundary drawn by Marbut between the zones of Pedocals and Pedalfera. This boundary was an a priori limit between series. Persons working near the boundary would first find out where this line bad been drawn and attempt to recognize different series on the two sides of the boundary. It was believed that soils on the two aides of the boundary were subject to somewhat-different processes of soil formation and consequently must differ enough to warrant separation at the series level. Careful comparisons of the soils to see whether or not they were distinguishable were not required within that, understanding of soils end their formation.

There is no escape from the impact of systems of eoil classification and of prevailing concepts of soils on soil correlation et any time. I think this is simply one of the facts of life which we must recognize. Furthermore, it is important to realize that series established and defined according to a given concept of soil and a given classification do not disappear when those are modified. The series persist, and there is the question of what should be done about them. Is redefinition the answer? Should certain series be dropped from active use? Some kind of changes must be made; it is not feasible to retain and try to carry on soil surveys according to the concepts and classifications of yesteryear. The kinds of information needed about soil8 are not the same now as they were. Tke understanding of soils and of their responses has also changed.

This situation is not peculiar to our times. Back in 1860 in a report on the geology and agriculture of Mississippi, Hilgard makes the statement that it is commonly charged upon professional men in general end upon those who cultivate the exact sciences in particular thst they are constantly wrapping up their learning in big words rather than staying with the old simple words. *He* states further that scientists are expected to develop new ideas and that any one should realize that such ideas cannot be expressed in old terms without changing their meaning. Old terms must be redefined or new terms introduced. Hilgard concludes with the argument thnt if a man grasps the new idea, he can understand the term, regardless of the language la which it may be expressed, and if a man does not want to make the effort to grasp the new idea he ought not to be carping about difficulties with terms. It is of some comfort to learn that as much as a century ago in this country there were problems related to the introduction of new ideas and that there were complaints about modifications and changes of the old.

I am convinced that the problems which follow from the need for changes in the framework of soil correlation -- needs that will persist until soils and their responses are fully known -- will continue and are not likely to get any simpler in the future than they arc now.

A second factor responsible for many of the current problems in soil correlation is the growing impact of the improved standard and techniques for describing and characterizing soils, especially morphologic features of soils. The preeent standards for color, texture, structure, and the like appeared in the Soil Survey Manual some 12 years ago, and their development was concentrated especially in tbc preceding decade. The standards draw on earlier experience, of course, but the distillation of that experience into the guides embodied in the Soil Survey Manual was largely accomplished between 1943 and 195.1, The use of these standards has now diffused generally among field scientists engaged in soil surveys in this country, as a result of which the descriptions of soils are more complete and precise than was possible earlier.

The availability of more complete and precise descriptions of the soils in survey areas has far-reaching implications to soil correlation, We can now get better definitions of map units than was possible previously. More critical comparisons of soils of different areas within a state or in two or more states are possible. This affords an opportunity for raising our standards from those in the past. The raising of standards is always a somewhat painful process. It does require more work and it requires more critical thought, neither of which are normally welcome.

Given the improved standards for describing soils, it is poseible to make more complete and more exact definitions of soil series than was possible:. previously. M&e thorough and more critical comparisons of series are thus possible now then bnfore. From these comparisons there flow problems in correlation a* effort8 are made to improve classification of soils into -series, to be as certain as we can that we are naming the soils in the' same way wherever they occur, and to avoid the, use of the. same series name for different soils.

Since it has been poeeible to sharpen the definitions of a number of series; we find that in some instances -- quite a few, in fact, -- a substantial.. range in propertier has been allowed in a series in the paot. The range turns out to be wider than seems appropriate now, wider than we now think can be justified. Wherever this situation obtains there is the problem of redefining the series, reclassifying some Of the soils that-it has included, or dropping this one series from active use and recognizing new ones.

Another kind of situation also turns up as more critical comparisons of series become possible. More series have boen recognized in some instances than I think we can differentiate now. For example, we have, in round numbers, some 400 series of Gray-Brown Podzolic soils in the North Central States, In that group there are 150 series of soils that have solums 2 to 3 1/2 feet thick and have moderately fine-textured B horizons. Consider the problem of defining and differentiating 150 series of soils that have the same horizon sequences, substantially the same dimensions of horizons, and a limited range in composition. Theae series were established within frameworks for soil correlation wed in the past; some were set up within one framework, some within another. At various times as theae 150 series were being eatabliahed-or propoeed, the comparisons that were poseible could not be as rigorous as those thst can be made at the present time. This follows mainly, though not entirely, from the improved standards and techniques for describing and characterizing, soils. I do not believe that we can define and differentiate adequately 150 series of Gray-Brown Podzolic soils with aolums in the same thickness range and with so little room for distinctions in B horizons. Yet the making of changes so that all the series we do recognize can bo defined and differentiated satisfactorily is a considerable job on several couute.

To summarize. we are in a period of change, primarily because of the. effects of changes in the framework for soil correlation and in the standards and techniques for describing and characterizing soils. A period of change is also a period of stress as well..: The modification in classification systems, in the concept of soil, and in available standards and techniques for describing and characterizing soils places stresses and strains on available concepts of series in many instances, and these stresses extend into correlation efforts generally. I do not expect these to disappear for a long while because I think the growth of knowledge about soils and their complexities will continue.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil conservation Service

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Soil Surveys on Private Woodlands

T. B. Plair

Soil surveys on private woodland is, I think, one of the most important topics you have on tha agenda. This has been discussed at every meeting that I bave attended during the past several years.,, Soil surveys for forestry uses has also been a subject for committee consideration at each conference I have attended. i hope you will think it is important enough to keep the subject' listed for national conferences and regional conferences. There are opportunities for you and others to develop an appreciation of the value of appropriate surveys on forest land6 by such further discussions.

Rather than to tell you bow to make a survey on forest land or how to interpret a survey for forestry purposes, I'd like to try to tell you just how important I think it is that good surveys be made--that they be proporly interpreted and that they be correctly used. Why are we interested in soil surveys on private woodland? Why not just soil surveys on forest land? A good survey, properly interpreted, can serve planning needs for all kinds of forest land, But, for the time being, thera is possibly a need for additional emphasis for interpretations of soil ourvey information for use on private woodland. About 140 million acres of privately-owned land in capability classes I through IV is presently in woodland. Even though that is not needed now, for cultivated purposes and may not ba needed for the next 30 or 40 years, there are other uses than the production of wood crop6 that may be made of it. There may be need for changing land uses from woodland to cultivation in some places, and to other uses in other areas. Certainly intensive use of land for the production of wood crops is a basic need by woodland owner6. The privately-owned land is normally more productive than most of our publicly-owned lands; even so, there is a range in production from 20 to 2,000 board-feet per acre. That is a very critical thing from the standpoint of what an individual may invest in the land and it6 management. So that is, I think, one of the very important reasons why good interpretations of good surveys on privately-owned land is of such great concern to you,

Proper interpretation6 indicate the kind of trees; the productive capacities; management limitations; and the investment possibilities. These certainly dictate the kind of treatment that needs to be and can be applied from the practical point of view.

The demand for this kind of technical information is increasing all the time. I know that you have had the experience, just as the Canadians have, when surveying some of this woodland of wondering what they're going to do with the information. That was true sometime ago. There are areas where you are surveying at the present time--where you ara still going to wonder, I suspect. But today there is a much greater demand for this kind of information than thsre ever has been before. It is needed for adequate planning uses by technicians in the Soil Conservation Service. Incidentally, I'm directing most of my remarks to the Soil Conservation Service personnel with the full understanding that personnel of the cooperative program are also concerned. I'm not in a position to tell them what to do, really, any more then I am anybody else, because I'm staff too. But I would like to suggest to you in operetlons--in the Service--that there is the opportunity to develop real useful technical information that is technically sound--that will be, used by planners, both in the Service and those who are responsible for management of privately-owned land.

The principal thing that landowners are concerned with et the moment is the productivity, of a particular species. Obviouely that is of primary concern because they are mainly concerned with how to do this job ot a profit.

There are management limitations imposed by soil related factors, such as the difficulty of getting natural regeneration. Sure, some of the foresters know that it is a tremendous problem, but many of them haven't yet appreciated that it is directly related to the soil. You can help them understand that.

I 'would also suggest that you do not permit the soil surveyors to feel that they have to do this job alone. There are other people who need to help them in making these interpretations. I think the woodland conservationist in the Service, foresters in State and in private employ can he extremely helpful. It is not just a problem for those two, but also the economist--and often the range conservationist can lend helpful assistance. This is a multi-discipline job of interpretation for land that has multiple uses. So get the help that is or should be available. To sell this information to technicians elsewhere is an important job for us. Since woodland occupies about a third of our land and the land yet to be surveyed is primarily in woodland, it is very important that we try to develop woodland interpretations. These are neaded so that soils information can be sold to people who can use aud should be using it. About three-qwrters of the remaining soil survey job that is east of the hundredthmeridian is in woodland, About three-quarters of the remaining soil survey job west of the hundredth meridian is now either woodland or range. Just how much the interpretation job is, I don't know. I would suspect it is relatively greater. So it is a pretty important piece of business for us. in soil surveys...

We in the Service think that there is a need to adequately exploin our soil woodland interpretations. Therefore, we are grouping the interpretations--or grouping the soils with their interpretations--into woodland suitability groups for purposes of simplification and making it more effective to use in working with the nontechnically trained--the nonsoils trained technician, shall I say. Now, rather than to try to sell you on these groupings, since my time is up, may I say that it's nice to be with you. I hope that we woodland conservationista can help you. If we can, we want you to ask us--we'll try. Thank you.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
Chicago, Illinois, March 25 - 29, 1965

The Soil Program of the U.S. Forest Service

John L. Retzer

The Soil Program of the Forest Service was formalized in mid 1957. We now have a staff of 60.

Survey Accomplishments

The main effort has been directed to detailed surveys. Some 5,000,000 acres have now been mapped at the detailed level. Surveys have been completed in 14 areas and are in progress in 16 other areas. Two reports hove been published and five reports are being written. Reports for four other areas are being written and will be published in conjunction with SCS.

Other Accomplishments

We have come a long way in other significant respects. For example, most of our operating procedures within the framework of the National Cooperative Soil Survey have now been solidified. The importance of this accomplishment should never be underestimated.

Survey ares boundaries have now been designated and named cr numbered in most States where National Forest and other public lands are involved. This removed many sticky problems at the field level.

Working relations between personnel of the participating agencies at the field level have been satiofactcry in most places-more so in the west and somewhat less so in the east.

Participotfon in Regional technical work-planning conferences by soil scientists of the participating agencies has been a major tool in defining, discussing and solving many thorny technical problems and in forwarding the goals of the soil survey.

Organization

As you know, the Forest Service conducts its field operations through ten Regional offices. Soil scientists are located in each of these regions. The organization that will be most effective in developing a vigorous survey program and at the same time provide management service to the operations people is being given serious consideration. It is our wish to establish a sharp distinction between the two, less surveys suffar in the interest of providing service.

Training

Training is and will remain a problem. It has two phases, (1) the technical training of soil scientists and (2) the training of administrative people to use soil information. We have drawn heavily on the Soil Conservation Service for technical training in the higher grade levels for our candidates who have promise and who we expect to assume more important responsibilities as the program develops. We think the joint training of these people is desirable for all participating agencies. We appreciate this cooperation from the SCS and hope that the entire national program will benefit.

We are seriously considering the establishment of an In-service training school for new employees at the GS-5 and 7 levels.

Training of administrative people in the use of soil surveys is a regional responsibility and is carried by the regional soil scientist,

Considerable thought is being given to a training program for soil management candidates at the GS-11 and 12 grades that will increase their effectiveness in these important positions.

Handbooks

Cur Category II Handbook (2512.5) on Soils is essentially completed; Work is now beginning on our Manual-directives Handbook. This handbook will spell out our technical operating procedures as well as some administrative aspects having to do with our joint program.

Common Problems

We do have problems needing attention to insure smoother operations and to conserve the valuable time of the National Cooperative Soil Survey group. Some of these are as follows:

1. In some States we ore still bothered with the problems of phases. In rough mountainous lands the use and management practices contrast sharply with those used on level lands. The establishment of significant phases and their class limits for slope, erosion, stone, rock, drainage and for some land forms is a problem needing attention. The problem is concerned not with the principlea nor any limitation in our existing operating procedures or directives but with some soil scientists who have become rather inflexibly wedded to the mapping units established for cultivated lands. Survey areas often include both cultivated and mountain land. Some thought needs be given to an acceptable way to shift from phases designed for cultivated lands. to phases significant to wild lends.

. We also need to recognize that a phase may be established in wildland surveys that is useful only for engineering purposes or perhaps for water yields and the soils may all perform the same with respect to the growing of trees, forage, etc.

2. We are in need of standard nomenclature for clay films, soil pores and roots. Currently a great deal of confusion exists and results in much lost time in writing, editing, etc. We, the Forest Service, have eatabliahed a nomenclature for clay films and will use 14 pending a resolution of the problem by the National Cooperative Soil Survey Group. Needless to aay we are having a great deal of editorial difficulties up the line with our reports but changes appear to be more of personal or individual preference.

3. The organization, 'writing and editing of reports has always been one of our most difficult problems and consequently a time consuming end expensive operation. To overcome this the Forest Service has developed a standard format tbat is interlocking between the (a) field soil notebook, (b) the soil management report, and (3) the soil survey rcport. The format is developed to the third or fourth place.

We expect to follow this format for all reports written by the Forest Service and we do not anticipate important reorganization' up tba editorial line.

We are forced into this position by a number of factors: (1) only six people in our entire staff have ever written a report end those now facing this job must have'guidance, (2) about the same number have written technical papers that were published, (3) we see no. merit in changing the basic organization of a report in accordance with 'the desires of individual editors in each correlation region. (there is a noticeable lack of uniformity between editors), (4) with our limited manpower and the increasing demands on their time es our program is accelerated in the Service we aimply'cannot afford the luxury of months of time spent on reorganizing, m-editing, repeated reviews, etc., (5) we summarily reject any proponftion that a atandardisod report is a bad thing or an undesirable practice.

4. There is a lack of uniformity In the designation of survey intensities between States. We think that the designation of differences; in intensities has much merit and should be continued but the lack of uniform application indicates a weakness in definitions or a lack of communication somewhere along the line.

5. In a cooperative program as large as this one that involves several agencies with widely divergent philosophica, responsibilities, problems, as well es agency prides, there could be some difficulty in the use and application of soil survey information that could be detrimental to all our programs.

There are relatively few divergent opinions between soil scientists regarding basic classification and mapping operations. But because our program will be critically reviewed by management people in the several agencies, it is necessary that interpretations and management statements in the soil survey report be limited to statements of productivity or yields or performance, etc. Interpretationa or arrangements of data based on special management practices, systems or methods of operation of any one agency should be omitted from the survey report. These can be placed in special reports such as the soil handbook of the Soil Conservation Service and the soil management report of the Forest Service.

6. If there is one place where our soil scientists have an opportunity to show their skill, it is in the chapter on Genesis and Morphology. We have too often settled for a perfunctory treatment of the subject that might well have been omitted from the report. In the Forest Service we are now taking steps to upgrade the importance of this basic topic to the point where a good contribution will be a matter of personal pride and a measure of scientific standing among our fraternity. We would like your suggestions and your criticisms.

Major Current Problem

It is the responsibility of all high level staff in our agencies to constantly seek for increased efficiency in operations at all levels. It appears to me that one of the important current bottlenecks to our orderly flow of work is concerned with the correlation activity. It is an absolutely essential and critical step in our work. Without correlation we would have no unified or effective program. But it tales too long. I know that much thought has been given to this topic and any suggestions I have are already old to most of you. But the fact remains that more must be done. Perhaps we can use more people, examine our flow charts and eliminate unnecessary operations, increase our efficiency by machine sorting, assign some of the operations to people of less skill, upgrade the importance of this activity in the field and require batter performance from the party leader and others up the line. Any other tightening up that would save a day or so along the line would help. This is a job not for efficiency engineers or administrative people but one for highly skilled scientists. It is our job end we had better demonstrate that we can do it--and soon.

I would not like to leave the impression that the National Cooperative Soil Survey is aging, sagging in the middle or about to retire on a government pension, Quite the contrary is true end we have the proof in the remarkable and varied accomplishments in the Last ten years and the plans for future years. But we do have problems. We can do better. We keep young by facing and solving problems and that is the purpose of this conference.

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Soil Inventory of Indian Lands

James D. Simpson

In making a statement on our work in this field, it is probably best that I review briefly the history of soil inventory work in the Bureau of Indian Affairs.

Increasing demands for soils information necessary for farm, ranch, watershed, and reservation planning prompted our Branch of Soil Conservation in the early 1950's to augment the staff of soils technicians to make soil inventories. By 1956 high-quality soil inventories were available for approximately 6,437,000 acres of Indian lands.

In 1957 the inventory program was expanded to include soil, water, forage, wildlife, and recreational resources and potentials. The program was also intensified to complete the mapping phase at the earliest possible date because several Indian tribes were requesting the inventories to use in overall planning. Special emphasis was placed on helping the Indians to understand and use the information in preparing plans for the full utilization and development of their resources.

Excluding forestry and minerals, a grand total of high-quality resource inventories are now available for roughly 22,041,348 acres. This represents completion of approximately 54 percent of the 41,000,000 acres of open Indian land to be mapped, Since 1959 the program has been progressing at the rate of approximately 3.5 million acre.9 per year. Our staff at this time has approximately 80 soil scientists.

Now, I would like to describe our approach to soil inventory work: Legends are developed by an examination of the soils of an area to be surveyed based on their characteristics and properties by trained soil scientists. Classification or taxonomic units are established and fully described in standard terminology. Then, by study of the classification units and the purpose and uses to be made of the inventory, the field mapping units are determined. The field mapping units are then fitted into a Bureau-wide system of symbolization for mapping purposes, but this is done only after the mapping units are determined. Complete field notes are kept on each field mapping unit.

Cur Bureau uses a standard method of symbolization for mapping and descriptive names for the field mapping unite. There are several reasons for this -- some of the more important are: We believe our method of symbolization and descriptive names to be very effective as a tool for teaching the significant differences in soils to users of soil inventory information without affecting the quality of the inventory of its correlation to other methods of symbolization and terminology, and the Bureau of Indian Affairs is cooperating very closely with the Federal and State Extension Service, and the terminology used by the Bureau in naming field mapping unite coincides very closely with that used in land-judging contests sponsored by these organizations. In this way, people with whom we work are not confused by a difference in terminology between the Extension services and our organization.

To present a united front with the Soil Conservation Service to tha people on the land as it relates to soil inventory work, the Bureau uses the Land Capabilfty classification system for presenting information about cultivated land and to a limited extent for range land, The major part of the information about land used for range, however, is presented through the range site approach, The Bureau prepares a limited number of reports designed for use with Indian people. These reports are based on an applied approach using the Land Capability and Range site methods of presenting land data to users.

Recently, we have been preparing completion reports on our irrigation projects. In this work we are using the Bureau of Reclamation classification system.

In closing, I would like to take this opportunity to thank the Soil Conservation Service for permitting us to participate in their report writing and correlation schools. I think these schools have been very beneficial to our people and have contributed a great deal to our training program, Thank you,

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Report of the Soil Surveys on BLM Lands

Marvin E. Noble

The Bureau of Land Management is very much interested in soil surveys. We appreciate the opportunity of discussing these with you and learning more about your soil survey procedures and correlation difficulties.

In the past, the Bureau has not used soils data to any great extent in evaluations of its range or forest lande. We have collected a minimum of soils information which was needed in obtaining some idea of the potentialities of these lands for use in making management decisions.

It has been primarily in the range and forest management programs of the Bureau that we have had an interest in soils Information. However, there are other activities that could benefit from the use of soils data - the land classification and engineering programs, fcr instance. At present, they have established procedures that do not incorporate the usual soil survey data. As this kind of information becomes available, therewill be more opportunity for its use and greater interest should be shown.

In the range management program of the Bureau there is perhaps the greatest interest in soils data, although our foresters are keenly interested. Cur range division has cooperated in setting Up some pilot studies to see what could be developed that may be useful to BLM. The Bureau has some problems. One of them is 178,000,000 acres of land in the 48 contiguous States that have to be managed and for which we have to make management decisions in the immediate future. We have to obtain, by one means or another, a sufficient fund of information and data on which we can base these decisions. This is one thing that has made Us question the use of soil survey procedures. Just how intensively we can get into it right now is problematical.

BLM personnel are interested in cooperating with the SCS and SC Districts, in soil survey planning. In just about every Western State, the BLM has a representative sit in on your annual soil survey planning meetings. Each of our State Office6 has some particular area or areas for which they are interested in obtaining soil survey data so they can start learning something about the uses of this kind of information. Some of our personnel came from your organization originally and brought with them a lot of interest in soil surveys.

About 2 years ago, the Bureau was approached about its Interest In soil surveys. It was agreed that we would establish three pilot study areas in three Western States - Montana, New Mexico and Nevada. These were areas where the SCS had planned to complete surveys, and which contained a fairly large proportion of BLM range lands. The Bureau agreed to place one range conservationist with some background in soils on each crew. This man was also to have an understanding of our range management program and its needs. The objective was to have some of our people learn something about soil surveys and how they might be used in our range evaluations. We are sure that sometime we will be using soil survey data in these evaluations;.

The surveys In two of the State6 - New Mexico and Montana - have been largely completed. They are about to the report writing stage. Our representative on each of these crews will write an additional report from the standpoint of Bureau use of the data.

In Nevada, it apparently will take another year to complte the pilot study. The man we had assigned there has just recently been transferred to Washington. He has written a report covering progress on that survey so far. A number of problems developed. One of them is the rate of lend coverage. At the rate a 3-man crew has completed the extensive type survey used, it would take approximately 40 years to cover the Elko Grazing District in northeastern Nevada, We have 58 of these grazing districts. In addition to the 158,000,000 acres in these'; we have over 20 million acres outside of grazing districts that are leased for grazing. So, it would take a long time to cover all of these lands with Soil surveys. We need some technique for evaluating our ranges more rapidly. This does not mean that we cannot use soil survey data in the meantime. Right now we could perhaps use such data where we have prospects of treating range lands. The Bureau has had a fairly high incidence of failure in its range seedings, for instance, and soil survey data, properly interpreted, could certainly help better these operations.,'

We have been cooperating In 8 few places with SCDs in conjunction with the SCS. We cooperate usually by aiding in planning, but in the Surprise Valley - Vya Soil Conservation District in northern California and Nevada we have contributed funds towards soil survey coverage. This year an attempt ha6 been made to have personnel of the Bureau of Land Management placed on soil survey crews. The decision has not yet been made on the Bureau's reaction, but we will undoubtedly continue to cooperate in one way or another in that particular survey and in others. It is our objective to cooperate when we ,can on those areas being planned for complete conservation programs.

This summarizes where the Bureau of Land Management stands with respect to soil surveys. We hope that we can learn more about them and how to interpret the survey data. A big problem is learning to interpret such data 88 a basis for accurate evaluations of the range forage resource and its potentialities. There has been a lot of work done on this, but at least the pilot study in Nevada hs indicated some real problems. That survey has gotten very complex which presents somequestion about the possibilities of accurate evaluations. The survey only attempts to determine vegetative potentials for each kind of soil Involved, but-we have to also evaluate the present forage supply In terms of proper use which will lead towards those potentials. This is One Of Our big future jobs.'

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Soil Survey Work in the Bureau of Public Roads

Adrian Pelzner

Mr. Hockensmith's invitation to me to present a statement of about five minutes in length concerning soil survey work in the Bureau of Public Roads leaves me with a problem. As all of you are probably aware, the Bureau's participation in this National soil survey program is quite extensive and I doubt that I can present a five minute statement that would adequately describe our participation. Therefore, I hope Mr. Hockensmith will forgive me if I speak a little longer than my allotted five minutes.

The Bureau of Public Roads has long recagnieed the value of soil survey information to the highway engineer. In 1951 we entered into a cooperative program with the Bureau of Plant Industry, Soils and Agricultural Engineering, to perform engineering tests on samples submitted by them or agencies cooperating with them in the National soil survey program. This program is presently being administered by Soil Conservation Service. Public Roads over the years has encouraged State highway departments to assist in this work and we have asked the highway departments to take on the task of performing the engineering tests on samples collected in their States.

Cur cooperative program with SCS has also expanded so that the Bureau of Public Roads now has the responsibility of making technical reviews of the engineering sections of the soil survey manuscripts prior to the publication of the bulletian.

Naturally a program as large as the National Soil Survey, where the engineering sections of hundreds of soil survey manuscripts are in various stages of development at anyone time, has many administrative problems. You soil scientists and people from the Washington office assembled here could correct many of Public Roads problems in connection with the program and I couldn't let this opportunity slip by without asking each of you to do some or all of the following:

1. Inform us when sampling is completed in a county. We can then judge as to the necessity of preparing a consolidated table of teat data.

2. Send samples, profile descriptions and air photos at one time. We in Public Roads, and I am sure most State highway departments, prefer to get the required items from a county all at one time and not in "dribs and drabs" over a period of several years.

3. Send only small samples of "B" and "C" horizons of modal profiles to the Bureau of Public Roads when the State highway departmanta are cooperating in the program. The highway departments should be given the large samples from all of the horizons eampled from the non-modal as well as the modal profiles,

4. Submit all of the required information as specified in SCS memorandum No. 7.

5. Inform us of the parent material of the sampled soils and the percentage8 and kind of material discarded in field sampling. The profile descriptions often do not contain this information.

6. Submit the required samples and related information as early as possible. We have 8 large backlog of tables to be prepared and we need sufficient lead time to prepare consolidated table8 of test data.

7. Consider SCS Memorandum No. 45 in the preparation of engineering sections. Better and more complete engineering chapter8 are produced when the chapter is prepared under the guide lines of SCS Memorandum No. 45.

8. List the engineering features of the soils rather than merely giving ratings when preparing table's of engineering interpretations. If ratings must be used the basis of the ratings should be stated.

The items that I have just read may sound like complain,& In a way they are. However, I should also like to read something else from a paper I have prepared entitled "Application8 of Agricultural Soil Surveys to Highway Geology" that I presented at Texas A 6 M last Friday.

> Since the inception of the cooperative program there have been over 10,000 sample8 taken for engineering tests in 392 counties in 47 States and Puerto Rico. Thirty-four State highway departments are cooperating in this program. Over 100 soil survey bulletins have been published containing an engineering section and 88 of January 1, 1963, 71 were being processed for publication.

This is a record in which 'I think we can all be proud. Certainly all, the work that has been done in the past in connection with the engineering chapters and a the work yet remaining to be done will be enormously beneficial to the eventual user of the assembled information.

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Land Classification Activities in the Bureau of Reclamation

John T. Maletic

May I extend my greetings and express my appreciation to you, Mr. Hockensmith, and to the Soil Survey Division for this opportunity to participate in your work planning conference. I am happy to be here because the Bureau of Reclamation has a continuing interest in the development and application of soil survey both at home and abroad, Much use of soil survey data is made within the Bureau...and to a large extent our water users depend on soil survey data along with land classification surveys in the layout of farm irrigation systems and the selection of management practices. We are, therefore, keenly interested in the progress of soil survey and in the development and improvement of methods and techniques.

For the participants from the Eastern States, the Bureau of Reclamation operates in the 17 Western States and its primary function is to plan, construct, and develop multipurpose water resource projects., We employ about 110 soil scientists.

The purpose of our land classification is to select lands suitable for sustained production under an *irrigation regime. The* requirement for such a survey is set forth in the Federal Reclamation Laws. These laws specify that all lands on an irrigation project must be classified with respect to their capacity under a proper agricultural program to pay water charges and adequately support a farm family. Under that concept we have developed an economic land classification which is performed on a team basis involving soil scientists. agricultural economists, drainage engineers, layout engineers, and hydrologists. The accomplishment of a land classification survey for irrigation that involves a contribution from many disciplines assures that the land resource8 allocated to irrigation development will achieve defined development goals.

We make three types of land classification. They are identified simply as reconnaissance, semidetailed, and detailed. Reconnaissance surveys are used to select areas which seemingly have a development potential. They are frequently applied to evaluate the potential within a river basin or major subbasins. If reconnaissance studies show promise of achieving local and national development goals, then more detailed studies are subsequently performed, The detailed land classification is made on aerial photographs having a scale of 400 feet equals 1 inch and is supported by topographic maps of the same scale having a contour interval of 1, 2, or 5 feet, depending upon both macro and microrelief.

The land classifcation survey is guided by certain fundamental principlea. Coals need to be established and these goals will influence the choice of the land resources to be included in any project plan. In the United States, plans are usually selected which achieve economic efficiency, where benefits exceed costs by the maximum amount. At other times and placer other social objectives may be more important. Different plans era needed when social goals include maximum employment opportunities, development of a self-sustaining dietary balance, economic growth, or a redistribution of income. Consideration of the goal involved is particularly important when working in foreign lands. Therefore, when land class differentiae are being selected, we must be ever cognizant of end adjust to the goals of people, and to the technological, institutional, and social factors operating within their environment.

Within such a context, pertinent principlea involved in selecting lands for irrigation can be specified.

First, the soil and water resources should be efficiently combined by an engineering and settlement plan that beet meets realistic, initially attainable goals of people. We cannot reach out and map conditionr anticipated so far in the future that we have an impractical basis for guiding development.

Second, the lend selected for irrigation should be permanently productive under the change in physical regimen anticipated under irrigationTherefore, land classes must express a prediction of future soil-weter-crop interactions. Under irrigation we are interested in diagnosis, but more importantly we must think in terms of prognosis. For example, the fact that a soil initially contains a salt level of 20 millimhos/cm, as measured on a natureted extract, is not an adequate basis for a declaration of nonirrigebility, because under good drainage condition8 it might be possible to leach the salts with 2 or 3 feet of water passing through the Soil profile. Therefore, our concern must be with the ultimate equilibrium conditions.

Third, the land classes should be defined to allow delineation of mutually exclusive classes. This ideal is difficult to realize with the lendscape as our universe, but it nevertheless is fundamental thet we approach this ideal as closely as is practically possible.

Fourth, relevant and mappable land characteristics should be chosen at a given time and place to comprise the set of land class differentie. These will not be the same in all places. In the Pacific Northwest we are interested in frost pockets and apple orchards. We are not on the Great Plains where e 'general crop and livestock economy prevails. Similarly, a 30 percent slope in the Pacific Northweet on apple orchards is entirely suitable for irrigation under the climatic conditions and the prerent state of technological development occurring there. Because of the much greater erosion hazard, it would be unwise to map land in Texas as irrigable on 30 percent slopes. Hence, irrigable lands in Texas are usually limited to slopes of 2 to 3 percent.

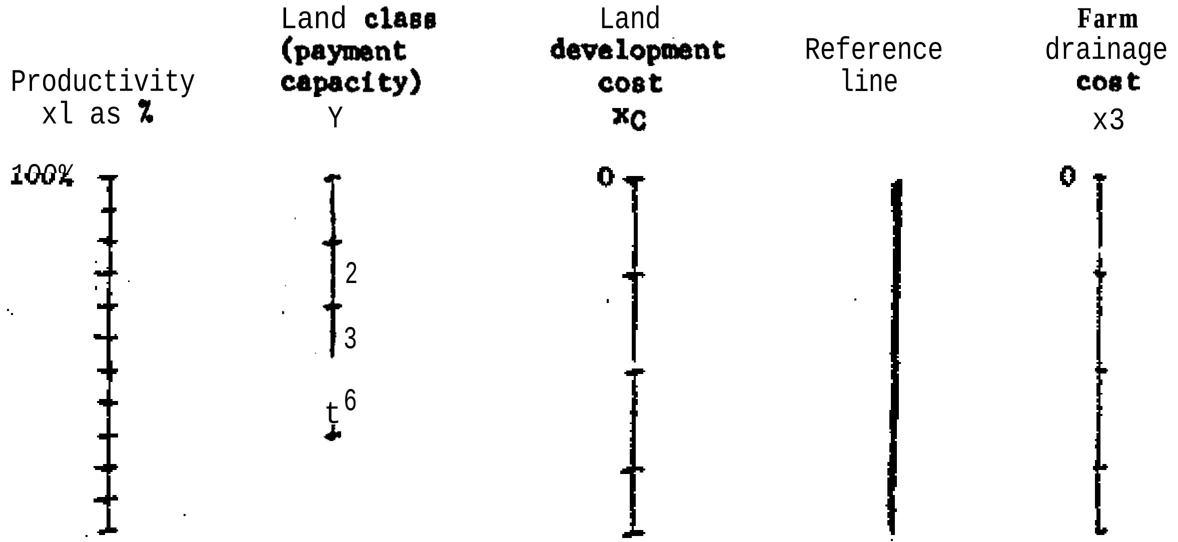
Fifth, knowledge regarding all relevant land class determining factors usually will not be available at the onset of the land classification survey, and therefore, revisions and adjustments in class differentiae will be required as the survey progresses. Here 1 would like to stress 'that the availability, of a basic soil survey is of great assistance in selecting and defining class differentiae.

Sixth, economic and physical factors are correlated in land classification by the relationship of physical conditiona to anticipated production, cost of production, and cost of land development at a selected level of managerial ability and technological development, This is a cardinal principle,. for it provides the conceptual basis for the amalgamation of soil science witb economics and agronomy.

Seventh, the extent and degree of correlation between economic and physical factors are more important in areas having a developed, complex economy. If we are working in California, we need one set of correlation factors between the economic and physical factors, based on the surrounding, already developed agricultural economy, so tbat the project can be best fitted into the existing pattern or into anticipated, realistic shifts of that pattern. If we are working in Ethiopia, we are interested in new economic opportunities for that country, and therefore, wa would strive to find the beet locations for irrigation developments, the best place for dryland agriculture...or more broadly a blueprint for the best use of land. 'In this case, quite a different set of factors would be involved in the correlation.

lastly, land classification should proceed in two basic steps. The first we identify as arability and the second as irrigability. In the first step, lands suitable for irrigation development are'delinaated. In the second step these lande are pared.. . tbe uneconomic incremante 'are eliminated, canal elevations are set, turnout elevations are set, water supply limitations are taken into account, economic feasibility and justification are measured, and on these bases we ultimately select a specific irrigable area suitable for development. That, in brief, covers the working principles.

In the Bureau of Reclamation land classes are defined on tba basis of payment capacity determined by use of farm budget analyses. We define payment capacity as the amount of farm income remaining after all other obligations on that income are met except the coat of water, Land class is. defined as a category of lands having similar physical and economic characteristics which affect tbe suitability of land for irrigation and which express a relative level of payment capacity.' On that basis we can write a formula having the general form $Y = k + aX_1 + bX_2 + cX_3$. ..wbich you will; immediately recognize as a multilinear correlation equation. However, our constants are not derived by statistical analysis--tbey are derived tbrougb farm budget analyses. Tbe equation can be arranged to.define our land classes and land subclasses.. . the latter being a category within a land class that identifies a deficiency or deficiencies responsible for payment capacity lower than that of Class 1. Thus, $Y = (aX_1 - k) - (bX_2 + cX_3)$, where Y is the payment capacity, Xl is the productivity rating, X_2 is the land development cost, and X_3 the farm drainage cost. The constants a, b, and c may be interpreted in the usual manner as net regression coefficienta. Tbe value "k" is the hypothetic&value of payment capacity wben the productivity index; drainage, and farm development coats are zero. The above equation, can be readily nomographed for various project conditiona as shown in this example:



The economic parameters on the scale can be directly replaced by physical factors, thereby achieving a correlation betwaen productivity, cost of production, land development costs and soils, topography, and drainage. The productivity level will depend upon the integrated effect of the whole soil profile as measured in terms of the selected class differentiae. Were the soil survey is of peat value to us, as those of you with whom I have worked in Nebraska and Kansan are well aware. The land development coat6 principally include land grading, 'farm ditches, and farm structures, while the drainage coat6 include surface and subsurface drains., Moreover, our lend classes can also be uniquely shown a6 occupying, by definition. a specific area on a three-dimensional block diagram. On such a diagram, the 2 axis would represent the payment capacity level, the X axis the combined costs for land development end drainage, and the Y axis the productivity.

As used by the Bureau of Reclamation, Cle66 1 baa the highest level of irrigation suitability; hence the highest payment capacity. Class 2 ha6 intermediate suitability and payment capacity. Class 3 has the lowest suitability and payment capacity. Class 4 designates special use classes such a6 4F fruit, or it is used to designate lend with excessive deficiencies which special enginesring and economic studies have shown to be irrigable. Class 5 is used a6 a temporary designation for lands, requiring special studies before a final land class designation can be made, and Class 6 is land not suitable for irrigation development." On the economic level, the Class 6 Lands are those which do not meet the estimated overage annual operation, maintenance, and replacement costs.

This is a very exciting time to be involved in the application of soil science. New development6 in clay mineralogy and in the physical chemistry of soils have now out-dated quality of water rating schemes. Formerly the primary basis for rating6 was laboratory analyses of water samples and an interpretation based on crudely defined "average conditions" in the field. We can now study individual soil-water reactions and determine whether or not a given water supply will favorably react with a given 6011. For their contribution6 to such new developments, we owe a debt of gratitude to the research workers at the U. S. Salinity laboratory. In South Dakota we have a case where an irrigation water ranging in concentration from 400 to 1,400 ppm and containing about 6.7 miliequivalents of residual sodium carbonate with a sodium absorption ratio of about 13 can be safely used for irrigation on soils having a clay mineral which will be only moderately expansive.

Other important developments involve the result6 of studies in unsaturated flow theory.. .work that is now being intensively pursued in many soil physic6 laboratories. We have also 6een the development of good field method6 for measuring permeability. Formula6 for computing the spacing of subsurface drain6 have removed some of the "art" out of drainage design and substituted more science into the engineering. Excellent work is being done regarding the leaching of soils. Studies under way on miscible displacement and the prediction6 of quality of percolating waters promise to be most useful. Cation exchange is becoming better understood with respect to both nonequilibrium end equilibrium conditions. Procedures also have been developed to predict rise in groundwater levels.

All these development6 are making it possible to better select land6 suitable for irrigation use. Those of us engaged in delineating the landscape for useful purposes will need to continually keep abreast such development6 if we era to improve the predictions we are asked to make.

In closing, I would like to describe some of the uses made of soil survey date by the Bureau of Reclamation. First, your maps are frequently scanned to determine where materials can be selected for construction purposes. Secondly, soil survey data are used in design flood studies wherein infiltration rate6 are related to soil series and types. We use the Soil Survey Manual definition6 to describe soil profiles for land classification purposes. Productivity rating6 are worked out in various areas according to soil series and types. I have also had the pleasure to work out, with some of you present here. a coordinated approach to the selection of irrigable land6 by the development of mapping legend6 that meet our joint needs.

I think we have some common problems, and I would like to mention a few. One involve6 training soil scientists; the other involve6 the entrance requirement6 for soil scientists into soil science positions, which are indeed set low. We are faced with a challenge, end so are our colleague6 et the land-grant universities.

In the matter of programing and scheduling of work, I would like to point out that the Bureau of Reclamation is now studying the critical path method of programing end scheduling investigation work. It has already been applied to construction. In this method, all pertinent activities needed to complete e 'job are listed in chronological order. A line is then drawn through those critical activities which must be completed before en ensuing step can be taken. It holds promise of removing the bottlenecks that so frequently delay completion of a report.

In closing, I want to thank you for this opportunity to discuss our method6 with you. I em looking forward to participation in the committee meetings... thank you.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
Chicago, Illinois, March 25 - 29, 1963

Report of the Land-Grant College Representative of the Nor theastern Region

R. P. Matelski

Thank you, Mr. Hockensmith. Mr. Hockensmith used to be my old boss in the dirty thirties and at that time we ueed to call him Hockey. It appeared he would hock our expense money -- we started off with $4.00 a day per diem and then we would get reduced to $2.40 a day, then finally the minimum -- zero per day.

Mr. Hockensmith asked me to speak about what we did up there in '62 in our Northeastern Regional meeting. We said, why don't you just review what You did up there. That was before I saw the program this morning when I noticed that he had several of our Northeast guests on the program -- Adrian Pelzner, Dr. Guy Smith, and Double A Klingebiel, not to be confused with single A Kling. This kind of extra speechmaking I wasn't prepared for, it reduced my speech considerably. Then, too, I looked over the program and I noticed tbat a lot of what we're going to be doing here in committee reports are also what we did in the Northeast Region. We did have laboratory characterization, soil texture, technical monographs, and soil survey in urban-fringe areas committee reports. I thought 1 wouldn't speak much on these as we'll be going over these in considerable detail. That didn't leave me much to speak about. There were few other committee reports that were made by our Northeast group. There was this one on benchmark soils. We did have a committee on benchmark soil reports and Dr. Pomerening of Maryland headed that group, and I suppose 'you have all seen the new Caribou Report. I don't know how many of you got this report but this was the combined effort of Canada as well as the State of Maine. We have a list of priority benchmark soils that we're working on and I recall there was some discussion by Baur, Paschall and Garland about whether or not these series would exist for a year. Now Marshall of New York -- the Stete soil scientist of New York, not our Olympic athlete from Penn State -- reported on improving soil survey operations and I imagine E. Templin has received some of that information on shaping and reshaping soils, I think we in the Northeast came up with some names -- made lend, made soil, or a phase of a series along with definitions, for these three groups.

There has been a lot of telk about correlation here today. I want to talk about it some more. I think there is a correlation lag from the intermediate to the final. In Pennsylvania we are still waiting for six counties -- Adams, Berks, Clinton, Columbia, Indiana, and Westmoreland. We are waiting for that correlation in six counties. We would like to get to know the names of some of those soil series that have recently been introduced, such as the one we don't like, Berks, ridges. Berks, ridges in Pennsylvania doesn't always seem to be on the ridges. There was a suggestion -- and 1 didn't hear it from Dr. Billy Ligon when he spoke -- but there was a suggestion by our group in the Northeast that a semi-annual report should come out on series revisions.

I think most of you know we do a lot of laboratory characterization work in Pennsylvania and I'm interested in laboratory characterization work. I have this observation along with some others -- and this is no offense to the engineers -- that it seems ve can get about 25 pages in the soil survey reports on engineering but only about a half dozen on soil characterization. We don't even get descriptions of the soils ve analyze in the report. In our laboratory work we use many methods -- many accepted methods - all accepted methods, I should say -- and Beltsville pretty much sets the standard for the use of these methods by our group at Penn State. I think I can make this general statement that for a large number of our soils in Pennsylvania most of the methods we use are poor. Take this simple one, pH. You've all done that one. In Pennsylvania ve are having a lot of trouble with that simple determination -- colorimetrically, which is what you field men use, is often a half unit -- a, half pH unit off, We also determine the pH in several ways electrometically. We determine it in the field as well as In the laboratory. I think I can say that in Pennsylvania most of the soils end up more acid when they are dons electrometrically in the laboratory. Something happens to that soil as It is air drying and moving to the laboratory. In Clinton County only 10 Of 137 of our lab samples agreed -- 70 percent were more acid. In Jefferson County, out of 95 samples, 84 percent were more acid and I can say that this is a general rule for many of the counties. I think this is probably true for all of the counties that we've sampled to date 'and these are on modal soils. There has been the suggestion that in place of water we use 0.01M. calcium chloride, and if time permits to also use 1N. KCl. These procedures, I believe -- I don't know nov -- are in the present 7th Approximation. Well, what happens to our soils in Pennsylvania when ve use either the 0.01M. calcium chloride or the 1N. potassium chloride? Practically all our soils, vbether they are limed. or unlimed become acid, In general, we lose at least one complete pH unit; that is, we go down from 6.5 to 5.5, from'5.5 to 4.5 with these procedures.

I want to say something on coarse fragments, In Pennsylvania, according to the CNI inventory -- or as Loughry has said, the seeing eye -- inventory, that Pennsylvania has over 50 percent -- or half -- of its soil in those textural designations as gravelly, slaty, shaly, channery, very stony -- those soils. It is important to us to estimate coarse fragments in soils. I think in general we can say when we use our best experience -- our correlators, our State soil scientist, our experiment station representative, in practically all cases, they are wrong. They are wrong in many cases by over 100 percent. That is, they may estimate the coarse fragments at 40 percent and it turns out they are about 15 percent. Now I'd like to tell this story about Dr. Baur on our Steinsberg soils. We examined the C horizon -- all of us who are supposedly experts. We examined this Steinsberg and came up in the field with 9 percent coarse fragments. We took that soil horizon to the laboratory and ran it under the accepted particle size distribution analysis and cane up with eero coarse fragments. This particular sandstone is veak and it is weak enough to melt away with water. I believe we've got to go further in our procedures to determine what we mean by the nature of coarse fragments. In many Pennsylvania soils we can't even get the 2-inch core, 3-inch core into the soil. There are, just too many coarse fragments. You might move the old core around to try and get a sample but that's not 'right but ve do' that. Or, like some of those from

Lincoln we might take out e clod, but e clod smaller then a hen's egg certainly doesn't catch many of those 3-inch fragments. That's a pretty poor estimation of coarse fragment8 -- using the clod method.

This same thing can carry over with bulk density. We have the same kind of problem of not being able to get the cores into the soil.

Each State representative in our Northeast Region gave a report on the current research et his station. Not all of them submitted a brief. I believe we need to go a little further than reporting on current research. We need to do something like they 8re doing in the West, They ere outlining the research to the future not just current research. At Penn State we are gradually catching up with the Midwest end the big State to the north, New York. We now have en Extension Specialist in soil survey end have just recently been publicizing, Dr. Steele, the Carbon County report -- publicizing it similarly to those in the Midwest end to that which I've been reading from Bikleberry. I think in Pennsylvania we have a first in that we have a PhD (that has concentrated his work in soil classification) assigned to a Stete Department of Aeelth, the Pennsylvania Department of Health, the sanitation division. It'8 up to him to set up soil standards for such things es sanitary land fills, septic tank drainage field8 end water use. He's celled into the Court8 quite a lot for refusing to OK certain rurben developments. Unfortunately, in some of these instances the lawyer decides -- or I should say the lawyer8 decide whether or not a piece of land will be used for septic tank drainage fields.

John Maletic this afternoon talked to you about upgrading Our soil scientists. Recently at Penn State we've come up with e preliminary program to upgrade Our professors -- send them to school. A8 a result of our soil characterization program et Pennsylvania, end this goes with, I think, what John Maletic has said, we professors are not skilled in all areas. We are particularly not skilled in type of clay analyses. At Penn State we have associated with us, Dr. Leon Johnson who has worked with Dr. George W. Brindley, a world-wide authority in type of clays analyses. Dr. Johnson will soon publish en article in the American Mineralogist On a regulerly interstratified 1 to 1 vermiculite chlorite in silt -- in silt; end, Pas&all, we wondered about tbe high cation exchange capacity in that Highfield soil in Adams County. Why could we get a cation exchange capacity of 12 milliequivelenta per 100 grams of soil with only 12 percent Clay? This is an explanation for that high cation exchange capacity. It's not coming from the clay, but rather from the silt.

I think in closing I would like to ssy that in this era of science we need to go beyond the visual. We do need the laboratory and beyond the laboratory we need research.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
Chicago, Illinois, March 25 - 29, 1963

Report of the I& Grant College Representative
of the Southern Region

Curtis L. Godfrey

This report gives the highlights of the recent coordinated activities, progress and plans of the experiment station representatives in soil survey in the Southern Region.

The biennial Southern Regional Soil Survey Work-Planning Conference met February 12-15, 1962, at Mississippi State University, State College, Mississippi, H. B. Vanderford, Mississippi State, Chairman; R. R. Covell, SCS, Vice-Chairman:

1. About 60 people from SCS and State experiment stations attended. All thirteen States had experiment station representatives present.

2. Strong interest was shown in general soil map6 of States and Of the region. Most States have a general State map completed or nearly so. The consensus was that the State maps should be completed as soon as possible but that uniformity of format among States is desirable. A regional map will be developed from the State maps. A committee now exists to coordinate all phases of this program and will report to the 1964 conference.

3. Interest in all States in engineering and other non-agricultural uses of soil survey was apparent, and the importance of this challenge to soil survey was stressed.

4. 'Accelerated programs in soil survey education are developing in most States as new soil survey reports are released. The need for a full-time well-trained extension specialist, with soil survey experience if possible, was stressed. such a specialist would coordinate all phases of soil survey education. Some States have extension staff with this responsibility but they usually are lacking in training and experience related to soil survey. A major effort of the national program should be to direct helpful information and suggestions to these people.

5. A special committee reported on the suggested outline for soil monographs end proposed areas of study. The committee recommended that the monographs be cooperative between federal and State personnel and that authorships be shared with State staff, including the S-14 group doing research on soil series characterization. (Harvey Oakes, SCS, and G. W. Kunze, Experiment Station, S-14, are now working on a monograph in Texas). It was further recommended that appropriate S-14 reports be accept& as regional monographs.

6. The need for better trained personnel in soil survey and related fields was stressed. Federal-State planning is needed on the content and level of courses in soil science, especially refresher courses for field and staff personnel. For whom, when, and where should refresher courses be offered? And what standards will the offering institution have to meet to satisfy all concerned? A cooperative program to develop incentive and to raise the standards for careers in soil survey would help colleges and universities induce students to take stronger undergraduate and graduate programs of training and to prepare for soil survey as a career. A program of financial assistance to graduate students sponsored by the national cooperative soil survey would make soil survey more attractive.

7. State soil-testing programs were pointed out as a potential source of additional soil management data which can be correlated with soil types in the region. Some States have soil type--soil test correlation programs.

8. The following committees reported to the 1962 conference:

I. Soil Survey Interpretation
II. Criteria for soil series, types, and phases.
III. Soil survey reports and maps.
IV. Assembling and interpreting data on key soils.
V. Soil surveys for forestry use.
VI. Soil structure
VII. Organic soils
VIII. Engineering application to soil survey.
IX. Improvement of soil survey procedures.
X. Improvement of methods of informing the public or users of information in published soil survey reports.

9. The following committees have been set up for the 1964 conference*

I. Climate in relation to soil classification and interpretation.
II. Made or shaped soils, classification and nomenclature.
III. Application of the new soil classification system (7th Approx.).
IV. Technical soil monographs.
V. Organic soil morphology and classification.
VI. Improvement of soil survey procedures.
VII. Soil survey reports and maps (set aside until after 1964 conference).
VIII. Application of soil survey to engineering and urbanization.
IX. General soil maps of States.
X. Soil survey for forestry use (dropped after 1962 conference, but now being reactivated because of Interest).

* A&M College of Texas
College Station, Texas
February 10-13, 1964
Chairman: J. R. Coover, State Soil Scientist, SCS
Vice-Chairman: C. L. Godfrey, A&M College

The State experiment station representative6 in soil survey in the Southern Region are responsible to the Southern Regional Soil Research Committee (SRSRC) made up of heads of Agronomy from the Land Grant Colleges and Universities and a representative from the Southern Region directors of experiment stations (Eric Winters, University of Tennessee). The SCS, TVA, Cooperative Extension Service and others also have representatives at the meetings of this committee. J. W. Fitts, North Carolina State, is the present chairman.

The committee meets annually, usually in October, to review research Progress and needs in the Southern Region. The State experiment station leaders in soil survey make up the Southern Regional Soil Survey Work Groups (SRSSW-G) of the research committee. The chairman of the work group (C.L.Godfrey, 1962-64)is customarily authorized to attend the National Technical Work-Planning Conference of the Cooperative Soil Survey.

At the 1962 meeting the SRSRC expressed interest in developing research related to urban expansion; soil engineering tests, standards and information exchange among agencies; and in techniques for defining soil management and crop yields in relation to soil types. The SRSSW-G has written a regional project on soil6 in relation to yields and soil management, but the project has not been approved by the research committee. However, the project has received favorable comment.

An "Advanced Science Seminar in Soil Clay Mineralogy" was held at Virginia Polytechnic Institute, July 2-28, 1962, for college and university personnel. This excellent seminar was sponsored by the S-14 group of the Southern Region and the National Science Foundation, Several soil survey representatives from experiment stations attended. This is an example of how Federal funds have been used for professional improvement of teaching and research personnel.

In summary, soil survey in the Southern Region is making progress. State experiment station people in soil survey and others in the Land Grant College and Universities are making a fine contribution. Rut a stronger source of direction is needed. Assistance from federal administrators in making our directors and department heads aware of our responsibilities and opportunities in soil survey would be appreciated.

The <u>cooperative</u> aspects of the National Cooperative Soil Survey needs more precise definition. The role to be played by all cooperating agencies needs to be spelled out.

Incentives for excellence are needed in soil survey, beginning in the classroom and extending to personnel In all agencies and institutions in the National Cooperative Soil Survey.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
Chicago, Illinois, March 25 - 29, 1963

'Report of the Land-Grant College Representative of the Western Region

Rodney J. Arkley

INTRODUCTION

The' Western 'Soil Survey Work Group operated as a subgroup of the Western Soil and Water Research Committee. during 1961-62. Activi ty of the work' group has been concentrated on the preparation of the Regional Soil Map for the Western United States, working in cooperation with State soil scientists of the Soil Conservation Service. Warren Starr continues as chairman of the group and reported to the National Work-Planning Conference at St. Louis on the initiation of the Regional Map project at Las Vegas in January 1960.

REGIONAL SOIL ASSOCIATION MAP

Since 1960, three meetings were held to work on the Mep Project, one in Salt Lake City in January 1962, another in Berkeley in October 1961, and a third in Las Cruces, New Mexico, in February 1962. In addition, several meetings of a smaller subgroup were held in the Northwest for map compilation and editorial work on the report to accompany the map. The soil map is now essentially complete. Thirteen associations of Great Soil Groups will be shown in color; these are essentially the same associations as reported by Warren Starr in 1960 except that areas of dominantly Regosolic soils are being shown separately from Lithosolic soils. Subgroups or subdivisions of soil associations are shown with line and symbol to differentiate predominance of soil groups within the associations or to show different proportions of inclusions of minor soil groups, The' report is nearly completion and is being edited and compiled under the direction of Warren Starr for submission to the Western Experiment Station Directors, who will h&idle the publication,

The proposed format for the publication is as follows:

TITLE: SOILS OF TBE WESTERN UNITED STATES
CONTRIBUTORS
INTRODUCTION
GENERAL DESCRIPTION OF THE AREA
- phyeiography
- Climate
- vegetation
- Relationship of soil distribution to physiography, climate and vegetation

OCCURRENCE AND DISTRIBUTION OF SOILS
- Group A. Light colored soils of the arid regions
  1. Morphology and distribution of Great Soil Groups
  2. Composition of soil associations

Group B. Moderately dark colored soils of the semiarid regions
1. Morphology and distribution of Great Soil Group
2. Composition of soil associations"

Group c. ....etc.

APPENDIX

I Descriptions of Great Soil Groups within the Western Region.
II Acreage distribution of soil association units summarized by states in the Western Region.
III Glossary of common and scientific plant names.

The sections included under Occurrence and Distribution of Soils include a detailed description of the area with respect to topography, climate, vegetation and soil parent materials, the morphology and genesis of the dominant Great Soil Groups, and a brief discussion of land use. The Composition of Soil Associations is treated in tabular form under headings of: map units, composition, distribution by states (including acreage), elevation, climate, native vegetation, physical characteristics, land use and land problems.

A greet deal of work has gone into the preparation of this map and report and we feel that it will be a valuable addition to the soils literature because it is a cooperative product of the efforts of soil scientists who are most intimately acquainted with the soils of the region.

OTHER ACTIVITIES OF THE WORK GROUP

In addition to our work on the Regional Soil Map, experiment station personnel are active in:

1. Developing date on bench mark soils for publication.
2. Compilation of analytical data for pedologic research and research planning in general.
3. Analysis of climate in relation to soil genesis and land classification.
4. Classification and interpretation of forest soils.
5. Studies on the relationships between soils, geomorphology and soil age.
6. Classification of soils in the 7th approximation.
7. Training in the use of soils information in Extension and Vocational agriculture,
a. Guiding graduate studies in soil morphology end genesis and their application to problems in soil classification, survey, and interpretation.
9. Application of soils information to watershed planning and management.
10. Interpretation of soil information for land appraisal and tax assessment.
11. Many other activities.

PLANS FOR THE FUTURE

With the completion of the Regional Soil Association Map, it has been proposed that the Work Group apply itself to the study of the distribution of soils shown by the map, and analysis of the soil forming factors responsible for the distribution. A suggested first problem is the study of soil-climate relationships of the region, using the climatic data being developed by tbe Climate Committee of the Western Regional Technical Work-Planning Conference for Soil survey.

DISCUSSION OF PROBLEMS RELATING TO SOIL SURVEY IN THE WESTERN REGION

Before coming to this meeting I solicited the views of the members 'of the Work Group for discussion here. I would like to read excerpts from two of their replies.

Quoting letter from Ellis Knox:

"The national cooperative soil survey needs n&of the highest competency who understand the whole range of soil survey activities. Although there are notable exceptions, it seems clear that it takes both field mapping experience and graduate work in soils end related fields to produce the level of competency that is needed in many poattions today. Yet we have too many men with either mapping experience or graduate treining but not both. Some inexperienced men with the M.S. degree move into field mapping, but very few or no inexperienced men with the Ph.D. degree do. Generally, a man with mapping experience must move into a graduate program to produce the combination that we need. This commonly means an S.C.S. men used to a full-time salary, with a wife, children, and perhaps a home of his own. The reluctance of such a man is quite understandable. Nevertheless, we need men with graduate training. What can be done to meet the need? You will note that this letter states a problem, but doesn't suggest any remedies."

Next I wish to read a paragraph from an author whose name I will not mention, for reasons which will become obviouo. I quota:

"Specifically, I am beginning to feel that interstate soil correlation, as it is now working, is more of a curse then a blessing. It appears that most states now have very little actual effect on the correlation of their soils, and that as a result soil series names are easily and very frequently changed. The consequence is that the research personnel who should be making good use of soil survey information are increasingly reluctant to do so because they recognize that these names lack lasting significance. I recognize that this is not 6 new problem. It is one which I once thought would resolve itself. Obviously it has not done so, at least in the ereas I am acquainted with."

I would like to comment on this problem myself. It appears to me that the abova comments have arisen primarily from the fact that too many decisions of soil correlation are being made at the Washington level and not enough at the state and regional level. This I feel is due to the fact that areas of responsibility and authority in dealing with correlation problems need to be more clearly spelled out and emphasized. We have a fine staff of state and regional correletors; of those with whom I am acquainted I feel that most ere fully as well trained and competent soil scientists as the Washington staff, especially with regard to soils within their area. As I see it, the areas of responsibility should be defined ebout es follows for maximum efficiency.

Washington level: Policy and procedures, international correlation, interregional correlation, regional correlation of soils with similar relatives in other regions not familiar to the regional correlator. Series level only.

Regional level: Interstate correlation, state correlation when soils have similar relatives in states not familiar to the state soil correlator. Series level only.

State level: All state correlation including series and mapping units.

I am sure that If the above outlined policy were adhered to as strictly as possible, the present delays in completing the final correlation would be largely eliminated.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
Washington 25, D. C.

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
Chicago, Illinois, March 25 - 29, 1963

SOIL SURVEYS - NORTH CENTRAL STATES

F. F. Riecken

The group from the North Central States that are here, Gerhard lee, John Elder and myself, are commenting on what we call NCR3, which is the North Central Regional Soil Survey Subcommittee. This is somewhat the same as the people from other regions have reported. Support for our regional work has come directly from the Directors of the Experiment Stations, and an such we are perhaps an official committee of the Experiment Stations and Directors of the North Central Region which includes 12 states. A North Central Regional Soil Survey Committee has been in existence since about the late or middle Thirties, indicating the interest of our Directors in the work of the soil survey as regional research and also a national effort. In its early years this Regional Soil Survey Committee dealt with policy end procedural items as well as sponsoring and encouraging interstate technical aspects of soil survey.

In later years our Directors have urged us to direct our interstate activities in soil survey towards some specific activity. As a result, the NCR3 Soil Survey Committee was formed. The publication in 1960 of "Soils of the North Central Region," NCR Publication No. 76, was supported by the Experiment Stations financially as well as through encouragement.

Currently we are in the process of developing several new interstate activities in soil survey. One is the preparation of a supplement to NCR76 on the crop yields of the major soil types and phases of the North Central Region. In December 1962 the NCR3 Committee met at the Soils Department, University of Minnesota, St. Paul, to discuss 'the outline and scope of this effort, prepare an initial list of soil types and phases etc. It is our plan to have a first draft ready by late 1964. Other activities in the process of development are as follows: (a) a compilation and examination of the data end criteria for "sandy" series of the region: (b) a compilation and examination of the data and criteria for the 'poorly" drained mineral series of the region. We expect to develop more firm outlines for this work at our next meeting.

It should be noted that the NCR3 Soil Survey Committee is not composed solely of state soil survey personnel. You may note the contributors to NCR Reg. Pub. No. 76 are listed alphabetically. It is headed by Dr. Aandahl, with second place to J. K. Ableiter. As I understand it, they represent a broader group, a joint Experiment Station-USDA regional research committee.

The state soil survey people participate in the North Central Regional Soil Survey Workshop. Normally our NCR3 So11 Survey Committee meets and conducts its work during the same week as the regional workshop. The state soil survey people are keenly interested in the Regional Soil Survey Workshop. Our Directors have given us excellent support in participating in the Soil Survey Workshop if state representation and attendance at these workshops is en indication of their support.

At the National Soil Survey Work Planning Conference, the participation of the North Central Regional state soil survey personnel has also been a continuing one, if record of attendance and committee assignment and participation are indicators of interest and contribution.

The interest of the state soil survey personnel of the North Central Region, and the support of our Directors for our attendance, indicates also that the Regional Workshops and the National Work Planning Conferences are important vehicles to improve and develop technical standards of soil surveys. There would seem to be no doubt that the North Central Regional soil survey personnel favor their continuance.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONF'RRENCR OF THE COOPERATIVE SOIL SURVEY
Chicago, Illinois, March 25 - 29, 1963

Soil Survey Interpretations

A. A. Klingebiel

One of the most important tasks facing us today in soil survey interpretations is that of developing and coordinating full interpretations for key or benchmark soils within major land resource areas both within and between States. Although we can expect aome differences in our interpretations for the same soils in different survey areas, we should have some justification for these differences. Summary tables of our interpretations by kinds of soil within land resource areas will not only make it easier to devolop our interpretatlona for handbooks and soil survey manuscripts but they will help us to develop more accurate interpretations. Good aoll lnterprctatlons properly coordinated will speed up and improve our work in soil correlation. It is essential that our interpretations be coordinated if we are to use them in river basins work, conservation and development and in cropland conversion programs in the various Staten. In addition these summary tables of interpretatlon will help to keep us from printing information that will haunt us a few years hence. Crop yield estimates, woodland interpretations, engineering interpretations, capability groupings and urban interpretation8 are among the more important interpretations that should be daveloped by resource areas for the benchmark soils. These items need immediate attention.

The quality of soil survey manuscripts has improved greatly over a few years ago; however, there is still some room for improvement. Soil descriptions are much better than they used to be but problems still exist with some of the sections on interpretations. Engineering interpretations are now included in most reports and woodland and range interpretations are included where they are an important laud use in the area, Urban interpretations are now placed in surveys that include or are adjacent to metropolitan areas. Interpretations for recreation and wildlife uses are also being included in many reports. We need to continue to provlde guidance to authore who are writing soil survey reports.

We are in the process of preparing another report writer's handbook. The principal soil correlators and a few State soil scientists have had an opportunity to review a draft of this handbook recently. After further adjustments aro made as a result of these reviews, this handbook will be reproduced. It will be available to the field within a few months.

A great deal of progress hae been made during the past two years in getting published soil surveys underetood and used in the field. Most States have now adopted a procedure for distributing published soil surveys.

Published soil surveys are now being used in our farm and ranch planning work. A study completed recently by a committee in the Washington office indicate6 that in a number of areas the maps at the printed scale can be used directly in planning. This will raeult in a saving of both time and money. The published surveys are also proving to be very useful to both the work unit conservationiet end to the landowner and operator.

We are in the midst of developing soil interpretations for urban planning end development. Tbe work done in Ela Township, lake County, Illinois, was a big step forward. There is still much to learn. We must develop soil interpretations that are easily understood and that will be useful to urban plannere. We must work closely with these people and understand their needs if we are to make useful interpratationa. We can expect demands from many urban areas for soil surveys as a result of a recent decision by the HHFA to provide planning funds to local people.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
Washington 25, D. C.

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
Chicago, Illinois, March 25 - 29, 1963

SOIL SURVEY PUBLICATIONS, STATUS, PROBLEM, AND OPFORTUNITIES

J. Gordon Steele

We think we have problems in processing the reports that form part of the Published soil surveys. My duties include some attention to soil maps and legends as well as reports. I'll comment here on a few of the problems that I believe we can solve.

We have, as Dr. Kellogg mentioned yesterday, quite a stockpile of soil surveys on which field work has been completed but correlation has not yet been done. The exact number depends somewhat on the rules by which we count, but we can be sure it is greater than 100. This year we are sending 36 to the printer. At that rate we have a three-year supply on hand if no new surveys were being completed.

We have on hand, already correlated, moat of the soil surveys we will Bend to the printer in fiscal year 1964. The three-year supply, therefore, is enough for fiscal years 1965, 1966, 1967 unless we speed up the publishing process. Cur stockpile of partly processed soil surveys isn't nearly so valuable to us or to the public as a warehouse full of publications. A manuscript soil map, one copy in a work unit office, can be consulted by a user only with difficulty; a publiehed soil survey is available in libraries, and any reader can go there to see it.

The first problem is one of scheduling the manuscripts that come to the editor in any one work year. The schedule depends, of course, on the surveys corre- lated. A few manuscripts are delayed long after final correlation. Two surveys on the schedule for next year were correlated more than two years ago. One had to be deferred again because the correlation is still subject to amend- ment.

We need to name, in May or June each year, the eoil surveys to be sent to the printer in the following three years. The list for the year just ahead has to be a firm one; the list for the following year ought to have on it only surveys for which aerial mosaics are about completed; the list for the third year names the mosaics that are to be made this year. The mosaic is needed before final correlation is done, 80 the map work can proceed promptly.

A year ago we picked 49 surveys for the 1964 work year. Already 16 have dropped out of that schedule; three others can be added, fortunately, to give a working list of 36. Of the original list of 49, 7 intermediate and 5 final correlations were delayed too long, two correlations are still subject to amendment, and two manuscripts will be too late for the 1964 year.

Correlations are coming through too late to give the Cartographic Division the lead time they deserve on most Jobs. Final correlation is not yet complete for 5 surveys on the 1964 list, and only 4 final correlations have been" completed, without need for amendment, toward6 1965.

We have some problems in scheduling editorial work within our section. They are mostly internal and we need not talk at length about them. Each of you can help, substantially, by sending manuscripts on which the technical and scientific work has been well done. You are already doing an excellent job in most places. Quality of manuscript8 ha13 improved enormously in the last few years.

We have some difficulty-- I presume we shall always have-- because changes are made in a manuscript after it has been edited and typed. Late revisions on three this year were particularly disappointing. One required an extra week of work on the part of the editor after the corrected, edited manuscript came back. Kling told me that the changes were needed because significant changes in capability groups were worked out by agreement among the states concerned. The. work was done in a costly way, however; because a change in one capability unit must be made at least three or four places in a manuscript. The change is not just a clerical one-- an editor or some other responsible person must check the context and decide on the wording; The pay of an editor for a week, plus clerical support, added about $200 to the' cost of editing each of those three manuscripts.

I should like to mention, also, some of the things that can happen, after a manuscript goes to the printer, to delay publication. We have some troubles in scheduling with the Cartographic, Division the preparation of map negatives to match the time that galley proofs are handled in the editorial section. We are sending now many surveys to the printer before map negatives are quite complete. If negatives are finished by the time we complete work on the galley proofs, all is, well. We have,, however, some galley proofs that came in last September, but the maps are'not yet finished. There are good reasons for the delays; a wait for new photographs in Maine, and a new contractor for map work on one or two other jobs. The delays can be explained, but we wish they did not need to happen.. This year, we are sending several surveys to the printer "before map negatives are finished, so these scheduling troubles will continue at least through another year. people in the Cartographic Division know what is needed and have set up deadlines; I think they will meet most of them.

Another familiar item is the legend of conventional symbols that should accompany each set of field maps. The Cartographic Division needs exact information in order to decide what conventional symbols can be shown On-the published map. Slick spots, clay spots, and the classification of intermittent drainage often give trouble. Pipe lines and buried cables are important, but cannot be shown if they were not mapped consistently on the 'field sheets. It would help to have more definite information than we get on some Jobs,

Matching of soil lines has been a problem in a few places. A few soil maps were published that appeared not to match the contemporary published maps of adjoining counties. I think each State soil scientist has now designated some-one to see that soil boundaries join or that the differences can be explained. Little can be done if problems are found after a set of maps is sent to be compiled.

One more problem has to do with manuscripts'. I believe that authors and re-viewers should send more information about decision6 you have made, alter-. natives you have considered, and your suggestions about how details ought to be handled. We had a manuscript from one State not long ago in which several interpretive sections were given coordinate first-grade heads. We thought they should have second-grade heeds, grouped under a single one of first grade. We learned later that this particular detail of arrangement had been dis-cussed by the Assistant State Soil Scientist and the Experiment Station repre-sentative. They had agreed on the larger-than-usual number of first-grade heads, but had neglected to tell us. The editor, properly concerned with appearance of the table of contents, made changes that seemed reasonable to him. We changed back after the field review without much extra work, but another State representative had his prejudice confirmed that the editor in-sists on casting everything in one mold.' If we had known the background we could have followed the preferred arrangement in the first place. A longer memorandum to accompany some of the manuscripts, and some notes that tell what you have done and what you prefer, might save time for us and make your duties easier when the time comes to review edited manuscripts.

I can also offer some constructive comments. The quality of manuscripts is definitely increasing. Most of our authors are learning how to write good engineering, woodland, range, and wildlife sections. I often suspect that our interpretations for farm crops and pastures have not been improved quite 80 much 88 those for the other uses.

Capacity of our editorial section is greater than at any time in the last ten years, unless something happens to cause the section to fall apart. Therefore, we can handle more manuscripts next year than ever before. The schedules show, however, that no more will be available than we had last year. Moreover, as I mentioned earlier we are giving our Cartographic Divi-sion a short lead time on map work. The pinch is certain to continue for at least another year, but I hope it can be resolved. We will be asking in the meantime for manuscripts for 1965 just as soon as those final corre-lations are completed. We might need to ask for some ahead of final corre-lation. I hope that does not happen, but the editorial capacity was once a bottleneck, and we do not want it to become one again.

I believe my ten minutes have been used.

KELLOGG: First of all some have the idea that one cannot write a soil survey report without the final correlation. This would be true only if field correlation were so bad that the survey ought not to be published anyway. We obviously need more lead time in Cartographic and in Dr. Simonson's office and Dr. Steele's office, because lots of difficulties can arise on individual reports and maps. I think, Dr. Steele, we may need to get a little blt arbitrary about some of these late changes. Before you put a man on some changes for a week, give me a ring and maybe You won't have to do it! We cannot keep on making the changes and meet reasonable schedules.

I continually hear that the editors change the meaning of the writers. Sometimes maybe they do, but many of our report writers are masters of the ambiguous sentence. When a writer writes a sentence that means one of two things the second meaning never occurs to him. If the editors pick the wrong one, he complains . Some of our editors are a little bit busy with the pencil and do a bit more editing than is necessary. Recently we have gone over a few manuscripts and discussed the problem.,

STEELE: We're working on that.

KELLOGG: But most of this so-called change of meaning goes back to these ambiguous sentences. And I swear that If they were ambiguous to the writer they certainly were ambiguous to the State soil scientist, to the assistant State soil scientist, and to everybody along the line. I think some of these manuscripts are read in the State offices, and in the principal correlators' offices with the reader's mind on something else. Otherwise the ambiguous sentence would have been noted before they got to Dr. Steele's office.

UNITEDSTATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
Chicago, Illinois, March 25-29, 1963

Report of the Committee on Criteria for Soil Series, Types, and Phases

A. Objective of Committee: "This Committee was proposed in the fall of 1953 primarily to study the conflicting Use of Unconforming highly contrasting substrata as criteria for recognition of series in some groups of States and as criteria for phases in other."* It has continued to function since that time. It has enlarged its original scope to handle problems and recommendations of the Regional Committees that have reported on the same subject or on problems related. to criteria for soil series, types, and phases, including phase nomenclature.

B. Subjects discussed by Regional Committees: Committee reports were on hand from the Souther, North-Central, and Western Regions. Each of these report6 discussed contrasting substratum as a criterion for series or phase distinction and allowable ranges in criteria for soil series. In addition questions ware raised by the Western Committee concerning nomenclature of rockiness classes. The Southern Committee discussed the soil series as the lowest category In the soil classification system.

C. Discussion and recommendations: The Committee discussed the relationship between soil series criteria and the Revised System of Soil Classification. Because the differentia accumulated at the family level in the System are also soil series criteria, it was considered that many of the limits In properties of soil series are defined by the System. Once the System is adopted, discussion of series criteria will be confined to subdivisions of families. The Committee was of the opinion that different soil series criteria will be desirable in different kinds of families. It was decided that further discussion of soil series criteria should be deferred Until the next draft of the Revised System is available.

The definition of the control section In soils without argillic, natric, or spodic horizons, and fragipans was discussed. The Western States had proposed a control section between 10 and 20 inches below the surface and the North Central and Southern States preferred 10 to at least 36 Inches. It was agreed that the control section of mineral soils should be between 10 and 30 inches both for soil series and for soil families.

The position of "Soil type" in the Revised System of Soil Classification was then discussed. It was considered that soil type is stlll a useful expression although it does not constitute a category in the System.

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* Quotation from Committee report for meetings of March 15-20, 1954.

The Committee recommends that classes of rockiness should be redefined so that rockiness will be handled as a complex mapping unit. Thus the actual percentage rockiness could be used in mapping unit names, e.g., Toomes loam - 30 to 50 percent rock outcrop.

The need for climatic phases was recognized. The Committee recommends that a study group should be formed to compile both soil moisture and soil temperature data and to develop a systemstic program for obtaining additional data. The Committee considered that the extreme ranges in soil temperature and moisture conditions of some of our more widespread series should be investigated.

It is recommended that the Committee be continued with the following charges:

I. To develop guidelines for soil series criteria for use in the different classes in the Revised System of Soil Classification;

II. To examine the existing definitions of the concept of soil series as outlined in the Manual and the Revised System of Soil Classification and to explore its improvement.

D. Committee Members:

Roy W. Simonson, Chairman	A. J. Klingelhoets
R. J. Arkley	J. E. McClelland, Acting Chairman
R. R. Covell	A. H. Wscball
R. W. Eikleberry	F. F. Riecken
J. A. Elder	J. G. Steele
R. B. Grossman	

All members participated in the meeting except Dr. Roy Simonson.

Vistors participating in all or part of the Committee meeting at Chicago:

R. D. Hockensmith	J. T. Maletic
A. Leahey	M. E. Noble

E. The Committee report was accepted by the conference with no discussion.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF TEE COOPERATIVE SOIL SURVEY
Chicago, Illinois, March 25 - 29, 1963

Report of the Committee on Soil Surveys in Urban-Fringe Areas

This is the second meeting of the committee on Soil Survey in Urban-Fringe Areas. In the 1960 report, this committee recommended that regional workshops be used to develop interpretative sections for published soil surveys. The Ela Township, Illinois, James Island, South Carolina, and the Town of Hanover, Massachusetts, reports are good exemples of this work. Information, in addition to usual Soil characterization data, is being collected in areas where local organizations shared in the finance of soil surveys. Examples are soil resistance data, more refined depths to hard rock and more refined depths to permanent water table, degree of soil wetness, flooding frequencies, more intensive classification of disturbed soils and more precise information on soil suitability for wildlife, and plants of value in urban areas.

Committee Objectives

1. To devise guide lines, criteria, and standards for predicting soil behavior in uses that are unique to urban-fringe areas.

2. To prepare methods for presenting soil interpretationa and facilitating the use of soil maps in the urban-fringe areas.

3. To outline a system for the standardization of soil interpretations for nonagricultural uses.

The committee objectives reflect proposals submitted by regional committees. The Western States did not have a corresponding committee active last year; hence, no report was received from them. The committee thanks the Regional Committee for their report.

Action of Committee

I. Criteria and standards for predicting soil behavior.

A. Soil Corrosion potential classes. (Attachment A.)

The first approximation of a aet of soil corrosion potential claasee and their definitions was presented to the committee. The classes are defined in terms of texture, soil-drainage classes, total acidity, and electrical resistivity. Circular 579, "Underground Corrosion," U.S. Department of Commerce, National Bureau of Standards, was used as the primary reference.' The correlation between the classes and values of soil qualities on the one hand and the behavior classes on the other was questioned by members of the committee. Most members felt that results from more recent work in Texas should be Incorporated into the propoeed definitions.

The committee designated Messrs. Stout and. Templin to revise the proposed classes and definitions. They have been asked to report their results to Committee VIII - Application of Soil Survey to Engineering and Urbanization--of the Southern Regional Work Planning Conference.

Other regional planning conferences are urged to review the attached approximation and submit their reaction to the National Committee. It may be necessary to prepare two systems of classes and definitions in order to achieve a better correlation within the humid and arid eectione of the country.

B. Septic tank suitability classes. (Attachment B.)

Suggested criteria and standards for rating soil behavior for septic tank filter fields were prepared. A system for rating soils within the framework of three classes -- suitable, questionable, and unsuitable -- was adopted by the committee. The committee recommends that the conference accept thin scheme and present it to the agencies concerned for dissemination to their fieldmen.

C. Sewage lagoon classes. (Attachment C.)

Suggested criteria and standards for rating soil behavior for sewage lagoons were prepared. Three degrees of limitations were adopted. The limitations are baaed on permeability, depth to bard rock, slope, coarse fragments in the soil, and unified soil engineering classes. The committee recommends that the conference accept this scheme and present it to the agencies concerned for dissemination to the field.

D. Shrink-swell behavior. (Attachment D.)

A system for rating shrink-swell behavior of soils was presented. This system is based on the work of William T. Iamb and recommendations of the Federal Housing Administration. Four classes, defined by volume change (PVC ratings) are recommended by the Federal Housing Administration. 1/

The PVC soil meter, developed by the Federal Housing Administration, is used to measure the soil volume change. Several States have acquired this instrument, other States are encouraged to do likewise and gather data, so that a more complete correlation can be made between taxonomic units and PVC ratings. The committee suggests that the conference adopt the system proposed by the Federal Housing Administration with the modification that the classes be designated as low, moderate, high, and very high.

1/ Federal Housing Administration, FHA-701, Washington 25, D.C.

E. Presumptive bearing values. (Attachment E.)

An initial draft of a system for determining presumptive bearing values was presented to each member of the committee for review. Each committee member was asked to provide the chairman with their comments so that second approximation can be prepared. This second approximation will be submitted to the Regional Committees for their considerations during the 1964 conferences.

F. planting guides for ornamental trees and shrubs. (Attachment F.)

Dr. John Reteer, U.S. Forest Service, presented a report on the needs and uses of planting guides for trees and shrubs that are used as ornamentals and as sources of food and cover for wildlife. The committee recommends that the conference appoint a new committee to follow through On the recommendations listed In Dr. Retzer's report. The committee suggests that plant material, wildlife specialists, foresters, and horticulturists be invited to participate. The committee recommends that Dr. Retzer be considered for chairman of this new committee.

II. Guides for predicting behavior of benchmark soils for nonagricultural uses.

A Procedure for correlating the predictions made for key benchmark soils was presented. The uses considered are dwellings, with and without septic tanks, camp sites, picnic areas, play areas, wildlife - high and low land, light industry, and highways. Time did not permit much committee deliberations. It is recommended that the corresponding regional committees give this procedure attention at their next workshop.

III. Methods of presenting interpretations and facilitating the use of soil maps.

Mr. John Quay, Lake County Planning Board, presented an interesting report of how soil surveys are being used in lake County. Published soil maps, without photo background, were assembled together for Ela Township. BY the use of color, salient soil properties (one property per map) and interpretative suitability ratings for specified use were indicated. These maps were made by Mr. Quay from Information in the soil survey report and are being used by the planning boards of Ela County. The committee recognizes the usefulness of interpretative maps and encourages their use.

IV. Future status of committee.

It is recommended that the committee be continued.

Future Activities

A. General soil maps -- their use in directing the expansion of communities.

General soil maps are effective tools in preliminary planning. Furthermore, their use should be expanded. The committee needs to deal with specifications of these maps such as scale, size, legends, etc. A map of this nature is being developed in a multiple county area bordering the Cape Canaveral area in Florida. Experience from this and similar areas should be discussed by this committee and corresponding Regional Committees. Procedures and methods need to be circulated.

B. The committee ehould recognize the needs of potential uses in the urban-fringe areas. This may be accomplished by assembling the different interpretations now being carried out in various parts of the country, especially In the use of colored maps.

C. Continue with the development of criteria and standards for soil corrosion potential and presumptive bearing values.

The regional committees are encouraged to work on the future activities of this committee and prepare any necessary guidelines for soil Interpretation. The national committee plans to review the regional reports immediately after their distribution and act on their recommendations prior to the next national meetings.

D. The regional committees are encouraged to specify their research needs In order to develop a more effective andadequate source of data. There is much research information available that can be applied to our present needs. For example, water behavior in soil is basic to behavior of a septic field as a drainage or irrigation system. The Regional Committee8 are urged'to assemble available data that is useful.

E. Regional Committees are urged to discuss and develop training programs and develop training outlines that will be effective In preparing soil scientists to make adequate soil maps and interpretations.

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All members present at committee meeting.

Other conference members and visitors who assisted the committee:

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R. W. Eikleberry, SCS
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R. D. Hockensmith, SCS
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Attachment A.

SOIL CORROSION POTENTIAL

(First Approximation)

Soil corrosion is that quality of the soil that correlates with its conductivity of an electric current. The nature and amount of soluble salts that includes acidity together with the moisture content of the soil, largely determines that quality. Physical properties that have some influence on the soil corrosion potential are chiefly those that determine the soil's ability to transmit water or air. (Destruction of protective coating on pipes is a problem and probably involves soil stability.)

One means of measuring quantitatively the soil corrosion potential is in terms of resistivity to a flow of current. Also, total soil acidity is Correlated, roughly, to rate of corrosion. It is difficult to correlate rate of corrosion with 8 single physical property, but texture is an important factor with respect to its effect on determining the aeration, moisture holding capacity, and water movement propertiee. Soil drainage classes, as they reflect soil runoff, soil permeability, wetting and drying cycle, and internal soil drainage, are considered useful In evaluating the corrosion potential.

On the basis of data provided in the publication, "Underground Corrosion," Circular 579, U.S. Department of Commerce, National Bureau of Standards, five soil corrosion potential classes are described below.

1. Very low. - Well drained coarse-textured soils with little if any clay build-up in subsoil. Water and air moves through the soil rapidly. The total acidity is below 4.0 me. per 100 g. soil; resistivity at moisture equivalent (field capacity) is greater than 10,000 ohms. - cm.

2. Low - Well drained soils with moderately coarse- and medium-textured B horizons. Imperfectly or somewhat poorly drained soils with coarse-textured subsoils. Water is removed from the soil readily, but not completely. The Imperfectly drained sands are apt to be wet for significant periods of time, thus their corrosion rate may be higher than tests indicate. The total acidity ranges from 4.1 to 8.0 me. per 100 g. of soil; resistivity at moisture equivalent is 5,000 to 10,000 ohm - cm. (slightly corrosive).

3. Moderate - Well drained soils with moderately fine textured B horizons; moderately well drained soils with medium-textured subsoils. This group includes soils with sufficient pore space to retain significant amounts of moisture and soils that are wet for a small but significant part of this time. Also included are somewhat poorly drained soils with moderately coarse-textured subsoils. Water is removed from these soils slowly enough to keep them wet for significant periods, but not all of the time. The total acidity ranges from 8.1 to 12.0 me. per 100 g. of soil; resistivity at moisture equivalent is 2,000 to 5,000 ohm - cm. (moderately corrosive).

4. High - Moderately well drained fine-textured soils, somewhat poorly drained soils with medium and moderately fine-textured subsoils; poorly drained soils with subsoil textures ranging from coarse to moderately fine. This group include8 soils that remain wet for a large part of the time. The water table is commonly at or near the surface during a considerable part of the year or water passes through the soil profile slowly.

   The total acidity ranges from 12.1 to 16 me. per 100 g. soil; resistivity at moisture equivalent is 1,000 - 2,000 ohm - cm. (highly corrosive).

5. Very high - (Flue texture.)' The somewhat poor and very poor fine-textured soils which retain some moisture throughout most of the year. Mucks and peats also are included. Total acidity is greater than 16 me. per 100 g. of soil and resistivity at moisture equivalent is below 1,000 ohm8 - cm. (very corrosive).

It is difficult to secure perfect correlation between single property deter--minations and corrosiveness on all soil types. Single property determinations tempered by the knowledge of other soil properties that affect corrosion are useful in placing soils into relative corrosive classes. The study Of soil factors that affect the access of oxygen and moisture to the metal, the electrolyte, the chemical reaction in the electrolyte, and the flow of current through the electrolyte in relation to local use experience will help the soil scientist place the soils more accurately.

If predictions are to be made of the corrosiveness of metal conduits, it my be necessary to determine the soil corrosion potential of each horizon, to a depth where the conduits are to be placed. The 8011 corrosion rate of the soil 18 set by the horizon with the highest corrosion potential in the profile. (Corrosion tests are made at the depth at which the pipe is to be burled.)

Attachment B.

Suggested Criteria and Standards for
Rating Soils for Septic Tank Filter Fields

Rating terms are on the basis of 3 classes -- suitable, questionable, and unsuitable. 1/

Soil Permeability -- Moderate to very rapid permeability is suitable. The slower end of the moderate range (about 1.0 to 0.65 inches per hour) is questionable unless measured results of experience show the soil to be suitable.

Caution:-- Although the very rapid to rapid range of permeability is suitable it should be noted that a contamination hazard exists if water supplies, streams, ponds, lakes or water courses are nearby (See coarse textured soils).

Soil Percolation Rate -- 60 minutes per inch is the rate generally thought of as the dividing line separating soils that are suitable from those unsuitable. Experience has shown that there is a questionable range in the vicinity of approximately 50-90 minutes per inch.

The approximate relationship between percolation rates (minutes per inch) permeability classes (inches per hour) and suitability for absorption fields is as follows:

Soil Characteristics and Properties	Soil Ratings 1/		
	Suitable	Questionable	Not Suitable
Permeability classes and hydraulic conductivity rate (Uhland core procedure)	Rapid, Moderately rapid, and fast end of moderate; more than 1.0 inch/hr.	Slow end of moderate; 1.0 to 0.63 inch/hr.	Moderately slow and slow; less than 0.63 inch/hr.
Percolation rate	Faster than 50.0 min./inch	50 to 90 min./inch	Slower than 90 min./inch

1/ It is suggested that these ratings be called Soil Limitations and that the soils be rated Slight, Moderate, and Severe rather than Suitable, Questionable, and Not Suitable. (A.A.K.)

Ground Water Level -- A seasonal water level-of any kind should be at least 4 feet 1/ below the soil surface. Soils with higber water level6 (1 - 4 feet) should be rated as questionable depending upon the frequency of wetting or water level in the 1 - 4 foot depth. In the humid area of the United States, soil drainage classes may provide a clue to suitability. Well drained and most moderately well drained soils are suitable. Poorly and very poorly drained soils are 'unsuitable. Somewhat poorly drained and some moderately well drained soils are questionable.

Bedrock -- Rock formations or other impervious layers should be more than 4 feet below the bottom of the tile trench floor.

Creviced or Fractured Rock -- Coarse Textured Soils Creviced or fractured rock without an adequate soil cover will permit unfiltered sewage to travel long distances.' Coarse textured soils such as loamy sands, sands, and-gravel are relatively poor filtering materials and will permit unfiltered sewage to travel long distances. Ratings on the basis of permeability alone should be supplemented by a statement pointing out the hazard of contaminating nearby water supplies.,.

Soils Subject to Flooding -- These soils are unsuitable even if the permeability rate is suitable and the ground water level below 4 feet. Flood waters will stop the functioning of the filter field and will carry unfiltered sewage in the flood waters.; Also flooded area8 are not suitable for home sites.

Drainageways and Water Courses -- Not suitable.

Related Problems. -- Slopes of 0 - 10 percent are the most desirable from the standpoint of construction and successful operation of the filter field. Mechanical problems of layout and construction Increase with slope steepness. Lateral seep or flow down-slope is a problem on all slopes if bands of impermeable material in the 0 - 4 foot depth outcrop.

The problem increases as the slope steepens even if bands of impermeable material are not present. Large rocks, boulders; and rock outcrops increase construction costs. Trench lines can be installed and grade maintained around these obstacles on nearly level soils. On sloping soils the grade of the trench system cannot be maintained if the obstacle cannot be removed.

1/ Manual of Septic Tank Practice, U.S. Department of Health, Education, and Welfare, Public Health Service.

Sewage lagoon requirements and the criteria ueed in evaluating the degree of limitations of soils for developing lagoons.

Sewage lagoons require consider&ion of the soil for two functions, (1) as 8 floor for the impounded area and (2) as material for the dam. The requirements for the dam are the same as for other embankments to hold impounded water. There must be adequate suitable material for the structure available and it must be capable of holding water without seepage providing Proper construction methods are used. The material should be free of coarse fragments of the stone size (more than 10 inches in diameter). as they interfere with compaction processes.

Material of the Unified Soil Classification groups SC, SC, and SM are most satisfactory. They have little limitation for this use. The coarse groups with little of the fines (SW, GP, SW, and SP) have high limitations (they are poorly Suited). The groups consisting of soils high in organic matter (CL, OH, and Pt) also have high limitations and are therefore poorly suited. Soil material of the other Unified Classification groups (GM, CL, CH, ML, and MH) are suitable if used in combination with soils of the well suited groups, given above, CC, SC, and SM.,

Requirements of soil for basin floors of lagoons are: (1) Effective sealingagainst seepage, (2) even surface of low gradient, and low relief, and (3) little or no organic matter. Specifications for lagoons 1/ state that the liquid depth should be not less than 2 feet and not more than 5 feet; that the floor should be as level as possible and that the materials for the basin floor should be sufficiently impervious to preclude excessive liquid loss. This is especially important where the water supply is from shallow wells. Instructions for taking soil samples imply that this impervious material should be at least 1 foot thick. These requirements necessitate a system of 6 or 7 criteria by which to evaluate the degree of limitations for soils forming the lagoon impoundment site. These criteria are:

1. Permeability.

2. Reservoir site material.

The flrst is either measured or estimated by the rate water moves downward through the soil (Definitions of all classes for all criteria and the degree of limitation for each class are given in table II, attached).

The second is evaluated by the classes in the Unified Soil Classification system. These Unified system classes are grouped into three "degree of limitation" classes for evaluating quality of the reservoir site material. Those In the Low limitation class include soils effective in functioning as well sealed basin floors and are low in organic matter. The soils in the High limitation class are either too porous or are too high in organic matter.

1/ Community Sewage Systems "Design Guides for Sewage Stabilization Basins," Series No. 1833. December 8, 1960, Federal Housing Administration.

3. Depth to bedrock.

4. Slope.

Definitions of Limitation classes for these two criteria are determined by the rather strict specification for minimum and maximum depths for the liquid body of 2 and 5 feet. Slope and relief must be low enough and the thickness of material Over bedrock must be great enough to make practical, any necessary smoothing required to obtain the specified uniformity in depths of the liquid body. Where the soil material is deep, a greater slope or relief is allowable although it is impractical to consider slope of more than 7 percent. On the other hand, a nearly level surface permits a shallower depth of suitable soil material. Where the relief is so low as to require little or no smoothing, the thickness of suitable soil material generally need not be more than the 36 to 60 inch range. Surface runoff water must be kept from entering the lagoon. This becomes a more difficult problem on steeper slopes.

5. Organic matter.

Organic matter is unfavorable in the basin floor even though it is underlain by suitable soil material. It is unfavorable for proper bacterial action in the liquid body and specifications for lagoon construction require removal of organic materials from the basin before it is put into use.

6. Coarse fragments less than 10 Inches in diameter.

7. Coarse fragments more than 10 inches in diameter.

Content of coarse fragments is a less important criteria. It does contribute toward excessive permeability and the larger fragments Interfere with any manipulation of soil material that may be necessary in smoothing the basin floor.

Table II.--Property classes and degree of limitation classes for evaluating soils for sewage lagoons.

A.--Soil in place under embankment and impoundment

Significant Soil Properties	Class definition and degree of limitation for lagoon basin floors			
Permeability	Less than .8 inch per hour---SLIGHT	.8 to 2.5 inches per hour---MODERATE		More than 2.5 inches per hour---SEVERE
Depth to hard rock	More than 60 inches---SLIGHT	36 to 60 inches---SLIGHT	20 to 36 inches---SEVERE	Less than 20 inches---VERY SEVERE
Slope	Lees than 2 percent---SLIGHT	2 to 7 percent---MODERATE		More than 7 percent---SEVERE
Organic Matter	Less than 2 percent---SLIGHT	2 to 15 percent--MODERATE		More than 15 percent--SEVERE
Coarse fragments less than 10 inches in diameter	Less than 50 percent by volume---SLIGHT		More than 50 percent by volume---SEVERE	
Coarse fragments more than 10 inches in diameter	Less than .1 percent of the surface---VERY SLIGHT	.1 to 3 percent of surface---SLIGHT	3 to 15 percent of surface---SEVERE	More than 15 percent of surface---VERY SEVERE
Reservoir 1/	GC,SC,CL,CH---SLIGHT	GM,ML,SM,MH---MODERATE		GP,GW,SP,SW,OL,OH,Pt---SEVERE

1/ Undisturbed soil underlying the embankment and impoundment.

B.--Soil as a source of berm material.

For Berm Construction	GC,SC,SM---SLIGHT	GM,CL,CH,ML,MH---MODERATE	GW,GP,SW,SP,OL,OH,Pt---SEVERE

Attachment D.

SHRINK-SWELL BEHAVIOR CLASSES

Shrink-swell behavior is that quality of the soil that determines its volume change with change in moisture content. These groupings would facilitate the prediction of soil behavior for foundations (for light structures). Most damages to building foundations are due to shrinking of soils due to drying or swelling of soils due to wetting after construction. The volume change behavior of soils is influenced by the amount and kind of clay present in the soil. Thus, a knowledge of the clay distribution will help predict the soil's behavior.

Means for determining quantitatively the shrink-swell behavior are the PVC meter developed by the Federal Housing Administration* and the Shrinkage Index used by soil engineers. The Shrinkage Index is defined as the difference between-the Plastic Limit and the Shrinkage Limit.

Classes:

1. Low.--Soils with PVC ratings of less than 2, or shrinkage indexes of less than 5.

   a. Clay loam, silty clay loam textures with kaolinitic mineralogy predominating in clays.

   b. Silt loam, loam, sandy loam, loamy sand with any kind of clay.

2. Moderate.-- Soils with PVC ratings of 2 to 4 or shrinkage indexes of 5 to 7. Generally Includes soils with following textures and clay mineralogy:

   a. Silty clay loam, silty clay, sandy clay textures with predominant kaolinitic mineralogy in clays.

   b. Heavy silt loam and heavy loam textures with mixed mineralogy in clays.

3. High.--Soils with PVC ratings of 4 to 6 or shrinkage indexes of 7 to 10. Generally includes soils with clay loam and silty clay loam textures with mixed mineralogy in clay.

4. High. --Soils with PVC ratings of more than 6, or Shrinkage Index of more than 10. Generally Includes soils with clayey textures and predominantly montmorillonitic mineralogy in the clay fraction.

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* Lambe, T. William. The Character and Identification of Expansive Soils. Soil PVC Meter, Federal Housing Administration, FHA-701. Washington 25, D.C. (1960).

Attachment E.

Presumptive Rearing Values for Undisturbed Soils

(First Approximation)

Presumptive soil bearing value is that quality of soil that determines its ability to support a static load. For large structures, usually, the bearing strength is determined by detailed investigations, including borings at the site, tests in the laboratory, and careful interpretation of the findings. For lightly loaded buildings not over three stories in height, detailed investigations commonly are not made, partly because such investigations are expensive. Instead, "presumptive bearing values" are estimated on the basis of past experience, including correlations With given kinds and conditions of soils. Thus far, the experience has been related mainly to engineers' "kinds" of soils and not to USDA textural classes or to taxonomic units in our pedological system.

The method of Investigating soils for foundations moat commonly used is the "Tentative Method for Penetration Test and Split-Barrel Sampling of Soils" (ASTM Designation: D 1586-58; issued 1958). This method, commonly referred to as the penetration test, measures the "penetration resistance" at the same time that a core sample is obtained, or at least can be obtained. The number of blows required to drive the split-barrel 1 foot is the "penetration resistance." The outside diameter of the split-barrel is 2 Inches, the Weight of hammer is 140 lbs., and a blow is a 30-inch fall of the hammer. The "penetration resistance" expressed in the "number of blows" is related to the presumptive bearing values, although the relationship is approximate.

Presumptive bearing values are related not only to texture but also to density and consistence and possibly to other characteristics such as gradation and the presence of organic matter.

Engineers have related the penetration resistance to "consistency" in cohesive soils and "density" in noncohesive soils. Without reference data on soil taxonomic units, the estimation of "persumptive bearing value" of cohesive soils requires first an estimate of the consistence in a set of terms used by engineers; and in this connection, the engineering references are not entirely consistent. Tables 1 and 2 from the FHA publication (1961), "Engineering Soil Classification for Residential Developments," define consistency and density classes in engineering terms.

Table 1.--Consistency of Undisturbed Cohesive Soils

consistency	q_u (Tsf)1/	Rule-of-thumb	Blows per foot2/
Very soft!	0.25	Core (height = twice diameter) sags under own weight.	o - 1
Soft	0.25-0.50	Can be pinched in two between,: thumb and forefinger.	2 - 4
Firm (medium)	0.50-1.00	Can be imprinted easily with fingers.	5 - 8
Stiff	1.00-2.00	Can be imprinted with considerable pressure from fingers.	9 - 15
Very stiff	2.00-4.00	Barely can be imprinted by pressure from fingers.	i6 - 30
Hard	4.00	Cannot be imprinted by fingers	Over 30

1/ q_u is unconfined 'compressive strength in tons/sq. ft.

2/ Blows as measured with 2-in. OD, 1 3/8 in. ID sampler driven 1 ft. by 140-lb. hammer falling 30 inches. See Tentative Method for Penetration Test and Split-Barrel Sampling of Soils, ASTM Designation: D1586-58T.

Table 2.--Relative Density of Cohesionless Soils

Term	Rule-of-Thumb	Blows [1/] per foot
Very loose	- - -	0 - 4
Loose	Easily penetrated with 1/2 in. reinforcing rod pushed by hand.	5 - 10
Firm (medium)	Easily penetrated with 1/2 In. reinforcing rod driven with 5-lb. hemmer.	11 - 30
Dense	Penetrated a foot with 1/2 in. reinforcing rod driven with 5-lb. hammer.	31 - 50
Very dense	Penetrated only a few inches with a 1/2 in. reinforcing rod driven with 5-lb. hammer.	Over 50

1/ Blows as measured with 2-in. OD, 1 3/8 in. ID sampler driven 1 ft. by 140-lb. hemmer felling 30 in. See Tentative Method for Penetration Test and Split-Barrel Sampling of Soils, ASTM Designation: D 1586-58T.

Note: The rules-of-thumb shown in column 2 are given merely as an example of one of numerous simple field procedures that are in current use for selecting an adjective to describe density. Many other procedures are equally as good, end column 2 is not intended to establish a preferred method. The results of the penetration test, as shown in column 3, are widely accepted as a standard for the terms shown in column 1.

On the basis of inferences from consistency and density tables and allowable bearing value tables in a few municipal building codes the general bearing value classes are described in Table 3. Each class is defined first in broad classes of "penetration resistance" in pounds per square foot. General relationships between presumptive bearing value classes and USDA texture classes as modified by consistency; density, and penetration tests also are listed in Table 4. These classes are provided for classifying taxonomic units when predicting behavior of soils to support lightly loaded buildings not over three stories high. The values are for conventional spread footings at ordinary depths, generally less than 6 feet. Each major horizon should be rated, but the value assigned a soil should reflect the weakest layer. Soil wetness affects the consistency; usually cohesive soils test soft and very soft only when wet. Cohesive soils with fluctuating or perched water table (somewhat poorly drained) that may test stiff or hard during dry seasons of the year should be downgraded 25 to 50 percent in order to reflect the bearing characteristics when wet.' Bearing values of mineral layers high in organic matter (more than 5 percent) should be reduced by 25 percent.

The consistence terms, such as soft, firm, etc., and the density terms, such as loose, firm, etc., are used according to Tables 1 and 2.

Table 3.--Presumptive Bearing Value Classes

Classes:

1. Very high: Presumptive bearing values 12,000 to 16,000 psf (pounds per square foot). Includes:

Sandy clay loams and loams	That are well graded and stiff (16-25 blows)

2. High: Presumptive bearing values 10,000 to 12,000 psf. Includes:

Sends and gravels	That are well graded and compact (31-50 blows)
Loams, sandy clay loams, and clay loams	That are poorly graded and stiff (16-25 blows)
Sandy clays and silty clay loams	That are hard (26+ blows)

3. Moderate: Presumptive bearing values 6,000 to 10,000 psf. Includes:

Sands and loamy sands	That are well graded and firm (11-30 blows)
Silts and fine sands	That are very compact (more than 50 blows)
Clays	That are hard (26+ blows) (non-expandable)
Loams, sandy loams, silt loams, and clay loams	That are stiff (16-25 blows)

4. Low: Presumptive bearing values 2,000 to 6,000 psf. Includes:

Gravels and sands and loamy sands	That are loose (less than 100 blows)
Sands and silts	That are compact (16-25 blows)
Clays	That are stiff (16-25 blows)
Loams, silt loams, silty clay loams, and clay loams	That are soft (3-5 blows)

5. Very low: Presumptive bearing values less than 2,000 psf. Includes:

Silts and fine sands	That are loose and poorly graded (less than 10 blows)
Clays	That are medium and soft (less than 15 blows)
Sandy loams, loams, silt loams, and clay loams	That are very soft (less than 2 blows)

(Note: Probably need but three classes.)

Table 4.--Presumptive Rearing Values, by Texture and Consistence (for Cohesive Soils) and Density (for Non-cohesive Soils)

Texture (USDA)	Consistency (for Cohesive Soils) or Density (for Non-cohesive Soils)	Blows	Presumptive Bearing Value (Class)
Gravels	Well graded and compact	31-50	High
"	Loose	<10	Low
Sands	Well graded and compact	31-50	High
"	Well graded and firm	11-30	Moderate
"	Compact	16-25	Moderate
"	Loose	<10	Low
Fine sands	Very compact	>50	Moderate
" "	Loose and poorly graded	<10	Very low
Loamy sands	Well graded and fins	11-30	Moderate
" "	Loose	<10	Low
Sandy loams	Stiff, well graded	16-25	Moderate
" "	soft	3-5	Low
Loams	Stiff	16-25	Moderate
"	Soft	3-5	Low
"	Very soft	<2	Very low
Silts	Very compact	>50	Moderate
"	compact	16-25	Low
"	Loose and poorly graded	<10	Very low
Sandy clay loams	Poorly graded and stiff	16-25	High
Silt loams	Stiff	16-25	Moderate
" "	soft	3-5	Low
" "	Very soft	<2	Very low
Clay loams	Stiff	16-25	Moderate
" "	Soft	3-5	Low
" "	Very soft	<2	Very low
Silty clay loams	Hard	726	High
" " "	Soft	3-5	Low
Sandy clays	Hard	>26	High
Clays	Hard	>26	Moderate
"	Stiff	16-25	Low
"	Medium or soft	<15	Very low

Attachment F.

PLANTING GUIDES FOR ORNAMENTAL TREES AND SHRUBS[1/]

John L. Retzer - U.S. Forest Service

The subject of planting guides for ornamental trees and shrubs has many potentialities and ramifications. The number of people involved is tremendous and includes not only the consumer--the home gardener and amateur landscaper--but professional nurserymen, professional landscape architects, the pesticide industries as well as a slice of the fertilizer Industry. This field contains its dedicated professionals and amateurs as well as its share of quacks and charletans.

Few subjects have a larger literature in the form of magazines, guides, books; scientific journals, encyclopedias'and sophisticated treatment6 of an individual genus by people who have devoted all their life to a limited". facet of this field.

To isolate a topic from this vast array of information that would be of value to this committee is no easy job. Two possibilities seem to be exploitable.

First: In view of the recent emphasis on the expansion of recreational opportunities on rural privately owned land under the Department's RAD, or Rural Areas Development, program there seems to be an opportunity for this committee to make a contribution that could be important to the success of this program.

Second: There is a similar movement underway for public lands at all levels. of government but particularly those in the Departments of Agriculture and Interior. These programs show promise of becoming really important because of the emphasis that can be generated from centralized directives and already established field organizations. The success of these efforts can be significantly dependent on technical advice and consultation of soil scientists and their committees.

We will restrict this discussion to certain facets of recreational developments on public lands.

Recreation on Public Lands

First, recreational areas on public lands will require a certain amount of landscaping. Shade will be required. In the layout or design of concentration areas it will be necessary to restrict use of certain sections and direct use to other areas. This can be done with shrubs of certain kinds. Sanitary facilities, etc. will need be masked. The central attraction of

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1/ Section G report for Committee on 8011 Surveys in Rural-Urban Fringe Areas. Rational Conference of Rational Cooperative Soil Survey. Chicago 1963.

moot such areas will be water, either natural lakes and streams or artificial ponds and lakes. Here the aesthetics will be closely equated to the landscape use of tree end shrubs.

Second, there will be an ever-increasing demand for the extensive type of recreation on public lends--namely, hunting. The success of this enterprise whether it be birds, small game or large game depends on suitable habitat end this means cover and food. The success of food end cover plantings on large or small areas can be strongly influenced by the selection Of the proper plantings for the soil in the area.

The programs will be successful end most economicalto the extent that local trees, shrubs end herbeceous food plants are utilized. Some exotics will be very successful end some will be a must in any program but they will usually be more expensive than the natives. It follows that the soil requirements of a great many plants will need be determined and catalogued and from this information planting guides can be developed.

In any program of this nature climatic edaptation is the foremost requirement of all trees end shrubs. Winter protection end frequent replacement is out of the question. Therefore, local shrubs should be given first consideration. It does frequently happen that many of the native shrub6 and plants have been eradicated by grazing and fire and will need be imported from other areas in which case it will be highly desirable to know the soils in which these shrubs are growing.

Status of Current Information

A number of studies end observations have been made on the soil requirements of specific plants. Some of these studies have been concerned with field and laboratory studies of specific soils end specific plants.

Bradley, Moyes and Flemming (1), conducted a greenhouse study of the growth of three varieties of azaleas on the Lonake, Dundee, Lentonia end Ruston soils in Arkansas. These soils differed widely in exchange capacity, pH, percent organic matter and exchangeable Ce, Mg and K. They found that the over-riding beneficial treatment was the addition of peat. It was beneficial even for those soils that had a low pH.

A greet many greenhouse studies of nutrient deficiencies of a great many soils have been made under the direction of J. Valamis et the University of California.

Box (2), reported an excellent study from San Patricio County in the Rio Grande Plain of Southwest Texas. In general, the soils were the Victoria, Monteola, Orelia, Leona, Frio end Lomalto, Nueces end Zavala. From our point of view, the chief limitations of the study were (1) vegetation was reported by vegetation types namely: communities of Mesqulte-buffalo grass, Chaparral-bristle grass, Bunchgrass-annual forb end prickley pear-short grass, (2) although the soils were carefully described end laboratory analyses made the results were reported as average values of selected soil properties rather than by soil series. Undoubtedly, the analytical information on plants and the laboratory analyses for soils are available in his raw data and could be assembled to provide a great deal of specific information for specific 80118 and plants.

A great deal of observational information is 'obtained during the course of soil surveys. For example, shrubby cinqufoil, Potentilla fruticosa, grows best in the moist zone along creek banks, around small lakes or depressions and on moist flood plains in the Rocky Mountains. Cliffrose, Cowania sp., grows in the Zuni Mountains only on dry soils from limestone. It has been reported that Flame azaleas grow dominately on the Belmont soils developed from limestone in West Virginia. This was also generally true of red bud. In the same location holly, Ilex ocapa, grows well on the DeKalb soils and not at all on the Ashby soils which are acid. In the Blue Ridge Mountains of Georgia and North Carolina redbud is most commonly found on soils from basic igneous and limestone rocks. This is also true of red cedar in that area. In the Umpqua area of Southwest Oregon rhodendodron and chinkapin grew densest and largest on the Acker and Vena soils which are developed from rhyolitic rocks. Jeffery pine and certain species of buck brush in this same vicinity grew beat on soils developed from serpentine and peridotite. Ceanothus velutinus grows abundantly on the Freezout and Dumont soils and much less abundantly on other soils in that area. There are numerous other similar examples In many soil survey reports which can be drawn upon as a basis for future research and for developing planting guides.,

Most of the more formal research in this field has been conducted by scientists in forestry, range, wildlife and especially by ecologists. Nearly all of this work has been oriented toward individual soil characteristics and correlations arrived at by the multiple regression type of statistical analyses. The concept of the series and phase has rarely, if ever, entered into the design of these studies.

Medin (3), studied the growth of Mountain mahogany, Cercocanpus montanus, in Western Colorado. The soils were derived from Interbedded sandstone and shales. The annual precipitation was 15.8 inches and 55 percent occurred between April through October. His general conclusions were that the most important factors were those that influenced the water holding capacity with soil depth being by far the most important single characteristic for both sandstone and shale. The clay content was important in soils from sandstone. None of the nutrients were limiting.

A study by D. R. Smith is currently underway for Mountain mahogany in the Front Range of Colorado on four recognized soil series. Tentative results indicate no differences between soils for height 'or crown diameter growth but there appears to be a significant difference in the numbers of plants growing on different soils;' The study is continuing.

Gibbens and Pieper (4), conducted a study in California of the effect of fertilization on Wedgeleaf ceanothus, Ceanothus cunestus, and Maripose manzanita, Arctostaphylos maripose, at two localities. Growth response was good but unfortunately the authors were apparently unaware of soils since they made no mention of the subject at all. This is an example of a study that could have been much more valuable to application and management if nothing more than the soil names had been given.

A great deal of recent work has been done on Bitterbrush, Purshia sp., because of its value for deer browse. In a general discussion Nord (5), states that "Bitterbrush grows best on coarse textured soils that are excessively drained, rapidly permeable throughout, and give a slightly acid soil reaction to a depth of five feet or more. Natural communities occur where the soil reaction is between pH 6.0 and 7.3 to a depth of at least three feet. The species do not generally develop where the soil is either saline or calcareous within three feet of the surface or where the soils are either imperfectly or poorly drained."

Many of the horticulture and landscaping plants now in use were collected from the wild. A great many more such as Mountain mahogany cliffrose, bitterbrush, etc. offer excellent possibilities for landscaping recreational areas Of all kinds as well as food and cover for wildlife.

Recommendations

1. A careful review of the literature should be made for each shrub starting with what appears to be the more important shrubs. Identification keys should be assembled.

2. Neld men should be alerted to make more critical observations and notes of the growth and occurrence of these plants in survey areas. An outline listing the more critical points might assist in recording these datn.

3. Develop a set of guides, or obtain these where available, that establish the climatic and soil requirements for each shrub. Some of this information can now be obtained from single factor studies and research discussed above.

4. As field surveys and studies expand relate the occurrence of these plants to series and phases.

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Comments on Committee on Soil Surveys in Urban-Fringe Areas

Charles E. Kellogg

I have used two terms--the general map for general planning end the detailed map for operational planning with individual tracts of land. I find this 8 better one. We must be clear. A good general soil map can be made on the basis of the old geological maps, old soil surveys, and the like. These can be made very rapidly in a good deal of the New England area, for example, where we need them. But I hear that some may say 'Well, we have a soil nap to locate soils suitable for cess pools". This could be dangerous because such maps are not suitable for operational planning. We need both kinds of maps. We can make 8 general map from a detailed map where the detailed map is too complicated for general planning. Well, Ideally, we should like to have the soil survey done and then make the general map from that, but in some cases we can't do it that way. If 8 group is eager to start, we have got to make the best general map that we can make. Any more comments about this report?

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
Chicago, Illinois, March 25 - 29, 1963

Report of the Committee on Organic Soils

The objectives of the committee were:

1. To review the 'progress 'made by three regional committees on classification of organic soils; and to review the work of Dr. Dawson and Dr. Farnham in developing a better organic soils classification system.

2. To draft a scheme for classifying organic soils that can be tested and incorporated into the general system for classifying soils presently being developed by the Soil Survey Staff,

Summary of Regional Committee Action on Proposals from the last National Committee Report.

The North Central, Southern and Western Regions'had Committees on Organic Soils that submitted reports in 1962. All the committees agreed with the Statement by the 1960 National Committee that a single system of classification accommodating both mineral and organic soils should be developed. The National Committee, therefore, proceeded on this basis.

Thickness of Control Sections in Organic Soils

The last National Committee recommended an arbitrary control section of 40 inches in drained Histosols and 56 inches in undrained Histosols. The North Central and Western Committees accepted this proposal. The Southern Committee accepted the principle, but suggested that local judgment should be used to adjust between these limits in partially or recently drained soils.

The Committee recommends that an arbitrary control section be used to classify organic soils without mineral horizons with thickness limits as follows:

	Total Thickness
Drained	40 inches or 1 meter
undrained	60 inches or 1.5 meters

Where the organic horizons are thinner than 40 inches if drained or 60 inches if undrained, and there is no lithic contact, the control section extends into the underlying mineral soil, but the limits should be adjusted to fit a 40-inch control section after drainage.

To determine the thickness of the control section in undrained soils, the thickness of undrained organic horizons is reduced by one third (i.e., 60 is reduced to 40, and 30 is reduced to 20). The thickness of the mineral horizons is assumed to be unchanging by drainage if the N factor is 0.5 or less (that is, if the mineral material will not pass between the fingers on squeezing). If the N factor in the mineral horizons exceeds 0.5, the assumption is made that they too, will subside on drainage, and to determine the base of the control section the mineral horizons are treated as organic horizons.

A lithic contact within the thickness limits of the control section is always used as the base of the control section.

Some organic soils have been drained to depths shallower than one meter. In these soils the control section should be intermediate in thickness between those of the drained and undrained organic soils. Perhaps the best general rule is to use the equation, S= Dwt + 1.5 (40 - Dwt). When S = thickness of control section, and Dwt = depth to water table."

Thus, a soil drained to a depth..of 30" would have a control section of 30 + 1.5(10) or 45 inches. One and one half inches of organic soil below the water table are considered equivalent to one inch above.

The limits of thickness that vary with drainage compensate for the initial very rapid subsidence that follows drainage, and helps prevent changes in classification that-would otherwise result from drainage alone. If the drainage system is 'known to be less than three years old, the initial subsidence will be incomplete. On these soils, some additional-adjustment of limits may be desired, The committee suggests that in making these adjustments it be assumed that 50 percent of the subsidence should come the first year after drainage, and about 33 percent the second year.

The control section of organic soils should be thicker than that of mineral soils. Drainage and cultivation, cause continuing subsidence of organic soils, Even with the thicker control section proposed, the classification of a given organic soil will change rapidly in comparison with mineral soil.

Definition of Organic Soils (Histosols)

To be consistent with the variable thicknesses of the control sections, the committee recommends that the definition of'organic soils (Histosols) be modified to include those soils that have 3.2 or more inches of drained organic horizons, and 18 or more inches of undrained organic horizons.

The committee considered whether it would be feasible to define the organic soils in terms of kilograms of organic matter in organic horizons per square meter, Because moss peats are so light in weight that 5 to 6 feet or more of moss peat may be required to equal the weight, of one foot of muck, and subsidence is slow in moss peats, no action was taken.

Horizon Nomenclature

'The committee chairman, Dr. Dawson, wrote to the National Committee prior to the meeting stating that, "no comprehensive classification of organic soils is possible until the nomenclature of horizons can be settled." The 1963 National Committee considered the diagnostic horizons discussed by the regional committees including:' umbric epipedon, mollic epipedon, illuvial humus B, and structural B. It agreed with the statement by the Southern Committee that the surface or plow depth of organic soils should not be used as a diagnostic horizon. The example of peat rapidly decomposing to muck upon drainage prompted this decision. The committee felt that an alternative set of horizons should be tested. Thin surface horizons should not be diagnostic if there are subsurface horizons that can be used.

In general the National Committee felt that systems based on modification of Dutch proposals for classifying organic soils were better suited to drained than to undrained soils. Emphasis should not be given to thin surface horizons because they change rapidly after drainage and cultivation. Surface horizons that are thicker than plow depth are appropriate to use, and the committee is tentatively proposing that they should be at least 24 inches thick in drained soils to be used at a high categoric level.

A set of three diagnostic horizons was suggested to the Committee by Dr. Rouse Farnham. These were based upon degree of decomposition of organic matter as shown by defined morphological characteristics. The committee believed that the morphological criteria proposed by Dr. Dawson for the Committee's consideration can be blended with the proposals of Dr. Farnham. The proposed names and definitions are given in a supplement to this report that was discussed with the conference and that is being circulated to the regional organic soil committees and other interested cooperators of the committee.

The Classification of Histosols

The Committee spent most of its time discussing the proposals of Dr. Farnham for a classification based on his proposed diagnostic horizons A modification of the proposal was developed and presented to the conference. A more complete classification was developed after the conference, and is available as a separate.

The committee recommends that this system be tested during the coming year by trial mapping of selected bogs in various parts of the country. As developed, the system provides for most, but not all, theoretically possible combinations of horizons and layers. Not all will occur and testing should not only indicate the value of the proposal but should simplify it appreciably.

The committee hopes that testing will produce suggestions for improvement of the proposed definitions of horizons and ether features used to define the taxa of the proposed classification.

The Committee recommends that it be continued,

The Committee regrets that illness: prevented the attendance of its Chairman, Dr. Da&son. His advice was sorely missed.

Committee Members

Guy D. Smith, Chairman elect
R. W. Chapin
Klaus Flach
G. B. Lee
Dirk van der. Voet

Visitors

John Day
Rouse Farnham
L. H. Rebinson

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
Chicago, Illinois, March 25 - 29, 1963

Report of the Committee on Soil Correlation Principles, Procedures, and Rules

The Committee met on Tuesday forenoon and afternoon with all members present--Aandahl, Baur, Carlisle, Coover, Godfrey, Hockensmith, Johnson, Ligon, and Ableiter. Dr. Ligon graciously agreed to be secretary. Other participants included Dr. Kellogg, Val Silkett, Myrvin Noble, and John Maletic.

The attention of the Committee was directed primarily to the question, "What are the reasons for the current delays in correlation and whet can be done to improve the situation."

The Committee also spent some time in a review of the five questions appearing under IIB of the report of the Ad Hoc Committee of the North Central Regional Workshop of March, 1962.

The Committee was in general agreement that delays in correlation, particularly at the intermediate and final levels, could be explained for the most part-by one or more of the following:

1. The lack of (or need for) common understanding and/or agreement regarding the criteria to be used at the series and phase levels. It is evident that former concepts interfere with the acceptance, consciously or otherwise, that series criteria be restricted to those features that reflect the morphology, composition, and genesis of the developed soil or the use of a 30 inch control section in the undeveloped soil. For example, the past recognition of series, largely on the basis of the character of the underlying materials poses problems in reaching agreement on series concepts. This is particularly true in the North Central States. The criteria to be used for series, types, and phases is the assignment of another committee and this committee did not deal with the problem.

2. The great amount of time needed to be spent in the preparation of new series descriptions and the revision of old descriptions. In the Far West, for example, soil surveys in the foothills, mountains, and basin range country are requiring hundreds of new series descriptions. In other areas names have been used for years without adequate concepts or descriptions.

3. The amount of time that is needed to check mapping units and series in the descriptive legends or handbooks against series descriptions to see if consistent statements are made.

4. The large number of units that are mapped and later recommended for correlation in the field correlation. An example was given of two adjacent soils surveys in similar country but separated. by a State boundary. In one, the legend was started with 30 mapping units and later expended to 40 of which 36 were finally correlated. In the other area, 8 large number of units was reduced to 220 in the field correlation and to 120 in the intermediate correlation. This called for 8 lot of work during correlation which should have been done earlier in the course of the survey.

5. The failure of people to accept their full share of responsibility at each step along the correlation route. Thus the party chief tends to refer too many questions to the State soil scientist who in turn refers them to the senior soil correlator, end who in turn passes them on to the principal soil correletor. The principal soil correletor also may be reluctant to take the necessary action and so passes the problems on to the Director of Soil Classification and Correlation.

6. The confusion between responsibility end authority at various levels, Troubles may be both technical and administrative. The pnrty chief or State soil scientist may not realize, for example, their technical responsibility for decisions relative to taxonomic units whereas others may question the responsibility of the Director of Soil Qessificetion end Correlation to make decisions.

7. The failure to realize that correlation decisions are based on evidence and that opinions do not replace evidence. Soils Memorandum - 44 discusses this matter of evidence.

8. The failure to state the justification for the correlation of individual phases. One statement of ths significance of each unit should be in the Soils Handbook or descriptive legend.

In discussing these various problems and reasons for delay in correlation, members of the Committee pointed out further:

1. That the efficiency of correlation depends largely upon the quality of the work performed by the field party and the decisions made during the initial and progress field reviews. The testing of the validity of the individual mapping units should be done long before the final field review. This means a review of map boundaries and the statements to be made on use and management.

2. That et the time of the fin81 field review, the correlation samples, the descriptions of the mapping units, and the series descriptions must be in complete agreement.

3. That it would be helpful if many of the decisions of the final field review would be made earlier in the course of the survey. This would shorten the final field review and hasten the preparation of the field correlation, and in turn, the intermediate correlation.

4. That the three steps of correlation--field, intermediate, and final--are desirable, as they provide an opportunity to review the correlation at State, regional, and national. levels.

5. That there is need for better communication with members of Experiment Stations and other cooperators regarding correlation decisions. It would appear, however, that the survey leader or other representative of the Experiment Station should take the major responsibility here, since they are a party to correlation.

As an aid to improving and speeding up correlation work, the Committee recommends:

1. That an advisory notice be sent to the State conservationists to emphasize to them once again the importance of carrying out the provisions of Soil8 Memorandum - 44 at the local and State levels.

2. That Dr. Simonson be given the responsibility for the preparation of a document covering the steps of the correlation process and outlining the workload and kinds of decisions made at the different levels.

3. As a beginning on this, it is suggested that Dr. Simonson prepare, for wider distribution, the material ha has written to the principal soil correlators covering such items as Fragipans, Eroded Phases, Nomenclature of Mapping Units, the Role of Fhyslography in Classification, etc. In order to speed this up, it was suggested that consideration be given to the assignment of an assistant principal correlator to Dr. Simonson's office for a matter of three or four weeks.

The following answers are submitted in reply to the questions raised by the Ad Hoc Committee of tie.1962 North Central Workshop:

1. "Should names of mapping units and taxonomic units be clearly differentiated?"

   This is a good question and ideally, the answer is "yes." The distinction between a mapping unit and a taxonomic unit should be made clear to the user of the soil survey report but the Committee had no suggestion other than to continue the present nomenclature.

2. "What different kinds of mapping units should be delineated and how should they be named?"

The Committee felt that this question was handled adequately by the Soil Survey Manual.

3. "What standards of accuracy should be required in mapping units on detailed, medium, and low Intensity maps?"

The question was not *entirely* clear to the Committee because the accuracy of both the boundaries and the composition of the units is involved. Again, the Committee expressed the thought that reference should be made to the Soil Survey Manual.

4. "Should all textural classes of the plow layer demonstrably present, covering the range of the texture classes, and mappable in sizeable areas, be correlated in each survey area? If not, what are the exceptions or desirable combinations?"

The answer depends, of course, upon the kinds of units that are needed to provide the information that will be most useful to users of the soil map. Again, the Committee thought that reference should be made to the Soil Survey Manuel.

5. "How are series with discontinuous horizons and soil complexes to be differentiated?"

This question is an important one. The answer involves the concept of the pedon. The Committee suggests that the 1960 text on Soil Classification (the 7th Approximation) carries a worthwhile discussion of this point.

The group expressed the opinion that a committee, such as this, should be continued so that the steps and problems in correlation can be given further review.

Committee Members

J. Kenneth Ableiter, Chairman
A. R. Aandahl
Arnold J. Baur
Frank J. Carlisle
J. R. Coover
Curtis L. Godfrey
R. D. Hockensmith
W. M. Johnson
W. S. Ligon

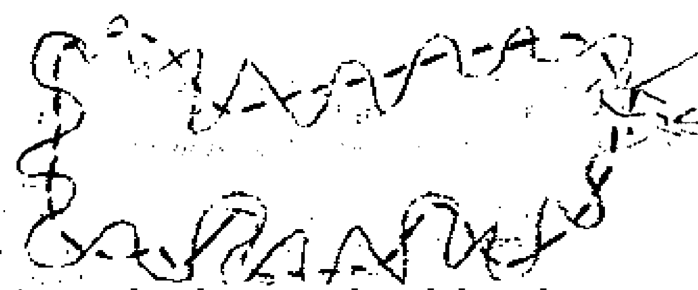
Vistors participating in all or part of the committee meeting:

Charles E. Kellogg
Val Silkett
Myrvin Noble
John Maletic

DISCUSSION ON REPORT OF COMMITTEE 4
Soil Correlation Principles, Procedures and Rules

Farnham: I was thinking, Ken, that in the Organic soils we may be faced with a little bit of a dilemma, in the distinction between the cartographic and classificational units. It was the intent, at least in the system that I have proposed, that it might be possible 'to use the units of the higher categories as mapping units. I'd like to illustrate what I mean. I talked': about the Entist and Heterist suborders. It would be possible, as I look at it, to map soils in the wild north of Minnesota, southern Manitoba and other places in the world equally as wild by using a number which would be the same for both the cartographic and the classification unit.

Kellogg: What we had in mind, or proposed, was the following: Here (using diagram) we have a very large scale map, something like 50 inches to the mile, and here, represented by the solid line is the soil individual. Maybe there are some other little individuals in it. Now in mapping at 4 inches to the mile. you can't reproduce all the details: you do the best you Can. You draw something like the dotted line in the diagram below.



So what you've enclosed in the dotted boundary, according to the rules,: is not supposed to be less than 85 percent of the soil that would be given a mono-taxonomic name--Miami silt loam, 3 to 7 percent slopes. We're saying that 85 percent or more of what's within the dotted line of the diagram is Miami silt loam, 3 to 7 percent slopes; which allows for 15 percent of something else. Now, then, we apply the same name--Miami silt loam--to a taxonomic unit (individuals that are pure) and to mapping unite which are not pure Miami silt loam. That's the problem, Miami silt loam means two things: (1) a specific taxonomic unit and (2) a mapping unit that is 85 percent or more Miami silt loan; Now/if the contaminants comprise more than 15 percent of the mapping unit, we use the double name, as for complexes. We've. got the two uses of the names of nearly.411 soils; we have the odd taxonomic unit that never shows up at all as a mapping unit by itself--it's always in units with others. But there aren't many. So what we're saying now, is that when we have this classification of Organic soils completed, at least 85 percent of the mapping unit shall be a taxonomic unit if it carries that name. Some have said that we ought to use Miami silt loam for the taxonomic unit and maybe "Chicago silt loam" for the mapping unit--but that certainly would put the cat in the dovecote. This is the problem that I think Mr. Ableiter was addressing himself to.

Farnham: I was thinking in terms of making a reconnaissance map of Organic soils in wild country where you vould have a mapping unit number on your map, (any scale,) which would coincide with a classification unit.

Anonymous: But this doesn't violate any principles, does it?

Kellogg: We were talking about tbe detailed soil surveys. In reconnaissance surveyswe do not hold strictly to the 15 percent. There are two things different about reconnaissance surveys in contrast to detailed surveys. First of all, indetailed surveys, the soil boundaries have been traced from observations made throughout their courses, whereas in reconnaissance surveys they are estimated from occasional observations. But, of course, the mapping units are not pure in reconnaissance surveys for many kinds of eoil; most are complexes of associations. But taxanomic units are defined alike in both detailed and reconnaissance surveys.

At thin point Dr. Frank Riecken asked a question, about whether the committee had considered the queationof how to determine and decide upon the proper type location of a series for the historical record. Ableiter replied that the committee had not done so but recognized that this matter of type Location was important.

Simoneon: I want to go back to the earlier point about naming the map entities in reconnaissance surveys. I wouldn't want the names in such work to be confused vith those that we use in detailed mapping, or to suggest that we're achieving any greater purity. For instance,. if a mapping unit on a reconnaissance survey would be as pure as one ve'd have on a detailed survey, why, then we'd use the same kind of name for it. But that's not going to happen very often. Some difference in names, it seems to me, would be essential.

Kellogg: We have tried to establish this role: The taxonomic units are defined the same in all of the soil survey. This means that in low intensity detailed surveys, and especially in reconniassance surveys, we have mainly soil associations rather than units that meet the requirements of not more than 15 percent contamination.

Reteer: Dr. Kellogg. I think this problem of whipping our correlation slowdown should begin at the beginning. By that I mean I don't think we've been using our party leaders as party leaders. We've been making soil surveyors out of them when they have all these other duties. 1 think we should have a survey party of 5 men and one party leader who should take the responsibility of getting this thing moving, keep the notes current, write the soil handbook report and the technical report when the survey's finished. When the correlatora come to the area, they can depend on him because he has his descriptions completed and when we're finished with the final correlation, it's done.

Kellogg: Well, I agree with that, John, es an ideal. The trouble is we have Soil Conservation Districts throughout the country and not enough men to concentrate wholly on progressive surveys. Now, as we complete progressive surveys, I'm hoping we can concentrate more. I would put the optimum at 5. but not the minimum. At the moment I would be happy to settle for three. What you're saying is that in places probably too much emphasis has been on progress in mapping rather than on progress with the whole job es we carry it out. And there may be something to that. This has been discussed with the state conservationists and I think as far an they're concerned, there will be no problem. Yet we probably need to remind everyone again that these other jobs have to be done.

Retter: What we're trying to do is eat up a group os soil management People who do all the interpretations and the surveyors do nothing but survey.

Kellogg: Well, that has scam advantagea and disadvantages. I think that some use of soil eurveys by soil surveyors is helpful in their education and training, although you might not want them to do it all the time. The test of the soil map is, "How does it work". And I think if the soil scientists are in on some of that tenting, John. it's helpful.

Dr. Simonson: I did ask the principal correletore that vhen they send the intermediates to you from here on out, they should use a blue pencil check on those correlations they feel satisfied with, end a red pencil on those they question. That doesn't mean that you are not to sample the blue penciled items but it will give you some guidance. And you are to have only two classes. either red or blue, no orange or violet.

Orvedal: I'm curious to know why they have to send forwards recommendations to Roy that they are dissatisfied with.

Kellogg: Kenneth has one: Two-thirds of the area of the soil lies either in the Great Plains or in the Southern region. It is especially to those kinds of instances that I think this would apply. I hope it is so limited.

The report is accepted.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PUNNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
Chicago, Illinois, March 25 - 29, 1963

Report of the Committee on Laboratory Characterization of Soils

A. Introduction

The Netionel Committee on Laboratory Cberecteriretion of Soils had not met et previous National Work-Planning Conferences. It had been established primarily upon recommendation of the Northeast Cooperative Soil Survey Work-Planning Conference, 1962, suggesting that "combined topics of Laboratory Characterization and Uses be considered et the national meeting. This would include en effort et coordinating textural classes and grain sizes for maximum use by many agencies." Inasmuch es a committee on soil texture, coordination of textural grades and grain sites met et the same National Work-Planning Conference, deliberations of the Soil Cherecterieetion Committee were largely restricted to leboxatory characterization of soil parameters other than soil texture.

B. Regional Committees

The report of the Northeast Regiooel Committee (chairman, Dr. Roy P. Matelski) contained the following recommendations:

1. An estimation of the percentage, size, end composition of coarse fragments should be reported on those not put in the sampling bag.

2. Where detailed data is published e detailed soil profile description should also be published.

3. Steps should be taken that the date are interpreted in the field.

In addition the Northeastern Committee had discussed difficulties encountered in measuring available moisture; bulk density, texture, field end laboratory pH, cation exchange capacity, es well es integration with engineers, coordination with benchmark soils,. end research projects for field men.

C. Other charges to the committee:

Dr. Guy D. Smith requested the committee to discuss the proposed publication of Soil Survey Laboratory data in e sequence of laboratory bulletins.

D. Report of the committee:

The committee discussed the following topics:

1. Publication of Soil Survey laboratory date.
2. Selection of soils to be characterized.
3. Characterization of paired pedons.
4. Sampling procedures.

5. Sample preparation.
6. Parameters of laboratory characterization of soils.
7. Laboratory methods.
8. Interpretation of laboratory data.

1. Publication of Soil Survey Laboratory data.

The Soil Survey Laboratory, SCS, proposes 'to assemble all reasonably complete data accumulated by the laboratory since 1952 in a sequence of published laboratory bulletins. These bulletins Will be in three volumes:

a. Data from states east of the Mississippi River and from Puerto Rico,
b. Data from states between the Mississippi giver and the Rocky Mountains, and
c. Data from states in and west of the Rocky Mountains.

Each set will be 8x10 in format, about 250 pages and contain the following: (1) A complete and detailed description of the methods used, (2) data and profile descriptions on facing pages, alpha-, betically arranged, and (3) a geographic index, by states and counties.

The first bulletin to be published will be' for the states between the Mississippi River and the Rocky Mountains.

The committee was strongly in favor of the proposed publication but some members expressed concern that old laboratory data may not represent modern concepts of the respective 'Soils. Therefore, the committee adopted the following recommendation:

Recommendation: The committee recommends that representatives of the State Experiment Stations, and the Soil Survey Staff of the states concerned be approached to screen the data as to proper classification before the data are published.

2. Selection of soils to be characterieed.

The committee discussed the selection of soils to be characterized in the laboratory. Soils selected for characterization should represent important reference points in the range of soils recognized in given areas, They need not necessarily be extensive. If good data for a given soil are not available the pedons sampled should be representative of the central concept of the series; one sample, if possible, should be from the type location, If data of the central concept of the soil are already available, consideration should be given to characterizing pedons that are representative of that soil as mapped in a given survey area. In the description of such pedona the kind of deviation in morphology, if any, from the central concept of the series should be indicated.

Similarly, if noncentral concepts of soils are sampled for specific reasons, for example, as part of a study of soils in relation to soil, forming factors, the reason for sampling and the deviations from the central concept of the series should be clearly stated in the profile description.

3. Characterization of pedons.

The committee agreed that no major modification in present policies for selection of paired profiles for characterization are indicated. However, there should be no restriction for sampling of soils in defined research projects.

4. Sampling procedures.

a. Samples should represent the whole horizon as described.

b. The importance of accurate estimates of particles larger than 2 mm. was discussed extensively.

Recommendation: 'She committee recommends that the sample taken to the laboratory should contain all material smaller than 3/4 inch (19 mm.) in diameter - excluding roots. A detailed estimate of the volume of materiel larger than 3/4 inch should be made and recorded in the profile descriptions.

Statistical considerations show that such a sample should be'10 to 20 lb. in sine. (This topic was also discussed in the committee on soil texture, coordination of textural gredee and grain sines, with similar but somewhat more rigorous recommendations.)

5. Sample preparation.

Sample preparation, primarily as related to the separation of rock fragments, was discussed. The committee concluded that no single technique could be developed that would allow for consistent separation of rock from soil in the field and in the laboratory under all conditions. As a general guide, coarse fragments having dynamic properties such as moisture retention and exchange capacity similar to that of the < 2 mm. material should be included in the < 2mm. sample if they can be crushed with a rolling pin. Coarse fragments not having dynamic properties should be excluded from the < 2 mm. sample as far as possible.

6. Parameters of laboratorv characterization of soils.

The committee discussed the parameters to be considered in characteriration, Although no formal resolution was made, the committee considered satisfactory the parameters presently being determined by the Soil Survey Laboratory. Messrs. Maletic and Matelski advocated the inclusion of infiltrationand permeability measurements. Considering the inherent difficulties of such measurements - and the important influences of such factors as depth to water table and recent cultural practices - the committee did not make a recommendation at this time.

The desirability of daveloping methods for characterizing the phosphorous supplying power of-soils and the rate of release of non-exchangeable potassium was discussed but no definite proposals were made.

7. Laboratory methods.

In discussing the report of the Northeastern Committee on laboratory characterization of soils deficiencies in the methods'presently in use were noted. Since,, among others, tbe Stats Experiment Station and the Soil Survey Laboratories are working on improving essentially all methods currently in use, the committee did not think that specific recommendations on this topic would be in order.

8. Interpretation of laboratory data.

The necessity for more and batter interpretation of data and training of soil scientists in, the use of laboratory date was discussed.', The Soil Survey Laboratory is working on a monograph on this subject. It seems, however, that the experiment station and colleges could contribute more to the training of soil scientists in the interpretation of laboratory data than they have in the past.

E. The committee voted to recommend that the functions of the committee on laboratory characterization of soils be continued. To avoid overlapping responsibilities, the committee recommends, however, that its functions. be combined with that of the committee on soil texture, coordination of textural grades and grain sizes. The committee further recommends that at least one State soil scientistbe added to the committee.

Committee Members:

J. R. Dawson	R. P. Matelski *
K. W. Flach, Chairman *	F. F. Riecken *
C. L. Godfrey *	E. H. Templin *
W. M. Johnson *	

*Present at meetings.

John Maletic, Bureau of Reclamation, and Ray Decker, SCS, were present during pert of the discussions of the committee.

F. Discussion

Kellogg: Are there questions you would like to ask Dr. Flach?

Maletic: I'd like to mention one thing, Dr. Kellogg. In the deliberations of the committee I think there must be a misunderstanding about those permeability measurements. The suggestion was that they, be made in the field rather than on samples transported to the laboratory. It is very important for ranchers and for us to be able to look at the chemical' analyses and the relationship 'to a good' field permeability determination.

Kellogg: There are a lot of,, people that argue juet the other way around. In the humid regions, we've had some bad failures with getting at permeability for the cess pools by' the field men. I don't think we can be real dogmatic about whether you need the tests or not.

Templin: As to the classification of soils in the proposed laboratory bulletin.

Smith: There is a Soils Memorandum that places theresponsibility in the State to review annually the correlation of all soil series for which data have been circulated in mimeographed laboratory reports. If the correla-, tion was valid, nothing was required in the way of response from the State soil scientist, If there were changes in the concept6 of the series that required changes in the identification they ware, by the first of the year, to notify the principal correlator. That was to be done annually. There have been two such reports required by this Soils Memorandum. We had assumed, of course, that the Stats soil scientist would consult with the experiment station people, I think the responsibility is in the State, and if data get published under the wrong name, it will be the responsibility of the State people.

If the profile does not fit any series, the intent of the Soils Memorandum was that they should so indicate. They wera to give the series which it now fits and if it doesn't fit any they should say so. We would be reluctant to publish data without a series identification.

Temnlin: (question not recorded)

Smith: Well, we can take care of those problems, Ed, very easily. After we assemble the profiles tbat we propose to put in the first bulletin we can submit them to each State so they will know which profiles are proposed for publication, They then will have an opportunity to protest the publication of that particular profile; if we beer nothing from them we will assume that the publication is satisfactory. That kind of a procedure can be tried.

Kellogg: Por many years, I think we have taken a conceited position on some of these data; that we get the date and we interpret them, I mean we soil scientists, and that's it. I've often wondered how we'd like it if the Weather Bureau ceased publishing their data and said now if you want some interpretations you write to us and we'll give you the interpretations. but you don't 'need, the data. We would be quite irritated by that. I think that there are a lot of people outside of our fraternity that could see a lot of things in our data if they had a chance to look at them; but we really haven't given them a chance. If a soil has a bad description and is unnameable, I wouldn't mind taking it out; but if it's on the side of Miami toward Brookston, and it's good laboratory work, I think it ought to go in with that statement. And I don't sae how any of them got done that were not some kind of soil. But I think I agree with the Import of your question, Bob (Grossman), and I don't think we ought to throw out the good data, If we're not smart enough to write something about how they fit into the classification, some of us ought to be fired. Some of the old data are very good on total analysis,, and we have very few data now on, total analysis. We have to go back to the' old bulletins, and so I have been anxious about those data. My screen and what can go in is a coarse one.

Arkley: I would Like to comment on one thing hare. If these data will be primarily for technical use it would seem to me that even though this pedon is classified in such and such series and it occurs on the maps in a mapping unit which has another name on it, I would Like to see the mapping unit named, as well as tbe location included on tbe description.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
Chicago, Illinois, March 25 - 29, 1963

Report of the Committee on Soil Morphology

This committee replaces tbe one on soil structure that reported to the conference concerning:

(a) amendments to the standards for describing soil structure that are contained in the Soil Survey Manual, and

(b) standards and conventions for describing morphological features for which we lack generally accepted terminology suitable for concise description.

This report consists of two parts: A. Reactions of this committee to propoaale or recommendations made by committees of the 1962 regional conferences that seem pertinent to the functions of this committee; and B. Proposals of this committee with respect to standards for field descriptions of clay films in soils. The committee also considered conventions for field descriptions of coatings of bleached silt and sand grains in soils, but it is not ready to make specific proposals on this subject.

A. Regional Committee Reports

The committee reviewed the 1962 reports of the North Central Regional Soil Morphology Committee and the Western and Southern Regional Soil Structure Committees.

The North Central Committee reported on work in progress but did not make specific proposals that need comment from this committee.

The report of the Western Committee includes e recommendation that descriptions of soil structure include a statement of the moisture status of the soil wben structure is described. Similar recommendations have been made by earlier committees of the 'National Conference and the present committee concurs in this recommendation.

Tbe report of the Southern Committee discusses at some length the definition of soil structure, tbe basis for soil structure characterization, and some specific problems in application of tbe present standards for describing soil structure. Their report quotes the following definition by Jongerius[1/]: "Soil structure is the spatial arrangement of the elementary constituents and any aggregates thereof and of the cavities occurring in the soil." They recommend that such a definition be considered to replace the present

1/ Jongerius, A. (1957) Morfologische Onderzolkingen Over de Bodemstructur. Bodemkundige Studies No. 2 - Wageningen.

definition (the one given in the Soil Survey Manual) and that necessary revisions in the present structure classification be made. The present committee does not concur in this recommendation, although it does commend the members of the Southern Committee for the serious thought they have given to their subject. The definition by Jongerius expresses a concept of soil structure, that is very similar to Rubiena's[2] concept of soil fabric. It represents a substantial departure from the present definition and concept of soil structure used in soil survey in this country. In the future we may come to a classification of soil fabric tbat is suitable for description of soils in the field, but at present we do not have a very clear' picture of the implications or consequences of this approach.

Cur present standards for describing soil structure are generally workable, though admittedly imperfect. It is evident that these standards are not always applied consistently, both within states end in different parts of the country. Lack of uniformity in application of the present standards seems to result in part from loose application of the definitions, in part from defects in the standards themselves, and in part from lack of a clear understanding, in some instances at least, as to what soil attributes are to be included in sol.1 structure, Appreciable improvement in our present standards apparently will require more thorough end more comprehensive study than has been made during the last several years. It is evident that such a study does need to be made.

B. Field Descriptions of Clay Films

It should be emphasized at the outset that we are concerned here with conventions and standards for describing clay films in field descriptions of soils. Standard terms or classes should be defined and described so that they can be applied with reasonable confidence and with reasonable uniformity by competent soil scientists in the field.

During the past several years at least, field descriptions of clay films have generally included statements with respect to frequency or abundance, thickness, and location of clay films relative to other morphological features. But we have lacked a generally accepted set of standard classes to which the statements about frequency end thickness could be referred. Except for the tentative standards that were preperad by Dr. McClelland for trial in California and which have been used by a number. of people in the Western States, most individuals have used their own system, and thickness and frequency classes commonly have not been defined. A committee of the North Central Region is testing two systems for describing clay films that are similar in general 'outline to,, but differ in detail from, the standards suggested in this report for testing and trial,

Conventions and standards for describing clay films, which are prepared for testing and trial, are outlined in the attached statement. It is suggested that the appropriate regional committees test these standards during the 1963 field season and consider criticisms and suggestions for improvement at their meetings in 1964.

2/ Rubiena, W. L. Micrcpedology. Collegiate Press, Inc., Ames, Iowa, 1938. pp. 125-128.

Sam general considerations that have influenced the. tentative limits of the frequency and thickness classes are indicated briefly in the remaining paragraphs. Several questions and problems tbat ware discussed by the committee but that are, as yet, not resolved are also pointed out.

Thickness class limits. In order to have thickness classes that can be applied uniformly the class limits must be either directly measurable or closely related to observations than can be made with simple tools in the field, The 0.005 mm. limit approximates the minimum thickness of a film that can be seen in cross-section with a 10X lens. The minimum thickness that can be seen will vary depending on the color contrast between the film and the adjacent material. If the color contrast is not strong, 0.010 mm. may more nearly approximate the minimum thickness of a film that can be seen in cross-section with a 10X lens. The 0.05 limit approximates the minimum thickness of a film that can be seen with the naked eye. The thicker limits can be measured directly. The very thin, thin, and moderately thick classes have similar spans on a logarithmic scale, whereas the moderately thick and thick: classes have similar *pans on a linear scale.

The thickness classes should, if possible, be useful for soil classification or interpretations. The proposed limits are largely arbitrary ones and the primary objective was to set limits of classes that can be identified in the field. It seems probable, however, that the reliability of field identification of cutans as clay films is related to the thickness of the film. Confidence in the identification of cutane as clay films is commonly appreciably greater if they are thick enough to be seen in cross-section than if they are too thin to be seen in cross-section and must be identified by surface properties alone. The limit between the very thin and thin classes seems useful in this respect. The 1 mm. thickness limit is used in new soil classification schema,

The proposed criteria for determining the 0.005 mm. and 0.05 mm. class limits in the field will need to be tasted on some samples by comparing field. designations of thickness class with measurements of actual thickness of the films in the laboratory.

Frequency classes. It seems probable that only a few frequency classes can be identified consistently because of the difficulties inherent in making accurate estimates *in* the field of the total ped and pore surfaces that are coated with clay films. It also seems advantageous to have as few different sets of class limits for describing soil morphology as is consistent with our needs. *For* these reasons the proposed frequency classes are few in number and two of the threa limits between classes coincide with the limits of the standard classes used to describe mottling in soils.

Other considerations. There are unresolved problems of terminology in the proposed schema with respect to the different kinds of pad surfaces (different kinds of cutane) that must be dealt with in describing soil morphology in the field. The reliability of identification of kinds of cutane in the field is an important consideration in this connectton. One's confidence in his identification of the kind of cutan that is present in a particular soil may be low although the existence of distinct cutans is evident. It was suggested during the committee's discussions that we should drop the terms "coating" and "film" and adopt the term cutan for field descriptions of ped end pore surfaces. Modifiers could be used to indicate the hind of material end the assumed genesis.

For examples: illwial clay cutans
pressure clay cutans
"indeterminate" clay cutans

("Indeterminate", or other term, to indicate much uncertainty as to the nature of the cutan.)

Such a convention presumably could be expanded to include a variety of Rinds of cutans. This suggestion was not thoroughly discussed by the committee and it deserves further attention,

The system proposed for testing was designed primarily for use in describing clay films tbet occur on the surfaces of peds and tubular pores. It may not be very useful for describing films of clay that exist es pore fillings in interstices of coarse textured material.

Committee Members:

F. J. Carlisle, Chairman
R. R. Covell
J. A. Elder
R. B. Grossman
G. B. Lao
W. S. Ligon
J. E. McClelland'
A. H. Paschall

John Day (Canada) also participated in the committee meeting in Chicago. Dr. Charles E. Kellogg and Dr. J. L. Retzer participated in the committee meeting part of the time.

Conventions and Standard **Classes** for Field Descriptions of Clay Films in Soils

(A tentative scheme proposed **3/28/63** for trial and testing)

The scheme described herein is intended for use in field descriptions Of films of clay' that occur on ped surfaces, in pores, and as coatings, on sand, grains and coarse fragments and which have been oalled clay skins, clay films, clay flows, and tonhaütchen. The nature of clay films, methods of identifying them, and illustrations of their appearance are given in <u>Soil Classification, A Comprehensive System. 7th Approximation</u>, 1960, pp. 35 to 44.

A complete description of clay films should include their frequency, thickness, and location with respect 'to other morphological. features. Other properties of clay films, such as color and continuity (whether existing as patches or a continuous network), may need to be described to adequately characterize the morphology of some soils. Standard classes for the description of frequency and thickness of clay films follow.

<u>Frequency classes</u>. The objective is to indicate the estimated percentage of the natural soil surfaces that are coated with clay films. The description may refer to the total surface of ped faces, or the total surface of tubular or interstitial pores, or to the combined surfaces of peda and pores in the soil material. The description of frequency of clay films is not intended to reflect total volume of clay films but simply percentage of ped faces and/or pore surfaces that are coated,

Class	Percent of surface covered	Remarks
Few	Present on less than 2 percent of surface	Patches of clay film are identifiable but their frequency is so iow that the significance of their presence may be nil or doubtful. The class includes occasional small patches of clay film not regularly asuocinted with other morphological features,
Common	2 to 20	Patches of clay film regularly associated with other morphological features. Most of the surfaces of peda and/or pores are not coated with clay film.
Many	20 to 80	Clay films regularly aeoociated with other morphological features. May occur as discrete patches or as a continuous network.
Continuous	More than 80	Most or all ped and/or pore surfaces are covered with clay films. Patches of natural surfaces may be free of clay films but the films are essentially continuous.

Thickness classes. Thickness of clay films often varies appreciably within distances of a few millimeters. In such cases an estimate of the average thickness should be used. If appreciable variations in thickness occur over distances of a centimeter or more or are related to other morphological features, and the variations are judged to be significant to description of the morphology, the variation should be described.

Thickness		Description
Very thin	< .005 mm.	Visible only when viewed normal to. surface; hand lens needed 'for identification; not visible in cross section with 10X hand lens; if present, very fine sand grains protrude, through the film and are readily apparent.
Thin	.005 to .05 mm.	Hand lens usually needed for identification; visible in cross-section with 10X lens but not to unaided eye; if present, very fine sand grains are enveloped by the film or their outlines are indistinct; fine send grains protrude through, the film or are only thinly coated and are readily apparent.
Nod. thick	.05 to .5 mm.	Visible in cross-section to unaided eye; fine. sand grains are enveloped by the film or their outlines are indistinct; film surfaces are relatively smooth.
Thick	.5 to 1.0 mm.	Clay films and their broken edges are readily visible without magnification; film surfaces are smooth; sand grains are enveloped by the film or their outlines are indistinct.
Very thick.	> 1.0 mm.	

Conventions. The convention for describing frequency, thickness. and location of clay films is illustreted in the following examples:

(a) common thin clay films on ped feces

(b) continuous moderately thick clay films in common medium tabular pores

(c) common moderately thick clay films on ped and pore surfaces

(d) continuous moderately thick clay films on vertical prism faces and common thin clay films on blocky peda (compound structure of coarse prisms and medium blocky peds)

The thickness and frequency classes seem most useful for description of films on pod and tubular pore surfaces. They may also be useful for description of films of clay that occur in interstitial pore space in coarse or moderately coarse textured soils. as illustrated in the following examples:

(a) continuous thin clay films in interstitial pores as coatings on grains and as bridges between grains

(b) common thin clay films in interstitial pores as bridges between grains but rarely coating grains

Discussion of the report of the Soil Morphology Committee
by the conference, 3-28-63

(The following notes on the discussion by the conference are not entirely complete and are not verbatim.--F. J. Carlisle)

Simonson: Baaed on the experience with classes for describing mottling, the thickness classes are apt to get reduced in number from 5 to 3.

Smith: I don't know that there is anything wrong with the thickness classes, but I normally carry 10, 20, 40 and 60-power hand lenses in the field, and I have found that to resolve fine silt I have to go to 40 or 60-power. It may be that others can resolve 5 microns with a lo-power lens but my eyes will not do it.

Flach: 1 question that clay skins as thin as 0.005 mm. in thickness can be identified with a hand lens. The resolving power of an optical microscope is somewhere near 0.001 mm. It is difficult to see that 0.005 mm. should be identifiable with a hand lens.

Carlisle: Two comments on the 0.005 limit between the very thin and thin classes. First, clay films 15 to 20 microns thick can be seen in cross-section with a 10X hand lens. With good light conditions and a 12X lens one can see lines on a stage micrometer that are about 0.005 mm. thick. I don't think S microns is far from the right value; perhaps it should be 10 microns rather than 5. We should find that out by testing. If we can see in cross-section the thickness of a clay film, our confidence goes up appreciably that we are looking at a clay film rather than a pressure face, for instance. If we must depend entirely on surface properties, then our confidence is less.

Smith: Needs to be looked at from the standpoint, can you actually see it. As you pointed out, contrast will have something to do with it (i.e., contrast between the clay film and adjacent material).

Carlisle: The basis for judging these kinds of thickness limits is whether or not they form classes that can be identified in the field. I think there is a benchmark where we can or cannot see the thickness in cross-section with a given magnification, There is another benchmark where we can or cannot see the cross-section with the naked eye.

Kellogg: This is the kind of argument that is going to have to be tested in operation.

Flach: Was thought been given to the definition of clay skins? The definition in the 7th Approximation is not entirely satisfactory. There is too much emphasis on clay orientation and not enough on particle size distribution. In fine textured soils clay skins are extremely difficult to identify even with the petrographic microscope. In describing clay films under the microscope, the abruptness of the boundary between matrix and cutan, the degree of differentiation in particle size distribution between matrix and cutan, as well as the degree of orientation in the cutan have to be considered for positive identification of clay skins, Smith: I notice the words clay skin and clay film are used interchangeably. Have you any preference?

Carlisle: Clay film is used in the committee report.

McClelland: Soil structural classes are meaningful when trained soil scientists examining a particular soil find the same numbers and kinds of peds. Where cutans are evident on ped faces, consistent observations can be made. In the absence of cutans the evaluation of structure is more difficult. It is then a matter of speculation whether the aggregates are clods, fragments, or peds. The nature of surfaces on "apparent" peds devoid, or nearly devoid, of cutans needs further investigation.

(McClelland's comment was followed by discussion of the relationship between pedality and cutans, evidence, for the existence of peds, identification of kinds of cutans, and whether or not a classification of clods is needed. The record of this discussion is too incomplete to allow a meaningful reproduction of the discussion here.--F. J. Carlisle)

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
Chicago, Illinois, March 25-29, 1963

Report of Committee on Climate in Relation to Soil Classification and Interpretation

A. **Objectives of committee.**

The 1960 National Soil Survey Work-Planning Committee Report and the five Regional committee reports concerned with climate in relation to soil classification and interpretation were reviewed by this committee. These "'reports were distributed to members of the committee in October 1962, and assignments were made for the major topics to be studied and discussed at this workshop. Participation by committee members prior to this workshop was most gratifying.

The charge to this committee, as outlined by the 1960 national committee, consisted of the following items:

1. Reparation and monitoring the contents of climatic sections of published reports of the National Cooperative Soil Survey.

2. Check progress, evaluate, and test the data developed in evapotranspiration and water balance as it applier to interpretations and classification.

3. Explore the possibilities of getting additional climatic data, for use in preparing a usable climatic inference, for important benchmark soils in sections of the country where climatic data is limiting.

4. Compile a special bibliography of literature pertinent to climate in relation to soil classification end interpretation for use by field soil scientists.

5. Consider other items pertinent to this committee.

B. **Committee actions.**

1. Members of the committee reviewed contents and progress made in preparation of climatic sections of.0011 rurvey reports published and in the process of publication. To date, members of the U.S. Weather Bureau staff have completed 106 climatic sections, have 15 in preparation; 'and have requests for-preparation of 44 additional ones.

The committee concurs in the new format developed for the climatic section of roil survey reports and recommends no further action on this item at this time,

This committee acknowledges with deep appreciation the exemplary cooperation received from climatologista, including the State Climatologists of the U. S. Weather Bureau, in the preparation of the new-type chapter on climate for our soil survey reports* The leadership provided by Franklin Newhall and Dwight Swanson, climatologists in tbe SCS, in the design of this chapter is also appreciated.

2 and 3. The committee considerad aod evaluated the work of many people using different methods for deriving data relating climate to soil interpretation and classification.

Here is a brief summary of some of our discussions.

L. Robinson discussed the work of tbe World Soil Map Staff in searching for a technique to develop a practical method for making probability yield estimates for the heat Plains.

R. J. Arkley discussed the progress of the Western States in completion and application of the water-balance method, including actual and potential evapotranspfration,

J. R. Coover reported on the work in Texas for seven stations concerned with the application of the water-balance and the PE index. The publication "Yield Probability for Dryland Grain Sorghum Production on Two Soils," by J. J. Bond, Army and Van Uoren was reviewed.

R. Ulricb reported on the work in the Western States, as charged by the climate committee of the Western Regional Committee, on some applications of the water-balance method in relationship to predicted yields and soil classification.

M. Edwards summarized the application of the publication "Agriculturel Drought in Georgia," by C. H. M. Van Bard and Carrekar, in relationship to predictions of yields by kinds of soils, rooting zone, and moisture retention.

R. W. Eikleberry discussed the work done in the Plain States in comparison of tbe PE index with the water-balance method for predicting yield expectancy and determining capability classes and otber interpretive groupings.

L. Garland reported on the progrere made in establishment of a climatic line in the Northeastern States for land capability classification and crop adaptability.

A. J. Klingelhoets reported on the adjustments and testing of the climatic line being tried in the Northern Lake States.

W. H. Render summarized the work being done by the Ad Hoc Committee of NCR-3 obtaining yield data for a regional repoct to accompany the regional soil map and report published in 1960. He also reported on the progress made in establishment and testing of a climatic line based on the 2100° ± 100 growing degree days in the Northern Lake States for soil survey interpretations and classification.

The committee recognized that no single climatic indices studied and tested to date would be applicable for all areas. The need for more reliable climatic indices for soil interpretations and classifications still exists. Committee recommendations are:

a. That the Western States continue their computations and testing of the water-balance method.

b. The Eastern Plain States discontinue their computation and testing of the water-balance method for the present time. This is based on the findings of studies in the Plains States.

c. That the yield predictions being prepared to accompany the NCR soil map and report be correlated with tbe National Cooperative Soil Survey and between adjoining land resource areas.

d. The Northeast States continua their work on establishment and testing of a climatic line for determining capability classifications and crop predictions.

e. That the Southeastern Regional Soil Survey Committee give consideration to establishment and testing of climatic indices where necessary for interpretations and classification.

f. There is need to coordinate soil interpretations by kinds of soils. Perhaps this can be done best within land resource areas. New authorizations in the 1962 Agricultural Act, stepped up River Basin activities, and the speed up in publishing soil surveys all emphasize the need for an orderly assembly of soil interpretations.

Some soils cover a broad range of climatic differences, such as those mapped from Texas to New Jersey. The Committee feels that additional guidance is needed from the committee dealing with soil series, types and phases regarding soil moisture and soil temperature as series criteria so that interpretations can be better correlated with series, types and phases.

4. A selected bibliography on climate for field soil scientists, with annotations given for each reference, was prepared by members of the World Soil Map Staff, This bibliography was reviewed and accepted by the committee.

The committee recommends that this bibliography be reproduced and made available by the Washington SCS office to all soil scientists. A copy of this bibliography is attached es a part of this report.

5. The Committee recommends its continuance in order to give further attention to the problems involved in climate in relation to soil classification and interpretation.

Committee Members:

R. W. Eikleberry, Chairmen
A. J. Klingelhoets, Recorder
R. J. Arkley
W. H. gender
J. R. Coover
M. J. Edwards

L. E. Garland'
A. A. Klingebiel
R. M. Marshall
A. C. Orvedal
Dirk van der Voet

All members participated in the committee meetings at Chicago.

Visitors participating in all or part of the &mitt& meeting at Chicago were:

R. S. Decker
Roy D. Hockensmith
A. Leahey
M. E. Noble
John-L. Retzer

Luther Robinson
Val W. Silkett
J. D. Simpson
R. Ulrich

A SELECTED BIBLIOGRAPHY ON CLIMATE FOR FIELD SOIL SCIENTISTS

The references included in this bibliography are suggested for field soil scientists who wish to bring up to date their knowledge of climate and its relationship to soils end crops. An annotation is given for each reference so as to provide more guidance than the title itself suggests. No references difficult to obtain, or borrow from libraries, have been included.

1. ARKLEY, J. R., and ULRICH, RUDOLPH
1962. THE USE OF CALCULATED ACTUAL AND POTENTIAL EVAPOTRANSPIRATION FOR ESTIMATING POTENTIAL PLANT GROWTH. Hilgardia, 32:443-462.

Four values ET_p, ET_a, ET_p 32°, and ET_a 32° were calculated according to Thornthwaite's (1948) procedure. The authors stats that comparison of these values with natural vegetation and crops in different regions of California and adjacent states indicates that the values are useful indices of expected growth of cultivated crops, range, and forests; includes an appendix of six pages of data.

2. BAVW, L. D.
1938. E. WOLLNY - A PIONEER IN SOIL AND WATER CONSERVATION RESEARCH. Soil SC. Soc. of Amer. Proc., 3:330-333.

Historical; Wollny's work wee done mainly during the years 1874-1898. Some early experiments show the amount of rain reaching the soil is dependent on the kind of vegetative cover and planting density - water loss by direct evaporation of precipitation a major factor in some crops, trees and at some stages of growth.

3. BENNETT, M.K.
1960. A WORL MAP OF FOOD CROP CLIMATES. Food Research Institute Studies, Stanford University, Stanford. California, 10 pp.

The food crop climates are separated on a purely physical basis into 21 climatic units. An interesting geographical treatment of crop and climate relationships.

4. BLANEY, BARRY F., and CRIDDLE, WAYNE D.
1962. DETERMINING CONSUMPTIVE USE AND IRRIGATION REQUIREMENTS. U.S. Dept. Agri. Tech. Bul. 1275, 59 pp.

A recent discussion on the method used as a basis for recommendations in SCS irrigation guides.

5. BYERS, HORACE R.
1944. GENERAL METEOROLOGY, 2nd ed., McGraw-Hill Book Co., New York, 645 pp.

A good standard text used in introductory courses in schools of meteorology. A half-dozen somewhat similar texts by other authors are currently in print and also a score of simplified treatments of the subject, many in paper-back editions.

6. CARSON, JAMES E.
1961. SOIL TEMPERATURE AND WEATHER CONDITIONS. U. S. Argonne National Laboratory (Chicago), ANL-6470, 244 pp.

Theoretical discussion and detailed analyses of soil temperatures at several depths at one site in NE Illinois. Comprehensive bibliography.

7. CHANG, J. H.
1958. GROUND TEMPERATURE. Harvard Univ. Blue Bill Meteorological Observatory, Milton, Mass. Vol. I, 300 pp; Vol. II, 196 pp.

Vol. I sets forth a comprehensive study end bibliography; Vol. If is .a collection of ground temperature means at stations located throughout the world.

8. COLE, J. S., and MATHEWS, O. R.
1954. SOIL MOISTURE STUDIES OF SOME GREAT PLAINS SOILS, Part I: FIELD CAPACITY AND "MINIMUM POINT" AS RELATED THE MOISTURE EQUIVALENT. Soil Sc. Soc. of Amer. Proc., 18:247-252.

A source of general info&&i& &soil moisture fluctuation at Dryland Experiment Stations.

9. DAY, J. A., and DECKER, F. W.
1955. RUDIMENTS OF WEATHER: THE STORY OF OUR ENERGETIC ATMOSPHERE. Oregon State College Coop, Assoc., Corvallis, Ore., 97 pp.

This is one of several easily read publications on cloud formations, weather measuring devices and the energy exchange processes that go into the weather conditions we observe.

10. GASSETT, BARRY, and WARNER, L. E.
1958. A MODERN APPROACH TO WHEAT FERTILIZATION. Plant Food Rev. 4(2-3): 6-8.

Presents march of soil moisture through a wheat-fallow sequence in the Columbia Basin based on gravimetric samples taken at 2-week to 3-month intervals at many sites. An example of the kind of information needed to compare soil moisture estimates for different soil series with measured values.

11. GEIGER, RUDOLPH
1950. THE CLIMATE NEAR TRE GROUND. 2nd ed., Harvard University Press, Cambridge, Mass., 482 pp.

This is the most comprehensive book available on the subject of microclimatology. A standard readible reference; perhaps the beat introduction to microclimatology. It is traneleted from the original German.

12. HARROLD, L. L.
1951. AGRICULTURAL HYDROLOGY AS EVALUATED BY MONOLITH LYSIMETERS. U. S. Dept. of Agr. Tech. Bul. 1050. 149 pp.

Describes Lysimeters and their operation, and presents data on the accretion and depletion of water in soils as measured by changes in lysimeter weight.

13. HAVENS, A. V., and McGUIRE, J. K.
1961. THE CLIMATE OF THE NORTHEAST: SPRING AND FALL LOW TEMPERATURE PROBABILITIES. New Jersey, Agric. Expt. Sta. Bul. 801, 31 pp. (Northeast Regional Research Publication)

A good example of treatment of the risk of freeze to growing crops.

14. KENDREW, W. G.
1961. THE CLIMATE OF THE CONTINENTS. 5th ed., Oxford University Press, Oxford, England, 608 pp.

A standard text in the field of regional descriptive climatology.

15. KLAGES, K. H. W.
1942. ECOLOGICAL CROP GEOGRAPHY. The MacMillan Co., New York, 615 pp.

Sections II and III of this pre-World War II text are an excellent source of information on earlier methods of deriving weather and climate factors useful in crop geography and crop production.

16. LANDSBERG, HELMUT
1960. PHYSICAL CLIMATOLOGY. 2nd ed. (rev.) Gray Printing Co., DuBois, Pa., 446 pp.

A standard text in physical climatology.

17. MATHEWS, O.R., and ARMY, T. J.
1960. MOISTURE STORAGE ON FALLOWED WHEAT LAND IN THE GREAT PLAINS. Soil Sci. Soc. of Amer. Proc., 24:414-418.

An analysis of long-time records for Great Plains Dryland Experiment Stations.

18. PALMER, W. C.
1961. METEOROLOGICAL DROUGHT: ITS MEASUREMENT AND CLASSIFICATION. U.S. Weather Bureau (manuscript, for official use), 98 pp.

A new method for classifying drought by using a derivation from Thornthwaite's water balance procedure. Drought is defined as periods when rainfall and soil moisture are markedly lower than "average." The procedure for obtaining drought and wetness indices is complex and time consuming. The method has been programmed for computer processing by the Weather Bureau at Ashville, North Carolina.

19. PALMER, W. C., and HAVENS, A. V.
1958. GRAPHIC TECHNIQUE FOR DETERMINING EVAPOTRANSPIRATION BY THE THORNTHWAITE METHOD. Monthly Weather Rev. 86:123-128.

The nomogram presented here is being used extensively by SCS soil scientists in the Western States. The authors also review three methods for computing evapotranapiration. (An enlargement of the nomogram was printed by SCS Portland Cartographic Unit, 1960)

20. PANOFSKY, H. A.
1956. REVIEW OF THE THEORIES OF CLIMATIC CHANGE. Weatherwise. 9:183-187, 204.

A good, simplified treatment of the diverse viewpoints on this subject.

21. PELTON, W. L., et al
1960. AN EVALUATION OF THE THORNTHWAITE AND OTHER MEAN TEMPERATURE METHODS OF DETERMINING POTENTIAL EVAPOTRANSPIRATION. Agron. Jour. 52:387-395.

A good evaluation, showing that these methods work best when temperatures are averaged over long (monthly or seasonal) intervale.

22. PENGRA, R. F.
1959. SEASONAL VARIATIONS OF SOIL MOISTURE IN SOUTH DAKOTA. S.D. Agri. Expt. Sta., Agri. Econ. Pam. 99, 55. pp.

Using Thornthwaite's potential evapotranspiration procedure and assuming values of 2 and 4 inches for available water capacity, the author has presented length-of-drought periods for several stations in South Dakota.

23. PENMAN, H. L.
1948. NATURAL EVAPORATION FROM OPEN WATER, BABE SOIL AND GRASS. Royal Soc. Proc. Series A 193:120-145.

The original statement of the "Penman" method. "This British scientist sets forth the relationship between open pan evaporation and that over different land surfaces for three periods of the year.

24. PENMAN, H. L.
1963. VEGETATION AND HYDROLOGY. Commonwealth Bur. of Soils, Tech. Commun. 53, 130 pp.

A critical review of published material on the sources of precipitation end its disposal, with especial emphasis on the measurement and prediction of evaporation and transpiration. Numerous experiments cited. (For sale by Commonwealth Agricultural Bureaux, Central Sales, Farnham Royal, Bucks, England.)

25. PRIESTLY, C. H. B.
1959. TURBULENT TRANSFER IN THE LOWER ATMOSPHERE. University of Chicago Press, Chicago, Ill., 130 pp.

A monograph giving the physical explanation of exchange of heat and water vapor between the land surface end atmosphere. Highly technical.

26. RUSSELL, M. B.
1959. WATER AND ITS RELATION TO SOILS AND CROPS. Advances in Agron. XI: 1-132.

A good, basic reference.

27. SHAPLEY, HARLOW (editor)
1953, CLIMATIC CHANGE - EVIDENCE, CAUSES AND EFFECTS. Harvard University Press, Cambridge, Mass., 318 pp.

A collection of 22 papers by experts in various fields where long-term climatic change is inferred, explained, or described.

28. SHAW, R. H., et al
1960. PRECIPITATION PROBABILITIES IN THE NORTB CENTRAL STATES. Mo. Agri. Exp. Sta. Bull. 753, 72 pp. (North Central Region, Regional Publication No. 115)

This study presents the results of 50 years of records to show averages, and chances of a given amount of precipitation for one to three-week intervals. Results are primarily in map form. This is an "N-Week" precipitation study; similar studies for other regions may be forthcoming.

29. SLATYER, RO. O., and McILROY, I. C.
1961. PRACTICAL MICROCLIMATOLOGY: SPECIFICALLY ON SOIL-PLANT-ATMOSPHERE RELATIONSHIPS. Commonwealth Sci. & Ind. Res. Org. (Australia), (prepared for UNESCG). 331 pp.

This is particularly good as a summary of subjects in microclimatology, definition of terms and a good recent bibliography.

30. THORNTHWAITE, C. W.
1948. AN APPROACH TOWARD A RATIONAL CIASSIPICATION OF CLIMATE. Geo. Rev. 38:1-39.

The first presentation of Thornthwaite's popular mean temperature estimate of potential evapotranspiration and his bookeeping schema for following changes in soil moisture.

31. UNITED STATES DEPARTMENT OF AGRICULTURE
1941. CLIMATE AND MAN. U.S. Dept. Agri. Ybk. 1941. 1248 pp., illus.

The first section of this book deals with climates of the world, climatic changes throughout history, climatic regions, and describes the data gathering process. The second section deals with climate end agricultural

settlement in the U. S. The third section deals with climate in relation to the farmer, crop production, soil, forestry, animal parasites and insects, and pathology, The physics of weather is discussed. Finally, a section of climatic descriptions and data by states fills a large part of the book, More complete records are available in several Weather Bureau publications but the variety of data pertinent to agriculture presented in one source is unusual here.

32. UNITED STATES DEPARTMENT OF AGRICULTURE
1955. WATER. U. S. Dept. Agri. Ybk. 1955. 751 pp., illus.

Includes several articles dealing with several aspects of climate and climatic interpratatione important in agriculture. Also discussed are the hydrologic cycle, precipitation measurements, cycles in weather, cloud seeding, climatic indices for irrigation, the water budget, soil moisture measurement, soil moisture management in dry areas, the Blaney-Criddle Index, and the Blaney-Criddle method of estimating irrigation water requirements.

33. VAN BAVEL, c. H. M.
1956. AGRICULTURAL DROUGHT IN WORTH CAROLINA. N.C. Agri. Expt. Sta. Tech. gull. 122, 60 pp.

An analysis of drought rinks. Similar bulletins have been published for other states, mainly southeastern. (More detailed description of method, with computational aids in ARS 41-11, Aug. 1956.)

34. VEIHMEYER, F. J., and HENDRICKSON, A. H.
1955. DOES TRANSPIRATION DECREASE AS SOIL MOISTURE DECREASES? Trans, American Geophysical Union, 36:425-428.

The authors meintein that soil moisture is lost at a uniform rate through? out the available range from field capacity to wilting point. They present one side in the argument about rate of soil moisture loss.

35. WANG, JEN YU, and BARGER, GERALD L.
1962. BIBLIOGRAPHY OF AGRICULTURAL METEOROLOGY. University of Wisconsin Press, Madison, Wie., 673 pp.

Over 10,000 references in the fields of agricultural meteorology and climatology.

36. WISCHMEIER, W. H. *
1961. A UNIVERSAL EQUATION FOR PREDICTING RAINFALL-EROSION LOSSES., AN AID TO CONSERVATION FARMING IN HUMID REGIONS. U.S. Dept. Agri. Res. Ser., Special Report ARS 22-66, 11 pp.

Illustration of author's method, and brief eocount of its development,, for predicting soil loss due to rainfall erosion on any soil and, under any system of cropping in the humid regions of the United States. Examples given. (See also author's article in Agr. Eng. 43:212-215, 225 (1962) illus.
*Dr. Wischmeier provided the research material presented in thin ARS information bulletin but is not cited as its author.

37. WORKMAN, E. J.
1962. THE PROBLEM OF WEATHER MODIFICATION. Science, 138:407-412.

Mainly a good discussion of cloud physics and cloud seeding in an arid area of southwest U.S. Some comments on the general problem of weather modification.

38. ZIKEEV, N. T.
1951. A SELECTIVE ANNOTATED BIBLIOGRAPHY ON SOIL TEMPERATURE. Meteorological Abstracts and Bibliography, 2: 209-232.

Includes about 200 articles selected to present a geographical and historical survey on progress in research and measurement of soil temperature.

U. S. WEATHER BUREAU

Of the many Weather Bureau publications, the following, dealing with climatology, are likely to be the main ones of interest to soil scientists:

CLIMATES OF THE STATES
Printed as separates for all States. This is a prime source for average temperature, precipitation, and freeze date for numerous stations within each State.

CLIMATIC SUMMARY OF THE UNITED STATES-SUPPLEMENT FOR 1931 THROUGH 1952.
Printed es separates for all States. This is a prima source for date on total monthly precipitation by years, mean monthly temperatures and snowfall, and extreme high and lw temperatures for numerous stations within each State, Data for years prior to 1931 were published an "Bulletin W".

WEEKLY WEATHER AND CROP BULLETIN
Discusses the weather of the previous week and the current condition of the important crops throughout the country. At irregular intervals short articles of a general nature in the field of climate-soils-crops are published,

For more detailed information on any of the above meteorological elements or for information on other elements such as wind and humidity, LOCAL CLIMATOLOGICAL DATA, its supplement, and SUMMARY OF HOURLY OBSERVATIONS are available for first-order weather stations.

The State climatologist ordinarily is able to provide copies of all of these Weather Bureau publications and can suggest the best publication for a specific need.

SOIL CONSRRVATION SERVICE: (In-service items.)

SOILS MEMORANDUM SCS-22, May 19, 1958.
Re: Soils-Land Capability Classification.
Sets forth current guidance on how to deal with climatic limitations, mainly for dry regions, in grouping soils for the Land Capability Classification.

SOILS MEMORANDUM SCS-23 (Revised), June 27, 1961.
Re: Climatological Services Available to States with Special Reference to the Section on Climate for Standard Soil Survey Reports.
Gives specific as well as general guidance for preparation of this section.

DISCUSSION OF REPORT OP COMMITTEE ON CLIMATE IN RELATION TO SOIL CLASSIFICATION AND INTERPRETATION

Kellogg: Perhaps we need to give this Committee some more specific charges. I have been impressed with the vork on water balance in the Western States. I hope that some ways can be found to make additional transects, including Perhaps some running North and South.

I believe that we shall have to do as ve have done vith some of the other phases and make nearly arbitrary definitions - that is, arbitrary as far as what we can actually see and measure in the soils themselves. Certainly soil temperature is a critical property, including the temperature of the surface soil. Whether or not the surface has frost is a critical matter. And this may not be reflected in the soil series since much of the vegetation may not be influenced by at least the odd frost. In the high' plateau.%' of the tropics, the occasional froat can be a vital matter. Around Elisabethville in the Katanga, for example, there are one or tvo frosts every year that kill tropical crops. These sharply limit crops that vould otherwise be adapted.

We shall need to decide on the main items that we shall vant to interpret from the temperature separations; Certainly ve cannot accommodate every crop. I should think ve vould want to have 8 temperature line near the northern end of this continent vhere we can have cereal grains and where we cannot. This would come somewhere in the northern part of the Peace River Country, I should suppose: Likely we shall vant a line that would coincide with the northern extension of cotton. Probably we should coneider' a line for the northern extension of important palms. I am not saying dogmatically that these are the ones to emphasize, but they illustrate what--I have in mind. Now, of course, we recognize that palms and cotton can be grown as botanical specimens in gardens north of these lines. We should need to think of reasonably good growth.

On soil moisture, certainly the first line we want to get is the line between the sown and the unsown that we cross in going from the Chestnut soils tovard the Desert. Actually,;-in practice the position of this line depends a good deal on how hard the local cultivators are pressed for land. So we shall need some qualifying definitions of yield I suppose. I ehould think we would be able to make such definitions.

I should like to see the Committee work along this line and come up with some conclusions and definitions as to the principal; lines that we should try to establish. Of course, this not 'only relates to phases within series, but also some of the classes in the higher categories of the new system of soil classification.

Eikleberry: We have dravn some lines, tentatively; and they're now being tested. I think the committee will have some firm proposals to make in a year or so.

Kellogg: Dr. Smith, do you want to eay anything about this climatic matter? I know it's been worrying you a good deal.

Smith: The place of temperature in soil classification has been worrying me enormously since the 1st Approximation; that's when we started to talk about it. And as Dr. Kellogg pointed out, the presence or absence of frost may have no relevance to genesis or properties of the 6011 but may have enormous relevance to the use-that can be made of the soil. I have about concluded that we probably will have to we climatic phases to indicate the presence or absence of frost. But the presence or absence of frost in the soil is a soil characteristic that could be used,, or the presence or absence of permafrost is another that could be used. Where we have permafrost Or cold Boils, we have what amounts to a shallow roil. And we may legitimately think of them as shallow soils, shallow because they are cold. But in the tropics, there is a very different situation insofar as soil temperature is concerned. With the same temperature, on the mean annual basis, in the tropics as in Alaska, there is frost practically every night. And there is no season when the soil warms more than . few degrees above the mean annual temperature, 80 one has an extremely shallow soil. In thinking of soil temperature as 6 characteristic, you have to think in terms not only of the mean but of the deviation8 from it. One of our problem6 ha6 been-to devise definition6 that would give us a reasonable classification of the ttiingr that we find in the world. And your committee did not comment on this.

Eikleberry: No. Use of temperature in the classification or for climatic phases, which 1 feel strongly in the same vein that you do, but I'm not the person incidentally who put6 names on soils. But there is one other thing I would like to mention in relation to this temperature. Over a year ago, Mr. Klingebiel gave each one, of the interpreters a thermometer. We did start last year Oh a project which is one of the extra little' jobs that you're supposed to do and we did set up some site6 and made observations. But we don't have enough data at the present time to bear discussion in this committee on that. But the thing I'd like to do--it wasn't discussed in this report--is to have more of those kind6 of thermometers and defined locations set up to where a party chief, 'tinder the regular State setup, in selected areas, could take some of these' soil temperatures down et greater depths than what we are usually taking, For example, at the Nebraska University there's a recording 'thermometer set up, but they only go to 30 inches on one soil--that's one under bare fellow and the other one is under continuous grass. The correlators for interpretation, in my opinion, isn't the place for this big job. It needs to be with an operations person who'6 located at the same place every night. I would like to see these measurements continued in ten or fifteen selected locations in each one of the Plains States. I would like to'propose that . project like this be set up in all of our areas.

Eikleberry: A better way is to get the State staff to cooperate with you. I'm sure if we show them the need we can get their help.

Smith: That's a better way, yes. You got it done. We didn't care how you got it done. We were faced with several problems in trying to tell how we could estimate soil temperature. The mean annual temperature in a good deal of the United States can be estimated from the mean air temperature, but we did not know the influence of the aspect of slope on soil temperature. We know in a general way, for Alaska, that ve have permafrost on the north facing slopes end not on the south facing slopes, 60 it must be a factor.

But we did not know anything about the magnitude of that difference or how far to the south it was a factor. So we did ask that you get these readings to see something about the magnitude of the differences. Now that we have the data we will get them analyzed to see whether we should go farther.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
Washington 25, D. C.

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
Chicago, Illinois, March 25 - 29, 1963

Report of the Committee on Technical Soil Monographs

The purpose of technical monographs is to provide a series of publications for comprehensive discussion of morphology, classification, and genesis of soils by rather large geographic areas and be some unique small ones.

Technical monographs are discussed in "Soils Memorandum SOS-39, March 29, 1961, Re: Policy on Publication of Soil Survey Reports and Maps."

The committee reviewed the reports of the regional committees and much of the material in this report is based on those reports. Suggested future activities for the regional committees are included in our recommendations.

The committee visualizes the following potential users of technical monographs:

1. Party leaders of soil surveys in writing their reports.

2. Soil scientists interested in learning about the soils of an area.

3. Laymen with some technical background and an interest in soils.

4. Professional men working with soils or with an interest in soils.

5. Teachers of soils.

A USDA publication series for technical monographs would aid teachers in locating class material.

Possibilities of Follow-Up Publications

Technical monographs with emphasis on benchmark soils would set the stage for an outstanding publication on soil survey interpretation for use management and productivity. It is hoped that experiment stations would take the leadership in the preparation and publication of these. The basic physical predictions in these would provide economists with the information needed for many kinds of economic studies and publications. It is almost a certainty that the economists would prepare economic publications if the physical scientists prepared the publications with physical predictions.

Outlines for Technical Monographs

The committee reviewed with Harvey Oakes his outline for 'SOILS OF NORTH CENTRAL TEXAS--THEIR GENESIS, MORPHOLOGY, AND CLASSIFICATION.

The above is a tentative or working title. A copy of his outline for technical monographs, as revised after the committee review, is attached. Copies of other outlines included in the reports of regional committees also are attached.

The committee included in its recommendations some minimum requirements. Aside from these, the committee believes that the author should have considerable freedom in developing his outline.

Areas for Technical Monographs

A map of the United States showing tentative monograph areas was prepared from regional maps. This resulted in 93 areas. A copy of this map is not attached to this report; but the relationships of these areas to the land resource areas of the January 1963 map are attached. A few uncolored copies of this land resource areas map are available from the Soil Conservation Service.

Need for a Long-Range, Approach--15 Years

Technical soil monographs will require the efforts of the most competent soil scientists in the field of soil classification.: These people are now busy with other tasks, but means should be found for them to make their contributions to technical monographs. For the most part, this, will require assigning some of their present tasks to other people.

Additional field studies and laboratory data of the soils of At areas Will be needed before satisfactory monographs can be prepared. Careful planning for a period of many years will be necessary if we are to complete the technical monographs in an effective and orderly manner.

The need for long-range planning of technical monographs is very closely related to the need for long-range planning of laboratory studies of soils. There will also be needed more complete studies of geomorphology in some areas.

The possibility of using retirees to prepare some technical monographs needs to be considered. State retirees may be hired by the Federal agencies and Federal retirees may be hired by the State agencies. Foundations and other sources Of funds should be considered.

The Committee Recommends:

1. That a USDA publication series be established for technical monographs.

2. That the minimum content of technical monographs include the following:

   a. Placement of all series with firm concepts and adequate information into great soil groups of the present classification system and into families of the new classification system.

   b. Discussion of the factors of soil formation of the area.

   c. Discussion of genesis, morphology, and classification of the soils with emphasis above the level of the soil series. Detail discussion of series only as necessary to develop concepts and relationships.

d. Man's Influence on the present direction of soil genisis.

e. general soil map or maps.

f. Publish all laboratory data, unless excessive, if not published elsewhere or if no plans exist for immediate publication elsewhere. If published, or if to be published elsewhere, include only the date needed to develop concepts and ideas. Each set of data for a soil profile should Include a narrative profile description and characteristics of the sample site.

3. That a standard form be used for the usual. laboratory data.

4. That the Regional Committees on Technical Monographs:

   a. Review the areas proposed for technical monographs.

   b. Develop priorities for publication.

   c. Develop plans for assembling data and for obtaining additional data.

5. That authors not be assigned until they can be given reasonable assurance that they will have sufficient time to complete the monograph within 2 to 3 years. Prior to this time the gathering of the needed information should be guided by the people normally responsible for the soil survey.

6. That a senior author be assigned the major responsibility and one or more junior authors assigned to assist. These junior author6 likely would be from different States and different agencies.

7. That the committee be continued.

Committee members:

Andrew R. Aandahl, Chairman
J. Kenneth Ableiter
Lindo J. Bartelli
Arnold J. Baur
Ray W. Chapin
Marlin G. Cline

Roy D. Hockensmith
Harvey Oakes
Fioy W. Simonson
Guy D. smith
J. Gordon Steele
Rudolph Ulrich

TENTATIVE OUTLINE FOR TECHNICAL SOIL MONOGRAPH

By Harvey Oakes 4/4/63

1. INTRODUCTION OR PREFACE

1.1 What the monograph is.

1.11 Purpose and for whom written - why the monograph. What Is discussed, etc.

2. LOCATION, EXTENT AND GENERAL DESCRIPTION OF THE AREA

2.1 Geographic location - size of area - proportion of states, etc.

2.12 Map showing outline of area discussed; map of scale 1:5,000,000 - of Texas and Oklahoma with section treated in monograph colored.

3. GENERAL DESCRIPTION OF LANDSCAPE - Topography - relief - dissection - drainage, etc.

3.1 Suitability of soils for agriculture, how now used, and relative importance in relation to rest of state. (The objective here is to indicate to the reader the kind of area discussed.)

3.2 Physical divisions of the state - By Fenneman.

4. CLIMATE

4.1 Present climate: (Pertinent, short, and the usual facts and a short discussion of the importance in soil genesis - soil use and management and other effects.)

4.11 Past Climate: If enough Information that seems relevant and is reliable can be found.

4.12 Range throughout area and significance of differences.

4.2 Climatic maps - rainfall, temperature, etc., as a Yearbook.

5. GEOLOGY AND GEOMORPHOLOGY

5.1 General statements of relation of geology to soils. Kinds of geologic materials; origin, age, etc.

5.11 Rate of weathering - time factor for each geologic formation; kinds of material that can be expected under a given Climate from each formation.

5.2 Time factor In soil development and comparison of end products (soils) under similar climate but shorter or longer time, etc.-

5.3 Land form and shape or gradient and Interrelation of other factors, especially climatic influence (microclimate).

6. MAP SHOWING GEOLOGIC FORMATIONS

7. RELIEF AND DRAINAGE

7.1 General description of land forms - including dominant or representative gradient extremes; minimum and maximum length, shape, etc., and its effect on soil development.

7.2 Cycles of erosion - geologic, catastrophic, or gradual (accelerated).

7.21 Dissection -streams degrading, aggrading, etc., siltation, flooding.

8. VEGETATION - native, density - composition, etc.

8.1 Small scale map showing native vegetation.

8.2 vegetative succession - discussion.

8.21 Present vegetation in pastures or uncultivated areas.

9. ANIMALS - past, present, both Macro and Micro and tbelr effects on soil formation and development.

10. METHODS AND PROCEDURES USED - This will be a brief statement on field and laboratory methods used. in obtaining the information. The details will be in appendix.

11. CLASSIFICATION OF SOILS

11.1 Great Soil Groups and Soil Series: Discussion followed by tabular outline of Great Soil Group and Soil Series by 1938 Yearbook Of Agriculture.

12. GENERAL DISCUSSION OF THE GREAT SOIL GROUPS AND SOIL SERIFS OF EACH

12.1 Short introductory paragraph (discussing each Great Group and the geology, land form, slope, parent material, vegetation and other factors and the combinations and interactions responsible and the resulting kinds of soils and soil series included.

12.2 Small scale map of 1:5,000,000 shoving areas of each Great Soil Group.

13. CHARACTERIZATION OF EACH MAJOR SERIES

13.1 Introductory paragrapb as In official series descriptions giving general characteristics of the series and statements concerning similarities to end differences from other soils.

13.11 Morphology of each major series and combinations of factors responsi- bls.

13.12 Genesis of each major series.

13.13 Range in morphology, parent material - postulation of causes and effects.

13.14 Changes and differences due to man's use.

13.2 **Laboratory Data 1/**

13.21 Chemical

13.22 Mineralogical

13.23 Physical

13.24 Macusaion of data - interpretations 1/ 2/

13.25 Summary and discussion of each major series

14. OTHER SERIFS IN THE GREAT GROUP

14.1 Discussion by comparison with major series in all characteristics that information allows.

15. SUMMARY AND CONCLUSIONS OF THE GREAT GROUPS

16. THE SOIL ASSOCIATION - (As Hen Ableiter so aptly phrased it, "Here we switch from the genetic to the geographic.")

16.1 The soil association - definition and discussion

16.11 Block diagram of each soil association showing position and relation of major and minor series.

16.12 Extent - acreage of the association.

16.2 Suitability for agriculture, fertility, productivity, ect.

16.3 Acreage of each series and proportion suited for cropland - other use* - narrative discussion.

16.4 Soil association map - scale probably 1:1,000,000.

17. CLASSIFICATION (Hack to morphology and genesis)

17.1 Classification by the new system and 1938 Yearbook - in tabular form. Soil order and subgroup by new system and Great Group by 1938 Yearbook of each series in the area covered by the monograph.

1/ By G. W. Kunze of T.A.E.S.
2/ By G. W. Kunze and Harvey Oakes

17.11 Relation and comparison of the two systems: to level of subgroup only.

18. LITERATURE CITED

19. APPENDIX

I Table of acreages of each major soil series of each soil association and total acreage of each Great group. This usually will include the two or three major series and like or similar soils and other soils (lumped together). This will include estimates of percent end acres suited for cropland.

II Methods and procedures in detail: both field and laboratory.

PROPOSED OUTLINE FOR TECHNICAL MONOGRAPHS OF SOILS
(Prepared by Northeastern States)
December 1961

I. Introduction - a concise characterization of the area as a whole, including

A. Location and extent
B. Geologic and geomorphologic history
C. Present physiography
D. Climate, present and past
E. Vegetation, present and past
F. The Impact of man - use and its effects
(This should be brief, for it would be Intended to orient the reader, not to educate him in detail)

IS. Soils of the Arr

A: Classification of soils in higher 'categories - to present the groups that are to be discussed as units. This might be built around a table or key developed to show the orders, suborders, and possibly great groups in the area in term5 of.the 7th approximation. In some areas, perhaps in all, It might include subgroups. Probably the relationships between units of the lowest category used and great groups of the 1938 system should be shown.

B. Geography of soils - This might be developed around a map that would tell&ate associations of great soil groups or subgroups. Again, series names would not be used.

III. Environment and Soils - This might be a potential section to be used in areas for which it would be useful but omitted in part or in whole in others.

Potential subsections might be:

A. Soils and Climate
B. Soils and Vegetation
C. Soils and Parent Material
D. Soils and Topography (catenary relationships at the great group or subgroup Level eight be one approach)
E. Soils and Geomorphology
F. Soils and Age
etc.
See the sections "Soils and Climate" and "Soils and Vegetation" pp. 89-109 in Soil Survey of Territory of Hawaii, Series 1939, No. 25, 1955, for examples of this kind of section. (This should be available in Libraries.)

IV. Morphology and Genesis of Major Kinds of Soils

A. Order No. A (7th approximation)

0. Genetic relationships (without heading) to Include

a. Features that distinguish this order from others

b. Genetic significance of those features
C. Factors that appear to govern their presence
a. A key to suborders in the area

1. **Suborder A1**

   0. Genetic relationships within the order (without heading) comparable to A_0 above, including a key to greet groups

      8. Great group Ala.

         (1) A key to soil series including the classification into subgroups and their differentiating criteria.
         (2) Idealized profile or a central profile description of the ortho subgroup.
         (3) Characterization data chosen to typify the great group or a specific subgroup. This might be for a specific pedon (characterization profile) or a summary for several. profiles (as means and standard deviations of specific properties). This would not be a place for a mass of detailed data to be used for reference to properties of soil series, but a table or tables and graphs to illustrate major properties characteristic of the group.
         (4) Relationships to environmental factors - which factors appear to be limiting or necessary for this great group within the suborder. For example, what combinations of slope and permeability are necessary for a typudalf to form instead fo an aqualf? What characteristics of parent material or other factors appear to result in a typudalf instead of en ochrept.
         (5) The things that have happened to produce these Properties - weathering, translocation, segregation, leaching, organic matter accretion, etc.,

         (6) Deviations from the ortho subgroup end conditions apparently responsible for them.

      b. Great group Alb - as above
      etc.

2. **Suborder A2** -as above
   etc.

TECHNICAL MONOGRAPHS OF SOILS

(This outline is an attempt to summarize suggestions from soil scientists of the Great Plains States. Perhaps the most important one was the need for maintaining adequate freedom for the auths.)

1. Introduction.

1.1 Purpose.

1.11 Technical monographs should be written for soil scientists and other professional people. They should include all available information, summarized as necessary, on soil morphology, genesis and. classification of benchmark and other important soils.

1.2 Location and extent of the area.

1.21 Map showing Location in more detail, including outliers, than on present Land Resource Map.

2. General nature of the area.

2.1 Climate.

2.11 Some mentioned both past and present and some stress thatit should be generalized and short.

2.12 Ranges in 'relation to geography likely should be included. General map may be helpful to illustrate.

2.2 Geology and geomorphology.

2.21 Nature, source, and dynamics of accumulation of parent materials.

2.22 Tim as a soil formation factor.

2.3 Relief and drainage.

2.4 Vegetation.

2.41 Native.

2.42 Present

2.5 Animals.

The tentative technical monograph areas include the following land resource areas of the January 1963 map:

Technical Monographs	Land Resource Are.38
TM-1	1
TM-2	2
TM-3	3
TM-4	4 & 5
TM-5	6
TM-6	7
TM-7	8
TM-8	9
TM-9	10, 11, & 13
TM-10	12
TM-11	14 & 15
TM-12	16 & 17
TM-13	18 & 22
TM-14	19 & 20
TM-15	21
TM-16	23, 25, & 26
TM-17	24
TM-18	27 & 28
TM-19	29, 30, & 31
TM-20	32
TM-21	33 & 34
TM-22	35
TM-23	36 & 37
TM-24	38 & 39
TM-.25	40
TM-26	41
TM-27	42
TM-28	43
TM-29	44
TM-30	45
TM-31	46
TM-32	47
TM-33	48 & 49
TM-34	50 & 51
TM-35	52 & 53
TM-36	54
m-37	55
TM-38	56
m-39	58 & 59
TM-40	60 & 63
TM-41	61 & 62
TM-42	64, 67, & 68

TM-43	65
TM-44	69
TM-45	70
TM-46	71, 73, 74, & 75
TM-47	72
TM-48	76
TM-49	77
TM-50	78
TM-51	79
TM-52	80, 84 (west)
TM-53	81
TM-54	82
TM-55	83
TM-56	84 (east), 85, 86, & 87
TM-57	57, 88, 89, 90, 91, 92, & 93
TM-58	94 & 96
TM-59	95
TM-60	97 & 98
TM-61	99
TM-62	100, 101, 141, & 142
TM-63	66 & 102
TM-64	103
TM-65	104
TM-66	105
TM-67	106 & 107
TM-68	108
TM-69	109, 113, 114
'PM-70	110
TM-71	111
TM-72	112
TM-73	115
TM-74	116
TM-75	117, 118, & 119
TM-76	120
m-77	121 & 123
TM-78	122
TM-79	124, 125, & 127
TM-80	126
TM-81	128 & 147
TM-82	129
TM-83	130 6,136
TM-84	131
TM-85	132 & 134
TM-86	133, 137, 138, & 154
TM-87	135
TM-88	139 & 140
TM-89	143, 144, 145, & 146
TM-90	148
TM-91	149
TM-92	150
TM-93	151, 152, 153, 155, & 156

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
Chicago, Illinois, March 25 - 29, 1963

SOIL MOISTURE COMMITTEE REPORT

The objectives of the 1963 Committee were to conclude work on several items dealing with definition of terms and classes for the description and evaluation of soil moisture and to continue work on the development of items which have not been solved.

The 1960 Soil Moisture Committee reported on eight topics. Thus to follow through our 1963 committee is also reporting on eight topics. These topics are divided into two categories, namely items concluded and items needing additional work. Three items are listed under the first category and five under the second.

The Committee made use of a number of materials in arriving at recommended action on each of the eight topics. The materials included soil moisture committee reports from the Nortb Central and Western Regions plus data and correspondence from committee members and others.

Items Concluded

I. Incidence of flooding.

The committee considered a proposal to establish classes of flooding hazard. This proposal was rejected, It was recalled that earlier committees had considered setting up this kind of classes, but decided against such action. The difficulty lies mainly in the fact that classes would be rather meaningless when trying to epply them on an area1 basis. Hazard and damage vary greatly from point to point on a flood plain depending on local conditions such as use of the land, structures up stream, and time of flooding. It is possible, however, to describe the physical conditions of flooding, and also damage without doing this in terms of specific classes. Instructions and example for this kind of description are given in Soils Memorandum SCS-40, April 27, 1961.

Recommendations:

1. Soils Memorandum SCS-40 gives adequate instructions for recording flooding hazards on flood plains.
2. This topic sbould be dropped from the agenda of the next regional and national soil moisture committees.

II. Rinds of water zones.

The committee reviewed briefly the kinds of water zones defined in the 1960 national committee report. These are:

A. Continuous water zones (traditionally called ground water) are thick, continuous to nonsoil barrier etrata, persist yaer round, and are low in diesolved oxygen. These zones make their' mark by Slaying. or mottling the soils and, if close to the soil surface, by furnishing an environment unsuitable for root growth of higher plante normally requiting an earatad soil.

B. Perched water zones are thin, low in oxygen, and ara not present the year round.

C. Aerated water zones are thin zones above slowly permeable soil horizons or rock in which the water stands temporarily over frozen soil, or moves down elope, and contains dieeolved oxygen. There are no evidences of mottling or gleying.

The concensus of the committee is that an understanding Of kinds of titer zones is important and we should try to make use of veter eone terms in soil survey work. The definitions given above mey not be complete, but they eeem to be the baet we can deviee at this time, We reaeivad no suggestions for changes in the definitions except that the Western Regional Conference asked for clarification of the terme "thick" end "thin," After due consideration the committee decided not to change the definition. The terme "thick" end "thin" as used iii the definition are descriptive rather than diagnostic.

Recommendations:

1. Water eone terme ae defined above should be ueed where applicable until more complete definitions are developed.

2. This item should be dropped from the agenda of the next regional and national committees.

III. Permeability classes.

The committee propoeed five classes for permeability. The proposal also provides two eubclaeeee each for the lowest and highest classes; these eubcleeeee are for uee where it is desired to make fine distinctions.

Permeability classes:	Rate, inches per hour
Slow	Less than 0.20
Moderately slow	0.20 to 0.63
Moderate	0.63 to 2.0
Moderately rapid	2.0 to 6.3
Rapid	More than 6.3
Subclasses	
Very elow	Lees than 0.063 .063
Slow	0.063 to 0.20
Rapid	6.3 to 20.0
Very rapid	More than 20

The classes and subclasses listed above are intended to replace the set of relative permeability classes with "very tentative suggested rates" given on page 168 of the 1951 Soil Survey Manual. They are the same as given in the 1957 Soil Moisture Committee report except for the addition of the subclasses.

The classes are baeed on hydraulic conductivity or saturated flow at the end of one hour as measured by the Uhlaiid core method (1,3). A statistical analysis (2) of a large number of Uhland core permeability determinations showed that a geometric progression based on .2 gave acceptable clasees.

Placement of each determination into a class could be done with a reasonable degree of reliability if five classes were used, but reliability dropped off rapidly if more clasees were used. Thus, if the subclasses listed above are used, it is probable that placement of a given soil is less reliable than if only five classes are used.

The committee recognized that the majority of permeability determinations are currently being made for planning sanitary waste 'disposal by the bore-hole method (4). We have no direct comparison between results using the bore-hole method and the Uhland core method. Although relationship between results from the two methods is not known, the values seem to fall within the same limits. Since determinations using the bore-hole method are made directly in the field, there is some question about control of some factors such as time of year, cracks or diocontinuities in the soil, and whether the soil is saturated for a sufficient distance from the bore-hole to obtain flow rates at saturation.

Recommendations:

1. Adopt the permeability classes and subclasses defined above.

2. Drop this topic from the agenda of the next regional and national committees unless some new work in this field comes to the attention of the national or regional committees.

   NOTE: The above listing of classes and subclasses gives two meanings to each "Slow" and "Rapid" in terms of rate. After adjournment of the Conference a member of our committee made two proposals for avoiding this problem, The first proposal is to retain the five class names but rename the subclasses as follows:

(1) Edminster, T. W. et al. Tests of small core samples for permeability measurements. Soil Sci. Soc. Amer. Proc. (1950) 15:417-420. 1951.
(2) Mason, D. D. et al, Hydraulic conductivity as related'to certain soil properties in a number of Great Soil Groups-sampling error involved. Soil Sci. Soc. Proc. 25:554-560. 1957.
(3) Uhland, R. E. and O'Neal, A. M. Soil permeability determinations for use in soil and water conservation. SCS TP-101. USDA. 1951.
(4) Manual of Septic Tank Practice, U.S. Dept. H.E.W., Public Health Service No. 526. pp. 4-5. U. S. GPO. 1960.

Subclasses

Extremely slow	Less than 0.063
Very slow	0.063 to 0.20
Very rapid	6.3 to 20.0
Extremely rapid	More than 20.0

The second proposal is to rename the lowest and the highest classes; the name "Slow" would be changed to "Restricted" and 'Rapid" would be changed to "Free." The subclass would remain as now named.

The conference did not have an opportunity to act on these proposals. We would like regional committee comments and alternative suggestions on this problem.

Conference action on items concluded:

1. The conference accepted committee recommendations on incidence of flooding and kinds of water zones.

2. Recommendations on permeability classes were accepted provisionally. Discussion from the floor brought out the point that some states were still using the class limits listed in the Soil Survey Manual. The conference desires more information on critical limits and also a comparison of the auger-hole and Uhland core methods,

ITEMS NEEDING ADDITIONAL WORK

I. Water table

The committee reviewed the definition of water table in the 1960 Soil Moisture Committee report and several proposals for revision of the definition, Among the proposals was a new set of definitions written by Dr. Robert D. Miller, Professor of Soil Phyoice, Cornell University. The committee believes that the definitions written by Miller are satisfactory, can be determined by fairly easy observations, and do not compromise more exact expressions where the latter may be needed. They are given below as written by Dr. Miller except for two changes in titles.

WATER TABLE. (Miller uoed Apparent Water Table.) The level at which water stands (adequate tine allowed for adjustments) in an unlined borehole is the apparent water table. It may or may not coincide with the water' table as defined elsewhere, and may vary according to the depth of the borehole.

TRUE WATER TABLE (Miller used Water Table), When a lined borehola is drilled from the surface downwards, the level of the bottom of the hole vhen seepage of water into the bole is first observed (adequate tine allowed for adjustments) is the level of the water table, providing the water does not rise to a significant height above the bottom of the hole.

PERCHED WATER TABLE. If a water table is found by the method described above, and if it is observed that further deepening of the lined bore-hole causes the equilibrium level of water in the hole to subside or to disappear, then the water table observed was a perched water table. Its level is designated as the level at which the water table was first encountered. A perched water table is likely to be encountered where a pervious stratum lies above a lees pervious stratum.

ARTESIAN WATER TABLE. If, after water first appears in a lined bore-hole, it eubsequently rises to an equilibrium level significantly above the bottom of the hole, the final level of water in the lined borehold is the level of the artesian water table.

Dr. Miller also wrote a definition for virtual water table, also known as hanging water table. His definition is:

VIRTUAL WATER TABLE. If conditions, as observed by tensiometric measure-mentc, are as if a static water table existed at a level that can be com-puted from. tedsiometer readings, that level is designated as the virtual water teble if a lined borehole fails to reveal a water table when driven to the indicated depth, A virtual water teble is likely to occur at or just below the bottom of a fine stratum that overlies a coarse stratum.

The conference as a whole questioned the need for "virtual Water table" in soil survey terminology.

Recommendation:

1. Regional committees era requested to review the above definitiona and submit opinions to the next national committee. The need for virtual water table and its definition should be given special consideration.

II. Depth to Water table.

The 1960 national committee report lists six classes for depth to water table. Before taking final action on these classes the committee would like to have regional committees examine the limit6 of the claseea in light of the 30-inch lower limit for the control section used as e criterion for eome classes in the new system of soil clesaification. The classes as listed in the 1960 national report and a proposed new set are:

Class	1960 Definition	Proposed Definition
Very shallow	0 to 10 inches	0 to 15 inches
Shallow	10 to 20 inches	15 to 30 inches
Moderately shallow	20 to 40 inches	30 to 60 inches
Moderately deep	40 to 60 inchee	60 to 120 inches
Deep	60 to 120 inchee	120 to 240 inches
Very deep	120 to 240 inches	-
(no significant influence)	More then 240 inches	More than 240 inches

Recommendation:

1. Regional committees should review the proposed new definitions end report decision.9 to the next national committee.

III. Duration of water table.

No change from 1960 national committee report except time of year and persistence of water table within a class should be described where such information is available.

Five classes for duration of water table are:

Very brief	1 month or less per year
Brief	1 to 2 months per year
Long	2 to 6 months per year
Very long	6 to '12 months per year
Continuous	More then 12 months

IV. Available soil moisture.

Moisture and bulk deneity date obtained by the Lincoln Soil Survey Laboratory were ueed to calculate 1/3 - minus 15-atm. percentage8 and in./in. values for the various textural classes (table below). The 1/3-atm. percentage was obtained on pieces of natural soil fabria (not on sieved samples). Bulk densities used to calculate the in./in. values were obtained by the natural-clod method on clods that were moistened by adsorption to 30-cm. tension; the bulk density values are considered to be near what the material would have at field capacity.

The standard deviation for available moisture percentage averages about 30 percent of the mean for the various textural classes. Standard deviation for bulk density of the various textural classes averages about 10 percent of the mean. Thus we might expect that estimates of in./in. of available water based on textural class would have standard deviations that average somewhat over 30 percent of the mean.

We plan to introduce morphological claceification and parent material into the stratification to determine whether the reliability of the estimates can be increased.

Textural Class	No. of Samples	Mean Available Water		Standard Deviation
		%	in./in.	% H_2O
Loam	38	9.0	0.14	2.0
Silt loam	151	13.2	0.19	2.8
Silt	22	16.8	0.24	2.2
Silty clay loam	96	11.7	0.17	3.4
Silty clay	44	9.3	0.14	3.3
Clay loam	27	7.5	0.12	2.2
Clay *	59	10.6	0.15	3.5

*Exclusive of Oxisola and Ultisols from Puerto Rico.

V. Soil aeration or soil drainage classes.

The committee agrees with statements in previous soil moisture committee reports that soil drainage classes as now written in the Soil Survey Manual are not satisfactory. It also recognized attempts which have been wade to characterize wetness conditions in terms of soil aeration and in other ways.

Data accumulated in response to Proposal No. 1 in the 1960 Soil Moisture Committee report was examined, but time did not permit a critical evaluation. It wan apparent, however, that not enough information was on hand to test the proposition wade in Proposal No. 1. Acknowledgment is made here for data from North Dakota attached to the North Central Committee report, data supplied by committee members Chapin, Godfrey and Coover, and data supplied by W. H. Lyford and D. van der Voet.

The committee favors continuation of the study of trying to relate depth and duration of water tables to soil morphology and drainage classes. This wae supported by the conference as a whole during discussion of this topic,

Proposal No. 1 fron'the 1960 Soil Moisture Committee report is repeated here to encourage participation in this work.

PROPOSAL NO. 1

The Soil Moisture Committee take the leadership and assemble available data on some known soils to see if combinations of water table depth and duration classes with permeability classes will give approximately the same groupings of series as the present drainage classes do in the humid temperate regions and also provide improvements in groupings of soils in the arid and tropical regions.

It is suggested this proposal be carried out on aalected soil series representing each drainage class and include a rather wide range of textures. Tabulations would include:

SOIL GROUPS ACCORDING TO WATER TABLE AND PERMEABILITY CLASSES

Series Name	Drainage Class	Water table Class Depth	Water table Class Duration	Permeability Class	Remarks

Definitions given in pravious sections of this report for depth to water table (1960 definitions), duration, and permeability classes should be used. The North Central regional committee suggests including information on fluctuating and perched water tables.

Recommendation:

1. Encourage regional committees and individuals to continue with the work of compiling factual information on ground water tables in relation to soil morphology and drainage classes.

Conference action on items needing additional work:

1. The committee should be continued.

2. Efforts should be concentrated on(a) definition of water table, (b) available moisture, and (c) characterization of weter tebles and relation to soil morphology and drainage classes,

Committee members:

*A. J. Baur, Chairman
*F. J. Carlisle
*J. R. Coover
J. E. Dawson
*R. W. Eikleberry
C. L. Godfrey
*R. B. Grossman
*A. A. Klingebiel
*F. F. Rieckea
*Guy D. Smith
*R. Ulrich
*R. W. Chapin

*Resent at committee meeting March 27, 1963.

Comments on Report of Committee on Soil Moisture

Incidence of Flooding.

Kellogg: I want to make one comment on the first part of Arnold's report on the flooding memo. That was designed simply to give soil scientists a method to include in the published soil survey the observations that they had already made. There was no thought that they make additional observations. The memo was based on experience. Some of the published soil surveys already had adequate material in them.

Permeability Classes.

Bartelli: Some states are still using the five permeability classes listed in the Soil Survey Manual. They like the moderately slow classes which is 0.20 to 0.80 inches per hour. It relates well to experience with rating soils for septic disposal.

Smith: To get classes that are equally divided for the kind of range with which we are dealing, separations should be made on a geometric scale. On such a scale 0.63 is half way between 0.2 and 2.0. If, on the other hand, a class is set with a range from 0.2 to 0.8 and another one from 0.8 to 2.0 you have quite uneven classes and reliability of placement in these two classes is not going to be the same.

Klingebiel: Classes should be set so that we can relate them to our actual field experience. Any soil which we have called moderately permeable has been suited for filter. The auger method is used to determine filter seals.

Smith: The auger hole method uses a 6 inch head of water and the Uhland core method a half inch or an Inch. So, even if other conditions were strictly comparable results would be different by the two methods. Under such conditions it could be that a rate of .63 Inches per hour with a half inch head would be comparable to .8 inches per hour using a 6 inch head. There are other problems with the auger hole method such as time of year when the tests are made and kind of clay.

Kellogg: It would be important for tbe committee to discuss ways and means of getting comparisons between methods.

Baur: The committee can look into this subject. Results of studies comparing methods should be brought to the attention of committee members.

Water table.

Smith: You get a very large difference between the apparent water table and the true water table under two conditions. If there is ground water under hydrostatic pressure, the water table will appear to be much higher than it should. This is not a common situation, but it does occur. The other situation where there would be a rather large difference would be in a soil in which there is a perched water table. If the bore bole goes through the impermeable layer into a permeable layer, it may appear that there is no water table in the soil.

Depth to Water table.

Smith: The depth classes, with one of the breaks at 30 inches, are proposed so that the dividing line between two of the classes fits the lower limit (30 inches) of the control section of a good many soils. This is the 30 inch lower limit for the control section used In the new comprehensive soil classification system. It is being used with soils in recent alluvium, and with various other soils with weakly developed horizons. The classes as set up in 1960 coincided at 20 and 40 inches with control sections proposed at that time. A change was made in limits of control sections and 30 inches is the only value now being used.

Soil Aeration or Soil Drainage Classes.

Baur: Do we need drainage classes?

Smith: No. If we describe conditions accurately there is no need for classes. If we specify whet the water table situation is or what we infer that It has been, then the class problem disappears.

Baur: We need more information and data on height and duration of water tables so that we can make this kind of terminology meaningful in describing soil..

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
Washington 25, D. C.

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
Chicago, Illinois, March 25 - 29, 1963

Report of the Committee on Shape of the Soil Areas

1. Regional Committee Reports.

Only one region, the North Central one, had or has a committee on shape of soil areas. An ad hoc committee of the North Central Regional Work Planning Conference reported in March 1962. Following are statements and recommendations from that report:

(a) "The committee agreed that shape and size of soil area6 was a problem on which little effort has been expended. However, the committee felt that the problemis one of post-survey interpretation and in most cases did not want size and shape of soil areas to be given additional consideration in determining mapping units."

(b) "The present management recommendations in most soil survey reports imply that each mapping unit can be treated separately. However, most fields contain more than one mapping unit. The occurrence on the landscape of soils of widely different productivities (i.e., paleosols, rock outcrops, solonetz, etc.) and soils of quite different slopes in rather intricate patterns are examples of problems under the general category of 'Shape and Size of Soil Areas.'"

(c) "One immediate problem associated with the evaluation of shape and size of soil areas is one of methodology. A large portion of a committee or special study group's efforts must be concerned with developing methods for evaluating shape and size of mapping units."

(d) "Since many of the problems affected by shape and size of soil areas must await adequate methods before they can be studied, this committee recommends that this subject be a topic on the agenda at the next National Soil Survey Workshop and that no national committee be formed."

As is evident, only'one of the regional committee's recommendations has been accepted.

The minutes of the Northeast Cooperative Soil Survey Work-Planning Conference of January 1962, state that shape of soil area is not an important problem in the Northeast.

2. Scope of National Committee.

2.1 Some members of the Work-Planning Conference have had the idea that this Committee would deal with shape of soils, that Is, with configuration of the soil surface. This is notcorrect.

2.2, Although the Committee title suggests that its charge was to deal strictly with problems resulting from shape of soil areas, this proved to be too narrow a restriction. The committee decided to concern itself with three intimately related characteristics of soil areas: their shapes, their sizes, and their geographic associates. The committee also agreed that relative position in or on the landscape may be an Important characteristic of areas of some soils.

3. Nature of the Problems.

3.1 Quotations from two documents illustrate clearly the nature of the problems that were primarily responsible for the establishment of this Committee:-

(a) First, this statement in a memorandum from Mr. R. D. Hockensmith: "In preparing the pamphlet 'Land and Rater Resources--A Policy Guide' issued May 1962 by USDA, a question arose on the estimate that '638 million acres in land capability classes I, II, and III are suitable for regular cultivation.' Is this so? Is not some of this acreage in small or irregular areas that cannot be farmed efficiently with modern machinery? If so, how much of the 638 million acres is in this category?"

(b) Second, these statements from a manuscript entitled "Some Aspects of Soil Classification in Farming" by Frank Riecken: "In Tame County, Iowa, there is a total of about 64,000 acres of Tama silt loam, level phase. If the full complex of corn production technology could be applied, it could produce about 5,760,000 bushels of corn each year. But because it occurs in areas of various sizes and shapes, the possible production may not be realizable. On many areas of this soil associated with Muscatine silt loam, a nearly level toposequence associate, the technologically possible corn production could be achieved. But for many smaller, irregularly shaped areas of Tama silt loam, level phase, associated with and field-dominated by more sloping associates, a cropping system appropriate to the eloping Tama silt loam would likely be the only practical one."

".......The implication to development of Interpretive statements is that predictions may need to be given for the alternative ways in which the mapping Unit will be put to practical use in the landscape;" "

3.2 The Committee considered the question. Are size and shape of soil areas characteristics that should be considered in soil classification and in soil mapping? It was agreed that, although shape of soil area <u>is</u> a soil characteristic that could be use in taxonomy,

(a) it is not being used at present, and

(b) we know of no reason why It should be so used.

It was also agreed that size arid shape of soil areas are problems in mapping that are appropriately settled either during the development of mapping legends or in subsequent testing of legends during the course of the 8011 survey.

3.3 To summarize, size and shape of soil areas

(a) -Are problems of mapping;

(b) Are characteristics of mapping unite that need to be described in handbooks, legends, and reports;

(c) In respect to interpretations are affected by the associated soils; and,

(d) Must be considered in making Interpretations of many soils, particularly in estimating yields.

4. Description of Size and Shape of Soil Areas.

4.1 The Committee recommends that additional emphasis be given to the need for descriptions of size and shape in soil mapping unit descriptions in legends, handbooks, and reports. It recommends that the Washington Office of the Soil Survey issue appropriate directions to bring about the extra emphasis.

4.2 The Committee gives the following examples of appropriate descriptions of mapping units:

(a) Sherman County, Oregon, report manuscript.

Walla Walla silt loam, very deep, 20, to 35 percent north slopes. “This soil has a definite north exposure and occurs on steep elopes. It occurs in narrow bands between the ridgetops and major drainageways. The slopes are convex and smooth, with very few basalt bedrock outcroppings. The soil is not extensive, and individual bodies occupy 5 to 35 acres.”

(b) Monoma County, Iowa.

Napa Soils.
"The Napa soils occur in small areas, each about an acre in size. Some areas are so small that they are indicated on the map by alkali-spot symbols. Normally, they occur in slight depressions within larger areas of Luton soils........The soil is usually cropped the same as surrounding Luton soils, but estimated yields are considerably lower.”

(c) Lynn county, Texas

Randall series.
"The Randall series consists of gray, compact, massive soils that occupy the floors of many of the playa lakes.... Randall clay occurs in all parts of the county, In playa lakes ranging from 2 to 40 acres, in size.....”

(a) Iowa county, Wisconsin.

Osseo series.
"The Osseo series is made up of light-colored, somewhat poorly drained, silty soils in narrow drainageways 8nd on fans. The soils are in small areas scattered throughout the county...."

4.3 Nomeclature.

Terms suitable for describing size and shape of soil areas are:

round	strips	pockets
elliptical	belts	large
oval	bands	small
branched	stringer8	narrow
smooth	crescents	wide
wiggly	oxbows	long
		short

It may he desirable to standardize the definitions of the adjectives Of size. Tim did not permit the Committe to explore fully such standards. For the time being, therefore, writers should give critical sizes in terms of length, breadth, or area, or define the adjectives (narrow,etc.) used.

4 . 4 Block Diagrams.

Three-dimensional block diagrams are helpful in depicting the various sizes and shapes of soil areas that are characteristic of some soil mapping units. Block diagrams are being used now in many soil handbooks and published soil surveys. Additional diagrams are desirable in places where complex size and shape relationships must be explained.

5. Reporting Acreages of Soils and Capability groups in Published Soil surveys.

5.1 As the quotations (3.1) from Hockensmith and Riecken indicate, acreage totals for different kinds of soils or capability classes often lead to erroneous interpretations. "Average total" potent&l production figures for 8 given crop on 8 given kind of soil are, strictly speaking, impossible to calculate on the basis of the total acreage of the certain soil. This is because (a) farmers won't cultivate isolated bodies of soil that are smaller than a certain minimum size; (b) areas of soil that are otherwise good for field crops may be so small or so irregular or awkward in shape that they will be cropped and managed like the surrounding bodies of less suitable soil--that is, at 8 lesser intensity of use or greater intensity of management, or both; and, (c) areas of soil that are otherwise good for field crops may be isolated topographically or geographically in such a way that access to machinery is prevented.'

5.2 Interpretations for individual fields and farms are properly made with consideration of these area-to-area relationships. County totals are of little or no: concern to such interpretations, but are significant to planning on 8 county-wide scale. Therefore, it would be helpful to have, in published soil surveys, a stratification of soil and capability acreage totals according to "alternative ways" in which the different soils "will be put to practical use in the landscape" (Riecken).

5.3 In horticultural enterprises and in non-mechanized agricultural systems, size and shape of soil area are not so important in determining how the soils shall be used. "me big differences cone in those places where field crops are grown in a mechanized system. The most important crops concerned are corn, wheat, grain sorghum, oats, rye, barley, oil flax, soybeans, rice, sugar beets, field beans, canning peas, potatoes in some places, pineapples, and machine-picked cotton.

5.4 The Committee recommends that some tests be conducted to see how to estimate or calculate most efficiently in 8 survey area tbe division of total acreages into two parts;

(a) acreage of areas so large or so situated with respect to other soils that they can and probably will be used so as to achieve the technologically maximum production; and,

(b) acreage of areas so small or irregular in shape, and field-dominated by soils of lower potential productivity, that they will be used less intensively and therefore will produce less than would be technologically possible.

It is suggested that the Washington Office of the Soil Survey arrange for these tests to be conducted in various parts of the country. If the tests show that these calculations can be made accurately and cheaply enough, it will be desirable to incorporate them into regular Soil Survey operating procedures.

5.5 Another soil pattern that causes 8 decrease in the value of the soil resource is that where rock outcrops, Solonetz spots, or other obstructions are dispersed in an area of soil that is otherwise suitable for machine operations. The Committee recognizes the significance of such patterns, especially to predictions of potential yields. The Committee, believes, though, that present directions (in the SOIL SURVEY MANUAL) for use of rocky and stony phases and of complexes of various sorts are clear and adequate for classification and mapping.

6. Research to Improve Interpretations.

6.1 Few-cost return data are available by which to evaluate the economy of use of soil areas of different sizes and shapes when they exist as isolated bodies. The Committee believes that an effort should be made to get such data from engineers, economists, and farm operators.

7. Future of the Committee.

7.1 The Committee believes that its task is completed if the Conference accepts the preceding recommendations.

7.2 The Committee recommends, therefore, that it be discharged.

8. Participation.

8.1 The entire Committee participated in the discussions at Chicago.

Membership is as follows:

A. R. Aandahl
W. H. Bender, Secretary
M. J. Edwards
L. E. Garland
R. D. Hockensmith
W. M. Johnson, Chairman
J. G. Steele

8.2 Others who participated in the discussions were the following:

R. W. Eikleberry
Charles E. Kellogg
A. A. Klingebiel
Alf Leahey
R. M. Marshall
M. E. Noble
J. L. Retzer

DISCUSSION ON REPORT OF COMMITTEE 11

"Shape of Soil Areas"

Dr. Kellogg: Speaking to your last recommendation, have you recommendations about who should evaluate these data, assuming studies can be made?

Mr. Johnson: Our thought was that we have in the employ of the Soil Conservation Service a staff of specialists in interpretation; we have on the staffs of most of the universities and in a number of the cooperating agencies people trained in and interested in interpretations--and that they would be appropriate people to evaluate these data.

Dr. Smith: I wonder if the Committee would be willing to modify "shape" by the word "planar" so that it will be clear that they're not referring to shape of slope.

Dr. Kellogg: When I sat with the Committee we talked about "interruption" - areas interrupted by rock outcrops, and so on. They didn't continue that any further then the Manual. Maybe it does need a little further clarification. What do you think?

Mr. Johnson: As Dr. Kellogg has pointed out, the Committee did discuss this point. This whole business of "dilution" of a good soil by a poor one, or the interruption of lines of traffic with machinery by rock out-, crops, wet spots, peaty areas, and the like. There simply wasn't time for us to go into it in sufficient detail to even see if generalization is possible. We felt that it is possible to generalize in acreage figures about things like Tama silt loam, level, for example, depending on the associated soils and the size and shape of the individual bodies of Tama silt loam, level. Total acreages could be broken down into two or even three, four, or five different subdivisions, depending on the intensity with which these bodies are likely to be used. Certainly it is possible to brdak down the acreage figures to show amounts of rock outcrops, wet spots, Solonetz spots, and so on. The Committee did not go into a full discussion of this question.

Mr. Chepin: Regarding areas of inclusions of other soils in mappable areas, in the State of Washington we now estimate within our mapping units the extent of soil areas of contrasting soils. Thus, it can be pointed out in legends, handbooks and published soil surveys that a given kind of soil mapping unit has 10 percent of soils of low yield. or other important difference. We also should point out that there are small patches, or odd-shaped areas of the given "good" soil that cannot be used for cultivated crops. This situation might be estimated by the napper and reported in the soil survey report 'manuscript.

Dr. Kellogg: I think that the case of rock outcrops is quite clear. I agree with the Chairman, I don't see how we could do this in a national definition. Perhaps locally we could set aside elao the areas in which there would be significant interruption of normal machine traffic. The case of Solonetz spots is not quite so clear, because in a good many places those things are dry when the farmer carries on his tillage and the spots do not interfere with machinery. They do cut yields. In other places, as Alf

Leahey and I discussed in Canada, where we are getting real close to the time when cerals need to be planted, the Solonetz spots are wet end they have a similar effect to rock outcrops - the machines must go around them. And if the farmer waits a week, he might just as well not seed the field. These kind6 of condition6 will have to be dealt with by local Judgment. We cannot have simple notional etanderds.

Dr. Kellogg: I am glad that this subject got on the agenda. We're concerned with the use of the soil survey. We don't want to mislead our users. It has seemed to me that this matter of shape of areas is something we ought to give attention to. Now, I'm not 8ure we need to give attention to it in every area. I have no doubt that in most of the New England are88 where they use small machinery in horticulture, this may not be a very big problem. But in the Great Plaines States and in the State8 producing much corn and machine-picked cotton, shape of soil areas is important in the interpretation of our soil surveys. if we're not to mislead people. Is there general agreement on that, that we ought to continue to make some Study Of this, or does somebody object to that?

Mr. Orvedel: I thick that this is 8 matter of considerable consequence, but it is not limited to the shape of soil areas. Linear features, whether they're called area8 or not, have the same effect--like e little stream going through 8 field.

Dr. Kellogg: That was discussed. If the Chairman put that in the report, he didn't reed that part. We folt that by the samples from the general soil map of a county, the soil scientist - either the party leader or some member of the part - could regularly scan representative samples, end by considering the adjoining soils, stream breaks, railroads, and highways--he could make 8 Judgment. You see, we would not need real precise figures, even if we could get them, because of the rapid changes in technology. If we could say that somewhere between 20 and 40 percent of Tama silt loam doe8 not lend itself to the maximum width tillage, that would be interesting and valuable information. If we made it 37 1/2 percent, in two years it would cot be 37 1/2 percent, because of changes in technology, roads, end railroads.

Mr. Orvedal: Comment too garbled to be transcribed.

Hr. Maletic: In the irrigated portions of the West, this has been a long-standing problem. From 5 to 20 percent of the ere8 of soils otherwise suited to irrigation may have to be eliminated because of isolation or irregular shape. Also, shape of soil area affect8 length of irrigation run and loss of area due to turn-rows.

Dr. Kellogg: That's correct. Any form of rural lend classification - and by "lend classification" I mean the classification of tracts of lend ha8 to take this into account. We did this in the tax assessment work in North Dakota. But there we took account of areas in detail; we measured the areas. I don't think we want to do that in moat of our soil surveys. Of course if we are making 8 land classification for planning irrigation for tex assessment, we have to have more detail than the Committee thought we should do generally in most soil surveys.

Dr. Arkely: I was recently involved in a law suit involving large tracts of land in which there were a number of appraisers involved. A million-dollar deal. The appraisers used the Same technique of applying, in some cases in a given landscape, a fixed percentage as wastage. However, I do not think we need to be concerned ebout that because most people dealing with this sort of ltnd problem will take care of it, and they understand it. I think, though, thst in preparing the acreage measurements it would be appropriate to make some stratification according to size of the blocks of individual bodieo of soils. For example, if ninety percent or more of a given Soil occurs in areas smaller than 10 acres, it isn't going to contribute much to the productivity of the area,

Dr. Kellogg: This appears to he in line with our thought that: if we have a field here (indicating on blackboard) and there are small areas...spots of Tama around in it, if they sit in a matrix of soil that is just about as good for corn and have about the same practices as Tama, then we wouldn't down-grade the field for being spotty. We have to scan the maps in order to see what kinds of soil are involved. Of course, any qualified appraiser would know that if there is an uncrossable stream here, he has to measure out the separate areas. Let's say that we're in the wheat-grazing country. Here an area of grazing land, within a potential wheat field should show a rating even less than that for grazing. Here (drawing on the blackboard) the grazing rating on this whole area would be 25, and the wheat rating for the better soils would be 60. We cannot give thie one 60 because part of the soil is too cut up for wheat; but nether can we give it 25 because it's impractical to use part of the soil for grazing a good deal of the time since the farmer cannot graze it while he has wheat on parte of the field. So it would even be under 25. Now, this is a lot more detail than should go into in our general soil survey reports. But the appraiser does need to take these details into account if the results are to be fair.

Mr. Barnard: (Remarks garbled)

Dr. Kellogg: We've got two problems. The first is an important one in New England--the size of the areas. I did not meet with the New England Committee but I think they meant that our maps were clear. Under the kind of agriculture they have, by inspection of the maps, and with the estimates that we make in the Soil Survey about the use of the soils we were not misleading the users.

Dr. Baur: That's right. We've got the problem.

Dr. Kellogg: Yet in other areas, we may be misleading people about the total area of land that is actually suitable for the economic production of certain crops.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
Chicago, Illinois, March 25 - 29, 1963

Report of Committee on Soil Texture; Coordination of Textural Classes and Grain Sizes

INTRODUCTION: For several years there has been no committee on soil texture;, the 1963 committee, therefore, can be considered new. Since the early committee on soil texture completed Its work more than a 'decade ago, applications of our soil surveys to engineering have become increasingly important; furthermore, such applications are likely to increase in importance, at Least for a while. In the development of tbe new system of soil classification, now nearing completion, an awareness of relevance to engineering ban been maintained in the selection of criteria; Consistent with this awareness, the first and perhaps most important objective of this new committee was to deal with certain criteria proposed for grouping soil series into families; but the committee also considered other problems the cognizance of which has bean brought about by engineering applications, of our soil surveys and by basic research in morphology and genesis of soils,..

OBJECTIVES: Three principal ones:

1. To evaluate the significance to engineering of the soil taxture criteria proposed for grouping soil series into families.

2. To examine the eat of grain-sise limits used by the Soil Survey, in relation to sets used by engineers and geologists, and to suggest or recommend Ehifte, if any, in soil survey grain-size limits so as to improve the correspondence with other sets in common use, especially by engineers.

3. To consider, the problem of soil texture designations for soils, such as those high In allophane, for which laboratory determinations of texture differ widely from field determinations or other indicators of texture.

Out committee had the assistance of two engineers in. its deliberations, Mr. Bay Decker;: who is in charge of the Lincoln SCS Soil Mechanics Laboratory, and Mr. Adrian Pelzner of the Bureau of Public Roads, We' appreciate their assistance.

Our committee first reviewed the report by the 1962 Committee on Soil Texture of the Northeast Soil Survey Work-Planning Conference. This NE Committee concluded that the upper Limit of silt size posed the principal problem in coordination of our soil survey grain-size limits with those of other systems,. It recommended that a solution to this problem be sought as soon as possible but did not itself propose a solution. Other regional committees have called attention to the disparities between our set of grain-size limits and other sets of such limits and have suggested that elimination or reduction of those disparities be sought, but again no specific solutiono were proposed.

First Objective:

In considering the first objective,' the committee concentrated its attention upon those criteria proposed for grouping soil series into family taxa on the bases of soil textures tentatively identified as light loamy, light silty, heavy loamy, and heavy silty. The "light" is to be differentiated from the 'heavy'! on the basis of clay content, the "light" having lees then 18 percent clay, the "heavy", more than 18 percent clay.

The evidence at hand indicates that, in both the AASHO* and Unified** engineering soil classification systems, the classes of fine-grained soils correlate reasonably well with clay content even though clay content itself is not a criterion in these classification systems. Instead of clay content, the liquid limit and plasticity index are used as criteria; but it happens that both these parameters correlate fairly well with clay content for many soils. The type of clay, of course, is important; a *given* percentage of montmorillonite, for example, will induce much higher values than an equal percentage of kaolinite. Yet, probably because the clay fraction of many, perhaps most, soils, at least in the conterminous United Staten. is made up of a mixture of clay minerals, the correlations of clay contents with liquid limit and plasticity index are fairly good; the correlation coefficients are on the order of 0.8 to 0.9.

In relation to the AASHO soil classification, a separation of loams, sandy loams and silt loams on the basis of more or less than 18 percent clay would result in a substantial improvement in the correlation between soil survey textural groups and AASHO groups (see attached chart). With this separation we could say with considerable confidence that the light loams, light silt loams, and the light sandy loams are A-4 soils in the AASHO classification, and that the heavy loams, heavy silt loams, and heavy randy loams are A-6 soils in tbe AASHO system.

In regard to correlations with the Unified classification, a separation on the basis of 15 percent clay, the limit originally proposed, would be better than 18, although the 18-percent limit would still result in a great improvement over the alternative of no aeparation of loams, sandy loams, end silt loams (see attached chart).

Many soils, perhaps most soils, with a clay content somewhere between 15 and 18 percent, are likely to have liquid limits and plasticity indices close to the threshold at which these characteristics become important to engineering.

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* Standard Specifications for Highway Materials and Methods of Sampling and Texting (Pt. 1, ed. 8, 1961); The Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes, AASHO Designation: M145-49(1).

**The Unified Soil Classification System. Tech. Memo., 3-357, v. 1, Waterways Experiment Station, Corps of Engineers. March 1953 (14).

Our committee concluded that the grouping of series into families on the basis of a clay content between 15 and 18 percent would substantially enhance the interpretation potential of soil families for engineering purposes. In fact, the enhancement would be so great that it alone is a strong argument for adopting some limit between 15 and 18 percent

The committee was unable to determine, with the limited information at hand, which percentage between 15 and 18 would be best; but in view of the Present proposal to use 18 percent as the critical limit, this committee

> RECOMMENDS that the grouping of soil series into families be tested using 18 percent clay content as the critical limit for separating light loamy from heavy loamy soils, and light silty from heavy silty soils.

If this trial grouping of series into families appears to be successful, the committee feels that some complementary testing should be done before final acceptance of this proposed texture criterion. This testing should ascertain whether field men can determine, with acceptable accuracy, the additional textural classes that would result, This committee, therefore.

> RECOMMENDS that a test be made of the accuracy with which the accitibnal textural classes can be determined by the manual field method.

If all the testing proves to be favorable and the proposed texture criterion is adopted, a revision of the definitions of textural classes and the texture triangle will then become necessary.

In regard to the proposed lower limit of 35 percent clay for fine textured soil groups, the committee concluded that this limit would produce somewhat better correlations with classes in both the AASHO and Unified engineering systems than the 40 percent limit proposed earlier.

__Second Objective__:

The committee next considered grain-size limits. Noted first of all was the obvious fact that some grain-size limits used by the Soil Survey differ from those in widespread use by engineers and also by many geologists. Noted also was the fact that these other sets of limits differ one from another.

In regard to clay-size particles, the concensus was that a sound scientific basis exists for an upper limit not larger than 0.002 mm., and that any change should not ba considered, even though 0.005 mm. is still the common limit in official engineering systems.

The committee discussed at some length the upper silt-size limit, which is 0.05 mm. in the Soil Survey system and 0.074 in most engineering systems. The difference is enough to be a nuisance, but, in the opinion of the committee, not enough to be significant to soil behavior. It was pointed out that the Soil

Survey has a partly systematic progression of grain-size limits; a shift to 0.074 mm. would destroy, for practical purposes, this progression. A shift to 0.074 mm. also would increase tha silt-size range, which is already large. If the silt-size range ware to be increased, consideration simultaneously ought to be given to subdividing it into fine silt end coarse silt with 0.02 mm. the dividing limit. Fine silt would than correspond to silt in the International sys tem. It was noted that 0.074 mm. is about the midpoint in the range for very fine sand, and if a shift were to be made to 0.074 mm. there no longer would be a need for the very fine send separate, a result which was viewed with favor by some,

The committee noted also that the Soil Survey now subdivides the sand separate into five subclasses, whereas the Unified system subdivides sand into three subclasses and the ASTM and AASRO systems into only two. Dc we nead five subclasses? Can field men distinguish five classes with acceptable accuracy? These questions mere asked but not answered. It was also noted that subclass limits of gravel varied among the systems, although there is good agreement on three inches as the upper limit for gravel. After recognizing the disparities noted, the committee concluded that a recommendation about the upper limit of silt should 'not be made until the whole array of grain-size limits from the lower limit of silt to the upper limit of gravel is studied, and the committee, therefore,

> RECOMMENDS that a study be made of, the set of soil survey grain-size limits to determine which changes can be made to obtain closer agreement with other principal systems without significant impairment to mapping, characterization, and interpretation of soils by the Soil Survey.,

In regard to the proposed texture groups for testing the grouping of series into families the committee concurs with the Soil Classification Conference (Feb. 1963) in the placement of very fine sandy loam with the appropriate loamy or silty groups rather than with the sandy groups.

Third Objective:

The third objective of the committee was to consider texture designations of soils for which laboratory determinations differ widely from field determinations. Cur Soil Survey Manual states that ". . . laboratory data . . . from mechanical analyses are nom regarded as absolute guides (to textural class names) in the mainland of, the United States," although it also acknowledges that the standards set forth are not perfect end anticipates improvements for Tundra soils and Latosols in which clays generally have different mineralogical composition from those of soils in temperate regions.

This problem has two aspects. On the one hand there are soils high in allopbane clay which cannot be dispersed, at least not adequately. On these soils, particle-sire analyses yield clay percentages that era too low, not only in comparison with manual determinations in the, field,, but also in comparison with other evidences of clay such as total surface:, base exchange capacity, and moisture retention under 15-atmosphere tension.

The other aspect concerns soils, or soil horizons, such as the C horizon.9 of deeply weathered soils on the Piedmont in SE United States and also on igneous rocks in California. In some of these soils particle-size determinations yield clay contents much greater than commonly indicated by manual field estimates of texture. Our Soil Survey Laboratories have recently discovered that many of the minerals which until now were thought to be mica are in fact kaolinite pseudomorphs of mica, and there may be similar pseudomorphs of feldspars too. Many of the pseudomorphs are of sand-size and apparently stable enough so that they feel like sand, unless rubbed quite vigorously between the fingers, and to some extent behave as sand grains. Yet when submitted to particle-size determination in the laboratory, they disintegrate into clay-size particles. The resulting total clay contents may be on the order of 60 percent for soils that may have been classed as clay loams in the field. Whatever the explanation, the disparity between manual and laboratory determinations of texture is great enough to merit investigation, not only to improve the correlation between field and laboratory texture determinations, but also to ascertain the proper interpretation of textural classes.

The committee concluded that it lacked the necessary knowledge to propose solutions to the problems of texture designations for soils high in allophane as well as for soils that contain kaolinite pseudomorphs of other minerals, and it, therefore,

RECOMMENDS that research be undertaken to develop guidance for textural designations on such soils.

A somewhat related problem was posed in regard to hardpans, such as those that occur in the Noncalcic Brown soils, and to permafrost layers. Samples from such hardpans and permafrost layers may, when submitted to ultimate dispersion in the laboratories, yield conventional texture classes. One point of view expressed was that the hardness of the hardpan or permafrost layers is a matter of consistence and not texture. The other view is that some hardpans and permafrost layers in their natural environment behave more like rock strata than discrete soil particles and, therefore, texture, as determined on laboratory samples, has little, if any, meaning in relation to plants. The committee took no action on this matter.

Other' Items:

In addition to dealing with the three major objectives the committee concerned itself briefly with three other items.

1. During the discussion about grain-sizes, it was learned that, in the collection of soil samples, the amount of material larger than 2 mm., much of which commonly is discarded, frequently is determined with insufficient accuracy, The committee, therefore,

   RECOMMENDS that the percentage by weight of fine gravel and coarse gravel be determined by the necessary sieving and weighing in the field, unless the sample is large enough to include all the gravel,

2. The committee noted that the word "texture" has acquired in soil science a meaning quite unrelated to its etymology, unrelated to its common meaning. While the committee recommends no substitution for the term "texture" at this time, it nevertheless does call to the attention of this conference the fact that the special meaning of texture in soil science increases the difficulty for non-soil scientists to understand and make use, of our soil surveys.

3. Another term which causes confusion is "soil class" to mean soil textural class. Non-soil scientists commonly interpret soil class to mean a taxonomic class or some other group of soils. The committee recommends no substitute expression at this time, but it does suggest that the word "textural" be used so that the expression will read "soil textural class" rather than simply "soil class."

Regarding Continuance:

This committee feels that it has responded conclusively to one of the principal purposes for its existence' and that the unfinished business probably could be assigned to other committees, such as those on Laboratory Characterization of Soils or on Soil Morphology. The Committee on Texture, therefore,

RECOMMENDS its discontinuance provided its unfinished business can be assigned to other committees.

Committee Members:

Arnold C. Orvedal, Chairman
Lindo J. Bertelli
John A. Elder
Klaus W. Flach
Gerhard B. Lee
R. P. Matelski
John E. McClelland
Dirk van der Voet

Other participants in committee meeting at Chicago:

John Day
Adrian Pelzner
Charles E. Kellogg (evening session)
John T. Maletic
Kay S. Decker (afternoon session)
Harvey Oakes (evening session)

DISCUSSION OF REPORT OF COMMITTEE ON SOIL TEXTURE

(Summary by Orvedal)

The recommendation for, the conditional abolishment of the committee was taken under advisement; Dr. Kellogg stated that the attainment of, better inter-discipline agreements on grain-siaa limits and better correlation between classes of soil texture and classes in engineering systems of soil classification is important, probably important enough to werrant retention of the committee,

Much of the subsequent discussion centered on the effect that the probable' abolishment of the very fine sand separate would have if tha upper limit of silt should, ot some later date, be shifted from 0.05 mm. to 0.074 mm. Such a shift probably also would entail an enlargement of fine sand to 0.074 - 0.25 mm. and the establishment of coarse silt with limits of 0.02 - 0.074 mm. and fine silt with limits of 0.02 - 0.002.

Dr. Grossman suggested that very fine sand should not be abolished without first making a careful analyses of the effects such a change would have on possible deductions about soil moisture relationships. Ulrich stated that very fine.: sandy loam was an important textural class in irrigated soils in California; and, he added later, that in the Columbia Basin in Washington, coarse silty soils had been separated as phases from the fine silty soils because of significant differences in moisture relationships. Dr. Ulrich was asked to prepare', for the committee's consideration, a statement about the relationship of soil textural classes to irrigation practices.

Dr. Smith explained that one effect, deemed desirable by many, of applying the proposed texture criteria for the new soil classification would be to combine into families those soils developed from loess and to exclude from such families those soils developed from glacial drift and other materials. Soils developed from loess would be in either "light silty" or "heavy silty" families. whereas, most soils developed, from till and many other materials would be in "light loamy" or "heavy loamy" families. As vary fine sand occurs in loess, at least in loese near its source, and as very fine sand has moisture relationships more like those of silts than of: other sands,. very fine, sandy loams have been included with the silty textural groups rather than with, the loamy textural groups.

Dr. Smith doubted that raising the upper limit of silt to 0.074 mm., with a simultaneous elimination of very fine sand as a separate, would impair -the desired groupings of series into families, although he would like Grossman to check thie with laboratory samples. Dr. Smith also doubted that inclusionof the lower half of very fine sand with silt would edversely affect potential deductions about, moisture relationships for the silts, at least not fur the coarse silts.

Dr. Maletic expressed the opinion that coarse silt and fine silt have significantly different moisture relationships and, therefora, would. be useful separations. Flach indicated that the correlation between available water capacities and particle-size classes would become poorer if the very fine sands were included with the silts using the present size limits, and that correlations would be improved if the silts were to be subdivided into coarse silt and fine silt.

In response to questions about agreement between field and laboratory determinations of soil texture, Drs. Simonson and Grossman stated that textures determined in the field frequently differ from textures determined in the laboratory, at least for loams and the sandy textural classes. Presumably, most differences did not exceed one textural class in magnitude. Dr. Smith added that many soils designated as very fine sandy loams or loamy very fine sands in the field turned out to be silt loams or silts on the basis of. laboratory determinations.

Dr. Kellogg recalled that vary 'fine. sand, loamy very fine sand and very fine sandy loam were important to highway engineering in Michigan. There was a strong tendency for ice lenses to form in these materials with resulting damage to the highways. Perhaps coarse silt, if expanded to include half of the very fine sand separate, would identify these frost-susceptible materials just as well as very fine sand.

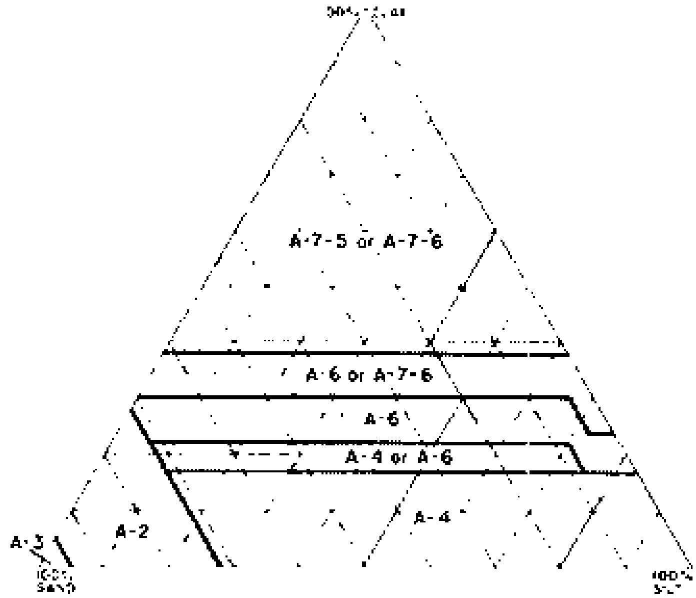
Dr. Kellogg also pointed out that classes in the engineering soil calssification systems carry no connotations of soil morphology as we understand it. Interpretations, therefore, are restricted to those possible for classes roughly equivalent to our texture classes. In contrast, we, in the Soil Survey, rarely, if ever, make interpretations based upon texture alone but upon texture and other relevant morphological features, such as consistence and structure. There is not much justification, therefore, in having soil textural classesrefined beyond the precision of classes of consistence, structure, and other morphological features, Perhaps our separates and 'textural classes could be evaluated batter if we also considered the Atterberg limits and the kinds of clay minerals.

There was criticism of the committee's recommendation that percentages of gravel be determined by sieving and weighing in the field, It was pointed out that this recommendation was at varianea with a related recommendation made by the Committee on Laboratory Characterization of Soils. Dr. Carlisle stated that field sieving of soils. in which the fine material is cohesive and not only sticks together but also adheres to the coarse fragments, is difficult indeed. Dr. Grossman added that the sample size, in order to be "adequate" for material as large as 3 inches in diameter, should be on the order of 1,000 to 1,500 pounds!

Dr. Bartelli explained that the intent of the committee's recommendation was to improve the estimates of gravel and he asked if there were some other way to attain this improvement. Grossman answered that some improvement might be possible by "cross-sectioning" or "gridding" a sufficiently large profile surface to aid in making more careful estimates of the volumes occupied by gravel as well as by fragments coarser than gravel. Dr. Kellogg suggested that to measure carefully the coarse fragments in about 3 profiles in a county would be useful; these could then serve as benchmarks for estimating coarse fragments in other profiles, Grossman suggested that to have coarse fragments, including gravel, as "percentage by volume" was more useful than "percentage by weight." Dr. Kellogg replied that this was a disputable matter. Most of our determinations of plant nutrients, such a8 available phosphorus, are calculated On the basis of soil material smaller than 2 mm. set a8 equal to 100 percent. These determinations ignore the soil volume, which may be occupied in part by stones, big roots, etc. It is the concentration of nutrients around the small plant root8 that's important. Dr. Kellogg added thet he would like to see a comparison of the accuracy of fertility recommendations pertaining to available phosphorus, for example, expressed on the basis of soil volume versus soil wright.

* * * *

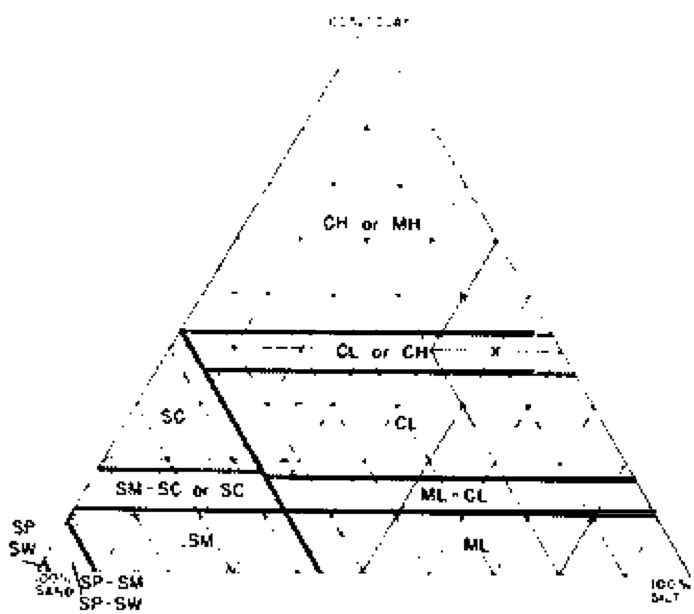
Encl: One page with two summary charts of generalized relationships of AASHO and CE (Unified) soil groups to USDA (Soil Survey) Soil Textural classes.



SUMMARY CHART GENERALIZED RELATIONSHIP OF AASHO SOIL GROUPS AND USDA TEXTURAL CLASSES

USDA TEXTURAL CLASS BOUNDARIES
———— GENERALIZED LIMITS OF AASHO SOIL GROUPS

ADVANCE COPY from manuscript of "The Relationship between Selected Pedological Data and Two Engineering Classifications of Soils" by Rieger, et al. SCS, Oct. '57



SUMMARY CHART GENERALIZED RELATIONSHIP OF CE SOIL GROUPS AND USDA TEXTURAL CLASSES.

USDA TEXTURAL CLASS BOUNDARIES
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UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

NATIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY
Chicago, Illinois, March 25 - 29, 1963

Summary of Conference

Charles E. Kellogg

We have had a good conference here. These conferences always Lift my morale. Some of us were talking about the reasons thin morning. We hear a lot nowadays of the importance of inter-disciplinary conferences, with economists and natural scientists together, and groups of natural scientists from different disciplines. Yat we must never fail to appreciate that every scientist also needs close communication with his peers, Unhappily, I once had to get quite well acquainted with the Mayo Clinic. The leaders explained that they never set up a new department of medicine or new specialization unless they bad the finances to hire at Least two top people in that field. They never had juot one alone. Their experience had shown that the lone export begins to become overconfident or to lose confidence if ho has no one to talk to at his level of competence. I realize that many of our soil scientists do have rather lonesome positions. It is important that all of us have opportunities to talk with our peers--with people of nearly equal competence and equal responsibflity.

I should like to point out a few conclusions and a few items of unfinished business: We have three major writing projects that are bearing down on us. Their priorities are as follows:

1. We need to complete the Soil Survey Policy Guida. This will be a loose-leaf document with numbered paragraphs to include the items in our Soil Survey memoranda, We hope to have it well indexed. Some of the material in the earlier memoranda will be omitted. Partly, the early memos were educational. I think we now have a right to assume that many items are not necessary any more in that form.

2. We should complete in written form the new system of soil classification. (Others even urged ma, Dr. Smith, not to approve any more travel for you until this was completed.) We've had to do this work with our left hands while the show went on. And Dr. Smith will continue to have other responsibilities besides completing this job.

3. After these jobs are finished we should develop a third edition of the Soil Survey Manual. This too will be a large undertaking. We need to prepare for it. From people like you I should like to have any ideas about content and arrangement as compared to our current Manual.

It is clear from all the discussions we had the last two weeks that we uaad to make some substantial management improvements in our methods of soil correlation. Dr. Simonson has been a&ad to prepare a document of considerable length based in part on tka many "court decisions" he has made about soil correlations and his reasons. But he will not be able to do that now until we can get a little more lead time on current correlations. gut we will send out rather aoon a document on the management and operations part of the soil correlation job, In this advisory notice we need to remind our State conservationists, area conservationists, and soil scientists about key points. I don't thick we really have a lot new to tell them, but we can give emphasis and explain tka consequences of not paying attention to the key operations. We shall try to be clear but one cannot cut up this job with a knife. One can hardly say exactly where the field party leader leaves off and senior correlator begins; OK where the Stat8 soil scientist end the principal soil correlator join hands. Soil correlation is a process involving several people; but perhaps wa can sharpen it up a good deal.

One small item I forgot to mention the other day, Dr. Bartelli, when you were presenting your report. The people in the Bureau of Public Roads have assured me that the test data made in connection with planning the superhighways in many counties and cities are available for our use. These are not published but are on file with the responsible engineers in tke State highway departments. In some places these could be of considerable help.

I was not here to hear the discussion of forest soils. I think we've made a lot of progress. There is a lot of interest, but I think we've got to do a little cleaning up of our methods. Commonly people in forestry locate even-age stands and make their measurements on many plotc, and then ask the soil scientist to identify the kinds of soil on the plots. Now this it3 not a good procedure, art we agreed in Monroe. Under it we get a lot of stuff that takes much time to interpret OK tbst simply cannot be used, A plot is commonly off on one side OK the other of the range of the kind of soil it represents. In fact, we are lucky if there is not a soil boundary right through the middle of the plot. On the other hand, we have people locating plots on the basis of soils and then baving one tree on tke plot: And I don't know what we are going to do with data from such plots, We probably have a few people bighly skilled in both forestry and soils, and such individuals aould locate proper plots. But I do not really believe tkat we kava many such people. Mainly plot selection is a joint job. We need to put mow emphasis on fair samples of both the kind of soil and the kind of vegetation that we're studying. Then we can have a high percentage of usaable plote. In some areas there are more plot data that cannot be used than there are data that can be used.

Now for a piece of unfinished business: I think one of tke biggest weaknesses in the present state of our soil science is a lack of knowledge of soil biology, In many of our problems we have gone just about as far as we can go with morphological techniques and with chemical and physical laboratory techniques. We need much more consideration of the effects of both the mall animals--earthworms, termites, ants, and the like--and the bacteria and fungi. Wa have vary few soil microbiologists in the United States with high-level skills in soil morphology. Some simply work with surface soils without reference to the genesis and morphology of the whole soil. So we need somewhere in some institution, ours or somewhere else, some people who are just as well informed on soil morphology as any of our leading soil scientists but also have high skills in biology.

AC one time our coil chemists didn't know much about soil morphology. Sow many soil chemists are also highly skilled in soil morphology and they are every so much more effective in Chat work. I wee impressed with the soil biologists in New Zealand. They have this kind of competence that we now expect of our 6011 chemists, They are thinking of the whole soil as much as our soil scientists working in soil chemistry and physics. Soil biology is a serious limiting factor with us.

I should like to tell another story about New Zealand. Many of you know Norman Teylor. He is one of the best research leaders I've ever known. We hed a little party for him where people presented little talks. One called Norman Taylor a humble man, with which I agree, and also a simple man, with which I don't agree. Any man that can get everybody from the lowest worker to the Prime Minister to do what he wants is not simple, even though ho may be humble. Well, Norman wanted to get a new soil science. building. When I was there in '49 their quarters wero left-over United States temporaries along tk quay in Wellington, They were quite simple, indeed, and crowded. So Norman designed his new building and in the process he cut out a good deal that he wanted. Finally he got the building designed. It kicked around the Cabinet but he could not get it approved.

Meanwhile the animal huobandry people had been working on a facial eczema disease of sheep. Some poison caused the disease, They had been able to extract a few milligrams of this poison. Norman Toylor bad on his staff the kind of soil biologists thst I've boen talking about,, They got the idea that this disease wee related to the soil, perhaps something in the soil flora. They finally located a fungus that grows in the soil which throws out spores containing this poison, They were able to make the poison by the pound. When they had the research sewed up reasonably well, they arranged demonstrations for tho Minister of Finance, the Minister of Science, the Minister of Agriculture. (Now you understand sheep are very important to New Zealand. I hadn't seen so many sheep per acre before.) So the next day the Minister of Finance told Norman Taylor that he had signed the requisition for his building and he was not even bothering to send it to the other Cabinet Ministers because he knew they would approve it anyway. Now I believe there is morel in this story. Unhappily, we may not have soil biologists who can get a building this way. But we can see that our work results in something thet people need, that prevents waste, and that improves the economic growth of the country. And I think that's what we're doing.

Thank you, gentlemen, and have a pleasant trip home.